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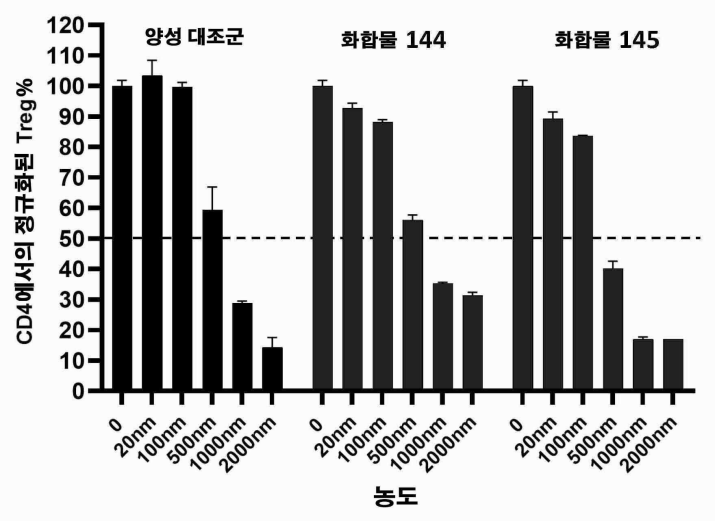
전체 청구항 수 : 총 167 항

(54) 발명의 명칭 **AKT3 조절제**

(57) 요 약

화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물이 기재되고, 여기서 다양한 치환기들은 본원에 정의되어 있다. 이 화합물은 시험관내 또는 생체내에서 Akt3의 특성 또는 효과를 조절할 수 있고, 다양한 병태의 예방 또는 치료에 개별적으로 또는 다른 작용제와 함께 사용될 수도 있다. 상기 화합물을 합성하는 방법이 기재된다. 약학 조성물, 및 상기 화합물 또는 상기 조성물을 다양한 병태의 예방 또는 치료에 개별적으로 또는 다른 작용제 또는 조성물과 함께 사용하는 방법도 기재된다.

대 표 도 - 도16



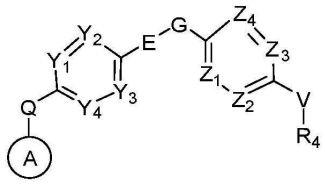
(52) CPC특허분류
A61K 31/4709 (2013.01)
A61K 31/519 (2013.01)
A61K 31/5377 (2013.01)
A61P 25/00 (2018.01)
A61P 29/00 (2023.02)
A61P 3/04 (2018.01)
A61P 35/02 (2018.01)
A61P 37/00 (2018.01)
C07D 401/14 (2013.01)

명 세 서

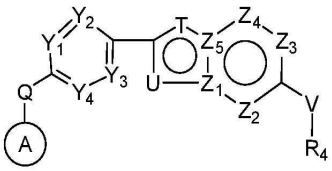
청구범위

청구항 1

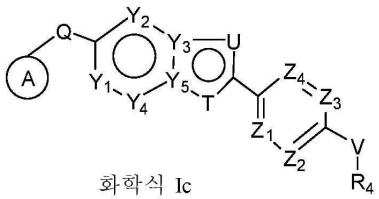
하기 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물, 또는 이의 약학적으로 허용되는 염:



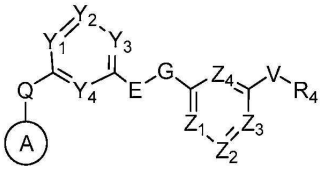
화학식 Ia ;



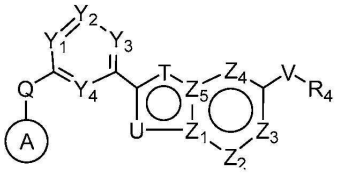
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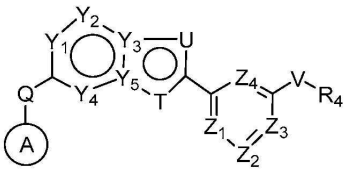
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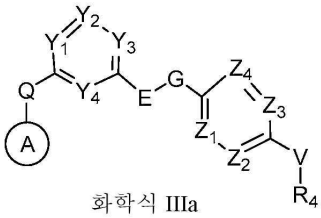
화학식 IIa ;



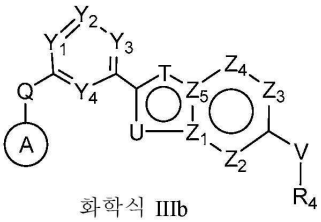
화학식 IIb ;



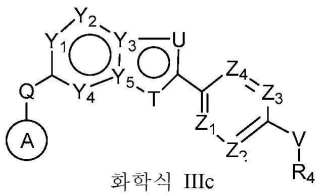
화학식 IIc ;



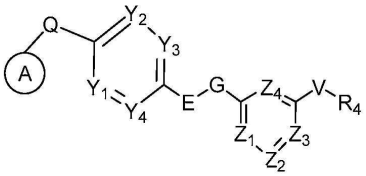
화학식 IIIa ;



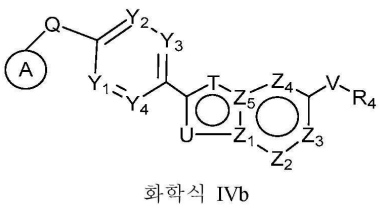
화학식 IIIb ;



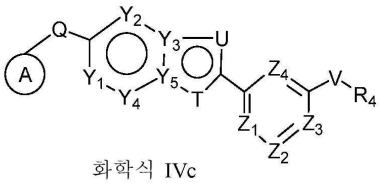
화학식 IIIc ;



화학식 IVa ;

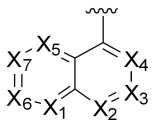
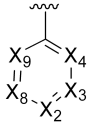
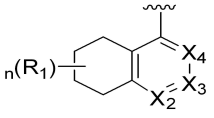


화학식 IVb ; 또는

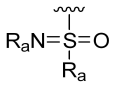
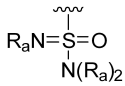
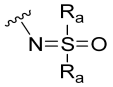
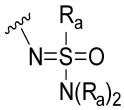


화학식 IVc ;

상기 식에서,

Ⓐ는 , , 또는 이고,

X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 및 X_9의 각 경우는 독립적으로 CR_1 또는 N이고;

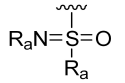
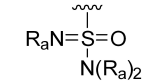
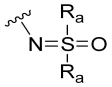
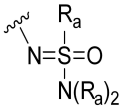
R_1의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, (C_4-C_{14})헤테로트리사이클로알케닐, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, , , , , 및 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$로 임의로 치환된 부분 포화 이환형 헤테로아릴로 이루어진 군으로부터 선택되고;

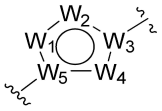
R_1의 (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, (C_4-C_{14})헤테로트리사이클로알케닐, 아릴 및 헤테로아릴은 각각 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$로 임의로 치환되고;

n은 원자가가 허용하는 경우 0 내지 4의 정수이고;

Q는 $C(R_a)_2$, O, NR_a, $N(C=O)R_a$, 또는 NSO_2R_a이고;

Y_1, Y_2, Y_3, Y_4 및 Y_5는 원자가가 허용하는 경우 각각 독립적으로 N 또는 CR_2이고;

R_2는 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, , , , 및 로 이루어진 군으로부터 선택되고;

-E-G-는 $-(C=O)NR_x-$, $-NR_x(C=O)-$, $-N(R_x)(C=O)N(R_x)-$, $-O(C=O)N(R_x)-$, $-N(R_x)(C=O)O-$, $-SO_2NR_x-$, $-NR_xSO_2-$, 또는 이고;

여기서 R_x의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, 아릴 또는 헤테로아릴이거나; R_x와 Y_2,

R_x와 Y_3, R_x와 Z_1, 또는 R_x와 Z_4는 함께 임의로 치환된 5원 또는 6원 헤테로사이클을 형성하고;

W_1, W_2, W_3, W_4 및 W_5는 원자가가 허용하는 경우 각각 독립적으로 CR_6, N 또는 NR_6이고;

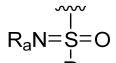
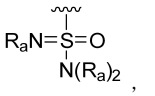
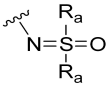
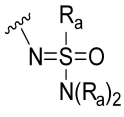
R_6의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬 및 (C_1-C_6)할로알킬로 이루어진 군으로부터 선택되고;

T의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이고;

U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이고;

R_b의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬이고;

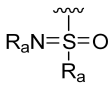
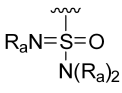
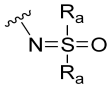
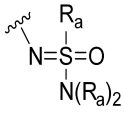
Z_1, Z_2, Z_3, Z_4 및 Z_5는 원자가가 허용하는 경우 각각 독립적으로 N 또는 CR_3이고;

R_3은 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, , , , 및 로 이루어진 군으로부터 선택되고;

V는 부재하거나, $C(R_a)_2$, NR_a, $N(C=O)R_a$, NSO_2R_a 또는 O이고;

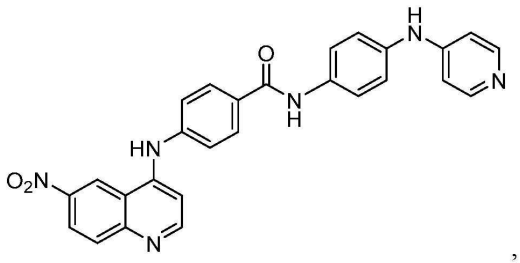
R_4는 각각 하나 이상의 R_5로 임의로 치환된 (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 아릴 및 헤테로아릴로 이루어진 군으로부터 선택되거나;

대안적으로, V와 R_4는 함께 (C_3-C_7)헤테로사이클로알킬 또는 (C_4-C_{10})헤테로스피로알킬을 형성하고;

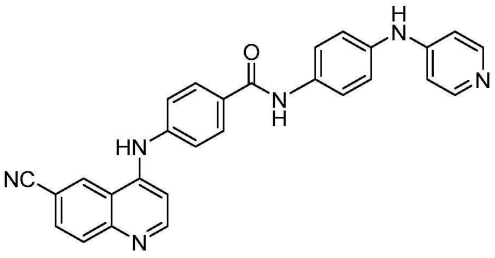
R_5의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, $N(R_a)COR_a$, , , , 및 로 이루어진 군으로부터 선택되고;

R_a의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_2-C_6)알케닐, (C_3-C_7)사이클로알킬, 아릴 또는 헤테로아릴이거나, 2개의 R_a는 함께 할로겐 또는 (C_1-C_6)알킬로 임의로 치환된 4원 내지 6원 고리를 형성하고;

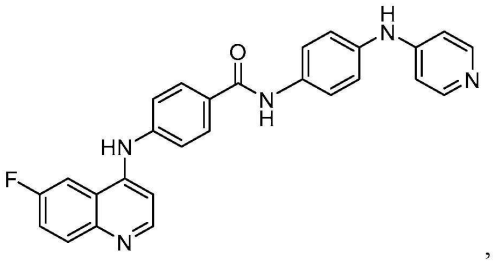
단, 상기 화합물은 하기 화합물이 아니다:



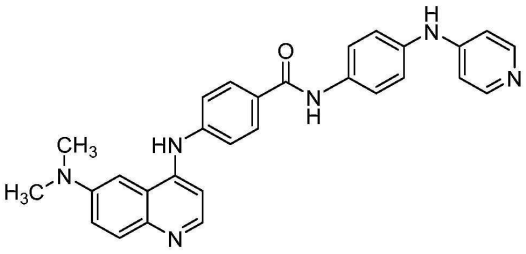
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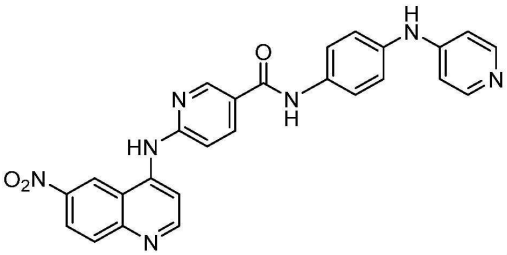
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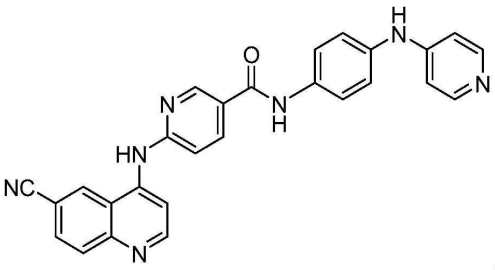
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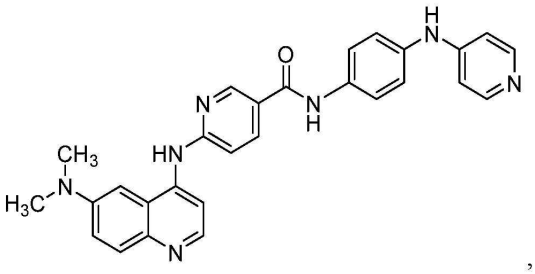
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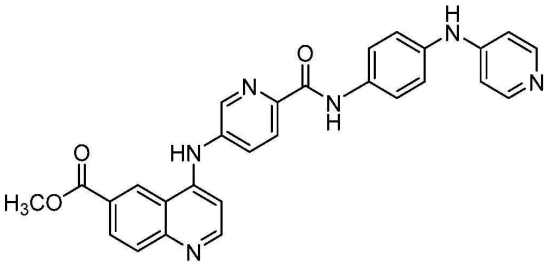
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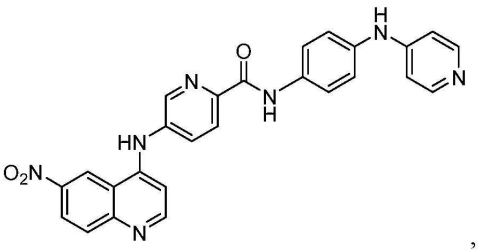
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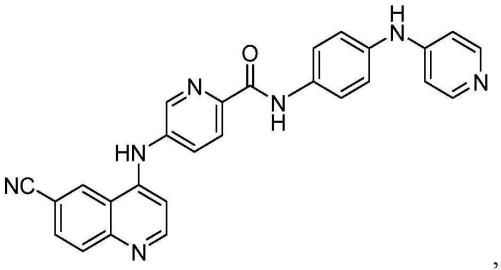
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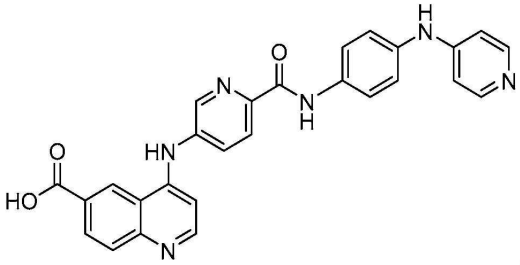
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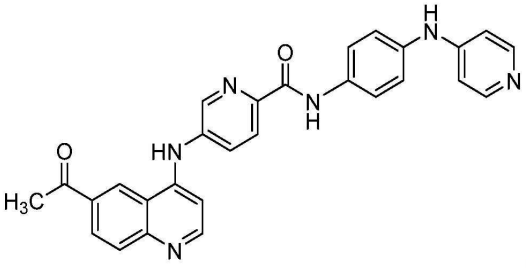
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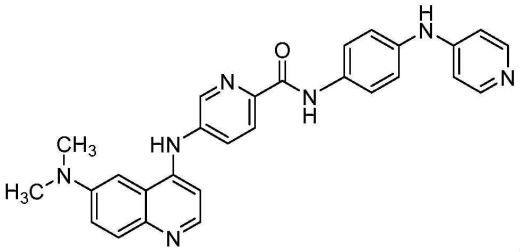
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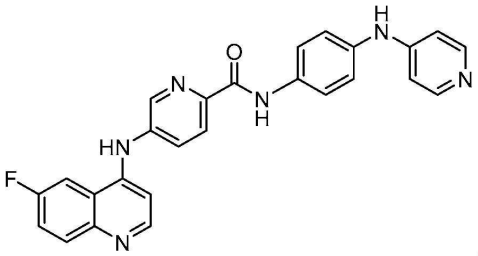
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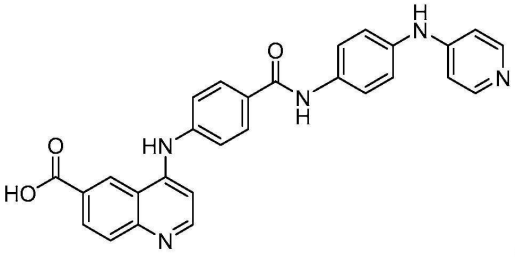
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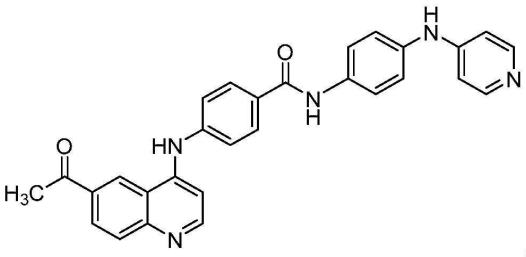
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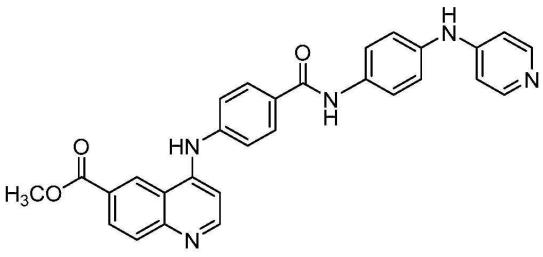
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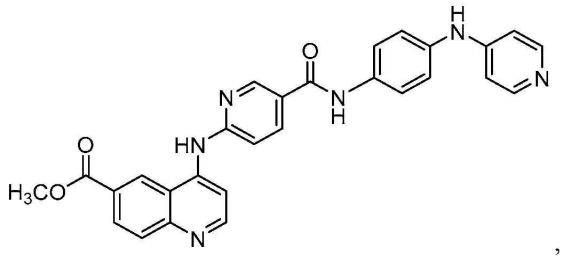
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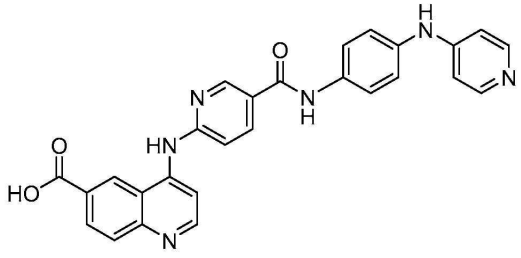


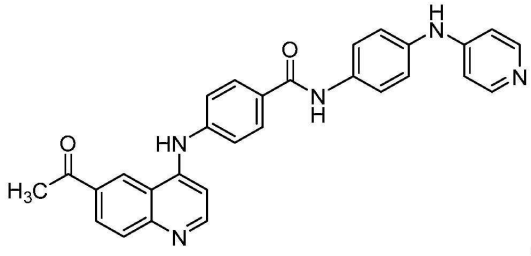
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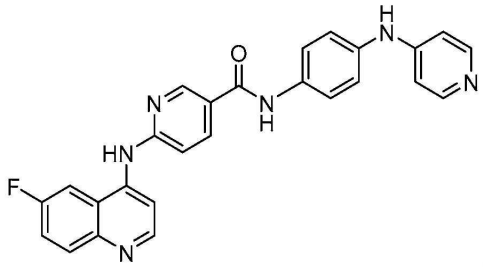


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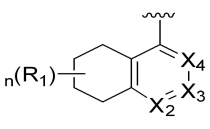
청구항 2

제1항에 있어서, Q, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, NH, NCH_3, N(C=O)H, $N(C=O)CH_3$, $N(C=O)CH_2CH_3$, NSO_2CH_3 또는 $NSO_2CH_2CH_3$인 화합물.

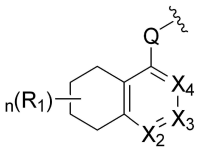
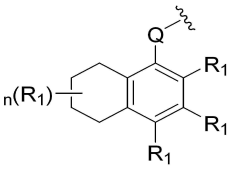
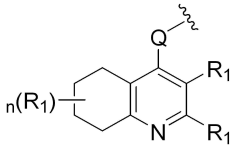
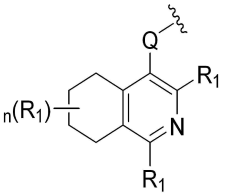
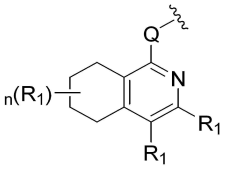
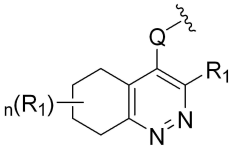
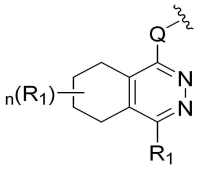
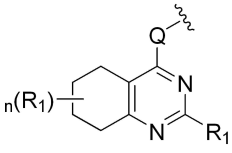
청구항 3

제1항 또는 제2항에 있어서, X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, Y_1, Y_2, Y_3, Y_4, Y_5, Z_1, Z_2, Z_3, Z_4 및 Z_5는 각각 독립적으로 CH, C(할로겐) 또는 N인 화합물.

청구항 4

제1항 내지 제3항 중 어느 한 항에 있어서, Ⓐ는  인 화합물.

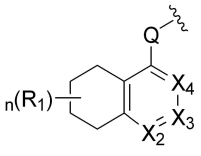
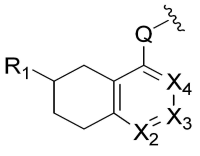
청구항 5

제1항 내지 제4항 중 어느 한 항에 있어서, 구조 모이어티  는 , , , , , , 또는  의 구조를 가진 것인 화합물.

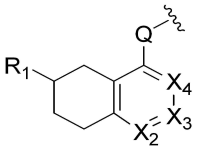
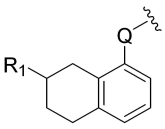
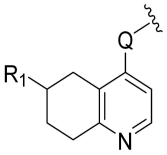
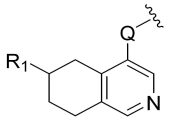
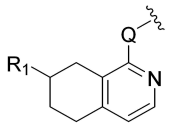
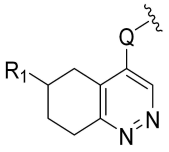
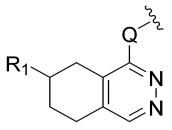
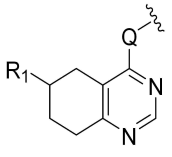
청구항 6

제1항 내지 제5항 중 어느 한 항에 있어서, n은 0, 1 또는 2인 화합물.

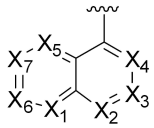
청구항 7

제1항 내지 제6항 중 어느 한 항에 있어서, 구조 모이어티  는  의 구조를 가진 것인 화합물.

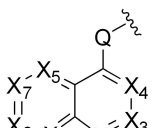
청구항 8

제7항에 있어서, 구조 모이어티  는 , , , , , , 또는  의 구조를 가진 것인 화합물.

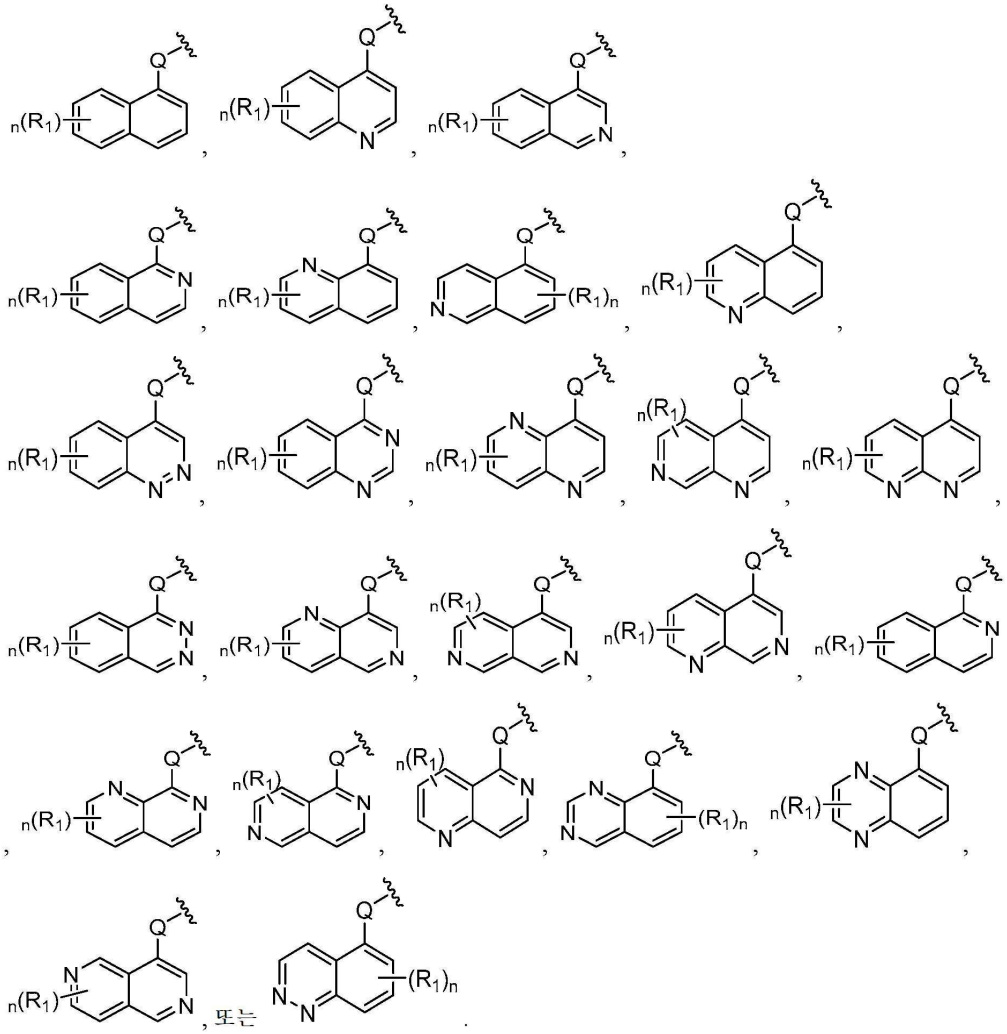
청구항 9

제1항 내지 제3항 중 어느 한 항에 있어서, Ⓐ 는  인 화합물.

청구항 10

제1항 내지 제3항 및 제9항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가

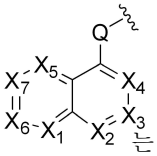
진 것인 화합물:

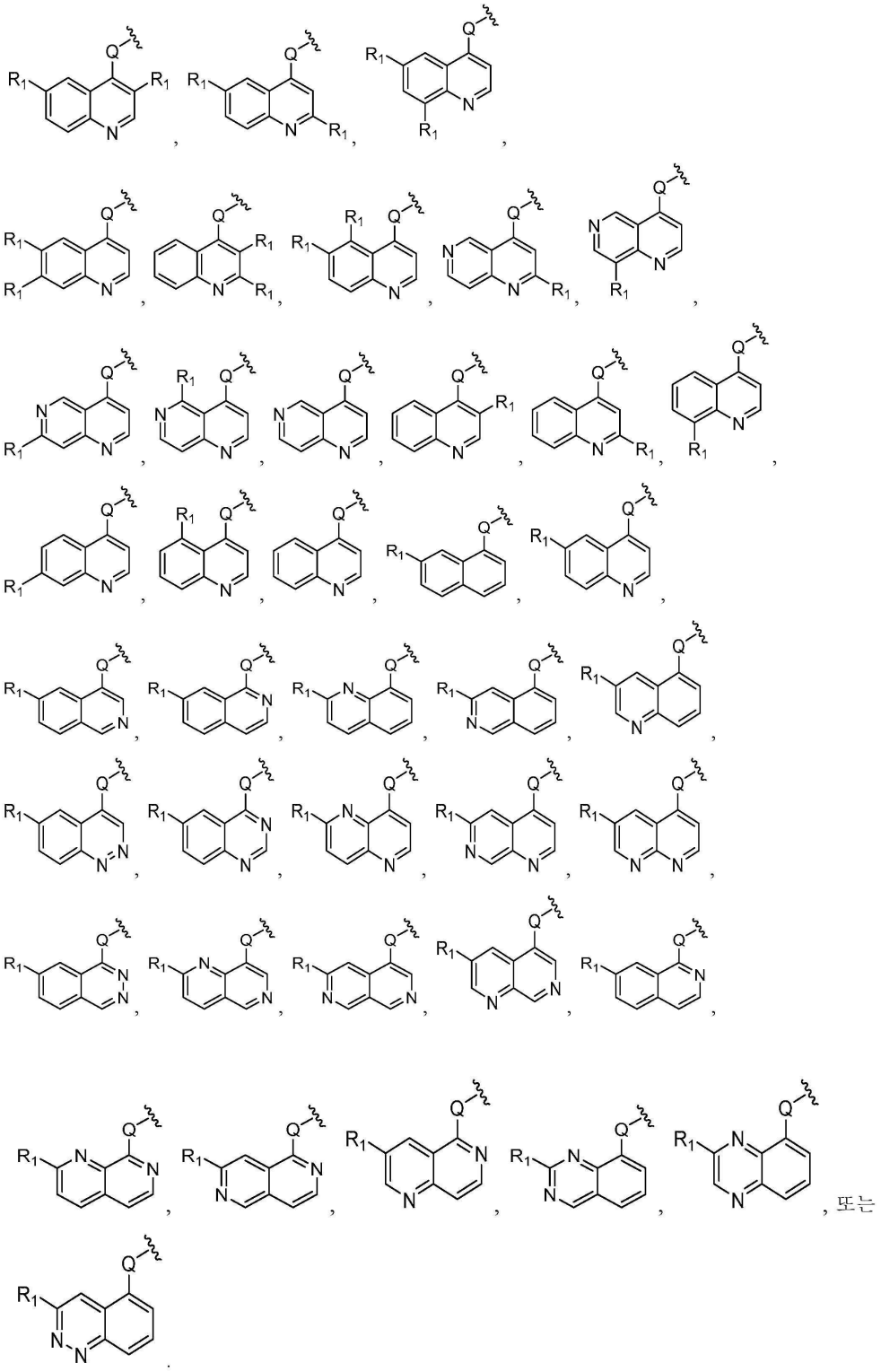


청구항 11

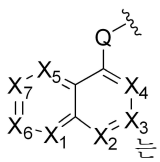
제1항 내지 제3항 및 제10항 중 어느 한 항에 있어서, n은 0, 1 또는 2인 화합물.

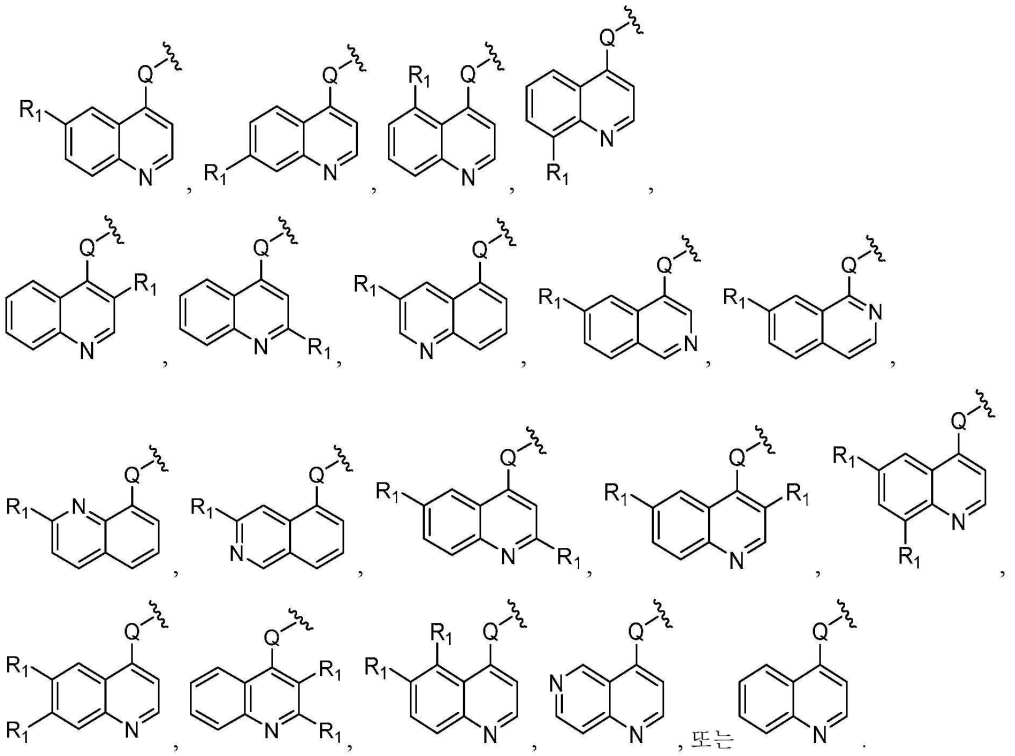
청구항 12

제1항 내지 제3항 및 제9항 내지 제11항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가진 것인 화합물:

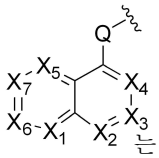


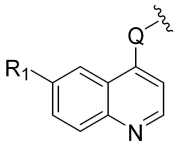
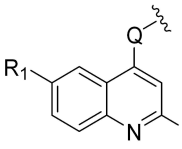
청구항 13

제1항 내지 제3항 및 제9항 내지 제12항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가진 것인 화합물:

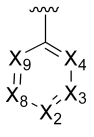


청구항 14

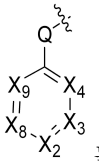
제1항 내지 제3항 및 제9항 내지 제12항 중 어느 한 항에 있어서, 구조 모이어티  는

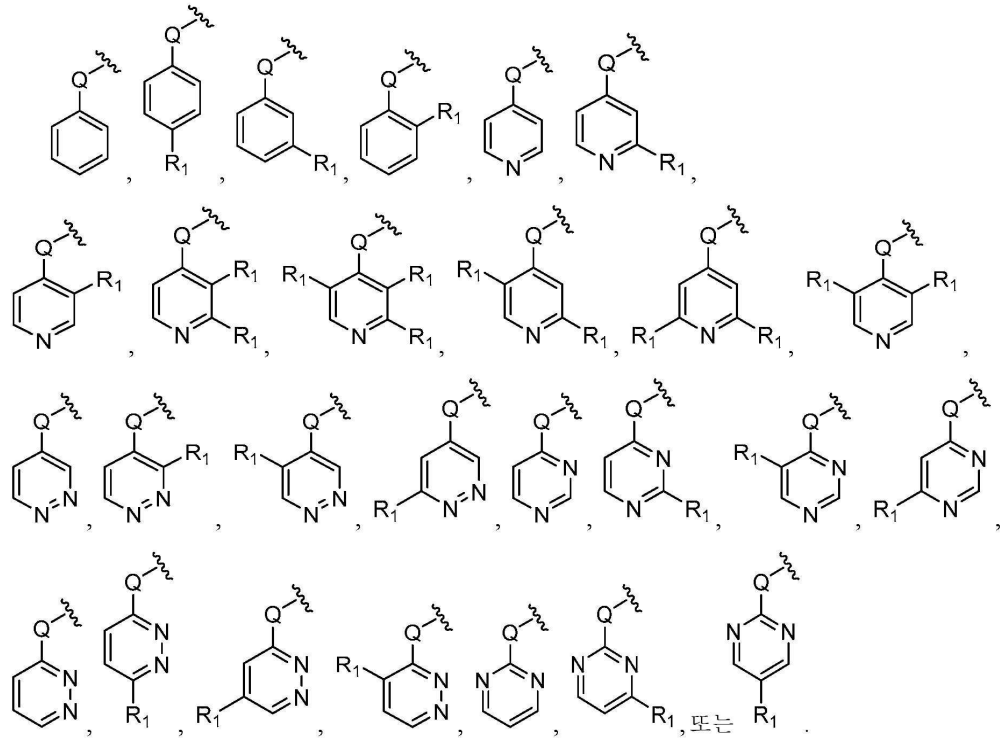
 , 또는  의 구조를 가진 것인 화합물.

청구항 15

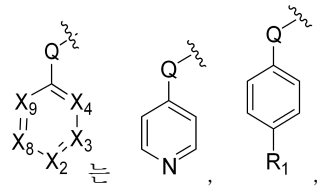
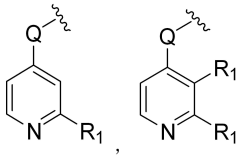
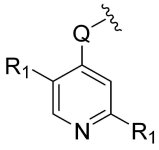
제1항 내지 제3항 중 어느 한 항에 있어서, Ⓐ 는  인 화합물.

청구항 16

제1항 내지 제3항 및 제15항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가진 것인 화합물:



청구항 17

제1항 내지 제3항, 제15항 및 제16항 중 어느 한 항에 있어서, 구조 모이어티  는 , 또는  의 구조를 가진 것인 화합물.

청구항 18

제1항 내지 제17항 중 어느 한 항에 있어서, Q는 O인 화합물.

청구항 19

제1항 내지 제17항 중 어느 한 항에 있어서, Q는 NR_a, $N(C=O)R_a$ 또는 NSO_2R_a인 화합물.

청구항 20

제1항 내지 제19항 중 어느 한 항에 있어서, R_1의 각 경우는 독립적으로 H, D, 할로겐, OR_a, $N(R_a)_2$, (C_1-C_6)알킬, (C_1-C_6)알키닐, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, (C_4-C_{10})비사이클로알킬, -CN, N_3, NO_2, COR_a, CO_2R_a, $CON(R_a)_2$, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$이고; 여기서 (C_3-C_7)헤테로사이클로알킬은 하나 이상의 (C_1-C_6)알킬로 임의로 치환되는 것인 화합물.

청구항 21

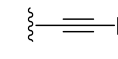
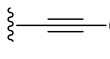
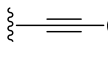
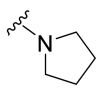
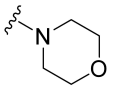
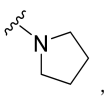
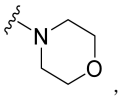
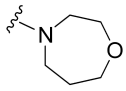
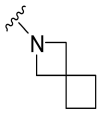
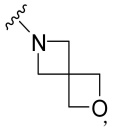
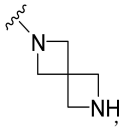
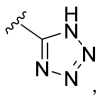
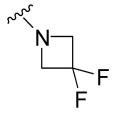
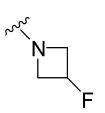
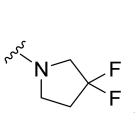
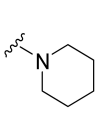
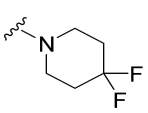
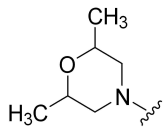
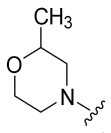
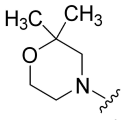
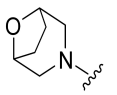
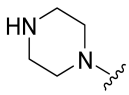
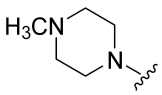
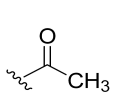
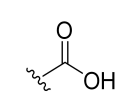
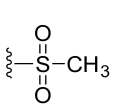
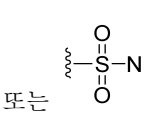
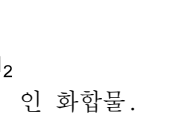
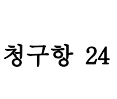
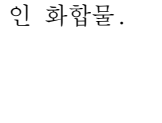
제1항 내지 제20항 중 어느 한 항에 있어서, R_1의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, $N(R_a)_2$ 또는 -CN이고; 여기서

(C_3-C_7)헤테로사이클로알킬은 하나 이상의 (C_1-C_6)알킬로 임의로 치환되는 것인 화합물.

청구항 22

제1항 내지 제21항 중 어느 한 항에 있어서, R_1의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로할로알킬 또는 (C_3-C_7)헤테로사이클로알킬이고; 여기서 (C_3-C_7)헤테로사이클로알킬은 하나 이상의 (C_1-C_6)알킬로 임의로 치환되는 것인 화합물.

청구항 23

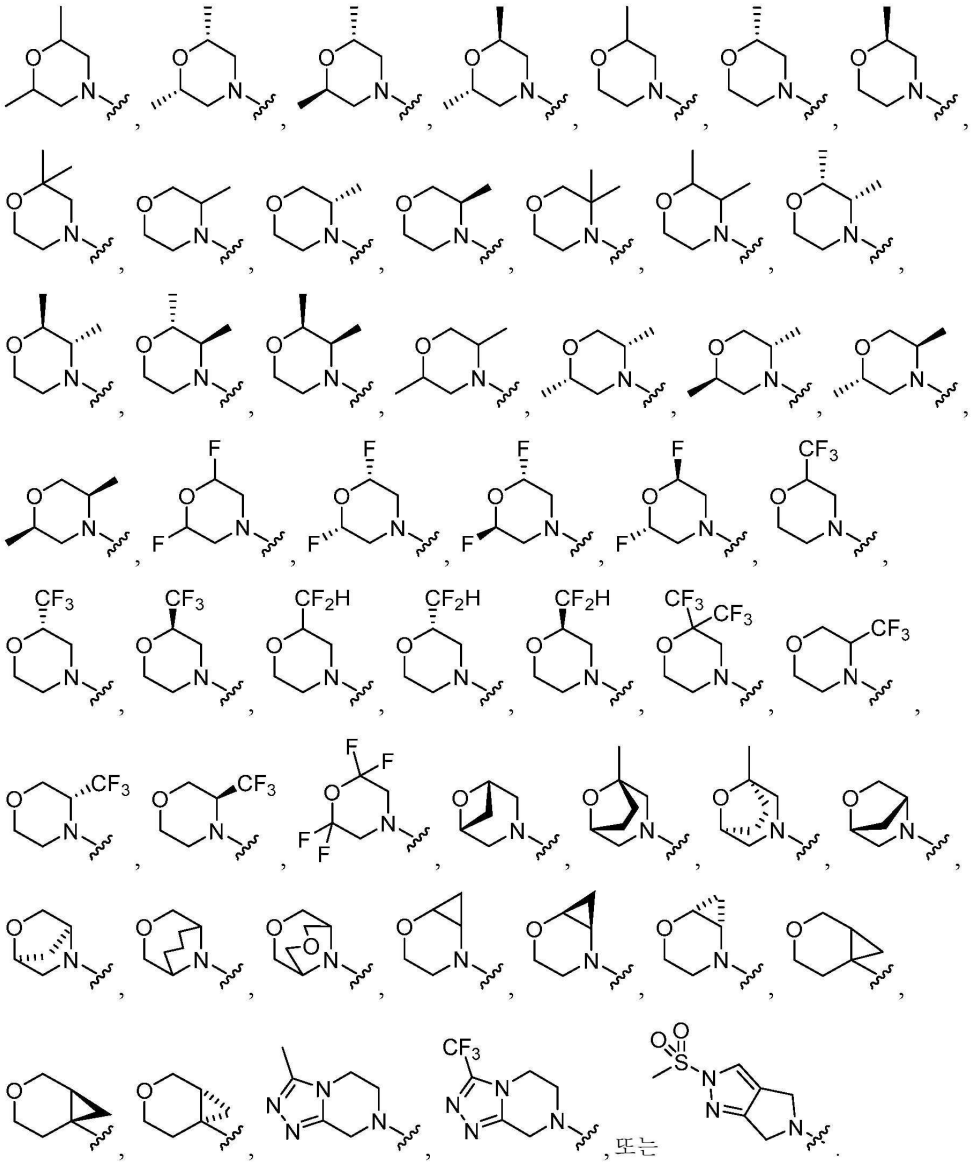
제1항 내지 제22항 중 어느 한 항에 있어서, R_1의 각 경우는 독립적으로 H, D, F, Cl, Br, CH_3, OCH_3, NH_2, $NHCH_3$, $N(CH_3)_2$, , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , -CN, N_3, NO_2, , , , , , , 또는 인 화합물.

청구항 24

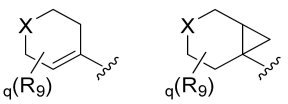
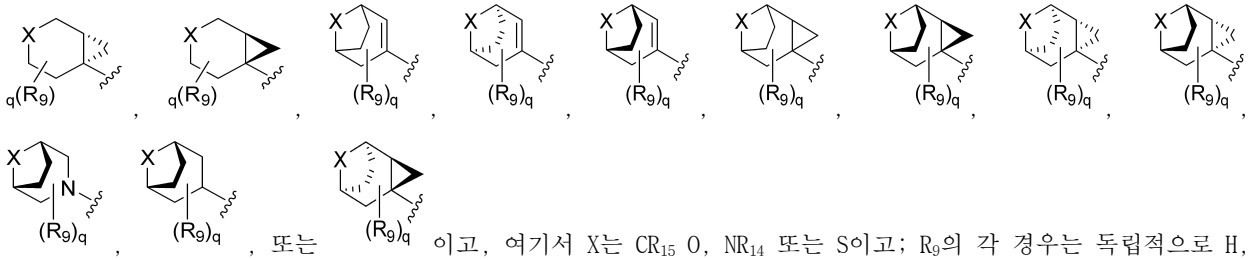
제1항 내지 제23항 중 어느 한 항에 있어서, R_1의 각 경우는 독립적으로 H, D, F, CH_3, NH_2, $NHCH_3$, $N(CH_3)_2$, , , , , 또는 인 화합물.

청구항 25

제1항 내지 제21항 중 어느 한 항에 있어서, R_1의 적어도 하나의 경우는 하기 화학식의 기인 화합물:



청구항 26

제1항 내지 제21항 중 어느 한 항에 있어서, R_1의 적어도 하나의 경우는 , , , 또는 이고, 여기서 X는 CR_{15} O, NR_{14} 또는 S이고; R_9의 각 경우는 독립적으로 H, $(C_1$-$C_6)$알킬, 할로겐화된 $(C_1$-$C_6)$알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; R_{14}는 H, $(C_1$-$C_6)$알킬, $(C_3$-$C_7)$사이클로알킬, $(C_3$-$C_7)$헤테로사이클로알킬, 아릴 또는 헤테로아릴이고; R_{15}의 각 경우는 독립적으로 H, $(C_1$-$C_6)$알킬, 할

로겐화된 (C_1-C_6)알킬, 할로겐, -OR_a, -CN 또는 -$N(R_a)_2$이고; q는 0, 1, 2 또는 3인 화합물.

청구항 27

제1항 내지 제21항 및 제26항 중 어느 한 항에 있어서, X는 O인 화합물.

청구항 28

제1항 내지 제21항, 제26항 및 제27항 중 어느 한 항에 있어서, R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬 또는 할로겐인 화합물.

청구항 29

제1항 내지 제21항 및 제26항 내지 제28항 중 어느 한 항에 있어서, R_9의 각 경우는 독립적으로 H, F, Cl, Br, CH_3, CF_3, OH, NH_2, -$NHCH_3$ 또는 -$N(CH_3)_2$인 화합물.

청구항 30

제1항 내지 제21항 및 제26항 내지 제29항 중 어느 한 항에 있어서, R_9의 각 경우는 독립적으로 H, F, Cl, Br 또는 CH_3인 화합물.

청구항 31

제1항 내지 제21항 및 제26항 내지 제30항 중 어느 한 항에 있어서, R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬 또는 할로겐인 화합물.

청구항 32

제1항 내지 제21항 및 제26항 내지 제31항 중 어느 한 항에 있어서, R_{15}의 각 경우는 독립적으로 H, F, Cl, Br 또는 CH_3인 화합물.

청구항 33

제1항 내지 제21항 및 제26항 내지 제32항 중 어느 한 항에 있어서, q는 0인 화합물.

청구항 34

제1항 내지 제21항 및 제26항 내지 제33항 중 어느 한 항에 있어서, q는 1인 화합물.

청구항 35

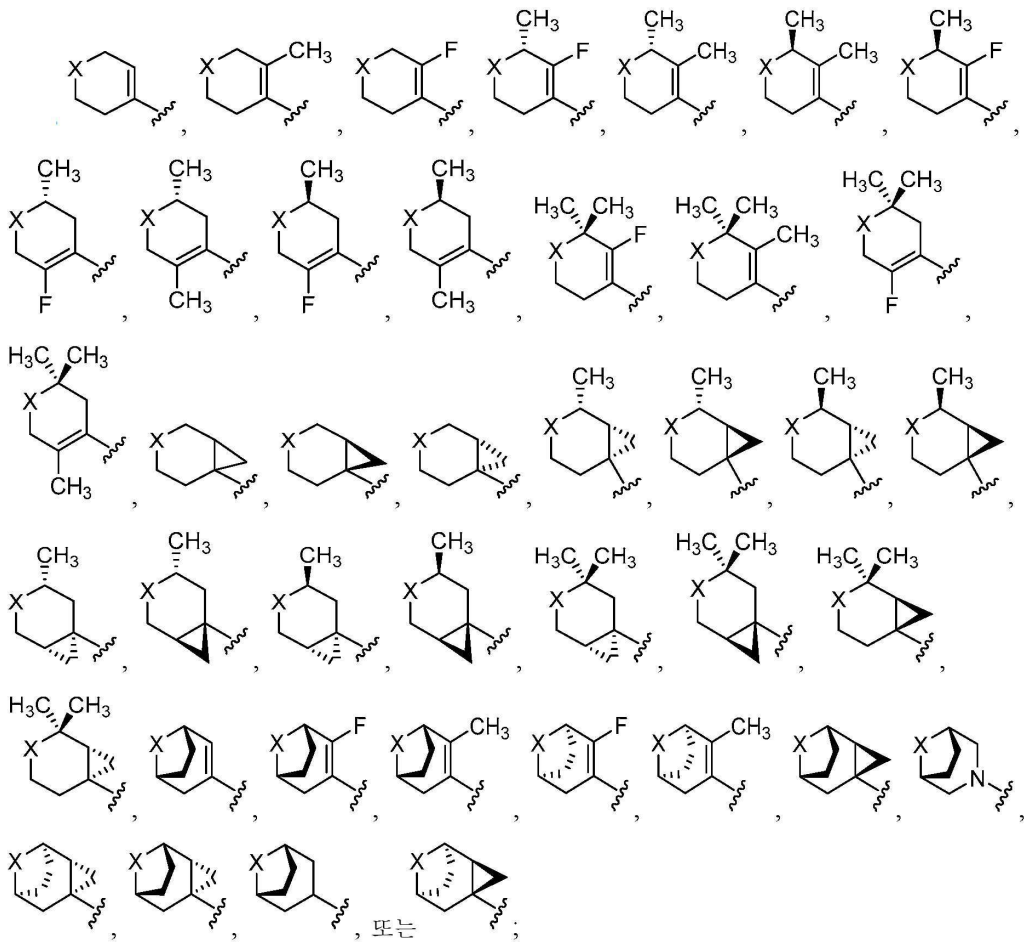
제1항 내지 제21항 및 제26항 내지 제34항 중 어느 한 항에 있어서, q는 2 또는 3인 화합물.

청구항 36

제1항 내지 제21항, 제26항 및 제28항 내지 제37항 중 어느 한 항에 있어서, X는 NR_{14}이고 R_{14}는 H 또는 (C_1-C_6)알킬인 화합물.

청구항 37

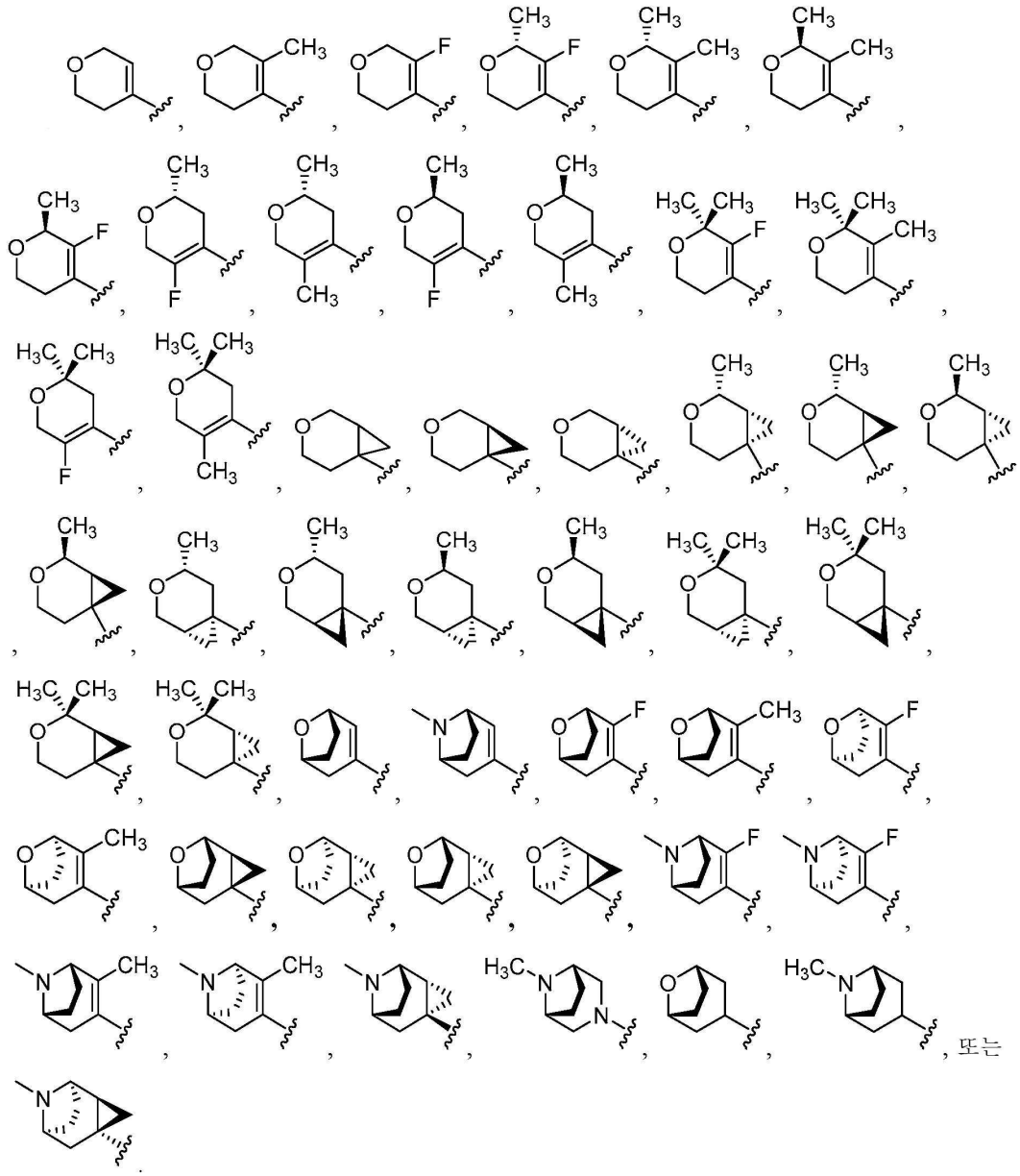
제1항 내지 제21항 및 제26항 중 어느 한 항에 있어서, R_1의 적어도 하나의 경우는 하기 화학식의 기인 화합물:



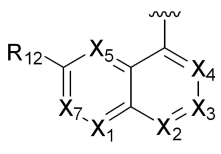
상기 식에서, X는 O 또는 NR_{14}이고; R_{14}는 H 또는 (C_1-C_6)알킬이다.

청구항 38

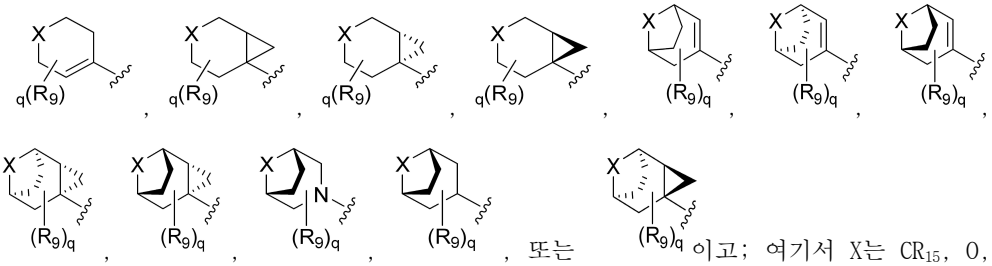
제1항 내지 제21항 및 제26항 중 어느 한 항에 있어서, R_1의 적어도 하나의 경우는 하기 화학식의 기인 화합물:



청구항 39

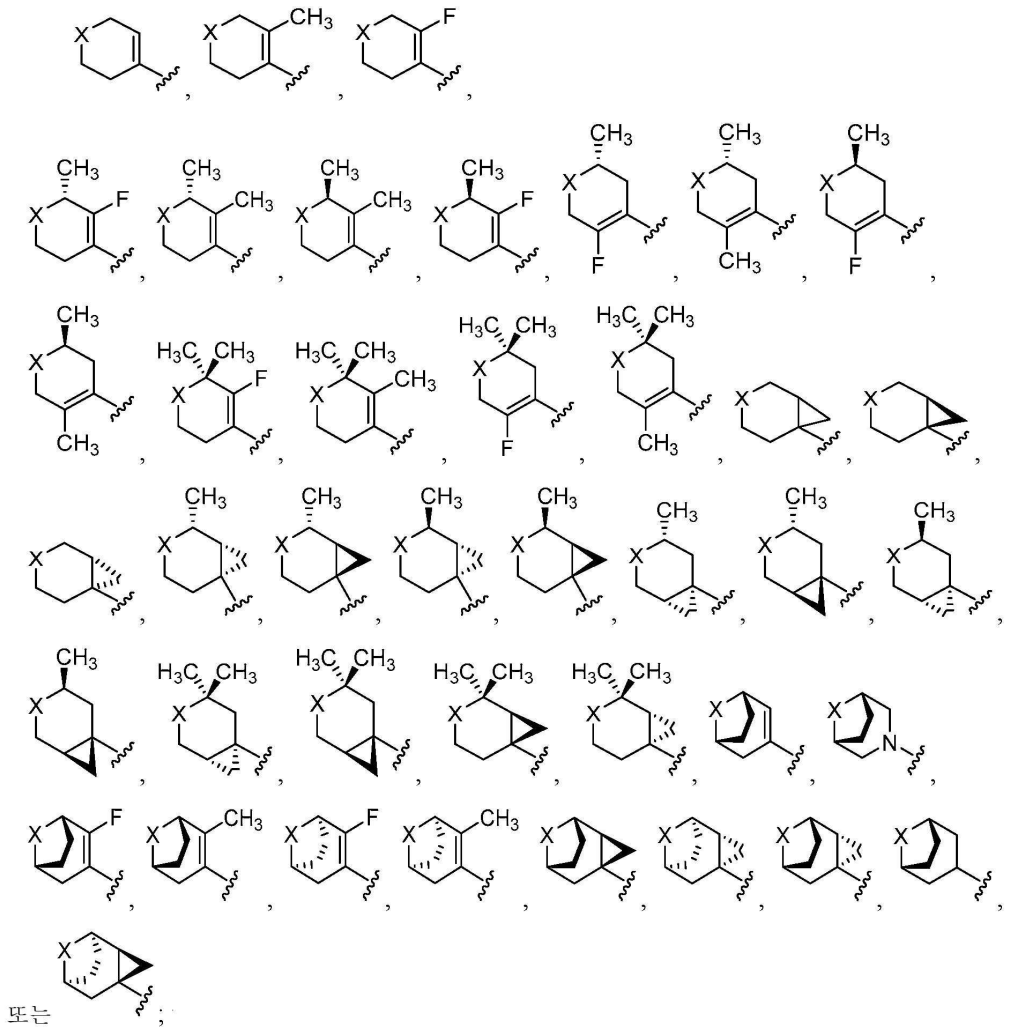
제1항 내지 제3항 중 어느 한 항에 있어서, Ⓐ는  이고, 여기서 R_{12}는 (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, 또는 (C_4-C_{14})헤테로트리사이클로알케닐이고, 이들 각각은 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$로 임의로 치환되는 것인 화합물.

청구항 40

제39항에 있어서, R_{12}는 , 또는 이고; 여기서 X는 CR_{15}, O, NR_{14} 또는 S이고; R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; R_{14}는 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 아릴 또는 헤테로아릴이고; R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; q는 0, 1, 2 또는 3인 화합물.

청구항 41

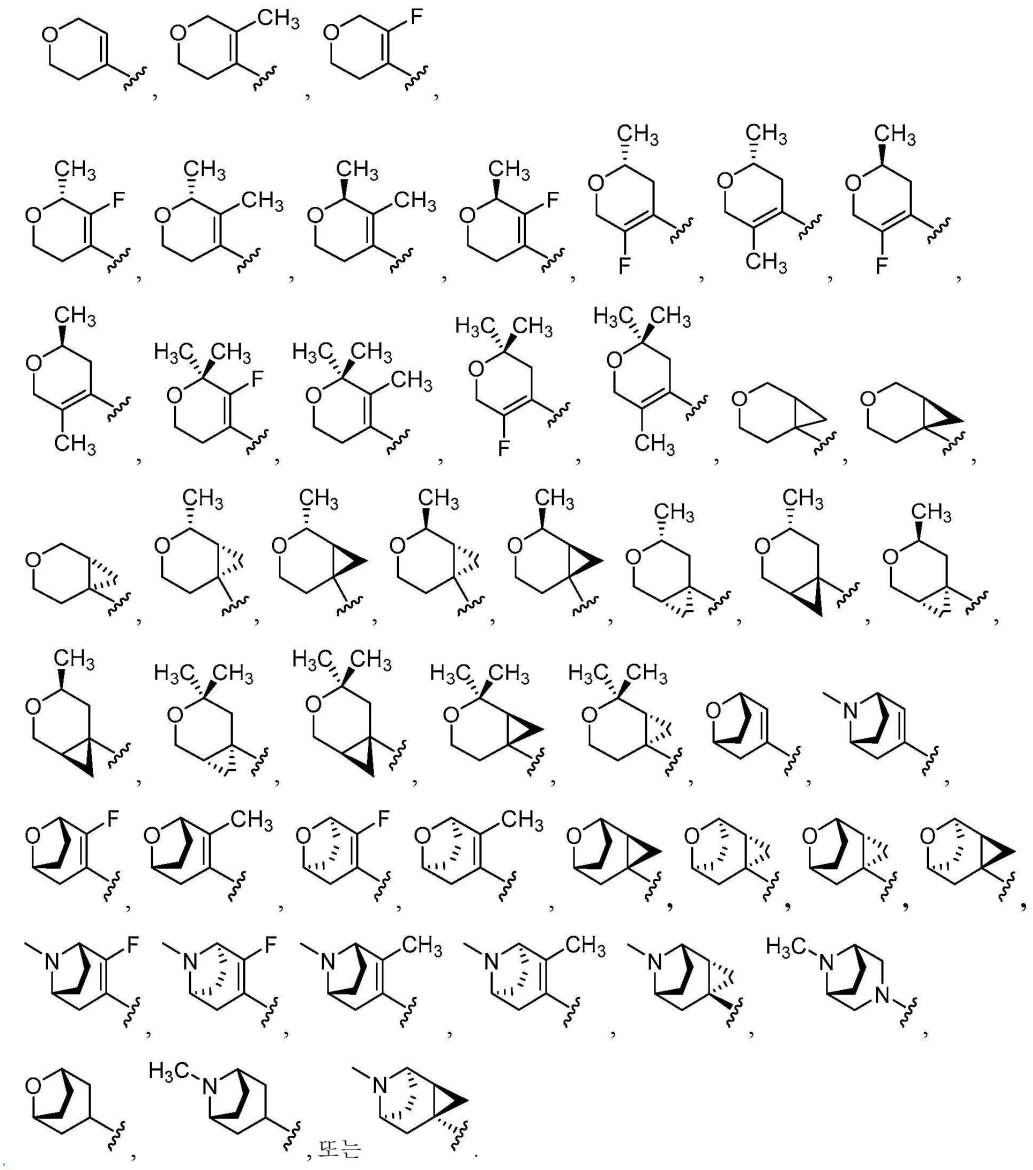
제39항에 있어서, R_{12}는 하기 화학식의 기인 화합물:


또는 ;

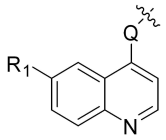
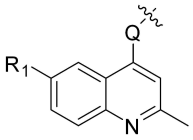
상기 식에서, X는 O 또는 NR_{14}이고; R_{14}는 H 또는 (C_1-C_6)알킬이다.

청구항 42

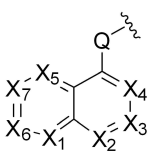
제39항에 있어서, R_{12}는 하기 화학식의 기인 화합물:

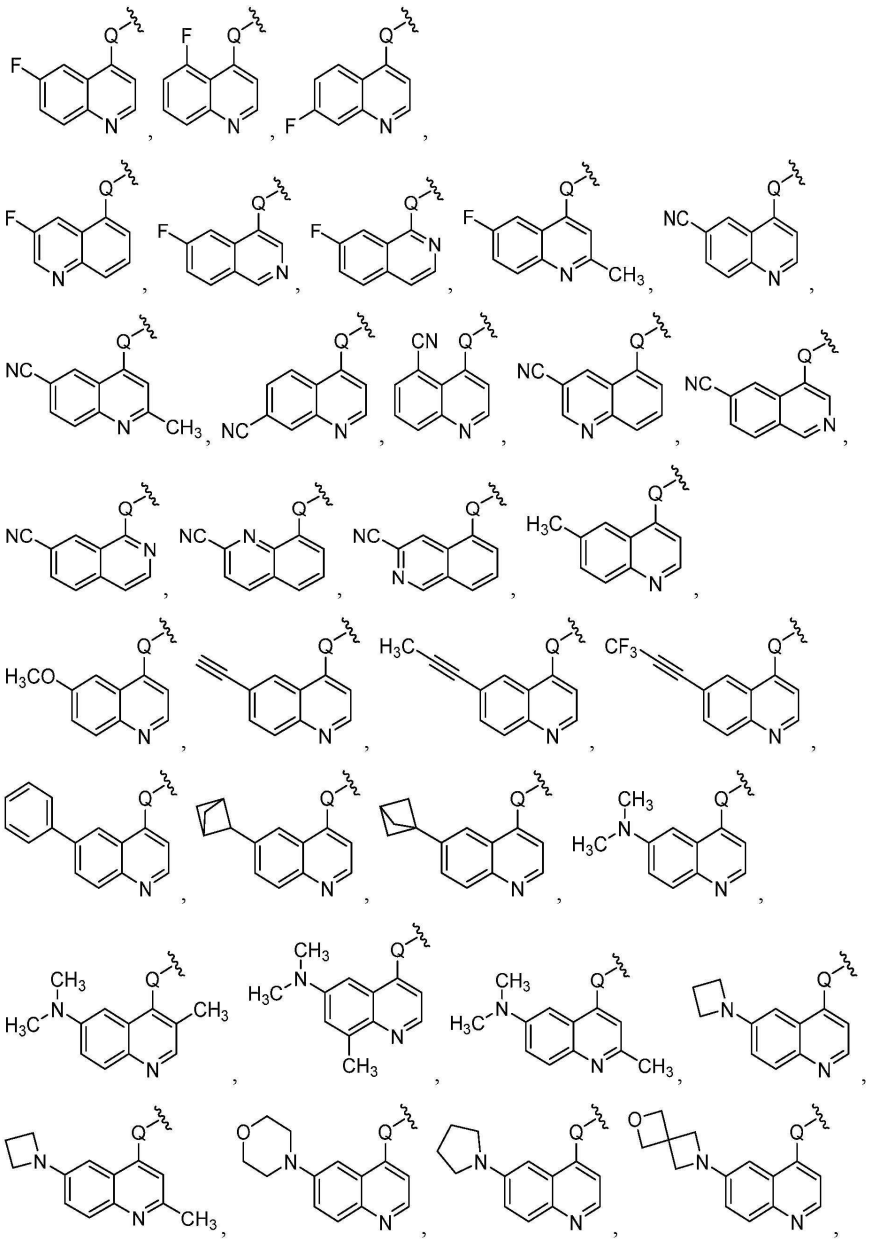


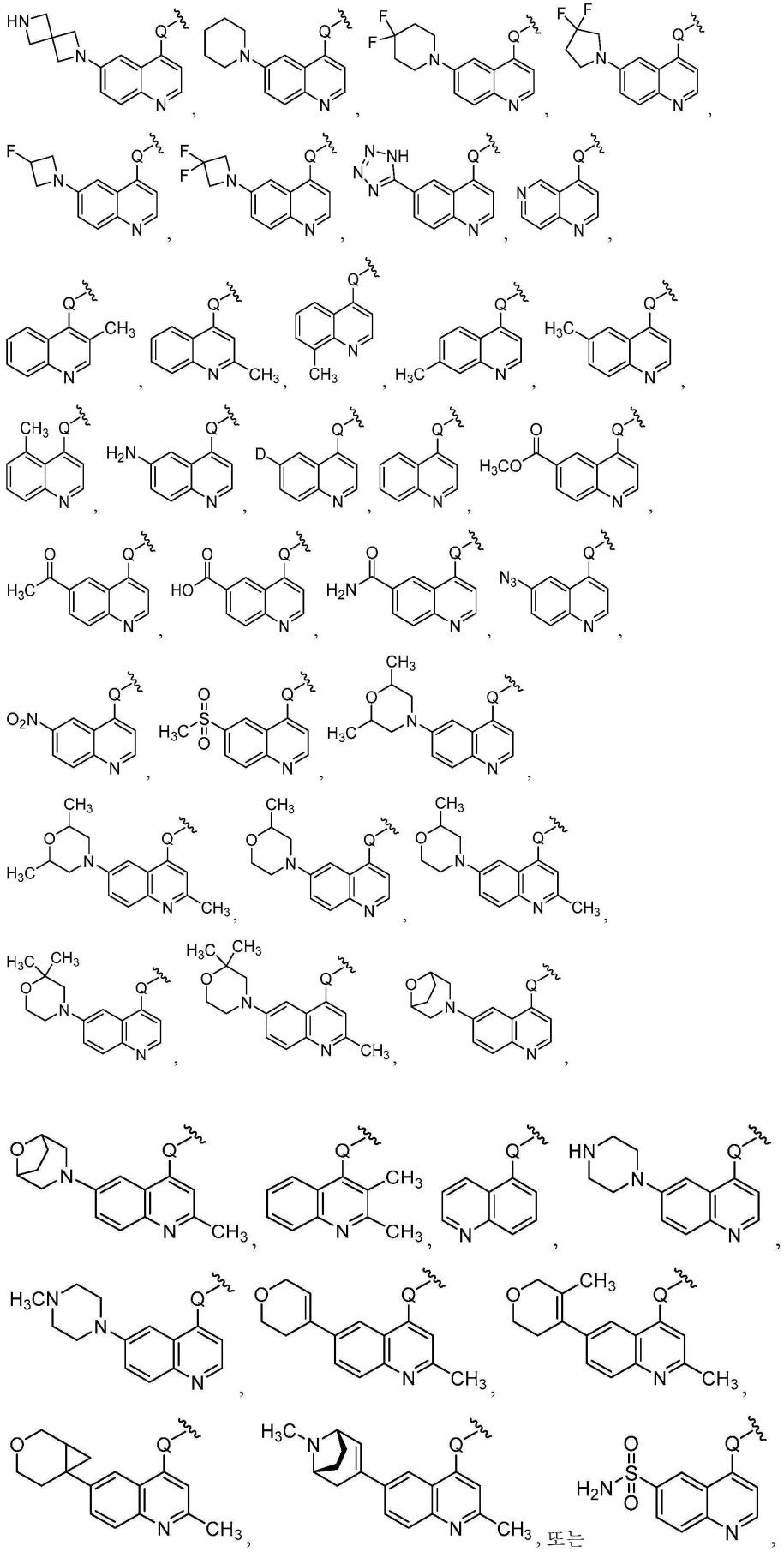
청구항 43

제25항에 있어서, Ⓐ는  또는  인 화합물.

청구항 44

제1항 내지 제3항, 제10항 내지 제14항 및 제18항 내지 제24항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가진 것인 화합물:

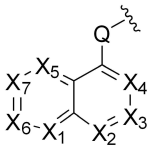




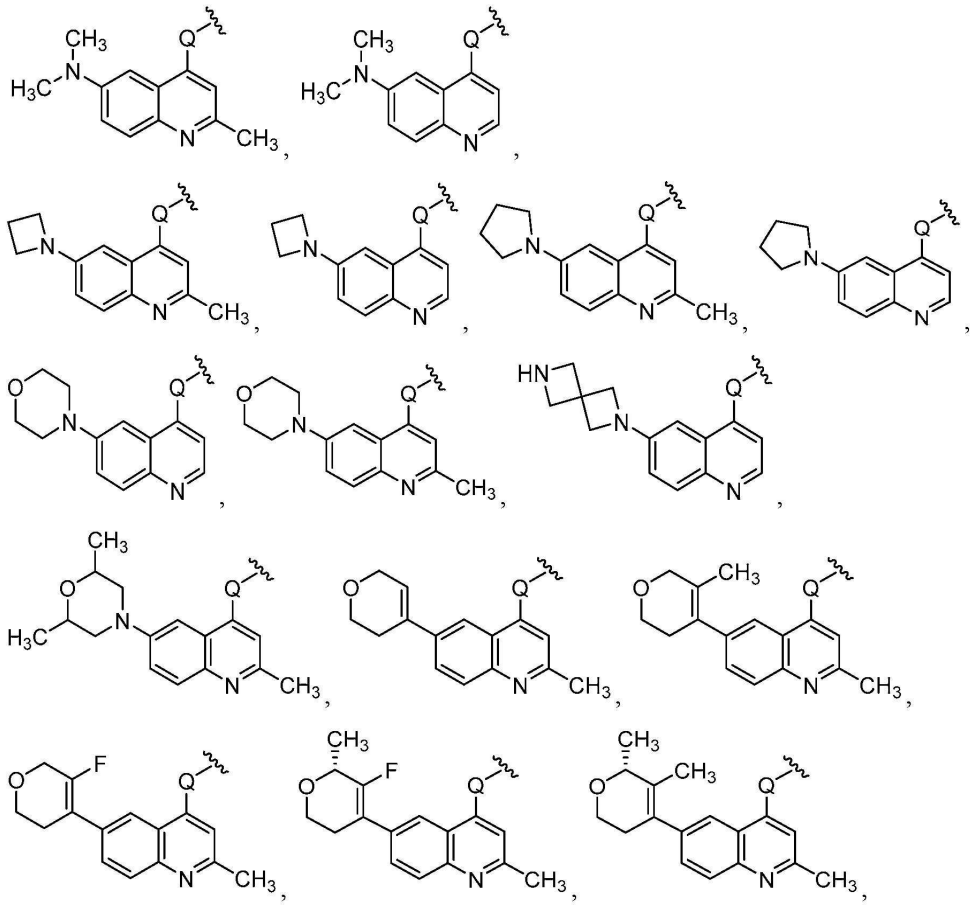
상기 식에서, Q는 O 또는 NH이다.

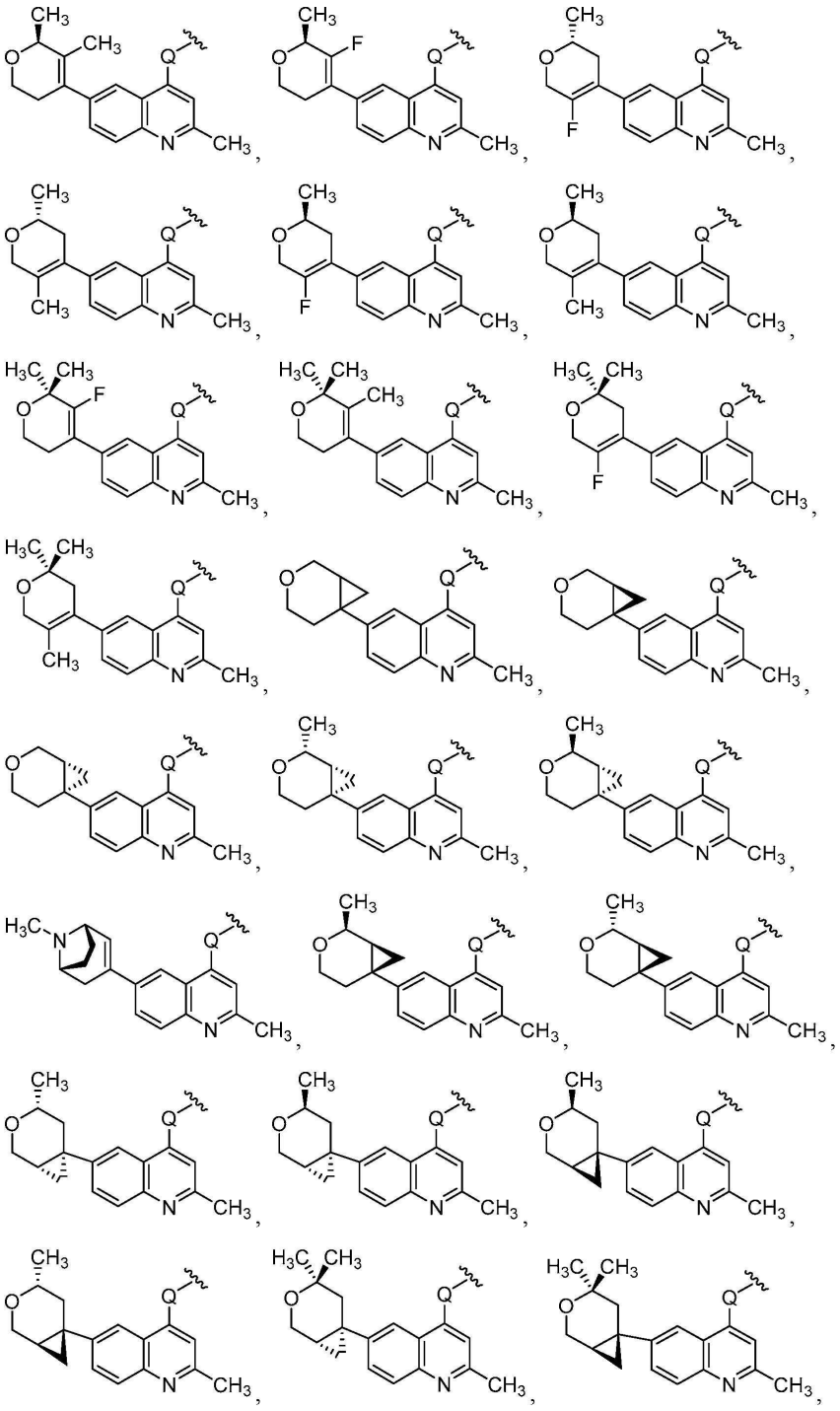
청구항 45

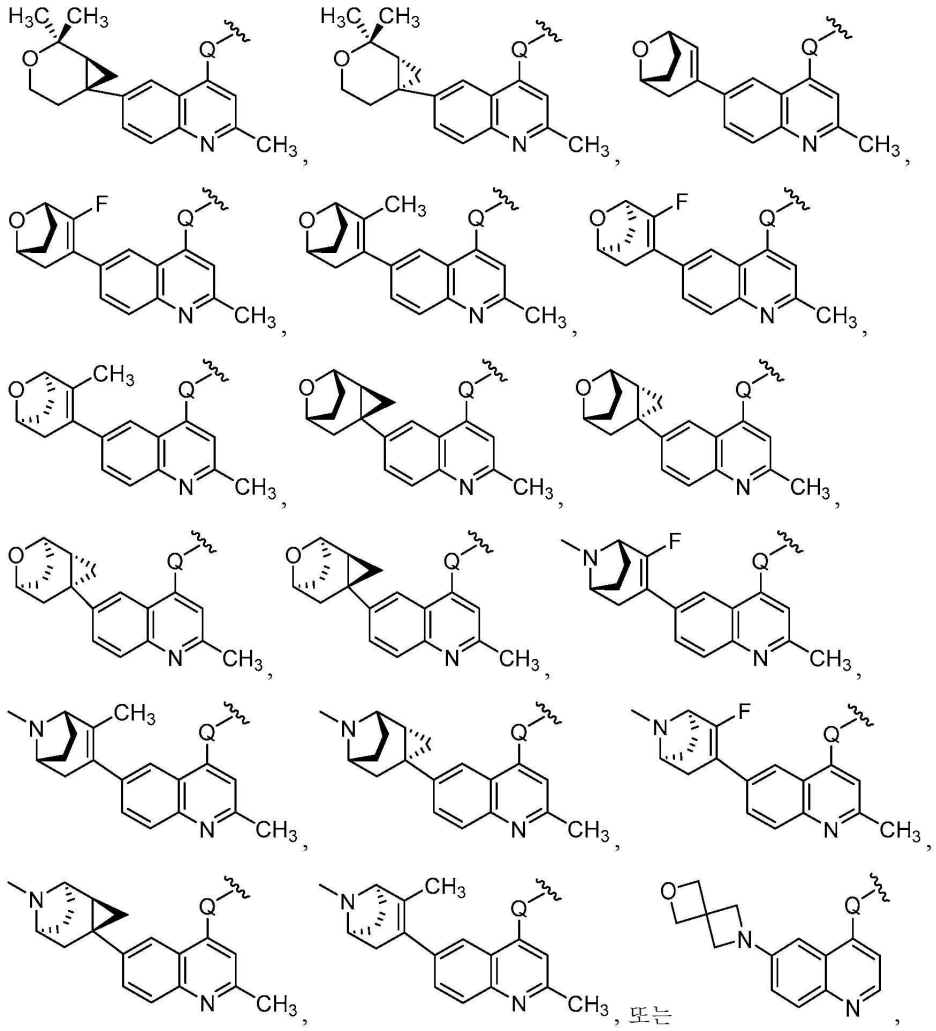
제1항 내지 제3항, 제10항 내지 제14항, 제18항 내지 제24항 및 제44항 중 어느 한 항에 있어서, 구조 모이어티



는 하기 화학식의 구조를 가진 것인 화합물:

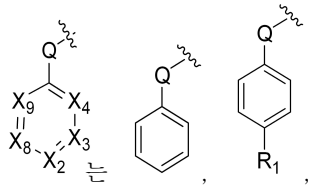


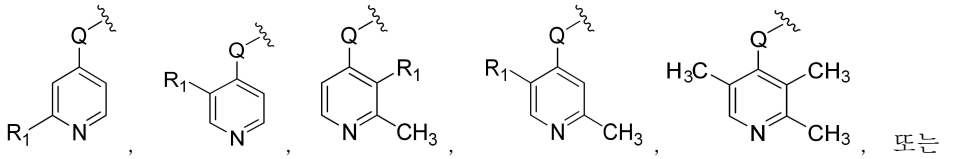




상기 식에서, Q는 O 또는 NH이다.

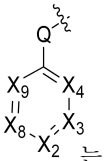
청구항 46

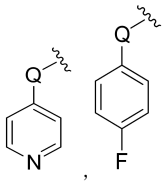
제1항 내지 제3항 및 제15항 내지 제24항 중 어느 한 항에 있어서, 구조 모이어티  는

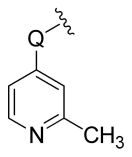
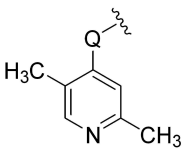
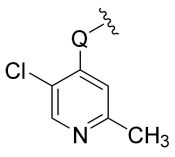
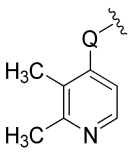
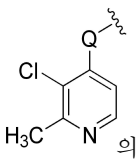


의 구조를 갖고, 여기서 Q는 O 또는 NH이고 R_1은 H, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬 또는 할로겐인 화합물.

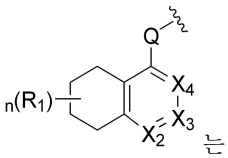
청구항 47

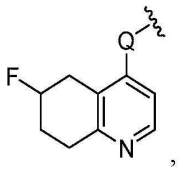
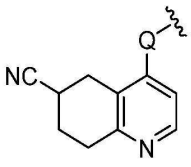
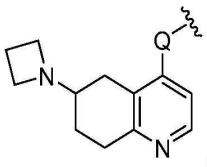
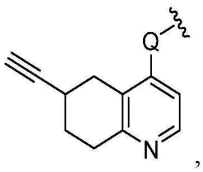
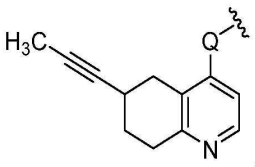
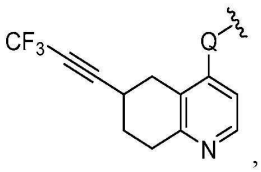
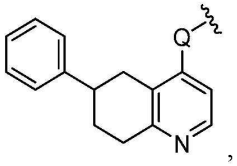
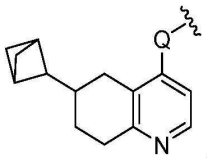
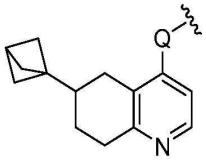
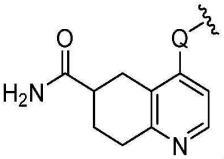
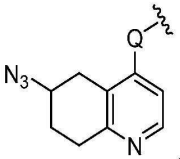
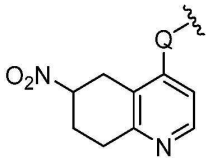
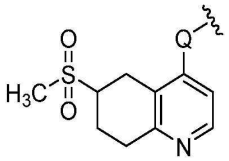
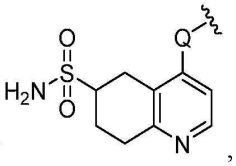
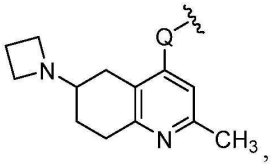
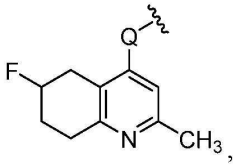
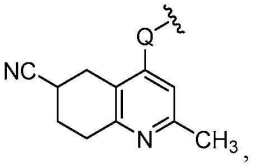
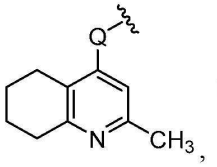
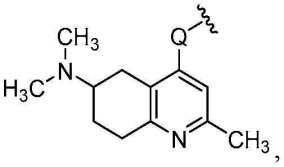
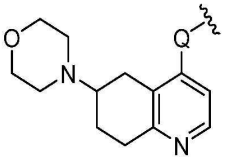
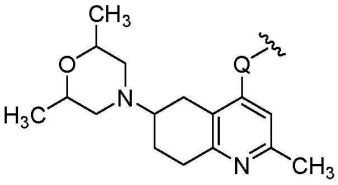
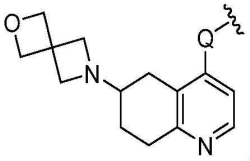
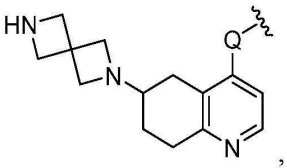
제1항 내지 제3항, 제15항 내지 제24항 및 제46항 중 어느 한 항에 있어서, 구조 모이어티  는







, 또는 의 구조를 갖고, 여기서 Q는 O 또는 NH인 화합물.

청구항 48

제1항 내지 제7항 및 제18항 내지 제24항 중 어느 한 항에 있어서, 구조 모이어티 는 하기 화학식의 구조를 가진 것인 화합물:














, or 








, 또는


상기 식에서, Q는 O 또는 NH이다.

청구항 49

제1항에 있어서, 화학식 Ia의 화학식을 가진 화합물.

청구항 50

제1항에 있어서, 화학식 IIa의 화학식을 가진 화합물.

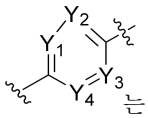
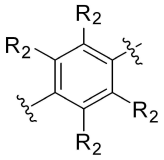
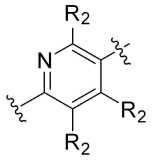
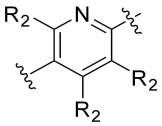
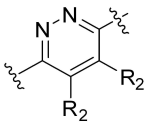
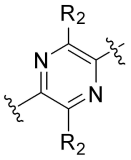
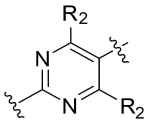
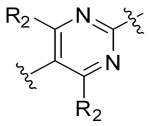
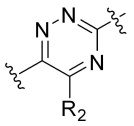
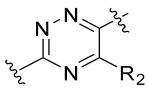
청구항 51

제1항에 있어서, 화학식 IIIa의 화학식을 가진 화합물.

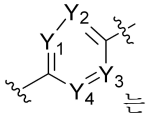
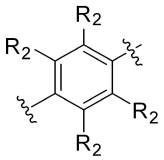
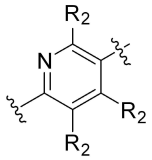
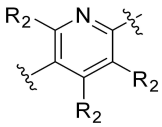
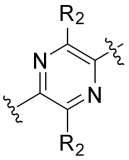
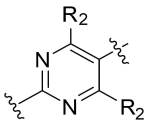
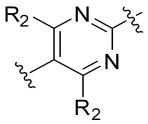
청구항 52

제1항에 있어서, 화학식 IVa의 화학식을 가진 화합물.

청구항 53

제1항, 제49항 및 제52항 중 어느 한 항에 있어서, 구조 모이어티  는 , , , , , , , , 또는  의 구조를 가진 것인 화합물.

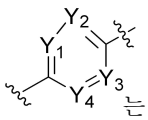
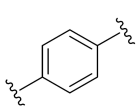
청구항 54

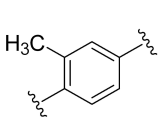
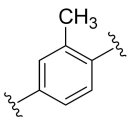
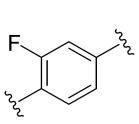
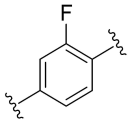
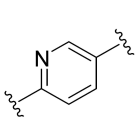
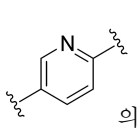
제1항, 제49항, 제52항 및 제53항 중 어느 한 항에 있어서, 구조 모이어티  는 , , , , , 또는  의 구조를 가진 것인 화합물.

청구항 55

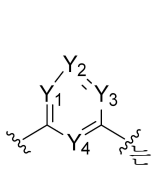
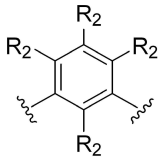
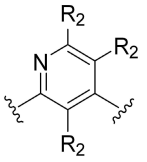
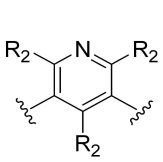
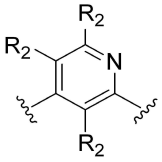
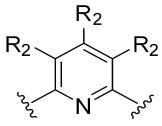
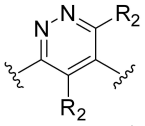
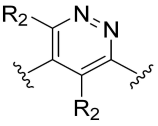
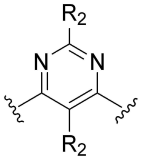
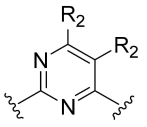
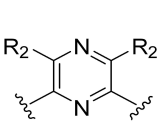
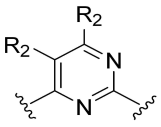
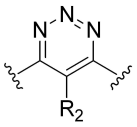
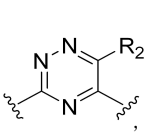
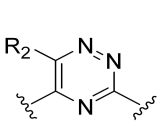
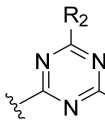
제1항, 제49항 및 제52항 내지 제54항 중 어느 한 항에 있어서, R_2의 각 경우는 독립적으로 H, 할로겐, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$인 화합물.

청구항 56

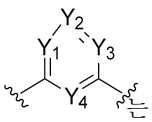
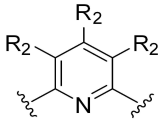
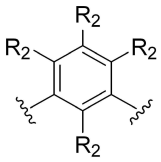
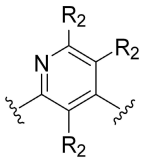
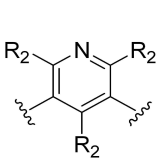
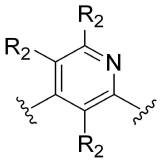
제1항, 제49항 및 제52항 내지 제55항 중 어느 한 항에 있어서, 구조 모이어티  는 ,






, 또는 
의 구조를 가진 것인 화합물.

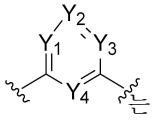
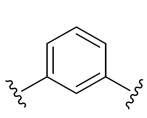
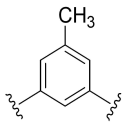
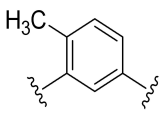
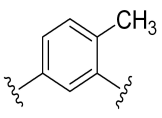
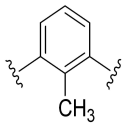
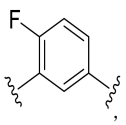
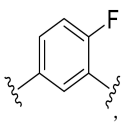
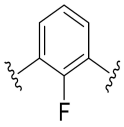
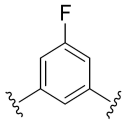
청구항 57

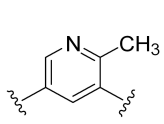
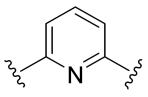
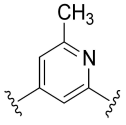
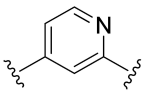
제1항, 제50항 및 제51항 중 어느 한 항에 있어서, 구조 모이어티 는 ,














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의 구조를 가진 것인 화합물.

청구항 58

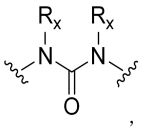
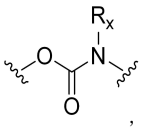
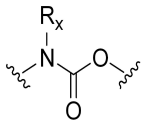
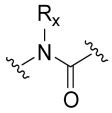
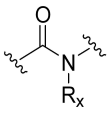
제1항, 제50항, 제51항 및 제57항 중 어느 한 항에 있어서, 구조 모이어티 는 ,




, 또는
의 구조를 가진 것인 화합물.

청구항 59

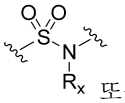
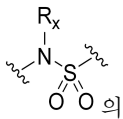
제1항, 제50항, 제51항, 제57항 및 제58항 중 어느 한 항에 있어서, 구조 모이어티 는











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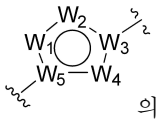
청구항 60

제1항 및 제49항 내지 제59항 중 어느 한 항에 있어서, 구조 모이어티 
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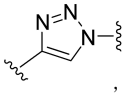
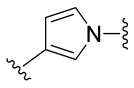
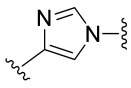
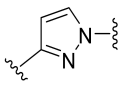
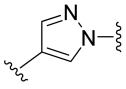
청구항 61

제1항 및 제49항 내지 제59항 중 어느 한 항에 있어서, 구조 모이어티 
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또는 
의 구조를 가진 것인 화합물.

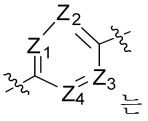
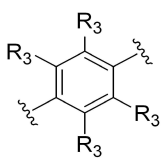
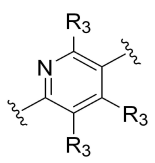
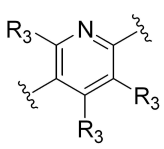
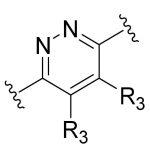
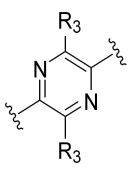
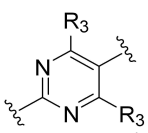
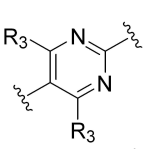
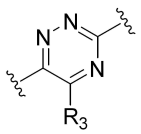
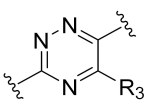
청구항 62

제1항 및 제49항 내지 제59항 중 어느 한 항에 있어서, 구조 모이어티 
는 
의 구조를 가진 것인 화합물.

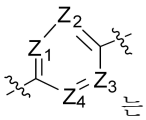
청구항 63

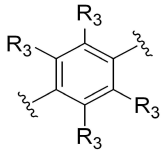
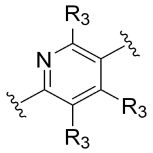
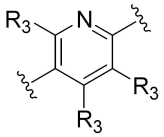
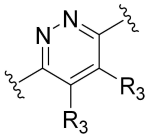
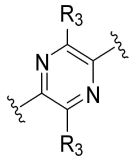
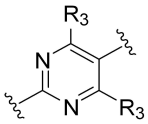
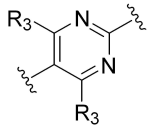
제1항, 제49항 내지 제59항 및 제62항 중 어느 한 항에 있어서, 구조 모이어티 
는 
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, 
, 또는 
의 구조를 가진 것인 화합물.

청구항 64

제1항, 제49항, 제51항 및 제53항 내지 제63항 중 어느 한 항에 있어서, 구조 모이어티 
는 
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, 또는 
의 구조를 가진 것인 화합물.

청구항 65

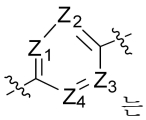
제1항, 제49항, 제51항 및 제53항 내지 제64항 중 어느 한 항에 있어서, 구조 모이어티  는

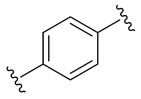
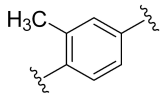
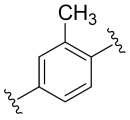
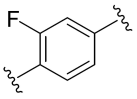
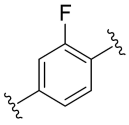
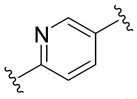
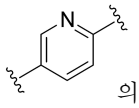
, , , , , , 또는  의 구조를 가진 것인 화합물.

청구항 66

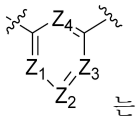
제1항, 제49항, 제51항 및 제53항 내지 제65항 중 어느 한 항에 있어서, R_3의 각 경우는 H, 할로겐, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$인 화합물.

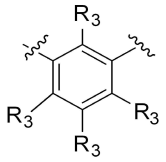
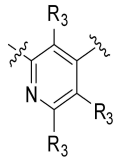
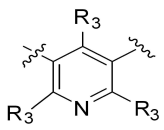
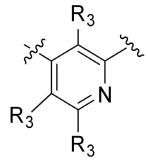
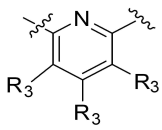
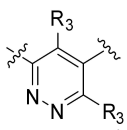
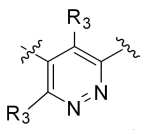
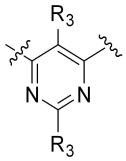
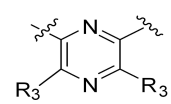
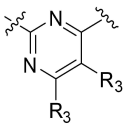
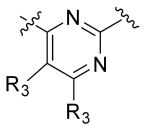
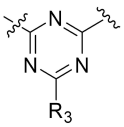
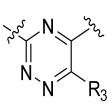
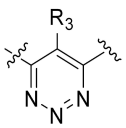
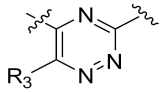
청구항 67

제1항, 제49항, 제51항 및 제53항 내지 제66항 중 어느 한 항에 있어서, 구조 모이어티  는

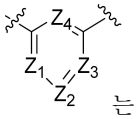
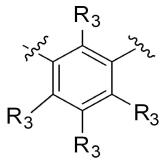
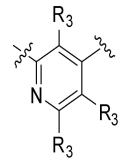
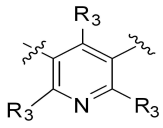
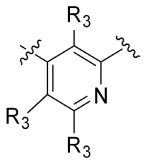
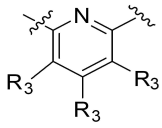
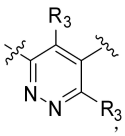
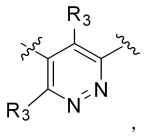
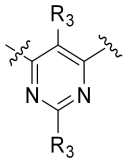
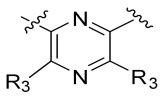
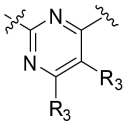
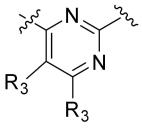
, , , , , , 또는  의 구조를 가진 것인 화합물.

청구항 68

제1항, 제50항, 제52항 및 제53항 내지 제63항 중 어느 한 항에 있어서, 구조 모이어티  는

, , , , , , , , , , , , , , 또는  의 구조를 가진 것인 화합물.

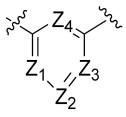
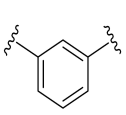
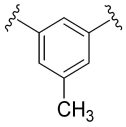
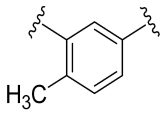
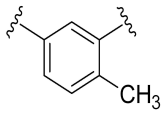
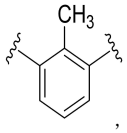
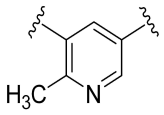
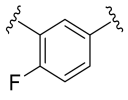
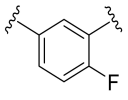
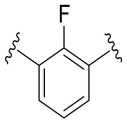
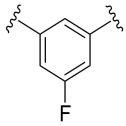
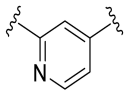
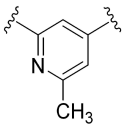
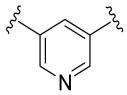
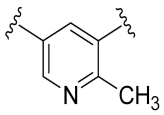
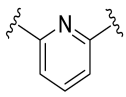
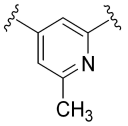
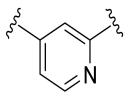
청구항 69

제1항, 제50항, 제52항, 제53항 내지 제63항 및 제68항 중 어느 한 항에 있어서, 구조 모이어티  는 , , , , , , , , , ,  또는 의 구조를 가진 것인 화합물.

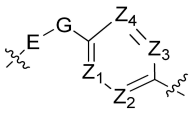
청구항 70

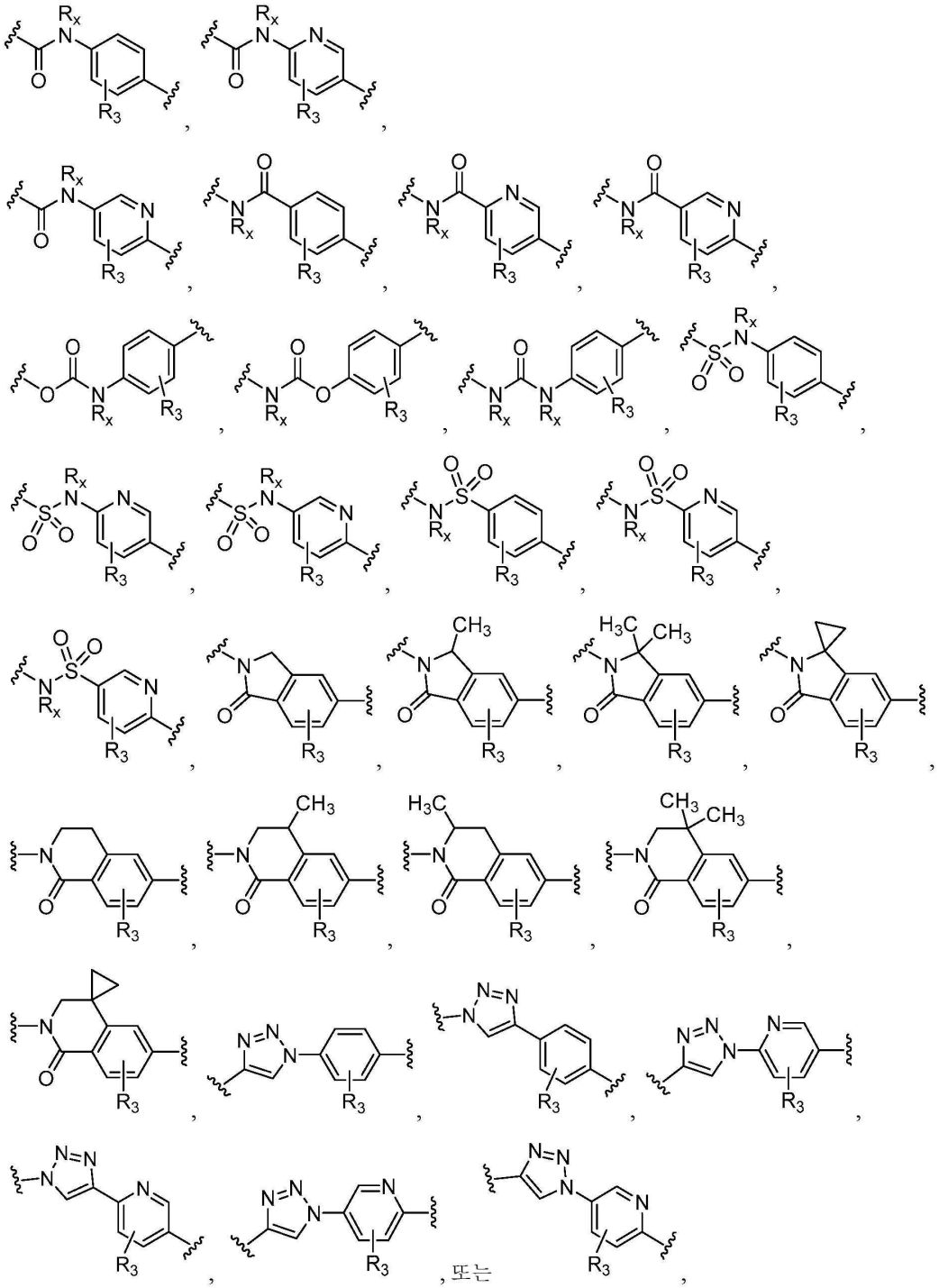
제1항, 제50항, 제52항, 제53항 내지 제63항, 제68항 및 제69항 중 어느 한 항에 있어서, R_3의 각 경우는 H, 할로겐, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$인 화합물.

청구항 71

제1항, 제50항, 제52항, 제53항 내지 제63항, 및 제68항 내지 제70항 중 어느 한 항에 있어서, 구조 모이어티  는 , , , , , , , , , , , , , , ,  또는  의 구조를 가진 것인 화합물.

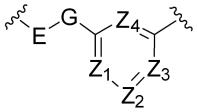
청구항 72

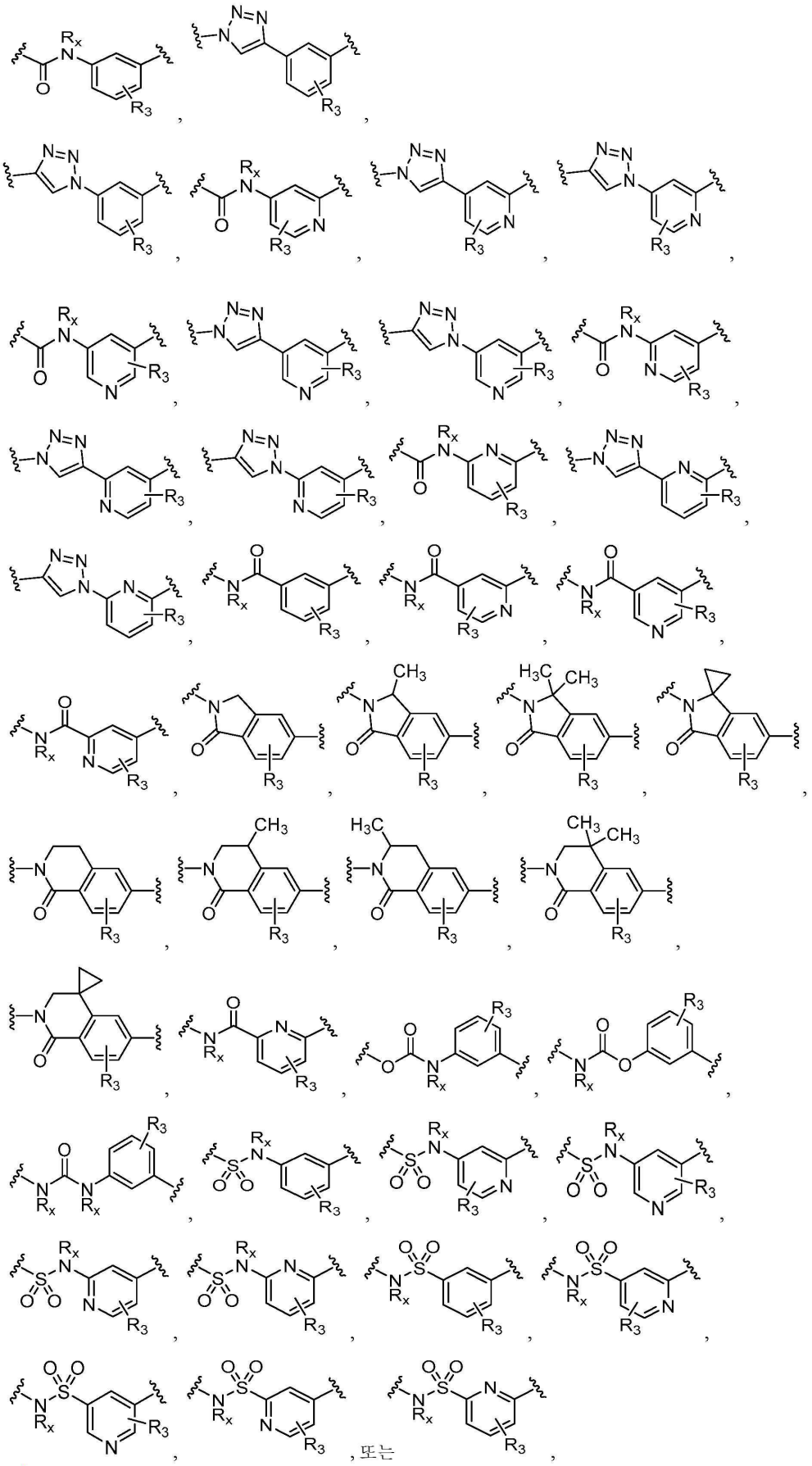
제1항, 제49항 및 제51항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가진 것인 화합물:



상기 식에서, R_3은 H, CH_3, OH, 할로겐 또는 NH_2이고; R_x는 H, CH_3 또는 CH_2CH_3이다.

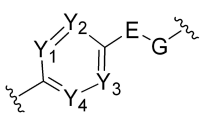
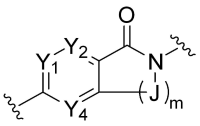
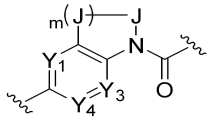
청구항 73

제1항, 제50항 및 제52항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가진 것인 화합물:

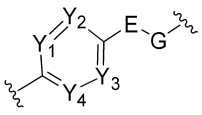
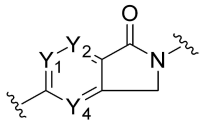
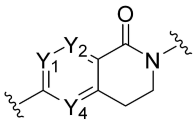
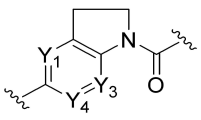
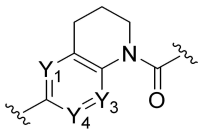


상기 식에서, R_3은 H, CH_3, OH, 할로겐 또는 NH_2이고; R_x는 H, CH_3 또는 CH_2CH_3이다.

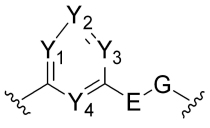
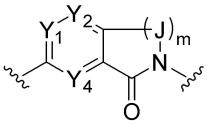
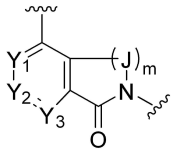
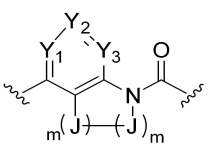
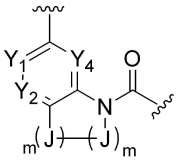
청구항 74

제1항, 제49항 및 제52항 중 어느 한 항에 있어서, 구조 모이어티  는  또는  의 구조를 갖고, 여기서 m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_y)_2$이고, R_y의 각 경우는 독립적으로 H, (C_1-C_6)알킬, OH, $O(C_1-C_6)$알킬 또는 할로겐인 화합물.

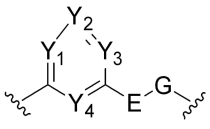
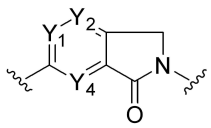
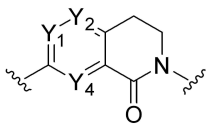
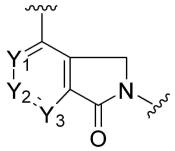
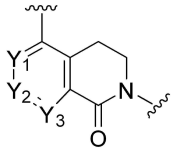
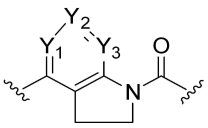
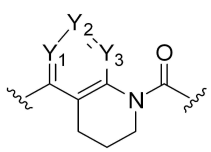
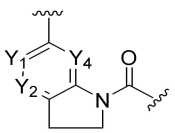
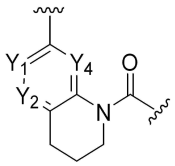
청구항 75

제1항, 제49항, 제52항 및 제74항 중 어느 한 항에 있어서, 구조 모이어티  는  ,  ,  , 또는  의 구조를 갖고, 여기서 Y_1, Y_2, Y_3 및 Y_4는 각각 독립적으로 N, CH, CCH_3 또는 CF인 화합물.

청구항 76

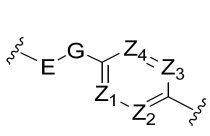
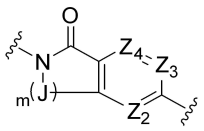
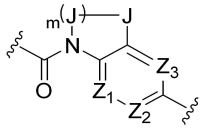
제1항, 제50항 및 제51항 중 어느 한 항에 있어서, 구조 모이어티  는  ,  ,  , 또는  의 구조를 갖고, 여기서 m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_y)_2$이고, R_y의 각 경우는 각각 독립적으로 H, (C_1-C_6)알킬, OH, $O(C_1-C_6)$알킬 또는 할로겐인 화합물.

청구항 77

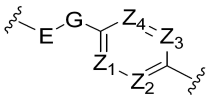
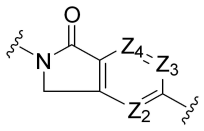
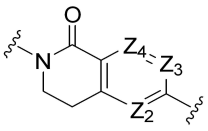
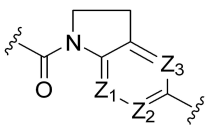
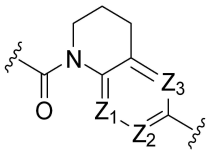
제1항, 제50항, 제51항 및 제76항 중 어느 한 항에 있어서, 구조 모이어티  는  ,  ,  ,  ,  ,  ,  , 또는  의 구조를 갖고, 여기서 Y_1, Y_2, Y_3 및 Y_4는 각각 독

립적으로 N, CH, CCH_3 또는 CF인 화합물.

청구항 78

제1항, 제49항 및 제51항 중 어느 한 항에 있어서, 구조 모이어티  는  또는  의 구조를 갖고, 여기서 m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_z)_2$이고, R_z의 각 경우는 독립적으로 H, (C_1-C_6)알킬, OH, $O(C_1-C_6)$알킬 또는 할로겐인 화합물.

청구항 79

제1항, 제49항, 제51항 및 제78항 중 어느 한 항에 있어서, 구조 모이어티  는  ,  ,  , 또는  의 구조를 갖고, 여기서 Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 N, CH, CCH_3 또는 CF인 화합물.

청구항 80

제1항에 있어서, 화학식 Ib의 화학식을 가진 화합물.

청구항 81

제1항에 있어서, 화학식 IIb의 화학식을 가진 화합물.

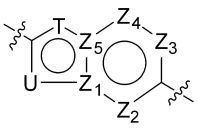
청구항 82

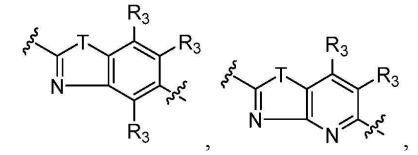
제1항에 있어서, 화학식 IIIb의 화학식을 가진 화합물.

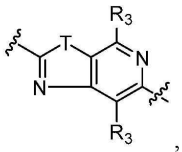
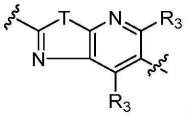
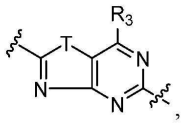
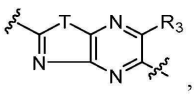
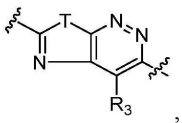
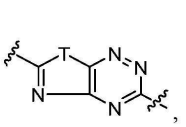
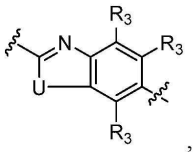
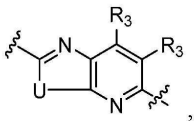
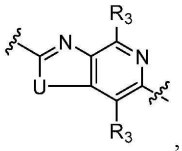
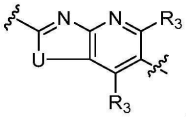
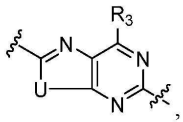
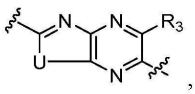
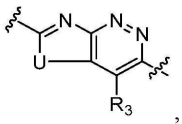
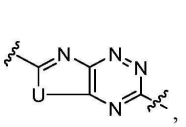
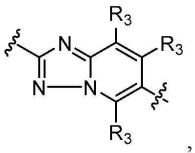
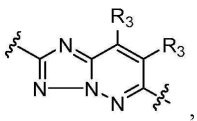
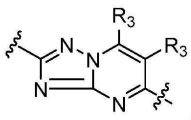
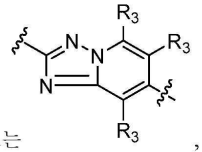
청구항 83

제1항에 있어서, 화학식 IVb의 화학식을 가진 화합물.

청구항 84

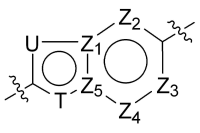
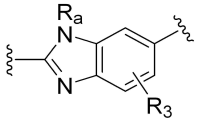
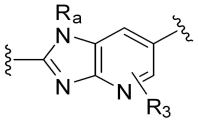
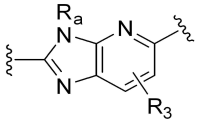
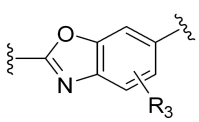
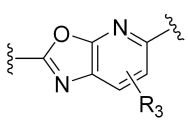
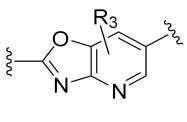
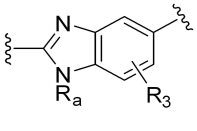
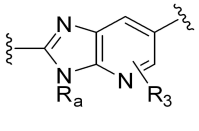
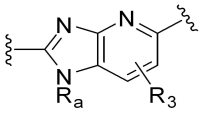
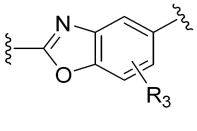
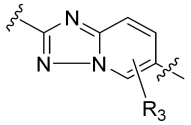
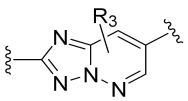
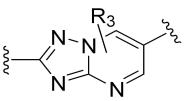
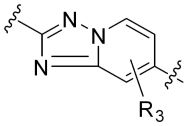
제1항, 제80항 및 제82항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가진 것인 화합물:


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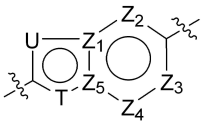
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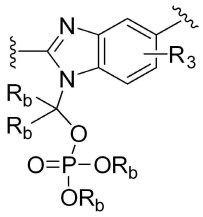
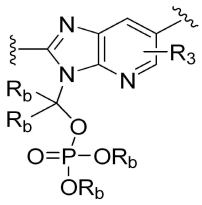
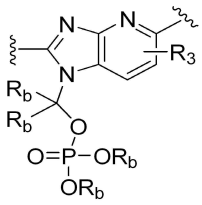
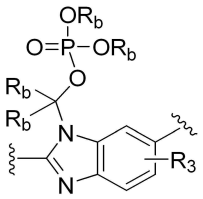
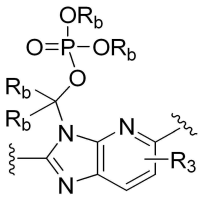
상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

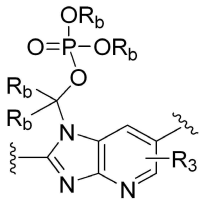
청구항 85

제1항, 제80항, 제82항 및 제84항 중 어느 한 항에 있어서, 구조 모이어티  는

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의 구조를 갖고, 여기서 R_3은 H, CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3, 또는 CH_2CH_3인 화합물.

청구항 86

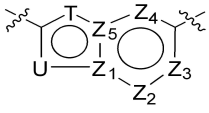
제1항, 제80항, 제82항, 제84항 및 제85항 중 어느 한 항에 있어서, 구조 모이어티  는

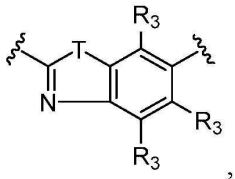
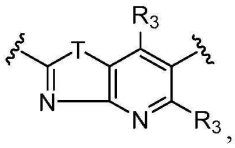
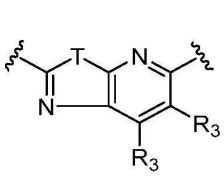
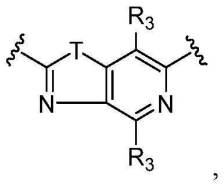
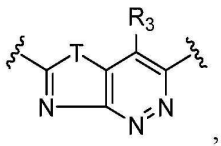
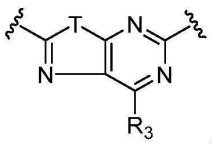
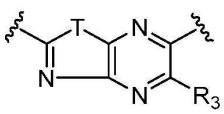
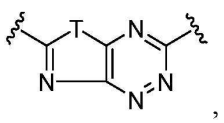
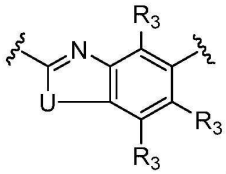
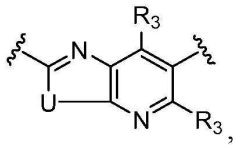
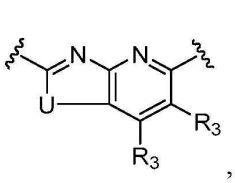
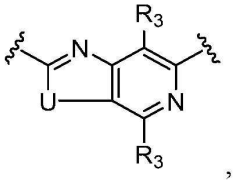
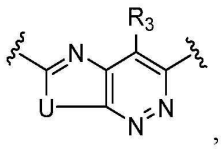
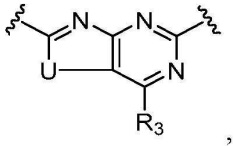
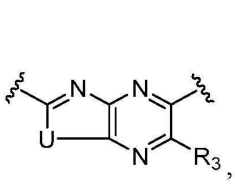
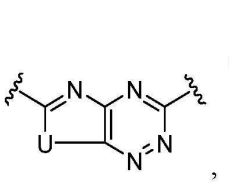
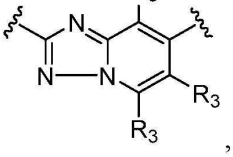
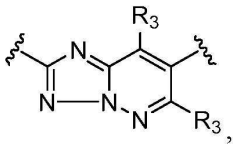
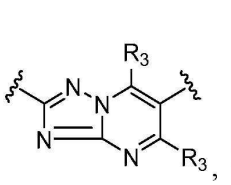
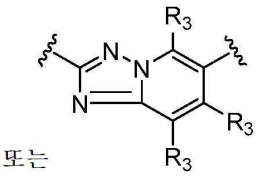
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의 구조를 가진 것인 화합물.

청구항 87

제1항, 제81항 및 제83항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가진 것인 화합물:


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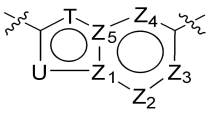
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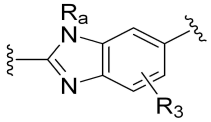
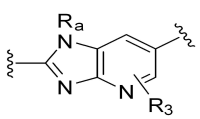
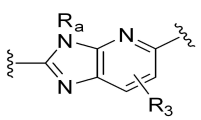
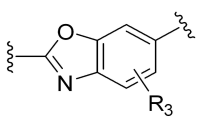
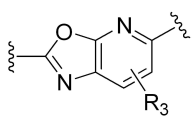
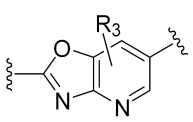
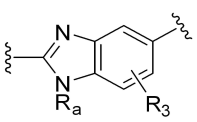
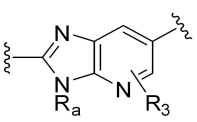
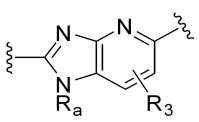
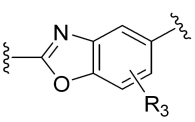
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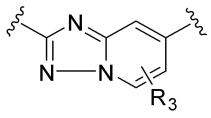
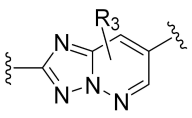
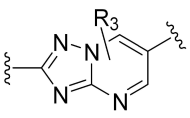
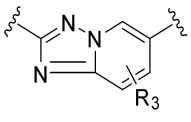
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상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

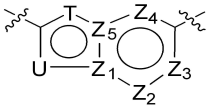
청구항 88

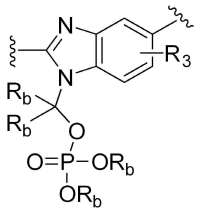
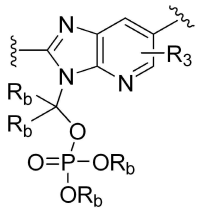
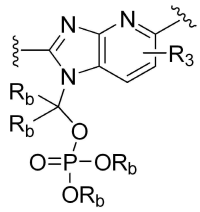
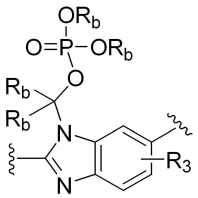
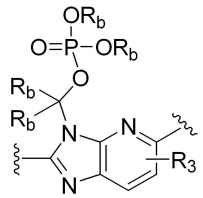
제1항, 제81항, 제83항 및 제87항 중 어느 한 항에 있어서, 구조 모이어티  는

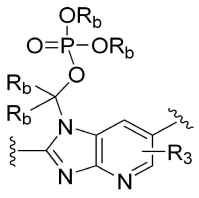

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의 구조를 갖고, 여기서 R_3은 H, CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3 또는 CH_2CH_3인 화합물.

청구항 89


제1항, 제81항, 제83항, 제87항 및 제88항 중 어느 한 항에 있어서, 구조 모이어티 는


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의 구조를 가진 것인 화합물.

청구항 90

제84항, 제86항, 제87항 및 제88항 중 어느 한 항에 있어서, R_b의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬인 화합물.

청구항 91

제84항, 제86항, 제87항, 제88항 및 제90항 중 어느 한 항에 있어서, R_b의 각 경우는 독립적으로 H, CH_3, CH_2CH_3 또는 $CH(CH_3)_2$인 화합물.

청구항 92

제1항에 있어서, 화학식 Ic의 화학식을 가진 화합물.

청구항 93

제1항에 있어서, 화학식 IIc의 화학식을 가진 화합물.

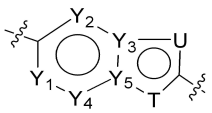
청구항 94

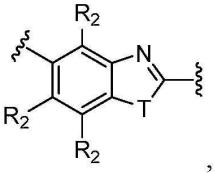
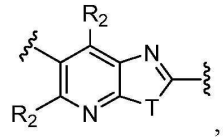
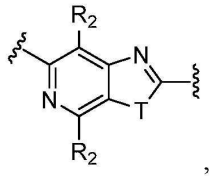
제1항에 있어서, 화학식 IIIc의 화학식을 가진 화합물.

청구항 95

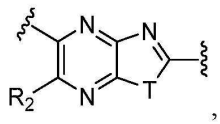
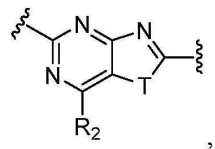
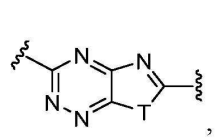
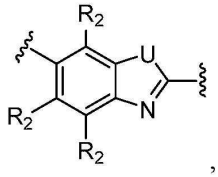
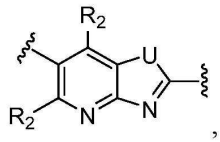
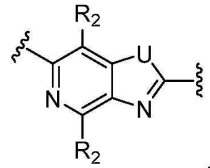
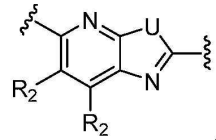
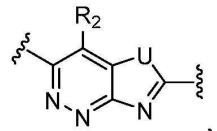
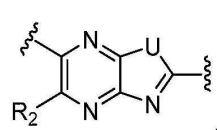
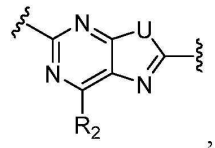
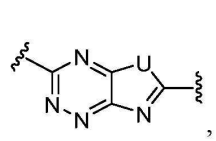
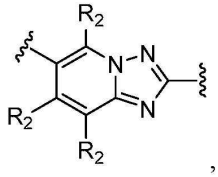
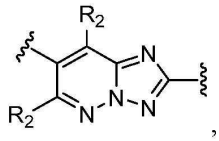
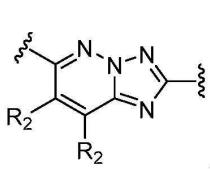
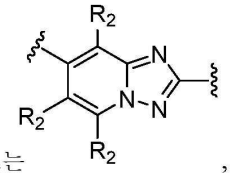
제1항에 있어서, 화학식 IVc의 화학식을 가진 화합물.

청구항 96


제1항, 제92항 및 제95항 중 어느 한 항에 있어서, 구조 모이어티 는 하기 화학식의 구조를 가진 것인 화합물:

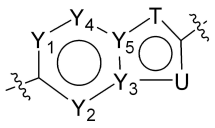

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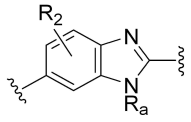
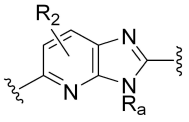
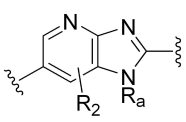
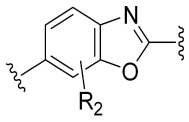
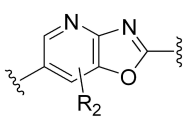
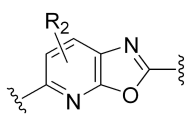
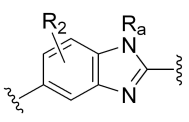
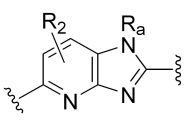
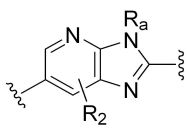
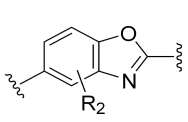
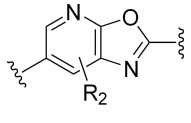
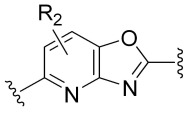
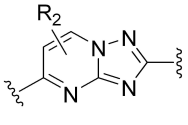
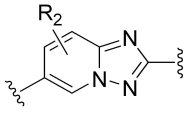
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상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

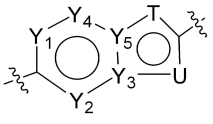
청구항 97

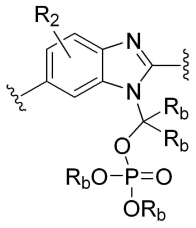
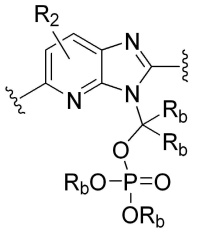
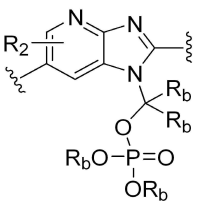
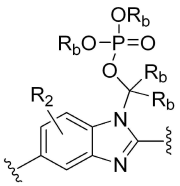
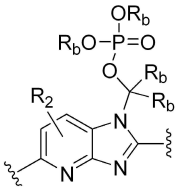
제1항, 제92항, 제95항 및 제96항 중 어느 한 항에 있어서, 구조 모이어티  는

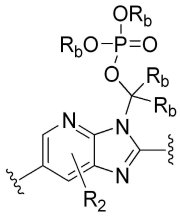

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의 구조를 갖고, 여기서 R_2는 H,

CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3 또는 CH_2CH_3인 화합물.

청구항 98

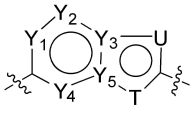
제1항, 제92항, 및 제95항 내지 제97항 중 어느 한 항에 있어서, 구조 모이어티  는

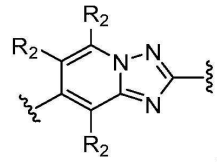
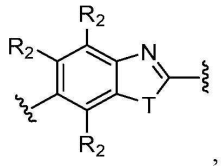
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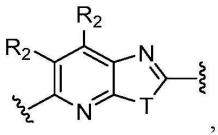
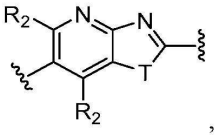
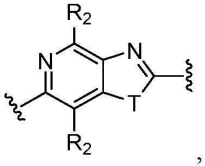
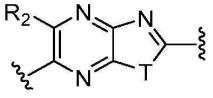


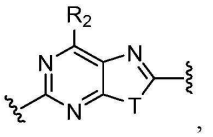
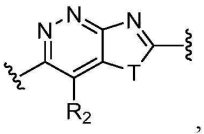
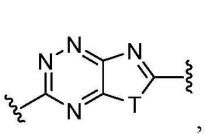
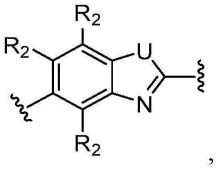
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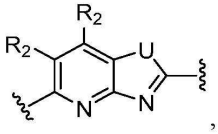
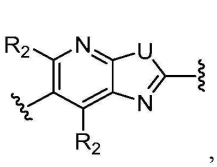
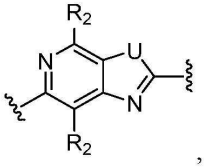
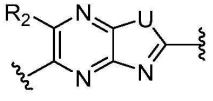
청구항 99

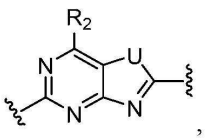
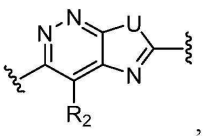
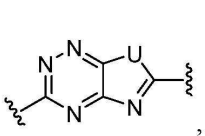
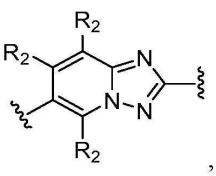
제1항, 제93항 및 제94항 중 어느 한 항에 있어서, 구조 모이어티  는 하기 화학식의 구조를 가진 것인 화합물:

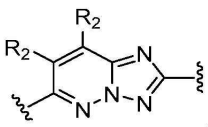
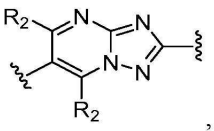
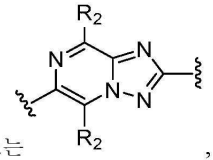
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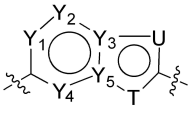
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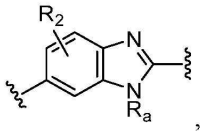
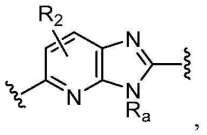
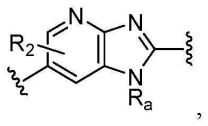
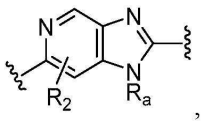
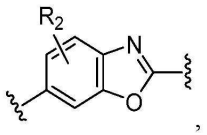
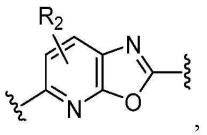
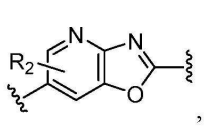
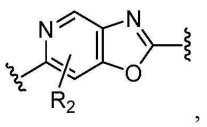
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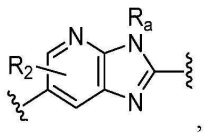
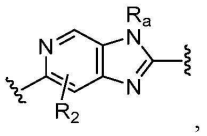
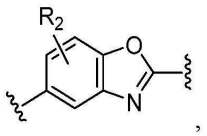
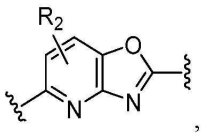
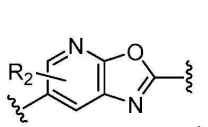
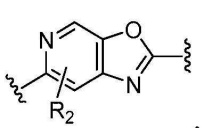
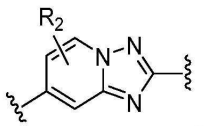
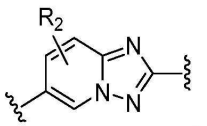
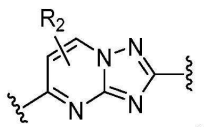
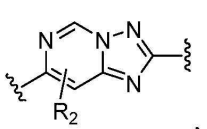
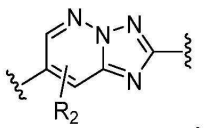
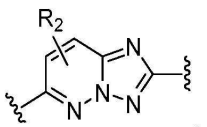
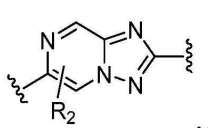
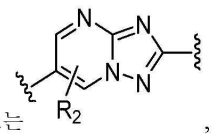


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상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

청구항 100

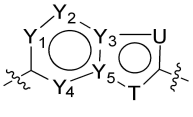
제1항, 제93항, 제94항 및 제99항 중 어느 한 항에 있어서, 구조 모이어티 는 하기 화학식의 구조를 가진 것인 화합물:

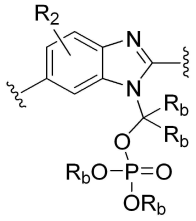
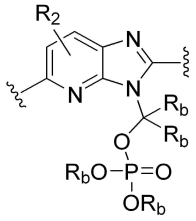
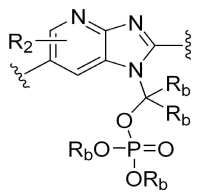
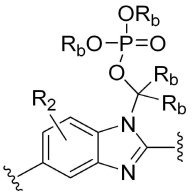
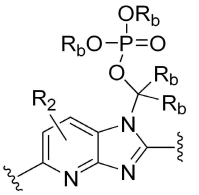
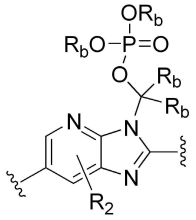























,또는

,

상기 식에서, R_2는 H, CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3 또는 CH_2CH_3이다.

청구항 101

제1항, 제93항, 제94항, 제99항 및 제100항 중 어느 한 항에 있어서, 구조 모이어티 는

, , , , , 또는 의 구조를 가진 것인 화합물.

청구항 102

제96항, 제98항, 제99항 및 제101항 중 어느 한 항에 있어서, R_b의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬인 화합물.

청구항 103

제96항, 제98항, 제99항, 제101항 및 제102항 중 어느 한 항에 있어서, R_b의 각 경우는 독립적으로 H, CH_3, CH_2CH_3 또는 $CH(CH_3)_2$인 화합물.

청구항 104

제1항 및 제96항 내지 제103항 중 어느 한 항에 있어서, R_2의 각 경우는 독립적으로 H, CH_3, OH, NH_2 또는 할로겐인 화합물.

청구항 105

제1항에 있어서, 구조 모이어티 는 의 구조를 가진 것인 화합물.

청구항 106

제1항에 있어서, 구조 모이어티 는 의 구조를 가진 것인 화합물.

청구항 107

제1항에 있어서, 구조 모이어티 는 의 구조를 가진 것인 화합물.

청구항 108

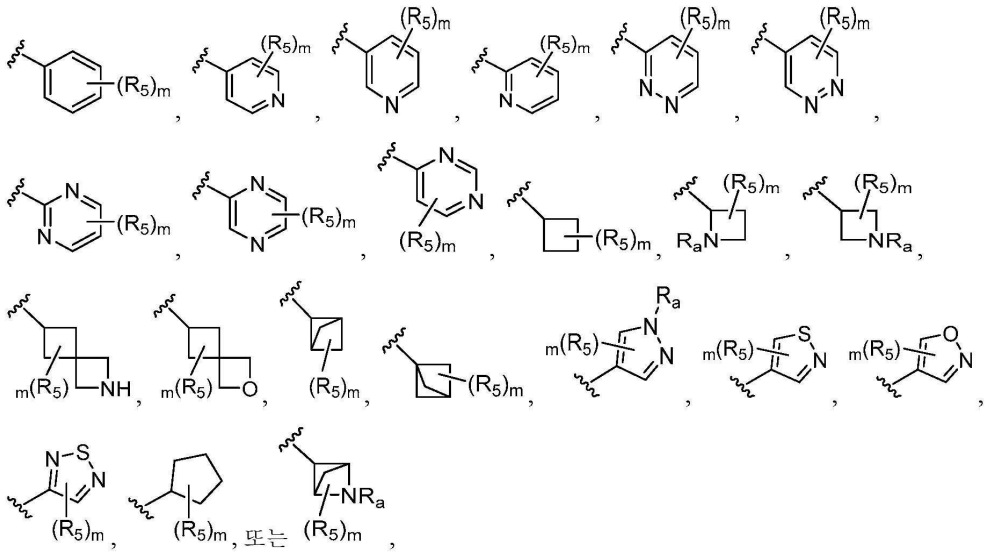
제1항에 있어서, 구조 모이어티 의 V와 R_4는 함께 (C_4-C_{10})헤테로스피로알킬을 형성하는 것인 화합물.

청구항 109

제1항에 있어서, V는 부재하는 것인 화합물.

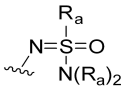
청구항 110

제1항 및 제105항 내지 제109항 중 어느 한 항에 있어서, R_4는 (C_1-C_6)알킬 또는 하기 화학식의 기인 화합물:

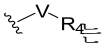


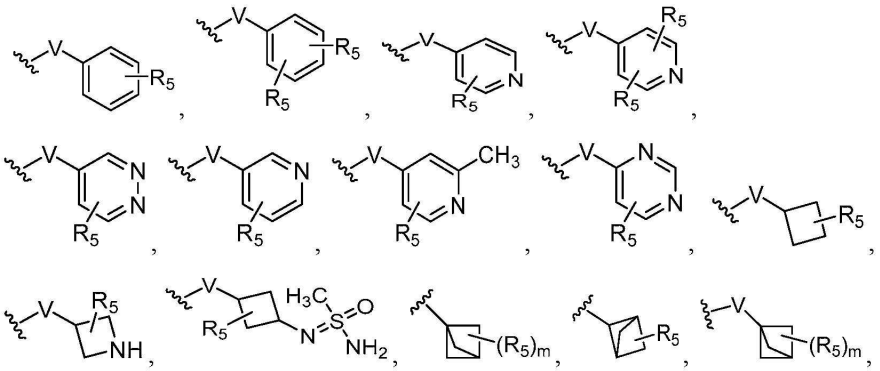
상기 식에서, m은 0 내지 3의 정수이다.

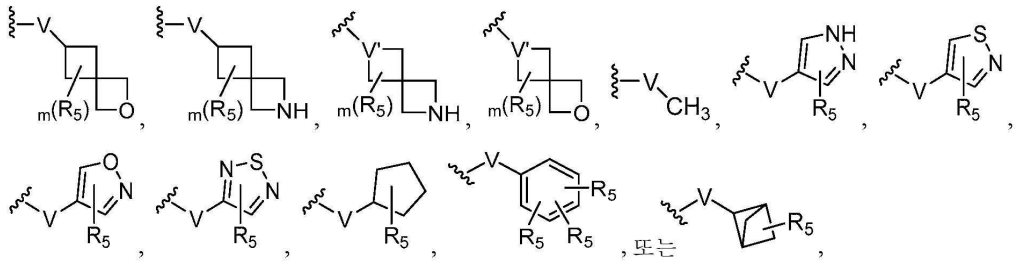
청구항 111

제1항 또는 제110항에 있어서, R_5의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐, OR_a, OH, NH_2, $N(R_a)COR_a$, CN, CF_3, (C_1-C_6)할로알킬 또는  이고, R_a의 각 경우는 독립적으로 H, (C_2-C_6)알케닐 또는 (C_1-C_6)알킬인 화합물.

청구항 112

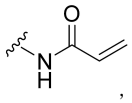
제1항 및 제105항 내지 제111항 중 어느 한 항에 있어서, 구조 모이어티 는 하기 화학식의 구조를 가진 것인 화합물:





상기 식에서, V는 $C(R_a)_2$, O, NR_a, $N(C=O)R_a$ 또는 NSO_2R_a이고, V'는 CR_a 또는 N이다.

청구항 113



제1항 또는 제112항에 있어서, R_5의 각 경우는 독립적으로 H, CH_3, 이소프로필, 할로겐, OH, CN, , CF_3, (C_1-C_6)할로알킬 또는 NH_2인 화합물.

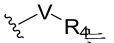
청구항 114

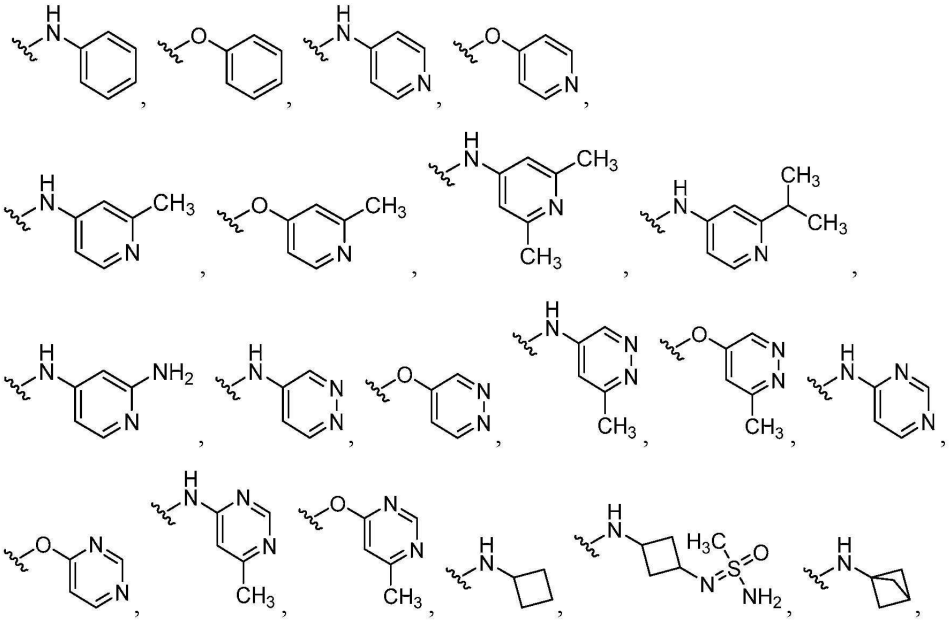
제1항 내지 제113항 중 어느 한 항에 있어서, R_a의 각 경우는 독립적으로 H, (C_2-C_6)알케닐 또는 (C_1-C_6)알킬인 화합물.

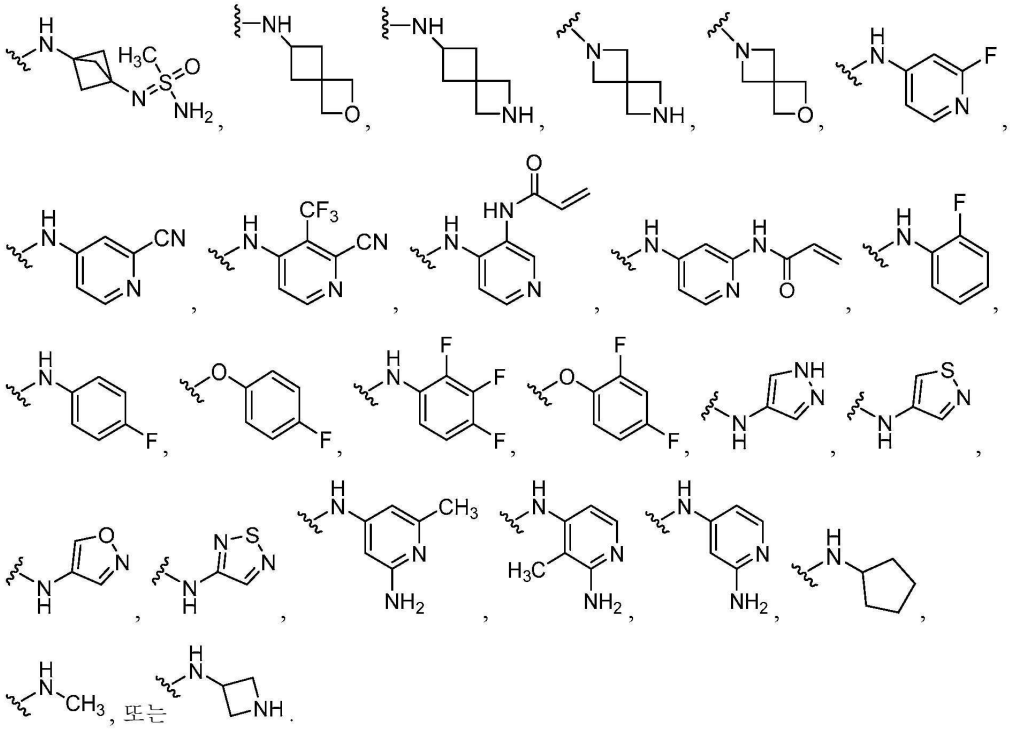
청구항 115

제1항 내지 제114항 중 어느 한 항에 있어서, R_a의 각 경우는 H, CH_3 또는 CH_2CH_3인 화합물.

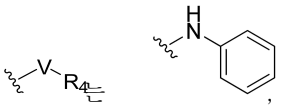
청구항 116

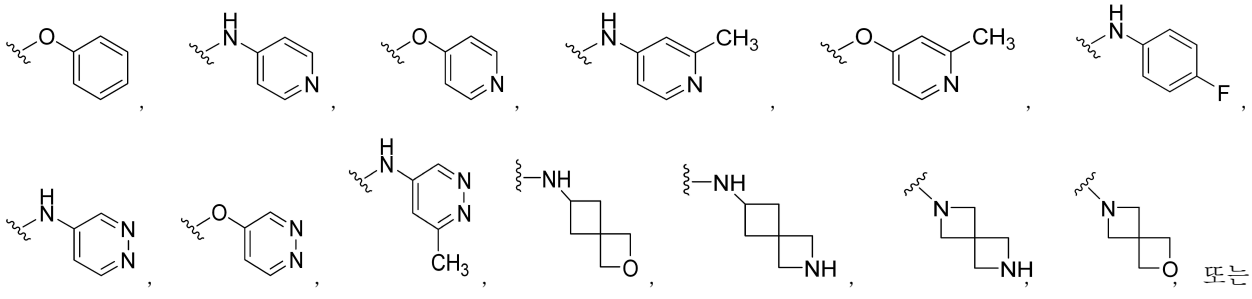
제1항 및 제105항 내지 제111항 중 어느 한 항에 있어서, 구조 모이어티 는 하기 화학식의 구조를 가진 것인 화합물:

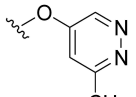




청구항 117

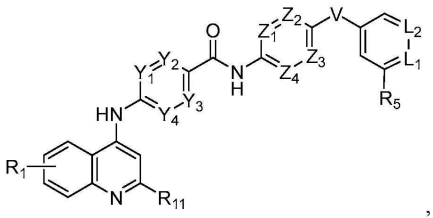
제1항 및 제105항 내지 제111항 중 어느 한 항에 있어서, 구조 모이어티 는 ,

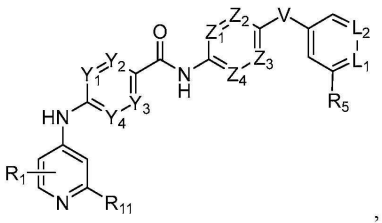


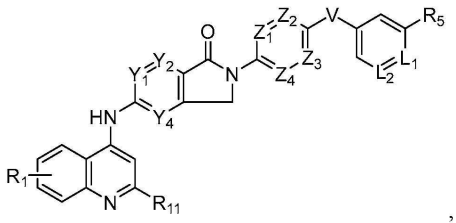
의 구조를 가진 것인 화합물.

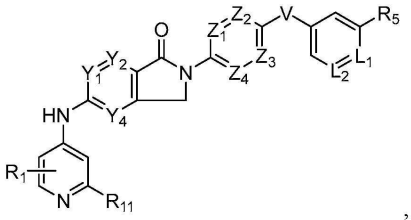
청구항 118

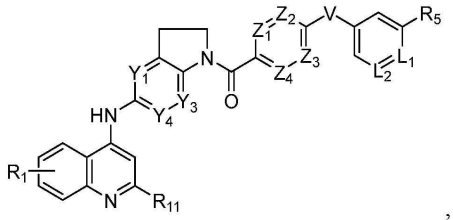
제1항 또는 제49항에 있어서, 화학식 Ia의 화합물은 하기 화학식의 구조를 가진 것인 화합물:

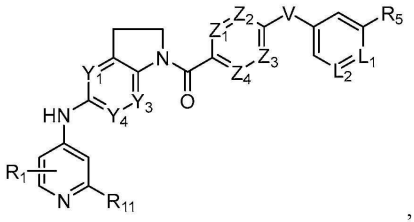

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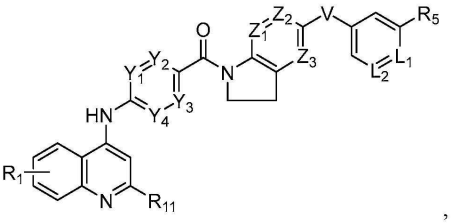

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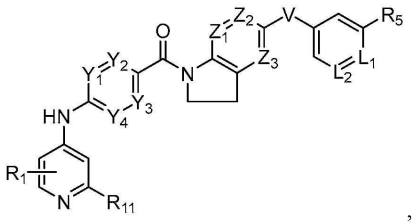

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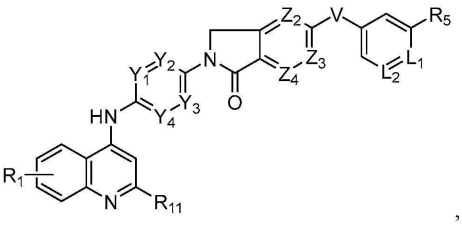

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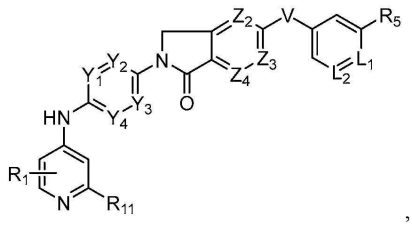
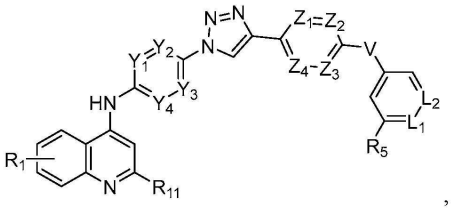
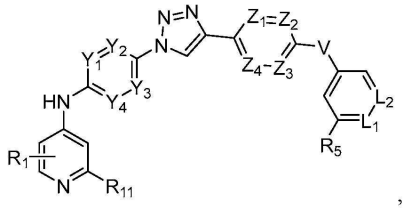
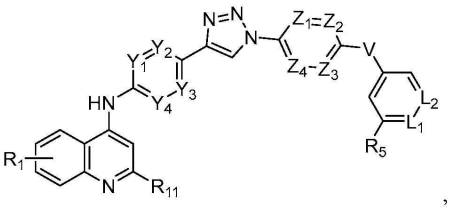
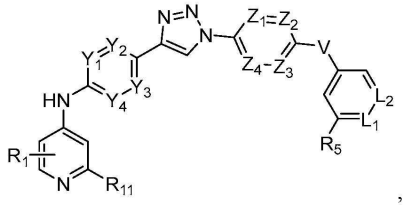

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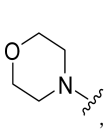
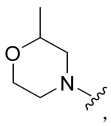
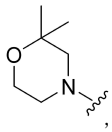
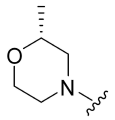
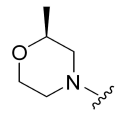
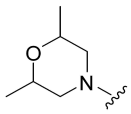
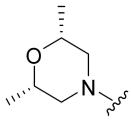
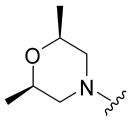
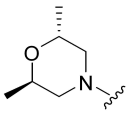
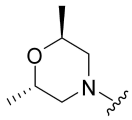
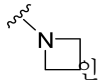

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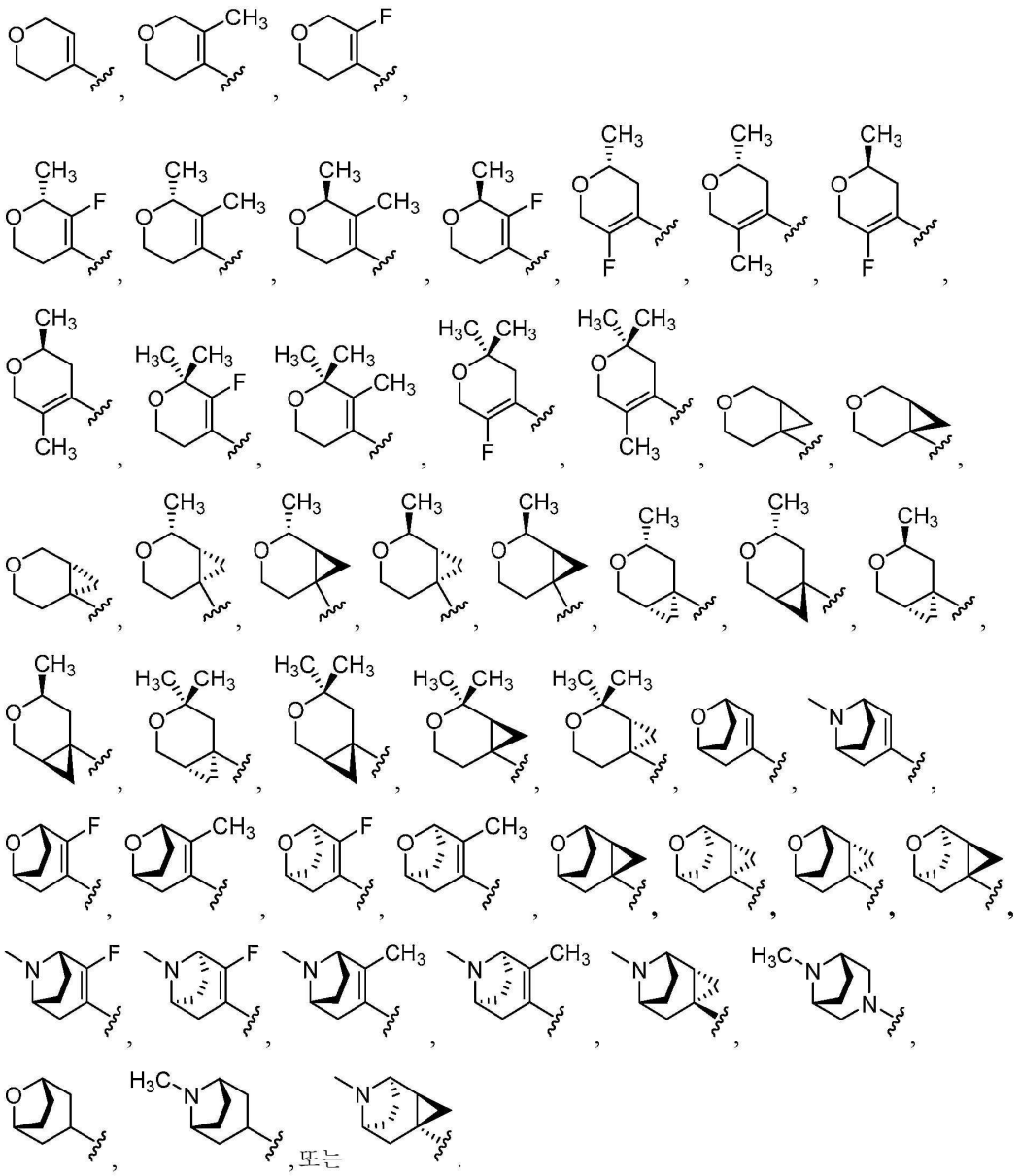
상기 식에서, R_1은 H, (C_1-C_6)알킬, $N(R_a)_2$, (C_3-C_7)헤테로사이클로알킬, 할로겐, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, 또는 (C_4-C_{14})헤테로트리사이클로알케닐이고; R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_1, Z_2, Z_3, Z_4, L_1 및 L_2는 각각 독립적으로 CH 또는 N이고; V는 NH 또는 O이다.

청구항 119

제118항에 있어서, R_1은 H, F, Cl, Br, CH_3, CH_2CH_3, $CH(CH_3)_2$, NH_2, NMe_2, , , , , , , , , , , 또는 인 화합물.

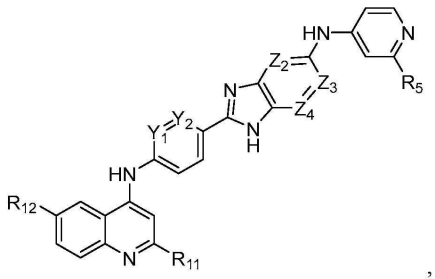
청구항 120

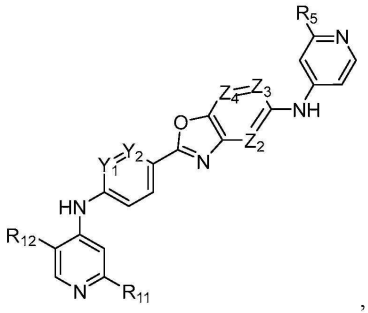
제118항에 있어서, R_1은 하기 화학식의 기인 화합물:

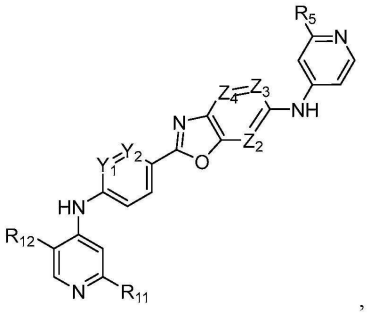


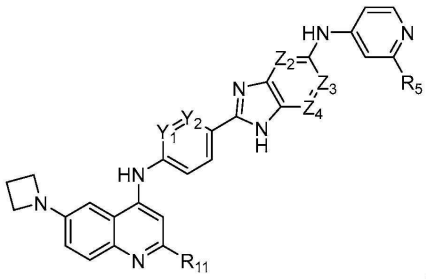
청구항 121

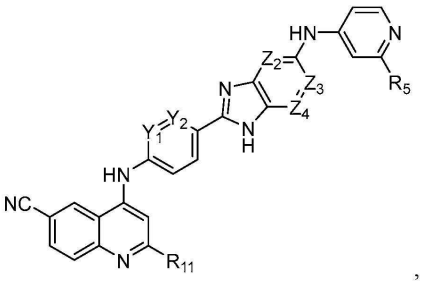
제1항 또는 제80항에 있어서, 화학식 Ib의 화합물은 하기 화학식의 구조를 가진 것인 화합물:

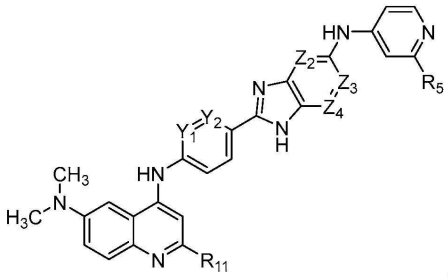

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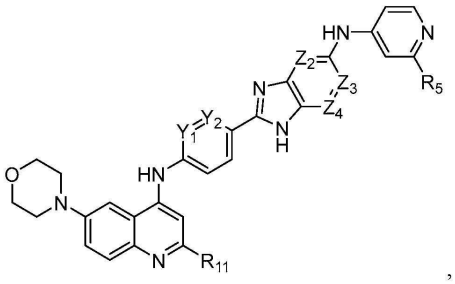

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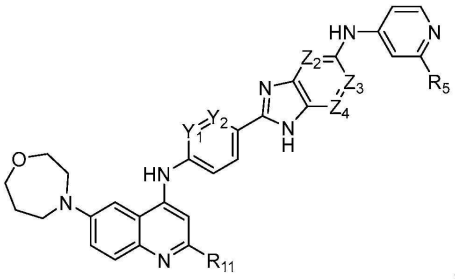

,

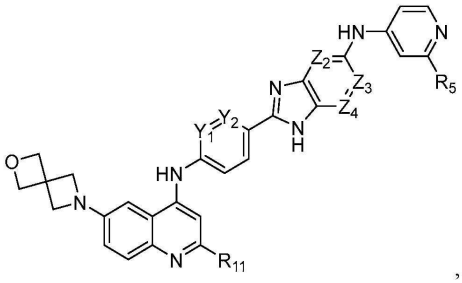

,

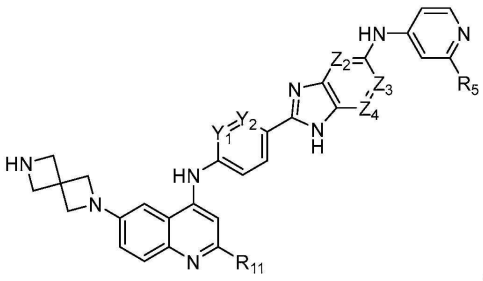

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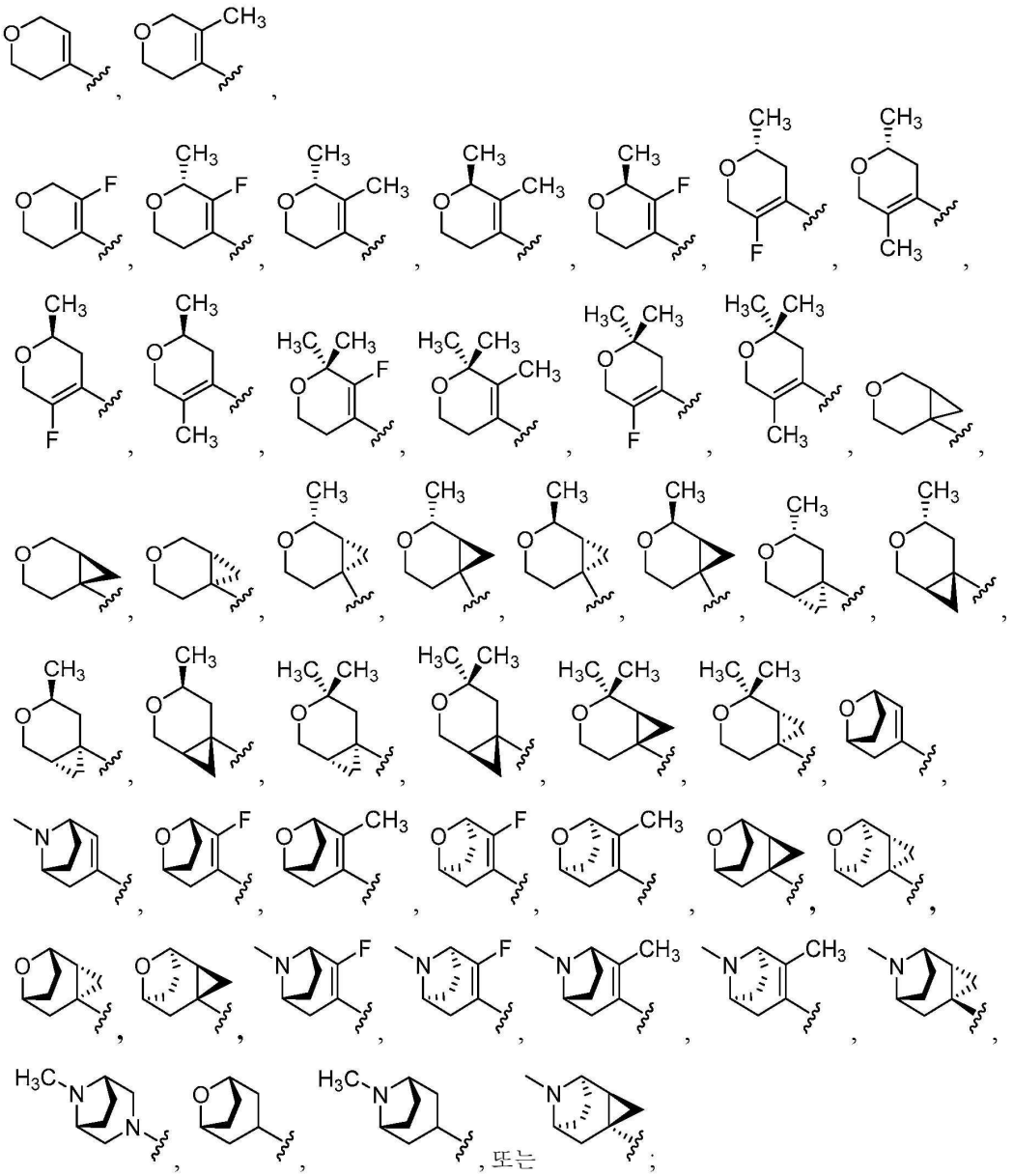

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,또는

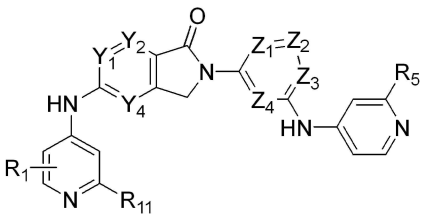

,

상기 식에서, R_{11} 및 R_5는 각각 독립적으로 H, 할로겐 또는 CH_3이고; R_{12}는 H, 할로겐, CH_3, 하기 화학식의 기이고:



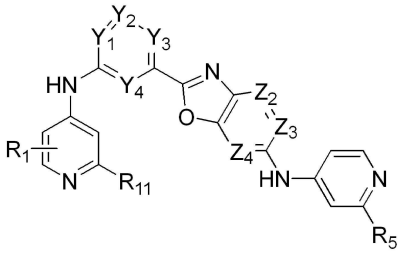
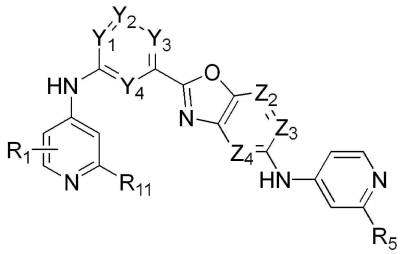
Y_1, Y_2, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

청구항 122

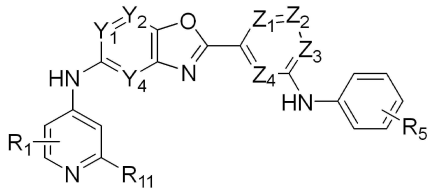
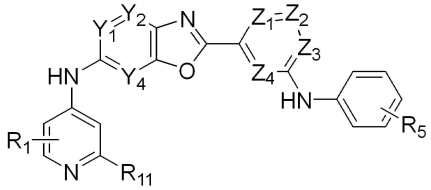


제1항에 있어서, 화학식 IIa의 화합물은 의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_4, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N인 화합물.

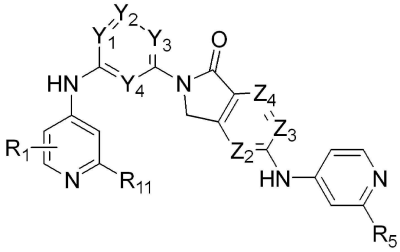
청구항 123

제1항에 있어서, 화학식 IIb의 화합물은  또는  의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N인 화합물.

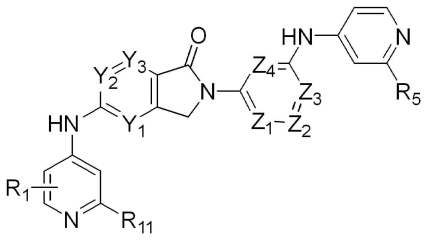
청구항 124

제1항에 있어서, 화학식 IIc의 화합물은  또는  의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_4, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N인 화합물.

청구항 125

제1항에 있어서, 화학식 IIIa의 화합물은  의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N인 화합물.

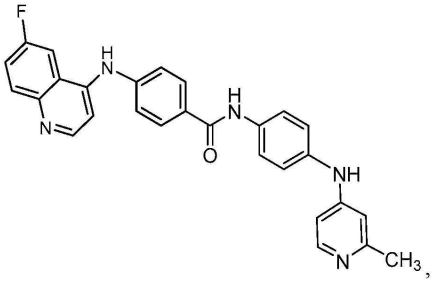
청구항 126

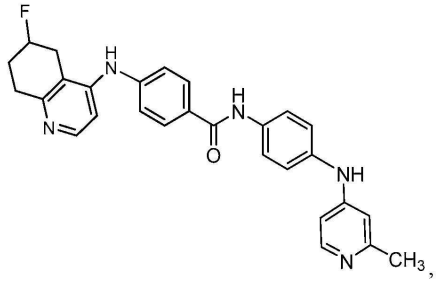
제1항에 있어서, 화학식 IVa의 화합물은  의 구조를 갖고, 여기서 R_1, R_5

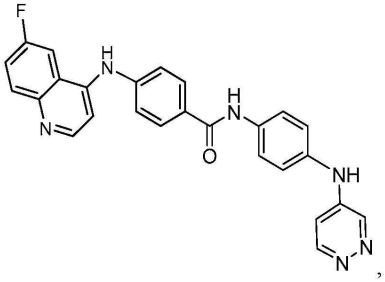
및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N인 화합물.

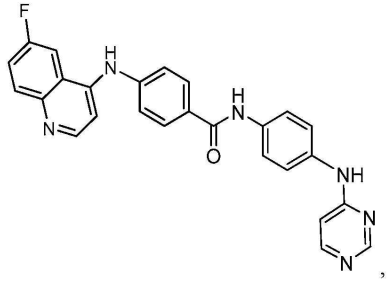
청구항 127

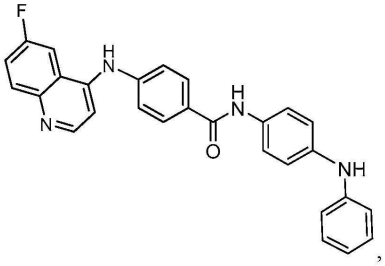
제1항에 있어서, 화학식 Ia의 화합물은 하기 화합물인 화합물:

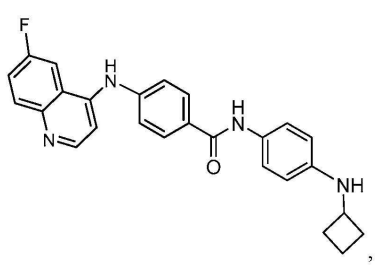


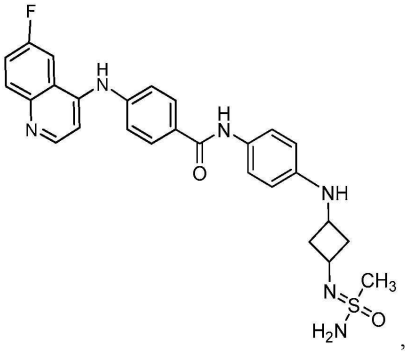


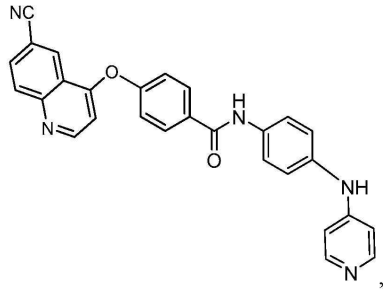


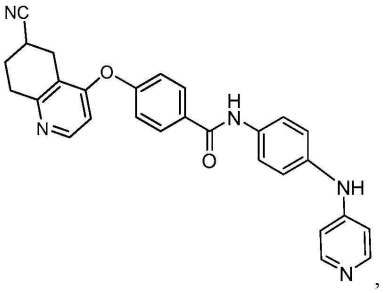


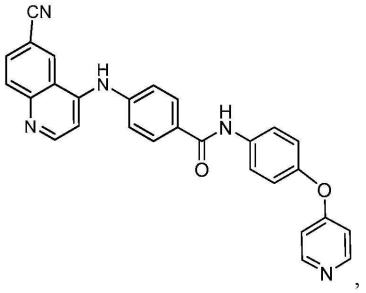


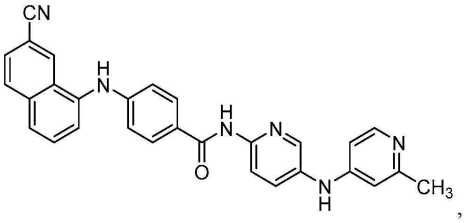


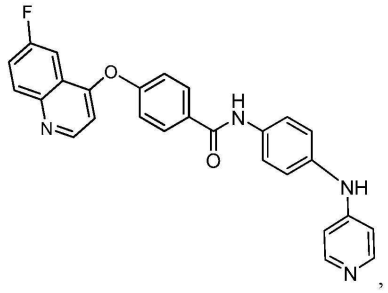


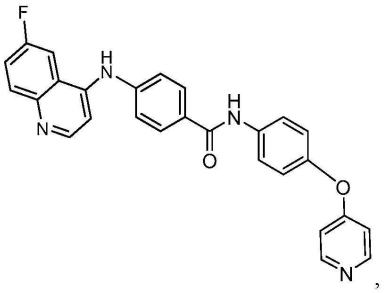


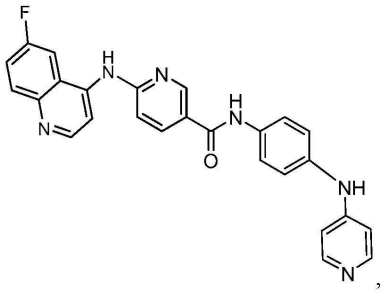


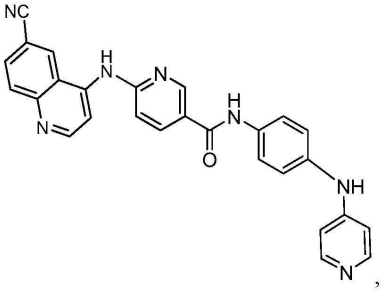


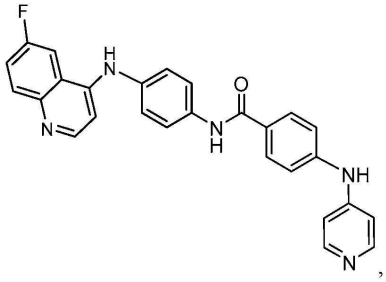


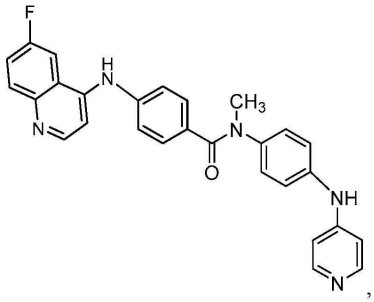


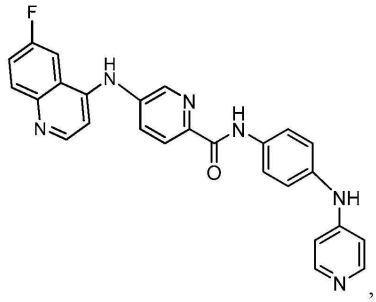


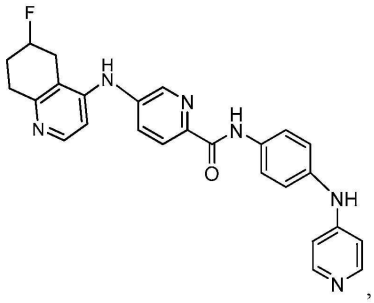


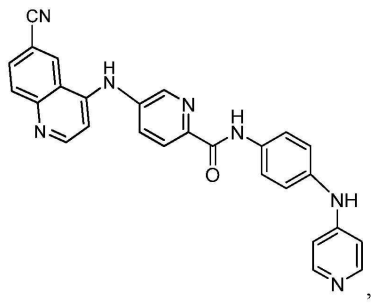


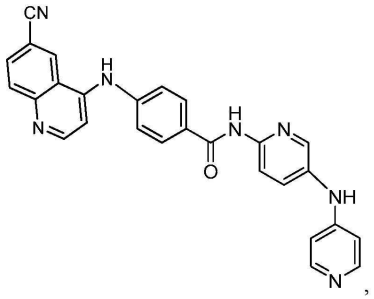


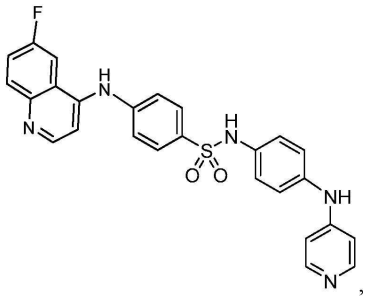


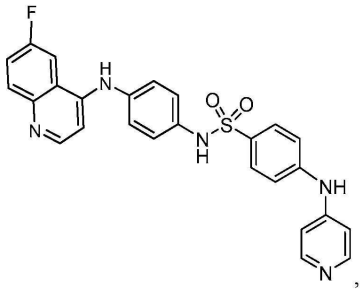


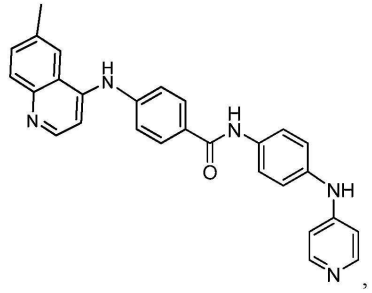


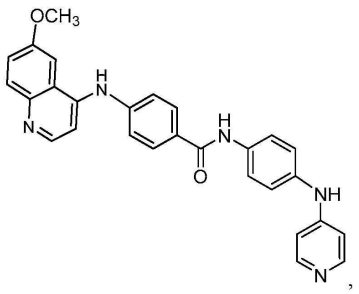
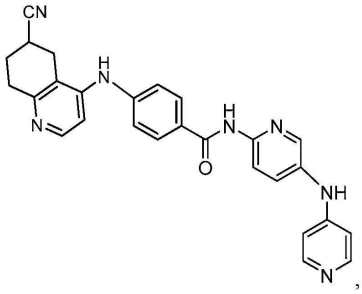
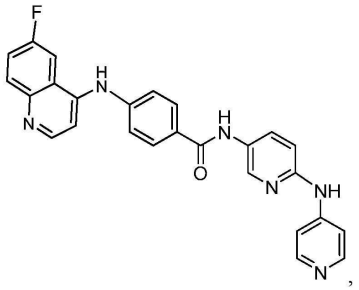
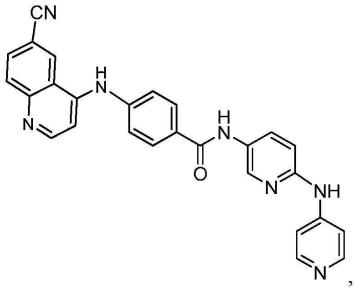
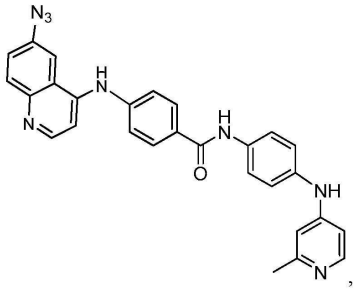
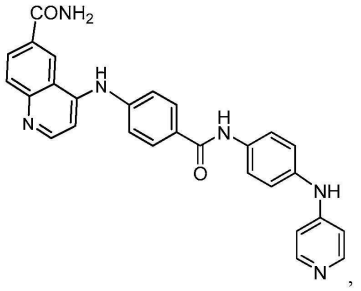
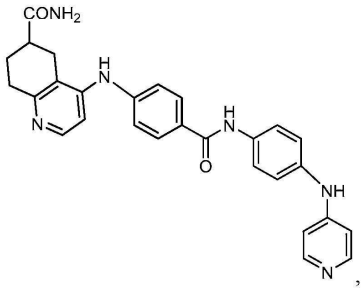
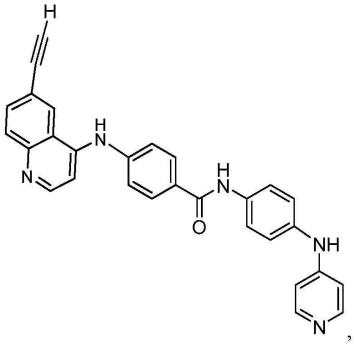


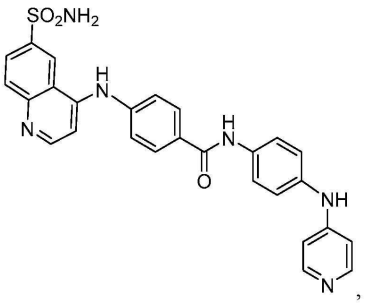
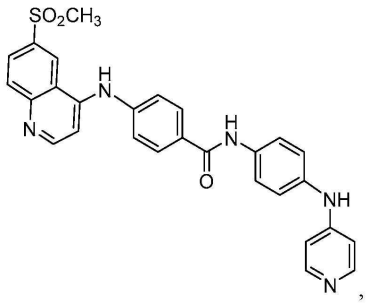
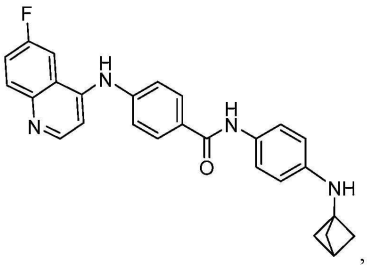
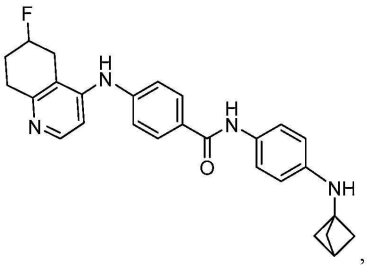
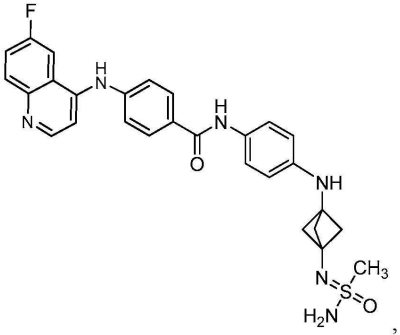
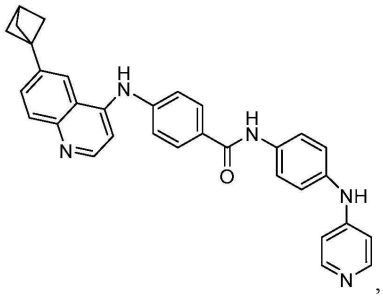
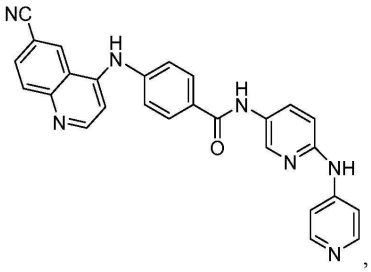
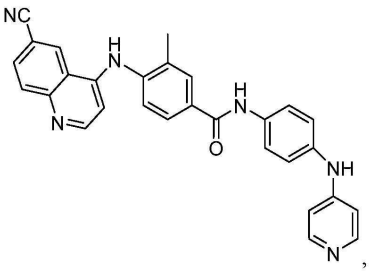


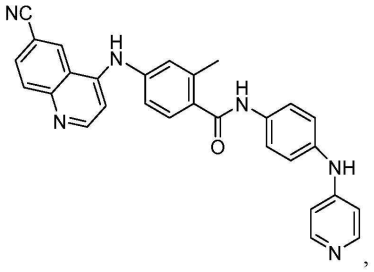
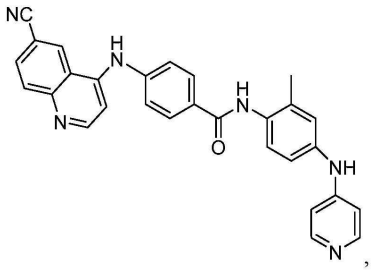
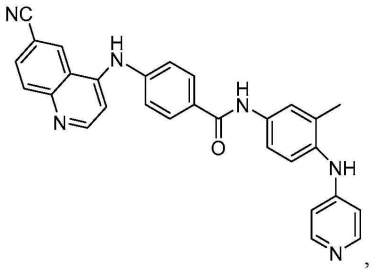
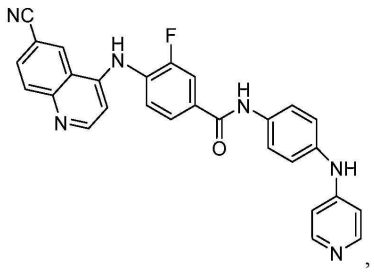
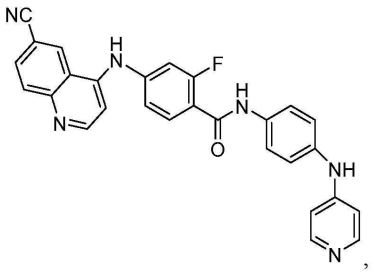
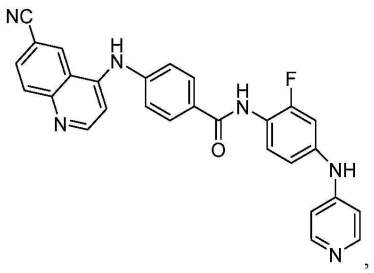
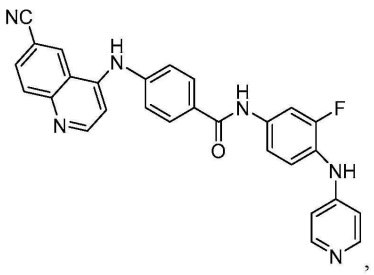
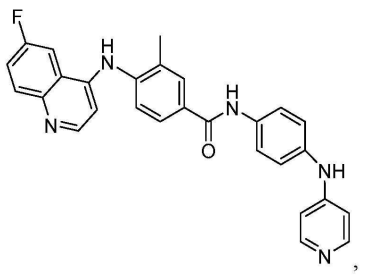


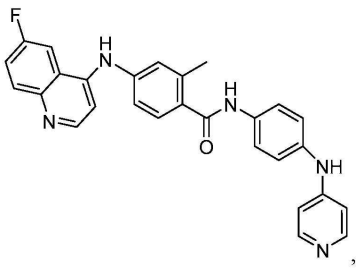
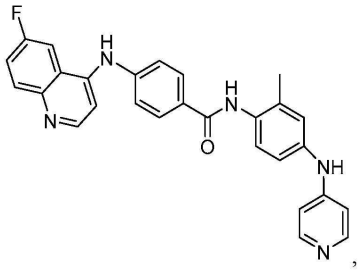
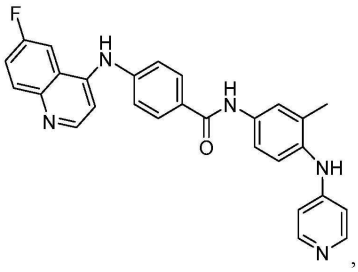
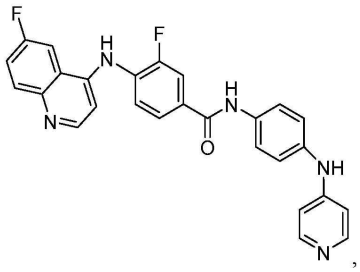
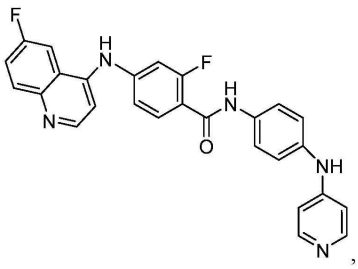
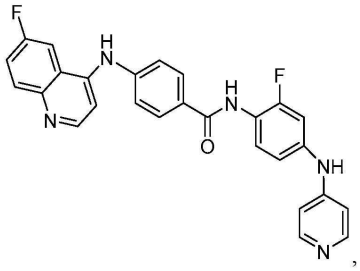
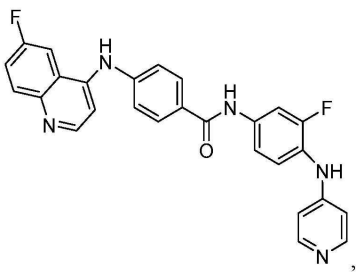
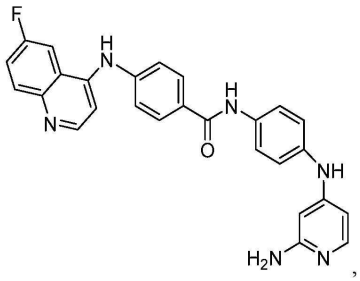


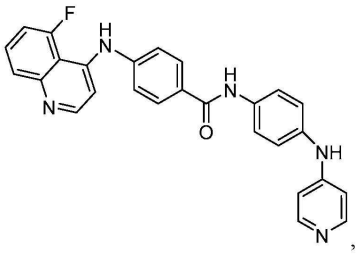


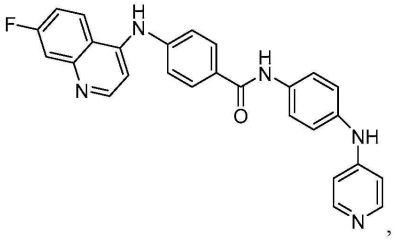

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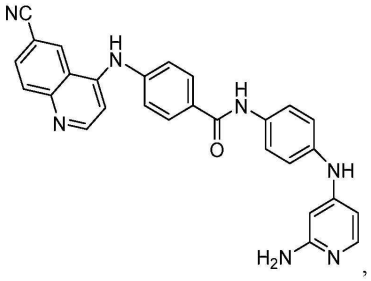

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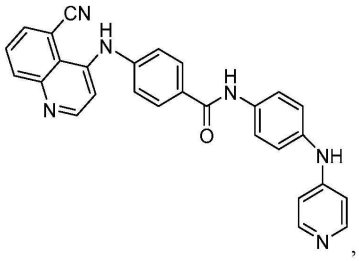

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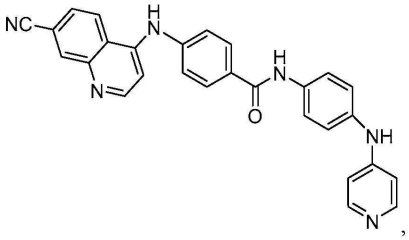
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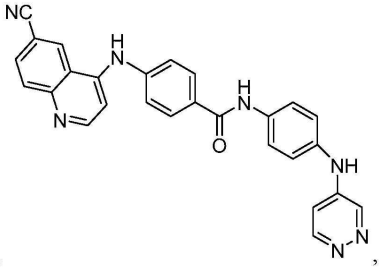


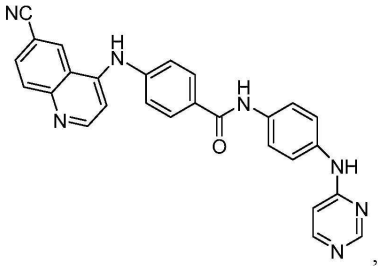


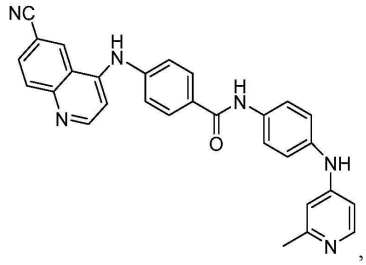
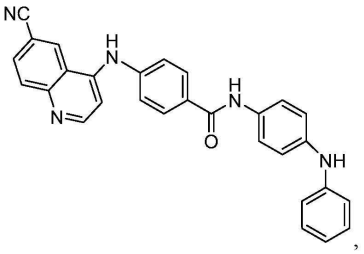
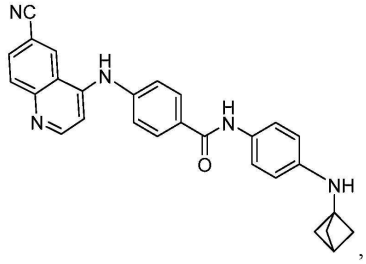
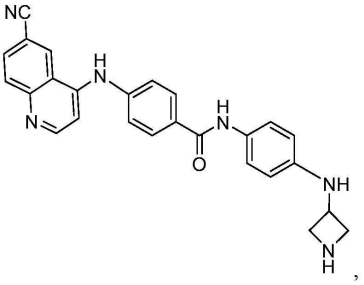
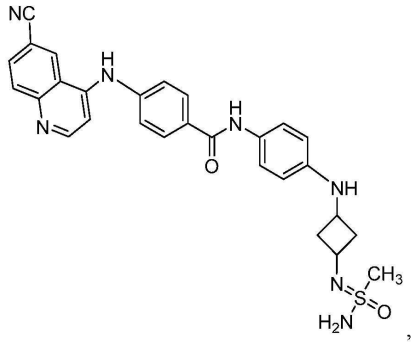
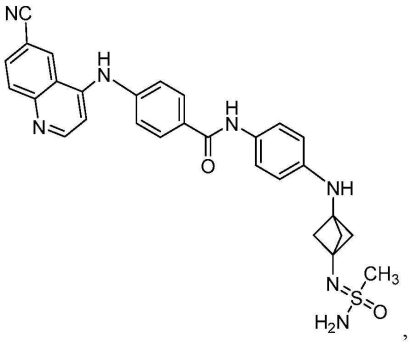
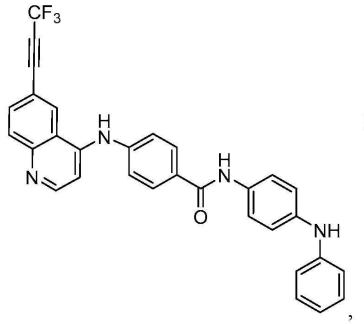
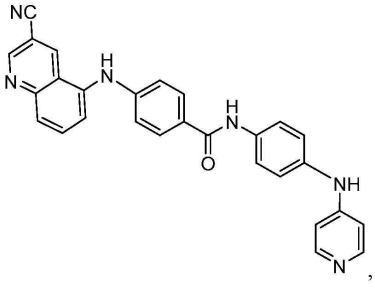


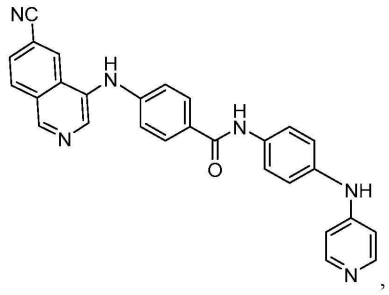
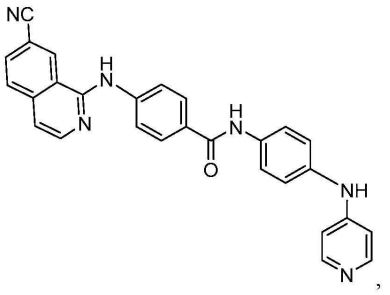
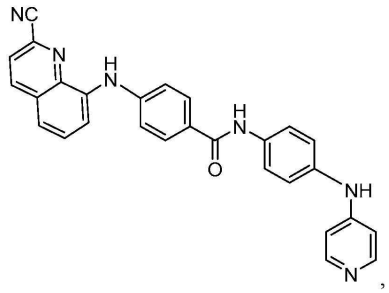
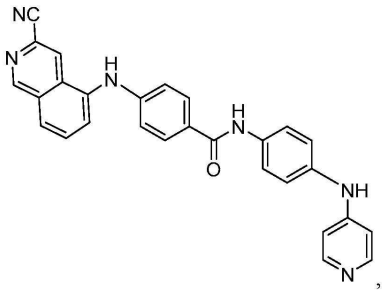
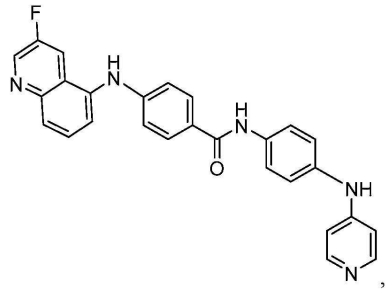
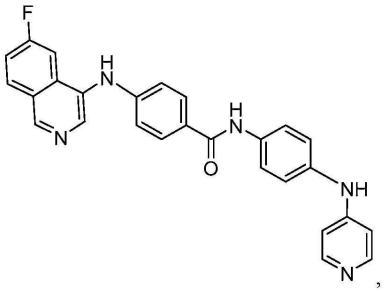
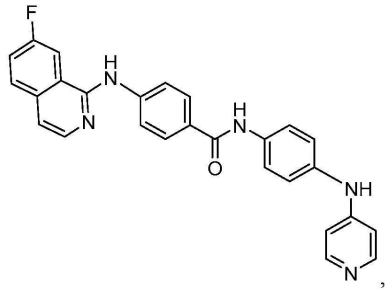
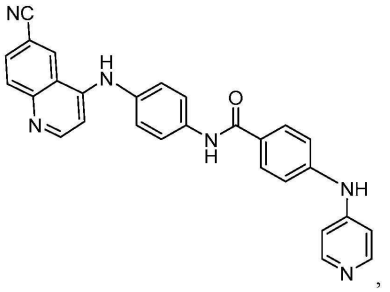


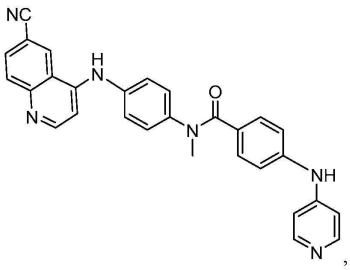
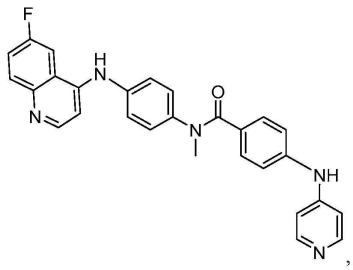
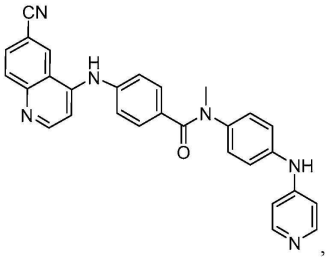
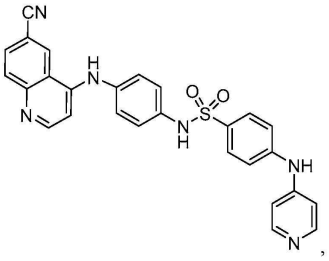
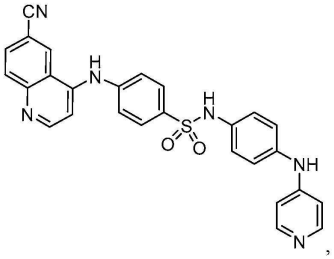
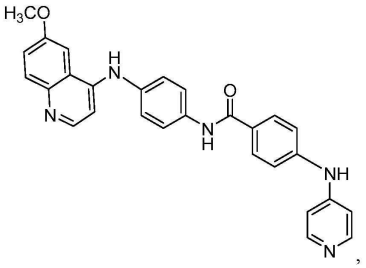
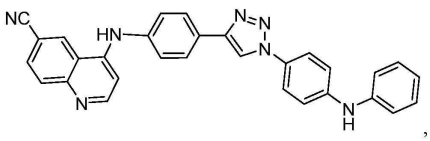
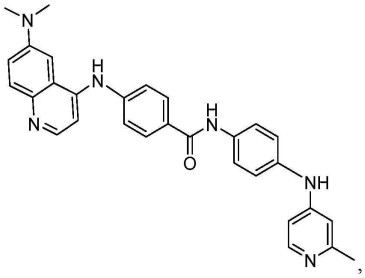
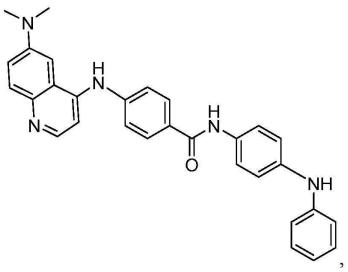


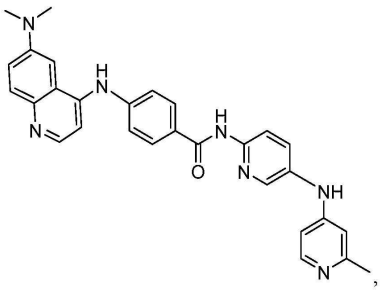


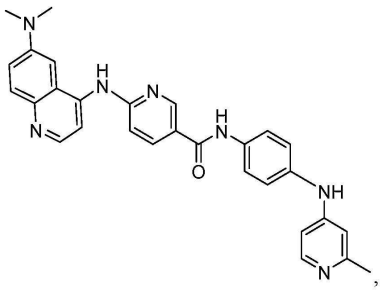


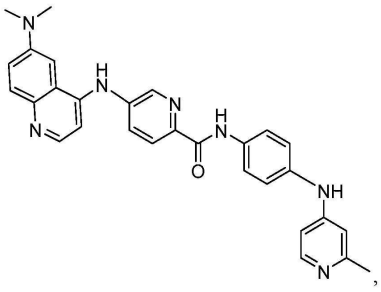

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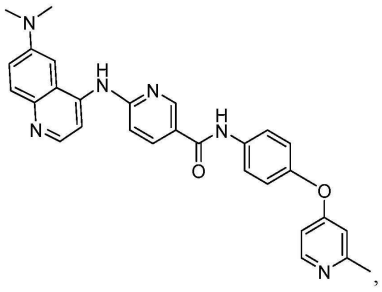

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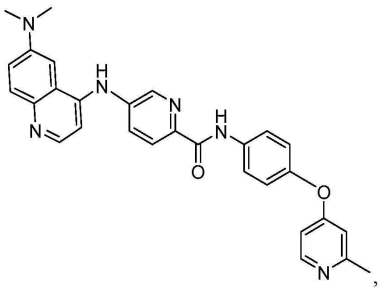

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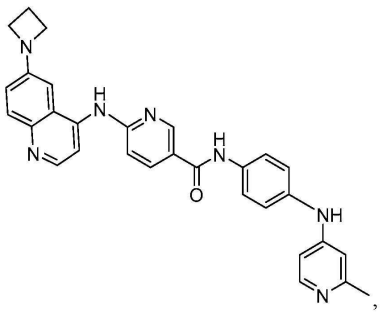


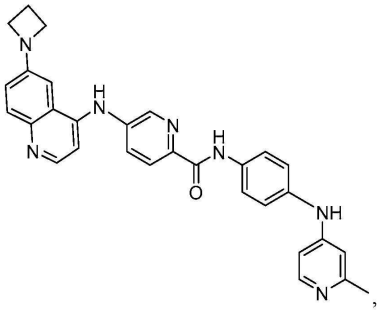


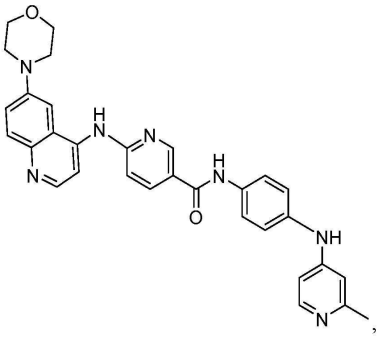


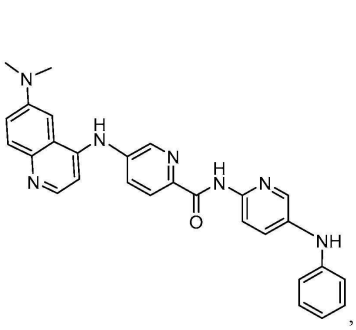
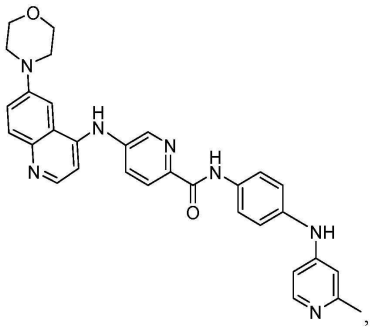
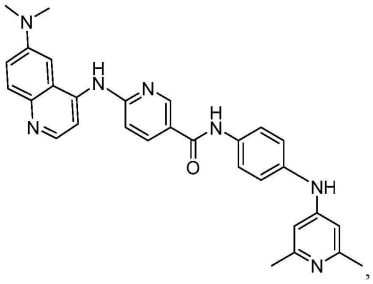
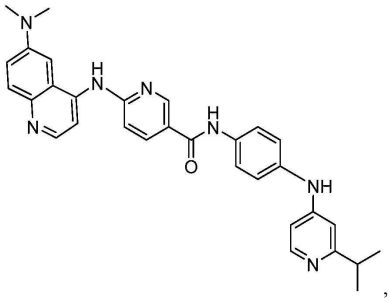
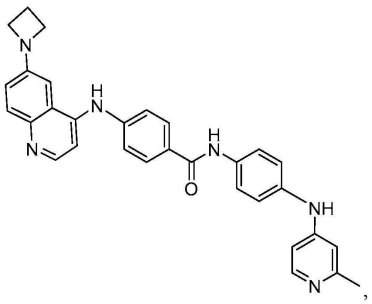
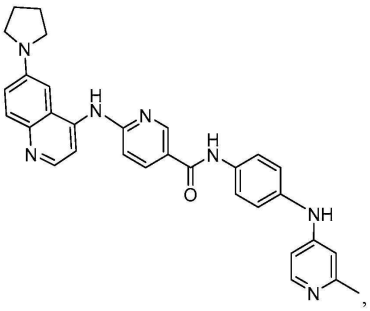
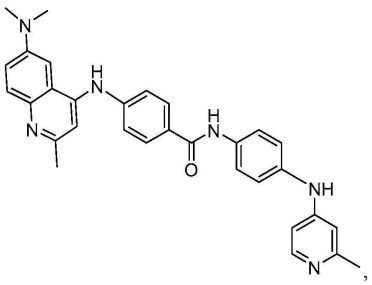
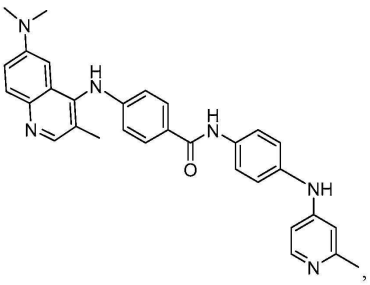


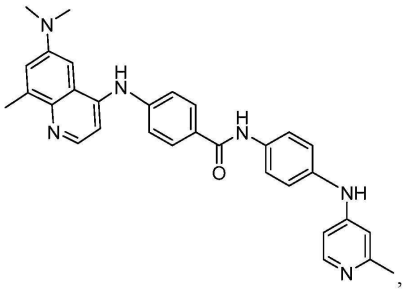
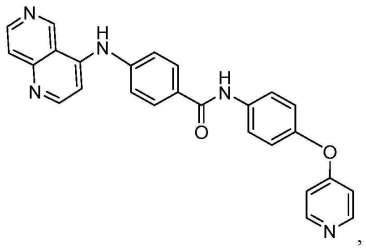
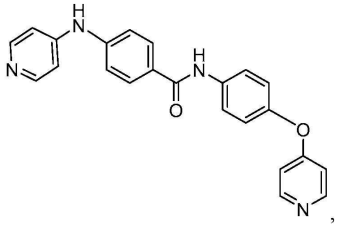
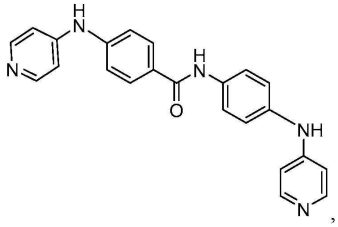
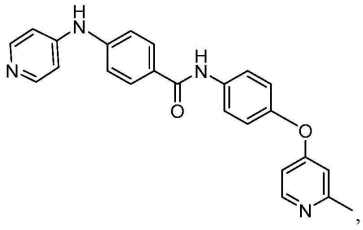
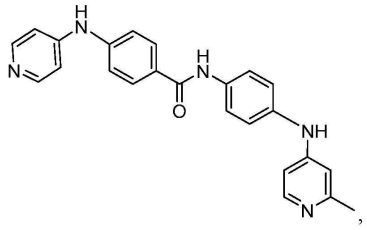
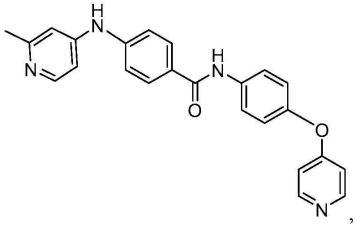
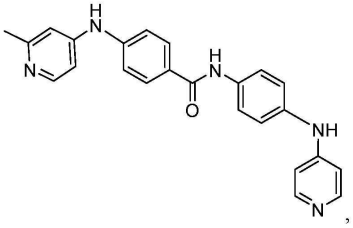
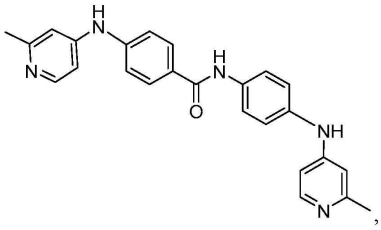
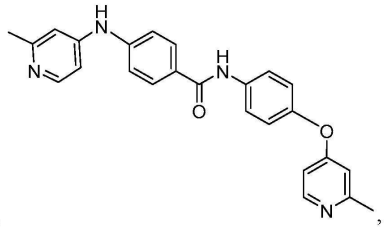


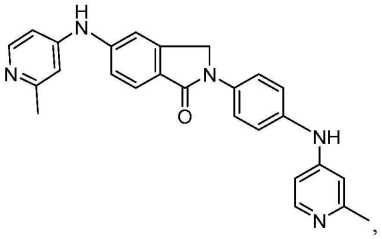
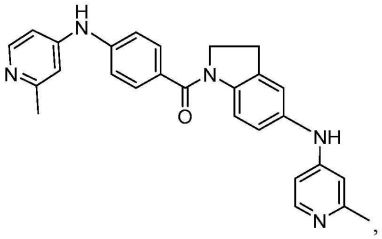
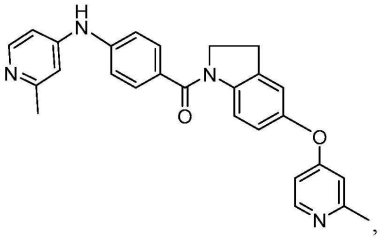
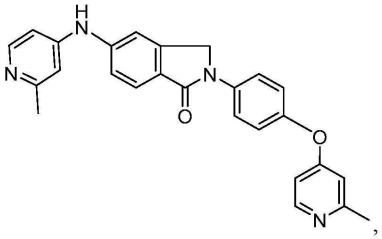
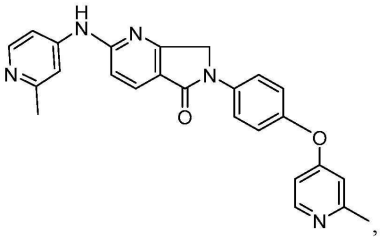
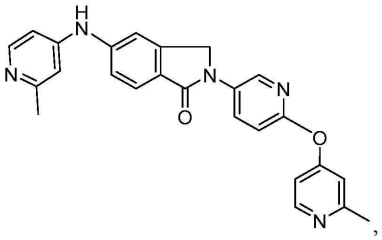
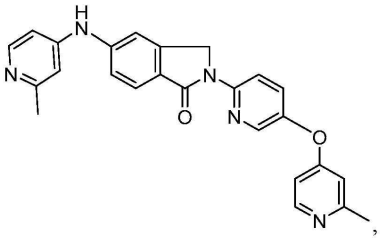
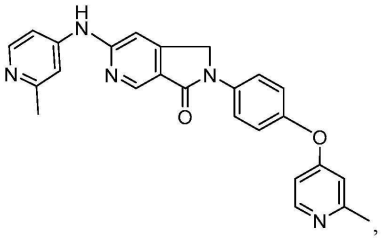
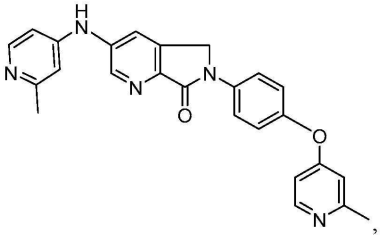
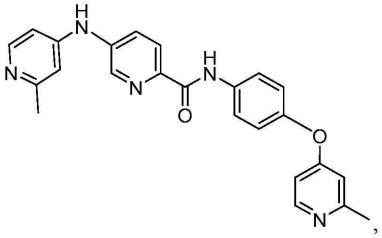


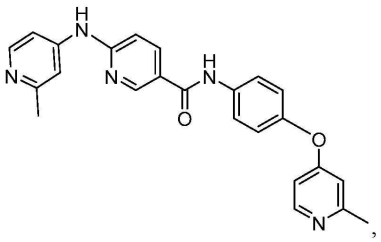
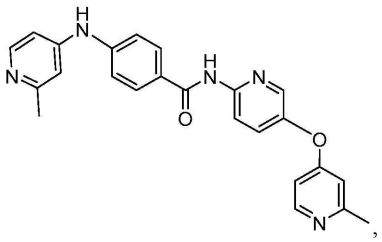
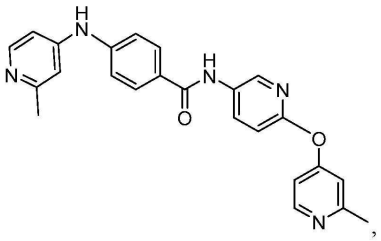
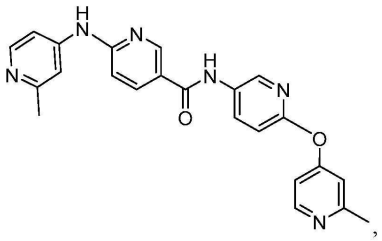
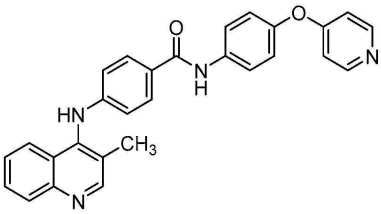
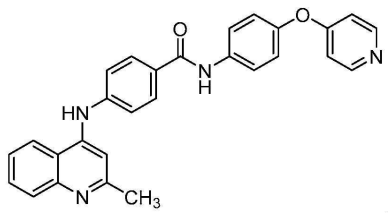
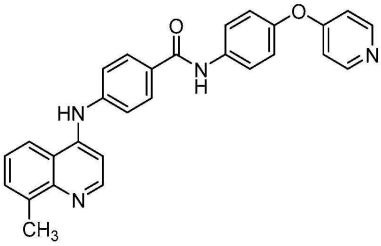
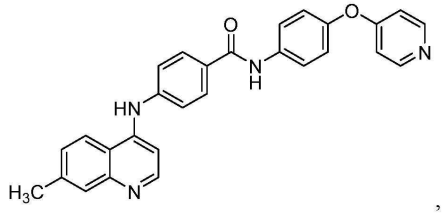
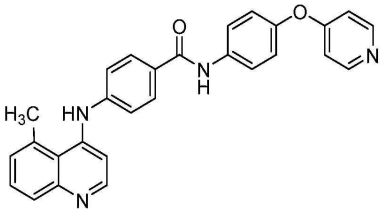
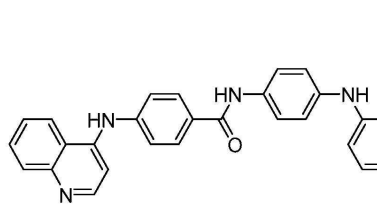


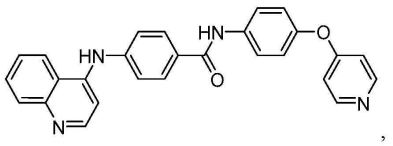
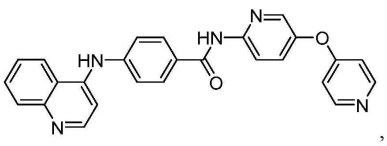
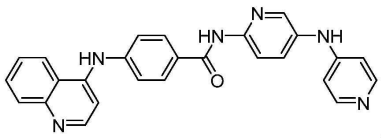
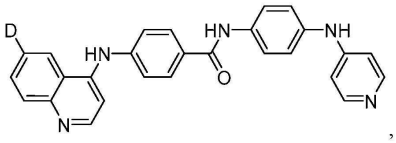
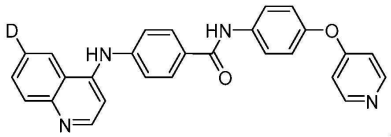
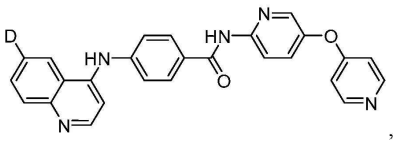
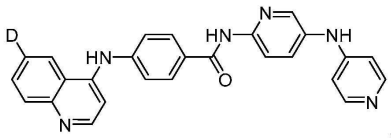
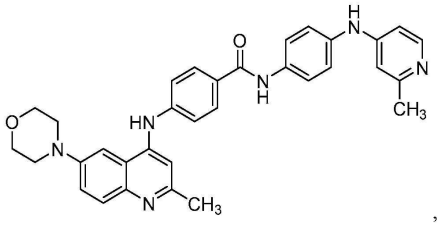
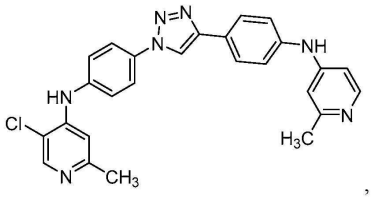
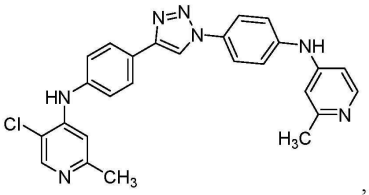
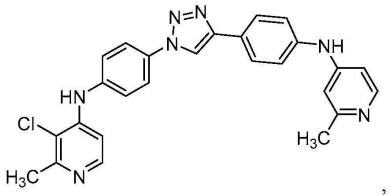
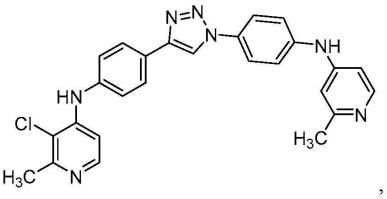


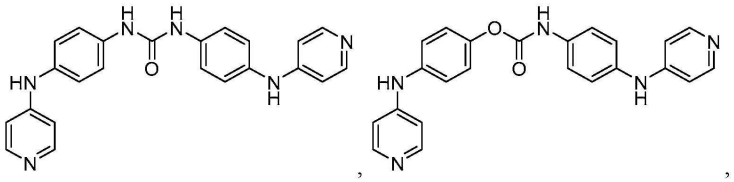
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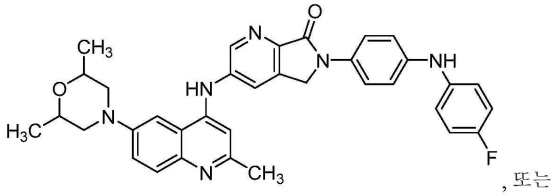
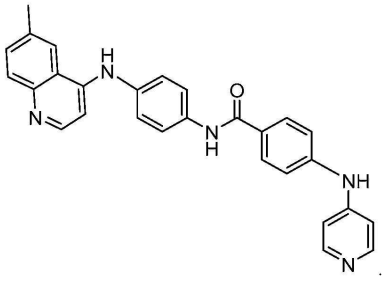
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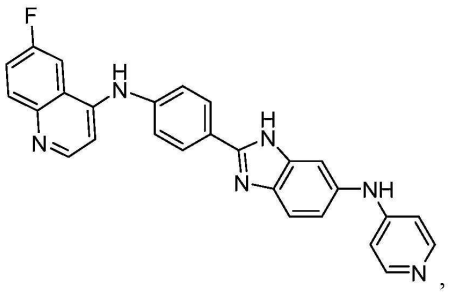
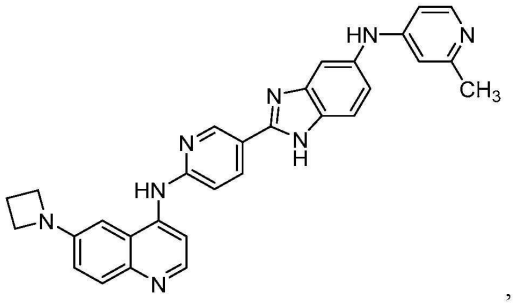
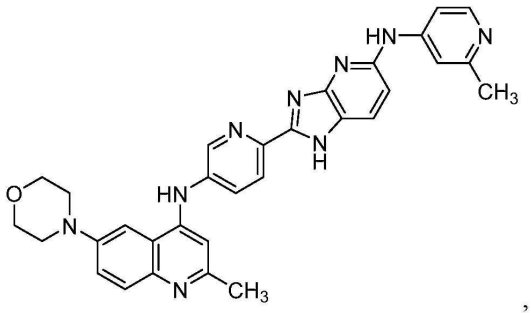

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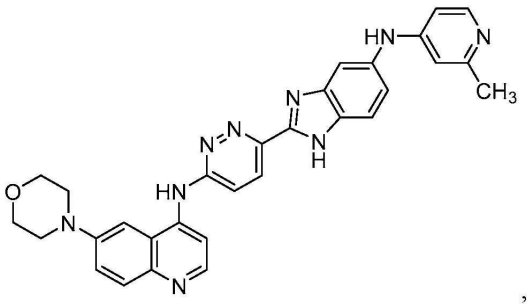

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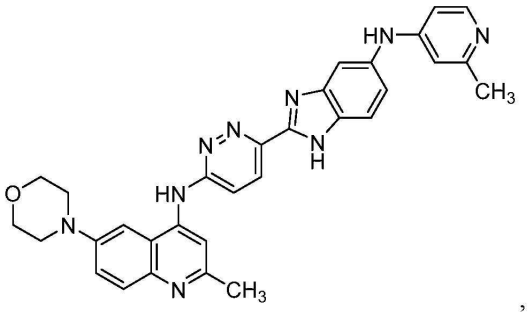
청구항 128

제1항에 있어서, 화학식 Ib의 화합물은 하기 화합물인 화합물:

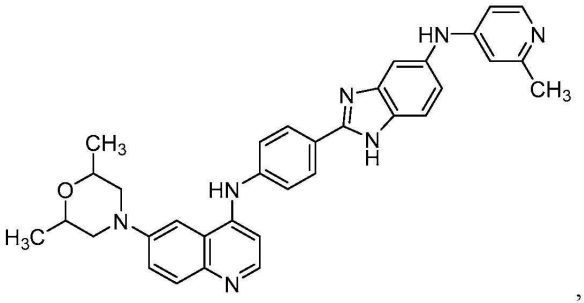

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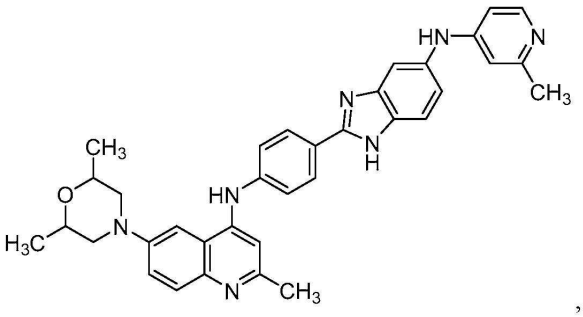
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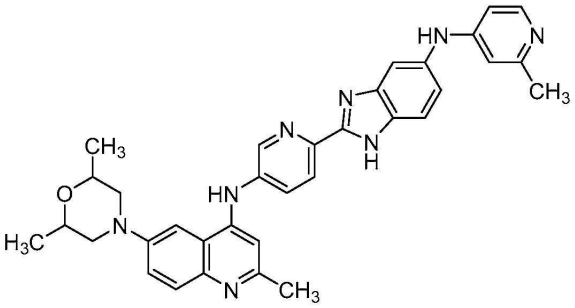
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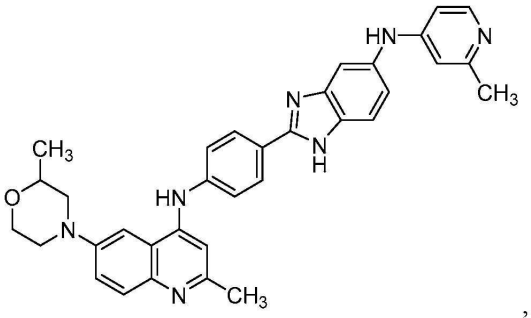
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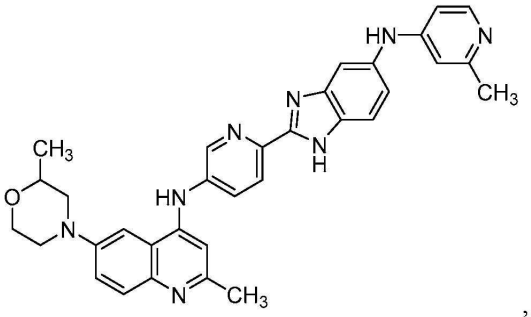
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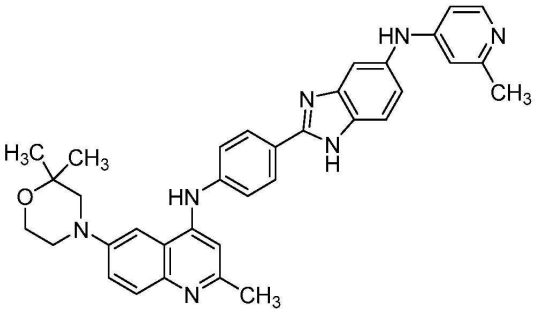
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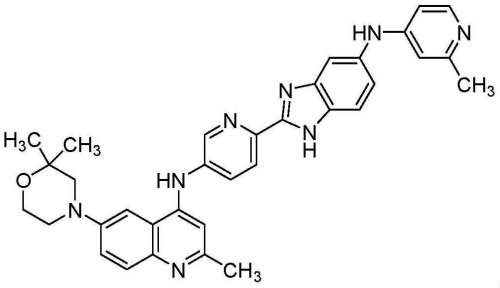
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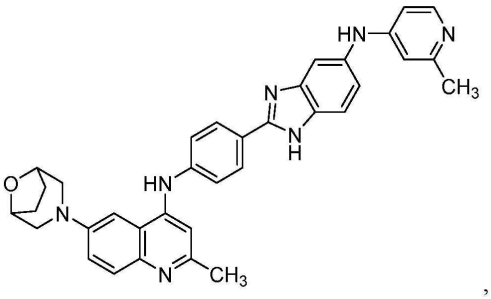
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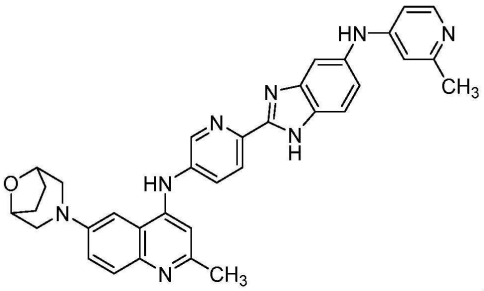
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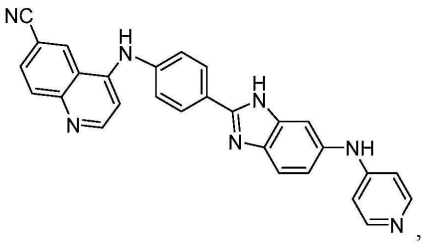
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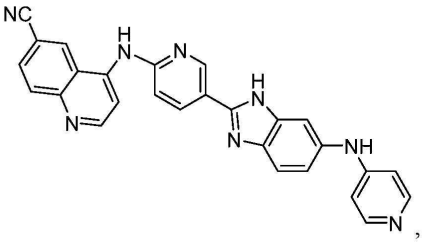
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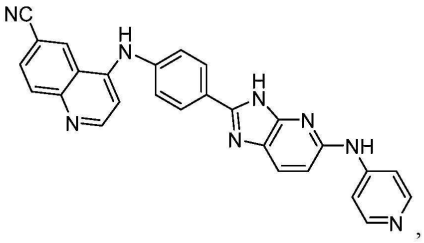
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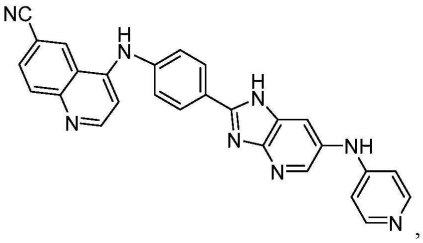
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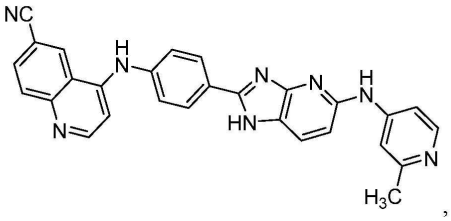
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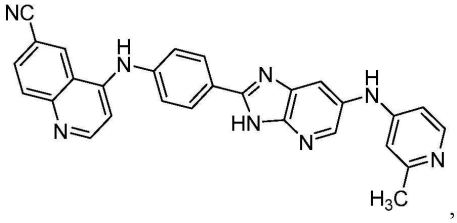
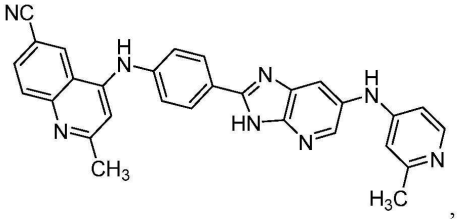
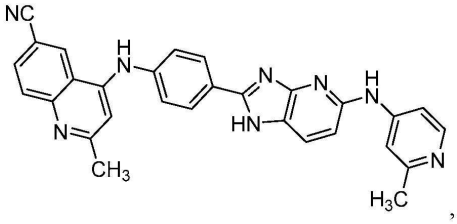
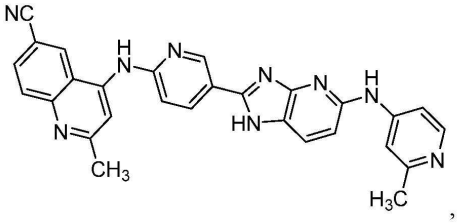
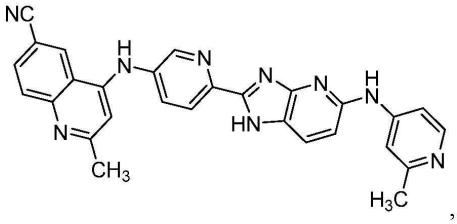
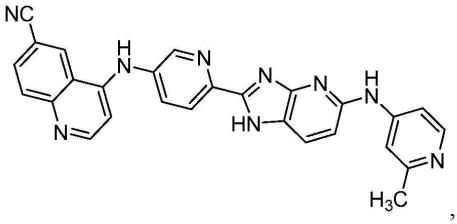
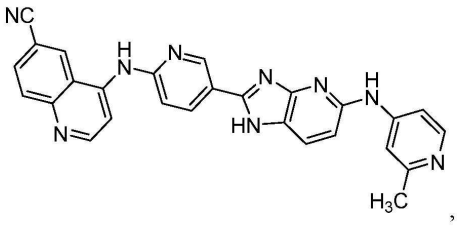
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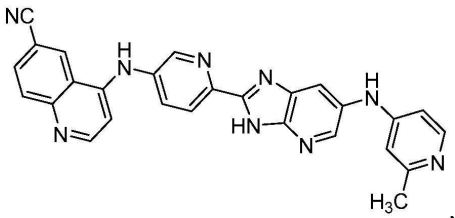
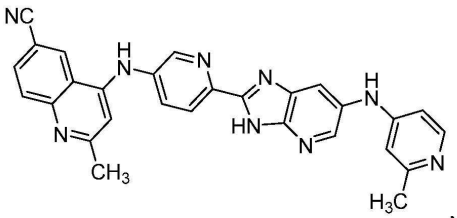
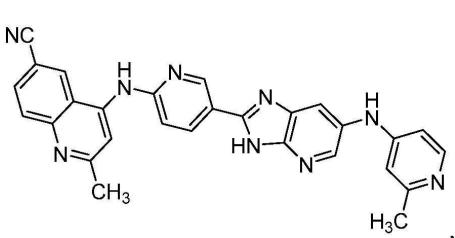
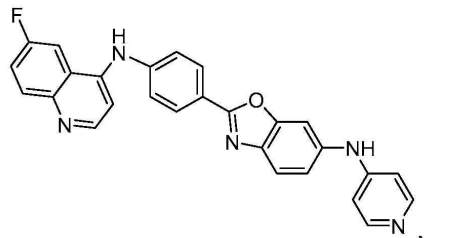


