

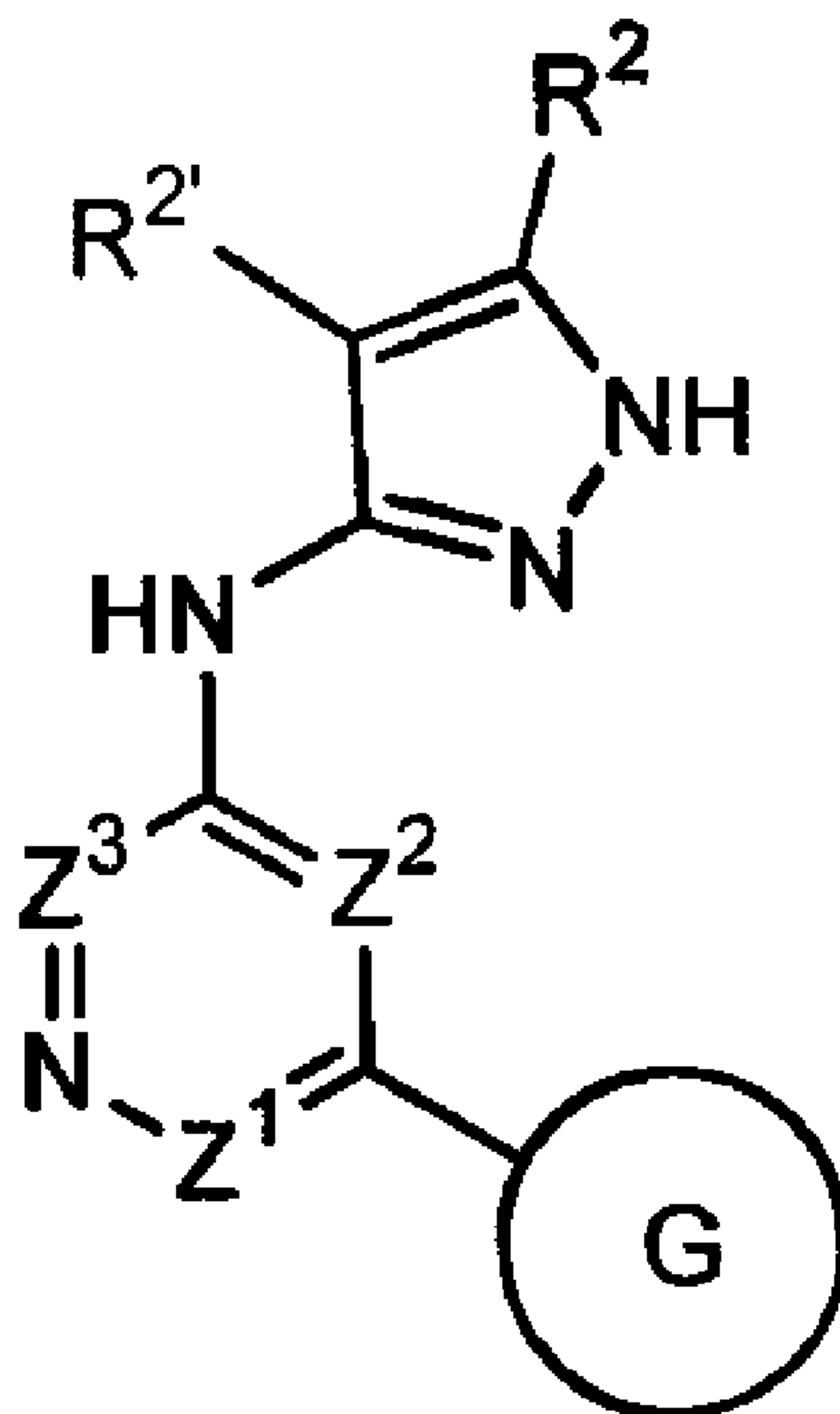


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(54) Titre : COMPOSES DE PYRAZOLE UTILES COMME INHIBITEURS DE PROTEINE KINASE
(54) Title: PYRAZOLE COMPOUNDS USEFUL AS PROTEIN KINASE INHIBITORS



VIII

(57) Abrégé/Abstract:

This invention describes novel pyrazole compositions comprising a pharmaceutically acceptable carrier and a compound of formula VIII, wherein Z^1 is N or C- R^9 , Z^2 is N or CH, and Z^3 is N or C- R^x , provided that one of Z^1 and Z^3 is nitrogen; G is Ring C or

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(57) Abrégé(suite)/Abstract(continued):

Ring D; Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from -R¹; Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl; and R^x, R¹, R², R^{2'}, R³ and R⁹ are as described in the specification. The compounds are useful as protein kinase inhibitors, especially as inhibitors of aurora-2 and GSK-3, for treating diseases such as cancer, diabetes and Alzheimer's disease.

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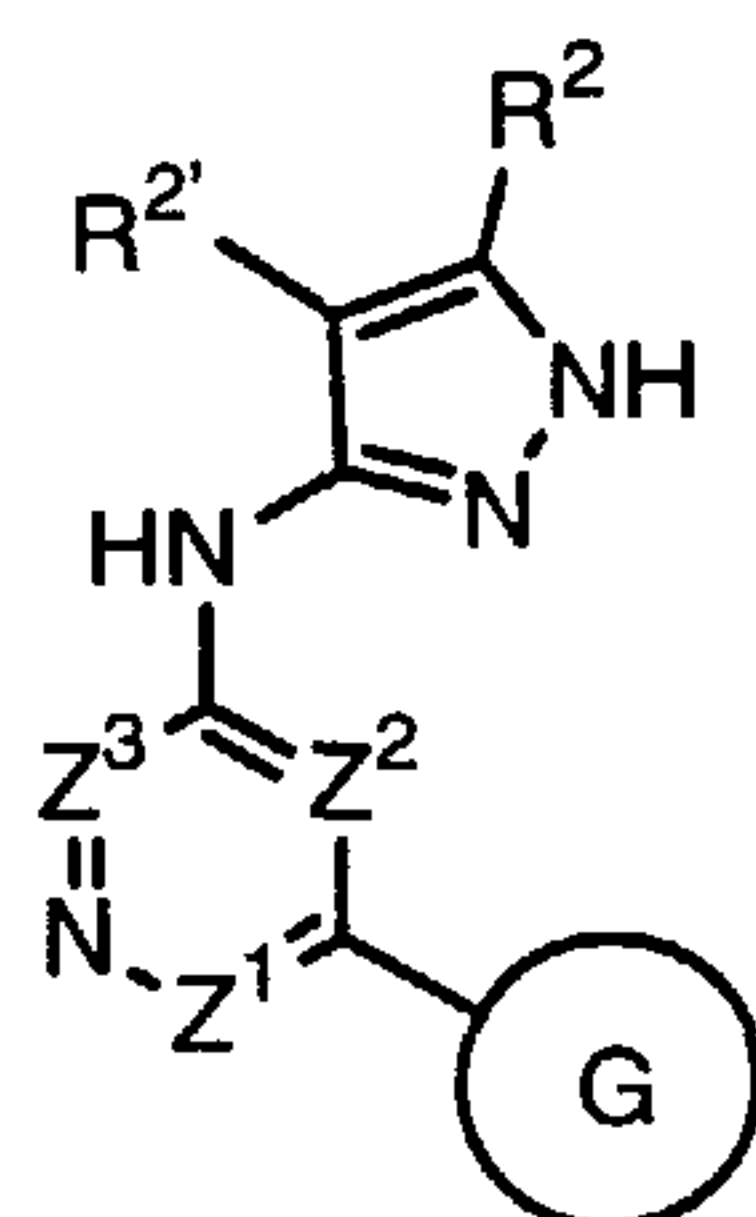
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(54) Title: PYRAZOLE COMPOUNDS USEFUL AS PROTEIN KINASE INHIBITORS



(VIII)

(57) Abstract: This invention describes novel pyrazole compositions comprising a pharmaceutically acceptable carrier and a compound of formula VIII, wherein Z¹ is N or C-R⁹, Z² is N or CH, and Z³ is N or C-R^x, provided that one of Z¹ and Z³ is nitrogen; G is Ring C or Ring D; Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from -R¹; Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl; and R^x, R¹, R², R^{2'}, R³ and R⁹ are as described in the specification. The compounds are useful as protein kinase inhibitors, especially as inhibitors of aurora-2 and GSK-3, for treating diseases such as cancer, diabetes and Alzheimer's disease.

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THIS IS VOLUME __1__ OF __2__

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PYRAZOLE COMPOUNDS USEFUL AS PROTEIN KINASE INHIBITORSFIELD OF THE INVENTION

The present invention is in the field of medicinal chemistry and relates to compounds that are protein kinase inhibitors, compositions containing such compounds and methods of use. More particularly, this invention relates to compounds that are inhibitors of GSK-3 and Aurora-2 protein kinases. The invention also relates to methods of treating diseases associated with these protein kinases, such as diabetes, cancer and Alzheimer's disease.

BACKGROUND OF THE INVENTION

The search for new therapeutic agents has been greatly aided in recent years by better understanding of the structure of enzymes and other biomolecules associated with target diseases. One important class of enzymes that has been the subject of extensive study is the protein kinases.

Protein kinases mediate intracellular signal transduction. They do this by effecting a phosphoryl

extracellular and other stimuli cause a variety of cellular responses to occur inside the cell. Examples of such stimuli include environmental and chemical stress signals (e.g. osmotic shock, heat shock, ultraviolet radiation, bacterial endotoxin, H₂O₂), cytokines (e.g. interleukin-1 (IL-1) and tumor necrosis factor α (TNF- α)), and growth factors (e.g. granulocyte macrophage-colony-stimulating factor (GM-CSF), and fibroblast growth factor (FGF)). An extracellular stimulus may effect one or more cellular responses related to cell growth, migration, differentiation, secretion of hormones, activation of transcription factors, muscle contraction, glucose metabolism, control of protein synthesis and regulation of cell cycle.

Many diseases are associated with abnormal cellular responses triggered by protein kinase-mediated events. These diseases include autoimmune diseases, inflammatory diseases, neurological and neurodegenerative diseases, cancer, cardiovascular diseases, allergies and asthma, Alzheimer's disease or hormone-related diseases. Accordingly, there has been a substantial effort in medicinal chemistry to find protein kinase inhibitors that are effective as therapeutic agents.

Aurora-2 is a serine/threonine protein kinase that has been implicated in human cancer, such as colon, breast and other solid tumors. This kinase is believed to be involved in protein phosphorylation events that regulate the cell cycle. Specifically, Aurora-2 may play a role in controlling the accurate segregation of chromosomes during mitosis. Misregulation of the cell cycle can lead to cellular proliferation and other abnormalities. In human colon cancer tissue, the aurora-2 protein has been found to be overexpressed. See Bischoff et al., *EMBO J.*, 1998, 17, 3052-3065; Schumacher

et al., *J. Cell Biol.*, 1998, 143, 1635-1646; Kimura et al., *J. Biol. Chem.*, 1997, 272, 13766-13771.

Glycogen synthase kinase-3 (GSK-3) is a serine/threonine protein kinase comprised of α and β isoforms that are each encoded by distinct genes [Coghlan et al., *Chemistry & Biology*, 7, 793-803 (2000); Kim and Kimmel, *Curr. Opinion Genetics Dev.*, 10, 508-514 (2000)]. GSK-3 has been implicated in various diseases including diabetes, Alzheimer's disease, CNS disorders such as manic depressive disorder and neurodegenerative diseases, and cardiomyocyte hypertrophy [WO 99/65897; WO 00/38675; and Haq et al., *J. Cell Biol.* (2000) 151, 117]. These diseases may be caused by, or result in, the abnormal operation of certain cell signaling pathways in which GSK-3 plays a role. GSK-3 has been found to phosphorylate and modulate the activity of a number of regulatory proteins. These proteins include glycogen synthase which is the rate limiting enzyme necessary for glycogen synthesis, the microtubule associated protein Tau, the gene transcription factor β -catenin, the translation initiation factor eIF2B, as well as ATP citrate lyase, axin, heat shock factor-1, c-Jun, c-Myc, c-Myb, CREB, and CEPB α . These diverse protein targets implicate GSK-3 in many aspects of cellular metabolism, proliferation, differentiation and development.

In a GSK-3 mediated pathway that is relevant for the treatment of type II diabetes, insulin-induced signaling leads to cellular glucose uptake and glycogen synthesis. Along this pathway, GSK-3 is a negative regulator of the insulin-induced signal. Normally, the presence of insulin causes inhibition of GSK-3 mediated phosphorylation and deactivation of glycogen synthase. The inhibition of GSK-3 leads to increased glycogen synthesis and glucose uptake [Klein et al., *PNAS*, 93,

8455-9 (1996); Cross et al., *Biochem. J.*, 303, 21-26 (1994); Cohen, *Biochem. Soc. Trans.*, 21, 555-567 (1993); Massillon et al., *Biochem J.* 299, 123-128 (1994)].

However, in a diabetic patient where the insulin response is impaired, glycogen synthesis and glucose uptake fail to increase despite the presence of relatively high blood levels of insulin. This leads to abnormally high blood levels of glucose with acute and long term effects that may ultimately result in cardiovascular disease, renal failure and blindness. In such patients, the normal insulin-induced inhibition of GSK-3 fails to occur. It has also been reported that in patients with type II diabetes, GSK-3 is overexpressed [WO 00/38675].

Therapeutic inhibitors of GSK-3 are therefore potentially useful for treating diabetic patients suffering from an impaired response to insulin.

GSK-3 activity has also been associated with Alzheimer's disease. This disease is characterized by the well-known β -amyloid peptide and the formation of intracellular neurofibrillary tangles. The neurofibrillary tangles contain hyperphosphorylated Tau protein where Tau is phosphorylated on abnormal sites. GSK-3 has been shown to phosphorylate these abnormal sites in cell and animal models. Furthermore, inhibition of GSK-3 has been shown to prevent hyperphosphorylation of Tau in cells [Lovestone et al., *Current Biology* 4, 1077-86 (1994); Brownlee et al., *Neuroreport* 8, 3251-55 (1997)]. Therefore, it is believed that GSK-3 activity may promote generation of the neurofibrillary tangles and the progression of Alzheimer's disease.

Another substrate of GSK-3 is β -catenin which is degraded after phosphorylation by GSK-3. Reduced levels of β -catenin have been reported in schizophrenic patients and have also been associated with other

diseases related to increase in neuronal cell death [Zhong et al., *Nature*, 395, 698-702 (1998); Takashima et al., *PNAS*, 90, 7789-93 (1993); Pei et al., *J. Neuropathol. Exp*, 56, 70-78 (1997)].

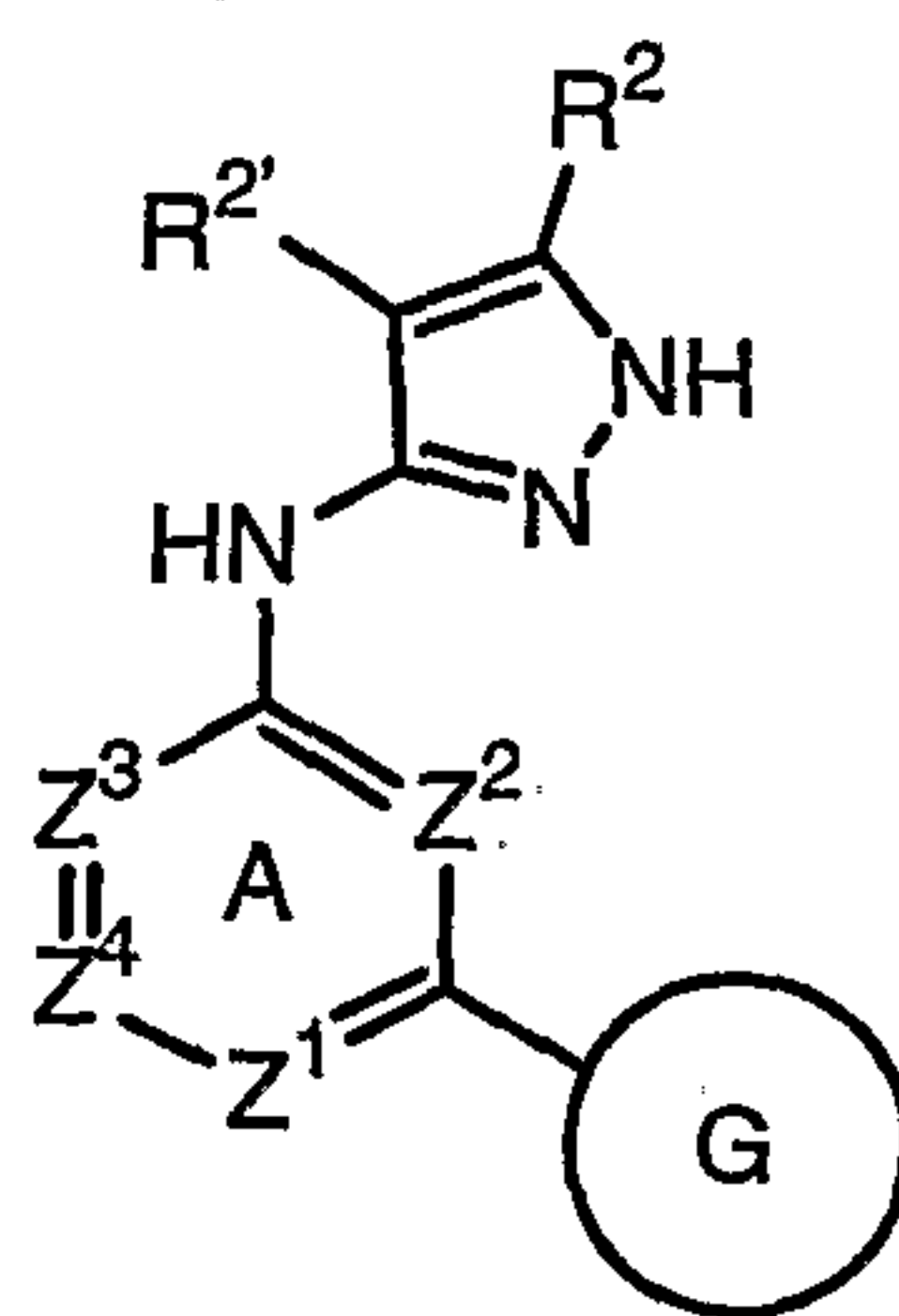
5 As a result of the biological importance of GSK-3, there is current interest in therapeutically effective GSK-3 inhibitors. Small molecules that inhibit GSK-3 have recently been reported [WO 99/65897 (Chiron) and WO 00/38675 (SmithKline Beecham)].

10 For many of the aforementioned diseases associated with abnormal GSK-3 activity, other protein kinases have also been targeted for treating the same diseases. However, the various protein kinases often act through different biological pathways. For example,
15 certain quinazoline derivatives have been reported recently as inhibitors of p38 kinase (WO 00/12497 to Scios). The compounds are reported to be useful for treating conditions characterized by enhanced p38- α activity and/or enhanced TGF- β activity. While p38
20 activity has been implicated in a wide variety of diseases, including diabetes, p38 kinase is not reported to be a constituent of an insulin signaling pathway that regulates glycogen synthesis or glucose uptake.
25 Therefore, unlike GSK-3, p38 inhibition would not be expected to enhance glycogen synthesis and/or glucose uptake.

 There is a continued need to find new therapeutic agents to treat human diseases. The protein kinases aurora-2 and GSK-3 are especially attractive
30 targets for the discovery of new therapeutics due to their important role in cancer, diabetes, Alzheimer's disease and other diseases.

DESCRIPTION OF THE INVENTION

It has now been found that compounds of this invention and pharmaceutical compositions thereof are effective as protein kinase inhibitors, particularly as inhibitors of aurora-2 and GSK-3. These compounds have the general formula I:



I

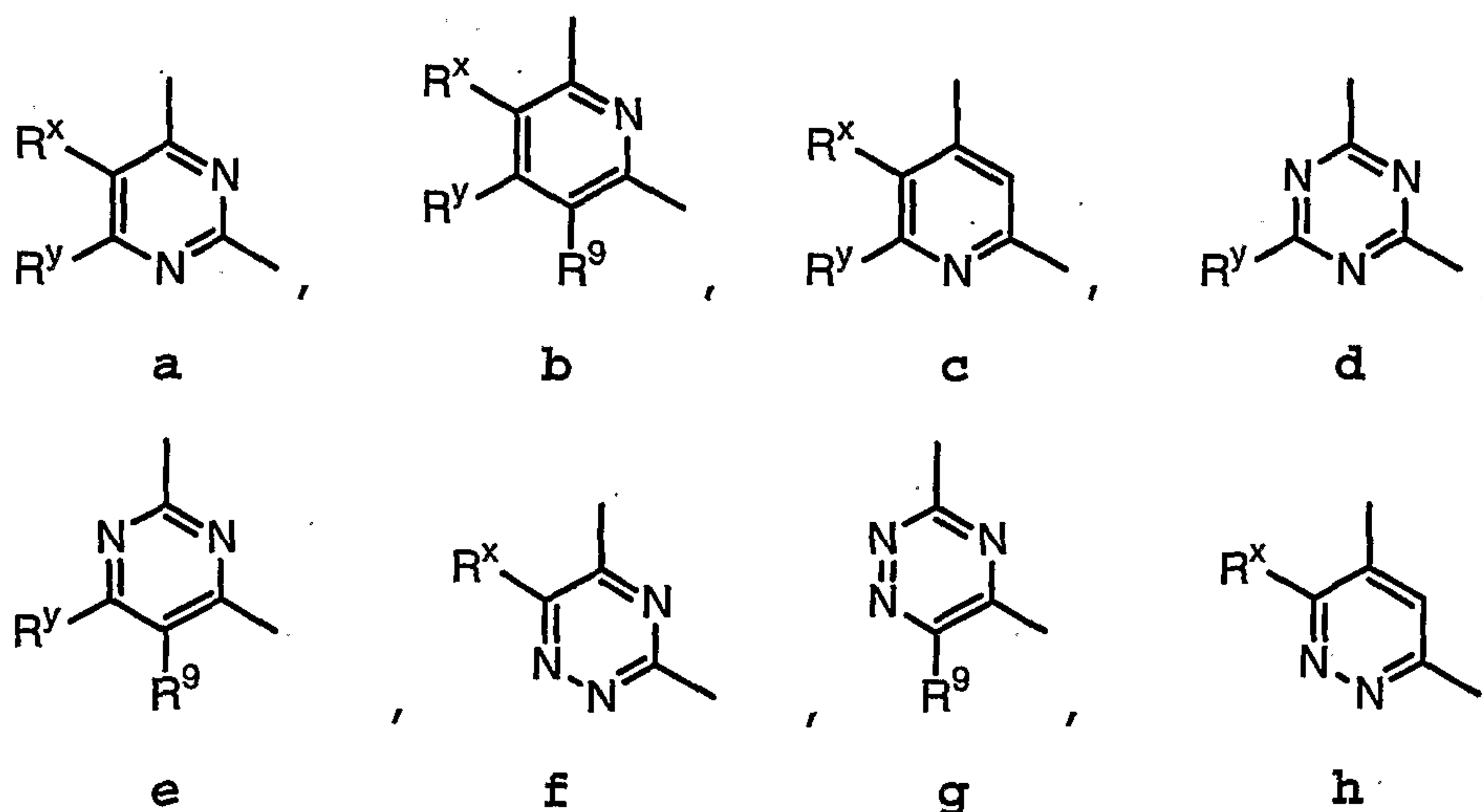
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or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

