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(54) 발명의 명칭 **피롤로[2,1-f][1,2,4]트리아진 및 그의 제조 및 용도**

(57) 요 약

다양한 질병 및 병리학을 치료하기 위한 피롤로[2,1-f][1,2,4]트리아진 화합물이 개시되어 있다. 보다 구체적으로, 본 개시내용은 DYRK1A의 과발현을 특징으로 하는 장애(예를 들어, 암, 다운 증후군, 알츠하이머병, 당뇨병, 바이러스 감염 및 골관절염)의 치료에 있어서 피롤로[2,1-f][1,2,4]트리아진 화합물 또는 이의 유사체의 용도에 관한 것이다.

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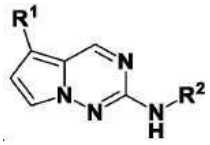
명 세 서

청구범위

청구항 1

식 I의 화합물, 또는 그의 약제학적으로 허용가능한 염:



I

여기서:

R^1은 헤테로아릴 1-10 R^3로 임의로 치환되고;

R^2은 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-5} 알킬렌)$_p$OR^4, 1-10 R^5로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, 1-10 R^6로 임의로 치환된 -헤테로아릴, 및 1-12 R^7로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

각각의 R^3는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-5} 알킬렌)$_p$OR^8, -(C_{1-5} 알킬렌)CN, 1-10 R^9로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, 1-12 R^{10}로 임의로 치환된 -카르보사이클릴, 1-10 R^{19}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로아릴, -(C_{1-5} 알킬렌)$_p$C(=O)N(R^{11})$_2$, 및 -C(=O)R^{12}로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

각각의 R^4는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^5는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-10 R^{15}로 임의로 치환된 -헤테로사이클릴, -(C_{1-5} 알킬렌)$_p$OR^{20}, -SO_2R^{22}, 및 -C(=O)R^{23}로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

대안적으로, 동일한 탄소 원자에 부착된 2개의 R^5는 함께 카르보닐 기를 형성하고;

각각의 R^6는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -OMe로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^7는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -N(R^{13})$_2$, -(C_{1-5} 알킬렌)$_p$OR^{14}, 1-10 R^{15}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, -C(=O)R^{21}, 및 -NH(=O)R^{22}로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

각각의 R^8는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^9는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{10}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{11}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-12 R^{16}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴, 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴, 및 1-10 R^{18}로 임의로 치환된 -헤테로아릴로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

각각의 R^{12}은 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴;

각각의 R^{13}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{14}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -(C_{1-5} 알킬렌)$_p$$OR^{20}$로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{15}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

대안적으로, 동일한 탄소 원자에 부착된 2개의 R^{15}는 함께 카르보닐 기를 형성하고;

각각의 R^{16}는 할라이드, -OMe, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{17}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{18}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{19}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{20}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{21}는 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴, -$N(R^{11})_2$ 및 -OR^{20}로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{22}는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9}

할로알킬), 및 -(C_{1-5} 알킬렌)$_p$OR^{20}로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 R^{23}는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 1-12 R^{24}로 임의로 치환된 -카르보사이클릴로 이루어진 그룹으로부터 독립적으로 선택되고;

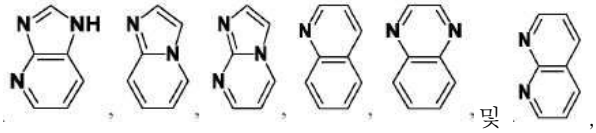
각각의 R^{24}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

각각의 p는 독립적으로 0 또는 1; 및

여기서 각각의 H 원자는 임의로, 독립적으로 ^{2}H (D) (중수소)로 대체된다.

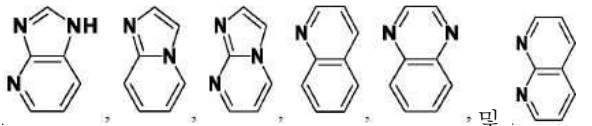
청구항 2

제1항에 있어서, R^{1}은 다음으로 이루어진 그룹으로부터 선택되는 화합물:


및 , 1-10 R^{3}로 임의로 치환됨.

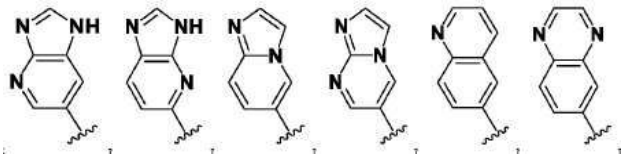
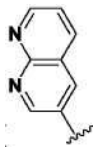
청구항 3

제1-2항 중 어느 한 항에 있어서, R^{1}은 다음으로 이루어진 그룹으로부터 선택되는 화합물:


및 , 1-3 R^{3}로 임의로 치환됨.

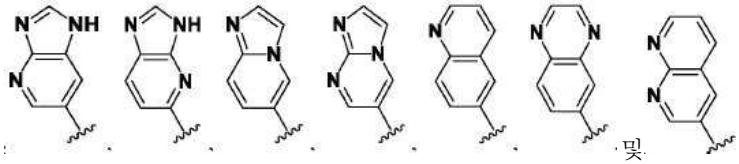
청구항 4

제1-3항 중 어느 한 항에 있어서, R^{1}은 다음으로 이루어진 그룹으로부터 선택되는 화합물:


및 , 1-3 R^{3}로 임의로 치환됨.

청구항 5

제1-4항 중 어느 한 항에 있어서, R^{1}은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

비치환된 
및 .

청구항 6

제1-4항 중 어느 한 항에 있어서, R^{3}은 할라이드, 비치환된 -(C_{1-4} 알킬), 비치환된 -(C_{1-4} 할로알킬), 1-3 R^{9}로 임의로 치환된 -헤테로사이클릴, 및 1-3 R^{10}로 임의로 치환된 -카르보사이클릴로 이루어진 그룹으로부터 선택되

는 화합물.

청구항 7

제1-6 항 중 어느 한 항에 있어서, R^2은 비치환된 -(C_{1-5} 알킬), 비치환된 -(C_{1-5} 할로알킬), 1-3 R^5로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$헤테로사이클릴, 및 1-3 R^7로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-2 할라이드로 임의로 치환되는 화합물.

청구항 8

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

5-(이미다조[1,2-a]피리딘-6-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [1];

5-(이미다조[1,2-a]피리딘-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [2];

N-(2-플루오로-2-메틸프로필)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [3];

N-(2,2-디플루오로프로필)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [4];

5-(이미다조[1,2-a]피리딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [5];

(R)-5-(이미다조[1,2-a]피리딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [6];

5-(이미다조[1,2-a]피리딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [7];

5-(이미다조[1,2-a]피리딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [8];

5-(이미다조[1,2-a]피리딘-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [9];

(R)-5-(이미다조[1,2-a]피리딘-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [10];

5-(이미다조[1,2-a]피리딘-6-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [11];

5-(이미다조[1,2-a]피리딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [12];

5-(이미다조[1,2-a]피리딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [13];

N-((1-플루오로사이클로부틸)메틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [14];

N-((3-플루오로옥세탄-3-일)메틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [15];

N-(사이클로프로필메틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [16];

(S)-N-(1-사이클로프로필에틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [17];

(R)-N-(1-사이클로프로필에틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [18];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [19];

5-(이미다조[1,2-a]피리딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [20];

5-(이미다조[1,2-a]피리딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [21];

N-사이클로부틸-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [22];

N-(3,3-디플루오로사이클로부틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [23];

N-(3,3-디메틸사이클로부틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [24];

3-((5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [25];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [26];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [27];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [28];

N-(*cis*-3-에톡시사이클로부틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [29];

N-(*trans*-3-에톡시사이클로부틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [30];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [31];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [32];

cis-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [33];

trans-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [34];

cis-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [35];

trans-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [36];

cis-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [37];

trans-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [38];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [39];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [40];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [41];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [42];

N-(4,4-디플루오로사이클로헥실)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [43];

cis-4-((5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [44];

(1s,4s)-4-((5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [45];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [46];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [47];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [48];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [49];

N-(*cis*-4-에톡시사이클로헥실)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [50];

N-(*trans*-4-에톡시사이클로헥실)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [51];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [52];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [53];

cis-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [54];

trans-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [55];

cis-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [56];

trans-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [57];

cis-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [58];

trans-N^1-(5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [59];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [60];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [61];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [62];

5-(이미다조[1,2-a]피리딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [63];

5-(이미다조[1,2-a]피리딘-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [64];

5-(이미다조[1,2-a]피리딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [65];

5-(이미다조[1,2-a]피리딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [66];

5-(이미다조[1,2-a]피리딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [67];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [68];

5-(이미다조[1,2-a]피리딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [69];

5-(이미다조[1,2-a]피리딘-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [70];

5-(이미다조[1,2-a]피리딘-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [71];

(6-(2-(iso프로필아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [72];

(6-(2-(이소부틸아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [73];

(6-(2-((2-플루오로-2-메틸프로필)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [74];

(6-(2-((2,2-디플루오로프로필)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [75];

피롤리딘-1-일(6-(2-((2,2,2-트리플루오로에틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)메탄온 [76];

(R)-피롤리딘-1-일(6-(2-((1,1,1-트리플루오로프로판-2-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)메탄온 [77];

피롤리딘-1-일(6-(2-((3,3,3-트리플루오로프로필)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)메탄온 [78];

피롤리딘-1-일(6-(2-((3,3,3-트리플루오로-2,2-디메틸프로필)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)메탄온 [79];

(6-(2-((2-메톡시에틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [80];

(R)-(6-(2-((1-메톡시프로판-2-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [81];

(6-(2-((2-이소프로폭시에틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [82];

(6-(2-(((1-메틸사이클로프로필)메틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [83];

피롤리딘-1-일(6-(2-(((1-(트리플루오로메틸)사이클로프로필)메틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)메탄온 [84];

(6-(2-(((1-플루오로사이클로부틸)메틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [85];

(6-(2-(((3-플루오로옥세탄-3-일)메틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [86];

(6-(2-((사이클로프로필메틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [87];

(S)-(6-(2-((1-사이클로프로필에틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [88];

(R)-(6-(2-((1-사이클로프로필에틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [89];

(6-(2-((2-사이클로프로필-2,2-디플루오로에틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [90];

(6-(2-((옥세탄-3-일메틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [91];

피롤리딘-1-일(6-(2-(((테트라히드로푸란-2-일)메틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)메탄온 [92];

(6-(2-(사이클로부틸아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [93];

(6-(2-((3,3-디플루오로사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [94];

(6-(2-((3,3-디메틸사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [95];

(6-(2-((3-히드록시-3-메틸사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [96];

(6-(2-((*cis*-3-메톡시사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [97];

(6-(2-((*trans*-3-메톡시사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [98];

(6-(2-((*trans*-3-(메톡시메틸)사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [99]; 및

(6-(2-((*cis*-3-에톡시사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [100]; 또는 그의 약제학적으로 허용가능한 염.

청구항 9

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

(6-(2-((*trans*-3-에톡시사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [101];

(6-(2-((*cis*-3-(2-메톡시에톡시)사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [102];

(6-(2-((*trans*-3-(2-메톡시에톡시)사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [103];

(6-(2-((*cis*-3-아미노사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [104];

(6-(2-((*trans*-3-아미노사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [105];

(6-(2-((*cis*-3-(메틸아미노)사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [106];

(6-(2-((*trans*-3-(메틸아미노)사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [107];

(6-(2-((*cis*-3-(디메틸아미노)사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [108];

(6-(2-((*trans*-3-(디메틸아미노)사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [109];

(6-(2-((*cis*-3-모르폴리노사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [110];

(6-(2-((*trans*-3-모르폴리노사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [111];

(6-(2-((*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [112];

(6-(2-((*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2

-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [113];

(6-(2-((4,4-디플루오로사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [114];

(6-(2-((*cis*-4-히드록시사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [115];

(6-(2-(((1s,4s)-4-히드록시-4-메틸사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [116];

(6-(2-((*cis*-4-메톡시사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [117];

(6-(2-((*trans*-4-메톡시사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [118];

(6-(2-((*cis*-4-(디플루오로메톡시)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [119];

(6-(2-((*trans*-4-(디플루오로메톡시)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [120];

(6-(2-((*cis*-4-에톡시사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [121];

(6-(2-((*trans*-4-에톡시사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [122];

(6-(2-((*cis*-4-(2-메톡시에톡시)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [123];

(6-(2-((*trans*-4-(2-메톡시에톡시)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [124];

(6-(2-((*cis*-4-아미노사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [125];

(6-(2-((*trans*-4-아미노사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [126];

(6-(2-((*cis*-4-(메틸아미노)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [127];

(6-(2-((*trans*-4-(메틸아미노)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [128];

(6-(2-((*cis*-4-(디메틸아미노)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [129];

(6-(2-((*trans*-4-(디메틸아미노)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [130];

(6-(2-((*cis*-4-모르폴리노사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [131];

(6-(2-((*trans*-4-모르폴리노사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [132];

(6-(2-((*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [133];

(6-(2-((*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2

-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [134];

(6-(2-((1-메틸아제티딘-3-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [135];

(6-(2-(옥세탄-3-일아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [136];

(6-(2-((1-메틸피페리딘-4-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [137];

피롤리딘-1-일(6-(2-((테트라히드로-2H-피란-4-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)메탄온 [138];

(6-(2-((6,6-디플루오로스피로[3.3]헵탄-2-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [139];

(6-(2-((2-옥사스피로[3.3]헵탄-6-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [140];

(6-(2-((2-메틸-2-아자스피로[3.3]헵탄-6-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [141];

(6-(2-((1-메틸-1H-피라졸-4-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [142];

5-(이미다조[1,2-b]피리다진-6-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [143];

5-(이미다조[1,2-b]피리다진-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [144];

N-(2-플루오로-2-메틸프로필)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [145];

N-(2,2-디플루오로프로필)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [146];

5-(이미다조[1,2-b]피리다진-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [147];

(R)-5-(이미다조[1,2-b]피리다진-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [148];

5-(이미다조[1,2-b]피리다진-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [149];

5-(이미다조[1,2-b]피리다진-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [150];

5-(이미다조[1,2-b]피리다진-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [151];

(R)-5-(이미다조[1,2-b]피리다진-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [152];

5-(이미다조[1,2-b]피리다진-6-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [153];

5-(이미다조[1,2-b]피리다진-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [154];

5-(이미다조[1,2-b]피리다진-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [155];

N-((1-플루오로사이클로부틸)메틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [156];

N-((3-플루오로옥세탄-3-일)메틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [157];

N-(사이클로프로필메틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [158];

(S)-N-(1-사이클로프로필에틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [159];

(R)-N-(1-사이클로프로필에틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [160];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [161];

5-(이미다조[1,2-b]피리다진-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [162];

5-(이미다조[1,2-b]피리다진-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [163];

N-사이클로부틸-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [164];

N-(3,3-디플루오로사이클로부틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [165];

N-(3,3-디메틸사이클로부틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [166];

3-((5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [167];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [168];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [169];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [170];

N-(*cis*-3-에톡시사이클로부틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [171];

N-(*trans*-3-에톡시사이클로부틸)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [172];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [173];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [174];

cis-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [175];

trans-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [176];

cis-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [177];

trans-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [178];

cis-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [179];

trans-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [180];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [181];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [182];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [183];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [184];

N-(4,4-디플루오로사이클로헥실)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [185];

cis-4-((5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [186];

(1s,4s)-4-((5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [187];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [188];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [189];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [190];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [191];

N-(*cis*-4-에톡시사이클로헥실)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [192];

N-(*trans*-4-에톡시사이클로헥실)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [193];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [194];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [195];

cis-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [196];

trans-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [197];

cis-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [198];

trans-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [199]; 및

cis-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [200]; 또는 그의 약제학적으로 허용가능한 염.

청구항 10

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

trans-N^1-(5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [201];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [202];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [203];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [204];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [205];

5-(이미다조[1,2-b]피리다진-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [206];

5-(이미다조[1,2-b]피리다진-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [207];

5-(이미다조[1,2-b]피리다진-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [208];

5-(이미다조[1,2-b]피리다진-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [209];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [210];

5-(이미다조[1,2-b]피리다진-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [211];

5-(이미다조[1,2-b]피리다진-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [212];

5-(이미다조[1,2-b]피리다진-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [213];

5-(이미다조[1,2-a]피리미딘-6-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [214];

5-(이미다조[1,2-a]피리미딘-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [215];

N-(2-플루오로-2-메틸프로필)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [216];

N-(2,2-디플루오로프로필)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [217];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [218];

(R)-5-(이미다조[1,2-a]피리미딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [219];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [220];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [221];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [222];

(R)-5-(이미다조[1,2-a]피리미딘-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [223];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [224];

5-(이미다조[1,2-a]피리미딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [225];

5-(이미다조[1,2-a]피리미딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [226];

N-((1-플루오로사이클로부틸)메틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [227];

N-((3-플루오로옥세탄-3-일)메틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [228];

N-(사이클로프로필메틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [229];

(S)-N-(1-사이클로프로필에틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [230];

(R)-N-(1-사이클로프로필에틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [231];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [232];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [233];

5-(이미다조[1,2-a]피리미딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [234];

N-사이클로부틸-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [235];

N-(3,3-디플루오로사이클로부틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [236];

N-(3,3-디메틸사이클로부틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [237];

3-((5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [238];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [239];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [240];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [241];

N-(*cis*-3-에톡시사이클로부틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [242];

N-(*trans*-3-에톡시사이클로부틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [243];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [244];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [245];

cis-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [246];

trans-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [247];

cis-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [248];

trans-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [249];

cis-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [250];

trans-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [251];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민

[252];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [253];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [254];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [255];

N-(4,4-디플루오로사이클로헥실)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [256];

cis-4-((5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [257];

(1s,4s)-4-((5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [258];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [259];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [260];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [261];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [262];

N-(*cis*-4-에톡시사이클로헥실)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [263];

N-(*trans*-4-에톡시사이클로헥실)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [264];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [265];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [266];

cis-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [267];

trans-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [268];

cis-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [269];

trans-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [270];

cis-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [271];

trans-N^1-(5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [272];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민

[273];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [274];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [275];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [276];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [277];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [278];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [279];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [280];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [281];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [282];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [283];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [284];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [285];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [286];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [287];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2,2-디플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [288];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [289];

(R)-5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [290];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [291];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [292];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [293];

(R)-5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [294];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [295];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [296];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-

f][1,2,4]트리아진-2-아민 [297];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-((1-플루오로사이클로부틸)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [298];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-((3-플루오로옥세탄-3-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [299]; 및

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(사이클로프로필메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [300]; 또는 그의 약제학적으로 허용가능한 염.

청구항 11

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

(S)-5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(1-사이클로프로필에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [301];

(R)-5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(1-사이클로프로필에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [302];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2-사이클로프로필-2,2-디플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [303];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [304];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [305];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-사이클로부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [306];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(3,3-디플루오로사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [307];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(3,3-디메틸사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [308];

3-((5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [309];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [310];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [311];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [312];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-에톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [313];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-에톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [314];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [315];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [316];

cis-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [317];

trans-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [318];

cis-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [319];

trans-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [320];

cis-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [321];

trans-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [322];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [323];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [324];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [325];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [326];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(4,4-디플루오로사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [327];

cis-4-((5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [328];

(1s,4s)-4-((5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [329];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [330];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [331];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(디플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [332];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-(디플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [333];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-에톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [334];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-에톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [335];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [336];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [337];

cis-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [338];

trans-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [339];

cis-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [340];

trans-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [341];

cis-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [342];

trans-N^1-(5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [343];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [344];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [345];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [346];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [347];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [348];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [349];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [350];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [351];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(6,6-디플루오로스피로[3.3]헵탄-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [352];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [353];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [354];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [355];

N-이소프로필-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [356];

N-이소부틸-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [357];

N-(2-플루오로-2-메틸프로필)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [358];

N-(2,2-디플루오로프로필)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민

[359];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [360];

(R)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [361];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [362];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [363];

N-(2-메톡시에틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [364];

(R)-N-(1-메톡시프로판-2-일)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [365];

N-(2-이소프로폭시에틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [366];

N-((1-메틸사이클로프로필)메틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [367];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [368];

N-((1-플루오로사이클로부틸)메틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [369];

N-((3-플루오로옥세탄-3-일)메틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [370];

N-(사이클로프로필메틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [371];

(S)-N-(1-사이클로프로필에틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [372];

(R)-N-(1-사이클로프로필에틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [373];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [374];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [375];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [376];

N-사이클로부틸-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [377];

N-(3,3-디플루오로사이클로부틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [378];

N-(3,3-디메틸사이클로부틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [379];

1-메틸-3-((5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [380];

N-(*cis*-3-메톡시사이클로부틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [381];

N-(*trans*-3-메톡시사이클로부틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아

민 [382];

N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [383];

N-(*cis*-3-에톡시사이클로부틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [384];

N-(*trans*-3-에톡시사이클로부틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [385];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [386];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [387];

cis-N^1-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [388];

trans-N^1-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [389];

cis-N^1-메틸-N^3-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [390];

trans-N^1-메틸-N^3-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [391];

cis-N^1,N^1-디메틸-N^3-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [392];

trans-N^1,N^1-디메틸-N^3-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [393];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [394];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [395];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [396];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [397];

N-(4,4-디플루오로사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [398];

cis-4-((5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [399]; 및

(1s,4s)-1-메틸-4-((5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [400]; 또는 그의 약제학적으로 허용가능한 염.

청구항 12

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

N-(*cis*-4-메톡시사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**401**];

N-(*trans*-4-메톡시사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**402**];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**403**];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**404**];

N-(*cis*-4-에톡시사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**405**];

N-(*trans*-4-에톡시사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**406**];

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**407**];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**408**];

cis-N^1-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**409**];

trans-N^1-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**410**];

cis-N^1-메틸-N^4-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**411**];

trans-N^1-메틸-N^4-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**412**];

cis-N^1,N^1-디메틸-N^4-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**413**];

trans-N^1,N^1-디메틸-N^4-(5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**414**];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**415**];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**416**];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**417**];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**418**];

N-(1-메틸아제티딘-3-일)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**419**];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**420**];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민

[421];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [422];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [423];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [424];

N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [425];

N-(1-메틸-1H-피라졸-4-일)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [426];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [427];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [428];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [429];

N-(2,2-디플루오로프로필)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [430];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [431];

(R)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [432];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [433];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [434];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [435];

(R)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [436];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [437];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [438];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [439];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-((1-플루오로사이클로부틸)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [440];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-((3-플루오로옥세탄-3-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [441];

N-(사이클로프로필메틸)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [442];

(S)-N-(1-사이클로프로필에틸)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [443];

(R)-N-(1-사이클로프로필에틸)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민

[444];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [445];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [446];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [447];

N-사이클로부틸-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [448];

N-(3,3-디플루오로사이클로부틸)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [449];

N-(3,3-디메틸사이클로부틸)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [450];

3-((5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [451];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [452];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [453];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [454];

N-(*cis*-3-에톡시사이클로부틸)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [455];

N-(*trans*-3-에톡시사이클로부틸)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [456];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [457];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [458];

cis-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [459];

trans-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [460];

cis-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [461];

trans-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [462];

cis-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [463];

trans-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [464];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-

아민 [465];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [466];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [467];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [468];

N-(4,4-디플루오로사이클로헥실)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [469];

cis-4-((5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [470];

(1s,4s)-4-((5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [471];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [472];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [473];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [474];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [475];

N-(*cis*-4-에톡시사이클로헥실)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [476];

N-(*trans*-4-에톡시사이클로헥실)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [477];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [478];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [479];

cis-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [480];

trans-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [481];

cis-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [482];

trans-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [483];

cis-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [484];

trans-N^1-(5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로

헥산-1,4-디아민 [485];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [486];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [487];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [488];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [489];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [490];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [491];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [492];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [493];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [494];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [495];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [496];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [497];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [498];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [499]; 및

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [500]; 또는 그의 약제학적으로 허용가능한 염.

청구항 13

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

N-(2,2-디플루오로프로필)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [501];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [502];

(R)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [503];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [504];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로

[2,1-f][1,2,4]트리아진-2-아민 [505];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [506];

(R)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [507];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [508];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [509];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [510];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-((1-플루오로사이클로부틸)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [511];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-((3-플루오로옥세탄-3-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [512];

N-(사이클로프로필메틸)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [513];

(S)-N-(1-사이클로프로필에틸)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [514];

(R)-N-(1-사이클로프로필에틸)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [515];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [516];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [517];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [518];

N-사이클로부틸-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [519];

N-(3,3-디플루오로사이클로부틸)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [520];

N-(3,3-디메틸사이클로부틸)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [521];

3-((5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [522];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [523];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [524];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [525];

N-(*cis*-3-에톡시사이클로부틸)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-

f][1,2,4]트리아진-2-아민 [526];

N-(*trans*-3-에톡시사이클로부틸)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [527];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [528];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [529];

cis-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [530];

trans-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [531];

cis-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [532];

trans-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [533];

cis-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [534];

trans-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [535];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [536];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [537];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [538];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [539];

N-(4,4-디플루오로사이클로헥실)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [540];

cis-4-((5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [541];

(1s,4s)-4-((5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [542];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [543];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [544];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [545];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [546];

N-(*cis*-4-에톡시사이클로헥실)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [547];

N-(*trans*-4-에톡시사이클로헥실)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [548];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [549];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [550];

cis-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [551];

trans-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [552];

cis-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [553];

trans-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [554];

cis-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [555];

trans-N^1-(5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [556];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [557];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [558];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [559];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [560];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [561];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [562];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [563];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [564];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로

[2,1-f][1,2,4]트리아진-2-아민 [565];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [566];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [567];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [568];

N-이소프로필-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [569];

N-이소부틸-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [570];

N-(2-플루오로-2-메틸프로필)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [571];

N-(2,2-디플루오로프로필)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [572];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [573];

(R)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [574];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [575];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [576];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [577];

(R)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [578];

N-(2-이소프로폭시에틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [579];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [580];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [581];

N-((1-플루오로사이클로부틸)메틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [582];

N-((3-플루오로옥세탄-3-일)메틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [583];

N-(사이클로프로필메틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [584];

(S)-N-(1-사이클로프로필에틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [585];

(R)-N-(1-사이클로프로필에틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-

f][1,2,4]트리아진-2-아민 [586];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [587];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [588];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [589];

N-사이클로부틸-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [590];

N-(3,3-디플루오로사이클로부틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [591];

N-(3,3-디메틸사이클로부틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [592];

3-((5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [593];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [594];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [595];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [596];

N-(*cis*-3-에톡시사이클로부틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [597];

N-(*trans*-3-에톡시사이클로부틸)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [598];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [599]; 및

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [600]; 또는 그의 약제학적으로 허용가능한 염.

청구항 14

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

cis-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [601];

trans-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [602];

cis-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [603];

trans-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [604];

cis-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-

디메틸사이클로부탄-1,3-디아민 [605];

trans-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [606];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [607];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [608];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [609];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [610];

N-(4,4-디플루오로사이클로헥실)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [611];

cis-4-((5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [612];

(1s,4s)-4-((5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [613];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [614];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [615];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [616];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [617];

N-(*cis*-4-에톡시사이클로헥실)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [618];

N-(*trans*-4-에톡시사이클로헥실)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [619];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [620];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [621];

cis-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [622];

trans-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [623];

cis-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [624];

trans-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메

틸사이클로헥산-1,4-디아민 [625];

cis-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [626];

trans-N^1-(5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [627];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [628];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [629];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [630];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [631];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [632];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [633];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [634];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [635];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [636];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [637];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [638];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [639];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [640];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [641];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [642];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2,2-디플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [643];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [644];

(R)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [645];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [646];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [647];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [648];

(R)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [649];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [650];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [651];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [652];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-플루오로사이클로부틸)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [653];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3-플루오로옥세탄-3-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [654];

N-(사이클로프로필메틸)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [655];

(S)-N-(1-사이클로프로필에틸)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [656];

(R)-N-(1-사이클로프로필에틸)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [657];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [658];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [659];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [660];

N-사이클로부틸-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [661];

N-(3,3-디플루오로사이클로부틸)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [662];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3-디메틸사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [663];

3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [664];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [665];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [666];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [667];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-에톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [668];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-에톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [669];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [670];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [671];

cis-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [672];

trans-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [673];

cis-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [674];

trans-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [675];

cis-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [676];

trans-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [677];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [678];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [679];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [680];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [681];

N-(4,4-디플루오로사이클로헥실)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [682];

cis-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [683];

(1s,4s)-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [684];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [685];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,

1-f][1,2,4]트리아진-2-아민 [686];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(디플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [687];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(디플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [688];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-에톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [689];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-에톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [690];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [691];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [692];

cis-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [693];

trans-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [694];

cis-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [695];

trans-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [696];

cis-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [697];

trans-N^1-(5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [698];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [699]; 및

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [700]; 또는 그의 약제학적으로 허용가능한 염.

청구항 15

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [701];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [702];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [703];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트

리아진-2-아민 [704];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [705];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [706];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(6,6-디플루오로스피로[3.3]헵탄-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [707];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [708];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [709];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [710];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [711];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [712];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [713];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2,2-디플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [714];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [715];

(R)-5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [716];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [717];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [718];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [719];

(R)-5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [720];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [721];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [722];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [723];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-플루오로사이클로부틸)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [724];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3-플루오로옥세탄-3-일)메틸)

피롤로[2,1-f][1,2,4]트리아진-2-아민 [725];

N-(사이클로프로필메틸)-5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [726];

(S)-N-(1-사이클로프로필에틸)-5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [727];

(R)-N-(1-사이클로프로필에틸)-5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [728];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [729];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [730];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [731];

N-사이클로부틸-5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [732];

N-(3,3-디플루오로사이클로부틸)-5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [733];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3-디메틸사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [734];

3-((5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [735];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [736];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [737];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [738];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-에톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [739];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-에톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [740];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [741];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [742];

cis-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [743];

trans-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [744];

cis-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [745];

trans-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [**746**];

cis-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [**747**];

trans-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [**748**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**749**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**750**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**751**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**752**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(4,4-디플루오로사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**753**];

cis-4-((5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [**754**];

(1s,4s)-4-((5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [**755**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**756**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**757**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(디플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**758**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(디플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**759**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-에톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**760**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-에톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**761**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**762**];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**763**];

cis-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**764**];

trans-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트

리아진-2-일)사이클로헥산-1,4-디아민 [765];

cis-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [766];

trans-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [767];

cis-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [768];

trans-N^1-(5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [769];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [770];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [771];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [772];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [773];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [774];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [775];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [776];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [777];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(6,6-디플루오로스피로[3.3]헵탄-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [778];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [779];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [780];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [781];

N-이소프로필-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [782];

N-이소부틸-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [783];

N-(2-플루오로-2-메틸프로필)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [784];

N-(2,2-디플루오로프로필)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [785];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [786];

(R)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [787];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [788];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [789];

N-(2-메톡시에틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [790];

(R)-N-(1-메톡시프로판-2-일)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [791];

N-(2-이소프로폭시에틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [792];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [793];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [794];

N-((1-플루오로사이클로부틸)메틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [795];

N-((3-플루오로옥세탄-3-일)메틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [796];

N-(사이클로프로필메틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [797];

(S)-N-(1-사이클로프로필에틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [798];

(R)-N-(1-사이클로프로필에틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [799]; 및

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [800]; 또는 그의 약제학적으로 허용가능한 염.

청구항 16

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [801];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [802];

N-사이클로부틸-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [803];

N-(3,3-디플루오로사이클로부틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피

롤로[2,1-f][1,2,4]트리아진-2-아민 [804];

N-(3,3-디메틸사이클로부틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [805];

1-메틸-3-((5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [806];

N-(*cis*-3-메톡시사이클로부틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [807];

N-(*trans*-3-메톡시사이클로부틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [808];

N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [809];

N-(*cis*-3-에톡시사이클로부틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [810];

N-(*trans*-3-에톡시사이클로부틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [811];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [812];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [813];

cis-N^1-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [814];

trans-N^1-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [815];

cis-N^1-메틸-N^3-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [816];

trans-N^1-메틸-N^3-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [817];

cis-N^1,N^1-디메틸-N^3-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [818];

trans-N^1,N^1-디메틸-N^3-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [819];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [820];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [821];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [822];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [823];

N-(4,4-디플루오로사이클로헥실)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피

롤로[2,1-f][1,2,4]트리아진-2-아민 [824];

cis-4-((5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [825];

(1s,4s)-1-메틸-4-((5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [826];

N-(*cis*-4-메톡시사이클로헥실)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [827];

N-(*trans*-4-메톡시사이클로헥실)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [828];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [829];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [830];

N-(*cis*-4-에톡시사이클로헥실)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [831];

N-(*trans*-4-에톡시사이클로헥실)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [832];

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [833];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [834];

cis-N^1-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [835];

trans-N^1-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [836];

cis-N^1-메틸-N^4-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [837];

trans-N^1-메틸-N^4-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [838];

cis-N^1,N^1-디메틸-N^4-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [839];

trans-N^1,N^1-디메틸-N^4-(5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [840];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [841];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [842];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [843];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(4-메틸피페라진-1-

일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [844];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [845];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [846];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [847];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [848];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [849];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [850];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [851];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [852];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [853];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [854];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [855];

N-(2,2-디플루오로프로필)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [856];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [857];

(R)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [858];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [859];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [860];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [861];

(R)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [862];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [863];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [864];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [865];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-플루오로사이클로부틸)메틸)피롤로[2,1-f][1,2,4]트리

아진-2-아민 [866];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3-플루오로옥세탄-3-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [867];

N-(사이클로프로필메틸)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [868];

(S)-N-(1-사이클로프로필에틸)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [869];

(R)-N-(1-사이클로프로필에틸)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [870];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [871];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [872];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [873];

N-사이클로부틸-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [874];

N-(3,3-디플루오로사이클로부틸)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [875];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3-디메틸사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [876];

3-((5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [877];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [878];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [879];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [880];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-에톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [881];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-에톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [882];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [883];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [884];

cis-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [885];

trans-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [886];

cis-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로

부탄-1,3-디아민 [887];

trans-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [888];

cis-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [889];

trans-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [890];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [891];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [892];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [893];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [894];

N-(4,4-디플루오로사이클로헥실)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [895];

cis-4-((5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [896];

(1s,4s)-4-((5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [897];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [898];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [899]; 및

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [900]; 또는 그의 약제학적으로 허용가능한 염.

청구항 17

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [901];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-에톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [902];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-에톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [903];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [904];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [905];

cis-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-

1,4-디아민 [906];

trans-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [907];

cis-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [908];

trans-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [909];

cis-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [910];

trans-N^1-(5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [911];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [912];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [913];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [914];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [915];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [916];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [917];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [918];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [919];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [920];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [921];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [922];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [923];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [924];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [925];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [926];

N-(2,2-디플루오로프로필)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [927];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [928];

(R)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [929];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [930];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [931];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [932];

(R)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [933];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [934];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [935];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [936];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-플루오로사이클로부틸)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [937];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3-플루오로옥세탄-3-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [938];

N-(사이클로프로필메틸)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [939];

(S)-N-(1-사이클로프로필에틸)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [940];

(R)-N-(1-사이클로프로필에틸)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [941];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [942];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [943];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [944];

N-사이클로부틸-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [945];

N-(3,3-디플루오로사이클로부틸)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [946];

N-(3,3-디메틸사이클로부틸)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [947];

3-((5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [948];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**949**];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**950**];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**951**];

N-(*cis*-3-에톡시사이클로부틸)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**952**];

N-(*trans*-3-에톡시사이클로부틸)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**953**];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**954**];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**955**];

cis-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [**956**];

trans-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [**957**];

cis-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [**958**];

trans-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [**959**];

cis-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [**960**];

trans-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [**961**];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**962**];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**963**];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**964**];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**965**];

N-(4,4-디플루오로사이클로헥실)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**966**];

cis-4-((5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [**967**];

(1s,4s)-4-((5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [**968**];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [969];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [970];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [971];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [972];

N-(*cis*-4-에톡시사이클로헥실)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [973];

N-(*trans*-4-에톡시사이클로헥실)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [974];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [975];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [976];

cis-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [977];

trans-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [978];

cis-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [979];

trans-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [980];

cis-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [981];

trans-N^1-(5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [982];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [983];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [984];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [985];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [986];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [987];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [988];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [989];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [990];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [991];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [992];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [993];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [994];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [995];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [996];

N-(2-플루오로-2-메틸프로필)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [997];

N-(2,2-디플루오로프로필)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [998];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [999]; 및

(R)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1000]; 또는 그의 약제학적으로 허용가능한 염.

청구항 18

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1001];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1002];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1003];

(R)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1004];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1005];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1006];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1007];

N-((1-플루오로사이클로부틸)메틸)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-

f][1,2,4]트리아진-2-아민 [1008];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3-플루오로옥세탄-3-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1009];

N-(사이클로프로필메틸)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1010];

(S)-N-(1-사이클로프로필에틸)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1011];

(R)-N-(1-사이클로프로필에틸)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1012];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1013];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1014];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1015];

N-사이클로부틸-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1016];

N-(3,3-디플루오로사이클로부틸)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1017];

N-(3,3-디메틸사이클로부틸)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1018];

3-((5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1019];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1020];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1021];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1022];

N-(*cis*-3-에톡시사이클로부틸)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1023];

N-(*trans*-3-에톡시사이클로부틸)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1024];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1025];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1026];

cis-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1027];

trans-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1028];

cis-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [**1029**];

trans-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [**1030**];

cis-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [**1031**];

trans-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [**1032**];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1033**];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1034**];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1035**];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1036**];

N-(4,4-디플루오로사이클로헥실)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1037**];

cis-4-((5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [**1038**];

(1s,4s)-4-((5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [**1039**];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1040**];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1041**];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1042**];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1043**];

N-(*cis*-4-에톡시사이클로헥실)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1044**];

N-(*trans*-4-에톡시사이클로헥실)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1045**];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1046**];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1047**];

cis-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사

이클로헥산-1,4-디아민 [1048];

trans-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1049];

cis-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [1050];

trans-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [1051];

cis-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [1052];

trans-N^1-(5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [1053];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1054];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1055];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1056];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1057];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1058];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1059];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1060];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1061];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1062];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1063];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1064];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1065];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 [1066];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 [1067];

N-(2-플루오로-2-메틸프로필)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1068];

N-(2,2-디플루오로프로필)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1069];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1070];

(R)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1071];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1072];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1073];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1074];

(R)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1075];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1076];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1077];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1078];

N-((1-플루오로사이클로부틸)메틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1079];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3-플루오로옥세탄-3-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1080];

N-(사이클로프로필메틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1081];

(S)-N-(1-사이클로프로필에틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1082];

(R)-N-(1-사이클로프로필에틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1083];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1084];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1085];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1086];

N-사이클로부틸-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1087];

N-(3,3-디플루오로사이클로부틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1088];

N-(3,3-디메틸사이클로부틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1089];

3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1090];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1091];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1092];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1093];

N-(*cis*-3-에톡시사이클로부틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1094];

N-(*trans*-3-에톡시사이클로부틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1095];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1096];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1097];

cis-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1098];

trans-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1099]; 및

cis-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1100]; 또는 그의 약제학적으로 허용가능한 염.

청구항 19

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

trans-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1101];

cis-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1102];

trans-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1103];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1104];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1105];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1106];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1107**];

N-(4,4-디플루오로사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1108**];

cis-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [**1109**];

(1s,4s)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [**1110**];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1111**];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1112**];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1113**];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1114**];

N-(*cis*-4-에톡시사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1115**];

N-(*trans*-4-에톡시사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1116**];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1117**];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1118**];

cis-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**1119**];

trans-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**1120**];

cis-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [**1121**];

trans-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [**1122**];

cis-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [**1123**];

trans-N^1-(5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [**1124**];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1125**];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로

[2,1-f][1,2,4]트리아진-2-아민 [1126];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1127];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1128];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1129];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1130];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1131];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1132];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1133];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1134];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1135];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1136];

N-이소프로필-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1137];

N-이소부틸-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1138];

N-(2-플루오로-2-메틸프로필)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1139];

N-(2,2-디플루오로프로필)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1140];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1141];

(R)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1142];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1143];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1144];

N-(2-메톡시에틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1145];

(R)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1146];

N-(2-이소프로폭시에틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트

리아진-2-아민 [1147];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1148];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1149];

N-((1-플루오로사이클로부틸)메틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1150];

N-((3-플루오로옥세탄-3-일)메틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1151];

N-(사이클로프로필메틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1152];

(S)-N-(1-사이클로프로필에틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1153];

(R)-N-(1-사이클로프로필에틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1154];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1155];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1156];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1157];

N-사이클로부틸-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1158];

N-(3,3-디플루오로사이클로부틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1159];

N-(3,3-디메틸사이클로부틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1160];

3-((5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1161];

N-(*cis*-3-메톡시사이클로부틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1162];

N-(*trans*-3-메톡시사이클로부틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1163];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(메톡시메틸)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1164];

N-(*cis*-3-에톡시사이클로부틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1165];

N-(*trans*-3-에톡시사이클로부틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1166];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1167];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로

[2,1-f][1,2,4]트리아진-2-아민 [1168];

cis-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1169];

trans-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1170];

cis-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1171];

trans-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1172];

cis-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1173];

trans-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1174];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1175];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1176];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1177];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1178];

N-(4,4-디플루오로사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1179];

cis-4-((5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1180];

(1s,4s)-4-((5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1181];

N-(*cis*-4-메톡시사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1182];

N-(*trans*-4-메톡시사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1183];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1184];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1185];

N-(*cis*-4-에톡시사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1186];

N-(*trans*-4-에톡시사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1187];

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1188**];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1189**];

cis-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**1190**];

trans-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [**1191**];

cis-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [**1192**];

trans-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [**1193**];

cis-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [**1194**];

trans-N^1-(5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [**1195**];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1196**];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1197**];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1198**];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1199**]; 및

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1200**]; 또는 그의 약제학적으로 허용가능한 염.

청구항 20

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1201**];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1202**];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1203**];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1204**];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [**1205**];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1206];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1207];

N-이소프로필-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1208];

N-이소부틸-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1209];

N-(2-플루오로-2-메틸프로필)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1210];

N-(2,2-디플루오로프로필)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1211];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1212];

(R)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1213];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1214];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1215];

N-(2-메톡시에틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1216];

(R)-N-(1-메톡시프로판-2-일)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1217];

N-(2-이소프로폭시에틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1218];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1219];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로 [2,1-f][1,2,4]트리아진-2-아민 [1220];

N-((1-플루오로사이클로부틸)메틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1221];

N-((3-플루오로옥세탄-3-일)메틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1222];

N-(사이클로프로필메틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1223];

(S)-N-(1-사이클로프로필에틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1224];

(R)-N-(1-사이클로프로필에틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1225];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1226];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1227];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1228];

N-사이클로부틸-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1229];

N-(3,3-디플루오로사이클로부틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1230];

N-(3,3-디메틸사이클로부틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1231];

1-메틸-3-((5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1232];

N-(*cis*-3-메톡시사이클로부틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1233];

N-(*trans*-3-메톡시사이클로부틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1234];

N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1235];

N-(*cis*-3-에톡시사이클로부틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1236];

N-(*trans*-3-에톡시사이클로부틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1237];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1238];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1239];

cis-N^1-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1240];

trans-N^1-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1241];

cis-N^1-메틸-N^3-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1242];

trans-N^1-메틸-N^3-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1243];

cis-N^1,N^1-디메틸-N^3-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1244];

trans-N^1,N^1-디메틸-N^3-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)사이클로부탄-1,3-디아민 [1245];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1246];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1247];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로 [2,1-

f][1,2,4]트리아진-2-아민 [1248];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸) 피롤로[2,1-f][1,2,4]트리아진-2-아민 [1249];

N-(4,4-디플루오로사이클로헥실)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1250];

cis-4-((5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로헥산-1-올 [1251];

(1s,4s)-1-메틸-4-((5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1252];

N-(*cis*-4-메톡시사이클로헥실)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1253];

N-(*trans*-4-메톡시사이클로헥실)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1254];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1255];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 [1256];

N-(*cis*-4-에톡시사이클로헥실)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1257];

N-(*trans*-4-에톡시사이클로헥실)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1258];

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1259];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 [1260];

cis-N^1-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1261];

trans-N^1-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일) 사이클로헥산-1,4-디아민 [1262];

cis-N^1-메틸-N^4-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일) 사이클로헥산-1,4-디아민 [1263];

trans-N^1-메틸-N^4-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1264];

cis-N^1,N^1-디메틸-N^4-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1265];

trans-N^1,N^1-디메틸-N^4-(5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)사이클로헥산-1,4-디아민 [1266];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1267];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f] [1,2,4]트리아

진-2-아민 [1268];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로 [2,1-f][1,2,4]트리아진-2-아민 [1269];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실) 피롤로[2,1-f][1,2,4]트리아진-2-아민 [1270];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1271];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1272];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1273];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1274];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1275];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1276];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1277];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1278];

N-이소프로필-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1279];

N-이소부틸-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1280];

N-(2-플루오로-2-메틸프로필)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1281];

N-(2,2-디플루오로프로필)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1282];

5-(퀴놀린-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1283];

(R)-5-(퀴놀린-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1284];

5-(퀴놀린-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1285];

5-(퀴놀린-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1286];

N-(2-메톡시에틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1287];

(R)-N-(1-메톡시프로판-2-일)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1288];

N-(2-이소프로폭시에틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1289];

N-((1-메틸사이클로프로필)메틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1290];

5-(퀴놀린-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1291];

N-((1-플루오로사이클로부틸)메틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1292];

N-((3-플루오로옥세탄-3-일)메틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1293];

N-(사이클로프로필메틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1294];

(S)-N-(1-사이클로프로필에틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1295];

(R)-N-(1-사이클로프로필에틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1296];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1297];

N-(옥세탄-3-일메틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1298];

5-(퀴놀린-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1299]; 및

N-사이클로부틸-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1300]; 또는 그의 약제학적으로 허용가능한 염.

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제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

N-(3,3-디플루오로사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1301];

N-(3,3-디메틸사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1302];

1-메틸-3-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1303];

N-(*cis*-3-메톡시사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1304];

N-(*trans*-3-메톡시사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1305];

N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1306];

N-(*cis*-3-에톡시사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1307];

N-(*trans*-3-에톡시사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1308];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1309];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1310];

cis-N^1-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1311];

trans-N^1-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1312];

cis-N^1-메틸-N^3-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1313];

trans-N^1-메틸-N^3-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1314];

cis-N^1,N^1-디메틸-N^3-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1315];

trans-N^1,N^1-디메틸-N^3-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1316];

N-(*cis*-3-모르폴리노사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1317];

N-(*trans*-3-모르폴리노사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1318];

N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1319];

N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1320];

N-(4,4-디플루오로사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1321];

cis-4-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1322];

(1s,4s)-1-메틸-4-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1323];

N-(*cis*-4-메톡시사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1324];

N-(*trans*-4-메톡시사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1325];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1326];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1327];

N-(*cis*-4-에톡시사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1328];

N-(*trans*-4-에톡시사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1329];

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1330];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1331];

cis-N^1-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1332];

trans-N^1-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1333];

cis-N^1-메틸-N^4-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1334];

trans-N^1-메틸-N^4-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1335];

cis-N^1,N^1-디메틸-N^4-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1336];

trans-N^1,N^1-디메틸-N^4-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1337];

N-(*cis*-4-모르폴리노사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1338];

N-(*trans*-4-모르폴리노사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1339];

N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1340];

N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1341];

N-(1-메틸아제티딘-3-일)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1342];

N-(옥세탄-3-일)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1343];

N-(1-메틸피페리딘-4-일)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1344];

5-(퀴놀린-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1345];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1346];

5-(퀴놀린-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1347];

N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1348];

N-(1-메틸-1H-피라졸-4-일)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1349];

N-이소프로필-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1350];

N-이소부틸-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1351];

N-(2-플루오로-2-메틸프로필)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1352];

N-(2,2-디플루오로프로필)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1353];

5-(퀸옥살린-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1354];

(R)-5-(퀸옥살린-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1355];

5-(퀸옥살린-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1356];

5-(퀸옥살린-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1357];

N-(2-메톡시에틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1358];

(R)-N-(1-메톡시프로판-2-일)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1359];

N-(2-이소프로폭시에틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1360];

N-((1-메틸사이클로프로필)메틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1361];

5-(퀸옥살린-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1362];

N-((1-플루오로사이클로부틸)메틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1363];

N-((3-플루오로옥세탄-3-일)메틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1364];

N-(사이클로프로필메틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1365];

(S)-N-(1-사이클로프로필에틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1366];

(R)-N-(1-사이클로프로필에틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1367];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1368];

N-(옥세탄-3-일메틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1369];

5-(퀸옥살린-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1370];

N-사이클로부틸-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1371];

N-(3,3-디플루오로사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1372];

N-(3,3-디메틸사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1373];

1-메틸-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1374];

N-(*cis*-3-메톡시사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1375];

N-(*trans*-3-메톡시사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1376];

N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1377];

N-(*cis*-3-에톡시사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1378];

N-(*trans*-3-에톡시사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1379];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1380];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1381];

cis-N^1-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1382];

trans-N^1-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1383];

cis-N^1-메틸-N^3-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1384];

trans-N^1-메틸-N^3-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1385];

cis-N^1,N^1-디메틸-N^3-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1386];

trans-N^1,N^1-디메틸-N^3-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1387];

N-(*cis*-3-모르폴리노사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1388];

N-(*trans*-3-모르폴리노사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1389];

N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1390];

N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민

[1391];

N-(4,4-디플루오로사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1392];

cis-4-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1393];

(1s,4s)-1-메틸-4-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1394];

N-(*cis*-4-메톡시사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1395];

N-(*trans*-4-메톡시사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1396];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1397];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1398];

N-(*cis*-4-에톡시사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1399]; 및

N-(*trans*-4-에톡시사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1400]; 또는 그의 약제학적으로 허용가능한 염.

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제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1401];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1402];

cis-N^1-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1403];

trans-N^1-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1404];

cis-N^1-메틸-N^4-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1405];

trans-N^1-메틸-N^4-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1406];

cis-N^1,N^1-디메틸-N^4-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1407];

trans-N^1,N^1-디메틸-N^4-(5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1408];

N-(*cis*-4-모르폴리노사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1409];

N-(*trans*-4-모르폴리노사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1410];

N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1411];

N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1412];

N-(1-메틸아제티딘-3-일)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1413];

N-(옥세탄-3-일)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1414];

N-(1-메틸피페리딘-4-일)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1415];

5-(퀸옥살린-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1416];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1417];

5-(퀸옥살린-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1418];

N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1419];

N-(1-메틸-1H-피라졸-4-일)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1420];

N-이소프로필-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1421];

N-이소부틸-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1422];

N-(2-플루오로-2-메틸프로필)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1423];

N-(2,2-디플루오로프로필)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1424];

5-(4-메톡시퀸아졸린-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1425];

(R)-5-(4-메톡시퀸아졸린-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1426];

5-(4-메톡시퀸아졸린-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1427];

5-(4-메톡시퀸아졸린-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1428];

N-(2-메톡시에틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1429];

(R)-N-(1-메톡시프로판-2-일)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1430];

N-(2-이소프로폭시에틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1431];

5-(4-메톡시퀸아졸린-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1432];

5-(4-메톡시퀸아졸린-6-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1433];

N-((1-플루오로사이클로부틸)메틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1434];

N-((3-플루오로옥세탄-3-일)메틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1435];

N-(사이클로프로필메틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1436];

(S)-N-(1-사이클로프로필에틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1437];

(R)-N-(1-사이클로프로필에틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1438];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1439];

5-(4-메톡시퀸아졸린-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1440];

5-(4-메톡시퀸아졸린-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1441];

N-사이클로부틸-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1442];

N-(3,3-디플루오로사이클로부틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1443];

N-(3,3-디메틸사이클로부틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1444];

3-((5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1445];

N-(*cis*-3-메톡시사이클로부틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1446];

N-(*trans*-3-메톡시사이클로부틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1447];

N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1448];

N-(*cis*-3-에톡시사이클로부틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1449];

N-(*trans*-3-에톡시사이클로부틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1450];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민

[1451];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1452];

cis-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1453];

trans-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1454];

cis-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1455];

trans-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1456];

cis-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1457];

trans-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1458];

5-(4-메톡시퀸아졸린-6-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1459];

5-(4-메톡시퀸아졸린-6-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1460];

5-(4-메톡시퀸아졸린-6-일)-N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1461];

5-(4-메톡시퀸아졸린-6-일)-N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1462];

N-(4,4-디플루오로사이클로헥실)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1463];

cis-4-((5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1464];

(1s,4s)-4-((5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1465];

N-(*cis*-4-메톡시사이클로헥실)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1466];

N-(*trans*-4-메톡시사이클로헥실)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1467];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1468];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1469];

N-(*cis*-4-에톡시사이클로헥실)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1470];

N-(*trans*-4-에톡시사이클로헥실)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1471];

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1472];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1473];

cis-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1474];

trans-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1475];

cis-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [1476];

trans-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [1477];

cis-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [1478];

trans-N^1-(5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [1479];

5-(4-메톡시퀸아졸린-6-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1480];

5-(4-메톡시퀸아졸린-6-일)-N-(*trans*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1481];

5-(4-메톡시퀸아졸린-6-일)-N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1482];

5-(4-메톡시퀸아졸린-6-일)-N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1483];

5-(4-메톡시퀸아졸린-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1484];

5-(4-메톡시퀸아졸린-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1485];

5-(4-메톡시퀸아졸린-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1486];

5-(4-메톡시퀸아졸린-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1487];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1488];

5-(4-메톡시퀸아졸린-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1489];

5-(4-메톡시퀸아졸린-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1490];

5-(4-메톡시퀸아졸린-6-일)-N-(1-메틸-1H-피라졸-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1491];

N-이소프로필-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1492];

N-이소부틸-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1493];

N-(2-플루오로-2-메틸프로필)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1494];

N-(2,2-디플루오로프로필)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1495];

5-(1,8-나프티리딘-3-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1496];

(R)-5-(1,8-나프티리딘-3-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1497];

5-(1,8-나프티리딘-3-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1498];

5-(1,8-나프티리딘-3-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1499]; 및

N-(2-메톡시에틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1500]; 또는 그의 약제학적으로 허용가능한 염.

청구항 23

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

(R)-N-(1-메톡시프로판-2-일)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1501];

N-(2-이소프로폭시에틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1502];

N-((1-메틸사이클로프로필)메틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1503];

5-(1,8-나프티리딘-3-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1504];

N-((1-플루오로사이클로부틸)메틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1505];

N-((3-플루오로옥세탄-3-일)메틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1506];

N-(사이클로프로필메틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1507];

(S)-N-(1-사이클로프로필에틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1508];

(R)-N-(1-사이클로프로필에틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1509];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1510];

5-(1,8-나프티리딘-3-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1511];

5-(1,8-나프티리딘-3-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1512];

N-사이클로부틸-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1513];

N-(3,3-디플루오로사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1514];

N-(3,3-디메틸사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1515];

3-((5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1516];

N-(*cis*-3-메톡시사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1517];

N-(*trans*-3-메톡시사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1518];

N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1519];

N-(*cis*-3-에톡시사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1520];

N-(*trans*-3-에톡시사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1521];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1522];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1523];

cis-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1524];

trans-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1525];

cis-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1526];

trans-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1527];

cis-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1528];

trans-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1529];

N-(*cis*-3-모르폴리노사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1530];

N-(*trans*-3-모르폴리노사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1531];

N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1532];

N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1533];

N-(4,4-디플루오로사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1534];

cis-4-((5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1535];

(1s,4s)-4-((5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1536];

N-(*cis*-4-메톡시사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1537];

N-(*trans*-4-메톡시사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1538];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1539];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1540];

N-(*cis*-4-에톡시사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1541];

N-(*trans*-4-에톡시사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1542];

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1543];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1544];

cis-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1545];

trans-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1546];

cis-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [1547];

trans-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [1548];

cis-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [1549];

trans-N^1-(5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [1550];

N-(*cis*-4-모르폴리노사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1551];

N-(*trans*-4-모르폴리노사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1552];

N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1553];

N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1554];

N-(1-메틸아제티딘-3-일)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1555];

5-(1,8-나프티리딘-3-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1556];

N-(1-메틸피페리딘-4-일)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1557];

5-(1,8-나프티리딘-3-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1558];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1559];

5-(1,8-나프티리딘-3-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1560];

N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1561];

N-(1-메틸-1H-피라졸-4-일)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1562];

N-이소프로필-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1563];

N-이소부틸-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1564];

N-(2-플루오로-2-메틸프로필)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1565];

N-(2,2-디플루오로프로필)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1566];

5-(피리도[2,3-b]피라진-7-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1567];

(R)-5-(피리도[2,3-b]피라진-7-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1568];

5-(피리도[2,3-b]피라진-7-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1569];

5-(피리도[2,3-b]피라진-7-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1570];

N-(2-메톡시에틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1571];

(R)-N-(1-메톡시프로판-2-일)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1572];

N-(2-이소프로폭시에틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1573];

N-((1-메틸사이클로프로필)메틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1574];

5-(피리도[2,3-b]피라진-7-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4] 트리아진-2-아민 화합물, 메탄 포함 (1:1) [1575];

N-((1-플루오로사이클로부틸)메틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1576];

N-((3-플루오로옥세탄-3-일)메틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1577];

N-(사이클로프로필메틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1578];

(S)-N-(1-사이클로프로필에틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1579];

(R)-N-(1-사이클로프로필에틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1580];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1581];

N-(옥세탄-3-일메틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1582];

5-(피리도[2,3-b]피라진-7-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1583];

N-사이클로부틸-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1584];

N-(3,3-디플루오로사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1585];

N-(3,3-디메틸사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1586];

1-메틸-3-((5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1587];

N-(*cis*-3-메톡시사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1588];

N-(*trans*-3-메톡시사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1589];

N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1590];

N-(*cis*-3-에톡시사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1591];

N-(*trans*-3-에톡시사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1592];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1593];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1594];

cis-N^1-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1595];

trans-N^1-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1596];

cis-N^1-메틸-N^3-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1597];

trans-N^1-메틸-N^3-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1598];

cis-N^1,N^1-디메틸-N^3-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일) 사이클로부탄-1,3-디아민 [1599]; 및

trans-N^1,N^1-디메틸-N^3-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일) 사이클로부탄-1,3-디아민 [1600]; 또는 그의 약제학적으로 허용가능한 염.

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제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

N-(*cis*-3-모르폴리노사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1601];

N-(*trans*-3-모르폴리노사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1602];

N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1603];

N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1604];

N-(4,4-디플루오로사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1605];

cis-4-((5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1606];

(1s,4s)-1-메틸-4-((5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로헥산-1-올 [1607];

N-(*cis*-4-메톡시사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1608];

N-(*trans*-4-메톡시사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1609];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1610];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1611];

N-(*cis*-4-에톡시사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1612];

N-(*trans*-4-에톡시사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1613];

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1614];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1615];

cis-N^1-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1616];

trans-N^1-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1617];

cis-N^1-메틸-N^4-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1618];

trans-N^1-메틸-N^4-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1619];

cis-N^1,N^1-디메틸-N^4-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일) 사이클로헥산-1,4-디아민 [1620];

trans-N^1,N^1-디메틸-N^4-(5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일) 사이클로헥산-1,4-디아민 [1621];

N-(*cis*-4-모르폴리노사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1622];

N-(*trans*-4-모르폴리노사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1623];

N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1624];

N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 [1625];

N-(1-메틸아제티딘-3-일)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1626];

N-(옥세탄-3-일)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1627];

N-(1-메틸피페리딘-4-일)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1628];

5-(피리도[2,3-b]피라진-7-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1629];

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1630];

5-(피리도[2,3-b]피라진-7-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1631];

N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1632];

N-(1-메틸-1H-피라졸-4-일)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1633];

N-이소프로필-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1634];

N-이소부틸-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1635];

N-(2-플루오로-2-메틸프로필)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1636];

N-(2,2-디플루오로프로필)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1637];

5-(1,5-나프티리딘-2-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1638];

(R)-5-(1,5-나프티리딘-2-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1639];

5-(1,5-나프티리딘-2-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1640];

5-(1,5-나프티리딘-2-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1641];

N-(2-메톡시에틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1642];

(R)-N-(1-메톡시프로판-2-일)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1643];

N-(2-이소프로폭시에틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1644];

N-((1-메틸사이클로프로필)메틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1645];

5-(1,5-나프티리딘-2-일)-N-((1-(트리플루오로메틸)사이클로프로필)메틸)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1646];

N-((1-플루오로사이클로부틸)메틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1647];

N-((3-플루오로옥세탄-3-일)메틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1648];

N-(사이클로프로필메틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1649];

(S)-N-(1-사이클로프로필에틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1650];

(R)-N-(1-사이클로프로필에틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1651];

N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1652];

5-(1,5-나프티리딘-2-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1653];

5-(1,5-나프티리딘-2-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1654];

N-사이클로부틸-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1655];

N-(3,3-디플루오로사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1656];

N-(3,3-디메틸사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1657];

3-((5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1658];

N-(*cis*-3-메톡시사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1659];

N-(*trans*-3-메톡시사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1660];

N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1661];

N-(*cis*-3-에톡시사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1662];

N-(*trans*-3-에톡시사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1663];

N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1664];

N-(*trans*-3-(2-메톡시에톡시)사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민

[1665];

cis-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1666];

trans-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로부탄-1,3-디아민 [1667];

cis-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1668];

trans-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3-메틸사이클로부탄-1,3-디아민 [1669];

cis-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1670];

trans-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^3,N^3-디메틸사이클로부탄-1,3-디아민 [1671];

N-(*cis*-3-모르폴리노사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1672];

N-(*trans*-3-모르폴리노사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1673];

N-(*cis*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1674];

N-(*trans*-3-(4-메틸피페라진-1-일)사이클로부틸)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1675];

N-(4,4-디플루오로사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1676];

cis-4-((5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1677];

(1s,4s)-4-((5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1678];

N-(*cis*-4-메톡시사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1679];

N-(*trans*-4-메톡시사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1680];

N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1681];

N-(*trans*-4-(디플루오로메톡시)사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1682];

N-(*cis*-4-에톡시사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1683];

N-(*trans*-4-에톡시사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1684];

N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1685];

N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1686];

cis-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1687];

trans-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 [1688];

cis-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민 [1689];

trans-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4-메틸사이클로헥산-1,4-디아민

[1690];

cis-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [1691];

trans-N^1-(5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)-N^4,N^4-디메틸사이클로헥산-1,4-디아민 [1692];

N-(*cis*-4-모르폴리노사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1693];

N-(*trans*-4-모르폴리노사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1694];

N-(*cis*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1695];

N-(*trans*-4-(4-메틸피페라진-1-일)사이클로헥실)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1696];

N-(1-메틸아제티딘-3-일)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1697];

5-(1,5-나프티리딘-2-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1698];

N-(1-메틸피페리딘-4-일)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1699]; 및

5-(1,5-나프티리딘-2-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1700]; 또는 그의 약제학적으로 허용가능한 염.

청구항 25

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1701];

5-(1,5-나프티리딘-2-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1702];

N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1703];

N-(1-메틸-1H-피라졸-4-일)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1704];

cis-3-((5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1705];

(6-(2-((*cis*-3-히드록시사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [1706];

cis-3-((5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1707];

cis-3-((5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1708];

cis-3-((5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로부탄-1-올 [1709];

cis-3-((5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로부탄-1-올 [1710];

cis-3-((5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로부탄-1-올 [1711];

cis-3-((5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아

미노)사이클로부탄-1-올 [1712];

cis-3-((5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1713];

cis-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1714];

cis-3-((5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1715];

cis-3-((5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1716];

cis-3-((5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1717];

cis-3-((5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1718];

cis-3-((5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1719];

cis-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1720];

cis-3-((5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1721];

cis-3-((5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로부탄-1-올 [1722];

cis-3-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1723];

cis-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1724];

cis-3-((5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1725];

cis-3-((5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1726];

cis-3-((5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1727];

cis-3-((5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1728];

5-(이미다조[1,2-a]피리딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1729];

(6-(2-((2-아자스피로[3.3]헵탄-6-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [1730];

5-(이미다조[1,2-b]피리다진-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1731];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1732];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1733];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1734];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1735];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1736];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1737];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1738];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1739];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1740];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1741];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1742];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1743];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1744];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1745];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1746];

5-(퀴놀린-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1747];

5-(퀸옥살린-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1748];

5-(4-메톡시퀸아졸린-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1749];

5-(1,8-나프티리딘-3-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1750];

5-(피리도[2,3-b]피라진-7-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1751];

5-(1,5-나프티리딘-2-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1752];

5-(이미다조[1,2-a]피리딘-6-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1753];

(6-(2-((2-이소부틸-2-아자스피로[3.3]헵탄-6-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [1754];

5-(이미다조[1,2-b]피리다진-6-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1755];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1756];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1757];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1758];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트

리아진-2-아민 [1759];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(2-이소부틸-2-아자스피로[3.3] 헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1760];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1761];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1762];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1763];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1764];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1765];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1766];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1767];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1768];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1769];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1770];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1771];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1772];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1773];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1774];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1775];

N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1776];

5-(이미다조[1,2-a]피리딘-6-일)-N-(cis-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1777];

피롤리딘-1-일(6-(2-((*cis*-4-(트리플루오로메톡시)사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)메탄온 [1778];

5-(이미다조[1,2-b]피리다진-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1779];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1780];

5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로 [2,1-

f][1,2,4]트리아진-2-아민 [1781];

5-(3-메틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로 [2,1-f][1,2,4]트리아진-2-아민 [1782];

5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1783];

5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(*cis*-4-(트리플루오로메톡시) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1784];

5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(트리플루오로메톡시) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1785];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(트리플루오로메톡시) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1786];

5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1787];

5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1788];

5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실) 피롤로[2,1-f][1,2,4]트리아진-2-아민 [1789];

5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실) 피롤로[2,1-f][1,2,4]트리아진-2-아민 [1790];

5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(트리플루오로메톡시) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1791];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1792];

5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(트리플루오로메톡시) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1793];

5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로 [2,1-f][1,2,4]트리아진-2-아민 [1794];

5-(퀴놀린-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1795];

5-(퀸옥살린-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1796];

5-(4-메톡시퀸아졸린-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1797];

5-(1,8-나프티리딘-3-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1798];

5-(피리도[2,3-b]피라진-7-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1799]; 및

5-(1,5-나프티리딘-2-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1800]; 또는 그의 약제학적으로 허용가능한 염.

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제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

N-(2-플루오로-2-메틸프로필)-5-(3-이소프로필-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 [1801];

5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(메톡시-d_3)사이클로헥실)피롤로[2,1-f][1,2,4] 트리아진-2-아민 [1802];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(메톡시-d_3) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1803];

cis-3-((5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1804];

(6-(2-((*cis*-3-히드록시-3-메틸사이클로부틸)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 [1805];

cis-3-((5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1806];

cis-3-((5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1807];

cis-3-((5-(3-클로로이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1808];

cis-1-메틸-3-((5-(3-메틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1809];

cis-3-((5-(3-에틸이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1810];

cis-3-((5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1811];

cis-3-((5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1812];

cis-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1813];

cis-3-((5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1814];

cis-1-메틸-3-((5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1815];

cis-3-((5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1816];

cis-3-((5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1817];

cis-3-((5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1818];

cis-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1819];

cis-3-((5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1820];

cis-1-메틸-3-((5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1821];

cis-1-메틸-3-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1822];

cis-1-메틸-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1823];

cis-3-((5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1824];

cis-3-((5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1825];

cis-1-메틸-3-((5-(피리도[2,3-b]피라진-7-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 [1826];

cis-3-((5-(1,5-나프티리딘-2-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1827];

trans-4-((5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1828];

cis-4-((5-(3-이소부틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1829];

(R)-2-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)프로판-1-올 [1830];

(R)-1-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)프로판-2-올 [1831];

(S)-1-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)프로판-2-올 [1832];

1-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-메틸프로판-2-올 [1833];

(*cis*-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸)메탄올 [1834];

trans-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 [1835];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(7-메틸-7-아자스피로[3.5]노난-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1836];

(*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메탄올 [1837];

N-(*cis*-4-(2,2-디플루오로에톡시)사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1838];

2-((*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)옥시)에탄-1-올 [1839];

trans-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1840];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-((4-메틸피페라진-1-일)메틸)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1841];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(모르폴리노메틸)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1842];

에틸 *cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-카복실레이트 [1843];

N-(*trans*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아

진-2-일)아미노)사이클로헥실)아세트아미드 [1844];

cis-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N-디메틸사이클로헥산-1-카복사미드 [1845];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메틸-2-아자스피로[3.5]노난-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1846];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1,4-디옥사스피로[4.5]데칸-8-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1847];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((4-메틸모르폴린-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1848];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(2-플루오로에틸)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1849];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(2,2-디플루오로에틸)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1850];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(3,3,3-트리플루오로프로필)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1851];

2-(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)에탄-1-올 [1852];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1853];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4R)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1854];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1855];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1856];

1-(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)에탄-1-온 [1857];

1-(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)프로판-1-온 [1858];

1-(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)-2-메틸프로판-1-온 [1859];

사이클로프로필(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 [1860];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(메틸설포닐)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1861];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1862];

(R)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1863];

(S)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1864];

(3R,4R)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진

-2-일)아미노)테트라히드로-2H-피란-3-올 [1865];

(3S,4R)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)테트라히드로-2H-피란-3-올 [1866];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-메톡시테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1867];

cis-1-메틸-4-((5-(2-메틸-3-(2,2,2-트리플루오로에틸)-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1868];

3-(5-(2-((*cis*-4-히드록시-4-메틸사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)-2,2-디메틸프로판니트릴 [1869];

1-(5-(2-((4,4-디플루오로사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)-2-메틸프로판-2-올 [1870];

2-메틸-1-(2-메틸-5-(2-((테트라히드로-2H-피란-4-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)-3H-이미다조[4,5-b]피리딘-3-일)프로판-2-올 [1871];

2-(5-(2-((*cis*-4-히드록시-4-메틸사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)-N,N-디메틸아세트아미드 [1872];

5-(3-(아제티딘-3-일메틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(4,4-디플루오로사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1873];

N-(4,4-디플루오로사이클로헥실)-5-(2-메틸-3-((1-메틸아제티딘-3-일)메틸)-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1874];

cis-1-메틸-4-((5-(2-메틸-3-(옥세탄-3-일메틸)-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1875];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(메톡시-d_3)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1876];

N-(*cis*-4-(2,2-디플루오로에톡시)사이클로헥실)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1877];

2-((*cis*-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)옥시)에탄-1-올 [1878];

trans-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1879];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1,4-디옥사스피로[4.5]데칸-8-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1880];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-(2-플루오로에틸)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1881];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-(2,2-디플루오로에틸)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1882];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-(3,3,3-트리플루오로프로필)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1883];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3S,4R)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1884];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3R,4R)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1885];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3S,4S)-3-플루오로-1-메틸피페리딘-

4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1886];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3R,4S)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1887];

1-(4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)-2-메틸프로판-1-온 [1888];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1889];

trans-4-((5-(1-(2,2-디플루오로에틸)-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1890];

trans-1-메틸-4-((5-(피라졸로[1,5-a]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 [1891];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1892];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1893];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-((3-플루오로아제티딘-1-일)메틸)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1894];

trans-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N-디메틸사이클로헥산-1-카복사미드 [1895];

아제티딘-1-일(*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메탄온 [1896];

(*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)(피롤리딘-1-일)메탄온 [1897];

N-(*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)아세트아미드 [1898];

1-(7-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-일)에탄-1-온 [1899]; 및

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1900]; 또는 그의 약제학적으로 허용가능한 염.

청구항 27

제1-7항 중 어느 한 항에 있어서, 식 I의 화합물은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1901];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1902];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1903];

(S)-1-(3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피롤리딘-1-일)에탄-1-온 [1904];

(R)-1-(3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피롤리딘-1-일)에탄-1-온 [1905];

(3S,4R)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)테트라히드로푸란-3-올 [1906];

(3R,4S)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)테트라히드로푸란-3-올 [1907];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-플루오로-1-이소부틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1908];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-3-플루오로-1-이소부틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1909];

1-(4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)에탄-1-온 [1910];

(S)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸피페리딘-2-온 [1911];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-플루오로테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1912];

N-((1R,5S,6r)-3-옥사바이사이클로[3.1.0]헥산-6-일)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1913];

N-((1R,5S,6s)-3-옥사바이사이클로[3.1.0]헥산-6-일)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1914];

(R)-N-(4,4-디플루오로사이클로헥실)-5-(1-((5-(1-플루오로에틸)-1,3,4-옥사디아졸-2-일)메틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1915];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1916];

(S)-(2,2-디플루오로사이클로프로필)(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 [1917];

(R)-(2,2-디플루오로사이클로프로필)(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 [1918];

N-((1s,3s)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)아세트아미드 [1919];

N-((1r,3r)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)아세트아미드 [1920];

(1r,3r)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N,1-트리메틸사이클로부탄-1-카복사미드 [1921];

(1s,3s)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N,1-트리메틸사이클로부탄-1-카복사미드 [1922];

((1s,3s)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)(피롤리딘-1-일)메탄온 [1923];

((1r,3r)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)(피롤리딘-1-일)메탄온 [1924];

1-(2-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)아미노)-7-아자스피로[3.5]노난-7-일)에탄-1-온 [1925];

1-((3aR,5s,6aS)-5-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로 [2,1-f][1,2,4]트리아진-2-일)아미노)헥사히드로사이클로펜타[c]피롤-2(1H)-일)에탄-1-온 [1926];

1-((3aR,5r,6aS)-5-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)헥사히드로사이클로펜타[c]피롤-2(1H)-일)에탄-1-온 [1927];

1-(7-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-일)에탄-1-온 [1928];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-옥사스피로[3.5]노난-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1929];

N-((1s,3s)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)아세트아미드 [1930];

N-((1r,3r)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)아세트아미드 [1931];

N-((1s,3s)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)프로피온아미드 [1932];

N-((1r,3r)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)프로피온아미드 [1933];

(1s,3s)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N,1-트리메틸사이클로부탄-1-카복사미드 [1934];

(1r,3r)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N,1-트리메틸사이클로부탄-1-카복사미드 [1935];

((1s,3s)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)(피롤리딘-1-일)메탄온 [1936];

((1r,3r)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)(피롤리딘-1-일)메탄온 [1937];

1-((1s,3s)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)피롤리딘-2-온 [1938];

1-((1r,3r)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)피롤리딘-2-온 [1939];

1-((3S,4R)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-4-플루오로피롤리딘-1-일)에탄-1-온 [1940];

1-((3R,4S)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-4-플루오로피롤리딘-1-일)에탄-1-온 [1941];

1-((3R,4R)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-4-플루오로피롤리딘-1-일)에탄-1-온 [1942];

1-((3S,4S)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-4-플루오로피롤리딘-1-일)에탄-1-온 [1943];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-4-플루오로-1-(옥세탄-3-일)피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1944];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-4-플루오로-1-(옥세탄-3-일)피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1945];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4R)-4-플루오로-1-(옥세탄-3-일)피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1946];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4S)-4-플루오로-1-(옥세탄-3-일)피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1947];

N-((1s,4s)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥실)아세트아미드 [1948];

N-((1r,4r)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥실)아세트아미드 [1949];

(3,3-디플루오로아제티딘-1-일)((1s,4s)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메탄온 [1950];

1-((3S,4R)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-3-플루오로피페리딘-1-일)에탄-1-온 [1951];

1-((3R,4S)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-3-플루오로피페리딘-1-일)에탄-1-온 [1952];

(4,4-디플루오로사이클로헥실)(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 [1953];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-플루오로-1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1954];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-3-플루오로-1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1955];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4R)-3-플루오로-1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1956];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4S)-3-플루오로-1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1957];

1-(2-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)아미노)-7-아자스피로[3.5]노난-7-일)에탄-1-온 [1958];

1-((3aR,5s,6aS)-5-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로 [2,1-f][1,2,4]트리아진-2-일)아미노)헥사히드로사이클로펜타[c]피롤-2(1H)-일)에탄-1-온 [1959];

1-((3aR,5r,6aS)-5-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로 [2,1-f][1,2,4]트리아진-2-일)아미노)헥사히드로사이클로펜타[c]피롤-2(1H)-일)에탄-1-온 [1960];

5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-옥사스피로[3.5]노난-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1961];

N-((1s,3s)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)아세트아미드 [1962];

N-((1r,3r)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)아세트아미드 [1963];

(1s,3s)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N,1-트리메틸사이클로부탄-1-카복사미드 [1964];

(1r,3r)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N,1-트리메틸사이클로부탄-1-카복사미드 [1965];

((1s,3s)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)(피롤리딘-1-일)메탄온 [1966];

((1r,3r)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)(피롤리딘-1-일)메탄온 [1967];

1-((1s,3s)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)피롤리딘-2-온 [1968];

1-((1r,3r)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)피롤리딘-2-온 [1969];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)-N-(*cis*-4-(트리플루오로메톡시) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1970];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-5-일)-N-(*cis*-4-(트리플루오로메톡시) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1971];

N-((1s,4s)-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥실)아세트아미드 [1972];

N-((1r,4r)-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥실)아세트아미드 [1973];

(1s,4s)-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 [1974];

1-(2-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-7-아자스피로[3.5]노난-7-일)에탄-1-온 [1975];

1-((3aR,5s,6aS)-5-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)헥사히드로사이클로펜타[c]피롤-2(1H)-일)에탄-1-온 [1976];

1-((3aR,5r,6aS)-5-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)헥사히드로사이클로펜타[c]피롤-2(1H)-일)에탄-1-온 [1977];

1-(7-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-일)에탄-1-온 [1978];

5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)-N-(2-옥사스피로[3.5]노난-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 [1979];

N-((1r,3r)-1-메틸-3-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸) 아세트아미드 [1980];

N-((1r,3r)-1-메틸-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸) 아세트아미드 [1981];

N-(*cis*-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)아세트아미드 [1982];

N-(*trans*-1-메틸-3-((5-(피라졸로[1,5-a]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로부틸)아세트아미드 [1983];

N-(*cis*-1-메틸-3-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸) 아세트아미드 [1984];

2-메톡시-N-(*trans*-1-메틸-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로부틸)아세트아미드 [1985]; 또는 그의 약제학적으로 허용가능한 염.

청구항 28

치료적으로 효과적인 양의 제1-27항 중 어느 한 항의 화합물, 또는 그의 약제학적으로 허용가능한 염, 및 약제학적으로 허용가능한 부형제를 포함하는 약제학적 조성물.

청구항 29

환자에서의 장애 또는 질환을 치료하는 방법으로서, 장애 또는 질환이 신경계 장애, 당뇨병 및 암으로 이루어진 군으로부터 선택되고, 환자에게 치료 유효량의 제1항 내지 제27항 중 어느 한 항에 따른 화합물 또는 약제학적으로 허용가능한 염, 또는 제28항에 따른 약제학적 조성물을 투여하는 것을 포함하는 방법.

청구항 30

제29항에 있어서, 장애 또는 질환은 암인 방법.

청구항 31

제29항에 있어서, 장애 또는 질환은 당뇨병인 방법.

청구항 32

제 29항에 있어서, 장애 또는 질환는 신경 장애인 방법.

청구항 33

제 29-30항 중 어느 한 항에 있어서, 암은 다음으로 이루어진 그룹으로부터 선택되는 방법: 뇌종양, 교모세포종, 난소암, 유방암, 두경부 편평 세포 암종, 간세포 암종, 췌장암, 급성 림프구성 백혈병, 급성 거핵구성 백혈병 및 만성 골수성 백혈병.

청구항 34

제 29 및 32 항 중 어느 한 항에 있어서, 장애 또는 질환은 신경계 장애이고, 여기서 신경계 장애는 다음으로 이루어진 그룹으로부터 선택되는 방법: 알츠하이머병, 근위축성 측삭 경화증, CDKL5 결핍 장애, 다운 증후군, 파킨슨증-17을 동반한 전두측두엽 치매(FTDP-17), 루이소체 치매, 파킨슨병, 픽병 및 자폐증, 치매, 간질, 헌팅턴병, 다발성 경화증과 같이 뚜렷한 신경퇴행이 있는 추가 질병; 만성 외상성 뇌병증, 외상성 뇌 손상, 종양, 뇌졸중, 피크병, 진행성 핵상 마비, 피질기저핵 변성, 호은성 곡물 질환, 구형 신경교 타우병증, 원발성 연령 관련 타우병증, 신경원섬유 농축체 치매, 만성 외상성 뇌병증(CTE), 타우 봉입물을 포함한 전두측두엽 엽변성(FTLD-tau) 및 노화 관련 타우 성상아교병증과 같은 후천적 뇌 손상과 관련된 질병 및 장애.

청구항 35

제29항, 제32항 및 제34항 중 어느 한 항에 있어서, 장애 또는 질환이 알츠하이머병인 방법.

청구항 36

제29항 내지 제35항 중 어느 한 항에 있어서, 환자가 인간인 방법.

발명의 설명

기 술 분 야

[0001] 관련 출원

[0002] 본 출원은 2021 년 10 월 12 일에 출원된 미국 가특허 출원 63/254,733호 및 2022 년 6 월 1 일에 출원된 63/347,757호의 이익을 주장하며 이는 그 전체가 본 명세서에 참조로 포함된다.

배 경 기 술

[0003] 기술분야

[0004] 본 개시내용은 이중-특이성 티로신 인산화 조절 1A 키나제의 억제제 및 이를 포함하는 조성물에 관한 것이다. 보다 구체적으로, 이는 DYRK1A의 비정상적인 발현 및/또는 활성을 특징으로 하는 장애(예:, 암, 다운증후군, 알츠하이머병, 당뇨병, 바이러스 감염 및 골관절염) 치료에 있어서 피롤로[2,1-f][1,2,4]트리아진 화합물 또는 이의 염 또는 유사체의 용도에 관한 것이다.

[0005] 배경기술

[0006] 이중-특이성 티로신 인산화 조절 키나제(DYRK1A, 1B, 2-4)는 진핵생물 키놈의 CMGC 그룹 내의 단백질 키나제 계열을 포함한다. 이러한 단백질 키나제는 세포내 신호전달, mRNA 스플라이싱, 염색질 전사, DNA 손상 복구, 세포 생존, 세포 주기 조절, 분화, 호모시스테인/메티오닌/엽산 조절, 체온 조절, 세포내이입, 신경 발달, 시냅스 가소성 등 다양한 세포 기능에 관여한다. 이러한 키나제 중 일부, 특히 DYRK1A의 비정상적인 발현 및/또는 활성은

다운증후군, 알츠하이머병 및 관련 질병, 타우병증, 치매, 픽병, 파킨슨병 및 기타 신경퇴행성 질환, 펠란-맥더미드 증후군, 자폐증 및 CDKL5 결핍 장애과 관련된 인지 결핍과 같은 많은 인간 신경계 질환에서 나타난다. DYRK는 또한 당뇨병, 비정상적인 엽산/메티오닌 대사, 골관절염, 여러 고형암(교모세포종, 유방암, 췌장암) 및 백혈병(급성 림프구성 백혈병, 급성 거핵구성 백혈병), 바이러스 감염(인플루엔자, HIV-1, HCMV, HCV, CMV, HPV) 및 단세포 기생충(*Leishmania, Trypanosoma, Plasmodium*)으로 인한 감염에도 관여한다(*International Journal of Molecular Sciences* (2021), *22(11)*, 6047). DYRK1A는 건선 진행 과정에서 각질화, 세포 과다증식, 비정상적인 분화 및 염증성 침윤에 기여하는 중요한 인자인 EGFR의 중요한 안정화제로도 확인되었다(*Cell Death & Disease* (2019), *10*, 282).

발명의 내용

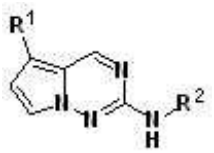
[0007] 요약

[0008] 본 개시내용은 DYRK1A 활성, 예를 들어 DYRK1A 활성을 길항하고, 예를 들어, 두경부 편평 세포 암종, 내강/HER_2 유방암(*Cell* (2016), *164(1-2)*, 293-309) 또는 췌장 선암종의 증식을 뿐만 아니라 교모세포종의 자가 재생 능력을 손상시키고 난소암 회전타원체 세포 생존력을 손상시키기에 (*Molecular Cancer Research* (2017), *15(4)*, 371-381) 충분한 양의 피롤로[2,1-f][1,2,4]트리아진 화합물과 같은 물질을 세포와 접촉시키는 것을 포함하는 방법 및 시약을 제공한다.

[0009] 본 개시내용은 또한 DYRK1A 활성을 길항하고, 예를 들어, i) 출생 전 및 출생 후 초기 뇌 발달을 정상화하기 위해; ii) 청소년과 성인기의 인지 기능을 향상시키기 위해; 및/또는 iii) 알츠하이머형 신경변성을 약화시키기 위해 충분한 양의 피롤로[2,1-f][1,2,4]트리아진 화합물과 같은 물질을 세포와 접촉시키는 것을 포함하는 방법 및 시약을 제공한다.

[0010] 본원에 개시된 일부 구체예는 피롤로[2,1-f][1,2,4]트리아진 코어를 함유하는 DYRK1A 억제제를 포함한다. 본 명세서에 개시된 다른 구체예는 약제학적 조성물 및 이들 화합물을 사용하는 치료 방법을 포함한다.

[0011] 여기서 개시된 하나의 구체예는 식 I의 구조를 가지는 화합물:

[0012] 

[0013] I

[0014] 또는 그의 약제학적으로 허용가능한 염을 포함하고,

[0015] 여기서,

[0016] R^1은 헤테로아릴 1-10 R^3로 임의로 치환되고;

[0017] R^2은 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-3} 알킬렌)$_p$$OR^4$, 1-10 R^5로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, 1-10 R^6로 임의로 치환된 -헤테로아릴, 및 1-12 R^7로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0018] 각각의 R^3는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-10 R^9로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$$OR^8$, -헤테로사이클릴, 1-12 R^{10}로 임의로 치환된 -카르보사이클릴, $-C(=O)N(R^{11})_2$, 및 $-C(=O)R^{12}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0019] 각각의 R^4는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0020] 각각의 R^5는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -OMe로 이루어진 그룹으로부터 독립적으로 선택되고;

[0021] 각각의 R^6는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -OMe로 이루어진 그룹으로부터 독립적으로 선택되고;

[0022] 각각의 R^7는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), $-N(R^{13})_2$, -(C_{1-5} 알킬렌)$_pOR^{14}$, 및 1-10 R^{15}로 임의로 치환된 -헤테로사이클릴로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0023] 각각의 R^8는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0024] 각각의 R^9는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0025] 각각의 R^{10}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0026] 각각의 R^{11}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-12 R^{16}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴, 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴, 및 1-10 R^{18}로 임의로 치환된 -헤테로아릴로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0027] 각각의 R^{12}은 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴;

[0028] 각각의 R^{13}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0029] 각각의 R^{14}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0030] 각각의 R^{15}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0031] 각각의 R^{16}는 할라이드, -OMe, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0032] 각각의 R^{17}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

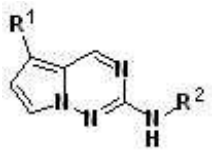
[0033] 각각의 R^{18}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된

-(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0034] 각각의 p는 독립적으로 0 또는 1; 및

[0035] 여기서 각각의 H 원자는 임의로, 독립적으로 ^{2}H (D) (중수소)로 대체된다.

[0036] 여기서 개시된 다른 구체예는 식 I의 구조를 가지는 화합물:



[0037]

[0038] I

[0039] 또는 그의 약제학적으로 허용가능한 염을 포함하고,

[0040] 여기서,

[0041] R^{1}은 헤테로아릴 1-10 R^{3}로 임의로 치환되고;

[0042] R^{2}은 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-5} 알킬렌)$_{p}OR^{4}$, 1-10 R^{5}로 임의로 치환된 -(C_{1-5} 알킬렌)$_{p}$헤테로사이클릴, 1-10 R^{6}로 임의로 치환된 -헤테로아릴, 및 1-12 R^{7}로 임의로 치환된 -(C_{1-5} 알킬렌)$_{p}$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0043] 각각의 R^{3}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-5} 알킬렌)$_{p}OR^{8}$, -(C_{1-5} 알킬렌)CN, 1-10 R^{9}로 임의로 치환된 -(C_{1-5} 알킬렌)$_{p}$헤테로사이클릴, 1-12 R^{10}로 임의로 치환된 -카르보사이클릴, 1-10 R^{19}로 임의로 치환된 -(C_{1-5} 알킬렌)$_{p}$헤테로아릴, -(C_{1-5} 알킬렌)$_{p}C(=O)N(R^{11})_{2}$, 및 $-C(=O)R^{12}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0044] 각각의 R^{4}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0045] 각각의 R^{5}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-10 R^{15}로 임의로 치환된 -헤테로사이클릴, -(C_{1-5} 알킬렌)$_{p}OR^{20}$, $-SO_{2}R^{22}$, 및 $-C(=O)R^{23}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0046] 대안적으로, 동일한 탄소 원자에 부착된 2개의 R^{5}는 함께 카르보닐 기를 형성하고;

[0047] 각각의 R^{6}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -OMe로 이루어진 그룹으로부터 독립적으로 선택되고;

[0048] 각각의 R^{7}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), $-N(R^{13})_{2}$, -(C_{1-5} 알킬렌)$_{p}OR^{14}$, 1-10 R^{15}로 임의로 치환된 -(C_{1-5} 알킬렌)$_{p}$헤테로사이클릴, $-C(=O)R^{21}$, 및 $-NHC(=O)R^{22}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-

5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0049] 각각의 R^8는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0050] 각각의 R^9는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0051] 각각의 R^{10}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0052] 각각의 R^{11}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-12 R^{16}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴, 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴, 및 1-10 R^{18}로 임의로 치환된 -헤테로아릴로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0053] 각각의 R^{12}은 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴;

[0054] 각각의 R^{13}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0055] 각각의 R^{14}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -(C_{1-5} 알킬렌)$_p$$OR^{20}$로 이루어진 그룹으로부터 독립적으로 선택되고;

[0056] 각각의 R^{15}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0057] 각각의 R^{16}는 할라이드, -OMe, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0058] 각각의 R^{17}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0059] 각각의 R^{18}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0060] 각각의 R^{19}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0061] 각각의 R^{20}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0062] 각각의 R^{21}는 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴, $-N(R^{11})_2$ 및 $-OR^{20}$로 이루어진 그룹으로부터 독립적으로 선택되고;

[0063] 각각의 R^{22}는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로

알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0064] 각각의 R^{23}는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 1-12 R^{24}로 임의로 치환된 -카르보사이클릴로 이루어진 그룹으로부터 독립적으로 선택되고;

[0065] 각각의 R^{24}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0066] 각각의 p는 독립적으로 0 또는 1; 및

[0067] 여기서 각각의 H 원자는 임의로, 독립적으로 ^{2}H (D) (중수소)로 대체된다.

[0068] 여기서 개시된 다른 구체예는 식 I의 구조를 가지는 화합물을 포함하고:

[0069] R^{1}은 헤테로아릴 1-10 R^{3}로 임의로 치환되고;

[0070] R^{2}은 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-5} 알킬렌)$_p$$OR^{4}$, 1-10 R^{5}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, 1-10 R^{6}로 임의로 치환된 -헤테로아릴, 및 1-12 R^{7}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0071] 각각의 R^{3}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-5} 알킬렌)$_p$$OR^{8}$, -($C_{1-5}$ 알킬렌)CN, 1-10 R^{9}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, 1-12 R^{10}로 임의로 치환된 -카르보사이클릴, 1-10 R^{19}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로아릴, -(C_{1-5} 알킬렌)$_p$$C(=O)N(R^{11})_2$, 및 $-C(=O)R^{12}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0072] 각각의 R^{4}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0073] 각각의 R^{5}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-10 R^{15}로 임의로 치환된 -헤테로사이클릴, -(C_{1-5} 알킬렌)$_p$$OR^{20}$, $-SO_2R^{22}$, 및 $-C(=O)R^{23}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0074] 대안적으로, 동일한 탄소 원자에 부착된 2개의 R^{5}는 함께 카르보닐 기를 형성하고;

[0075] 각각의 R^{6}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -OMe로 이루어진 그룹으로부터 독립적으로 선택되고;

[0076] 각각의 R^{7}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), $-N(R^{13})_2$, -(C_{1-5} 알킬렌)$_p$$OR^{14}$, 1-10 R^{15}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, $-C(=O)R^{21}$, 및 $-NH(=O)R^{22}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0077] 각각의 R^8는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0078] 각각의 R^9는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0079] 각각의 R^{10}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0080] 각각의 R^{11}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-12 R^{16}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴, 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴, 및 1-10 R^{18}로 임의로 치환된 -헤테로아릴로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환되고;

[0081] 각각의 R^{12}은 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴;

[0082] 각각의 R^{13}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0083] 각각의 R^{14}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -(C_{1-5} 알킬렌)$_p$$OR^{20}$로 이루어진 그룹으로부터 독립적으로 선택되고;

[0084] 각각의 R^{15}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0085] 대안적으로, 동일한 탄소 원자에 부착된 2개의 R^{15}는 함께 카르보닐 기를 형성하고;

[0086] 각각의 R^{16}는 할라이드, -OMe, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0087] 각각의 R^{17}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0088] 각각의 R^{18}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0089] 각각의 R^{19}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0090] 각각의 R^{20}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0091] 각각의 R^{21}는 1-10 R^{17}로 임의로 치환된 -헤테로사이클릴, $-N(R^{11})_2$ 및 $-OR^{20}$로 이루어진 그룹으로부터 독립적으로 선택되고;

[0092] 각각의 R^{22}는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9}

할로알킬), 및 -(C_{1-5} 알킬렌)$_p$OR^{20}로 이루어진 그룹으로부터 독립적으로 선택되고;

[0093] 각각의 R^{23}는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 1-12 R^{24}로 임의로 치환된 -카르보사이클릴로 이루어진 그룹으로부터 독립적으로 선택되고;

[0094] 각각의 R^{24}는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택되고;

[0095] 각각의 p는 독립적으로 0 또는 1; 및

[0096] 여기서 각각의 H 원자는 임의로, 독립적으로 ^{2}H (D) (중수소)로 대체된다.

[0097] 일부 구체예는 화학식 I의 화합물의 입체이성질체 및 약제학적으로 허용가능한 염을 포함한다. 일부 구체예는 화학식 I의 화합물의 약제학적으로 허용가능한 염을 포함한다.

[0098] 일부 구체예는 화학식 I의 화합물의 전구약물을 포함한다.

[0099] 본 개시내용의 일부 구체예는 화학식 I의 화합물 및 약제학적으로 허용가능한 담체, 희석제 또는 부형제를 포함하는 약제학적 조성물을 포함한다.

[0100] 여기서 개시된 다른 구체예는 DYRK1A 과발현이 암시된 장애 또는 질환 가령 알츠하이머 병, 근위축성 측삭 경화증, CDKL5 결핍 장애, 다운 증후군, 파킨슨증을 동반한 전측두엽성 치매 (FTDP-17), 루이소체 치매, 파킨슨 병, 픽병, 그리고 뚜렷한 신경 퇴화가있는 추가 질환 가령 자폐증, 치매, 간질, 헌팅턴병, 다발성 경화증; 후천성 뇌 손상과 관련된 질병 및 장애 가령 만성 외상성 뇌병증, 외상성 뇌 손상, 종양 및 뇌졸중에 걸린 환자에게 투여하는 것에 의해 DYRK1A을 저해하는 방법을 포함한다.

[0101] DYRK1A의 억제제는 또한 타우병증을 치료하는데 사용될 수 있다. 타우병증은 뇌에 비정상적인 타우 단백질이 침착되는 것을 특징으로 하는 신경퇴행성 장애이다. 타우 병리의 스펙트럼은 픽병, 진행성 핵상 마비, 피질기저핵 변성 및 호은성 곡물 질환과 같이 전통적으로 논의된 질병 형태를 넘어 확장된다. 신흥 실체 및 병리는 구형 신경교 타우 병증, 신경원섬유 농축체 치매를 포함하는 원발성 연령 관련 타우 병증, 만성 외상성 뇌병증 (CTE), 타우 포함 전두 측두엽 변성 (FTLD-tau) 및 노화 관련 타우 성상교병증을 포함한다. 임상 증상은 전두측두엽 치매, 피질기저핵 증후군, 리처드슨 증후군, 파킨슨증, 보행 동결을 동반한 순수 무운동증, 드물게 운동 뉴런 증상 또는 소뇌 운동실조를 포함한다 (*Handbook of Clinical Neurology* (2018), *145*, 355-368 및 *Aging Cell* (2019), *18(5)*, e13000).

[0102] DYRK1A 억제제는 또한 비정상적인 엽산/메티오닌 대사와 관련된 장애를 치료하는 데 사용될 수 있다.

[0103] 본원에 제공된 화합물 및 조성물로 치료될 수 있는 질병의 비제한적인 예는 다양한 암, 당뇨병, 건선, 무릎 골관절염, 건병증, 인간 면역결핍 바이러스 1형(HIV-1), 인간 거대세포바이러스(HCMV), C형 간염 바이러스(HCV) 및 단순 포진 바이러스 1(HSV-1)을 포함한다.

[0104] 본 개시내용의 일부 구체예는 화학식 I의 화합물을 제조하는 방법을 포함한다.

[0105] 전술한 일반적인 설명과 다음의 상세한 설명은 단지 예시적이고 설명하기 위한 것이며 청구된 바와 같은 개시내용을 제한하지 않는다는 것이 이해되어야 한다.

발명을 실시하기 위한 구체적인 내용

[0106] DYRK1A을 저해하는 조성물 및 방법이 여기서 제공된다.

[0107] 본 명세서에 제공된 일부 실시예는 신경 질환 또는 장애, 암, 인지 결핍, 무릎 골관절염, 건병증, 바이러스 감염, 단세포 기생충 감염 및 운동 결핍을 포함하지만 이에 제한되지 않는 질병을 치료하는 방법에 관한 것이다.

[0108] 일부 구체예에서, 본원에 제공된 화합물 및 조성물로 치료될 수 있는 신경 질환 또는 장애의 비제한적인 예는 알츠하이머병, 근위축성 측삭 경화증, 다운 증후군, 파킨슨병-17을 동반한 전두측두엽 치매 (FTDP-17), 루이소체 치매, 파킨슨병, 픽병 타우병증, 및 자폐증, 치매, 간질, 헌팅턴병, 다발성 경화증과 같은 뚜렷한 신경퇴행이 있는 추가 질병; 만성 외상성 뇌병증, 외상성 뇌 손상, 종양 및 뇌졸중과 같은 후천성 뇌 손상과 관련된 질

병 및 장애를 포함하지만 이에 제한되지는 않는다.

[0109] 일부 구체예에서, 본원에 제공된 화합물 및 조성물로 치료될 수 있는 암의 비제한적인 예는 고형암(예를 들어, 교모세포종, 난소암, 유방암 및 췌장암) 및 백혈병(예를 들어, 급성 림프구성 백혈병, 급성 거핵구성 백혈병, 만성 골수성 백혈병)을 포함한다.

[0110] 일부 구체예에서, DYRK1A 과발현에 의해 유발되는 동물, 예를 들어 포유동물의 질병 치료에 효과적인 약제학적 조성물이 제공된다. 조성물은 약제학적으로 허용가능한 담체 및 본원에 기술된 화합물을 포함한다.

[0111] 정의

[0112] 다르게 정의되지 않는다면, 여기서 사용된 모든 기술적 과학적 용어는 본발명이 속하는 분야에서의 숙련가에게 흔히 이해되는 것과 동일한 의미를 가진다. 모든 특허, 출원, 공개된 출원 및 기타 출판물은 그 전체가 참조로 포함된다. 여기에서 용어에 대한 정의가 여러 개가 있는 경우, 달리 명시되지 않는 한 이 섹션의 정의가 우선한다.

[0113] 여기서 사용된, "알킬"은 단지 탄소 및 수소를 함유하는 분지쇄, 또는 직쇄 화학적 기, 가령 메틸, 에틸, n-프로필, 이소-프로필, n-부틸, 이소-부틸, sec-부틸, tert-부틸, n-펜틸, 이소-펜틸, sec-펜틸 및 neo-펜틸을 의미한다. 알킬 기는 비치환 또는 하나 이상의 치환체로 치환될 수 있다. 일부 구체예에서, 알킬 기는 1 내지 9 탄소 원자 (예를 들어, 1 내지 6 탄소 원자, 1 내지 4 탄소 원자, 또는 1 내지 2 탄소 원자)를 포함한다.

[0114] 여기서 사용된, "알케닐"은 단지 탄소 및 수소를 함유하고 적어도 하나의 탄소-탄소 이중 결합을 함유하는 직쇄 또는 분지쇄 화학적 기, 가령 에테닐, 1-프로페닐, 2-프로페닐, 2-메틸-1-프로페닐, 1-부테닐, 2-부테닐, 등을 의미한다. 다양한 구체예에서, 알케닐 기는 비치환 또는 하나 이상의 치환체로 치환될 수 있다. 대표적으로, 알케닐 기는 2 내지 9 탄소 원자 (예를 들어, 2 내지 6 탄소 원자, 2 내지 4 탄소 원자, 또는 2 탄소 원자)를 포함할 것이다.

[0115] 여기서 사용된, "알키닐"은 단지 탄소 및 수소를 함유하고 적어도 하나의 탄소-탄소 삼중 결합을 함유하는 직쇄 또는 분지쇄 화학적 기, 가령 에티닐, 1-프로피닐, 1-부티닐, 2-부티닐, 등을 의미한다. 다양한 구체예에서, 알키닐 기는 비치환 또는 하나 이상의 치환체로 치환될 수 있다. 대표적으로, 알키닐 기는 2 내지 9 탄소 원자 (예를 들어, 2 내지 6 탄소 원자, 2 내지 4 탄소 원자, 또는 2 탄소 원자)를 포함할 것이다.

[0116] 여기서 사용된, "알킬렌"은 단지 탄소 및 수소를 함유하는 2가 분지쇄, 또는 직쇄 화학적 기, 가령 메틸렌, 에틸렌, n-프로필렌, 이소-프로필렌, n-부틸렌, 이소-부틸렌, sec-부틸렌, tert-부틸렌, n-펜틸렌, 이소-펜틸렌, sec-펜틸렌 및 neo-펜틸렌을 의미한다. 알킬렌 기는 비치환 또는 하나 이상의 치환체로 치환될 수 있다. 일부 구체예에서, 알킬렌 기는 1 내지 9 탄소 원자 (예를 들어, 1 내지 6 탄소 원자, 1 내지 4 탄소 원자, 또는 1 내지 2 탄소 원자)를 포함한다.

[0117] 여기서 사용된, "알케닐렌"은 단지 탄소 및 수소를 함유하고 적어도 하나의 탄소-탄소 이중 결합을 함유하는 2가 분지쇄, 또는 직쇄 화학적 기, 가령 에테닐렌, 1-프로페닐렌, 2-프로페닐렌, 2-메틸-1-프로페닐렌, 1-부테닐렌, 2-부테닐렌, 등을 의미한다. 다양한 구체예에서, 알케닐렌 기는 비치환 또는 하나 이상의 치환체로 치환될 수 있다. 대표적으로, 알케닐렌 기는 2 내지 9 탄소 원자 (예를 들어, 2 내지 6 탄소 원자, 2 내지 4 탄소 원자, 또는 2 탄소 원자)를 포함할 것이다.

[0118] 여기서 사용된, "알키닐렌"은 단지 탄소 및 수소를 함유하고 적어도 하나의 탄소-탄소 삼중 결합, 가령 에티닐렌, 1-프로피닐렌, 1-부티닐렌, 2-부티닐렌, 등을 함유하는 2가 분지쇄, 또는 직쇄 화학적 기를 의미한다. 다양한 구체예에서, 알키닐렌 기는 비치환 또는 하나 이상의 치환체로 치환될 수 있다. 대표적으로, 알키닐렌 기는 2 내지 9 탄소 원자 (예를 들어, 2 내지 6 탄소 원자, 2 내지 4 탄소 원자, 또는 2 탄소 원자)를 포함할 것이다.

[0119] 여기서 사용된, "알콕시"은 알킬 기가 여기서 기술된 바와 같은 알킬-O- 기를 의미한다. 예시적 알콕시 기는 메톡시, 에톡시, n-프로폭시, i-프로폭시, n-부톡시, s-부톡시, t-부톡시, 펜톡시, 헥속시 및 헵톡시, 및 또한 그의 선형 또는 분지쇄 위치 이성질체를 포함한다.

[0120] 여기서 사용된, "할로알콕시"은 할로알킬 기가 여기서 기술된 바와 같은 할로알킬-O- 기를 의미한다. 예시적 할로알콕시 기는 플루오로메톡시, 디플루오로메톡시, 트리플루오로메톡시, 및 또한 그의 선형 또는 분지쇄 위치 이성질체를 포함한다.

[0121] 본원에 사용된 "카르보사이클릴"은 고리계 골격에 탄소 원자만 함유하는 고리형 고리계, 예를 들어 사이클로프로필, 사이클로부틸, 사이클로펜틸, 사이클로헥실 및 사이클로헥세닐을 의미한다. 카르보사이클릴은 다중 융합 고리를 포함할 수 있다. 카르보사이클릴은 고리 시스템의 고리 중 어느 것도 방향족이 아닌 한 임의의 포화도를 가질 수 있다. 카르보사이클릴 기는 비치환되거나 하나 이상의 치환기로 치환될 수 있다. 일부 구체예에서, 카르보사이클릴 기는 3 내지 10개의 탄소 원자, 예를 들어 3 내지 6개의 탄소 원자를 포함한다.

[0122] 본원에 사용된 "아릴"은 5 내지 14개의 고리 원자, 대안적으로 5, 6, 9 또는 10개의 고리 원자를 갖고; 순환 배열에서 공유되는 6, 10 또는 14개의 pi 전자를 갖는 고리 골격에 탄소 원자만 존재하는 모노-, 바이-, 트리- 또는 폴리사이클릭 기를 의미하고 여기서 시스템 내의 적어도 하나의 고리는 방향족이다. 아릴 기는 비치환 또는 하나 이상의 치환체로 치환될 수 있다. 아릴의 예는 페닐, 나프틸, 테트라히드로나프틸, 2,3-디히드로-1H-인데닐 등을 포함한다. 일부 구체예에서, 아릴은 페닐이다.

[0123] 본원에 사용된 "아릴알킬렌"은 아릴 및 알킬렌 부분이 앞서 기술된 바와 같은 아릴-알킬렌- 그룹을 의미한다. 일부 구체예에서, 아릴알킬렌 기는 C_{1-4} 알킬렌 부분을 함유한다. 예시적인 아릴알킬렌 기는 벤질 및 2-페네틸을 포함한다.

[0124] 본원에 사용된 용어 "헤테로아릴"은 5 내지 14개의 고리 원자, 대안적으로 5, 6, 9 또는 10개의 고리 원자를 갖고; 순환 배열에서 공유되는 6, 10 또는 14개의 pi 전자를 갖는 모노-, 바이-, 트리- 또는 폴리사이클릭 기를 의미하며; 여기서 시스템 중 하나 이상의 고리는 방향족이고, 시스템 중 하나 이상의 고리는 N, O 및 S로 구성된 군으로부터 독립적으로 선택된 하나 이상의 헤테로원자를 함유한다. 헤테로아릴 기는 비치환되거나 하나 이상의 치환기로 치환될 수 있다. 헤테로아릴의 예는 티에닐, 피리디닐, 푸릴, 옥사졸릴, 옥사디아졸릴, 피롤릴, 이미다졸릴, 트리아졸릴, 티오디아졸릴, 피라졸릴, 이속사졸릴, 티아디아졸릴, 피라닐, 피라지닐, 피리미디닐, 피리다지닐, 트리아지닐, 티아졸릴 벤조티에닐, 벤족사디아졸릴, 벤조푸라닐, 니지미다졸릴, 벤조트리아졸릴, 신놀리닐, 인다졸릴, 인돌릴, 이소퀴놀리닐, 이소티아졸릴, 나프티리디닐, 퓨리닐, 티에노피리디닐, 피리도[2,3-*d*]피리미디닐, 피롤로[2,3-*b*]피리디닐, 퀴나졸리닐, 퀴놀리닐, 티에노[2,3-*c*]피리디닐, 피라졸로 [3,4-*b*]피리디닐, 피라졸로[3,4-*c*]피리디닐, 피라졸로[4,3-*c*]피리딘, 피라졸로[4,3-*b*]피리디닐, 테트라졸릴, 크로만, 2,3-디하이드로벤조[*b*][1,4]디옥신, 벤조[*d*][1,3]디옥솔, 2,3-디히드로벤조푸란, 테트라히드로퀴놀린, 2,3-디히드로벤조[*b*][1,4]옥사틴, 이소인돌린 등을 포함한다. 일부 구체예에서, 헤테로아릴은 티에닐, 피리디닐, 푸릴, 피라졸릴, 이미다졸릴, 이소인돌리닐, 피라닐, 피라지닐 및 피리미디닐로부터 선택된다.

[0125] 본원에 사용된 "할로", "할라이드" 또는 "할로겐"은 클로로, 브로모, 플루오로 또는 요오도 원자 라디칼이다. 일부 구체예에서, 할로는 클로로, 브로모 또는 플루오로이다. 예를 들어, 할로겐화물은 플루오로일 수 있다.

[0126] 본원에 사용된 "할로알킬"은 하나 이상의 클로로, 브로모, 플루오로 및/또는 요오도 원자(들)로 치환된 선형 또는 분지형 알킬, 알케닐 또는 알키닐인 탄화수소 치환기를 의미한다. 일부 구체예에서, 할로알킬은 플루오로알킬이며, 여기서 수소 원자 중 하나 이상이 플루오로로 치환된다. 일부 구체예에서, 할로알킬은 길이가 1 내지 3개의 탄소(예를 들어, 1 내지 2개의 탄소 길이 또는 1개의 탄소 길이)이다. "할로알킬렌"이라는 용어는 할로알킬의 디라디칼 변형을 의미하며, 이러한 디라디칼은 라디칼, 다른 원자 사이, 또는 고리와 다른 작용기 사이에서 스페이서 역할을할 수 있다.

[0127] 본원에 사용된 "헤테로사이클릴"은 고리 시스템 골격에 하나 이상의 헤테로원자를 포함하는 비방향족 사이클릭 고리 시스템을 의미한다. 헤테로사이클릴은 바이사이클릭 및 스피로사이클릭 헤테로사이클릴과 같은 다중 융합 고리를 포함할 수 있다. 헤테로사이클릴은 하나 이상의 치환기로 치환되거나 치환되지 않을 수 있다. 일부 구체예에서, 헤테로사이클은 3-11개의 구성원을 갖는다. 6원 모노사이클릭 헤테로사이클에서, 헤테로원자(들)는 O, N 및 S 중 1 내지 3개로부터 선택되고, 헤테로사이클이 5원인 경우, 이는 O, N 및 S로부터 선택된 1개 또는 2개의 헤테로원자를 가질 수 있다. 헤테로사이클릴의 예시는 아지리닐, 아지리디닐, 아제티디닐, 옥세타닐, 티에타닐, 1,4,2-디티아졸릴, 디히드로피리디닐, 1,3-디옥사닐, 1,4-디옥사닐, 1,3-디옥솔라닐, 모르폴리닐, 티오모르폴리닐, 피페라지닐, 피라닐, 피롤리디닐, 테트라히드로푸릴, 테트라히드로피리디닐, 옥사진기닐, 티아지닐, 티이닐, 티아졸리디닐, 이소티아졸리디닐, 옥사졸리디닐, 이속사졸리디닐, 피페리디닐, 피라졸리디닐 이미다졸리디닐, 티오모르폴리닐 등을 포함한다. 일부 구체예에서, 헤테로사이클릴은 아제티디닐, 모르폴리닐, 피페라지닐, 피롤리디닐 및 테트라히드로피리디닐로부터 선택된다.

[0128] 본원에 사용된 "단환식 헤테로사이클릴"은 고리 시스템 골격에 하나 이상의 헤테로원자를 포함하는 단일 비방향족 사이클릭 고리를 의미한다. 헤테로사이클릴은 하나 이상의 치환기로 치환되거나 치환되지 않을 수 있다. 일

부 구체예에서, 헤테로사이클은 3-7개의 구성원을 갖는다. 6원 모노사이클릭 헤테로사이클에서, 헤테로원자(들)는 O, N 및 S 중 1 내지 3개로부터 선택되고, 헤테로사이클이 5원인 경우, 이는 O, N 및 S로부터 선택된 1개 또는 2개의 헤테로원자를 가질 수 있다. 단환식 헤테로사이클릴의 예시는 아지리닐, 아지리디닐, 아제티디닐, 옥세타닐, 티에타닐, 1,4,2-디티아졸릴, 디히드로피리디닐, 1,3-디옥사닐, 1,4-디옥사닐, 1,3-디옥솔라닐, 모르폴리닐, 티오모르폴리닐, 피페라지닐, 피라닐, 피롤리디닐, 테트라히드로푸릴, 테트라히드로피리디닐, 옥사진기닐, 티아지닐, 티이닐, 티아졸리디닐, 이소티아졸리디닐, 옥사졸리디닐, 이속사졸리디닐, 피페리디닐, 피라졸리디닐 이미다졸리디닐, 티오모르폴리닐 등을 포함한다.

[0129] 본원에 사용된 "헤테로사이클릴"은 고리 시스템 골격에 하나 이상의 헤테로원자를 포함하는 비방향족 2환식 고리 시스템을 의미한다. 2환식 헤테로사이클릴은 하나 이상의 치환기로 치환되거나 치환되지 않을 수 있다. 일부 구체예에서, 이환식 헤테로사이클은 O, N 및 S 중 1 내지 5개로부터 선택되는 헤테로원자를 갖는 4 내지 11개의 구성원을 갖는다. 이환식 헤테로사이클릴의 예는 2-아자바이사이클로[1.1.0]부탄, 2-아자바이사이클로[2.1.0]펜탄, 2-아자바이사이클로[1.1.1]펜탄, 3-아자바이사이클로[3.1.0]헥산, 5-아자바이사이클로[2.1.1]헥산, 3-아자바이사이클로[3.2.0]헵탄, 옥타히드로사이클로펜타[*c*]피롤, 3-아자바이사이클로[4.1.0]헵탄, 7-아자바이사이클로[2.2.1]헵탄, 6-아자바이사이클로[3.1.1]헵탄, 7-아자바이사이클로[4.2.0]옥탄, 2-아자바이사이클로[2.2.2]옥탄, 등을 포함한다.

[0130] 본원에 사용된 "스피로사이클릭 헤테로사이클릴"은 고리 시스템 골격에 하나 이상의 헤테로원자를 포함하고 고리가 단 하나의 원자를 통해 연결된 비방향족 이환식 고리 시스템을 의미한다. 스피로사이클릭 헤테로사이클릴은 하나 이상의 치환기로 치환되거나 치환되지 않을 수 있다. 일부 구체예에서, 스피로사이클릭 헤테로사이클은 O, N 및 S 중 1 내지 5개로부터 선택되는 헤테로원자를 갖는 5 내지 11원을 갖는다. 스피로사이클릭 헤테로사이클릴의 예는 2-아자스피로[2.2]펜탄, 4-아자스피로[2.5]옥탄, 1-아자스피로[3.5]노난, 2-아자스피로[3.5]노난, 7-아자스피로[3.5]노난, 2-아자스피로[4.4]노난, 6-아자스피로[2.6]노난, 1,7-디아자스피로[4.5]데칸, 2,5-디아자스피로[3.6]데칸, 등을 포함한다.

[0131] 용어 "치환된"은 분자의 하나 이상의 비수소 원자 상의 수소를 대체하는 치환기를 갖는 모이어티를 지칭한다.."치환" 또는 "로 치환된"은, 그와 같인 치환이 치환된 원자 및 치환체의 허용된 원자가를 따르고, 상기 치환이 예를 들어 재배열, 고리화, 제거 등과 같은 것에 의해 변환을 자발적으로 겪지 않는 안정한 화합물을 생성하도록 암시된 조건을 포함하는 것으로 이해될 것이다. 치환기는, 예를 들어, 히드록실, $-NH_2$, $-NH(C_{1-3}$ 알킬), 및 $-N(C_{1-3}$ 알킬$)_2$중 하나 이상으로 임의로 치환된 $-(C_{1-9}$ 알킬); $-(C_{1-9}$ 할로알킬); 할라이드; 히드록실; 카르보닐 [가령 -C(O)OR, 및 -C(O)R]; 티오카르보닐 [가령 -C(S)OR, -C(O)SR, 및 -C(S)R]; 할라이드, 히드록실, $-NH_2$, $-NH(C_{1-3}$ 알킬), 및 $-N(C_{1-3}$ 알킬$)_2$중 하나 이상으로 임의로 치환된 $-(C_{1-9}$ 알콕시); $-OPO(OH)_2$; 포스포네이트 [가령 $-PO(OH)_2$ 및 $-PO(OR')_2$]; -OPO(OR')R"; -NRR'; -C(O)NRR'; -C(NR)NR'R"; -C(NR')R"; 시아노; 니트로; azido; -SH; -S-R; $-OSO_2(OR)$; 설포네이트 [가령 $-SO_2(OH)$ 및 $-SO_2(OR)$]; $-SO_2NR'R"$; 및 $-SO_2R$; 여기서 각각의 경우의 R, R' 및 R"는 로부터 독립적으로 선택되고 H; $-(C_{1-9}$ 알킬); 1-3 R'''로 임의로 치환된 C_{6-10} 아릴; N, O, 및 S로부터 독립적으로 선택된 1-4 헤테로원자를 갖고 1-3 R'''로 임의로 치환된 5-10 원 헤테로아릴; 1-3 R'''로 임의로 치환된 C_{3-7} 카르보사이클릴; 및 N, O, 및 S로부터 독립적으로 선택된 1-4 헤테로원자를 갖고 1-3 R'''로 임의로 치환된 3-8 원 헤테로사이클릴; 여기서 각각의 R'''는 $-(C_{1-6}$ 알킬), $-(C_{1-6}$ 할로알킬), 할라이드 (예를 들어, F), 히드록실, -C(O)OR, -C(O)R, $-(C_{1-6}$ 알콕실), -NRR', -C(O)NRR', 및 시아노로부터 독립적으로 선택되고, 여기서 각각의 경우의 R 및 R'는 H 및 $-(C_{1-6}$ 알킬)로부터 독립적으로 선택됨,을 포함할 수 있다. 일부 구체예에서, 치환기는 $-(C_{1-6}$ 알킬), $-(C_{1-6}$ 할로알킬), 할라이드 (예를 들어, F), 히드록실, -C(O)OR, -C(O)R, $-(C_{1-6}$ 알콕실), -NRR', -C(O)NRR', 및 시아노로부터 선택되고, 여기서 각각의 경우의 R 및 R'는 H 및 $-(C_{1-6}$ 알킬)로부터 독립적으로 선택된다.