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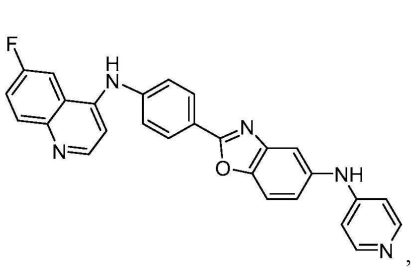
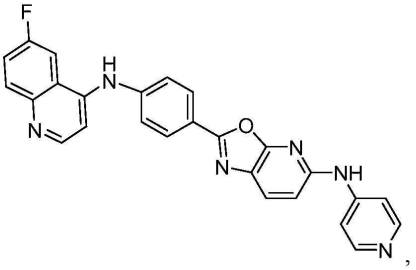
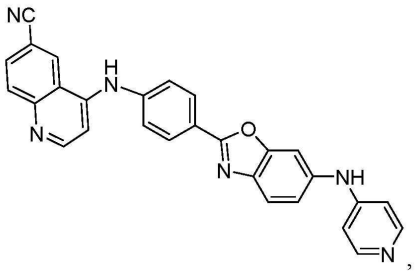
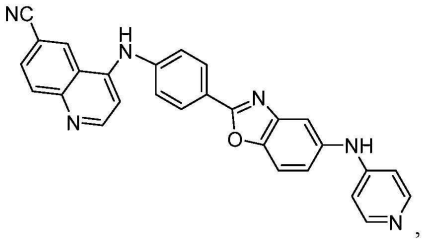
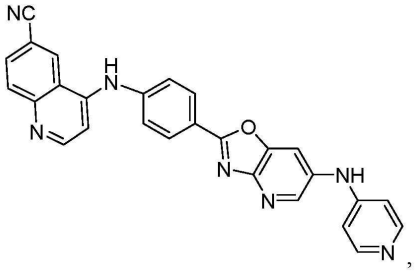
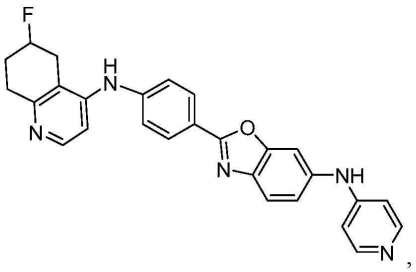
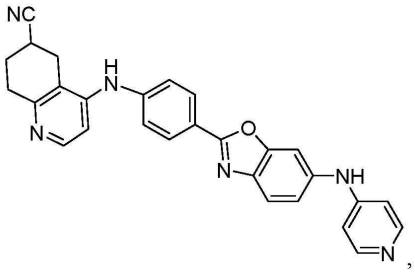
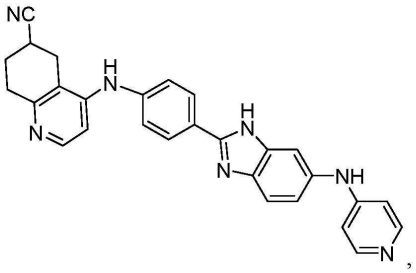
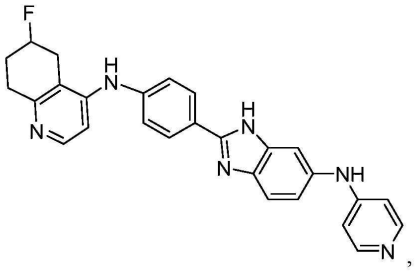
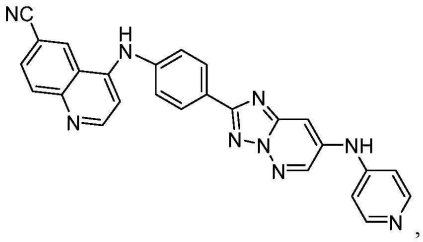
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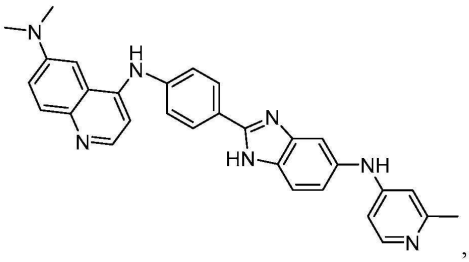
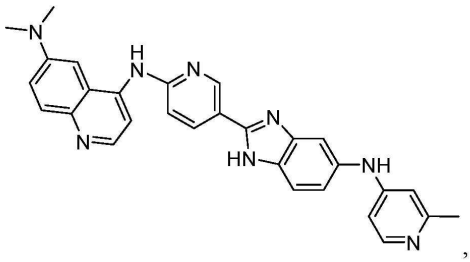
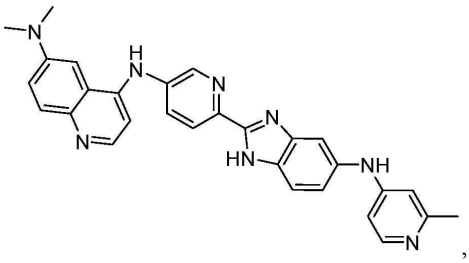
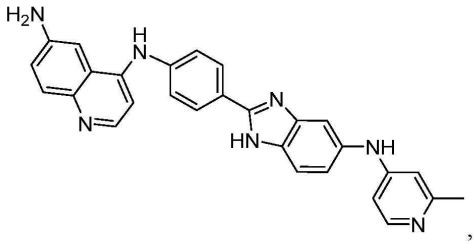
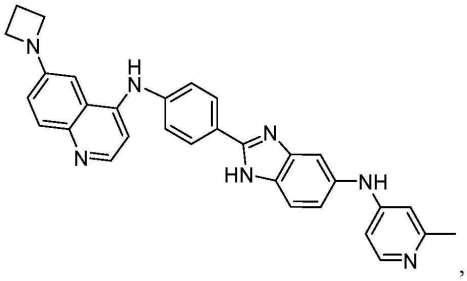
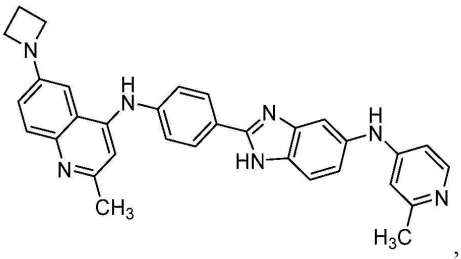
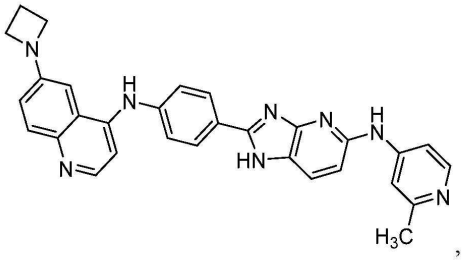
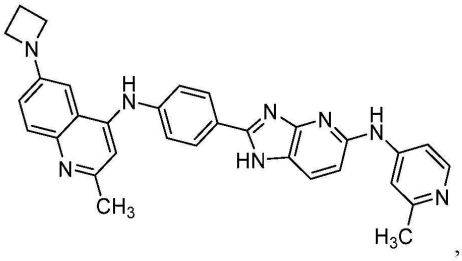
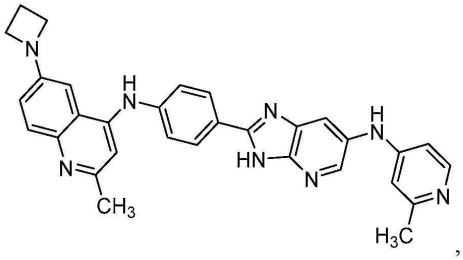
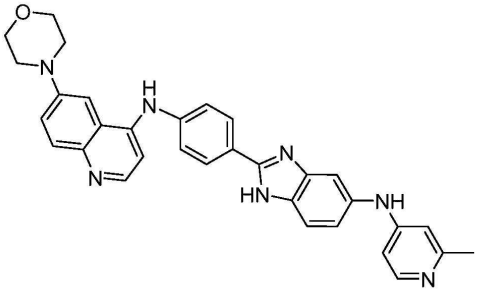
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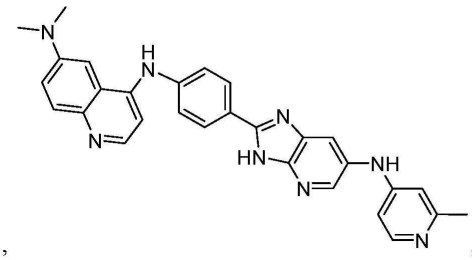
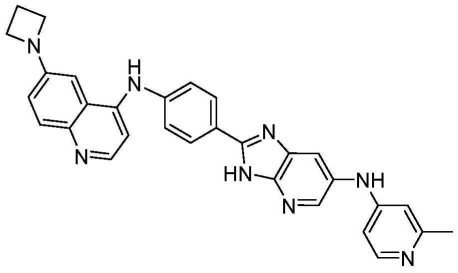
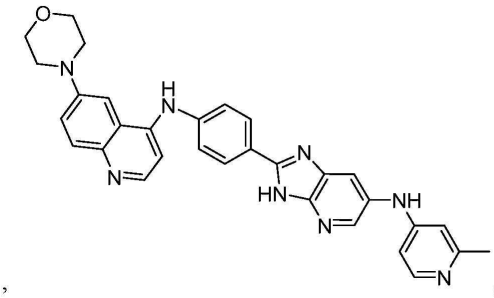
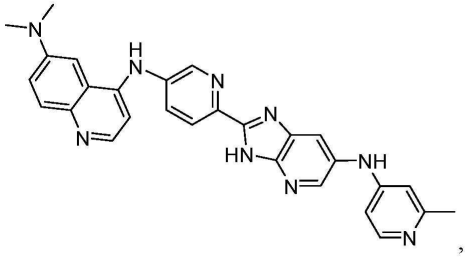
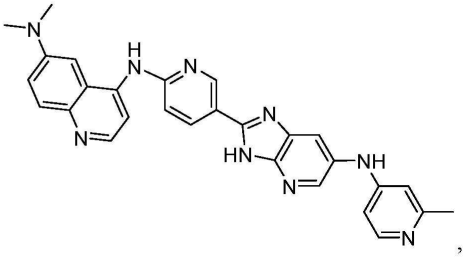
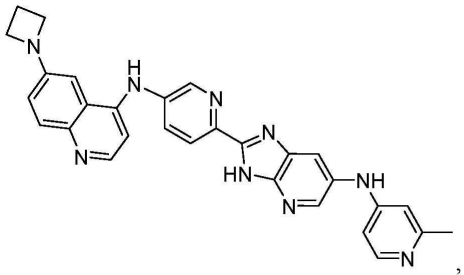
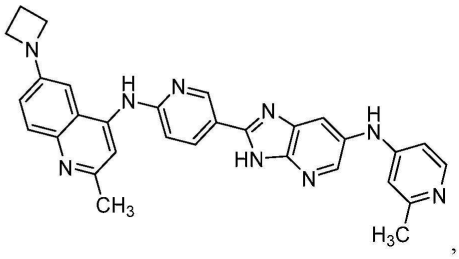
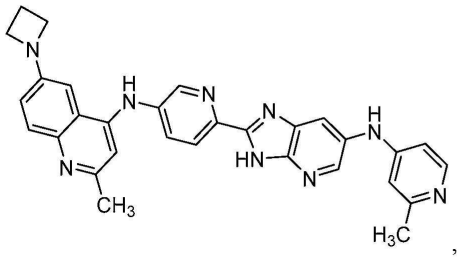
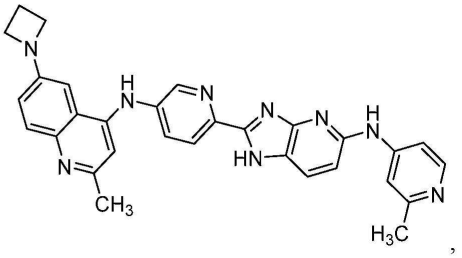
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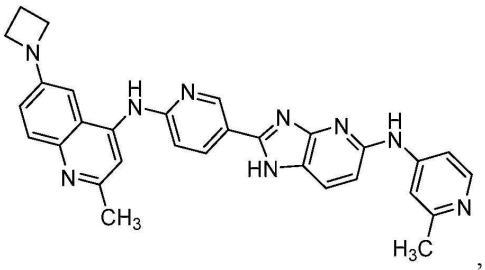
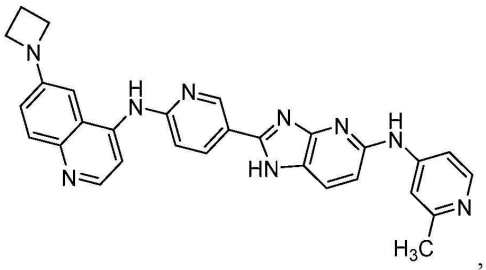
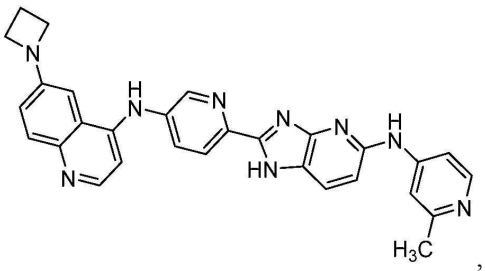
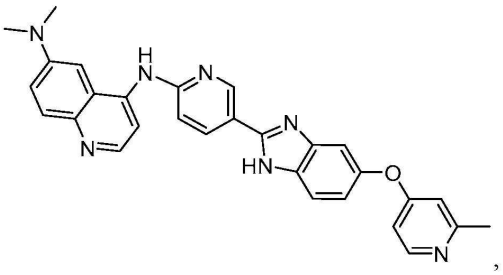
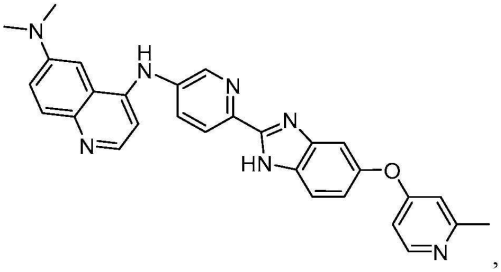
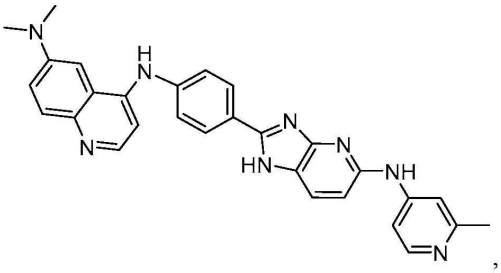
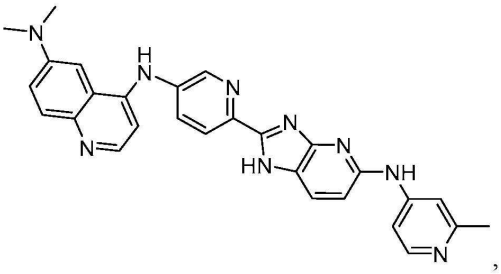
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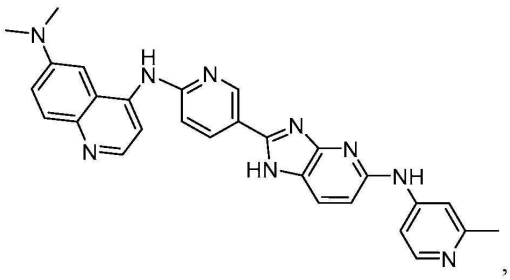
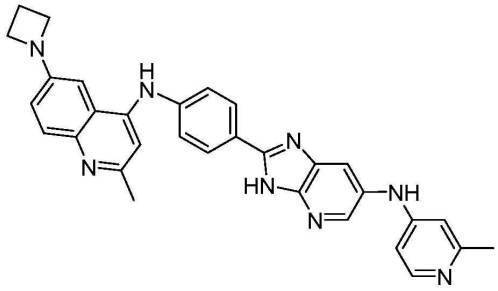
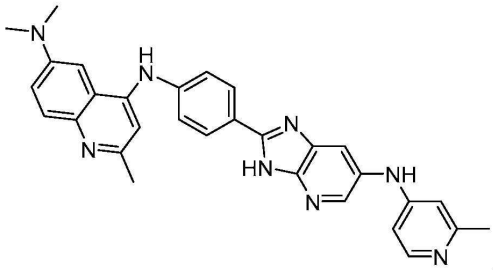
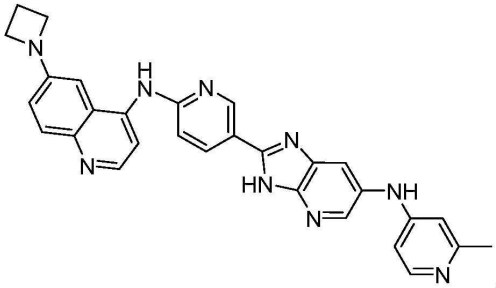
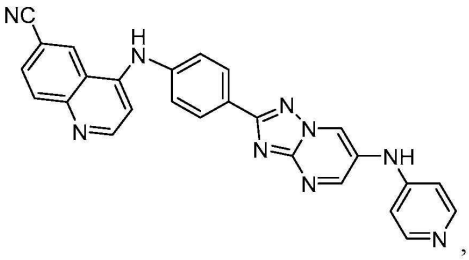
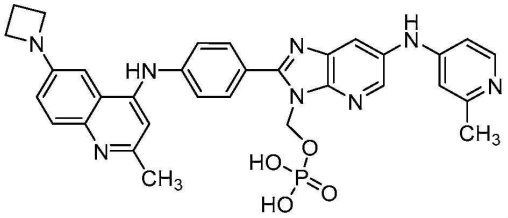
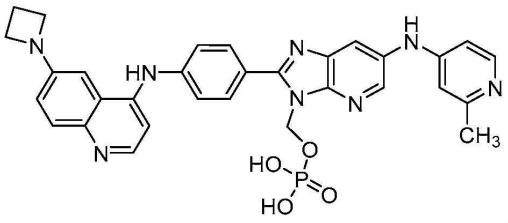

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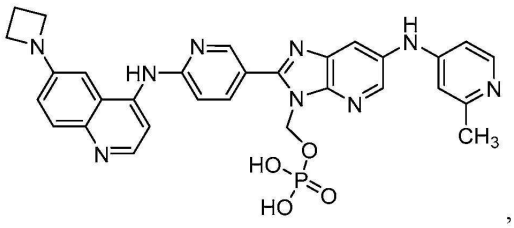

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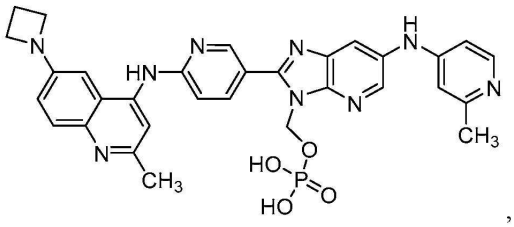
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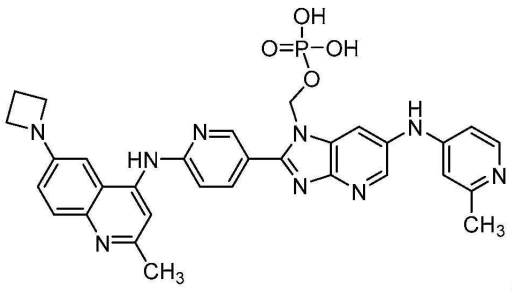

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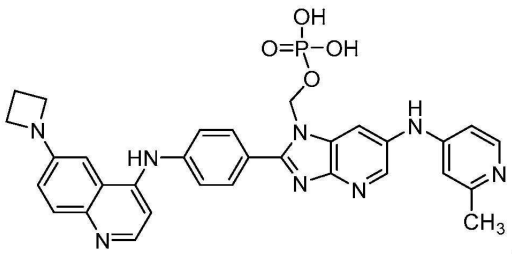
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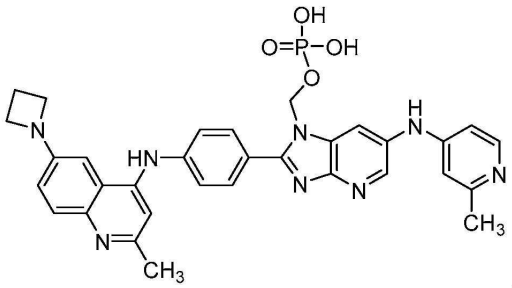
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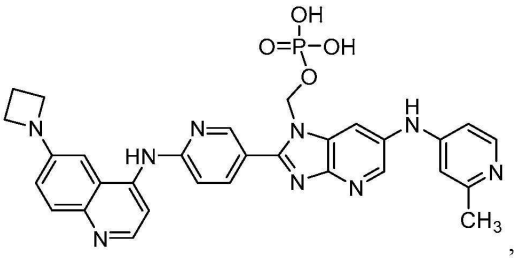
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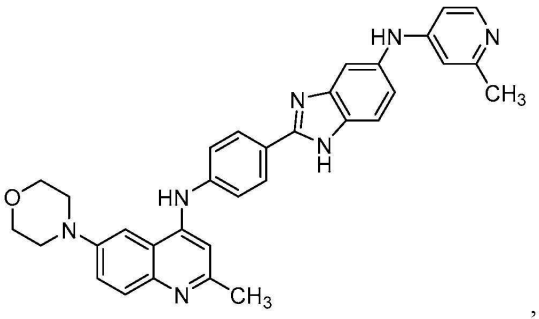


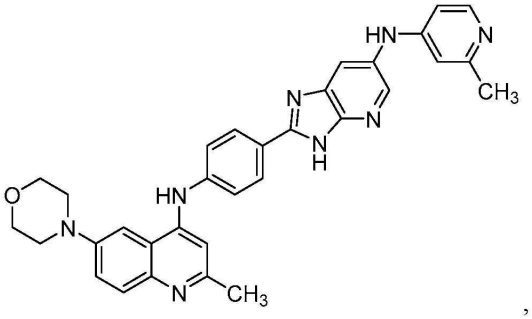
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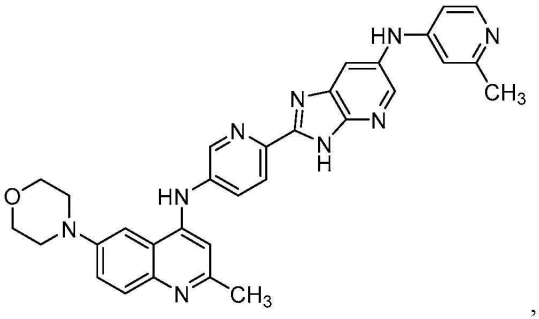


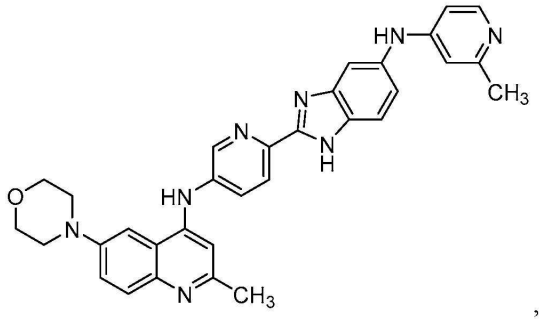
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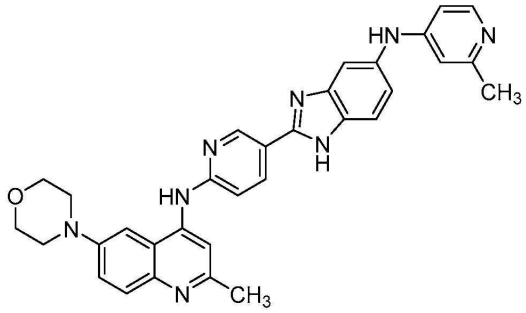

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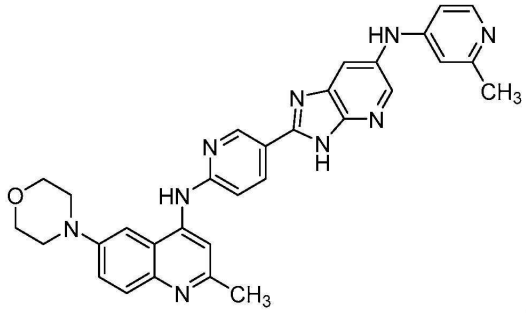

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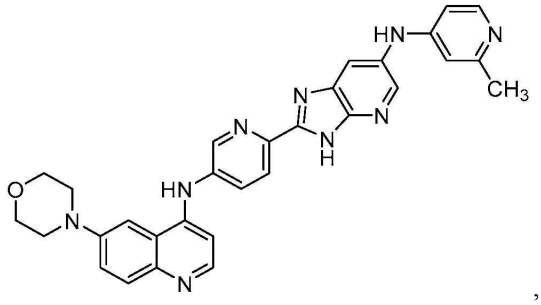

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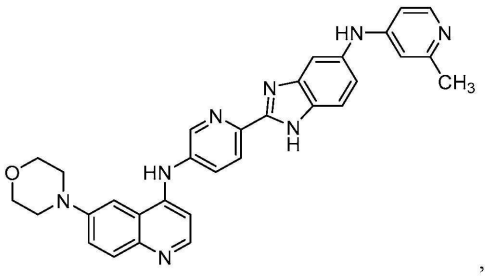

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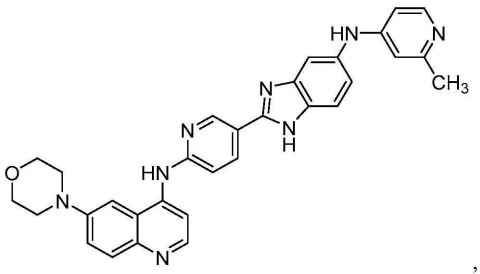

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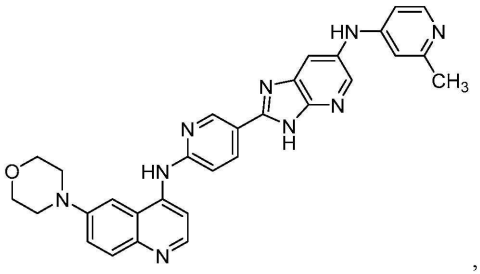

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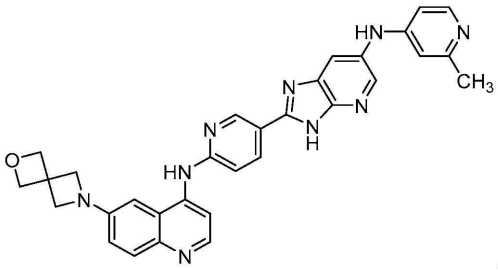
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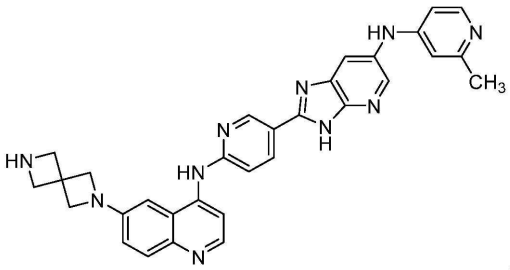
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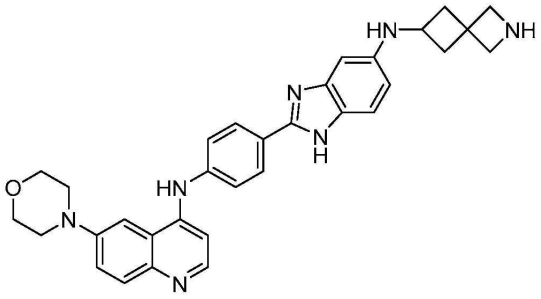
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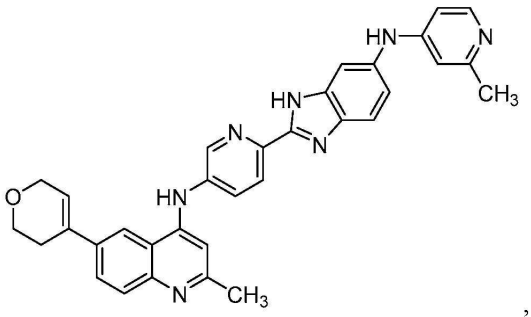
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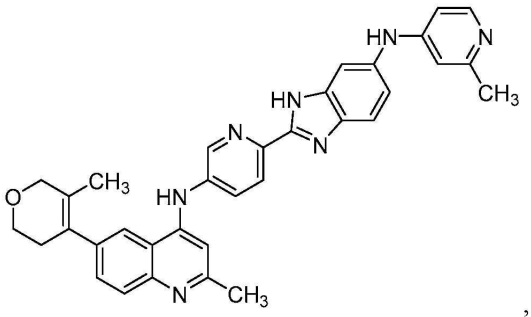
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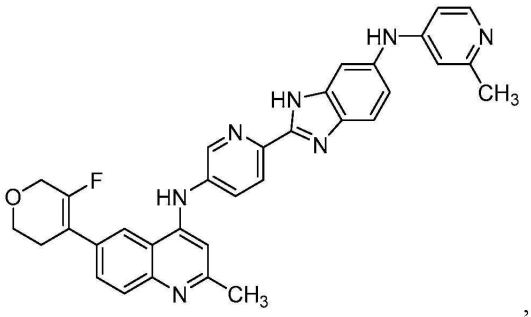
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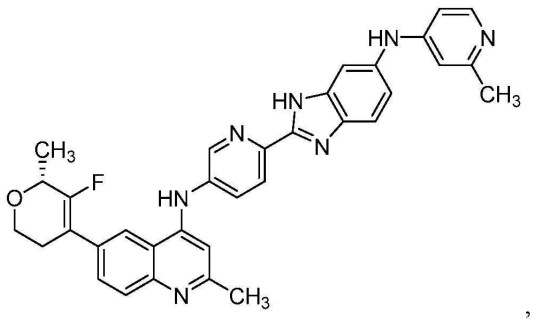
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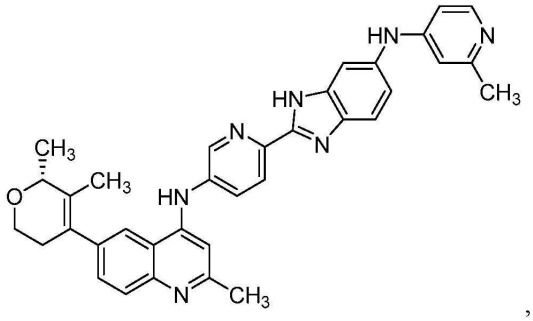


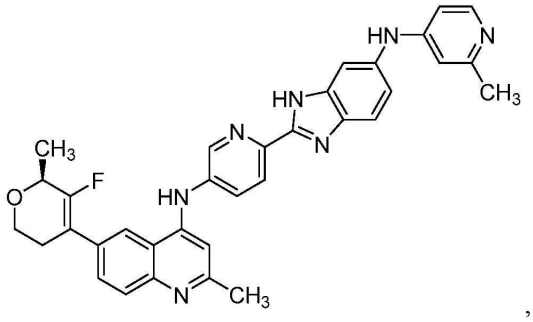
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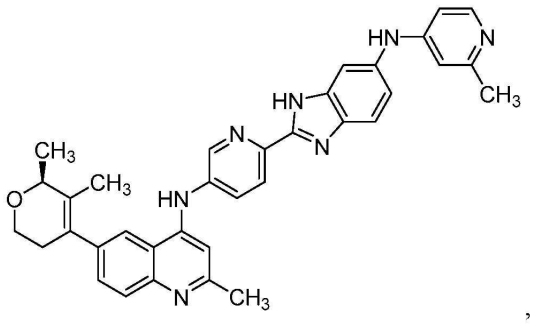


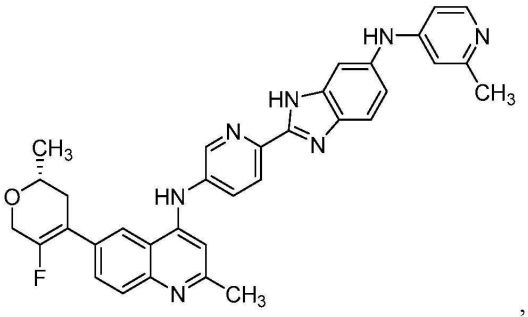
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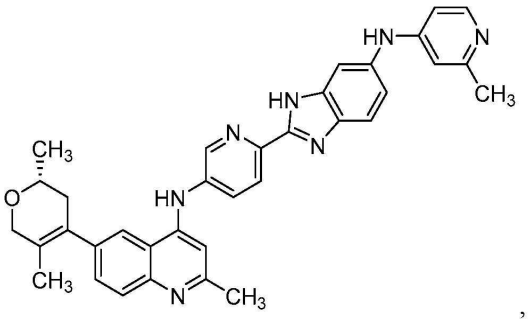

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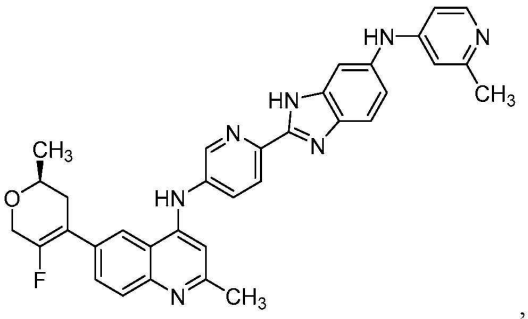

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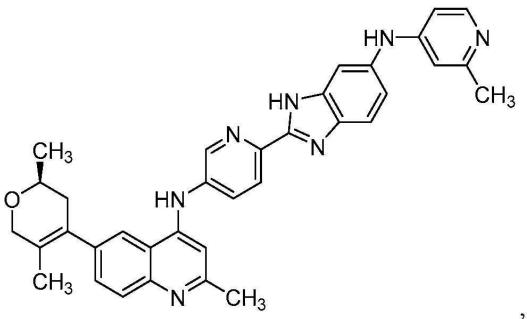

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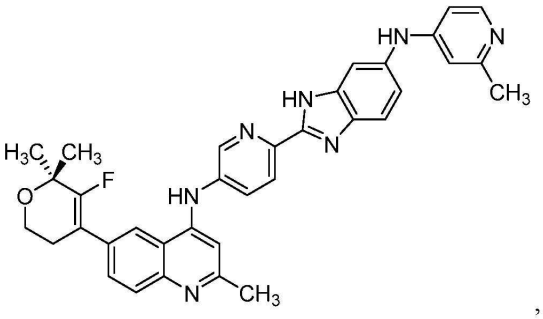

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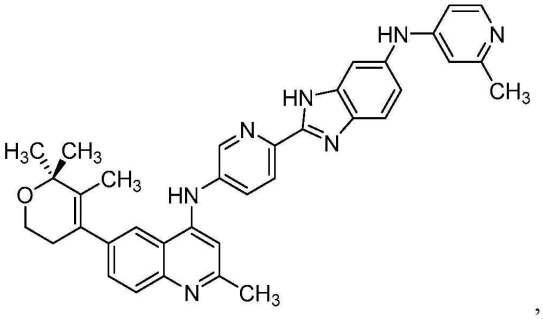

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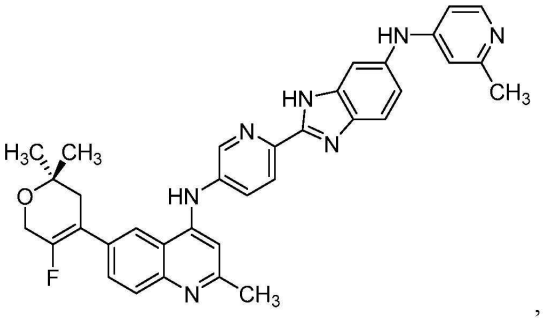

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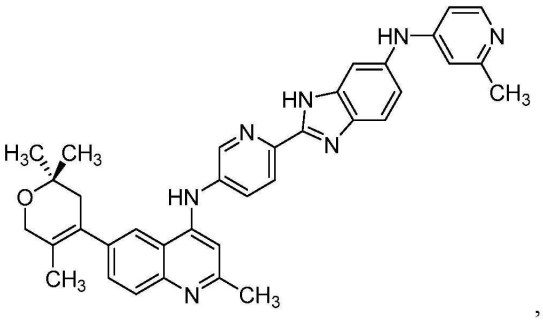

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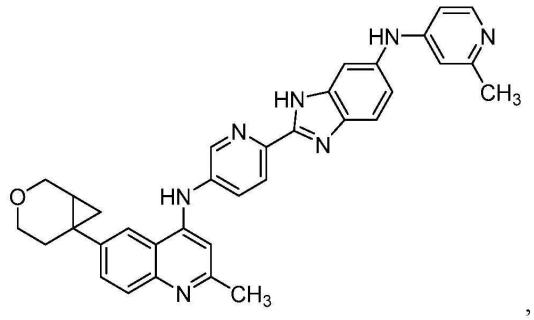

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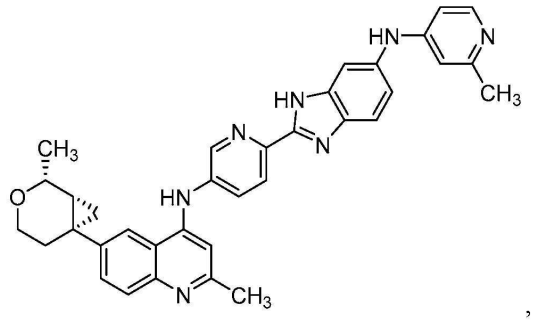

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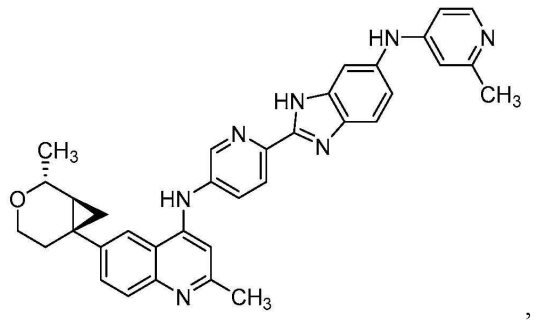

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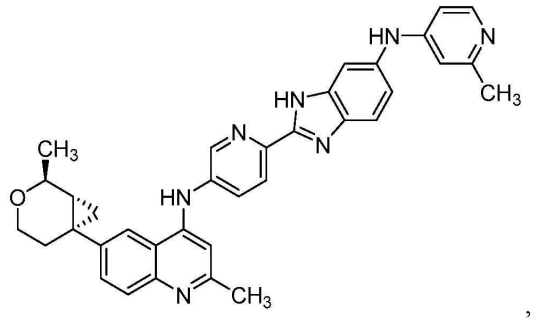

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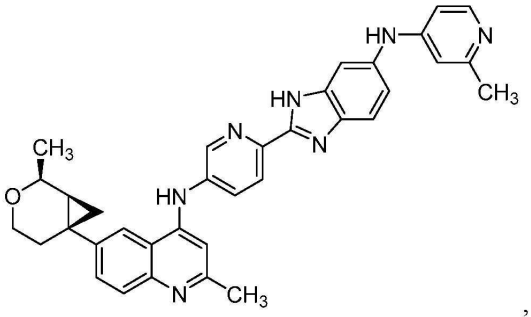

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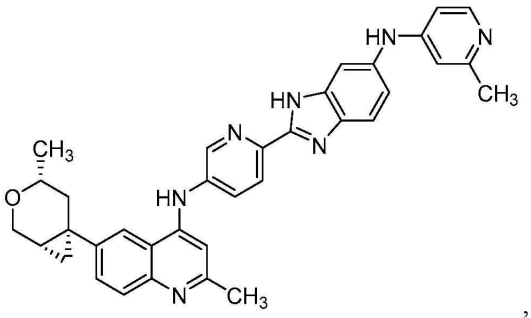

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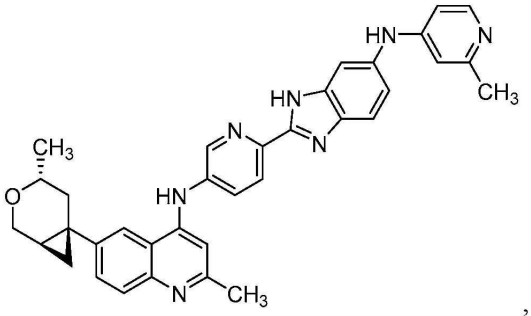

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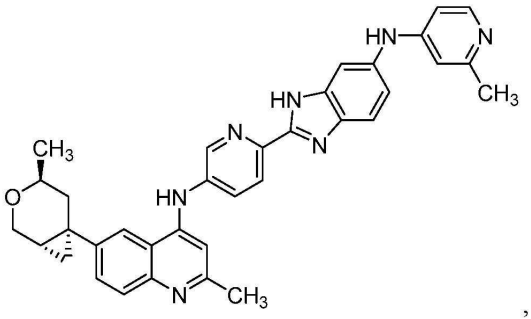

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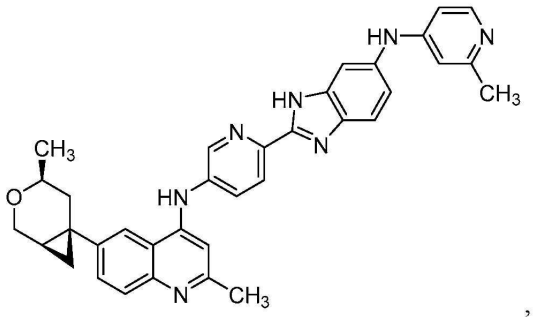

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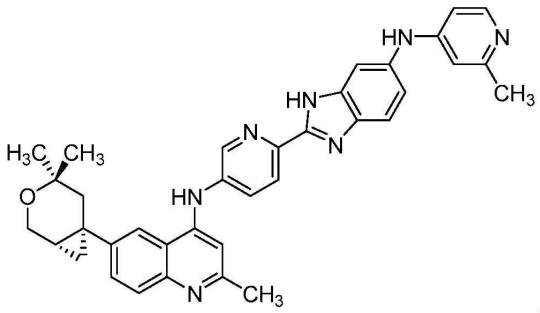

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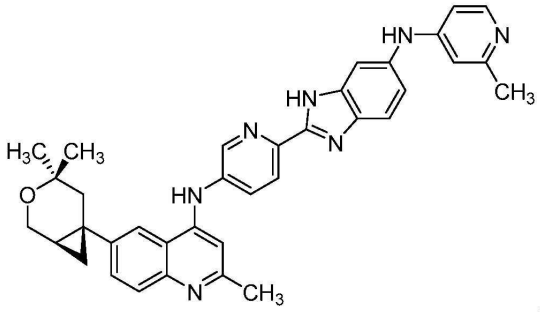

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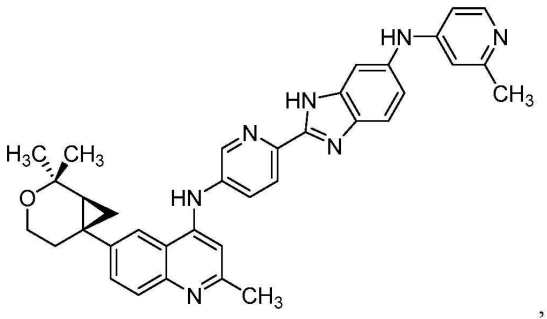
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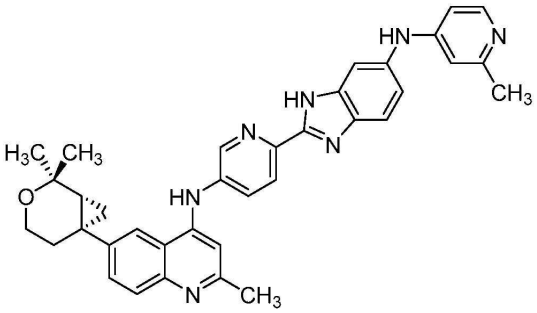
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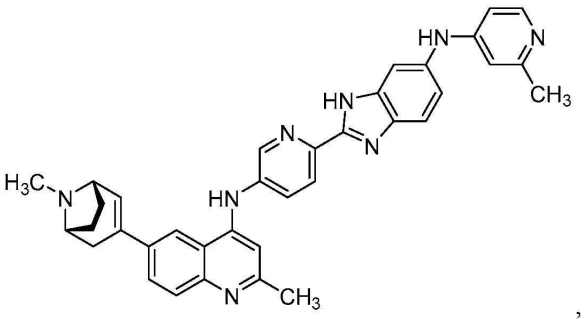


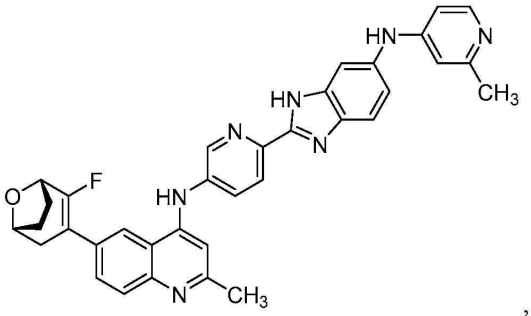
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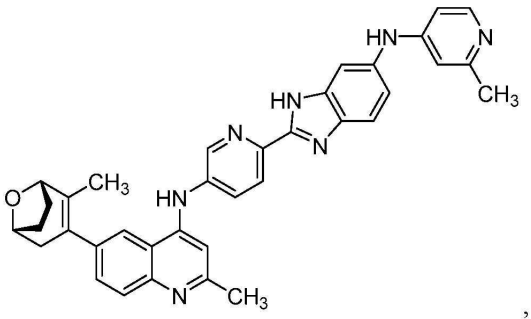


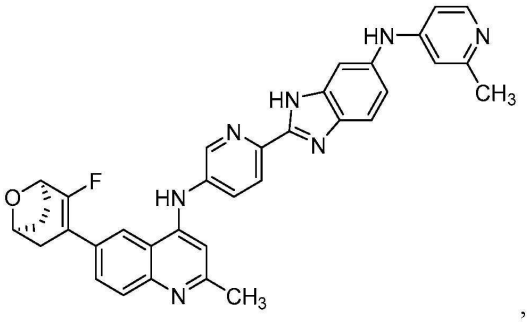
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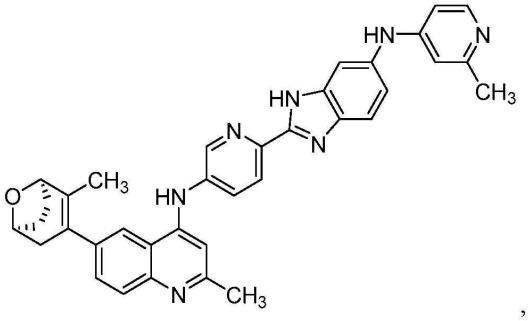

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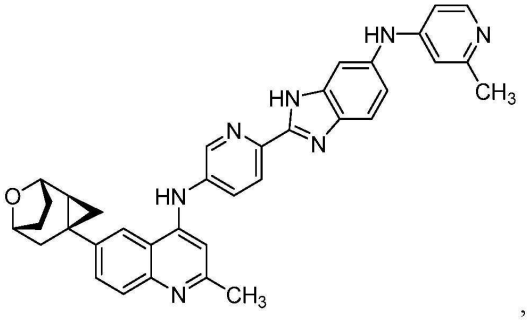

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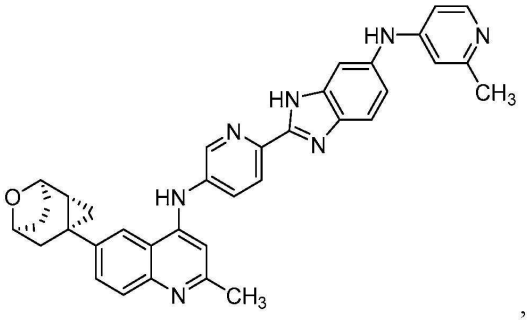

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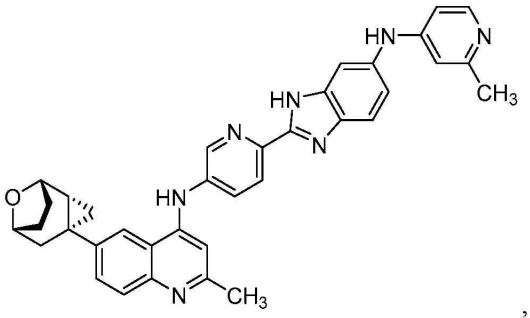

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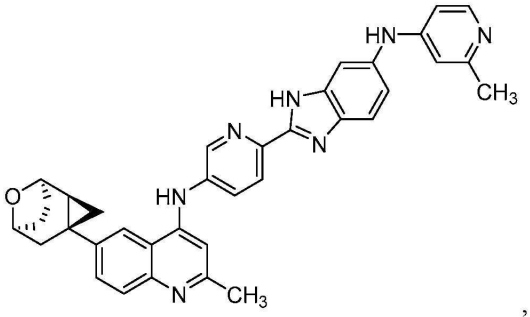

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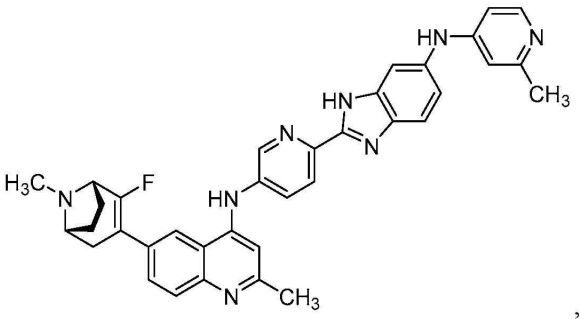

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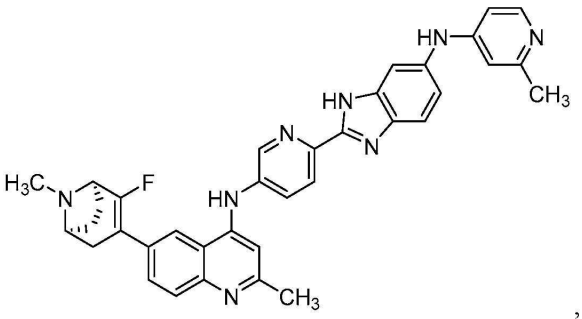
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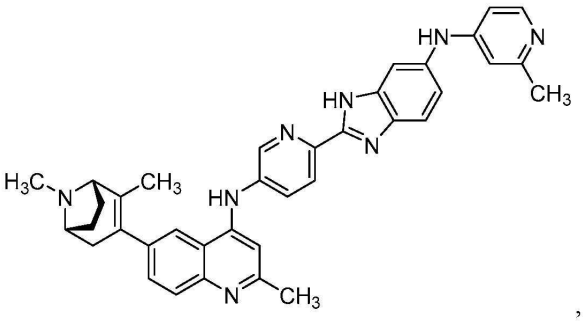
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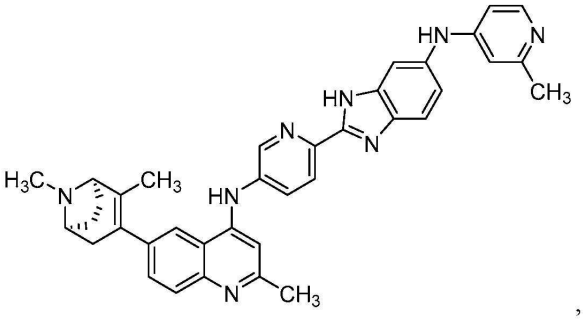


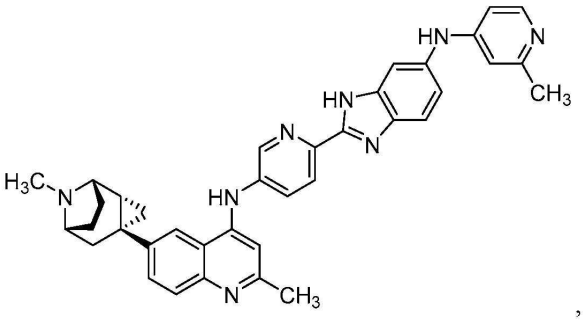
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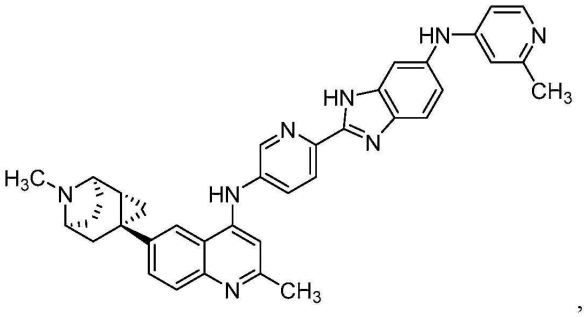


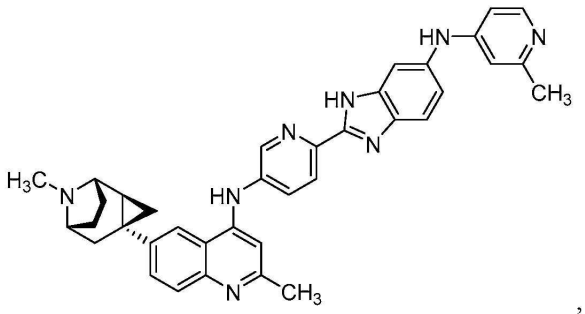
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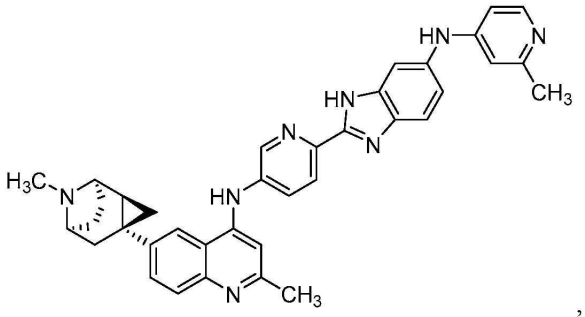

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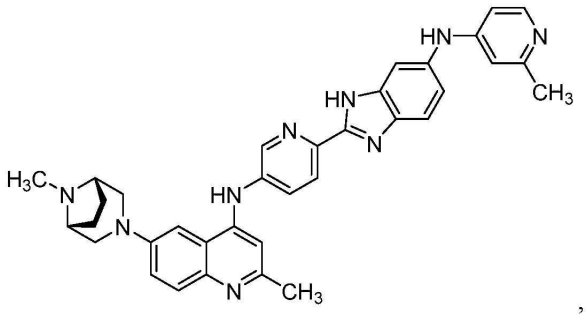

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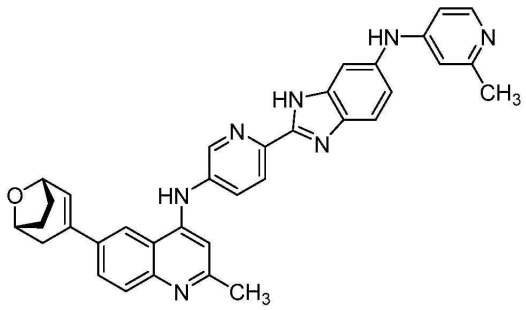

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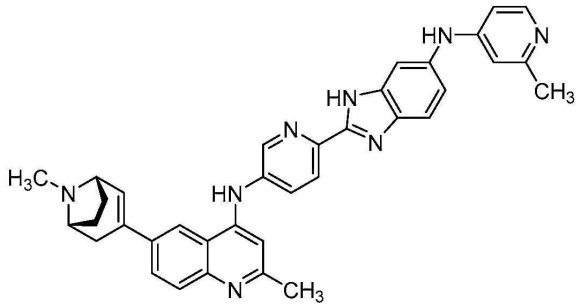

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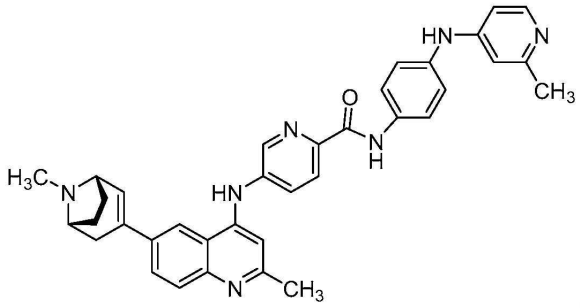

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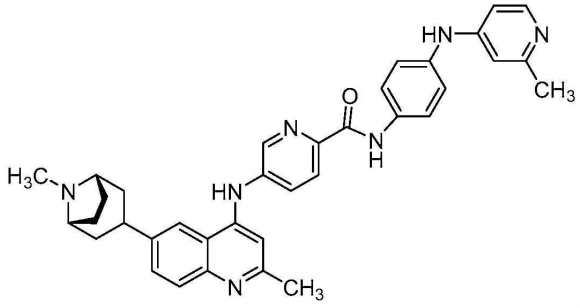

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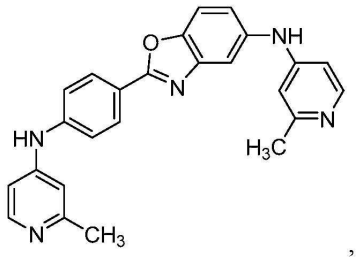

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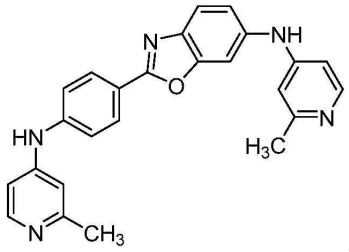

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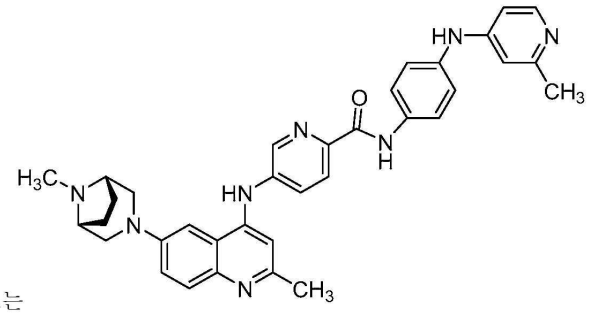

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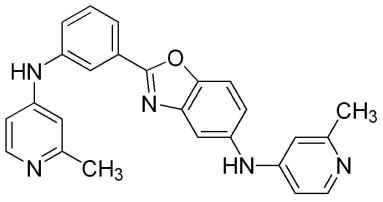

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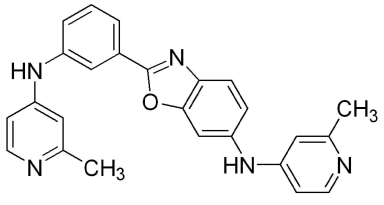

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청구항 129

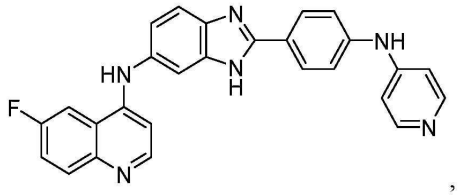
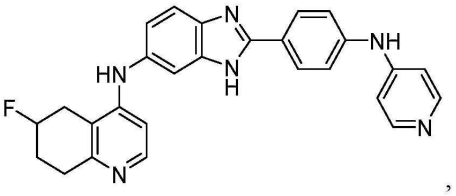
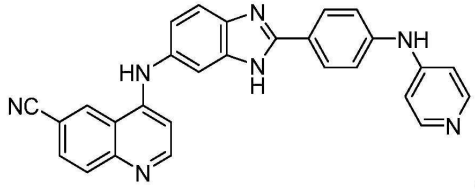
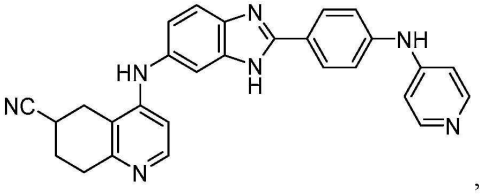
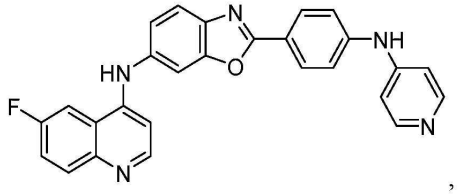
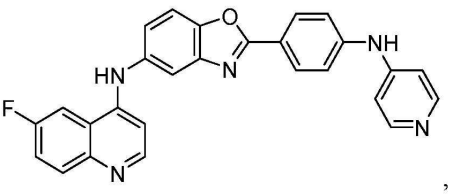
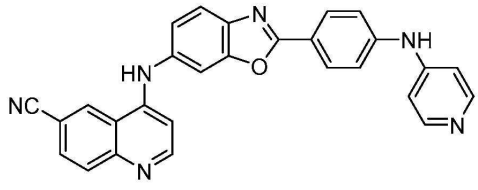
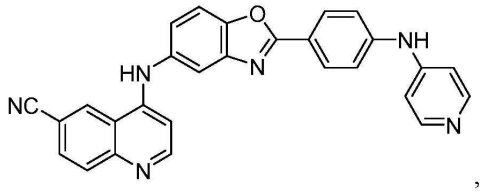
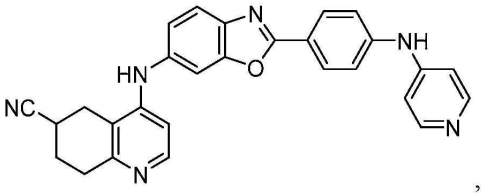
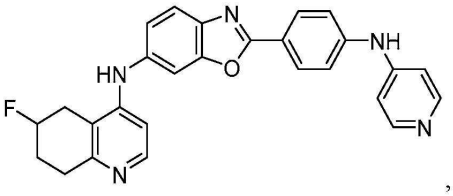
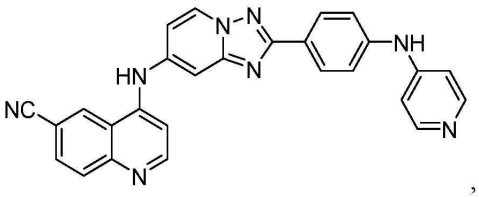
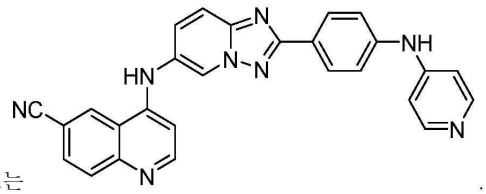
제1항에 있어서, 화학식 IIb의 화합물은


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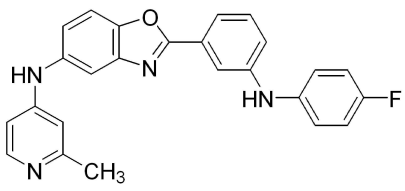

인 화합물.

청구항 130

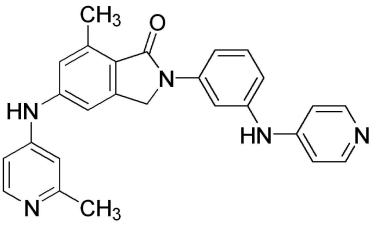
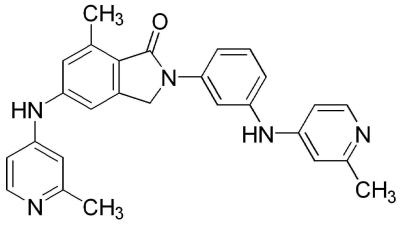
제1항에 있어서, 화학식 Ic의 화합물은 하기 화합물인 화합물:


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청구항 131

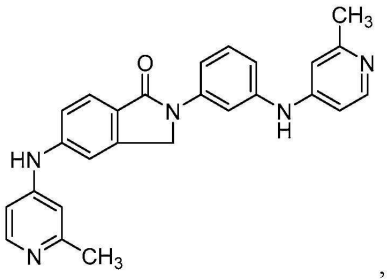
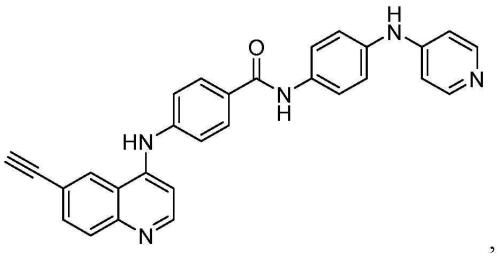
제1항에 있어서, 화학식 IIc의 화합물은  인 화합물.

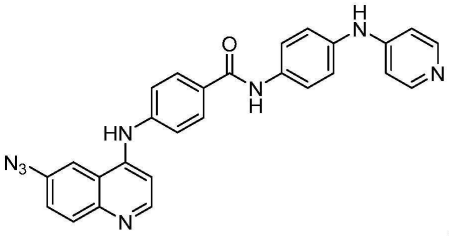
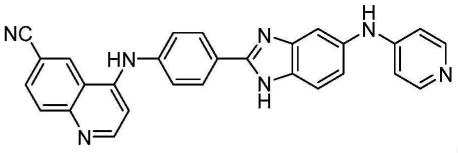
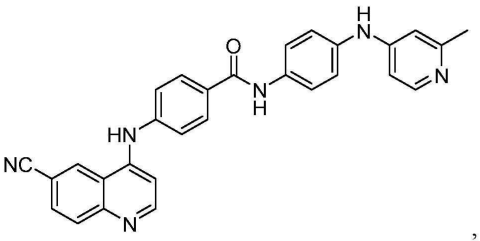
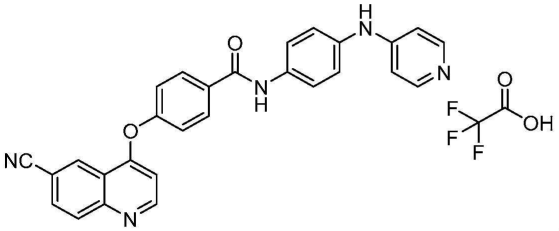
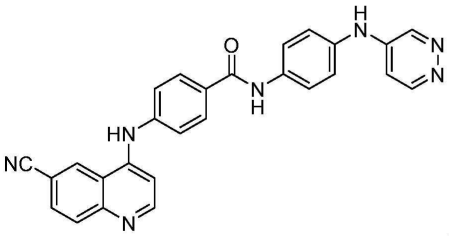
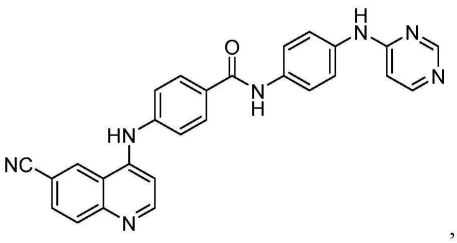
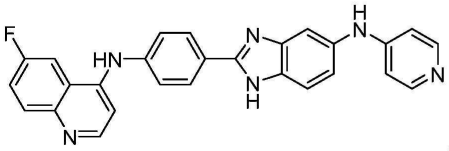
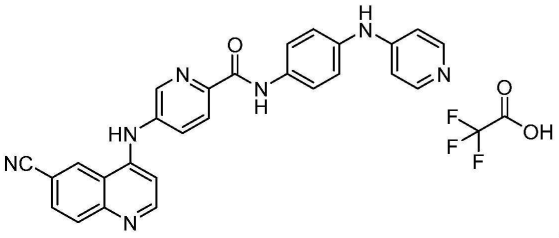
청구항 132

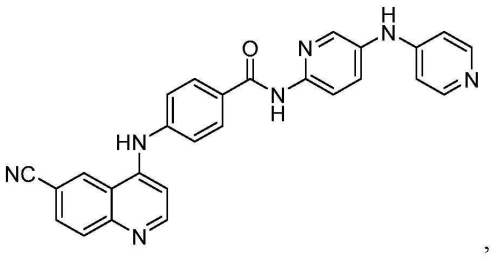
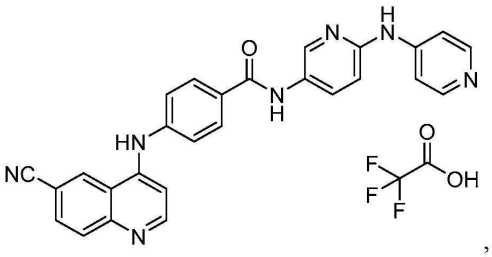
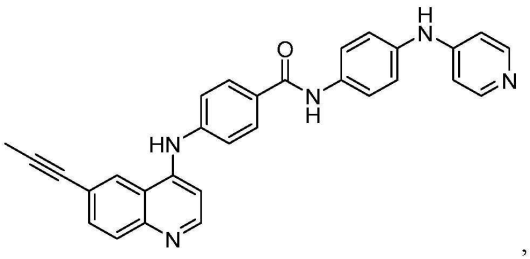
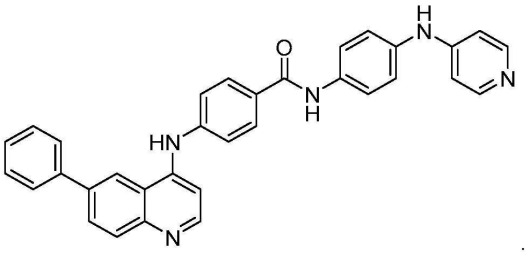
제1항에 있어서, 화학식 IVa의 화합물은  또는  인 화합물.

청구항 133

제1항에 있어서, 하기 화합물인 화합물:

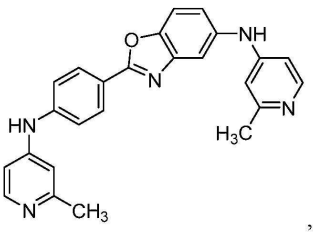
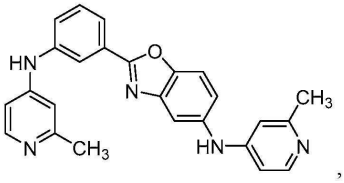
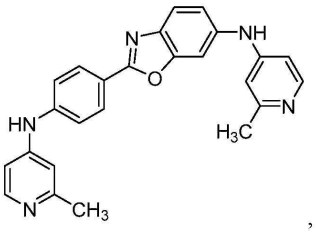
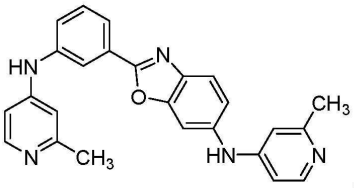
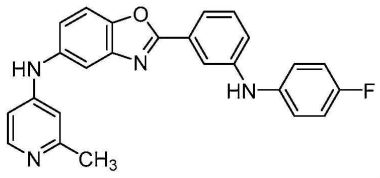
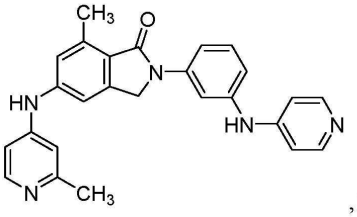
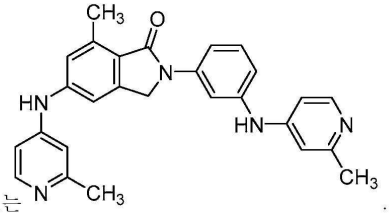
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청구항 134

제1항에 있어서, 하기 화합물인 화합물:


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청구항 135

제1항에 있어서, 각각 실시예 2 내지 9, 11 내지 14, 30, 및 32 내지 145의 화합물 2 내지 9, 11 내지 14, 30, 및 32 내지 145로 이루어진 군으로부터 선택된 화합물.

청구항 136

질환의 치료를 필요로 하는 대상체에서 질환을 치료하는 방법으로서, 제1항 내지 제135항 중 어느 한 항의 화합물의 유효량을 상기 대상체에게 투여하는 단계를 포함하는 방법.

청구항 137

제136항에 있어서, 질환은 신경변성 질환, 악액질, 거식증, 비만증, 비만 합병증, 염증성 질환, 바이러스 유발 염증 반응, 길프전 증후군, 결절성 경화증, 망막색소변성증, 이식 거부증, 암, 자가면역 질환, 허혈성 조직 손상, 외상성 조직 손상 및 이들의 조합으로 이루어진 군으로부터 선택된 것인 방법.

청구항 138

제137항에 있어서, 질환은 신경변성 질환인 방법.

청구항 139

제138항에 있어서, 신경변성 질환은 파킨슨병, 알츠하이머병, 근위축성 측삭 경화증, 운동 뉴런 질환, 헌팅톤병, HIV 유발 신경변성, 루이소체 질환, 척수성 근위축증, 프리온병, 척수소뇌성 운동실조증, 가족성 아밀로이드성 다발신경병증, 다발성 경화증 및 이들의 조합으로 이루어진 군으로부터 선택된 것인 방법.

청구항 140

제137항에 있어서, 질환은 악액질 또는 거식증인 방법.

청구항 141

제137항에 있어서, 질환은 비만증 또는 비만 합병증인 방법.

청구항 142

제141항에 있어서, 비만 합병증은 당불내성, 간 지방증, 이상지질혈증 및 이들의 조합으로 이루어진 군으로부터 선택된 것인 방법.

청구항 143

제137항에 있어서, 질환은 염증성 질환인 방법.

청구항 144

제143항에 있어서, 염증성 질환은 아토피성 피부염, 알러지, 천식 및 이들의 조합으로 이루어진 군으로부터 선택된 것인 방법.

청구항 145

제137항에 있어서, 질환은 바이러스 유발 염증 반응인 방법.

청구항 146

제145항에 있어서, 바이러스 유발 염증 반응은 SARS 유발 염증성 폐렴, 코로나바이러스병 2019, 또는 이들의 조합인 방법.

청구항 147

제137항에 있어서, 질환은 길프전 증후군 또는 결절성 경화증인 방법.

청구항 148

제137항에 있어서, 질환은 망막색소변성증 또는 이식 거부증인 방법.

청구항 149

제137항에 있어서, 질환은 허혈성 조직 손상 또는 외상성 조직 손상인 방법.

청구항 150

제137항에 있어서, 질환은 암인 방법.

청구항 151

제150항에 있어서, 암은 성인 T-세포 백혈병/림프종, 방광암, 뇌암, 유방암, 자궁경부암, 결장직장암, 식도암, 신장암, 간암, 폐암, 비강인두암, 췌장암, 전립선암, 피부암, 위암, 자궁암, 난소암 및 고환암으로 이루어진 군으로부터 선택된 것인 방법.

청구항 152

제150항에 있어서, 암은 백혈병인 방법.

청구항 153

제152항에 있어서, 백혈병은 성인 T-세포 백혈병/림프종인 방법.

청구항 154

제153항에 있어서, 성인 T-세포 백혈병/림프종은 인간 T-세포 림프친화성 바이러스에 의해 유발된 것인 방법.

청구항 155

제137항에 있어서, 질환은 자가면역 질환인 방법.

청구항 156

제155항에 있어서, 자가면역 질환은 이완불능증, 애디슨병(Addison's disease), 성인 스틸병(Still's disease), 무감마글로불린혈증, 원형 탈모증, 아밀로이드증, 강직성 척추염, 항사구체 기저막 질환, 항세뇨관 기저막 항체 신장염, 항인지질 증후군, 자가면역 혈관부종, 자가면역 자율신경 실조증, 자가면역 뇌척수염, 자가면역 간염, 자가면역 내이 질환, 자가면역 심근염, 자가면역 난소염, 자가면역 고환염, 자가면역 췌장염, 자가면역 망막병증, 자가면역 두드러기, 축삭 및 뉴런 신경병증, 발로병(Balo disease), 베체트병(Behcet's disease), 양성 점막 유천포창, 수포성 유천포창, 캐슬만병(Castleman disease), 셀리악병, 샤가스병(Chagas disease), 만성 염증성 탈수초 다발신경병증, 만성 재발성 다초점성 골수염, 척-스트라우스(Churg-Strauss) 증후군, 호산구 육아종증, 반흔성 유천포창, 코간(Cogan) 증후군, 한랭 응집소증, 선천성 심장 차단, 콕삭키(Coxsackie) 심근염, CREST 증후군, 크론병(Crohn's disease), 포진성 피부염, 피부근육염, 데빅병(Devic's disease)(시신경 척수염), 원판상 루푸스, 드레슬러(Dressler) 증후군, 자궁내막증, 호산구 식도염, 호산구 근막염, 결절성 홍반, 본태성 혼합형 한랭글로불린혈증, 에반스(Evans) 증후군, 섬유근육통, 섬유성 폐포염, 거대세포 동맥염(측두 동맥염), 거대 세포 심근염, 사구체신염, 굿파스처(Goodpasture) 증후군, 다발 혈관염을 갖는 육아종증, 그레이브스병(Graves' disease), 길랑-바레(Guillain-Barre) 증후군, 하시모토(Hashimoto) 갑상선염, 용혈성 빈혈, 헤노흐-쉰라인(Henoch-Schonlein) 자반증, 임신 유천포창, 화농성 한선염(아크네 인버사), 저감마글로불린혈증, IgA 신병증, IgG4 연관 경화성 질환, 면역 혈소판감소성 자반증, 봉입체(inslusion body) 근육염, 간질성 방광염, 소아 관절염, 소아 당뇨병(1형 당뇨병), 소아 근육염, 가와사키병(Kawasaki disease), 람베르트-이튼(Lambert-Eaton) 증후군, 백혈구파괴 혈관염, 편평 태선, 경화 태선, 목질 결막염, 선상 IgA 질환, 루푸스, 만성 라임병(Lyme disease), 메니에르병(Meniere's disease), 현미경적 다발 혈관염, 혼합 결합 조직 질환, 무렌(Mooren) 궤양, 무카-하베르만병(Mucha-Habermann disease), 다초점 운동 신경병증, 다발성 경화증, 중증 근육무력증, 근육염, 기면증, 신생아 루푸스, 시신경 척수염, 호중구감소증, 안 반흔성 유천포창, 시신경염, 재발성 류마티즘, 소아 자가면역 신경정신 질환, 부종양성 소뇌 변성, 발작성 야간 혈색소뇨증, 패리 롬버그(Parry Romberg) 증후군, 편평부염(주변 포도막염), 파르소니지-터너(Parsonage-Turner) 증후

군, 천포창, 말초 신경병증, 정맥주위성 뇌척수염, 악성 빈혈, POEMS 증후군, 결절성 다발동맥염, I형 다선 증후군, II형 다선 증후군, III형 다선 증후군, 류마티스성 다발근육통, 다발성 근육염, 심근경색증후 증후군, 심낭막절개술후 증후군, 원발성 담즙성 간경변증, 원발성 경화성 담관염, 프로게스테론 피부염, 건선, 건선성 관절염, 순수 적혈구 무형성증, 괴저성 농피증, 레이노병, 반응성 관절염, 반사 교감신경 위축증, 재발성 다발연골염, 하지 불안 증후군, 후복막 섬유증, 류마티스열, 류마티스 관절염, 사르코이드증, 슈미트(Schmidt) 증후군, 공막염, 공피증, 쇼그렌(Sjogren) 증후군, 정자 및 고환 자가면역 질환, 강직 인간 증후군, 아급성 세균성 심내막염, 스삭(Susac) 증후군, 교감성 안염, 타카야스(Takayasu) 동맥염, 측두 동맥염(거대 세포 동맥염), 혈소판감소성 자반증, 톨로사-헌트(Tolosa-Hunt) 증후군, 횡단성 척수염, 궤양성 대장염, 미분화 결합 조직 질환, 포도막염, 혈관염, 백반증, 보그트-고야나기-하라다병(Vogt-Koyanagi-Harada disease) 및 이들의 조합으로 이루어진 군으로부터 선택된 것인 방법.

청구항 157

제136항 내지 제156항 중 어느 한 항에 있어서, 화합물이 면역 세포에서 Akt3을 조절하는 것인 방법.

청구항 158

제157항에 있어서, 면역 세포가 T 세포, B 세포, 대식세포 및 신경아교세포로 이루어진 군으로부터 선택된 것인 방법.

청구항 159

제158항에 있어서, 신경아교세포가 성상세포, 미세아교세포 또는 희소돌기아교세포인 방법.

청구항 160

제158항에 있어서, T 세포가 T 조절 세포인 방법.

청구항 161

제136항 또는 제137항에 있어서, 화합물이 Akt3 신호전달을 활성화시키는 것인 방법.

청구항 162

제136항 또는 제137항에 있어서, 화합물이 Akt3 신호전달을 억제하는 것인 방법.

청구항 163

제136항 또는 제137항에 있어서, 화합물이 T 조절 세포 활성 또는 생성을 증가시키는 것인 방법.

청구항 164

제136항 또는 제137항에 있어서, 화합물이 T 조절 세포 활성 또는 생성을 감소시키는 것인 방법.

청구항 165

제136항 내지 제164항 중 어느 한 항에 있어서, 제2 치료제를 대상체에게 투여하는 단계를 추가로 포함하는 방법.

청구항 166

제165항에 있어서, 제2 치료제가 영양 보충제, 화학요법제, 항염제, 면역억제제, 콜린에스터라제(cholinesterase) 억제제, 항우울제, 항불안제, 항정신병제, 릴루졸(riluzole), 에다바론(edavarone), 도파민 아고니스트, MAO B 억제제, 카테콜 O-메틸트랜스퍼라제(methyltransferase) 억제제, 항콜린작용제, 항경련제, 테트라베나진(tetrabenazine), 카르비도파-레보도파(carbidopa-levodopa), 항경직제, 항체, 융합 단백질, 효소, 핵산, 리보핵산, 항증식제, 세포독성제, 식욕 자극제, 5-HT3 길항제, Cox-2 억제제 및 이들의 조합으로 이루어진 군으로부터 선택된 것인 방법.

청구항 167

제136항 내지 제164항 중 어느 한 항에 있어서, 대상체를 면역 치료제, 면역 조절제, 보조자극 활성화 아고니스트, 사이토카인, 케모카인, 케모카인 인자, 종양용해성 바이러스, 생물제제(biologics), 백신, 소분자, 표적화 요법, 항염제, 세포 요법, 화학요법제 또는 방사선 요법으로 치료하는 단계를 추가로 포함하는 방법.

발명의 설명

기 술 분 야

[0001] **관련 출원의 교차참조**

[0002] 본원은 2021년 11월 5일에 출원된 미국 가출원 제63/276,338호의 이익과 우선권을 주장하고, 이 출원의 내용은 그의 전체가 본원에 참고로 포함된다. 본원은 2021년 5월 7일에 출원된 국제 특허 출원 제PCT/US2021/031297호, 2021년 5월 7일에 출원된 국제 특허 출원 제PCT/US2021/031325호, 2021년 5월 7일에 출원된 국제 특허 출원 제PCT/US2021/031381호 및 2021년 5월 7일에 출원된 국제 특허 출원 제PCT/US2021/031386호와 관련되어 있고, 이들 모두의 내용은 그의 전체가 본원에 참고로 포함된다.

[0003] **참조에 의한 포함**

[0004] 본원에서 인용된 임의의 특허, 특허 간행물, 학술지 간행물 또는 다른 문헌은 그의 전체가 본원에 명백히 참고로 포함된다.

[0005] **발명의 분야**

[0006] 본 발명은 일반적으로 Akt3 조절제, 및 Akt3 신호전달을 조절함으로써 질환을 치료하고 예방하는 방법에 관한 것이다.

배 경 기 술

[0007] 만성 질병 및 질환은 지속적인 의학적 관심을 요구하고 전형적으로 환자의 삶의 질에 부정적인 영향을 미치는 장기 지속 병태이다. 만성 질환은 미국에서 장애와 사망의 주요 원인이다. 일반적인 만성 질환은 심장 질환, 암, 신경변성 질환, 당뇨병, 비만, 섭식 장애 및 관절염을 포함하나, 이들로 제한되지 않는다. 미국 성인 10명 중 약 6명은 만성 질환을 갖고, 여기서 10명 중 4명은 2종 이상의 만성 질환을 갖는 것으로 추정된다. 만성 질환은 또한 미국의 연간 건강 관리 비용 3조 3천억 달러의 주요 요인이다(문헌["About Chronic Diseases", National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention; updated October 23, 2019] 참조). 이 통계자료는 예를 들어, 암, 염증성 질환, 신경변성 질환, 병원성 감염, 면역결핍 장애, 체중 증가 장애, 체중 감소 장애, 호르몬 불균형, 결절성 경화증, 망막색소변성증 및 울혈성 심부전과 같은 질환에 대한 새로운 개선된 치료 및 예방적 중재의 필요성을 강조한다.

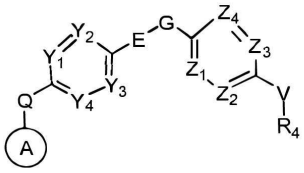
[0008] 신경변성 질환은 뉴런으로서도 지칭되는 신경 세포의 진행성 퇴행 및 사멸을 특징으로 하는 쇠약 병태이다. 뉴런은 신경계의 구축 블록이고 통상적으로 손상 또는 사멸 후 자가 보충되지 않는다. 신경변성 질환을 가진 환자에서 뉴런의 손실 또는 기능이상은 신체 움직임 및 뇌 기능에 영향을 미칠 수 있다. 신경변성 질환은 알츠하이머병, 근위축성 측삭 경화증, 헌팅톤병, 파킨슨병, 다발성 경화증, 프리온병, 운동 뉴런 질환, 척수소뇌성 운동실조증 및 척수성 근위축증을 포함하나, 이들로 제한되지 않는다. 진행된 신경변성 질환의 증상은 환자가 기억력, 움직임에 대한 통제력 및 인격을 상실하기 때문에 파괴적일 수 있다. 신경변성 질환에 대한 기존 치료는 증상을 관리할 수 있으나, 일반적으로 질환을 예방할 수 없거나 치유할 수 없다. 이러한 기존 치료는 전형적으로 환자의 삶의 질을 더 악화시키는 부정적인 부작용을 가진다.

[0009] 신경변성 질환 및 암과 같은 만성 질환의 심각한 합병증은 소모성 증후군으로서도 지칭되는 악액질이다. 악액질은 만성 질환의 존재 하에 12개월 이하 이내에 체중의 5% 초과의 체중 감소로서 정의된다. 악액질의 다른 증상은 근육 위축, 피로, 쇠약, 및 종종 식욕 상실을 포함한다. 악액질과 관련된 체중 감소는 지방뿐만 아니라 근육량도 상실되기 때문이다. 악액질을 가진 환자는 여전히 정상적인 식사를 하고 있을지라도 종종 체중이 감소된다. 신경변성 질환과 마찬가지로, 많은 만성 질환 관련 사망에 기여하는 악액질에 대한 효과적인 치료는 현재 없다.

[0010] 따라서, 이들 질환과 다른 질환, 및 이들 질환과 관련된 합병증에 대한 보다 더 효과적이고 견딜 수 있는 치료 및 예방적 중재에 대한 충족되지 않은 요구가 있다.

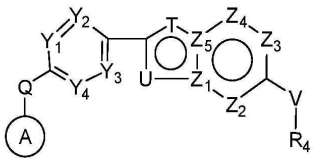
발명의 내용

[0011] 본원에서 사용된 바와 같이, Akt3은 인간에서 *Akt3* 유전자에 의해 코딩되는 효소인 RAC-감마 세린/트레오닌-단백질 키나제(kinase)이다. 한 측면에서, 하기 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb



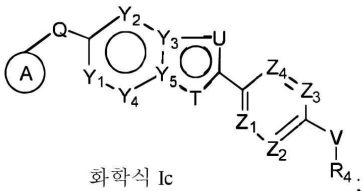
화학식 Ia

,



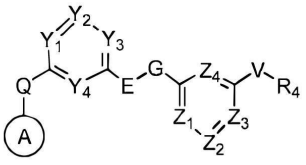
화학식 Ib

,



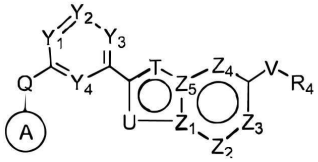
화학식 Ic

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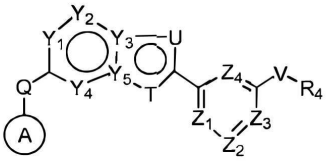
화학식 IIa

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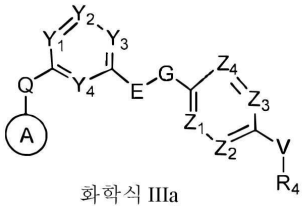
화학식 IIb

;



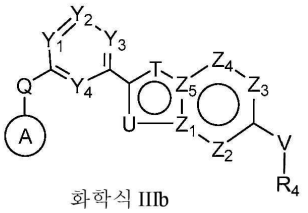
화학식 IIc

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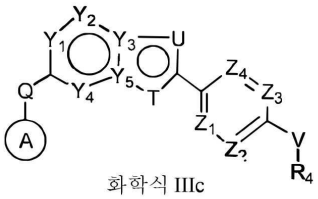
화학식 IIIa

;



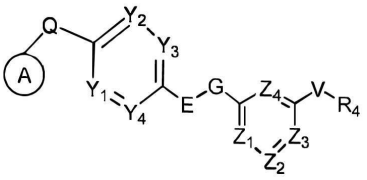
화학식 IIIb

;



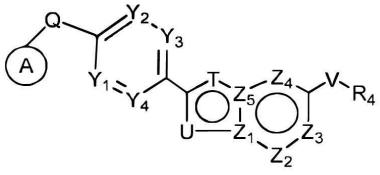
화학식 IIIc

;

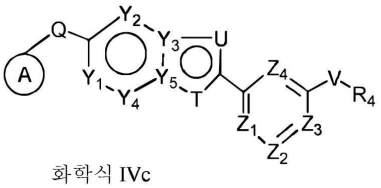


화학식 IVa

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화학식 IVb

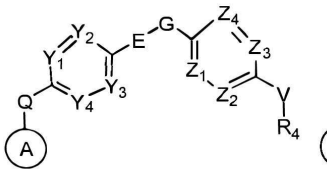


화학식 IVc

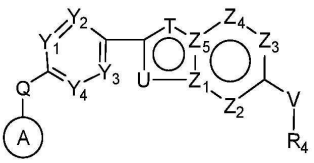
; 또는

또는 IVc( )의 구조를 가진 화합물 또는 이의 염이 기재되고, 여기서 다양한 치환기는 본원에 정의되어 있다. 특정 실시양태에서, 상기 화합물은 시험관내 또는 생체에서 Akt3의 특성 또는 효과를 조절할 수 있고/있거나, 다양한 병태의 예방 또는 치료에 개별적으로 또는 다른 작용제와 함께 사용될 수도 있다. 다른 실시양태에서, 상기 화합물을 합성하는 방법이 제공된다. 또 다른 측면에서, 상기 화합물을 포함하는 약학 조성물, 및 이 조성물을 다양한 병태의 예방 또는 치료에 개별적으로 또는 다른 작용제 또는 조성물과 함께 사용하는 방법도 본원에 기재된다.

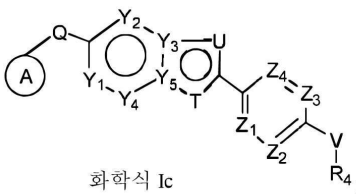
[0012] 한 측면에서, 하기 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물, 또는 이의 약학적으로 허용되는 염이 기재된다:



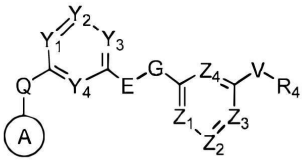
화학식 Ia ;



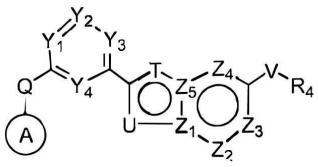
화학식 Ib ,



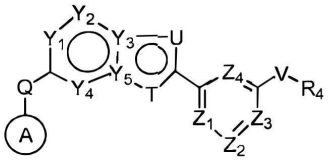
화학식 Ic ;



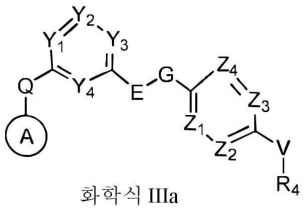
화학식 IIa ;



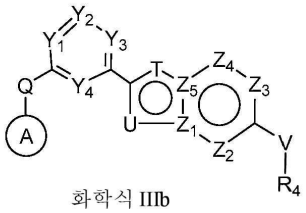
화학식 IIb ;



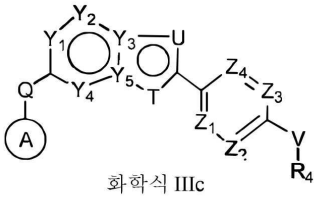
화학식 IIc ;



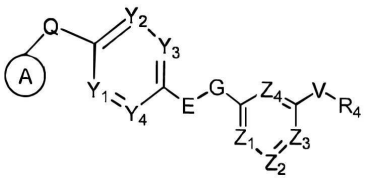
화학식 IIIa ;



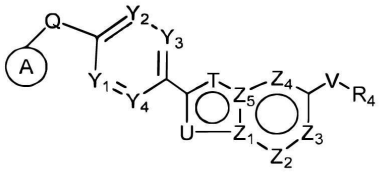
화학식 IIIb ;



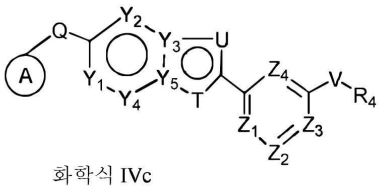
화학식 IIIc ;



화학식 IVa ;



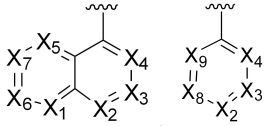
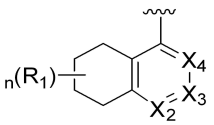
화학식 IVb



화학식 IVc ; 또는

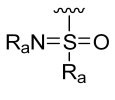
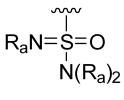
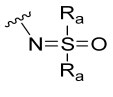
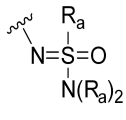
[0013]

[0014] 상기 식에서,

[0015] Ⓐ는  ,  , 또는 이고;

[0016] X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 및 X_9의 각 경우는 독립적으로 CR_1 또는 N이고;

[0017] R_1의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테

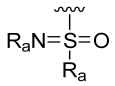
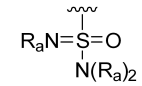
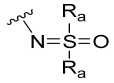
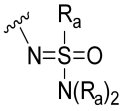
로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, (C_4-C_{14})헤테로트리사이클로알케닐, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, , , , , 및 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$로 임의로 치환된 부분 포화 이환형 헤테로아릴로 이루어진 군으로부터 선택되고;

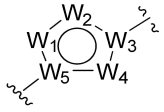
[0018] 여기서 R_1의 (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, $(C3-C7)$사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, (C_4-C_{14})헤테로트리사이클로알케닐, 아릴 및 헤테로아릴은 각각 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$로 임의로 치환되고;

[0019] n은 원자가가 허용하는 경우 0 내지 4의 정수이고;

[0020] Q는 $C(R_a)_2$, O, NR_a, $N(C=O)R_a$, 또는 NSO_2R_a이고;

[0021] Y_1, Y_2, Y_3, Y_4 및 Y_5는 원자가가 허용하는 경우 각각 독립적으로 N 또는 CR_2이고;

[0022] R_2는 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, , ; , 및 로 이루어진 군으로부터 선택되고;

[0023] -E-G-는 $-(C=O)NR_x-$, $-NR_x(C=O)-$, $-N(R_x)(C=O)N(R_x)-$, $-O(C=O)N(R_x)-$, $-N(R_x)(C=O)O-$, $-SO_2NR_x-$, $-NR_xSO_2-$, 또는 이고;

[0024] 여기서 R_x의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, 아릴 또는 헤테로아릴이거나; R_x와 Y_2, R_x와 Y_3, R_x와 Z_1, 또는 R_x와 Z_4는 함께 임의로 치환된 5원 또는 6원 헤테로사이클을 형성하고;

[0025] W_1, W_2, W_3, W_4 및 W_5는 원자가가 허용하는 경우 각각 독립적으로 CR_6, N 또는 NR_6이고;

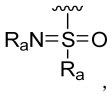
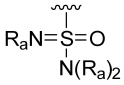
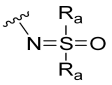
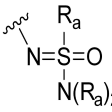
[0026] R_6의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬 및 (C_1-C_6)할로알킬로 이루어진 군으로부터 선택되고;

[0027] T의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이고;

[0028] U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이고;

[0029] R_b의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬이고;

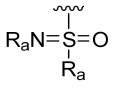
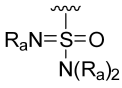
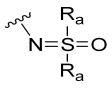
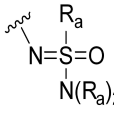
[0030] Z_1, Z_2, Z_3, Z_4 및 Z_5는 원자가가 허용하는 경우 각각 독립적으로 N 또는 CR_3이고;

[0031] R_3은 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, , , , 및 로 이루어진 군으로부터 선택되고;

[0032] V는 부재하거나, $C(R_a)_2$, NR_a, $N(C=O)R_a$, NSO_2R_a 또는 O이고;

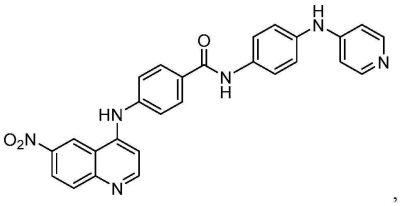
[0033] R_4는 각각 하나 이상의 R_5로 임의로 치환된 (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 아릴 및 헤테로아릴로 이루어진 군으로부터 선택되거나;

[0034] 대안적으로, V와 R_4는 함께 (C_3-C_7)헤테로사이클로알킬 또는 (C_4-C_{10})헤테로스피로알킬을 형성하고;

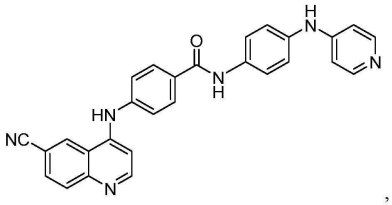
[0035] R_5의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, $N(R_a)COR_a$, , , , 및 로 이루어진 군으로부터 선택되고;

[0036] R_a의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_2-C_6)알케닐, (C_3-C_7)사이클로알킬, 아릴 또는 헤테로아릴이거나, 2개의 R_a는 함께 할로겐 또는 (C_1-C_6)알킬로 임의로 치환된 4원 내지 6원 고리를 형성하고;

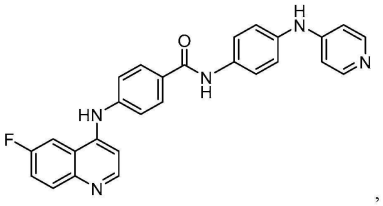
[0037] 단, 상기 화합물은 하기 화합물이 아니다:



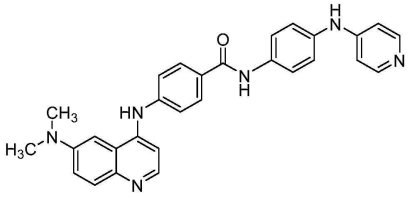
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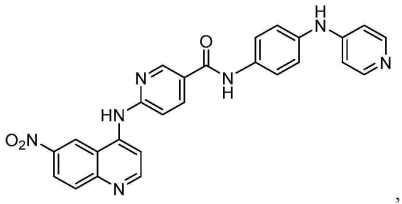
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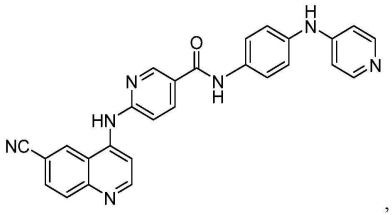
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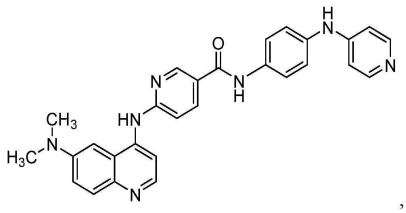


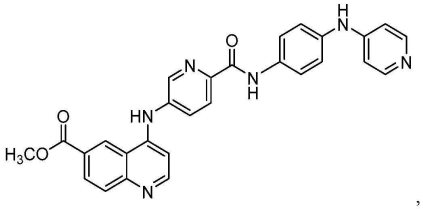
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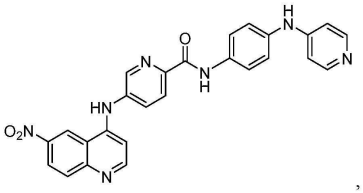


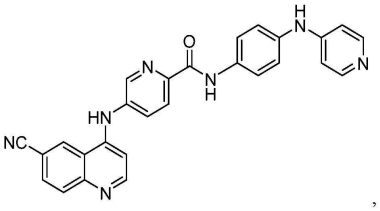
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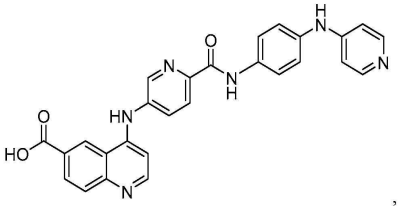
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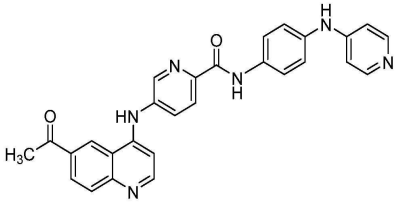

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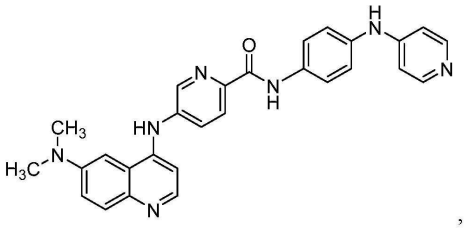

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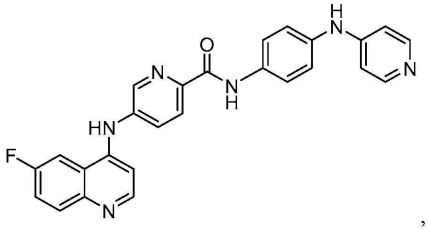

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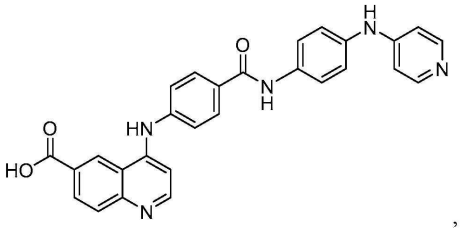

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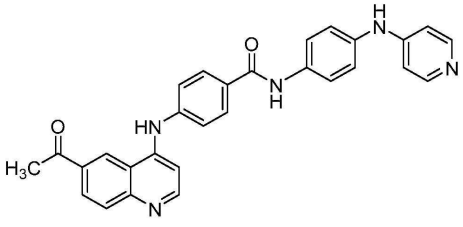

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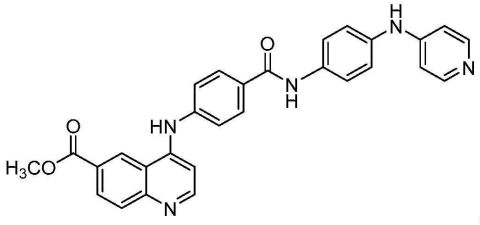
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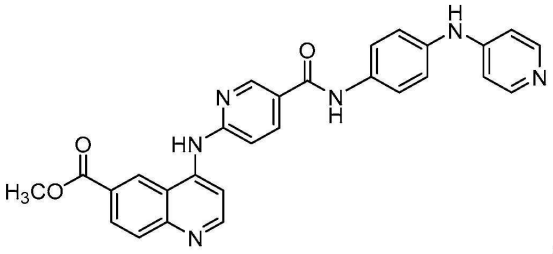

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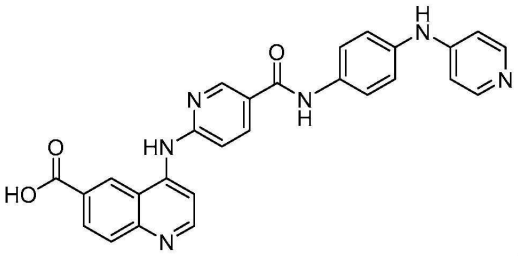

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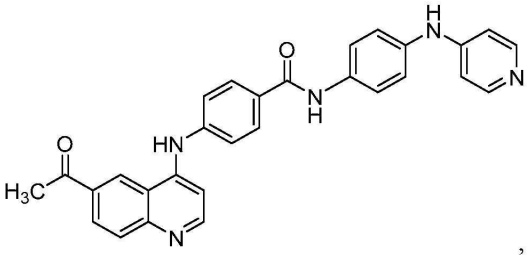

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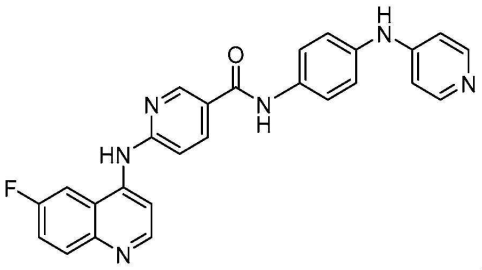

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[0040]


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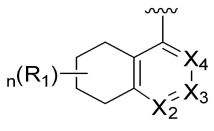

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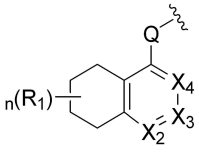

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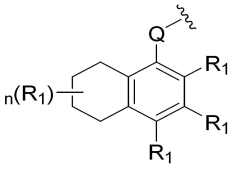
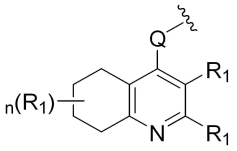
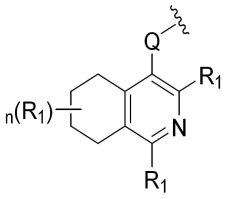
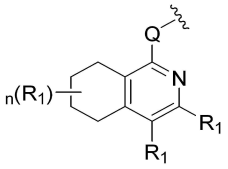
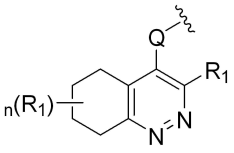
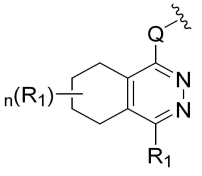
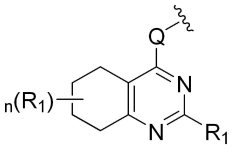
[0041]

[0042] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, Q, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, NH, NCH_3, N(C=O)H, $N(C=O)CH_3$, $N(C=O)CH_2CH_3$, NSO_2CH_3 또는 $NSO_2CH_2CH_3$이다. 본원에 개시된 실시양태들 중 어느 한 실시양태에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NH, NCH_3, N(C=O)H, $N(C=O)CH_3$, $N(C=O)CH_2CH_3$, NSO_2CH_3 또는 $NSO_2CH_2CH_3$이다.

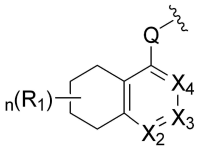
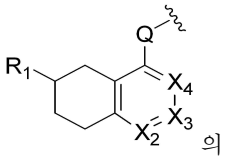
[0043] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, Y_1, Y_2, Y_3, Y_4, Y_5, Z_1, Z_2, Z_3, Z_4 및 Z_5는 각각 독립적으로 CH, C(할로겐) 또는 N이다.

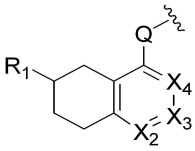
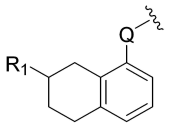
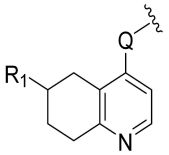
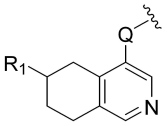
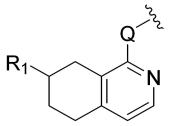
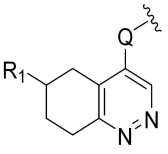
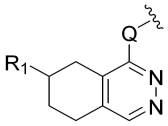
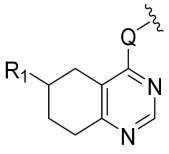
[0044] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, Ⓐ는  이다.

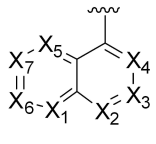
[0045] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는

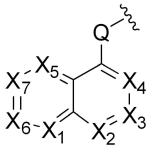

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의 구조를 가진다.

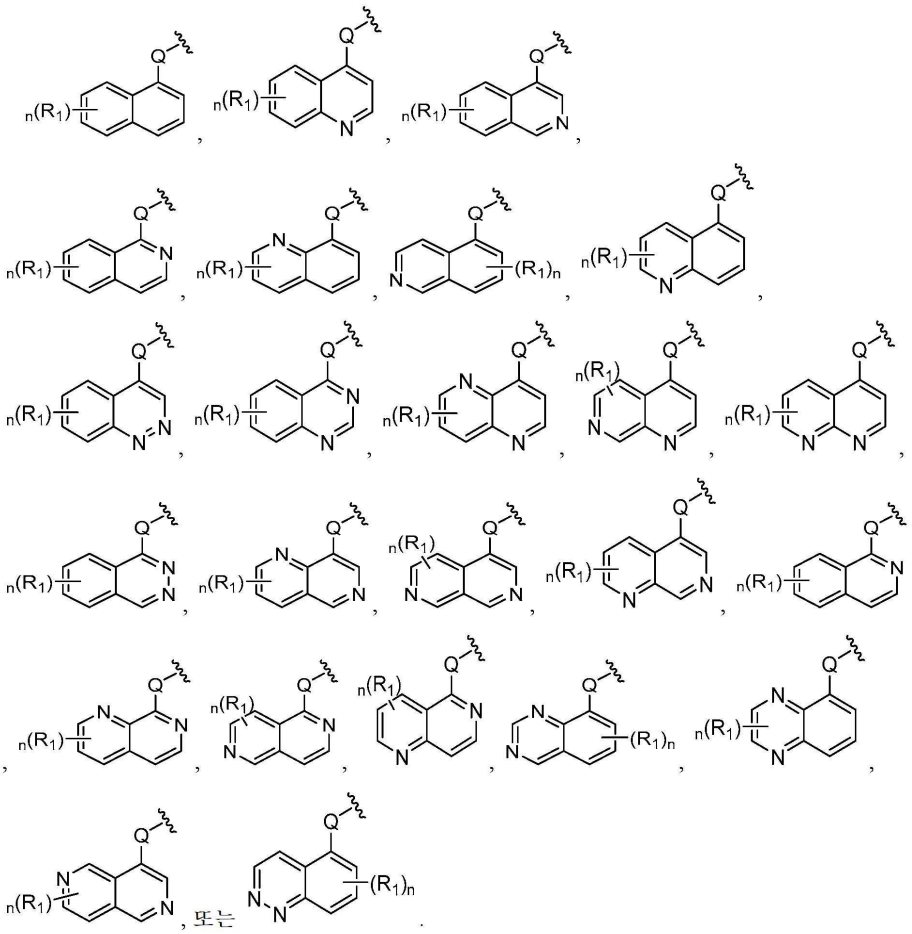
[0046] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, n은 0, 1 또는 2이다.

[0047] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
는 
의 구조를 가진다.

[0048] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
는 
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의 구조를 가진다.

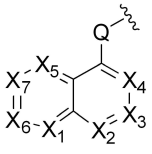
[0049] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, Ⓐ 는 
이다.

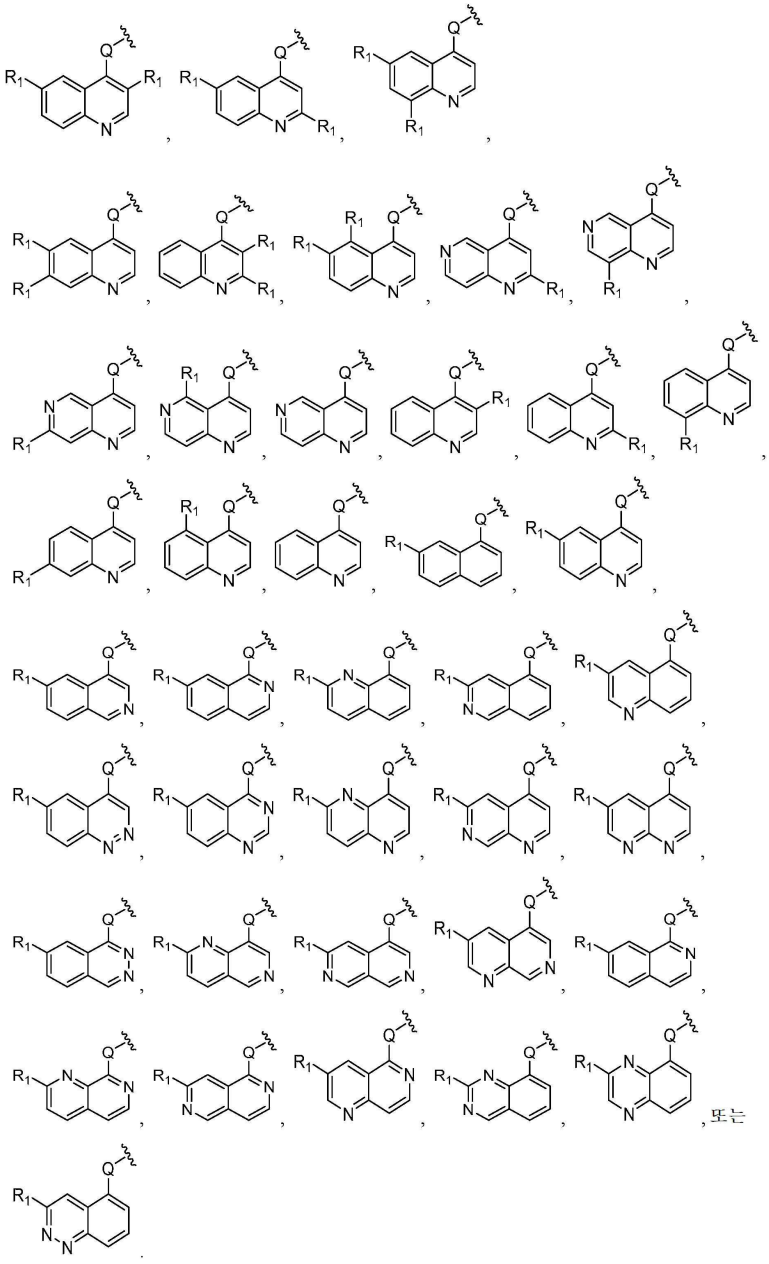
[0050] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
는 하기 화학식의 구조를 가진다:



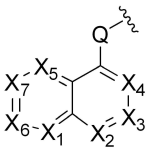
[0051]

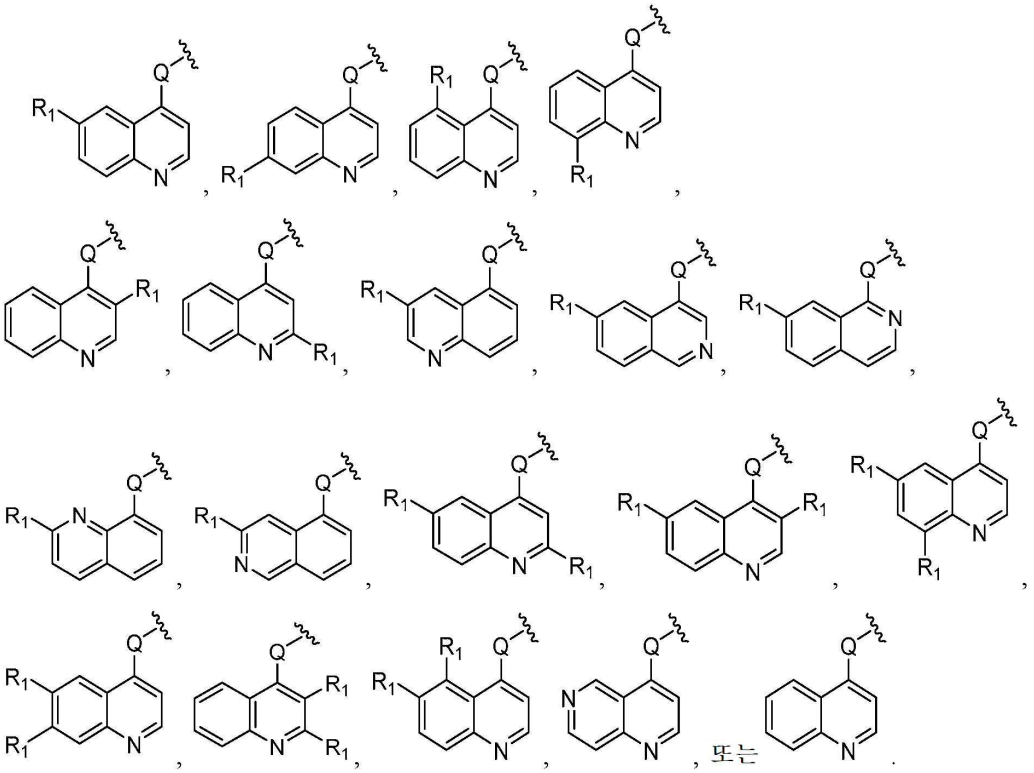
[0052] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, n은 0, 1 또는 2이다.

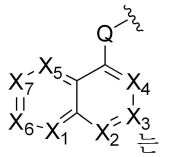
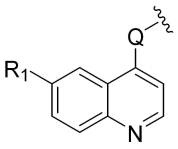
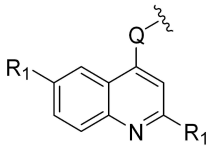
[0053] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

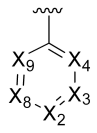


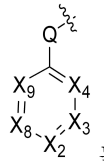
[0054]

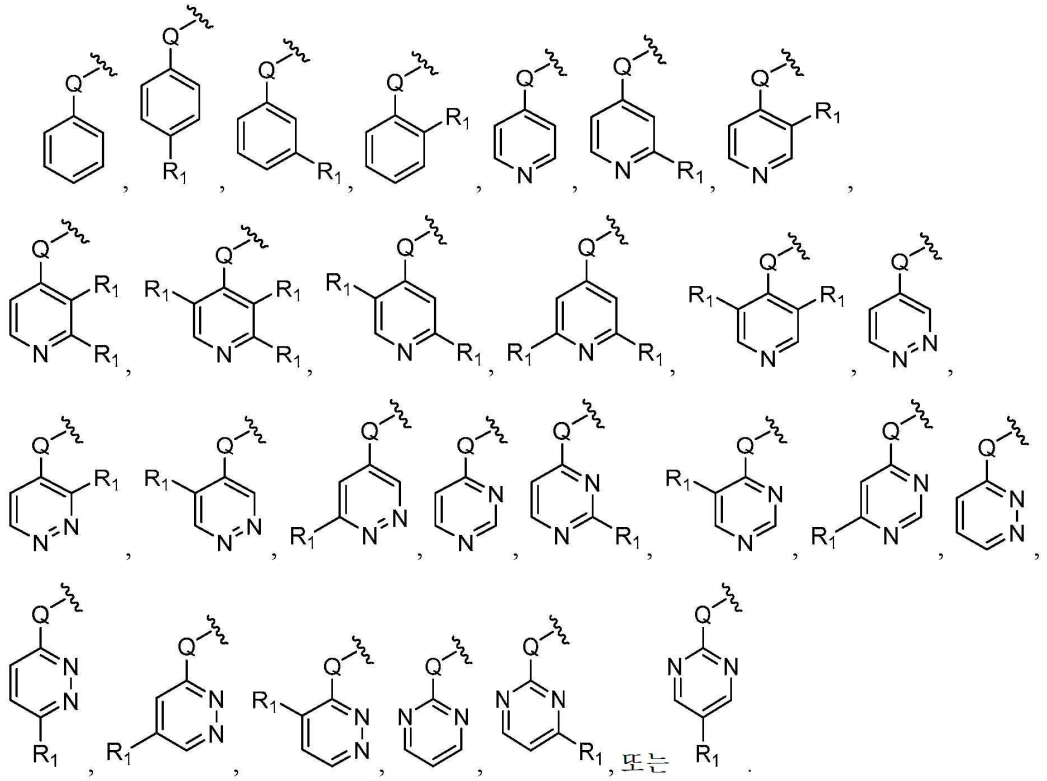
[0055] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

[0056] 

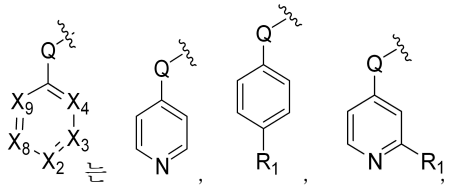
[0057] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  , 또는  의 구조를 가진다.

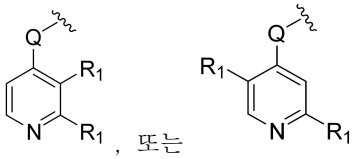
[0058] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, Ⓐ 는  이다.

[0059] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:



[0060]

[0061] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는

 의 구조를 가진다.

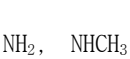
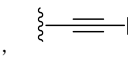
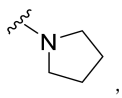
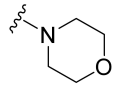
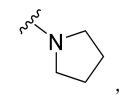
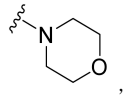
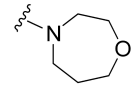
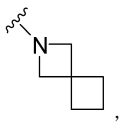
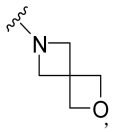
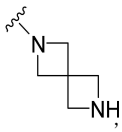
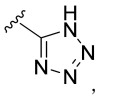
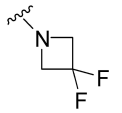
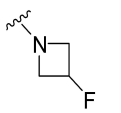
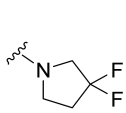
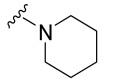
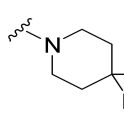
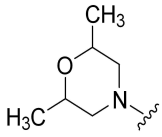
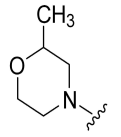
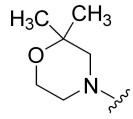
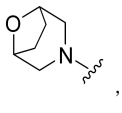
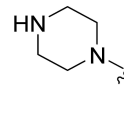
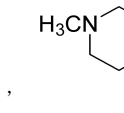
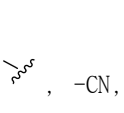
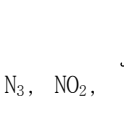
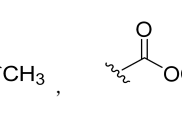
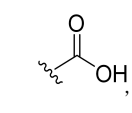
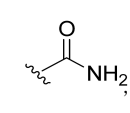
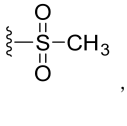
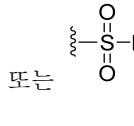
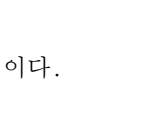
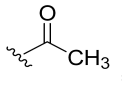
[0062] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, Q는 O이다.

[0063] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, Q는 NR_a, $N(C=O)R_a$ 또는 NSO_2R_a이다.

[0064] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1의 각 경우는 독립적으로 H, D, 할로겐, OR_a, $N(R_a)_2$, (C_1-C_6)알킬, (C_1-C_6)알키닐, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, (C_4-C_{10})비사이클로알킬, -CN, N_3, NO_2, COR_a, CO_2R_a, $CON(R_a)_2$, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$이고; 여기서 (C_3-C_7)헤테로사이클로알킬은 하나 이상의 (C_1-C_6)알킬로 임의로 치환된다.

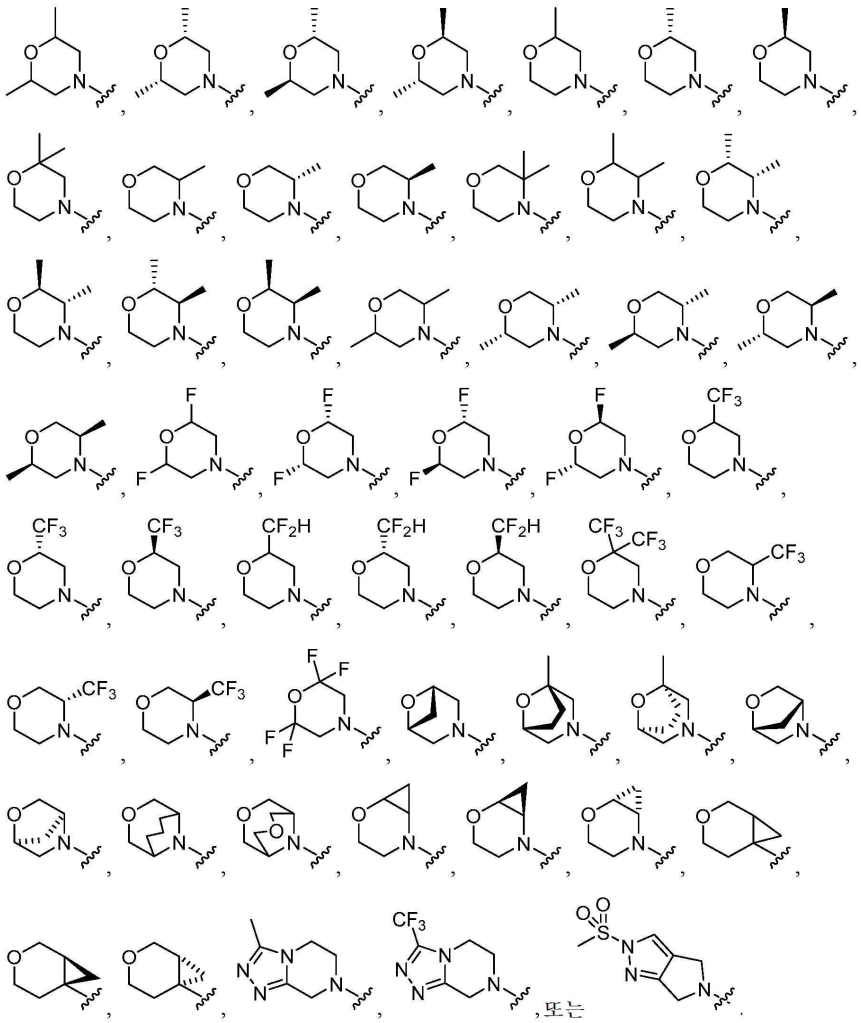
[0065] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, $N(R_a)_2$ 또는 -CN이고; 여기서 (C_3-C_7)헤테로사이클로알킬은 하나 이상의 (C_1-C_6)알킬로 임의로 치환된다.

[0066] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로할로알킬 또는 (C_3-C_7)헤테로사이클로알킬이고; 여기서 (C_3-C_7)헤테로사이클로알킬은 하나 이상의 (C_1-C_6)알킬로 임의로 치환된다.

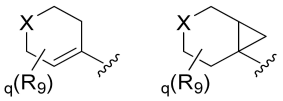
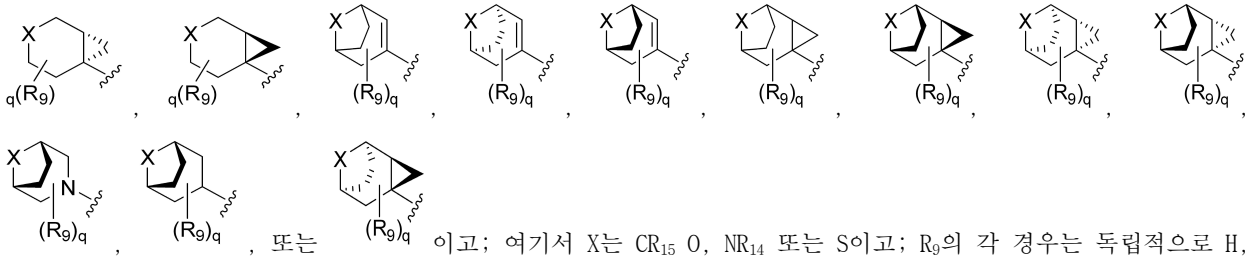
[0067] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1의 각 경우는 독립적으로 H, D, F, Cl, Br, CH_3, OCH_3, NH_2, $NHCH_3$, $N(CH_3)_2$, , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , , -CN, N_3, NO_2, , , , , , 또는 이다.

[0068] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1의 각 경우는 독립적으로 H, D, F, CH_3, NH_2, $NHCH_3$, $N(CH_3)_2$, , , , , 또는 이다.

[0069] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1의 적어도 하나의 경우는 하기 화학식의 기이다:



[0070] ,또는

[0071] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1의 적어도 하나의 경우는 , , 또는 이고; 여기서 X는 CR_{15} O, NR_{14} 또는 S이고; R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; R_{14}는 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 아릴 또는 헤테로아릴이고; R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; q는 0, 1, 2 또는 3이다.

[0072] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, X는 O이다.

[0073] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬 또는 할로겐이다.

[0074] 본원에 개시된 실시양태들 중 어느 한 실시양태서, R_9의 각 경우는 독립적으로 H, F, Cl, Br, CH_3, CF_3, OH,

NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$이다.

[0075] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_9의 각 경우는 독립적으로 H, F, Cl, Br 또는 CH_3이다.

[0076] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬 또는 할로겐이다.

[0077] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_{15}의 각 경우는 독립적으로 H, F, Cl, Br 또는 CH_3이다.

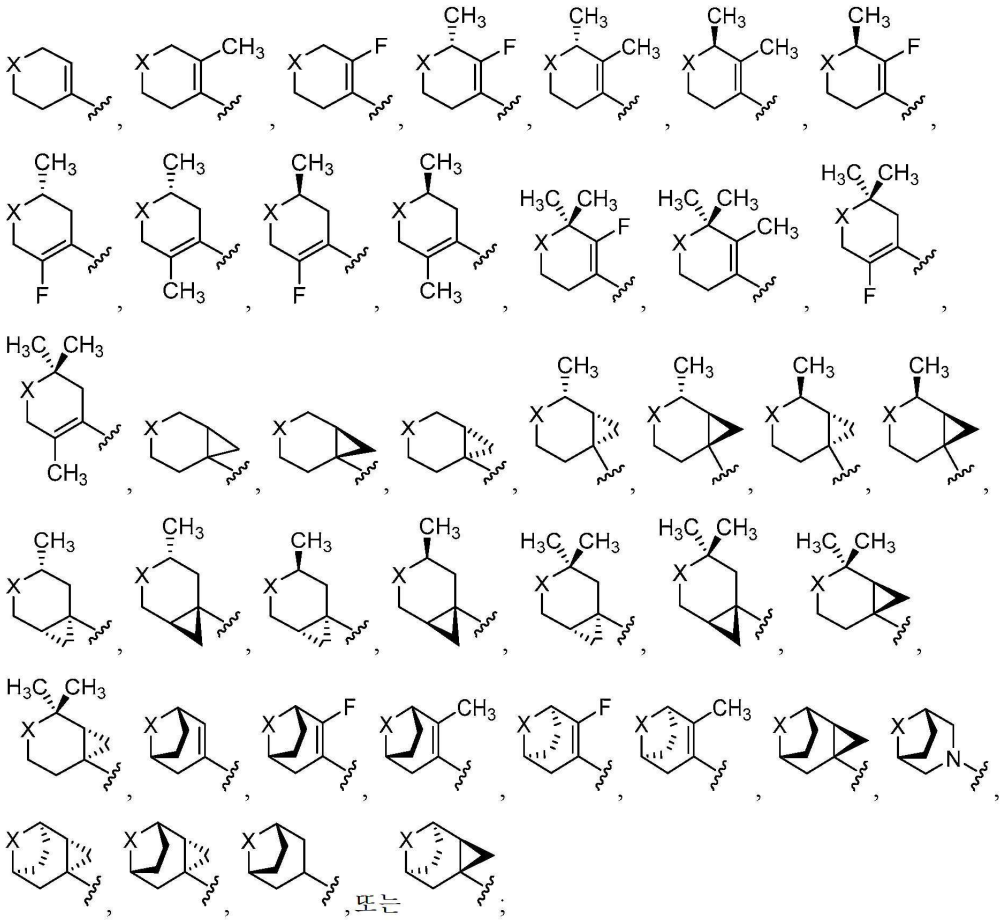
[0078] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, q는 0이다.

[0079] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, q는 1이다.

[0080] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, q는 2 또는 3이다.

[0081] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, X는 NR_{14}이고 R_{14}는 H 또는 (C_1-C_6)알킬이다.

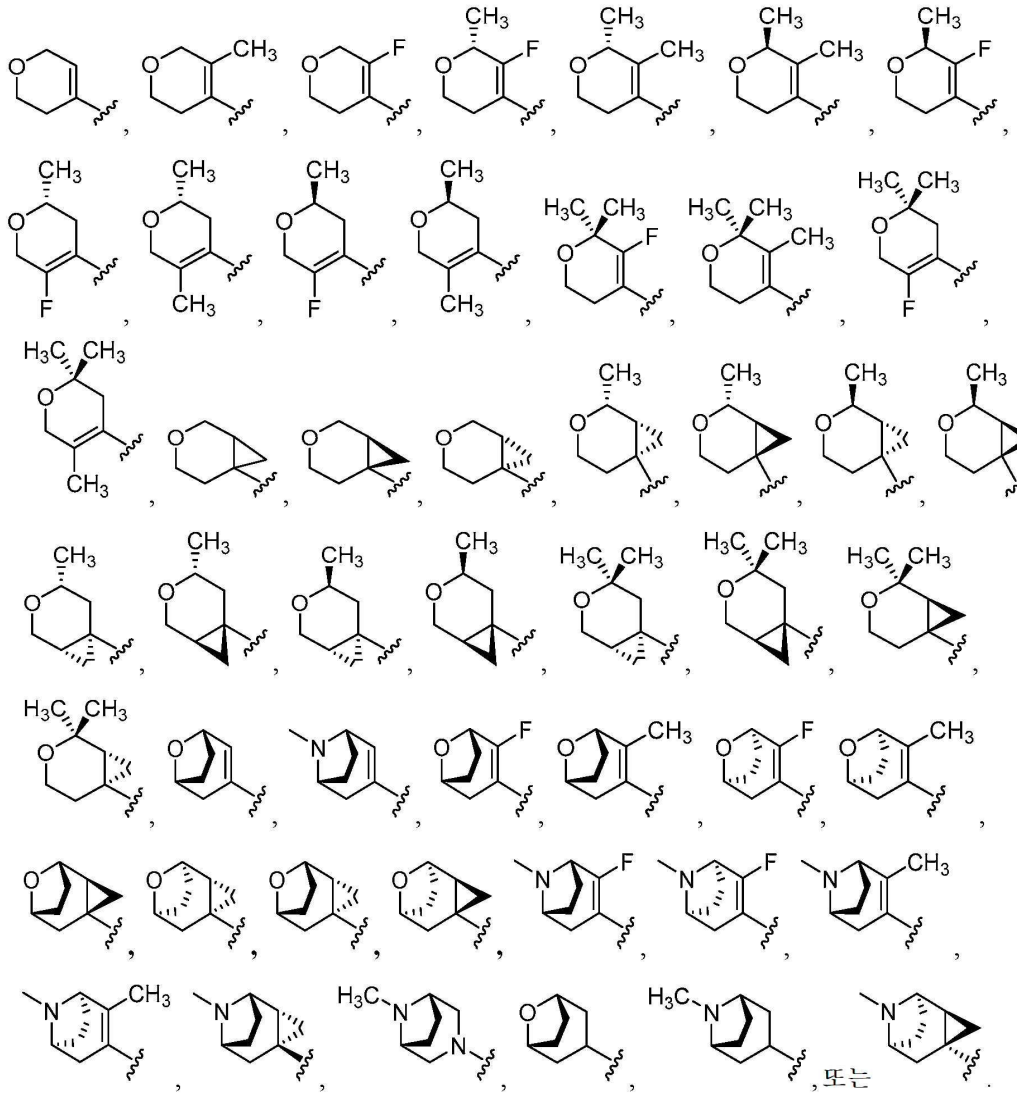
[0082] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1의 적어도 하나의 경우는 하기 화학식의 기이다:



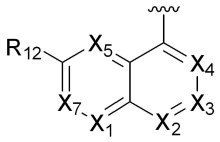
[0083] ,또는 ;

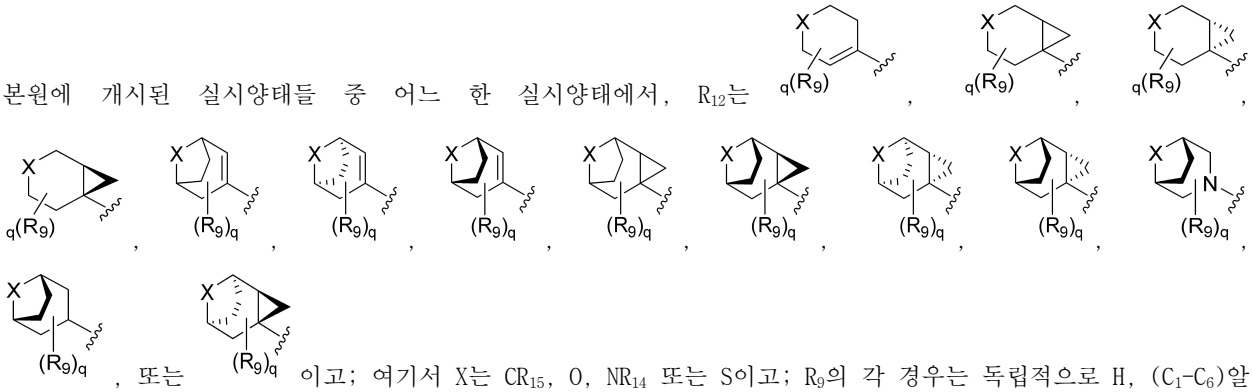
[0084] 상기 식에서, X는 O 또는 NR_{14}이고; R_{14}는 H 또는 (C_1-C_6)알킬이다.

[0085] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1의 적어도 하나의 경우는 하기 화학식의 기이다:



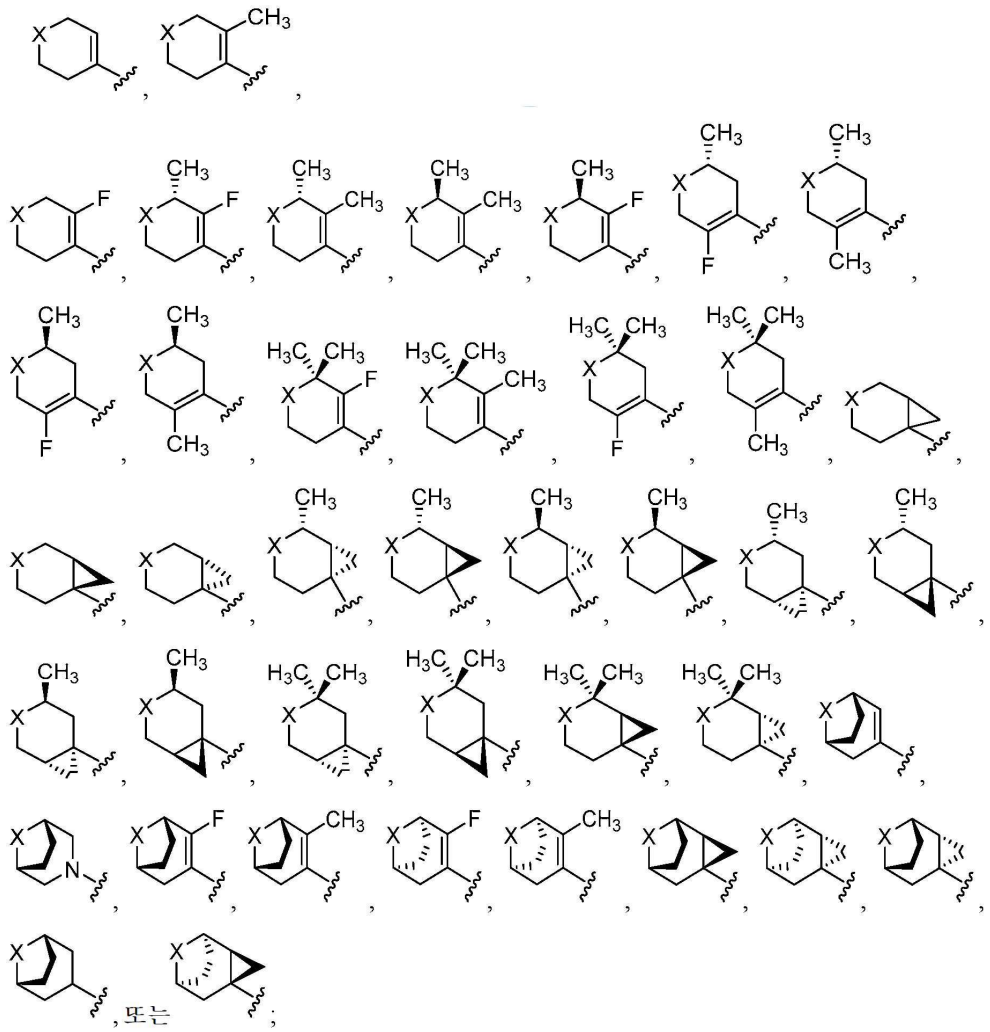
[0086] ,또는 .

[0087] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, Ⓐ는  이고, 여기서 R_{12}는 (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, 또는 (C_4-C_{14})헤테로트리사이클로알케닐이고, 이들 각각은 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$로 임의로 치환된다.

[0088] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_{12}는  , 또는 이고; 여기서 X는 CR_{15}, O, NR_{14} 또는 S이고; R_9의 각 경우는 독립적으로 H, (C_1-C_6)알

킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; R_{14}는 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 아릴 또는 헤테로아릴이고; R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; q는 0, 1, 2 또는 3이다.

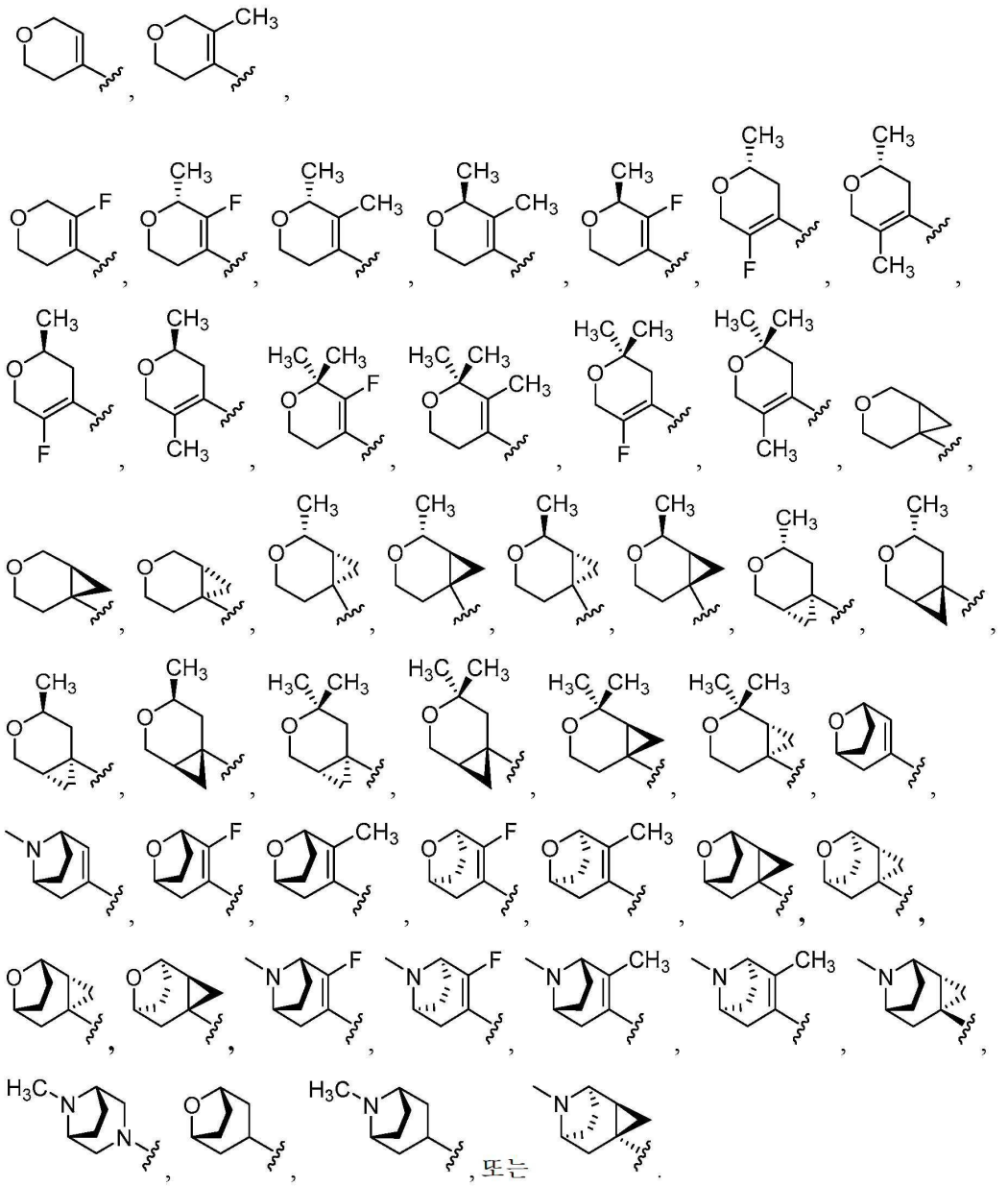
[0089] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_{12}는 하기 화학식의 기이다:



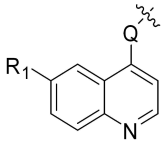
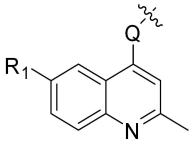
[0090] ;

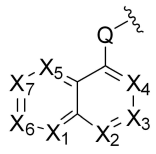
[0091] 상기 식에서, X는 O 또는 NR_{14}이고; R_{14}는 H 또는 (C_1-C_6)알킬이다.

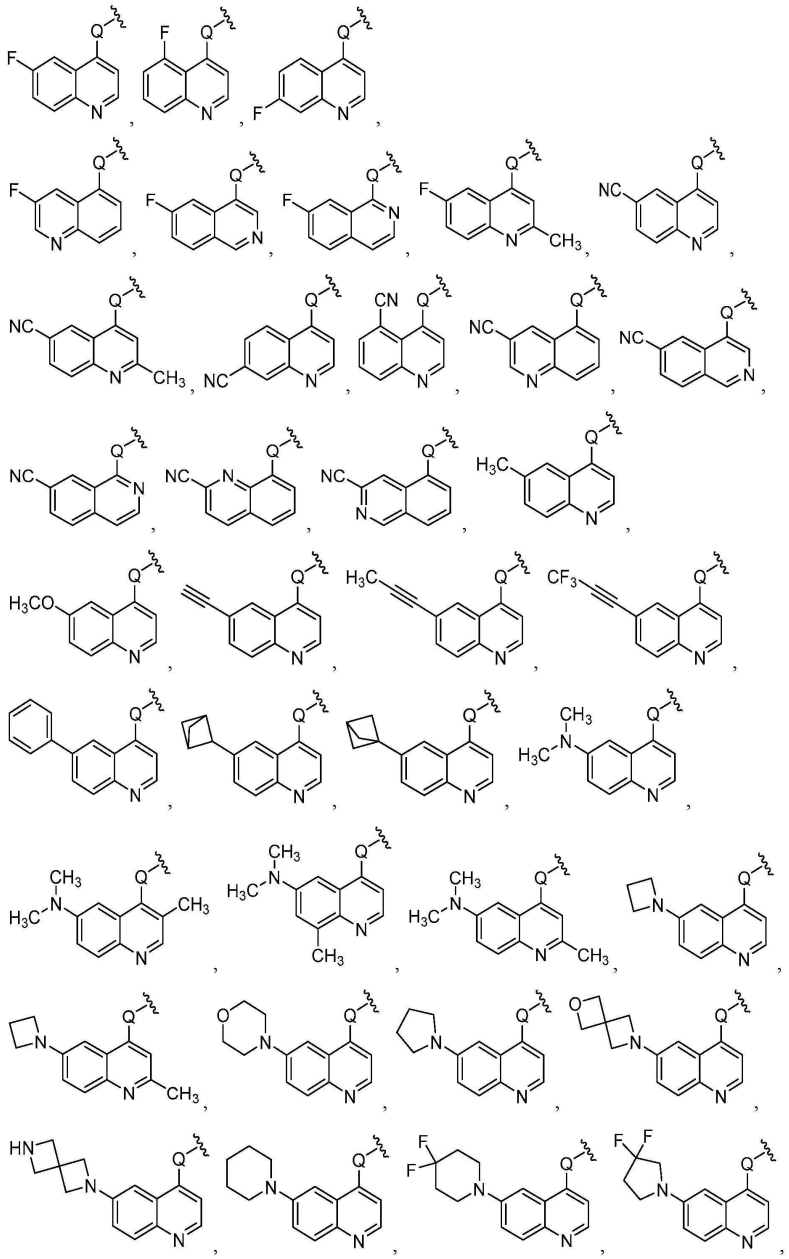
[0092] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_{12}는 하기 화학식의 기이다:

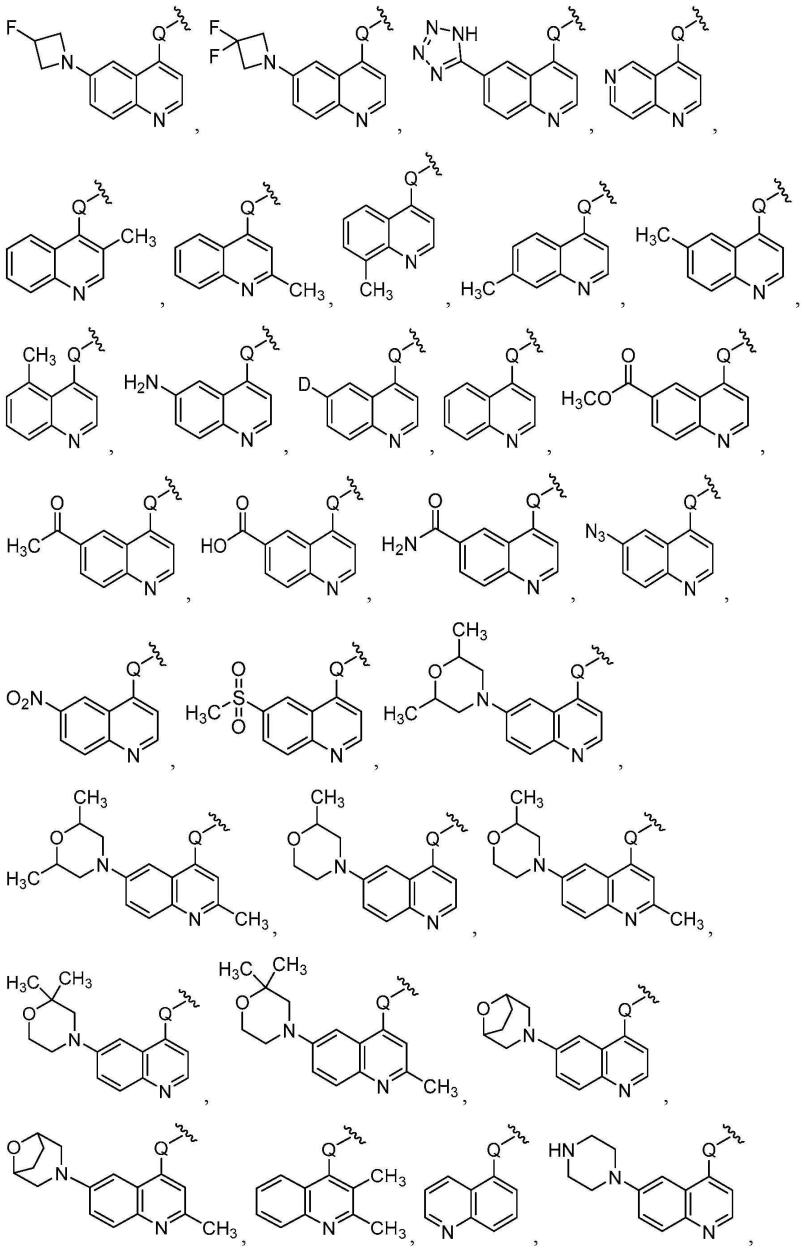


[0093]

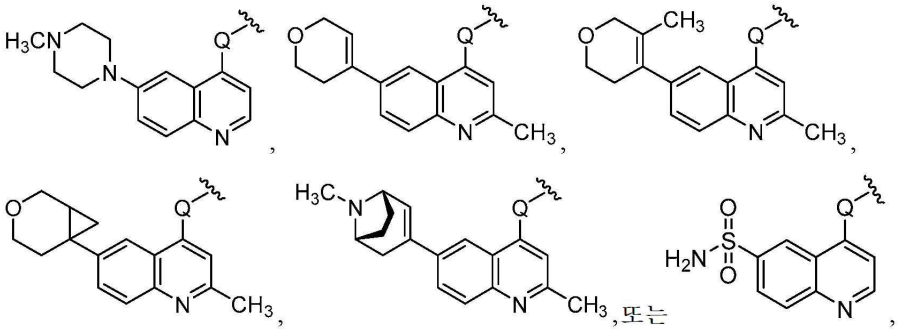
[0094] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, Ⓐ는  또는  이다.

[0095] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

[0096] 

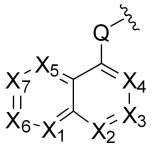


[0097]

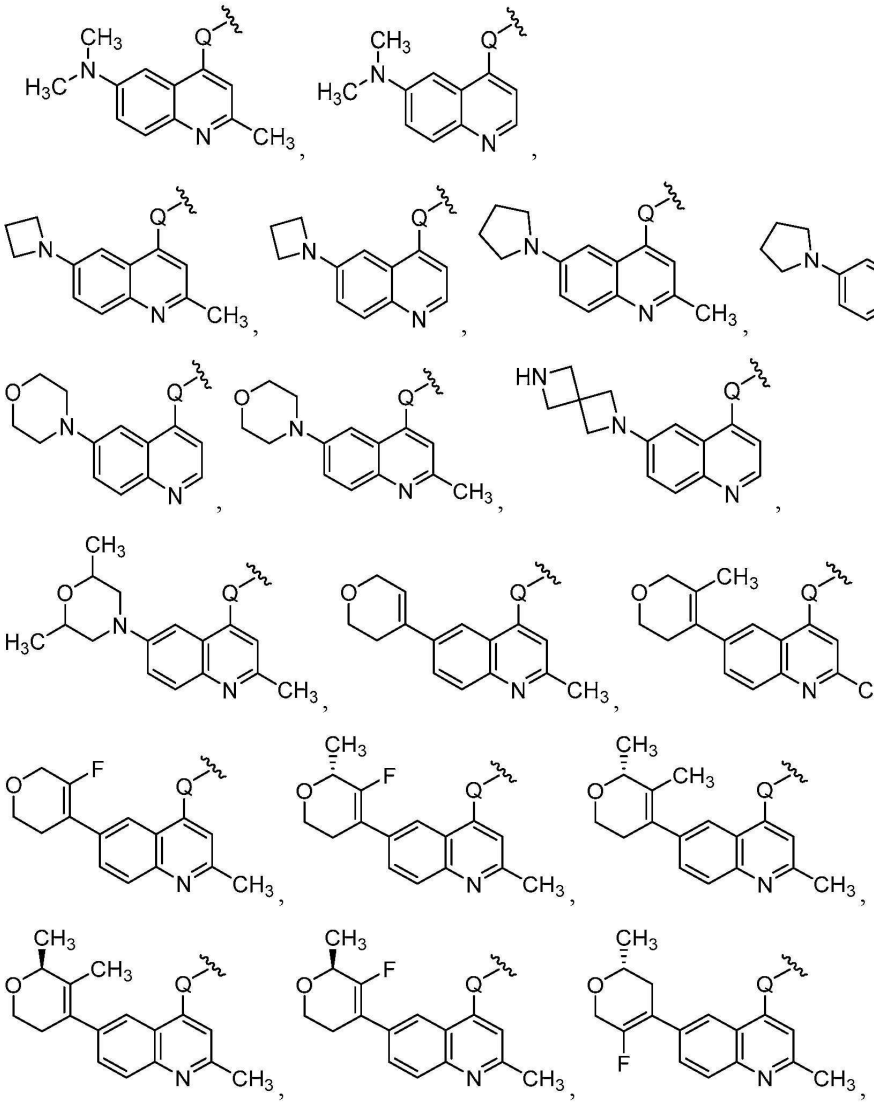


[0098]

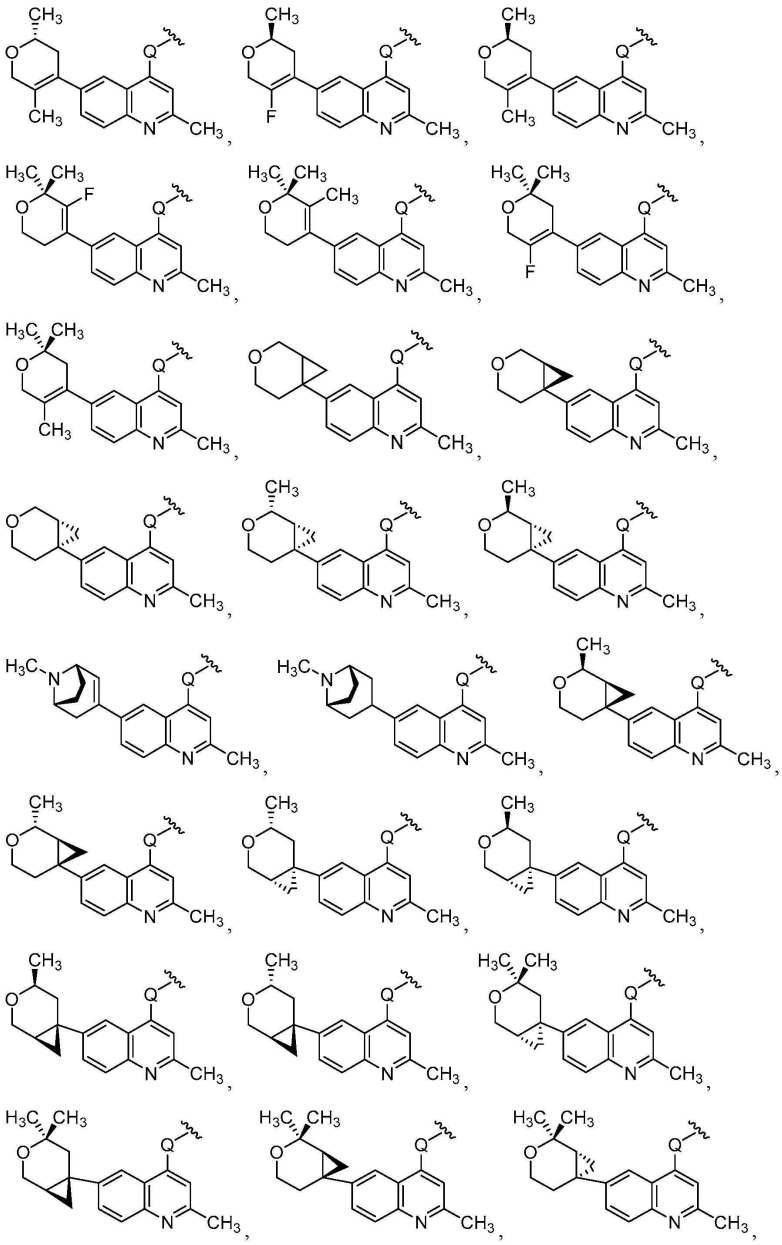
[0099] 상기 식에서, Q는 O 또는 NH이다.

[0100] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가

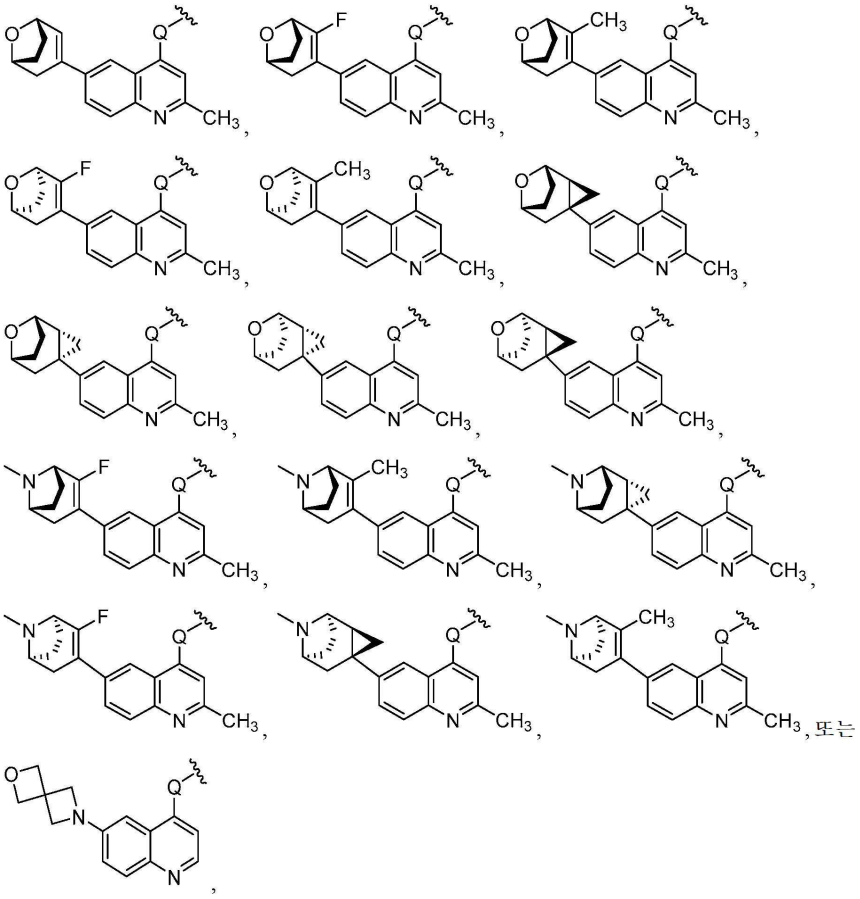
진다:



[0101]

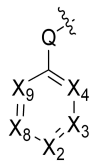
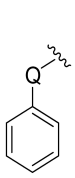
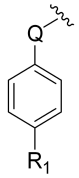
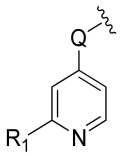
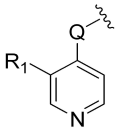
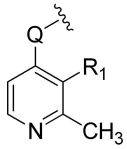
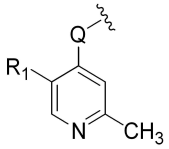
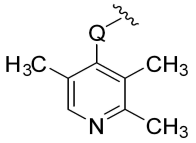
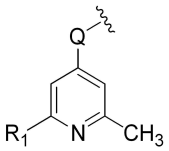


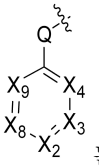
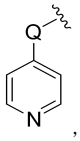
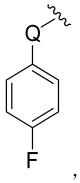
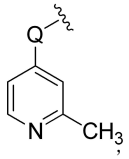
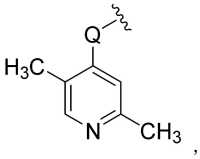
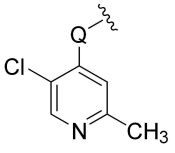
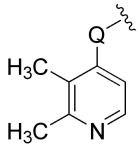
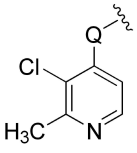
[0102]

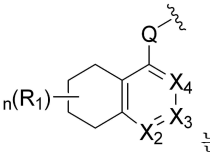


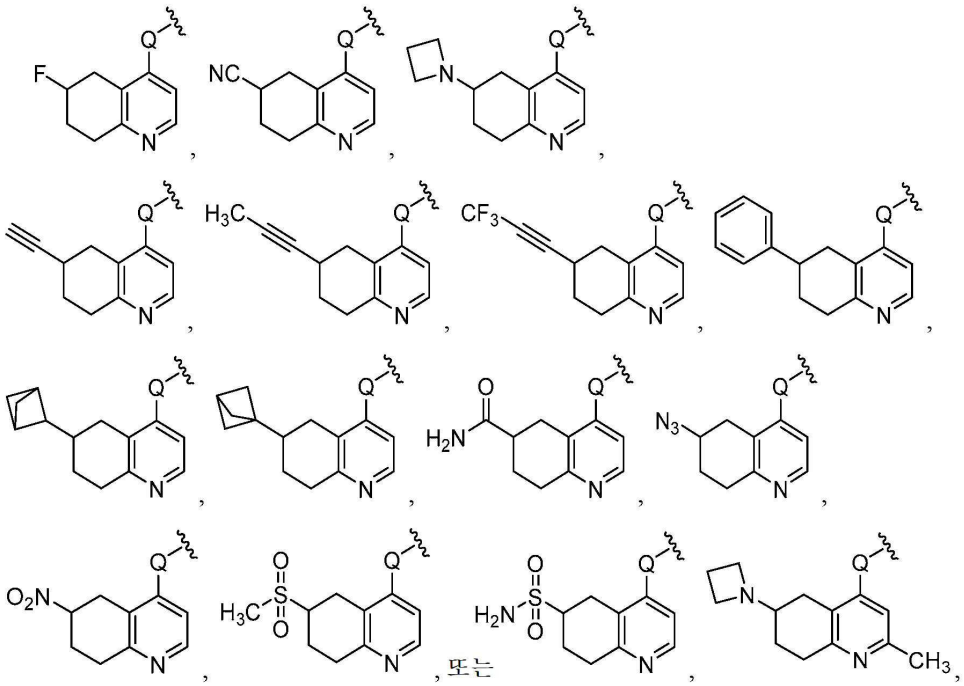
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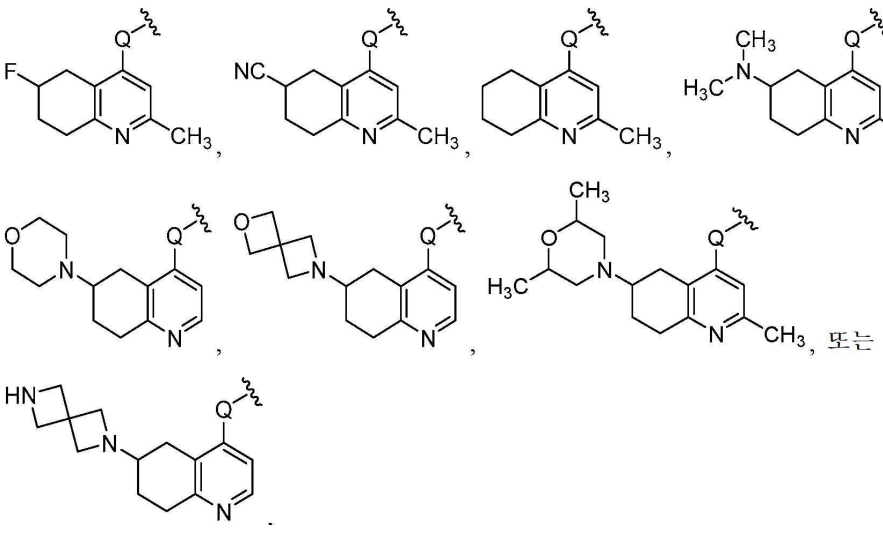
[0104] 상기 식에서, Q는 O 또는 NH이다.

[0105] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , , , , , , 또는 의 구조를 갖고, 여기서 Q는 O 또는 NH이고 R_1은 H, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬 또는 할로겐이다.

[0106] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , , , , , 또는 의 구조를 갖고, 여기서 Q는 O 또는 NH이다.

[0107] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

[0108] 

[0109] 

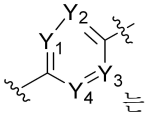
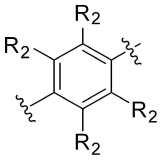
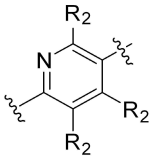
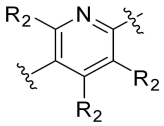
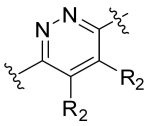
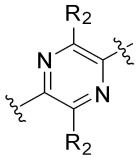
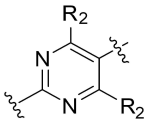
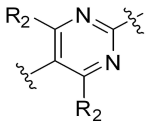
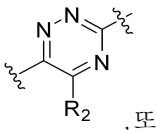
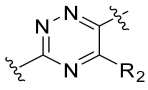
[0110] 상기 식에서, Q는 O 또는 NH이다.

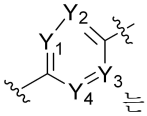
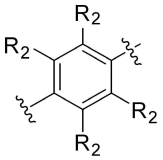
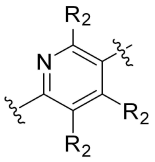
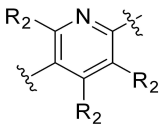
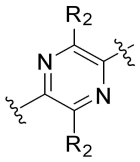
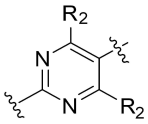
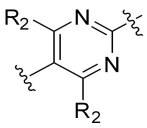
[0111] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 Ia의 화학식을 가진다.

[0112] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 IIa의 화학식을 가진다.

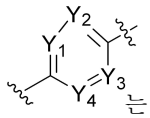
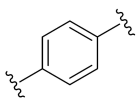
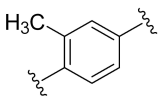
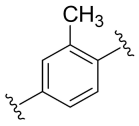
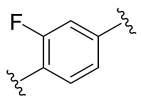
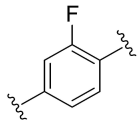
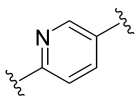
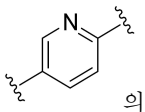
[0113] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 IIIa의 화학식을 가진다.

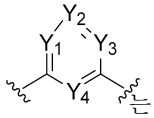
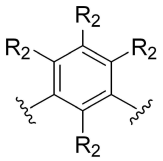
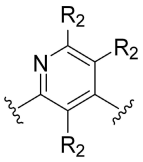
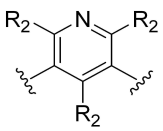
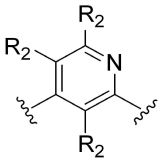
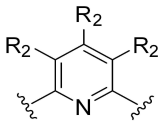
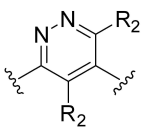
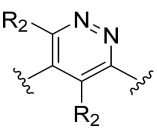
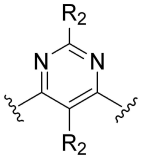
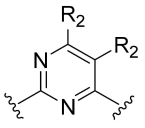
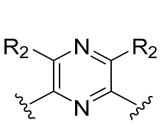
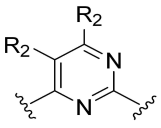
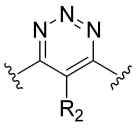
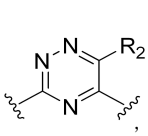
[0114] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 IVa의 화학식을 가진다.

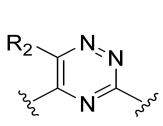
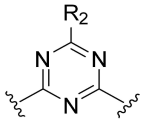
[0115] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  ,  ,  ,  ,  ,  ,  ,  ,또는  의 구조를 가진다.

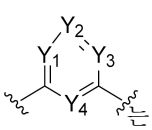
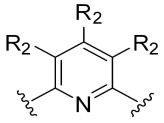
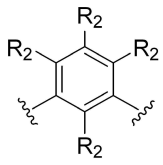
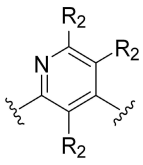
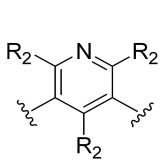
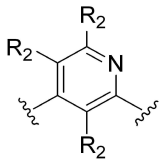
[0116] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  ,  ,  ,  ,  , 또는  의 구조를 가진다.

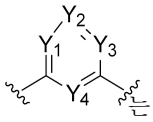
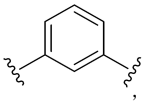
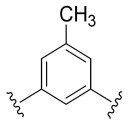
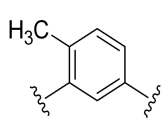
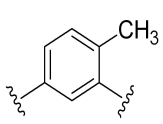
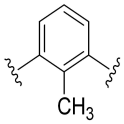
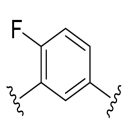
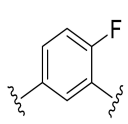
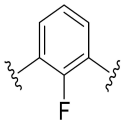
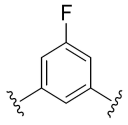
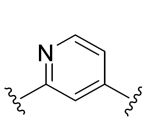
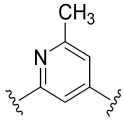
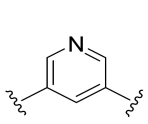
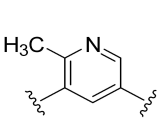
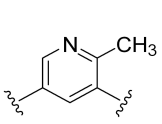
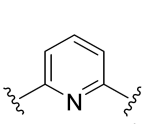
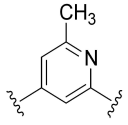
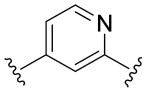
[0117] 본 명세서에 실시양태들 중 어느 한 실시양태에서, R_2의 각 경우는 독립적으로 H, 할로겐, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$이다.

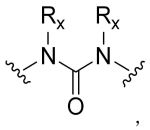
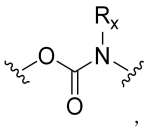
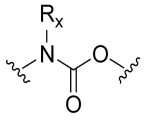
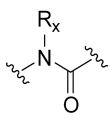
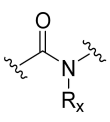
[0118] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  ,  ,  ,  ,  ,  , 또는  의 구조를 가진다.

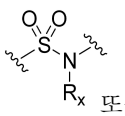
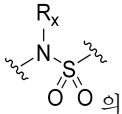
[0119] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  ,  ,  ,  ,  ,  ,  ,  ,  ,  ,  ,  ,  ,

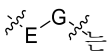
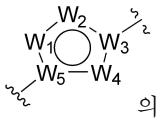

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의 구조를 가진다.

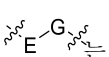
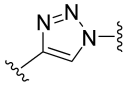
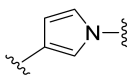
[0120] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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의 구조를 가진다.

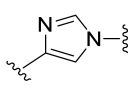
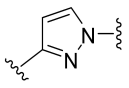
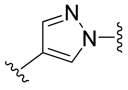
[0121] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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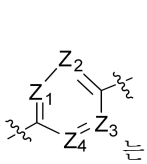
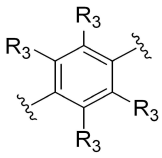
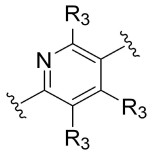
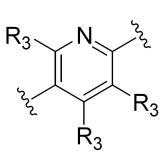
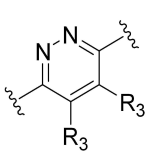
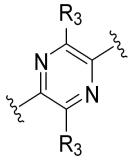
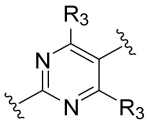
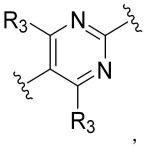
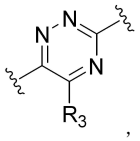
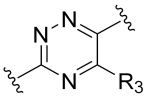
[0122] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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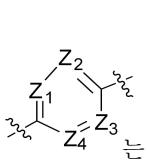
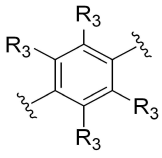
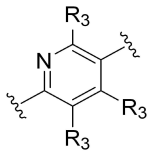
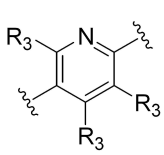
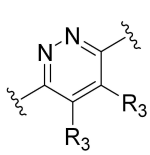
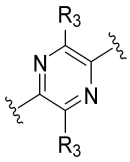
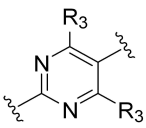
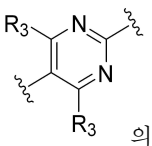
[0123] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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또는 
의 구조를 가진다.

[0124] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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의 구조를 가진다.

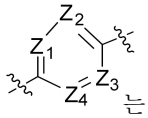
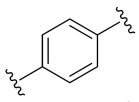
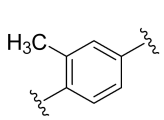
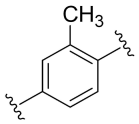
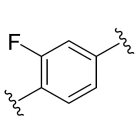
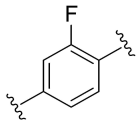
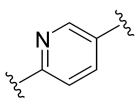
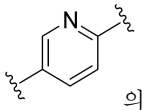
[0125] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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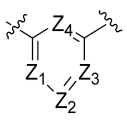
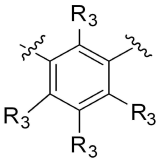
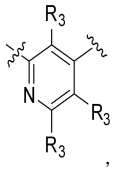
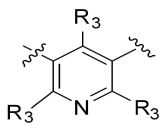
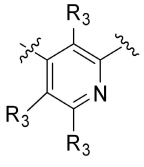
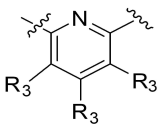
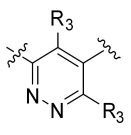
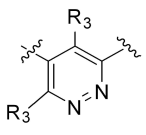
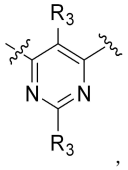
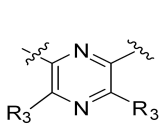

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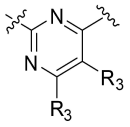
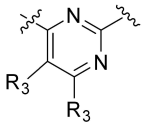
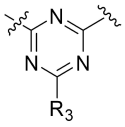
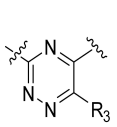
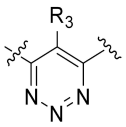
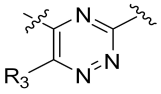
[0126] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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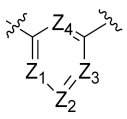
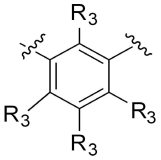
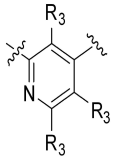
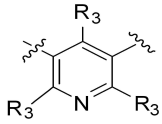
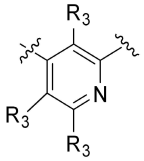
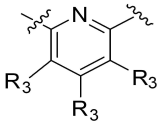
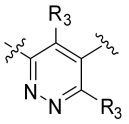
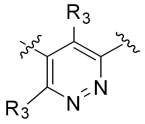
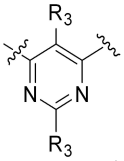
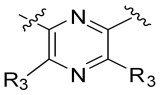
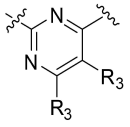
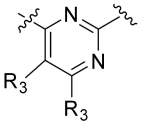
[0127] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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[0128] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_3의 각 경우는 H, 할로겐, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$이다.

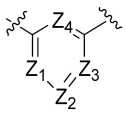
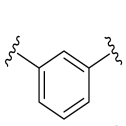
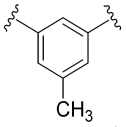
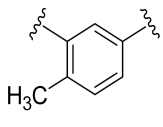
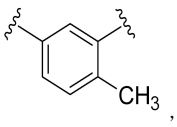
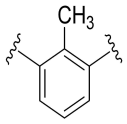
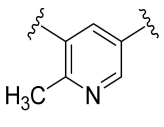
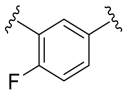
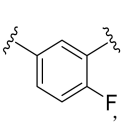
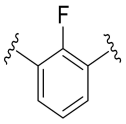
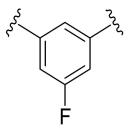
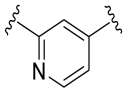
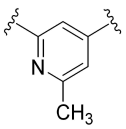
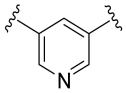
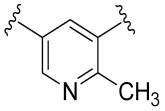
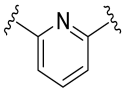
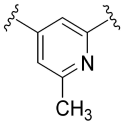
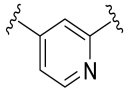
[0129] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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의 구조를 가진다.

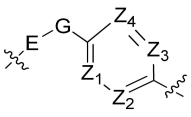
[0130] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 
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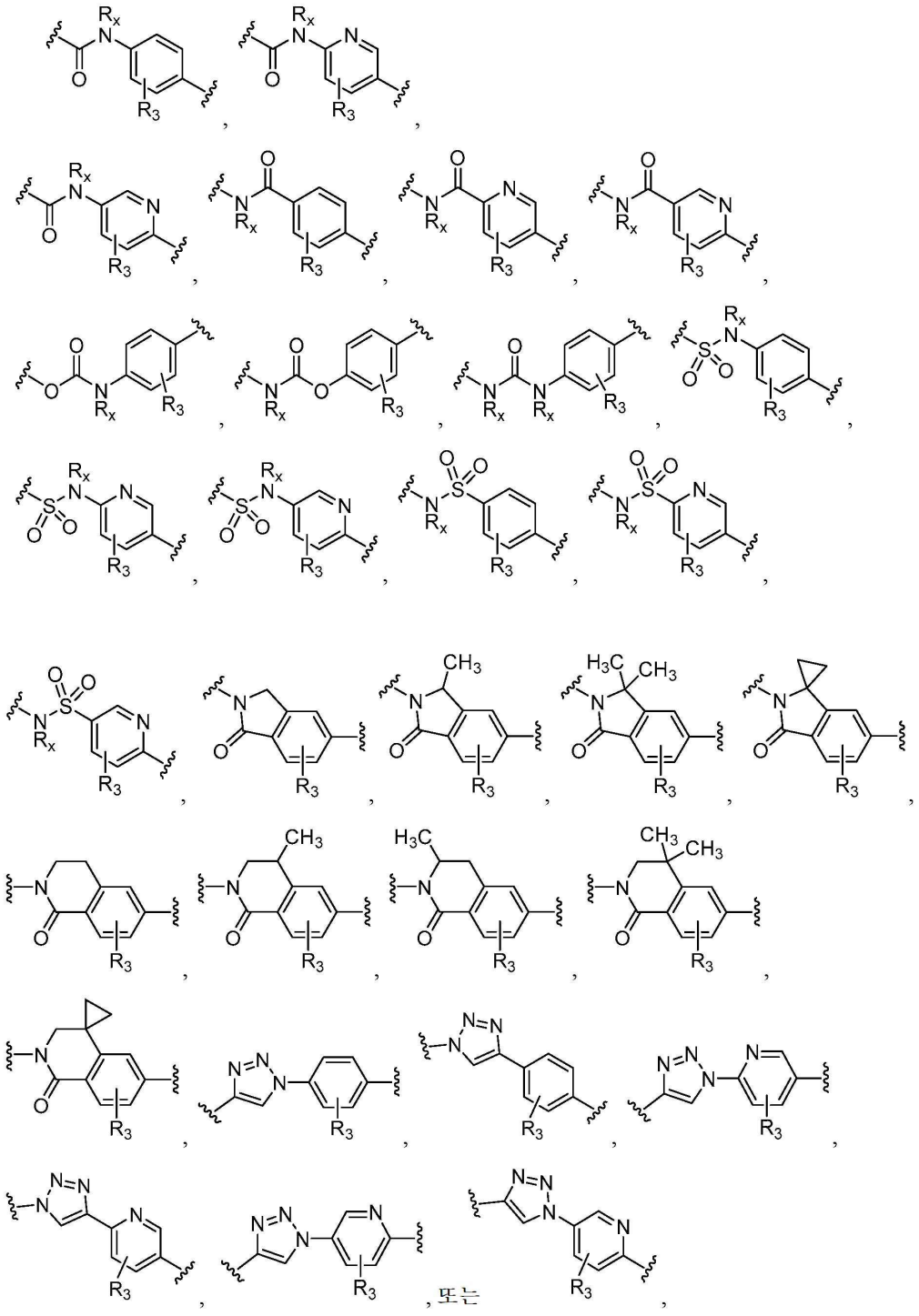





, 또는  의 구조를 가진다.

[0131] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , , , , , , , , ,  또는 의 구조를 가진다.

[0132] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_3의 각 경우는 H, 할로겐, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$이다.

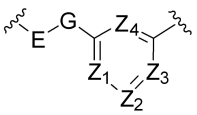
[0133] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , , , , , , , , , , , , , , , 또는  의 구조를 가진다.

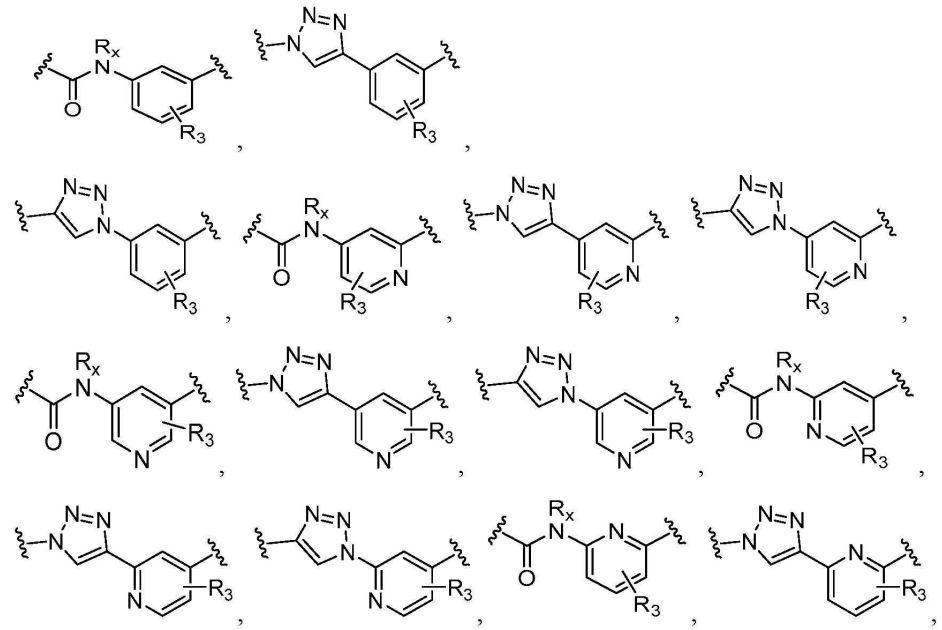
[0134] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

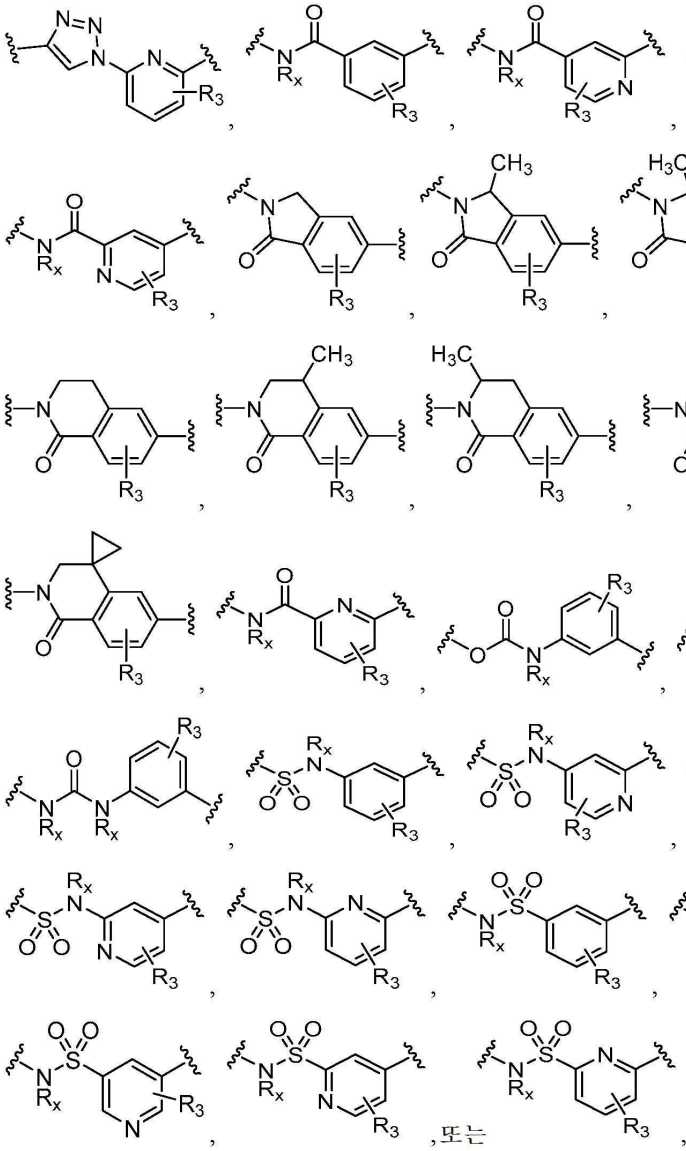
[0135] 

[0136] , 또는

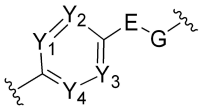
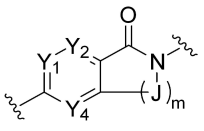
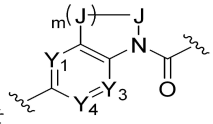
[0137] 상기 식에서, R_3은 H, CH_3, OH, 할로겐 또는 NH_2이고; R_x는 H, CH_3 또는 CH_2CH_3이다.

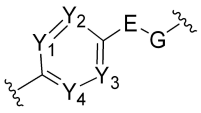
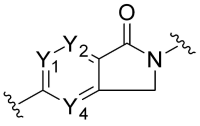
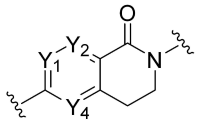
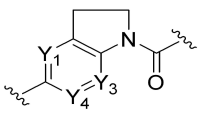
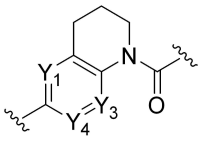
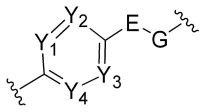
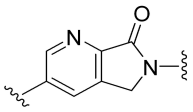
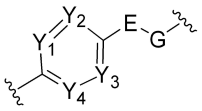
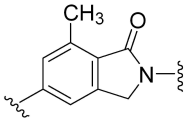
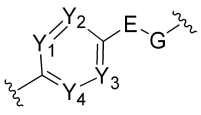
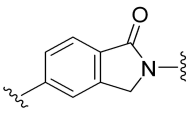
[0138] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 는 하기 화학식의 구조를 가진다:

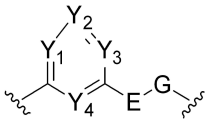
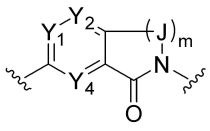
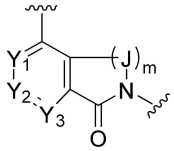
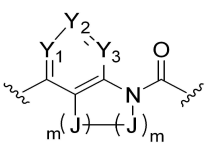
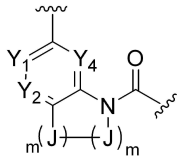
[0139] 

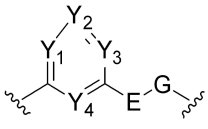
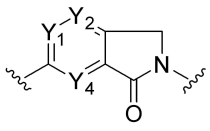
[0140] 
또는

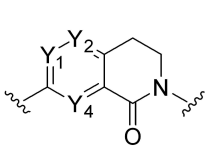
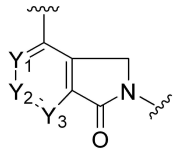
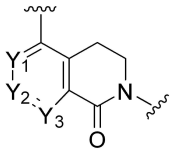
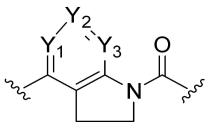
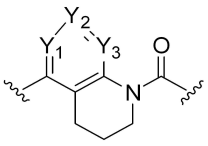
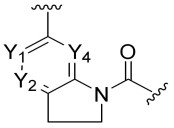
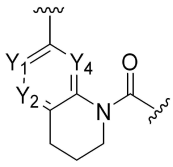
[0141] 상기 식에서, R_3은 H, CH_3, OH, 할로겐 또는 NH_2이고; R_x는 H, CH_3 또는 CH_2CH_3이다.

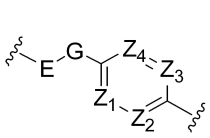
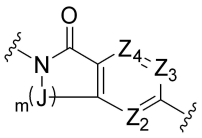
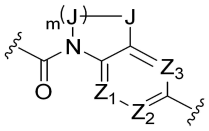
[0142] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  또는  의 구조를 갖고, 여기서 m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_y)_2$이고, R_y의 각 경우는 독립적으로 H, $(C_1$-$C_6)$알킬, OH, $O(C_1$-$C_6)$알킬 또는 할로겐이다.

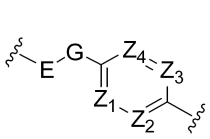
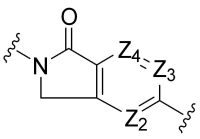
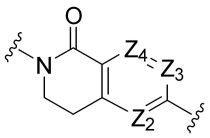
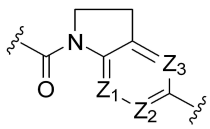
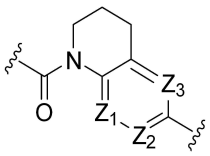
[0143] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  ,  ,  , 또는  의 구조를 갖고, 여기서 Y_1, Y_2, Y_3 및 Y_4는 각각 독립적으로 N, CH, CCH_3 또는 CF이다. 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  의 구조를 가진다.

[0144] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  ,  ,  , 또는  의 구조를 갖고, 여기서 m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_y)_2$이고, R_y의 각 경우는 독립적으로 H, $(C_1$-$C_6)$알킬, OH, $O(C_1$-$C_6)$알킬 또는 할로겐이다.

[0145] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  ,


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, 또는

의 구조를 갖고, 여기서 Y_1, Y_2, Y_3 및 Y_4는 각각 독립적으로 N, CH, CCH_3 또는 CF이다.

[0146] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티

는

또는

의 구조를 갖고, 여기서 m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_z)_2$이고, R_z의 각 경우는 독립적으로 H, (C_1-C_6)알킬, OH, $O(C_1-C_6)$알킬 또는 할로겐이다.

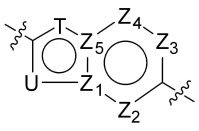
[0147] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티

는

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의 구조를 갖고, 여기서 Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 N, CH, CCH_3 또는 CF이다.

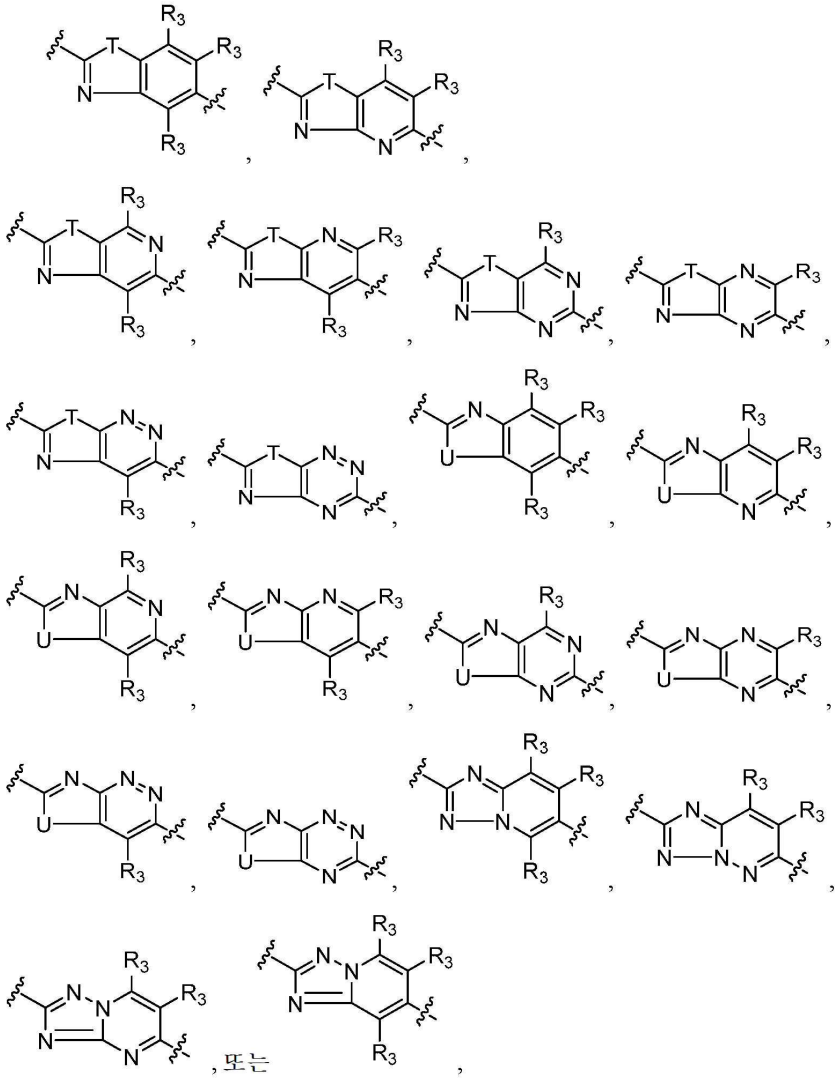
[0148] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 Ib의 화학식을 가진다.

[0149] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 IIb의 화학식을 가진다.

[0150] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 IIIb의 화학식을 가진다.

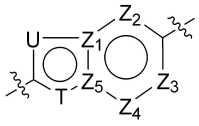
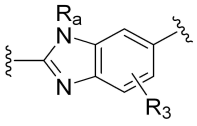
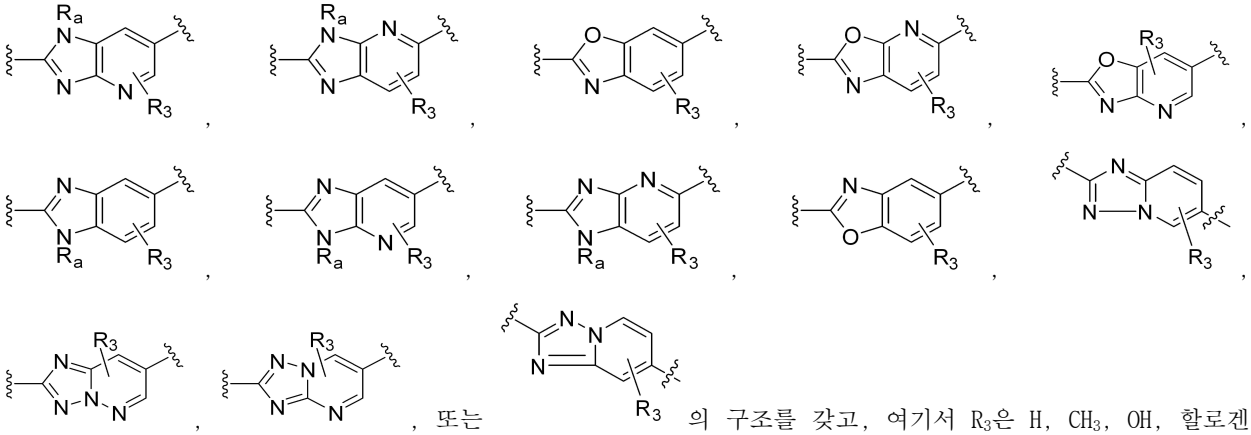
[0151] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 IVb의 화학식을 가진다.

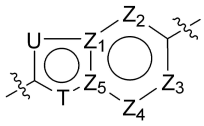
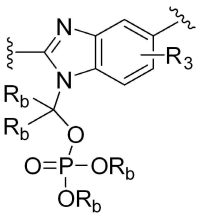
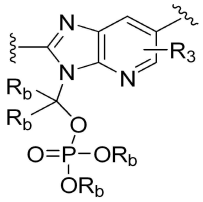
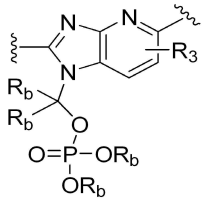
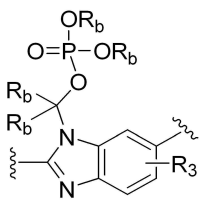
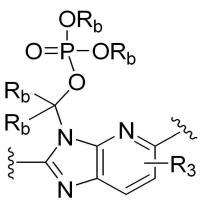
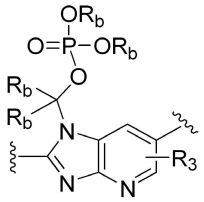
[0152] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티

는 하기 화학식의 구조를 가진다:

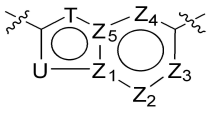


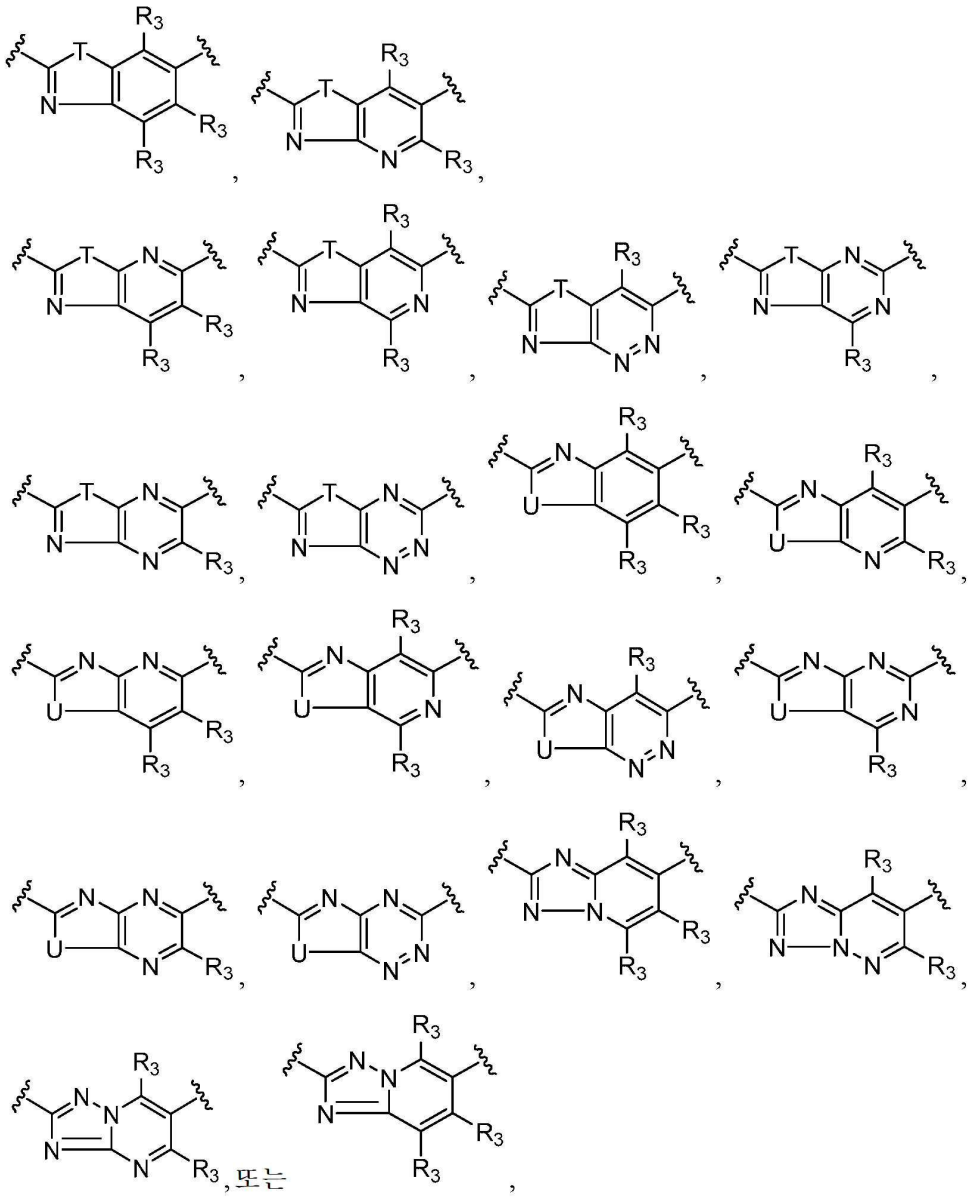
[0153]

[0154] 상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

[0155] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , 또는 의 구조를 갖고, 여기서 R_3은 H, CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3 또는 CH_2CH_3이다.

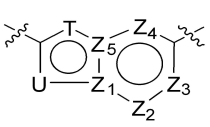
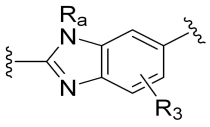
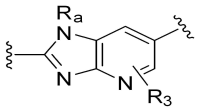
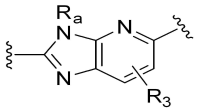
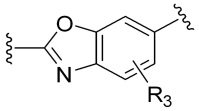
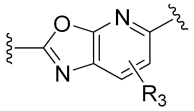
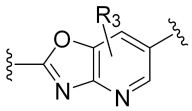
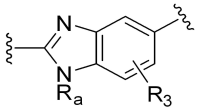
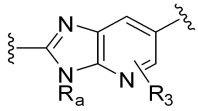
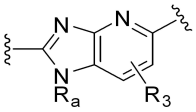
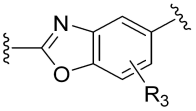
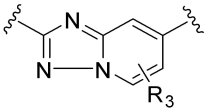
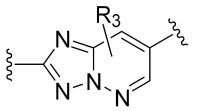
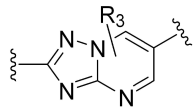
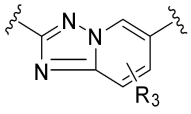
[0156] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , , , , 또는 의 구조를 가진다.

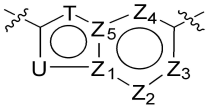
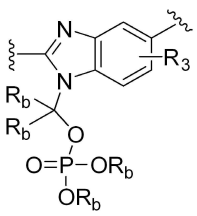
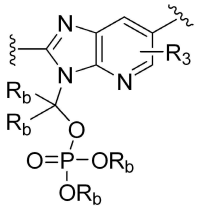
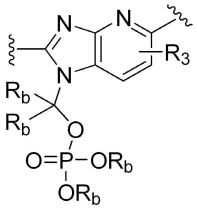
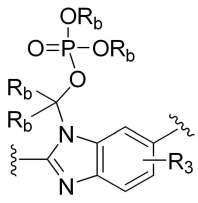
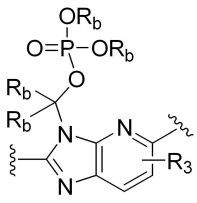
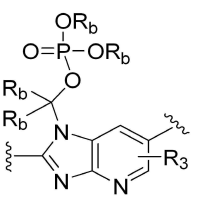
[0157] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:



[0158] 또는

[0159] 상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

[0160] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , , , , , , , , , , , ,  의 구조를 갖고, 여기서 R_3은 H, CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3 또는 CH_2CH_3이다.

[0161] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , , , , 또는  의 구조를 가진다.

[0162] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_b의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬이다.

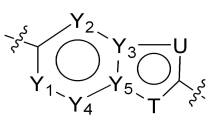
[0163] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_b의 각 경우는 독립적으로 H, CH_3, CH_2CH_3 또는 $CH(CH_3)_2$이다.

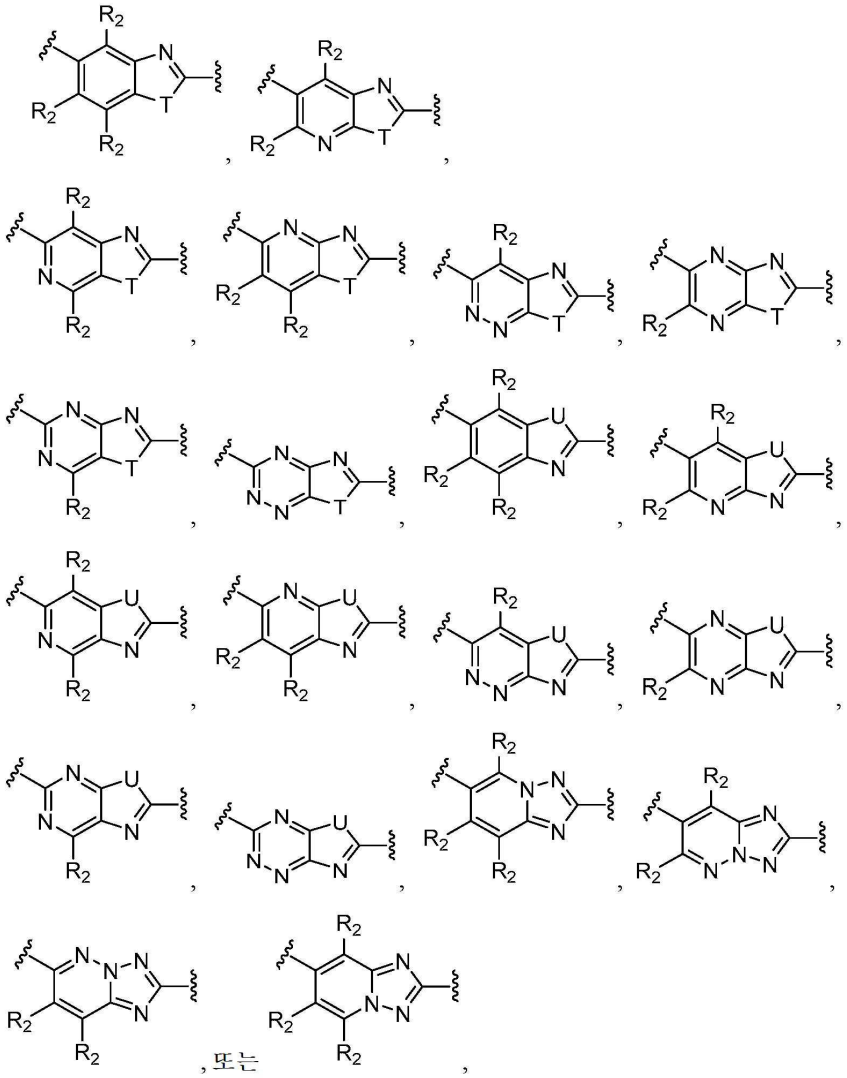
[0164] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 Ic의 화학식을 가진다.

[0165] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 IIc의 화학식을 가진다.

[0166] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 IIIc의 화학식을 가진다.

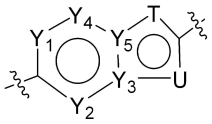
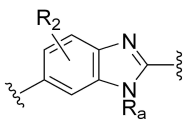
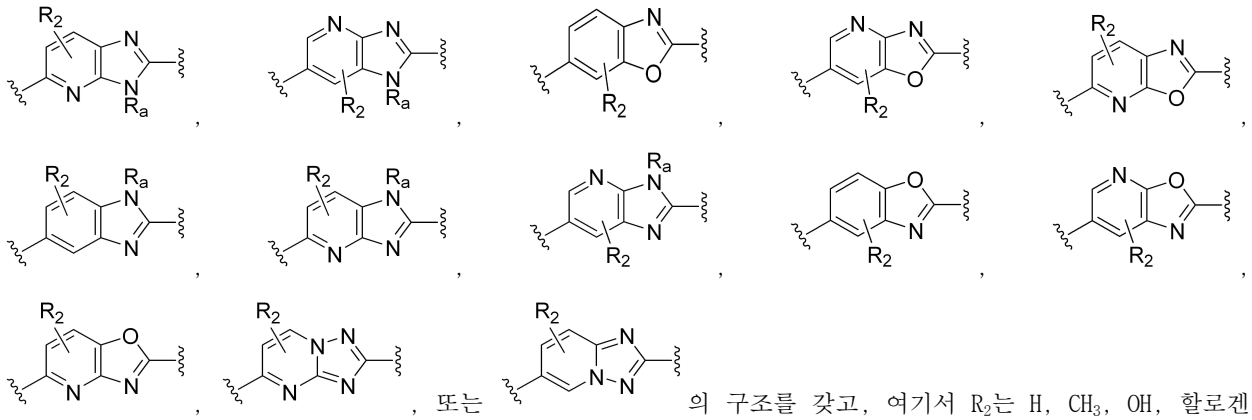
[0167] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 화학식 IVc의 화학식을 가진다.

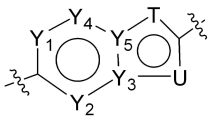
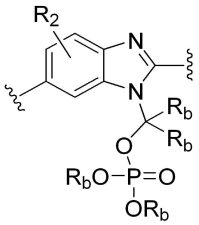
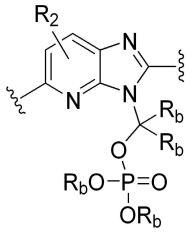
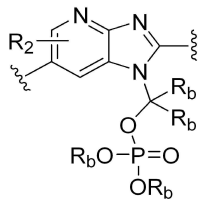
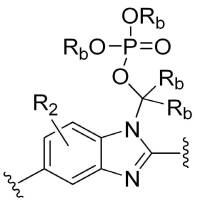
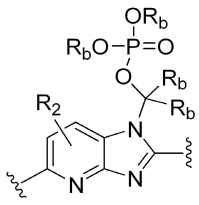
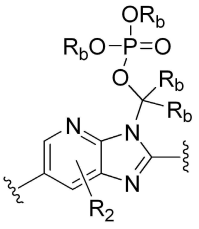
[0168] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

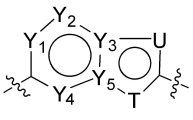


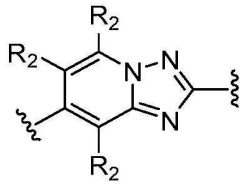
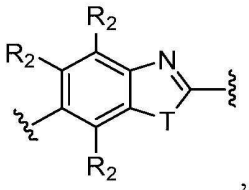
[0169]

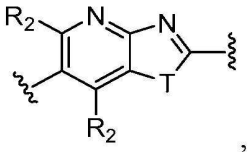
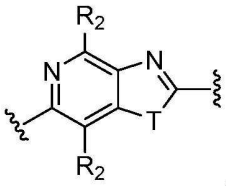
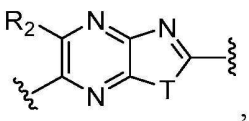
[0170] 상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 각각 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

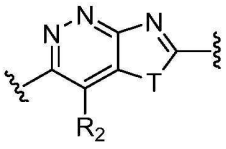
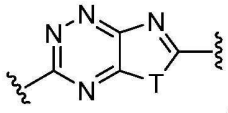
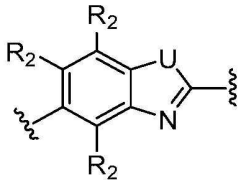
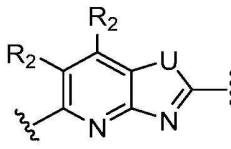
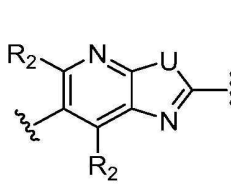
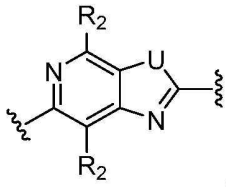
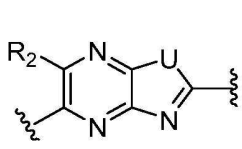
[0171] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , 의 구조를 갖고, 여기서 R_2는 H, CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3 또는 CH_2CH_3이다.

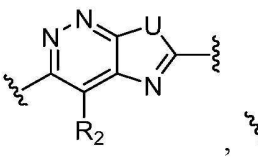
[0172] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , , , , 또는  의 구조를 가진다.

[0173] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:


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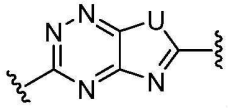
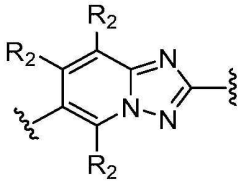
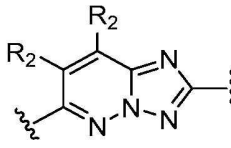
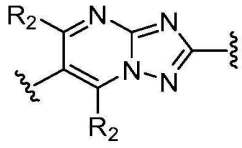
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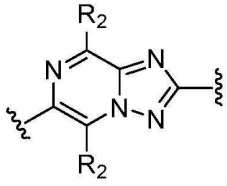
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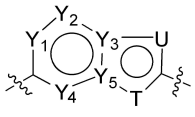
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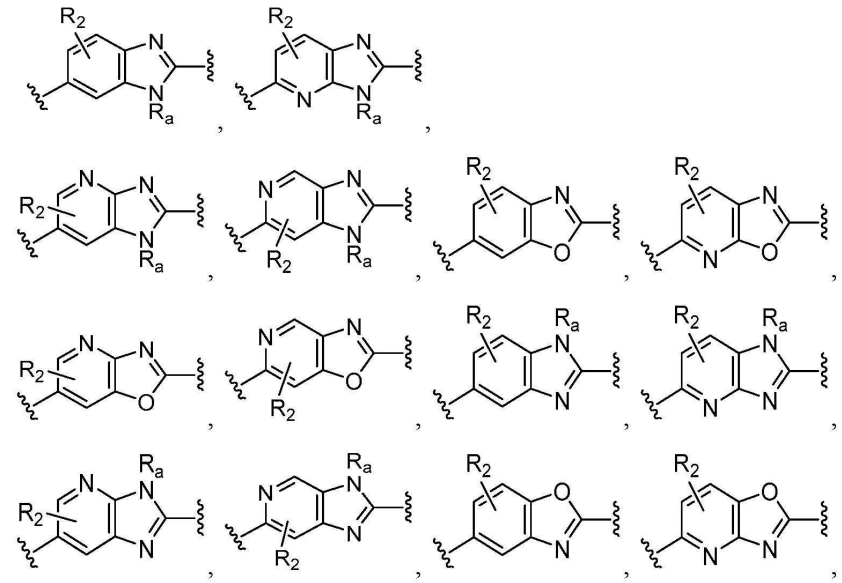
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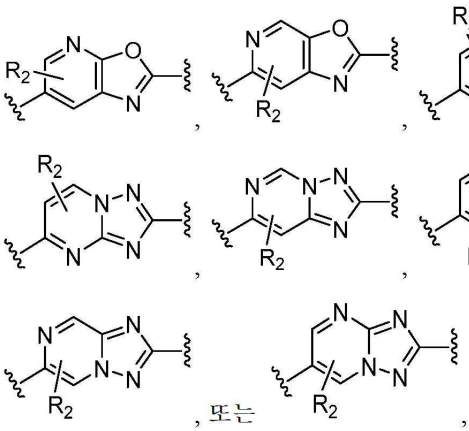
, 또는

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[0174]

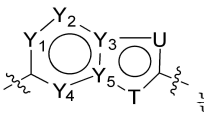
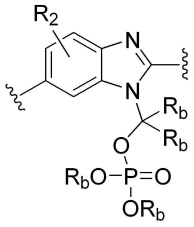
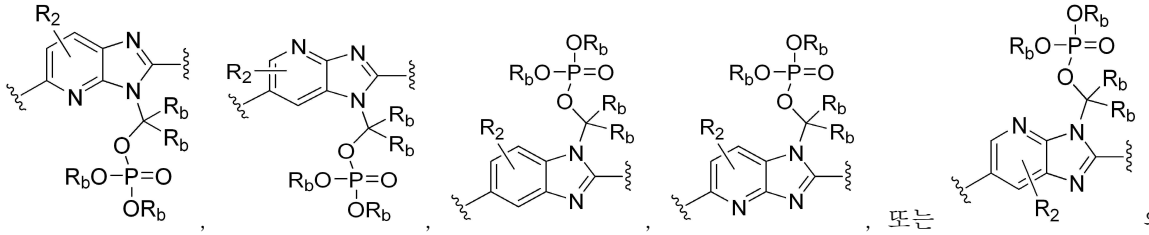
[0175] 상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

[0176] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

[0177] 

[0178] 

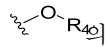
[0179] 상기 식에서, R_2는 H, CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3 또는 CH_2CH_3이다.

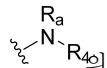
[0180] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 , , 또는 의 구조를 가진다.

[0181] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_b의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬이다.

[0182] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_b의 각 경우는 독립적으로 H, CH_3, CH_2CH_3 또는 $CH(CH_3)_2$이다.

[0183] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_2의 각 경우는 독립적으로 H, CH_3, OH, NH_2 또는 할로겐이다.

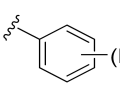
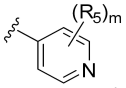
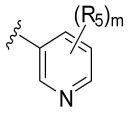
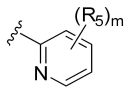
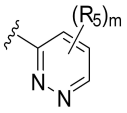
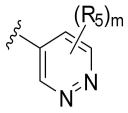
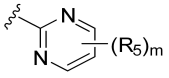
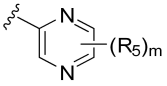
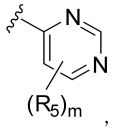
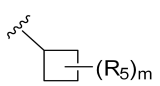
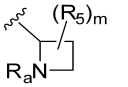
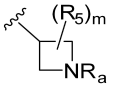
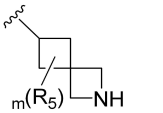
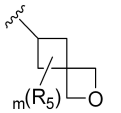
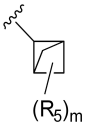
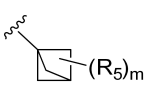
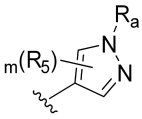
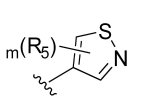
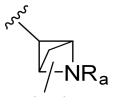
[0184] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 의 구조를 가진다.

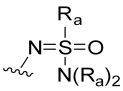
[0185] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 는 의 구조를 가진다.

[0186] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티 는 의 구조를 가진다.

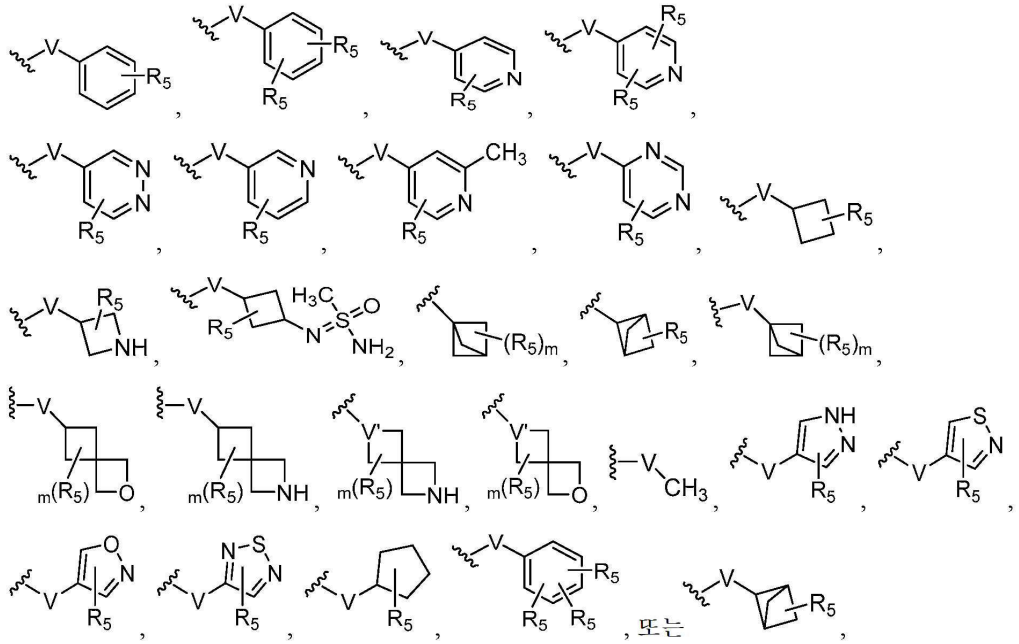
[0187] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  의 V와 R_4는 함께 (C_4-C_{10})헤테로스피로알킬을 형성한다.

[0188] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, V는 부재한다.

[0189] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_4는 (C_1-C_6)알킬, , , , , , , , , , , , , , , , , , , , , , , , , , , 또는  이고, 여기서 m은 0 내지 3의 정수이다.

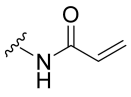
[0190] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_5의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐, OR_a, OH, NH_2, $N(R_a)COR_a$, CN, CF_3, (C_1-C_6)할로알킬, 또는  이고, R_a의 각 경우는 독립적으로 H, (C_2-C_6)알케닐 또는 (C_1-C_6)알킬이다.

[0191] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:



[0192]

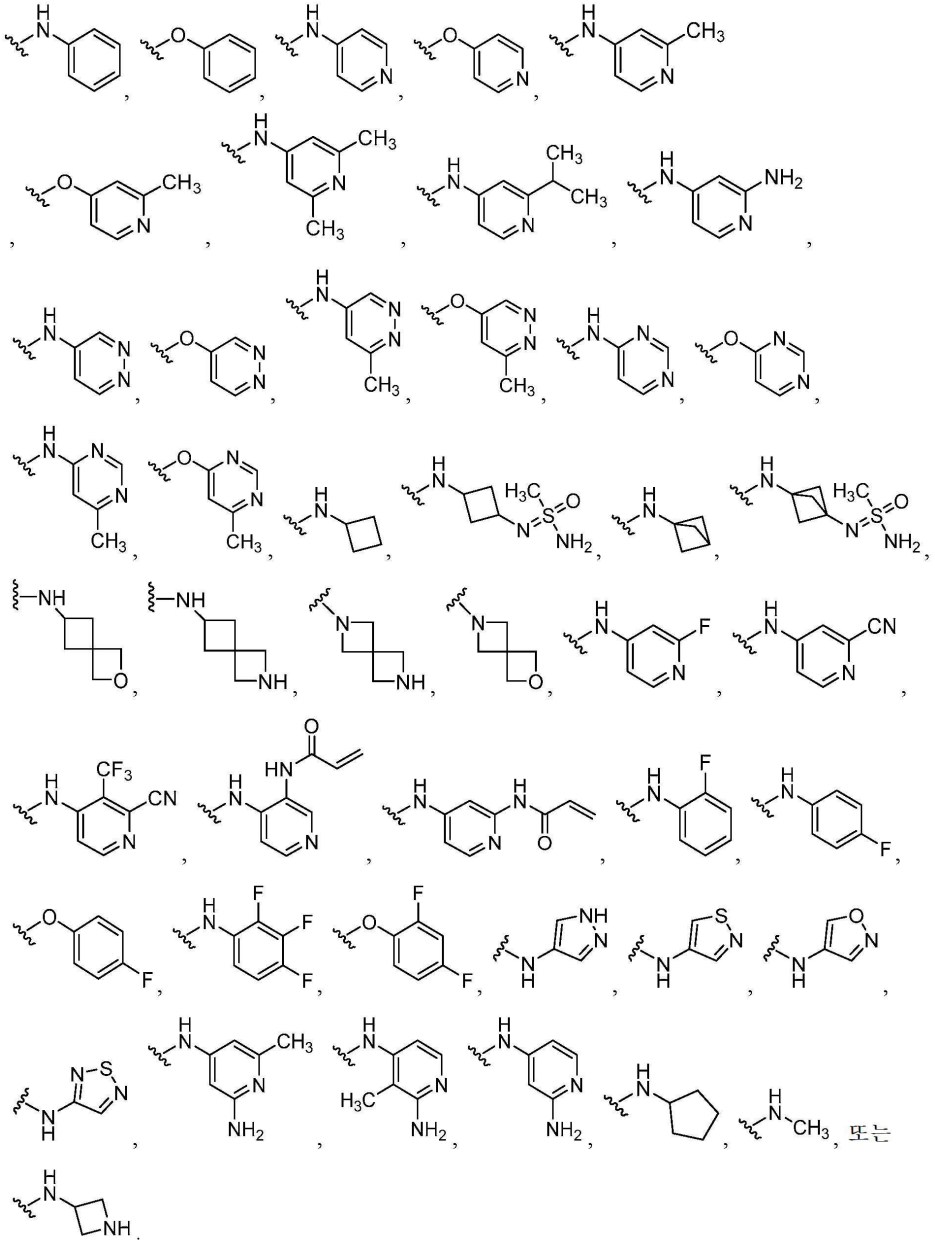
[0193] 상기 식에서, V는 $C(R_a)_2$, O, NR_a, $N(C=O)R_a$ 또는 NSO_2R_a이고 V'는 CR_a 또는 N이다.

[0194] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_5의 각 경우는 독립적으로 H, CH_3, 이소프로필, 할로겐, OH, CN,  , CF_3, (C_1-C_6)할로알킬 또는 NH_2이다.

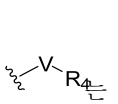
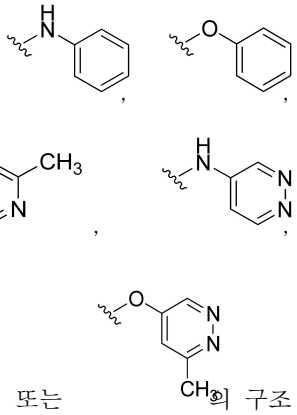
[0195] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_a의 각 경우는 독립적으로 H, (C_2-C_6)알케닐, 또는 (C_1-C_6)알킬이다.

[0196] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_a의 각 경우는 H, CH_3 또는 CH_2CH_3이다.

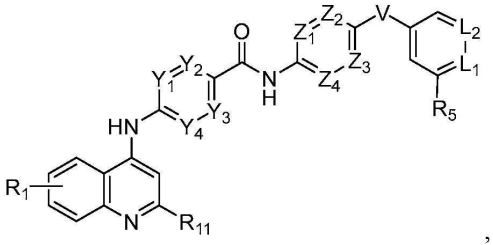
[0197] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

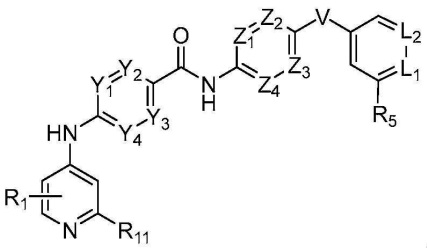


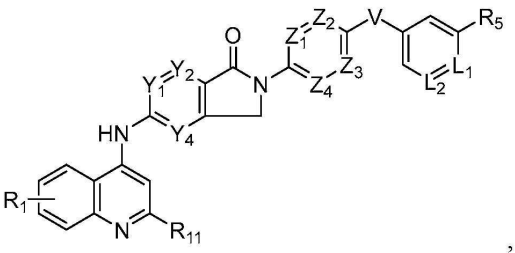
[0198]

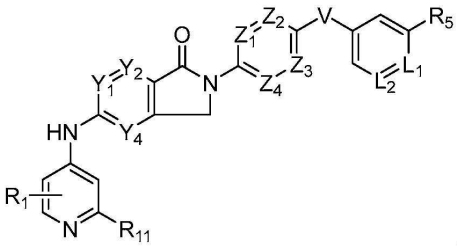
[0199] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 구조 모이어티  는  의 구조를 가진다.

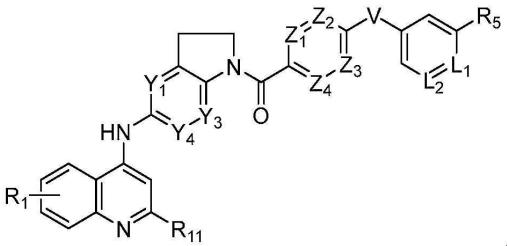
[0200] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 Ia의 화합물은 하기 화학식의 구조를 가진다:

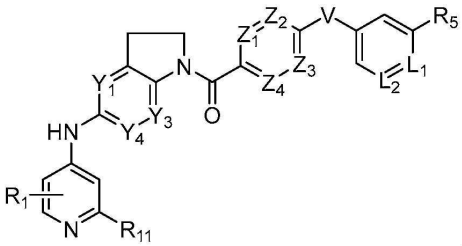

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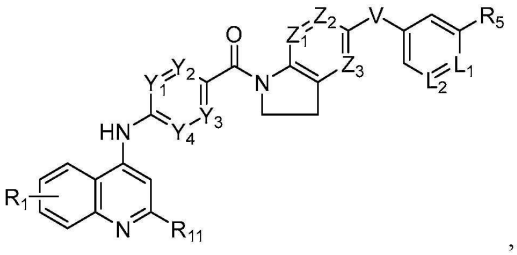

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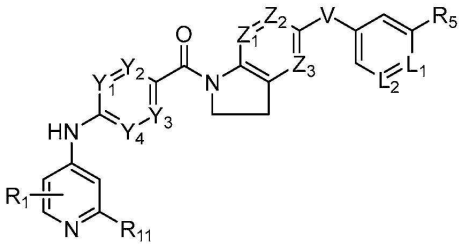
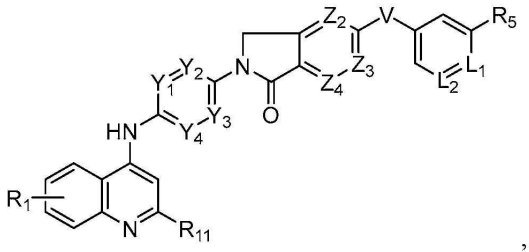
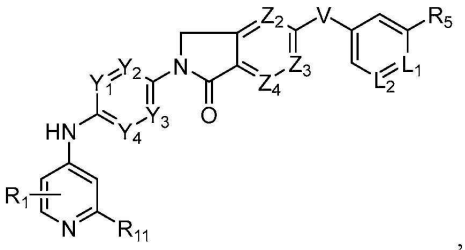
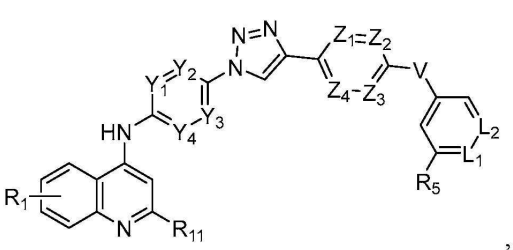
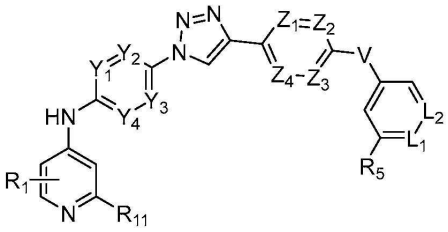
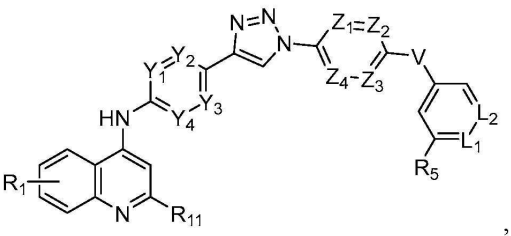
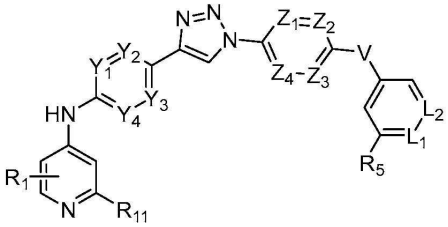

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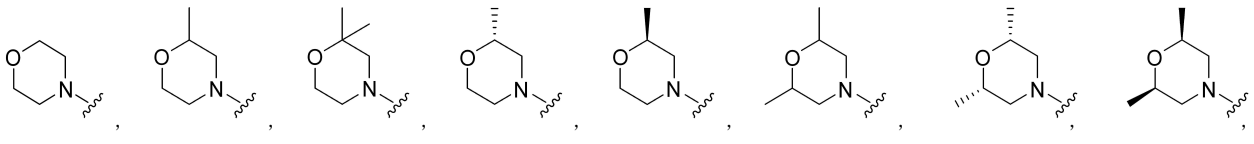
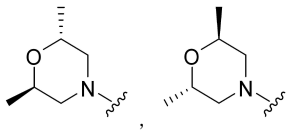

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[0201]

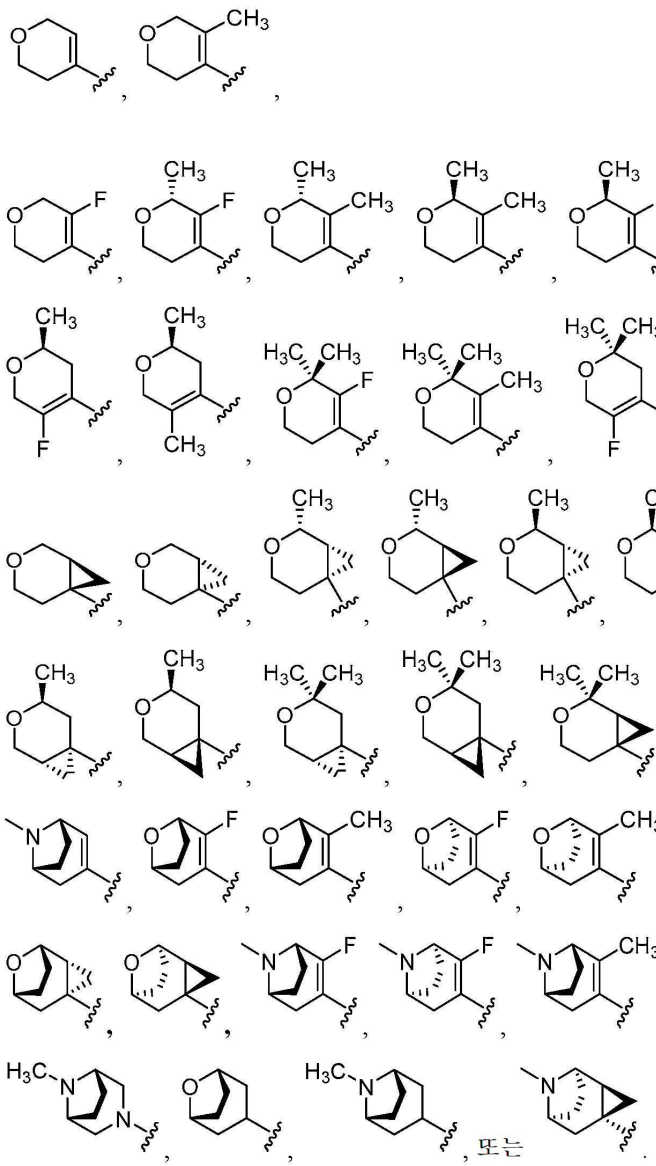

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[0202]

[0203] 상기 식에서, R_1은 H, (C_1-C_6)알킬, $N(R_a)_2$, (C_3-C_7)헤테로사이클로알킬, 할로겐, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, 또는 (C_4-C_{14})헤테로트리사이클로알케닐이고; R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_1, Z_2, Z_3, Z_4, L_1 및 L_2는 각각 독립적으로 CH 또는 N이고; V는 NH 또는 O이다.

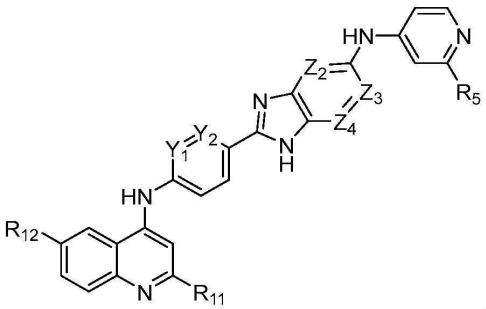
[0204] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1은 H, F, Cl, Br, CH_3, CH_2CH_3, $CH(CH_3)_2$, NH_2, NMe_2,


, 또는  이다.