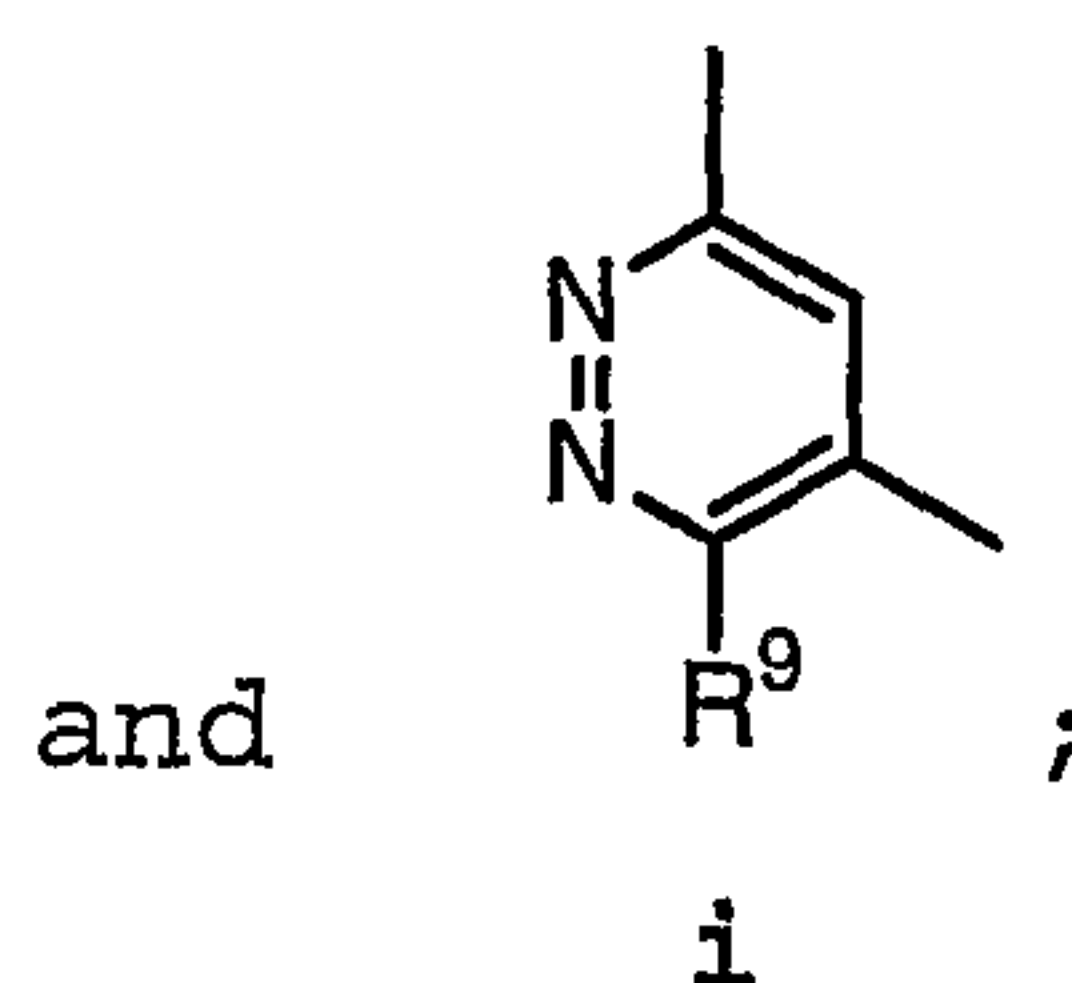
Z¹ to Z⁴ are as described below;

Ring A is selected from the group consisting of:

15



20



G is Ring C or Ring D;

- 5 Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from $-R^1$, any substitutable non-ortho carbon position on Ring C is independently substituted by $-R^5$, and two adjacent substituents on
- 10 Ring C are optionally taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-6 membered ring having 0-3 heteroatoms selected from oxygen, sulfur or nitrogen, said fused ring being optionally substituted by halo,
- 15 oxo, or $-R^8$;

- Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or
- 20 heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by oxo or $-R^5$, and at any substitutable ring nitrogen by $-R^4$, provided that when Ring D is a six-membered aryl or
- 25 heteroaryl ring, $-R^5$ is hydrogen at each ortho carbon position of Ring D;

- R^1 is selected from -halo, -CN, $-NO_2$, T-V- R^6 , phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C_{1-6} aliphatic group, said phenyl, heteroaryl,
- 30 and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo,

oxo, or $-R^8$, said C_{1-6} aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R^1 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^x and R^y are independently selected from $T-R^3$, or R^x and R^y are taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-8 membered ring having 0-3 ring heteroatoms selected from oxygen, sulfur, or nitrogen, wherein any substitutable carbon on said fused ring formed by R^x and R^y is substituted by oxo or $T-R^3$, and any substitutable nitrogen on said ring formed by R^x and R^y is substituted by R^4 ;

T is a valence bond or a C_{1-4} alkylidene chain;

5 R^2 and $R^{2'}$ are independently selected from $-R$, $-T-W-R^6$, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring having 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur, wherein each

10 substitutable carbon on said fused ring formed by R^2 and $R^{2'}$ is substituted by halo, oxo, $-CN$, $-NO_2$, $-R^7$, or $-V-R^6$, and any substitutable nitrogen on said ring formed by R^2 and $R^{2'}$ is substituted by R^4 ;

R^3 is selected from $-R$, $-halo$, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-COCH_2COR$, $-NO_2$, $-CN$, $-S(O)R$, $-S(O)_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^7)_2$, $-SO_2N(R^7)_2$, $-OC(=O)R$, $-N(R^7)COR$, $-N(R^7)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^7)CON(R^7)_2$, $-N(R^7)SO_2N(R^7)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^7)_2$;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R^4 is independently selected from $-R^7$, $-\text{COR}^7$, $-\text{CO}_2(\text{C}_{1-6} \text{ aliphatic})$, $-\text{CON}(\text{R}^7)_2$, or $-\text{SO}_2\text{R}^7$, or two R^4 on the same nitrogen are taken together to form a 5-8 membered heterocyclyl or heteroaryl ring;

- 5 each R^5 is independently selected from $-\text{R}$, halo, $-\text{OR}$, $-\text{C}(=\text{O})\text{R}$, $-\text{CO}_2\text{R}$, $-\text{COCOR}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{S}(\text{O})\text{R}$, $-\text{SO}_2\text{R}$, $-\text{SR}$, $-\text{N}(\text{R}^4)_2$, $-\text{CON}(\text{R}^4)_2$, $-\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{OC}(=\text{O})\text{R}$, $-\text{N}(\text{R}^4)\text{COR}$, $-\text{N}(\text{R}^4)\text{CO}_2(\text{optionally substituted } \text{C}_{1-6} \text{ aliphatic})$, $-\text{N}(\text{R}^4)\text{N}(\text{R}^4)_2$, $-\text{C}=\text{NN}(\text{R}^4)_2$, $-\text{C}=\text{N}-\text{OR}$, $-\text{N}(\text{R}^4)\text{CON}(\text{R}^4)_2$,
 10 $-\text{N}(\text{R}^4)\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{N}(\text{R}^4)\text{SO}_2\text{R}$, or $-\text{OC}(=\text{O})\text{N}(\text{R}^4)_2$, or R^5 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;
 V is $-\text{O}-$, $-\text{S}-$, $-\text{SO}-$, $-\text{SO}_2-$, $-\text{N}(\text{R}^6)\text{SO}_2-$, $-\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$, $-\text{N}(\text{R}^6)\text{CO}-$, $-\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$,
 15 $-\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{O})\text{N}(\text{R}^6)-$, $-\text{OC}(\text{O})\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$, $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$, $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{R}^6)=\text{NN}(\text{R}^6)-$, $-\text{C}(\text{R}^6)=\text{N}-\text{O}-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, or
 20 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$;

- W is $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$, $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$, $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$, $-\text{C}(\text{R}^6)\text{OC}(\text{O})-$, $-\text{C}(\text{R}^6)\text{OC}(\text{O})\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CO}-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{R}^6)=\text{NN}(\text{R}^6)-$, $-\text{C}(\text{R}^6)=\text{N}-\text{O}-$,
 25 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$, or $-\text{CON}(\text{R}^6)-$;

- each R^6 is independently selected from hydrogen or an optionally substituted C_{1-4} aliphatic group, or two R^6 groups on the same nitrogen atom are taken together
 30 with the nitrogen atom to form a 5-6 membered heterocyclyl or heteroaryl ring;

each R^7 is independently selected from hydrogen or an optionally substituted C_{1-6} aliphatic group, or two R^7 on the same nitrogen are taken together with the

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nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring;

each R^8 is independently selected from an optionally substituted C_{1-4} aliphatic group, $-OR^6$, $-SR^6$, $-COR^6$,
 5 $-SO_2R^6$, $-N(R^6)_2$, $-N(R^6)N(R^6)_2$, $-CN$, $-NO_2$, $-CON(R^6)_2$, or $-CO_2R^6$; and

R^9 is selected from $-R$, halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$,
 $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$,
 $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally
 10 substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$,
 $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or
 $-OC(=O)N(R^4)_2$.

In an embodiment of the present invention, there is a compound of general formula I, wherein Z^1 is N or $C-R^9$, Z^2 is N or CH,
 15 and Z^3 is N or $C-R^X$, provided that one of Z^1 and Z^2 is nitrogen.

As used herein, the following definitions shall apply unless otherwise indicated. The phrase "optionally substituted" is used interchangeably with the phrase "substituted or unsubstituted" or with the term
 20 "(un)substituted." Unless otherwise indicated, an optionally substituted group may have a substituent at each substitutable position of the group, and each substitution is independent of the other.

The term "aliphatic" as used herein means
 25 straight-chain, branched or cyclic C_1-C_{12} hydrocarbons which are completely saturated or which contain one or more units of unsaturation but which are not aromatic. For example, suitable aliphatic groups include substituted or unsubstituted linear, branched or cyclic
 30 alkyl, alkenyl, alkynyl groups and hybrids thereof such as (cycloalkyl)alkyl, (cycloalkenyl)alkyl or (cycloalkyl)alkenyl. The terms "alkyl", "alkoxy", "hydroxyalkyl", "alkoxyalkyl", and "alkoxycarbonyl", used alone or as part of a larger moiety includes both straight and branched chains containing one to twelve carbon atoms. The terms "alkenyl" and "alkynyl" used alone or as part of a larger moiety shall include both

straight and branched chains containing two to twelve carbon atoms. The term "cycloalkyl" used alone or as part of a larger moiety shall include cyclic C₃-C₁₂ hydrocarbons which are completely saturated or which contain one or more units of unsaturation, but which are not aromatic.

The terms "haloalkyl", "haloalkenyl" and "haloalkoxy" means alkyl, alkenyl or alkoxy, as the case may be, substituted with one or more halogen atoms. The term "halogen" means F, Cl, Br, or I.

The term "heteroatom" means nitrogen, oxygen, or sulfur and includes any oxidized form of nitrogen and sulfur, and the quaternized form of any basic nitrogen. Also the term "nitrogen" includes a substitutable nitrogen of a heterocyclic ring. As an example, in a saturated or partially unsaturated ring having 0-3 heteroatoms selected from oxygen, sulfur or nitrogen, the nitrogen may be N (as in 3,4-dihydro-2H-pyrrolyl), NH (as in pyrrolidinyl) or NR⁺ (as in N-substituted pyrrolidinyl).

The terms "carbocycle", "carbocyclyl", "carbocyclo", or "carbocyclic" as used herein means an aliphatic ring system having three to fourteen members. The terms "carbocycle", "carbocyclyl", "carbocyclo", or "carbocyclic" whether saturated or partially unsaturated, also refers to rings that are optionally substituted. The terms "carbocycle", "carbocyclyl", "carbocyclo", or "carbocyclic" also include aliphatic rings that are fused to one or more aromatic or nonaromatic rings, such as in a decahydronaphthyl or tetrahydronaphthyl, where the radical or point of attachment is on the aliphatic ring.

The term "aryl" used alone or as part of a larger moiety as in "aralkyl", "aralkoxy", or "aryloxyalkyl", refers to aromatic ring groups having

five to fourteen members, such as phenyl, benzyl, phenethyl, 1-naphthyl, 2-naphthyl, 1-anthracyl and 2-anthracyl. The term "aryl" also refers to rings that are optionally substituted. The term "aryl" may be used interchangeably with the term "aryl ring". "Aryl" also includes fused polycyclic aromatic ring systems in which an aromatic ring is fused to one or more rings. Examples include 1-naphthyl, 2-naphthyl, 1-anthracyl and 2-anthracyl. Also included within the scope of the term "aryl", as it is used herein, is a group in which an aromatic ring is fused to one or more non-aromatic rings, such as in an indanyl, phenanthridinyl, or tetrahydronaphthyl, where the radical or point of attachment is on the aromatic ring.

The term "heterocycle", "heterocyclyl", or "heterocyclic" as used herein includes non-aromatic ring systems having five to fourteen members, preferably five to ten, in which one or more ring carbons, preferably one to four, are each replaced by a heteroatom such as N, O, or S. Examples of heterocyclic rings include 3-1H-benzimidazol-2-one, (1-substituted)-2-oxo-benzimidazol-3-yl, 2-tetrahydrofuranyl, 3-tetrahydrofuranyl, 2-tetrahydropyranyl, 3-tetrahydropyranyl, 4-tetrahydropyranyl, [1,3]-dioxalanyl, [1,3]-dithiolanyl, [1,3]-dioxanyl, 2-tetrahydrothiophenyl, 3-tetrahydrothiophenyl, 2-morpholinyl, 3-morpholinyl, 4-morpholinyl, 2-thiomorpholinyl, 3-thiomorpholinyl, 4-thiomorpholinyl, 1-pyrrolidinyl, 2-pyrrolidinyl, 3-pyrrolidinyl, 1-piperazinyl, 2-piperazinyl, 1-piperidinyl, 2-piperidinyl, 3-piperidinyl, 4-piperidinyl, 4-thiazolidinyl, diazolonyl, N-substituted diazolonyl, 1-phthalimidinyl, benzoxanyl, benzopyrrolidinyl, benzopiperidinyl, benzoxolanyl, benzothiolanyl, and benzothianyl. Also included within the scope of the term

"heterocyclyl" or "heterocyclic", as it is used herein, is a group in which a non-aromatic heteroatom-containing ring is fused to one or more aromatic or non-aromatic rings, such as in an indolinyl, chromanyl, phenanthridinyl, or tetrahydroquinolinyl, where the radical or point of attachment is on the non-aromatic heteroatom-containing ring. The term "heterocycle", "heterocyclyl", or "heterocyclic" whether saturated or partially unsaturated, also refers to rings that are optionally substituted.

The term "heteroaryl", used alone or as part of a larger moiety as in "heteroaralkyl" or "heteroarylalkoxy", refers to heteroaromatic ring groups having five to fourteen members. Examples of heteroaryl rings include 2-furanyl, 3-furanyl, N-imidazolyl, 2-imidazolyl, 4-imidazolyl, 5-imidazolyl, 3-isoxazolyl, 4-isoxazolyl, 5-isoxazolyl, 2-oxadiazolyl, 5-oxadiazolyl, 2-oxazolyl, 4-oxazolyl, 5-oxazolyl, 1-pyrrolyl, 2-pyrrolyl, 3-pyrrolyl, 2-pyridyl, 3-pyridyl, 4-pyridyl, 2-pyrimidyl, 4-pyrimidyl, 5-pyrimidyl, 3-pyridazinyl, 2-thiazolyl, 4-thiazolyl, 5-thiazolyl, 5-tetrazolyl, 2-triazolyl, 5-triazolyl, 2-thienyl, 3-thienyl, carbazolyl, benzimidazolyl, benzothienyl, benzofuranyl, indolyl, quinolinyl, benzotriazolyl, benzothiazolyl, benzooxazolyl, benzimidazolyl, isoquinolinyl, indolyl, isoindolyl, acridinyl, or benzoisoxazolyl. Also included within the scope of the term "heteroaryl", as it is used herein, is a group in which a heteroatomic ring is fused to one or more aromatic or nonaromatic rings where the radical or point of attachment is on the heteroaromatic ring. Examples include tetrahydroquinolinyl, tetrahydroisoquinolinyl, and pyrido[3,4-d]pyrimidinyl. The term "heteroaryl" also refers to rings that are optionally substituted. The term "heteroaryl" may be

used interchangeably with the term "heteroaryl ring" or the term "heteroaromatic".

An aryl (including aralkyl, aralkoxy, aryloxyalkyl and the like) or heteroaryl (including heteroaralkyl and heteroarylalkoxy and the like) group may contain one or more substituents. Examples of suitable substituents on the unsaturated carbon atom of an aryl, heteroaryl, aralkyl, or heteroaralkyl group include a halogen, $-R^{\circ}$, $-OR^{\circ}$, $-SR^{\circ}$, 1,2-methylene-dioxy, 1,2-ethylenedioxy, protected OH (such as acyloxy), phenyl (Ph), substituted Ph, $-O(Ph)$, substituted $-O(Ph)$, $-CH_2(Ph)$, substituted $-CH_2(Ph)$, $-CH_2CH_2(Ph)$, substituted $-CH_2CH_2(Ph)$, $-NO_2$, $-CN$, $-N(R^{\circ})_2$, $-NR^{\circ}C(O)R^{\circ}$, $-NR^{\circ}C(O)N(R^{\circ})_2$, $-NR^{\circ}CO_2R^{\circ}$, $-NR^{\circ}NR^{\circ}C(O)R^{\circ}$, $-NR^{\circ}NR^{\circ}C(O)N(R^{\circ})_2$, $-NR^{\circ}NR^{\circ}CO_2R^{\circ}$, $-C(O)C(O)R^{\circ}$, $-C(O)CH_2C(O)R^{\circ}$, $-CO_2R^{\circ}$, $-C(O)R^{\circ}$, $-C(O)N(R^{\circ})_2$, $-OC(O)N(R^{\circ})_2$, $-S(O)_2R^{\circ}$, $-SO_2N(R^{\circ})_2$, $-S(O)R^{\circ}$, $-NR^{\circ}SO_2N(R^{\circ})_2$, $-NR^{\circ}SO_2R^{\circ}$, $-C(=S)N(R^{\circ})_2$, $-C(=NH)-N(R^{\circ})_2$, $-(CH_2)_yNHC(O)R^{\circ}$, $-(CH_2)_yNHC(O)CH(V-R^{\circ})(R^{\circ})$; wherein R° is hydrogen, a substituted or unsubstituted aliphatic group, an unsubstituted heteroaryl or heterocyclic ring, phenyl (Ph), substituted Ph, $-O(Ph)$, substituted $-O(Ph)$, $-CH_2(Ph)$, or substituted $-CH_2(Ph)$; y is 0-6; and V is a linker group. Examples of substituents on the aliphatic group or the phenyl ring of R° include amino, alkylamino, dialkylamino, aminocarbonyl, halogen, alkyl, alkylaminocarbonyl, dialkylaminocarbonyl, alkylaminocarbonyloxy, dialkylaminocarbonyloxy, alkoxy, nitro, cyano, carboxy, alkoxycarbonyl, alkylcarbonyl, hydroxy, haloalkoxy, or haloalkyl.

An aliphatic group or a non-aromatic heterocyclic ring may contain one or more substituents. Examples of suitable substituents on the saturated carbon of an aliphatic group or of a non-aromatic heterocyclic

ring include those listed above for the unsaturated carbon of an aryl or heteroaryl group and the following: =O, =S, =NNHR*, =NN(R*)₂, =N-, =NNHC(O)R*, =NNHCO₂(alkyl), =NNHSO₂(alkyl), or =NR*, where each R* is independently
 5 selected from hydrogen, an unsubstituted aliphatic group or a substituted aliphatic group. Examples of substituents on the aliphatic group include amino, alkylamino, dialkylamino, aminocarbonyl, halogen, alkyl, alkylaminocarbonyl, dialkylaminocarbonyl,
 10 alkylaminocarbonyloxy, dialkylaminocarbonyloxy, alkoxy, nitro, cyano, carboxy, alkoxycarbonyl, alkylcarbonyl, hydroxy, haloalkoxy, or haloalkyl.

Suitable substituents on the nitrogen of a non-aromatic heterocyclic ring include -R⁺, -N(R⁺)₂, -C(O)R⁺,
 15 -CO₂R⁺, -C(O)C(O)R⁺, -C(O)CH₂C(O)R⁺, -SO₂R⁺, -SO₂N(R⁺)₂, -C(=S)N(R⁺)₂, -C(=NH)-N(R⁺)₂, and -NR⁺SO₂R⁺; wherein R⁺ is hydrogen, an aliphatic group, a substituted aliphatic group, phenyl (Ph), substituted Ph,
 -O(Ph), substituted -O(Ph), CH₂(Ph), substituted CH₂(Ph),
 20 or an unsubstituted heteroaryl or heterocyclic ring. Examples of substituents on the aliphatic group or the phenyl ring include amino, alkylamino, dialkylamino, aminocarbonyl, halogen, alkyl, alkylaminocarbonyl, dialkylaminocarbonyl, alkylaminocarbonyloxy,
 25 dialkylaminocarbonyloxy, alkoxy, nitro, cyano, carboxy, alkoxycarbonyl, alkylcarbonyl, hydroxy, haloalkoxy, or haloalkyl.

The term "linker group" or "linker" means an organic moiety that connects two parts of a compound.
 30 Linkers are typically comprised of an atom such as oxygen or sulfur, a unit such as -NH-, -CH₂-, -C(O)-, -C(O)NH-, or a chain of atoms, such as an alkylidene chain. The molecular mass of a linker is typically in the range of about 14 to 200, preferably in the range of 14 to 96 with

a length of up to about six atoms. Examples of linkers include a saturated or unsaturated C₁₋₆ alkylidene chain which is optionally substituted, and wherein one or two saturated carbons of the chain are optionally replaced by
5 -C(O)-, -C(O)C(O)-, -CONH-, -CONHNH-, -CO₂-, -OC(O)-, -NHCO₂-, -O-, -NHCONH-, -OC(O)NH-, -NHNH-, -NHCO-, -S-, -SO-, -SO₂-, -NH-, -SO₂NH-, or -NHSO₂-.

The term "alkylidene chain" refers to an optionally substituted, straight or branched carbon chain
10 that may be fully saturated or have one or more units of unsaturation. The optional substituents are as described above for an aliphatic group.