[0132] 본원에 사용된 바와 같이, 2개의 기가 "고리"를 형성하기 위해 "연결된" 또는 "결합된" 것으로 표시되는 경우, 결합은 2개의 기 사이에 형성되고 수소 원자의 대체를 수반할 수 있다는 것을 이해해야 한다. 결합으로 하나 또는 두 기 모두에 결합하여 카르보사이클릴, 헤테로사이클릴, 아릴 또는 헤테로아릴 고리를 형성한다. 숙련된 기술자는 이러한 고리가 일상적인 화학 반응에 의해 쉽게 형성될 수 있고 쉽게 형성된다는 것을 인식할 것이다. 일부 구체예에서, 이러한 링은 3-7개의 부재, 예를 들어 5 또는 6개의 부재를 갖는다.

[0133] 당업자는 본원에 기재된 일부 화학 구조가 하나 이상의 다른 공명 형태로 종이에 표현될 수 있음을 인식할 것이다. 또는 하나 이상의 다른 호변이성체 형태로 존재할 수 있으며, 동역학적인 경우에도 당업자는 그러한 호변이성체 형태가 그러한 화합물(들) 샘플의 매우 작은 부분만을 나타낸다는 것을 인식한다. 이러한 화합물은 본 개시내용의 범위 내에서 명백히 고려되지만, 이러한 공명 형태 또는 호변이성체는 본원에서 명시적으로 나타내지 않는다.

[0134] 본원에 제공된 화합물은 다양한 입체화학적 형태를 포함할 수 있다. 화합물은 또한 부분입체이성질체 및 광학이성질체, 예를 들어 라세미 혼합물을 포함하는 거울상이성질체의 혼합물뿐만 아니라 특정 화합물의 구조적 비대칭의 결과로 발생하는 개별 거울상이성질체 및 부분입체이성질체도 포함한다. 개별 이성질체의 분리 또는 개별 이성질체의 선택적 합성은 당업자에게 잘 알려진 다양한 방법을 적용하여 달성된다. 달리 명시하지 않는 한, 개시된 화합물이 입체화학을 명시하지 않고 구조에 의해 명명되거나 묘사되고 하나 이상의 키랄 중심을 갖는 경우, 이는 화합물의 모든 가능한 입체이성질체를 나타내는 것으로 이해된다.

[0135] 본 개시내용은 하나 이상의 원자가 동일한 원자 번호를 갖지만 자연에서 지배적인 원자 질량 또는 질량 수와는 다른 원자 질량 또는 질량 수를 갖는 원자로 대체된 모든 약제학적으로 허용가능한 동위원소 표지된 화학식 I의 화합물을 포함한다. 본 발명의 화합물에 포함되기에 적합한 동위원소의 예는 ^{2}H(중수소) 및 ^{3}H(삼중수소)와 같은 수소 동위원소, ^{11}C, ^{13}C 및 ^{14}C와 같은 탄소 동위원소, 염소 동위원소(예: ^{36}Cl), 불소 동위원소(예: ^{18}F), 요오드 동위원소(예: ^{123}I 및 ^{125}I), 질소 동위원소(예: ^{13}N 및 ^{15}N), 산소 동위원소(예: ^{15}O, ^{17}O 및 ^{18}O), 인 동위원소(예: ^{32}P), 황 동위원소(예: ^{35}S)을 포함한다.

[0136] 용어 "투여" 또는 "투여하는"은 포유동물, 새, 어류 또는 양서류를 포함하는 척추동물 또는 무척추동물에게 화합물 또는 약제학적 조성물의 투여량을 제공하는 방법을 지칭하며, 여기서 투여방법은 예를 들어, 경구, 피하, 정맥내, 림프내, 비강내, 국소, 경피, 복강내, 근육내, 폐내, 질내, 직장, 존재론적으로, 신경이과학적으로, 안구내, 결막하, 전안방 주사를 통해, 유리체내, 복강내, 척수강내, 방광 내, 흉막 내, 상처 세척을 통해, 협구내, 복부 내, 관절 내, 귀 내, 기관지 내, 피막 내, 수막 내, 흡입을 통해, 기관 내 또는 기관지 내 점적을 통해, 폐강에 직접 점적을 통해, 척수 내, 윤활막 내, 흉강 내 흉강관 세척, 경막외, 고막내, 수조내, 혈관내, 뇌실내, 골내, 감염된 뼈 세척 또는 보철 장치와의 혼합물의 일부로서의 적용을 통해서이다. 투여 방법은 다양한 요인, 예를 들어 약제학적 조성물의 성분, 질병 부위, 관련 질병 및 질병의 중증도에 따라 달라질 수 있다.

[0137] 본원에 사용된 "진단"은 건강 또는 질병 상태의 식별 또는 특성화를 돕는 화합물, 방법, 시스템 또는 장치이다. 진단은 당업계에 공지된 표준 분석에 사용될 수 있다.

[0138] "포유류"라는 용어는 일반적인 생물학적 의미로 사용된다. 따라서 여기에는 구체적으로 인간, 소, 말, 원숭이, 개, 고양이, 생쥐, 쥐, 소, 양, 돼지, 염소 및 인간이 아닌 영장류가 포함되지만 다른 많은 종도 포함된다.

[0139] "약제학적으로 허용가능한 담체", "약제학적으로 허용가능한 희석제" 및 "약제학적으로 허용가능한 부형제"라는 용어는 생물학적으로나 달리 해롭지 않은 모든 용매, 공용매, 착화제, 분산 매질, 코팅, 등장성 및 흡수 지연제 등을 포함한다. 약제학적 활성 물질에 대한 이러한 매질 및 물질의 사용은 해당 분야에 잘 알려져 있다. 임의의 통상적인 매질 또는 물질이 활성 성분과 양립할 수 없는 경우를 제외하고, 치료 조성물에서의 그의 사용이 고려된다. 보충 활성 성분도 조성물에 포함될 수 있다..또한, 당해 분야에서 일반적으로 사용되는 다양한 보조제를 포함할 수 있다. 이들 및 기타 이러한 화합물은 문헌, 예를 들어 Merck Index, Merck & Company, Rahway, NJ에 기재되어 있다. 약제학적 조성물에 다양한 성분을 포함시키는 것에 대한 고려사항은 예를 들어 Gilman *et al.* (Eds.) (2010); Goodman and Gilman's: The Pharmacological Basis of Therapeutics, 12th Ed., The McGraw-Hill Companies에 기재되어 있다.

[0140] 용어 "약제학적으로 허용가능한 염"은 본원에 제공된 화합물의 생물학적 유효성 및 특성을 유지하고 생물학적으로 또는 달리 해롭지 않은 염을 의미한다. 많은 경우에, 본원에 제공된 화합물은 아미노 및/또는 카르복실 기 또는 이와 유사한 기의 존재로 인해 산 및/또는 염기 염을 형성할 수 있다. 이러한 많은 염은 예를 들어 WO 87/05297에 기술된 바와 같이 당업계에 공지되어 있다. 약제학적으로 허용가능한 산부가염은 무기산 및 유기산으로 형성될 수 있다. 염이 유도될 수 있는 무기산은 예를 들어 염산, 브롬화수소산, 황산, 질산, 인산 등을 포함한다. 염이 유도될 수 있는 유기산은 예를 들어 아세트산, 프로피온산, 글리콜산, 피루브산, 옥살산, 말레산, 말론산, 숙신산, 푸마르산, 타르타르산, 시트르산, 벤조산, 신남산, 만델산, 메탄술폰산, 에탄술폰산, p-톨루엔술폰산, 살리실산 등을 포함한다. 약제학적으로 허용가능한 염기 부가 염은 무기 및 유기 염기로 형성될 수 있

다. 염이 유도될 수 있는 무기 염기는 예를 들어 나트륨, 칼륨, 리튬, 암모늄, 칼슘, 마그네슘, 철, 아연, 구리, 망간, 알루미늄 등을 포함하며; 암모늄, 칼륨, 나트륨, 칼슘 및 마그네슘 염이 특히 바람직하다. 염이 유도될 수 있는 유기 염기는 예를 들어 1차, 2차 및 3차 아민, 자연 발생 치환 아민을 포함하는 치환 아민, 고리형 아민, 염기성 이온 교환 수지 등, 특히 이소프로필아민, 트리메틸아민, 디에틸아민, 트리에틸아민, 트리프로필아민, 및 에탄올아민을 포함한다.

[0141] 본 명세서에 사용된 "환자"는 인간 또는 인간이 아닌 포유동물, 예를 들어 개, 고양이, 마우스, 쥐, 소, 양, 돼지, 염소, 인간이 아닌 영장류, 또는 새, 예를 들어 닭, 뿐만 아니라 임의의 다른 척추동물 또는 무척추동물을 의미한다. 일부 구체예에서, 환자는 인간이다.

[0142] 본원에 제공된 바와 같은 화합물의 "치료 유효량"은 원하는 생리학적 효과를 달성하기에 충분한 양이며, 질병 상태의 특성 및 중증도, 그리고 화합물의 효능에 따라 달라질 수 있다. "치료 유효량"은 또한 본원에 기술된 질환 및/또는 병태를 치료하는데 효과적인 하나 이상의 다른 제제와 조합된 하나 이상의 화학식 I의 화합물을 포함하도록 의도된다. 화합물의 조합은 시너지 효과가 있는 조합일 수 있다. 예를 들어 Chou and Talalay, *Advances in Enzyme Regulation* (1984), *22*, 27-55에 설명된 바와 같은 시너지 효과는 조합 투여 시의 화합물의 효과가 단일 물질로서 단독 투여 시의 화합물의 상가 효과보다 클 때 발생한다. 일반적으로 시너지 효과는 최적이 아닌 농도의 화합물에서 가장 명확하게 나타난다. 활동성 질환의 치료보다는 예방을 위해 다양한 농도가 사용될 수 있음이 이해될 것이다. 이 양은 환자의 키, 체중, 성별, 연령 및 병력에 따라 달라질 수 있다.

[0143] 치료 효과는 질병의 증상 중 하나 이상을 어느 정도 완화시킨다.

[0144] 본원에 사용된 "치료하다", "치료" 또는 "치료하는"은 치료 목적을 위해 본원에 제공된 바와 같은 화합물 또는 약제학적 조성물을 투여하는 것을 지칭한다. "치료적 치료"라는 용어는 이미 질병을 앓고 있는 환자에게 치료를 투여하여 기존 증상을 개선하거나, 증상의 근본적인 대사 원인을 개선하거나, 장애의 추가 발생을 연기하거나 예방하는 것 및/또는 발생할 것으로 예상되는 증상의 중증도를 감소시키는 것 등 치료적으로 유익한 효과를 일으키는 것을 의미한다.

[0145] 본원에 사용된 "약물-용출" 및/또는 제어 방출은 약물 용출 물질에 혼입된 약물(들)이 그로부터 시간이 지남에 따라 주변 신체 조직으로 들어가는 임의의 및 모든 메커니즘, 예를 들어 확산, 이동, 침투 및/또는 탈착을 의미한다.

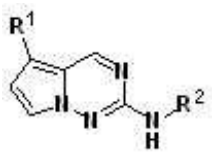
[0146] 본원에 사용된 "약물-용출 물질" 및/또는 제어 방출 물질은 원하는 모양 또는 구성을 획득 및 유지할 수 있고 하나 이상의 약물이 혼입될 수 있고 시간이 지남에 따라 통합된 약물이 용출될 수 있는 임의의 천연, 합성 또는 반합성 물질을 의미한다.

[0147] 본원에 사용된 "용출성 약물"은 혼입되는 약물-용출 물질로부터 신체 주변 부위로 시간이 지남에 따라 통과하는 능력을 갖는 임의의 약물 또는 약물 조합을 지칭한다.

[0148] 화합물

[0149] 본원에 기술된 화합물 및 조성물은 DYRK1A 과발현이 연루된 장애 또는 질환, 예를 들어 신경 질환 또는 장애, 암, 인지 결핍, 무릎 골관절염, 건병증, 바이러스 감염, 단세포성 기생충 감염 및 운동 장애를 치료하기 위해 DYRK1A를 억제하는 데 사용될 수 있다.

[0150] 본개시물의 일부 구체예는 식 I 화합물:

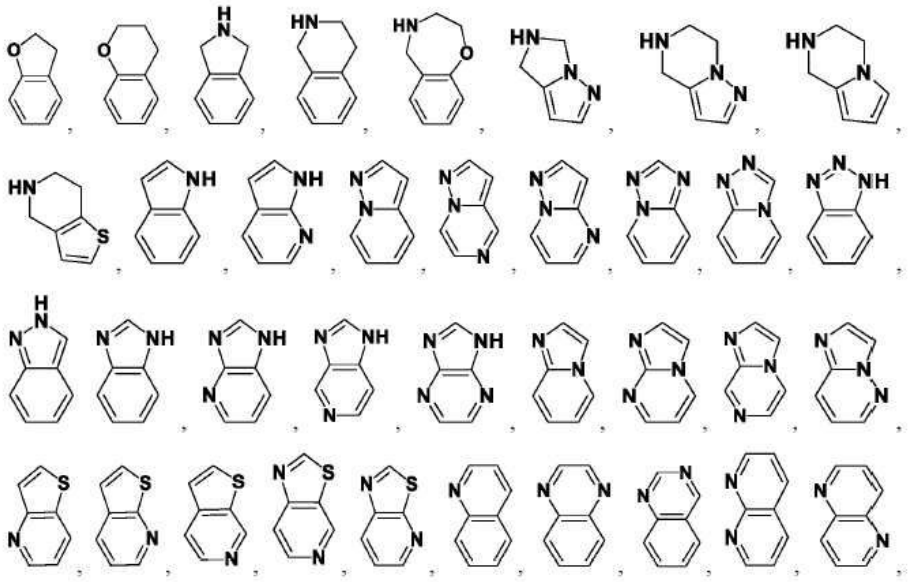
[0151] 

[0152] I

[0153] 또는 그의 염, 약제학적으로 허용가능한 염, 또는 전구약물을 포함한다.

[0154] 식 I의 일부 구체예에서, R^1은 1-10 R^3로 임의로 치환된 헤테로아릴이다. 일부 구체예에서, R^1은 1-10, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 또는 1 R^3로 임의로 치환된 헤테로아릴이다.

[0155] 식 I의 일부 구체예에서, R^1는 다음으로 이루어진 헤테로아릴 그룹으로부터 선택된다:



[0156] , 및 , 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^3로 임의로 치환됨.

[0157] 식 I의 일부 구체예에서, R^1는 다음으로 이루어진 헤테로아릴 그룹으로부터 선택된다:

[0158] , 및 , 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^3로 임의로 치환됨.

[0159] 식 I의 일부 구체예에서, R^1는 다음으로 이루어진 헤테로아릴 그룹으로부터 선택된다:

[0160] , 및 , 1-3 (예를 들어, 1-2, 1) R^3로 임의로 치환됨.

[0161] 식 I의 일부 구체예에서, R^1은 다음으로 이루어진 그룹으로부터 선택된다:

[0162] , 및 , 1-3 R^3로 임의로 치환됨.

[0163] 제1-3항 중 어느 한 항에 있어서, R^1은 다음으로 이루어진 그룹으로부터 선택되는 화합물:

[0164] 비치환된 , 및 .

[0165] 식 I의 일부 구체예에서, R^2은 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-3} 알킬렌)$_p$$OR^4$, 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^5로

임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^6로 임의로 치환된 -헤테로아릴, 및 1-12 (예를 들어, 1-11, 1-10, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^7로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 (예를 들어, 1-4, 1-3, 1-2, 1) 할라이드 (예를 들어, F, Cl, Br, I) 및/또는 1-3 (예를 들어, 1-2, 1) 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

[0166] 식 I의 일부 구체예에서, R^2은 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-10 R^5로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$OR^4, -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, 1-10 R^6로 임의로 치환된 -헤테로아릴, 및 1-12 R^7로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

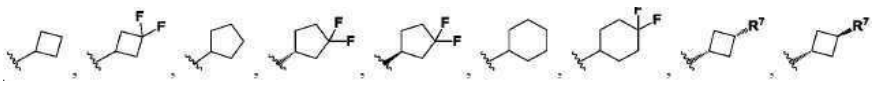
[0167] 식 I의 일부 구체예에서, R^2은 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{1-9} 할로알킬), 헤테로사이클릴 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^5로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$, 1-10 R^6로 임의로 치환된 -헤테로아릴, 및1-12 (예를 들어, 1-11, 1-10, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^7로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 (예를 들어, 1-4, 1-3, 1-2, 1) 할라이드 (예를 들어, F, Cl, Br, I) 및/또는 1-3 (예를 들어, 1-2, 1) 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

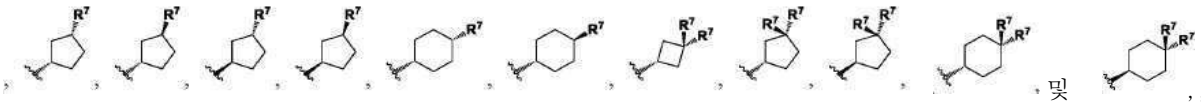
[0168] 식 I의 일부 구체예에서, R^2은 비치환된 -(C_{1-5} 알킬), 비치환된 -(C_{1-5} 할로알킬), 1-3 (예를 들어, 1-2, 1) R_5로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$헤테로사이클릴, 및 1-3 (예를 들어, 1-2, 1) R^7로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-2 할라이드로 임의로 치환된다.

[0169] 식 I의 일부 구체예에서, R^2은 비치환된 -(C_{1-5} 알킬), 비치환된 -(C_{2-5} 알케닐), 비치환된 -(C_{2-5} 알키닐), 비치환된 -(C_{1-5} 할로알킬), -(C_{1-2} 알킬렌)$_p$OR^4, 1-3 R^5로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$헤테로사이클릴, 1-3 R^6로 임의로 치환된 -헤테로아릴, 및 1-3 R^7로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$카르보사이클릴로 이루어진 그룹으로부터 선택되고, 여기서 각각의 -(C_{1-2} 알킬렌)은, 독립적으로, 1-2 할라이드로 임의로 치환된다.

[0170] 식 I의 일부 구체예에서, R^2은 1-3 R^5로 임의로 치환된-(C_{1-2} 알킬렌)$_p$헤테로사이클릴이고, 여기서 -(C_{1-5} 알킬렌)은 1-2 할라이드로 임의로 치환되고 여기서 헤테로사이클릴은 옥세타닐, 테트라히드로푸라닐, 테트라히드로피라닐, 아제티디닐, 피롤리디닐, 피페리디닐, 모르폴리닐, 피페라지닐1, 옥사스피로[3.3]헵타닐, 및 옥사스피로[3.3]헵타닐로 이루어진 그룹으로부터 선택된다.

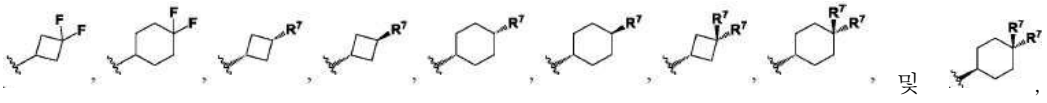
[0171] 식 I의 일부 구체예에서, R^2은 다음으로 이루어진 그룹으로부터 선택되고:


,


, 및 ,, 여기서 각각의 R^7는 F, Me, -CH_2F, -CHF_2, -CF_3, -CH_2OH, -CH_2OMe, -OH, -OMe, -OEt, -OCD_3, -OCF_3, -OCH_2CH_2F, -OCH_2CHF_2, -OCH_2CF_3, -OCH_2CH_2OMe, -OCH_2CH_2OH, -NH_2, -NHMe, 및 -NMe_2로 이루어진 그룹으로부터 독립적으로 선택

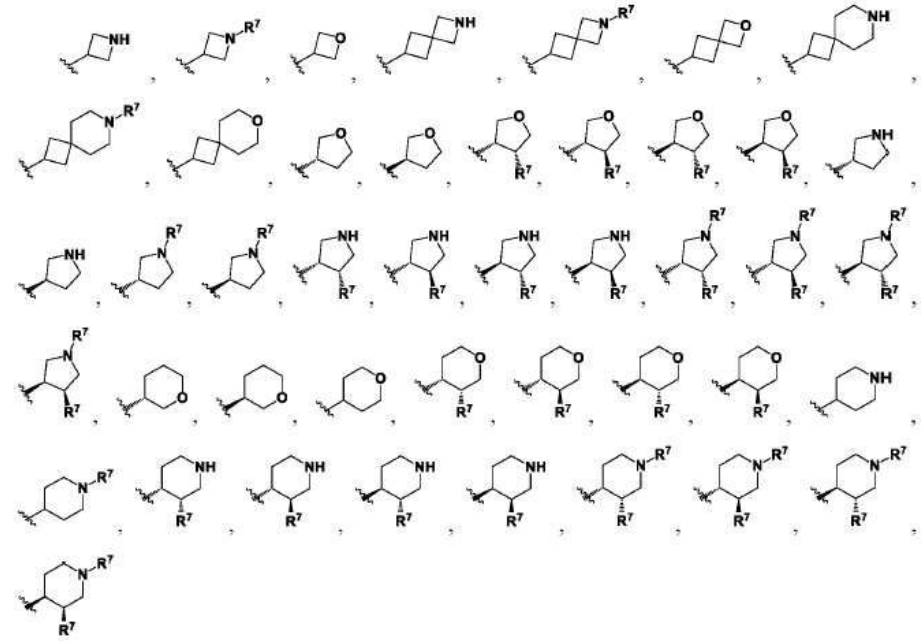
된다.

[0172] 식 I의 일부 구체예에서, R^2은 다음으로 이루어진 그룹으로부터 선택되고:



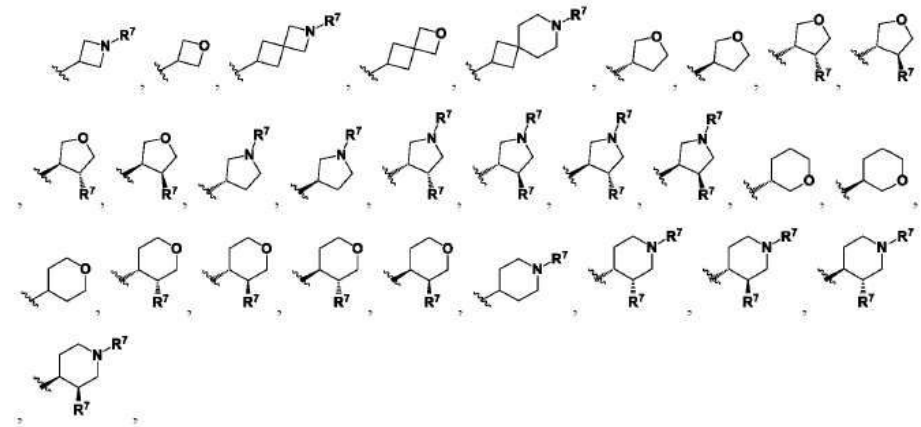
여기서 각각의 R^7는 F, Me, $-CHF_2$, $-CH_2OMe$, -OH, -OMe, $-OCD_3$, $-OCH_2CHF_2$, 및 $-OCH_2CH_2OMe$로 이루어진 그룹으로부터 독립적으로 선택된다.

[0173] 식 I의 일부 구체예에서, R^2은 다음으로 이루어진 그룹으로부터 선택되고:



여기서 각각의 R^7는 F, Me, Et, iPr, iBu, $-CH_2F$, $-CHF_2$, $-CF_3$, $-CH_2OH$, $-CH_2OMe$, -OH, -OMe, -OEt, $-OCD_3$, $-OCF_3$, $-CH_2CH_2F$, $-CH_2CHF_2$, $-CH_2CF_3$, $-CH_2CH_2CF_3$, $-CH_2CH_2OMe$, $-CH_2CH_2OH$, -C(=O)Me, -C(=O)Et, -C(=O)iPr, , 및 $-SO_2Me$로 이루어진 그룹으로부터 독립적으로 선택되고; 단 F, -OH, -OMe, -OEt, $-OCD_3$, 및 $-OCF_3$은 N에 부착되지 않는다.

[0174] 식 I의 일부 구체예에서, R^2은 다음으로 이루어진 그룹으로부터 선택되고:



여기서 각각의 R^7는 F, Me, iBu, -OH, -OMe, $-CH_2CH_2F$, $-CH_2CHF_2$, $-CH_2CF_3$, $-CH_2CH_2CF_3$, $-CH_2CH_2OMe$, $-CH_2CH_2OH$, -C(=O)Me, -C(=O)Et, 및 -C(=O)iPr로 이루어진 그룹으로부터 독립적으로 선택되고; 단 F, -OH, -OMe은 N에 부착되지 않는다.

[0175] 식 I의 일부 구체예에서, R^2은 1-2 R^6로 임의로 치환된 -헤테로아릴이고, 여기서 헤테로아릴은 피라졸릴이다.

[0176] 식 I의 일부 구체예에서, R^2은 1-3 R^7로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$카르보사이클릴이고, 여기서 -(C_{1-5} 알킬렌)은 1-2 할라이드로 임의로 치환되고 여기서 카르보사이클릴은 사이클로프로필, 사이클로부틸, 사이클로펜틸, 사이클로헥실, 및 스피로[3.3]헵타닐로 이루어진 그룹으로부터 선택된다.

[0177] 식 I의 일부 구체예에서, 각각의 R^3는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-5} 알킬렌)$_p$OR^8, 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^9 로 임의로 치환된 -헤테로사이클릴, 1-12 (예를 들어, 1-11, 1-10, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{10}로 임의로 치환된 -카르보사이클릴, -C(=O)N(R^{11})$_2$, 및 -C(=O)R^{12}로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 (예를 들어, 1-4, 1-3, 1-2, 1) 할라이드 (예를 들어, F, Cl, Br, I) 및/또는 1-3 (예를 들어, 1-2, 1) 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

[0178] 식 I의 일부 구체예에서, 각각의 R^3는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-5} 알킬렌)$_p$OR^8, -(C_{1-5} 알킬렌)CN, 1-10 R^9로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, 1-12 R^{10}로 임의로 치환된 -카르보사이클릴, -(C_{1-5} 알킬렌)$_p$로 임의로 치환된 헤테로아릴 1-10 R^{19}, -(C_{1-5} 알킬렌)$_p$C(=O)N(R^{11})$_2$, 및 -C(=O)R^{12}로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

[0179] 식 I의 일부 구체예에서, 각각의 R^3는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{1-9} 할로알킬), -(C_{1-5} 알킬렌)$_p$OR^8, 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^9로 임의로 치환된 -헤테로사이클릴, 1-12 (예를 들어, 1-11, 1-10, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{10}로 임의로 치환된 -카르보사이클릴, 및 -C(=O)R^{12}로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 (예를 들어, 1-4, 1-3, 1-2, 1) 할라이드 (예를 들어, F, Cl, Br, I) 및/또는 1-3 (예를 들어, 1-2, 1) 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

[0180] 식 I의 일부 구체예에서, 각각의 R^3는 할라이드, 비치환된 -(C_{1-5} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-5} 알키닐), 비치환된 -(C_{1-5} 할로알킬), -(C_{1-4} 알킬렌)$_p$OR^8, -(C_{1-2} 알킬렌)$_p$OR^8, -(C_{1-4} 알킬렌)CN, -(C_{1-2} 알킬렌)CN, 1-2 R^9로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$헤테로사이클릴, 1-2 R^{10}로 임의로 치환된 -카르보사이클릴, 1-2 R^{19}로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$헤테로아릴, -(C_{1-2} 알킬렌)$_p$C(=O)N(R^{11})$_2$, 및 -C(=O)R^{12}로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-2} 알킬렌) 또는 -(C_{1-4} 알킬렌)은, 독립적으로, 1-2 할라이드로 임의로 치환된다.

[0181] 식 I의 일부 구체예에서, 각각의 R^3는 F, Cl, 비치환된 -(C_{1-5} 알킬), 비치환된 -(C_{1-5} 할로알킬), -(C_{1-4} 알킬렌)$_p$OH, -(C_{1-2} 알킬렌)$_p$OMe, -(C_{1-4} 알킬렌)CN, -(C_{1-2} 알킬렌)CN, -(CH_2)$_p$헤테로사이클릴 1-2 R^9로 임의로 치환된, 1-2 R^{10}로 임의로 치환된 -카르보사이클릴, 1-2 R^{19}로 임의로 치환된 -(CH_2)$_p$헤테로아릴, -(CH_2)C(=O)N(Me)$_2$, 및 -C(=O)R^{12}로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-2} 알킬렌) 또는 -(C_{1-4} 알킬렌)은, 독립적으로, 1-2 할라이드로 임의로 치환된다.

[0182] 식 I의 일부 구체예에서, 각각의 R^3는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-4} 알킬), 비치환된

-(C_{1-4} 할로알킬), 1-3 (예를 들어, 1-2, 1) R^9로 임의로 치환된 -헤테로사이클릴, 및 1-3 (예를 들어, 1-2, 1) R^{10}로 임의로 치환된 -카르보사이클릴로 이루어진 그룹으로부터 독립적으로 선택된다.

[0183] 식 I의 일부 구체예에서, 각각의 R^3는 할라이드, 비치환된 -(C_{1-3} 알킬), 비치환된 -(C_{1-3} 할로알킬), -(C_{1-3} 알킬렌)$_pOR^8$, 1-2 R^9로 임의로 치환된 -헤테로사이클릴, 1-2 R^{10}로 임의로 치환된 -카르보사이클릴, 및 $-C(=O)R^{12}$로 이루어진 그룹으로부터 독립적으로 선택된다.

[0184] 식 I의 일부 구체예에서, 각각의 R^3는 클로로, 메틸, 에틸, 이소프로필, 2-플루오로에틸, 2,2-디플루오로에틸, 메톡시, 메톡시메틸, 테트라히드로피라닐, 디플루오로사이클로부틸, 및 (피롤리딘-1-일)메탄온으로 이루어진 그룹으로부터 독립적으로 선택된다.

[0185] 식 I의 일부 구체예에서, 각각의 R^4는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0186] 식 I의 일부 구체예에서, 각각의 R^4는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0187] 식 I의 일부 구체예에서, 각각의 R^4는 H, 비치환된 -(C_{1-5} 알킬), 비치환된 -(C_{2-5} 알케닐), 비치환된 -(C_{2-5} 알키닐), 및 비치환된 -(C_{1-5} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0188] 식 I의 일부 구체예에서, 각각의 R^4는 H, 비치환된 -(C_{1-3} 알킬), 및 비치환된 -(C_{1-3} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0189] 식 I의 일부 구체예에서, 각각의 R^5는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -OMe로 이루어진 그룹으로부터 독립적으로 선택된다.

[0190] 식 I의 일부 구체예에서, 각각의 R^5는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{15}로 임의로 치환된 -헤테로사이클릴, -(C_{1-5} 알킬렌)$_pOR^{20}$, $-SO_2R^{22}$, 및 $-C(=O)R^{23}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

[0191] 식 I의 일부 구체예에서, 각각의 R^5는 F, Cl, 비치환된 -(C_{1-5} 알킬), 비치환된 -(C_{1-5} 할로알킬), 1-2 R^{15}로 임의로 치환된 -헤테로사이클릴, -(C_{1-2} 알킬렌)$_pOR^{20}$, $-SO_2R^{22}$, 및 $-C(=O)R^{23}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-2} 알킬렌)은 1-2 할라이드로 임의로 치환된다.

[0192] 식 I의 일부 구체예에서, 각각의 R^5는 F, Cl, 비치환된 -(C_{1-5} 알킬), 비치환된 -(C_{1-5} 할로알킬), 1-2 R^{15}로 임의로 치환된 -헤테로사이클릴, -OH, -OMe, $-SO_2Me$, 및 $-C(=O)R^{23}$로 이루어진 그룹으로부터 독립적으로 선택된다.

[0193] 식 I의 일부 구체예에서, 동일한 탄소 원자에 부착된 두 개의 R^5는 함께 카르보닐 기를 형성한다.

[0194] 식 I의 일부 구체예에서, 각각의 R^6는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -OMe로 이루어진 그룹으로부터 독립적으로 선택된다.

[0195] 식 I의 일부 구체예에서, 각각의 R^6는 F, Cl, Me, CF_3, 및 -OMe로 이루어진 그룹으로부터 독립적으로 선택된다.

[0196] 식 I의 일부 구체예에서, 각각의 R^7는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), $-N(R^{13})_2$, -(C_{1-5} 알킬렌)$_pOR^{14}$, 및 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{15}로 임의로 치환된 -헤테로사이클릴로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 (예를 들어, 1-4, 1-3, 1-2, 1) 할라이드 (예를 들어, F, Cl, Br, I) 및/또는 1-3 (예를 들어, 1-2, 1) 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

[0197] 식 I의 일부 구체예에서, 각각의 R^7는 할라이드, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), $-N(R^{13})_2$, -(C_{1-5} 알킬렌)$_pOR^{14}$, 1-10 R^{15}로 임의로 치환된 -(C_{1-5} 알킬렌)$_p$헤테로사이클릴, $-C(=O)R^{21}$, 및 $-NHC(=O)R^{22}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-5} 알킬렌)은, 독립적으로, 1-5 할라이드 및/또는 1-3 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

[0198] 식 I의 일부 구체예에서, 각각의 R^7는 할라이드, 비치환된 -(C_{1-5} 알킬), 비치환된 -(C_{2-5} 알케닐), 비치환된 -(C_{2-5} 알키닐), 비치환된 -(C_{1-5} 할로알킬), $-N(R^{13})_2$, -(C_{1-2} 알킬렌)$_pOR^{14}$, 1-2 R^{15}로 임의로 치환된 -(C_{1-2} 알킬렌)$_p$헤테로사이클릴, $-C(=O)R^{21}$, 및 $-NHC(=O)R^{22}$로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 각각의 -(C_{1-2} 알킬렌)은, 독립적으로, 1-2 할라이드로 임의로 치환된다.

[0199] 식 I의 일부 구체예에서, 각각의 R^8는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0200] 식 I의 일부 구체예에서, 각각의 R^9는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0201] 식 I의 일부 구체예에서, 각각의 R^{10}는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0202] 식 I의 일부 구체예에서, 각각의 R^{11}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬), 1-12 (예를 들어, 1-11, 1-10, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{16}로 임의로 치환된-(C_{1-5} 알킬렌)$_p$카르보사이클릴, 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{17}로 임의로 치환된 -헤테로사이클릴, 및 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{18}로 임의로 치환된 -헤테로아릴로 이루어진 그룹으로부터 독립적으로 선택되고, 여기서 -(C_{1-5} 알킬렌)은 1-5 (예를 들어, 1-4, 1-3, 1-2, 1) 할라이드 (예를 들어, F, Cl, Br, I) 및/또는 1-3 (예를 들어, 1-2, 1) 비치환된 -(C_{1-3} 알킬)로 임의로 치환된다.

[0203] 식 I의 일부 구체예에서, 각각의 R^{12}은 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{17}로 임의로 치환된 -헤테로사이클릴이다.

[0204] 식 I의 일부 구체예에서, 각각의 R^{13}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0205] 식 I의 일부 구체예에서, 각각의 R^{14}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0206] 식 I의 일부 구체예에서, 각각의 R^{14}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -(C_{1-5} 알킬렌)$_p$$OR^2$로 이루어진 그룹으로부터 독립적으로 선택되고 ^{0}.

[0207] 식 I의 일부 구체예에서, 각각의 R^{15}는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0208] 식 I의 일부 구체예에서, 동일한 탄소 원자에 부착된 두 개의 R^{15}는 함께 카르보닐 기를 형성한다.

[0209] 식 I의 일부 구체예에서, 각각의 R^{16}는 할라이드 (예를 들어, F, Cl, Br, I), -OMe, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0210] 식 I의 일부 구체예에서, 각각의 R^{17}는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0211] 식 I의 일부 구체예에서, 각각의 R^{18}는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0212] 식 I의 일부 구체예에서, 각각의 R^{19}는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0213] 식 I의 일부 구체예에서, 각각의 R^{20}는 H, 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0214] 식 I의 일부 구체예에서, 각각의 R^{21}는 1-10 (예를 들어, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{17}로 임의로 치환된 -헤테로사이클릴, -$N(R^{11})_2$ 및 -OR^{20}로 이루어진 그룹으로부터 독립적으로 선택된다.

[0215] 식 I의 일부 구체예에서, 각각의 R^{22}는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

[0216] 식 I의 일부 구체예에서, 각각의 R^{22}는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 -(C_{1-5} 알킬렌)$_p$$OR^{20}$로 이루어진 그룹으로부터 독립적으로 선택된다.

[0217] 식 I의 일부 구체예에서, 각각의 R^{23}는 비치환된 -(C_{1-9} 알킬), 비치환된 -(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 비치환된 -(C_{1-9} 할로알킬), 및 1-12 (예를 들어, 1-11, 1-10, 1-9, 1-8, 1-7, 1-6, 1-5, 1-4, 1-3, 1-2, 1) R^{24}로 임의로 치환된 -카르보사이클릴로 이루어진 그룹으로부터 독립적으로 선택된다.

[0218] 식 I의 일부 구체예에서, 각각의 R^{24}는 할라이드 (예를 들어, F, Cl, Br, I), 비치환된 -(C_{1-9} 알킬), 비치환된

-(C_{2-9} 알케닐), 비치환된 -(C_{2-9} 알키닐), 및 비치환된 -(C_{1-9} 할로알킬)로 이루어진 그룹으로부터 독립적으로 선택된다.

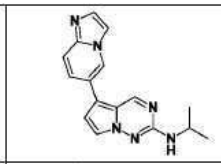
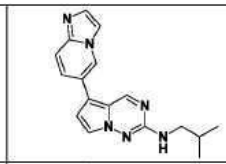
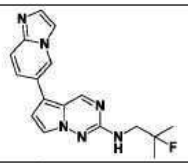
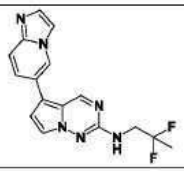
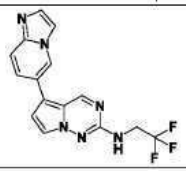
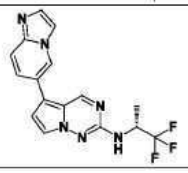
[0219] 식 I의 일부 구체예에서, 각각의 p는 독립적으로 0 또는 1이다.

[0220] 식 I의 일부 구체예에서, 각각의 H 원자는 임의로, 독립적으로 ^{2}H (D) (중수소)로 대체되고.

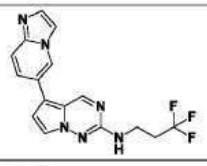
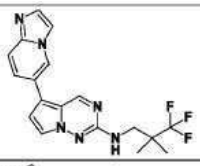
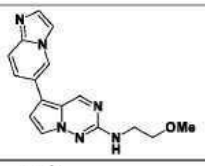
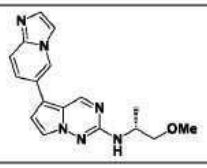
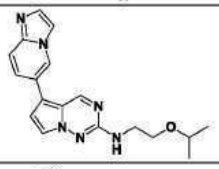
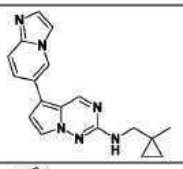
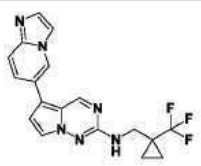
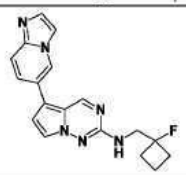
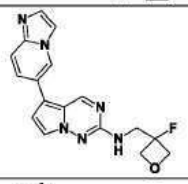
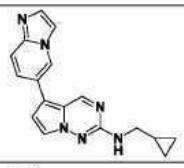
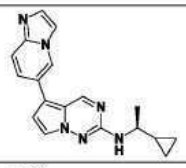
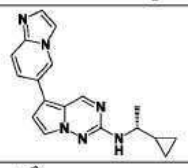
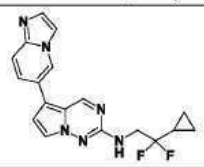
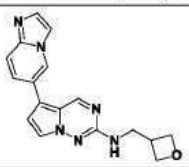
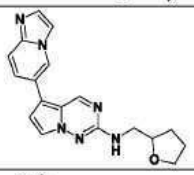
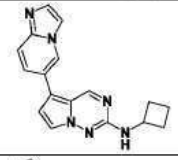
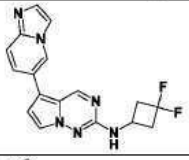
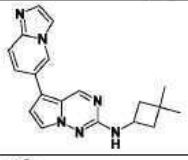
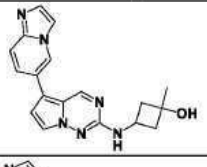
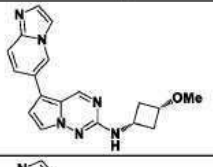
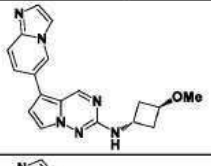
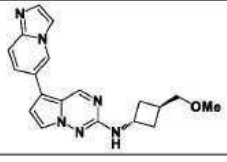
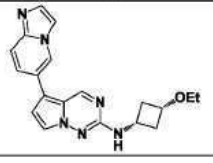
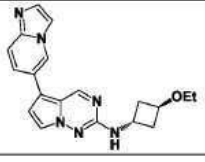
[0221] 예시적 식 (I)의 화합물을 표 1에 나타낸다.

[0222] **표 1.**

[0223]

1		2		3	
4		5		6	

[0224]

7		8		9	
10		11		12	
13		14		15	
16		17		18	
19		20		21	
22		23		24	
25		26		27	
28		29		30	

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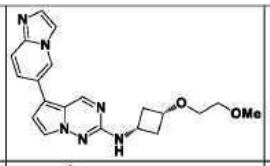
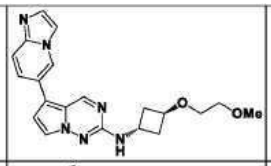
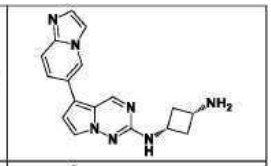
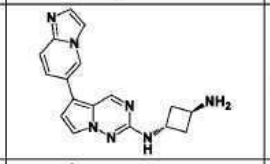
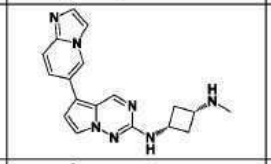
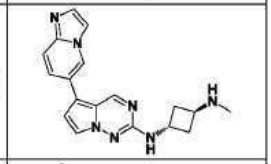
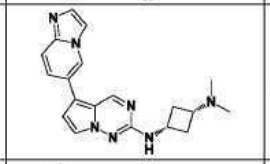
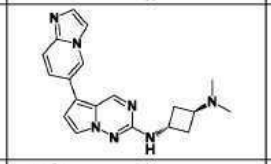
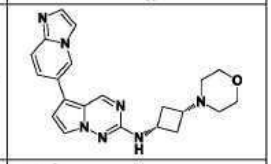
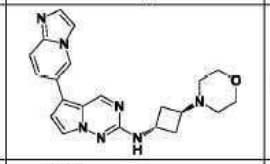
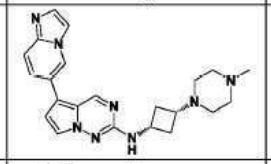
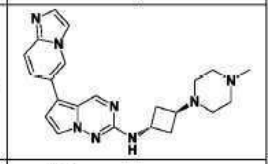
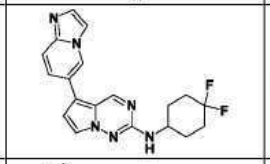
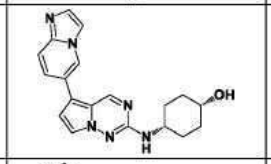
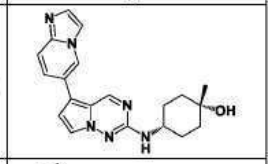
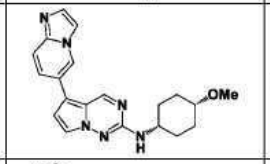
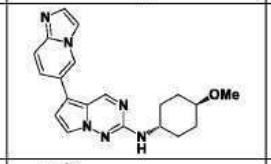
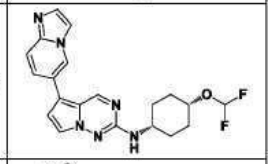
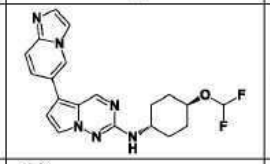
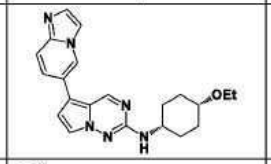
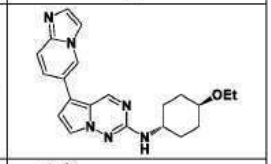
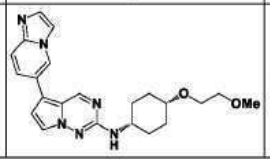
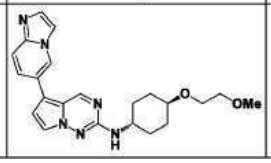
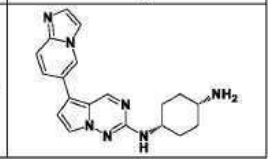
31		32		33	
34		35		36	
37		38		39	
40		41		42	
43		44		45	
46		47		48	
49		50		51	
52		53		54	

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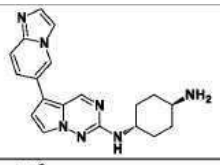
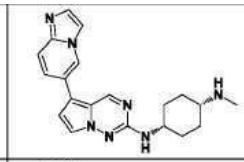
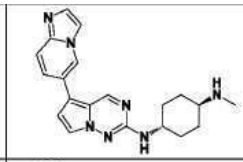
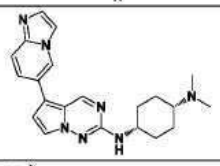
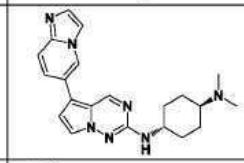
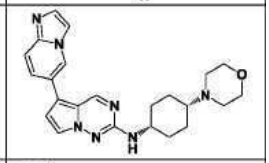
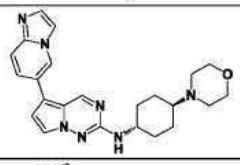
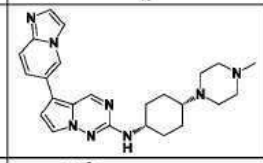
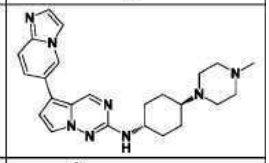
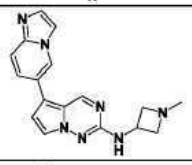
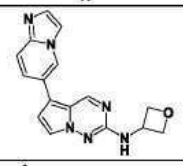
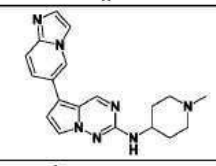
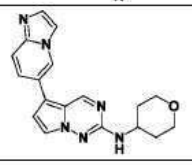
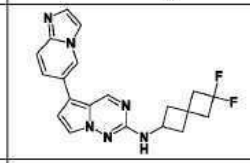
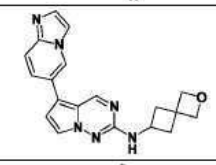
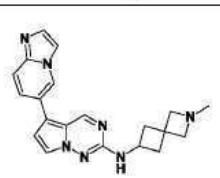
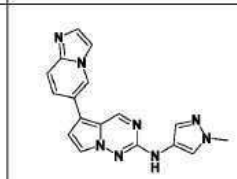
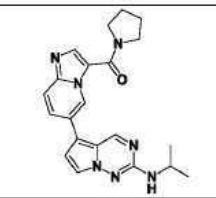
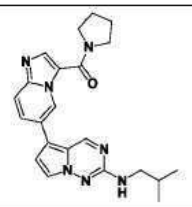
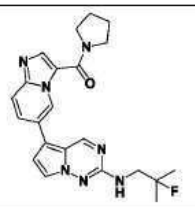
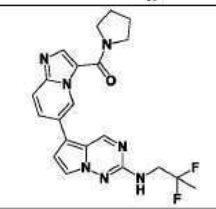
55		56		57	
58		59		60	
61		62		63	
64		65		66	
67		68		69	
70		71		72	
73		74		75	

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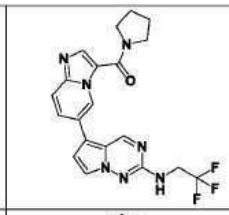
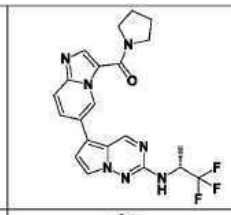
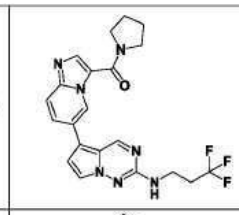
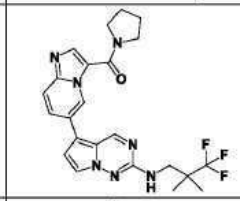
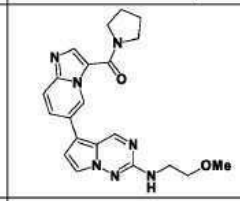
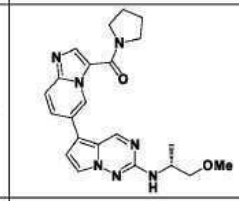
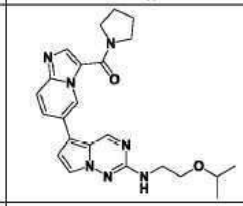
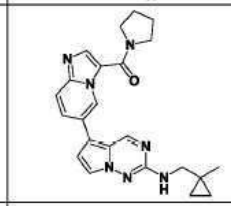
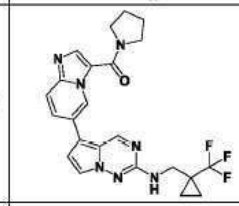
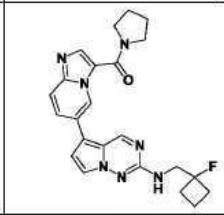
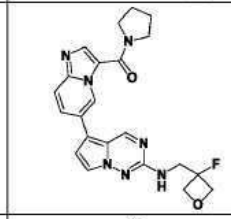
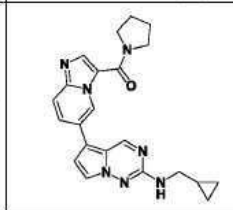
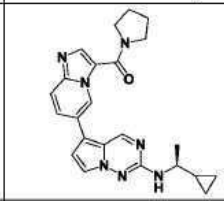
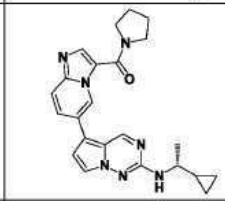
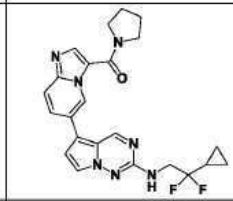
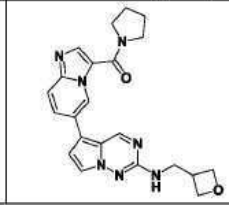
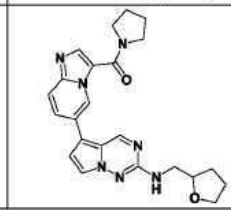
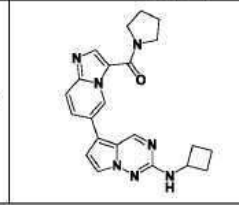
76		77		78	
79		80		81	
82		83		84	
85		86		87	
88		89		90	
91		92		93	

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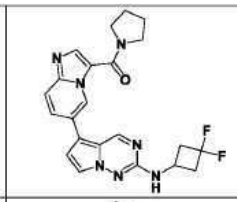
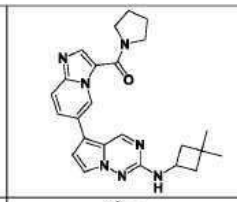
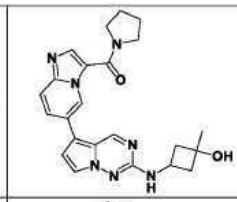
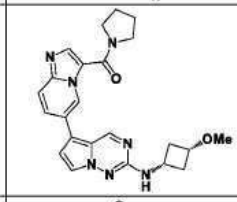
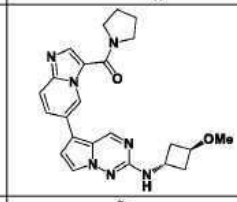
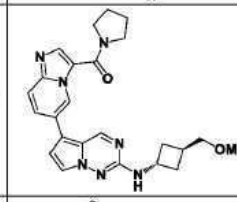
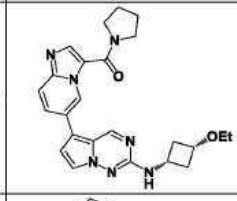
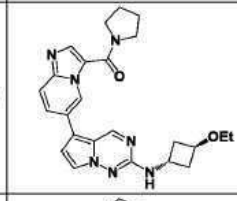
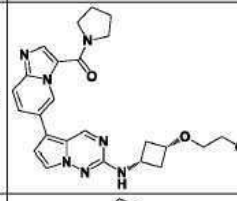
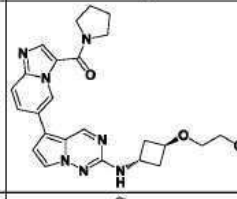
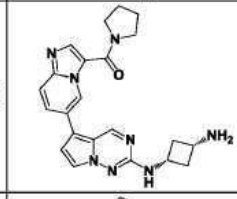
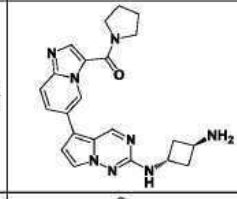
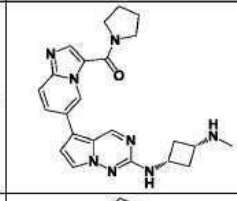
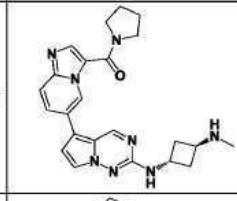
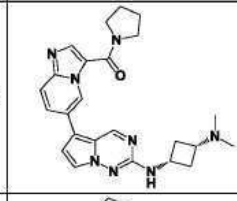
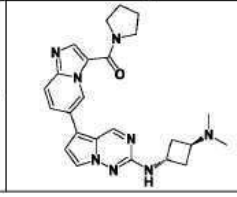
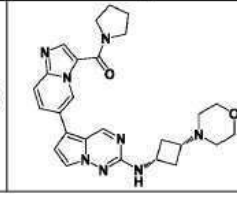
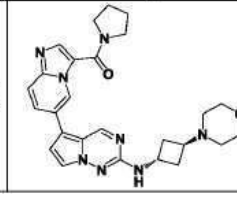
94		95		96	
97		98		99	
100		101		102	
103		104		105	
106		107		108	
109		110		111	

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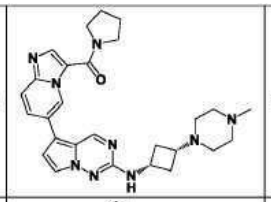
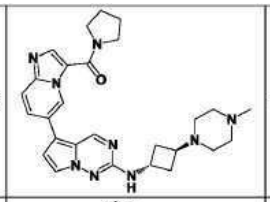
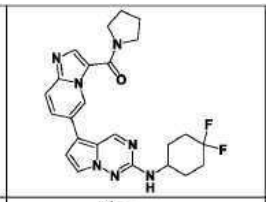
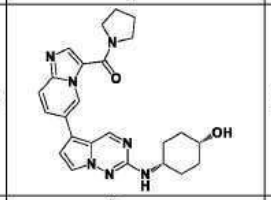
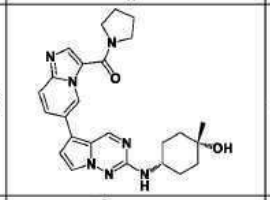
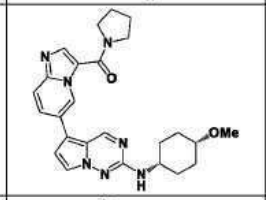
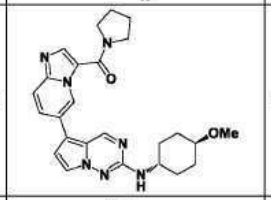
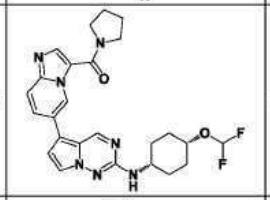
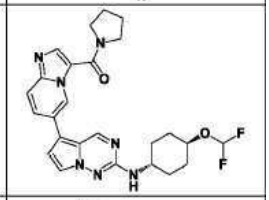
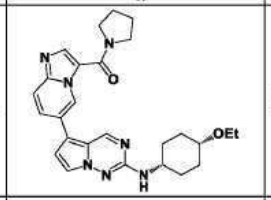
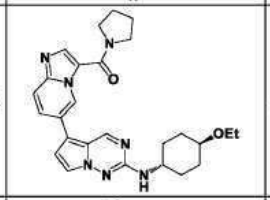
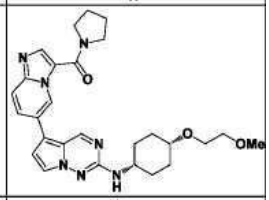
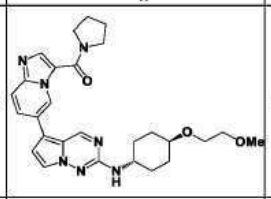
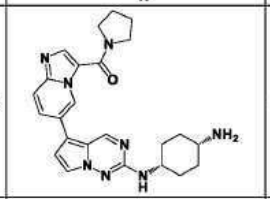
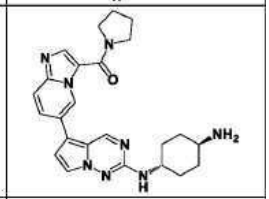
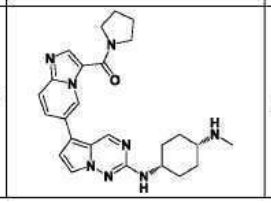
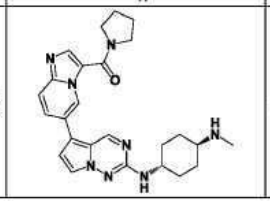
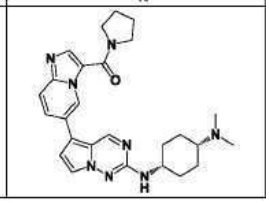
112		113		114	
115		116		117	
118		119		120	
121		122		123	
124		125		126	
127		128		129	

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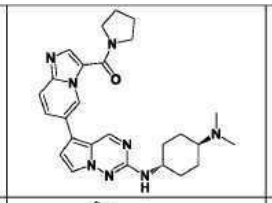
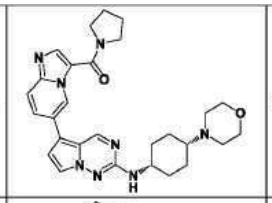
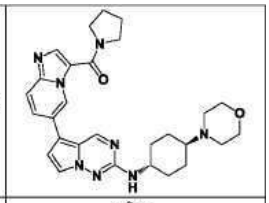
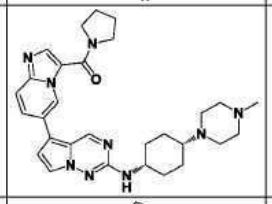
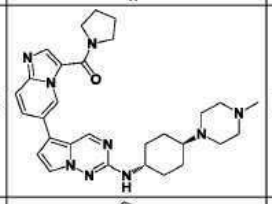
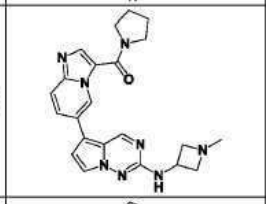
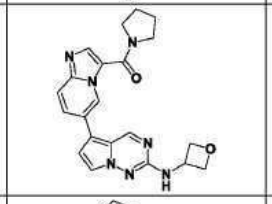
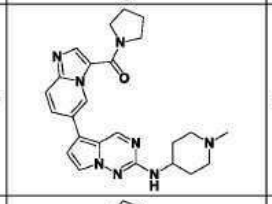
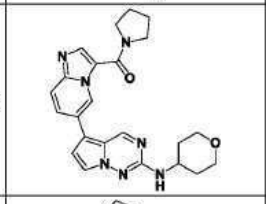
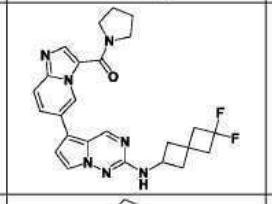
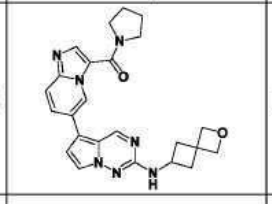
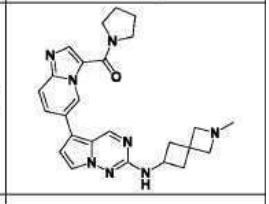
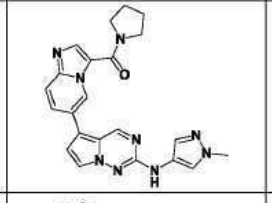
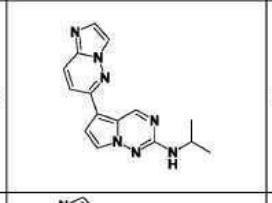
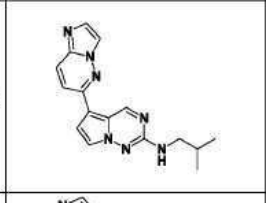
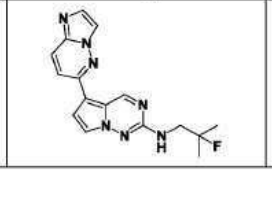
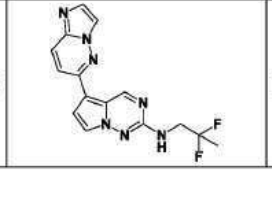
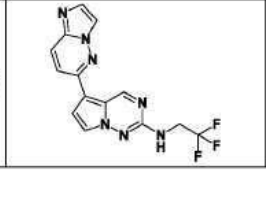
130		131		132	
133		134		135	
136		137		138	
139		140		141	
142		143		144	
145		146		147	

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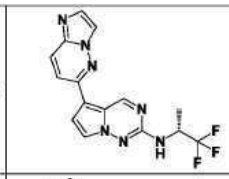
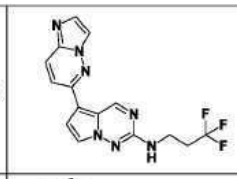
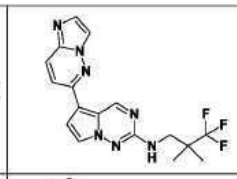
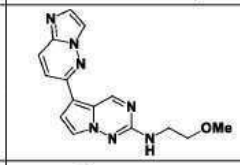
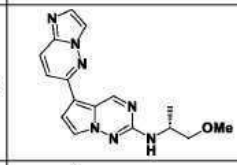
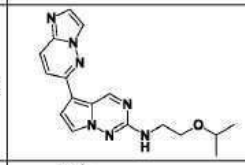
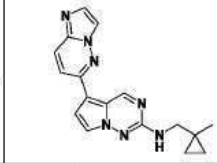
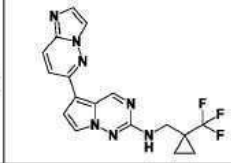
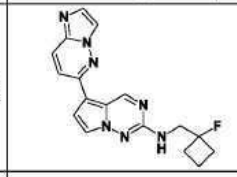
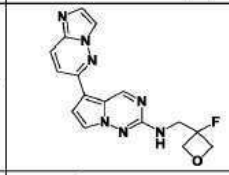
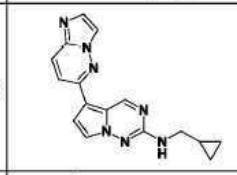
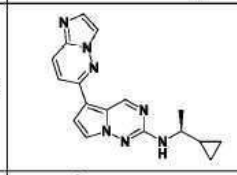
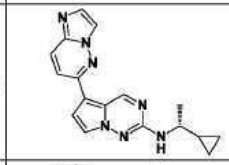
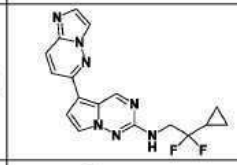
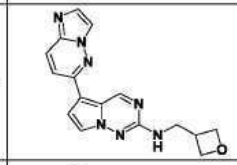
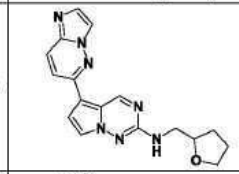
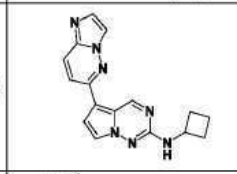
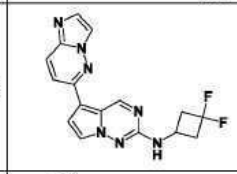
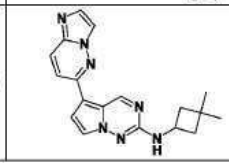
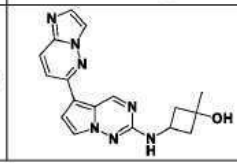
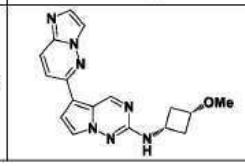
148		149		150	
151		152		153	
154		155		156	
157		158		159	
160		161		162	
163		164		165	
166		167		168	

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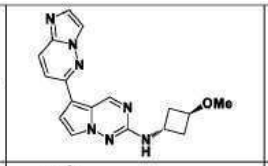
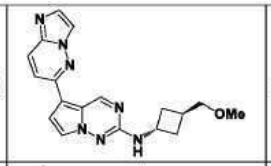
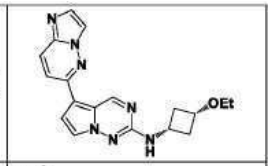
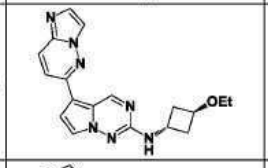
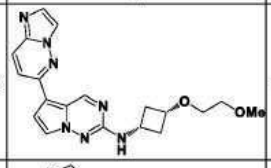
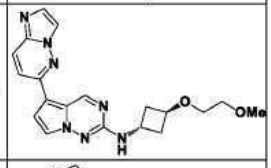
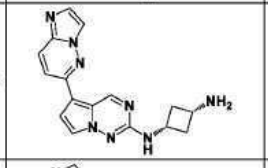
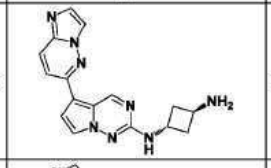
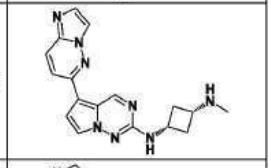
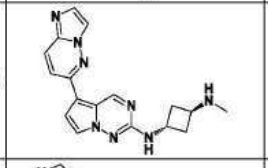
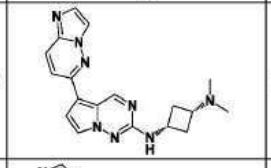
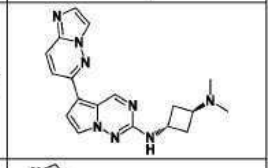
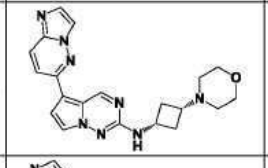
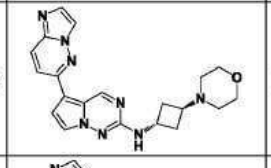
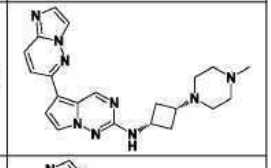
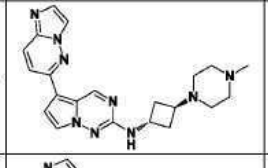
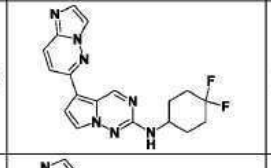
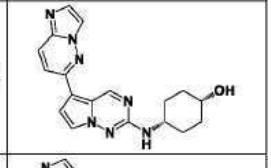
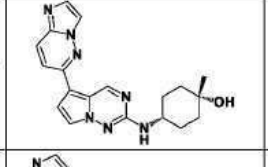
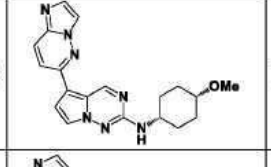
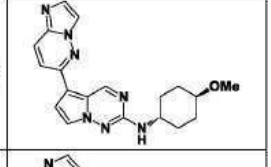
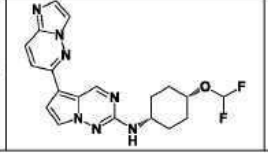
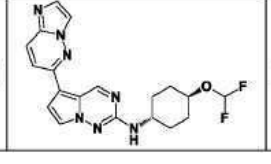
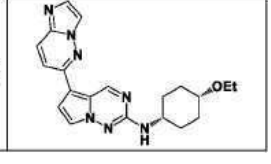
169		170		171	
172		173		174	
175		176		177	
178		179		180	
181		182		183	
184		185		186	
187		188		189	
190		191		192	

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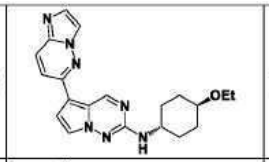
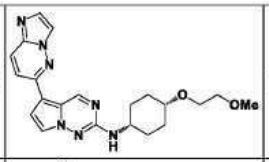
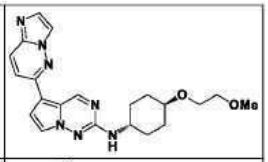
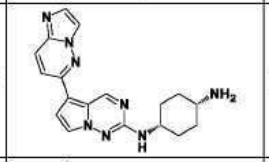
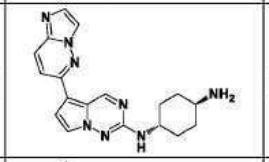
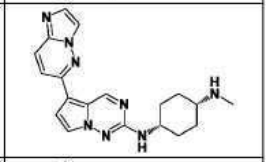
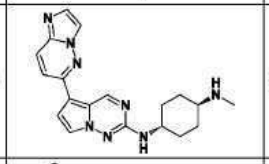
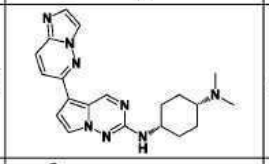
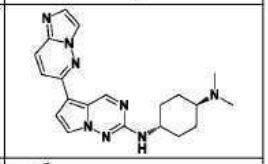
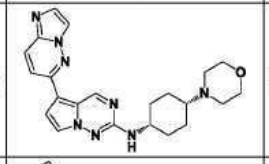
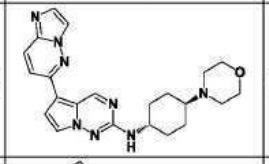
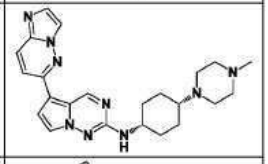
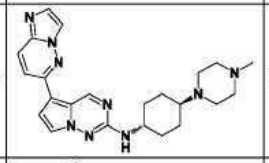
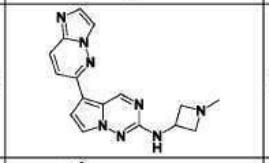
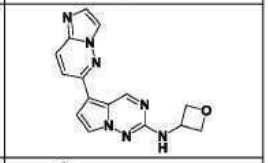
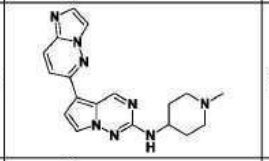
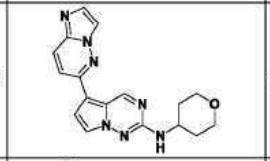
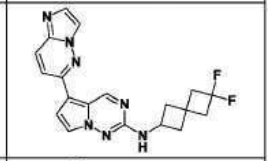
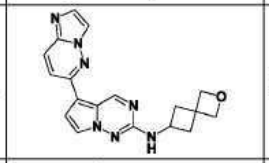
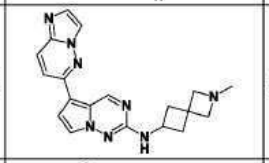
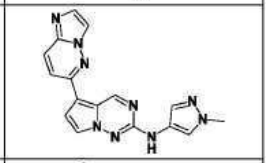
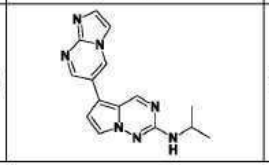
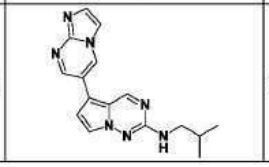
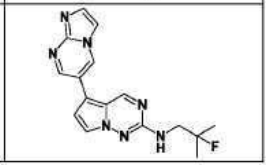
193		194		195	
196		197		198	
199		200		201	
202		203		204	
205		206		207	
208		209		210	
211		212		213	
214		215		216	

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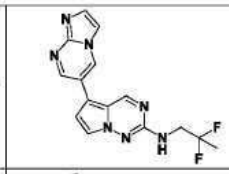
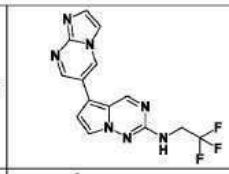
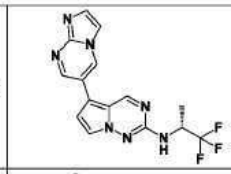
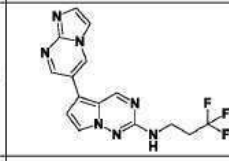
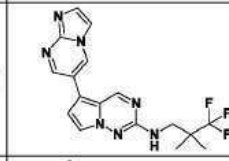
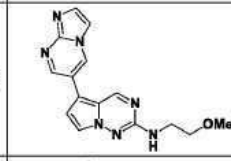
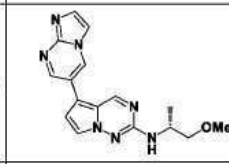
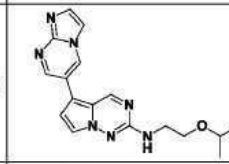
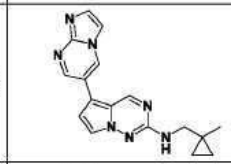
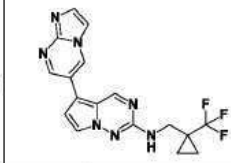
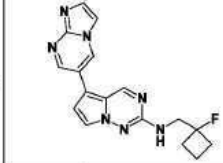
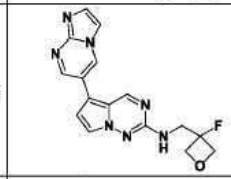
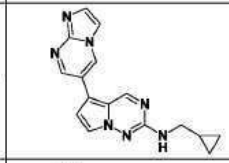
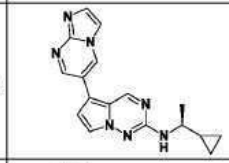
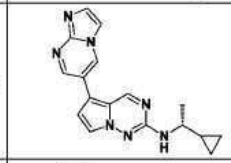
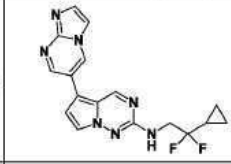
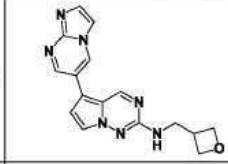
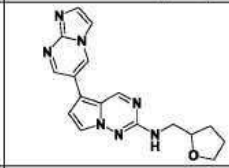
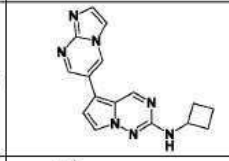
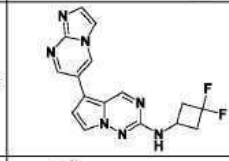
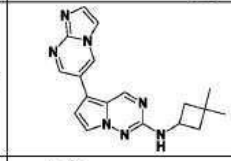
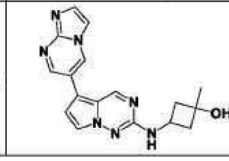
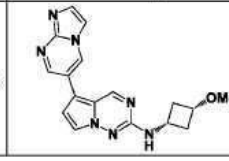
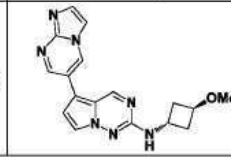
217		218		219	
220		221		222	
223		224		225	
226		227		228	
229		230		231	
232		233		234	
235		236		237	
238		239		240	

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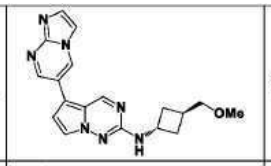
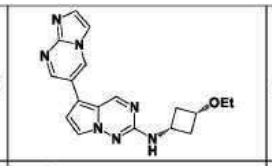
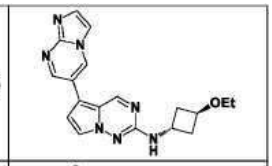
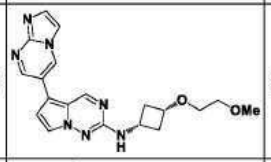
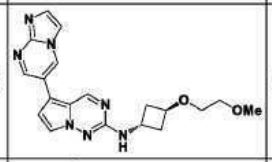
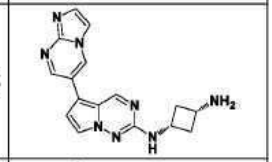
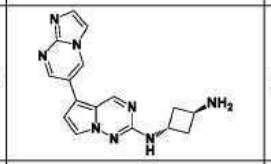
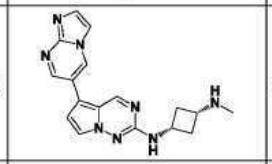
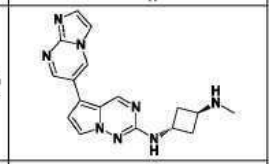
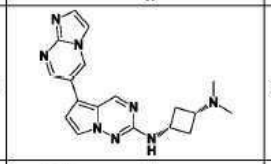
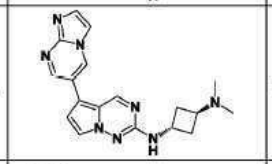
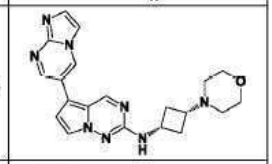
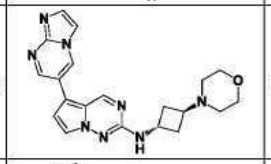
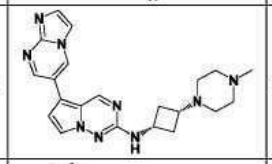
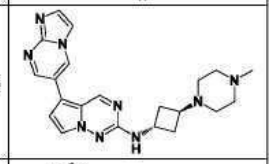
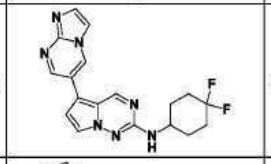
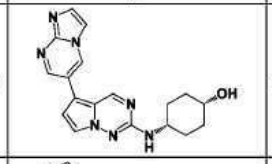
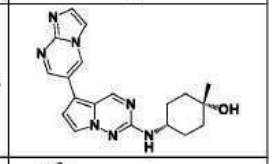
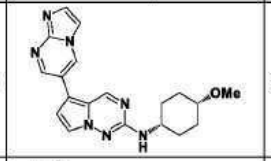
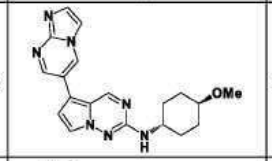
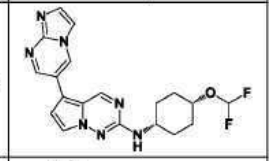
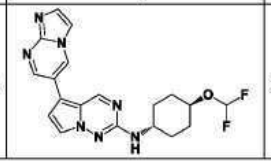
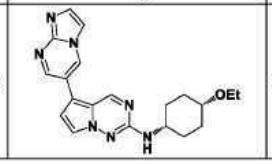
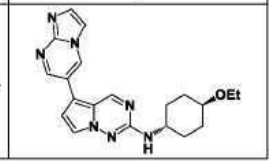
241		242		243	
244		245		246	
247		248		249	
250		251		252	
253		254		255	
256		257		258	
259		260		261	
262		263		264	

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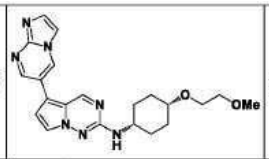
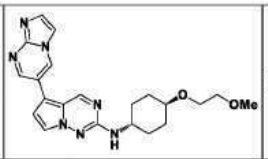
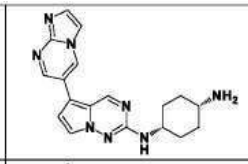
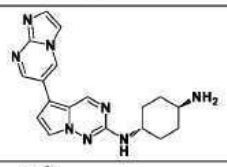
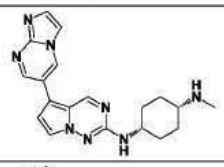
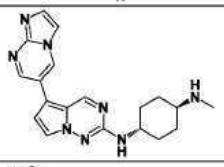
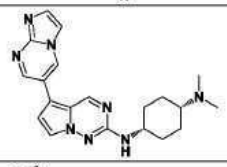
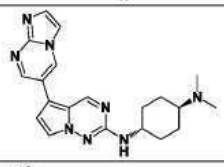
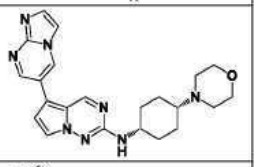
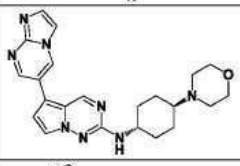
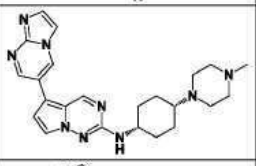
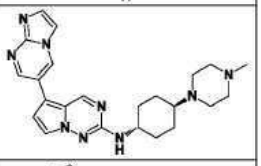
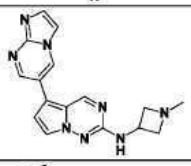
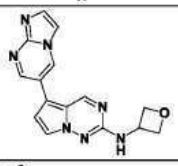
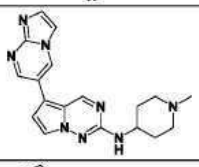
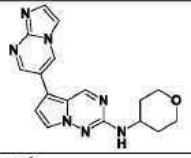
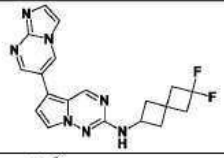
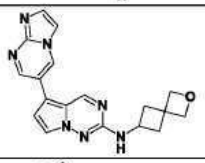
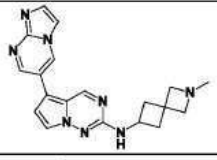
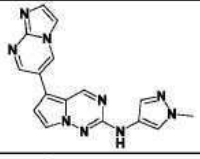
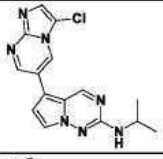
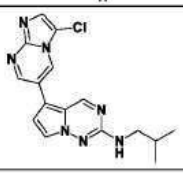
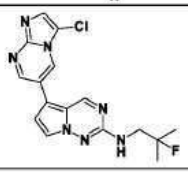
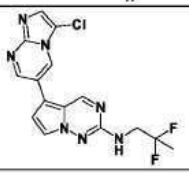
265		266		267	
268		269		270	
271		272		273	
274		275		276	
277		278		279	
280		281		282	
283		284		285	
286		287		288	

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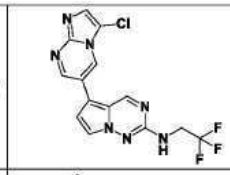
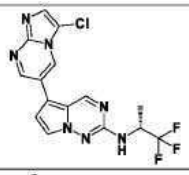
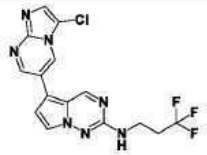
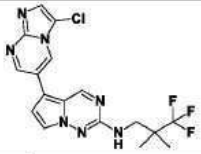
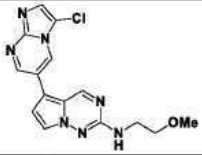
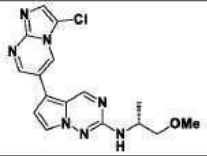
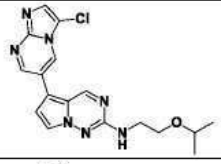
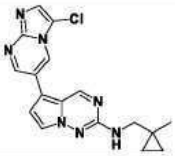
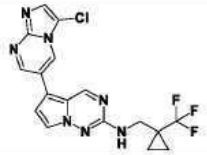
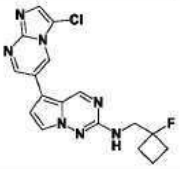
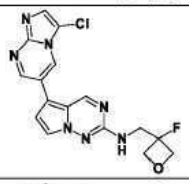
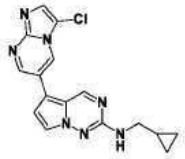
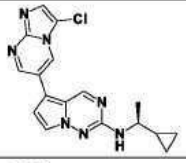
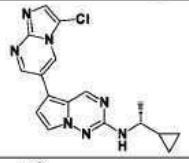
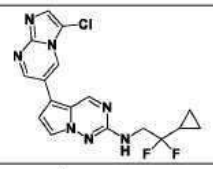
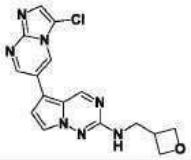
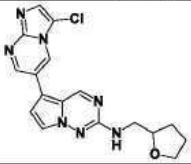
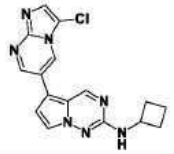
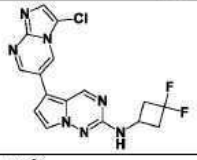
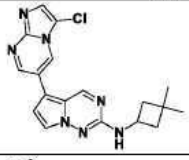
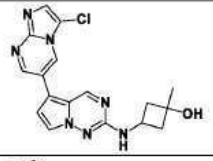
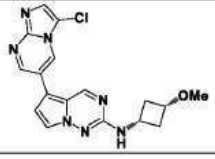
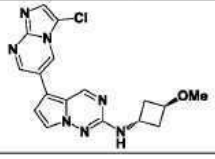
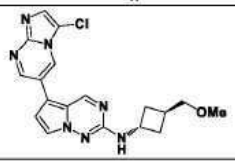
289		290		291	
292		293		294	
295		296		297	
298		299		300	
301		302		303	
304		305		306	
307		308		309	
310		311		312	

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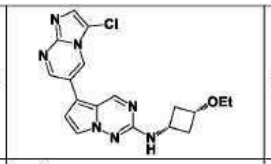
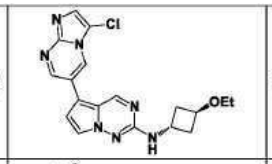
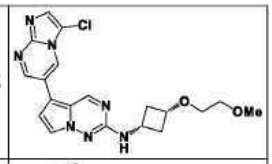
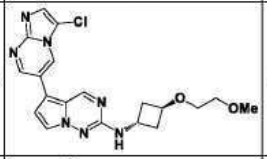
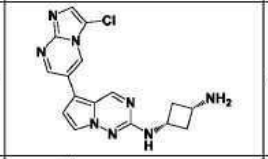
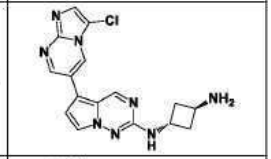
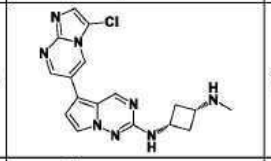
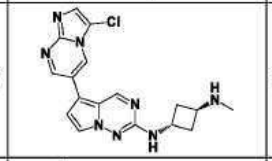
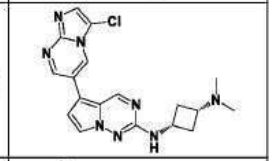
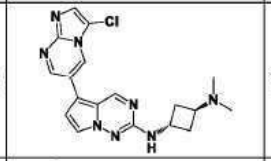
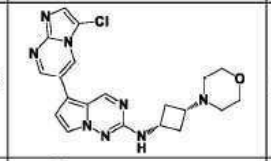
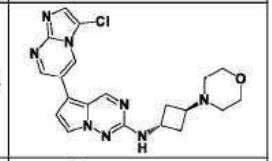
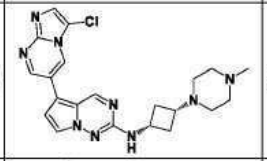
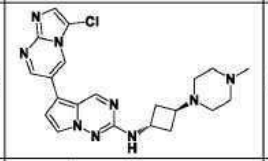
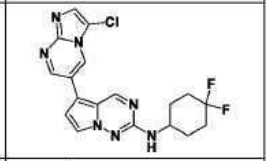
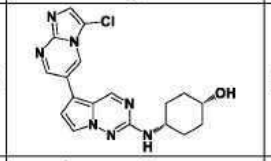
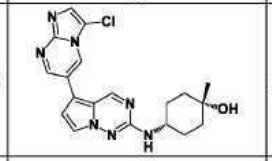
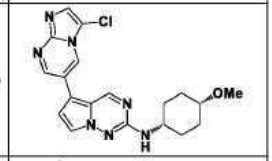
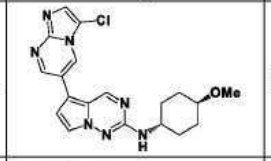
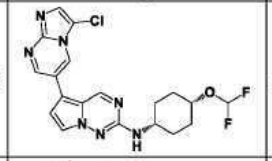
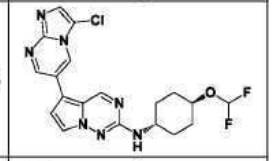
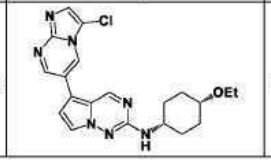
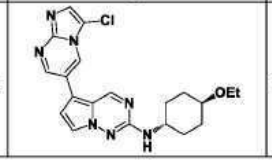
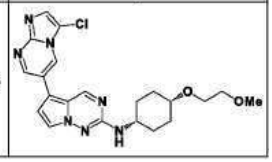
313		314		315	
316		317		318	
319		320		321	
322		323		324	
325		326		327	
328		329		330	
331		332		333	
334		335		336	

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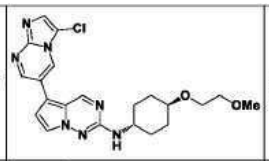
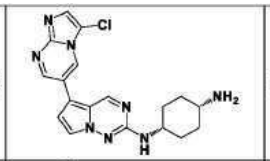
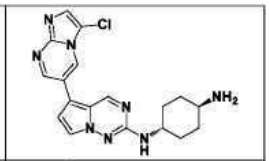
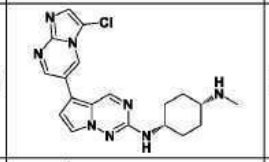
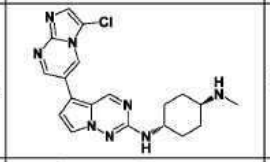
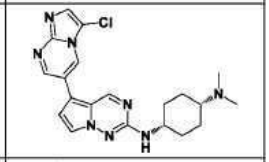
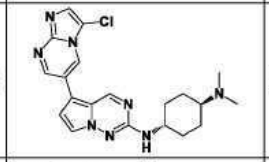
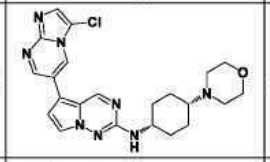
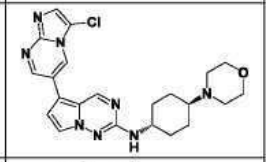
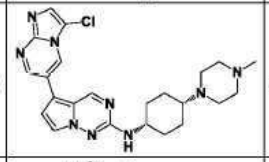
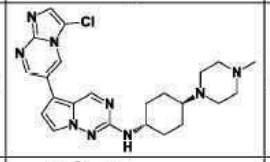
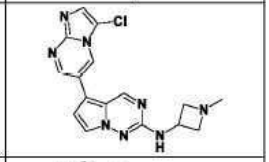
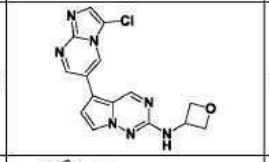
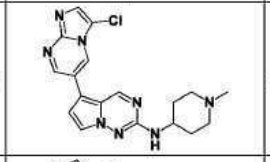
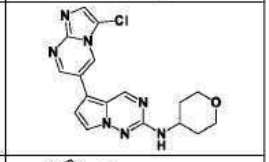
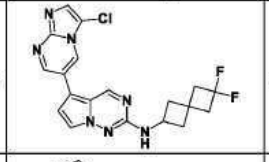
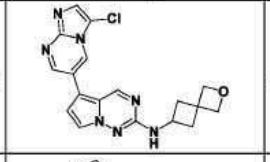
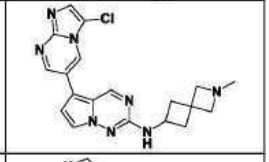
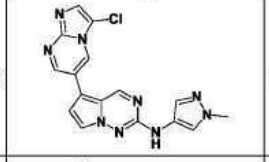
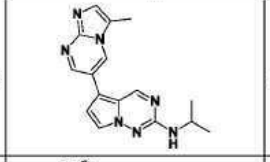
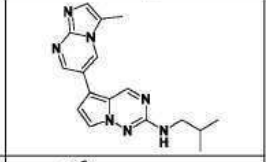
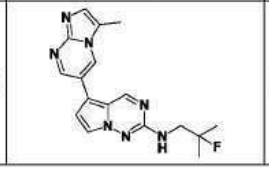
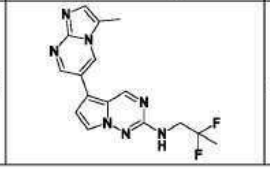
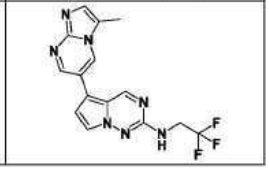
337		338		339	
340		341		342	
343		344		345	
346		347		348	
349		350		351	
352		353		354	
355		356		357	
358		359		360	

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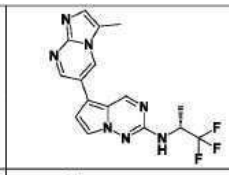
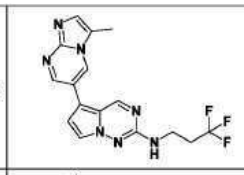
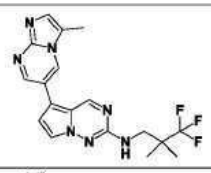
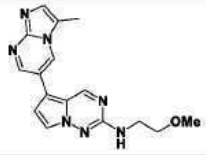
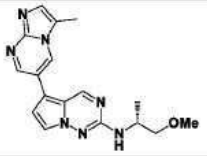
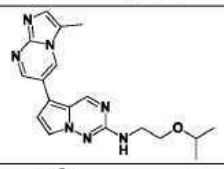
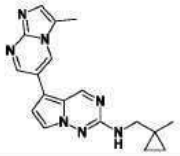
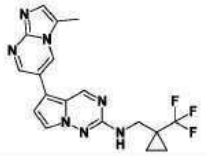
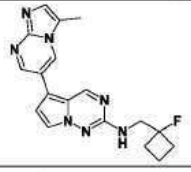
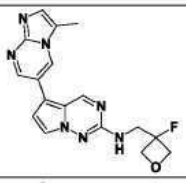
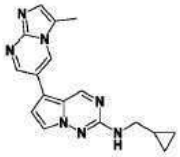
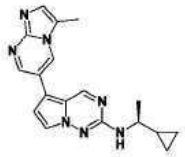
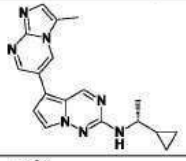
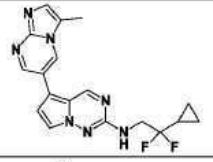
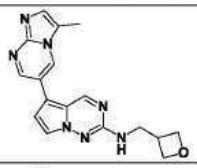
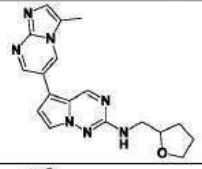
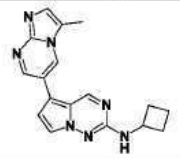
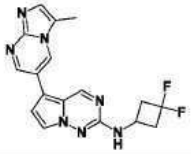
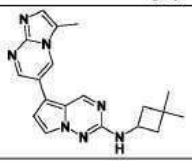
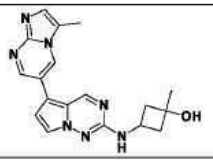
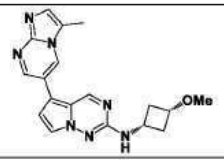
361		362		363	
364		365		366	
367		368		369	
370		371		372	
373		374		375	
376		377		378	
379		380		381	

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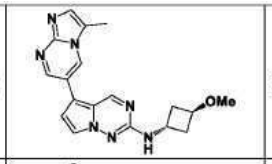
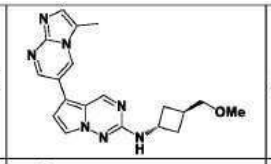
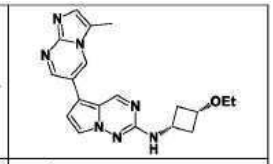
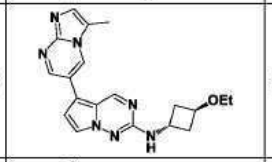
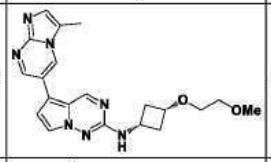
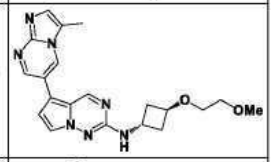
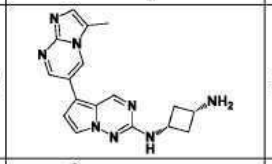
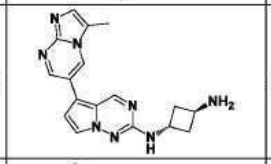
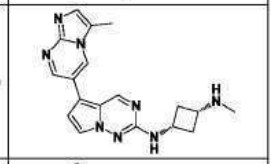
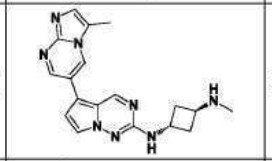
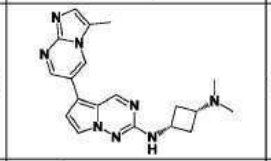
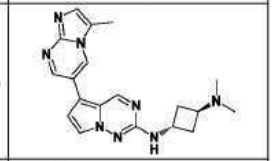
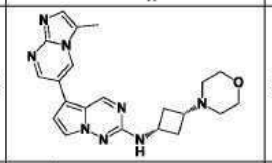
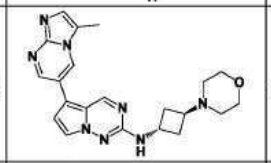
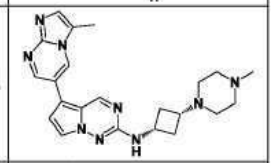
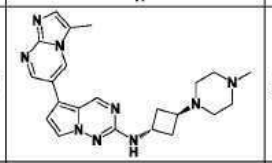
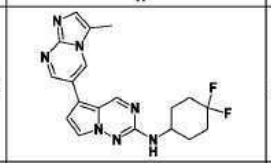
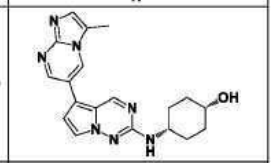
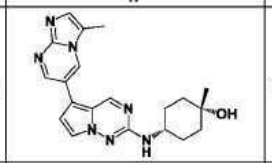
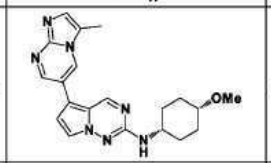
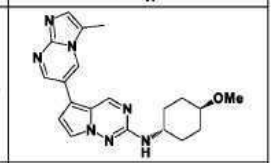
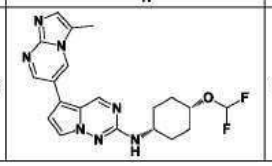
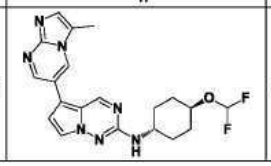
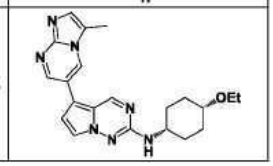
382		383		384	
385		386		387	
388		389		390	
391		392		393	
394		395		396	
397		398		399	
400		401		402	
403		404		405	

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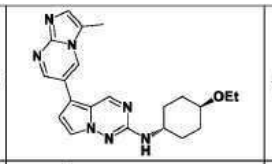
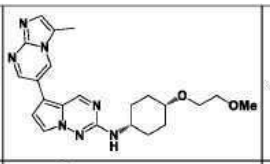
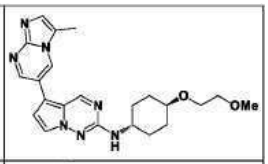
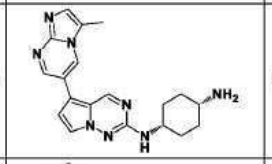
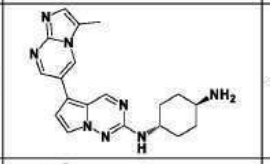
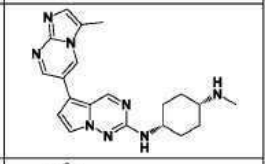
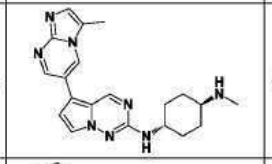
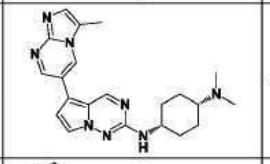
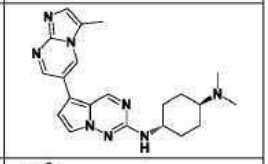
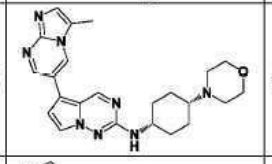
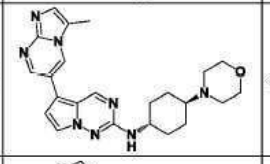
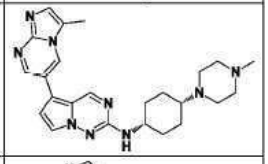
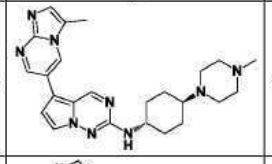
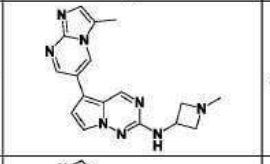
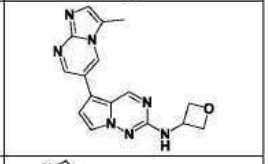
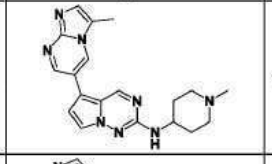
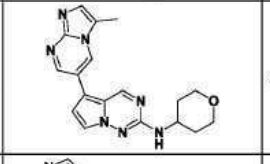
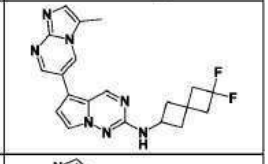
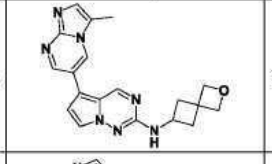
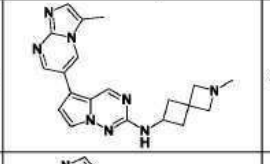
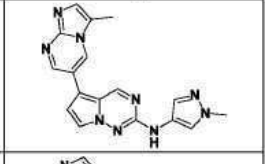
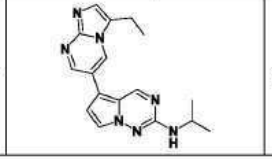
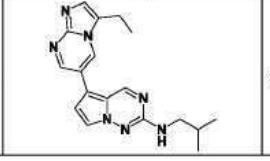
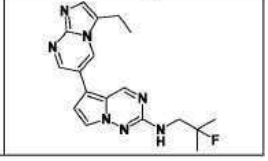
406		407		408	
409		410		411	
412		413		414	
415		416		417	
418		419		420	
421		422		423	
424		425		426	
427		428		429	

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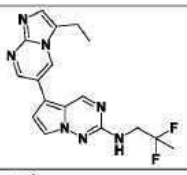
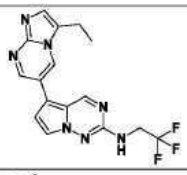
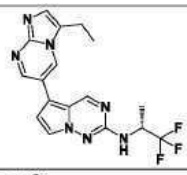
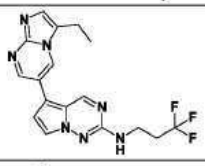
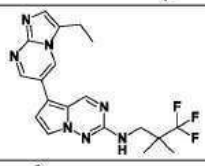
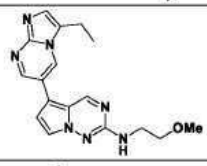
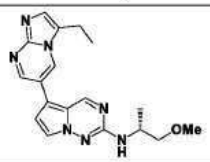
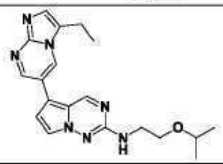
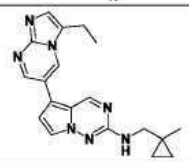
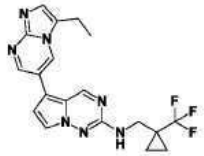
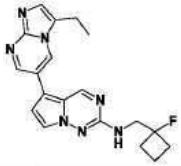
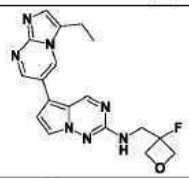
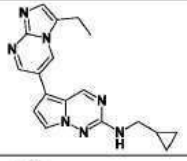
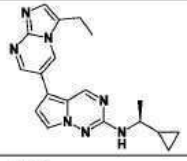
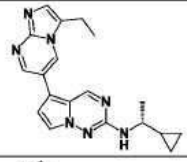
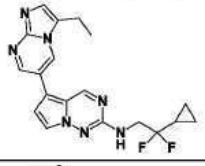
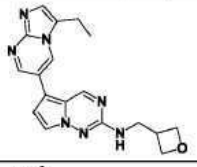
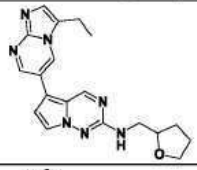
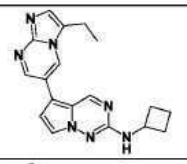
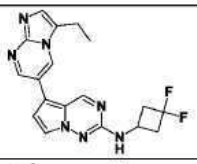
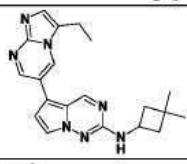
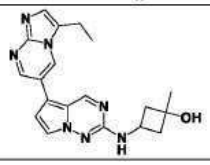
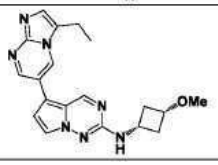
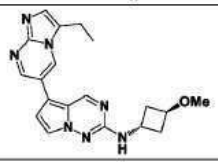
430		431		432	
433		434		435	
436		437		438	
439		440		441	
442		443		444	
445		446		447	
448		449		450	
451		452		453	

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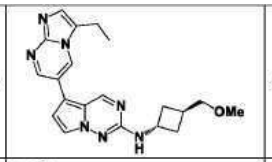
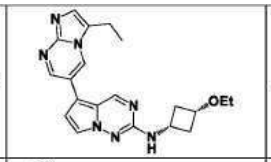
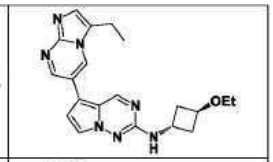
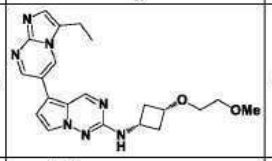
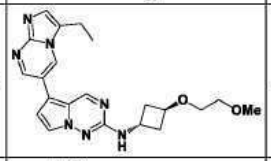
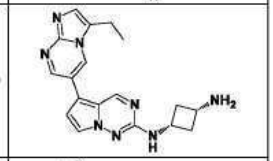
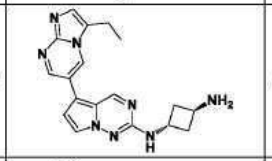
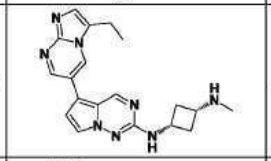
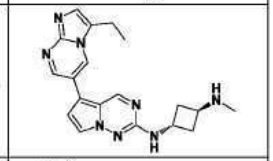
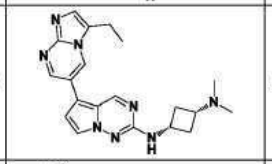
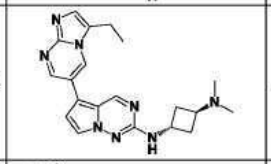
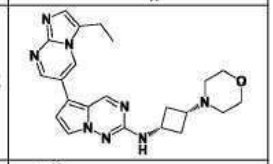
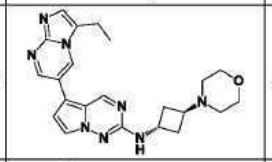
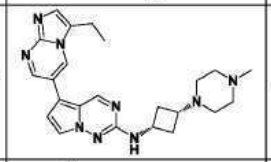
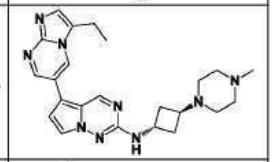
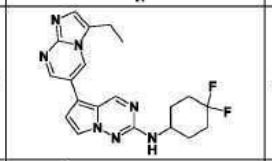
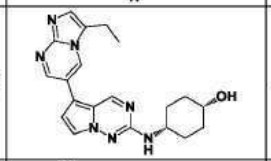
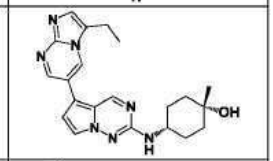
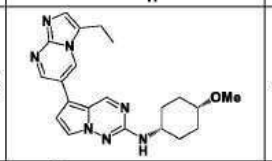
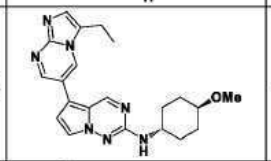
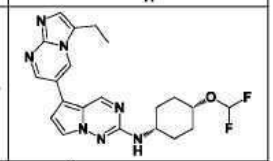
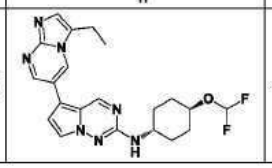
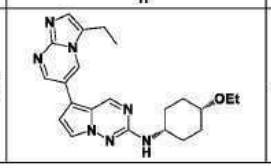
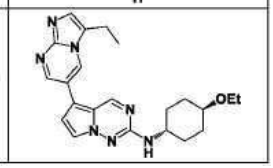
454		455		456	
457		458		459	
460		461		462	
463		464		465	
466		467		468	
469		470		471	
472		473		474	
475		476		477	

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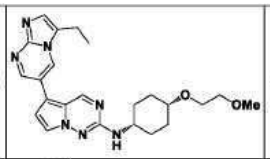
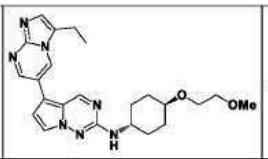
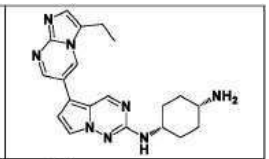
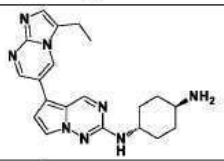
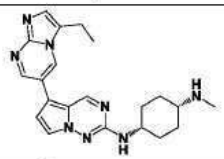
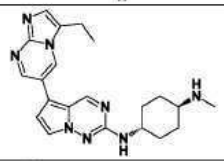
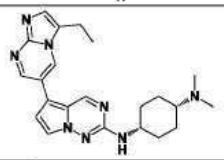
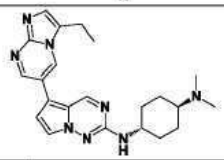
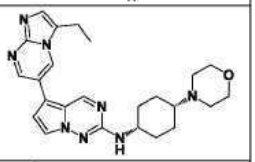
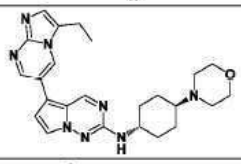
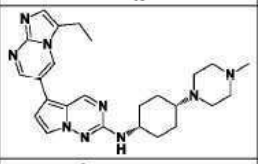
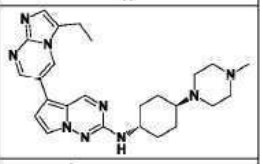
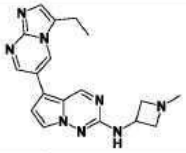
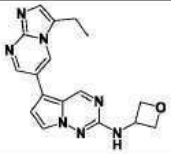
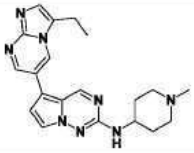
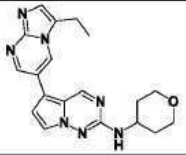
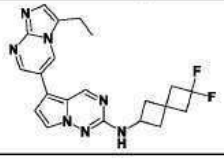
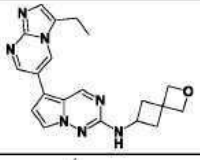
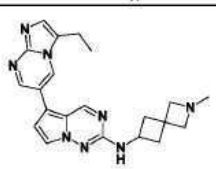
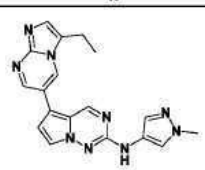
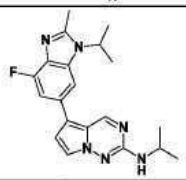
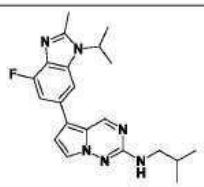
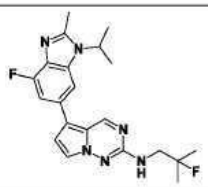
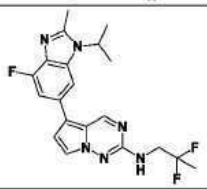
478		479		480	
481		482		483	
484		485		486	
487		488		489	
490		491		492	
493		494		495	
496		497		498	
499		500		501	

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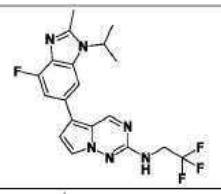
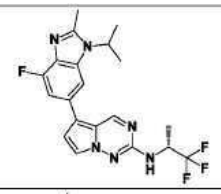
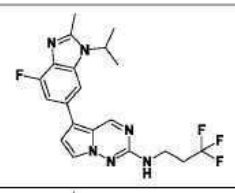
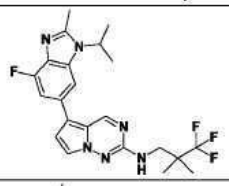
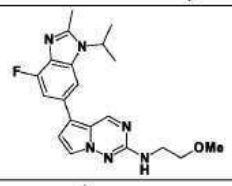
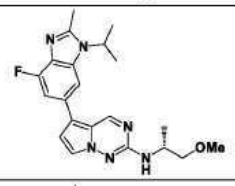
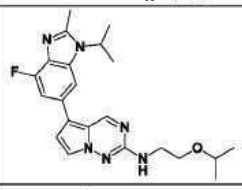
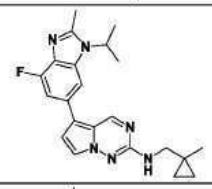
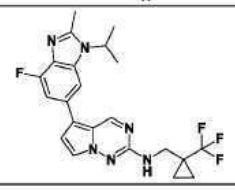
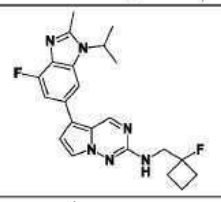
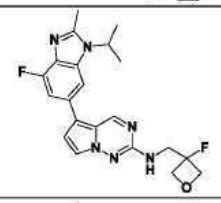
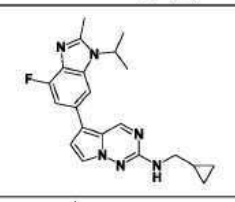
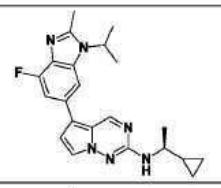
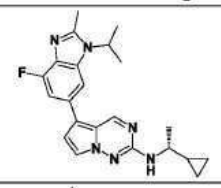
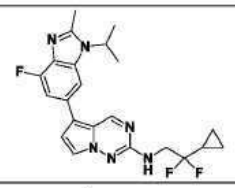
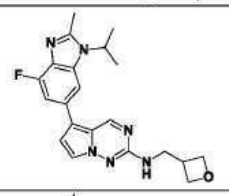
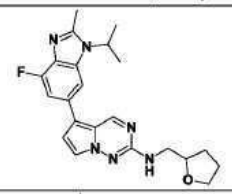
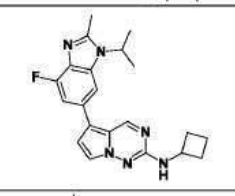
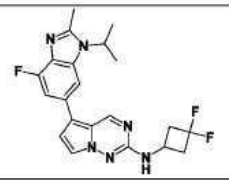
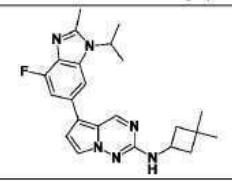
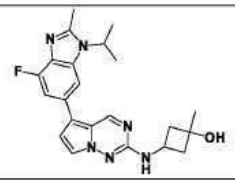
502		503		504	
505		506		507	
508		509		510	
511		512		513	
514		515		516	
517		518		519	
520		521		522	