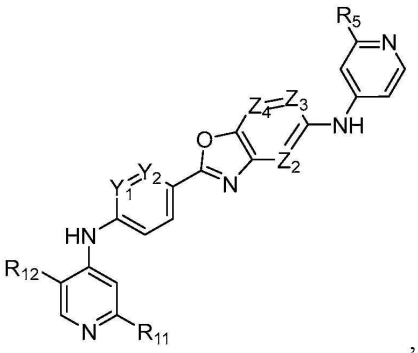
[0205] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, R_1은 하기 화학식의 기이다:

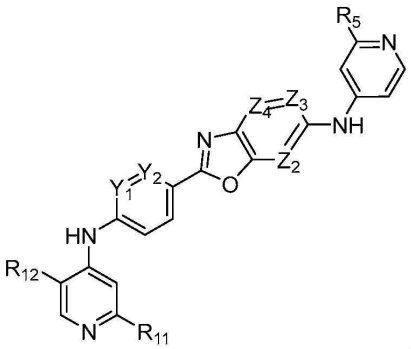


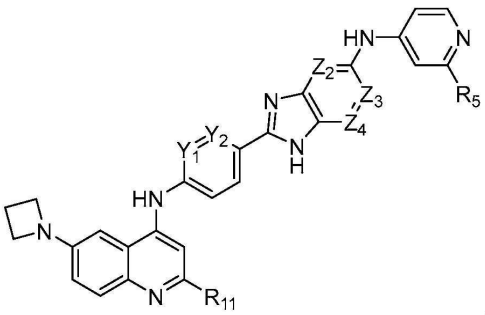
[0206]

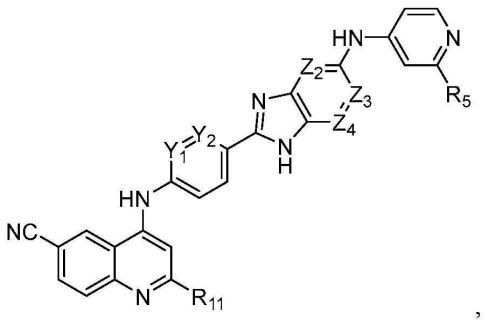
[0207] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 Ib의 화합물은 하기 화학식의 구조를 가진다:

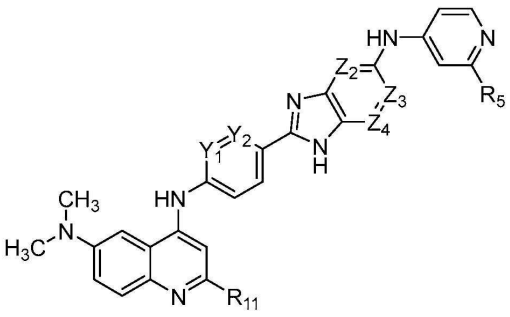

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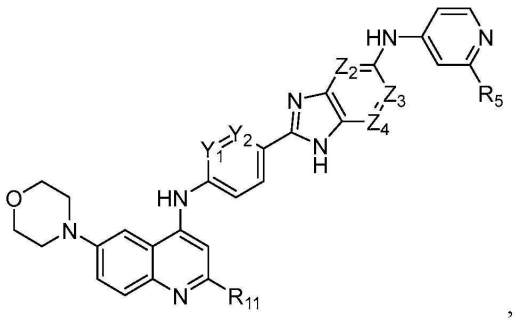

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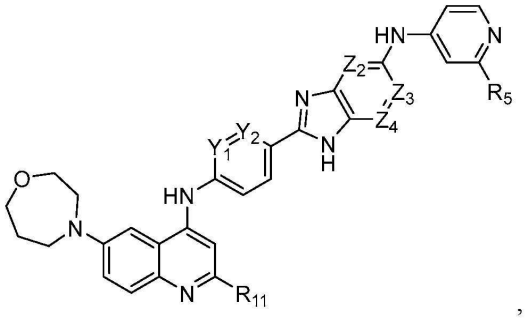

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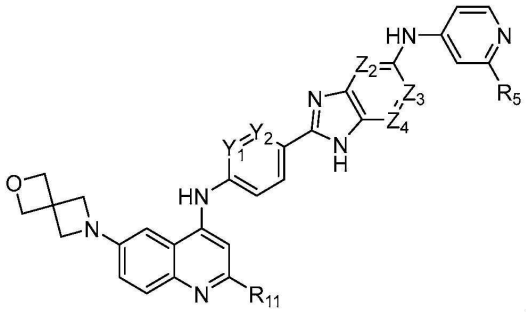
[0208]



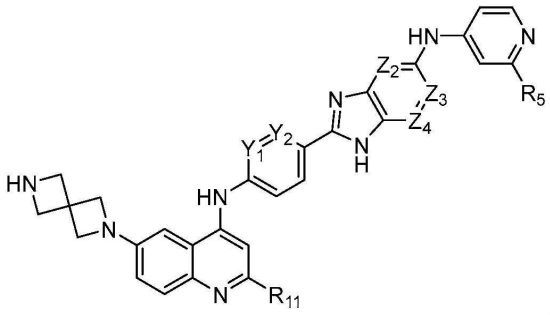
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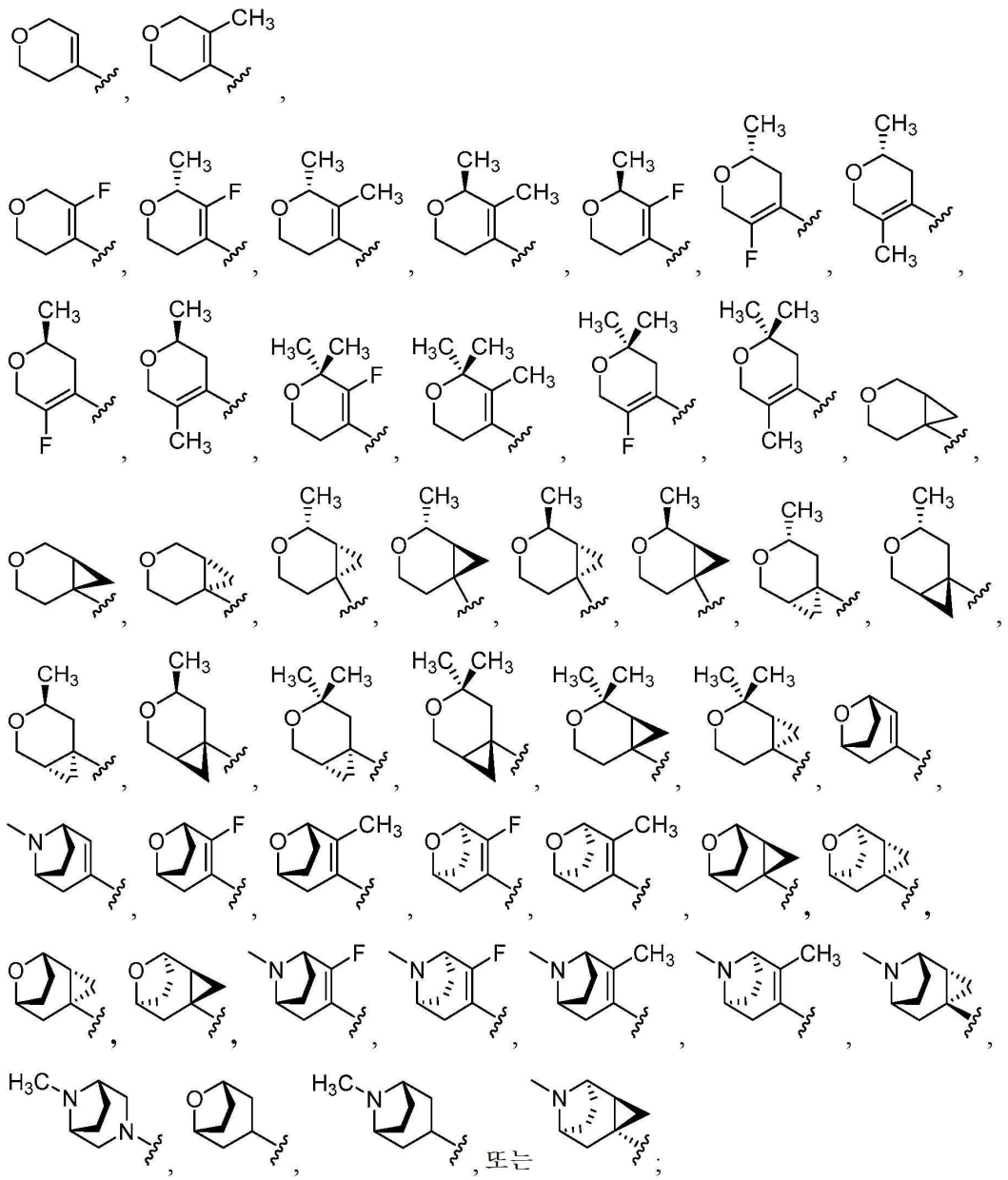
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[0209]

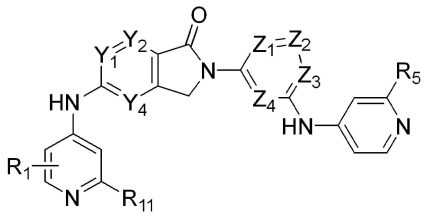
[0210] 상기 식에서, R_{11} 및 R_5는 각각 독립적으로 H, 할로겐 또는 CH_3이고; R_{12}는 독립적으로 H, 할로겐, CH_3, 하기 화학식의 기이고:



[0211]

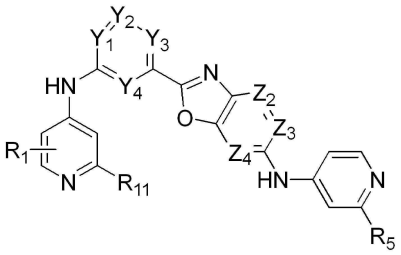
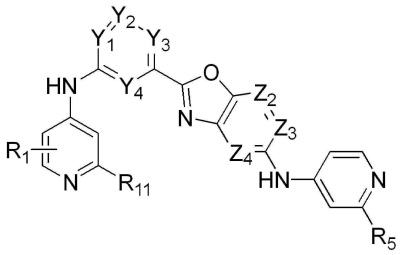
[0212] Y_1, Y_2, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

[0213] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 IIa의 화합물은



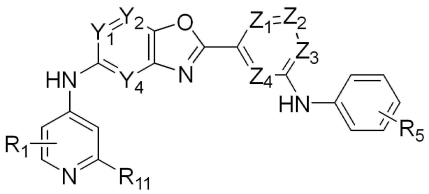
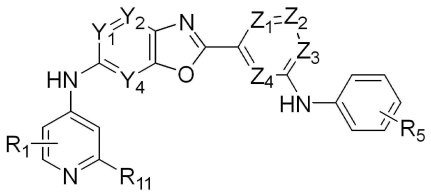
의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_4, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

[0214] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 IIb의 화합물은

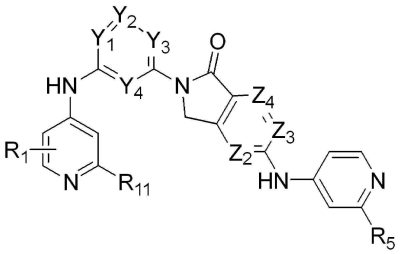
또는 의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

[0215] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 IIc의 화합물은

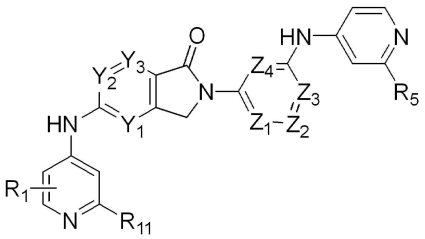
또는 의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_4, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

[0216] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 IIIa의 화합물은



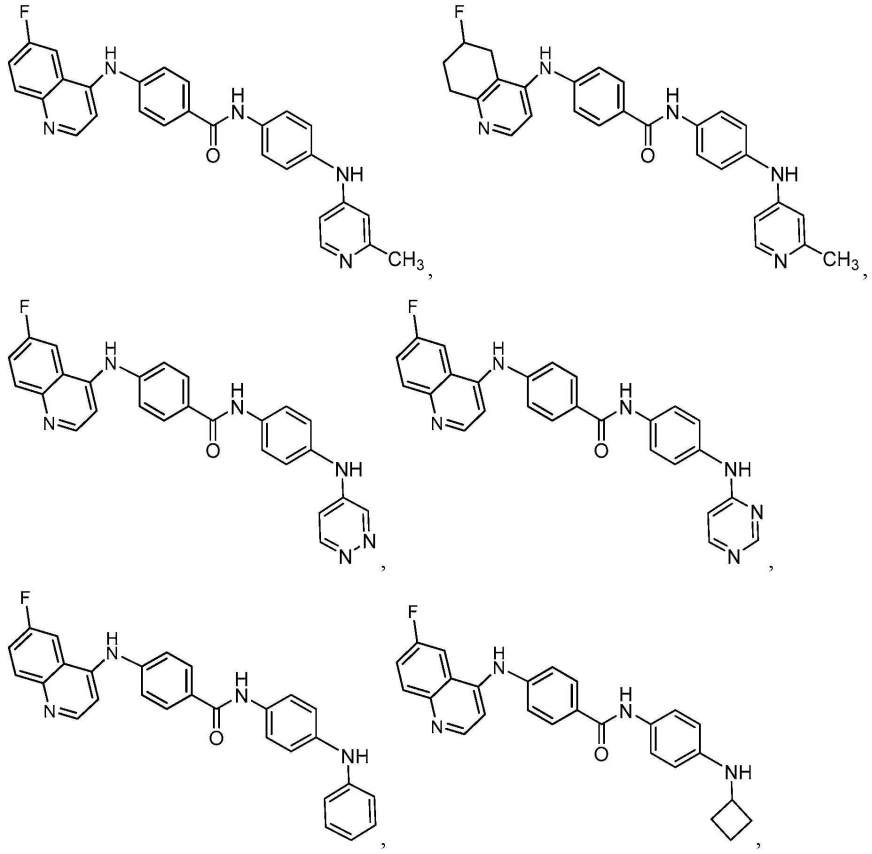
의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

[0217] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 IVa의 화합물은

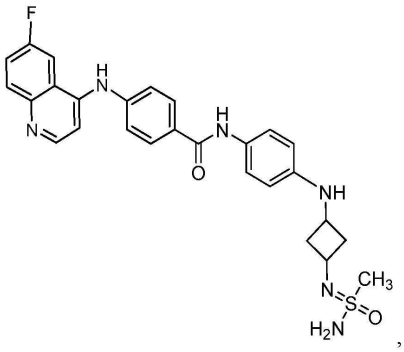


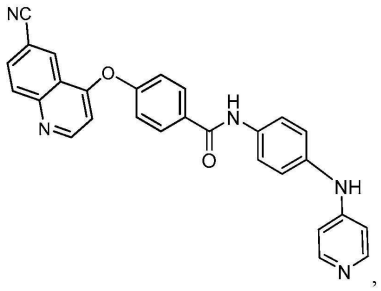
의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

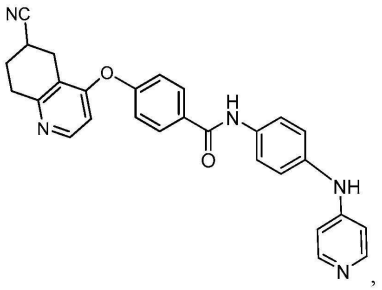
[0218] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 Ia의 화합물은 하기 화합물이다:

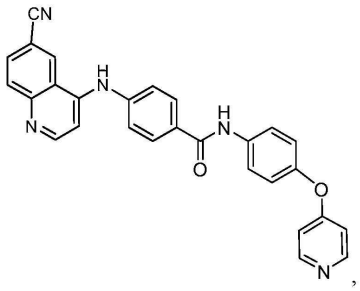


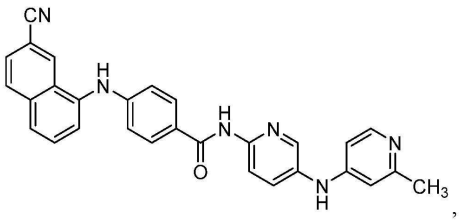
[0219]

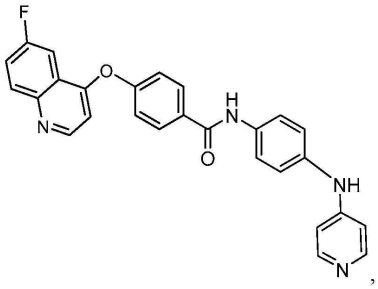


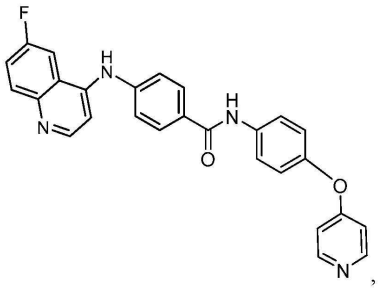


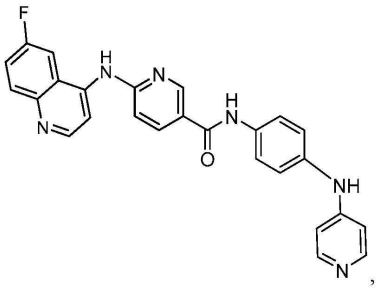




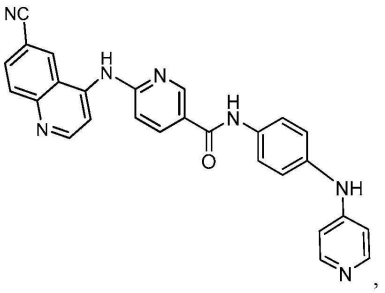
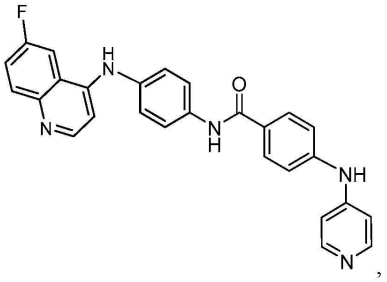
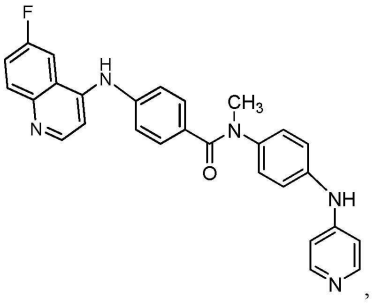
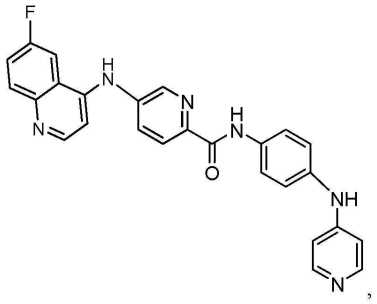
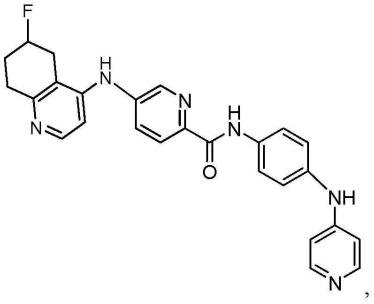
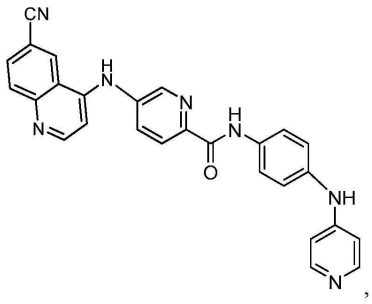
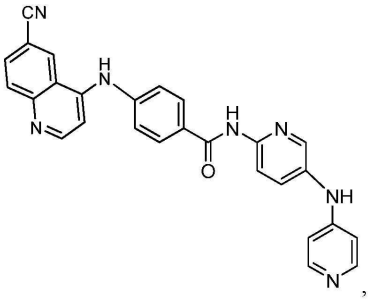
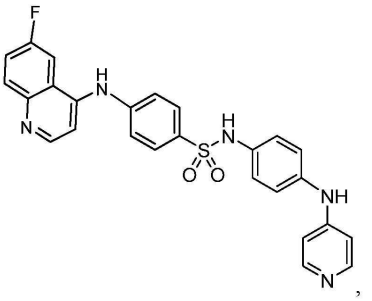




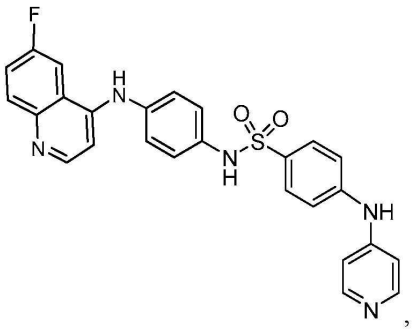
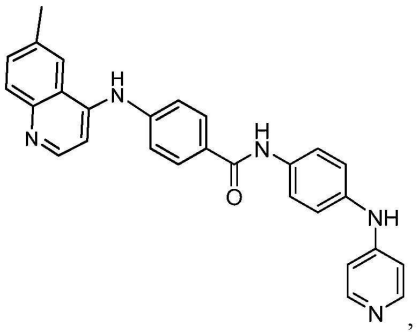
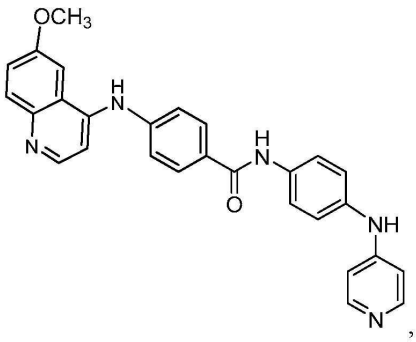
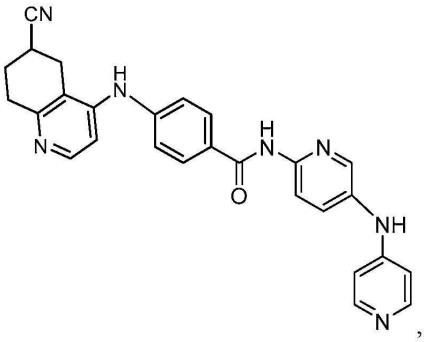
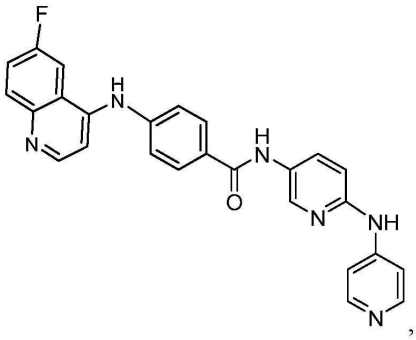
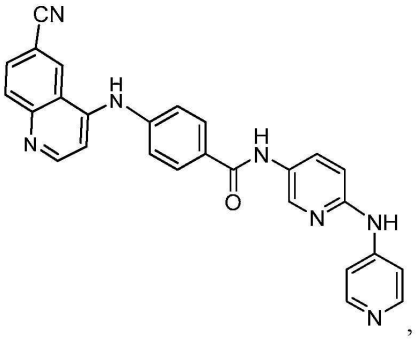
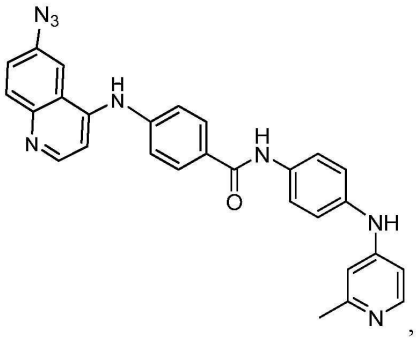
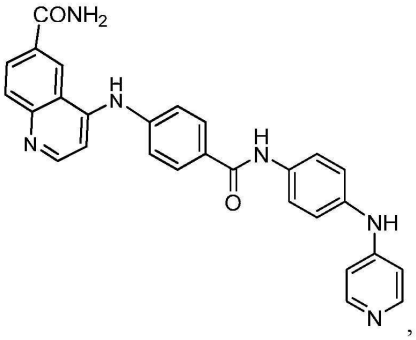




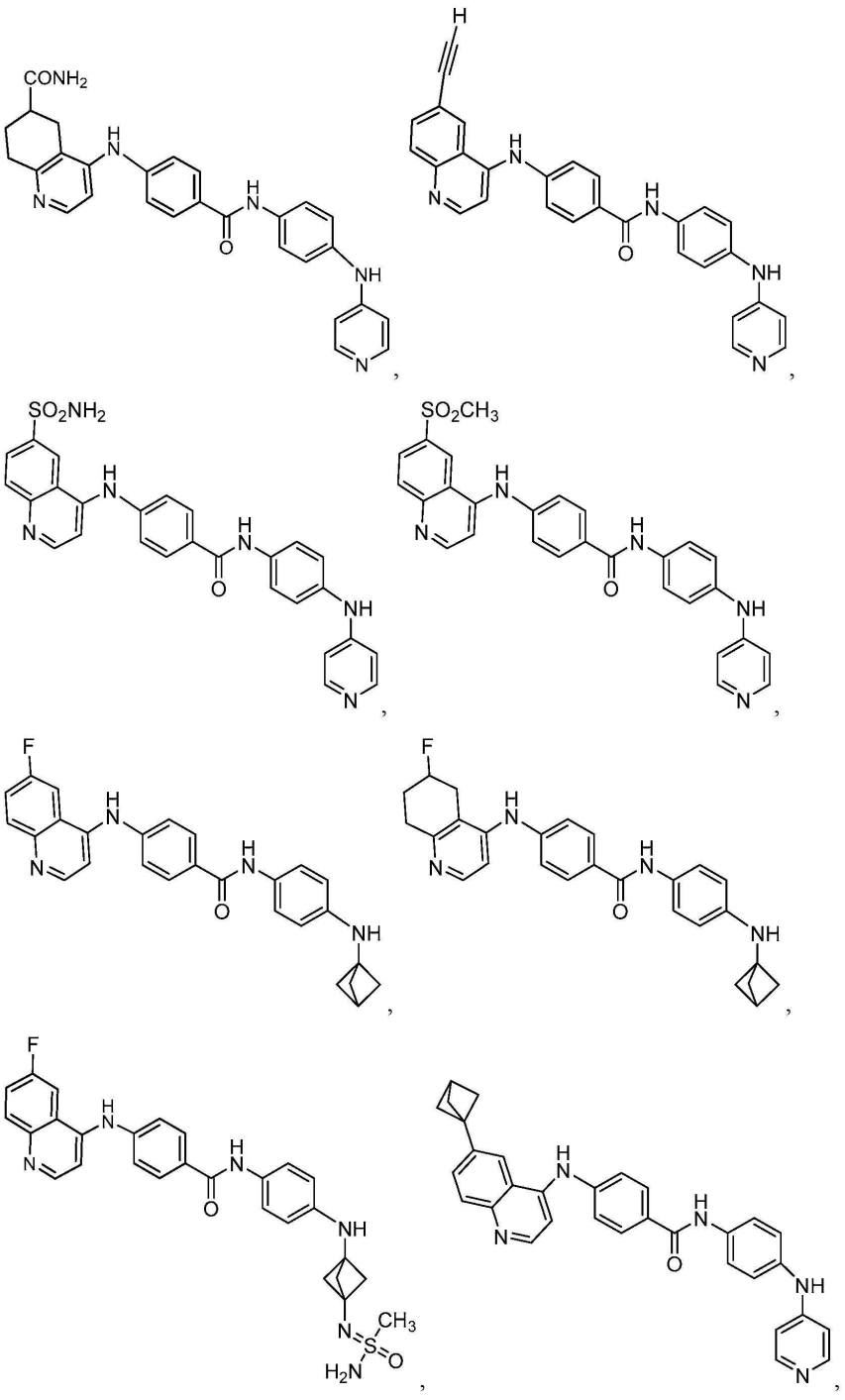
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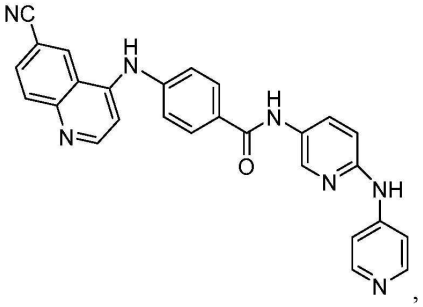
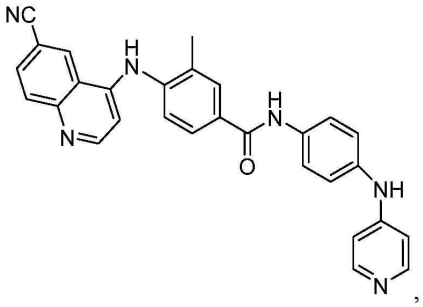
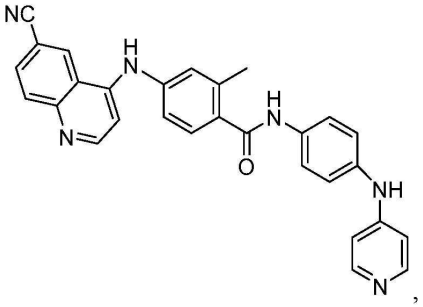
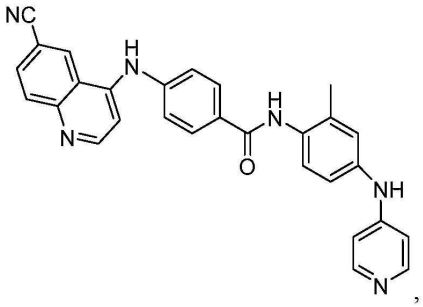
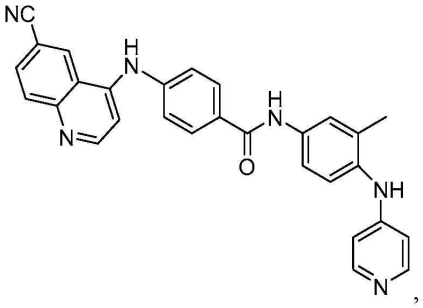
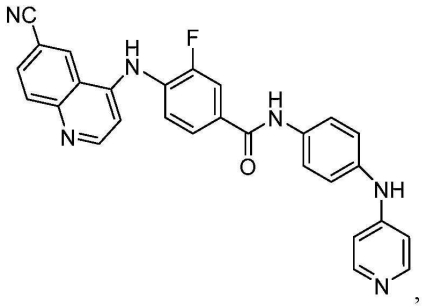
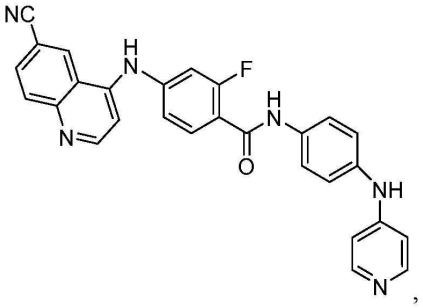
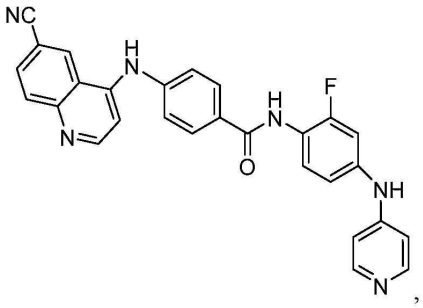
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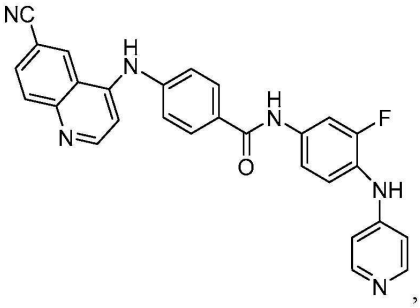
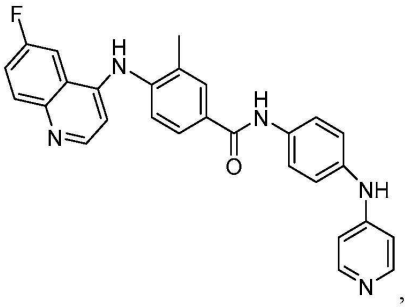
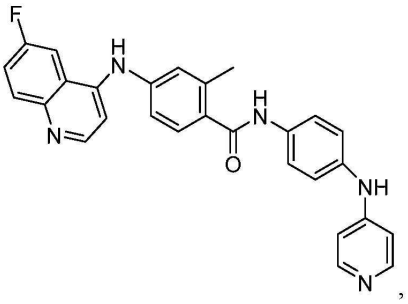
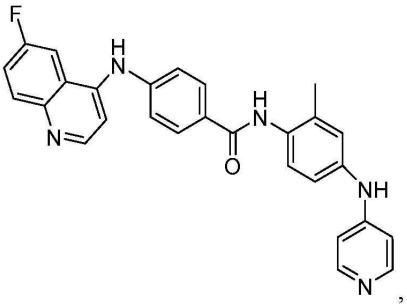
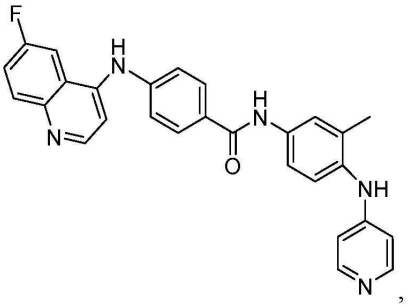
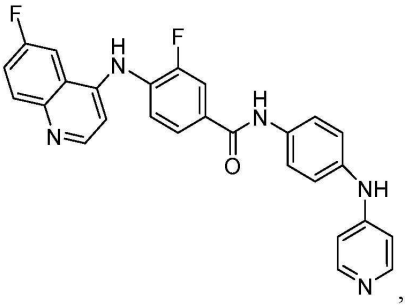
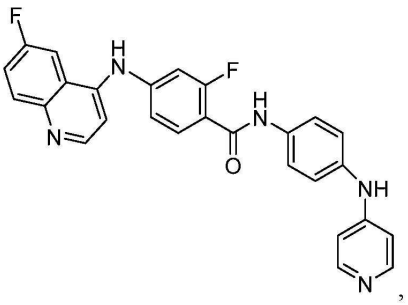
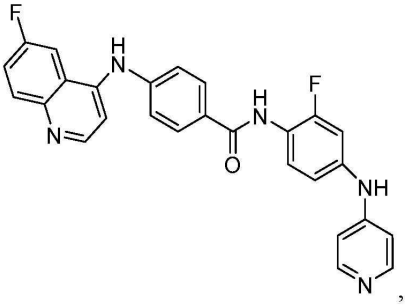
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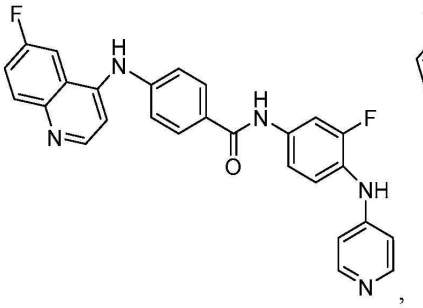
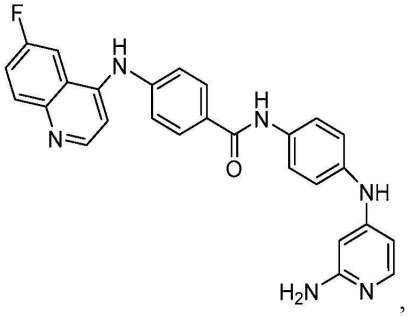
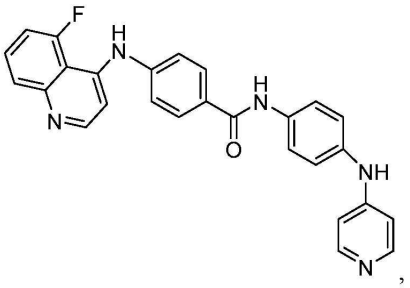
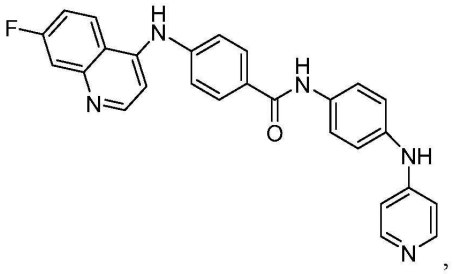
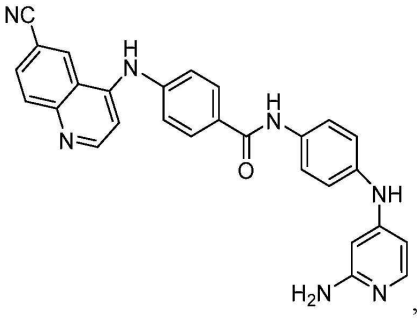
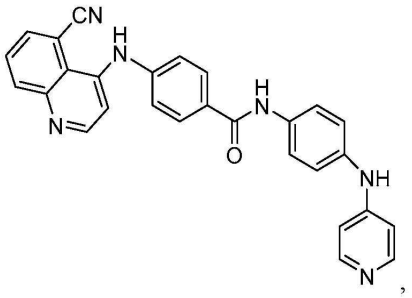
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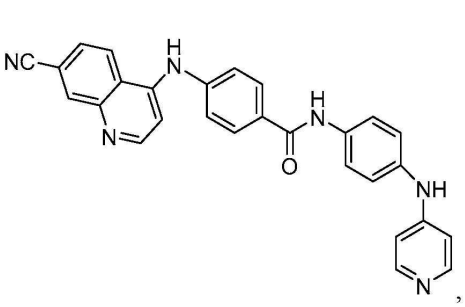
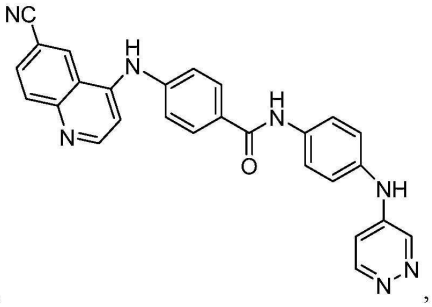
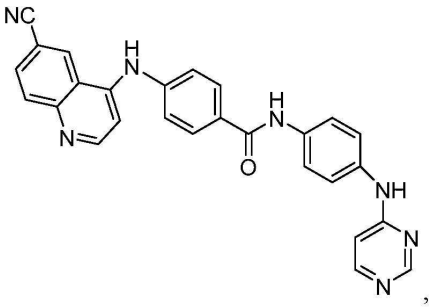
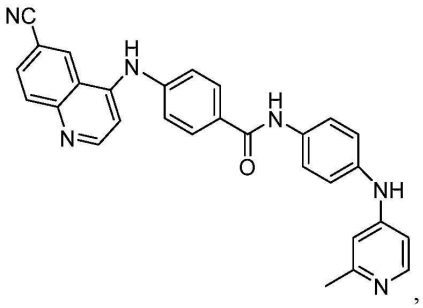
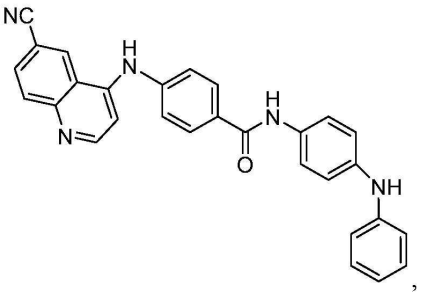
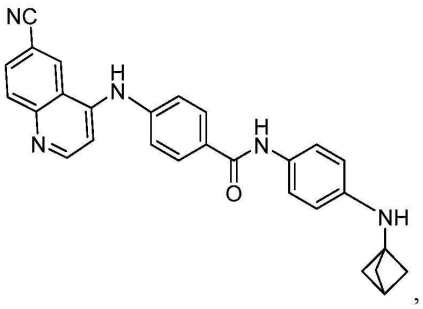
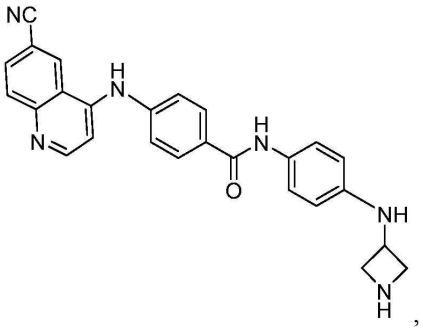
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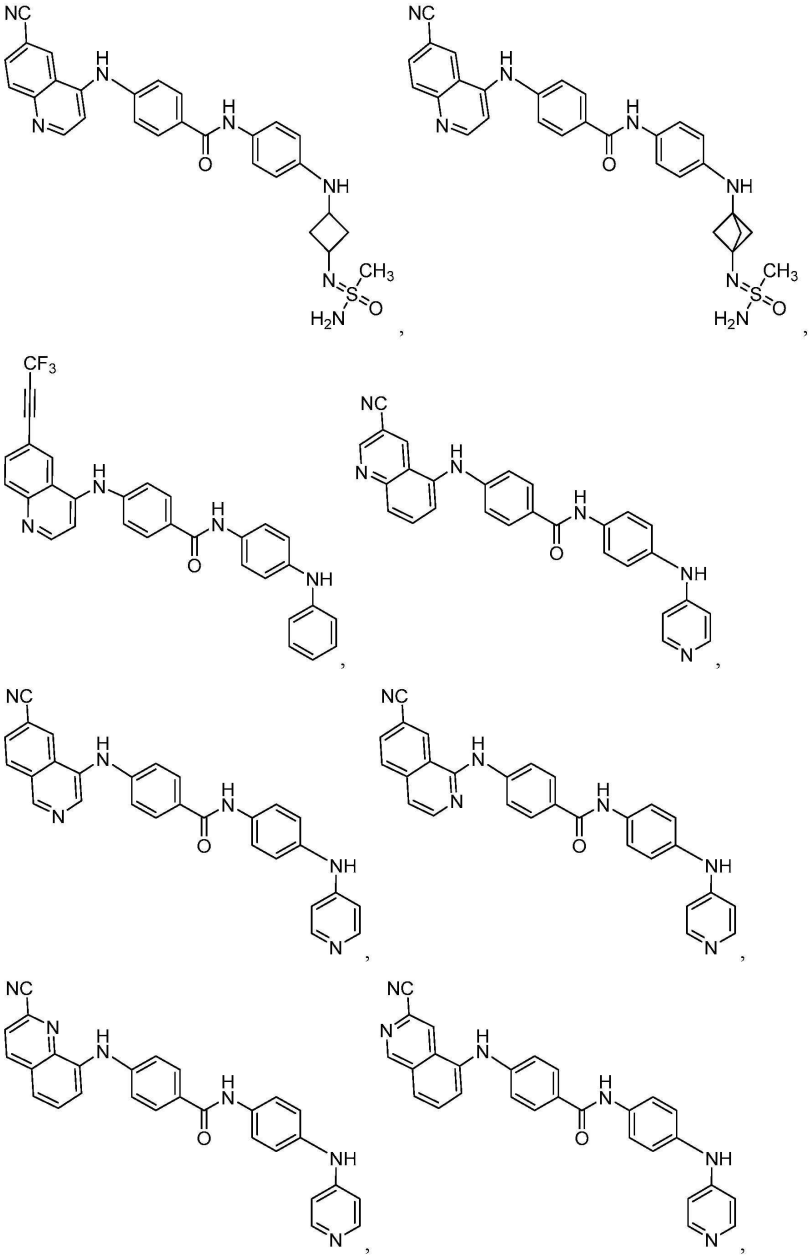
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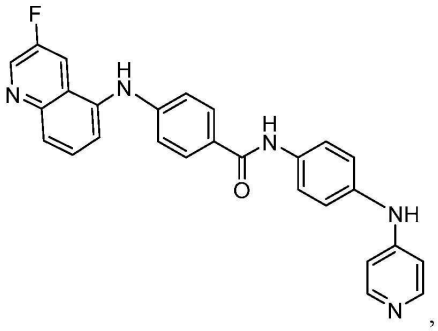
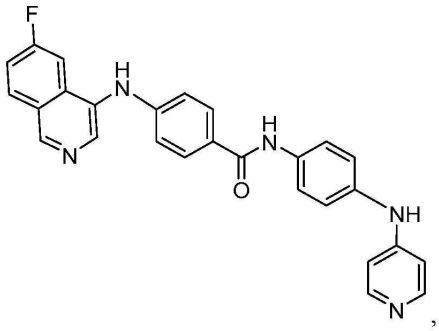
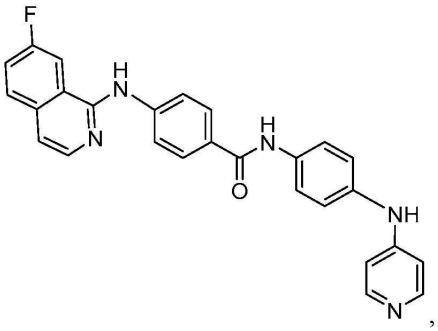
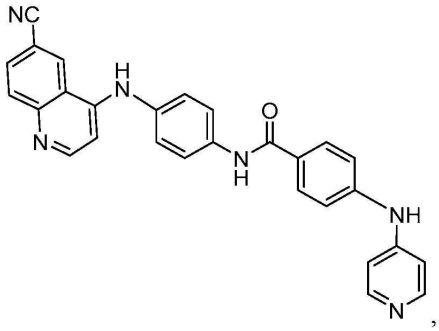
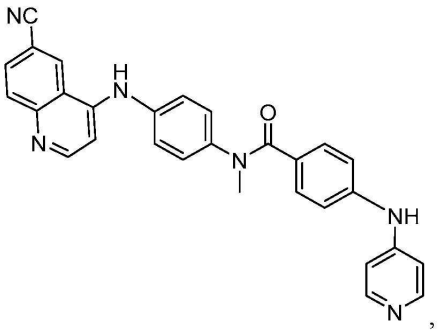
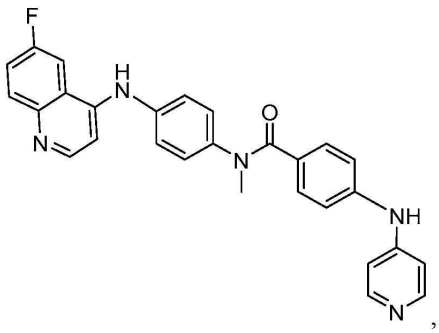
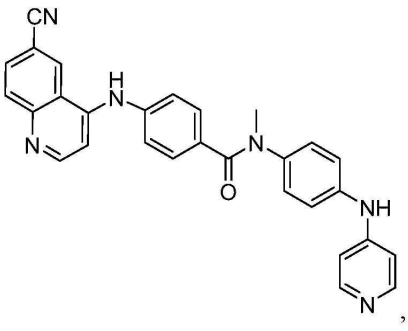
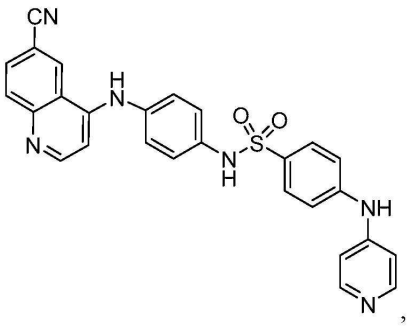
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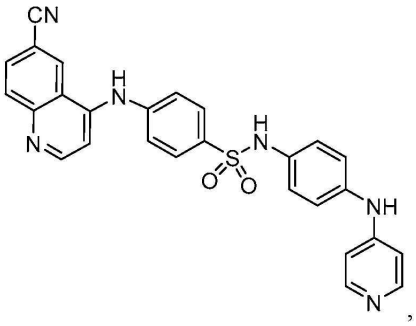
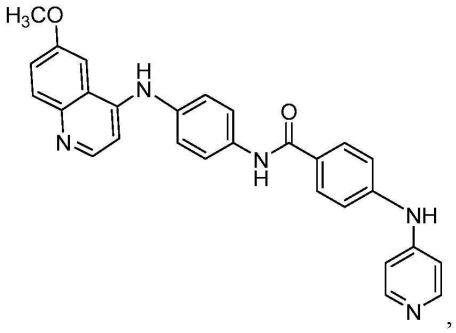
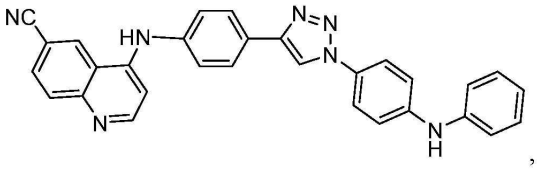
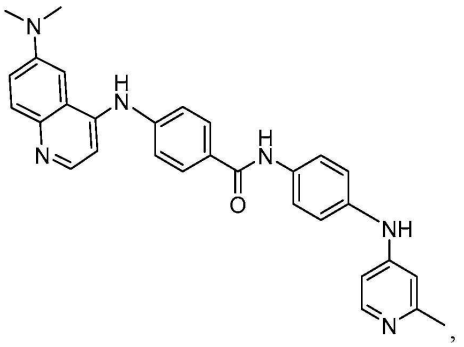
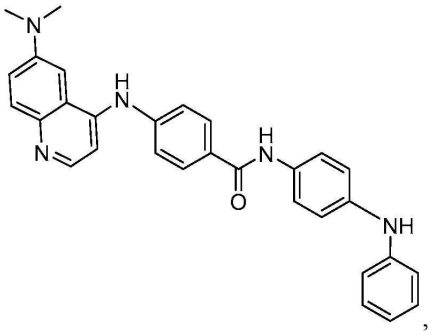
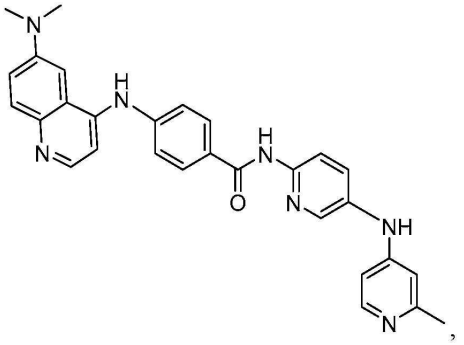
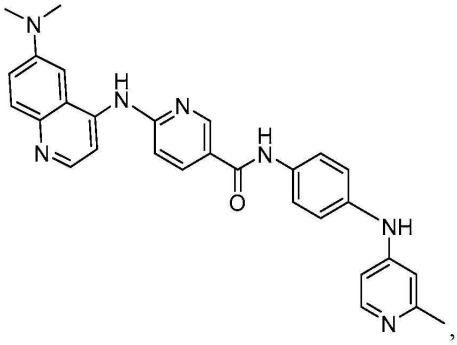
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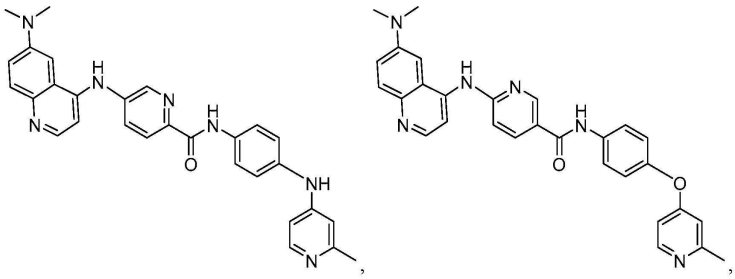
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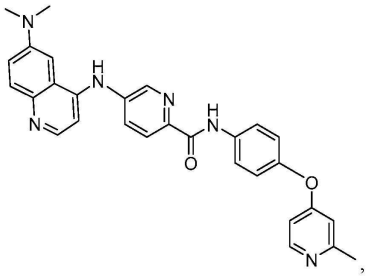
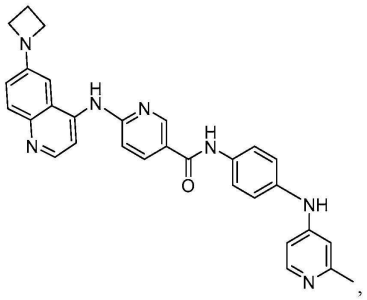
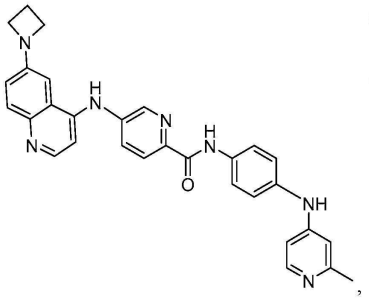
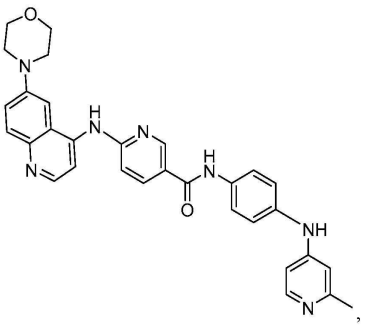
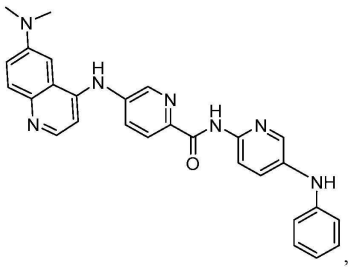
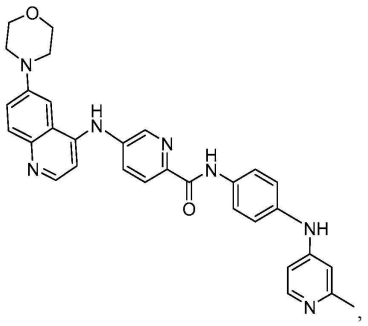

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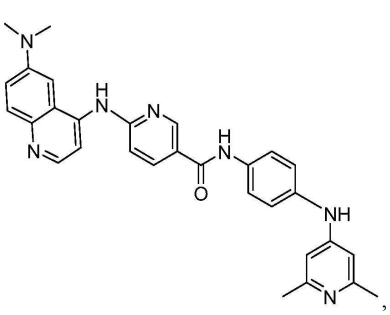
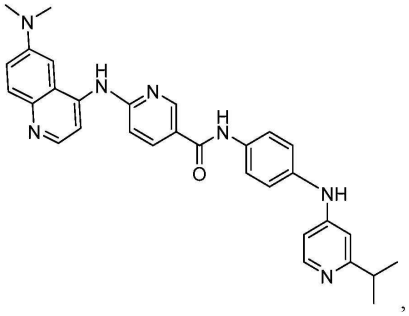
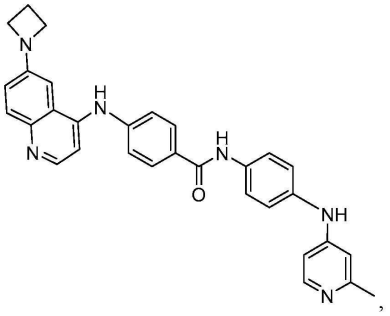
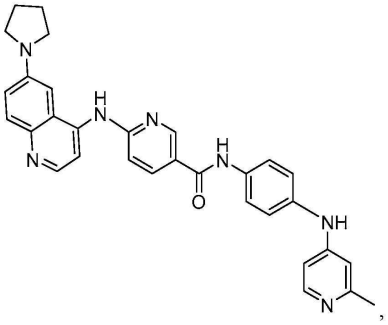
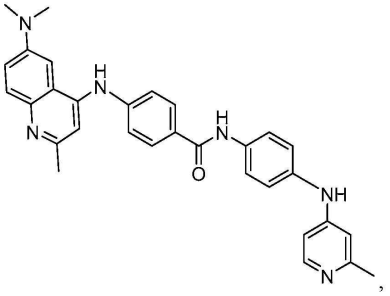
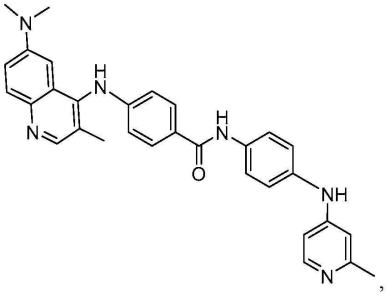
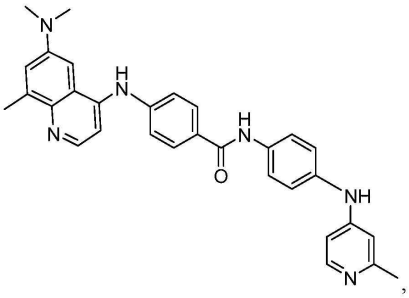
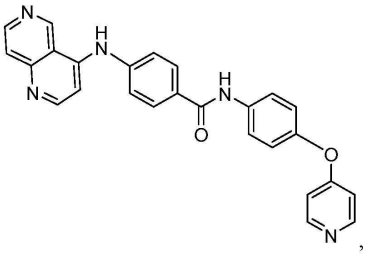

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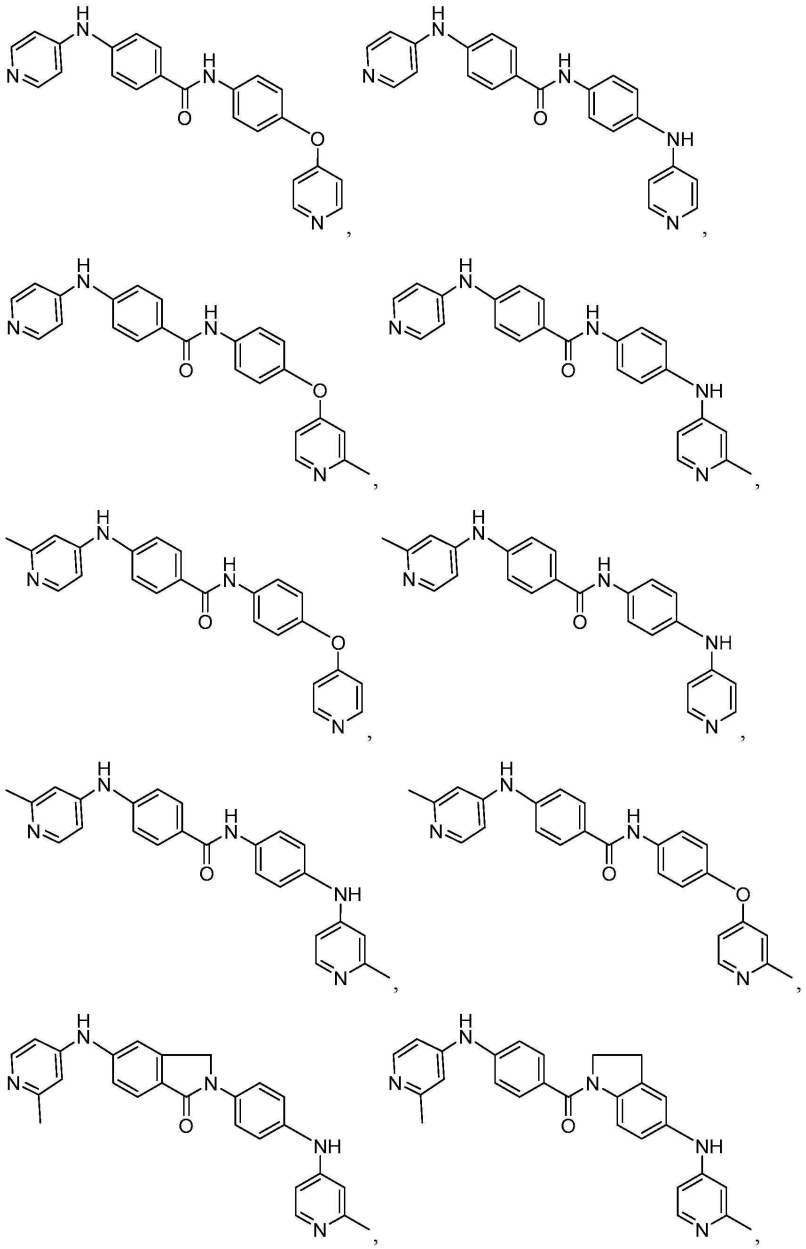


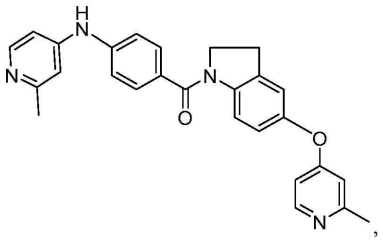
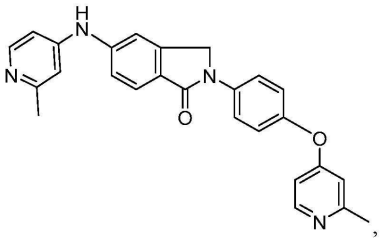
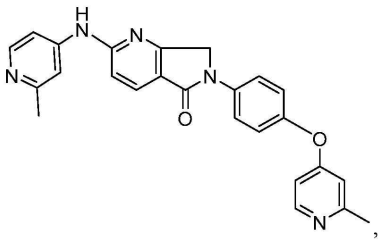
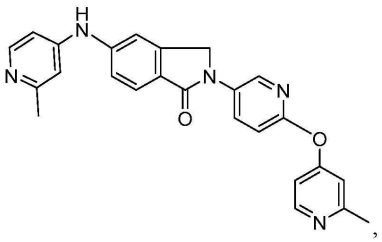
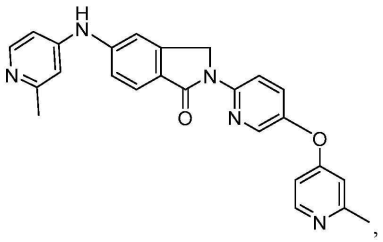
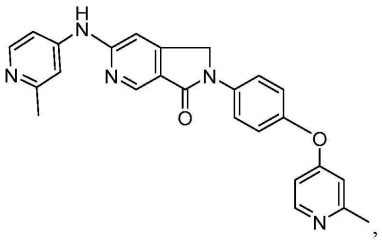
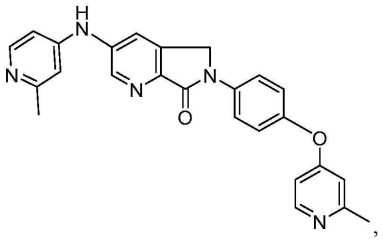
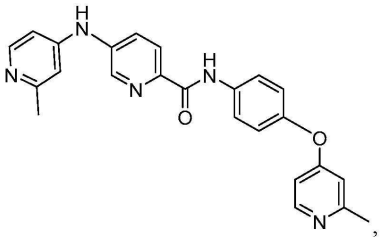
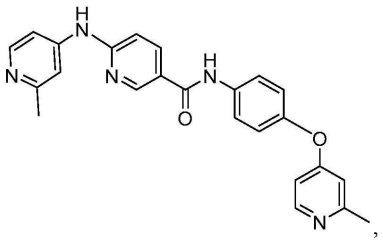
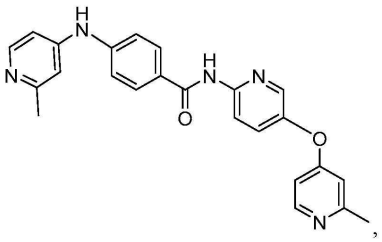
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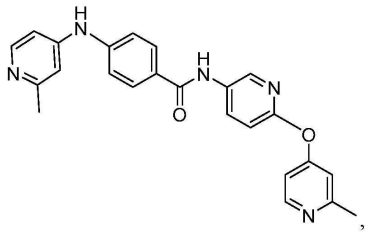
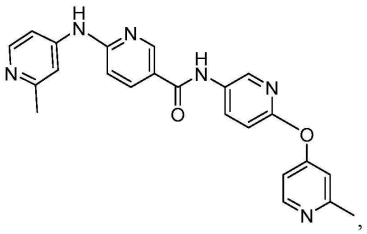
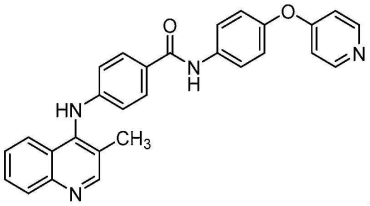
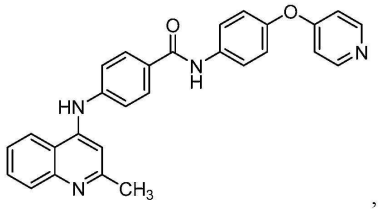
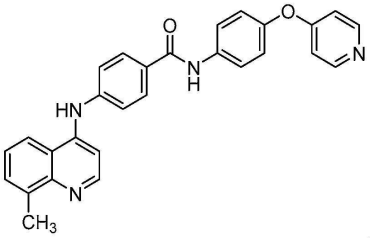
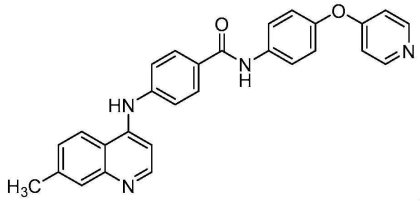
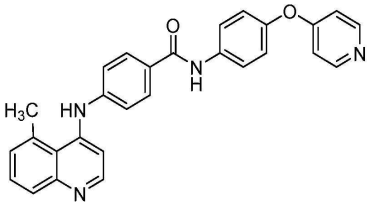
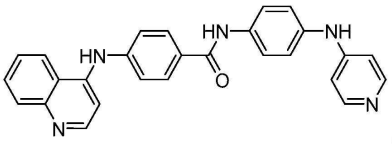
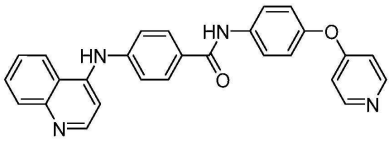
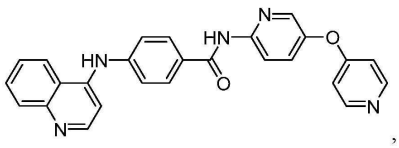
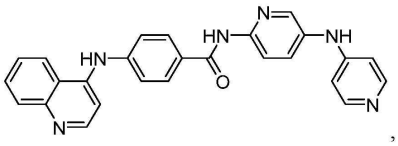
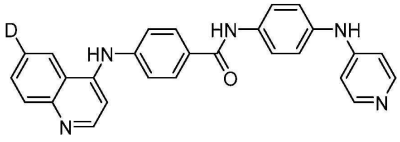
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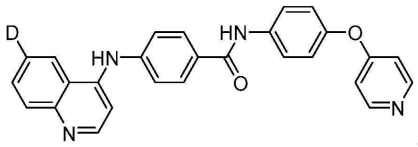
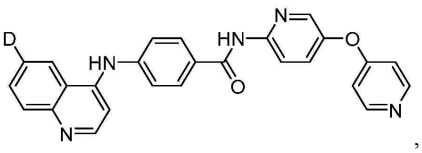
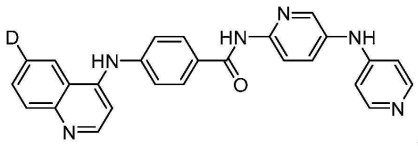
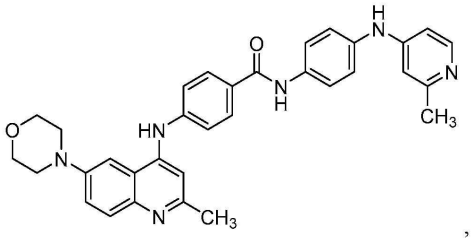
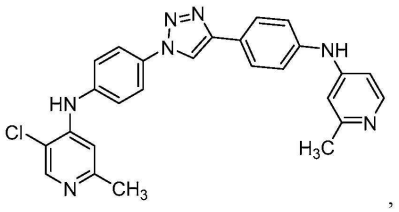
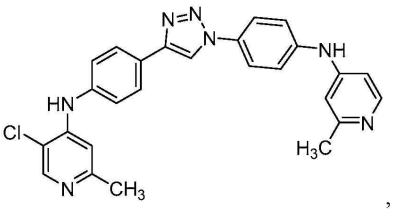
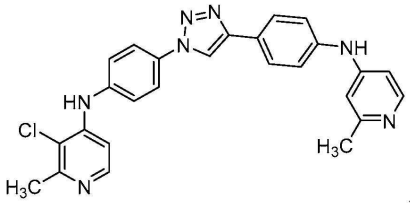
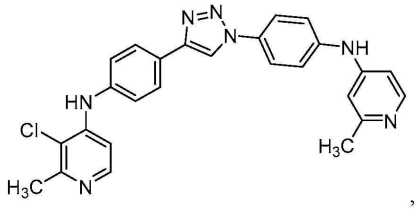
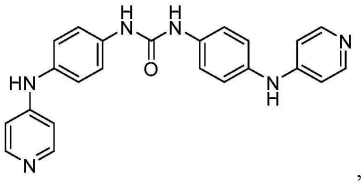
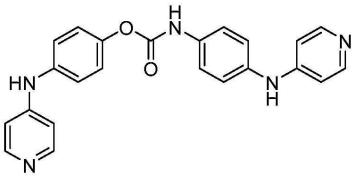

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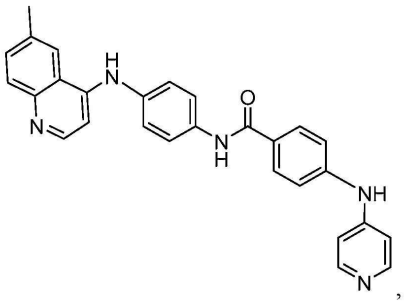

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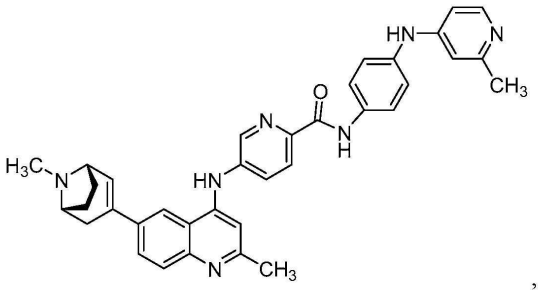
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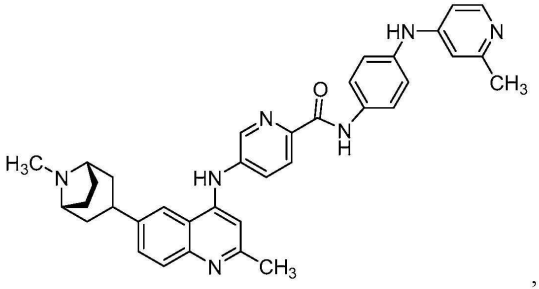
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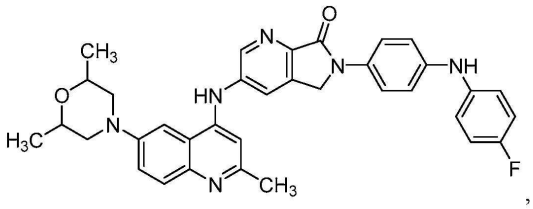

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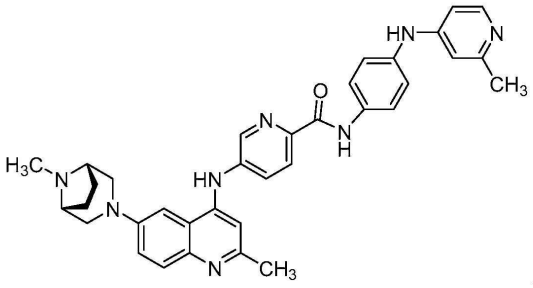
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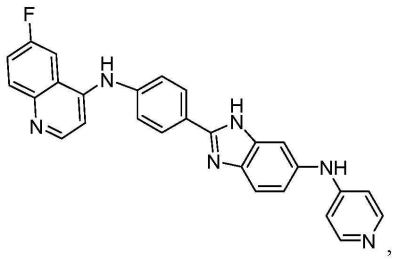
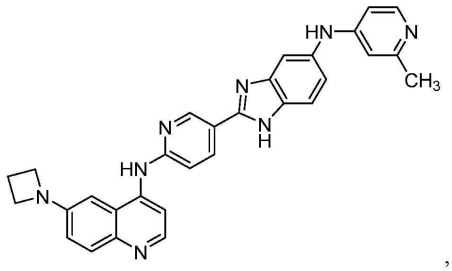
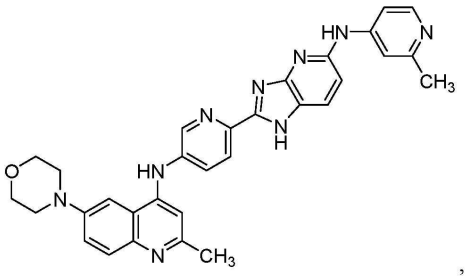
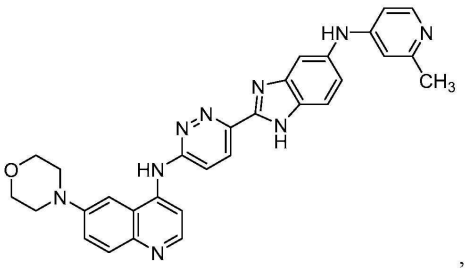
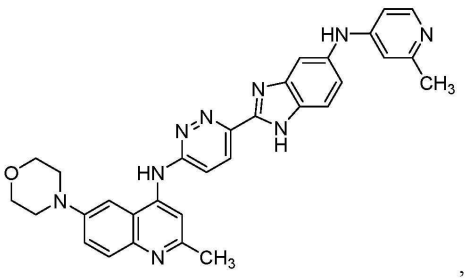

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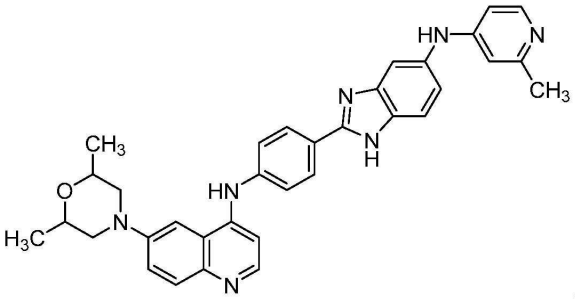

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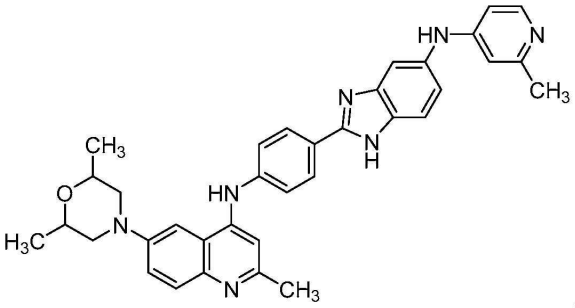
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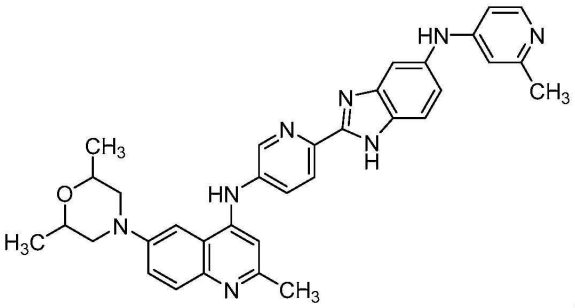
[0238] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 Ib의 화합물은 하기 화합물이다:

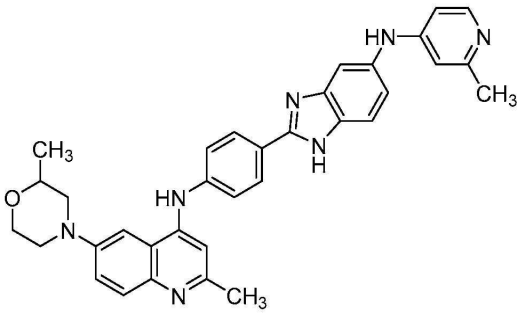

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[0239]

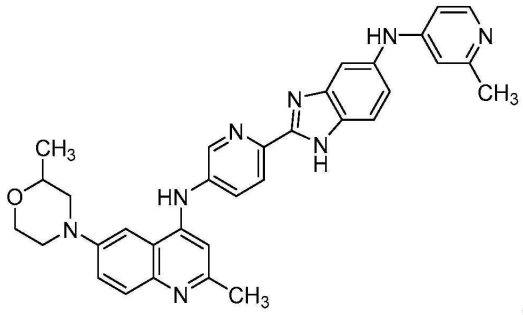

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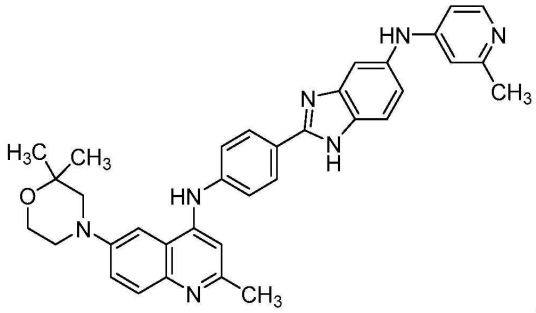

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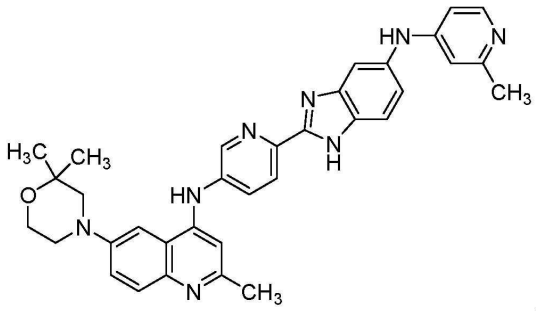

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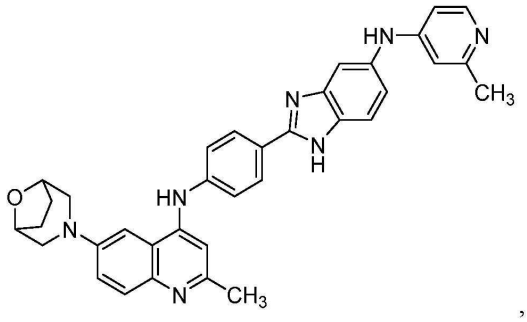

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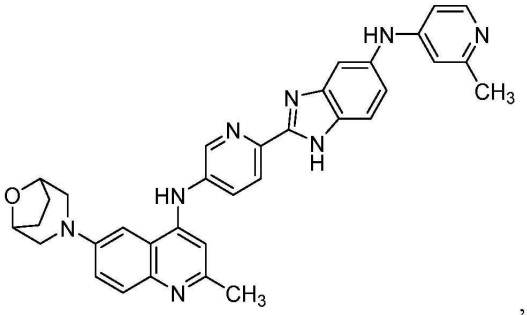
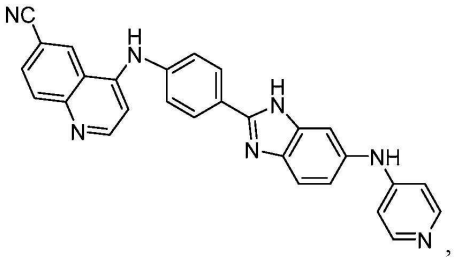
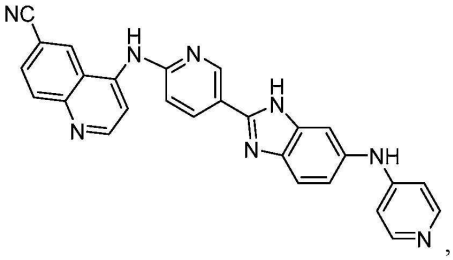
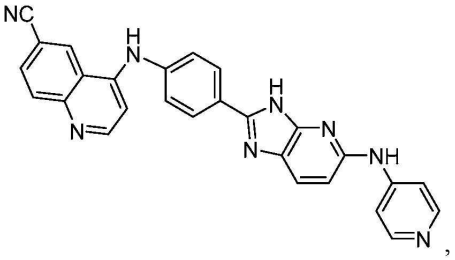
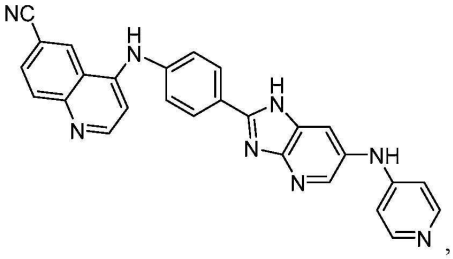
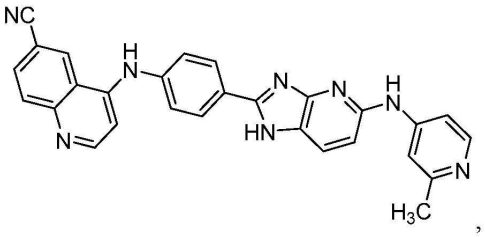
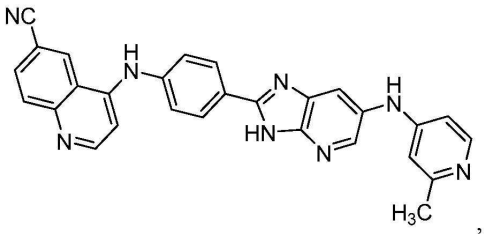
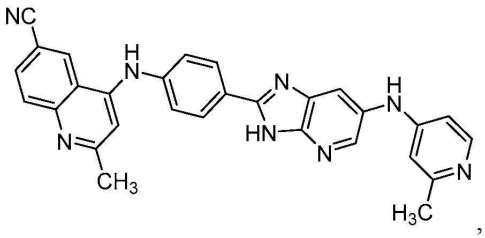
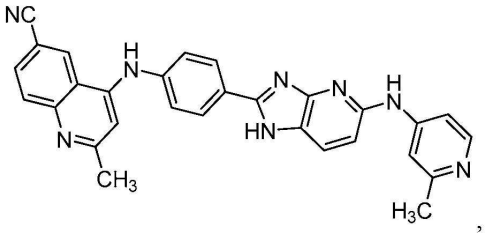
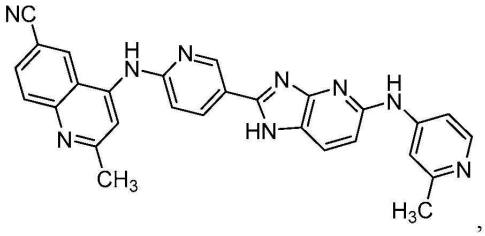

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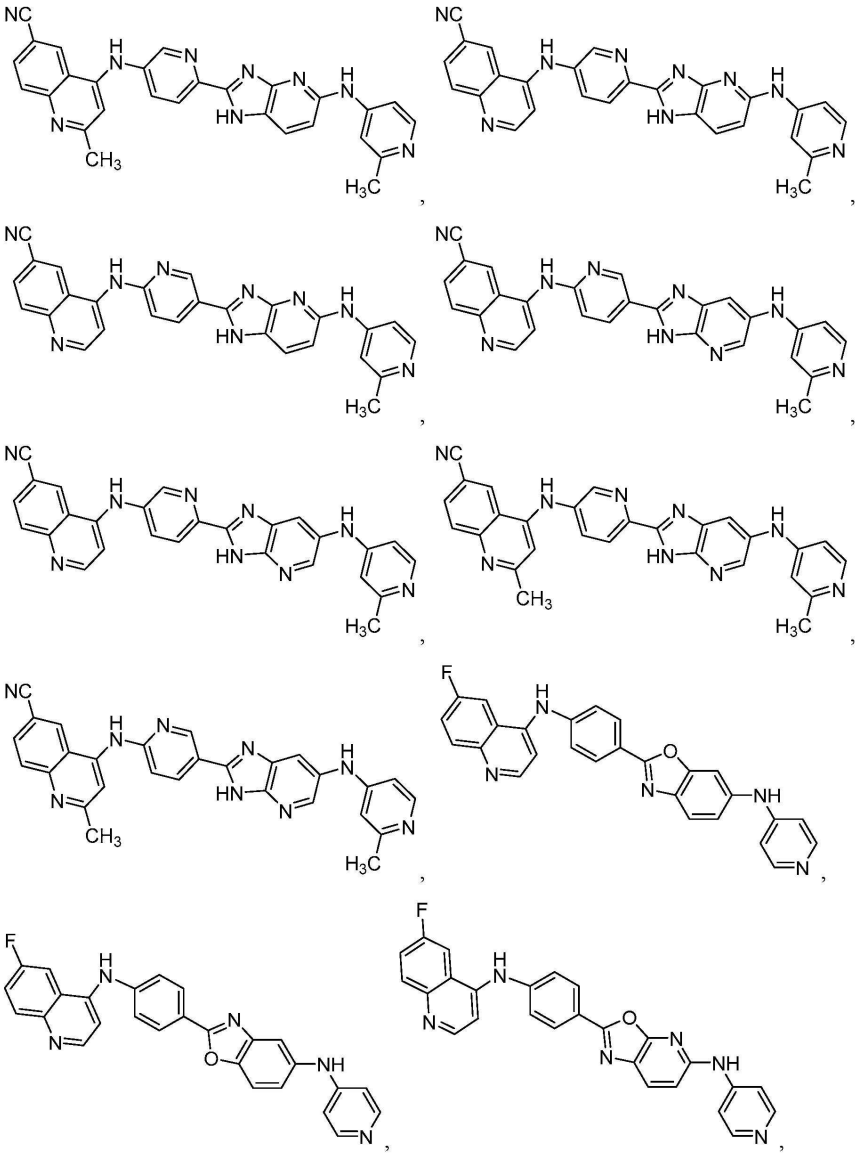

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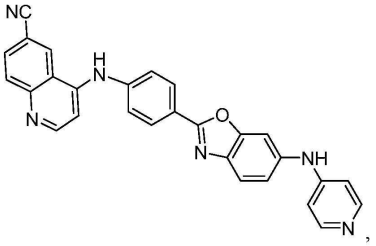
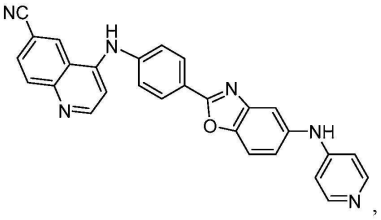
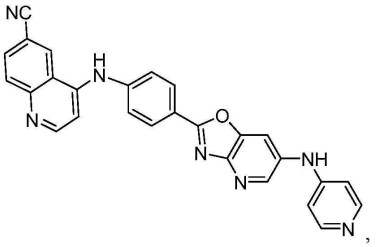
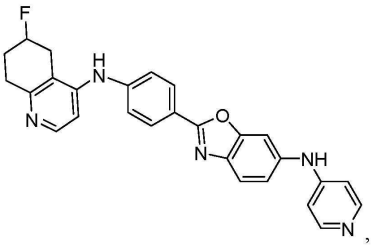
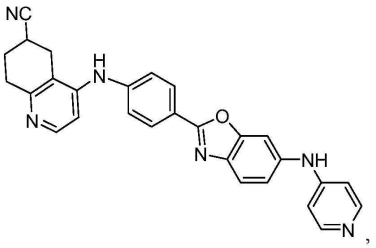
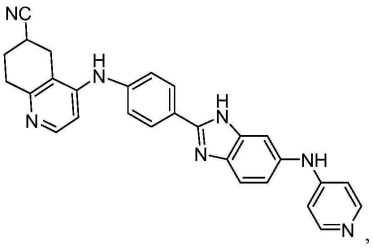
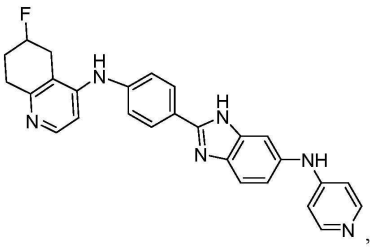
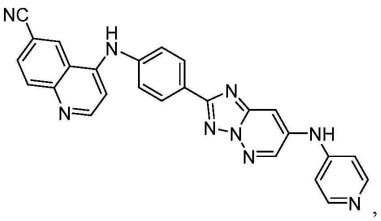
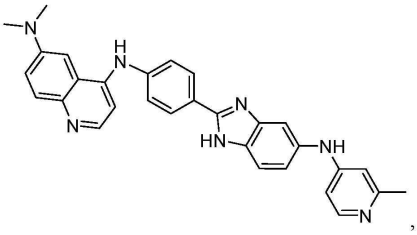
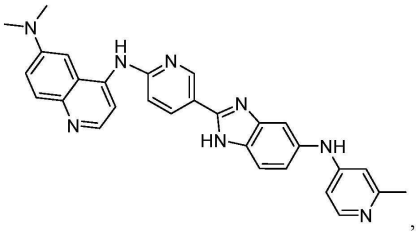
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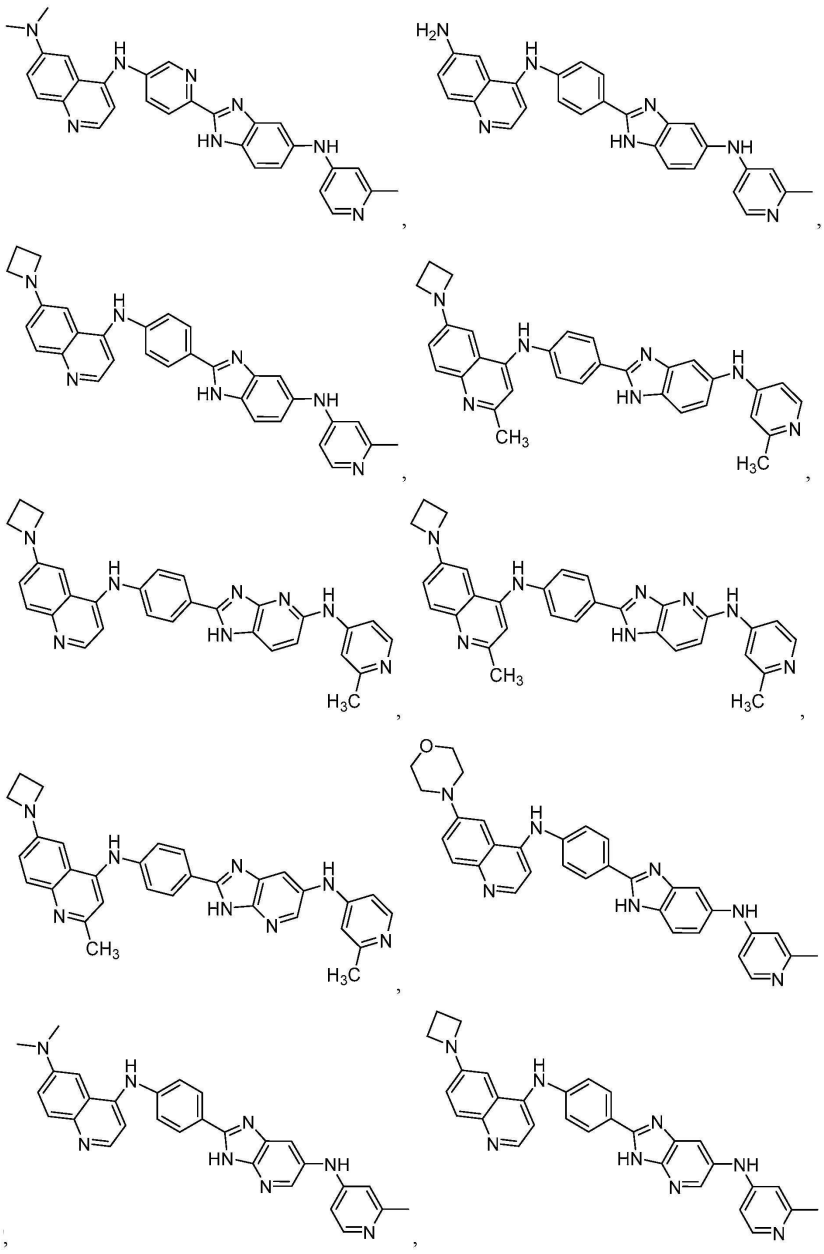
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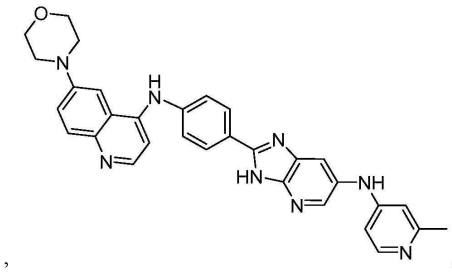


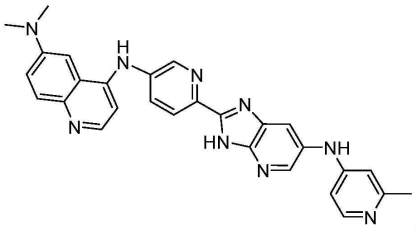
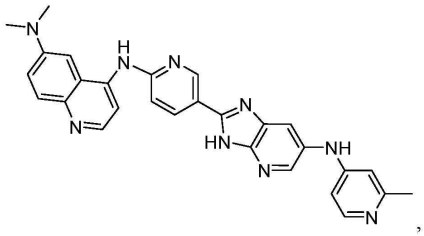
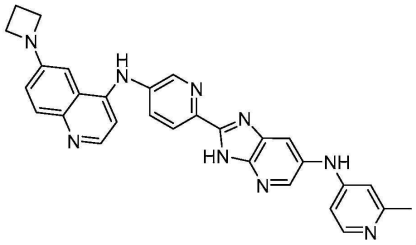
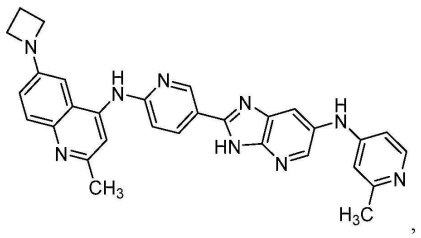
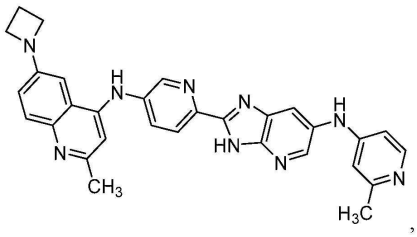
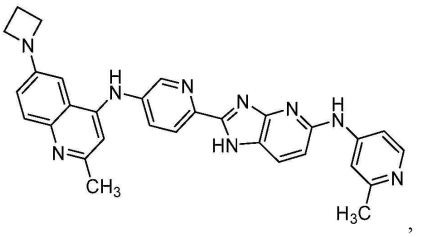
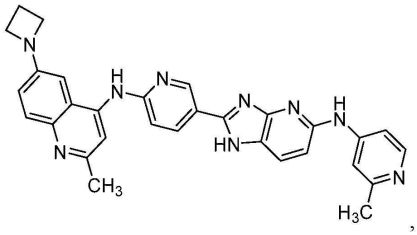
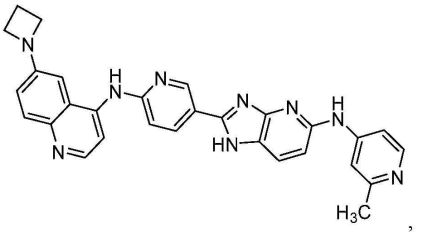
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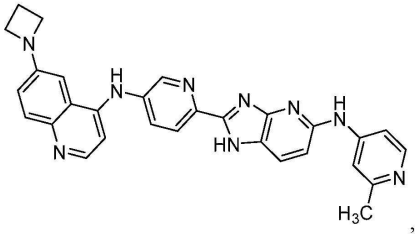
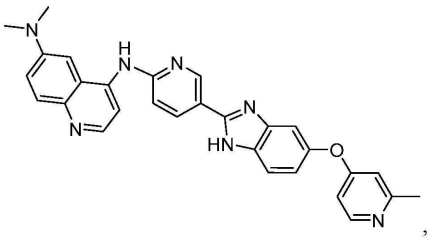
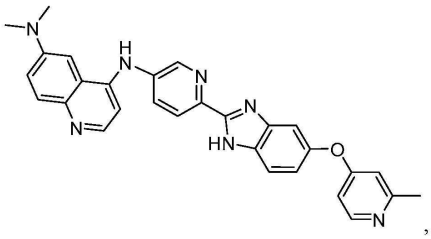
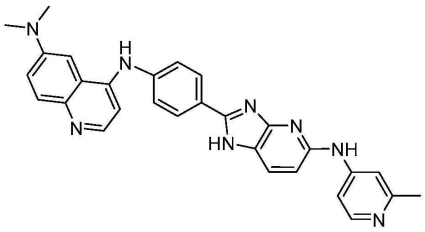
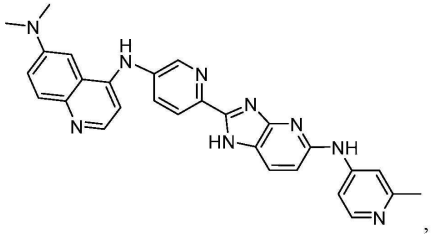
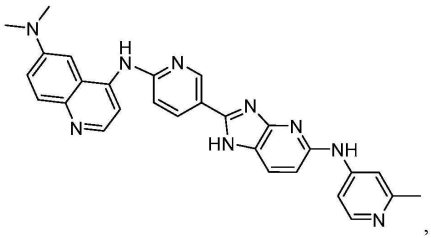
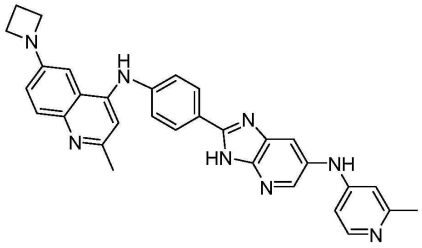
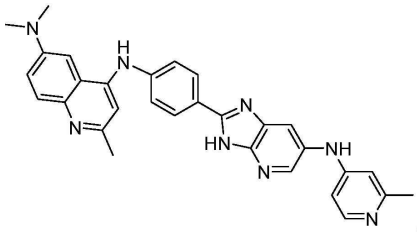
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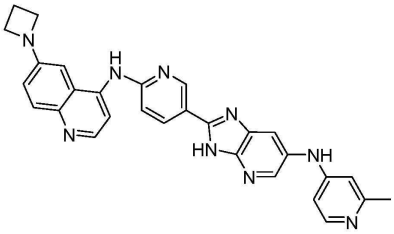
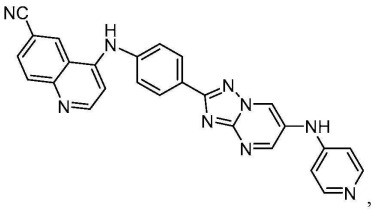
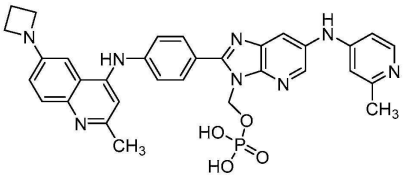
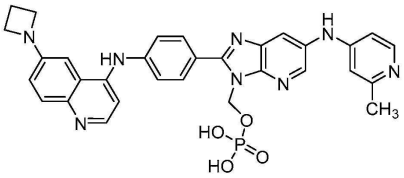
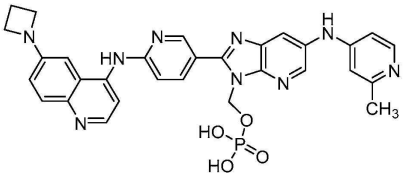
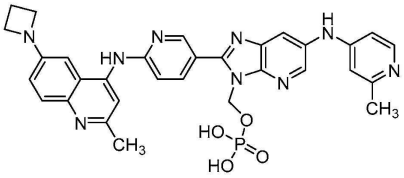
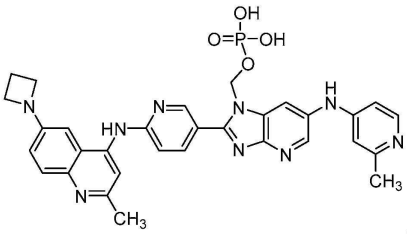

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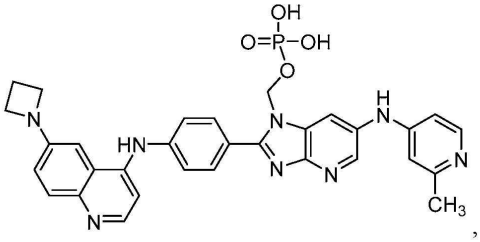
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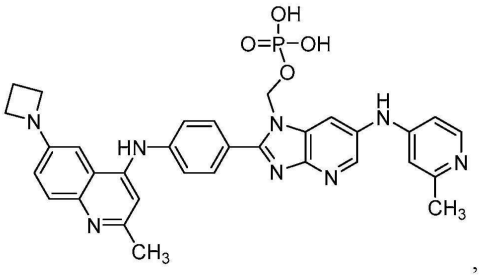

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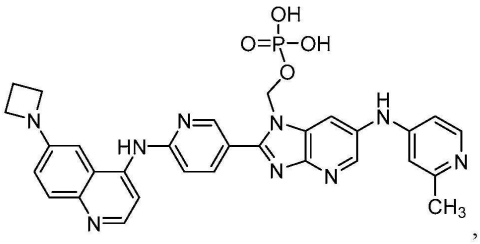
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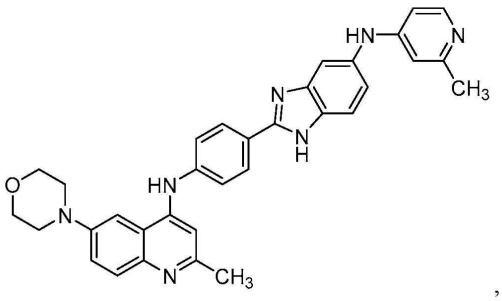

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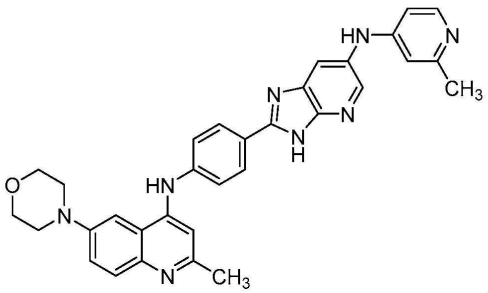
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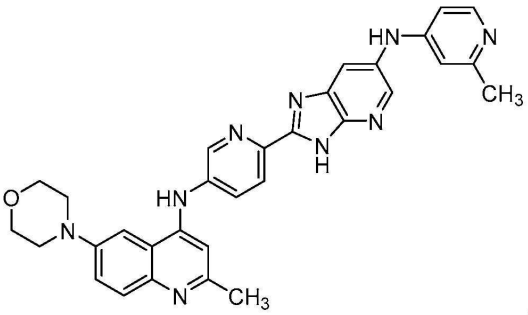

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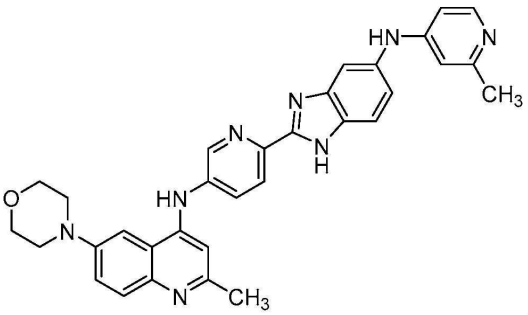

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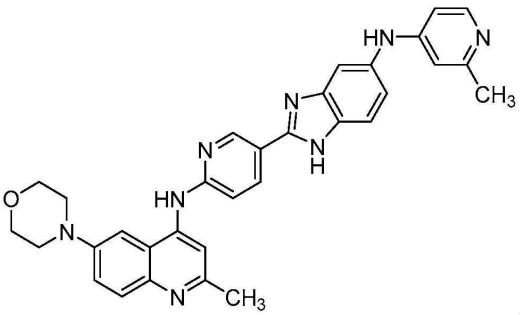

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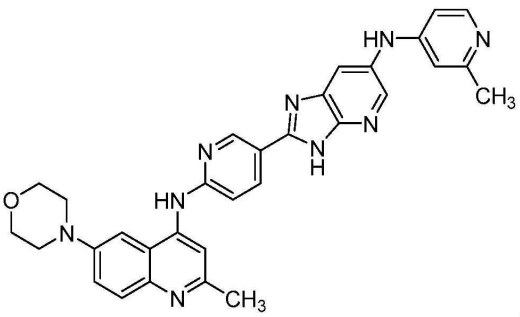

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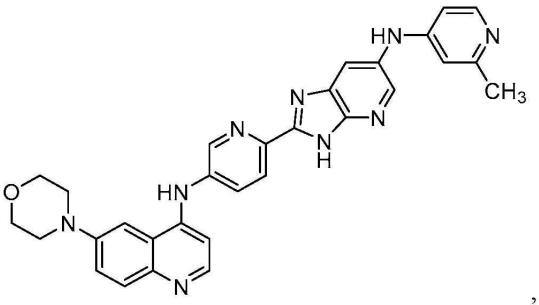

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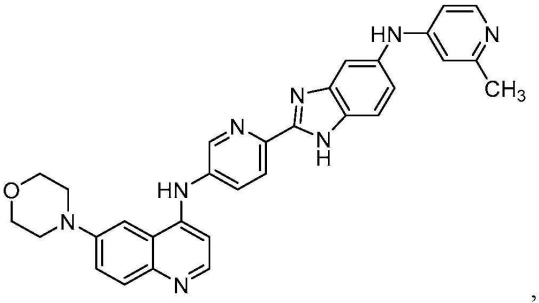

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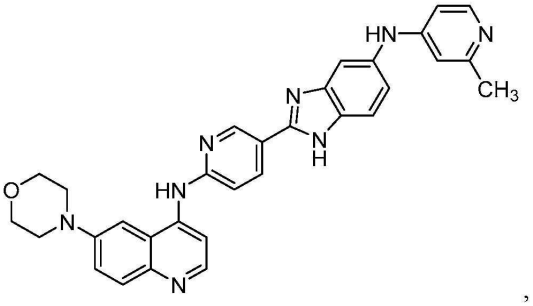

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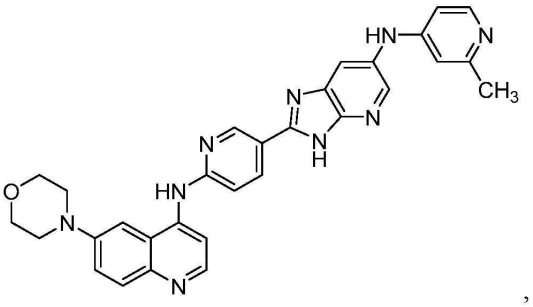

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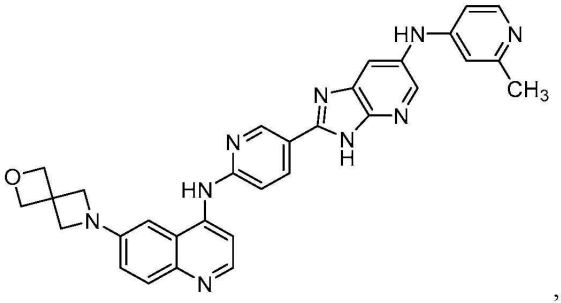

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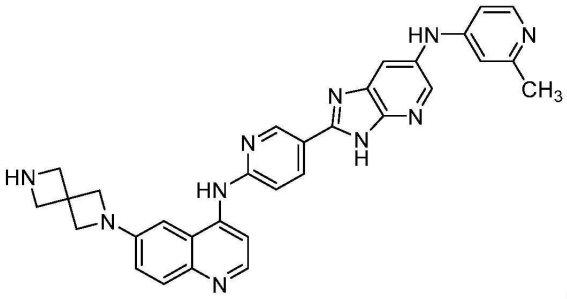

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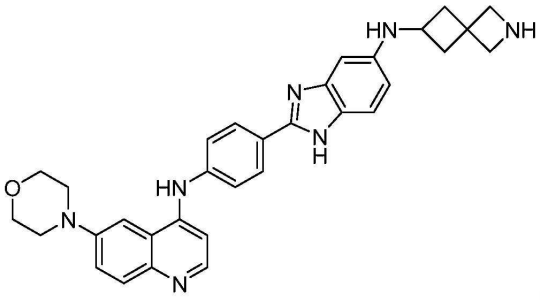
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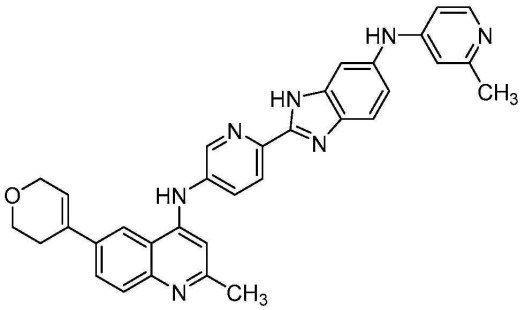
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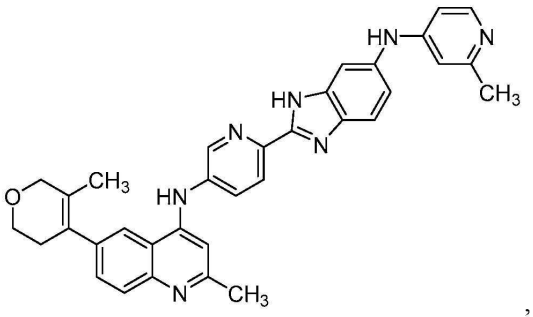


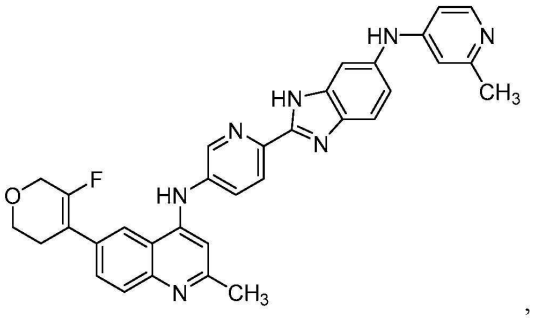
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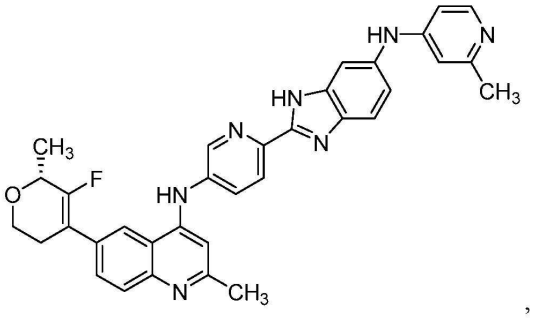


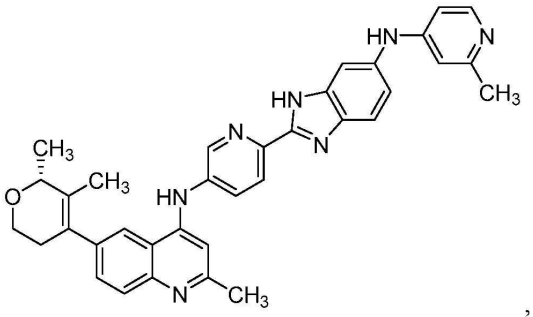
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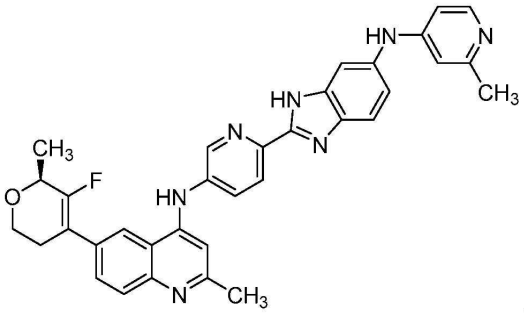

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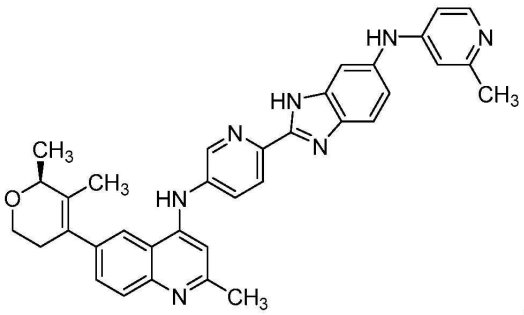

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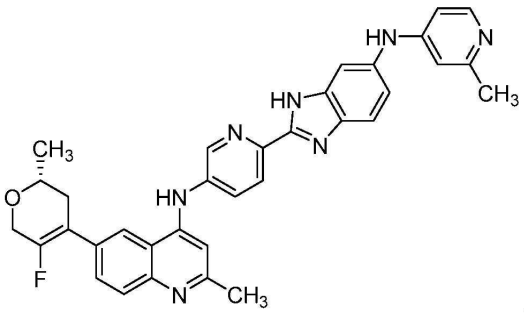

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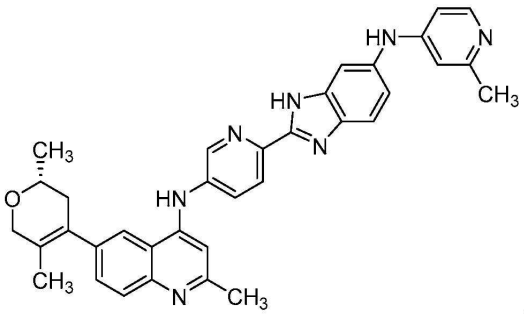

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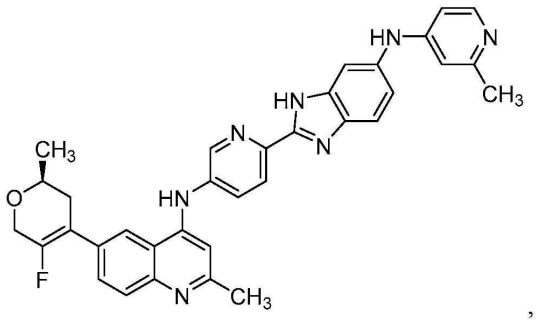

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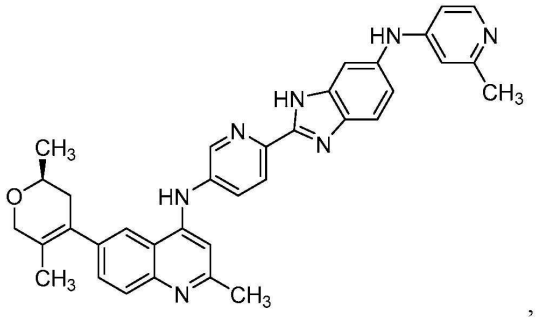

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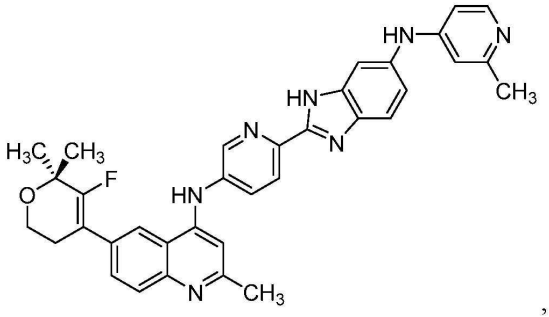

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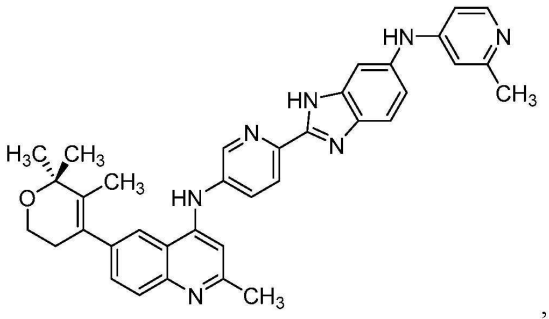

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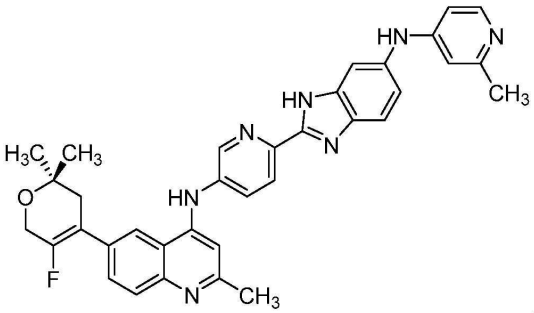
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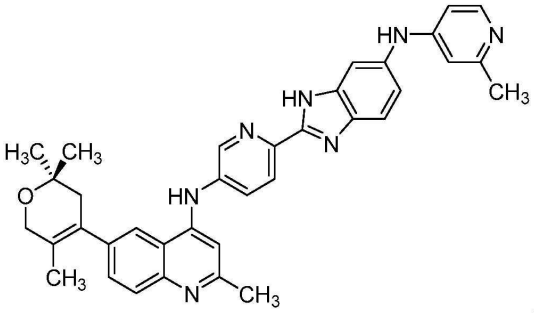

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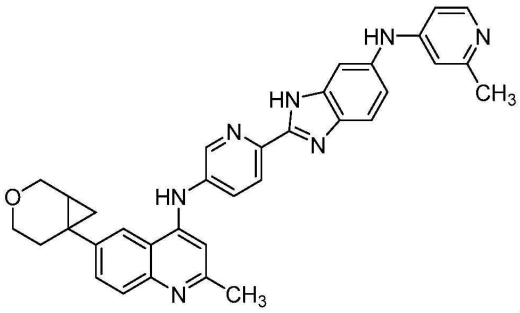

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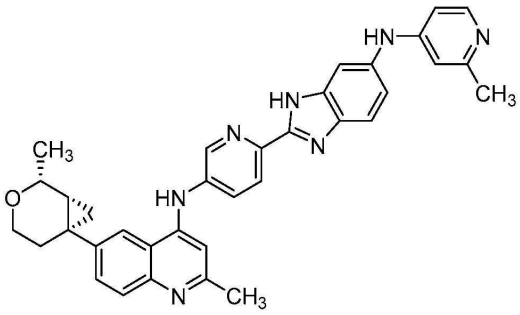

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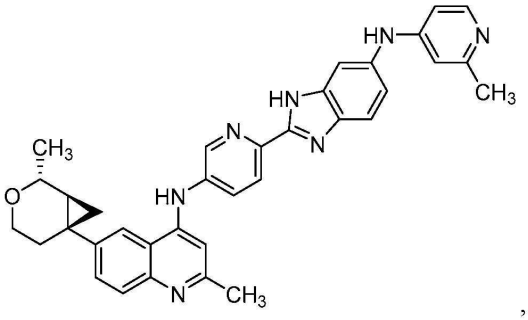

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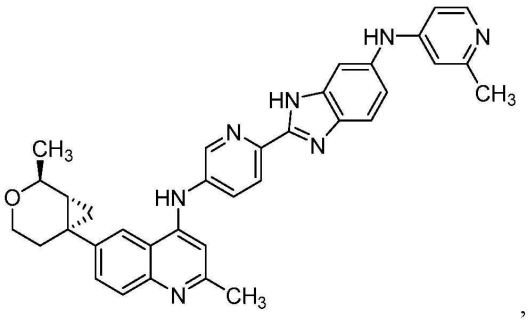

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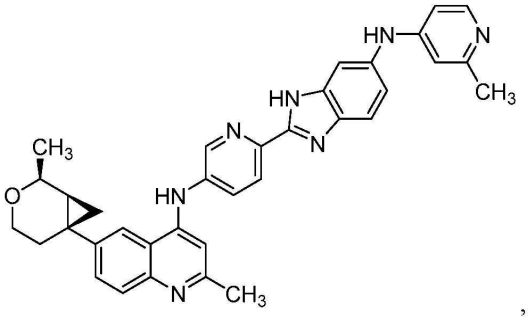

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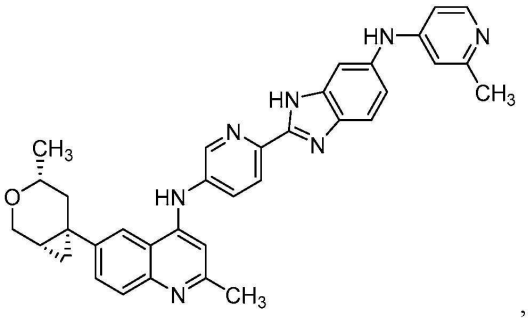

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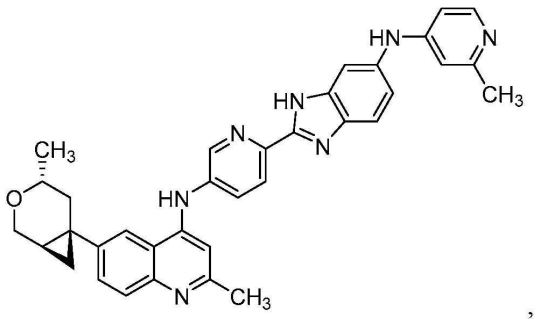

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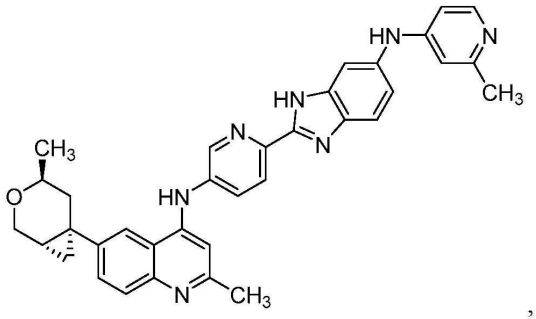

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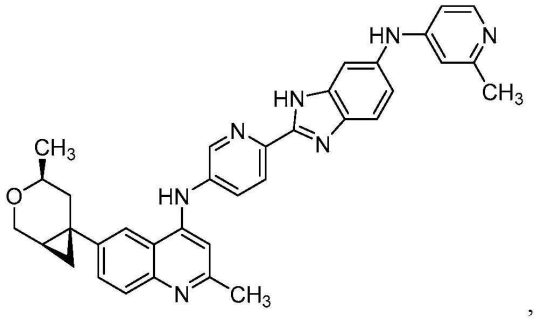

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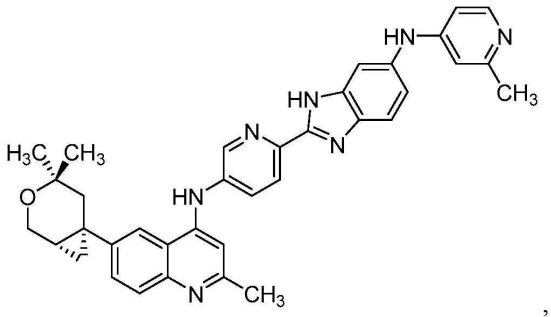

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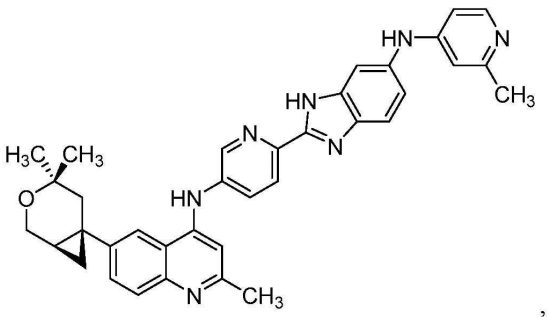
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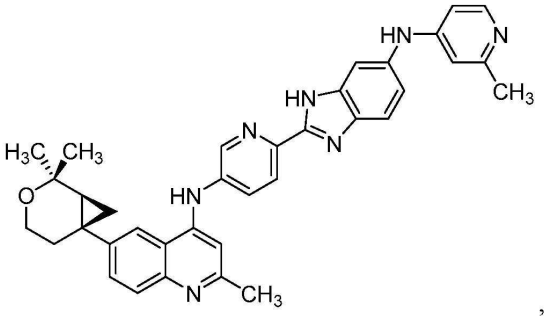

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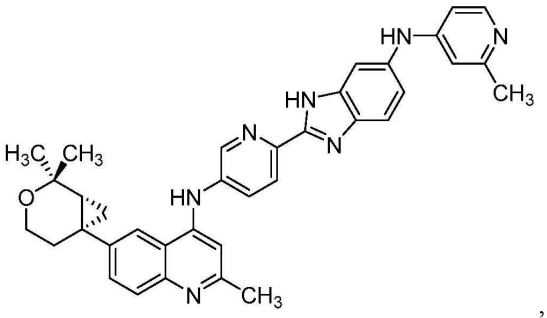

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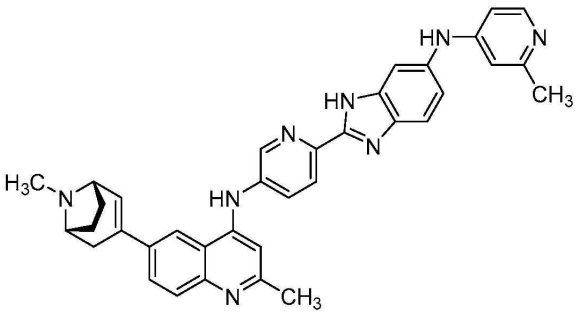

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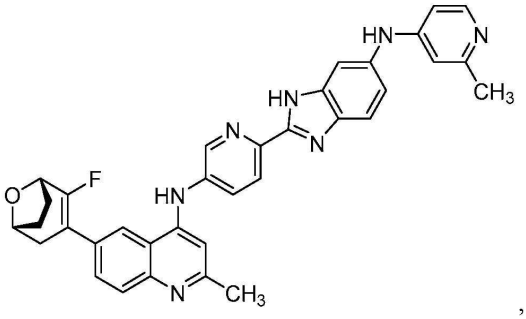

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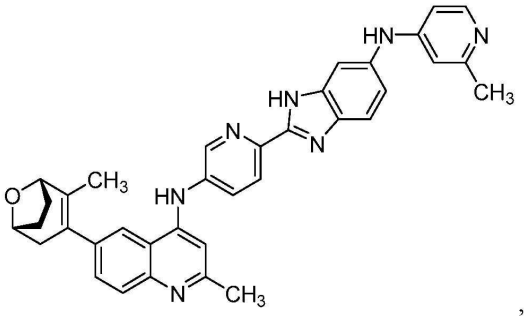

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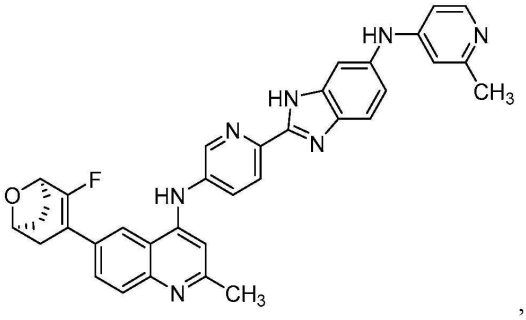

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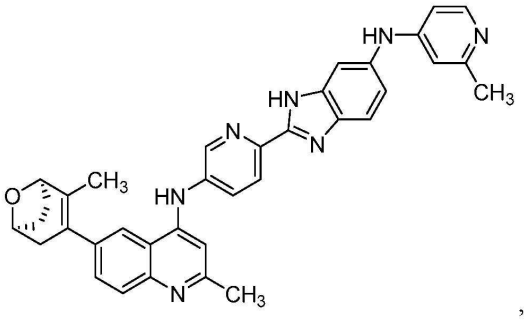

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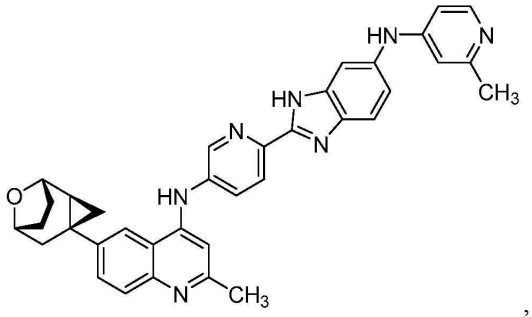

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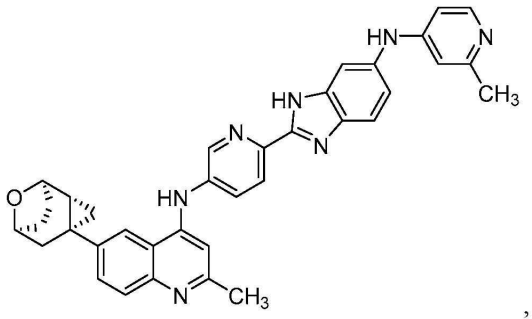

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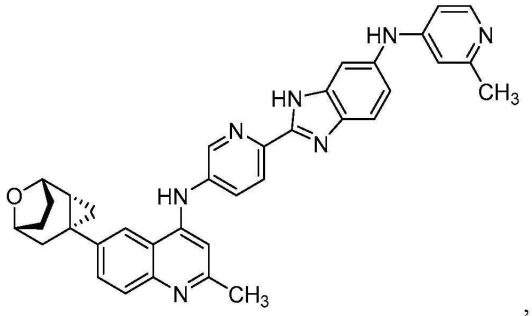

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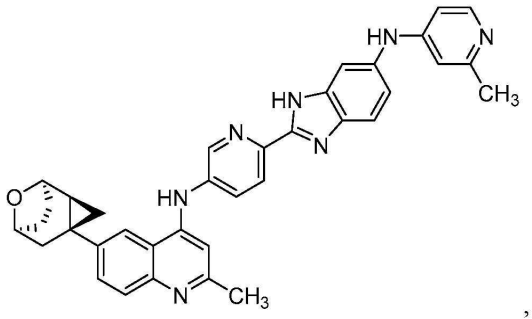

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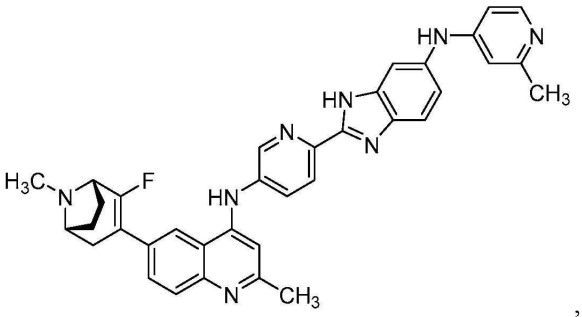

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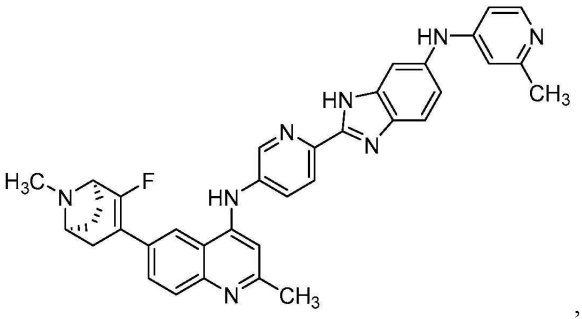

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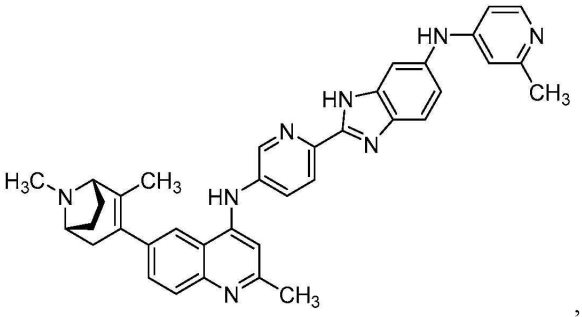

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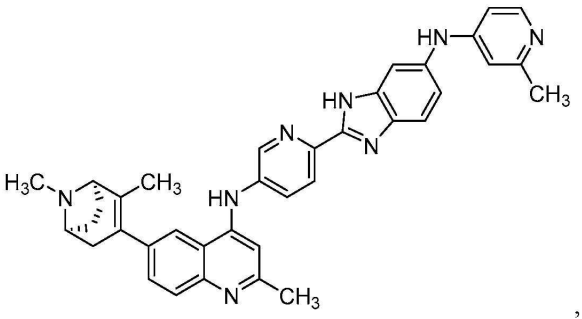

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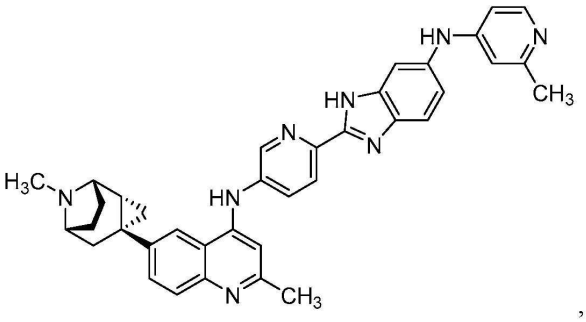

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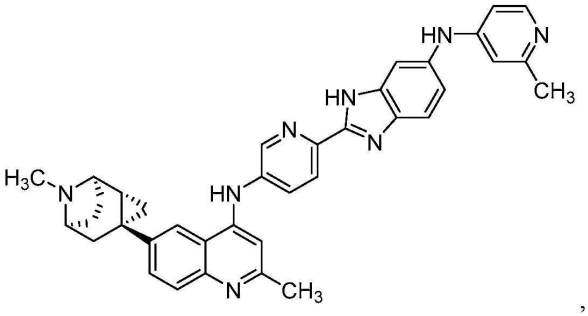

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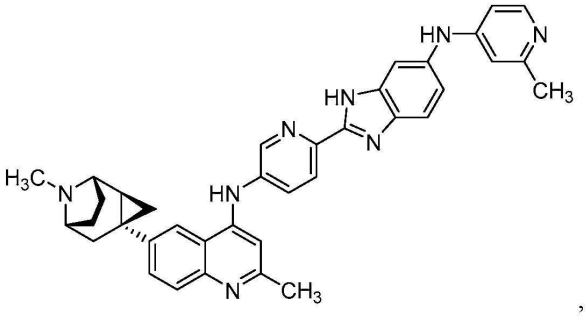

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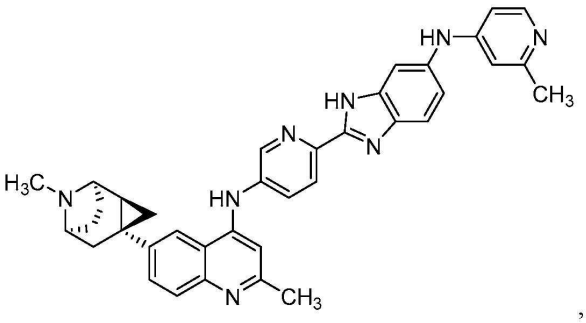

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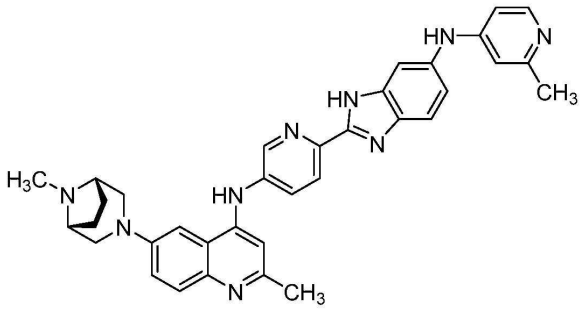

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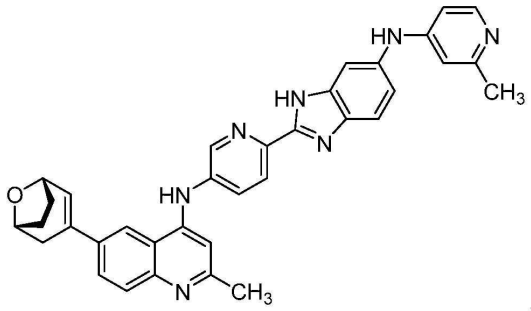

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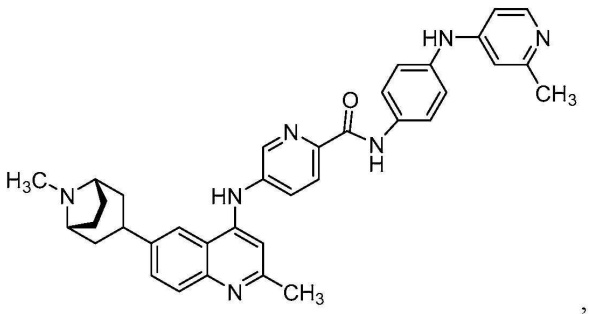

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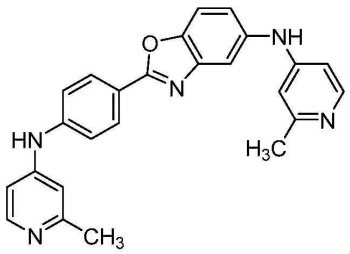

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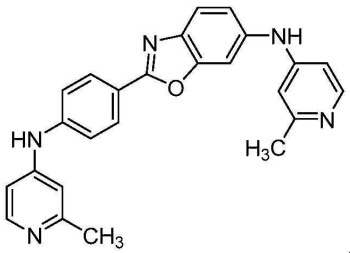
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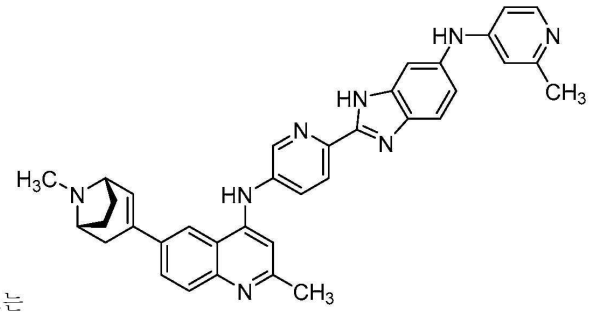

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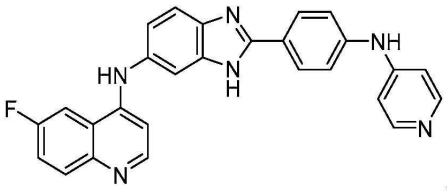
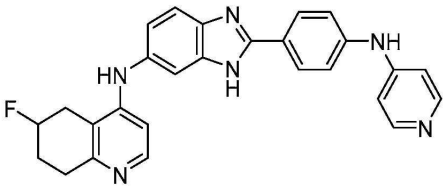
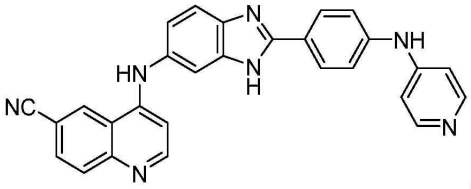
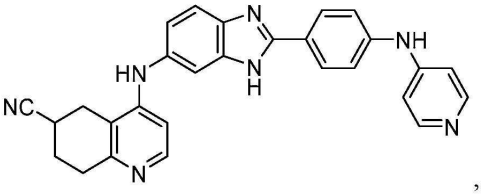
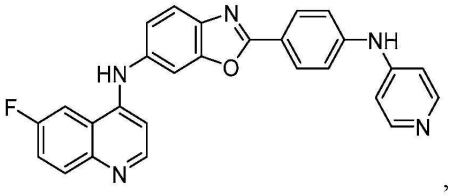
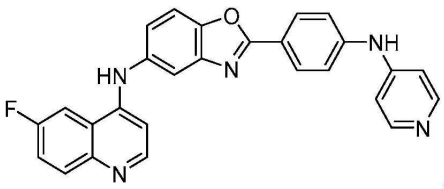
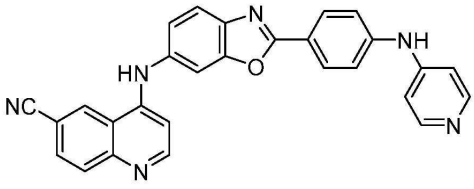
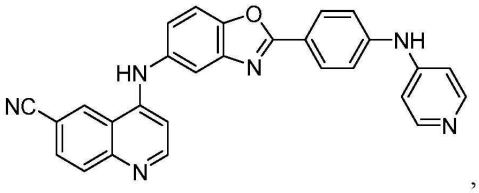
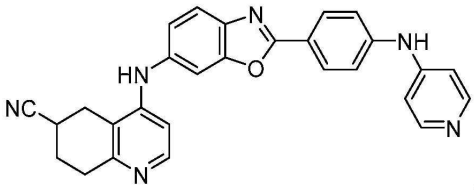
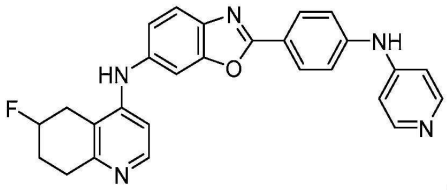
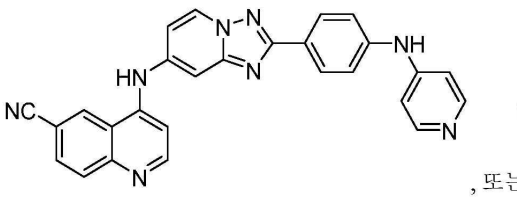
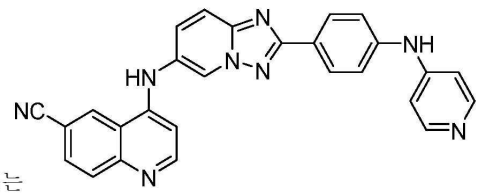

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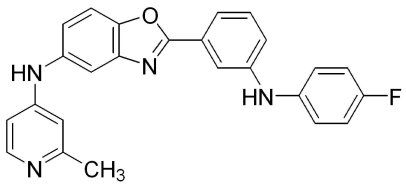
[0264]

[0265] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 Ic의 화합물은 하기 화합물이다:


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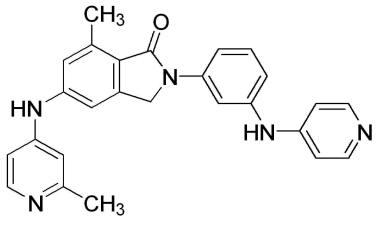
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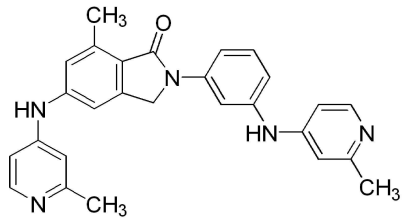
[0267] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 IIc의 화합물은



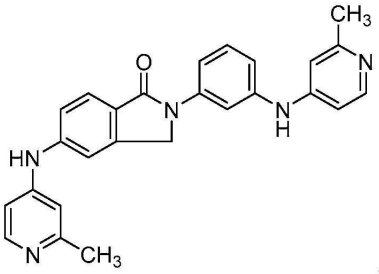
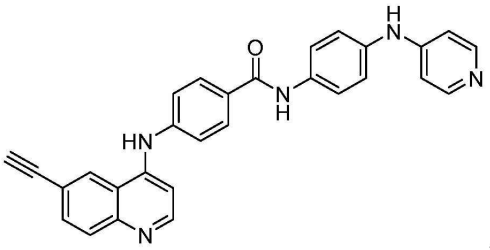
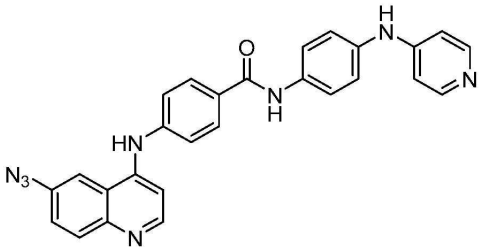
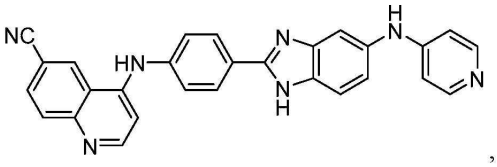
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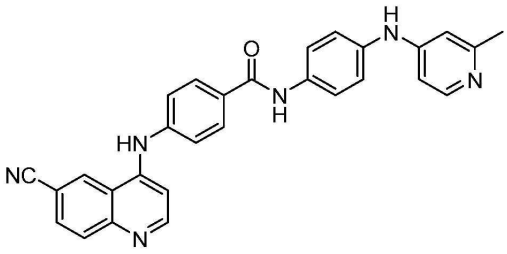
[0268] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화학식 IVa의 화합물은

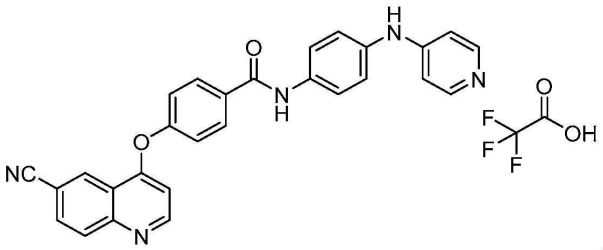


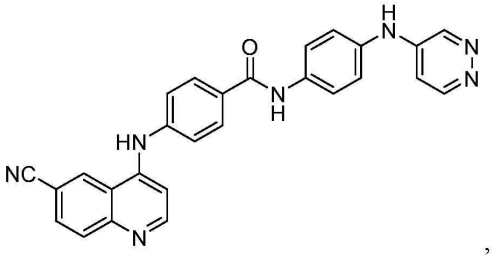
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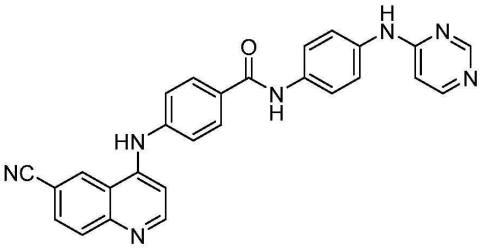
[0269] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 하기 화합물이다:

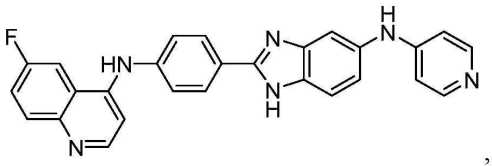
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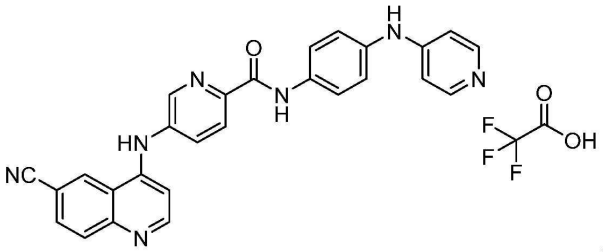
[0270] ,

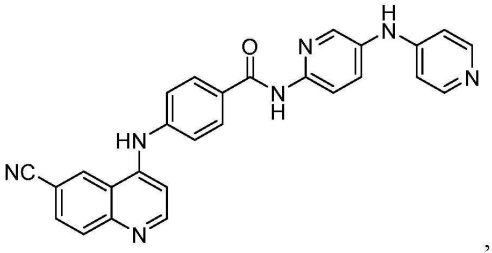

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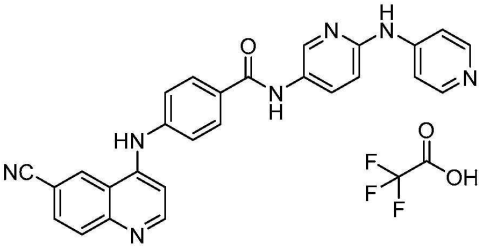

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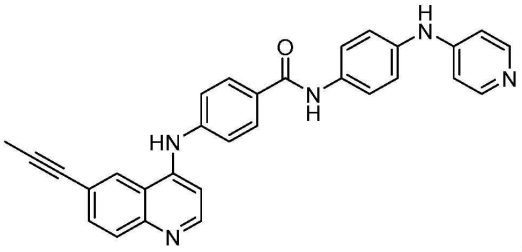

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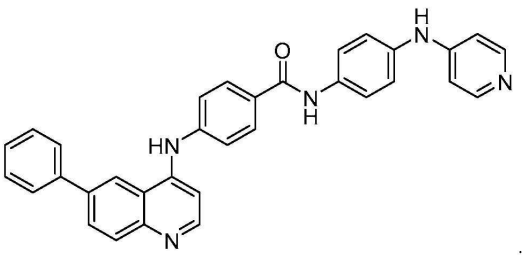

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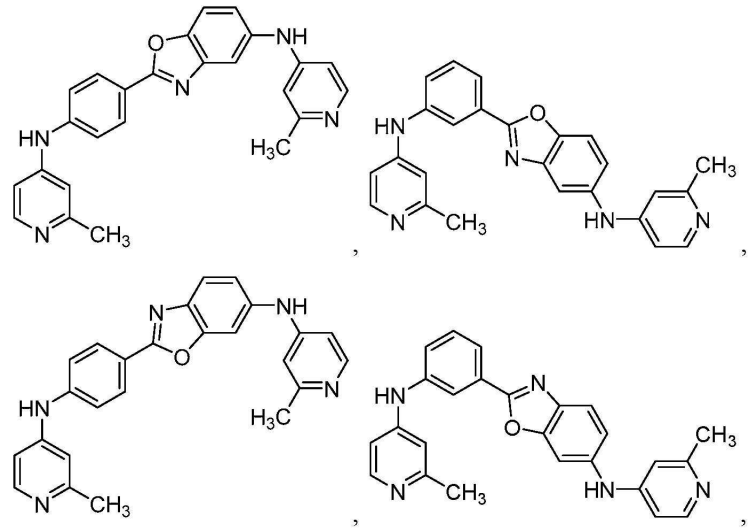
[0271]

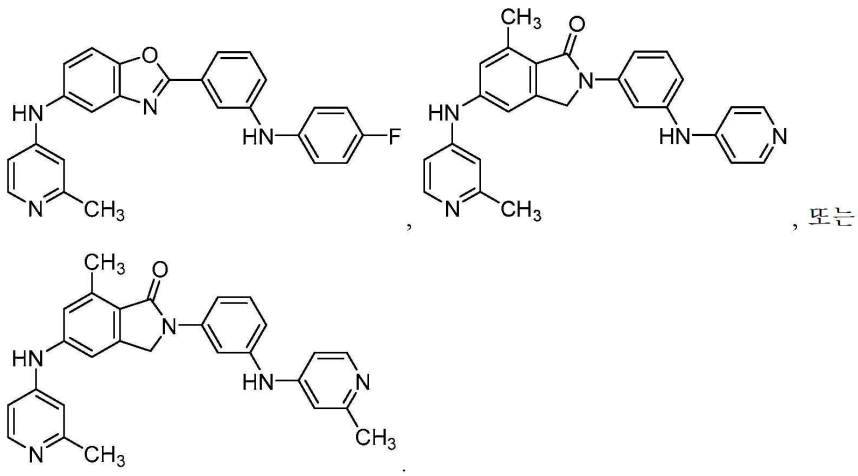

,또는


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[0272]

[0273] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 하기 화합물이다:

[0274] 

[0275] 

[0276] 본원에 개시된 실시양태들 중 어느 한 실시양태에서, 화합물은 각각 실시예 2 내지 9, 11 내지 14, 30, 및 32 내지 145의 화합물 2 내지 9, 11 내지 14, 30, 및 32 내지 145로 이루어진 군으로부터 선택된다.

[0277] 또 다른 측면에서, 질환의 치료를 필요로 하는 대상체에서 질환을 치료하는 방법으로서, 본원에 개시된 실시양태들 중 어느 한 실시양태의 화합물을 유효량으로 상기 대상체에게 투여하는 단계를 포함하는 방법이 기재된다.

[0278] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 신경변성 질환, 악액질, 거식증, 비만증, 비만 합병증, 염증성 질환, 바이러스 유발 염증 반응, 걸프전 증후군, 결절성 경화증, 망막색소변성증, 이식 거부증, 암, 자가면역 질환, 허혈성 조직 손상, 외상성 조직 손상 및 이들의 조합으로 이루어진 군으로부터 선택된다.

[0279] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 신경변성 질환이다.

[0280] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 신경변성 질환은 파킨슨병, 알츠하이머병, 근위축성 측삭경화증, 운동 뉴런 질환, 헌팅톤병, HIV 유발 신경변성, 루이소체 질환, 척수성 근위축증, 프리온병, 척수소뇌성 운동실조증, 가족성 아밀로이드성 다발신경병증, 다발성 경화증 및 이들의 조합으로 이루어진 군으로부터 선택된다.

[0281] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 악액질 또는 거식증이다.

[0282] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 비만증 또는 비만 합병증이다.

[0283] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 비만 합병증은 당불내성, 간 지방증, 이상지질혈증 및 이들의 조합으로 이루어진 군으로부터 선택된다.

[0284] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 염증성 질환이다.

[0285] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 염증성 질환은 아토피성 피부염, 알러지, 천식 및 이들의 조합으로 이루어진 군으로부터 선택된다.

[0286] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 바이러스 유발 염증 반응이다.

[0287] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 바이러스 유발 염증 반응은 SARS 유발 염증성 폐렴, 코로나바이러스병 2019, 또는 이들의 조합이다.

[0288] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 걸프전 증후군 또는 결절성 경화증이다.

[0289] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 망막색소변성증 또는 이식 거부증이다.

[0290] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 허혈성 조직 손상 또는 외상성 조직 손상이다.

[0291] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 암이다.

[0292] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 암은 성인 T-세포 백혈병/림프종, 방광암, 뇌암, 유방암, 자궁경부암, 결장직장암, 식도암, 신장암, 간암, 폐암, 비강인두암, 췌장암, 전립선암, 피부암, 위암, 자궁암, 난소암 및 고환암으로 이루어진 군으로부터 선택된다.

[0293] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 암은 백혈병이다.

[0294] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 백혈병은 성인 T-세포 백혈병/림프종이다.

[0295] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 성인 T-세포 백혈병/림프종은 인간 T-세포 림프친화성 바이러스에 의해 유발된다.

[0296] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 질환은 자가면역 질환이다.

[0297] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 자가면역 질환은 이완불능증, 애디슨병(Addison's disease), 성인 스틸병(Still's disease), 무감마글로불린혈증, 원형 탈모증, 아밀로이드증, 강직성 척추염, 항사구체 기저막 질환, 항세뇨관 기저막 항체 신장염, 항인지질 증후군, 자가면역 혈관부종, 자가면역 자율신경실조증, 자가면역 뇌척수염, 자가면역 간염, 자가면역 내이 질환, 자가면역 심근염, 자가면역 난소염, 자가면역 고환염, 자가면역 췌장염, 자가면역 망막병증, 자가면역 두드러기, 축삭 및 뉴런 신경병증, 발로병(Balo disease), 베체트병(Behcet's disease), 양성 점막 유천포창, 수포성 유천포창, 캐슬만병(Castleman disease), 셀리악병, 샤가스병(Chagas disease), 만성 염증성 탈수초 다발신경병증, 만성 재발성 다초점성 골수염, 척-스트라우스(Churg-Strauss) 증후군, 호산구 육아종증, 반흔성 유천포창, 코간(Cogan) 증후군, 한랭 응집소증, 선천성 심장 차단, 콕삭키(Coxsackie) 심근염, CREST 증후군, 크론병(Crohn's disease), 포진성 피부염, 피부근육염, 데빅병(Devic's disease)(시신경 척수염), 원판상 루푸스, 드레슬러(Dressler) 증후군, 자궁내막증, 호산구 식도염, 호산구 근막염, 결절성 홍반, 본태성 혼합형 한랭글로불린혈증, 에반스(Evans) 증후군, 섬유근육통, 섬유성 폐포염, 거대 세포 동맥염(측두 동맥염), 거대 세포 심근염, 사구체신염, 굿파스처(Goodpasture) 증후군, 다발 혈관염을 갖는 육아종증, 그레이브스병(Graves' disease), 길랑-바레(Guillain-Barre) 증후군, 하시모토(Hashimoto) 갑상선염, 용혈성 빈혈, 헤노흐-쉰라인(Henoch-Schonlein) 자반증, 임신 유천포창, 화농성 한선염(아크네 인버사), 저감마글로불린혈증, IgA 신병증, IgG4 연관 경화성 질환, 면역 혈소판감소성 자반증, 봉입체 근육염, 간질성 방광염, 소아 관절염, 소아 당뇨병(1형 당뇨병), 소아 근육염, 가와사키병(Kawasaki disease), 람베르트-이튼(Lambert-Eaton) 증후군, 백혈구파괴 혈관염, 편평 태선, 경화 태선, 목질 결막염, 선상 IgA 질환, 루푸스, 만성 라임병(Lyme disease), 메니에르병(Meniere's disease), 현미경적 다발 혈관염, 혼합 결합 조직 질환, 무렌(Mooren) 궤양, 무카-하베르만병(Mucha-Habermann disease), 다초점 운동 신경병증, 다발성 경화증, 중증 근육무력증, 근육염, 기면증, 신생아 루푸스, 시신경 척수염, 호중구감소증, 안 반흔성 유천포창, 시신경염, 재발성 류마티즘, 소아 자가면역 신경정신 질환, 부종양성 소뇌 변성, 발작성 야간 혈색소뇨증, 패리 롬버그(Parry Romberg) 증후군, 편평부염(주변 포도막염), 파르소니지-터너(Parsonage-Turner) 증후군, 천포창, 말초 신경병증, 정맥주위성 뇌척수염, 악성 빈혈, POEMS 증후군, 결절성 다발동맥염, I형 다선 증후군, II형 다선 증후군, III형 다선 증후군, 류마티스성 다발근육통, 다발성 근육염, 심근경색증후 증후군, 심낭막절개술후 증후군, 원발성 담즙성 간경변증, 원발성 경화성 담관염, 프로게스테론 피부염, 건선, 건선성 관절염, 순수 적혈구 무형성증, 괴저성 농피증, 레이노병, 반응성 관절염, 반사 교감신경 위축증, 재발성 다발연골염, 하지 불안 증후군, 후복막 섬유증, 류마티스열, 류마티스 관절염, 사르코이드증, 슈미트(Schmidt) 증후군, 공막염, 공피증, 쇼그렌(Sjogren) 증후군, 정자 및 고환 자가면역 질환, 강직 인간 증후군, 아급성 세균성 심내막염, 스삭(Susac) 증후군, 교감성 안염, 타카야스(Takayasu) 동맥염, 측두 동맥염(거대 세포 동맥

염), 혈소판감소성 자반증, 톨로사-헌트(Tolosa-Hunt) 증후군, 횡단성 척수염, 궤양성 대장염, 미분화 결합 조직 질환, 포도막염, 혈관염, 백반증, 보그트-고야나기-하라다병(Vogt-Koyanagi-Harada disease) 및 이들의 조합으로 이루어진 군으로부터 선택된다.

[0298] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 화합물은 면역 세포에서 Akt3을 조절한다.

[0299] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 면역 세포는 T 세포, B 세포, 대식세포 및 신경아교세포로 이루어진 군으로부터 선택된다.

[0300] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 신경아교세포는 성상세포, 미세아교세포 또는 희소돌기아교세포이다.

[0301] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, T 세포는 T 조절 세포이다.

[0302] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 화합물은 Akt3 신호전달을 활성화시킨다.

[0303] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 화합물은 Akt3 신호전달을 억제한다.

[0304] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 화합물은 T 조절 세포 활성 또는 생성을 증가시킨다.

[0305] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 화합물은 T 조절 세포 활성 또는 생성을 감소시킨다.

[0306] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 상기 방법은 제2 치료제를 대상체에게 투여하는 단계를 추가로 포함한다.

[0307] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 제2 치료제는 영양 보충제, 화학요법제, 항염제, 면역억제제, 콜린에스터라제(cholinesterase) 억제제, 항우울제, 항불안제, 항정신병제, 릴루졸(riluzole), 에다바론(edavarone), 도파민 아고니스트, MAO B 억제제, 카테콜 O-메틸트랜스퍼라제(methyltransferase) 억제제, 항콜린작용제, 항경련제, 테트라베나진(tetrabenazine), 카르비도파-레보도파(carbidopa-levodopa), 항경직제, 항체, 융합 단백질, 효소, 핵산, 리보핵산, 항증식제, 세포독성제, 식욕 자극제, 5-HT3 길항제, Cox-2 억제제 및 이들의 조합으로 이루어진 군으로부터 선택된다.

[0308] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, 상기 방법은 대상체를 면역 치료제, 면역 조절제, 보조자극 활성화 아고니스트, 사이토카인, 케모카인, 케모카인 인자, 종양용해성 바이러스, 생물제제(biologics), 백신, 소분자, 표적화 요법, 항염제, 세포 요법, 화학요법제 또는 방사선 요법으로 치료하는 단계를 추가로 포함한다.

[0309] 본원에 개시된 실시양태들 중 어느 한 실시양태는 본원에 개시된 임의의 다른 실시양태와 적절하게 조합될 수 있다. 본원에 개시된 실시양태들 중 어느 한 실시양태와 본원에 개시된 임의의 다른 실시양태의 조합이 명확히 예상된다. 구체적으로, 하나의 치환기에 대한 하나 이상의 실시양태의 선택은 임의의 다른 치환기에 대한 하나 이상의 특정 실시양태의 선택과 적절하게 조합될 수 있다. 이러한 조합은 본원에 기재된 적용 또는 본원에 기재된 임의의 화학식의 어느 하나 이상의 실시양태에서 만들어질 수 있다.

도면의 간단한 설명

[0310] 본원은 예시의 목적으로만 제공되며 제한하고자 하는 것이 아닌 하기 도면을 참조함으로써 설명된다. 도면에서:

도 1은 본원에 기재된 하나 이상의 실시양태에 따라, 항-CD3/항-CD28/IL-2/TGFβ의 존재 하에 화합물 131, 51, 42, 56, 50, 55, 53, 57, 5, 15, 18, 19 및 24로 처리된 인간 CD4 T 세포로부터의 iTreg 유도(FoxP3)의 평가를 보여준다. 화합물 15를 20 nM, 100 nM, 500 nM 및 1000 nM의 농도에서 평가하였다. 화합물 18 및 24를 20 nM, 100 nM 및 500 nM의 농도에서 평가하였다.

도 2는 본원에 기재된 하나 이상의 실시양태에 따라, 항-CD3/항-CD28/IL-2/TGFβ의 존재 하에 화합물 131, 72, 65, 63, 67, 70, 68, 77, 69, 84, 62, 83, 78 및 79로 처리된 인간 CD4 T 세포로부터의 iTreg 유도(FoxP3)의 평가를 보여준다. 화합물 77을 20 nM, 100 nM, 500 nM 및 1000 nM의 농도에서 평가하였다. 화합물 84 및 83을 20 nM, 100 nM 및 500 nM의 농도에서 평가하였다.

도 3은 본원에 기재된 하나 이상의 실시양태에 따라, 항-CD3/항-CD28/IL-2/TGFβ의 존재 하에 화합물 131, 103, 89, 104, 93, 94, 92, 102, 90, 110, 87, 88, 91, 111, 96 및 97로 처리된 인간 CD4 T 세포로부터의 iTreg 유도(FoxP3)의 평가를 보여준다. 화합물 93, 94, 92, 102 및 97을 20 nM, 100 nM, 500 nM 및 1000 nM의 농도에서

평가하였다. 화합물 110, 87 및 91을 20 nM, 100 nM 및 500 nM의 농도에서 평가하였다. 화합물 88을 20 nM 및 100 nM의 농도에서 평가하였다.

도 4는 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 131, 24, 69, 70, 87, 90, 97 및 102로 처리된 인간 CD4 T 세포에서의 iTreg 유도의 평가를 보여준다. 화합물 97 및 102를 20 nM, 100 nM, 500 nM 및 1000 nM의 농도에서 평가하였다. 화합물 24, 87 및 90을 20 nM, 100 nM 및 500 nM의 농도에서 평가하였다.

도 5는 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 131, 24, 69, 70, 87, 90, 97 및 102로 처리된 인간 CD4 T 세포에서의 FoxP3 단백질 수준의 평가를 보여준다.

도 6은 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 131, 24, 69, 87, 90, 97 및 102의 Akt 동형체 특이성의 평가를 보여준다.

도 7은 본원에 기재된 하나 이상의 실시양태에 따라, 항-CD3/항-CD28/IL-2 자극의 존재 하에 24시간 동안 화합물 131, 24, 69, 70, 87, 90, 97 및 102로 처리된 인간 nTreg 세포로부터의 상청액에서 IL-10의 평가를 보여준다.

도 8은 본원에 기재된 하나 이상의 실시양태에 따라, 항-CD3/항-CD28/IL-2 자극의 존재 하에 48시간 동안 화합물 131, 24, 69, 70, 87, 90, 97 및 102로 처리된 인간 nTreg 세포로부터의 상청액에서 IL-10의 평가를 보여준다.

도 9는 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 131, 24, 69, 70, 87, 90, 97 및 102를 사용한 PO 치료(10 mg/kg) 후 0일째 날부터 4일째 날까지 마우스의 비장에서 Treg의 생체내 변화를 보여준다.

도 10은 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 131, 24, 69, 70, 87, 90, 97 및 102를 사용한 IV 치료(1 mg/kg) 후 0일째 날부터 3일째 날까지 마우스의 비장에서 Treg의 생체내 변화를 보여준다.

도 11은 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 131, 132, 133 및 134를 사용하여 단일 경구 위관영양법으로 치료한 지 2일 후 C57/B16 마우스의 단리된 비장에서 Treg 활성화(비치료 대조군으로 정규화됨; 유세포분석에 의해 측정됨)의 평가를 보여준다.

도 12는 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 131, 121 및 127을 사용하여 단일 경구 위관영양법으로 치료한 지 2일 후 C57/B16 마우스의 단리된 비장에서 Treg 활성화(비치료 대조군으로 정규화됨; 유세포분석에 의해 측정됨)의 평가를 보여준다.

도 13은 본원에 기재된 하나 이상의 실시양태에 따라, 치료한 지(화합물 131, 123, 126 및 129를 사용한 PO) 2일 후 C57/B16 마우스의 단리된 비장에서 Treg 활성화(비치료 대조군으로 정규화됨; 유세포분석에 의해 측정됨)의 평가를 보여준다.

도 14는 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 138을 사용한 치료에 대한 반응으로 Treg 활성화의 평가를 보여준다.

도 15는 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 139 내지 143으로 처리된 인간 CD4 T 세포로부터의 iTreg 유도(FoxP3)의 평가를 보여준다.

도 16은 본원에 기재된 하나 이상의 실시양태에 따라, 화합물 144 및 145로 처리된 인간 CD4 T 세포로부터의 iTreg 유도의 평가를 보여준다.

발명을 실시하기 위한 구체적인 내용

[0311] **정의**

[0312] 본 개시내용은 본원에 기재된 조성물 및 방법뿐만 아니라 기재된 실험 조건으로도 제한되지 않으며, 그 자체가 변경될 수 있음을 인식해야 한다. 본 개시내용의 범위는 첨부된 청구범위에 의해서만 제한될 것이기 때문에, 본원에서 사용된 용어는 특정 실시양태만을 설명하기 위한 것이고 제한하기 위한 것이 아님을 이해해야 한다.

[0313] 달리 정의되지 않는 한, 본원에서 사용된 모든 기술 및 과학 용어는 본 개시내용이 속하는 분야에서 통상의 기술을 가진 자에 의해 일반적으로 이해되는 의미와 동일한 의미를 가진다. 본원에 기재된 조성물, 방법 및 재료와 유사하거나 동등한 임의의 조성물, 방법 및 재료가 본 발명의 실시 또는 시험에 사용될 수 있다.

[0314] 본원에 달리 표시되거나 문맥에 의해 명확히 모순되지 않는 한, 청구된 본 발명을 설명하는 문맥에서(특히 청구

범위의 문맥에서) 단수형 용어 및 유사한 지시대상의 사용은 단수형 및 복수형 둘 다를 커버하는 것으로 해석되어야 한다.

[0315] 본원에 달리 표시되지 않는 한, 본원에서 값의 범위의 언급은 단지 범위 내에 속하는 각각의 별개의 값을 개별적으로 언급하는 속기 방법으로서 역할을 하기 위한 것이고, 각각의 별개의 값은 본원에 개별적으로 인용되는 것처럼 본 명세서에 포함된다.

[0316] 용어 "약"의 사용은 약 ±10%의 범위 내에서 언급된 값보다 더 높거나 더 낮은 값을 설명하기 위한 것이다. 일부 실시양태에서, 값은 약 ±5%의 범위 내에서 언급된 값보다 더 높거나 더 낮을 수 있다. 일부 실시양태에서, 값은 약 ±2%의 범위 내에서 언급된 값보다 더 높거나 더 낮을 수 있다. 다른 실시양태에서, 값은 약 ±1%의 범위 내에서 언급된 값보다 더 높거나 더 낮을 수 있다. 앞의 범위는 문맥에 의해 명확해지기 위한 것이고, 추가 제한은 내포되지 않는다. 본원에 달리 표시되거나 문맥에 의해 명확히 모순되지 않는 한, 본원에 기재된 모든 방법은 임의의 적합한 순서로 수행될 수 있다. 달리 표시되지 않는 한, 본원에서 제공된 임의의 모든 예 또는 예시적인 용어(예를 들어, "예시적인", "예컨대", "예를 들어", "포함하나, 이들로 제한되지 않는")의 사용은 단지 본 발명을 더 잘 설명하기 위한 것이고 본 발명의 범위를 제한하지 않는다.

[0317] 다음은 본 명세서에서 사용된 용어의 정의이다. 달리 표시되지 않는 한, 본원에서 기 또는 용어에 대해 제공된 처음 정의는 본 명세서 전체에 걸쳐 개별적으로 또는 또 다른 기의 일부로서 해당 기 또는 용어에 적용된다. 달리 정의되지 않는 한, 본원에서 사용된 모든 기술 및 과학 용어는 당분야에서 통상의 기술을 가진 자에 의해 일반적으로 이해되는 의미와 동일한 의미를 가진다.

[0318] 용어 "알킬" 및 "알크"는 1개 내지 12개의 탄소 원자, 바람직하게는 1개 내지 6개의 탄소 원자를 함유하는 직쇄 또는 분지쇄 알칸(탄화수소) 라디칼을 지칭한다. 예시적인 "알킬" 기는 메틸, 에틸, 프로필, 이소프로필, n-부틸, t-부틸, 이소부틸, 펜틸, 헥실, 이소헥실, 헵틸, 4,4-디메틸펜틸, 옥틸, 2,2,4-트리메틸펜틸, 노닐, 데실, 운데실, 도데실 등을 포함한다. 용어 "(C_1-C_4)알킬"은 1개 내지 4개의 탄소 원자를 함유하는 직쇄 또는 분지쇄 알칸(탄화수소) 라디칼, 예컨대, 메틸, 에틸, 프로필, 이소프로필, n-부틸, t-부틸 및 이소부틸을 지칭한다. "치환된 알킬"은 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 4개의 치환기로 치환된 알킬 기를 지칭한다. 예시적인 치환기는 하기 기들 중 하나 이상을 포함하나, 이들로 제한되지 않는다: 수소, 할로겐(예를 들어, 단일 할로겐 치환기, 또는 CF_3 또는 CCl_3을 가진 알킬 기와 같은 기를 형성하는 다수의 할로 치환기), 시아노, 니트로, 옥소(즉, =O), CF_3, OCF_3, 사이클로알킬, 비사이클로알킬, 스피로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클, 아릴, OR_a, SR_a, $S(=O)R_e$, $S(=O)_2R_e$, $P(=O)_2R_e$, $S(=O)_2OR_e$, $-N=S(=O)(R_a)$, $S(=O)(=NR_a)(=N(R_a)_2)$(S 또는 N를 통해 분자에 연결됨), $P(=O)_2OR_e$, NR_bR_c, $NR_bS(=O)_2R_e$, $NR_bP(=O)_2R_e$, $S(=O)_2NR_bR_c$, $P(=O)_2NR_bR_c$, $C(=O)OR_d$, $C(=O)R_a$, $C(=O)NR_bR_c$, $OC(=O)R_a$, $OC(=O)NR_bR_c$, $NR_bC(=O)OR_e$, $NR_dC(=O)NR_bR_c$, $NR_dS(=O)_2NR_bR_c$, $NR_dP(=O)_2NR_bR_c$, $NR_bC(=O)R_a$, 또는 $NR_bP(=O)_2R_e$, 여기서 R_a의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이고; R_b, R_c 및 R_d의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 헤테로사이클 또는 아릴이거나, 상기 R_b와 R_c는 이들에 결합된 N와 함께 임의로 헤테로사이클을 형성하고, R_e의 각 경우는 독립적으로 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이다. 일부 실시양태에서, 알킬, 사이클로알킬, 알케닐, 알키닐, 사이클로알케닐, 헤테로사이클 및 아릴과 같은 기는 그 자체가 임의로 치환될 수 있다.

[0319] 용어 "헤테로알킬"은 쇄 내에 바람직하게는 2개 내지 12개의 탄소, 보다 바람직하게는 2개 내지 10개의 탄소를 갖고 이들 중 하나 이상이 S, O, P 및 N로 이루어진 군으로부터 선택된 헤테로원자로 대체되어 있는 직쇄 또는 분지쇄 알킬 기를 지칭한다. 예시적인 헤테로알킬은 알킬 에테르, 2차 및 3차 알킬 아민, 알킬 설파이드 등을 포함하나, 이들로 제한되지 않는다. 기는 말단 기 또는 가교 기일 수 있다. 일부 실시양태에서, 헤테로알킬은 임의로 치환된다.

[0320] 용어 "알케닐"은 2개 내지 12개의 탄소 원자 및 적어도 하나의 탄소-탄소 이중 결합을 함유하는 직쇄 또는 분지쇄 탄화수소 라디칼을 지칭한다. 예시적인 이러한 기는 에테닐 또는 알릴을 포함한다. 용어 "C_2-C_6 알케닐"은 2개 내지 6개의 탄소 원자 및 적어도 하나의 탄소-탄소 이중 결합을 함유하는 직쇄 또는 분지쇄 탄화수소 라디칼, 예컨대, 에틸레닐, 프로페닐, 2-프로페닐, (*E*)-부트-2-에닐, (*Z*)-부트-2-에닐, 2-메틸(*E*)-부트-2-에닐, 2-메틸(*Z*)-부트-2-에닐, 2,3-디메틸-부트-2-에닐, (*Z*)-펜트-2-에닐, (*E*)-펜트-1-에닐, (*Z*)-헥스-1-에닐, (*E*)-

펜트-2-에닐, (*Z*)-헥스-2-에닐, (*E*)-헥스-2-에닐, (*Z*)-헥스-1-에닐, (*E*)-헥스-1-에닐, (*Z*)-헥스-3-에닐, (*E*)-헥스-3-에닐, 및 (*E*)-헥스-1,3-디에닐을 지칭한다. "치환된 알케닐"은 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 4개의 치환기로 치환된 알케닐 기를 지칭한다. 예시적인 치환기는 하기 기들 중 하나 이상을 포함하나, 이들로 제한되지 않는다: 수소, 할로겐, 알킬, 할로겐화된 알킬(즉, 단일 할로겐 치환기 또는 다수의 할로겐 치환기를 가진 알킬 기, 예컨대, CF_3 또는 CCl_3), 시아노, 니트로, 옥소(즉, =O), CF_3, OCF_3, 사이클로알킬, 비사이클로알킬, 스피로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클, 아릴, OR_a, SR_a, $S(=O)R_e$, $S(=O)_2R_e$, $-N=S(=O)(R_a)$, $-R_aS(=O)(=NR_a)$, $S(=O)(=NR_a)(=N(R_a)_2)$(R_a 또는 N를 통해 분자에 연결됨), $P(=O)_2R_e$, $S(=O)_2OR_e$, $P(=O)_2OR_e$, NR_bR_c, $NR_bS(=O)_2R_e$, $NR_bP(=O)_2R_e$, $S(=O)_2NR_bR_c$, $P(=O)_2NR_bR_c$, $C(=O)OR_d$, $C(=O)R_a$, $C(=O)NR_bR_c$, $OC(=O)R_a$, $OC(=O)NR_bR_c$, $NR_bC(=O)OR_e$, $NR_dC(=O)NR_bR_c$, $NR_dS(=O)_2NR_bR_c$, $NR_dP(=O)_2NR_bR_c$, $NR_bC(=O)R_a$ 또는 $NR_bP(=O)_2R_e$, 여기서 R_a의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이고; R_b, R_c 및 R_d의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 헤테로사이클 또는 아릴이거나, 상기 R_b와 R_c는 이들에 결합된 N와 함께 임의로 헤테로사이클을 형성하고; R_e의 각 경우는 독립적으로 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이다. 예시적인 치환기는 그 자체가 임의로 치환될 수 있다.

[0321] 용어 "알키닐"은 2개 내지 12개의 탄소 원자 및 적어도 하나의 탄소-탄소 삼중 결합을 함유하는 직쇄 또는 분지쇄 탄화수소 라디칼을 지칭한다. 예시적인 기는 에티닐을 포함한다. 용어 "C_2-C_6 알키닐"은 2개 내지 6개의 탄소 원자 및 적어도 하나의 탄소-탄소 삼중 결합을 함유하는 직쇄 또는 분지쇄 탄화수소 라디칼, 예컨대, 에티닐, 프로프-1-이닐, 프로프-2-이닐, 부트-1-이닐, 부트-2-이닐, 펜트-1-이닐, 펜트-2-이닐, 헥스-1-이닐, 헥스-2-이닐 또는 헥스-3-이닐을 지칭한다. "치환된 알키닐"은 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 4개의 치환기로 치환된 알키닐을 지칭한다. 예시적인 치환기는 하기 기들 중 하나 이상을 포함하나, 이들로 제한되지 않는다: 수소, 할로겐(예를 들어, 단일 할로겐 치환기, 또는 CF_3 또는 CCl_3을 가진 알킬 기와 같은 기를 형성하는 다수의 할로 치환기), 시아노, 니트로, 옥소(즉, =O), CF_3, OCF_3, 사이클로알킬, 비사이클로알킬, 스피로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클, 아릴, OR_a, SR_a, $S(=O)R_e$, $S(=O)_2R_e$, $P(=O)_2R_e$, $S(=O)_2OR_e$, $-N=S(=O)(R_a)$, $-R_aS(=O)(=NR_a)$, $S(=O)(=NR_a)(=N(R_a)_2)$(R_a 또는 N를 통해 분자에 연결됨), $P(=O)_2OR_e$, NR_bR_c, $NR_bS(=O)_2R_e$, $NR_bP(=O)_2R_e$, $S(=O)_2NR_bR_c$, $P(=O)_2NR_bR_c$, $C(=O)OR_d$, $C(=O)R_a$, $C(=O)NR_bR_c$, $OC(=O)R_a$, $OC(=O)NR_bR_c$, $NR_bC(=O)OR_e$, $NR_dC(=O)NR_bR_c$, $NR_dS(=O)_2NR_bR_c$, $NR_dP(=O)_2NR_bR_c$, $NR_bC(=O)R_a$, 또는 $NR_bP(=O)_2R_e$, 여기서 R_a의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이고; R_b, R_c 및 R_d의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 헤테로사이클 또는 아릴이거나, 상기 R_b와 R_c는 이들에 결합된 N와 함께 임의로 헤테로사이클을 형성하고; R_e의 각 경우는 독립적으로 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이다. 예시적인 치환기는 그 자체가 임의로 치환될 수 있다.

[0322] 용어 "사이클로알킬"은 1개 내지 4개의 고리 및 고리당 3개 내지 8개의 탄소를 함유하는 전체 포화 환형 탄화수소 기를 지칭한다. "C_3-C_7 사이클로알킬"은 사이클로프로필, 사이클로부틸, 사이클로펜틸, 사이클로헥실 또는 사이클로헵틸을 지칭한다. "치환된 사이클로알킬"은 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 4개의 치환기로 치환된 사이클로알킬 기를 지칭한다. 예시적인 치환기는 하기 기들 중 하나 이상을 포함하나, 이들로 제한되지 않는다: 수소, 할로겐(예를 들어, 단일 할로겐 치환기, 또는 CF_3 또는 CCl_3을 가진 알킬 기와 같은 기를 형성하는 다수의 할로 치환기), 시아노, 니트로, 옥소(즉, =O), CF_3, OCF_3, 사이클로알킬, 비사이클로알킬, 스피로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클, 아릴, OR_a, SR_a, $S(=O)R_e$, $S(=O)_2R_e$, $-N=S(=O)(R_a)$, $-R_aS(=O)(=NR_a)$, $S(=O)(=NR_a)(=N(R_a)_2)$(R_a 또는 N를 통해 분자에 연결됨), $P(=O)_2R_e$, $S(=O)_2OR_e$, $P(=O)_2OR_e$, NR_bR_c, $NR_bS(=O)_2R_e$, $NR_bP(=O)_2R_e$, $S(=O)_2NR_bR_c$, $P(=O)_2NR_bR_c$, $C(=O)OR_d$, $C(=O)R_a$, $C(=O)NR_bR_c$, $OC(=O)R_a$, $OC(=O)NR_bR_c$, $NR_bC(=O)OR_e$, $NR_dC(=O)NR_bR_c$, $NR_dS(=O)_2NR_bR_c$, $NR_dP(=O)_2NR_bR_c$, $NR_bC(=O)R_a$ 또는 $NR_bP(=O)_2R_e$, 여기서 R_a의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이고; R_b, R_c 및 R_d의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 헤테로

사이클 또는 아릴이거나, 상기 R_b와 R_c는 이들에 결합된 N와 함께 임의로 헤테로사이클을 형성하고; R_e의 각 경우는 독립적으로 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이다. 예시적인 치환기는 그 자체가 임의로 치환될 수 있다. 예시적인 치환기는 스피로-부착된 또는 융합된 환형 치환기, 특히 스피로-부착된 사이클로알킬, 스피로-부착된 사이클로알케닐, 스피로-부착된 헤테로사이클(헤테로아릴 제외), 융합된 사이클로알킬, 융합된 사이클로알케닐, 융합된 헤테로사이클 또는 융합된 아릴도 포함하고, 여기서 상기 언급된 치환기, 예컨대, 사이클로알킬, 사이클로알케닐, 헤테로사이클 및 아릴 치환기는 그 자체가 임의로 치환될 수 있다.

[0323] 용어 "비사이클로알킬" 또는 "스피로알킬"은 적어도 하나의 다른 사이클로알킬 고리와 하나 이상의 고리 원자를 공유하는 적어도 하나의 사이클로알킬 고리를 함유하는 기를 지칭한다. 용어 "헤테로비사이클로알킬" 또는 "헤테로스피로알킬"은 적어도 하나의 고리에서 적어도 하나, 바람직하게는 1개 내지 3개의 탄소 원자가 N, S, O 또는 P으로 이루어진 군으로부터 선택된 헤테로원자로 대체되어 있는 비사이클로알킬 기를 지칭한다. 헤테로원자는 말단 위치 또는 가교 위치(즉, 2개의 고리 사이의 연결점)를 점유할 수 있다. 예시적인 비사이클로알킬 기는 아다만틸, 비사이클로[1.1.1]펜틸, 비사이클로[2.2.1]헵틸, 비사이클로[3.1.1]헵틸, 비사이클로[2.1.1]헥실, 옥타하이드로펜탈레닐, 비사이클로[3.2.1]옥틸, 비사이클로[3.3.3] 운데카닐, 데카하이드로나프탈레닐, 비사이클로[3.2.0]헵틸, 옥타하이드로-1*H*-인데닐, 비사이클로[4.2.1]노나닐 등을 포함한다. 예시적인 스피로 비사이클로알킬 기는 스피로[4.4]노닐, 스피로[3.3]헵틸, 스피로[5.5]운데실, 스피로[3.5]노닐, 스피로[4.5]데실 등을 포함한다. "치환된 비사이클로알킬", "치환된 스피로알킬", "치환된 헤테로비사이클로알킬" 및 "치환된 헤테로스피로알킬"은 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 4개의 치환기로 치환된 비사이클로알킬, 스피로알킬, 헤테로비사이클로알킬 또는 헤테로스피로알킬 기를 지칭한다. 예시적인 치환기는 하기 기들 중 하나 이상을 포함하나, 이들로 제한되지 않는다: 수소, 할로겐(예를 들어, 단일 할로겐 치환기, 또는 CF_3 또는 CCl_3을 가진 알킬 기와 같은 기를 형성하는 다수의 할로 치환기), 시아노, 니트로, 옥소(즉, =O), CF_3, OCF_3, 사이클로알킬, 비사이클로알킬, 스피로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클, 아릴, OR_a, SR_a, $S(=O)R_e$, $S(=O)_2R_e$, $-N=S(=O)(R_a)$, $-R_aS(=O)(=NR_a)$, $S(=O)(=NR_a)(=N(R_a)_2)$(R_a 또는 N를 통해 분자에 연결됨), $P(=O)_2R_e$, $S(=O)_2OR_e$, $P(=O)_2OR_e$, NR_bR_c, $NR_bS(=O)_2R_e$, $NR_bP(=O)_2R_e$, $S(=O)_2NR_bR_c$, $P(=O)_2NR_bR_c$, $C(=O)OR_d$, $C(=O)R_a$, $C(=O)NR_bR_c$, $OC(=O)R_a$, $OC(=O)NR_bR_c$, $NR_bC(=O)OR_e$, $NR_dC(=O)NR_bR_c$, $NR_dS(=O)_2NR_bR_c$, $NR_dP(=O)_2NR_bR_c$, $NR_bC(=O)R_a$, 또는 $NR_bP(=O)_2R_e$, 여기서 R_a의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이고; R_b, R_c 및 R_d의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 헤테로사이클 또는 아릴이거나, 상기 R_b와 R_c는 이들에 결합된 N와 함께 임의로 헤테로사이클을 형성하고; R_e의 각 경우는 독립적으로 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이다. 예시적인 치환기는 그 자체가 임의로 치환될 수 있다. 예시적인 치환기는 스피로-부착된 또는 융합된 환형 치환기, 특히 스피로-부착된 사이클로알킬, 스피로-부착된 사이클로알케닐, 스피로-부착된 헤테로사이클(헤테로아릴 제외), 융합된 사이클로알킬, 융합된 사이클로알케닐, 융합된 헤테로사이클 또는 융합된 아릴도 포함하고, 여기서 상기 언급된 치환기, 예컨대, 사이클로알킬, 사이클로알케닐, 헤테로사이클 및 아릴 치환기는 그 자체가 임의로 치환될 수 있다.

[0324] 용어 "헤테로사이클로알킬" 또는 "사이클로헤테로알킬"은 적어도 하나의 고리에서 질소, 황 및 산소로 이루어진 군으로부터 선택된 적어도 하나의 헤테로원자, 바람직하게는 1개 내지 3개의 헤테로원자를 함유하는 포화 또는 부분 포화 일환형, 이환형 또는 다환형 고리를 지칭한다. 각각의 고리는 바람직하게는 3원 내지 10원, 보다 바람직하게는 4원 내지 7원이다. 일부 실시양태에서, 헤테로사이클로알킬 또는 사이클로헤테로알킬은 임의로 치환된다. 적합한 헤테로사이클로알킬 치환기의 예는 아제티디닐, 옥세타닐, 피롤리딜, 테트라하이드로푸릴, 테트라하이드로티오푸라닐, 피페리딜, 피페라질, 테트라하이드로피라닐, 모르폴리노, 1,3-디아제파닐, 1,4-디아제파닐, 1,4-옥사제파닐 및 1,4-옥사티아파닐을 포함하나, 이들로 제한되지 않는다. 기는 말단 기 또는 가교 기일 수 있다.

[0325] 용어 "사이클로알케닐"은 1개 내지 4개의 고리 및 고리당 3개 내지 8개의 탄소를 함유하는 부분 불포화 환형 탄화수소 기를 지칭한다. 예시적인 이러한 기는 사이클로부테닐, 사이클로펜테닐, 사이클로헥세닐 등을 포함한다. "치환된 사이클로알케닐"은 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 4개의 치환기로 치환된 사이클로알케닐 기를 지칭한다. 예시적인 치환기는 하기 기들 중 하나 이상을 포함하나, 이들로 제한되지 않는다: 수소, 할로겐(예를 들어, 단일 할로겐 치환기, 또는 CF_3 또는 CCl_3을 가진 알킬 기와 같은

기를 형성하는 다수의 할로 치환기), 시아노, 니트로, 옥소(즉, =O), CF_3, OCF_3, 사이클로알킬, 비사이클로알킬, 스피로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클, 아릴, OR_a, SR_a, $S(=O)R_e$, $S(=O)_2R_e$, $-N=S(=O)(R_a)$, $-R_aS(=O)(=NR_a)$, $S(=O)(=NR_a)(=N(R_a)_2)$(R_a 또는 N를 통해 분자에 연결됨), $P(=O)_2R_e$, $S(=O)_2OR_e$, $P(=O)_2OR_e$, NR_bR_c, $NR_bS(=O)_2R_e$, $NR_bP(=O)_2R_e$, $S(=O)_2NR_bR_c$, $P(=O)_2NR_bR_c$, $C(=O)OR_d$, $C(=O)R_a$, $C(=O)NR_bR_c$, $OC(=O)R_a$, $OC(=O)NR_bR_c$, $NR_bC(=O)OR_e$, $NR_dC(=O)NR_bR_c$, $NR_dS(=O)_2NR_bR_c$, $NR_dP(=O)_2NR_bR_c$, $NR_bC(=O)R_a$, 또는 $NR_bP(=O)_2R_e$, 여기서 R_a의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이고; R_b, R_c 및 R_d의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 헤테로사이클 또는 아릴이거나, 상기 R_b와 R_c는 이들에 결합된 N와 함께 임의로 헤테로사이클을 형성하고; R_e의 각 경우는 독립적으로 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이다. 예시적인 치환기는 그 자체가 임의로 치환될 수 있다. 예시적인 치환기는 스피로-부착된 또는 융합된 환형 치환기, 특히 스피로-부착된 사이클로알킬, 스피로-부착된 사이클로알케닐, 스피로-부착된 헤테로사이클(헤테로아릴 제외), 융합된 사이클로알킬, 융합된 사이클로알케닐, 융합된 헤테로사이클 또는 융합된 아릴도 포함하고, 여기서 상기 언급된 치환기, 예컨대, 사이클로알킬, 사이클로알케닐, 헤테로사이클 및 아릴 치환기는 그 자체가 임의로 치환될 수 있다.

[0326] 용어 "아릴"은 1개 내지 5개의 방향족 고리를 가진 환형 방향족 탄화수소 기, 특히 단환형 또는 이환형 기, 예컨대, 페닐, 비페닐 또는 나프틸을 지칭한다. 2개 이상의 방향족 고리를 함유하는 경우(이환형 등), 아릴 기의 방향족 고리는 단일 점에서 연결될 수 있거나(예를 들어, 비페닐) 융합될 수 있다(예를 들어, 나프틸, 페난트레닐 등). 용어 "융합된 방향족 고리"는 2개의 인접 방향족 고리가 2개의 탄소 원자를 공유하는 2개 이상의 방향족 고리를 가진 분자 구조를 지칭한다. "치환된 아릴"은 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 3개의 치환기로 치환된 아릴 기를 지칭한다. 예시적인 치환기는 하기 기들 중 하나 이상을 포함하나, 이들로 제한되지 않는다: 수소, 할로겐(예를 들어, 단일 할로겐 치환기, 또는 CF_3 또는 CCl_3을 가진 알킬 기와 같은 기를 형성하는 다수의 할로 치환기), 시아노, 니트로, 옥소(즉, =O), CF_3, OCF_3, 사이클로알킬, 비사이클로알킬, 스피로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클, 아릴, OR_a, SR_a, $S(=O)R_e$, $S(=O)_2R_e$, $-N=S(=O)(R_a)$, $-R_aS(=O)(=NR_a)$, $S(=O)(=NR_a)(=N(R_a)_2)$(R_a 또는 N를 통해 분자에 연결됨), $P(=O)_2R_e$, $S(=O)_2OR_e$, $P(=O)_2OR_e$, NR_bR_c, $NR_bS(=O)_2R_e$, $NR_bP(=O)_2R_e$, $S(=O)_2NR_bR_c$, $P(=O)_2NR_bR_c$, $C(=O)OR_d$, $C(=O)R_a$, $C(=O)NR_bR_c$, $OC(=O)R_a$, $OC(=O)NR_bR_c$, $NR_bC(=O)OR_e$, $NR_dC(=O)NR_bR_c$, $NR_dS(=O)_2NR_bR_c$, $NR_dP(=O)_2NR_bR_c$, $NR_bC(=O)R_a$, 또는 $NR_bP(=O)_2R_e$, 여기서 R_a의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이고; R_b, R_c 및 R_d의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 헤테로사이클 또는 아릴이거나, 상기 R_b와 R_c는 이들에 결합된 N와 함께 임의로 헤테로사이클을 형성하고; R_e의 각 경우는 독립적으로 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이다. 예시적인 치환기는 그 자체가 임의로 치환될 수 있다. 예시적인 치환기는 융합된 환형 기, 특히 융합된 사이클로알킬, 융합된 사이클로알케닐, 융합된 헤테로사이클 또는 융합된 아릴도 포함하고, 여기서 상기 언급된 치환기, 예컨대, 사이클로알킬, 사이클로알케닐, 헤테로사이클 및 아릴 치환기는 그 자체가 임의로 치환될 수 있다.

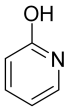
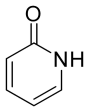
[0327] 용어 "비아릴"은 단일 결합에 의해 연결된 2개의 아릴 기를 지칭한다. 용어 "비헤테로아릴"은 단일 결합에 의해 연결된 2개의 헤테로아릴 기를 지칭한다. 유사하게, 용어 "헤테로아릴-아릴"은 단일 결합에 의해 연결된 헤테로아릴 기와 아릴 기를 지칭하고, 용어 "아릴-헤테로아릴"은 단일 결합에 의해 연결된 아릴 기와 헤테로아릴 기를 지칭한다. 특정 실시양태에서, 헤테로아릴 및/또는 아릴 고리에서 고리 원자의 수는 치환기에서 아릴 또는 헤테로아릴 고리의 크기를 특정하는 데 사용된다. 예를 들어, 5,6-헤테로아릴-아릴은 5원 헤테로아릴이 6원 아릴 기에 연결되어 있는 치환기를 지칭한다. 다른 조합 및 고리 크기는 유사하게 특정될 수 있다.

[0328] 용어 "카르보사이클" 또는 "탄소환"은 1개 내지 4개의 고리 및 고리당 3개 내지 8개의 탄소를 함유하는 전체 포화 또는 부분 포화 환형 탄화수소 기, 또는 1개 내지 5개의 방향족 고리를 가진 환형 방향족 탄화수소 기, 특히 단환형 또는 이환형 기, 예컨대, 페닐, 비페닐 또는 나프틸을 지칭한다. 용어 "카르보사이클"은 상기 본원에서 정의된 사이클로알킬, 사이클로알케닐, 사이클로알키닐 및 아릴을 포괄한다. 용어 "치환된 카르보사이클"은 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 4개의 치환기로 치환된 카르보사이클 또는 탄소환형 기를 지칭한다. 예시적인 치환기는 치환된 사이클로알킬, 치환된 사이클로알케닐, 치환된 사이클로알키닐 및 치환된 아릴에 대해 상기 기재된 치환기들을 포함하나, 이들로 제한되지 않는다. 예시적인 치환기

는 임의의 이용 가능한 부착점 또는 부착점들에서 스피로-부착된 또는 융합된 환형 치환기, 특히 스피로-부착된 사이클로알킬, 스피로-부착된 사이클로알케닐, 스피로-부착된 헤테로사이클(헤테로아릴 제외), 융합된 사이클로알킬, 융합된 사이클로알케닐, 융합된 헤테로사이클 또는 융합된 아릴도 포함하고, 여기서 상기 언급된 치환기, 예컨대, 사이클로알킬, 사이클로알케닐, 헤테로사이클 및 아릴 치환기는 그 자체가 임의로 치환될 수 있다.

[0329] 용어 "헤테로사이클" 및 "헤테로환형"은 적어도 하나의 탄소 원자 함유 고리에서 적어도 하나의 헤테로원자를 가진 방향족(즉, "헤테로아릴") 환형 기(예를 들어, 3원 내지 7원 일환형, 7원 내지 11원 이환형, 또는 8원 내지 16원 삼환형 고리 시스템)를 포함하는 전체 포화, 또는 부분 또는 전체 불포화 헤테로환형 기를 지칭한다. 헤테로환형 기의 각각의 고리는 독립적으로 포화될 수 있거나, 부분적으로 또는 전체적으로 불포화될 수 있다. 헤테로원자를 함유하는 헤테로환형 기의 각각의 고리는 질소 원자, 산소 원자 및 황 원자로 이루어진 군으로부터 선택된 1개, 2개, 3개 또는 4개의 헤테로원자를 가질 수 있고, 여기서 질소 및 황 헤테로원자는 임의로 산화될 수 있고 질소 헤테로원자는 임의로 4차화될 수 있다. (용어 "헤테로아릴륨"은 4차 질소 원자를 가짐으로써 양전하를 가진 헤테로아릴 기를 지칭한다.) 헤테로환형 기는 고리 또는 고리 시스템의 임의의 헤테로원자 또는 탄소 원자에서 분자의 나머지 부분에 부착될 수 있다. 예시적인 일환형 헤테로환형 기는 아제티디닐, 피롤리디닐, 피롤릴, 피라졸릴, 옥세타닐, 피라졸리닐, 이미다졸릴, 이미다졸리닐, 이미다졸리디닐, 옥사졸릴, 옥사졸리디닐, 이속사졸리닐, 이속사졸릴, 티아졸릴, 티아디아졸릴, 티아졸리디닐, 이소티아졸릴, 이소티아졸리디닐, 푸릴, 테트라하이드로푸릴, 티에닐, 옥사디아졸릴, 피페리디닐, 피페라지닐, 2-옥소피페라지닐, 2-옥소피페리디닐, 2-옥소피롤로디닐, 2-옥소아제피닐, 아제피닐, 헥사하이드로디아제피닐, 4-피페리도닐, 피리딜, 피라지닐, 피리미디닐, 피리다지닐, 트리아지닐, 트리아졸릴, 테트라졸릴, 테트라하이드로피라닐, 모르폴리닐, 티아모르폴리닐, 티아모르폴리닐 설폭사이드, 티아모르폴리닐 설폰, 1,3-디옥솔란 및 테트라하이드로-1,1-디옥소티에닐 등을 포함한다. 예시적인 이환형 헤테로환형 기는 인돌릴, 인돌리닐, 이소인돌릴, 벤조티아졸릴, 벤족사졸릴, 벤족사디아졸릴, 벤조티에닐, 벤조[*d*][1,3]디옥솔릴, 디하이드로-2H-벤조[*b*][1,4]옥사진, 2,3-디하이드로벤조[*b*][1,4]디옥시닐, 퀴누클리디닐, 퀴놀리닐, 테트라하이드로이소퀴놀리닐, 이소퀴놀리닐, 벤즈이미다졸릴, 벤조피라닐, 인돌리지닐, 벤조푸릴, 벤조푸라자닐, 디하이드로벤조[*d*]옥사졸, 크로모닐, 쿠마리닐, 벤조피라닐, 신놀리닐, 퀴녹살리닐, 인다졸릴, 피롤로피리딜, 푸로피리디닐(예컨대, 푸로[2,3-c]피리디닐, 푸로[3,2-b]피리디닐] 또는 푸로[2,3-b]피리디닐), 디하이드로이소인돌릴, 디하이드로퀴나졸리닐(예컨대, 3,4-디하이드로-4-옥소-퀴나졸리닐), 트리아지닐아제피닐, 테트라하이드로퀴놀리닐 등을 포함한다. 예시적인 삼환형 헤테로환형 기는 카르바졸릴, 벤지돌릴, 페난트롤리닐, 아크리디닐, 페난트리디닐, 크산테닐 등을 포함한다. 용어 "부분 포화 이환형 헤테로아릴"은 부분적으로 포화되어 있는, 예를 들어, 포화 사이클로알킬 또는 헤테로환형 알킬 고리를 가진 이환형 헤테로아릴을 지칭한다.

[0330] "치환된 헤테로사이클" 및 "치환된 헤테로환형"(예컨대, "치환된 헤테로아릴")은 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 4개의 치환기로 치환된 헤테로사이클 또는 헤테로환형 기를 지칭한다. 예시적인 치환기는 하기 기들 중 하나 이상을 포함하나, 이들로 제한되지 않는다: 수소, 할로겐(예를 들어, 단일 할로겐 치환기, 또는 CF_3 또는 CCl_3을 가진 알킬 기와 같은 기를 형성하는 다수의 할로 치환기), 시아노, 니트로, 옥소(즉, =O), CF_3, OCF_3, 사이클로알킬, 비사이클로알킬, 스피로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클, 아릴, OR_a, SR_a, $S(=O)R_e$, $S(=O)_2R_e$, $-N=S(=O)(R_a)$, $-R_aS(=O)(=NR_a)$, $S(=O)(=NR_a)(=N(R_a)_2)$(R_a 또는 N를 통해 분자에 연결됨), $P(=O)_2R_e$, $S(=O)_2OR_e$, $P(=O)_2OR_e$, NR_bR_c, $NR_bS(=O)_2R_e$, $NR_bP(=O)_2R_e$, $S(=O)_2NR_bR_c$, $P(=O)_2NR_bR_c$, $C(=O)OR_d$, $C(=O)R_a$, $C(=O)NR_bR_c$, $OC(=O)R_a$, $OC(=O)NR_bR_c$, $NR_bC(=O)OR_e$, $NR_dC(=O)NR_bR_c$, $NR_dS(=O)_2NR_bR_c$, $NR_dP(=O)_2NR_bR_c$, $NR_bC(=O)R_a$, 또는 $NR_bP(=O)_2R_e$, 여기서 R_a의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이고; R_b, R_c 및 R_d의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 헤테로사이클 또는 아릴이거나, 상기 R_b와 R_c는 이들에 결합된 N와 함께 임의로 헤테로사이클을 형성하고; R_e의 각 경우는 독립적으로 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이다. 예시적인 치환기는 그 자체가 임의로 치환될 수 있다. 예시적인 치환기는 임의의 이용 가능한 부착점 또는 부착점들에서 스피로-부착된 또는 융합된 환형 치환기, 특히 스피로-부착된 사이클로알킬, 스피로-부착된 사이클로알케닐, 스피로-부착된 헤테로사이클(헤테로아릴 제외), 융합된 사이클로알킬, 융합된 사이클로알케닐, 융합된 헤테로사이클 또는 융합된 아릴도 포함하고, 여기서 상기 언급된 치환기, 예컨대, 사이클로알킬, 사이클로알케닐, 헤테로사이클 및 아릴 치환기는 그 자체가 임의로 치환될 수 있다.

[0331] 용어 "옥소"는 카르보사이클 또는 헤테로사이클의 탄소 고리 원자에 부착될 수 있는 $=O$ 치환기를 지칭한다. 옥소 치환기가 방향족 기, 예를 들어, 아릴 또는 헤테로아릴의 탄소 고리 원자에 부착될 때, 방향족 고리의 결합은 원자가 요건을 충족시키기 위해 재배열될 수 있다. 예를 들어, 2-옥소 치환기를 가진 피리딘은 그의 호변이성질체 형태인  도 포함하는  의 구조를 가질 수 있다.

[0332] 용어 "알킬아미노"는 구조 -NHR'을 가진 기를 지칭하고, 여기서 R'은 본원에서 정의된 바와 같이 수소, 알킬 또는 치환된 알킬, 사이클로알킬 또는 치환된 사이클로알킬이다. 알킬아미노 기의 예는 메틸아미노, 에틸아미노, n-프로필아미노, 이소-프로필아미노, 사이클로프로필아미노, n-부틸아미노, tert-부틸아미노, 네오펜틸아미노, n-펜틸아미노, 헥실아미노, 사이클로헥실아미노 등을 포함하나, 이들로 제한되지 않는다.

[0333] 용어 "디알킬아미노"는 구조 -NRR'을 가진 기를 지칭하고, 여기서 R 및 R'은 본원에서 정의된 바와 같이 각각 독립적으로 알킬 또는 치환된 알킬, 사이클로알킬 또는 치환된 사이클로알킬, 사이클로알케닐 또는 치환된 사이클로알케닐, 아릴 또는 치환된 아릴, 헤테로사이클 또는 치환된 헤테로사이클이다. R 및 R'은 디알킬아미노 모이어티에서 동일할 수 있거나 상이할 수 있다. 디알킬아미노 기의 예는 디메틸아미노, 메틸에틸아미노, 디에틸아미노, 메틸프로필아미노, 디(n-프로필)아미노, 디(이소-프로필)아미노, 디(사이클로프로필)아미노, 디(n-부틸)아미노, 디(tert-부틸)아미노, 디(네오펜틸)아미노, 디(n-펜틸)아미노, 디(헥실)아미노, 디(사이클로헥실)아미노 등을 포함하나, 이들로 제한되지 않는다. 특정 실시양태에서, R 및 R'은 연결되어 환형 구조를 형성한다. 생성된 환형 구조는 방향족 또는 비방향족일 수 있다. 생성된 환형 구조의 예는 아지리디닐, 피롤리디닐, 피페리디닐, 모르폴리닐, 피롤릴, 이미다졸릴, 1,2,4-트리아졸릴 및 테트라졸릴을 포함하나, 이들로 제한되지 않는다.

[0334] 용어 "할로겐" 또는 "할로"는 염소, 브롬, 불소 또는 요오드를 지칭한다.

[0335] 용어 "치환된"은 원자가가 허용하는 경우 분자, 분자 모이어티 또는 치환기(예를 들어, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴 기, 또는 본원에 개시된 임의의 다른 기)가 임의의 이용 가능한 부착점에서 하나 이상의 치환기, 바람직하게는 1개 내지 6개의 치환기로 치환되는 실시양태를 의미한다. 예시적인 치환기는 하기 기들 중 하나 이상을 포함하나, 이들로 제한되지 않는다: 수소, 할로겐(예를 들어, 단일 할로겐 치환기, 또는 CF_3 또는 CCl_3을 가진 알킬 기와 같은 기를 형성하는 다수의 할로 치환기), 시아노, 니트로, 옥소(즉, =O), CF_3, OCF_3, 알킬, 할로겐 치환된 알킬, 사이클로알킬, 비사이클로알킬, 스피로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클, 아릴, OR_a, SR_a, $S(=O)R_e$, $S(=O)_2R_e$, $P(=O)_2R_e$, $S(=O)_2OR_e$, $-N=S(=O)(R_a)$, $-R_aS(=O)(=NR_a)$, $S(=O)(=NR_a)(=N(R_a)_2)$(R_a 또는 N를 통해 분자에 연결됨), $P(=O)_2OR_e$, NR_bR_c, $NR_bS(=O)_2R_e$, $NR_bP(=O)_2R_e$, $S(=O)_2NR_bR_c$, $P(=O)_2NR_bR_c$, $C(=O)OR_d$, $C(=O)R_a$, $C(=O)NR_bR_c$, $OC(=O)R_a$, $OC(=O)NR_bR_c$, $NR_bC(=O)OR_e$, $NR_dC(=O)NR_bR_c$, $NR_dS(=O)_2NR_bR_c$, $NR_dP(=O)_2NR_bR_c$, $NR_bC(=O)R_a$, 또는 $NR_bP(=O)_2R_e$, 여기서 R_a의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이고; R_b, R_c 및 R_d의 각 경우는 독립적으로 수소, 알킬, 사이클로알킬, 헤테로사이클 또는 아릴이거나, 상기 R_b와 R_c는 이들에 결합된 N와 함께 임의로 헤테로사이클을 형성하고; R_e의 각 경우는 독립적으로 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴이다. 상기 언급된 예시적인 치환기에서, 알킬, 사이클로알킬, 알케닐, 알키닐, 사이클로알케닐, 헤테로사이클 및 아릴과 같은 기는 그 자체가 임의로 치환될 수 있다. 용어 "임의로 치환된"은 분자, 분자 모이어티 또는 치환기(예를 들어, 알킬, 사이클로알킬, 알케닐, 사이클로알케닐, 알키닐, 헤테로사이클 또는 아릴 기, 또는 본원에 개시된 임의의 다른 기)가 상기 언급된 하나 이상의 치환기로 치환될 수 있거나 치환되지 않을 수 있는 실시양태를 의미한다.

[0336] 달리 표시되지 않는 한, 충족되지 않은 원자가를 가진 임의의 헤테로원자는 원자가를 충족시키기에 충분한 수소 원자를 가진 것으로 가정된다.

[0337] 본 발명의 화합물은 마찬가지로 본 발명의 범위 내에 있는 염을 형성할 수 있다. 달리 표시되지 않는 한, 본 발명의 화합물의 언급은 이의 염의 언급을 포함하는 것으로 이해된다. 본원에서 사용된 바와 같이, 용어 "염(들)"은 무기 및/또는 유기 산 및 염기에 의해 형성된 산성 및/또는 염기성 염을 의미한다. 또한, 본 발명의 화

합물이 피리딘 또는 이미다졸과 같은, 그러나 이들로 제한되지 않는, 염기성 모이어티, 및 카르복실산과 같은, 그러나 이로 제한되지 않는, 산성 모이어티 둘 다를 함유하는 경우, 양쪽성이온("내염")이 형성될 수 있고 본원에서 사용된 용어 "염(들)" 내에 포함된다. 약학적으로 허용되는(즉, 무독성, 생리학적으로 허용되는) 염이 바람직하지만, 다른 염도 예를 들어, 제조 동안 이용될 수 있는 단리 또는 정제 단계에서 유용하다. 본 발명의 화합물의 염은, 예를 들어, 매질, 예컨대, 염이 침전되는 매질, 또는 수성 매질에서 본원에 기재된 화합물을 일정량, 예컨대, 당량의 산 또는 염기와 반응시킨 후 동결건조함으로써 형성될 수 있다.

[0338] 아민 또는 피리딘 또는 이미다졸 고리와 같은, 그러나 이들로 제한되지 않는, 염기성 모이어티를 함유하는 본 발명의 화합물은 다양한 유기산 및 무기산과 함께 염을 형성할 수 있다. 예시적인 산 부가 염은 아세테이트(예컨대, 아세트산 또는 트리할로아세트산, 예를 들어, 트리플루오로아세트산에 의해 형성된 아세테이트), 아디페이트, 알기네이트, 아스코르베이트, 아스파르테이트, 벤조에이트, 벤젠설포네이트, 비설페이트, 보레이트, 부티레이트, 시트레이트, 캄포레이트, 캄포르설포네이트, 사이클로펜탄프로피오네이트, 디글루코네이트, 도데실설페이트, 에탄설포네이트, 푸마레이트, 글루코헵타노에이트, 글리세로포스페이트, 헤미설페이트, 헵타노에이트, 헥사노에이트, 염산염, 브롬화수소산염, 요오드화수소산염, 하이드록시에탄설포네이트(예를 들어, 2-하이드록시에탄설포네이트), 락테이트, 말레에이트, 메탄설포네이트, 나프탈렌설포네이트(예를 들어, 2-나프탈렌설포네이트), 니코티네이트, 니트레이트, 옥살레이트, 펙티네이트, 퍼설페이트, 페닐프로피오네이트(예를 들어, 3-페닐프로피오네이트), 포스페이트, 피크레이트, 피발레이트, 프로피오네이트, 살리실레이트, 석시네이트, 설페이트(예컨대, 황산에 의해 형성된 설페이트), 설포네이트, 타르트레이트, 티오시아네이트, 톨루엔설포네이트, 예컨대, 토실레이트, 운데카노에이트 등을 포함한다.

[0339] 카르복실산과 같은, 그러나 이로 제한되지 않는, 산성 모이어티를 함유하는 본 발명의 화합물은 다양한 유기 염기 및 무기 염기와 함께 염을 형성할 수 있다. 예시적인 염기성 염은 암모늄 염, 알칼리 금속 염, 예컨대, 나트륨, 리튬 및 칼륨 염, 알칼리 토금속 염, 예컨대, 칼슘 및 마그네슘 염, 유기 염기(예를 들어, 유기 아민), 예컨대, 벤자틴, 디사이클로헥실아민, 하이드라바민(N,N-비스(데하이드로아비에틸)에틸렌디아민에 의해 형성됨), N-메틸-D-글루카민, N-메틸-D-글리카마이드, t-부틸 아민에 의해 형성됨 염, 및 아미노산, 예컨대, 아르기닌, 라이신 등에 의해 형성된 염을 포함한다. 염기성 질소 함유 기는 저급 알킬 할라이드(예를 들어, 메틸, 에틸, 프로필 및 부틸 클로라이드, 브로마이드 및 요오다이드), 디알킬 설페이트(예를 들어, 디메틸, 디에틸, 디부틸 및 디아밀 설페이트), 장쇄 할라이드(예를 들어, 데실, 라우릴, 미리스틸 및 스테아릴 클로라이드, 브로마이드 및 요오다이드), 아르알킬 할라이드(예를 들어, 벤질 및 페네틸 브로마이드) 등과 같은 작용제에 의해 4차화될 수 있다.

[0340] 본 발명의 화합물의 프로드러그 및 용매화물도 본원에서 고려된다. 본원에서 사용된 용어 "프로드러그"는 대상체에게 투여될 때 대사적 또는 화학적 과정에 의한 화학적 전환을 거쳐 본 발명의 화합물, 또는 이의 염 및/또는 용매화물을 생성하는 화합물을 의미한다. 본 발명의 화합물의 용매화물은 예를 들어, 수화물을 포함한다.

[0341] 본 발명의 화합물, 및 이의 염 또는 용매화물은 그의 호변이성질체 형태(예를 들어, 아미드 또는 이미놀로서)로 존재할 수 있다. 모든 이러한 호변이성질체 형태는 본원에서 본 발명의 일부로서 간주된다. 본원에서 사용된 바와 같이, 화합물의 임의의 묘사된 구조는 그의 호변이성질체 형태를 포함한다.

[0342] 거울상이성질체 형태 및 부분입체이성질체 형태를 포함하는, 본원에 기재된 화합물의 모든 입체이성질체(예를 들어, 다양한 치환기의 비대칭 탄소로 인해 존재할 수 있는 입체이성질체)는 본 발명의 범위 내에서 예상된다. 본 발명의 화합물의 개별 입체이성질체는 예를 들어, 다른 이성질체를 실질적으로 결여할 수 있거나(예를 들어, 특정된 활성을 가진 순수한 또는 실질적으로 순수한 광학 이성질체로서), 예를 들어, 라세미체로서 혼합될 수 있거나 모든 다른 또는 다른 선택된 입체이성질체와 혼합될 수 있다. 본 발명의 키랄 중심은 IUPAC(International Union of Pure and Applied Chemistry) 1974 권고에 의해 정의된 *S* 또는 *R* 배열을 가질 수 있다. 라세미체 형태는 물리적 방법, 예를 들어, 분별 결정화, 부분입체이성질체성 유도체의 분리 또는 결정화, 또는 키랄 컬럼 크로마토그래피에 의한 분리에 의해 분할될 수 있다. 개별 광학 이성질체는 통상적인 방법, 예를 들어, 광학 활성 산을 사용한 염 형성에 이은 결정화를 포함하나 이들로 제한되지 않는 임의의 적합한 방법에 의해 라세미체로부터 수득될 수 있다.

[0343] 본 발명의 화합물을 그의 제조 후에 바람직하게는 단리하고 정제하여, 중량 기준으로 90% 이상, 예를 들어, 95% 이상 또는 99% 이상의 양으로 화합물("실질적으로 순수한" 화합물)을 함유하는 조성물을 수득한 후, 본원에 기재된 바와 같이 사용하거나 제제화한다. 본 발명의 이러한 "실질적으로 순수한" 화합물도 본원에서 본 발명의 일부로서 간주된다.

[0344] 본 발명의 화합물의 모든 배위 이성질체는 혼합물 형태, 또는 순수한 또는 실질적으로 순수한 형태로 존재할 것으로 예상된다. 본 발명의 화합물의 정의는 *시스*(*Z*) 및 *트랜스*(*E*) 알켄 이성질체뿐만 아니라, 환형 탄화수소 또는 헤테로환형 고리의 *시스* 및 *트랜스* 이성질체도 포괄한다.

[0345] 본 명세서 전체에 걸쳐, 기 및 이의 치환기는 안정한 모이어티 및 화합물을 제공하도록 선택될 수 있다.

[0346] 특정 작용기 및 화학 용어의 정의는 본원에 더 상세히 기재되어 있다. 본 발명의 목적을 위해, 화학 원소는 원소 주기율표(CAS 버전, 문헌[*Handbook of Chemistry and Physics*, 75th Ed.], 내부 표지)에 따라 식별되고, 특정 작용기는 본원에 기재된 바와 같이 일반적으로 정의된다. 또한, 유기 화학의 일반 원리뿐만 아니라, 특정 작용 모이어티 및 반응성도 문헌["Organic Chemistry", Thomas Sorrell, University Science Books, Sausalito (1999)]에 기재되어 있다.

[0347] 본 발명의 특정 화합물은 특히 기하 이성질체 또는 입체이성질체 형태로 존재할 수 있다. 본 발명은 본 발명의 범위 내에 속하는, *시스*-이성질체, *트랜스*-이성질체, *R*-거울상이성질체, *S*-거울상이성질체, 부분입체이성질체, (D)-이성질체, (L)-이성질체, 이들의 라세미체 혼합물, 및 이들의 다른 혼합물을 포함하는 모든 이러한 화합물들을 예상한다. 추가 비대칭 탄소 원자는 알킬 기와 같은 치환기에 존재할 수 있다. 모든 이러한 이성질체들뿐만 아니라 이들의 혼합물도 본 발명에 포함된다.

[0348] 임의의 다양한 이성질체 비를 함유하는 이성질체 혼합물이 본 발명에 따라 사용될 수 있다. 예를 들어, 2개의 이성질체만이 조합되는 경우, 50:50, 60:40, 70:30, 80:20, 90:10, 95:5, 96:4, 97:3, 98:2, 99:1 또는 100:0 이성질체 비를 함유하는 혼합물 모두가 본 발명에 의해 예상된다. 당분야에서 통상의 기술을 가진 자는 유사한 비가 더 복잡한 이성질체 혼합물에 대해 예상된다는 것을 쉽게 인식할 것이다.

[0349] 본 발명은 하나 이상의 원자가 자연에서 일반적으로 발견되는 원자 질량 또는 질량수와 상이한 원자 질량 또는 질량수를 가진 원자로 대체된다는 사실을 제외하고 본원에 개시된 화합물과 동일한 동위원소 표지된 화합물도 포함한다. 본 발명의 화합물 내로 혼입될 수 있는 동위원소의 예는 수소, 탄소, 질소, 산소, 인, 황, 불소 및 염소의 동위원소, 예컨대, 각각 ^{2}H(또는 D), ^{3}H, ^{13}C, ^{11}C, ^{14}C, ^{15}N, ^{18}O, ^{17}O, ^{31}P, ^{32}P, ^{35}S, ^{18}F 및 ^{36}Cl를 포함한다. 상기 언급된 동위원소 및/또는 다른 원자의 다른 동위원소를 함유하는 본 발명의 화합물, 또는 이의 거울상이성질체, 부분입체이성질체, 호변이성질체 또는 약학적으로 허용되는 염 또는 용매화물은 본 발명의 범위 내에 있다. 본 발명의 특정 동위원소 표지된 화합물, 예를 들어, 방사성 동위원소, 예컨대, ^{3}H 및 ^{14}C가 혼입된 화합물은 약물 및/또는 기질 조직 분포 어세이에 유용하다. 삼중수소, 즉 ^{3}H 및 탄소-14, 즉 ^{14}C 동위원소가 이들의 제조 용이성 및 검출 가능성 때문에 특히 바람직하다. 또한, 중수소, 즉 ^{2}H와 같은 더 무거운 동위원소를 사용한 치환은 더 큰 대사 안정성으로부터 비롯된 특정 치료 이점, 예를 들어, 증가된 생체내 반감기 또는 감소된 용량 요구를 제공할 수 있으므로, 일부 상황에서 바람직할 수 있다. 동위원소 표지된 화합물은 일반적으로 동위원소로 표지되지 않은 시약 대신에 용이하게 입수 가능한 동위원소 표지된 시약을 사용하여, 하기 반응식 및/또는 실시예에 개시된 절차를 수행함으로써 제조될 수 있다.

[0350] 예를 들어, 본 발명의 화합물의 특정 거울상이성질체가 필요한 경우, 이 거울상이성질체는 비대칭 합성에 의해 제조될 수 있거나, 키랄 보조제를 사용한 유도체화에 의해 제조될 수 있고, 여기서 생성된 부분입체이성질체 혼합물은 분리되고 보조 기는 절단되어 순수한 원하는 거울상이성질체를 제공한다. 대안적으로, 분자가 아미노와 같은 염기성 작용기 또는 카르복실과 같은 산성 작용기를 함유하는 경우, 부분입체이성질체 염은 적절한 광학 활성 산 또는 염기에 의해 형성되고, 이어서 이로써 형성된 부분입체이성질체는 당분야에서 잘 알려진 분별 결정화 또는 크로마토그래피 수단에 의해 분할되고, 그 후 순수한 거울상이성질체가 회수된다.

[0351] 본원에 기재된 바와 같이, 화합물은 임의의 수의 치환기 또는 작용 모이어티로 치환될 수 있음이 인식될 것이다. 일반적으로, 용어 "임의로"가 앞에 있든 아니면 앞에 있지 않든 관계없이 용어 "치환된", 및 본 발명의 화학식에 함유된 치환기는 주어진 구조에서 수소 라디칼이 특정된 치환기의 라디칼로 대체되는 것을 의미한다. 임의의 주어진 구조에서 하나 초과의 위치가 특정된 군으로부터 선택된 하나 초과의 치환기로 치환될 수 있는 경우, 치환기는 모든 위치에서 동일할 수 있거나 상이할 수 있다. 본원에서 사용된 바와 같이, 용어 "치환된"은 유기 화합물의 모든 허용되는 치환기를 포함하는 것으로 간주된다. 넓은 측면에서, 허용되는 치환기는 유기 화합물의 비환형 및 환형, 분지형 및 비분지형, 탄소환형 및 헤테로환형, 방향족 및 비방향족 치환기를 포함한다. 본 발명의 목적을 위해, 질소와 같은 헤테로원자는 헤테로원자의 원자가를 충족시키는, 본원에 기재된 유기 화합물의 수소 치환기 및/또는 임의의 허용되는 치환기를 가질 수 있다. 더욱이, 본 발명은 유기 화합물의 허용되

는 치환기에 의해 어떠한 방식으로도 제한되지 않는다. 본 발명에 의해 예상되는 치환기 및 변수의 조합은 바람직하게는 예를 들어, 증식성 장애의 치료에 유용한 안정한 화합물의 형성을 야기하는 조합이다. 본원에서 사용된 바와 같이, 용어 "안정한"은 바람직하게는 제조를 가능하게 하기에 충분한 안정성을 갖고 검출되기에 충분한 시간 동안, 바람직하게는 본원에 상세히 기재된 목적에 유용한 충분한 시간 동안 화합물의 온전성을 유지하는 화합물을 지칭한다.

[0352] 본원에서 사용된 바와 같이, 용어 "암" 및 동등하게는 "종양"은 숙주 기원의 비정상적으로 복제하는 세포가 대상체에서 검출 가능한 양으로 존재하는 상태를 지칭한다. 암은 악성 또는 비-악성 암일 수 있다. 암 또는 종양은 성인 T-세포 백혈병/림프종(인간 T-세포 림프친화성 바이러스(HTLV-1)에 의해 야기된 것을 포함함); 담도암; 뇌암; 유방암; 자궁경부암; 융모막암종; 결장암; 자궁내막암; 식도암; 위(복부)암; 상피내 신생물; 백혈병; 림프종; 간암; 폐암(예를 들어, 소세포 및 비-소세포); 흑색종; 신경모세포종; 구강암; 난소암; 췌장암; 전립선암; 직장암; 신(신장)암; 육종; 피부암; 고환암; 갑상선암뿐만 아니라; 다른 암종 및 육종도 포함하나, 이들로 제한되지 않는다. 본원에서 사용된 바와 같이, 용어 "림프종"은 림프계의 암 또는 림프구로부터 발생하는 혈액암을 지칭한다. 암은 원발성 또는 전이성 암일 수 있다. 암 이외의 질환은 Ras 신호전달 경로의 구성요소의 돌연변이성 변경과 연관될 수 있고, 본원에 개시된 화합물은 이러한 비-암 질환을 치료하는 데 사용될 수 있다. 이러한 비-암 질환은 신경섬유종증; 표범 증후군; 누난(Noonan) 증후군; 레기우스(Legius) 증후군; 코스텔로(Costello) 증후군; 심장-안면-피부 증후군; 유전성 치은 섬유종증 제1형; 자가면역 림프증식성 증후군; 및 모세혈관 기형-동정맥 기형을 포함할 수 있다.

[0353] 본원에서 사용된 바와 같이, "유효량"은 원하는 결과를 달성하거나 촉진하는 데 필요하거나 충분한 임의의 양을 지칭한다. 일부 경우, 유효량은 치료 유효량이다. 치료 유효량은 대상체에서 원하는 생물학적 반응을 촉진하거나 달성하는 데 필요하거나 충분한 임의의 양이다. 임의의 특정 적용을 위한 유효량은 치료되는 질환 또는 병태, 투여되는 특정 작용제, 대상체의 크기, 또는 질환 또는 병태의 중증도와 같은 요인에 따라 달라질 수 있다. 당분야에서 통상의 기술을 가진 자는 과도한 실험을 필요로 하지 않으면서 특정 작용제의 유효량을 경험적으로 결정할 수 있다.

[0354] 본원에서 사용된 바와 같이, 용어 "대상체"는 척추 동물을 지칭한다. 한 실시양태에서, 대상체는 포유동물 또는 포유동물 종이다. 한 실시양태에서, 대상체는 인간이다. 다른 실시양태에서, 대상체는 비-인간 영장류, 실험실 동물, 가축, 경주마, 사육 동물 및 비-사육 동물을 포함하나 이들로 제한되지 않는 비-인간 척추 동물이다.

[0355] 본원에서 사용된 용어 "면역 세포"는 호중구, 호산구, 호염기구, 신경아교세포(예를 들어, 성상세포, 미세아교세포 및 희소돌기아교세포), 단핵구, 대식세포, 수지상세포, B 세포, T 세포 및 NK 세포를 포함하는 림프구를 포함하나 이들로 제한되지 않는 선천성 및 후천성 면역계의 세포를 지칭한다.

[0356] 본원에서 사용된 바와 같이, "통상적인 T 세포"는 αβ T 세포 수용체("TCR")뿐만 아니라 보조수용체 CD4 또는 CD8도 발현하는 T 림프구이다. 통상적인 T 세포는 말초 혈액, 림프절 및 조직에 존재한다. 문헌[Roberts and Girardi, "Conventional and Unconventional T Cells", Clinical and Basic Immunodermatology, pp. 85-104, (Gaspari and Tyring (ed.)), Springer London (2008)]을 참조한다. 본원에서 사용된 바와 같이, "비통상적인 T 세포"는 γδ TCR을 발현하는 림프구이고 일반적으로 피부, 위장관 또는 비뇨생식관과 같은 상피 환경에 존재할 수 있다. 비통상적인 T 세포의 또 다른 서브세트는 통상적인 T 세포의 표현형적 및 기능적 능력을 가질 뿐만 아니라 천연 킬러 세포의 특징(예를 들어, 세포용해 활성)도 가진 불변 천연 킬러 T("NKT") 세포이다. 상기 문헌을 참조한다. 본원에서 사용된 바와 같이, 조절 T 세포("Treg")는 면역계를 조절하고, 자가 항원에 대한 내성을 유지하고, 자가면역 질환을 제거하고, 그렇지 않으면 다른 세포의 면역 자극 또는 활성화 반응을 억제하는 T 세포의 하위집단이다. Treg는 다양한 형태로 존재하며, 이들 중 가장 잘 이해되어 있는 형태는 CD4, CD25 및 Foxp3을 발현하는 형태이다. 본원에서 사용된 바와 같이, "천연 Treg" 또는 "nTreg"는 흉선에서 발생하는 Treg 또는 세포를 지칭한다. 본원에서 사용된 바와 같이, "유도된 Treg" 또는 "iTreg"는 흉선 외부에서 성숙 CD4+ 통상적인 T 세포로부터 발생하는 Treg 또는 세포를 지칭한다.

[0357] Akt3의 "활성"은 Akt3 단백질의 생물학적 기능을 지칭한다. 생체활성은 단백질의 기본 수준의 활성을 증가시키거나 감소시킴으로써, 단백질의 기본 수준의 결합력, 단백질의 양, Akt 단백질의 하나 이상의 다른 동형체(예를 들어, Akt1 또는 Akt2)에 대한 Akt3의 비를 증가시키거나 감소시킴으로써, 단백질의 발현 수준을 증가시키거나 감소시킴으로써(Akt3의 mRNA 발현을 증가시키거나 감소시키는 것을 포함함), 또는 이들의 조합을 통해 증가될 수 있거나 감소될 수 있다. 예를 들어, 생체이용 가능한 Akt3 단백질은 키나제 활성을 갖고 Akt3의 기질에 결합하여 이를 인산화할 수 있는 단백질이다. 생체이용 가능하지 않은 Akt3 단백질은 잘못 위치되어 있거나 Akt 기

질에 결합하여 이를 인산화할 수 없는 Akt3 단백질을 포함한다.

[0358] 일부 실시양태에서, 개시된 화합물은 Akt1 및 Akt2에 비해 Akt3을 선택적으로 조절한다. 일부 실시양태에서, 개시된 화합물들 중 어느 한 화합물은 Akt1 및 Akt2를 통계적으로 유의미한 정도로 조절하지 않는다. 다른 실시양태에서, 개시된 화합물에 의한 Akt3의 조절은 Akt1 및/또는 Akt2의 조절보다 약 5배, 약 10배, 약 15배, 약 50배, 약 100배, 약 1000배 또는 약 5000배 더 크다.

[0359] 본원에서 사용된 바와 같이, 용어 "펩타이드" 또는 "폴리펩타이드"는 변형(예를 들어, 인산화 또는 글리코실화)과 관계없이 임의의 길이의 아미노산 쇄를 지칭한다. 이 용어들은 단백질 및 이의 단편을 포함한다. 폴리펩타이드는 "외생성" 폴리펩타이드일 수 있는데, 이는 이 폴리펩타이드가 "이종" 폴리펩타이드, 즉 이용되는 숙주 세포에 대한 외래 폴리펩타이드, 예컨대, 세균 세포에 의해 생성된 인간 폴리펩타이드임을 의미한다. 폴리펩타이드는 본원에서 아미노산 잔기 서열로서 개시된다. 이러한 서열은 아미노에서 카르복시 말단 방향으로 왼쪽에서 오른쪽으로 기재된다. 표준 명명법에 따라, 아미노산 잔기 서열은 하기 표시된 바와 같이 3문자 또는 1문자 코드로 표기된다: 알라닌(Ala, A), 아르기닌(Arg, R), 아스파라긴(Asn, N), 아스파르트산(Asp, D), 시스테인(Cys, C), 글루타민(Gln, Q), 글루탐산(Glu, E), 글리신(Gly, G), 히스티딘(His, H), 이소류신(Ile, I), 류신(Leu, L), 라이신(Lys, K), 메티오닌(Met, M), 페닐알라닌(Phe, F), 프롤린(Pro, P), 세린(Ser, S), 트레오닌(Thr, T), 트립토판(Trp, W), 티로신(Tyr, Y) 및 발린(Val, V).

[0360] 용어 "의 발현을 자극한다"는 발현에 영향을 미치는 것, 예를 들어, 발현 또는 활성을 유도하거나 정상적인 건강한 대조군에 비해 증가된/더 큰 발현 또는 활성을 유도하는 것을 의미한다.

[0361] 용어 "면역 활성화 반응", "면역 반응의 활성화" 및 "면역 자극 반응"은 선천성 또는 후천성 면역의 활성화 또는 효율을 개시하거나, 유도하거나, 향상시키거나 증가시키는 반응을 의미한다. 이러한 면역 반응은 예를 들어, 수용자 환자에서 펩타이드에 대한 유리한 체액성(항체에 의해 매개됨) 및/또는 세포성(항원 특이적 T 세포 또는 이의 분비 생성물에 의해 매개됨) 반응의 발생을 포함한다. 이러한 반응은 면역원의 투여에 의해 유도되는 능동 반응일 수 있거나, 항체 또는 프라이밍된 T 세포의 투여에 의해 유도되는 수동 반응일 수 있다. 세포성 면역 반응은 항원 특이적 CD4+ T 헬퍼 세포 및/또는 CD8+ 세포독성 T 세포를 활성화시키기 위해 클래스 I 또는 클래스 II 주조직적합성 복합체("MHC") 분자와 함께 폴리펩타이드 에피토프를 제시함으로써 유발된다. 상기 반응은 또한 단핵구, 대식세포, NK 세포, 호염기구, 수지상세포, 성상세포, 미세아교세포, 호산구의 활성화, 호중구의 활성화 또는 동원, 또는 선천성 면역의 다른 구성요소를 포함할 수 있다. 세포 매개 면역학적 반응의 존재는 증식 어세이(CD4+ T 세포) 또는 세포독성 T 림프구("CTL") 어세이에 의해 확인될 수 있다. 면역원의 보호 또는 치료 효과에 대한 체액성 반응 및 세포성 반응의 상대적인 기여는 면역화된 동계 동물로부터 항체 및 T 세포를 따로 단리하고 제2 대상체에서 보호 또는 치료 효과를 측정함으로써 식별될 수 있다.

[0362] 용어 "억제 면역 반응" 및 "면역 억제 반응"은 선천성 또는 후천성 면역의 활성화 또는 효율을 감소시키거나 방해하는 반응을 지칭한다.

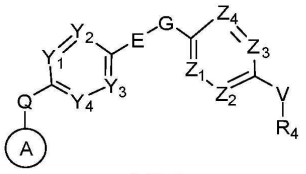
[0363] 용어 "면역 내성"은 잠재적으로 유해한 면역 반응이 예방되거나, 억제되거나 유해하지 않은 면역 반응으로 전환되는 임의의 기작을 지칭한다(문헌[Bach, et al., *N. Eng. J. Med.*, 347: 911-920 (2002)] 참조).

[0364] 용어 "면역원성 작용제" 또는 "면역원"은 임의로 아쥬번트(adjuvant)와 함께 포유동물에게 투여될 때 그 자신에 대한 면역학적 반응을 유도할 수 있는 작용제를 지칭한다.

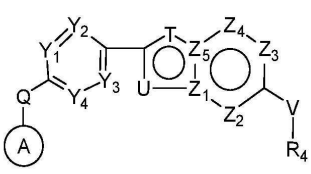
[0365] **화합물**

[0366] 한 측면에서, 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 Akt3 조절제로서 기재된다. 본 출원인은 놀랍게도 본원에 개시된 화합물이 그의 구조 및 치환에 따라 Akt3 활성을 조절한다는 것, 예를 들어, Akt3 활성 및/또는 다운스트림 이벤트를 활성화시키거나 억제한다는 것을 발견하였다.