A combination of substituents or variables is permissible only if such a combination results in a
15 stable or chemically feasible compound. A stable compound or chemically feasible compound is one in which the chemical structure is not substantially altered when kept at a temperature of 40 °C or less, in the absence of moisture or other chemically reactive conditions, for at
20 least a week.

Unless otherwise stated, structures depicted herein are also meant to include all stereochemical forms of the structure; i.e., the R and S configurations for each asymmetric center. Therefore, single stereochemical
25 isomers as well as enantiomeric and diastereomeric mixtures of the present compounds are within the scope of the invention. Unless otherwise stated, structures depicted herein are also meant to include compounds which differ only in the presence of one or more isotopically
30 enriched atoms. For example, compounds having the present structures except for the replacement of a hydrogen by a deuterium or tritium, or the replacement of a carbon by a ¹³C- or ¹⁴C-enriched carbon are within the scope of this invention.

Compounds of formula I or salts thereof may be formulated into compositions. In a preferred embodiment, the composition is a pharmaceutical composition. In one embodiment, the composition comprises an amount of the
5 protein kinase inhibitor effective to inhibit a protein kinase, particularly GSK-3, in a biological sample or in a patient. In another embodiment, compounds of this invention and pharmaceutical compositions thereof, which comprise an amount of the protein kinase inhibitor
10 effective to treat or prevent a GSK-3-mediated condition and a pharmaceutically acceptable carrier, adjuvant, or vehicle, may be formulated for administration to a patient.

The term "GSK-3-mediated condition" or
15 "disease", as used herein, means any disease or other deleterious condition or state in which GSK-3 is known to play a role. Such diseases or conditions include, without limitation, diabetes, Alzheimer's disease, Huntington's Disease, Parkinson's Disease, AIDS-
20 associated dementia, amyotrophic lateral sclerosis (AML), multiple sclerosis (MS), schizophrenia, cardiomyocyte hypertrophy, reperfusion/ischemia, and baldness.

One aspect of this invention relates to a method of enhancing glycogen synthesis and/or lowering
25 blood levels of glucose in a patient in need thereof, which method comprises administering to the patient a therapeutically effective amount of a compound of formula I or a pharmaceutical composition thereof. This method is especially useful for diabetic patients. Another
30 method relates to inhibiting the production of hyperphosphorylated Tau protein, which is useful in halting or slowing the progression of Alzheimer's disease. Another method relates to inhibiting the

phosphorylation of β -catenin, which is useful for treating schizophrenia.

Another aspect of the invention relates to inhibiting GSK-3 activity in a biological sample, which method comprises contacting the biological sample with a GSK-3 inhibitor of formula I.

Another aspect of this invention relates to a method of inhibiting Aurora-2 activity in a patient, which method comprises administering to the patient a compound of formula I or a composition comprising said compound.

Another aspect of this invention relates to a method of treating or preventing an Aurora-2-mediated disease with an Aurora-2 inhibitor, which method comprises administering to a patient in need of such a treatment a therapeutically effective amount of a compound of formula I or a pharmaceutical composition thereof.

The term "Aurora-2-mediated condition" or "disease", as used herein, means any disease or other deleterious condition in which Aurora is known to play a role. The term "Aurora-2-mediated condition" or "disease" also means those diseases or conditions that are alleviated by treatment with an Aurora-2 inhibitor. Such conditions include, without limitation, cancer. The term "cancer" includes, but is not limited to the following cancers: colon and ovarian.

Another aspect of the invention relates to inhibiting Aurora-2 activity in a biological sample, which method comprises contacting the biological sample with the Aurora-2 inhibitor of formula I, or a composition thereof.

Another aspect of this invention relates to a method of treating or preventing a CDK-2-mediated

diseases with a CDK-2 inhibitor, which method comprises administering to a patient in need of such a treatment a therapeutically effective amount of a compound of formula I or a pharmaceutical composition thereof.

5 The term "CDK-2-mediated condition" or "disease", as used herein, means any disease or other deleterious condition in which CDK-2 is known to play a role. The term "CDK-2-mediated condition" or "disease" also means those diseases or conditions that are
10 alleviated by treatment with a CDK-2 inhibitor. Such conditions include, without limitation, cancer, Alzheimer's disease, restenosis, angiogenesis, glomerulonephritis, cytomegalovirus, HIV, herpes, psoriasis, atherosclerosis, alopecia, and autoimmune
15 diseases such as rheumatoid arthritis. See Fischer, P.M. and Lane, D.P., *Current Medicinal Chemistry*, 7, 1213-1245 (2000); Mani, S., Wang, C., Wu, K., Francis, R. and Pestell, R., *Exp. Opin. Invest. Drugs*, 9, 1849 (2000); Fry, D.W. and Garrett, M.D., *Current Opinion in*
20 *Oncologic, Endocrine & Metabolic Investigational Drugs*, 2, 40-59 (2000).

Another aspect of the invention relates to inhibiting CDK-2 activity in a biological sample or a patient, which method comprises administering to the
25 patient a compound of formula I or a composition comprising said compound.

Another aspect of this invention relates to a method of treating or preventing an ERK-2-mediated diseases with an ERK-2 inhibitor, which method comprises
30 administering to a patient in need of such a treatment a therapeutically effective amount of a compound of formula I or a pharmaceutical composition thereof.

The term "ERK-mediated condition", as used herein means any disease state or other deleterious

condition in which ERK is known to play a role. The term "ERK-2-mediated condition" or "disease" also means those diseases or conditions that are alleviated by treatment with a ERK-2 inhibitor. Such conditions include, without
5 limitation, cancer, stroke, diabetes, hepatomegaly, cardiovascular disease including cardiomegaly, Alzheimer's disease, cystic fibrosis, viral disease, autoimmune diseases, atherosclerosis, restenosis, psoriasis, allergic disorders including asthma,
10 inflammation, neurological disorders and hormone-related diseases. The term "cancer" includes, but is not limited to the following cancers: breast, ovary, cervix, prostate, testis, genitourinary tract, esophagus, larynx, glioblastoma, neuroblastoma, stomach, skin,
15 keratoacanthoma, lung, epidermoid carcinoma, large cell carcinoma, small cell carcinoma, lung adenocarcinoma, bone, colon, adenoma, pancreas, adenocarcinoma, thyroid, follicular carcinoma, undifferentiated carcinoma, papillary carcinoma, seminoma, melanoma, sarcoma, bladder
20 carcinoma, liver carcinoma and biliary passages, kidney carcinoma, myeloid disorders, lymphoid disorders, Hodgkin's, hairy cells, buccal cavity and pharynx (oral), lip, tongue, mouth, pharynx, small intestine, colon-rectum, large intestine, rectum, brain and central
25 nervous system, and leukemia. ERK-2 protein kinase and its implication in various diseases has been described [Bokemeyer et al. 1996, *Kidney Int.* 49, 1187; Anderson et al., 1990, *Nature* 343, 651; Crews et al., 1992, *Science* 258, 478; Bjorbaek et al., 1995, *J. Biol. Chem.* 270, 18848; Rouse et al., 1994, *Cell* 78, 1027; Raingeaud et al., 1996, *Mol. Cell Biol.* 16, 1247; Raingeaud et al. 1996; Chen et al., 1993 *Proc. Natl. Acad. Sci. USA* 90, 10952; Oliver et al., 1995, *Proc. Soc. Exp. Biol. Med.* 210, 162; Moodie et al., 1993, *Science* 260, 1658; Frey

and Mulder, 1997, *Cancer Res.* 57, 628; Sivaraman et al., 1997, *J Clin. Invest.* 99, 1478; Whelchel et al., 1997, *Am. J. Respir. Cell Mol. Biol.* 16, 589].

Another aspect of the invention relates to
5 inhibiting ERK-2 activity in a biological sample or a patient, which method comprises administering to the patient a compound of formula I or a composition comprising said compound.

Another aspect of this invention relates to a
10 method of treating or preventing an AKT-mediated diseases with an AKT inhibitor, which method comprises administering to a patient in need of such a treatment a therapeutically effective amount of a compound of formula I or a pharmaceutical composition thereof.

15 The term "AKT-mediated condition", as used herein, means any disease state or other deleterious condition in which AKT is known to play a role. The term "AKT-mediated condition" or "disease" also means those diseases or conditions that are alleviated by treatment
20 with a AKT inhibitor. AKT-mediated diseases or conditions include, but are not limited to, proliferative disorders, cancer, and neurodegenerative disorders. The association of AKT, also known as protein kinase B, with various diseases has been described [Khwaja, A., *Nature*,
25 pp. 33-34, 1990; Zang, Q. Y., et al, *Oncogene*, 19 2000; Kazuhiko, N., et al, *The Journal of Neuroscience*, 20 2000].

Another aspect of the invention relates to inhibiting AKT activity in a biological sample or a
30 patient, which method comprises administering to the patient a compound of formula I or a composition comprising said compound.

Another aspect of this invention relates to a method of treating or preventing a Src-mediated disease

with a Src inhibitor, which method comprises administering to a patient in need of such a treatment a therapeutically effective amount of a compound of formula I or a pharmaceutical composition thereof.

5 The term "Src-mediated condition", as used herein means any disease state or other deleterious condition in which Src is known to play a role. The term "Src-mediated condition" or "disease" also means those diseases or conditions that are alleviated by treatment
10 with a Src inhibitor. Such conditions include, without limitation, hypercalcemia, osteoporosis, osteoarthritis, cancer, symptomatic treatment of bone metastasis, and Paget's disease. Src protein kinase and its implication in various diseases has been described [Soriano, *Cell*,
15 69, 551 (1992); Soriano et al., *Cell*, 64, 693 (1991); Takayanagi, *J. Clin. Invest.*, 104, 137 (1999); Boschelli, *Drugs of the Future* 2000, 25(7), 717, (2000); Talamonti, *J. Clin. Invest.*, 91, 53 (1993); Lutz, *Biochem. Biophys. Res.* 243, 503 (1998); Rosen, *J. Biol. Chem.*, 261, 13754
20 (1986); Bolen, *Proc. Natl. Acad. Sci. USA*, 84, 2251 (1987); Masaki, *Hepatology*, 27, 1257 (1998); Biscardi, *Adv. Cancer Res.*, 76, 61 (1999); Lynch, *Leukemia*, 7, 1416 (1993); Wiener, *Clin. Cancer Res.*, 5, 2164 (1999); Staley, *Cell Growth Diff.*, 8, 269 (1997)].

25 Another aspect of the invention relates to inhibiting Src activity in a biological sample or a patient, which method comprises administering to the patient a compound of formula I or a composition comprising said compound.

30 The term "pharmaceutically acceptable carrier, adjuvant, or vehicle" refers to a non-toxic carrier, adjuvant, or vehicle that may be administered to a patient, together with a compound of this invention, and

which does not destroy the pharmacological activity thereof.

The term "patient" includes human and veterinary subjects.

5 The term "biological sample", as used herein, includes, without limitation, cell cultures or extracts thereof; preparations of an enzyme suitable for *in vitro* assay; biopsied material obtained from a mammal or
10 tears, or other body fluids or extracts thereof.

 The amount effective to inhibit protein kinase, for example, GSK-3 and Aurora-2, is one that measurably inhibits the kinase activity where compared to the activity of the enzyme in the absence of an inhibitor.
15 Any method may be used to determine inhibition, such as, for example, the Biological Testing Examples described below.

 Pharmaceutically acceptable carriers that may be used in these pharmaceutical compositions include, but
20 are not limited to, ion exchangers, alumina, aluminum stearate, lecithin, serum proteins, such as human serum albumin, buffer substances such as phosphates, glycine, sorbic acid, potassium sorbate, partial glyceride mixtures of saturated vegetable fatty acids, water, salts
25 or electrolytes, such as protamine sulfate, disodium hydrogen phosphate, potassium hydrogen phosphate, sodium chloride, zinc salts, colloidal silica, magnesium trisilicate, polyvinyl pyrrolidone, cellulose-based substances, polyethylene glycol, sodium
30 carboxymethylcellulose, polyacrylates, waxes, polyethylene-polyoxypropylene-block polymers, polyethylene glycol and wool fat.

 The compositions of the present invention may be administered orally, parenterally, by inhalation

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spray, topically, rectally, nasally, buccally, vaginally or via an implanted reservoir. The term "parenteral" as used herein includes subcutaneous, intravenous, intramuscular, intra-articular, intra-synovial, intrasternal, intrathecal, intrahepatic, intralesional and intracranial injection or infusion techniques. Preferably, the compositions are administered orally, intraperitoneally or intravenously.

Sterile injectable forms of the compositions of this invention may be aqueous or oleaginous suspension. These suspensions may be formulated according to techniques known in the art using suitable dispersing or wetting agents and suspending agents. The sterile injectable preparation may also be a sterile injectable solution or suspension in a non-toxic parenterally-acceptable diluent or solvent, for example as a solution in 1,3-butanediol. Among the acceptable vehicles and solvents that may be employed are water, Ringer's solution and isotonic sodium chloride solution. In addition, sterile, fixed oils are conventionally employed as a solvent or suspending medium. For this purpose, any bland fixed oil may be employed including synthetic mono- or di-glycerides. Fatty acids, such as oleic acid and its glyceride derivatives are useful in the preparation of injectables, as are natural pharmaceutically-acceptable oils, such as olive oil or castor oil, especially in their polyoxyethylated versions. These oil solutions or suspensions may also contain a long-chain alcohol diluent or dispersant, such as carboxymethyl cellulose or similar dispersing agents which are commonly used in the formulation of pharmaceutically acceptable dosage forms including emulsions and suspensions. Other commonly used surfactants, such as TweensTM, SpansTM and other emulsifying agents or bioavailability enhancers

which are commonly used in the manufacture of pharmaceutically acceptable solid, liquid, or other dosage forms may also be used for the purposes of formulation.

5 The pharmaceutical compositions of this invention may be orally administered in any orally acceptable dosage form including, but not limited to, capsules, tablets, aqueous suspensions or solutions. In the case of tablets for oral use, carriers commonly used
10 include lactose and corn starch. Lubricating agents, such as magnesium stearate, are also typically added. For oral administration in a capsule form, useful diluents include lactose and dried cornstarch. When aqueous suspensions are required for oral use, the active
15 ingredient is combined with emulsifying and suspending agents. If desired, certain sweetening, flavoring or coloring agents may also be added.

 Alternatively, the pharmaceutical compositions of this invention may be administered in the form of
20 suppositories for rectal administration. These can be prepared by mixing the agent with a suitable non-irritating excipient which is solid at room temperature but liquid at rectal temperature and therefore will melt in the rectum to release the drug. Such materials
25 include cocoa butter, beeswax and polyethylene glycols.

 The pharmaceutical compositions of this invention may also be administered topically, especially when the target of treatment includes areas or organs readily accessible by topical application, including
30 diseases of the eye, the skin, or the lower intestinal tract. Suitable topical formulations are readily prepared for each of these areas or organs.

 Topical application for the lower intestinal tract can be effected in a rectal suppository formulation

(see above) or in a suitable enema formulation.
Topically-transdermal patches may also be used.

For topical applications, the pharmaceutical compositions may be formulated in a suitable ointment
5 containing the active component suspended or dissolved in one or more carriers. Carriers for topical administration of the compounds of this invention include, but are not limited to, mineral oil, liquid petrolatum, white petrolatum, propylene glycol,
10 polyoxyethylene, polyoxypropylene compound, emulsifying wax and water. Alternatively, the pharmaceutical compositions can be formulated in a suitable lotion or cream containing the active components suspended or dissolved in one or more pharmaceutically acceptable
15 carriers. Suitable carriers include, but are not limited to, mineral oil, sorbitan monostearate, polysorbate 60, cetyl esters wax, cetearyl alcohol, 2-octyldodecanol, benzyl alcohol and water.

For ophthalmic use, the pharmaceutical
20 compositions may be formulated as micronized suspensions in isotonic, pH adjusted sterile saline, or, preferably, as solutions in isotonic, pH adjusted sterile saline, either with or without a preservative such as benzylalkonium chloride. Alternatively, for ophthalmic
25 uses, the pharmaceutical compositions may be formulated in an ointment such as petrolatum.

The pharmaceutical compositions of this invention may also be administered by nasal aerosol or inhalation. Such compositions are prepared according to
30 techniques well-known in the art of pharmaceutical formulation and may be prepared as solutions in saline, employing benzyl alcohol or other suitable preservatives, absorption promoters to enhance bioavailability,

fluorocarbons, and/or other conventional solubilizing or dispersing agents.

In addition to the compounds of this invention, pharmaceutically acceptable derivatives or prodrugs of the compounds of this invention may also be employed in compositions to treat or prevent the above-identified diseases or disorders.

A "pharmaceutically acceptable derivative or prodrug" means any pharmaceutically acceptable salt, ester, salt of an ester or other derivative of a compound of this invention which, upon administration to a recipient, is capable of providing, either directly or indirectly, a compound of this invention or an inhibitorily active metabolite or residue thereof. Particularly favored derivatives or prodrugs are those that increase the bioavailability of the compounds of this invention when such compounds are administered to a patient (e.g., by allowing an orally administered compound to be more readily absorbed into the blood) or which enhance delivery of the parent compound to a biological compartment (e.g., the brain or lymphatic system) relative to the parent species.

Pharmaceutically acceptable prodrugs of the compounds of this invention include, without limitation, esters, amino acid esters, phosphate esters, metal salts and sulfonate esters.

Pharmaceutically acceptable salts of the compounds of this invention include those derived from pharmaceutically acceptable inorganic and organic acids and bases. Examples of suitable acid salts include acetate, adipate, alginate, aspartate, benzoate, benzenesulfonate, bisulfate, butyrate, citrate, camphorate, camphorsulfonate, cyclopentanepropionate, digluconate, dodecylsulfate, ethanesulfonate, formate,

fumarate, glucoheptanoate, glycerophosphate, glycolate, hemisulfate, heptanoate, hexanoate, hydrochloride, hydrobromide, hydroiodide, 2-hydroxyethanesulfonate, lactate, maleate, malonate, methanesulfonate, 2-
5 naphthalenesulfonate, nicotinate, nitrate, oxalate, palmoate, pectinate, persulfate, 3-phenylpropionate, phosphate, picrate, pivalate, propionate, salicylate, succinate, sulfate, tartrate, thiocyanate, tosylate and undecanoate. Other acids, such as oxalic, while not in
10 themselves pharmaceutically acceptable, may be employed in the preparation of salts useful as intermediates in obtaining the compounds of the invention and their pharmaceutically acceptable acid addition salts.

Salts derived from appropriate bases include
15 alkali metal (e.g., sodium and potassium), alkaline earth metal (e.g., magnesium), ammonium and $N^+(C_{1-4} \text{ alkyl})_4$ salts. This invention also envisions the quaternization of any basic nitrogen-containing groups of the compounds disclosed herein. Water or oil-soluble or dispersible
20 products may be obtained by such quaternization.

The amount of the protein kinase inhibitor that may be combined with the carrier materials to produce a single dosage form will vary depending upon the patient treated and the particular mode of administration.
25 Preferably, the compositions should be formulated so that a dosage of between 0.01 - 100 mg/kg body weight/day of the inhibitor can be administered to a patient receiving these compositions.

It should also be understood that a specific
30 dosage and treatment regimen for any particular patient will depend upon a variety of factors, including the activity of the specific compound employed, the age, body weight, general health, sex, diet, time of administration, rate of excretion, drug combination, and

the judgment of the treating physician and the severity of the particular disease being treated. The amount of the inhibitor will also depend upon the particular compound in the composition.

5 Depending upon the particular protein kinase-mediated condition to be treated or prevented, additional therapeutic agents, which are normally administered to treat or prevent that condition, may be administered together with the inhibitors of this invention. For
10 example, in the treatment of diabetes other anti-diabetic agents may be combined with the GSK-3 inhibitors of this invention to treat diabetes. These agents include, without limitation, insulin or insulin analogues, in injectable or inhalation form, glitazones, alpha
15 glucosidase inhibitors, biguanides, insulin sensitizers, and sulfonyl ureas.

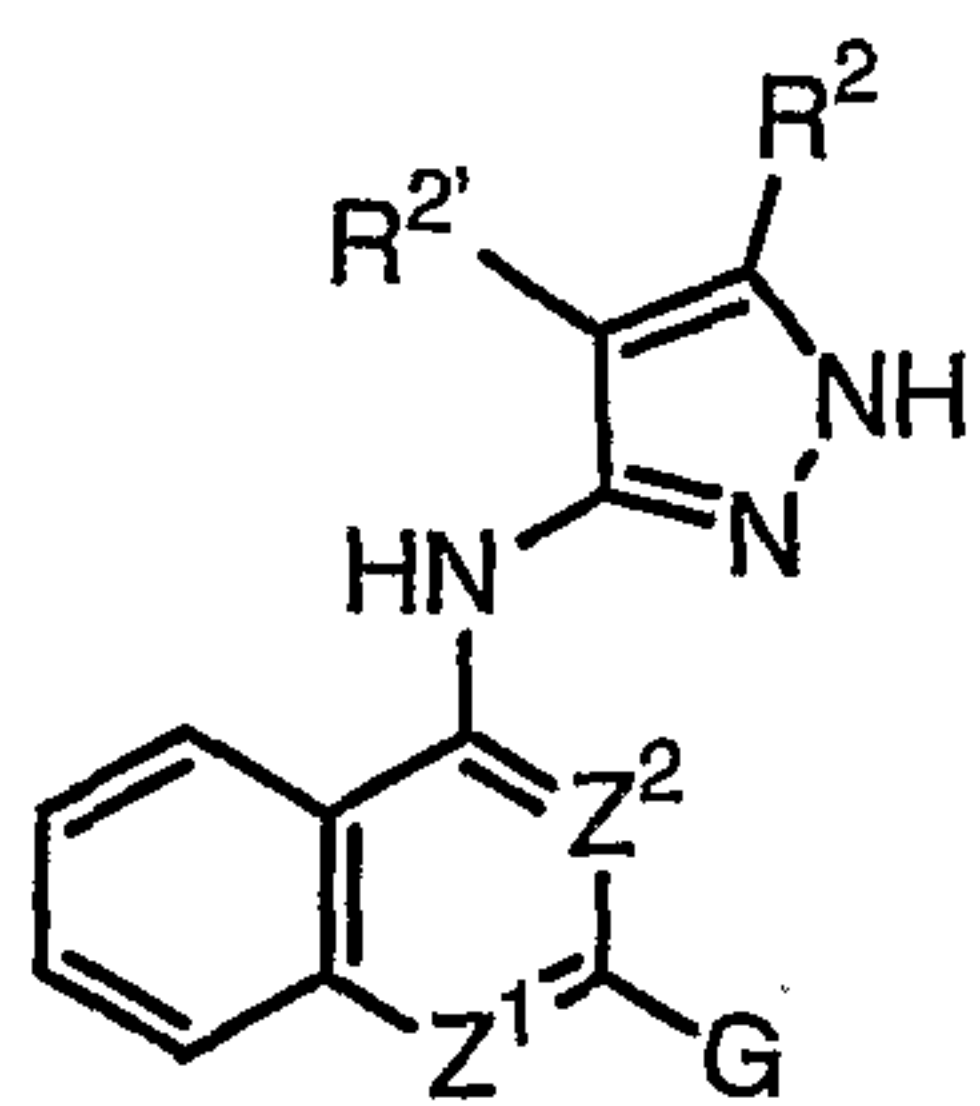
 Other examples of agents the inhibitors of this invention may also be combined with include, without limitation, chemotherapeutic agents or other anti-
20 proliferative agents such as adriamycin, dexamethasone, vincristine, cyclophosphamide, fluorouracil, topotecan, taxol, interferons, and platinum derivatives; anti-inflammatory agents such as corticosteroids, TNF
 blockers, IL-1 RA, azathioprine, cyclophosphamide, and
25 sulfasalazine; immunomodulatory and immunosuppressive agents such as cyclosporin, tacrolimus, rapamycin, mycophenolate mofetil, interferons, corticosteroids, cyclophosphamide, azathioprine, and sulfasalazine;
 neurotrophic factors such as acetylcholinesterase
30 inhibitors, MAO inhibitors, interferons, anti-convulsants, ion channel blockers, riluzole, and anti-Parkinsonian agents; agents for treating cardiovascular disease such as beta-blockers, ACE inhibitors, diuretics, nitrates, calcium channel blockers, and statins; agents

Those additional agents may be administered separately from the protein kinase inhibitor-containing composition, as part of a multiple dosage regimen.