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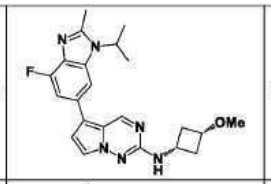
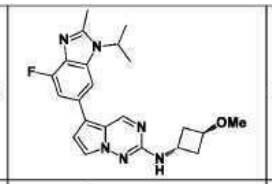
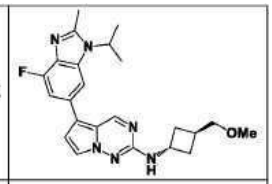
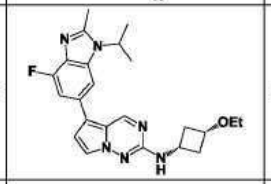
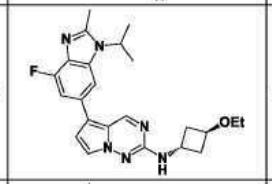
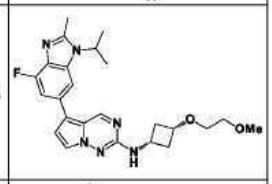
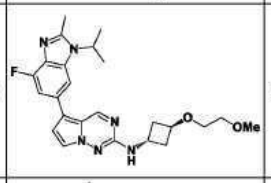
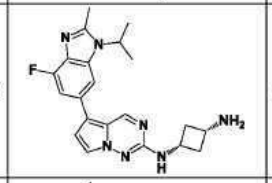
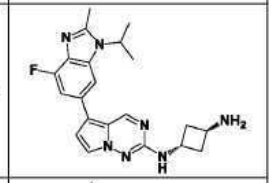
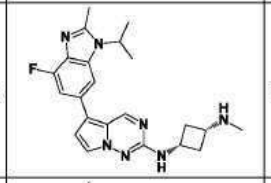
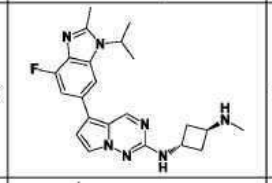
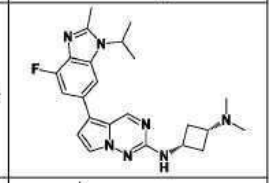
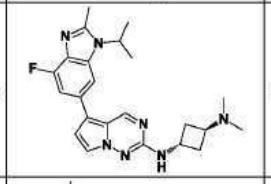
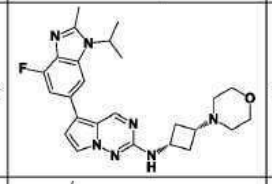
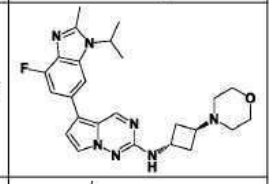
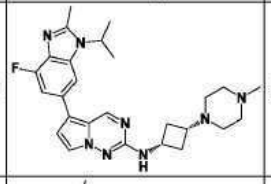
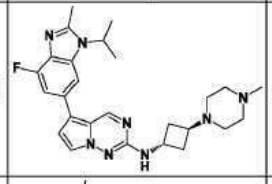
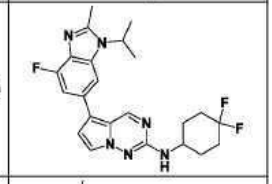
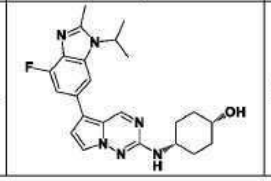
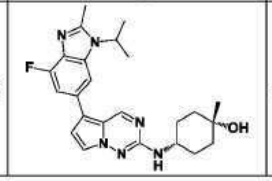
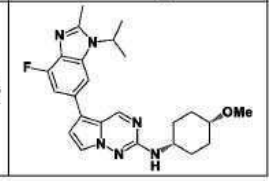
523		524		525	
526		527		528	
529		530		531	
532		533		534	
535		536		537	
538		539		540	
541		542		543	

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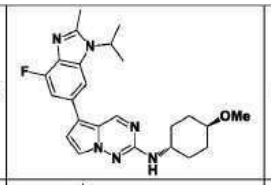
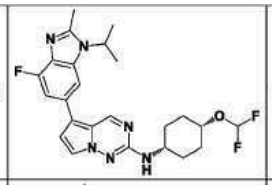
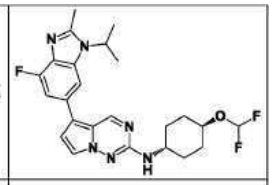
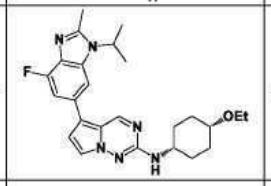
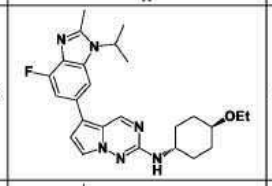
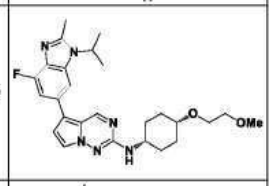
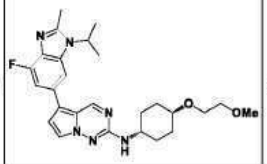
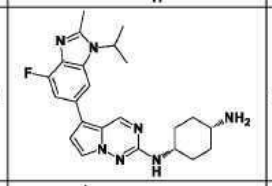
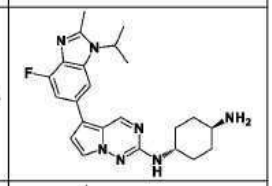
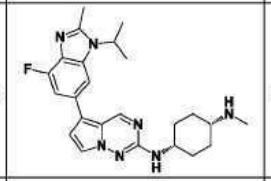
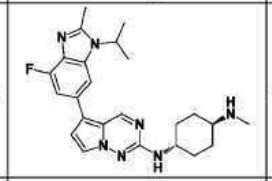
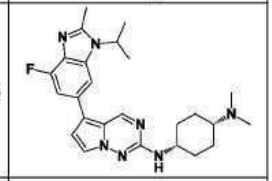
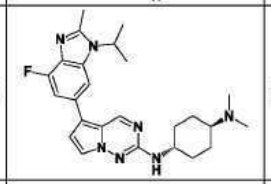
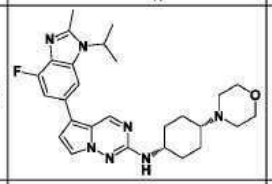
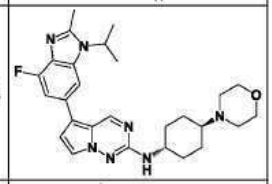
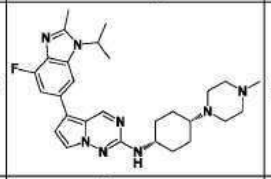
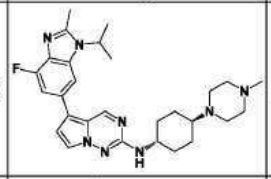
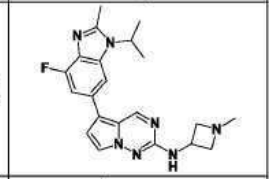
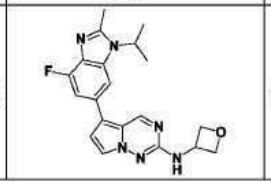
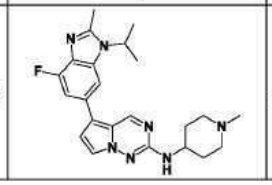
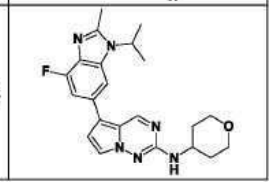
544		545		546	
547		548		549	
550		551		552	
553		554		555	
556		557		558	
559		560		561	
562		563		564	

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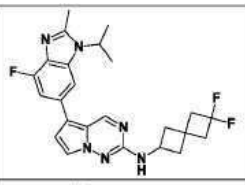
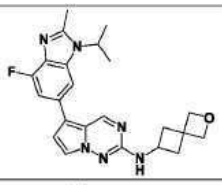
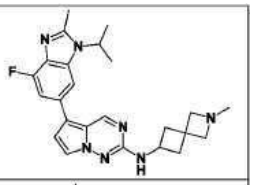
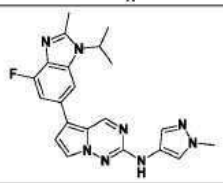
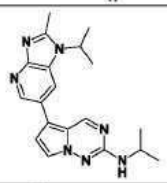
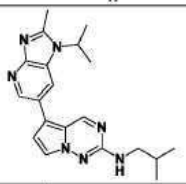
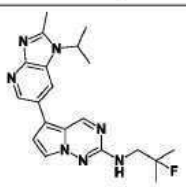
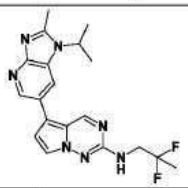
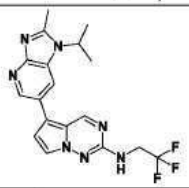
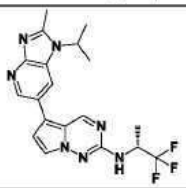
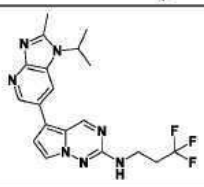
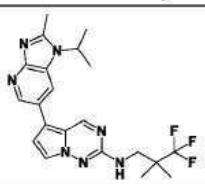
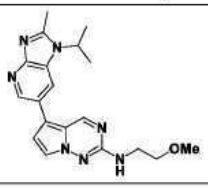
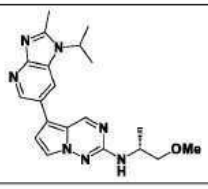
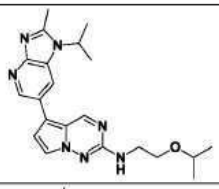
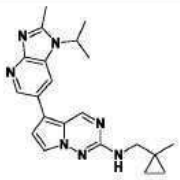
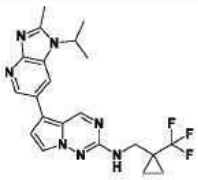
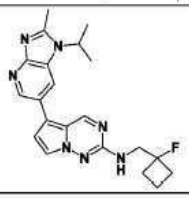
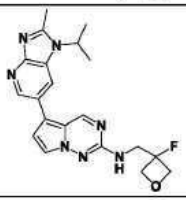
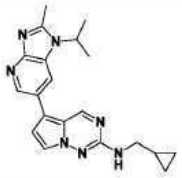
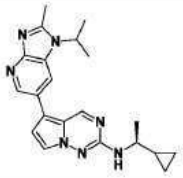
565		566		567	
568		569		570	
571		572		573	
574		575		576	
577		578		579	
580		581		582	
583		584		585	

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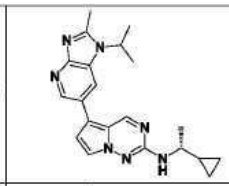
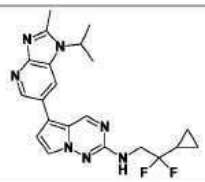
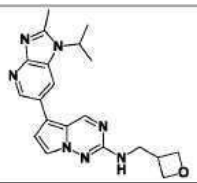
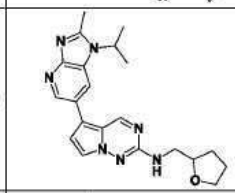
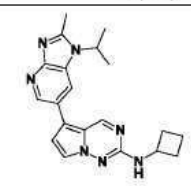
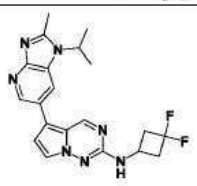
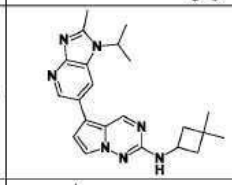
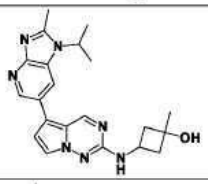
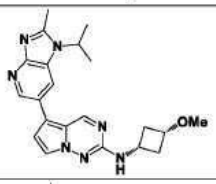
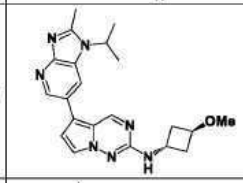
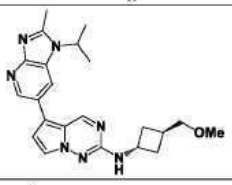
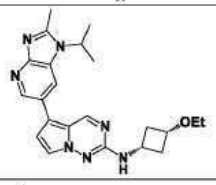
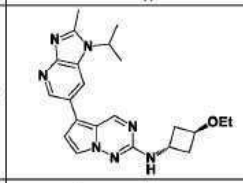
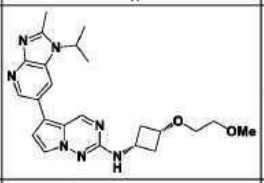
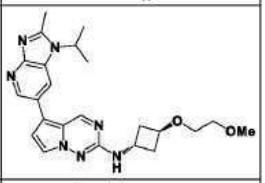
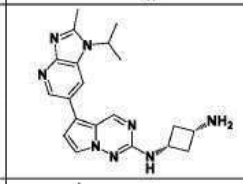
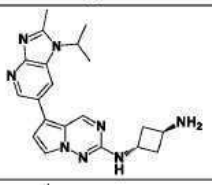
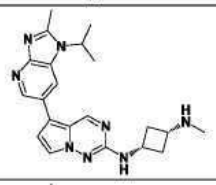
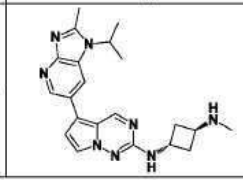
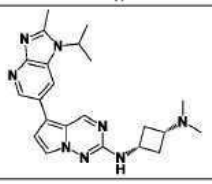
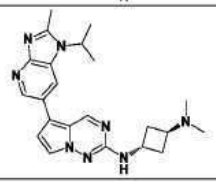
586		587		588	
589		590		591	
592		593		594	
595		596		597	
598		599		600	
601		602		603	
604		605		606	

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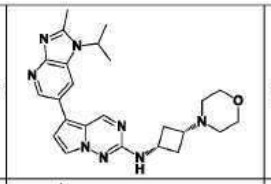
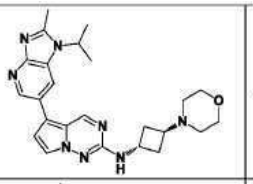
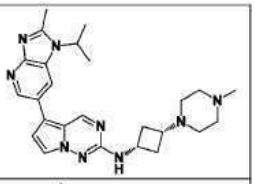
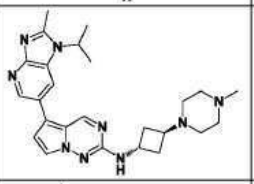
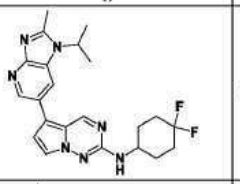
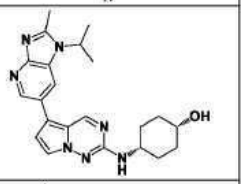
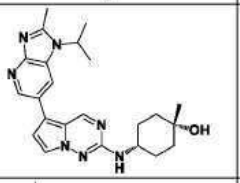
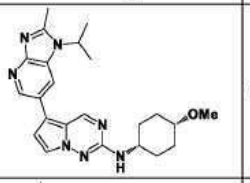
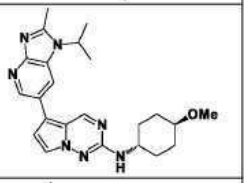
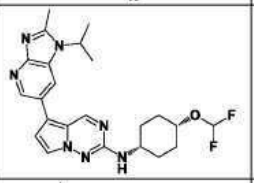
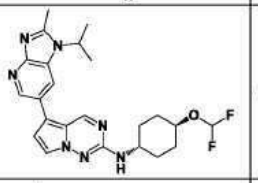
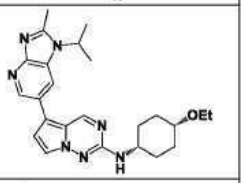
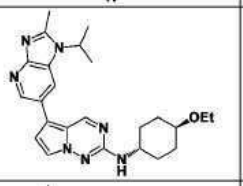
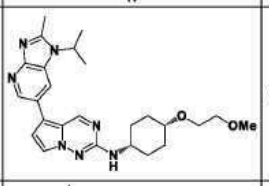
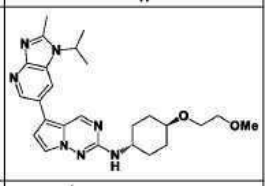
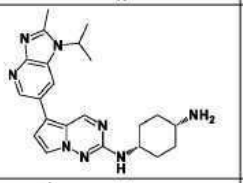
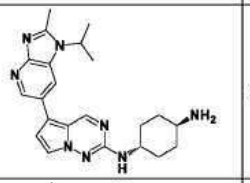
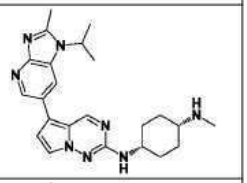
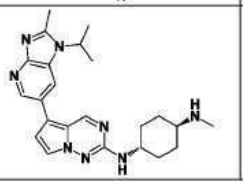
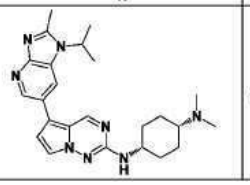
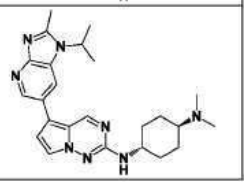
607		608		609	
610		611		612	
613		614		615	
616		617		618	
619		620		621	
622		623		624	
625		626		627	

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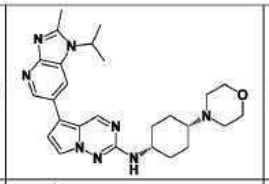
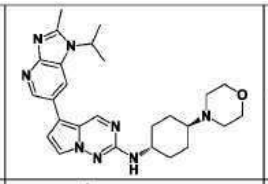
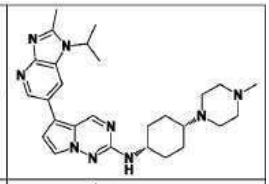
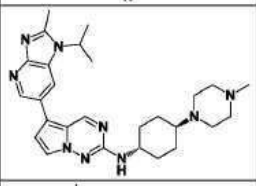
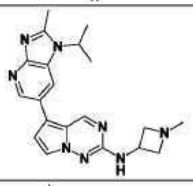
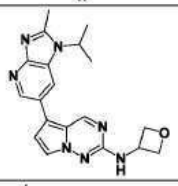
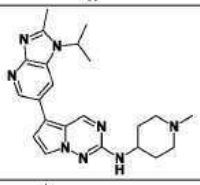
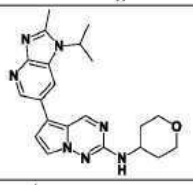
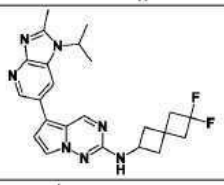
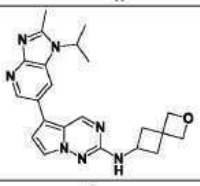
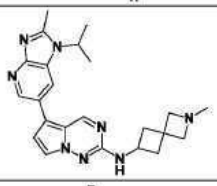
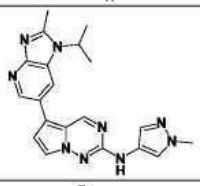
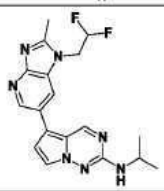
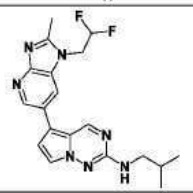
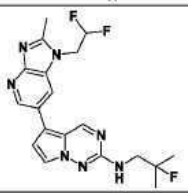
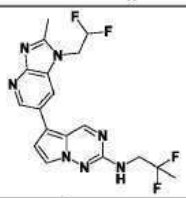
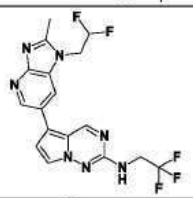
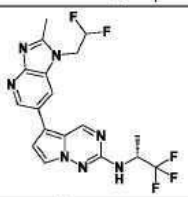
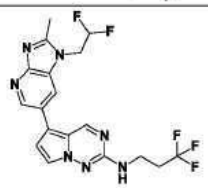
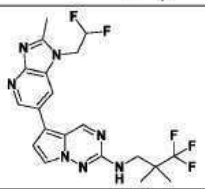
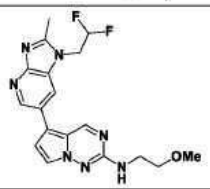
628		629		630	
631		632		633	
634		635		636	
637		638		639	
640		641		642	
643		644		645	
646		647		648	

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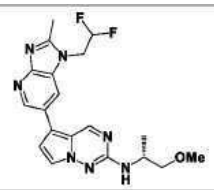
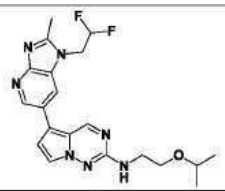
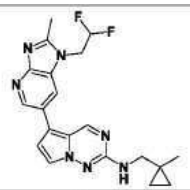
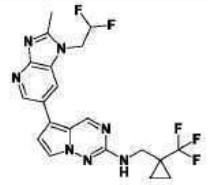
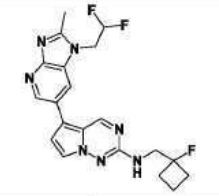
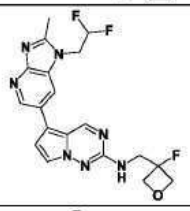
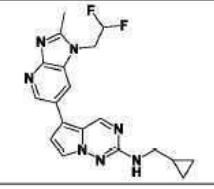
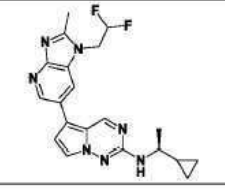
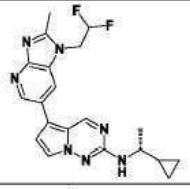
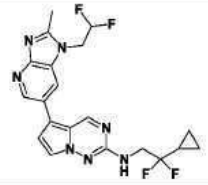
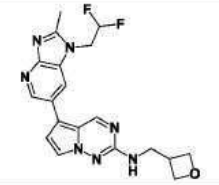
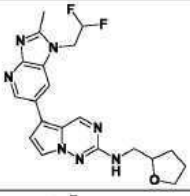
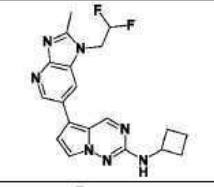
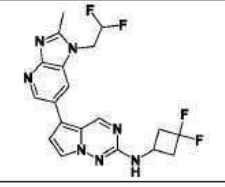
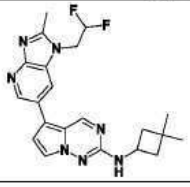
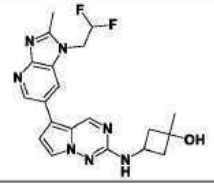
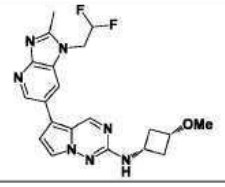
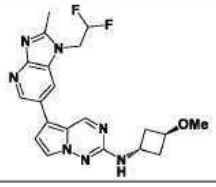
649		650		651	
652		653		654	
655		656		657	
658		659		660	
661		662		663	
664		665		666	

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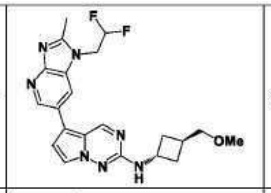
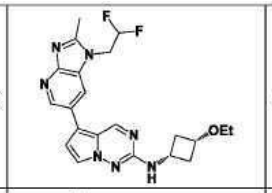
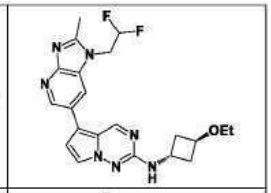
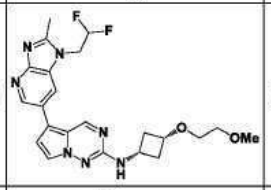
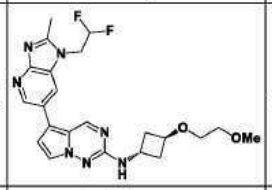
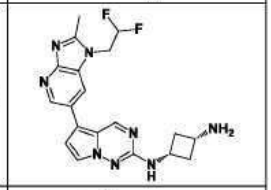
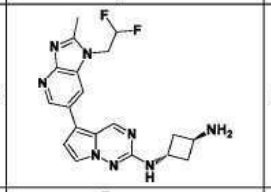
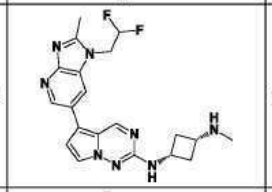
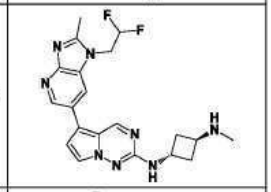
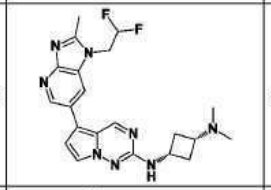
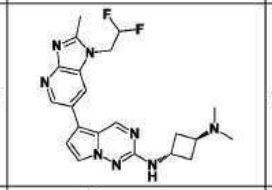
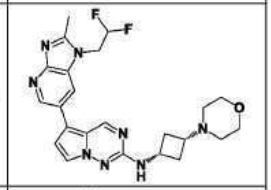
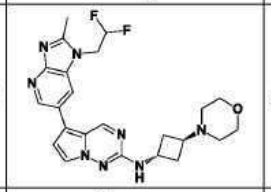
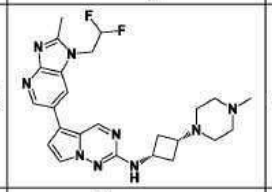
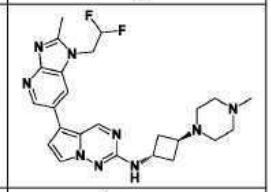
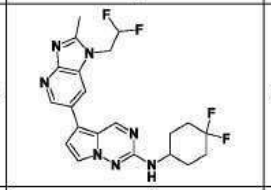
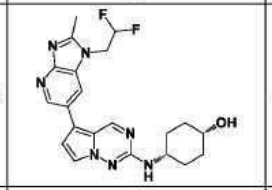
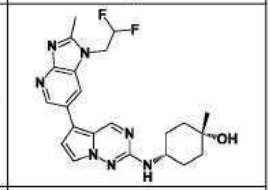
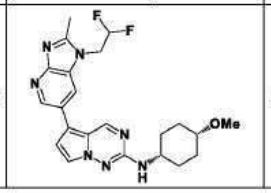
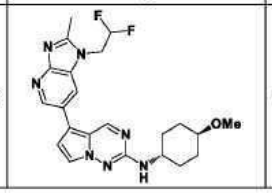
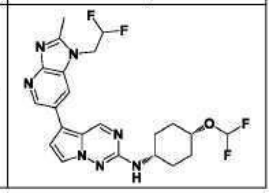
667		668		669	
670		671		672	
673		674		675	
676		677		678	
679		680		681	
682		683		684	
685		686		687	

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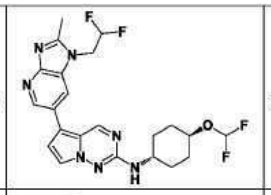
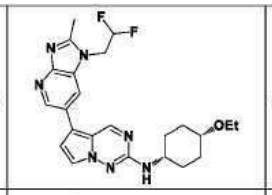
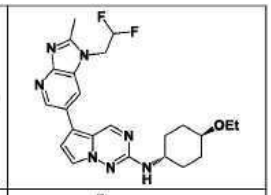
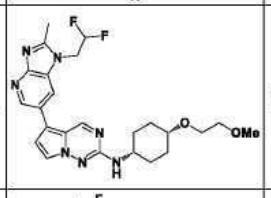
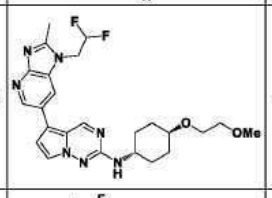
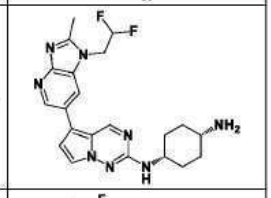
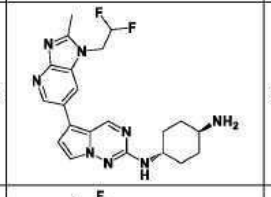
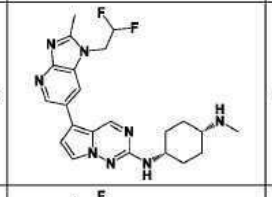
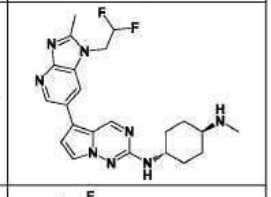
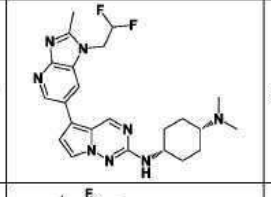
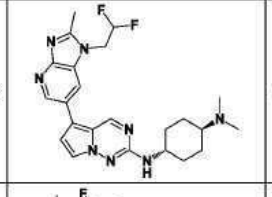
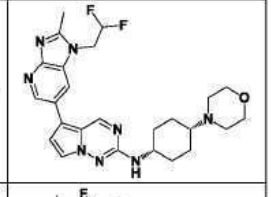
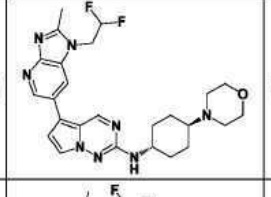
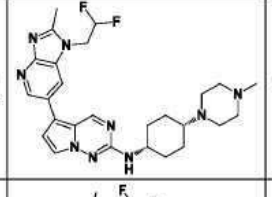
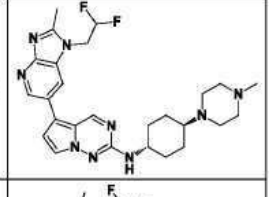
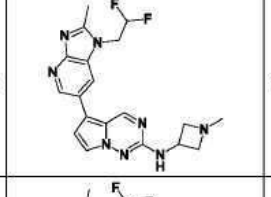
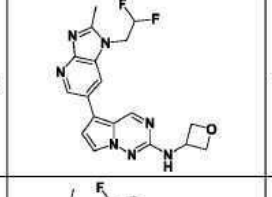
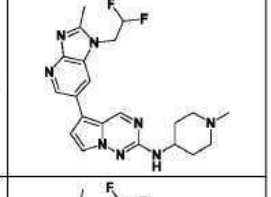
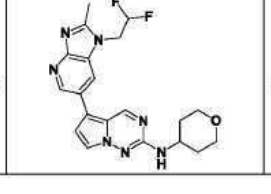
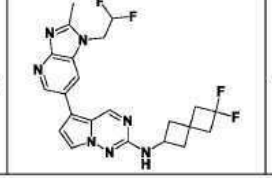
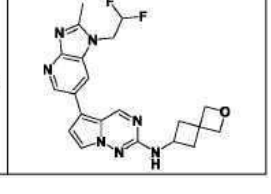
688		689		690	
691		692		693	
694		695		696	
697		698		699	
700		701		702	
703		704		705	
706		707		708	

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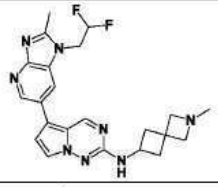
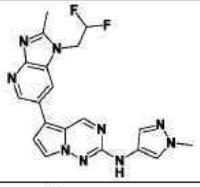
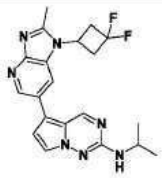
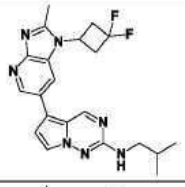
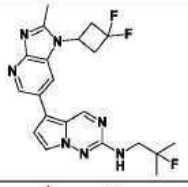
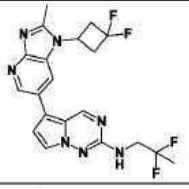
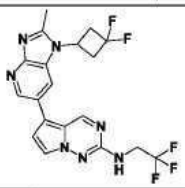
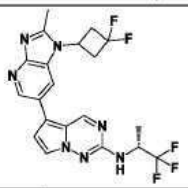
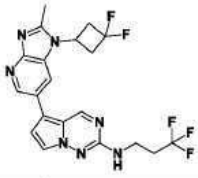
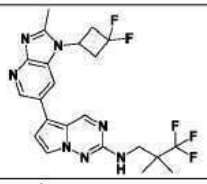
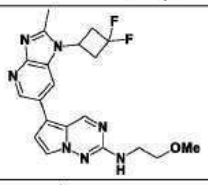
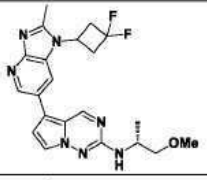
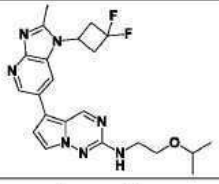
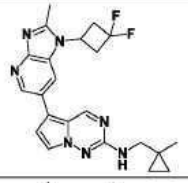
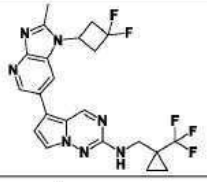
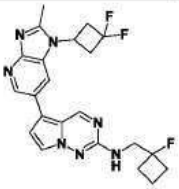
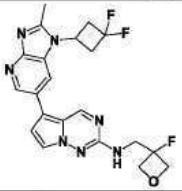
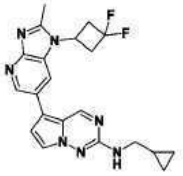
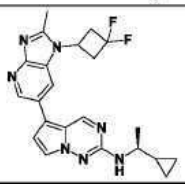
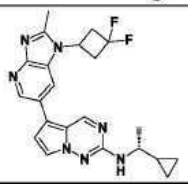
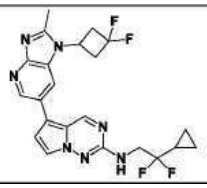
709		710		711	
712		713		714	
715		716		717	
718		719		720	
721		722		723	
724		725		726	
727		728		729	

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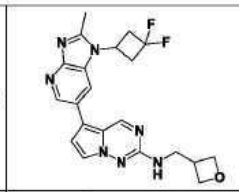
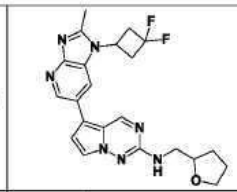
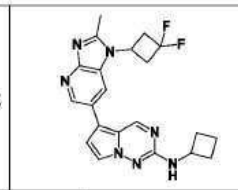
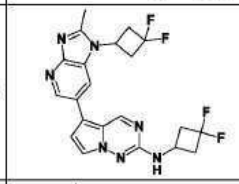
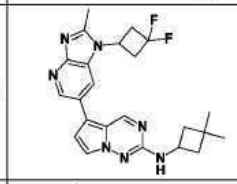
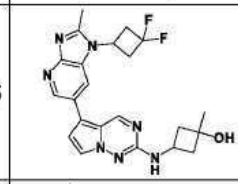
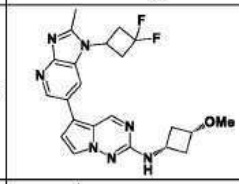
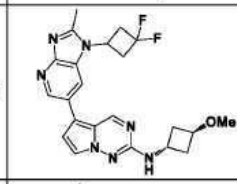
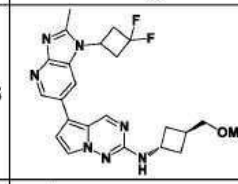
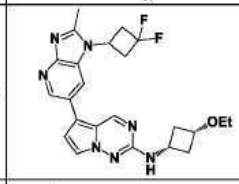
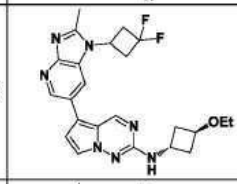
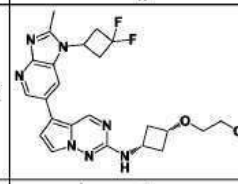
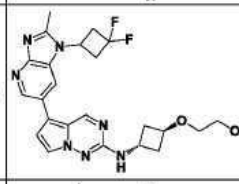
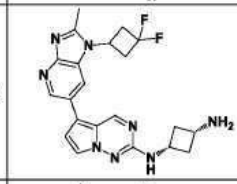
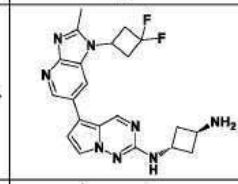
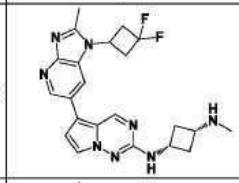
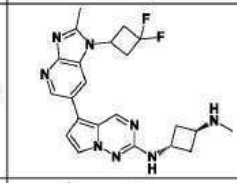
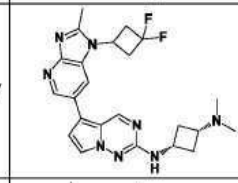
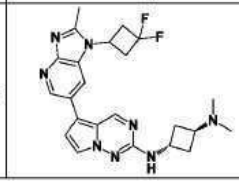
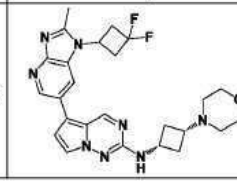
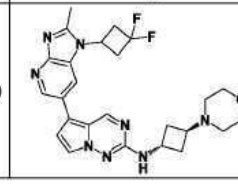
730		731		732	
733		734		735	
736		737		738	
739		740		741	
742		743		744	
745		746		747	
748		749		750	

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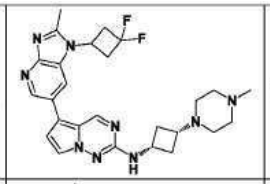
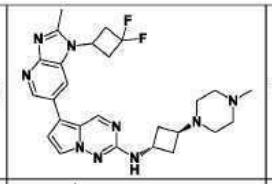
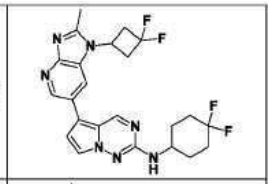
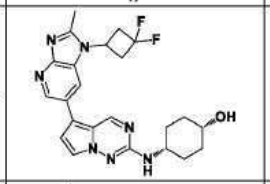
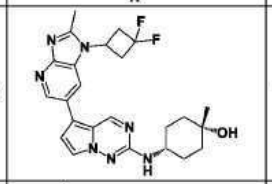
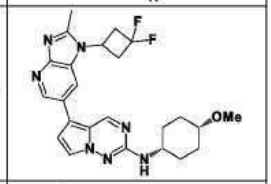
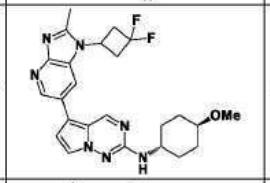
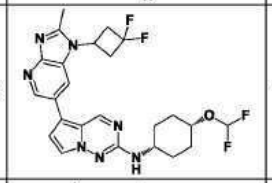
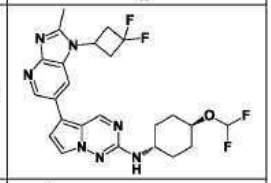
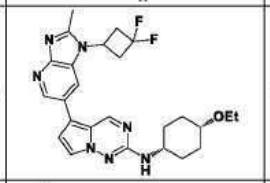
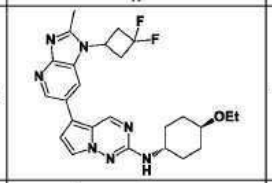
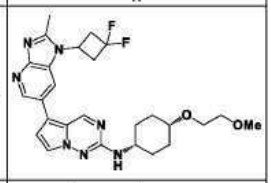
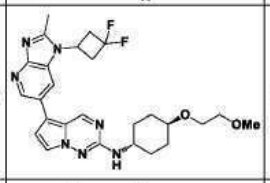
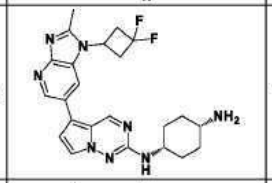
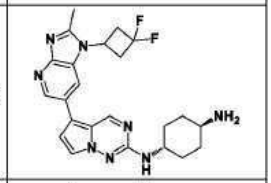
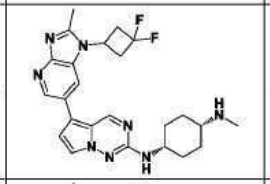
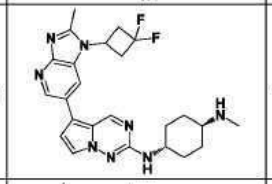
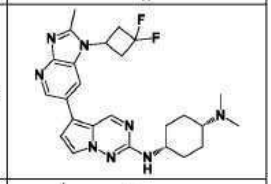
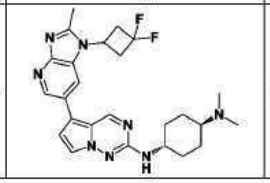
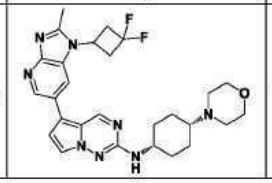
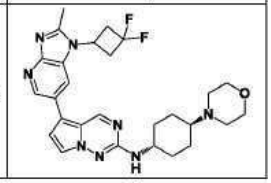
751		752		753	
754		755		756	
757		758		759	
760		761		762	
763		764		765	
766		767		768	
769		770		771	

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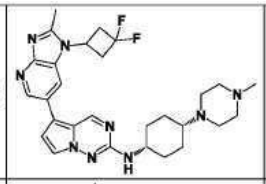
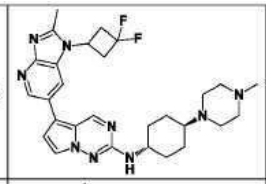
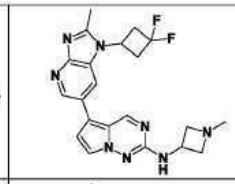
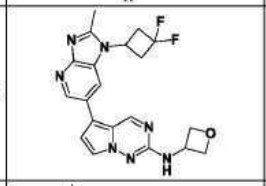
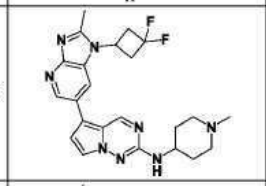
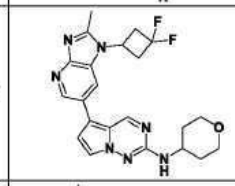
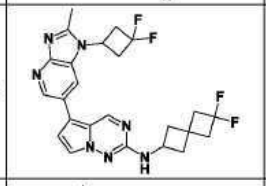
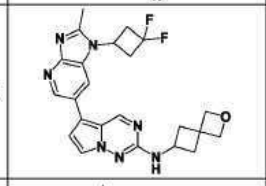
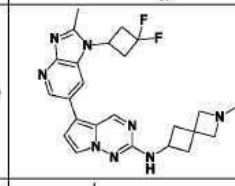
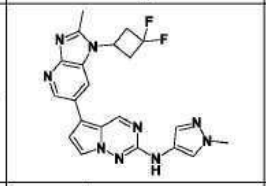
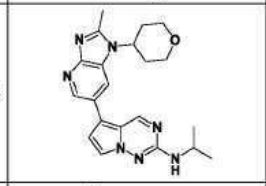
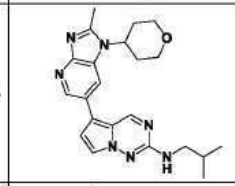
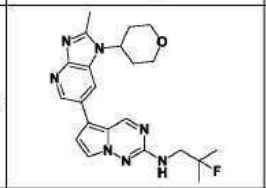
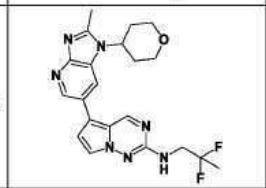
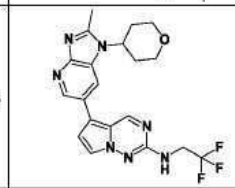
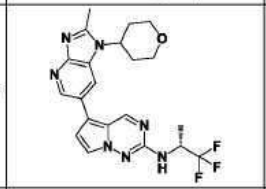
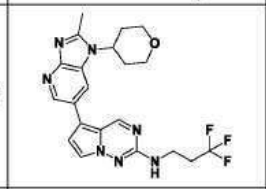
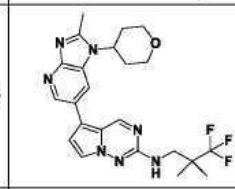
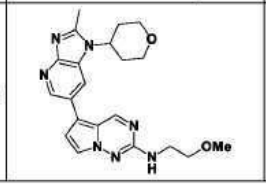
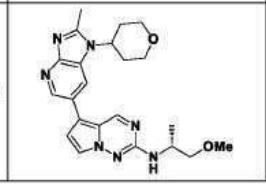
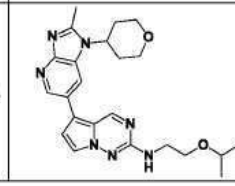
772		773		774	
775		776		777	
778		779		780	
781		782		783	
784		785		786	
787		788		789	
790		791		792	

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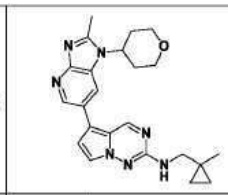
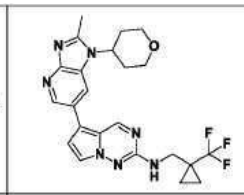
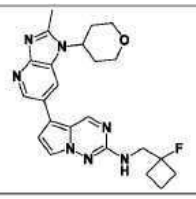
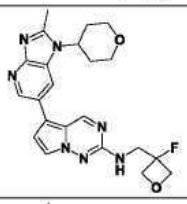
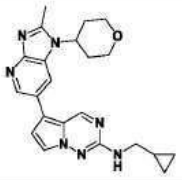
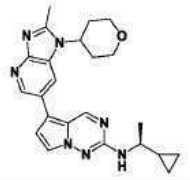
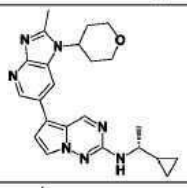
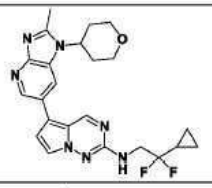
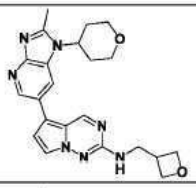
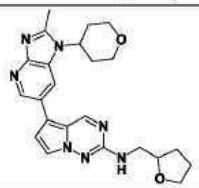
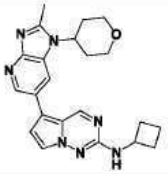
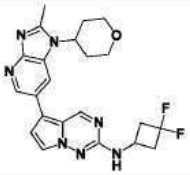
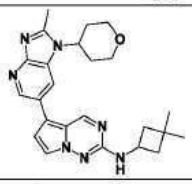
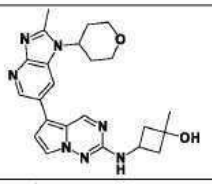
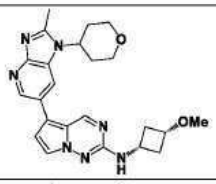
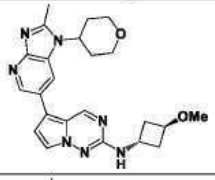
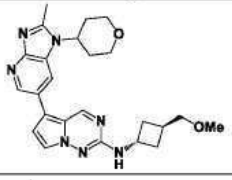
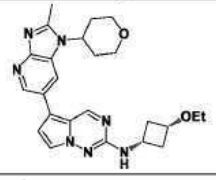
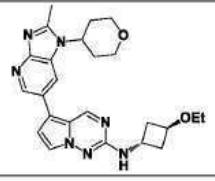
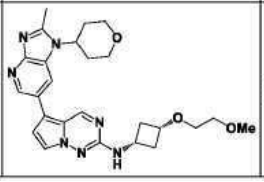
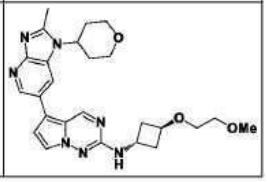
793		794		795	
796		797		798	
799		800		801	
802		803		804	
805		806		807	
808		809		810	
811		812		813	

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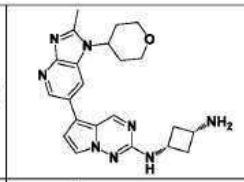
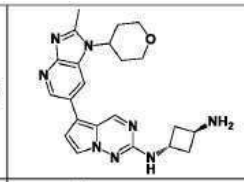
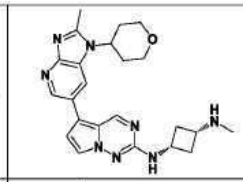
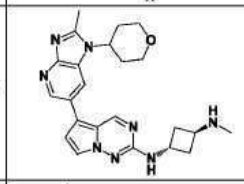
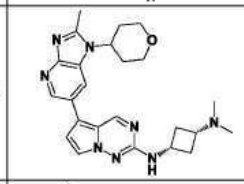
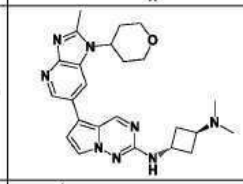
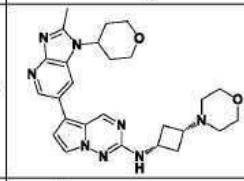
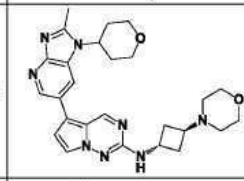
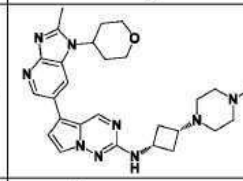
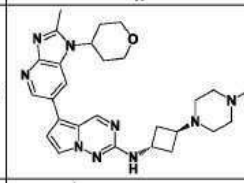
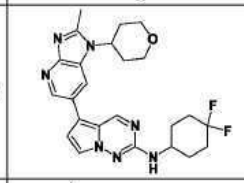
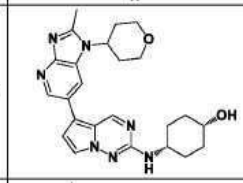
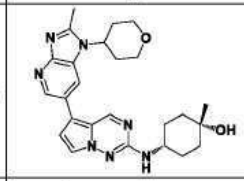
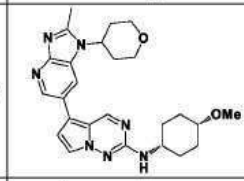
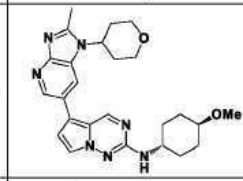
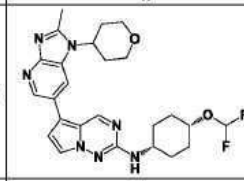
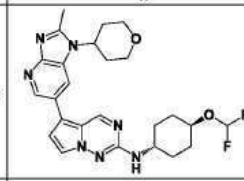
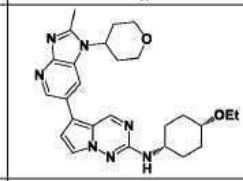
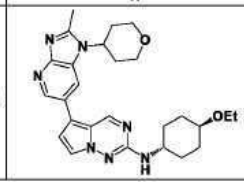
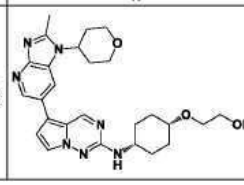
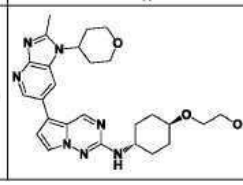
814		815		816	
817		818		819	
820		821		822	
823		824		825	
826		827		828	
829		830		831	
832		833		834	

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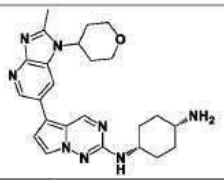
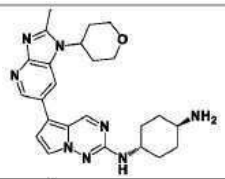
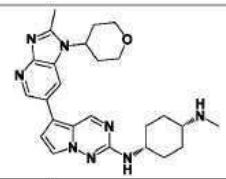
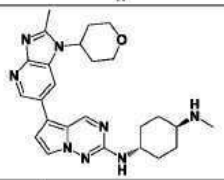
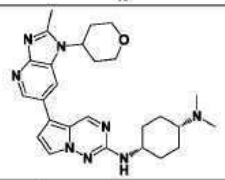
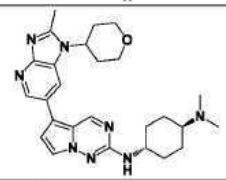
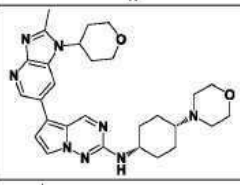
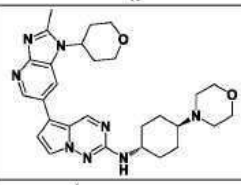
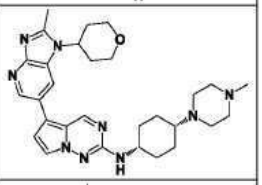
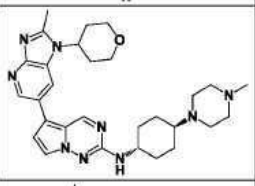
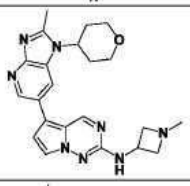
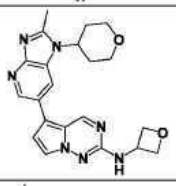
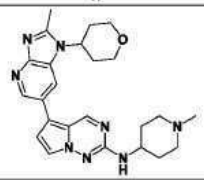
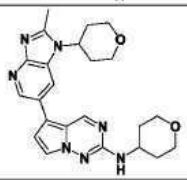
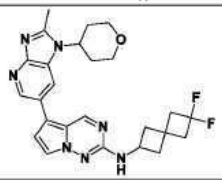
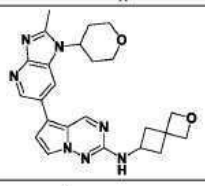
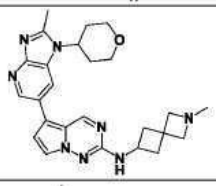
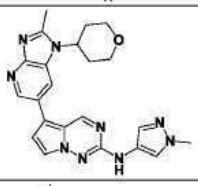
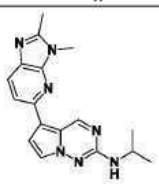
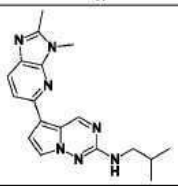
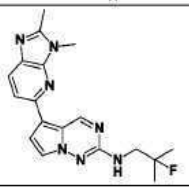
835		836		837	
838		839		840	
841		842		843	
844		845		846	
847		848		849	
850		851		852	
853		854		855	

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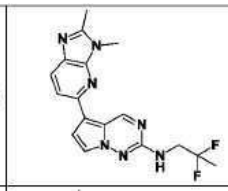
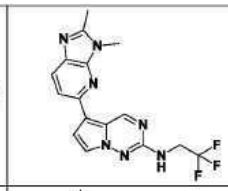
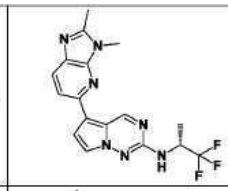
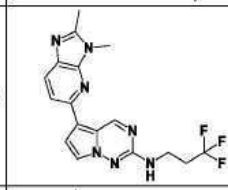
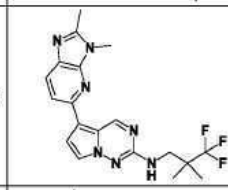
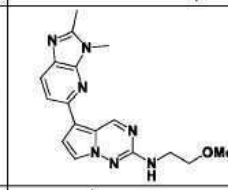
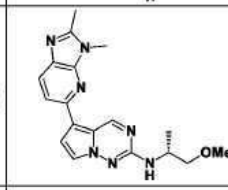
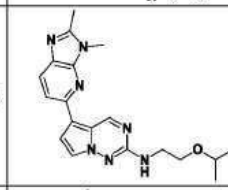
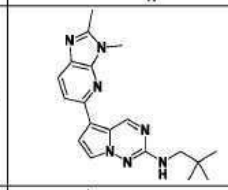
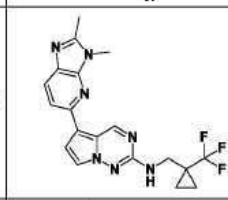
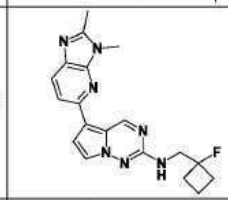
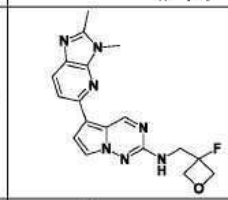
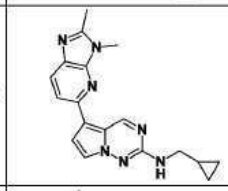
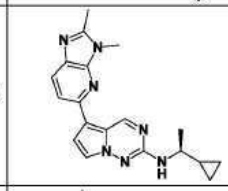
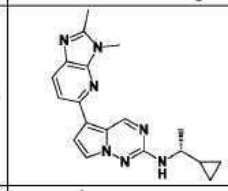
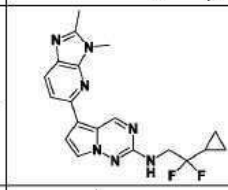
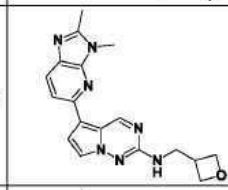
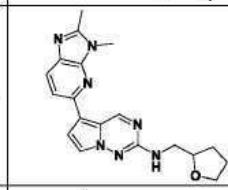
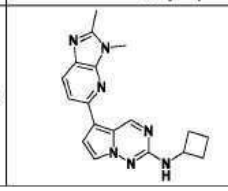
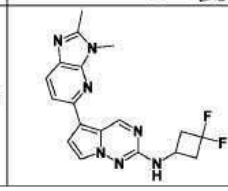
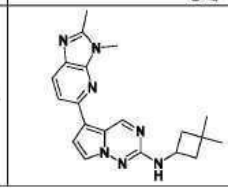
856		857		858	
859		860		861	
862		863		864	
865		866		867	
868		869		870	
871		872		873	
874		875		876	

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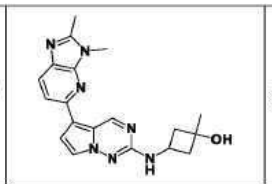
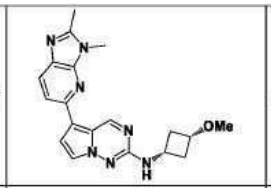
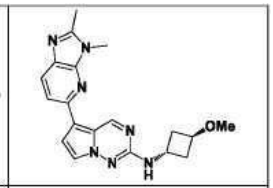
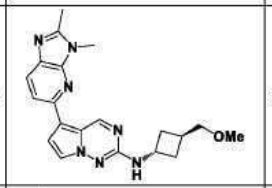
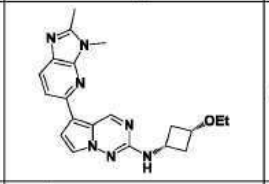
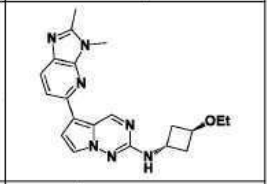
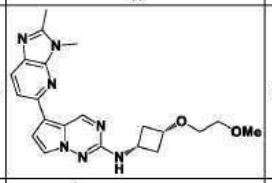
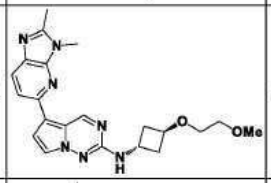
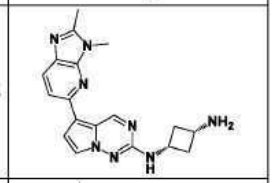
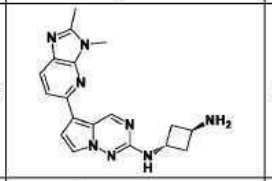
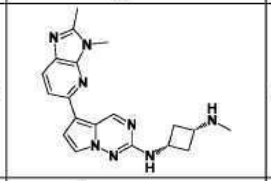
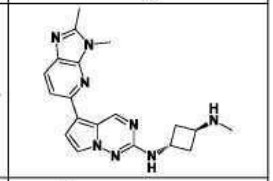
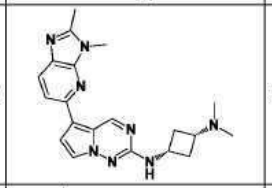
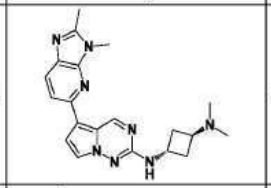
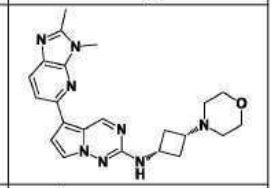
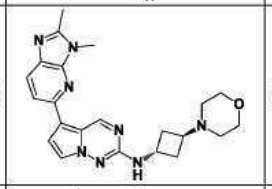
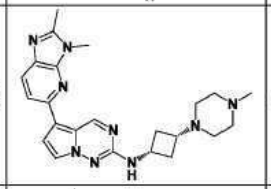
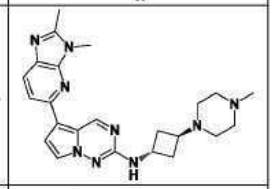
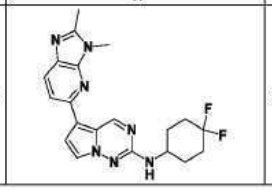
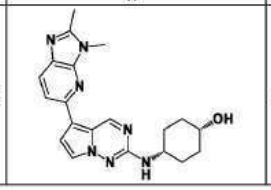
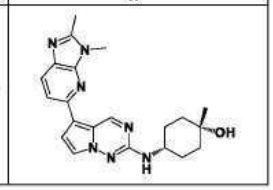
877		878		879	
880		881		882	
883		884		885	
886		887		888	
889		890		891	
892		893		894	
895		896		897	

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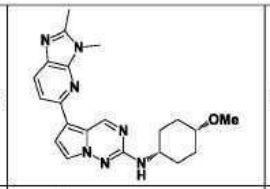
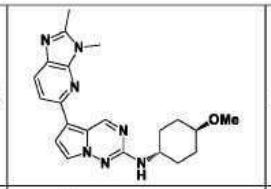
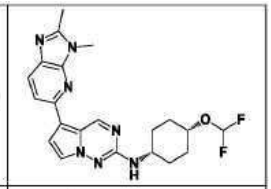
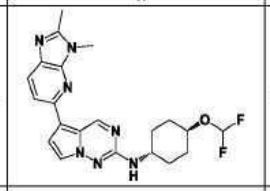
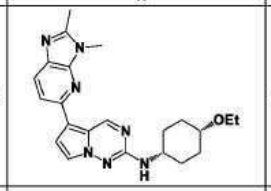
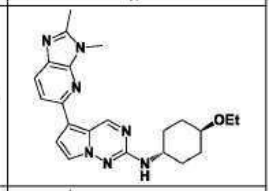
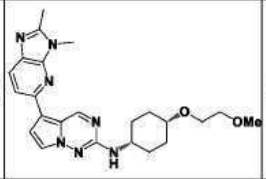
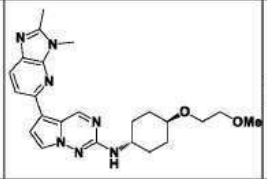
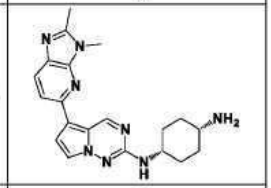
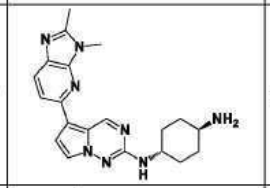
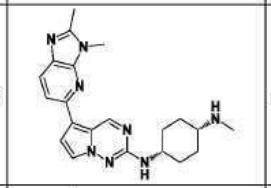
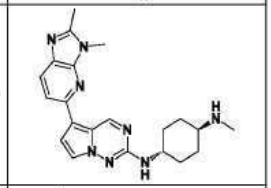
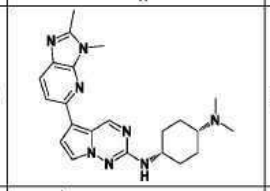
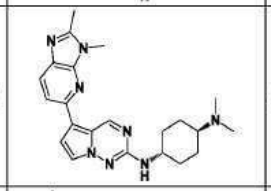
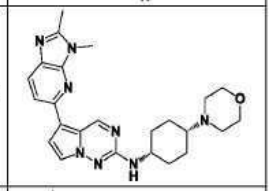
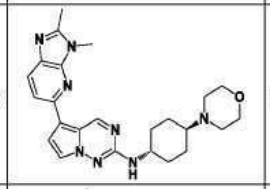
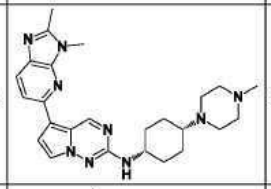
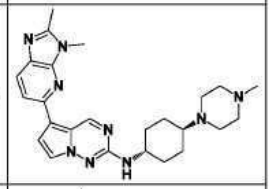
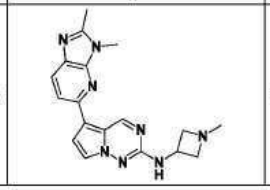
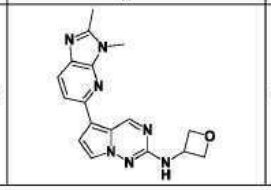
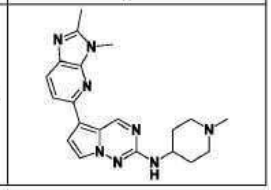
898		899		900	
901		902		903	
904		905		906	
907		908		909	
910		911		912	
913		914		915	
916		917		918	

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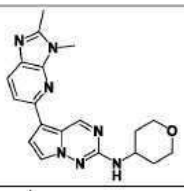
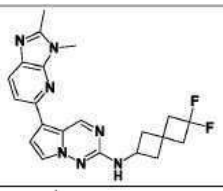
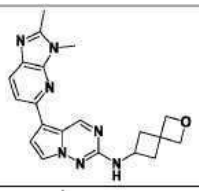
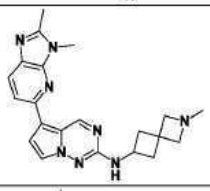
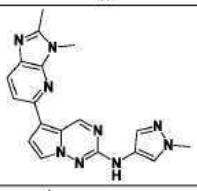
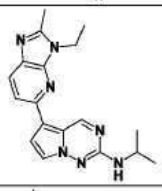
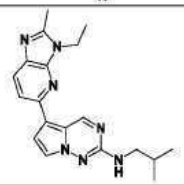
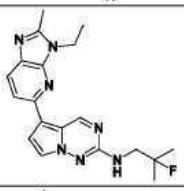
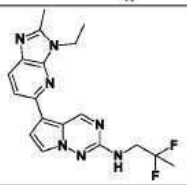
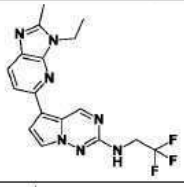
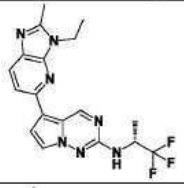
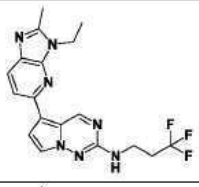
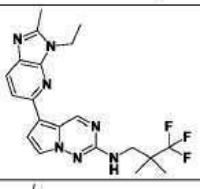
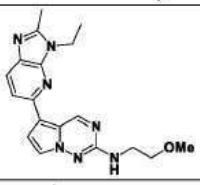
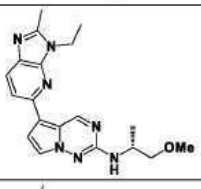
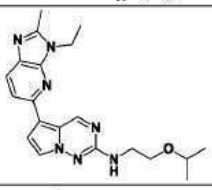
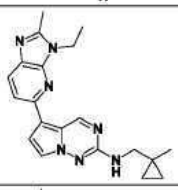
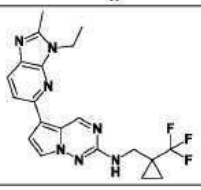
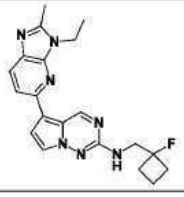
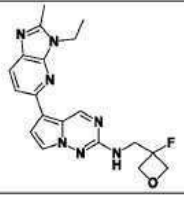
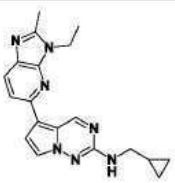
919		920		921	
922		923		924	
925		926		927	
928		929		930	
931		932		933	
934		935		936	
937		938		939	

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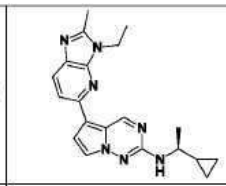
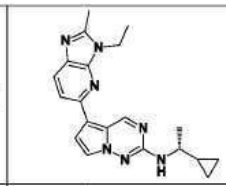
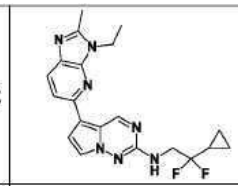
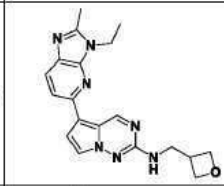
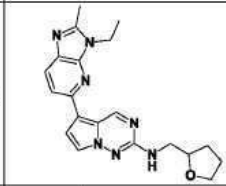
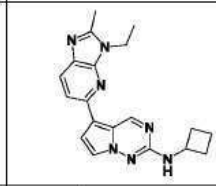
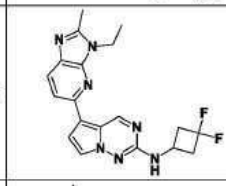
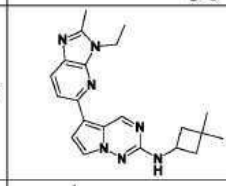
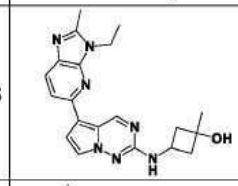
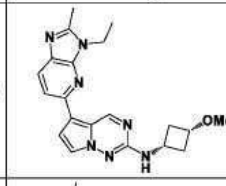
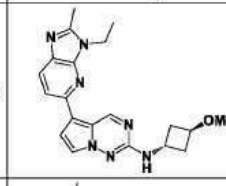
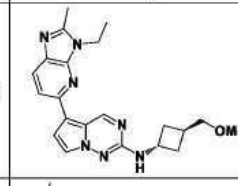
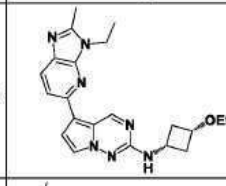
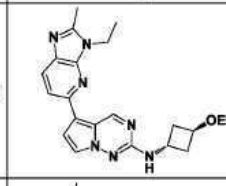
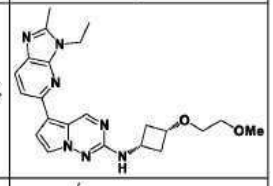
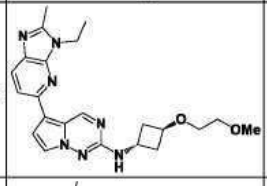
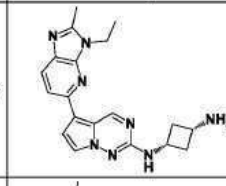
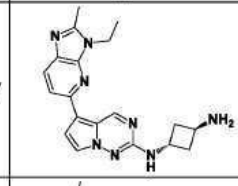
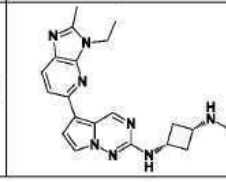
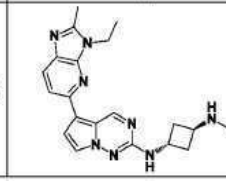
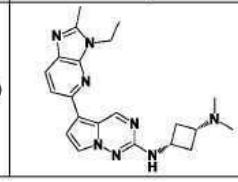
940		941		942	
943		944		945	
946		947		948	
949		950		951	
952		953		954	
955		956		957	
958		959		960	

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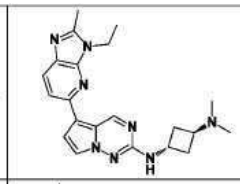
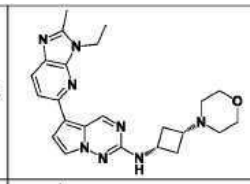
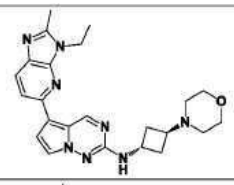
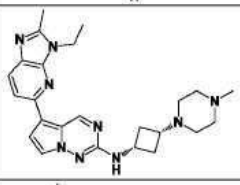
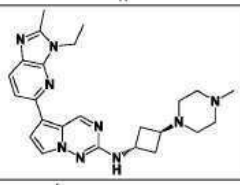
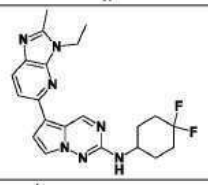
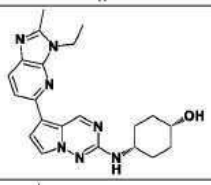
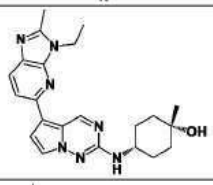
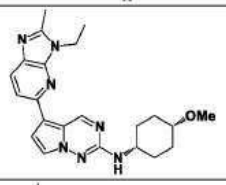
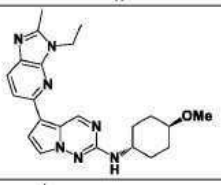
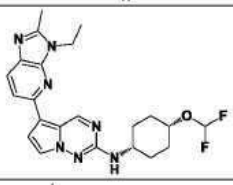
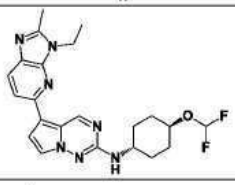
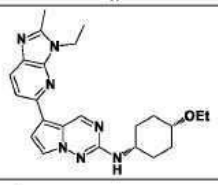
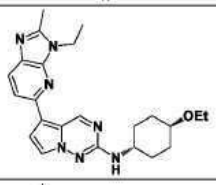
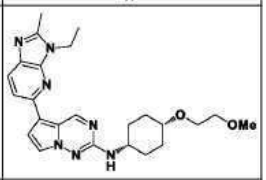
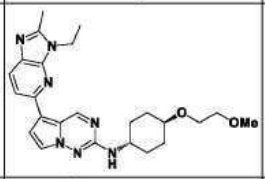
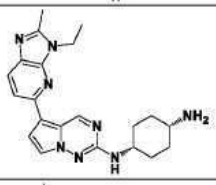
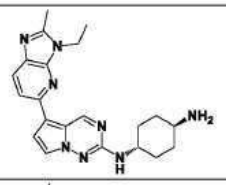
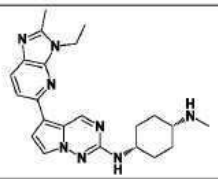
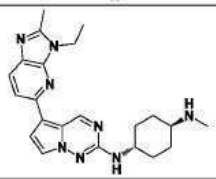
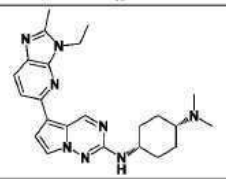
961		962		963	
964		965		966	
967		968		969	
970		971		972	
973		974		975	
976		977		978	
979		980		981	

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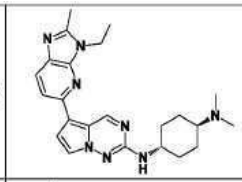
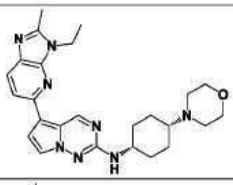
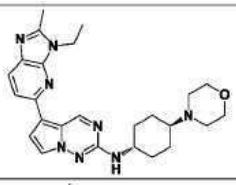
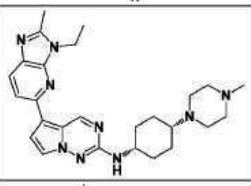
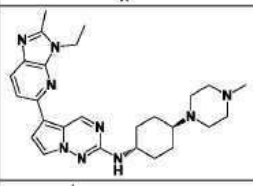
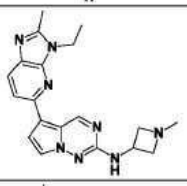
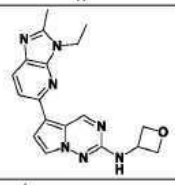
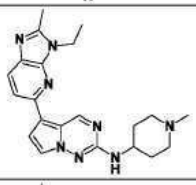
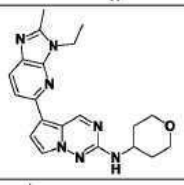
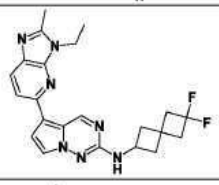
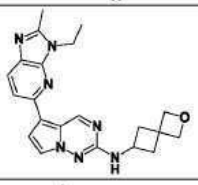
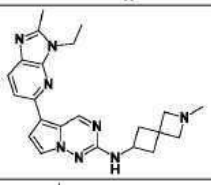
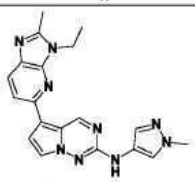
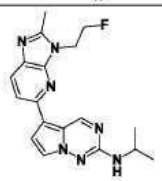
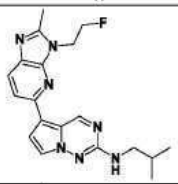
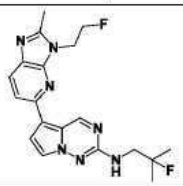
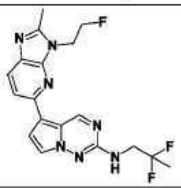
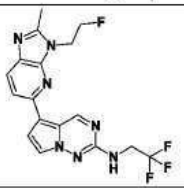
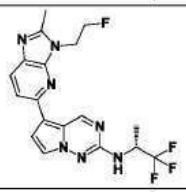
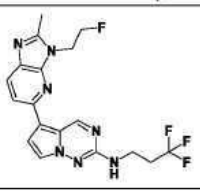
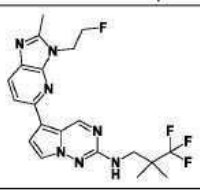
982		983		984	
985		986		987	
988		989		990	
991		992		993	
994		995		996	
997		998		999	
1000		1001		1002	

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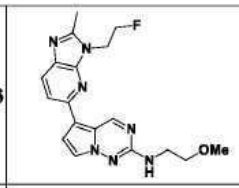
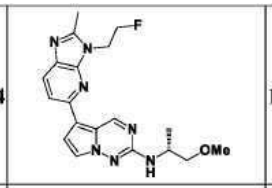
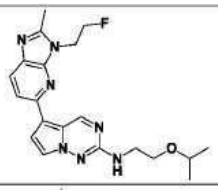
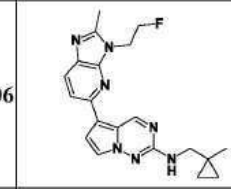
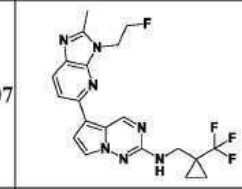
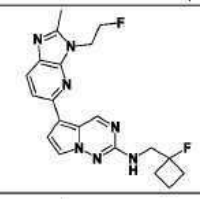
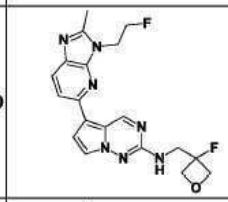
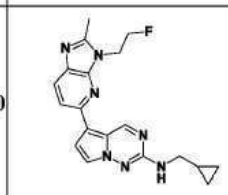
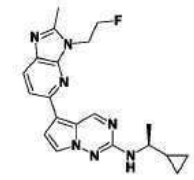
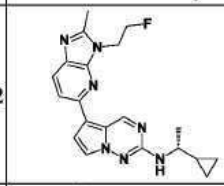
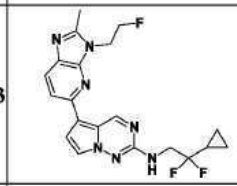
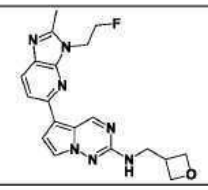
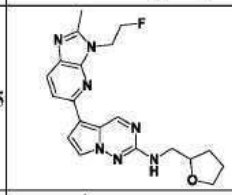
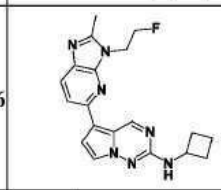
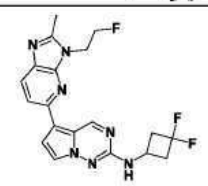
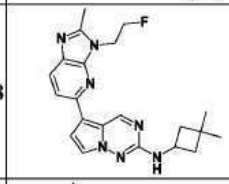
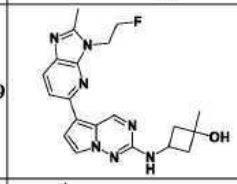
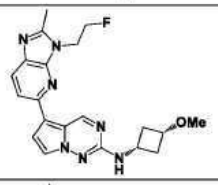
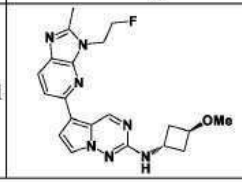
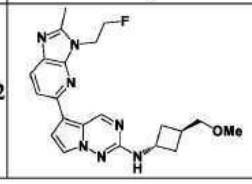
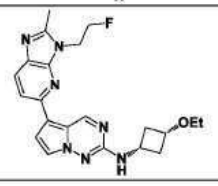
1003		1004		1005	
1006		1007		1008	
1009		1010		1011	
1012		1013		1014	
1015		1016		1017	
1018		1019		1020	
1021		1022		1023	

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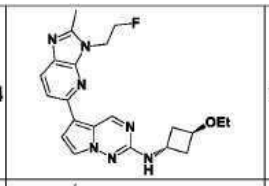
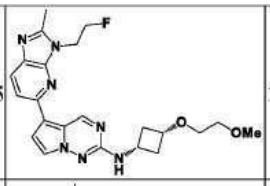
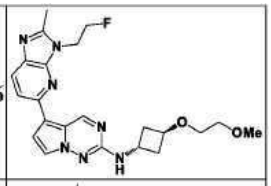
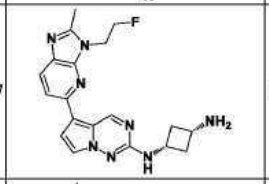
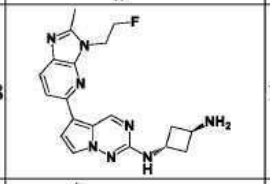
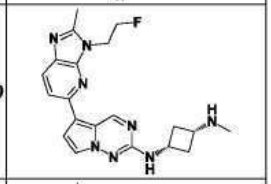
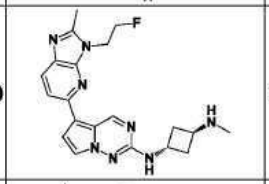
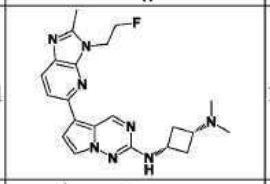
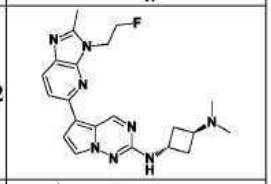
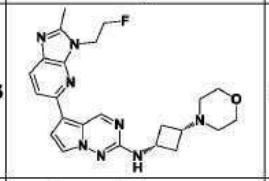
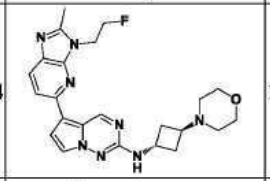
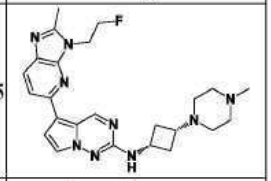
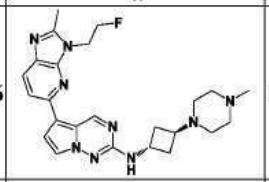
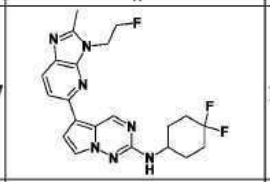
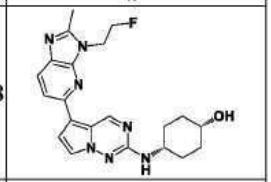
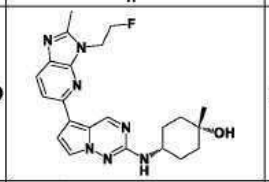
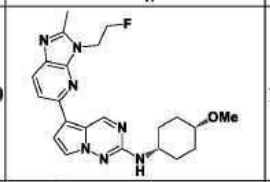
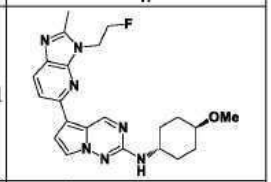
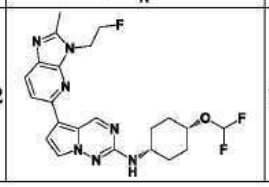
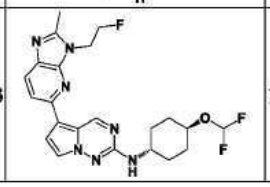
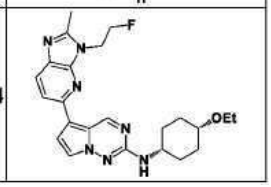
1024		1025		1026	
1027		1028		1029	
1030		1031		1032	
1033		1034		1035	
1036		1037		1038	
1039		1040		1041	
1042		1043		1044	

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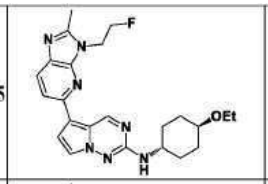
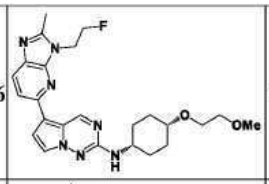
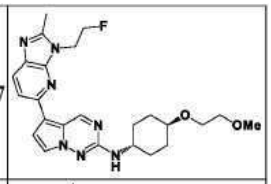
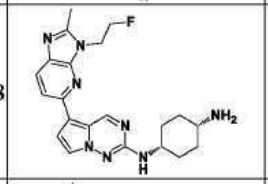
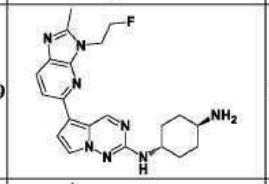
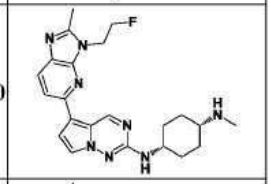
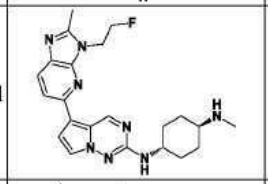
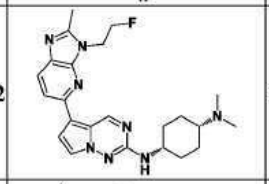
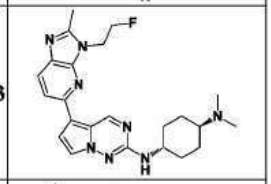
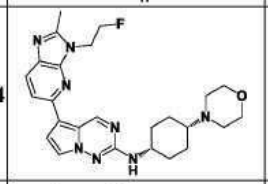
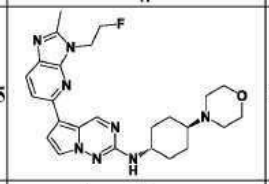
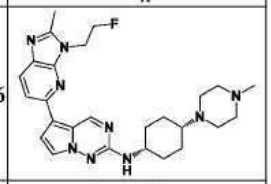
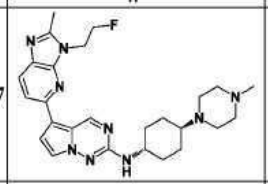
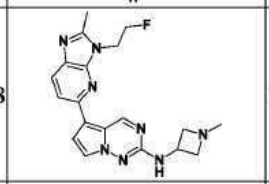
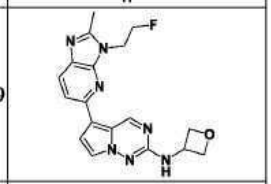
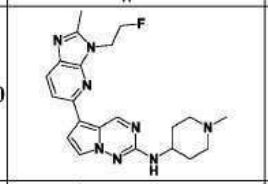
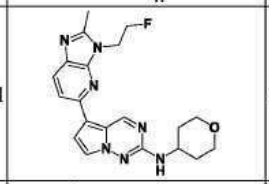
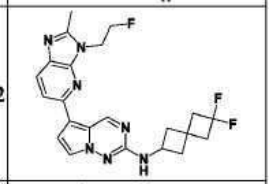
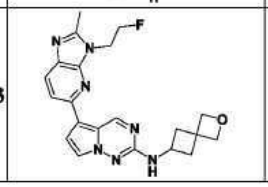
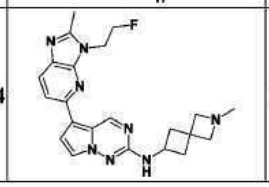
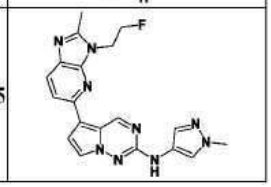
1045		1046		1047	
1048		1049		1050	
1051		1052		1053	
1054		1055		1056	
1057		1058		1059	
1060		1061		1062	
1063		1064		1065	

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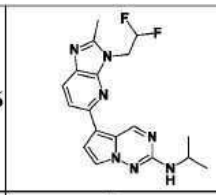
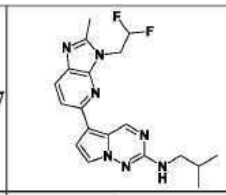
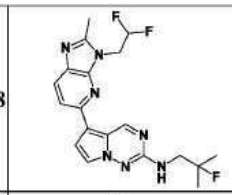
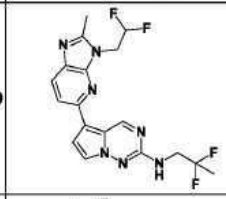
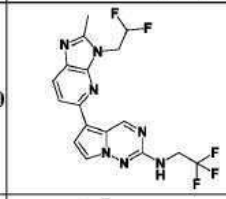
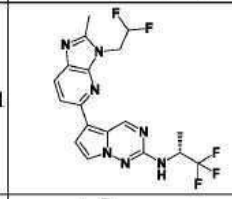
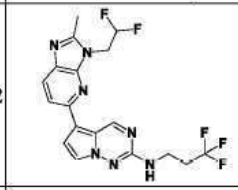
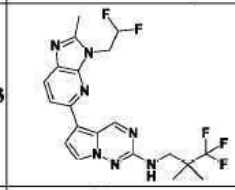
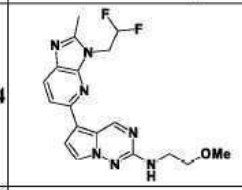
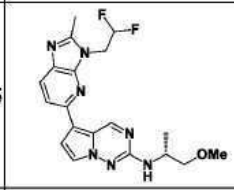
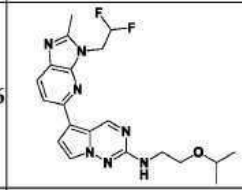
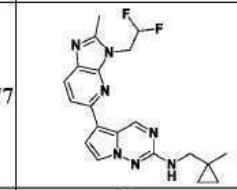
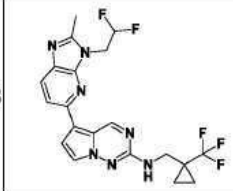
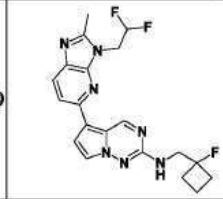
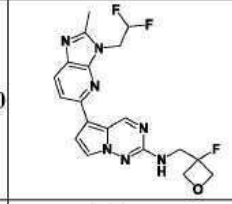
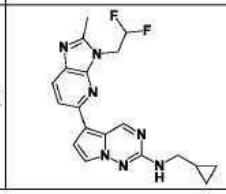
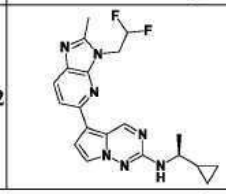
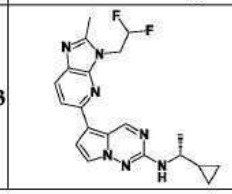
1066		1067		1068	
1069		1070		1071	
1072		1073		1074	
1075		1076		1077	
1078		1079		1080	
1081		1082		1083	

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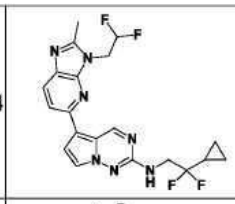
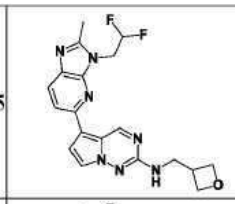
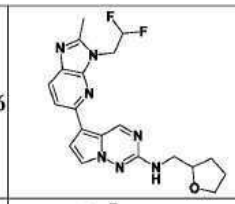
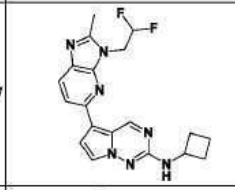
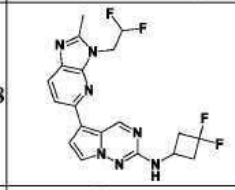
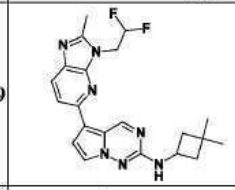
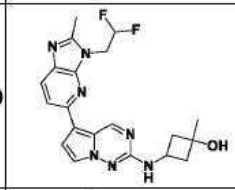
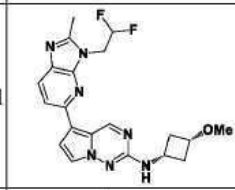
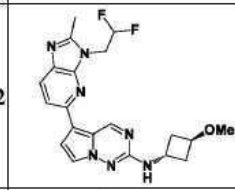
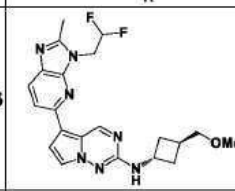
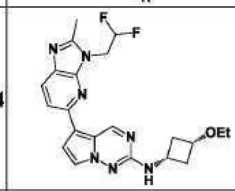
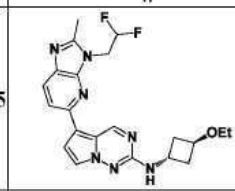
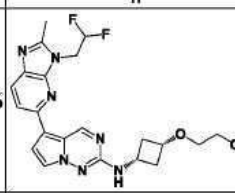
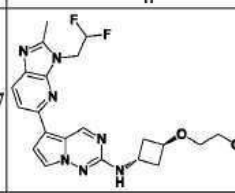
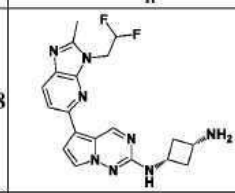
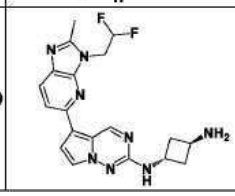
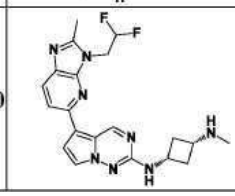
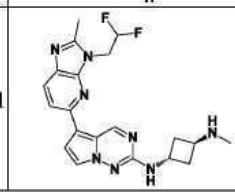
1084		1085		1086	
1087		1088		1089	
1090		1091		1092	
1093		1094		1095	
1096		1097		1098	
1099		1100		1101	

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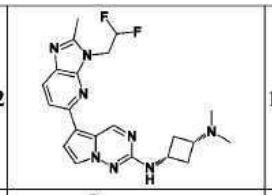
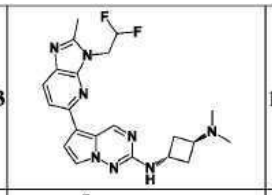
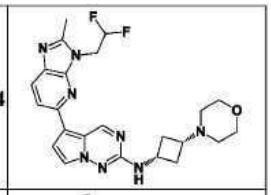
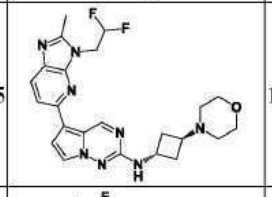
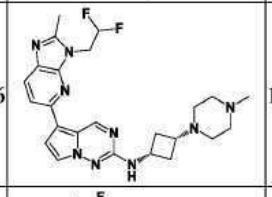
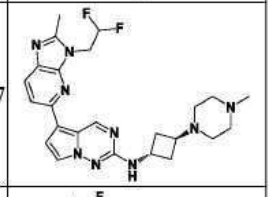
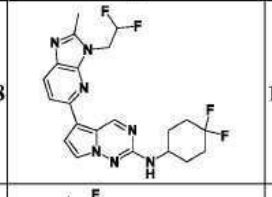
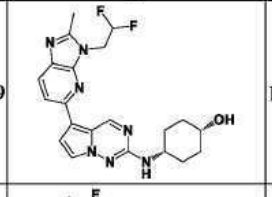
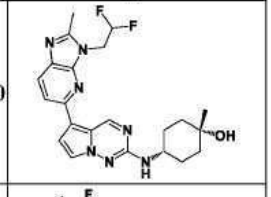
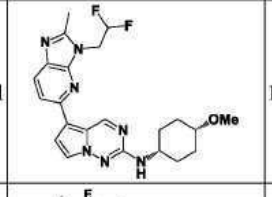
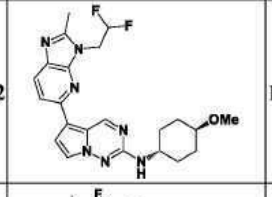
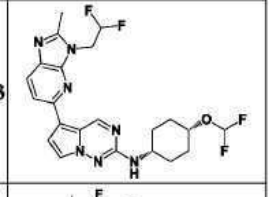
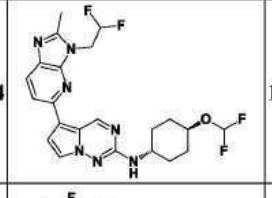
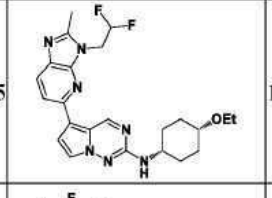
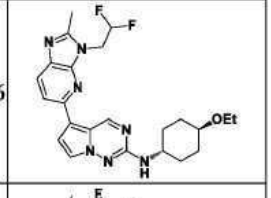
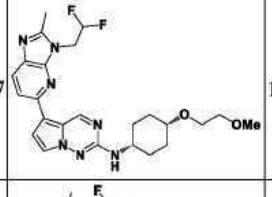
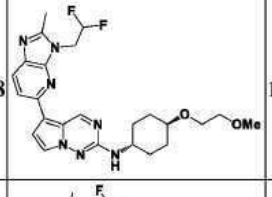
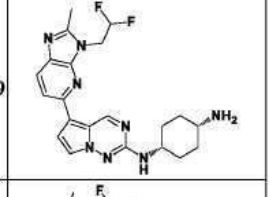
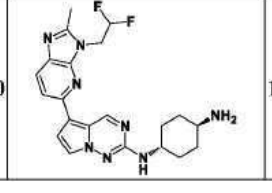
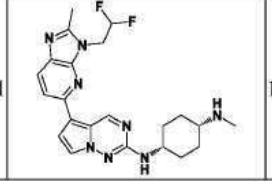
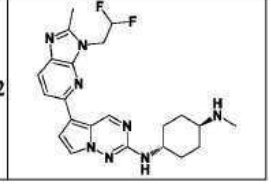
1102		1103		1104	
1105		1106		1107	
1108		1109		1110	
1111		1112		1113	
1114		1115		1116	
1117		1118		1119	
1120		1121		1122	

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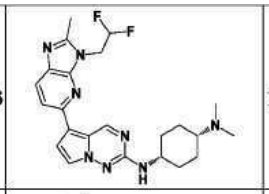
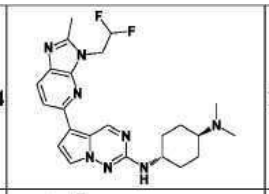
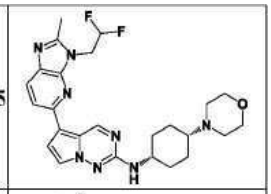
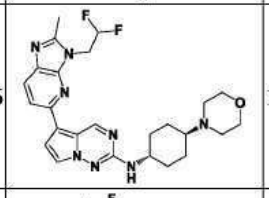
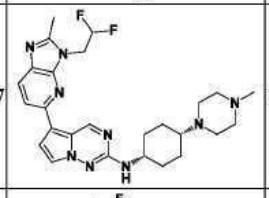
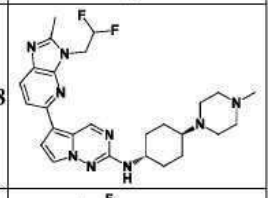
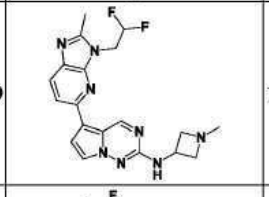
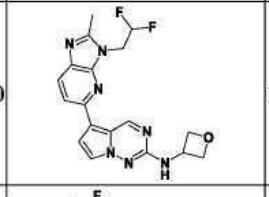
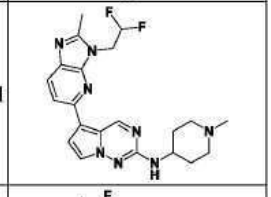
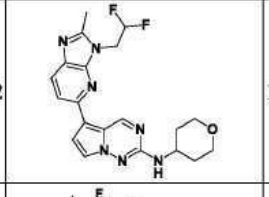
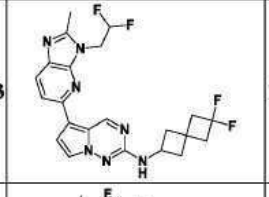
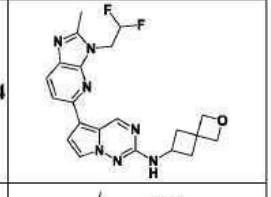
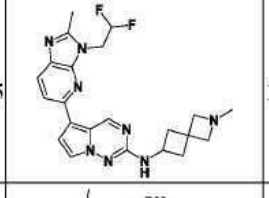
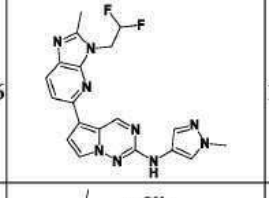
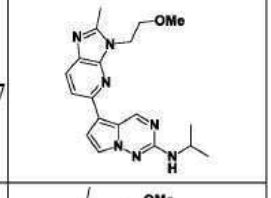
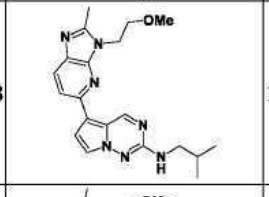
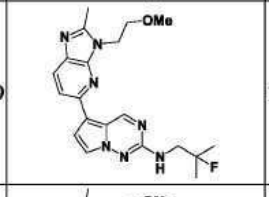
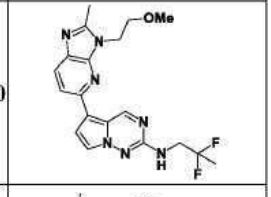
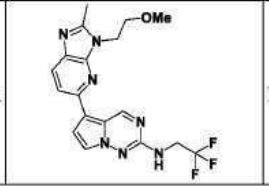
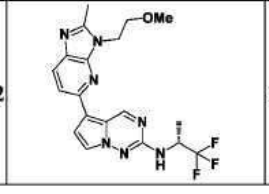
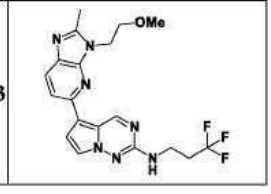
1123		1124		1125	
1126		1127		1128	
1129		1130		1131	
1132		1133		1134	
1135		1136		1137	
1138		1139		1140	
1141		1142		1143	

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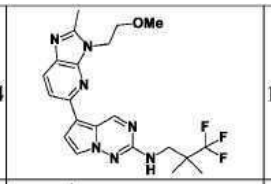
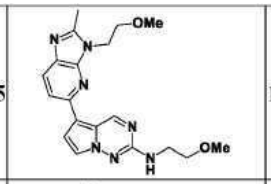
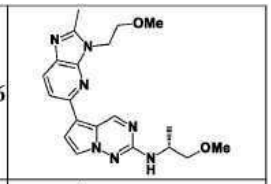
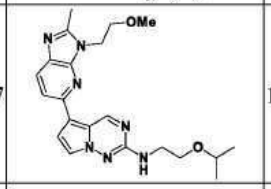
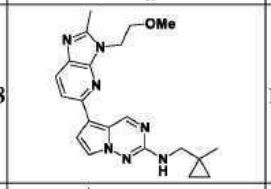
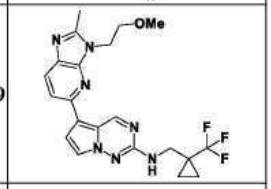
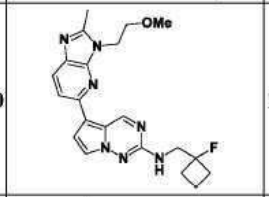
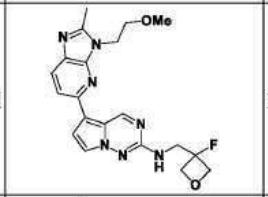
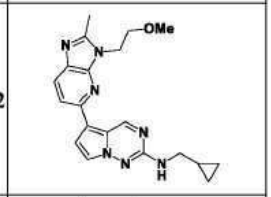
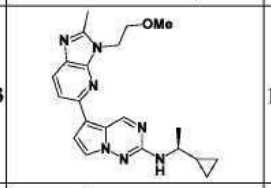
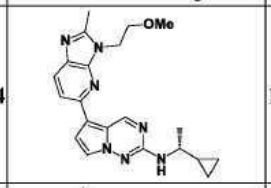
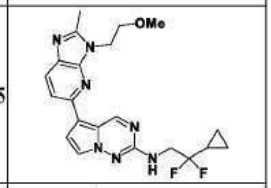
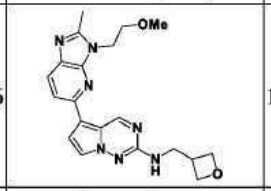
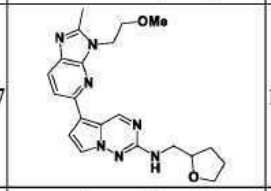
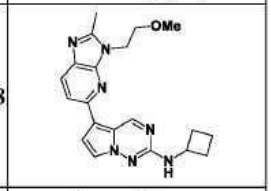
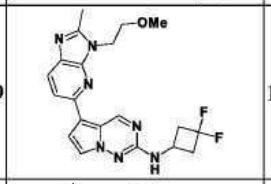
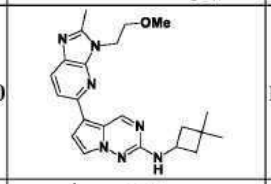
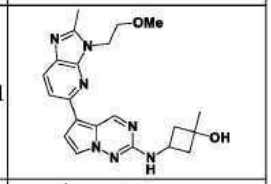
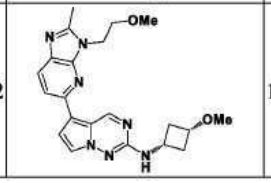
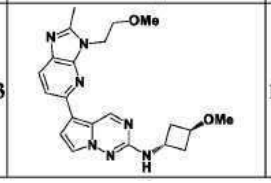
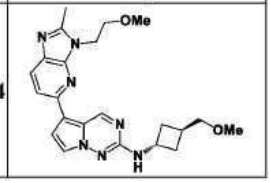
1144		1145		1146	
1147		1148		1149	
1150		1151		1152	
1153		1154		1155	
1156		1157		1158	
1159		1160		1161	
1162		1163		1164	

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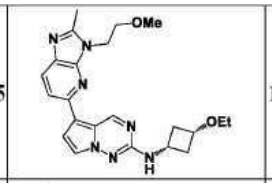
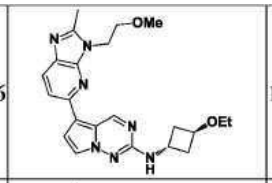
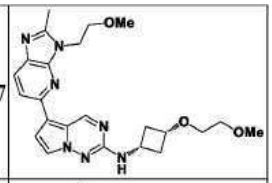
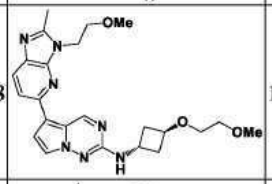
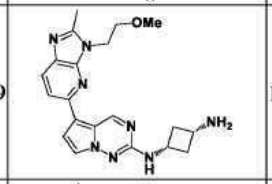
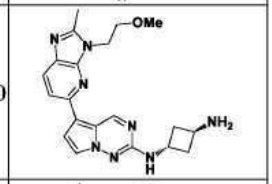
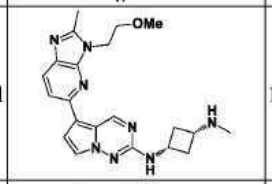
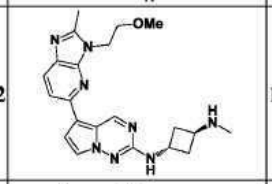
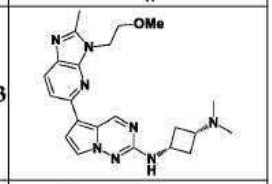
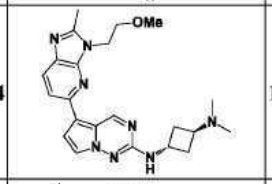
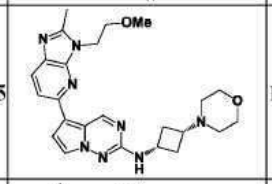
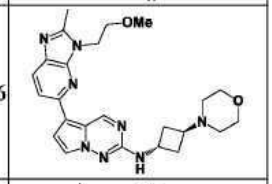
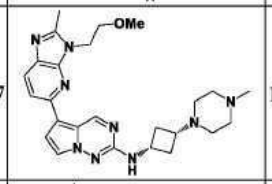
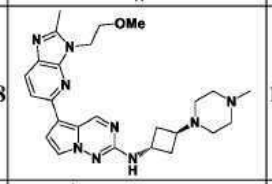
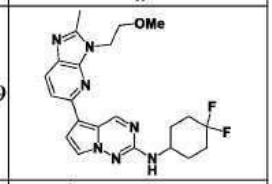
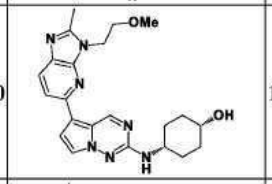
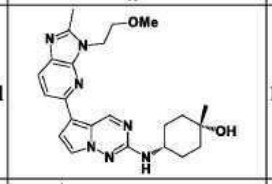
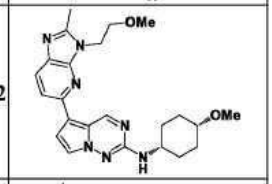
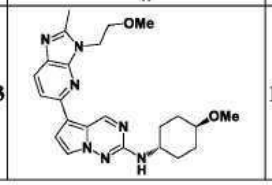
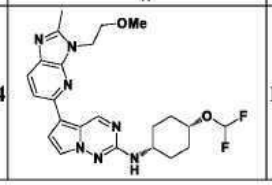
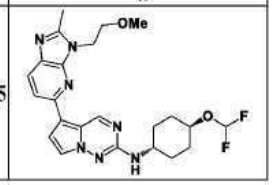
1165		1166		1167	
1168		1169		1170	
1171		1172		1173	
1174		1175		1176	
1177		1178		1179	
1180		1181		1182	
1183		1184		1185	

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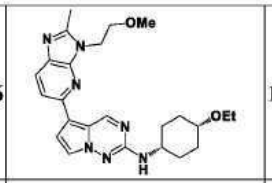
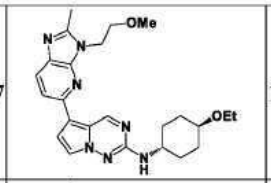
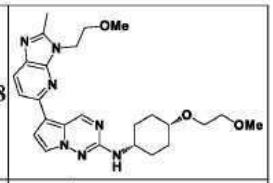
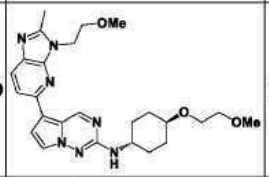
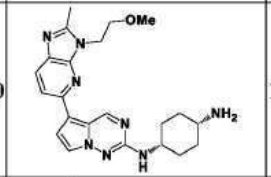
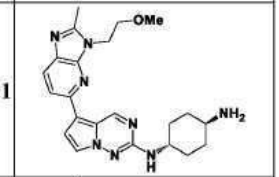
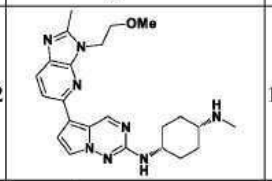
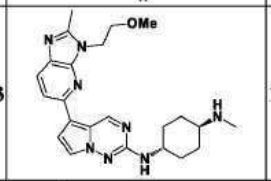
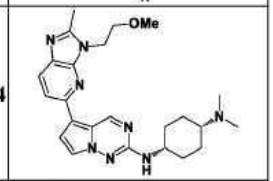
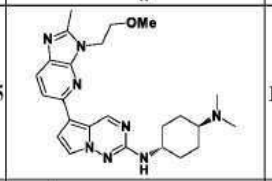
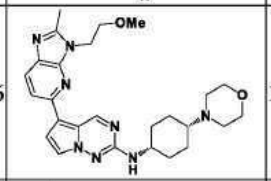
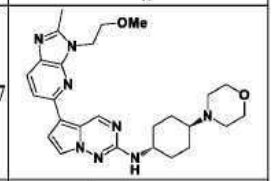
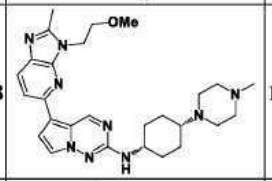
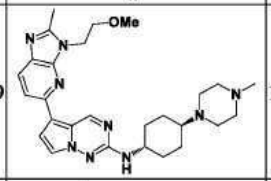
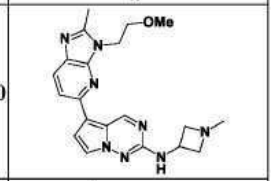
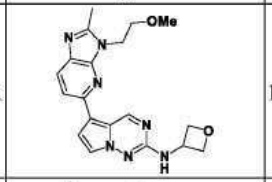
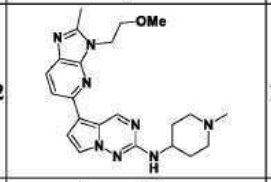
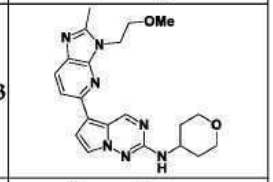
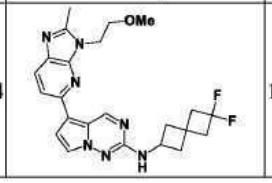
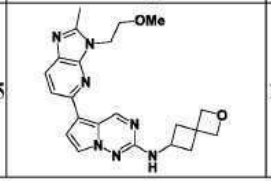
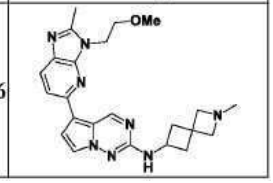
1186		1187		1188	
1189		1190		1191	
1192		1193		1194	
1195		1196		1197	
1198		1199		1200	
1201		1202		1203	
1204		1205		1206	

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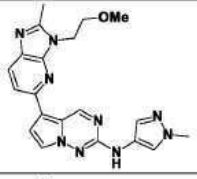
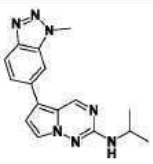
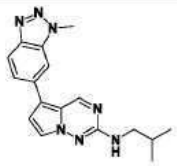
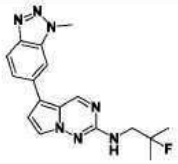
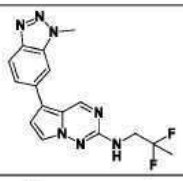
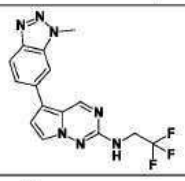
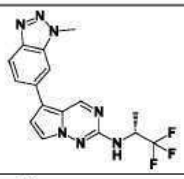
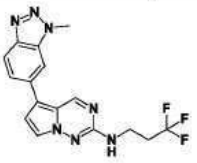
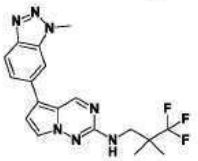
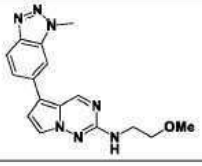
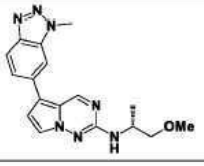
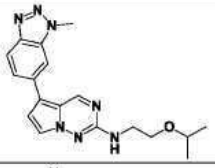
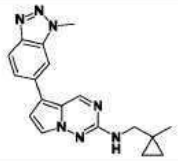
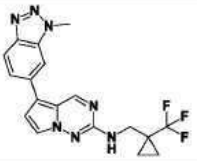
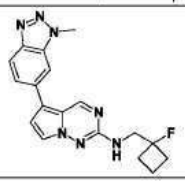
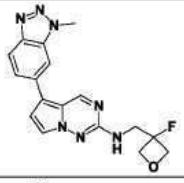
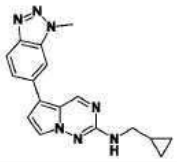
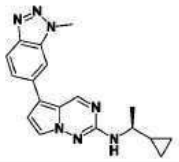
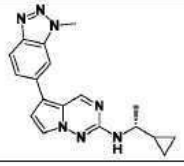
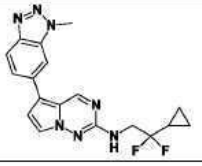
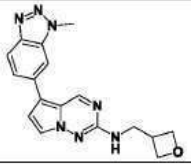
1207		1208		1209	
1210		1211		1212	
1213		1214		1215	
1216		1217		1218	
1219		1220		1221	
1222		1223		1224	
1225		1226		1227	