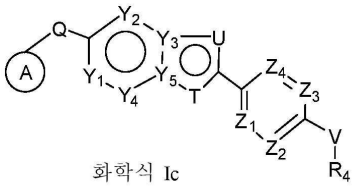
[0367] 한 측면에서, 하기 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물, 또는 이의 약학적으로 허용되는 염이 기재된다:



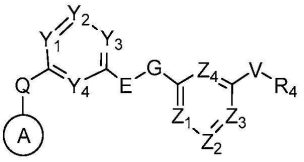
화학식 Ia ;



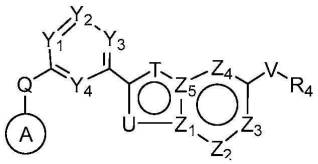
화학식 Ib ;



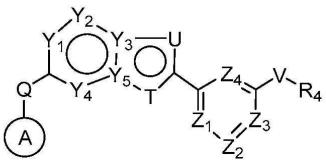
화학식 Ic ;



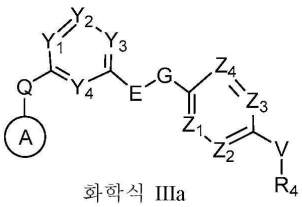
화학식 IIa ;



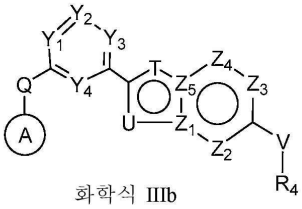
화학식 IIb ;



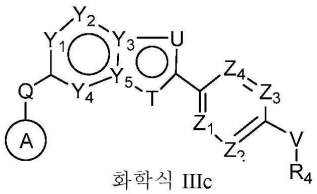
화학식 IIc ;



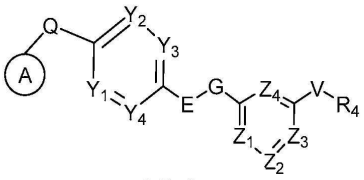
화학식 IIIa ;



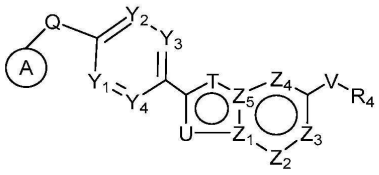
화학식 IIIb ;



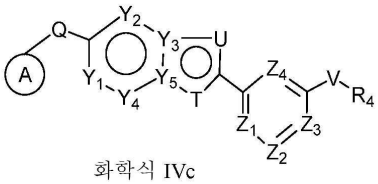
화학식 IIIc ;



화학식 IVa ;



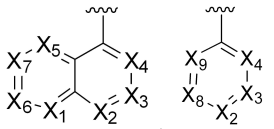
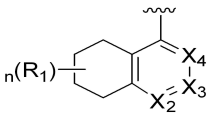
화학식 IVb ; 또는



화학식 IVc ;

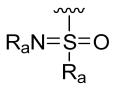
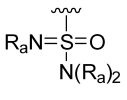
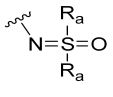
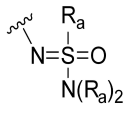
[0368]

[0369] 상기 식에서,

[0370] Ⓐ는  , , 또는  이고,

[0371] X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 및 X_9의 각 경우는 독립적으로 CR_1 또는 N이고;

[0372] R_1의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테

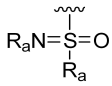
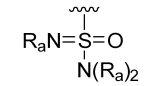
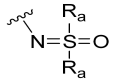
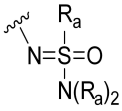
로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, (C_4-C_{14})헤테로트리사이클로알케닐, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, , , , , 및 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$로 임의로 치환된 부분 포화 이환형 헤테로아릴로 이루어진 군으로부터 선택되고;

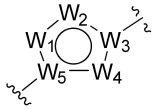
[0373] 여기서 R_1의 (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, (C_4-C_{14})헤테로트리사이클로알케닐, 아릴 및 헤테로아릴은 각각 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$로 임의로 치환되고;

[0374] n은 원자가가 허용하는 경우 0 내지 4의 정수이고;

[0375] Q는 $C(R_a)_2$, O, NR_a, $N(C=O)R_a$, 또는 NSO_2R_a이고;

[0376] Y_1, Y_2, Y_3, Y_4 및 Y_5는 원자가가 허용하는 경우 각각 독립적으로 N 또는 CR_2이고;

[0377] R_2는 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, , , , 및 로 이루어진 군으로부터 선택되고;

[0378] -E-G-는 $-(C=O)NR_x-$, $-NR_x(C=O)-$, $-N(R_x)(C=O)N(R_x)-$, $-O(C=O)N(R_x)-$, $-N(R_x)(C=O)O-$, $-SO_2NR_x-$, $-NR_xSO_2-$, 또는 이고;

[0379] 여기서 R_x의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, 아릴 또는 헤테로아릴이거나; R_x와 Y_2, R_x와 Y_3, R_x와 Z_1, 또는 R_x와 Z_4는 함께 임의로 치환된 5원 또는 6원 헤테로사이클을 형성하고;

[0380] W_1, W_2, W_3, W_4 및 W_5는 원자가가 허용하는 경우 각각 독립적으로 CR_6, N 또는 NR_6이고;

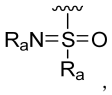
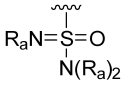
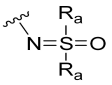
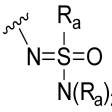
[0381] R_6의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬 및 (C_1-C_6)할로알킬로 이루어진 군으로부터 선택되고;

[0382] T의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이고;

[0383] U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이고;

[0384] R_b의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬이고;

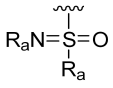
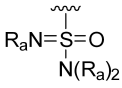
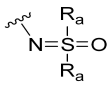
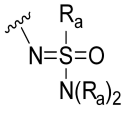
[0385] Z_1, Z_2, Z_3, Z_4 및 Z_5는 원자가가 허용하는 경우 각각 독립적으로 N 또는 CR_3이고;

[0386] R_3은 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, , , , 및 로 이루어진 군으로부터 선택되고;

[0387] V는 부재하거나, $C(R_a)_2$, NR_a, $N(C=O)R_a$, NSO_2R_a 또는 O이고;

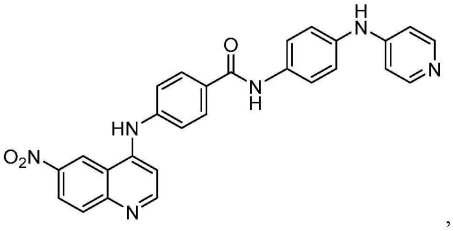
[0388] R_4는 각각 하나 이상의 R_5로 임의로 치환된 (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 아릴 및 헤테로아릴로 이루어진 군으로부터 선택되거나;

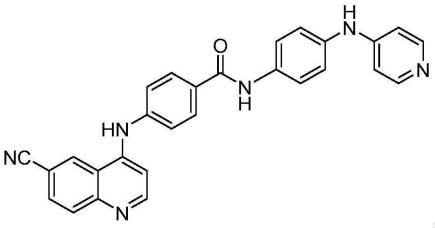
[0389] 대안적으로, V와 R_4는 함께 (C_3-C_7)헤테로사이클로알킬 또는 (C_4-C_{10})헤테로스피로알킬을 형성하고;

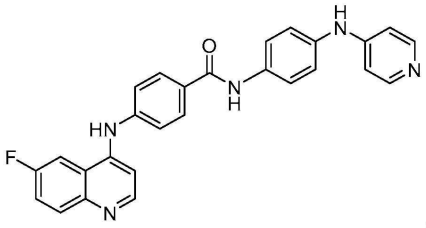
[0390] R_5의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$, $N(R_a)COR_a$, , , , 및 로 이루어진 군으로부터 선택되고;

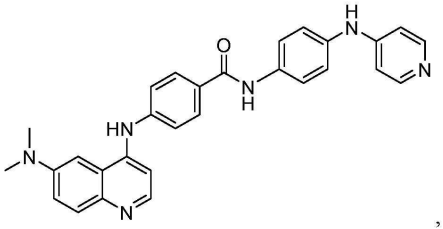
[0391] R_a의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_2-C_6)알케닐, (C_3-C_7)사이클로알킬, 아릴 또는 헤테로아릴이거나, 2개의 R_a는 함께 할로겐 또는 (C_1-C_6)알킬로 임의로 치환된 4원 내지 6원 고리를 형성하고;

[0392] 단, 상기 화합물은 하기 화합물이 아니다:

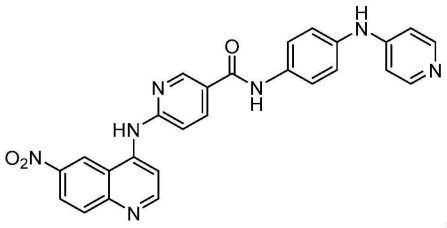

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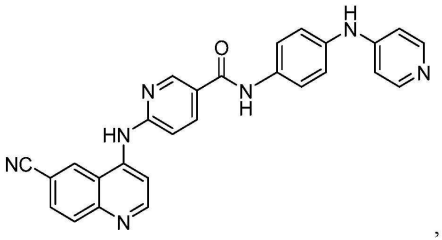

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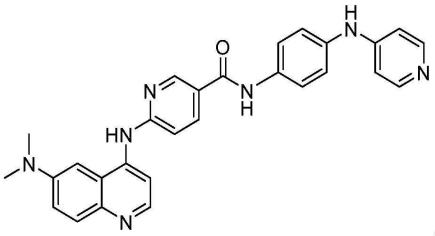

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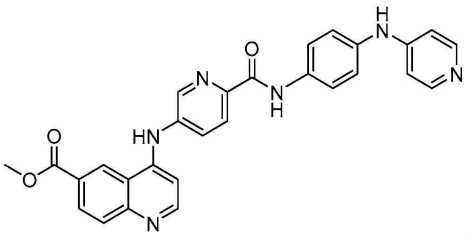

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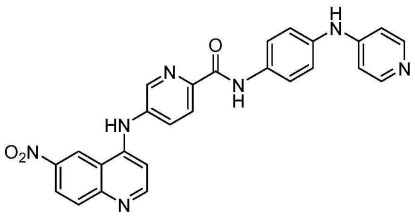
[0393]

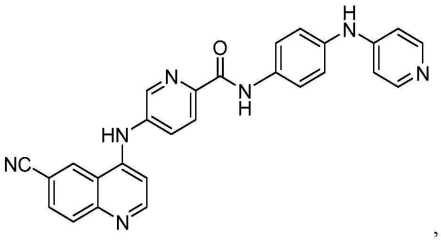

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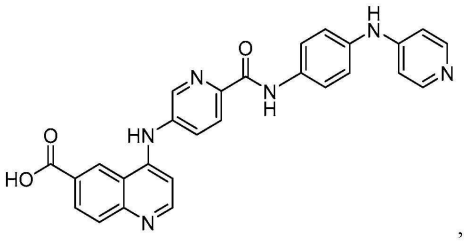

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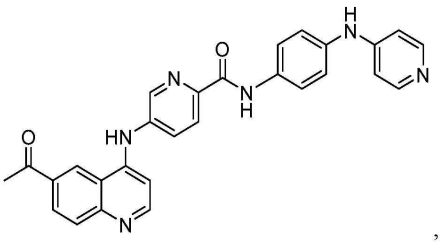
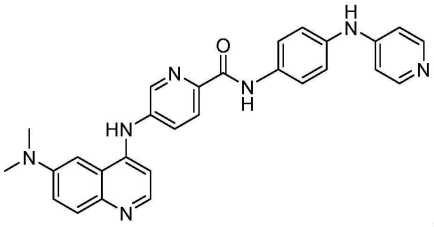
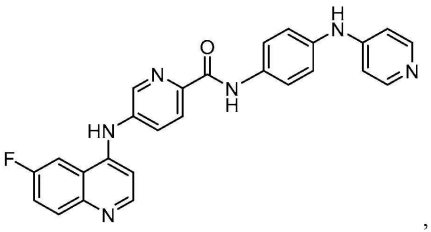
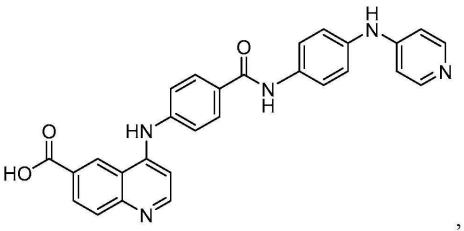
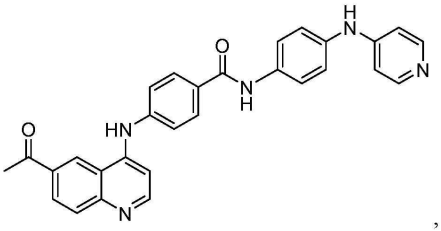
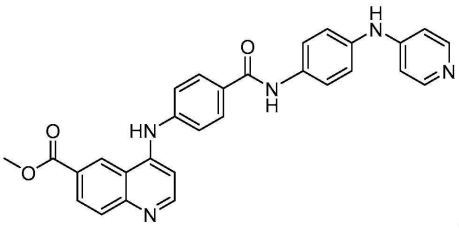

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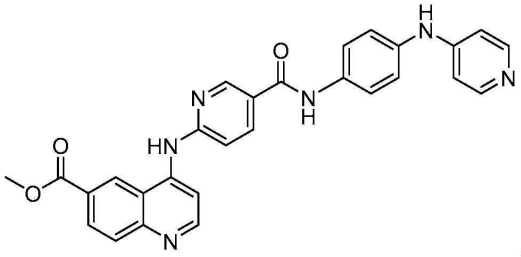

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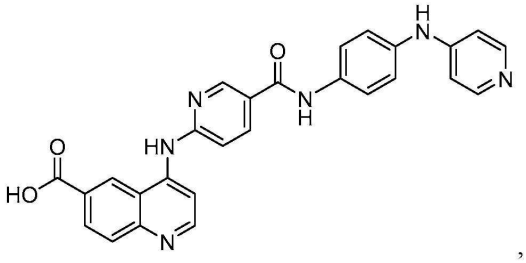

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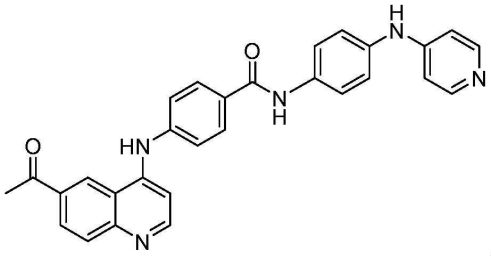
[0394]

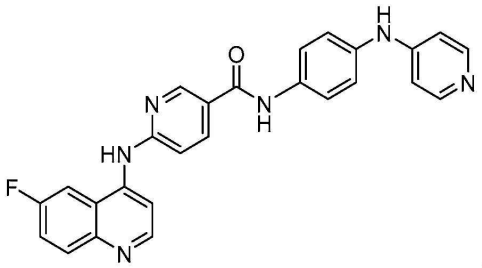

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[0395]

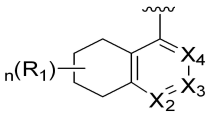
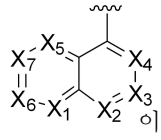
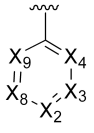

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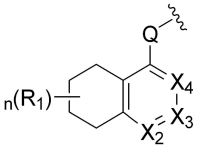

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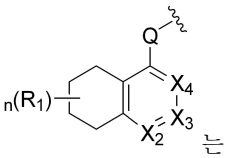
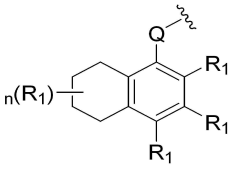
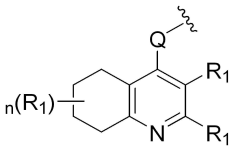
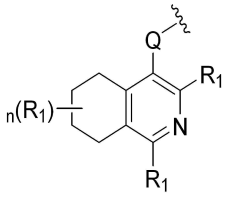
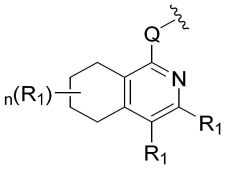
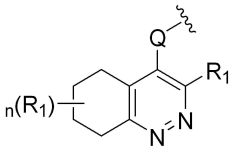
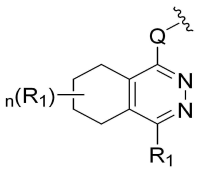
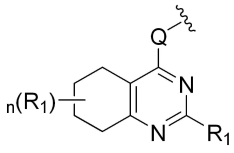
[0396]

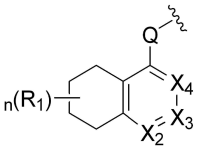
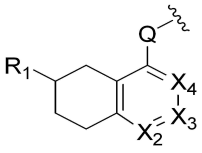
[0397] 일부 실시양태에서, Ⓐ는  이다. 일부 실시양태에서, Ⓐ는  이다. 일부 실시양태에서, Ⓐ는  이다.

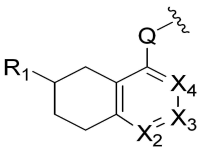
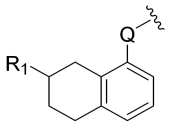
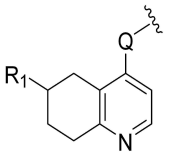
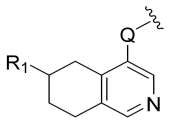
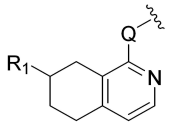
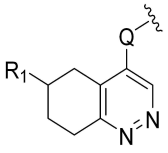
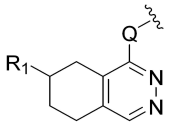
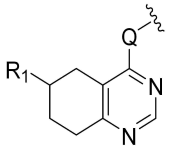
[0398] 일부 실시양태에서, Q는 $C(R_a)_2$, O 또는 NR_a이다. 일부 실시양태에서, Q는 O이다. 일부 실시양태에서, Q는 NR_a이다. 일부 실시양태에서, Q는 NH이다. 일부 실시양태에서, Q는 NCH_3 또는 NCH_2CH_3이다. 일부 실시양태에서, Q는 $N(C=O)R_a$ 또는 NSO_2R_a이다. 일부 실시양태에서, Q는 N(C=O)H이다. 일부 실시양태에서, Q는 $N(C=O)CH_3$ 또는 $N(C=O)CH_2CH_3$이다. 일부 실시양태에서, Q는 NSO_2H이다. 일부 실시양태에서, Q는 NSO_2CH_3 또는 $NSO_2CH_2CH_3$이다.

[0399] 일부 실시양태에서, n은 0, 1, 2, 3 또는 4이다. 일부 실시양태에서, n은 0이다. 일부 실시양태에서, n은 1이다. 일부 실시양태에서, n은 2이다. 일부 실시양태에서, n은 3이다. 일부 실시양태에서, n은 4이다.

[0400] 일부 실시양태에서, Ⓐ는  이다. 일부 실시양태에서, X_2, X_3 및 X_4는 각각 독립적으로 CR_1 또는 N이다. 일부 실시양태에서, X_2, X_3 및 X_4는 CR_1이다. 일부 실시양태에서, X_2, X_3 및 X_4는 CH이다. 일부 실시양태에서, X_2, X_3 및 X_4 중 하나는 N이고, 나머지는 CR_1이다. 일부 실시양태에서, X_2, X_3 및 X_4 중 하나는 N이고, 나머지는 CH이다. 일부 실시양태에서, X_2, X_3 및 X_4 중 둘은 N이고, 나머지는 CR_1이다. 일부 실시양태에서, X_2, X_3 및 X_4 중 둘은 N이고, 나머지는 CH이다.

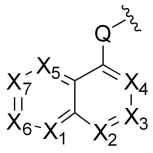
[0401] 일부 실시양태에서, 구조 모이어티  는  ,  ,  ,  ,  ,  , 또는  의 구조를 가진다.

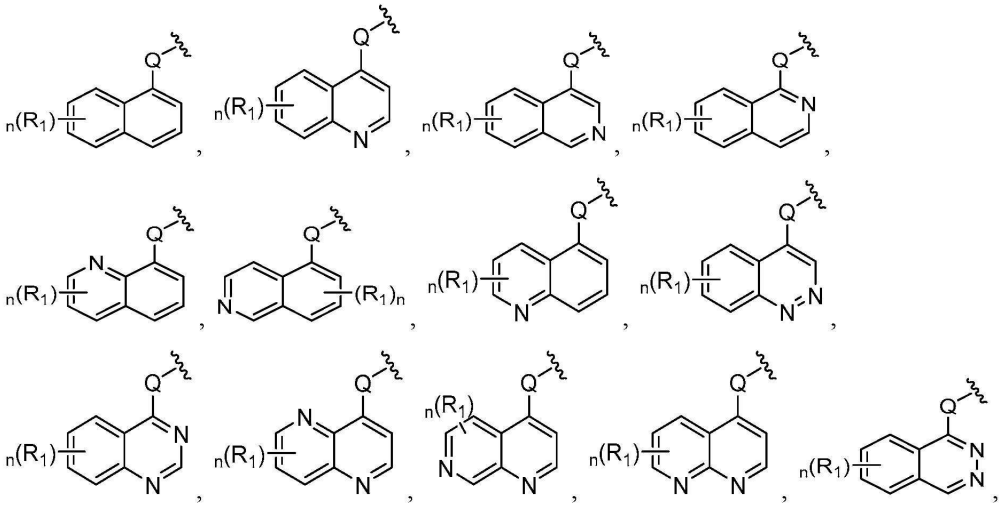
[0402] 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다.

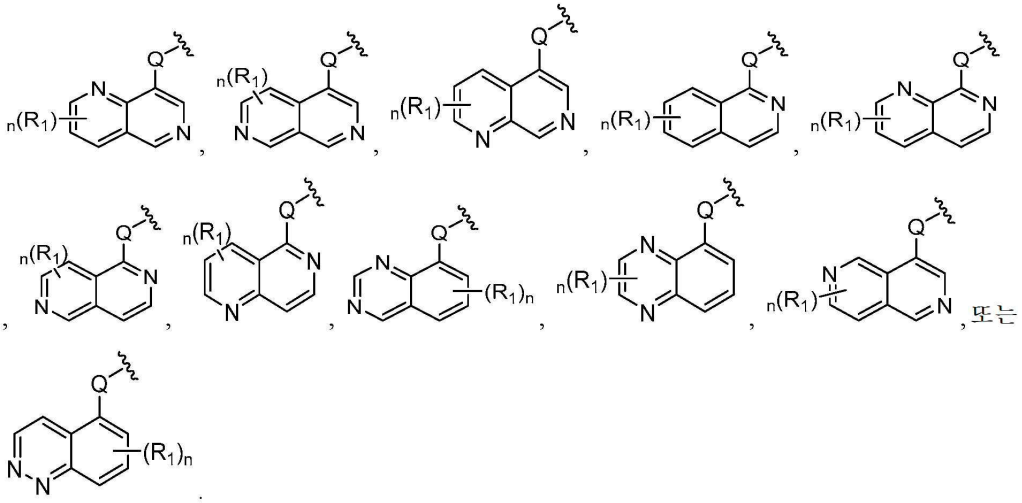
[0403] 일부 실시양태에서, 구조 모이어티  는  ,  ,  ,  ,  ,  , 또는  의 구조를 가진다.

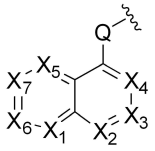
[0404] 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7은 각각 독립적으로 CR_1 또는 N이다. 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7은 CR_1이다. 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7은 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7 중 하나는 N이고, 나머지는 CR_1이다. 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7 중 하나는 N이고, 나머지는 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7 중 둘은 N이고, 나머지는 CR_1이다. 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7 중 둘은 N이고, 나머지는 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7 중 셋은 N이고, 나머지는 CR_1이다. 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7 중 셋은 N이고, 나머지는 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에

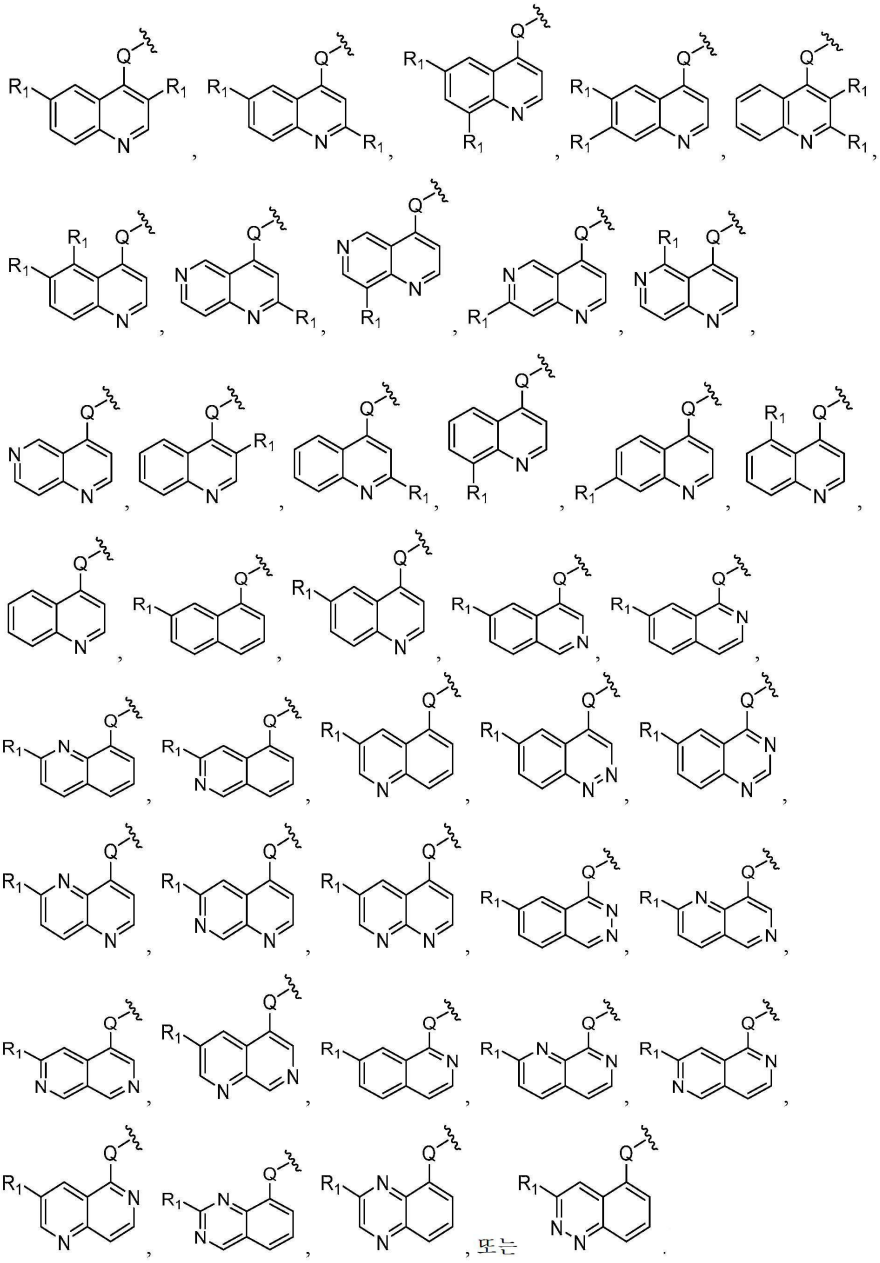
서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7 중 넷은 N이고, 나머지는 CR_1이다. 일부 실시양태에서, X_1, X_2, X_3, X_4, X_5, X_6 및 X_7 중 넷은 N이고, 나머지는 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_2는 N이고, X_7은 CR_1이고, X_1, X_3, X_4, X_5 및 X_6은 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_2는 N이고, X_7은 CR_1이고, X_3은 C(할로겐) 또는 CCH_3이고, X_1, X_4, X_5 및 X_6은 CH이다. 일부 실시양태에서, X_2 및 X_7은 N이고, X_1, X_3, X_4, X_5 및 X_6은 CR_1이다. 일부 실시양태에서, X_2 및 X_7은 N이고, X_1, X_3, X_4, X_5 및 X_6은 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9는 각각 독립적으로 CR_1 또는 N이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9는 CR_1이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9는 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9 중 하나는 N이고, 나머지는 CR_1이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9 중 하나는 N이고, 나머지는 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9 중 둘은 N이고, 나머지는 CR_1이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9 중 둘은 N이고, 나머지는 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9 중 셋은 N이고, 나머지는 CR_1이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9 중 셋은 N이고, 나머지는 각각 독립적으로 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9 중 넷은 N이고, 하나는 CR_1이다. 일부 실시양태에서, X_2, X_3, X_4, X_8 및 X_9 중 넷은 N이고, 하나는 CH, C(할로겐) 또는 CCH_3이다. 일부 실시양태에서, 할로겐은 F, Cl, Br 또는 I이다. 일부 실시양태에서, 할로겐은 F이다.

[0405] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

[0406] 

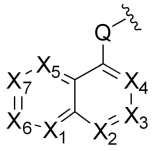
[0407] 

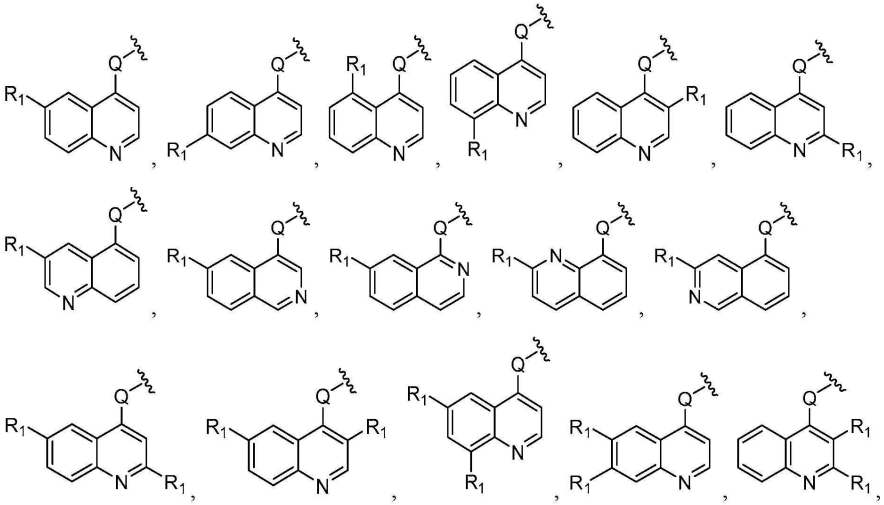
[0408] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

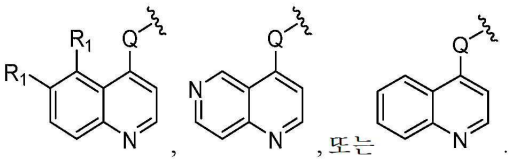
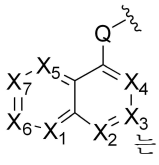
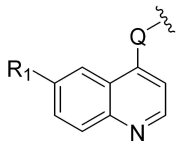
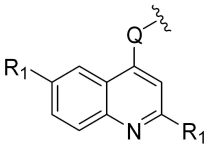


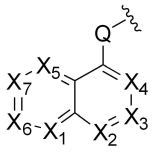
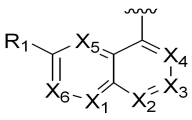
[0409] 또는

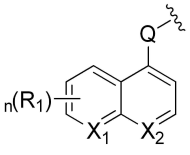
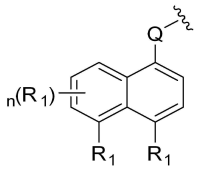
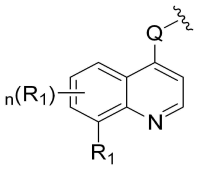
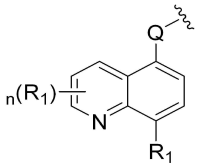
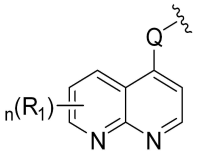
[0410] 일부 실시양태에서, Q는 O이다. 일부 실시양태에서, Q는 NR_a, $N(C=O)R_a$ 또는 NSO_2R_a이다. 일부 실시양태에서, Q는 NH이다. 일부 실시양태에서, Q는 NCH_3 또는 NCH_2CH_3이다.

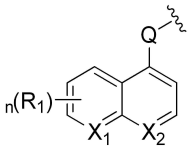
[0411] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

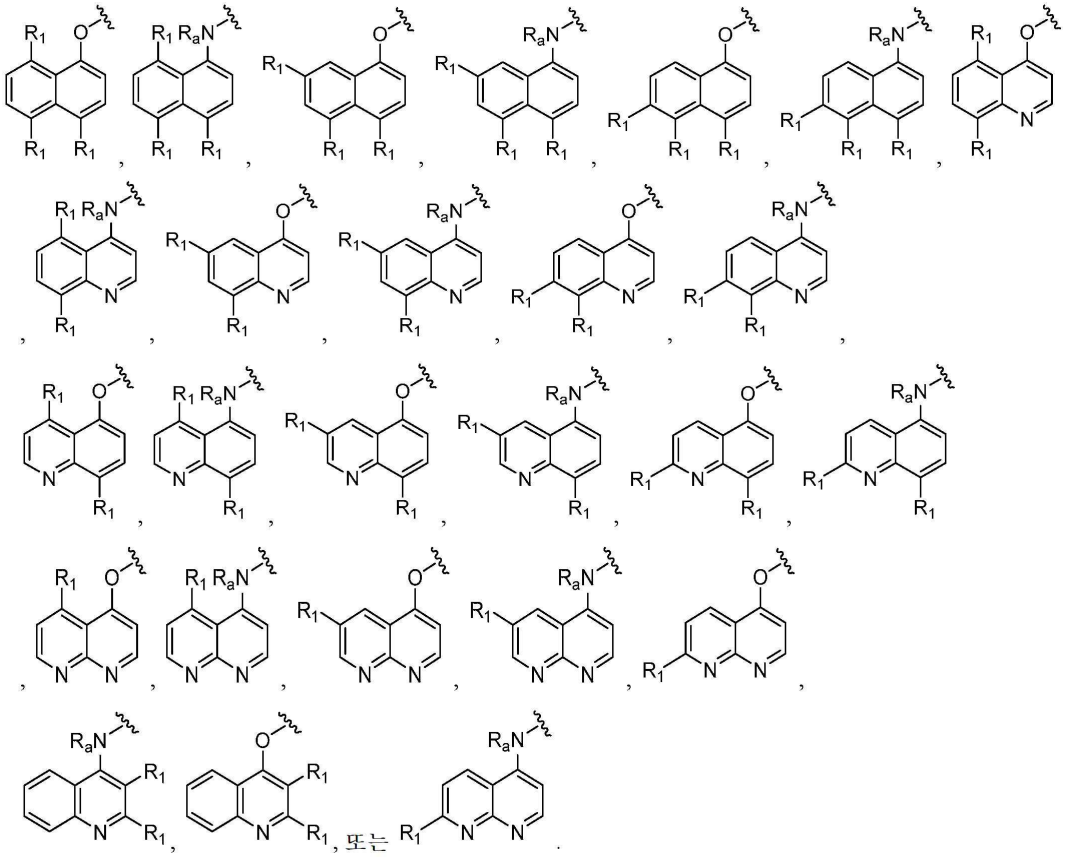
[0412] 

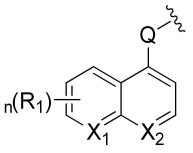
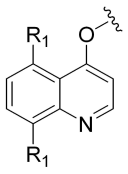
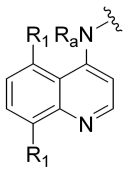
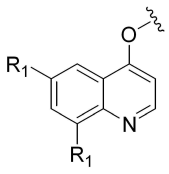
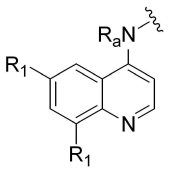
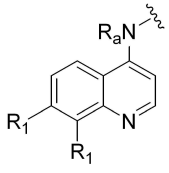
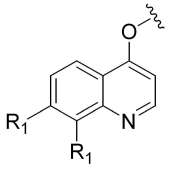
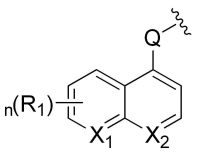
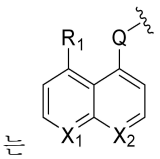
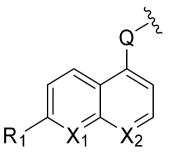
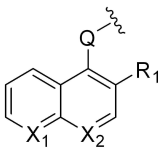
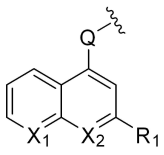
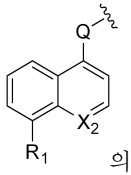
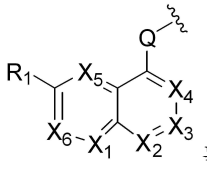
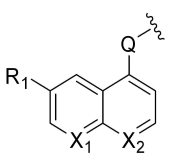
[0413] , 또는 . 일부 실시양태에서, 구조 모이어티  는  또는  의 구조를 가진다. 일부 실시양태에서, Q는 O이다. 일부 실시양태에서, Q는 NR_a, $N(C=O)R_a$ 또는 NSO_2R_a이다. 일부 실시양태에서, Q는 NH이다. 일부 실시양태에서, Q는 NCH_3 또는 NCH_2CH_3이다.

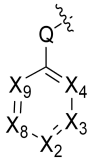
[0414] 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다.

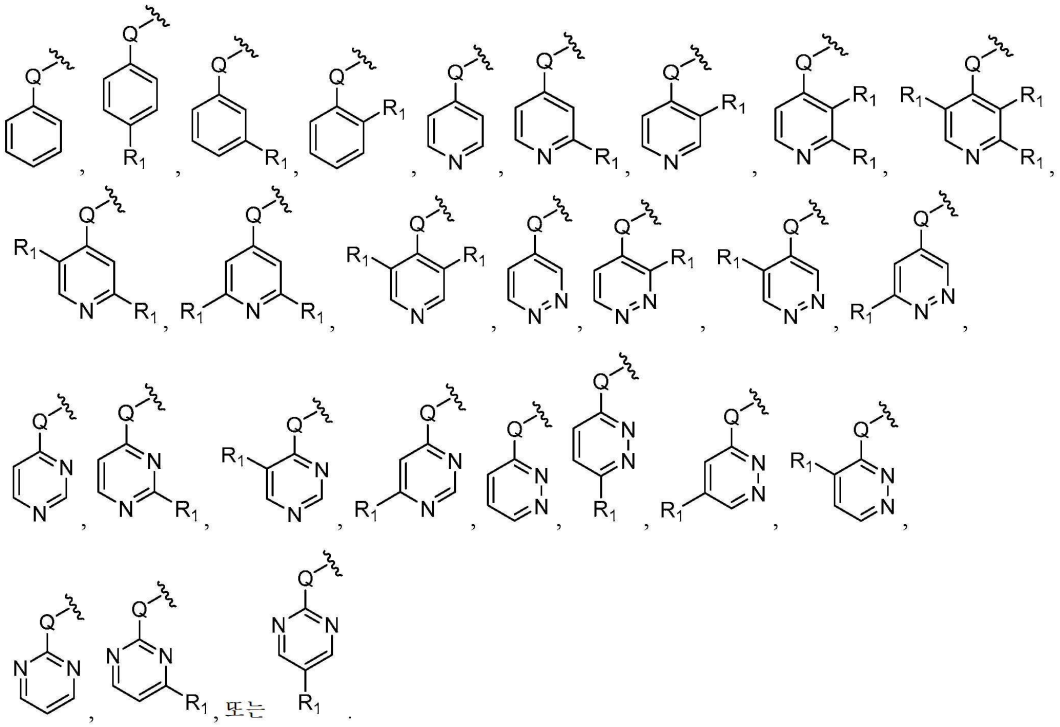
[0415] 일부 실시양태에서, 구조 모이어티  는 , , , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티

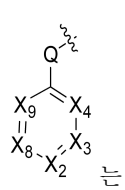
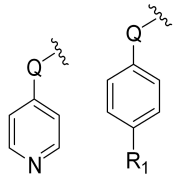
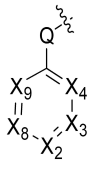
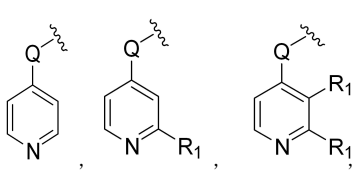

는 하기 화학식의 구조를 가진다:



일부 실시양태에서, 구조 모이어티 
는 
, 
, 
, 
, 
, 또는 
의 구조를 가진다. 일부 실시양태에서, 구조 모이어티 
는 
, 
, 
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, 또는 
의 구조를 가진다. 일부 실시양태에서, 구조 모이어티 
는 
의 구조를 가진다.

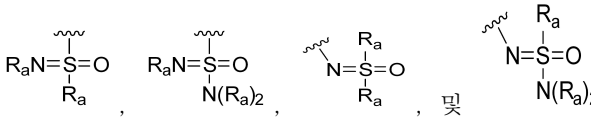
[0416] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:



[0417] 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, Q는 O이다. 일부 실시양태에서, Q는 NR_a, $N(C=O)R_a$ 또는 NSO_2R_a이다. 일부 실시양태에서, Q는 NH이다. 일부 실시양태에서, Q는 NCH_3 또는 NCH_2CH_3이다.

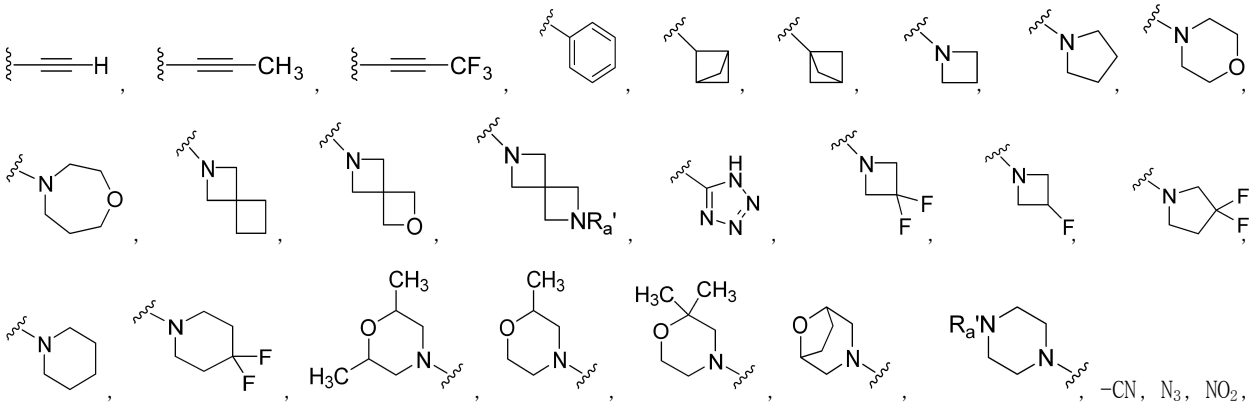
[0418] 일부 실시양태에서, R_1의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, (C_4-C_{14})헤테로트리사이클로알케닐, 아릴, 헤테로아릴, $-OR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, 및 $-N(R_a)SO_2R_a$로 이루어진 군으로부터 선택되고; 여기서 (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, $(C_3-$

C_7)헤테로사이클로알케닐, (CC_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, (C_4-C_{14})헤테로트리사이클로알케닐, 아릴 및 헤테로아릴은 각각 하나 이상의 (C_1-C_6)알킬로 임의로 치환된다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬 및 (C_4-C_{10})헤테로비사이클로알킬로 이루어진 군으로부터 선택되고; 여기서 (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬 및 (C_4-C_{10})헤테로비사이클로알킬은 각각 하나 이상의 (C_1-C_6)알킬로 임의로 치환된다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴 및 헤테로아릴로 이루어진 군으로부터 선택되고; 여기서 (C_4-C_{10})헤테로스피로알킬, 아릴 및 헤테로아릴은 각각 하나 이상의 (C_1-C_6)알킬로 임의로 치환된다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 임의로 치환된 (C_3-C_7)사이클로알케닐 또는 임의로 치환된 (C_3-C_7)헤테로사이클로알케닐이다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 임의로 치환된 (C_4-C_{10})비사이클로알케닐 또는 임의로 치환된 (C_4-C_{10})헤테로비사이클로알케닐이다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 임의로 치환된 (C_4-C_{14})트리사이클로알케닐 또는 임의로 치환된 (C_4-C_{14})헤테로트리사이클로알케닐이다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 임의로 치환된 (C_4-C_{14})트리사이클로알킬 또는 임의로 치환된 (C_4-C_{14})헤테로트리사이클로알킬이다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$ 및 $-N(R_a)SO_2R_a$로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_1의 각 경우는 독립적으로

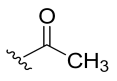
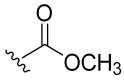
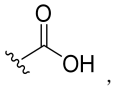
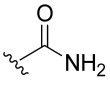
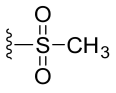
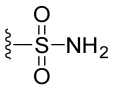
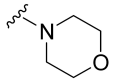
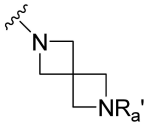
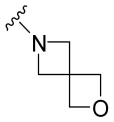
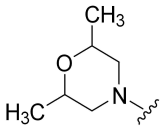
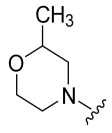
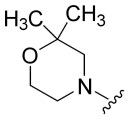
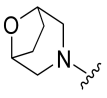
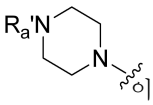


, 및

로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 H, D, 할로겐, OR_a, $N(R_a)_2$, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_1-C_6)알키닐, 아릴, (C_4-C_{10})비사이클로알킬, -CN, N_3, NO_2, COR_a, CO_2R_a, $CON(R_a)_2$, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$이고; 여기서 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 아릴 및 (C_4-C_{10})비사이클로알킬은 각각 하나 이상의 (C_1-C_6)알킬로 임의로 치환된다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_1-C_6)알키닐, 아릴, (C_4-C_{10})비사이클로알킬, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$이고; 여기서 아릴 및 (C_4-C_{10})비사이클로알킬은 각각 하나 이상의 (C_1-C_6)알킬로 임의로 치환된다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, $N(R_a)_2$, 또는 -CN이고; 여기서 (C_3-C_7)헤테로사이클로알킬 및 (C_4-C_{10})헤테로스피로알킬은 각각 하나 이상의 (C_1-C_6)알킬로 임의로 치환된다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 하나 이상의 (C_1-C_6)알킬로 임의로 치환된 (C_4-C_{10})헤테로스피로알킬이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 하나 이상의 (C_1-C_6)알킬로 임의로 치환된 할로겐화된 (C_3-C_7)헤테로사이클로알킬이다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 H, D, F, Cl, Br, CH_3, OCH_3, NH_2, $NHCH_3$, $N(CH_3)_2$,

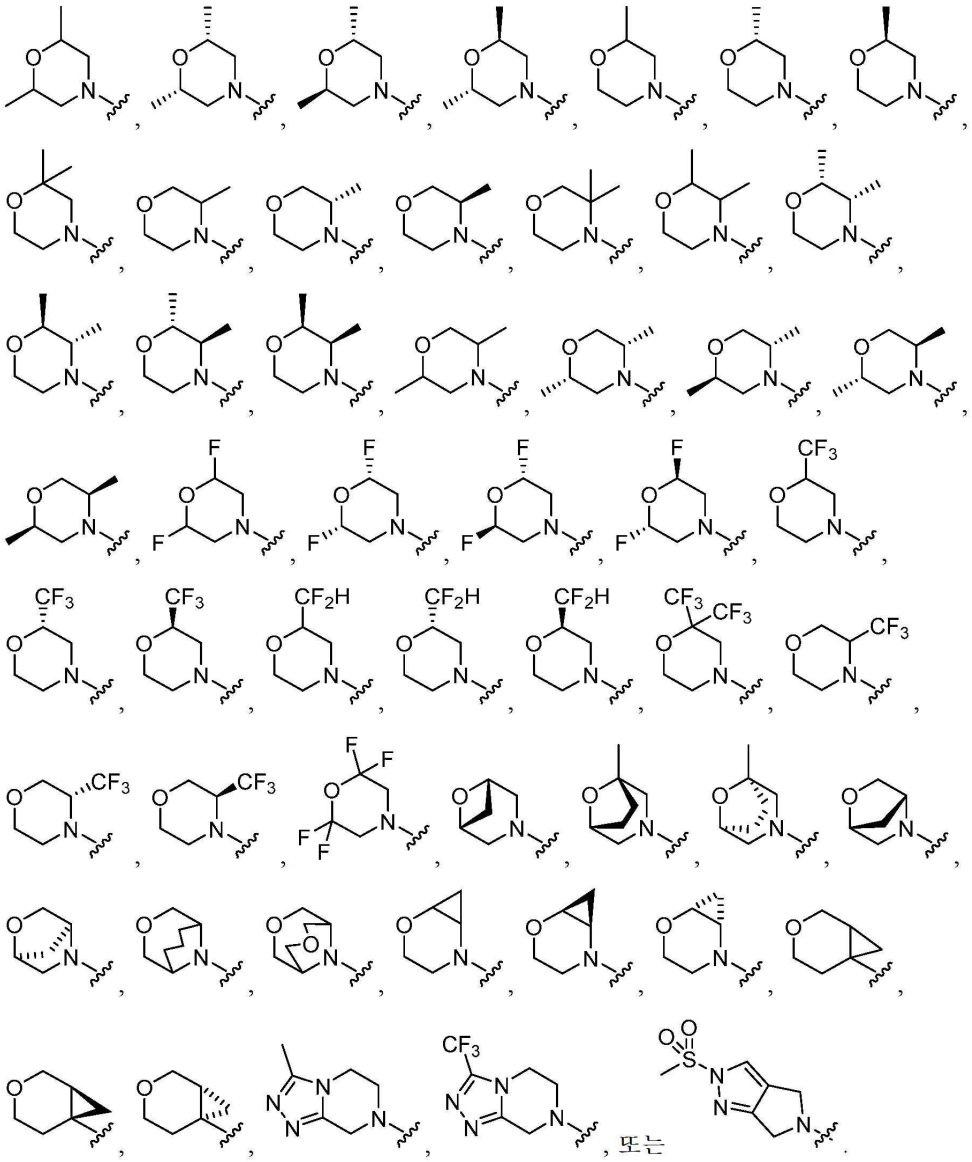


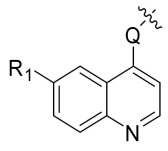
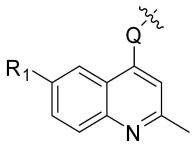
, -CN, N_3, NO_2,

, , , , , 또는  이고, 여기서 R_a'는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 H, D, F, CH_3, $N(CH_3)_2$, , , , , 또는  이고, 여기서 R_a'는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_1의 각 경우는 독립적으로 , , , , 이다.

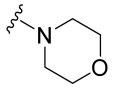
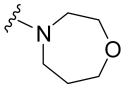
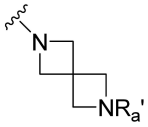
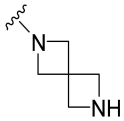
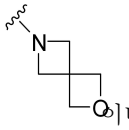
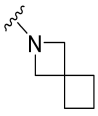
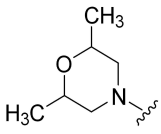
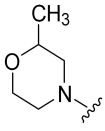
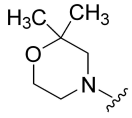
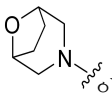
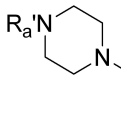
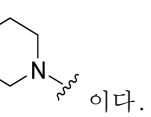
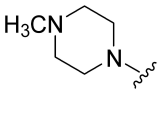
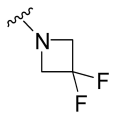
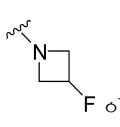
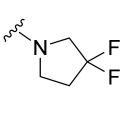
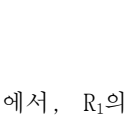
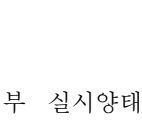
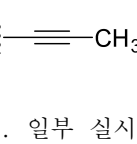
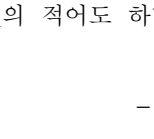
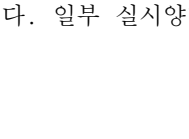
[0419] 일부 실시양태에서, R_1의 (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, (C_4-C_{14})헤테로트리사이클로알케닐, (C_4-C_{14})트리사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, 아릴 및 헤테로아릴은 각각 하나 이상의 할로겐, (C_1-C_6)알킬, $-OR_a$, -CN 또는 $-N(R_a)_2$로 임의로 치환된다.

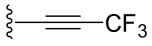
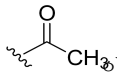
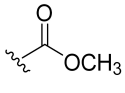
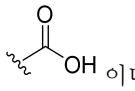
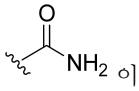
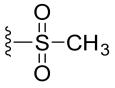
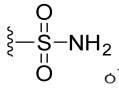
[0420] 일부 실시양태에서, R_1의 적어도 하나의 경우는 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$로 임의로 치환된 부분 포화 이환형 헤테로아릴이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 하기 화학식의 기이다:

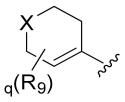
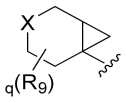
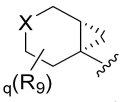
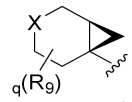
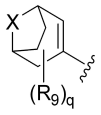
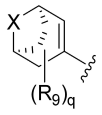
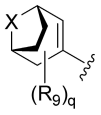
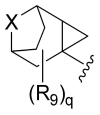
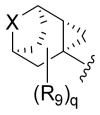
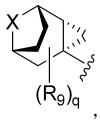
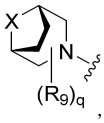
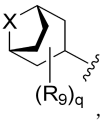
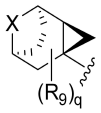


일부 실시양태에서, A는  또는  이다.

[0421] 일부 실시양태에서, R_1의 적어도 하나의 경우는 H, D 또는 할로겐이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 H이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 D이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 F이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 CH_3이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 OCH_3이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 NH_2이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 $NHCH_3$이다. 일부 실시양태에서, R_1 의 적어도 하나의 경우는 $N(CH_3)_2$이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다.

일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이고, 여기서 R_a'는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이고, 여기서 R_a'는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 ,  , 또는 이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_1의

적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 -CN이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 -NC이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 O_2이다. 일부 실시양태에서, R_1 의 적어도 하나의 경우는 N_3이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는  이다.

[0422] 일부 실시양태에서, R_1의 적어도 하나의 경우는 , , , , , , , , , , , , , 또는  이고; X는 CR_{15}, O, NR_{14}, 또는 S이고; R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; R_{14}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 아릴 또는 헤테로아릴이고; R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; q는 0, 1, 2 또는 3이다.

[0423] 일부 실시양태에서, X는 O이다. 일부 실시양태에서, X는 S이다. 일부 실시양태에서, X는 CR_{15}이다. 일부 실시양태에서, X는 NR_{14}이다.

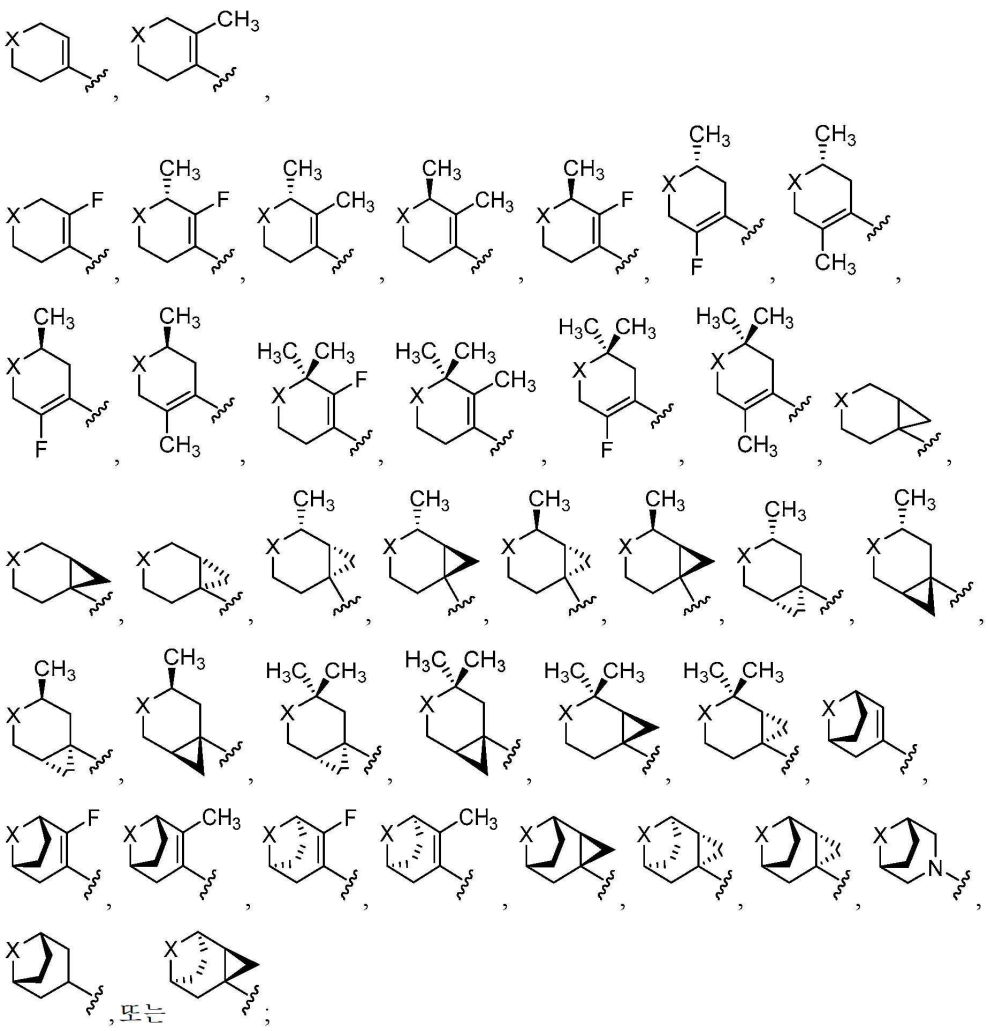
[0424] 일부 실시양태에서, R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이다. 일부 실시양태에서, R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬 또는 할로겐이다. 일부 실시양태에서, R_9의 각 경우는 독립적으로 H, F, Cl, Br, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$이다. 일부 실시양태에서, R_9의 각 경우는 독립적으로 H, F, Cl, Br 또는 CH_3이다.

[0425] 일부 실시양태에서, R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이다. 일부 실시양태에서, R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬 또는 할로겐이다. 일부 실시양태에서, R_{15}의 각 경우는 독립적으로 H, F, Cl, Br, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$이다. 일부 실시양태에서, R_{15}의 각 경우는 독립적으로 H, F, Cl, Br 또는 CH_3이다.

[0426] 일부 실시양태에서, q는 0이다. 일부 실시양태에서, q는 1이다. 일부 실시양태에서, q는 2이다. 일부 실시양태에서, q는 3이다.

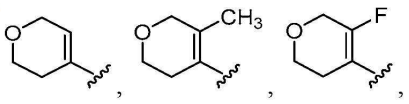
[0427] 일부 실시양태에서, R_{14}는 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 아릴 또는 헤테로아릴이다. 일부 실시양태에서, R_{14}는 H, (C_1-C_6)알킬 또는 (C_3-C_7)사이클로알킬이다. 일부 실시양태에서, R_{14}는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_{14}는 H 또는 CH_3이다.

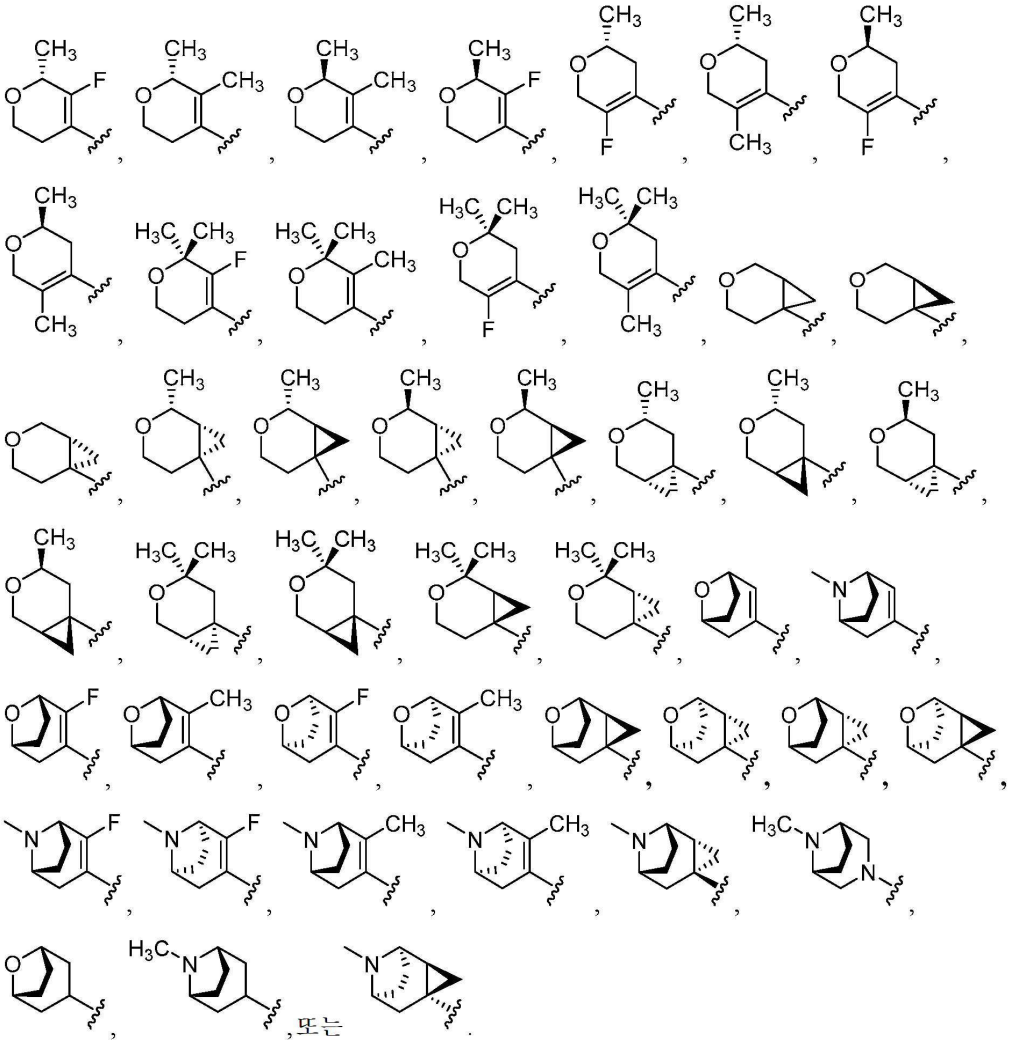
[0428] 일부 실시양태에서, R_1의 적어도 하나의 경우는 하기 화학식의 기이다:



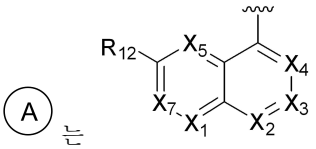
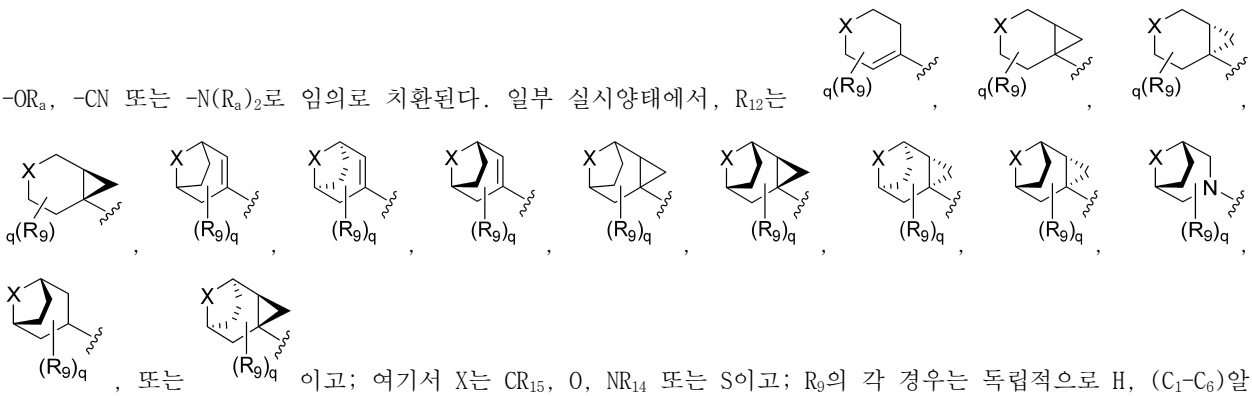
[0429]

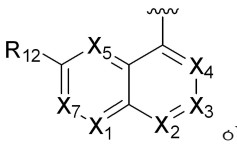
[0430] 상기 식에서, X는 O 또는 NR_{14}이고; R_{14}는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_1의 적어도 하나의 경우는 하기 화학식의 기이다:

[0431] 



[0432]

[0433] 일부 실시양태에서,  는 이고, 여기서 R_{12}는 (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, 또는 (C_4-C_{14})헤테로트리사이클로알케닐이고, 이들 각각은 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$로 임의로 치환된다. 일부 실시양태에서, R_{12}는  , 또는 이고; 여기서 X는 CR_{15}, O, NR_{14} 또는 S이고; R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; R_{14}는 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 아릴 또는 헤테로아릴이고; R_{14}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이고; q는 0, 1, 2 또는 3이다. 일부 실시양태에서, X_2는 N이다. 일

부 실시양태에서, X_3은 CH 또는 CCH_3이다. 일부 실시양태에서, Ⓐ는  이고, 여기서 X_2는 N이고; X_3은 CH 또는 CCH_3이고; R_{12}는 (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, 또는 (C_4-C_{14})헤테로트리사이클로알케닐이고, 이들 각각은 하나 이상의 (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN, 또는 $-N(R_a)_2$로 임의로 치환된다.

[0434] 일부 실시양태에서, X는 O이다. 일부 실시양태에서, X는 S이다. 일부 실시양태에서, X는 CR_{15}이다. 일부 실시양태에서, X는 NR_{14}이다.

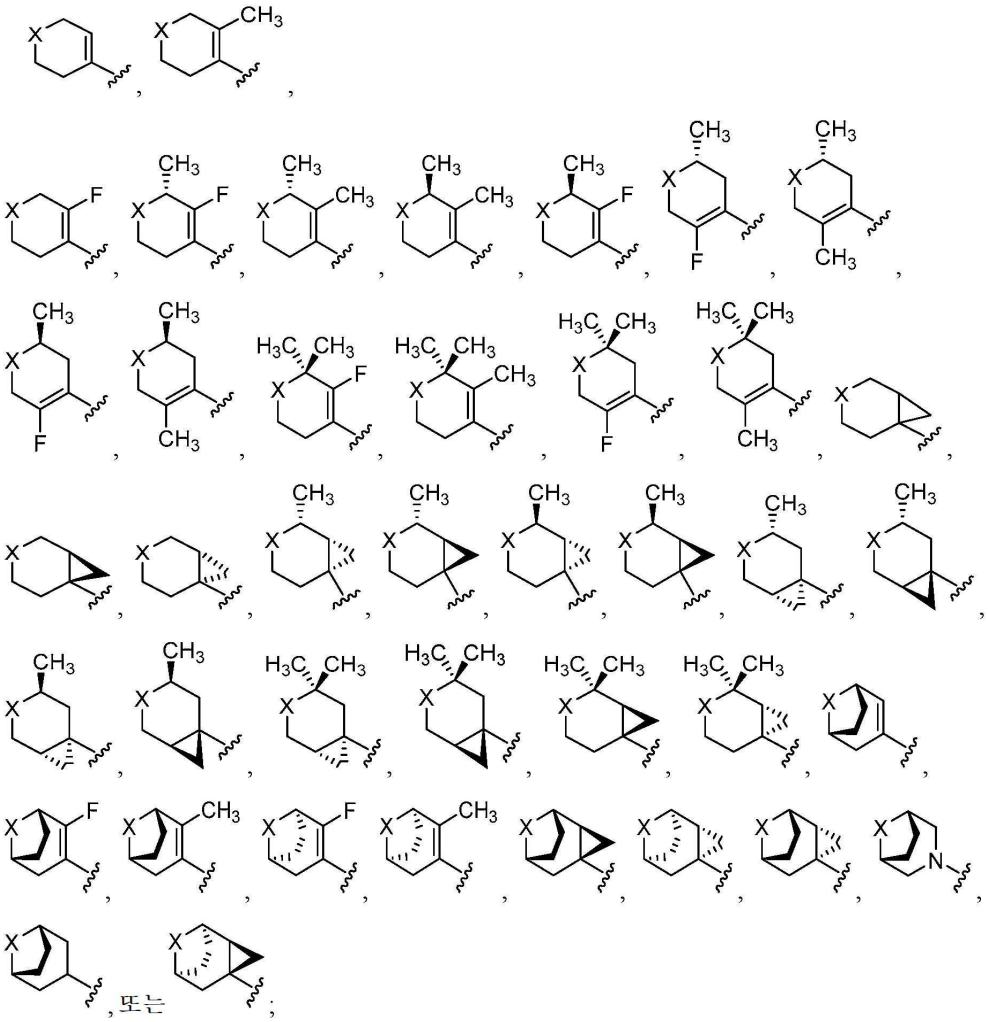
[0435] 일부 실시양태에서, R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이다. 일부 실시양태에서, R_9의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬 또는 할로겐이다. 일부 실시양태에서, R_9의 각 경우는 독립적으로 H, F, Cl, Br, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$이다. 일부 실시양태에서, R_9의 각 경우는 독립적으로 H, F, Cl, Br 또는 CH_3이다.

[0436] 일부 실시양태에서, R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬, 할로겐, $-OR_a$, -CN 또는 $-N(R_a)_2$이다. 일부 실시양태에서, R_{15}의 각 경우는 독립적으로 H, (C_1-C_6)알킬, 할로겐화된 (C_1-C_6)알킬 또는 할로겐이다. 일부 실시양태에서, R_{15}의 각 경우는 독립적으로 H, F, Cl, Br, CH_3, CF_3, OH, NH_2, $-NHCH_3$ 또는 $-N(CH_3)_2$이다. 일부 실시양태에서, R_{15}의 각 경우는 독립적으로 H, F, Cl, Br 또는 CH_3이다.

[0437] 일부 실시양태에서, q는 0이다. 일부 실시양태에서, q는 1이다. 일부 실시양태에서, q는 2이다. 일부 실시양태에서, q는 3이다.

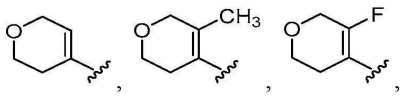
[0438] 일부 실시양태에서, R_{14}는 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 아릴 또는 헤테로아릴이다. 일부 실시양태에서, R_{14}는 H, (C_1-C_6)알킬 또는 (C_3-C_7)사이클로알킬이다. 일부 실시양태에서, R_{14}는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_{14}는 H 또는 CH_3이다.

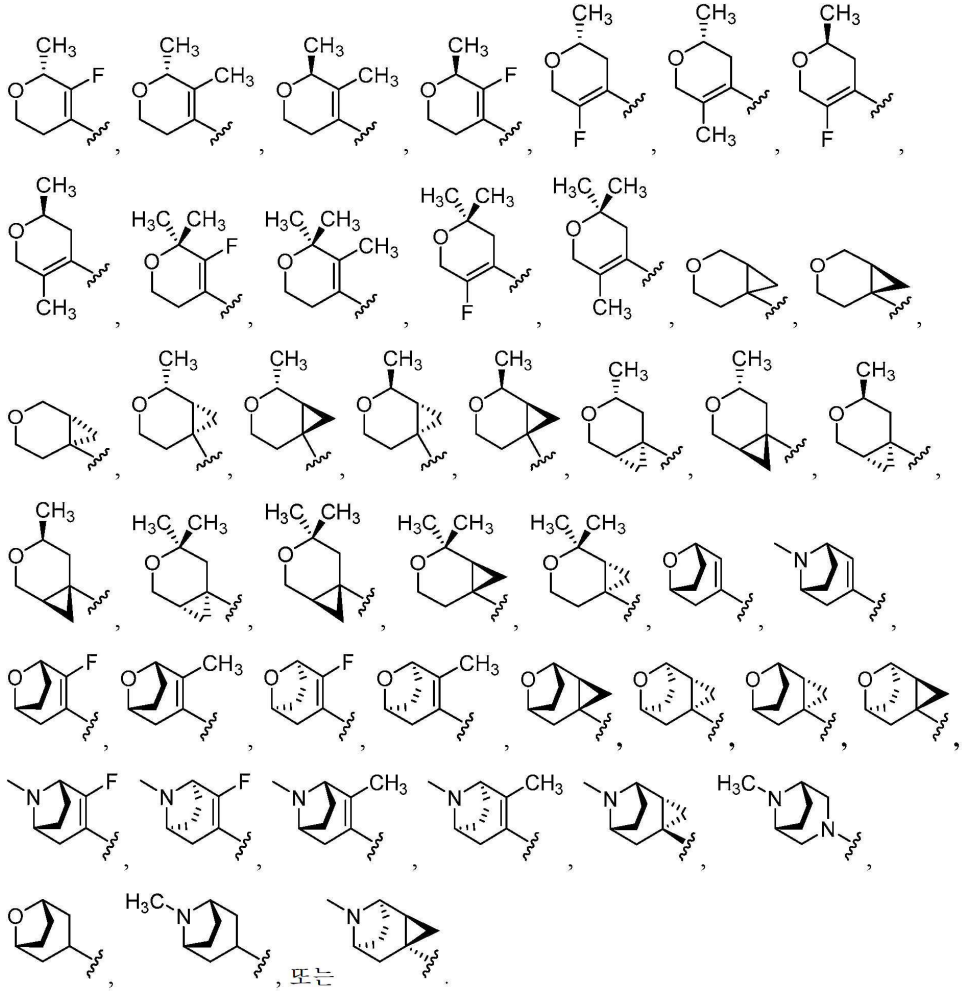
[0439] 일부 실시양태에서, R_{12}의 적어도 하나의 경우는 하기 화학식의 기이다:



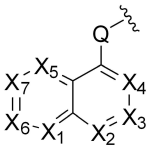
[0440]

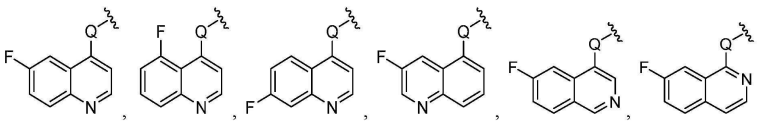
[0441] 상기 식에서, X는 O 또는 NR_{14}이고; R_{14}는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_{12}의 적어도 하나의 경우는 하기 화학식의 기이다:

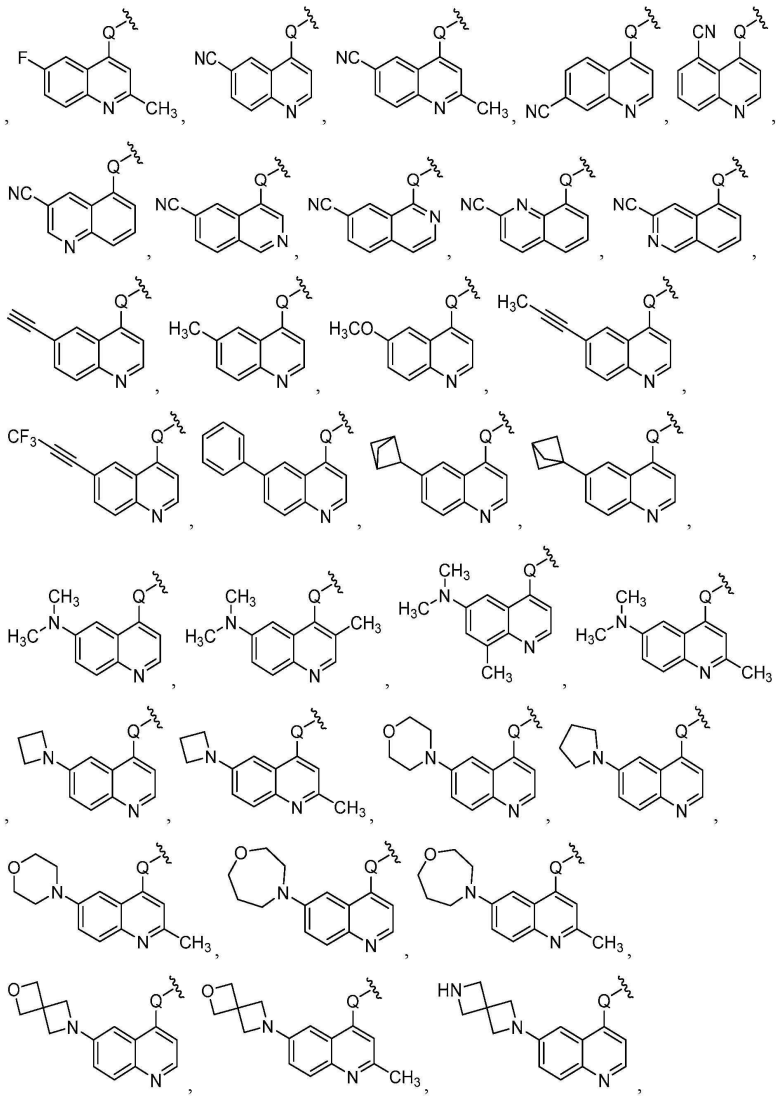
[0442] 

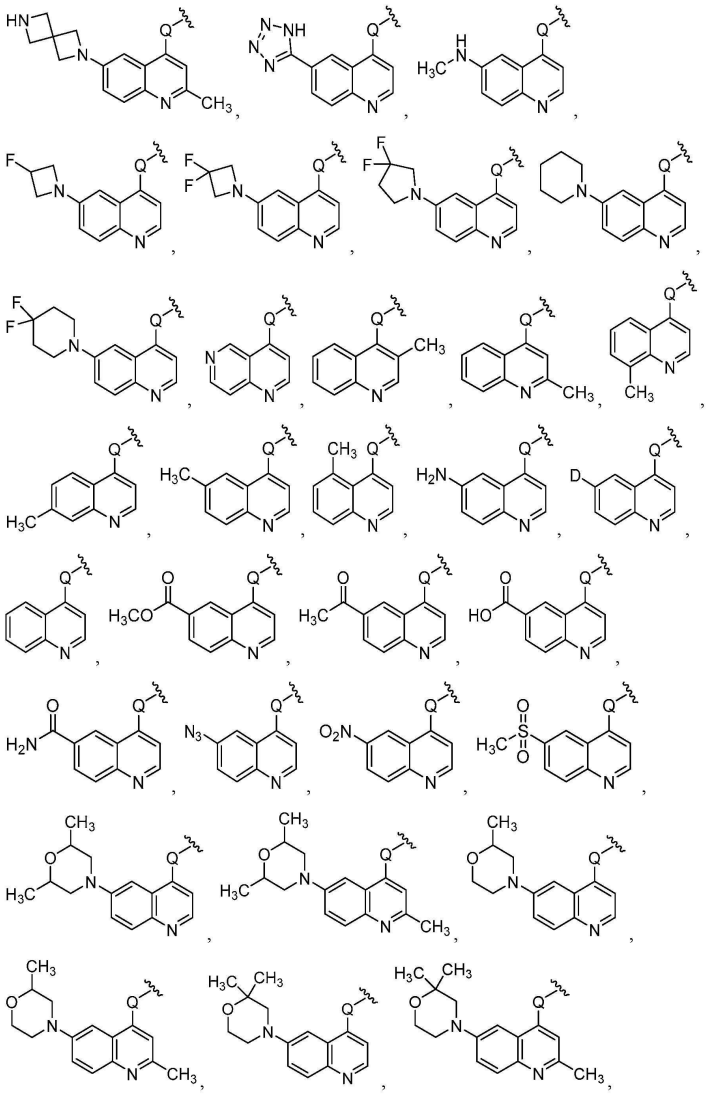


[0443] , 또는 .

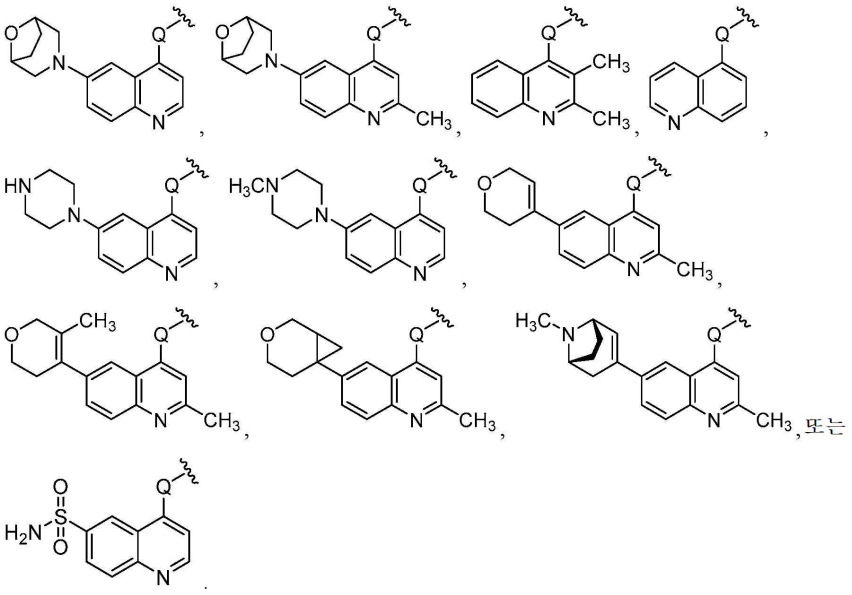
[0444] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

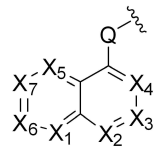
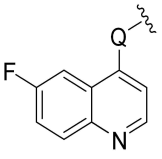
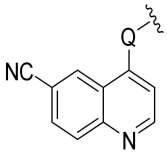
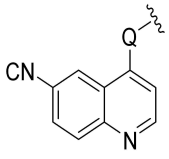
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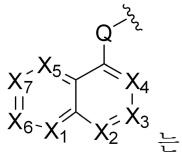
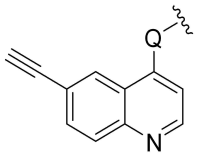
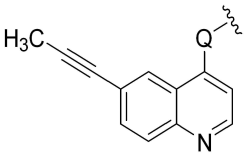
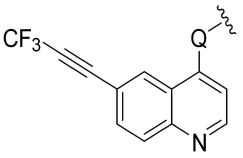
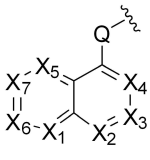
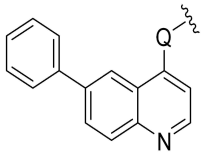
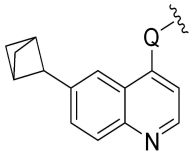
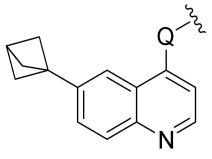
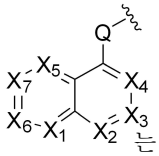
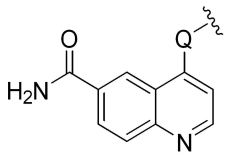
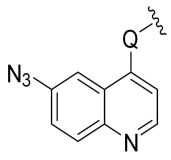
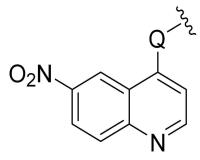
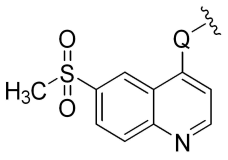
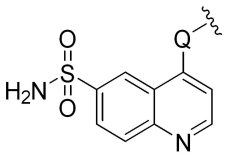
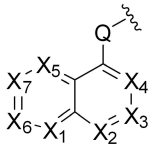
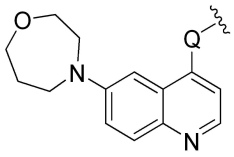
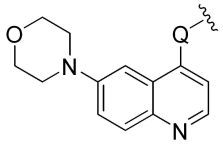
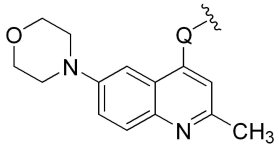
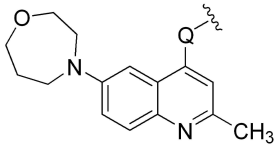
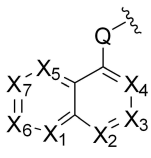
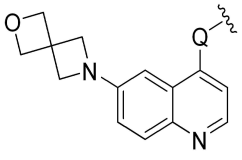
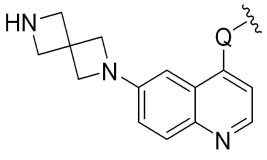
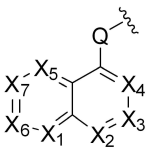
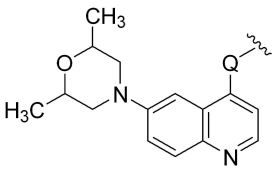
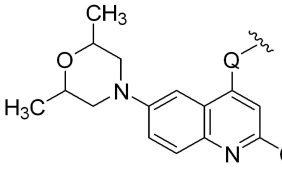
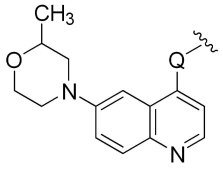
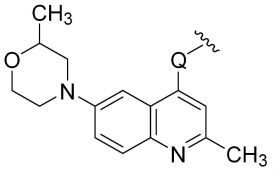
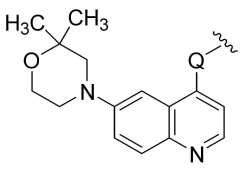
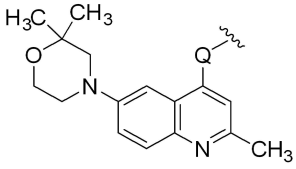
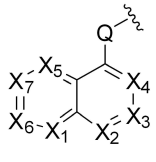
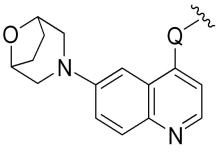
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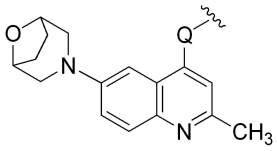
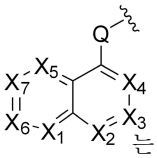
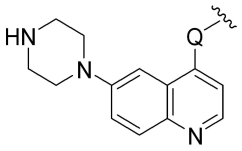
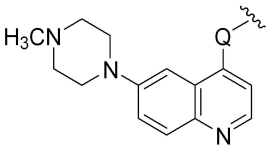
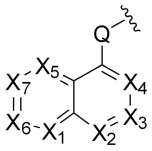
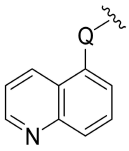
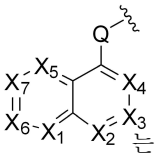
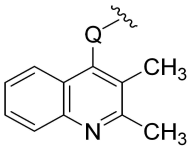
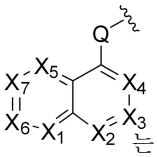
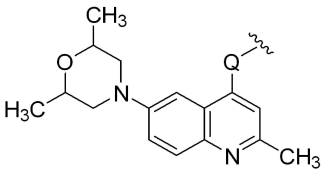


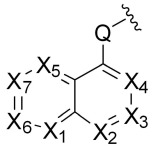
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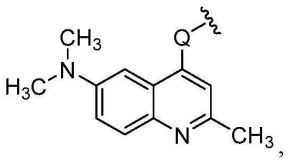
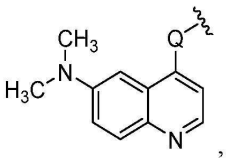
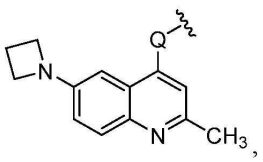
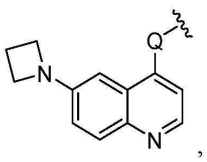


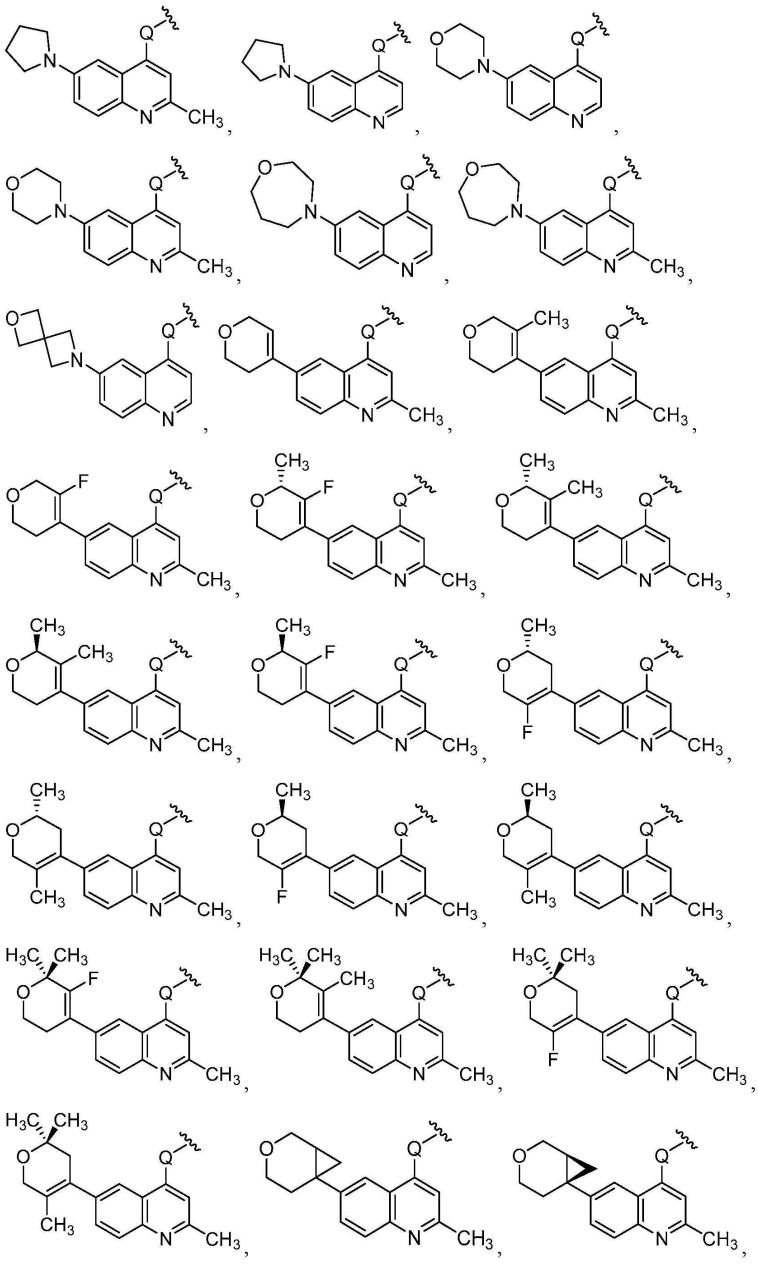
[0448] 일부 실시양태에서, 구조 모이어티  는 , , 또는  의 구조를 가진다. 일부 실시양태에

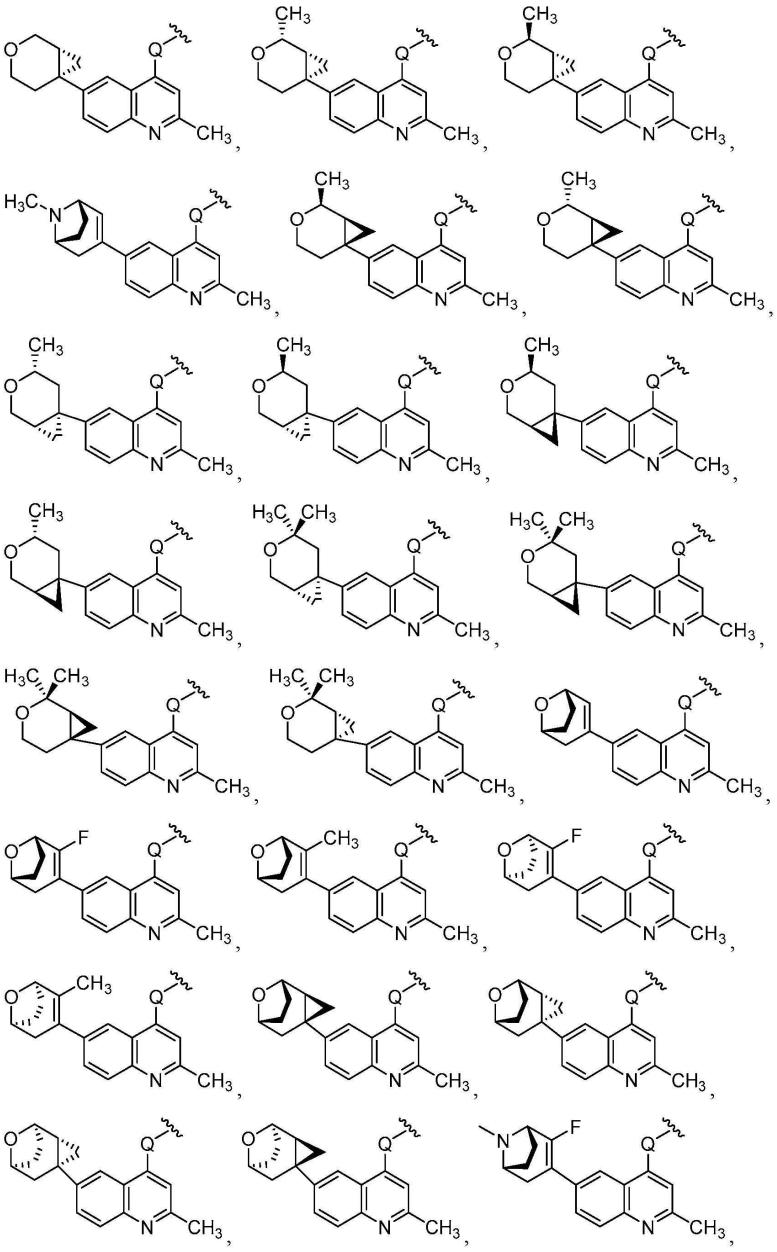
서, 구조 모이어티  는 , , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 , , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 , , , , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 , , , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 , , , , , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  또는

 의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다.

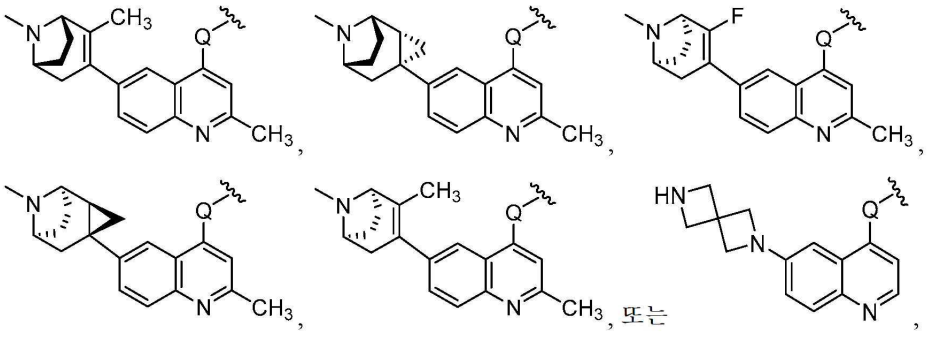
[0449] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

[0450] , , , ,

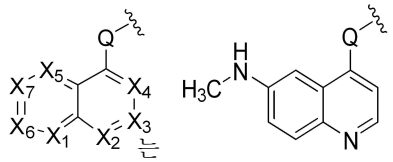
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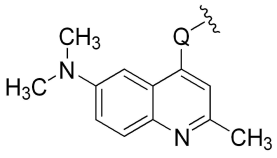
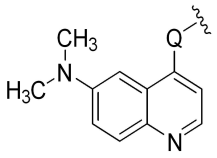
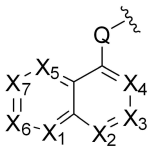
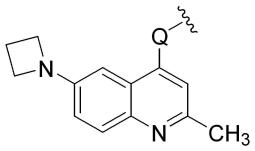
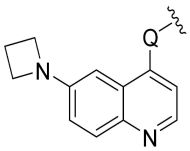
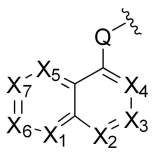
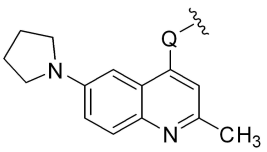
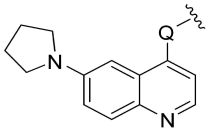
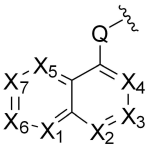
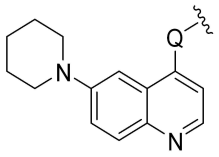
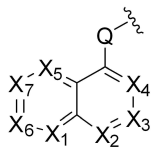
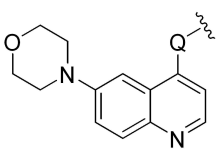
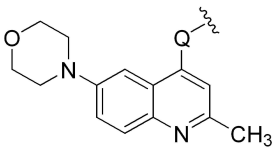
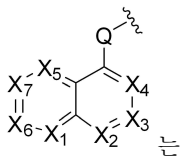
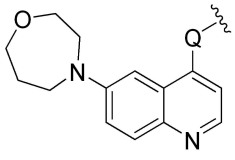
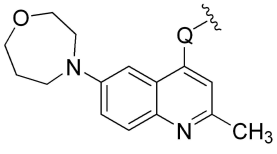
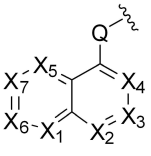
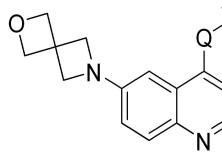
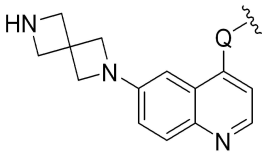
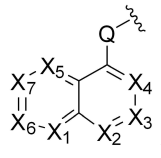
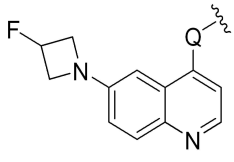
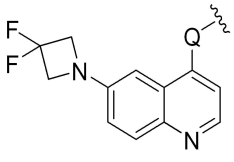
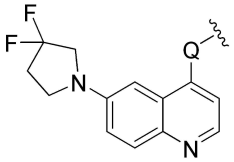
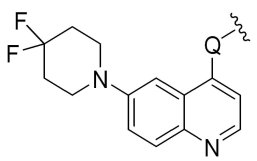
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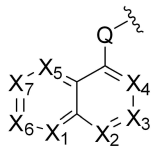
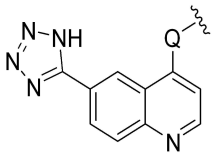


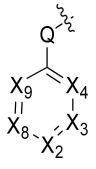
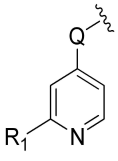
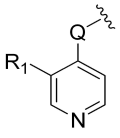
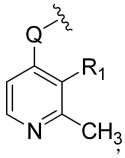
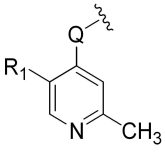
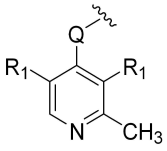
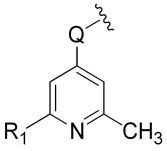
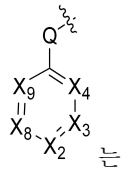
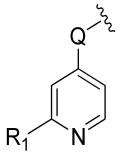
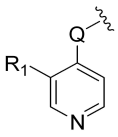
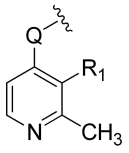
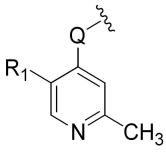
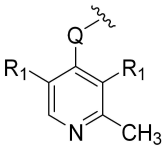
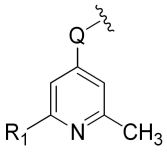
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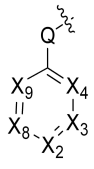
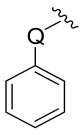
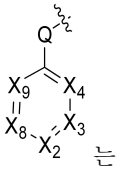
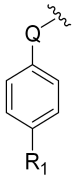
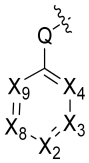
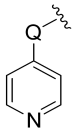
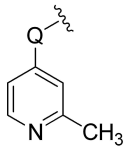
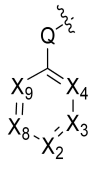
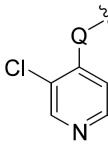
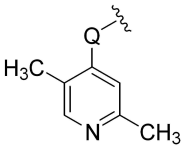
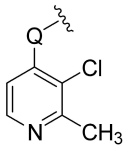
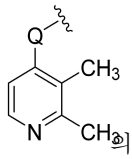


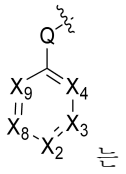
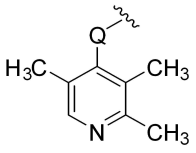
[0454] 상기 식에서, Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티 는 ,

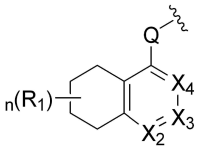

, 또는 
의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티 
는 
또는 
의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티 
는 
또는 
의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티 
는 
의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티 
는 
또는 
의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티 
는 
또는 
의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티 
는 
또는 
의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티 
는 
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의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태

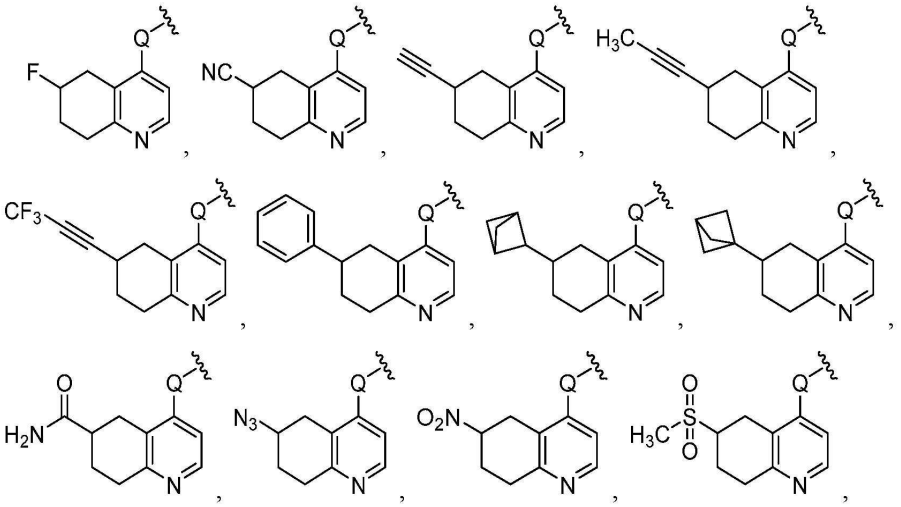
에서, 구조 모이어티  는  의 구조를 갖고, 여기서 Q는 O 또는 NH이다.

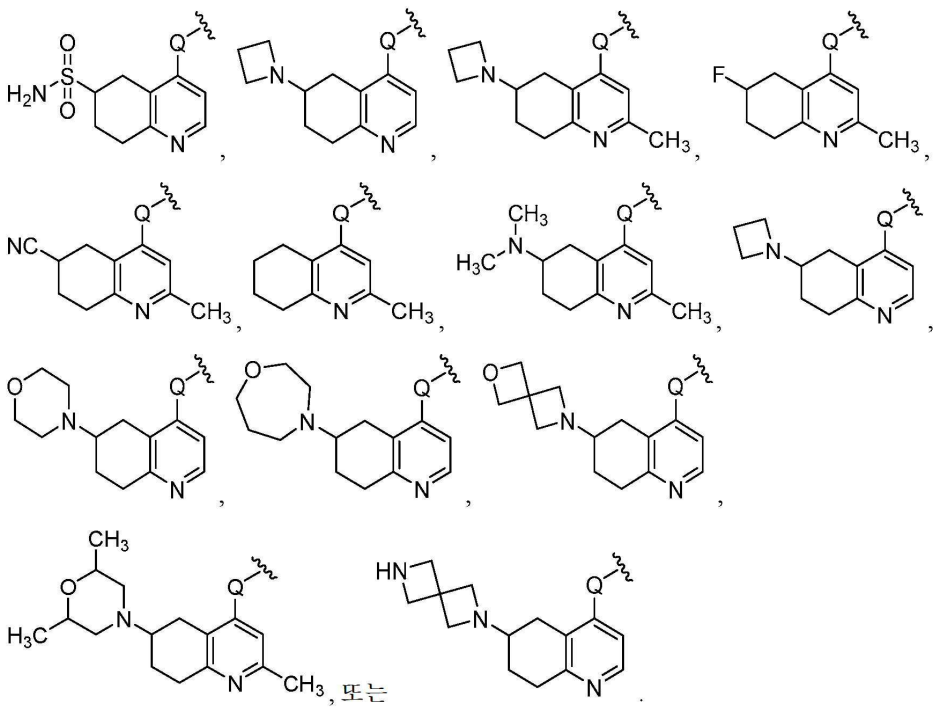
[0455] 일부 실시양태에서, 구조 모이어티  는 , , , , , 또는 의 구조를 갖고, 여기서 Q는 O 또는 NH이고, R_1은 H, D, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬 또는 할로겐이다. 일부 실시양태에서, 구조 모이어티  는 , , , , , 또는 의 구조를 갖고, 여기서 Q는 O 또는 NH이고, R_1은 H, D, 메틸, 에틸, 프로필, 이소프로필, 부틸, 이소부틸, *sec*-부틸, *tert*-부틸, F, Cl 또는 Br이다.

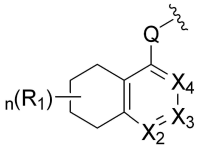
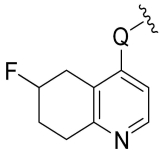
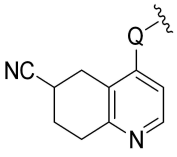
[0456] 일부 실시양태에서, 구조 모이어티  는  의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티  는  또는 의 구조를 갖고, 여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티  는 , , , 또는 의 구조를 갖고,

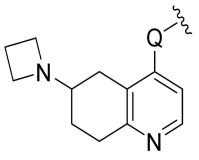
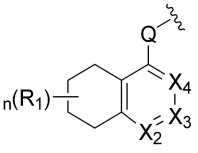
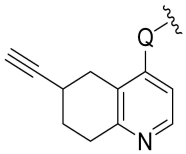
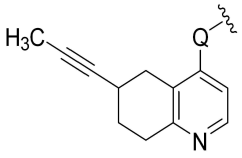
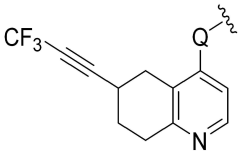
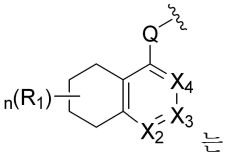
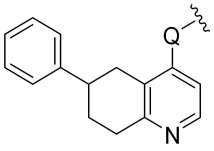
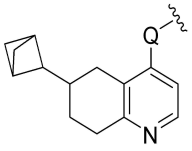
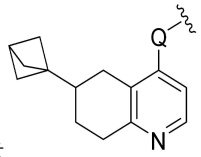
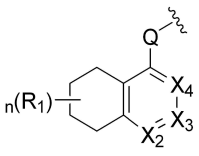
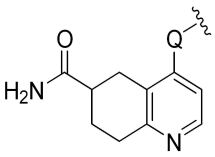
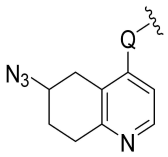
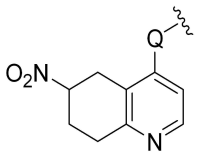
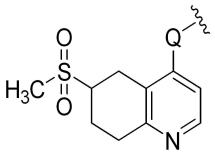
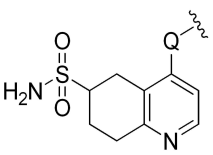
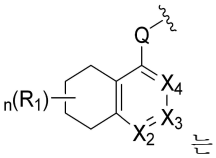
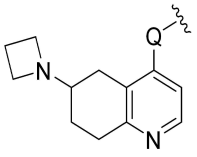
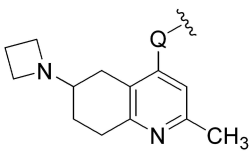
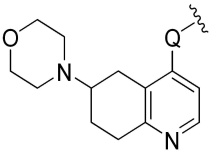
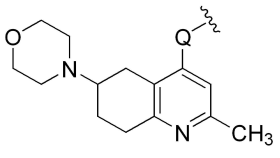
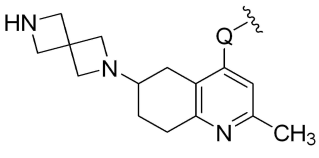
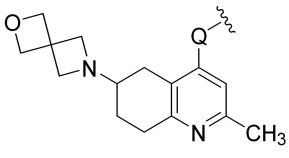
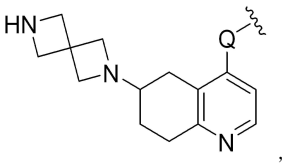
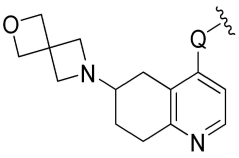
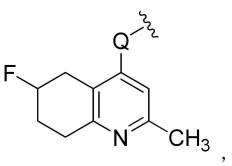
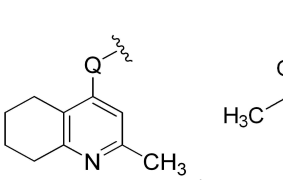
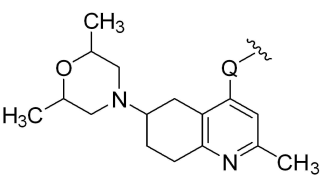
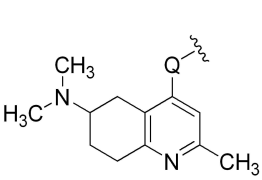
여기서 Q는 O 또는 NH이다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 갖고, 여기서 Q는 O 또는 NH이다.

[0457] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

[0458] 

[0459] 

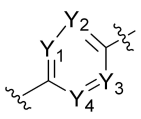
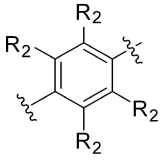
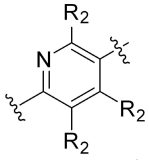
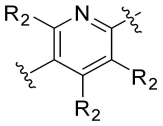
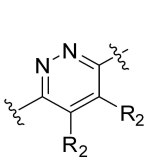
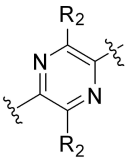
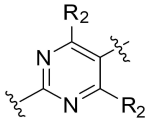
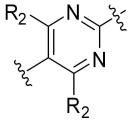
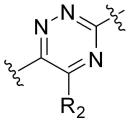
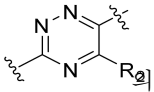
[0460] 일부 실시양태에서, 구조 모이어티  는  ,  , 또는

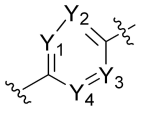
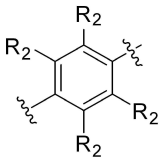
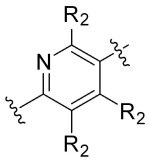
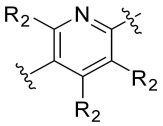
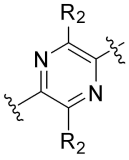
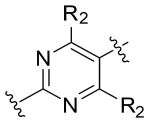
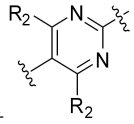

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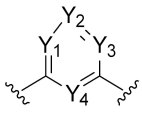
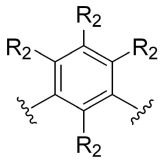
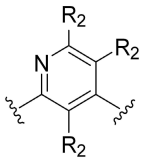
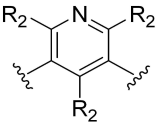
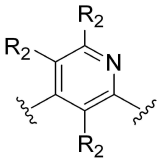
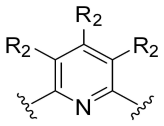
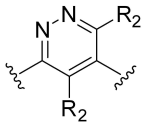
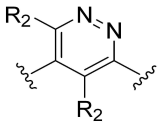
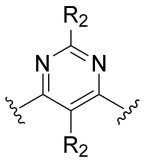
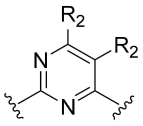
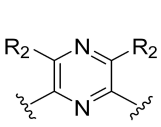
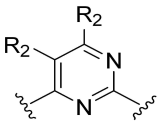
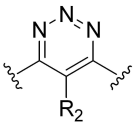
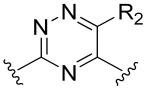
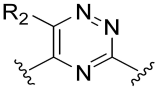
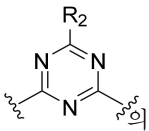
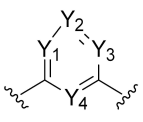
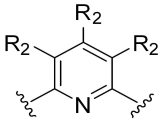
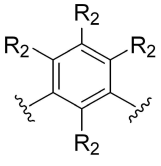
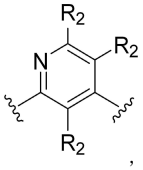
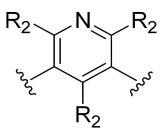
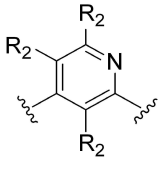
[0461] 일부 실시양태에서, 화합물은 화학식 Ia의 구조를 가진다. 일부 실시양태에서, 화합물은 화학식 IIa의 구조를 가진다. 일부 실시양태에서, 화합물은 화학식 IIIa의 구조를 가진다. 일부 실시양태에서, 화합물은 화학식 IVa의 구조를 가진다.

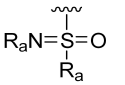
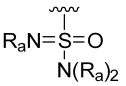
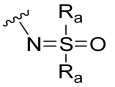
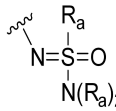
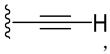
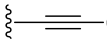
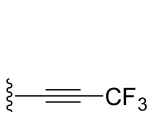
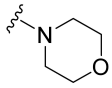
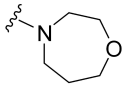
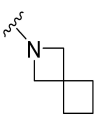
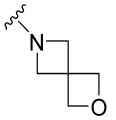
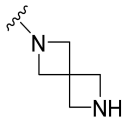
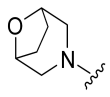
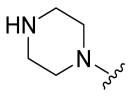
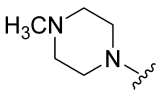
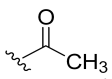
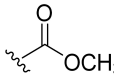
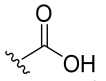
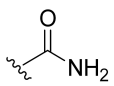
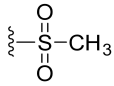
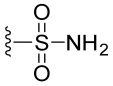
[0462] 일부 실시양태에서, Y_1, Y_2, Y_3, Y_4 및 Y_5는 각각 독립적으로 CR_2 또는 N이다. 일부 실시양태에서, Y_1, Y_2, Y_3, Y_4 및 Y_5는 각각 CR_2이다. 일부 실시양태에서, Y_1, Y_2, Y_3, Y_4 및 Y_5는 각각 CH이다. 일부 실시양태에서, Y_1, Y_2, Y_3,

Y_4 및 Y_5는 각각 N이다. 일부 실시양태에서, Y_1, Y_2, Y_3, Y_4 및 Y_5 중 하나는 CR_2이고, 나머지는 N이다. 일부 실시양태에서, Y_1, Y_2, Y_3, Y_4 및 Y_5 중 하나는 CH이고, 나머지는 N이다. 일부 실시양태에서, Y_1, Y_2, Y_3, Y_4 및 Y_5 중 둘은 CR_2이고, 나머지는 N이다. 일부 실시양태에서, Y_1, Y_2, Y_3, Y_4 및 Y_5 중 둘은 CH이고, 나머지는 N이다. 일부 실시양태에서, Y_1, Y_2, Y_3, Y_4 및 Y_5 중 셋은 CR_2이고, Y_1, Y_2, Y_3, Y_4 및 Y_5 중 둘은 N이다. 일부 실시양태에서, Y_1, Y_2, Y_3, Y_4 및 Y_5 중 셋은 CH이고, Y_1, Y_2, Y_3, Y_4 및 Y_5 중 둘은 N이다.

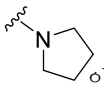
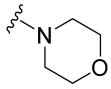
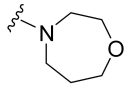
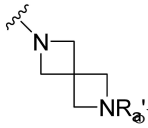
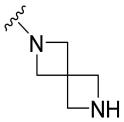
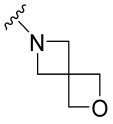
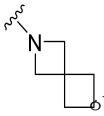
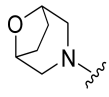
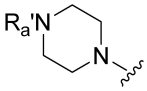
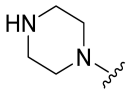
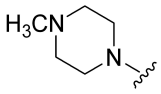
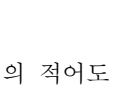
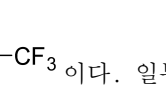
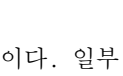
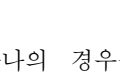
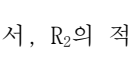
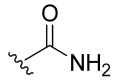
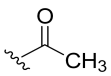
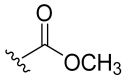
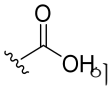
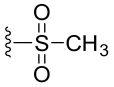
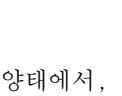
[0463] 일부 실시양태에서, 구조 모이어티  는 , , , , , , , , 또는 의 구조를 가진다.

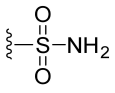
일부 실시양태에서, 구조 모이어티  는 , , , ,  또는 의 구조를 가진다.

[0464] 일부 실시양태에서, 구조 모이어티  는 , , , , , , , , , , , , , , 또는 의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 , , , , 또는 의 구조를 가진다.

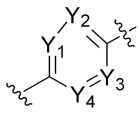
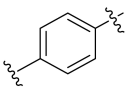
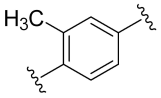
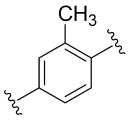
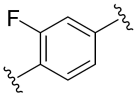
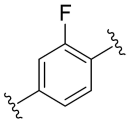
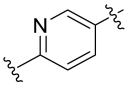
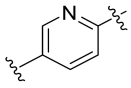
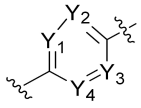
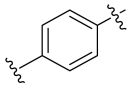
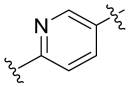
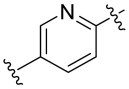
[0465] 일부 실시양태에서, R_2의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$ 및 $-N(R_a)SO_2R_a$로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬 및 (C_4-C_{10})헤테로비사이클로알킬로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴 및 헤테로아릴로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$ 및 $-N(R_a)SO_2R_a$로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 , , , 및 로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 H, D, 할로겐, OR_a, $N(R_a)_2$, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, (C_1-C_6)알키닐, 아릴, (C_4-C_{10})비사이클로알킬, -CN, N_3, NO_2, COR_a, CO_2R_a, $CON(R_a)_2$, $-SO_2R_a$, 또는 $-SO_2N(R_a)_2$이다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, $N(R_a)_2$, 또는 -CN이다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_1-C_6)알키닐, 아릴, (C_4-C_{10})비사이클로알킬, $-SO_2R_a$, 또는 $-SO_2N(R_a)_2$이다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 H, D, F, Cl, Br, CH_3, OCH_3, NH_2, $N(CH_3)_2$, , , , , , , , , , , , , , , , , -CN, N_3, NO_2, , , , , , , 또는 이다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 H, D, F, CH_3, $N(CH_3)_2$, , 또는  이다.

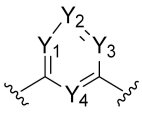
[0466] 일부 실시양태에서, R_2의 적어도 하나의 경우는 H, D 또는 할로겐이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 H이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 D이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 F이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 CH_3이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 OCH_3이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 NH_2이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 $N(CH_3)_2$이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_2

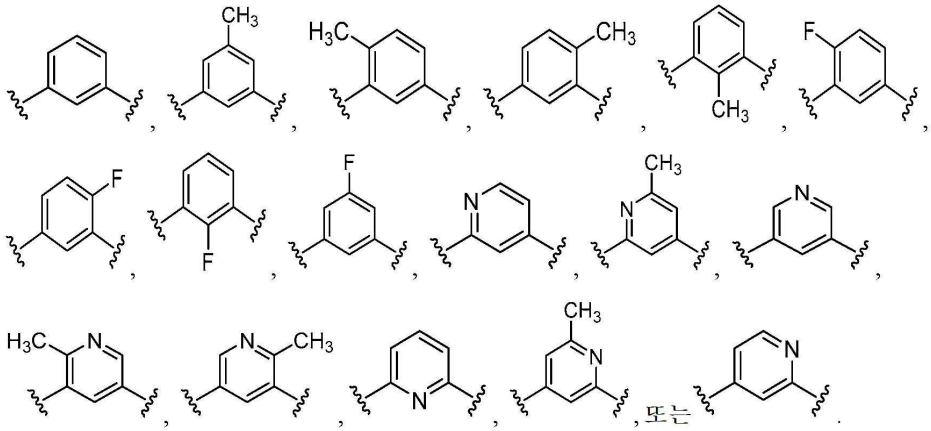
의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이고, 여기서 R_a'는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이고, 여기서 R_a'는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 -CN이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 -NC이다. 일부 실시양태에서, R_2 의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 NO_2이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 N_3이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는


이다.

[0467] 일부 실시양태에서, R_2의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, $-N(R_a)_2$, NO_2 및 $-OR_a$로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_2의 각 경우는 독립적으로 H, 할로겐, CH_3, CF_3, OH, NH_2, $-NHCH_3$, 또는 $-N(CH_3)_2$이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 H이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 $-N(R_a)_2$, NO_2 또는 $-OR_a$이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 H, CH_3, OH, NH_2 또는 할로겐이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 H이다. 일부 실시양태에서, R_2의 적어도 하나의 경우는 CF_3이다. 일부 실시양태에서, R_2는 H 또는 CH_3이다.

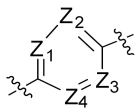
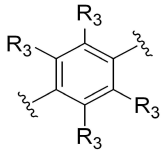
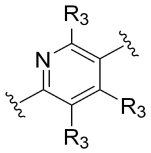
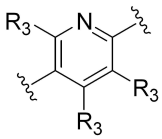
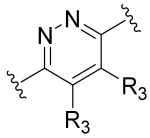
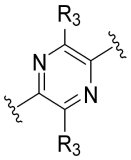
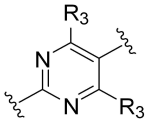
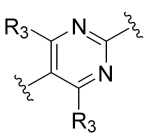
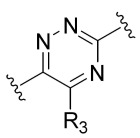
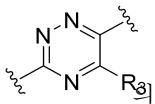
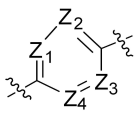
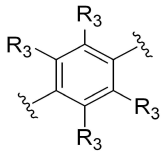
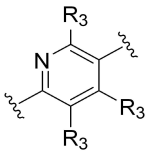
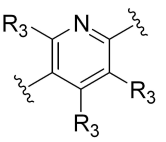
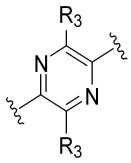
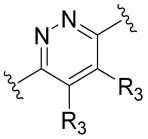
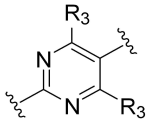
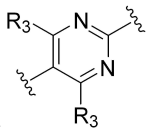
[0468] 일부 실시양태에서, 구조 모이어티 는 , , , , , , 또는 의 구조를 가진다. 일부 실시양태에서, 구조 모이어티 는 , , 또는 의 구조를 가진다.

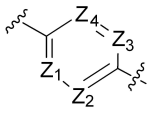
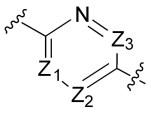
[0469] 일부 실시양태에서, 구조 모이어티 는 하기 화학식의 구조를 가진다:

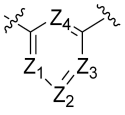
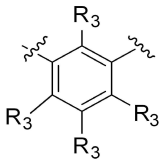
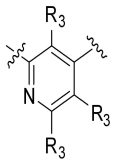
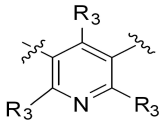
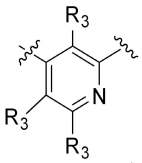
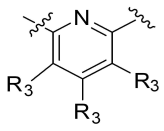
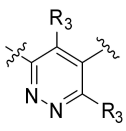
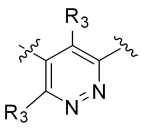
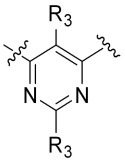
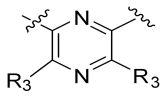
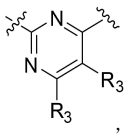
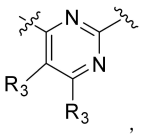
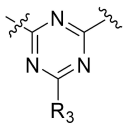
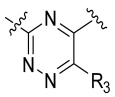
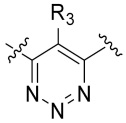
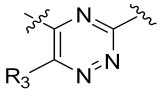
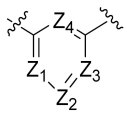
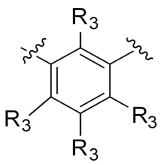
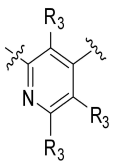


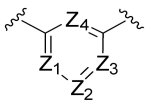
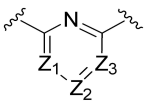
[0470]

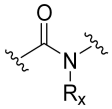
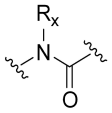
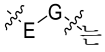
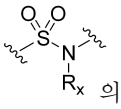
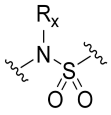
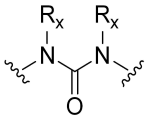
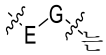
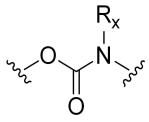
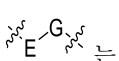
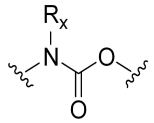
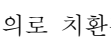
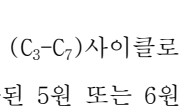
[0471] 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5는 각각 독립적으로 CR_3 또는 N이다. 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5는 각각 독립적으로 CR_3이다. 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5는 각각 독립적으로 CH이다. 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5는 각각 N이다. 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5 중 하나는 CR_3이고, 나머지는 N이다. 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5 중 하나는 CH이고, 나머지는 N이다. 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5 중 둘은 CR_3이고, 나머지는 N이다. 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5 중 둘은 CH이고, 나머지는 N이다. 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5 중 셋은 CR_3이고, 나머지 둘은 N이다. 일부 실시양태에서, Z_1, Z_2, Z_3, Z_4 및 Z_5 중 셋은 CH이고, 나머지 둘은 N이다. 일부 실시양태에서, Z_4는 N이고, Z_1, Z_2, Z_3 및 Z_5는 CR_3이다.

[0472] 일부 실시양태에서, 구조 모이어티  는 , , , , , , , , 또는 의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 , , , , , , , 또는 의 구조를 가진다.

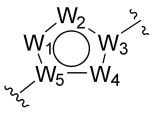
[0473] 일부 실시양태에서, 구조 모이어티  는 의 구조를 가진다.

[0474] 일부 실시양태에서, 구조 모이어티  는 , , , , , , , , , , , , , , 또는 의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 , , , , , , , , , , 또는 의 구조를 가진다. 일부 실시양태

에서, 구조 모이어티  는  의 구조를 가진다.

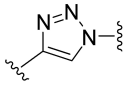
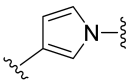
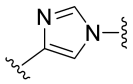
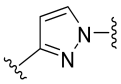
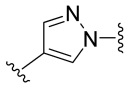
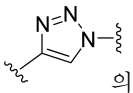
[0475] 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다.

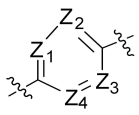
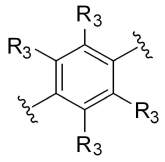
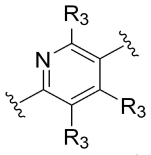
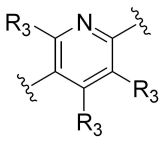
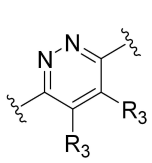
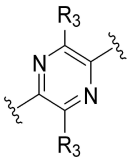
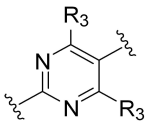
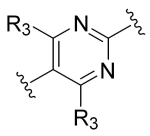
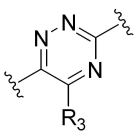
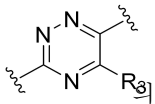
[0476] 일부 실시양태에서, R_x의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, 아릴 또는 헤테로아릴이거나; R_x와 Y_2, R_x와 Y_3, R_x와 Z_1, 또는 R_x와 Z_4는 함께 임의로 치환된 5원 또는 6원 헤테로사이클을 형성한다. 일부 실시양태에서, R_x의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, 아릴 또는 헤테로아릴이다. 일부 실시양태에서, R_x의 각 경우는 독립적으로 H, CH_3, 또는 CH_2CH_3이다. 일부 실시양태에서, R_x와 Y_2는 함께 임의로 치환된 5원 또는 6원 헤테로사이클을 형성한다. 일부 실시양태에서, R_x와 Y_3은 함께 임의로 치환된 5원 또는 6원 헤테로사이클을 형성한다. 일부 실시양태에서, R_x와 Z_1은 함께 임의로 치환된 5원 또는 6원 헤테로사이클을 형성한다. 일부 실시양태에서, R_x와 Z_4는 함께 임의로 치환된 5원 또는 6원 헤테로사이클을 형성한다.

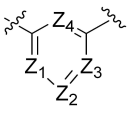
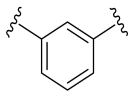
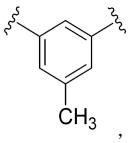
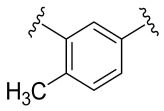
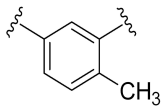
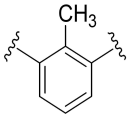
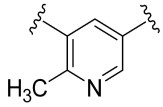
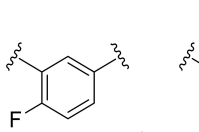
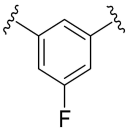
[0477] 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다.

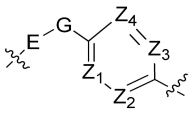
[0478] 일부 실시양태에서, 원자가가 허용하는 경우 W_1, W_2, W_3, W_4 및 W_5는 각각 독립적으로 CR_6, N 또는 NR_6이다. 일부 실시양태에서, 원자가가 허용하는 경우 W_1, W_2, W_3, W_4 및 W_5 중 하나는 N 또는 NR_6이고, 나머지는 C 또는 CR_6이다. 일부 실시양태에서, 원자가가 허용하는 경우 W_1, W_2, W_3, W_4 및 W_5 중 둘은 N 또는 NR_6이고, 나머지는 C 또는 CR_6이다. 일부 실시양태에서, 원자가가 허용하는 경우 W_1, W_2, W_3, W_4 및 W_5 중 셋은 N 또는 NR_6이고, 나머지 둘은 C 또는 CR_6이다. 일부 실시양태에서, 원자가가 허용하는 경우 W_1, W_2, W_3, W_4 및 W_5 중 하나는 N이고, 나머지는 C 또는 CR_6이다. 일부 실시양태에서, 원자가가 허용하는 경우 W_1, W_2, W_3, W_4 및 W_5 중 둘은 N이고, 나머지는 C 또는 CR_6이다. 일부 실시양태에서, 원자가가 허용하는 경우 W_1, W_2, W_3, W_4 및 W_5 중 셋은 N이고, 나머지 둘은 C 또는 CR_6이다.

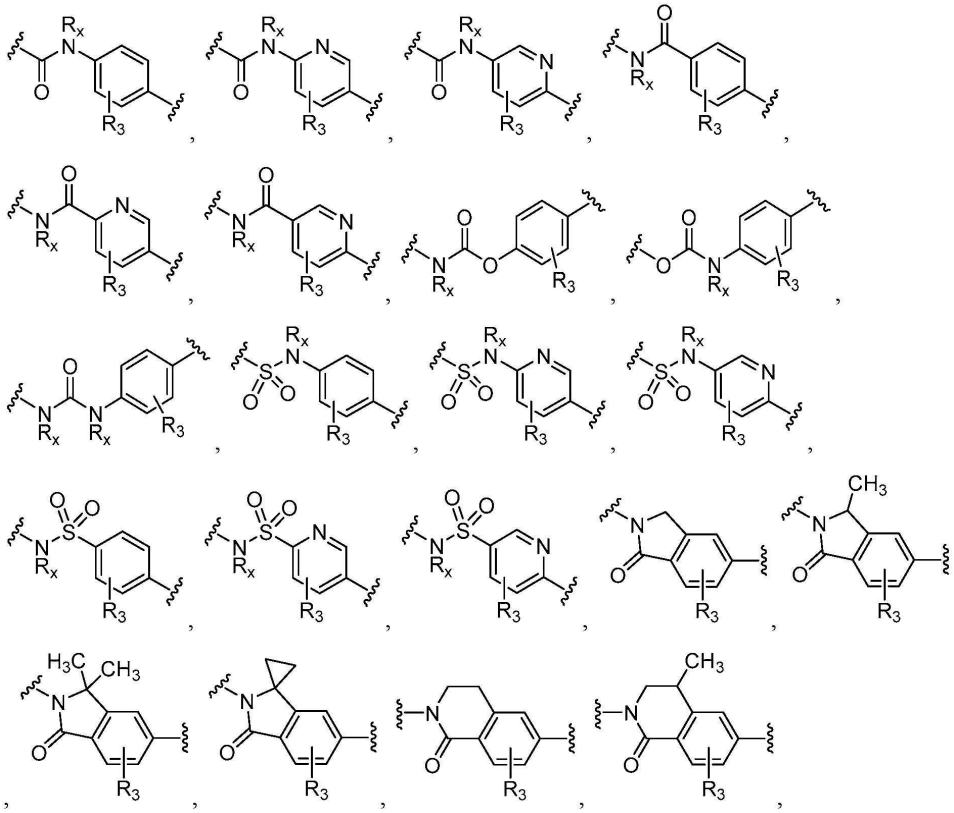
[0479] 일부 실시양태에서, R_6의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬 및 (C_1-C_6)할로알킬로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_6의 각 경우는 독립적으로 H, F, CH_3 및 CH_2CH_3로 이루어진 군으로부터 선택된다.

[0480] 일부 실시양태에서, 구조 모이어티  는 , , , , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다.

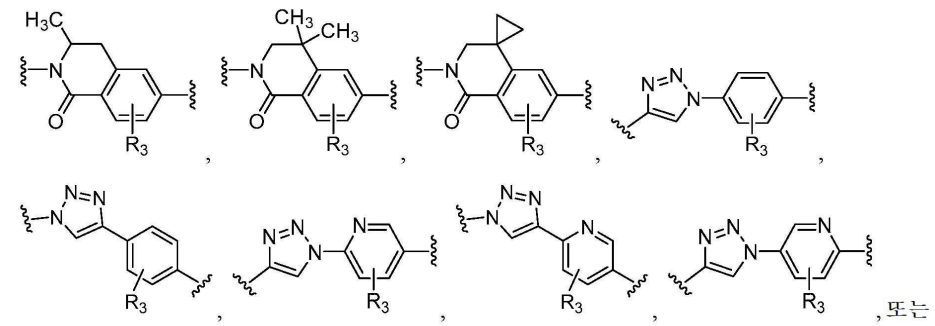
[0481] 일부 실시양태에서, 구조 모이어티  는 , , , , , , , , 또는  의 구조를 가진다.

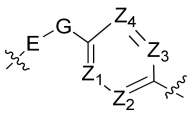
[0482] 일부 실시양태에서, 구조 모이어티  는 , , , , , , , ,

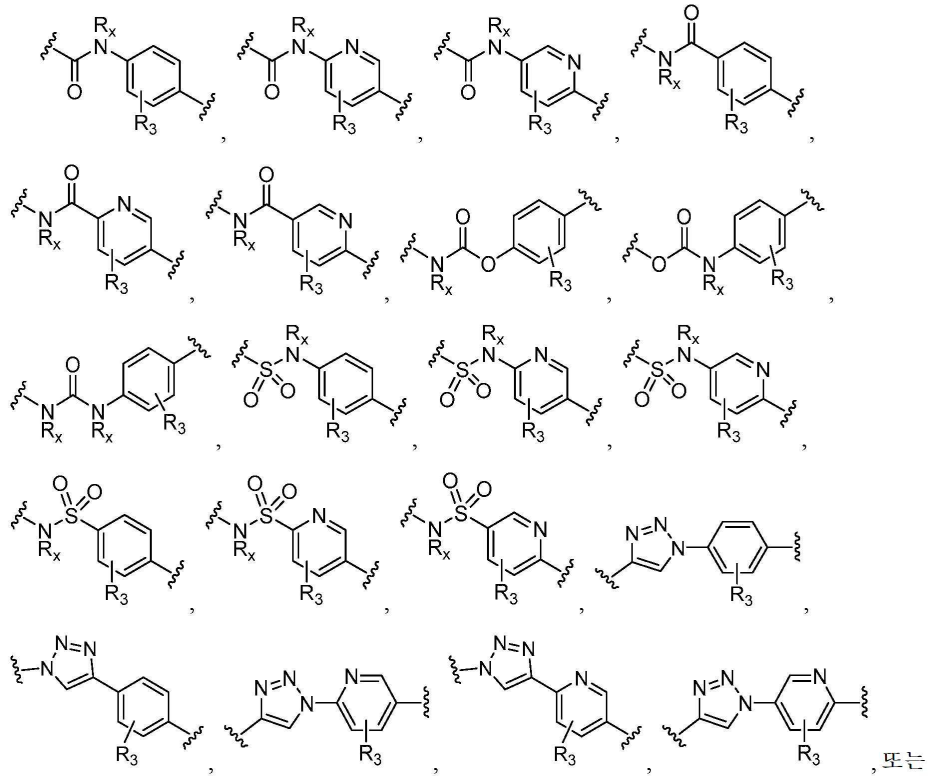
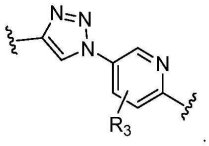
[0483] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:



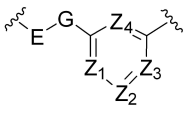
[0484]

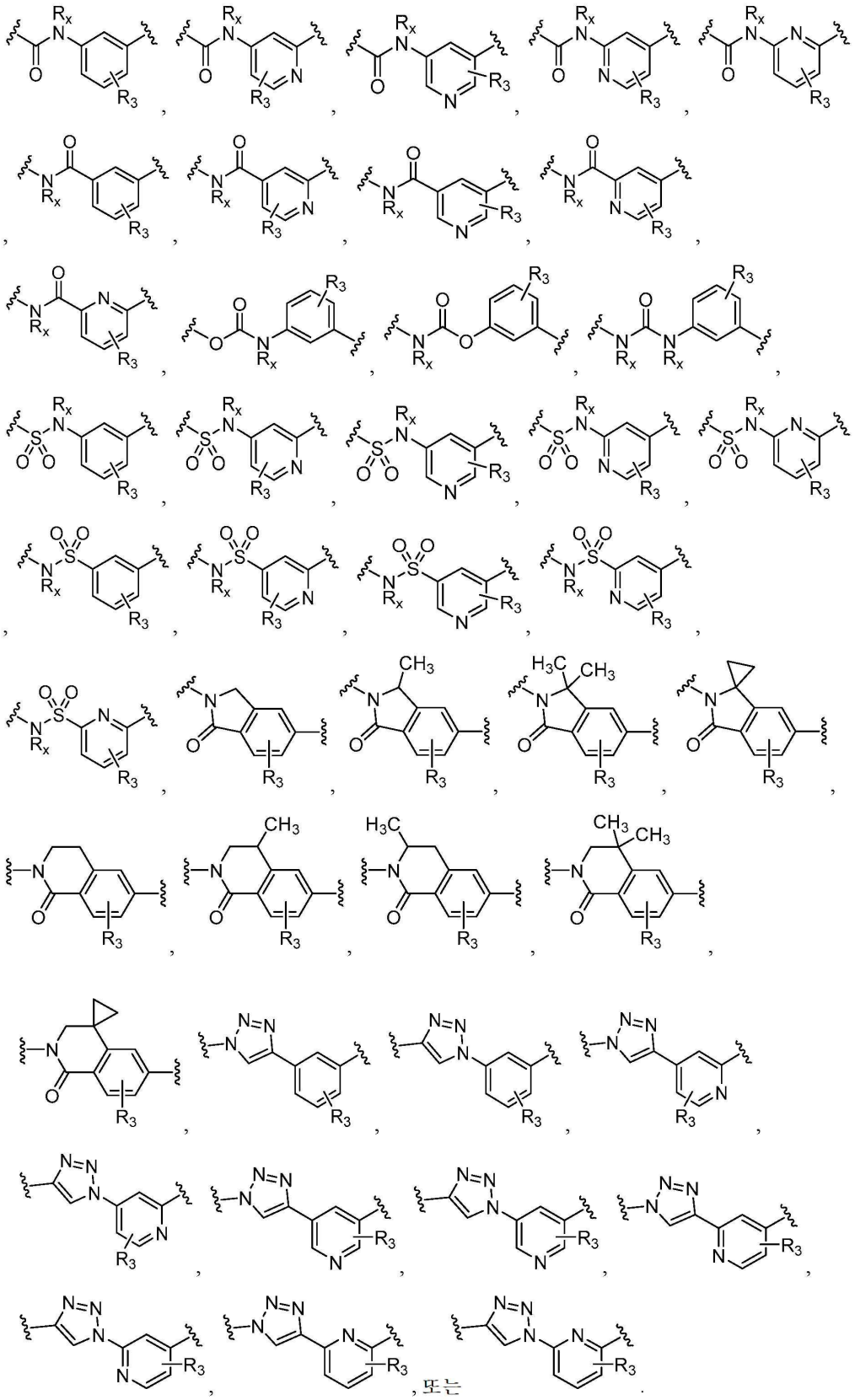


[0485] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

[0486] , 또는 .

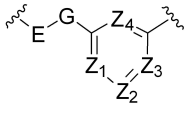
[0487] 일부 실시양태에서, R_3은 H, CH_3, OH, 할로겐 또는 NH_2이다. 일부 실시양태에서, R_x는 H, CH_3 또는 CH_2CH_3이다.

[0488] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

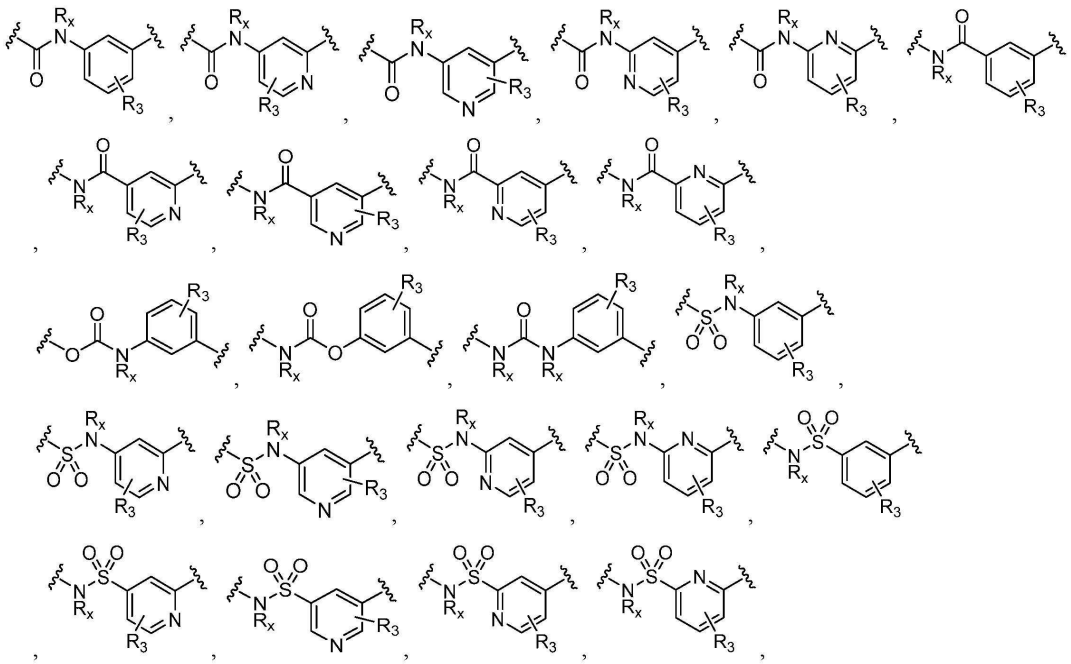


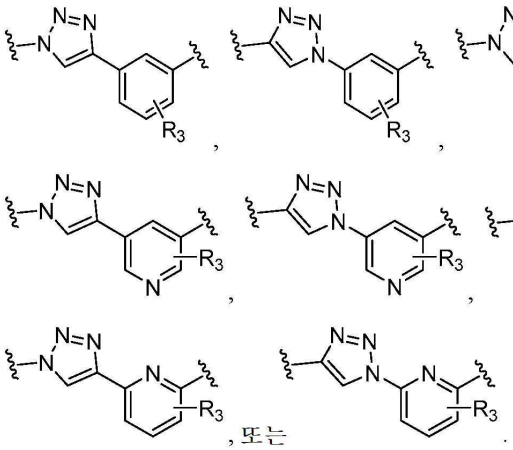
[0489]

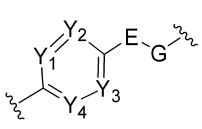
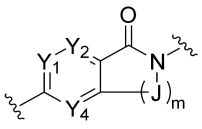
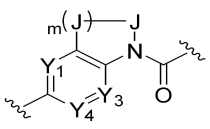
[0490] , 또는 . 일부 실시양태에

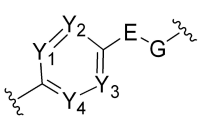
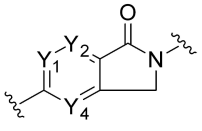
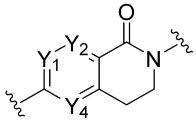


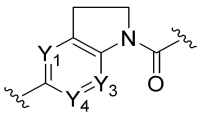
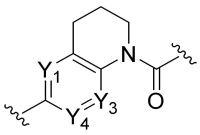
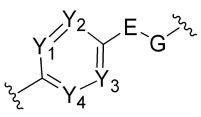
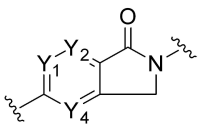
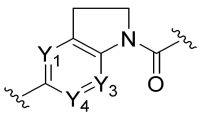
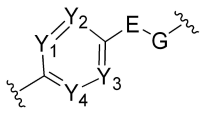
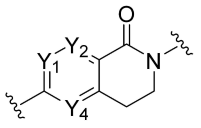
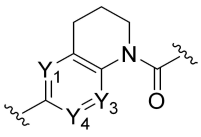
서, 구조 모이어티 는 하기 화학식의 구조를 가진다:

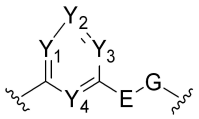
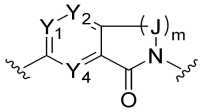
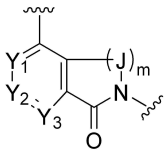
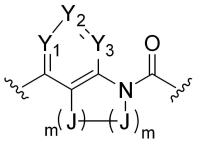
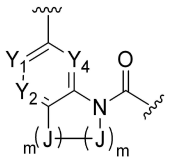
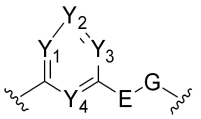
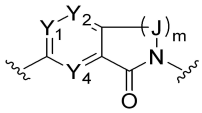
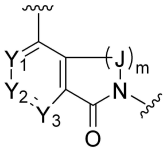
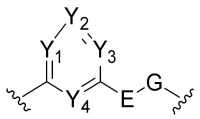
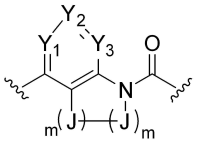
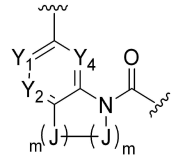
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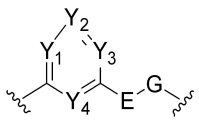
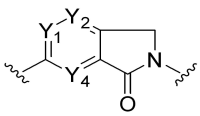
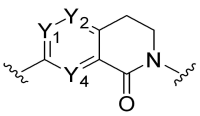
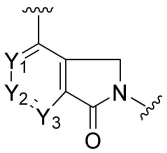
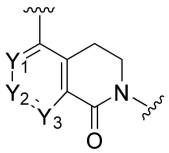
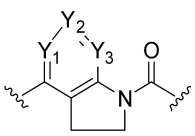
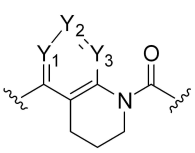
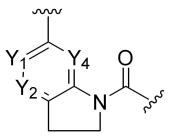
[0492] , 또는 . 일부 실시양태에서, R_3은 H, CH_3, OH, 할로겐 또는 NH_2이다. 일부 실시양태에서, R_x는 H, CH_3 또는 CH_2CH_3이다.

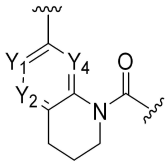
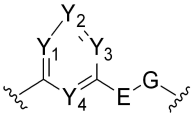
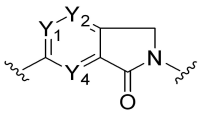
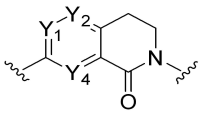
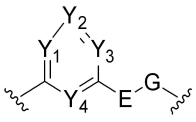
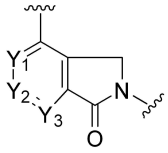
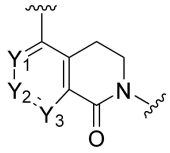
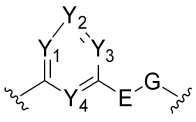
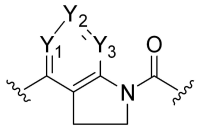
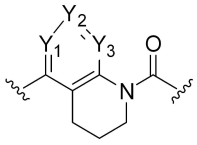
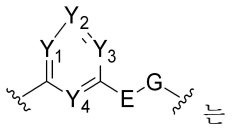
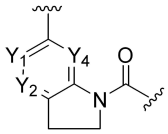
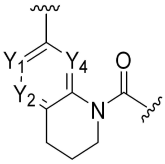
[0493] 일부 실시양태에서, 구조 모이어티 는  또는 의 구조를 갖고, 여기서 m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_y)_2$이고, R_y의 각 경우는 독립적으로 H, $(C_1$-$C_6)$알킬, OH, $O(C_1$-$C_6)$알킬 또는 할로겐이다. 일부 실시양태에서, m은 1이다. 일부 실시양태에서, m은 2이다. 일부 실시양태에서, R_y의 각 경우는 독립적으로 H 또는 $(C_1$-$C_6)$알킬이다. 일부 실시양태에서, R_y의 각 경우는 독립적으로 OH, $O(C_1$-$C_6)$알킬 또는 할로겐이다. 일부 실시양태에서, R_y의 각 경우는 H이다.

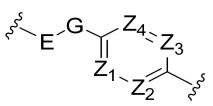
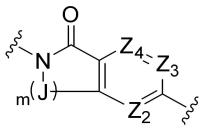
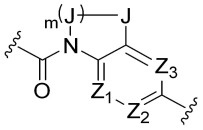
[0494] 일부 실시양태에서, 구조 모이어티 는 , ,

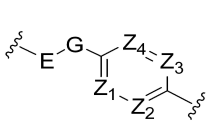
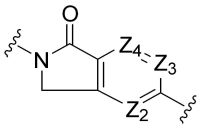
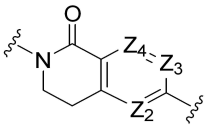
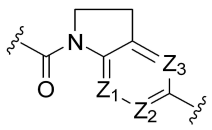
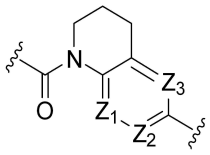
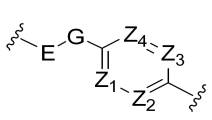
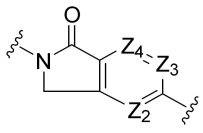
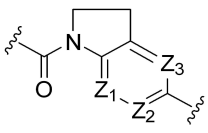

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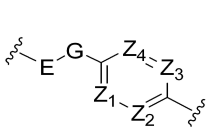
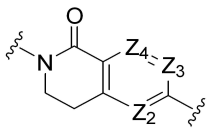
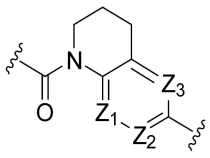
[0495] 일부 실시양태에서, 구조 모이어티 
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의 구조를 가진다. 일부 실시양태에서, m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_y)_2$이고, R_y의 각 경우는 독립적으로 H, (C_1-C_6)알킬, OH, $O(C_1-C_6)$알킬 또는 할로겐이다. 일부 실시양태에서, m은 1이다. 일부 실시양태에서, m은 2이다. 일부 실시양태에서, R_y의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서 R_y의 각 경우는 독립적으로 OH, $O(C_1-C_6)$알킬 또는 할로겐이다. 일부 실시양태에서, R_y의 각 경우는 H이다.

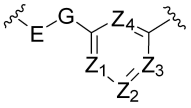
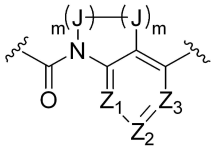
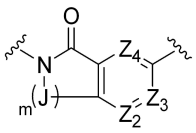
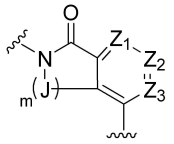
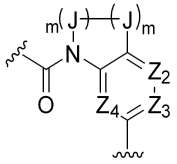
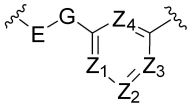
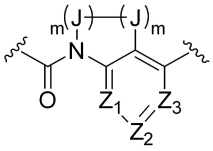
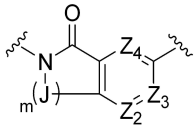
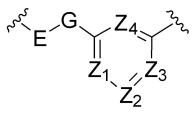
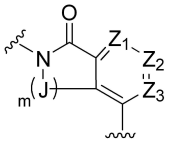
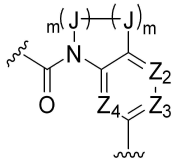
[0496] 일부 실시양태에서, 구조 모이어티 
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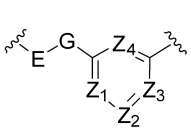
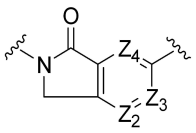
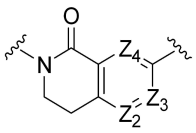
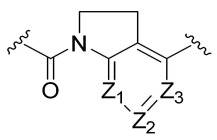
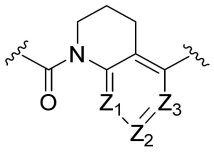
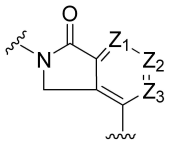
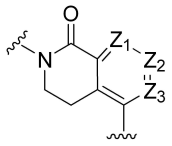
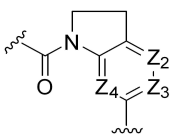
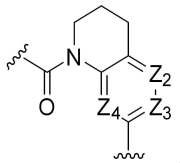
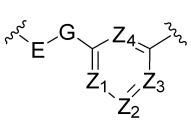
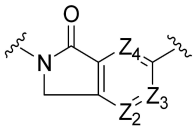
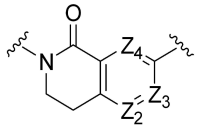
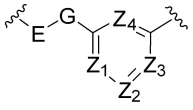

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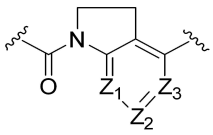
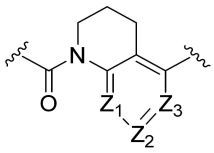
[0497] 일부 실시양태에서, 구조 모이어티 
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의 구조를 갖고, 여기서 m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_z)_2$이고, R_z의 각 경우는 독립적으로 H, $(C_1$-$C_6)$알킬, OH, $O(C_1$-$C_6)$알킬 또는 할로겐이다. 일부 실시양태에서, m은 1이다. 일부 실시양태에서, m은 2이다. 일부 실시양태에서, R_z의 각 경우는 독립적으로 H 또는 $(C_1$-$C_6)$알킬이다. 일부 실시양태에서, R_z의 각 경우는 독립적으로 OH, $O(C_1$-$C_6)$알킬, 또는 할로겐이다. 일부 실시양태에서, R_z의 각 경우는 H이다.

[0498] 일부 실시양태에서, 구조 모이어티 
는 
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의 구조를 가진다. 일부 실시양태에서, 구조 모이어티 
는 
또는 
의 구조를 가진다. 일부 실시양태에서, 구조

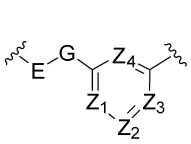
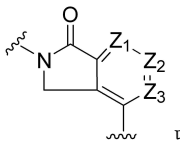
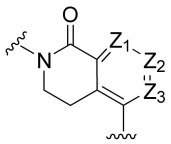
모이어티  는  또는  의 구조를 가진다. 일부 실시양태에서, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 N, CH, CCH_3 또는 CF이다. 일부 실시양태에서, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 N 또는 CH이다.

[0499] 일부 실시양태에서, 구조 모이어티  는  ,  ,  , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  또는  의 구조를 가진다. 일부 실시양태에서, m의 각 경우는 독립적으로 1 또는 2이고, J는 $C(R_z)_2$이고, R_z의 각 경우는 독립적으로 H, $(C_1$-$C_6)$알킬, OH, $O(C_1$-$C_6)$알킬 또는 할로겐이다. 일부 실시양태에서, m은 1이다. 일부 실시양태에서, m은 2이다. 일부 실시양태에서, R_z의 각 경우는 독립적으로 H 또는 $(C_1$-$C_6)$알킬이다. 일부 실시양태에서, R_z의 각 경우는 독립적으로 OH, $O(C_1$-$C_6)$알킬 또는 할로겐이다. 일부 실시양태에서, R_z의 각 경우는 H이다.

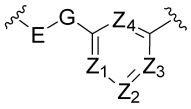
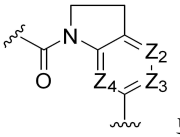
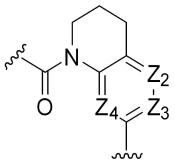
[0500] 일부 실시양태에서, 구조 모이어티  는  ,  ,  ,  ,  ,  ,  , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는

또는 의 구조를 가진다. 일부 실시양태에서, 구조 모이어티

는 또는 의 구조를 가진다. 일부 실시양태에서, 구조 모이어티

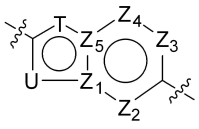
는 또는 의 구조를 가진다. 일부 실시양태에서, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 N, CH, CCH_3 또는 CF이다. 일부 실시양태에서, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 N 또는 CH이다.

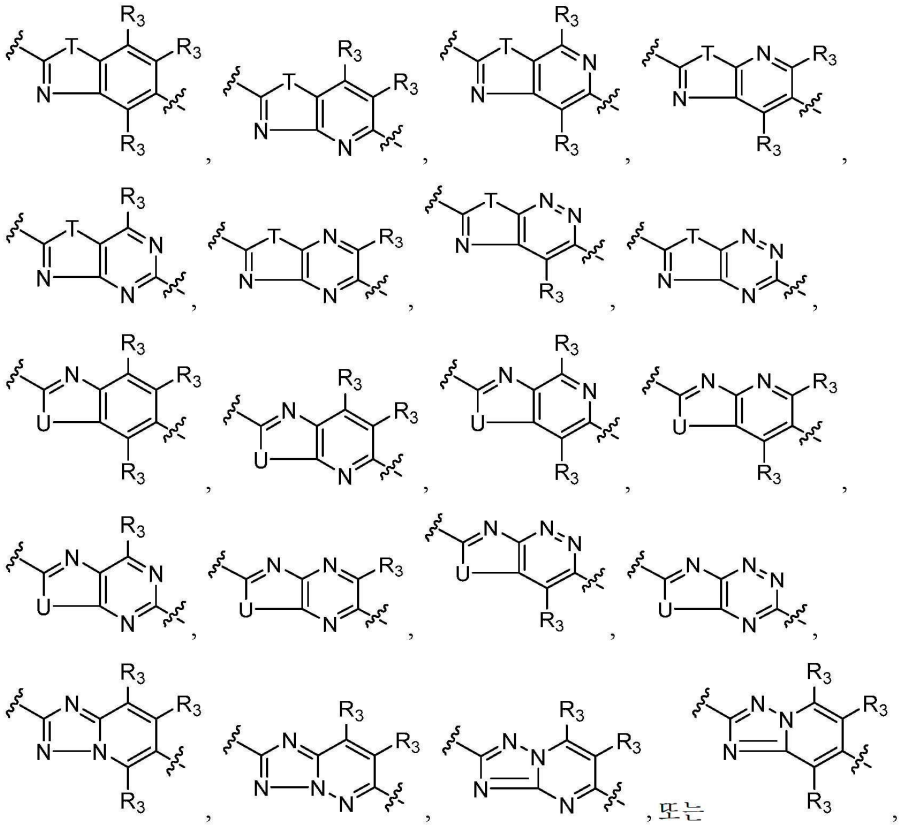
[0501] 일부 실시양태에서, 화합물은 화학식 Ib의 구조를 가진다. 일부 실시양태에서, 화합물은 화학식 IIb의 구조를 가진다. 일부 실시양태에서, 화합물은 화학식 IIIb의 구조를 가진다. 일부 실시양태에서, 화합물은 화학식 IVb의 구조를 가진다.

[0502] 일부 실시양태에서, T는 $N(C=O)R_a$ 또는 NSO_2R_a이다. 일부 실시양태에서, T는 N(C=O)Me 또는 N(C=O)Et이다. 일부 실시양태에서, T는 NSO_2Me 또는 NSO_2Et이다. 일부 실시양태에서, T는 O 또는 NR_a이다. 일부 실시양태에서, T는 O이다. 일부 실시양태에서, T는 NR_a이다. 일부 실시양태에서, T는 NH이다. 일부 실시양태에서, T는 NCH_3 또는 NCH_2CH_3이다. 일부 실시양태에서, T는 $NC(R_b)_2OP(=O)(OR_b)_2$이다. 일부 실시양태에서, T는 원자가가 허용하는 경우 N 또는 O이다.

[0503] 일부 실시양태에서, U는 $N(C=O)R_a$ 또는 NSO_2R_a이다. 일부 실시양태에서, U는 N(C=O)Me 또는 N(C=O)Et이다. 일부 실시양태에서, U는 NSO_2Me 또는 NSO_2Et이다. 일부 실시양태에서, U는 O 또는 NR_a이다. 일부 실시양태에서, U는 O이다. 일부 실시양태에서, U는 NR_a이다. 일부 실시양태에서, U는 NH이다. 일부 실시양태에서, U는 NCH_3 또는 NCH_2CH_3이다. 일부 실시양태에서, T는 $NC(R_b)_2OP(=O)(OR_b)_2$이다. 일부 실시양태에서, U는 원자가가 허용하는 경우 N 또는 O이다.

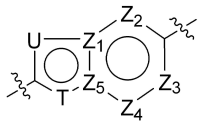
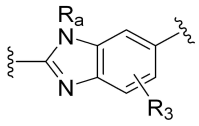
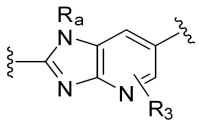
[0504] 일부 실시양태에서, R_b의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_b의 각 경우는 독립적으로 H, 메틸, 에틸, 프로필, 이소프로필, 부틸, *sec*-부틸, 이소부틸 또는 *tert*-부틸이다. 일부 실시양태에서, R_b의 각 경우는 독립적으로 H 또는 CH_3이다. 일부 실시양태에서, R_b의 각 경우는 H이다.

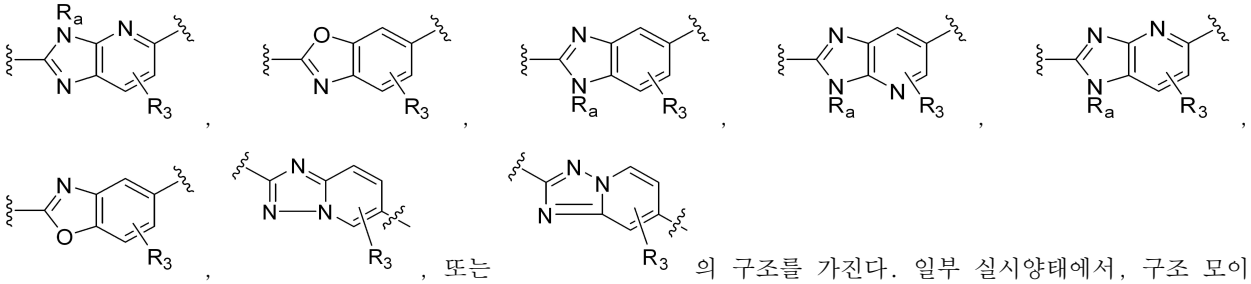
[0505] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

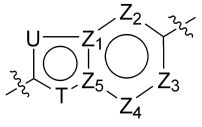
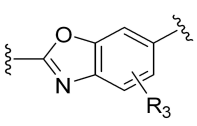
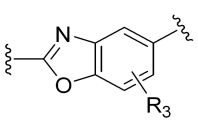


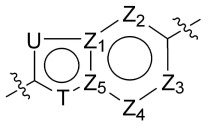
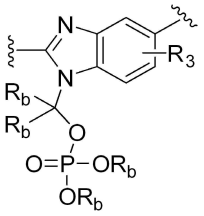
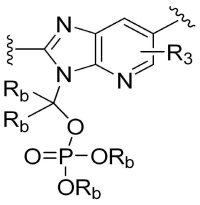
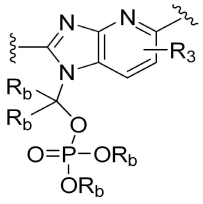
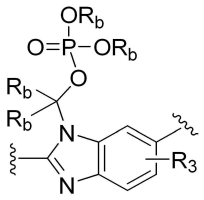
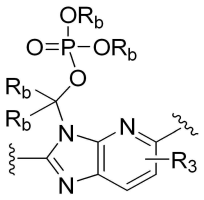
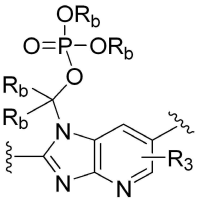
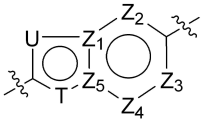
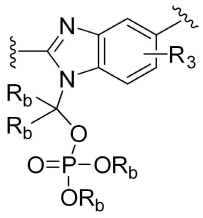
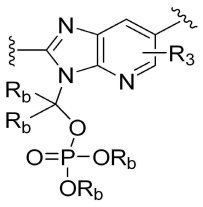
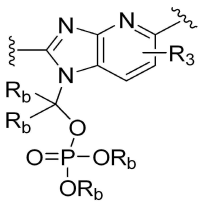
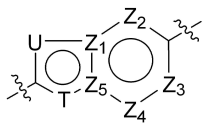
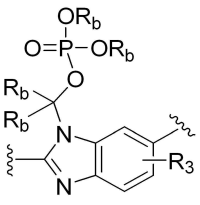
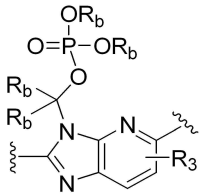
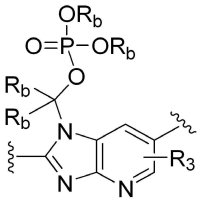
[0506] ,또는 ,

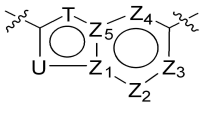
[0507] 상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

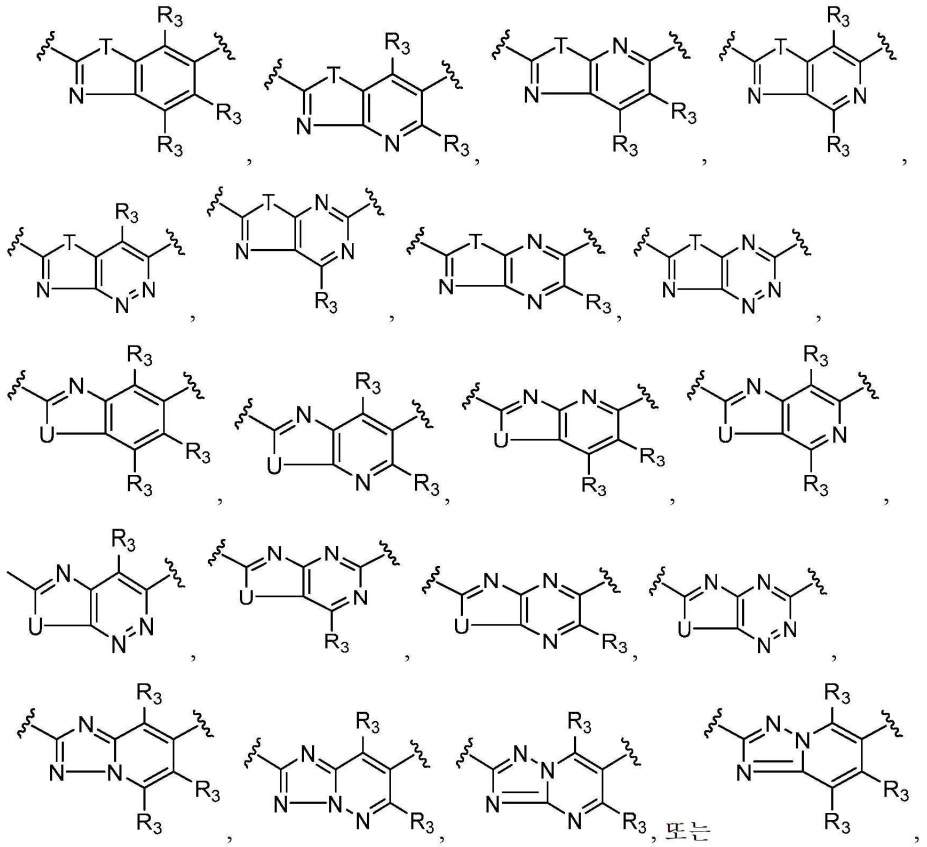
[0508] 일부 실시양태에서, 구조 모이어티  는  ,  ,



의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  또는  의 구조를 가진다.

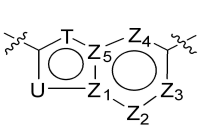
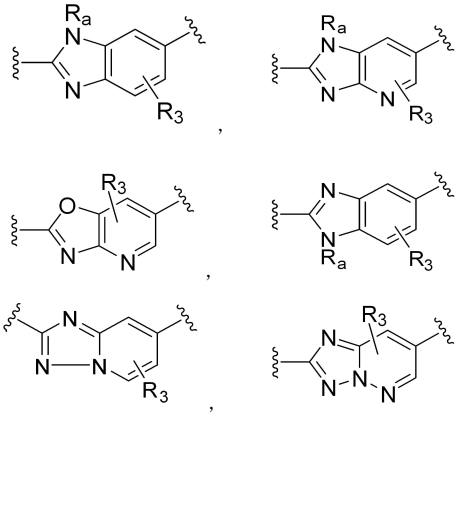
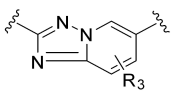
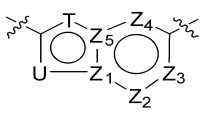
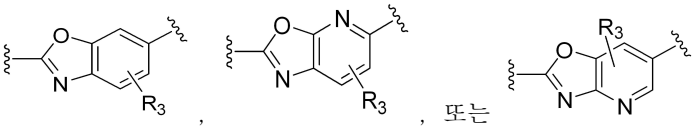
[0509] 일부 실시양태에서, 구조 모이어티  는 , , , , , 또는 의 구조를 갖고, 여기서 R_b의 각 경우는 독립적으로 H 또는 CH_3이다. 일부 실시양태에서, 구조 모이어티  는 , , 또는 의 구조를 갖고, 여기서 R_b의 각 경우는 독립적으로 H 또는 CH_3이다. 일부 실시양태에서, 구조 모이어티  는 , , 또는 의 구조를 갖고, 여기서 R_b의 각 경우는 독립적으로 H 또는 CH_3이다.

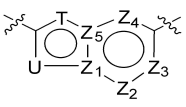
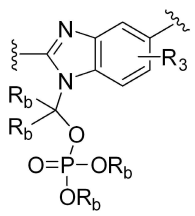
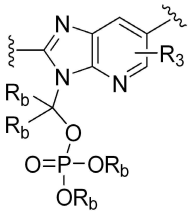
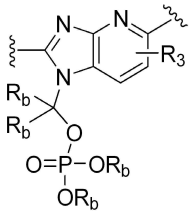
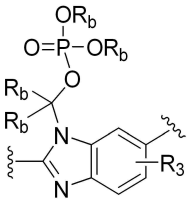
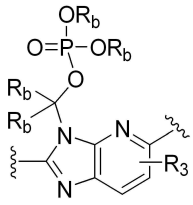
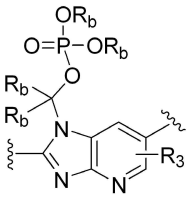
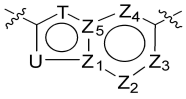
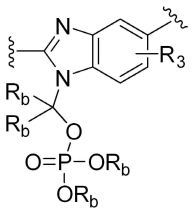
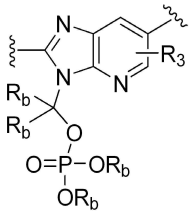
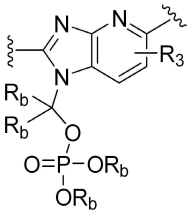
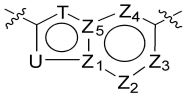
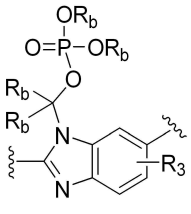
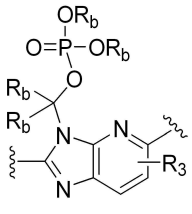
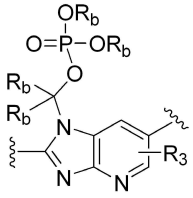
[0510] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:



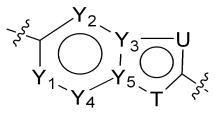
[0511]

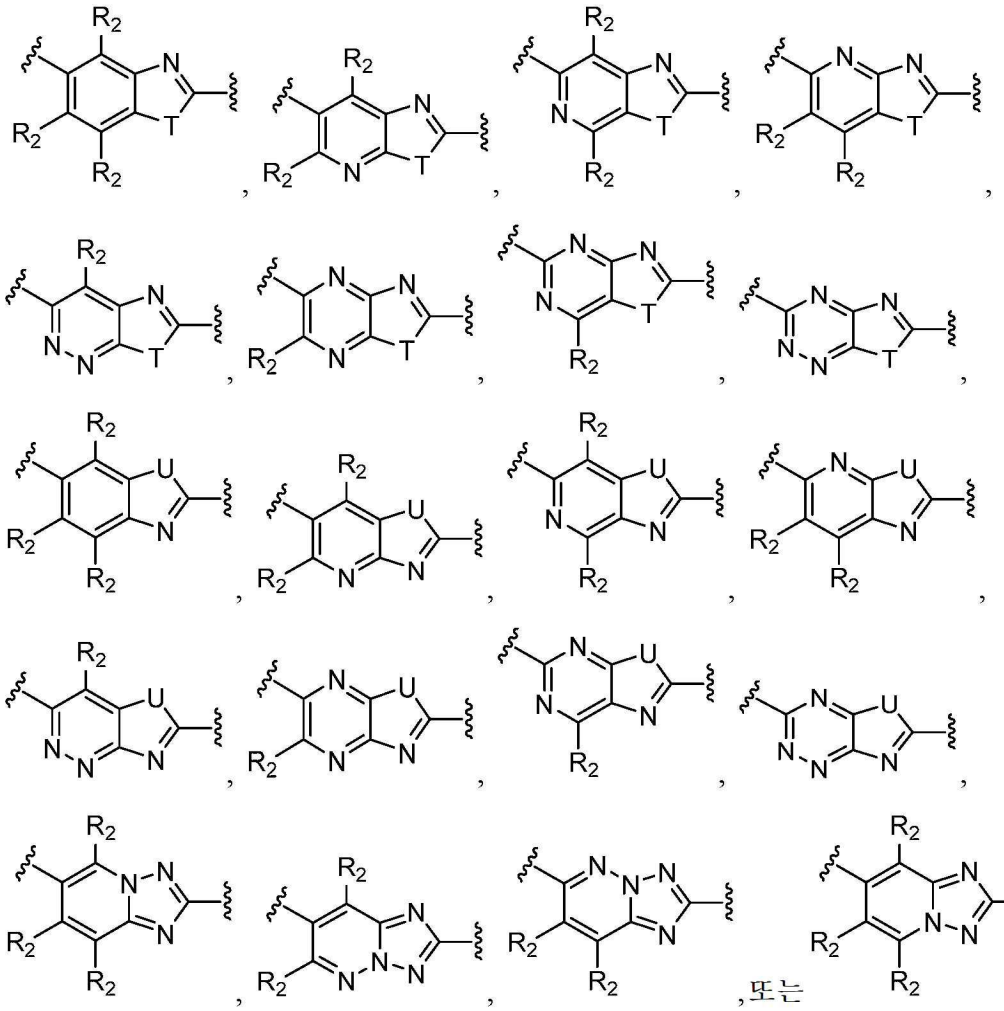
[0512] 상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$ $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

[0513] 일부 실시양태에서, 구조 모이어티  는 , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 , 또는 의 구조를 가진다. 일부 실시양태에서, R_3은 H, CH_3, OH, 할로겐 또는 N_{H2}이고; R_a는 H, CH_3 또는 CH_2CH_3이다.

[0514] 일부 실시양태에서, 구조 모이어티  는  ,  ,  ,  ,  , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  ,  , 또는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는  ,  또는  의 구조를 가진다. R_b의 각 경우는 독립적으로 H 또는 CH_3이다.

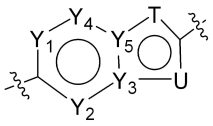
[0515] 일부 실시양태에서, 화합물은 화학식 Ic의 구조를 가진다. 일부 실시양태에서, 화합물은 화학식 IIc의 구조를 가진다. 일부 실시양태에서, 화합물은 화학식 IIIc의 구조를 가진다. 일부 실시양태에서, 화합물은 화학식 IVc의 구조를 가진다.

[0516] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

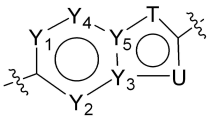
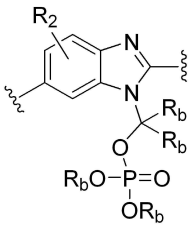
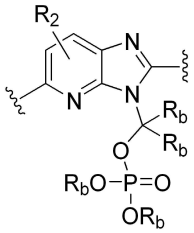
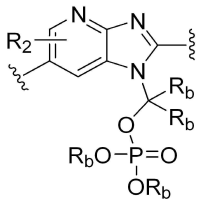
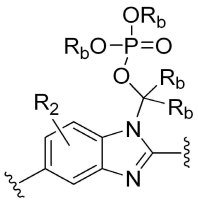
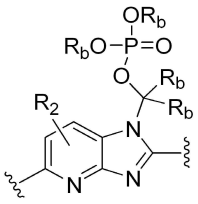
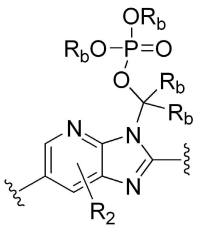
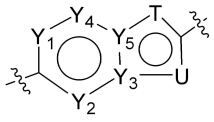
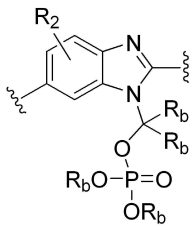
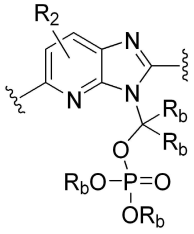
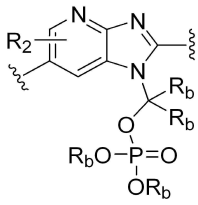
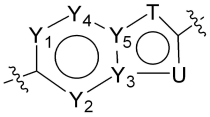
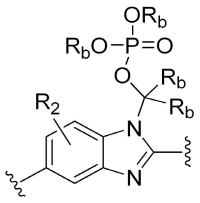
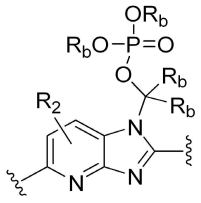
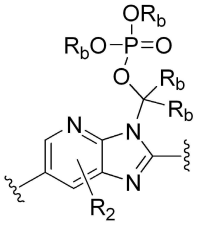


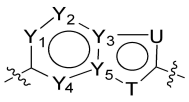
[0517] ,또는

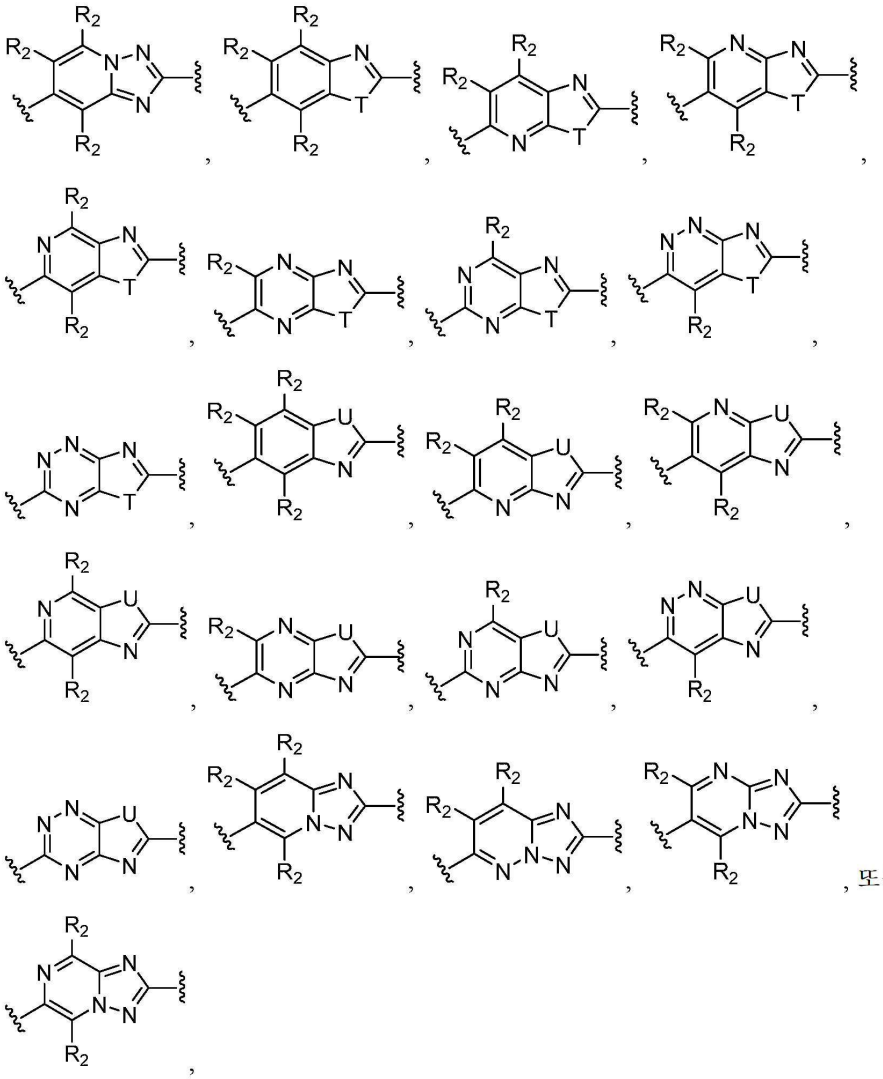
[0518] 상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$ 또는 NSO_2R_a이다.

[0519] 일부 실시양태에서, 구조 모이어티  는 의 구조를 갖고, 여기서 R_2는 H, CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3 또는 CH_2CH_3이다. 일부 실시양태에서, R_2는 H, CH_3, OH, 할로겐 또는 NH_2이다. 일부 실시양태에서, R_a는

H, CH_3 또는 CH_2CH_3이다.

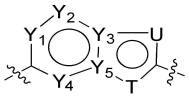
[0520] 일부 실시양태에서, 구조 모이어티  는 , , , , , 또는 의 구조를 갖고, 여기서 R_b의 각 경우는 독립적으로 H 또는 CH_3이다. 일부 실시양태에서, 구조 모이어티  는 , , 또는 의 구조를 갖고, 여기서 R_b의 각 경우는 독립적으로 H 또는 CH_3이다. 일부 실시양태에서, 구조 모이어티  는 , , 또는 의 구조를 갖고, 여기서 R_b의 각 경우는 독립적으로 H 또는 CH_3이다.

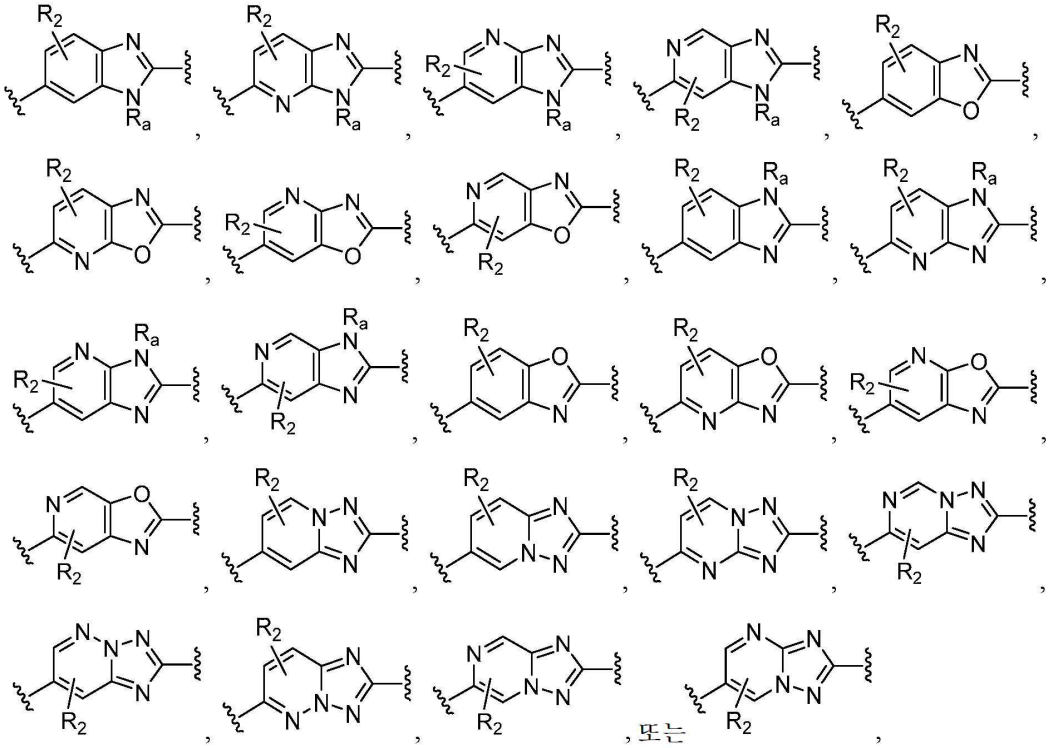
[0521] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:



[0522] ,

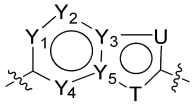
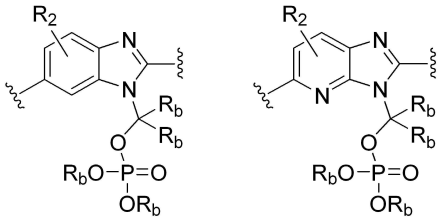
[0523] 상기 식에서, T 및 U의 각 경우는 원자가가 허용하는 경우 독립적으로 O, N, NR_a, $N(C=O)R_a$, $NC(R_b)_2OP(=O)(OR_b)_2$ 또는 NSO_2R_a이다.

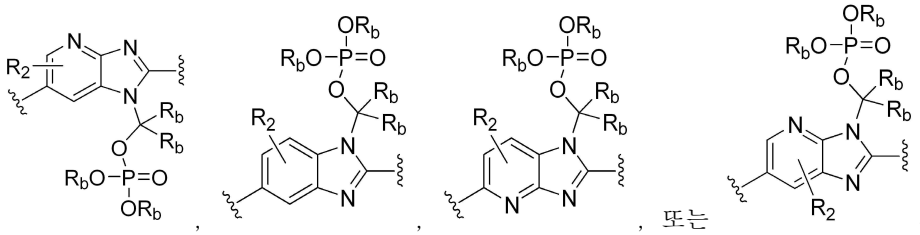
[0524] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

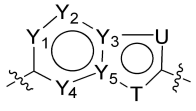
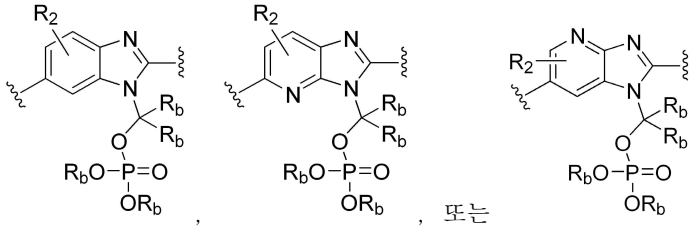


[0525]

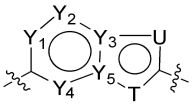
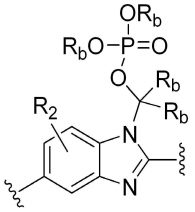
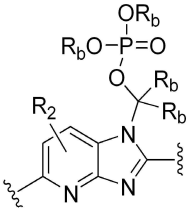
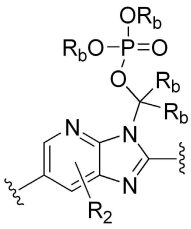
[0526] 상기 식에서, R_2는 H, CH_3, OH, 할로겐 또는 NH_2이고; R_a는 H, CH_3 또는 CH_2CH_3이다. 일부 실시양태에서, R_2는 H, CH_3, OH, 할로겐 또는 NH_2이다. 일부 실시양태에서, R_a는 H, CH_3 또는 CH_2CH_3이다.

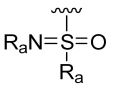
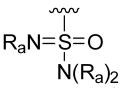
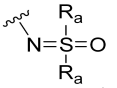
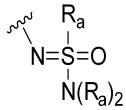
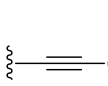
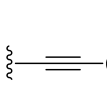
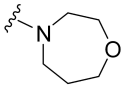
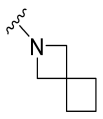
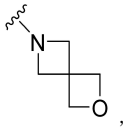
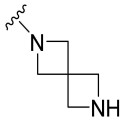
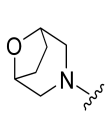
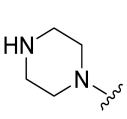
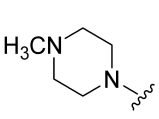
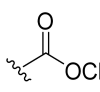
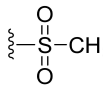
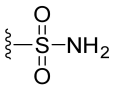
[0527] 일부 실시양태에서, 구조 모이어티  는 



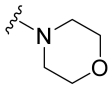
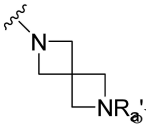
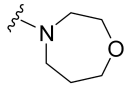
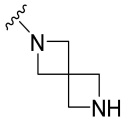
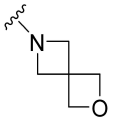
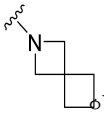
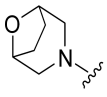
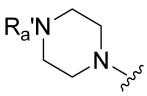
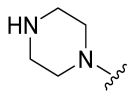
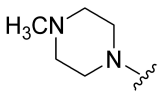
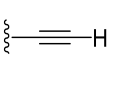
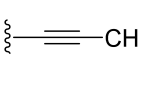
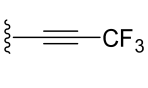
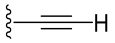
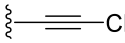
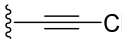
의 구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 

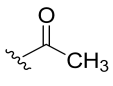
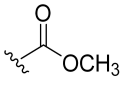
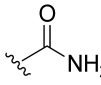
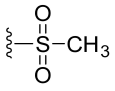
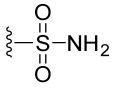
의

구조를 가진다. 일부 실시양태에서, 구조 모이어티  는 , , 또는  의 구조를 가진다. 일부 실시양태에서, R_b의 각 경우는 독립적으로 H 또는 CH_3이다.

[0528] 일부 실시양태에서, R_3의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, 및 $-N(R_a)SO_2R_a$로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_3의 각 경우는 독립적으로 (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬 및 (C_4-C_{10})헤테로비사이클로알킬로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_3의 각 경우는 독립적으로 (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴 및 헤테로아릴로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_3의 각 경우는 독립적으로 $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$ 및 $-N(R_a)SO_2R_a$로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_3의 각 경우는 독립적으로 , , , 및  로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_3의 각 경우는 독립적으로 H, D, 할로겐, OR_a, $N(R_a)_2$, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, (C_1-C_6)알키닐, 아릴, (C_4-C_{10})비사이클로알킬, -CN, N_3, NO_2, COR_a, CO_2R_a, $CON(R_a)_2$, $-SO_2R_a$, 또는 $-SO_2N(R_a)_2$이다. 일부 실시양태에서, R_3의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_1-C_6)알키닐, 아릴, (C_4-C_{10})비사이클로알킬, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$이다. 일부 실시양태에서, R_3의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, $N(R_a)_2$, 또는 -CN이다. 일부 실시양태에서, R_3의 각 경우는 독립적으로 H, D, F, Cl, Br, CH_3, OCH_3, NH_2, $N(CH_3)_2$, , , , , , , , , , , , , , , , , -CN, N_3, NO_2, , , , , , 또는  이다. 일부 실시양태에서, R_3의 각 경우는 독

립적으로 H, D, F, CH_3, $N(CH_3)_2$, , 또는 이다.

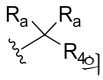
[0529] 일부 실시양태에서, R_3의 적어도 하나의 경우는 H, D 또는 할로겐이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 H이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 D이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 F이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 CH_3이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 OCH_3이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 NH_2이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 $N(CH_3)_2$이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3 의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이고, 여기서 R_a'는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이고, 여기서 R_a'는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 , , 또는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 -CN이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 -NC이다. 일부 실시양태에서, R_3의 적어도 하나의 경우

는  이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 NO_2이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 N_3이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는  이다.

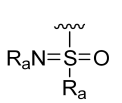
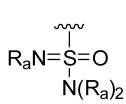
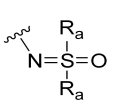
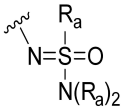
[0530] 일부 실시양태에서, R_3의 각 경우는 독립적으로 H, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, $-N(R_a)_2$, NO_2 및 $-OR_a$로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 H, CH_3, OH, NH_2 또는 할로겐이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 H 또는 CH_3이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 OH 또는 NH_2이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 할로겐이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 H이다. 일부 실시양태에서, R_3의 적어도 하나의 경우는 CF_3이다. 일부 실시양태에서, R_3은 H 또는 CH_3이다.

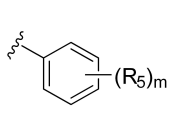
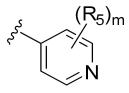
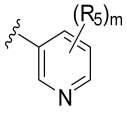
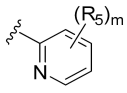
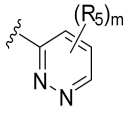
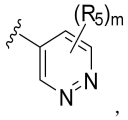
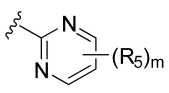
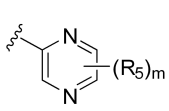
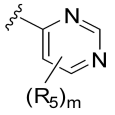
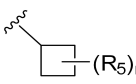
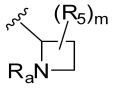
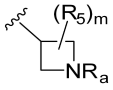
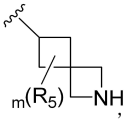
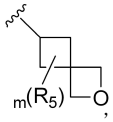
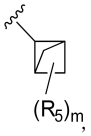
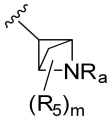
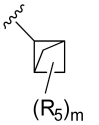
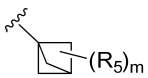
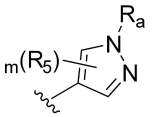
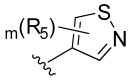
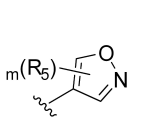
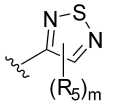
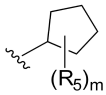
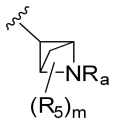
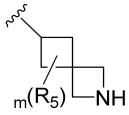
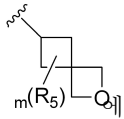
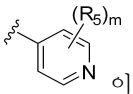
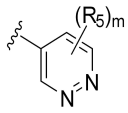
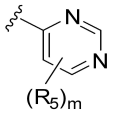
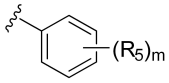
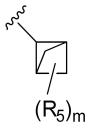
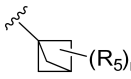
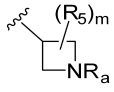
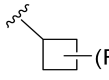
[0531] 일부 실시양태에서, V는 부재하거나, O 또는 NR_a이다. 일부 실시양태에서, V는 부재한다. 일부 실시양태에서, V는 O이다. 일부 실시양태에서, V는 NR_a이다. 일부 실시양태에서, V는 NH이다. 일부 실시양태에서, V는 NCH_3 또는 NCH_2CH_3이다.

[0532] 일부 실시양태에서, V는 $N(C=O)R_a$ 또는 NSO_2R_a이다. 일부 실시양태에서, V는 N(C=O)H이다. 일부 실시양태에서, V는 $N(C=O)CH_3$ 또는 $N(C=O)CH_2CH_3$이다. 일부 실시양태에서, V는 NSO_2H이다. 일부 실시양태에서, V는 NSO_2CH_3 또는 $NSO_2CH_2CH_3$이다.

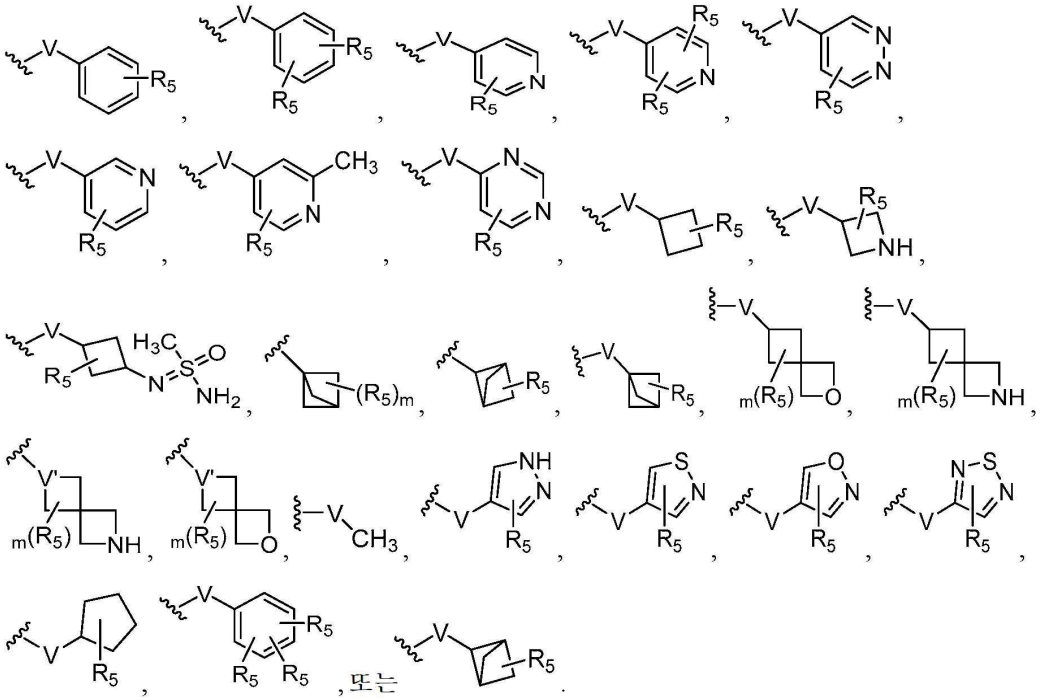
[0533] 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티 는  의 구조를 가진다. 일부 실시양태에서, 구조 모이어티 는  의 구조를 가진다.

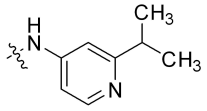
[0534] 일부 실시양태에서, 구조 모이어티  의 V와 R_4는 함께 (C_4-C_{10})헤테로스피로알킬을 형성한다.

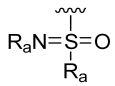
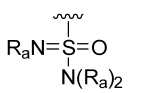
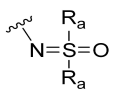
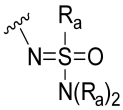
[0535] 일부 실시양태에서, R_4는 각각 하나 이상의 R_5로 임의로 치환된 (C_1-C_6)알킬, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, 아릴 및 헤테로아릴로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_4는 0개, 1개, 2개, 3개, 4개, 5개 또는 6개의 R_5 치환기로 치환되고, 여기서 R_5는 각각 독립적으로 H, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-SR_a$, $-N(R_a)_2$, $N(R_a)COR_a$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, $-CN$, $-NC$, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$,  ,  ,  , 및  로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_4

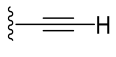
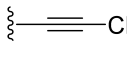
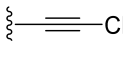
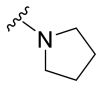
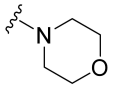
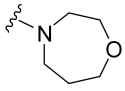
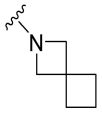
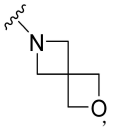
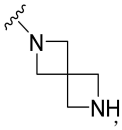
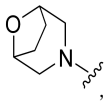
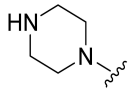
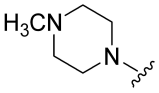
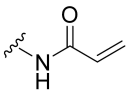
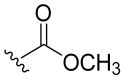
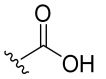
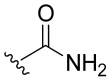
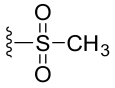
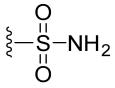
는 , , , , , , , , , , , , , , , , 또는  이고, 여기서 , , , , , , , 또는  에서 R_5는 가교 헤드 탄소를 포함하는 비사이클로알킬 또는 헤테로비사이클로알킬의 임의의 위치에 부착될 수 있고,  및 에서 R_5는 어느 한 고리에서 임의의 이용 가능한 위치에 부착될 수 있다. 일부 실시양태에서, R_4는  이다. 일부 실시양태에서, R_4는  이다. 일부 실시양태에서, R_4는  이다. 일부 실시양태에서, R_4는  이다. 일부 실시양태에서, R_4는  이다. 일부 실시양태에서, R_4는  이다. 일부 실시양태에서, R_4는  이다. 일부 실시양태에서, R_4는  이다. 일부 실시양태에서, m은 0 내지 3의 정수이다. 일부 실시양태에서, m은 0이다. 일부 실시양태에서, m은 1이다. 일부 실시양태에서, m은 2이다. 일부 실시양태에서, m은 3이다.

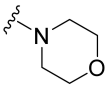
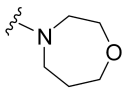
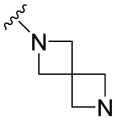
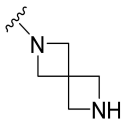
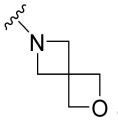
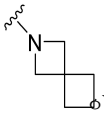
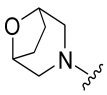
[0536] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

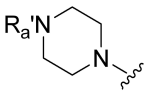
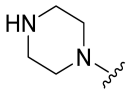
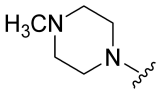
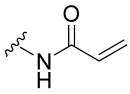


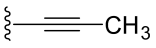
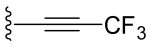
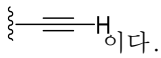
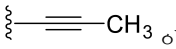
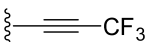
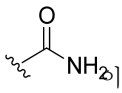
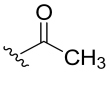
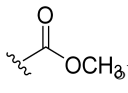
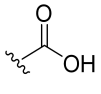
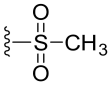
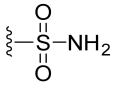
[0537] 일부 실시양태에서, V는 $C(R_a)_2$, O, NR_a, $N(C=O)R_a$ 또는 NSO_2R_a이다. 일부 실시양태에서, V'는 CR_a 또는 N이다. 일부 실시양태에서, 구조 모이어티  는  의 구조를 가진다.

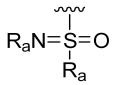
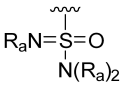
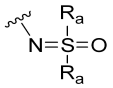
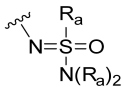
[0538] 일부 실시양태에서, R_5의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴, 헤테로아릴, $-OR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $N(R_a)COR_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $-SO_2N(R_a)_2$ 및 $-N(R_a)SO_2R_a$로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_5의 각 경우는 독립적으로 (C_1-C_6)알킬, (C_1-C_6)할로알킬, (C_2-C_6)알케닐, (C_2-C_6)할로알케닐, (C_2-C_6)알키닐, (C_2-C_6)할로알키닐, (C_3-C_7)사이클로알킬, (C_4-C_{10})비사이클로알킬, (C_3-C_7)헤테로사이클로알킬 및 (C_4-C_{10})헤테로비사이클로알킬로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_5의 각 경우는 독립적으로 (C_4-C_{10})헤테로스피로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, 아릴 및 헤테로아릴로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_5의 각 경우는 독립적으로 $-OR_a$, $-SR_a$, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, -CN, -NC, NO_2, N_3, $-SO_2R_a$, $N(R_a)COR_a$, $-SO_2N(R_a)_2$ 및 $-N(R_a)SO_2R_a$로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_5의 각 경우는 독립적으로 , , , 및  로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_5의 각 경우는 독립적으로 H, D, 할로겐, OR_a, $N(R_a)_2$, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, (C_1-C_6)알키닐, 아릴, (C_4-C_{10})비사이클로알킬, -CN, N_3, NO_2, COR_a, CO_2R_a, $CON(R_a)_2$, $-SO_2R_a$, $N(R_a)COR_a$ 또는 $-SO_2N(R_a)_2$이다. 일부 실시양태에서, R_5의 각 경우는 독립적으로 H, D, 할로겐, (C_1-C_6)알킬, (C_3-C_7)헤테로사이클로알킬, $N(R_a)COR_a$, $N(R_a)_2$ 또는 -CN이다. 일부 실시양태에서, R_5의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_1-C_6)알키닐, 아릴, (C_4-C_{10})비사이클로알킬, $-SO_2R_a$ 또는 $-SO_2N(R_a)_2$이다. 일부 실시양태에서, R_5의 각 경우는 립적으로 H, D, F, Cl, Br, CH_3,

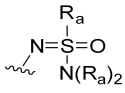
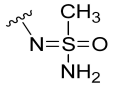
CF_3, 이소프로필, OCH_3, NH_2, $N(CH_3)_2$, , , , , , , , , , , , , , , , , , , $-CN$, N_3, NO_2, , , , , , , 또는 이다. 일부 실시양태에서, R_5의 각 경우는 독립적으로 H, D, F, CH_3, $N(CH_3)_2$, , 또는  이다.

[0539] 일부 실시양태에서, R_5의 적어도 하나의 경우는 H, D 또는 할로겐이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 H이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 D이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 F이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 CH_3이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 OCH_3이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 NH_2이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 $N(CH_3)_2$이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_5 의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 이고, 여기서 R_a'는 H 또는 $(C_1$-$C_6)$알킬이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는  이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는


이고, 여기서 R_a'는 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

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, 또는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 -CN이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 -NC이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 NO_2이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 N_3이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다.

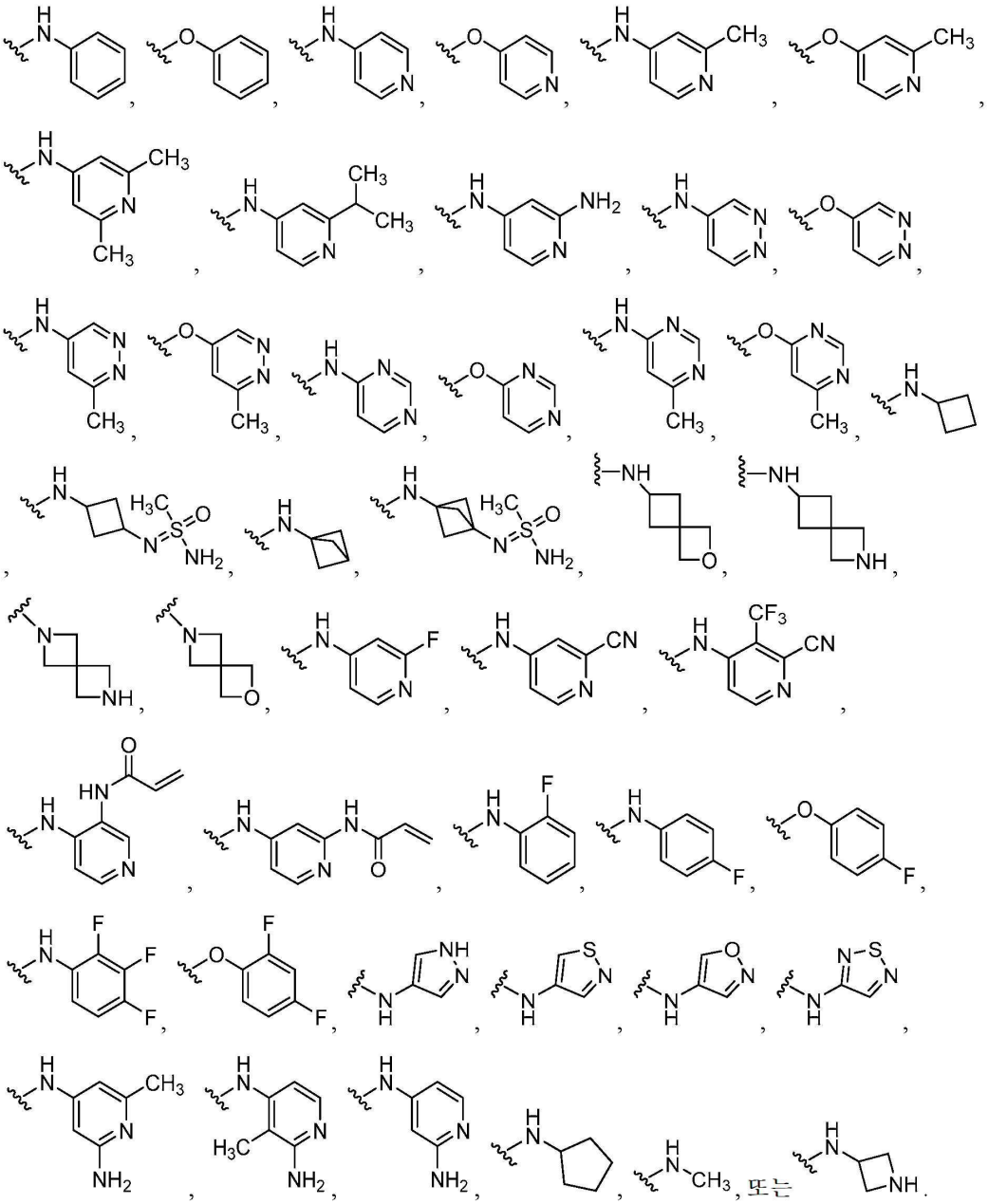
[0540] 일부 실시양태에서, R_5의 각 경우는 독립적으로 할로겐, (C_1-C_6)알킬, (C_1-C_6)할로알킬, OR_a, $-N(R_a)_2$, $-COR_a$, $-CO_2R_a$, $CON(R_a)_2$, $N(R_a)COR_a$, -CN, NO_2, $-SO_2R_a$, $-SO_2N(R_a)_2$, $-N(R_a)SO_2R_a$,

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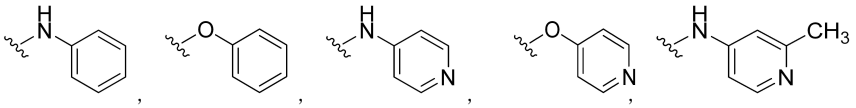
로 이루어진 군으로부터 선택된다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 (C_1-C_6)알킬, 할로겐, OH, NH_2 또는

이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 CH_3, 할로겐, OH 또는 NH_2이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 OH이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는 CH_3이다. 일부 실시양태에서, R_5의 적어도 하나의 경우는

이다.

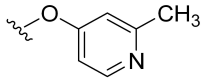
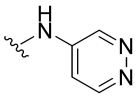
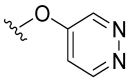
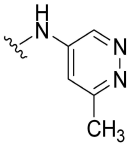
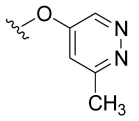
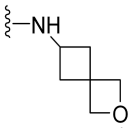
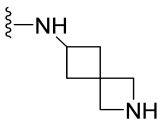
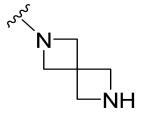
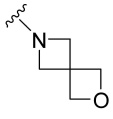
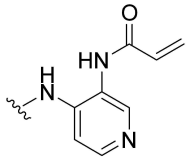
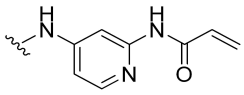
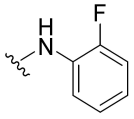
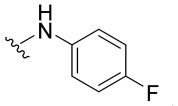
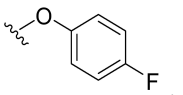
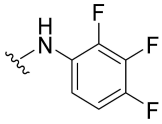
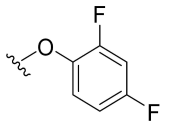
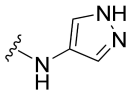
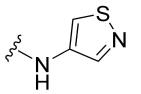
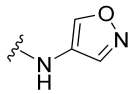
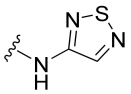
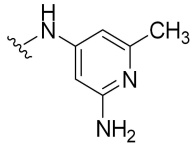
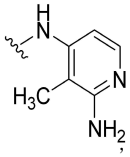
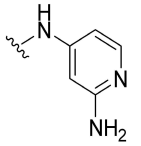
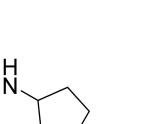
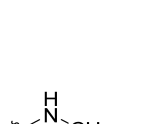
[0541] 본원에 기재된 실시양태들 중 어느 한 실시양태에서, R_a의 각 경우는 H, (C_1-C_6)알킬, (C_2-C_6)알케닐, (C_3-C_7)사이클로알킬, 아릴 또는 헤테로아릴이다. 본원에 기재된 실시양태들 중 어느 한 실시양태에서, R_a의 적어도 하나의 경우는 아릴 또는 헤테로아릴이다. 본원에 기재된 실시양태들 중 어느 한 실시양태에서, R_a의 각 경우는 독립적으로 H, (C_1-C_6)알킬, (C_2-C_6)알케닐 또는 (C_3-C_7)사이클로알킬이거나, 2개의 R_a는 함께 할로겐 또는 (C_1-C_6)알

킬로 임의로 치환된 5원 또는 6원 고리를 형성한다. 일부 실시양태에서, R_a의 각 경우는 독립적으로 H 또는 (C_1-C_6)알킬이다. 일부 실시양태에서, R_a의 각 경우는 독립적으로 (C_2-C_6)알케닐이다. 일부 실시양태에서, R_a의 각 경우는 독립적으로 H, CH_3 또는 CH_2CH_3이다. 일부 실시양태에서, R_a 의 적어도 하나의 경우는 H 또는 CH_3이다. 일부 실시양태에서, R_a의 각 경우는 H이다. 일부 실시양태에서, R_a의 각 경우는 CH_3이다. 일부 실시양태에서, R_a의 적어도 하나의 경우는 할로겐 또는 (C_1-C_6)알킬로 임의로 치환된 (C_3-C_7)사이클로알킬이다. 일부 실시양태에서, R_a의 적어도 하나의 경우는 할로겐 또는 (C_1-C_6)알킬로 임의로 치환된 사이클로프로필, 사이클로부틸, 사이클로펜틸 또는 사이클로헥실이다.

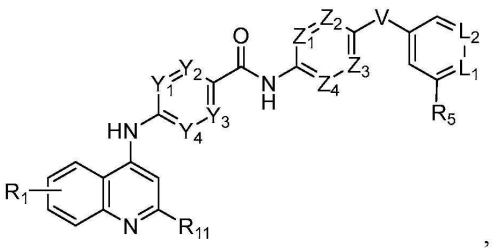
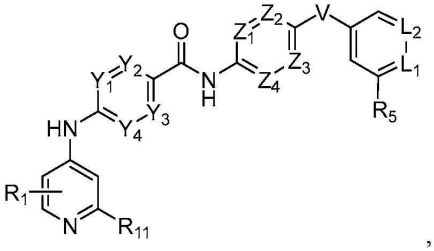
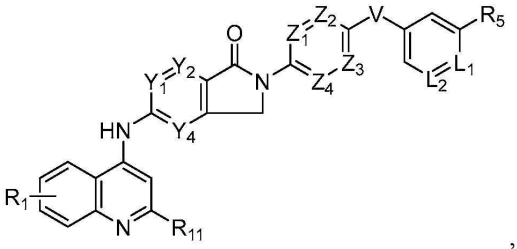
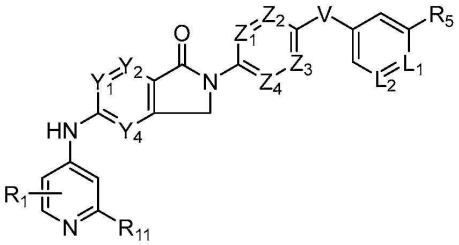
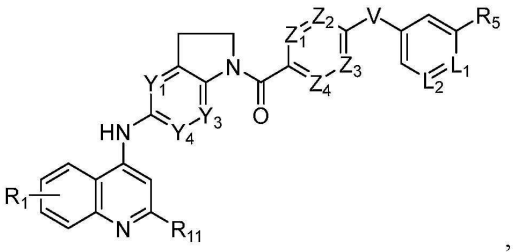
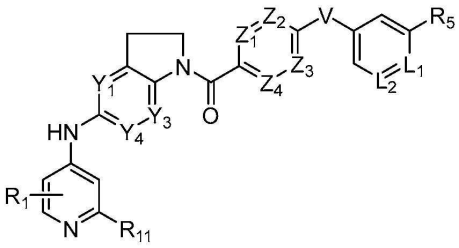
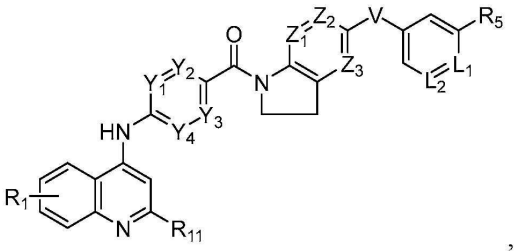
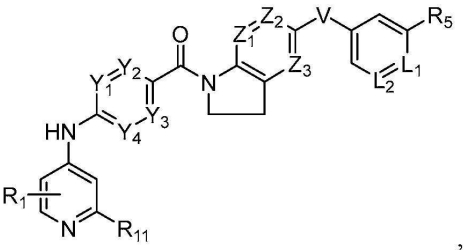
[0542] 일부 실시양태에서, 구조 모이어티  는 하기 화학식의 구조를 가진다:

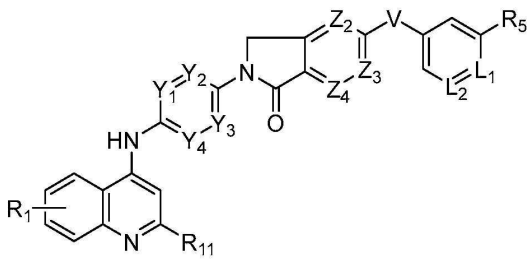
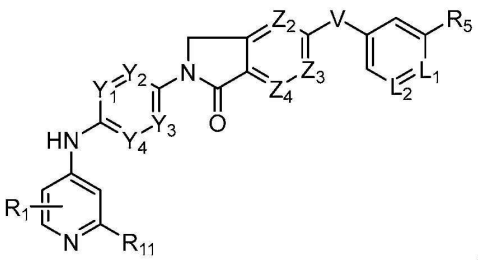
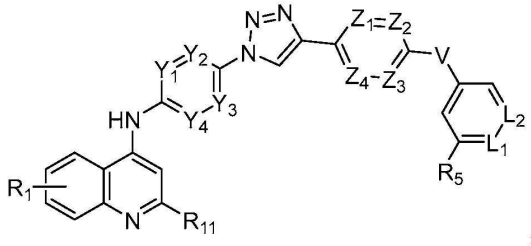
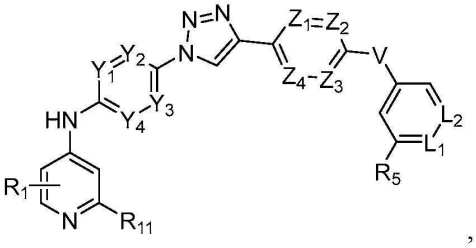
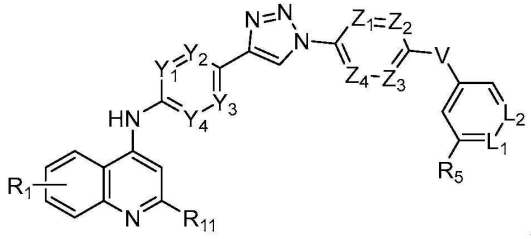
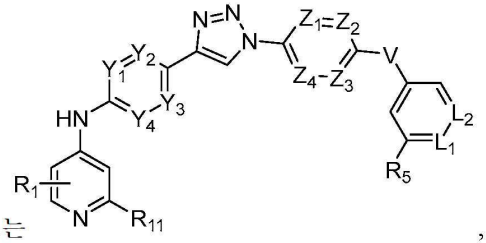


[0543] 일부 실시양태에서, 구조 모이어티 는 

, , , , , , , , 또는 의 구조를 가진다. 일부 실시양태에서, 구조 모이어티 는 , , , , , , , , , , , , , , , , , , , , , , 또는 의 구조를 가진다.

[0544] 일부 실시양태에서, 화학식 Ia의 화합물은 하기 화학식의 구조를 가진다:

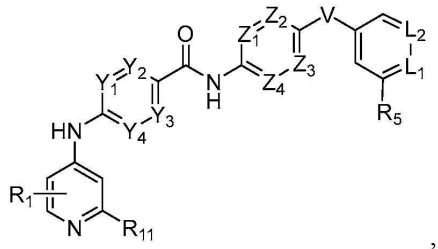

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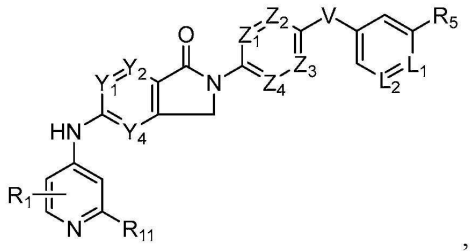
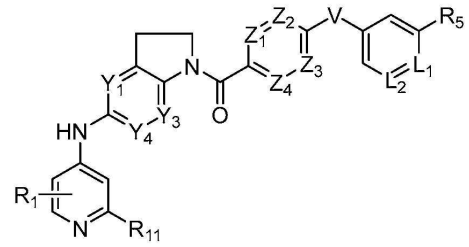
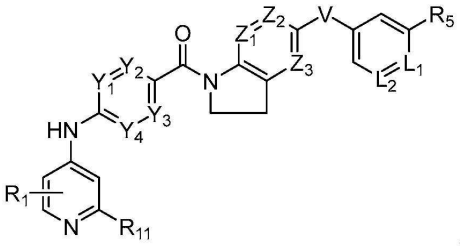
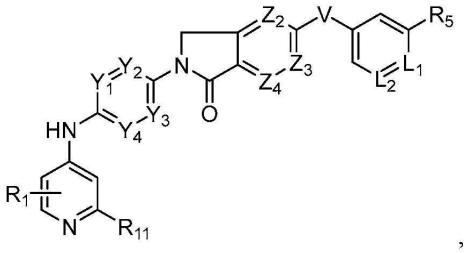
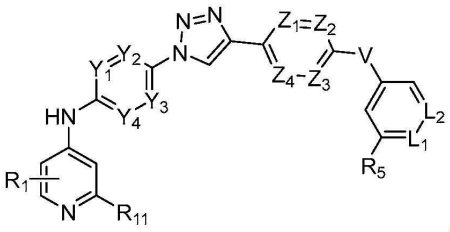
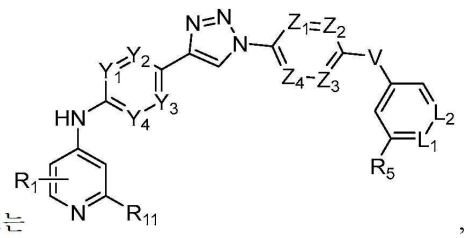
[0546]

[0547] 상기 식에서,

[0548] R_1은 H, (C_1-C_6)알킬, $N(R_a)_2$, (C_3-C_7)헤테로사이클로알킬 또는 할로겐이고; R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_1, Z_2, Z_3, Z_4, L_1 및 L_2는 각각 독립적으로 CH 또는 N이고; V는 NH 또는 O이다. 일부 실시양태에서, 화학식 Ia의 화합물은 하기 화학식의 구조를 가진다:



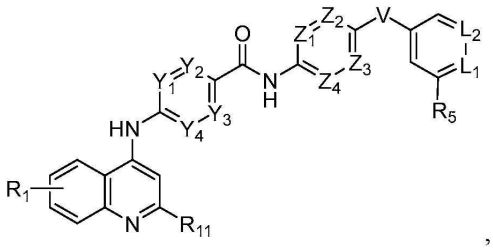
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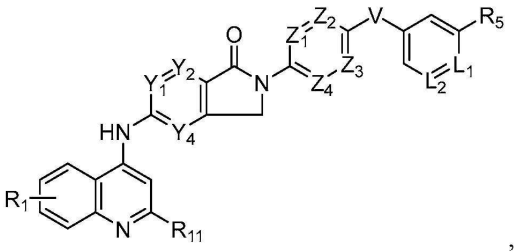
[0549] 
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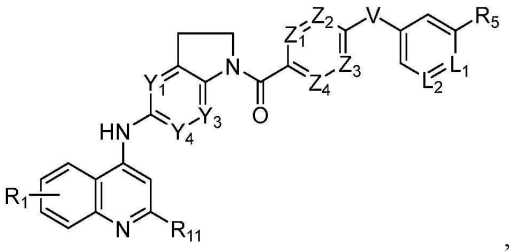
[0550]

[0551] 상기 식에서,

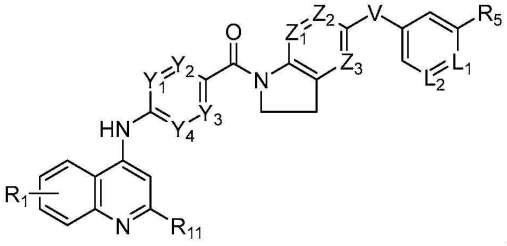
[0552] R_1은 H, (C_1-C_6)알킬, $N(R_a)_2$, (C_3-C_7)헤테로사이클로알킬 또는 할로겐이고; R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_1, Z_2, Z_3, Z_4, L_1 및 L_2는 각각 독립적으로 CH 또는 N이고; V는 NH 또는 O이다. 일부 실시양태에서, 화학식 Ia의 화합물은 하기 화학식의 구조를 가진다:

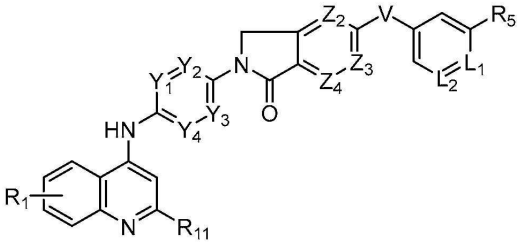

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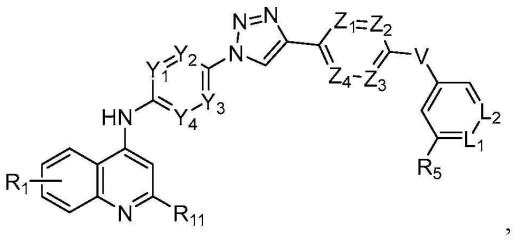

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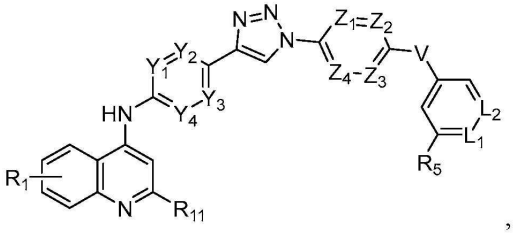

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[0553]


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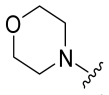
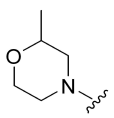
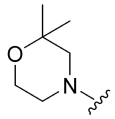

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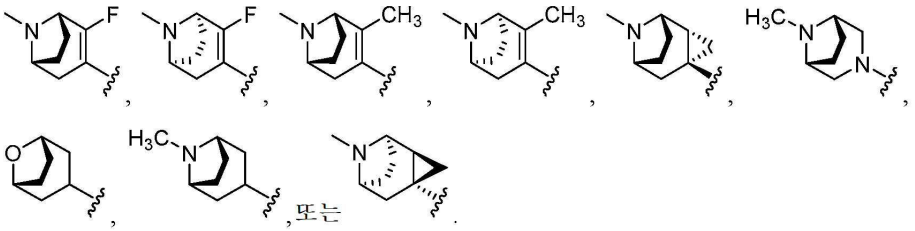

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[0554]

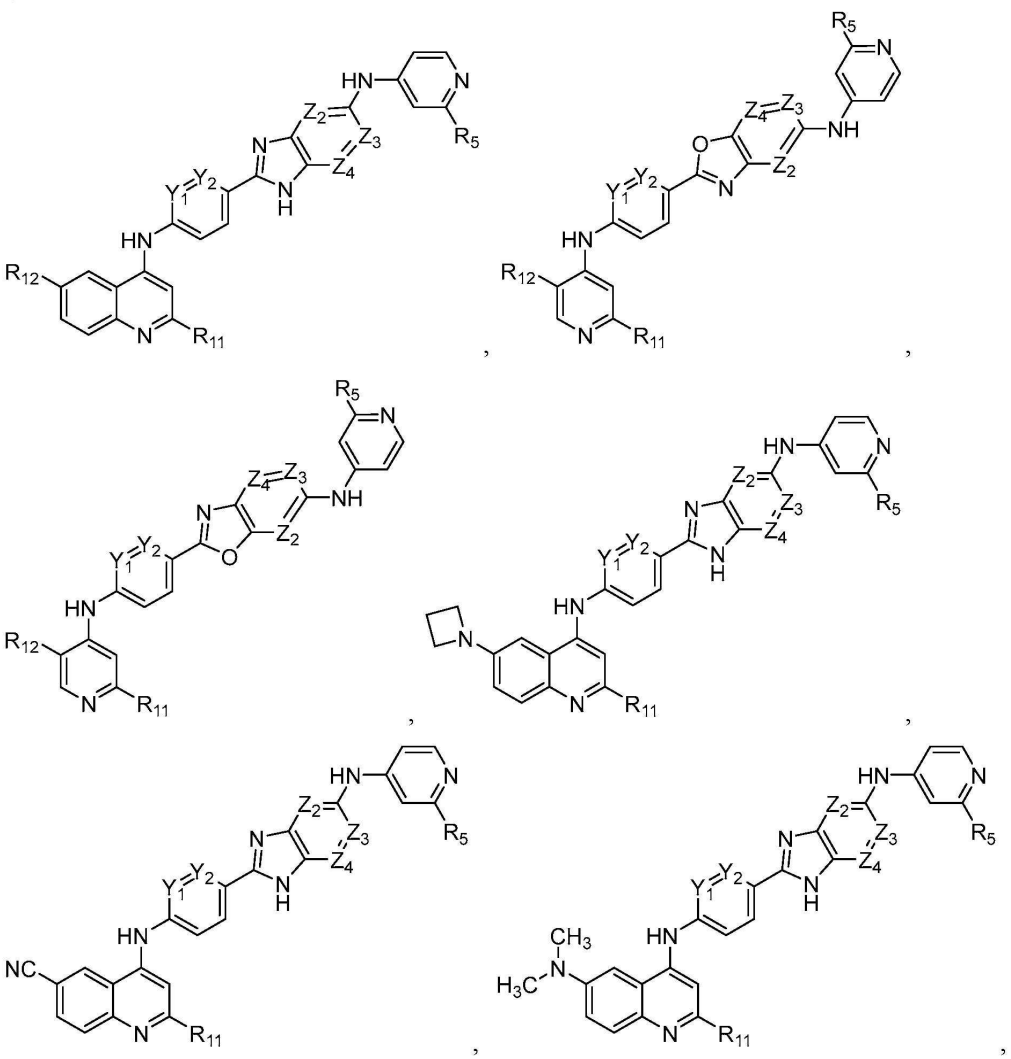
[0555] 상기 식에서,

[0556] R_1은 H, (C_1-C_6)알킬, $N(R_a)_2$, (C_3-C_7)헤테로사이클로알킬, 할로겐, (C_4-C_{14})트리사이클로알킬, (C_3-C_7)헤테로사이클로알킬, 할로겐화된 (C_3-C_7)헤테로사이클로알킬, (C_4-C_{10})헤테로비사이클로알킬, (C_4-C_{14})헤테로트리사이클로알킬, (C_4-C_{10})헤테로스피로알킬, (C_3-C_7)사이클로알케닐, (C_3-C_7)헤테로사이클로알케닐, (C_4-C_{10})비사이클로알케닐, (C_4-C_{10})헤테로비사이클로알케닐, (C_4-C_{14})트리사이클로알케닐, 또는 (C_4-C_{14})헤테로트리사이클로알케닐; R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_1, Z_2, Z_3, Z_4, L_1 및 L_2는 각각 독립적으로 CH 또는 N이고; V는 NH 또는 O이다. 일부 실시양태에서, R_1은 H, F, Cl, Br, CH_3, CH_2CH_3, 또는 $CH(CH_3)_2$, , , 

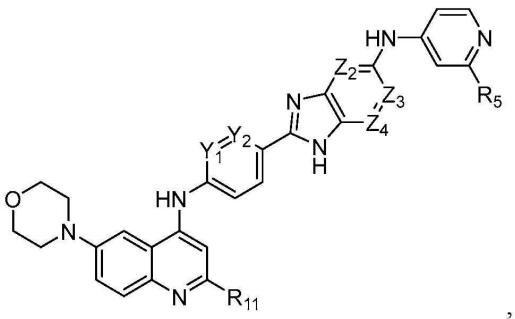


[0558]

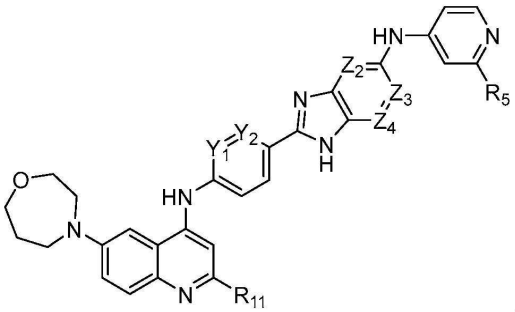
[0559] 일부 실시양태에서, 화학식 Ib의 화합물은 하기 화학식의 구조를 가진다:



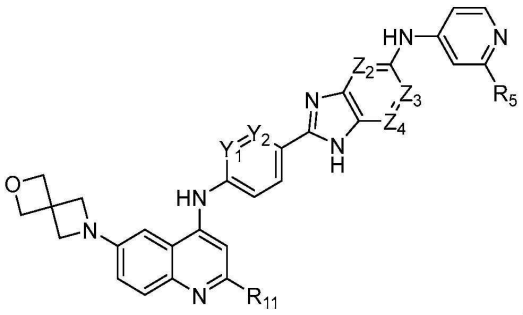
[0560]



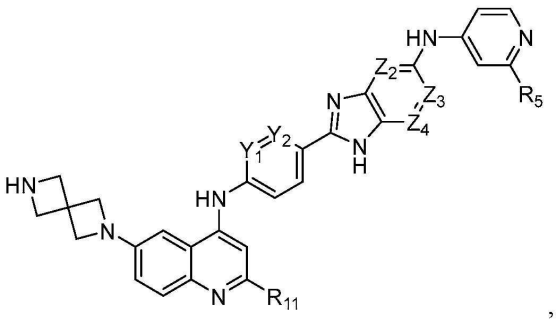
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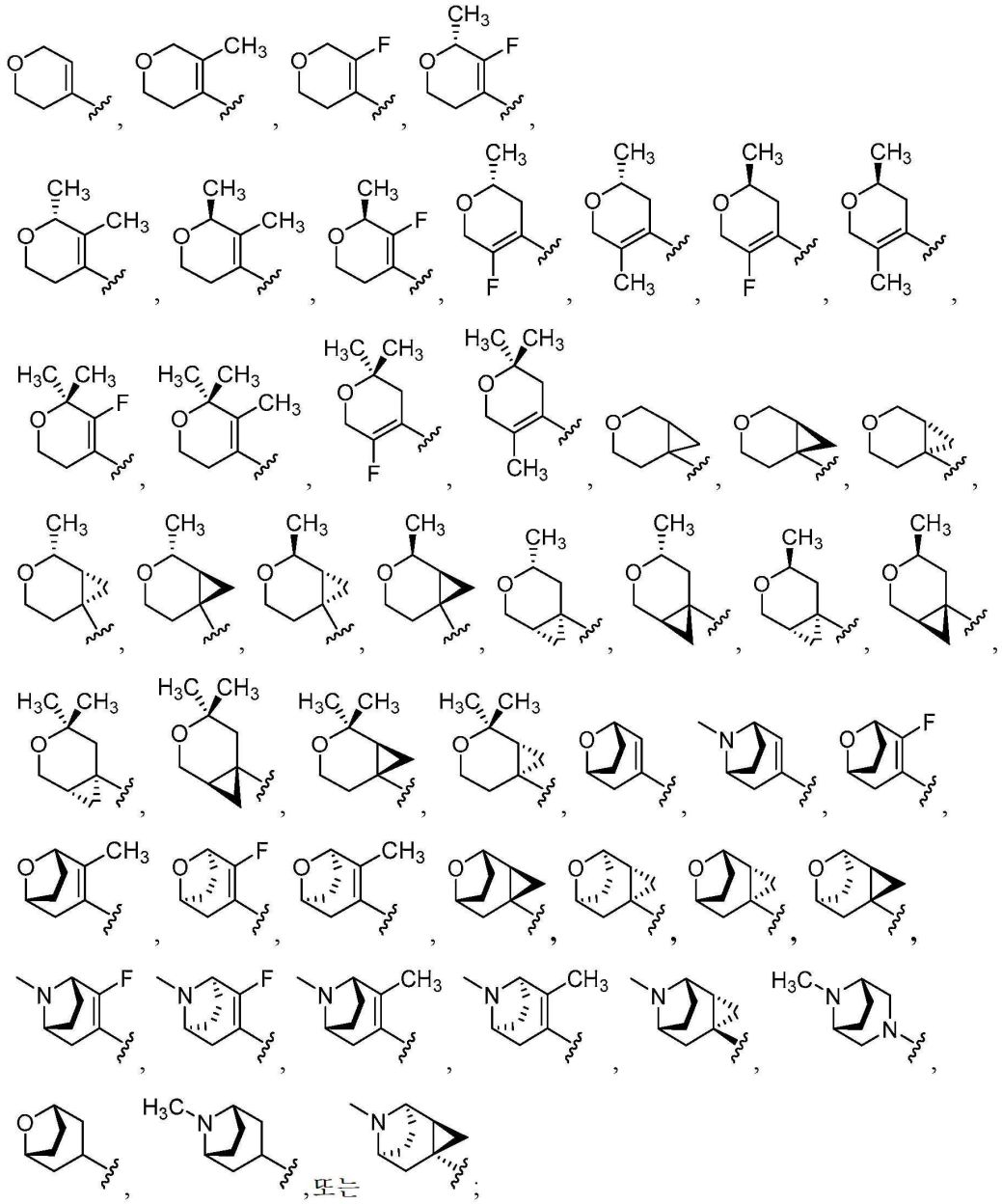


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[0561]

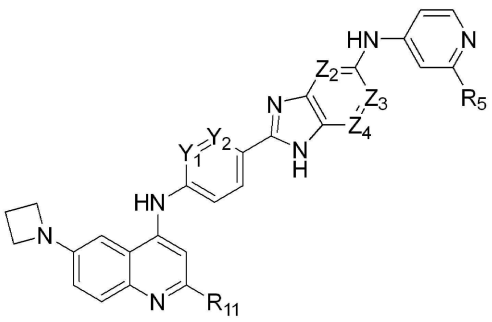
[0562] 상기 식에서,

[0563] R_{11} 및 R_5는 각각 독립적으로 H, 할로겐 또는 CH_3이고; R_{12}는 H, 할로겐, CH_3, 하기 화학식의 기이고:

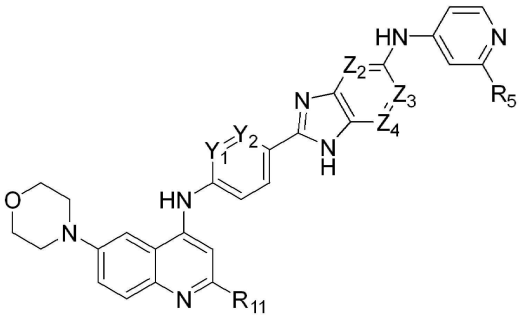


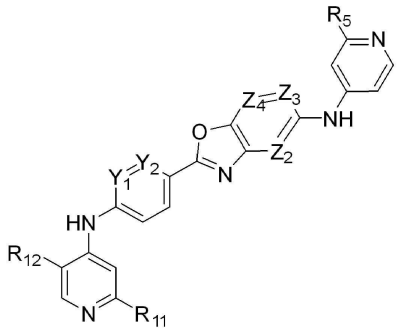
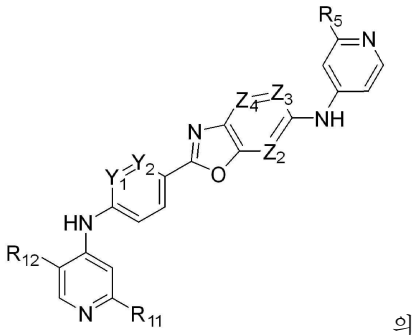
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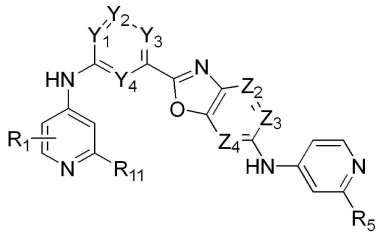
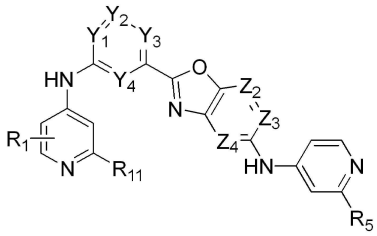
[0565] Y_1, Y_2, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

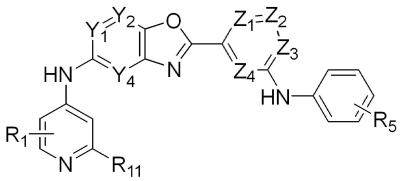
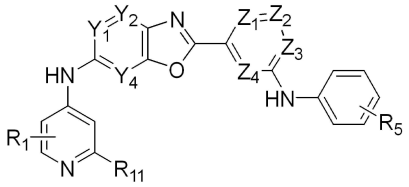


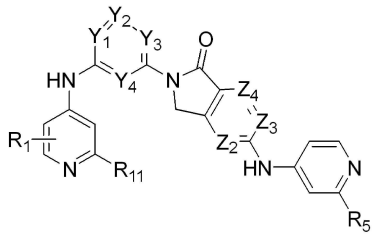
[0566] 일부 실시양태에서, 화학식 Ib의 화합물은 의 구조를 갖고, 여기서 R_{11} 및 R_5는 각각 독립적으로 H 또는 CH_3이고; Y_1, Y_2, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다. 일부 실시



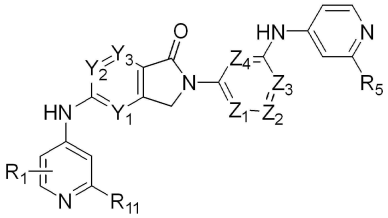
양태에서, 화학식 Ib의 화합물은 의 구조를 갖고, 여기서 R_{11} 및 R_5는 각각 독립적으로 H 또는 CH_3이고; Y_1, Y_2, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다. 일부 실시양태에서, 화학식 Ib의 화합물은  또는  의 구조를 갖고, 여기서 R_{11} 및 R_5는 각각 독립적으로 H, 할로겐 또는 CH_3이고; R_{12}는 H, 할로겐, CH_3이고; Y_1, Y_2, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

[0567] 일부 실시양태에서, 화학식 IIb의 화합물은  또는  의 구조를 가지며, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

[0568] 일부 실시양태에서, 화학식 IIc의 화합물은  또는  의 구조를 갖고, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_4, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

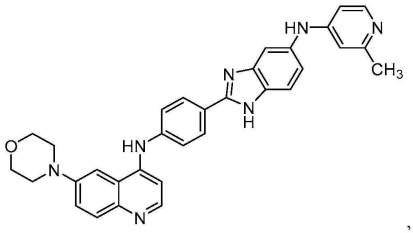
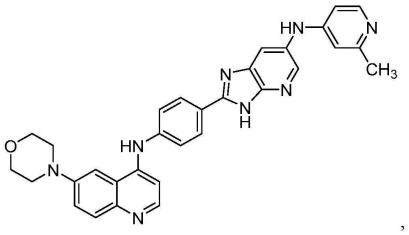
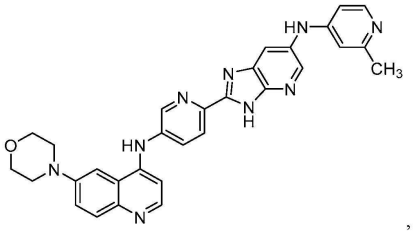
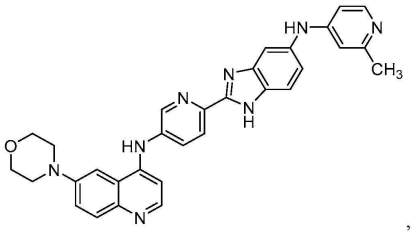
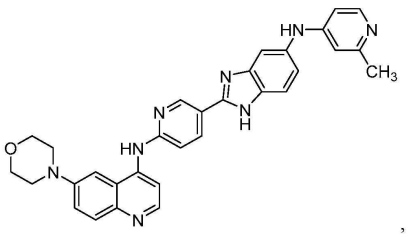
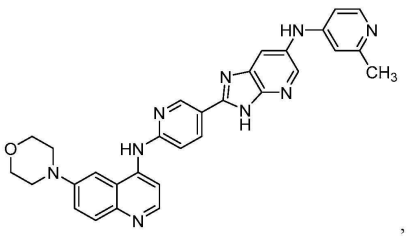


[0569] 일부 실시양태에서, 화학식 IIIa의 화합물은 의 구조를 가지며, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Y_4, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

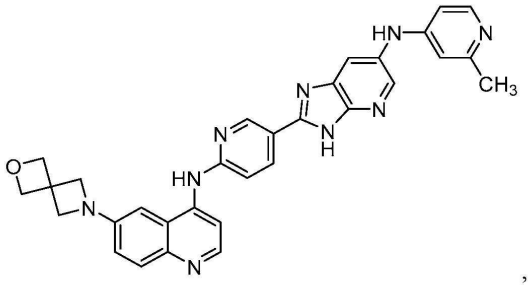


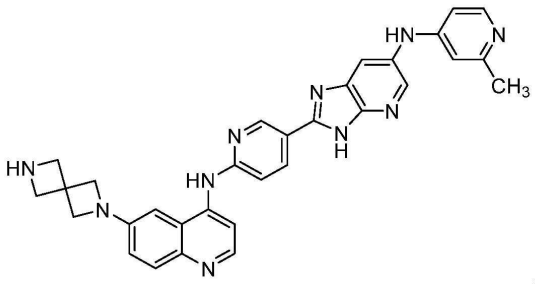
[0570] 일부 실시양태에서, 화학식 IVa의 화합물은 의 구조를 가지며, 여기서 R_1, R_5 및 R_{11}은 각각 독립적으로 H, 할로겐 또는 CH_3이고; Y_1, Y_2, Y_3, Z_1, Z_2, Z_3 및 Z_4는 각각 독립적으로 CH 또는 N이다.