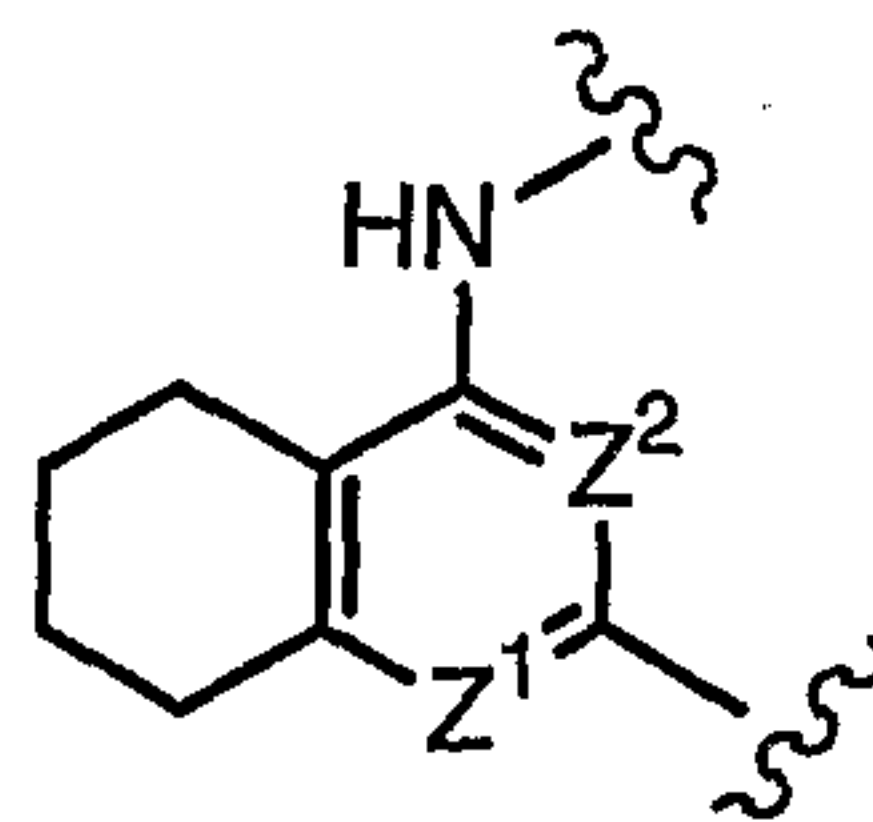
10 Alternatively, those agents may be part of a single dosage form, mixed together with the protein kinase inhibitor of this invention in a single composition.

Chemical reaction scheme showing the tautomerization of a nucleoside derivative. Structure 1 (left) is a purine-like nucleoside with an NH group at the 2-position of the purine ring. Structure 2 (right) is the tautomer where the NH group has moved to the 1-position. The structures are connected by a double-headed equilibrium arrow. Substituents include R^2 , $R^{2'}$, Z^1 , Z^2 , Z^3 , and Z^4 .