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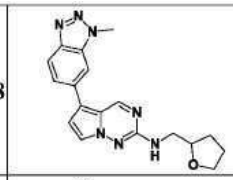
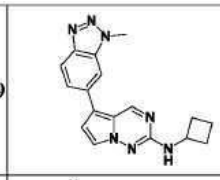
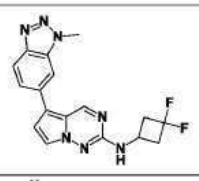
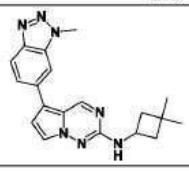
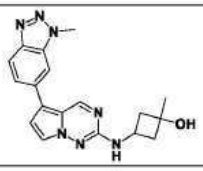
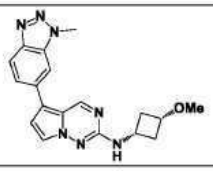
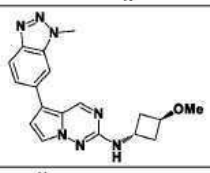
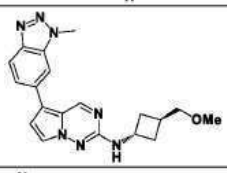
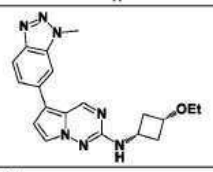
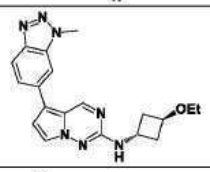
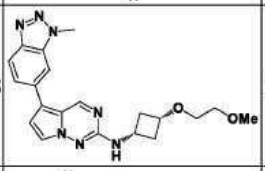
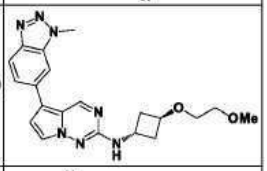
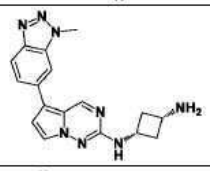
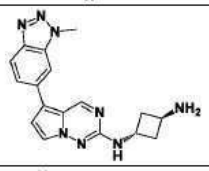
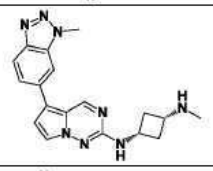
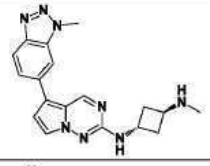
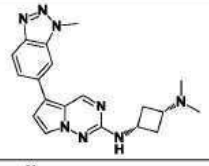
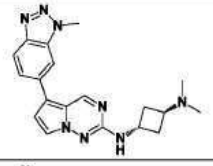
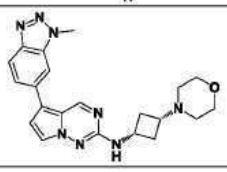
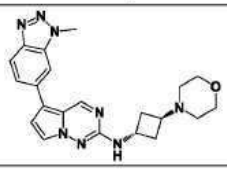
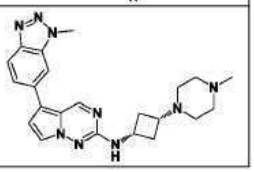
1228		1229		1230	
1231		1232		1233	
1234		1235		1236	
1237		1238		1239	
1240		1241		1242	
1243		1244		1245	
1246		1247		1248	

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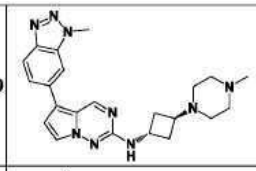
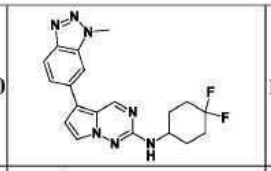
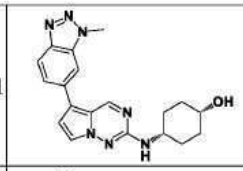
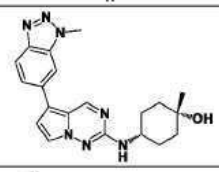
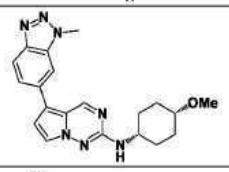
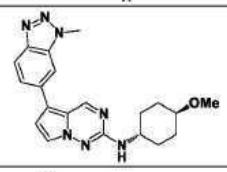
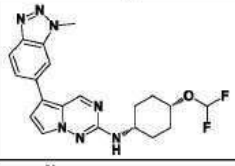
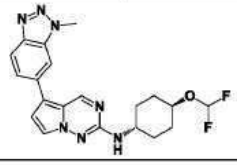
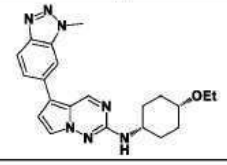
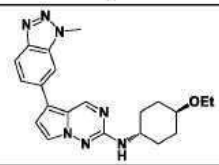
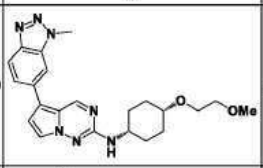
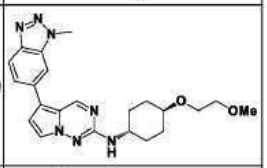
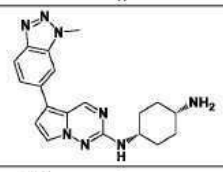
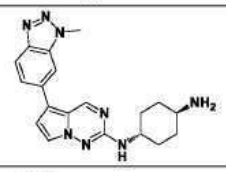
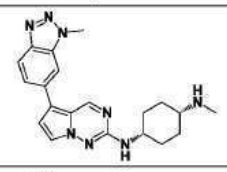
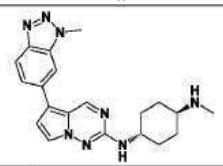
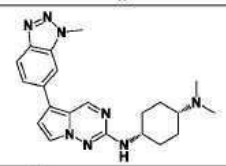
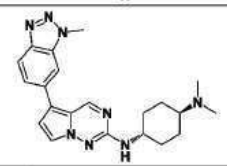
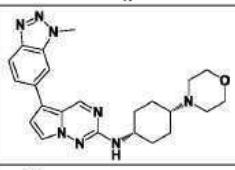
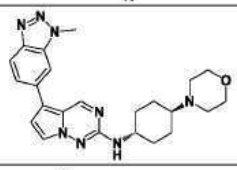
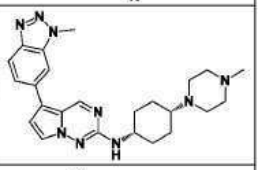
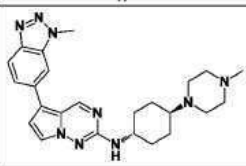
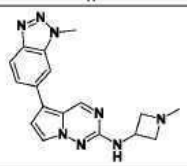
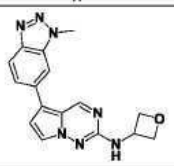
1249		1250		1251	
1252		1253		1254	
1255		1256		1257	
1258		1259		1260	
1261		1262		1263	
1264		1265		1266	
1267		1268		1269	
1270		1271		1272	

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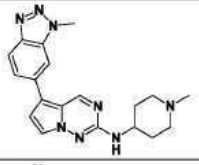
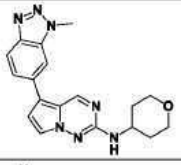
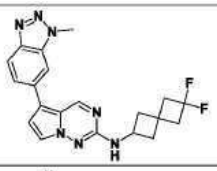
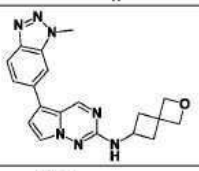
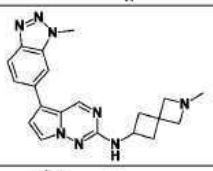
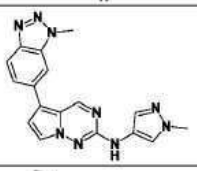
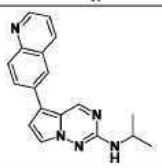
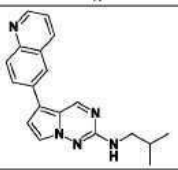
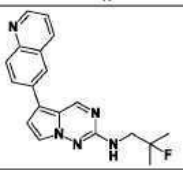
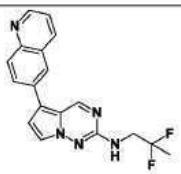
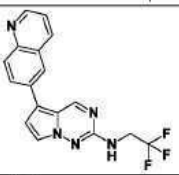
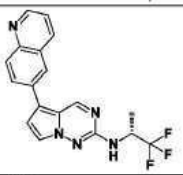
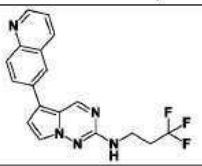
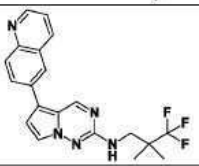
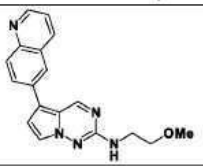
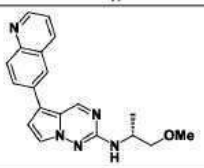
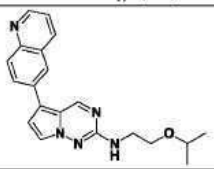
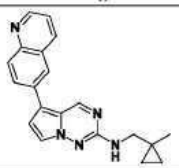
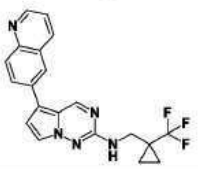
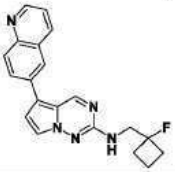
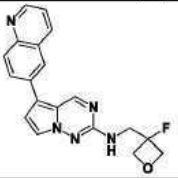
1273		1274		1275	
1276		1277		1278	
1279		1280		1281	
1282		1283		1284	
1285		1286		1287	
1288		1289		1290	
1291		1292		1293	

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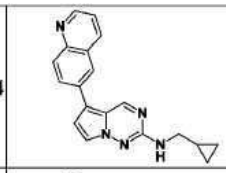
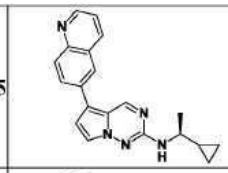
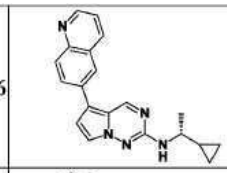
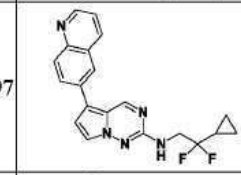
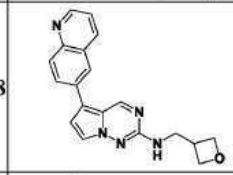
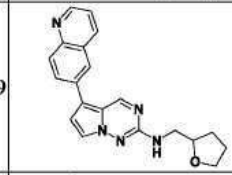
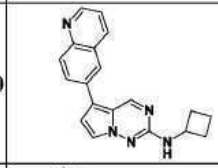
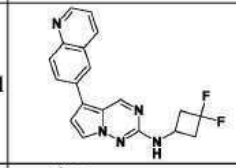
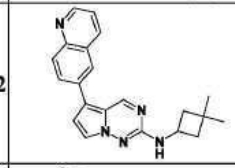
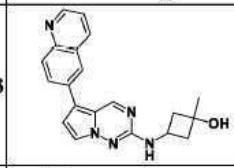
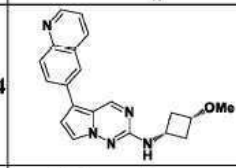
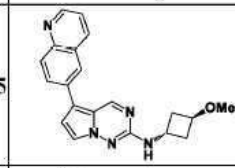
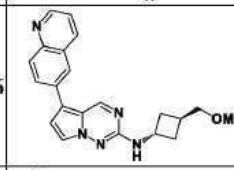
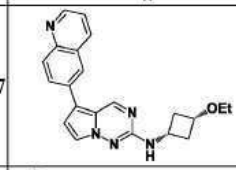
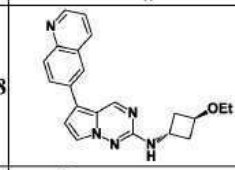
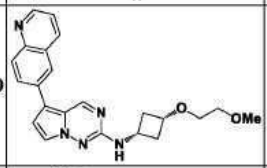
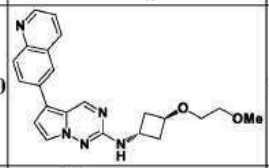
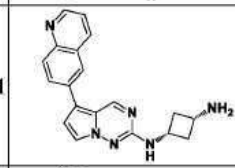
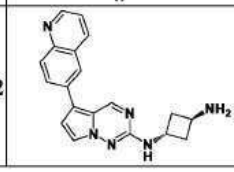
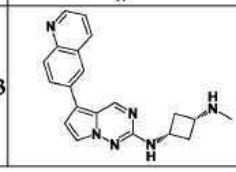
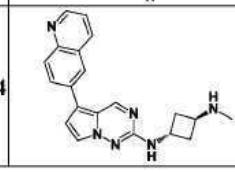
1294		1295		1296	
1297		1298		1299	
1300		1301		1302	
1303		1304		1305	
1306		1307		1308	
1309		1310		1311	
1312		1313		1314	

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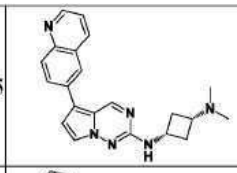
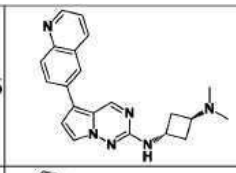
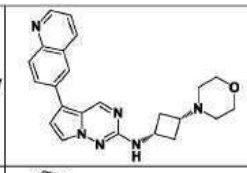
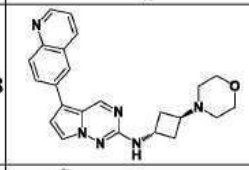
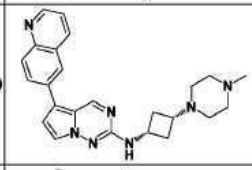
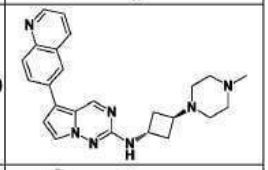
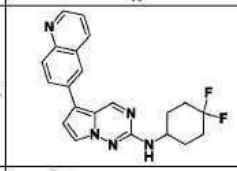
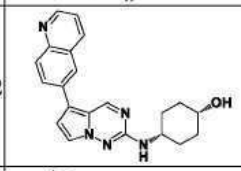
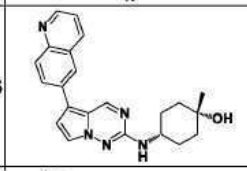
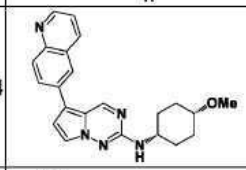
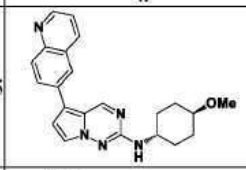
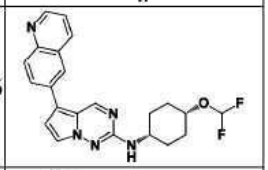
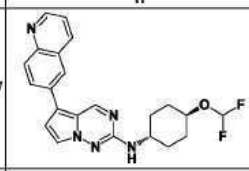
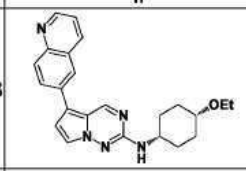
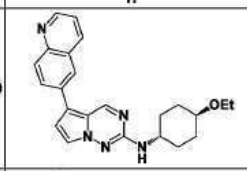
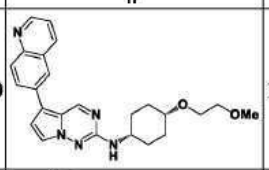
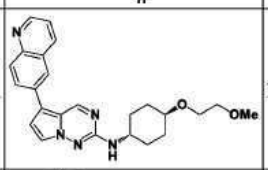
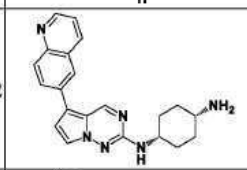
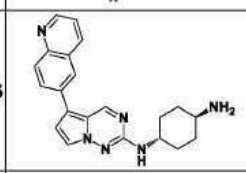
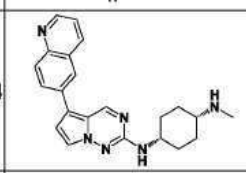
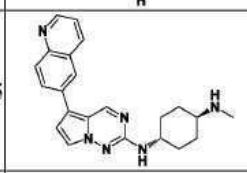
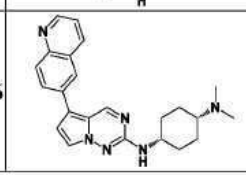
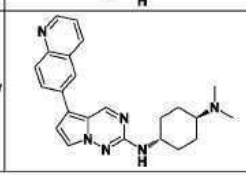
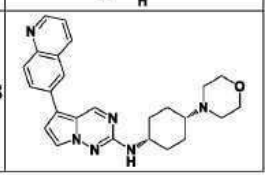
1315		1316		1317	
1318		1319		1320	
1321		1322		1323	
1324		1325		1326	
1327		1328		1329	
1330		1331		1332	
1333		1334		1335	
1336		1337		1338	

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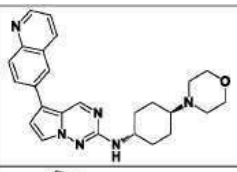
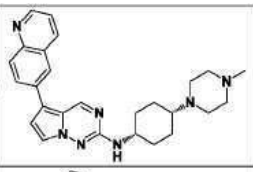
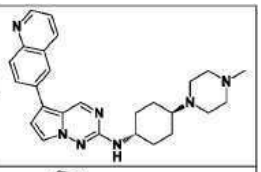
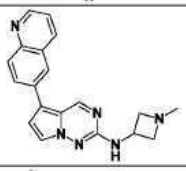
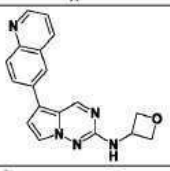
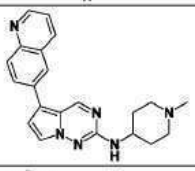
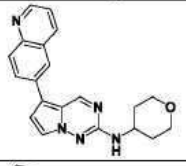
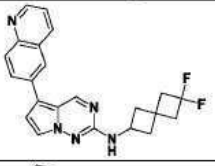
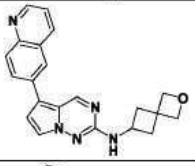
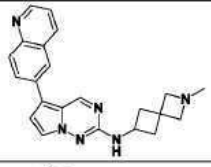
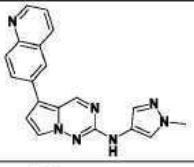
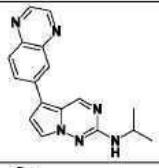
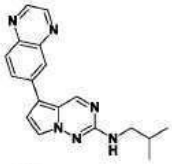
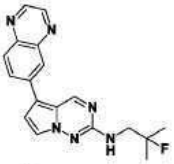
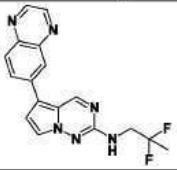
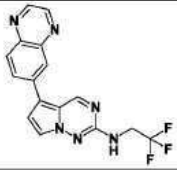
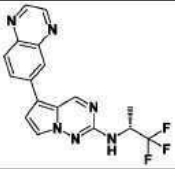
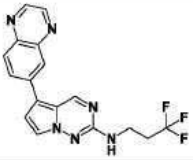
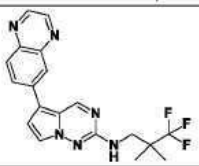
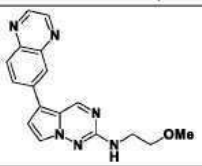
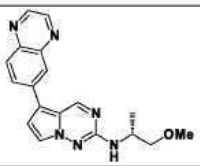
1339		1340		1341	
1342		1343		1344	
1345		1346		1347	
1348		1349		1350	
1351		1352		1353	
1354		1355		1356	
1357		1358		1359	

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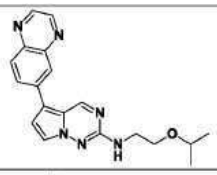
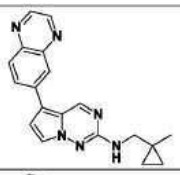
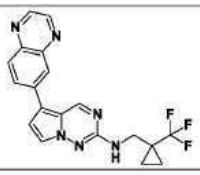
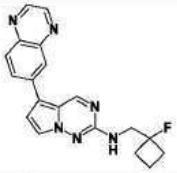
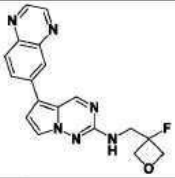
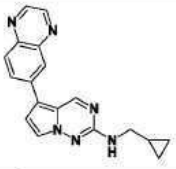
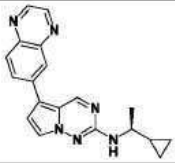
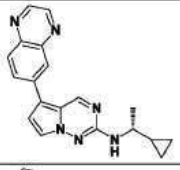
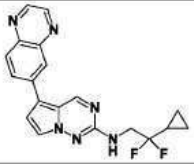
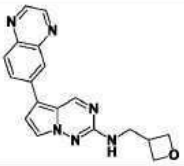
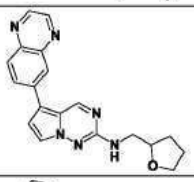
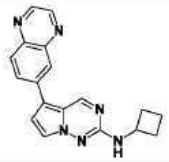
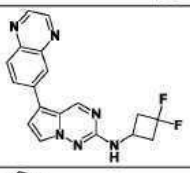
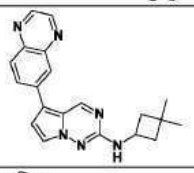
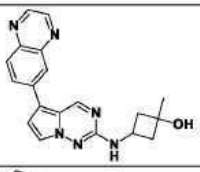
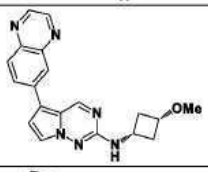
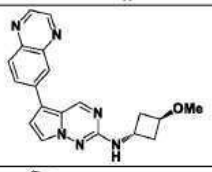
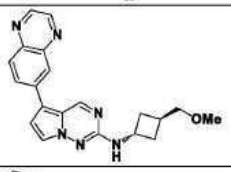
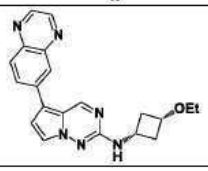
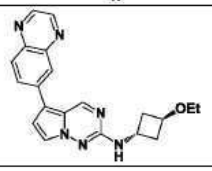
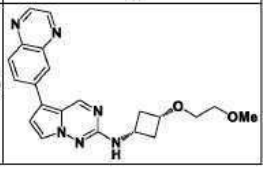
1360		1361		1362	
1363		1364		1365	
1366		1367		1368	
1369		1370		1371	
1372		1373		1374	
1375		1376		1377	
1378		1379		1380	

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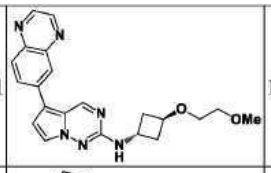
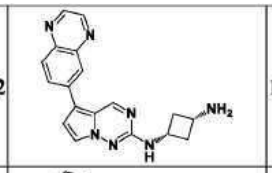
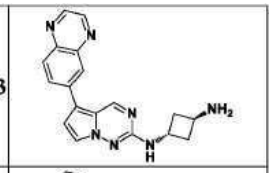
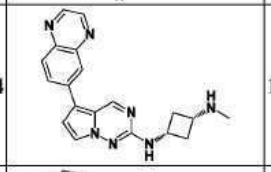
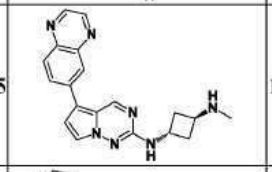
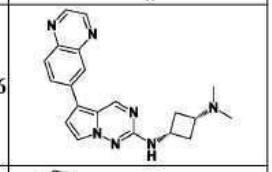
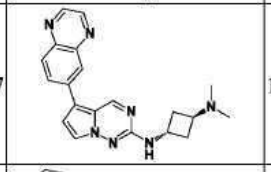
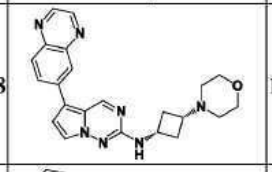
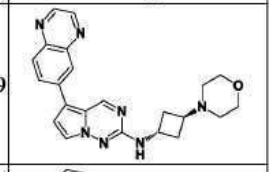
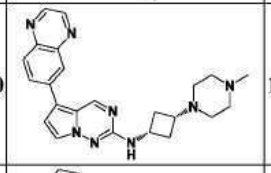
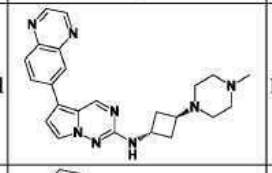
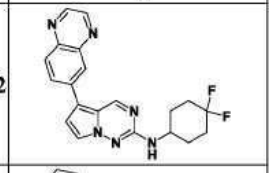
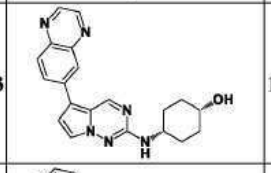
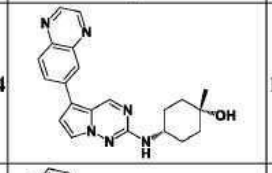
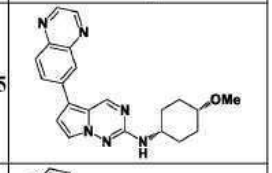
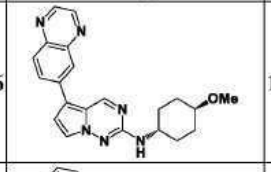
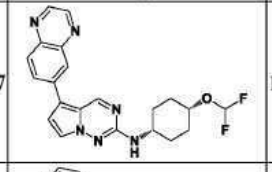
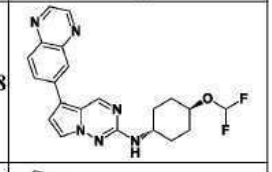
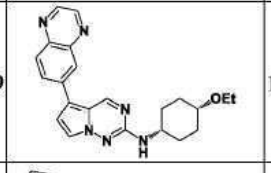
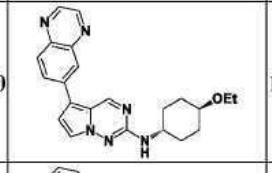
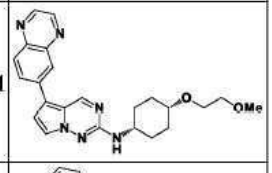
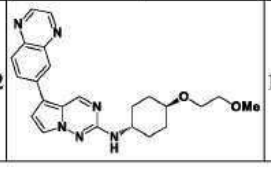
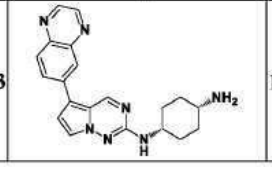
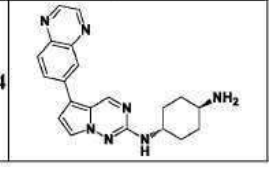
1381		1382		1383	
1384		1385		1386	
1387		1388		1389	
1390		1391		1392	
1393		1394		1395	
1396		1397		1398	
1399		1400		1401	
1402		1403		1404	

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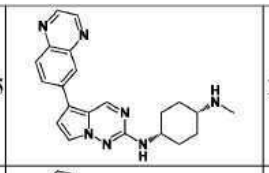
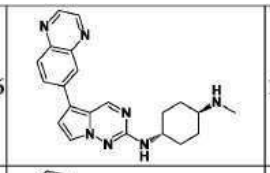
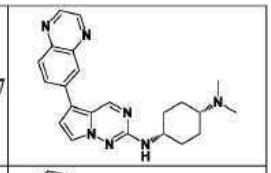
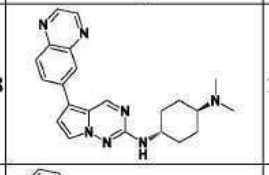
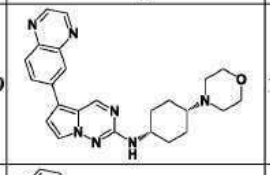
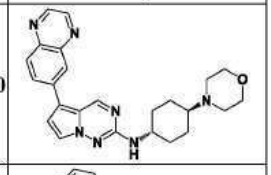
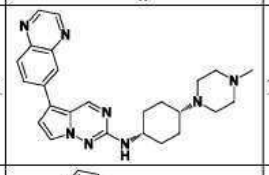
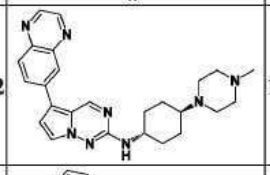
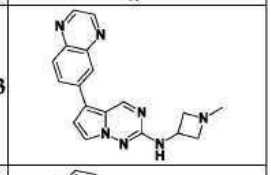
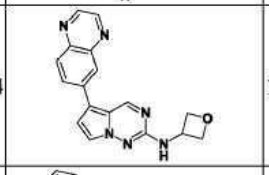
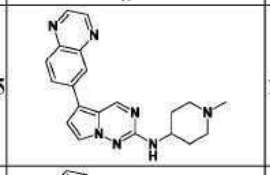
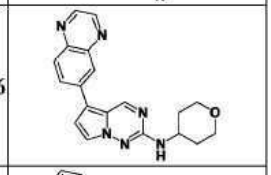
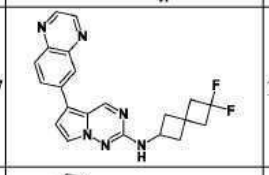
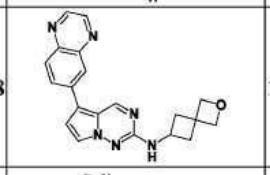
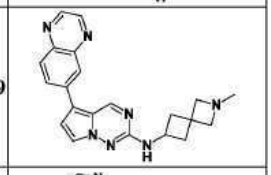
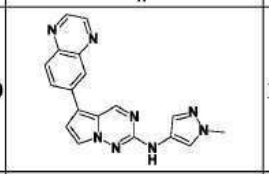
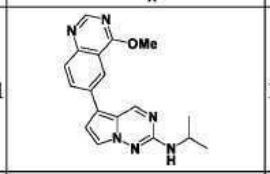
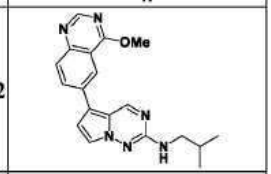
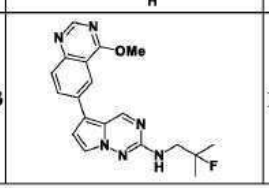
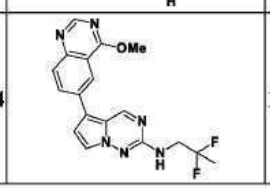
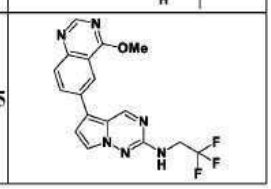
1405		1406		1407	
1408		1409		1410	
1411		1412		1413	
1414		1415		1416	
1417		1418		1419	
1420		1421		1422	
1423		1424		1425	

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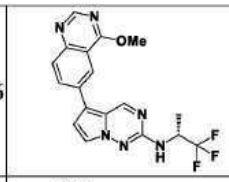
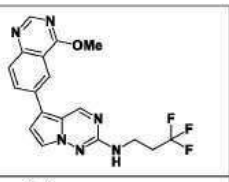
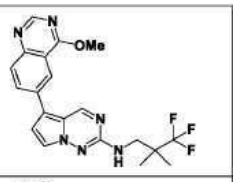
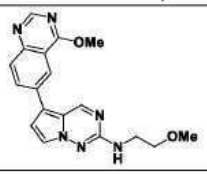
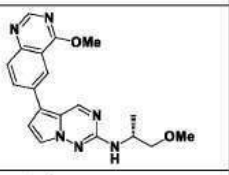
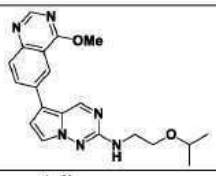
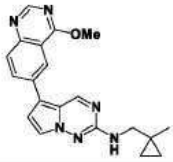
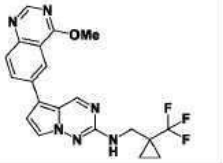
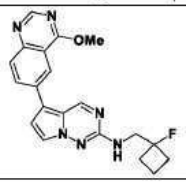
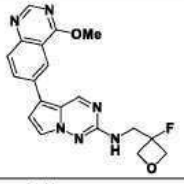
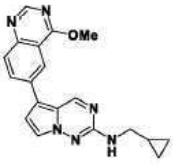
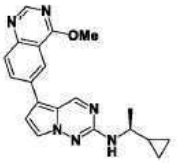
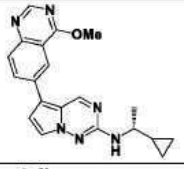
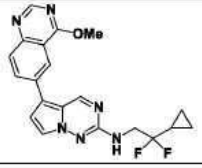
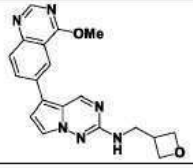
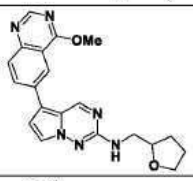
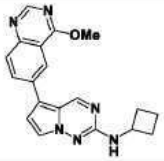
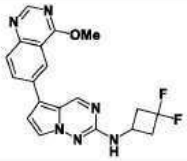
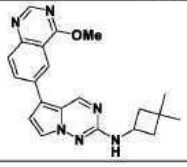
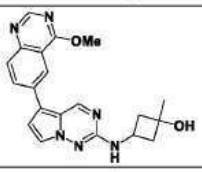
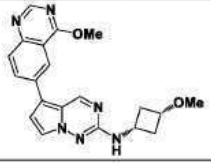
1426		1427		1428	
1429		1430		1431	
1432		1433		1434	
1435		1436		1437	
1438		1439		1440	
1441		1442		1443	
1444		1445		1446	

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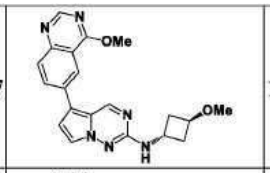
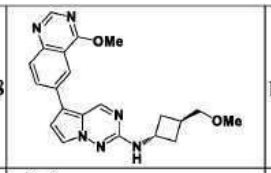
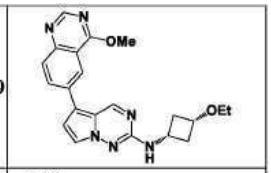
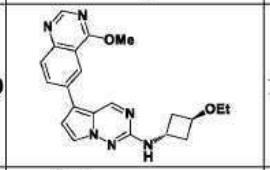
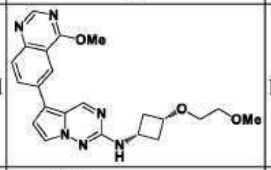
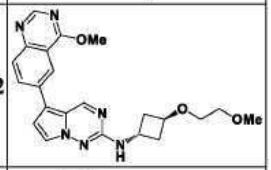
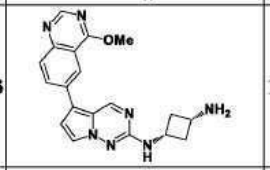
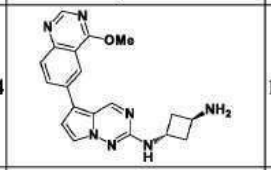
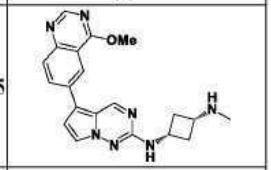
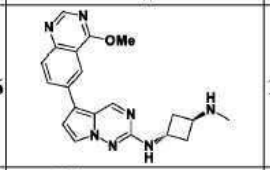
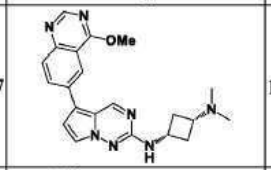
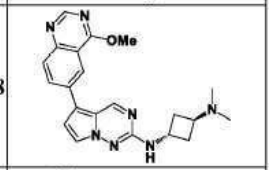
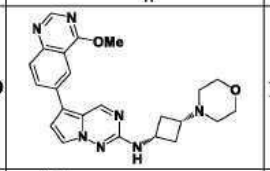
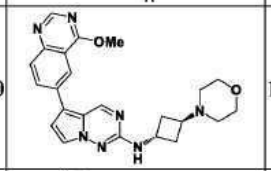
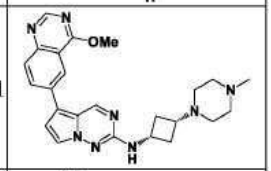
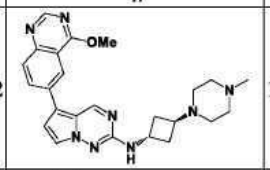
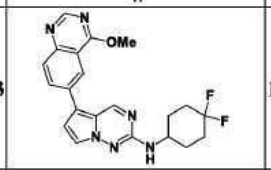
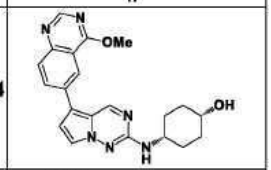
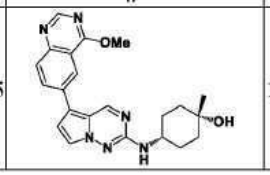
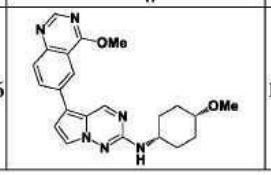
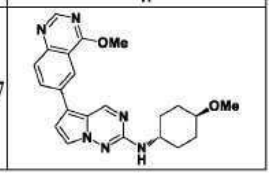
1447		1448		1449	
1450		1451		1452	
1453		1454		1455	
1456		1457		1458	
1459		1460		1461	
1462		1463		1464	
1465		1466		1467	

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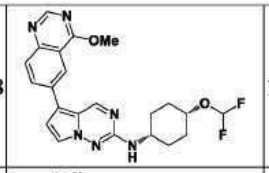
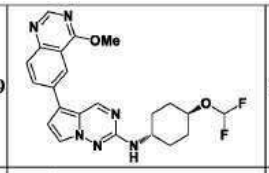
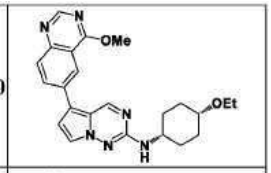
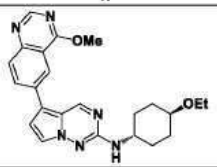
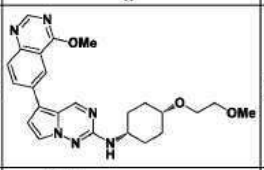
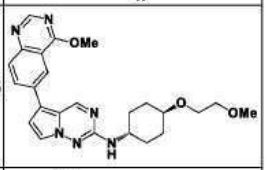
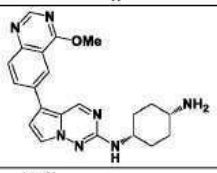
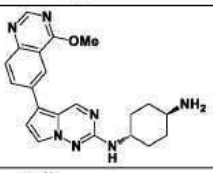
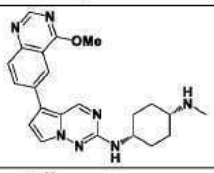
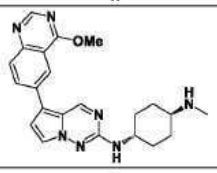
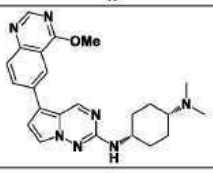
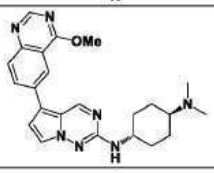
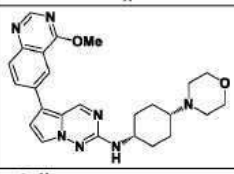
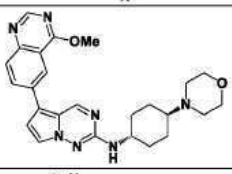
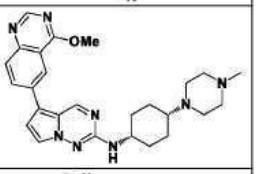
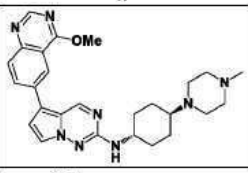
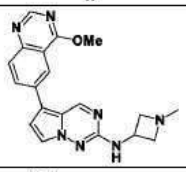
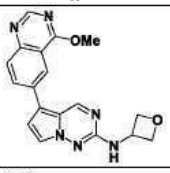
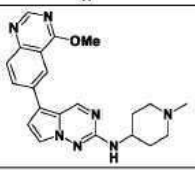
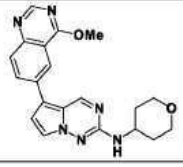
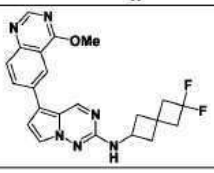
1468		1469		1470	
1471		1472		1473	
1474		1475		1476	
1477		1478		1479	
1480		1481		1482	
1483		1484		1485	
1486		1487		1488	

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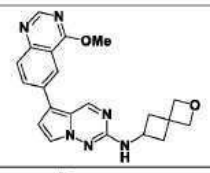
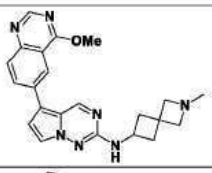
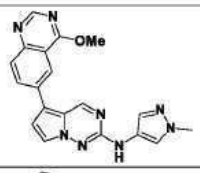
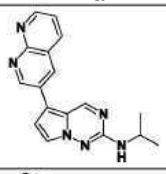
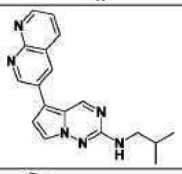
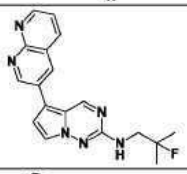
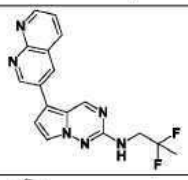
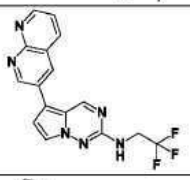
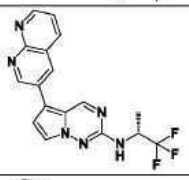
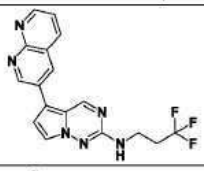
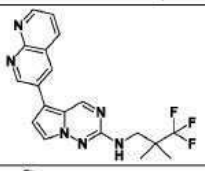
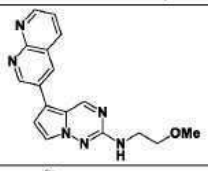
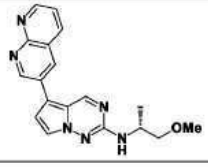
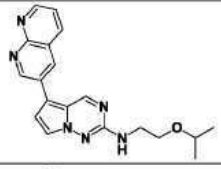
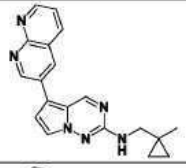
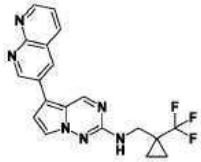
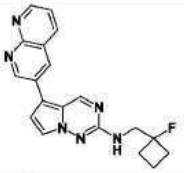
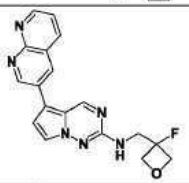
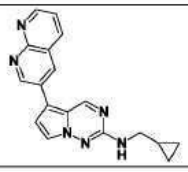
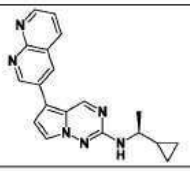
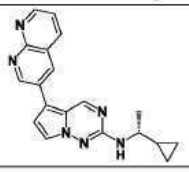
1489		1490		1491	
1492		1493		1494	
1495		1496		1497	
1498		1499		1500	
1501		1502		1503	
1504		1505		1506	
1507		1508		1509	

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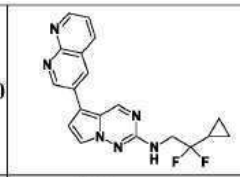
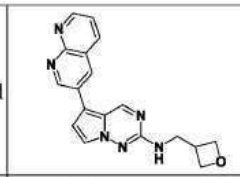
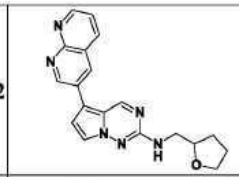
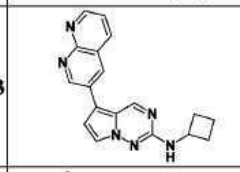
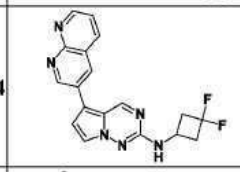
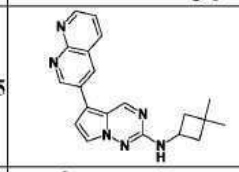
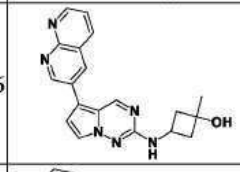
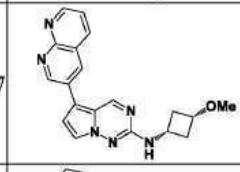
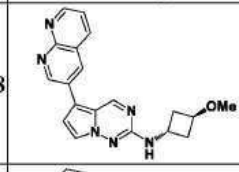
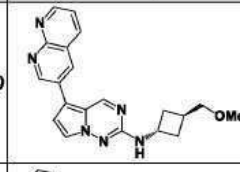
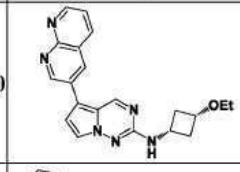
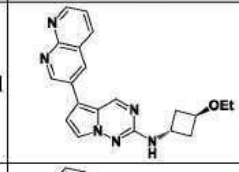
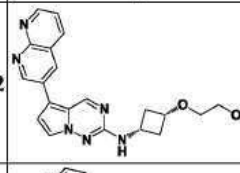
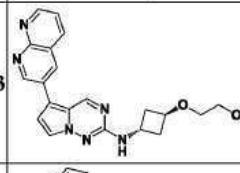
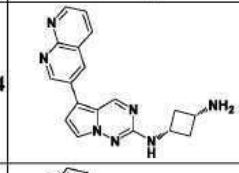
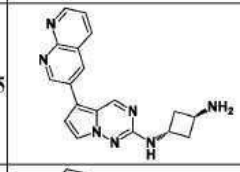
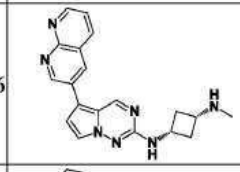
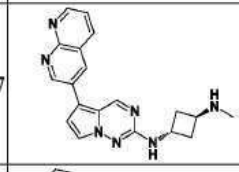
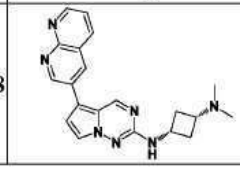
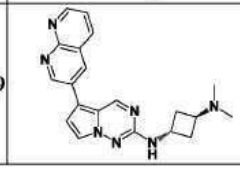
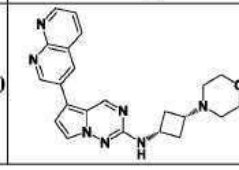
1510		1511		1512	
1513		1514		1515	
1516		1517		1518	
1519		1520		1521	
1522		1523		1524	
1525		1526		1527	
1528		1529		1530	

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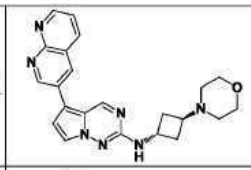
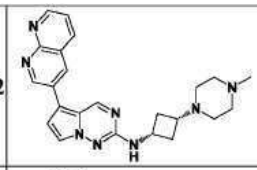
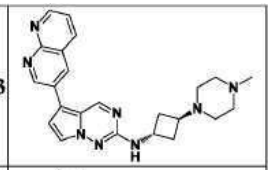
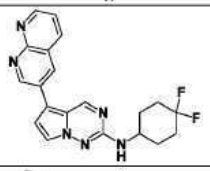
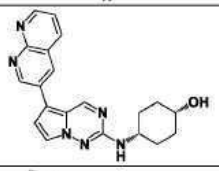
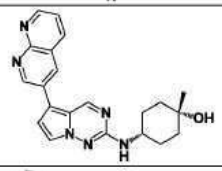
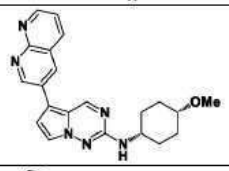
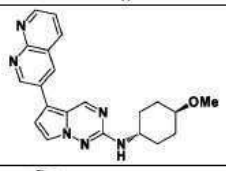
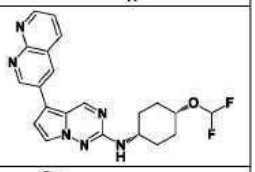
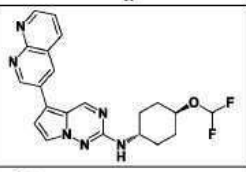
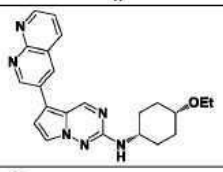
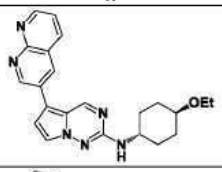
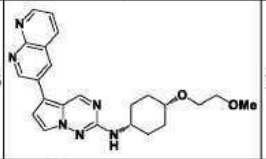
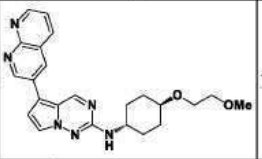
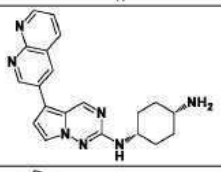
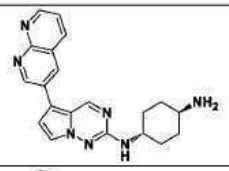
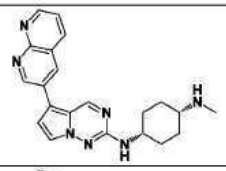
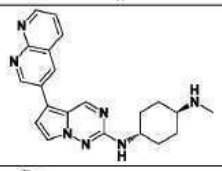
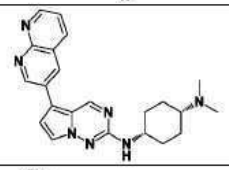
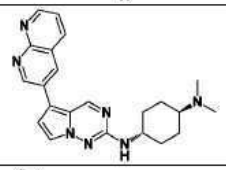
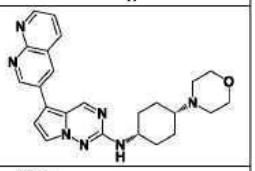
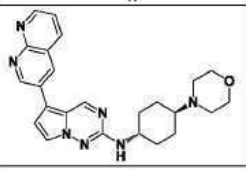
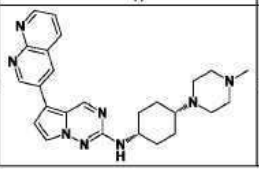
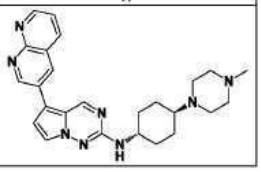
1531		1532		1533	
1534		1535		1536	
1537		1538		1539	
1540		1541		1542	
1543		1544		1545	
1546		1547		1548	
1549		1550		1551	
1552		1553		1554	

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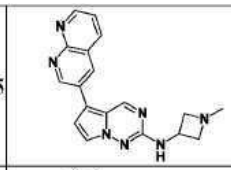
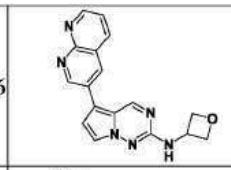
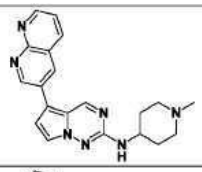
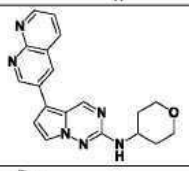
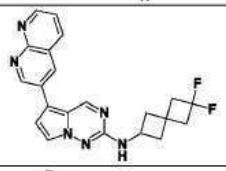
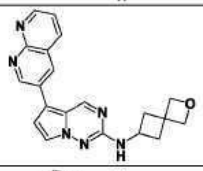
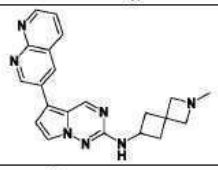
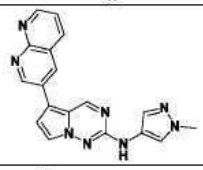
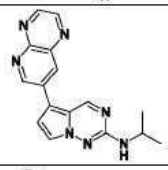
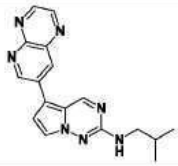
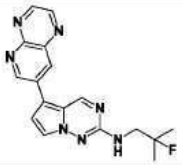
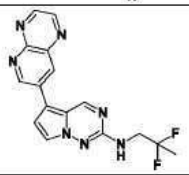
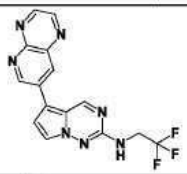
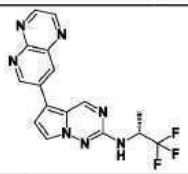
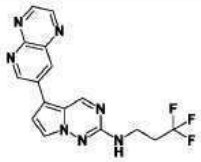
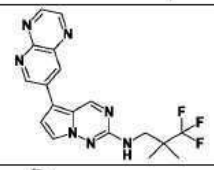
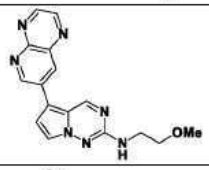
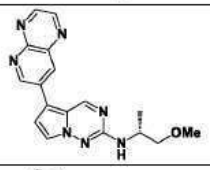
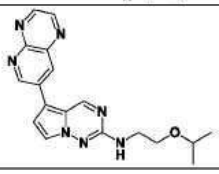
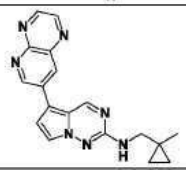
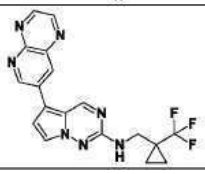
1555		1556		1557	
1558		1559		1560	
1561		1562		1563	
1564		1565		1566	
1567		1568		1569	
1570		1571		1572	
1573		1574		1575	

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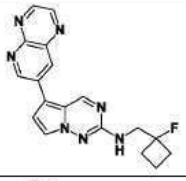
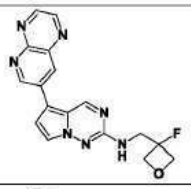
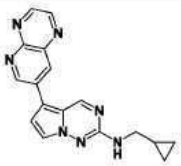
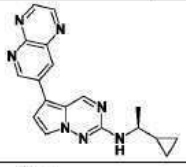
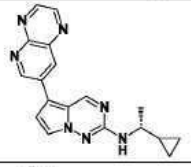
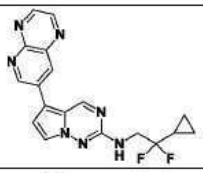
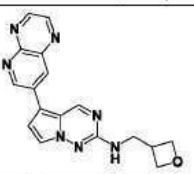
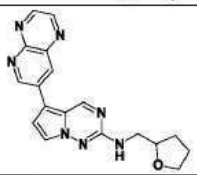
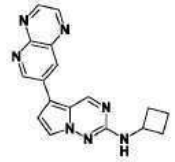
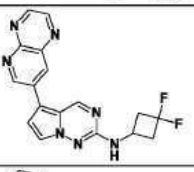
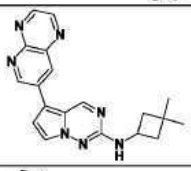
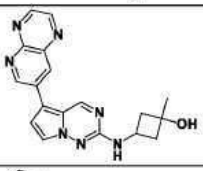
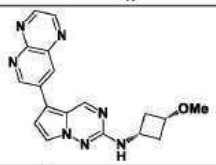
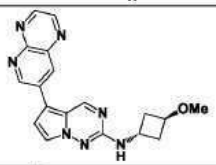
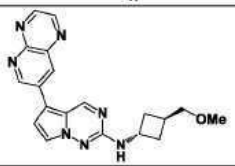
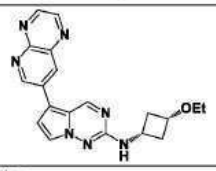
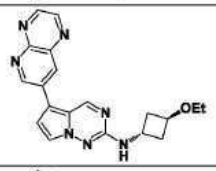
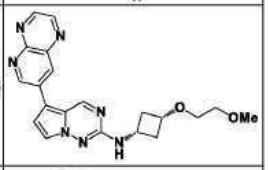
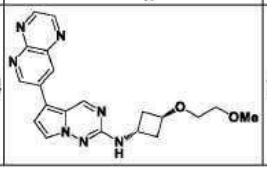
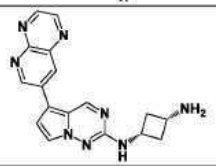
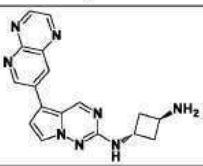
1576		1577		1578	
1579		1580		1581	
1582		1583		1584	
1585		1586		1587	
1588		1589		1590	
1591		1592		1593	
1594		1595		1596	

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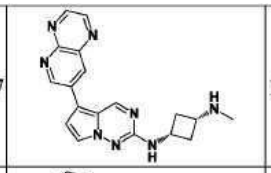
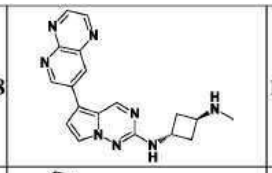
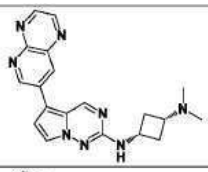
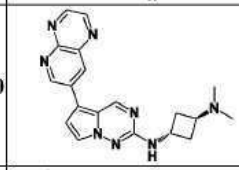
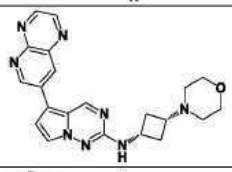
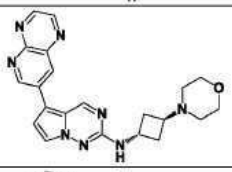
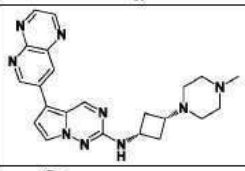
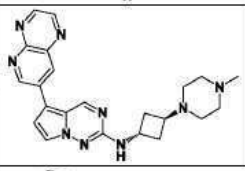
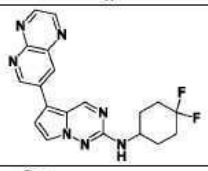
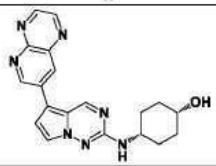
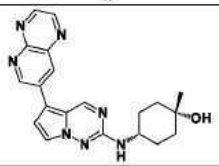
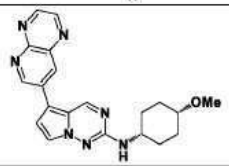
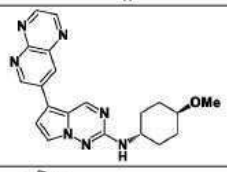
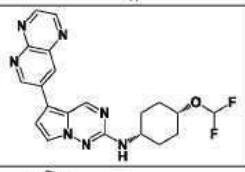
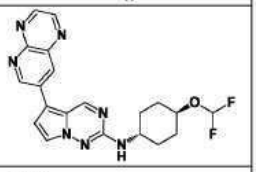
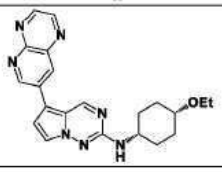
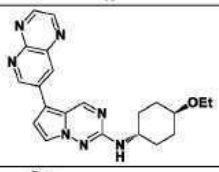
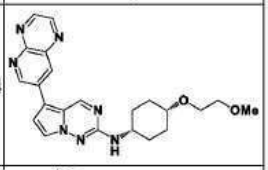
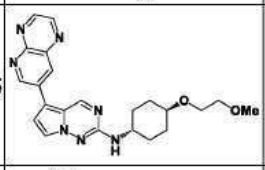
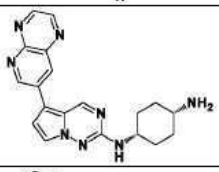
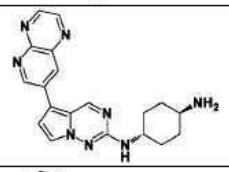
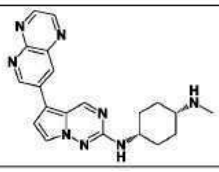
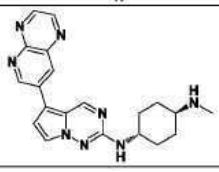
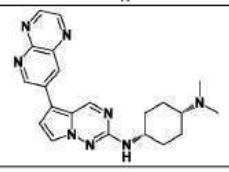
1597		1598		1599	
1600		1601		1602	
1603		1604		1605	
1606		1607		1608	
1609		1610		1611	
1612		1613		1614	
1615		1616		1617	
1618		1619		1620	

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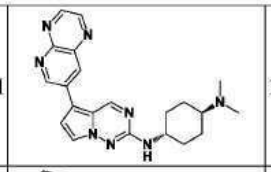
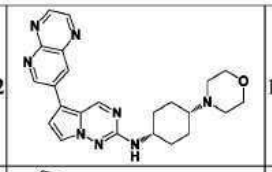
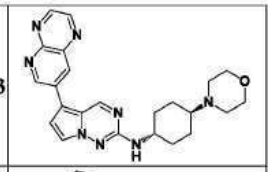
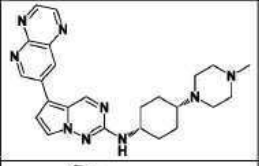
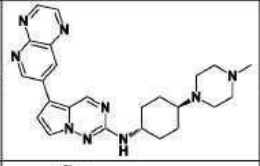
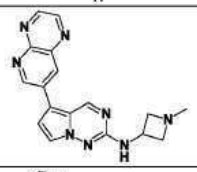
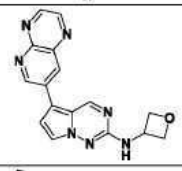
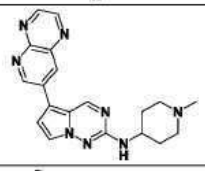
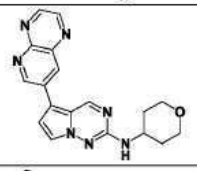
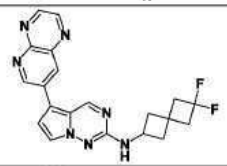
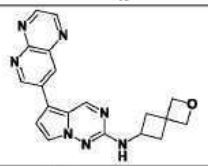
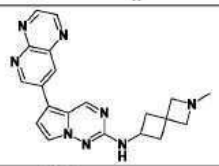
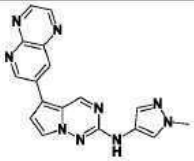
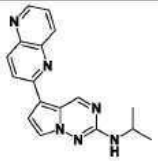
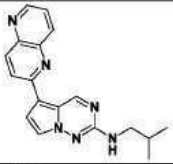
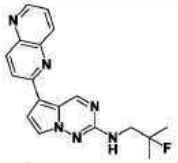
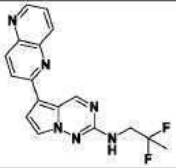
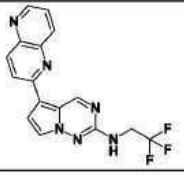
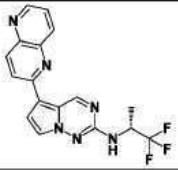
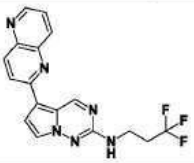
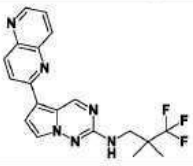
1621		1622		1623	
1624		1625		1626	
1627		1628		1629	
1630		1631		1632	
1633		1634		1635	
1636		1637		1638	
1639		1640		1641	

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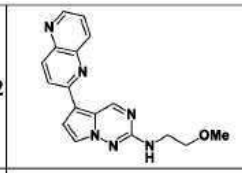
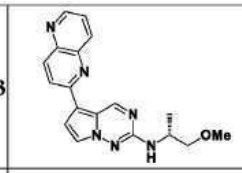
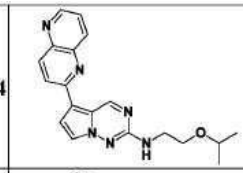
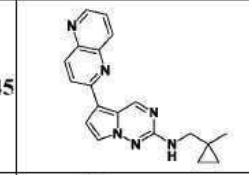
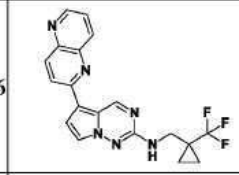
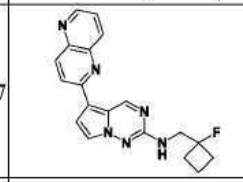
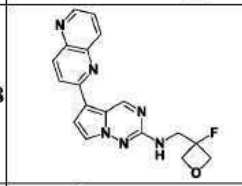
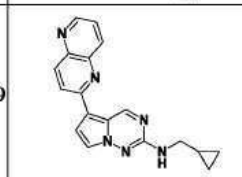
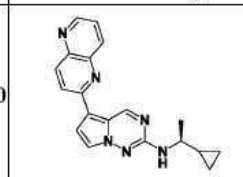
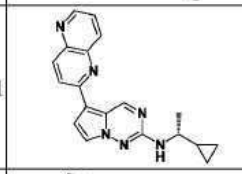
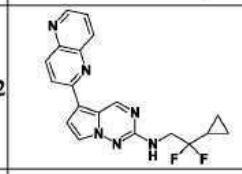
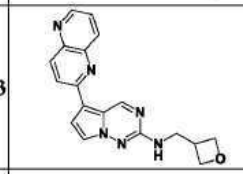
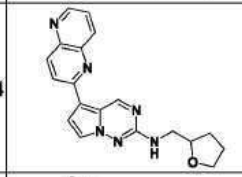
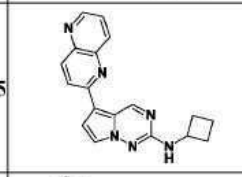
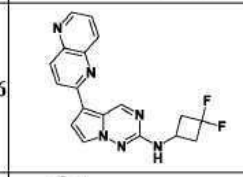
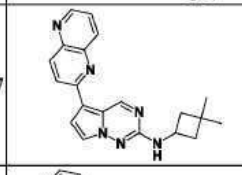
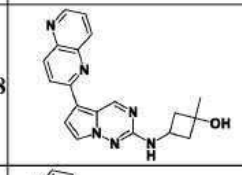
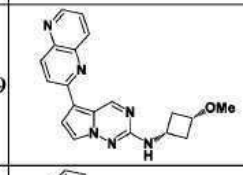
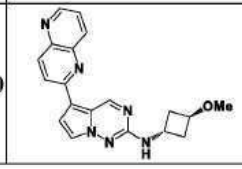
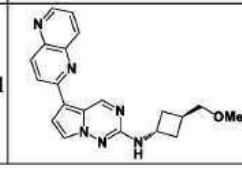
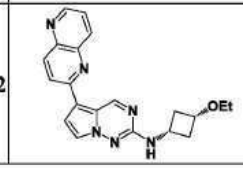
1642		1643		1644	
1645		1646		1647	
1648		1649		1650	
1651		1652		1653	
1654		1655		1656	
1657		1658		1659	
1660		1661		1662	

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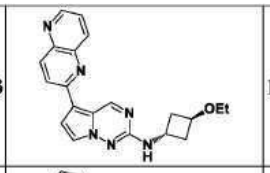
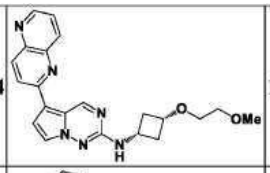
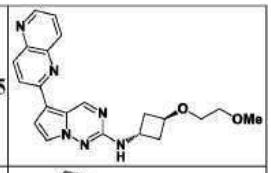
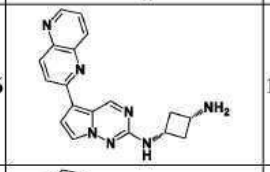
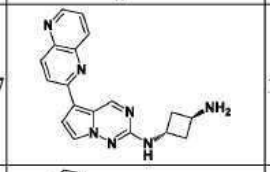
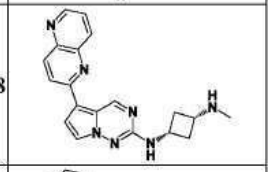
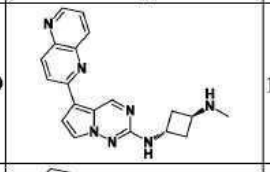
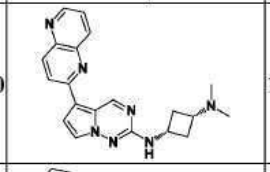
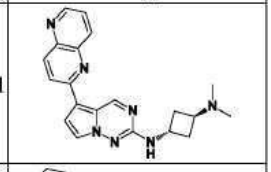
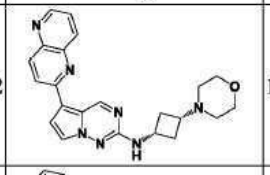
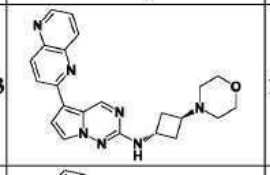
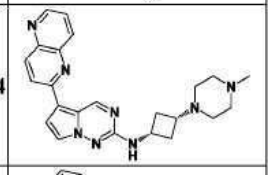
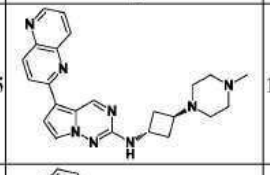
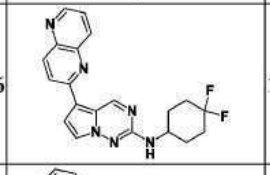
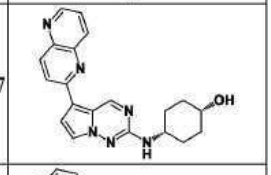
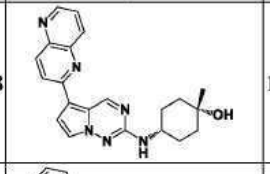
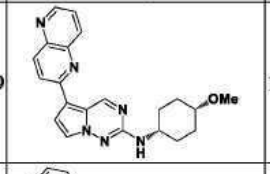
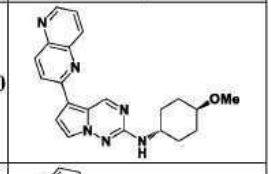
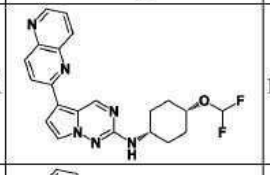
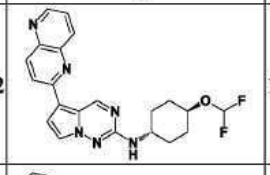
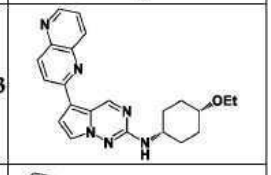
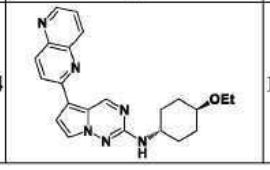
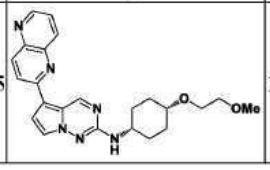
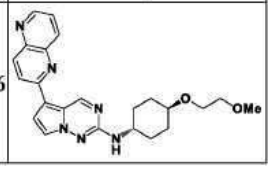
1663		1664		1665	
1666		1667		1668	
1669		1670		1671	
1672		1673		1674	
1675		1676		1677	
1678		1679		1680	
1681		1682		1683	
1684		1685		1686	

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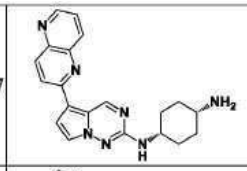
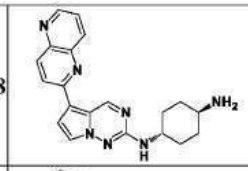
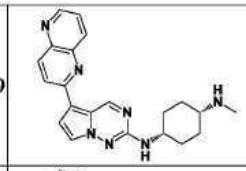
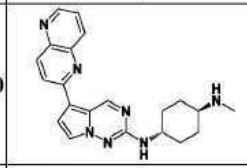
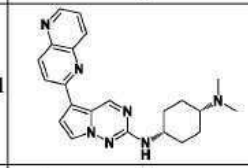
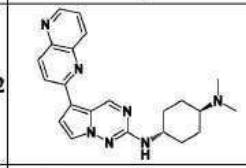
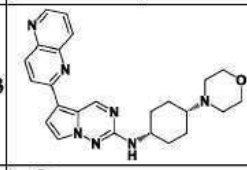
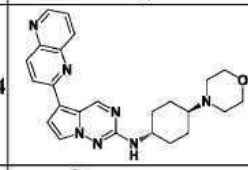
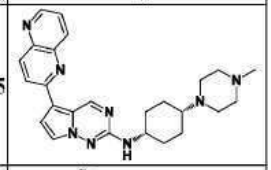
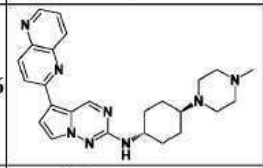
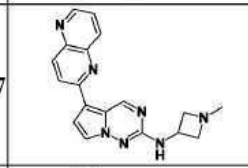
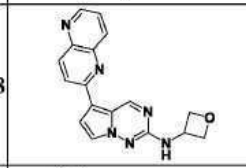
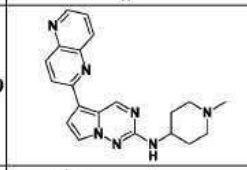
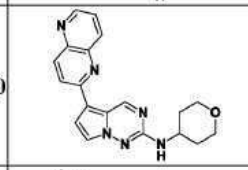
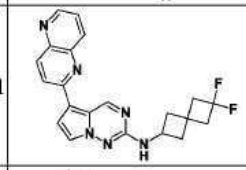
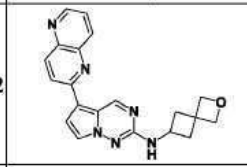
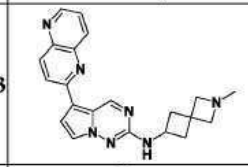
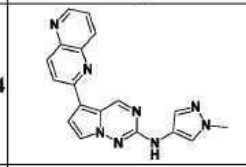
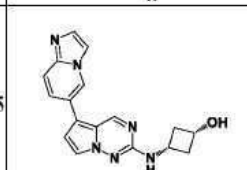
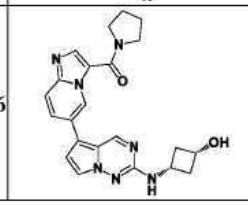
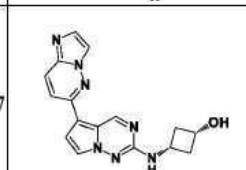
1687		1688		1689	
1690		1691		1692	
1693		1694		1695	
1696		1697		1698	
1699		1700		1701	
1702		1703		1704	
1705		1706		1707	

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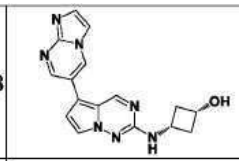
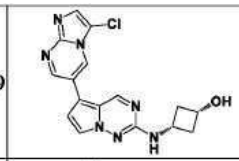
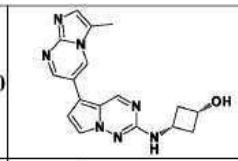
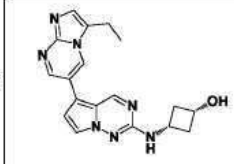
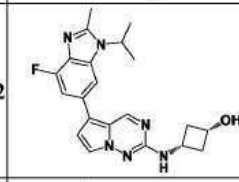
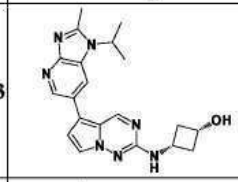
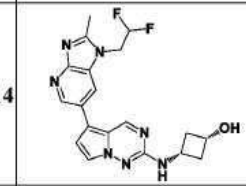
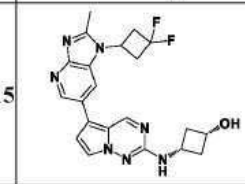
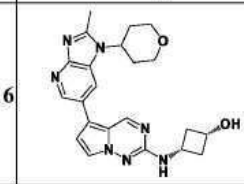
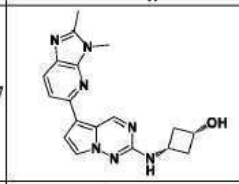
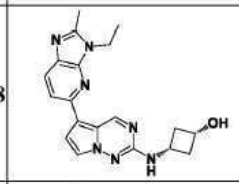
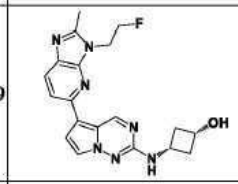
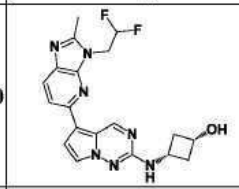
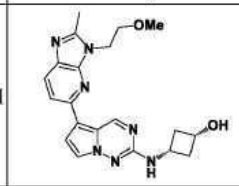
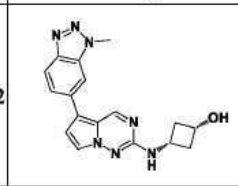
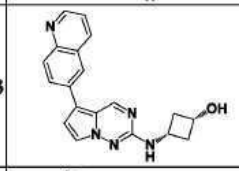
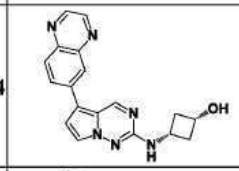
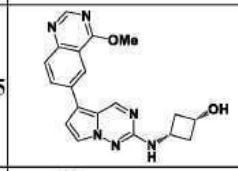
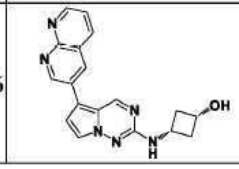
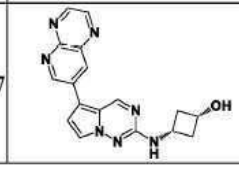
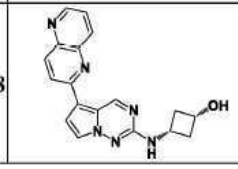
1708		1709		1710	
1711		1712		1713	
1714		1715		1716	
1717		1718		1719	
1720		1721		1722	
1723		1724		1725	
1726		1727		1728	

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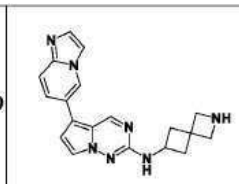
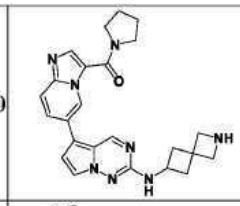
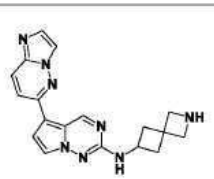
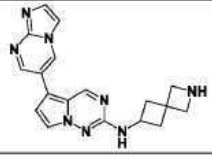
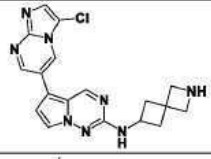
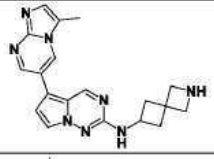
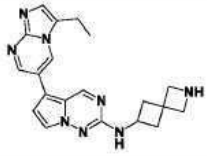
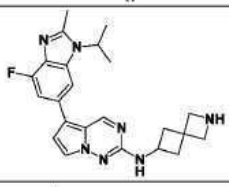
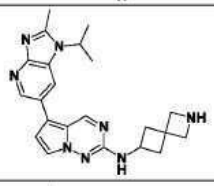
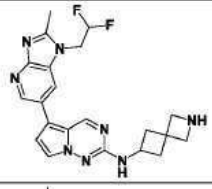
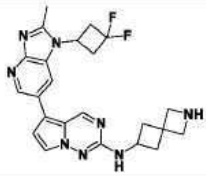
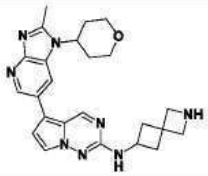
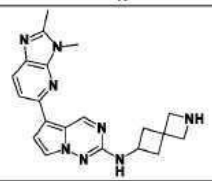
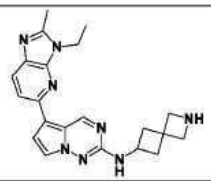
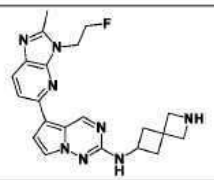
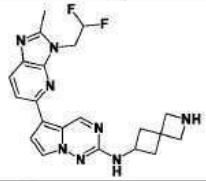
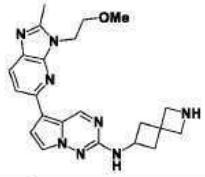
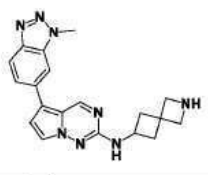
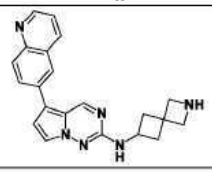
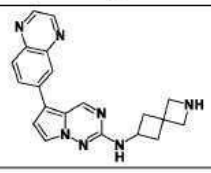
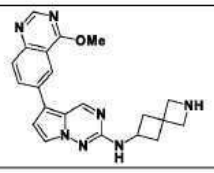
1729		1730		1731	
1732		1733		1734	
1735		1736		1737	
1738		1739		1740	
1741		1742		1743	
1744		1745		1746	
1747		1748		1749	

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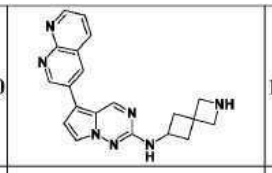
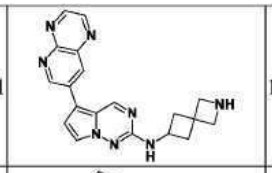
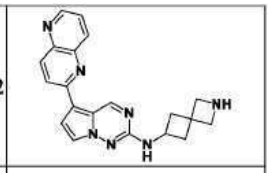
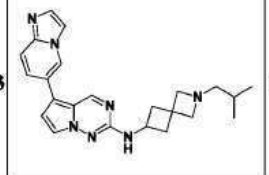
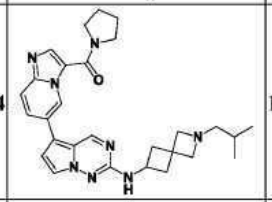
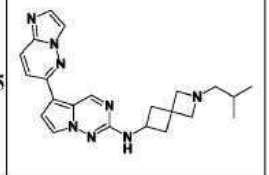
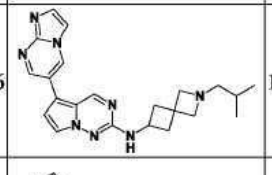
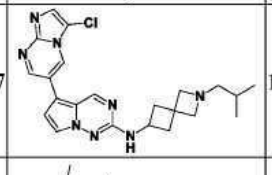
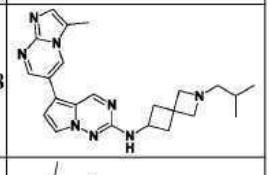
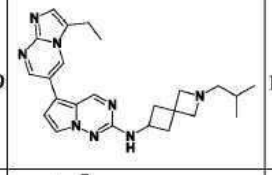
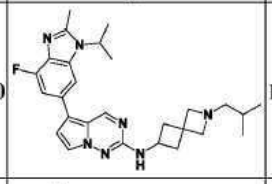
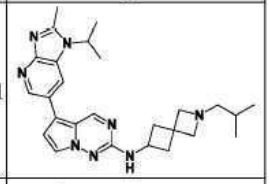
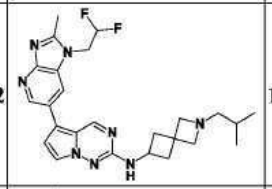
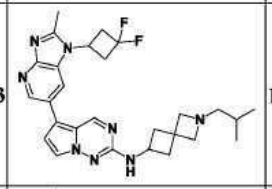
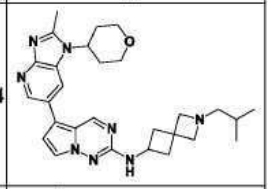
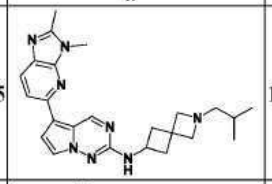
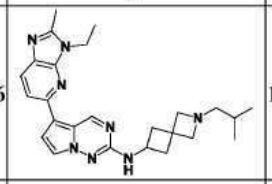
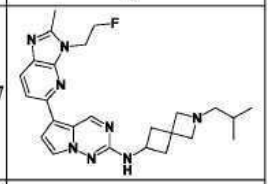
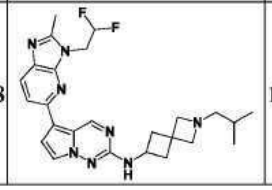
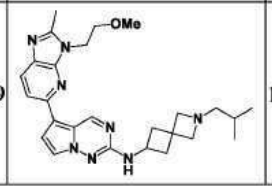
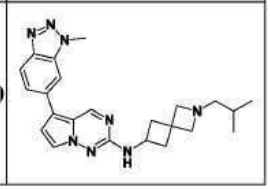
1750		1751		1752	
1753		1754		1755	
1756		1757		1758	
1759		1760		1761	
1762		1763		1764	
1765		1766		1767	
1768		1769		1770	

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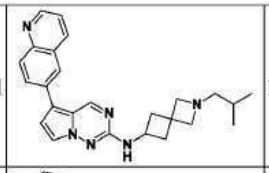
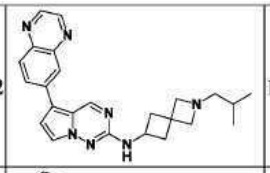
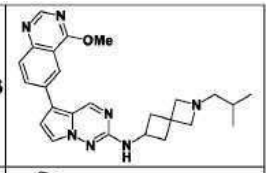
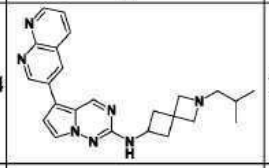
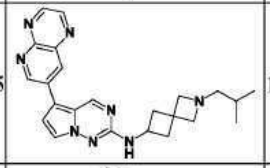
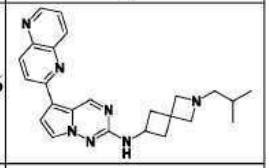
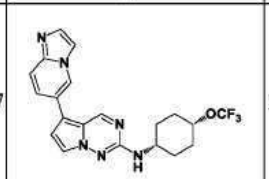
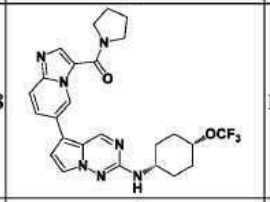
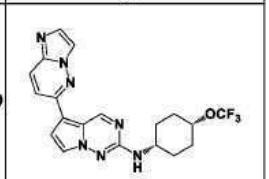
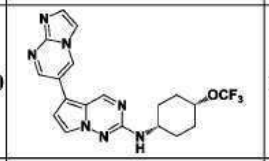
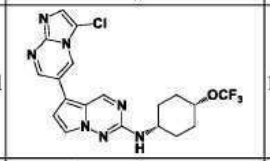
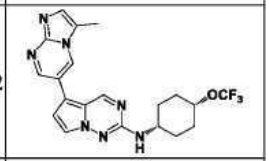
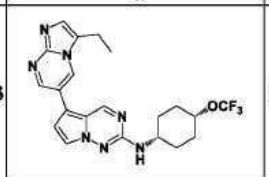
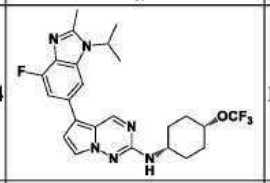
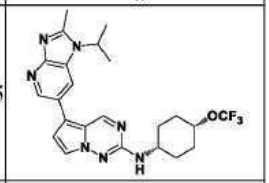
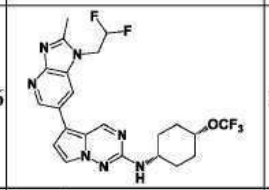
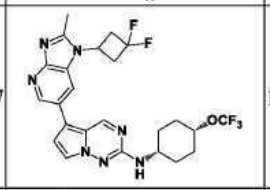
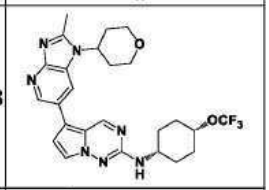
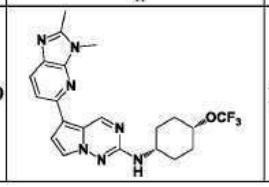
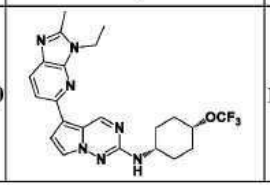
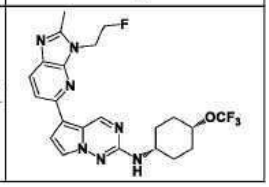
1771		1772		1773	
1774		1775		1776	
1777		1778		1779	
1780		1781		1782	
1783		1784		1785	
1786		1787		1788	
1789		1790		1791	

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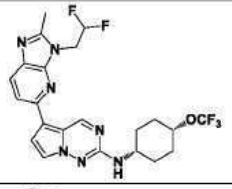
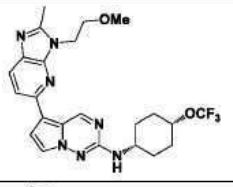
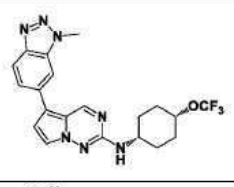
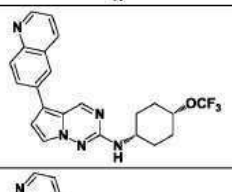
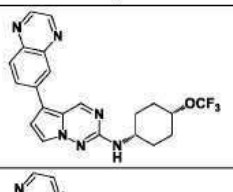
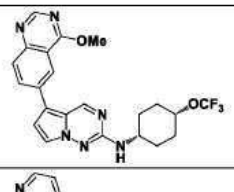
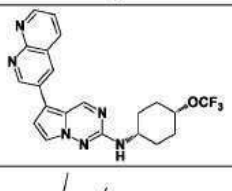
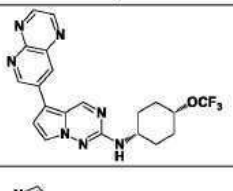
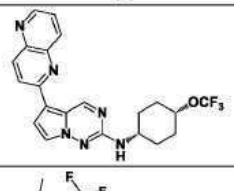
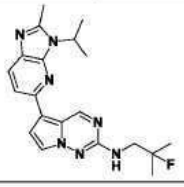
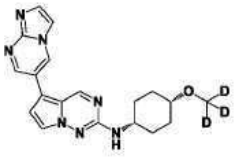
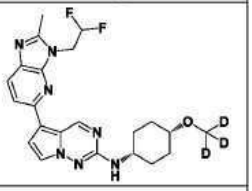
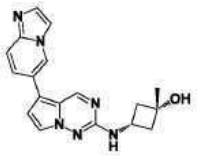
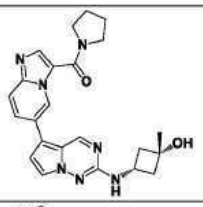
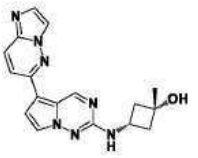
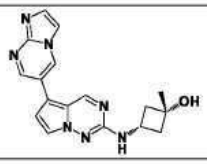
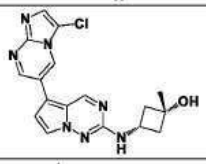
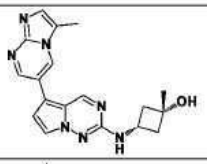
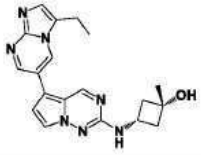
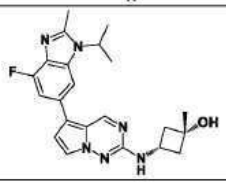
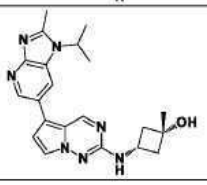
1792		1793		1794	
1795		1796		1797	
1798		1799		1800	
1801		1802		1803	
1804		1805		1806	
1807		1808		1809	
1810		1811		1812	

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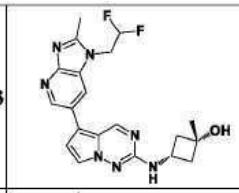
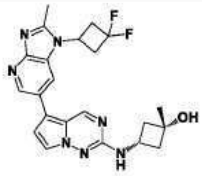
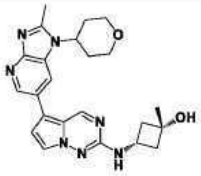
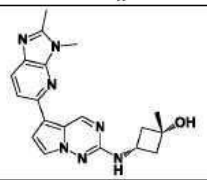
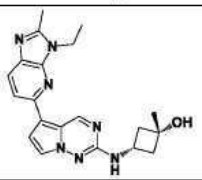
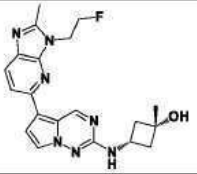
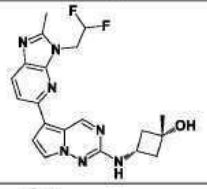
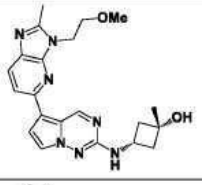
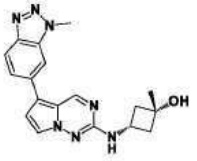
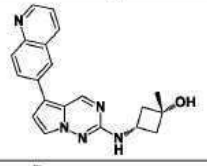
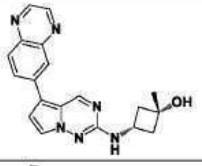
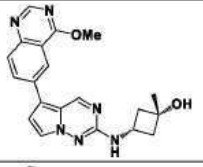
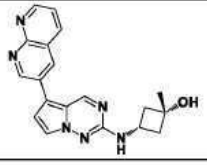
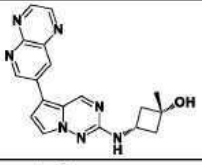
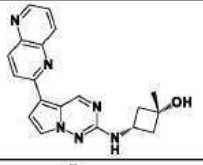
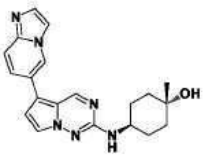
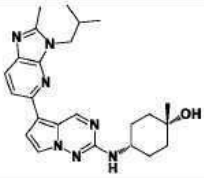
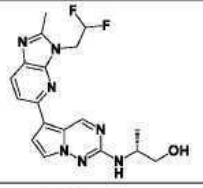
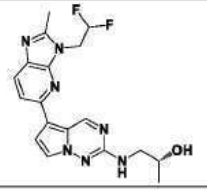
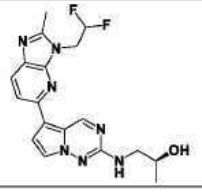
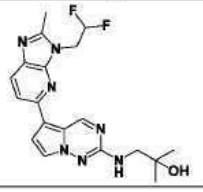
1813		1814		1815	
1816		1817		1818	
1819		1820		1821	
1822		1823		1824	
1825		1826		1827	
1828		1829		1830	
1831		1832		1833	

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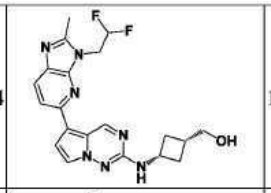
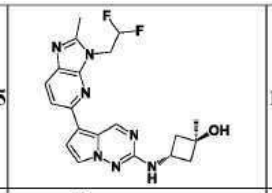
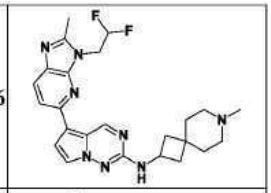
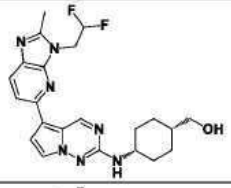
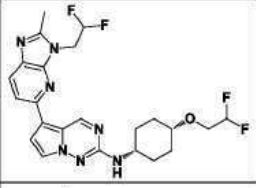
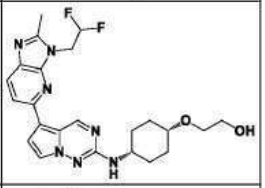
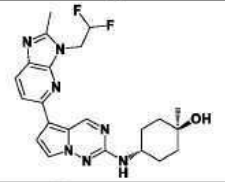
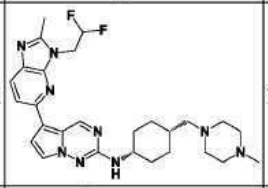
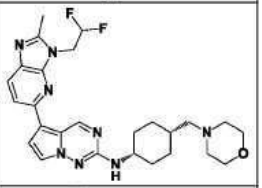
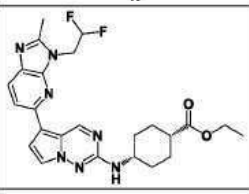
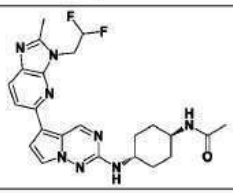
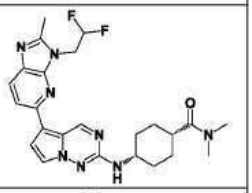
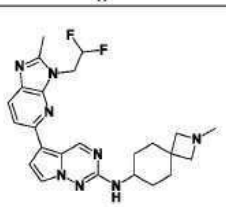
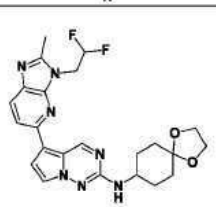
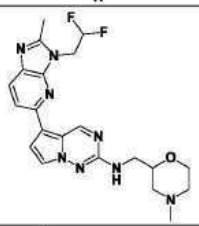
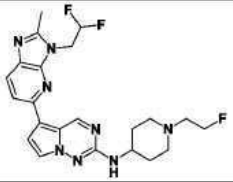
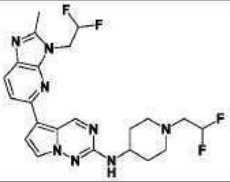
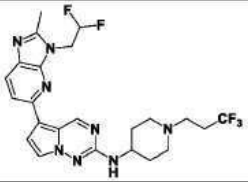
1834		1835		1836	
1837		1838		1839	
1840		1841		1842	
1843		1844		1845	
1846		1847		1848	
1849		1850		1851	

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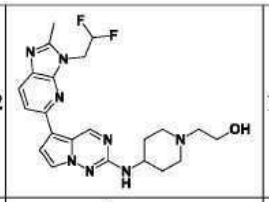
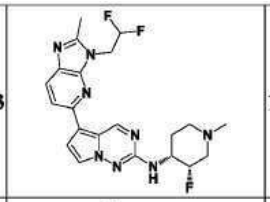
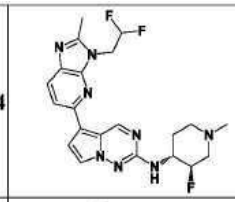
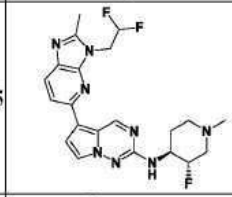
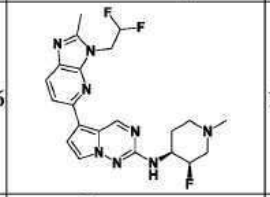
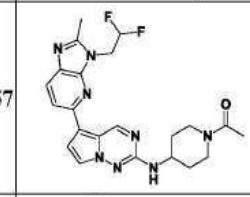
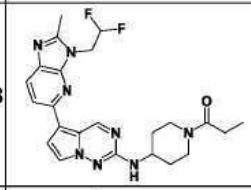
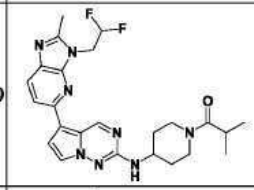
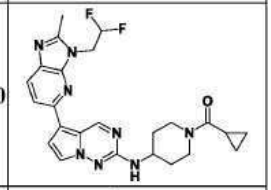
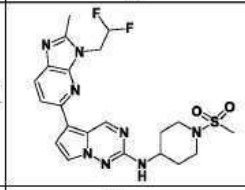
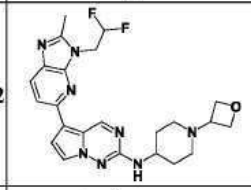
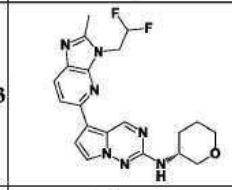
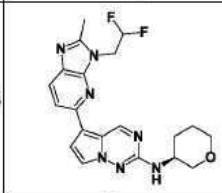
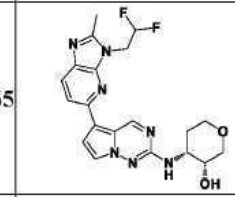
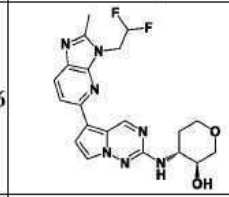
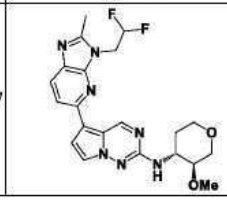
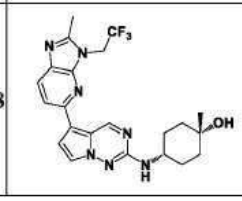
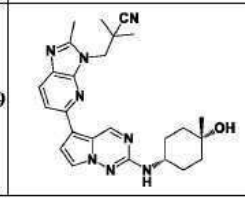
1852		1853		1854	
1855		1856		1857	
1858		1859		1860	
1861		1862		1863	
1864		1865		1866	
1867		1868		1869	

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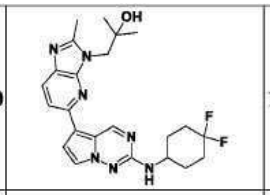
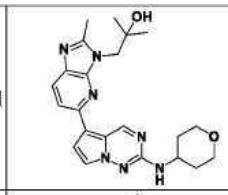
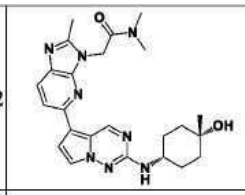
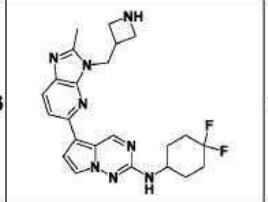
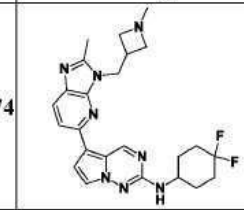
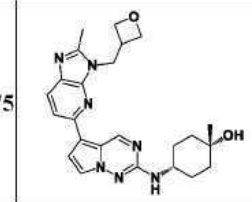
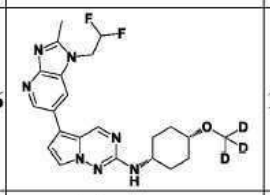
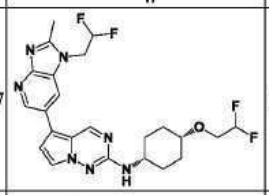
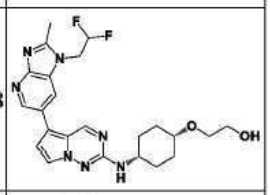
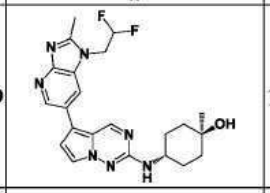
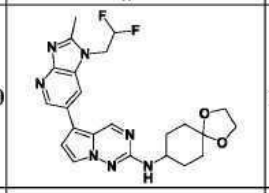
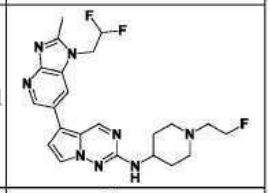
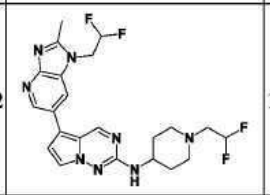
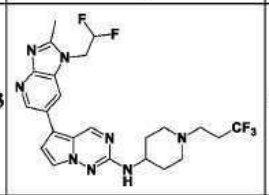
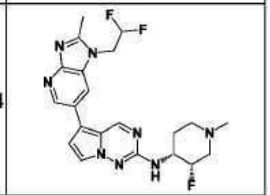
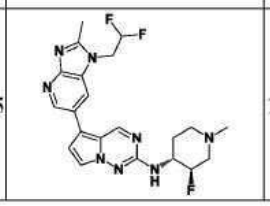
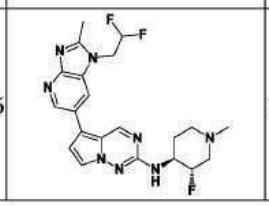
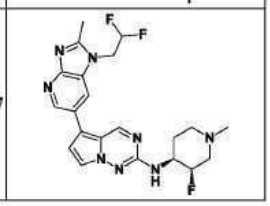
1870		1871		1872	
1873		1874		1875	
1876		1877		1878	
1879		1880		1881	
1882		1883		1884	
1885		1886		1887	

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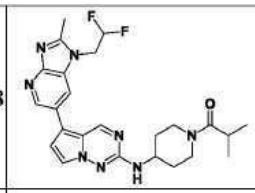
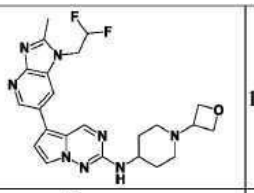
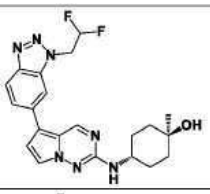
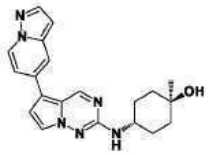
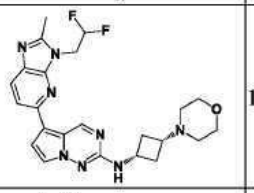
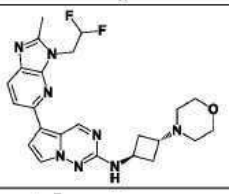
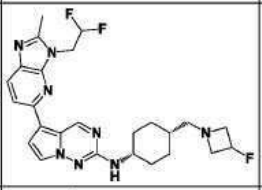
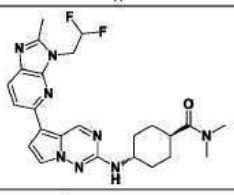
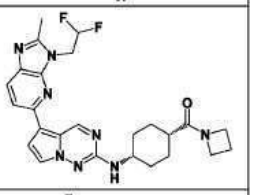
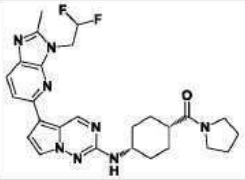
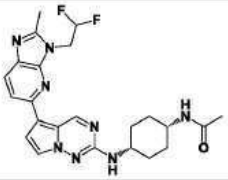
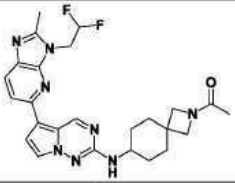
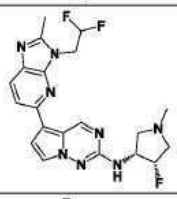
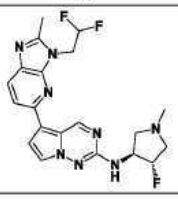
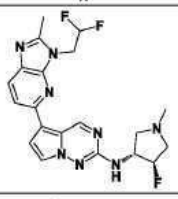
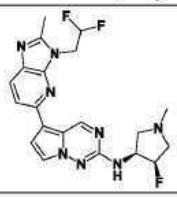
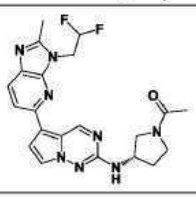
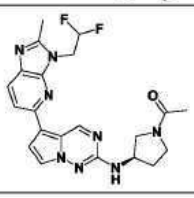
1888		1889		1890	
1891		1892		1893	
1894		1895		1896	
1897		1898		1899	
1900		1901		1902	
1903		1904		1905	

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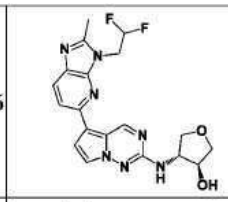
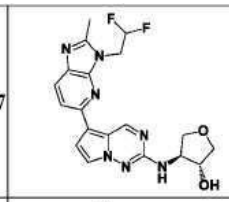
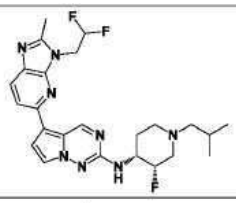
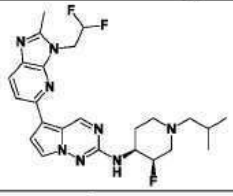
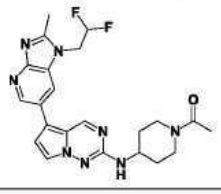
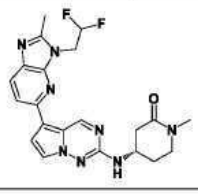
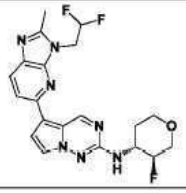
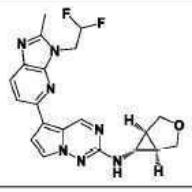
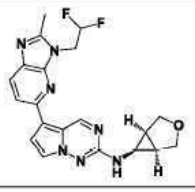
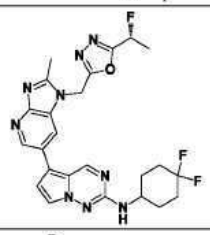
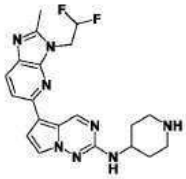
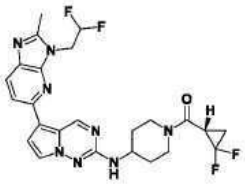
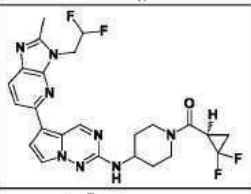
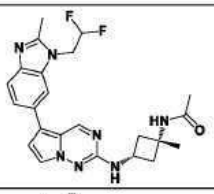
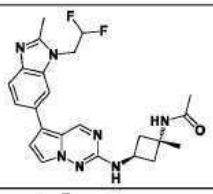
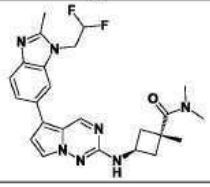
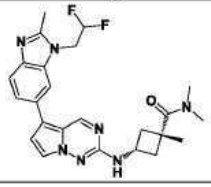
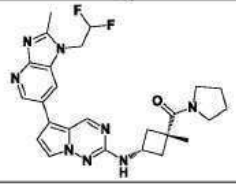
1906		1907		1908	
1909		1910		1911	
1912		1913		1914	
1915		1916		1917	
1918		1919		1920	
1921		1922		1923	

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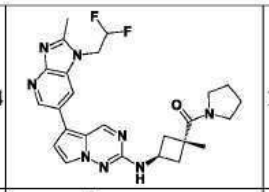
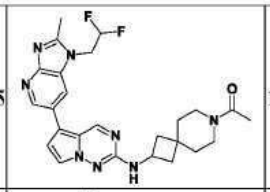
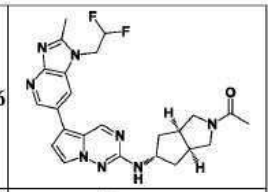
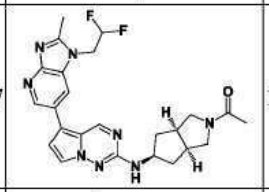
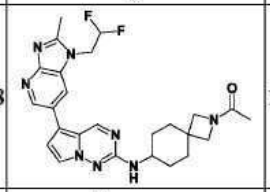
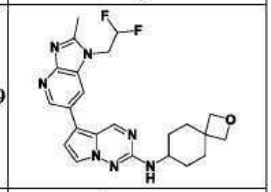
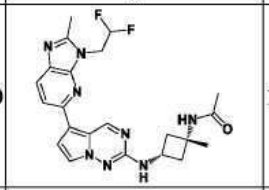
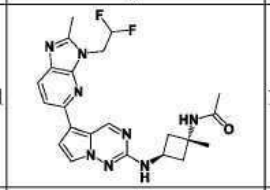
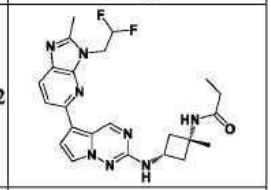
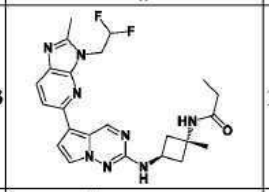
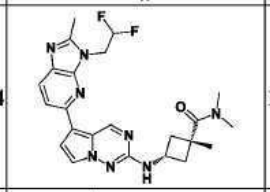
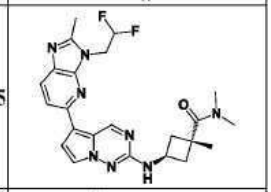
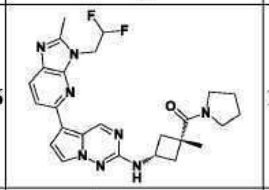
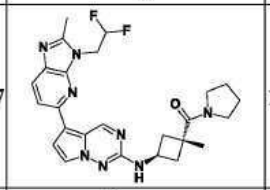
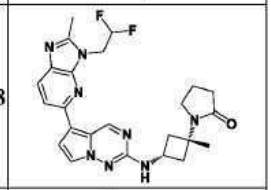
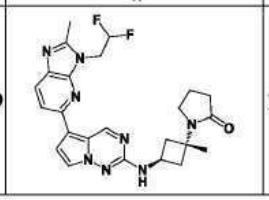
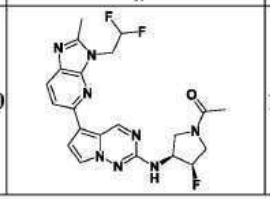
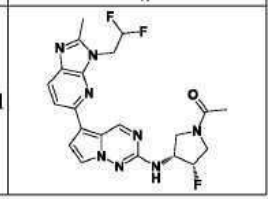
1924		1925		1926	
1927		1928		1929	
1930		1931		1932	
1933		1934		1935	
1936		1937		1938	
1939		1940		1941	

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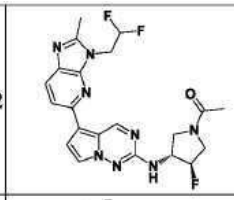
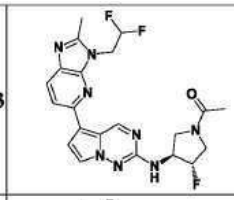
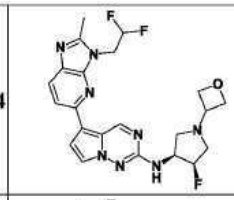
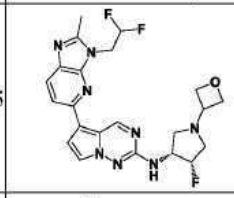
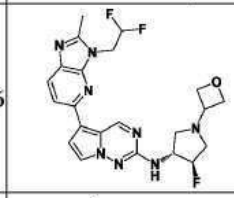
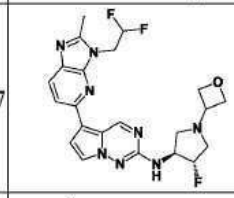
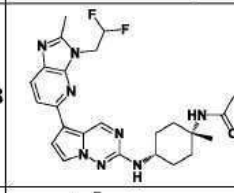
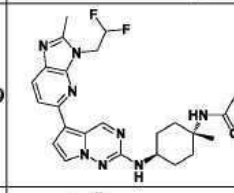
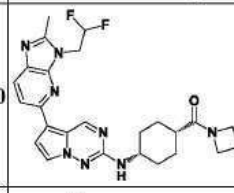
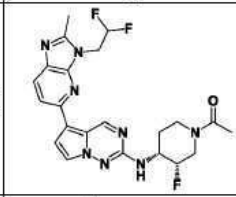
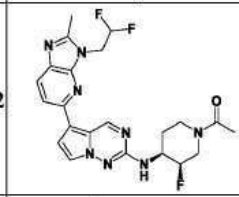
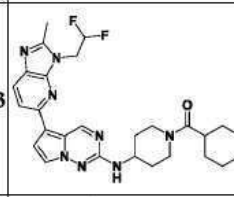
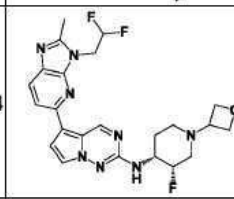
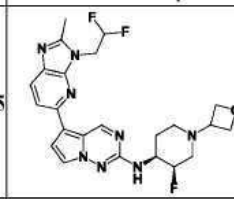
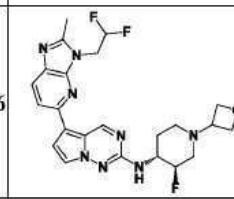
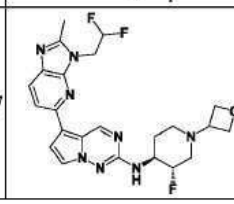
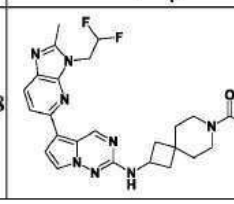
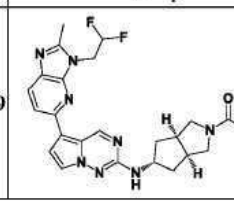
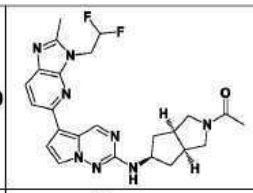
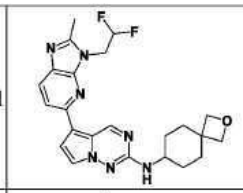
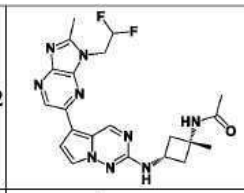
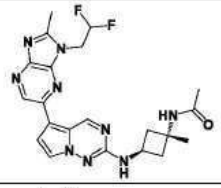
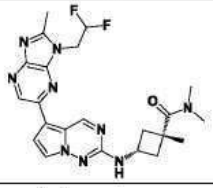
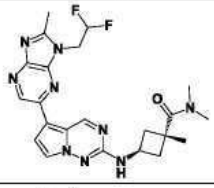
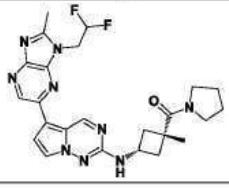
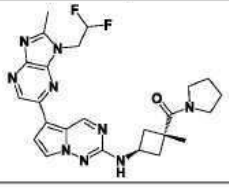
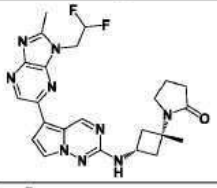
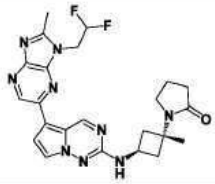
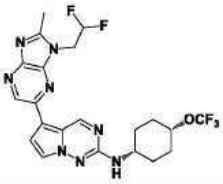
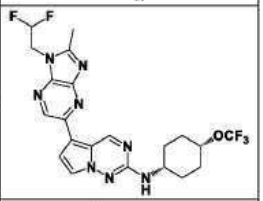
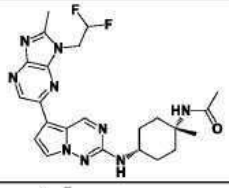
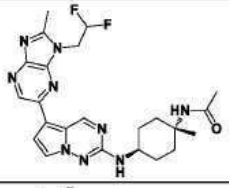
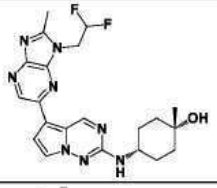
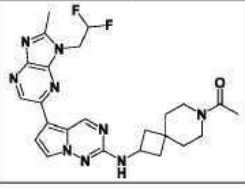
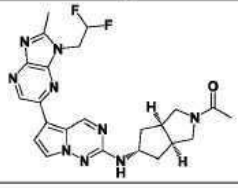
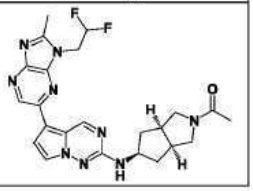
1942		1943		1944	
1945		1946		1947	
1948		1949		1950	
1951		1952		1953	
1954		1955		1956	
1957		1958		1959	

[0316]

1960		1961		1962	
1963		1964		1965	
1966		1967		1968	
1969		1970		1971	
1972		1973		1974	
1975		1976		1977	

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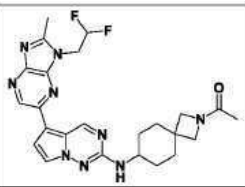
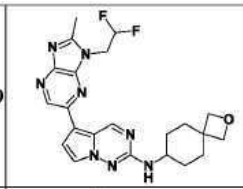
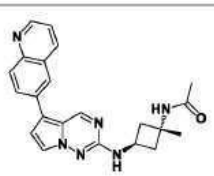
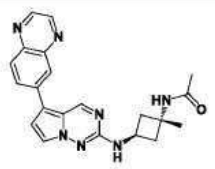
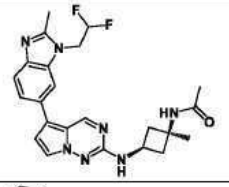
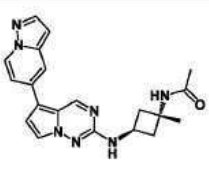
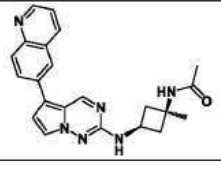
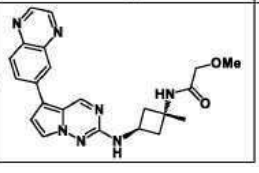
1978		1979		1980	
1981		1982		1983	
1984		1985			

[0318] 투여 및 약제학적 조성물

[0319] 일부 구체예는 (a) 치료 유효량의 본원에 제공된 화합물, 또는 그의 상응하는 거울상이성질체, 부분입체이성질체 또는 호변이성질체, 또는 약제학적으로 허용가능한 염; 및 (b) 약제학적으로 허용가능한 담체를 포함하는 약제학적 조성물을 포함한다.