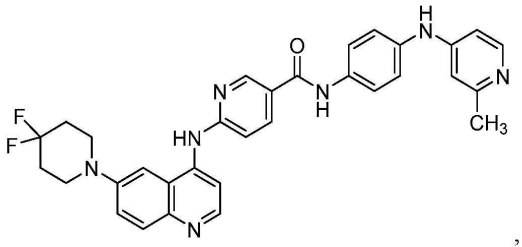
[0571] 일부 실시양태에서, 화학식 Ia, Ib 또는 Ic의 화합물은 Akt3을 활성화시키고 하기 화합물들로 이루어진 군으로부터 선택된다:

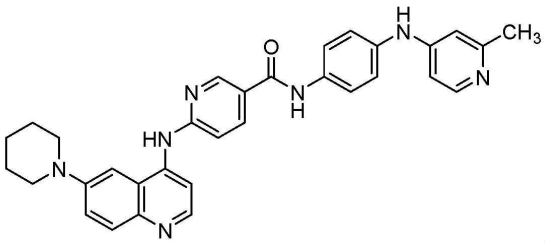

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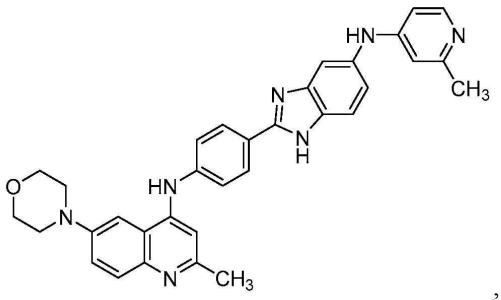
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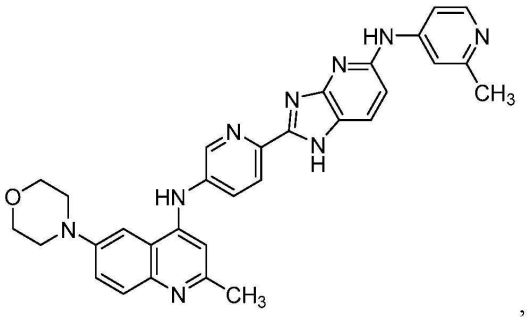

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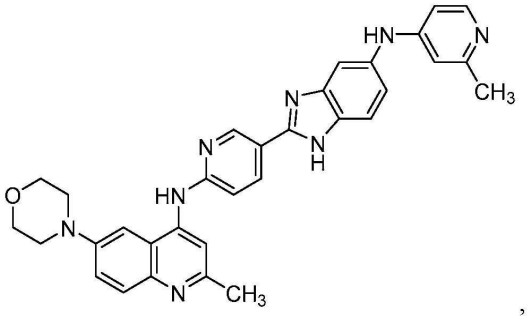

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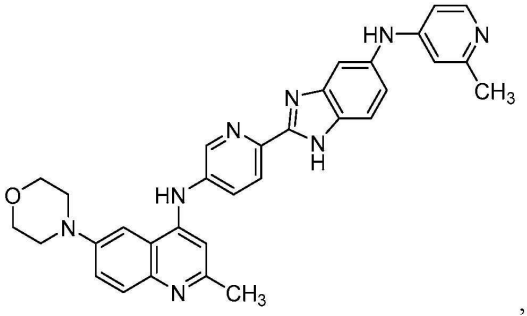

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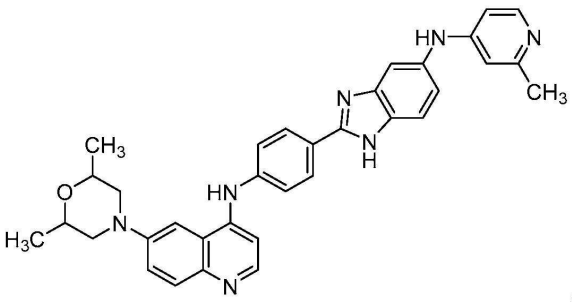

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[0573]

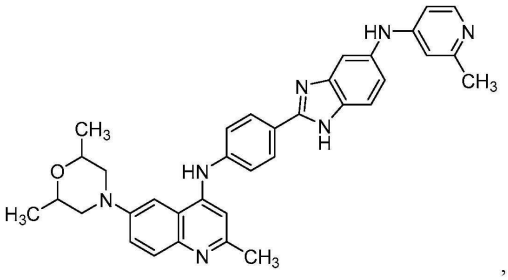
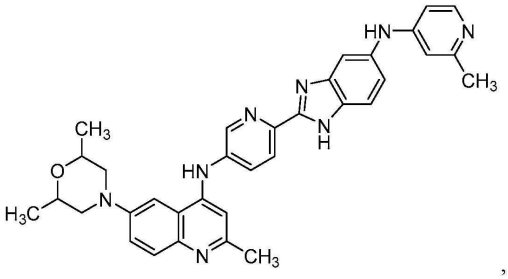
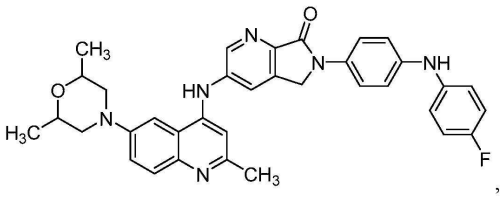
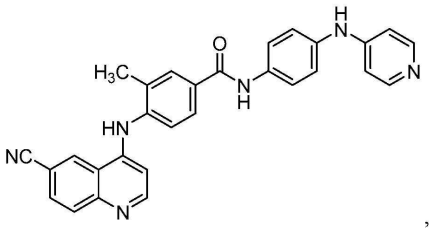
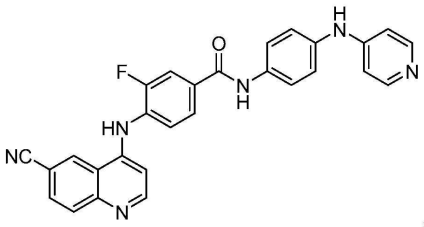
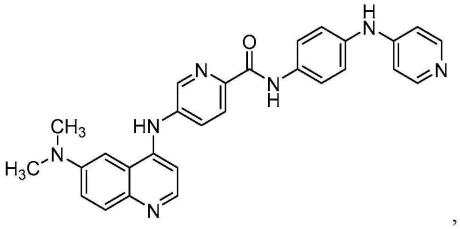

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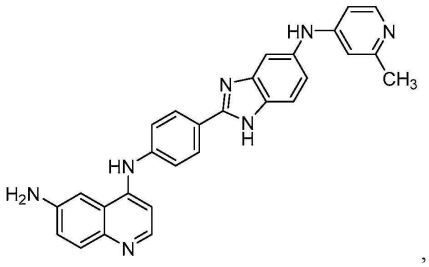
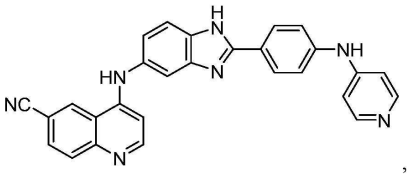
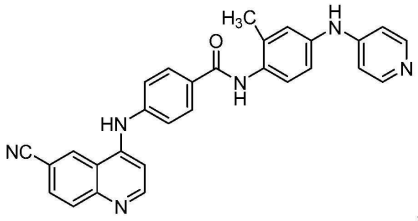
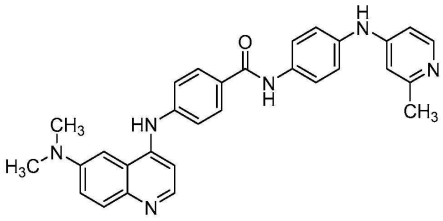
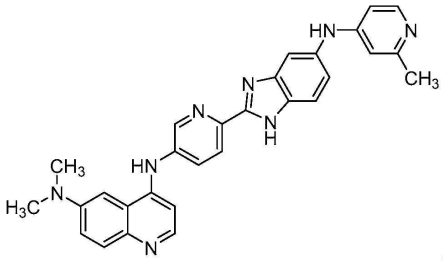
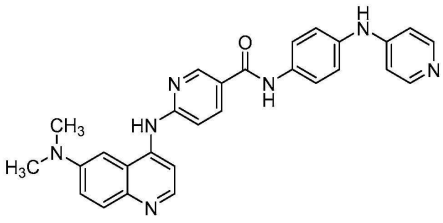

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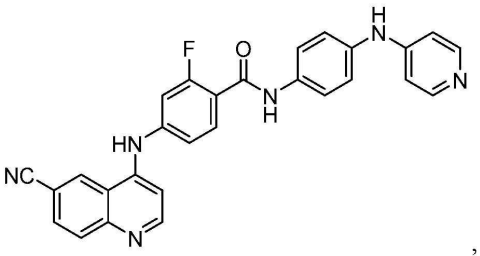
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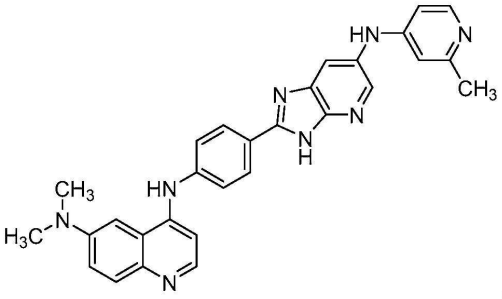

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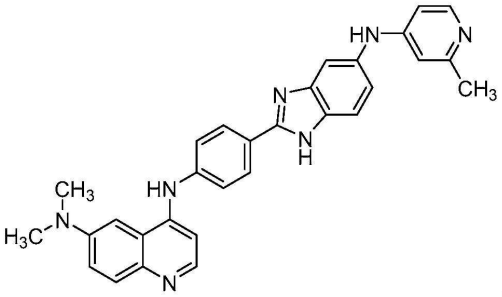
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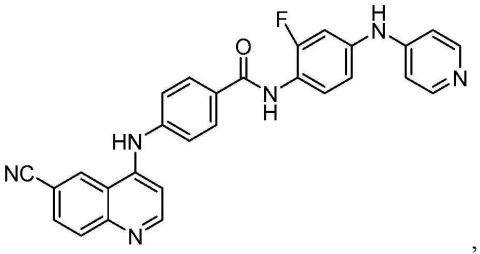

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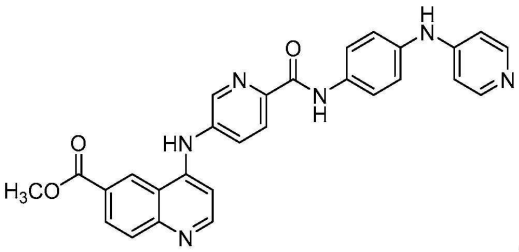
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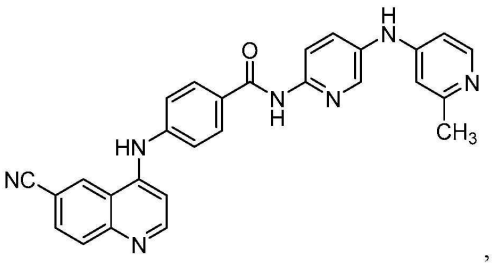

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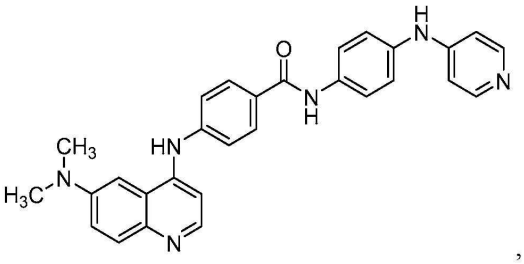

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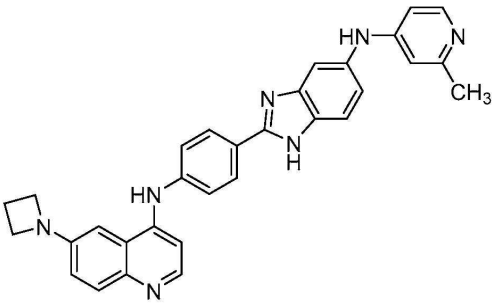

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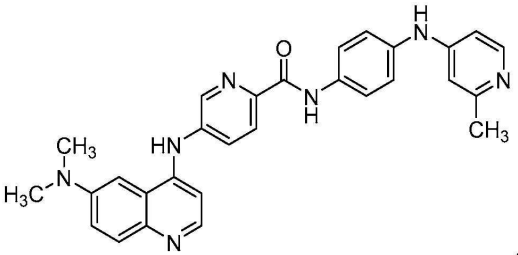

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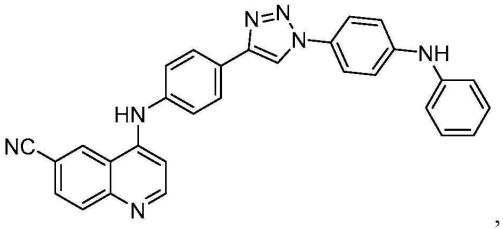
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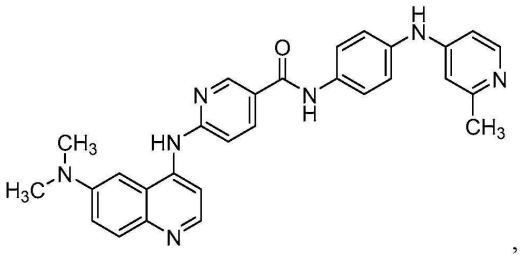

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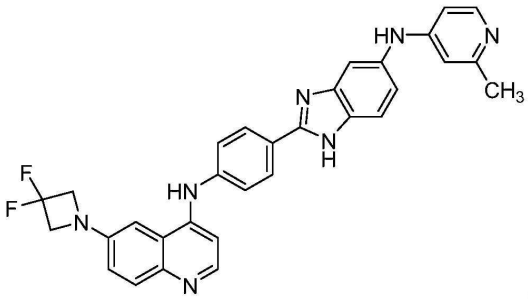

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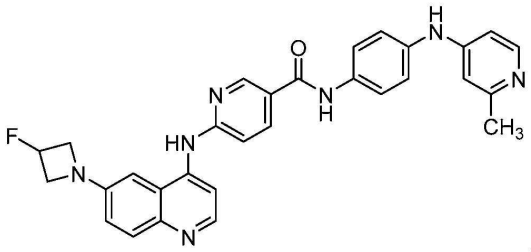
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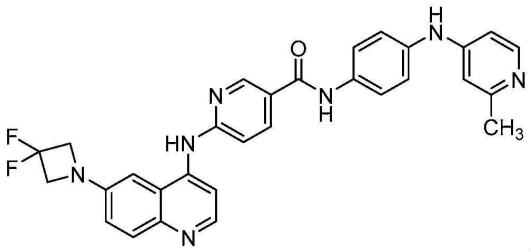
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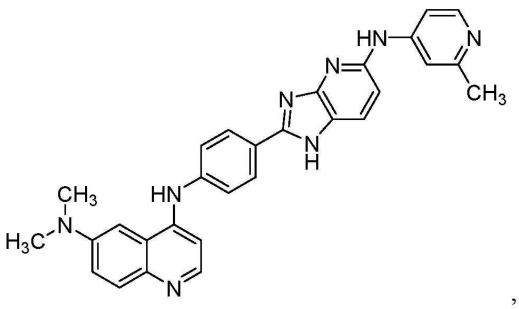
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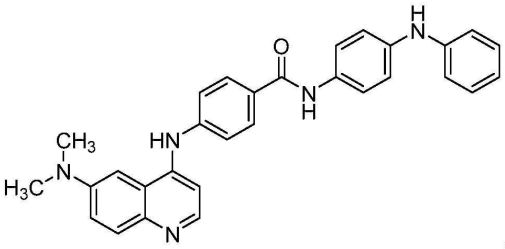


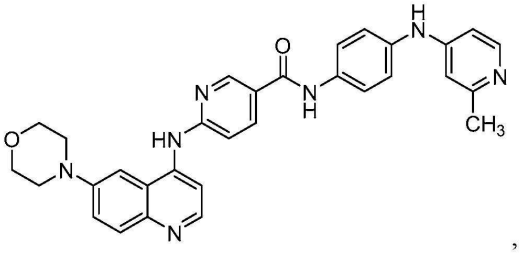
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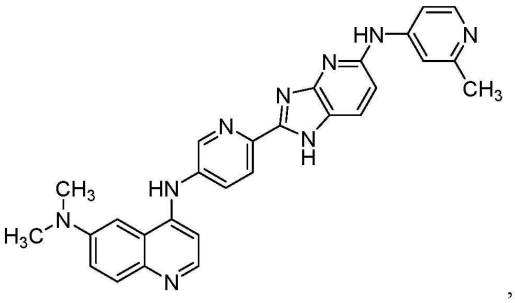


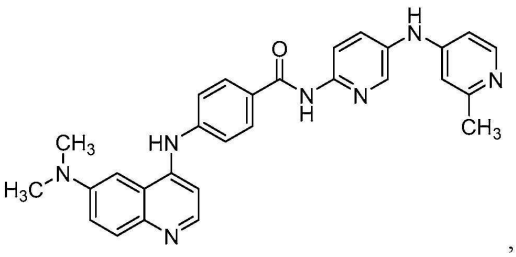
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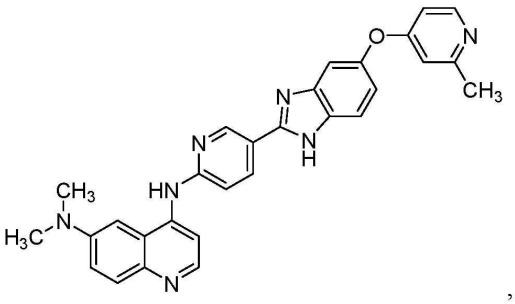
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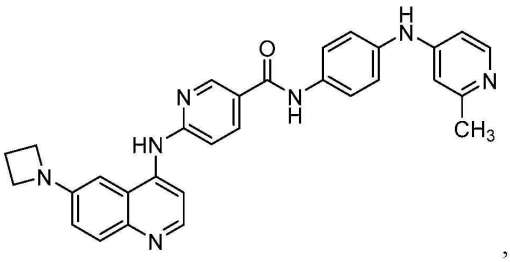

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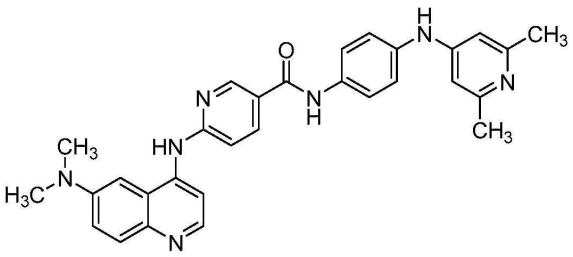

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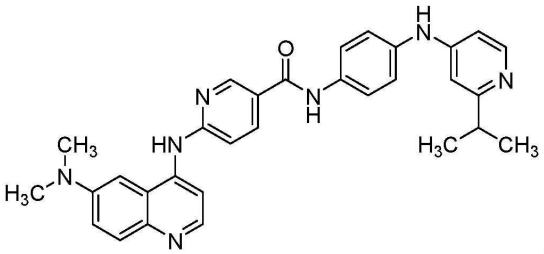
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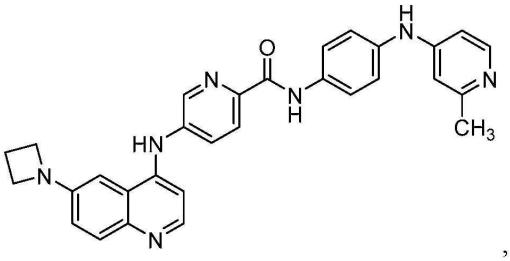
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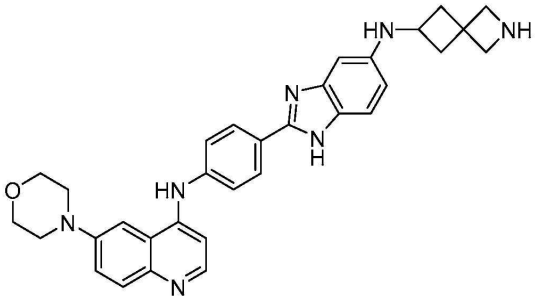
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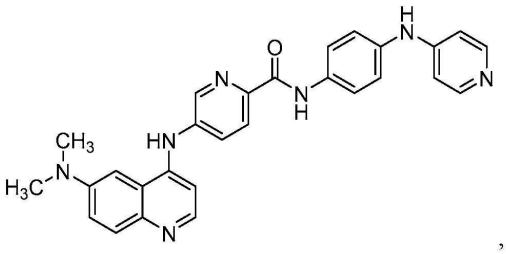
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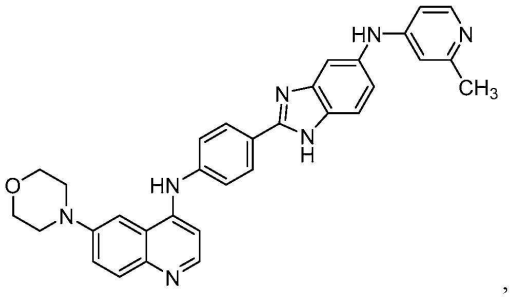


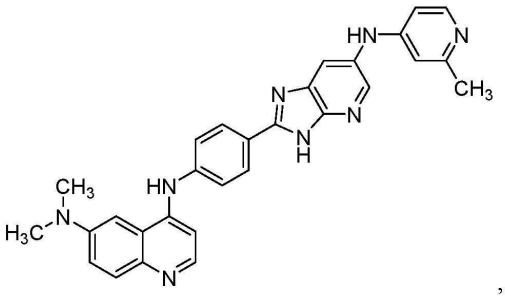
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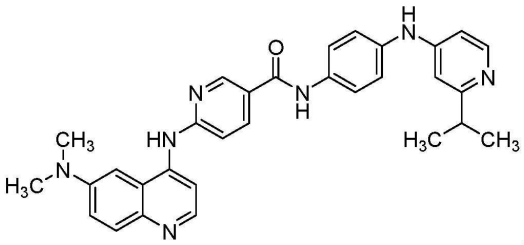


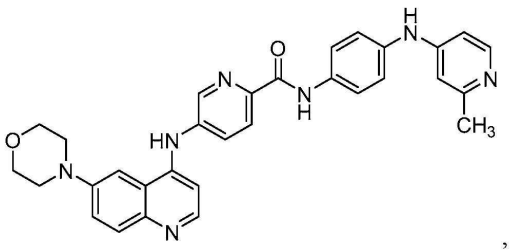
[0581] · 일부 실시양태에서, 화학식 Ia, Ib 또는 Ic의 화합물은 Akt3을 활성화시키고 하기 화합물들로 이루어진 군으로부터 선택된다:


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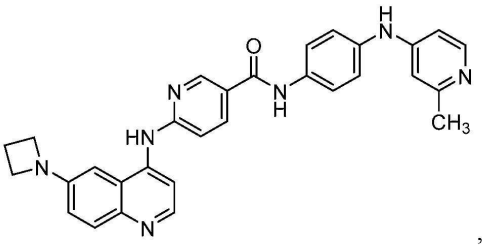

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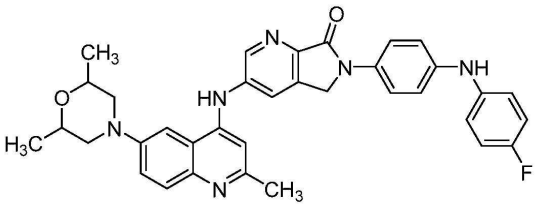

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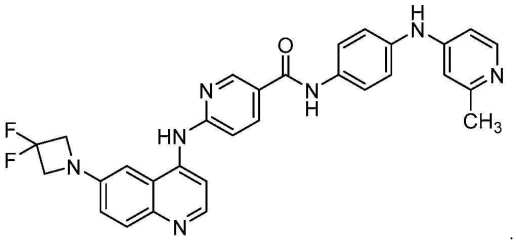
[0582]



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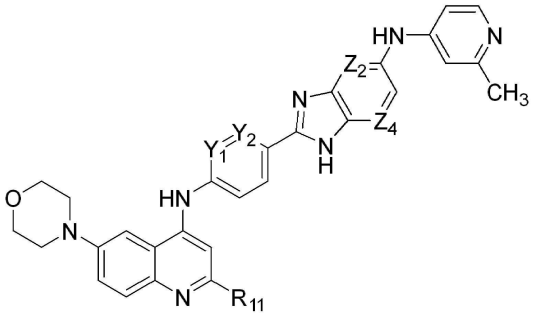


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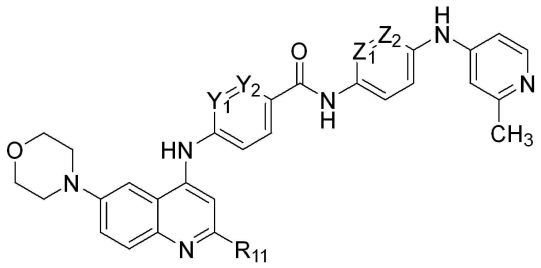


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[0583] 일부 실시양태에서, 화학식 Ia, Ib 또는 Ic의 화합물은

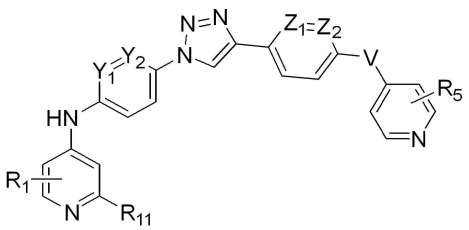


Akt3을 활성화시키고 , 및

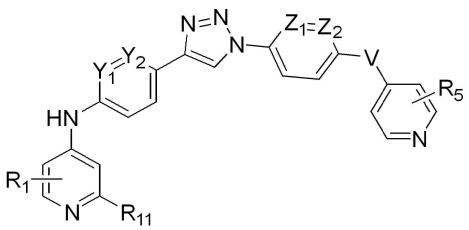


로 이루어진 군으로부터 선택되고, 여기서 R_{11}은 (C_1-C_6)알킬이고 Y_1, Y_2, Z_1, Z_2 및 Z_4는 각각 독립적으로 CH 또는 N이다. 일부 실시양태에서, R_{11}은 메틸이다. 일부 실시양태에서, 화학식 Ia, Ib 또는 Ic의 화합물은 Akt3을 활성화시키고 표 2에 제시된 화합물 2, 4 내지 7, 10, 11, 15, 18, 19, 24, 53, 55, 57, 62, 68 내지 70, 77 내지 79, 83, 84, 87, 88, 90 내지 92, 96, 97, 102, 110, 111, 120 내지 123, 125 내지 129, 135 및 138로 이루어진 군으로부터 선택된다.

[0584] 일부 실시양태에서, 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은

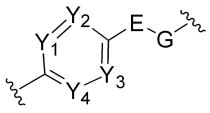
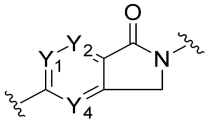
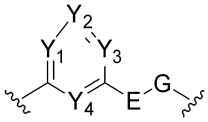
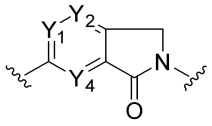
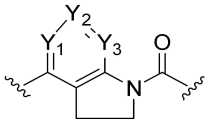
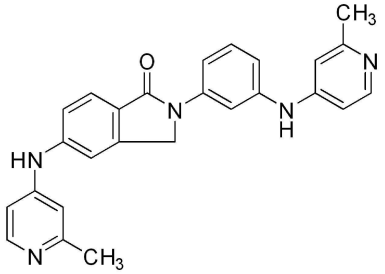


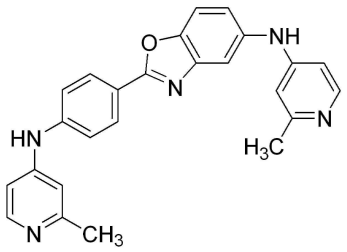
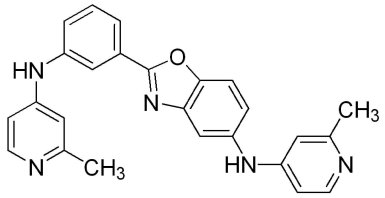
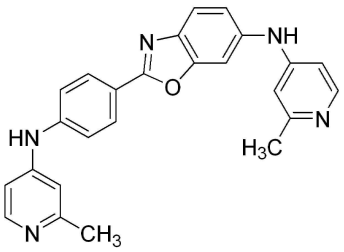
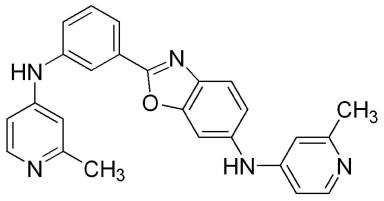
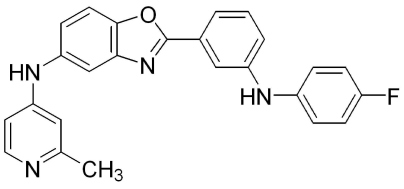
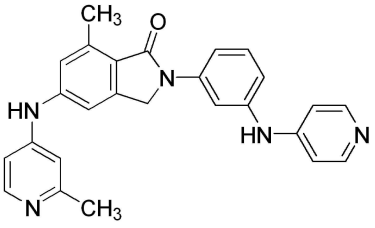
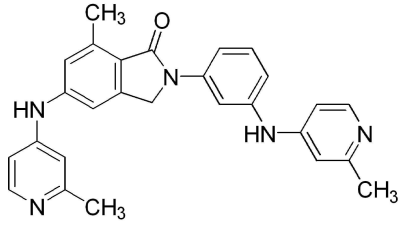
Akt3을 억제하고 또는



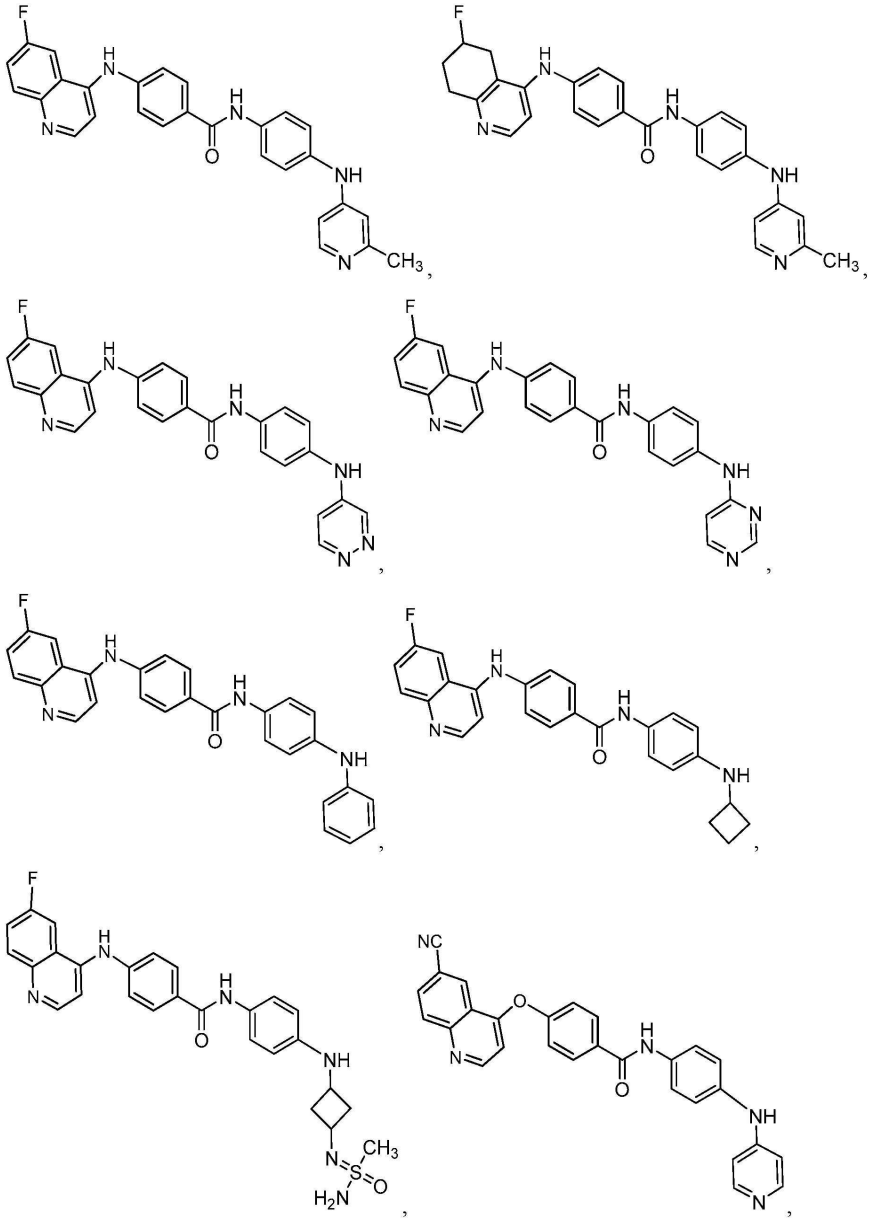
로 이루어진 군으로부터 선택되고, 여기서 R_1은 H, (C_1-C_6)알킬 또는 할로겐이고; R_5 및 R_{11}은 독립적으로 H 또는

(C_1-C_6)알킬이고; Y_1, Y_2, Z_1 및 Z_2는 각각 독립적으로 CH 또는 N이고; V는 NH 또는 O이다. 일부 실시양태에서, R_1은 H, 메틸, F 또는 Cl이다. 일부 실시양태에서, R_5 및 R_{11}은 독립적으로 H 또는 메틸이다. 일부 실시양태에서, 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 Akt3을 억제하고 표 1에 제시된 화합물 3 또는 137이다.

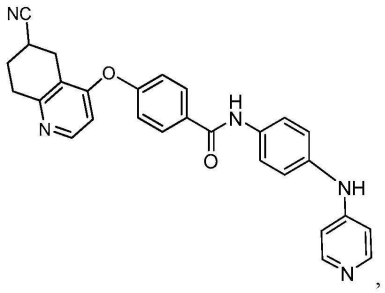
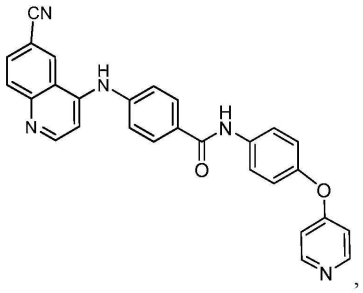
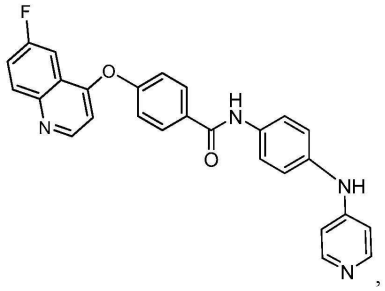
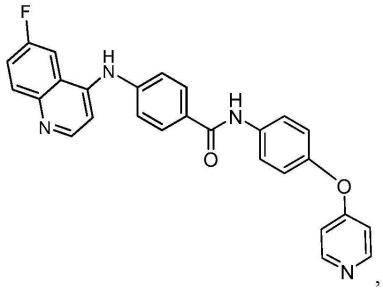
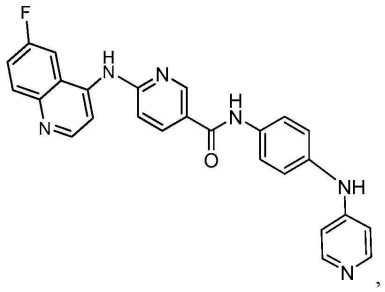
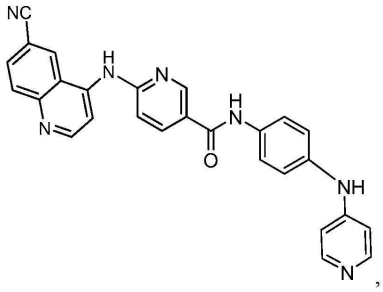
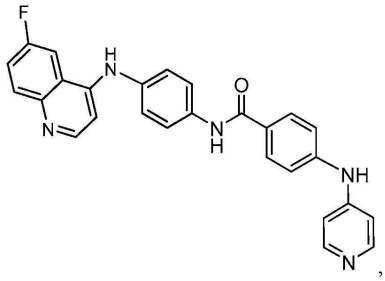
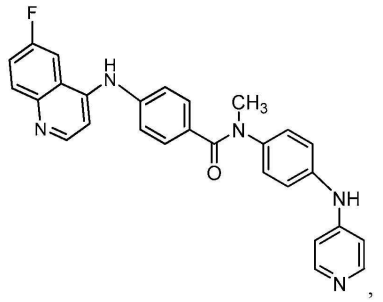
[0585] 일부 실시양태에서, 화학식 Ia 또는 IVa의 구조를 가진 본 발명의 화합물은 Akt3을 조절하고, 여기서 -E-G-는 -(C=O)NR_x-이고 R_x와 Y_3은 5원 헤테로사이클을 형성한다. 일부 실시양태에서, 화학식 IIa 또는 IIIa의 구조를 가진 본 발명의 화합물은 Akt3을 조절하며, 여기서 -E-G-는 -(C=O)NR_x-이고, R_x와 Y_3 또는 R_x와 Y_4는 5원 헤테로사이클을 형성한다. 일부 실시양태에서, 화학식 Ia 또는 IVa의 구조를 가진 본 발명의 화합물은 Akt3을 조절하며, 여기서 구조 모이어티  는  의 구조를 가진다. 일부 실시양태에서, 화학식 IIa 또는 IIIa의 구조를 가진 본 발명의 화합물은 Akt3을 조절하며, 여기서 구조 모이어티  는  또는  의 구조를 가진다. 일부 실시양태에서,  의 구조를 가진 본 발명의 화합물은 Akt3을 조절한다.

[0586] 일부 실시양태에서, 화학식 Ia, Ib, IIa, IIb, IIc, IIIa 또는 IVa의 화합물은 Akt3을 억제하고 , , , , , , 및  로 이루어진 군으로부터 선택된다.

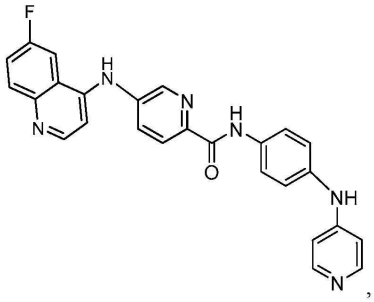
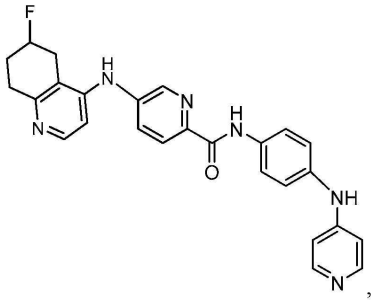
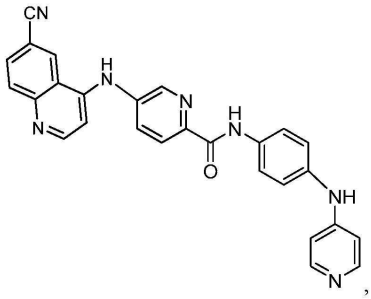
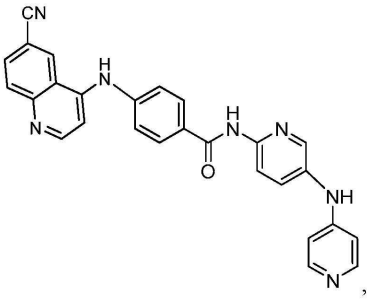
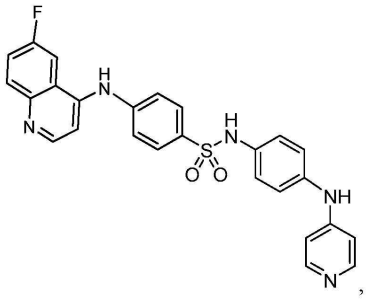
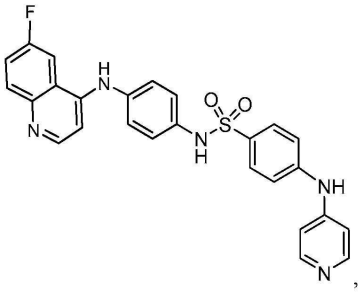
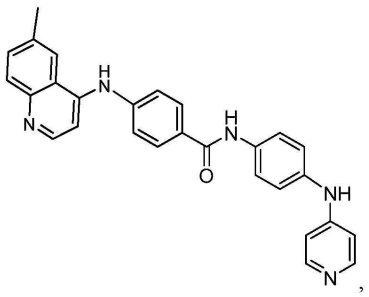
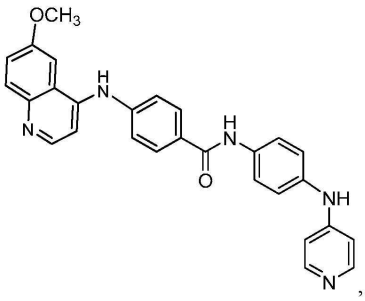
[0587] 일부 실시양태에서, 화학식 Ia의 화합물은 하기 화합물이다:



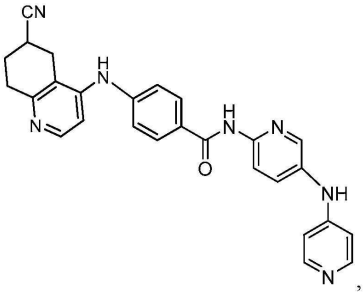
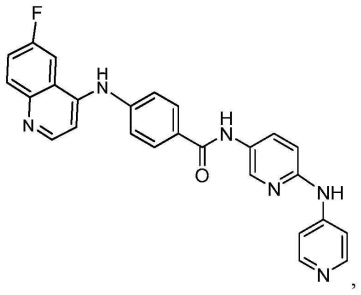
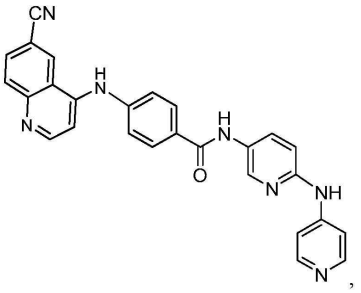
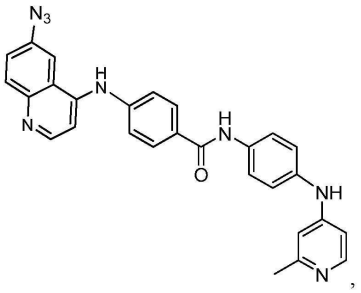
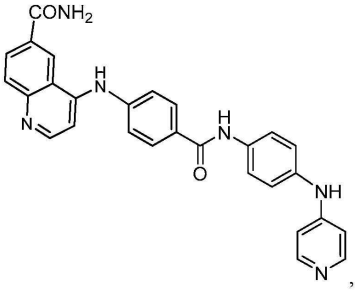
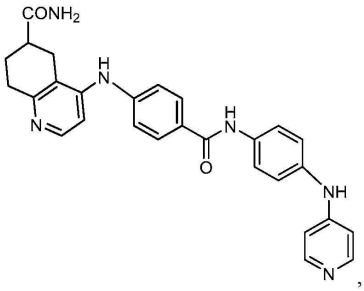
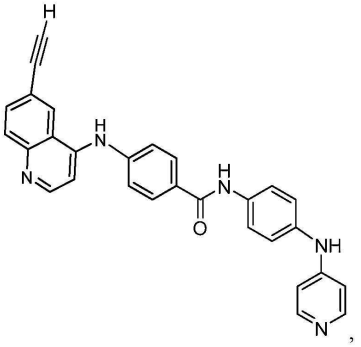
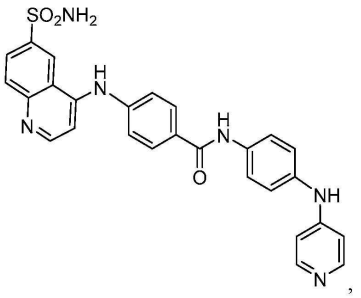
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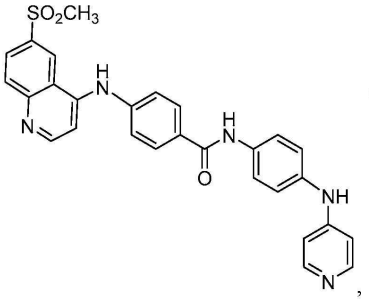
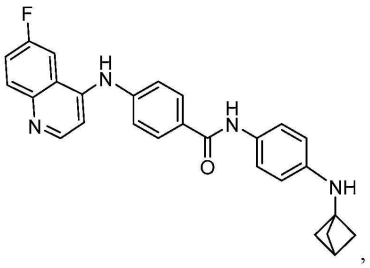
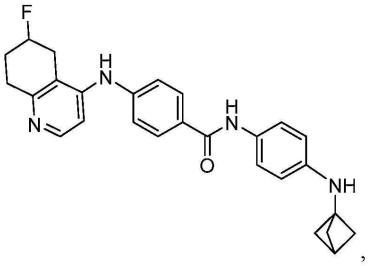
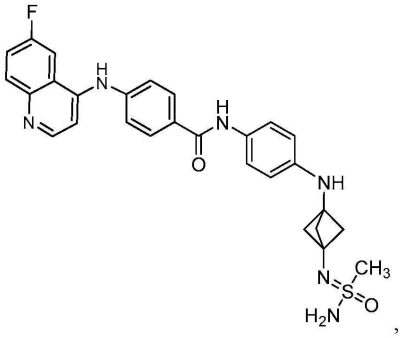
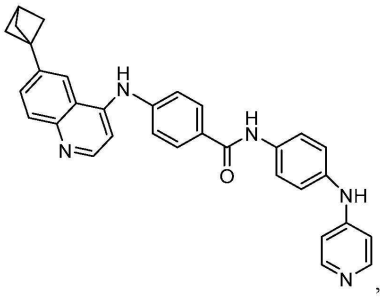
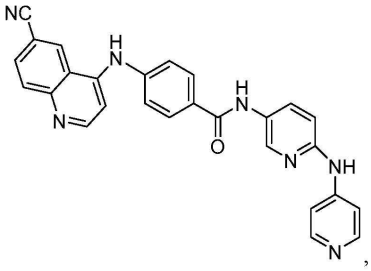
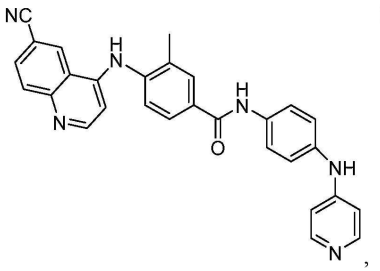
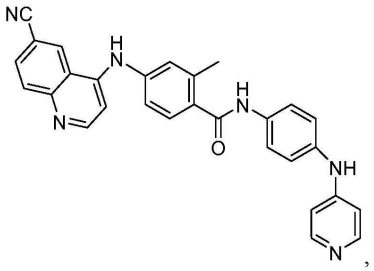
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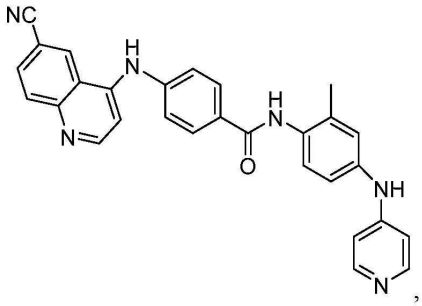
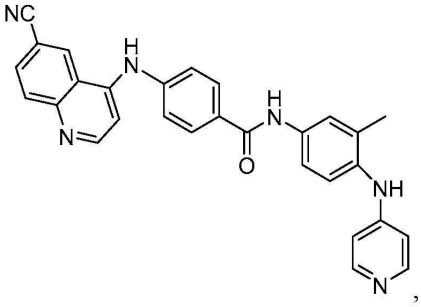
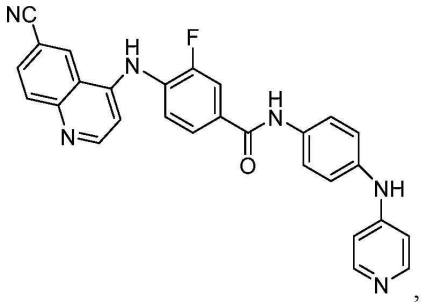
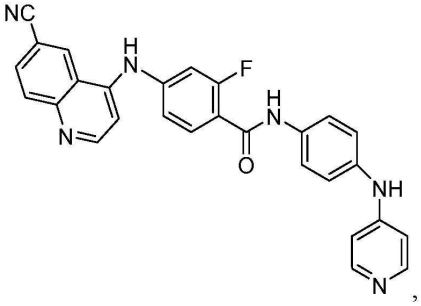
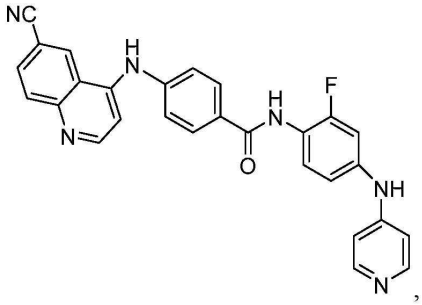
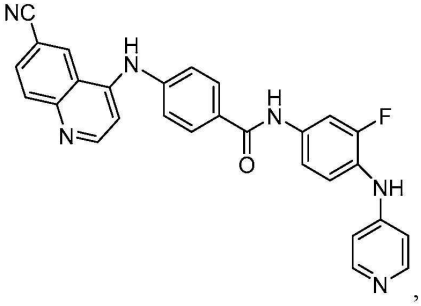
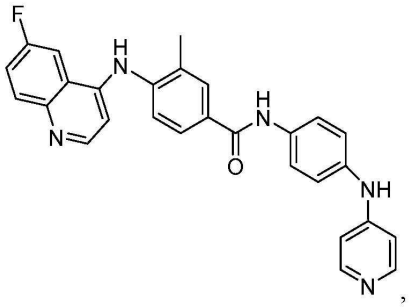
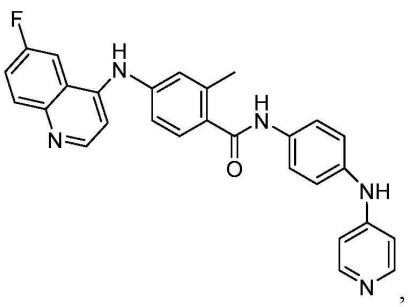
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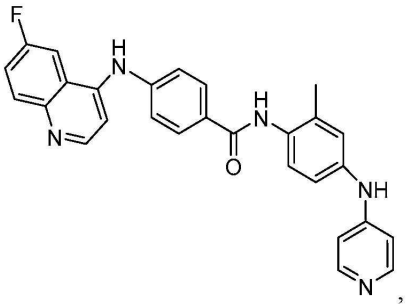
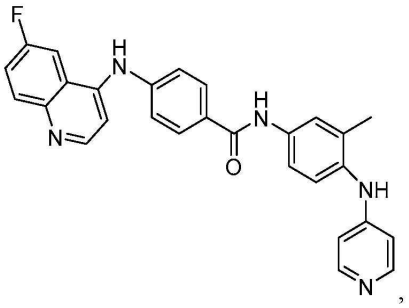
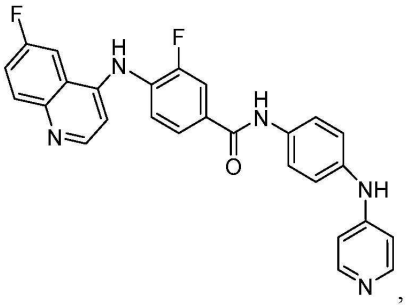
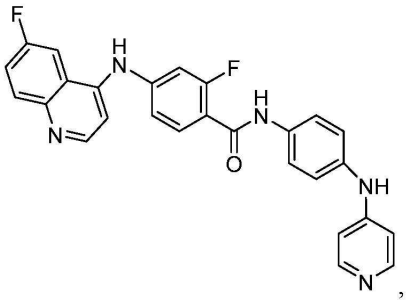
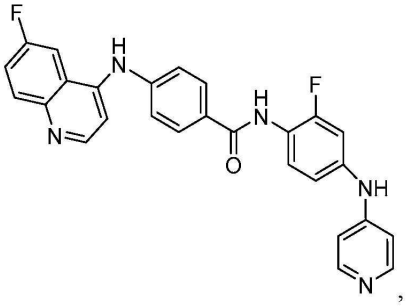
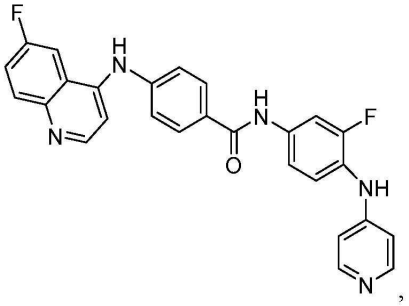
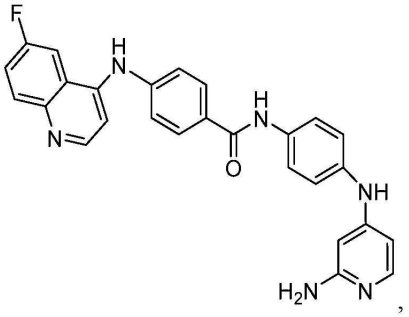
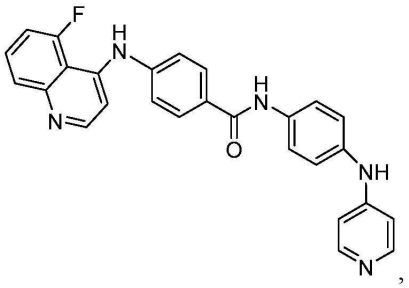
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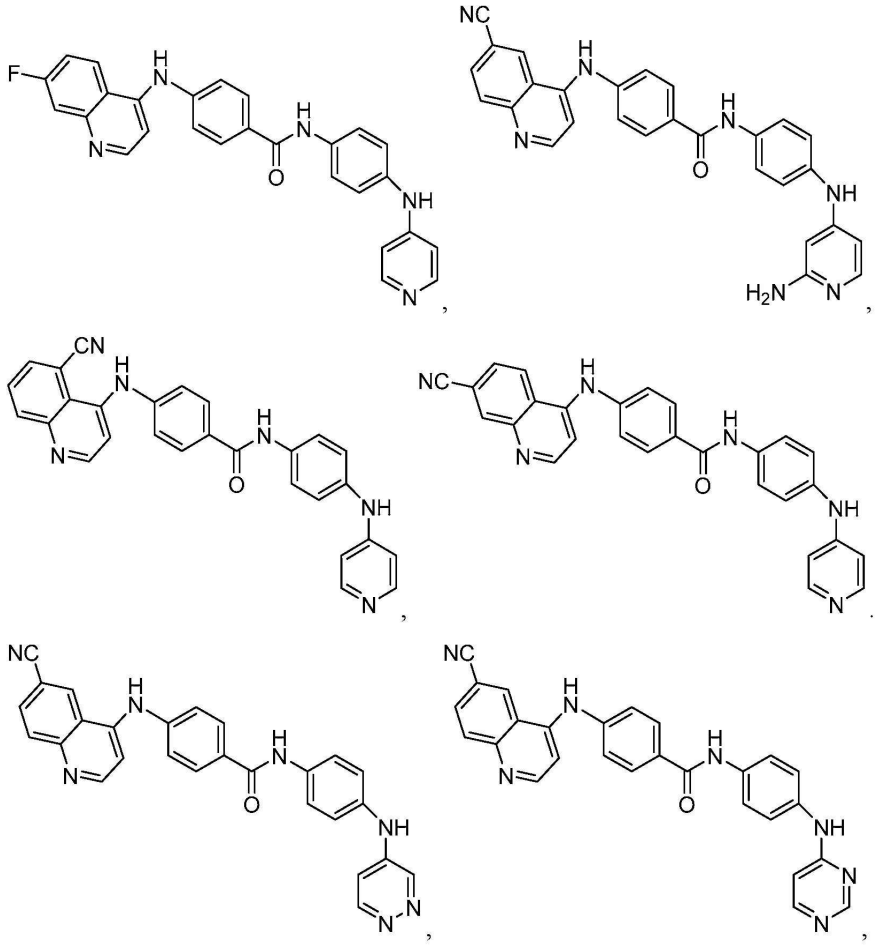
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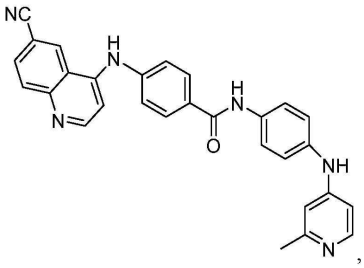
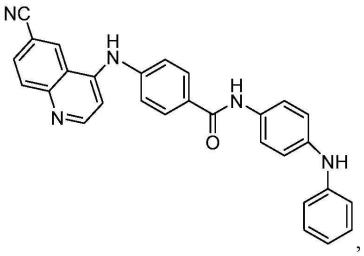
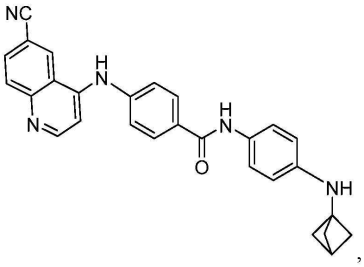
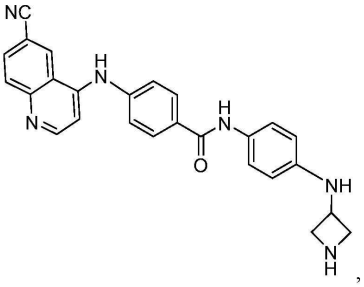
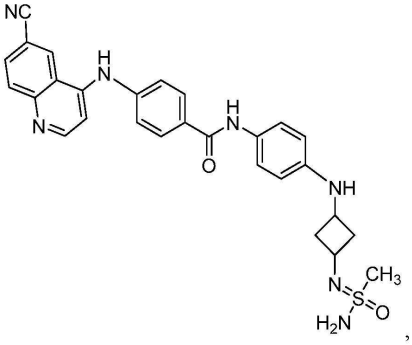
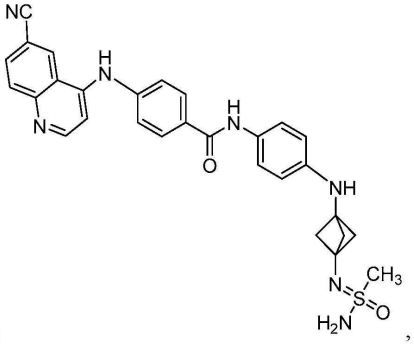
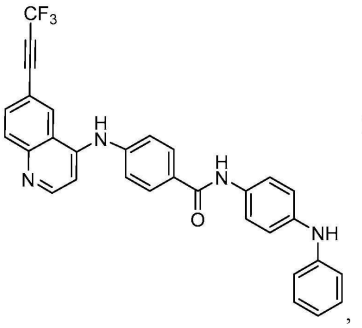
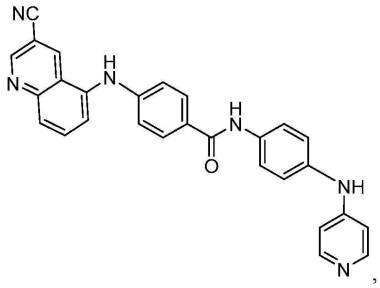

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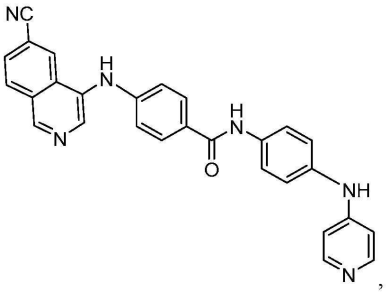
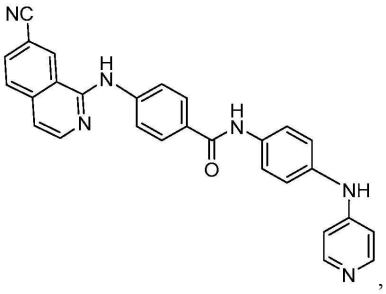
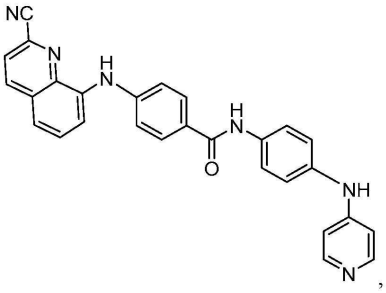
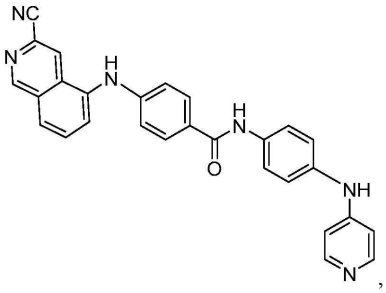
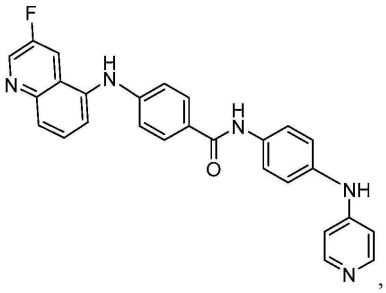
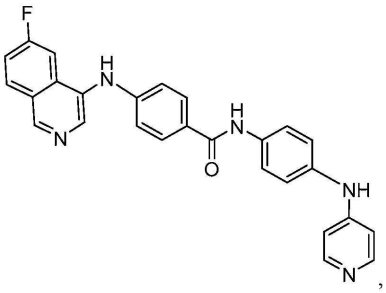
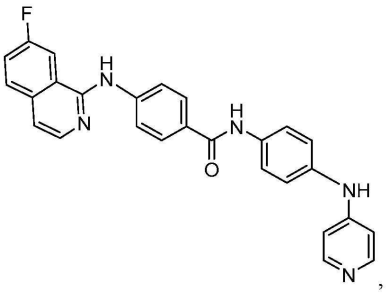
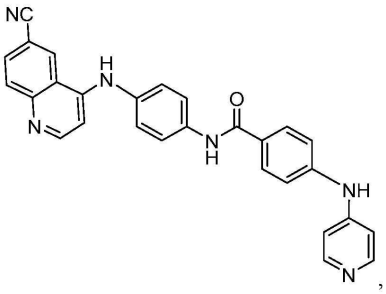

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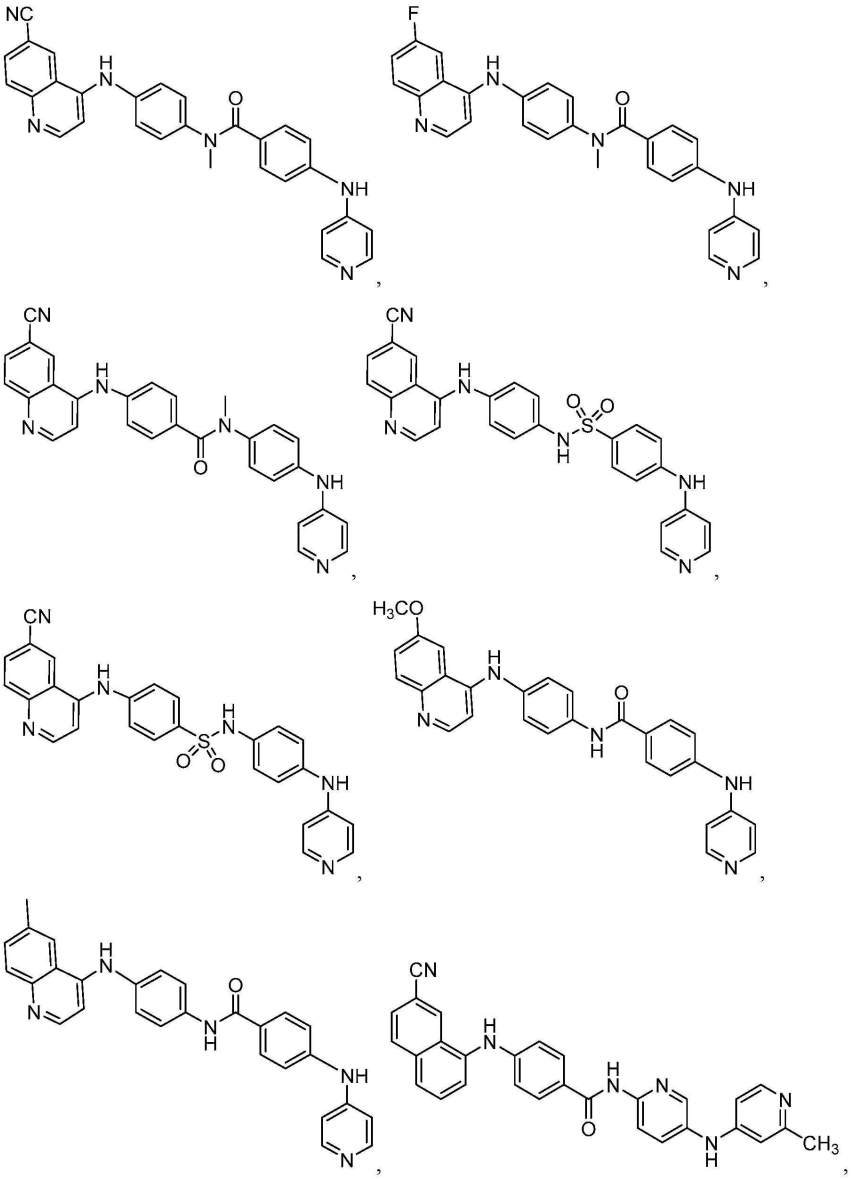
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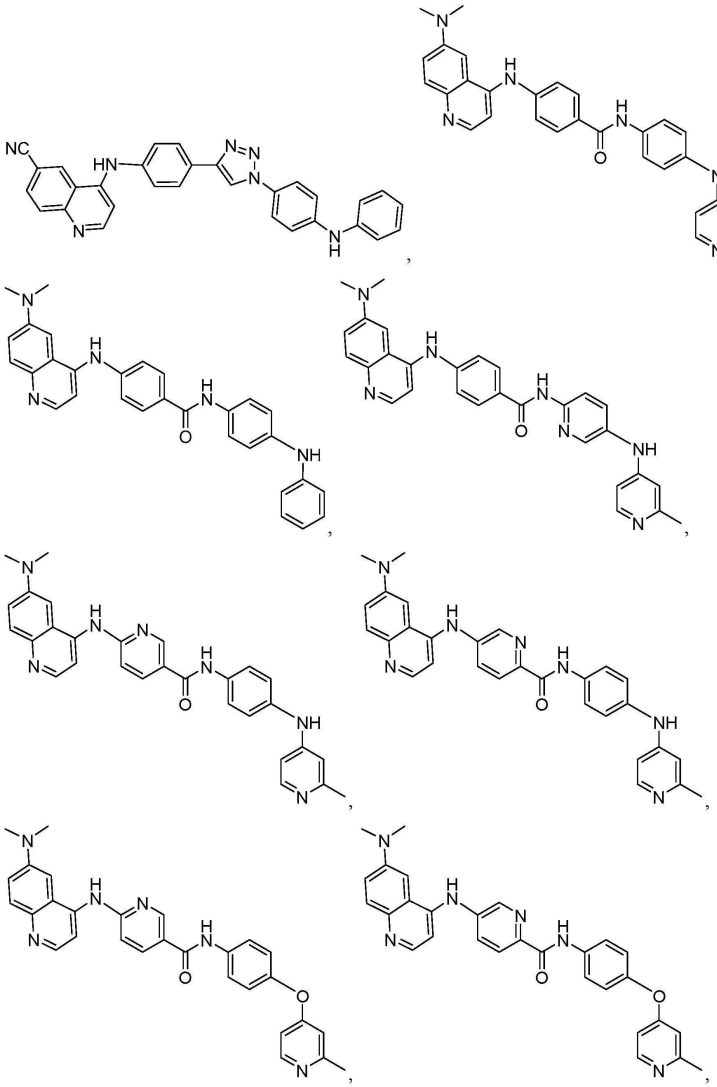

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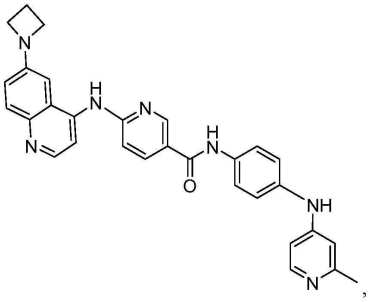
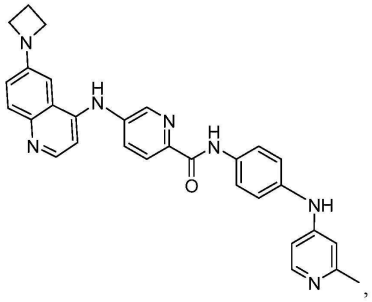
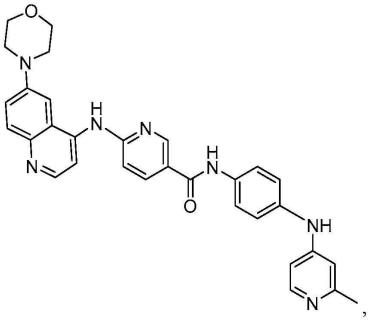
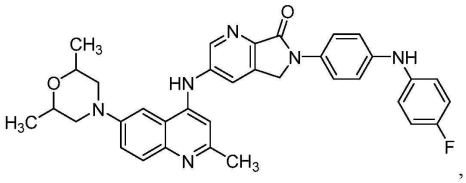
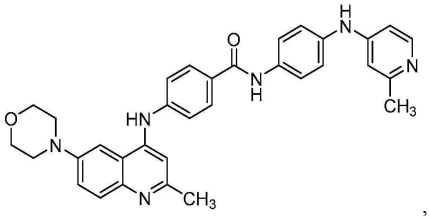
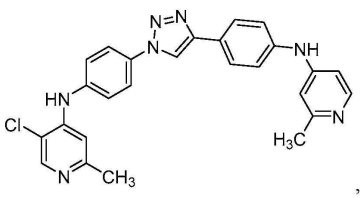
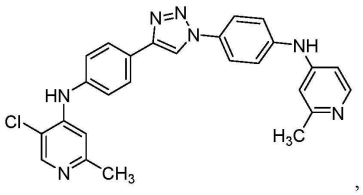
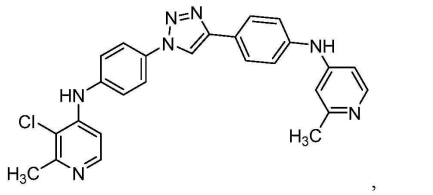
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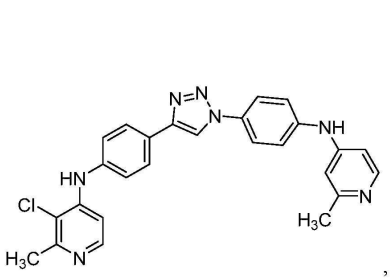
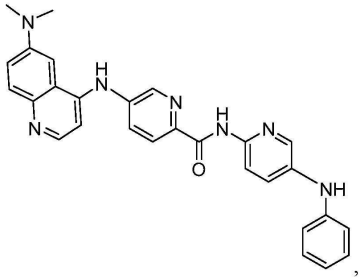
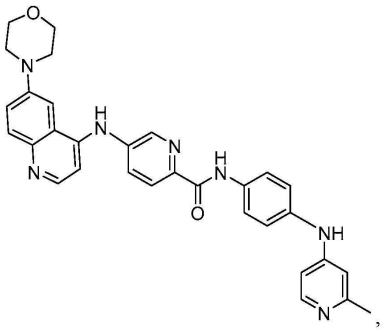
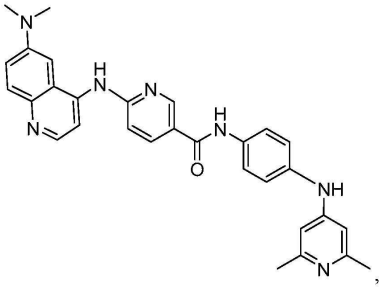
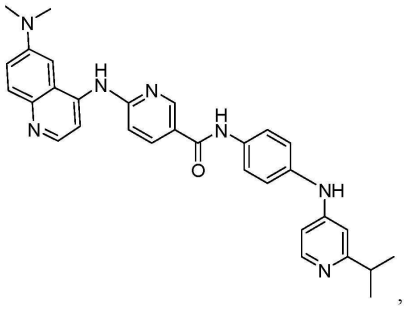
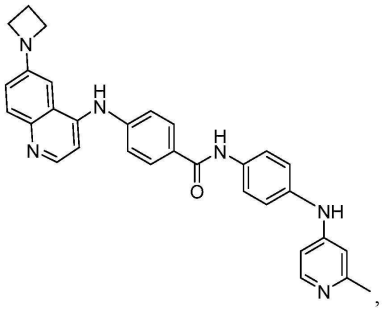
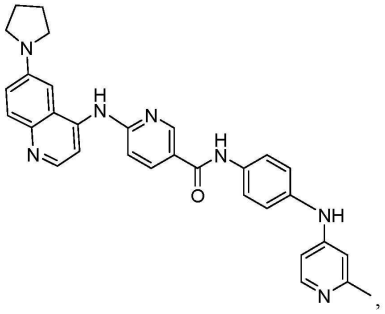
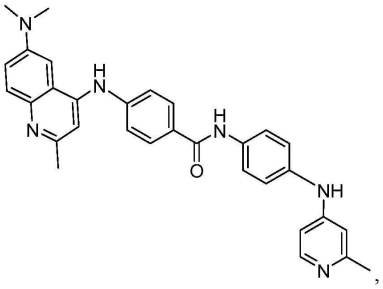
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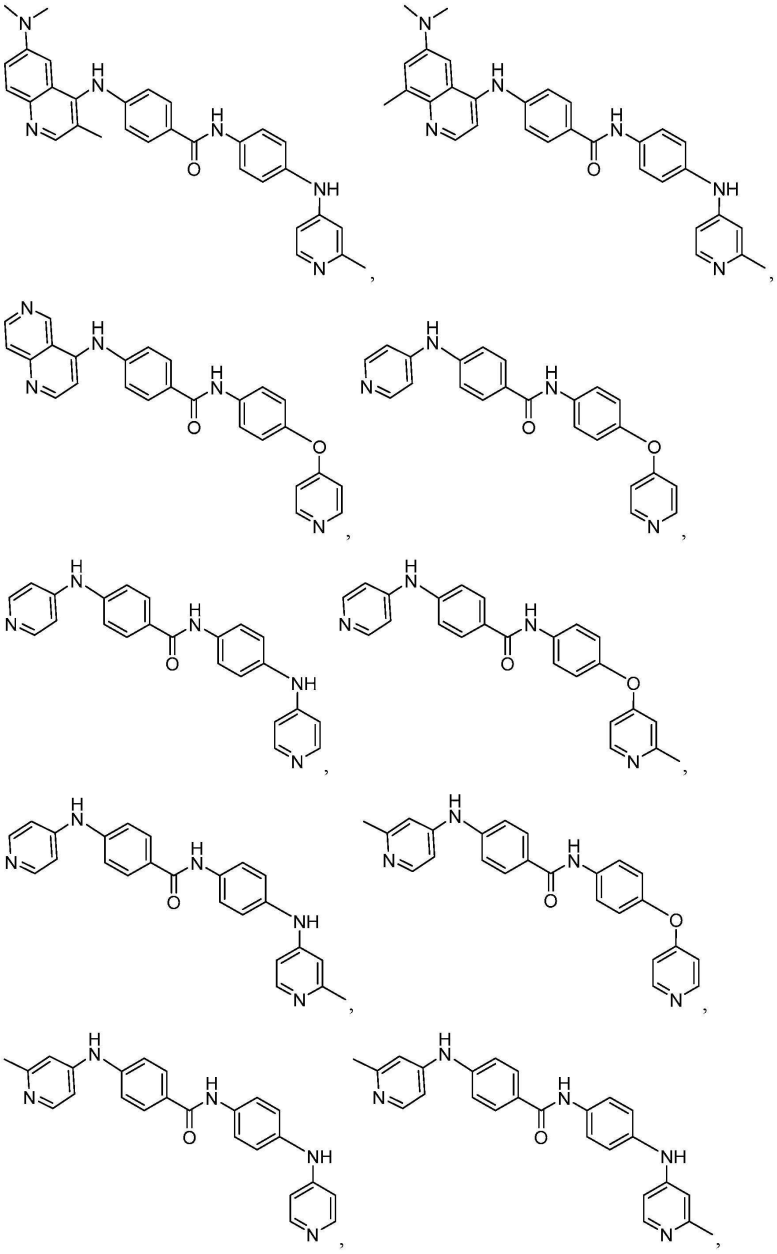
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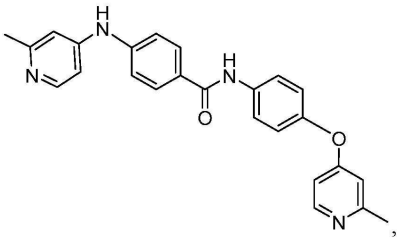
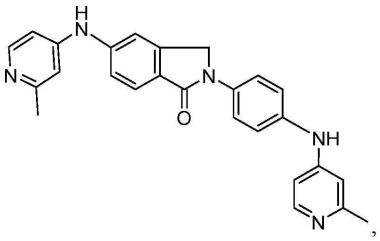
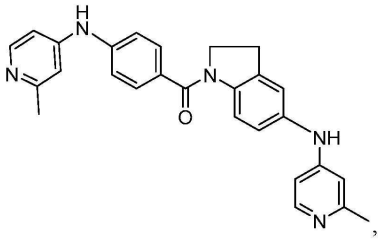
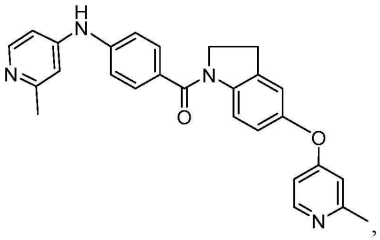
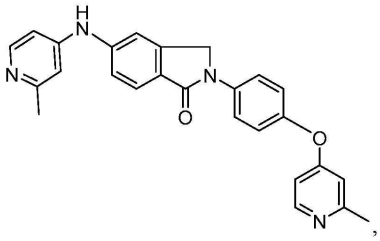
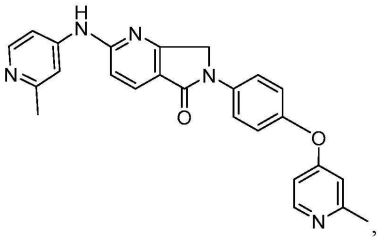
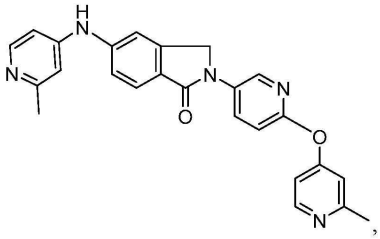
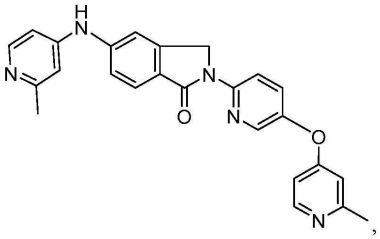
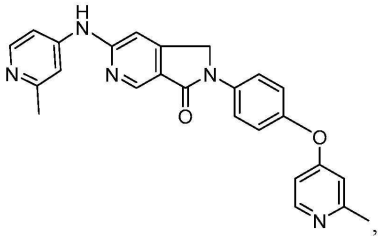
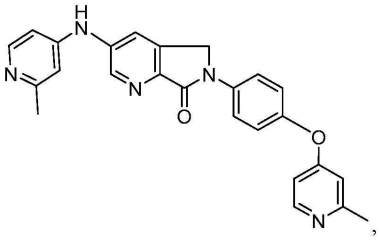

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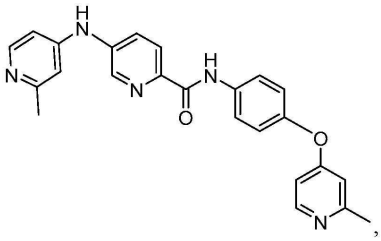
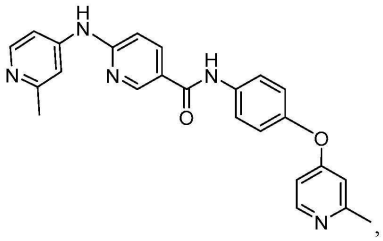
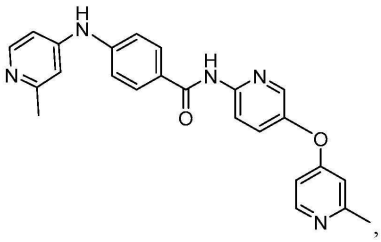
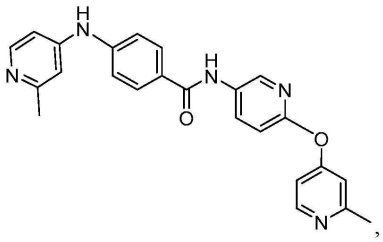
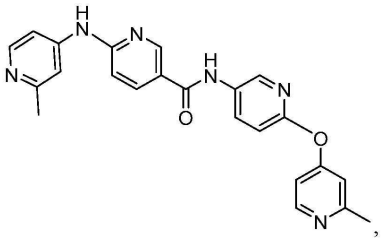
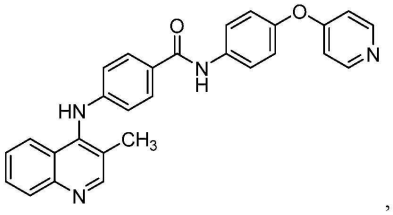
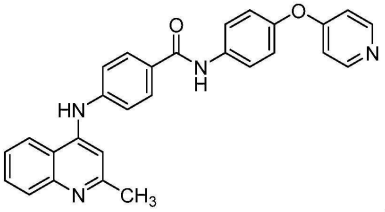
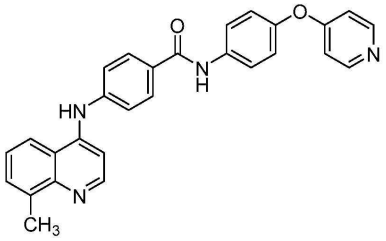
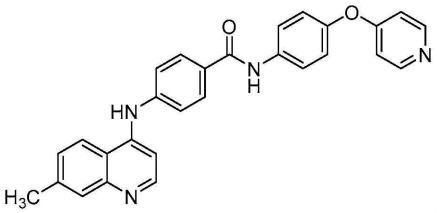
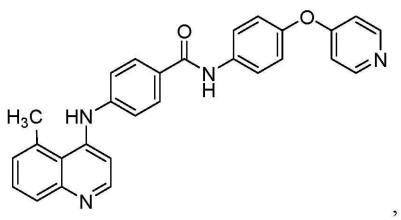
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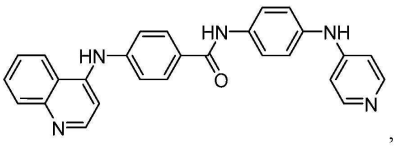
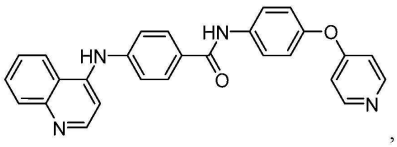
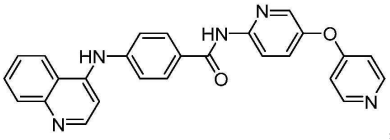
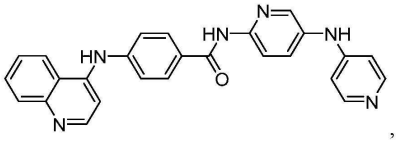
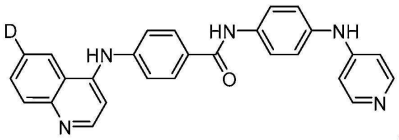
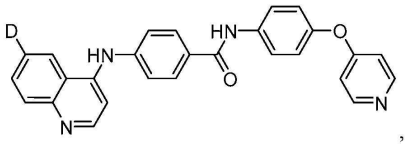
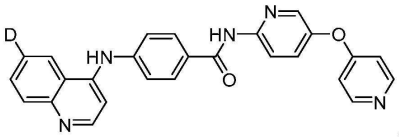
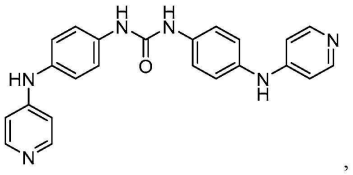
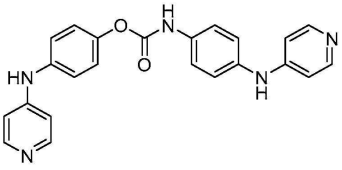
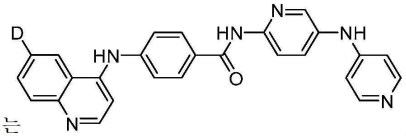


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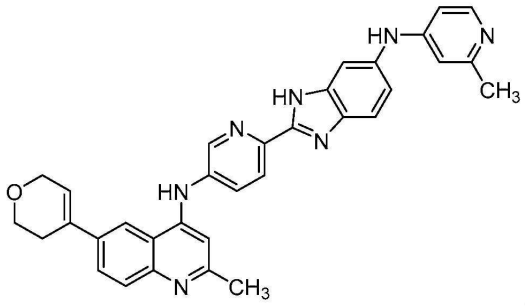
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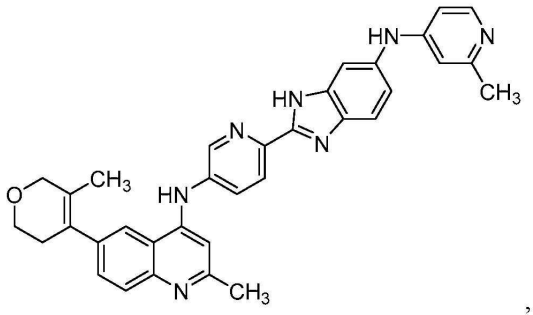

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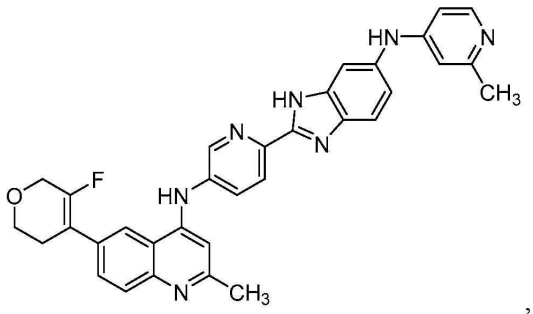
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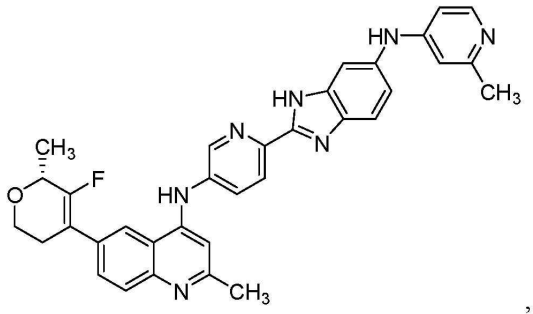
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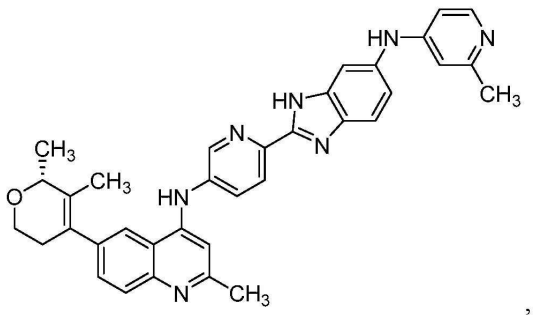

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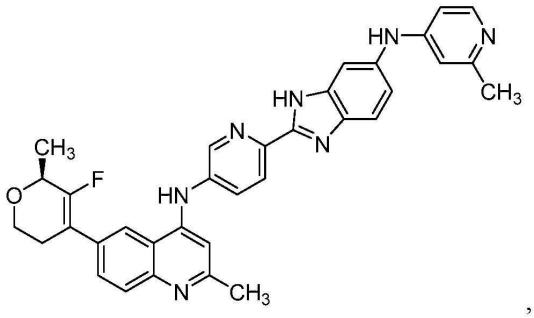

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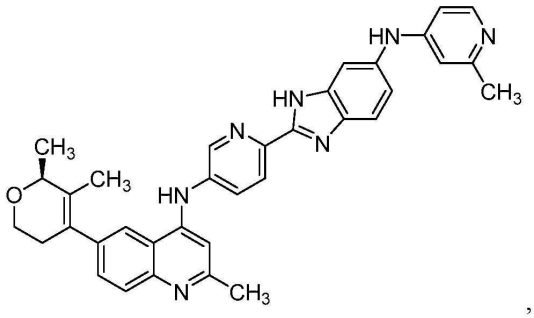

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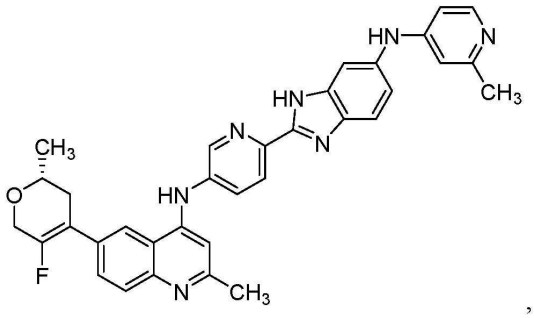

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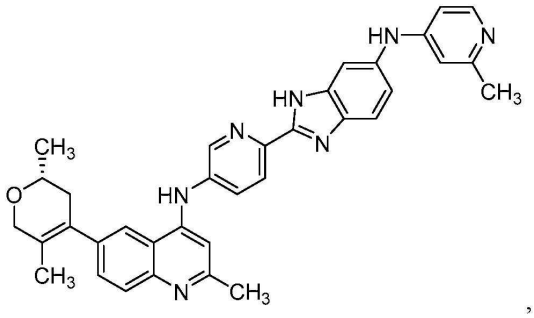

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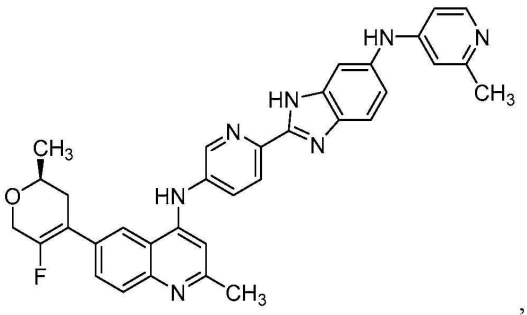

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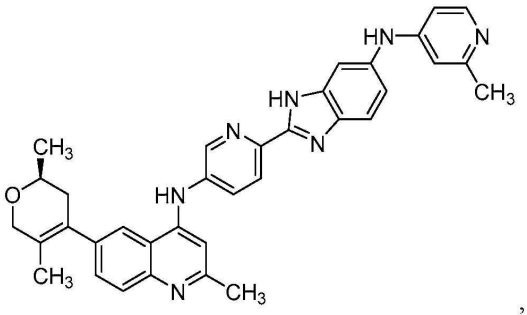

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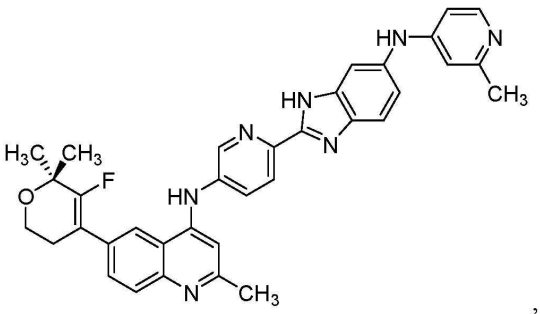

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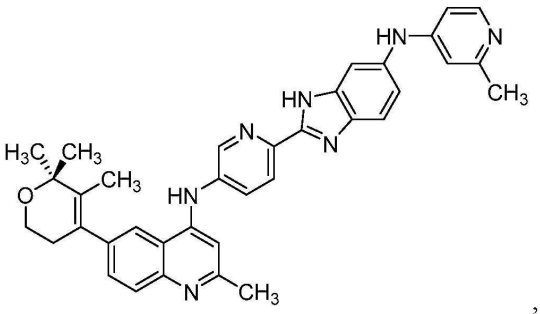

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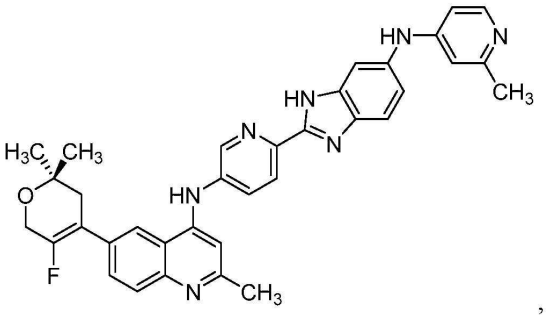

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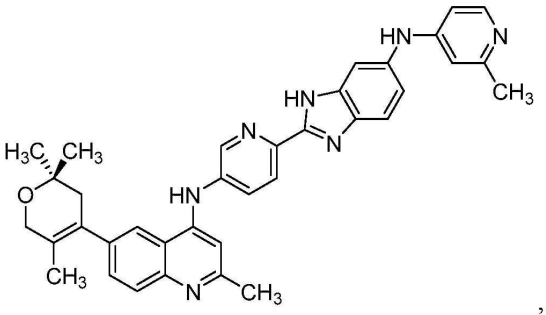

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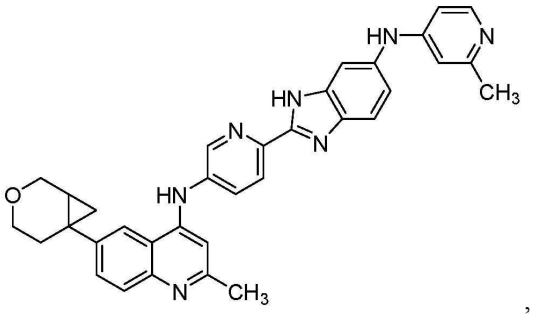

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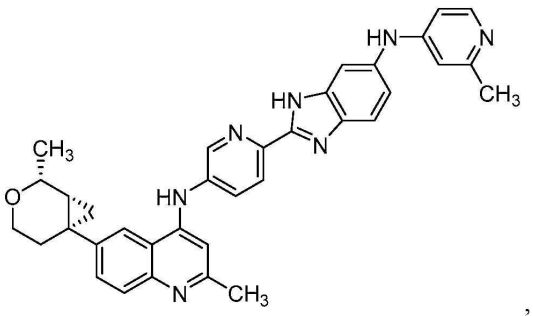

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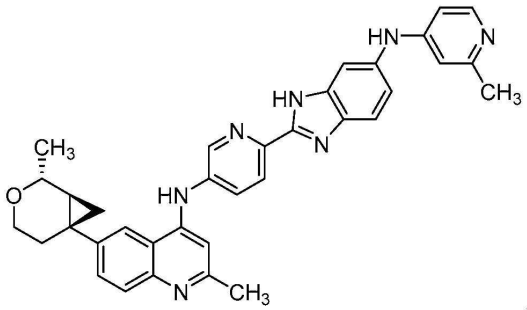

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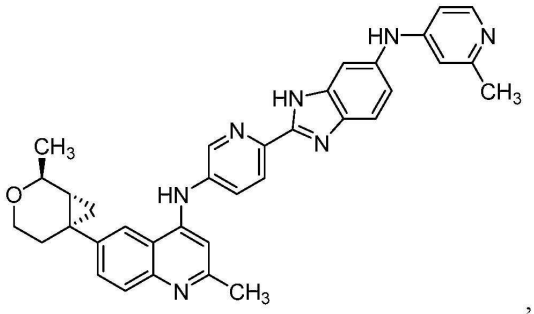

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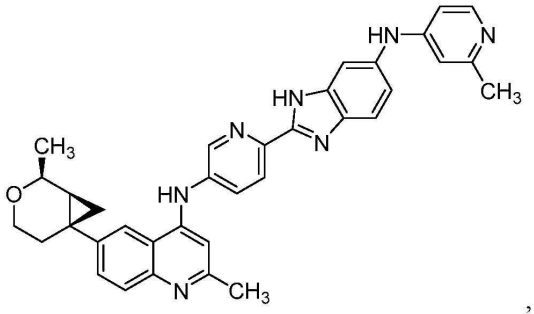

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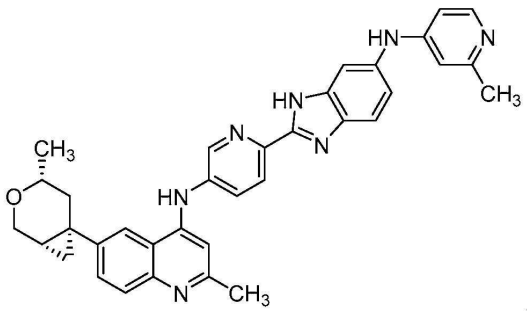

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[0611]

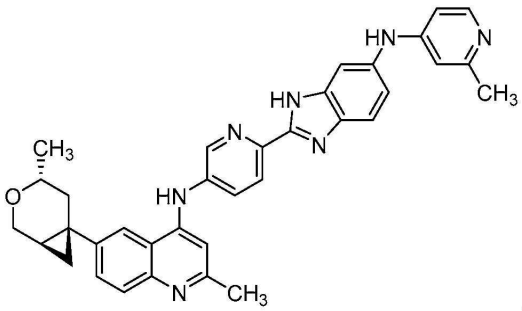

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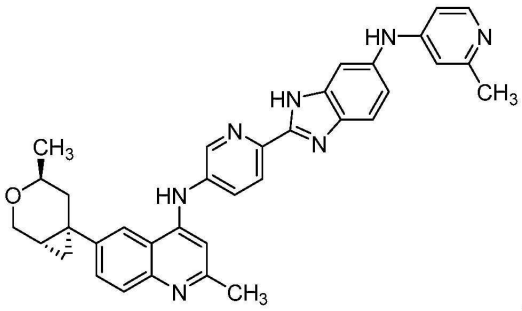

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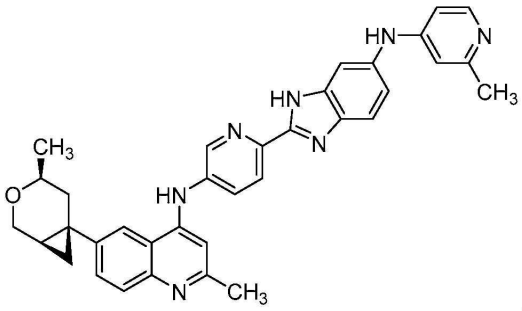

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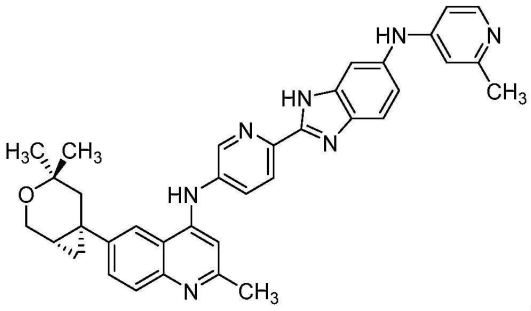

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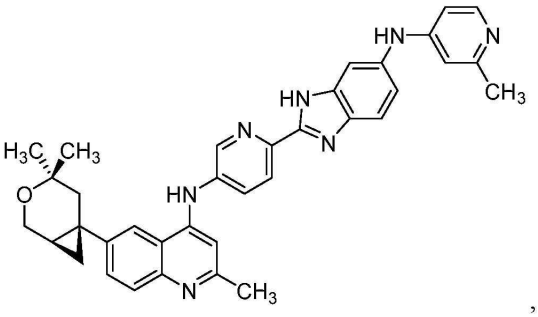

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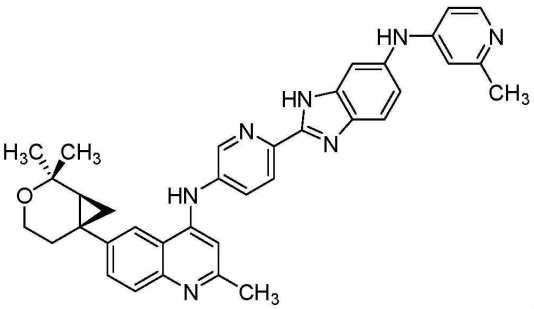

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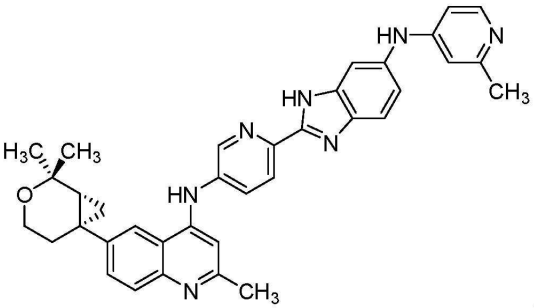

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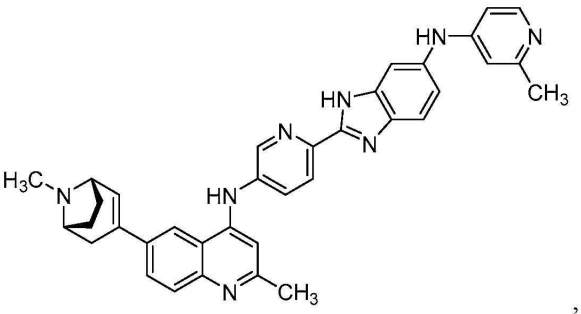

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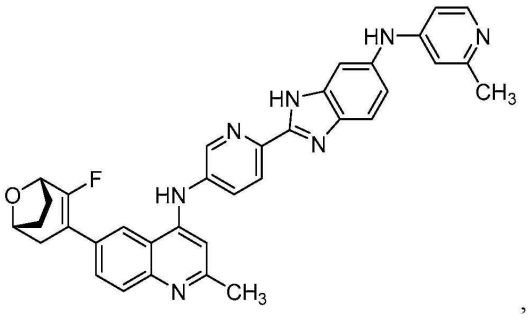

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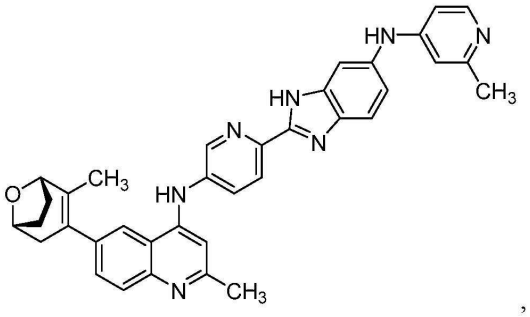

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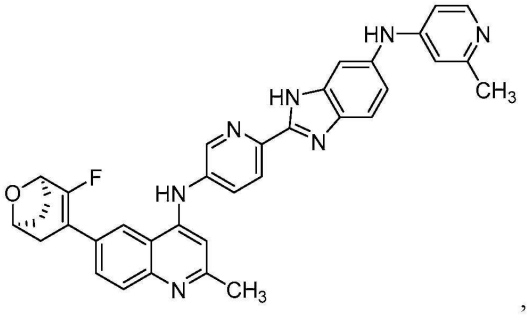

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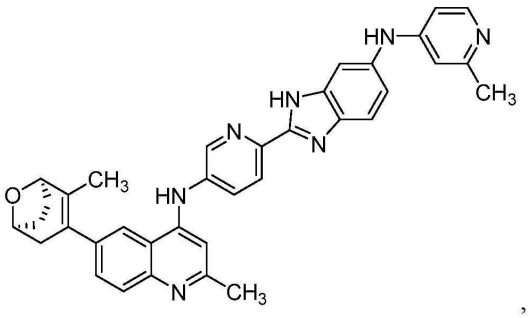

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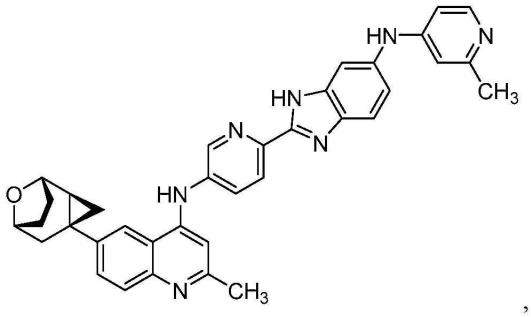

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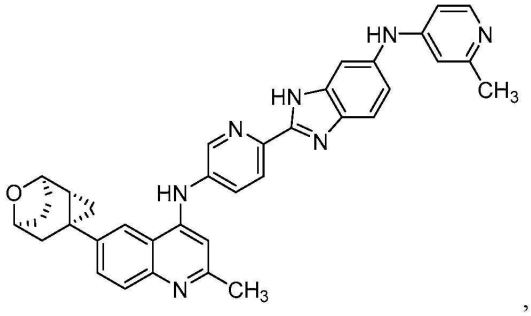

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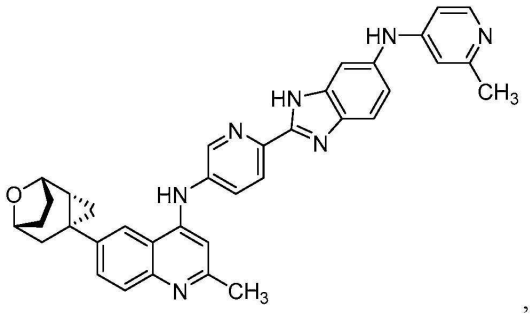

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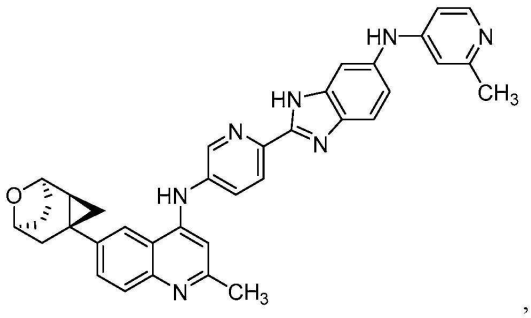

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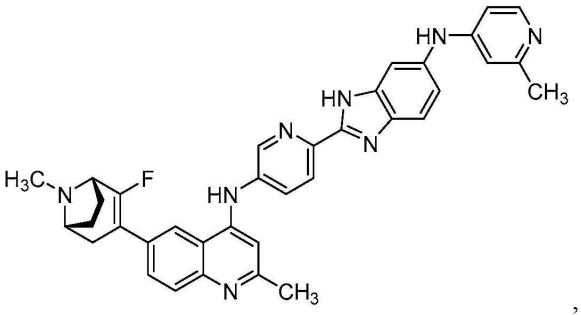
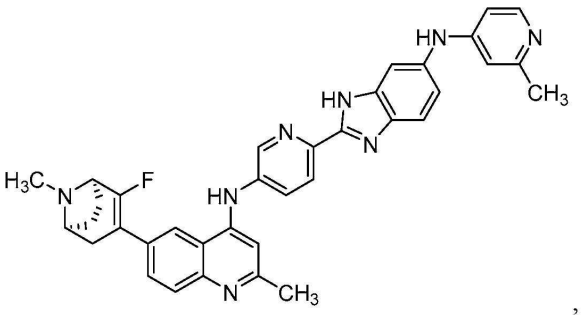
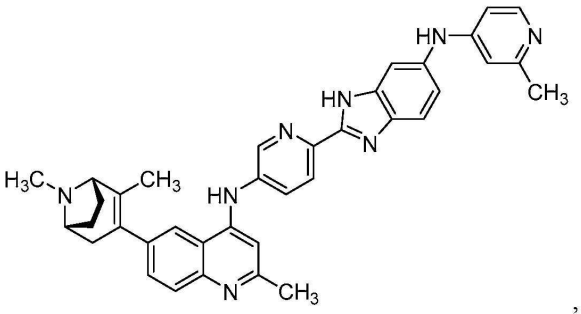

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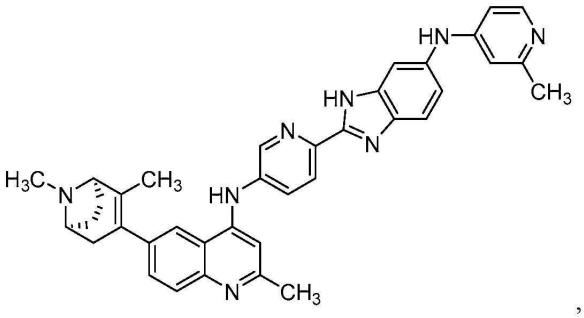

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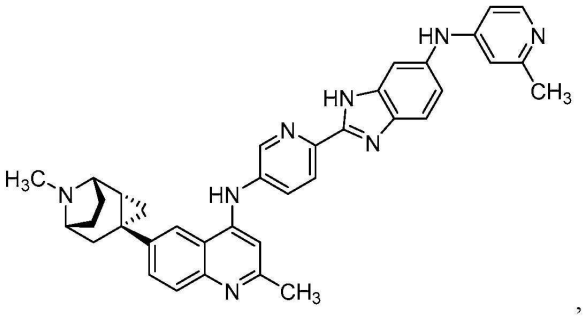

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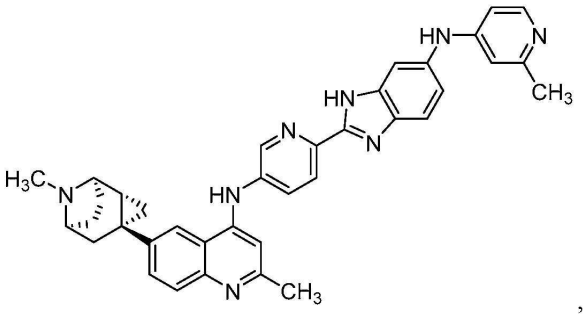

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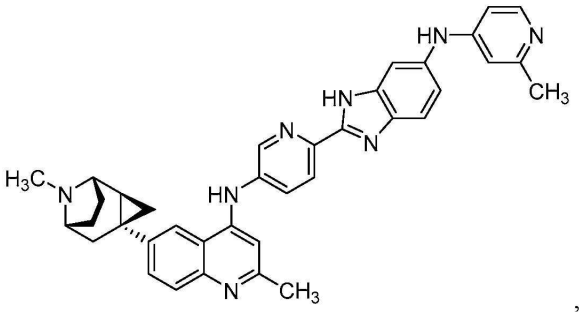
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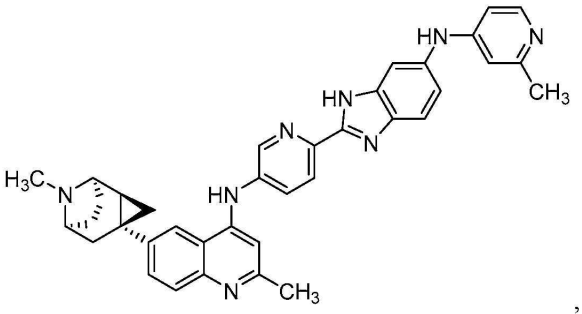

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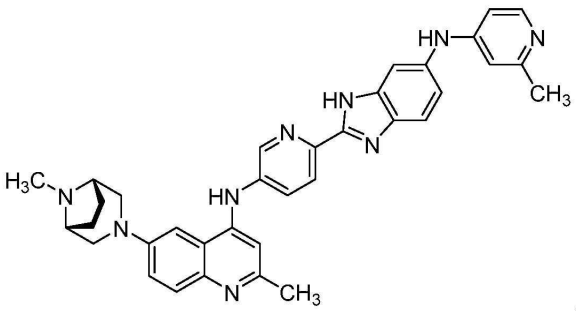

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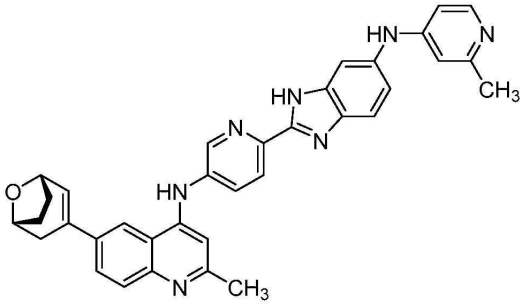
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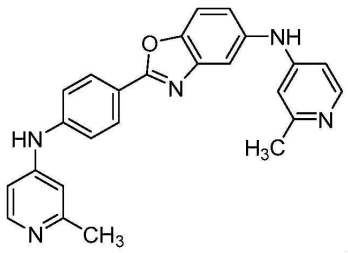

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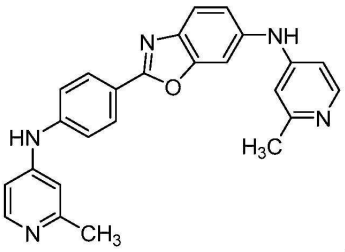

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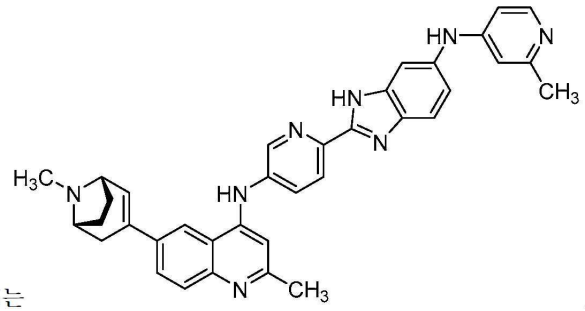

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[0619]

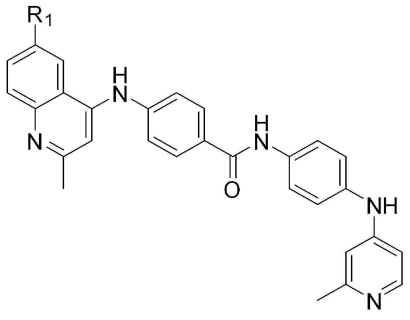

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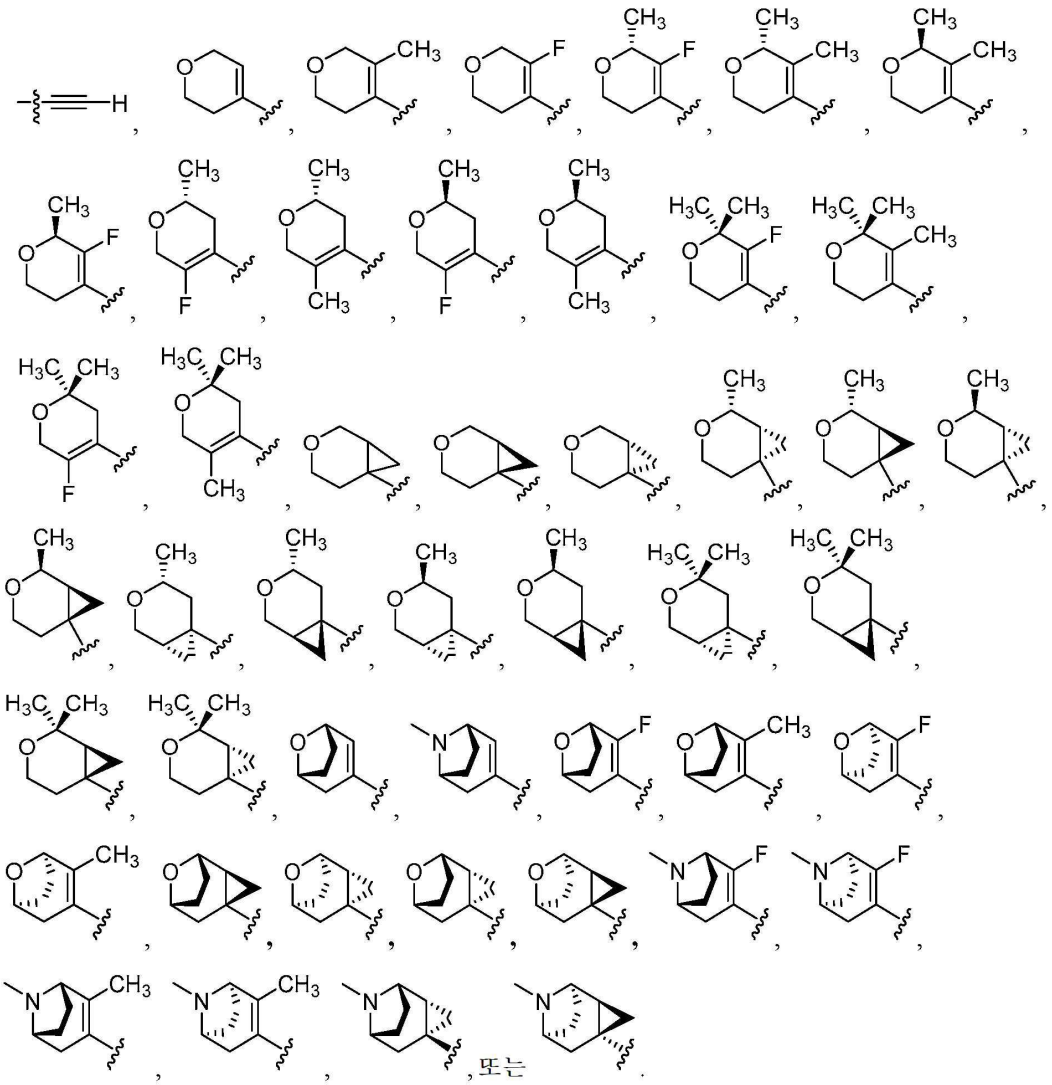

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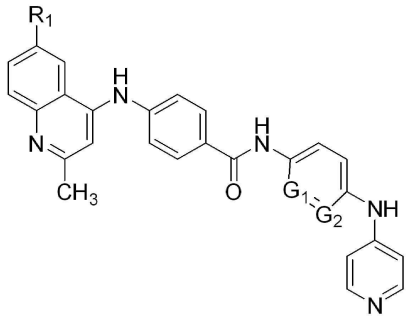
[0620]



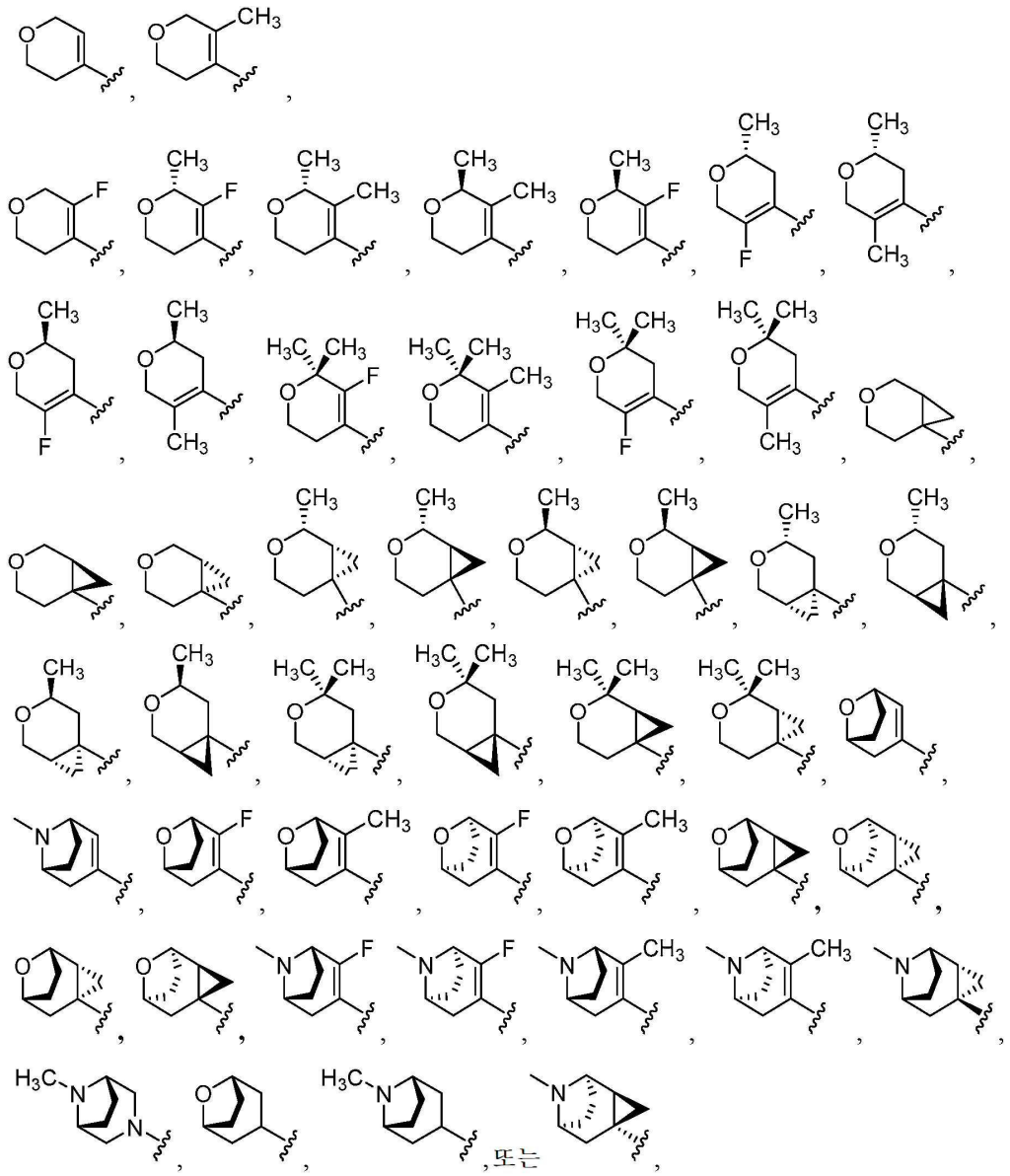
[0621] 일부 실시양태에서, 화학식 Ia의 화합물은 이고, 여기서 R_1은 $-CONH_2$, $-SO_2NH_2$, $-SO_2CH_3$, 또는 하기 화학식의 기이다:



[0622]



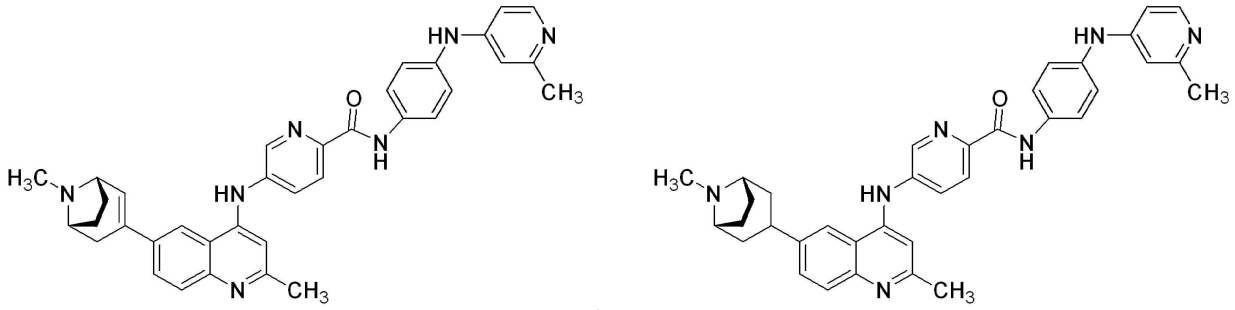
[0623] 일부 실시양태에서, 화학식 Ia의 화합물은 이고, 여기서 R_1은 -CN, -F, 또는 하기 화학식의 기이고:

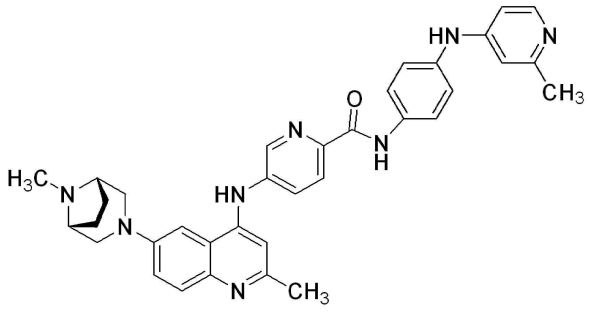


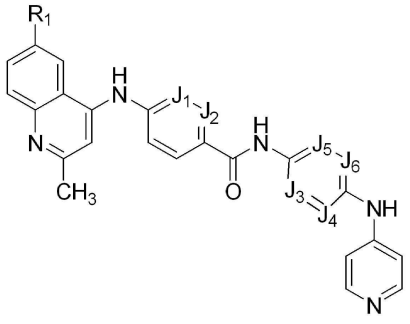
[0624]

[0625] G_1 및 G_2는 -N- 및 -CH-, 또는 -CH- 및 -N-이다.

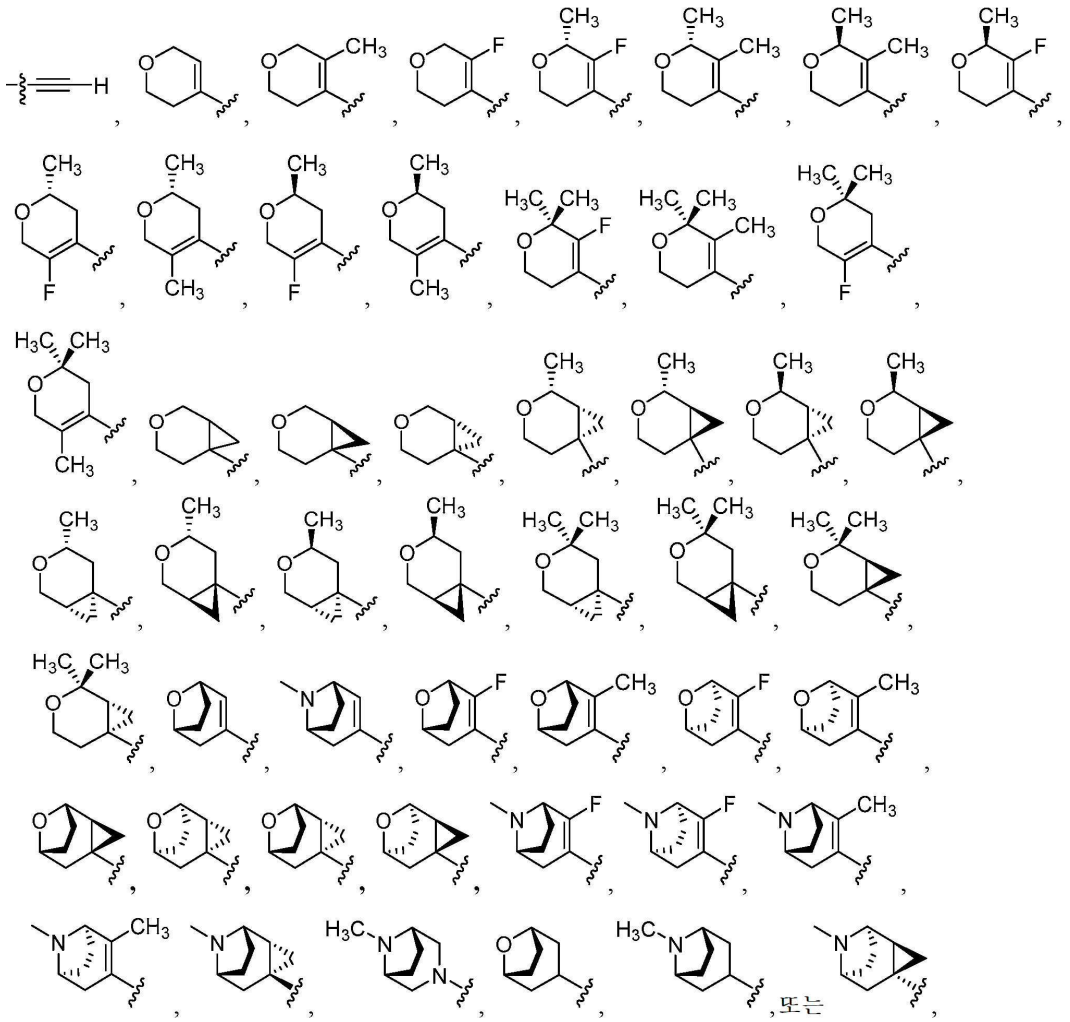
[0626] 일부 실시양태에서, 화학식 Ia의 화합물은 하기 화합물이다:

[0627] 

또는  .



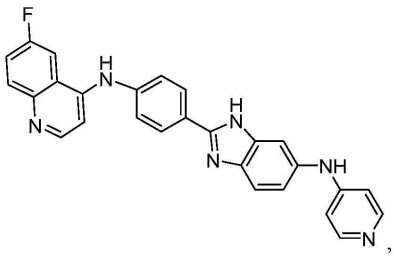
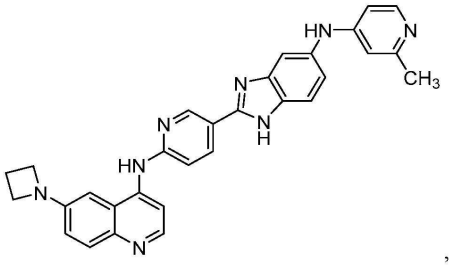
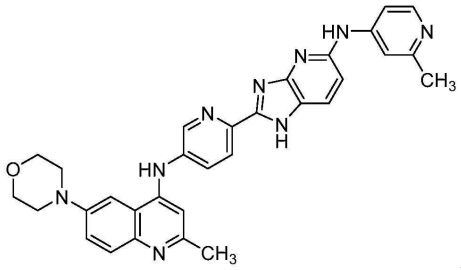
[0628] 일부 실시양태에서, 화학식 Ia의 화합물은 이고, 여기서 R_1은 $-CONH_2$, $-SO_2NH_2$, $-SO_2CH_3$, 또는 하기 화학식의 기이고:

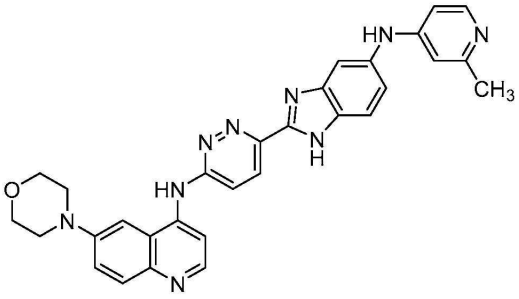
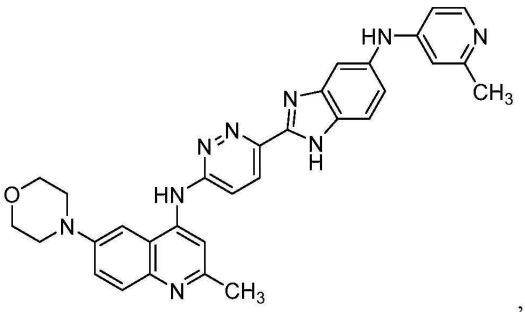
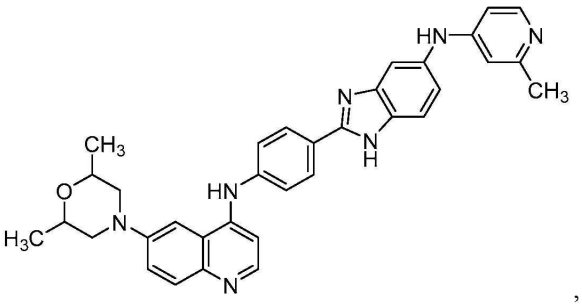
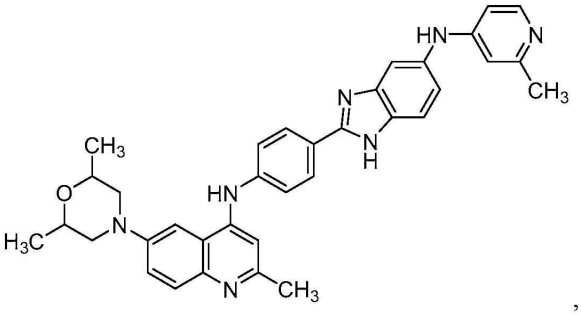


[0629]

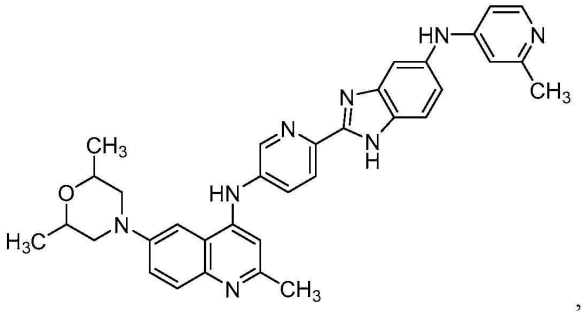
[0630] J_1, J_2, J_3, J_4, J_5 및 J_6은 각각 독립적으로 -N- 또는 -CF이다.

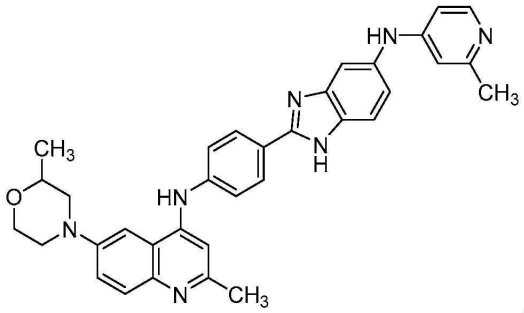
[0631] 일부 실시양태에서, 화학식 Ib의 화합물은 하기 화합물이다:

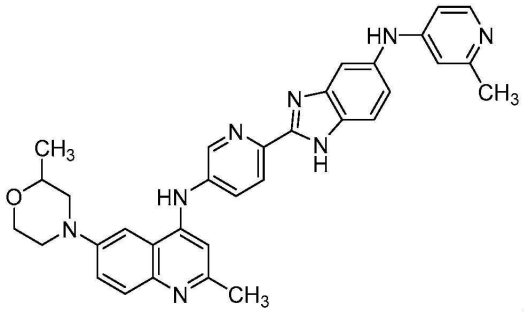

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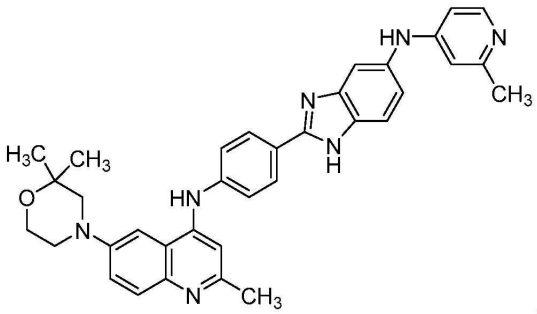
[0632]

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[0633]

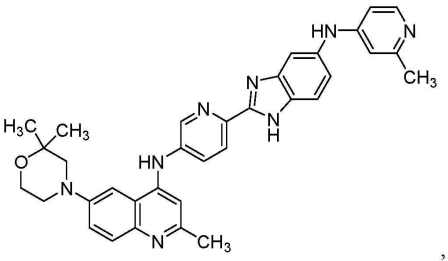
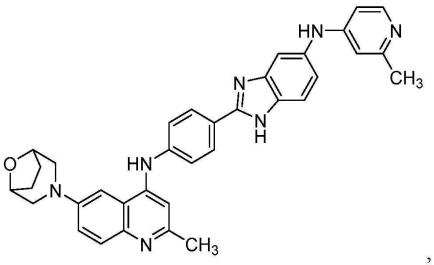
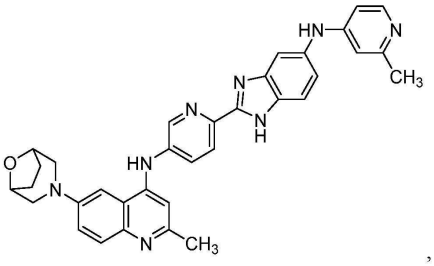
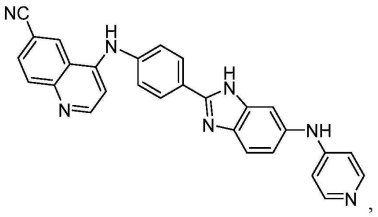
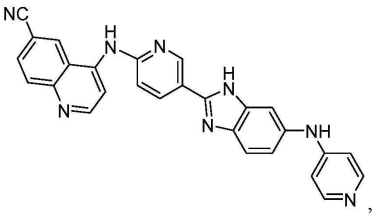
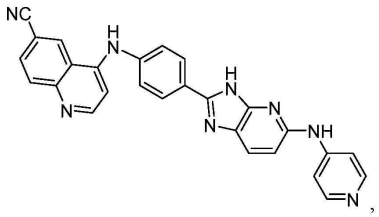
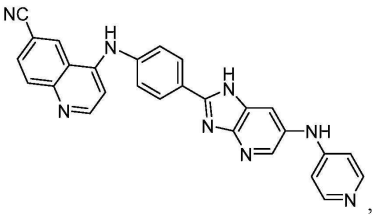
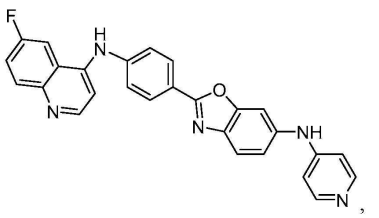

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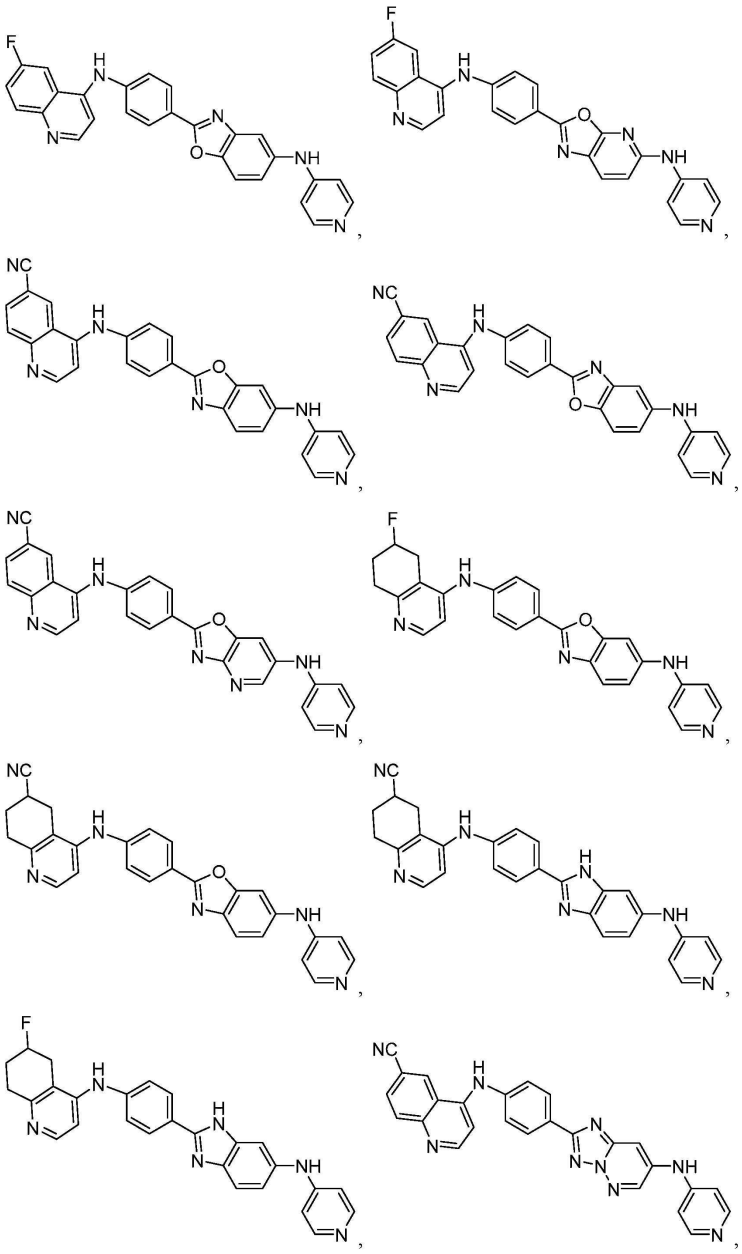

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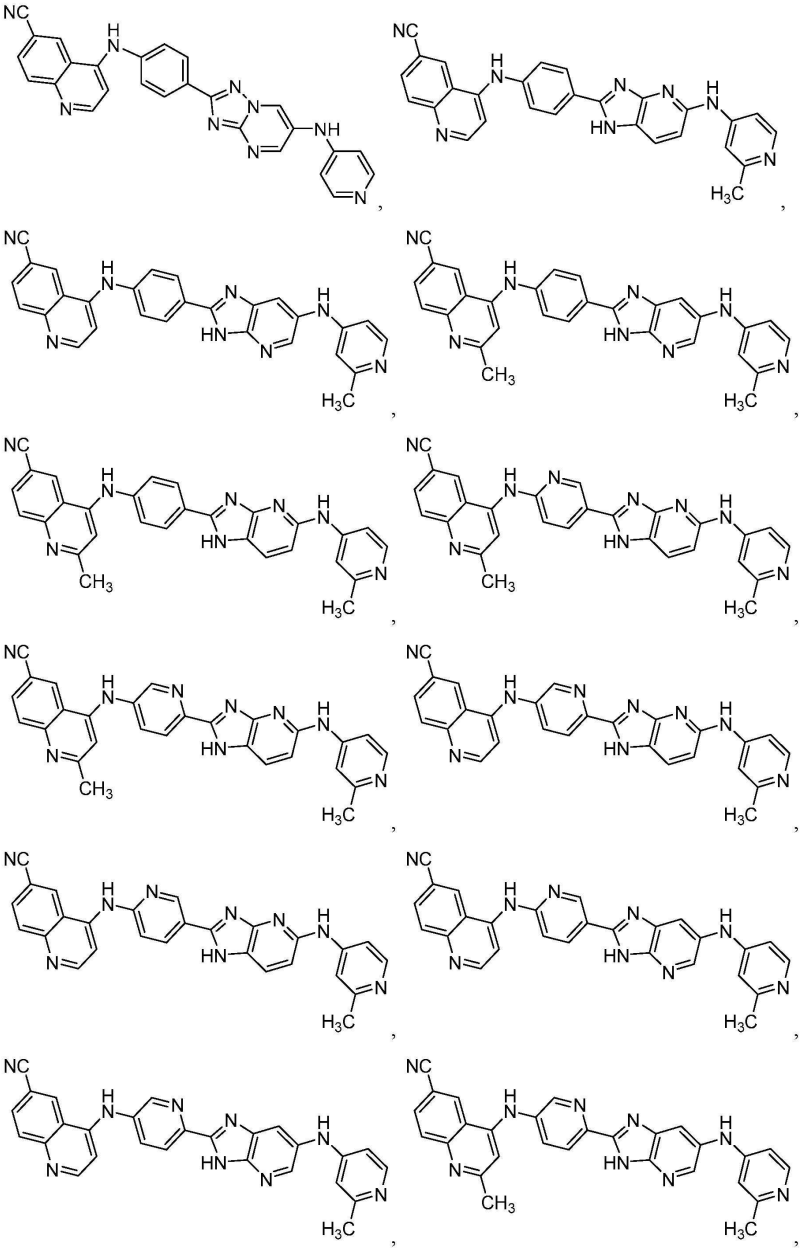
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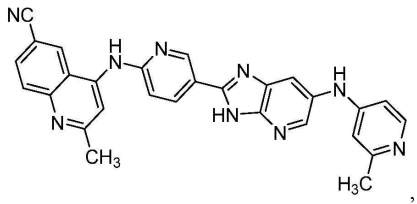
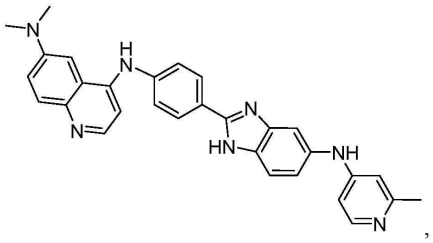
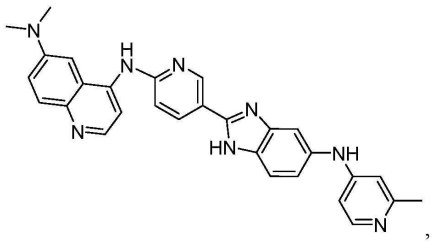
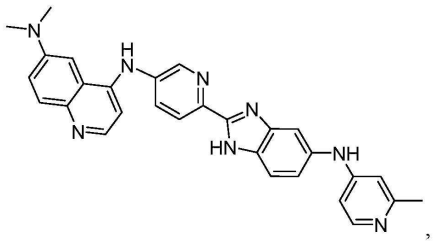
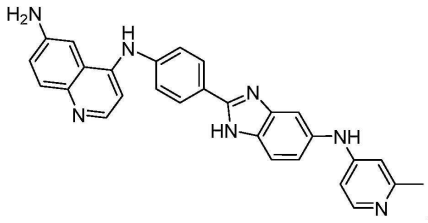
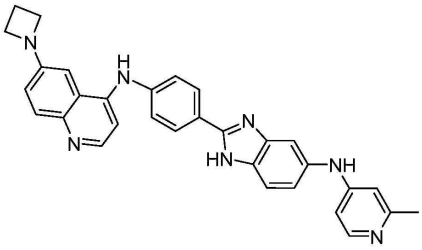
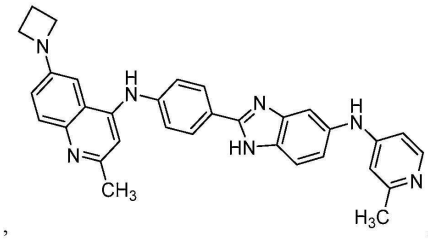
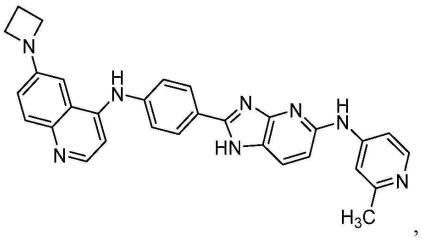
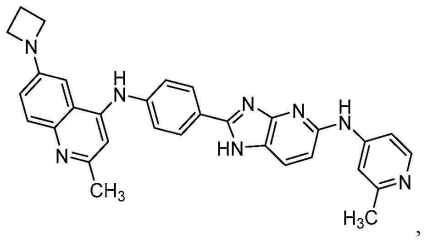
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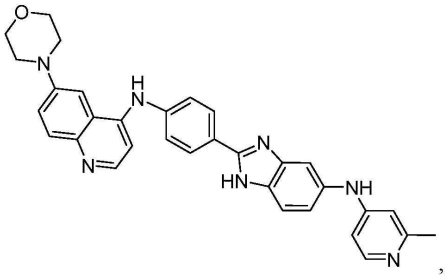
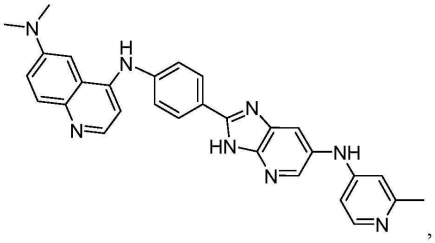
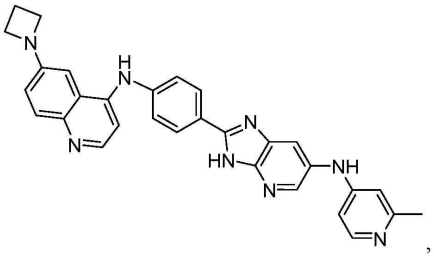
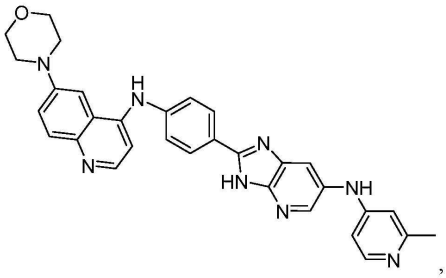
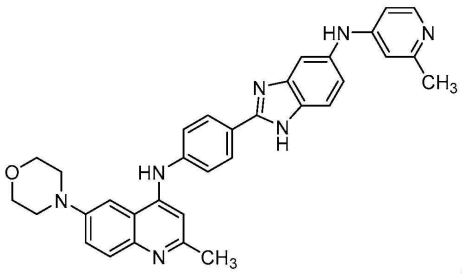
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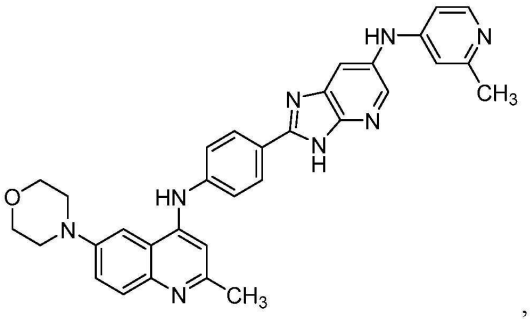
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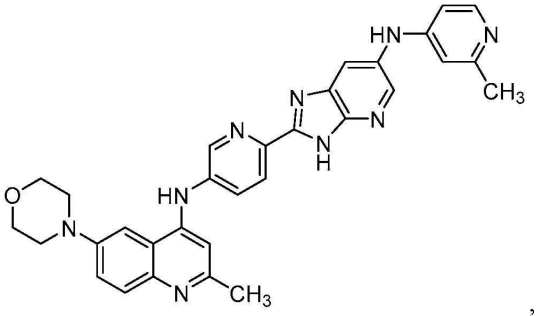

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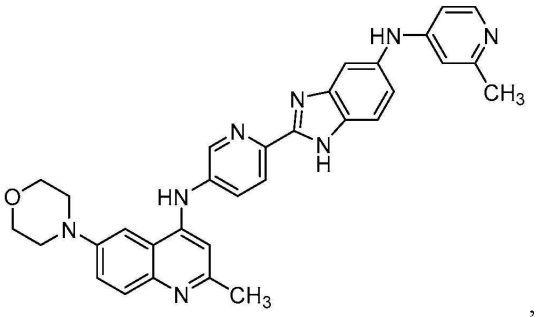
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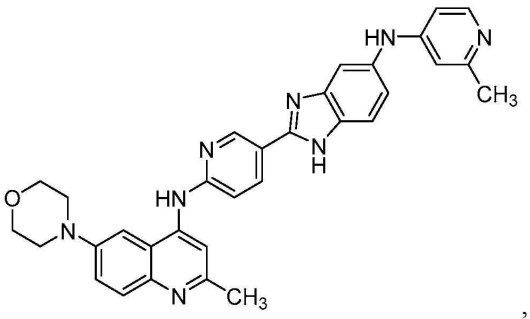

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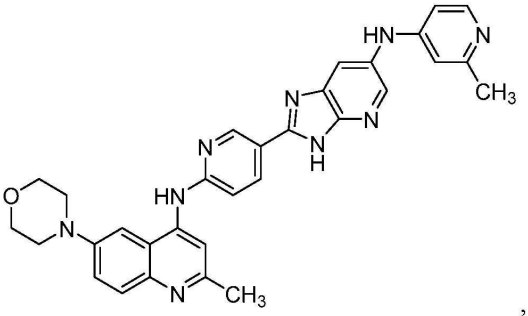

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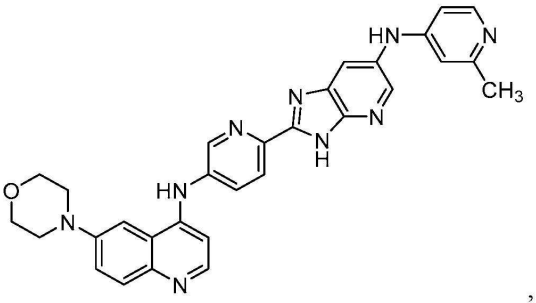

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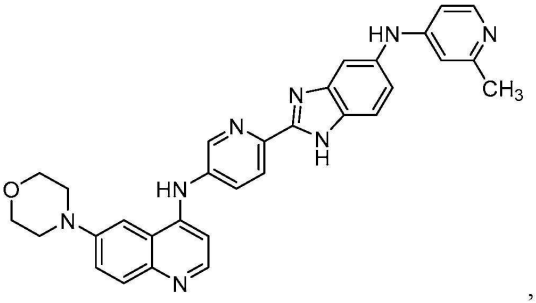

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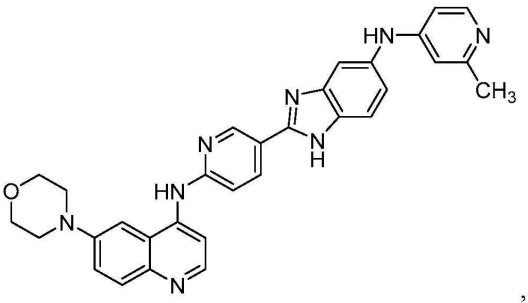

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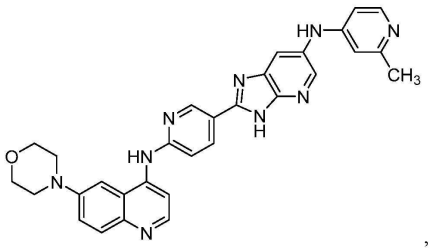
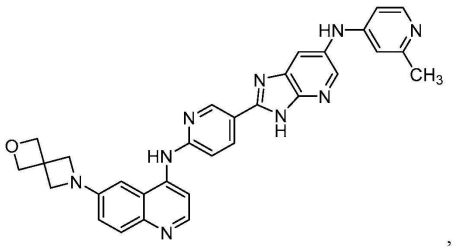
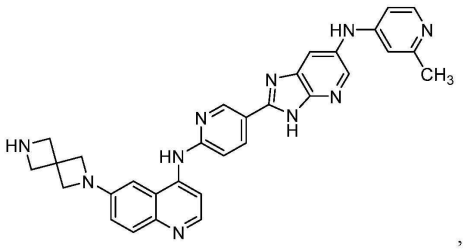
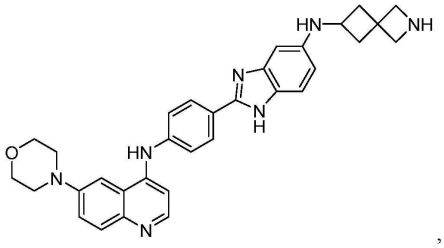
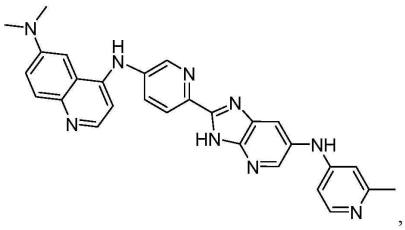
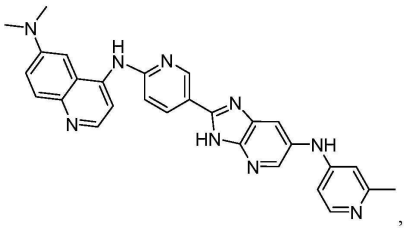

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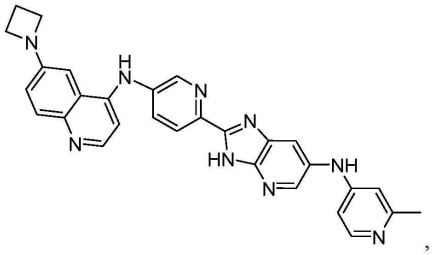
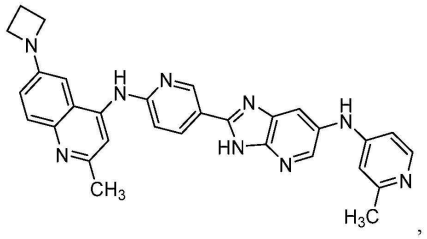
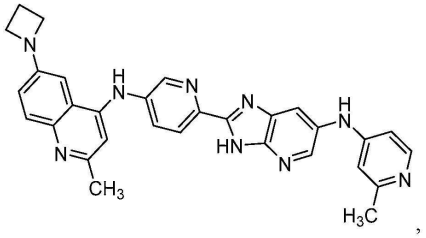
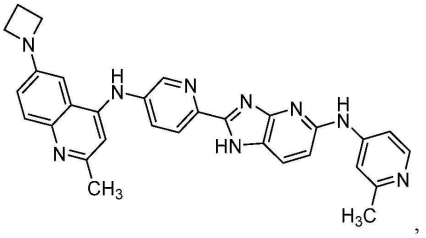
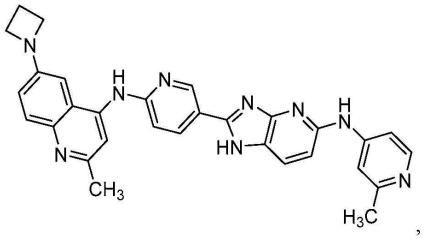
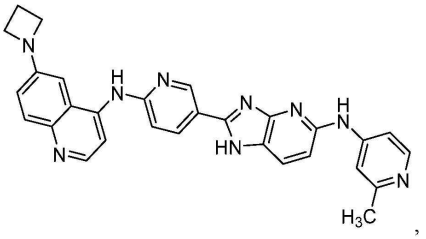
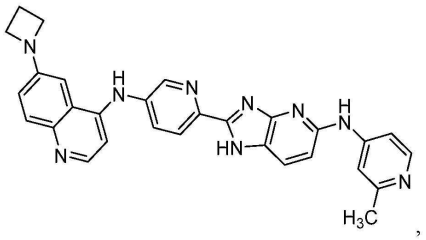
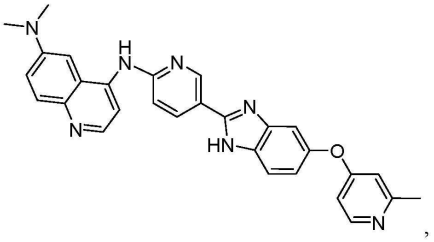
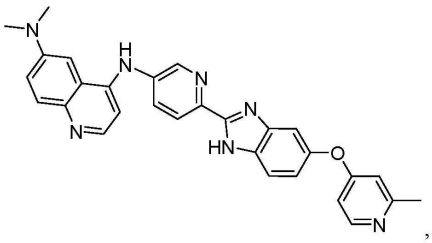
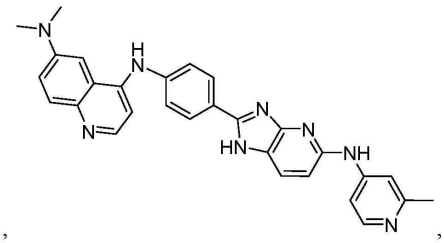

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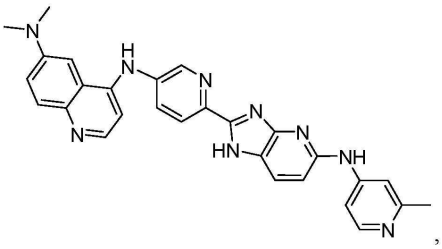
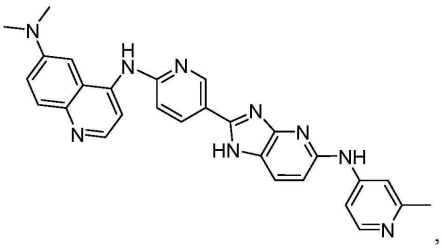
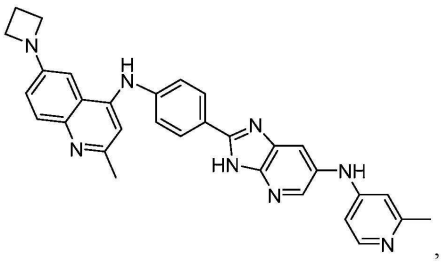
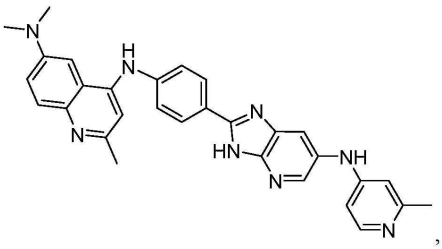
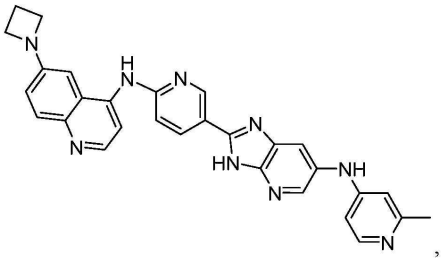
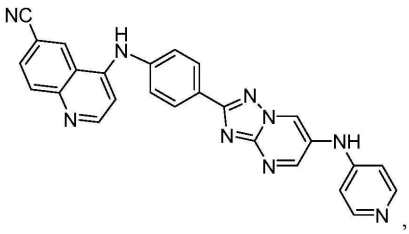
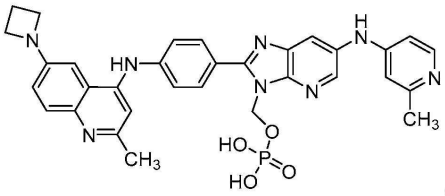
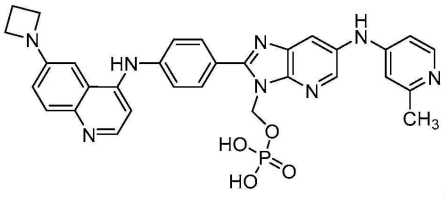

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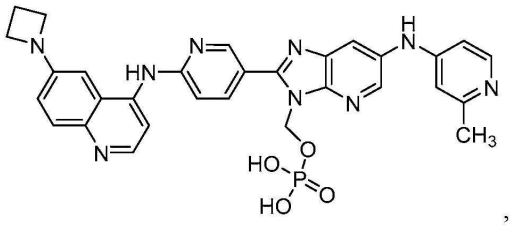

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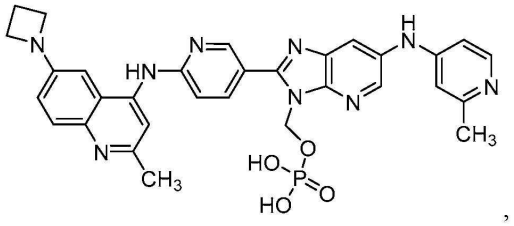
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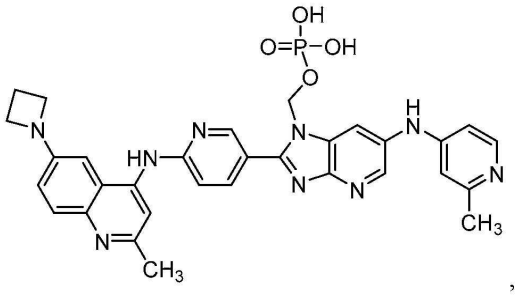

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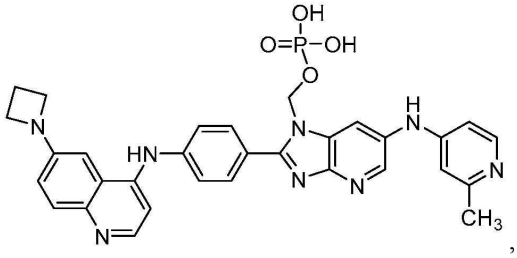

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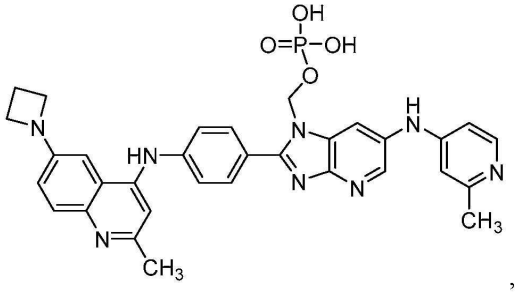
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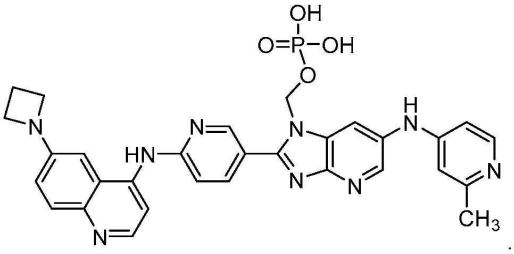

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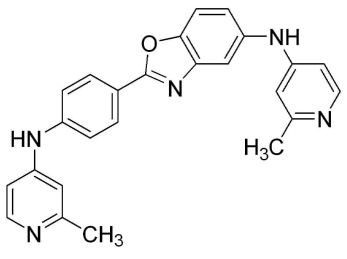

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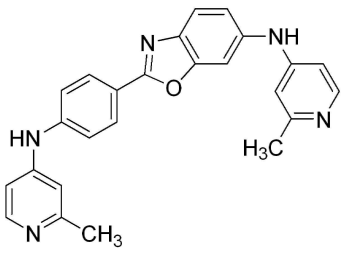

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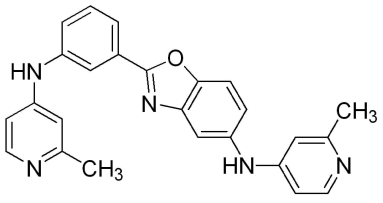
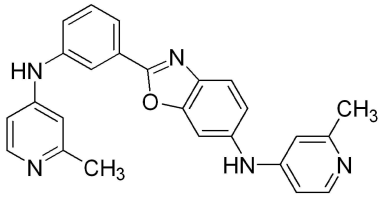
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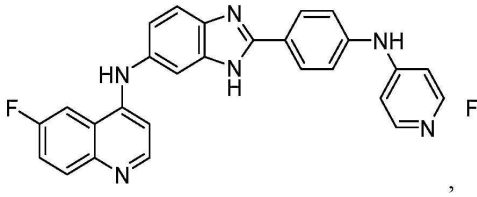
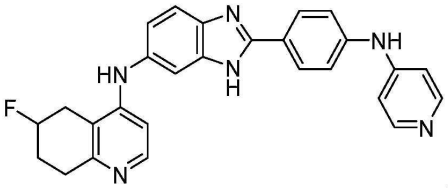
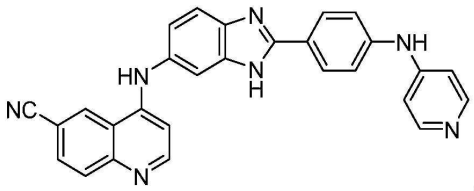
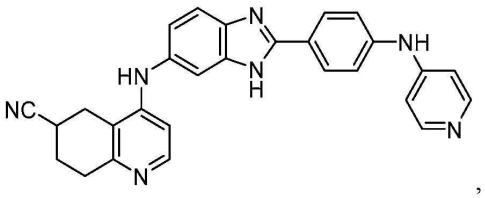
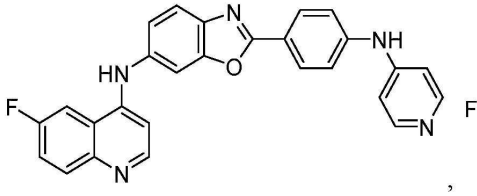
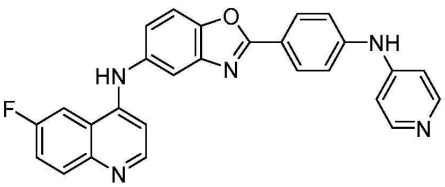
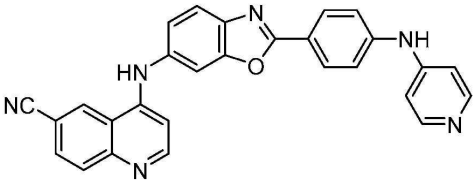
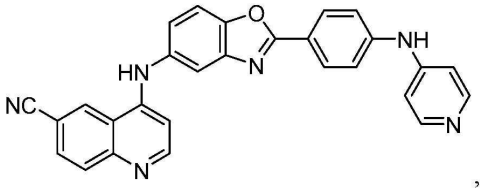
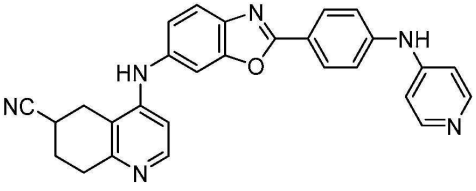
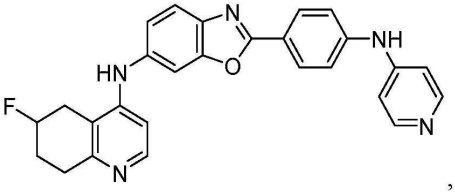
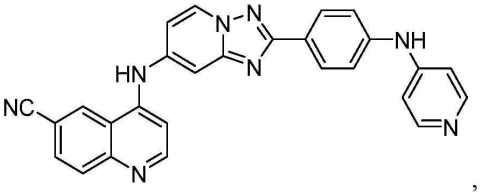
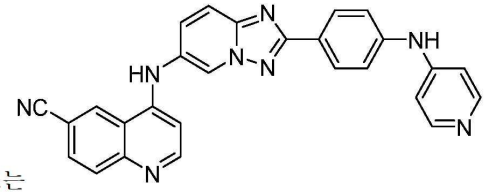
[0646] 일부 실시양태에서, 화학식 Ib의 화합물은


또는


이다.

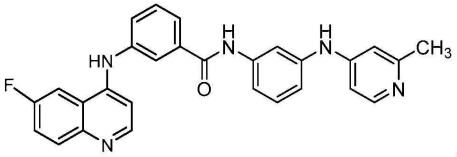
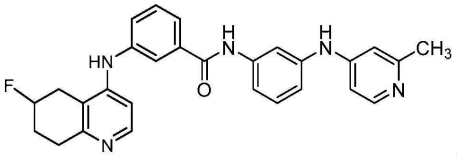
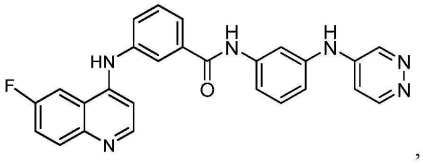
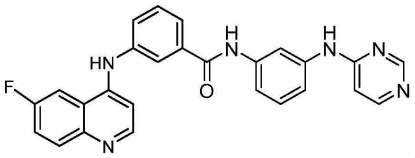
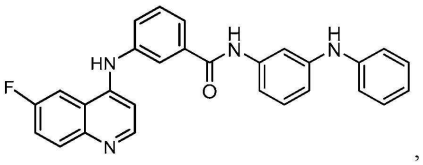
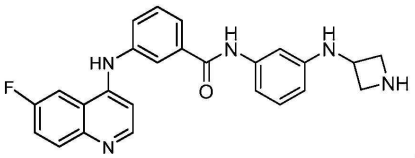
[0647] 일부 실시양태에서, 화학식 IIb의 화합물은  또는  이다.

[0648] 일부 실시양태에서, 화학식 Ic의 화합물은 하기 화합물이다:

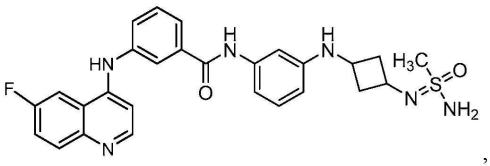
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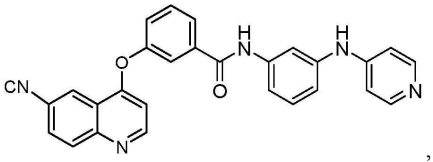
[0650] ,또는 .

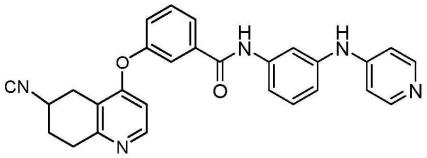
[0651] 일부 실시양태에서, 화학식 IIa의 화합물은 하기 화합물이다:

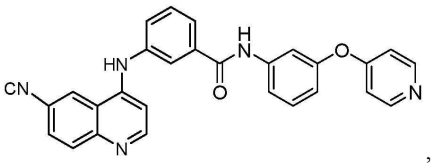

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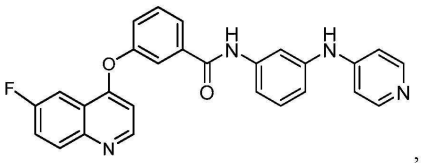
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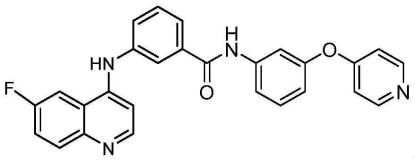

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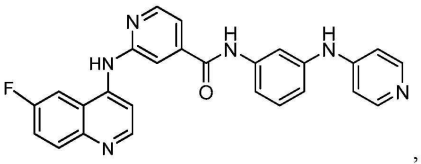

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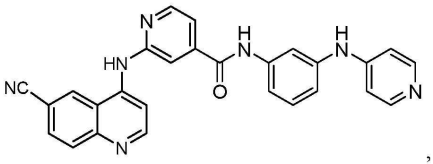

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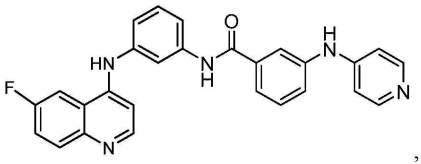

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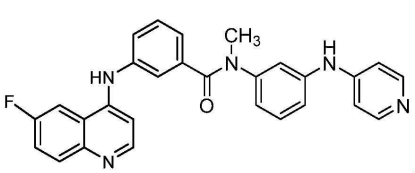

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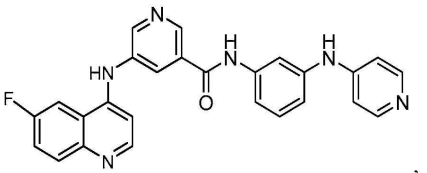

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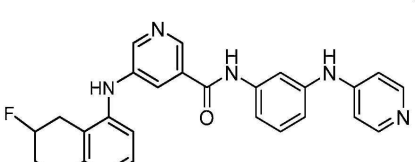

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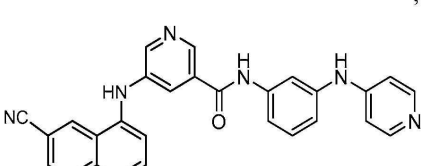

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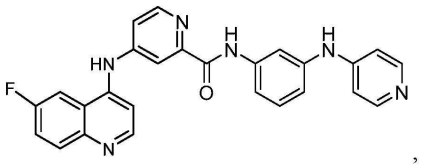
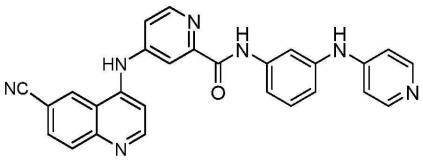
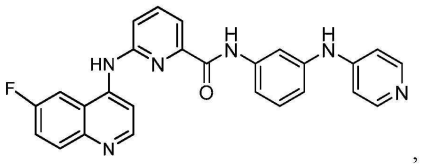
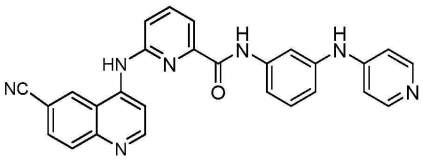
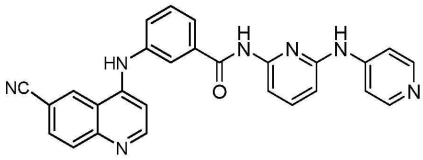
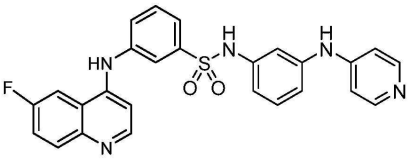

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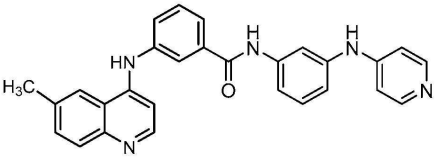
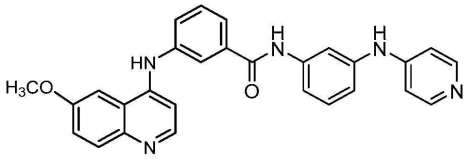
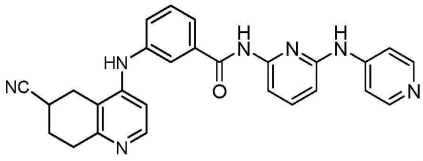
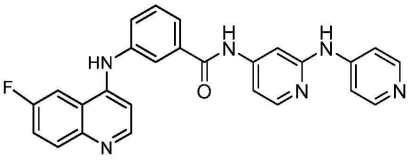
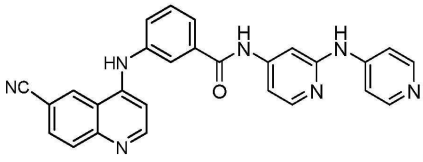
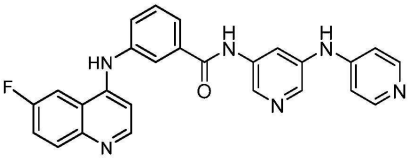

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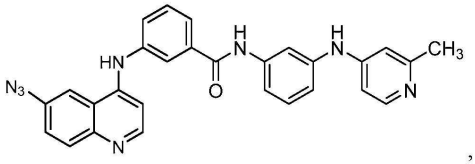

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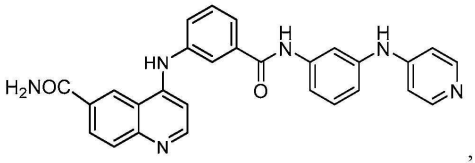
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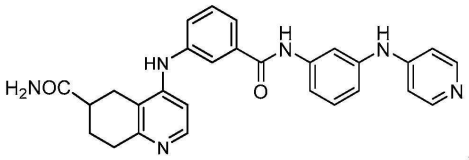

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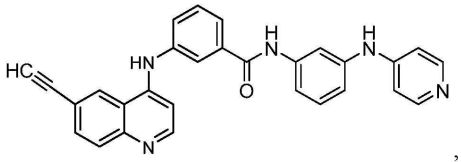
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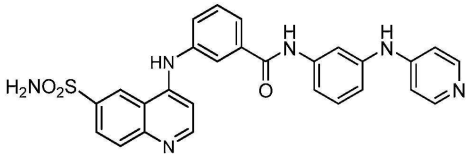
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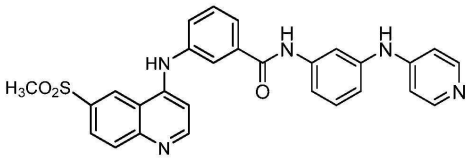

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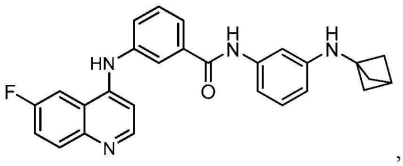

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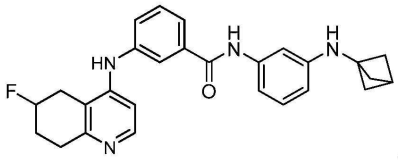

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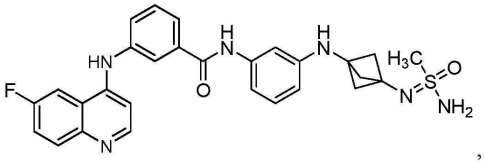
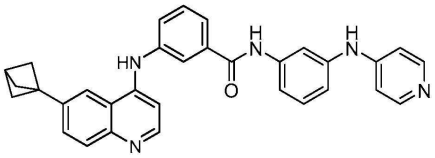
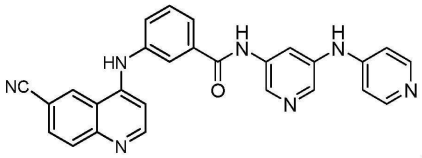
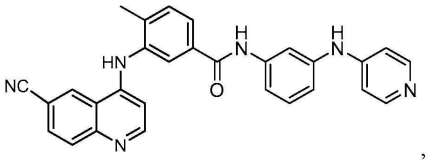
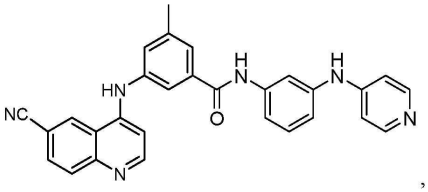
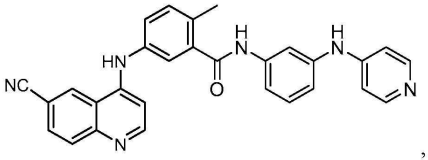
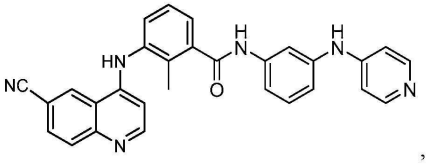
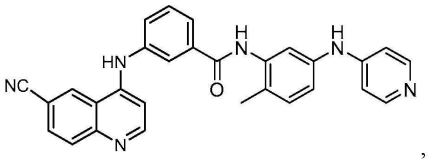
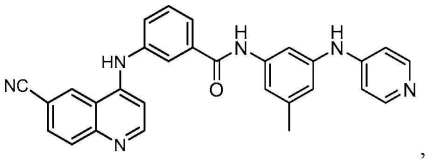
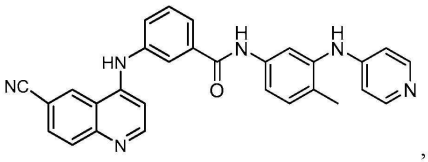
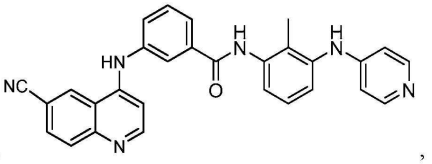
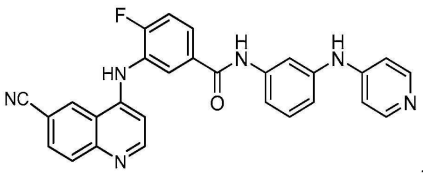
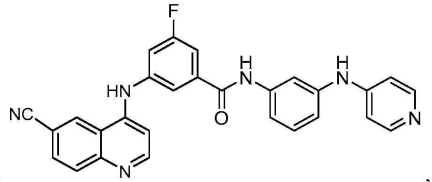

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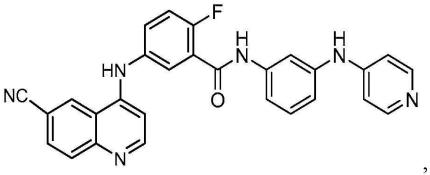
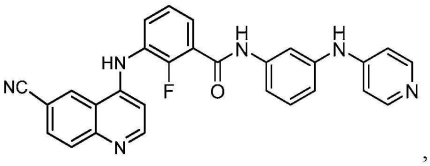
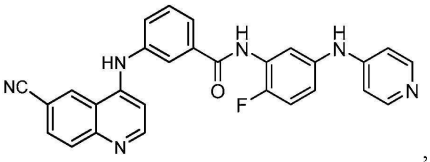
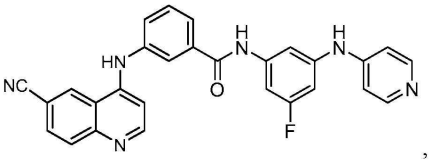
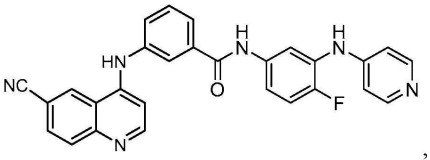
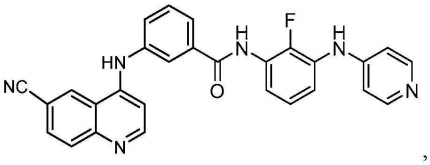
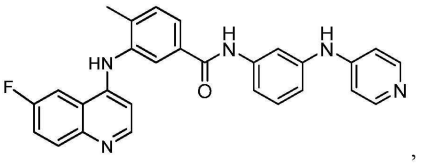
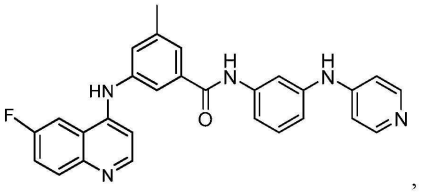
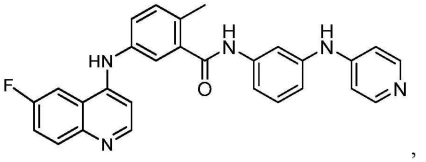
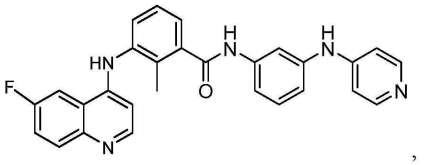

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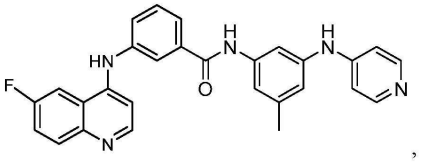
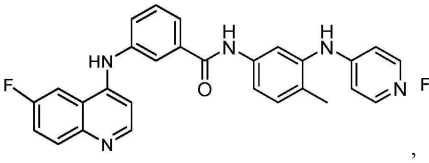
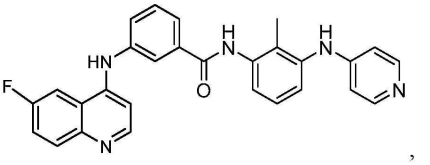
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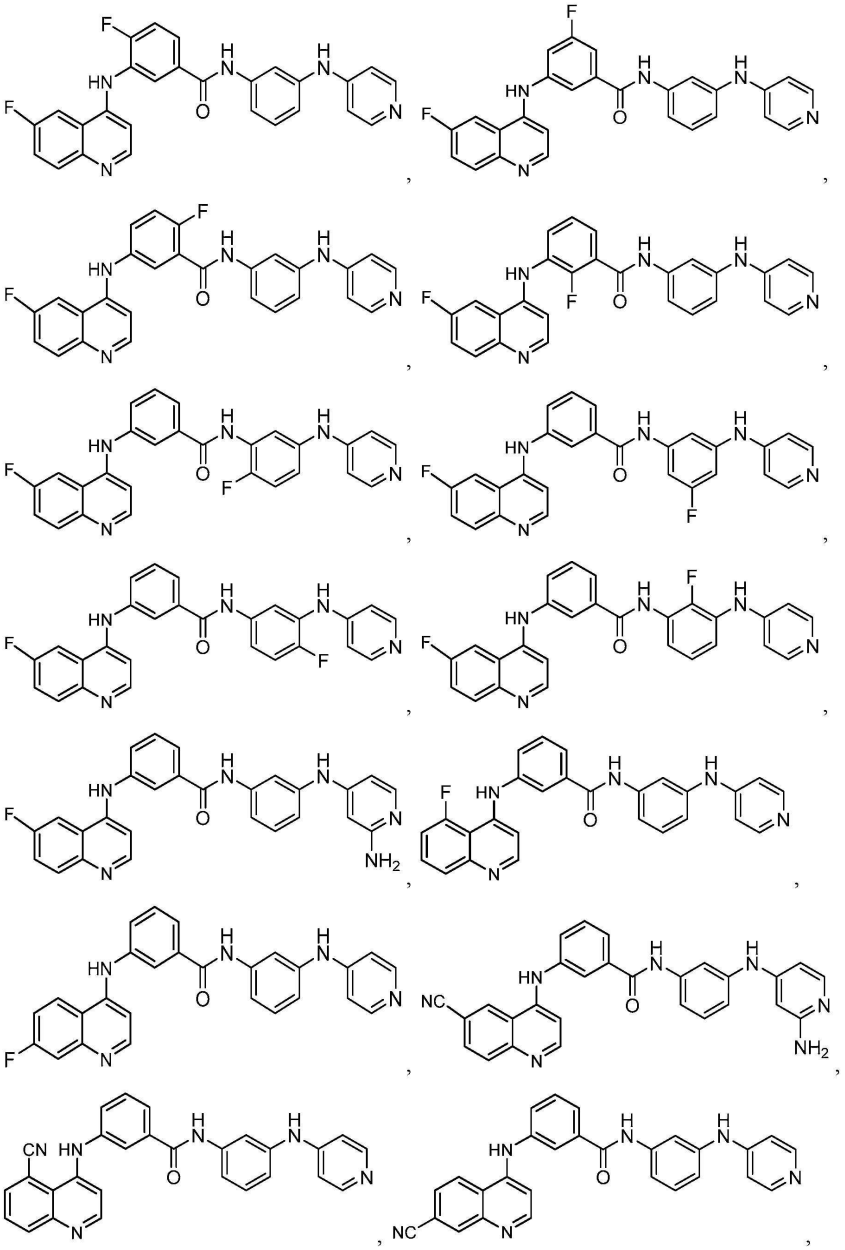

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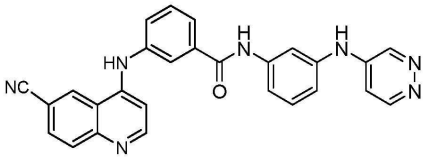
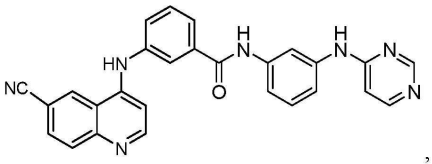
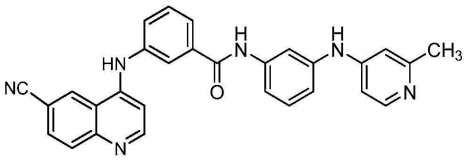
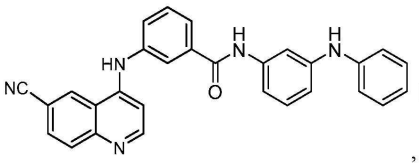
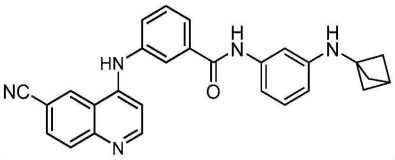
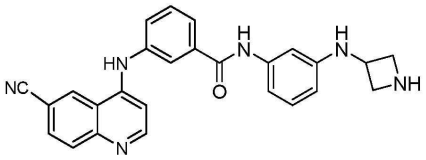
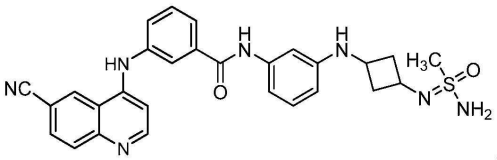
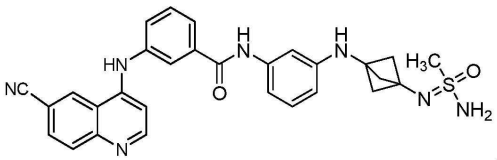
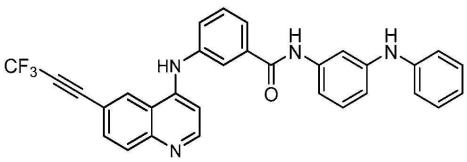
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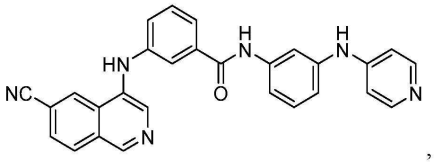
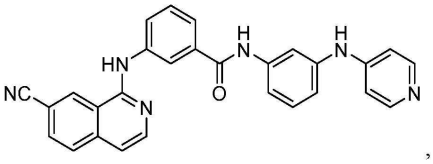
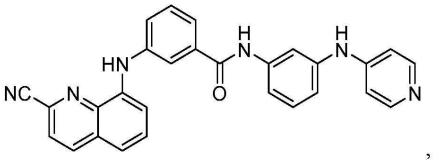
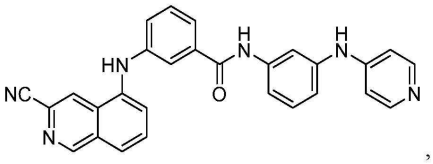
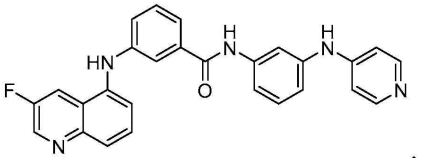
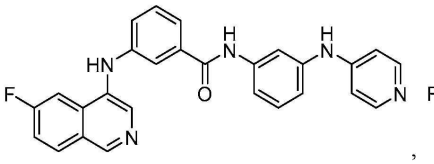
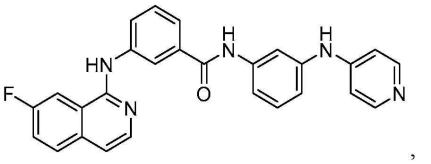
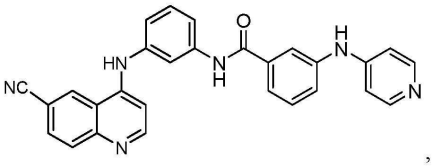
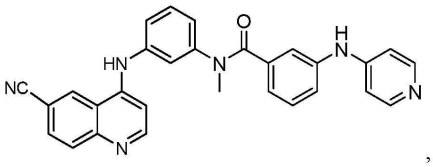
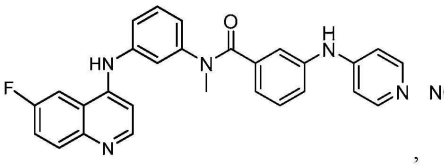
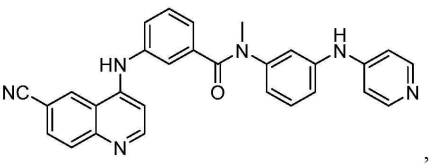
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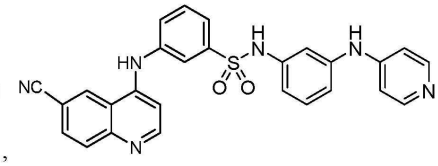


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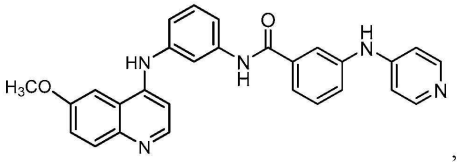
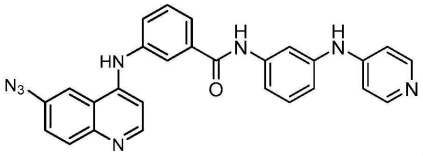
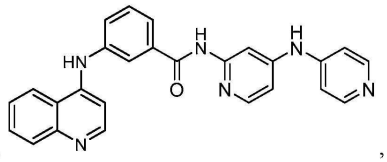
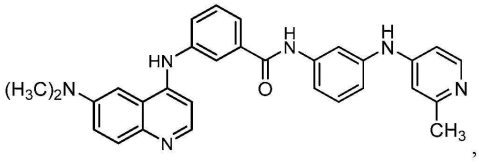
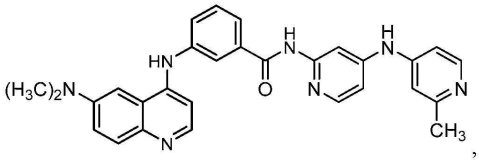
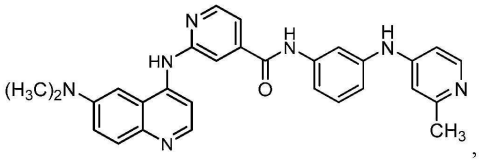
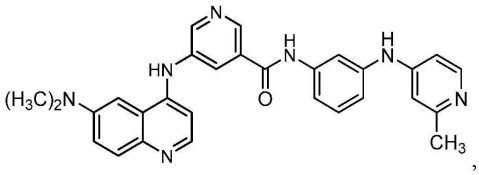
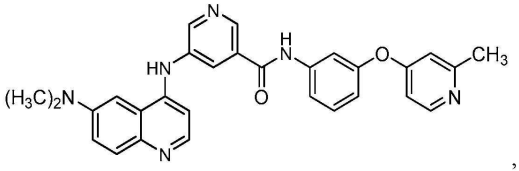
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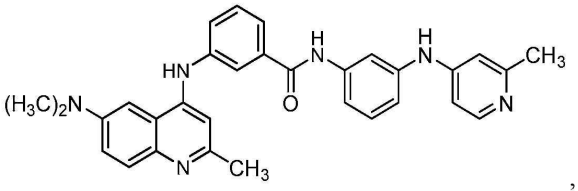
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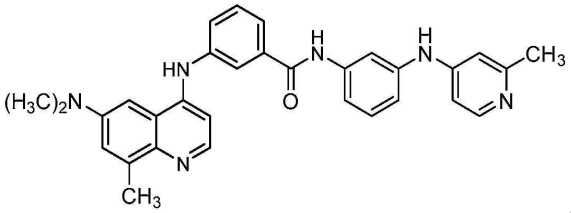
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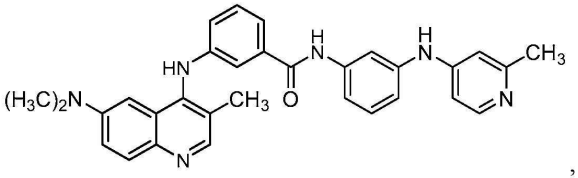
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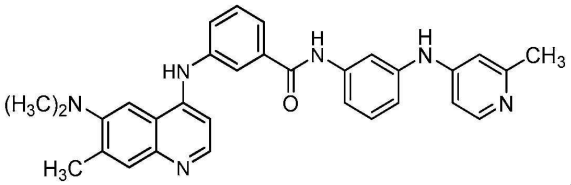

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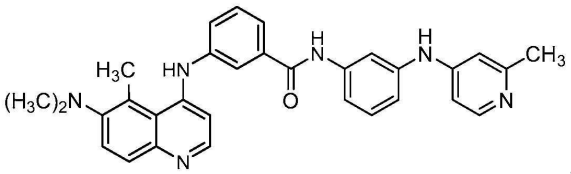
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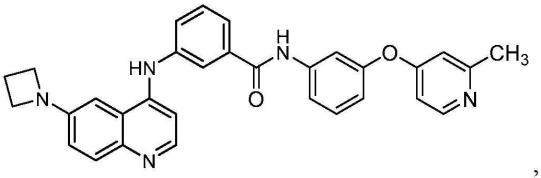

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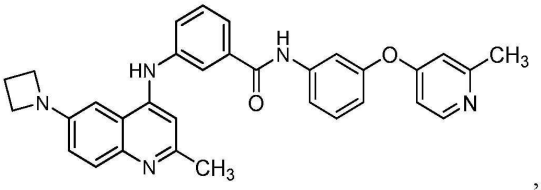

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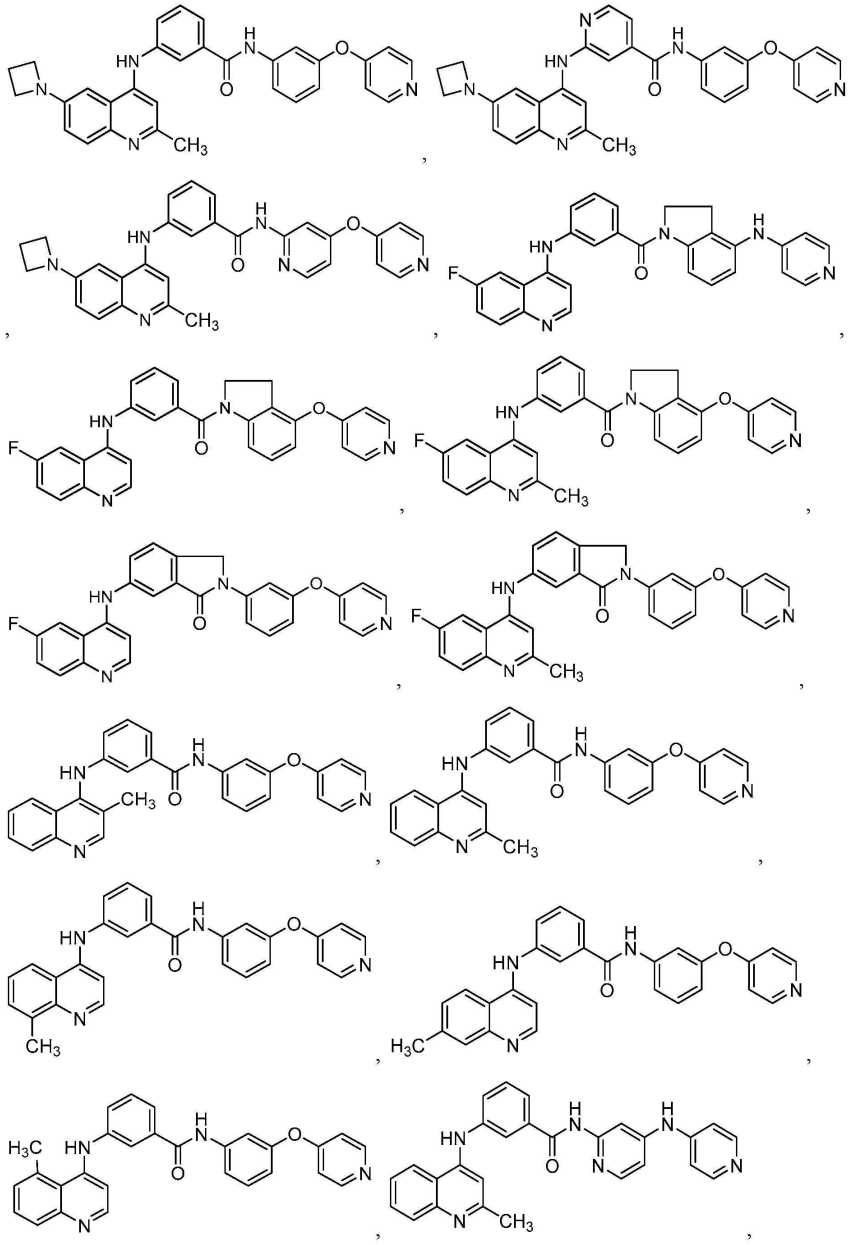

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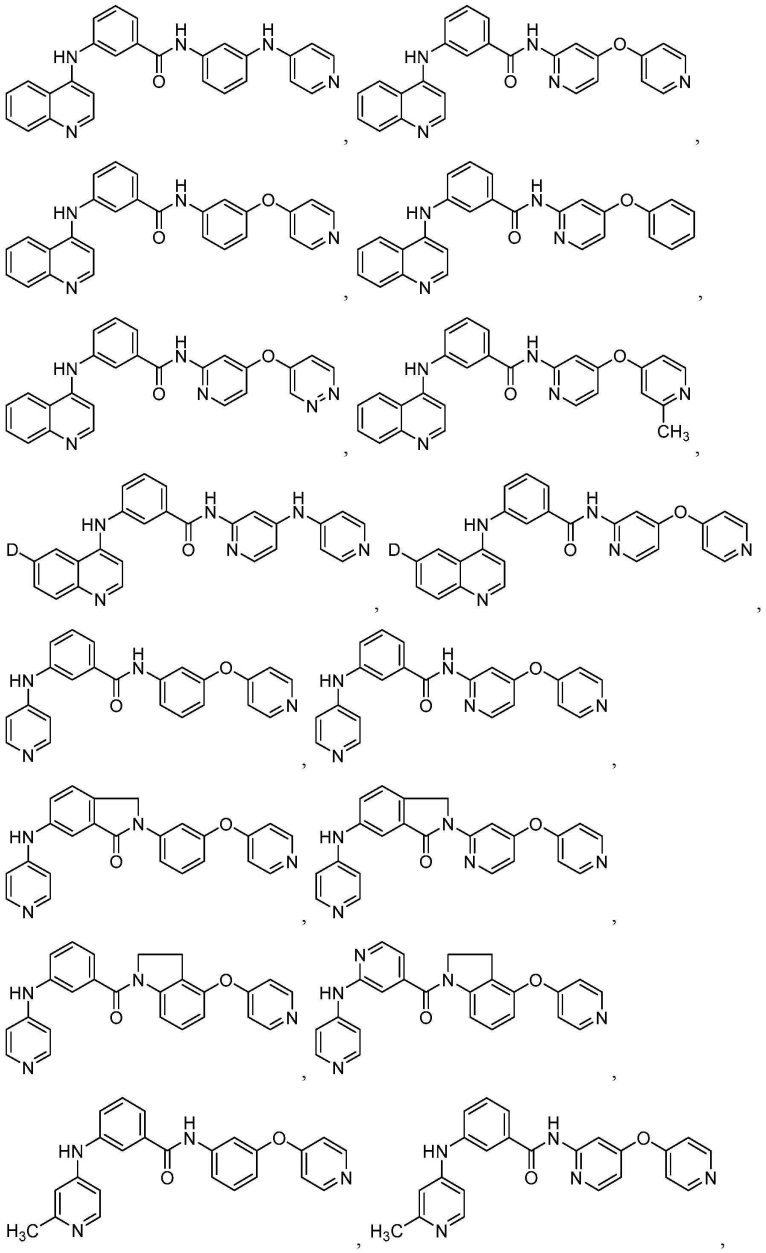

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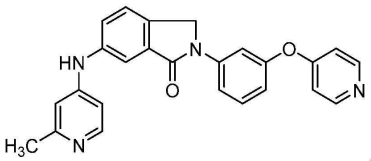
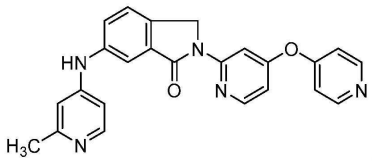
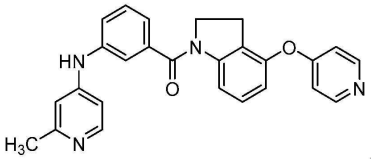
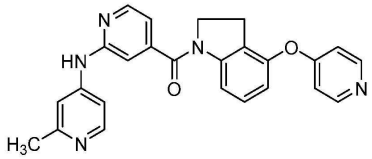
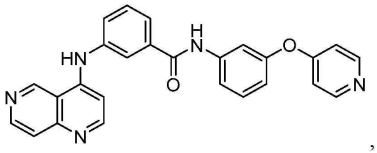
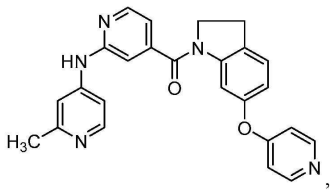
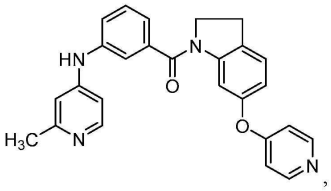
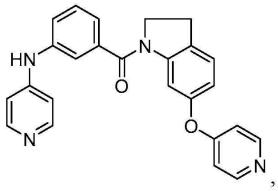
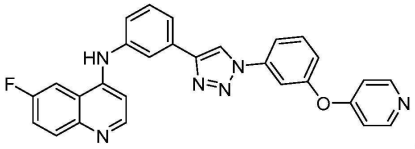
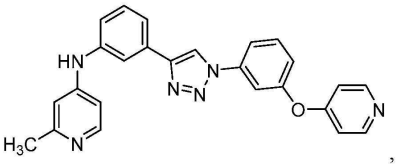
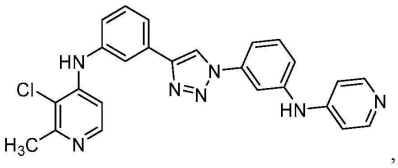
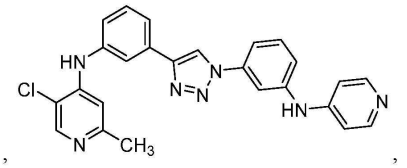
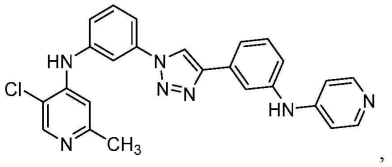
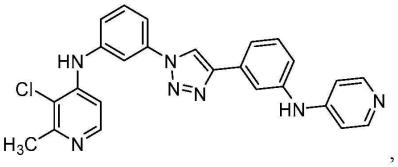

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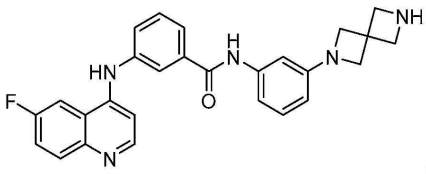
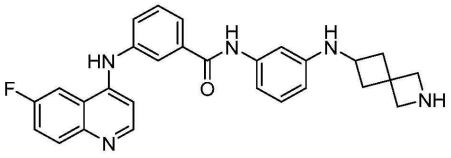
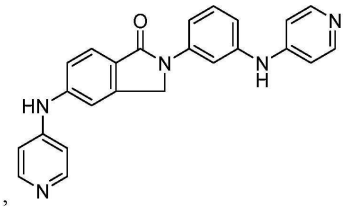
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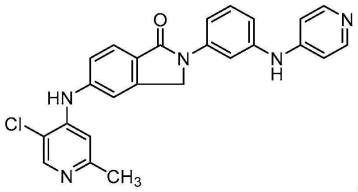
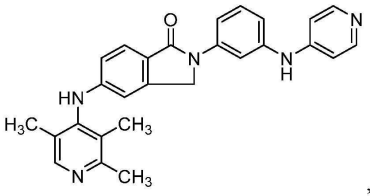
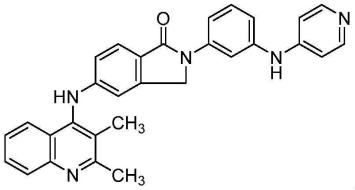
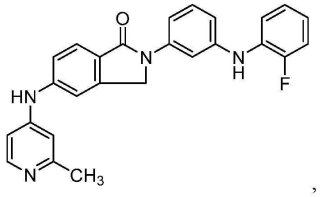
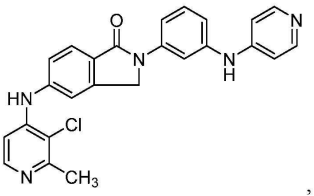
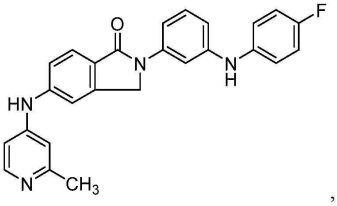
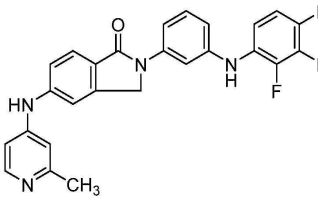
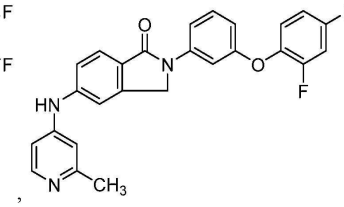
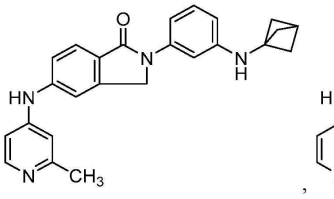
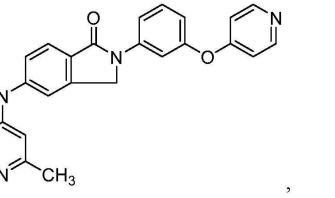
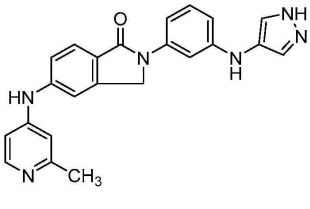
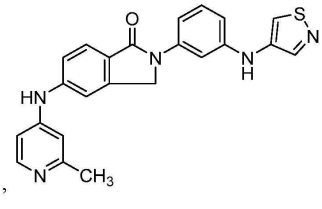

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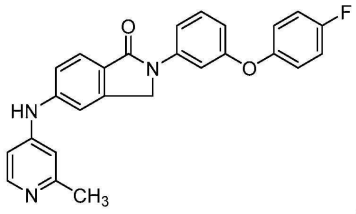
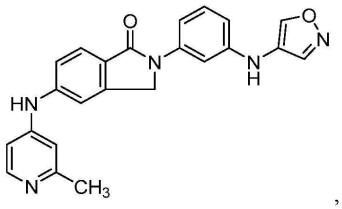
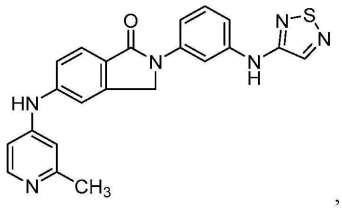
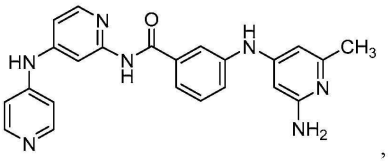
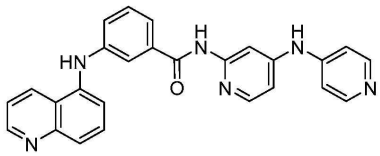
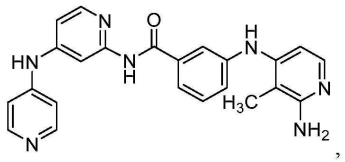
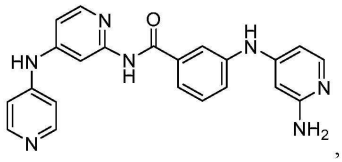
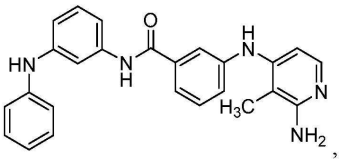
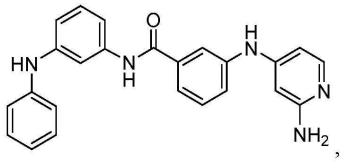
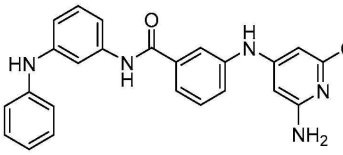
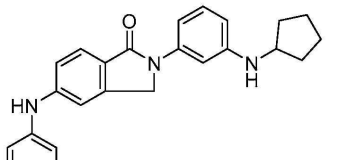
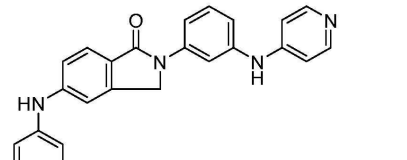
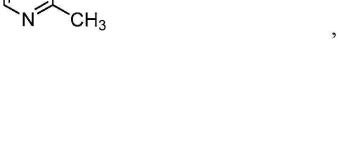
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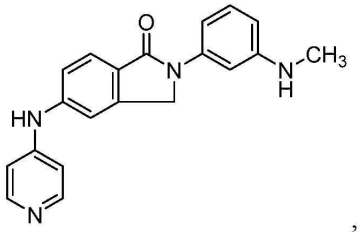
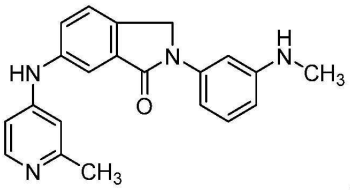
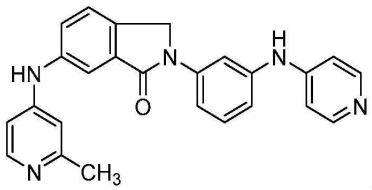
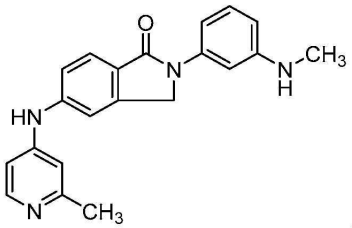
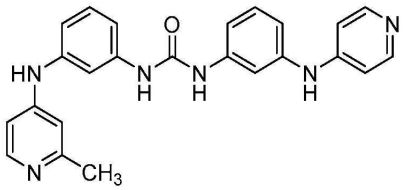
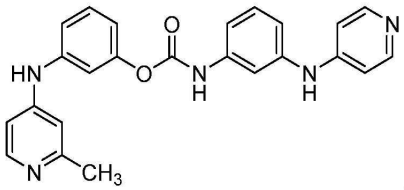
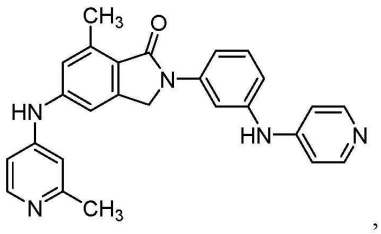
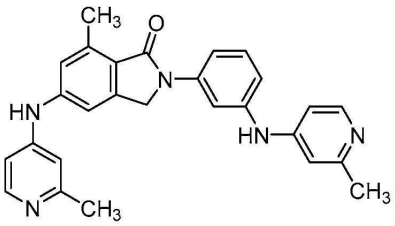
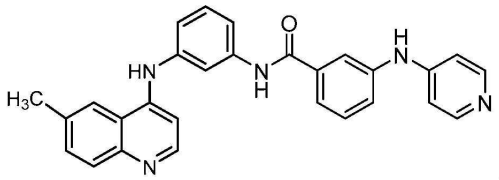
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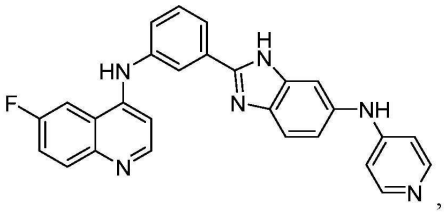
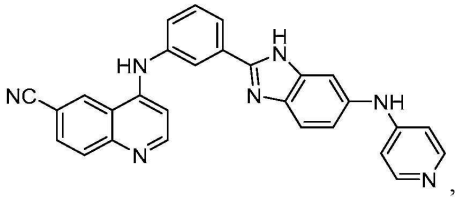
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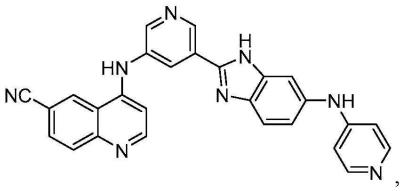
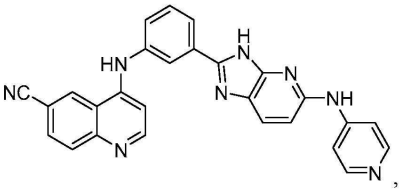
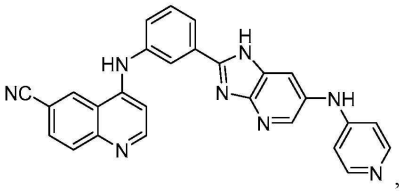
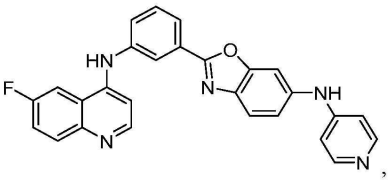
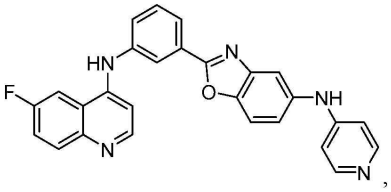
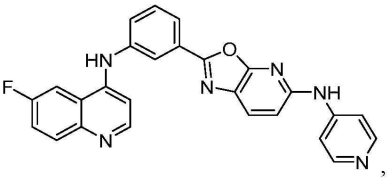
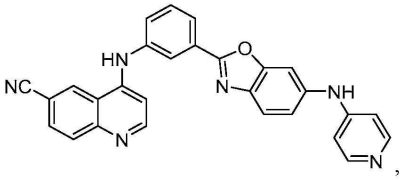
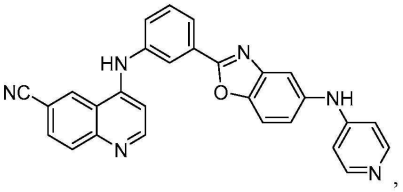
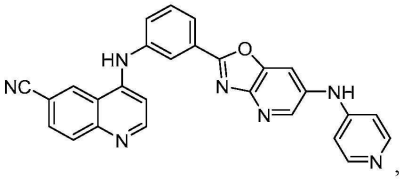
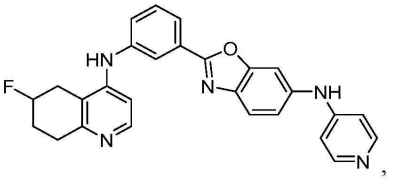
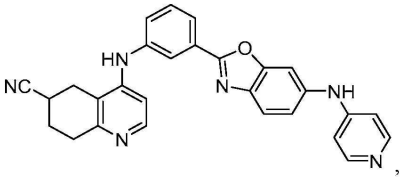
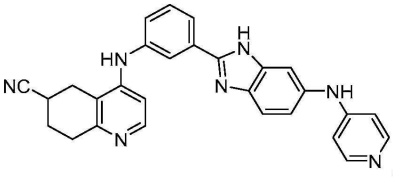

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[0669]

[0670] 일부 실시양태에서, 화학식 IIb의 화합물은 하기 화합물이다:


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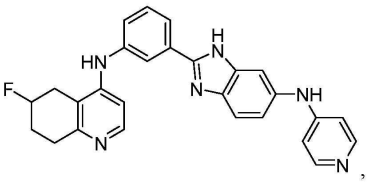
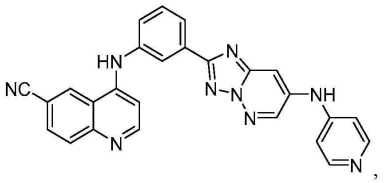
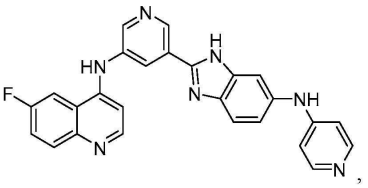
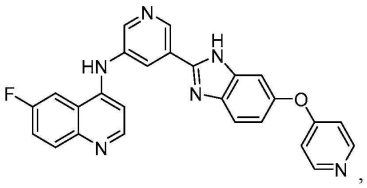
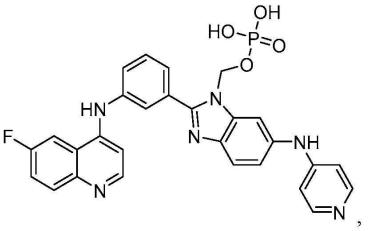
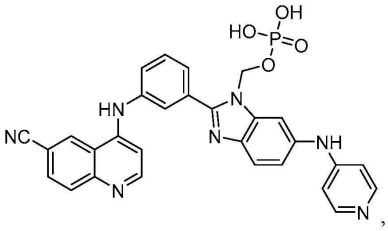
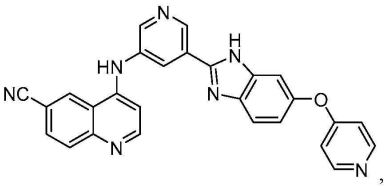
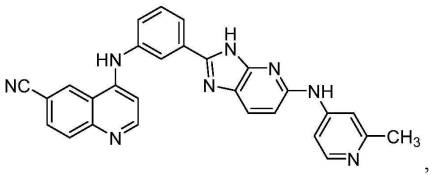
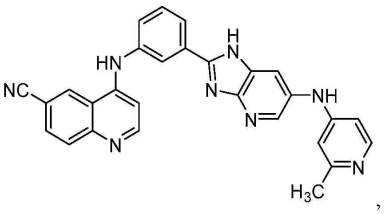
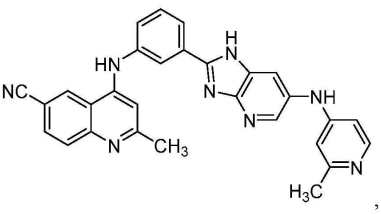
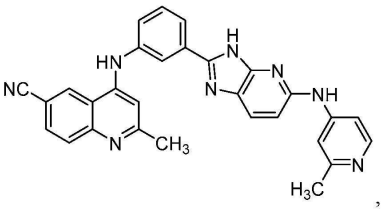
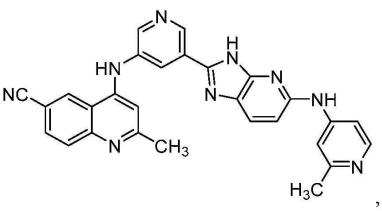
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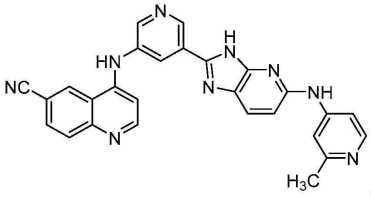
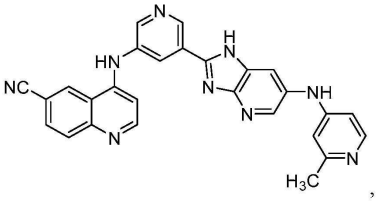
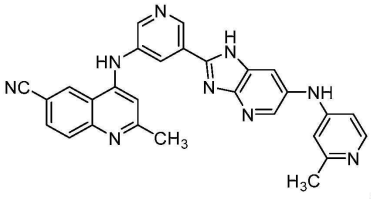
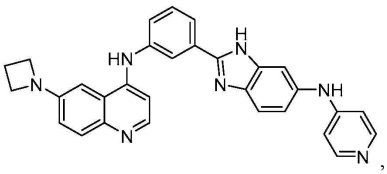
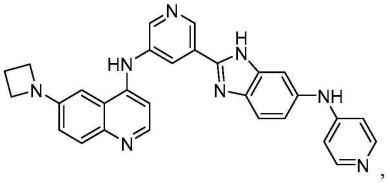
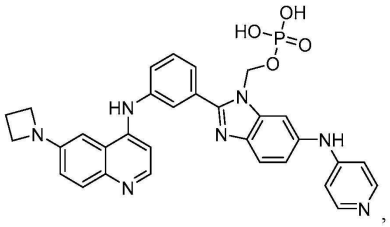
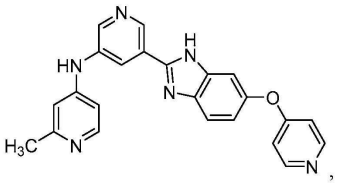
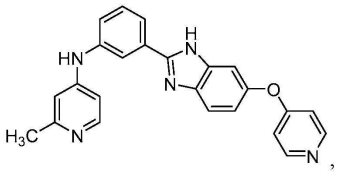
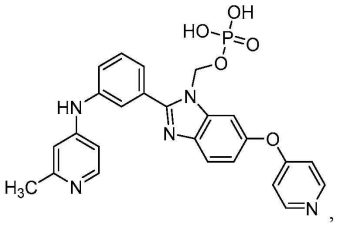
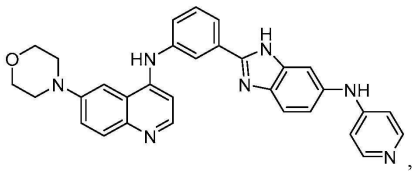
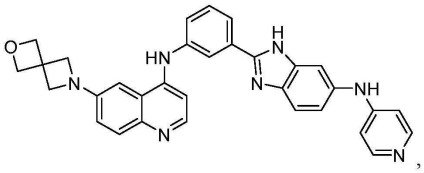
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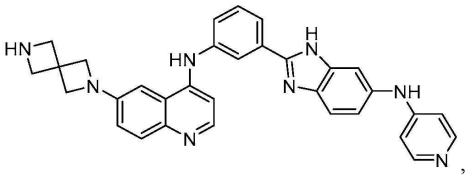
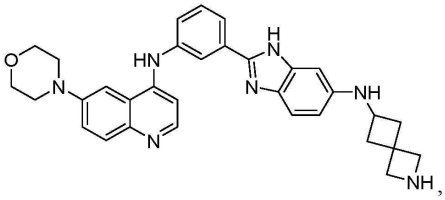
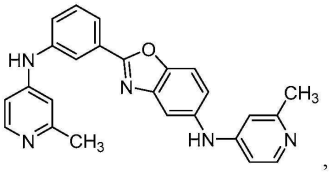
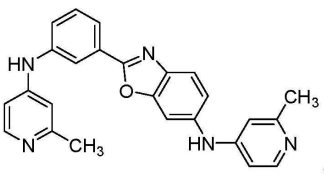
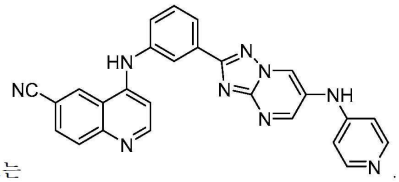
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[0673]

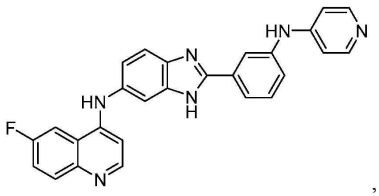
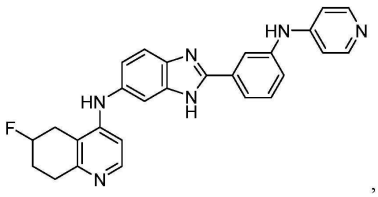
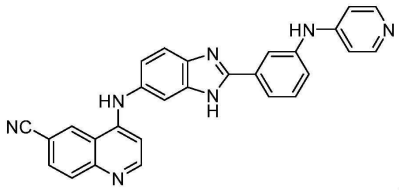
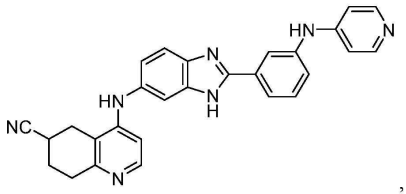
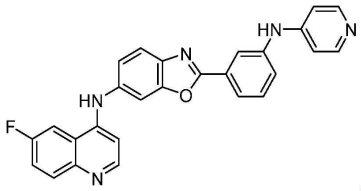
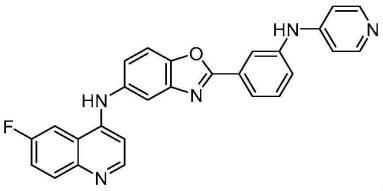

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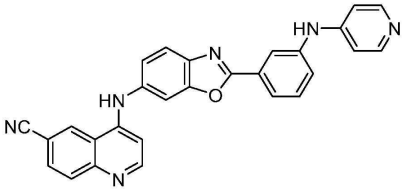
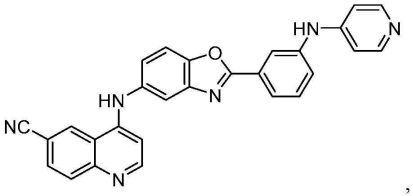
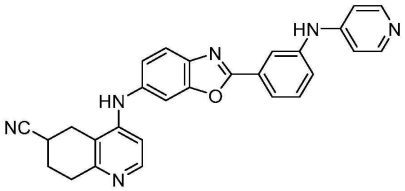
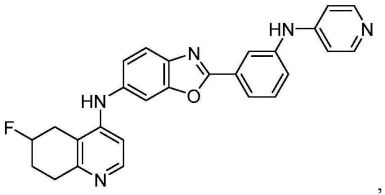
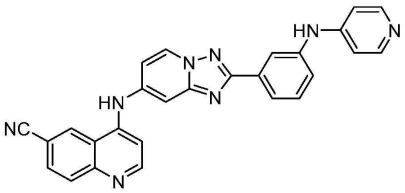
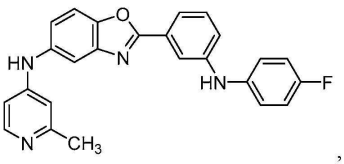
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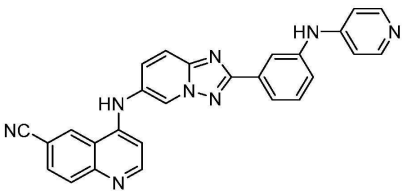

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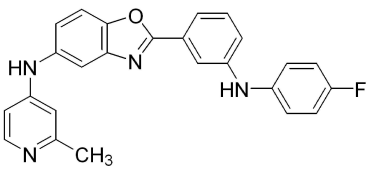
[0675]

[0676] 일부 실시양태에서, 화학식 IIc의 화합물은 하기 화합물이다:

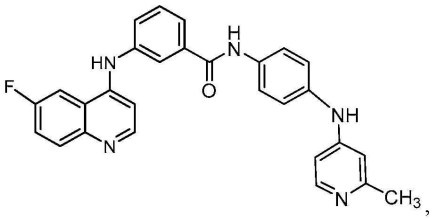

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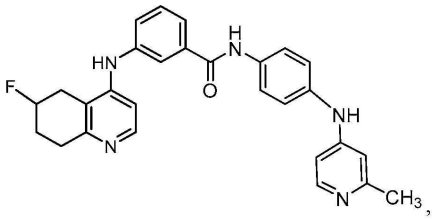
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[0678]


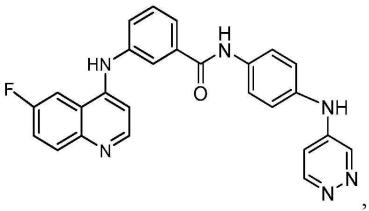
[0679] 일부 실시양태에서, 화학식 IIc의 화합물은

이다.