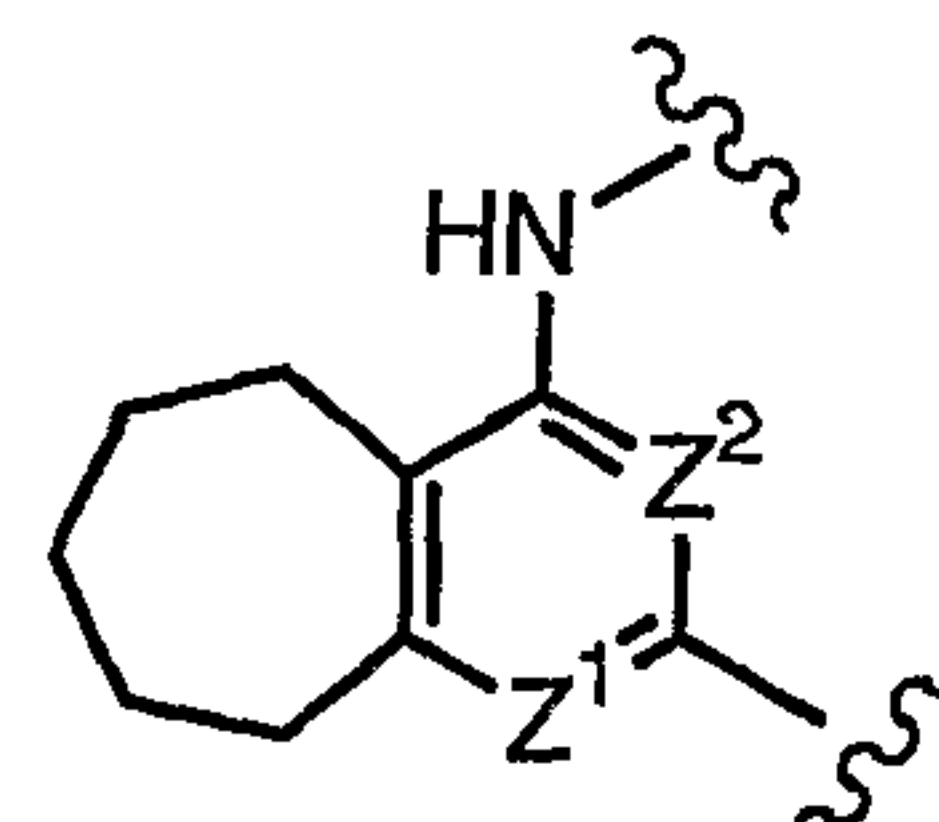
- 30 -



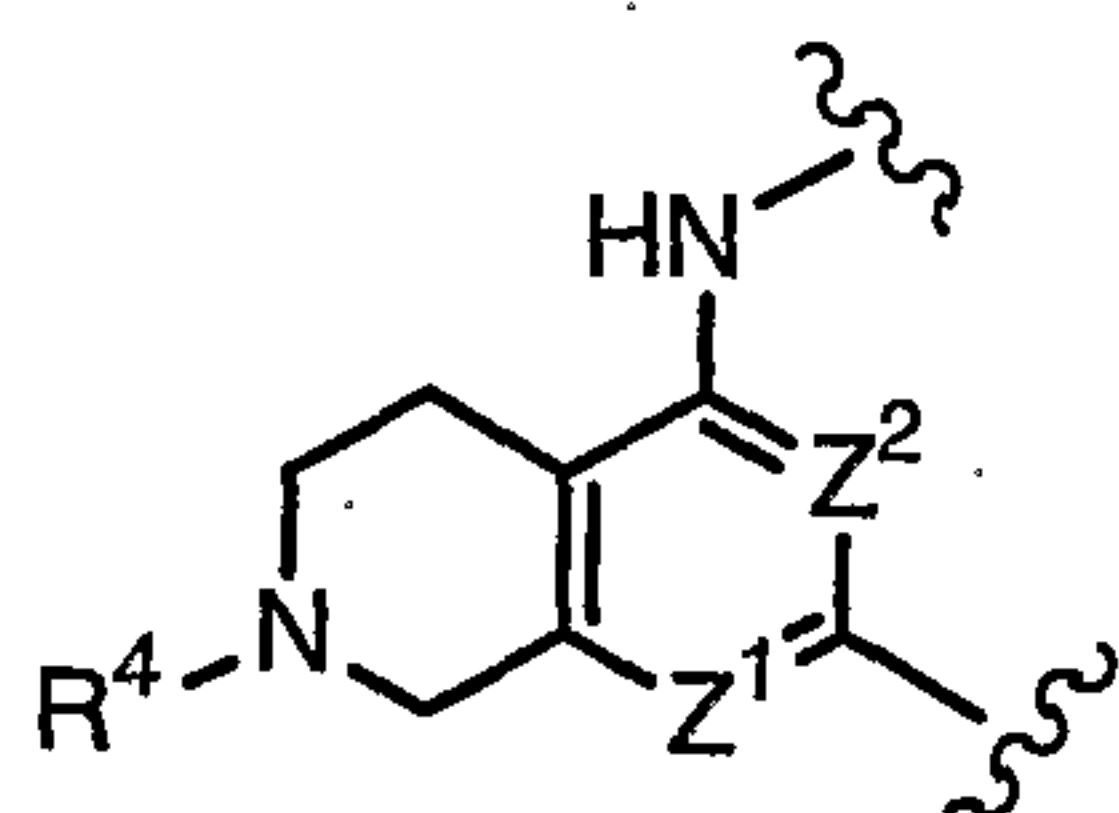
I-A



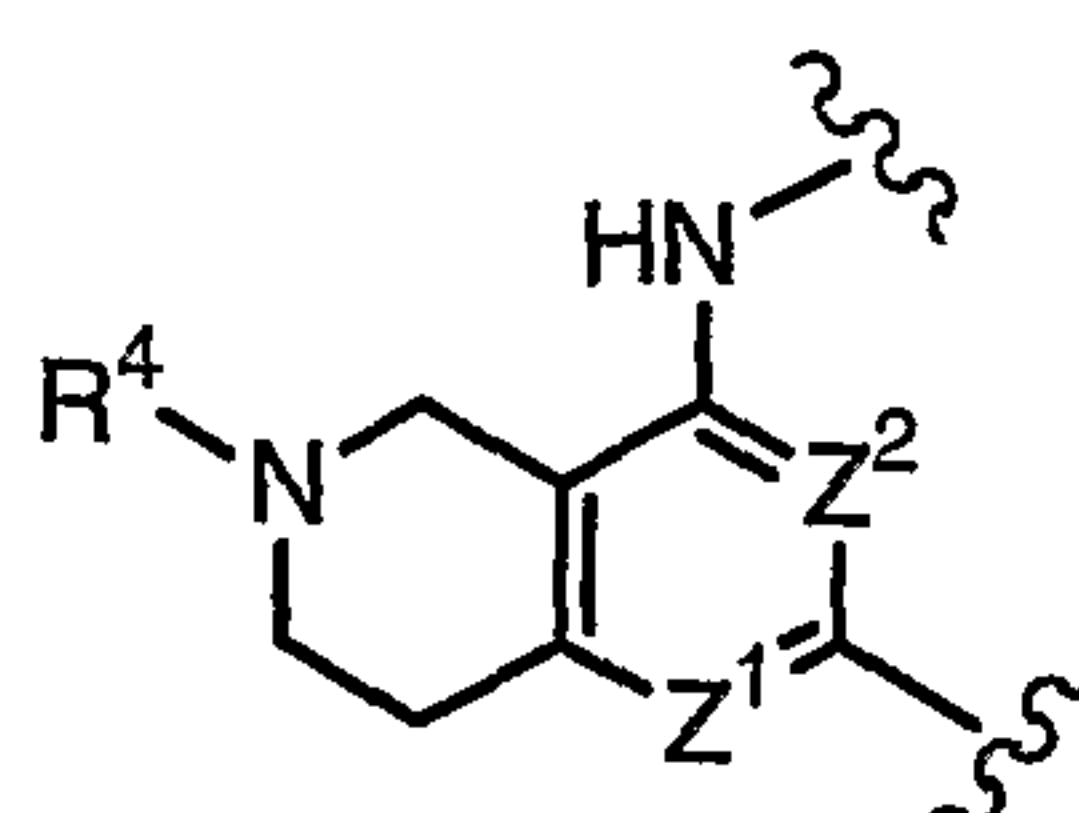
I-B



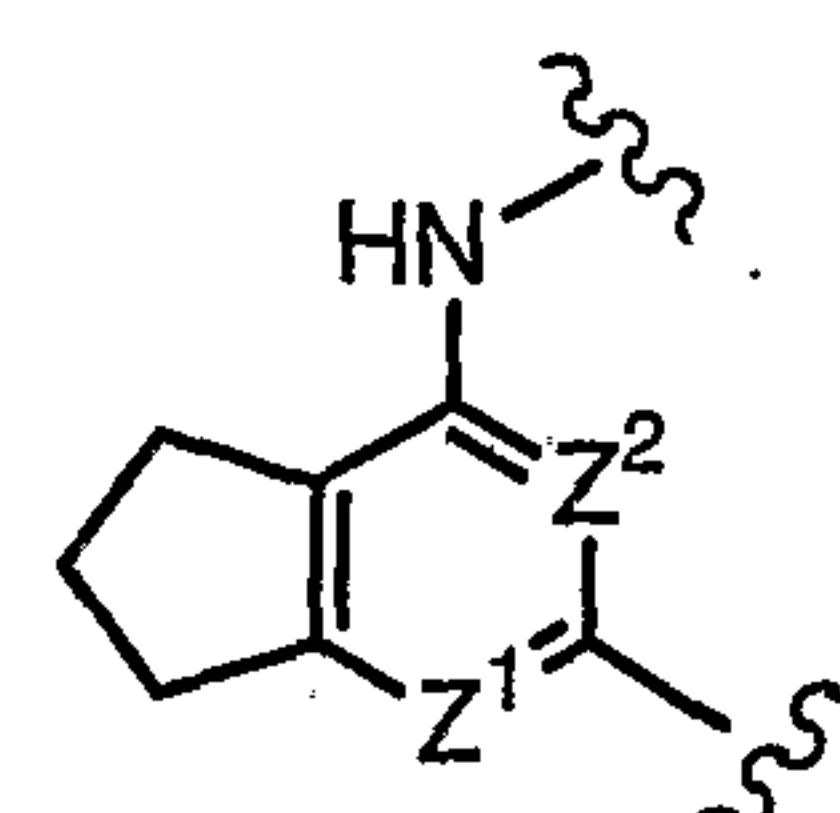
I-C



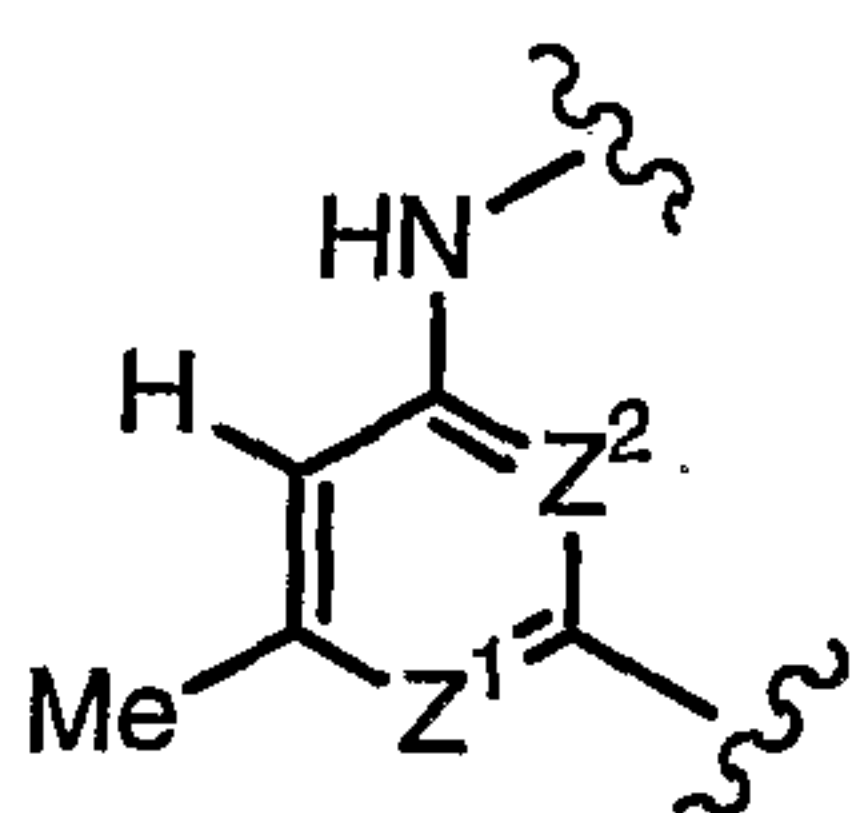
I-D



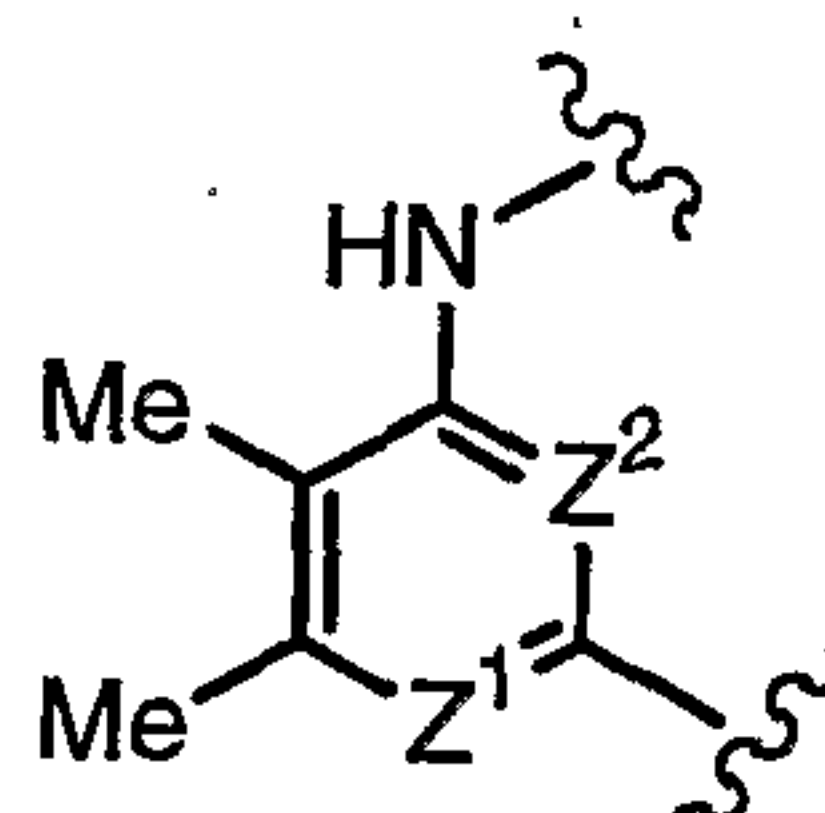
I-E



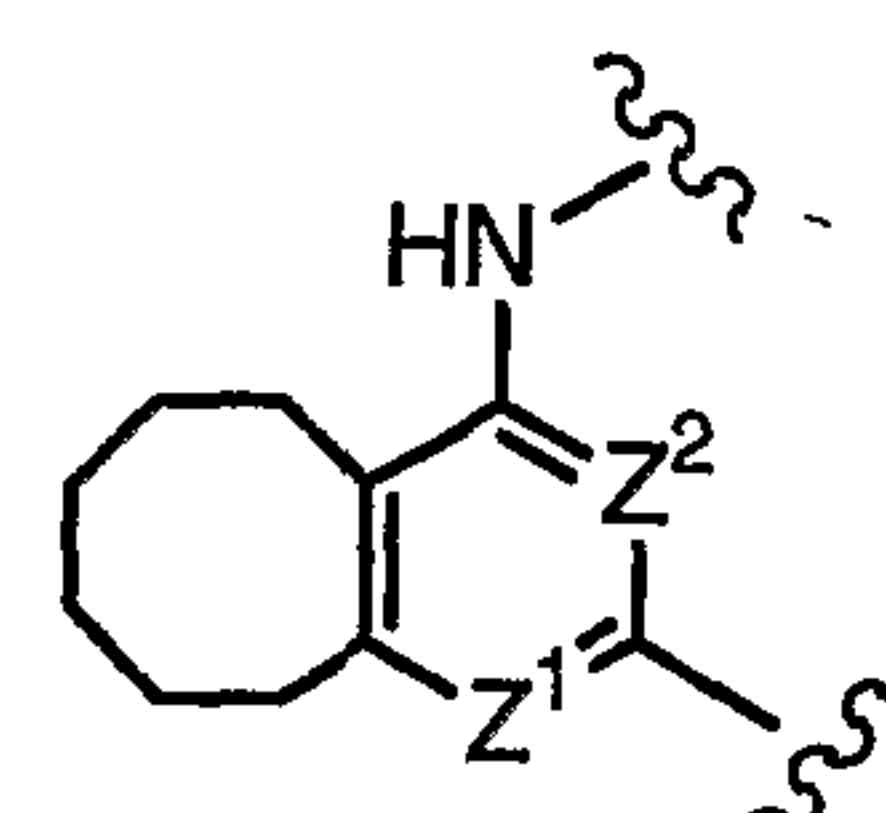
I-F



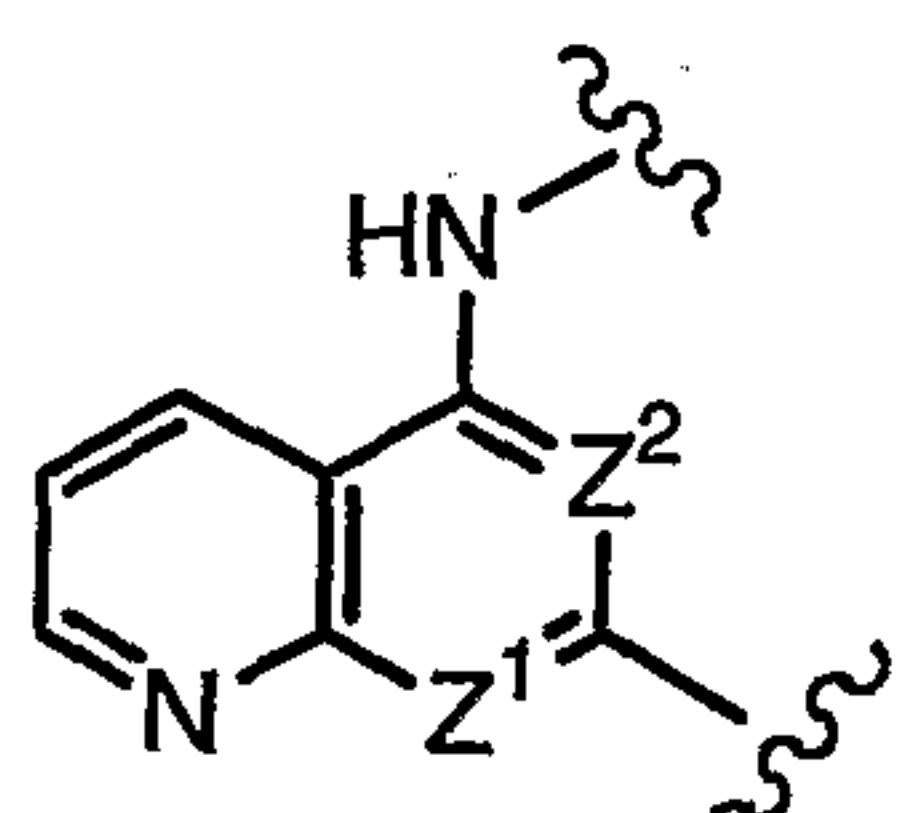
I-G



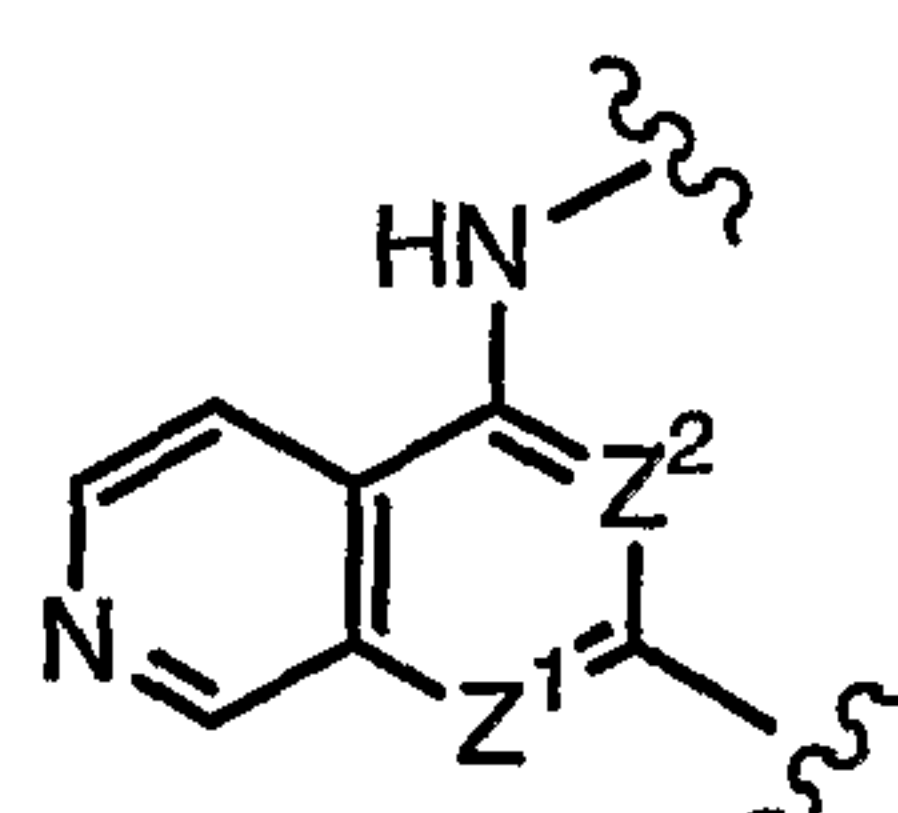
I-H



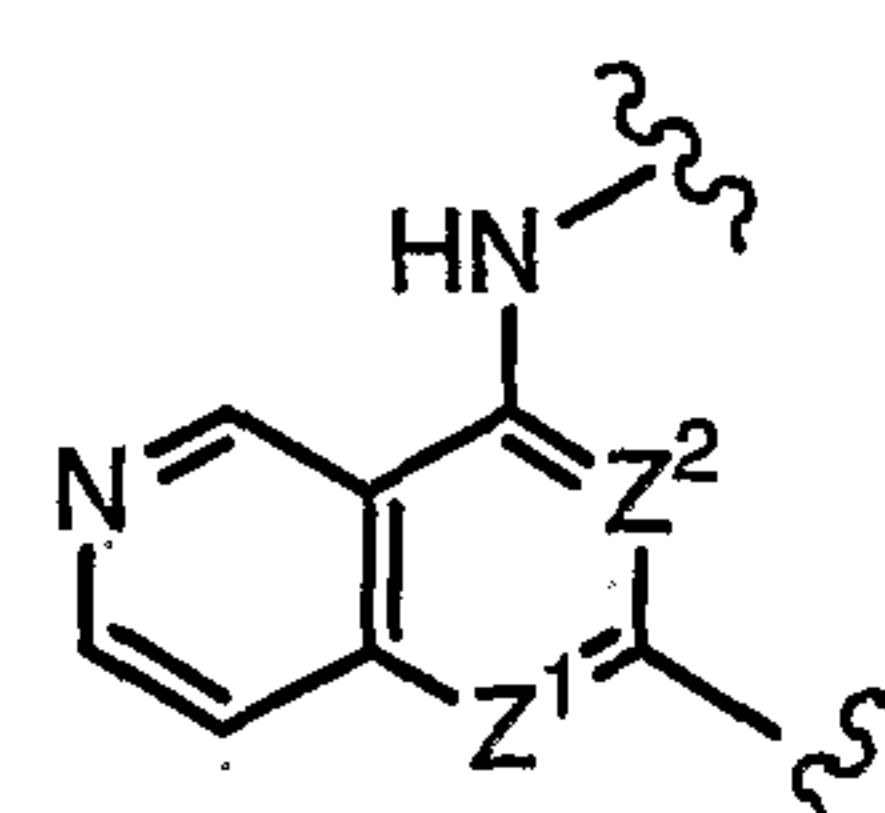
I-I



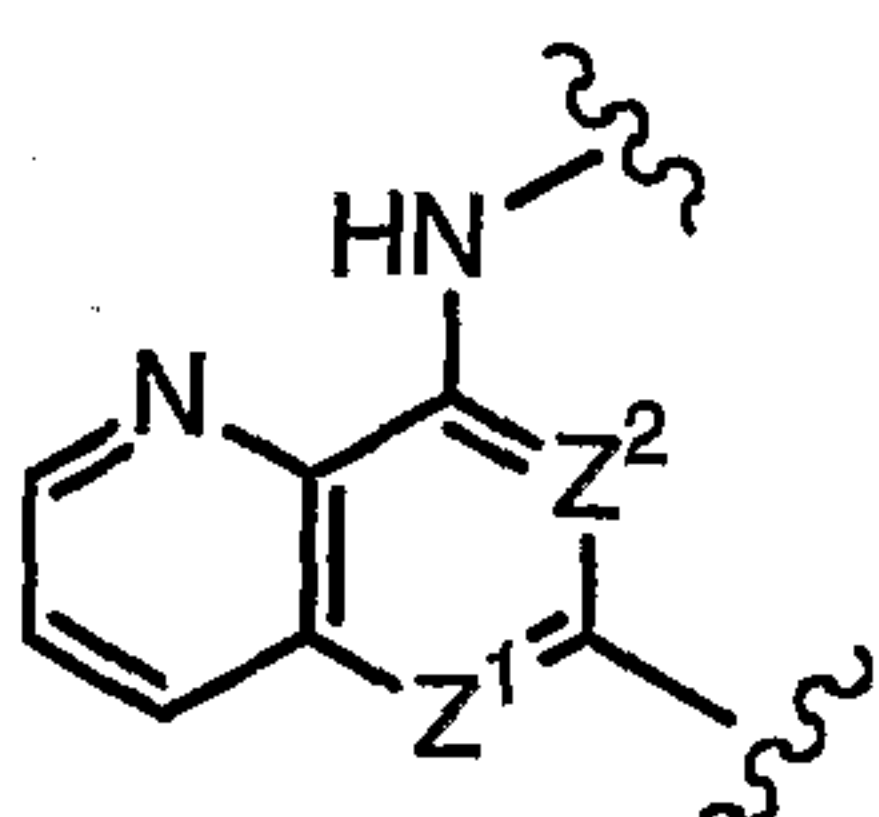
I-J



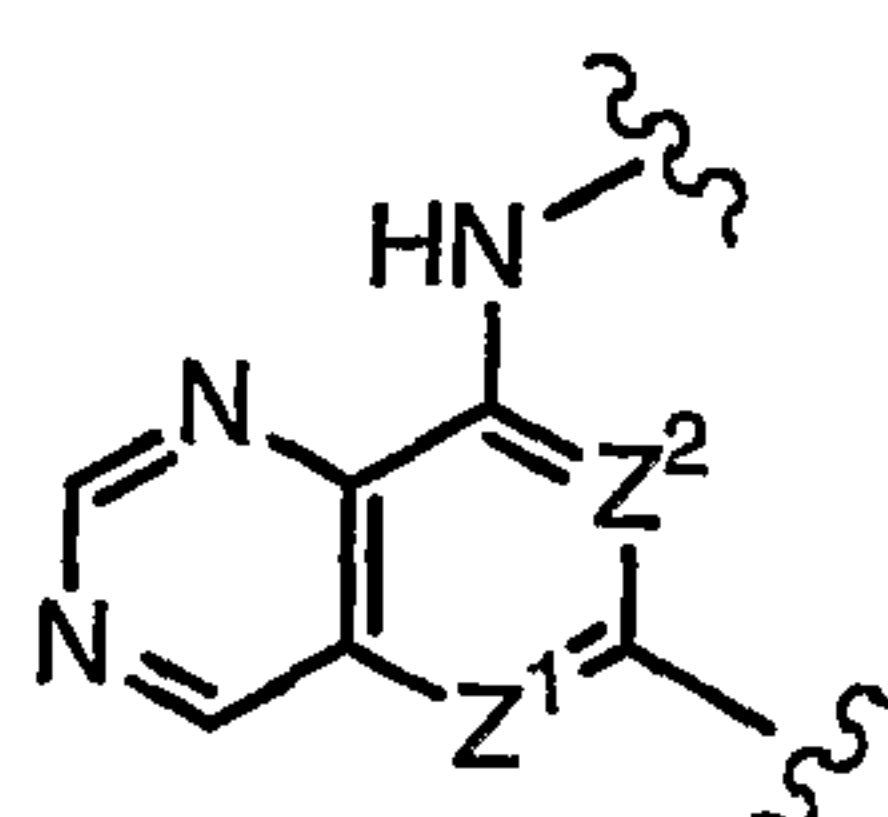
I-K



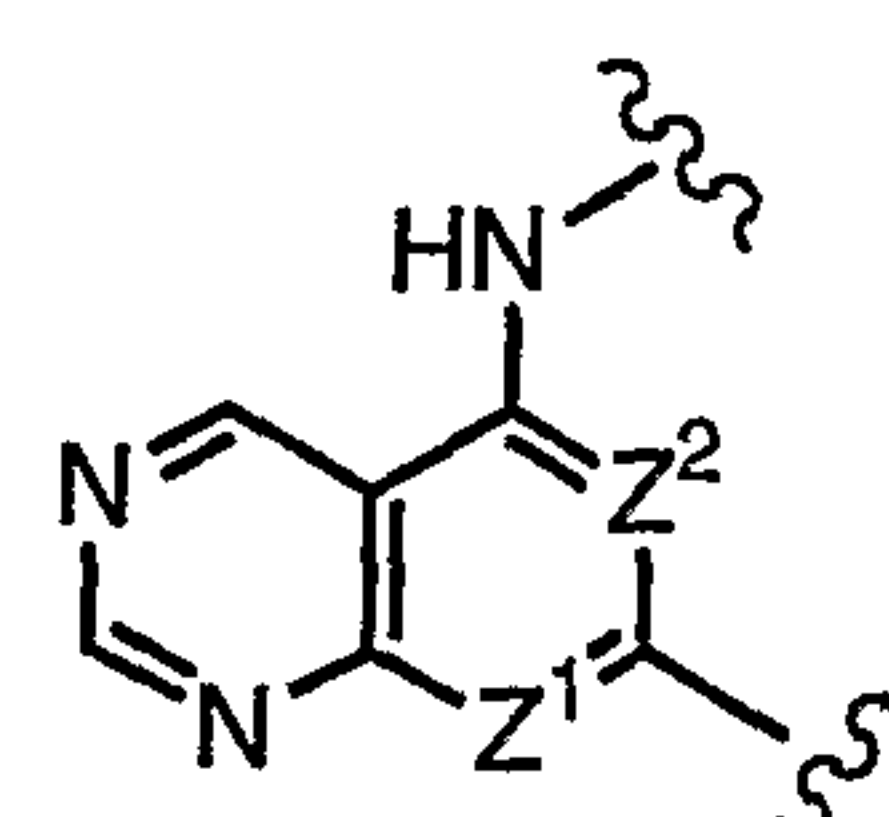
I-L



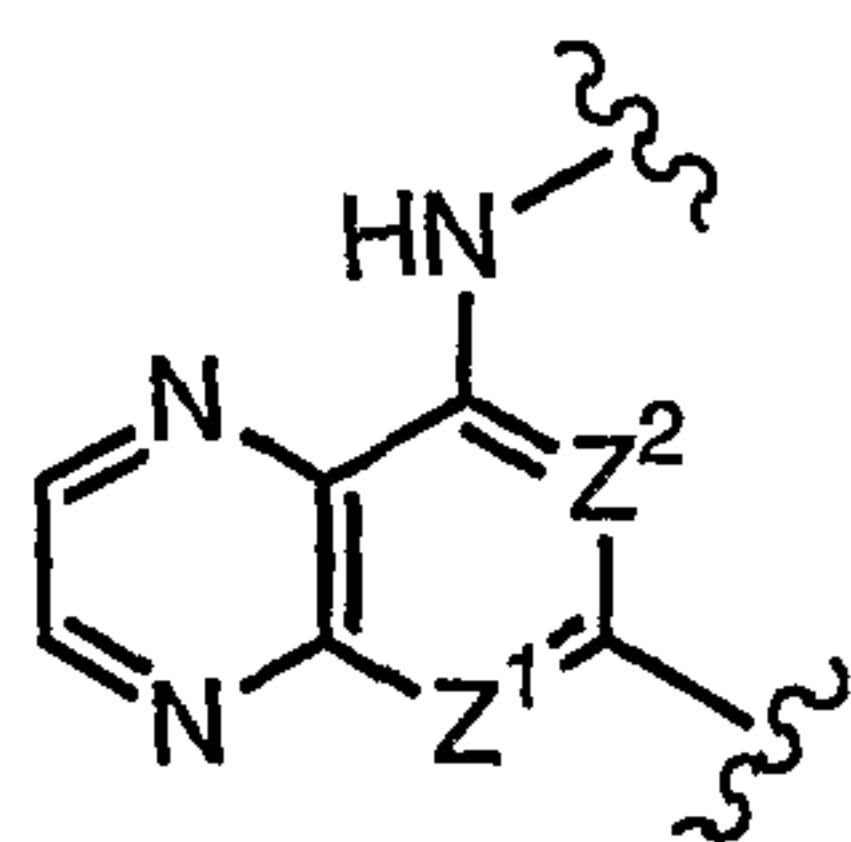
I-M



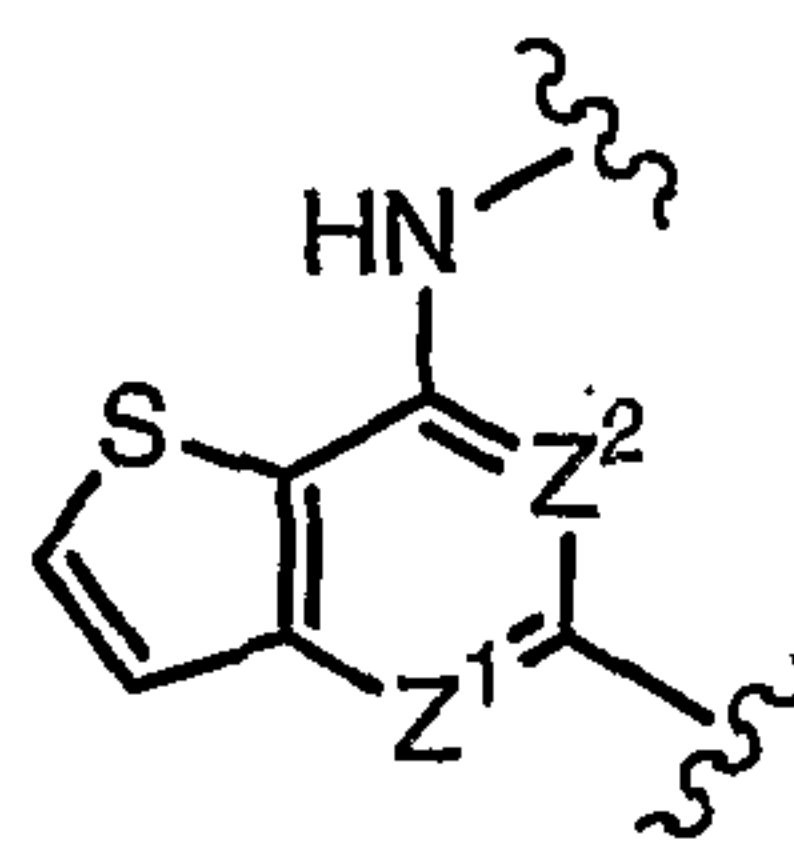
I-N



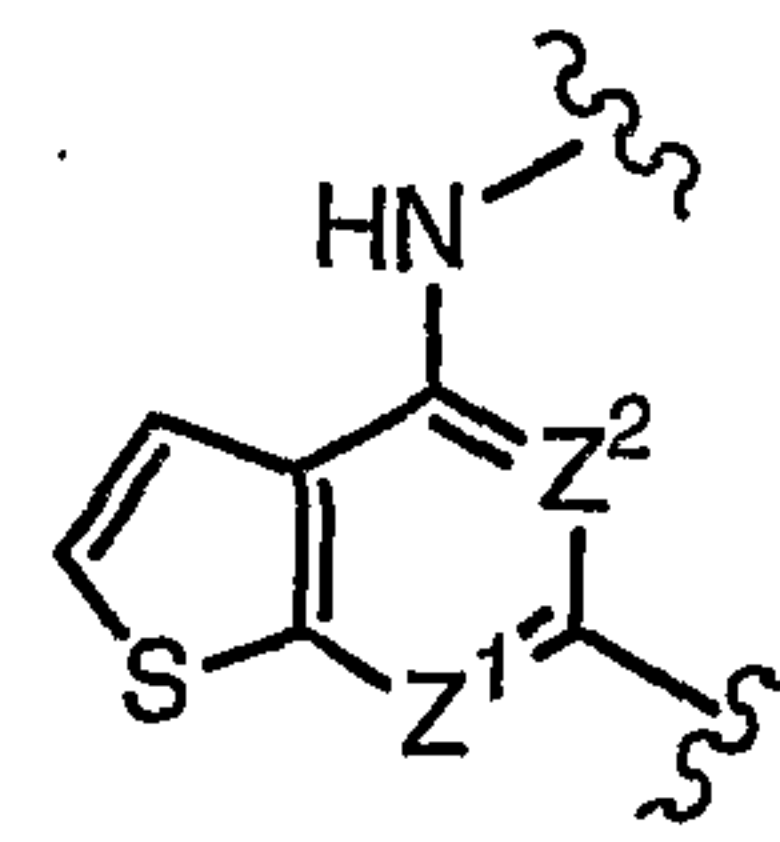
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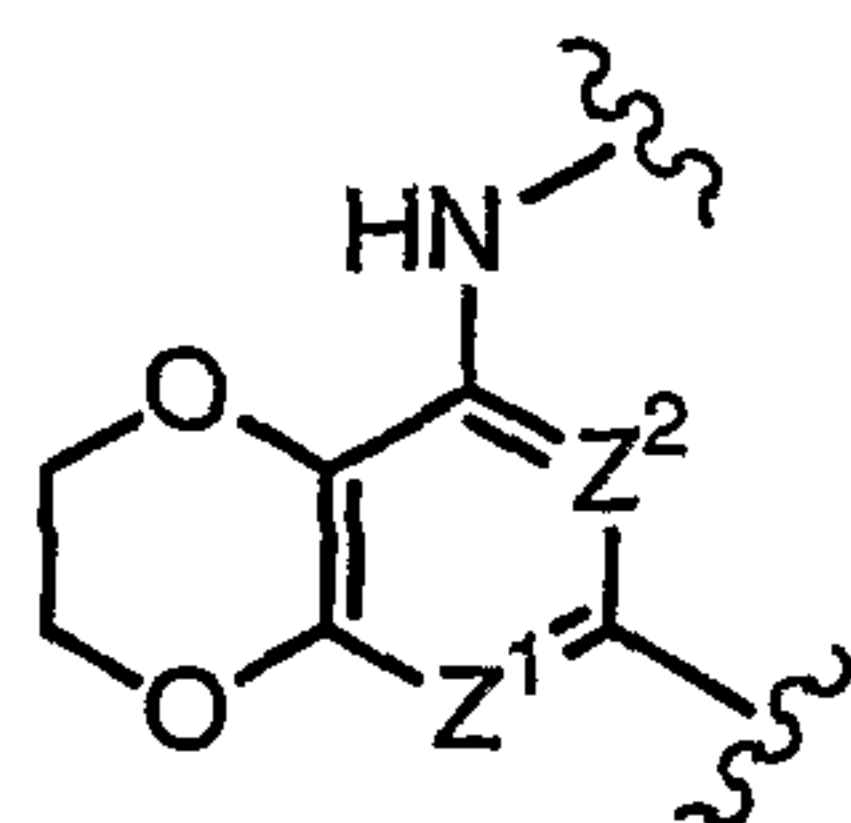
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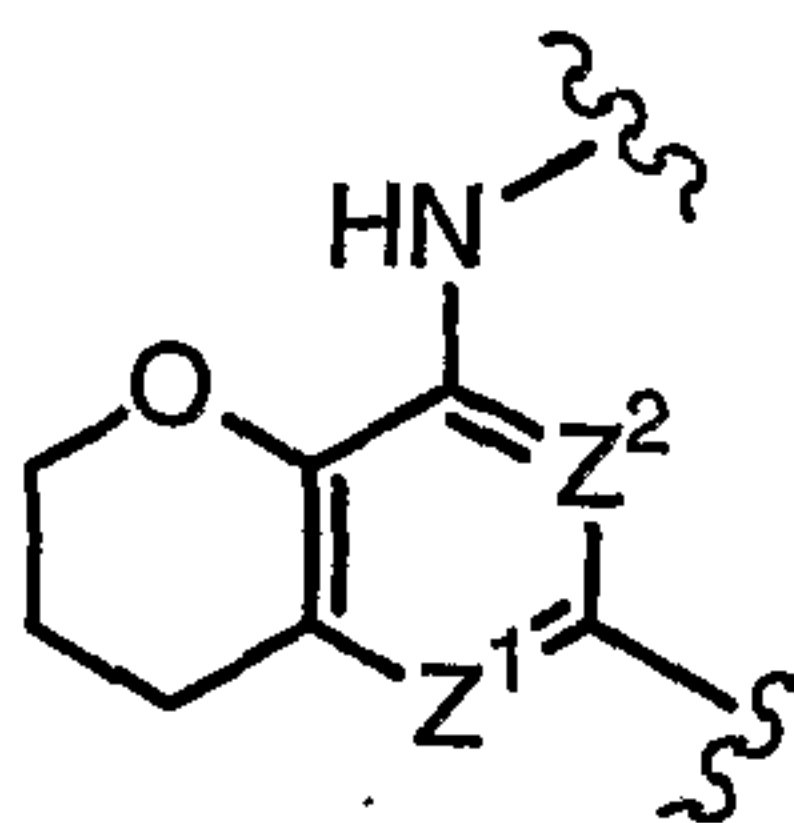
I-Q