[0320] 본원에 제공된 화합물은 또한 다른 공지된 제제와 조합하여(함께 또는 순차적으로 투여) 유용할 수 있다.

[0321] 화학식 I의 화합물과 또 다른 활성제의 조합으로 치료할 수 있는 질환의 비제한적 예는 결장직장암, 난소암, 간세포 암종, 두경부 편평 세포 암종, 급성 림프구성 백혈병(ALL), 췌장암, 뇌종양, 급성 거핵구성 백혈병(AMKL) 및 골관절염이다. 예를 들어, 화학식 I의 화합물은 하나 이상의 화학요법 화합물과 조합될 수 있다.

[0322] 일부 구체예에서, 간세포 암종은 화학식 I의 화합물과 다음 약물/요법 중 하나 이상의 조합으로 치료될 수 있다: 소라페닙(Nexavar®); 레고라페닙(Stivarga®, Regonix®), 니볼루맙(Opdivo®); 렌바티닙(Lenvima®); 펨브롤리주맙(Keytruda®); 카보잔티닙(Cometriq®, Cabometyx®); 5-플루오로우라실(5-FU®); 라무시루맙(Cyramza®); 젬시타빈과 옥살리플라틴(GEMOX)의 조합. 화학식 I의 화합물과 조합하여 수행될 수 있는 다른 치료법은 i) 독소루비신(DOXIL®), 시스플라틴 또는 미토마이신 C(Mitosol®, Mutamycin®, Jelmyto®)와 조합된 경피적 동맥 화학색전술(TACE); ii) 저선량 근접치료이다.

[0323] 일부 구체예에서, 두경부 편평 세포 암종은 화학식 I의 화합물과 다음 약물/치료법 중 하나 이상의 조합으로 치료될 수 있다: 경구강 로봇 수술(TORS); 방사선 요법을 이용한 TORS; 라로트렉티닙(Vitrakvi®); EGFR 억제제, 예: 에를로티닙(Tarceva®), 오시머티닙(Tagrisso®), 네라티닙(Nerlynx®), 게피티닙(Iressa®), 세툭시맙(Erbitux®), 파니투무맙(Vectibix®), 다코미티닙(Vizimpro®), 라파티닙(Tykerb)®), 네시투무맙(Portrazza), 반데타닙(Caprelsa®).

[0324] 일부 구체예에서, 급성 림프구성 백혈병(ALL)은 화학식 I의 화합물과 다음 약물/치료법 중 하나 이상의 조합으로 치료될 수 있다: 완화 유도 요법; 강화 요법; 넬라라빈(Arranon®); 아스파라기나제 Erwinia Chrysanthemi(Erwinaze®); 아스파라기나제 Erwinia Chrysanthemi(재조합)-rywn(Rylaze®); 칼라스파가제 Pegol-mknl(Asparlas®); 이노투주맙 오조가미신(Besponsa®); 블리나투모맙(Blincyto®); 다우노루비신 염산염(Cerubidine®); 클로파라빈(Clolar®); 사이클로포스파미드; 메토트렉세이트 나트륨(Trexall®); 시타라빈(Cytosar-U®); 다사티닙(Sprycel®); 덱사메타손; 이마티닙 메실레이트(Gleevec®); 포나티닙 염산염(Iclusig®); 메르캅토퓨린(Purinethol®, Purixan®); 티사겐클레우셀(Kymriah®); 빈크리스틴 황산염 리포솜(Marqibo®); 페가스파가제(Oncaspar®); 프레드니손; 다우노루비신 염산염(Rubidomycin®); 및 빈크리스틴 황산염.

[0325] 일부 구체예에서, 췌장암은 화학식 I의 화합물과 다음 약물/치료법 중 하나 이상의 조합으로 치료될 수 있다: 절제 및 색전 치료; 젬시타빈(Gemzar®); 5-플루오로우라실(5-FU®); 옥살리플라틴(Eloxatin®); 알부민 결합 파클리탁셀(Abraxane®); 카페시타빈(Xeloda®); 시스플라틴; 이리노테칸(Camptosar®); 리포솜 이리노테칸(Onivyde®); 파클리탁셀(Taxol®) 및 도세탁셀(Taxotere®).

[0326] 일부 구체예에서, 뇌종양은 화학식 I의 화합물과 다음 약물/치료법 중 하나 이상의 조합으로 치료될 수 있다: 카르무스틴은 글리아델 웨이퍼를 통해 투여될 수 있고; 교모세포종 및 고급 신경교종의 경우, 매일 저용량 테모졸로미드(Temodar®)를 사용한 방사선 치료에 이어 6개월~1년 동안 방사선 치료 후 매달 테모졸로미드를 투여한다; 로무스틴(Gleostine®), 프로카바진(Matulane®) 및 빈크리스틴(Vincasar®)은 방사선 요법과 함께 사용되었다; 베바시주맙(Avastin®, Mvasi®)을 이용한 항혈관신생 요법; 및 라로트렉티닙(Vitrakvi®)를 사용한 표적 치료법이 있다.

[0327] 일부 구체예에서, 급성 거핵구성 백혈병(AMKL)은 화학식 I의 화합물과 다음 약물/치료법 중 하나 이상의 조합으로 치료될 수 있다: 시타라빈(Cytosar-U®), 에토포시드(Vepesid®)) 및 안트라사이클린 약물. 안트라사이클린은 다우노루비신(Cerubidine®), 이다루비신(Idamycin®) 및 미톡산트론(Novantrone®)을 포함한다.

[0328] 일부 구체예에서, 급성 골수성 백혈병(AML)은 화학식 I의 화합물과 다음 약물/요법 중 하나 이상의 조합으로 치료될 수 있다: 베네토클락스 및 저메틸화제(예를 들어, 데시타빈, 아자시티딘), 유도 화학요법(시타라빈 및 안트라사이클린(예: 다우노루비신 또는 이다루비신), 올트랜스-레티노산(ATRA) 및 삼산화비소(ATO) 단독요법 또는

안트라사이클린), 강화 요법(시타라빈).

[0329] 일부 구체예에서, 골수이형성 증후군(MDS)은 화학식 I의 화합물과 다음 약물/요법 중 하나 이상의 조합으로 치료될 수 있다: 5-아자시티딘, 데시타빈, 레날리도마이드 및 데시타빈/세다주리딘(Inqovi®).

[0330] 일부 구체예에서, 대장결장 암은 화학식 I의 화합물 및 다음 약물 중 하나 이상의 조합으로 치료 될 수 있다: 5- 플루 오로라 실 (5-FU), 이는 비타민 유사와 함께 투여 될 수 있음; 비타민-유사 약물 류코보린 (폴린 산이라고도 함); 카페시타빈 (XELODA®), 이리노테칸 (CAMPOSTAR®), 옥살리플라틴 (ELOXATIN®). 화학식 I의 화합물과 추가로 조합 될 수 있은 이들 약물의 조합의 예는 FOLFOX (5-FU, 류코보린 및 옥살리플라틴), FOLFIRI (5-FU, 류코보린 및 이리노테칸), FOLFOXIRI (류코보린, 5- FU, 옥살리플라틴 및 이리노테칸) 및 CapeOx (카페시타빈 및 옥살리플라틴)이다. 직장암의 경우, 수술 전에 5-FU 화학 요법 또는 방사선과 병용 카페시 타빈을 투여할 수 있다 (신보조제 치료).

[0331] 일부 구체예에서, 난소 암은 화학식 I의 화합물 및 하나 이상의 다음 약물의 조합으로 치료 될 수 있다: 토포테칸, 리포솜 독소루비신 (DOXIL®), 젬시타빈 (GEMZAR®), 사이클로포스파미드 (CYTOXAN) ®), 빈노렐빈 (NAVELBINE®), 이포스파미드 (IFEX®), 에토포시드 (VP-16), 알트레타민 (HEXALEN®), 카페시타빈 (XELODA®), 이리노테칸 (CPT-11, CAMPTOSAR®), 멜팔란, 페메트렉세드 (ALIMTA®) 및 알부민 결합 파클리탁셀 (nab-paclitaxel, ABRAXANE®). 화학식 I의 화합물과 추가로 조합 될 수 있은 이러한 약물의 조합의 예는 TIP (파클리탁셀 [탁솔], 이포스파미드 및 시스플라틴), VeIP (빈블라스틴, 이포스파미드 및 시스플라틴) 및 VIP (에토포사이드 [VP-16], 이포스파미드 및 시스플라틴)이다. 난소암은 또한 화학식 I의 화합물과 면역 체크포인트 차단 (ICB) 요법의 조합으로 치료할 수 있다.

[0332] 일부 구체예에서, 화학식 I의 화합물은 다음 방법 중 임의의 것과 조합하여 암을 치료하는 데 사용될 수 있다: (**a**) 호르몬 요법, 예컨대 아로마타제 억제제, LHRH(황체형성 호르몬 방출 호르몬) 유사체 및 억제제, 등; (**b**) 고주파 절제술(RFA), 에탄올(알코올) 절제술, 마이크로파 온열요법 및 냉동수술(냉동요법)과 같은 절제 또는 색전술 절차; (**c**) 시스플라틴 및 카보플라틴, 옥살리플라틴, 메클로레타민, 사이클로포스파미드, 클로람부실 및 이포스파미드와 같은 알킬화제를 사용한 화학요법; (**d**) 아자티오프린 및 메르캅토퓨린과 같은 항대사물질을 사용한 화학요법; (**e**) 빈카 알칼로이드(즉, 빈크리스틴, 빈블라스틴, 비노렐빈 및 빈데신) 및 탁산과 같은 식물 알칼로이드 및 테르페노이드를 사용한 화학요법; (**f**) 포도필로톡신, 에토포사이드, 테니포사이드 및 도세탁셀을 사용한 화학요법; (**g**) 이리노테칸, 토포테칸, 암사크린, 에토포사이드, 에토포사이드 포스페이트 및 테니포사이드와 같은 토포이소머라제 억제제를 사용한 화학요법; (**h**) 악티노마이신, 안트라사이클린, 독소루비신, 다우노루비신, 발루비신, 이다루비신, 에피루비신, 블레오마이신, 플리카마이신 및 미토마이신과 같은 세포독성 항생제를 사용한 화학요법; (**i**) 이마티닙 메실레이트 (GLEEVEC®, STI-571로도 알려짐), 게피티닙 (Iressa, ZD1839로도 알려짐), 에를로티닙 (TARCEVA®로 시판됨), 보르테조밉(VELCADE®), 타목시펜, 토파시티닙, 크리조티닙, Bcl-2 억제제(예: Obatoclax, Navitoclax(ABT-263), oblimersen(G3139), venetoclax(ABT-199), Gossypol), PARP 억제제(예: Iniparib, Olaparib, Rucaparib, Niraparib, Talazoparib), PI3K 억제제(예: 3상 시험의 페리포신), VEGF 수용체 2 억제제(예: Apatinib), AN-152, (AEZS-108), Braf 억제제(예: 베무라페닙, 다브라페닙 및 LGX818), MEK 억제제(예: 트라메티닙 및 MEK162), CDK 억제제(예: PD-0332991), 살리노마이신 및 소라페닙과 같은 티로신-키나제 억제제를 사용한 화학요법; (**j**) 리툭시맙(MABTHERA® 또는 RITUXAN®으로 시판됨), 트라스투주맙(ErbB2로도 알려진 Herceptin), 세툭시맙(ERBITUX®로 시판됨) 및 베바시주맙(AVASTIN®으로 시판됨)과 같은 단클론 항체를 사용한 화학요법; (**k**) 소토라십(Lumakras® 및 Lumykras®), 아다그라십(MRTX849) 및 ARS-3248(Wellspring Biosciences)과 같은 KRAS G12C 억제제를 사용한 화학요법; (**l**) 이필리무맙(Yervoy®),니볼루맙 (Opdivo®), 펨브롤리주맙(Keytruda®), 아테졸리주맙(Tecentriq®), 아벨루맙(Bavencio), 더발루맙(Imfinzi), 세미플리맙(Libtayo®)및 스파탈리주맙(PDR<00>1)과 같은 체크포인트 억제제 요법을 사용한 화학요법; (**m**) 젬투주맙 오조가미신, 브렌툭시맙 베도틴, 트라스투주맙 엠탄신, 이노투주맙 오조가미신, 폴라투주맙 베도틴, 엔포르투주맙 베도틴, 트라스투주맙 데룩테칸, 사시투주맙 고비테칸, 벨란타마브 마포도틴, 목세투모맙 파수도톡스 및 론카스톡시맙 테시린과 같은 항체-약물 접합체 (ADC)를 사용한 화학 요법; (**n**) 카르필조밉, 락타시스틴, 디설피람, 살리노스포라미드 A(마리조밉), 오프로조밉, 델란조밉, 에폭소미신, MG132, β-히드록시 β-

메틸부티르산(HMB), 보르테조밉, 익사조밉(단독 또는 레날리도마이드 및 덱사메타손과의 병용)과 같은 프로테아좀 억제제를 사용하는 화학요법); 및 (o) 방사선 치료.

[0333] 일부 구체예에서, 화학식 I의 화합물은 다음 방법 중 임의의 것과 조합하여 당뇨병을 치료하는데 사용될 수 있다: (a) 인슐린 주사; (b) 메트포르민(글루코파지), 펜포르민(DBI) 및 부포르민과 같은 비구아나이드; (c) 로시글리타존(Avandia), 피오글리타존(Actos) 및 이로글리타존(Rezulin)과 같은 티아졸리딘디온(TZD); (d) 글리메피리드(Amaryl®) 및 톨리미돈(MLR-1023)과 같은 린 키나제 활성화제; (e) 설포닐우레아와 같은 분비촉진제(비제한적인 예로는 아세토헥사미드, 카부타미드, 클로르프로파미드, 글리사이클아미드(톨사이클아미드), 메타헥사미드, 톨라자미드, 톨부타미드, 글리벤클라미드(글리부리드), 글리보누리드, 글리클라지드, 글리피지드, 글리퀴돈, 글리속세피드, 글리클로피라미드 및 글리메피리드가 있음) 및 메글리티니드(비제한적인 예로는 레파글리니드(Prandin), 나테글리니드(Starlix) 및 미티글리니드(Glufast)가 있음); (f) 아카보스(Glucobay, Precose, Prandase), 미글리톨(Glyset) 및 보글리보스와 같은 알파-글루코시다제 억제제; (g) 글루카곤 유사 펩타이드-1(GLP-1) 및 위 억제 펩타이드(포도당-의존성 인슐린분비 펩타이드, GIP)와 같은 주사 가능한 인크레틴 유사체, 주사 가능한 글루카곤 유사 펩타이드(GLP) 유사체 및 작용제의 비제한적인 예는 엑세나타이드(엑센딘-4(Byetta로 시판됨), 리라글루티드(Victoza, Saxenda), 타스포글루타이드, 릭시세나티드(Lyxumia), 세마글루타이드(Ozempic, Rybelsus), 둘라글루타이드(Trulicity), 알비글루타이드(Tanzeum), 디펩티딜 펩티다제-4(DPP-4)억제제의 비제한적 예는 시타글립틴(자누비아), 빌다글립틴(갈부스), 삭사글립틴(옹라자), 리나글립틴(트라젠타), 게미글립틴(제미글로), 아나글립틴(수이니), 테네리글립틴(테넬리아), 알로글립틴(네시나, 비피디아, 카자노, 비피도메트(네시나, 비피디아, 카자노, 비피도메트(메트포르민포함)), Oseni, Incresync(피오글리타존 포함)), 트레라글립틴(Zafatek, Wedica), 오마리글립틴(MK-3102), 에보글립틴(Suganon, Evodine), 고소글립틴(Saterex) 및 두토글립틴; (h) 프람린타이드(Symlin)와 같은 주사 가능한 아밀린 유사체; (i) 카나글리플로진(Invokana, Sulisent, Prominad), 다파글리플로진(Forxiga, Farxiga, Edistride), 엠파글리플로진(Jardiance, Sciampa-M), 에르투글리플로진(Steglatro), 이프라글리플로진(Suglat), 루세오글리플로진(Lusefi)과 같은 글리코당류(SGLT2 억제제)), 레모글리플로진 에타보네이트(레모글리플로진의 전구약물), 세르글리플로진 에타보네이트(GW869682X), 소타글리플로진(진퀴스타) 및 토포글리플로진(CSG452).

[0334] 일부 구체예에서, 화학식 I의 화합물을 사용하여 다음 방법 중 임의의 방법과 조합하여 골관절염을 치료할 수 있다: (d) Wnt 신호전달 경로 억제제(예: lorecivivint)의 주사; (a) 이부프로펜, 나프록센, 아스피린 및 아세트 아미노펜과 같은 비 스테로이드 성 항 염증 약물 (NSAID); (b) 물리 치료; (c) 코르티코 스테로이드 약물의 주사; (d) 히알루론산 유도체 (예: Hyalgan, Synvisc); (e) 코데인과 같은 마약; (f) 보조기 및 / 또는 신발 삽입물 또는 관절을 고정하거나 지지하여줄절에 압력을 가하지 않도록 도와줄할 수 있은 장치와 함께 사용 (예: 부목, 보조기, 신발 삽입물 또는 기타 의료 기기). (g) 뼈 재정렬 (절골술); (h) 관절 치환술 (관절 치환술); 및 (i) 만성 통증 부류와 함께.

[0335] 일부 구체예에서, 화학식 I의 화합물은 아두카누맙(Aduhelm™); 아세틸콜린에스테라제 억제제, 예를 들어 타크린, 리바스티그민(Exelon®), 갈란타민(Razadyne® 및 GalantaMind™) 및 도네페질(Aricept®); 및 메만틴(Axura®, Ebixa®, Namenda®)과 조합하여 알츠하이머병을 치료하는데 사용될 수 있다.

[0336] 본원에 개시된 화합물 또는 그의 약제학적 상 허용가능한 염의 투여는 경구, 피하, 정맥 내, 비강 내, 국소, 경피, 복강 내, 근육 내, 폐내, 질, 직장, 존재론적, 신경이학적, 안구 내, 접합 하, 전방 안구 주입을 통해, 유리 체내, 복강 내, 척수강 내, 낭내, 흉막 내, 상처 관개를 통해, 구강 내, 복강 내, 관절 내, 귀내, 기관지내, 캡슐 내, 수막 내, 흡입을 통해, 기관 내 또는 기관지내 점안을 통해, 폐강에 직접 점적을 통해, 척추강 내, 활액 내, 흉강 내, 흉강 내 관개를 통해, 경막내, 고막내, 골막내, 관내, 혈관 내, 감염의 심실내 뼈, 또는 보철 장치와의 혼합물의 일부로서의 적용을 통해를 포함하나 이에 제한되지 않는 임의의 허용된 투여 방식을 통해 이루어질 수 있다. 일부 구체예에서, 투여 방법은 경구 또는 비경 구 투여를 포함한다.

[0337] 약제학적 용도로 본원에 제공된 화합물은 결정질 또는 무정형 제품으로 투여 될 수 있다. 약제학적으로 허용가능한 조성물은 고체, 반고체, 액체, 용액, 콜로이드, 리포솜, 에멀젼, 현탁액, 복합체, 코아세르베이트 및 에어로졸을 포함할 수 있다. 예를 들어, 정제, 캡슐, 분말, 액체, 현탁액, 좌약, 에어로졸, 임플란트, 제어 방출 등과 같은 투여 형태. 예를 들어, 이들은 침전, 결정화, 밀링, 분쇄, 초임계 유체 처리, 코아 세르 베이션, 복합 코아 세르 베이션, 캡슐화, 유화, 복합화, 동결 건조, 분무 건조와 같은 방법에 의해 고체 플러그, 분말 또는 필름으로 얻을 수 있다. 이를 위해 마이크로파 또는 무선 주파수 건조를 사용할 수 있다. 화합물은 또한 미리

결정된 속도로 장기간 및 / 또는 시간에 따른 펄스 투여를 위해 데포 주사, 삼투 펌프, 알약 (정제 및 또는 캡슐), 경피 (전기 수송 포함) 패치, 임플란트 등을 포함하는 지속 또는 제어 방출 투여 형태로 투여 될 수 있다.

[0338] 화합물은 단독으로 또는 통상적인 약제학적 담체, 부형제 등과 조합하여 투여 될 수 있다. 약제학적으로 허용가능한 부형제는 이온 교환기, 알루미나, 알루미늄 스테아 레이트, 레시틴, 자기 유화 약물 전달 시스템 (SEDDS), 예컨대 d-α- 토코페롤 폴리에틸렌 글리콜 1000 숙시 네이트, 트윈, 폴록 사머 또는 기타 유사한 중합체 전달 매트릭스과 같은 약제학적 투여 형에 사용되는 계면 활성제, 인간 혈청 알부민과 같은 혈청 단백질, 인산염, 트리스, 글리신, 소르 브산, 소르 브산 칼륨과 같은 완충 물질, 포화 식물성 지방산, 물, 염 또는 전해질의 부분 글리세 라이드 혼합물, 프로타민 설페이트, 인산 수소이나트륨, 인산 수소 칼륨, 염화나트륨, 아연 염, 콜로이드 실리카, 마그네슘 트리실리케이트, 폴리 비닐 피롤리 돈, 셀룰로오스 기반 물질, 폴리에틸렌 글리콜, 나트륨 카르복시 메틸 셀룰로오스, 폴리아크릴 레이트, 왁스, 폴리에틸렌-폴리옥시프로필렌-블록 중합체 및 양모 지방를 포함하지만 이에 제한되지는 않는다. α-, β 및 γ- 사이클로 덱스트린과 같은 사이클로덱스트린, 또는 2- 및 3- 히드 록시 프로필 -β- 사이클로 덱스트린을 포함하는 히드록시 알킬 사이클로덱스트린과 같은 화학적으로 변형된 유도체, 또는 기타 가용화된 유도체는 또한 본원에 기재된 화합물의 전달을 향상시키기 위해 사용될 수 있다. 본 명세서에 기재된 바와 같은 화합물을 0.005 % 내지 100 % 범위로 함유하는 투여 형태 또는 조성물은 무독성 담체로 구성되어 제조 될 수 있다. 고려되는 조성물은 본원에 제공된 화합물 0.001 % -100 %, 한 구체예에서 0.1-95 %, 다른 구체예에서 75-85 %, 추가 구체예에서 20-80 %를 함유할 수 있다. 이러한 투여 형태를 제조하는 실제 방법은 당업자에게 공지되어 있거나 명백할 것이며; 예를 들어, *Remingtonː The Science and Practice of Pharmacy*, 22nd Edition (Pharmaceutical Press, London, UK. 2012) 참조.

[0339] 한 구체예에서, 조성물은 환약 또는 정제와 같은 단위 투여 형태의 형태를 취할 것이며, 따라서 조성물은 본원에 제공된 화합물과 함께 락토스, 수 크로스, 인산이칼슘, 또는 등; 마그네슘 스테아레이트 등과 같은 윤활제; 및 전분, 아카시아 검, 폴리비닐 피롤리딘, 젤라틴, 셀룰로오스, 셀룰로오스 유도체 등과 같은 결합제를 포함한다. 다른 고체 투여 형태에서, 분말, 마루, 용액 또는 현탁액 (예를 들어, 프로필렌 카보네이트, 식물성 오일, PEG, 폴록사머 124 또는 트리글리세리드)은 캡슐 (젤라틴 또는 셀룰로스베이스 캡슐)에 캡슐화된다. 본원에 제공된 하나 이상의 화합물 또는 추가 활성제가 물리적으로 분리된 단위 투여 형태도 고려된다; 예를 들어, 각 약물의 과립 (또는 캡슐 내의 정제)이 있는 캡슐; 2 층 정제; 2- 구획 겔 캡 등. 장용 코팅 또는 지연 방출 경구 투여 형태가 또한 고려된다.

[0340] 액체 약제학적으로 투여 가능한 조성물은 예를 들어 본원에 제공된 화합물 및 임의의 약제학적 보조제를 담체 (예를 들어, 물, 식염수, 수성 덱스트로스, 글리세롤, 글리콜, 에탄올 등)에 용해, 분산 등으로 제조할 수 있다.) 용액, 콜로이드, 리포솜, 에멀젼, 복합체, 코아세르베이트 또는 현탁액을 형성한다. 원하는 경우, 약제학적 조성물은 또한 습윤제, 유화제, 공용 매, 가용화제, pH 완충제 등과 같은 소량의 무독성 보조 물질 (예를 들어, 나트륨 아세테이트, 나트륨 시트레이트, 사이클로덱스트린 유도체, 소르비탄 모노 라우레이트, 트리에탄올 아민 아세테이트, 트리에탄올 아민 올레이트 등)을 함유할 수 있다.

[0341] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 0.25 mg/Kg 내지 약 50 mg/Kg이다.

[0342] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 0.25 mg/Kg 내지 약 20 mg/Kg이다.

[0343] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 0.50 mg/Kg 내지 약 19 mg/Kg이다.

[0344] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 0.75 mg/Kg 내지 약 18 mg/Kg이다.

[0345] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 1.0 mg/Kg 내지 약 17 mg/Kg이다.

[0346] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 1.25 mg/Kg 내지 약 16 mg/Kg이다.

[0347] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 1.50 mg/Kg 내지 약 15 mg/Kg이다.

[0348] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 1.75 mg/Kg 내지 약 14 mg/Kg이다.

[0349] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 2.0 mg/Kg 내지 약 13 mg/Kg이다.

[0350] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 3.0 mg/Kg 내지 약 12 mg/Kg이다.

[0351] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 4.0 mg/Kg 내지 약 11 mg/Kg이다.

[0352] 일부 구체예에서, 식 (I)의 화합물의 단위 투여량은 사람에서 약 5.0 mg/Kg 내지 약 10 mg/Kg이다.

[0353] 일부 구체예에서, 상기 조성물은 단일 투여에 적절한 단위 투여량 형태로 제공된다.

[0354] 일부 구체예에서, 상기 조성물은 1일 2회 투여에 적절한 단위 투여량 형태로 제공된다.

[0355] 일부 구체예에서, 상기 조성물은 1일 3회 투여에 적절한 단위 투여량 형태로 제공된다.

[0356] 주사제는 액체 용액, 콜로이드, 리포좀, 복합체, 코아세르베이트 또는 현탁액으로서, 에멀젼으로서, 또는 주사 전에 액체에서 재구성하기에 적합한 고체 형태로 통상적인 형태로 제조 될 수 있다. 이러한 비경구 조성물에 함유된 본원에서 제공되는 화합물의 백분율은 화합물의 활성 및 환자의 요구뿐만 아니라 그의 특정 특성에 크게 의존한다. 그러나, 용액에서 0.01 % 내지 10 %의 활성 성분의 백분율이 사용될 수 있고, 조성물이 고체 또는 현탁액 인 경우 더 높을 수 있으며, 이는 후속 적으로 상기 백분율로 희석 될 수 있다.

[0357] 일부 구체예에서, 상기 조성물은 용액 내 약 0.1-10%의 활성 물질을 포함한다.

[0358] 일부 구체예에서, 상기 조성물은 용액 내 약 0.1-5%의 활성 물질을 포함한다.

[0359] 일부 구체예에서, 상기 조성물은 용액 내 약 0.1-4%의 활성 물질을 포함한다.

[0360] 일부 구체예에서, 상기 조성물은 용액 내 약 0.15-3%의 활성 물질을 포함한다.

[0361] 일부 구체예에서, 상기 조성물은 용액 내 약 0.2-2%의 활성 물질을 포함한다.

[0362] 일부 구체예에서, 상기 조성물은 약 1-96 시간의 기간에 걸쳐 정맥내 주입에 의한 계속 투여에 적절한 투여량 형태로 제공된다.

[0363] 일부 구체예에서, 상기 조성물은 약 1-72 시간의 기간에 걸쳐 정맥내 주입에 의한 계속 투여에 적절한 투여량 형태로 제공된다.

[0364] 일부 구체예에서, 상기 조성물은 약 1-48 시간의 기간에 걸쳐 정맥내 주입에 의한 계속 투여에 적절한 투여량 형태로 제공된다.

[0365] 일부 구체예에서, 상기 조성물은 약 1-24 시간의 기간에 걸쳐 정맥내 주입에 의한 계속 투여에 적절한 투여량 형태로 제공된다.

[0366] 일부 구체예에서, 상기 조성물은 약 1-12 시간의 기간에 걸쳐 정맥내 주입에 의한 계속 투여에 적절한 투여량 형태로 제공된다.

[0367] 일부 구체예에서, 상기 조성물은 약 1-6 시간의 기간에 걸쳐 정맥내 주입에 의한 계속 투여에 적절한 투여량 형태로 제공된다.

[0368] 일부 구체예에서, 이들 조성물은 약 5 mg/m^2 내지 약 300 mg/m^2의 투여량에서 사람에게 정맥내 주입에 의해 투여될 수 있다.

[0369] 일부 구체예에서, 이들 조성물은 약 5 mg/m^2 내지 약 200 mg/m^2의 투여량에서 사람에게 정맥내 주입에 의해 투여될 수 있다.

[0370] 일부 구체예에서, 이들 조성물은 약 5 mg/m^2 내지 약 100 mg/m^2의 투여량에서 사람에게 정맥내 주입에 의해 투여될 수 있다.

[0371] 일부 구체예에서, 이들 조성물은 약 10 mg/m^2 내지 약 50 mg/m^2의 투여량에서 사람에게 정맥내 주입에 의해 투여될 수 있다.

[0372] 일부 구체예에서, 이들 조성물은 약 50 mg/m^2 내지 약 200 mg/m^2의 투여량에서 사람에게 정맥내 주입에 의해 투여될 수 있다.

[0373] 일부 구체예에서, 이들 조성물은 약 75 mg/m^2 내지 약 175 mg/m^2의 투여량에서 사람에게 정맥내 주입에 의해 투여될 수 있다.

[0374] 일부 구체예에서, 이들 조성물은 약 100 mg/m^2 내지 약 150 mg/m^2의 투여량에서 사람에게 정맥내 주입에 의해 투여될 수 있다.

[0375] 농도 및 투여 량 값은 또한 특정 화합물 및 완화 될 병태의 중증도에 따라 달라질 수 있음에 유의해야한다. 임의의 특정 환자에 대해, 특정 투여 요법은 조성물의 투여를 투여하거나 감독하는 사람의 개인적 필요 및 전문적인 판단에 따라 시간이 지남에 따라 조정되어야 하며, 여기에 제시된 농도 범위는 단지 예시 일 뿐이며 청구된 조성물의 범위 또는 실행을 제한하려는 것은 아님을 추가로 이해해야 한다.

[0376] 한 구체예에서, 조성물은 예를 들어 분무기, 정량 흡입기, 분무기, 분무기, 에어로졸, 건조 분말 흡입기, 주입기, 액체 점적 또는 기타 적합한 장치 또는 기술을 통해 호흡기 (비강 및 폐 포함)에 투여 될 수 있다.

[0377] 일부 구체예에서, 코를 통한 흡입을 위해 코 점막으로 전달하기위한 에어로졸이 제공된다. 비강으로의 최적 전달을 위해, 약 5 내지 약 100 마이크론의 흡입 입자 크기가 유용하며, 약 10 내지 약 60 마이크론의 입자 크기가 바람직하다. 비강 전달의 경우, 비점막에 대한 충격을 최대화하고 투여된 제제의 폐 침착을 최소화하거나 방지하기 위해 더 큰 흡입 입자 크기가 필요할 수 있다. 일부 구체예에서, 폐로 전달하기위한 에어로졸은 코 또는 입을 통한 흡입을 위해 제공된다. 폐로 전달하기 위해서는 약 10 μm 미만의 흡입 공기 역학적 입자 크기가 유용하다 (예: 약 1 내지 약 10 마이크론). 흡입 입자는 용해된 약물을 포함하는 액체 방울, 부유 약물 입자를 포함하는 액체 방울 (약물이 현탁 매질에 불용성인 경우), 순수 약물 물질의 건조 입자, 부형제가 포함된 약물 물질, 리포솜, 에멀젼, 콜로이드 시스템, 코아세르베이트, 약물 나노 입자의 응집체, 또는 약물 나노 입자가 내장된 희석제의 건조 입자로 정의 될 수 있다.

[0378] 일부 구체예에서, 호흡 전달 (전신 또는 국소)을 위해 본원에 개시된 화학식 I의 화합물은 수성 제제로서, 비수성 용액 또는 현탁액으로서, 또는 알코올을 갖는 또는 없는 할로겐화 탄화수소 추진제 중의 현탁액 또는 용액으로서, 콜로이드 시스템, 에멀젼, 코아세르베이트 또는 건조 분말로서 투여 될 수 있다. 수성 제제는 수압 또는 초음파 분무를 사용하는 액체 분무기 또는 변형된 마이크로 펌프 시스템 (예: 소프트 미스트 흡입기, Aerodose® 또는 AERx® 시스템)에 의해 에어로졸화 될 수 있다. 추진제 기반 시스템은 적절한 가압 정량 흡입기 (pMDI)를 사용할 수 있다. 건조 분말은 원료 의약품을 효과적으로 분산시킬 수 있은 건조 분말 흡입기 (DPI)를 사용할 수 있다. 적절한 장치를 선택하여 원하는 입자 크기와 분포를 얻을 수 있다.

[0379] 일부 구체예에서, 본원에 개시된 화학식 I의 조성물은 다양한 방법에 의해 귀에 투여 될 수 있다. 예를 들어, 둥근 창 카테터 (예: 미국 특허 번호 6,440,102 및 6,648,873)를 사용할 수 있다.

[0380] 대안적으로, 제형은 외이와 중이 사이에 사용하기 위해 심지에 통합되거나 (예를 들어, 미국 특허 번호 6,120,484) 콜라겐 스펀지 또는 다른 고체 지지체에 흡수 될 수 있다 (예를 들어, 미국 특허 번호 4,164,559).

[0381] 원하는 경우, 본 개시 내용의 제형은 겔 제형 (예를 들어, 미국 특허 번호 4,474,752 및 6,911,211)에 포함될 수 있다.

[0382] 일부 구체예에서, 귀에 전달하기 위해 본원에 개시된 화학식 I의 화합물은 이식된 펌프 및 전달 시스템을 통해 바늘을 통해 중이 또는 내이 (와우)로 직접 또는 인공 와우 스타일 렛 전극 채널 또는 대안 적으로 준비된 약물 전달 채널, 예를 들어 바늘에 한정되지 않고 측두골을 통해 달팽이관으로 투여 될 수 있다.

[0383] 다른 옵션은 이러한 목적을 위해 박막에 특별히 삽입된 약물 전달 채널 (경로)이 새겨진 다채널 전극 또는 전극 상에 코팅된 박막을 통한 펌프를 통한 전달을 포함한다. 다른 구체예에서, 화학식 I의 산성 또는 염기성 고체 화합물은 외부 또는 내부 이식된 펌핑 시스템의 저장소로부터 전달 될 수 있다.

[0384] 본 개시 내용의 제형은 또한 중이, 내이 또는 달팽이관 (예를 들어, 미국 특허 번호 6,377,849 및 일련 번호 11 / 337,815)으로의 고막내 주사에 의해 귀에 투여 될 수 있다.

[0385] 치료제의 고막내 주사는 고막 뒤의 치료제를 중이 및 / 또는 내이로 주사하는 기술이다. 한 구체예에서, 본원에 기재된 제제는 고막을 통한 주사를 통해 원형 창 막 상에 직접 투여된다. 또 다른 구체예에서, 본원에 기재된 이온 채널 조절제 귀에 허용되는 제제는 내이에 대한 비-고막 접근법을 통해 둥근 창 막 상에 투여된다. 추가 구체예에서, 본원에 기재된 제형은 윤창 달팽이관의 변형을 포함하는 둥근 창 막에 대한 외과적 접근을 통해 둥근 창 막 상에 투여된다.

[0386] 일부 구체예에서, 식 (I)의 화합물은 직장 조성물 가령 종래의 좌약 기재 가령 코코아 버터 또는 다른 글리세리드 그리고 폴리비닐 피롤리돈, PEG (PEG 연고와 같은) 등과 같은 합성 중합체를 함유하는 관장제, 직장 겔, 직장 폼, 직장 에어로졸, 좌약, 젤리 좌약, 또는 체류 관장제로 제제화된다.

[0387] 약물의 직장 투여를 위한 좌약 (용액, 콜로이드, 현탁액 또는 복합체)은 본원에 제공된 화합물을 상온에서는 고

체이지만 직장에서는 액체이고 따라서 직장에서 녹거나 침식 / 용해되어 화합물을 방출하는 적절한 비자극성 부형제와 혼합하여 제조할 수 있다. 이러한 물질에는 코코아 버터, 글리세린화 젤라틴, 수소화 식물성 기름, 폴록사머, 다양한 분자량의 폴리에틸렌 글리콜 혼합물 및 폴리에틸렌 글리콜의 지방산 에스테르가 포함된다. 조성물의 좌약 형태에서, 선택적으로 코코아 버터와 조합된 지방산 글리세리드의 혼합물 (이에 제한되지 않음)과 같은 저 융점 왁스가 먼저 용융된다.

[0388] 고체 조성물은 본원에 제공된 화합물의 물리 화학적 특성, 원하는 용해 속도, 비용 고려 사항 및 기타 기준에 따라 다양한 상이한 유형의 투여 형태로 제공 될 수 있다. 구체예 중 하나에서, 고체 조성물은 단일 단위이다. 이것은 하나의 단위 용량의 화합물이 단일 물리적 형태의 고체 형태 또는 물품에 포함된다는 것을 의미한다. 즉, 단위가 일관성이 없는 다중 단위 투여 형태와는 달리 고체 조성물은 일관성이 있다.

[0389] 고체 조성물의 투여 형태로 사용될 수 있은 단일 단위의 예는 압축 정제, 필름 형 단위, 호일형 단위, 웨이퍼, 동결 건조된 매트릭스 단위 등과 같은 정제를 포함한다. 한 구체예에서, 고체 조성물은 고도로 다공성의 동결 건조된 형태이다. 이러한 동결 건조물 (때때로 웨이퍼 또는 동결 건조 정제라고도 함)은 화합물의 신속한 용해를 가능하게하는 빠른 분해에 특히 유용한다.

[0390] 한편, 일부 적용을 위해 고체 조성물은 또한 상기 정의된 바와 같이 다중 단위 투여 형태로 형성 될 수 있다. 다중 단위의 예는 분말, 과립, 마이크로 입자, 펠릿, 소형 정제, 비드, 동결 건조 분말 등이다. 한 구체예에서, 고체 조성물은 동결 건조된 분말이다. 이러한 분산된 동결 건조 시스템은 다수의 분말 입자로 구성되며, 분말 형성에 사용되는 동결 건조 공정으로 인해 각 입자는 불규칙한 다공성 미세 구조를 가지고 있어 분말이 물을 매우 빠르게 흡수할 수 있어 빠른 용해가 가능한다. 발포성 조성물은 또한 화합물의 빠른 분산 및 흡수를 돕기 위해 고려된다.

[0391] 또한 신속한 약물 용해를 달성할 수 있은 또 다른 유형의 다중 미립자 시스템은 화합물이 개별 입자의 외부 표면에 위치하도록 본원에 제공된 화합물로 코팅된 수용성 부형제의 분말, 과립 또는 펠렛의 시스템이다. 이러한 유형의 시스템에서, 수용성 저 분자량 부형제는 이러한 코팅된 입자의 코어를 제조하는 데 유용할 수 있으며, 이는 후속적으로 화합물 및 예를 들어, 하나 이상의 추가 부형제 가령 결합제, 기공 형성제, 당류, 당 알코올, 필름 형성 중합체, 가소제, 또는 약제학적 코팅 조성물에 사용되는 기타 부형제를 포함하는 코팅 조성물로 코팅 될 수 있다.

[0392] 또한 키트가 본원에서 제공된다. 전형적으로, 키트는 본원에 기재된 바와 같은 하나 이상의 화합물 또는 조성물을 포함한다. 특정 구체예에서, 키트는 예를 들어 본원에 제공된 바와 같은 화합물을 전달 또는 투여하기위한 하나 이상의 전달 시스템 및 키트 사용 지침 (예를 들어, 환자 치료를위한 지침)을 포함할 수 있다. 또 다른 구체예에서, 키트는 본원에 기재된 화합물 또는 조성물 및 내용물이 암 환자에게 투여되어야 함을 나타내는 라벨을 포함할 수 있다. 또 다른 구체예에서, 키트는 본원에 기재된 화합물 또는 조성물 및 내용물이 교모세포종, 난소암, 유방암, 췌장암, 급성 림프구성 백혈병, 급성 거핵모세포종 백혈병, 만성 골수성 백혈병, 알츠하이머병, 근위축성 측삭 경화증, CDKL5 결핍 장애, 다운 증후군, 파킨슨증-17을 동반한 전두측두엽 치매(FTDP-17), 루이체 치매, 파킨슨병, 픽병, 자폐증, 치매, 간질, 헌팅턴병 및 다발성 경화증에 걸린 환자에게 투여되어야 함을 나타내는 라벨을 포함할 수 있다.

[0393] 치료방법

[0394] 본원에 제공된 화합물 및 조성물은 DYRK1A의 억제제로서 사용될 수 있으며, 따라서 DYRK1A의 과발현이 연루된 다양한 장애 및 질병, 예를 들어 암 및 신경학적 병태/장애/질병을 치료하는 데 사용될 수 있다. 본원에 제공된 화합물 및 조성물로 치료할 수 있는 질병의 비제한적인 예는 다양한 암, 알츠하이머병, 근위축성 측삭 경화증, CDKL5 결핍 장애, 다운 증후군, 파킨슨증-17을 동반한 전두측두엽 치매(FTDP-17), 루이(Lewy)소체 치매, 파킨슨병, 픽병, 그리고 자폐증, 치매, 간질, 헌팅턴병, 다발성 경화증과 같은 뚜렷한 신경퇴행이 있는 추가 질병; 만성 외상성 뇌병증, 외상성 뇌 손상, 종양, 뇌졸중, 타우병증(예: 픽병, 진행성 핵상 마비, 피질기저핵 변성, 호은성 곡물 질환, 구형 신경교 타우병증, 원발성 연령 관련 타우병증, 신경원섬유 농축체 치매, 만성 외상성 뇌병증(CTE), 타우 함유 전두측두엽 변성(FTLD-tau), 및 노화 관련 타우 성상아교병증을 포함한다. 임상 증상은 전두측두엽 치매, 피질기저핵 증후군, 리처드슨 증후군, 파킨슨증, 보행 동결을 동반한 순수 무운동증, 드물게 운동 뉴런 증상 또는 소뇌 운동실조, 당뇨병, 건선, 무릎 골관절염, 건병증, 인간 면역결핍 바이러스 1형(HIV-1), 인간 거대세포 바이러스(HCMV), C형 간염 바이러스(HCV) 및 단순 포진 바이러스 1 (HSV-1)을 포함한다.

[0395] DYRK1A를 코딩하는 유전자는 다운증후군 결정 영역(DSCR) 내의 염색체 21에 위치하며, 이 삼배체는 대부분의 다

운증후군 관련 결핍증의 원인이 된다(*FEBS Journal* (2011), *278*, 246-256). DYRK1A의 단순한 1.5배 과발현이 다운 증후군 환자에서 관찰되는 대부분의 인지 결핍의 원인임을 보여주는 상당한 유전적 및 약리학적 증거가 있다(*Pharmacology & Therapeutics* (2019), *194*, 199-221 and *Brain Science* (2018), *8(10)*, 187). DYRK1A 수준의 유전적 정상화 또는 촉매 활성의 약리학적 억제는 인지 기능을 회복시킨다. DYRK1A의 약리학적 억제제의 개발은 다운증후군과 관련된 인지 결핍의 치료를 위한 주요 방법이다.

[0396] DYRK1A 및 DYRK1B는 인간 거대세포바이러스(HCMV) 태반 복제 중에 활용된다. DYRK를 억제하면 C형 간염 바이러스(HCV), 인간 거대세포 바이러스(HCMV), 인간 면역결핍 바이러스 1형(HIV-1), 단순 포진 바이러스 1(HSV-1)을 포함한 다양한 바이러스의 복제를 방지한다(*Journal of Virology* (2020), *94(6)* and *PLoS ONE* (2015), *10*, e0144229).

[0397] DYRK1A/1B 억제제가 인슐린을 생성하는 췌장 β 세포의 증식을 유도하여 DYRK1A/1B 키나제가 제1형 및 2형 당뇨병 및 임신성 당뇨병 모두에 대한 β 세포 재생을 위한 매력적인 치료 표적이 된다는 것을 보여주는 증거가 늘어나고 있다 (*Nature Communications* (2015), *6(8372)*; *Diabetes* (2016), *65(6)*, 1660-1671; *JCI Insight* (2020), *5(1)*, e132594; *Science Translational Medicine* (2020), *12(530)*; *International Journal of Molecular Sciences* (2021), *22(16)*, 9083; and *Journal of Medicinal Chemistry* (2021), *64(6)*, 2901-2922). DYRK 억제제로 치료할 수 있는 다른 형태의 당뇨병으로는 젊은이의 성숙 발병 당뇨병(MODY, 단일 유전자 당뇨병), 인슐린에 반응하지 않는 신체 조직 수용체로 인해 발생하는 당뇨병 사례, 이중 당뇨병(제1형 당뇨병 환자가 인슐린 저항성인 경우), 인슐린 길항 호르몬의 과도한 분비와 관련된 당뇨병, 영양실조 관련 당뇨병(ICD-10 코드 E12), 베타 세포 기능에 결함을 초래하는 유전적 돌연변이(상염색체 또는 미토콘드리아)로 인한 당뇨병이다.

[0398] DYRK1A를 고형암 및 백혈병과 연결하는 많은 문헌이 있다 (*Pharmacology & Therapeutics* (2015), *151*, 87-98; *Cancers* (2020), *12(8)*, 2106; and *Cellular and Molecular Life Sciences* (2021), *78*, 603-619). 가장 두드러진 예는 췌장암(*Gut* (2019), *68(8)*, 1465-1476 and *Gene* (2020), *758*, 144960), 뇌종양, 교모세포종(*Journal of Clinical Investigation* (2013), *123(6)*, 2475-2487), 급성 거핵구성 백혈병(AMKL)(*Journal of Clinical Investigation* (2012), *122(3)*, 948-962) 및 급성 림프구성 백혈병(ALL)(*Journal of Clinical Investigation* (2021), *131(1)*, e135937)이다. DYRK1A와 관련된 다른 암으로는 난소(*Frontiers in Oncology* (2021), *11*, 637193), 두경부 편평 세포 암종(*Scientific Reports* (2016), *6*, 36132), 간세포 암종(*Cell Death & Disease* (2021), *12*, 125)이 있고, DYRK1A는 DNA 손상 반응을 조절한다(*Scientific Reports* (2019), *9*, 6014 and *Scientific Reports* (2019), *9*, 6539). 일부 상황에서는 DYRK1A가 종양 억제 단백질로 기능하는 것으로 보이다(*Molecular & Cellular Oncology* (2015), *2(1)*, e970048 and *Nature* (2016), *529*, 172-177).

[0399] 다른 암도 본 명세서에 기술된 화합물 및 조성물로 치료될 수 있다.

[0400] 보다 구체적으로, 본원에 기술된 화합물, 조성물 및 방법에 의해 치료될 수 있는 암에는 다음이 포함되지만 이에 제한되지는 않는다:

[0401] 1) 유방암, 예를 들어 ER+ 유방암, ER- 유방암, her2- 유방암, her2+ 유방암, 섬유선종, 엽상종양 및 육종과 같은 간질 종양, 및 대장 유두종과 같은 상피 종양을 포함함; 유관 상피내 암종(파제트병 포함) 및 소엽 상피내 암종을 포함하는 상피내(비침습) 암종, 및 침윤성 유관 암종, 침윤성 소엽 암종, 수질 암종을 포함하나 이에 제한되지 않는 침윤성(침윤성) 암종, 콜로이드(점액성) 암종, 관상 암종, 및 침윤성 유두암종을 포함하는 유방의 암종; 화학저항성 유방암(TNBC) 및 기타 악성 신생물. 유방암의 추가 예는 내강 A, 내강 B, 기저 A, 기저 B 및 에스트로겐 수용체 음성(ER-), 프로게스테론 수용체 음성 및 her2 음성(her2-)인 삼중 음성 유방암을 포함할 수 있다. 일부 구체예에서, 유방암은 고위험 종양형 점수를 가질 수 있다.

[0402] 2) 예를 들어 육종, 예를 들어 혈관육종, 섬유육종, 횡문근육종 및 지방육종; 점액종; 횡문근종; 섬유종; 지방종 및 기형종을 포함하는 심장암.

[0403] 3) 폐암, 예를 들어 기관지성 암종, 예를 들어 편평 세포, 미분화 소세포, 미분화 대세포 및 선암종; 폐포 및 기관지 암종; 기관지 선종; 육종; 림프종; 연골종성 과오종; 화학저항성 소세포폐암(SCLC) 및 중피종.

[0404] 4) 예를 들어 식도암, 예를 들어 편평 세포 암종, 선암종, 평활근육종 및 림프종을 포함하는 위장암; 위암, 예를 들어 암종, 림프종 및 평활근육종; 췌장암, 예를 들어 관 선암종, 인슐린종, 글루카곤종, 가스트린종, 카르시노이드 종양 및 비포종; APC 유전자 돌연변이가 있는 결장암; 소장암, 예를 들어 선암종, 림프종, 카르시노이드 종양, 카포시 육종, 평활근종, 혈관종, 지방종, 신경섬유종 및 섬유종; 대장암, 예를 들어 선암종, 관상 선

종, 융모 선종, 과오종 및 평활근종.

[0405] 5) 예를 들어 신장암, 예를 들어 선암종, 윌름종양(신모세포종), 림프종 및 백혈병을 포함하는 비뇨생식관암; 방광 및 요도암, 예를 들어 편평 세포 암종, 이행 세포 암종 및 선암종; 전립선암, 예를 들어 선암종 및 육종; 고환암, 예를 들어 정상피종, 기형종, 배아 암종, 기형암종, 융모상피암종, 육종, 간질 세포 암종, 섬유종, 섬유선종, 선종양 종양 및 지방종.

[0406] 6) 간암, 예를 들어 간암, 예를 들어 간세포 암종; 담관암종; 간모세포종; 혈관육종; 간세포 선종; 및 혈관종.

[0407] 7) 뼈암, 예를 들어 골육종(골육종), 섬유육종, 악성 섬유성 조직구종, 연골육종, 유잉 육종, 악성 림프종(세망세포 육종), 다발성 골수종, 악성 거대 세포 종양 척색종, 골연골종(골연골종)을 포함함 골외증), 양성 연골종, 연골모세포종, 연골점액섬유종, 유골 골종 및 거대 세포 종양.

[0408] 8) 예를 들어 두개골 암, 예를 들어 골종, 혈관종, 육아종, 황색종 및 변형 골염을 포함하는 신경계 암; 수막암, 예를 들어 수막종, 수막육종 및 신경교종증; 뇌암, 예를 들어 성상세포종, 수모세포종, 신경아교종, 뇌실막종, 배아종(송과선종), 다형성 교모세포종, 희돌기교종, 희소돌기아교세포종, 신경초종, 망막모세포종 및 선천성 종양; 및 척수암, 예를 들어 신경섬유종, 수막종, 신경교종 및 육종; 소아 뇌암, 예를 들어 성상세포종, 수모세포종, 신경교종, 뇌실막종, 배세포종(예: 배아종) 및 비배아종성 종양, 가령 기형종, 융모막암종, 내배엽동 종양(난황낭 종양), 배아 암종 및 혼합 종양.

[0409] 9) 부인과 암, 예를 들어 자궁암, 예를 들어 자궁내막암(예를 들어 암종, 자궁내막 선암종, 장액성 암종, 투명세포 암종, 점액성 암종, 혼합 또는 미분화 암종(혼합 뮐러 종양 포함))을 포함함, 자궁내막 간질 육종, 자궁내막의 편평 세포 암종, 요로상피 암종, CTNNB1 돌연변이가 있는 자궁내막암); 자궁경부암, 예를 들어 자궁경부 암종 및 종양 전 자궁경부 이형성증; 난소암, 예를 들어 BRCA 돌연변이 난소암, 표면 상피-기질 종양(상피성 난소암(1형(자궁내막, 점액성, 투명 세포, 저등급 장액)) 또는 2형(저분화, 암육종, 고급 장액))), 장액성 낭선암종, 점액성 낭선암종, 자궁내막모양 종양, 소세포 난소암(고칼슘혈증형 소세포 난소암, 폐형 소세포 난소암)을 포함한 난소 암종, 분류되지 않은 암종, 과립막 세포 종양, 세르톨리 레이디히(Sertoli Leydig) 세포 종양, 미분화세포종 및 악성 기형종; 외음부암, 예를 들어 편평 세포 암종, 상피내 암종, 선암종, 섬유육종 및 흑색종; 질암, 예를 들어 투명 세포 암종, 편평 세포 암종, 보트리오이드 육종 및 배아 횡문근육종; 및 나팔관암, 예를 들어 암종, 원발성 나팔관암; 원발성 복막암(장액성 표면 유두상 암종, 원발성 복막 암종, 난소외 장액성 암종, 원발성 장액 유두상 암종 및 건선암종으로도 알려져 있음).

[0410] 10) 혈액암, 예를 들어 혈액암, 예를 들어 급성 골수성 백혈병, 만성 골수성 백혈병, 골수이형성 증후군(단일선 이형성증을 동반한 난치성 혈구감소증(불응성 빈혈, 불응성 호중구감소증 및 불응성 혈소판감소증)), 불응성 빈혈 고리철아세포, 다계통 이형성증을 동반한 난치성 혈구감소증, 과잉 아구 I 및 II를 동반한 난치성 빈혈, 소아기의 불응성 혈구감소증) 및 골수증식성 신생물, 급성 림프구성 백혈병, 만성 림프구성 백혈병, 골수증식성 질환, 다발성 골수종, 골수이형성 증후군, 골수이형성-골수증식성 질환, 호지킨 림프종, 비호지킨 림프종(악성 림프종) 및 발덴스트롬 마크로글로불린혈증.

[0411] 11) 예를 들어 악성 흑색종 및 전이성 흑색종, 기저 세포 암종, 편평 세포 암종, 카포시 육종, 모반 이형성 모반, 지방종, 혈관종, 피부 섬유종, 켈로이드 및 경피증을 포함하는 피부암 및 피부 장애.

[0412] 12) 예를 들어 신경모세포종을 포함하는 부신암.

[0413] 13) 연조직 육종(STS), 예를 들어 섬유육종, 악성 섬유성 조직구종, 피부섬유육종, 지방육종, 횡문근육종, 평활근육종, 혈관육종, 카포시 육종, 림프관육종, 윤활막 육종, 악성 말초 신경초 종양(악성 신경섬유육종이라고도 함, 신경초종 및 신경성 육종), 신경섬유육종, 골격외 연골육종, 골격외 골육종, 골격외 점액성 연골육종, 골격외 중간엽, 배아, 폐포 연부육종 및 영아 혈관주위세포종.

[0414] 보다 구체적으로, 본원에 기술된 화합물, 조성물 및 방법에 의해 치료될 수 있는 중추신경계 종양은 다음을 포함한다:

[0415] 1) 성상세포종양, 예를 들어 미만성 성상세포종(원섬유성, 원형질성 성상세포종, 혼합형), 역형성(악성) 성상세포종, 다형성 교모세포종(거대 세포 교모세포종 및 신경교육종), 모세포 성상세포종(필로믹소이드 성상세포종), 다형성 황색성상세포종, 거대한 세포 성상세포종, 뇌교종증.

[0416] 2) 핍지교종 종양, 예를 들어 핍지교종 및 역형성 핍지교종.

[0417] 3) 희성성상세포 종양, 예를 들어 희소성상세포종 및 역형성 희소성상세포종.

[0418] 4) 뇌실막 종양, 예를 들어 뇌실막하종, 점액유두상세포종, 뇌실막종, (세포성, 유두상, 투명 세포, 탄핵세포) 및 역형성(악성) 뇌실막종.

[0419] 5) 맥락막 신경총 종양, 예를 들어 맥락막 신경총 유두종, 비정형 맥락총 유두종 및 맥락막 신경총 암종.

[0420] 6) 신경 및 혼합 신경교교종 종양, 예를 들어 신경절세포종, 신경절교종, 배아형성 신경상피 종양(DNET), 소뇌의 이형성 신경절세포종(Lhermitte-Duclos), 결합형성 영아 성상세포종/신경교종, 중추 신경세포종, 역형성 신경교종, 뇌실외 신경세포종, 소뇌 지방신경세포종, 유두신경교종양, 제4뇌실의 로제트 형성 신경교종양, 및 종사의 부신경절종.

[0421] 7) 송과체 종양, 예를 들어 송과세포종, 송과체모세포종, 송과체 영역의 유두 종양 및 중간 분화의 송과체 실질 종양.

[0422] 8) 배아 종양, 예를 들어 수모세포종(광범위한 결절성을 갖는 수모세포종, 역형성 수모세포종, 결합형성, 대세포, 흑색증, 수모세포종), 수질상피종, 천막상 원시 신경외배엽 종양, 및 원시 신경외배엽 종양(PNET), 예를 들어 신경모세포종, 신경절신경모세포종, 뇌실막세포종, 비정형 기형/횡문근 종양.

[0423] 9) 신경모세포 종양, 예를 들어 후각(감각신경모세포종), 후각 신경상피종, 및 부신 및 교감신경계의 신경모세포종.

[0424] 10) 신경교 종양, 예를 들어 성상아세포종, 제3뇌실의 척색 신경교종, 및 혈관중심 신경교종.

[0425] 11) 뇌신경 및 척수주위 신경의 종양, 예를 들어 신경초종, 신경섬유종 회음부종 및 악성 말초 신경초 종양.

[0426] 12) 수막 종양, 예를 들어 수막상피 세포의 종양, 예를 들어 수막종(비정형 수막종 및 역형성 수막종); 중간엽 종양, 예를 들어 지방종, 혈관지방종, 동면종, 지방육종, 고립성 섬유종, 섬유육종, 악성 섬유성 조직구종, 평활근종, 평활근육종, 횡문근종, 횡문근육종, 연골종, 연골육종, 골종, 골육종, 골연골종, 혈관종, 혈관내피종, 혈관주위세포종, 역형성 혈관주위세포종, 혈관육종, 카포시 육종 및 유잉 육종; 원발성 멜라닌세포 병변, 예를 들어 미만성 멜라닌세포증, 흑색세포종, 악성 흑색종, 수막 흑색종증; 및 혈관모세포종.

[0427] 13) 조혈계 종양, 예를 들어 악성 림프종, 형질세포종 및 과립구 육종.

[0428] 14) 생식 세포 종양, 예를 들어 배아종, 배아 암종, 난황낭 종양, 융모막암종, 기형종 및 혼합 생식 세포 종양.

[0429] 15) 셀라 영역의 종양, 예를 들어 두개인두종, 과립 세포 종양, 뇌하수체종 및 선하수체의 방추 세포 종양종.

[0430] 암은 전이성이거나 비전이성일 수 있는 고형 종양일 수 있다. 백혈병처럼 확산된 조직으로 암이 발생할 수도 있다. 따라서, 본원에 제공된 용어 "종양 세포"는 상기 확인된 장애 중 어느 하나에 의해 고통받는 세포를 포함한다.

[0431] 본원에 기재된 바와 같은 화합물 또는 조성물을 사용하여 암을 치료하는 방법은 예를 들어 화학요법, 방사선 조사 또는 수술(예를 들어 난소절제술)에 의해 암을 치료하는 기존 방법과 조합될 수 있다. 일부 구체예에서, 화합물 또는 조성물은 또 다른 항암제 또는 치료 전, 도중 또는 후에 투여될 수 있다.

[0432] 알츠하이머병 발병에서 DYRK1A의 역할에 대한 증거가 늘어나고 있다(*Future Medicinal Chemistry* **(2016)**, *8(6)*, 681-696 and *European Journal of Medicinal Chemistry* **(2018)**, *158*, 559-592). DYRK1A는 알츠하이머병 및 치매와 관련된 주요 기질인 Tau, septin 4, 아밀로이드 전구체 단백질(APP), 프레세닐린 1, 네프릴리신, Munc18-1, α-시누클레인, RCAN1 및 β-투불린을 인산화한다. Tau 엑손 10의 대체 스플라이싱을 조절함으로써 DYRK1A는 4R-Tau 이소형에 비해 3R-Tau 스플라이스 이소형(DS/AD/타우병증의 특징)의 생성을 유리하게 한다(*Journal of Biological Chemistry* **(2015)**, *290*, 15219-15237).

[0433] 게놈 전체 연관 연구(GWAS)는 DYRK1A가 파킨슨병의 위험 요인임을 밝혀냈다(*The Lancet Neurology* **(2019)**, *18(12)*, 1091-1102). DYRK1A는 파킨슨병, 셉틴 4, α-시누클레인과 같은 파킨슨병의 주요 인자를 인산화한다. 파킨슨병에 특이적인 마이크로 RNA의 상향 조절은 DYRK1A 발현을 표적으로 한다. 파킨슨병과 픽병에서 DYRK1A 발현이 증가한다는 추가 증거가 있다(*Neurobiology of Disease* **(2005)**, *20(2)*, 392-400).

[0434] 본원에 제공된 화합물 및 조성물은 효소 DYRK1A의 억제제 및/또는 조절제로서 사용될 수 있으며, 이에 따라 타우 단백질과 관련된 다양한 장애 및 질병을 치료하는 데 사용될 수 있고, 이는 알츠하이머병, 근위축성 측삭 경

화증(ALS), 다운 증후군, 파킨슨증-17을 동반한 FTD(FTDP-17)를 포함한 전두측두엽 치매(FTD), 행동 변이 전두측두엽 치매(bvFTD), 운동 신경 질환(MND) 환자의 FTD(일반적으로 근위축성 측두엽 치매) 경화증(FTD-ALS라고도 함), 피질기저핵 변성(CBD)(피질기저핵 변성이라고도 함), 진행성 핵상 마비, 원발성 진행성 실어증(PPA), 구형 신경교 타우병증(GGT), 근긴장성 이영양증 1형(DM1)(또는 DM1)(또는 FTD-ALS라고도 함) 스테이너트병), 근긴장 이영양증 2형(DM2)(근위 근긴장성 근병증이라고도 함), 괌 복합증, 호은성 곡물병, 권투선수 치매, 뇌염후 파킨슨증, 루이소체 치매, 파킨슨병, 픽병 및 뚜렷한 신경퇴행이 있는 추가 질병 자폐증, 치매, 간질, 헌팅턴병, 다발성 경화증 등; 만성 외상성 뇌병증, 외상성 뇌 손상, 종양 및 뇌졸중과 같은 후천적 뇌 손상과 관련된 질병 및 장애를 포함하지만 이에 제한되지 않는다.

[0435] 본원에 제공된 화합물 및 조성물로 치료될 수 있는 신경 장애(예를 들어, 신경 질환 및 신경 질환)의 비제한적 예는 다음을 포함한다: 알츠하이머병, 실어증, 실행증, 거미막염, 모세혈관 확장증, 주의력 결핍 과잉 행동 장애, 청각 처리 장애, 자폐증, 알코올 중독, 벨 마비, 양극성 장애, 상완 신경총 손상, 카나반병, 수근관 증후군, 작열통, 중추 통증 증후군, 중추 뇌교 척수용해증, 중심핵근병증, 두부 장애, 뇌동맥류, 뇌동맥경화증, 뇌위축증, 뇌거대증, 뇌성마비, 뇌혈관염, 경추관협착증, 샤르코-마리-투스병, 키아리 기형, 만성피로증후군, 만성염증성 탈수초성 다발신경병증(CIDP), 만성통증, 코핀-로우리 증후군, 복합부위통증증후군, 압박신경병증, 선천성 안면 양측 마비, 피질기저핵 변성, 두개골 동맥염, 두개골 유합증, 크로이츠펠트-야콥병, 누적 외상 장애, 쿠싱 증후군, 세포거대 봉입체 질환(CIBD)댄디-워커 증후군, 도슨병, 드 모르시에 증후군, 데제린-클럼프케 마비, 데제린- 소타스병, 수면위상지연증후군, 치매, 피부근염, 발달장애, 당뇨병성 신경병증, 미만성 경화증, 드라베증후군, 자율신경증, 난산증, 난서증, 난독증, 근긴장이상, 공안장증후군, 뇌염, 뇌류, 뇌삼차혈관종증, 유분증, 간질, 에르브병 마비, 홍반사지통증, 본태성 떨림, 파브리병, 파브리병, 파흐 증후군, 가족성 경직성 마비, 열성경련, 피셔 증후군, 프리드라이히 운동실조증, 섬유근육통, 포빌 증후군, 고셔병, 게르스트만 증후군, 거대 세포 동맥염, 거대 세포 봉입병, 구상 세포 백질이영양증, 회백질 이소증, 길랭-바레 증후군, HTLV-1 관련 골수병증, 할러보든-스파츠병, 편측 안면 경련, 유전성 경직성 하반신 마비, 다발성 다발성 유전병증, 귀 대상포진, 대상 포진, 히라야마 증후군, 전전뇌증, 헌팅턴병, 수두뇌증, 수두증, 코르티솔 과다증, 저산소증, 면역 매개 뇌척수염, 봉입체 근염, 색소성 요실금, 영아 피탄산 축적 질환, 영아 레프섬병, 영아 연축, 염증성 근육병증, 두개내 낭종, 두개내 고혈압, 주베르 증후군, 카락 증후군, 컨스-세이어 증후군, 케네디 질병, 킨스본 증후군, 클리펠 파일 증후군, 크라베병, 쿠겔베르그-웰란더병, 쿠루, 라포라병, 램버트-이튼 근무력증 증후군, 란다우-클레프너 증후군, 외측 수질(발렌버그) 증후군, 레이병, 레녹스-가스토 증후군, 레슈- 니한증후군, 백질이영양증, 루이소체치매, 무해증, 감금증후군, 루게릭병, 요추디스크질환, 요추척추관협착증, 라임병, 마차도조셉병(척수소뇌실조증 3형), 대뇌증, 대시증, 거대뇌증, 멜커슨- 로젠탈 증후군, 메니에르병, 수막염, 멘케스병, 이염성 백질이영양증, 소두증, 소시증, 밀러 피셔 증후군, 미소포니아, 미토콘드리아 근육병증, 뫼비우스 증후군, 단일체 근위축, 운동 신경 질환, 운동 기능 장애, 모야모야병, 뮤코다당증, 다발성 경색 치매 다초점운동신경병증, 다발경화증, 다계통위축, 근이영양증, 근육성뇌척수염, 중증근육무력증, 골수파괴성 미만성 경화증, 근간대성 영아뇌병증, 간대성 근병증, 근세관근병증, 선천성 근긴장증, 기면증, 신경섬유종증, 악성신경이완증후군, 홍반루푸스 신경근긴장증, 신경세로이드 리포푸스증, 니만-픽병, 오설리반-맥레오드 증후군, 후두 신경통, 초자연적 척수 이상증 서열, 오타하라 증후군, 올리보교소뇌 위축, 눈간대근경련 증후군, 시신경염, 기립성 저혈압, 회음증, 감각이상, 파킨슨병, 선천성 근긴장증, 부신생물 질환, 발작 발작, 패리-롬베르그 증후군, 펠리자우스-메르츠바허병, 주기성 마비, 말초 신경병증, 광성 재채기 반사, 피탄산축적병, 픽병, 다발성 소체증(PMG), 다발근염, 뇌수종, 소아마비후 증후군, 대상포진후 신경통(PHN), 체위저혈압, 프라더-윌리 증후군, 원발성 측삭 경화증, 프리온 질환, 진행성 편측안면 위축, 진행성 다초점 백질뇌병증, 진행성 핵상 마비, 가성뇌종양, 램지 헌트 증후군 I형, 램지 헌트 증후군 II형, 램지 헌트증후군 3형, 라스무센뇌염, 반사신경혈관이영양증, 레프섬병, 하지불안증후군, 레트로바이러스 관련 척수병증, 레트증후군, 라이증후군, 리듬운동장애, 롬베르그증후군, 성비투스댄스, 샌드호프병, 정신분열증, 스킬더병, 정신분열증, 감각통합장애, 중격시신경이형성증, 샤이드래거 증후군, 쇼그렌 증후군, 후천증, 소토스 증후군, 경직, 척추이분증, 척수 종양, 척수근위축증, 척수소뇌실조증, 스틸-리처드슨-올스제프스키 증후군, 강직증후군, 뇌졸중, 스터지- 웨버 증후군, 아급성 경화성 범뇌염, 피질하 동맥경화성 뇌병증, 표재성 철퇴증, 시덴함 무도병, 실신, 공감각, 척수공동증, 족근관 증후군, 만발성 운동 이상증, 만발성 분열증, 타를로프 낭종, 테이삭스병, 측두 동맥염, 파상풍, 척수 속박 증후군, 톰센병, 흉곽 출구 증후군, 틱 둘루르, 토드 마비, 뚜렛 증후군, 독성 뇌병증, 일과성 허혈 발작, 전염성 해면상 뇌병증, 횡단 척수염, 떨림, 삼차 신경통, 열대 경직성 하반신 마비, 트리파노소마증, 결절성 경화증, 편재성 편재증, 폰 히펠- 린다우병(VHL), 빌리위스크 뇌척수염(VE), 발렌베르그 증후군, 베르드니히병, 호프만병, 웨스트 증후군, 윌리엄스 증후군, 윌슨병 및 젤위거 증후군.

[0436] 화합물 및 조성물은 또한 침습성 암의 발병, 종양 혈관신생 및 전이를 억제하는데 유용할 수 있다.

[0437] 일부 구체예에서, 약제학적 조성물은 치료 유효량의 화학식 I의 화합물 또는 그의 약제학적으로 허용가능한 염, 및 약제학적으로 허용가능한 부형제를 포함한다.

[0438] 일부 구체예에서, 장애 또는 질환은 암이다.

[0439] 일부 구체예에서, 장애 또는 질환은 전이성 흑색종이다.

[0440] 일부 구체예에서, 장애 또는 질환은 힘줄 재생이다.

[0441] 일부 구체예에서, 장애 또는 질환은 당뇨병이다.

[0442] 일부 구체예에서, 장애 또는 질환은 퇴행성 디스크 질환이다.

[0443] 일부 구체예에서, 장애 또는 질환은 골관절염이다.

[0444] 일부 구체예에서, 장애 또는 질환은 바이러스 감염이다.

[0445] 일부 구체예에서, 장애 또는 질환은 신경 장애이다.

[0446] 일부 구체예에서, 장애 또는 질환은 알츠하이머병이다.

[0447] 일부 구체예에서, 장애 또는 질환은 골관절염이다.

[0448] 일부 구체예에서, 환자는 인간이다.

[0449] 일부 구체예에서, 암은 다음으로부터 선택된다: 간세포성 암종, 대장 암, 유방 암, 췌장 암, 만성 골수 백혈병(CML), 만성 골수단핵구 백혈병, 만성 림프구 백혈병 (CLL), 급성 골수 백혈병, 급성 림프구 백혈병, 호지킨 림프종, 림프종, 육종, 및 난소 암.

[0450] 일부 구체예에서, 암은 다음으로부터 선택된다: 폐 암 - 비-소세포, 폐 암 - 소세포, 다발성 골수종, 비인두 암, 신경아세포종, 골육종, 음경암, 뇌하수체 종양, 전립선 암, 망막아종, 활막 육종, 횡문근육종, 침샘 암, 피부 암 - 기저 및 편평상피 세포, 피부 암 - 흑색종, 소장암, 위 암, 고환 암, 흉선암, 갑상선 암, 자궁 육종, 질암, 외음부 암, 후두 또는 하인두 암, 신장 암, Kaposi 육종, 임신영양막병, 위장관 간질 종양, 위장관 암종 종양, 담낭 암, 안암 (흑색종 및 림프종), Ewing 종양, 식도 암, 자궁 내막 암, 대장결장 암, 자궁경부 암, 뇌 또는 척수 종양, 골 전이, 골 암, 방광 암, 담관 암, 항문 암, 및 부신피질 암.

[0451] 일부 구체예에서, 암은 간세포 암종; 일부 구체예에서, 암은 결장암이고; 일부 구체예에서, 암은 대장암이고; 일부 구체예에서, 암은 유방암이고; 일부 구체예에서, 암은 췌장암이고; 일부 구체예에서, 암은 만성 골수성 백혈병(CML)이고; 일부 구체예에서, 암은 만성 골수단구성 백혈병이고; 일부 구체예에서, 암은 만성 림프구성 백혈병(CLL)이고; 일부 구체예에서, 암은 급성 골수성 백혈병이고; 일부 구체예에서, 암은 급성 림프구성 백혈병이고; 일부 구체예에서, 암은 호지킨 림프종이고; 일부 구체예에서, 암은 림프종이고; 일부 구체예에서, 암은 육종이고; 일부 구체예에서, 암은 난소암이고; 일부 구체예에서, 암은 폐암 - 비소세포이고; 일부 구체예에서, 암은 폐암 - 소세포이고; 일부 구체예에서, 암은 다발성 골수종이고; 일부 구체예에서, 암은 비인두암이고; 일부 구체예에서, 암은 신경모세포종이고; 일부 구체예에서, 암은 골육종이고; 일부 구체예에서, 암은 음경암이고; 일부 구체예에서, 암은 뇌하수체 종양이고; 일부 구체예에서, 암은 전립선암이고; 일부 구체예에서, 암은 망막모세포종이고; 일부 구체예에서, 암은 횡문근육종이고; 일부 구체예에서, 암은 타액선암이고; 일부 구체예에서, 암은 피부암 - 기저 세포 및 편평 세포이고; 일부 구체예에서, 암은 피부암 - 흑색종이고; 일부 구체예에서, 암은 소장암이고; 일부 구체예에서, 암은 위암이고; 일부 구체예에서, 암은 고환암이고; 일부 구체예에서, 암은 흉선암이고; 일부 구체예에서, 암은 갑상선암이고; 일부 구체예에서, 암은 자궁육종이고; 일부 구체예에서, 암은 질암이고; 일부 구체예에서, 암은 외음부암이고; 일부 구체예에서, 암은 윌름스 종양이고; 일부 구체예에서, 암은 후두암 또는 하인두암이고; 일부 구체예에서, 암은 신장암이고; 일부 구체예에서, 암은 카포시 육종이고; 일부 구체예에서, 암은 임신 융모성 질환이고; 일부 구체예에서, 암은 위장 간질 종양이고; 일부 구체예에서, 암은 위장 카르시노이드 종양이고; 일부 구체예에서, 암은 담낭암이고; 일부 구체예에서, 암은 눈암(흑색종 및 림프종)이고; 일부 구체예에서, 암은 유잉 종양이고; 일부 구체예에서, 암은 식도암이고; 일부 구체예에서, 암은 자궁내막암이고; 일부 구체예에서, 암은 대장암이고; 일부 구체예에서, 암은 자궁경부암이고; 일부 구체예에서, 암은 뇌 또는 척수 종양이고; 일부 구체예에서, 암은 골전이이고; 일부 구체예에서, 암은 골암이고; 일부 구체예에서, 암은 방광암이고; 일부 구체예에서, 암은 담관암이고; 일부 구체

예에서, 암은 항문암이고; 일부 구체예에서 암은 부신피질암이다.

[0452] 일부 구체예에서, 일부 구체예에서, 장애 또는 질환은 신경학적 병태, 장애, 또는 질병이고, 여기서 신경학적 질환은 다음으로부터 선택된다: 알츠하이머병, 전두측두엽 치매, 파킨슨병, 헌팅턴병, 진행성 핵상 마비, 피질기저핵 변성, 다발성 시스템 위축증, 근위축성 측삭 경화증(ALS), 봉입체 근염, 자폐증, 퇴행성 근병증.

[0453] 일부 구체예에서, 장애 또는 질환은 다음으로 이루어진 그룹으로부터 선택된다: 알츠하이머 병, 근위축성 측삭 경화증, 다운 증후군, 파킨슨증을 동반한 전측두엽성 치매 (FTDP-17), 루이소체 치매, 파킨슨 병, 픽병, 그리고 뚜렷한 신경 퇴화가있는 추가 질환 가령 자폐증, 치매, 간질, 헌팅턴병, 다발성 경화증; 후천성 뇌 손상과 관련된 질병 및 장애 가령 만성 외상성 뇌병증, 외상성 뇌 손상, 종양 및 뇌졸중.

[0454] 일부 구체예에서, 화학식 I의 화합물은 DYRK1A를 억제한다.

[0455] 일부 구체예에서, 방법은 환자에서 키나제 활성에 의해 매개되는 질환 또는 장애를 치료하고, 방법은 환자에게 치료 유효량의 화학식 I의 화합물(들) 또는 그의 약제학적으로 허용가능한 염을 투여하는 것을 포함한다.

[0456] 일부 구체예에서, 질환 또는 장애는 종양 성장, 세포 증식 또는 혈관신생을 포함한다.

[0457] 일부 구체예에서, 방법은 단백질 키나제 수용체의 활성을 억제하고, 방법은 수용체를 유효량의 화학식 I의 화합물(들) 또는 그의 약제학적으로 허용가능한 염과 접촉시키는 것을 포함한다.

[0458] 일부 구체예에서, 방법은 환자의 비정상적인 세포 증식과 연관된 질환 또는 장애를 치료하고; 방법은 환자에게 치료 유효량의 화학식 I의 화합물(들) 또는 그의 약제학적으로 허용가능한 염을 투여하는 것을 포함한다.

[0459] 일부 구체예에서, 방법은 환자의 비정상적인 세포 증식을 예방하거나 감소시키고; 방법은 환자에게 치료 유효량의 화학식 I의 화합물(들) 또는 그의 약제학적으로 허용가능한 염을 투여하는 것을 포함한다.

[0460] 일부 구체예에서, 방법은 환자의 비정상적인 세포 증식과 연관된 질환 또는 장애를 치료하고, 방법은 약제학적으로 허용가능한 담체 그리고 하나 이상의 다른 물질과 조합된 제1항의 화합물 중 1종 이상을 포함하는 약제학적 조성물을 환자에게 투여하는 것을 포함한다.

[0461] 생물학적 활성 평가

[0462] 본원에 기술된 화합물의 생물학적 활성은 당업자에게 공지된 임의의 적합한 분석을 사용하여 테스트될 수 있다. 예를 들어, 화합물의 활성은 아래에 설명된 테스트 방법 중 하나 이상을 사용하여 테스트할 수 있다.

[0463] 예를 들어, DYRK1A 생물학적 활성에 대한 시험관내 분석, 예를 들어 인간 SH-SY5Y 신경모세포종 세포주와 같은 신경 세포주에서 미세관 관련 단백질 타우(MAPT/Tau) 인산화의 조절이 사용될 수 있다. DYRK1A 조절된 인산화 수준에 대한 분석은 기본 pSer396 Tau 수준의 모니터링을 포함할 수 있으며, 이는 예를 들어 10 마이크로몰 최고 농도를 사용하여 후보 억제제 조성물의 연속 희석에 의해 측정되고 ELISA 또는 웨스턴 블롯팅에 의해 검출될 수 있다. DYRK-1A 조절 인산화에 대한 예시적인 분석은 미세소관 및 타우 인산화를 안정화하기에 충분한 기간(보통 최소 2일) 동안 96웰 플레이트 형식에서 배양하고 밤새 화합물을 그 후 1/3 연속 희석액으로 처리하고 용해시킨 SH-SY5Y 세포를 사용한다. 세포 용해물은 SDS PAGE로 분리된 후 니트로셀룰로오스로 옮겨지고 pSer396 Tau에 특이적인 항체로 탐침된다. 웨스턴 블롯팅에 사용된 HRP 연결 항체에 대한 화학발광 신호는 Carestream Image Station을 사용하여 검출하고 pSer396 및 베타-액틴에 대한 블롯 농도계는 ImageJ(NIH)를 사용하여 분석한다.

[0464] 추가 예에서, 후보 화합물의 활성은 위에서 언급한 용해물을 전체 Tau 코팅 플레이트에 첨가하고 특정 pThr212Tau 항체로 검출함으로써 phosphoTau(Thr212) AlphaLISA에 의해 측정될 수 있다. AlphaLISA 신호의 비색 검출은 EnVision Multilabel Plate Reader(Perkin Elmer)에 의해 수행된다.

[0465] 본 개시내용을 추가로 설명하기 위해, 다음 실시예가 포함된다. 물론, 실시예는 본 개시 내용을 구체적으로 제한하는 것으로 해석되어서는 안 된다. 청구범위의 범위 내에서 이러한 예의 변형은 당업자의 범위 내에 있으며, 본 명세서에 기술되고 청구된 개시의 범위 내에 속하는 것으로 간주된다. 독자는 본 개시내용으로 무장된 당업자 및 당업자가 배타적인 예시 없이 본 개시내용을 준비하고 사용할 수 있다는 것을 인식할 것이다.

[0466] **실시예**

[0467] 화합물 제조

[0468] 본 개시의 화합물을 제조하는데 사용되는 출발 물질은 공지되어 있거나, 공지된 방법에 의해 제조되거나, 상업

적으로 입수 가능하다. 본원에 청구된 화합물과 관련된 전구체 및 기능성을 제조하는 방법이 일반적으로 문헌에 기재되어 있다는 것은 당업자에게 명백할 것이다. 문헌 및 본 개시 내용을 바탕으로 숙련된 기술자는 임의의 화합물을 제조할 수 있는 장비를 잘 갖추고 있다.

[0469] 유기 화학 분야의 숙련된 기술자는 추가 지시 없이 쉽게 조작을 수행할 수 있다는 것이 인식된다, 즉, 이러한 조작을 수행하는 것은 숙련된 기술자의 범위 및 실행 내에 충분히 포함된다. 여기에는 카르보닐 화합물의 상응하는 알코올로의 환원, 산화, 아실화, 친전자성 및 친핵성 방향족 치환, 에테르화, 에스테르화 및 비누화 등이 포함된다. 이러한 조작은 *March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure* 7th Ed., John Wiley & Sons (2013), Carey and Sundberg, *Advanced Organic Chemistry* 5th Ed., Springer (2007), *Comprehensive Organic Transformations: A Guide to Functional Group Transformations*, 2nd Ed., John Wiley & Sons (1999)(전체 내용이 참조로 여기에 포함됨) 등과 같은 표준 텍스트에서 논의된다.

[0470] 숙련된 기술자는 다른 작용기가 분자 내에서 차폐되거나 보호될 때 특정 반응이 가장 잘 수행되어 임의의 바람직하지 않은 부반응을 피하고/하거나 반응 수율을 증가시킨다는 것을 쉽게 인식할 것이다. 종종 숙련된 기술자는 이러한 증가된 수율을 달성하거나 원하지 않는 반응을 피하기 위해 보호기를 활용한다. 이러한 반응은 문헌에서 발견되며 또한 숙련된 기술자의 범위 내에 있다. 이러한 조작의 많은 예는 예를 들어 P. Wuts *Greene's Protective Groups in Organic Synthesis,* 5th Ed., John Wiley & Sons (2014)에서 찾을 수 있으며, 이는 전체 내용이 참조로 여기에 포함된다.

[0471] 본 명세서에 사용된 상표는 단지 예일 뿐이며 개시 당시 사용된 예시 자료를 반영한다. 당업자는 로트, 제조 공정 등의 변화가 예상된다는 것을 인식할 것이다. 따라서, 예 및 여기에 사용된 상표는 제한적이지 않으며, 제한하려는 의도가 아니며 단지 숙련된 기술자가 본 개시의 하나 이상의 실시예를 수행하기 위해 선택할 수 있는 방법을 보여주는 예시일 뿐이다.

[0472] (^{1}H) 핵자기 공명 스펙트럼(NMR)은 Bruker NMR 분광계(Avance TM DRX300, 1H의 경우 300MHz 또는 Avance TM DRX500, ^{1}H의 경우 500MHz) 또는 Varian NMR 분광계(Mercury 400BB, ^{1}H의 경우 400MHz)를 사용하여 표시된 용매에서 측정되었다. 피크 위치는 테트라메틸실란의 다운필드 백만분율(ppm) 단위로 표시된다. 피크 다중도는 다음과 같이 표시된다. s, 단일선; d, 이중선; t, 삼중항; q, 사중항; ABq, AB 4중항; quin, 5중항; sex, 6중항; sep, 7중항; non, 9중항; dd, 이중선의 이중선; ddd, 이중선의 이중선의 이중선; d/ABq, AB 사중선의 이중선; dt, 삼중항의 이중항; td, 이중선의 삼중선; dq, 사중선의 이중선; m, 다중선.

[0473] 다음 약어는 표시된 의미를 갖는다:

[0474] Ac_2O = 아세트산 무수물

[0475] 염수 = 포화 수성 염화나트륨

[0476] ^{t}BuOK = 포타슘 *tert*-부톡사이드

[0477] $CDCl_3$ = 중수소화 클로로포름

[0478] m-CPBA = 메타-클로로퍼옥시벤조산

[0479] Cs_2CO_3 = 탄산세슘

[0480] DCE = 디클로로에탄

[0481] DCM = 디클로로메탄

[0482] DIPEA=N,N-디이소프로필에틸아민

[0483] DME = 디메톡시에탄, 또는 글라임, 또는 모노글라임

[0484] DMF = N,N-디메틸포름아미드

[0485] DMPU = N,N′-디메틸프로필렌우레아

[0486] DMSO-d_6 = 중수소화 디메틸술폭시드

[0487] ESIMS = 전자분무 질량분석법

[0488] EtOAc = 에틸 아세테이트

[0489] HATU = 1-[비스(디메틸아미노)메틸렌]-1H-1,2,3-트리아졸로[4,5-b]피리디늄 3-옥시드 헥사플루오로포스페이트

[0490] HCl = 염산

[0491] HOAc = 아세트산

[0492] ISCO = Teledyne ISCO, Inc 브랜드 CombiFlash® Rf 200

[0493] KOAc = 포타슘 아세테이트

[0494] LC/MS = 액체 크로마토그래피-질량 분석법

[0495] MeCN = 아세토니트릴

[0496] MeOH = 메탄올

[0497] $MgSO_4$ = 마그네슘 설페이트

[0498] 모노글라임 = 1,2-디메톡시에탄

[0499] MsCl = 메실 클로라이드 또는 메탄설포닐 클로라이드

[0500] MW = 마이크로파 조사

[0501] $NaHCO_3$ = 소듐 비카보네이트

[0502] $Na(OAc)_3BH$ = 소듐 트리아세톡시보로하이브리드

[0503] Na_2SO_4 = 소듐 설페이트

[0504] NMR=핵자기공명

[0505] ON = 밤새

[0506] PCy_3 = 트리사이클로헥실포스핀

[0507] Pd/C = 탄소상 팔라듐

[0508] $Pd_2(dba)_3$ = 트리스(디벤질리덴아세톤)디팔라듐(0)

[0509] $Pd(dppf)Cl_2$ = 1,1'-비스(디페닐포스피노)페로센-팔라듐(II)디클로라이드

[0510] $Pd(OH)_2/C$ = 탄소 상의 수산화팔라듐

[0511] prep-TLC = 분취용 박층 크로마토그래피

[0512] r.t. = 실온

[0513] SM = 출발 물질

[0514] T3P = 프로판포스폰산 무수물

[0515] TEA= 트리에틸아민

[0516] TFA = 트리플루오로아세트산

[0517] THF = 테트라히드로푸란

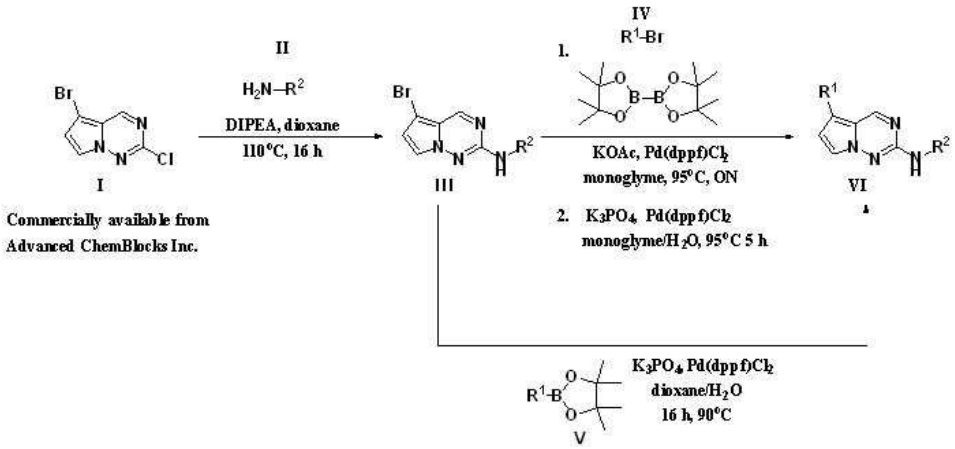
[0518] TLC = 박층 크로마토그래피

[0519] 다음 예시 반응식은 독자의 안내를 위해 제공되며, 본원에 제공된 화합물을 제조하기 위한 예시 방법을 집합적으로 나타낸다. 또한, 본 개시의 화합물을 제조하기 위한 다른 방법은 하기 반응식 및 실시예에 비추어 당업자에게 쉽게 명백해질 것이다. 숙련된 기술자는 문헌 및 본 개시내용에 제공된 방법에 의해 이들 화합물을 제조할

수 있는 충분한 장비를 갖추고 있다. 아래에 설명된 합성 반응식에 사용된 화합물 번호 지정은 해당 특정 반응식만을 의미하며 출원의 다른 섹션에 있는 동일한 번호 지정으로 해석하거나 혼동해서는 안된다. 달리 명시하지 않는 한, 모든 변수는 위에 정의된 바와 같다.

[0520] 일반 절차

[0521] 본 개시내용의 화학식 I의 화합물은 반응식 1에 도시된 바와 같이 제조될 수 있다.

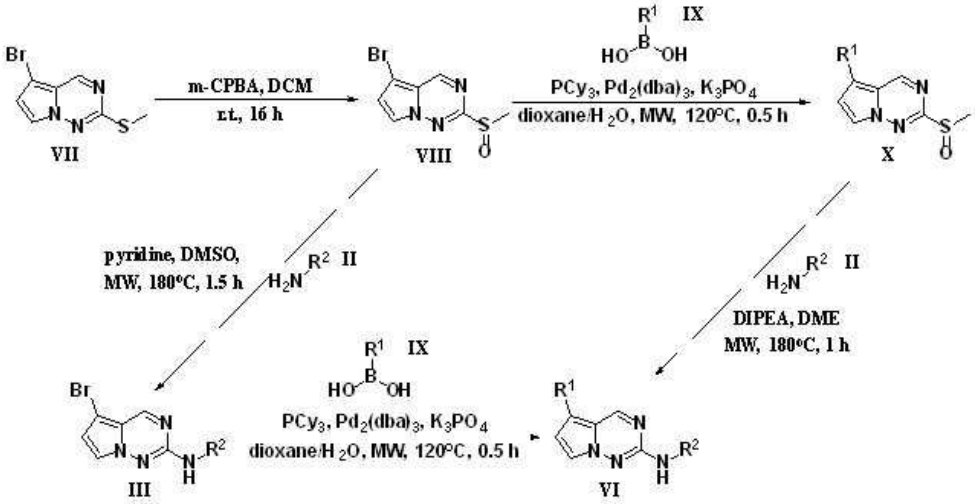


[0522]

[0523] **반응식 1**

[0524] 반응식 1은 먼저 염화물(I)을 다양한 아민(II)과 커플링하여 브로모 피롤로[2,1-f][1,2,4]트리아진 III를 생성함으로써 피롤로[2,1-f][1,2,4]트리아진 유도체(VI)를 제조하는 방법을 설명한다. 다양한 브롬화물(IV)을 비스(피나콜라토)디보론과 반응시켜 다양한 보론산 피나콜 에스테르 형성, 이후 브로마이드(IV)와의 스즈키 커플링에 의해 최종 피롤로[2,1-f][1,2,4]트리아진(VI)이 생성된다. 대안적으로, 다양한 상업용 보론산 피나콜 에스테르(V)를 브로마이드(III)와 직접 결합하여 최종 피롤로[2,1-f][1,2,4]트리아진(VI)을 생성할 수 있다.

[0525] 본 개시내용의 화학식 I의 화합물은 반응식 2에 도시된 바와 같이 또한 제조될 수 있다.



[0526]

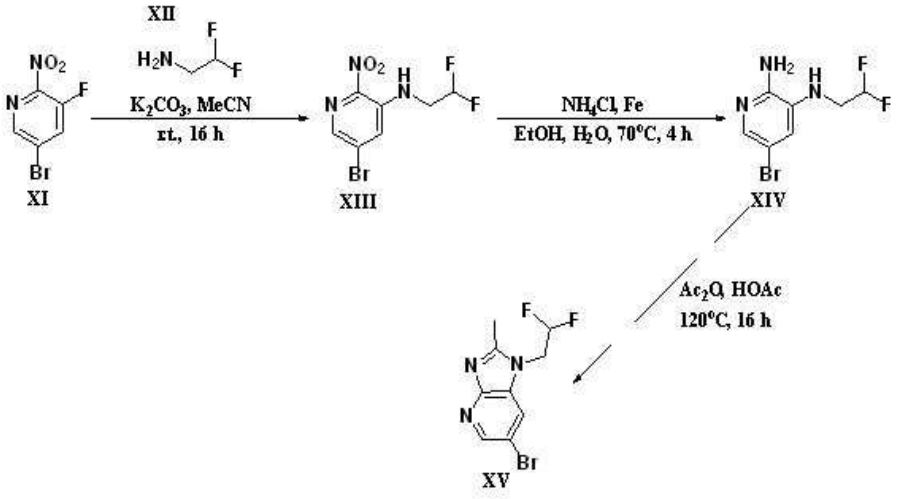
[0527] **반응식 2**

[0528] 반응식 2는 설파이드 VII를 설폰 VIII으로 산화시켜 피롤로[2,1-f][1,2,4]트리아진 유도체(VI)를 제조하는 방법을 설명한다. 그런 다음 설폰 VIII을 다양한 아민(II)과 결합하여 브로모 피롤로[2,1-f][1,2,4]트리아진 III을 생성한 다음 다양한 보론산(IX)과 스즈키 결합하여 최종 피롤로[2,1-f][1,2,4]트리아진(VI)을 생성한다. 대안적으로, 다양한 보론산(IX)을 설폰 VIII과 커플링된 후 다양한 아민(II)과 결합시켜 최종 피롤로[2,1-f][1,2,4]트리아진(VI)을 생성할 수 있다.

[0529] 예시적 화합물 실시예

[0530] 중간체 6-브로모-1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘 (XV)의 제조가 아래 반응식 3에 도

시된다.



[0531]

[0532] **반응식 3**

[0533] 단계 1

[0534] MeCN (20 mL) 내 2,2-디플루오로에탄-1-아민 (**XII**) (410 mg, 5.02 mmol), 5-브로모-3-플루오로-2-니트로피리딘 (**XI**) (Ark Pharma Scientific Limited에서 시판) (1.0 g, 4.53 mmol) 및 K_2CO_3 (1.38 g, 9.95 mmol)의 혼합물을 실온에서 16 h 동안 교반했다. 반응을 여과하고 고 진공 하에서 농축했다. 잔사를 물에 넣고, 1 시간 동안 교반하고 고체를 여과에 의해 수집하고 진공 건조시키고 5-브로모-N-(2,2-디플루오로에틸)-2-니트로피리딘-3-아민 (**XIII**) (1.066 g, 3.780 mmol, 83.5% 수율)을 황색 고체로서 얻었고 이를 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_7H_6BrF_2N_3O_2$ *m/z* 282.0 (^{79}BrM+H).

[0535] 단계 2

[0536] 5-브로모-N-(2,2-디플루오로에틸)-2-니트로피리딘-3-아민 (**XIII**) (1.32 g, 4.69 mmol), Fe (3.07 g, 46.95 mmol) 및 NH_4Cl (3.77 g, 70.48 mmol)의 혼합물을 EtOH (18 mL), 및 물 (6 mL)의 혼합물에 넣고 혼합물을 70° C까지 4 h 동안 가열했다. 반응 혼합물을 냉각하고 Celite®를 통해 여과했다. 여과액을 EtOAc에 넣고, 물 및 염수로 세척하고, 무수 Na_2SO_4 상에서 건조시키고, 여과하고, 감압 하에서 농축하고 5-브로모-N^3-(2,2-디플루오로에틸)피리딘-2,3-디아민 (**XIV**) (630 mg, 2.499 mmol, 53.2% 수율)을 회색 고체로서 얻었고 이를 추가 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_7H_8BrF_2N_3$ *m/z* 252.0 (^{79}BrM+H).

[0537] 단계 3

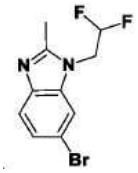
[0538] HOAc (15 mL) 내 5-브로모-N^3-(2,2-디플루오로에틸)피리딘-2,3-디아민 (**XIV**) (630 mg, 2.5 mmol) 및 아세트산 무수물 (0.28 mL, 2.97 mmol)의 용액을 120° C까지 16 h 동안 가열했다. 반응 혼합물을 농축하고, 잔사를 EtOAc/1 N NaOH 사이에서 분배시키고, 유기물을 분리하고, 물 및 염수로 세척했다. 유기물을 무수 Na_2SO_4 상에서 건조시키고, 용매 및 고 진공 하에서 농축했다. 잔사를 디에틸 에테르로 분쇄하고, 초음파처리하고 고체를 여과에 의해 수집하고 고 진공 하에서 건조시키고 6-브로모-1-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘 (**XV**) (325 mg, 1.177 mmol, 47.1% 수율)을 회색 고체로서 얻었고 이를 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_9H_8BrF_2N_3$ *m/z* 276.0 (^{79}BrM+H).

[0539] 다음 중간체를 상기 반응식 **3**에서 기술된 절차에 따라서 제조했다.

[0540] 

[0541] **XVI**

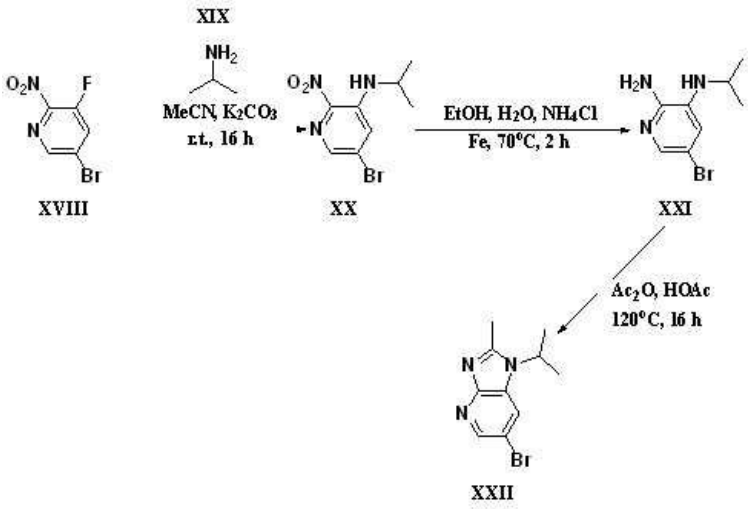
[0542] 6-브로모-1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b] 피리딘 (**XVI**): 회색 고체 (1.57 g, 6.178 mmol, 68.3% 수율). ESIMS 실험치 $C_{11}H_{10}BrF_2N_3$ *m/z* 302.1 (M+H).

[0543] 

[0544] **XVII**

[0545] 6-브로모-1-(2,2-디플루오로에틸)-2-메틸-1H-벤조[d]이미다졸 (**XVII**): 베이지색 고체 (970 mg, 3.526 mmol, 79.0% 수율). ESIMS 실험치 $C_{10}H_9BrF_2N_2$ *m/z* 275.0 (M+H).

[0546] 중간체 6-브로모-1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘 (**XXII**)의 제조가 아래 반응식 **4**에 도시된다.

[0547] 

[0548] **반응식 4**

[0549] 단계 **1**

[0550] MeCN (40 mL) 내 2-아미노프로판 (**XIX**) (0.86 mL, 9.96 mmol), 5-브로모-3-플루오로-2-니트로피리딘 (**XVIII**) (2 g, 9.05 mmol) 및 K_2CO_3 (2.5 g, 18.1 mmol)의 혼합물을 실온에서 16 h 동안 교반했다. 반응 혼합물을 물 (200 mL)에 부가하고, 1 h 동안 교반하고 생성된 고체를 여과에 의해 수집하고 고 진공 하에서 건조시키고 5-브로모-N-이소프로필-2-니트로피리딘-3-아민 (**XX**) (2.36 g, 9.074 mmol, 100.3% 수율)을 황색 고체로서 얻었고 이를 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_8H_{10}BrN_3O_2$ *m/z* 260.0 (M+H).

[0551] 단계 2

[0552] 5-브로모-N-이소프로필-2-니트로피리딘-3-아민 (**XX**) (2.35 g, 9.04 mmol) Fe (5.91 g, 90.35 mmol) 및 NH_4Cl (7.25 g, 135.53 mmol)의 혼합물을 EtOH (30 mL) 및 물 (10 mL)의 혼합물에 넣고 혼합물을 70° C까지 2 h 동안 가열했다. 반응 혼합물을 냉각하고, Celite®를 통해 여과하고, 여과액을 EtOAc에 넣고, 물 이후 염수로 세척하

고, 무수 Na_2SO_4 상에서 건조시키고, 여과하고, 감압 하에서 농축하고 5-브로모-N^3-이소프로필피리딘-2,3-디아민 (**XXI**) (2.2 g, 9.561 mmol, 105.8% 수율)을 짙은 갈색 고체로서 얻었고 이를 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_8H_{12}BrN_3$ *m/z* 230.05 (M+H).

[0553] 단계 3

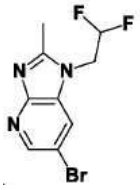
[0554] HOAc (20 mL) 내 5-브로모-N^3-이소프로필피리딘-2,3-디아민 (**XXI**) (2.08 g, 9.04 mmol) 및 Ac_2O (1.05 mL, 10.84 mmol)의 용액을 120° C까지 16 h 동안 가열했다. 반응 혼합물을 농축하고, 잔사를 EtOAc/1 N NaOH 사이에서 분배시키고, 유기물을 분리하고, 물 및 염수로 세척했다. 유기물을 무수 Na_2SO_4 상에서 건조시키고, 용매를 농축하고 고 진공 하에서 건조시키고 6-브로모-1-이소프로필-2-메틸-1H-이미다조[4,5-b]피리딘 (**XXII**) (1.57 g, 6.178 mmol, 68.3% 수율)을 짙은 갈색 고체로서 얻었고 이를 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_{10}H_{12}BrN_3$ *m/z* 254.0 (M+H).

[0555] 다음 중간체를 상기 반응식 **4**에서 기술된 절차에 따라서 제조했다.

[0556] 

[0557] **XXIII**

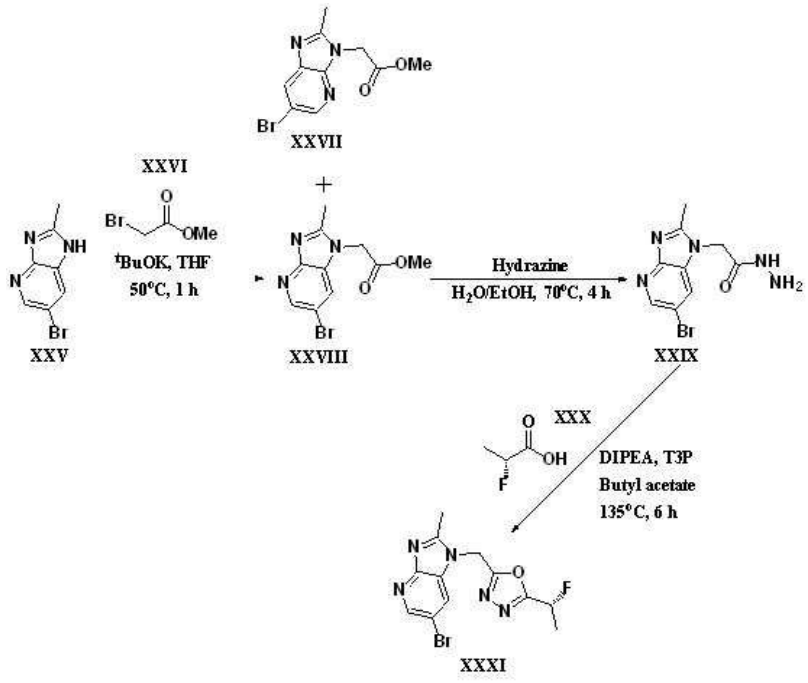
[0558] 6-브로모-2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘 (**XXIII**): 회색 고체 (722 mg, 2.438 mmol, 66.3% 수율). ESIMS 실험치 $C_{12}H_{14}BrN_3O$ *m/z* 296.0 (M+H).

[0559] 

[0560] **XXIV**

[0561] 6-브로모-1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘 (**XXIV**): 회색 고체 (325 mg, 1.177 mmol, 47.1% 수율). ESIMS 실험치 $C_9H_8BrF_2N_3$ *m/z* 276.0 (M+H).

[0562] 중간체 (R)-2-((6-브로모-2-메틸-1H-이미다조[4,5-b]피리딘-1-일)메틸)-5-(1-플루오로에틸)-1,3,4-옥사디아졸 (**XXXI**)의 제조가 아래 반응식 **5**에 도시된다.



[0563]

[0564] **반응식 5**

[0565] 단계 1

[0566] THF (40 mL) 내 ^{t}BuOK (2.1 g, 18.71 mmol) 및 6-브로모-2-메틸-3H-이미다조[4,5-b]피리딘 (**XXV**) (4 g, 18.86 mmol)의 혼합물을 50° C에서 20 분 동안 교반했다. 메틸 브로모아세테이트 (**XXVI**) (1.98 mL, 20.92 mmol)을 혼합물에 부가했다. 혼합물을 50° C에서 1 h 동안 교반했다. 반응을 0° C에서 HOAc/물 (1/10, 10 mL)로 중단시키고, 혼합물을 EtOAc (20 mL) 및 포화 수성 $NaHCO_3$ (20 mL)로 희석했다. 혼합물을 농축하고, 침전물을 여과하여 수집하고, 생성된 고체를 물과 소량의 EtOAc로 세척하여 생성물이 2개인 밝은 갈색의 화합물을 얻었다. 수성상을 $CHCl_3$(3×50 mL)로 추출하고 고체와 합한 다음 실리카겔 컬럼 크로마토그래피(MeOH 중 0→40% 1.7 N NH_3)로 정제하여 LC//MS에 따른 정확한 분자량을 포함하는 두 세트의 분획을 생성했다. 가장 극성이 낮은 분획은 부산물인 메틸 2-(6-브로모-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)아세테이트(XXVII) 메틸(1.48 g, 5.209 mmol, 27.6% 수율)로 분리했다. ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm 2.54 (3 H, s), 3.71 (3 H, s), 5.18 (2 H, s), 8.25 (1 H, d, *J*=1.65 Hz), 8.36 (1 H, d, *J*=1.37 Hz); 다음에 대한 ESIMS 실험치: $C_{10}H_{10}BrN_3O_2$ *m/z* 284.0 (M+H). 더 극성인 분획은 원하는 생성물인 메틸 2-(6-브로모-2-메틸-1H-이미다조[4,5-b]피리딘-1-일)아세테이트 (**XXVIII**) (2.43 g, 8.55 mmol, 45.3% 수율)로 회-백색 고체로서 분리했다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.51 (3 H, s), 3.72 (3 H, s), 5.27 (2 H, s), 8.33 (1 H, d, *J*=2.19 Hz), 8.41 (1 H, d, *J*=2.19 Hz); 다음에 대한 ESIMS 실험치: $C_{10}H_{10}BrN_3O_2$ *m/z* 284.0 (M+H).

[0567] 단계 2

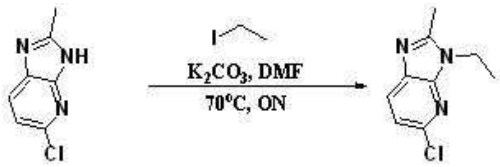
[0568] EtOH (26 mL)/물 (1.3 mL) 내 메틸 2-(6-브로모-2-메틸이미다조[4,5-b]피리딘-1-일)아세테이트 (**XXVIII**) (2.35 g, 8.27 mmol))의 현탁액을 70° C에서 10 min 동안 교반했다 (투명한 황색 용액). 히드라진 수화물 (3.6 mL, 73.86 mmol)을 혼합물에 부가하고, 혼합물을 70° C에서 4 h 동안 교반했다 (회-백색 ppt 형태). 반응을 실온까지 냉각하고 농축했다. 침전물을 여과에 의해 수집하고 EtOH로 세척하여 2-(6-브로모-2-메틸이미다조[4,5-b]피리딘-1-일)아세토히드라지드 (**XXIX**) (1.94 g, 6.828 mmol, 82.6% 수율)을 회-백색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.53 (3 H, s), 4.36 (2 H, br s), 4.87 (2 H, s), 8.22 (1 H, d, *J*=2.19 Hz), 8.39 (1 H, d, *J*=2.19 Hz), 9.48 (1 H, br s); 다음에 대한 ESIMS 실험치: $C_9H_{10}BrN_5O$ *m/z* 284.0 (M+H).

[0569] 단계 3

[0570] EtOAc (1.2 mL, 2.06 mmol) 및 DIPEA (0.89 mL, 5.11 mmol) 내 (2R)-2-플루오로프로판산 (**XXX**) (0.16 g, 1.76

mmol), 2-(6-브로모-2-메틸이미다조[4,5-b]피리딘-1-일)아세토히드라지드 (**XXIX**) (0.5 g, 1.76 mmol), T3P를 부틸 아세테이트 (11 mL)에 실온에서 마이크로파 바이알에서 부가했다. 바이알을 밀봉하고, 혼합물을 50℃에서 30분 동안 교반하고, EtOAc(1.2mL, 2.06mmol) 중 T3P의 두 번째 배치를 혼합물에 첨가하고, 생성된 혼합물을 3시간 동안 135℃로 가열했다. 반응은 아직 완료되지 않았다. EtOAc(0.58mL, 1mmol) 중 T3P의 세 번째 배치를 첨가하고, 혼합물을 135℃에서 추가로 3시간 동안 교반하였다. 혼합물을 냉각시킨 후, 포화 수성 $NaHCO_3$(30 mL)를 혼합물에 첨가하였다. 액체 층을 EtOAc(75 mL*3)로 추출하고, 유기 층을 물 및 포화 염수로 세척하고 Na_2SO_4로 건조시켰다. 유기 층을 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0→5% MeOH/$CHCl_3$) (R)-2-((6-브로모-2-메틸-1H-이미다조[4,5-b]피리딘-1-일)메틸)-5-(1-플루오로에틸)-1,3,4-옥사디아졸 (**XXXI**) (430 mg, 1.264 mmol, 71.8% 수율)를 회-백색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.71 (3 H, dd, *J*=24.40, 6.60 Hz), 2.62 (3 H, s), 5.99 (1 H, dq, *J*=47.20, 6.60 Hz), 5.95 (2 H, s), 8.38 (1 H, d, *J*=2.19 Hz), 8.45 (1 H, d, *J*=2.19 Hz); 다음에 대한 ESIMS 실험치: $C_{12}H_{11}BrFN_5O$ *m/z* 340.0 (M+H).

[0571] 중간체 5-클로로-3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘 (**XXXIII**)의 제조가 아래 반응식 **6**에 도시된다.



XXXII XXXIII

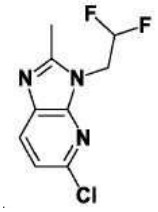
[0572]

[0573] **반응식 6**

[0574] 단계 1

[0575] DMF (10 mL) 내 5-클로로-2-메틸-3H-이미다조[4,5-b]피리딘 (**XXXII**) (eNovation Chemicals, LLC에서 시판) (500 mg, 2.98 mmol), 아이오도에탄 (560 mg, 3.58 mmol) 및 K_2CO_3 (830 mg, 5.97 mmol)의 혼합물 을 70° C까지 밤새 가열했다. 반응 혼합물을 냉각하고, 용매를 농축하고, 잔사를 EtOAc/물 사이에서 분배시키고, 유기 층을 분리하고, 염수로 세척하고, 무수 $MgSO_4$ 상에서 건조시키고 용매를 진공 하에서 농축하고 건조시키고 5-클로로-3-에틸-2-메틸이미다조[4,5-b]피리딘 (**XXXIII**) (466 mg, 2.382 mmol, 79.8% 수율)을 짙은 갈색 고체로서 얻었고 이를 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_9H_{10}ClN_3$ *m/z* 196.05 (M+H).

[0576] 다음 중간체를 상기 반응식 **6**에서 기술된 절차에 따라서 제조했다.

[0577] 

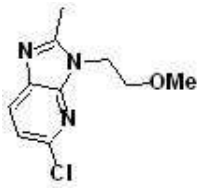
[0578] **XXXIV**

[0579] 5-클로로-3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘 (**XXXIV**): 베이지색 고체 (830 mg, 3.583 mmol, 60.1% 수율). ESIMS 실험치 $C_9H_8ClF_2N_3$ *m/z* 232.0 (M+H).

[0580] 

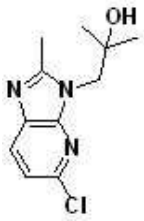
[0581] **XXXV**

[0582] 5-클로로-3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘 (**XXXV**): 베이지색 고체 (220 mg, 1.030 mmol, 57.5% 수율). ESIMS 실험치 $C_9H_9ClFN_3$ *m/z* 214.05 (M+H).

[0583] 

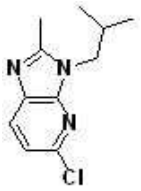
[0584] **XXXVI**

[0585] 5-클로로-3-(2-메톡시에틸)-2-메틸-3H-이미다조[4,5-b]피리딘 (**XXXVI**): 베이지색 고체 (195 mg,0.864 mmol, 48.3% 수율). ESIMS 실험치 $C_{10}H_{12}ClN_3O$ *m/z* 226.1 (M+H).

[0586] 

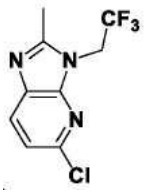
[0587] **XXXVII**

[0588] 1-(5-클로로-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)-2-메틸프로판-2-올 (**XXXVII**): 백색 고체 (229.9 mg, 0.959 mmol, 39.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (6 H, s), 2.63 (3 H, s), 4.11 (2 H, s), 4.80 (1 H, s), 7.25 (1 H, d, *J*=8.21 Hz), 7.96 (1 H, d, *J*=8.21 Hz); ESIMS 실험치 $C_{11}H_{14}ClN_3O$ *m/z* 240.1 (M+H).

[0589] 

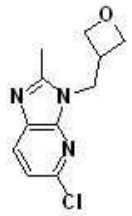
[0590] **XXXVIII**

[0591] 5-클로로-3-이소부틸-2-메틸-3H-이미다조[4,5-b]피리딘 (**XXXVIII**): 백색 고체 (206.8 mg, 0.925 mmol, 38.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.87 (6 H, d, *J*=6.57 Hz), 2.22 (1 H, dquin, *J*=13.89, 7.07, 7.07, 7.07, 7.07 Hz), 2.58 (3 H, s), 4.01 (2 H, d, *J*=7.67 Hz), 7.26 (1 H, d, *J*=8.21 Hz), 7.98 (1 H, d, *J*=8.21 Hz); ESIMS 실험치 $C_{11}H_{14}ClN_3$ *m/z* 224.1 (M+H).

[0592] 

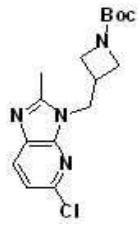
[0593] **XXXIX**

[0594] 5-클로로-2-메틸-3-(2,2,2-트리플루오로에틸)-3H-이미다조[4,5-b]피리딘 (**XXXIX**): 베이지색 고체 (372 mg, 1.490 mmol, 50.0% 수율). ESIMS 실험치 $C_9H_7ClF_3N_3$ *m/z* 250.0 (M+H).