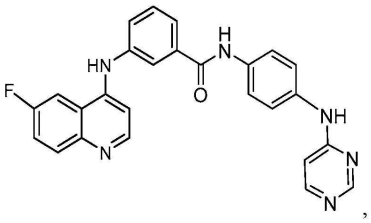
[0680] 일부 실시양태에서, 화학식 IIIa의 화합물은 하기 화합물이다:

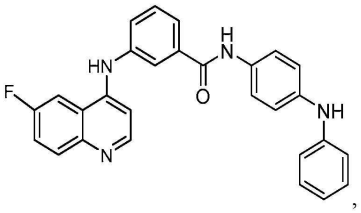


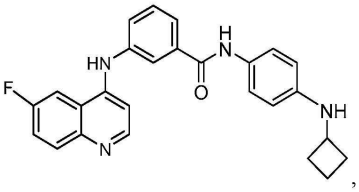


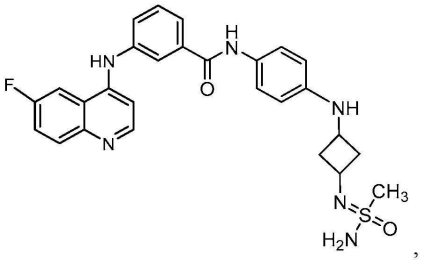
[0681]

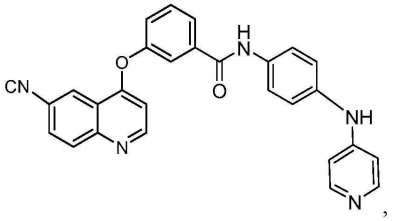


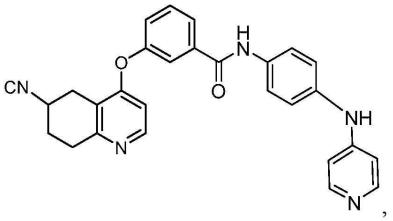


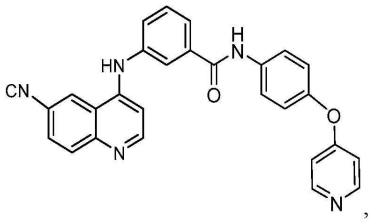


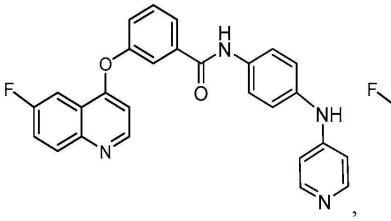


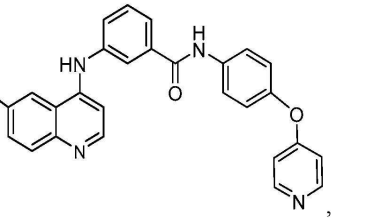




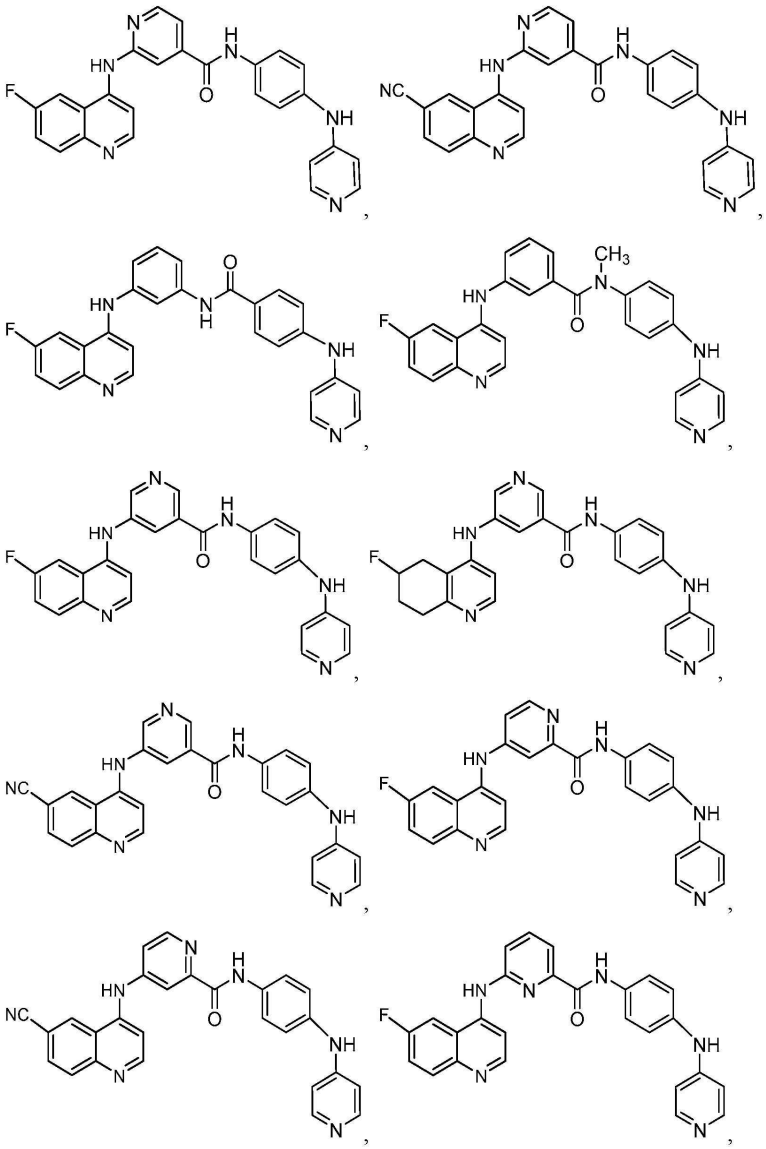




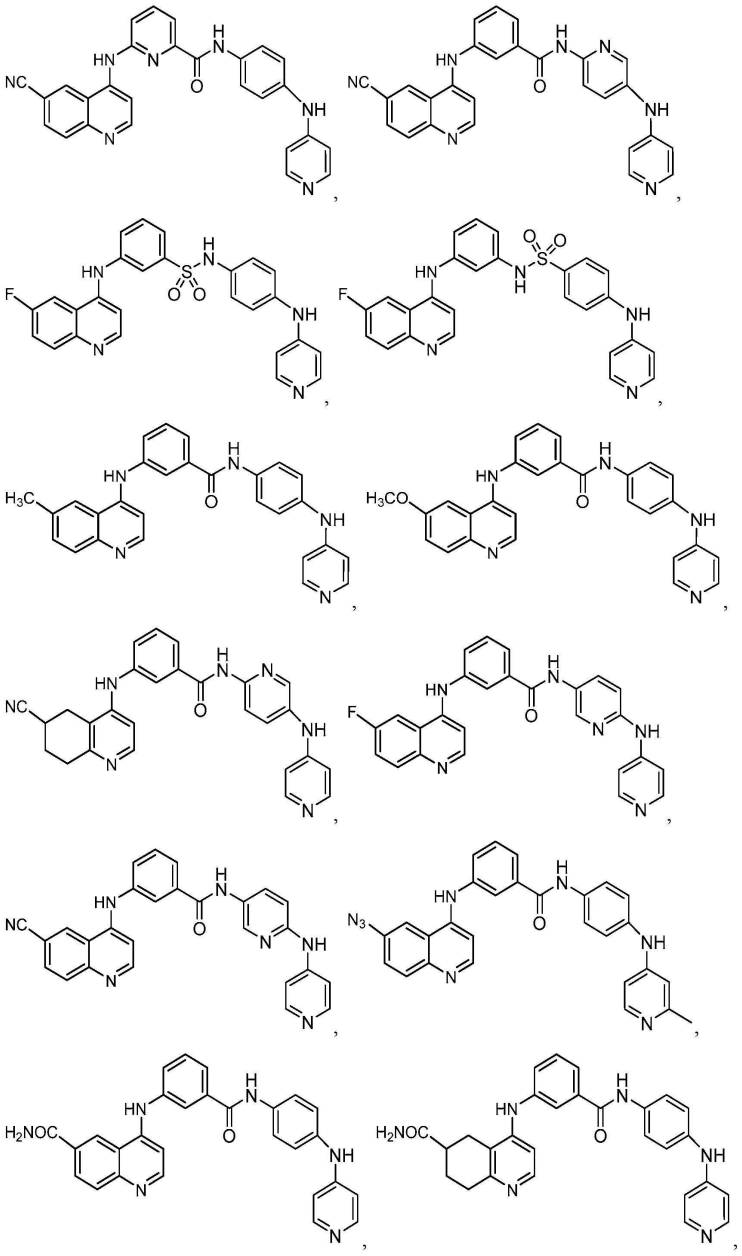




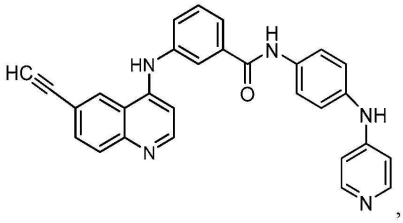
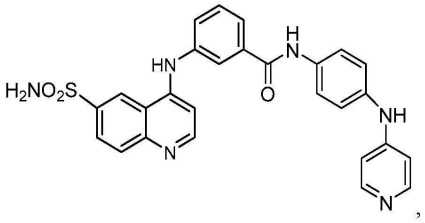
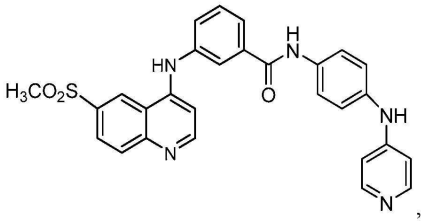
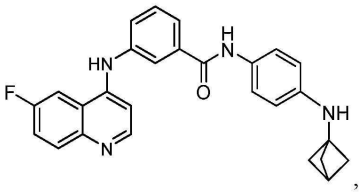
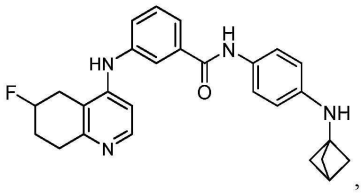
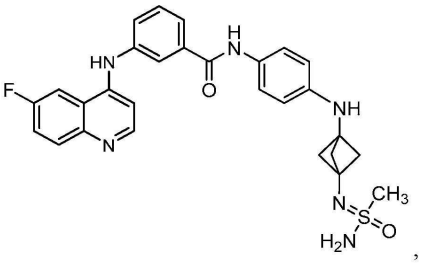
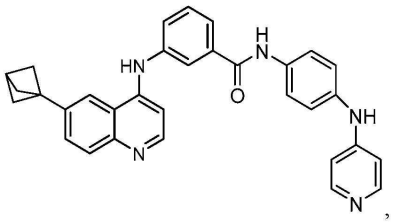
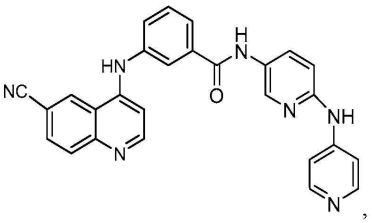
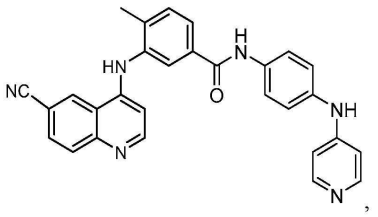
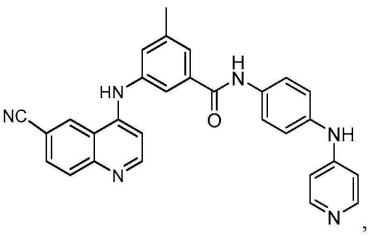
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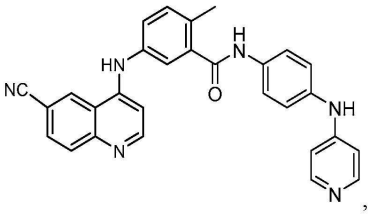
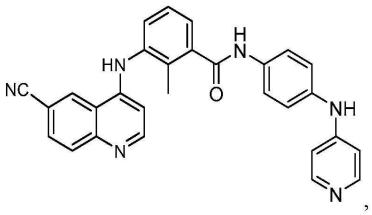
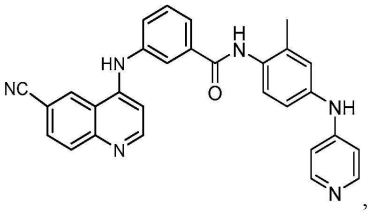
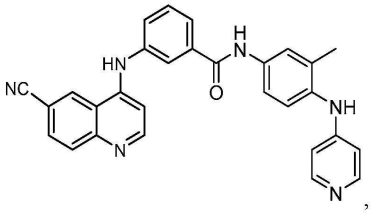
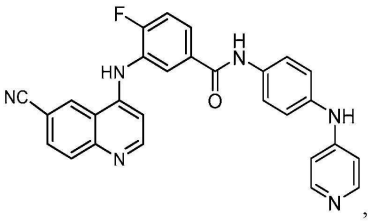
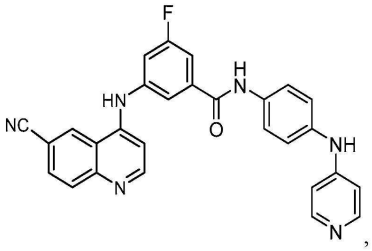
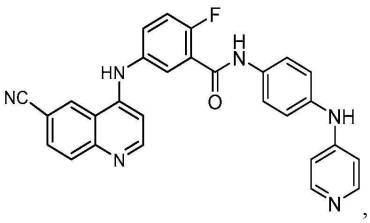
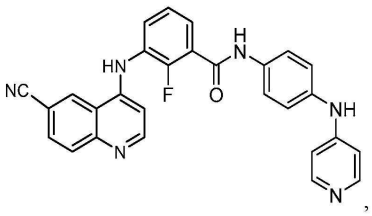
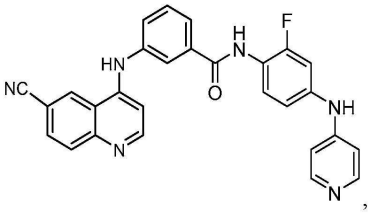
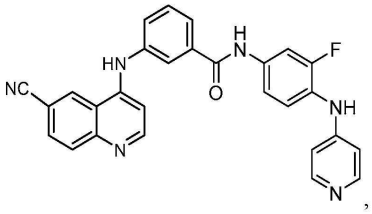


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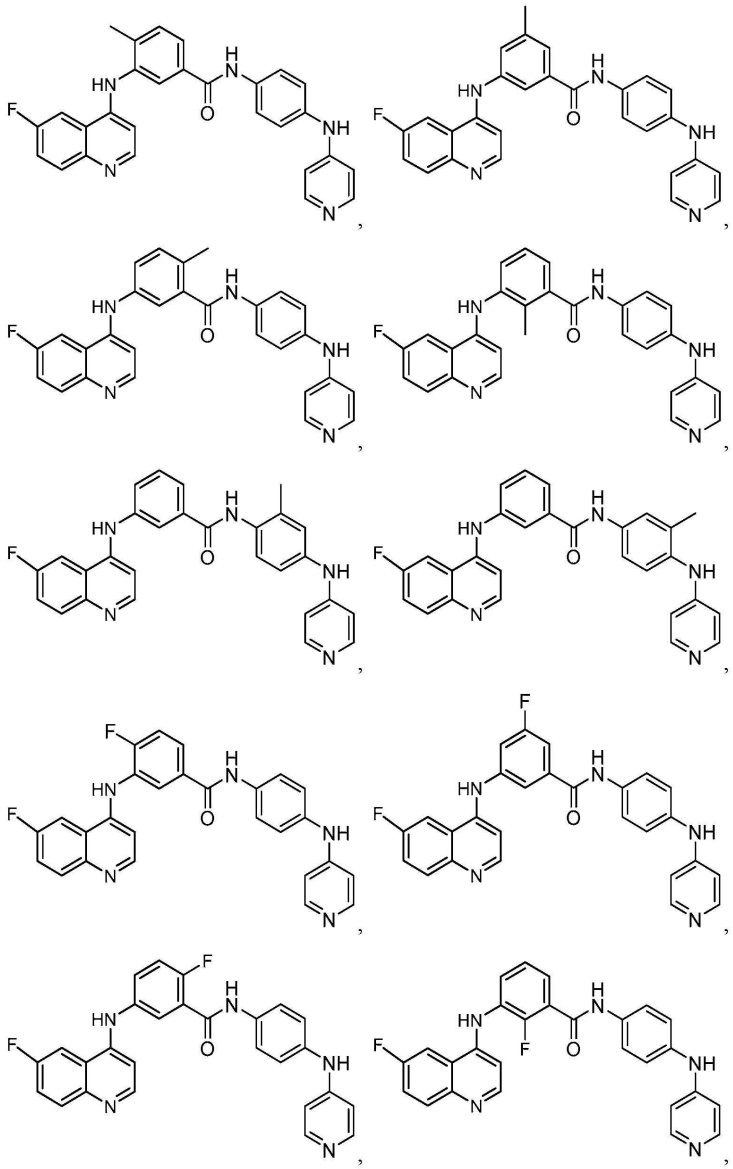


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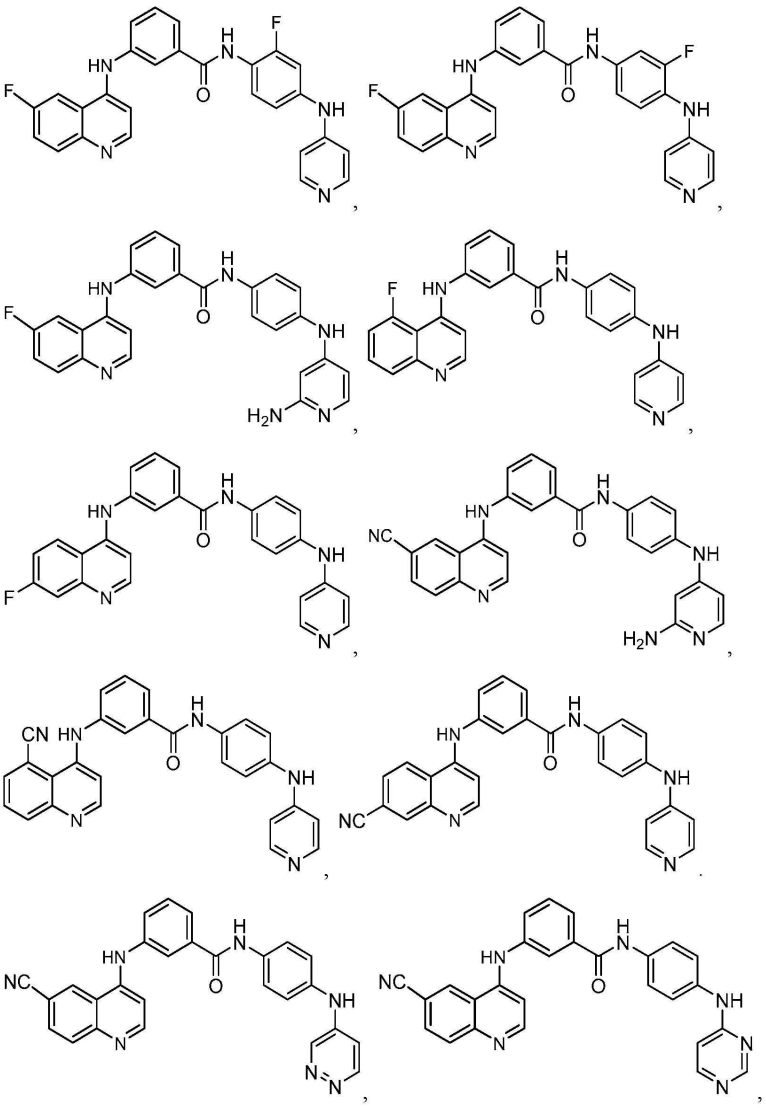

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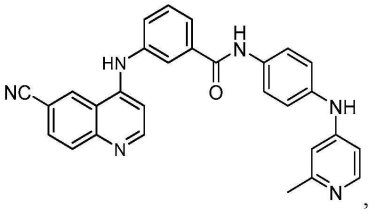
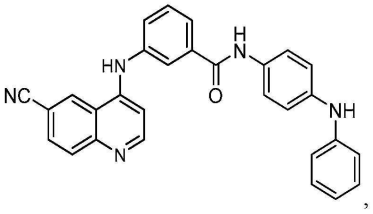
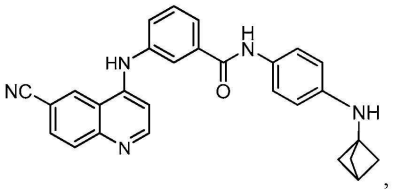
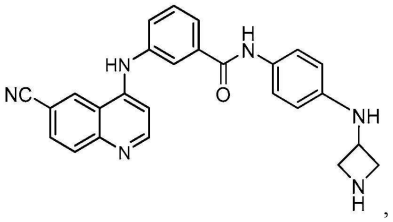
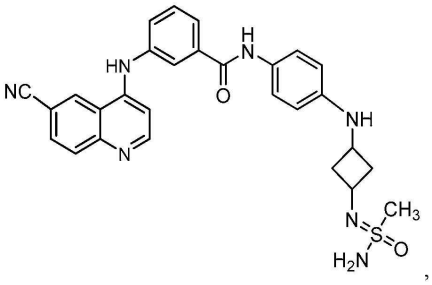
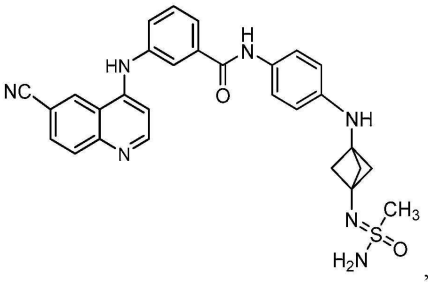
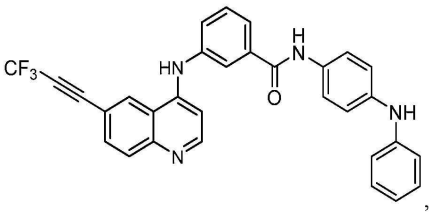
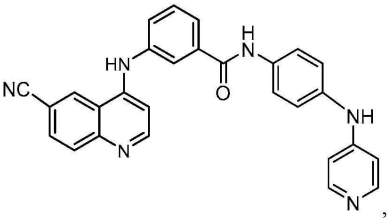
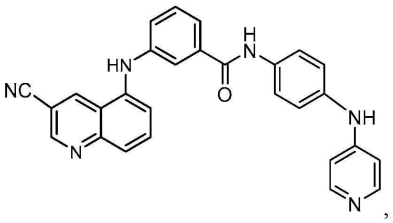
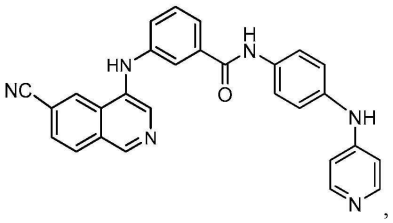
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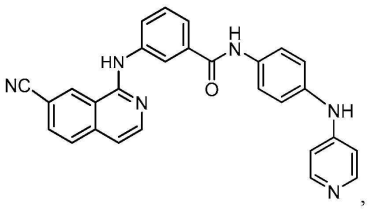
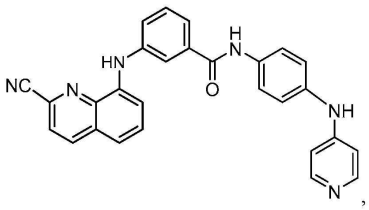
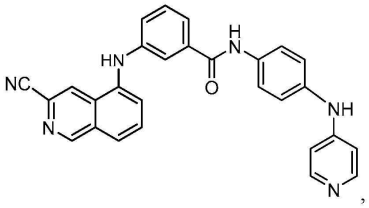
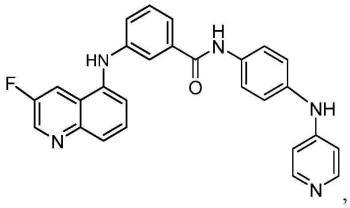
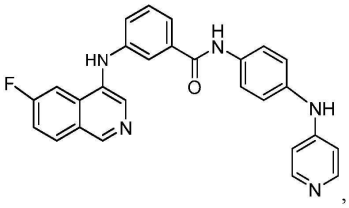
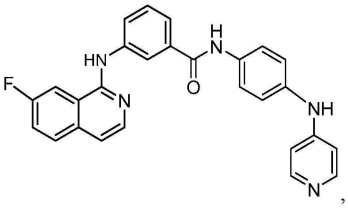
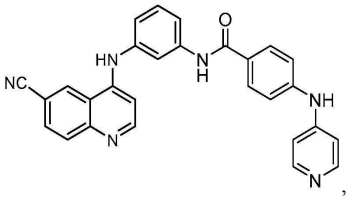
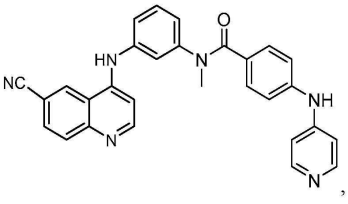
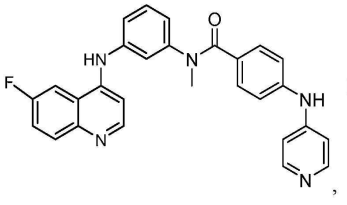
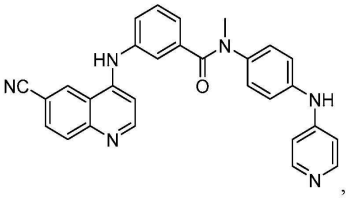
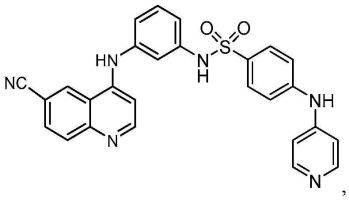
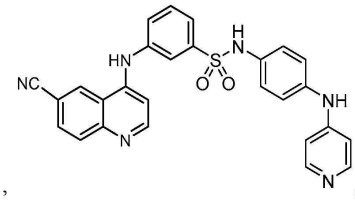
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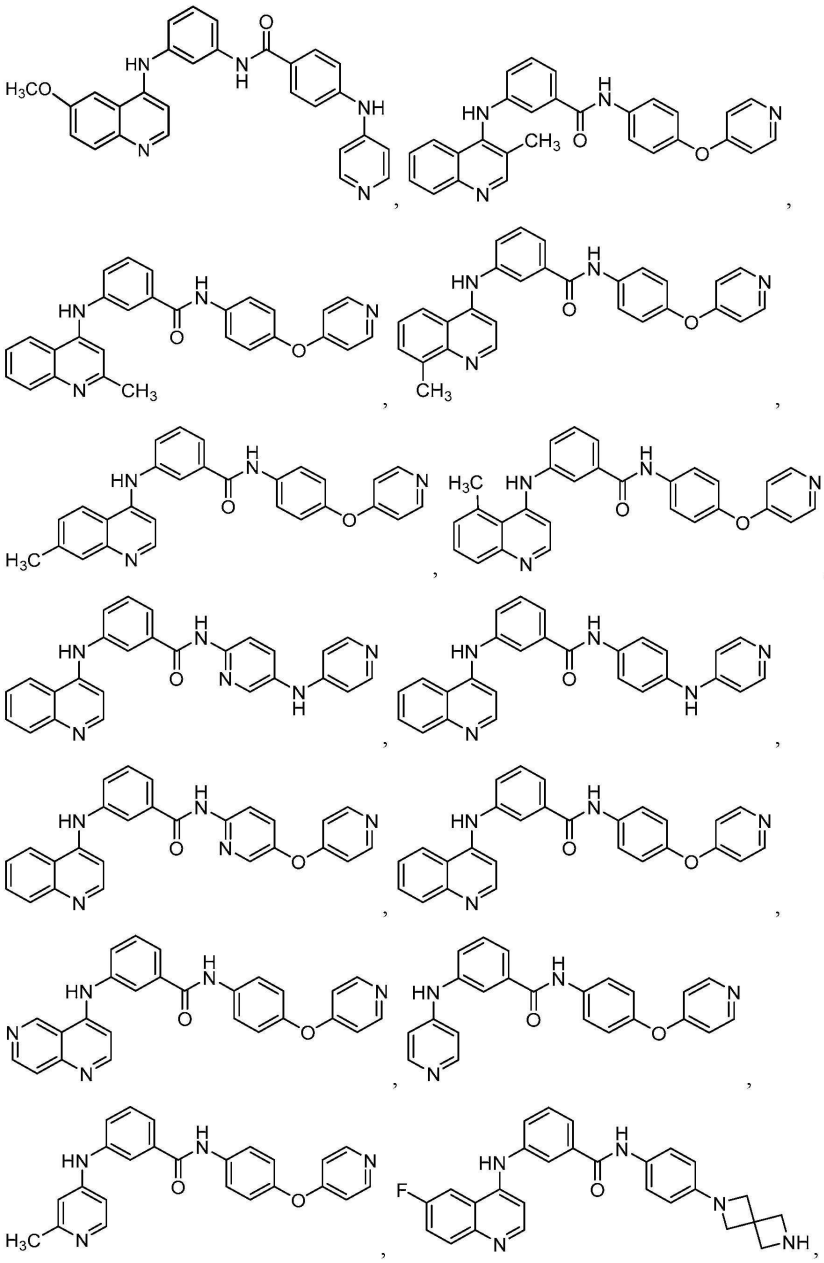
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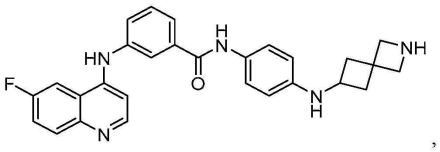
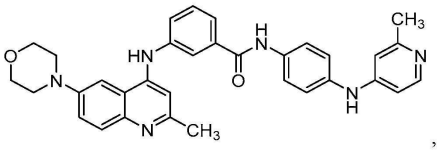
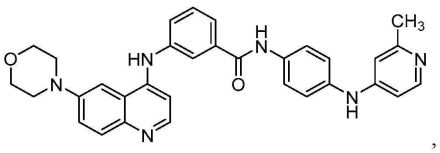
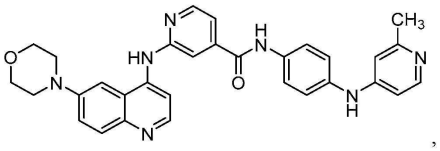
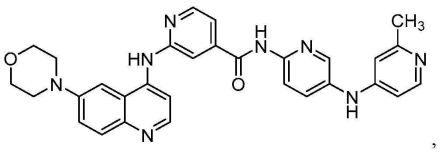
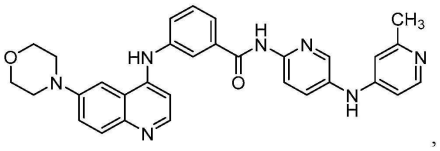
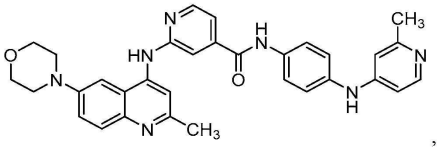
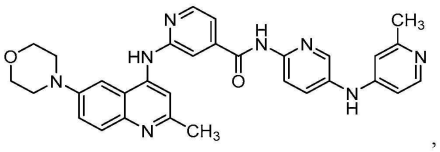

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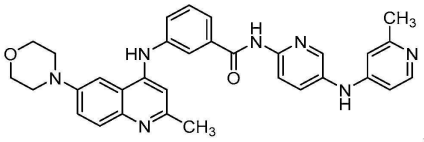
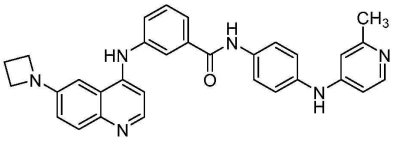
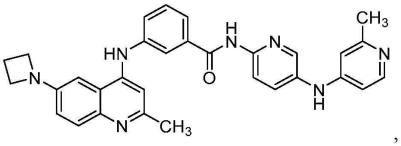
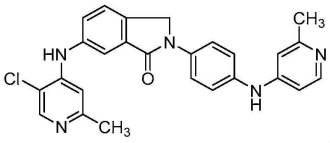
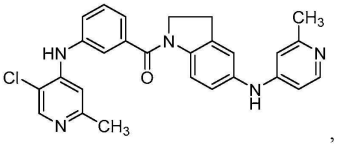
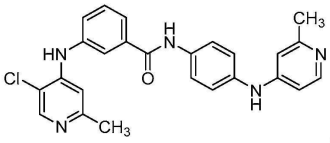
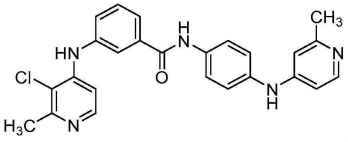
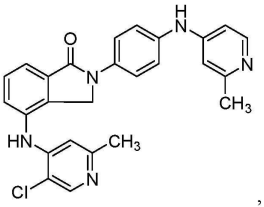
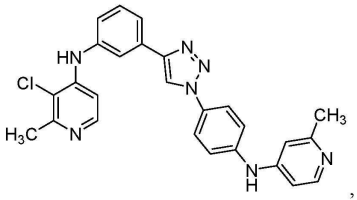
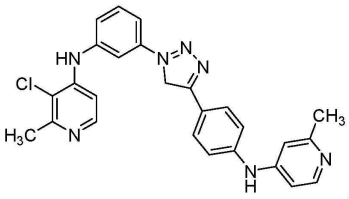
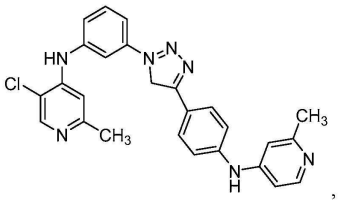
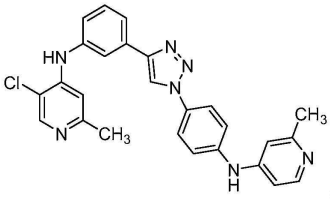
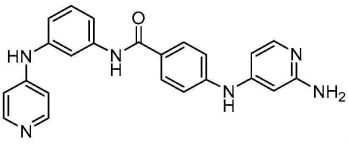
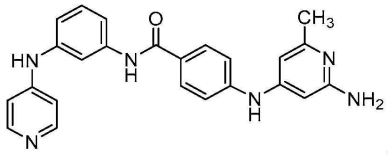
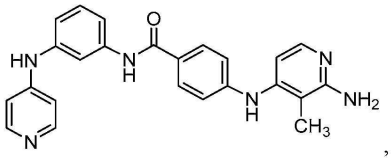
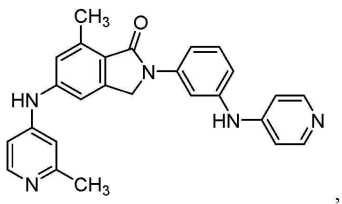
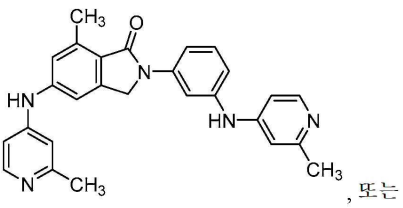
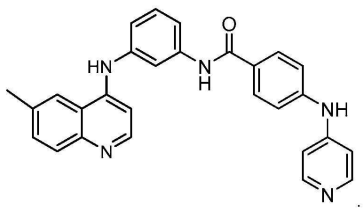
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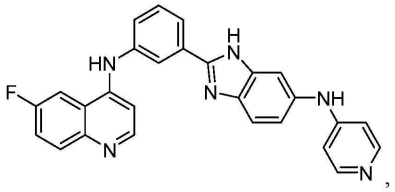
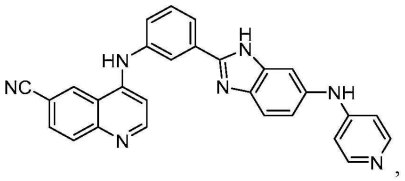
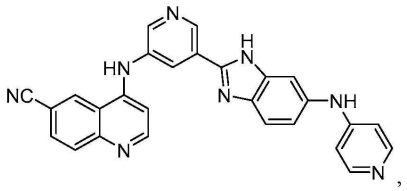
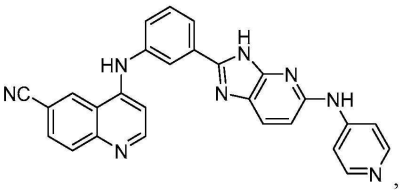
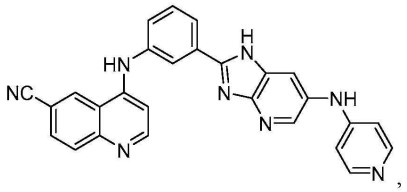
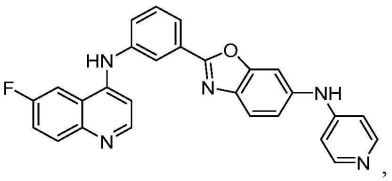
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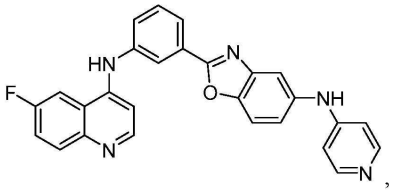
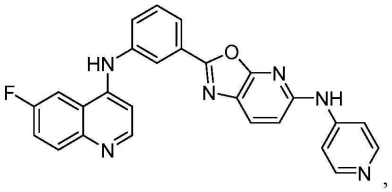
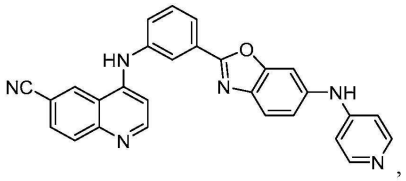
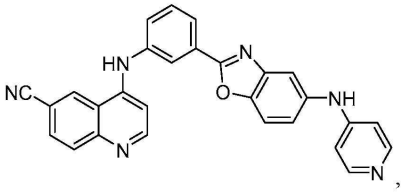
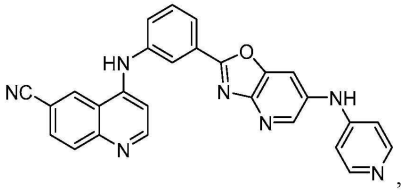
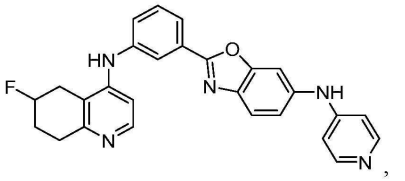
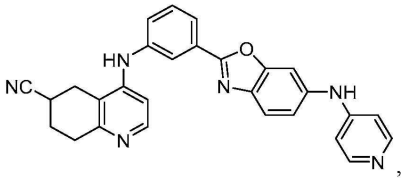
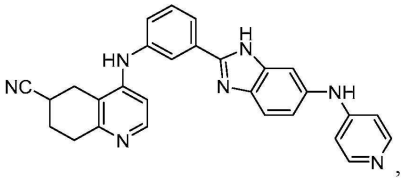
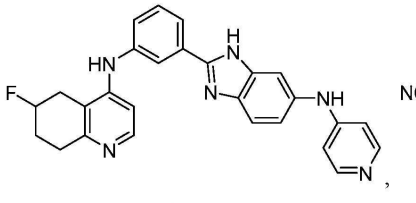
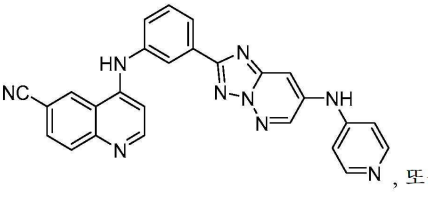
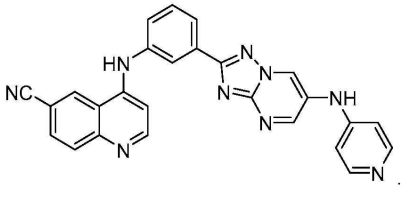
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[0694]

[0695] 일부 실시양태에서, 화학식 IIIb의 화합물은 하기 화합물이다:


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[0696]

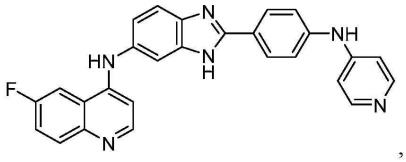
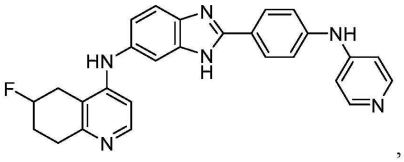
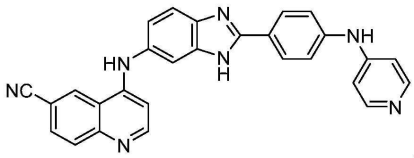
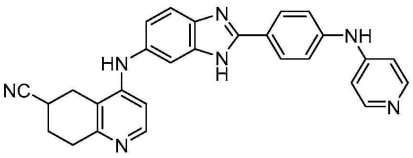
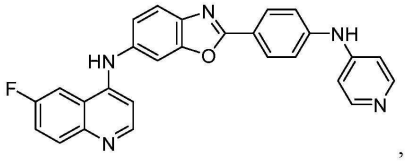
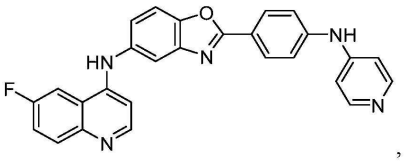
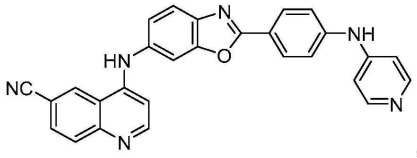
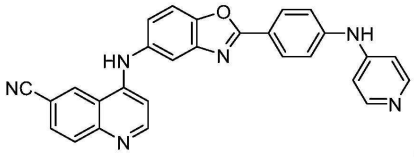
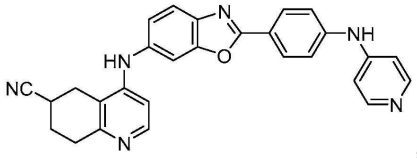
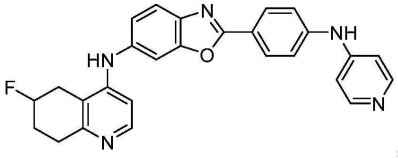
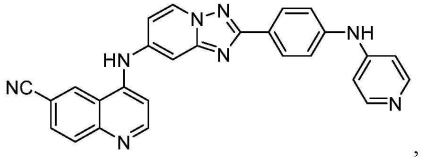
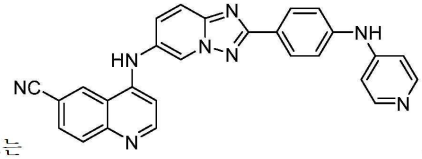

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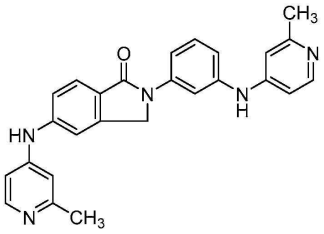
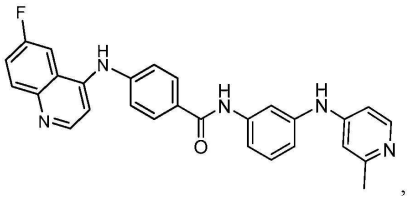
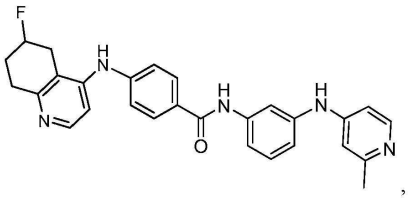
[0698] 일부 실시양태에서, 화학식 IIIc의 화합물은 하기 화합물이다:

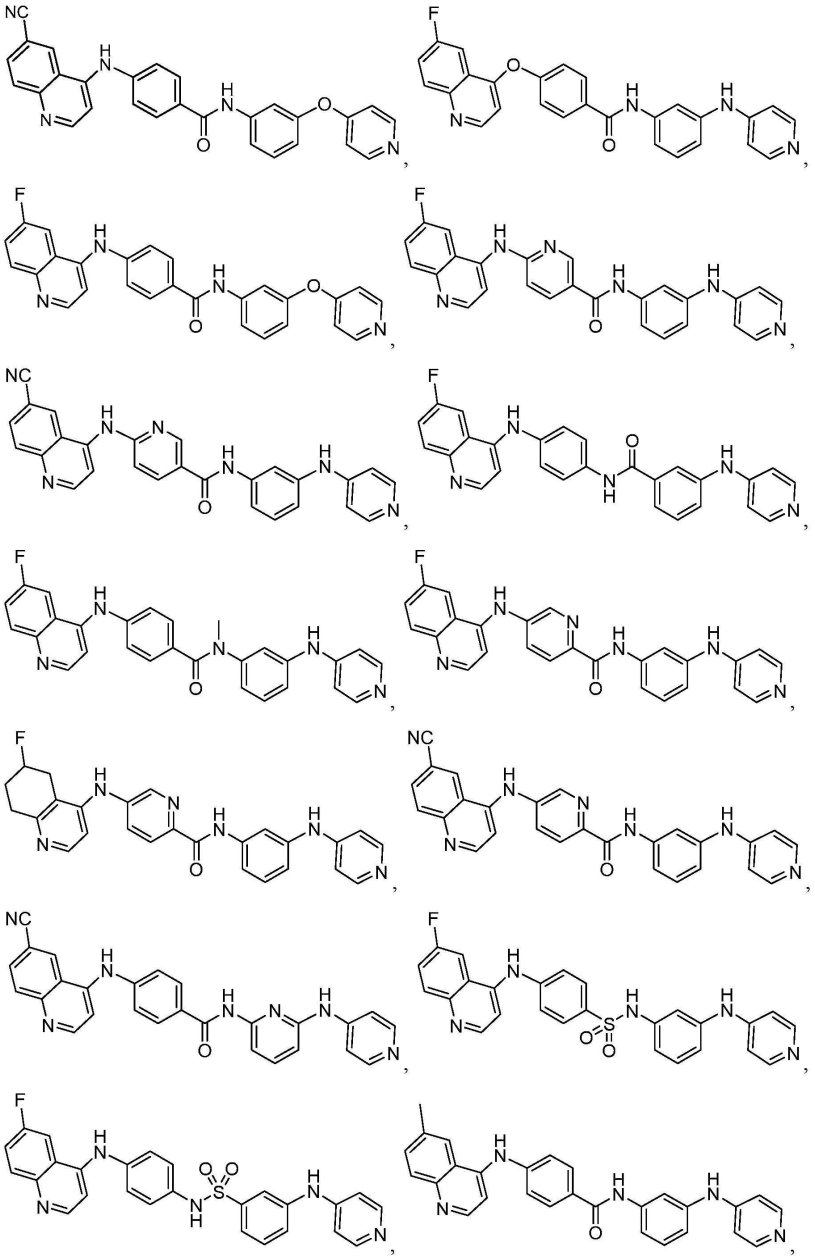

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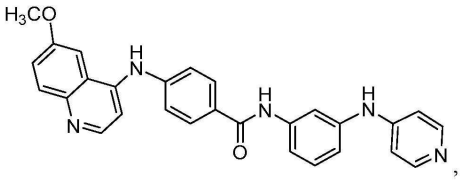
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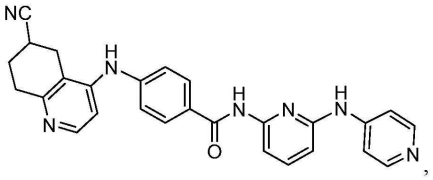
[0700] 일부 실시양태에서, 화학식 IVa의 화합물은 하기 화합물이다:

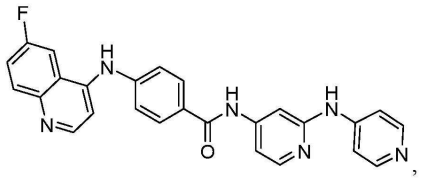

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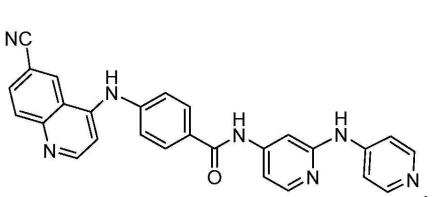


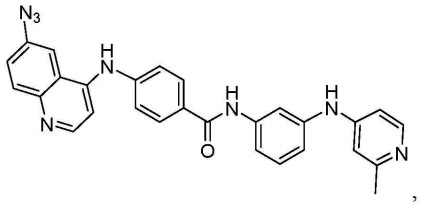
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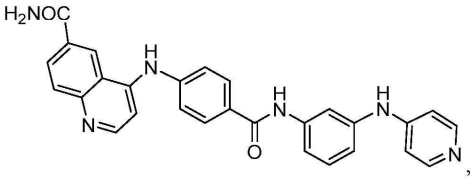


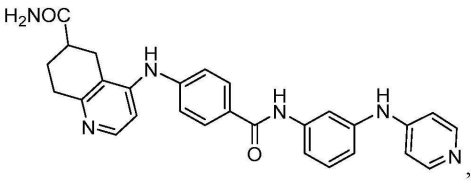


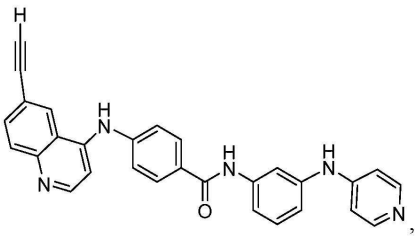




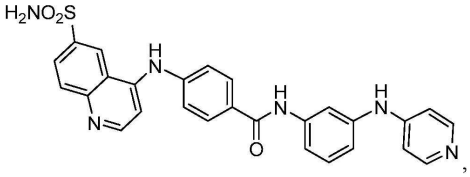


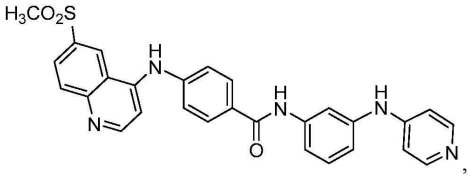


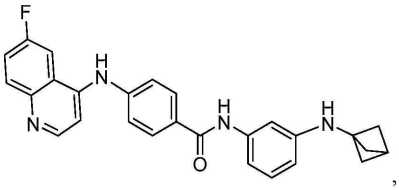


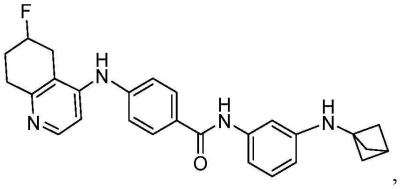


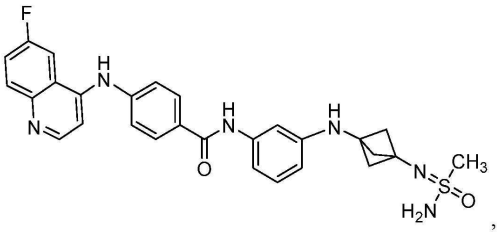
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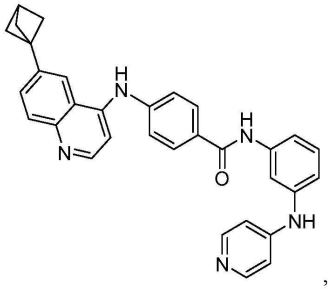


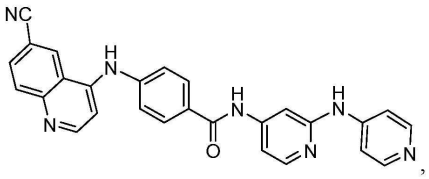


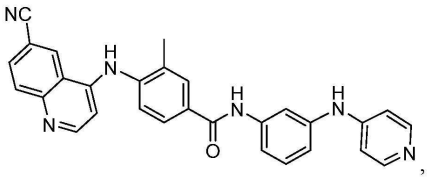


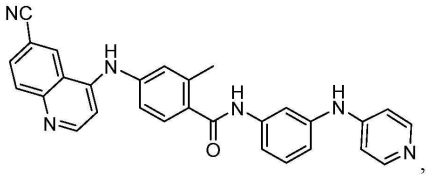


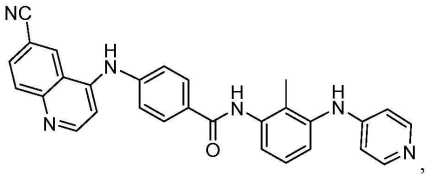




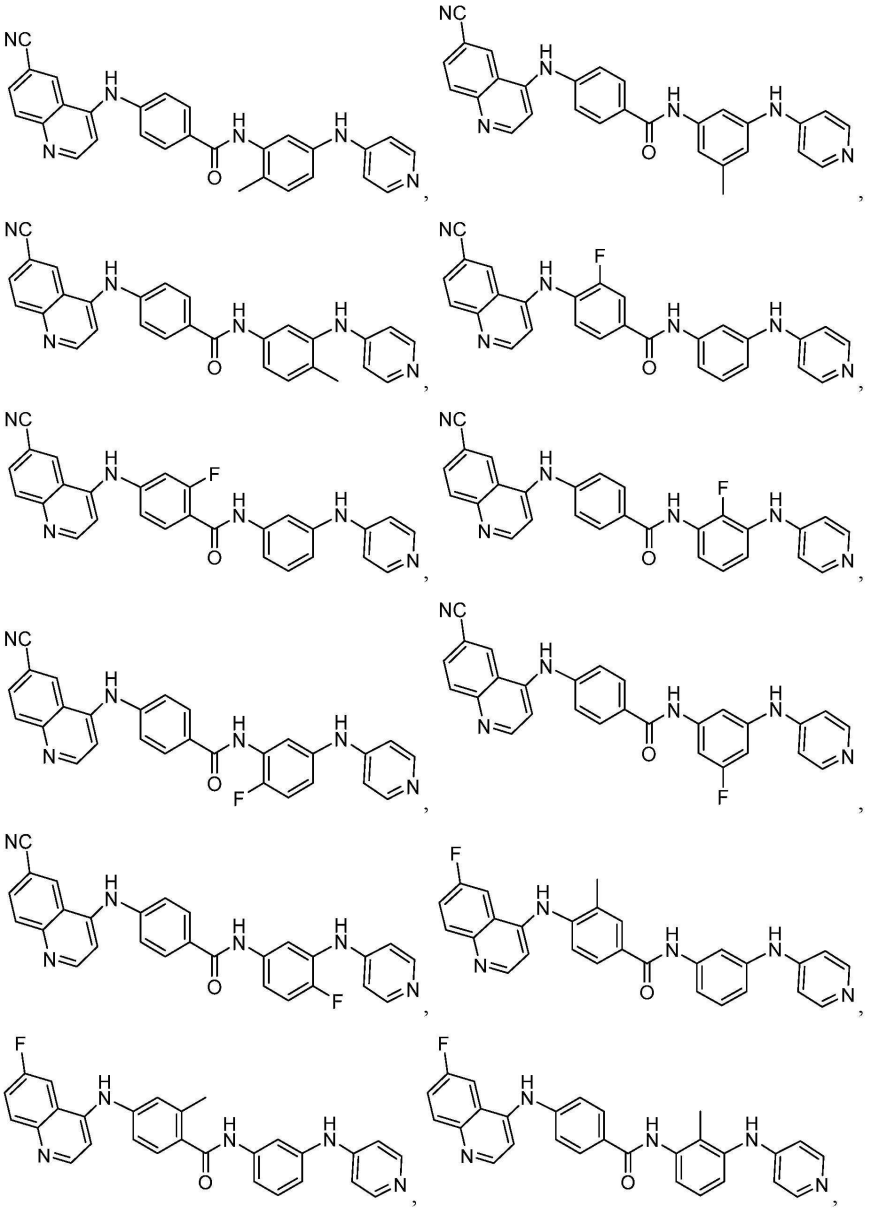


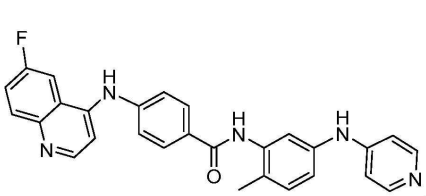
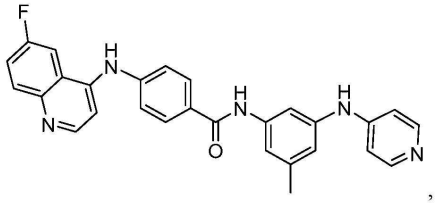
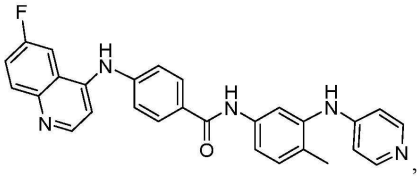
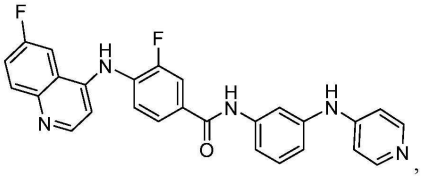
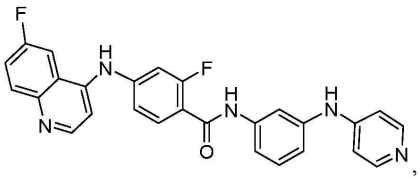
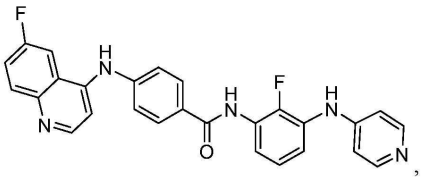
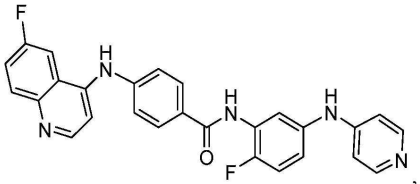
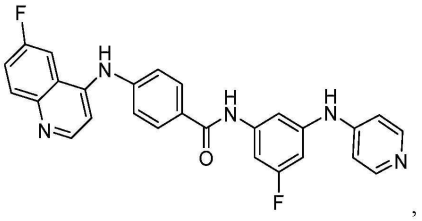
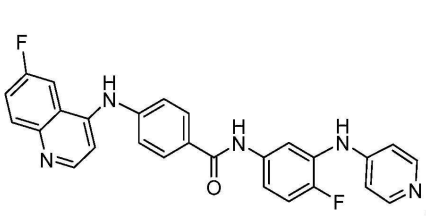
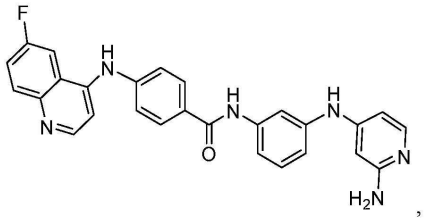




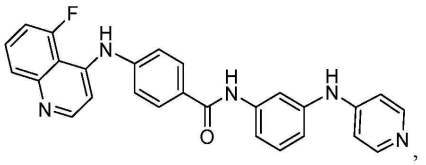


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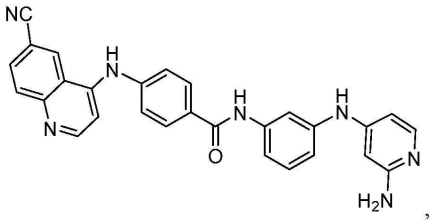
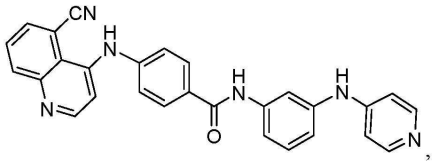
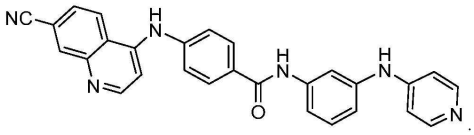
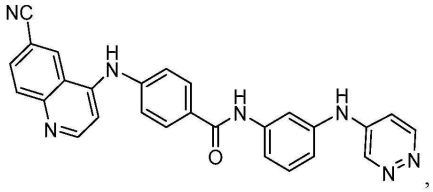
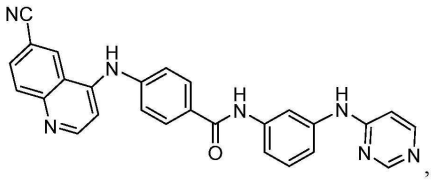
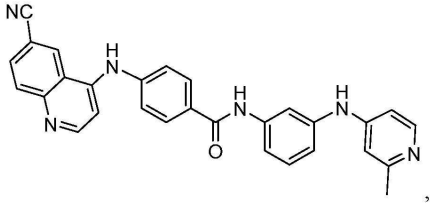
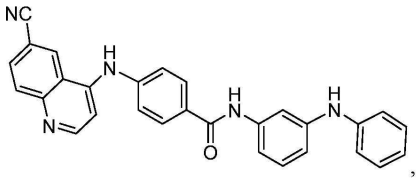
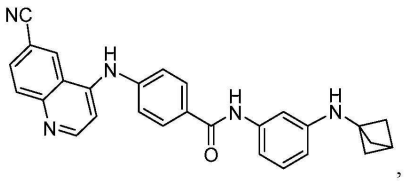
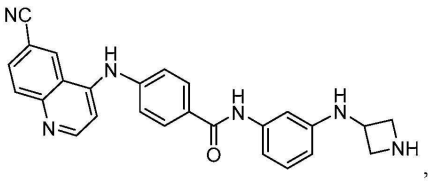
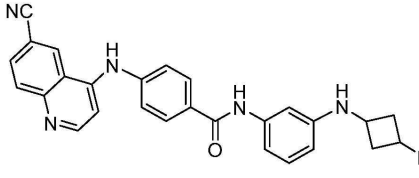
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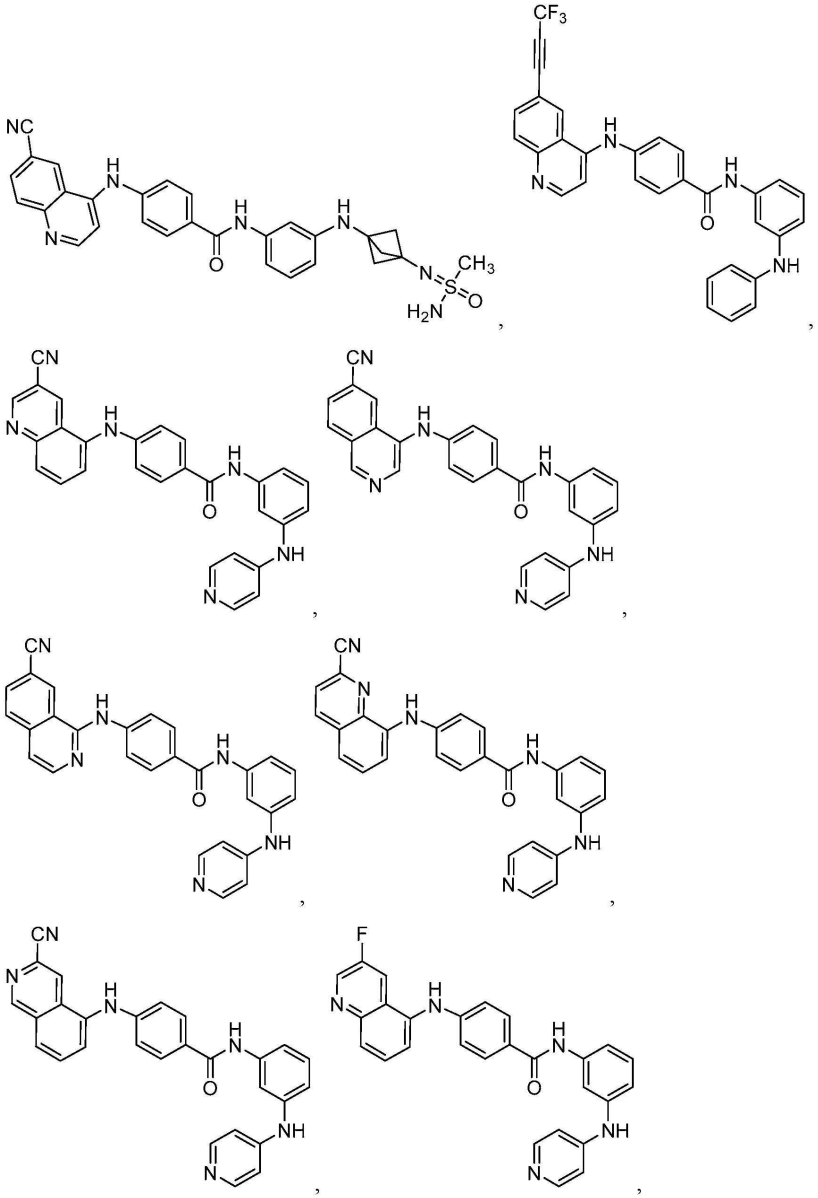
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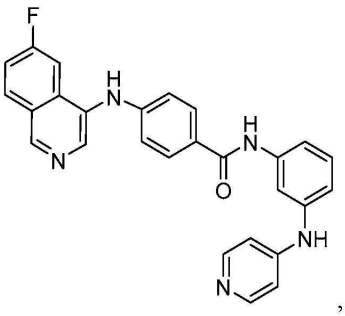
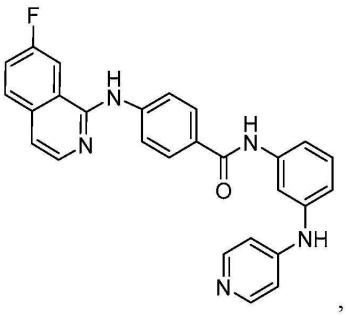
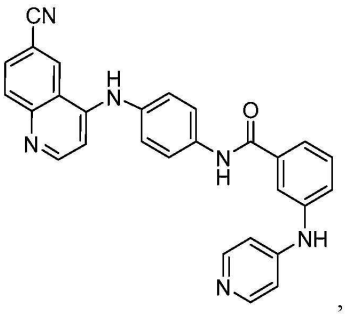
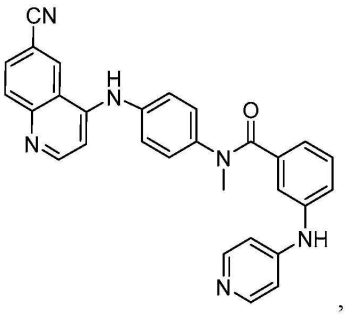
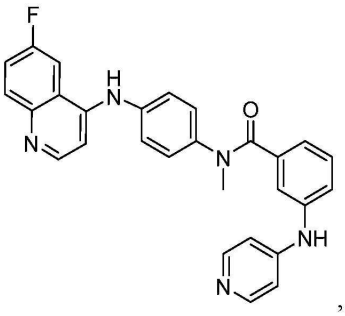
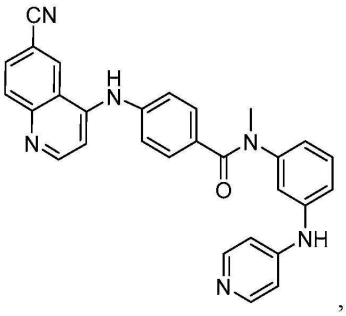
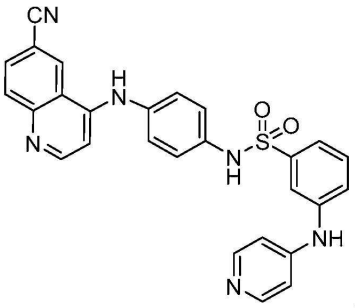
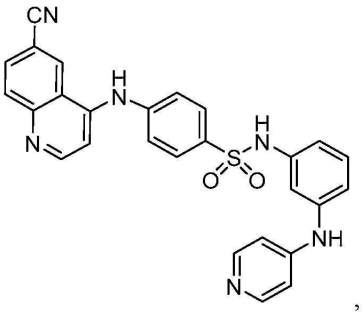
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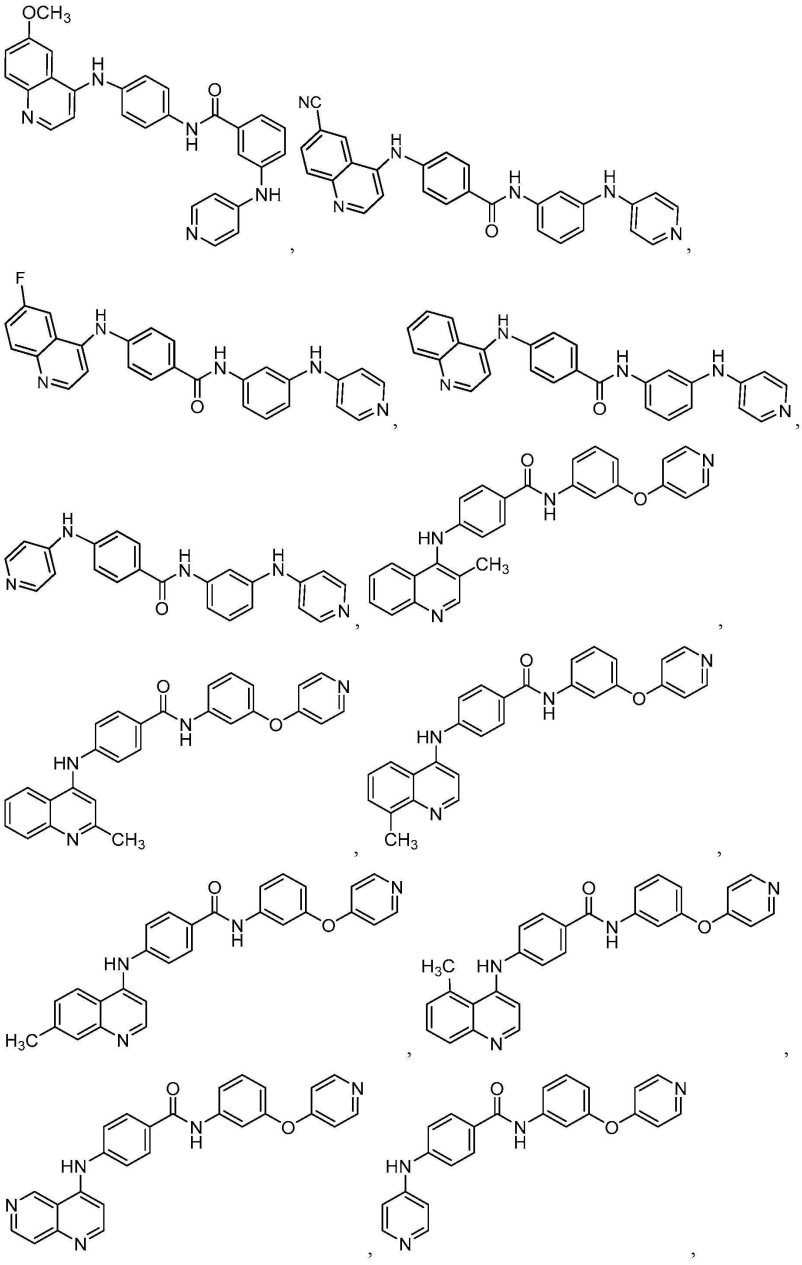
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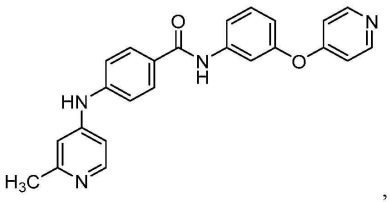
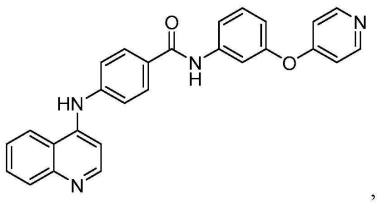
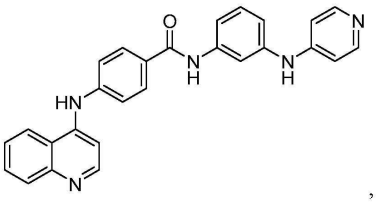
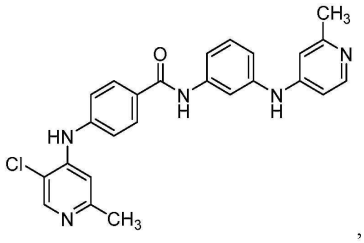
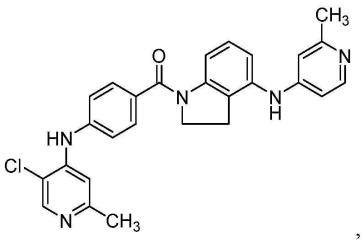
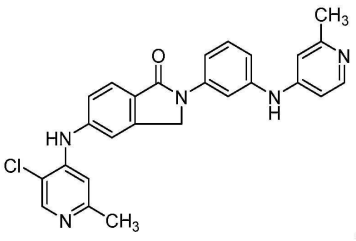
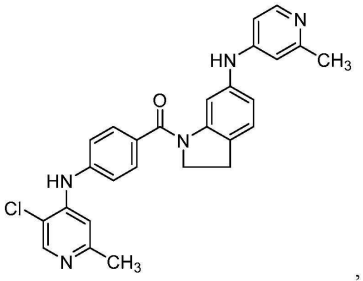
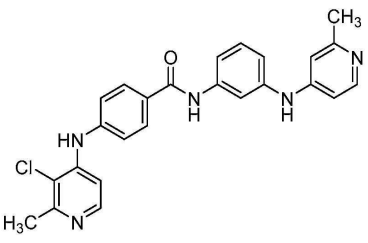
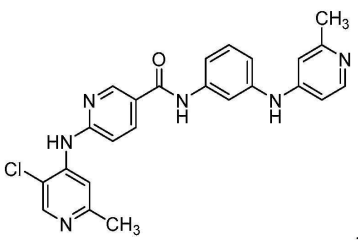
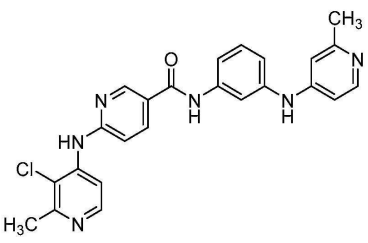
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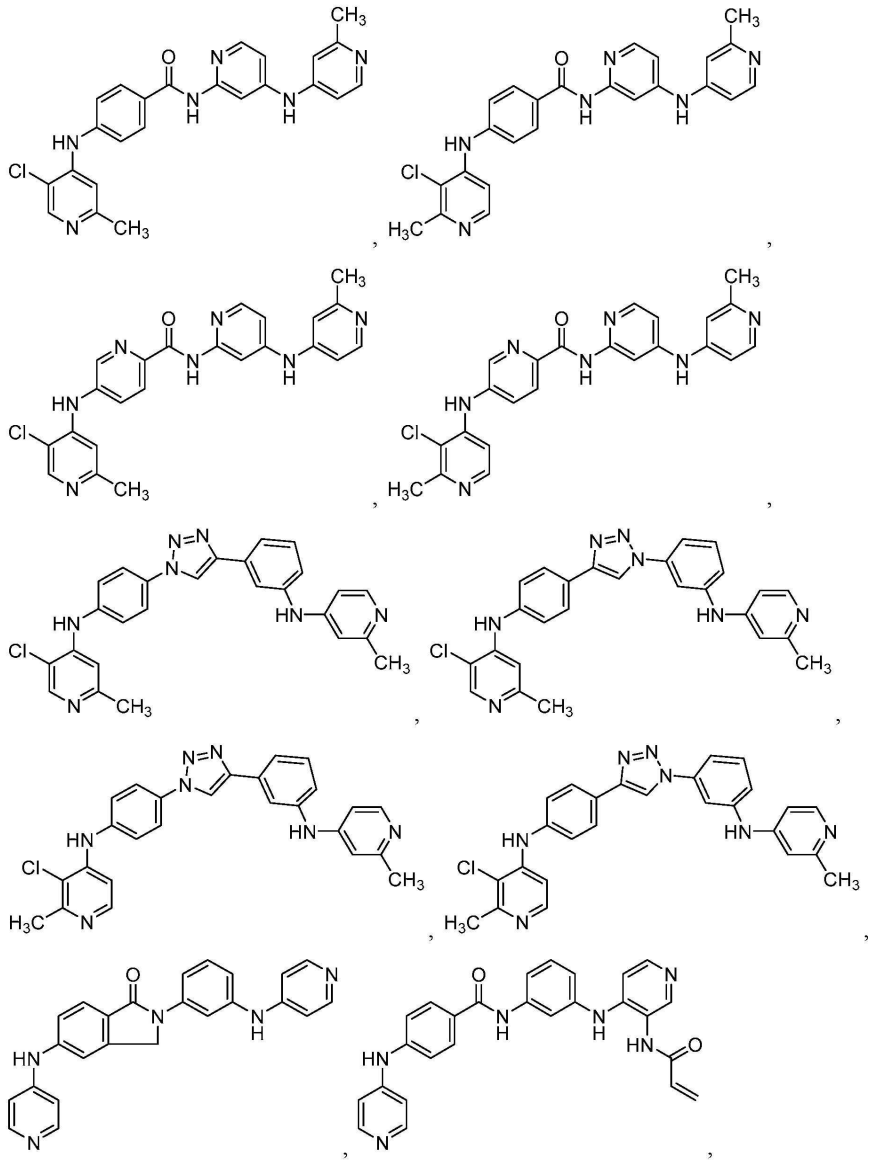

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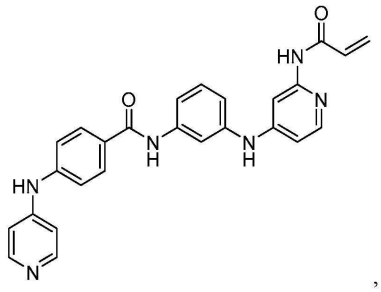
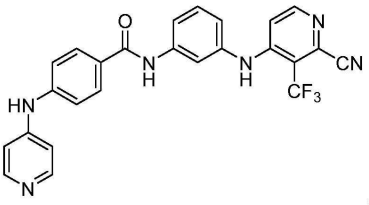
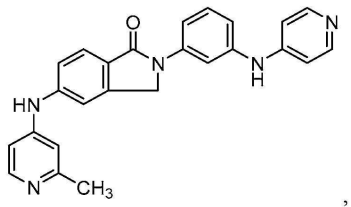
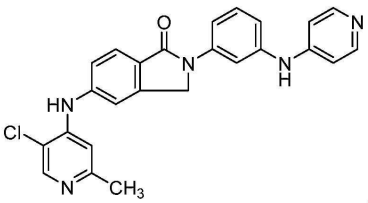
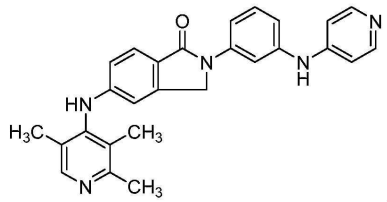
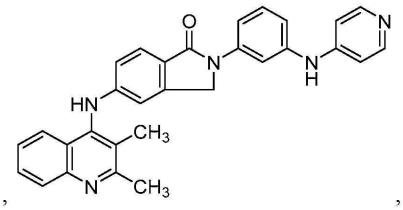
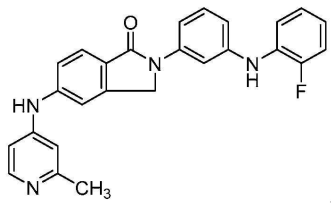
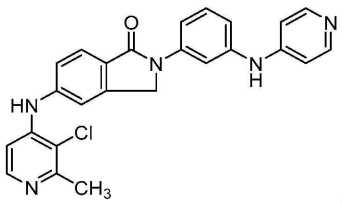
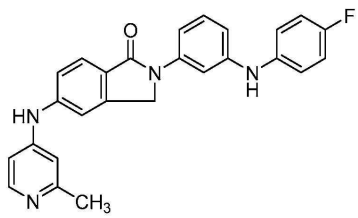
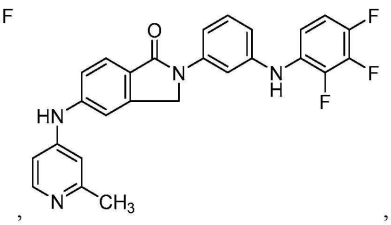
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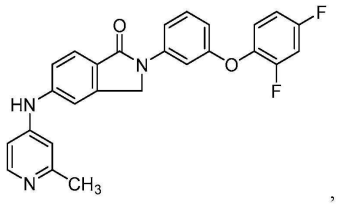
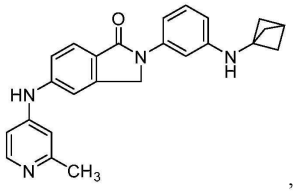
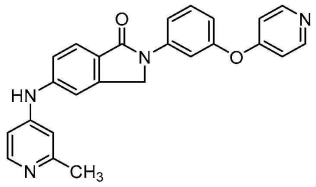
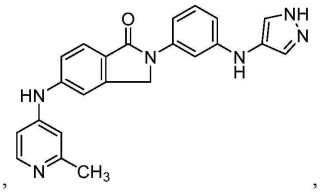
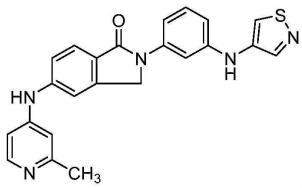
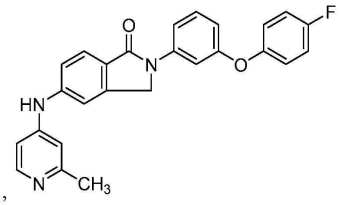
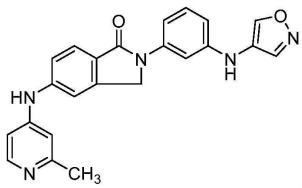
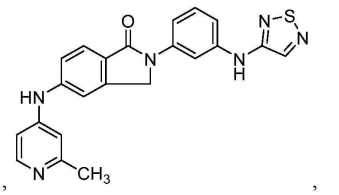
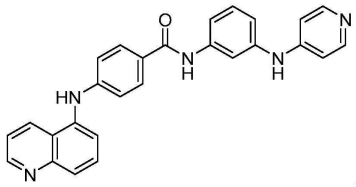
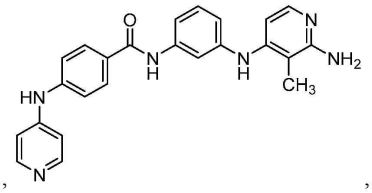
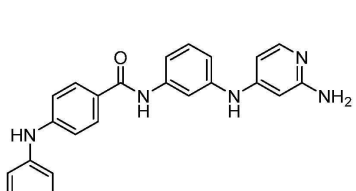
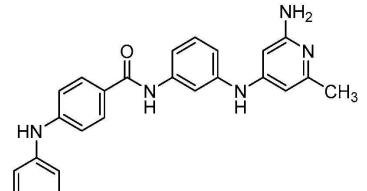


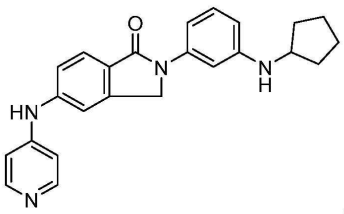
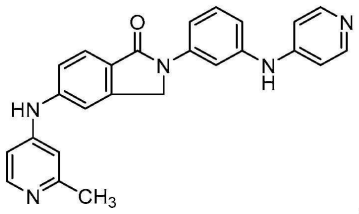
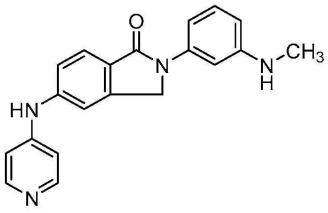
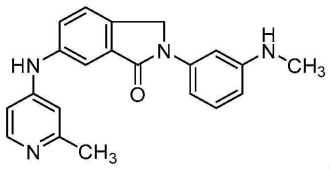
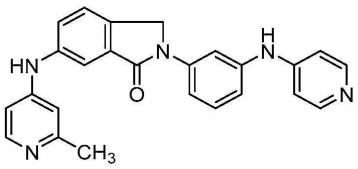
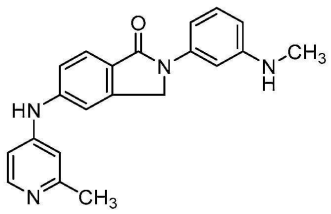
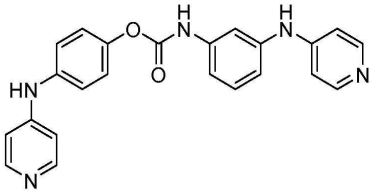
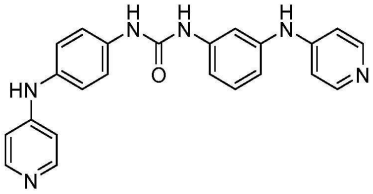
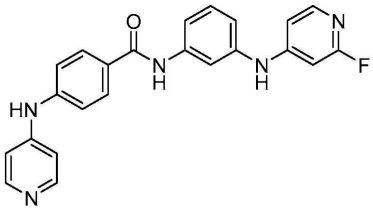
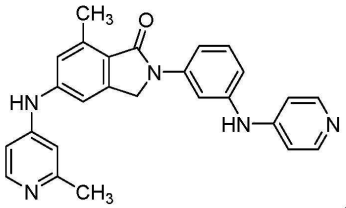
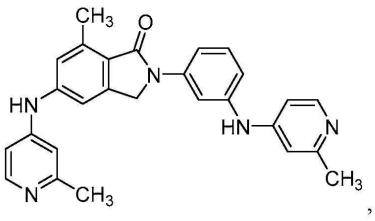
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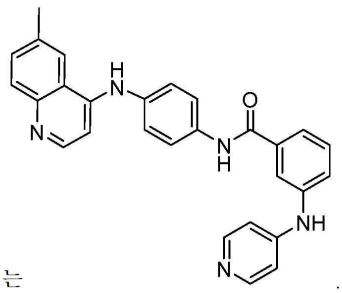
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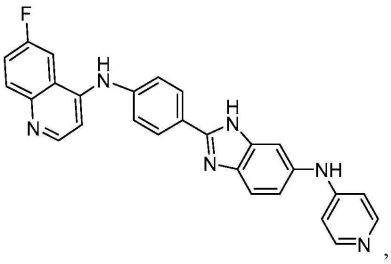
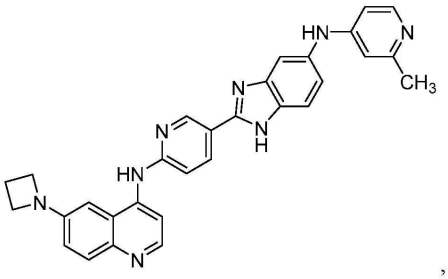
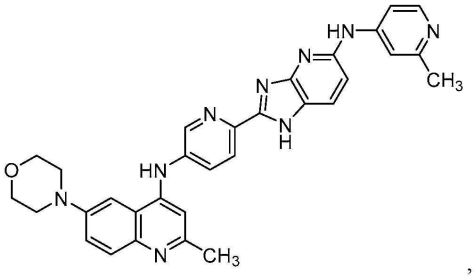
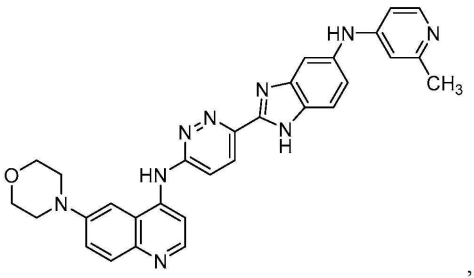
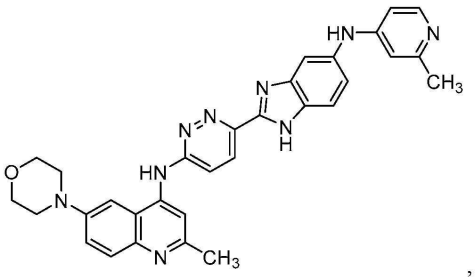
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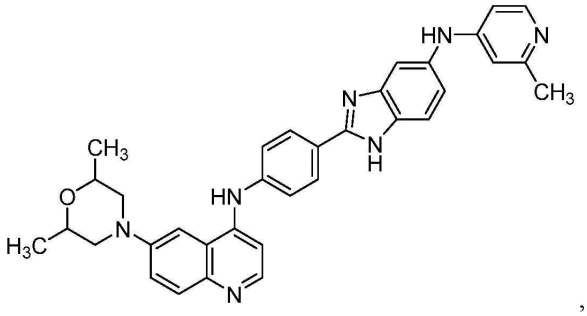
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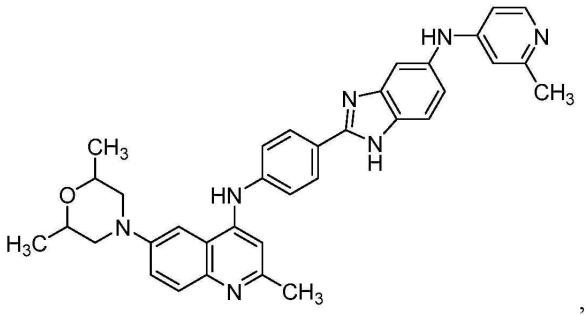
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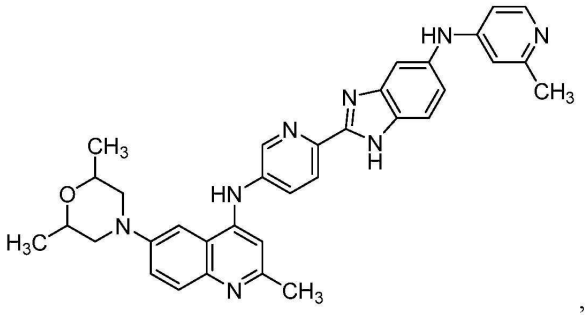
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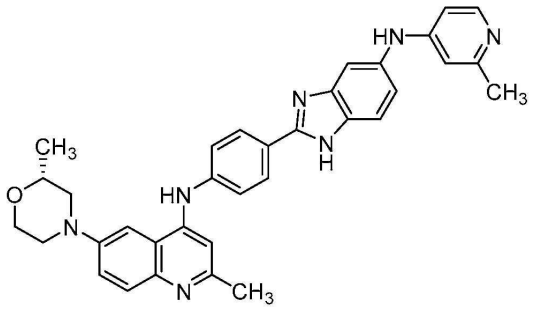

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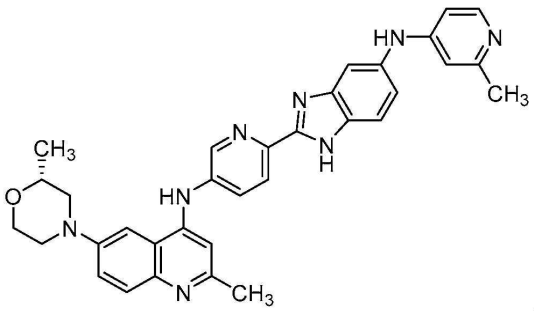

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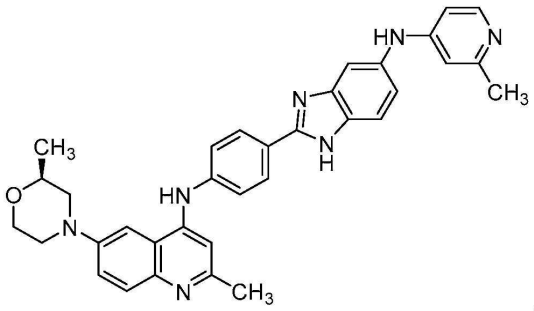

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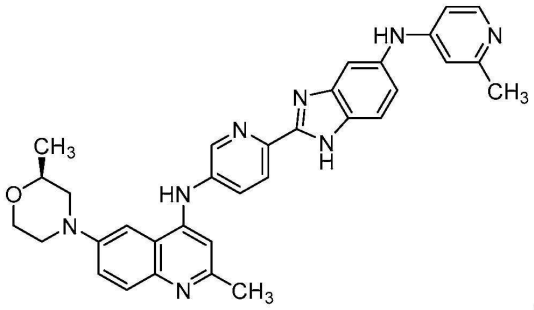

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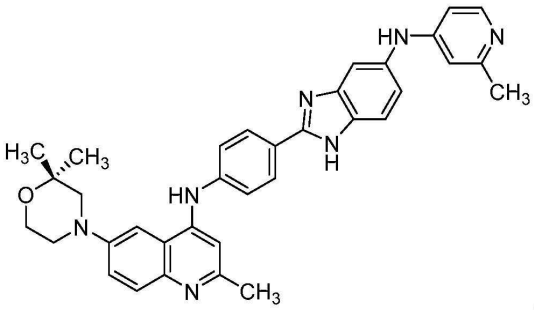

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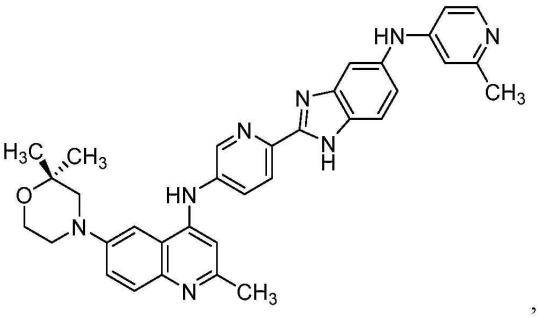

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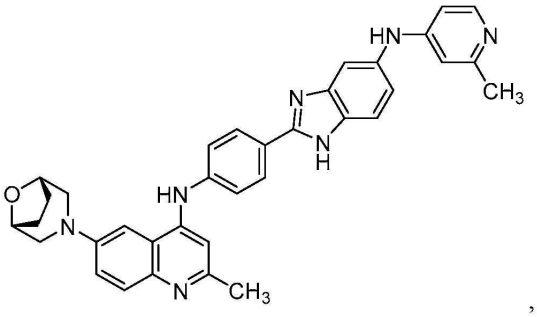

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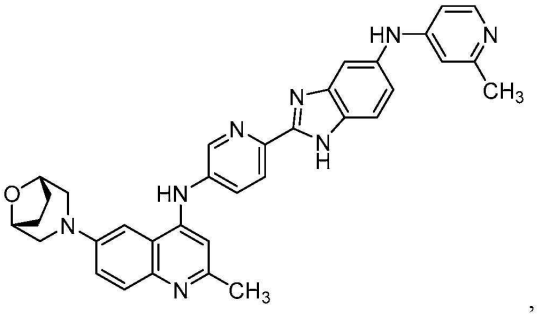

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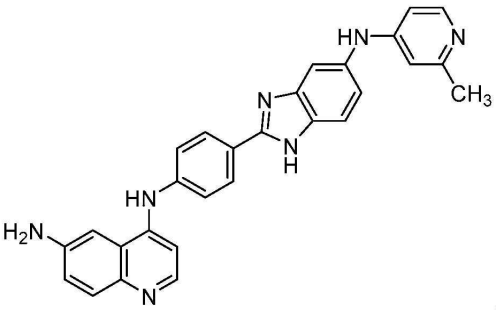

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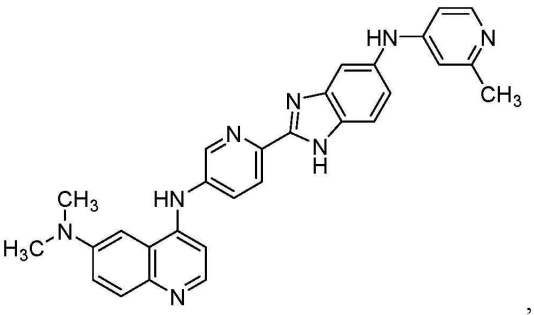

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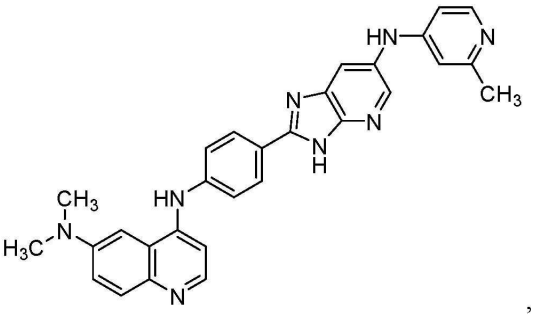

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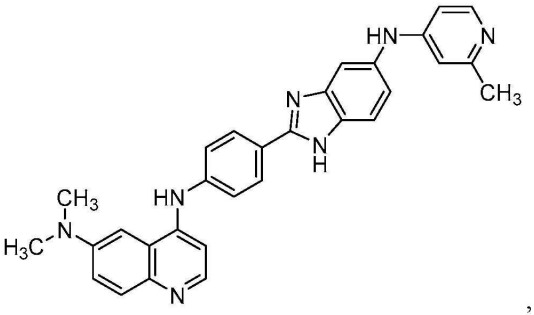

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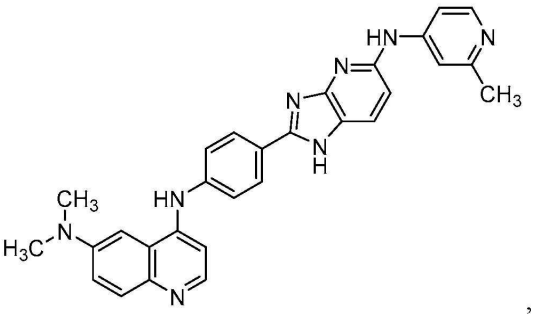

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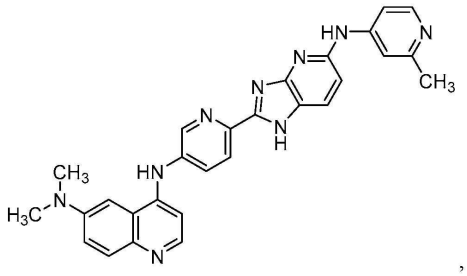
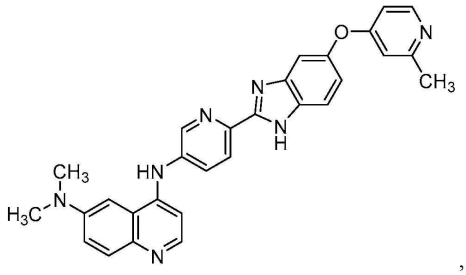
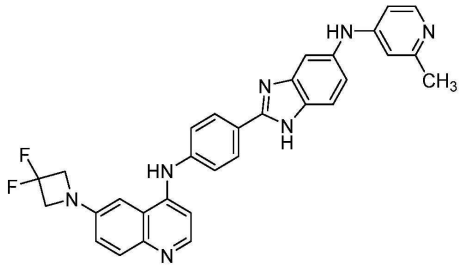
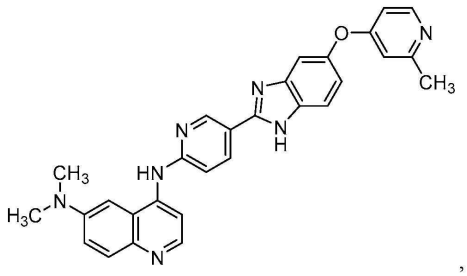
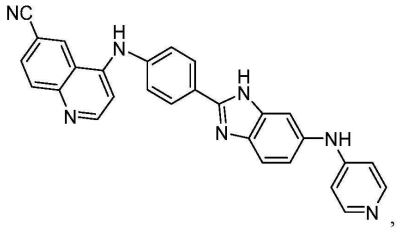

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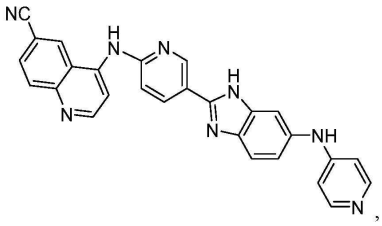
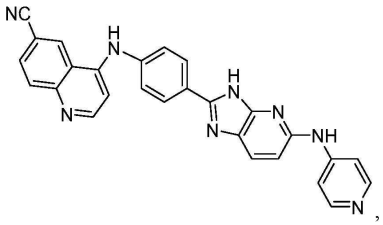
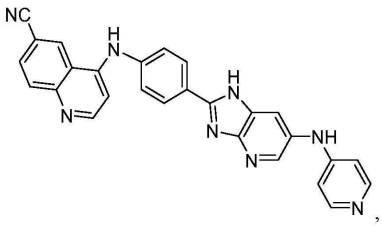
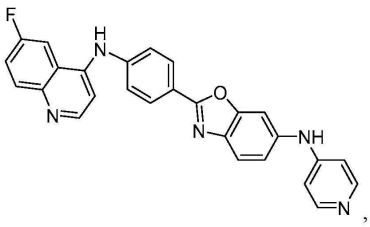
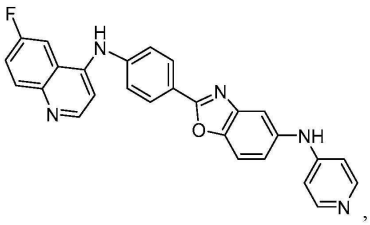
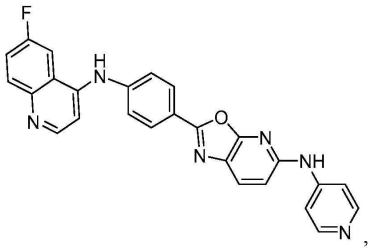
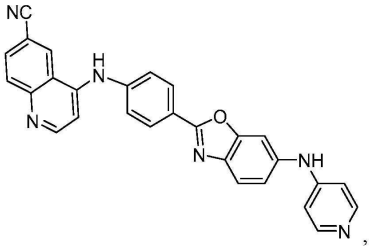
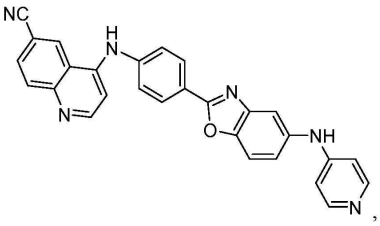
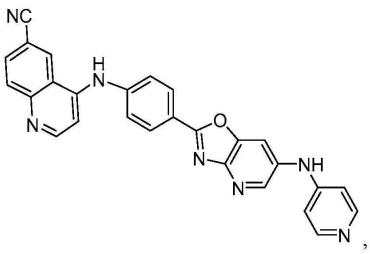

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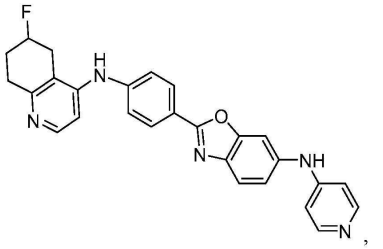

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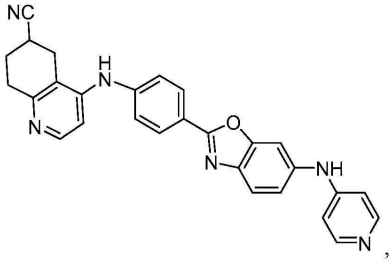
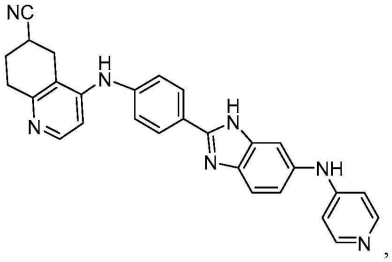
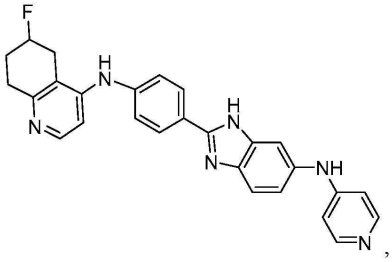
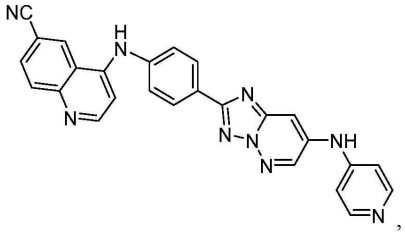
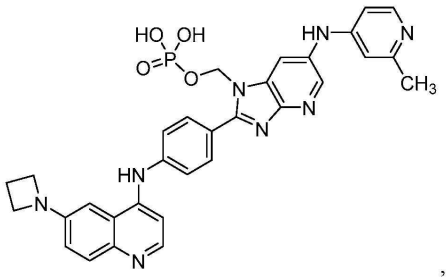
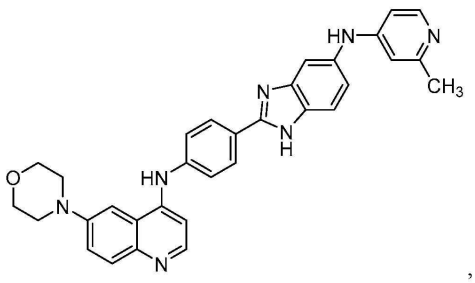
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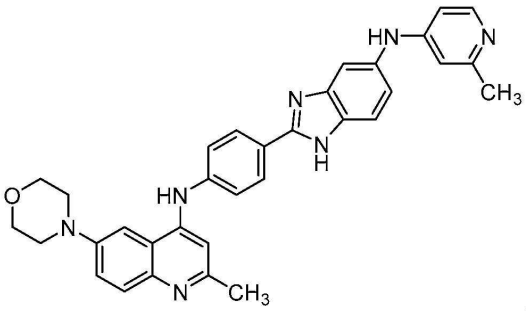
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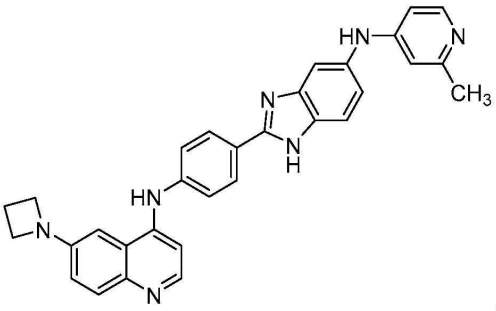
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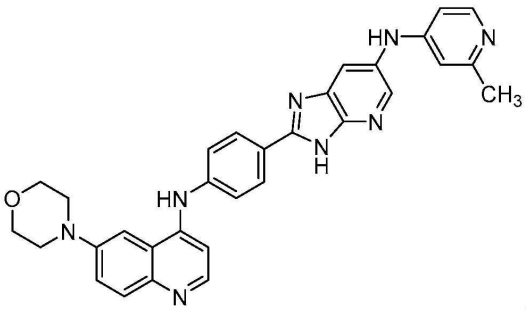
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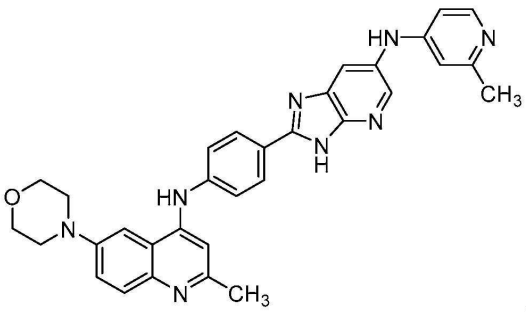

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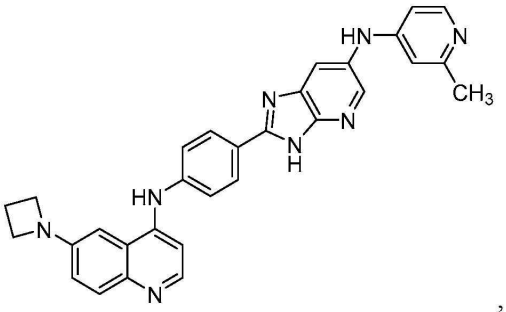

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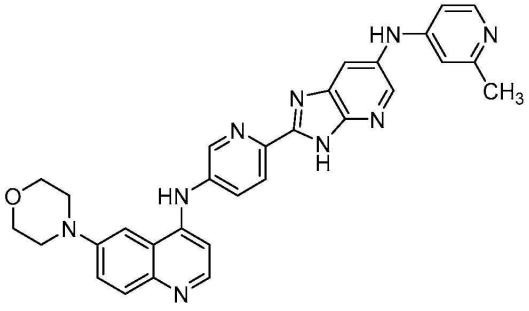

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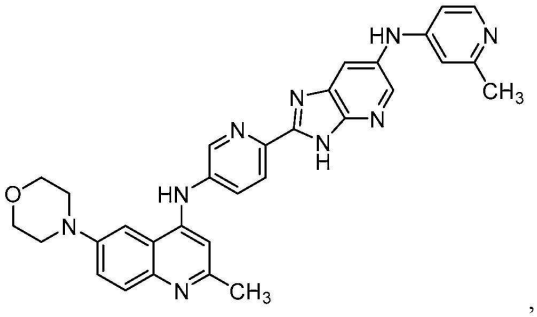

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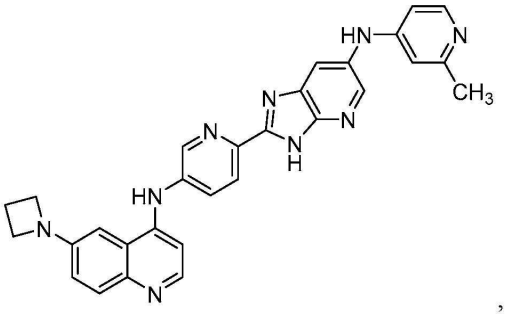

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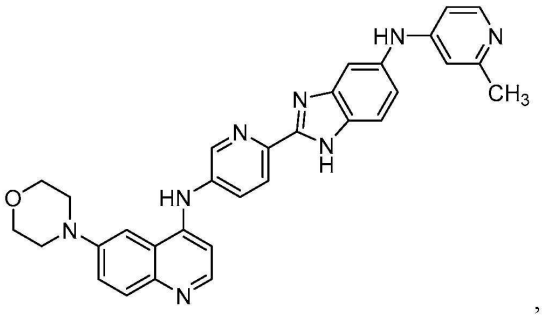

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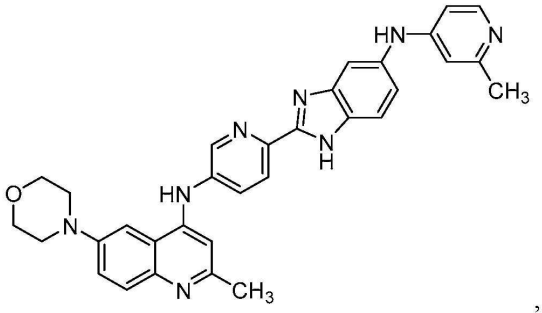

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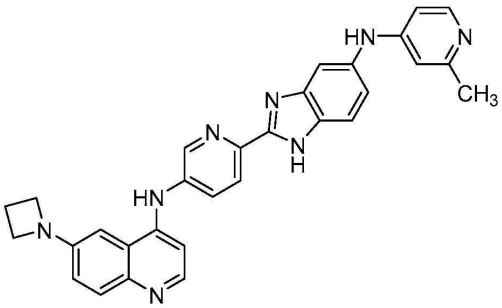

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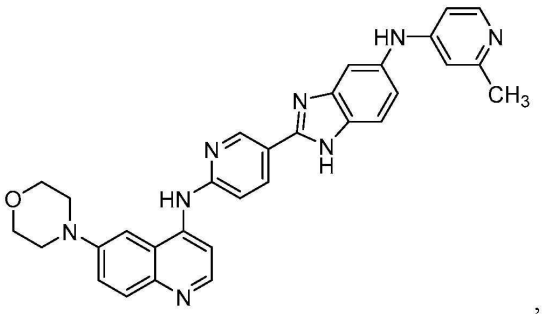

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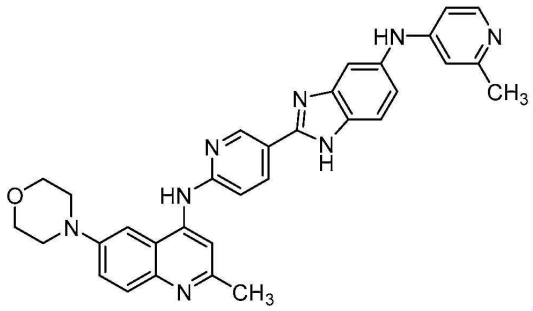

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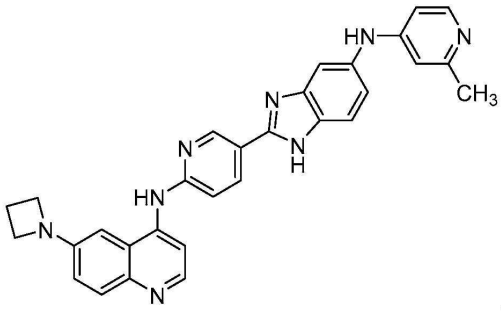

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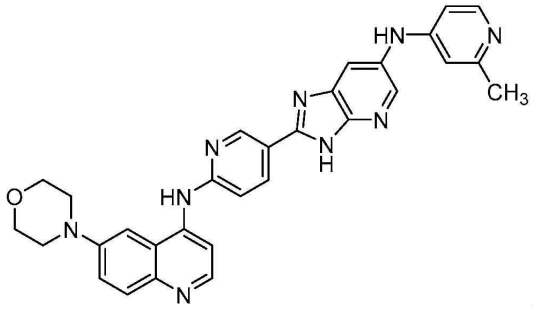

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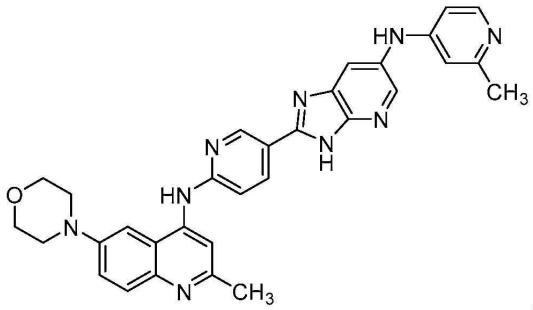

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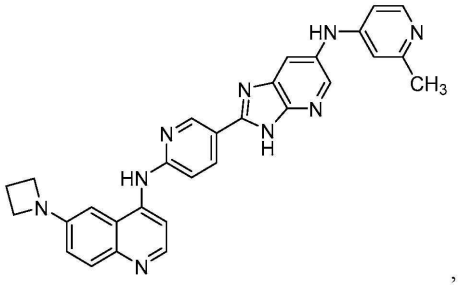

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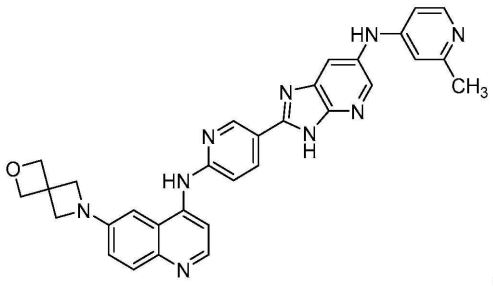

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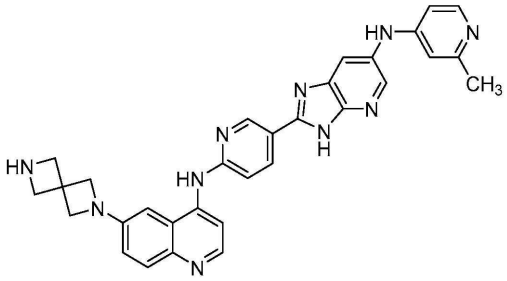
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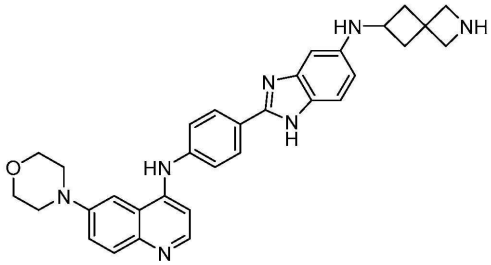
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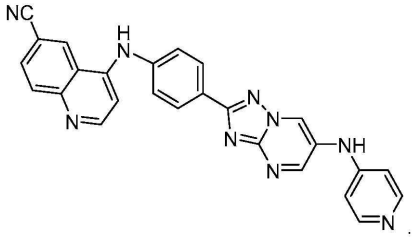
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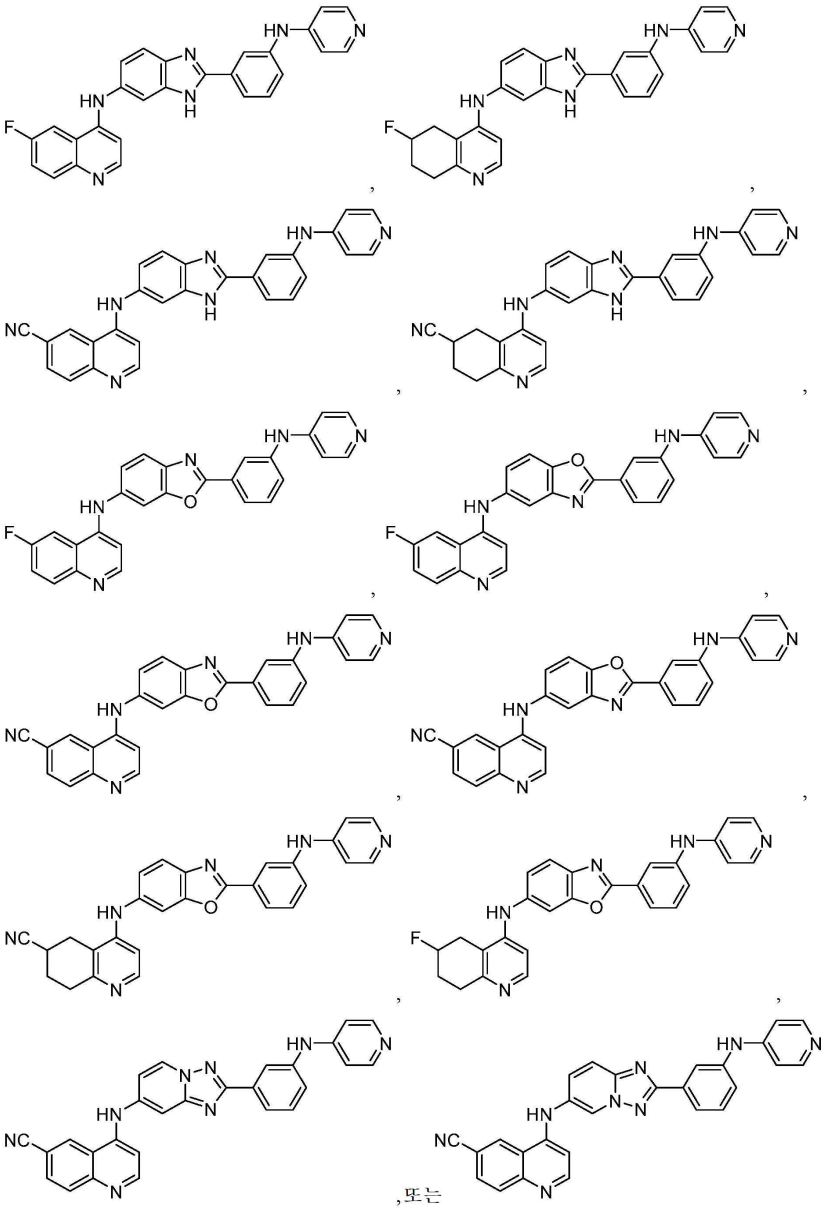
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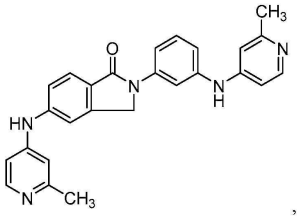
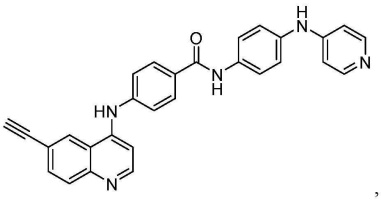
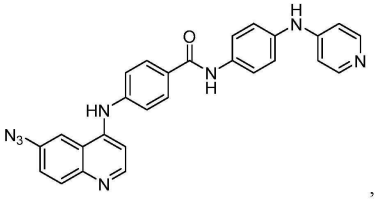
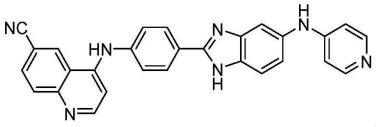
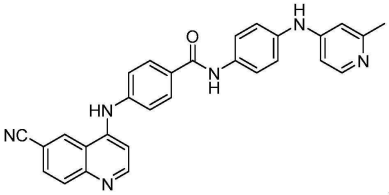
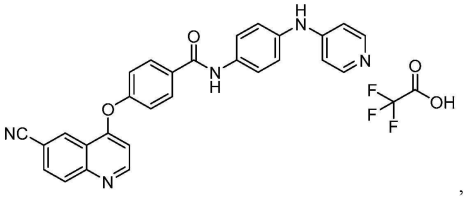
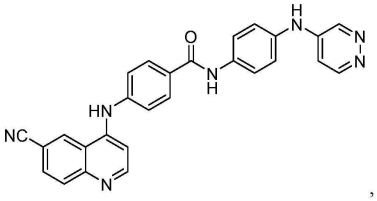
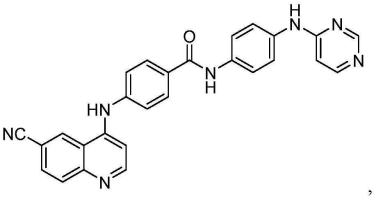
[0729]

[0730] 일부 실시양태에서, 화학식 IVc의 화합물은 하기 화합물이다:

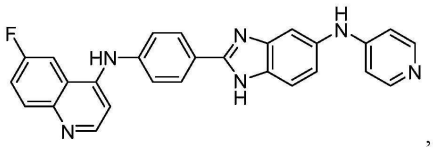


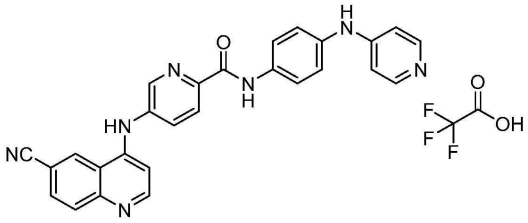
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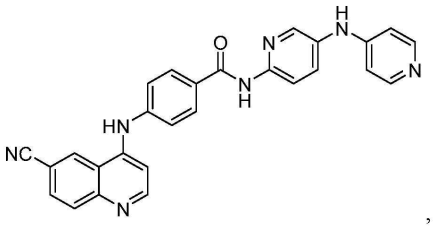
[0732] 일부 실시양태에서, 화합물은 하기 화합물이다:

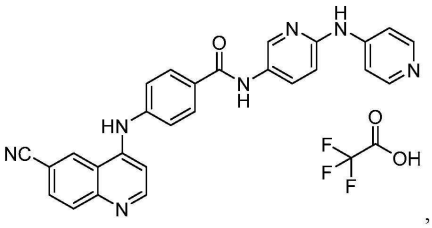

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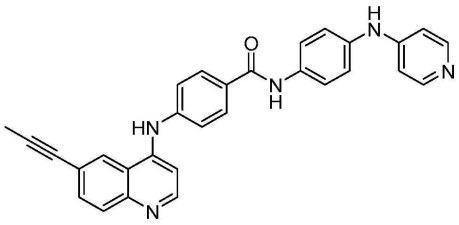
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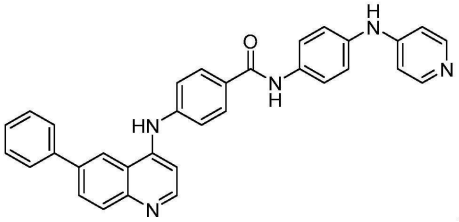

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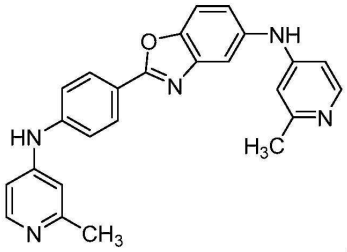
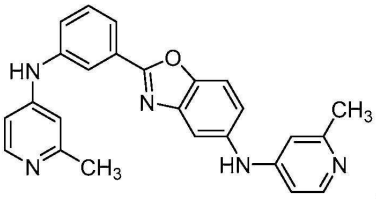
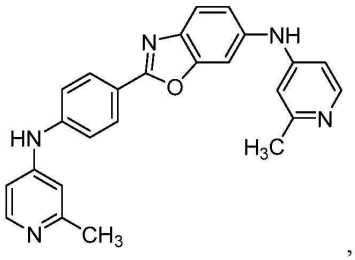
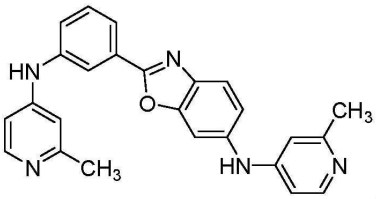
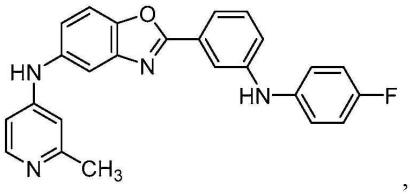
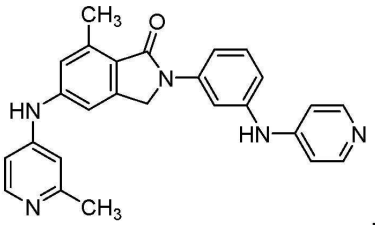
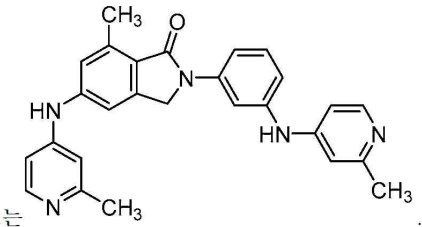

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[0734]

[0735] 일부 실시양태에서, 화합물은 하기 화합물이다:


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[0736]

[0737] 일부 실시양태에서, 화합물은 각각 실시예 2 내지 9, 11 내지 14, 30, 및 32 내지 146의 화합물 2 내지 9, 11 내지 14, 30, 및 32 내지 145로 이루어진 군으로부터 선택된다.

[0738] 일부 실시양태에서, 화합물은 각각 실시예 5, 15, 18, 19, 24, 42, 50, 51, 53, 55 내지 57, 62, 63, 65, 67 내지 70, 72, 77 내지 79, 83, 84, 87 내지 89, 90 내지 94, 96, 97, 102 내지 104, 110, 111, 121, 123, 126, 127, 129, 131 내지 134, 및 138 내지 145의 화합물 5, 15, 18, 19, 24, 42, 50, 51, 53, 55 내지 57, 62, 63, 65, 67 내지 70, 72, 77 내지 79, 83, 84, 87 내지 89, 90 내지 94, 96, 97, 102 내지 104, 110, 111, 121, 123, 126, 127, 129, 131 내지 134, 및 138 내지 145로 이루어진 군으로부터 선택된다. 일부 실시양태에서, 화합물은 실시예 24, 69, 70, 87, 90, 97, 102, 121, 123, 126, 127, 129, 131 내지 134, 및 138 내지 145의 화합물 24, 69, 70, 87, 90, 97, 102, 121, 123, 126, 127, 129, 131 내지 134, 및 138 내지 145로 이루어진 군으로부터 선택된다.

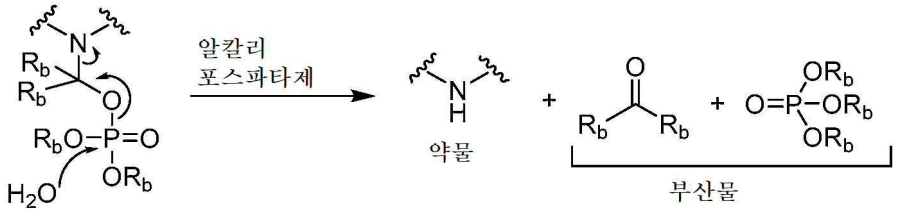
[0739] 일부 실시양태에서, 화합물은 표 2에 제시된 화합물 2, 4 내지 7, 10, 11, 15, 18, 19, 24, 53, 55, 57, 62, 68 내지 70, 77 내지 79, 83, 84, 87, 88, 90 내지 92, 96, 97, 102, 110, 111, 120 내지 123, 125 내지 129, 135 및 138로 이루어진 군으로부터 선택된다.

[0740] 일부 실시양태에서, 화합물은 표 1에 제시된 화합물 3, 137, 또는 139 내지 145이다.

[0741] **프로드러그**

[0742] 일부 실시양태에서, 본원에 기재된 화합물들 중 어느 한 화합물은 절단 가능한 모이어티를 그 내부의 하나 이상의 작용기에 부착함으로써 프로드러그로 만들어질 수 있다. 예를 들어, 문헌[*J. Med. Chem.*, Vol. 61, pp. 62-80 (2018)]; 문헌[*J. Med. Chem.*, Vol. 61, pp. 6308-6327 (2018)]; 및 문헌[*J. Med. Chem.*, Vol. 61, pp. 3918-3929 (2018)]을 참조한다. 일부 실시양태에서, 상기 모이어티는 자극에의 노출 시 절단될 수 있다. 이러한 자극의 비제한적인 예는 온도, 전자기 복사, 음파 진동, pH, 용매, 및 살아있는 유기체에서 발견되는 물질과 과

정을 포함한다. 일부 실시양태에서, 절단 가능한 모이어티는 살아있는 유기체와 접촉할 때 제거된다. 일부 실시양태에서, 절단 가능한 모이어티는 효소와 접촉할 때 제거된다. 일부 실시양태에서, 절단 가능한 모이어티는 알칼리 포스파타제와 접촉할 때 제거된다. 일부 실시양태에서, 절단 가능한 모이어티는 하기 반응식 A에 예시된 바와 같이 절단되는 포스포노옥시메틸 모이어티이다.



반응식 A

[0743]

[0744] **Akt3을 조절하는 방법**

[0745] RAC-감마 세린/트레오닌-단백질 키나제로서도 지칭되는 Akt3은 인간에서 *Akt3* 유전자에 의해 코딩되는 효소이다. Akt 키나제는 인슐린 및 성장 인자에 대한 반응으로 세포 신호전달의 조절제인 것으로 알려져 있고, 세포 증식, 분화, 아폽토시스 및 종양형성뿐만 아니라 글리코겐 합성 및 글루코스 흡수도 포함하나 이들로 제한되지 않는 광범위한 생물학적 과정과 관련되어 있다. Akt3은 혈소판 유래 성장 인자("PDGF"), 인슐린 및 인슐린 유사 성장 인자 1("IGF1")에 의해 자극되는 것으로 밝혀졌다.

[0746] Akt3 키나제 활성은 다양한 다운스트림 기질들의 세린 및/또는 트레오닌 인산화를 매개한다. Akt3에 대한 핵산 서열은 당분야에 공지되어 있다. 예를 들어, 전체가 구체적으로 참고로 포함되고 하기 핵산 서열을 제공하는 Genbank 수탁번호 AF124141.1을 참조한다: *호모 사피엔스 단백질 키나제 B 감마 mRNA*, 완전한 cds:

AGGGGAGTCATCATGAGCGATGTTACCATTGTGAAGGAAGGTTGGGTTCAGAAGAGGGGA
GAATATATAAAAAACTGGAGGCCAAGATACTTCCTTTTGAAGACAGATGGCTCATTCATA
GGATATAAAGAGAAACCTCAAGATGTGGATTTACCTTATCCCCTCAACAACTTTTCAGTG
GCAAAATGCCAGTTAATGAAAACAGAACGACCAAAGCCAAACACATTTATAATCAGATGT
CTCCAGTGGACTACTGTTATAGAGAGAACATTTCATGTAGATACTCCAGAGGAAAGGGAA
GAATGGACAGAAGCTATCCAGGCTGTAGCAGACAGACTGCAGAGGCAAGAAGAGGAGAGA
ATGAATTGTAGTCCAACTTCACAAATTGATAATATAGGAGAGGAAGAGATGGATGCCTCT
ACAACCCATCATAAAAGAAAGACAATGAATGATTTTGACTATTTGAAACTACTAGGTAAA
GGCACTTTTGGGAAAGTTATTTTGGTTCGAGAGAAGGCAAGTGGAAAATACTATGCTATG
AAGATTCTGAAGAAAGAAGTCATTATTGCAAAGGATGAAGTGGCACACACTCTAACTGAA
AGCAGAGTATTAAAGAACACTAGACATCCCTTTTTAACATCCTTGAAATATTCCTTCCAG
ACAAAAGACCGTTTGTGTTTTGTGATGGAATATGTTAATGGGGGCGAGCTGTTTTTCCAT
TTGTCGAGAGAGCGGGTGTTCTCTGAGGACCGCACACGTTTCTATGGTGCAGAAATTGTC
TCTGCCTTGGACTATCTACATTCCGGAAAGATTGTGTACCGTGATCTCAAGTTGGAGAAT
CTAATGCTGGACAAAGATGGCCACATAAAAATTACAGATTTTGGACTTTGCAAAGAAGGG
ATCACAGATGCAGCCACCATGAAGACATTCTGTGGCACTCCAGAATATCTGGCACCAGAG
GTGTTAGAAGATAATGACTATGGCCGAGCAGTAGACTGGTGGGGCCTAGGGGTTGTCATG
TATGAAATGATGTGTGGGAGGTTACCTTTCTACAACCAGGACCATGAGAAACTTTTTGAA
TTAATATTAATGGAAGACATTAAATTTCCTCGAACACTCTCTTCAGATGCAAAATCATTG
CTTTCAGGGCTCTTGATAAAGGATCCAAATAAACGCCTTGGTGGAGGACCAGATGATGCA
AAAGAAATTATGAGACACAGTTTCTTCTCTGGAGTAAACTGGCAAGATGTATATGATAAA
AAGCTTGTACCTCCTTTTAAACCTCAAGTAACATCTGAGACAGATACTAGATATTTTGAT
GAAGAATTTACAGCTCAGACTATTACAATAACACCACCTGAAAAATATGATGAGGATGGT
ATGGACTGCATGGACAATGAGAGGCGGCCGCATTTCCCTCAATTTTCCTACTCTGCAAGT
GGACGAGAATAAGTCTCTTTCATTCTGCTACTTCACTGTCATCTTCAATTTATTACTGAA
AATGATTCCTGGACATCACCAGTCCTAGCTCTTACACATAGCAGGGGCACCTTCCGACAT
CCCAGACCAGCCAAGGGTCCTCACCCCTCGCCACCTTTCACCCTCATGAAAACACACATA
CACGCAAATACACTCCAGTTTTTGTTTTTGCATGAAATTGTATCTCAGTCTAAGGTCTCA
TGCTGTTGCTGCTACTGTCTTACTATTA

(서열번호 1).

[0747]

[0748] Akt3에 대한 아미노산 서열도 당분야에 공지되어 있다. 예를 들어, 전체가 구체적으로 참고로 포함되고 하기 아미노산 서열을 제공하는 UniProtKB/Swiss-Prot 수탁번호 Q9Y243(Akt3_HUMAN)을 참조한다:

MSDVTIVKEGWVQKRGEYIKNWRPRYFLLKTDGSFIGYKEKPQDVDLPYPLNNFSVAKCQ
LMKTERPKPNTFIIRCLQWTTVIERTFHVDTPEEREEWTEAIQAVADRLQRQEEERMNCS
PTSQIDNIGEEEMDASTTHHKRKTMNDFDYLKLLGKGTFGKVILVREKASGKYYAMKILK
KEVIIAKDEVAHTLTESRVLKNTRHPFLTSLKYSFQTKDRLCFVMEYVNGGELFFHLSRE
RVFSEDRTRFYGAEIVSALDYLHSGKIVYRDLKLENLMLDKDGHIKITDFGLCKEGITDA
ATMKTFCGTPEYLAPEVLEDNDYGRAVDWWGLGVVMYEMMCGRLPFYNQDHEKLFELILM
EDIKFPRTLSSDAKSLLSGLLIKDPNKRLGGGPDDAKEIMRHSFFSGVNWQDVYDKKLVP
PFKPQVTSETDTRYFDEEFTAQTITITPPEKYDEDGMDCMDNERRPHFPQFSYSASGRE

(서열번호 2).

[0749]

[0750] Akt3의 도메인 구조는 문헌[Romano, *Scientifica*, Volume 2013 (2013), Article ID 317186, 12 pages]에서 검토되어 있고, N-말단 플렉스트린 상동성 도메인("PH")에 이어 촉매 키나제 도메인("KD") 및 C-말단 조절 소수성 영역을 포함한다. KD 및 조절 도메인은 둘 다 Akt 단백질 키나제에 의해 매개되는 생물학적 작용에 중요하고 3

종의 Akt 동형체들 사이에 최대 정도의 상동성을 나타낸다. PH 도메인은 지질 기질, 예컨대, 포스파티딜이노시톨(3,4) 디포스페이트("PIP2") 및 포스파티딜이노시톨(3,4,5) 트리포스페이트("PIP3")에 결합한다. ATP 결합 부위는 AGC 키나제 계열의 다른 구성요소, 예컨대, p70 S6 키나제("S6K") 및 p90 리보좀 S6 키나제("RSK"), 단백질 키나제 A("PKA") 및 단백질 키나제 B("PKB")와 상당한 정도의 상동성을 가진 촉매 키나제 도메인의 대략 중간에 위치한다. 소수성 조절 모이어티는 AGC 키나제 계열의 전형적인 특징이다. 서열번호 2를 기준으로, Akt3은 일반적으로 다음과 같이 요약된 분자 처리 및 도메인 구조를 갖는 것으로 간주된다.

분자 프로세싱:

특징 핵심	위치(들)	길이	설명
개시자 메티오닌1	1	제거됨	
쇄	2-479	478	Akt3

영역:

특징 핵심	위치(들)	길이	설명
도메인	5-107	103	PH
도메인	148-405	258	단백질 키나제
도메인	406-479	74	AGC-키나제, C-말단
뉴클레오타이드 결합	154-162	9	ATP

부위:

특징 핵심	위치(들)	길이	설명
활성 부위	271	1	양성자 수용체
결합 부위	177	1	ATP

[0751]

[0752] 서열번호 2의 개시자 메티오닌은 Akt3 기능에 있어서 일회용이다. 따라서, 일부 실시양태에서, 화합물은 하기 아미노산 서열을 가진 Akt3의 발현 또는 생체이용률을 직접적으로 또는 간접적으로 조절한다:

SDVTIVKEGWVQKRGEYIKNWRPRYFLLKTDGSFIGYKEKPQDVDLPYPLNNFSVAKCQ
LMKTERPKPNTFIIRCLQWTTVIERTFHVDTPEEREEWTEAIQAVADRLQRQEEERMNCS
PTSQIDNIGEEEMDASTTHHKRKTMNDFDYLKLLGKGTFGKVILVREKASGKYYAMKILK
KEVIIAKDEVAHTLTESRVLKNTRHPFLTSLKYSFQTKDRLCFVMEYVNGGELFFHLSRE
RVFSEDRTRFYGAEIVSALDYLHSGKIVYRDLKLENLMLDKDGHIKITDFGLCKEGITDA
ATMKTFCGTPEYLAPEVLEDNDYGRAVDWWGLGVVMYEMMCGRLPFYNQDHEKLFELILM
EDIKFPRTLSSDAKSLLSGLLIKDPNKRLGGGPDDAKEIMRHSFFSGVNWQDVYDKKLVP
PFKPQVTSETDTRYFDEEFTAQTITITPPEKYDEDGMDCMDNERRPHFPQFSYSASGRE

(서열번호 3).

[0753]

[0754] 2개의 특정 부위, 즉 키나제 도메인 내의 한 부위(서열번호 2를 기준으로 Thr-305) 및 C-말단 조절 영역 내의 다른 한 부위(서열번호 2를 기준으로 Ser-472)는 Akt3의 완전한 활성화를 위해 인산화될 필요가 있다. Akt3의 PH 도메인과 TCL1A 사이의 상호작용은 Akt3 인산화 및 활성화를 향상시킨다. IGF-1은 세포 생존을 조절하는 데 있어서 역할을 할 수 있는 Akt3의 활성화를 유발한다.

[0755] 일부 실시양태에서, 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 Akt3의 억제제이다. 다른 실시양태에서, 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 Akt3의 활성화제이다.

[0756] **약학 조성물**

[0757] 본 발명의 일부 측면은 특정 결과를 달성하기 위해 유효량의 조성물을 대상체에게 투여하는 것을 포함한다. 따라서, 본 발명의 방법에 따라 유용한 소분자 조성물은 약학 용도에 적합한 임의의 방식으로 제제화될 수 있다.

[0758] 본 발명의 제제는 약학적으로 허용되는 농도의 염, 완충제, 방부제, 적합한 담체, 보조제 및 임의로 다른 치료 성분을 관용적으로 함유할 수 있는 약학적으로 허용되는 용액으로 투여된다.

[0759] 요법에 사용하기 위해, 화합물이 적절한 표적 세포에 의해 흡수될 수 있게 하는 임의의 방식으로 유효량의 화합물을 대상체에게 투여할 수 있다. 본 발명의 약학 조성물을 "투여"하는 것은 숙련된 당업자에게 공지된 임의의 수단에 의해 달성될 수 있다. 구체적인 투여 경로는 경구, 경피(예를 들어, 패치를 통해), 비경구 주사(피하, 피내, 근육내, 정맥내, 복강내, 척수강내 등) 또는 점막(비강내, 기관내, 흡입, 직장내, 질내 등)을 포함하나, 이들로 제한되지 않는다. 주입은 볼루스 또는 연속 주입일 수 있다.

[0760] 예를 들어, 본 발명에 따른 약학 조성물은 종종 정맥내, 근육내 또는 다른 비경구 수단에 의해 투여된다. 이 조성물은 또한 비강내 적용, 흡입, 국소, 경구 또는 이식에 의해 투여될 수 있고; 심지어 직장 또는 질 사용도 가능하다. 적합한 액체 또는 고체 약학 제제 형태는 예를 들어, 주사 또는 흡입을 위한 수성 또는 식염수 용액이거나, 마이크로캡슐화되거나 엔코클레이팅되거나(encochleated), 미세한 금 입자 상에 코팅되거나, 리포좀에 함유되거나, 분무되거나, 에어로졸이거나, 피부 내로의 이식을 위한 펠렛이거나, 피부 내로 긁혀질 날카로운 물체 상에 건조된다. 약학 조성물은 또한 과립, 산제, 정제, 코팅된 정제, (마이크로)캡슐, 좌약, 시럽, 유화액, 현탁액, 크림, 점적제, 또는 활성 화합물의 방출을 지연시키는 제제를 포함하고, 이들의 제조 시 부형제 및 첨가제 및/또는 보조제, 예컨대, 붕해제, 결합제, 코팅제, 팽윤제, 윤활제, 풍미제, 감미제 또는 가용화제가 전술된 바와 같이 통상적으로 사용된다. 약학 조성물은 다양한 약물 전달 시스템에 사용되기에 적합하다. 현재 약물 전달 방법에 대한 간략한 검토를 위해서는 문헌[Langer R (1990) *Science* 249:1527-33]을 참조한다.

[0761] 본 발명의 방법에 사용되는 조성물에 포함되는 화합물의 농도는 약 1 nM 내지 약 100 μM일 수 있다. 유효 용량은 약 10 피코몰/kg 내지 약 100 마이크로몰/kg인 것으로 여겨진다.

[0762] 약학 조성물은 바람직하게는 용량 유닛으로 제조되고 투여된다. 액체 용량 유닛은 주사 또는 다른 비경구 투여용 바이알 또는 앰플이다. 고체 용량 유닛은 정제, 캡슐, 산제 및 좌약이다. 환자의 치료를 위해, 화합물의 활성, 투여 방식, 투여 목적(즉, 예방 또는 치료), 장애의 특성과 중증도, 환자의 연령과 체중에 따라 상이한 용량이 필요할 수 있다. 주어진 용량의 투여는 개별 용량 유닛 또는 여러 개의 더 작은 용량 유닛의 형태로 단일 투여에 의해 수행될 수 있다. 수일, 수주 또는 수개월 분리된 특정 간격으로 용량을 반복적으로 다회 투여하는 것도 본 발명에 의해 고려된다.

[0763] 조성물은 그 자체로(순수한) 투여될 수 있거나, 약학적으로 허용되는 염의 형태로 투여될 수 있다. 의약에 사용될 때, 염은 약학적으로 허용되어야 하지만, 약학적으로 허용되지 않는 염은 그의 약학적으로 허용되는 염을 제조하는 데 편리하게 사용될 수 있다. 이러한 염은 하기 산으로부터 제조된 염들을 포함하나, 이들로 제한되지 않는다: 염산, 브롬화수소산, 황산, 질산, 인산, 말레산, 아세트산, 살리실산, TsOH(p-톨루엔 설폰산), 주석산, 구연산, 메탄 설폰산, 포름산, 말론산, 석신산, 나프탈렌-2-설폰산 및 벤젠 설폰산. 또한, 이러한 염은 알칼리 금속 또는 알칼리 토금속 염, 예컨대, 카르복실산 기의 나트륨, 칼륨 또는 칼슘 염으로서 제조될 수 있다.

[0764] 적합한 완충제는 아세트산 및 염(1% 내지 2% w/v); 구연산 및 염(1% 내지 3% w/v); 붕산 및 염(0.5% 내지 2.5% w/v); 및 인산 및 염(0.8% 내지 2% w/v)을 포함한다. 적합한 방부제는 벤즈알코늄 클로라이드(0.003% 내지 0.03% w/v); 클로로부탄올(0.3% 내지 0.9% w/v); 파라벤(0.01% 내지 0.25% w/v); 및 티메로살(0.004% 내지 0.02% w/v)을 포함한다.

[0765] 비경구 투여에 적합한 조성물은 편리하게는 수용자의 혈액과 등장성일 수 있는 멸균 수성 제제를 포함한다. 허용되는 비히클 및 용매 중에는 물, 링거 용액, 인산염 완충 식염수 및 등장성 염화나트륨 용액이 있다. 추가로, 멸균 고정유는 용매 또는 현탁 매질로서 통상적으로 사용된다. 이를 위해, 합성 모노글리세라이드 또는 디글리세라이드를 비롯한 임의의 순한 고정 광유 또는 비-광유를 사용할 수 있다. 또한, 올레산과 같은 지방산은 주사제의 제조에 사용된다. 피하, 근육내, 복강내, 정맥내 등 투여에 적합한 담체 제제는 문헌[*Remington's Pharmaceutical Sciences*, Mack Publishing Company, Easton, PA]에서 찾을 수 있다.

[0766] 본 발명에 유용한 화합물은 2개 이상의 이러한 화합물의 혼합물로 전달될 수 있다. 혼합물은 화합물의 조합 이외에 하나 이상의 보조제를 추가로 포함할 수 있다.

[0767] 다양한 투여 경로가 이용될 수 있다. 선택된 구체적인 방식은 물론 선택된 구체적인 화합물, 대상체의 연령과

일반적인 건강 상태, 치료되는 구체적인 병태, 및 치료 효능에 필요한 용량에 의해 좌우될 것이다. 본 발명의 방법은 임상적으로 허용되지 않는 불리한 효과를 야기하지 않으면서 효과적인 수준의 반응을 생성하는 임의의 방식을 의미하는, 의학적으로 허용되는 임의의 투여 방식을 이용함으로써 실시될 수 있다. 바람직한 투여 방식은 앞서 논의되어 있다.

[0768] 조성물은 편리하게는 유닛 제형으로 제공될 수 있고 약학 분야에 잘 알려져 있는 임의의 방법에 의해 제조될 수 있다. 모든 방법은 화합물을 하나 이상의 보조 성분을 구성하는 담체와 회합시키는 단계를 포함한다. 일반적으로, 조성물은 화합물을 액체 담체, 미분된 고체 담체 또는 이들 둘 다와 균일하고 친밀하게 회합시킨 다음, 필요하다면 생성물을 성형함으로써 제조된다.

[0769] 다른 전달 시스템은 한시 방출, 지연 방출 또는 지속 방출 전달 시스템을 포함할 수 있다. 이러한 시스템은 화합물의 반복 투여를 피하여, 대상체와 의사의 편의성을 증가시킬 수 있다. 많은 유형의 방출 전달 시스템들이 이용될 수 있고 당분야에서 통상의 기술을 가진 자에게 공지되어 있다. 이들은 중합체 기반 시스템, 예컨대, 폴리(락타이드-글리콜라이드), 코폴리옥살레이트, 폴리카프로락톤, 폴리에스테르아미드, 폴리오르토에스테르, 폴리하이드록시부티르산 및 폴리무수물을 포함한다. 약물을 함유하는 상기 중합체의 마이크로캡슐은 예를 들어, 미국 특허 제5,075,109호에 기재되어 있다. 전달 시스템은 스테롤, 예컨대, 콜레스테롤, 콜레스테롤 에스테르 및 지방산, 또는 중성 지방, 예컨대, 모노글리세라이드, 디글리세라이드 및 트리글리세라이드; 하이드로겔 방출 시스템; 실라스틱 시스템; 펩타이드 기반 시스템; 왁스 코팅; 통상적인 결합제 및 부형제를 사용하는 압축 정제; 부분적으로 융합된 이식물 등인 비-중합체 시스템도 포함한다. 구체적인 예는 (a) 본 발명의 작용제가 미국 특허 제4,452,775호, 제4,675,189호 및 제5,736,152호에 기재된 매트릭스와 같은 매트릭스 내에 한 형태로 함유되어 있는 부식 시스템, 및 (b) 활성 성분이 예컨대, 미국 특허 제3,854,480호, 제5,133,974호 및 제5,407,686호에 기재된 바와 같은 중합체로부터 제어된 속도로 침투하는 확산 시스템을 포함하나, 이들로 제한되지 않는다. 추가로, 펌프 기반 하드웨어 전달 시스템을 사용할 수 있고, 이들 중 일부는 이식에 적합하다.

[0770] **질환을 치료하는 방법**

[0771] 또 다른 측면에서, 질환의 치료를 필요로 하는 대상체에서 질환을 치료하는 방법은 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물을 유효량으로 상기 대상체에게 투여하는 단계를 포함한다.

[0772] 일부 실시양태에서, 질환은 신경변성 질환, 악액질, 거식증, 비만, 비만 합병증, 염증성 질환, 바이러스 유발 염증 반응, 걸프전 증후군, 결절성 경화증, 망막색소변성증, 이식 거부증, 암, 자가면역 질환, 허혈성 조직 손상, 외상성 조직 손상 및 이들의 조합으로 이루어진 군으로부터 선택된다.

[0773] 일부 실시양태에서, 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 면역 세포에서 Akt3을 조절한다. 면역 세포의 비제한적인 예는 T 세포(예를 들어, T 조절 세포("Treg")), B 세포, 대식세포 및 신경아교세포(예를 들어, 성상세포, 미세아교세포 또는 희소돌기아교세포)를 포함한다. 일부 실시양태에서, 면역 세포는 Treg이다. 일부 실시양태에서, 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 Akt3 신호전달을 활성화시킨다. 다른 실시양태에서, 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 Akt3 신호전달을 억제한다. 일부 실시양태에서, 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 Treg에서 Akt3을 조절한다. 본 발명자들은 놀랍게도, 일부 실시양태에서 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물이 Treg 활성 또는 생성을 증가시키는 반면, 다른 실시양태에서 상기 화합물이 Treg 활성 또는 생성을 감소시킨다는 것을 발견하였다. 본 발명자들은 놀랍게도, 일부 실시양태에서 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물이 Akt3 신호전달을 활성화시키는 반면, 다른 실시양태에서 상기 화합물이 Akt3 신호전달을 억제한다는 것도 발견하였다.

[0774] *신경변성 질환*

[0775] 일부 실시양태에서, 신경변성 질환의 치료 또는 예방을 필요로 하는 대상체에서 신경변성 질환을 치료하거나 예방하는 방법으로서, 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물을 유효량으로 상기 대상체에게 투여함으로써 Akt3 신호전달을 조절하는 단계를 포함하는 방법이 기재된다. 일부 실시양태에서, 신경변성 질환은 파킨슨병, 알츠하이머병, 근위축성 측삭 경화증, 운동 뉴런 질환, 헌팅톤병, HIV 유발 신경변성, 루이소체 질환, 척수성 근위축증, 프리온병, 척수소뇌성 운동실조증, 가족성 아밀로이드성 다발신경병증, 다발성 경화증 및 이들의 조합으로 이루어진 군으로부터 선택된다.

[0776] 신경변성 질환은 뇌 또는 말초 신경계의 신경 세포가 시간 경과에 따라 기능을 상실하고 궁극적으로 사멸할 때 발생한다. 많은 신경변성 질환에서, 만성 신경염증은 질환 진행에 기여한다. 현재 치료가 신경변성 질환과 관련된 신체적 또는 정신적 증상의 일부를 경감시키는 데 도움이 될 수 있지만, 질환 진행을 늦추는 방법 및 알려진 치유법은 현재 없다.

[0777] 신경변성 과정을 야기하는 기작은 알려져 있지 않지만, 증가하는 증거는 알츠하이머병, 파킨슨병, 헌팅톤병, 다발성 경화증, 척수성 근위축증, 가족성 아밀로이드성 다발신경병증 및 ALS와 같은 신경변성 질환의 발병기전에 있어서 면역 및 면역계의 중요한 역할을 암시한다. Treg는 면역 반응을 억제하는 CD4+ T 세포의 서브세트이고 자가 내성 및 면역 항상성의 필수 매개자이다(문헌[Sakaguchi, et al., *Cell*, 133, 775-787 (2008)] 참조). 증거는 Treg가 신경변성 질환의 진행에 있어서 중요한 역할을 함을 암시한다. 예를 들어, Akt3은 천연 Treg의 억제 기능 및 유도된 Treg의 분극화를 조절할 수 있으므로, 면역 세포에서의 Akt3의 조절은 면역 반응을 조절할 수 있다. 보다 구체적으로, 면역 세포에서의 Akt3의 활성화는 증가된 면역 억제 반응을 유발할 수 있는 반면, 면역 세포에서의 Akt3의 억제는 감소된 면역 억제 반응을 유발할 수 있다. 어느 한 이론에 구속받지 않지만, 면역 세포에서의 Akt3 신호전달의 조절은 신경변성 질환의 치료 및 예방에 사용될 수 있다고 여겨진다.

[0778] 일부 실시양태에서, 신경변성 질환의 치료 또는 예방을 필요로 하는 대상체에서 신경변성 질환을 치료하거나 예방하는 방법으로서, 면역 억제 반응을 유도하고 질환의 진행을 치료하거나 지연시키기에 효과적인 양으로 Akt3 활성화제인 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물을 상기 대상체에게 투여하는 단계를 포함하는 방법이 기재된다. 일부 실시양태에서, Akt3 활성화제는 면역 억제 세포의 억제 기능을 증가시킴으로써 면역 반응을 조절한다. 일부 실시양태에서, Akt3은 면역 세포에서 선택적으로 활성화된다. 예시적인 면역 세포는 T 세포, B 세포, 대식세포, 및 신경아교세포, 예컨대, 성상세포, 미세아교세포 및 희소돌기아교세포를 포함하나, 이들로 제한되지 않는다. 바람직한 실시양태에서, Akt3은 Treg에서 활성화된다. 일부 실시양태에서, Akt3 활성화제는 Treg의 활성 또는 생성을 증가시키거나 촉진하거나, Treg로부터 IL-10과 같은 사이토카인의 생성을 증가시키거나, Treg의 분화를 증가시키거나, Treg의 수를 증가시키거나, Treg의 생존을 증가시키는 데 사용될 수도 있다.

[0779] 일부 실시양태에서, 신경변성 질환의 치료 또는 예방을 필요로 하는 대상체에서 신경변성 질환을 치료하거나 예방하는 방법으로서, 면역 억제 반응을 억제하고 질환의 진행을 치료하거나 예방하기에 효과적인 양으로 Akt3 억제제인 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물을 상기 대상체에게 투여하는 단계를 포함하는 방법이 기재된다. 일부 실시양태에서, Akt3 억제제인 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 면역 억제 반응을 감소시키거나 면역 자극 반응을 증가시킴으로써 면역 반응을 조절한다. 일부 실시양태에서, Akt3은 면역 세포에서 선택적으로 억제된다. 예시적인 면역 세포는 T 세포, B 세포, 대식세포, 및 신경아교세포, 예컨대, 성상세포, 미세아교세포 및 희소돌기아교세포를 포함하나, 이들로 제한되지 않는다. 바람직한 실시양태에서, Akt3은 Treg에서 억제된다.

[0780] 한 실시양태에서, 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 ALS를 치료할 수 있거나 예방할 수 있다. 루게릭병으로서도 지칭되는 ALS는 뇌 및 척수의 운동 뉴런에 영향을 미치는 진행성 신경변성 질환이다. ALS의 증상은 말하기, 삼키기, 걷기, 이동 및 호흡의 어려움을 포함하나, 이들로 제한되지 않는다. ALS는 일반적으로 40세 내지 70세의 남성 및 여성에게 영향을 미친다. 두 상이한 유형의 ALS, 즉 산발성 ALS와 가족성 ALS가 있다. 미국에서 이 질환의 가장 흔한 형태인 산발성 ALS는 전체 사례의 90% 내지 95%를 차지한다. 가족성 ALS는 Cu/Zn 수퍼록사이드 디스뮤타제(superoxide dismutase)(SOD1)의 돌연변이와 관련되어 있다. 산화 스트레스, 미토콘드리아 기능이상, 흥분독성, 단백질 응집, 소포체 스트레스, 축삭 수송의 손상, 뉴런-신경아교 상호작용의 조절이상 및 아폽토시스는 모두 돌연변이체 SOD1의 존재 하에 운동 뉴런 손상에 기여하는 것으로 입증되었다. 어느 한 이론에 구속되지 않지만, Treg 기능이상은 ALS의 발생에 있어서 역할을 하고 Akt3 조절제의 투여는 ALS의 진행을 치료할 수 있거나 예방할 수 있다고 믿어진다. 빠르게 진행하는 ALS를 가진 일부 대상체는 Treg 억제 기능의 손상을 초래하는, Treg 마스터 전사 인자 FOXP3의 결핍을 가진다. 한 실시양태는 면역 세포에서 Akt3을 활성화시키고 면역 억제 반응을 유도하기에 효과적인 양의 Akt3 활성화제를, ALS의 치료를 필요로 하는 대상체에게 투여함으로써, ALS의 치료를 필요로 하는 대상체에서 ALS를 치료하는 방법을 제공한다. 바람직한 실시양태에서, Akt3은 Treg에서 활성화된다.

[0781] 일부 실시양태에서, 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 Akt3 활성화제를, ALS를 가진 대상체에게 투여한 경우, 질환 진행은 느려지고 대상체의 생존은 연장된다.

[0782] 개시된 Akt3 조절제를 사용하여, 예를 들어, 진행성 연수 마비, 가성연수 마비, 원발성 측삭 경화증, 척수성 근위축증 및 소아마비후 증후군을 포함하는 다른 운동 뉴런 질환을 치료할 수 있거나 예방할 수 있다.

[0783] 파킨슨병은 흑질로서 지칭되는, 뇌의 특정 영역에서 도파민 생성 뉴런에 주로 영향을 미치는 신경변성 장애이다. 파킨슨병은 더 많은 뉴런이 손상되거나 사멸하기 때문에 시간 경과에 따라 악화되는 진행성 질환이다. 파킨슨병에서 뉴런 사멸의 원인은 알려져 있지 않다. 파킨슨병의 증상은 손, 팔, 다리, 턱 또는 머리의 떨림, 팔다리와 몸통의 뻣뻣함, 움직임의 느림, 및 손상된 균형과 협응을 포함하나, 이들로 제한되지 않는다.

[0784] 한 실시양태는 면역 세포에서 Akt3을 활성화시키거나 억제하고 면역 억제 반응을 유도하기에 효과적인 양의 Akt3 조절제를, 파킨슨병의 치료를 필요로 하는 대상체에게 투여함으로써 파킨슨병을 치료하는 방법을 제공한다. 일부 실시양태에서, Akt3 활성화제를, 파킨슨병을 가진 대상체에게 투여한 경우, 영향을 받지 않은 뇌 영역으로의 질환 진행은 늦추어지거나 중단될 것이다.

[0785] 일부 실시양태에서, 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 개시된 Akt3 활성화제는 대상체가 파킨슨병 또는 다른 신경변성 질환의 가족력을 가진 경우 상기 대상체에게 예방적으로 투여될 수 있다. 일부 실시양태에서, Akt3 활성화제는 질환 유도로부터 뉴런을 보호할 수 있거나 질환 유도를 늦출 수 있다.

[0786] 헌팅톤병은 진행성 신경변성 질환이다. 이 질환은 뇌 내의 신경 세포의 점진적인 파괴를 특징으로 한다. 헌팅톤병의 증상은 불수의 움직임 문제 및 수의 움직임의 손상, 예컨대, 불수의 경련, 근육 경직, 느리거나 비정상적인 안구 움직임, 손상된 보행, 자세 및 균형, 물리적 언어 생성 또는 삼키기의 어려움; 인지 손상, 예컨대, 조직화, 우선순위결정 또는 작업 집중의 어려움, 유연성의 결여, 또는 사고, 행동 또는 행위에 집착하는 성향, 충동 제어의 결여, 자신의 행동 및 능력에 대한 인식의 결여, 사고 처리 또는 단어 찾기의 느림, 및 새로운 정보 학습의 어려움; 및 정신과 장애, 예컨대, 우울증을 포함하나, 이들로 제한되지 않는다. 한 실시양태에서, 개시된 Akt3 조절제는 헌팅톤병의 증상의 진행을 경감시킬 수 있거나 늦출 수 있다.

[0787] 한 실시양태는 면역 세포에서 Akt3을 활성화시키거나 억제하고 면역 억제 반응을 유도하기에 효과적인 양의 Akt3 조절제를, 헌팅톤병의 치료를 필요로 하는 대상체에게 투여함으로써, 상기 대상체에서 헌팅톤병을 치료하는 방법을 제공한다. 일부 실시양태에서, Akt3 조절제는 헌팅톤병을 가진 대상체에서 질환 증상의 진행을 늦출 수 있거나 중단시킬 수 있다. 또 다른 실시양태에서, Akt3 조절제는 Treg/Th17 균형을 변경시킬 수 있다.

[0788] 헌팅톤병은 대체로 유전된다; 헌팅톤병을 가진 부모의 모든 자녀는 이 질환을 물려받을 확률이 50/50이다. 한 실시양태에서, 헌팅톤병의 가족력을 가진 대상체는 질환 증상의 발현을 예방하거나 늦추기 위해 이 질환의 증상이 나타나기 전에 개시된 Akt3 조절제 중 하나를 예방적으로 투여받을 수 있다.

[0789] 알츠하이머병은 뇌 세포가 퇴화되어 결국 사멸되게 하는 진행성 장애이다. 알츠하이머병은 치매의 가장 흔한 원인이고 독립적으로 기능하는 사람의 능력을 파괴하는, 사고, 행동 및 사회적 기술의 지속적인 감퇴를 특징으로 한다. 알츠하이머병의 증상은 기억 손실, 사고와 추론 능력의 손상, 판단과 결정의 어려움, 및 성격과 행동의 변화를 포함하나, 이들로 제한되지 않는다. 알츠하이머병의 정확한 원인은 완전히 이해되지 않았지만, 핵심 문제는 뉴런 기능을 파괴하고 일련의 독성 이벤트를 유발하는, 뇌 단백질의 기능이상이라고 여겨진다. 손상은 기억을 제어하는 뇌 영역에서 가장 흔히 시작되지만, 과정은 첫 번째 증상이 나타나기 수년 전에 시작된다. 뉴런의 손실은 다소 예측 가능한 패턴으로 뇌의 다른 영역으로 퍼진다. 이 질환의 말기에는 뇌가 상당히 축소된다. 베타-아밀로이드 플라크 및 tau 단백질 엉킴은 알츠하이머병에서 대부분의 뉴런 손상 및 기능이상의 가장 흔한 원인이다.

[0790] 한 실시양태는 Treg에서 Akt3을 활성화시키고 뇌에서 다운스트림 신경보호 경로를 활성화시키기에 효과적인 양의 Akt3 활성화제를 대상체에게 투여함으로써, 대상체에서 알츠하이머병을 치료하는 방법을 제공한다. 또 다른 실시양태에서, 대상체는 알츠하이머병의 증상을 감소시키거나 제거하거나 질환 진행을 늦추기 위해 유효량의 Akt3 활성화제를 투여받는다.

[0791] 또 다른 실시양태는 Treg에서 Akt3을 억제하고 면역 반응을 유도하거나 면역 억제 반응을 감소시키기에 효과적인 양으로 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 Akt3 억제제를 대상체에게 투여함으로써, 대상체에서 알츠하이머병의 진행을 치료하거나 예방하는 방법을 제공한다. 일부 실시양태에서, Treg에서의 Akt3의 억제는 베타-아밀로이드 플라크 제거, 신경염증 반응의 완화 및 인지 감퇴의 역전을 유발한다.

[0792] 척수성 근위축증("SMA")은 운동 뉴런의 진행성 손실 및 근육 소모를 특징으로 하는 일군의 만성 신경근 장애이다. SMA는 일반적으로 중증도, 및 질환이 발현되는 삶의 단계에서 상이한 4종의 유형으로 분류된다. 이 유형은 다음과 같다:

[0793] 생후 0개월 내지 6개월 동안 발현되는 SMA1 또는 베르드니히-호프만병(Werdnig-Hoffmann disease)("유아" SMA);

[0794] 생후 6개월 내지 18개월 동안 발현되는 SMA2 또는 두보위츠병(Dubowitz disease)("중간" SMA);

[0795] 1세 이후에 발현되는 SMA3 또는 쿠겔베르그-벨란더병(Kugelberg-Welander disease)("소아" SMA); 및

[0796] 성인기 동안 발현되는 SMA4("성인 발병" SMA).

[0797] SMA1의 가장 심각한 형태는 때때로 SMA0("중증 유아" SMA)으로서 지칭된다. SMA의 징후 및 증상은 유형에 따라 다르지만, 가장 흔한 것은 절뚝거림 또는 넘어지는 경향, 앉기, 서기 또는 걷기의 어려움, 호흡근의 강도 손실, 경련, 및 먹고 삼키기의 어려움을 포함하나, 이들로 제한되지 않는다. 모든 유형의 SMA는 SMN 단백질의 발현을 방해하는, *SMN1* 유전자의 엑손 결실 및/또는 점 돌연변이와 연관되어 있다. 유형에 따라, SMA는 다양한 유전자 요법, 보조 영양 및 호흡, 정형외과치료 및 이들의 조합에 의해 치료될 수 있다. 신경보호 약물은 운동 뉴런 손실을 안정화하는 방법으로서 기대되지만, 현재 사용 가능한 후보는 아직 임상 시험을 성공적으로 통과하지 못하였다. 따라서, SMA의 치료를 위해 더 많은 후보 신경보호 약물이 필요하다.

[0798] 한 실시양태는 운동 뉴런의 생존을 가능하게 하기에 효과적인 양으로 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 Akt3 조절제를 대상체에게 투여함으로써, 대상체에서 SMA를 치료하는 방법을 제공한다. 또 다른 실시양태에서, 대상체는 SMA의 증상을 감소시키거나 제거하거나 질환 진행을 늦추기 위해 유효량의 Akt3 조절제를 투여받는다.

[0799] 다발성 경화증("MS")은 뇌 및 척수의 신경 세포가 탈수초화되어, 신경 세포 손상을 일으키고 신경계 전체에 걸쳐 신호 전달을 방해하는 질환이다. MS를 앓고 있는 사람은 거의 모든 신경학적 징후/증상을 경험할 수 있고, 여기서 자율신경, 시각, 운동 및 감각 손상이 가장 흔하다. MS의 정확한 원인은 알려져 있지 않으나, 주조직적합성 복합체의 염색체 이상과 같은 유전적 요인과, 감염원 및 독소에의 노출과 같은 환경적 요인의 조합인 것으로 생각된다. 약물 및 물리적 요법을 포함하나 이들로 제한되지 않는 MS 치료는 급성 발작 후 영향을 받은 영역에서 기능을 회복시키고 새로운 발작이 발생하는 것을 예방하고자 한다. MS에 대한 알려진 치유법은 없으며, 많은 현재 약물들은 중간 정도의 효과를 나타내지만 심각한 부작용을 가질 수 있고 내약성이 좋지 않다. 따라서, MS의 안전하고 효과적인 회복 및 예방 치료를 위한 신규 약물이 필요하다.

[0800] 한 실시양태는 발작 후 기능 상실을 회복시키고/시키거나 발작의 발생을 예방하기에 효과적인 양으로 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 Akt3 조절제를 대상체에게 투여함으로써, 대상체에서 MS를 치료하는 방법을 제공한다. 또 다른 실시양태에서, 대상체는 MS의 증상을 감소시키거나 제거하거나 질환 진행을 늦추기 위해 유효량의 Akt3 조절제를 투여받는다.

[0801] *체중 감소*

[0802] 일부 실시양태에서, 극심한 체중 감소를 치료하거나 예방하는 방법으로서, 본원에 개시된 화합물을, 이러한 치료 또는 예방을 필요로 하는 대상체에게 투여하는 단계를 포함하는 방법이 본원에 개시된다. 체중 감소 장애의 비제한적인 예는 악액질, 거식증 및 신경성 거식증을 포함한다. 예시적인 방법은 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물을 투여함으로써, Akt3의 억제를 필요로 하는 대상체에서 Akt3을 억제하는 단계를 포함한다. 어느 한 이론에 구속되지 않지만, Akt3은 지방생성에 있어서 중요한 역할을 하는 것으로 여겨진다. 백색 지방생성은 FOXO1, C/EBP 계열의 여러 구성원 및 PPARγ를 포함하나 이들로 제한되지 않는 다수의 전사 인자의 순차적 유도를 수반하는 전사 캐스케이드의 활성화를 필요로 한다. FOXO1은 지방생성의 필수 음성 조절제이고 Akt를 비롯한 효소에 의한 여러 잔기의 인산화/아세틸화를 통해 주로 제어된다. FOXO1은 세린/트레오닌 단백질 키나제 SGK1에 의해 제어될 수도 있다. SGK1은 PI3K의 다운스트림이고 인산화 시 FOXO1을 억제할 수 있다. SGK1은 세린/트레오닌 단백질 키나제 WNK1에 의해 조절되며, 이 키나제도 Akt 및 SGK1에 의해 조절될 수 있다. Akt3은 WNK1의 인산화를 통해 지방생성을 억제하여, SGK1 활성의 하향조절 및 FOXO1의 SGK-1 매개 억제를 유발한다. 한 실시양태에서, Treg에서의 Akt3의 억제는 지방생성을 촉진할 수 있고 질환에 의해 유도된 체중 감소를 역전시킬 수 있다.

[0803] 악액질 또는 소모성 증후군은 통상적인 영양 보충에 의해 완전히 역전될 수 없고 진행성 기능 손상으로 이어지

는, 골격근의 지속적인 손실을 특징으로 하는 다인성 증후군이다. 악액질은 신체가 영양 부족을 감지할 때 다른 에너지원, 즉 골격근과 지방 조직을 활용할 정도로 파괴적이다. 이것은 진행된 암을 가진 환자의 대다수에게 영향을 미치며, 감염과 싸우는 능력, 치료 내성, 치료에 대한 반응, 삶의 질 및 생존 기간의 감소와 관련되어 있다. 한 실시양태에서, 악액질은 암, 염증성 질환, 신경변성 질환, 병원성 감염, 면역결핍 장애, 체중 증가 장애, 체중 감소 장애, 호르몬 불균형, 결절성 경화증, 망막색소변성증, 울혈성 심부전 및 이들의 조합과 같은, 그러나 이들로 제한되지 않는, 만성 질환에 의해 야기된다. 한 실시양태는 악액질의 증상을 감소시키기에 효과적인 양으로 Akt3 억제제인 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물을, 악액질의 치료를 필요로 하는 대상체에게 투여함으로써, 이러한 대상체에서 악액질을 치료하는 방법을 제공한다. 또 다른 실시양태는 대상체에서 지방생성을 촉진하기에 효과적인 양으로 Akt3 억제제인 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물을, 체중 증가의 촉진을 필요로 하는 대상체에게 투여함으로써, 이러한 대상체에서 체중 증가를 촉진하는 방법을 제공한다. 한 실시양태에서, 악액질에 취약한 것으로 의심되는 대상체(예를 들어, 암 또는 다른 질환으로 진단받은 대상체)는 악액질 증후군의 발현을 예방하거나 늦추기 위해 Akt3 억제제를 예방적으로 투여받을 수 있다. 일부 실시양태에서, 본원에 개시된 화합물은 T 조절 세포를 조절하는 것이 아니라 Akt3을 조절함으로써 악액질을 치료하는 데 사용된다.

[0804] 신경성 거식증은 성장기 어린이의 체중 감소 또는 체중 증가 부족, 신장, 연령 및 키에 적절한 체중 유지의 어려움, 및 종종 왜곡된 신체상을 특징으로 하는 섭식 장애이다. 거식증 치료의 첫 번째 목표 중 하나는 정상적인 체중의 회복이다. 일부 실시양태에서, 본원에 개시된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 거식증을 가진 대상체에서 그의 수준이 증가되는 에스트라디올에 의해 과활성화된 Akt3을 억제한다. 일부 실시양태에서, 본원에 개시된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 거식증을 치료하는 데 사용될 수 있다. 한 실시양태에서, 개시된 Akt3 억제제인 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 지방생성을 촉진하고 극심한 체중 감소를 역전시키기에 효과적인 양으로 거식증으로 진단받은 대상체에게 투여될 수 있다.

[0805] *비만증 및 비만 합병증*

[0806] 체중 증가를 특징으로 하는 질환(예를 들어, 비만)은 미국에서만 성인의 40% 및 어린이와 청소년의 20%에 영향을 미치는 것으로 추정되고, 이 수치는 증가하는 추세이다. 문헌["Overweight & Obesity: Data & Statistics", U.S. Centers for Disease Control and Prevention, accessed April 3, 2020]을 참조한다. 30 kg/m^2 초과의 체질량 지수를 특징으로 하는 비만은 다양한 질환들(예를 들어, 심혈관 질환 및 제2형 당뇨병)의 확률을 증가시킨다. Akt3 활성화는 비만에 대한 보호 효과를 갖는 것으로 확인되었다. 한 실시양태에서, 비만을 치료하는 방법은 이 질환의 영향을 역전시키거나 예방하기에 효과적인 양의 Akt3 활성화제를, 비만을 갖거나 비만을 발생시킬 위험이 있는 대상체에게 투여하는 단계를 포함한다.

[0807] 일부 실시양태에서, Akt3을 조절하는 본원에 개시된 화합물은 비만증 및/또는 비만 합병증을 치료하는 데 사용된다. 일부 실시양태에서, 비만 합병증은 당불내성, 간 지방증, 이상지질혈증 및 이들의 조합으로 이루어진 군으로부터 선택된다. 일부 실시양태에서, 본원에 개시된 화합물은 T 조절 세포를 조절하는 것이 아니라 Akt3을 조절함으로써 비만증 및/또는 비만 합병증을 치료하는 데 사용된다.

[0808] *염증성 질환*

[0809] Akt3 신호전달은 염증성 질환에 기여하는 만성 또는 급성 염증과 연관되어 있다. 한 실시양태는 염증성 질환의 치료 또는 예방을 필요로 하는 대상체에서 염증성 질환을 치료하거나 예방하는 방법으로서, Akt3 신호전달을 조절하고 질환의 진행을 치료하거나 지연시키기에 효과적인 양의 Akt3 조절제를 포함하는 조성물을 상기 대상체에게 투여하는 단계를 포함하는 방법을 제공한다. 일부 실시양태에서, Akt3 조절제는 Akt3 신호전달을 활성화시키고/시키거나 Treg 활성 또는 생성을 증가시킴으로써, 면역억제 효과를 생성한다.

[0810] 염증성 질환의 비제한적인 예는 아토피성 피부염, 알러지, 천식 및 이들의 조합을 포함한다.

[0811] *바이러스 유발 염증 반응*

[0812] Akt3 신호전달은 중증 급성 호흡기 증후군("SARS") 및 코로나바이러스병 2019("COVID-19")과 같은 바이러스 유도 염증성 질환에 기여하는 급성 면역 반응과 연관되어 있다. 따라서, 한 실시양태에서, 바이러스 유도 염증성 질환의 치료를 필요로 하는 대상체에서 바이러스 유도 염증성 질환을 치료하는 방법은 질환의 진행을 역전시키

거나 늦추기에 효과적인 양의 Akt3 조절제를 상기 대상체에게 투여하는 단계를 포함한다.

[0813] *암*

[0814] 일부 실시양태에서, 암의 치료 또는 예방을 필요로 하는 대상체에서 암을 치료하거나 예방하는 방법으로서, 본원에 기재된 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물을 유효량으로 상기 대상체에게 투여함으로써 Akt3 신호전달을 조절하는 단계를 포함하는 방법이 제공된다. 일부 실시양태에서, 화학식 Ia, Ib, Ic, IIa, IIb, IIc, IIIa, IIIb, IIIc, IVa, IVb 또는 IVc의 화합물은 Akt3 신호전달을 억제하고/하거나 Treg 활성 또는 생성을 감소시킴으로써, 면역 반응 활성화 효과를 생성한다.

[0815] 일부 실시양태에서, 암은 방광암, 뇌암, 유방암, 자궁경부암, 결장직장암, 식도암, 신장암, 간암, 폐암, 비강인두암, 췌장암, 전립선암, 피부암, 위암, 자궁암, 난소암, 고환암, 성인 T-세포 백혈병/림프종 및 이들의 조합으로 이루어진 군으로부터 선택된다.

[0816] 일부 실시양태에서, 본원에 개시된 화합물 및 조성물은 백혈병의 치료에 유용하다. 일부 실시양태에서, Akt3을 억제하는 본원에 개시된 화합물 및 조성물은 백혈병의 치료에 유용하다. 이 실시양태에서, Akt3을 억제하는 본원에 개시된 화합물 및 조성물은 면역 반응 자극 치료제로서 생체내 및 생체외에서 유용하다. Akt3을 억제하여 Treg 매개 면역 억제를 억제하거나 감소시키는 능력은 더 강력한 면역 반응을 가능하게 한다. 일부 실시양태에서, 본원에 개시된 화합물 및 조성물은 또한 T 세포를 수반하는 면역 자극 또는 활성화 반응을 자극하거나 향상시키는 데 유용하다. 일부 실시양태에서, 본원에 개시된 화합물 및 조성물은 Akt3을 선택적으로 억제함으로써 백혈병을 치료하기 위해 숙주에서 면역 반응을 자극하거나 향상시키는 데 유용하다. 이 실시양태에서, 본원에 개시된 화합물 및 조성물은 대상체에서 T 세포를 자극하기에 효과적인 양으로 대상체에게 투여될 수 있다. 본원에 개시된 화합물 및 조성물로 치료할 수 있는 백혈병의 유형은 급성 골수성 백혈병(AML), 만성 골수성 백혈병(CML), 급성 림프구성 백혈병(ALL), 만성 림프구성 백혈병(CLL), 성인 T-세포 백혈병/림프종(ATLL) 및 만성 골수단핵구성 백혈병(CMML)을 포함하나, 이들로 제한되지 않는다.

[0817] 일부 실시양태에서, ATLL은 거의 성인에서만 진단되며, 평균 연령은 60대 중반이다. 일부 실시양태에서, 4가지 유형의 ATLL이 있다: (1) 급성, (2) 만성, (3) 무증상 및 (4) 림프종성. 일부 실시양태에서, 급성 ATLL은 가장 흔한 형태이고, 높은 백혈구 수, 고칼슘혈증, 장기비대 및 높은 락토스 데하이드로게나제(dehydrogenase)를 특징으로 한다. 일부 실시양태에서, 림프종성 ATLL은 순환하는 림프구가 1% 미만인 림프절에서 나타난다. 일부 실시양태에서, 만성 및 무증상 ATLL은 덜 공격적인 임상 경과를 특징으로 하고 장기간 생존을 허용한다. 일부 실시양태에서, 급성 및 림프종성 ATLL에 대한 4년 생존율은 5% 미만이다. 일부 실시양태에서, ATLL의 만성 및 무증상 형태는 각각 26.9% 및 62%의 4년 생존율을 가진다. 일부 실시양태에서, 성인 T-세포 백혈병/림프종은 인간 T-세포 림프친화성 바이러스(HTLV-1)에 의해 야기된다.

[0818] 일부 실시양태에서, 본원에 개시된 화합물 및 조성물은 ATLL을 치료하는 데 유용하다. 일부 실시양태에서, Akt3을 억제하는 본원에 개시된 화합물 및 조성물은 ATLL을 치료하는 데 유용하다. 일부 실시양태에서, CD25 및 FoxP3을 발현하는 Treg는 ATLL 세포로 형질전환될 수 있다. 일부 실시양태에서, ATLL 세포는 활성화된 헬퍼/유도제 T 세포 표현형을 표시하지만, 강한 면역억제 활성을 나타낸다. 일부 실시양태에서, Akt3을 억제하는 본원에 개시된 화합물 및 조성물은 ATLL 세포의 면역억제 반응을 감소시킨다. 다른 실시양태에서, Akt3을 억제하는 본원에 개시된 화합물 및 조성물은 ATLL 세포의 강한 면역억제 활성을 극복하기 위해 면역 자극 반응을 증가시킨다.

[0819] 일부 실시양태에서, 백혈병 또는 ATLL을 치료하는 데 유용한 본원에 개시된 화합물 및 조성물은 천연 Treg(nTreg) 세포의 면역 억제 기능 및 유도된 Treg(iTreg)로의 통상적인 T 세포의 유도와 같은, 그러나 이들로 제한되지 않는, 면역 억제 반응을 감소시키거나 억제한다. 이 실시양태에서, 감소되거나 억제되는 nTreg 세포의 면역 억제 기능은 IL10, TGFβ 또는 이들의 조합과 같은, 그러나 이들로 제한되지 않는, 하나 이상의 소염성 사이토카인의 분비이다. 일부 실시양태에서, 백혈병 또는 성인 T-세포 백혈병/림프종을 치료하는 방법은 진토 약물, 화학요법 약물 또는 증강제(예를 들어, 사이클로포스파마이드)와 같은, 그러나 이들로 제한되지 않는, 제2 활성제를 대상체에게 투여하는 단계를 포함한다.

[0820] *자가면역 질환*

[0821] 일부 실시양태에서, 질환은 자가면역 질환이다. 자가면역 질환의 비제한적인 예는 이완불능증, 애디슨병, 성인 스틸병, 무감마글로불린혈증, 원형 탈모증, 아밀로이드증, 강직성 척추염, 항사구체 기저막 질환, 항세뇨관 기저막 항체 신장염, 항인지질 증후군, 자가면역 혈관부종, 자가면역 자율신경 실조증, 자가면역 뇌척수염, 자가

면역 간염, 자가면역 내이 질환, 자가면역 심근염, 자가면역 난소염, 자가면역 고환염, 자가면역 췌장염, 자가면역 망막병증, 자가면역 두드러기, 축삭 및 뉴런 신경병증, 발로병, 베체트병, 양성 점막 유천포창, 수포성 유천포창, 캐슬만병, 셀리악병, 샤가스병, 만성 염증성 탈수초 다발신경병증, 만성 재발성 다초점성 골수염, 척-스트라우스 증후군, 호산구 육아종증, 반흔성 유천포창, 코간 증후군, 한랭 응집소증, 선천성 심장 차단, 콕삭키 심근염, CREST 증후군, 크론병, 포진성 피부염, 피부근육염, 데빅병(시신경 척수염), 원판상 루푸스, 드레슬러 증후군, 자궁내막증, 호산구 식도염, 호산구 근막염, 결절성 홍반, 본태성 혼합형 한랭글로불린혈증, 에반스 증후군, 섬유근육통, 섬유성 폐포염, 거대 세포 동맥염(측두 동맥염), 거대 세포 심근염, 사구체신염, 굿파스처 증후군, 다발 혈관염을 갖는 육아종증, 그레이브스병, 길랑-바레 증후군, 하시모토 갑상선염, 용혈성 빈혈, 헤노흐-쉔라인 자반증, 임신 유천포창, 화농성 한선염(아크네 인버사), 저감마글로불린혈증, IgA 신병증, IgG4 연관 경화성 질환, 면역 혈소판감소성 자반증, 봉입체 근육염, 간질성 방광염, 소아 관절염, 소아 당뇨병(1형 당뇨병), 소아 근육염, 가와사키병, 람베르트-이튼 증후군, 백혈구파괴 혈관염, 편평 태선, 경화 태선, 목질 결막염, 선상 IgA 질환, 루푸스, 만성 라임병, 메니에르병, 현미경적 다발 혈관염, 혼합 결합 조직 질환, 무렌 궤양, 무카-하베르만병, 다초점 운동 신경병증, 다발성 경화증, 중증 근육무력증, 근육염, 기면증, 신생아 루푸스, 시신경 척수염, 호중구감소증, 안 반흔성 유천포창, 시신경염, 재발성 류마티즘, 소아 자가면역 신경정신 질환, 부종양성 소뇌 변성, 발작성 야간 혈색소뇨증, 패리 롬버그 증후군, 편평부염(주변 포도막염), 파르소니지-터너 증후군, 천포창, 말초 신경병증, 정맥주위성 뇌척수염, 악성 빈혈, POEMS 증후군, 결절성 다발동맥염, I형 다선 증후군, II형 다선 증후군, III형 다선 증후군, 류마티스성 다발근육통, 다발성 근육염, 심근경색증후 증후군, 심낭막절개술후 증후군, 원발성 담즙성 간경변증, 원발성 경화성 담관염, 프로게스테론 피부염, 건선, 건선성 관절염, 순수 적혈구 무형성증, 괴저성 농피증, 레이노병, 반응성 관절염, 반사 교감신경 위축증, 재발성 다발연골염, 하지 불안 증후군, 후복막 섬유증, 류마티스열, 류마티스 관절염, 사르코이드증, 슈미트 증후군, 공막염, 공피증, 쇼그렌 증후군, 정자 및 고환 자가면역 질환, 강직 인간 증후군, 아급성 세균성 심내막염, 스삭 증후군, 교감성 안염, 타카야스 동맥염, 측두 동맥염(거대 세포 동맥염), 혈소판감소성 자반증, 톨로사-헌트 증후군, 횡단성 척수염, 궤양성 대장염, 미분화 결합 조직 질환, 포도막염, 혈관염, 백반증, 및 보그트-고야나기-하라다병을 포함한다.

[0822] *다른 적응증*

[0823] 일부 실시양태에서, 본원에 개시된 화합물은 Akt3을 조절하고 걸프전 증후군, 결절성 경화증, 망막색소변성증, 이식 거부증, 허혈성 조직 손상 또는 외상성 조직 손상을 치료하는 데 사용된다. 일부 실시양태에서, 이식 거부증은 이식편 대 숙주 질환이다. 일부 실시양태에서, 본원에 개시된 화합물은 T 조절 세포를 조절하는 것이 아니라 Akt3을 조절함으로써 망막색소변성증을 치료하는 데 사용된다. 일부 실시양태에서, 본원에 개시된 화합물은 허혈성 조직 손상 또는 외상성 조직 손상을 치료하는 데 사용된다. 일부 실시양태에서, 허혈성 조직 손상 또는 외상성 조직 손상은 뇌의 허혈성 조직 손상 또는 외상성 조직 손상이다.

[0824] **조합 요법의 방법**

[0825] 일부 실시양태에서, 개시된 화합물은 단독으로 또는 하나 이상의 추가 치료제와 함께 이를 필요로 하는 대상체에게 투여될 수 있다. 일부 실시양태에서, 상기 화합물과 추가 치료제는 별개로 그러나 동시에 투여된다. 일부 실시양태에서, 상기 화합물과 추가 치료제는 동일한 조성물의 일부로서 투여된다. 다른 실시양태에서, 상기 화합물과 제2 치료제는 별개로 상이한 시간에 투여되지만, 동일한 치료법의 일부로서 투여된다.

[0826] 일부 실시양태에서, 대상체는 제2 치료제를 투여받기 1시간, 2시간, 3시간, 4시간, 5시간, 6시간 이상, 또는 1일, 2일, 3일, 4일, 5일, 6일, 7일 이상 전에 제1 치료제를 투여받을 수 있다. 일부 실시양태에서, 대상체는 제2 치료제의 첫 번째 투여 전에 1일, 2일, 3일, 4일, 5일, 6일, 7일, 14일, 21일, 28일, 35일 또는 48일마다 1회 이상의 용량의 제1 치료제를 투여받을 수 있다. 본원에 개시된 화합물은 제1 또는 제2 치료제일 수 있다.

[0827] 일부 실시양태에서, 화합물과 추가 치료제는 치료법의 일부로서 투여될 수 있다. 예를 들어, 제1 치료제가 4일마다 대상체에게 투여될 수 있는 경우, 제2 치료제는 제1일, 제2일, 제3일 또는 제4일, 또는 이들의 조합에 투여될 수 있다. 제1 치료제 또는 제2 치료제는 전체 치료법에 걸쳐 반복적으로 투여될 수 있다.

[0828] 예시적인 추가 치료제는 사이토카인, 화학요법제, 방사성핵종, 다른 면역치료제, 효소, 항생제, 항바이러스제(예를 들어, 단독으로 사용되거나, HIV 또는 B형 또는 C형 간염 치료용 뉴클레오사이드와 함께 사용되는 프로테아제 억제제), 항기생충(예를 들어, 연충 또는 원생동물), 성장 인자, 성장 억제제, 호르몬, 호르몬 길항제, 항체 및 이의 생체활성 단편(인간화된 항체, 단일 쇄 항체 및 키메라 항체를 포함함), 항원 및 백신 제제(아쥬번트를 포함함), 펩타이드 약물, 항염제, Toll 유사 수용체(CpG 올리고뉴클레오타이드를 포함하나, 이것으로 제한

되지 않음)에 결합하여 선천성 면역계를 활성화시키는 리간드, 적응 면역계를 동원하고 최적화하는 분자, 세포독성 T 림프구, NK 세포 및 헬퍼 T 세포의 작용을 활성화시키거나 상향조절하는 다른 분자, 및 억제 또는 조절 T 세포를 불활성화시키거나 하향조절하는 다른 분자를 포함하나, 이들로 제한되지 않는다.

[0829] 치료될 병태, 장애 또는 질환을 기반으로 추가 치료제를 선택한다. 예를 들어, 본 발명의 화합물은 면역 반응을 향상시키거나 촉진하거나 면역 반응을 감소시키거나 억제하는 기능을 하는 하나 이상의 추가 작용제와 공-투여될 수 있다.

[0830] *화학요법제*

[0831] 일부 실시양태에서, 본 발명의 화합물은 하나 이상의 화학요법제 또는 전구아폽토시스 작용제와 조합될 수 있다. 대표적인 화학요법제는 암사크린(amsacrine), 블레오마이신(bleomycin), 부설판(busulfan), 카페시타빈(capecitabine), 카르보플라틴(carboplatin), 카르무스틴(carmustine), 클로람부실(chlorambucil), 시스플라틴(cisplatin), 클라드리빈(cladribine), 클로파라빈(clofarabine), 크리산타스파제(crisantaspase), 사이클로포스파마이드, 사이타라빈(cytarabine), 다카르바진(dacarbazine), 닥티노마이신(dactinomycin), 다우노루비신(daunorubicin), 도세탁셀(docetaxel), 독소루비신(doxorubicin), 에피루비신(epirubicin), 에토포사이드(etoposide), 플루다라빈(fludarabine), 플루오로우라실(fluorouracil), 젬시타빈(gemcitabine), 하이드록시카르바마이드(hydroxycarbamide), 이다루비신(idarubicin), 이포스파마이드(ifosfamide), 이리노테칸(irinotecan), 류코보린(leucovorin), 리포좀 독소루비신, 리포좀 다우노루비신, 로무스틴(lomustine), 멜팔란(melphalan), 머캡토퓨린(mercaptopurine), 메스나(mesna), 메토트렉세이트(methotrexate), 미토마이신(mitomycin), 미톡산트론(mitoxantrone), 옥살리플라틴(oxaliplatin), 파클리탁셀(paclitaxel), 페메트렉세드(pemetrexed), 펜토스타틴(pentostatin), 프로카르바진(procarbazine), 랄티트렉세드(raltitrexed), 사트라플라틴(satraplatin), 스트렙토조신(streptozocin), 테가푸르-우라실(tegafur-uracil), 테모졸로마이드(temozolomide), 테니포사이드(teniposide), 티오테파(thiotepa), 티오구아닌(tioguanine), 토포테칸(topotecan), 트레오설판(treosulfan), 빈블라스틴(vinblastine), 빈크리스틴(vincristine), 빈데신(vindesine), 빈노렐빈(vinorelbine), 또는 이들의 조합을 포함하나, 이들로 제한되지 않는다. 대표적인 전구아폽토시스 작용제는 플루다라비네타우로스포린(fludarabinetaurosporine), 사이클로헥시마이드(cycloheximide), 악티노마이신(actinomycin) D, 락토실세라마이드(lactosylceramide), 15d-PGJ(2), 및 이들의 조합을 포함하나, 이들로 제한되지 않는다.

[0832] *항염제*

[0833] 다른 적합한 추가 치료제는 항염제를 포함하나, 이로 제한되지 않는다. 일부 실시양태에서, 항염제는 비-스테로이드, 스테로이드 또는 이들의 조합일 수 있다. 한 실시양태는 약 1%(w/w) 내지 약 5%(w/w), 전형적으로 약 2.5%(w/w)의 항염제를 함유하는 경구 조성물을 제공한다. 비-스테로이드 항염제의 대표적인 예는 옥시캄(oxicam), 예컨대, 피록시캄(piroxicam), 이속시캄(isoxicam), 테녹시캄(tenoxicam), 수독시캄(sudoxicam); 살리실레이트, 예컨대, 아스피린(aspirin), 디살시드(disalcid), 베노릴레이트(benorylate), 트릴리세이트(trilisate), 사파프린(safapryn), 솔프린(solprin), 디플루니살(diflunisal) 및 펜도살(fendosal); 아세트산 유도체, 예컨대, 디클로페낙(diclofenac), 펜클로페낙(fenclofenac), 인도메타신(indomethacin), 설린닥(sulindac), 톨메틴(tolmetin), 이속세팍(isoxepac), 푸로페낙(furofenac), 티오피낙(tiopinac), 지도메타신(zidometacin), 아세마타신(acematacin), 펜티아작(fentiazac), 조메피락(zomepirac), 클린다낙(clindanac), 옥세피낙(oxepinac), 펠비낙(felbinac) 및 케토롤락(ketorolac); 페나메이트(fenamate), 예컨대, 메페남산, 메클로페남산, 플루페남산, 니플룸산 및 톨페남산; 프로피온산 유도체, 예컨대, 이부프로펜(ibuprofen), 나프록센(naproxen), 베녹사프로펜(benoxaprofen), 플루르비프로펜(flurbiprofen), 케토프로펜(ketoprofen), 페노프로펜(fenoprofen), 펜부펜(fenbufen), 인도프로펜(indopropfen), 피르프로펜(pirprofen), 카르프로펜(carprofen), 옥사프로진(oxaprozin), 프라노프로펜(pranoprofen), 미로프로펜(miroprofen), 티옥사프로펜(tioxaprofen), 수프로펜(suprofen), 알미노프로펜(alminoprofen) 및 티아프로페닉(tiaprofenic); 피라졸, 예컨대, 페닐부타존(phenylbutazone), 옥시펜부타존(oxyphenbutazone), 페프라존(feprazone), 아자프로파존(azapropazone) 및 트리메타존(trimethazone)을 포함하나, 이들로 제한되지 않는다. 일부 실시양태에서, 이들 비-스테로이드성 항염제들의 혼합물도 사용될 수 있다.

[0834] 스테로이드성 소염 약물의 대표적인 예는 코르티코스테로이드(corticosteroid), 예컨대, 하이드로코르티손(hydrocortisone), 하이드록실-트리암시놀론(hydroxyl-triamcinolone), 알파-메틸 덱사메타손(dexamethasone), 덱사메타손-포스페이트, 베클로메타손(beclomethasone) 디프로피오네이트, 클로베타솔(clobetasol) 발레레이트,

데소나이드(desonide), 데속시메타손(desoxymethasone), 데속시코르티코스테론(desoxycorticosterone) 아세테이트, 덱사메타손, 디클로리손(dichlorisone), 디플로라손(diflorasone) 디아세테이트, 디플루코르톨론(diflucortolone) 발레레이트, 플루아드레놀론(fluadrenolone), 플루클로롤론(fluclorolone) 아세토나이드, 플루드로코르티손(fludrocortisone), 플루메타손(flumethasone) 피발레이트, 플루오시놀론(fluosinolone) 아세토나이드, 플루시노나이드(fluocinonide), 플루코르틴(flucortine) 부틸에스테르, 플루오코르톨론(fluocortolone), 플루프레드니덴(fluprednidene)(플루프레드닐리덴(fluprednylidene)) 아세테이트, 플루란드레놀론(flurandrenolone), 할시노나이드(halcinonide), 하이드로코르티손 아세테이트, 하이드로코르티손 부티레이트, 메틸프레드니솔론(methylprednisolone), 트리암시놀론(triamcinolone) 아세토나이드, 코르티손(cortisone), 코르토독손(cortodoxone), 플루세토나이드(flucetonide), 플루드로코르티손(fludrocortisone), 디플루오로손(difluorosone) 디아세테이트, 플루라드레놀론(fluradrenolone), 플루드로코르티손(fludrocortisone), 디플루로손 디아세테이트, 플루라드레놀론 아세토나이드, 메드리손(medrysone), 암시나펠(amcinafel), 암시나파이드(amcinafide), 베타메타손(betamethasone) 및 이의 에스테르의 나머지, 클로로프레드니손(chloroprednisone), 클로르프레드니손 아세테이트, 클로코르텔론(clocortelone), 클레시놀론(clescinolone), 디클로리손(dichlorisone), 디플루르프레드네이트(diflurprednate), 플루클로로나이드(flucloronide), 플루니솔라이드(flunisolide), 플루오로메탈론(fluoromethalone), 플루페롤론(fluperolone), 플루프레드니솔론(fluprednisolone), 하이드로코르티손 발레레이트, 하이드로코르티손 사이클로펜틸프로피오네이트, 하이드로코르타메이트(hydrocortamate), 메프레드니손(meprednisone), 파라메타손(paramethasone), 프레드니솔론, 프레드니손, 베클로메타손 디프로피오네이트, 트리암시놀론 및 이들의 혼합물을 포함하나, 이들로 제한되지 않는다.

[0835] *면역억제제*

[0836] 일부 실시양태에서, 본원에 개시된 화합물은 Treg 활성 또는 생성을 감소시킨다. 일부 실시양태에서, 본원에 개시된 화합물은 암에 대한 유도 요법에 사용된다. 일부 실시양태에서, 본원에 개시된 화합물은 다른 면역치료제, 면역 조절제, 보조자극 활성화 아고니스트, 다른 사이토카인 및 케모카인 및 인자, 백신, 종양용해성 바이러스, 세포 요법, 소분자 및 표적화 요법, 화학요법 및 방사선 요법과 함께 사용된다. 일부 실시양태에서, 면역 조절제는 항-PD1, 항-CTLA4, 항-TIM3, 항-LAG3과 같은 체크포인트 억제제를 포함한다. 일부 실시양태에서, 항-OX40, 항-GITR 등을 포함하는 보조자극 활성화 아고니스트. 일부 실시양태에서, 세포 요법은 조작된 T 세포, CAR-T, TCR-T 세포 등을 포함한다.

[0837] 일부 실시양태에서, 본원에 개시된 화합물은 다른 면역 치료제, 면역 조절제, 생물제제(예를 들어, 항체), 백신, 소분자 및 표적화 요법, 항염제, 세포 요법(예를 들어, 조작된 Treg 및 다른 유형의 세포), 화학요법 및 방사선 요법과 함께 사용된다.

[0838] 일부 실시양태에서, 단독으로 사용되거나 다른 작용제와 함께 사용되는 본원에 개시된 화합물은 정맥내, 근육내 또는 다른 비경구 수단에 의해 환자에게 생체내 투여된다. 이들은 또한 비강내 적용, 흡입, 직장, 질, 국소, 경구 또는 이식에 의해 투여될 수도 있다. 다른 실시양태에서, 단독으로 사용되거나 다른 작용제와 함께 사용되는 본원에 개시된 화합물은 천연 Treg, 유도 Treg, 조작된 Treg 및 다른 유형의 억제 T 세포를 포함하는 억제 Treg의 기능을 향상시키기 위해 생체외 적용되고, 그 후 이러한 세포는 임의로 환자를 치료하는 데 사용될 수 있다.

[0839] 일부 실시양태에서, 추가 치료제는 면역억제제이다. 면역억제제는 다른 림프구 표면 마커(예를 들어, CD40, 알파-4 인테그린) 또는 사이토카인에 대한 항체, 융합 단백질(예를 들어, CTLA-4-Ig(Orencia®), TNFR-Ig(Enbrel®)), TNF-α 차단제, 예컨대, 엔브렐(Enbrel), 레미케이드(Remicade), 심지아(Cimzia) 및 휴미라(Humira), 사이클로포스파마이드("CTX")(예를 들어, Endoxan®, Cytoxan®, Neosar®, Procytox® 및 Revimmune™), 메토트렉세이트("MTX")(예를 들어, Rheumatrex® 및 Trexall®), 벨리무맙(belimumab)(예를 들어, Benlysta®), 다른 면역억제 약물(예를 들어, 사이클로스포린 A, FK506 유사 화합물, 라파마이신 화합물 및 스테로이드), 항증식제, 세포독성제, 및 면역억제에 도움이 될 수 있는 다른 화합물을 포함하나, 이들로 제한되지 않는다.

[0840] 일부 실시양태에서, 추가 치료제는 체크포인트 억제제일 수 있다. 일부 실시양태에서, 추가 치료제는 CTLA-4 융합 단백질, 예컨대, CTLA-4-Ig(아바타셉트(abatacept))일 수 있다. CTLA-4-Ig 융합 단백질은 항원 제시 세포의 CD80/CD86(B7-1/B7-2)에 결합하기 위해 T 세포의 보조자극 수용체인 CD28과 경쟁할 수 있으므로, T 세포 활성화를 억제하는 기능을 한다. 또 다른 실시양태에서, 추가 치료제는 벨라타셉트(belatacept)로서 알려진 CTLA-4-Ig

융합 단백질이다. 벨라타셉트는 생체내에서 CD86에 대한 그의 결합력을 현저히 증가시킬 수 있는 2개의 아미노산 치환(L104E 및 A29Y)을 함유한다. 또 다른 실시양태에서, 추가 치료제는 Maxy-4이다.

[0841] 또 다른 실시양태에서, 추가 치료제는 CTX이다. 사이토포스판(cytophosphane)으로서도 알려진 CTX(Endoxan®, Cytoxan®, Neosar®, Procytox® 및 Revimmune™에 대한 일반명)는 옥사조포린(oxazophorine) 군의 질소 머스타드 알킬화제이다. 이것은 다양한 유형의 암과 일부 자가면역 장애를 치료하는 데 사용될 수 있다. CTX는 신장 루푸스를 가진 환자의 미만성 증식 사구체신염에 사용되는 일차 약물이다.

[0842] 일부 실시양태에서, 추가 치료제는 항-이중 가닥 DNA("항-ds DNA") 자가 항체의 혈액 또는 혈청 수준의 감소 및/또는 단백뇨의 감소를 필요로 하는 환자에서 이러한 혈액 또는 혈청 수준을 감소시키고/시키거나 이러한 단백뇨를 감소시키기에 효과적인 양으로 투여될 수 있다.

[0843] 또 다른 실시양태에서, 추가 치료제는 혈청에서 아데노신의 양을 증가시킬 수 있다(예를 들어, 국제 특허출원 공개 제WO 08/147482호 참조). 예를 들어, 제2 치료제는 CD73-Ig, 재조합 CD73, 또는 CD73의 발현을 증가시키는 또 다른 작용제(예를 들어, 사이토카인, 단일클론 항체 또는 소분자)일 수 있다(예를 들어, 국제 특허출원 공개 제WO 04/084933호 참조). 또 다른 실시양태에서, 추가 치료제는 인터페론-베타이다.

[0844] 일부 실시양태에서, 추가 치료제는 IL-1β, TNF-α, TGF-베타, IFN-ɣ, IL-18, IL-17, IL-6, IL-23, IL-22, IL-21 및 MMP를 포함하나 이들로 제한되지 않는 염증성 분자를 분비하거나 다른 세포가 이러한 염증성 분자를 분비하게 하는 Th1, Th17, Th22 및/또는 다른 세포에 의한 분화, 증식, 활성, 사이토카인 생성 및/또는 사이토카인 분비를 억제하거나 감소시키는 소분자일 수 있다. 또 다른 실시양태에서, 추가 치료제는 Treg와 상호작용하거나, Treg 활성을 향상시키거나, Treg에 의한 IL-10 분비를 촉진하거나 향상시키거나, Treg의 수를 증가시키거나, Treg의 억제 능력을 증가시키거나, 이들의 조합 효과를 나타내는 소분자이다.

[0845] 일부 실시양태에서, 조성물은 Treg 활성 또는 생성을 증가시킨다. 예시적인 Treg 향상제는 글루코코르티코이드 플루티카손(fluticasone), 살메테로알(salmeteroal), IL-12, IFN-ɣ 및 IL-4에 대한 항체; 비타민 D3 및 덱사메타손, 및 이들의 조합을 포함하나, 이들로 제한되지 않는다.

[0846] 일부 실시양태에서, 추가 치료제는 항체, 예를 들어, IL-6, IL-23, IL-22 또는 IL-21과 같은 전구염증성 분자에 대한 기능 차단 항체이다.

[0847] 일부 실시양태에서, 추가 치료제는 핵산을 포함한다. 일부 실시양태에서, 추가 치료제는 리보핵산을 포함한다.

[0848] *신경변성 질환에 대한 조합 치료*

[0849] 일부 실시양태에서, 본원에 개시된 화합물은 대상체의 질환 상태를 기반으로 선택된 제2 치료제와 함께 투여될 수 있다. 일부 실시양태에서, 제2 치료제는 알츠하이머병에 대한 치료제일 수 있다. 알츠하이머병에 대한 현재 치료제는 콜린에스터라제 억제제, 예컨대, 도네페질(donepezil), 리바스티그민(rivastigmine) 및 갈란타민(galantamine); 메만틴(memantine); 항우울제, 예컨대, 시탈로프람(citalopram), 플루옥세틴(fluoxetine), 파록세틴(paroxetine), 세르트랄린(sertraline) 및 트라자돈(trazadone); 항불안제, 예컨대, 로라제팜(lorazepam) 및 옥사제팜(oxazepam); 및 항정신병제, 예컨대, 아리피프라졸(aripiprazole), 클로자핀(clozapine), 할로페리돌(haloperidol), 올란자핀(olanzapine), 퀘티아핀(quetiapine), 리스페리돈(risperidone) 및 지프라시돈(ziprasidone)을 포함하나, 이들로 제한되지 않는다.

[0850] 또 다른 실시양태에서, 추가 치료제는 ALS에 대한 치료제일 수 있다. 현재 미국 FDA에 의해 승인을 받은 2종의 ALS 치료제인 릴루졸 및 에다바론이 있다. 두 약물 모두 ALS의 진행을 늦추는 것으로 밝혀졌다. 릴루졸 및 에다바론 이외에, ALS를 가진 대상체는 질환의 특정 증상을 표적화하는 약물로도 치료받을 수 있다. 예시적인 이러한 약물은 경련을 감소시키는 약물, 예컨대, 항경련제(예를 들어, 바클로펜(baclofen), 단트롤렌(dantrolene) 및 디아제팜(diazepam)); 신경통 제어를 돕는 약물, 예컨대, 아미트립틸린(amitriptyline), 카르바마제핀(carbamazepine), 둘록세틴(duloxetine), 가바펜틴(gabapentin), 라모트리긴(lamotrigine), 밀나시프란(milnacipran), 노르트립틸린(nortriptyline), 프레가발린(pregabalin) 및 벤라팍신(venlafaxine); 및 환자가 삼키는 것을 돕는 약물, 예컨대, 트리헥시페니딜(trihexyphenidyl) 또는 아미트립틸린을 포함하나, 이들로 제한되지 않는다.

[0851] 한 실시양태에서, 추가 치료제는 파킨슨병에 대한 치료제일 수 있다. 파킨슨병에 대한 현재 치료제는 카르비도파-레보도파; 도파민 아고니스트, 예컨대, 프라미펙솔(pramipexole), 로피니롤(ropinirole) 및 로티고틴

(rotigotine); MAO B 억제제, 예컨대, 셀레길린(selegiline), 라사길린(rasagiline) 및 사피나마이드(safinamide); 카테콜 O-메틸트랜스퍼라제 억제제, 예컨대, 엔타카폰(entacapone) 및 톨카폰(tolcapone); 항콜린작용제, 예컨대, 벤츠트로핀(bentztropine) 및 트리헥시페니딜; 및 아만타딘(amantadine)을 포함하나, 이들로 제한되지 않는다.

[0852] 일부 실시양태에서, 제2 치료제는 헌팅톤병에 대한 치료제일 수 있다. 헌팅톤병에 대한 현재 치료제는 테트라베나진; 항정신병제, 예컨대, 할로페리돌, 클로르프로마진, 리스페리돈 및 퀘티아핀; 아만타딘; 레베티라세탐(levetiracetam); 클로나제팜; 항우울제, 예컨대, 시탈로프람, 에스시탈로프람, 플루옥세틴 및 세르트랄린; 및 항경련제, 예컨대, 발프로에이트, 카르바마제핀 및 라모트리긴을 포함하나, 이들로 제한되지 않는다.

[0853] *체중 감량에 대한 조합 치료*

[0854] 일부 실시양태에서, 본원에 개시된 화합물은 악액질 또는 극심한 체중 감소를 치료하는 데 사용되는 추가 치료제와 함께 대상체에게 투여될 수 있다. 악액질 및 극심한 체중 감소를 치료하는 현재 전략은 적절한 영양분 섭취를 보장하기 위해 식욕 자극제를 사용하여 식욕을 개선하는 것이다. 식욕 자극제, 영양 보충제, 5-HT3 길항제 및 Cox-2 억제제를 사용한 약리학적 중재가 암 악액질을 치료하는 데 사용되고 있다.

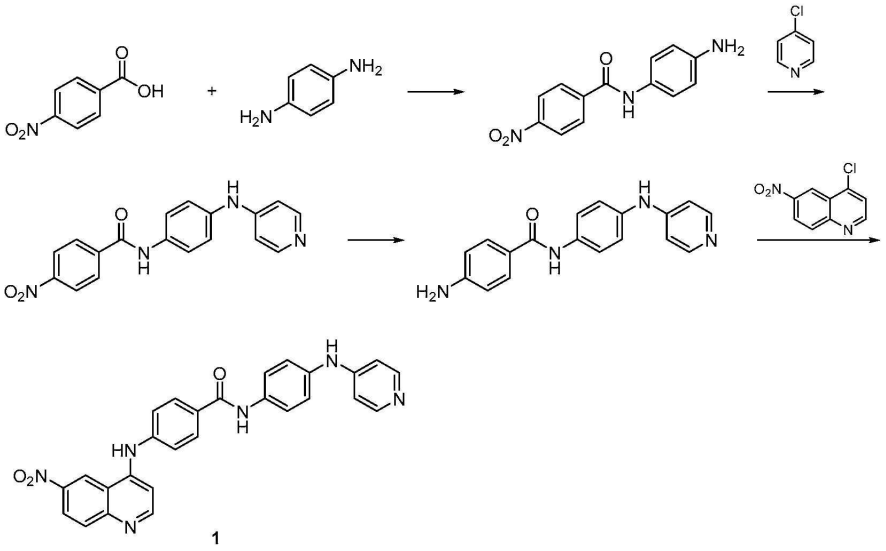
[0855] 일부 실시양태에서, 식욕 자극제는 예를 들어, 아연, 티아민 또는 어유를 포함하나 이들로 제한되지 않는 비타민, 미네랄 또는 허브이다. 또 다른 실시양태에서, 식욕 자극제는 드로나비놀(dronabinol), 메게스테롤(megesterol) 및 옥산드롤론(oxandrolone)을 포함하나 이들로 제한되지 않는 약물이다.

[0856] **등가물**

[0857] 하기 대표적인 실시예는 본 발명을 예시하는 데 도움을 주기 위한 것이고, 본 발명의 범위를 제한하기 위한 것이 아니고 그렇게 해석되어서도 안 된다. 실제로, 본원에 제시되고 기재된 것 외에도, 본 발명의 다양한 변형 및 이의 많은 추가 실시양태는 하기 실시예를 비롯한 본 명세서의 전체 내용, 및 본원에서 인용된 과학 문헌과 특허 문헌의 참조로부터 당분야에서 숙련된 자에게 명확해질 것이다. 이 인용된 참조문헌의 내용은 최신 기술을 설명하는 데 도움을 주기 위해 본원에 참고로 포함된다는 것도 인식해야 한다. 하기 실시예는 다양한 실시양태들과 이들의 등가물에서 본 발명의 실시에 적용될 수 있는 중요한 추가 정보, 예시 및 지침을 함유한다.

[0858] **실시예**

[0859] **실시예 1: 화합물 1(4-((6-니트로퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



반응식 1

[0860]

[0861] 반응식 1에 나타낸 바와 같이, HOBt 및 DIPEA의 존재 하에 EDCI를 사용하여 *파라*-니트로벤조산을 1,4-페닐렌디아민과 커플링시켰다. 생성된 중간체를 4-클로로-피리딘과 커플링시킨 후, Sn/HCl을 사용하여 니트로 기를 아미노 기로 환원시켰다. 이어서, 2 또는 3 방울의 TEA를 첨가하면서, 생성된 아미노-중간체를 3시간 동안 환류 하에 EtOH에서 4-클로로-6-니트로-퀴놀린과 반응시켜, *파라*-치환된 생성물인 화합물 1을 제공하였다. 실온에 도달한 직후 반응 혼합물로부터 최종 생성물을 침전시킨 후, 여과하고 EtOH:디에틸 에테르 1:1로부터의 재결정화를

통해 정제하였다.

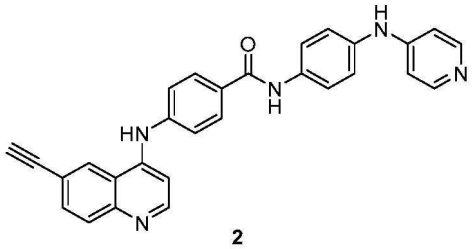
[0862] 하기 실시예에 나타낸 화합물을, 실시예 1에 기재된 실험 절차를 기반으로 한 유사한 방식, 및/또는 이하에 기재된 방식과 유사한 방식, 및/또는 당분야에 공지된 방법으로 제조하였다.

[0863] 하기 실시예에서 사용된 하기 약어는 하기 정의를 가진다: AIBN = 아조비스이소부티로니트릴; BINAP = 2,2'-비스(디페닐포스피노)-1,1'-비나프틸; DCE = 디클로로에탄; DCM = 디클로로메탄; DIEPA 또는 DIPEA = N,N-디이소프로필에틸아민; DMAP = 4-디메틸아미노피리딘; DMF = 디메틸포름아미드; EA 또는 EtOAc = 에틸 아세테이트; EDC 또는 EDCI = 1-에틸-3-(3-디메틸아미노프로필)카르보디이미드; HATU = 1-[비스(디메틸아미노)메틸렌]-1H-1,2,3-트리아졸로[4,5-b]피리디늄 3-옥시드 헥사플루오로포스페이트; HPLC = 고성능 액체 크로마토그래피; LCMS = 액체 크로마토그래피 질량 분광법; MS = 질량 분광법; NBS = N-브로모석신이미드; NMR = 핵 자기 공명; PE = 석유 에테르; RT = 보유 시간(예를 들어, HPLC 보유 시간); TEA = 트리에틸아민; TFA = 트리플루오로아세트산; THF = 테트라하이드로푸란; TLC = 박층 크로마토그래피; 및 TsOH 또는 TosOH = p-톨루엔설폰산. 이러한 약어 및 정의는 본원의 다른 약어 및 정의를 제한하기 위한 것이 아니다.

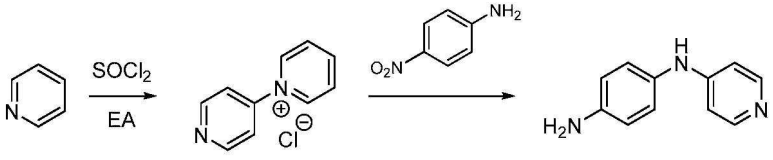
[0864] 다음 실시예 중 하나 이상에서, 다음 일반적인 방법을 이용하였다. 기질 및 시약을 상업적으로 입수할 수 있으며 추가 정제 없이 사용하였다. 사전코팅된 유리 플레이트를 사용하여 LCMS 또는 TLC로 반응을 모니터링하였다. 실리카 겔(200-300 메쉬) 또는 바이오티지(Biotage) 기기(일반적인 HPLC)를 사용하여 컬럼 크로마토그래피를 수행하였다. 분취 HPLC 방법은 길슨(Gilson) 281(PHG012) 기기, 웰치(Welch) 10 μm 150A 21.2*250 mm 컬럼, A: 물(12 mM NH_4HCO_3), B: 아세토니트릴로 구성된 이동상, 유속 30.00 mℓ/분, 및 214/254 nm에서의 검출을 이용하였다. ^{1}H NMR 스펙트럼을 500 또는 400 MHz 브루커(Bruker) NMR 분광계에서 $CDCl_3$/MeOD/DMSO-d*6*으로 기록하였으며 공명을 테트라메틸실란에 비해 백만분율로 제공한다. 데이터를 다음과 같이 보고한다: 화학적 이동, 다중도(s = 단일항, d = 이중항, t = 삼중항, m = 다중항), 커플링 상수(Hz) 및 적분. MS 데이터를 전기분무 공급원이 장착된 LCMS 기계에서 수득하였다.

[0865] **실시예 2: 화합물 2(4-((6-에티닐퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**

[0866]

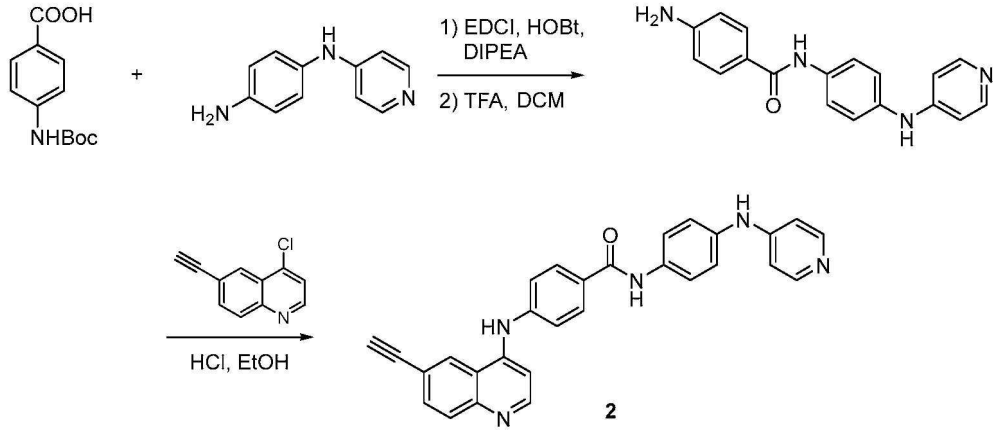


2



반응식 2

[0867]

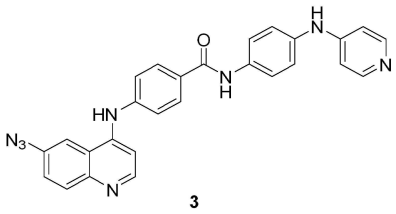


반응식 3

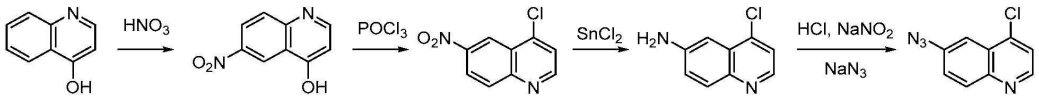
[0868]

[0869] **화합물 2**를 반응식 2 및 3에 나타낸 방법으로 제조하였다. **화합물 2**(4-((6-에티닐퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)를 반응식 2 및 3에 나타낸 바와 같이 제조하였다: $C_{29}H_{21}N_5O$; 455.52 g/mol; 47 mg; 황색 고체; ESI-LCMS m/z = 456 $[M+H]^+$; LCMS RT = 1.598분, 100% (214 nm).

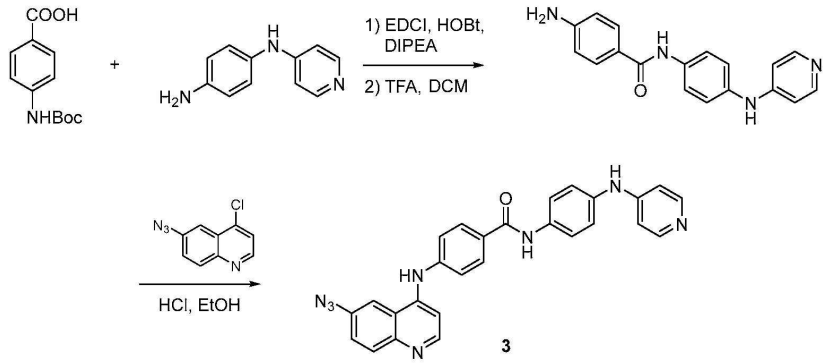
[0870] **실시예 3: 화합물 3(4-((6-아지도퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



[0871]



반응식 4

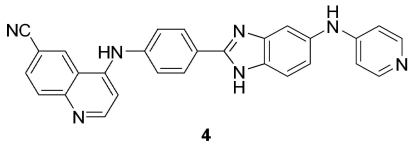


반응식 5

[0872]

[0873] **화합물 3**을 반응식 4 및 5에 나타낸 방법으로 제조하였다. **화합물 3**(4-((6-아지도퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 4 및 5에 나타낸 바와 같이 제조하였다: $C_{27}H_{20}N_8O$; 472.51 g/mol; 25 mg; 황색 고체; ESI-LCMS m/z = 473 $[M+H]^+$; LCMS RT = 1.632분, 100% (214 nm).

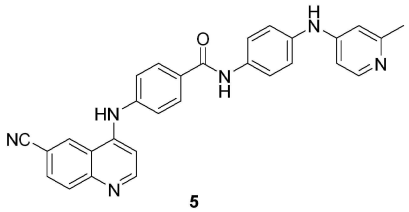
[0874] **실시예 4: 화합물 4(4-((4-(5-(피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)아미노)퀴놀린-6-카르보니트릴)**



[0875] **4**

[0876] **화합물 4**를 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 4**(4-((4-(5-(피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)아미노)퀴놀린-6-카르보니트릴): $C_{28}H_{19}N_7$; 453.51 g/mol; 48 mg; 황색 고체; ESI-LCMS m/z = 454 $[M+H]^+$; LCMS RT = 1.508분, 100% (214 nm).

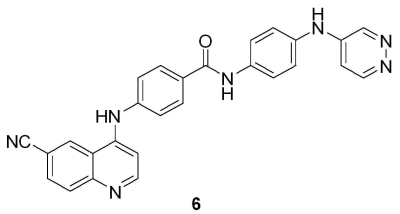
[0877] **실시예 5: 화합물 5(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드)**



[0878] **5**

[0879] **화합물 5**를 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 5**(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드): $C_{29}H_{22}N_6O$; 470.54 g/mol; 33 mg; 황색 고체; ESI-LCMS m/z = 471 $[M+H]^+$; LCMS RT = 1.597분, 95.63 % (214 nm).

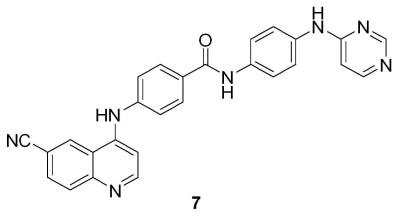
[0880] **실시예 6: 화합물 6(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리다진-4-일아미노)페닐)벤즈아미드)**



[0881] **6**

[0882] **화합물 6**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 6**(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리다진-4-일아미노)페닐)벤즈아미드): $C_{27}H_{19}N_7O$; 457.50 g/mol; 9.8 mg; 백색 고체; ESI-LCMS m/z = 458.2 $[M+H]^+$; LCMS RT = 1.568분, 100% (214 nm).

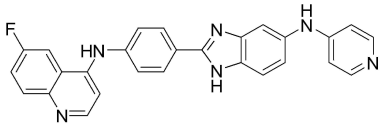
[0883] **실시예 7: 화합물 7(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리미딘-4-일아미노)페닐)벤즈아미드)**



[0884] **7**

[0885] **화합물 7**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 7**(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리미딘-4-일아미노)페닐)벤즈아미드): $C_{27}H_{19}N_7O$; 457.50 g/mol; 22 mg; 황색 고체; ESI-LCMS m/z = 458 $[M+H]^+$; LCMS RT = 1.588분, 100% (214 nm).

[0886] **실시예 8: 화합물 8(6-플루오로-N-(4-(5-(피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)**

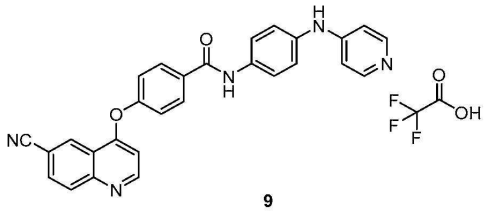


8

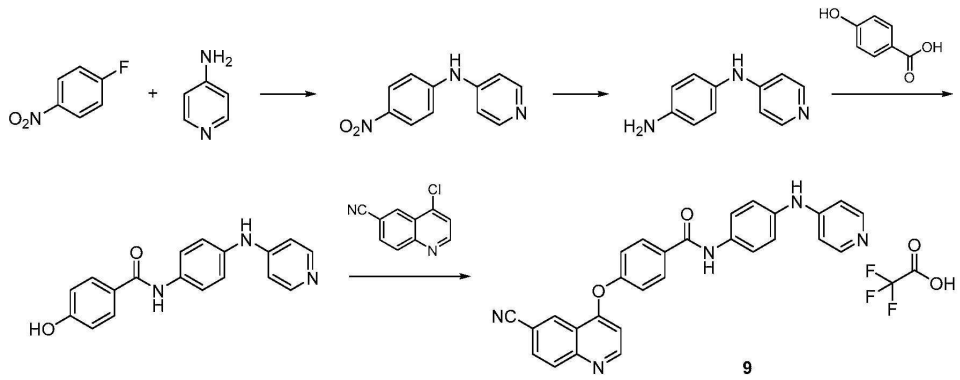
[0887]

[0888] **화합물 8**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 8**(6-플루오로-N-(4-(5-(피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민): $C_{27}H_{19}FN_6$; 446.49 g/mol; 25 mg; 황색 고체; ESI-LCMS m/z = 447 $[M+H]^+$; LCMS RT = 1.549분, 100% (214 nm 및 254 nm).

[0889] **실시예 9: 화합물 9(4-((6-시아노퀴놀린-4-일)옥시)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드 2,2,2-트리플루오로아세테이트)**



9

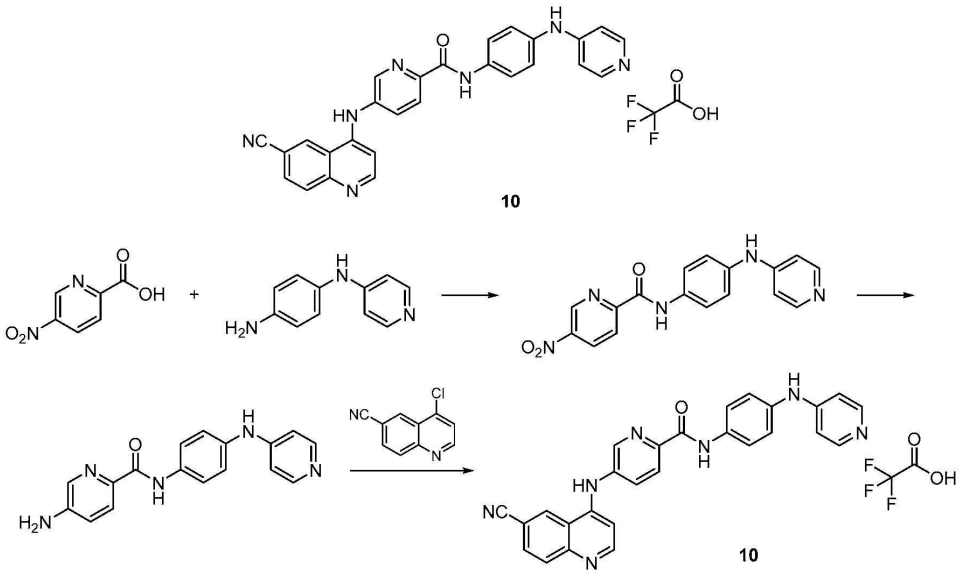


반응식 6

[0890]

[0891] **화합물 9**를 반응식 6에 나타낸 방법으로 제조하였다. **화합물 9**(4-((6-시아노퀴놀린-4-일)옥시)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드 2,2,2-트리플루오로아세테이트)를 반응식 6에 나타낸 바와 같이 제조하였다: $C_{30}H_{20}F_3N_5O_4$; 571.52 g/mol; ESI-LCMS m/z = 458.1 $[M+H]^+$; LCMS RT = 2.753분, 96.8% (210 nm).

[0892] **실시예 10: 화합물 10(5-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드 2,2,2-트리플루오로아세테이트)**



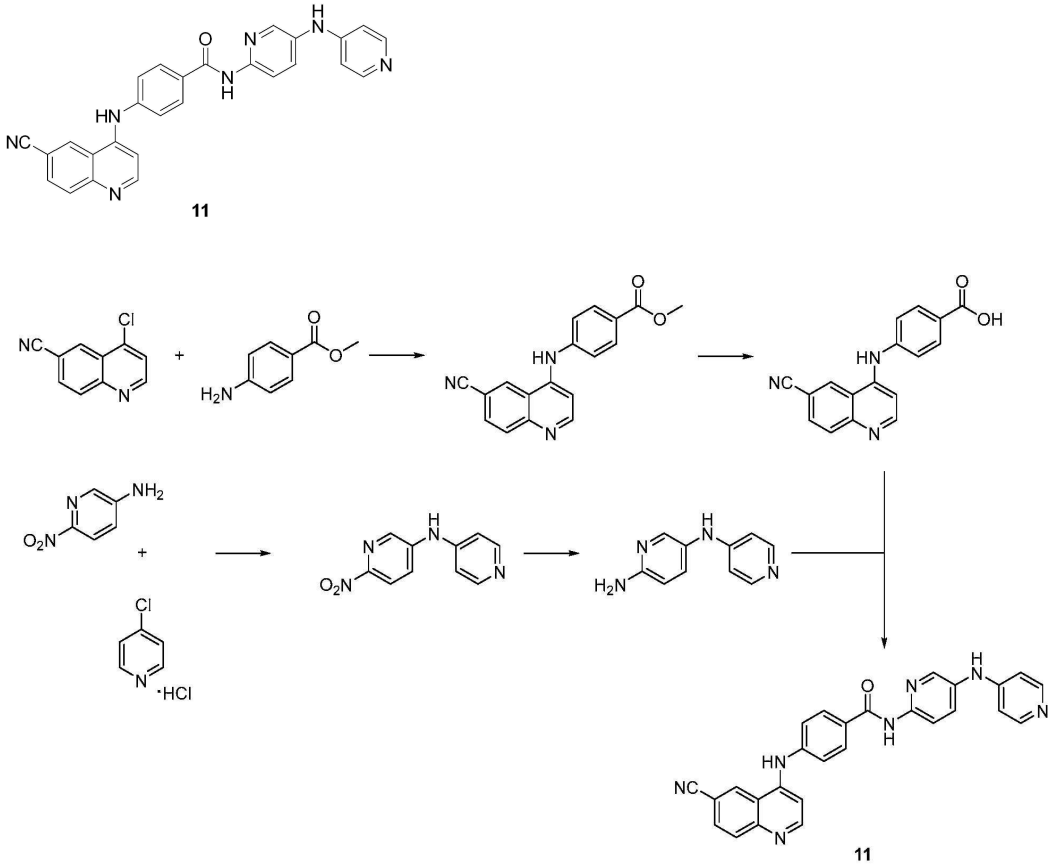
반응식 7

[0893]

[0894] **화합물 10**을 반응식 7에 나타낸 방법으로 제조하였다. **화합물 10**(5-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드 2,2,2-트리플루오로아세테이트)을 반응식 7에 나타낸 바와 같이 제조하였다: $C_{29}H_{20}F_3N_7O_3$; 571.52 g/mol; ESI-LCMS m/z = 458.1 $[M+H]^+$; LCMS RT = 2.408분, >95% (210 nm).

[0895] **실시예 11: 화합물 11(4-((6-시아노퀴놀린-4-일)아미노)-N-(5-(피리딘-4-일아미노)피리딘-2-일)벤즈아미드)**

[0896]



반응식 8

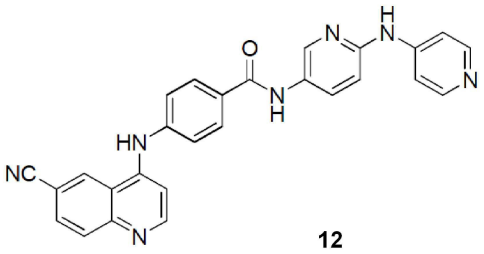
[0897]

[0898] **화합물 11**을 반응식 8에 나타낸 방법으로 제조하였다. **화합물 11**(4-((6-시아노퀴놀린-4-일)아미노)-N-(5-(피리딘-4-일아미노)피리딘-2-일)벤즈아미드)을 반응식 8에 나타낸 바와 같이 제조하였다: $C_{27}H_{19}N_7O$; 457.49 g/mol;

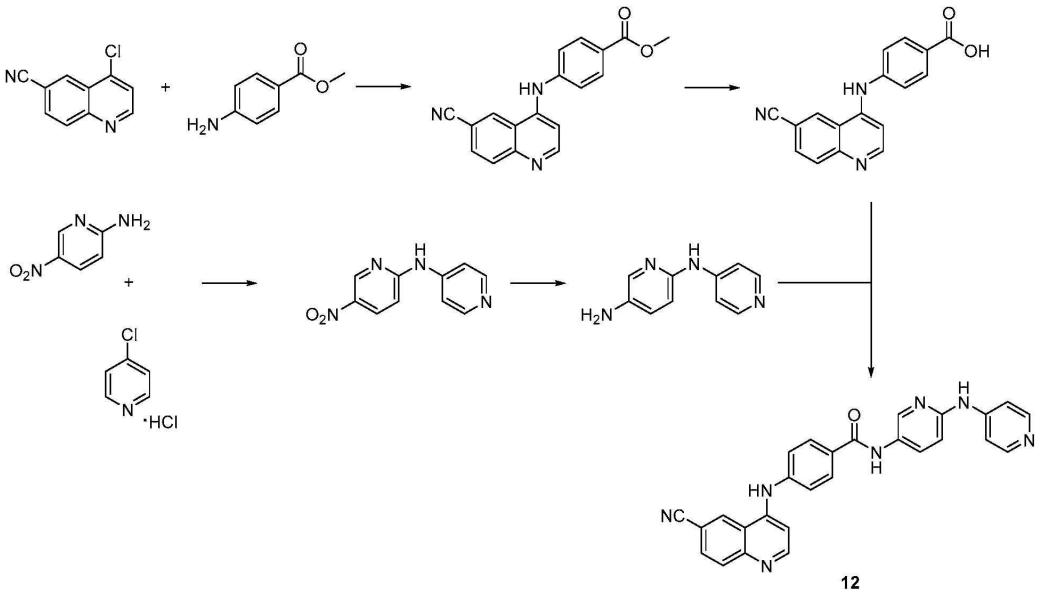
11 mg; 옅은 황색 고체; ESI-LCMS m/z = 458 $[M+H]^+$; LCMS RT = 1.44분, >95.00% (214 nm).

[0899] **실시예 12: 화합물 12(4-(6-시아노퀴놀린-4-일아미노)-N-(6-(피리딘-4-일아미노)피리딘-3-일)벤즈아미드)**

[0900]



12



12

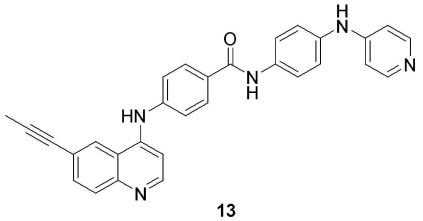
반응식 9

[0901]

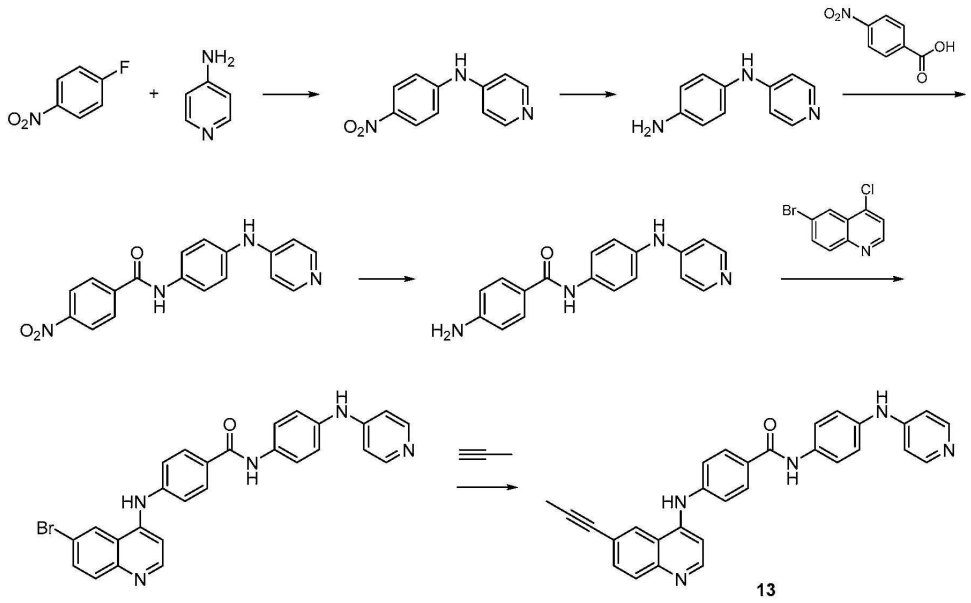
[0902] **화합물 12**를 반응식 9에 나타낸 방법으로 제조하였다. **화합물 12**(4-(6-시아노퀴놀린-4-일아미노)-N-(6-(피리딘-4-일아미노)피리딘-3-일)벤즈아미드)를 반응식 9에 나타낸 바와 같이 제조하였다: $C_{27}H_{19}N_7O$; 457.49 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 458 $[M+H]^+$; LCMS RT = 1.36분, >95.00% (214 nm).

[0903] **실시예 13: 화합물 13(4-((6-(프로프-1-인-1-일)퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**

[0904]



13



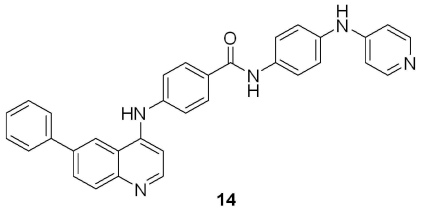
반응식 10

[0905]

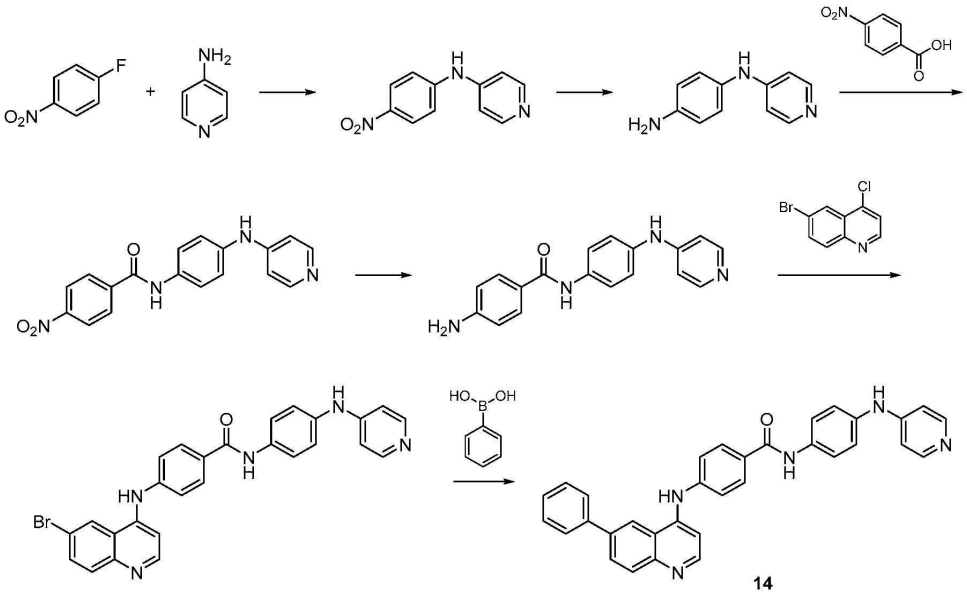
[0906] **화합물 13**을 반응식 10에 나타낸 방법으로 제조하였다. **화합물 13**(4-((6-(프로프-1-인-1-일)퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 10에 나타낸 바와 같이 제조하였다: $C_{30}H_{23}N_5O$; 469.55 g/mol; ESI-LCMS m/z = 470.1 $[M+H]^+$; LCMS RT = 2.889분, 98.6% (210 nm).

[0907] **실시예 14: 화합물 14(4-((6-페닐퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**

[0908]



14

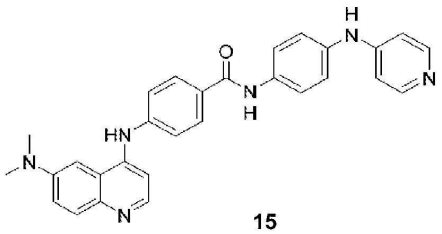


반응식 11

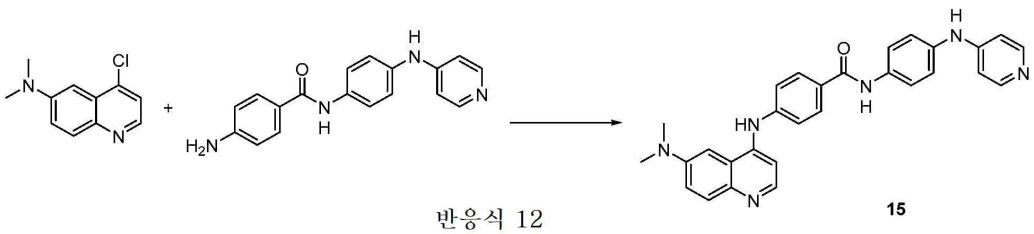
[0909]

[0910] **화합물 14**를 반응식 11에 나타낸 방법으로 제조하였다. **화합물 14**(4-((6-페닐퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)를 반응식 11에 나타낸 바와 같이 제조하였다: $C_{33}H_{25}N_5O$; 507.60 g/mol; ESI-LCMS m/z =508.2 $[M+H]^+$; LCMS RT = 3.199분, 98.3% (210 nm).