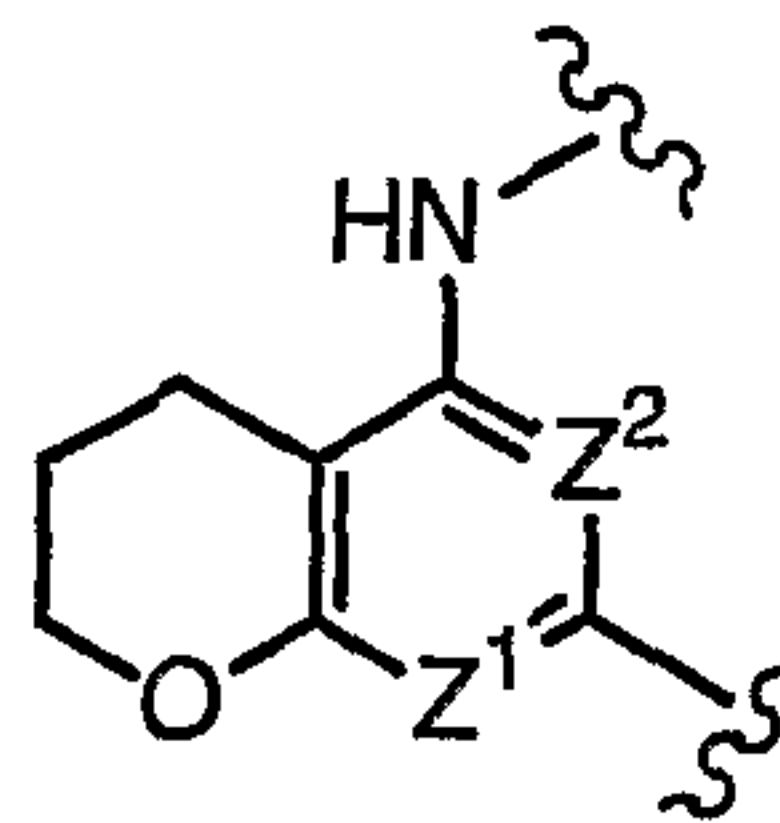
I-R



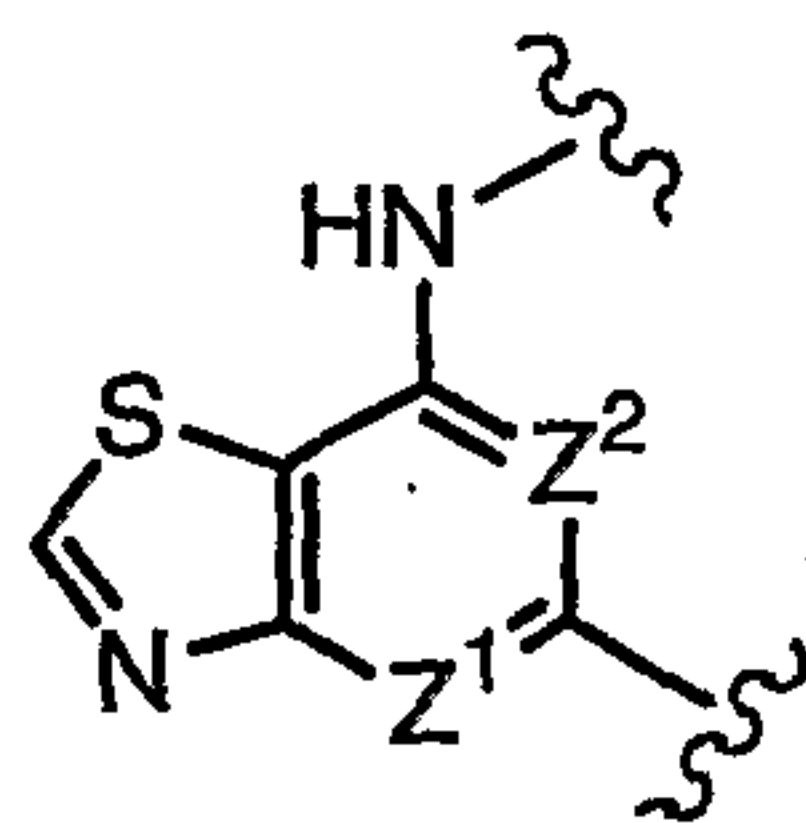
I-S



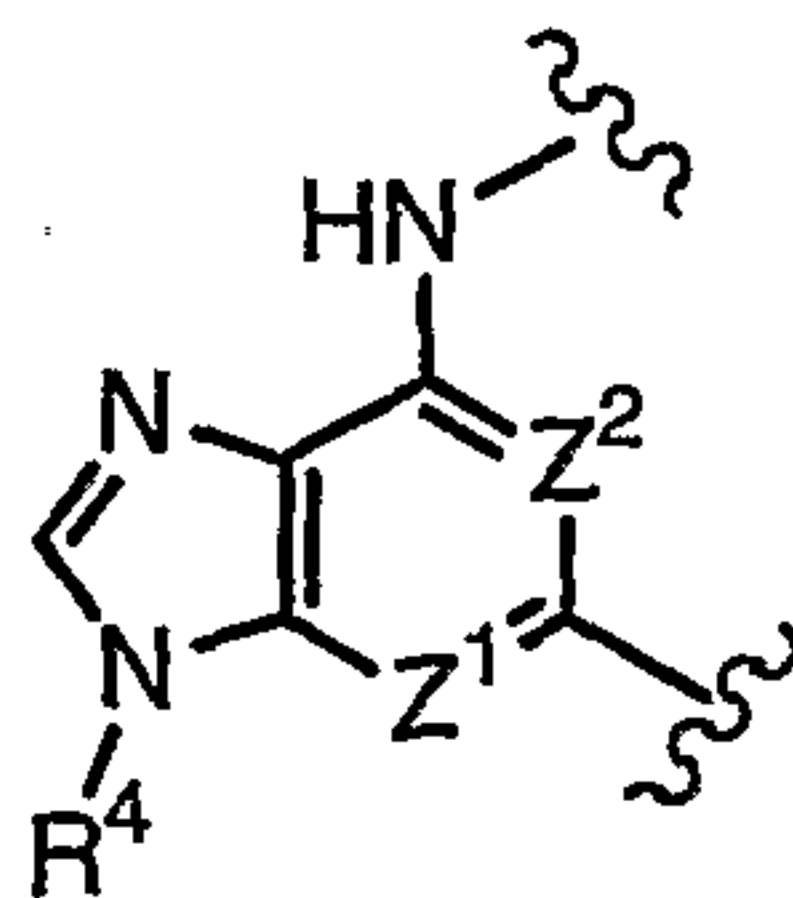
I-T



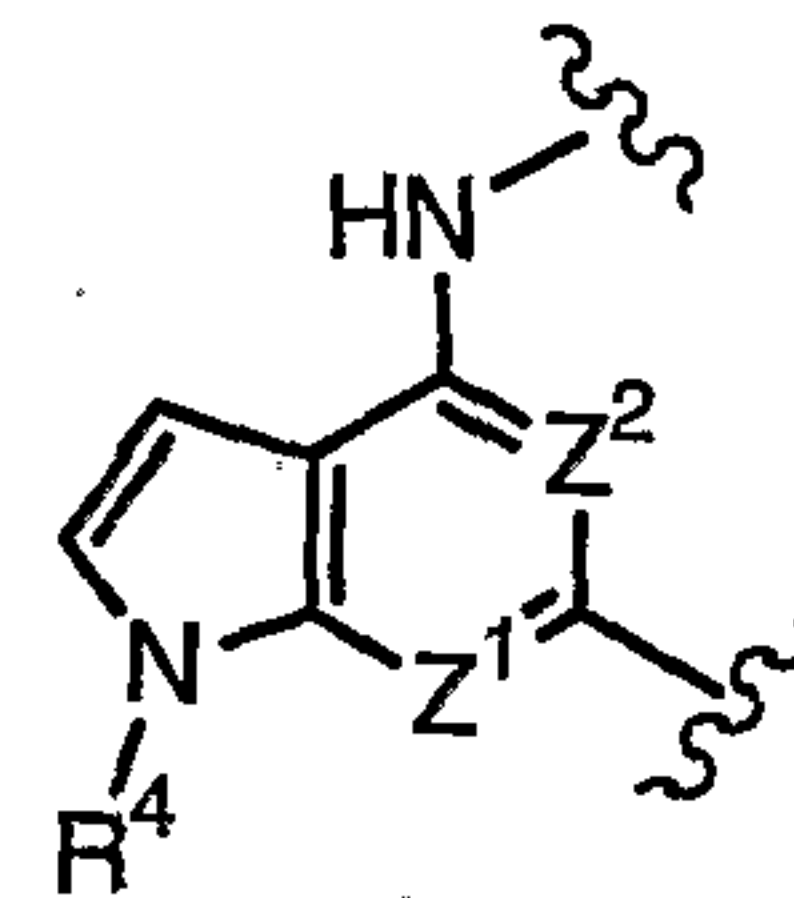
I-U



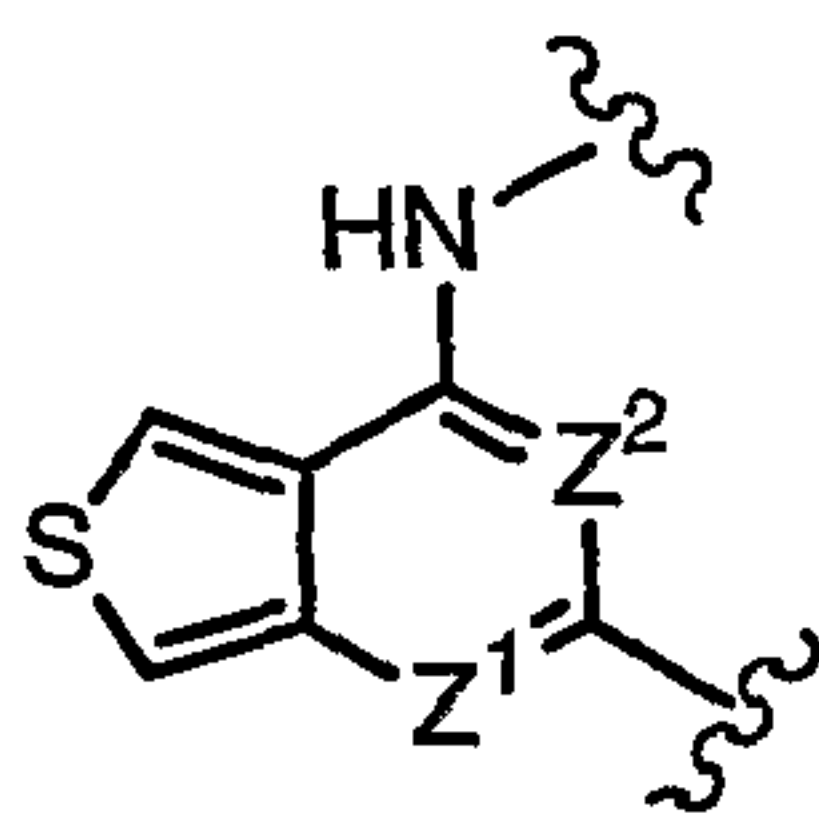
I-V



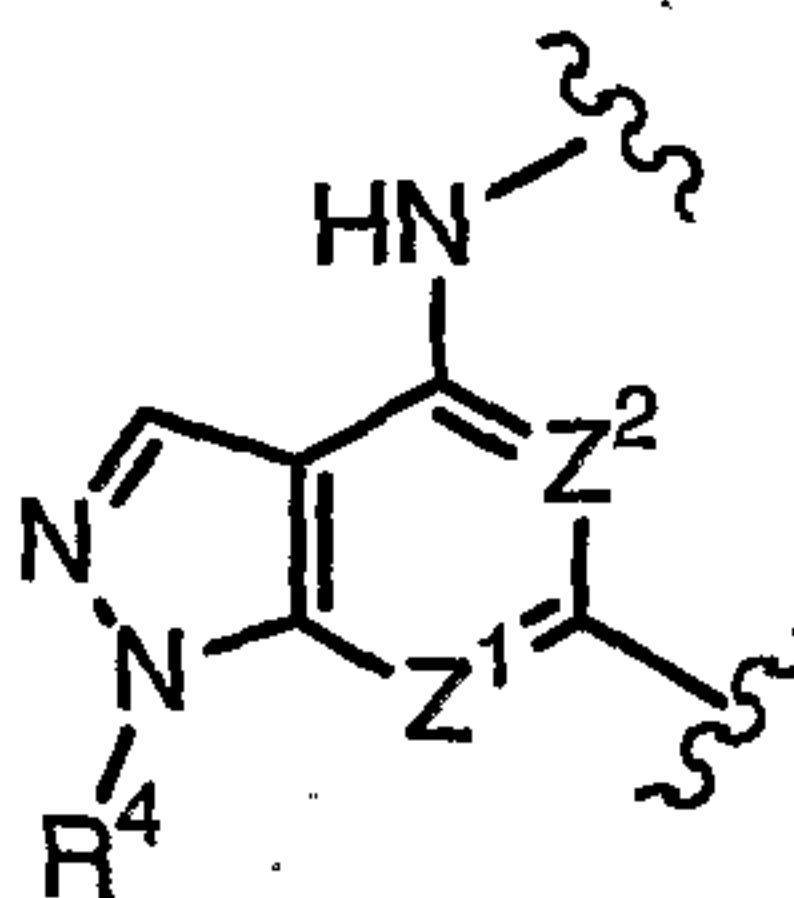
I-W



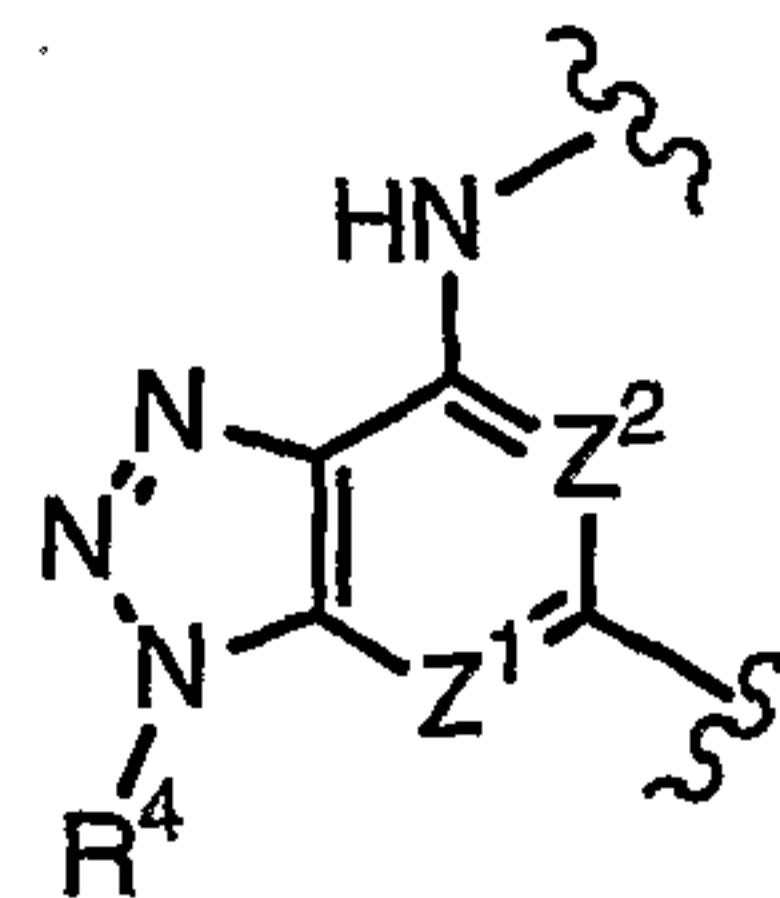
I-X



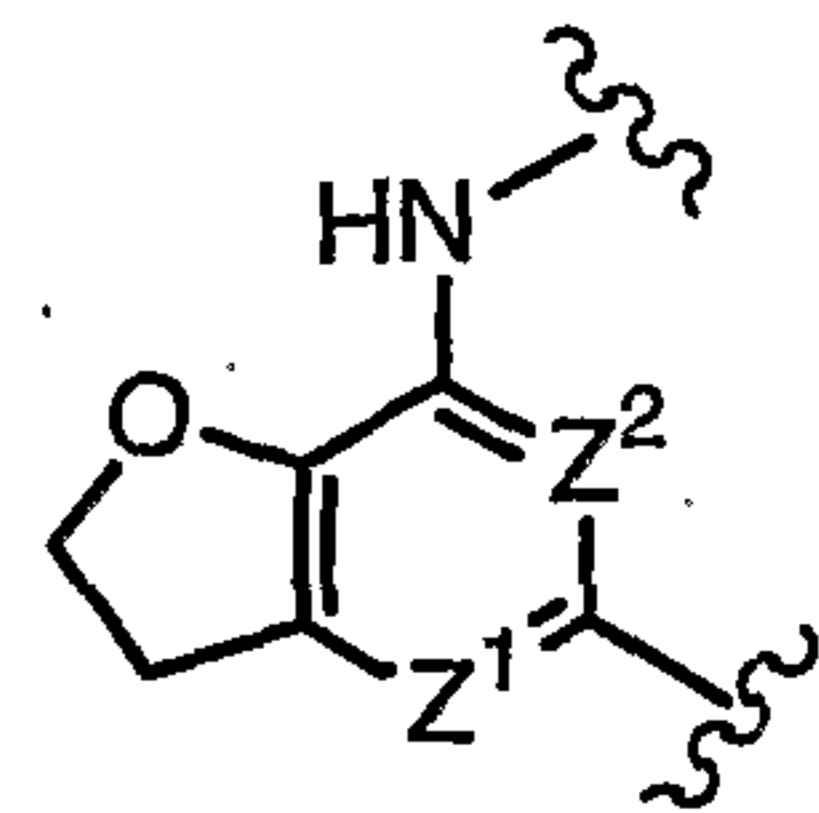
I-Y



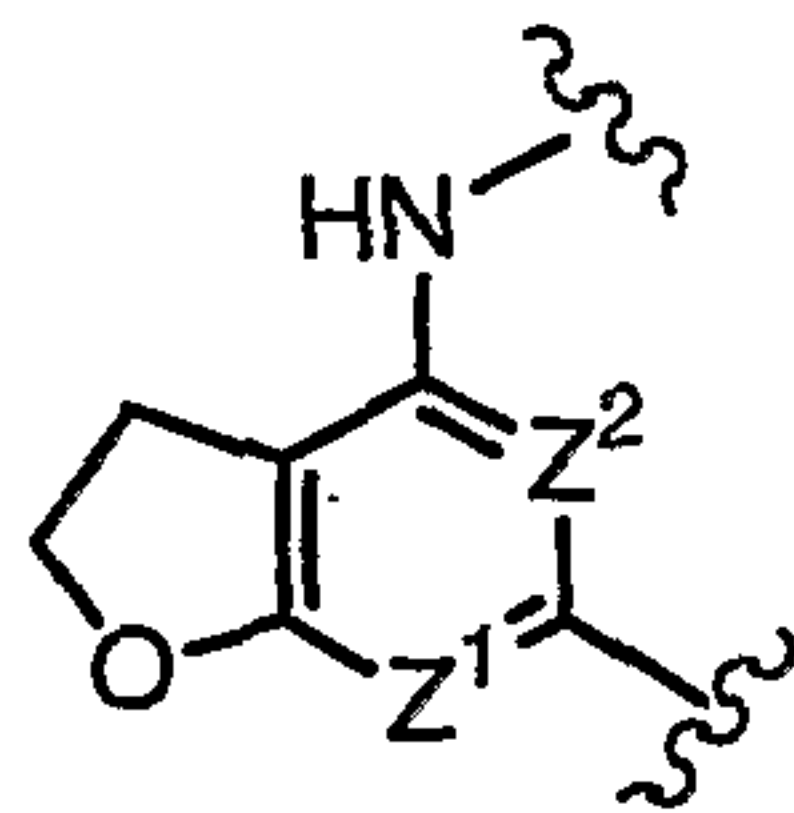
I-Z



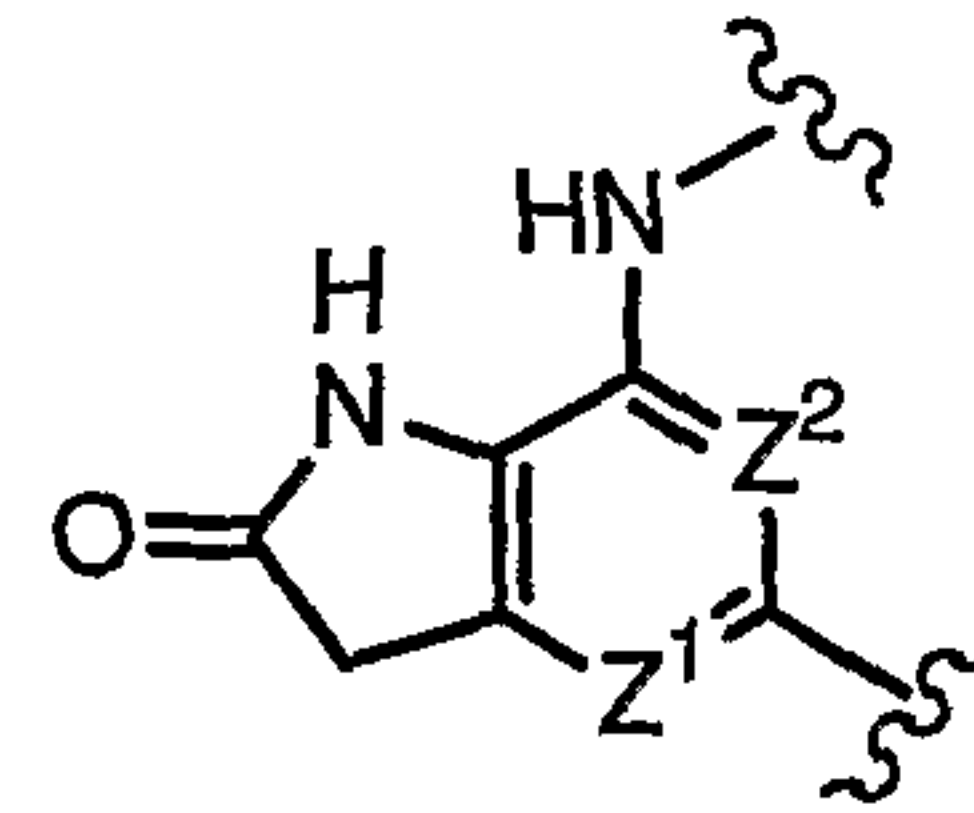
I-AA



I-BB



I-CC



I-DD

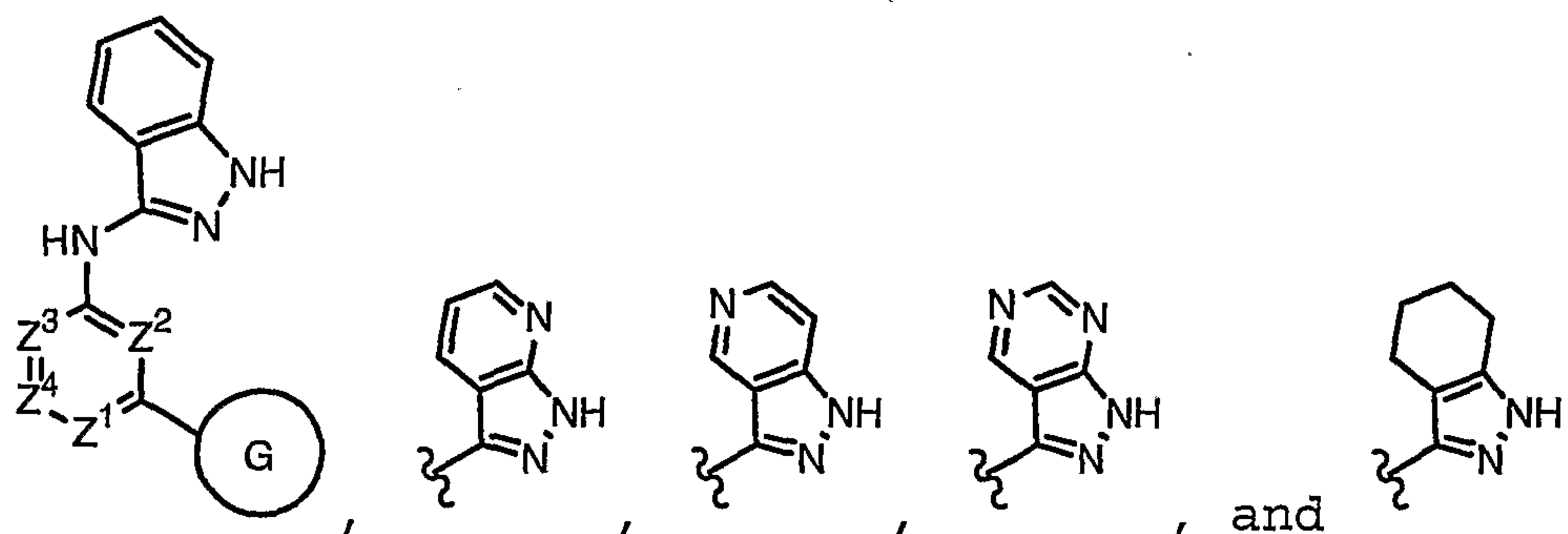
Preferred bicyclic Ring A systems include I-A,
 15 I-B, I-C, I-D, I-E, I-F, I-G, I-H, I-I, I-J, I-K, I-L,
 and I-M, more preferably I-A, I-B, I-C, I-F, and I-H, and
 most preferably I-A, I-B, and I-H.

In the monocyclic Ring A system, preferred R^x groups, when present, include hydrogen, alkyl- or dialkylamino, acetamido, or a C_{1-4} aliphatic group such as methyl, ethyl, cyclopropyl, isopropyl or t-butyl.

5 Preferred R^y groups, when present, include $T-R^3$ wherein T is a valence bond or a methylene, and R^3 is $-R$, $-N(R^4)_2$, or $-OR$. Examples of preferred R^y include 2-pyridyl, 4-pyridyl, piperidinyl, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, alkyl- or dialkylamino, acetamido,
10 optionally substituted phenyl such as phenyl or halo-substituted phenyl, and methoxymethyl.

In the bicyclic Ring A system, the ring formed when R^x and R^y are taken together may be substituted or unsubstituted. Suitable substituents include $-R$, halo,
15 $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$, wherein R and
20 R^4 are as defined above. Preferred R^x/R^y ring substituents include $-halo$, $-R$, $-OR$, $-COR$, $-CO_2R$, $-CON(R^4)_2$, $-CN$, or $-N(R^4)_2$ wherein R is hydrogen or an optionally substituted C_{1-6} aliphatic group.

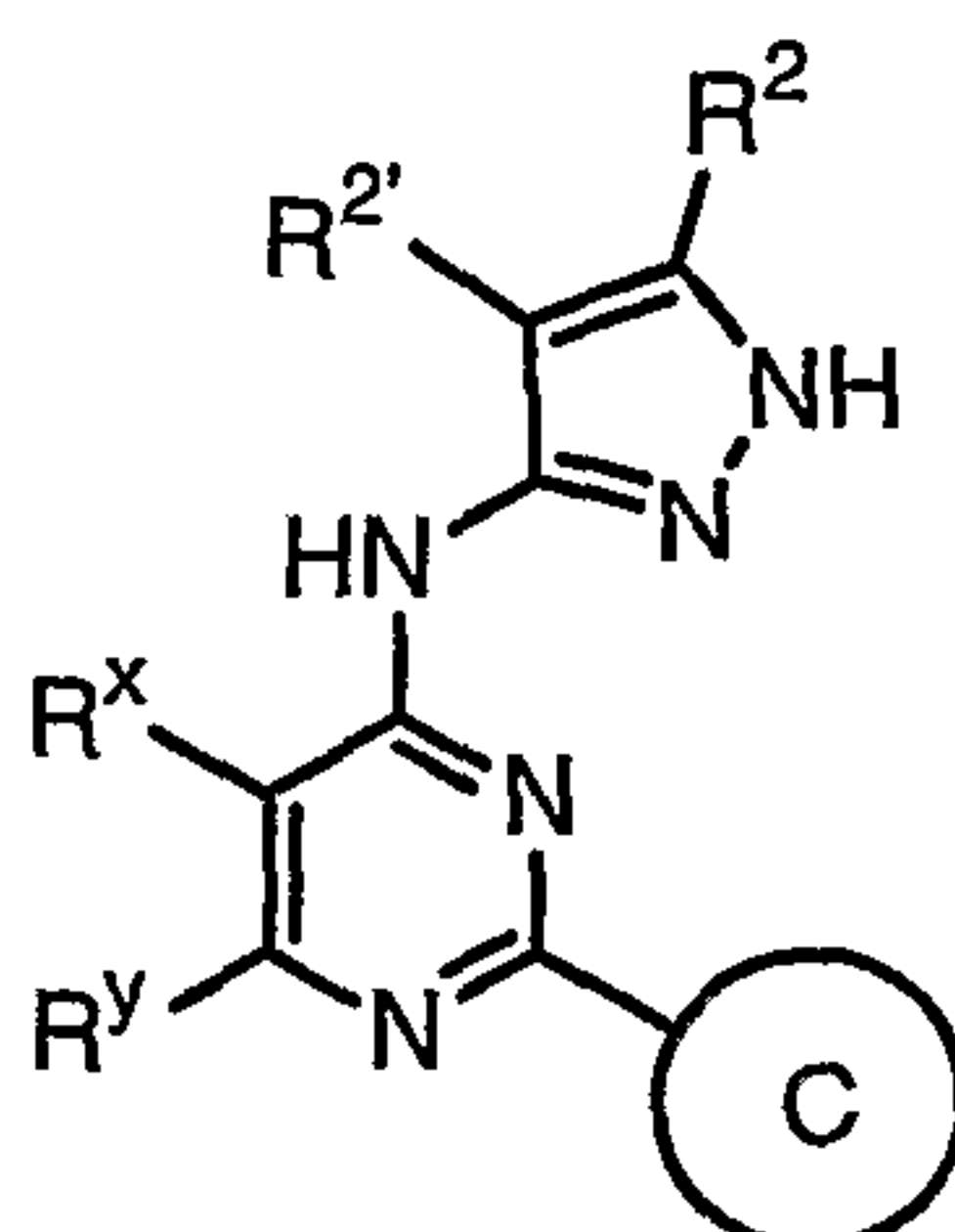
R^2 and $R^{2'}$ may be taken together to form a fused
25 ring, thus providing a bicyclic ring system containing a pyrazole ring. Preferred fused rings include benzo, pyrido, pyrimido, and a partially unsaturated 6-membered carbocyclo ring, wherein said fused ring is optionally substituted. These are exemplified in the following
30 formula I compounds having a pyrazole-containing bicyclic ring system:



Preferred substituents on the $R^2/R^{2'}$ fused ring include one or more of the following: -halo, $-N(R^4)_2$, $-C_{1-3}$ alkyl, $-C_{1-3}$ haloalkyl, $-NO_2$, $-O(C_{1-3}$ alkyl), $-CO_2(C_{1-3}$ alkyl), $-CN$, $-SO_2(C_{1-3}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-3}$ alkyl), $-NHC(O)(C_{1-3}$ alkyl), $-C(O)NH_2$, and $-CO(C_{1-3}$ alkyl), wherein the $(C_{1-3}$ alkyl) is most preferably methyl.

When the pyrazole ring system is monocyclic, preferred R^2 groups include hydrogen, C_{1-4} aliphatic, alkoxy carbonyl, (un)substituted phenyl, hydroxyalkyl, alkoxyalkyl, aminocarbonyl, mono- or dialkylaminocarbonyl, aminoalkyl, alkylaminoalkyl, dialkylaminoalkyl, phenylaminocarbonyl, and (N-heterocyclyl)carbonyl. Examples of such preferred R^2 substituents include methyl, cyclopropyl, ethyl, isopropyl, propyl, t-butyl, cyclopentyl, phenyl, CO_2H , CO_2CH_3 , CH_2OH , CH_2OCH_3 , $CH_2CH_2CH_2OH$, $CH_2CH_2CH_2OCH_3$, $CH_2CH_2CH_2OCH_2Ph$, $CH_2CH_2CH_2NH_2$, $CH_2CH_2CH_2NHCOOC(CH_3)_3$, $CONHCH(CH_3)_2$, $CONHCH_2CH=CH_2$, $CONHCH_2CH_2OCH_3$, $CONHCH_2Ph$, $CONH(cyclohexyl)$, $CON(Et)_2$, $CON(CH_3)CH_2Ph$, $CONH(n-C_3H_7)$, $CON(Et)CH_2CH_2CH_3$, $CONHCH_2CH(CH_3)_2$, $CON(n-C_3H_7)_2$, $CO(3-methoxymethylpyrrolidin-1-yl)$, $CONH(3-tolyl)$, $CONH(4-tolyl)$, $CONHCH_3$, $CO(morpholin-1-yl)$, $CO(4-methylpiperazin-1-yl)$, $CONHCH_2CH_2OH$, $CONH_2$, and $CO(piperidin-1-yl)$. A preferred $R^{2'}$ group is hydrogen.

An embodiment that is particularly useful for treating GSK3-mediated diseases relates to compounds of formula II:



II

or a pharmaceutically acceptable derivative or prodrug thereof, wherein;

Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from -R¹, any substitutable non-ortho carbon position on Ring C is independently substituted by -R⁵, and two adjacent substituents on Ring C are optionally taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-6 membered ring having 0-3 heteroatoms selected from oxygen, sulfur or nitrogen, said fused ring being optionally substituted by halo, oxo, or -R⁸;

R¹ is selected from -halo, -CN, -NO₂, T-V-R⁶, phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C₁₋₆ aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or -R⁸, said C₁₋₆ aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R¹ and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^x and R^y are independently selected from $T-R^3$, or R^x and R^y are taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-8 membered ring having 0-3 ring heteroatoms selected from oxygen, sulfur, or nitrogen, wherein any substitutable carbon on said fused ring formed by R^x and R^y is substituted by oxo or $T-R^3$, and any substitutable nitrogen on said ring formed by R^x and R^y is substituted by R^4 ;

T is a valence bond or a C_{1-4} alkylidene chain;

R^2 and $R^{2'}$ are independently selected from $-R$, $-T-W-R^6$, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring having 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur, wherein each substitutable carbon on said fused ring formed by R^2 and $R^{2'}$ is substituted by halo, oxo, $-CN$, $-NO_2$, $-R^7$, or $-V-R^6$, and any substitutable nitrogen on said ring formed by R^2 and $R^{2'}$ is substituted by R^4 ;

R^3 is selected from $-R$, $-halo$, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-COCH_2COR$, $-NO_2$, $-CN$, $-S(O)R$, $-S(O)_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^7)_2$, $-SO_2N(R^7)_2$, $-OC(=O)R$, $-N(R^7)COR$, $-N(R^7)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^7)CON(R^7)_2$, $-N(R^7)SO_2N(R^7)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^7)_2$;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

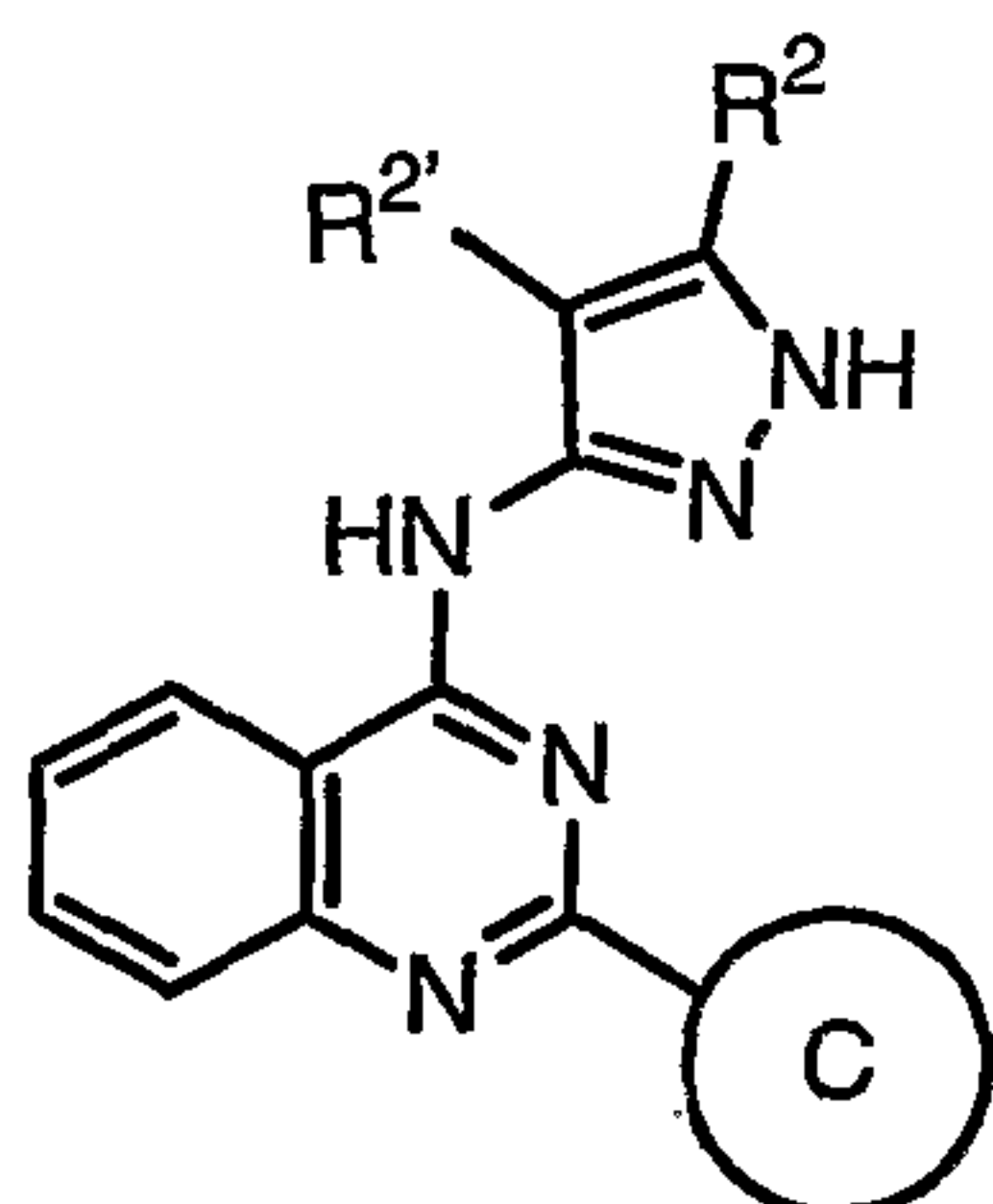
each R^4 is independently selected from $-R^7$, $-COR^7$, $-CO_2$ (optionally substituted C_{1-6} aliphatic), $-CON(R^7)_2$, or $-SO_2R^7$, or two R^4 on the same nitrogen are taken

together to form a 5-8 membered heterocyclyl or heteroaryl ring;

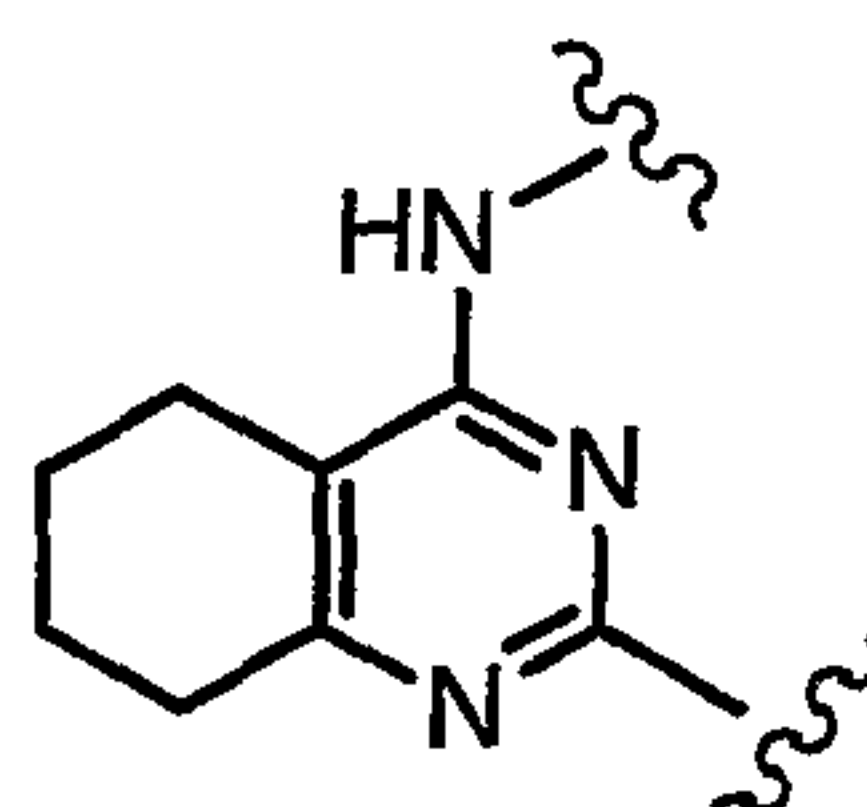
- each R^5 is independently selected from -R, halo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂, or R^5 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;
- V is -O-, -S-, -SO-, -SO₂-, -N(R⁶)SO₂-, -SO₂N(R⁶)-, -N(R⁶)-, -CO-, -CO₂-, -N(R⁶)CO-, -N(R⁶)C(O)O-, -N(R⁶)CON(R⁶)-, -N(R⁶)SO₂N(R⁶)-, -N(R⁶)N(R⁶)-, -C(O)N(R⁶)-, -OC(O)N(R⁶)-, -C(R⁶)₂O-, -C(R⁶)₂S-, -C(R⁶)₂SO-, -C(R⁶)₂SO₂-, -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-, -C(R⁶)₂N(R⁶)C(O)-, -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-, -C(R⁶)=N-O-, -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-, or -C(R⁶)₂N(R⁶)CON(R⁶)-;
- W is -C(R⁶)₂O-, -C(R⁶)₂S-, -C(R⁶)₂SO-, -C(R⁶)₂SO₂-, -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-, -CO-, -CO₂-, -C(R⁶)OC(O)-, -C(R⁶)OC(O)N(R⁶)-, -C(R⁶)₂N(R⁶)CO-, -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-, -C(R⁶)=N-O-, -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)CON(R⁶)-, or -CON(R⁶)-;
- each R^6 is independently selected from hydrogen, an optionally substituted C₁₋₄ aliphatic group, or two R^6 groups on the same nitrogen atom are taken together with the nitrogen atom to form a 5-6 membered heterocyclyl or heteroaryl ring;
- each R^7 is independently selected from hydrogen or an optionally substituted C₁₋₆ aliphatic group, or two R^7 on the same nitrogen are taken together with the nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring; and

each R^6 is independently selected from an optionally substituted C_{1-4} aliphatic group, $-OR^6$, $-SR^6$, $-COR^6$, $-SO_2R^6$, $-N(R^6)_2$, $-N(R^6)N(R^6)_2$, $-CN$, $-NO_2$, $-CON(R^6)_2$, or $-CO_2R^6$.