[0595] 

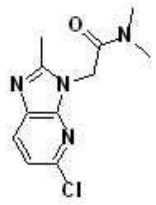
[0596] XL

[0597] 5-클로로-2-메틸-3-(옥세탄-3-일메틸)-3H-이미다조[4,5-b]피리딘 (**XL**): 옅은 갈색 고체 (289.7 mg, 1.219 mmol, 40.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.59 (3 H, s), 3.43 - 3.56 (1 H, m), 4.47 (2 H, t, *J*=6.02 Hz), 4.52 (2 H, d, *J*=7.67 Hz), 4.62 (2 H, dd, *J*=7.67, 6.02 Hz), 7.27 (1 H, d, *J*=8.21 Hz), 7.98 (1 H, d, *J*=8.21 Hz); ESIMS 실험치 $C_{11}H_{12}ClN_3O$ *m/z* 238.1 (M+H).

[0598] 

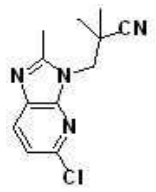
[0599] XLI

[0600] *tert*-부틸 3-((5-클로로-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)메틸)아제티딘-1-카복실레이트 (**XLI**): 회-백색 비정형 고체 (532.6 mg, 1.581 mmol, 52.1% 수율). ESIMS 실험치 $C_{16}H_{21}ClN_4O_2$ *m/z* 337.1 (M+H).

[0601] 

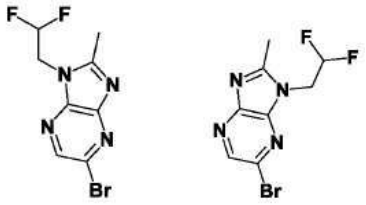
[0602] XLII

[0603] 2-(5-클로로-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)-N,N-디메틸아세트아미드 (**XLII**): 회-백색 고체 (474.4 mg, 1.877 mmol, 62.6% 수율). ESIMS 실험치 $C_{11}H_{13}ClN_4O$ *m/z* 253.1 (M+H).

[0604] 

[0605] XLIII

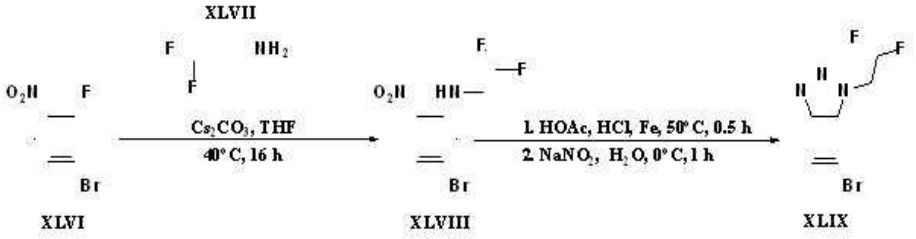
[0606] 3-(5-클로로-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)-2,2-디메틸프로판니트릴 (**XLIII**): 회-백색 비정형 고체 (59.1 mg, 0.238 mmol, 7.9% 수율). ESIMS 실험치 $C_{12}H_{13}ClN_4$ *m/z* 249.1 (M+H).



[0607] XLIV XLV

[0608] 갈색 고체로서 5-브로모-1-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피라진 (**XLIV**) 및 5-브로모-3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피라진 (**XLV**)의 분리불가능한 혼합물(556 mg, 2.007 mmol, 40.7% 수율). ESIMS 실험치 $C_8H_7BrF_2N_4$ *m/z* 277.0 (M+H). 화합물 1970 및 1971 합성의 혼합물로 사용되었다. 최종 화합물은 키랄 초임계 유체 크로마토그래피(SFC)로 분리되었다.

[0609] 중간체 6-브로모-1-(2,2-디플루오로에틸)-1H-벤조[d][1,2,3]트리아졸 (**XLIX**)의 제조가 아래 반응식 **7**에 도시된다.



[0610]

[0611] **반응식 7**

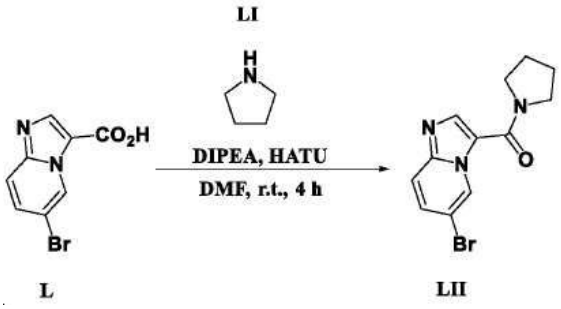
[0612] 단계 1

[0613] THF (500.0 mL) 내 4-브로모-2-플루오로-1-니트로벤젠 (**XLVI**) (20.0 g, 98.03 mmol)의 용액을 0℃로 냉각했다. Cs_2CO_3 (63.9 g, 196.06 mmol)을 부가하고, 2,2-디플루오로에탄-1-아민 (**XLVII**) (36.6 g, 183.81 mmol)을 0℃에서 부가했다. 반응을 40° C까지 16 h 동안 데웠다. 반응 혼합물을 EtOAc로 추출했다 (500 L x 3). 조합시킨 유기물을 염수로 세척했다 (500 mL x 3). 조합시킨 유기 층을 Na_2SO_4로 건조시키고, 여과하고, 농축하고 미정제 생성물을 얻었다. 미정제물을 실리카겔 상 컬럼 크로마토그래피로 정제하여 (10→20% EtOAc/석유 에테르) 5-브로모-N-(2,2-디플루오로에틸)-2-니트로아닐린 (**XLVIII**) (23 g, 81.83 mmol, 83.5% 수율)을 황색 고체로서 얻었다. ^{1}H NMR (400 MHz, DMSO-d_6) δ 3.99 (tdd, *J* = 15.6, 6.6, 3.8 Hz, 2H), 6.29 (tt, *J* = 55.4, 3.7 Hz, 1H), 6.96 (dd, *J* = 9.2, 2.0 Hz, 1H), 7.51 (d, *J* = 1.6 Hz, 1H), 8.05 (d, *J* = 9.2 Hz, 1H), 8.33 (t, J = 6.4 Hz, 1H); 다음에 대한 ESIMS 실험치: $C_8H7BrF_2N_2O_2$ *m/z* 280.9 (M+H).

[0614] 단계 2

[0615] HOAc/HCl (500/50 mL) 내 5-브로모-N-(2,2-디플루오로에틸)-2-니트로아닐린 (**XLVIII**) (12.0 g, 42.86 mmol)의 용액에 Fe (30.0 g, 428.62 mmol)을 부가했다. 반응 혼합물을 50° C에서 30 분 동안 교반하고, 이후 실온까지 냉각하고 여과했다. 이어서, 물(20 mL) 중의 $NaNO_2$(3.0 g, 53.58 mmol)를 0℃에서 상기 산 용액에 적가하였다. 반응 용액을 0℃에서 1시간 동안 교반하였다. 반응 혼합물을 농축 건조시키고, 반응 혼합물을 EtOAc(300 mL) 및 H_2O(300 mL)에 부었다. $NaHCO_3$를 사용하여 pH를 >7로 조정했다. 반응 혼합물을 EtOAc로 추출했다 (500 mL x 3). 조합시킨 유기물을 염수로 세척했다 (500 mL x 3). 유기 층을 농축하고, Na_2SO_4 상에서 건조시키고, 여과하고, 농축하고 미정제물을 얻었다. 미정제물을 실리카겔 상 컬럼 크로마토그래피로 정제하여 (10→50% EtOAc/석유 에테르) 6-브로모-1-(2,2-디플루오로에틸)-1H-벤조[d][1,2,3]트리아졸 (**XLIX**) (5 g, 19.08 mmol, 44.5%)을 갈색 고체로서얻었다. ^{1}H NMR (400 MHz, DMSO-d_6) δ 5.41 - 5.29 (m, 2H), 6.61 (tt, *J* = 54.2, 3.2 Hz, 1H), 7.60 (dd, *J* = 8.8, 1.7 Hz, 1H), 8.08 (d, *J* = 8.8 Hz, 1H), 8.31 (d, *J* = 1.0 Hz, 1H); 다음에 대한 ESIMS 실험치: $C_8H_6BrF_2N_3$ *m/z* 261.9 (M+H).

[0616] 중간체 (6-브로모이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 (**LII**)의 제조가 아래 반응식 **8**에 도시된다.

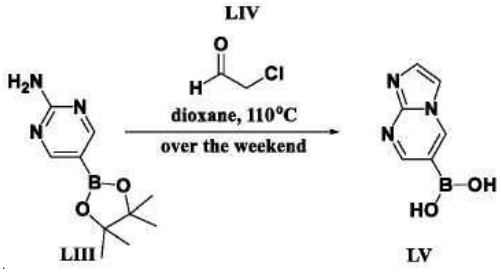
[0617] 

[0618] **반응식 8**

[0619] 단계 **1**

[0620] DMF (4 mL) 내 6-브로모이미다조[1,2-a]피리딘-3-카복실산 (**L**) (0.5 g, 2.07 mmol), DIPEA (0.9 mL, 5.17 mmol) 및 HATU (0.79 g, 2.07 mmol)의 혼합물을 5 min 동안 교반했다. 피롤리딘 (**LI**) (0.32 mL, 3.18 mmol)을 이후 부가하고, 반응 혼합물을 실온에서 4 h 동안 계속 교반했다. 용매를 농축하고, 잔사를 EtOAc 및 포화 수성 $NaHCO_3$ 사이에서 분배시키고, 유기 층을 분리하고, 물 및 식염수로 세척했다. 유기 층을 무수 Na_2SO_4 상에서 건조시키고, 농축하고 고 진공 하에서 건조시키고 (6-브로모이미다조[1,2-a]피리딘-3-일)-피롤리딘-1-일메탄온 (**LII**) (577 mg, 1.962 mmol, 94.6% 수율)을 베이지색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{12}H_{12}BrN_3O$ *m/z* 294.0 (M+H).

[0621] 중간체 이미다조[1,2-a]피리미딘-6-일보론산 (**LV**)의 제조가 아래 반응식 **9**에 도시된다.

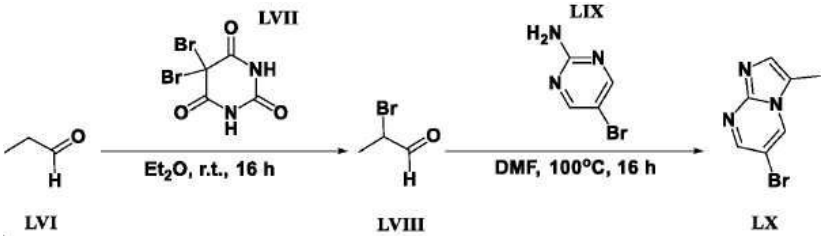
[0622] 

[0623] **반응식 9**

[0624] 단계 **1**

[0625] 5-(4,4,5,5-테트라메틸-1,3,2-디옥사보롤란-2-일)피리미딘-2-아민 (**LIII**) (1 g, 4.52 mmol) 및 클로로아세트알데히드 (**LIV**) (0.92 mL, 5.39 mmol)의 혼합물을 1,4-디옥산 (20 mL) 내에 용해시키고 110° C까지 주말에 걸쳐 가열했다. 반응 혼합물을 냉각하고,고체를 여과에 의해 수집하고 고 진공 하에서 건조시키고 이미다조[1,2-a]피리미딘-6-일보론산 (**LV**) (650 mg, 3.989 mmol, 88.2% 수율)을 갈색 고체로서 얻었고 이를 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_6H_6BN_3O_2$ *m/z* 164.1 (M+H).

[0626] 중간체 6-브로모-3-메틸이미다조[1,2-a]피리미딘 (**LX**)의 제조가 아래 반응식 **10** 에 도시된다.

[0627] 

[0628] **반응식 10**

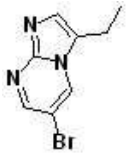
[0629] 단계 1

[0630] Et_2O (150 mL) 내 프로피온알데히드 (**LVI**) (5 g, 70 mmol)의 혼합물에 5,5-디브로모피리미딘-2,4,6(1H,3H,5H)-트리온 (**LVII**) (9.91 g, 35 mmol)을 부가하고 생성된 혼합물을 실온에서 16 h 동안 교반했다. 완료 후, 혼합물을 석유 에테르로 세척했다 (80 mL x 2). 유기 층을 여과하고 농축하고 2-브로모프로판알 (**LVIII**) (2.0 g, 14.6 mmol, 20.9% 수율)을 황색 오일로서 얻었다.

[0631] 단계 2

[0632] DMF (20 mL) 내 2-브로모프로판알 (**LVIII**) (0.7 g, 5.11 mol)의 용액에 5-브로모피리미딘-2-아민 (**LIX**) (0.97 g, 5.56 mmol)을 실온에서 Ar 하에서 부가했다. 혼합물을 100°C에서 16 h 동안 교반했다. 완료 후, 혼합물을 EtOAc로 희석하고 염수로 세척했다 (20 mL x 3). 유기 층을 무수 Na_2SO_4 상에서 건조시키고, 여과하고 농축했다. 미정제 잔사를 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0%→20% EtOAc/석유 에테르) 6-브로모-3-메틸이미다조[1,2-a]피리미딘 (**LX**) (80 mg, 0.377 mmol, 7.4% 수율)을 백색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_7H_6BrN_3$ *m/z* 212.1 (M+H).

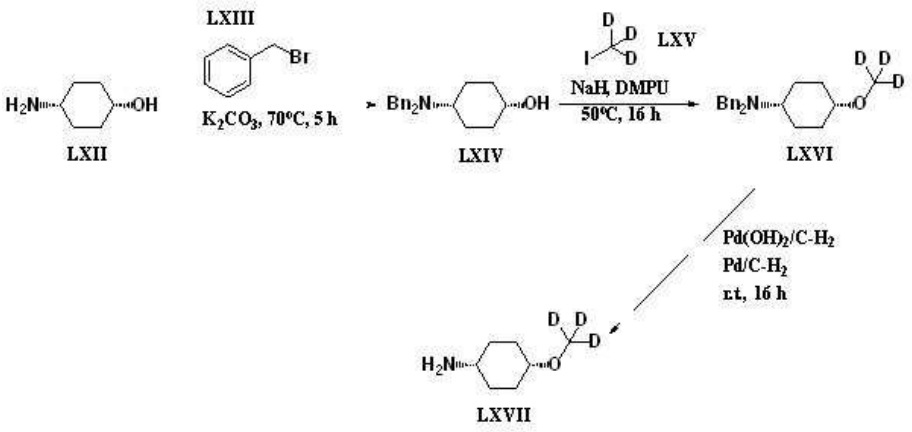
[0633] 다음 중간체를 상기 반응식 **19**에서 기술된 절차에 따라서 제조했다.

[0634] 

[0635] **LXI**

[0636] 6-브로모-3-에틸이미다조[1,2-a]피리미딘 (**LXI**): 백색 고체 (200 mg, 0.885 mmol, 19.1% 수율). ESIMS 실험치 $C_8H_8BrN_3$ *m/z* 226.0 (M+H).

[0637] 중간체 *cis*-4-(메톡시-d_3)사이클로헥산-1-아민 (**LXVII**)의 제조가 아래 반응식 **11**에 도시된다.

[0638] 

[0639] **반응식 11**

[0640] 단계 1

[0641] MeCN (80 mL) 내 *cis*-4-아미노사이클로헥산-1-올 (**LXII**) (5 g, 32.9 mmol), (브로모메틸)벤젠 (**LXIII**) (11.25 g, 65.8 mmol)의 용액에 K_2CO_3 (13.64 g, 98.7 mmol)을 부가했다. 혼합물을 70°C에서 5 h 동안 교반했다. 반응 혼합물을 감압 하에서 농축하여 MeCN를 제거했다. 혼합물을 EtOAc로 희석하고 이후 EtOAc (100 mL x 3) 및 H_2O로 추출했다. 조합시킨 유기 층을 농축하고,미정제 잔사를 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0%→30% EtOAc/석유 에테르) *cis*-4-(디벤질아미노)사이클로헥산-1-올 (**LIV**) (8.0 g, 27.08 mmol, 82.3% 수율)을 백색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{20}H_{25}NO$ *m/z* 296.4 (M+H).

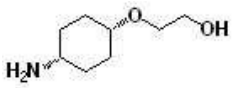
[0642] 단계 2

[0643] DMPU (80 mL) 내 *cis*-4-(디벤질아미노)사이클로헥산-1-올 (**LIV**) (8.0 g, 27.08 mmol)의 용액에 계속 교반하면서 천천히 NaH (5.98 g, 149.7 mmol)을 질소 분위기 하에서 부가했다. 반응 혼합물을 실온에서 1 h 동안 교반했다. 이후 아이오도메탄-d_3 (**LXV**) (10.85 g, 74.86 mmol)을 실온에서 10 min의 기간에 걸쳐 부가했다. 완전 부가 후, 반응 혼합물을 50°C에서 16 h 동안 교반했다. 반응 혼합물을 이후 포화 수성 NH_4Cl (300 mL)로 급냉하고 10 min 동안 교반했다. 혼합물을 EtOAc로 희석하고 이후 EtOAc (300 mL x 3) 및 H_2O로 추출했다. 미정제 잔사를 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0%→20% EtOAc/석유 에테르) *cis*-N,N-디벤질-4-(메톡시-d_3)사이클로헥산-1-아민 (**LXVI**) (6 g, 19.202 mmol, 70.9% 수율)을 무색 오일로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{21}H_{24}D_3NO$ *m/z* 313.0 (M+H).

[0644] 단계 3

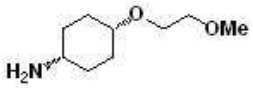
[0645] EtOH (5 mL) 내 *cis*-N,N-디벤질-4-(메톡시-d_3)사이클로헥산-1-아민 (**LXVI**) (200 mg, 0.64 mmol)의 용액에 $Pd(OH)_2/C$ (50 mg) 및 Pd/C (50 mg)을 부가했다. 혼합물을 실온에서 16 h 동안 교반했다. 혼합물을 Celite®를 통해 여과하고 EtOH로 세척했다. 반응 혼합물을 감압 하에서 농축하고 *cis*-4-(메톡시-d_3)사이클로헥산-1-아민 (**LXVII**) (76.4 mg, 0.578 mmol, 90.3% 수율)을 무색 오일로서 얻었다. ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.51 - 1.40 (m, 4H), 1.67 - 1.56 (m, 4H), 1.86 (td, *J* = 9.8, 4.6 Hz, 2H), 2.71 (tt, *J* = 10.8, 5.4 Hz, 1H), 3.34 (td, *J* = 4.8, 2.4 Hz, 1H); 다음에 대한 ESIMS 실험치: $C_7H_{12}D_3NO$ *m/z* 133.0 (M+H).

[0646] 다음 중간체를 상기 반응식 **11**에서 기술된 절차에 따라서 제조했다.

[0647] 

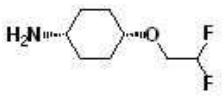
[0648] **LXVIII**

[0649] 2-((*cis*-4-아미노사이클로헥실)옥시)에탄-1-올 (**LXVIII**): 무색 오일 (0.5 g, 3.14 mmol, 67.4% 수율). 다음에 대한 ESIMS 실험치: $C_8H_{17}NO_2$ *m/z* 160. (M+H).

[0650] 

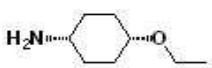
[0651] **LXIX**

[0652] *cis*-4-(2-메톡시에톡시)사이클로헥산-1-아민 (**LXIX**): 무색 오일 (1.5 g, 8.65 mmol, 76.6% 수율). 다음에 대한 ESIMS 실험치: $C_9H_{19}NO_2$ *m/z* 174.1 (M+H).

[0653] 

[0654] **LXX**

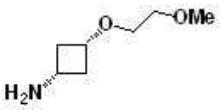
[0655] *cis*-4-(2,2-디플루오로에톡시)사이클로헥산-1-아민 (**LXX**): 백색 고체 (1.352 g, 7.54 mmol, 90.3% 수율). 다음에 대한 ESIMS 실험치: $C_8H_{15}F_2NO$ *m/z* 180.1 (M+H).

[0656] 

[0657] **LXXI**

[0658] *cis*-4-에톡시사이클로헥산-1-아민 (**LXXI**): 무색 오일 (2 g, 13.96 mmol, 64.4% 수율). ^{1}H NMR (400 MHz, $CDCl_3$) δ 1.19 (t, *J* = 7.0 Hz, 3H), 1.49 - 1.44 (m, 6H), 1.62 - 1.55 (m, 2H), 1.86 - 1.79 (m, 2H), 2.4 -

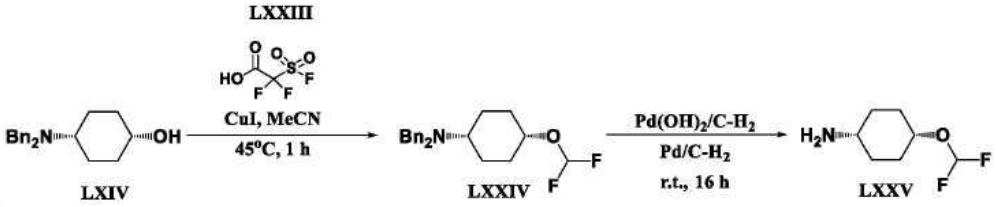
2.723 (m, 1H), 3.49 - 3.41 (m, 3H).

[0659] 

[0660] LXXII

[0661] *cis*-3-(2-메톡시에톡시)사이클로부탄-1-아민 (**LXXII**): 무색 오일. ^{1}H NMR (400 MHz, DMSO-d_6) δ 1.51 (dd, J = 13.4, 5.2 Hz, 2H), 2.49 - 2.40 (m, 2H), 2.89 - 2.75 (m, 1H), 3.23 (s, 3H), 3.37 - 3.35 (m, 3H), 3.47 (s, 2H), 3.54 - 3.48 (m, 1H).

[0662] 중간체 *cis*-4-(디플루오로메톡시)사이클로헥산-1-아민 (**LXXV**)의 제조가 아래 반응식 **12**에 도시된다.

[0663] 

[0664] **반응식 12**

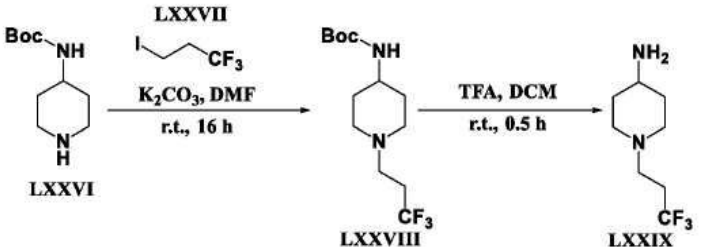
[0665] 단계 1

[0666] MeCN (5 mL) 내 *cis*-4-(디벤질아미노)사이클로헥산-1-올 (**LXIV**) (50 mg, 0.170 mmol)의 용액에, CuI (6.5 mg, 0.034 mmol) 및 45°C까지 질소 분위기하에서 5 min 동안 가열했다. 이 혼합물에 (2 mL) MeCN 내 2,2-디플루오로-2-(플루오로설포닐)아세트산 (**LXXIII**) (60 mg, 0.339 mmol)의 용액을 10 min에 걸쳐 부가했다. 이후 혼합물을 45°C에서 1 h 동안 교반했다. 이어서, 휘발성 성분을 증발을 통해 제거하고 잔사를 EtOAc(100mL) 및 물과 포화 수성 $NaHCO_3$의 1:1 혼합물 100mL로 희석했다. 고체를 함유하는 생성된 2상 혼합물을 소결 유리 부흐너 깔때기를 통해 여과했다. 여액 층을 분리하고,수성층을 EtOAc (50 mL)로 추출했다. 조합시킨 EtOAc 층을 50 mL 염수 및 물의 1:1 혼합물로 세척하고, 무수 $MgSO_4$ 상에서 건조시키고, 여과하고, 농축하여 오일을 얻었다. 미정제 오일을 실리카 겔 크로마토그래피에 의해 정제했다 (0→30% EtOAc/헥산). 생성물 함유 분획을 합하고 농축하여 *cis*-N,N-디벤질-4-(디플루오로메톡시)사이클로헥산-1-아민 (**LXXIV**) (25 mg, 0.072 mmol, 42.3% 수율)을 오일로 얻었고, 이는 회-백색 고체로 고체화되었다. 다음에 대한 ESIMS 실험치: $C_{21}H_{25}F_2NO$ *m/z* 346.1 (M+H).

[0667] 단계 2

[0668] THF (60 mL) 내 *cis*-N,N-디벤질-4-(디플루오로메톡시)사이클로헥산-1-아민 (**LXXIV**) (2.8 g, 8.11 mmol)의 용액에 Pd (OH)$_2$/C (1.4 g) 및 Pd/C (1.4 g)을 부가했다. 혼합물을 실온에서 16 h 동안 교반했다. 혼합물을 Celite® 를 통해 여과하고 THF로 세척했다. 반응 혼합물을 감압 하에서 농축하고 *cis*-4-(디플루오로메톡시)사이클로헥산-1-아민 (**LXXV**) (1.05 g, 6.36 mmol, 78.4% 수율)를 무색 오일로서 얻었다. 다음에 대한 ESIMS 실험치: $C_7H_{13}F_2NO$ *m/z* 166.1 (M+H).

[0669] 중간체 1-(3,3,3-트리플루오로프로필)피페리딘-4-아민 (**LXXIX**)의 제조가 아래 반응식 **13**에 도시된다.

[0670] 

[0671] **반응식 13**

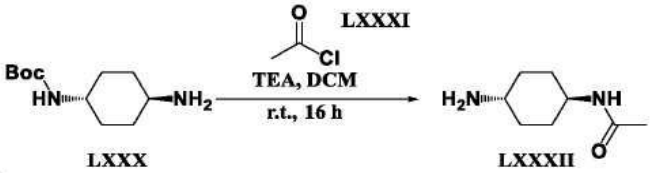
[0672] 단계 1

[0673] *tert*-부틸 피페리딘-4-일카바메이트 (**LXXVI**) (Combi-Blocks Inc.에서 시판) (1 g, 4.99 mmol) 및 K_2CO_3 (1.73 g, 12.52 mmol)를 DMF (15 mL) 내에 용해시키고 1-아이오도-3,3,3-트리플루오로프로판 (**LXXVII**) (878 μL, 7.49 mmol)을 부가하고 반응을 실온에서 16 h 동안 교반했다. 반응 혼합물을 EtOAc 내에 붓고, 수성 층을 분리했다. 수성 층을 EtOAc (×3)로 추출하고 이후 조합시킨 유기 층을 pH 4.5로 1 M 시트르산으로 산성화했다. 유기층을 소량의 물로 3회 세척하여 미반응 SM을 제거했다. 유기층에 충분한 양의 생성물이 남아있고 이를 무수 $MgSO_4$로 건조시킨 후 진공에서 환원시켜 생성물 *tert*-부틸 N-[1-(3,3,3-트리플루오로프로필)피페리딘-4-일]카바메이트 (**LXXVIII**) (861 mg, 2.906 mmol, 58.2% 수율)을 백색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{13}H_{23}F_3N_2O_2$ *m/z* 297.2 (M+H).

[0674] 단계 2

[0675] tert-부틸 N-[1-(3,3,3-트리플루오로프로필)피페리딘-4-일]카바메이트 (**LXXVIII**) (200 mg, 0.670 mmol)을 내에 용해시키고 DCE (3.2 mL) 및 TFA (800 μL, 10.38 mmol)을 부가하고 반응을 실온에서 30 m동안 교반했다. 반응 혼합물을 건조시키고 과량의 TFA를 고진공으로 제거하여 미정제 중간체 1-(3,3,3-트리플루오로프로필)피페리딘-4-아민(**LXXIX**)(209mg, 0.674mmol, 99.8% 수율)을 백색 반고체로서 얻었고 이를 더 이상 정제하지 않고 사용하였다. 다음에 대한 ESIMS 실험치: $C_8H_{15}F_3N_2$ *m/z* 197.1 (M+H).

[0676] 중간체 N-(*trans*-4-아미노사이클로헥실)아세트아미드 (**LXXXII**)의 제조가 아래 반응식 **14**에 도시된다.

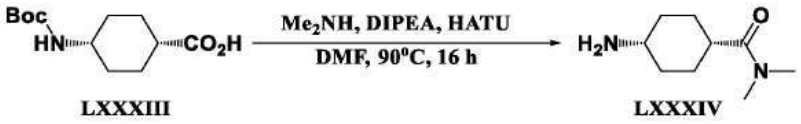
[0677] 

[0678] **반응식 14**

[0679] 단계 1

[0680] DCM (6 mL) 내 *tert*-부틸 N-(4-아미노사이클로헥실)카바메이트 (**LXXX**) (Combi-Blocks Inc.에서 시판) (0.6 g, 2.8 mmol)의 교반 용액에 TEA (1.2 mL, 8.61 mmol)을 부가했다. 아세틸 클로라이드 (**LXXXI**) (0.22 mL, 3.09 mmol)을 이후 천천히, 및 반응 혼합물을 실온에서 16 h 동안 교반했다. 용매를 제거하고,미정제 물질을 EtOAc 내에 용해시키고, 1 M NaOH, 염수로 세척하고, 무수 $MgSO_4$ 상에서 건조시키고 마지막으로 농축했다. 생성물을 EtOH (2 mL) 및 4 M HCl (1 mL) 내에 용해시켰다. 용액을 실온에서 2시간 동안 교반한 후 증발 건조시켜 N-(4-아미노사이클로헥실)아세트아미드 (**LXXXII**)의 HCl 염 (480 mg, 2.49 mmol, 89.0% 수율)을 백색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_8H_{16}N_2O$ *m/z* 157.05 (M+H).

[0681] 중간체 *cis*-4-아미노-N,N-디메틸사이클로헥산-1-카복사미드 (**LXXXIV**) 가의 제조 아래 반응식 **15**에 도시된다.

[0682] 

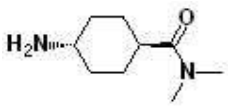
[0683] **반응식 15**

[0684] 단계 1

[0685] DMF (6 mL) 내 4-(*tert*-부톡시카르보닐아미노)사이클로헥산카복실산 (**LXXXIII**) (Combi-Blocks Inc.에서 시판) (0.3 g, 1.23 mmol)의 교반 용액에 DIPEA (0.65 mL, 3.73 mmol) 및 HATU (0.7 g, 1.85 mmol)을 부가했다. 반응을 5 min 동안 실온에서 교반했다. 디메틸아민 (0.92 mL, 1.84 mmol)을 부가하고, 반응을 90C까지 16 h 동안 가열했다. 반응을 농축하고 EtOH (2 mL) 및 4 M 디옥산 내 HCl (1 mL) 내에 용해시켰다. 혼합물을 2 h 동안 실온에서 교반하고, 진공 하에서 농축하고 4-아미노-N,N-디메틸사이클로헥산-1-카복사미드 (**LXXXIV**) (280 mg,

1.355 mmol, 109.9% 수율)의 HCl 염을 옅은 갈색 점성 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_9H_{18}N_2O$ *m/z* 171.15 (M+H).

[0686] 다음 중간체를 상기 반응식 10에서 기술된 절차에 따라서 제조했다.

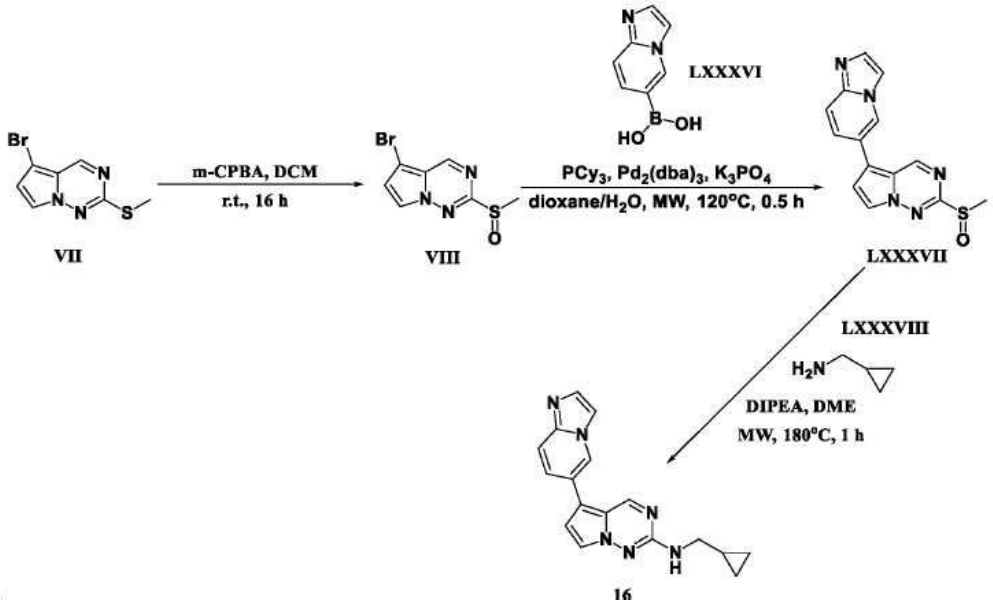
[0687] 

[0688] LXXXV

[0689] *trans*-4-아미노-N,N-디메틸사이클로헥산-1-카복사미드 (LXXXV): 옅은 갈색 점성 고체 (290 mg, 1.403 mmol, 113.8% 수율). 다음에 대한 ESIMS 실험치: $C_9H_{18}N_2O$ *m/z* 171.1 (M+H).

[0690] 실시예 1.

[0691] N-(사이클로프로필메틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (16)의 제조가 아래 반응식 16에 도시된다.

[0692] 

[0693] 반응식 16

[0694] 단계 1

[0695] DCM (80 mL) 내 5-브로모-2-(메틸티오)피롤로[2,1-f][1,2,4]트리아진 (VII) (Combi-Blocks Inc.에서 시판) (4.0 g, 15.59 mmol)의 용액에 *m*-CPBA (3.22 g, 18.66 mmol)을 0°C에서 부가했다. 혼합물을 실온에서 16 h 동안 교반했다. 반응 혼합물을 포화 수성 NaS_2O_3로 0°C에서 급냉하고, H_2O (50 mL)로 희석하고 EtOAc로 추출했다 (200 mL). 조합시킨 유기 층을 농축하고 잔사를 얻었다. 수성상을 농축하고, DCM/MeOH(200mL/10mL)로 세척하고, 여과하여 잔사를 얻었다. 합한 잔사를 역상 크로마토그래피(C18-I, 일반 C18 20-40 μm, 120 g, 40→45% MeCN/H_2O 중 0.1% 포름산)로 정제하여 5-브로모-2-(메틸설피닐)피롤로[2,1-f][1,2,4]트리아진 (VIII) (1.5 g, 5.767 mmol, 37%)를 황색 고체로서 얻었다. ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.01 (s, 3H), 7.10 (d, J = 2.8 Hz, 1H), 7.97 (d, J = 2.7 Hz, 1H), 8.93 (s, 1H); 다음에 대한 ESIMS 실험치: $C_7H_6BrN_3OS$ *m/z* 261.9 (^{81}BrM+H).

[0696] 단계 2

[0697] 1,4-디옥산/H_2O (6 mL/2 mL) 내 5-브로모-2-(메틸설피닐)피롤로[2,1-f][1,2,4]트리아진 (VIII) (400 mg, 1.55 mmol), 이미다조[1,2-a]피리딘-6-일보론산 (LXXXVI) (Synthonix Corpo비n에서 시판) (301.2 mg, 1.86 mmol), PCy_3 (86.8 mg, 0.31 mmol), $Pd_2(dba)_3$ (141.8 mg, 0.155 mmol) 및 K_3PO_4 (657.2 mg, 3.1 mmol)의 용액을 N_2 하

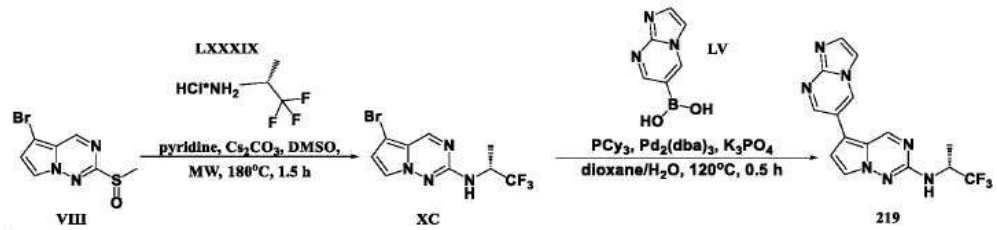
에서 120°C에서 0.5시간 동안 마이크로파로 조사했다. 반응 혼합물을 H_2O (30 mL)로 희석하고 EtOAc로 추출했다 (60 mL). 조합시킨 유기 층을 농축하고 잔사를 얻었다. 잔사를 역상 크로마토그래피로 정제하여 (C18-I, 일반 C18, 20-40 μm, 120 g, 50% MeCN/0.1% H_2O 내 포름산) 생성물 5-(이미다조[1,2-a]피리딘-6-일)-2-(메틸설피닐)피롤로[2,1-f][1,2,4]트리아진 (**LXXXVII**) (240 mg, 0.807 mmol, 52.1% 수율)를 황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{14}H_{11}N_5OS$ *m/z* 298. (M+H).

[0698] 단계 3

[0699] DME (2 mL) 내 5-(이미다조[1,2-a]피리딘-6-일)-2-(메틸설피닐)피롤로[2,1-f][1,2,4]트리아진 (**LXXXVII**) (58 mg, 0.185 mmol), 사이클로프로필메탄아민 (**LXXXVIII**) (40.0 mg, 0.555 mmol) 및 DIPEA (71.8 mg, 0.555 mmol)의 용액을 마이크로파로 180°C 에서 1 h 동안 조사했다. 반응 혼합물을 H_2O (30 mL)로 희석하고 EtOAc로 추출했다 (60 mL). 조합시킨 유기 층을 농축하고 잔사를 얻었다. 잔사를 분취용 HPLC로 정제하여 (Sunfire C18 21.2*250 mm*10 μm, 18→20% MeCN/0.1% H_2O 내 포름산) N-(사이클로프로필메틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 (**16**) (5.16 mg, 0.017 mmol, 9.2% 수율)를 황색 고체로서 얻었다. ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 0.19 - 0.28 (2 H, m), 0.40 - 0.50 (2 H, m), 1.07 - 1.17 (1 H, m), 3.09 (2 H, t, *J*=6.24 Hz), 6.96 (1 H, d, *J*=2.57 Hz), 7.04 (1 H, t, *J*=5.81 Hz), 7.53 - 7.65 (2 H, m), 7.58 (1 H, d, *J*=1.10 Hz), 7.71 (1 H, dd, *J*=2.45, 0.61 Hz), 7.95 (1 H, s), 8.92 (1 H, dd, *J*=1.65, 1.04 Hz), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{17}H_{16}N_6$ *m/z* 305.3 (M+1).

[0700] **실시예 2.**

[0701] (R)-5-(이미다조[1,2-a]피리미딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**219**)의 제조가 아래 반응식 **17**에 도시된다.

[0702] 

[0703] **반응식 17**

[0704] 단계 1

[0705] (R)-1,1,1-트리플루오로프로판-2-아민 (**LXXXIX**) (433.7 mg, 0.29 mmol) 및 Cs_2CO_3 (945.4 mg, 2.9 mmol)를 DMSO (2 mL) 내에 용해시키고 30 min 동안 교반했다. 이 혼합물에 5-브로모-2-(메틸설피닐)피롤로[2,1-f][1,2,4]트리아진 (**VIII**) (150 mg, 0.58 mmol) 및 피리딘 (229.39 mg, 2.9 mmol)을 부가했다. 생성된 혼합물을 밀봉하고 마이크로파로 180℃에서 1.5 h 동안 조사했다. 반응 혼합물을 이후 실온까지 냉각하고 EtOAc (30 mL)로 희석했다. 용액을 물 (30 mL)로 세척하고,수성 부분을 EtOAc로 추출했다 (30 mL). 조합시킨 유기 추출물을 염수 (30 mL)로 세척하고 무수 $MgSO_4$ 상에서 건조시키고, 여과하고,진공 농축하고 미정제 생성물을 얻었고 이를 pre-TLC (16.7% EtOAc/석유 에테르)로 정제하여 (R)-5-브로모-N-(1,1,1-트리플루오로프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**XC**) (58 mg, 0.187 mmol, 64.5% 수율)을 황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_9H_8BrF_3N_4$ *m/z* 309.0 (^{79}BrM+H).

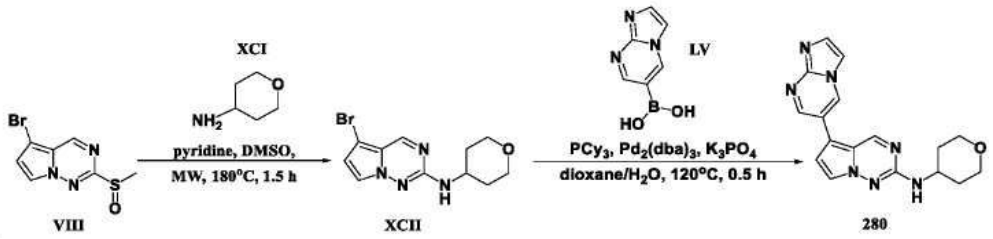
[0706] 단계 2

[0707] 실시예 3, 반응식 18, 단계 2에 나타낸 절차를 사용하여 수행하여 (R)-5-(이미다조[1,2-a]피리미딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 (**219**) (20.91 mg, 0.060 mmol)을 황색 고체로서 얻었다. ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.37 (3 H, d, *J*=7.00 Hz), 4.66 - 4.82 (1 H, m), 7.15 (1 H, d, *J*=2.50 Hz), 7.60 (1 H, d, *J*=9.13 Hz), 7.75 (1 H, d, *J*=1.13 Hz), 7.84 (1 H, d, *J*=2.63 Hz),

7.90 (1 H, d, *J*=1.25 Hz), 8.90 (1 H, d, *J*=2.50 Hz), 9.24 (1 H, s), 9.33 (1 H, d, *J*=2.50 Hz); 다음에 대한 ESIMS 실험치: $C_{15}H_{12}F_3N_7$ *m/z* 348.1 (M+1).

[0708] **실시예 3.**

[0709] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**280**)의 제조가 아래 반응식 **18**에 도시된다.

[0710] 

[0711] **반응식 18**

[0712] 단계 1

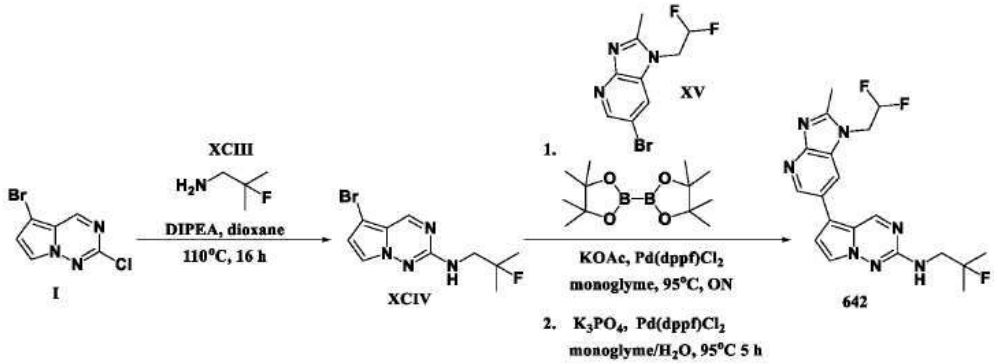
[0713] DMSO (3 mL) 내 5-브로모-2-(메틸설피닐)피롤로[2,1-f][1,2,4]트리아진 (**VIII**) (150 mg, 0.58 mmol), 테트라히드로-2H-피란-4-아민 (**XCI**) (293.3 mg, 2.9 mmol), 및 피리딘 (225 μL, 2.9 mmol)의 용액을 밀봉하고 마이크로파로 180℃에서 1.5 h 동안 조사했다. 반응 혼합물을 이후 실온까지 냉각하고 EtOAc (30 mL)로 희석했다. 용액을 물 (30 x 3 mL)로 세척하고,수성 부분을 EtOAc로 추출했다 (30 x 3 mL). 조합시킨 유기 추출물을 염수 (30 x 3 mL)로 세척하고 무수 Na_2SO_4 상에서 건조시키고, 여과하고,진공 농축하고 미정제 잔사를 얻었다. 잔사를 pre-TLC (20% EtOAc/석유 에테르로 정제하여) 5-브로모-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**XCII**) (220 mg, 0.740 mmol, >100% 수율)를 황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{11}H_{13}BrN_4O$ *m/z* 297.0 (^{79}BrM+H).

[0714] 단계 2

[0715] 디옥산 /물 (12 mL, 3:1 비) 내 5-브로모-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**XCII**) (190 mg, 0.64 mmol), 이미다조[1,2-a]피리미딘-6-일보론산 (**LV**) (1.04 g, 6.4 mmol), PCy_3 (71.8 mg, 0.26 mmol), $Pd_2(dba)_3$ (117.1 mg, 0.13 mmol) 및 K_3PO_4 (407.6 mg, 1.92 mmol)의 용액을 밀봉하고 마이크로파로 120℃에서 30 min 동안 조사했다. 반응 혼합물을 이후 실온까지 냉각하고 EtOAc (30 x 3 mL)로 희석했다. 용액을 물 (30 x 3 mL)로 세척하고,수성 부분을 EtOAc로 추출했다 (30 x 3 mL). 조합시킨 유기 추출물을 염수 (30 x 3 mL)로 세척하고 무수 Na_2SO_4 상에서 건조시키고, 여과하고, 진공 농축하고 미정제물을 얻었고 이를 pre-TLC (6.25% MeOH/DCM→50% EtOAc/석유 에테르)로 정제하여 5-(이미다조[1,2-a]피리미딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**280**) (25.1 mg, 0.075 mmol, 11.7% 수율)를 황색 고체로서 얻었다. ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.45 - 1.61 (2 H, m), 1.90 (2 H, br dd, *J*=12.51, 2.00 Hz), 3.35 - 3.43 (2 H, m), 3.72 - 3.83 (1 H, m), 3.84 - 3.93 (2 H, m), 7.01 (1 H, d, *J*=7.75 Hz), 7.06 (1 H, d, *J*=2.50 Hz), 7.74 (2 H, dd, *J*=4.13, 1.88 Hz), 7.89 (1 H, d, *J*=1.25 Hz), 8.88 (1 H, d, *J*=2.50 Hz), 9.16 (1 H, s), 9.29 (1 H, d, *J*=2.50 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{17}N_7O$ *m/z* 336.1 (M+1).

[0716] **실시예 4.**

[0717] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**642**)의 제조가 아래 반응식 **19**에 도시된다.



[0718]

[0719] **반응식 19**

[0720] 단계 1

[0721] 1,4-디옥산 (4 mL) 내 2-플루오로-2-메틸프로판-1-아민 히드로클로라이드 (**XCIII**) (290 mg, 2.26 mmol), 5-브로모-2-클로로피롤로[2,1-f][1,2,4]트리아진 (**I**) (Advanced ChemBlocks Inc.에서 시판) (350 mg, 1.51 mmol) 및 DIPEA (1.2 mL, 6.89 mmol)의 혼합물을 110° C까지 16 h 동안 가열했다. 반응 혼합물을 농축하고, 잔사를 $CHCl_3$/물 사이에서 분배시키고, 유기 층을 분리하고, 염 용액으로 세척하고, 무수 Na_2SO_4 상에서 건조시키고, 용매를 농축하고 고 진공 하에서 건조시키고 미정제 5-브로모-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**XCIV**) (435 mg, 1.52 mmol, 100.6% 수율)을 얻었고 이를 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_{10}H_{12}BrFN_4$ *m/z* 287.0 (^{79}BrM+H).

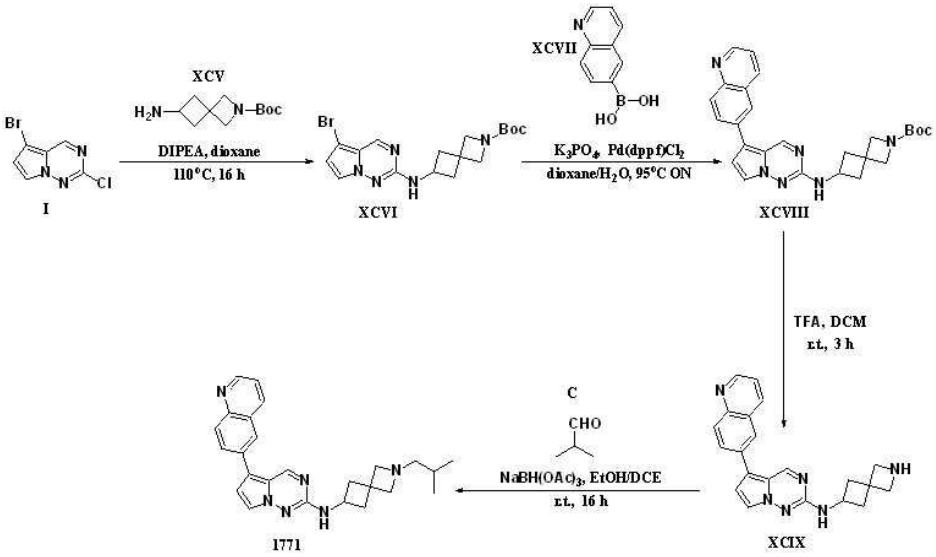
[0722] 단계 2-3

[0723] 6-브로모-1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘 (**XV**) (100 mg, 0.370 mmol), 비스(피나콜라토)디보론 (100 mg, 0.400 mmol), KOAc (110 mg, 1.1 mmol) 및 $Pd(dppf)Cl_2$ (100 mg, 0.020 mmol)의 혼합물을 모노글라임(1.5 mL)에 넣고 N_2을 혼합물에 2분 동안 퍼징하고 바이알을 밀봉하고 밤새 95° C로 가열했다. LCMS는 반응 완료 및 보론산 형성을 보여주었다.

[0724] 혼합물에 5-브로모-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**XCIV**) (70 mg, 0.240 mmol), $Pd(dppf)Cl_2$ (100 mg, 0.020 mmol) 및 K_3PO_4 (0.37 mL, 0.750 mmol)의 2 N 용액을 부가하고, N_2을 2 min 동안 퍼징하고 혼합물을 95°C까지 5 h 동안 가열했다. 유기물을 분리하고 실리카겔에 흡수시킨 후, ISCO (0→6%7 N NH_3 MeOH/$CHCl_3$)로 정제했다. 순수한 분획을 합치고, 디에틸 에테르로 분쇄하고, 초음파 처리하고, 고체를 여과하여 수집하여 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**642**) (37 mg, 0.092 mmol, 37.6% 수율)을 황색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 2.63 (3 H, s), 3.49 (2 H, dd, *J*=19.30, 6.43 Hz), 4.91 (2 H, td, *J*=15.88, 3.01 Hz), 6.53 (1 H, tt, *J*=54.40, 3.20 Hz), 7.01 (1 H, d, *J*=2.74 Hz), 7.03 (1 H, t, *J*=6.43 Hz), 7.73 (1 H, d, *J*=2.46 Hz), 8.25 (1 H, d, *J*=1.92 Hz), 8.67 (1 H, d, *J*=1.92 Hz), 9.14 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{20}F_3N_7$ *m/z* 404.2 (M+1).

[0725] **실시예 5.**

[0726] N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(퀴놀린-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 (**1771**)의 제조가 아래 반응식 **20**에 도시된다.



[0727]

[0728] **반응식 20**

[0729] 단계 1

[0730] 1,4-디옥산 (4 mL) 내 DIPEA (0.79 mL, 4.52 mmol), 5-브로모-2-클로로피롤로[2,1-f][1,2,4]트리아진 (**I**) (Advanced ChemBlocks Inc.에서 시판) (350 mg, 1.51 mmol) 및 *tert*-부틸 6-아미노-2-아자스피로[3.3]헵탄-2-카복실레이트 (**XCV**) (480 mg, 2.26 mmol)의 혼합물을 110° C까지 16 h 동안 가열했다. 반응 혼합물을 농축하고, 잔사를 DCM/물 사이에서 분배시키고, 유기 층을 분리하고, 염 용액으로 세척하고, 무수 Na_2SO_4 상에서 건조시키고, 용매를 농축하고 고 진공 하에서 건조시키고 미정제 *tert*-부틸 6-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.3]헵탄-2-카복실레이트 (**XCVI**) (630 mg, 1.54 mmol, 102.5% 수율)을 얻었고 이를 정제 없이 다음 단계에서 사용했다. 다음에 대한 ESIMS 실험치: $C_{17}H_{22}BrN_5O_2$ *m/z* 352.1 (M+H-^{t}Bu).

[0731] 단계 2

[0732] *tert*-부틸 6-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.3]헵탄-2-카복실레이트 (**XCVI**) (620 mg, 1.51 mmol), K_3PO_4의 2 N 수성 용액 (4.44 mL, 8.88 mmol), 및 Pd(dppf)Cl_2 (60 g, 0.080 mmol)의 혼합물을 1,4-디옥산 (8 mL)에 넣고 퀴놀린-6-보론산 (**XCVII**) (520 mg, 3.01 mmol)을 부가했다. 반응 혼합물을 N_2 가스로 5분 동안 퍼징하고, 바이알을 밀봉하고 95℃에서 밤새 가열하였다. 용매를 포화 수성 $NaHCO_3$에 부가하고, 고체를 여과에 의해 수집하고 미정제물을 ISCO (4% $CHCl_3$ 내 7 N NH_3 MeOH)로 정제하여 *tert*-부틸 6-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.3]헵탄-2-카복실레이트 (**XCVIII**) (588 mg, 1.29 mmol, 85.5% 수율)를 황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{26}H_{28}N_6O_2$ *m/z* 457.3 (M+H).

[0733] 단계 3

[0734] DCM (10 mL) 내 *tert*-부틸 6-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)아미노)-2-아자스피로[3.3]헵탄-2-카복실레이트 (**XCVIII**) (590 mg, 1.29 mmol)의 교반 용액에 TFA (3.8 mL, 49.3 mmol)을 부가하고 혼합물을 실온에서 3 h 동안 교반했다. 혼합물을 농축하고 MeOH 중 2 N NH_3 용액으로 염기성화하고 컬럼 크로마토그래피(MeOH/$CHCl_3$ 중 0→8% 7 N NH_3)를 통해 정제하여 5-(퀴놀린-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**XCIX**) (410 mg, 1.15 mmol, 89.3% 수율)을 황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{21}H_{20}N_6$ *m/z* 357.2 (M+H).

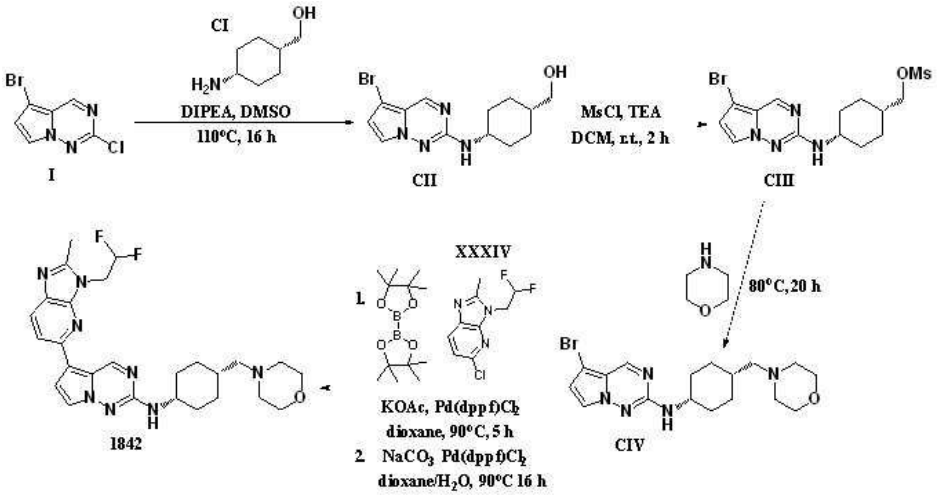
[0735] 단계 4

[0736] DCE (1 mL) 및 EtOH (0.125 mL) 내 5-(퀴놀린-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**XCIX**) (100 mg, 0.280 mmol)의 교반 용액에 이소부티르알데히드 (**C**) (0.26 mL, 2.81 mmol)을 부가했다. 반응 혼합물을 30분 동안 교반하고 $NaBH(OAc)_3$ (150 mg, 0.700 mmol)을 부가했다. 반응 혼합물을 실온

에서 16시간 동안 교반되도록 하였다. 포화 수성 $NaHCO_3$로 반응을 급냉했다. DCM로 추출했다. 유기물을 염수로 세척하고 $MgSO_4$로 건조시켰다. 농축했다. 컬럼 크로마토그래피를 통해 정제했다. (100% $CHCl_3$ => 6% MeOH/$CHCl_3$ 내 7 N NH_3) 5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(트리플루오로메톡시) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1771**) (20 mg, 0.048 mmol, 18.2% 수율)를 갈색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.62 - 1.71 (2 H, m), 1.71 - 1.80 (2 H, m), 1.80 - 1.88 (2 H, m), 1.95 (2 H, br dd, *J*=9.03, 4.65 Hz), 3.65 - 3.77 (1 H, m), 4.57 - 4.65 (1 H, m), 7.02 (1 H, d, *J*=7.12 Hz), 7.07 (1 H, d, *J*=2.74 Hz), 7.73 - 7.76 (2 H, m), 7.89 (1 H, d, *J*=1.09 Hz), 8.88 (1 H, d, *J*=2.74 Hz), 9.16 (1 H, s), 9.30 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{18}F_3N_7O$ *m/z* 418.2 (M+1).

[0737] **실시예 6.**

[0738] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(모르폴리노메틸)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1842**)의 제조가 아래 반응식 **21**에 도시된다.



[0739]

[0740] **반응식 21**

[0741] 단계 **1**

[0742] DMSO (1 mL) 내 5-브로모-2-클로로피롤로[2,1-f][1,2,4]트리아진 (**I**) (Advanced ChemBlocks Inc.에서 시판) (200 mg, 0.860 mmol), (*cis*-4-아미노사이클로헥실)메탄올 HCl 염 (**CI**) (Combi-Blocks Inc.에서 시판) (215 mg, 1.3 mmol) 및 DIPEA (0.44 mL, 2.53 mmol)의 혼합물을 110° C까지 16 h 동안 가열했다. 반응 혼합물을 농축했다. 잔사를 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0→00% EtOAc/헥산) (*cis*-4-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메탄올 (**CII**) (203.9 mg, 0.627 mmol, 72.9% 수율)를 갈색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.42 - 1.51 (5 H, m), 1.53 - 1.60 (2 H, m), 1.66 - 1.74 (2 H, m), 3.30 (2 H, t, *J*=5.75 Hz), 3.70 - 3.80 (1 H, m), 4.37 (1 H, t, *J*=5.34 Hz), 6.73 (1 H, d, *J*=2.46 Hz), 6.82 (1 H, d, *J*=7.12 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 8.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{13}H_{17}BrN_4O$ *m/z* 325.0 (M+H).

[0743] 단계 **2**

[0744] DCM (4 mL) 내 (*cis*-4-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실) 메탄올 (**CII**) (180 mg, 0.550 mmol)의 용액에0°C에서 MsCl (43 uL, 0.560 mmol) 및 TEA (231 µL, 1.66 mmol)을 부가했다. 반응 혼합물을 실온까지 데워지도록 방치하고 2h 동안 교반했다. 반응물을 Celite®로 증발시키고 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0→100% EtOAc/헥산) ((*cis*-4-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메틸 메탄설포네이트 (**CIII**) (182 mg, 0.451 mmol, 81.5% 수율)를 회-백색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.53 (4 H, q, *J*=5.75 Hz), 1.56 - 1.64 (2 H, m), 1.77 (2 H, br dd, *J*=12.73, 5.06 Hz), 1.80 - 1.86 (1 H, m), 3.17 (3 H, s), 3.75 - 3.85 (1 H, m), 4.10 (2 H, d, *J*=7.12

Hz), 6.74 (1 H, d, *J*=2.74 Hz), 6.87 (1 H, d, *J*=7.12 Hz), 7.63 - 7.70 (1 H, m), 8.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{14}H19BrN_4O_3S$ *m/z* 403.1 (M+H).

[0745] 단계 3

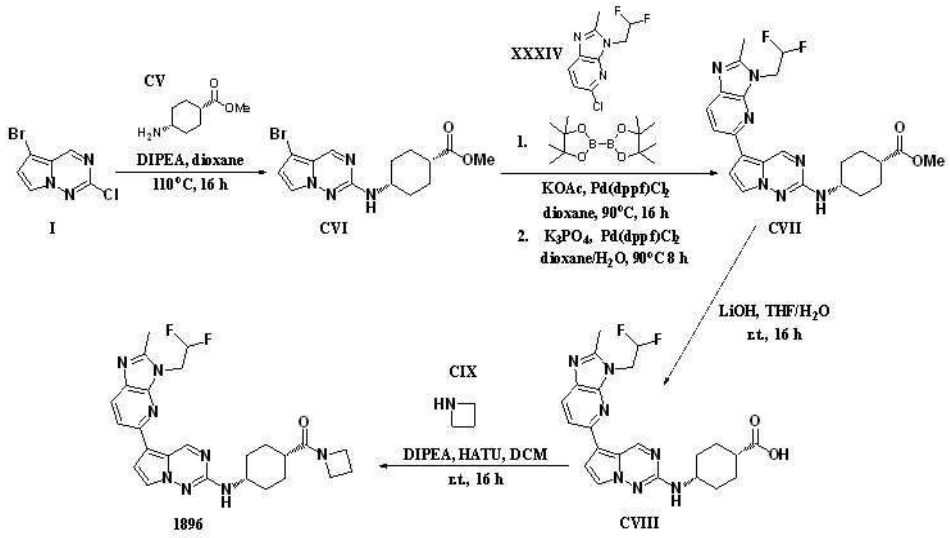
[0746] 모르폴린 (1 mL, 11.59 mmol) 내 ((*cis*-4-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실) 메틸 메탄설포네이트 (**CIII**) (60 mg, 0.150 mmol)의 용액을 80° C까지 20 h 동안 가열했다. 용매를 감압 하에서 제거하고 잔사를 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0 to 5% MeOH/$CHCl_3$) 5-브로모-N-(*cis*-4-(모르폴리노메틸) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CIV**) (73 mg, 0.185 mmol, 124.4% 수율)를 회-백색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{17}H_{24}BrN_5O$ *m/z* 394.1 (M+H).

[0747] 단계 4-5

[0748] 5-클로로-3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘 (**XXXIV**) (50 mg, 0.220 mmol), Pd(dppf)Cl_2 (17 mg, 0.020 mmol), 비스(피나콜라토)디보론 (82 mg, 0.320 mmol) 및 KOAc (63 mg, 0.640 mmol)를 디옥산 (4 mL) 내 현탁했다. 반응물을 N_2로 탈기시킨 후 90℃에서 5시간 동안 교반하였다. 반응을 실온까지 냉각한 후 5-브로모-N-(*cis*-4-(모르폴리노메틸)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CIV**) (73 mg, 0.190 mmol), Na_2CO_3 (0.69 mL, 0.650 mmol), Pd(dppf)Cl_2 (17 mg, 0.020 mmol), 및 모노글라임 (4 mL)의 수성 용액을 부가했다. 반응을 90° C까지 16 h 동안 가열했다. 반응물을 Celite® 로 증발시키고 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0→50% MeOH/$CHCl_3$) 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(모르폴리노메틸)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1842**) (38 mg, 0.074 mmol, 34.5% 수율)를 옅은 갈색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.42 - 1.56 (4 H, m), 1.56 - 1.65 (2 H, m), 1.65 - 1.76 (3 H, m), 2.18 (2 H, br d, *J*=7.12 Hz), 2.32 (4 H, br s), 2.61 (3 H, s), 3.57 (4 H, br t, *J*=4.24 Hz), 3.76 - 3.85 (1 H, m), 4.83 (2 H, td, *J*=15.81, 2.33 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.67 (1 H, d, *J*=7.39 Hz), 7.22 (1 H, d, *J*=2.46 Hz), 7.64 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{26}H_{32}F_2N_8O$ *m/z* 511.3 (M+1).

[0749] **실시예 7.**

[0750] 아제티딘-1-일(*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메탄온 (**1896**)의 제조가 아래 반응식 **22**에 도시된다.

[0751] 

[0752] **반응식 22**

[0753] 단계 1

[0754] 1,4-디옥산 (10 mL) 내 DIPEA (1.35 mL, 7.75 mmol), 5-브로모-2-클로로피롤로[2,1-f][1,2,4]트리아진 (**I**)

(Advanced ChemBlocks Inc.에서 시판) (600 mg, 2.58 mmol) 및 메틸 4-아미노사이클로헥산-1-카복실레이트 (**CV**) (Combi-Blocks Inc.에서 시판) (490 mg, 3.1 mmol) 의 혼합물을 110° C까지 16 h 동안 가열했다. 반응을 농축하고 컬럼 크로마토그래피를 통해 정제하여 (0→2% MeOH/$CHCl_3$) (12 g의 실리카겔) 메틸 4-[(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노]사이클로헥산-1-카복실레이트 (**CVI**) (729 mg, 2.064 mmol, 80.0% 수율)을 옅은 갈색 점성 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{14}H_{17}BrN_4O_2$ *m/z* 353.1 (M-^{t}Bu+H).

[0755] 단계 **2-3**

[0756] 마이크로파 바이알에 1,4-디옥산 (15 mL) 내 5-클로로-3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘 (**XXXIV**) (720 mg, 3.1 mmol), 비스(피나콜라토)디보론 (1.05 g, 4.13 mmol), KOAc (0.91 g, 9.29 mmol), 및 Pd(dppf)Cl_2 (0.13 g, 0.15 mmol)을 부가했다. 반응 혼합물을 90°C까지 16 h 동안 가열하고 이후 메틸 4-[(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노]사이클로헥산-1-카복실레이트 (**CVI**) (730 mg, 2.06 mmol), K_3PO_4의 2 N 수성 용액 (3.3 mL, 6.6 mmol), 및 Pd(dppf)Cl_2 (130 mg, 0.15 mmol)을 부가했다. 반응을 90°C에서 부가적 8 h 동안 교반했다. 반응을 농축하고 컬럼 크로마토그래피를 통해 정제하여 (0→8% MeOH/$CHCl_3$) (24 g의 실리카겔) 메틸 4-[[5-[3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘-5-일]피롤로[2,1-f][1,2,4]트리아진-2-일]아미노]사이클로헥산-1-카복실레이트 (**CVII**) (765 mg, 1.629 mmol, 78.9% 수율)을 호박색 점성 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_2N_7O_2$ *m/z* 470.2 (M+H).

[0757] 단계 **4**

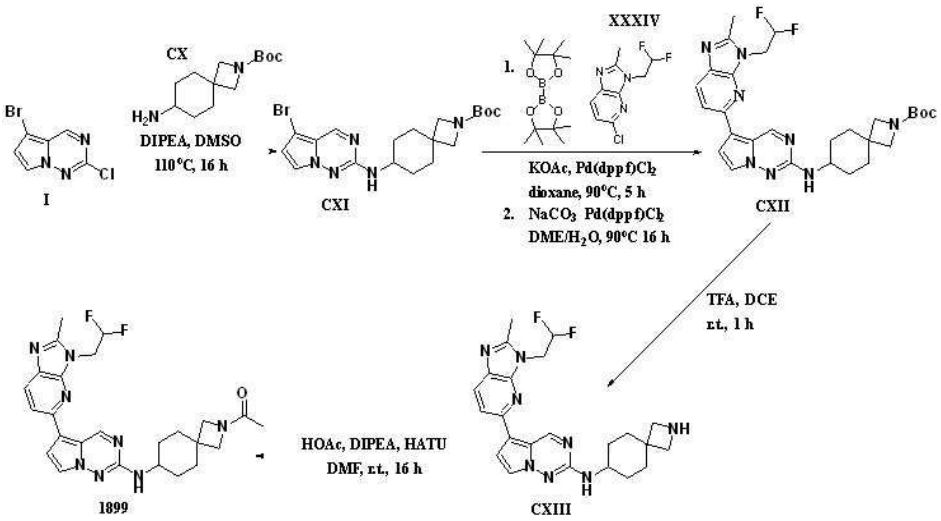
[0758] 메틸 4-[[5-[3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘-5-일]피롤로[2,1-f][1,2,4]트리아진-2-일]아미노]사이클로헥산-1-카복실레이트 (**CVII**) (729 mg, 1.55 mmol) 물 (3 mL) 및 THF (12 mL)의 혼합물, 이후 LiOH (1.4 mL, 2.8 mmol)에. 반응을 실온에서 16 h 동안 교반했다. 농축 HCl (2.9 mL, 2.9 mmol)을 첨가하여 반응을 중화시켰다. 반응 혼합물을 제거하고 Celite® 상에서 증발시키고, 샘플을 역상 C18 실리카겔(0→20% MeCN/물(0.1% 포름산 함유))로 정제했다. 화합물을 함유한 분획을 동결건조(-78°C에서 냉동)하여 4-[[5-[3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘-5-일]피롤로[2,1-f][1,2,4]트리아진-2-일]아미노]사이클로헥산-1-카복실산 (**CVIII**) (450 mg, 0.988 mmol, 63.6% 수율)를 오렌지색-갈색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{22}H_{23}F_2N_7O_2$ *m/z* 456.2 (M+H).

[0759] 단계 5

[0760] DCM (1 mL) 내 4-[[5-[3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘-5-일]피롤로[2,1-f][1,2,4]트리아진-2-일]아미노]사이클로헥산-1-카복실산 (**CVIII**) (50 mg, 0.1 mmol)의 교반 용액에 DIPEA (0.07 mL, 0.4 mmol) 및 HATU (60 mg, 0.15 mmol)을 부가했다. 반응을 실온에서 5 min 동안 교반했다. 아제티딘 히드로클로라이드 (**CIX**) (20 mg, 0.2 mmol)을 이후 부가하고 반응을 실온에서 16 h 동안 교반했다. 반응을 농축하고 컬럼 크로마토그래피를 통해 정제하여 (0→8 % MeOH/클로로포름 내 7 N NH_3) (8 g의 실리카겔) 아제티딘-1-일(*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메탄온 (**1896**) (7 mg, 0.014 mmol, 14.3% 수율)를 황색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.42 - 1.50 (2 H, m), 1.57 - 1.66 (2 H, m), 1.73 - 1.83 (2 H, m), 1.92 (2 H, dt, *J*=6.64, 3.39 Hz), 2.13 - 2.22 (2 H, m), 2.31 (1 H, tt, *J*=8.62, 4.11 Hz), 2.61 (3 H, s), 3.75 - 3.80 (1 H, m), 3.82 (2 H, t, *J*=7.67 Hz), 4.15 (2 H, t, *J*=7.53 Hz), 4.83 (2 H, td, *J*=15.95, 2.60 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.77 (1 H, d, *J*=6.30 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8O$ *m/z* 495.3 (M+1).

[0761] **실시예 8.**

[0762] 1-(7-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-일)에탄-1-온 (**1899**)의 제조가 아래 반응식 **23**에 도시된다.

[0763] 

[0764] **반응식 23**

[0765] 단계 1

[0766] DMSO (1 mL) 내 5-브로모-2-클로로피롤로[2,1-f][1,2,4]트리아진 (**I**) (Advanced ChemBlocks Inc.에서 시판) (200 mg, 0.860 mmol), *tert*-부틸 7-아미노-2-아자스피로[3.5]노난-2-카복실레이트 (**CX**) (A2B Chem LLC에서 시판) (311.9 mg, 1.3 mmol) 및 DIPEA (0.44 mL, 2.53 mmol)의 혼합물을 110° 까지 C 16 h 동안 가열했다. 반응 혼합물을 고 진공하에서 농축했다. 잔사를 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0→100% EtOAc/헥산) *tert*-부틸 7-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-카복실레이트 (**CXI**) (2.185 mg, 0.501 mmol, 58.2% 수율)를 갈색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{19}H_{26}BrN_5O_2$ *m/z* 380.1 (M-^{t}Bu+H).

[0767] 단계 2-3

[0768] 5-클로로-3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘 (**XXXVI**) (100 mg, 0.430 mmol), Pd(dppf)Cl_2 (35 mg, 0.040 mmol), 비스(피나콜라토)디보론 (164 mg, 0.650 mmol), 및 KOAc (127 mg, 1.29 mmol)를 디옥산 (4 mL) 내 현탁했다. 반응물을 N_2로 탈기시킨 후 90℃에서 5시간 동안 교반하였다. 반응을 실온까지 냉각하고 이후 *tert*-부틸 7-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-카복실레이트 (**CXI**) (124 mg, 0.280 mmol), Na_2CO_3의 수성 용액 (1.3 mL, 1.3 mmol), Pd(dppf)Cl_2 (35 mg, 0.040 mmol), 및 DME (4 mL)을 부가하고, 반응을 90° C까지 16 h 동안 가열했다. 반응물을 Celite®로 증발시키고 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0→50% MeOH/$CHCl_3$) *tert*-부틸 7-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-카복실레이트 (**CXII**) (133 mg, 0.241 mmol, 55.7% 수율)을 황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{28}H_{34}F_2N_8O_2$ *m/z* 553.3 (M+H).

[0769] 단계 4

[0770] *tert*-부틸 7-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-카복실레이트 (**CXII**) (133 mg, 0.240 mmol)을 DCE (4 mL) 내 TFA (1 mL, 12.98 mmol)에 부가하고 실온에서 1 h 동안 교반했다. 용매를 제거하고,잔사를 실리카겔 칼럼 크로마토그래피에 의해 정제하여 (0→10% MeOH/$CHCl_3$ 내 7 N NH_3) 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-아자스피로[3.5]노난-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CXIII**) (112 mg, 0.248 mmol, 102.8% 수율)를 옅은-황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8$ *m/z* 453.2 (M+H).

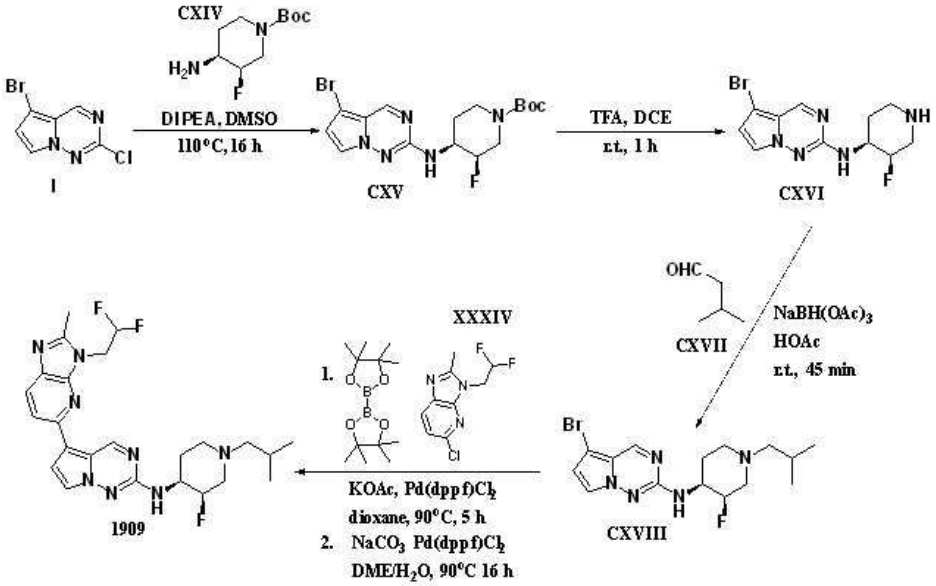
[0771] 단계 5

[0772] DMF (1.2 mL) 내 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-아자스피로[3.5]노난-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CXIII**) (55 mg, 0.120 mmol)의 용액에 HOAc (8 μL, 0.140

mmol), 이후 HATU (60 mg, 0.160 mmol) 및 DIPEA (64 μL, 0.370 mmol)을 부가했다. 용액을 실온에서 16 h 동안 교반했다. 물 (40 mL)을 부가하고,용액을 EtOAc로 추출했다. 반응물을 Celite®로 증발시키고 실리카겔 칼럼 크로마토그래피 (0→100% EtOAc/헥산)에 의해 정제했다. NMR에 따르면 화합물은 여전히 순수하지 않았다. 미정제 생성물을 DCM 내에 용해시키고 포화 수성 $NaHCO_3$로 세척하고 이후 실리카겔 컬럼 크로마토그래피를 사용하여 재-정제하여 (0→100% EtOAc/헥산) 1-(7-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-일)에탄-1-온 (**1899**) (33 mg, 0.067 mmol, 54.9% 수율)를 황색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.27 - 1.41 (2 H, m), 1.50 - 1.62 (2 H, m), 1.73 - 1.79 (3 H, m), 1.88 (4 H, br d, *J*=10.13 Hz), 2.60 (3 H, s), 3.45 - 3.55 (2 H, m), 3.55 - 3.66 (1 H, m), 3.70 - 3.85 (2 H, m), 4.77 - 4.90 (2 H, m), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.74 (1 H, dd, *J*=12.05, 7.94 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, t, *J*=3.01 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{25}H_{28}F_2N_8O$ *m/z* 495.25 (M+1).

[0773] **실시예 9.**

[0774] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-3-플루오로-1-이소부틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1909**)의 제조가 아래 반응식 **24**에 도시된다.



[0775]

[0776] **반응식 24**

[0777] 단계 1

[0778] DMSO (1 mL) 내 5-브로모-2-클로로피롤로[2,1-f][1,2,4]트리아진 (**I**) (Advanced ChemBlocks Inc.에서 시판) (200 mg, 0.860 mmol) 및 *tert*-부틸 (3R,4S)-4-아미노-3-플루오로피페리딘-1-카복실레이트 (**CXIV**) (에서 시판 Sunshine Chemlab, Inc.) (282 mg, 1.29 mmol)의 용액에 DIPEA (450 μL, 2.58 mmol)을 부가했다. 반응을 120 °C에서 16 h 동안 교반했다. 반응 혼합물을 이후 물 및 EtOAc에 부가하고 유기 층을 분리했다. 수성 층을 EtOAc (×3)로 추출하고 조합시킨 유기 층을 염수로 세척하고, 건조시키고 ($MgSO_4$), 및 진공 감소시켜 미정제 생성물 *tert*-부틸 (3R,4S)-4-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-3-플루오로피페리딘-1-카복실레이트 (**CXV**) (457 mg, 1.103 mmol, 128% 수율)을 푹신한 갈색 고체로서 얻었고 이를 추가 정제 없이 사용했다. 다음에 대한 ESIMS 실험치: $C_{16}H_{21}BrFN_5O_2$ *m/z* 358.1 (M-^{t}Bu+H).

[0779] 단계 2

[0780] DCE (2.7 mL) 내 *tert*-부틸 (3R,4S)-4-((5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-3-플루오로피페리딘-1-카복실레이트 (**CXV**) (356 mg, 0.860 mmol)의 용액에 TFA (300 μL, 3.89 mmol)을 부가했다. 반응을 실온에서 3 h 동안 교반했다. 반응 혼합물을 건조시키고 과량의 TFA를 고진공으로 제거하여 미정제 중간체 5-브로

모-N-((3R,4S)-3-플루오로피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CXVI**) (270 mg, 0.859 mmol, 100% 수율)을 갈색 반-고체로서 얻었고 이를 추가 정제 없이 사용했다. 다음에 대한 ESIMS 실험치: $C_{11}H_{13}BrFN_5$ *m/z* 314.0 (M+H).

[0781] 단계 3

[0782] MeOH (3 mL) 내 5-브로모-N-((3R,4S)-3-플루오로피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CXVI**) (135 mg, 0.430 mmol)의 용액에 HOAc (50 μL, 0.870 mmol) 및 이소부티르알데히드 (**CXVII**) (78 μL, 0.850 mmol)을 부가했다. 반응을 실온에서 20 분 동안 교반했다. $NaBH(OAc)_3$ (228 mg, 1.08 mmol)을 부가하고,반응을 10 분 동안 교반했다. LCMS는 부분 전환을 나타내었으므로 LCMS가 완료를 확인할 때까지(3회 첨가) $NaBH(OAc)_3$(228mg, 1.08mmol)을 5분 간격으로 첨가했다. 반응물을 Celite®로 증발시키고 역상 크로마토그래피로 정제하여 (0→20% MeCN/0.1% H_2O 내 포름산) 5-브로모-N-((3R,4S)-3-플루오로-1-이소부틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CXVIII**) (33 mg, 0.089 mmol, 20.7% 수율)을 갈색 반-고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{15}H_{21}BrFN_5$ *m/z* 370.1 (M+H).

[0783] 단계 4

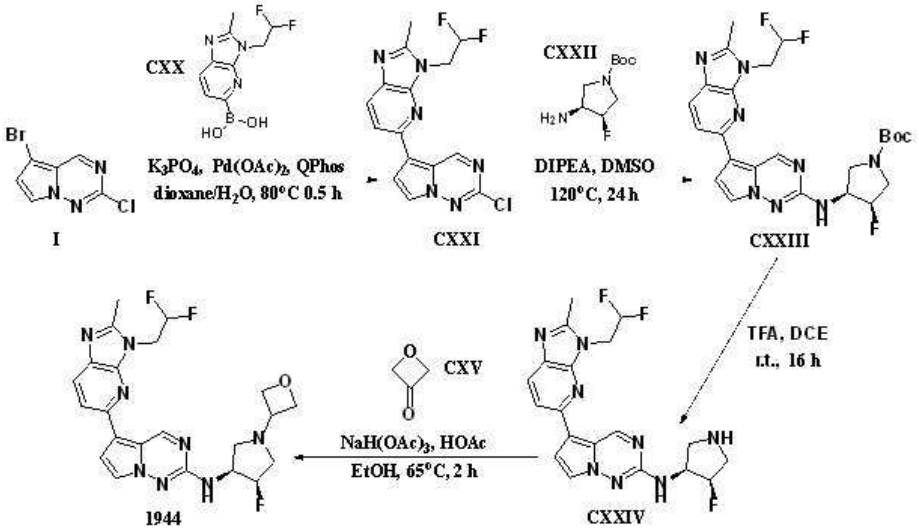
[0784] 5-클로로-3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘 (**XXXIV**) (1 g, 4.32 mmol), 비스(피나콜라토)디보론 (1.75 g, 6.89 mmol), $Pd(dppf)Cl_2$ (176 mg, 0.220 mmol) 및 KOAc (1.28 g, 13.04 mmol)를 건조 DMF (30 mL) 내에 용해시키고 반응물을 초음파 처리하고 Ar로 5분 동안 탈기시켰다. 반응을 100° C에서 16 h 동안 교반했다. 반응 혼합물을 냉각하고 진공 감소시켜 흑색 고체를 얻었다. 미정제 생성물을 C18Aq 역상 컬럼 크로마토그래피 (0→11% MeCN/0.1% H_2O 내 포름산)로 정제했다. 적절한 분획을 수집하고 고진공 하에서 증발시켜 (3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)보론산 (**CXIX**) (543 mg, 2.253 mmol, 52.2% 수율)를 폭신한 황색 고체로서 얻었고 이를 -20° C에 저장했다. 다음에 대한 ESIMS 실험치: $C_9H_{10}BF_2N_3O_2$ *m/z* 242.1 (M+H).

[0785] 단계 5

[0786] 디옥산 (1.5 mL) 내 5-브로모-N-((3R,4S)-3-플루오로-1-이소부틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CXVIII**) (32 mg, 0.090 mmol), (3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)보론산 (**CXIX**) (31 mg, 0.130 mmol) 및 $Pd(dppf)Cl_2$ (3 mg, 0 mmol)의 현탁액에 Na_2CO_3 (274 μL, 0.260 mmol)의 수성 용액을 부가했다. 반응물을 초음파 처리하고 Ar로 5분간 탈기한 후 16시간 동안 100° C로 가열했다. 반응 혼합물을 컬럼 크로마토그래피로 정제했다 (0→10% MeOH/$CHCl_3$ 내 7.0 M NH_3). 화합물을 역상 크로마토그래피로 추가로 정제했다 (0→17% MeCN/0.1% H_2O 내 포름산). 적절한 분획을 수집하고 포화 수성 $NaHCO_3$에 부가하고 DCM (×3)로 추출했다. 조합시킨 유기 층을 염수로 세척하고, 건조시키고 ($MgSO_4$) 진공 감소시켜 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-3-플루오로-1-이소부틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1909**) (15 mg, 0.031 mmol, 35.7% 수율)를 황색 고체로서 얻었다. ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm 0.86 (6 H, br d, *J*=6.31 Hz), 1.66 - 1.82 (2 H, m), 1.88 - 1.99 (1 H, m), 2.00 - 2.11 (3 H, m), 2.12 - 2.27 (1 H, m), 2.61 (3 H, s), 2.80 - 2.91 (1 H, m), 3.05 - 3.17 (1 H, m), 3.73 - 3.92 (1 H, m), 4.84 (2 H, td, *J*=15.85, 2.61 Hz), 4.94 (1 H, br s), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.86 (1 H, br d, *J*=7.68 Hz), 7.26 (1 H, d, *J*=2.47 Hz), 7.66 (1 H, d, *J*=2.47 Hz), 7.74 (1 H, d, *J*=8.51 Hz), 7.96 (1 H, d, *J*=8.51 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{29}F_3N_8$ *m/z* 487.3 (M+1).

[0787] **실시예 10.**

[0788] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-4-플루오로-1-(옥세탄-3-일)피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1944**)의 제조가 아래 반응식 **25**에 도시된다.



[0789]

[0790] **반응식 25**

[0791] 단계 1

[0792] 5-브로모-2-클로로피롤로[2,1-f][1,2,4]트리아진 (**I**) (Advanced ChemBlocks Inc.에서 시판) (1.5 g, 6.45 mmol), [3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘-5-일]보론산 (**CXX**) (1.63 g, 6.78 mmol), $Pd(OAc)_2$ (45 mg, 0.2 mmol) 및 QPhos (270 mg, 0.38 mmol)를 건조1,4-디옥산 (35 mL) 내에 용해시키고 Ar로 5 min 동안 퍼징했다. K_3PO_4의 2 N 수성 용액 (6.45 mL, 12.9 mmol)을 부가하고 반응을 Ar로 추가로 2 min 동안 퍼징했다. 반응을 이후 80° C까지 30 min 동안 가열했다. 반응 혼합물에 DCM을 부가하고 수성 포화 NH_4Cl 용액을 부가하고, 유기 층을 분리했다. 수성 층을 DCM (×3)로 추출하고, 조합시킨 유기 층을 건조시키고 (무수 $MgSO_4$) 진공 감소시켜 오렌지색 고체를 얻었다. 미정제 생성물을 컬럼 크로마토그래피 (0→100% EtOAc/헥산), 이후 (0→6% MeOH/$CHCl_3$ 내 7.0 M NH_3)로 정제했다. 적절한 분획을 조합시키고 진공 감소시켜 오렌지색 고체를 얻었다. 고체를 MeOH로 분쇄하고 여과하고 MeOH로 세척하였다. 생성물 5-(2-클로로피롤로[2,1-f][1,2,4]트리아진-5-일)-3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘 (1.79 g, 5.133 mmol, 79.5% 수율)을 황색 고체로서 수집했다. 여과액을 진공 감소시켜 부가적 5-(2-클로로피롤로[2,1-f][1,2,4]트리아진-5-일)-3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘 (**CXXI**) (481 mg, 1.379 mmol, 21.4% 수율)을 오렌지색 고체 (60% 순도)로서 얻었고 추가 정제 없이 사용했다. 다음에 대한 ESIMS 실험치: $C_{15}H_{11}ClF_2N_6$ *m/z* 349.1 (M+H).

[0793] 단계 2

[0794] 5-(2-클로로피롤로[2,1-f][1,2,4]트리아진-5-일)-3-(2,2-디플루오로에틸)-2-메틸이미다조 [4,5-b]피리딘 (**CXXI**) (150 mg, 0.43 mmol) 및 *tert*-부틸 (3S,4R)-3-아미노-4-플루오로피롤리딘-1- 카복실레이트 (**CXXII**) (114 mg, 0.56 mmol)를 DMSO (1 mL) 내에 용해시키고 DIPEA (150 μL, 0.86 mmol)을 부가하고 반응을 120° C에서 24 h 동안 교반했다. 반응 혼합물을 물 및 EtOAc에 부가하고 유기 층을 분리했다. 수성 층을 EtOAc (×3)로 추출하고 조합시킨 유기 층을 염수로 세척하고, 건조시키고 (무수 $MgSO_4$), 진공 감소시켜 미정제 생성물 *tert*-부틸 (3S,4R)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-4-플루오로피롤리딘-1-카복실레이트 (**CXXIII**) (222 mg, 0.430 mmol, 99.9% 수율)을 갈색 반-고체로서 얻었고(정량적 수율 가정), 이를 추가 정제 없이 사용했다. 다음에 대한 ESIMS 실험치: $C_{24}H_{27}F_3N_8O_2$ *m/z* 517.3 (M+H).

[0795] 단계 3

[0796] *tert*-부틸 (3S,4R)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-4-플루오로피롤리딘-1-카복실레이트 (**CXXIII**) (222 mg, 0.43 mmol)을 DCE (4.5 mL) 내에 용해시키고 반응을 0° C로 냉각했다. TFA (0.50 mL)을 부가하고 반응을 실온에서 16 h 동안 교반했다. 반응 혼합물을 증발시키고, 미정제 생성물을 컬럼 크로마토그래피로 정제하여 (0→2% MeOH/$CHCl_3$ 내 7.0

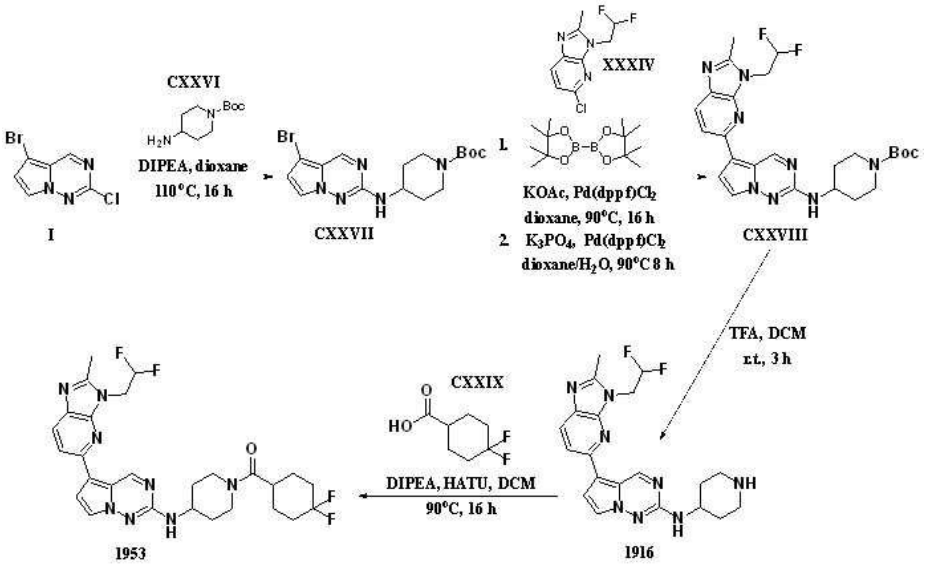
M NH_3) 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-4-플루오로피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CXXIV**) (138 mg, 0.331 mmol, 77.1% 수율)을 황색 반-고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{19}H_{19}F_3N_8$ *m/z* 417.2 (M+H).

[0797] 단계 4

[0798] EtOH (3 mL) 내 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-4-플루오로피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**CXXIV**) (138 mg, 0.33 mmol)의 용액에 HOAc (95 μL, 1.66 mmol) 및 옥세탄-3-온 (**CXXV**) (97 μL, 1.66 mmol)을 부가했다. 반응을 실온에서 10 min동안 교반했다. $NaH(OAc)_2$ (105 mg, 0.5 mmol)을 부가하고 반응을 실온에서 다시 20 min동안 교반했다. LCMS는 미미한 생성물 형성을 나타냈으므로, 반응물을 30분 동안 65℃로 가열했다. LCMS는 더 많은 전환을 보여주었다. 부가적 옥세탄-3-온 (**CXXV**) (97 μL, 1.66 mmol) 및 HOAc (95 μL, 1.66 mmol)를 부가하고 실온에서 5 min 동안 교반했다. $NaH(OAc)_2$ (105 mg, 0.5 mmol)을 부가하고 65° C에서 1 h 동안 교반했다. 더 이상 전환이 관찰되지 않을 때까지 (~90%) 후속 라운드의 시약을 첨가하여 반응을 중단했다. 반응 혼합물을 Celite®에 로딩하고 컬럼 크로마토그래피(MeOH/$CHCl_3$ 중 0→6% 7.0 M NH_3)로 정제했다. 생성물을 HPLC(0→35% MeCN/H_2O(0.1% 포름산 함유))로 추가로 정제하였다. 적절한 분획을 수집하고 포화 $NaHCO_3$수용액으로 중화하고 DCM(×2)으로 추출했다. 조합시킨 유기층을 건조시키고 (무수 $MgSO_4$) 진공 감소시켜 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-4-플루오로-1-(옥세탄-3-일)피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1944**) (80 mg, 0.169 mmol, 51.1% 수율)를 황색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.61 (3 H, s), 2.71 (1 H, t, *J*=9.17 Hz), 2.80 (1 H, dd, *J*=28.50, 11.20 Hz), 3.04 (1 H, t, *J*=8.21 Hz), 3.17 (1 H, ddd, *J*=33.45, 12.05, 4.40 Hz), 3.80 (1 H, quin, *J*=6.16 Hz), 4.23 - 4.40 (1 H, m), 4.48 (2 H, t, *J*=5.89 Hz), 4.60 (2 H, t, *J*=6.57 Hz), 4.84 (2 H, td, *J*=16.02, 2.74 Hz), 5.26 (1 H, dt, *J*=56.25, 3.55 Hz), 6.56 (1 H, tt, *J*=54.50, 3.00 Hz), 7.06 (1 H, d, *J*=7.94 Hz), 7.28 (1 H, d, *J*=2.74 Hz), 7.69 (1 H, d, *J*=2.46 Hz), 7.75 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}F_3N_8O$ *m/z* 473.3 (M+1).

[0799] **실시예 11.**

[0800] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1916**) 및 (4,4-디플루오로사이클로헥실)(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 (**1953**)의 제조가 아래 반응식 **26**에 도시된다.

[0801] 

[0802] **반응식 26**

[0803] 단계 1

[0804] 1,4-디옥산 (10 mL) 내 DIPEA (1.6 mL, 9.19 mmol), 5-브로모-2-클로로피롤로[2,1-f][1,2,4]트리아진 (**I**) (Advanced ChemBlocks Inc.에서 시판) (530 mg, 2.26 mmol) 및 4-아미노-1-Boc-피페리딘 (**CXXVI**) (Combi-Blocks Inc.에서 시판) (540 mg, 2.71 mmol)의 혼합물을 110° C까지 16 h 동안 가열했다. 반응을 농축하고 DCM 내에 용해시키고, 물, 염수로 세척했다. 무수 $MgSO_4$ 상에서 건조시키고, 여과하고, 농축하고 *tert*-부틸 4-[(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노]피페리딘-1-카복실레이트 (**CXXVII**) (940 mg, 2.372 mmol, 105.0% 수율)를 옅은 갈색 점성 고체로서 얻었다. 추가 정제 없이 다음 단계로 진행하였다. 다음에 대한 ESIMS 실험치: $C_{16}H_{22}BrN_5O_2$ *m/z* 396.1 (M+H).

[0805] 단계 2-3

[0806] 마이크로파 바이알에 1,4-디옥산 (5 mL) 내 5-클로로-3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘 (**XXXIV**) (350 mg, 1.51 mmol), 비스(피나콜라토)디보론 (510 mg, 2.02 mmol), KOAc (450 mg, 4.54 mmol), 및 $Pd(dppf)Cl_2$ (60 mg, 0.08 mmol)을 부가했다. 반응 혼합물을 90°C까지 16 h 동안 가열했다. *tert*-부틸 4-[(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노]피페리딘-1-카복실레이트 (**CXXVII**) (400 mg, 1.01 mmol),의 2 N 수성 용액 K_3PO_4 (1.6 mL, 3.2 mmol), 및 $Pd(dppf)Cl_2$ (60 mg, 0.08 mmol)을 부가하고 90°C에서 부가적 8 h 동안 교반했다. 반응을 농축하고 컬럼 크로마토그래피를 통해 정제했다. (0→8 % MeOH/$CHCl_3$) (12 g의 실리카겔) *tert*-부틸 4-[[5-[3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘-5-일]피롤로[2,1-f][1,2,4]트리아진-2-일]아미노]피페리딘-1-카복실레이트 (**CXXVIII**) (470 mg, 0.917 mmol, 90.8% 수율)을 호박색 점성 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{25}H_{30}F_2N_8O_2$ *m/z* 513.3 (M+H).

[0807] 단계 4

[0808] DCM (5 mL) 내 *tert*-부틸 4-[[5-[3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘-5-일]피롤로[2,1-f][1,2,4]트리아진-2-일]아미노]피페리딘-1-카복실레이트 (**CXXVIII**) (470 mg, 0.92 mmol)의 용액에 TFA (0.7 mL, 9.09 mmol)을 부가했다. 반응 혼합물을 실온에서 3 h 동안 교반했다. 반응을 농축하고 MeOH 내 NH_4 용액 (7 N)로 염기성화하고 이후 컬럼 크로마토그래피를 통해 정제하여 (0→10% MeOH/$CHCl_3$ 내 7 N NH_3) (12 g의 실리카겔) 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1916**) (220 mg, 0.533 mmol, 58.2% 수율)을 황색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.36 (2 H, qd, *J*=11.59, 3.83 Hz), 1.88 (2 H, br d, *J*=9.86 Hz), 2.51 - 2.55 (2 H, m), 2.60 (3 H, s), 2.96 (2 H, br d, *J*=12.32 Hz), 3.59 - 3.72 (1 H, m), 4.83 (2 H, td, *J*=15.95, 2.60 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.80 (1 H, d, *J*=7.94 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{22}F_2N_8$ *m/z* 413.2 (M+1).

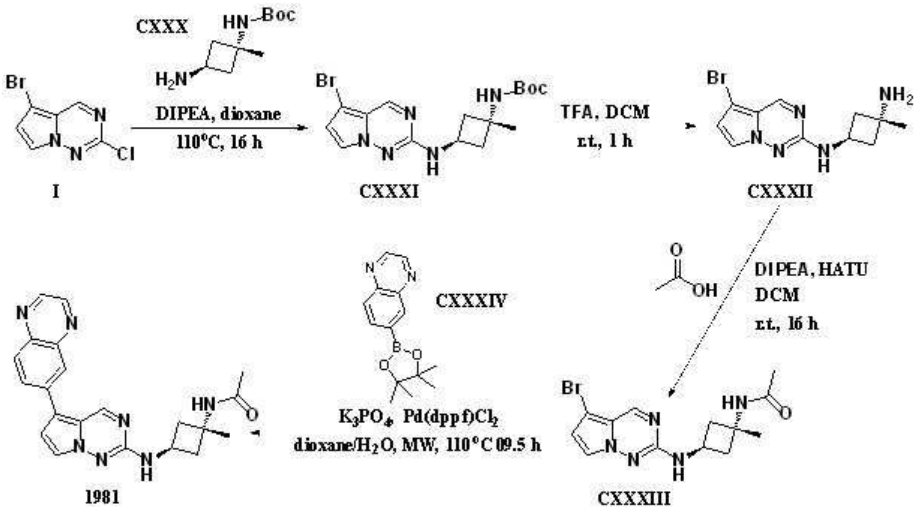
[0809] 단계 5

[0810] DCM (1 mL) 내 5-[3-(2,2-디플루오로에틸)-2-메틸이미다조[4,5-b]피리딘-5-일]-N-피페리딘-4-일피롤로[2,1-f][1,2,4]트리아진-2-아민 (**1916**) (30 mg, 0.07 mmol)의 용액에 DIPEA (40 μL, 0.24 mmol) 및 HATU (40 mg, 0.11 mmol)을 부가했다. 반응을 실온에서 5 min 동안 교반했다. 4,4-디플루오로사이클로헥산카복실산 (**CXXIX**) (10 mg, 0.09 mmol)을 이후 부가하고 반응을 90° C까지 16 h 동안 가열했다. 반응을 농축하고 컬럼 크로마토그래피를 통해 정제하여 (0→8% MeOH/$CHCl_3$ 내 7 N NH_3) (8 g의 실리카겔) (4,4-디플루오로사이클로헥실)(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 (**1953**) (18 mg, 0.032 mmol, 44.3% 수율)를 황색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.30 - 1.39 (1 H, m), 1.41 - 1.51 (1 H, m), 1.53 - 1.67 (2 H, m), 1.73 (2 H, br d, *J*=13.14 Hz), 1.81 - 1.92 (1 H, m), 1.92 - 1.98 (2 H, m), 1.98 - 2.12 (3 H, m), 2.61 (3 H, s), 2.74 - 2.81 (1 H, m), 2.84 (1 H, br t, *J*=11.23 Hz), 3.20 (1 H, br t, *J*=11.91 Hz), 3.82 - 3.94 (1 H, m), 3.99 (1 H, br d, *J*=13.42 Hz), 4.31 (1 H, br d, *J*=12.59 Hz), 4.83 (2 H, td, *J*=16.02, 2.74 Hz), 6.55 (1 H, tt, *J*=54.50, 3.00 Hz), 6.91 (1 H, d, *J*=7.94 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz),

7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{27}H_{30}F_4N_8O$ *m/z* 559.3 (M+1).

[0811] **실시예 12.**

[0812] N-((1r,3r)-1-메틸-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸)아세트아미드 (**1981**)의 제조가 아래 반응식 **27**에 도시된다.



[0813]

[0814] **반응식 27**

[0815] 단계 **1**

[0816] 1,4-디옥산 (10 mL) 내 5-브로모-2-클로로피롤로[2,1-f][1,2,4]트리아진 (**I**) (Advanced ChemBlocks Inc.에서 시판) (500 mg, 2.15 mmol)의 마이크로파 바이알에 DIPEA (1.12mL, 6.43 mmol) 및 *trans*-*tert*-부틸 N-(3-아미노-1-메틸사이클로부틸)카바메이트 (**CXXX**) (PharmaBlock (USA), Inc.에서 시판) (544 mg, 2.72 mmol)을 부가했다. 반응 바이알을 뚜껑을 덮고 110° C까지 16 h 동안 가열했다. 반응을 농축하고 컬럼 크로마토그래피를 통해 정제하여 (0→8% MeOH/$CHCl_3$ 내 7 N NH_3) (8g 실리카겔) *tert*-부틸 N-[3-[(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노]-1-메틸사이클로부틸]카바메이트 (**CXXXI**) (266 mg, 0.671 mmol, 31.2% 수율)을 옅은-황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{16}H_{22}BrN_5O_2$ *m/z* 396.1 (M-^{t}Bu+H).

[0817] 단계 **2**

[0818] DCM (1 mL) 내 *tert*-부틸 N-[3-[(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노]-1-메틸사이클로부틸]카바메이트 (**CXXXI**) (266 mg, 0.67 mmol)의 교반 용액에 TFA (1.6 mL, 20.77 mmol)을 부가했다. 혼합물을 실온에서 1 h 동안 교반하고, 농축하고 잔사를 ISCO (0→8% 7 N NH_3 MeOH/$CHCl_3$)로 정제했다. 순수 분획을 수집하고, 감압 하에서 농축하고, 고 진공 하에서 건조시키고 3-N-(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)-1-메틸사이클로부탄-1,3-디아민 (**CXXXII**) (126 mg, 0.425mmol, 63.4% 수율)을 짙은 황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{11}H_{14}BrN_5$ *m/z* 296.05 (M+H).

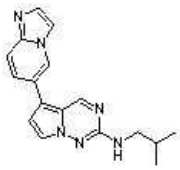
[0819] 단계 **3**

[0820] DMF (200 μL) 내 HOAc (37 μL, 0.65 mmol), HATU (243 mg, 0.64 mmol)의 용액에 DIPEA (220 μL, 1.26 mmol)을 부가했다. 혼합물을 5 min 동안 교반하고 이후, DMF (300 μL) 내 3-N-(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)-1-메틸사이클로부탄-1,3-디아민 (**CXXXII**) (146 mg, 0.49 mmol)을 부가하고 반응 혼합물을 실온에서 16 h 동안 교반했다. 물 (10 mL)을 부가하고, 용액을 EtOAc로 추출했다. 유기물을 분리하고, 농축하고, 실리카겔에 흡수시키고, ISCO (0→100% MeOH/$CHCl_3$ 내 7 N NH_3)로 정제했다. 순수 분획을 농축하고 고 진공 하에서 건조시키고 N-[3-[(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노]-1-메틸사이클로부틸]아세트아미드 (**CXXXIII**) (130 mg, 0.384 mmol, 78.0% 수율)을 짙은 황색 고체로서 얻었다. 다음에 대한 ESIMS 실험치: $C_{13}H_{16}BrN5O$ *m/z* 338.1 (M+H).

[0821] 단계 4

[0822] *trans*-N-[3-[(5-브로모피롤로[2,1-f][1,2,4]트리아진-2-일)아미노]-1-메틸사이클로부틸]아세트아미드 (**CXXXIII**) (30 mg, 0.09 mmol), 6-(4,4,5,5-테트라메틸-1,3,2-디옥사보롤란-2-일)퀸옥살린 (**CXXXIV**) (AmBeed, Inc.에서 시판) (27.3 mg, 0.11 mmol), $Pd(dppf)Cl_2$ (3.7 mg, 0.0045 mmol), 및 1,4-디옥산 (5 mL) 내 K_3PO_4의 2 N 수성 용액(130 μL, 0.26 mmol)의 혼합물을 N_2 가스로 5 min 동안퍼징했다. 혼합물을 교반하고 마이크로파로 110° C에서 30 min동안 조사했다. 반응 혼합물을 냉각하고, 유기 층을 분리하고, 농축하고 컬럼 크로마토그래피를 통해 정제하여 (0→7% MeOH/$CHCl_3$ 내 7 N NH_3) (8 g의 실리카겔) N-((1r,3r)-1-메틸-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸)아세트아미드 (**1981**) (14 mg, 0.036 mmol, 40.7% 수율)를 황색 고체로서 얻었다. ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.37 (3 H, s), 1.82 (3 H, s), 1.90 - 2.01 (2 H, m), 2.66 (2 H, ddd, *J*=10.27, 7.94, 2.60 Hz), 4.20 (1 H, sxt, *J*=7.72 Hz), 7.19 (1 H, d, *J*=2.74 Hz), 7.36 (1 H, d, *J*=7.12 Hz), 7.75 (1 H, d, *J*=2.46 Hz), 7.96 (1 H, s), 8.13 (1 H, d, *J*=8.76 Hz), 8.23 (1 H, dd, *J*=8.76, 1.92 Hz), 8.31 (1 H, d, *J*=2.19 Hz), 8.90 (1 H, d, *J*=1.92 Hz), 8.95 (1 H, d, *J*=1.92 Hz), 9.19 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{21}N_7O$ *m/z* 388.2 (M+1).

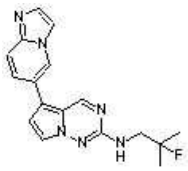
[0823] 다음 화합물을 상기 반응식 **1-27**에서 기술된 절차에 따라서 제조했다.

[0824] 

[0825] **2**

[0826] 5-(이미다조[1,2-a]피리딘-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 **2**.

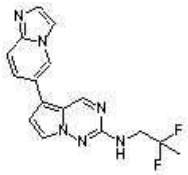
[0827] 황색 고체 (40.14 mg, 0.131 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 0.92 (6 H, d, *J*=6.60 Hz), 1.95 (1 H, dquin, *J*=13.49, 6.75, 6.75, 6.75, 6.75 Hz), 3.03 (2 H, dd, *J*=6.85, 5.99 Hz), 6.94 (1 H, d, *J*=2.57 Hz), 7.00 (1 H, t, *J*=5.75 Hz), 7.53 - 7.58 (1 H, m), 7.58 (1 H, d, *J*=1.22 Hz), 7.60 - 7.65 (1 H, m), 7.70 (1 H, dd, *J*=2.57, 0.61 Hz), 7.94 (1 H, d, *J*=0.73 Hz), 8.91 (1 H, dd, *J*=1.71, 1.10 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{17}H_{18}N_6$ *m/z* 307.2 (M+1).

[0828] 

[0829] **3**

[0830] N-(2-플루오로-2-메틸프로필)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **3**.

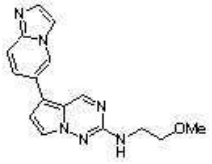
[0831] 옅은 황색 고체 (16 mg, 0.049 mmol, 38.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.37 (6 H, d, *J*=21.40 Hz), 3.48 (2 H, dd, *J*=19.16, 6.57 Hz), 6.98 (1 H, d, *J*=2.46 Hz), 7.05 (1 H, t, *J*=6.43 Hz), 7.54 - 7.58 (1 H, m), 7.59 (1 H, d, *J*=1.09 Hz), 7.61 - 7.64 (1 H, m), 7.72 (1 H, d, *J*=2.46 Hz), 7.95 (1 H, s), 8.89 - 8.96 (1 H, m), 9.14 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{17}H_{17}FN_6$ *m/z* 325.2 (M+1).

[0832] 

[0833] **4**

[0834] N-(2,2-디플루오로프로필)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 **4**.

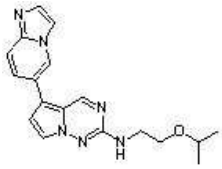
[0835] 황색 고체 (9.31 mg, 0.028 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.66 (3 H, t, *J*=19.01 Hz), 3.72 (2 H, td, *J*=13.75, 6.72 Hz), 7.01 (1 H, d, *J*=2.57 Hz), 7.33 (1 H, t, *J*=6.66 Hz), 7.55 - 7.66 (2 H, m), 7.59 (1 H, s), 7.76 (1 H, d, *J*=2.45 Hz), 7.95 (1 H, s), 8.93 (1 H, s), 9.17 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{16}H_{14}F_2N_6$ *m/z* 329.1 (M+1).

[0836] 

[0837] **9**

[0838] 5-(이미다조[1,2-a]피리딘-6-일)-N-(2-메톡시에틸)피롤로[2,1-f][1,2,4] 트리아진-2-아민 **9**.

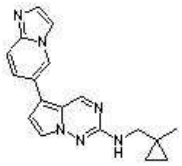
[0839] 황색 고체 (55.95 mg, 0.181 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 3.28 (3 H, s), 3.36 - 3.38 (2 H, m), 3.50 - 3.54 (2 H, m), 6.91 (1 H, br t, *J*=5.69 Hz), 6.96 (1 H, d, *J*=2.57 Hz), 7.54 - 7.65 (2 H, m), 7.58 (1 H, s), 7.72 (1 H, d, *J*=2.32 Hz), 7.94 (1 H, s), 8.91 (1 H, s), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{16}H_{16}N_6O$ *m/z* 309.1 (M+1).

[0840] 

[0841] **11**

[0842] 5-(이미다조[1,2-a]피리딘-6-일)-N-(2-이소프로폭시에틸)피롤로[2,1-f][1,2,4] 트리아진-2-아민 11.

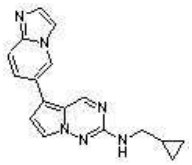
[0843] 황색 고체 (30.8 mg, 0.092 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.10 (6 H, d, *J*=6.13 Hz), 3.34 - 3.38 (2 H, m), 3.55 (2 H, t, *J*=6.19 Hz), 3.57 - 3.63 (1 H, m), 6.84 (1 H, t, *J*=5.75 Hz), 6.97 (1 H, d, *J*=2.50 Hz), 7.53 - 7.65 (2 H, m), 7.58 (1 H, d, *J*=1.00 Hz), 7.73 (1 H, d, *J*=2.50 Hz), 7.94 (1 H, s), 8.92 (1 H, s), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{20}N_6O$ *m/z* 337.1 (M+1).

[0844] 

[0845] **12**

[0846] 5-(이미다조[1,2-a]피리딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 **12**.

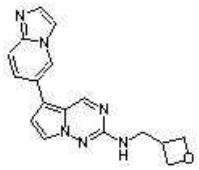
[0847] 황색 고체 (13.6 mg, 0.043 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 0.22 - 0.30 (2 H, m), 0.48 - 0.54 (2 H, m), 1.11 (3 H, s), 3.17 (2 H, d, *J*=5.88 Hz), 6.91 - 6.99 (2 H, m), 7.53 - 7.64 (2 H, m), 7.58 (1 H, d, *J*=0.88 Hz), 7.69 (1 H, d, *J*=2.50 Hz), 7.94 (1 H, s), 8.92 (1 H, s), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{18}N_6$ *m/z* 319.1 (M+1).

[0848] 

[0849] 16

[0850] N-(사이클로프로필메틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 16.

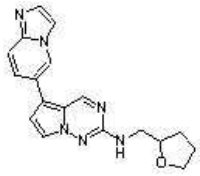
[0851] 황색 고체 (5.16 mg, 0.017 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 0.19 - 0.28 (2 H, m), 0.40 - 0.50 (2 H, m), 1.07 - 1.17 (1 H, m), 3.09 (2 H, t, *J*=6.24 Hz), 6.96 (1 H, d, *J*=2.57 Hz), 7.04 (1 H, t, *J*=5.81 Hz), 7.53 - 7.65 (2 H, m), 7.58 (1 H, d, *J*=1.10 Hz), 7.71 (1 H, dd, *J*=2.45, 0.61 Hz), 7.95 (1 H, s), 8.92 (1 H, dd, *J*=1.65, 1.04 Hz), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{17}H_{16}N_6$ *m/z* 305.3 (M+1).

[0852] 

[0853] 20

[0854] 5-(이미다조[1,2-a]피리딘-6-일)-N-(옥세탄-3-일메틸)피롤로[2,1-f][1,2,4] 트리아진-2-아민 20.

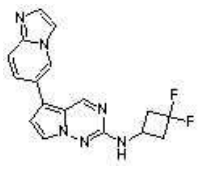
[0855] 황색 고체 (14.48 mg, 0.045 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 3.26 (1 H, br s), 3.51 (2 H, br s), 4.36 (2 H, br s), 4.66 (2 H, br s), 6.96 (1 H, br s), 7.16 (1 H, br s), 7.59 (3 H, br d, *J*=8.31 Hz), 7.73 (1 H, br s), 7.94 (1 H, br s), 8.91 (1 H, br s), 9.12 (1 H, br s); 다음에 대한 ESIMS 실험치: $C_{17}H_{16}N_6O$ *m/z* 321.0 (M+1).

[0856] 

[0857] 21

[0858] 5-(이미다조[1,2-a]피리딘-6-일)-N-((테트라히드로푸란-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 21.

[0859] 황색 고체 (36.87 mg, 0.110 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.56 - 1.70 (1 H, m), 1.74 - 1.89 (2 H, m), 1.90 - 2.01 (1 H, m), 3.15 - 3.26 (1 H, m), 3.29 - 3.38 (1 H, m), 3.58 - 3.70 (1 H, m), 3.74 - 3.85 (1 H, m), 4.08 (1 H, quin, *J*=6.36 Hz), 6.92 (1 H, t, *J*=5.99 Hz), 6.96 (1 H, d, *J*=2.57 Hz), 7.54 - 7.64 (2 H, m), 7.58 (1 H, d, *J*=0.98 Hz), 7.72 (1 H, d, *J*=2.45 Hz), 7.94 (1 H, s), 8.92 (1 H, s), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{18}N_6O$ *m/z* 335.4 (M+1).

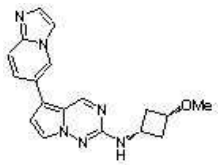
[0860] 

[0861] 23

[0862] N-(3,3-디플루오로사이클로부틸)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 23.

[0863] 황색 고체 (4.61 mg, 0.014 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 2.57 - 2.77 (2 H, m), 2.91 - 3.07 (2

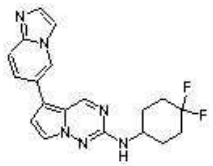
H, m), 3.99 - 4.13 (1 H, m), 7.00 (1 H, d, *J*=2.57 Hz), 7.52 - 7.65 (3 H, m), 7.59 (1 H, d, *J*=1.10 Hz), 7.76 (1 H, d, *J*=2.57 Hz), 7.95 (1 H, s), 8.93 (1 H, s), 9.17 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{17}H_{14}F_2N_6$ *m/z* 341.0 (M+1).

[0864] 

[0865] 26

[0866] 5-(이미다조[1,2-a]피리딘-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f] [1,2,4]트리아진-2-아민 26.

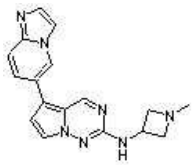
[0867] 황색 고체 (37.9 mg, 0.113 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.78 - 1.91 (2 H, m), 2.60 - 2.72 (2 H, m), 3.14 (3 H, s), 3.62 (1 H, quin, *J*=7.09 Hz), 3.78 (1 H, sxt, *J*=7.85 Hz), 6.96 (1 H, d, *J*=2.45 Hz), 7.28 (1 H, d, *J*=7.34 Hz), 7.53 - 7.64 (3 H, m), 7.70 (1 H, d, *J*=2.57 Hz), 7.94 (1 H, s), 8.92 (1 H, s), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{18}N_6O$ *m/z* 335.4 (M+1).

[0868] 

[0869] 43

[0870] N-(4,4-디플루오로사이클로헥실)-5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 43.

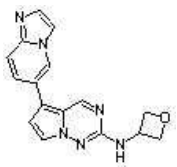
[0871] 황색 고체 (52.2 mg, 0.142 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.64 (2 H, q, *J*=11.25 Hz), 1.82 - 2.03 (4 H, m), 2.04 - 2.17 (2 H, m), 3.72 - 3.88 (1 H, m), 6.97 (1 H, d, *J*=2.57 Hz), 7.02 (1 H, d, *J*=7.58 Hz), 7.54 - 7.65 (2 H, m), 7.59 (1 H, s), 7.72 (1 H, d, *J*=2.45 Hz), 7.95 (1 H, s), 8.92 (1 H, s), 9.13 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{18}F_2N_6$ *m/z* 369.1 (M+1).