[0911] **실시예 15: 화합물 15(4-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



15

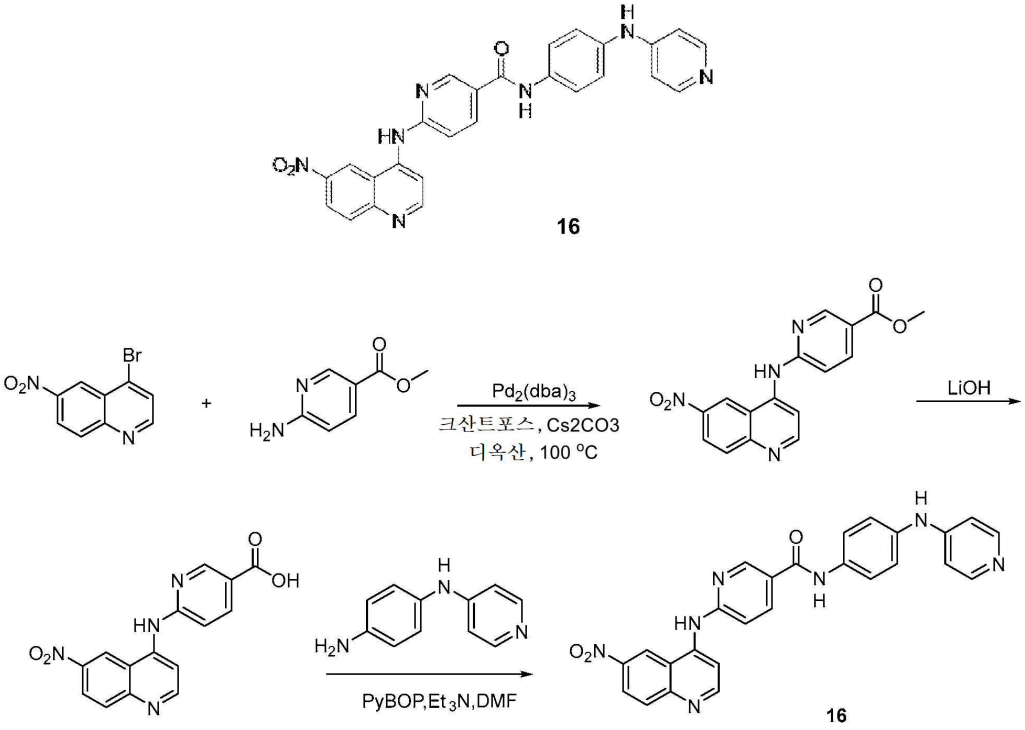


반응식 12

[0912]

[0913] **화합물 15**를 반응식 12에 나타낸 방법으로 제조하였다. **화합물 15**(4-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)를 반응식 12에 나타낸 바와 같이 제조하였다: $C_{29}H_{26}N_6O$; 474.57 g/mol; 18 mg; 옅은 황색 고체; ESI-LCMS m/z = 475 $[M+H]^+$; LCMS RT = 1.42분, >95.00% (214 nm).

[0914] **실시예 16: 화합물 16(6-(6-니트로퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)니코틴아미드)**



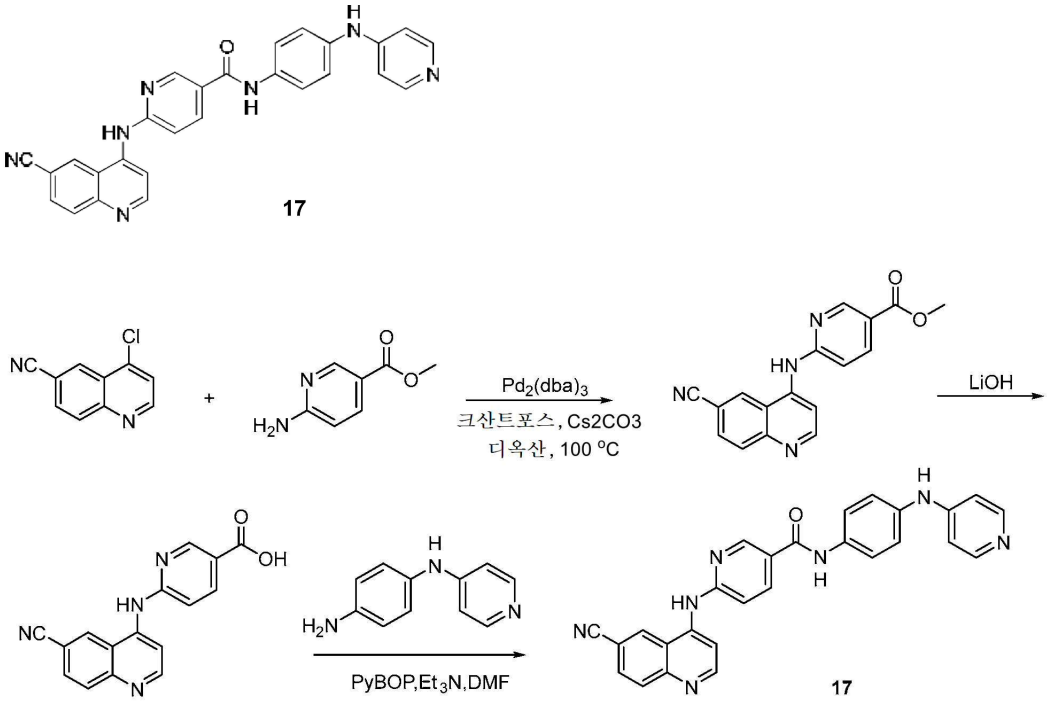
반응식 13

[0915]

[0916] **화합물 16**을 반응식 13에 나타낸 방법으로 제조하였다. **화합물 16**(6-(6-니트로퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)니코틴아미드)을 반응식 13에 나타낸 바와 같이 제조하였다: $C_{26}H_{19}N_7O_3$; 477.47 g/mol; 24 mg; 옅은 황색 고체; ESI-LCMS m/z = 478 $[M+H]^+$; LCMS RT = 1.65분, >95.00% (214 nm).

[0917] **실시예 17: 화합물 17(6-(6-시아노퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)니코틴아미드)**

[0918]



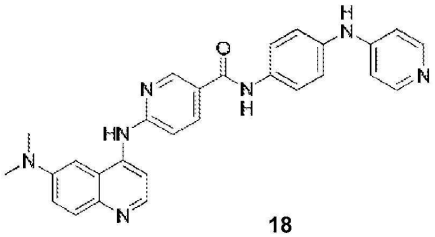
반응식 14

[0919]

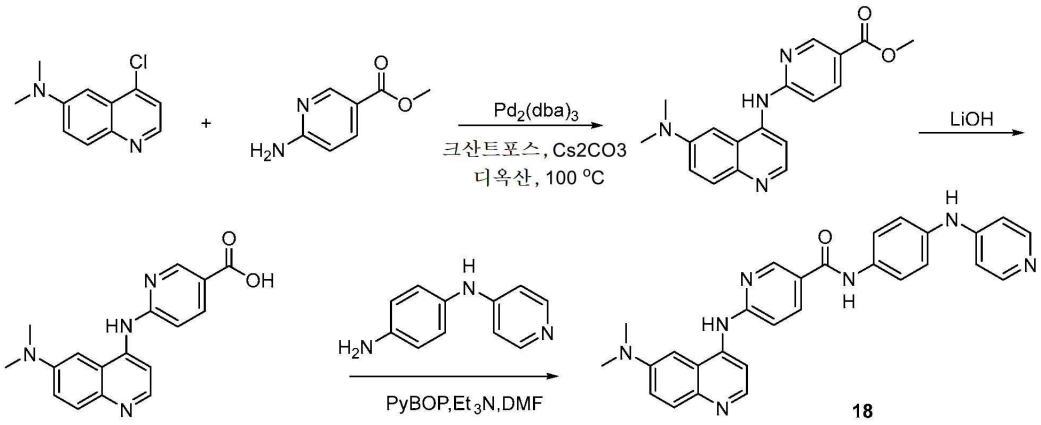
[0920] **화합물 17**을 반응식 14에 나타낸 방법으로 제조하였다. **화합물 17**(6-(6-시아노퀴놀린-4-일아미노)-N-(4-(피리딘

-4-일아미노)페닐)니코틴아미드)을 반응식 14에 나타낸 바와 같이 제조하였다: $C_{27}H_{19}N_7O$; 457.49 g/mol; 14 mg; 옅은 황색 고체; ESI-LCMS m/z = 458 $[M+H]^+$; LCMS RT = 1.63분, >95.00% (214 nm).

[0921] **실시예 18: 화합물 18(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)니코틴아미드)**



18

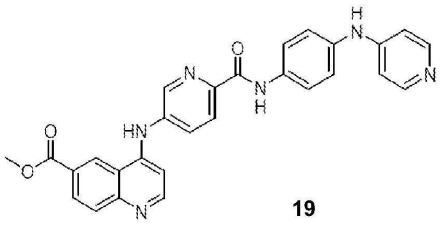


반응식 15

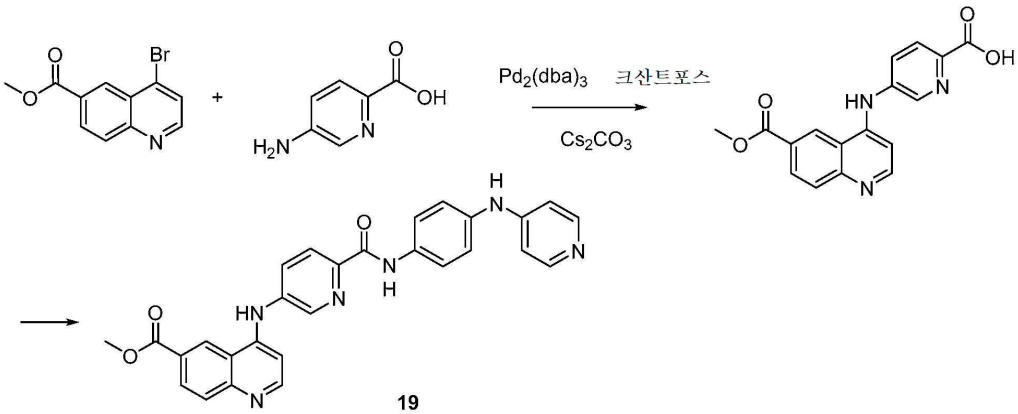
[0922]

[0923] **화합물 18**을 반응식 15에 나타낸 방법으로 제조하였다. **화합물 18**(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)니코틴아미드)을 반응식 15에 나타낸 바와 같이 제조하였다: $C_{28}H_{25}N_7O$; 475.54 g/mol; 17 mg; 황색 고체; ESI-LCMS m/z = 476 $[M+H]^+$; LCMS RT = 1.73분, >95.00% (214 nm).

[0924] **실시예 19: 화합물 19(4-(6-(4-(피리딘-4-일아미노)페닐카르바모일)피리딘-3-일아미노)퀴놀린-6-카르복실레이트)**



19

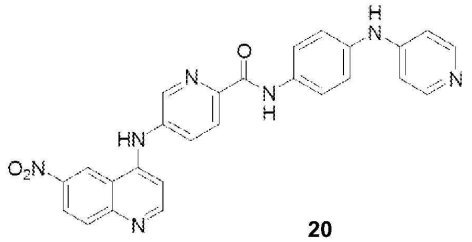


반응식 16

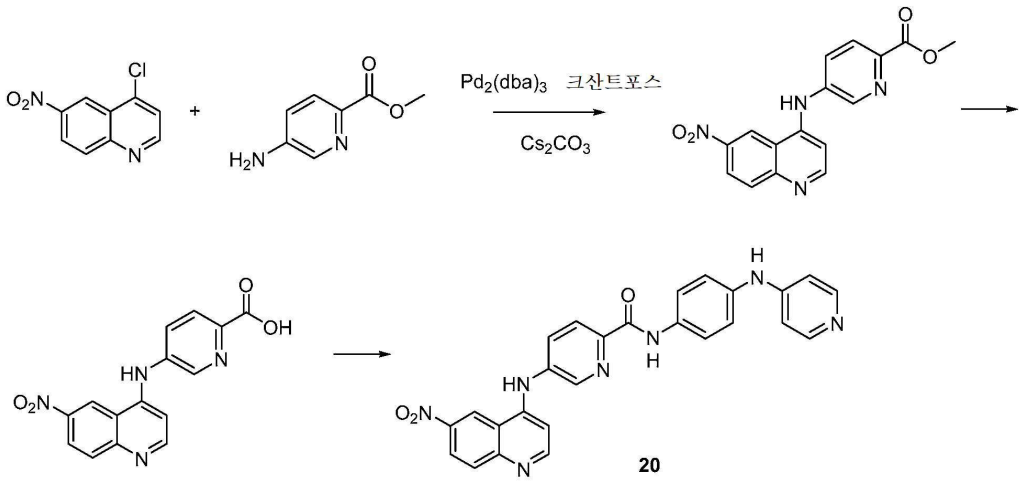
[0925]

[0926] **화합물 19**를 반응식 16에 나타낸 방법으로 제조하였다. **화합물 19**(4-(6-(4-(피리딘-4-일아미노)페닐카르바모일)피리딘-3-일아미노)퀴놀린-6-카르복실레이트)를 반응식 16에 나타낸 바와 같이 제조하였다: $C_{28}H_{22}N_6O_3$; 490.51 g/mol; 13 mg; 옅은 황색 고체; ESI-LCMS m/z = 491 $[M+H]^+$; LCMS RT = 1.38분, >95.00% (214 nm).

[0927] **실시예 20: 화합물 20(5-(6-니트로퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)**



20

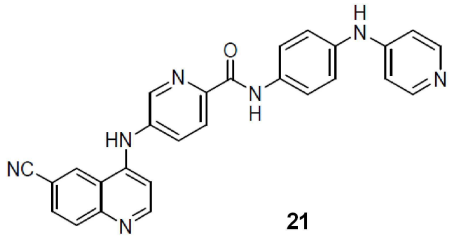


반응식 17

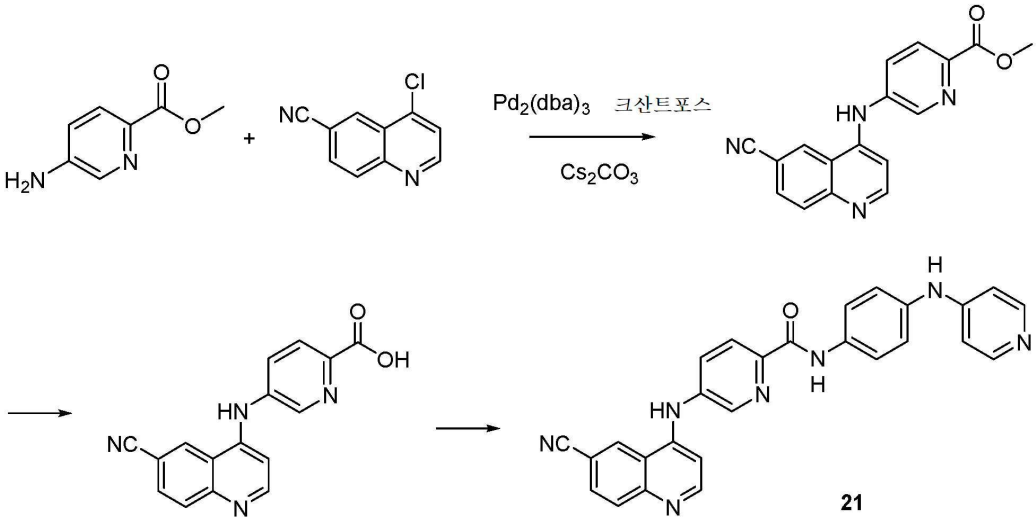
[0928]

[0929] **화합물 20**을 반응식 17에 나타낸 방법으로 제조하였다. **화합물 20**(5-(6-니트로퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)을 반응식 17에 나타낸 바와 같이 제조하였다: $C_{26}H_{19}N_7O_3$; 477.47 g/mol; 12 mg; 황갈색 고체; ESI-LCMS m/z = 478 $[M+H]^+$; LCMS RT = 1.39분, >95.00% (214 nm).

[0930] **실시예 21: 화합물 21(5-(6-시아노퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)**

[0931] 

21



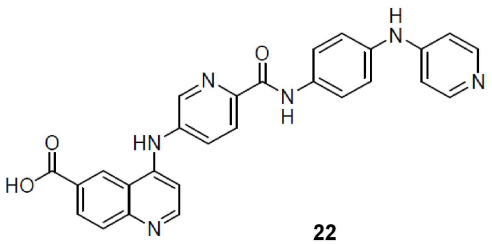
21

반응식 18

[0932]

[0933] **화합물 21**을 반응식 18에 나타낸 방법으로 제조하였다. **화합물 21**(5-(6-시아노퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)을 반응식 18에 나타낸 바와 같이 제조하였다: $C_{27}H_{19}N_7O$; 457.49 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 458 $[M+H]^+$; LCMS RT = 1.37분, >95.00% (214 nm).

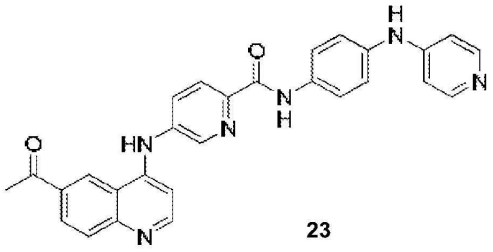
[0934] **실시예 22: 화합물 22(4-(6-(4-(피리딘-4-일아미노)페닐카르바모일)피리딘-3-일아미노)퀴놀린-6-카르복실산)**

[0935] 

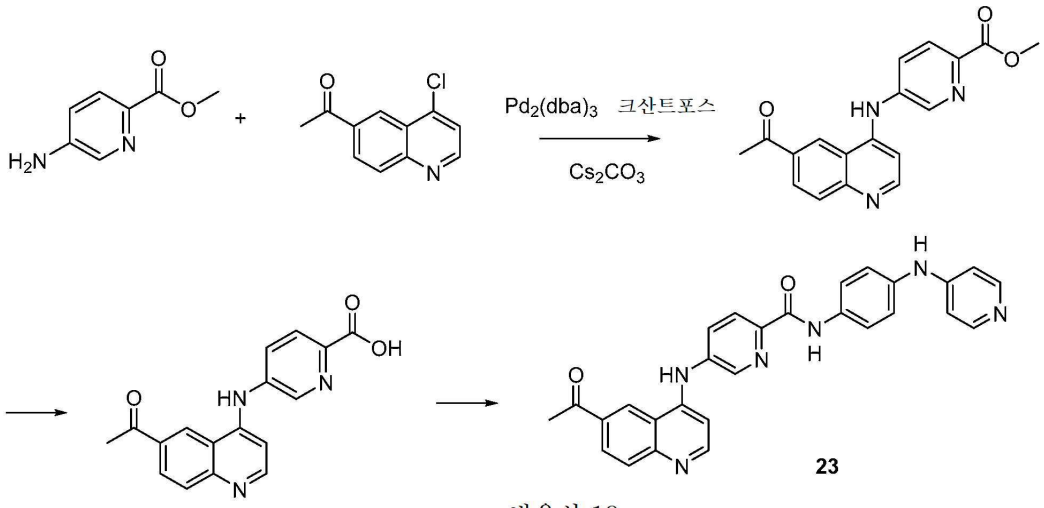
22

[0936] **화합물 22**를 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 22**(4-(6-(4-(피리딘-4-일아미노)페닐카르바모일)피리딘-3-일아미노)퀴놀린-6-카르복실산): $C_{27}H_{20}N_6O_3$; 476.49 g/mol; 19 mg; 옅은 황색 고체; ESI-LCMS m/z = 477 $[M+H]^+$; LCMS RT = 1.33분, >95.00% (214 nm).

[0937] **실시예 23: 화합물 23(5-(6-아세틸퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)**



23



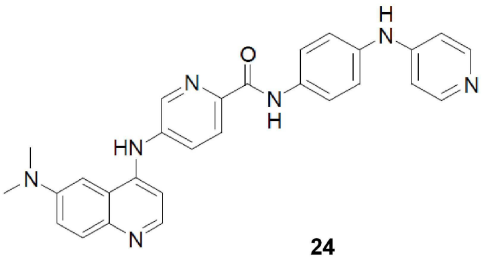
반응식 19

[0938]

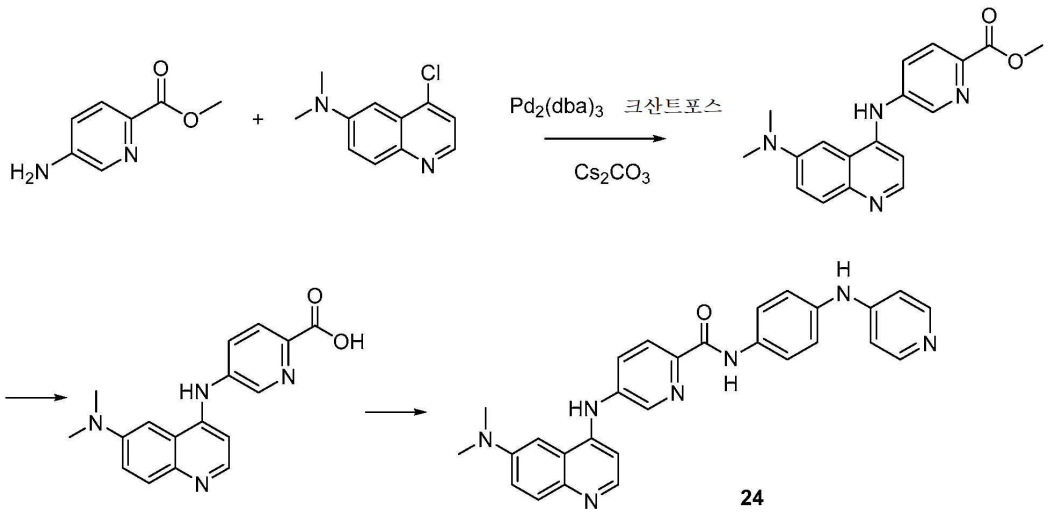
[0939] **화합물 23**을 반응식 19에 나타낸 방법으로 제조하였다. **화합물 23**(5-(6-아세틸퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)을 반응식 19에 나타낸 바와 같이 제조하였다: $C_{28}H_{22}N_6O_2$; 474.51 g/mol; 20 mg; 옅은 황색 고체; ESI-LCMS m/z = 475 $[M+H]^+$; LCMS RT = 1.38분, >95.00% (214 nm).

[0940] **실시예 24: 화합물 24(5-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)**

[0941]



24

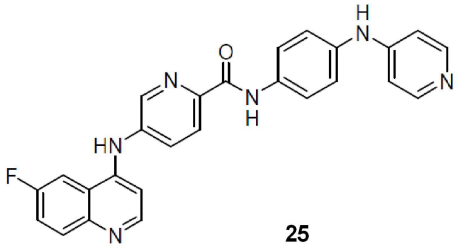


반응식 20

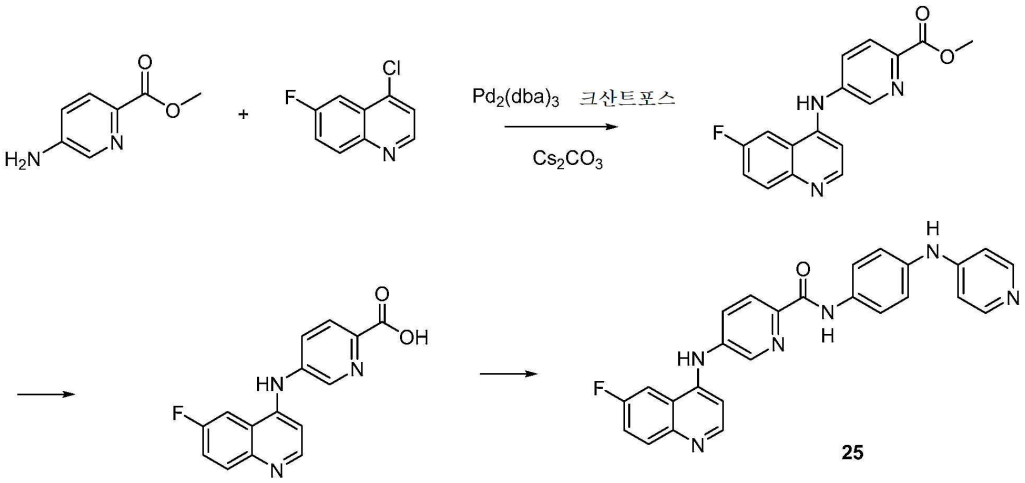
[0942]

[0943] **화합물 24**를 반응식 20에 나타낸 방법으로 제조하였다. **화합물 24**(5-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)를 반응식 20에 나타낸 바와 같이 제조하였다: $C_{28}H_{25}N_7O$; 475.54 g/mol; 18 mg; 옅은 황색 고체; ESI-LCMS m/z = 476 $[M+H]^+$; LCMS RT = 1.52분, >95.00% (214 nm).

[0944] **실시예 25: 화합물 25(5-(6-플루오로퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)**

[0945] 

25



Pd2(dba)3 크산트포스

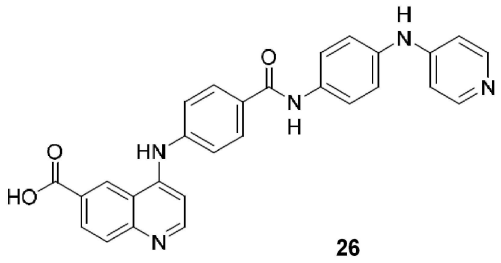
Cs2CO3

25

[0946] 반응식 21

[0947] **화합물 25**를 반응식 21에 나타낸 방법으로 제조하였다. **화합물 25**(5-(6-플루오로퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)피콜린아미드)를 반응식 21에 나타낸 바와 같이 제조하였다: $C_{26}H_{19}FN_6O$; 450.47 g/mol; 10 mg; 옅은 황색 고체; ESI-LCMS m/z = 451 $[M+H]^+$; LCMS RT = 1.38분, >95.00% (214 nm).

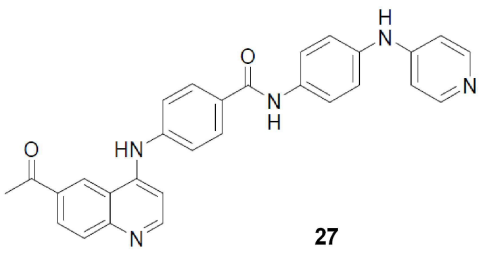
[0948] **실시예 26: 화합물 26(4-((4-((4-(피리딘-4-일아미노)페닐)카르바모일)페닐)아미노)퀴놀린-6-카르복실산)**

[0949] 

26

[0950] **화합물 26**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 26**(4-((4-((4-(피리딘-4-일아미노)페닐)카르바모일)페닐)아미노)퀴놀린-6-카르복실산): $C_{28}H_{21}N_5O_3$; 475.51 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 476 $[M+H]^+$; LCMS RT = 1.34분, >95.00% (214 nm).

[0951] **실시예 27: 화합물 27(4-(6-아세틸퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**

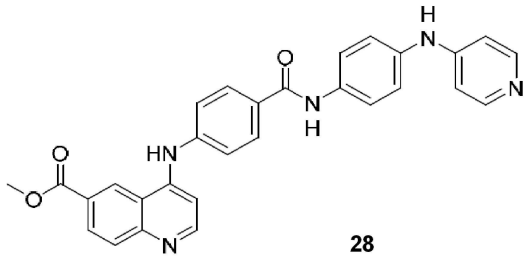
[0952] 

27

[0953] **화합물 27**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 27**(4-

(6-아세틸퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드): $C_{29}H_{23}N_5O_2$; 473.53 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 474 $[M+H]^+$; LCMS RT = 1.44분, >95.00% (214 nm).

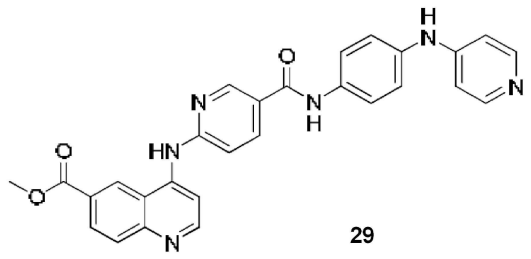
[0954] **실시예 28: 화합물 28(메틸 4-((4-((4-(피리딘-4-일아미노)페닐)카르바모일)페닐)아미노)퀴놀린-6-카르복실레이트)**

[0955] 

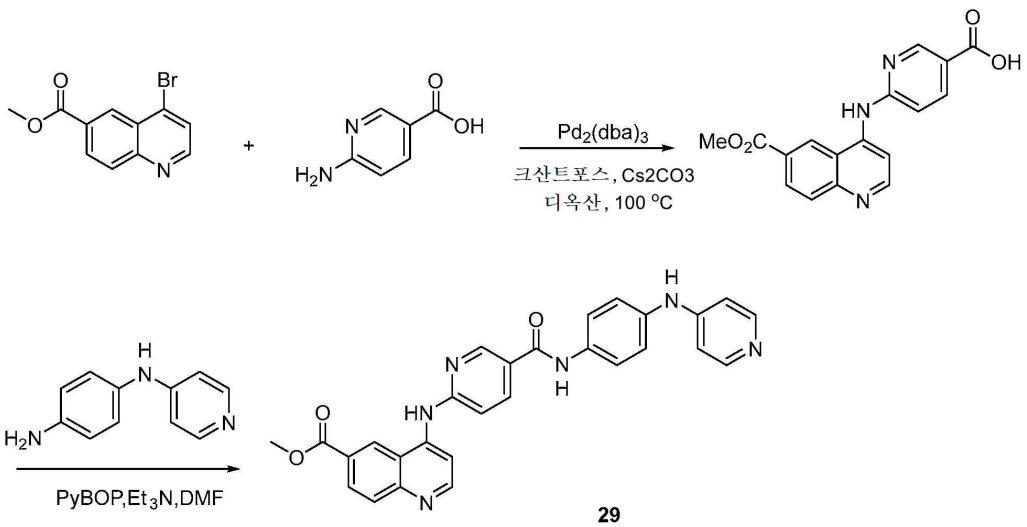
28

[0956] **화합물 28**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 28**(메틸 4-((4-((4-(피리딘-4-일아미노)페닐)카르바모일)페닐)아미노)퀴놀린-6-카르복실레이트): $C_{29}H_{23}N_5O_3$; 489.54 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 490 $[M+H]^+$; LCMS RT = 1.43분, >95.00% (214 nm).

[0957] **실시예 29: 화합물 29(메틸 4-(5-(4-(피리딘-4-일아미노)페닐카르바모일)피리딘-2-일아미노)퀴놀린-6-카르복실레이트)**

[0958] 

29



29

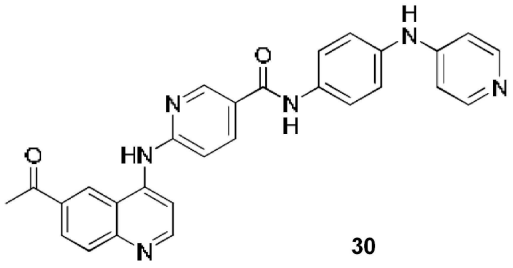
반응식 22

[0959]

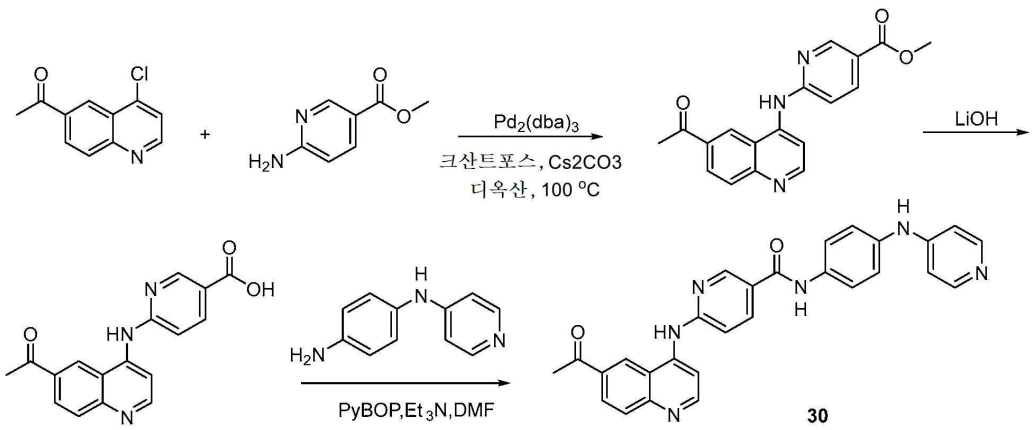
[0960] **화합물 29**를 반응식 22에 나타낸 방법으로 제조하였다. **화합물 29**(메틸 4-(5-(4-(피리딘-4-일아미노)페닐카르바모일)피리딘-2-일아미노)퀴놀린-6-카르복실레이트)를 반응식 22에 나타낸 바와 같이 제조하였다: $C_{28}H_{22}N_6O_3$; 490.51 g/mol; 15 mg; 황색 고체; ESI-LCMS m/z = 491 $[M+H]^+$; LCMS RT = 1.39분, >95.00% (214 nm).

[0961] **실시예 30: 화합물 30(6-(6-아세틸퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)니코틴아미드)**

[0962]



30

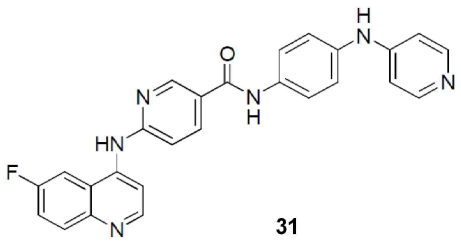


[0963] 반응식 23

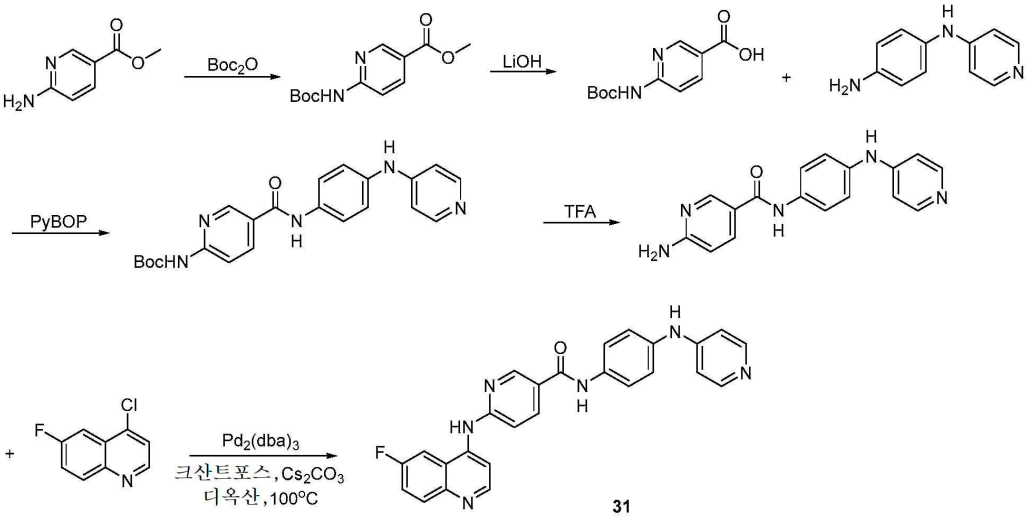
[0964] **화합물 30**을 반응식 23에 나타낸 방법으로 제조하였다. **화합물 30**(6-(6-아세틸퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)니코틴아미드)을 반응식 23에 나타낸 바와 같이 제조하였다: $C_{28}H_{22}N_6O_2$; 474.51 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 475 $[M+H]^+$; LCMS RT = 1.49분, >95.00% (214 nm).

[0965] **실시예 31: 화합물 31(6-(6-플루오로퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)니코틴아미드)**

[0966]



31

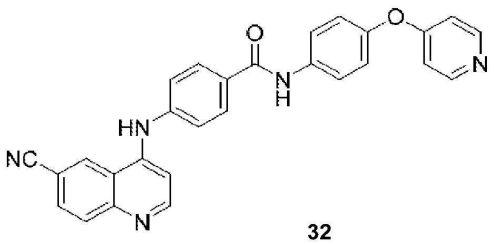


반응식 24

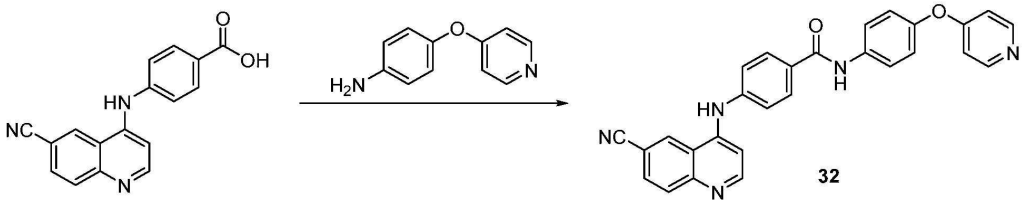
[0967]

[0968] **화합물 31**을 반응식 24에 나타낸 방법으로 제조하였다. **화합물 31**(6-(6-플루오로퀴놀린-4-일아미노)-N-(4-(피리딘-4-일아미노)페닐)니코틴아미드)을 반응식 24에 나타낸 바와 같이 제조하였다: $C_{26}H_{19}FN_6O$; 450.47 g/mol; 13 mg; 옅은 황색 고체; ESI-LCMS m/z = 451 $[M+H]^+$; LCMS RT = 1.60분, >95.00% (214 nm).

[0969] **실시예 32: 화합물 32(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일옥시)페닐)벤즈아미드)**



32



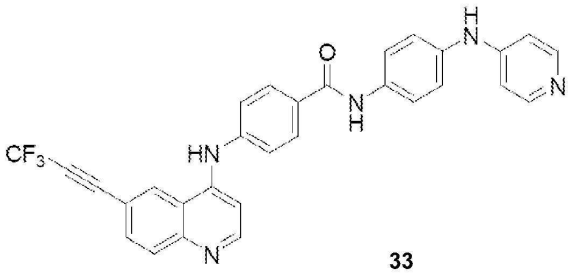
32

반응식 25

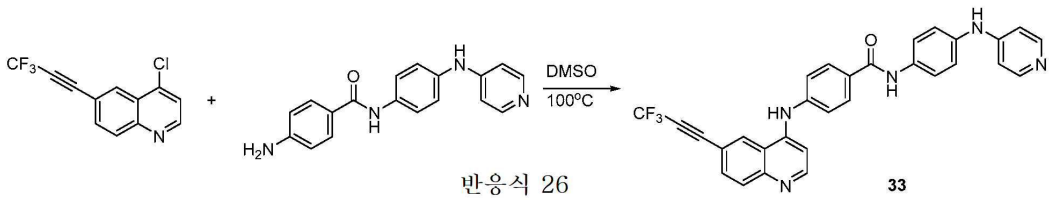
[0970]

[0971] **화합물 32**를 반응식 25에 나타낸 방법으로 제조하였다. **화합물 32**(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일옥시)페닐)벤즈아미드)를 반응식 25에 나타낸 바와 같이 제조하였다: $C_{26}H_{19}FN_6O$; 457.49 g/mol; 14 mg; 옅은 황색 고체; ESI-LCMS m/z = 458 $[M+H]^+$; LCMS RT = 1.38분, >95.00% (214 nm).

[0972] **실시예 33: 화합물 33(N-(4-(피리딘-4-일아미노)페닐)-4-((6-(3,3,3-트리플루오로프로프-1-인-1-일)퀴놀린-4-일)아미노)벤즈아미드)**



33



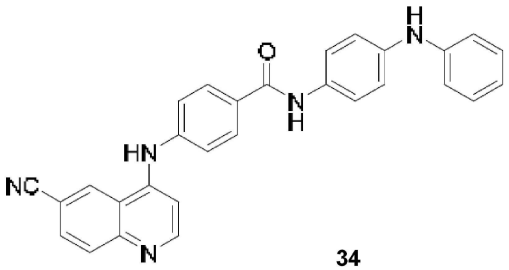
33

반응식 26

[0973]

[0974] **화합물 33**을 반응식 26에 나타낸 방법으로 제조하였다. **화합물 33**(N-(4-(피리딘-4-일아미노)페닐)-4-((6-(3,3,3-트리플루오로프로프-1-인-1-일)퀴놀린-4-일)아미노)벤즈아미드)을 반응식 26에 나타낸 바와 같이 제조하였다: $C_{30}H_{20}F_3N_5O$; 523.52 g/mol; 15 mg; 옅은 황색 고체; ESI-LCMS m/z = 524 $[M+H]^+$; LCMS RT = 1.94분, >95.00% (214 nm).

[0975] **실시예 34: 화합물 34(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(페닐아미노)페닐)벤즈아미드)**

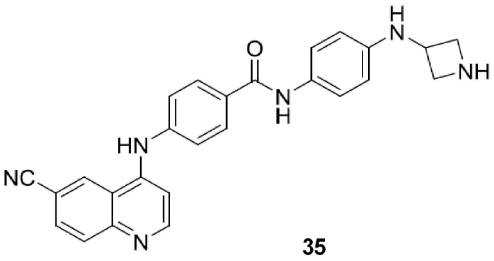


34

[0976]

[0977] **화합물 34**를 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 34**(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(페닐아미노)페닐)벤즈아미드): $C_{29}H_{21}N_5O$; 455.52 g/mol; 15 mg; 옅은 황색 고체; ESI-LCMS m/z = 456 $[M+H]^+$; LCMS RT = 1.19분, >95.00% (214 nm).

[0978] **실시예 35: 화합물 35(N-(4-(아제티딘-3-일아미노)페닐)-4-((6-시아노퀴놀린-4-일)아미노)벤즈아미드)**

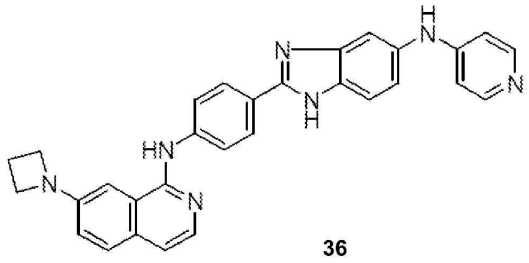


35

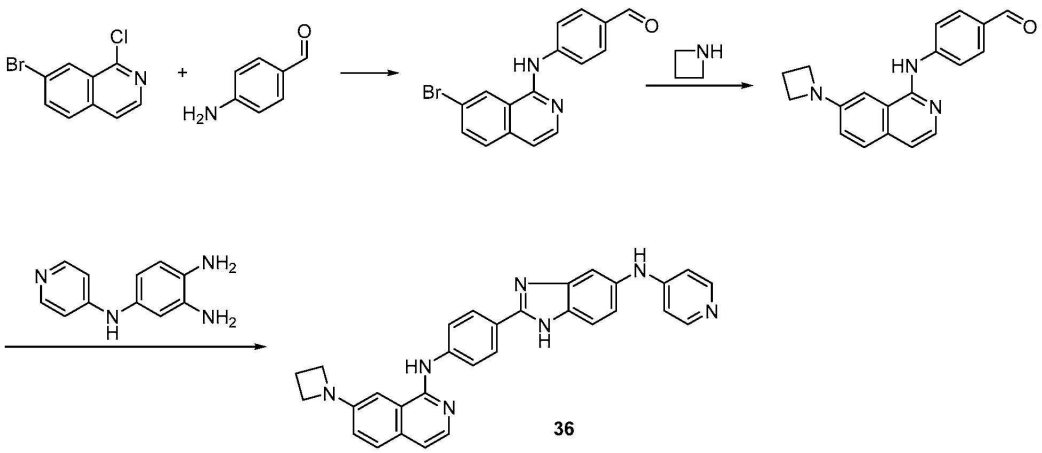
[0979]

[0980] **화합물 35**를 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 35**(N-(4-(아제티딘-3-일아미노)페닐)-4-((6-시아노퀴놀린-4-일)아미노)벤즈아미드): $C_{26}H_{22}N_6O$; 434.50 g/mol; 13 mg; 옅은 황색 고체; ESI-LCMS m/z = 435 $[M+H]^+$; LCMS RT = 1.33분, >95.00% (214 nm).

[0981] **실시예 36: 화합물 36(7-(아제티딘-1-일)-N-(4-(5-(피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)이소퀴놀린-1-아민)**



36



36

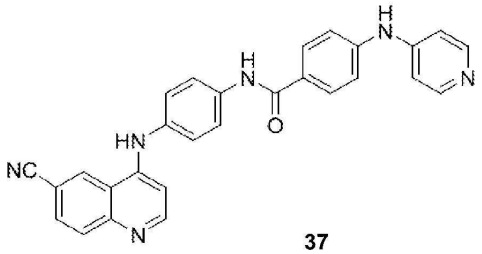
반응식 27

[0982]

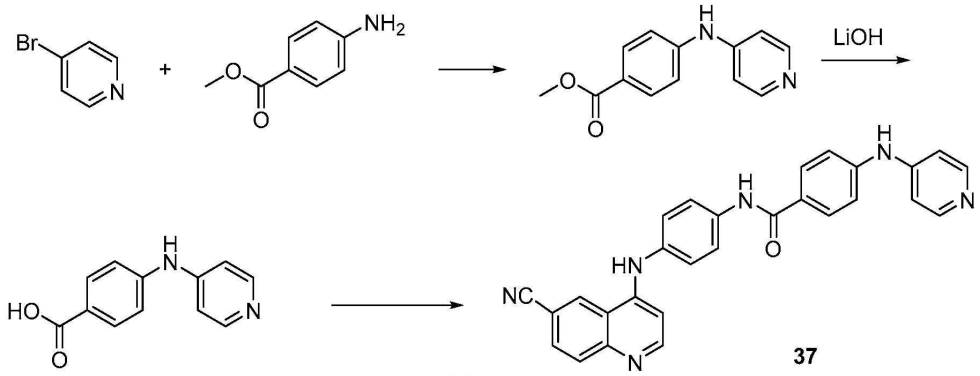
[0983] **화합물 36**을 반응식 27에 나타낸 방법으로 제조하였다. **화합물 36**(7-(아제티딘-1-일)-N-(4-(5-(피리딘-4-일아미

노)-1H-벤조[d]이미다졸-2-일)페닐)이소퀴놀린-1-아민)을 반응식 26에 나타낸 바와 같이 제조하였다: $C_{30}H_{25}N_7$; 483.58 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 484 $[M+H]^+$; LCMS RT = 1.71분, >95.00% (214 nm).

[0984] **실시예 37: 화합물 37(N-(4-((6-시아노퀴놀린-4-일)아미노)페닐)-4-(피리딘-4-일아미노)벤즈아미드)**



37

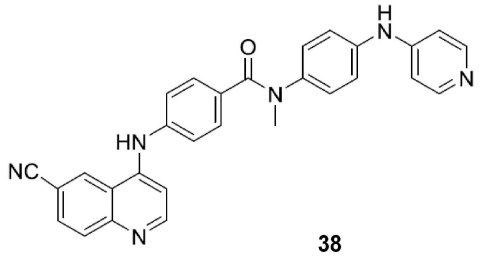


반응식 28

[0985]

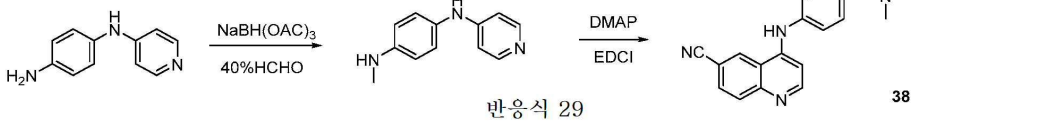
[0986] **화합물 37**을 반응식 28에 나타낸 방법으로 제조하였다. **화합물 37**(N-(4-((6-시아노퀴놀린-4-일)아미노)페닐)-4-(피리딘-4-일아미노)벤즈아미드)을 반응식 28에 나타낸 바와 같이 제조하였다: $C_{28}H_{20}N_6O$; 456.51 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 457 $[M+H]^+$; LCMS RT = 1.39분, >95.00% (214 nm).

[0987] **실시예 38: 화합물 38(4-((6-시아노퀴놀린-4-일)아미노)-N-메틸-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



38

[0988]

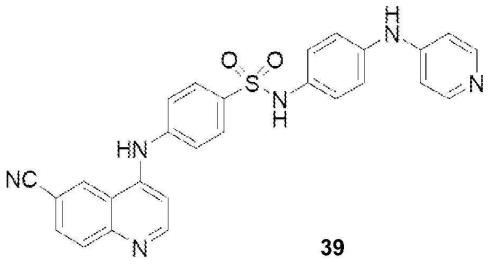


반응식 29

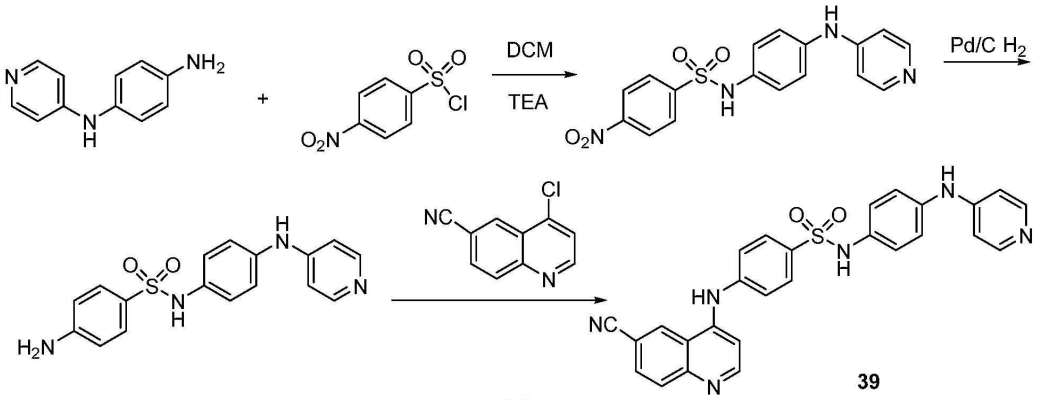
[0989]

[0990] **화합물 38**을 반응식 29에 나타낸 방법으로 제조하였다. **화합물 38**(4-((6-시아노퀴놀린-4-일)아미노)-N-메틸-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 29에 나타낸 바와 같이 제조하였다: $C_{29}H_{22}N_6O$; 470.54 g/mol; 14 mg; 옅은 황색 고체; ESI-LCMS m/z = 471 $[M+H]^+$; LCMS RT = 1.36분, >95.00% (214 nm).

[0991] **실시예 39: 화합물 39(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤젠설폰아미드)**



39

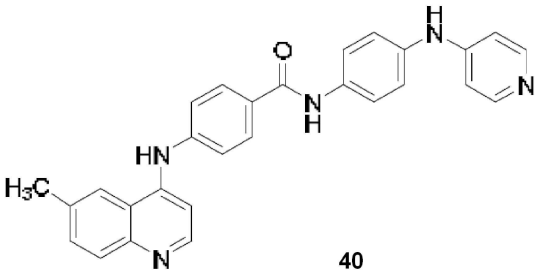


반응식 30

[0992]

[0993] **화합물 39**를 반응식 30에 나타낸 방법으로 제조하였다. **화합물 39**(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤젠설폰아미드)를 반응식 30에 나타낸 바와 같이 제조하였다: $C_{27}H_{20}N_6O_2S$; 492.56 g/mol; 16 mg; 옅은 황색 고체; ESI-LCMS m/z = 493 $[M+H]^+$; LCMS RT = 0.96분, >95.00% (214 nm).

[0994] **실시예 40: 화합물 40(4-((6-메틸퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**

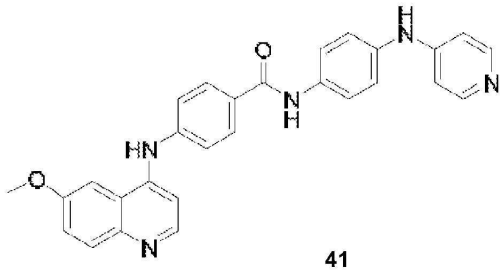


40

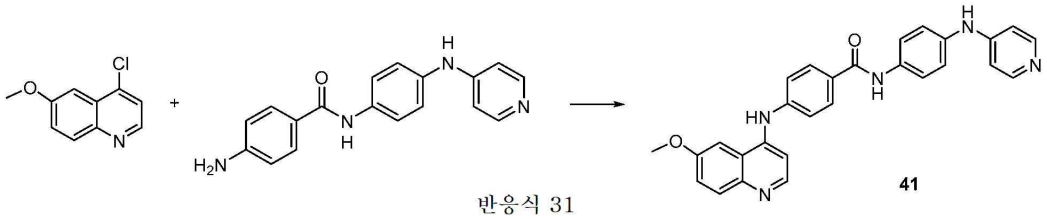
[0995]

[0996] **화합물 40**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 40**(4-((6-메틸퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드): $C_{28}H_{23}N_5O$; 445.53 g/mol; 13 mg; 옅은 황색 고체; ESI-LCMS m/z = 446 $[M+H]^+$; LCMS RT = 1.44분, >95.00% (214 nm).

[0997] **실시예 41: 화합물 41(4-((6-메톡시퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



41

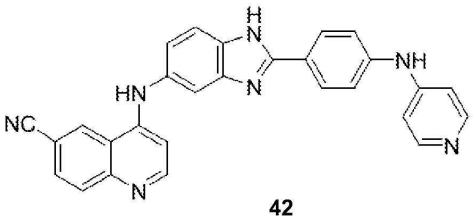


반응식 31

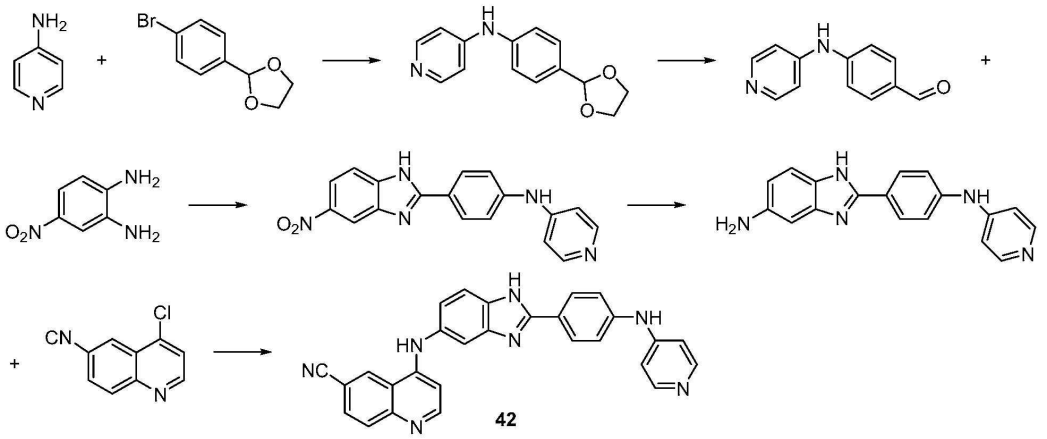
[0998]

[0999] **화합물 41**을 반응식 31에 나타낸 방법으로 제조하였다. **화합물 41**(4-((6-메톡시퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 31에 나타낸 바와 같이 제조하였다: $C_{28}H_{23}N_5O_2$; 461.53 g/mol; 16 mg; 옅은 황색 고체; ESI-LCMS m/z = 462 $[M+H]^+$; LCMS RT = 1.40분, >95.00% (214 nm).

[1000] **실시예 42: 화합물 42(4-((2-(4-(피리딘-4-일아미노)페닐)-1H-벤조[d]이미다졸-5-일)아미노)퀴놀린-6-카르보니트릴)**



42

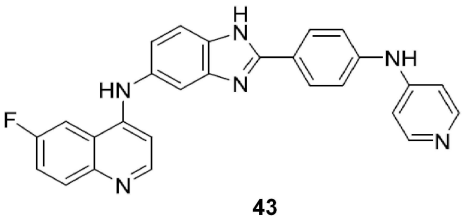


반응식 32

[1001]

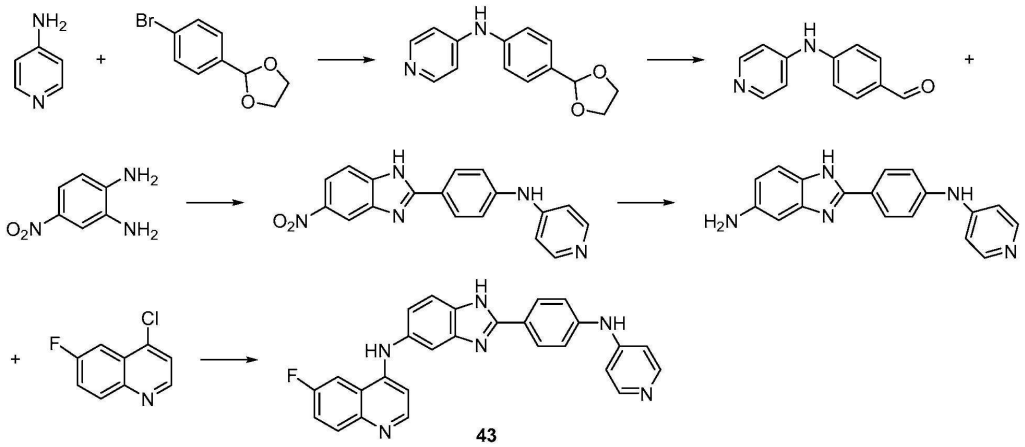
[1002] **화합물 42**를 반응식 32에 나타낸 방법으로 제조하였다. **화합물 42**(4-((2-(4-(피리딘-4-일아미노)페닐)-1H-벤조[d]이미다졸-5-일)아미노)퀴놀린-6-카르보니트릴)를 반응식 32에 나타낸 바와 같이 제조하였다: $C_{28}H_{19}N_7$; 453.51 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 454 $[M+H]^+$; LCMS RT = 1.35분, >95.00% (214 nm).

[1003] **실시예 43: 화합물 43(6-플루오로-N-(2-(4-(피리딘-4-일아미노)페닐)-1H-벤조[d]이미다졸-5-일)퀴놀린-4-아민)**



43

[1004]



43

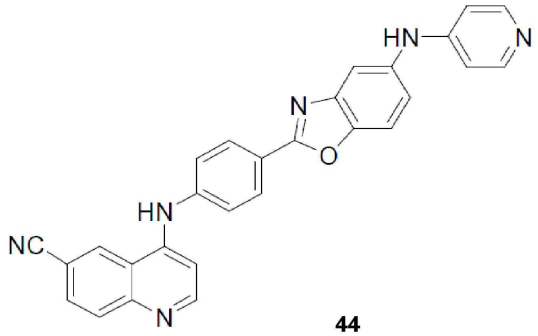
반응식 33

[1005]

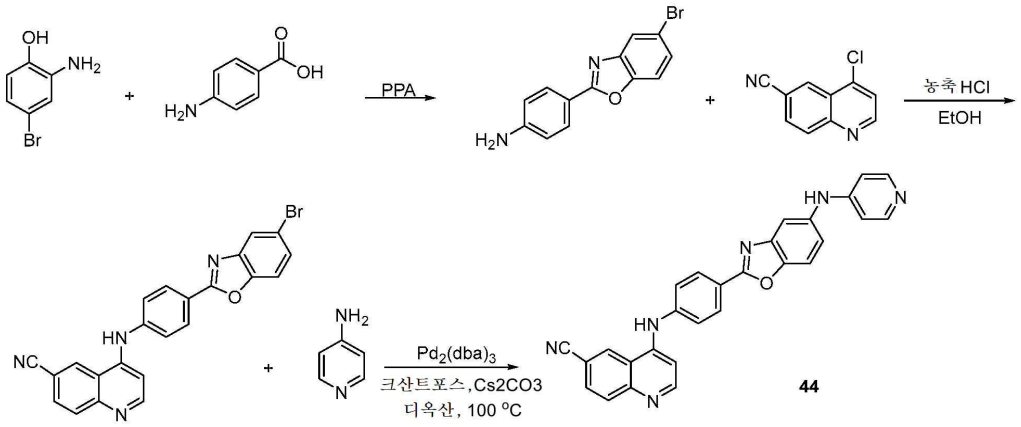
[1006] **화합물 43**을 반응식 33에 나타낸 방법으로 제조하였다. **화합물 43**(6-플루오로-N-(2-(4-(피리딘-4-일아미노)페닐)-1H-벤조[d]이미다졸-5-일)퀴놀린-4-아민)을 반응식 33에 나타낸 바와 같이 제조하였다: $C_{27}H_{19}FN_6$; 446.49 g/mol; 13 mg; 옅은 황색 고체; ESI-LCMS m/z = 447 $[M+H]^+$; LCMS RT = 1.38분, >95.00% (214 nm).

[1007] **실시예 44: 화합물 44(4-(4-(5-(피리딘-4-일아미노)벤조[d]옥사졸-2-일)페닐아미노)퀴놀린-6-카르보니트릴)**

[1008]



44

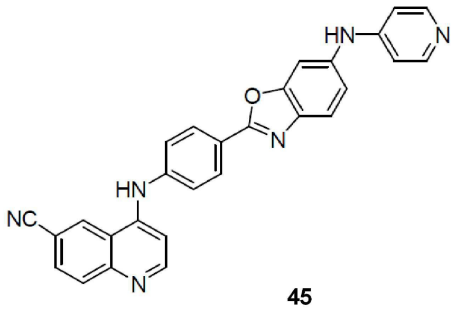


반응식 34

[1009]

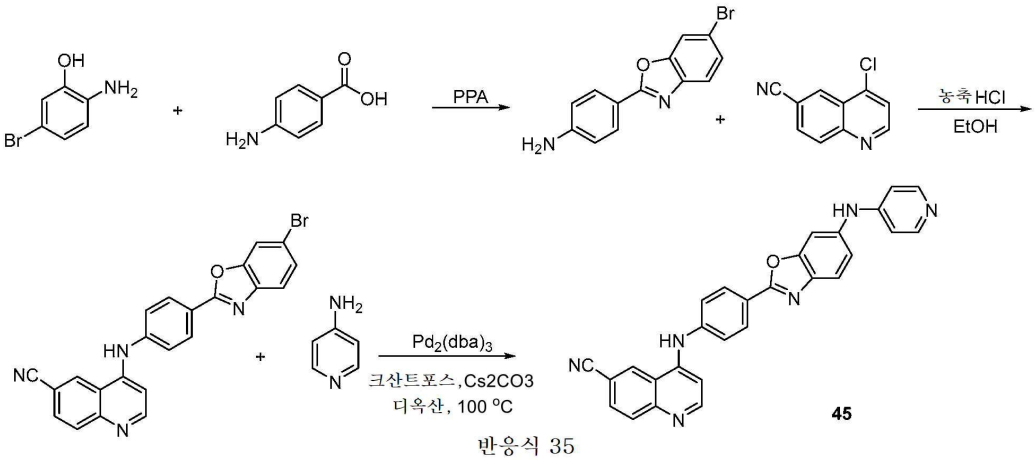
[1010] **화합물 44**를 반응식 34에 나타낸 방법으로 제조하였다. **화합물 44**(4-(4-(5-(피리딘-4-일아미노)벤조[d]옥사졸-2-일)페닐아미노)퀴놀린-6-카르보니트릴)를 반응식 34에 나타낸 바와 같이 제조하였다: $C_{28}H_{18}N_6O$; 454.48 g/mol; 12 mg; 황색 고체; ESI-LCMS m/z = 455 $[M+H]^+$; LCMS RT = 1.88분, >95.00% (214 nm).

[1011] **실시예 45: 화합물 45(4-(4-(6-(피리딘-4-일아미노)벤조[d]옥사졸-2-일)페닐아미노)퀴놀린-6-카르보니트릴)**



45

[1012]



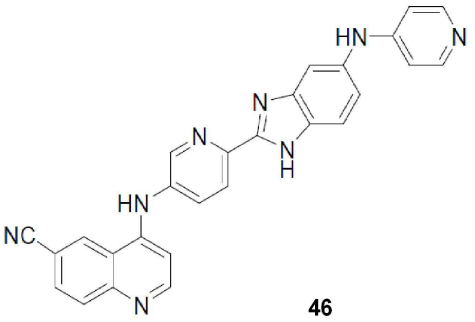
반응식 35

[1013]

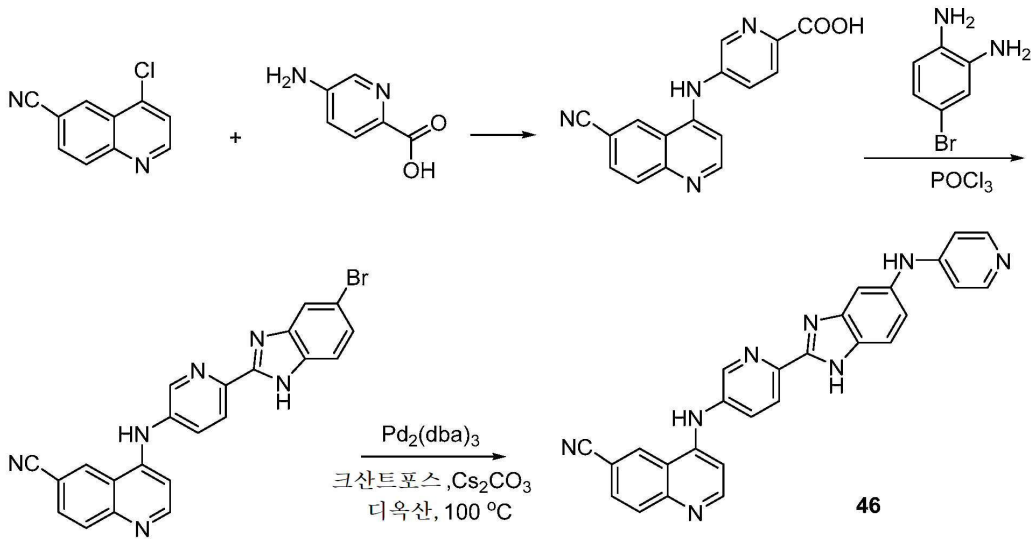
[1014] **화합물 45**를 반응식 35에 나타낸 방법으로 제조하였다. **화합물 45**(4-(4-(6-(피리딘-4-일아미노)벤조[d]옥사졸-2-일)페닐아미노)퀴놀린-6-카르보니트릴)를 반응식 35에 나타낸 바와 같이 제조하였다: $C_{28}H_{18}N_6O$; 454.48 g/mol; 14 mg; 황색 고체; ESI-LCMS m/z = 455 $[M+H]^+$; LCMS RT = 1.85분, >95.00% (214 nm).

[1015] **실시예 46: 화합물 46(4-(6-(5-(피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일아미노)퀴놀린-6-카르보니트릴)**

[1016]



46



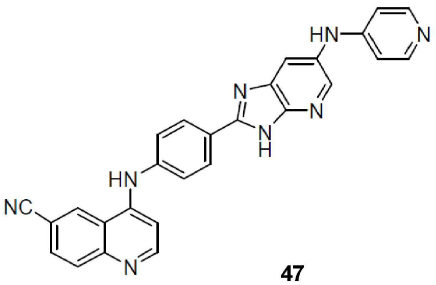
반응식 36

[1017]

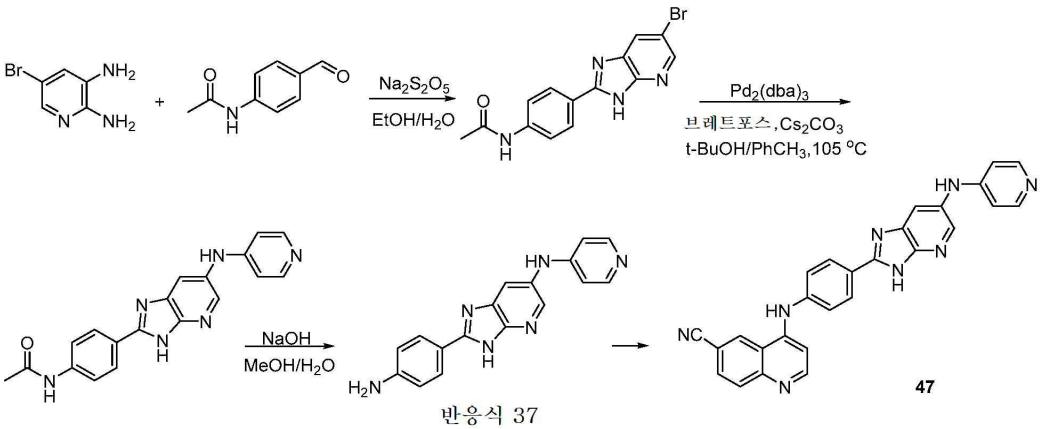
[1018] **화합물 46**을 반응식 36에 나타낸 방법으로 제조하였다. **화합물 46**(4-(6-(5-(피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일아미노)퀴놀린-6-카르보니트릴)을 반응식 36에 나타낸 바와 같이 제조하였다: $C_{27}H_{18}N_8$; 454.49 g/mol; 12 mg; 황색 고체; ESI-LCMS m/z = 455 $[M+H]^+$; LCMS RT = 1.41분, >95.00% (214 nm).

[1019] **실시예 47: 화합물 47(4-(4-(6-(피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)페닐아미노)퀴놀린-6-카르보니트릴)**

[1020]



47

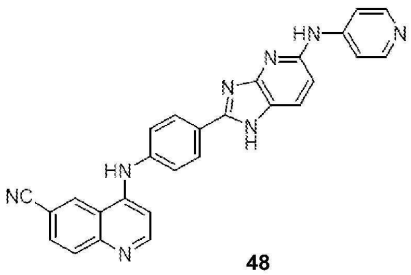


반응식 37

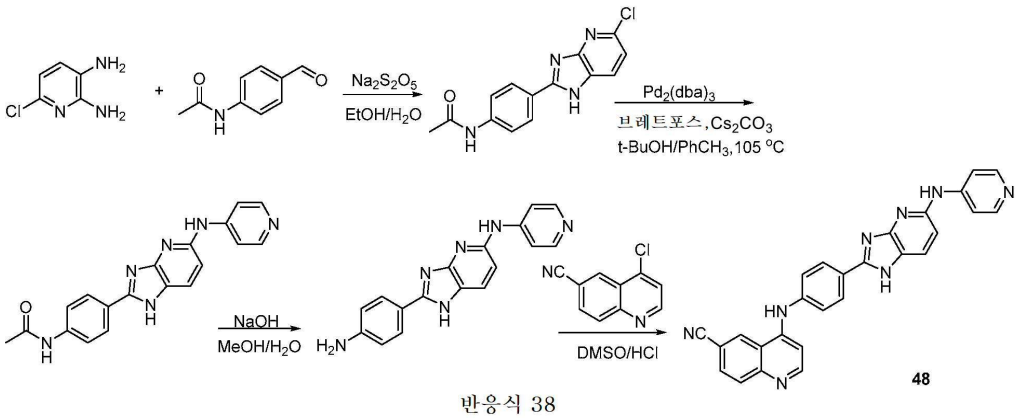
[1021]

[1022] **화합물 47**을 반응식 37에 나타낸 방법으로 제조하였다. **화합물 47**(4-(4-(6-(피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)페닐아미노)퀴놀린-6-카르보니트릴)을 반응식 37에 나타낸 바와 같이 제조하였다: $C_{27}H_{18}N_8$; 454.49 g/mol; 12 mg; 황색 고체; ESI-LCMS m/z = 455 $[M+H]^+$; LCMS RT = 1.66분, >95.00% (214 nm).

[1023] **실시예 48: 화합물 48(4-(4-(5-(피리딘-4-일아미노)-1H-이미다조[4,5-b]피리딘-2-일)페닐아미노)퀴놀린-6-카르보니트릴)**



48



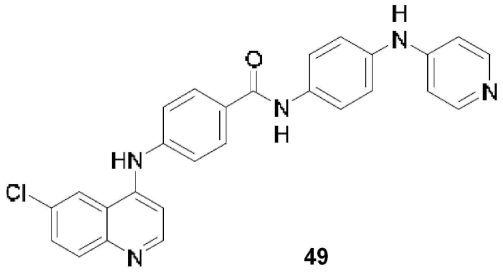
반응식 38

[1024]

[1025] **화합물 48**을 반응식 38에 나타낸 방법으로 제조하였다. **화합물 48**(4-(4-(5-(피리딘-4-일아미노)-1H-이미다조[4,5-b]피리딘-2-일)페닐아미노)퀴놀린-6-카르보니트릴)을 반응식 38에 나타낸 바와 같이 제조하였다: $C_{27}H_{18}N_8$;

454.49 g/mol; 11 mg; 황색 고체; ESI-LCMS m/z = 455 $[M+H]^+$; LCMS RT = 1.66분, >95.00% (214 nm).

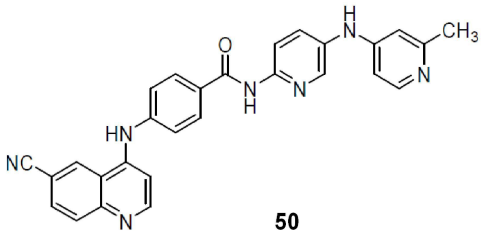
[1026] **실시예 49: 화합물 49(4-((6-클로로퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**

[1027] 

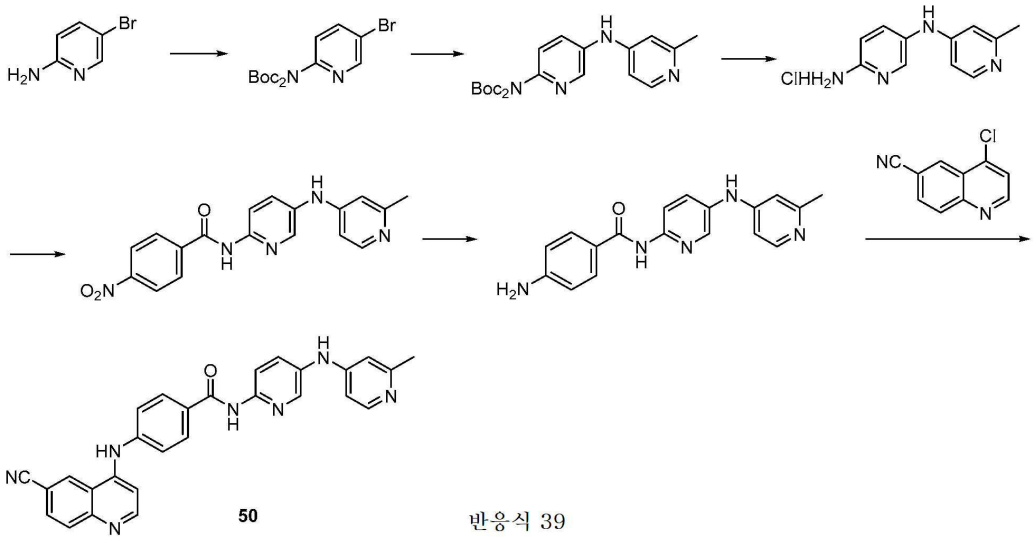
49

[1028] **화합물 49**를 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 49**(4-((6-클로로퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드): $C_{27}H_{20}ClN_5O$; 465.94 g/mol; 17 mg; 옅은 황색 고체; ESI-LCMS m/z = 466 $[M+H]^+$; LCMS RT = 1.49분, >95.00% (214 nm).

[1029] **실시예 50: 화합물 50(4-(6-시아노퀴놀린-4-일아미노)-N-(5-(2-메틸피리딘-4-일아미노)피리딘-2-일)벤즈아미드)**

[1030] 

50

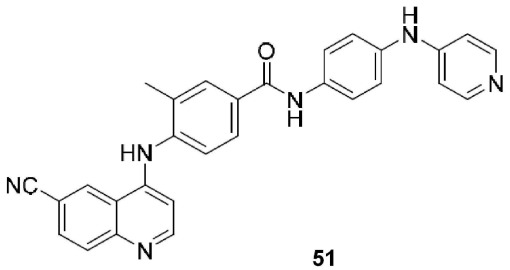


50 반응식 39

[1031]

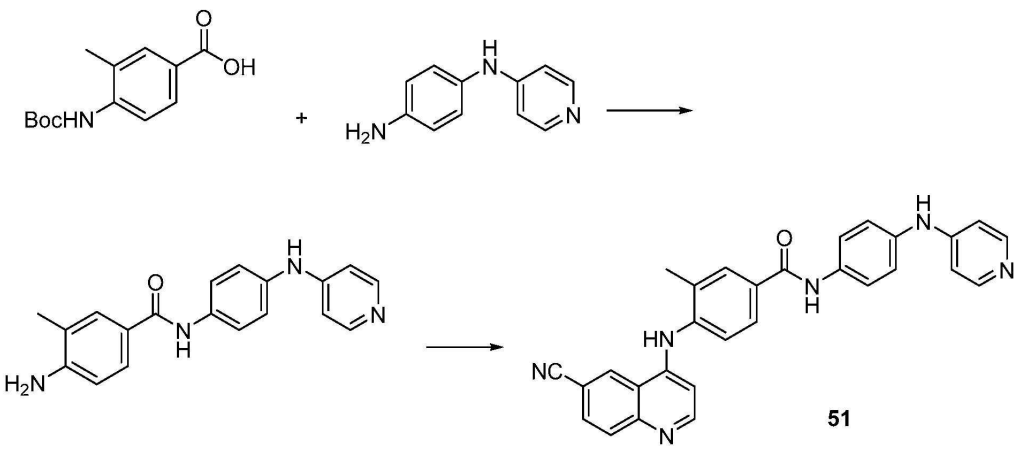
[1032] **화합물 50**을 반응식 39에 나타낸 방법으로 제조하였다. **화합물 50**(4-(6-시아노퀴놀린-4-일아미노)-N-(5-(2-메틸피리딘-4-일아미노)피리딘-2-일)벤즈아미드)을 반응식 39에 나타낸 바와 같이 제조하였다: $C_{28}H_{21}N_7O$; 471.51 g/mol; 25 mg; 옅은 황색 고체; ESI-LCMS m/z = 472 $[M+H]^+$; LCMS RT = 1.38분, >95.00% (214 nm).

[1033] **실시예 51: 화합물 51(4-((6-시아노퀴놀린-4-일)아미노)-3-메틸-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



51

[1034]

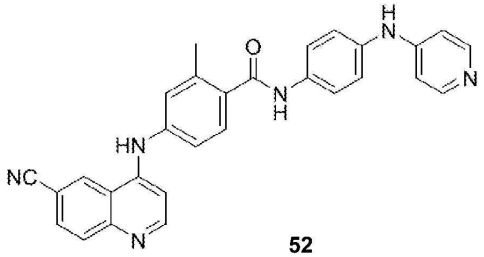


반응식 40

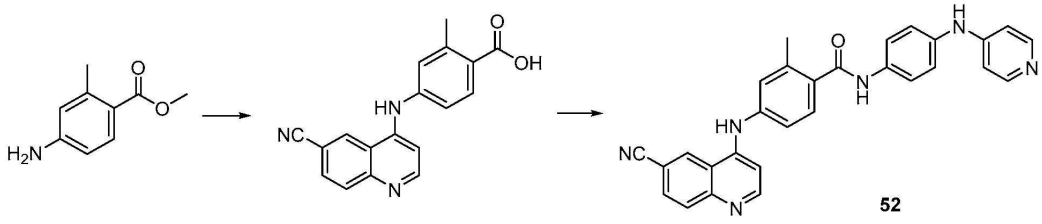
[1035]

[1036] **화합물 51**을 반응식 40에 나타낸 방법으로 제조하였다. **화합물 51**(4-((6-시아노퀴놀린-4-일)아미노)-3-메틸-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 40에 나타낸 바와 같이 제조하였다: $C_{29}H_{22}N_6O$; 470.54 g/mol; 15 mg; 옅은 황색 고체; ESI-LCMS m/z = 471 $[M+H]^+$; LCMS RT = 1.39분, >95.00% (214 nm).

[1037] **실시예 52: 화합물 52(4-((6-시아노퀴놀린-4-일)아미노)-2-메틸-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



52

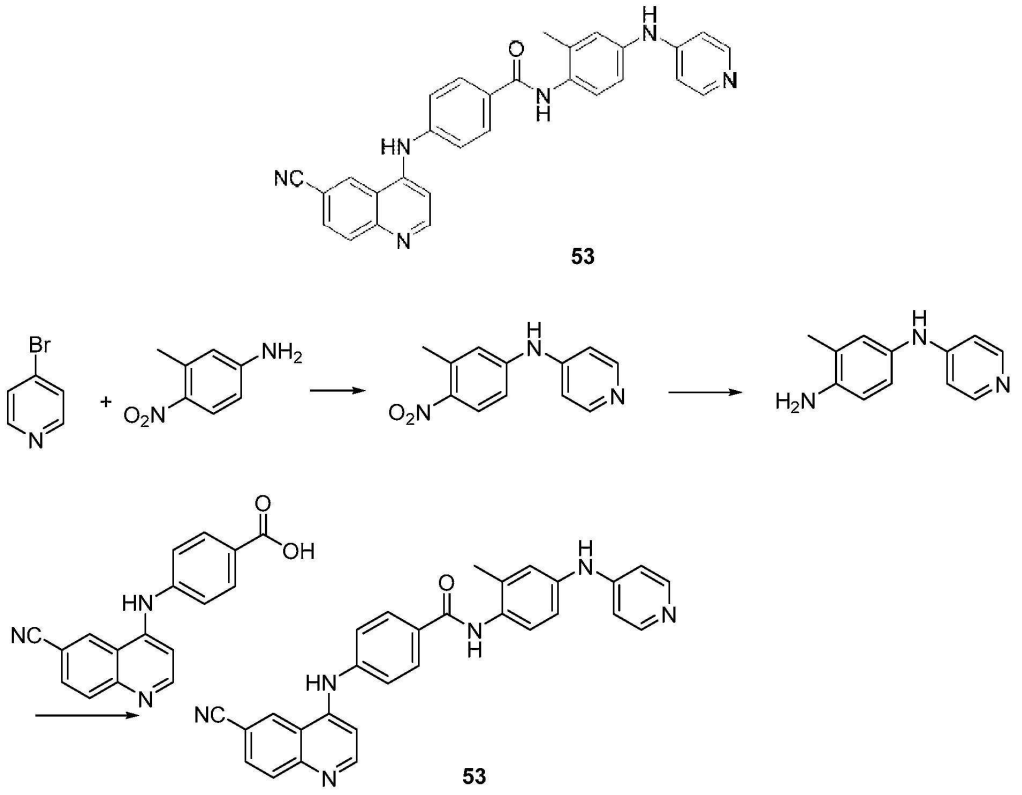


반응식 41

[1038]

[1039] **화합물 52**를 반응식 41에 나타낸 방법으로 제조하였다. **화합물 52**(4-((6-시아노퀴놀린-4-일)아미노)-2-메틸-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)를 반응식 41에 나타낸 바와 같이 제조하였다: $C_{29}H_{22}N_6O$; 470.54 g/mol; 20 mg; 옅은 황색 고체; ESI-LCMS m/z = 471 $[M+H]^+$; LCMS RT = 1.49분, >95.00% (214 nm).

[1040] **실시예 53: 화합물 53(4-((6-시아노퀴놀린-4-일)아미노)-N-(2-메틸-4-(피리딘-4-일아미노)페닐)벤즈아미드)**

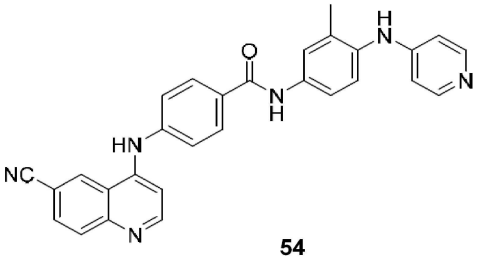


반응식 42

[1041]

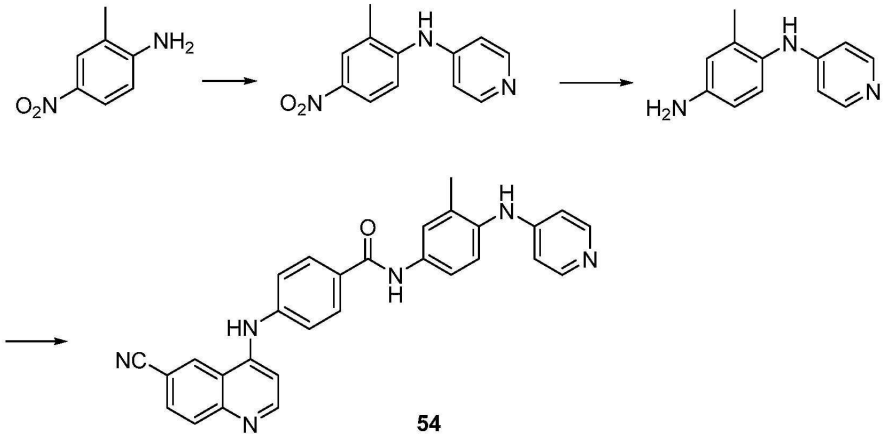
[1042] **화합물 53**을 반응식 42에 나타낸 방법으로 제조하였다. **화합물 53**(4-((6-시아노퀴놀린-4-일)아미노)-N-(2-메틸-4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 42에 나타낸 바와 같이 제조하였다: $C_{29}H_{22}N_6O$; 470.54 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 471 $[M+H]^+$; LCMS RT = 1.37분, >95.00% (214 nm).

[1043] **실시예 54: 화합물 54(4-((6-시아노퀴놀린-4-일)아미노)-N-(3-메틸-4-(피리딘-4-일아미노)페닐)벤즈아미드)**



54

[1044]

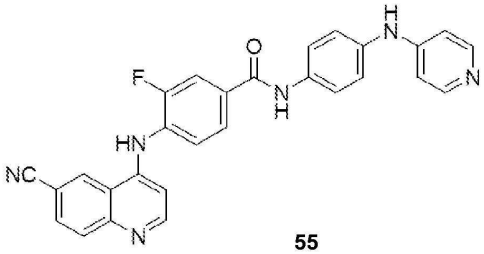


54

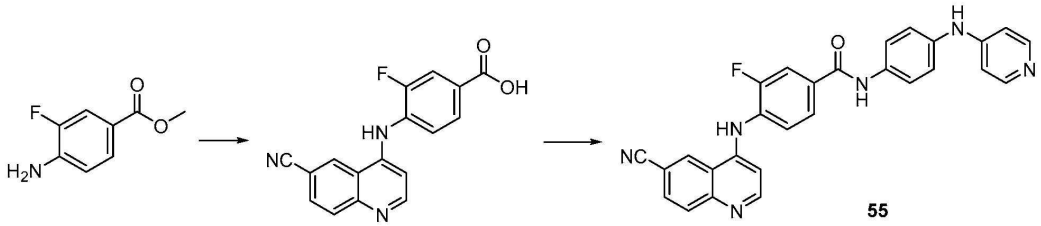
[1045] 반응식 43

[1046] **화합물 54**를 반응식 43에 나타낸 방법으로 제조하였다. **화합물 54**(4-((6-시아노퀴놀린-4-일)아미노)-N-(3-메틸-4-(피리딘-4-일아미노)페닐)벤즈아미드)를 반응식 43에 나타낸 바와 같이 제조하였다: $C_{29}H_{22}N_6O$; 470.54 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 471 $[M+H]^+$; LCMS RT = 1.39분, >95.00% (214 nm).

[1047] **실시예 55: 화합물 55(4-(6-시아노퀴놀린-4-일아미노)-3-플루오로-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



55

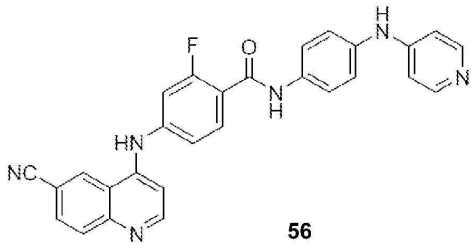


55

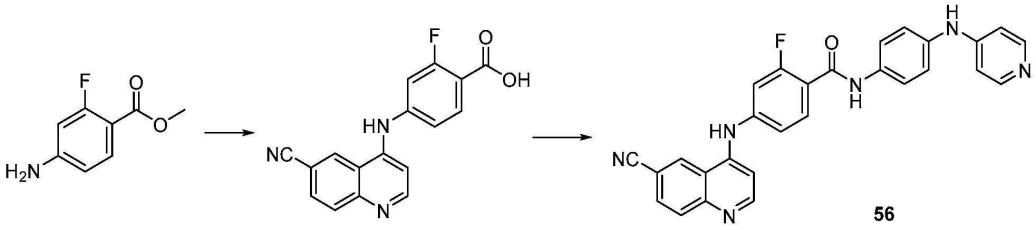
[1048] 반응식 44

[1049] **화합물 55**를 반응식 44에 나타낸 방법으로 제조하였다. **화합물 55**(4-(6-시아노퀴놀린-4-일아미노)-3-플루오로-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)를 반응식 44에 나타낸 바와 같이 제조하였다: $C_{28}H_{19}FN_6O$; 474.49 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 475 $[M+H]^+$; LCMS RT = 1.40분, >95.00% (214 nm).

[1050] **실시예 56: 화합물 56(4-(6-시아노퀴놀린-4-일아미노)-2-플루오로-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



56



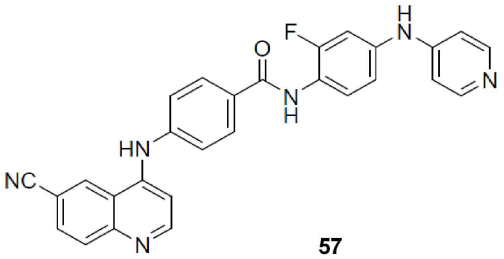
56

반응식 45

[1051]

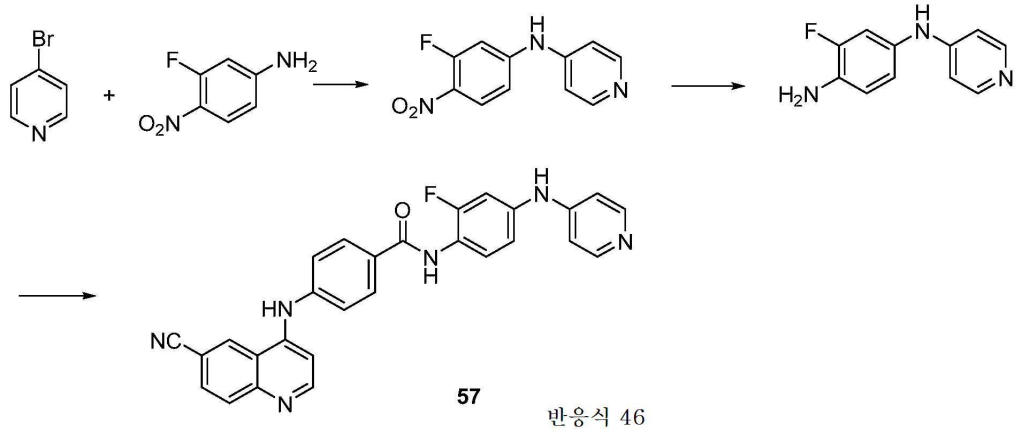
[1052] **화합물 56**을 반응식 45에 나타낸 방법으로 제조하였다. **화합물 56**(4-(6-시아노퀴놀린-4-일아미노)-2-플루오로-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 45에 나타낸 바와 같이 제조하였다: $C_{28}H_{19}FN_6O$; 474.49 g/mol; 13 mg; 옅은 황색 고체; ESI-LCMS m/z = 475 $[M+H]^+$; LCMS RT = 1.36분, >95.00% (214 nm).

[1053] **실시예 57: 화합물 57(4-(6-시아노퀴놀린-4-일아미노)-N-(2-플루오로-4-(피리딘-4-일아미노)페닐)벤즈아미드)**



57

[1054]



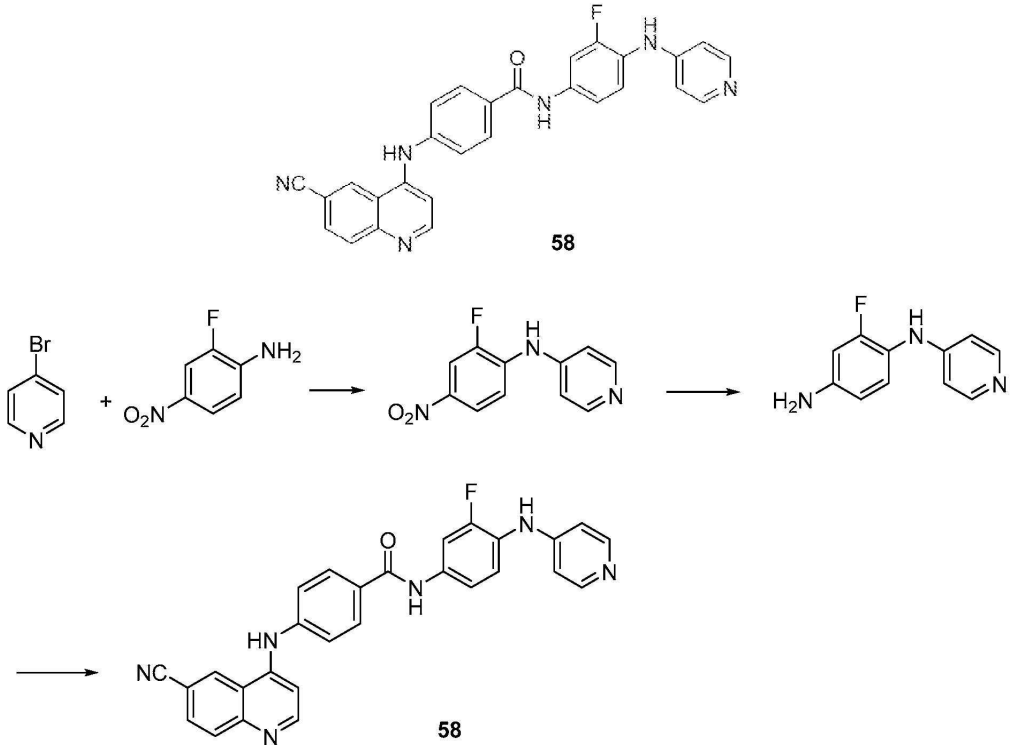
57

반응식 46

[1055]

[1056] **화합물 57**을 반응식 46에 나타낸 방법으로 제조하였다. **화합물 57**(4-(6-시아노퀴놀린-4-일아미노)-N-(2-플루오로-4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 46에 나타낸 바와 같이 제조하였다: $C_{28}H_{19}FN_6O$; 474.49 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 475 $[M+H]^+$; LCMS RT = 1.36분, >95.00% (214 nm).

[1057] **실시예 58: 화합물 58(4-(6-시아노퀴놀린-4-일아미노)-N-(3-플루오로-4-(피리딘-4-일아미노)페닐)벤즈아미드)**

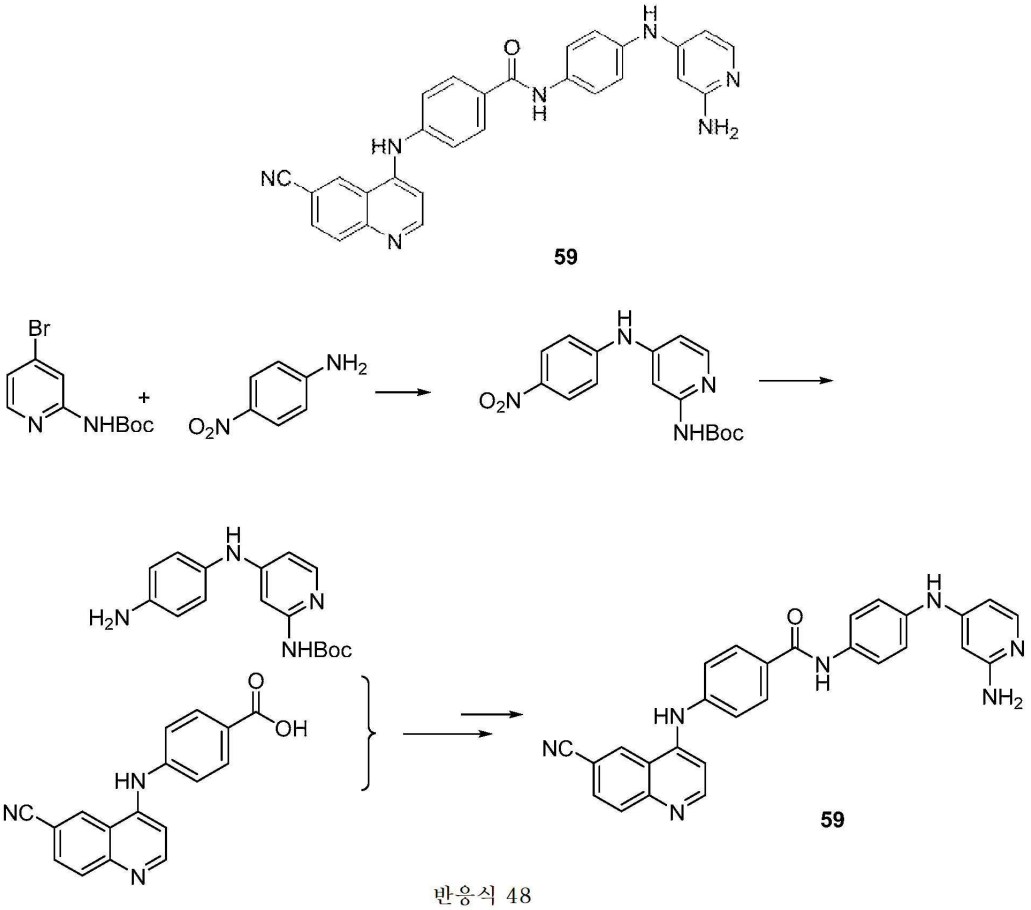


반응식 47

[1058]

[1059] **화합물 58**을 반응식 47에 나타낸 방법으로 제조하였다. **화합물 58**(4-(6-시아노퀴놀린-4-일아미노)-N-(3-플루오로-4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 47에 나타낸 바와 같이 제조하였다: $C_{28}H_{19}FN_6O$; 474.49 g/mol; 14 mg; 옅은 황색 고체; ESI-LCMS m/z = 475 $[M+H]^+$; LCMS RT = 1.38분, >95.00% (214 nm).

[1060] **실시예 59: 화합물 59(N-(4-((2-아미노피리딘-4-일)아미노)페닐)-4-((6-시아노퀴놀린-4-일)아미노)벤즈아미드)**

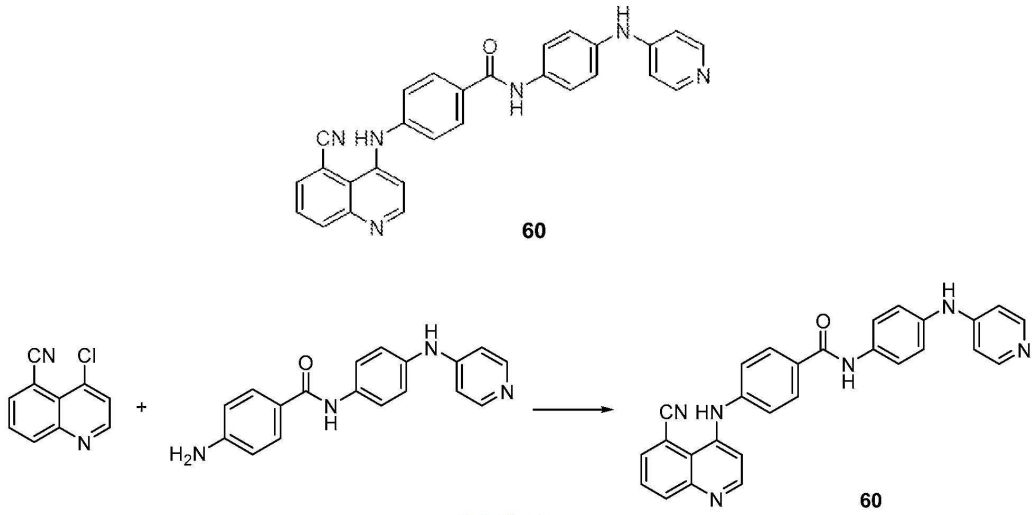


반응식 48

[1061]

[1062] **화합물 59**를 반응식 48에 나타낸 방법으로 제조하였다. **화합물 59**(N-(4-((2-아미노피리딘-4-일)아미노)페닐)-4-((6-시아노퀴놀린-4-일)아미노)벤즈아미드)를 반응식 48에 나타낸 바와 같이 제조하였다: $C_{28}H_{21}N_7O$; 471.52 g/mol; 10 mg; 옅은 황색 고체; ESI-LCMS m/z = 472 $[M+H]^+$; LCMS RT = 0.99분, >95.00% (214 nm).

[1063] **실시예 60: 화합물 60(4-((5-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



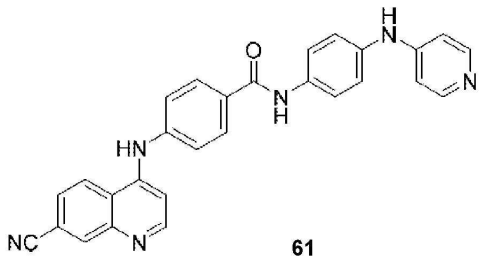
반응식 49

[1064]

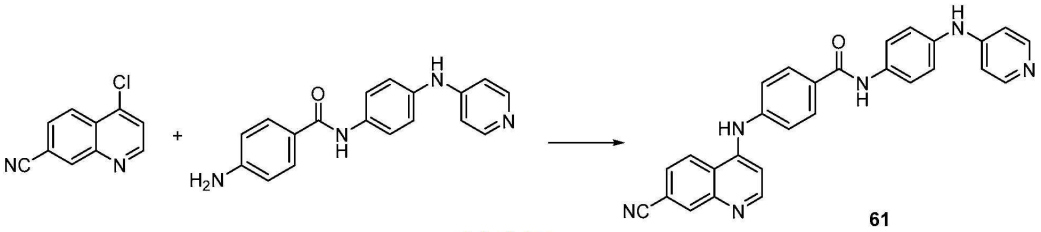
[1065] **화합물 60**을 반응식 49에 나타낸 방법으로 제조하였다. **화합물 60**(4-((5-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 49에 나타낸 바와 같이 제조하였다: $C_{28}H_{20}N_6O$; 456.51 g/mol; 11 mg;

황색 고체; ESI-LCMS m/z = 457 $[M+H]^+$; LCMS RT = 1.34분, >95.00% (214 nm).

[1066] **실시예 61: 화합물 61(4-((7-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



61



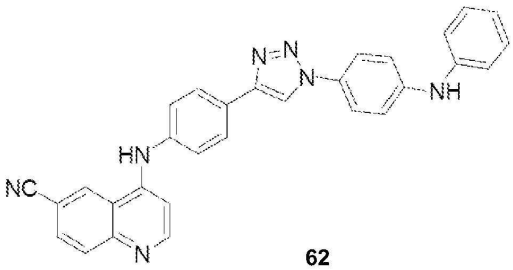
61

반응식 50

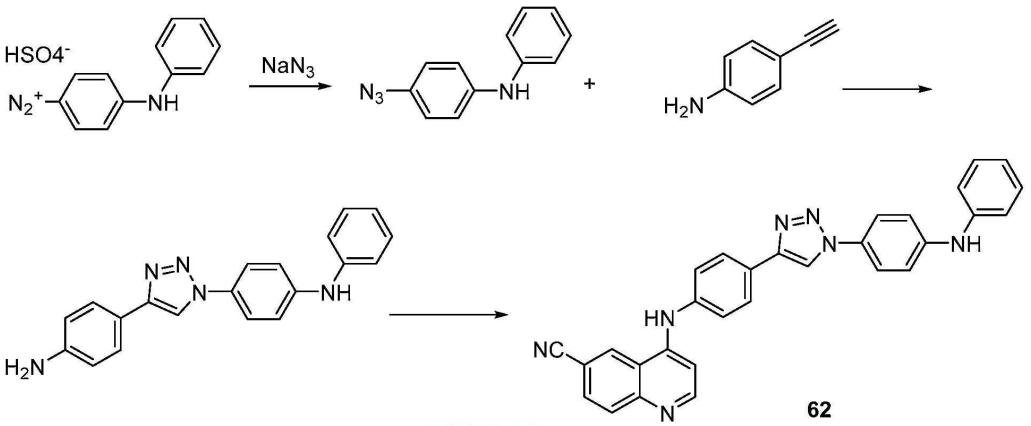
[1067]

[1068] **화합물 61**을 반응식 50에 나타낸 방법으로 제조하였다. **화합물 61**(4-((7-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 50에 나타낸 바와 같이 제조하였다: $C_{28}H_{20}N_6O$; 456.51 g/mol; 13 mg; 옅은 황색 고체; ESI-LCMS m/z = 457 $[M+H]^+$; LCMS RT = 1.37분, >95.00% (214 nm).

[1069] **실시예 62: 화합물 62(4-((4-(1-(4-(페닐아미노)페닐)-1H-1,2,3-트리아졸-4-일)페닐)아미노)퀴놀린-6-카르보니트릴)**



62



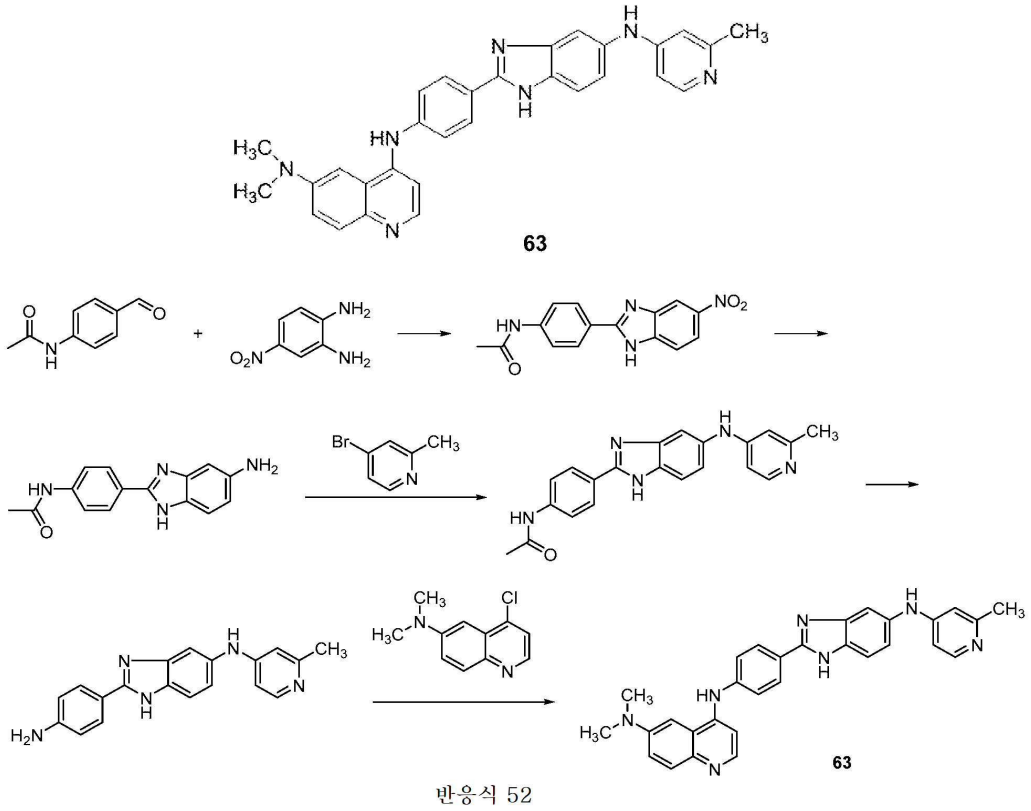
62

반응식 51

[1070]

[1071] **화합물 62**를 반응식 51에 나타낸 방법으로 제조하였다. **화합물 62**(4-((4-(1-(4-(페닐아미노)페닐)-1H-1,2,3-트리아졸-4-일)페닐)아미노)퀴놀린-6-카르보니트릴)를 반응식 51에 나타낸 바와 같이 제조하였다: $C_{30}H_{21}N_7$; 479.55 g/mol; 13 mg; 황색 고체; ESI-LCMS m/z = 480 $[M+H]^+$; LCMS RT = 1.70분, >95.00% (214 nm).

[1072] **실시예 63: 화합물 63(N^6,N^6-디메틸-N^4-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4,6-디아민)**



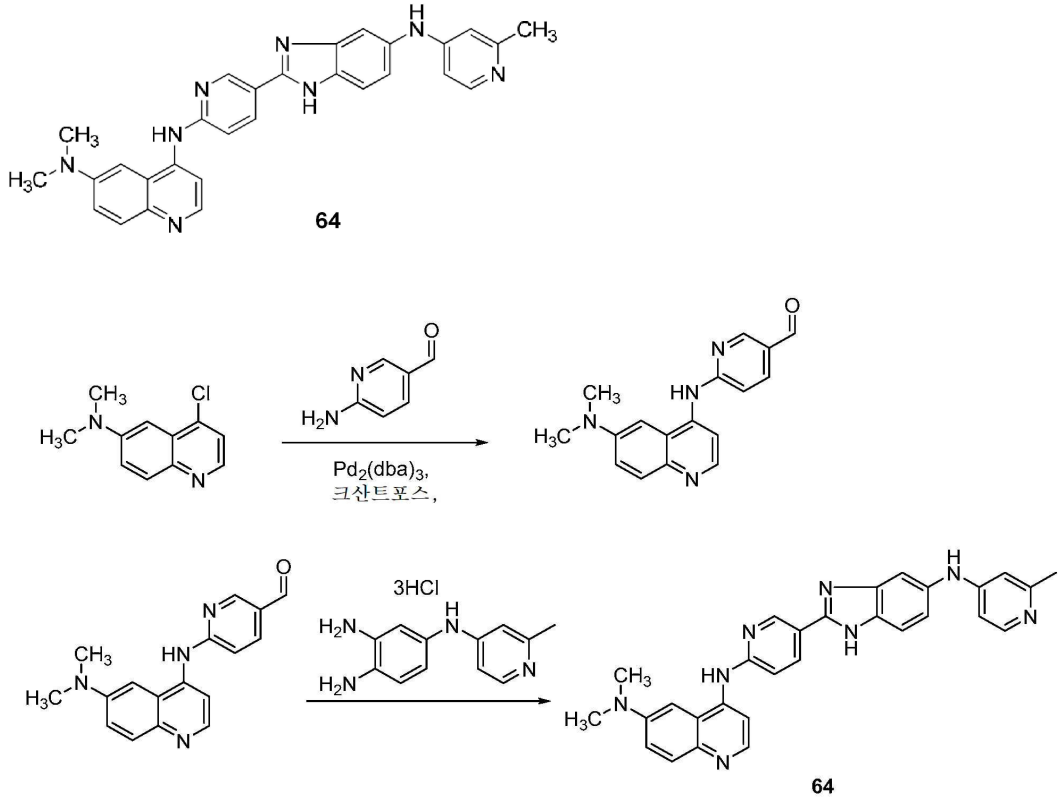
반응식 52

[1073]

[1074] **화합물 63**을 반응식 52에 나타낸 방법으로 제조하였다. **화합물 63**(N^6,N^6-디메틸-N^4-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4,6-디아민)을 반응식 52에 나타낸 바와 같이 제조하였다: $C_{30}H_{27}N_7$; 485.60 g/mol; 10 mg; 황색 고체; ESI-LCMS m/z = 486 $[M+H]^+$; LCMS RT = 1.58분, >95.00% (214 nm).

[1075] **실시예 64: 화합물 64(N^6,N^6-디메틸-N^4-(5-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4,6-디아민)**

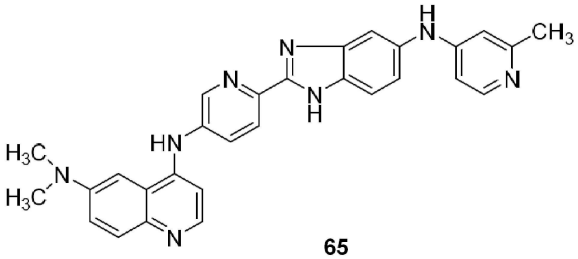
[1076]



[1077] 반응식 53

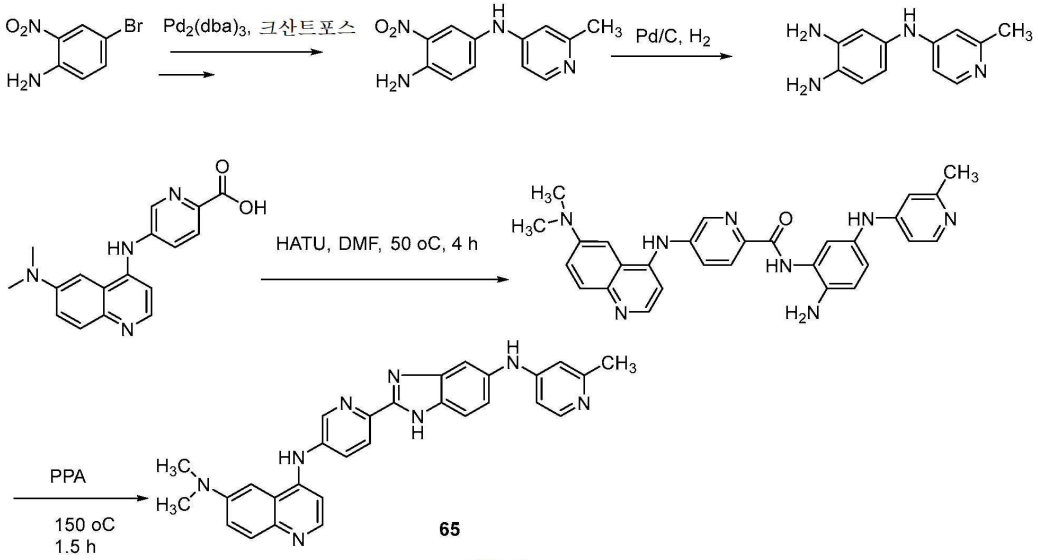
[1078] **화합물 64**를 반응식 53에 나타낸 방법으로 제조하였다. **화합물 64**(N^6,N^6-디메틸-N^4-(5-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4,6-디아민)를 반응식 53에 나타낸 바와 같이 제조하였다: $C_{29}H_{26}N_8$; 486.57 g/mol; 11 mg; 짙은 황색 고체; ESI-LCMS m/z = 487.0 $[M+H]^+$; LCMS RT = 1.39분, >95.00% (214 nm).

[1079] **실시예 65: 화합물 65(N^6,N^6-디메틸-N^4-(6-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4,6-디아민)**



65

[1080]



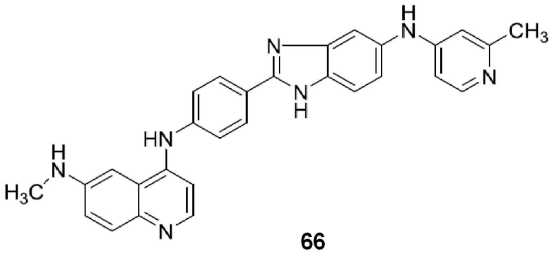
반응식 54

[1081]

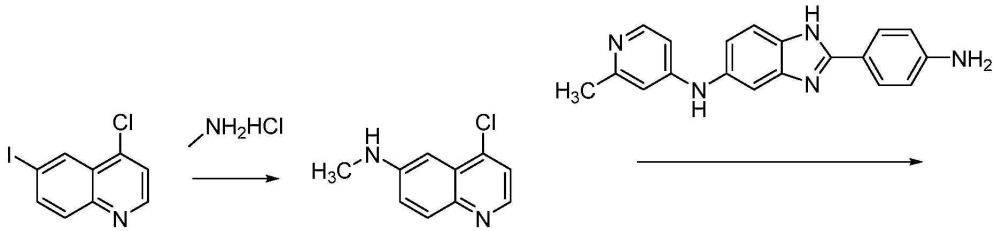
[1082] **화합물 65**를 반응식 54에 나타낸 방법으로 제조하였다. **화합물 65**(N^6,N^6-디메틸-N^4-(6-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4,6-디아민)를 반응식 54에 나타낸 바와 같이 제조하였다: $C_{29}H_{26}N_8$; 486.58 g/mol; 18 mg; 황색 고체; ESI-LCMS m/z = 487 $[M+H]^+$; LCMS RT = 1.38분, >95.00% (214 nm).

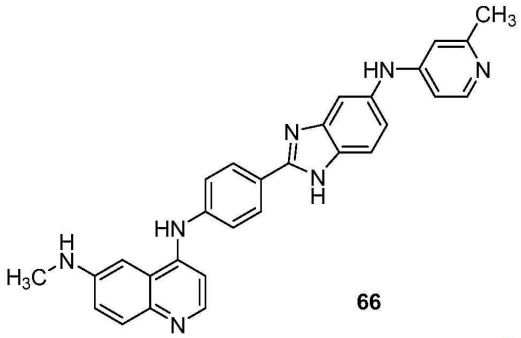
[1083] **실시예 66: 화합물 66(N^6-메틸-N^4-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4,6-디아민)**

[1084]



66





66

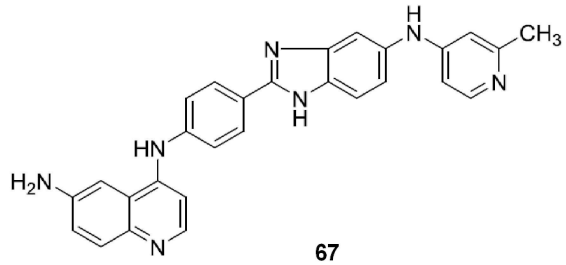
반응식 55

[1085]

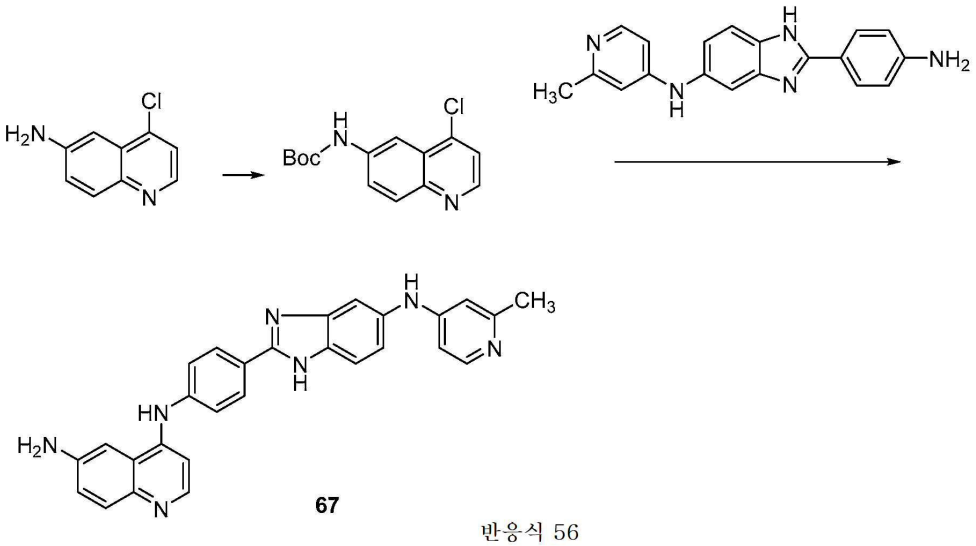
[1086] **화합물 66**을 반응식 55에 나타낸 방법으로 제조하였다. **화합물 66**(N^6-메틸-N^4-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4,6-디아민)을 반응식 55에 나타낸 바와 같이 제조하였다: $C_{29}H_{25}N_7$; 471.57 g/mol; 10 mg; 황색 고체; ESI-LCMS m/z = 472 $[M+H]^+$; LCMS RT = 1.51분, >95.00% (214 nm).

[1087] **실시예 67: 화합물 67(N^4-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4,6-디아민)**

[1088]



67



67

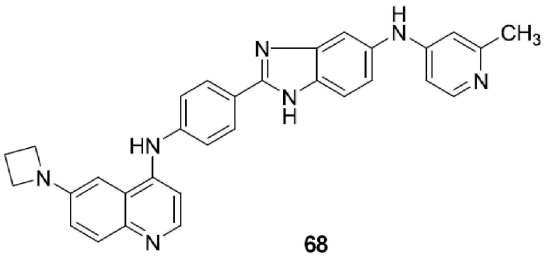
반응식 56

[1089]

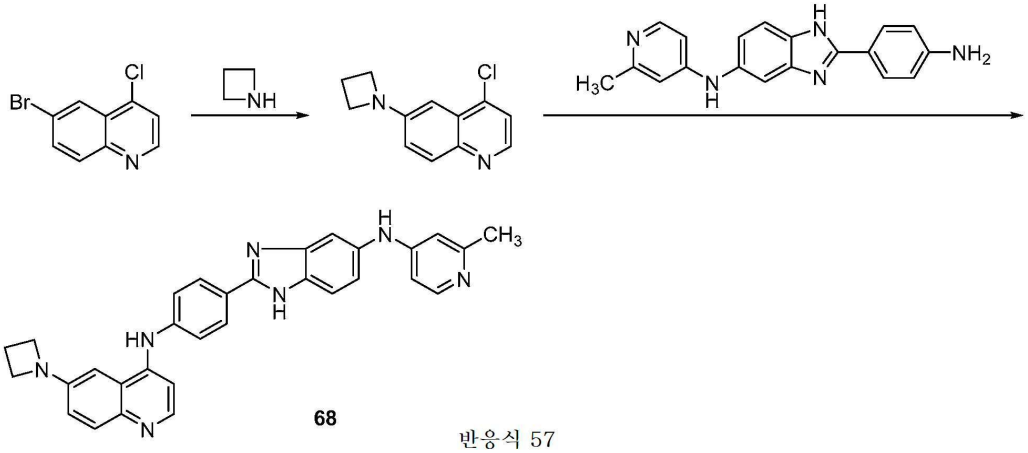
[1090] **화합물 67**을 반응식 56에 나타낸 방법으로 제조하였다. **화합물 67**(N^4-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4,6-디아민)을 반응식 56에 나타낸 바와 같이 제조하였다: $C_{28}H_{23}N_7$; 457.54 g/mol; 11 mg; 황색 고체; ESI-LCMS m/z = 458 $[M+H]^+$; LCMS RT = 1.47분, >95.00% (214 nm).

[1091] **실시예 68: 화합물 68(6-(아제티딘-1-일)-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)**

[1092]



68



68

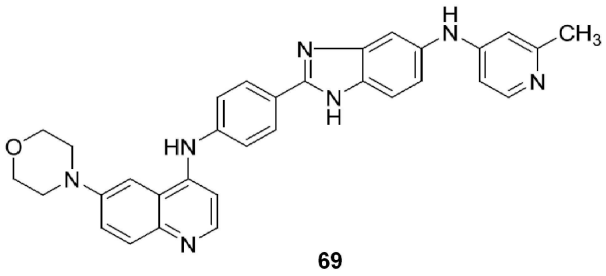
반응식 57

[1093]

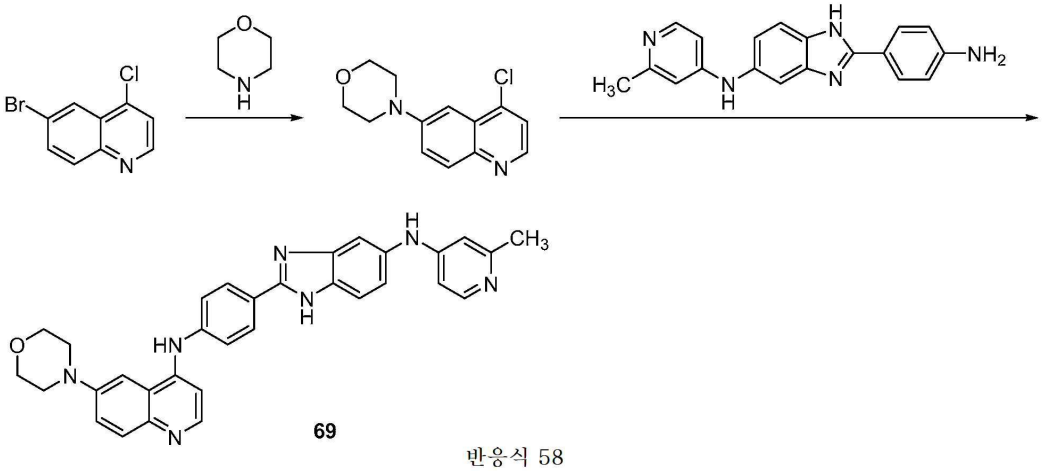
[1094] **화합물 68**을 반응식 57에 나타낸 방법으로 제조하였다. **화합물 68**(6-(아제티딘-1-일)-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)을 반응식 57에 나타낸 바와 같이 제조하였다: $C_{31}H_{27}N_7$; 497.61 g/mol; 15 mg; 황색 고체; ESI-LCMS m/z = 498 $[M+H]^+$; LCMS RT = 1.50분, >95.00% (214 nm).

[1095] **실시예 69: 화합물 69(N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)-6-모르폴리노퀴놀린-4-아민)**

[1096]



69



69

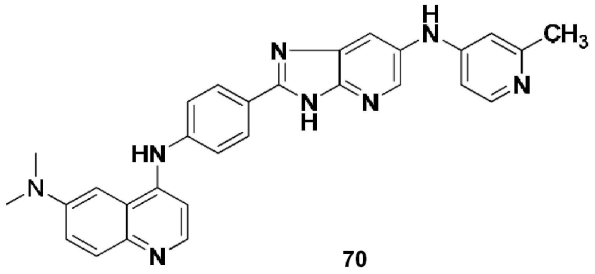
반응식 58

[1097]

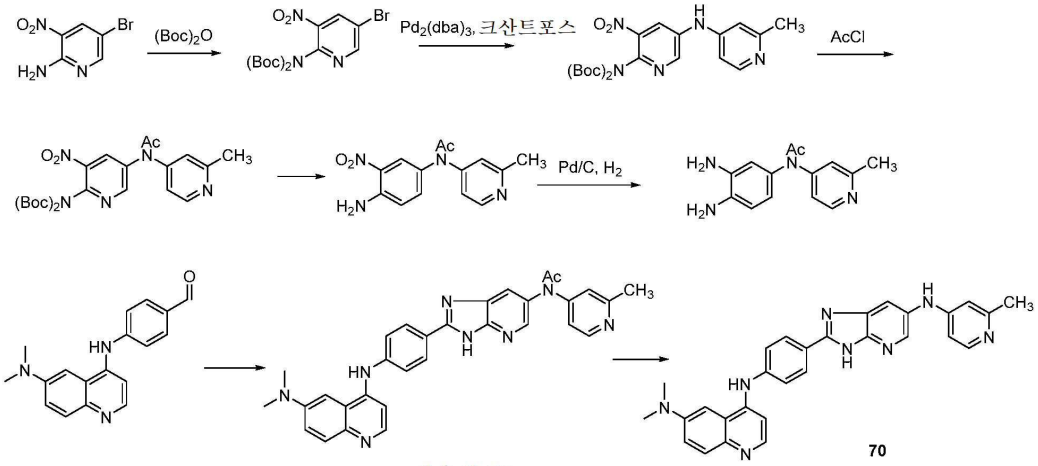
[1098] **화합물 69**를 반응식 58에 나타낸 방법으로 제조하였다. **화합물 69**(N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤

조[d]이미다졸-2-일)페닐)-6-모르폴리노퀴놀린-4-아민)를 반응식 58에 나타낸 바와 같이 제조하였다: $C_{32}H_{29}N_7O$; 527.63 g/mol; 16 mg; 황색 고체; ESI-LCMS m/z = 528 $[M+H]^+$; LCMS RT = 1.51분, >95.00% (214 nm).

[1099] **실시예 70: 화합물 70(N^6,N^6-디메틸-N^4-(4-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)페닐)퀴놀린-4,6-디아민)**

[1100] 

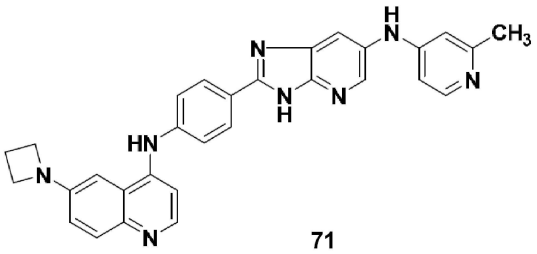
70

[1101] 

반응식 59

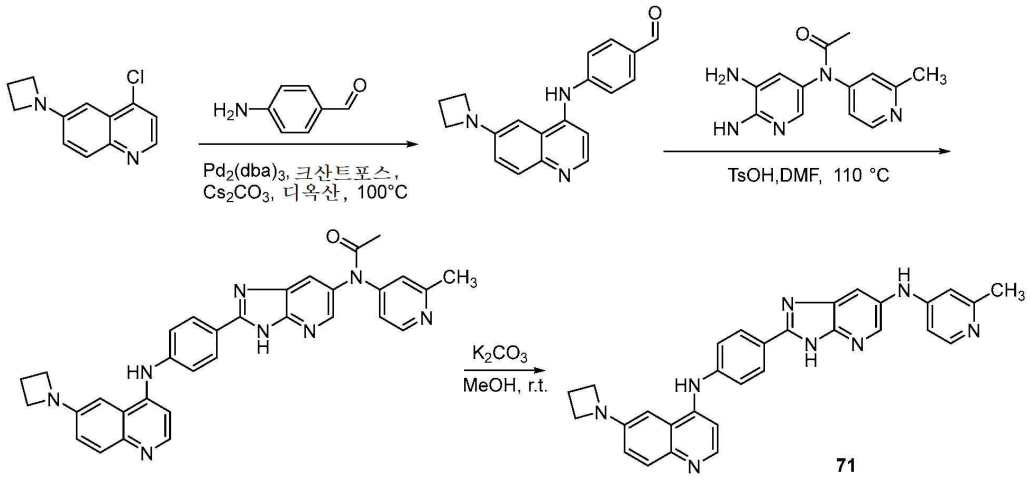
[1102] **화합물 70**을 반응식 59에 나타낸 방법으로 제조하였다. **화합물 70**(N^6,N^6-디메틸-N^4-(4-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)페닐)퀴놀린-4,6-디아민)을 반응식 59에 나타낸 바와 같이 제조하였다: $C_{29}H_{26}N_8$; 486.57 g/mol; 20 mg; 황색 고체; ESI-LCMS m/z = 487 $[M+H]^+$; LCMS RT = 1.37분, >95.00% (214 nm).

[1103] **실시예 71: 화합물 71(6-(아제티딘-1-일)-N-(4-(6-((2-메틸피리딘-4-일)아미노)-3H-이미다조[4,5-b]피리딘-2-일)페닐)퀴놀린-4-아민)**



71

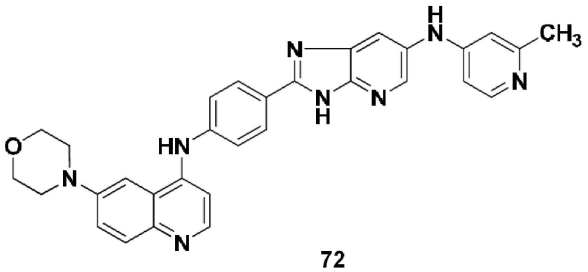
[1104]



[1105] 반응식 60

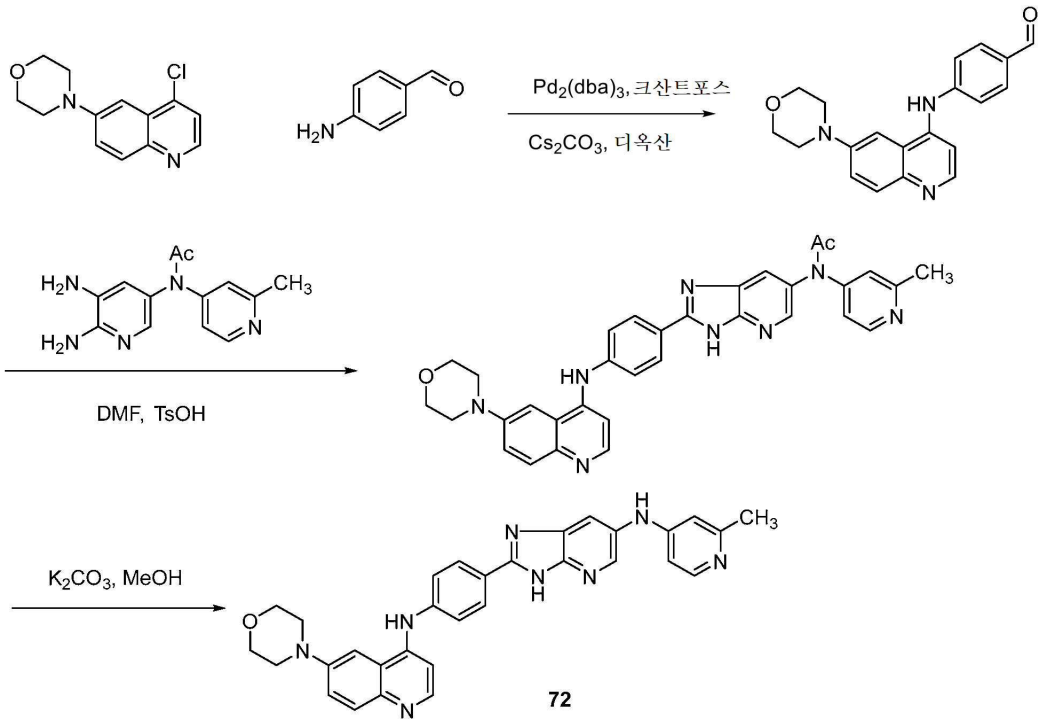
[1106] **화합물 71**을 반응식 60에 나타낸 방법으로 제조하였다. **화합물 71**(6-(아제티딘-1-일)-N-(4-(6-((2-메틸피리딘-4-일)아미노)-3H-이미다조[4,5-b]피리딘-2-일)페닐)퀴놀린-4-아민)을 반응식 60에 나타낸 바와 같이 제조하였다: $C_{30}H_{26}N_8$; 498.594 g/mol; 15 mg; 황색 고체; ESI-LCMS m/z = 499.0 $[M+H]^+$; LCMS RT = 1.22분, >95.00% (214 nm).

[1107] **실시예 72: 화합물 72(N-(4-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)페닐)-6-모르폴리노퀴놀린-4-아민)**



72

[1108]



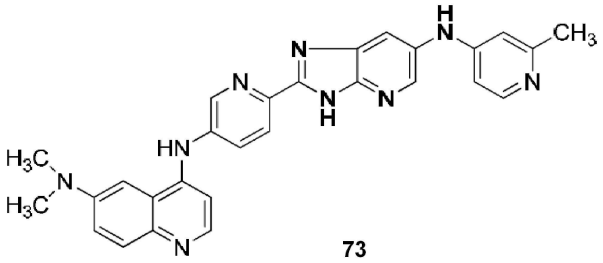
반응식 61

[1109]

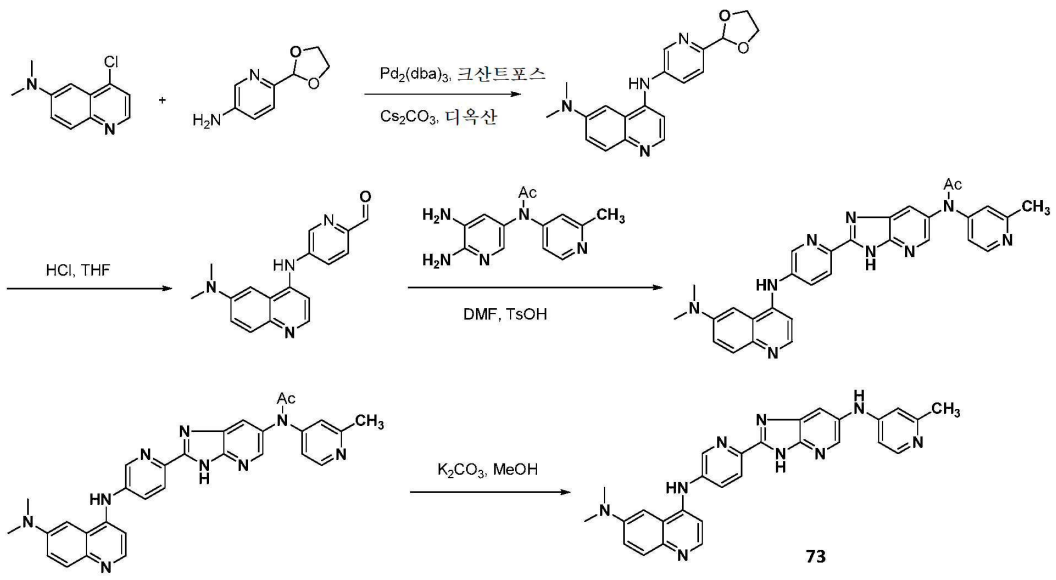
[1110] **화합물 72**를 반응식 61에 나타낸 방법으로 제조하였다. **화합물 72**(N-(4-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)페닐)-6-모르폴리노퀴놀린-4-아민)를 반응식 61에 나타낸 바와 같이 제조하였다: $C_{31}H_{28}N_8O$; 528.61 g/mol; 20 mg; 황색 고체; ESI-LCMS m/z = 529 $[M+H]^+$; LCMS RT = 1.32분, >95.00% (214 nm).

[1111] **실시예 73: 화합물 73(N^6,N^6-디메틸-N^4-(6-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)퀴놀린-4,6-디아민)**

[1112]



73



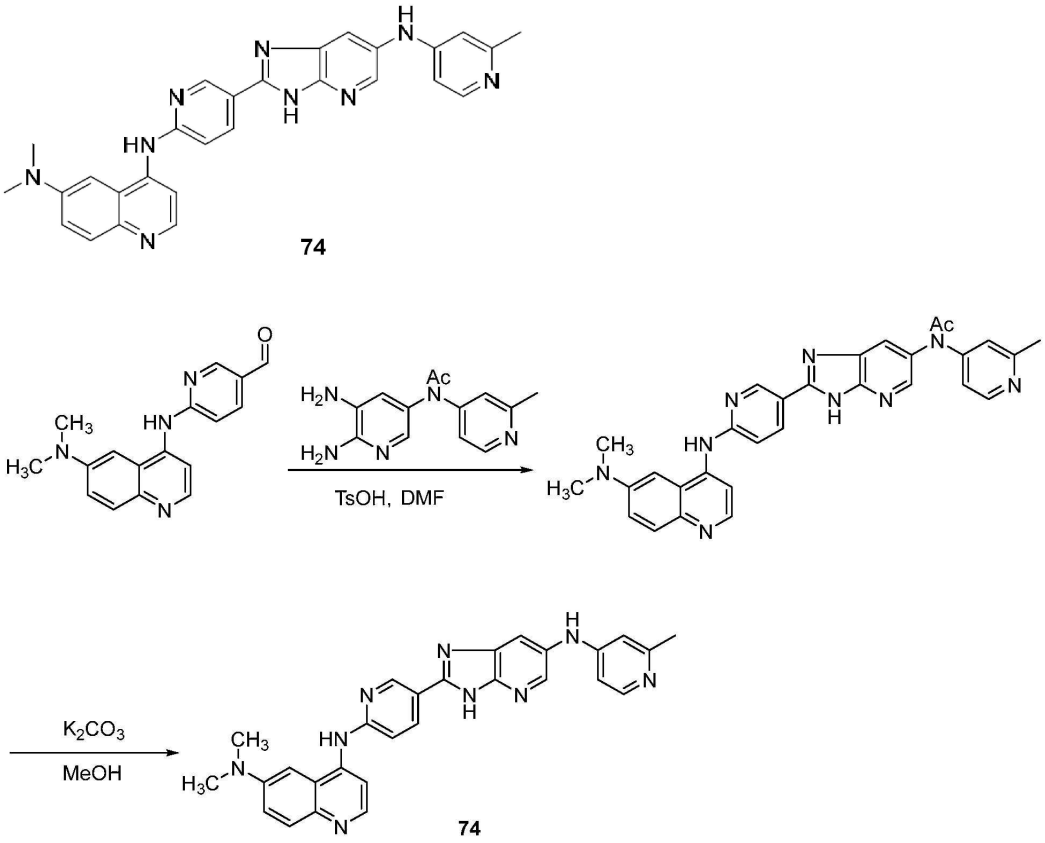
반응식 62

[1113]

[1114] **화합물 73**을 반응식 62에 나타낸 방법으로 제조하였다. **화합물 73**(N^6,N^6-디메틸-N^4-(6-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)퀴놀린-4,6-디아민)을 반응식 62에 나타낸 바와 같이 제조하였다: $C_{28}H_{25}N_9$; 487.56 g/mol; 15 mg; 황색 고체; ESI-LCMS m/z = 488 $[M+H]^+$; LCMS RT = 1.35분, >95.00% (214 nm).

[1115] **실시예 74: 화합물 74(N^6,N^6-디메틸-N^4-(5-(6-((2-메틸피리딘-4-일)아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-2-일)퀴놀린-4,6-디아민)**

[1116]

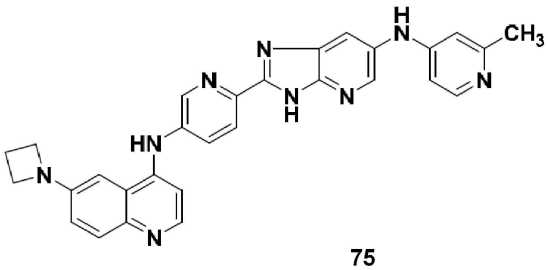


반응식 63

[1117]

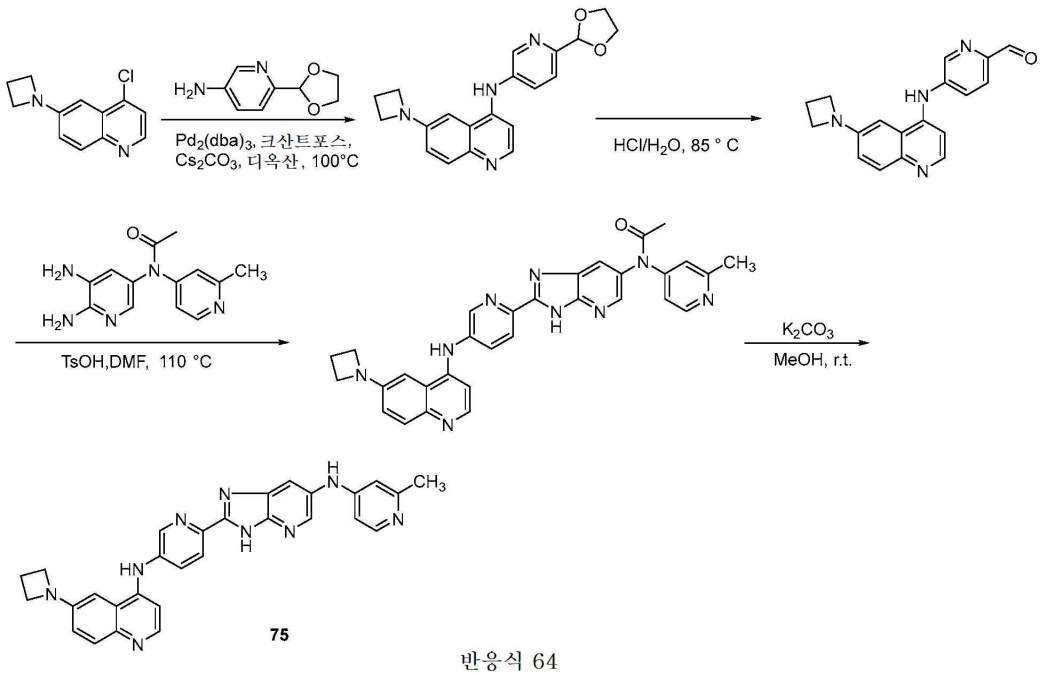
[1118] **화합물 74**를 반응식 63에 나타낸 방법으로 제조하였다. **화합물 74**(N^6,N^6-디메틸-N^4-(5-(6-((2-메틸피리딘-4-일)아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-2-일)퀴놀린-4,6-디아민)를 반응식 63에 나타낸 바와 같이 제조하였다: $C_{28}H_{25}N_9$; 487.57 g/mol; 11 mg; 황색 고체; ESI-LCMS m/z = 488 $[M+H]^+$; LCMS RT = 1.23분, >95.00% (214 nm).

[1119] **실시예 75: 화합물 75(6-(아제티딘-1-일)-N-(6-(6-((2-메틸피리딘-4-일)아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)퀴놀린-4-아민)**



75

[1120]



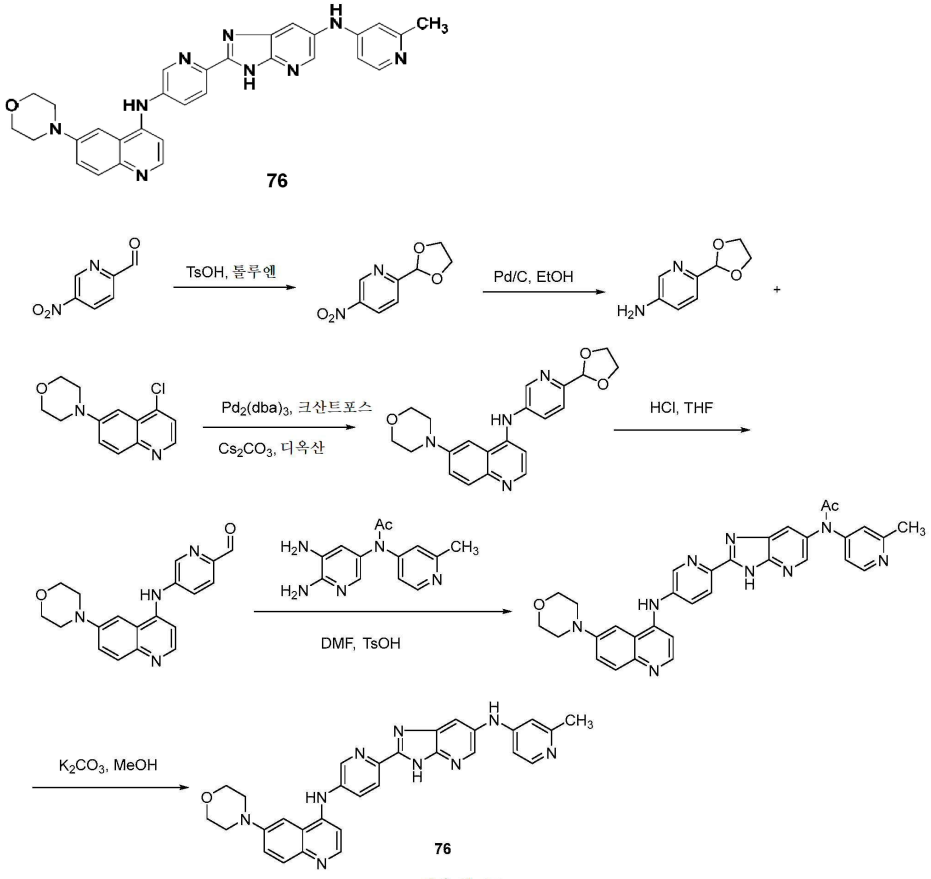
반응식 64

[1121]

[1122] **화합물 75**를 반응식 64에 나타낸 방법으로 제조하였다. **화합물 75**(6-(아제티딘-1-일)-N-(6-(6-((2-메틸피리딘-4-일)아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)퀴놀린-4-아민)를 반응식 64에 나타낸 바와 같이 제조하였다: $C_{29}H_{25}N_9$; 499.582 g/mol; 13 mg; 황색 고체; ESI-LCMS m/z = 500.1 $[M+H]^+$; LCMS RT = 1.35분, >95.00% (214 nm).

[1123] **실시예 76: 화합물 76(N-(6-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민)**

[1124]



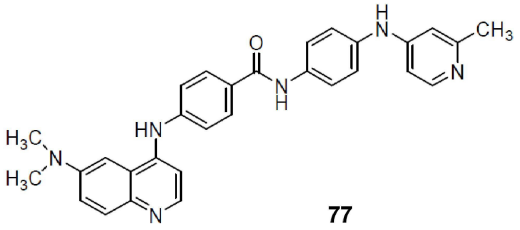
반응식 65

[1125]

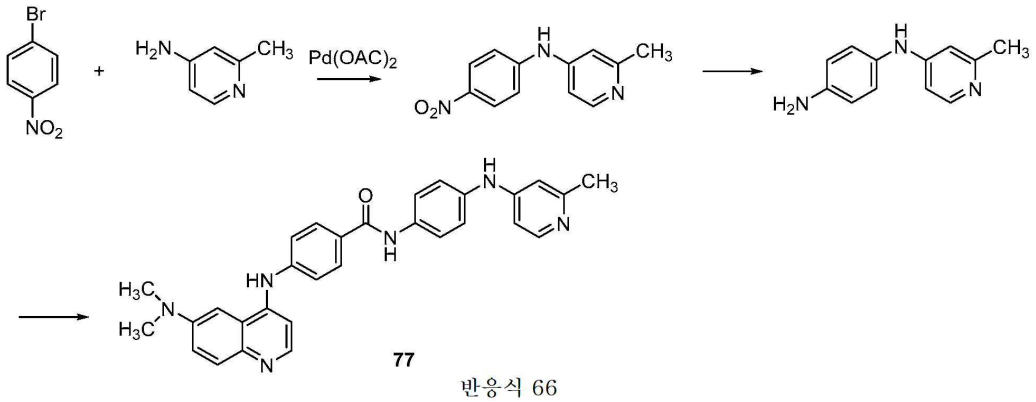
[1126] **화합물 76**을 반응식 65에 나타낸 방법으로 제조하였다. **화합물 76**(N-(6-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민)을 반응식 65에 나타낸 바와 같이 제조하였다: $C_{30}H_{27}N_9O$; 529.60 g/mol; 20 mg; 황색 고체; ESI-LCMS m/z = 530 $[M+H]^+$; LCMS RT = 1.31분, >95.00% (214 nm).

[1127] **실시예 77: 화합물 77(4-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드)**

[1128]



77



77

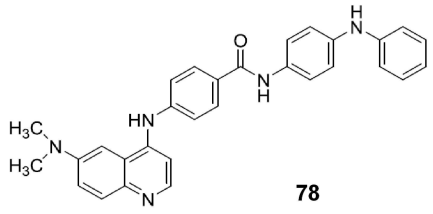
반응식 66

[1129]

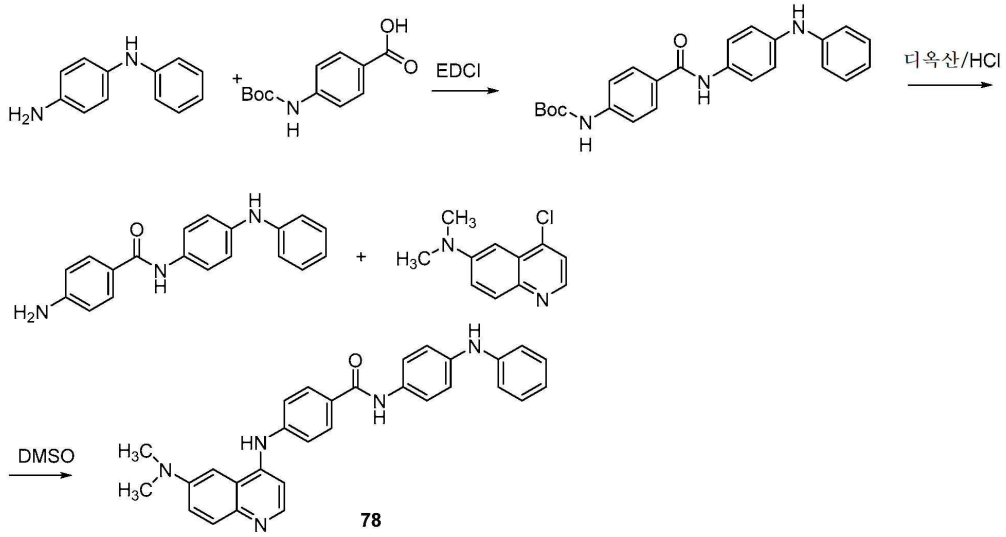
[1130] **화합물 77**을 반응식 66에 나타낸 방법으로 제조하였다. **화합물 77**(4-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드)을 반응식 66에 나타낸 바와 같이 제조하였다: $C_{30}H_{28}N_6O$; 488.60 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 489 $[M+H]^+$; LCMS RT = 1.63분, >95.00% (214 nm).

[1131] **실시예 78: 화합물 78(4-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(4-(페닐아미노)페닐)벤즈아미드)**

[1132]



78



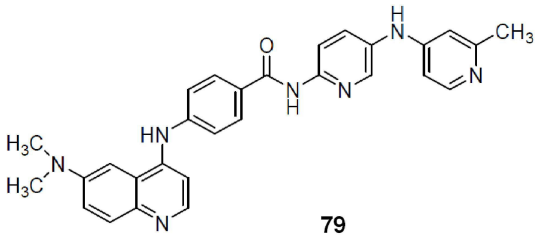
78

반응식 67

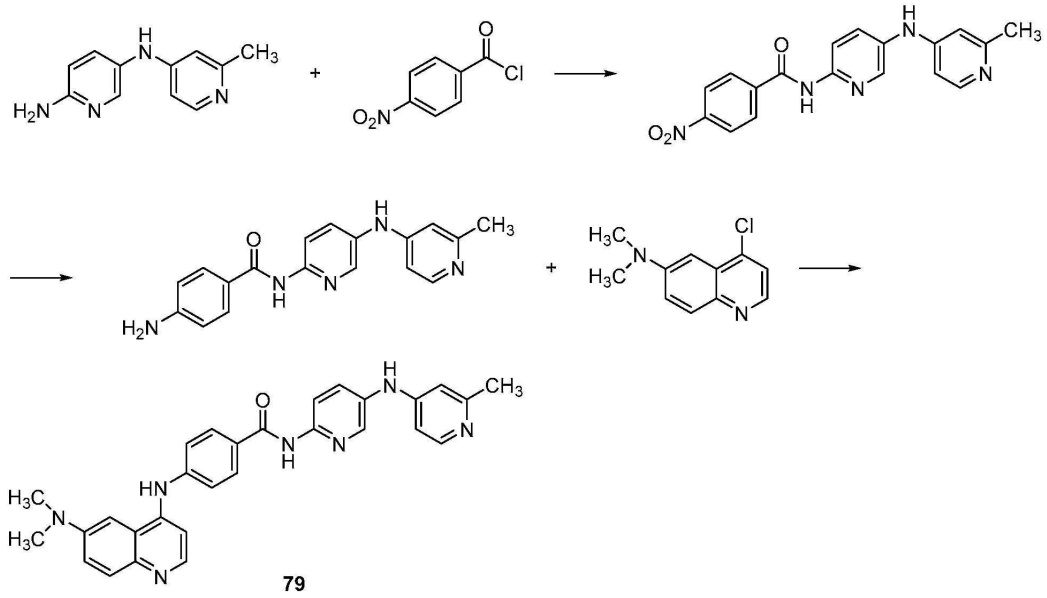
[1133]

[1134] **화합물 78**을 반응식 67에 나타낸 방법으로 제조하였다. **화합물 78**(4-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(4-(페닐아미노)페닐)벤즈아미드)을 반응식 67에 나타낸 바와 같이 제조하였다: $C_{30}H_{27}N_5O$; 473.58 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 474 $[M+H]^+$; LCMS RT = 1.76분, >95.00% (214 nm).

[1135] **실시예 79: 화합물 79(4-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(5-(2-메틸피리딘-4-일아미노)피리딘-2-일)벤즈아미드)**

[1136] 

79



79

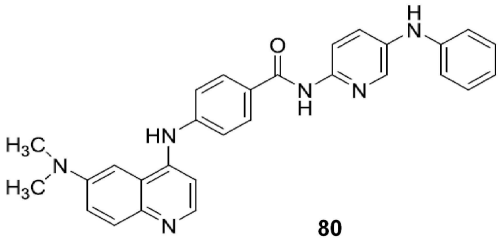
반응식 68

[1137]

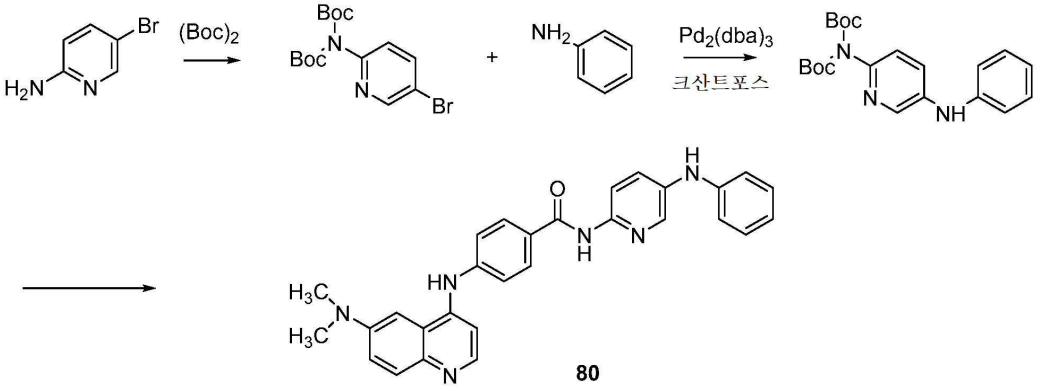
[1138] **화합물 79**를 반응식 68에 나타낸 방법으로 제조하였다. **화합물 79**(4-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(5-(2-메틸피리딘-4-일아미노)피리딘-2-일)벤즈아미드)를 반응식 68에 나타낸 바와 같이 제조하였다: $C_{29}H_{27}N_7O$; 489.57 g/mol; 23 mg; 황색 고체; ESI-LCMS m/z = 490 $[M+H]^+$; LCMS RT = 1.48분, >95.00% (214 nm).

[1139] **실시예 80: 화합물 80(4-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(5-(페닐아미노)피리딘-2-일)벤즈아미드)**

[1140]



80



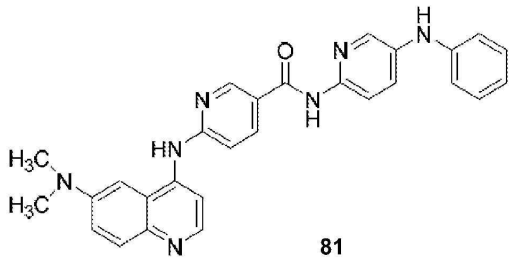
80

반응식 69

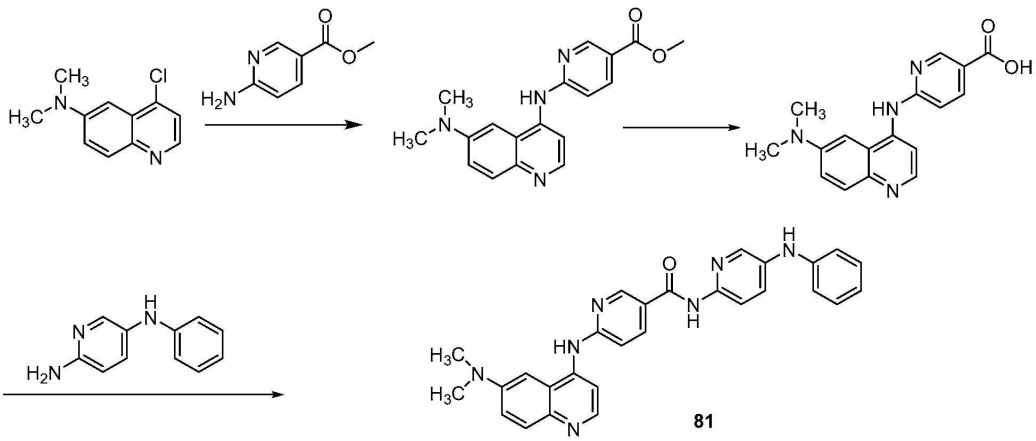
[1141]

[1142] **화합물 80**을 반응식 69에 나타낸 방법으로 제조하였다. **화합물 80**(4-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(5-(페닐아미노)피리딘-2-일)벤즈아미드)을 반응식 69에 나타낸 바와 같이 제조하였다: $C_{29}H_{26}N_6O$; 474.57 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 475 $[M+H]^+$; LCMS RT = 1.79분, >95.00% (214 nm).

[1143] **실시예 81: 화합물 81(6-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(5-(페닐아미노)피리딘-2-일)니코틴아미드)**



81



81

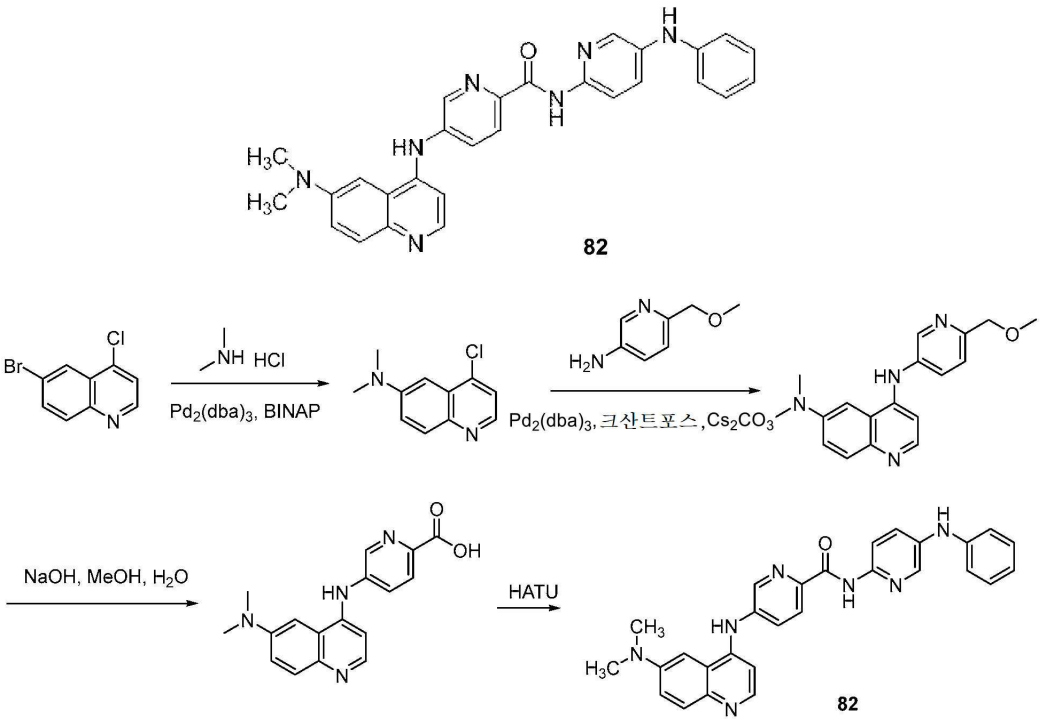
반응식 70

[1144]

[1145] **화합물 81**을 반응식 70에 나타낸 방법으로 제조하였다. **화합물 81**(6-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(5-(페닐아미노)피리딘-2-일)니코틴아미드)을 반응식 70에 나타낸 바와 같이 제조하였다: $C_{28}H_{25}N_7O$; 475.56

g/mol; 19 mg; 옅은 황색 고체; ESI-LCMS m/z = 476 $[M+H]^+$; LCMS RT = 1.71분, >95.00% (214 nm).

[1146] **실시예 82: 화합물 82(5-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(5-(펜닐아미노)피리딘-2-일)피콜린아미드)**

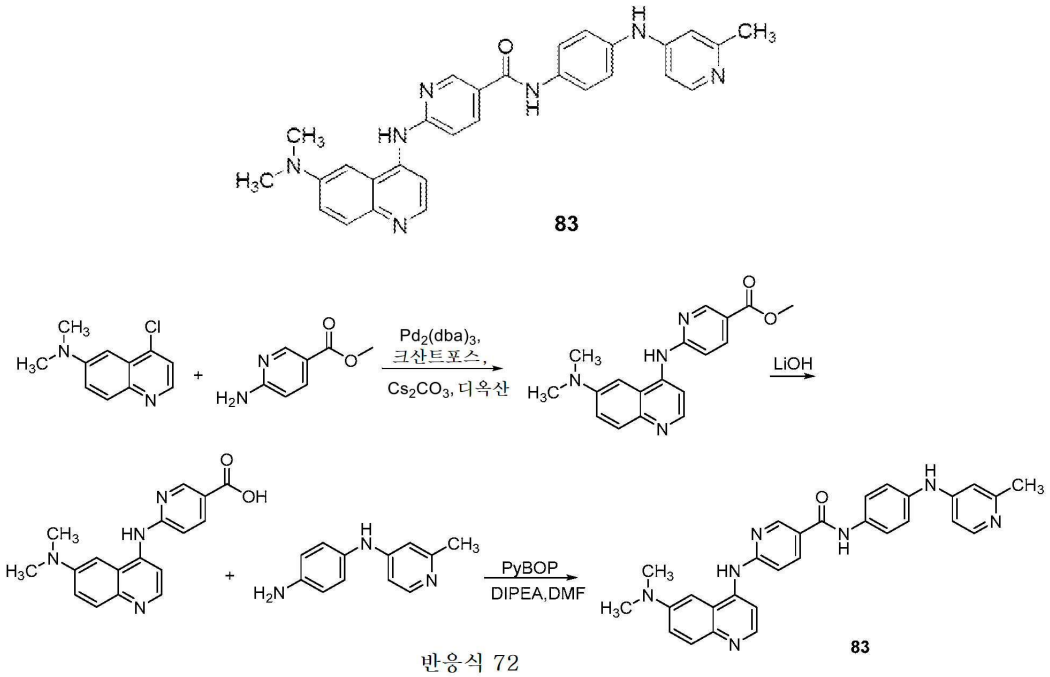


반응식 71

[1147]

[1148] **화합물 82**를 반응식 71에 나타낸 방법으로 제조하였다. **화합물 82**(5-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(5-(펜닐아미노)피리딘-2-일)피콜린아미드)를 반응식 71에 나타낸 바와 같이 제조하였다: $C_{28}H_{25}N_7O$; 475.56 g/mol; 19 mg; 황색 고체; ESI-LCMS m/z = 476 $[M+H]^+$; LCMS RT = 1.78분, >95.00% (214 nm).

[1149] **실시예 83: 화합물 83(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)펜닐)니코틴아미드)**



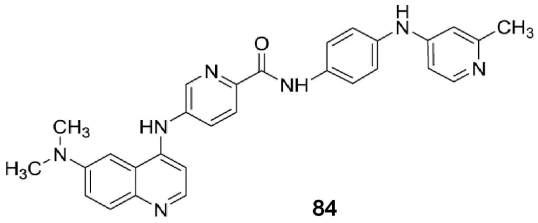
반응식 72

[1150]

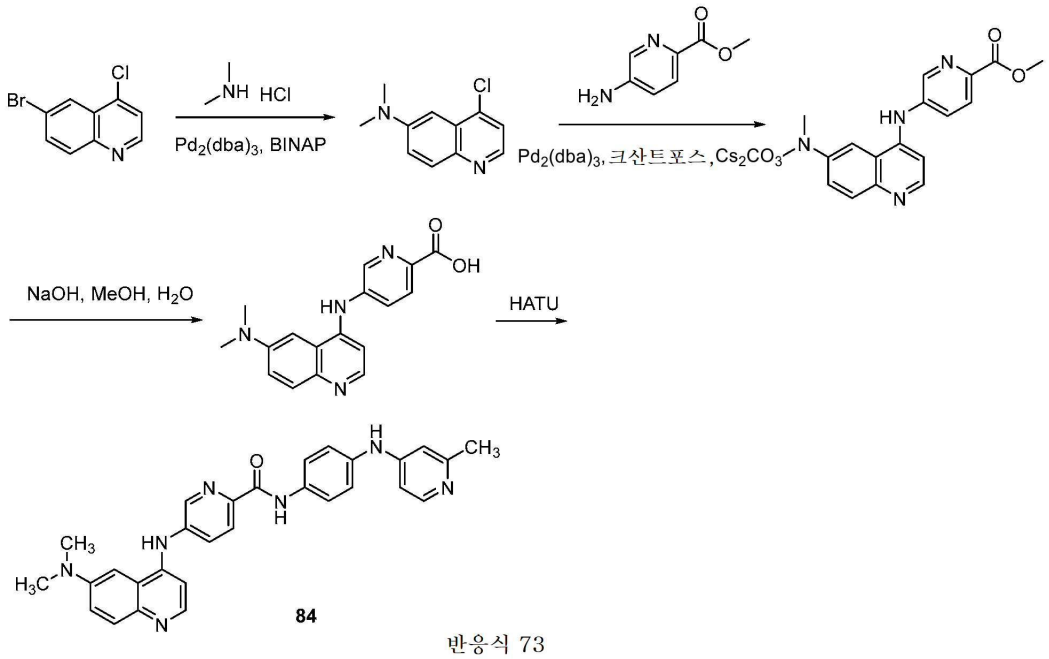
[1151] **화합물 83**을 반응식 72에 나타낸 방법으로 제조하였다. **화합물 83**(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-

(4-(2-메틸피리딘-4-일아미노)페닐)니코틴아미드)을 반응식 72에 나타낸 바와 같이 제조하였다: $C_{29}H_{27}N_7O$; 489.57 g/mol; 16 mg; 황색 고체; ESI-LCMS m/z = 490 $[M+H]^+$; LCMS RT = 1.50분, >95.00% (214 nm).

[1152] **실시예 84: 화합물 84(5-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)페닐)피콜린아미드)**

[1153] 

84

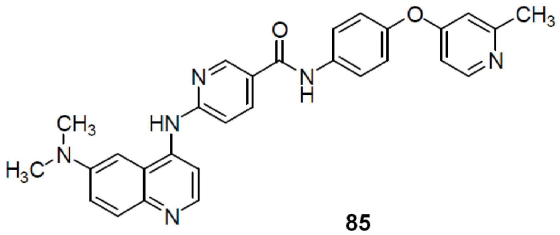


반응식 73

[1154]

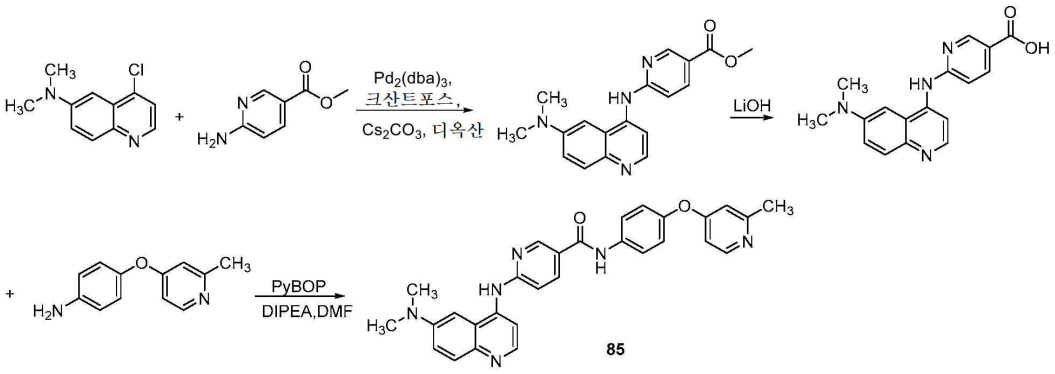
[1155] **화합물 84**를 반응식 73에 나타낸 방법으로 제조하였다. **화합물 84**(5-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)페닐)피콜린아미드)를 반응식 73에 나타낸 바와 같이 제조하였다: $C_{29}H_{27}N_7O$; 489.57 g/mol; 24 mg; 옅은 황색 고체; ESI-LCMS m/z = 490 $[M+H]^+$; LCMS RT = 1.42분, >95.00% (214 nm).

[1156] **실시예 85: 화합물 85(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일옥시)페닐)니코틴아미드)**



85

[1157]

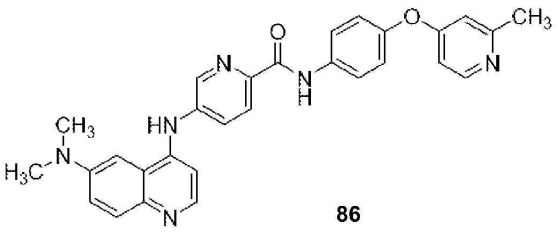


반응식 74

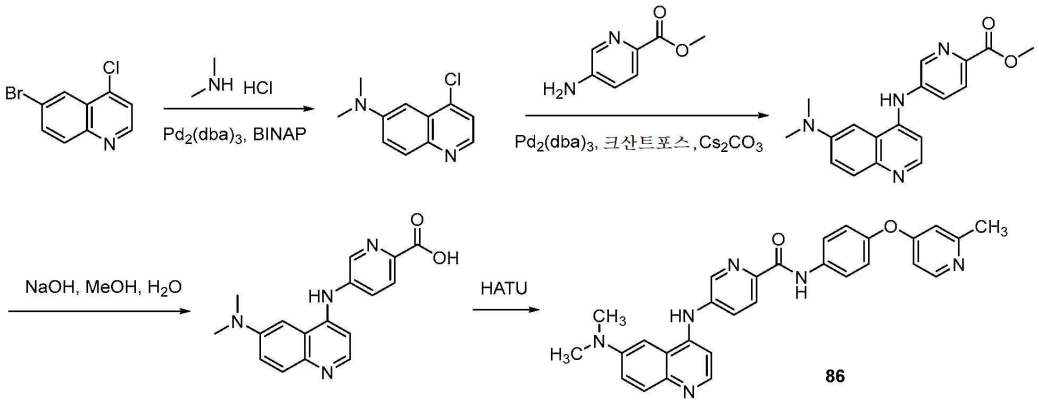
[1158]

[1159] **화합물 85**를 반응식 74에 나타낸 방법으로 제조하였다. **화합물 85**(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일옥시)페닐)니코틴아미드)를 반응식 74에 나타낸 바와 같이 제조하였다: $C_{29}H_{26}N_6O_2$; 490.56 g/mol; 20 mg; 황색 고체; ESI-LCMS m/z = 491 $[M+H]^+$; LCMS RT = 1.51분, >95.00% (214 nm).

[1160] **실시예 86: 화합물 86(5-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)옥시)페닐)피콜린아미드)**



86



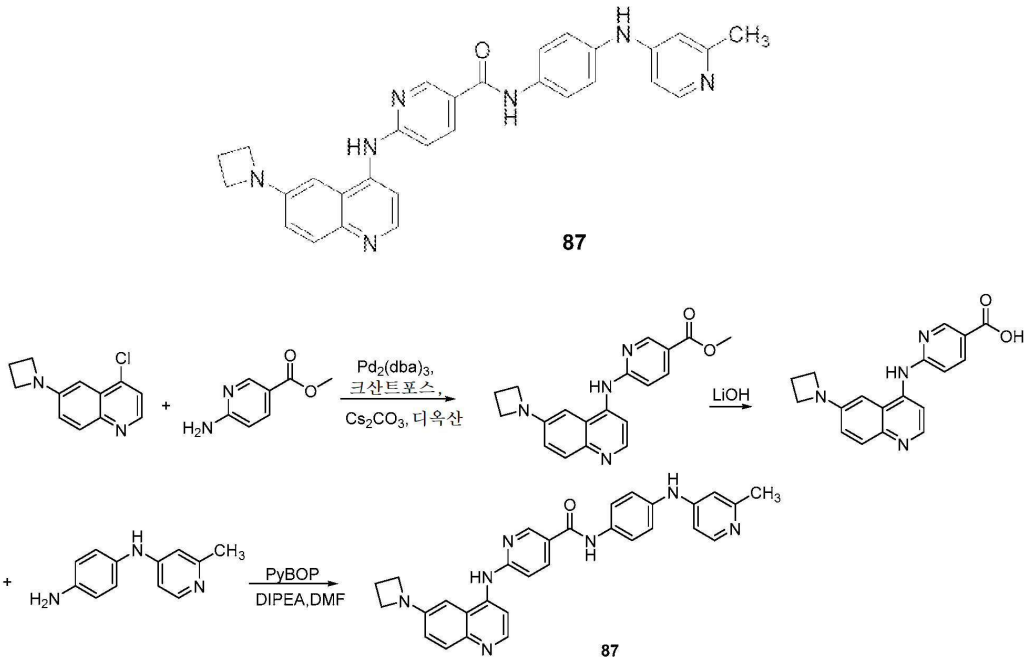
반응식 75

[1161]

[1162] **화합물 86**을 반응식 75에 나타낸 방법으로 제조하였다. **화합물 86**(5-((6-(디메틸아미노)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)옥시)페닐)피콜린아미드)을 반응식 75에 나타낸 바와 같이 제조하였다: $C_{29}H_{26}N_6O_2$; 490.56 g/mol; 20 mg; 황색 고체; ESI-LCMS m/z = 491 $[M+H]^+$; LCMS RT = 1.78분, >95.00% (214 nm).

[1163] **실시예 87: 화합물 87(6-(6-(아제티딘-1-일)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)페닐)니코틴아**

미드)



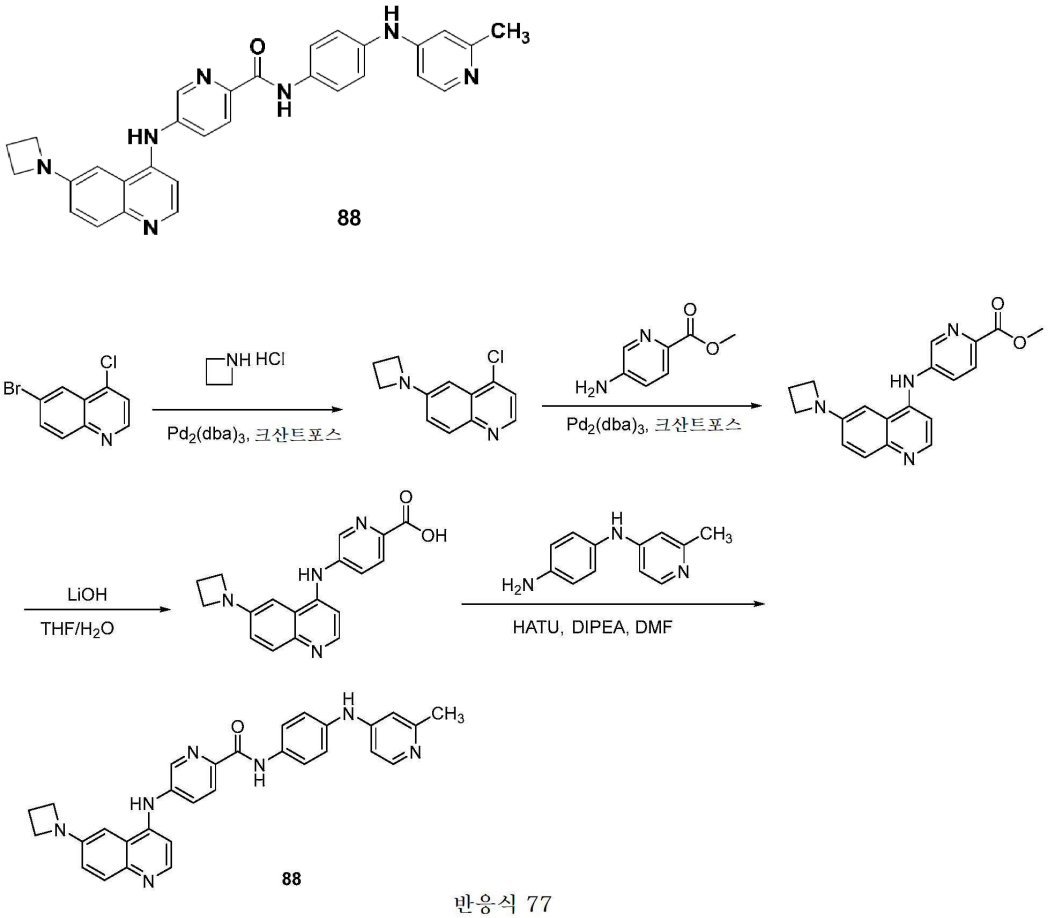
반응식 76

[1164]

[1165] **화합물 87**을 반응식 76에 나타낸 방법으로 제조하였다. **화합물 87**(6-(6-(아제티딘-1-일)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)페닐)니코틴아미드)을 반응식 76에 나타낸 바와 같이 제조하였다: $C_{30}H_{27}N_7O$; 501.58 g/mol; 24 mg; 황색 고체; ESI-LCMS m/z = 502 $[M+H]^+$; LCMS RT = 1.78분, >95.00% (214 nm).

[1166] **실시예 88: 화합물 88(5-((6-(아제티딘-1-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)피콜린아미드)**

[1167]



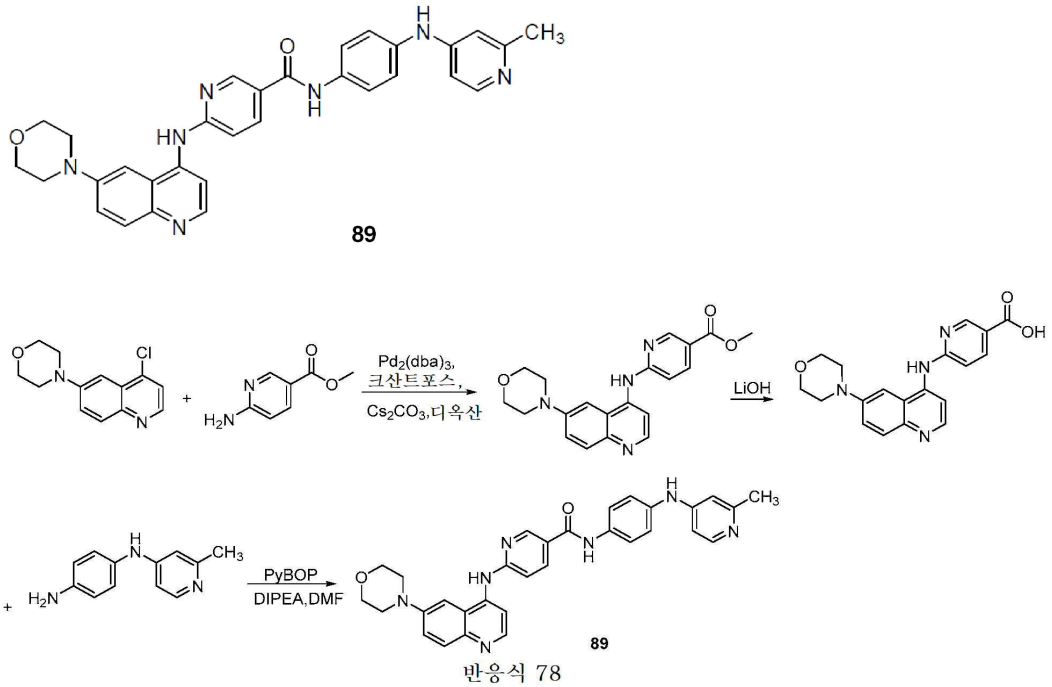
반응식 77

[1168]

[1169] **화합물 88**을 반응식 77에 나타낸 방법으로 제조하였다. **화합물 88**(5-((6-(아제티딘-1-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)피콜린아미드)을 반응식 77에 나타낸 바와 같이 제조하였다: $C_{30}H_{27}N_7O$; 501.594 g/mol; 20 mg; 황색 고체; ESI-LCMS m/z = 502 $[M+H]^+$; LCMS RT = 1.74분, >95.00% (214 nm).

[1170] **실시예 89: 화합물 89(N-(4-(2-메틸피리딘-4-일아미노)페닐)-6-(6-모르폴리노퀴놀린-4-일아미노)니코틴아미드)**

[1171]



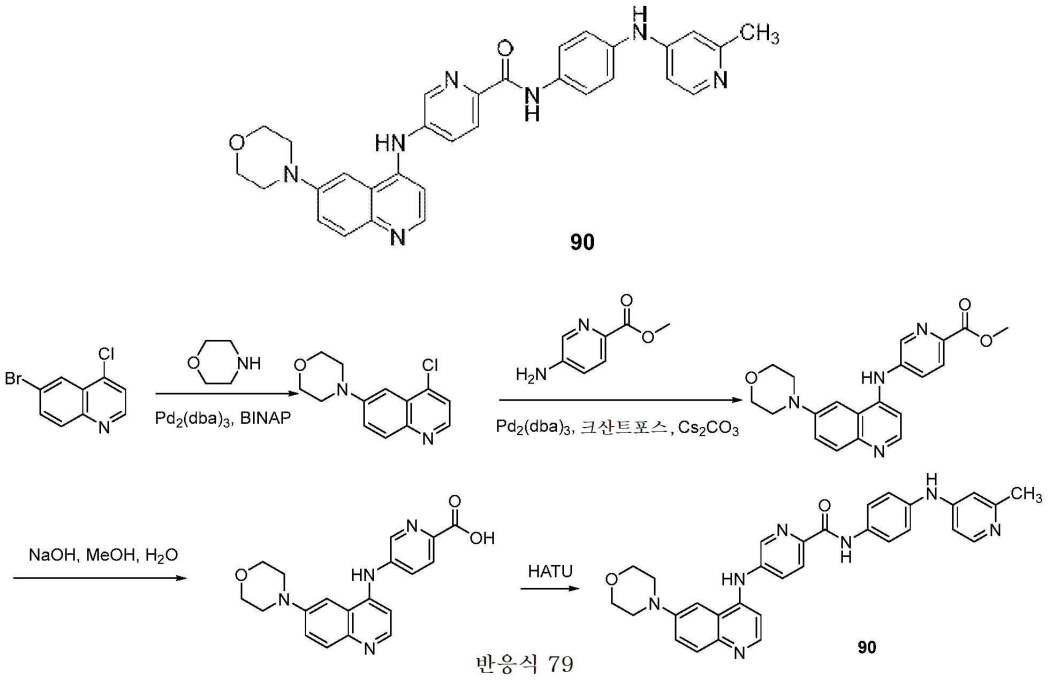
반응식 78

[1172]

[1173] **화합물 89**를 반응식 78에 나타낸 방법으로 제조하였다. **화합물 89**(N-(4-(2-메틸피리딘-4-일아미노)페닐)-6-

(6-모르폴리노퀴놀린-4-일아미노)니코틴아미드)를 반응식 78에 나타낸 바와 같이 제조하였다: $C_{31}H_{29}N_7O_2$; 531.61 g/mol; 17 mg; 황색 고체; ESI-LCMS m/z = 532 $[M+H]^+$; LCMS RT = 1.51분, >95.00% (214 nm).

[1174] **실시예 90: 화합물 90(N-(4-((2-메틸피리딘-4-일)아미노)페닐)-5-((6-모르폴리노퀴놀린-4-일)아미노)피콜린아미드)**

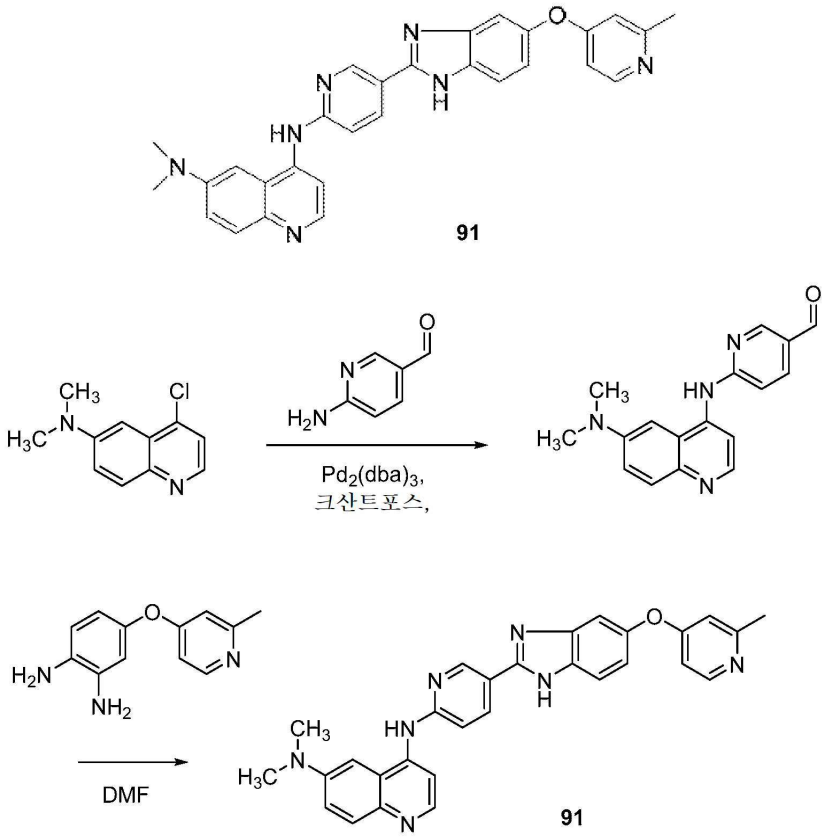


반응식 79

[1175]

[1176] **화합물 90**을 반응식 79에 나타낸 방법으로 제조하였다. **화합물 90**(N-(4-((2-메틸피리딘-4-일)아미노)페닐)-5-((6-모르폴리노퀴놀린-4-일)아미노)피콜린아미드)을 반응식 79에 나타낸 바와 같이 제조하였다: $C_{31}H_{29}N_7O_2$; 531.62 g/mol; 13 mg; 회색 고체; ESI-LCMS m/z = 532.2 $[M+H]^+$; LCMS RT = 1.49분, >95.00% (214 nm).

[1177] **실시예 91: 화합물 91(N^6,N^6-디메틸-N^4-(5-(5-((2-메틸피리딘-4-일)옥시)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4,6-디아민)**

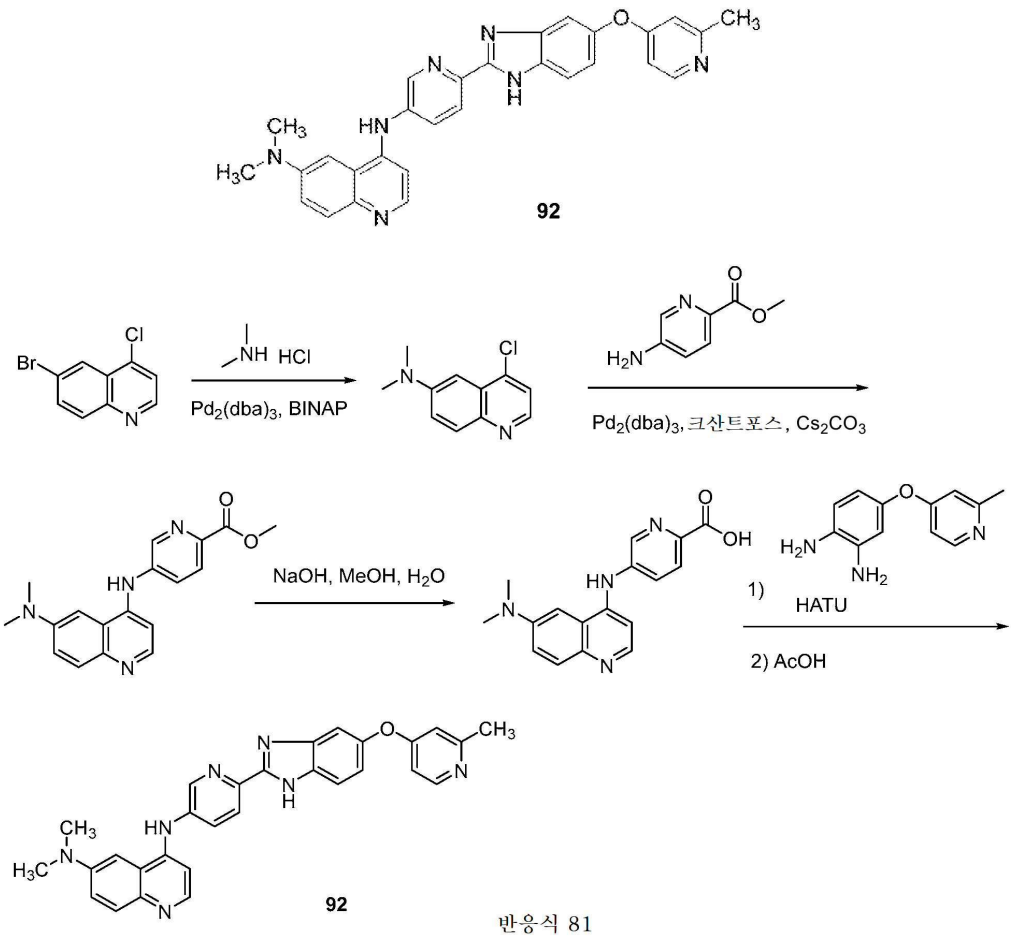


반응식 80

[1178]

[1179] **화합물 91**을 반응식 80에 나타낸 방법으로 제조하였다. **화합물 91**(N^6,N^6-디메틸-N^4-(5-(5-((2-메틸피리딘-4-일)옥시)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4,6-디아민)을 반응식 80에 나타낸 바와 같이 제조하였다: $C_{29}H_{25}N_7O$; 487.57 g/mol; 13 mg; 황색 고체; ESI-LCMS m/z = 488 $[M+H]^+$; LCMS RT = 1.66분, >95.00% (214 nm).

[1180] **실시예 92: 화합물 92(N^6,N^6-디메틸-N^4-(6-(5-((2-메틸피리딘-4-일)옥시)-1H 벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4,6-디아민)**



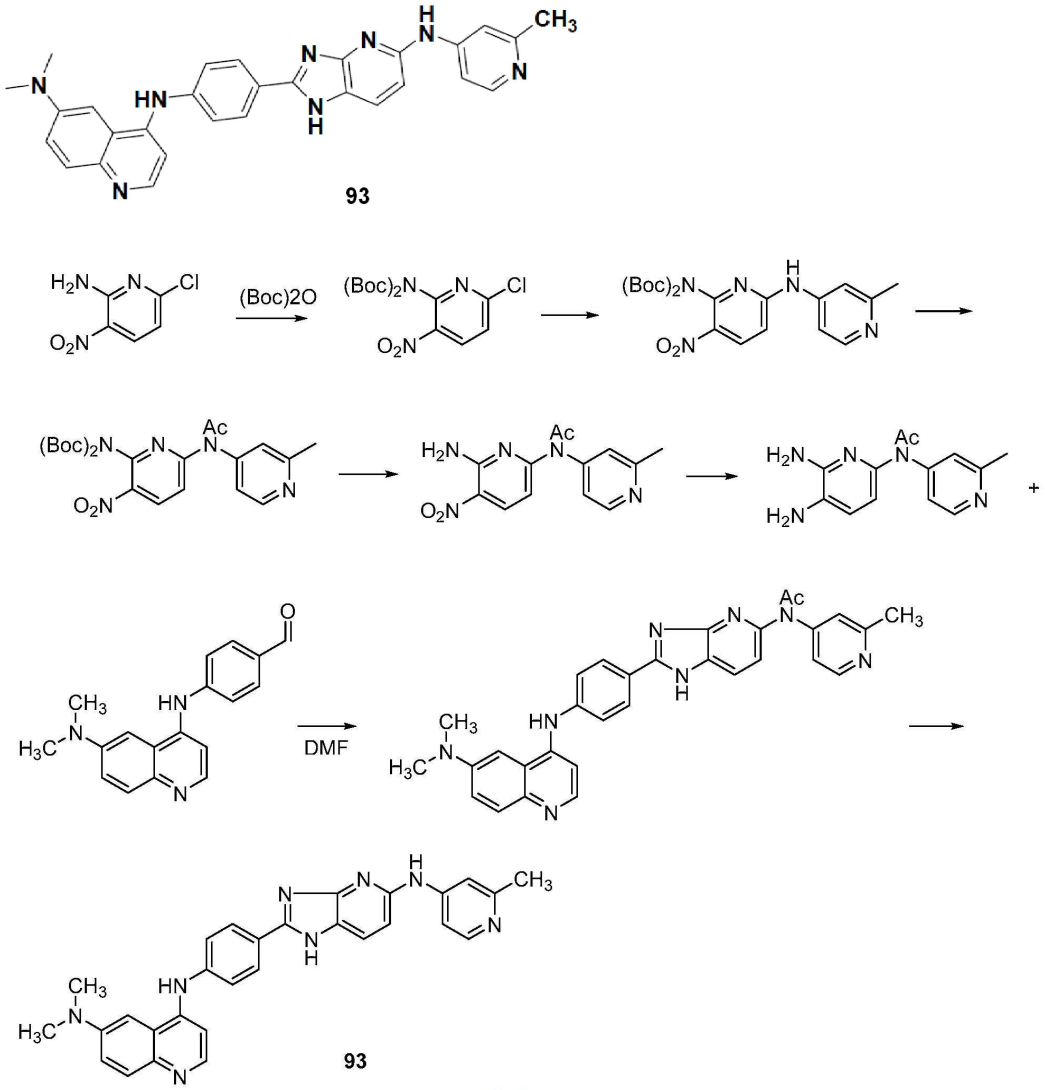
반응식 81

[1181]

[1182] **화합물 92**를 반응식 81에 나타낸 방법으로 제조하였다. **화합물 92**(N^6,N^6-디메틸-N^4-(6-(5-((2-메틸피리딘-4-일)옥시)-1H 벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4,6-디아민)를 반응식 81에 나타낸 바와 같이 제조하였다: $C_{29}H_{25}N_7O$; 487.57 g/mol; 25 mg; 황색 고체; ESI-LCMS m/z = 488 $[M+H]^+$; LCMS RT = 1.78분, >95.00% (214 nm).

[1183] **실시예 93: 화합물 93(N^6,N^6-디메틸-N^4-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-이미다조[4,5-b]피리딘-2-일)페닐)퀴놀린-4,6-디아민)**

[1184]



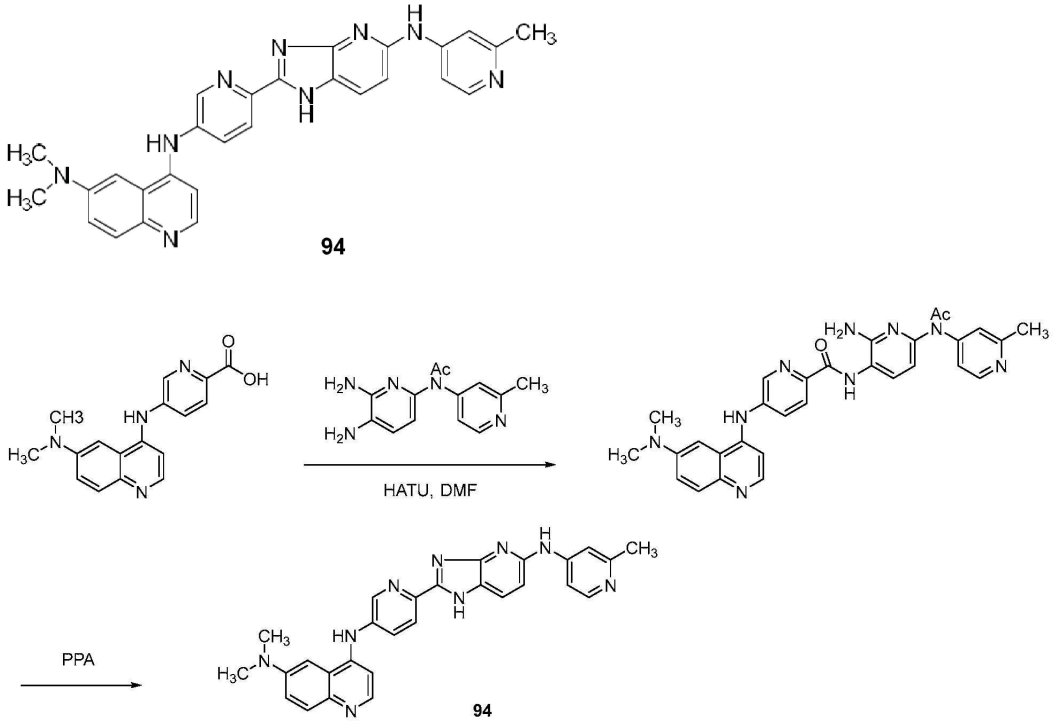
반응식 82

[1185]

[1186] **화합물 93**을 반응식 82에 나타낸 방법으로 제조하였다. **화합물 93**(N^6,N^6-디메틸-N^4-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-이미다조[4,5-b]피리딘-2-일)페닐)퀴놀린-4,6-디아민)을 반응식 82에 나타낸 바와 같이 제조하였다: $C_{29}H_{26}N_8$; 486.58 g/mol; 18 mg; 황갈색 고체; ESI-LCMS m/z = 487 $[M+H]^+$; LCMS RT = 1.401분, >95.00% (214 nm).

[1187] **실시예 94: 화합물 94(N^6,N^6-디메틸-N^4-(6-(5-((2-메틸피리딘-4-일)아미노)-1H 이미다조[4,5-b]피리딘-2-일)피리딘-3-일)퀴놀린-4,6-디아민)**

[1188]



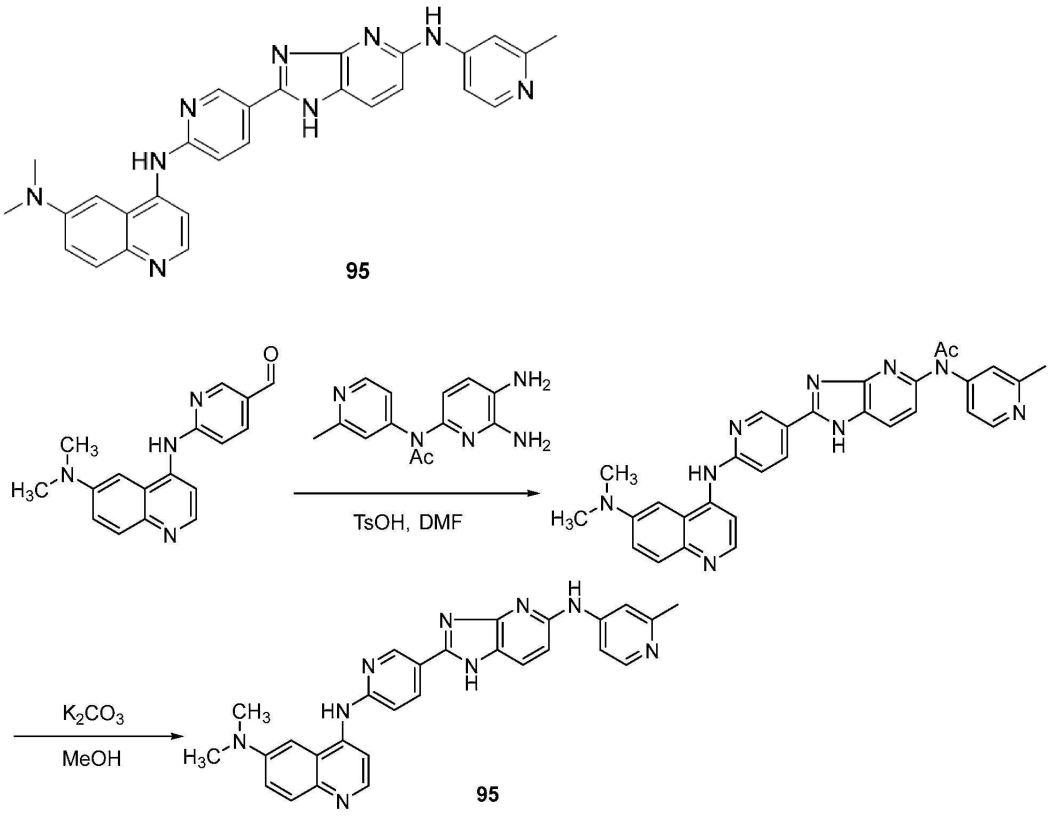
반응식 83

[1189]

[1190] **화합물 94**를 반응식 83에 나타낸 방법으로 제조하였다. **화합물 94**(N^6,N^6-디메틸-N^4-(6-(5-((2-메틸피리딘-4-일)아미노)-1H 이미다조[4,5-b]피리딘-2-일)피리딘-3-일)퀴놀린-4,6-디아민)를 반응식 83에 나타낸 바와 같이 제조하였다: $C_{28}H_{25}N_9$; 487.57 g/mol; 14 mg; 회색 고체; ESI-LCMS m/z = 488 $[M+H]^+$; LCMS RT = 1.39분, >95.00% (214 nm).

[1191] **실시예 95: 화합물 95(N^6,N^6-디메틸-N^4-(5-(5-((2-메틸피리딘-4-일)아미노)-1H-이미다조[4,5-b]피리딘-2-일)피리딘-2-일)퀴놀린-4,6-디아민)**

[1192]



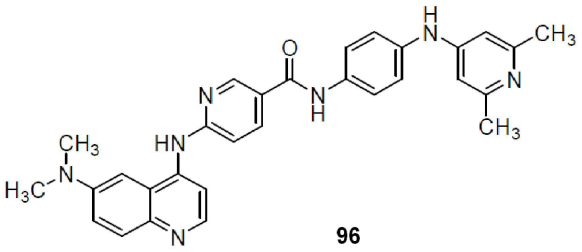
반응식 84

[1193]

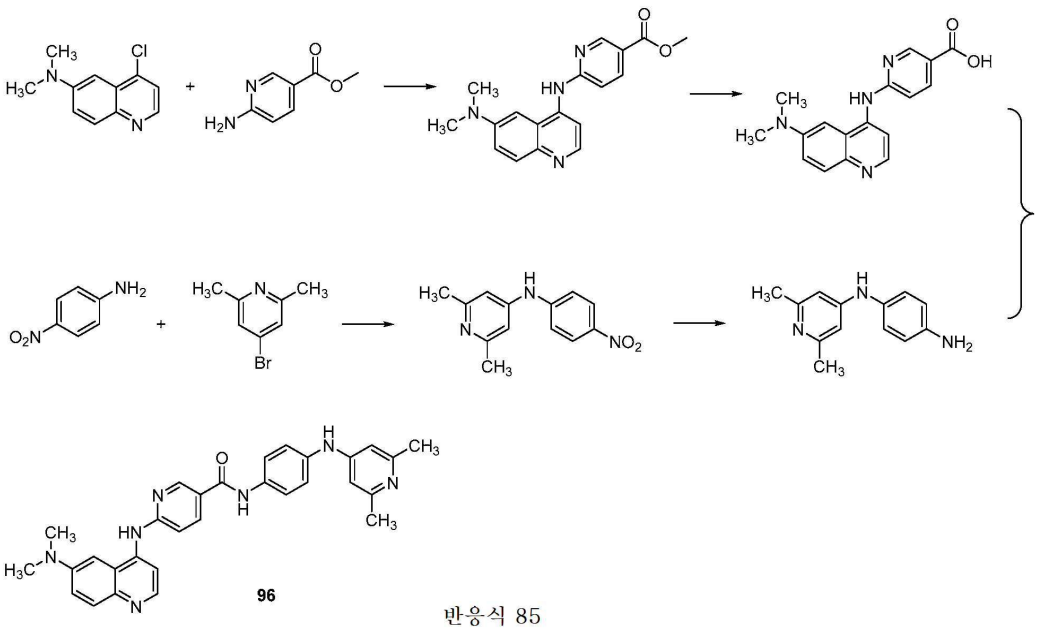
[1194] **화합물 95**를 반응식 84에 나타낸 방법으로 제조하였다. **화합물 95**(N^6,N^6-디메틸-N^4-(5-(5-((2-메틸피리딘-4-일)아미노)-1H-이미다조[4,5-b]피리딘-2-일)피리딘-2-일)퀴놀린-4,6-디아민)를 반응식 84에 나타낸 바와 같이 제조하였다: $C_{28}H_{25}N_9$; 487.57 g/mol; 10.3 mg; 녹색 고체; ESI-LCMS m/z = 488 $[M+H]^+$; LCMS RT = 1.403분, >95.00% (214 nm).

[1195] **실시예 96: 화합물 96(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(2,6-디메틸피리딘-4-일아미노)페닐)니코틴아미드)**

[1196]



96



96

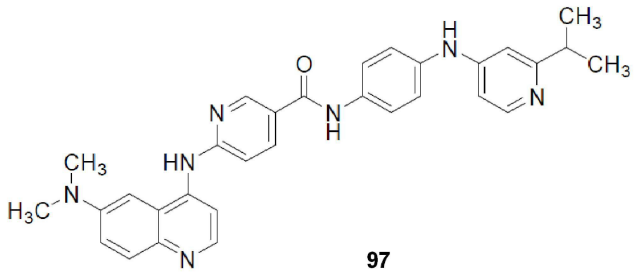
반응식 85

[1197]

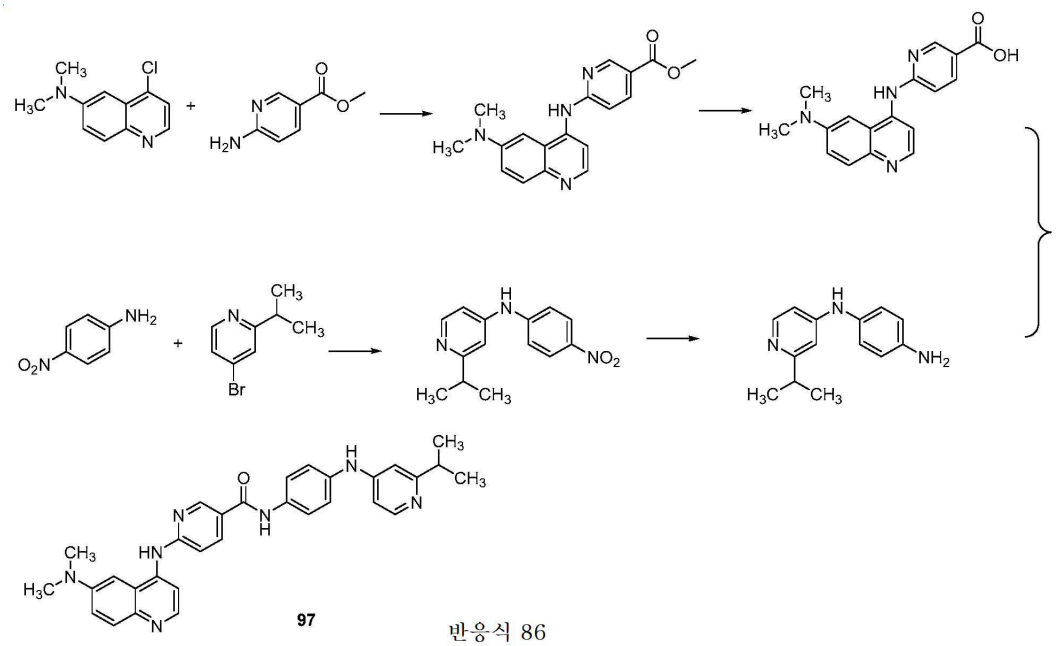
[1198] **화합물 96**을 반응식 85에 나타낸 방법으로 제조하였다. **화합물 96**(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(2,6-디메틸피리딘-4-일아미노)페닐)니코틴아미드)을 반응식 85에 나타낸 바와 같이 제조하였다: $C_{30}H_{29}N_7O$; 503.60 g/mol; 17 mg; 황색 고체; ESI-LCMS m/z = 504 $[M+H]^+$; LCMS RT = 1.54분, >95.00% (214 nm).

[1199] **실시예 97: 화합물 97(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(2-이소프로필피리딘-4-일아미노)페닐)니코틴아미드)**

[1200]



97



97

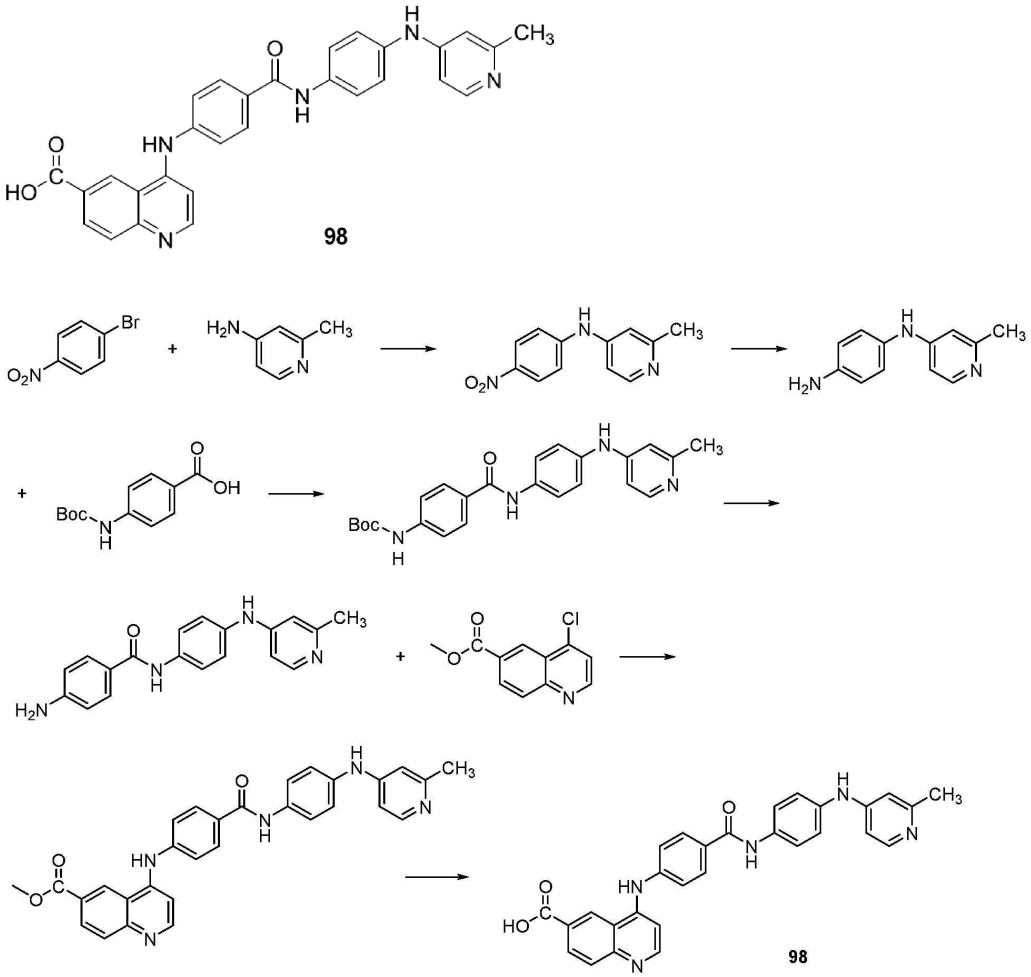
반응식 86

[1201]

[1202] **화합물 97**을 반응식 86에 나타낸 방법으로 제조하였다. **화합물 97**(6-(6-(디메틸아미노)퀴놀린-4-일아미노)-N-(4-(2-이소프로필피리딘-4-일아미노)페닐)니코틴아미드)을 반응식 86에 나타낸 바와 같이 제조하였다: $C_{31}H_{31}N_7O$; 517.62 g/mol; 20 mg; 황색 고체; ESI-LCMS m/z = 518 $[M+H]^+$; LCMS RT = 1.59분, >95.00% (214 nm).

[1203] **실시예 98: 화합물 98(4-((4-((4-((2-메틸피리딘-4-일)아미노)페닐)카르바모일)페닐)아미노)퀴놀린-6-카르복실산)**

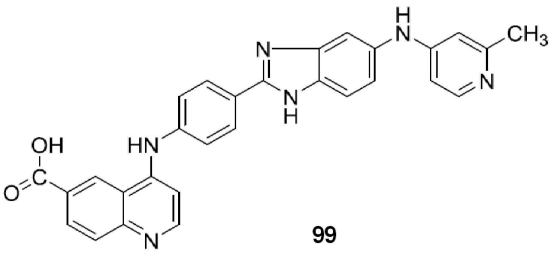
[1204]



[1205] 반응식 87

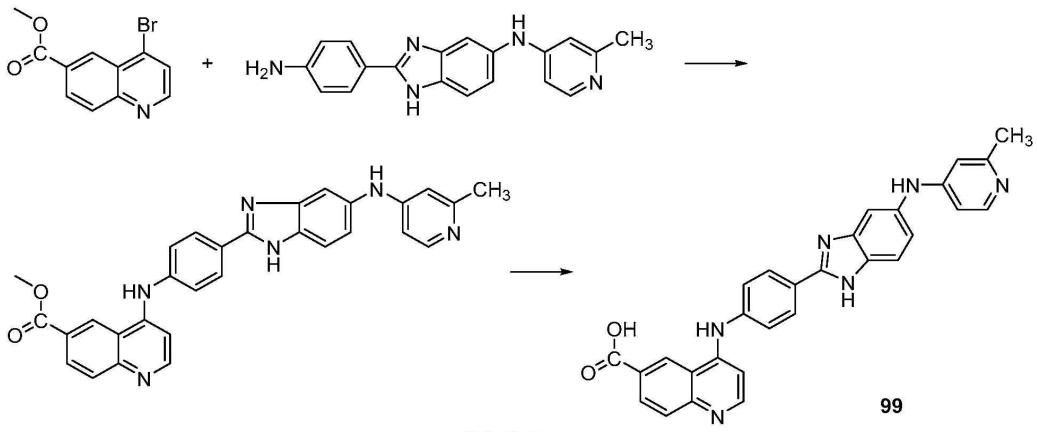
[1206] **화합물 98**을 반응식 87에 나타낸 방법으로 제조하였다. **화합물 98**(4-((4-((4-((2-메틸피리딘-4-일)아미노)페닐)카르바모일)페닐)아미노)퀴놀린-6-카르복실산)을 반응식 87에 나타낸 바와 같이 제조하였다: $C_{29}H_{23}N_5O_3$; 489.54 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 490 $[M+H]^+$; LCMS RT = 1.07분, >95.00% (214 nm).

[1207] **실시예 99: 화합물 99(4-((4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)아미노)퀴놀린-6-카르복실산)**



99

[1208]

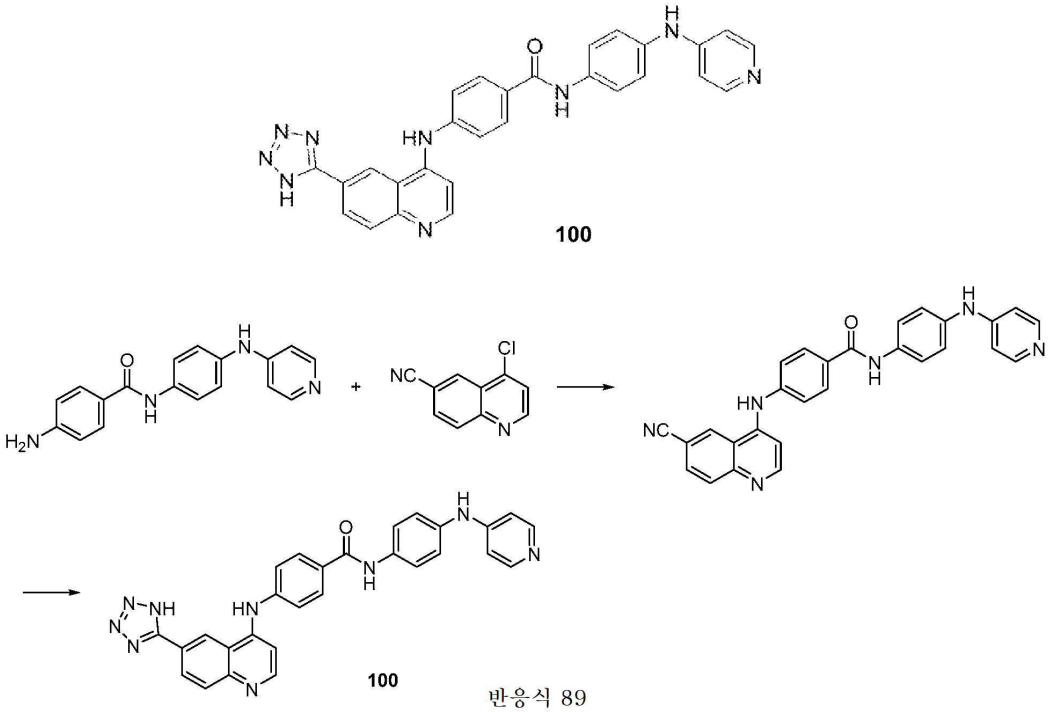


반응식 88

[1209]

[1210] **화합물 99**를 반응식 88에 나타낸 방법으로 제조하였다. **화합물 99**(4-((4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)아미노)퀴놀린-6-카르복실산)를 반응식 88에 나타낸 바와 같이 제조하였다: $C_{29}H_{22}N_6O_2$; 486.54 g/mol; 11 mg; 황색 고체; ESI-LCMS m/z = 487 $[M+H]^+$; LCMS RT = 1.39분, >95.00% (214 nm).

[1211] **실시예 100: 화합물 100(4-((6-(1H-테트라졸-5-일)퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**



100

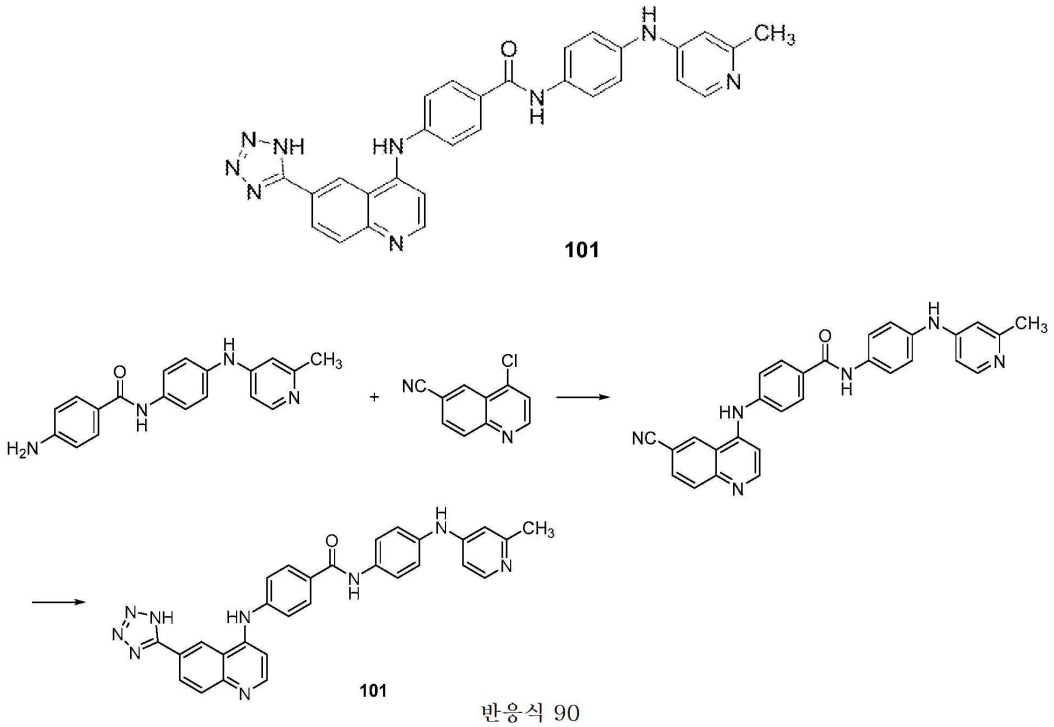
반응식 89

[1212]

[1213] **화합물 100**을 반응식 89에 나타낸 방법으로 제조하였다. **화합물 100**(4-((6-(1H-테트라졸-5-일)퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)을 반응식 89에 나타낸 바와 같이 제조하였다: $C_{28}H_{21}N_9O$; 499.54

g/mol; 16 mg; 옅은 황색 고체; ESI-LCMS m/z = 500 $[M+H]^+$; LCMS RT = 1.14분, >95.00% (214 nm).

[1214] **실시예 101: 화합물 101(4-((6-(1H-테트라졸-5-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드)**

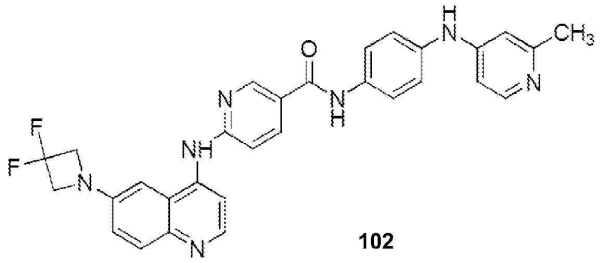


반응식 90

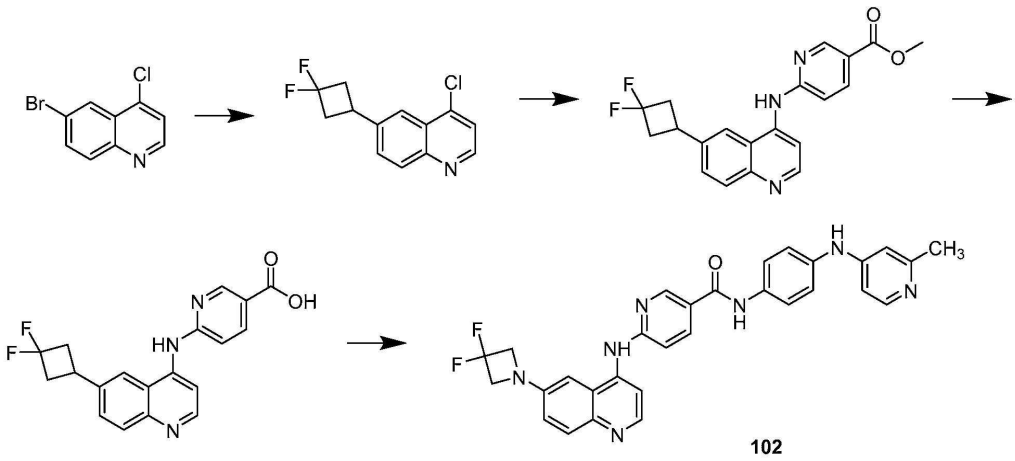
[1215]

[1216] **화합물 101**을 반응식 90에 나타낸 방법으로 제조하였다. **화합물 101**(4-((6-(1H-테트라졸-5-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드)을 반응식 90에 나타낸 바와 같이 제조하였다: $C_{29}H_{23}N_9O$; 513.57 g/mol; 18 mg; 옅은 황색 고체; ESI-LCMS m/z = 514 $[M+H]^+$; LCMS RT = 1.11분, >95.00% (214 nm).

[1217] **실시예 102: 화합물 102(6-(6-(3,3-디플루오로아제티딘-1-일)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)페닐)니코틴아미드)**



102



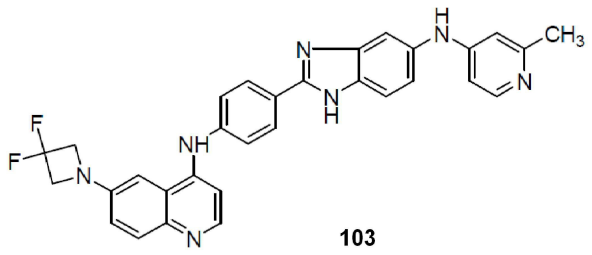
102

반응식 91

[1218]

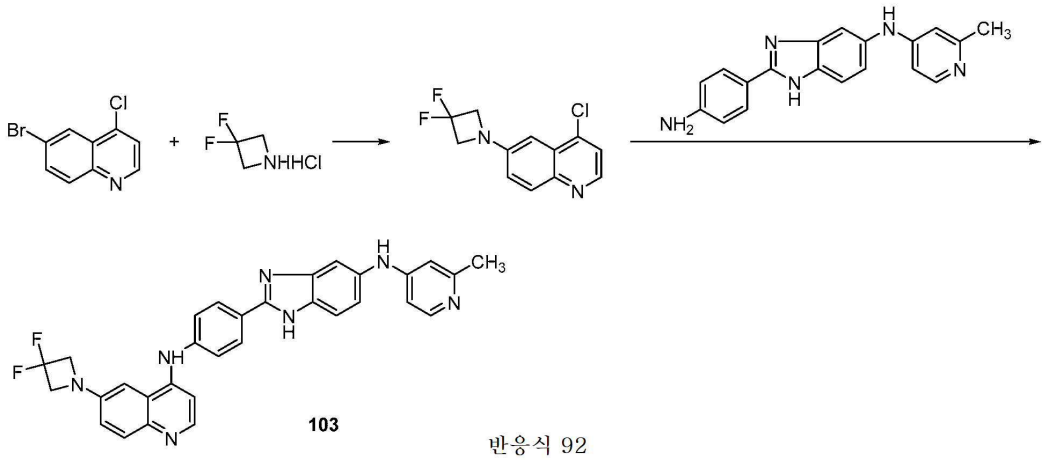
[1219] **화합물 102**를 반응식 91에 나타낸 방법으로 제조하였다. **화합물 102**(6-(6-(3,3-디플루오로아제티딘-1-일)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)페닐)니코틴아미드)를 반응식 91에 나타낸 바와 같이 제조하였다: $C_{30}H_{25}F_2N_7O$; 537.56 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 538 $[M+H]^+$; LCMS RT = 1.54분, >95.00% (214 nm).

[1220] **실시예 103: 화합물 103(6-(3,3-디플루오로아제티딘-1-일)-N-(4-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)**



103

[1221]



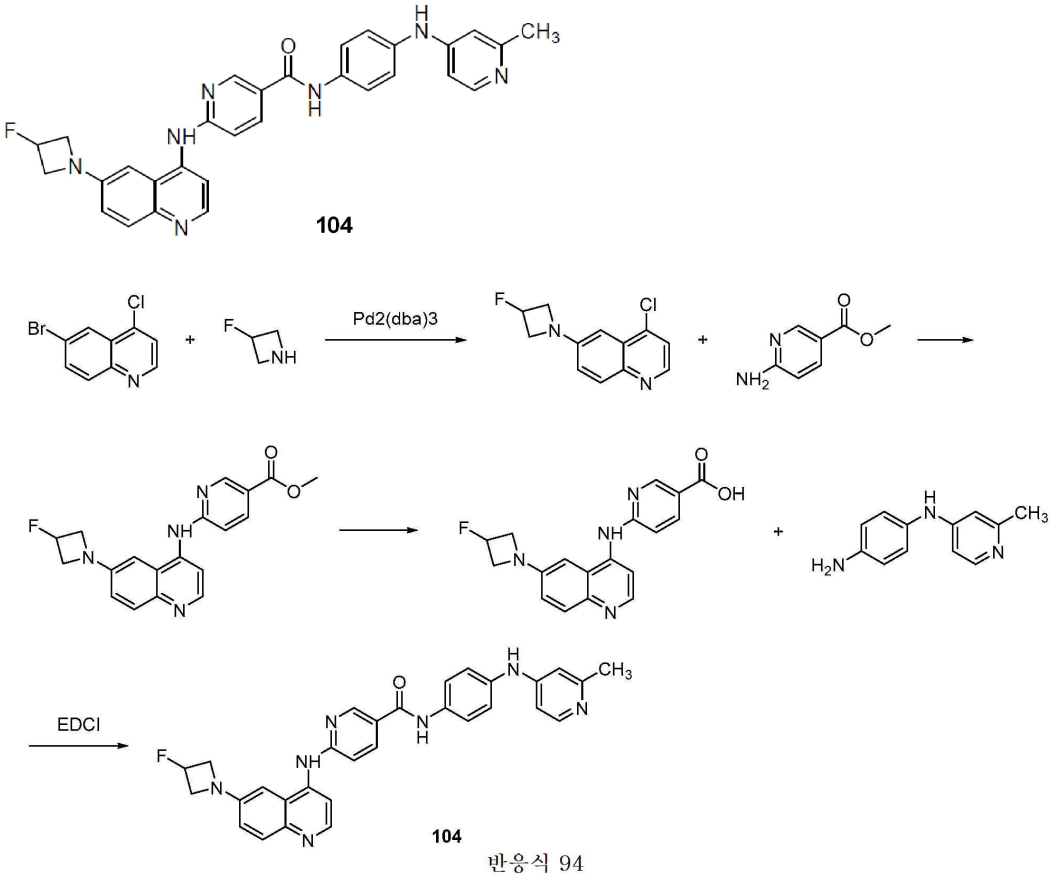
103

반응식 92

[1222]

[1223] **화합물 103**을 반응식 92에 나타낸 방법으로 제조하였다. **화합물 103**(6-(3,3-디플루오로아제티딘-1-일)-N-(4-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)을 반응식 92에 나타낸 바와 같이 제조하였다: $C_{31}H_{25}F_2N_7$; 533.57 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 534 $[M+H]^+$; LCMS RT = 1.55분, >95.00% (214 nm).

[1224] **실시예 104: 화합물 104(6-((6-(3-플루오로아제티딘-1-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)니코틴아미드)**

[1225] 

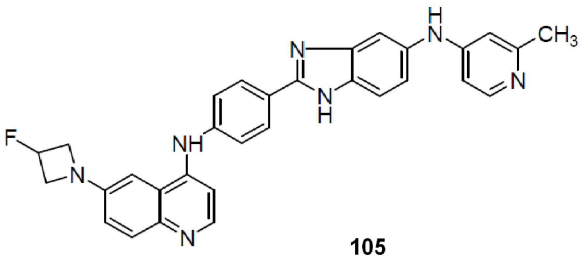
반응식 94

[1226]

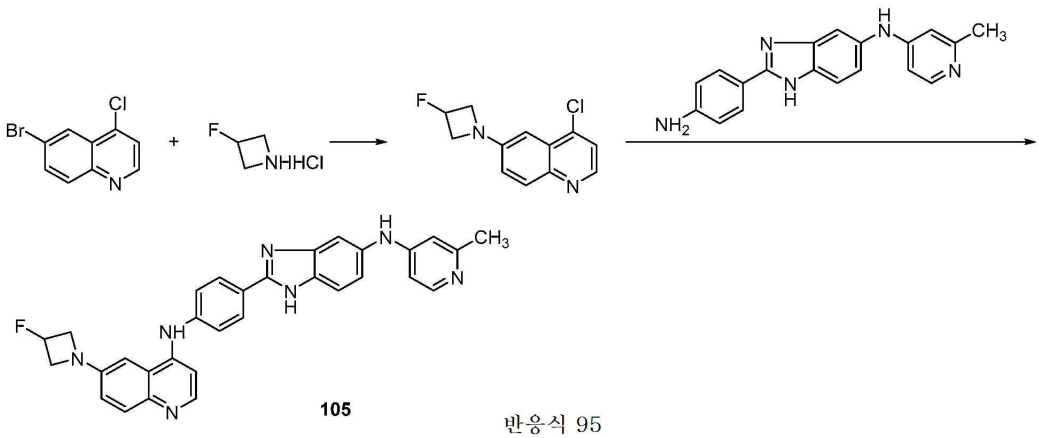
[1227] **화합물 104**를 반응식 94에 나타낸 방법으로 제조하였다. **화합물 104**(6-((6-(3-플루오로아제티딘-1-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)니코틴아미드)를 반응식 94에 나타낸 바와 같이 제조하였다: $C_{30}H_{26}FN_7O$; 519.58 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 520 $[M+H]^+$; LCMS RT = 1.51분, >95.00% (214 nm).

[1228] **실시예 105: 화합물 105(6-(3-플루오로아제티딘-1-일)-N-(4-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)**

[1229]



105



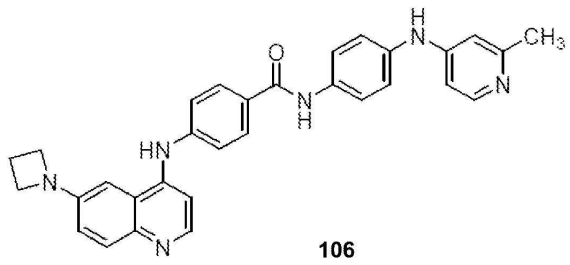
105

반응식 95

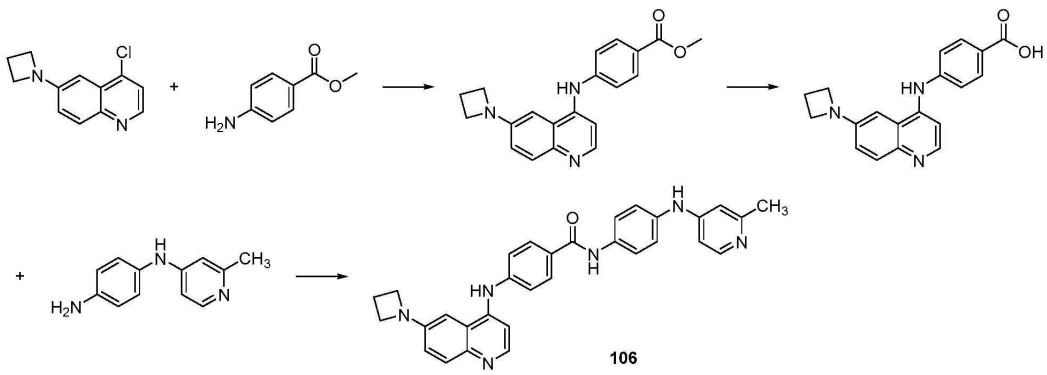
[1230]

[1231] **화합물 105**를 반응식 95에 나타낸 방법으로 제조하였다. **화합물 105**(6-(3-플루오로아제티딘-1-일)-N-(4-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)를 반응식 95에 나타낸 바와 같이 제조하였다: $C_{31}H_{26}FN_7$; 515.58 g/mol; 18 mg; 옅은 황색 고체; ESI-LCMS m/z = 516 $[M+H]^+$; LCMS RT = 1.49분, >95.00% (214 nm).