[0872] 

[0873] 64

[0874] 5-(이미다조[1,2-a]피리딘-6-일)-N-(1-메틸아제티딘-3-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 64.

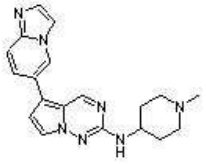
[0875] 황색 고체 (1.93 mg, 0.006 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 2.25 (3 H, s), 2.91 (2 H, t, *J*=7.21 Hz), 3.57 - 3.64 (2 H, m), 4.22 (1 H, sxt, *J*=6.80 Hz), 6.97 (1 H, d, *J*=2.57 Hz), 7.43 (1 H, d, *J*=6.85 Hz), 7.54 - 7.64 (2 H, m), 7.58 (1 H, d, *J*=0.98 Hz), 7.72 (1 H, d, *J*=2.08 Hz), 7.94 (1 H, s), 8.92 (1 H, s), 9.14 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{17}H_{17}N_7$ *m/z* 320.0 (M+1).

[0876] 

[0877] 65

[0878] 5-(이미다조[1,2-a]피리딘-6-일)-N-(옥세탄-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **65**.

[0879] 황색 고체 (28.58 mg, 0.093 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 4.55 (2 H, s), 4.74 - 4.85 (3 H, m), 6.99 (1 H, d, *J*=2.50 Hz), 7.54 - 7.65 (2 H, m), 7.59 (1 H, s), 7.72 (1 H, d, *J*=2.50 Hz), 7.76 (1 H, br d, *J*=5.38 Hz), 7.94 (1 H, s), 8.93 (1 H, s), 9.17 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{16}H_{14}N_6O$ *m/z* 307.2 (M+1).

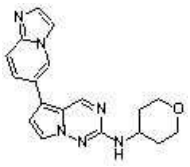


[0880]

[0881] **66**

[0882] 5-(이미다조[1,2-a]피리딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **66**.

[0883] 황색 고체 (38.32 mg, 0.110 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.53 (2 H, qd, *J*=11.59, 3.61 Hz), 1.86 - 2.00 (4 H, m), 2.16 (3 H, s), 2.75 (2 H, br d, *J*=11.62 Hz), 3.47 - 3.61 (1 H, m), 6.85 (1 H, d, *J*=7.83 Hz), 6.95 (1 H, d, *J*=2.57 Hz), 7.53 - 7.64 (2 H, m), 7.58 (1 H, d, *J*=1.10 Hz), 7.71 (1 H, d, *J*=2.08 Hz), 7.94 (1 H, s), 8.88 - 8.94 (1 H, m), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{21}N_7$ *m/z* 348.1 (M+1).

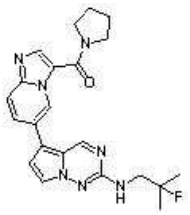


[0884]

[0885] **67**

[0886] 5-(이미다조[1,2-a]피리딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **67**.

[0887] 황색 고체 (7.97 mg, 0.024 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.46 - 1.63 (2 H, m), 1.91 (2 H, br d, *J*=11.13 Hz), 3.40 (2 H, br t, *J*=10.82 Hz), 3.73 - 3.84 (1 H, m), 3.89 (2 H, br d, *J*=11.37 Hz), 6.91 - 7.01 (2 H, m), 7.54 - 7.66 (3 H, m), 7.71 (1 H, d, *J*=2.20 Hz), 7.95 (1 H, s), 8.91 (1 H, s), 9.13 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{18}N_6O$ *m/z* 335.1 (M+1).

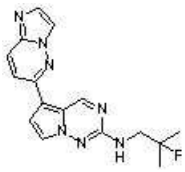


[0888]

[0889] **74**

[0890] (6-(2-((2-플루오로-2-메틸프로필)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일) 이미다조[1,2-a]피리딘-3-일)(피롤리딘-1-일)메탄온 **74**.

[0891] 황색 고체 (21 mg, 0.050 mmol, 22.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 1.91 (2 H, br s), 1.95 (2 H, br s), 3.49 (2 H, dd, *J*=19.16, 6.30 Hz), 3.58 (2 H, br s), 3.81 (2 H, br s), 6.99 (1 H, d, *J*=2.46 Hz), 7.08 (1 H, t, *J*=6.43 Hz), 7.74 (1 H, d, *J*=2.46 Hz), 7.77 - 7.86 (2 H, m), 8.22 (1 H, s), 9.03 (1 H, s), 9.65 (1 H, t, *J*=1.37 Hz); 다음에 대한 ESIMS 실험치: $C_{22}H_{24}FN_7O$ *m/z* 422.2 (M+1).

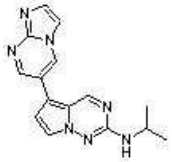


[0892]

[0893] **145**

[0894] N-(2-플루오로-2-메틸프로필)-5-(이미다조[1,2-b]피리다진-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **145**.

[0895] 옅은 갈색 고체 (18 mg, 0.055 mmol, 21.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 3.49 (2 H, dd, *J*=19.03, 6.43 Hz), 7.25 (1 H, t, *J*=6.43 Hz), 7.41 (1 H, d, *J*=2.74 Hz), 7.73 - 7.78 (3 H, m), 8.13 (1 H, d, *J*=9.58 Hz), 8.35 (1 H, s), 9.58 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{16}H_{16}FN_7$ *m/z* 326.1 (M+1).

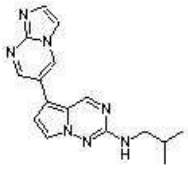


[0896]

[0897] **214**

[0898] 5-(이미다조[1,2-a]피리미딘-6-일)-N-이소프로필피롤로[2,1-f][1,2,4]트리아진-2-아민 **214**.

[0899] 황색 고체 (12.01 mg, 0.041 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.19 (6 H, d, *J*=6.50 Hz), 3.82 - 3.97 (1 H, m), 6.84 (1 H, d, *J*=7.88 Hz), 7.05 (1 H, d, *J*=2.63 Hz), 7.74 (2 H, d, *J*=1.50 Hz), 7.89 (1 H, d, *J*=1.13 Hz), 8.88 (1 H, d, *J*=2.50 Hz), 9.14 (1 H, s), 9.29 (1 H, d, *J*=2.38 Hz); 다음에 대한 ESIMS 실험치: $C_{15}H_{15}N_7$ *m/z* 294.1 (M+1).

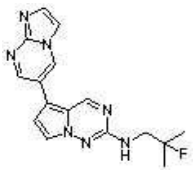


[0900]

[0901] **215**

[0902] 5-(이미다조[1,2-a]피리미딘-6-일)-N-이소부틸피롤로[2,1-f][1,2,4]트리아진-2-아민 **215**.

[0903] 황색 고체 (25.06 mg, 0.082 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 0.92 (6 H, d, *J*=6.50 Hz), 1.95 (1 H, dquin, *J*=13.30, 6.65, 6.65, 6.65, 6.65 Hz), 3.03 (2 H, br t, *J*=6.25 Hz), 7.00 - 7.09 (2 H, m), 7.74 (2 H, br s), 7.89 (1 H, s), 8.88 (1 H, s), 9.14 (1 H, s), 9.29 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{16}H_{17}N_7$ *m/z* 308.0 (M+1).



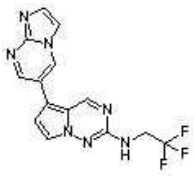
[0904]

[0905] **216**

[0906] N-(2-플루오로-2-메틸프로필)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **216**.

[0907] 황색 고체 (102 mg, 0.314 mmol, 20.0% 수율). ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm 1.37 (6 H, d, *J*=21.40 Hz), 3.48 (2 H, dd, *J*=18.94, 6.31 Hz), 7.09 (1 H, d, *J*=2.74 Hz), 7.11 (1 H, t, *J*=6.45 Hz), 7.74 (1 H, d,

J=1.37 Hz), 7.75 - 7.77 (1 H, m), 7.89 (1 H, d, *J*=1.37 Hz), 8.89 (1 H, d, *J*=2.47 Hz), 9.18 (1 H, d, *J*=0.82 Hz), 9.31 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{16}H_{16}FN_7$ *m/z* 326.1 (M+1).

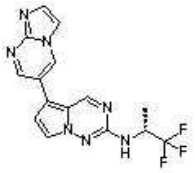


[0908]

[0909] 218

[0910] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(2,2,2-트리플루오로에틸)피롤로[2,1-f] [1,2,4]트리아진-2-아민 218.

[0911] 황색 고체 (8.99 mg, 0.027 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 4.03 - 4.17 (2 H, m), 7.16 (1 H, d, *J*=2.63 Hz), 7.65 (1 H, t, *J*=7.00 Hz), 7.75 (1 H, d, *J*=1.25 Hz), 7.86 (1 H, d, *J*=2.63 Hz), 7.90 (1 H, d, *J*=1.25 Hz), 8.90 (1 H, d, *J*=2.50 Hz), 9.25 (1 H, s), 9.33 (1 H, d, *J*=2.63 Hz); 다음에 대한 ESIMS 실험치: $C_{14}H_{10}F_3N_7$ *m/z* 334.1 (M+1).

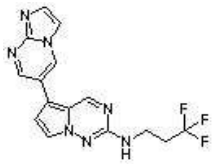


[0912]

[0913] 219

[0914] (R)-5-(이미다조[1,2-a]피리미딘-6-일)-N-(1,1,1-트리플루오로프로판-2-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 219.

[0915] 황색 고체 (20.91 mg, 0.060 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.37 (3 H, d, *J*=7.00 Hz), 4.66 - 4.82 (1 H, m), 7.15 (1 H, d, *J*=2.50 Hz), 7.60 (1 H, d, *J*=9.13 Hz), 7.75 (1 H, d, *J*=1.13 Hz), 7.84 (1 H, d, *J*=2.63 Hz), 7.90 (1 H, d, *J*=1.25 Hz), 8.90 (1 H, d, *J*=2.50 Hz), 9.24 (1 H, s), 9.33 (1 H, d, *J*=2.50 Hz); 다음에 대한 ESIMS 실험치: $C_{15}H_{12}F_3N_7$ *m/z* 348.1 (M+1).

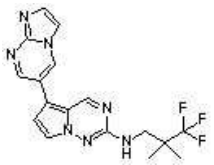


[0916]

[0917] 220

[0918] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로프로필)피롤로[2,1-f] [1,2,4]트리아진-2-아민 220.

[0919] 황색 고체 (12.8 mg, 0.037 mmol ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 2.55 - 2.71 (2 H, m), 3.47 (2 H, q, *J*=6.70 Hz), 7.10 (1 H, d, *J*=2.63 Hz), 7.19 (1 H, t, *J*=5.69 Hz), 7.74 (1 H, s), 7.80 (1 H, d, *J*=2.50 Hz), 7.89 (1 H, d, *J*=0.88 Hz), 8.89 (1 H, d, *J*=2.50 Hz), 9.18 (1 H, s), 9.31 (1 H, d, *J*=2.50 Hz); 다음에 대한 ESIMS 실험치: $C_{15}H_{12}F_3N_7$ *m/z* 348.0 (M +1).

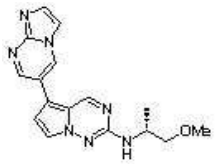


[0920]

[0921] 221

[0922] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(3,3,3-트리플루오로-2,2-디메틸프로필) 피롤로[2,1-f][1,2,4]트리아진-2-아민 **221**.

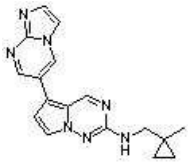
[0923] 옅은 황색 고체 (29 mg, 0.077 mmol, 26.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.16 (6 H, s), 3.48 (2 H, d, *J*=6.57 Hz), 7.10 (1 H, d, *J*=2.74 Hz), 7.13 (1 H, t, *J*=6.57 Hz), 7.75 (1 H, d, *J*=1.09 Hz), 7.78 (1 H, d, *J*=2.74 Hz), 7.90 (1 H, d, *J*=1.09 Hz), 8.89 (1 H, d, *J*=2.19 Hz), 9.20 (1 H, s), 9.31 (1 H, d, *J*=2.19 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{16}F_3N_7$ *m/z* 376.2 (M+1).

[0924] 

[0925] **223**

[0926] (R)-5-(이미다조[1,2-a]피리미딘-6-일)-N-(1-메톡시프로판-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **223**.

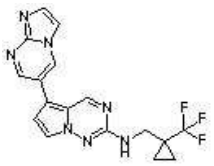
[0927] 황색 고체 (28.36 mg, 0.088 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.17 (3 H, d, *J*=6.63 Hz), 3.26 - 3.32 (1 H, m), 3.28 (3 H, s), 3.43 - 3.48 (1 H, m), 3.94 - 4.09 (1 H, m), 6.79 (1 H, d, *J*=8.25 Hz), 7.07 (1 H, d, *J*=2.50 Hz), 7.74 (1 H, br s), 7.75 (1 H, d, *J*=2.50 Hz), 7.89 (1 H, s), 8.88 (1 H, d, *J*=2.50 Hz), 9.16 (1 H, s), 9.30 (1 H, d, *J*=2.38 Hz); 다음에 대한 ESIMS 실험치: $C_{16}H_{17}N_7O$ *m/z* 324.0 (M+1).

[0928] 

[0929] **225**

[0930] 5-(이미다조[1,2-a]피리미딘-6-일)-N-((1-메틸사이클로프로필)메틸)피롤로 [2,1-f][1,2,4]트리아진-2-아민 **225**.

[0931] 옅은 황색 고체 (43 mg, 0.135 mmol, 37.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.23 - 0.30 (2 H, m), 0.47 - 0.54 (2 H, m), 1.11 (3 H, s), 3.17 (2 H, d, *J*=6.02 Hz), 7.00 (1 H, t, *J*=5.75 Hz), 7.06 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=2.19 Hz), 7.74 (1 H, d, *J*=1.10 Hz), 7.89 (1 H, d, *J*=1.10 Hz), 8.88 (1 H, d, *J*=2.19 Hz), 9.16 (1 H, s), 9.30 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{17}N_7$ *m/z* 3202. (M+1).

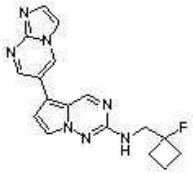
[0932] 

[0933] **226**

[0934] 5-(이미다조[1,2-a]피리미딘-6-일)-N-((1-(트리플루오로메틸)사이클로프로필) 메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 **226**.

[0935] 옅은 황색 고체 (27 mg, 0.072 mmol, 24.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.88 - 0.94 (2 H, m), 0.94 - 1.01 (2 H, m), 3.63 (2 H, d, *J*=6.57 Hz), 7.10 (1 H, d, *J*=2.74 Hz), 7.14 (1 H, t, *J*=6.30 Hz), 7.74 (1 H, d, *J*=1.09 Hz), 7.78 (1 H, d, *J*=2.19 Hz), 7.89 (1 H, d, *J*=1.64 Hz), 8.89 (1 H, d, *J*=2.74

Hz), 9.19 (1 H, s), 9.31 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{14}F_3N_7$ *m/z* 374.1 (M+1).

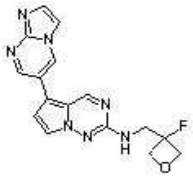


[0936]

[0937] **227**

[0938] N-((1-플루오로사이클로부틸)메틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 **227**.

[0939] 옅은 황색 고체 (30 mg, 0.089 mmol, 26.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.48 - 1.63 (1 H, m), 1.71 - 1.84 (1 H, m), 2.14 - 2.24 (2 H, m), 2.25 - 2.32 (2 H, m), 3.57 - 3.68 (2 H, m), 7.09 (1 H, d, *J*=2.74 Hz), 7.16 (1 H, t, *J*=6.30 Hz), 7.74 (1 H, d, *J*=1.64 Hz), 7.77 (1 H, d, *J*=2.74 Hz), 7.89 (1 H, d, *J*=1.09 Hz), 8.89 (1 H, d, *J*=2.74 Hz), 9.19 (1 H, s), 9.31 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{16}FN_7$ *m/z* 338.2 (M+1).

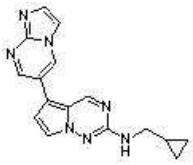


[0940]

[0941] **228**

[0942] N-((3-플루오로옥세탄-3-일)메틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 **228**.

[0943] 황색 고체 (26 mg, 0.077 mmol, 33.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 3.80 (2 H, dd, *J*=19.71, 6.02 Hz), 4.61 - 4.77 (4 H, m), 7.11 (1 H, d, *J*=2.19 Hz), 7.37 (1 H, t, *J*=6.30 Hz), 7.75 (1 H, d, *J*=1.10 Hz), 7.80 (1 H, d, *J*=2.19 Hz), 7.90 (1 H, d, *J*=1.10 Hz), 8.89 (1 H, d, *J*=2.74 Hz), 9.20 (1 H, s), 9.32 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{16}H_{14}FN_7O$ *m/z* 340.1 (M+1).

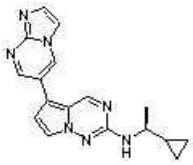


[0944]

[0945] **229**

[0946] N-(사이클로프로필메틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **229**.

[0947] 황색 고체 (11.82 mg, 0.039 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 0.21 - 0.29 (2 H, m), 0.41 - 0.50 (2 H, m), 1.08 - 1.21 (1 H, m), 3.10 (2 H, t, *J*=6.25 Hz), 7.05 - 7.11 (2 H, m), 7.75 (2 H, dd, *J*=3.56, 1.94 Hz), 7.89 (1 H, d, *J*=1.13 Hz), 8.88 (1 H, d, *J*=2.50 Hz), 9.16 (1 H, s), 9.30 (1 H, d, *J*=2.50 Hz); 다음에 대한 ESIMS 실험치: $C_{16}H_{15}N_7$ *m/z* 306.1 (M+1).

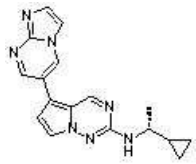


[0948]

[0949] 230

[0950] (S)-N-(1-사이클로프로필에틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 230.

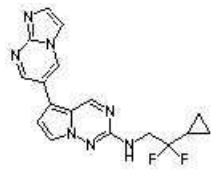
[0951] 황색 고체 (28.31 mg, 0.089 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 0.15 - 0.24 (1 H, m), 0.31 - 0.51 (3 H, m), 0.97 - 1.09 (1 H, m), 1.24 (3 H, d, *J*=6.63 Hz), 3.35 (1 H, br d, *J*=4.38 Hz), 7.05 (1 H, br d, *J*=3.25 Hz), 7.18 (1 H, d, *J*=2.63 Hz), 7.78 (1 H, d, *J*=2.50 Hz), 8.17 (1 H, d, *J*=2.25 Hz), 8.25 (1 H, d, *J*=2.13 Hz), 9.22 (1 H, s), 9.37 (1 H, d, *J*=2.25 Hz), 9.61 (1 H, d, *J*=2.38 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{17}N_7$ *m/z* 320.2 (M+1).

[0952] 

[0953] 231

[0954] (R)-N-(1-사이클로프로필에틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 231.

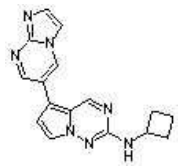
[0955] 황색 고체 (21.29 mg, 0.067 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 0.14 - 0.24 (1 H, m), 0.31 - 0.50 (3 H, m), 0.96 - 1.08 (1 H, m), 1.23 (3 H, d, *J*=6.50 Hz), 6.90 (1 H, d, *J*=8.38 Hz), 7.05 (1 H, d, *J*=2.50 Hz), 7.71 (1 H, d, *J*=2.38 Hz), 7.74 (1 H, s), 7.89 (1 H, s), 8.88 (1 H, d, *J*=2.50 Hz), 9.14 (1 H, s), 9.29 (1 H, d, *J*=2.50 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{17}N_7$ *m/z* 320.1 (M +1).

[0956] 

[0957] 232

[0958] N-(2-사이클로프로필-2,2-디플루오로에틸)-5-(이미다조[1,2-a]피리미딘-6-일) 피롤로[2,1-f][1,2,4]트리아진-2-아민 232.

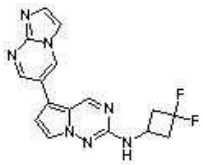
[0959] 황색 고체 (3 mg, 0.008 mmol, 4.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.55 - 0.60 (4 H, m), 1.41 - 1.55 (1 H, m), 3.82 (2 H, td, *J*=13.96, 6.57 Hz), 7.12 (1 H, d, *J*=2.19 Hz), 7.36 (1 H, t, *J*=6.57 Hz), 7.75 (1 H, d, *J*=1.10 Hz), 7.80 (1 H, d, *J*=2.19 Hz), 7.89 (1 H, d, *J*=1.64 Hz), 8.90 (1 H, d, *J*=2.74 Hz), 9.21 (1 H, s), 9.32 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{15}F_2N_7$ *m/z* 356.1 (M+1).

[0960] 

[0961] 235

[0962] N-사이클로부틸-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 235.

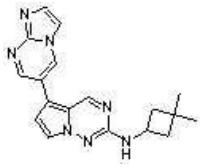
[0963] 황색 고체 (11.92 mg, 0.039 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.60 - 1.76 (2 H, m), 1.92 - 2.06 (2 H, m), 2.22 - 2.35 (2 H, m), 4.18 (1 H, dt, *J*=15.99, 7.96 Hz), 7.23 (1 H, d, *J*=2.57 Hz), 7.81 (1 H, d, *J*=2.57 Hz), 8.28 - 8.35 (2 H, m), 9.29 (1 H, s), 9.44 (1 H, d, *J*=2.32 Hz), 9.82 (1 H, d, *J*=2.20 Hz); 다음에 대한 ESIMS 실험치: $C_{16}H_{15}N_7$ *m/z* 306.2 (M+1).

[0964] 

[0965] 236

[0966] N-(3,3-디플루오로사이클로부틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 236.

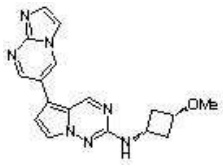
[0967] 황색 고체 (10.03 mg, 0.029 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 2.58 - 2.75 (2 H, m), 2.92 - 3.06 (2 H, m), 4.01 - 4.13 (1 H, m), 7.11 (1 H, d, *J*=2.38 Hz), 7.58 (1 H, d, *J*=6.25 Hz), 7.74 (1 H, s), 7.79 (1 H, d, *J*=2.38 Hz), 7.89 (1 H, s), 8.88 (1 H, d, *J*=2.25 Hz), 9.20 (1 H, s), 9.31 (1 H, d, *J*=2.25 Hz); 다음에 대한 ESIMS 실험치: $C_{16}H_{13}F_2N_7$ *m/z* 342.0 (M+1).

[0968] 

[0969] 237

[0970] N-(3,3-디메틸사이클로부틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 237.

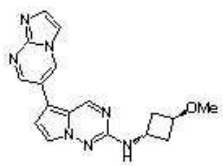
[0971] 황색 고체 (9.7 mg, 0.029 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.11 (3 H, s), 1.16 (3 H, s), 1.77 - 1.89 (2 H, m), 2.16 (2 H, ddd, *J*=9.14, 7.92, 2.51 Hz), 4.16 (1 H, dt, *J*=16.11, 8.02 Hz), 7.22 (1 H, d, *J*=2.69 Hz), 7.83 (1 H, d, *J*=2.57 Hz), 8.27 (1 H, d, *J*=2.20 Hz), 8.32 (1 H, d, *J*=2.20 Hz), 9.26 (1 H, s), 9.43 (1 H, d, *J*=2.32 Hz), 9.76 (1 H, d, *J*=2.20 Hz); 다음에 대한 ESIMS 실험치: $C_{18}H_{19}N_7$ *m/z* 334.2 (M+1).

[0972] 

[0973] 239

[0974] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f] [1,2,4]트리아진-2-아민 239.

[0975] 황색 고체 (3.11 mg, 0.009 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.78 - 1.90 (2 H, m), 2.66 (2 H, dtd, *J*=9.06, 6.66, 6.66, 2.81 Hz), 3.14 (3 H, s), 3.56 - 3.68 (1 H, m), 3.78 (1 H, dq, *J*=15.59, 7.93 Hz), 7.08 (1 H, d, *J*=2.57 Hz), 7.32 (1 H, d, *J*=7.34 Hz), 7.69 - 7.77 (2 H, m), 7.89 (1 H, d, *J*=1.34 Hz), 8.88 (1 H, d, *J*=2.45 Hz), 9.16 (1 H, s), 9.30 (1 H, d, *J*=2.57 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{17}N_7O$ *m/z* 336.1 (M+1).

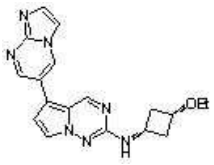
[0976] 

[0977] 240

[0978] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-3-메톡시사이클로부틸)피롤로 [2,1-f][1,2,4]트리아진-2-아민

240.

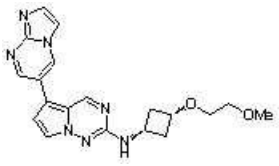
[0979] 황색 고체 (9.17 mg, 0.027 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 2.18 - 2.34 (4 H, m), 3.16 (3 H, s), 3.98 - 4.03 (1 H, m), 4.15 - 4.25 (1 H, m), 7.17 (1 H, d, *J*=2.63 Hz), 7.47 (1 H, br d, *J*=6.00 Hz), 7.81 (1 H, d, *J*=2.50 Hz), 8.10 - 8.14 (2 H, m), 9.21 (1 H, s), 9.25 (1 H, d, *J*=2.25 Hz), 9.54 (1 H, d, *J*=2.38 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{17}N_7O$ *m/z* 336.1 (M +1).

[0980] 

[0981] 242

[0982] N-(*cis*-3-에톡시사이클로부틸)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 242.

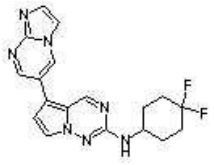
[0983] 갈색 고체 (20 mg, 0.057 mmol, 11.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.10 (3 H, t, *J*=6.84 Hz), 1.80 - 1.92 (2 H, m), 2.66 (2 H, dtd, *J*=8.90, 6.78, 6.78, 2.74 Hz), 3.33 - 3.38 (2 H, m), 3.66 - 3.73 (1 H, m), 3.73 - 3.83 (1 H, m), 7.07 (1 H, d, *J*=2.74 Hz), 7.31 (1 H, d, *J*=7.12 Hz), 7.72 - 7.75 (2 H, m), 7.89 (1 H, d, *J*=1.10 Hz), 8.88 (1 H, d, *J*=2.19 Hz), 9.15 (1 H, s), 9.30 (1 H, d, *J*=2.19 Hz); 다음에 대한 ESIMS 실험치: $C_{18}H_{19}N_7O$ *m/z* 350.15 (M+1).

[0984] 

[0985] 244

[0986] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-3-(2-메톡시에톡시)사이클로부틸) 피롤로[2,1-f][1,2,4]트리아진-2-아민 244.

[0987] 갈색 고체 (12 mg, 0.032 mmol, 5.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.82 - 1.93 (2 H, m), 2.62 - 2.71 (2 H, m), 3.25 (3 H, s), 3.42 (4 H, s), 3.68 - 3.84 (2 H, m), 7.07 (1 H, d, *J*=2.19 Hz), 7.32 (1 H, d, *J*=7.12 Hz), 7.74 (1 H, d, *J*=4.38 Hz), 7.74 (1 H, s), 7.89 (1 H, d, *J*=1.64 Hz), 8.88 (1 H, d, *J*=2.19 Hz), 9.16 (1 H, s), 9.30 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{21}N_7O_2$ *m/z* 380.2 (M+1).

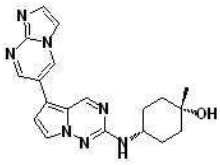
[0988] 

[0989] 256

[0990] N-(4,4-디플루오로사이클로헥실)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 256.

[0991] 옅은 황색 고체 (67 mg, 0.1814 mmol, 23.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.57 - 1.71 (2 H, m), 1.85 - 2.04 (4 H, m), 2.04 - 2.15 (2 H, m), 3.74 - 3.86 (1 H, m), 7.06 (1 H, d, *J*=8.21 Hz), 7.08 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=1.64 Hz), 7.76 (1 H, d, *J*=2.74 Hz), 7.89 (1 H, d, *J*=1.64 Hz), 8.89 (1 H, d, *J*=2.19 Hz), 9.17 (1 H, s), 9.30 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{18}H_{17}F_2N_7$ *m/z* 370.1

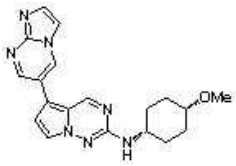
(M+1).

[0992] 

[0993] 258

[0994] (1s,4s)-4-((5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 258.

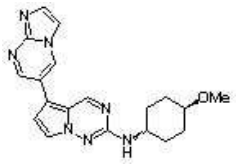
[0995] 황색 고체 (37 mg, 0.102 mmol, 33.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.12 (3 H, s), 1.37 (2 H, td, *J*=13.00, 4.11 Hz), 1.58 (2 H, br d, *J*=12.05 Hz), 1.61 - 1.69 (2 H, m), 1.69 - 1.75 (2 H, m), 3.45 - 3.57 (1 H, m), 4.02 (1 H, s), 6.84 (1 H, d, *J*=8.21 Hz), 7.04 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=1.10 Hz), 7.89 (1 H, d, *J*=1.10 Hz), 8.88 (1 H, d, *J*=2.19 Hz), 9.14 (1 H, s), 9.29 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{21}N_7O$ *m/z* 364.2 (M+1).

[0996] 

[0997] 259

[0998] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 259.

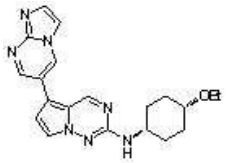
[0999] 베이지색 고체 (5 mg, 0.014 mmol, 4.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.42 - 1.55 (2 H, m), 1.56 - 1.65 (2 H, m), 1.66 - 1.76 (2 H, m), 1.80 - 1.91 (2 H, m), 3.22 (3 H, s), 3.33 - 3.37 (1 H, m), 3.59 - 3.68 (1 H, m), 6.89 (1 H, d, *J*=7.67 Hz), 7.05 (1 H, q, *J*=2.19 Hz), 7.71 - 7.75 (2 H, m), 7.89 (1 H, d, *J*=1.64 Hz), 8.88 (1 H, d, *J*=2.19 Hz), 9.14 (1 H, s), 9.29 (1 H, d, *J*=2.19 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{21}N_7O$ *m/z* 364.2 (M+1).

[1000] 

[1001] 260

[1002] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로 [2,1-f][1,2,4]트리아진-2-아민 260.

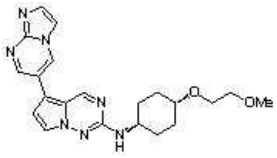
[1003] 황색 고체 (16.56 mg, 0.046 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.14 - 1.27 (2 H, m), 1.27 - 1.41 (2 H, m), 1.95 - 2.08 (4 H, m), 3.13 (1 H, tt, *J*=10.06, 3.45 Hz), 3.24 (3 H, s), 3.51 - 3.63 (1 H, m), 6.88 (1 H, d, *J*=7.95 Hz), 7.06 (1 H, d, *J*=2.57 Hz), 7.74 (1 H, d, *J*=1.34 Hz), 7.76 (1 H, d, *J*=2.08 Hz), 7.89 (1 H, d, *J*=1.34 Hz), 8.88 (1 H, d, *J*=2.57 Hz), 9.15 (1 H, s), 9.29 (1 H, d, *J*=2.45 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{21}N_7O$ *m/z* 364.2 (M +1).

[1004] 

[1005] 263

[1006] N-(*cis*-4-에톡시사이클로헥실)-5-(이미다조[1,2-a]피리미딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 263.

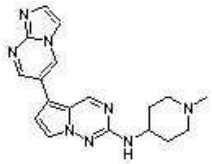
[1007] 갈색 고체 (44 mg, 0.117 mmol, 26.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.12 (3 H, t, *J*=7.12 Hz), 1.43 - 1.56 (2 H, m), 1.58 - 1.75 (4 H, m), 1.77 - 1.87 (2 H, m), 3.42 (2 H, q, *J*=7.12 Hz), 3.44 - 3.47 (1 H, m), 3.59 - 3.69 (1 H, m), 6.88 (1 H, d, *J*=7.67 Hz), 7.05 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=3.85 Hz), 7.74 (1 H, s), 7.89 (1 H, d, *J*=1.64 Hz), 8.88 (1 H, d, *J*=2.19 Hz), 9.14 (1 H, s), 9.29 (1 H, d, *J*=2.19 Hz); 다음에 대한 ESIMS 실험치: $C_{20}H_{23}N_7O$ *m/z* 378.2 (M+1).

[1008] 

[1009] 265

[1010] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실) 피롤로[2,1-f][1,2,4]트리아진-2-아민 265.

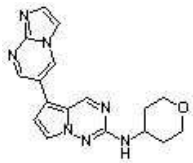
[1011] 황색 고체 (18 mg, 0.044 mmol, 12.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.44 - 1.57 (2 H, m), 1.60 - 1.75 (4 H, m), 1.78 - 1.88 (2 H, m), 3.27 (3 H, s), 3.43 - 3.46 (2 H, m), 3.46 - 3.49 (1 H, m), 3.49 - 3.52 (2 H, m), 3.58 - 3.69 (1 H, m), 6.91 (1 H, d, *J*=7.67 Hz), 7.05 (1 H, d, *J*=2.74 Hz), 7.73 - 7.75 (2 H, m), 7.89 (1 H, d, *J*=1.10 Hz), 8.88 (1 H, d, *J*=2.74 Hz), 9.15 (1 H, s), 9.29 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{21}H_{25}N_7O_2$ *m/z* 408.2 (M+1).

[1012] 

[1013] 279

[1014] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 279.

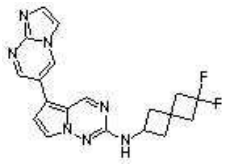
[1015] 황색 고체 (18 mg, 0.052 mmol, 16.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.60 (2 H, m), 1.90 (2 H, br d, *J*=9.86 Hz), 1.96 (2 H, br t, *J*=11.50 Hz), 2.17 (3 H, s), 2.75 (2 H, br d, *J*=12.05 Hz), 3.48 - 3.59 (1 H, m), 6.90 (1 H, d, *J*=7.67 Hz), 7.06 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=1.64 Hz), 7.75 (1 H, d, *J*=2.19 Hz), 7.89 (1 H, d, *J*=1.64 Hz), 8.88 (1 H, d, *J*=2.74 Hz), 9.16 (1 H, s), 9.30 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{20}N_8$ *m/z* 349.2 (M+1).

[1016] 

[1017] 280

[1018] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **280**.

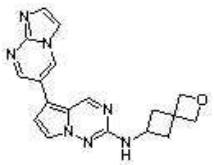
[1019] 황색 고체 (54.78 mg, 0.163 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.45 - 1.61 (2 H, m), 1.90 (2 H, br dd, *J*=12.51, 2.00 Hz), 3.35 - 3.43 (2 H, m), 3.72 - 3.83 (1 H, m), 3.84 - 3.93 (2 H, m), 7.01 (1 H, d, *J*=7.75 Hz), 7.06 (1 H, d, *J*=2.50 Hz), 7.74 (2 H, dd, *J*=4.13, 1.88 Hz), 7.89 (1 H, d, *J*=1.25 Hz), 8.88 (1 H, d, *J*=2.50 Hz), 9.16 (1 H, s), 9.29 (1 H, d, *J*=2.50 Hz); 다음에 대한 ESIMS 실험치: $C_{17}H_{17}N_7O$ *m/z* 336.1 (M+1).

[1020] 

[1021] **281**

[1022] N-(6,6-디플루오로스피로[3.3]헵탄-2-일)-5-(이미다조[1,2-a]피리미딘-6-일) 피롤로[2,1-f][1,2,4]트리아진-2-아민 **281**.

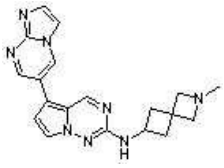
[1023] 베이지색 고체 (33 mg, 0.087 mmol, 29.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.12 - 2.21 (2 H, m), 2.45 - 2.49 (2 H, m), 2.58 (2 H, br t, *J*=12.59 Hz), 2.65 - 2.76 (2 H, m), 4.13 (1 H, sxt, *J*=7.78 Hz), 7.07 (1 H, d, *J*=2.74 Hz), 7.34 (1 H, d, *J*=7.12 Hz), 7.74 (1 H, d, *J*=1.64 Hz), 7.76 (1 H, d, *J*=2.74 Hz), 7.89 (1 H, d, *J*=1.10 Hz), 8.88 (1 H, d, *J*=2.19 Hz), 9.16 (1 H, s), 9.30 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{17}F_2N_7$ *m/z* 382.2 (M+1).

[1024] 

[1025] **282**

[1026] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **282**.

[1027] 옅은 갈색 고체 (11 mg, 0.032 mmol, 10.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.12 - 2.22 (2 H, m), 2.58 - 2.67 (2 H, m), 3.99 (1 H, sxt, *J*=7.67 Hz), 4.52 (2 H, s), 4.64 (2 H, s), 7.07 (1 H, d, *J*=2.74 Hz), 7.29 (1 H, d, *J*=6.57 Hz), 7.72 - 7.76 (2 H, m), 7.89 (1 H, d, *J*=1.64 Hz), 8.88 (1 H, d, *J*=2.74 Hz), 9.15 (1 H, s), 9.30 (1 H, d, *J*=2.19 Hz); 다음에 대한 ESIMS 실험치: $C_{18}H_{17}N_7O$ *m/z* 348.2 (M+1).

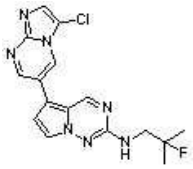
[1028] 

[1029] **283**

[1030] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **283**.

[1031] 황색 고체 (5 mg, 0.014 mmol, 12.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.03 - 2.10 (2 H, m), 2.16 (3 H, s), 2.45 (2 H, ddd, *J*=9.72, 7.26, 2.74 Hz), 3.04 (2 H, s), 3.16 (2 H, s), 4.03 (1 H, sxt, *J*=7.67 Hz), 7.07 (1 H, d, *J*=2.74 Hz), 7.27 (1 H, d, *J*=7.12 Hz), 7.74 (1 H, d, *J*=1.64 Hz), 7.75 (1 H, d, *J*=2.74 Hz), 7.89 (1 H, d, *J*=1.09 Hz), 8.88 (1 H, d, *J*=2.74 Hz), 9.14 (1 H, s), 9.29 (1 H, d, *J*=2.19

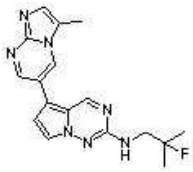
Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{20}N_8$ *m/z* 361.2 (M+1).

[1032] 

[1033] 287

[1034] 5-(3-클로로이미다조[1,2-a]피리미딘-6-일)-N-(2-플루오로-2-메틸프로필) 피롤로[2,1-f][1,2,4]트리아진-2-아민 287.

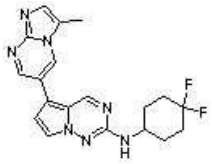
[1035] 황색 고체 (16 mg, 0.045 mmol, 18.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 3.49 (2 H, dd, *J*=19.16, 6.30 Hz), 7.11 - 7.15 (2 H, m), 7.77 (1 H, d, *J*=2.19 Hz), 7.89 (1 H, s), 8.95 (2 H, q, *J*=2.28 Hz), 9.15 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{16}H_{15}ClFN_7$ *m/z* 360.1 (M+1).

[1036] 

[1037] 358

[1038] N-(2-플루오로-2-메틸프로필)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일) 피롤로[2,1-f][1,2,4]트리아진-2-아민 358.

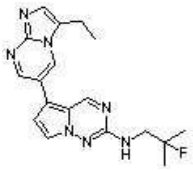
[1039] 황색 고체 (10.71 mg, 0.032 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.33 (6 H, d, *J*=21.40 Hz), 2.46 (2 H, br s), 3.44 (2 H, dd, *J*=19.20, 6.32 Hz), 6.98 - 7.08 (2 H, m), 7.49 (1 H, s), 7.71 (1 H, d, *J*=2.50 Hz), 8.77 (1 H, d, *J*=2.25 Hz), 8.86 (1 H, d, *J*=2.13 Hz), 9.14 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{17}H_{18}FN_7$ *m/z* 340.1 (M+1).

[1040] 

[1041] 398

[1042] N-(4,4-디플루오로사이클로헥실)-5-(3-메틸이미다조[1,2-a]피리미딘-6-일) 피롤로[2,1-f][1,2,4]트리아진-2-아민 398.

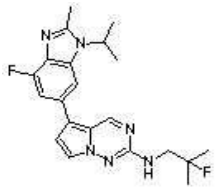
[1043] 황색 고체 (2.1 mg, 0.005 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.58 - 1.72 (2 H, m), 1.86 - 2.04 (4 H, m), 2.09 (2 H, br d, *J*=7.38 Hz), 2.54 (3 H, s), 3.76 - 3.89 (1 H, m), 7.01 (1 H, br d, *J*=7.63 Hz), 7.07 (1 H, d, *J*=2.38 Hz), 7.53 (1 H, s), 7.75 (1 H, d, *J*=2.38 Hz), 8.81 (1 H, d, *J*=2.25 Hz), 8.89 (1 H, d, *J*=2.13 Hz), 9.18 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{19}F_2N_7$ *m/z* 384.2 (M+1).

[1044] 

[1045] 429

[1046] 5-(3-에틸이미다조[1,2-a]피리미딘-6-일)-N-(2-플루오로-2-메틸프로필) 피롤로[2,1-f][1,2,4]트리아진-2-아민 **429**.

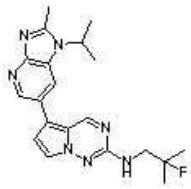
[1047] 황색 고체 (11.07 mg, 0.031 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.31 - 1.37 (3 H, m), 1.37 (6 H, d, *J*=21.40 Hz), 2.98 (2 H, q, *J*=7.50 Hz), 3.49 (2 H, br dd, *J*=19.20, 6.32 Hz), 7.03 - 7.12 (2 H, m), 7.55 (1 H, s), 7.76 (1 H, d, *J*=2.25 Hz), 8.82 (1 H, d, *J*=2.25 Hz), 8.94 (1 H, d, *J*=2.38 Hz), 9.15 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{20}FN_7$ *m/z* 354.3 (M+1).

[1048] 

[1049] **500**

[1050] 5-(4-플루오로-1-이소프로필-2-메틸-1H-벤조[d]이미다졸-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 **500**.

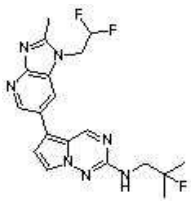
[1051] 황색 고체 (34 mg, 0.085 mmol, 49.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.37 (6 H, d, *J*=21.40 Hz), 1.59 (6 H, d, *J*=6.84 Hz), 2.60 (3 H, s), 3.48 (2 H, dd, *J*=19.16, 6.57 Hz), 4.83 (1 H, dt, *J*=13.89, 6.88 Hz), 6.96 - 7.01 (2 H, m), 7.24 (1 H, dd, *J*=11.77, 1.10 Hz), 7.63 (1 H, d, *J*=1.10 Hz), 7.68 (1 H, d, *J*=2.46 Hz), 8.98 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{24}F_2N_6$ *m/z* 399.2 (M+1).

[1052] 

[1053] **571**

[1054] N-(2-플루오로-2-메틸프로필)-5-(1-이소프로필-2-메틸-1H-이미다조[4,5-b] 피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **571**.

[1055] 황색 고체 (39 mg, 0.102 mmol, 39.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 1.60 (6 H, d, *J*=6.84 Hz), 2.64 (3 H, s), 3.49 (2 H, dd, *J*=19.30, 6.43 Hz), 4.76 - 4.90 (1 H, m), 6.99 - 7.04 (2 H, m), 7.72 (1 H, d, *J*=2.46 Hz), 8.22 (1 H, d, *J*=1.92 Hz), 8.60 (1 H, d, *J*=2.19 Hz), 8.99 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{24}FN_7$ *m/z* 382.2 (M+1).

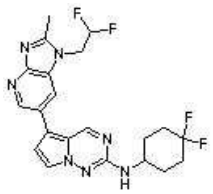
[1056] 

[1057] **642**

[1058] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 **642**.

[1059] 황색 고체 (37 mg, 0.092 mmol, 37.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 2.63 (3 H, s), 3.49 (2 H, dd, *J*=19.30, 6.43 Hz), 4.91 (2 H, td, *J*=15.88, 3.01 Hz), 6.53 (1 H, tt,

J=54.40, 3.20 Hz), 7.01 (1 H, d, *J*=2.74 Hz), 7.03 (1 H, t, *J*=6.43 Hz), 7.73 (1 H, d, *J*=2.46 Hz), 8.25 (1 H, d, *J*=1.92 Hz), 8.67 (1 H, d, *J*=1.92 Hz), 9.14 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{20}F_3N_7$ *m/z* 404.2 (M+1).

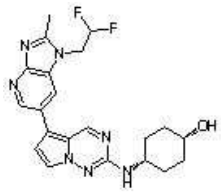


[1060]

[1061] 682

[1062] N-(4,4-디플루오로사이클로헥실)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 682.

[1063] 황갈색 고체 (8 mg, 0.018 mmol, 5.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.56 - 1.70 (2 H, m), 1.87 - 2.03 (4 H, m), 2.03 - 2.16 (2 H, m), 2.63 (3 H, s), 3.76 - 3.86 (1 H, m), 4.90 (2 H, td, *J*=15.88, 2.74 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.98 (1 H, d, *J*=8.21 Hz), 7.00 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=2.74 Hz), 8.24 (1 H, d, *J*=2.19 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.13 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{21}F_4N_7$ *m/z* 448.2 (M+1).

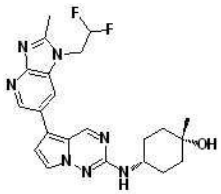


[1064]

[1065] 683

[1066] *cis*-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 683.

[1067] 옅은 갈색 고체 (6 mg, 0.014 mmol, 4.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.57 (2 H, m), 1.61 - 1.69 (4 H, m), 1.70 - 1.81 (2 H, m), 2.62 (3 H, s), 3.57 - 3.68 (1 H, m), 3.74 (1 H, br d, *J*=2.46 Hz), 4.35 (1 H, d, *J*=3.01 Hz), 4.90 (2 H, td, *J*=15.95, 2.87 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.76 (1 H, d, *J*=7.67 Hz), 6.97 (1 H, d, *J*=2.46 Hz), 7.71 (1 H, d, *J*=2.46 Hz), 8.23 (1 H, d, *J*=2.19 Hz), 8.66 (1 H, d, *J*=1.92 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_2N_7O$ *m/z* 428.2 (M+1).



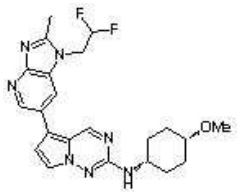
[1068]

[1069] 684

[1070] *cis*-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 684.

[1071] 짙은 황색 고체 (16 mg, 0.036 mmol, 11.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.37 (2 H, td, *J*=13.14, 4.38 Hz), 1.59 (2 H, br d, *J*=12.05 Hz), 1.62 - 1.70 (2 H, m), 1.70 - 1.76 (2 H, m), 2.62 (3 H, s), 3.47 - 3.60 (1 H, m), 4.01 (1 H, s), 4.90 (2 H, td, *J*=15.74, 3.01 Hz), 6.52 (1 H, tt, *J*=54.40, 3.00 Hz), 6.74 (1 H, d, *J*=7.67 Hz), 6.96 (1 H, d, *J*=2.74 Hz), 7.69 (1 H, d, *J*=2.74 Hz), 8.22

(1 H, d, *J*=2.19 Hz), 8.65 (1 H, d, *J*=2.19 Hz), 9.09 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_2N_7O$ *m/z* 442.2 (M+1).

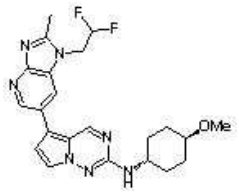


[1072]

[1073] 685

[1074] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 685.

[1075] 옅은 갈색 고체 (46 mg, 0.104 mmol, 33.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.44 - 1.53 (2 H, m), 1.55 - 1.65 (2 H, m), 1.66 - 1.74 (2 H, m), 1.82 - 1.90 (2 H, m), 2.62 (3 H, s), 3.22 (3 H, s), 3.35 (1 H, br d, *J*=2.19 Hz), 3.60 - 3.72 (1 H, m), 4.90 (2 H, td, *J*=15.88, 2.74 Hz), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.80 (1 H, d, *J*=7.94 Hz), 6.97 (1 H, d, *J*=2.74 Hz), 7.71 (1 H, d, *J*=2.19 Hz), 8.23 (1 H, d, *J*=1.92 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_2N_7O$ *m/z* 442.2 (M+1).

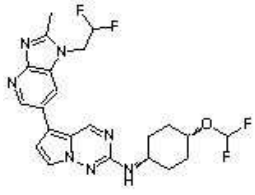


[1076]

[1077] 686

[1078] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 686.

[1079] 옅은 갈색 고체 (42 mg, 0.095 mmol, 30.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.14 - 1.26 (2 H, m), 1.27 - 1.38 (2 H, m), 1.95 - 2.09 (4 H, m), 2.62 (3 H, s), 3.13 (1 H, tt, *J*=10.13, 3.42 Hz), 3.25 (3 H, s), 3.51 - 3.64 (1 H, m), 4.90 (2 H, td, *J*=15.81, 2.60 Hz), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.79 (1 H, d, *J*=8.21 Hz), 6.98 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=2.46 Hz), 8.23 (1 H, d, *J*=1.64 Hz), 8.66 (1 H, d, *J*=1.92 Hz), 9.11 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_2N_7O$ *m/z* 442.2 (M+1).



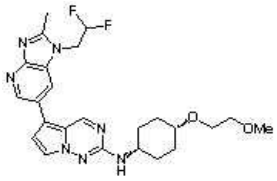
[1080]

[1081] 687

[1082] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(디플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 687.

[1083] 옅은 갈색 고체 (7 mg, 0.015 mmol, 5.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.60 - 1.72 (4 H, m), 1.73 - 1.82 (2 H, m), 1.88 (2 H, dt, *J*=9.31, 4.65 Hz), 2.63 (3 H, s), 3.64 - 3.76 (1 H, m), 4.29 (1 H, br s), 4.90 (2 H, td, *J*=15.88, 2.74 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.73 (1 H, t, *J*=76.80 Hz), 6.90 (1 H, d, *J*=7.67 Hz), 6.98 (1 H, d, *J*=2.19 Hz), 7.71 (1 H, d, *J*=2.19 Hz), 8.23 (1 H, d, *J*=2.19

Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.11 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}F_4N_7O$ *m/z* 478.2 (M+1).

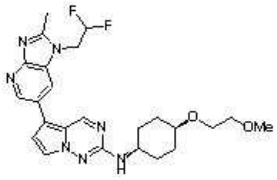


[1084]

[1085] **691**

[1086] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **691**.

[1087] 황색 고체 (23 mg, 0.047 mmol, 17.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.57 (2 H, m), 1.59 - 1.75 (4 H, m), 1.79 - 1.89 (2 H, m), 2.62 (3 H, s), 3.27 (3 H, s), 3.43 - 3.47 (2 H, m), 3.47 - 3.49 (1 H, m), 3.49 - 3.52 (2 H, m), 3.59 - 3.70 (1 H, m), 4.90 (2 H, td, *J*=15.81, 2.87 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.81 (1 H, d, *J*=7.67 Hz), 6.97 (1 H, d, *J*=2.46 Hz), 7.71 (1 H, d, *J*=2.46 Hz), 8.23 (1 H, d, *J*=1.92 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{29}F_2N_7O_2$ *m/z* 486.2 (M+1).

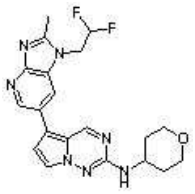


[1088]

[1089] **692**

[1090] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **692**.

[1091] 짙은 황색 고체 (25 mg, 0.052 mmol, 19.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.18 - 1.39 (4 H, m), 2.01 (4 H, br dd, *J*=10.40, 2.20 Hz), 2.62 (3 H, s), 3.21 - 3.28 (1 H, m), 3.25 (2 H, s), 3.42 (2 H, t, *J*=4.90 Hz), 3.54 (2 H, t, *J*=4.90 Hz), 3.55 - 3.62 (1 H, m), 4.84 - 4.97 (2 H, m), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.77 (1 H, d, *J*=8.21 Hz), 6.98 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=2.74 Hz), 8.23 (1 H, d, *J*=1.64 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.11 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{29}F_2N_7O_2$ *m/z* 486.2 (M+1).



[1092]

[1093] **706**

[1094] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **706**.

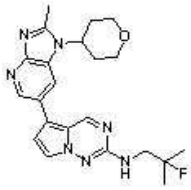
[1095] 옅은 갈색 고체 (8 mg, 0.019 mmol, 5.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.59 (2 H, m), 1.91 (2 H, br dd, *J*=12.59, 2.19 Hz), 2.63 (3 H, s), 3.41 (2 H, td, *J*=11.64, 1.92 Hz), 3.75 - 3.85 (1 H, m), 3.86 - 3.94 (2 H, m), 4.90 (2 H, td, *J*=15.88, 2.74 Hz), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.91 (1 H, d, *J*=7.67 Hz), 6.99 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=2.19 Hz), 8.23 (1 H, d, *J*=2.19 Hz), 8.66 (1 H, d, *J*=1.64 Hz), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O$ *m/z* 414.2 (M+1).

[1096] 

[1097] 713

[1098] 5-(1-(3,3-디플루오로사이클로부틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 713.

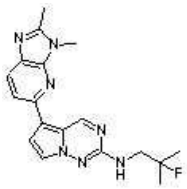
[1099] 황색 고체 (45 mg, 0.105 mmol, 43.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 2.64 (3 H, s), 3.35 - 3.43 (2 H, m), 3.48 (2 H, dd, *J*=19.30, 6.43 Hz), 3.53 - 3.64 (2 H, m), 5.04 - 5.17 (1 H, m), 6.99 - 7.06 (2 H, m), 7.73 (1 H, d, *J*=2.46 Hz), 8.04 (1 H, d, *J*=1.92 Hz), 8.66 (1 H, d, *J*=1.92 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{22}F_3N_7$ *m/z* 430.2 (M+1).

[1100] 

[1101] 784

[1102] N-(2-플루오로-2-메틸프로필)-5-(2-메틸-1-(테트라히드로-2H-피란-4-일)-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 784.

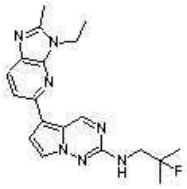
[1103] 황색 고체 (19 mg, 0.045 mmol, 19.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 1.87 (2 H, br dd, *J*=12.32, 2.46 Hz), 2.44 (2 H, qd, *J*=12.37, 4.52 Hz), 2.68 (3 H, s), 3.49 (2 H, dd, *J*=19.30, 6.43 Hz), 3.54 - 3.62 (2 H, m), 4.04 (2 H, br dd, *J*=11.23, 4.11 Hz), 4.68 (1 H, tt, *J*=12.22, 4.21 Hz), 7.01 (1 H, t, *J*=6.43 Hz), 7.04 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=2.46 Hz), 8.18 (1 H, d, *J*=1.92 Hz), 8.61 (1 H, d, *J*=1.92 Hz), 9.01 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{26}FN_7O$ *m/z* 424.2 (M+1).

[1104] 

[1105] 855

[1106] 5-(2,3-디메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 855.

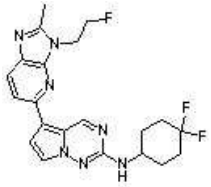
[1107] 황색 고체 ((16 mg, 0.045 mmol, 18.6% 수율). ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 2.58 (3 H, s), 3.49 (2 H, dd, *J*=19.35, 6.45 Hz), 3.82 (3 H, s), 7.02 (1 H, t, *J*=6.45 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.69 (1 H, d, *J*=8.51 Hz), 7.90 (1 H, d, *J*=8.23 Hz), 9.76 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{20}FN_7$ *m/z* 354.2 (M+1).

[1108] 

[1109] **926**

[1110] 5-(3-에틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-플루오로-2-메틸프로필)피롤로[2,1-f][1,2,4]트리아진-2-아민 **926**.

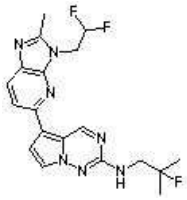
[1111] 황색 고체 (13 mg, 0.035 mmol, 13.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 1.41 (3 H, t, *J*=7.10 Hz), 2.60 (3 H, s), 3.49 (2 H, dd, *J*=19.71, 6.57 Hz), 4.33 (2 H, q, *J*=7.12 Hz), 7.01 (1 H, t, *J*=6.30 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.19 Hz), 7.69 (1 H, d, *J*=8.21 Hz), 7.91 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{22}FN_7$ *m/z* 368.2 (M+1).

[1112] 

[1113] **1037**

[1114] N-(4,4-디플루오로사이클로헥실)-5-(3-(2-플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1037**.

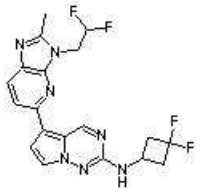
[1115] 황색 고체 (19 mg, 0.044 mmol, 19.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.58 - 1.72 (2 H, m), 1.86 - 2.03 (4 H, m), 2.03 - 2.16 (2 H, m), 2.59 (3 H, s), 3.76 - 3.90 (1 H, m), 4.66 (2 H, dt, *J*=27.40, 4.80 Hz), 4.87 (2 H, dt, *J*=47.20, 4.90 Hz), 6.92 (1 H, d, *J*=7.67 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.71 (1 H, d, *J*=8.21 Hz), 7.93 (1 H, d, *J*=8.21 Hz), 9.67 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{22}F_3N_7$ *m/z* 430.2 (M+1).

[1116] 

[1117] **1068**

[1118] N-(2-플루오로-2-메틸프로필)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1068**.

[1119] 황색 고체 (86 mg, 0.213 mmol, 38.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 2.61 (3 H, s), 3.50 (2 H, dd, *J*=19.44, 6.30 Hz), 4.84 (2 H, td, *J*=16.02, 3.01 Hz), 6.56 (1 H, tt, *J*=54.90, 3.20 Hz), 7.01 (1 H, t, *J*=6.30 Hz), 7.25 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.72 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{20}F_3N_7$ *m/z* 404.2 (M+1).

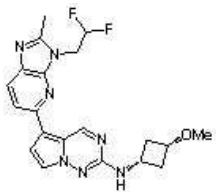


[1120]

[1121] 1088

[1122] N-(3,3-디플루오로사이클로부틸)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조 [4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1088**.

[1123] 황색 고체 (13 mg, 0.031 mmol, 12.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.61 (3 H, s), 2.63 - 2.74 (2 H, m), 2.95 - 3.04 (2 H, m), 4.02 - 4.15 (1 H, m), 4.84 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.40, 2.90 Hz), 7.28 (1 H, d, *J*=2.74 Hz), 7.46 (1 H, d, *J*=6.02 Hz), 7.70 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.21 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{17}F_4N_7$ *m/z* 420.15 (M+1).

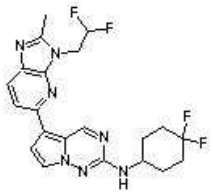


[1124]

[1125] 1091

[1126] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-메톡시사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1091**.

[1127] 황색 고체 (5 mg, 0.012 mmol, 4.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.80 - 1.94 (2 H, m), 2.62 - 2.72 (2 H, m), 3.15 (3 H, s), 3.59 - 3.67 (1 H, m), 3.76 - 3.88 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.50, 3.10 Hz), 7.20 (1 H, d, *J*=7.12 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O$ *m/z* 414.2 (M+1).

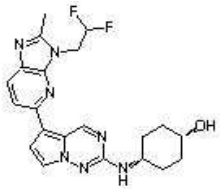


[1128]

[1129] 1108

[1130] N-(4,4-디플루오로사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조 [4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1108**.

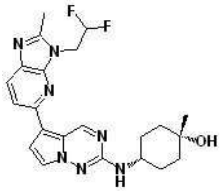
[1131] 황색 고체 (35 mg, 0.078 mmol, 25.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.57 - 1.72 (2 H, m), 1.86 - 2.03 (4 H, m), 2.03 - 2.15 (2 H, m), 3.77 - 3.88 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.90, 3.30 Hz), 6.95 (1 H, d, *J*=7.67 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.76 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{21}F_4N_7$ *m/z* 448.2 (M+1).

[1132] 

[1133] 1109

[1134] *cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 1109.

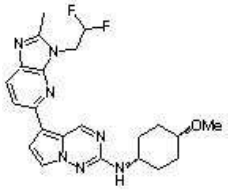
[1135] 황색 고체 (9 mg, 0.021 mmol, 6.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.56 (2 H, m), 1.61 - 1.70 (4 H, m), 1.71 - 1.80 (2 H, m), 2.61 (3 H, s), 3.56 - 3.69 (1 H, m), 3.74 (1 H, br d, *J*=1.64 Hz), 4.36 (1 H, d, *J*=2.74 Hz), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.50, 3.00 Hz), 6.74 (1 H, d, *J*=7.67 Hz), 7.21 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.76 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_2N_7O$ *m/z* 428.2 (M+1).

[1136] 

[1137] 1110

[1138] (1s,4s)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 1110.

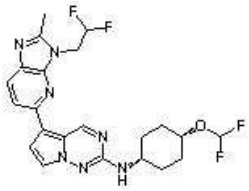
[1139] 옅은 황색 고체 (70 mg, 0.159 mmol, 51.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.37 (2 H, td, *J*=13.00, 4.65 Hz), 1.59 (2 H, br d, *J*=12.59 Hz), 1.63 - 1.76 (4 H, m), 2.60 (3 H, s), 3.48 - 3.60 (1 H, m), 4.02 (1 H, s), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.85, 3.30 Hz), 6.72 (1 H, d, *J*=8.21 Hz), 7.21 (1 H, d, *J*=2.74 Hz), 7.62 (1 H, d, *J*=2.19 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.94 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_2N_7O$ *m/z* 442.2 (M+1).

[1140] 

[1141] 1111

[1142] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-메톡시사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 1111.

[1143] 옅은 황색 고체 (50 mg, 0.113 mmol, 36.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.55 (2 H, m), 1.56 - 1.66 (2 H, m), 1.66 - 1.74 (2 H, m), 1.80 - 1.91 (2 H, m), 2.61 (3 H, s), 3.23 (3 H, s), 3.33 - 3.39 (1 H, m), 3.60 - 3.72 (1 H, m), 4.83 (2 H, td, *J*=16.15, 2.74 Hz), 6.55 (1 H, tt, *J*=54.50, 3.30 Hz), 6.76 (1 H, d, *J*=8.21 Hz), 7.21 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.94 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_2N_7O$ *m/z* 442.2 (M+1).

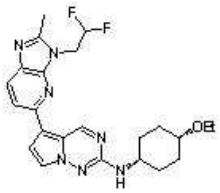


[1144]

[1145] 1113

[1146] N-(*cis*-4-(디플루오로메톡시)사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1113**.

[1147] 황색 고체 (32 mg, 0.067 mmol, 24.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.59 - 1.73 (4 H, m), 1.74 - 1.83 (2 H, m), 1.88 (2 H, dt, *J*=9.38, 4.76 Hz), 2.61 (3 H, s), 3.71 (1 H, dt, *J*=7.80, 3.76 Hz), 4.30 (1 H, br s), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.73 (1 H, t, *J*=77.05 Hz), 6.88 (2 H, d, *J*=7.12 Hz), 7.22 (1 H, d, *J*=2.46 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}F_4N_7O$ *m/z* 478.2 (M+1).

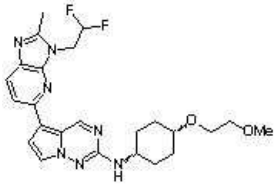


[1148]

[1149] 1115

[1150] N-(*cis*-4-에톡시사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조 [4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1115**.

[1151] 황색 고체 (54 mg, 0.119 mmol, 53.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, t, *J*=6.84 Hz), 1.45 - 1.57 (2 H, m), 1.59 - 1.75 (4 H, m), 1.78 - 1.88 (2 H, m), 2.60 (3 H, s), 3.42 (2 H, q, *J*=7.12 Hz), 3.45 - 3.48 (1 H, m), 3.62 - 3.72 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.85, 2.75 Hz), 6.77 (1 H, d, *J*=7.67 Hz), 7.21 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.94 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{27}F_2N_7O$ *m/z* 456.25 (M+1).

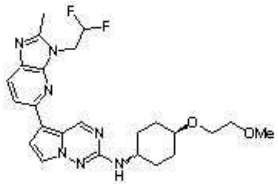


[1152]

[1153] 1117

[1154] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1117**.

[1155] 황색 고체 (44 mg, 0.091 mmol, 44.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.46 - 1.57 (2 H, m), 1.59 - 1.75 (4 H, m), 1.79 - 1.88 (2 H, m), 2.61 (3 H, s), 3.27 (3 H, s), 3.44 - 3.47 (2 H, m), 3.47 - 3.49 (1 H, m), 3.49 - 3.52 (2 H, m), 3.61 - 3.71 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.90, 3.30 Hz), 6.79 (1 H, d, *J*=7.67 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{29}F_2N_7O_2$ *m/z* 486.2 (M+1).

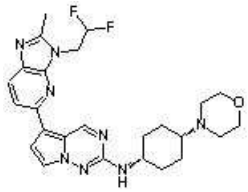


[1156]

[1157] **1118**

[1158] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1118**.

[1159] 황색 고체 (12 mg, 0.025 mmol, 12.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.17 - 1.41 (4 H, m), 2.01 (4 H, br dd, *J*=9.58, 2.46 Hz), 2.61 (3 H, s), 3.22 - 3.29 (1 H, m), 3.25 (3 H, s), 3.41 - 3.44 (2 H, m), 3.52 - 3.55 (2 H, m), 3.56 - 3.63 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.75 (1 H, d, *J*=8.21 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{29}F_2N_7O_2$ *m/z* 486.2 (M+1).

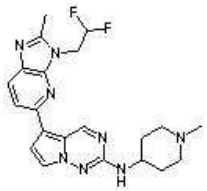


[1160]

[1161] **1125**

[1162] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-모르폴리노사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1125**.

[1163] 갈색 고체 (65.0 mg, 0.131 mmol, 30.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.46 - 1.55 (2 H, m), 1.55 - 1.63 (2 H, m), 1.74 - 1.89 (4 H, m), 2.14 - 2.21 (1 H, m), 2.44 (4 H, br s), 2.61 (3 H, s), 3.58 (4 H, t, *J*=4.52 Hz), 3.75 - 3.83 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.60, 3.30 Hz), 6.81 (1 H, d, *J*=7.12 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{25}H_{30}F_2N_8O$ *m/z* 497.3 (M+1).

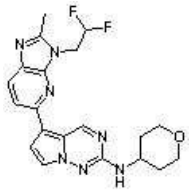


[1164]

[1165] **1131**

[1166] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1131**.

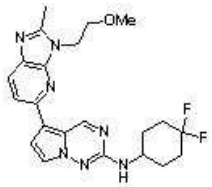
[1167] 황색 고체 (62 mg, 0.145 mmol, 45.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.50 - 1.66 (2 H, m), 1.88 - 1.99 (2 H, m), 2.10 (2 H, br t, *J*=10.95 Hz), 2.23 (3 H, s), 2.61 (3 H, s), 2.83 (2 H, br d, *J*=12.05 Hz), 3.54 - 3.65 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.82 (1 H, d, *J*=7.67 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.19 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{24}F_2N_8$ *m/z* 427.2 (M+1).

[1168] 

[1169] 1132

[1170] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1132**.

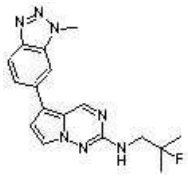
[1171] 황색 고체 (46.0 mg, 0.111 mmol, 33.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.62 (2 H, m), 1.91 (2 H, br dd, *J*=12.59, 2.19 Hz), 2.61 (3 H, s), 3.41 (2 H, td, *J*=11.64, 1.92 Hz), 3.76 - 3.85 (1 H, m), 3.86 - 3.93 (2 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.40, 3.20 Hz), 6.89 (1 H, d, *J*=8.21 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.76 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O$ *m/z* 414.2 (M+1).

[1172] 

[1173] 1179

[1174] N-(4,4-디플루오로사이클로헥실)-5-(3-(2-메톡시에틸)-2-메틸-3H-이미다조 [4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1179**.

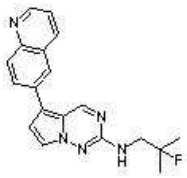
[1175] 황색 고체 (20 mg, 0.045 mmol, 20.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.56 - 1.73 (2 H, m), 1.87 - 2.04 (4 H, m), 2.04 - 2.15 (2 H, m), 2.59 (3 H, s), 3.25 (3 H, s), 3.77 (2 H, t, *J*=5.48 Hz), 3.80 - 3.88 (1 H, m), 4.47 (2 H, t, *J*=5.48 Hz), 6.95 (1 H, d, *J*=7.67 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.69 (1 H, d, *J*=8.21 Hz), 7.91 (1 H, d, *J*=8.76 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_2N_7O$ *m/z* 442.2 (M+1).

[1176] 

[1177] 1210

[1178] N-(2-플루오로-2-메틸프로필)-5-(1-메틸-1H-벤조[d][1,2,3]트리아졸-6-일) 피롤로[2,1-f][1,2,4]트리아진-2-아민 **1210**.

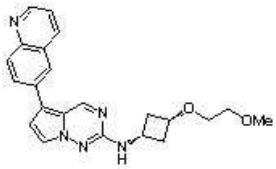
[1179] 황색 고체 (47 mg, 0.139 mmol, 53.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 3.49 (2 H, dd, *J*=19.16, 6.30 Hz), 4.36 (3 H, s), 7.08 (1 H, s), 7.06 (1 H, d, *J*=2.46 Hz), 7.70 - 7.75 (2 H, m), 8.05 (1 H, d, *J*=8.76 Hz), 8.07 (1 H, s), 9.23 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{17}H_{18}FN_7$ *m/z* 340.15 (M+1).

[1180] 

[1181] 1281

[1182] N-(2-플루오로-2-메틸프로필)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1281**.

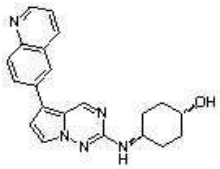
[1183] 황색 고체 (19.6 mg, 0.058 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.39 (6 H, d, *J*=21.40 Hz), 3.49 (2 H, dd, *J*=19.20, 6.32 Hz), 7.07 (1 H, t, *J*=6.38 Hz), 7.11 (1 H, d, *J*=2.63 Hz), 7.54 (1 H, dd, *J*=8.25, 4.13 Hz), 7.74 (1 H, d, *J*=2.50 Hz), 8.03 - 8.13 (2 H, m), 8.30 (1 H, d, *J*=1.75 Hz), 8.40 - 8.47 (1 H, m), 8.86 (1 H, dd, *J*=4.19, 1.56 Hz), 9.25 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{18}FN_5$ *m/z* 336.2 (M+1).

[1184] 

[1185] 1309

[1186] N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1309**.

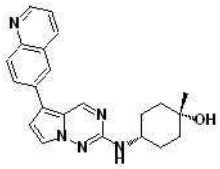
[1187] 황색 고체 (48.0 mg, 0.123 mmol, 35.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.81 - 1.94 (2 H, m), 2.61 - 2.73 (2 H, m), 3.25 (3 H, s), 3.40 - 3.45 (4 H, m), 3.69 - 3.76 (1 H, m), 3.76 - 3.84 (1 H, m), 7.09 (1 H, d, *J*=2.74 Hz), 7.30 (1 H, d, *J*=7.67 Hz), 7.54 (1 H, dd, *J*=8.49, 4.11 Hz), 7.72 (1 H, d, *J*=2.19 Hz), 8.03 - 8.07 (1 H, m), 8.08 - 8.12 (1 H, m), 8.28 (1 H, d, *J*=2.19 Hz), 8.43 (1 H, dd, *J*=8.21, 1.64 Hz), 8.86 (1 H, dd, *J*=4.38, 1.64 Hz), 9.23 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}N_5O_2$ *m/z* 390.2 (M+1).

[1188] 

[1189] 1322

[1190] *cis*-4-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 **1322**.

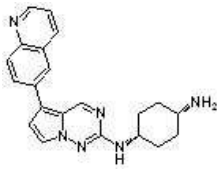
[1191] 갈색 고체 (11 mg, 0.031 mmol, 9.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.57 (2 H, m), 1.61 - 1.71 (4 H, m), 1.71 - 1.82 (2 H, m), 3.57 - 3.67 (1 H, m), 3.74 (1 H, br d, *J*=2.19 Hz), 4.36 (1 H, d, *J*=2.74 Hz), 6.82 (1 H, d, *J*=7.67 Hz), 7.07 (1 H, d, *J*=2.19 Hz), 7.54 (1 H, dd, *J*=8.49, 4.11 Hz), 7.72 (1 H, d, *J*=2.19 Hz), 8.03 - 8.07 (1 H, m), 8.08 - 8.12 (1 H, m), 8.28 (1 H, d, *J*=2.19 Hz), 8.39 - 8.46 (1 H, m), 8.85 (1 H, dd, *J*=4.38, 1.64 Hz), 9.22 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{21}N_5O$ *m/z* 360.2 (M+1).

[1192] 

[1193] 1323

[1194] (1s,4s)-1-메틸-4-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일) 아미노)사이클로헥산-1-올 **1323**.

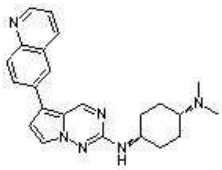
[1195] 황색 고체 (8 mg, 0.021 mmol, 5.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.37 (2 H, td, *J*=13.14, 4.38 Hz), 1.59 (2 H, br d, *J*=12.05 Hz), 1.63 - 1.76 (4 H, m), 3.46 - 3.59 (1 H, m), 4.01 (1 H, s), 6.80 (1 H, d, *J*=7.67 Hz), 7.07 (1 H, d, *J*=2.74 Hz), 7.49 - 7.58 (1 H, m), 7.71 (1 H, d, *J*=2.19 Hz), 8.03 - 8.07 (1 H, m), 8.08 - 8.12 (1 H, m), 8.28 (1 H, d, *J*=2.19 Hz), 8.42 (1 H, dd, *J*=8.49, 1.37 Hz), 8.85 (1 H, dd, *J*=3.83, 1.64 Hz), 9.21 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}N_5O$ *m/z* 374.2 (M+1).

[1196] 

[1197] **1332**

[1198] *cis*-N^1-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)사이클로헥산-1,4-디아민 **1332**.

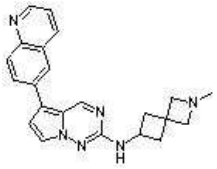
[1199] 황색 고체 (335 mg, 0.935 mmol, 79.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.48 - 1.56 (4 H, m), 1.58 - 1.66 (2 H, m), 1.74 - 1.88 (2 H, m), 2.79 - 2.89 (1 H, m), 3.68 (1 H, tq, *J*=7.39, 3.65 Hz), 6.72 (1 H, d, *J*=7.12 Hz), 7.08 (1 H, d, *J*=2.19 Hz), 7.54 (1 H, dd, *J*=8.21, 4.38 Hz), 7.73 (1 H, d, *J*=2.19 Hz), 8.03 - 8.07 (1 H, m), 8.08 - 8.12 (1 H, m), 8.28 (1 H, d, *J*=2.19 Hz), 8.43 (1 H, dd, *J*=8.49, 1.37 Hz), 8.86 (1 H, dd, *J*=4.38, 1.64 Hz), 9.22 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{22}N_6$ *m/z* 359.2 (M+1).

[1200] 

[1201] **1336**

[1202] *cis*-N^1,N^1-디메틸-N^4-(5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일) 사이클로헥산-1,4-디아민 **1336**.

[1203] 황색 고체 (22 mg, 0.057 mmol, 35.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.48 (2 H, td, *J*=8.35, 4.11 Hz), 1.60 (2 H, ddd, *J*=12.46, 8.35, 3.83 Hz), 1.71 - 1.89 (4 H, m), 2.02 - 2.11 (1 H, m), 2.17 (6 H, s), 3.72 - 3.83 (1 H, m), 6.86 (1 H, d, *J*=7.12 Hz), 7.07 (1 H, d, *J*=2.19 Hz), 7.54 (1 H, dd, *J*=8.21, 3.83 Hz), 7.73 (1 H, d, *J*=2.74 Hz), 8.04 - 8.07 (1 H, m), 8.08 - 8.12 (1 H, m), 8.28 (1 H, d, *J*=2.19 Hz), 8.39 - 8.47 (1 H, m), 8.86 (1 H, dd, *J*=3.83, 1.64 Hz), 9.22 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}N_6$ *m/z* 387.3 (M+1).

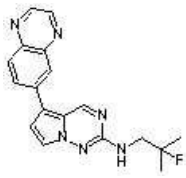
[1204] 

[1205] **1348**

[1206] N-(2-메틸-2-아자스피로[3.3]헵탄-6-일)-5-(퀴놀린-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **1348**.

[1207] 황색 고체 (19 mg, 0.051 mmol, 18.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.03 - 2.12 (2 H, m), 2.16 (3 H, s), 2.42 - 2.49 (2 H, m), 3.06 (2 H, s), 3.17 (2 H, s), 4.05 (1 H, sxt, *J*=7.78 Hz), 7.09 (1 H, d, *J*=2.19 Hz), 7.24 (1 H, d, *J*=7.12 Hz), 7.54 (1 H, dd, *J*=8.21, 4.38 Hz), 7.74 (1 H, d, *J*=2.19 Hz),

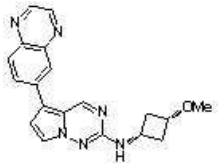
8.03 - 8.06 (1 H, m), 8.08 - 8.11 (1 H, m), 8.28 (1 H, d, *J*=2.19 Hz), 8.42 (1 H, dd, *J*=8.49, 1.37 Hz), 8.86 (1 H, dd, *J*=3.83, 1.64 Hz), 9.22 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{22}N_6$ *m/z* 371.1 (M+1).

[1208] 

[1209] **1352**

[1210] N-(2-플루오로-2-메틸프로필)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1352**.

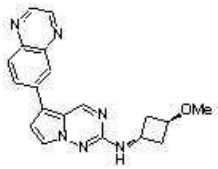
[1211] 황색 고체 (38.22 mg, 0.114 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.39 (6 H, d, *J*=21.40 Hz), 3.49 (2 H, dd, *J*=19.20, 6.44 Hz), 7.14 (1 H, t, *J*=6.44 Hz), 7.20 (1 H, d, *J*=2.50 Hz), 7.77 (1 H, d, *J*=2.38 Hz), 8.14 (1 H, d, *J*=8.76 Hz), 8.24 (1 H, dd, *J*=8.82, 1.69 Hz), 8.32 (1 H, d, *J*=1.75 Hz), 8.90 (1 H, d, *J*=1.63 Hz), 8.96 (1 H, d, *J*=1.50 Hz), 9.22 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{17}FN_6$ *m/z* 337.1 (M+1).

[1212] 

[1213] **1375**

[1214] N-(*cis*-3-메톡시사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1375**.

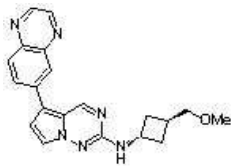
[1215] 황색 고체 (32 mg, 0.092 mmol, 36.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.80 - 1.91 (2 H, m), 2.61 - 2.72 (2 H, m), 3.15 (3 H, s), 3.58 - 3.69 (1 H, m), 3.73 - 3.86 (1 H, m), 7.19 (1 H, d, *J*=2.74 Hz), 7.36 (1 H, d, *J*=7.67 Hz), 7.75 (1 H, d, *J*=1.64 Hz), 8.13 (1 H, d, *J*=8.76 Hz), 8.23 (1 H, dd, *J*=8.76, 1.64 Hz), 8.31 (1 H, d, *J*=1.64 Hz), 8.90 (1 H, d, *J*=1.64 Hz), 8.95 (1 H, d, *J*=1.64 Hz), 9.19 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{18}N_6O$ *m/z* 347.2 (M+1).

[1216] 

[1217] **1376**

[1218] N-(*trans*-3-메톡시사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 **1376**.

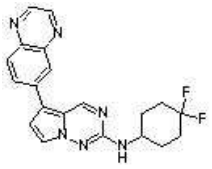
[1219] 황색 고체 (28.54 mg, 0.082 mmol, % 수율). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 2.18 - 2.35 (4 H, m), 3.16 (3 H, s), 3.96 - 4.07 (1 H, m), 4.16 - 4.27 (1 H, m), 7.19 (1 H, d, *J*=2.57 Hz), 7.78 (1 H, d, *J*=2.57 Hz), 8.09 - 8.17 (1 H, m), 8.19 - 8.26 (1 H, m), 8.30 (1 H, d, *J*=1.71 Hz), 8.89 (1 H, d, *J*=1.71 Hz), 8.95 (1 H, d, *J*=1.71 Hz), 9.20 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{18}N_6O$ *m/z* 347.1 (M +1).

[1220] 

[1221] **1377**

[1222] N-(*trans*-3-(메톡시메틸)사이클로부틸)-5-(퀸옥살린-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **1377**.

[1223] 황색 고체 (37 mg, 0.103 mmol, 42.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.07 - 2.18 (4 H, m), 2.39 - 2.47 (1 H, m), 3.29 (3 H, s), 3.41 (2 H, d, *J*=7.12 Hz), 4.25 (1 H, sxt, *J*=7.34 Hz), 7.18 (1 H, d, *J*=2.74 Hz), 7.39 (1 H, d, *J*=7.12 Hz), 7.77 (1 H, d, *J*=2.19 Hz), 8.13 (1 H, d, *J*=8.76 Hz), 8.23 (1 H, dd, *J*=8.49, 1.92 Hz), 8.31 (1 H, d, *J*=2.19 Hz), 8.89 (1 H, d, *J*=2.19 Hz), 8.95 (1 H, d, *J*=1.64 Hz), 9.19 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{20}N_6O$ *m/z* 361.2 (M+1).

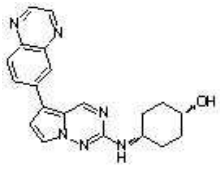


[1224]

[1225] **1392**

[1226] N-(4,4-디플루오로사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1392**.

[1227] 황색 고체 (26 mg, 0.068 mmol, 30.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.59 - 1.71 (2 H, m), 1.86 - 2.04 (4 H, m), 2.04 - 2.16 (2 H, m), 3.76 - 3.88 (1 H, m), 7.11 (1 H, d, *J*=7.67 Hz), 7.19 (1 H, d, *J*=2.74 Hz), 7.77 (1 H, d, *J*=2.19 Hz), 8.13 (1 H, d, *J*=8.76 Hz), 8.23 (1 H, dd, *J*=8.76, 2.19 Hz), 8.32 (1 H, d, *J*=2.19 Hz), 8.90 (1 H, d, *J*=1.64 Hz), 8.95 (1 H, d, *J*=1.64 Hz), 9.21 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{18}F_2N_6$ *m/z* 381.2 (M+1).

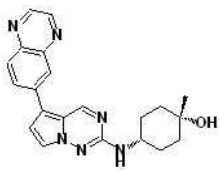


[1228]

[1229] **1393**

[1230] *cis*-4-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로헥산-1-올 **1393**.

[1231] 베이지색 고체 (7 mg, 0.019 mmol, 6.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.44 - 1.56 (2 H, m), 1.61 - 1.71 (4 H, m), 1.71 - 1.82 (2 H, m), 3.57 - 3.67 (1 H, m), 3.74 (1 H, br d, *J*=2.19 Hz), 4.36 (1 H, d, *J*=2.74 Hz), 6.89 (1 H, d, *J*=7.67 Hz), 7.17 (1 H, d, *J*=2.74 Hz), 7.75 (1 H, d, *J*=2.74 Hz), 8.13 (1 H, d, *J*=8.76 Hz), 8.23 (1 H, dd, *J*=8.76, 2.19 Hz), 8.31 (1 H, d, *J*=2.19 Hz), 8.89 (1 H, d, *J*=2.19 Hz), 8.95 (1 H, d, *J*=1.64 Hz), 9.18 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{20}N_6O$ *m/z* 361.2 (M+1).



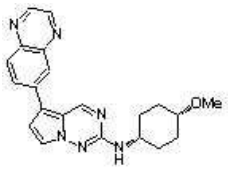
[1232]

[1233] **1394**

[1234] (1s,4s)-1-메틸-4-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일) 아미노)사이클로헥산-1-올 **1394**.

[1235] 황색 고체 (30 mg, 0.080 mmol, 19.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.37 (2 H, td, *J*=12.87, 4.38 Hz), 1.59 (2 H, br d, *J*=12.05 Hz), 1.63 - 1.76 (4 H, m), 3.46 - 3.59 (1 H, m), 4.02 (1 H, s), 6.87 (1 H, d, *J*=8.21 Hz), 7.16 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=2.74 Hz), 8.12 (1 H, d, *J*=8.76 Hz), 8.22 (1 H, dd, *J*=8.76, 2.19 Hz), 8.30 (1 H, d, *J*=1.64 Hz), 8.89 (1 H, d, *J*=1.64 Hz), 8.95

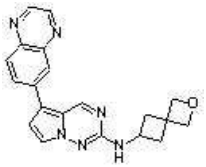
(1 H, d, *J*=1.64 Hz), 9.17 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{22}N_6O$ *m/z* 375.2 (M+1).

[1236] 

[1237] **1395**

[1238] N-(*cis*-4-메톡시사이클로헥실)-5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 **1395**.

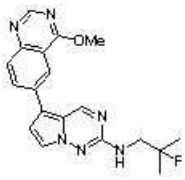
[1239] 황색 고체 (62 mg, 0.166 mmol, 39.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.46 - 1.55 (2 H, m), 1.56 - 1.67 (2 H, m), 1.67 - 1.75 (2 H, m), 1.81 - 1.90 (2 H, m), 3.23 (3 H, s), 3.33 - 3.37 (1 H, m), 3.59 - 3.71 (1 H, m), 6.93 (1 H, d, *J*=7.67 Hz), 7.17 (1 H, d, *J*=2.74 Hz), 7.75 (1 H, d, *J*=2.74 Hz), 8.13 (1 H, d, *J*=8.76 Hz), 8.23 (1 H, dd, *J*=8.76, 2.19 Hz), 8.31 (1 H, d, *J*=1.64 Hz), 8.89 (1 H, d, *J*=2.19 Hz), 8.95 (1 H, d, *J*=1.64 Hz), 9.18 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{22}N_6O$ *m/z* 375.2 (M+1).

[1240] 

[1241] **1418**

[1242] 5-(퀸옥살린-6-일)-N-(2-옥사스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 **1418**.

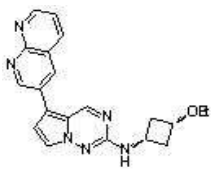
[1243] 옅은 황색 고체 (26 mg, 0.073 mmol, 24.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.13 - 2.23 (2 H, m), 2.59 - 2.68 (2 H, m), 4.01 (1 H, sxt, *J*=7.67 Hz), 4.52 (2 H, s), 4.64 (2 H, s), 7.19 (1 H, d, *J*=2.19 Hz), 7.33 (1 H, d, *J*=7.12 Hz), 7.76 (1 H, d, *J*=2.19 Hz), 8.13 (1 H, d, *J*=8.76 Hz), 8.20 - 8.26 (1 H, m), 8.31 (1 H, d, *J*=2.19 Hz), 8.90 (1 H, d, *J*=1.64 Hz), 8.95 (1 H, d, *J*=2.19 Hz), 9.19 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{18}N_6O$ *m/z* 359.2 (M+1).

[1244] 

[1245] **1423**

[1246] N-(2-플루오로-2-메틸프로필)-5-(4-메톡시퀸아졸린-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **1423**.

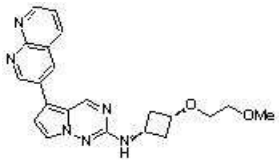
[1247] 황색 고체 (52.33 mg, 0.143 mmol). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.40 Hz), 3.49 (2 H, dd, *J*=19.20, 6.40 Hz), 4.18 (3 H, s), 7.10 - 7.14 (1 H, m), 7.11 (1 H, d, *J*=2.63 Hz), 7.75 (1 H, d, *J*=2.50 Hz), 7.97 (1 H, d, *J*=9.63 Hz), 8.27 - 8.31 (1 H, m), 8.28 (1 H, s), 8.79 (1 H, s), 9.11 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{19}FN_6O$ *m/z* 367.2 (M+1).

[1248] 

[1249] **1520**

[1250] N-(*cis*-3-에톡시사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 **1520**.

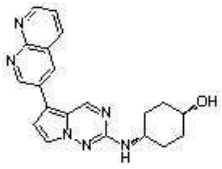
[1251] 베이지색 고체 (62 mg, 0.172 mmol, 53.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.11 (3 H, t, *J*=6.84 Hz), 1.81 - 1.95 (2 H, m), 2.61 - 2.73 (2 H, m), 3.35 (2 H, q, *J*=7.12 Hz), 3.66 - 3.74 (1 H, m), 3.75 - 3.85 (1 H, m), 7.24 (1 H, d, *J*=2.74 Hz), 7.35 (1 H, d, *J*=7.67 Hz), 7.66 (1 H, dd, *J*=8.21, 4.38 Hz), 7.77 (1 H, d, *J*=2.74 Hz), 8.52 (1 H, dd, *J*=8.21, 2.19 Hz), 8.74 (1 H, d, *J*=2.19 Hz), 9.03 (1 H, dd, *J*=4.11, 1.92 Hz), 9.29 (1 H, s), 9.45 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{20}H_{20}N_6O$ *m/z* 361.2 (M+1).

[1252] 

[1253] **1522**

[1254] N-(*cis*-3-(2-메톡시에톡시)사이클로부틸)-5-(1,8-나프티리딘-3-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 **1522**.

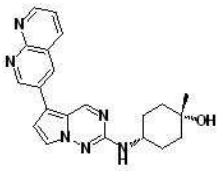
[1255] 옅은 갈색 고체 (51 mg, 0.131 mmol, 44.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.81 - 1.94 (2 H, m), 2.61 - 2.73 (2 H, m), 3.25 (3 H, s), 3.40 - 3.46 (1 H, m), 3.43 (3 H, s), 3.70 - 3.76 (1 H, m), 3.76 - 3.83 (1 H, m), 7.24 (1 H, d, *J*=2.74 Hz), 7.36 (1 H, d, *J*=7.67 Hz), 7.64 - 7.70 (1 H, m), 7.77 (1 H, d, *J*=2.74 Hz), 8.52 (1 H, dd, *J*=8.21, 1.64 Hz), 8.74 (1 H, d, *J*=2.74 Hz), 9.00 - 9.07 (1 H, m), 9.29 (1 H, s), 9.45 (1 H, d, *J*=2.19 Hz); 다음에 대한 ESIMS 실험치: $C_{21}H_{22}N_6O_2$ *m/z* 391.2 (M+1).

[1256] 

[1257] **1535**

[1258] *cis*-4-((5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로헥산-1-올 **1535**.

[1259] 옅은 오렌지색 고체 (4.0 mg, 0.011 mmol, 62.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.44 - 1.58 (2 H, m), 1.62 - 1.71 (4 H, m), 1.71 - 1.81 (2 H, m), 3.56 - 3.69 (2 H, m), 3.75 (1 H, br s), 4.36 (1 H, br s), 6.90 (1 H, d, *J*=7.67 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.61 - 7.71 (1 H, m), 7.77 (1 H, d, *J*=2.74 Hz), 8.52 (1 H, dd, *J*=8.21, 2.19 Hz), 8.74 (1 H, d, *J*=2.74 Hz), 9.03 (1 H, dd, *J*=4.38, 2.19 Hz), 9.28 (1 H, s), 9.45 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{20}H_{20}N_6O$ *m/z* 361.1 (M+1).

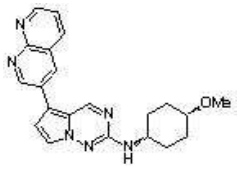
[1260] 

[1261] **1536**

[1262] (1s,4s)-4-((5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 **1536**.

[1263] 베이지색 고체 (7 mg, 0.019 mmol, 4.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.37 (2 H, td, *J*=12.87, 4.38 Hz), 1.59 (2 H, br d, *J*=12.05 Hz), 1.63 - 1.76 (4 H, m), 3.46 - 3.59 (1 H, m), 4.02

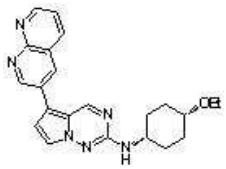
(1 H, s), 6.88 (1 H, d, *J*=7.67 Hz), 7.21 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, dd, *J*=7.94, 4.11 Hz), 7.76 (1 H, d, *J*=2.74 Hz), 8.51 (1 H, dd, *J*=8.21, 1.64 Hz), 8.73 (1 H, d, *J*=2.74 Hz), 9.03 (1 H, dd, *J*=4.11, 1.92 Hz), 9.27 (1 H, s), 9.45 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{21}H_{22}N_6O$ *m/z* 375.2 (M+1).

[1264] 

[1265] **1537**

[1266] N-(*cis*-4-메톡시사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **1537**.

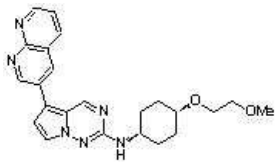
[1267] 옅은 황색 고체 (18 mg, 0.048 mmol, 15.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.46 - 1.56 (2 H, m), 1.57 - 1.67 (2 H, m), 1.67 - 1.76 (2 H, m), 1.81 - 1.91 (2 H, m), 3.23 (3 H, s), 3.34 - 3.39 (1 H, m), 3.60 - 3.72 (1 H, m), 6.93 (1 H, d, *J*=7.67 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, dd, *J*=7.94, 4.11 Hz), 7.77 (1 H, d, *J*=2.74 Hz), 8.52 (1 H, dd, *J*=7.94, 1.92 Hz), 8.74 (1 H, d, *J*=2.74 Hz), 9.03 (1 H, dd, *J*=4.11, 1.92 Hz), 9.28 (1 H, s), 9.45 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{21}H_{22}N_6O$ *m/z* 375.2 (M+1).

[1268] 

[1269] **1541**

[1270] N-(*cis*-4-에톡시사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 **1541**.

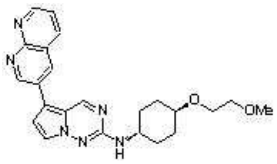
[1271] 옅은 갈색 고체 (61 mg, 0.157 mmol, 61.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, t, *J*=6.84 Hz), 1.44 - 1.57 (2 H, m), 1.60 - 1.75 (4 H, m), 1.78 - 1.88 (2 H, m), 3.42 (2 H, q, *J*=6.75 Hz), 3.45 - 3.48 (1 H, m), 3.58 - 3.71 (1 H, m), 6.93 (1 H, d, *J*=7.67 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, dd, *J*=7.94, 4.11 Hz), 7.77 (1 H, d, *J*=2.74 Hz), 8.51 (1 H, dd, *J*=8.21, 1.64 Hz), 8.73 (1 H, d, *J*=2.74 Hz), 9.03 (1 H, dd, *J*=4.11, 1.92 Hz), 9.28 (1 H, s), 9.45 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{22}H_{24}N_6O$ *m/z* 389.2 (M+1).

[1272] 

[1273] **1543**

[1274] N-(*cis*-4-(2-메톡시에톡시)사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 **1543**

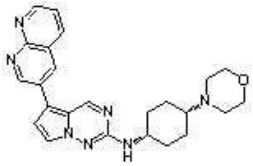
[1275] 짙은 황색 고체 (85 mg, 0.203 mmol, 50.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.57 (2 H, m), 1.59 - 1.76 (4 H, m), 1.79 - 1.90 (2 H, m), 3.27 (3 H, s), 3.44 - 3.46 (2 H, m), 3.47 - 3.49 (1 H, m), 3.49 - 3.52 (2 H, m), 3.65 (1 H, qt, *J*=8.53, 4.45 Hz), 6.94 (1 H, d, *J*=7.67 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, dd, *J*=8.21, 4.38 Hz), 7.77 (1 H, d, *J*=2.74 Hz), 8.51 (1 H, dd, *J*=8.21, 1.64 Hz), 8.73 (1 H, d, *J*=2.74 Hz), 9.03 (1 H, dd, *J*=4.11, 1.92 Hz), 9.28 (1 H, s), 9.45 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}N_6O_2$ *m/z* 419.2 (M+1).

[1276] 

[1277] 1544

[1278] N-(*trans*-4-(2-메톡시에톡시)사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 **1544**.

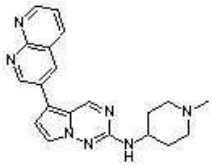
[1279] 옅은 갈색 고체 (16 mg, 0.038 mmol, 23.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.17 - 1.40 (4 H, m), 2.02 (4 H, br d, *J*=9.31 Hz), 3.22 - 3.28 (1 H, m), 3.25 (3 H, s), 3.43 (2 H, dd, *J*=5.75, 4.11 Hz), 3.54 (2 H, dd, *J*=5.48, 3.83 Hz), 3.56 - 3.62 (1 H, m), 6.92 (1 H, d, *J*=7.67 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.61 - 7.69 (1 H, m), 7.80 (1 H, d, *J*=2.74 Hz), 8.52 (1 H, dd, *J*=8.21, 2.19 Hz), 8.74 (1 H, d, *J*=2.19 Hz), 9.03 (1 H, dd, *J*=4.11, 1.92 Hz), 9.29 (1 H, s), 9.45 (1 H, d, *J*=2.19 Hz); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}N_6O_2$ *m/z* 419.3 (M+1).

[1280] 

[1281] 1551

[1282] N-(*cis*-4-모르폴리노사이클로헥실)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **1551**.

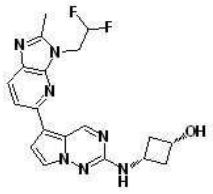
[1283] 황색 고체 (25 mg, 0.058 mmol, 41.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.56 (2 H, m), 1.56 - 1.64 (2 H, m), 1.75 - 1.82 (2 H, m), 1.82 - 1.90 (2 H, m), 2.12 - 2.23 (1 H, m), 2.45 (4 H, br s), 3.59 (4 H, t, *J*=4.38 Hz), 3.76 - 3.85 (1 H, m), 6.95 (1 H, d, *J*=7.12 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, dd, *J*=7.94, 4.11 Hz), 7.78 (1 H, d, *J*=2.74 Hz), 8.52 (1 H, dd, *J*=7.94, 1.92 Hz), 8.74 (1 H, d, *J*=2.74 Hz), 9.03 (1 H, dd, *J*=4.11, 1.92 Hz), 9.29 (1 H, s), 9.46 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{24}H_{27}N_7O$ *m/z* 430.3 (M+1).

[1284] 

[1285] 1557

[1286] N-(1-메틸피페리딘-4-일)-5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4] 트리아진-2-아민 **1557**.

[1287] 옅은 갈색 고체 (50 mg, 0.139 mmol, 28.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, t, *J*=6.84 Hz), 1.44 - 1.57 (2 H, m), 1.60 - 1.75 (4 H, m), 1.78 - 1.88 (2 H, m), 3.42 (2 H, q, *J*=6.75 Hz), 3.45 - 3.48 (1 H, m), 3.58 - 3.71 (1 H, m), 6.93 (1 H, d, *J*=7.67 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, dd, *J*=7.94, 4.11 Hz), 7.77 (1 H, d, *J*=2.74 Hz), 8.51 (1 H, dd, *J*=8.21, 1.64 Hz), 8.73 (1 H, d, *J*=2.74 Hz), 9.03 (1 H, dd, *J*=4.11, 1.92 Hz), 9.28 (1 H, s), 9.45 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}N_7$ *m/z* 360.2 (M+1).

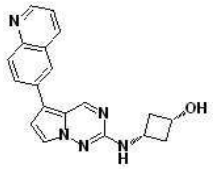


[1288]

[1289] 1720

[1290] *cis*-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 1720.

[1291] 옅은 황색 고체 (43 mg, 0.108 mmol, 44.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.79 - 1.89 (2 H, m), 2.59 - 2.66 (2 H, m), 2.62 (3 H, s), 3.67 (1 H, dq, *J*=14.89, 7.54 Hz), 3.82 - 3.92 (1 H, m), 4.85 (2 H, td, *J*=15.88, 2.46 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.16 (1 H, br d, *J*=7.12 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.46 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{19}F_2N_7O$ *m/z* 400.2 (M+1).

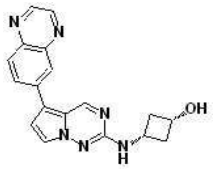


[1292]

[1293] 1723

[1294] *cis*-3-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부탄-1-올 1723.

[1295] 황색 고체 (14 mg, 0.042 mmol, 11.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.79 - 1.90 (2 H, m), 2.58 - 2.68 (2 H, m), 3.60 - 3.72 (1 H, m), 3.8- - 3.93 (1 H, m), 5.06 (1 H, br d, *J*=4.38 Hz), 7.09 (1 H, d, *J*=2.74 Hz), 7.24 (1 H, d, *J*=7.12 Hz), 7.54 (1 H, dd, *J*=8.21, 4.38 Hz), 7.71 (1 H, d, *J*=2.19 Hz), 8.03 - 8.07 (1 H, m), 8.08 - 8.12 (1 H, m), 8.28 (1 H, d, *J*=2.19 Hz), 8.43 (1 H, dd, *J*=8.49, 1.37 Hz), 8.86 (1 H, dd, *J*=4.38, 1.64 Hz), 9.22 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{17}N_5O$ *m/z* 332.2 (M+1).

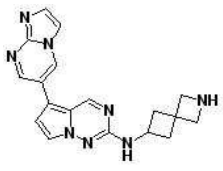


[1296]

[1297] 1724

[1298] *cis*-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노) 사이클로부탄-1-올 1724.

[1299] 황색 고체 (16 mg, 0.048 mmol, 13.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.79 - 1.89 (2 H, m), 2.58 - 2.69 (2 H, m), 3.61 - 3.72 (1 H, m), 3.82 - 3.93 (1 H, m), 5.06 (1 H, d, *J*=6.02 Hz), 7.18 (1 H, d, *J*=2.74 Hz), 7.30 (1 H, d, *J*=7.12 Hz), 7.74 (1 H, d, *J*=2.74 Hz), 8.13 (1 H, d, *J*=8.76 Hz), 8.23 (1 H, dd, *J*=8.76, 2.19 Hz), 8.31 (1 H, d, *J*=1.64 Hz), 8.90 (1 H, d, *J*=1.64 Hz), 8.95 (1 H, d, *J*=2.19 Hz), 9.19 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{16}N_6O$ *m/z* 333.2 (M+1).

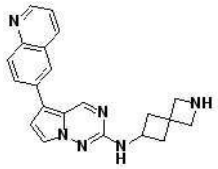


[1300]

[1301] **1732**

[1302] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1732**.

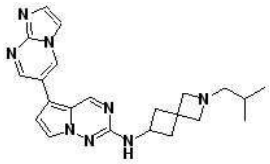
[1303] 옅은 황색 고체 (90 mg, 0.260 mmol, 71.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.17 - 2.27 (2 H, m), 2.60 - 2.70 (2 H, m), 3.95 (2 H, s), 4.00 - 4.10 (1 H, m), 4.05 (2 H, br s), 7.09 (1 H, d, *J*=2.74 Hz), 7.33 (1 H, d, *J*=6.57 Hz), 7.73 (1 H, d, *J*=2.19 Hz), 7.75 (1 H, d, *J*=1.10 Hz), 7.90 (1 H, d, *J*=1.10 Hz), 8.89 (1 H, d, *J*=2.74 Hz), 9.17 (1 H, s), 9.31 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{18}H_{18}N_8$ *m/z* 347.2 (M+1).

[1304] 

[1305] **1747**

[1306] 5-(퀴놀린-6-일)-N-(2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1747**.

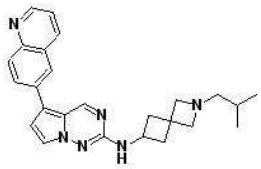
[1307] 황색 고체 (45 mg, 0.126 mmol, 25.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.17 - 2.28 (2 H, m), 2.60 - 2.70 (2 H, m), 3.94 (2 H, s), 4.05 - 4.11 (1 H, m), 7.11 (1 H, d, *J*=2.74 Hz), 7.31 (1 H, d, *J*=7.12 Hz), 7.54 (1 H, dd, *J*=8.21, 3.83 Hz), 7.71 (1 H, d, *J*=2.74 Hz), 8.04 - 8.07 (1 H, m), 8.08 - 8.12 (1 H, m), 8.28 (1 H, d, *J*=1.64 Hz), 8.43 (1 H, dd, *J*=8.21, 1.09 Hz), 8.86 (1 H, dd, *J*=4.38, 1.64 Hz), 9.23 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{20}N_6$ *m/z* 357.2 (M+1).

[1308] 

[1309] **1756**

[1310] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1756**.

[1311] 황색 고체 (20 mg, 0.050 mmol, 43.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.82 (6 H, d, *J*=6.57 Hz), 1.48 (1 H, dquin, *J*=13.48, 6.76, 6.76, 6.76, 6.76 Hz), 1.57 - 1.58 (1 H, m), 2.04 - 2.11 (2 H, m), 2.11 (2 H, d, *J*=7.12 Hz), 2.45 (2 H, ddd, *J*=9.72, 7.26, 2.74 Hz), 3.03 (2 H, s), 3.15 (2 H, s), 4.04 (1 H, sxt, *J*=7.67 Hz), 7.07 (1 H, d, *J*=2.19 Hz), 7.27 (1 H, d, *J*=7.12 Hz), 7.74 (1 H, d, *J*=1.64 Hz), 7.75 (1 H, d, *J*=2.74 Hz), 7.89 (1 H, d, *J*=1.09 Hz), 8.88 (1 H, d, *J*=2.74 Hz), 9.14 (1 H, s), 9.29 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{22}H_{26}N_8$ *m/z* 403.2 (M+1).

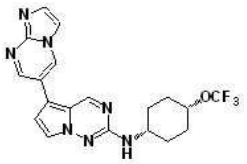
[1312] 

[1313] **1771**

[1314] N-(2-이소부틸-2-아자스피로[3.3]헵탄-6-일)-5-(퀴놀린-6-일)피롤로[2,1-f] [1,2,4]트리아진-2-아민 **1771**.

[1315] 황색 고체 (60 mg, 0.145 mmol, 51.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.82 (6 H, d, *J*=7.12 Hz),

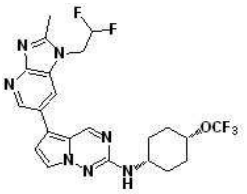
1.48 (1 H, dquin, *J*=13.48, 6.62, 6.62, 6.62, 6.62 Hz), 2.06 - 2.10 (2 H, m), 2.11 (2 H, d, *J*=6.57 Hz), 2.46 (2 H, ddd, *J*=9.72, 7.26, 2.74 Hz), 3.03 (2 H, s), 3.15 (2 H, s), 4.05 (1 H, sxt, *J*=7.78 Hz), 7.09 (1 H, d, *J*=2.74 Hz), 7.24 (1 H, d, *J*=7.12 Hz), 7.50 - 7.58 (1 H, m), 7.73 (1 H, d, *J*=2.19 Hz), 8.03 - 8.06 (1 H, m), 8.08 - 8.12 (1 H, m), 8.28 (1 H, d, *J*=2.19 Hz), 8.42 (1 H, dd, *J*=8.49, 1.37 Hz), 8.85 (1 H, dd, *J*=4.38, 1.64 Hz), 9.22 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{25}H_{28}N_6$ *m/z* 413.25 (M+1).

[1316] 

[1317] 1780

[1318] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실) 피롤로[2,1-f][1,2,4]트리아진-2-아민 1780.

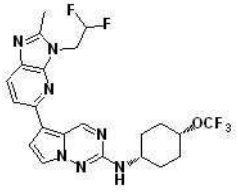
[1319] 갈색 고체 (20 mg, 0.048 mmol, 18.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.62 - 1.71 (2 H, m), 1.71 - 1.80 (2 H, m), 1.80 - 1.88 (2 H, m), 1.95 (2 H, br dd, *J*=9.03, 4.65 Hz), 3.65 - 3.77 (1 H, m), 4.57 - 4.65 (1 H, m), 7.02 (1 H, d, *J*=7.12 Hz), 7.07 (1 H, d, *J*=2.74 Hz), 7.73 - 7.76 (2 H, m), 7.89 (1 H, d, *J*=1.09 Hz), 8.88 (1 H, d, *J*=2.74 Hz), 9.16 (1 H, s), 9.30 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{18}F_3N_7O$ *m/z* 418.2 (M+1).

[1320] 

[1321] 1786

[1322] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(트리플루오로메톡시) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 1786.

[1323] 옅은 갈색 고체 (35 mg, 0.071 mmol, 26.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.62 - 1.71 (2 H, m), 1.72 - 1.80 (2 H, m), 1.81 - 1.88 (2 H, m), 1.91 - 2.01 (2 H, m), 2.63 (3 H, s), 3.67 - 3.79 (1 H, m), 4.56 - 4.66 (1 H, m), 4.90 (2 H, td, *J*=15.81, 2.87 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.93 (1 H, d, *J*=7.94 Hz), 6.98 (1 H, d, *J*=2.46 Hz), 7.71 (1 H, d, *J*=2.46 Hz), 8.23 (1 H, d, *J*=1.92 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{22}F_5N_7O$ *m/z* 496.2 (M+1).

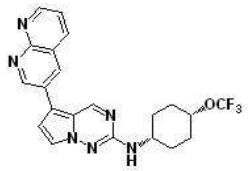
[1324] 

[1325] 1792

[1326] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 1792.

[1327] 옅은 황색 고체 (33 mg, 0.067 mmol, 21.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.61 - 1.71 (2 H, m), 1.72 - 1.80 (2 H, m), 1.81 - 1.88 (2 H, m), 1.92 - 2.00 (2 H, m), 2.61 (3 H, s), 3.67 - 3.81 (1 H, m), 4.56 - 4.66 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.85, 3.30 Hz), 6.90 (1 H,

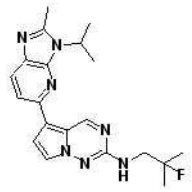
d, *J*=7.67 Hz), 7.23 (1 H, d, *J*=2.19 Hz), 7.64 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{22}F_5N_7O$ *m/z* 496.2 (M+1).

[1328] 

[1329] 1798

[1330] 5-(1,8-나프티리딘-3-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로 [2,1-f][1,2,4]트리아진-2-아민 1798.

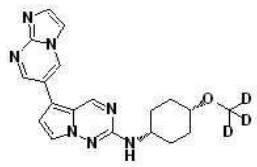
[1331] 황색 고체 (13 mg, 0.030 mmol, 9.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.62 - 1.72 (2 H, m), 1.73 - 1.81 (2 H, m), 1.81 - 1.89 (2 H, m), 1.96 (2 H, br dd, *J*=9.03, 4.65 Hz), 3.66 - 3.79 (1 H, m), 4.56 - 4.66 (1 H, m), 7.06 (1 H, d, *J*=7.67 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, dd, *J*=7.94, 4.11 Hz), 7.78 (1 H, d, *J*=2.19 Hz), 8.52 (1 H, dd, *J*=8.21, 2.19 Hz), 8.74 (1 H, d, *J*=2.74 Hz), 9.03 (1 H, dd, *J*=4.38, 2.19 Hz), 9.30 (1 H, s), 9.45 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{21}H_{19}F_3N_6O$ *m/z* 429.15 (M+1).

[1332] 

[1333] 1801

[1334] N-(2-플루오로-2-메틸프로필)-5-(3-이소프로필-2-메틸-3H-이미다조[4,5-b] 피리딘-5-일)피롤로 [2,1-f][1,2,4]트리아진-2-아민 1801.

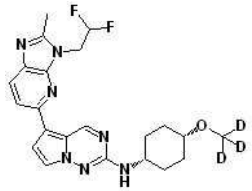
[1335] 황색 고체 (24 mg, 0.063 mmol, 21.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.38 (6 H, d, *J*=21.20 Hz), 1.72 (6 H, d, *J*=6.84 Hz), 2.61 (3 H, s), 3.49 (2 H, dd, *J*=19.30, 6.43 Hz), 4.84 (1 H, spt, *J*=6.80 Hz), 7.02 (1 H, t, *J*=6.30 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.69 (1 H, d, *J*=8.49 Hz), 7.89 (1 H, d, *J*=8.21 Hz), 9.66 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{24}FN_7$ *m/z* 382.2 (M+1).

[1336] 

[1337] 1802

[1338] 5-(이미다조[1,2-a]피리미딘-6-일)-N-(*cis*-4-(메톡시-d_3)사이클로헥실)피롤로 [2,1-f][1,2,4] 트리아진-2-아민 1802.

[1339] 옅은 황색 고체 (61 mg, 0.167 mmol, 54.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.54 (2 H, m), 1.56 - 1.65 (2 H, m), 1.66 - 1.74 (2 H, m), 1.80 - 1.88 (2 H, m), 3.33 - 3.36 (1 H, m), 3.58 - 3.69 (1 H, m), 6.89 (1 H, d, *J*=7.67 Hz), 7.05 (1 H, d, *J*=2.74 Hz), 7.69 - 7.78 (2 H, m), 7.89 (1 H, d, *J*=1.64 Hz), 8.88 (1 H, d, *J*=2.74 Hz), 9.14 (1 H, s), 9.29 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{18}[2H_3]N_7O$ *m/z* 367.2 (M+1).

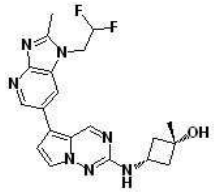


[1340]

[1341] 1803

[1342] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(메톡시-d_3) 사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1803**.

[1343] 옅은 황색 고체 (50 mg, 0.113 mmol, 36.9% 수율). ^{11}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.55 (2 H, m), 1.56 - 1.66 (2 H, m), 1.66 - 1.74 (2 H, m), 1.81 - 1.89 (2 H, m), 2.60 (3 H, s), 3.33 - 3.37 (1 H, m), 3.59 - 3.74 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.85, 3.30 Hz), 6.77 (1 H, d, *J*=7.67 Hz), 7.21 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.19 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.94 (1 H, d, *J*=8.76 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{22}[2H_3]F_2N_7O$ *m/z* 445.2 (M+1).



[1344]

[1345] 1813

[1346] *cis*-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 **1813**.

[1347] 올리브 그린 고체 (8 mg, 0.019 mmol, 5.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.28 (3 H, s), 1.97 - 2.08 (2 H, m), 2.32 - 2.43 (2 H, m), 2.62 (3 H, s), 3.73 (1 H, dq, *J*=15.06, 7.57 Hz), 4.85 - 4.95 (2 H, m), 4.94 (1 H, s), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.98 (1 H, d, *J*=2.19 Hz), 7.17 (1 H, br d, *J*=6.57 Hz), 7.73 (1 H, d, *J*=2.19 Hz), 8.23 (1 H, d, *J*=1.64 Hz), 8.65 (1 H, d, *J*=1.64 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O$ *m/z* 414.2 (M+1).

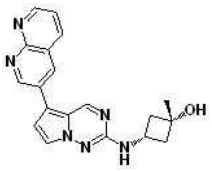


[1348]

[1349] 1819

[1350] *cis*-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 **1819**.

[1351] 올리브 그린 고체 (13 mg, 0.031 mmol, 12.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.28 (3 H, s), 2.03 (2 H, td, *J*=9.03, 2.19 Hz), 2.33 - 2.42 (2 H, m), 2.61 (3 H, s), 3.74 (1 H, dq, *J*=15.33, 7.67 Hz), 4.83 (2 H, td, *J*=15.88, 2.74 Hz), 4.95 (1 H, s), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.14 (1 H, d, *J*=7.12 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O$ *m/z* 414.2 (M+1).

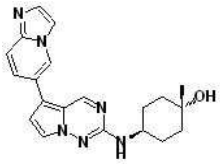


[1352]

[1353] 1825

[1354] *cis*-3-((5-(1,8-나프티리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 1825.

[1355] 갈색을 띤 오렌지색 고체 (6 mg, 0.017 mmol, 5.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.28 (3 H, s), 1.98 - 2.09 (2 H, m), 2.33 - 2.43 (2 H, m), 3.68 - 3.80 (1 H, m), 4.95 (1 H, br s), 7.23 (1 H, d, *J*=2.74 Hz), 7.31 (1 H, d, *J*=6.57 Hz), 7.66 (1 H, dd, *J*=8.21, 4.38 Hz), 7.79 (1 H, d, *J*=2.74 Hz), 8.52 (1 H, dd, *J*=8.21, 1.64 Hz), 8.74 (1 H, d, *J*=2.74 Hz), 9.03 (1 H, dd, *J*=4.38, 2.19 Hz), 9.28 (1 H, s), 9.45 (1 H, d, *J*=2.74 Hz); 다음에 대한 ESIMS 실험치: $C_{19}H_{18}N_6O$ *m/z* 347. (M+1).

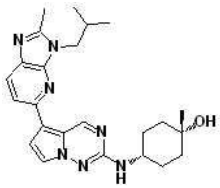


[1356]

[1357] 1828

[1358] *trans*-4-((5-(이미다조[1,2-a]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 1828.

[1359] 베이지색 고체 (22 mg, 0.061 mmol, 24.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.14 (3 H, s), 1.36 - 1.53 (4 H, m), 1.57 - 1.66 (2 H, m), 1.81 - 1.95 (2 H, m), 3.64 (1 H, br dd, *J*=7.80, 3.97 Hz), 4.24 (1 H, br s), 6.77 (1 H, d, *J*=7.94 Hz), 6.94 (1 H, d, *J*=2.46 Hz), 7.54 - 7.57 (1 H, m), 7.58 (1 H, d, *J*=0.82 Hz), 7.60 - 7.64 (1 H, m), 7.72 (1 H, d, *J*=2.46 Hz), 7.94 (1 H, s), 8.91 (1 H, s), 9.11 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{22}N_6O$ *m/z* 363.2 (M+1).