[1232] **실시예 106: 화합물 106(4-((6-(아제티딘-1-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드)**



106



106

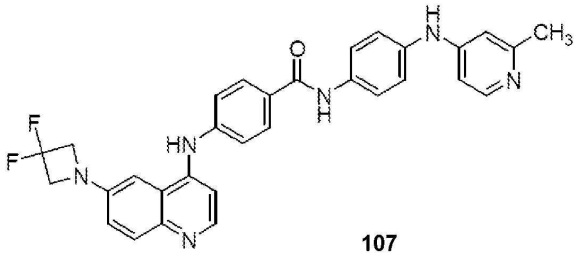
반응식 96

[1233]

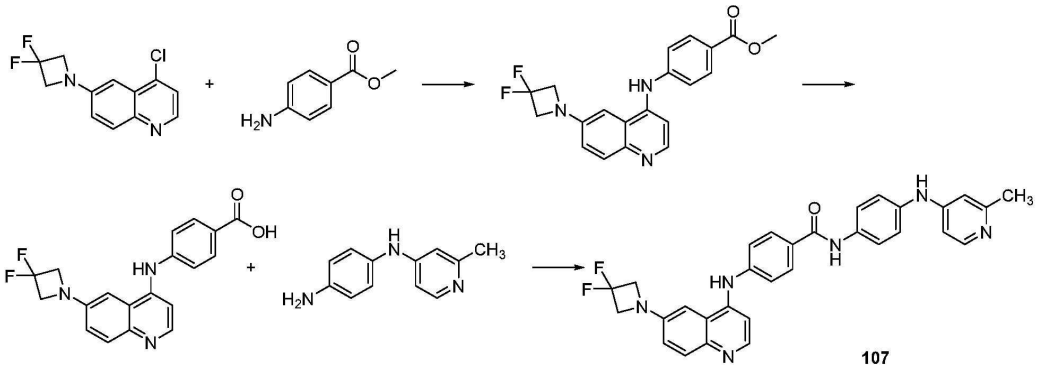
[1234] **화합물 106**을 반응식 96에 나타낸 방법으로 제조하였다. **화합물 106**(4-((6-(아제티딘-1-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드)을 반응식 96에 나타낸 바와 같이 제조하였다:

$C_{31}H_{28}FN_6O$; 500.61 g/mol; 20 mg; 옅은 황색 고체; ESI-LCMS m/z = 501 $[M+H]^+$; LCMS RT = 1.53분, >95.00% (214 nm).

[1235] **실시예 107: 화합물 107(4-((6-(3,3-디플루오로아제티딘-1-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드)**



107

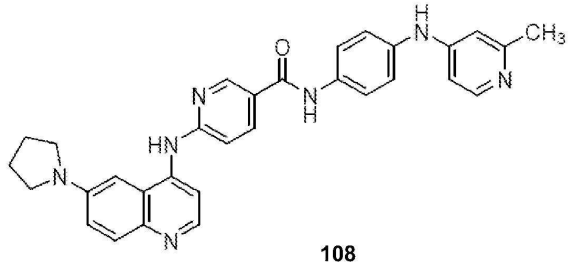


반응식 97

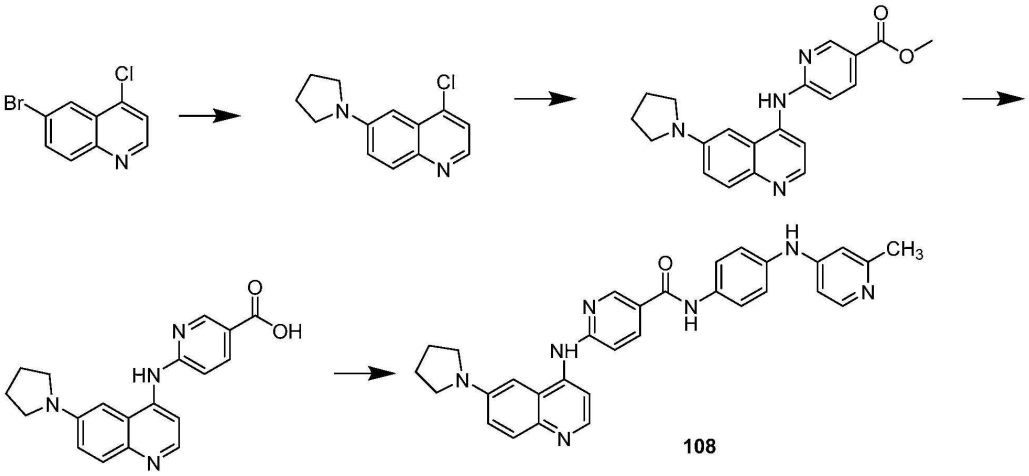
[1236]

[1237] **화합물 107**을 반응식 97에 나타낸 방법으로 제조하였다. **화합물 107**(4-((6-(3,3-디플루오로아제티딘-1-일)퀴놀린-4-일)아미노)-N-(4-((2-메틸피리딘-4-일)아미노)페닐)벤즈아미드)을 반응식 97에 나타낸 바와 같이 제조하였다: $C_{31}H_{26}F_2N_6O$; 536.59 g/mol; 15 mg; 옅은 황색 고체; ESI-LCMS m/z = 537 $[M+H]^+$; LCMS RT = 1.52분, >95.00% (214 nm).

[1238] **실시예 108: 화합물 108(N-(4-(2-메틸피리딘-4-일아미노)페닐)-6-(6-(피롤리딘-1-일)퀴놀린-4-일아미노)니코틴아미드)**



108



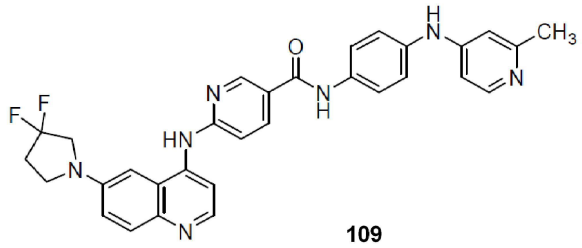
108

반응식 98

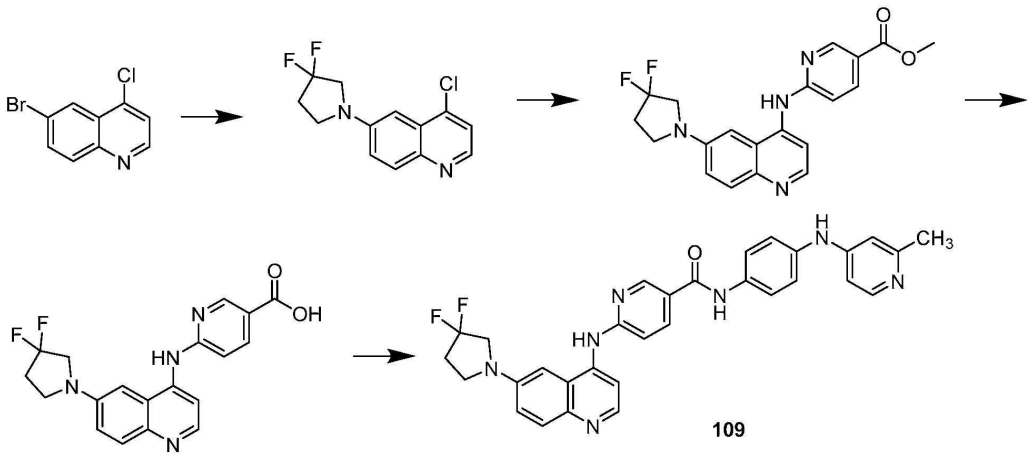
[1239]

[1240] **화합물 108**을 반응식 98에 나타낸 방법으로 제조하였다. **화합물 108**(N-(4-(2-메틸피리딘-4-일아미노)페닐)-6-(6-(피롤리딘-1-일)퀴놀린-4-일아미노)니코틴아미드)을 반응식 98에 나타낸 바와 같이 제조하였다: $C_{31}H_{29}N_7O$; 515.61 g/mol; 10 mg; 옅은 황색 고체; ESI-LCMS m/z = 516 $[M+H]^+$; LCMS RT = 1.61분, >95.00% (214 nm).

[1241] **실시예 109: 화합물 109(6-(6-(3,3-디플루오로피롤리딘-1-일)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)페닐)니코틴아미드)**

[1242] 

109



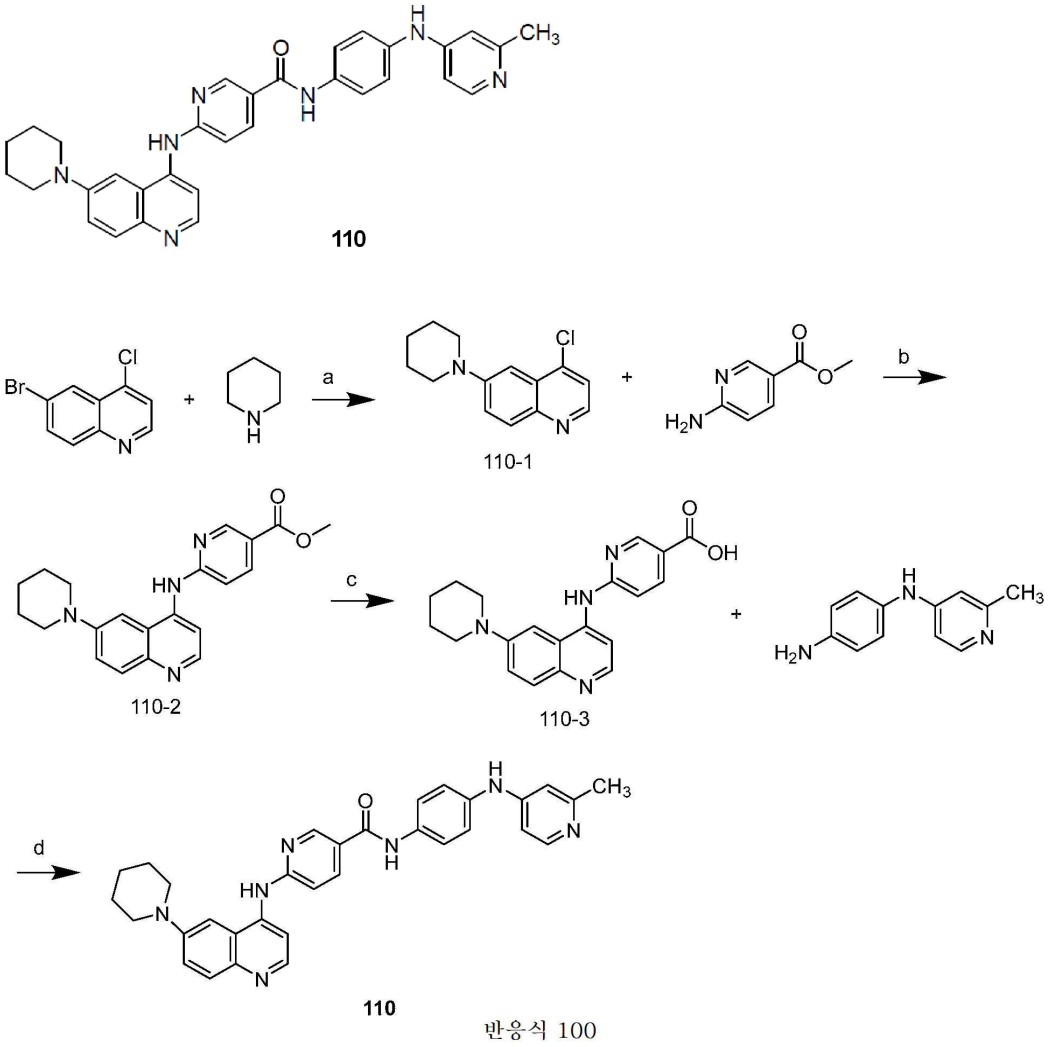
109

[1243] 반응식 99

[1244] **화합물 109**를 반응식 99에 나타낸 방법으로 제조하였다. **화합물 109**(6-(6-(3,3-디플루오로피롤리딘-1-일)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)페닐)니코틴아미드)를 반응식 99에 나타낸 바와 같이 제조하였다: $C_{31}H_{27}F_2N_7O$; 551.59 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 552 $[M+H]^+$; LCMS RT = 1.56분, >95.00% (214 nm).

[1245] **실시예 110: 화합물 110(N-(4-(2-메틸피리딘-4-일아미노)페닐)-6-(6-(피페리딘-1-일)퀴놀린-4-일아미노)니코틴아미드)**

[1246]



반응식 100

[1247]

[1248] 단계 a: Cs_2CO_3(716 mg, 2.2 mmol), $Pd_2(dba)_3$(30 mg) 및 크산트포스(30 mg)를 1,4-디옥산(4 mℓ) 중의 6-브로모-4-클로로퀴놀린(362 mg, 1.5 mmol) 및 피페리딘(127 mg, 1.5 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여, 화합물 110-1(250 mg, 67.8%)을 제공하였다.

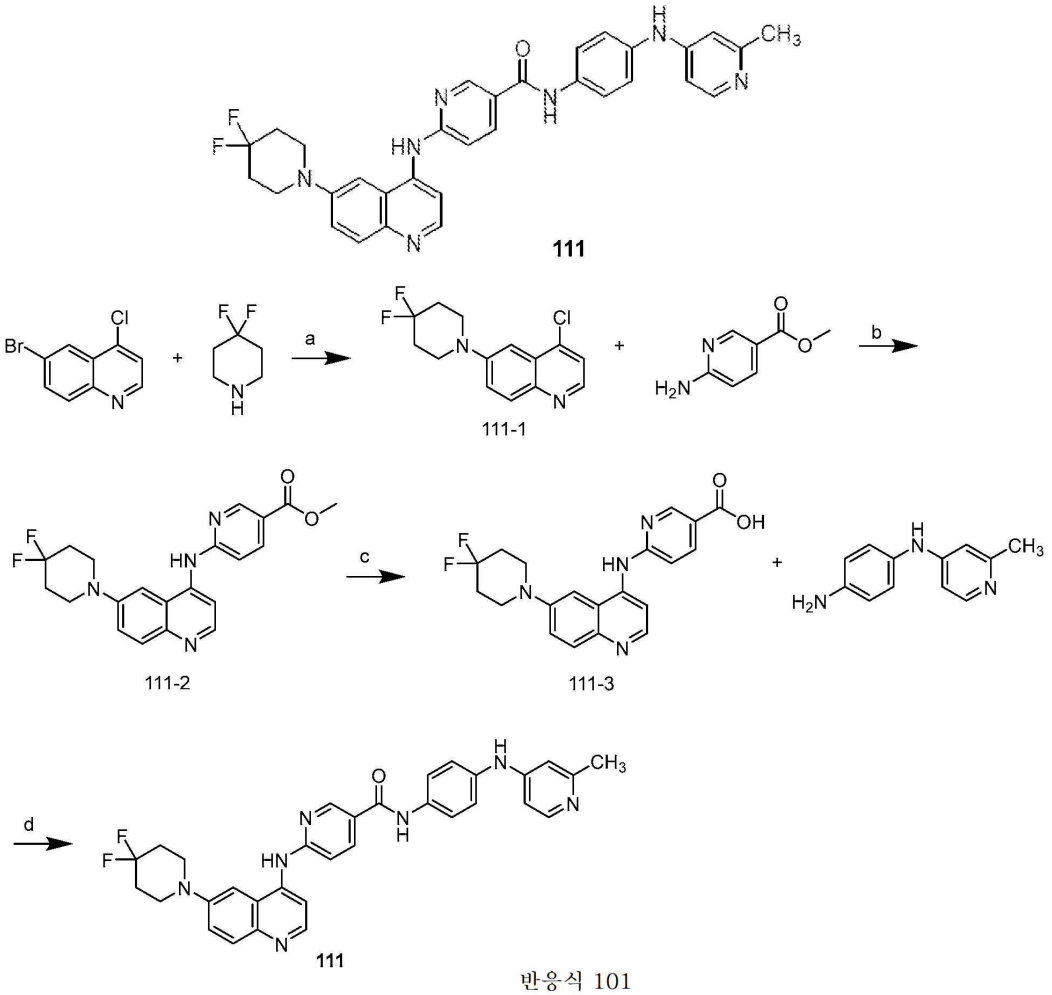
[1249] 단계 b: Cs_2CO_3(487 mg, 1.5 mmol), $Pd_2(dba)_3$(20 mg) 및 크산트포스(20 mg)를 1,4-디옥산(4 mℓ) 중의 화합물 110-1(250 mg, 1.0 mmol) 및 메틸 6-아미노니코티네이트(154 mg, 1.0 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여, 화합물 110-2(200 mg, 55.2%)를 제공하였다.

[1250] 단계 c: NaOH(1 mℓ, 2 N)을 MeOH(3 mℓ) 중의 화합물 110-2(200 mg, 0.55 mmol)의 교반 용액에 첨가하였다. 생성된 혼합물을 실온에서 2시간 동안 교반하였다. 반응물을 농축하고, 1 N HCl을 사용하여 pH를 4로 조절하고 여과하여, 화합물 110-3(167 mg, 87%)을 제공하였다.

[1251] 단계 d: EDCI(135 mg, 0.7 mmol) 및 DMAP(85 mg, 0.7 mmol)를 DMF(2 mℓ) 중의 화합물 110-3(164 mg, 0.47 mmol) 및 N1-(2-메틸피리딘-4-일)벤젠-1,4-디아민(94 mg, 0.47 mmol)의 교반 용액에 첨가하였다. 혼합물을 실온에서 8시간 동안 교반하였다. 반응물을 분취 HPLC로 정제하여, 옅은 황색 고체로서 **화합물 110**(N-(4-(2-메틸피리딘-4-일아미노)페닐)-6-(6-(피페리딘-1-일)퀴놀린-4-일아미노)니코틴아미드)(18 mg, 7.2%)을 제공하였다: $C_{32}H_{31}N_7O$; 529.63 g/mol; ESI-LCMS m/z = 530 $[M+H]^+$; LCMS RT = 1.60분, >95.00% (214 nm).

[1252] **실시예 111: 화합물 111(6-(6-(4,4-디플루오로피페리딘-1-일)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미**

노)페닐)니코틴아미드



반응식 101

[1253]

[1254] 단계 a: Cs_2CO_3(716 mg, 2.2 mmol), $Pd_2(dba)_3$(30 mg) 및 크산트포스(30 mg)를 1,4-디옥산(4 mℓ) 중의 6-브로모-4-클로로퀴놀린(362 mg, 1.5 mmol) 및 피페리딘(181 mg, 1.5 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여, 화합물 111-1(275 mg, 65%)을 제공하였다.

[1255] 단계 b: Cs_2CO_3(487 mg, 1.5 mmol), $Pd_2(dba)_3$(20 mg) 및 크산트포스(20 mg)를 1,4-디옥산(4 mℓ) 중의 화합물 111-1(275 mg, 0.97 mmol) 및 메틸 6-아미노니코티네이트(154 mg, 1.0 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여, 화합물 111-2(216 mg, 56%)를 제공하였다.

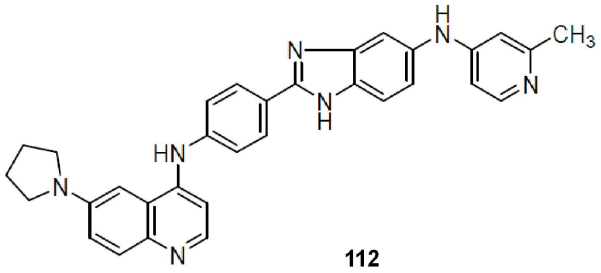
[1256] 단계 c: NaOH(1 mℓ, 2 N)을 MeOH(3 mℓ) 중의 화합물 111-2(216 mg, 0.54 mmol)의 교반 용액에 첨가하였다. 생성된 혼합물을 실온에서 2시간 동안 교반하였다. 반응물을 농축하고, 1 N HCl을 사용하여 pH를 4로 조절하고 여과하여, 화합물 111-3(190 mg, 92%)을 제공하였다.

[1257] 단계 d: EDCI(135 mg, 0.7 mmol) 및 DMAP(85 mg, 0.7 mmol)를 DMF(2 mℓ) 중의 화합물 111-3(180 mg, 0.47 mmol) 및 N1-(2-메틸피리딘-4-일)벤젠-1,4-디아민(94 mg, 0.47 mmol)의 교반 용액에 첨가하였다. 혼합물을 실온에서 8시간 동안 교반하였다. 반응물을 분취 HPLC로 정제하여, 옅은 황색 고체로서 **화합물 111**(6-(6-(4,4-디플루오로피페리딘-1-일)퀴놀린-4-일아미노)-N-(4-(2-메틸피리딘-4-일아미노)페닐)니코틴아미드)(20 mg, 7.5%)을 제공하였다: $C_{32}H_{29}F_2N_7O$; 565.62 g/mol; ESI-LCMS m/z = 566 $[M+H]^+$; LCMS RT = 1.58분, >95.00% (214 nm).

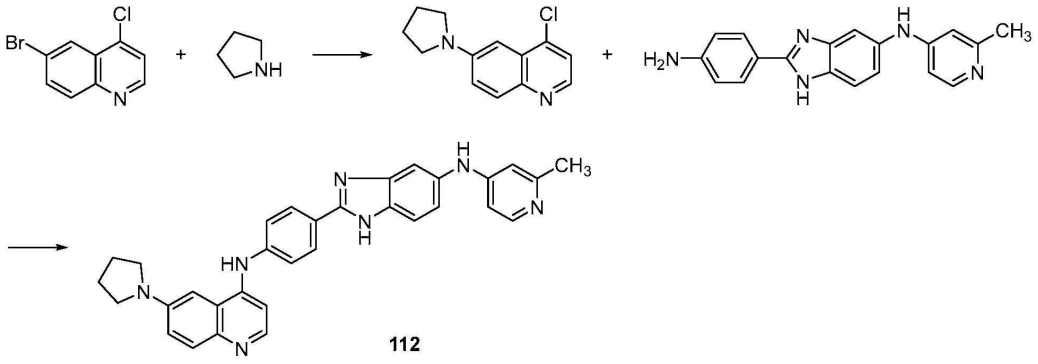
[1258] **실시예 112: 화합물 112(N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)-6-(피롤리딘-1-**

일)퀴놀린-4-아민)

[1259]



112



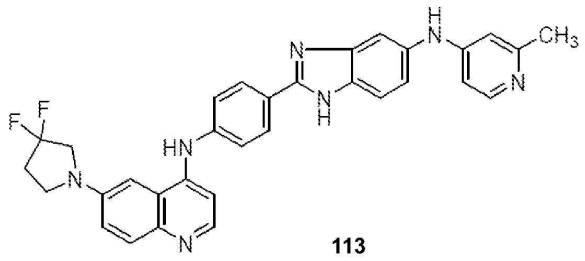
112

반응식 102

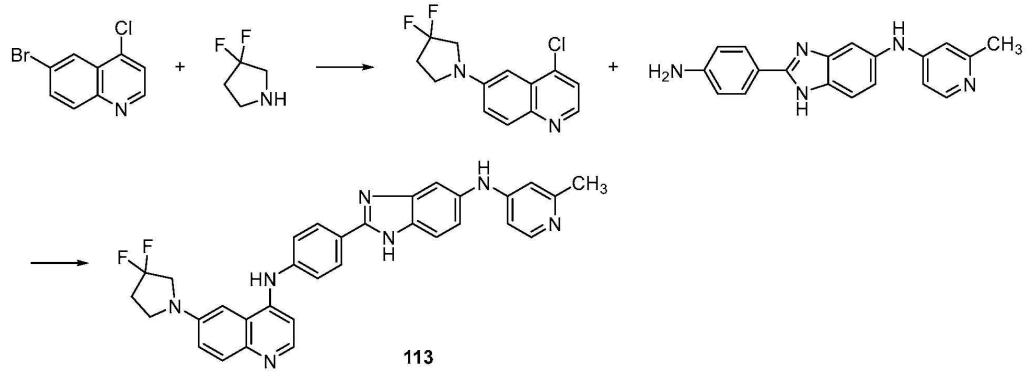
[1260]

[1261] **화합물 112**를 반응식 102에 나타낸 방법으로 제조하였다. **화합물 112**(N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)-6-(피롤리딘-1-일)퀴놀린-4-아민)를 반응식 102에 나타낸 바와 같이 제조하였다: $C_{32}H_{29}N_7$; 511.63 g/mol; 11 mg; 옅은 황색 고체; ESI-LCMS m/z = 512 $[M+H]^+$; LCMS RT = 1.57분, >95.00% (214 nm).

[1262] **실시예 113: 화합물 113(6-(3,3-디플루오로피롤리딘-1-일)-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)**



113



113

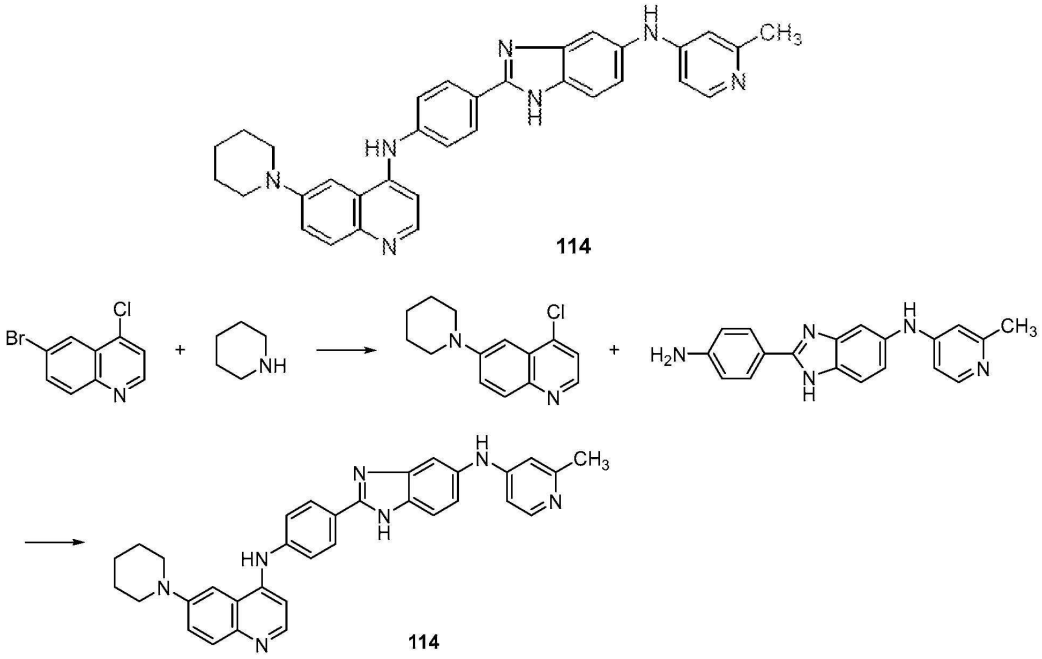
반응식 103

[1263]

[1264] **화합물 113**을 반응식 103에 나타낸 방법으로 제조하였다. **화합물 113**(6-(3,3-디플루오로피롤리딘-1-일)-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)을 반응식 103에 나타낸 바와 같

이 제조하였다: $C_{32}H_{27}F_2N_7$; 547.61 g/mol; 10 mg; 옅은 황색 고체; ESI-LCMS m/z = 548 $[M+H]^+$; LCMS RT = 1.55분, >95.00% (214 nm).

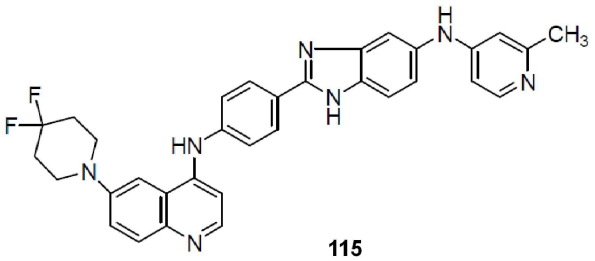
[1265] **실시예 114: 화합물 114(N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)-6-(피페리딘-1-일)퀴놀린-4-아민)**



[1266] 반응식 104

[1267] **화합물 114**를 반응식 104에 나타낸 방법으로 제조하였다. **화합물 114**(N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)-6-(피페리딘-1-일)퀴놀린-4-아민)를 반응식 104에 나타낸 바와 같이 제조하였다: $C_{33}H_{31}N_7$; 525.66 g/mol; 10 mg; 옅은 황색 고체; ESI-LCMS m/z = 526 $[M+H]^+$; LCMS RT = 1.57분, >95.00% (214 nm).

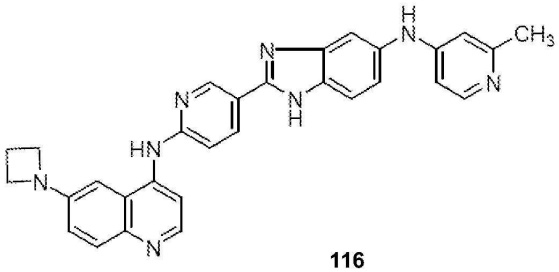
[1268] **실시예 115: 화합물 115(6-(4,4-디플루오로피페리딘-1-일)-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)**



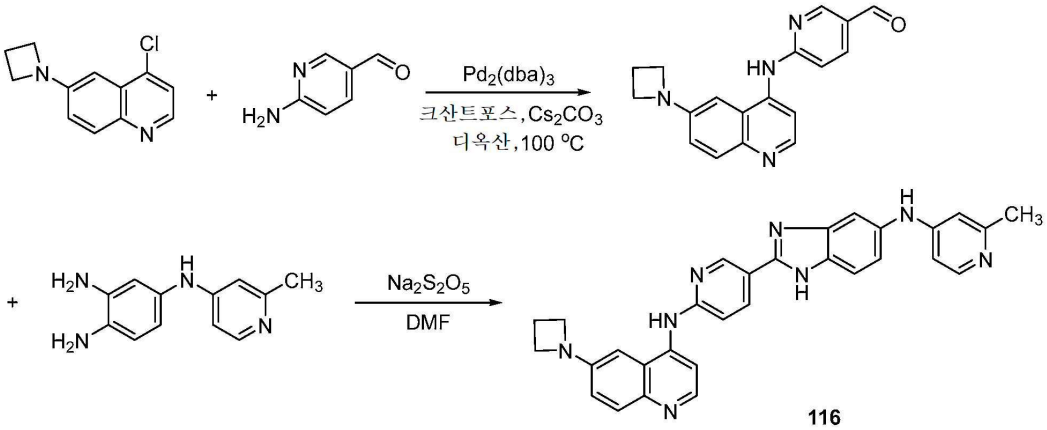
[1269]

[1270] **화합물 115**를 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 115**(6-(4,4-디플루오로피페리딘-1-일)-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)를 반응식 105에 나타낸 바와 같이 제조하였다: $C_{33}H_{31}F_2N_7$; 561.64 g/mol; 13 mg; 옅은 황색 고체; ESI-LCMS m/z = 562 $[M+H]^+$; LCMS RT = 1.65분, >95.00% (214 nm).

[1271] **실시예 116: 화합물 116(6-(아제티딘-1-일)-N-(5-(5-(2-메틸피리딘-4-일아미노)-1H 벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4-아민)**



116

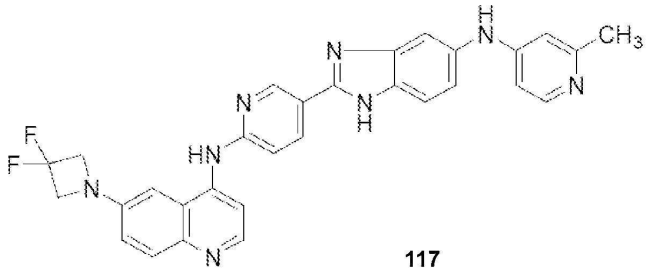


반응식 106

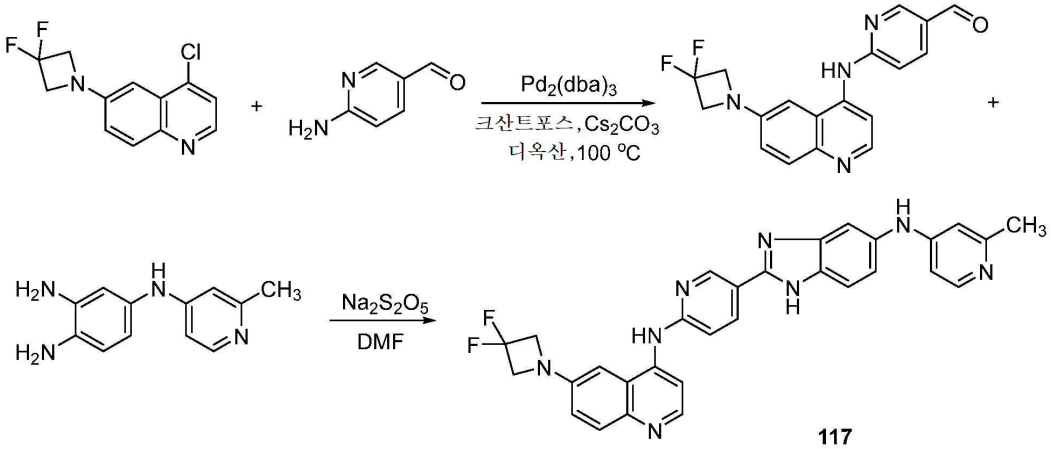
[1272]

[1273] **화합물 116**을 반응식 106에 나타낸 방법으로 제조하였다. **화합물 116**(6-(아제티딘-1-일)-N-(5-(5-(2-메틸피리딘-4-일아미노)-1H 벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4-아민)을 반응식 106에 나타낸 바와 같이 제조하였다: $C_{30}H_{26}N_8$; 498.58 g/mol; 13 mg; 황색 고체; ESI-LCMS m/z = 499 $[M+H]^+$; LCMS RT = 1.91분, >95.00% (214 nm).

[1274] **실시예 117: 화합물 117(6-(3,3-디플루오로아제티딘-1-일)-N-(5-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4-아민)**



117

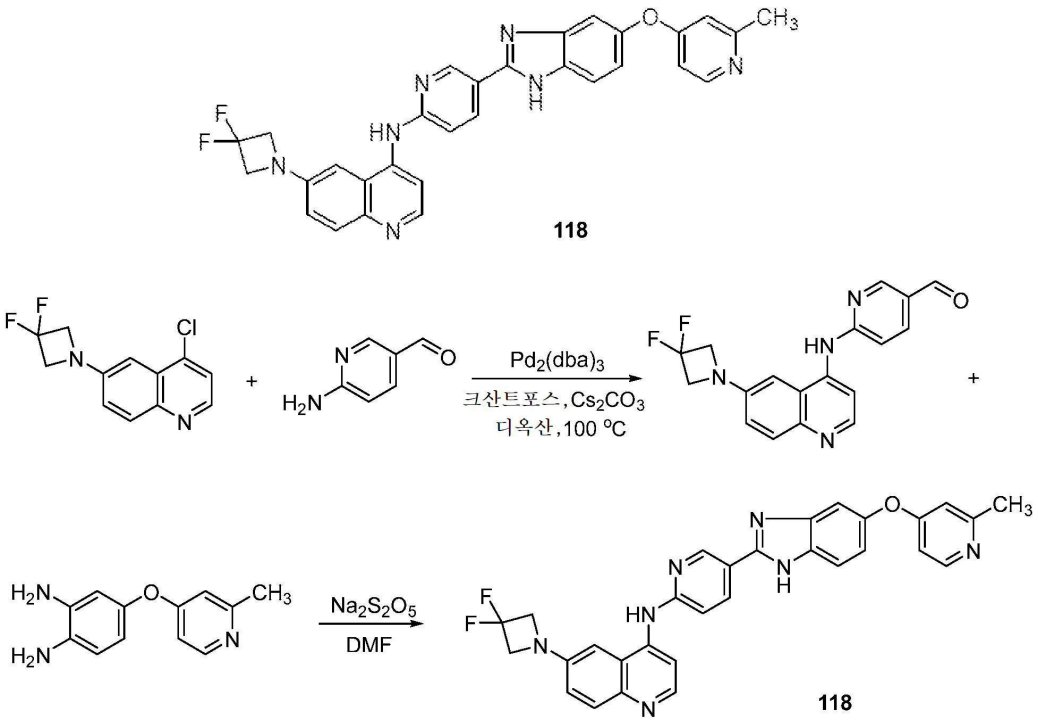


반응식 107

[1275]

[1276] **화합물 117**을 반응식 107에 나타낸 방법으로 제조하였다. **화합물 117**(6-(3,3-디플루오로아제티딘-1-일)-N-(5-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4-아민)을 반응식 107에 나타낸 바와 같이 제조하였다: $C_{30}H_{24}F_2N_8$; 534.56 g/mol; 28 mg; 황색 고체; ESI-LCMS m/z = 535 $[M+H]^+$; LCMS RT = 1.52분, >95.00% (214 nm).

[1277] **실시예 118: 화합물 118(6-(3,3-디플루오로아제티딘-1-일)-N-(5-(5-(2-메틸피리딘-4-일옥시)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4-아민)**



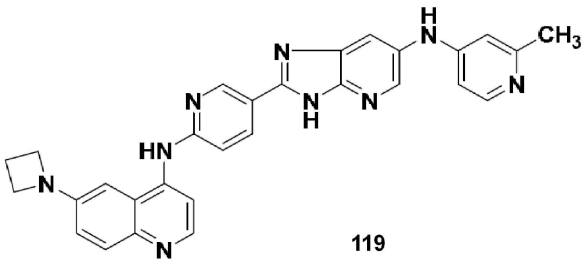
반응식 108

[1278]

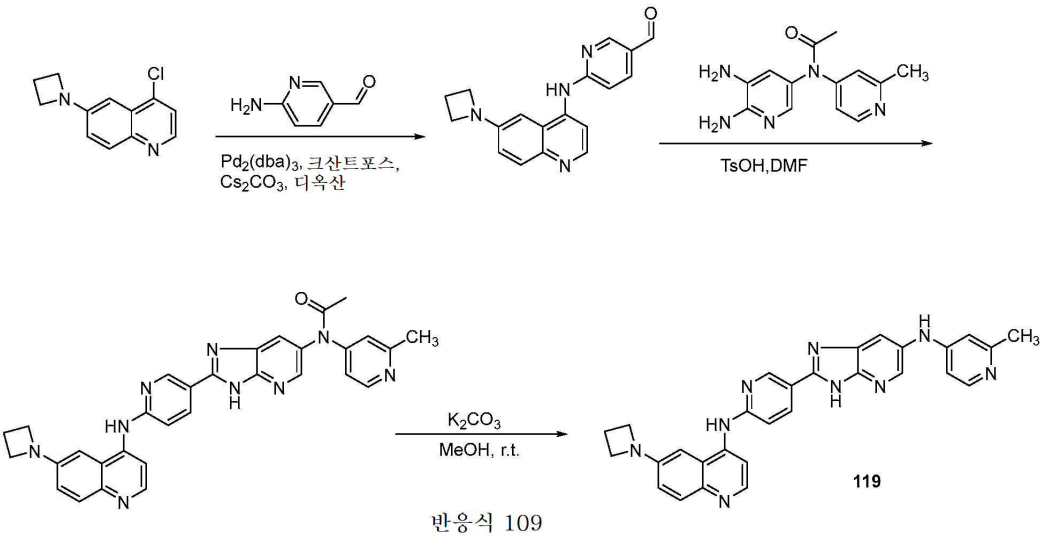
[1279] **화합물 118**을 반응식 108에 나타낸 방법으로 제조하였다. **화합물 118**(6-(3,3-디플루오로아제티딘-1-일)-N-(5-(5-(2-메틸피리딘-4-일옥시)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)퀴놀린-4-아민)을 반응식 108에 나타낸 바와 같이 제조하였다: $C_{30}H_{23}F_2N_7O$; 535.55 g/mol; 22 mg; 옅은 황색 고체; ESI-LCMS m/z = 536 $[M+H]^+$; LCMS RT = 1.56분, >95.00% (214 nm).

[1280] **실시예 119: 화합물 119(6-(아제티딘-1-일)-N-(5-(6-((2-메틸피리딘-4-일)아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-2-일)퀴놀린-4-아민)**

[1281]



119

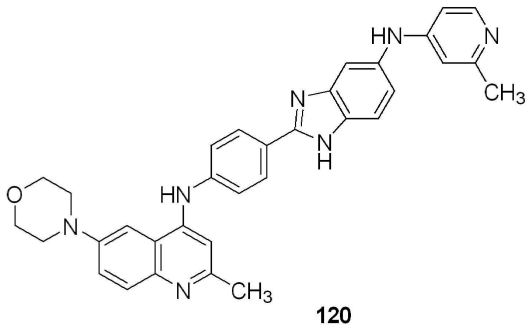


반응식 109

[1282]

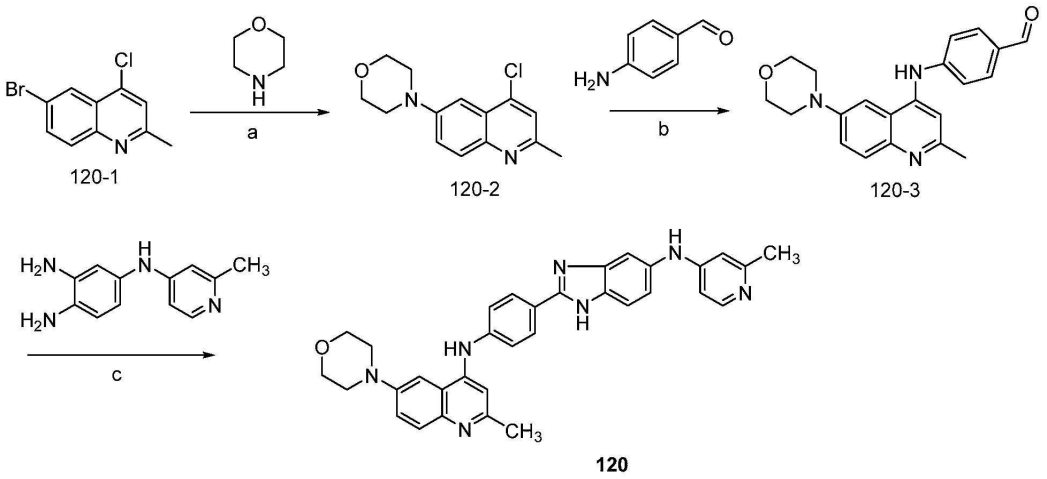
[1283] **화합물 119**를 반응식 109에 나타낸 방법으로 제조하였다. **화합물 119**(6-(아제티딘-1-일)-N-(5-(6-((2-메틸피리딘-4-일)아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-2-일)퀴놀린-4-아민)를 반응식 109에 나타낸 바와 같이 제조하였다: $C_{29}H_{25}N_9$; 499.582 g/mol; 11 mg; 황색 고체; ESI-LCMS m/z = 500.1 $[M+H]^+$; LCMS RT = 1.11분, >95.00% (214 nm).

[1284] **실시예 120: 화합물 120(2-메틸-N-(4-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)-6-모르폴리노퀴놀린-4-아민)**



120

[1285]



120-1 120-2 120-3 120

반응식 110

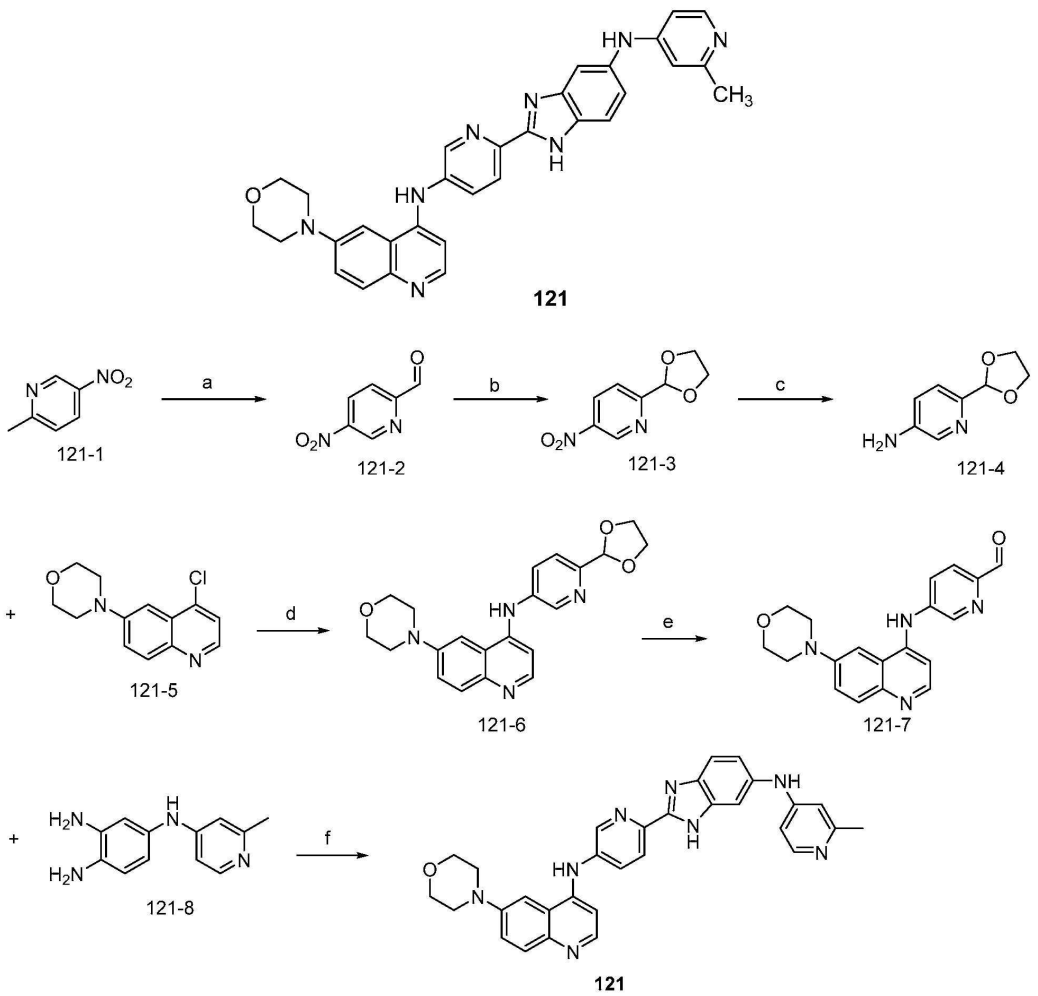
[1286]

[1287] 단계 a: Cs_2CO_3(1.3 g, 4.5 mmol), $Pd_2(dba)_3$(80 mg) 및 크산트포스(80 mg)를 1,4-디옥산(8 mℓ) 중의 화합물 120-1(765 mg, 3 mmol) 및 모르폴린(261 mg, 3 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여, 화합물 120-2(518 mg, 66%)를 제공하였다.

[1288] 단계 b: Cs_2CO_3(487 mg, 1.5 mmol), $Pd_2(dba)_3$(20 mg) 및 크산트포스(20 mg)를 1,4-디옥산(4 mℓ) 중의 화합물 120-2(259 mg, 0.99 mmol) 및 4-아미노벤즈알데하이드(120 mg, 0.99 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여, 화합물 120-3(190 mg, 55.5%)을 제공하였다.

[1289] 단계 c: N4-(2-메틸피리딘-4-일)벤젠-1,2,4-트리아민(92 mg, 0.43 mmol)을 DMF(3 mℓ) 중의 화합물 120-3(150 mg, 0.43 mmol)의 교반 용액에 첨가하였다. 생성된 혼합물을 130℃에서 2시간 동안 교반하고 분취 HPLC로 정제하여, 황색 고체로서 **화합물 120**(2-메틸-N-(4-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)-6-모르폴리노퀴놀린-4-아민)(20 mg, 8.5%)을 제공하였다: $C_{33}H_{31}N_7O$; 541.65 g/mol; ESI-LCMS m/z = 552 $[M+H]^+$; LCMS RT = 1.56분, >95.00% (214 nm).

[1290] **실시예 121: 화합물 121(N-(6-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민)**



반응식 111

[1291]

[1292] 단계 a: SeO_2(1.1 g, 10.0 mmol)를 1,4-디옥산(30 ㎖) 중의 화합물 121-1(1.4 g, 10.0 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 잔사를 실리카 겔 컬럼 크로마토그래피(PE/EA = 5/1)로 정제하여, 황색 고체로서 화합물 121-2(1.2 g, 80%)를 제공하였다.

[1293] 단계 b: 에탄-1,2-디올(1.0 g, 16.0 mmol) 및 TosOH(138 mg, 0.8 mmol)를 톨루엔(20 ㎖) 중의 화합물 121-2(1.2 g, 8.0 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 잔사를 실리카 겔 컬럼 크로마토그래피(PE/EA = 5/1)로 정제하여, 황색 고체로서 화합물 121-3(1.4 g, 90%)을 제공하였다.

[1294] 단계 c: Pd/C(140 mg)을 MeOH(20 ㎖) 중의 화합물 121-3(1.4 g, 7.1 mmol)의 혼합물에 첨가하고, 혼합물을 H_2 하에 실온에서 12시간 동안 교반하였다. 혼합물을 여과하고 농축하여, 추가 정제 없이 다음 단계에서 사용된 화합물 121-4(1.2 g, 100%)를 제공하였다.

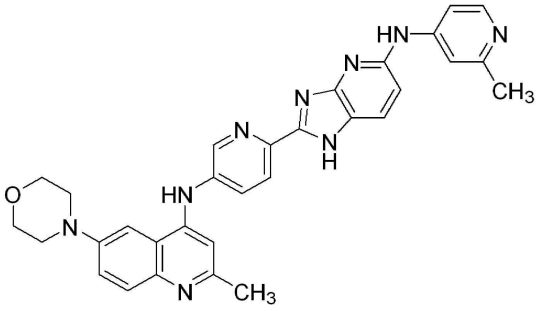
[1295] 단계 d: 화합물 121-4(33 mg, 0.2 mmol), $Pd_2(dba)_3$(9.1 mg, 0.01 mmol), 크산트포스(6 mg, 0.01 mmol) 및 Cs_2CO_3(130 mg, 0.4 mmol)을 1,4-디옥산(1 ㎖) 중의 화합물 121-5(50 mg, 0.2 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고, 미정제 잔사를 실리카 겔 컬럼 크로마토그래피(MeOH/EA = 1/20)로 정제하여, 황색 고체로서 화합물 121-6(53 mg, 70%)을 제공하였다.

[1296] 단계 e: HCOOH(2 ㎖) 중의 화합물 121-6(50 mg, 0.13 mmol)의 혼합물을 N_2 하에 80℃에서 1시간 동안 교반하였다. 혼합물을 농축하여, 황색 고체로서 화합물 121-7(44 mg, 100%)을 제공하였다.

[1297] 단계 f: DMF(1 ㎖) 중의 화합물 121-7(40 mg, 0.12 mmol) 및 화합물 121-8(39 mg, 0.18 mmol)의 혼합물을 130℃에서 1시간 동안 교반하였다. 혼합물을 분취 HPLC로 정제하여, 황색 고체로서 **화합물 121**(N-(6-(5-((2-메틸피

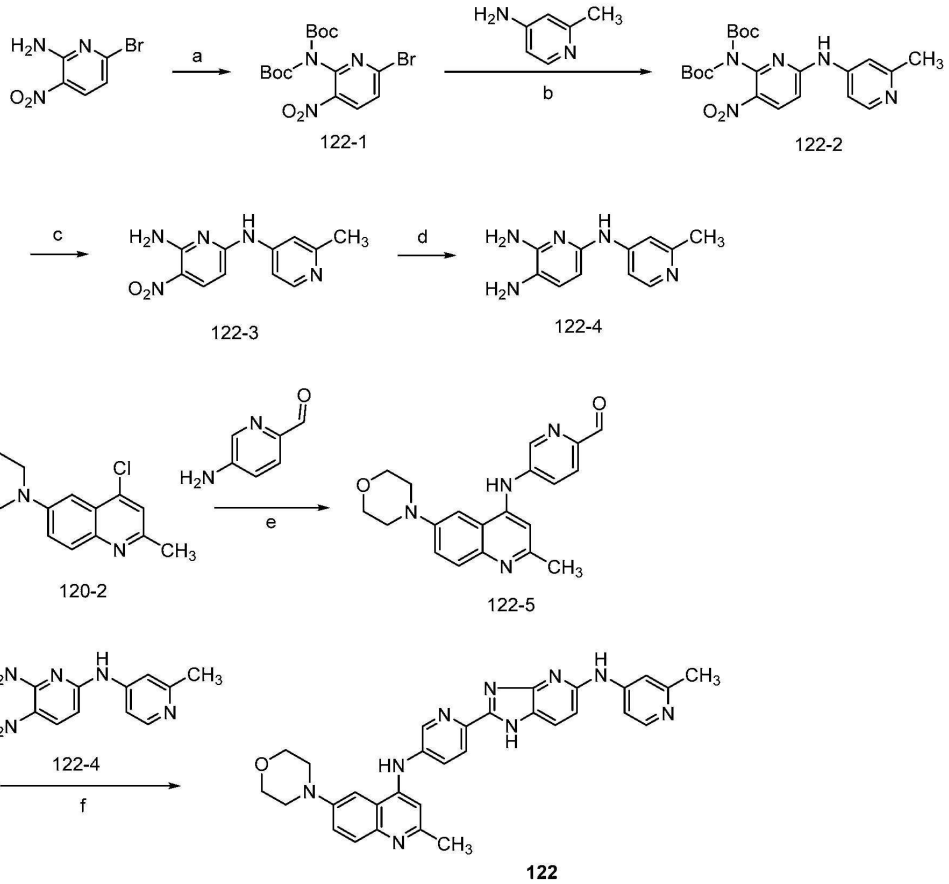
리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민)(33 mg, 53%)을 제공하였다: $C_{31}H_{28}N_8O$; 528.62 g/mol; ESI-LCMS m/z = 529 $[M+H]^+$; LCMS RT = 1.37분, >95.00% (214 nm).

[1298] **실시예 122: 화합물 122(2-메틸-N-(6-(5-(2-메틸피리딘-4-일아미노)-1H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민)**



122

[1299]



[1300] 반응식 112

[1301] 화합물 120-2를 실시예 120에 기재된 방식과 유사한 방식으로 합성하였다.

[1302] 단계 a: $(Boc)_2$(30 g, 138 mmol) 및 TEA(14 g, 138 mmol)를 THF(20 ㎖) 중의 6-브로모-3-니트로피리딘-2-아민(10 g, 46 mmol)의 혼합물에 첨가하고, 혼합물을 실온에서 6시간 동안 교반하였다. 잔사를 실리카 겔 상의 플래쉬 크로마토그래피(PE 중의 0% 내지 30% EA)로 정제하여, 백색 고체로서 화합물 122-1(18 g, 94%)을 제공하였다.

[1303] 단계 b: 2-메틸피리딘-4-아민(4.6 g, 0.1 mol), Cs_2CO_3(28 g, 86 mmol), $Pd_2(dba)_3$(457 mg, 0.5 mmol) 및 크산트포스(457 mg, 0.8 mmol)를 질소 대기 하에 1,4-디옥산(500 ㎖) 중의 화합물 122-1(18 g, 43 mmol)의 교반 혼합물에 첨가하였다. 생성된 혼합물을 100℃에서 2시간 동안 교반하였다. 이어서, 반응물을 물(500 ㎖)로 켄칭하

고 EA(3 x 500 mℓ)로 추출하였다. 합한 유기층을 Na_2SO_4 상에서 건조하고 여과하고 농축하였다. 잔사를 실리카 겔 상의 플래쉬 크로마토그래피(PE 중의 0% 내지 50% EA)로 정제하여, 백색 고체로서 화합물 122-2(16 g, 83.6%)를 제공하였다.

[1304] 단계 c: 디옥산 하이드로클로라이드(1000 mℓ, 4 M) 중의 화합물 122-2(16 g, 36 mmol)의 혼합물을 실온에서 4시간 동안 교반하였다. 합한 유기층을 농축하여, 백색 고체로서 화합물 122-3(8 g, 90.7%)을 제공하였다.

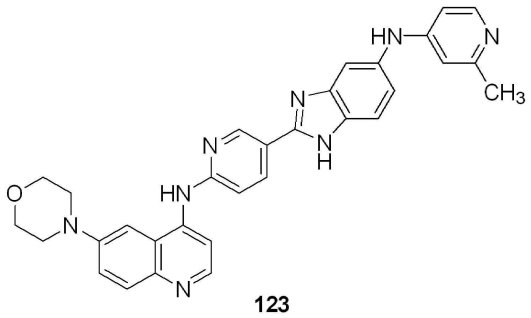
[1305] 단계 d: Pd/C(270 mg, 0.26 mmol)을 MeOH(300 mℓ) 중의 화합물 122-3(8 g, 32 mmol)의 혼합물에 첨가하고, 혼합물을 H_2 하에 실온에서 4시간 동안 교반하였다. 합한 유기층을 규조토로 여과하여, 황색 고체로서 화합물 122-4(6.7 g, 97%)를 제공하였다.

[1306] 단계 e: 5-아미노피콜린알데하이드(93 mg, 0.763 mmol), $Pd_2(dba)_3$(91 mg, 0.1 mmol), 크산트포스(60 mg, 0.1 mmol) 및 Cs_2CO_3(500 mg, 1.5 mmol)을 1,4-디옥산(5 mℓ) 중의 화합물 120-2(200 mg, 0.763 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 잔사를 실리카 겔 컬럼 크로마토그래피(MeOH/EA = 1/20)로 정제하여, 황색 고체로서 화합물 122-5(160 mg, 60%)를 제공하였다.

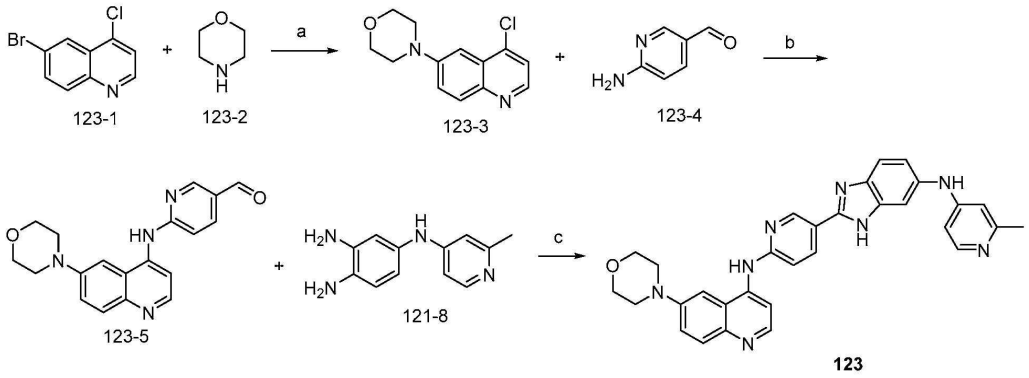
[1307] 단계 f: DMF(1 mℓ) 중의 화합물 122-5(50 mg, 0.14 mmol) 및 화합물 122-4(31 mg, 0.14 mmol)의 혼합물을 130℃에서 1시간 동안 교반하였다. 혼합물을 분취 HPLC로 정제하여, 황색 고체로서 **화합물 122**(2-메틸-N-(6-(5-(2-메틸피리딘-4-일아미노)-1H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민)(15 mg, 20%)를 제공하였다: $C_{31}H_{29}N_9O$; 543.62 g/mol; ESI-LCMS m/z = 544 $[M+H]^+$; LCMS RT = 1.52분, >95.00% (214 nm).

[1308] **실시예 123: 화합물 123(N-(5-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)-6-모르폴리노퀴놀린-4-아민)**

[1309]



123



123-1 123-2 123-3 123-4 123-5 121-8 123

반응식 113

[1310]

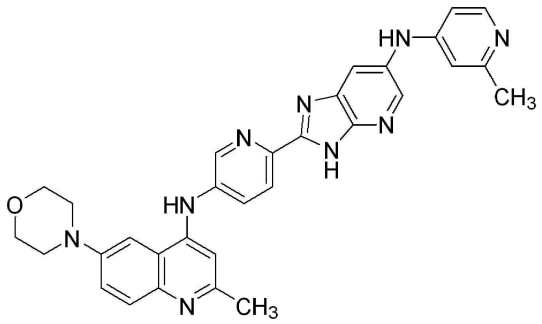
[1311] 화합물 121-8을 실시예 121에 기재된 방식과 유사한 방식으로 합성하였다.

[1312] 단계 a: 화합물 123-2(174 mg, 2.0 mmol), $Pd_2(dba)_3$(91 mg, 0.1 mmol), 크산트포스(58 mg, 0.1 mmol) 및 Cs_2CO_3(1.3 g, 4.0 mmol)을 1,4-디옥산(10 mℓ) 중의 화합물 123-1(482 mg, 2.0 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 잔사를 실리카 겔 컬럼 크로마토그래피(PE/EA = 2/1)로 정제하여, 황색 고체로서 화합물 123-3(406 mg, 82%)을 제공하였다.

[1313] 단계 b: 화합물 123-4(25 mg, 0.2 mmol), $Pd_2(dba)_3$(9.1 mg, 0.01 mmol), 크산트포스(6 mg, 0.01 mmol) 및 Cs_2CO_3(130 mg, 0.4 mmol)을 1,4-디옥산(1 mℓ) 중의 화합물 123-3(50 mg, 0.2 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 잔사를 실리카 겔 컬럼 크로마토그래피(MeOH/EA = 1/20)로 정제하여, 황색 고체로서 화합물 123-5(47 mg, 70%)를 제공하였다.

[1314] 단계 c: DMF(1 mℓ) 중의 화합물 123-5(40 mg, 0.12 mmol) 및 화합물 121-8(39 mg, 0.18 mmol)의 혼합물을 130℃에서 1시간 동안 교반하였다. 혼합물을 분취 HPLC로 정제하여, 황색 고체로서 **화합물 123**(N-(5-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)-6-모르폴리노퀴놀린-4-아민)(31 mg, 50%)을 제공하였다: $C_{31}H_{28}N_8O$; 528.62 g/mol; ESI-LCMS m/z = 529 $[M+H]^+$; LCMS RT = 1.40분, >95.00% (214 nm).

[1315] **실시예 124: 화합물 124(2-메틸-N-(6-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민)**

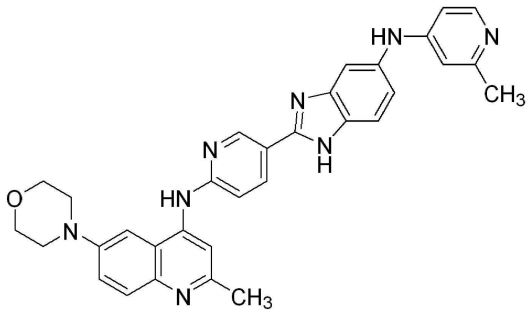


124

[1316]

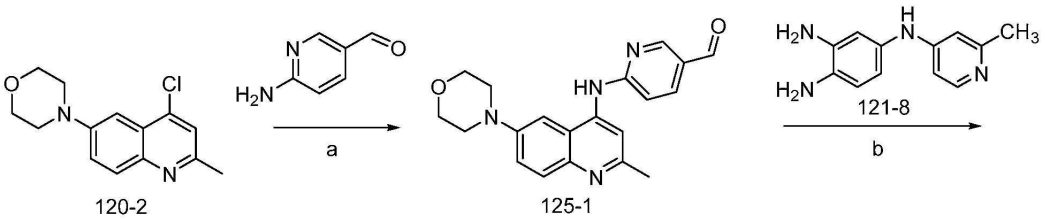
[1317] **화합물 124**를 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 124**(2-메틸-N-(6-(6-(2-메틸피리딘-4-일아미노)-3H-이미다조[4,5-b]피리딘-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민): $C_{31}H_{29}N_9O$; 543.62 g/mol; 11 mg; 황색 고체; ESI-LCMS m/z = 544 $[M+H]^+$; LCMS RT = 1.45분, >95.00% (214 nm).

[1318] **실시예 125: 화합물 125(2-메틸-N-(5-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)-6-모르폴리노퀴놀린-4-아민)**

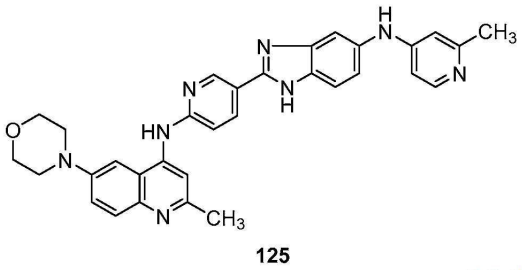


125

[1319]



120-2 125-1 121-8



125

반응식 114

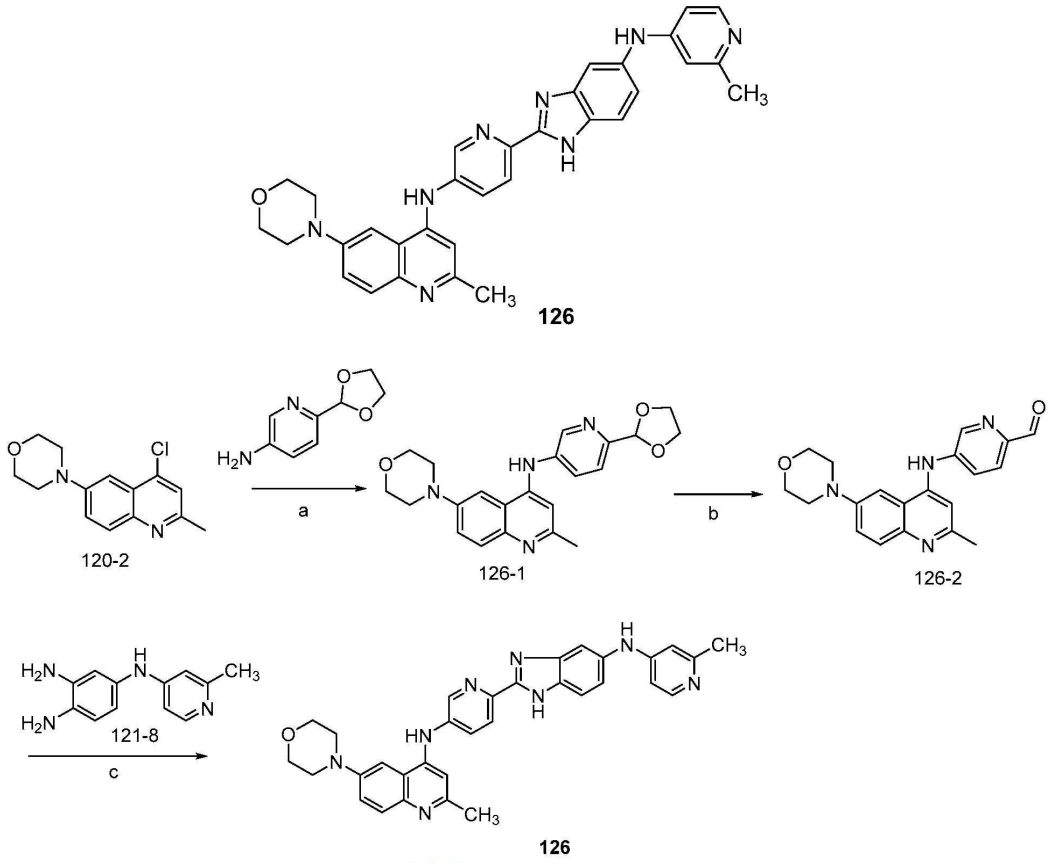
[1320]

[1321] 화합물 120-2를 실시예 120에 기재된 방식과 유사한 방식으로 합성하였다. 화합물 121-8을 실시예 121에 기재된 방식과 유사한 방식으로 합성하였다.

[1322] 단계 a: Cs_2CO_3(487 mg, 1.5 mmol), $Pd_2(dba)_3$(20 mg) 및 크산트포스(20 mg)를 1,4-디옥산(4 mℓ) 중의 화합물 120-2(259 mg, 0.99 mmol) 및 6-아미노니코틴알데하이드(120 mg, 0.99 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여 화합물 125-1(186 mg, 53%)을 제공하였다.

[1323] 단계 b: N4-(2-메틸피리딘-4-일)벤젠-1,2,4-트리아민(화합물 121-8)(92 mg, 0.43 mmol)을 DMF(3 mℓ) 중의 화합물 125-1(150 mg, 0.43 mmol)의 교반 용액에 첨가하였다. 생성된 혼합물을 130℃에서 2시간 동안 교반하고 분취 HPLC로 정제하여, 황색 고체로서 **화합물 125**(2-메틸-N-(5-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-2-일)-6-모르폴리노퀴놀린-4-아민(20 mg, 8.5%)을 제공하였다: $C_{32}H_{30}N_8O$; 542.63 g/mol; ESI-LCMS m/z = 543 $[M+H]^+$; LCMS RT = 1.43분, >95.00% (214 nm).

[1324] **실시예 126: 화합물 126(2-메틸-N-(6-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민)**



반응식 115

[1325]

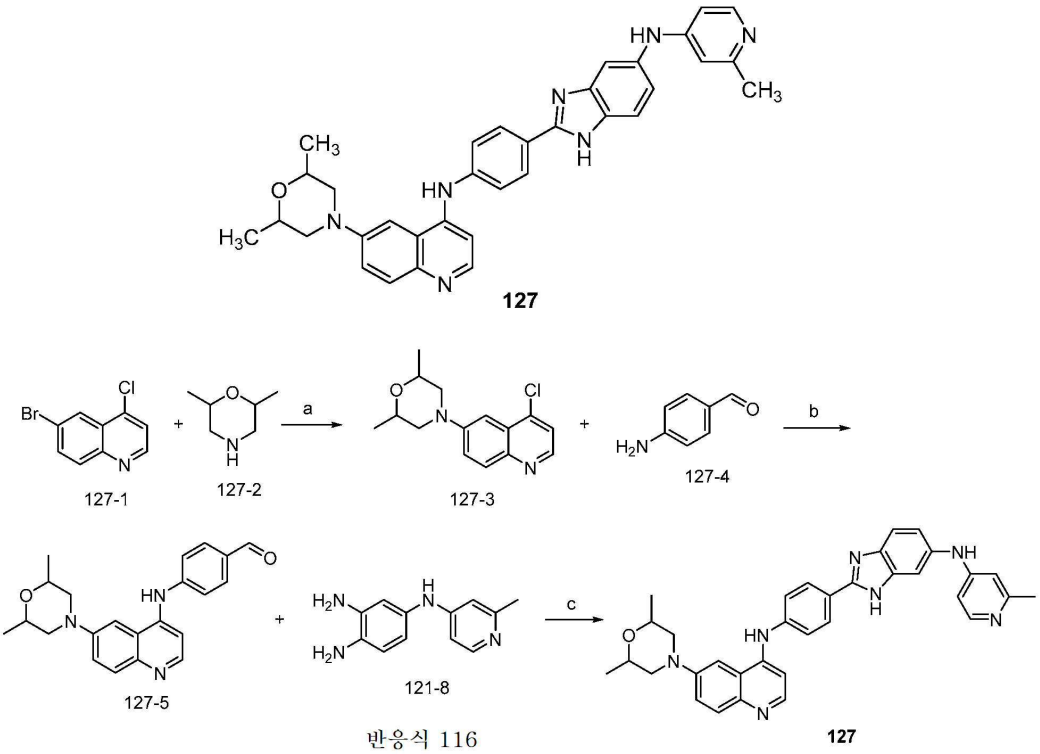
[1326] 화합물 120-2를 실시예 120에 기재된 방식과 유사한 방식으로 합성하였다. 화합물 121-8을 실시예 121에 기재된 방식과 유사한 방식으로 합성하였다.

[1327] 단계 a: Cs_2CO_3(487 mg, 1.5 mmol), $Pd_2(dba)_3$(20 mg) 및 크산트포스(20 mg)를 1,4-디옥산(4 mℓ) 중의 화합물 120-2(259 mg, 0.99 mmol) 및 6-(1,3-디옥솔란-2-일)피리딘-3-아민(164 mg, 0.99 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여 화합물 126-1(209 mg, 54%)을 제공하였다.

[1328] 단계 b: HCOOH(1 mℓ)을 DCM(3 mℓ) 중의 화합물 126-1(209 mg, 0.53 mmol)의 교반 용액에 첨가하였다. 생성된 혼합물을 40℃에서 2시간 동안 교반하고, $NaHCO_3$으로 켄칭하고, DCM으로 추출하고, 건조하고 농축하여, 오일로서 화합물 126-2(169 mg, 92%)를 제공하였다.

[1329] 단계 c: N4-(2-메틸피리딘-4-일)벤젠-1,2,4-트리아민(화합물 121-8)(92 mg, 0.43 mmol)을 DMF(3 mℓ) 중의 화합물 126-2(150 mg, 0.43 mmol)의 교반 용액에 첨가하였다. 생성된 혼합물을 130℃에서 2시간 동안 교반하고 분취 HPLC로 정제하여, 황색 고체로서 **화합물 126**(2-메틸-N-(6-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)-6-모르폴리노퀴놀린-4-아민)(20 mg, 8.5%)을 제공하였다: $C_{32}H_{30}N_8O$; 542.63 g/mol; ESI-LCMS m/z = 543 $[M+H]^+$; LCMS RT = 1.44분, >95.00% (214 nm).

[1330] **실시예 127: 화합물 127(6-(2,6-디메틸모르폴리노)-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)**



반응식 116

[1331]

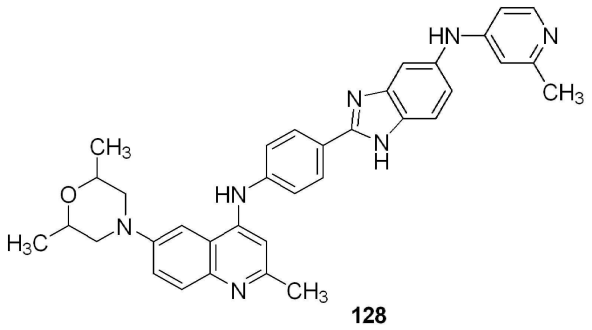
[1332] 화합물 121-8을 실시예 121에 기재된 방식과 유사한 방식으로 합성하였다.

[1333] 단계 a: 화합물 127-2(230 mg, 2.0 mmol), $Pd_2(dba)_3$(91 mg, 0.1 mmol), 크산트포스(58 mg, 0.1 mmol) 및 Cs_2CO_3(1.3 g, 4.0 mmol)을 1,4-디옥산(10 mℓ) 중의 화합물 127-1(482 mg, 2.0 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 잔사를 실리카 겔 컬럼 크로마토그래피(PE/EA = 2/1)로 정제하여, 황색 고체로서 화합물 127-3(414 mg, 75%)을 제공하였다.

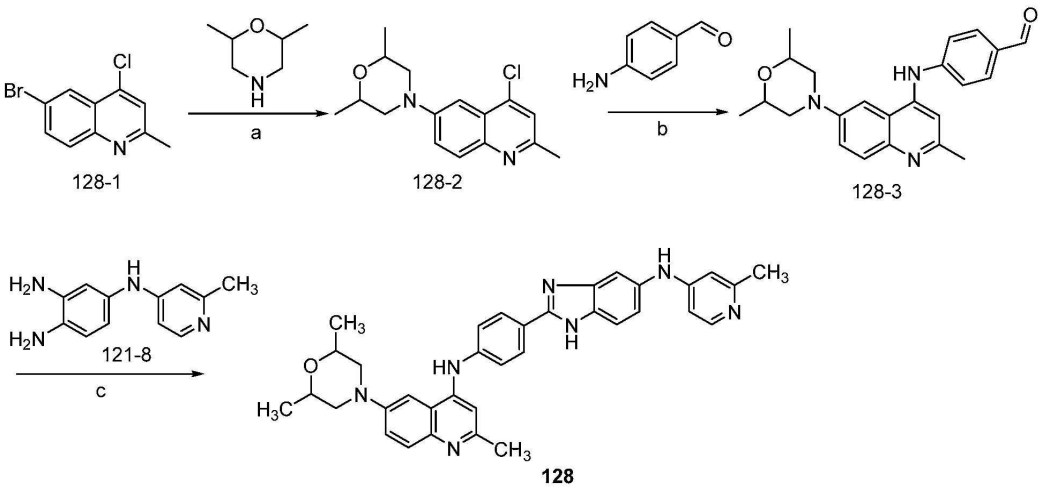
[1334] 단계 b: 화합물 127-4(24 mg, 0.2 mmol), $Pd_2(dba)_3$(9.1 mg, 0.01 mmol), 크산트포스(6 mg, 0.01 mmol) 및 Cs_2CO_3(130 mg, 0.4 mmol)을 1,4-디옥산(1 mℓ) 중의 화합물 127-3(55 mg, 0.2 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 잔사를 실리카 겔 컬럼 크로마토그래피(MeOH/EA = 1/20)로 정제하여, 황색 고체로서 화합물 127-5(45 mg, 62%)를 제공하였다.

[1335] 단계 c: DMF(1 mℓ) 중의 화합물 127-5(40 mg, 0.11 mmol) 및 화합물 121-8(39 mg, 0.18 mmol)의 혼합물을 130℃에서 1시간 동안 교반하였다. 혼합물을 분취 HPLC로 정제하여, 황색 고체로서 **화합물 127**(6-(2,6-디메틸모르폴리노)-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)(35 mg, 57%)을 제공하였다: $C_{34}H_{33}N_7O$; 555.69 g/mol; ESI-LCMS m/z = 556 $[M+H]^+$; LCMS RT = 1.47분, >95.00% (214 nm).

[1336] **실시예 128: 화합물 128(6-(2,6-디메틸모르폴리노)-2-메틸-N-(4-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)**



[1337]



반응식 117

[1338]

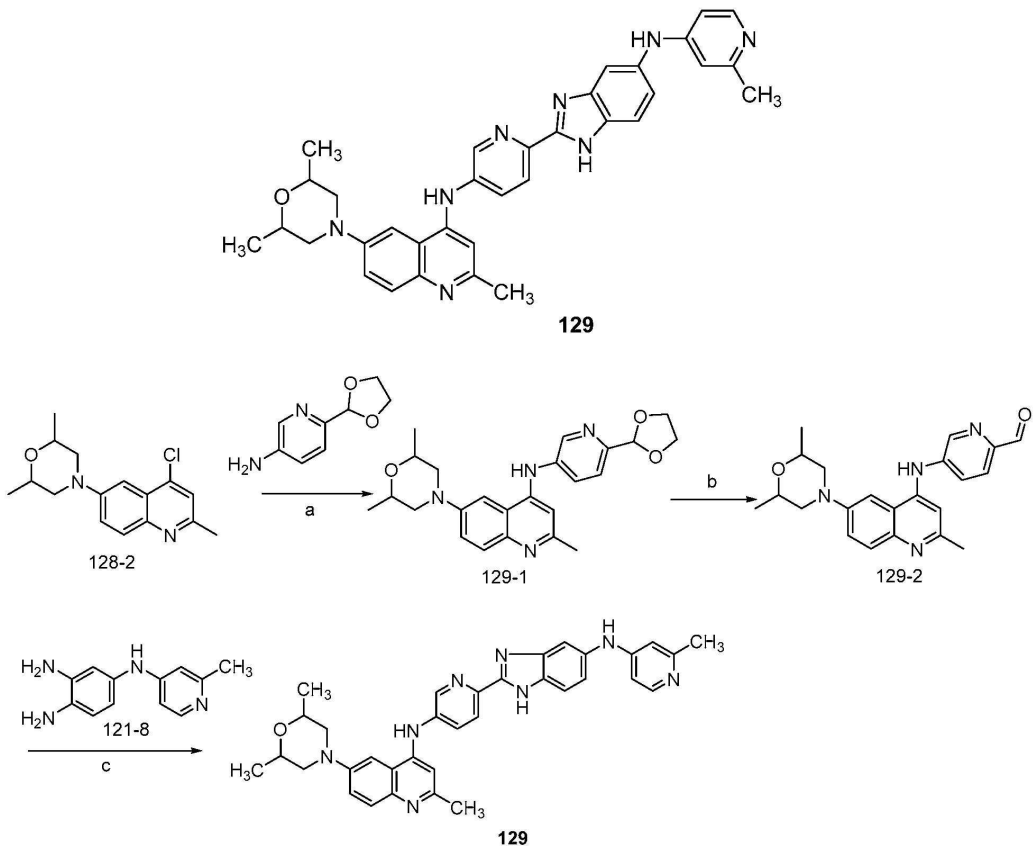
[1339] 화합물 121-8을 실시예 121에 기재된 방식과 유사한 방식으로 합성하였다.

[1340] 단계 a: Cs_2CO_3(1.3 g, 4.5 mmol), $Pd_2(dba)_3$(80 mg) 및 크산트포스(80 mg)를 1,4-디옥산(8 mℓ) 중의 화합물 128-1(765 mg, 3 mmol) 및 2,6-디메틸모르폴린(345 mg, 3 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여 화합물 128-2(583 mg, 67%)를 제공하였다.

[1341] 단계 b: Cs_2CO_3(487 mg, 1.5 mmol), $Pd_2(dba)_3$(20 mg) 및 크산트포스(20 mg)를 1,4-디옥산(4 mℓ) 중의 화합물 128-2(287 mg, 0.99 mmol) 및 4-아미노벤즈알데하이드(120 mg, 0.99 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여 화합물 128-3(200 mg, 54%)을 제공하였다.

[1342] 단계 c: N4-(2-메틸피리딘-4-일)벤젠-1,2,4-트리아민(화합물 121-8)(92 mg, 0.43 mmol)을 DMF(3 mℓ) 중의 화합물 128-3(160 mg, 0.43 mmol)의 교반 용액에 첨가하였다. 생성된 혼합물을 130℃에서 2시간 동안 교반하고 분취 HPLC로 정제하여, 황색 고체로서 **화합물 128**(6-(2,6-디메틸모르폴리노)-2-메틸-N-(4-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)(20 mg, 8.2%)을 제공하였다: $C_{35}H_{35}N_7O$; 569.70 g/mol; ESI-LCMS m/z = 570 $[M+H]^+$; LCMS RT = 1.50분, >95.00% (214 nm).

[1343] **실시예 129: 화합물 129(6-(2,6-디메틸모르폴리노)-2-메틸-N-(6-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민)**



반응식 118

[1344]

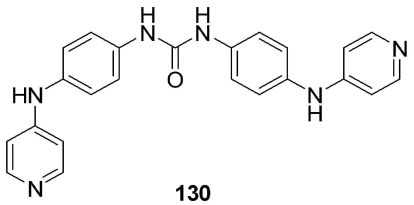
[1345] 화합물 121-8을 실시예 121에 기재된 방식과 유사한 방식으로 합성하였다. 화합물 128-2를 실시예 128에 기재된 방식과 유사한 방식으로 합성하였다.

[1346] 단계 a: Cs_2CO_3(487 mg, 1.5 mmol), $Pd_2(dba)_3$(20 mg) 및 크산트포스(20 mg)를 1,4-디옥산(4 ㎖) 중의 화합물 128-2(287 mg, 0.99 mmol) 및 4-아미노벤즈알데하이드(164 mg, 0.99 mmol)의 용액에 첨가하였다. 반응 혼합물을 100℃에서 밤새 교반하고, 물로 켄칭하고, EA로 추출하고, 물 및 염수로 세척하고, 건조하고, 감압 하에 농축하였다. 미정제 생성물을 실리카 겔 크로마토그래피(MeOH:DCM = 1:20)로 정제하여 화합물 129-1(228 mg, 55%)을 제공하였다.

[1347] 단계 b: HCOOH(1 ㎖)을 DCM(3 ㎖) 중의 화합물 129-1(228 mg, 0.54 mmol)의 교반 용액에 첨가하였다. 생성된 혼합물을 40℃에서 2시간 동안 교반하고, $NaHCO_3$으로 켄칭하고, DCM으로 추출하고, 건조하고 농축하여, 오일로서 화합물 129-2(182 mg, 90%)를 제공하였다.

[1348] 단계 c: N4-(2-메틸피리딘-4-일)벤젠-1,2,4-트리아민(화합물 121-8)(92 mg, 0.43 mmol)을 DMF(3 ㎖) 중의 화합물 129-2(161 mg, 0.43 mmol)의 교반 용액에 첨가하였다. 생성된 혼합물을 130℃에서 2시간 동안 교반하고 분취 HPLC로 정제하여, 황색 고체로서 **화합물 129**(6-(2,6-디메틸모르폴리노)-2-메틸-N-(6-(5-(2-메틸피리딘-4-일아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민)(21 mg, 8.5%)를 제공하였다: $C_{34}H_{34}N_8O$; 570.69 g/mol; ESI-LCMS m/z = 571 $[M+H]^+$; LCMS RT = 1.50분, >95.00% (214 nm).

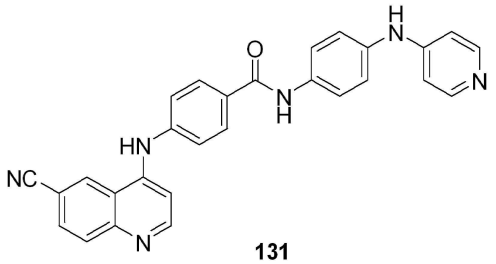
[1349] **실시예 130: 화합물 130(1,3-비스(4-(피리딘-4-일아미노)페닐)우레아)**



[1350]

[1351] **화합물 130**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 130**(1,3-비스(4-(피리딘-4-일아미노)페닐)우레아); $C_{23}H_{20}N_6O$; 396.44 g/mol; 11 mg; 백색 고체; ESI-LCMS m/z = 397 $[M+H]^+$; LCMS RT = 1.36분, >95.00% (214 nm).

[1352] **실시예 131: 화합물 131(4-((6-시아노퀴놀린-4-일)아미노)-N-(4-(피리딘-4-일아미노)페닐)벤즈아미드)**

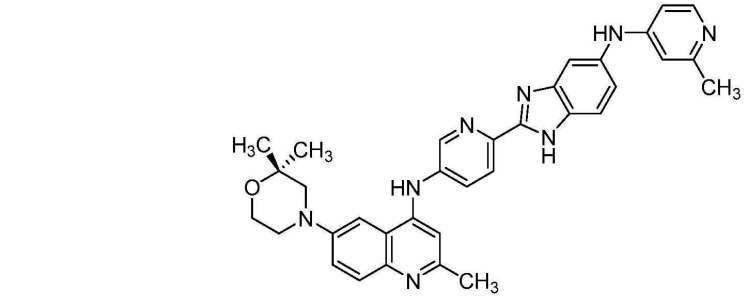


131

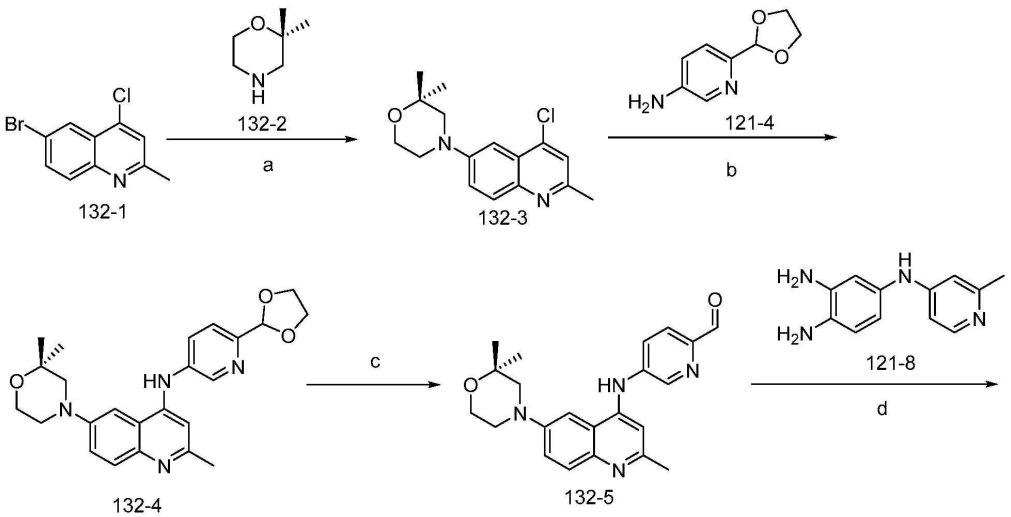
[1353]

[1354] **화합물 131**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다.

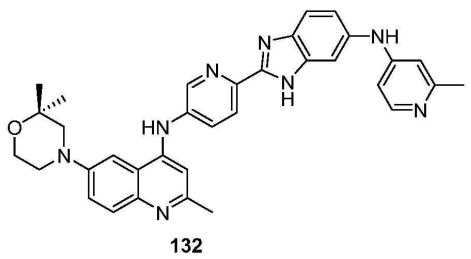
[1355] **실시예 132: 화합물 132(6-(2,2-디메틸모르폴리노)-2-메틸-N-(6-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민)**



132



132-1 132-2 a 132-3 121-4 b 132-4 c 132-5 121-8 d



132

반응식 119

[1356]

[1357] 화합물 121-4 및 121-8을 실시예 121에 기재된 방식과 유사한 방식으로 합성하였다.

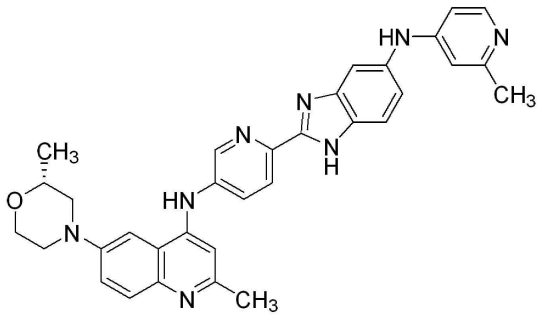
[1358] 단계 a: 화합물 132-2(230 mg, 2.0 mmol), $Pd_2(dba)_3$(91 mg, 0.1 mmol), 크산트포스(58 mg, 0.1 mmol) 및 t-BuONa(384 mg, 4.0 mmol)을 1,4-디옥산(10 ㎖) 중의 화합물 132-1(510 mg, 2.0 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 물질을 실리카 겔 컬럼(PE/EA=2/1)으로 정제하여, 황색 고체로서 화합물 132-3(476 mg, 수율: 82%)을 수득하였다.

[1359] 단계 b: 화합물 132-4(33 mg, 0.2 mmol), $Pd_2(dba)_3$(9.1 mg, 0.01 mmol), 크산트포스(6 mg, 0.01 mmol) 및 Cs_2CO_3(130 mg, 0.4 mmol)을 1,4-디옥산(1 ㎖) 중의 화합물 132-3(58 mg, 0.2 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 물질을 실리카 겔 컬럼(MeOH/EA=1/20)으로 정제하여, 황색 고체로서 화합물 132-4(57 mg, 수율: 68%)를 수득하였다.

[1360] 단계 c: HCOOH(2 ㎖) 중의 화합물 132-4(50 mg, 0.12 mmol)의 혼합물을 N_2 하에 80℃에서 1시간 동안 교반하였다. 혼합물을 농축하여 황색 고체로서 화합물 132-5(45 mg, 수율: 100%)를 수득하였다.

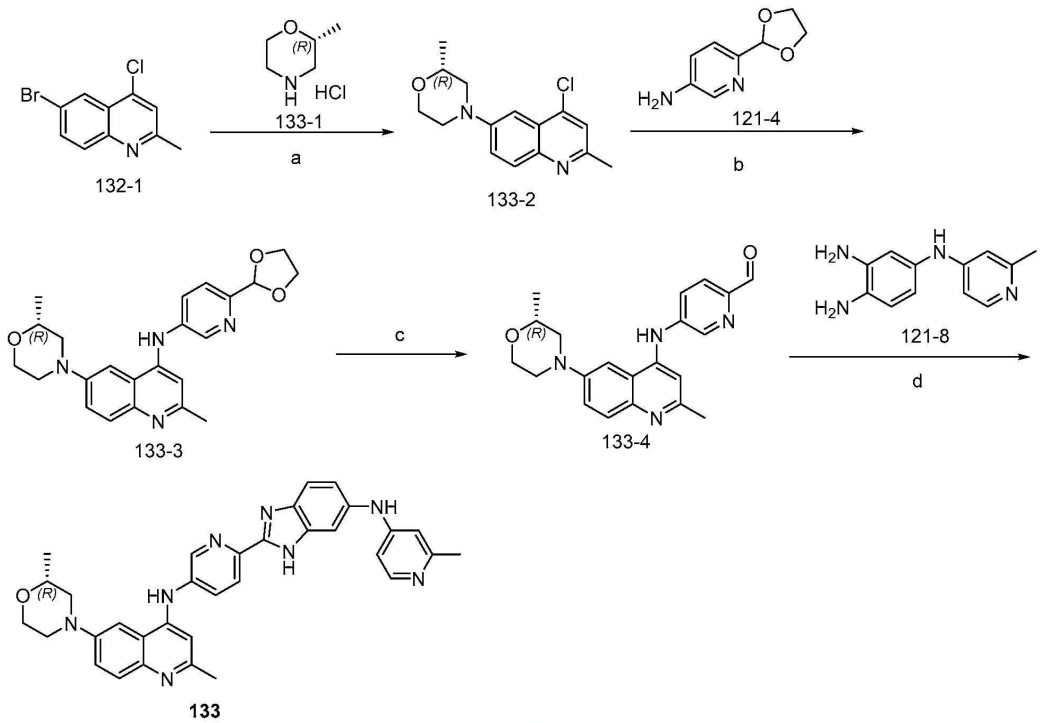
[1361] 단계 d: DMF(1 ㎖) 중의 화합물 132-5(42 mg, 0.11 mmol) 및 화합물 121-8(39 mg, 0.18 mmol)의 혼합물을 130℃에서 1시간 동안 교반하였다. 혼합물을 분취 HPLC로 정제하여, 황색 고체로서 **화합물 132**(6-(2,2-디메틸모르폴리노)-2-메틸-N-(6-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민)(39 mg, 수율: 63%)를 제공하였다: $C_{34}H_{34}N_8O$; 570.70 g/mol; ESI-LCMS m/z = 571 $[M+H]^+$; RT = 1.51분, >98.00% (214 nm).

[1362] **실시예 133: 화합물 133((R)-2-메틸-6-(2-메틸모르폴리노)-N-(6-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민)**



133

[1363]



반응식 120

[1364]

[1365] 화합물 121-4 및 121-8을 실시예 121에 기재된 방식과 유사한 방식으로 합성하였다.

[1366] 단계 a: 화합물 133-1(274 mg, 2.0 mmol), $Pd_2(dba)_3$(91 mg, 0.1 mmol), 크산트포스(58 mg, 0.1 mmol) 및 t-BuONa(384 mg, 4.0 mmol)을 1,4-디옥산(10 mℓ) 중의 화합물 132-1(510 mg, 2.0 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 물질을 실리카 겔 컬럼(PE/EA=2/1)으로 정제하여, 황색 고체로서 화합물 133-2(342 mg, 수율: 62%)를 수득하였다.

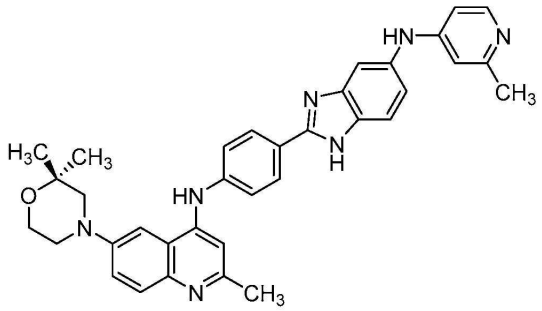
[1367] 단계 b: 화합물 121-4(33 mg, 0.2 mmol), $Pd_2(dba)_3$(9.1 mg, 0.01 mmol), 크산트포스(6 mg, 0.01 mmol) 및 Cs_2CO_3(130 mg, 0.4 mmol)을 1,4-디옥산(1 mℓ) 중의 화합물 133-2(55 mg, 0.2 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 물질을 실리카 겔 컬럼(MeOH/EA=1/20)으로 정제하여, 황색 고체로서 화합물 133-3(47 mg, 수율: 58%)을 수득하였다.

[1368] 단계 c: HCOOH(2 mℓ) 중의 화합물 133-3(47 mg, 0.12 mmol)의 혼합물을 N_2 하에 80℃에서 1시간 동안 교반하였다. 혼합물을 농축하여, 황색 고체로서 화합물 133-4(42 mg, 수율: 100%)를 수득하였다.

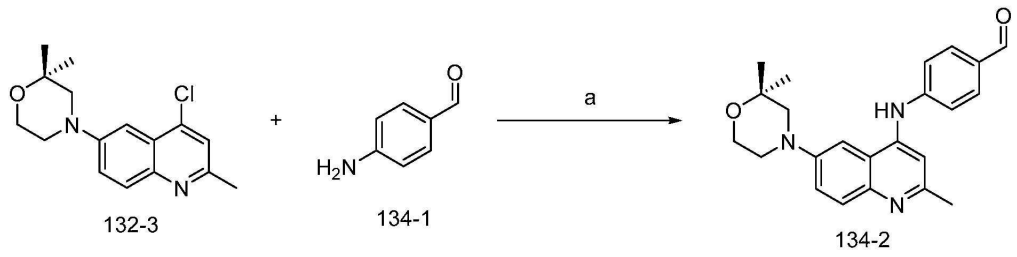
[1369] 단계 d: DMF(1 mℓ) 중의 화합물 133-4(40 mg, 0.11 mmol) 및 화합물 121-8(39 mg, 0.18 mmol)의 혼합물을 130℃에서 1시간 동안 교반하였다. 혼합물을 분취 HPLC로 정제하여, 황색 고체로서 **화합물 133**((R)-2-메틸-6-(2-메틸모르폴리노)-N-(6-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민)(30 mg, 수율: 50%)을 제공하였다: $C_{33}H_{32}N_8O$; 556.67 g/mol; ESI-LCMS m/z = 557 $[M+H]^+$; RT = 1.48분, >98.00%

(214 nm).

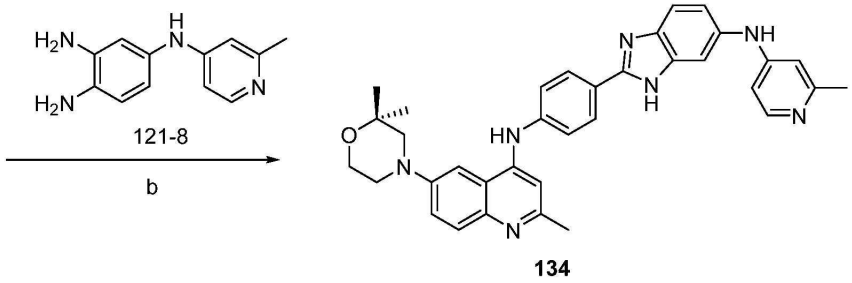
[1370] **실시예 134: 화합물 134(6-(2,2-디메틸모르폴리노)-2-메틸-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)**



134



132-3 134-1 134-2



121-8 **134**

반응식 121

[1371]

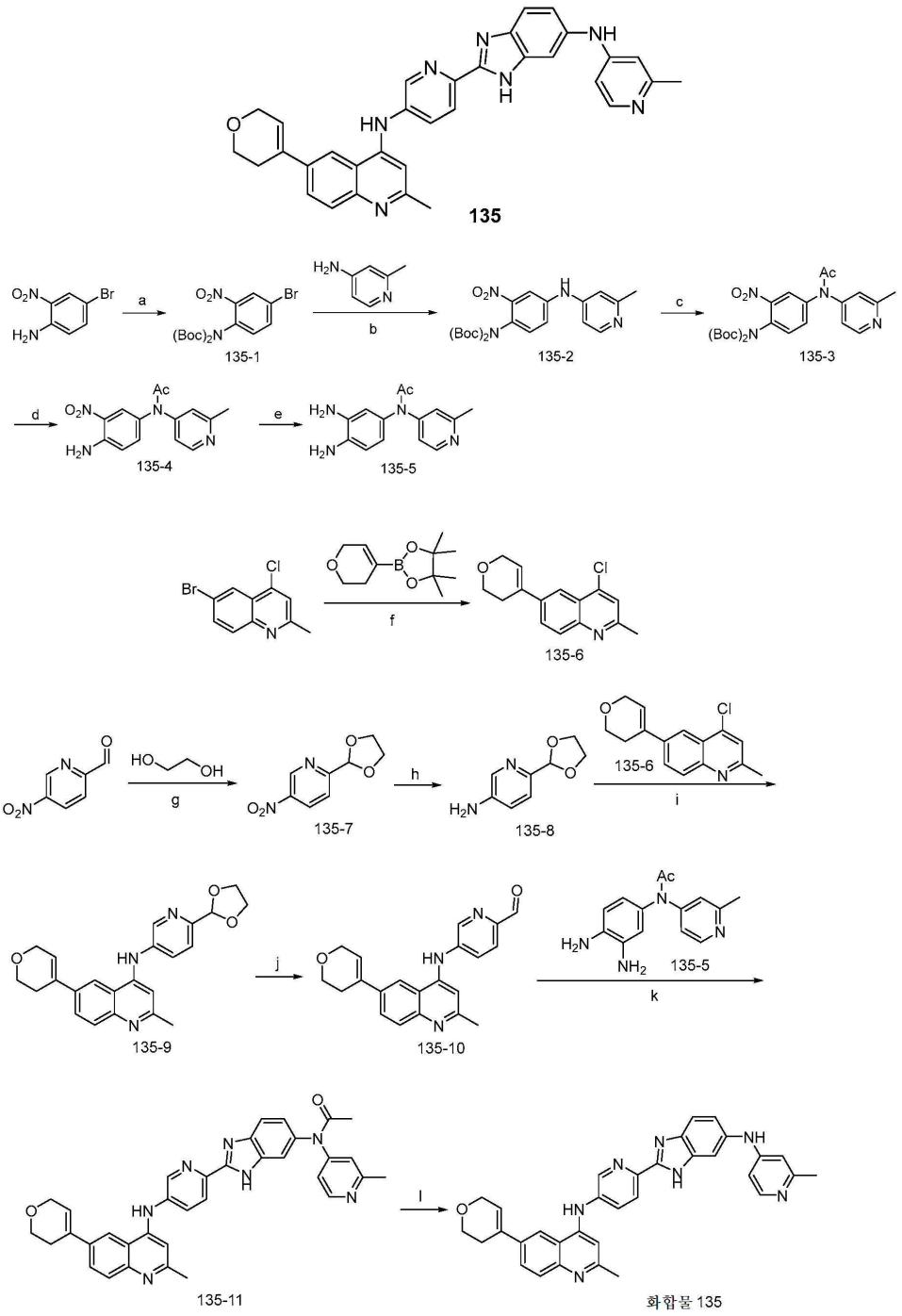
[1372] 화합물 121-8을 실시예 121에 기재된 방식과 유사한 방식으로 합성하였다.

[1373] 화합물 132-3을 실시예 132에 기재된 방식과 유사한 방식으로 합성하였다.

[1374] 단계 a: 화합물 134-1(24 mg, 0.2 mmol), $Pd_2(dba)_3$(9.1 mg, 0.01 mmol), 크산트포스(6 mg, 0.01 mmol) 및 Cs_2CO_3(130 mg, 0.4 mmol)을 1,4-디옥산(1 mℓ) 중의 화합물 132-3(58 mg, 0.2 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 물질을 실리카 겔 컬럼(MeOH/EA=1/20)으로 정제하여, 황색 고체로서 화합물 134-2(53 mg, 수율: 71%)를 수득하였다.

[1375] 단계 b: DMF(1 mℓ) 중의 화합물 134-2(45 mg, 0.12 mmol) 및 화합물 121-8(39 mg, 0.18 mmol)의 혼합물을 130℃에서 1시간 동안 교반하였다. 혼합물을 분취 HPLC로 정제하여, 황색 고체로서 **화합물 134**(6-(2,2-디메틸모르폴리노)-2-메틸-N-(4-(5-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)페닐)퀴놀린-4-아민)(42 mg, 수율: 62%)를 제공하였다: $C_{35}H_{35}N_7O$; 569.71 g/mol; ESI-LCMS m/z = 570 $[M+H]^+$; RT = 1.48분, >98.00% (214 nm).

[1376] **실시예 135: 화합물 135(6-(3,6-디하이드로-2H-피란-4-일)-2-메틸-N-(6-(6-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민)**



[1377]

[1378] 반응식 122

[1379] **화합물 135**를 반응식 122에 나타낸 방법으로 제조하였다.

[1380] 단계 a: 30 mℓ DCM 중의 4-브로모-2-니트로아닐린(1.5 g, 6.9 mmol), $(Boc)_2O$(4.5 g, 20.8 mmol) 및 Et_3N(2.1 g, 20.8 mmol)의 혼합물 실온에서 16시간 동안 교반하였다. 혼합물을 농축하고 실리카 겔 크로마토그래피(0% 내지 30% EtOAc/석유 에테르)로 정제하여, 황색 고체로서 화합물 135-1(2 g, 69% 수율)을 제공하였다.

[1381] 단계 b: 20 mℓ 톨루엔 중의 화합물 135-1(2 g, 4.8 mmol), 2-메틸피리딘-4-아민(778 mg, 7.2 mmol), $Pd_2(dba)_3$(550 mg, 0.6 mmol), x-phos(476 mg, 1 mmol) 및 Cs_2CO_3(3.12 g, 9.6 mmol)의 혼합물을 100℃에서 4시간 동안 교반하였다. 상기 혼합물을 농축하고 실리카 겔 크로마토그래피(10% 내지 60% EtOAc/석유 에테르)로 정제하여, 황색 고체로서 화합물 135-2(1.2 g, 56% 수율)를 제공하였다.

[1382] 단계 c: 염화아세틸(316 mg, 5 mmol)을 0℃에서 15 mℓ DCM 중의 화합물 135-2(1.2 g, 2.7 mmol)와 Et_3N(818

mg, 8.1 mmol)의 혼합물에 첨가하였다. 상기 혼합물을 실온에서 5시간 동안 교반하고, 물(10 ㎖)로 켄칭하고, DCM(3 x 20 ㎖)으로 추출하였다. 합한 유기 용매를 농축하고 실리카 겔 크로마토그래피(0% 내지 40% EtOAc/석유 에테르)로 정제하여, 황색 고체로서 화합물 135-3(1 g, 76% 수율)을 제공하였다.

[1383] 단계 d: TFA(2 ㎖)를 DCM(8 ㎖) 중의 화합물 135-3(1 g, 2 mmol)의 교반 혼합물에 첨가하였다. 상기 혼합물을 실온에서 1시간 동안 교반한 후, 농축 건조하였다. 잔사를 물(10 ㎖)에 용해시키고 K_2CO_3 수용액으로 8의 pH 8까지 중화시켰다. 혼합물을 EtOAc(3 x 15 ㎖)로 추출하였다. 합한 유기 용매를 Na_2SO_4 상에서 건조하고 농축하여, 황색 고체로서 화합물 135-4(450 mg, 78% 수율)를 제공하였다.

[1384] 단계 e: 화합물 135-4(450 mg, 1.6 mmol)와 Pd/C(100 mg, 활성탄 상의 10%)의 혼합물을 H_2 하에 3시간 동안 교반하였다. 상기 혼합물을 여과한 다음, 여액을 농축하여, 황색 고체로 화합물 135-5(380 mg, 74% 수율)를 제공하였다.

[1385] 단계 f: 20 ㎖ 디옥산 중의 6-브로모-4-클로로-2-메틸퀴놀린(256 mg, 1.0 mmol), 2-(3,6-디하이드로-2H-피란-4-일)-4,4,5,5-테트라메틸-1,3,2-디옥사보롤란(137 mg, 1.0 mmol), $Pd_2(dba)_3$(183 mg, 0.2 mmol), BINAP(248 mg, 0.4 mmol) 및 t-BuONa(168 mg, 1.5 mmol)의 혼합물을 100℃에서 1시간 동안 교반하였다. 상기 혼합물을 농축하고 실리카 겔 크로마토그래피(0% 내지 40% EtOAc/석유 에테르)로 정제하여, 황색 고체로서 화합물 135-6(220 mg, 75% 수율)을 제공하였다.

[1386] 단계 g: 30 ㎖ 톨루엔 중의 4-니트로벤즈알데하이드(1.0 g, 6.67 mmol), 에탄-1,2-디올(0.62 g, 10.0 mmol) 및 TsOH(0.19 g, 1.0 mmol)의 혼합물을 110℃에서 16시간 동안 교반하였다. 상기 혼합물을 농축하고 실리카 겔 크로마토그래피(0% 내지 25% EtOAc/석유 에테르)로 정제하여, 황색 고체로서 화합물 135-7(1.2 g, 93% 수율)을 제공하였다.

[1387] 단계 h: 30 ㎖ 에탄올 중의 화합물 135-7(1.2 g, 6.12 mmol), Pd/C(0.6 g) 및 TsOH(0.19 g, 1.0mmol)의 혼합물을 H_2 하에 실온에서 16시간 동안 교반하였다. 촉매를 여과하고, 여액을 농축하여 화합물 135-8(800 mg, 79% 수율)을 제공하였다.

[1388] 단계 i: 10 ㎖ 디옥산 중의 화합물 135-6(200 mg, 0.69 mmol), 화합물 135-8(115 mg, 0.69 mmol), $Pd_2(dba)_3$(146 mg, 0.16 mmol), X-Phos(152 mg, 0.32 mmol) 및 Cs_2CO_3(522 mg, 1.6 mmol)의 혼합물을 110℃에서 2시간 동안 교반하였다. 상기 혼합물을 농축하고 실리카 겔 크로마토그래피(0% 내지 60% MeOH/EtOAc)로 정제하여, 황색 고체로서 화합물 135-9(160 mg, 55% 수율)를 제공하였다.

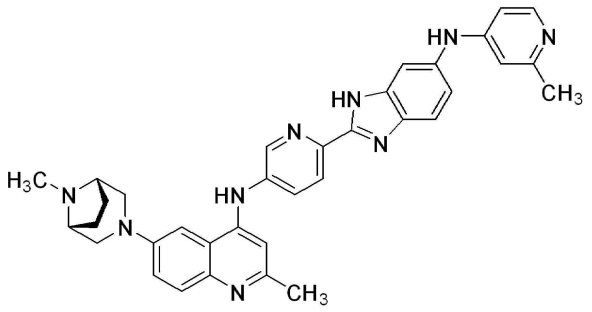
[1389] 단계 j: 6 ㎖ THF 및 6 ㎖ 3 N HCl 중의 화합물 135-9(160 mg, 0.38 mmol)의 혼합물을 60℃에서 2시간 동안 교반하였다. 상기 혼합물을 농축하고, K_2CO_3으로 pH를 8까지 조절하고, EtOAc로 추출하고, 유기층을 건조하고 농축하여, 황색 고체로서 화합물 135-10(140 mg, 97% 수율)을 제공하였다.

[1390] 단계 k: 5 ㎖ DMF 중의 화합물 135-10(70 mg, 0.19 mmol), 화합물 135-5(48 mg, 0.19 mmol) 및 TsOH(19 mg, 0.1 mmol)의 혼합물을 100℃에서 2시간 동안 교반하였다. 상기 혼합물을 역상 HPLC(NH_4HCO_3)로 정제하여, 황색 고체로서 화합물 135-11(60 mg, 52% 수율)을 제공하였다.

[1391] 단계 l: 2 ㎖ MeOH 중의 화합물 135-11(60 mg, 0.1 mmol)과 K_2CO_3(45 mg, 0.326 mmol)의 혼합물을 실온에서 2시간 동안 교반하였다. 물(20 ㎖)을 첨가하고 고체를 모으고 진공 하에 건조하여, 황색 고체로서 화합물 135(20 mg, 35% 수율)를 제공하였다.

[1392] **화합물 135**(6-(3,6-디하이드로-2H-피란-4-일)-2-메틸-N-(6-(6-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민): $C_{33}H_{29}N_7O$; 539.64 g/mol; 12 mg; 옅은 황색 고체; ESI-LCMS m/z = 540.3 $[M+H]^+$; LCMS RT = 1.49분, >95.00%(214 nm).

[1393] **실시예 136: 화합물 136(2-메틸-6-((1R,5S)-8-메틸-3,8-디아자비사이클로[3.2.1]옥탄-3-일)-N-(6-(6-((2-메틸피리딘-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민)**

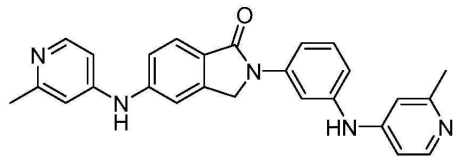


136

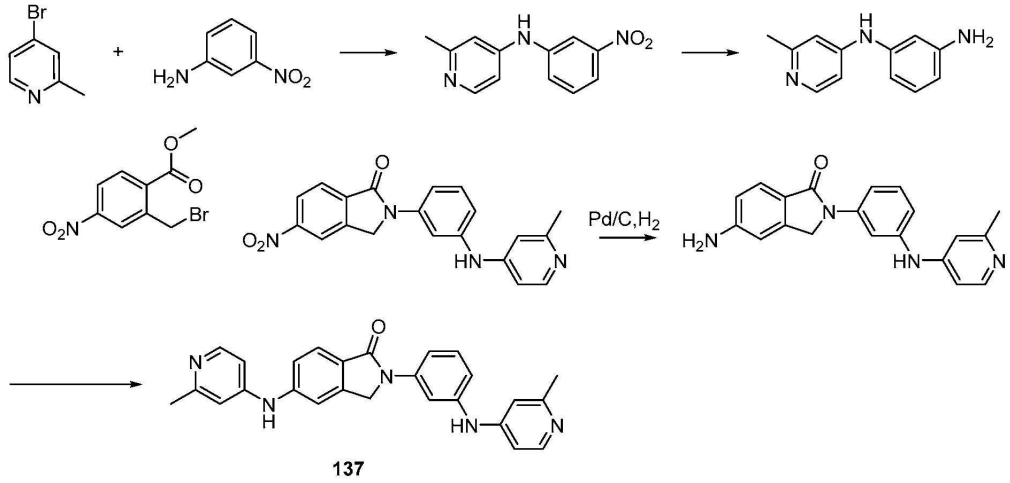
[1394]

[1395] **화합물 136**을 당분야에 공지된 방법 및/또는 본원에 기재된 방법과 유사한 방법으로 제조하였다. **화합물 136**(2-메틸-6-((1R,5S)-8-메틸-3,8-디아자비사이클로[3.2.1]옥탄-3-일)-N-(6-(6-((2-메틸피리딘)-4-일)아미노)-1H-벤조[d]이미다졸-2-일)피리딘-3-일)퀴놀린-4-아민): $C_{35}H_{35}N_9$; 581.73 g/몰; 16 mg; 황색 고체; ESI-LCMS m/z = 582 $[M+H]^+$; LCMS RT = 1.16분, >95.00%(214 nm).

[1396] **실시예 137: 화합물 137(5-((2-메틸피리딘-4-일)아미노)-2-(3-((2-메틸피리딘-4-일)아미노)페닐)이소인돌린-1-온)**



137



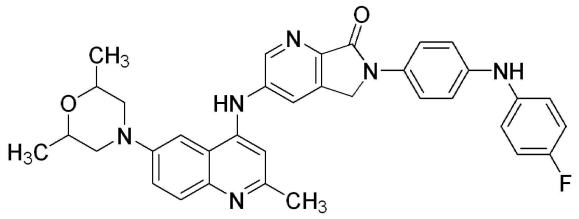
137

반응식 123

[1397]

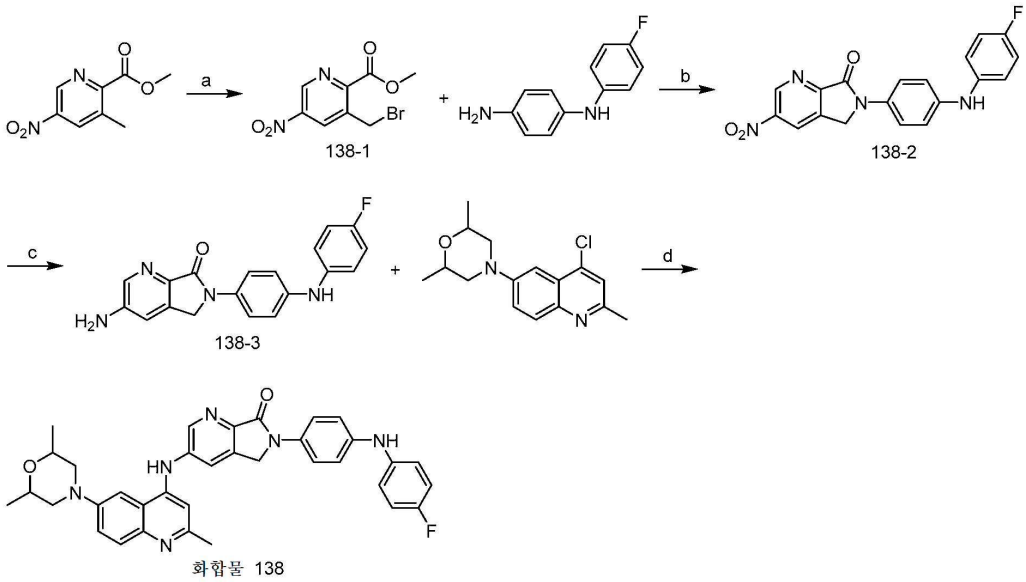
[1398] **화합물 137**을 반응식 123에 나타낸 방법으로 제조하였다. **화합물 137**(5-((2-메틸피리딘-4-일)아미노)-2-(3-((2-메틸피리딘-4-일)아미노)페닐)이소인돌린-1-온): $C_{26}H_{23}N_5O$; 421.49 g/몰; 7.1 mg; 황색 고체; ESI-LCMS m/z = 422 $[M+H]^+$; LCMS RT = 1.29분, >95.00%(214 nm).

[1399] **실시예 138: 화합물 138(3-((6-(2,6-디메틸모르폴리노)-2-메틸퀴놀린-4-일)아미노)-6-(4-((4-플루오로페닐)아미노)페닐)-5,6-디하이드로-7H-피롤로[3,4-b]피리딘-7-온)**



138

[1400]



반응식 124

[1401]

[1402] **화합물 138**을 반응식 124에 나타낸 방법으로 제조하였다.

[1403] 단계 a: NBS(4.54 g, 25.5 mmol) 및 AIBN(4.18 g, 25.5 mmol)을 실온에서 DCM(20 ㎖) 중의 메틸 3-메틸-5-니트로피콜리네이트(5 g, 25.5 mmol) 용액에 첨가하고, 혼합물을 80℃에서 6시간 동안 교반하였다. 상기 혼합물을 실온까지 냉각시키고, 물로 켄칭하고, DCM(2 x 50 ㎖)으로 추출하였다. 합한 유기층을 염수로 세척하고, 무수 Na_2SO_4 상에서 건조하고, 감압 하에 농축하였다. 용매를 제거한 후, 미정제 생성물을 실리카 겔 크로마토그래피(20% EtOAc/석유 에테르)로 정제하여, 황색 고체로서 화합물 138-1(5.0 g, 30% 수율)을 제공하였다.

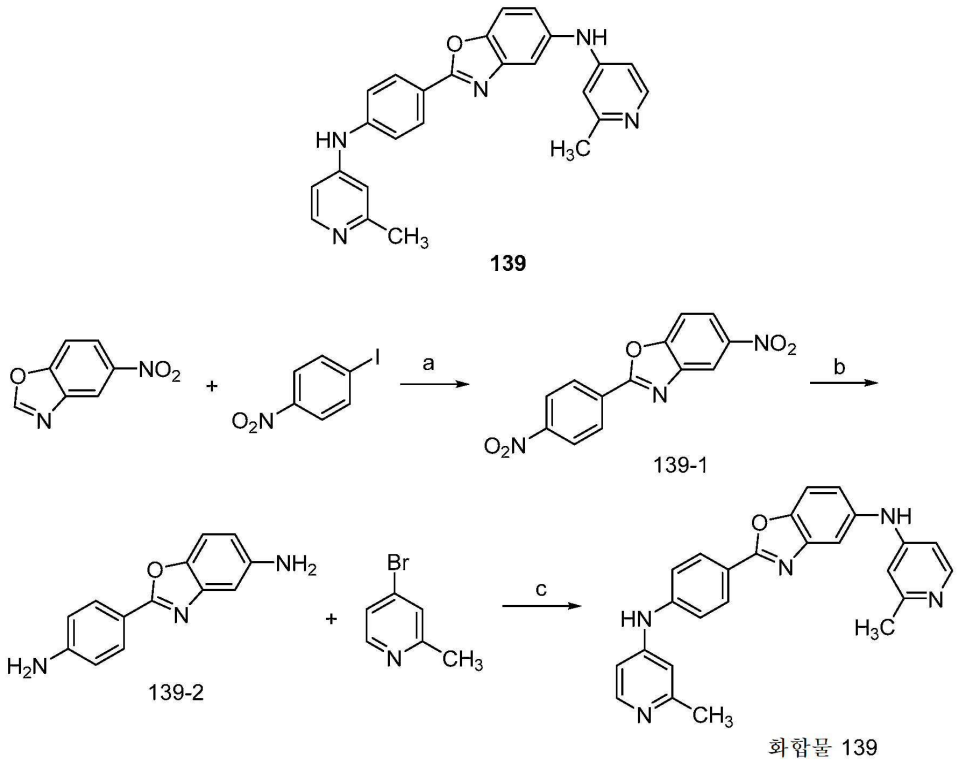
[1404] 단계 b: N1-(4-플루오로페닐)벤젠-1,4-디아민(480 mg, 2.37 mmol) 및 피리딘(2 ㎖)을 EtOH(20 ㎖) 중의 화합물 138-1(1.05 g, 2.00 mmol) 용액에 첨가하였다. 혼합물을 80℃에서 4시간 동안 교반한 후 여과하여, 황색 고체로서 화합물 138-2(580 mg, 80% 수율)를 제공하였다.

[1405] 단계 c: Pd/C(10%, 130 mg)을 MeOH(30 ㎖) 중의 화합물 138-2(260 mg, 0.71 mmol) 용액에 첨가하였다. 혼합물을 실온에서 2시간 동안 교반한 후 여과하여, 황색 고체로서 화합물 138-3(169 mg, 71% 수율)을 제공하였다.

[1406] 단계 d: 1,4-디옥산(10 ㎖) 중의 화합물 138-3(100 mg, 0.30 mmol), 4-(4-클로로-2-메틸퀴놀린-6-일)-2,6-디메틸모르폴린(87 mg, 0.30 mmol), $Pd(OAc)_2$(14 mg, 0.06 mmol), 크산트포스(69 mg, 0.12 mmol) 및 Cs_2CO_3(195 mg, 0.60 mmol)의 혼합물을 100℃에서 3시간 동안 교반한 후, 농축하였다. 합한 유기층을 염수로 세척하고, 무수 Na_2SO_4 상에서 건조하고, 감압 하에 농축하였다. 용매를 제거한 후, 미정제 생성물을 실리카 겔 크로마토그래피(10% MeOH/EtOAc)로 정제하여, 연황색 고체로서 화합물 138(12 mg, 7% 수율)을 제공하였다.

[1407] **화합물 138**(3-((6-(2,6-디메틸모르폴리노)-2-메틸퀴놀린-4-일)아미노)-6-(4-((4-플루오로페닐)아미노)페닐)-5,6-디하이드로-7H-피롤로[3,4-b]피리딘-7-온): $C_{35}H_{33}FN_6O_2$; 588.67 g/몰; 12 mg; 연황색 고체. ESI-LCMS m/z = 589.0 $[M+H]^+$; LCMS RT = 1.56분, >95.00%(214 및 254 nm).

[1408] **실시예 139: 화합물 139(N-(2-메틸피리딘-4-일)-2-(4-((2-메틸피리딘-4-일)아미노)페닐)벤조[d]옥사졸-5-아민)**



반응식 125

[1409]

[1410] **화합물 139**를 반응식 125에 나타낸 방법으로 제조하였다.

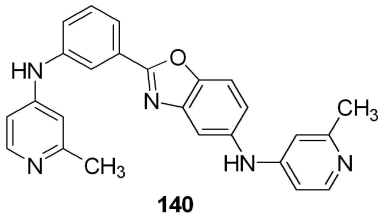
[1411] 단계 a: 1-요오도-4-니트로벤젠(910 mg, 3.65 mmol), 리튬 t-부톡사이드(490 mg, 6.10 mmol) 및 $Pd(PPh_3)_4$(175 mg, 0.15 mmol)을 1,4-디옥산(20 mℓ) 중의 5-니트로벤조[d]옥사졸(500 mg, 3.05 mmol) 용액에 첨가하였다. 혼합물을 Ar 하에 100℃에서 밤새 교반하였다. 물(60 mℓ)을 첨가하고 혼합물을 DCM(3×60 mℓ)으로 추출하였다. 합한 유기층을 염수(10 mℓ)로 세척하고, 무수 황산나트륨 상에서 건조하고, 여과하고, 진공에서 농축하여 미정제 화합물 139-1을 제공하였다. 미정제 물질(1.2 g)을 다음 단계에서 직접 사용하였다.

[1412] 단계 b: 한 숟가락의 레이니 니켈(Raney Nickel) 및 $N_2H_4 \cdot H_2O$(3 mℓ)를 에탄올(15 mℓ) 중의 미정제 화합물 139-1(1.2 g) 용액에 첨가하였다. 혼합물을 N_2 하에 실온에서 1시간 동안 교반하였다. 혼합물을 여과하고 용매를 진공에서 제거하였다. 미정제 물질을 분취 TLC(석유 에테르:에틸 아세테이트 = 1:1, 254 nm, 실리카)로 정제하여, 갈색 고체로서 화합물 139-2(500 mg, 35% 수율)를 제공하였다.

[1413] 단계 c: 4-브로모-2-메틸피리딘(0.03 mℓ, 0.62 mmol), Pd_2dba_3(56 mg, 0.062 mmol), K_2CO_3(95 mg, 0.64 mmol) 및 X-Phos(146 mg, 0.29 mmol)를 에탄올(6 mℓ) 중의 화합물 139-2(140 mg, 0.62 mmol) 용액에 첨가하였다. 혼합물을 100℃에서 밤새 교반하였다. 물(20 mℓ)을 첨가하고 혼합물을 에틸 아세테이트(2 x 20 mℓ)로 추출하였다. 합한 유기층을 염수(5 mℓ)로 세척하고, 무수 황산나트륨 상에서 건조하고, 여과하고, 진공에서 농축하여 미정제 생성물을 제공하였다. 미정제 물질을 분취 HPLC로 정제하여, 백색 고체로서 화합물 139(60 mg, 63% 수율)를 제공하였다.

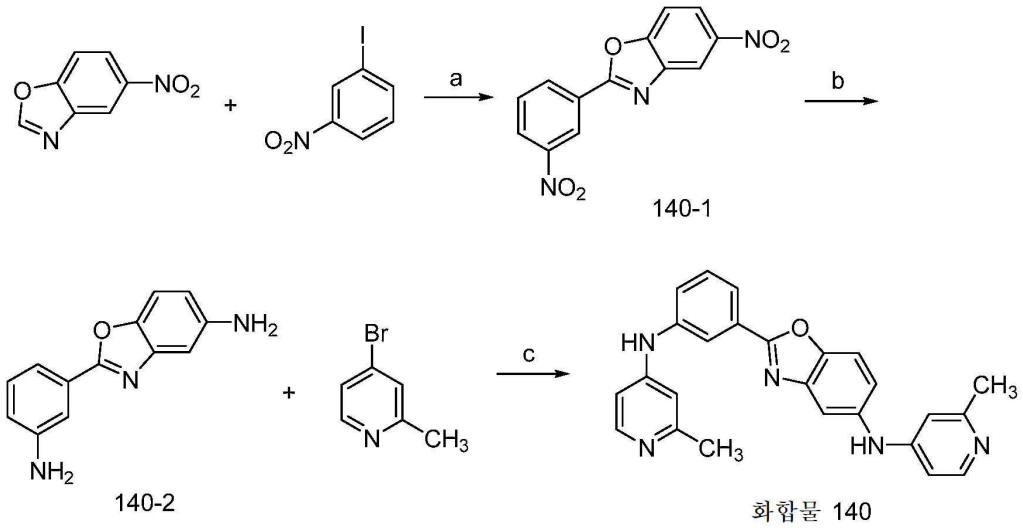
[1414] **화합물 139**(N-(2-메틸피리딘-4-일)-2-(4-((2-메틸피리딘-4-일)아미노)페닐)벤조[d]옥사졸-5-아민): $C_{25}H_{21}N_5O$; 407.47 g/몰; 60 mg; 백색 고체; ESI-LCMS m/z = 408 $[M+H]^+$; LCMS RT = 1.67분, >95.00%(214 및 254 nm).

[1415] **실시예 140: 화합물 140(N-(2-메틸피리딘-4-일)-2-(3-((2-메틸피리딘-4-일)아미노)페닐)벤조[d]옥사졸-5-아민)**



140

[1416]



반응식 126

[1417]

[1418] **화합물 140**을 반응식 126에 나타낸 방법으로 제조하였다.

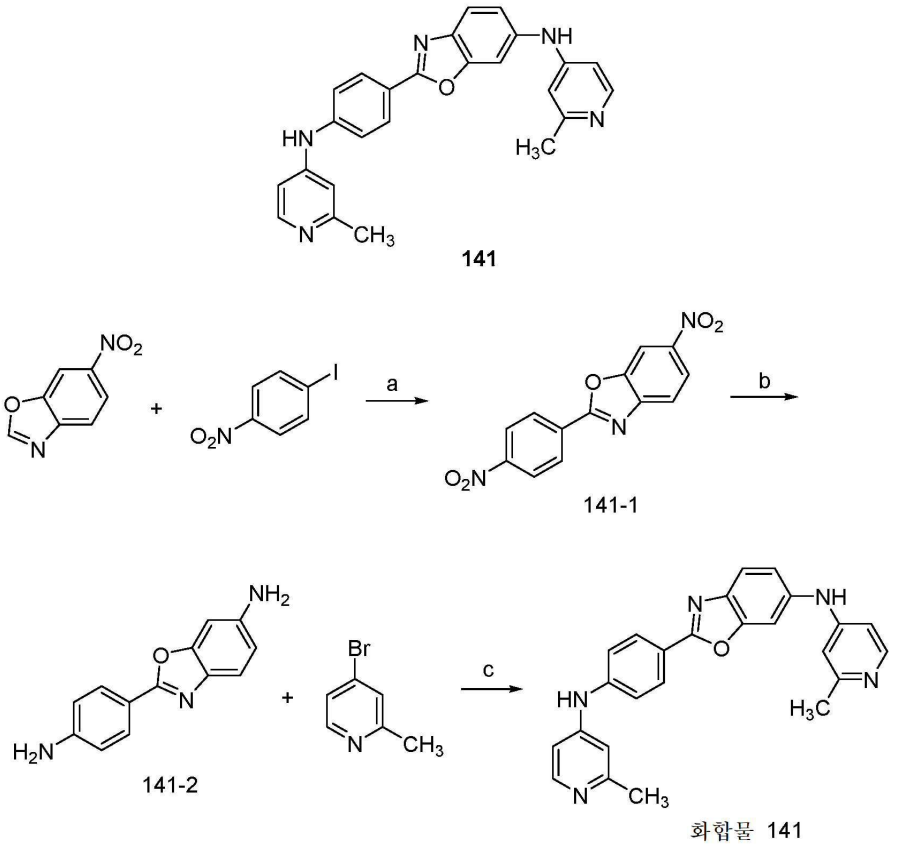
[1419] 단계 a: 1-요오도-4-니트로벤젠(910 mg, 3.65 mmol), 리튬 t-부톡사이드(490 mg, 6.10 mmol) 및 $Pd(PPh_3)_4$(175 mg, 0.15 mmol)을 1,4-디옥산(20 mℓ) 중의 5-니트로벤조[d]옥사졸(500 mg, 3.05 mmol)의 용액에 첨가하였다. 혼합물을 Ar 하에 100℃에서 밤새 교반하였다. 물(60 mℓ)을 첨가하고 혼합물을 DCM(3×60 mℓ)으로 추출하였다. 합한 유기층을 염수(10 mℓ)로 세척하고, 무수 황산나트륨 상에서 건조하고, 여과하고, 진공에서 농축하여 미정제 화합물 140-1을 제공하였다. 미정제 물질(1.1 g)을 다음 단계에서 직접 사용하였다.

[1420] 단계 b: 한 숟가락의 레이니 니켈 및 $N_2H_4 \cdot H_2O$(3 mℓ)를 에탄올(15 mℓ) 중의 미정제 화합물 140-1(1.1 g) 용액에 첨가하였다. 혼합물을 N_2 하에 실온에서 1시간 동안 교반하였다. 혼합물을 여과하고 용매를 진공에서 제거하였다. 미정제 물질을 분취 TLC(석유 에테르:에틸 아세테이트 = 1:1, 254 nm, 실리카)로 정제하여, 갈색 고체로서 화합물 140-2(475 mg, 33% 수율)를 제공하였다.

[1421] 단계 c: 4-브로모-2-메틸피리딘(0.06 mℓ, 1.1 mmol), Pd_2dba_3(100 mg, 0.11 mmol), K_2CO_3(170 mg, 1.2 mmol) 및 X-Phos(261 mg, 0.55 mmol)를 에탄올(60 mℓ) 중의 화합물 140-2(250 mg, 1.1 mmol) 용액에 첨가하였다. 혼합물을 100℃에서 밤새 교반하였다. 물(150 mℓ)을 첨가하고 혼합물을 에틸 아세테이트(2 x 150 mℓ)로 추출하였다. 합한 유기층을 염수(20 mℓ)로 세척하고, 무수 황산나트륨 상에서 건조하고, 여과하고, 진공에서 농축하여 미정제 생성물을 제공하였다. 미정제 물질을 분취 HPLC로 정제하여, 백색 고체로서 화합물 140(80 mg, 67% 수율)을 제공하였다.

[1422] **화합물 140**(N-(2-메틸피리딘-4-일)-2-(3-((2-메틸피리딘-4-일)아미노)페닐)벤조[d]옥사졸-5-아민): $C_{25}H_{21}N_5O$; 407.47 g/몰; 80 mg; 백색 고체; ESI-LCMS m/z = 408 $[M+H]^+$; LCMS RT = 1.75분, >95.00%(214 및 254 nm).

[1423] **실시예 141: 화합물 141(N-(2-메틸피리딘-4-일)-2-(4-((2-메틸피리딘-4-일)아미노)페닐)벤조[d]옥사졸-6-아민)**



반응식 127

[1424]

[1425] **화합물 141**을 반응식 127에 나타낸 방법으로 제조하였다.

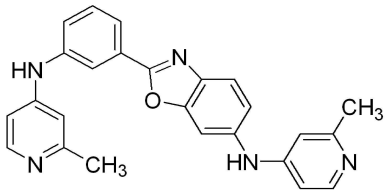
[1426] 단계 a: 1-요오도-4-니트로벤젠(910 mg, 3.65 mmol), 리튬 t-부톡사이드(490 mg, 6.10 mmol) 및 $Pd(PPh_3)_4$(175 mg, 0.15 mmol)을 1,4-디옥산(20 ㎖) 중의 6-니트로벤조[d]옥사졸(500 mg, 3.05 mmol) 용액에 첨가하였다. 혼합물을 Ar 하에 100℃에서 밤새 교반하였다. 물(60 ㎖)을 첨가하고 혼합물을 DCM(3×60 ㎖)으로 추출하였다. 합한 유기층을 염수(10 ㎖)로 세척하고, 무수 황산나트륨 상에서 건조하고, 여과하고, 진공에서 농축하여 미정제 화합물 141-1을 제공하였다. 미정제 물질(1.5 g)을 다음 단계에서 직접 사용하였다.

[1427] 단계 b: 한 숟가락의 레이니 니켈 및 $N_2H_4 \cdot H_2O$(3 ㎖)를 에탄올(15 ㎖) 중의 미정제 화합물 141-1(1.5 g) 용액에 첨가하였다. 혼합물을 N_2 하에 실온에서 1시간 동안 교반하였다. 혼합물을 여과하고 용매를 진공에서 제거하였다. 미정제 물질을 분취 TLC(석유 에테르:에틸 아세테이트 = 1:1, 254 nm, 실리카)로 정제하여, 갈색 고체로서 화합물 141-2(321 mg, 30% 수율)를 제공하였다.

[1428] 단계 c: 4-브로모-2-메틸피리딘(0.04 ㎖, 0.60 mmol), Pd_2dba_3(68 mg, 0.060 mmol), K_2CO_3(116 mg, 0.71 mmol) 및 X-Phos(177 mg, 0.32 mmol)를 에탄올(8 ㎖) 중의 화합물 141-2(170 mg, 0.60 mmol) 용액에 첨가하였다. 혼합물을 100℃에서 밤새 교반하였다. 물(20 ㎖)을 첨가하고 혼합물을 에틸 아세테이트(2 x 20 ㎖)로 추출하였다. 합한 유기층을 염수(5 ㎖)로 세척하고, 무수 황산나트륨 상에서 건조하고, 여과하고, 진공에서 농축하여 미정제 생성물을 제공하였다. 미정제 물질을 분취 HPLC로 정제하여, 백색 고체로서 화합물 141(32 mg, 57% 수율)을 제공하였다.

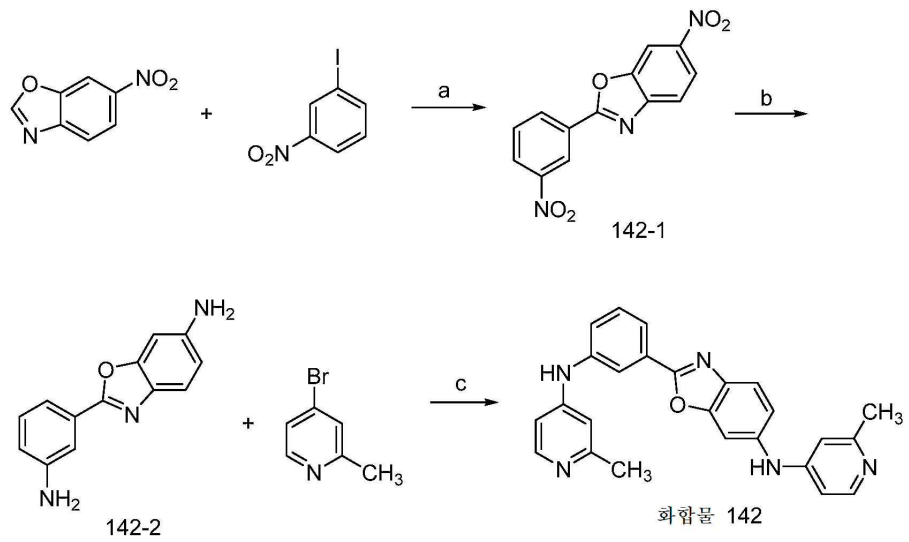
[1429] **화합물 141**(N-(2-메틸피리딘-4-일)-2-(4-((2-메틸피리딘-4-일)아미노)페닐)벤조[d]옥사졸-6-아민): $C_{25}H_{21}N_5O$; 407.47 g/몰; 32 mg; 백색 고체; ESI-LCMS m/z = 408 $[M+H]^+$; LCMS RT = 1.65분, >95.00%(214 및 254 nm).

[1430] **실시예 142: 화합물 142 (N-(2-메틸피리딘-4-일)-2-(3-((2-메틸피리딘-4-일)아미노)페닐)벤조[d]옥사졸-6-아민)**



142

[1431]



반응식 128

[1432]

[1433] **화합물 142**를 반응식 128에 나타낸 방법으로 제조하였다.

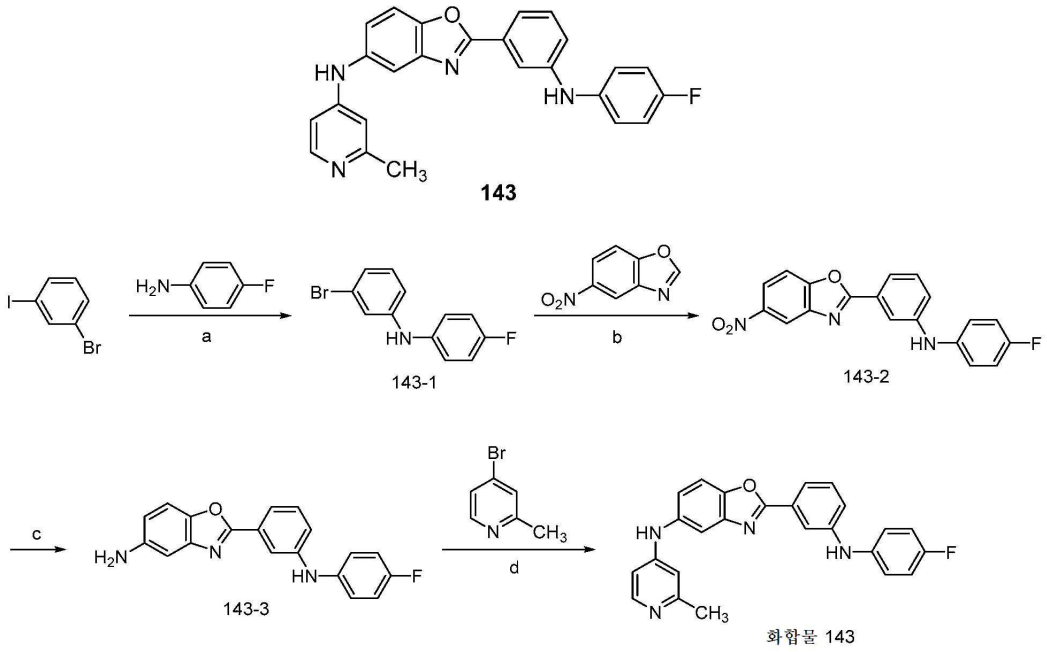
[1434] 단계 a: 1-요오도-4-니트로벤젠(910 mg, 3.65 mmol), 리튬 t-부톡사이드(490 mg, 6.10 mmol) 및 $Pd(PPh_3)_4$(175 mg, 0.15 mmol)을 1,4-디옥산(20 ㎖) 중의 6-니트로벤조[d]옥사졸(500 mg, 3.05 mmol) 용액에 첨가하였다. 혼합물을 Ar 하에 100℃에서 밤새 교반하였다. 물(60 ㎖)을 첨가하고 혼합물을 DCM(3×60 ㎖)으로 추출하였다. 합한 유기층을 염수(10 ㎖)로 세척하고, 무수 황산나트륨 상에서 건조하고, 여과하고, 진공에서 농축하여 미정제 화합물 142-1을 제공하였다. 미정제 물질(1.2 g)을 다음 단계에서 직접 사용하였다.

[1435] 단계 b: 한 숟가락의 레이니 니켈 및 $N_2H_4 \cdot H_2O$(3 ㎖)를 에탄올(15 ㎖) 중의 미정제 화합물 142-1(1.2 g) 용액에 첨가하였다. 혼합물을 N_2 하에 실온에서 1시간 동안 교반하였다. 혼합물을 여과하고 용매를 진공에서 제거하였다. 미정제 물질을 분취 TLC(석유 에테르:에틸 아세테이트 = 1:1, 254 nm, 실리카)로 정제하여, 갈색 고체로서 화합물 142-2(563 mg, 42% 수율)를 제공하였다.

[1436] 단계 c: 4-브로모-2-메틸피리딘(0.06 ㎖, 1.1 mmol), Pd_2dba_3(100 mg, 0.11 mmol), K_2CO_3(170 mg, 1.2 mmol) 및 X-Phos(261 mg, 0.55 mmol)를 에탄올(60 ㎖) 중의 화합물 142-2(250 mg, 1.1 mmol) 용액에 첨가하였다. 혼합물을 100℃에서 밤새 교반하였다. 물(150 ㎖)을 첨가하고 혼합물을 에틸 아세테이트(2×150 ㎖)로 추출하였다. 합한 유기층을 염수(20 ㎖)로 세척하고, 무수 황산나트륨 상에서 건조하고, 여과하고, 진공에서 농축하여 미정제 생성물을 제공하였다. 미정제 물질을 분취 HPLC로 정제하여, 백색 고체로서 화합물 142(40 mg, 53% 수율)를 제공하였다.

[1437] **화합물 142**(N-(2-메틸피리딘-4-일)-2-(3-((2-메틸피리딘-4-일)아미노)페닐)벤조[d]옥사졸-6-아민): $C_{25}H_{21}N_5O$; 407.47 g/몰; 40 mg; 백색 고체; ESI-LCMS m/z = 408 $[M+H]^+$; LCMS RT = 1.53분, >95.00%(214 및 254 nm).

[1438] **실시예 143: 화합물 143(2-(3-((4-플루오로페닐)아미노)페닐)-N-(2-메틸피리딘-4-일)벤조[d]옥사졸-5-아민)**



반응식 129

[1439]

[1440] **화합물 143**을 반응식 129에 나타낸 방법으로 제조하였다.

[1441] 단계 a: 4-플루오로아닐린(40 mg, 0.36 mmol), $Pd(PPh_3)_2Cl_2$(25 mg, 0.036 mmol), PPh(10 mg, 0.07 mmol) 및 t-BuONa(120 mg, 1.08 mmol)을 Ar 하에 크실렌(10 ㎖) 중의 1-브로모-3-요오도벤젠(200 mg, 0.7 mmol) 용액에 첨가하였다. 혼합물을 Ar 하에 140℃에서 16시간 동안 교반하였다. 혼합물을 농축하고 잔사를 EA/PE(0% 내지 10%)로 정제하여, 황색 고체로서 화합물 143-1(150 mg, 80% 수율)을 제공하였다.

[1442] 단계 b: 5-니트로벤조[d]옥사졸(75 mg, 0.5 mmol), $Pd(Ph_3)_4$(57 mg, 0.05 mmol) 및 t-BuLi(60 mg, 1.0 mmol)을 Ar 하에 실온에서 1,4-디옥산(5 ㎖) 중의 화합물 143-1(160 mg, 0.6 mmol) 용액에 첨가하였다. 혼합물을 Ar 하에 100℃에서 밤새 교반하였다. 혼합물을 농축하고 잔사를 EA/PE(0% 내지 10%)로 정제하여, 황색 고체로서 화합물 143-2(50 mg, 50% 수율)를 제공하였다.

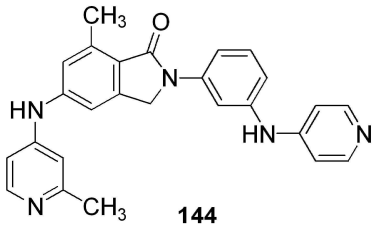
[1443] 단계 c: $NH_2NH_2 \cdot H_2O$(14 mg, 0.28 mmol) 및 레이니-Ni(10 mg)을 H_2 하에 실온에서 EtOH(6 ㎖) 및 DCM(3 ㎖) 중의 화합물 143-2(50 mg, 0.28 mmol) 용액에 첨가하였다. 혼합물을 실온에서 16시간 동안 교반하였다. 혼합물을 여과하였다. 여액을 농축하여, 황색 고체로서 화합물 143-3(50 mg, 100% 수율)을 제공하였다.

[1444] 단계 d: 4-브로모-2-메틸피리딘(100 mg, 0.6 mmol), X-phos(74 mg, 0.062 mmol), $Pd_2(dba)_3$(30 mg, 0.031 mmol) 및 K_2CO_3(200 mg, 1.55 mmol)을 Ar 하에 실온에서 EtOH(3 ㎖) 중의 화합물 143-3(100 mg, 0.31 mmol) 용액에 첨가하였다. 혼합물을 Ar 하에 100℃에서 밤새 교반하였다. 반응물을 실온까지 냉각시키고 여과하였다. 여액을 감압 하에 농축하였다. 잔사를 분취 HPLC(NH_4HCO_3/H_2O/MeCN)로 정제하여, 황색 고체로서 화합물 143(38.2mg, 30% 수율)을 제공하였다.

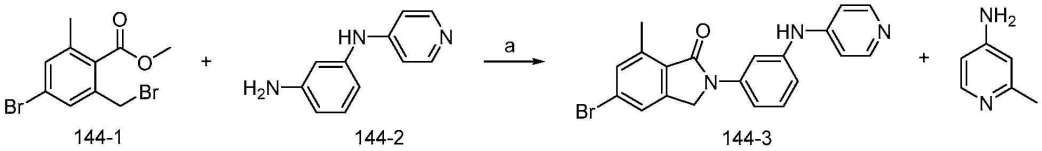
[1445] **화합물 143**(2-(3-((4-플루오로페닐)아미노)페닐)-N-(2-메틸피리딘-4-일)벤조[d]옥사졸-5-아민): $C_{25}H_{19}FN_4O$; 410.45 g/mol; 38.2 mg; 황색 고체; ESI-LCMS m/z = 411 $[M+H]^+$; LCMS RT = 1.106분, >95.00%(214 및 254 nm).

[1446] **실시예 144: 화합물 144(7-메틸-5-((2-메틸피리딘-4-일)아미노)-2-(3-(피리딘-4-일아미노)페닐)이소인돌린-1-온)**

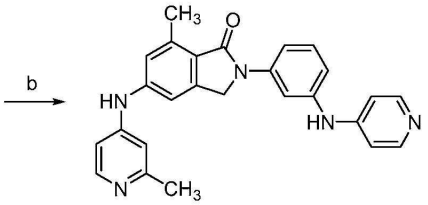
[1447]



144



144-1 144-2 144-3



화합물 144

반응식 130

[1448]

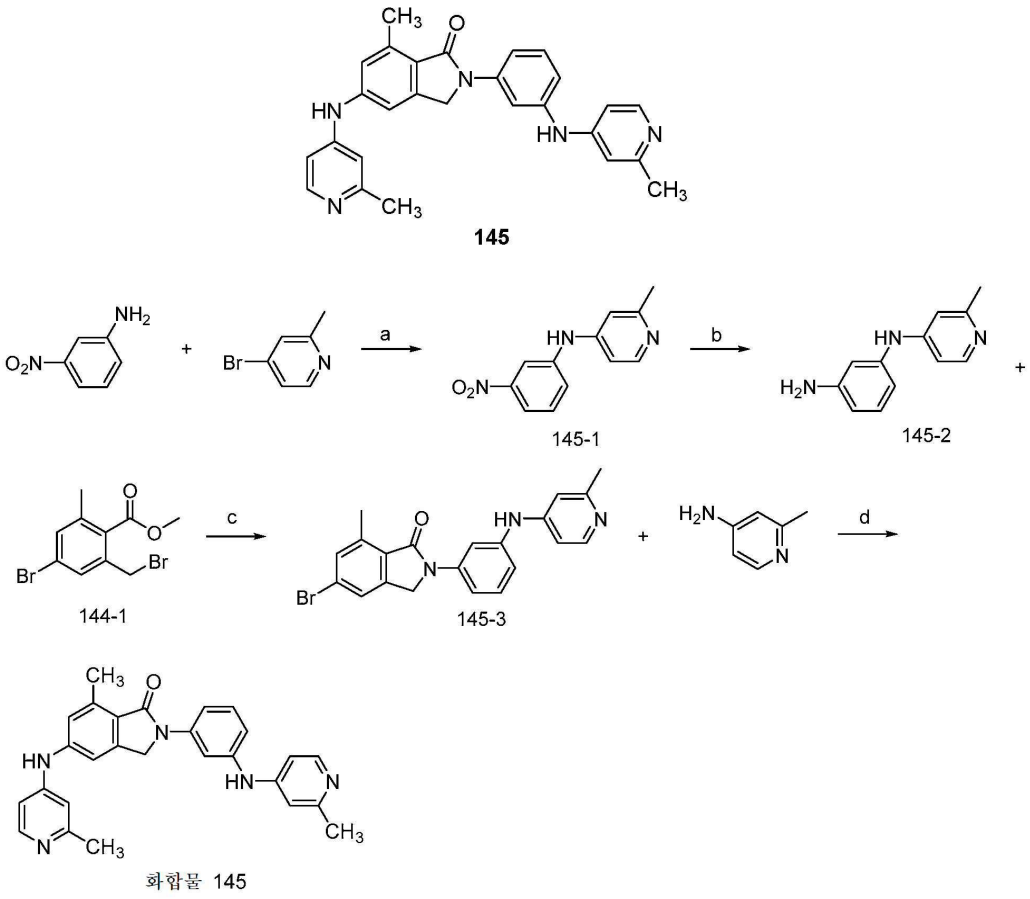
[1449] **화합물 144**를 반응식 130에 나타낸 방법으로 제조하였다.

[1450] 단계 a: TEA(606 mg, 6 mmol)를 MeOH(10 ㎖) 중의 화합물 144-1(640 mg, 2 mmol)과 화합물 144-2(407 mg, 2.2 mmol)의 혼합물에 첨가하고, 혼합물을 85℃에서 16시간 동안 교반하였다. 합한 유기층을 농축하였다. 잔사를 실리카 겔 상에서 플래쉬 크로마토그래피(DCM 중의 0% 내지 20% MeOH)로 정제하여, 고체로서 화합물 144-3(400 mg, 50.8% 수율)을 제공하였다.

[1451] 단계 b: 2-메틸피리딘-4-아민(50 mg, 0.45 mmol), $Pd_2(dba)_3$(20 mg, 0.02 mmol), 브레트포스(Brettphos)(20 mg, 0.02 mmol) 및 Cs_2CO_3(247 mg, 0.76 mmol)을 t-BuOH(5 ㎖)/톨루엔(5 ㎖) 중의 화합물 144-3(150 mg, 0.38 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 혼합물을 농축하고 미정제 물질을 분취 HPLC로 정제하여, 황색 고체로서 화합물 144(15 mg, 10% 수율)를 제공하였다.

[1452] **화합물 144**(7-메틸-5-((2-메틸피리딘-4-일)아미노)-2-(3-(피리딘-4-일아미노)페닐)이소인돌린-1-온): $C_{26}H_{23}N_5O$; 421.49 g/몰; 15 mg; 황색 고체; ESI-LCMS m/z = 422 $[M+H]^+$; LCMS RT = 1.30분, >95.00%(214 및 254 nm).

[1453] **실시예 145: 화합물 145(7-메틸-5-((2-메틸피리딘-4-일)아미노)-2-(3-((2-메틸피리딘-4-일)아미노)페닐)이소인돌린-1-온)**



반응식 131

[1454]

[1455] **화합물 145**를 반응식 131에 나타낸 방법으로 제조하였다.

[1456] 단계 a: 4-브로모-2-메틸피리딘(3.42 g, 0.02 mol), Cs_2CO_3(13 g, 0.04 mol), $Pd_2(dba)_3$(280 mg, 0.25 mmol) 및 크산트포스(280 mg, 0.4 mmol)를 N_2 하에 1,4-디옥산(30 mℓ) 중의 3-니트로아닐린(2.76 g, 0.02 mol)의 교반 혼합물에 첨가하였다. 생성된 혼합물을 100℃에서 3시간 동안 교반하였다. 반응물을 물(60 mℓ)로 켄칭하고 EtOAc(3×50 mℓ)로 추출하였다. 합한 유기층을 Na_2SO_4 상에서 건조하고, 여과하고, 농축하였다. 잔사를 실리카 겔 상에서 플래쉬 크로마토그래피(석유 에테르 중의 0% 내지 50% EtOAc)로 정제하여, 황색 고체로서 화합물 145-1(4 g, 87% 수율)을 제공하였다.

[1457] 단계 b: Pd/C(400 mg)을 MeOH(100 mℓ) 중의 화합물 145-1(4 g, 17.5 mmol)의 혼합물에 첨가하고, 상기 혼합물을 H_2 하에 실온에서 4시간 동안 교반하였다. 합한 유기층을 규조토로 여과하여, 황색 고체로서 화합물 145-2(3 g, 88.7% 수율)를 제공하였다.

[1458] 단계 c: TEA(253 mg, 2.5 mmol)를 MeOH(10 mℓ) 중의 화합물 144-1(400 mg, 1.25 mmol)과 화합물 145-2(273 mg, 1.3 mmol)의 혼합물에 첨가하였다. 상기 혼합물을 85℃에서 16시간 동안 교반하였다. 합한 유기층을 농축하였다. 잔사를 실리카 겔 상에서 플래쉬 크로마토그래피(DCM 중의 0% 내지 20% MeOH)로 정제하여, 고체로서 화합물 145-3(300 mg, 59% 수율)을 제공하였다.

[1459] 단계 d: 2-메틸피리딘-4-아민(39 mg, 0.45 mmol), $Pd_2(dba)_3$(20 mg, 0.02 mmol), 브레트포스(20 mg, 0.02 mmol) 및 Cs_2CO_3(234 mg, 0.72 mmol)을 t-BuOH(5 mℓ)/톨루엔(5 mℓ) 중의 화합물 145-3(150 mg, 0.36 mmol)의 혼합물에 첨가하고, 혼합물을 N_2 하에 100℃에서 12시간 동안 교반하였다. 상기 혼합물을 농축하고 미정제 물질을 분취 HPLC로 정제하여, 황색 고체로서 화합물 145(18 mg, 11% 수율)를 제공하였다.

[1460] **화합물 145**(7-메틸-5-((2-메틸피리딘-4-일)아미노)-2-(3-((2-메틸피리딘-4-일)아미노)페닐)이소인돌린-1-온): $C_{27}H_{25}N_5O$; 435.53 g/몰; 18 mg; 황색 고체; ESI-LCMS m/z = 436 $[M+H]^+$; LCMS RT = 1.41분, >95.00%(214 및 254

nm).

[1461] **실시예 146. 생물학적 어세이**

[1462] **Foxp3 유도 어세이**

[1463] C57/B16 마우스의 분류된 또는 농축된(밀테니이(Miltenyi) 자기 분리) CD4 통상적인 T 세포(Tconvs -CD4+/CD25)를 iTreg의 유도에 사용하였다. 다양한 농도의 약물(일반적으로 0.01 μM 내지 10 μM로 적정됨)의 부재 또는 존재 하에 10 ㎍/㎖의 플레이트 결합 항-CD3 항체(96웰 플레이트의 경우 웰당 50 ㎕), 2.5 ㎍/㎖의 가용성 항-CD28 항체, 100 IU/㎖의 IL2 및 5 ng/㎖의 TGF-β를 사용하였다. TGF-β가 없는 샘플을 유도에 대한 음성 대조군으로서 사용하였다.

[1464] 자극, TGF-β 및 약물의 존재 하에 3일 동안 배양한 후, 게이팅 및 독성 용량의 배제를 위해 세포를 고정 가능한 생존/사멸 세포 염료(Life Technologies, 뉴욕주 소재)로 염색하였다. 마우스 Foxp3 완충제 키트를 제조사의 설명서(BD Bioscience, 캘리포니아주 산호세 소재)에 따라 사용하여 세포를 고정시키고 투과 가능하게 만들었다. 항-CD4 항체 및 항-Foxp3 항체를 사용하여 세포를 염색하였다. 염색 후, 유세포분석기를 이용하여 세포를 획득하였다.

[1465] **Jurkat-FoxP3 리포터 어세이**(BPS 바이오사이언스(Bioscience)에 따름, 카탈로그 # 60628)

[1466] **세포 배양 과정:** 5 ㎖의 미리 가온된 해동 배지 2(G418 없음)를 가진 50 ㎖ 원추형 튜브 및 T-25 배양 플라스크를 준비한다. 일정하고 느리게 교반하면서 37℃ 수조에서 세포를 빠르게 해동한다. 전체 내용물을, 해동 배지 2(G418 없음)를 함유하는 원추형 튜브로 즉시 옮기고 세포를 200 x g에서 3분 동안 원심분리한다. 세포를 6 ㎖의 미리 가온된 해동 배지 2(G418 없음)에 재현탁하고 전체 내용물을, 해동 배지 2(G418 없음)를 함유하는 T25 배양 플라스크로 옮긴다. 5% CO_2를 가진 가습된 37℃ 인큐베이터에서 세포를 인큐베이션한다. 인큐베이션한 지 48시간 후, 세포를 250 x g에서 5분 동안 원심분리하고 신선한 해동 배지 2(G418 없음)에 재현탁한다. 2일 내지 3일 동안 생장을 계속 모니터링하고 배지를 교체하여 사멸 파편을 제거한다. 다수의 세포 콜로니(덩어리)가 나타나기 시작한 후(건강한 세포 분열을 표시함) 생장 배지 2B(G418을 함유함)로 교체한다.

[1467] **어세이 프로토콜 후: (CD3/CD28)**

[1468] 1. 백색 불투명 384웰 플레이트에서, 어세이 배지(1% 페니실린/스트렙토마이신으로 보충된 RPMI 1640 배지(Thermo Fisher, 카탈로그 #A1049101))에서 약 2.5 x 10^3개 세포/웰(웰당 10 ㎕)로 Jurkat-FoxP3-루시퍼라제 리포터 세포를 인간 T 활성화제 CD3/CD28 Dynabead(Thermo Fisher, 카탈로그 번호 11161D)의 부재 및 존재(비: 1:5) 하에 배양하였다.

[1469] 2. 약물 연속 희석 범위 1 내지 60,000 nM을 만들고, 1 내지 30,000 nM의 범위를 제공할 10 ㎕의 약물을 첨가하고 부드러운 마포로 혼합한다. 일부 실험에서, 상기 범위는 10 내지 20,000 nM이다. 세포를 5% CO_2와 함께 37℃에서 약물의 존재 및 부재 하에 12시간 동안 배양하였다.

[1470] 3. 프로토콜에 따라 ONE-Step™ 루시퍼라제 어세이 시스템(BPS Bioscience, 카탈로그 #60690)을 각각의 웰에 첨가한다. 동등한 부피의 루시퍼라제 어세이 작업 용액(성분 A + 성분 B)을 각각의 웰 내의 배양 배지에 첨가한다. 예를 들어, 20 ㎕의 배양 배지를 가진 384웰 플레이트는 웰당 20 ㎕의 루시퍼라제 어세이 작업 용액을 필요로 한다.

[1471] 4. 실온에서 15분 이상 동안 플레이트를 부드럽게 흔든다. 발광계를 이용하여 반딧불이 발광을 측정한다.

[1472] 본원에 개시된 선택된 화합물의 Akt3 억제 및 활성화 활성을 각각 표 1 및 2에 나타내었다.

[1473] **인-Akt 동형체 특이성 어세이**

[1474] 인간 CD4+/CD45RA+/CD25-미감작 T 세포를 화합물의 부재 또는 존재 하에 유도 조건(IL-2/항-CD3/항-CD28 + TGFβ) 하에 72시간 동안 플레이팅하였다. 각각의 인-AKT 동형체에 대한 화합물의 특이성을 측정하기 위해, 인-AKT 세포 HTRF 키트(Cisbio 카탈로그 번호 63ADK078PEG(pAKT1), 63ADK080PEG(p-AKT2) 및 63ADK082PEG(pAKT3))를 제조사의 설명서에 따라 사용하였다. 요약하면, 상청액을 제거한 후, 세포를 용해시키고, 모든 샘플에 대해 총 단백질 농도를 측정하고 정규화하였다. 세포 용해물을 384웰 플레이트로 옮기고 Eu 크립테이트(Cryptate) 항체 + d2 항체 혼합물을 첨가하였다. 이 과정은 각각의 동형체에 대해 동일하였으나, 각각의 키트로부터의 상응하는 동형체 항체를 사용하였다. 양성 및 음성 대조군(키트와 함께 제공됨)을 각각의 실험에 포함시켰다. 플레이트를

밤새 인큐베이션하였다. TRF 형광 프로토콜에 대한 설정을 이용하여 바리오스칸 룩스(Varioskan Lux) 판독기에서 데이터 획득을 수행하였다. 데이터를 DMSO 처리 대조군에 대한 퍼센트 변화로서 제시하였다. 각각의 시험 조건을 이중으로 실행하였고, 어세이를 적어도 2회 수행하였다.

[1475] 도 6에 의해 예시된 데이터는 적어도 부분적으로 이 어세이 프로토콜을 이용함으로써 수득되었다.

[1476] **IL-10 ELISA 어세이**

[1477] 인간 CD4+/CD25+ 천연 Treg 세포를 화합물의 부재 또는 존재 하에 자극 조건(IL-2/항-CD3/항-CD28) 하에 플레이팅하였다. 인큐베이션한 지 24시간 및 48시간 후, 상청액을 모으고, 제조사 설명서(Invitrogen BMS215-2)에 따라 인간 IL-10 ELISA 키트를 사용하여 IL-10 농도를 측정하였다. 요약하면, 상청액을 미리 코팅된 96웰 ELISA 플레이트에 첨가하고 인큐베이션한 다음, 바이오틴 접합된 검출 항체 및 스트렙타비딘-HRP를 첨가하였다. 인큐베이션 후, 기질을 첨가하고, 산을 첨가하여 반응을 중단시켰다. 바리오스칸 룩스 판독기를 이용하여 450 nm에서 흡광도를 측정하였다. 알려진 농도의 IL-10(키트에 제공됨)을 사용하여 보정 곡선을 생성하고 상청액 중의 IL-10의 농도를 계산하였다. 데이터를 비처리 자극된 세포 대조군에 대한 퍼센트 변화로서 제시하였다. 각각의 시험 조건을 삼중으로 실행하였고, 어세이를 적어도 2회 수행하였다.

[1478] 도 7 및 8에 의해 예시된 데이터는 적어도 부분적으로 이 어세이 프로토콜을 이용함으로써 수득되었다.

[1479] **FoxP3 ELISA 어세이**

[1480] 인간 CD4+/CD45RA+/CD25-미감작 T 세포를 화합물의 부재 또는 존재 하에 유도 조건(IL-2/항-CD3/항-CD28 + TGFβ) 하에 72시간 동안 플레이팅하였다. 인큐베이션 후, 세포를 용해시키고 제조사 설명서(LSBio, LS-F5047)에 따라 인간 FoxP3 ELISA 키트를 사용하여 용해물에서 FoxP3 단백질을 측정하였다. 요약하면, 용해물을 미리 코팅된 96웰 ELISA 플레이트에 첨가하고 인큐베이션한 후, 바이오틴 접합된 검출 항체 및 스트렙타비딘-HRP를 첨가하였다. 인큐베이션 후, 기질을 첨가하고, 산을 첨가하여 반응을 중단시켰다. 바리오스칸 룩스 판독기를 이용하여 450 nm에서 흡광도를 측정하였다. 알려진 농도의 FoxP3(키트에 제공됨)을 사용하여 보정 곡선을 생성하고 용해물 중의 FoxP3의 농도를 계산하였다. 데이터를 화합물의 부재 하에 유도된 세포에 대한 퍼센트 변화로서 제시하였다. 각각의 시험 조건을 이중으로 실행하였고, 어세이를 적어도 2회 수행하였다.

[1481] 도 5에 의해 예시된 데이터는 적어도 부분적으로 이 어세이 프로토콜을 이용함으로써 수득되었다.

[1482] **iTreg 유도 어세이**

[1483] 분류된 인간 CD4 T 세포를 iTreg의 유도에 사용하였다. 다양한 농도의 약물의 부재 또는 존재 하에 인간 T 세포 활성화 비드(Gibco Dynabeads CD3/CD28), 100 IU/㎖의 IL2 및 5 ng/㎖의 TGF-β를 사용하였다. TGF-β가 없는 샘플을 유도에 대한 음성 대조군으로서 사용하였다. TGF-β 및 약물을 사용한 자극의 존재 하에 3일 동안 배양한 후, 게이팅 및 독성 용량의 배제를 위해 세포를 고정 가능한 생존/사멸 세포 염료(Life Technologies)로 염색하고, Foxp3 완충제 키트를 제조사 설명서(BD Bioscience)에 따라 사용하여 고정시키고 투과 가능하게 만들고, 항-Foxp3 항체로 염색하였다. 염색 후, 유세포분석기를 이용하여 세포를 획득하였다. 각각의 시험 조건을 이중으로 실행하였고, 어세이를 적어도 2회 수행하였다.

[1484] 도 1 내지 4에 의해 예시된 데이터는 적어도 부분적으로 이 어세이 프로토콜을 이용함으로써 수득되었다.

[1485] 도 1 내지 4는 항-CD3/항-CD28/IL-2/TGFβ의 존재 하에 본원에 기재된 특정 화합물로 처리된 인간 CD4 T 세포로부터의 iTreg 유도(FoxP3)의 평가를 보여준다. 도 5는 본원에 기재된 화합물 131, 24, 69, 70, 87, 90, 97 및 102로 처리된 인간 CD4 T 세포에서의 FoxP3 단백질 수준의 평가를 보여준다. 도 6은 본원에 기재된 화합물 131, 24, 69, 87, 90, 97 및 102의 Akt 동형체 특이성의 평가를 보여준다. 도 7은 항-CD3/항-CD28/IL-2 자극의 존재 하에 24시간 동안 본원에 기재된 화합물 131, 24, 69, 70, 87, 90, 97 및 102로 처리된 인간 nTreg 세포로부터의 상청액에서의 IL-10의 평가를 보여준다. 도 8은 항-CD3/항-CD28/IL-2 자극의 존재 하에 48시간 동안 본원에 기재된 화합물 131, 24, 69, 70, 87, 90, 97 및 102로 처리된 인간 nTreg 세포로부터의 상청액에서의 IL-10의 평가를 보여준다. 도 9는 본원에 기재된 화합물 131, 24, 69, 70, 87, 90, 97 및 102를 사용한 PO 치료(10 mg/kg) 후 0일째 날부터 4일째 날까지 마우스의 비장에서의 생체내 Treg 변화를 보여준다. 도 10은 본원에 기재된 화합물 131, 24, 69, 70, 87, 90, 97 및 102를 사용한 IV 치료(1 mg/kg) 후 0일째 날부터 3일째 날까지 마우스의 비장에서의 생체내 Treg 변화를 보여준다.

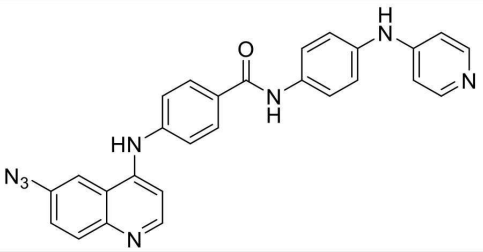
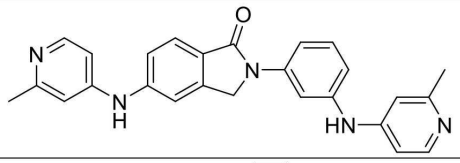
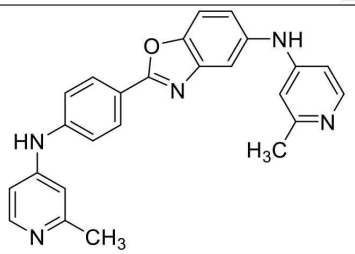
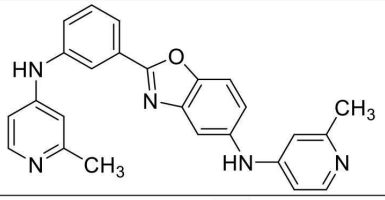
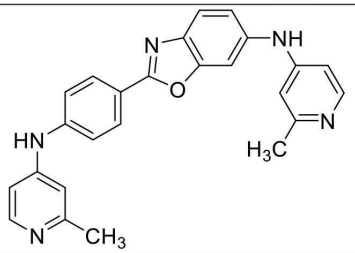
[1486] 경구 위관영양법을 통해 TC-1 종양 보유 마우스를 표시된 용량의 소분자로 치료하였다. 단일 치료 2일 후, 비장을 단리하고 유세포분석을 이용하여 Treg의 %를 평가하였다. % Treg를 비치료 대조군으로 정규화하였다. 도 11

은 화합물 131 내지 134를 사용하여 단일 경구 위관영양법으로 치료한 지 2일 후 C57/B16 마우스의 단리된 비장에서 Treg 활성화(비치료 대조군으로 정규화됨; 유세포분석에 의해 측정됨)의 평가를 보여준다. 도 12는 화합물 131, 121 및 127을 사용하여 단일 경구 위관영양법으로 치료한 지 2일 후 C57/B16 마우스의 단리된 비장에서 Treg 활성화(비치료 대조군으로 정규화됨; 유세포분석에 의해 측정됨)의 평가를 보여준다. 도 13은 치료한 지(화합물 131, 123, 126 및 129를 사용한 PO) 2일 후 C57/B16 마우스의 단리된 비장에서 Treg 활성화(비치료 대조군으로 정규화됨; 유세포분석에 의해 측정됨)의 평가를 보여준다.

[1487] 본원에 개시된 선택된 화합물의 Akt3 억제 및 활성화 활성은 각각 표 1 및 2에 표시되어 있다.

표 1

선택된 화합물의 Akt3 억제 활성

화합물 번호	구조	IC_{50} (μM)
3		< 0.5
137		< 0.5
139		<5
140		<2
141		<5

[1488]

[1489]

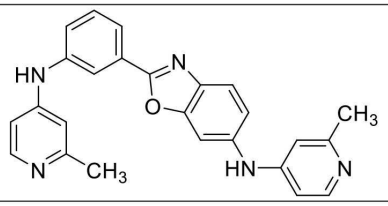
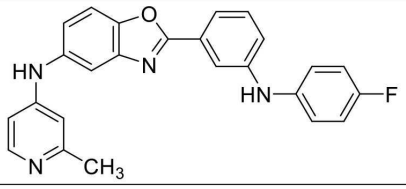
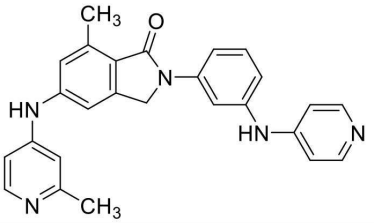
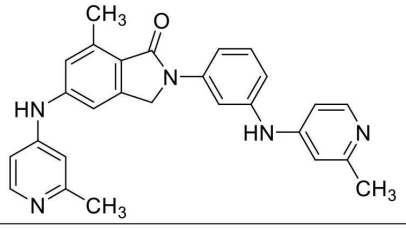
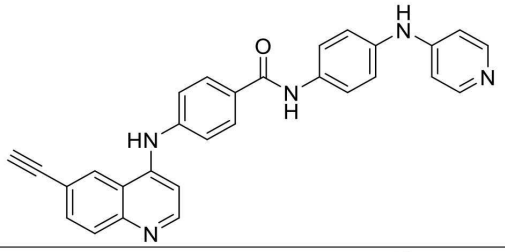
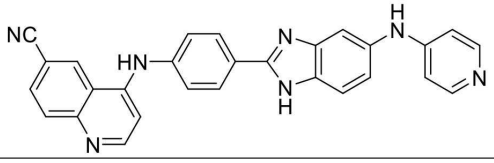
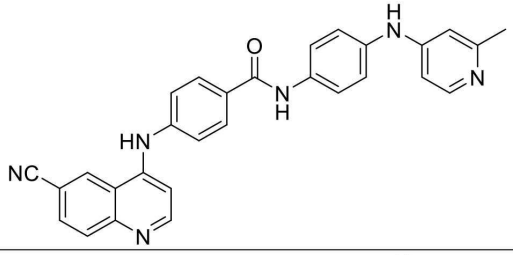
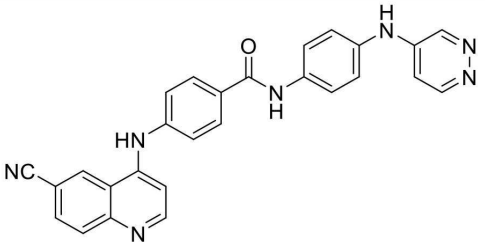
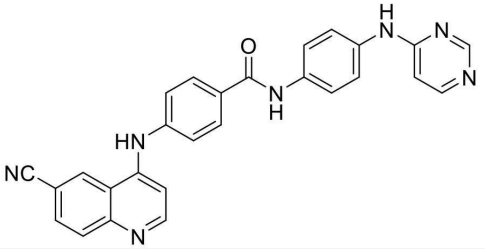
화합물 번호	구조	IC_{50} (μM)
142		<5
143		<5
144		<1
145		<1

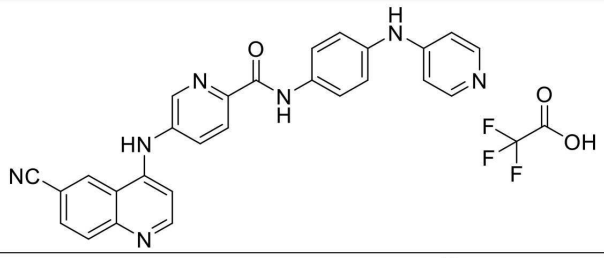
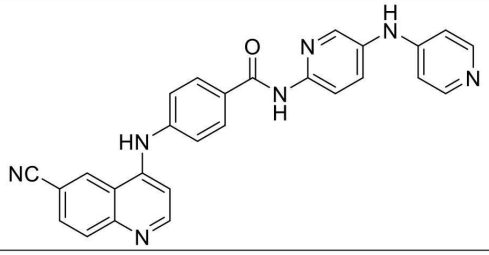
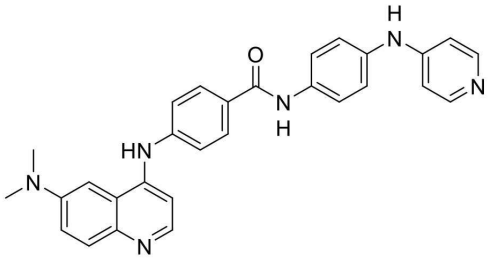
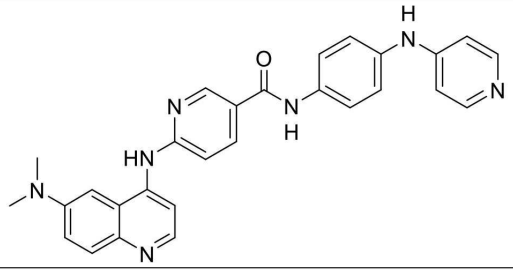
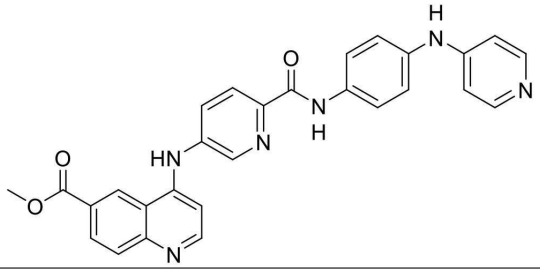
표 2

선택된 화합물의 Akt3 활성화 활성

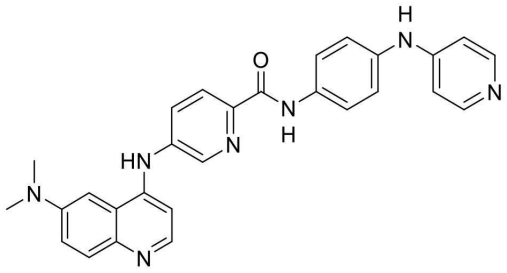
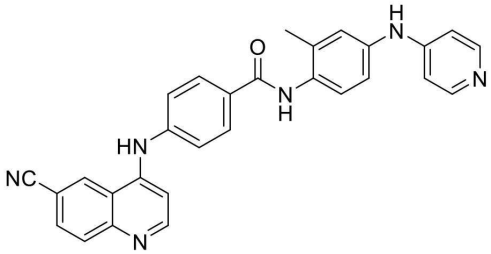
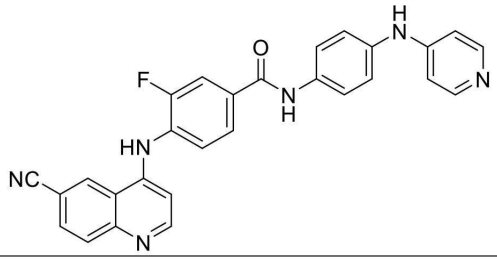
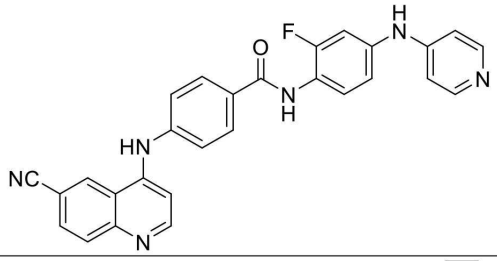
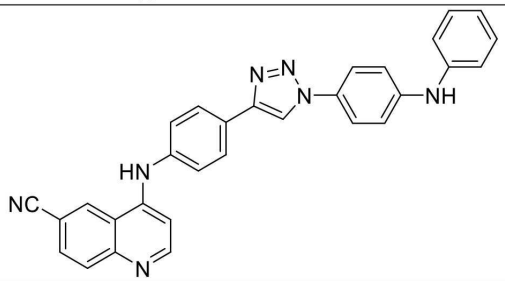
화합물 번호	구조	EC_{50} (μM)
2		< 2
4		< 5
5		< 5
6		< 5
7		< 5

[1490]

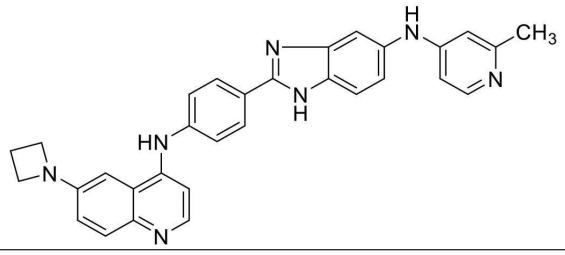
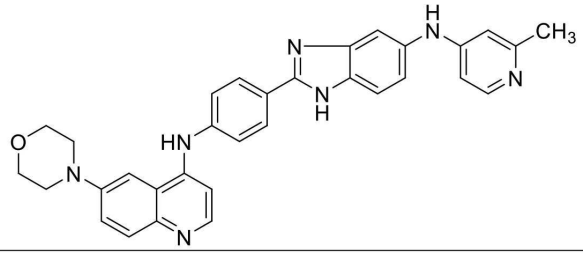
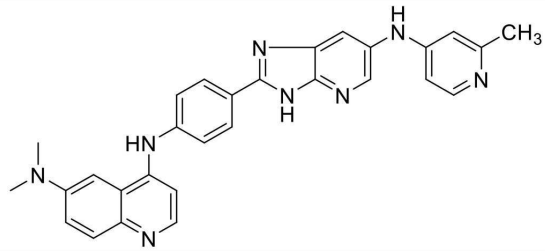
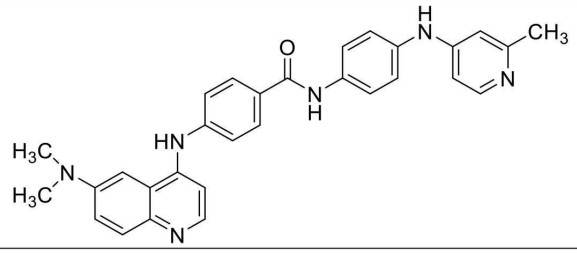
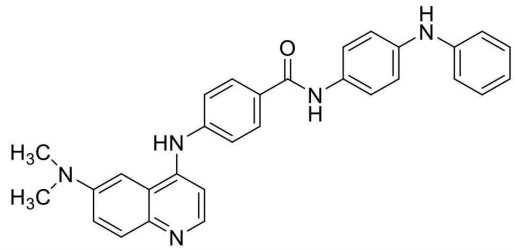
[1491]

화합물 번호	구조	EC_{50} (μM)
10		< 2
11		< 0.5
15		< 1
18		< 0.5
19		< 1

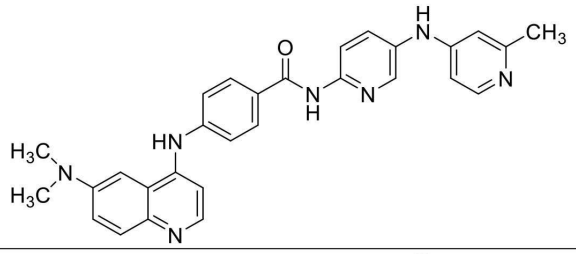
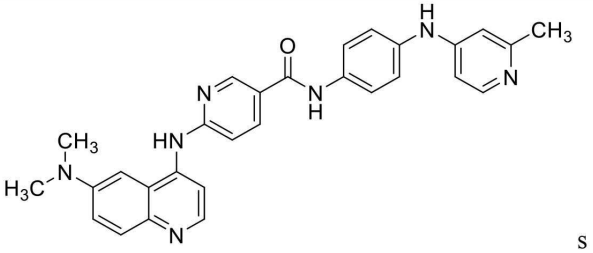
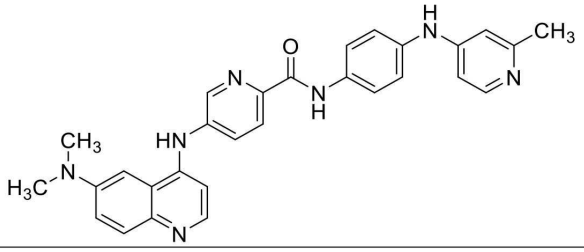
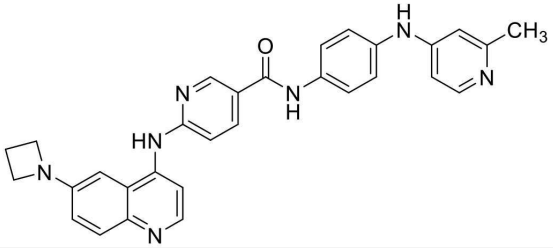
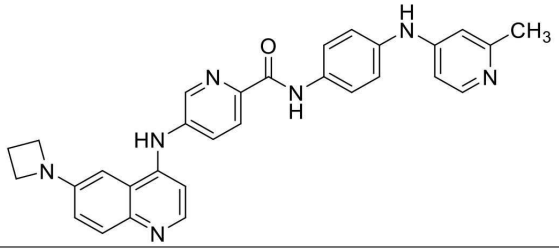
[1492]

화합물 번호	구조	EC_{50} (μM)
24		< 0.5
53		< 2
55		< 5
57		< 1
62		< 0.5

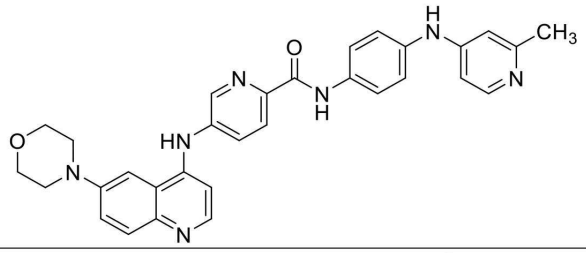
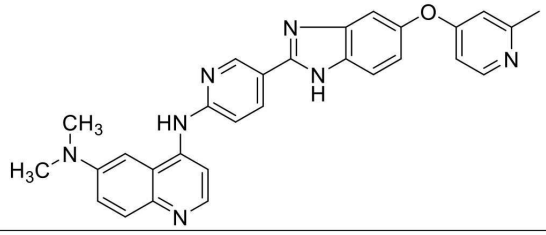
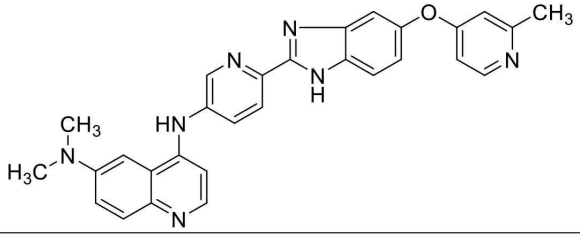
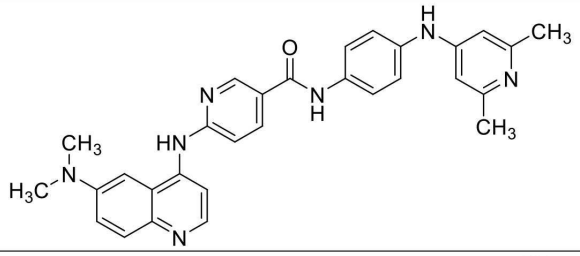
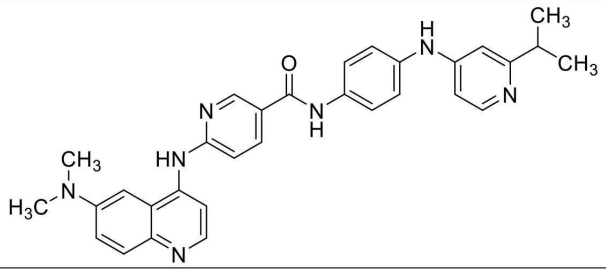
[1493]

화합물 번호	구조	EC_{50} (μM)
68		< 1
69		< 0.5
70		< 1
77		< 1
78		< 0.5

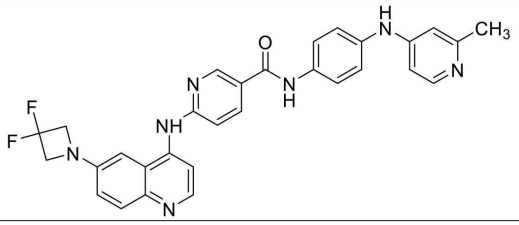
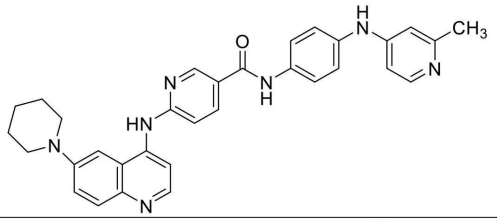
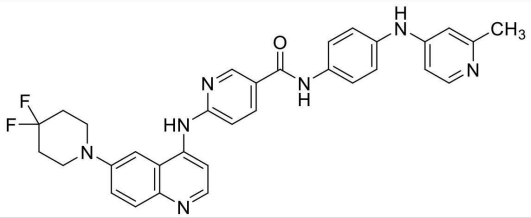
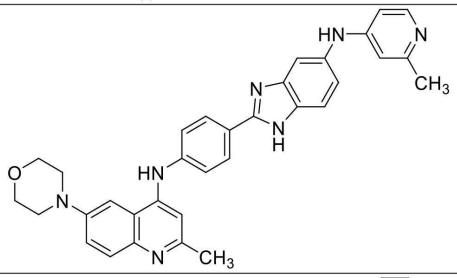
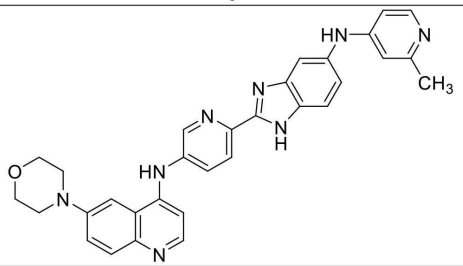
[1494]

화합물 번호	구조	EC_{50} (μM)
79		< 1
83		< 0.5
84		< 0.5
87		< 0.5
88		< 0.5

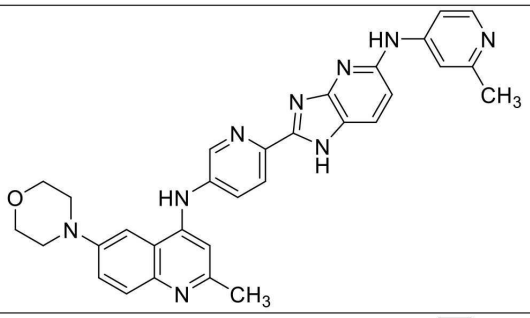
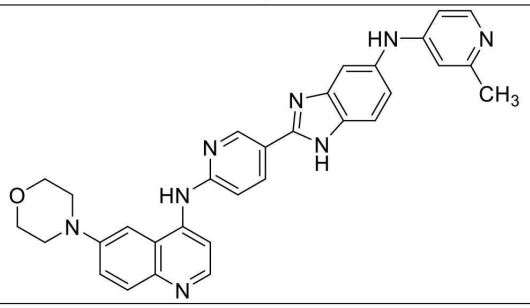
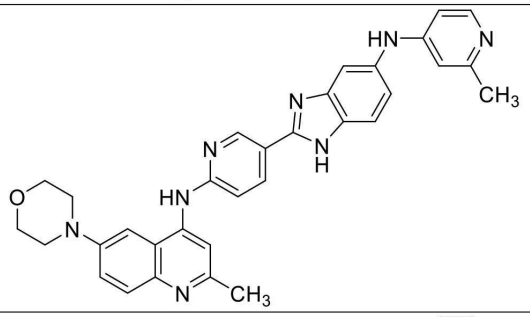
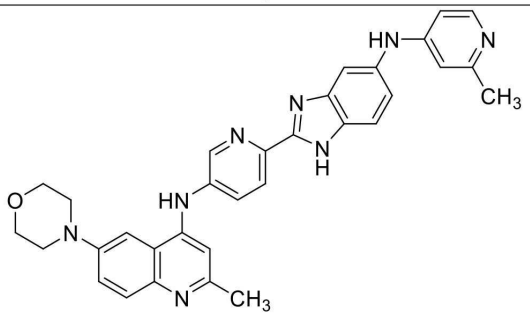
[1495]

화합물 번호	구조	EC_{50} (μM)
90		< 0.5
91		< 0.5
92		< 1
96		< 1
97		< 0.5

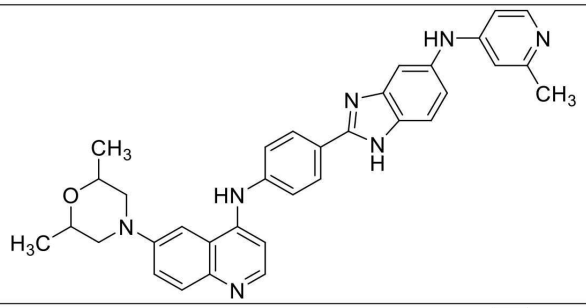
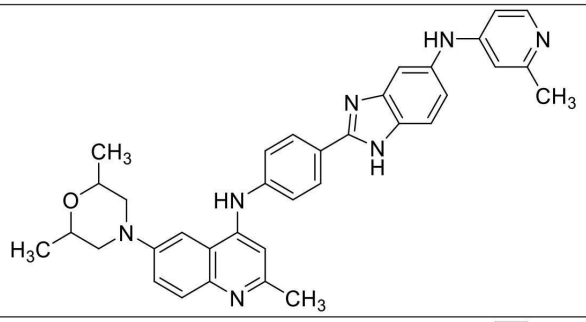
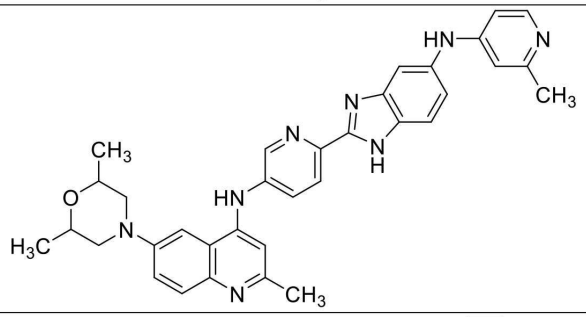
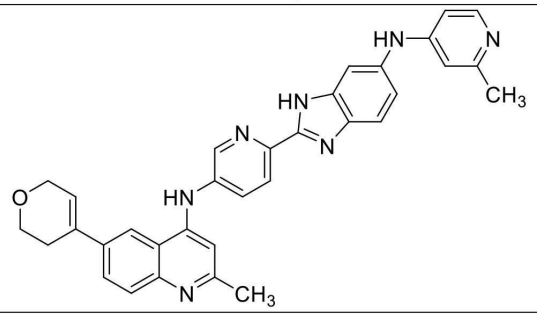
[1496]

화합물 번호	구조	EC_{50} (μM)
102		< 0.5
110		< 0.5
111		< 0.5
120		< 0.1
121		< 0.02

[1497]

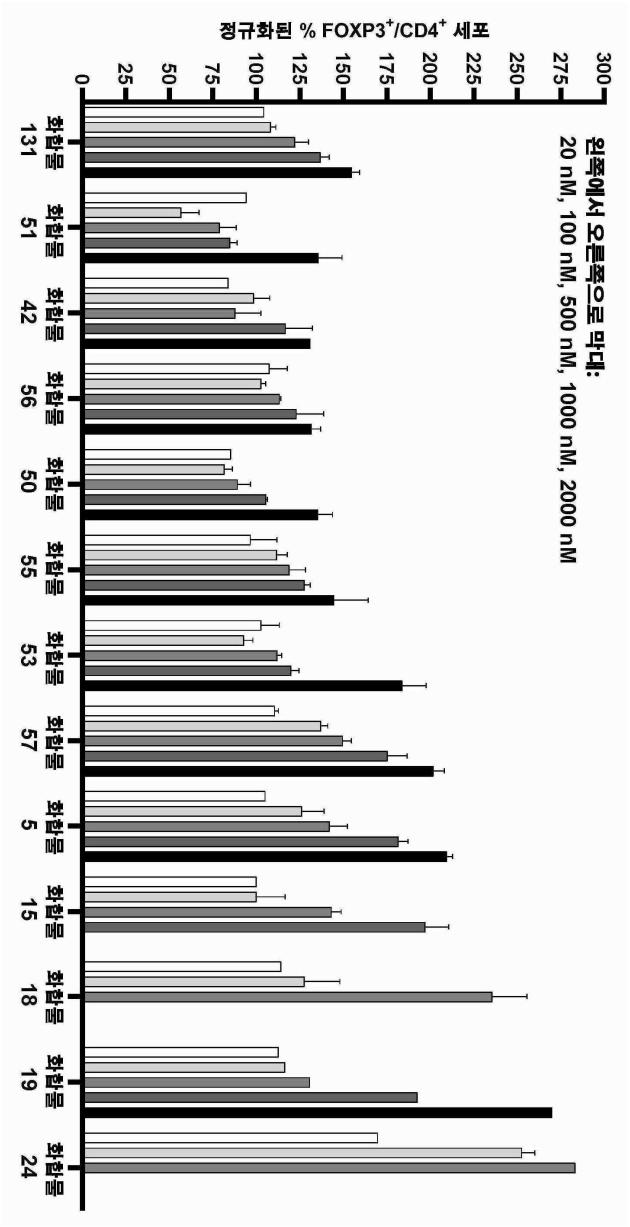
화합물 번호	구조	EC_{50} (μM)
122		< 2
123		< 0.05
125		< 0.05
126		< 0.05

[1498]

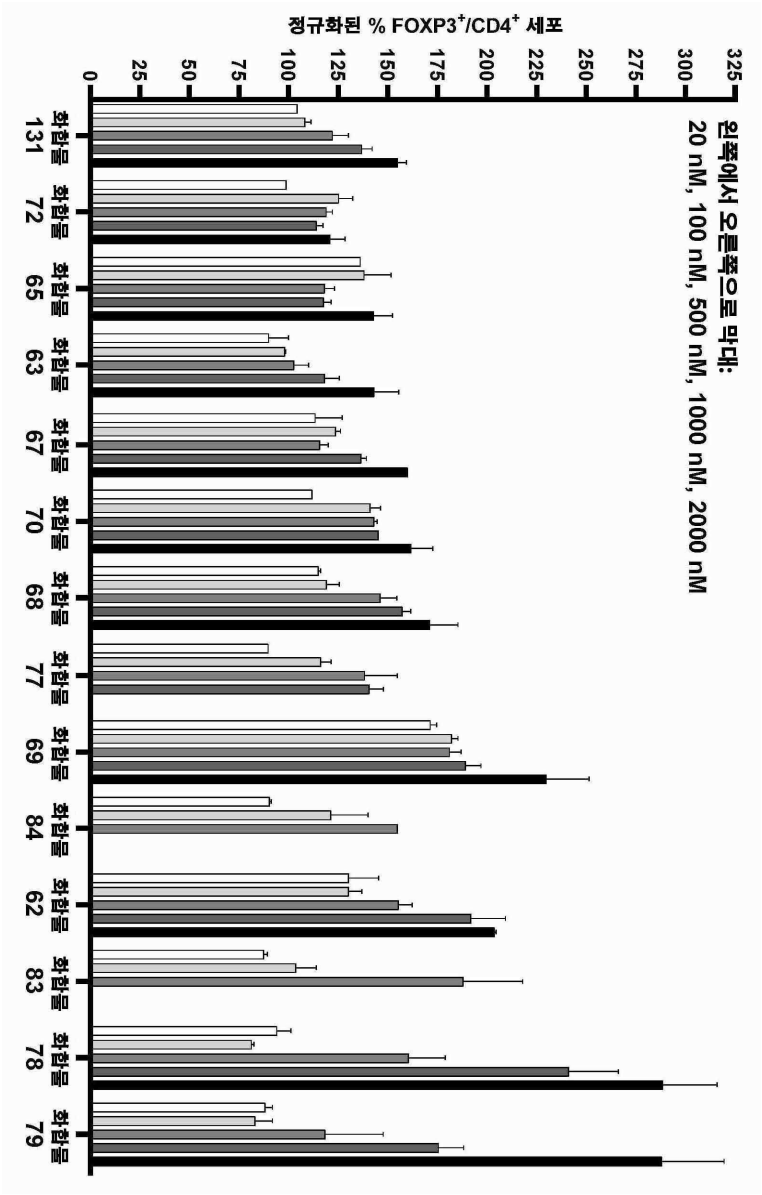
화합물 번호	구조	EC_{50} (μM)
127		< 0.02
128		< 0.05
129		< 0.05
135		< 0.5

도면

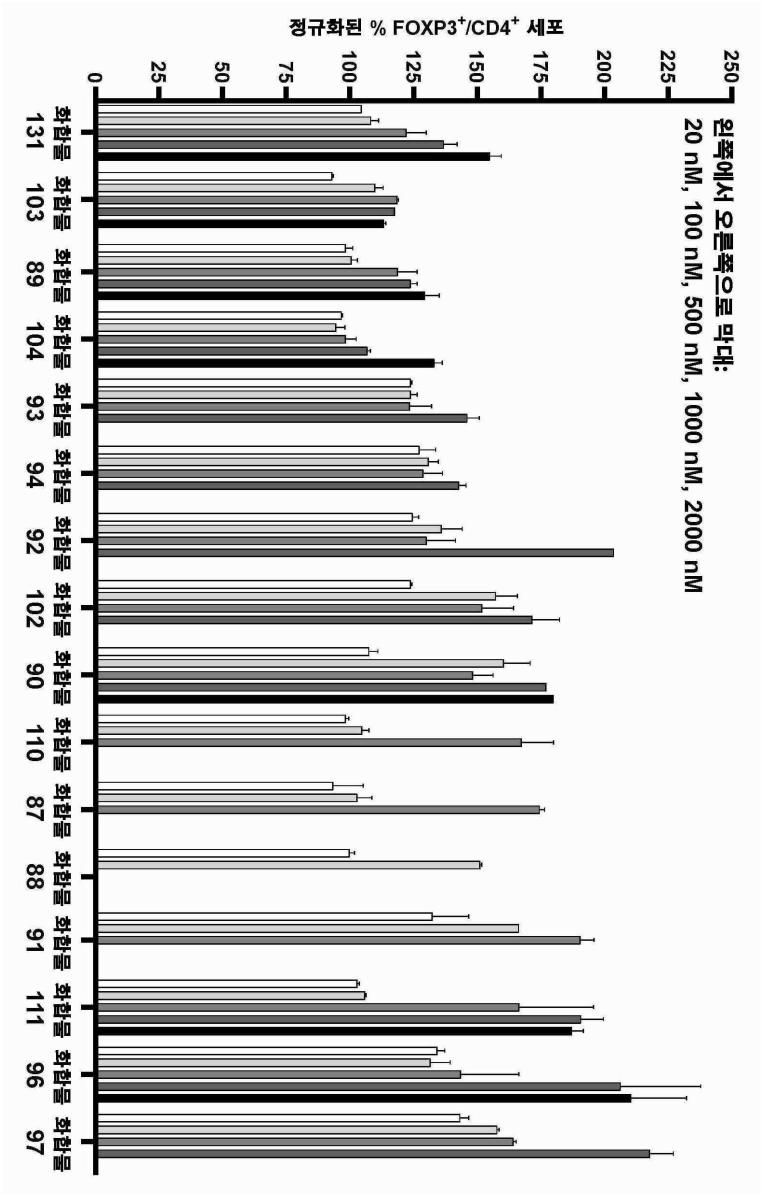
도면1


정규화된 % FOXP3+/CD4+ 세포
0
25
50
75
100
125
150
175
200
225
250
275
300
왼쪽에서 오른쪽으로 막대:
20 nM, 100 nM, 500 nM, 1000 nM, 2000 nM
화합물 131
화합물 51
화합물 42
화합물 56
화합물 50
화합물 55
화합물 53
화합물 57
화합물 5
화합물 15
화합물 18
화합물 19
화합물 24

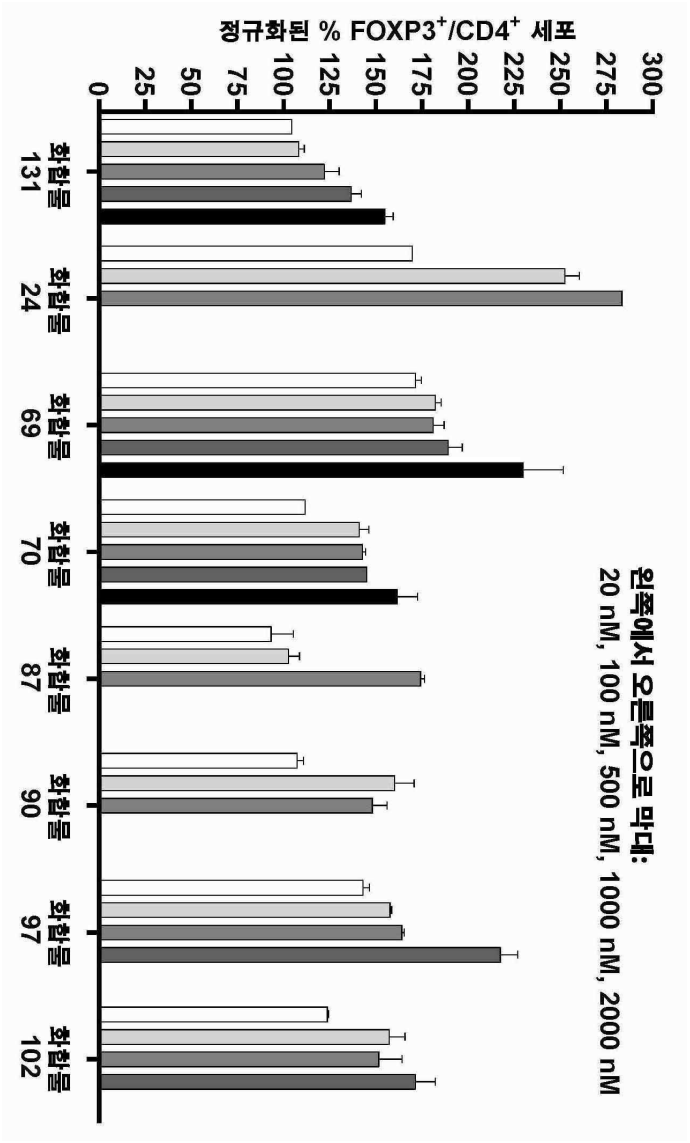
도면2


정규화된 % FOXP3+/CD4+ 세포
0
25
50
75
100
125
150
175
200
225
250
275
300
325
왼쪽에서 오른쪽으로 막대:
20 nM, 100 nM, 500 nM, 1000 nM, 2000 nM
화합물 131
화합물 72
화합물 65
화합물 63
화합물 67
화합물 70
화합물 68
화합물 77
화합물 69
화합물 84
화합물 62
화합물 83
화합물 78
화합물 79

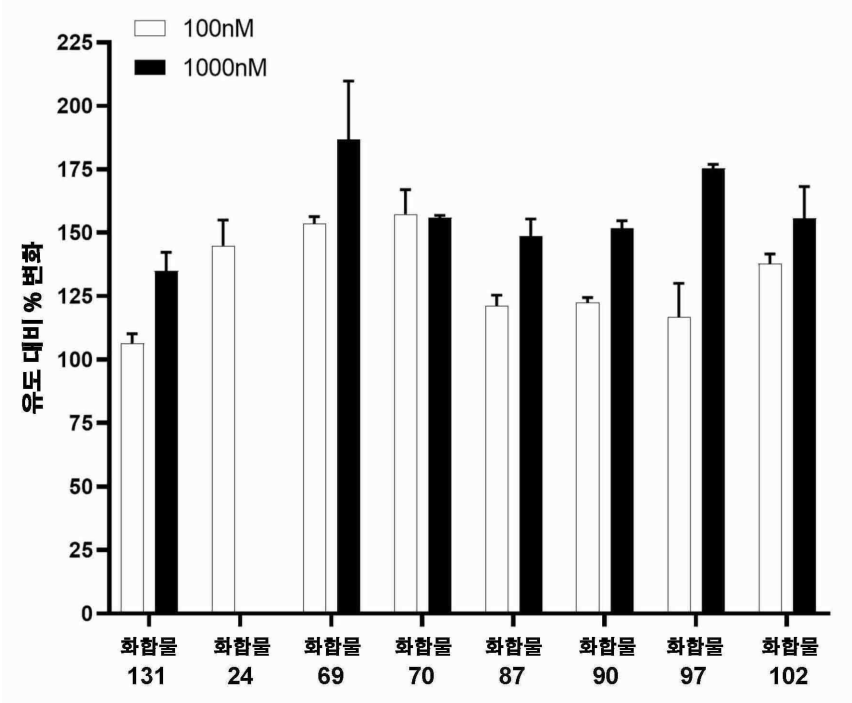
도면3


정규화된 % FOXP3+/CD4+ 세포
0
25
50
75
100
125
150
175
200
225
250
왼쪽에서 오른쪽으로 막대:
20 nM, 100 nM, 500 nM, 1000 nM, 2000 nM
화합물 131
화합물 103
화합물 89
화합물 104
화합물 93
화합물 94
화합물 92
화합물 102
화합물 90
화합물 110
화합물 87
화합물 88
화합물 91
화합물 111
화합물 96
화합물 97

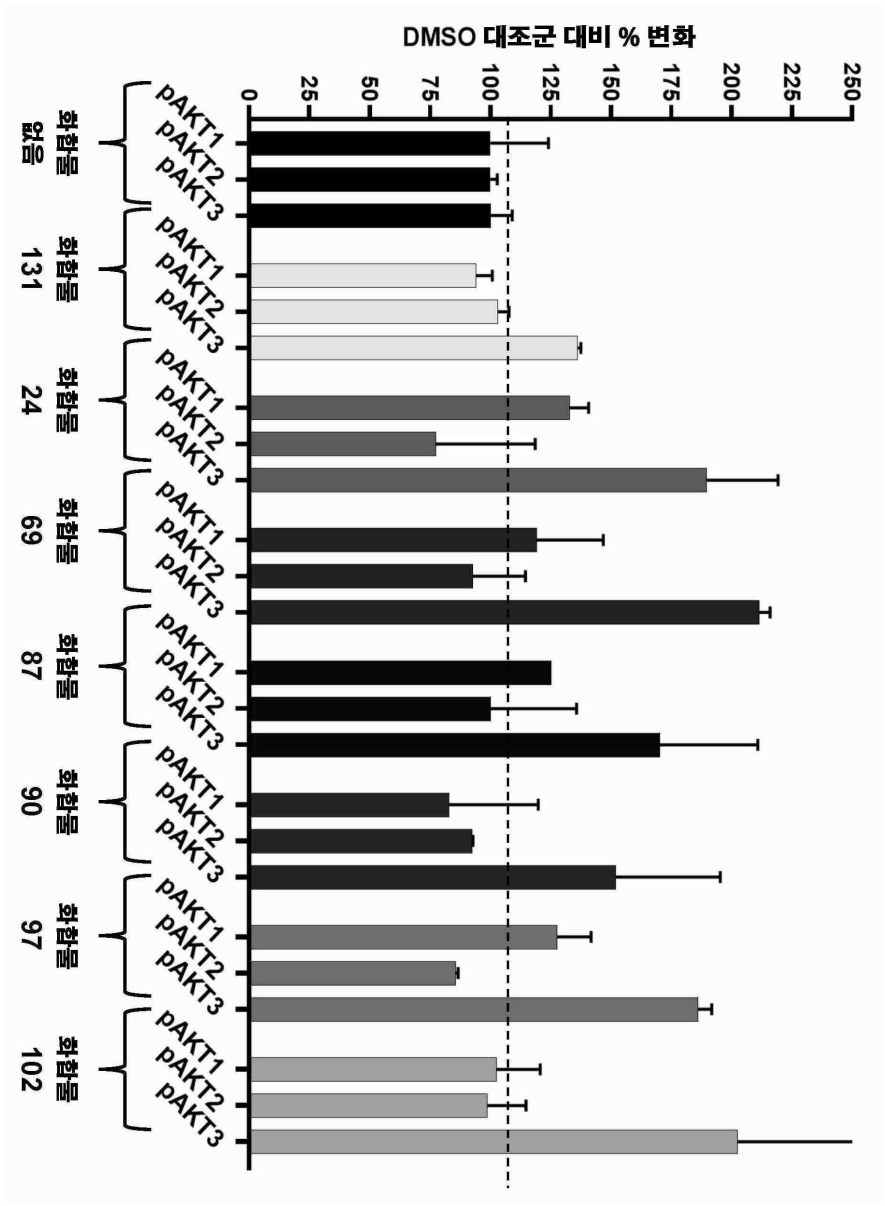
도면4


정규화된 % FOXP3+/CD4+ 세포
0
25
50
75
100
125
150
175
200
225
250
275
300
화합물 131
화합물 24
화합물 69
화합물 70
화합물 87
화합물 90
화합물 97
화합물 102
왼쪽에서 오른쪽으로 막대:
20 nM, 100 nM, 500 nM, 1000 nM, 2000 nM

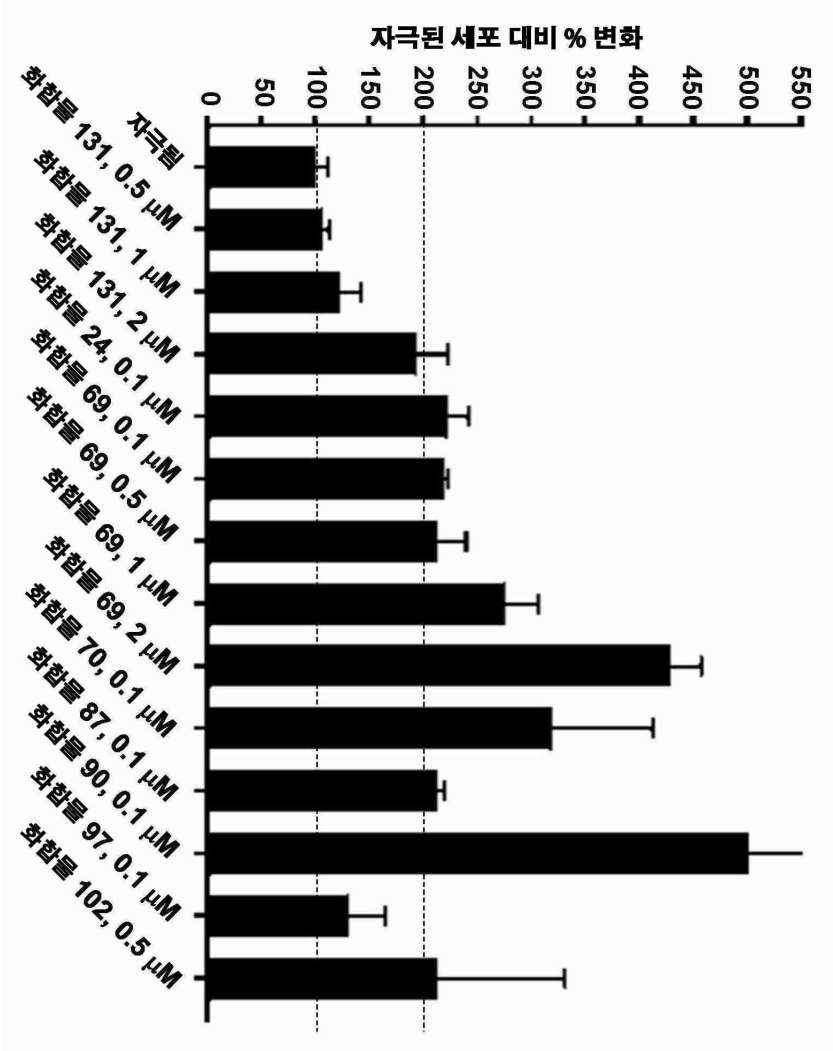
도면5


100nM
1000nM
225
200
175
150
125
100
75
50
25
0
유도 대비 % 변화
화합물 131
화합물 24
화합물 69
화합물 70
화합물 87
화합물 90
화합물 97
화합물 102

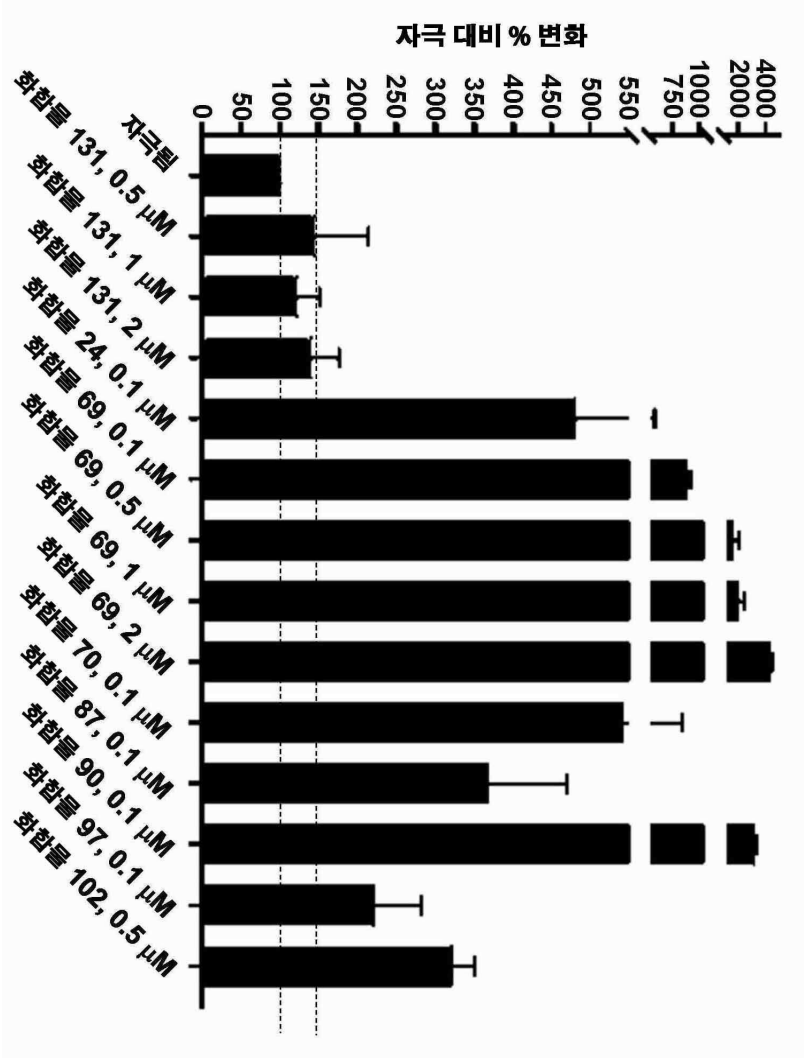
도면6


DMSO 대조군 대비 % 변화
0
25
50
75
100
125
150
175
200
225
250
pAKT1
pAKT2
pAKT3
화합물 없음
화합물 131
화합물 24
화합물 69
화합물 87
화합물 90
화합물 97
화합물 102

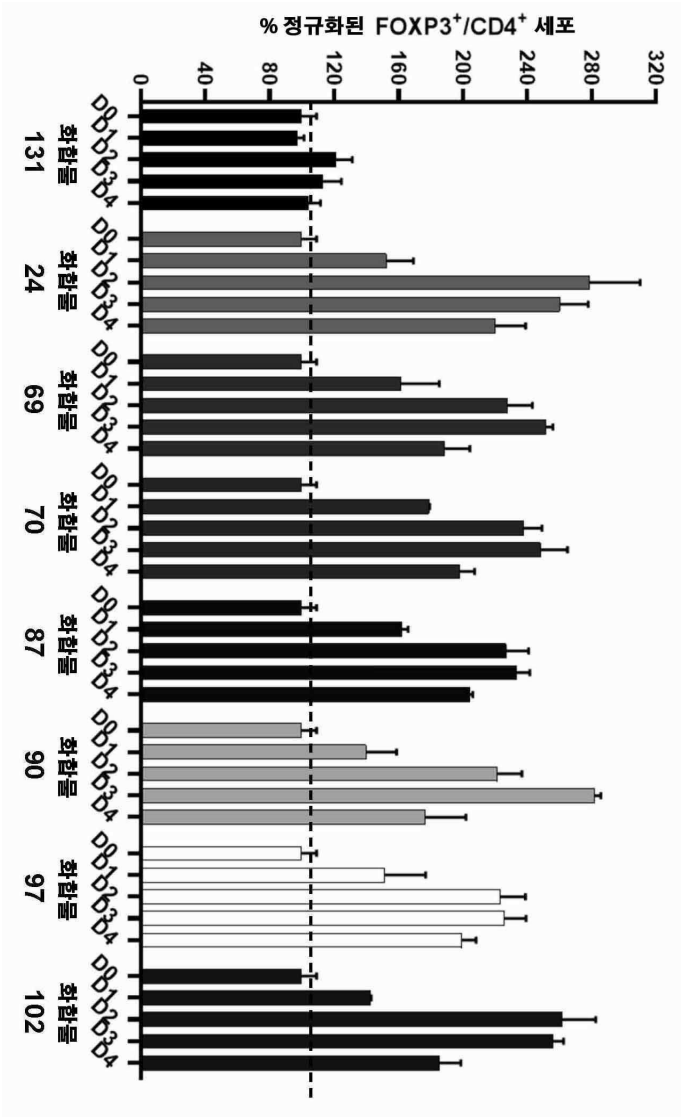
도면7


자극된 세포 대비 % 변화
0
50
100
150
200
250
300
350
400
450
500
550
자극됨
화합물 131, 0.5 μM
화합물 131, 1 μM
화합물 131, 2 μM
화합물 24, 0.1 μM
화합물 69, 0.1 μM
화합물 69, 0.5 μM
화합물 69, 1 μM
화합물 69, 2 μM
화합물 70, 0.1 μM
화합물 87, 0.1 μM
화합물 90, 0.1 μM
화합물 97, 0.1 μM
화합물 102, 0.5 μM

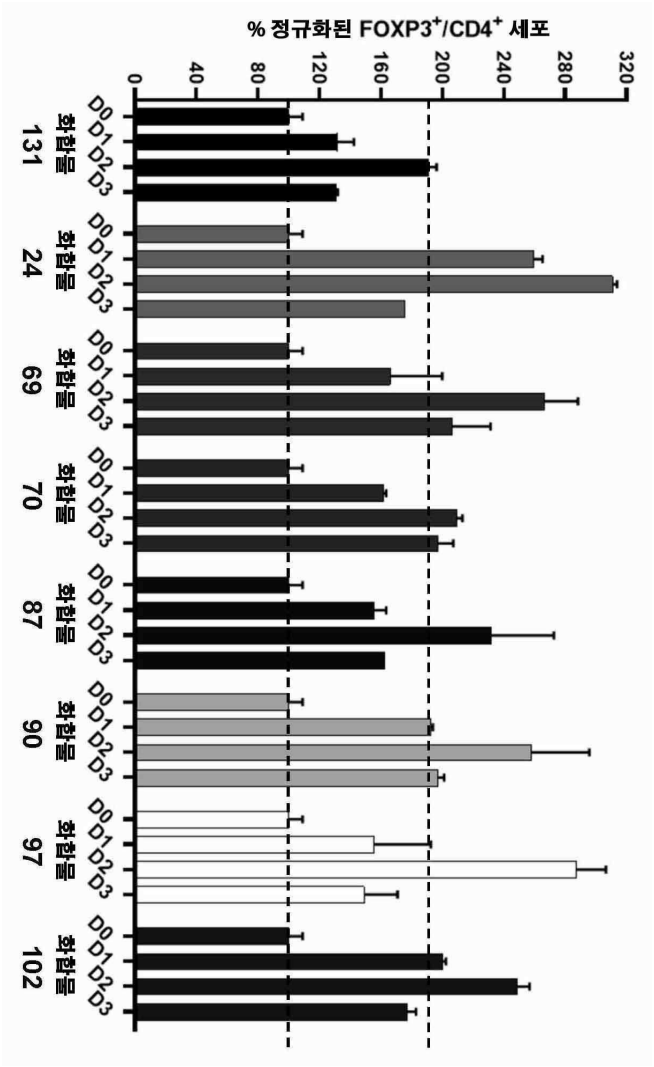
도면8


자극 대비 % 변화
0
50
100
150
200
250
300
350
400
450
500
550
750
1000
2000
4000
자극물
화합물 131, 0.5 μM
화합물 131, 1 μM
화합물 131, 2 μM
화합물 24, 0.1 μM
화합물 69, 0.1 μM
화합물 69, 0.5 μM
화합물 69, 1 μM
화합물 69, 2 μM
화합물 70, 0.1 μM
화합물 87, 0.1 μM
화합물 90, 0.1 μM
화합물 97, 0.1 μM
화합물 102, 0.5 μM

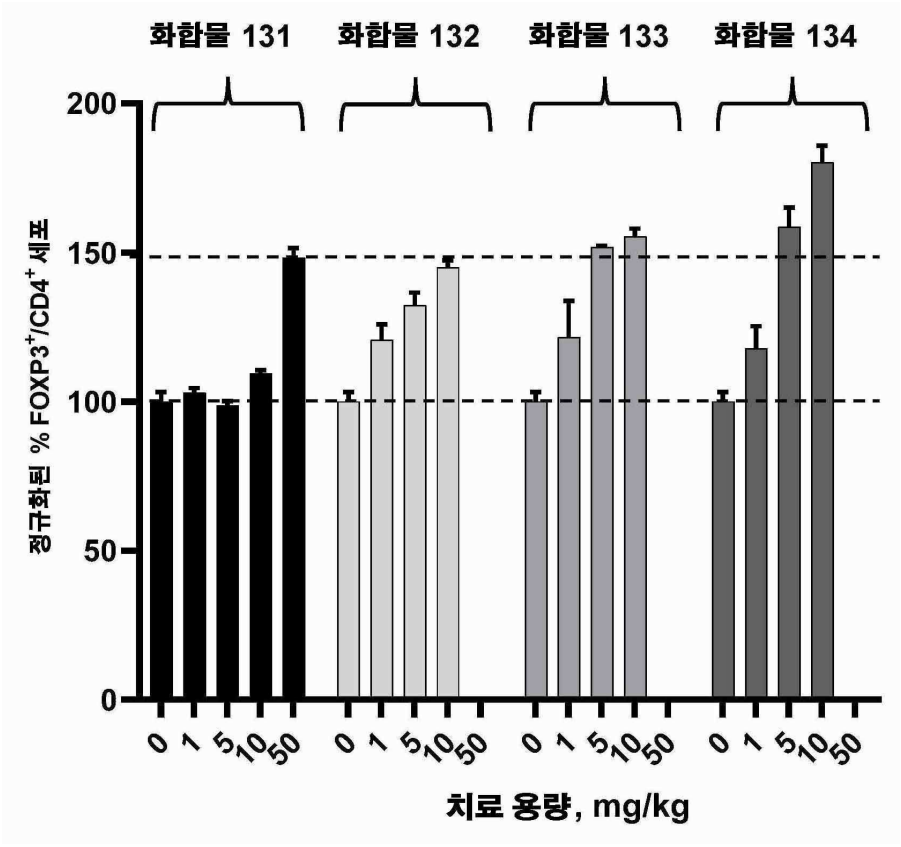
도면9


% 정규화된 FOXP3+/CD4+ 세포
0
40
80
120
160
200
240
280
320
화합물
131
24
69
70
87
90
97
102

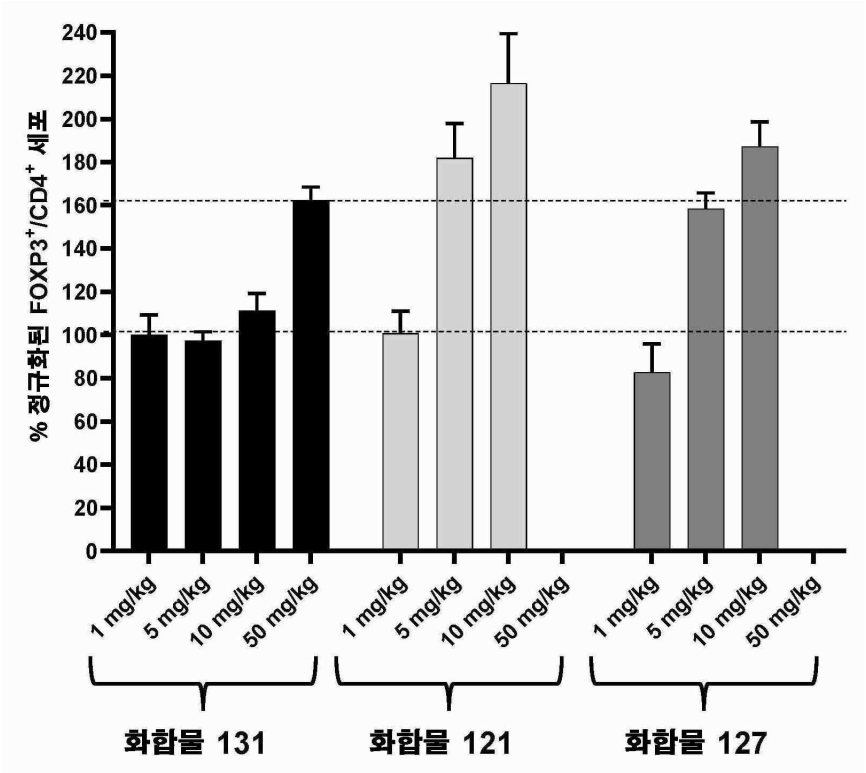
도면10


% 정규화된 FOXP3+/CD4+ 세포
0
40
80
120
160
200
240
280
320
D0
D1
D2
D3
화합물
131
24
69
70
87
90
97
102

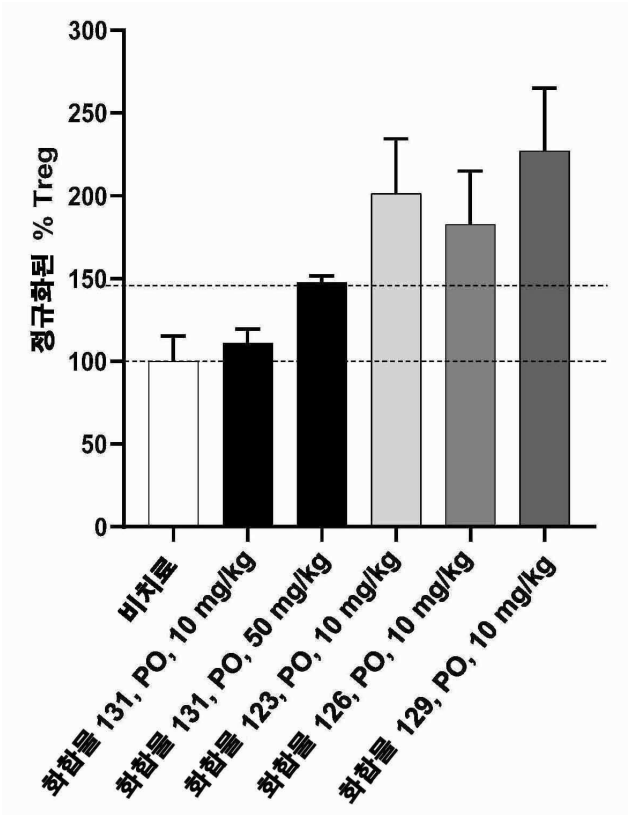
도면11


화합물 131
화합물 132
화합물 133
화합물 134
200
150
100
50
0
정규화된 % FOXP3+/CD4+ 세포
0 1 5 10 50
치료 용량, mg/kg

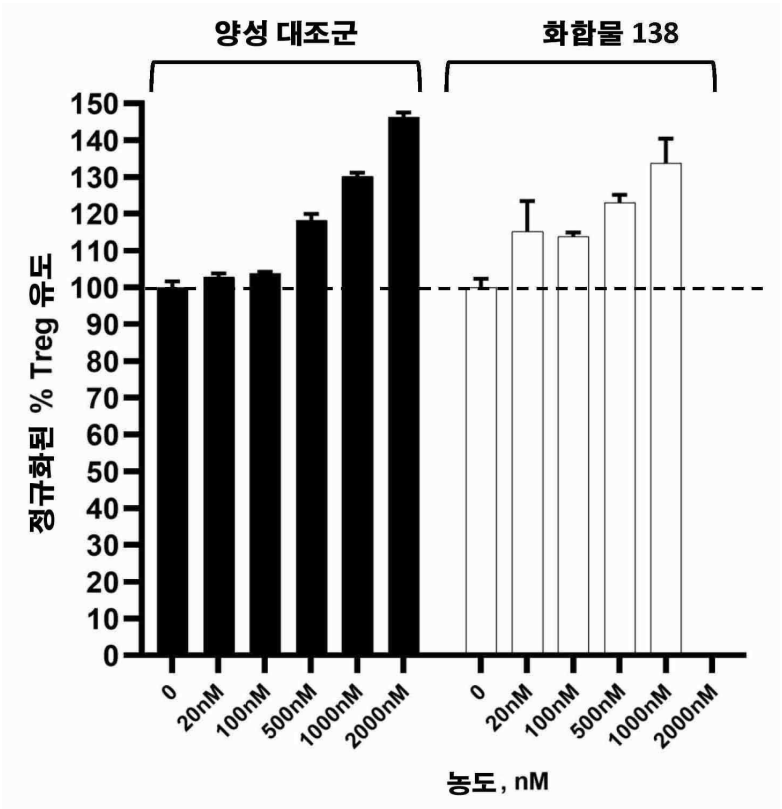
도면12


240
220
200
180
160
140
120
100
80
60
40
20
0
% 정규화된 FOXP3+/CD4+ 세포
1 mg/kg
5 mg/kg
10 mg/kg
50 mg/kg
화합물 131
화합물 121
화합물 127

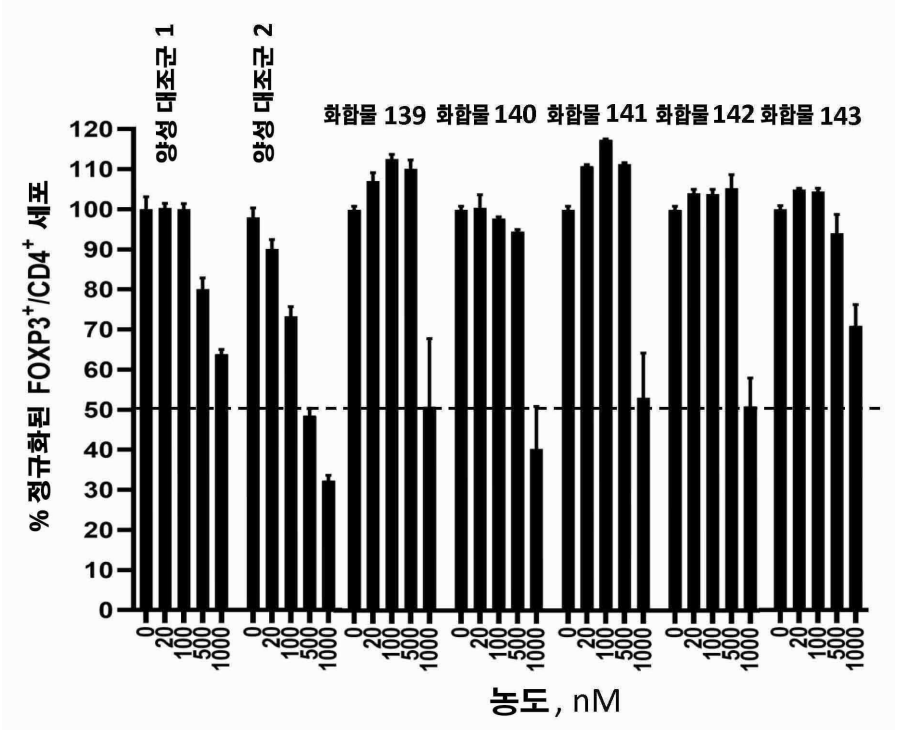
도면13


정규화된 % Treg
300
250
200
150
100
50
0
비처료
화합물 131, PO, 10 mg/kg
화합물 131, PO, 50 mg/kg
화합물 123, PO, 10 mg/kg
화합물 126, PO, 10 mg/kg
화합물 129, PO, 10 mg/kg

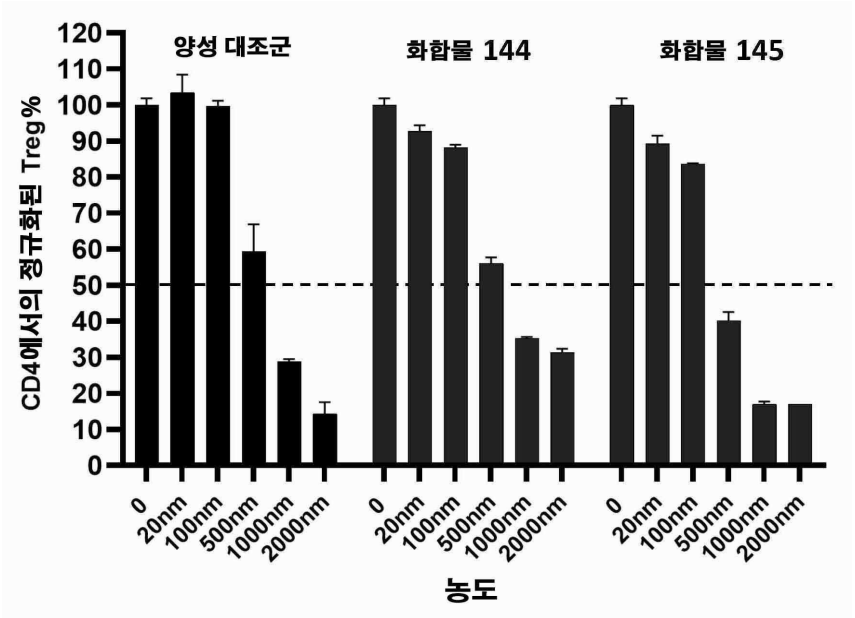
도면14


양성 대조군
화합물 138
정규화된 % Treg 유도
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
20nM
100nM
500nM
1000nM
2000nM
농도, nM

도면15


양성 대조군 1
양성 대조군 2
화합물 139
화합물 140
화합물 141
화합물 142
화합물 143
% 정규화된 FOXP3+/CD4+ 세포
120
110
100
90
80
70
60
50
40
30
20
10
0
0
20
100
500
1000
농도, nM

도면16


양성 대조군
화합물 144
화합물 145
CD4에서의 정규화된 Treg %
120
110
100
90
80
70
60
50
40
30
20
10
0
0
20nm
100nm
500nm
1000nm
2000nm
농도

서 열 목 록 (첨부)



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