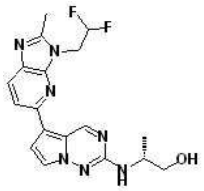


[1360]

[1361] 1829

[1362] *cis*-4-((5-(3-이소부틸-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 1829.

[1363] 황색 고체 (18.4 mg, 0.042 mmol, 21.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.95 (6 H, d, *J*=6.57 Hz), 1.13 (3 H, s), 1.37 (2 H, td, *J*=12.87, 3.83 Hz), 1.58 (2 H, br d, *J*=12.05 Hz), 1.63 - 1.68 (2 H, m), 1.69 - 1.76 (2 H, m), 2.25 - 2.39 (1 H, m), 2.58 (3 H, s), 3.45 - 3.58 (2 H, m), 4.01 (1 H, s), 4.10 (2 H, br d, *J*=7.67 Hz), 6.81 (1 H, br d, *J*=7.67 Hz), 7.20 (1 H, d, *J*=2.74 Hz), 7.62 (1 H, d, *J*=2.74 Hz), 7.68 (1 H, d, *J*=8.21 Hz), 7.90 (1 H, d, *J*=8.76 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{31}N_7O$ *m/z* 434.3 (M+1).

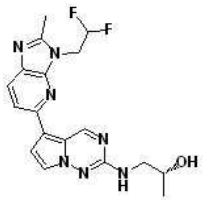


[1364]

[1365] 1830

[1366] (R)-2-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)프로판-1-올 1830.

[1367] 옅은 황색 고체 (30 mg, 0.077 mmol, 37.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.17 (3 H, d, *J*=6.57 Hz), 2.61 (3 H, s), 3.37 (1 H, dt, *J*=10.54, 6.09 Hz), 3.52 (1 H, dt, *J*=10.47, 5.30 Hz), 3.78 - 3.92 (1 H, m), 4.71 (1 H, t, *J*=5.61 Hz), 4.83 (2 H, td, *J*=16.02, 2.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.53 (1 H, d, *J*=8.21 Hz), 7.23 (1 H, d, *J*=2.46 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{19}F_2N_7O$ *m/z* 388.2 (M+1).

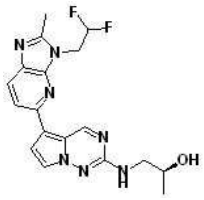


[1368]

[1369] 1831

[1370] (R)-1-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)프로판-2-올 1831.

[1371] 옅은 황색 고체 (54 mg, 0.139 mmol, 46.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.11 (3 H, d, *J*=6.30 Hz), 2.61 (3 H, s), 3.18 (2 H, t, *J*=6.02 Hz), 3.83 - 3.95 (1 H, m), 4.72 (1 H, d, *J*=4.65 Hz), 4.84 (2 H, td, *J*=16.08, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.71 (1 H, t, *J*=5.89 Hz), 7.24 (1 H, d, *J*=2.46 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{19}F_2N_7O$ *m/z* 388.2 (M+1).

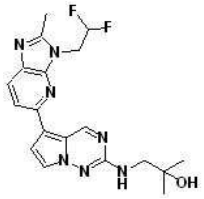


[1372]

[1373] 1832

[1374] (S)-1-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)프로판-2-올 1832.

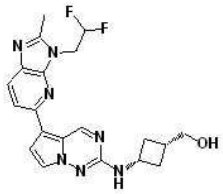
[1375] 옅은 황색 고체 (48 mg, 0.124 mmol, 38.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.11 (3 H, d, *J*=6.30 Hz), 2.61 (3 H, s), 3.17 (2 H, t, *J*=6.16 Hz), 3.83 - 3.95 (1 H, m), 4.72 (1 H, d, *J*=4.93 Hz), 4.84 (2 H, td, *J*=16.02, 2.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.71 (1 H, t, *J*=5.89 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{18}H_{19}F_2N_7O$ *m/z* 388.15 (M+1).

[1376] 

[1377] 1833

[1378] 1-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-메틸프로판-2-올 **1833**.

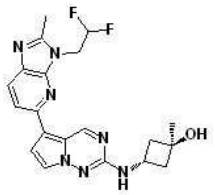
[1379] 옅은 황색 고체 (43 mg, 0.107 mmol, 30.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.17 (6 H, s), 2.61 (3 H, s), 3.24 (2 H, d, *J*=6.02 Hz), 4.56 (1 H, s), 4.84 (2 H, td, *J*=15.95, 2.87 Hz), 6.43 (1 H, t, *J*=6.02 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.24 (1 H, d, *J*=2.46 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{21}F_2N_7O$ *m/z* 402.2 (M+1).

[1380] 

[1381] 1834

[1382] (*cis*-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸)메탄올 **1834**.

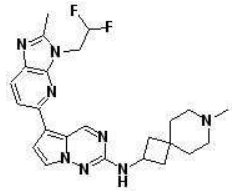
[1383] 옅은 황색 고체 (50 mg, 0.121 mmol, 44.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.66 - 1.76 (2 H, m), 2.03 - 2.15 (1 H, m), 2.30 - 2.40 (2 H, m), 2.60 (3 H, s), 3.38 (2 H, t, *J*=5.61 Hz), 4.02 - 4.11 (1 H, m), 4.48 (1 H, t, *J*=5.34 Hz), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.11 (1 H, d, *J*=7.39 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O$ *m/z* 414.2 (M+1).

[1384] 

[1385] 1835

[1386] *trans*-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부탄-1-올 **1835**.

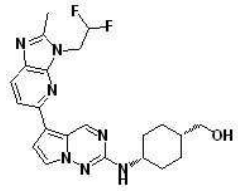
[1387] 옅은 황색 고체 (40 mg, 0.097 mmol, 45.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.29 (3 H, s), 1.96 - 2.04 (2 H, m), 2.30 - 2.38 (2 H, m), 2.61 (3 H, s), 3.07 (1 H, s), 4.26 (1 H, sxt, *J*=7.39 Hz), 4.83 (2 H, td, *J*=15.88, 2.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.15 (1 H, d, *J*=6.84 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O$ *m/z* 414.2 (M+1).

[1388] 

[1389] 1836

[1390] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(7-메틸-7-아자스피로[3.5]노난-2-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 1836.

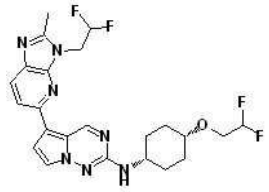
[1391] 황색 고체 (44 mg, 0.086 mmol, 97.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.54 (2 H, t, *J*=5.48 Hz), 1.61 (2 H, br t, *J*=5.20 Hz), 1.74 (2 H, br dd, *J*=11.50, 8.21 Hz), 2.16 (3 H, s), 2.13 - 2.39 (4 H, m), 2.23 (2 H, br t, *J*=9.86 Hz), 2.60 (3 H, s), 4.16 (1 H, dq, *J*=15.50, 7.79 Hz), 4.83 (2 H, td, *J*=16.02, 2.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.17 (1 H, d, *J*=7.39 Hz), 7.23 (1 H, d, *J*=2.46 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{28}F_2N_8$ *m/z* 467.25 (M+1).

[1392] 

[1393] 1837

[1394] (*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메탄올 1837.

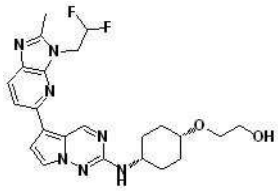
[1395] 옅은 황색 고체 (226 mg, 0.512 mmol, 59.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.43 - 1.55 (5 H, m), 1.56 - 1.65 (2 H, m), 1.68 - 1.78 (2 H, m), 2.61 (3 H, s), 3.29 - 3.33 (2 H, m), 3.76 - 3.86 (1 H, m), 4.39 (1 H, t, *J*=5.34 Hz), 4.82 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.68 (1 H, d, *J*=7.39 Hz), 7.22 (1 H, d, *J*=2.46 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_2N_7O$ *m/z* 442.2 (M+1).

[1396] 

[1397] 1838

[1398] N-(*cis*-4-(2,2-디플루오로에톡시)사이클로헥실)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 1838.

[1399] 황색 고체 (20 mg, 0.041 mmol, 20.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.51 - 1.60 (2 H, m), 1.60 - 1.68 (2 H, m), 1.68 - 1.75 (2 H, m), 1.81 - 1.92 (2 H, m), 2.61 (3 H, s), 3.57 - 3.62 (1 H, m), 3.63 - 3.71 (1 H, m), 3.67 (2 H, td, *J*=15.33, 3.83 Hz), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.13 (1 H, tt, *J*=55.12, 3.85 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.81 (1 H, d, *J*=7.67 Hz), 7.22 (1 H, d, *J*=2.19 Hz), 7.63 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_4N_7O$ *m/z* 492.2 (M+1).

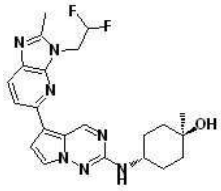


[1400]

[1401] 1839

[1402] 2-((*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)옥시)에탄-1-올 **1839**.

[1403] 황색 고체 (4 mg, 0.009 mmol, 4.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.56 (2 H, m), 1.62 - 1.73 (4 H, m), 1.80 - 1.88 (2 H, m), 2.61 (3 H, s), 3.41 (2 H, t, *J*=5.48 Hz), 3.49 (1 H, br d, *J*=2.74 Hz), 3.51 (2 H, t, *J*=5.50 Hz), 3.66 (1 H, td, *J*=8.21, 4.38 Hz), 4.52 (1 H, br s), 4.77 - 4.91 (2 H, m), 6.55 (2 H, tt, *J*=54.60, 3.00 Hz), 6.76 (1 H, d, *J*=7.67 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{27}F_2N_7O_2$ *m/z* 472.2 (M+1).

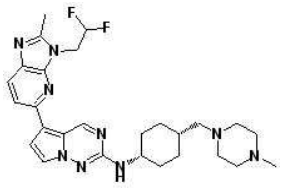


[1404]

[1405] 1840

[1406] *trans*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 **1840**.

[1407] 갈색을 띤 오렌지색 고체 (9 mg, 0.020 mmol, 6.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.15 (3 H, s), 1.38 - 1.54 (4 H, m), 1.57 - 1.66 (2 H, m), 1.84 - 1.94 (2 H, m), 2.61 (3 H, s), 3.66 (1 H, dt, *J*=7.87, 3.87 Hz), 4.23 (1 H, s), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (2 H, tt, *J*=54.60, 3.00 Hz), 6.71 (1 H, d, *J*=7.94 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_2N_7O$ *m/z* 442.2 (M+1).

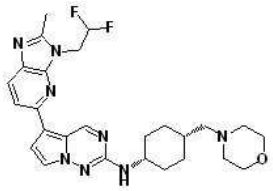


[1408]

[1409] 1841

[1410] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-((4-메틸피페라진-1-일)메틸)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1841**.

[1411] 옅은 갈색 고체 (24 mg, 0.046 mmol, 21.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.40 - 1.54 (4 H, m), 1.55 - 1.63 (2 H, m), 1.64 - 1.75 (3 H, m), 2.14 (3 H, s), 2.17 (2 H, d, *J*=7.39 Hz), 2.19 - 2.44 (8 H, m), 2.61 (3 H, s), 3.81 (1 H, br d, *J*=2.74 Hz), 4.82 (2 H, td, *J*=15.88, 2.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.66 (1 H, d, *J*=7.39 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{27}H_{35}F_2N_9$ *m/z* 524.35 (M+1).

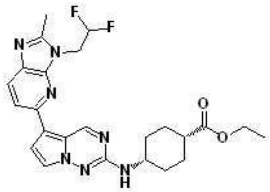


[1412]

[1413] 1842

[1414] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-(모르폴리노메틸)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1842**.

[1415] 옅은 갈색 고체 (38 mg, 0.074 mmol, 34.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.42 - 1.56 (4 H, m), 1.56 - 1.65 (2 H, m), 1.65 - 1.76 (3 H, m), 2.18 (2 H, br d, *J*=7.12 Hz), 2.32 (4 H, br s), 2.61 (3 H, s), 3.57 (4 H, br t, *J*=4.24 Hz), 3.76 - 3.85 (1 H, m), 4.83 (2 H, td, *J*=15.81, 2.33 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.67 (1 H, d, *J*=7.39 Hz), 7.22 (1 H, d, *J*=2.46 Hz), 7.64 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{26}H_{32}F_2N_8O$ *m/z* 511.3 (M+1).

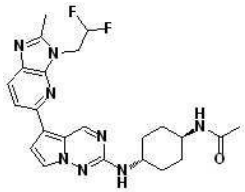


[1416]

[1417] 1843

[1418] 에틸 *cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-카복실레이트 **1843**.

[1419] 황색 고체 (22 mg, 0.046 mmol, 8.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.20 (3 H, t, *J*=7.12 Hz), 1.55 - 1.68 (4 H, m), 1.71 - 1.80 (2 H, m), 1.92 - 2.04 (2 H, m), 2.51 - 2.56 (1 H, m), 2.61 (3 H, s), 3.72 (1 H, br s), 4.09 (2 H, q, *J*=7.12 Hz), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.80 (1 H, d, *J*=7.39 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{27}F_2N_7O_2$ *m/z* 484.2 (M+1).

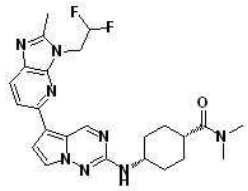


[1420]

[1421] 1844

[1422] N-(*trans*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)아세트아미드 **1844**.

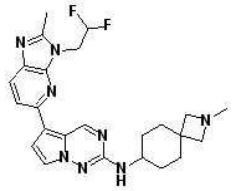
[1423] 황색 고체 (7 mg, 0.015 mmol, 8.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.20 - 1.30 (2 H, m), 1.31 - 1.42 (2 H, m), 1.79 (3 H, s), 1.83 (2 H, br d, *J*=10.95 Hz), 2.01 (2 H, br d, *J*=11.23 Hz), 2.61 (3 H, s), 3.46 - 3.53 (1 H, m), 3.54 - 3.61 (1 H, m), 4.83 (2 H, br t, *J*=15.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.76 (1 H, d, *J*=7.94 Hz), 7.22 (1 H, d, *J*=2.46 Hz), 7.66 (1 H, d, *J*=2.19 Hz), 7.70 - 7.77 (2 H, m), 7.95 (1 H, d, *J*=8.49 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8O$ *m/z* 469.2 (M+1).

[1424] 

[1425] 1845

[1426] *cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N-디메틸사이클로헥산-1-카복사미드 **1845**.

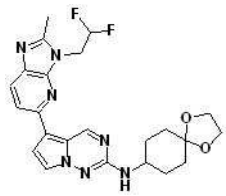
[1427] 황색 고체 (55 mg, 0.114 mmol, 41.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.43 - 1.53 (2 H, m), 1.59 - 1.69 (2 H, m), 1.72 - 1.86 (2 H, m), 1.92 - 2.04 (2 H, m), 2.61 (3 H, s), 2.65 - 2.73 (1 H, m), 2.81 (3 H, s), 3.01 (3 H, s), 3.83 (1 H, br d, *J*=4.11 Hz), 4.75 - 4.91 (2 H, m), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.76 (1 H, d, *J*=6.02 Hz), 7.22 (1 H, d, *J*=2.46 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{28}F_2N_8O$ *m/z* 483.3 (M+1).

[1428] 

[1429] 1846

[1430] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-메틸-2-아자스피로[3.5]노난-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1846**.

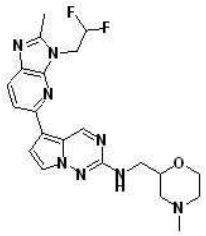
[1431] 황색 고체 (35 mg, 0.075 mmol, 61.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.23 - 1.36 (2 H, m), 1.41 - 1.52 (2 H, m), 1.81 - 1.90 (4 H, m), 2.23 (3 H, s), 2.60 (3 H, s), 2.87 (2 H, s), 2.94 (2 H, s), 3.50 - 3.60 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.69 (1 H, d, *J*=7.94 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.94 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{28}F_2N_8$ *m/z* 467.2 (M+1).

[1432] 

[1433] 1847

[1434] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1,4-디옥사스피로[4.5]데칸-8-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1847**.

[1435] 황색 고체 (78 mg, 0.166 mmol, 48.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.52 - 1.66 (4 H, m), 1.69 - 1.77 (2 H, m), 1.89 - 1.96 (2 H, m), 2.60 (3 H, s), 3.64 - 3.75 (1 H, m), 3.83 - 3.90 (4 H, m), 4.83 (2 H, td, *J*=15.88, 2.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.84 (1 H, d, *J*=7.94 Hz), 7.22 (1 H, d, *J*=2.46 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_2N_7O_2$ *m/z* 470.25 (M+1).

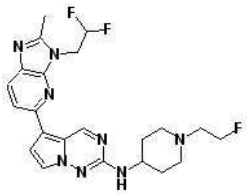


[1436]

[1437] 1848

[1438] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((4-메틸모르폴린-2-일)메틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 1848.

[1439] 짙은 황색 고체 (46 mg, 0.104 mmol, 44.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.71 - 1.81 (1 H, m), 1.98 (1 H, td, *J*=11.23, 3.29 Hz), 2.17 (3 H, s), 2.55 - 2.59 (1 H, m), 2.61 (3 H, s), 2.77 (1 H, br d, *J*=11.23 Hz), 3.18 - 3.27 (1 H, m), 3.30 - 3.37 (1 H, m), 3.50 (1 H, td, *J*=11.16, 2.33 Hz), 3.67 - 3.75 (1 H, m), 3.79 (1 H, dt, *J*=9.72, 1.44 Hz), 4.84 (2 H, td, *J*=16.08, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.91 (1 H, t, *J*=6.02 Hz), 7.25 (1 H, d, *J*=2.74 Hz), 7.67 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{24}F_2N_8O$ *m/z* 443.2 (M+1).

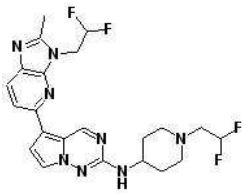


[1440]

[1441] 1849

[1442] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(2-플루오로에틸)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 1849.

[1443] 황색 고체 (2.4 mg, 0.005 mmol, 2.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.62 (2 H, m), 1.92 (2 H, br d, *J*=10.95 Hz), 2.07 - 2.19 (2 H, m), 2.62 (2 H, dt, *J*=28.25, 4.90 Hz), 2.61 (3 H, s), 2.89 (2 H, br d, *J*=11.77 Hz), 3.54 - 3.67 (1 H, m), 4.53 (2 H, dt, *J*=48.00, 5.00 Hz), 4.83 (2 H, td, *J*=15.95, 2.60 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.82 (1 H, d, *J*=7.94 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_3N_8$ *m/z* 459.3 (M+1).



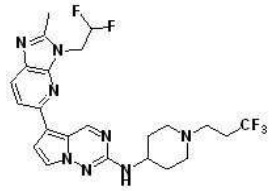
[1444]

[1445] 1850

[1446] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(2,2-디플루오로에틸)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 1850.

[1447] 황색 고체 (32 mg, 0.067 mmol, 28.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.49 - 1.62 (2 H, m), 1.91 (2 H, br d, *J*=10.68 Hz), 2.27 (2 H, br t, *J*=10.13 Hz), 2.61 (3 H, s), 2.68 - 2.81 (2 H, m), 2.91 (2 H, br d, *J*=8.76 Hz), 3.60 (1 H, br d, *J*=4.11 Hz), 4.83 (2 H, td, *J*=16.02, 2.74 Hz), 6.14 (1 H, tt, *J*=55.12, 3.85 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.57 - 6.63 (1 H, m), 6.82 (1 H, br d, *J*=6.84

Hz), 7.23 (1 H, d, *J*=2.46 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{24}F_4N_8$ *m/z* 477.2 (M+1).

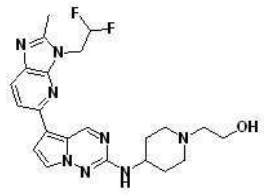


[1448]

[1449] 1851

[1450] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(3,3,3-트리플루오로프로필)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1851**.

[1451] 황색 고체 (7 mg, 0.014 mmol, 10.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.46 - 1.60 (2 H, m), 1.87 - 1.97 (2 H, m), 2.02 - 2.12 (2 H, m), 2.40 - 2.48 (2 H, m), 2.51 - 2.56 (2 H, m), 2.61 (3 H, s), 2.88 (2 H, br d, *J*=11.50 Hz), 3.55 - 3.67 (1 H, m), 4.83 (2 H, td, *J*=16.02, 2.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.82 (1 H, d, *J*=7.94 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_5N_8$ *m/z* 509.2 (M+1).

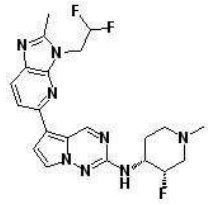


[1452]

[1453] 1852

[1454] 2-(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)에탄-1-올 **1852**.

[1455] 옅은 갈색 고체 (13 mg, 0.029 mmol, 12.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.61 (2 H, m), 1.91 (2 H, br d, *J*=10.95 Hz), 2.08 (2 H, br s), 2.33 - 2.44 (2 H, m), 2.61 (3 H, s), 2.88 (2 H, br d, *J*=10.68 Hz), 3.44 - 3.53 (2 H, m), 3.54 - 3.66 (1 H, m), 4.38 (1 H, br s), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.81 (1 H, br d, *J*=7.94 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{26}F_2N_8O$ *m/z* 457.2 (M+1).



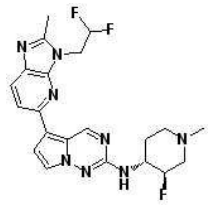
[1456]

[1457] 1853

[1458] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1853**.

[1459] 황색 고체 (2 mg, 0.005 mmol, 3.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.68 - 1.75 (1 H, m), 1.93 (1 H, qd, *J*=12.14, 3.56 Hz), 2.03 - 2.10 (1 H, m), 2.12 - 2.25 (1 H, m), 2.19 (3 H, s), 2.61 (3 H, s), 2.81 (1 H, br d, *J*=12.32 Hz), 3.01 - 3.10 (1 H, m), 3.70 - 3.87 (1 H, m), 4.79 - 4.97 (2 H, m), 4.84

(1 H, br d, *J*=3.01 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.86 (1 H, d, *J*=7.94 Hz), 7.26 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_3N_8$ *m/z* 445.2 (M+1).

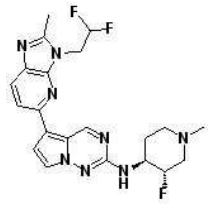


[1460]

[1461] 1854

[1462] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4R)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1854**.

[1463] 황색 고체 (2.5 mg, 0.006 mmol, 4.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.48 - 1.62 (1 H, m), 1.94 - 2.05 (2 H, m), 2.08 (1 H, dt, *J*=9.92, 5.03 Hz), 2.24 (3 H, s), 2.61 (3 H, s), 2.71 (1 H, br d, *J*=11.22 Hz), 3.05 - 3.12 (1 H, m), 3.77 - 3.92 (1 H, m), 4.59 (1 H, dtd, *J*=49.90, 9.24, 9.24, 4.52 Hz), 4.84 (2 H, td, *J*=16.02, 2.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.04 (1 H, d, *J*=8.76 Hz), 7.25 (1 H, d, *J*=2.46 Hz), 7.67 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_3N_8$ *m/z* 445.2 (M+1).

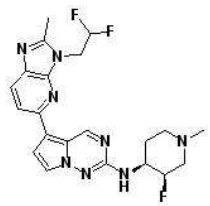


[1464]

[1465] 1855

[1466] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1855**.

[1467] 황색 고체 (4 mg, 0.009 mmol, 7.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.49 - 1.62 (1 H, m), 1.94 - 2.05 (2 H, m), 2.05 - 2.12 (1 H, m), 2.24 (3 H, s), 2.61 (3 H, s), 2.71 (1 H, br d, *J*=11.22 Hz), 3.06 - 3.11 (1 H, m), 3.78 - 3.91 (1 H, m), 4.59 (1 H, dtd, *J*=49.65, 9.31, 9.31, 4.65 Hz), 4.84 (2 H, td, *J*=16.02, 2.74 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.03 (1 H, d, *J*=8.49 Hz), 7.25 (1 H, d, *J*=2.74 Hz), 7.67 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_3N_8$ *m/z* 445.2 (M+1).



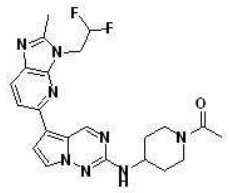
[1468]

[1469] 1856

[1470] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1856**.

[1471] 황색 고체 (4 mg, 0.009 mmol, 8.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.67 - 1.78 (1 H, m), 1.93 (1 H, qd, *J*=12.18, 3.70 Hz), 2.04 - 2.12 (1 H, m), 2.13 - 2.26 (1 H, m), 2.20 (3 H, s), 2.61 (3 H, s),

2.81 (1 H, br d, *J*=11.23 Hz), 3.01 - 3.12 (1 H, m), 3.71 - 3.89 (1 H, m), 4.80 - 4.97 (2 H, m), 4.84 (1 H, d, *J*=3.01 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.86 (1 H, d, *J*=7.94 Hz), 7.26 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.46 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_3N_8$ *m/z* 445.2 (M+1).

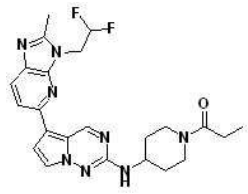


[1472]

[1473] 1857

[1474] 1-(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)에탄-1-온 1857.

[1475] 황색 고체 (5 mg, 0.011 mmol, 3.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.30 - 1.40 (1 H, m), 1.41 - 1.52 (1 H, m), 1.89 - 1.96 (1 H, m), 1.99 (1 H, br d, *J*=12.87 Hz), 2.02 (3 H, s), 2.61 (3 H, s), 2.73 - 2.84 (1 H, m), 3.12 - 3.23 (1 H, m), 3.79 - 3.84 (1 H, m), 3.84 - 3.90 (1 H, m), 4.28 (1 H, br d, *J*=13.96 Hz), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (2 H, tt, *J*=54.60, 3.00 Hz), 6.91 (1 H, d, *J*=7.94 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{24}F_2N_8O$ *m/z* 455.2 (M+1).

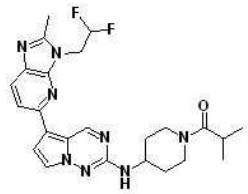


[1476]

[1477] 1858

[1478] 1-(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)프로판-1-온 1858.

[1479] 옅은 오렌지색 고체 (5 mg, 0.011 mmol, 37.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.00 (3 H, t, *J*=7.39 Hz), 1.30 - 1.39 (1 H, m), 1.39 - 1.49 (1 H, m), 1.88 - 2.03 (2 H, m), 2.33 (2 H, q, *J*=7.39 Hz), 2.61 (3 H, s), 2.77 (1 H, br t, *J*=11.23 Hz), 3.14 (1 H, br t, *J*=11.64 Hz), 3.81 - 3.91 (2 H, m), 4.30 (1 H, br d, *J*=12.59 Hz), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.90 (1 H, d, *J*=7.94 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8O$ *m/z* 469.2 (M+1).



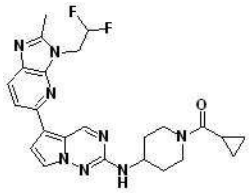
[1480]

[1481] 1859

[1482] 1-(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)-2-메틸프로판-1-온 1859.

[1483] 황색 고체 (5 mg, 0.010 mmol, 5.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.98 - 1.04 (6 H, m), 1.28 - 1.39 (1 H, m), 1.40 - 1.50 (1 H, m), 1.94 (1 H, br d, *J*=10.95 Hz), 2.01 (1 H, br d, *J*=11.50 Hz), 2.61

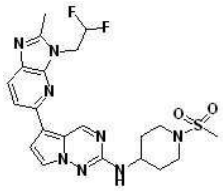
(3 H, s), 2.72 - 2.80 (1 H, m), 2.87 - 2.94 (1 H, m), 3.18 (1 H, br t, *J*=11.64 Hz), 3.81 - 3.90 (1 H, m), 3.95 (1 H, br d, *J*=13.96 Hz), 4.28 - 4.39 (1 H, m), 4.83 (2 H, td, *J*=15.95, 2.60 Hz), 6.55 (2 H, tt, *J*=54.60, 3.00 Hz), 6.89 (1 H, d, *J*=7.94 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{28}F_2N_8O$ *m/z* 483.2 (M+1).

[1484] 

[1485] 1860

[1486] 사이클로프로필(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 **1860**.

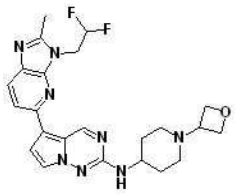
[1487] 황색 고체 (19 mg, 0.040 mmol, 14.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.65 - 0.78 (4 H, m), 1.30 - 1.41 (1 H, m), 1.43 - 1.54 (1 H, m), 1.90 - 1.97 (1 H, m), 1.97 - 2.07 (2 H, m), 2.61 (3 H, s), 2.75 - 2.86 (1 H, m), 3.21 - 3.29 (1 H, m), 3.84 - 3.97 (1 H, m), 4.18 - 4.34 (2 H, m), 4.83 (2 H, td, *J*=15.95, 3.15 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.91 (1 H, d, *J*=7.94 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.67 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{26}F_2N_8O$ *m/z* 481.2 (M+1).

[1488] 

[1489] 1861

[1490] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(메틸설포닐)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1861**.

[1491] 회-백색 고체 (58 mg, 0.118 mmol, 55.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.53 - 1.67 (2 H, m), 1.98 - 2.09 (2 H, m), 2.61 (3 H, s), 2.87 - 2.94 (2 H, m), 2.89 (3 H, s), 3.51 - 3.59 (2 H, m), 3.72 - 3.83 (1 H, m), 4.83 (2 H, td, *J*=16.08, 2.87 Hz), 6.55 (2 H, tt, *J*=54.60, 3.00 Hz), 6.97 (1 H, d, *J*=7.94 Hz), 7.25 (1 H, d, *J*=2.46 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.72 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{24}F_2N_8O_2S$ *m/z* 491.2 (M+1).

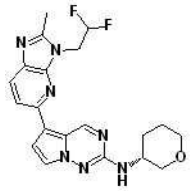
[1492] 

[1493] 1862

[1494] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1862**.

[1495] 황색 고체 (31 mg, 0.066 mmol, 28.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.49 - 1.62 (2 H, m), 1.88 (2 H, br t, *J*=11.64 Hz), 1.93 (2 H, br d, *J*=12.32 Hz), 2.61 (3 H, s), 2.69 (2 H, br d, *J*=11.22 Hz),

3.39 (1 H, quin, *J*=6.43 Hz), 3.55 - 3.68 (1 H, m), 4.42 (2 H, t, *J*=6.02 Hz), 4.53 (2 H, t, *J*=6.57 Hz), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.85 (1 H, d, *J*=7.94 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8O$ *m/z* 469.25 (M+1).



[1496]

[1497] 1863

[1498] (R)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1863**.

[1499] 회-백색 고체 (48 mg, 0.116 mmol, 53.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.50 - 1.65 (2 H, m), 1.67 - 1.78 (1 H, m), 1.95 - 2.05 (1 H, m), 2.61 (3 H, s), 3.14 (1 H, dd, *J*=10.40, 9.31 Hz), 3.27 - 3.32 (1 H, m), 3.72 - 3.83 (2 H, m), 3.90 - 4.01 (1 H, m), 4.83 (2 H, td, *J*=16.08, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.81 (1 H, d, *J*=7.94 Hz), 7.25 (1 H, d, *J*=2.74 Hz), 7.68 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O$ *m/z* 414.2 (M+1).

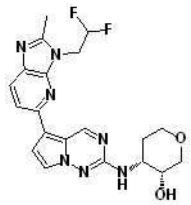


[1500]

[1501] 1864

[1502] (S)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(테트라히드로-2H-피란-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1864**.

[1503] 회-백색 고체 (59 mg, 0.143 mmol, 77.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.50 - 1.64 (2 H, m), 1.68 - 1.77 (1 H, m), 1.96 - 2.05 (1 H, m), 2.61 (3 H, s), 3.14 (1 H, dd, *J*=10.68, 9.31 Hz), 3.27 - 3.32 (1 H, m), 3.71 - 3.82 (2 H, m), 3.90 - 3.99 (1 H, m), 4.83 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.81 (1 H, d, *J*=7.94 Hz), 7.25 (1 H, d, *J*=2.74 Hz), 7.67 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O$ *m/z* 414.2 (M+1).



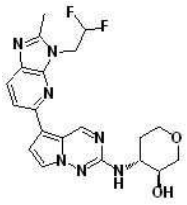
[1504]

[1505] 1865

[1506] (3R,4R)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)테트라히드로-2H-피란-3-올 **1865**.

[1507] 황색 고체 (116 mg, 0.270 mmol, 84.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.67 (1 H, br dd, *J*=13.28,

3.15 Hz), 1.84 - 2.00 (1 H, m), 2.61 (3 H, s), 3.42 (1 H, td, *J*=11.36, 2.19 Hz), 3.49 (1 H, dd, *J*=11.77, 1.37 Hz), 3.76 (1 H, dd, *J*=11.77, 3.01 Hz), 3.79 - 3.85 (2 H, m), 3.89 (1 H, ddt, *J*=11.05, 7.43, 3.90, 3.90 Hz), 4.84 (2 H, td, *J*=15.95, 2.87 Hz), 4.95 (1 H, d, *J*=4.93 Hz), 6.20 (1 H, d, *J*=7.94 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.25 (1 H, d, *J*=2.74 Hz), 7.67 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O_2$ *m/z* 430.2 (M+1).

[1508] 

[1509] 1866

[1510] (3S,4R)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)테트라히드로-2H-피란-3-올 1866.

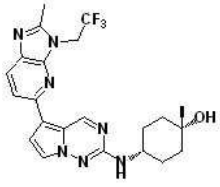
[1511] 황색 고체 (70 mg, 0.163 mmol, 78.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.44 - 1.58 (1 H, m), 1.98 - 2.09 (1 H, m), 2.61 (3 H, s), 3.07 (1 H, dd, *J*=10.95, 9.86 Hz), 3.34 - 3.39 (1 H, m), 3.45 - 3.58 (1 H, m), 3.64 - 3.75 (1 H, m), 3.78 - 3.88 (2 H, m), 4.84 (2 H, td, *J*=16.08, 2.87 Hz), 4.96 (1 H, d, *J*=5.48 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.76 (1 H, d, *J*=7.94 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_2N_7O_2$ *m/z* 430.2 (M+1).

[1512] 

[1513] 1867

[1514] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-메톡시테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 1867.

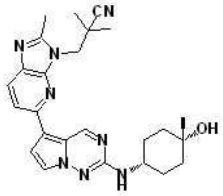
[1515] 회-백색 고체 (69 mg, 0.156 mmol, 75.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.61 (1 H, m), 1.96 - 2.06 (1 H, m), 2.61 (3 H, s), 3.11 (1 H, dd, *J*=11.23, 9.03 Hz), 3.28 (1 H, td, *J*=8.90, 4.38 Hz), 3.34 (3 H, s), 3.38 (1 H, td, *J*=11.29, 2.33 Hz), 3.78 - 3.91 (2 H, m), 4.03 (1 H, dd, *J*=11.23, 4.38 Hz), 4.84 (2 H, td, *J*=16.02, 3.01 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.99 (1 H, d, *J*=8.21 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_2N_7O_2$ *m/z* 444.2 (M+1).

[1516] 

[1517] 1868

[1518] *cis*-1-메틸-4-((5-(2-메틸-3-(2,2,2-트리플루오로에틸)-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 1868.

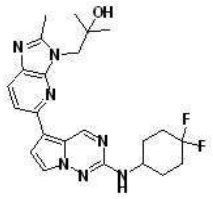
[1519] 황색 고체 (12.1 mg, 0.026 mmol, 13.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.32 - 1.42 (2 H, m), 1.59 (2 H, br d, *J*=12.59 Hz), 1.63 - 1.77 (4 H, m), 2.63 (3 H, s), 3.48 - 3.61 (1 H, m), 4.02 (1 H, s), 5.30 - 5.39 (2 H, m), 6.75 (1 H, br d, *J*=7.67 Hz), 7.23 (1 H, br s), 7.63 (1 H, br s), 7.76 (1 H, br d, *J*=8.21 Hz), 7.97 (1 H, br d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{24}F_3N_7O$ *m/z* 460.2 (M+1).

[1520] 

[1521] 1869

[1522] 3-(5-(2-((*cis*-4-히드록시-4-메틸사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)-2,2-디메틸프로판니트릴 1869.

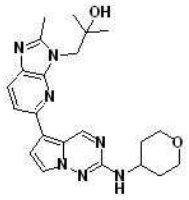
[1523] 황색 고체 (17.2 mg, 0.038 mmol, 15.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.37 (2 H, td, *J*=13.07, 4.24 Hz), 1.50 (6 H, s), 1.58 (2 H, br d, *J*=12.05 Hz), 1.61 - 1.69 (2 H, m), 1.69 - 1.75 (2 H, m), 2.69 (3 H, s), 3.46 - 3.59 (1 H, m), 4.02 (1 H, br s), 4.57 (2 H, s), 6.78 (1 H, d, *J*=7.94 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.21 Hz), 7.94 (1 H, d, *J*=8.21 Hz), 9.79 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{25}H_{30}N_8O$ *m/z* 459.3 (M+1).

[1524] 

[1525] 1870

[1526] 1-(5-(2-((4,4-디플루오로사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)-2-메틸프로판-2-올 1870.

[1527] 황색 고체 (12.2 mg, 0.027 mmol, 13.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.19 (6 H, s), 1.57 - 1.71 (2 H, m), 1.87 - 2.03 (4 H, m), 2.04 - 2.16 (2 H, m), 2.64 (3 H, s), 3.74 - 3.88 (1 H, m), 4.23 (2 H, s), 4.86 (1 H, br s), 7.00 (1 H, d, *J*=7.67 Hz), 7.23 (1 H, d, *J*=2.19 Hz), 7.65 (1 H, d, *J*=2.74 Hz), 7.69 (1 H, d, *J*=8.76 Hz), 7.90 (1 H, d, *J*=8.21 Hz), 9.77 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{27}F_2N_7O$ *m/z* 456.3 (M+1).

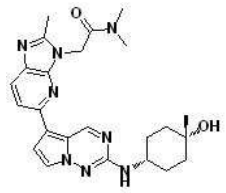
[1528] 

[1529] 1871

[1530] 2-메틸-1-(2-메틸-5-(2-((테트라히드로-2H-피란-4-일)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)-3H-이미다조[4,5-b]피리딘-3-일)프로판-2-올 1871.

[1531] 황색 고체 (15.9 mg, 0.038 mmol, 17.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.19 (6 H, s), 1.46 -

1.60 (2 H, m), 1.91 (2 H, br dd, *J*=12.59, 2.19 Hz), 2.64 (3 H, s), 3.41 (2 H, td, *J*=11.50, 2.19 Hz), 3.72 - 3.85 (1 H, m), 3.85 - 3.94 (2 H, m), 4.23 (2 H, s), 4.86 (1 H, s), 6.95 (1 H, d, *J*=8.21 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.19 Hz), 7.68 (1 H, d, *J*=8.21 Hz), 7.89 (1 H, d, *J*=8.21 Hz), 9.76 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{27}N_7O_2$ *m/z* 422.2 (M+1).

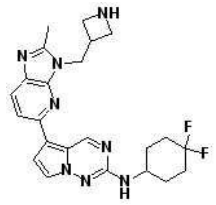


[1532]

[1533] **1872**

[1534] 2-(5-(2-((*cis*-4-히드록시-4-메틸사이클로헥실)아미노)피롤로[2,1-f][1,2,4]트리아진-5-일)-2-메틸-3H-이미다조[4,5-b]피리딘-3-일)-N,N-디메틸아세트아미드 **1872**.

[1535] 황색 고체 (23.9 mg, 0.052 mmol, 25.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.37 (2 H, td, *J*=13.07, 4.24 Hz), 1.58 (2 H, br d, *J*=12.32 Hz), 1.62 - 1.69 (2 H, m), 1.69 - 1.75 (2 H, m), 2.47 (3 H, s), 2.89 (3 H, s), 3.23 (3 H, s), 3.46 - 3.58 (1 H, m), 4.01 (1 H, s), 5.27 (2 H, s), 6.77 (1 H, d, *J*=7.94 Hz), 7.18 (1 H, d, *J*=2.74 Hz), 7.61 (1 H, d, *J*=2.46 Hz), 7.67 (1 H, d, *J*=8.49 Hz), 7.91 (1 H, d, *J*=8.21 Hz), 9.59 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{30}N_8O_2$ *m/z* 463.3 (M+1).

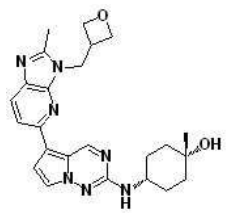


[1536]

[1537] **1873**

[1538] 5-(3-(아제티딘-3-일메틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(4,4-디플루오로사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1873**.

[1539] 황색 고체 (18.0 mg, 0.040 mmol, 34.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.57 - 1.71 (2 H, m), 1.86 - 2.03 (4 H, m), 2.05 - 2.16 (2 H, m), 2.59 (3 H, s), 3.07 - 3.19 (2 H, m), 3.36 - 3.46 (1 H, m), 3.49 (2 H, br t, *J*=7.39 Hz), 3.78 - 3.90 (1 H, m), 4.54 (2 H, br d, *J*=7.39 Hz), 7.01 (1 H, d, *J*=7.67 Hz), 7.24 (1 H, d, *J*=2.46 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.70 (1 H, d, *J*=8.21 Hz), 7.90 (1 H, d, *J*=8.49 Hz), 9.79 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8$ *m/z* 453.2 (M+1).



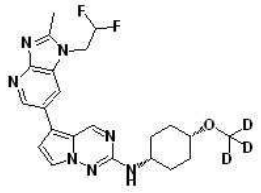
[1540]

[1541] **1875**

[1542] *cis*-1-메틸-4-((5-(2-메틸-3-(옥세탄-3-일메틸)-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥산-1-올 **1875**.

[1543] 회-백색 고체 (19.9 mg, 0.045 mmol, 19.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.37 (2 H, td, *J*=13.00, 4.38 Hz), 1.59 (2 H, br d, *J*=12.05 Hz), 1.62 - 1.69 (2 H, m), 1.70 - 1.75 (2 H, m), 2.59 (3 H, s), 3.47 - 3.60 (2 H, m), 4.02 (1 H, br s), 4.53 (2 H, t, *J*=5.89 Hz), 4.62 - 4.67 (4 H, m),

6.78 (1 H, d, *J*=7.94 Hz), 7.21 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.46 Hz), 7.69 (1 H, d, *J*=8.49 Hz), 7.90 (1 H, d, *J*=8.21 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{29}N_7O_2$ *m/z* 448.3 (M+1).

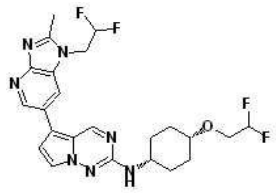


[1544]

[1545] **1876**

[1546] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(*cis*-4-(메톡시-d_3)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1876**.

[1547] 옅은 갈색 고체 (62 mg, 0.140 mmol, 41.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.44 - 1.55 (2 H, m), 1.55 - 1.66 (2 H, m), 1.66 - 1.75 (2 H, m), 1.80 - 1.90 (2 H, m), 2.62 (3 H, s), 3.33 - 3.37 (1 H, m), 3.59 - 3.70 (1 H, m), 4.90 (2 H, td, *J*=15.95, 2.87 Hz), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.80 (1 H, d, *J*=7.94 Hz), 6.97 (1 H, d, *J*=2.46 Hz), 7.71 (1 H, d, *J*=2.46 Hz), 8.23 (1 H, d, *J*=1.92 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{22}[2H_3]F_2N_7O$ *m/z* 445.1 (M+1).

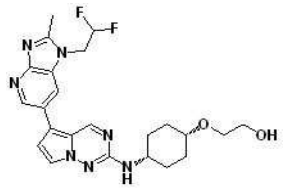


[1548]

[1549] **1877**

[1550] N-(*cis*-4-(2,2-디플루오로에톡시)사이클로헥실)-5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1877**.

[1551] 황색 고체 (27 mg, 0.055 mmol, 20.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.50 - 1.60 (2 H, m), 1.60 - 1.68 (2 H, m), 1.69 - 1.75 (2 H, m), 1.82 - 1.92 (2 H, m), 2.62 (3 H, s), 3.59 (1 H, br s), 3.62 - 3.69 (1 H, m), 3.67 (2 H, td, *J*=15.06, 3.83 Hz), 4.90 (2 H, td, *J*=15.88, 2.74 Hz), 6.13 (1 H, tt, *J*=55.12, 3.85 Hz), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.83 (1 H, d, *J*=7.67 Hz), 6.97 (1 H, d, *J*=2.74 Hz), 7.71 (1 H, d, *J*=2.19 Hz), 8.23 (1 H, d, *J*=1.64 Hz), 8.66 (1 H, d, *J*=1.64 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_4N_7O$ *m/z* 492.2 (M+1).



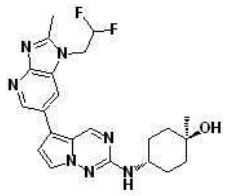
[1552]

[1553] **1878**

[1554] 2-((*cis*-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)옥시)에탄-1-올 **1878**.

[1555] 올리브 그린 고체 (19 mg, 0.040 mmol, 20.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.57 (2 H, m), 1.60 - 1.75 (4 H, m), 1.79 - 1.89 (2 H, m), 2.62 (3 H, s), 3.39 - 3.42 (2 H, m), 3.46 - 3.52 (1 H, m), 3.50 - 3.53 (2 H, m), 3.59 - 3.71 (1 H, m), 4.51 (1 H, t, *J*=5.48 Hz), 4.90 (2 H, td, *J*=15.88, 2.74 Hz), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.78 (1 H, d, *J*=7.67 Hz), 6.97 (1 H, d, *J*=2.74 Hz), 7.71 (1 H,

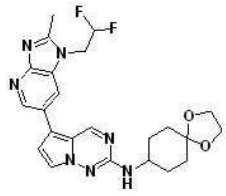
d, *J*=2.74 Hz), 8.23 (1 H, d, *J*=2.19 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{27}F_2N_7O_2$ *m/z* 472.2 (M+1).

[1556] 

[1557] 1879

[1558] *trans*-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 **1879**.

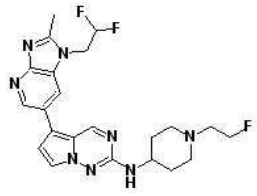
[1559] 올리브 그린 고체 (38 mg, 0.086 mmol, 28.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.15 (3 H, s), 1.39 - 1.52 (4 H, m), 1.58 - 1.66 (2 H, m), 1.84 - 1.94 (2 H, m), 2.62 (3 H, s), 3.61 - 3.71 (1 H, m), 4.23 (1 H, s), 4.83 - 4.96 (2 H, m), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.72 (1 H, d, *J*=7.67 Hz), 6.97 (1 H, d, *J*=2.19 Hz), 7.72 (1 H, d, *J*=2.19 Hz), 8.23 (1 H, d, *J*=1.64 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_2N_7O$ *m/z* 442.2 (M+1).

[1560] 

[1561] 1880

[1562] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1,4-디옥사스피로[4.5]데칸-8-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1880**.

[1563] 옅은 황색 고체 (36 mg, 0.077 mmol, 26.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.51 - 1.67 (4 H, m), 1.70 - 1.78 (2 H, m), 1.88 - 1.97 (2 H, m), 2.62 (3 H, s), 3.61 - 3.75 (1 H, m), 3.81 - 3.92 (4 H, m), 4.90 (2 H, td, *J*=15.81, 2.87 Hz), 6.52 (1 H, tt, *J*=54.60, 3.00 Hz), 6.86 (1 H, d, *J*=7.94 Hz), 6.97 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=2.19 Hz), 8.23 (1 H, d, *J*=1.92 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.10 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_2N_7O_2$ *m/z* 470.2 (M+1).

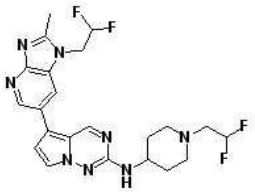
[1564] 

[1565] 1881

[1566] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-(2-플루오로에틸)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1881**.

[1567] 황색 고체 (7 mg, 0.015 mmol, 13.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.48 - 1.60 (2 H, m), 1.91 (2 H, br d, *J*=13.42 Hz), 2.12 (2 H, br t, *J*=10.95 Hz), 2.62 (2 H, dt, *J*=28.52, 4.93 Hz), 2.62 (3 H, s), 2.89 (2 H, br d, *J*=11.77 Hz), 3.53 - 3.65 (1 H, m), 4.53 (2 H, dt, *J*=47.65, 4.95 Hz), 4.90 (2 H, td, *J*=15.81, 2.33 Hz), 6.53 (1 H, tt, *J*=54.40, 3.00 Hz), 6.84 (1 H, d, *J*=7.94 Hz), 6.98 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=2.46 Hz), 8.23 (1 H, d, *J*=1.64 Hz), 8.66 (1 H, d, *J*=1.92 Hz), 9.12 (1 H,

s); 다음에 대한 ESIMS 실험치: $C_{22}H_{25}F_3N_8$ *m/z* 459.2 (M+1).

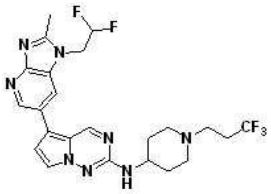


[1568]

[1569] 1882

[1570] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-(2,2-디플루오로에틸)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1882**.

[1571] 황색 고체 (18 mg, 0.038 mmol, 34.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.48 - 1.62 (2 H, m), 1.90 (2 H, br d, *J*=13.14 Hz), 2.22 - 2.32 (2 H, m), 2.62 (3 H, s), 2.73 (2 H, td, *J*=15.61, 4.38 Hz), 2.91 (2 H, br d, *J*=11.77 Hz), 3.53 - 3.65 (1 H, m), 4.85 - 4.97 (2 H, m), 6.14 (1 H, tt, *J*=55.95, 4.10 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.85 (1 H, d, *J*=7.94 Hz), 6.98 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=2.46 Hz), 8.23 (1 H, d, *J*=1.64 Hz), 8.66 (1 H, d, *J*=1.92 Hz), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{24}F_4N_8$ *m/z* 477.2 (M+1).

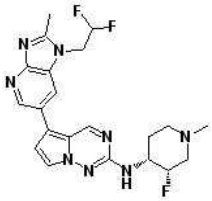


[1572]

[1573] 1883

[1574] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-(3,3,3-트리플루오로프로필)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1883**.

[1575] 짙은 황색 고체 (13 mg, 0.026 mmol, 16.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.45 - 1.59 (2 H, m), 1.87 - 1.96 (2 H, m), 2.01 - 2.10 (2 H, m), 2.41 - 2.48 (2 H, m), 2.52 - 2.56 (2 H, m), 2.62 (3 H, s), 2.88 (2 H, br d, *J*=11.50 Hz), 3.52 - 3.65 (1 H, m), 4.84 - 4.97 (2 H, m), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.84 (1 H, d, *J*=7.94 Hz), 6.98 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=2.46 Hz), 8.23 (1 H, d, *J*=1.64 Hz), 8.66 (1 H, d, *J*=1.92 Hz), 9.11 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_5N_8$ *m/z* 509.2 (M+1).



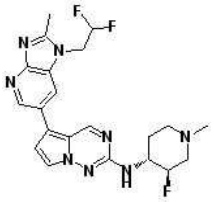
[1576]

[1577] 1884

[1578] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3S,4R)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1884**.

[1579] 짙은 황색 고체 (16 mg, 0.036 mmol, 29.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.74 (1 H, br d, *J*=11.77 Hz), 1.91 - 2.03 (1 H, m), 2.07 - 2.35 (2 H, m), 2.25 (3 H, br s), 2.63 (3 H, s), 2.87 (1 H, br d, *J*=2.74 Hz), 3.09 - 3.23 (1 H, m), 3.73 - 3.92 (1 H, m), 4.86 - 5.02 (2 H, m), 4.91 (1 H, br d, *J*=2.74 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.93 (1 H, br d, *J*=5.20 Hz), 7.02 (1 H, d, *J*=2.46 Hz),

7.73 (1 H, d, *J*=2.46 Hz), 8.24 (1 H, d, *J*=1.92 Hz), 8.67 (1 H, d, *J*=1.92 Hz), 9.15 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_3N_8$ *m/z* 445.2 (M+1).

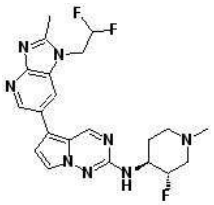


[1580]

[1581] 1885

[1582] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3R,4R)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1885**.

[1583] 짙은 황색 고체 (16 mg, 0.036 mmol, 29.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.46 - 1.66 (1 H, m), 1.94 - 2.16 (3 H, m), 2.26 (3 H, br s), 2.63 (3 H, s), 2.69 - 2.83 (1 H, m), 3.08 - 3.19 (1 H, m), 3.78 - 3.93 (1 H, m), 4.50 - 4.74 (1 H, m), 4.85 - 4.95 (2 H, m), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 7.01 (1 H, d, *J*=2.46 Hz), 7.08 (1 H, br d, *J*=7.94 Hz), 7.75 (1 H, d, *J*=2.46 Hz), 8.24 (1 H, d, *J*=1.64 Hz), 8.67 (1 H, d, *J*=1.92 Hz), 9.14 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_3N_8$ *m/z* 445.2 (M+1).

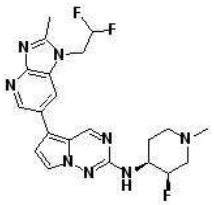


[1584]

[1585] 1886

[1586] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3S,4S)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1886**.

[1587] 짙은 황색 고체 (19 mg, 0.043 mmol, 35.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.66 (1 H, m), 1.93 - 2.16 (3 H, m), 2.26 (3 H, br s), 2.63 (3 H, s), 2.67 - 2.81 (1 H, m), 3.08 - 3.17 (1 H, m), 3.76 - 3.90 (1 H, m), 4.50 - 4.73 (1 H, m), 4.91 (2 H, td, *J*=15.88, 2.74 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 7.01 (1 H, d, *J*=2.46 Hz), 7.08 (1 H, br d, *J*=7.67 Hz), 7.75 (1 H, d, *J*=2.46 Hz), 8.24 (1 H, d, *J*=1.92 Hz), 8.67 (1 H, d, *J*=1.92 Hz), 9.14 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_3N_8$ *m/z* 445.2 (M+1).



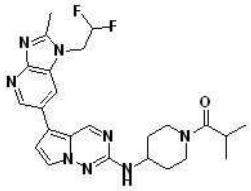
[1588]

[1589] 1887

[1590] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-((3R,4S)-3-플루오로-1-메틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1887**.

[1591] 짙은 황색 고체 (16 mg, 0.036 mmol, 33.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.71 (1 H, br dd, *J*=8.49, 3.83 Hz), 1.93 (1 H, qd, *J*=12.14, 3.56 Hz), 2.02 - 2.11 (1 H, m), 2.12 - 2.26 (1 H, m), 2.20 (3 H, s), 2.63 (3 H, s), 2.81 (1 H, br d, *J*=11.22 Hz), 3.00 - 3.12 (1 H, m), 3.70 - 3.86 (1 H, m), 4.87 (1 H, br d, *J*=3.29 Hz), 4.89 - 4.98 (2 H, m), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.89 (1 H, d,

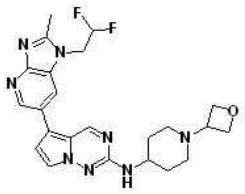
J=7.94 Hz), 7.01 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=2.46 Hz), 8.24 (1 H, d, *J*=1.92 Hz), 8.67 (1 H, d, *J*=2.19 Hz), 9.15 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_3N_8$ *m/z* 445.2 (M+1).

[1592] 

[1593] 1888

[1594] 1-(4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)-2-메틸프로판-1-온 **1888**.

[1595] 옅은 갈색 고체 (5 mg, 0.010 mmol, 5.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 0.94 - 1.06 (6 H, m), 1.34 (1 H, q, *J*=10.22 Hz), 1.44 (1 H, q, *J*=10.31 Hz), 1.94 (1 H, br d, *J*=12.32 Hz), 2.01 (1 H, br d, *J*=11.77 Hz), 2.63 (3 H, s), 2.71 - 2.81 (1 H, m), 2.90 (1 H, spt, *J*=6.71 Hz), 3.17 (1 H, br t, *J*=12.05 Hz), 3.79 - 3.91 (1 H, m), 3.95 (1 H, br d, *J*=12.87 Hz), 4.32 (1 H, br d, *J*=12.59 Hz), 4.91 (2 H, td, *J*=15.74, 2.46 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.92 (1 H, d, *J*=7.94 Hz), 7.00 (1 H, d, *J*=2.46 Hz), 7.74 (1 H, d, *J*=2.46 Hz), 8.24 (1 H, d, *J*=1.92 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.13 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{28}F_2N_8O$ *m/z* 483.2 (M+1).

[1596] 

[1597] 1889

[1598] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)-N-(1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1889**.

[1599] 짙은 황색 고체 (29 mg, 0.062 mmol, 54.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.47 - 1.61 (2 H, m), 1.87 (2 H, br t, *J*=11.36 Hz), 1.93 (2 H, br d, *J*=10.95 Hz), 2.62 (3 H, s), 2.69 (2 H, br d, *J*=10.13 Hz), 3.35 - 3.43 (1 H, m), 3.54 - 3.67 (1 H, m), 4.43 (2 H, br t, *J*=5.89 Hz), 4.53 (2 H, t, *J*=6.43 Hz), 4.84 - 4.97 (2 H, m), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.88 (1 H, br d, *J*=7.67 Hz), 6.98 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=2.46 Hz), 8.23 (1 H, d, *J*=1.64 Hz), 8.66 (1 H, d, *J*=2.19 Hz), 9.12 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8O$ *m/z* 469.3 (M+1).

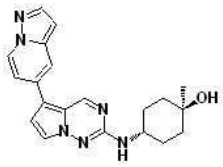
[1600] 

[1601] 1890

[1602] *trans*-4-((5-(1-(2,2-디플루오로에틸)-1H-벤조[d][1,2,3]트리아졸-6-일)피롤로 [2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 **1890**.

[1603] 황색 고체 (5 mg, 0.012 mmol, 8.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.15 (3 H, s), 1.39 - 1.53 (4 H, m), 1.57 - 1.66 (2 H, m), 1.84 - 1.93 (2 H, m), 3.65 (1 H, br dd, *J*=8.35, 3.97 Hz), 4.24 (1 H, s), 5.38 (2 H, td, *J*=15.54, 3.15 Hz), 6.62 (1 H, tt, *J*=54.30, 3.15 Hz), 6.79 (1 H, d, *J*=7.94 Hz), 7.03 (1

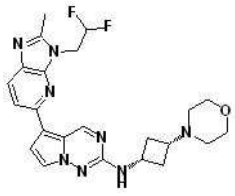
H, d, *J*=2.74 Hz), 7.73 - 7.78 (2 H, m), 8.10 (1 H, d, *J*=8.49 Hz), 8.14 (1 H, s), 9.19 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{23}F_2N_7O$ *m/z* 428.2 (M+1).

[1604] 

[1605] **1891**

[1606] *trans*-1-메틸-4-((5-(피라졸로[1,5-a]피리딘-5-일)피롤로[2,1-f][1,2,4] 트리아진-2-일)아미노)사이클로헥산-1-올 **1891**.

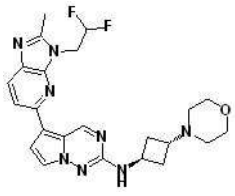
[1607] 황색 고체 (80 mg, 0.221 mmol, 71.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.14 (3 H, s), 1.36 - 1.52 (4 H, m), 1.57 - 1.66 (2 H, m), 1.82 - 1.94 (2 H, m), 3.64 (1 H, br dd, *J*=7.67, 3.56 Hz), 4.24 (1 H, s), 6.59 (1 H, d, *J*=1.92 Hz), 6.83 (1 H, d, *J*=7.94 Hz), 7.05 (1 H, d, *J*=2.46 Hz), 7.21 (1 H, dd, *J*=7.26, 1.78 Hz), 7.72 (1 H, d, *J*=2.46 Hz), 7.98 (1 H, s), 7.98 (1 H, s), 8.67 (1 H, d, *J*=7.12 Hz), 9.16 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{22}N_6O$ *m/z* 363.2 (M+1).

[1608] 

[1609] **1892**

[1610] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1893**.

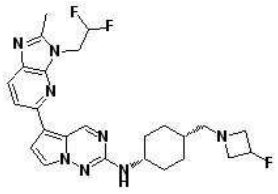
[1611] 황색 고체 (37 mg, 0.079 mmol, 11.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.02 - 2.13 (2 H, m), 2.18 - 2.35 (6 H, m), 2.61 (3 H, s), 2.79 - 2.87 (1 H, m), 3.60 (4 H, br s), 4.12 - 4.21 (1 H, m), 4.84 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.29 (1 H, br d, *J*=6.57 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8O$ *m/z* 469.2 (M+1).

[1612] 

[1613] **1893**

[1614] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*trans*-3-모르폴리노사이클로부틸)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1893**.

[1615] 황색 고체 (32 mg, 0.068 mmol, 9.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.75 - 1.86 (2 H, m), 2.26 (4 H, br s), 2.40 - 2.48 (3 H, m), 2.60 (3 H, s), 3.54 - 3.63 (4 H, m), 3.89 - 4.00 (1 H, m), 4.84 (2 H, td, *J*=16.08, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.18 (1 H, s), 7.24 (1 H, d, *J*=2.74 Hz), 7.63 (1 H, d, *J*=2.46 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8O$ *m/z* 469.2 (M+1).

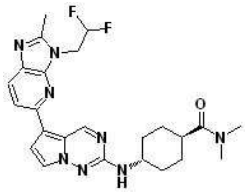


[1616]

[1617] 1894

[1618] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(*cis*-4-((3-플루오로아제티딘-1-일)메틸)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1894**.

[1619] 황색 고체 (5.7 mg, 0.011mmol, 22.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.48 (5 H, br s), 1.53 - 1.63 (2 H, m), 1.68 (2 H, br s), 2.37 - 2.44 (1 H, m), 2.51 - 2.53 (1 H, m), 2.61 (3 H, s), 2.93 - 3.12 (2 H, m), 3.47 - 3.63 (2 H, m), 3.79 (1 H, br d, *J*=3.29 Hz), 4.82 (2 H, td, *J*=15.95, 2.87 Hz), 5.05 - 5.28 (1 H, m), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.69 (1 H, br d, *J*=7.12 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.74 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{25}H_{29}F_3N_8$ *m/z* 250.2 (M/2+1).

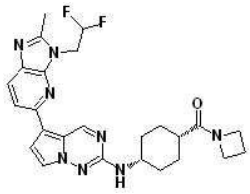


[1620]

[1621] 1895

[1622] *trans*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-N,N-디메틸사이클로헥산-1-카복사미드 **1895**.

[1623] 황색 고체 (8 mg, 0.017 mmol, 6.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.29 - 1.40 (2 H, m), 1.34 - 1.34 (2 H, m), 1.40 - 1.51 (2 H, m), 1.74 (2 H, br d, *J*=12.05 Hz), 2.05 (2 H, br dd, *J*=12.18, 2.60 Hz), 2.56 (1 H, tt, *J*=11.64, 3.42 Hz), 2.61 (3 H, s), 2.81 (3 H, s), 3.02 (3 H, s), 3.51 - 3.65 (1 H, m), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.81 (1 H, d, *J*=7.94 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{28}F_2N_8O$ *m/z* 483.2 (M+1).

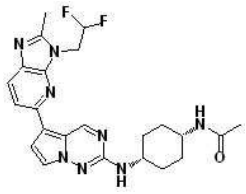


[1624]

[1625] 1896

[1626] 아제티딘-1-일(*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메탄온 **1896**.

[1627] 황색 고체 (7 mg, 0.014 mmol, 14.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.42 - 1.50 (2 H, m), 1.57 - 1.66 (2 H, m), 1.73 - 1.83 (2 H, m), 1.92 (2 H, dt, *J*=6.64, 3.39 Hz), 2.13 - 2.22 (2 H, m), 2.31 (1 H, tt, *J*=8.62, 4.11 Hz), 2.61 (3 H, s), 3.75 - 3.80 (1 H, m), 3.82 (2 H, t, *J*=7.67 Hz), 4.15 (2 H, t, *J*=7.53 Hz), 4.83 (2 H, td, *J*=15.95, 2.60 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.77 (1 H, d, *J*=6.30 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{26}F_2N_8O$ *m/z* 495.3 (M+1).

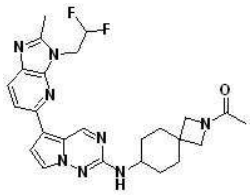


[1628]

[1629] 1898

[1630] N-(*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)아세트아미드 1898.

[1631] 황색 고체 (60 mg, 0.128 mmol, 72.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.52 - 1.59 (2 H, m), 1.61 - 1.73 (4 H, m), 1.74 - 1.80 (2 H, m), 1.82 (3 H, s), 2.61 (3 H, s), 3.68 (2 H, br d, *J*=3.29 Hz), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.72 (1 H, d, *J*=6.57 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, d, *J*=2.46 Hz), 7.71 - 7.75 (1 H, m), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{25}H_{28}F_2N_8O$ *m/z* 469.2 (M+1).

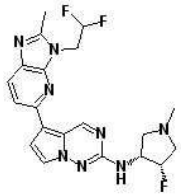


[1632]

[1633] 1899

[1634] 1-(7-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-2-아자스피로[3.5]노난-2-일)에탄-1-온 1899.

[1635] 황색 고체 (33 mg, 0.067 mmol, 54.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.27 - 1.41 (2 H, m), 1.50 - 1.62 (2 H, m), 1.73 - 1.79 (3 H, m), 1.88 (4 H, br d, *J*=10.13 Hz), 2.60 (3 H, s), 3.45 - 3.55 (2 H, m), 3.55 - 3.66 (1 H, m), 3.70 - 3.85 (2 H, m), 4.77 - 4.90 (2 H, m), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.74 (1 H, dd, *J*=12.05, 7.94 Hz), 7.23 (1 H, d, *J*=2.74 Hz), 7.65 (1 H, t, *J*=3.01 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{25}H_{28}F_2N_8O$ *m/z* 495.25 (M+1).

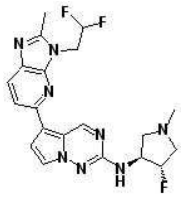


[1636]

[1637] 1900

[1638] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-4-플루오로-1-메틸피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 1900.

[1639] 황색 고체 (36 mg, 0.084 mmol, 26.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.33 (3 H, s), 2.61 (3 H, s), 2.62 - 2.72 (2 H, m), 2.95 (1 H, br t, *J*=8.21 Hz), 3.15 (1 H, ddd, *J*=30.20, 11.77, 4.65 Hz), 4.23 - 4.37 (1 H, m), 4.84 (2 H, td, *J*=16.02, 2.74 Hz), 5.22 (1 H, dtd, *J*=55.70, 4.86, 4.86, 2.05 Hz), 6.56 (1 H, tt, *J*=54.60, 3.00 Hz), 7.01 (1 H, d, *J*=7.94 Hz), 7.28 (1 H, d, *J*=2.74 Hz), 7.68 (1 H, d, *J*=2.46 Hz), 7.75 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_3N_8$ *m/z* 431.2 (M+1).

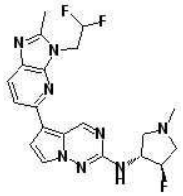


[1640]

[1641] 1901

[1642] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4S)-4-플루오로-1-메틸피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1901**.

[1643] 황색 고체 (34 mg, 0.079 mmol, 24.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.24 - 2.30 (1 H, m), 2.32 (3 H, s), 2.61 (3 H, s), 2.62 - 2.75 (1 H, m), 2.88 - 3.01 (1 H, m), 3.24 - 3.30 (1 H, m), 4.24 - 4.35 (1 H, m), 4.84 (2 H, td, *J*=16.02, 3.01 Hz), 5.09 (1 H, dd, *J*=53.20, 4.70 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.22 (1 H, d, *J*=7.12 Hz), 7.28 (1 H, d, *J*=2.74 Hz), 7.70 (1 H, d, *J*=2.46 Hz), 7.75 (1 H, d, *J*=8.21 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_3N_8$ *m/z* 431.2 (M+1).

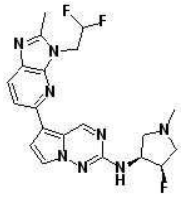


[1644]

[1645] 1902

[1646] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4R)-4-플루오로-1-메틸피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1902**.

[1647] 황색 고체 (28 mg, 0.065 mmol, 20.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.34 (4 H, br s), 2.61 (3 H, s), 2.66 - 2.80 (1 H, m), 2.91 - 3.05 (1 H, m), 3.28 - 3.31 (1 H, m), 4.24 - 4.38 (1 H, m), 4.84 (2 H, td, *J*=16.08, 2.87 Hz), 5.10 (1 H, dd, *J*=53.20, 4.25 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.22 (1 H, d, *J*=7.12 Hz), 7.28 (1 H, d, *J*=2.74 Hz), 7.71 (1 H, d, *J*=2.74 Hz), 7.75 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_3N_8$ *m/z* 431.2 (M+1).



[1648]

[1649] 1903

[1650] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-4-플루오로-1-메틸피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1903**.

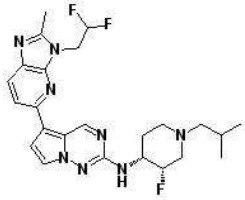
[1651] 황색 고체 (35 mg, 0.081 mmol, 25.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.33 (3 H, s), 2.61 (3 H, s), 2.63 - 2.73 (2 H, m), 2.95 (1 H, t, *J*=8.21 Hz), 3.16 (1 H, ddd, *J*=30.20, 11.77, 4.65 Hz), 4.23 - 4.37 (1 H, m), 4.84 (2 H, td, *J*=15.95, 2.87 Hz), 5.22 (1 H, dtd, *J*=55.65, 4.77, 4.77, 1.64 Hz), 6.56 (1 H, tt, *J*=54.60, 3.00 Hz), 7.01 (1 H, d, *J*=7.67 Hz), 7.28 (1 H, d, *J*=2.74 Hz), 7.68 (1 H, d, *J*=2.46 Hz), 7.75 (1 H, d, *J*=8.21 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}F_3N_8$ *m/z* 431.2 (M+1).

[1652] 

[1653] 1906

[1654] (3S,4R)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)테트라히드로푸란-3-올 1906.

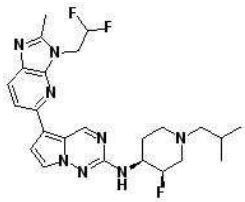
[1655] 황색 고체 (80 mg, 0.193 mmol, 57.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.61 (3 H, s), 3.55 (1 H, dd, *J*=9.31, 2.19 Hz), 3.64 - 3.73 (1 H, m), 3.92 (1 H, dd, *J*=9.31, 4.38 Hz), 4.00 - 4.07 (2 H, m), 4.26 (1 H, td, *J*=4.04, 2.05 Hz), 4.84 (2 H, td, *J*=16.08, 2.87 Hz), 5.21 (1 H, d, *J*=4.11 Hz), 6.55 (1 H, tt, *J*=54.50, 3.00 Hz), 7.13 (1 H, d, *J*=6.02 Hz), 7.26 (1 H, d, *J*=2.74 Hz), 7.68 (1 H, d, *J*=2.46 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.72 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{19}H_{19}F_2N_7O_2$ *m/z* 416.2 (M+1).

[1656] 

[1657] 1908

[1658] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-플루오로-1-이소부틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 1908.

[1659] 황색 고체 (22 mg, 0.045 mmol, 55.8% 수율). ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm 0.86 (6 H, br d, *J*=6.31 Hz), 1.65 - 1.83 (2 H, m), 1.86 - 1.99 (1 H, m), 2.02 - 2.11 (3 H, m), 2.12 - 2.26 (1 H, m), 2.61 (3 H, s), 2.85 (1 H, br d, *J*=10.70 Hz), 3.05 - 3.17 (1 H, m), 3.74 - 3.94 (1 H, m), 4.84 (2 H, td, *J*=16.05, 2.47 Hz), 4.83 - 4.96 (1 H, m), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.85 (1 H, br d, *J*=7.96 Hz), 7.26 (1 H, br s), 7.66 (1 H, d, *J*=2.47 Hz), 7.74 (1 H, d, *J*=8.23 Hz), 7.96 (1 H, d, *J*=8.23 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{29}F_3N_8$ *m/z* 487.3 (M+1).

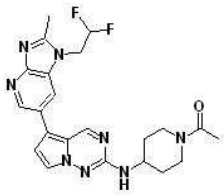
[1660] 

[1661] 1909

[1662] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-3-플루오로-1-이소부틸피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 1909.

[1663] 황색 고체 (15 mg, 0.031 mmol, 35.7% 수율). ^{1}H NMR (500 MHz, DMSO-d_6) δ ppm 0.86 (6 H, br d, *J*=6.31 Hz), 1.66 - 1.82 (2 H, m), 1.88 - 1.99 (1 H, m), 2.00 - 2.11 (3 H, m), 2.12 - 2.27 (1 H, m), 2.61 (3 H, s), 2.80 - 2.91 (1 H, m), 3.05 - 3.17 (1 H, m), 3.73 - 3.92 (1 H, m), 4.84 (2 H, td, *J*=15.85, 2.61 Hz), 4.94 (1 H, br s), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.86 (1 H, br d, *J*=7.68 Hz), 7.26 (1 H, d, *J*=2.47 Hz), 7.66 (1 H, d, *J*=2.47 Hz), 7.74 (1 H, d, *J*=8.51 Hz), 7.96 (1 H, d, *J*=8.51 Hz), 9.73 (1 H,

s); 다음에 대한 ESIMS 실험치: $C_{24}H_{29}F_3N_8$ *m/z* 487.3 (M+1).



[1664]

[1665] 1910

[1666] 1-(4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)에탄-1-온 **1910**.

[1667] 옅은 갈색 고체 (8 mg, 0.0178 mmol, 3.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.29 - 1.39 (1 H, m), 1.40 - 1.53 (1 H, m), 1.90 - 2.00 (2 H, m), 2.01 (3 H, s), 2.63 (3 H, s), 2.71 - 2.81 (1 H, m), 3.13 - 3.23 (1 H, m), 3.78 - 3.89 (2 H, m), 4.28 (1 H, br dd, *J*=13.42, 1.37 Hz), 4.91 (2 H, td, *J*=15.88, 2.74 Hz), 6.53 (1 H, tt, *J*=54.60, 3.00 Hz), 6.95 (1 H, d, *J*=7.94 Hz), 6.99 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=2.46 Hz), 8.24 (1 H, d, *J*=1.92 Hz), 8.66 (1 H, d, *J*=1.92 Hz), 9.13 (1 H, s) 다음에 대한 ESIMS 실험치: $C_{22}H_{24}F_2N_8O$ *m/z* 455.2 (M+1).

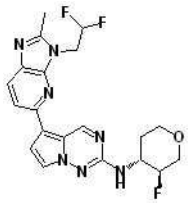


[1668]

[1669] 1911

[1670] (S)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸피페리딘-2-온 **1911**.

[1671] 황색 고체 (12 mg, 0.027 mmol, 67.9% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.90 - 1.97 (1 H, m), 1.98 - 2.06 (1 H, m), 2.28 - 2.44 (2 H, m), 2.61 (3 H, s), 2.81 (3 H, s), 3.26 (1 H, dd, *J*=12.05, 7.94 Hz), 3.58 (1 H, dd, *J*=11.77, 4.93 Hz), 4.05 - 4.16 (1 H, m), 4.84 (2 H, td, *J*=15.95, 2.60 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.13 (1 H, d, *J*=7.12 Hz), 7.27 (1 H, d, *J*=2.46 Hz), 7.70 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{22}F_2N_8O$ *m/z* 441.2 (M+1).



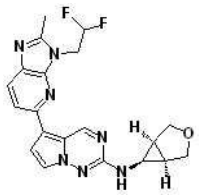
[1672]

[1673] 1912

[1674] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-플루오로테트라히드로-2H-피란-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1912**.

[1675] 황색 고체 (17 mg, 0.039 mmol, 62.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.57 - 1.67 (1 H, m), 2.05 - 2.12 (1 H, m), 2.61 (3 H, s), 3.43 (1 H, ddd, *J*=11.43, 8.15, 6.16 Hz), 3.46 - 3.52 (1 H, m), 3.79 - 3.87 (1 H, m), 3.97 - 4.05 (1 H, m), 4.06 - 4.16 (1 H, m), 4.49 - 4.66 (1 H, m), 4.84 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 7.17 (1 H, d, *J*=8.21 Hz), 7.27 (1 H, d, *J*=2.46

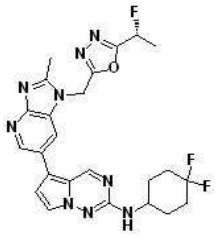
Hz), 7.69 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{20}F_3N_7O$ *m/z* 432.2 (M+1).

[1676] 

[1677] **1914**

[1678] N-((1R,5S,6s)-3-옥사바이사이클로[3.1.0]헥산-6-일)-5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1914**.

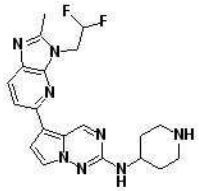
[1679] 황색 고체 (58 mg, 0.141 mmol, 80.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.03 (2 H, d, *J*=6.84 Hz), 2.61 (3 H, s), 2.89 (1 H, td, *J*=6.78, 3.42 Hz), 3.84 (4 H, s), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.57 (1 H, d, *J*=3.29 Hz), 7.26 (1 H, d, *J*=2.74 Hz), 7.69 (1 H, d, *J*=2.46 Hz), 7.74 (1 H, d, *J*=8.21 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{19}F_2N_7O$ *m/z* 412.2 (M+1).

[1680] 

[1681] **1915**

[1682] (R)-N-(4,4-디플루오로사이클로헥실)-5-(1-((5-(1-플루오로에틸)-1,3,4-옥사디아졸-2-일)메틸)-2-메틸-1H-이미다조[4,5-b]피리딘-6-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1915**.

[1683] 베이지색 고체 (15 mg, 0.029 mmol, 16.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.59 - 1.68 (2 H, m), 1.70 (3 H, dd, *J*=24.10, 6.55 Hz), 1.86 - 2.03 (4 H, m), 2.03 - 2.15 (2 H, m), 2.65 (3 H, s), 3.80 (1 H, br d, *J*=8.21 Hz), 5.97 (1 H, dq, *J*=47.15, 6.60 Hz), 6.04 (2 H, s), 6.96 - 7.01 (2 H, m), 7.72 (1 H, d, *J*=2.19 Hz), 8.28 (1 H, d, *J*=2.19 Hz), 8.69 (1 H, d, *J*=2.19 Hz), 9.13 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{24}H_{24}F_3N_9O$ *m/z* 512.2 (M+1).

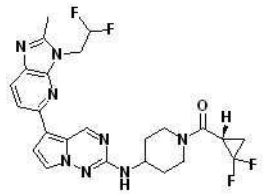
[1684] 

[1685] **1916**

[1686] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1916**.

[1687] 황색 고체 (220 mg, 0.533 mmol, 58.2% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.36 (2 H, qd, *J*=11.59, 3.83 Hz), 1.88 (2 H, br d, *J*=9.86 Hz), 2.51 - 2.55 (2 H, m), 2.60 (3 H, s), 2.96 (2 H, br d, *J*=12.32 Hz), 3.59 - 3.72 (1 H, m), 4.83 (2 H, td, *J*=15.95, 2.60 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.80 (1 H, d, *J*=7.94 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.49 Hz), 7.95

(1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{22}F_2N_8$ *m/z* 413.2 (M+1).

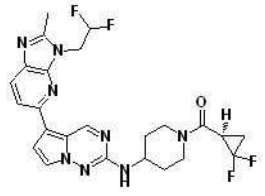


[1688]

[1689] **1917**

[1690] (S)-(2,2-디플루오로사이클로프로필)(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 **1917**.

[1691] 황색 고체 (9 mg, 0.017 mmol, 14.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.30 - 1.62 (2 H, m), 1.78 - 1.87 (1 H, m), 1.87 - 1.94 (1 H, m), 1.97 (1 H, br d, *J*=13.42 Hz), 1.99 - 2.12 (1 H, m), 2.61 (3 H, s), 2.86 - 2.98 (1 H, m), 3.10 - 3.30 (2 H, m), 3.85 - 3.97 (1 H, m), 3.99 - 4.14 (1 H, m), 4.22 - 4.34 (1 H, m), 4.77 - 4.91 (2 H, m), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.97 (1 H, dd, *J*=7.80, 4.24 Hz), 7.25 (1 H, d, *J*=2.46 Hz), 7.67 (1 H, dd, *J*=5.34, 2.60 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.72 (1 H, d, *J*=1.37 Hz); 다음에 대한 ESIMS 실험치: $C_{24}H_{24}F_4N_8O$ *m/z* 517.2 (M+1).

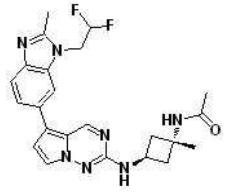


[1692]

[1693] **1918**

[1694] (R)-(2,2-디플루오로사이클로프로필)(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 **1918**.

[1695] 황색 고체 (14 mg, 0.027 mmol, 22.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.29 - 1.62 (2 H, m), 1.78 - 1.86 (1 H, m), 1.87 - 1.94 (1 H, m), 1.97 (1 H, br d, *J*=13.42 Hz), 1.99 - 2.12 (1 H, m), 2.61 (3 H, s), 2.85 - 2.98 (1 H, m), 3.10 - 3.31 (2 H, m), 3.86 - 3.97 (1 H, m), 3.99 - 4.13 (1 H, m), 4.28 (1 H, br t, *J*=12.32 Hz), 4.77 - 4.91 (2 H, m), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.97 (1 H, dd, *J*=7.94, 4.11 Hz), 7.25 (1 H, d, *J*=2.46 Hz), 7.67 (1 H, dd, *J*=5.48, 2.74 Hz), 7.73 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.72 (1 H, d, *J*=1.37 Hz); 다음에 대한 ESIMS 실험치: $C_{24}H_{24}F_4N_8O$ *m/z* 517.2 (M+1).



[1696]

[1697] **1920**

[1698] N-((1r,3r)-3-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-벤조[d]이미다졸-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로부틸)아세트아미드 **1920**.

[1699] 황색 고체 (23 mg, 0.051 mmol, 24.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.37 (3 H, s), 1.82 (3 H, s), 1.90 - 2.01 (2 H, m), 2.56 (3 H, s), 2.65 (2 H, ddd, *J*=10.20, 7.87, 2.74 Hz), 4.19 (1 H, sxt, *J*=7.83 Hz), 4.85 (2 H, td, *J*=15.88, 2.46 Hz), 6.49 (1 H, tt, *J*=54.50, 3.00 Hz), 6.89 (1 H, d, *J*=2.46 Hz), 7.16 (1 H, d, *J*=7.12 Hz), 7.45 (1 H, dd, *J*=8.35, 1.51 Hz), 7.57 (1 H, d, *J*=8.21 Hz), 7.66 (1 H,

d, *J*=2.46 Hz), 7.80 (1 H, s), 7.95 (1 H, s), 9.06 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_2N_7O$ *m/z* 454.2 (M+1).

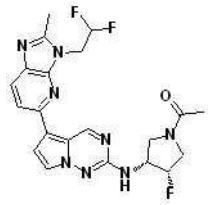


[1700]

[1701] **1940**

[1702] 1-((3S,4R)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-4-플루오로피롤리딘-1-일)에탄-1-온 **1940**.

[1703] 황색 고체 (9 mg, 0.020 mmol, 45.4% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.93 - 2.03 (3 H, m), 2.61 (3 H, s), 3.47 - 3.78 (2 H, m), 3.81 (0.5 H, s), 3.84 - 3.92 (1 H, m), 3.97 (0.5 H, t, *J*=9.03 Hz), 4.31 - 4.62 (1 H, m), 4.77 - 4.92 (2 H, m), 5.23 - 5.51 (1 H, m), 6.56 (1 H, tt, *J*=54.50, 3.00 Hz), 7.26 - 7.32 (2 H, m), 7.70 (1 H, dd, *J*=4.65, 2.74 Hz), 7.76 (1 H, dd, *J*=8.35, 0.96 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.76 (1 H, d, *J*=3.83 Hz); 다음에 대한 ESIMS 실험치: $C_{21}H_{21}F_3N_8O$ *m/z* 459.2 (M+1).

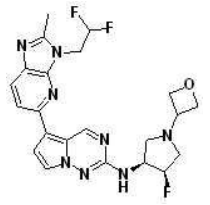


[1704]

[1705] **1941**

[1706] 1-((3R,4S)-3-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-4-플루오로피롤리딘-1-일)에탄-1-온 **1941**.

[1707] 황색 고체 (8 mg, 0.018 mmol, 22.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.94 - 2.01 (3 H, m), 2.61 (3 H, s), 3.48 - 3.76 (2 H, m), 3.81 (0.5 H, s), 3.84 - 3.91 (1 H, m), 3.97 (0.5 H, t, *J*=9.03 Hz), 4.33 - 4.60 (1 H, m), 4.79 - 4.90 (2 H, m), 5.27 - 5.48 (1 H, m), 6.56 (1 H, tt, *J*=54.50, 3.00 Hz), 7.27 - 7.32 (2 H, m), 7.70 (1 H, dd, *J*=4.65, 2.46 Hz), 7.76 (1 H, dd, *J*=8.35, 0.96 Hz), 7.97 (1 H, d, *J*=8.49 Hz), 9.76 (1 H, d, *J*=4.11 Hz); 다음에 대한 ESIMS 실험치: $C_{21}H_{21}F_3N_8O$ *m/z* 459.2 (M +1).



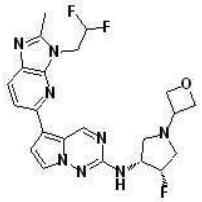
[1708]

[1709] **1944**

[1710] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-4-플루오로-1-(옥세탄-3-일)피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1944**.

[1711] 황색 고체 (80 mg, 0.169 mmol, 51.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.61 (3 H, s), 2.71 (1 H, t, *J*=9.17 Hz), 2.80 (1 H, dd, *J*=28.50, 11.20 Hz), 3.04 (1 H, t, *J*=8.21 Hz), 3.17 (1 H, ddd, *J*=33.45, 12.05, 4.40 Hz), 3.80 (1 H, quin, *J*=6.16 Hz), 4.23 - 4.40 (1 H, m), 4.48 (2 H, t, *J*=5.89 Hz), 4.60 (2 H, t, *J*=6.57 Hz), 4.84 (2 H, td, *J*=16.02, 2.74 Hz), 5.26 (1 H, dt, *J*=56.25, 3.55 Hz), 6.56 (1 H, tt, *J*=54.50, 3.00 Hz), 7.06 (1 H, d, *J*=7.94 Hz), 7.28 (1 H, d, *J*=2.74 Hz), 7.69 (1 H, d, *J*=2.46 Hz), 7.75

(1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}F_3N_8O$ *m/z* 473.3 (M+1).

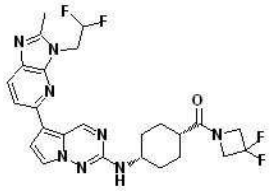


[1712]

[1713] **1945**

[1714] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-4-플루오로-1-(옥세탄-3-일)피롤리딘-3-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1945**.

[1715] 황색 고체 (59 mg, 0.125 mmol, 38.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 2.61 (3 H, s), 2.71 (1 H, br t, *J*=9.17 Hz), 2.80 (1 H, dd, *J*=29.65, 11.80 Hz), 3.04 (1 H, br t, *J*=8.21 Hz), 3.17 (1 H, ddd, *J*=33.45, 12.05, 4.10 Hz), 3.81 (1 H, quin, *J*=5.95 Hz), 4.26 - 4.40 (1 H, m), 4.48 (2 H, t, *J*=5.89 Hz), 4.60 (2 H, t, *J*=6.57 Hz), 4.84 (2 H, td, *J*=15.95, 2.87 Hz), 5.26 (1 H, dt, *J*=56.40, 3.55 Hz), 6.56 (1 H, tt, *J*=54.50, 3.00 Hz), 7.06 (1 H, br d, *J*=7.67 Hz), 7.28 (1 H, d, *J*=2.74 Hz), 7.69 (1 H, d, *J*=2.46 Hz), 7.75 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}F_3N_8O$ *m/z* 473.2 (M +1).

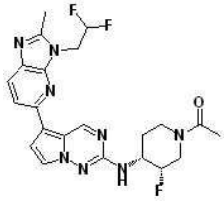


[1716]

[1717] **1950**

[1718] (3,3-디플루오로아제티딘-1-일)(*cis*-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로헥실)메탄온 **1950**.

[1719] 황색 고체 (10 mg, 0.019 mmol, 19.1% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.49 - 1.57 (2 H, m), 1.60 - 1.68 (2 H, m), 1.77 - 1.85 (2 H, m), 1.86 - 1.94 (2 H, m), 2.44 (1 H, tt, *J*=8.38, 4.07 Hz), 2.61 (3 H, s), 3.79 (1 H, br d, *J*=5.48 Hz), 4.46 (4 H, dt, *J*=195.00, 12.35 Hz), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.60, 3.00 Hz), 6.81 (1 H, d, *J*=6.57 Hz), 7.22 (1 H, d, *J*=2.46 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.70 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{25}H_{26}F_4N_8O$ *m/z* 531.2 (M+1).



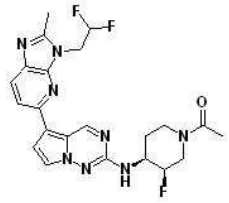
[1720]

[1721] **1951**

[1722] 1-((3S,4R)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-3-플루오로피페리딘-1-일)에탄-1-온 **1951**.

[1723] 황색 고체 (31 mg, 0.066 mmol, 58.8% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.67 - 1.90 (2 H, m), 1.98 - 2.07 (3 H, m), 2.61 (3 H, s), 2.67 - 2.77 (0.5 H, m), 2.84 - 2.99 (0.5 H, m), 3.18 - 3.27 (0.5 H,

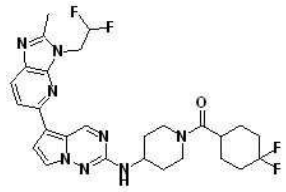
m), 3.38 - 3.52 (0.5 H, m), 3.91 (0.5 H, br d, *J*=13.14 Hz), 3.98 - 4.06 (0.5 H, m), 4.07 - 4.18 (1 H, m), 4.41 - 4.49 (0.5 H, m), 4.66 - 4.76 (0.5 H, m), 4.84 (2 H, td, *J*=15.95, 2.33 Hz), 4.90 - 5.06 (1 H, m), 6.55 (1 H, tt, *J*=54.50, 3.00 Hz), 7.00 (1 H, br d, *J*=7.94 Hz), 7.27 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.21 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}F_3N_8O$ *m/z* 473.25 (M+1).

[1724] 

[1725] 1952

[1726] 1-((3R,4S)-4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-3-플루오로피페리딘-1-일)에탄-1-온 1952.

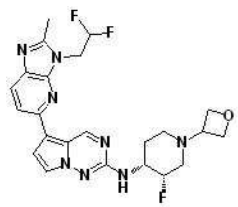
[1727] 황색 고체 (30 mg, 0.064 mmol, 51.6% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.65 - 1.75 (1 H, m), 1.80 (0.5 H, ddd, *J*=13.21, 9.51, 4.11 Hz), 1.86 (0.5 H, dd, *J*=12.46, 3.97 Hz), 1.98 - 2.07 (3 H, m), 2.61 (3 H, s), 2.68 - 2.76 (0.5 H, m), 2.84 - 2.98 (0.5 H, m), 3.18 - 3.26 (0.5 H, m), 3.38 - 3.51 (0.5 H, m), 3.91 (0.5 H, br d, *J*=14.78 Hz), 3.98 - 4.06 (0.5 H, m), 4.06 - 4.17 (1 H, m), 4.40 - 4.50 (0.5 H, m), 4.64 - 4.75 (0.5 H, m), 4.84 (2 H, td, *J*=16.02, 2.74 Hz), 4.91 - 5.07 (1 H, m), 6.55 (1 H, tt, *J*=54.50, 3.00 Hz), 7.00 (1 H, d, *J*=7.94 Hz), 7.27 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.49 Hz), 9.74 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}F_3N_8O$ *m/z* 473.2 (M +1).

[1728] 

[1729] 1953

[1730] (4,4-디플루오로사이클로헥실)(4-((5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)피페리딘-1-일)메탄온 1953.

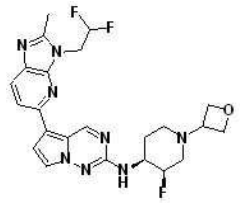
[1731] 황색 고체 (18 mg, 0.032 mmol, 44.3% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.30 - 1.39 (1 H, m), 1.41 - 1.51 (1 H, m), 1.53 - 1.67 (2 H, m), 1.73 (2 H, br d, *J*=13.14 Hz), 1.81 - 1.92 (1 H, m), 1.92 - 1.98 (2 H, m), 1.98 - 2.12 (3 H, m), 2.61 (3 H, s), 2.74 - 2.81 (1 H, m), 2.84 (1 H, br t, *J*=11.23 Hz), 3.20 (1 H, br t, *J*=11.91 Hz), 3.82 - 3.94 (1 H, m), 3.99 (1 H, br d, *J*=13.42 Hz), 4.31 (1 H, br d, *J*=12.59 Hz), 4.83 (2 H, td, *J*=16.02, 2.74 Hz), 6.55 (1 H, tt, *J*=54.50, 3.00 Hz), 6.91 (1 H, d, *J*=7.94 Hz), 7.24 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.73 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.49 Hz), 9.71 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{27}H_{30}F_4N_8O$ *m/z* 559.3 (M+1).

[1732] 

[1733] 1954

[1734] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3S,4R)-3-플루오로-1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1954**.

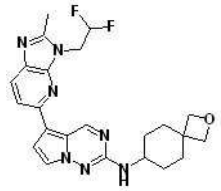
[1735] 황색 고체 (67 mg, 0.138 mmol, 38.0% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.75 (1 H, br d, *J*=9.86 Hz), 1.92 (1 H, qd, *J*=12.09, 3.42 Hz), 1.99 - 2.08 (1 H, m), 2.17 (1 H, dd, *J*=37.05, 12.90 Hz), 2.61 (3 H, s), 2.76 (1 H, br d, *J*=9.31 Hz), 2.99 (1 H, br t, *J*=10.13 Hz), 3.50 (1 H, quin, *J*=6.37 Hz), 3.77 - 3.94 (1 H, m), 4.41 (1 H, t, *J*=6.16 Hz), 4.46 (1 H, t, *J*=6.16 Hz), 4.54 (2 H, td, *J*=6.57, 3.01 Hz), 4.79 - 4.87 (2 H, m), 4.92 (1 H, d, *J*=52.65 Hz), 6.55 (1 H, tt, *J*=54.50, 3.00 Hz), 6.92 (1 H, d, *J*=7.94 Hz), 7.26 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.46 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_3N_8O$ *m/z* 487.3 (M+1).

[1736] 

[1737] **1955**

[1738] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-((3R,4S)-3-플루오로-1-(옥세탄-3-일)피페리딘-4-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1955**.

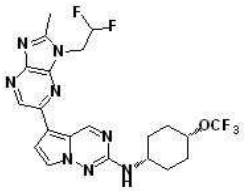
[1739] 황색 고체 (69 mg, 0.142 mmol, 40.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.71 - 1.79 (1 H, m), 1.92 (1 H, qd, *J*=12.00, 3.70 Hz), 1.99 - 2.07 (1 H, m), 2.17 (1 H, dd, *J*=37.00, 12.90 Hz), 2.61 (3 H, s), 2.76 (1 H, br d, *J*=10.68 Hz), 2.95 - 3.04 (1 H, m), 3.50 (1 H, quin, *J*=6.37 Hz), 3.79 - 3.93 (1 H, m), 4.41 (1 H, t, *J*=6.16 Hz), 4.46 (1 H, t, *J*=6.02 Hz), 4.54 (2 H, td, *J*=6.43, 3.01 Hz), 4.79 - 4.87 (2 H, m), 4.93 (1 H, d, *J*=52.65 Hz), 6.55 (1 H, tt, *J*=54.50, 3.00 Hz), 6.92 (1 H, d, *J*=7.94 Hz), 7.26 (1 H, d, *J*=2.74 Hz), 7.66 (1 H, d, *J*=2.74 Hz), 7.74 (1 H, d, *J*=8.49 Hz), 7.96 (1 H, d, *J*=8.21 Hz), 9.73 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_3N_8O$ *m/z* 487.3 (M +1).

[1740] 

[1741] **1961**

[1742] 5-(3-(2,2-디플루오로에틸)-2-메틸-3H-이미다조[4,5-b]피리딘-5-일)-N-(2-옥사스피로[3.5]노난-7-일)피롤로[2,1-f][1,2,4]트리아진-2-아민 **1961**.

[1743] 황색 고체 (60 mg, 0.132 mmol, 38.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.21 - 1.33 (2 H, m), 1.53 (2 H, td, *J*=12.87, 3.29 Hz), 1.88 (2 H, br dd, *J*=13.14, 3.29 Hz), 2.07 (2 H, br d, *J*=12.87 Hz), 2.60 (3 H, s), 3.50 - 3.63 (1 H, m), 4.24 (2 H, s), 4.33 (2 H, s), 4.83 (2 H, td, *J*=15.95, 2.87 Hz), 6.55 (1 H, tt, *J*=54.50, 3.00 Hz), 6.71 (1 H, d, *J*=7.94 Hz), 7.22 (1 H, d, *J*=2.74 Hz), 7.64 (1 H, d, *J*=2.46 Hz), 7.72 (1 H, d, *J*=8.21 Hz), 7.95 (1 H, d, *J*=8.21 Hz), 9.69 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{23}H_{25}F_2N_7O$ *m/z* 454.25 (M+1).

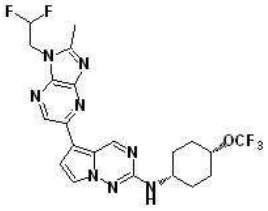


[1744]

[1745] 1970

[1746] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 1970.

[1747] 백색 고체 (6.52 mg, 0.013 mmol, 10.0% 수율). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.60 - 1.80 (4 H, m), 1.81 - 1.89 (2 H, m), 1.95 (2 H, br dd, *J*=9.05, 3.91 Hz), 2.68 (3 H, s), 3.67 - 3.80 (1 H, m), 4.62 (1 H, br d, *J*=2.69 Hz), 4.84 - 4.99 (2 H, m), 6.56 (1 H, tt, *J*=54.60, 3.00 Hz), 6.98 (1 H, d, *J*=7.95 Hz), 7.39 (1 H, d, *J*=2.69 Hz), 7.70 (1 H, d, *J*=2.32 Hz), 8.97 (1 H, s), 9.65 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{21}F_5N_8O$ *m/z* 497.1 (M+1).

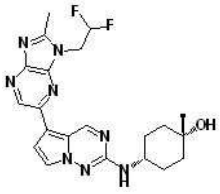


[1748]

[1749] 1971

[1750] 5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-5-일)-N-(*cis*-4-(트리플루오로메톡시)사이클로헥실)피롤로[2,1-f][1,2,4]트리아진-2-아민 1971.

[1751] 백색 고체 (6.75 mg, 0.014 mmol, 10.3% 수율). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.62 - 1.80 (4 H, m), 1.81 - 1.89 (2 H, m), 1.91 - 2.02 (2 H, m), 2.69 (3 H, s), 3.66 - 3.78 (1 H, m), 4.60 (1 H, br s), 4.74 - 4.91 (2 H, m), 6.51 (1 H, tt, *J*=54.08, 3.00 Hz), 7.09 (1 H, d, *J*=7.58 Hz), 7.36 (1 H, d, *J*=2.81 Hz), 7.70 (1 H, d, *J*=2.69 Hz), 8.87 (1 H, s), 9.57 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{21}F_5N_8O$ *m/z* 497.1 (M+1).

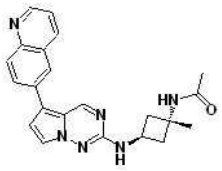


[1752]

[1753] 1974

[1754] *cis*-4-((5-(1-(2,2-디플루오로에틸)-2-메틸-1H-이미다조[4,5-b]피라진-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)-1-메틸사이클로헥산-1-올 1974.

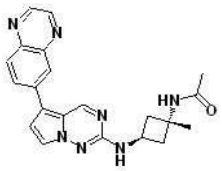
[1755] 황색 폭신한 고체 (27 mg, 0.06 mmol, 24.8% 수율). ^{1}H NMR (400 MHz, DMSO-d_6) δ ppm 1.13 (3 H, s), 1.31 - 1.44 (2 H, m), 1.54 - 1.62 (2 H, m), 1.64 - 1.75 (4 H, m), 2.68 (3 H, s), 3.47 - 3.62 (1 H, m), 4.03 (1 H, s), 4.83 - 4.97 (2 H, m), 6.56 (1 H, tt, *J*=54.30, 3.00 Hz), 6.81 (1 H, d, *J*=8.07 Hz), 7.37 (1 H, d, *J*=2.69 Hz), 7.68 (1 H, d, *J*=2.57 Hz), 8.97 (1 H, s), 9.63 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{24}F_2N_8O$ *m/z* 443.2 (M+1).

[1756] 

[1757] 1980

[1758] N-((1r,3r)-1-메틸-3-((5-(퀴놀린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸)아세트아미드 1980.

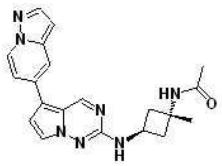
[1759] 황색 고체 (4 mg, 0.010 mmol, 11.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.37 (3 H, s), 1.82 (3 H, s), 1.91 - 2.02 (2 H, m), 2.60 - 2.71 (2 H, m), 4.20 (1 H, sxt, *J*=7.72 Hz), 7.09 (1 H, d, *J*=2.74 Hz), 7.30 (1 H, d, *J*=7.12 Hz), 7.54 (1 H, dd, *J*=8.35, 4.24 Hz), 7.73 (1 H, d, *J*=2.46 Hz), 7.95 (1 H, s), 8.03 - 8.07 (1 H, m), 8.08 - 8.12 (1 H, m), 8.29 (1 H, d, *J*=1.92 Hz), 8.43 (1 H, dd, *J*=8.35, 1.23 Hz), 8.86 (1 H, dd, *J*=4.24, 1.78 Hz), 9.23 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{22}N_6O$ *m/z* 387.2 (M+1).

[1760] 

[1761] 1981

[1762] N-((1r,3r)-1-메틸-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸)아세트아미드 1981.

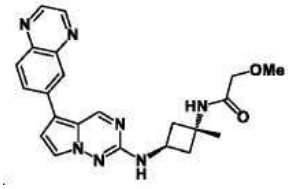
[1763] 황색 고체 (14 mg, 0.036 mmol, 40.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.37 (3 H, s), 1.82 (3 H, s), 1.90 - 2.01 (2 H, m), 2.66 (2 H, ddd, *J*=10.27, 7.94, 2.60 Hz), 4.20 (1 H, sxt, *J*=7.72 Hz), 7.19 (1 H, d, *J*=2.74 Hz), 7.36 (1 H, d, *J*=7.12 Hz), 7.75 (1 H, d, *J*=2.46 Hz), 7.96 (1 H, s), 8.13 (1 H, d, *J*=8.76 Hz), 8.23 (1 H, dd, *J*=8.76, 1.92 Hz), 8.31 (1 H, d, *J*=2.19 Hz), 8.90 (1 H, d, *J*=1.92 Hz), 8.95 (1 H, d, *J*=1.92 Hz), 9.19 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{21}H_{21}N_7O$ *m/z* 388.2 (M+1).

[1764] 

[1765] 1983

[1766] N-(*trans*-1-메틸-3-((5-(피라졸로[1,5-a]피리딘-5-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸)아세트아미드 1983.

[1767] 황색 고체 (10 mg, 0.027 mmol, 22.5% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.36 (3 H, s), 1.82 (3 H, s), 1.91 - 2.02 (2 H, m), 2.60 - 2.71 (2 H, m), 4.12 - 4.26 (1 H, m), 6.59 (1 H, d, *J*=1.64 Hz), 7.06 (1 H, d, *J*=2.46 Hz), 7.21 (1 H, dd, *J*=7.26, 2.05 Hz), 7.32 (1 H, d, *J*=7.39 Hz), 7.70 (1 H, d, *J*=2.19 Hz), 7.95 (1 H, s), 7.98 - 8.00 (2 H, m), 8.67 (1 H, d, *J*=7.12 Hz), 9.17 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{20}H_{21}N_7O$ *m/z* 376.2 (M+1).

[1768] 

[1769] 1985

[1770] 2-메톡시-N-(*trans*-1-메틸-3-((5-(퀸옥살린-6-일)피롤로[2,1-f][1,2,4]트리아진-2-일)아미노)사이클로부틸)아세트아미드 1985.

[1771] 황색 고체 (8 mg, 0.019 mmol, 14.7% 수율). ^{1}H NMR (499 MHz, DMSO-d_6) δ ppm 1.40 (3 H, s), 1.94 - 2.06 (2 H, m), 2.69 - 2.81 (2 H, m), 3.33 (3 H, s), 3.79 (2 H, s), 4.19 (1 H, sxt, *J*=7.67 Hz), 7.19 (1 H, d, *J*=2.46 Hz), 7.37 (1 H, d, *J*=7.12 Hz), 7.74 (1 H, s), 7.76 (1 H, d, *J*=2.46 Hz), 8.13 (1 H, d, *J*=8.76 Hz), 8.23 (1 H, dd, *J*=8.76, 1.92 Hz), 8.31 (1 H, d, *J*=1.92 Hz), 8.90 (1 H, d, *J*=1.92 Hz), 8.95 (1 H, d, *J*=1.64 Hz), 9.19 (1 H, s); 다음에 대한 ESIMS 실험치: $C_{22}H_{23}N_7O_2$ *m/z* 418.2 (M+1).

[1772] **실시예 13.**

[1773] 대표적인 화합물은 아래 설명된 대로 DYRK1A 키나제 활성에 대한 분석 절차를 사용하여 스크리닝했다.

[1774] 각 화합물을 10mM 스톡으로서 DMSO에 용해시키고 화합물 소스 플레이트를 제조하는 데 사용했다. 연속 희석(1:3, 10μM에서 0.00016μM까지의 11점 용량-반응 곡선) 및 화합물 전달은 ECHO 550(Labcyte, Sunnyvale, CA)을 사용하여 1536웰 검은색 벽의 둥근 바닥 플레이트(Corning)로 수행했다.

[1775] DYRK1A 키나제 분석은 제조업체의 지침(Life Technologies - a Division of Thermo-Fisher)에 따라 Ser/Thr 18 펩티드 Z-lyte 분석 키트를 사용하여 실행했다. 이는 쿠마린 방출/플루오레세인 방출의 비율로 표시되는 키나제 활성을 검출하기 위해 쿠마린과 플루오레세인 사이의 형광 공명 에너지 전달(FRET)을 사용하는 비방사성 분석이다.

[1776] 간략하게, 재조합 DYRK1A 키나제, ATP 및 Ser/Thr 펩티드 18을 1X 키나제 완충액에서 각각 0.25μg/mL, 15μM 및 4μM의 최종 농도로 제조했다. 혼합물을 대표 화합물과 함께 실온에서 1시간 동안 배양하였다. 모든 반응은 이중으로 수행되었다. Ser/Thr 18의 인산화되지 않은("0% 대조") 및 인산화된("100% 대조") 형태는 대조 반응으로 사용되었다. 추가적으로, 스타우로스포린(상위 1uM)의 11점 용량-반응 곡선을 실행하여 양성 화합물 대조군으로 사용했다.

[1777] 인큐베이션 후, 현상 시약 A를 현상 완충액에 희석한 후 반응물에 첨가하고 실온에서 1시간 동안 추가로 인큐베이션했다. 쿠마린 신호를 검출하기 위해 Ex 400 Em 455에서 플레이트를 판독하고, 신호를 측정하기 위해 Ex 400 Em 520에서 판독했다(EnVision Multilabel Plate Reader, PerkinElmer).

[1778] 방출비(Em)는 쿠마린(C) 방출 신호(445 nm에서)/플루오레세인(F) 방출 신호(520 nm에서)의 비율로 계산되었다. 인산화율은 다음 공식을 사용하여 계산되었다: [1 - ((Em 비율 X F100%)-C100%)/((C0%-C100%) + (Em 비율 X (F100% - F0%)))]. 용량-반응 곡선을 생성하고, Dotmatics' Studies Software(Bishops Stortford, UK)의 비선형 회귀 곡선 맞춤을 사용하여 억제 농도(IC_{50}) 값을 계산했다.

[1779] 표 2는 본원에 기재된 바와 같은 대표적인 화학식 I의 화합물에 대해 측정된 활성을 나타낸다.

[1780] 표 2.

화합물	EC_{50} (μM)	화합물	EC_{50} (μM)	화합물	EC_{50} (μM)	화합물	EC_{50} (μM)
2	0.041	683	0.006	1747	0.003	1876	0.002
3	0.023	684	0.004	1756	0.018	1877	0.002
4	0.073	685	0.003	1771	0.005	1878	0.002
9	0.081	686	0.005	1780	0.007	1879	0.002
11	0.116	687	0.002	1786	0.005	1880	0.003
12	0.045	691	0.003	1792	0.026	1881	0.002
16	0.048	692	0.028	1798	0.004	1882	0.004
20	0.067	706	0.005	1801	0.005	1883	0.009
21	0.061	713	0.011	1802	0.005	1884	0.007
23	0.028	784	0.011	1803	0.003	1885	0.006
26	0.011	855	0.043	1813	0.004	1886	0.003
43	0.019	926	0.027	1819	0.003	1887	0.031
64	0.192	1037	0.020	1825	0.005	1888	0.003
65	0.025	1068	0.004	1828	0.010	1889	0.007
66	0.264	1088	0.004	1829	0.033	1890	0.014
67	0.040	1091	3.335	1830	0.016	1891	0.011
74	5.100	1108	0.008	1831	0.007	1892	0.002
145	0.045	1109	0.006	1832	0.006	1893	0.005
214	0.033	1110	0.003	1833	0.008	1894	0.011
215	0.006	1111	0.003	1834	0.003	1895	0.003
216	0.012	1113	0.007	1835	0.003	1896	0.003
218	0.013	1115	0.003	1836	0.003	1898	0.003
219	0.014	1117	0.004	1837	0.006	1899	0.001
220	0.014	1118	0.005	1838	0.006	1900	0.005
221	0.029	1125	0.018	1839	0.004	1901	0.004
223	0.101	1131	0.016	1840	0.003	1902	0.006
225	0.011	1132	0.005	1841	0.006	1903	0.012
226	0.011	1179	0.026	1842	0.005	1906	0.004
227	0.004	1210	0.066	1843	0.033	1908	0.007
228	0.013	1281	0.015	1844	0.003	1909	0.005
229	0.009	1309	0.003	1845	0.004	1910	0.004
230	0.058	1322	0.393	1846	0.004	1911	0.004
231	0.028	1323	0.007	1847	0.005	1912	0.007
232	0.009	1332	0.020	1848	0.005	1914	0.005
235	0.377	1336	0.025	1849	0.007	1915	0.009
236	0.009	1348	0.005	1850	0.008	1916	0.005
237	0.003	1352	0.027	1851	0.011	1917	0.009
239	0.006	1375	0.006	1852	0.009	1918	0.007
240	0.014	1376	0.014	1853	0.005	1920	0.001
242	0.005	1377	0.008	1854	0.008	1940	0.007

[1781]

244	0.005	1392	0.529	1855	0.006	1941	0.004
256	0.005	1393	0.023	1856	0.006	1944	0.013
258	0.010	1394	0.014	1857	0.003	1945	0.001
259	0.007	1395	0.011	1858	0.007	1950	0.003
260	0.009	1418	0.011	1859	0.008	1951	0.005
263	0.006	1423	0.149	1860	0.005	1952	0.004
265	0.006	1520	0.963	1861	0.007	1953	0.007
279	0.049	1522	0.003	1862	0.006	1954	0.006
280	0.015	1535	0.007	1863	0.008	1955	0.004
281	0.003	1536	0.005	1864	0.003	1961	0.003
282	0.007	1537	0.003	1865	0.020	1970	0.007
283	0.020	1541	0.003	1866	0.033	1971	0.379
287	0.170	1543	0.002	1867	0.032	1974	0.002
358	0.025	1544	0.005	1868	0.009	1980	0.001
398	0.012	1551	0.038	1869	0.016	1981	0.002
429	0.654	1557	0.018	1870	0.078	1983	0.001
500	0.044	1720	0.005	1871	0.072	1985	0.003
571	0.011	1723	0.004	1872	0.498		
642	0.004	1724	0.011	1873	0.131		
682	0.004	1732	0.013	1875	0.014		

[1782]

[1783] **실시예 14.**

[1784] 대표적인 화합물은 아래 설명된 대로 타우 인산화 활성에 대한 분석 절차를 사용하여 스크리닝했다.

[1785] 10% FBS(Corning, 35-011-CV) 및 페니실린/스트렙토마이신(Thermo Fisher Scientific, 15140163)이 보충된 DMEM(Thermo Fisher Scientific, 10566024)에서 배양된 HEK293T 세포(ATCC, CRL3216)를 8.1 x 10^6 세포/플라스크에서 75cm^2 플라스크 내에서 접종했다. 그런 다음 HEK293T 세포를 Lipofectamine 3000(Thermo Fisher Scientific, L30000015)을 사용하여 5㎍ DYRK1A(NM_001396) 인간 태그-없는 클론(OriGene, SC314641) 및 2.5㎍ MAPT(441 a.a. Tau 유전자)(NM_005910) 인간 태그-없는 클론(OriGene, TP313312)으로 일시적으로 형질감염시키고, 37°C, 5% CO_2의 가습 인큐베이터에서 20~30시간 동안 배양했다. 인큐베이션 후, DYRK1A 및 MAPT 발현 벡터로 형질감염된 HEK293T 세포를 수확하고 Bi°Coat 폴리-D 리신 코팅된 96-웰 플레이트(Corning, 354461)에 3 x 10_4개 세포/웰로 접종했다.

[1786] 상기 합성된 화합물은 아래에 설명된 Thr212(pThr212)에서 감소된 Tau 인산화를 평가하기 위해 세포 분석 절차를 사용하여 스크리닝했다.

[1787] 각 화합물을 10mM 스톡으로서 DMSO(Sigma-Aldrich, D8418-100mL)에 용해시켰다. 10mM 스톡을 1:3, 10점 용량-반응 곡선으로 연속 희석하고 20㎛M~1.1nM 범위의 최종 농도로 세포에 첨가했다. 세포를 화합물로 두 번 처리하고 37°C 및 5% CO_2의 가습 인큐베이터에서 18-24시간 동안 배양했다.

[1788] 밤새 화합물 처리 후, 세포를 1X Halt Phosphatase Inhibitor Cocktail(Thermo Fisher Scientific, 78427) 및 1X Halt Protease Inhibitor Cocktail(Thermo Fisher Scientific, 78438)로 보충된 1X Alpha Surefire Ultra Lysis Buffer(Perkin Elmer, ALSU-LB-100ML)로 용해했다. 용해물을 10분 동안 12,000g으로 회전시켜 세포 잔해를 제거하고 용해물 5㎕를 phosphoTau(Thr212) AlphaLISA 분석에서 Tau 인산화 측정을 위해 384웰 Opti-Plate(Perkin Elmer, 6007290)에 분배했다. 기증자 항체, 비오틴화된 HT7Tau(Thermo Fisher Scientific, MN1000B) 및 수용자 항체, pThr212Tau(Thermo Fisher Scientific, 44740G)를 모두 최종 농도 3nM로 세포 용해물에 첨가하고 실온에서 1시간 동안 배양했다. 용해물을 기증자 및 수용체 항체와 함께 배양한 후, 항토끼 IgG(Fc 특이적) AlphaLISA 수용체 비드(Perkin Elmer, AL104C)를 10ug/mL 최종 농도로 첨가하고 빛으로부터 보호된 실온에서 1시간 동안 배양했다. 마지막으로 AlphaScreen 스트렙타비딘 공여자 비드(PerkinElmer, 6760002)를 40 ug/mL 최종 농도로 첨가하고 빛이 차단된 실온에서 1시간 동안 배양했다. EnVision 다중 라벨 플레이트 판독기(Perkin Elmer)를 사용하여 Ex= 665nm 및 Em=615nm에서 플레이트를 판독했다.

[1789] phospho-Tau(Thr212) AlphaLISA 신호를 사용하여 플롯을 작성하고 곡선 피팅을 그리고 Prism(GraphPad)에서 각

화합물의 EC_{50}을 결정했다.

[1790] 표 3은 본원에 제공된 대표적인 화합물의 활성을 보여준다.

[1791] **표 3.**

화합물	pTau (Thr212) EC_{50} (μM)	화합물	pTau (Thr212) EC_{50} (μM)	화합물	pTau (Thr212) EC_{50} (μM)	화합물	pTau (Thr212) EC_{50} (μM)
3	1.841	256	0.220	1068	0.159	1395	0.380
23	0.794	259	0.150	1108	0.126	1418	0.212
26	0.238	281	0.070	1111	0.071	1724	0.305
43	0.504	282	0.172	1179	0.470	1801	0.152
65	0.828	571	0.725	1332	0.524		
216	0.455	784	0.516	1393	0.718		
228	0.292	1037	0.403	1394	0.709		

[1792]