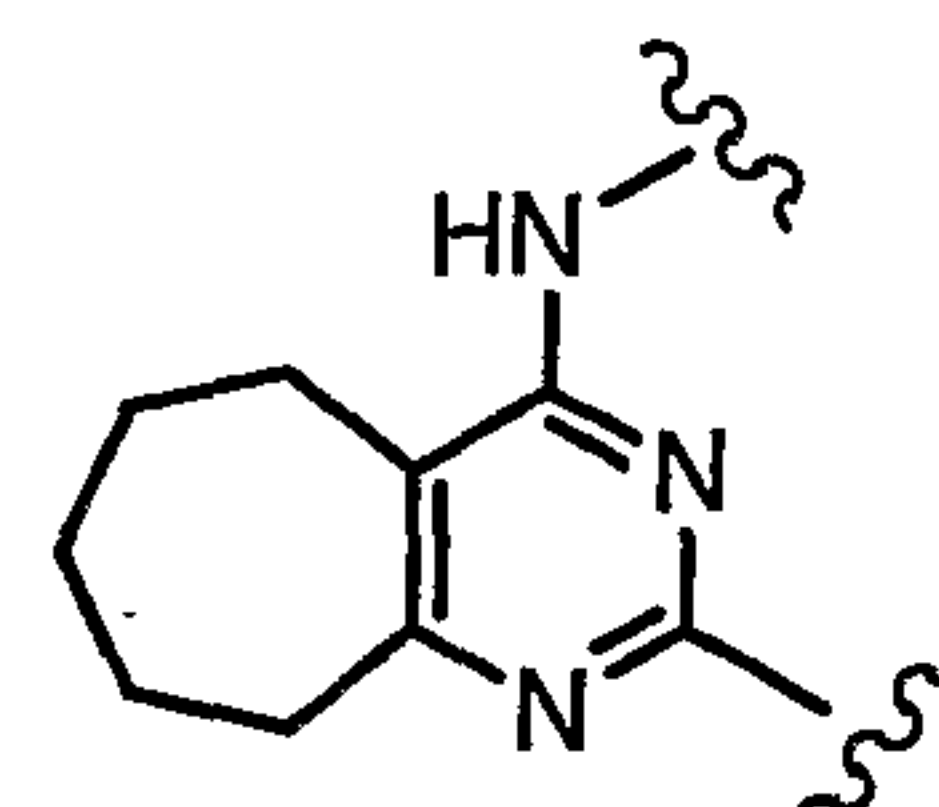
5 When the R^x and R^y groups of formula II are taken together to form a fused ring, preferred R^x/R^y rings include a 5-, 6-, 7-, or 8-membered unsaturated or partially unsaturated ring having 0-2 heteroatoms, wherein said R^x/R^y ring is optionally substituted. This
10 provides a bicyclic ring system containing a pyrimidine ring. Examples of preferred pyrimidine ring systems of formula II are the mono- and bicyclic systems shown below.



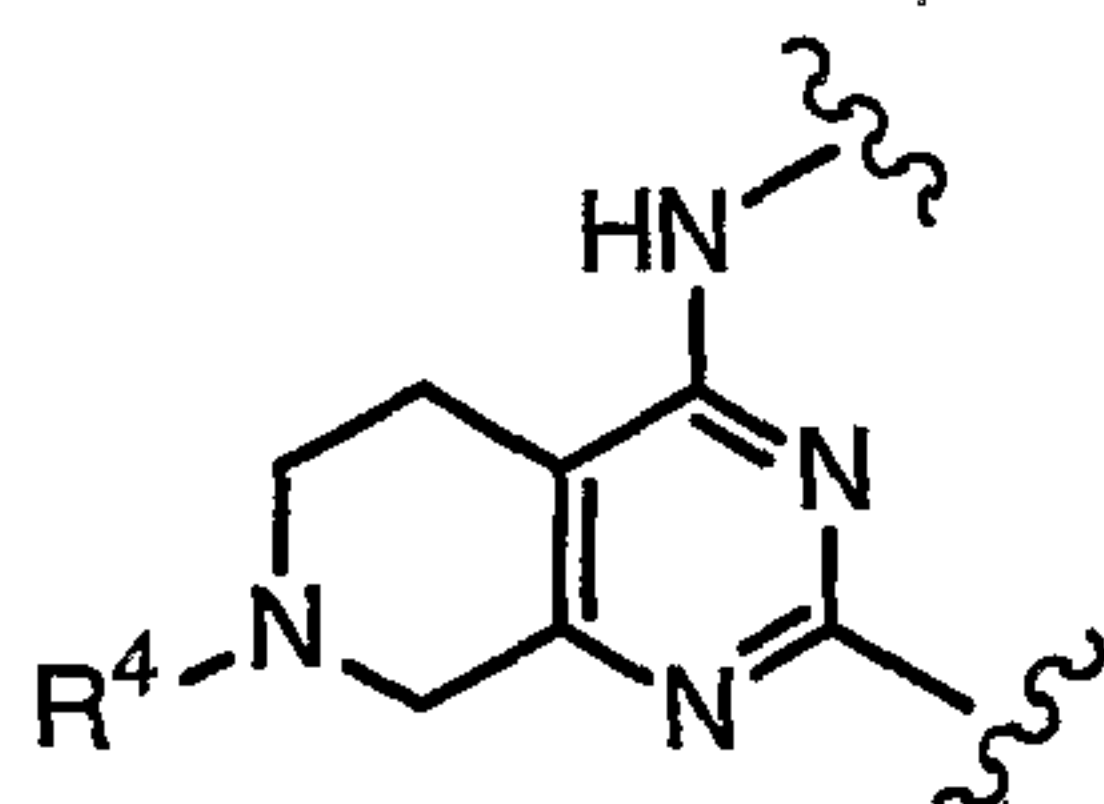
II-A



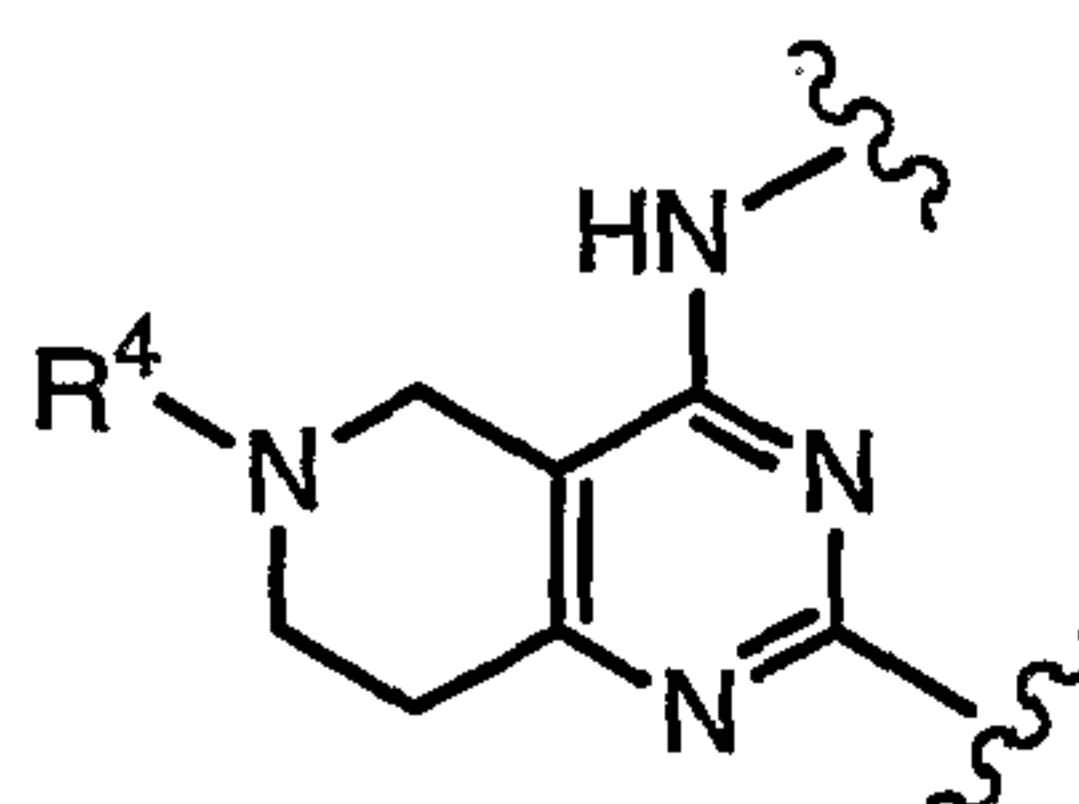
II-B



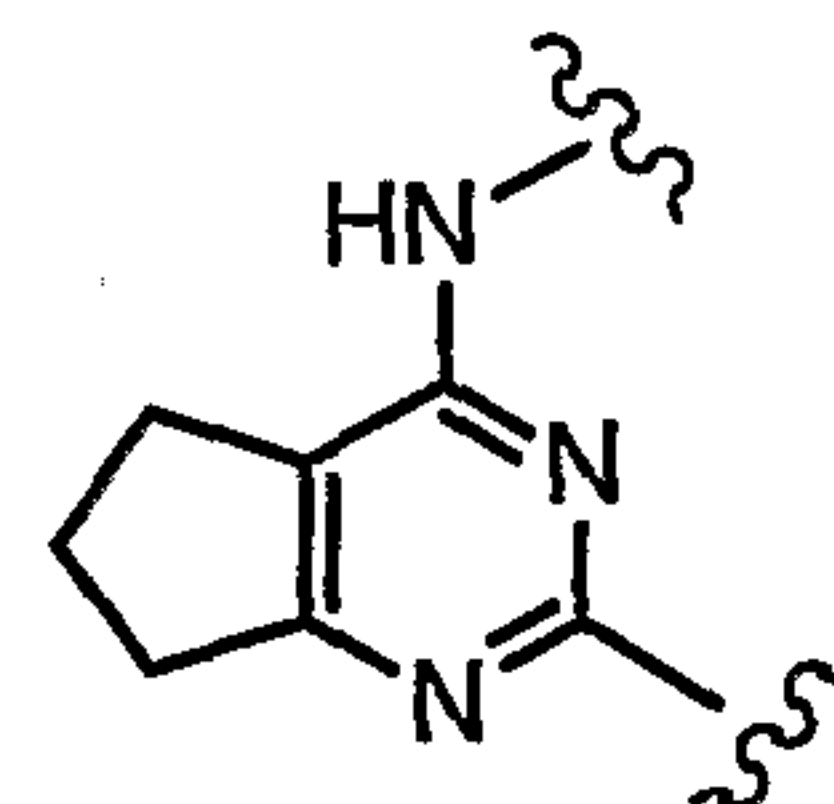
II-C



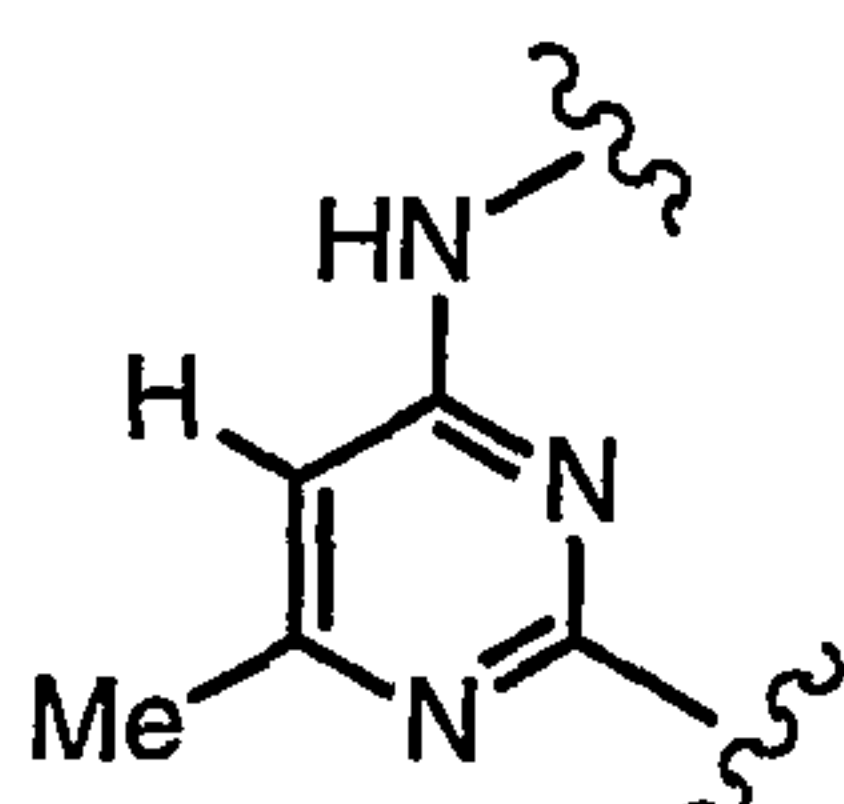
II-D



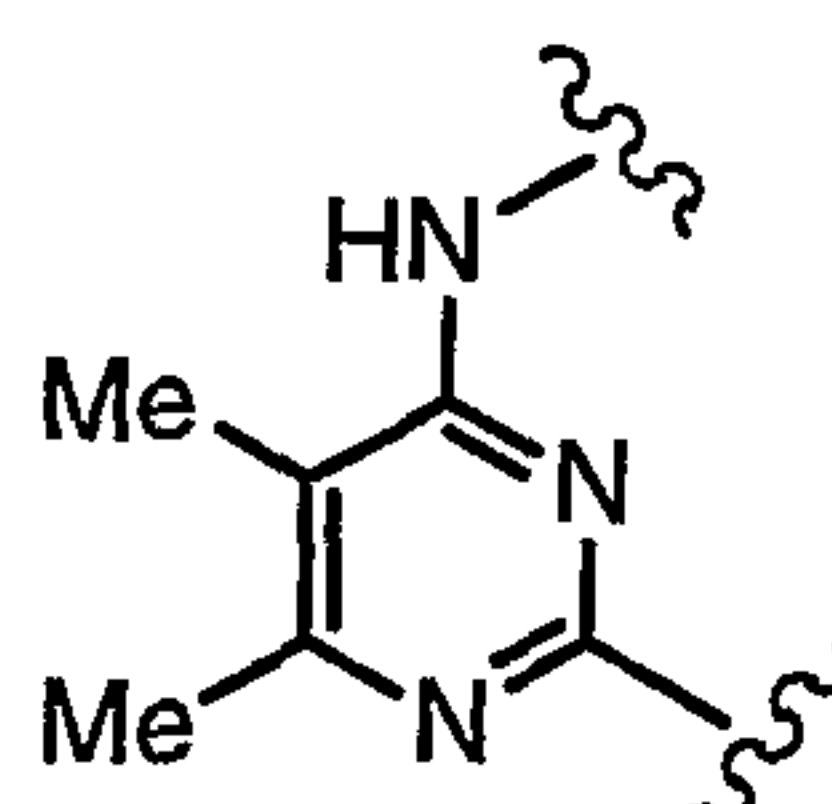
II-E



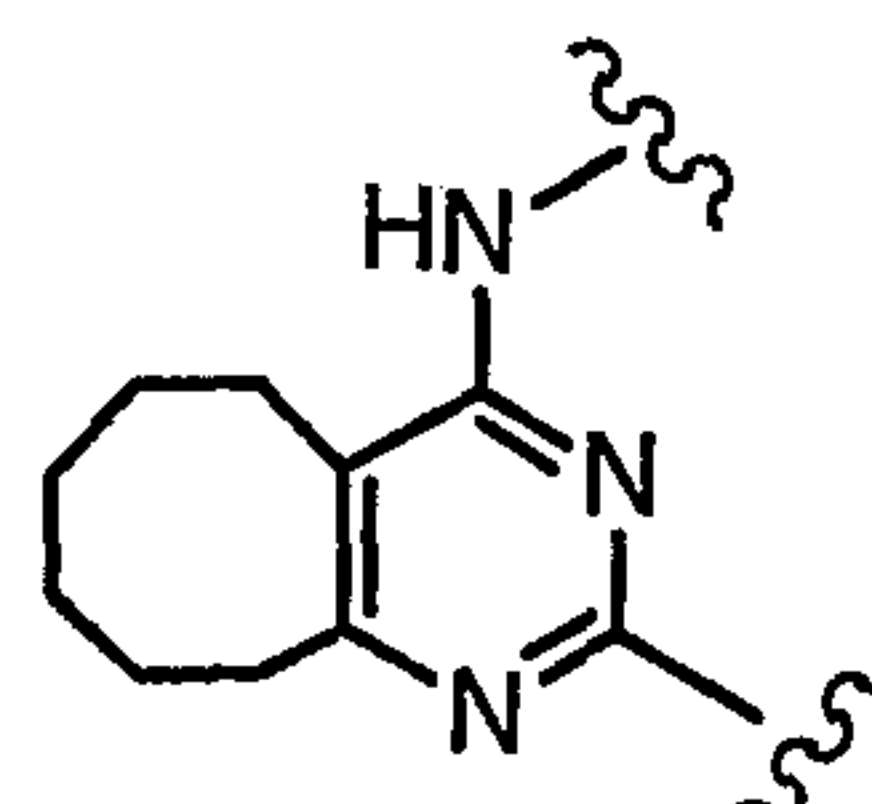
II-F



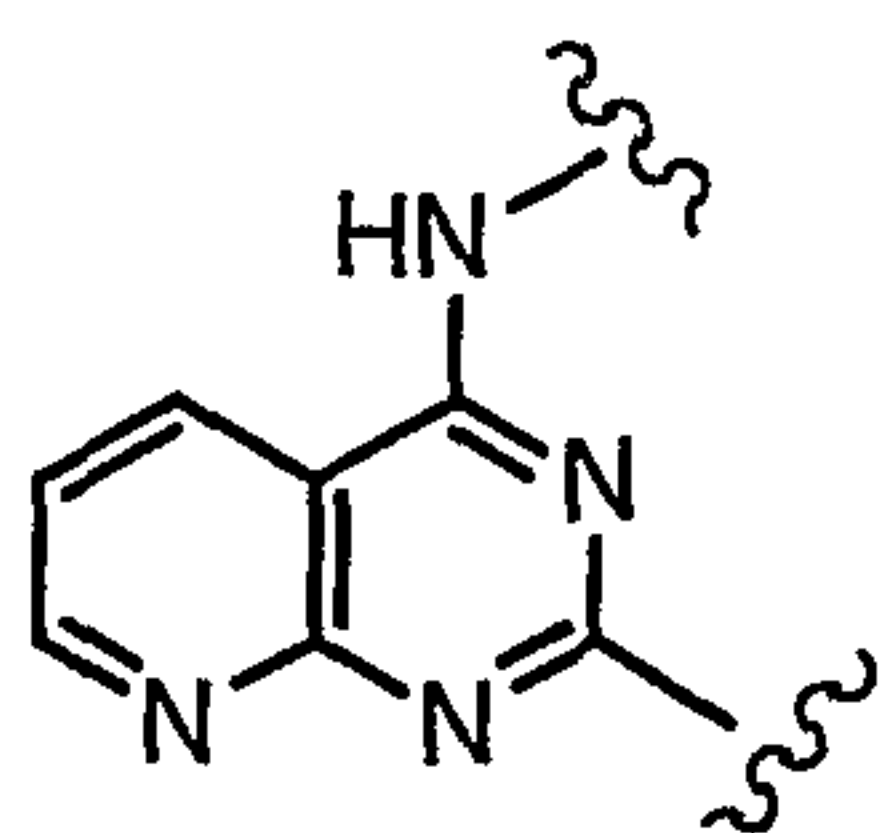
II-G



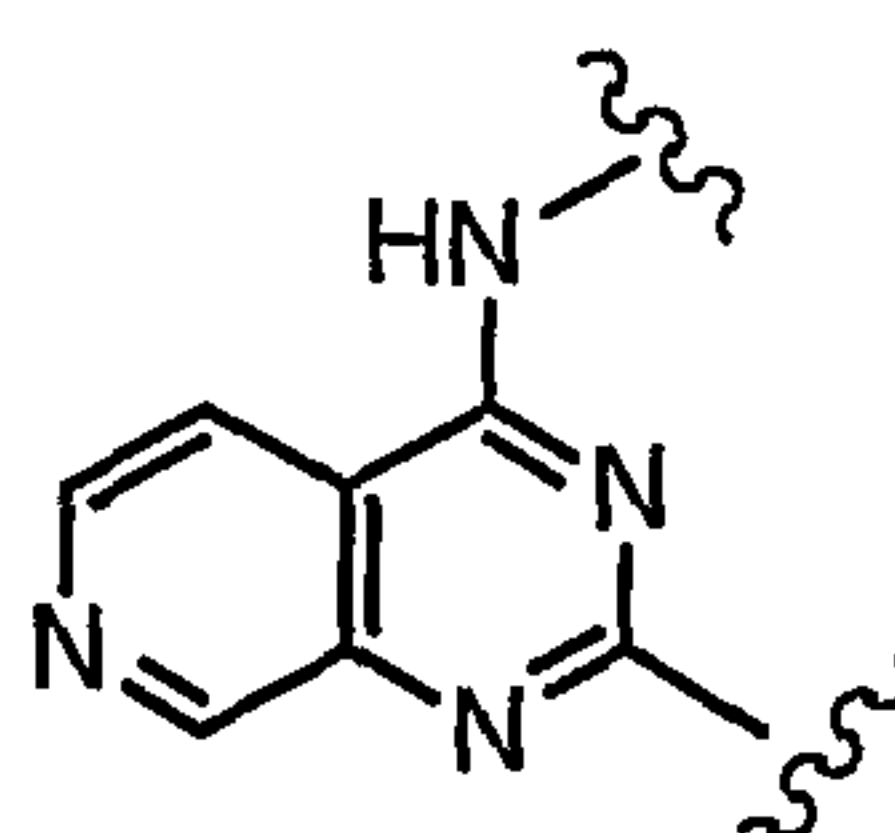
II-H



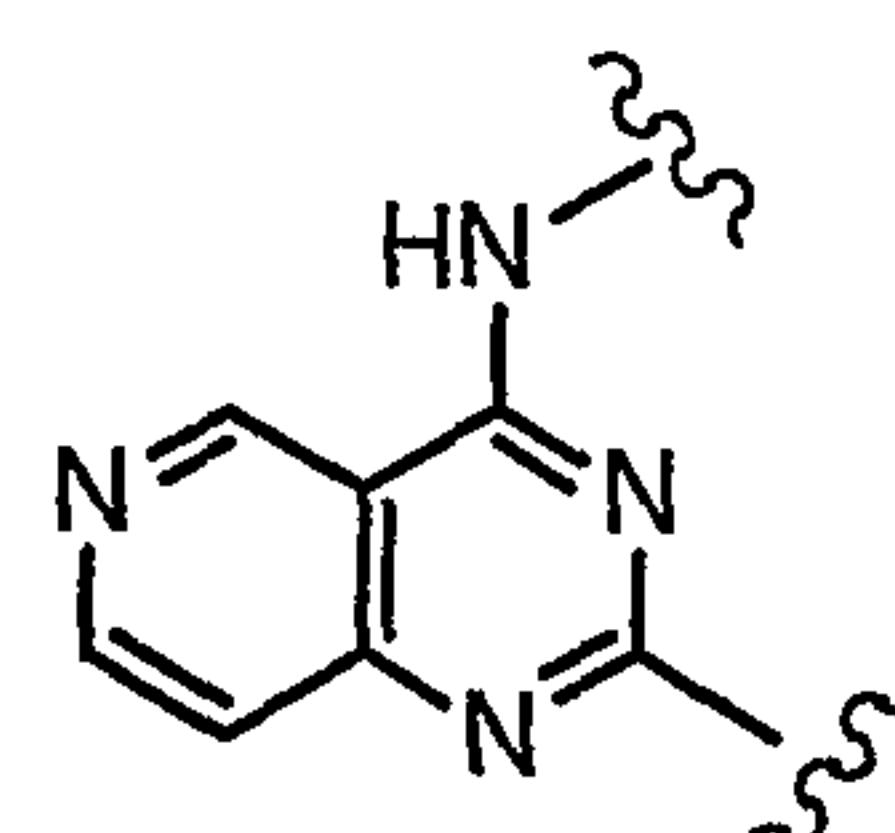
II-I



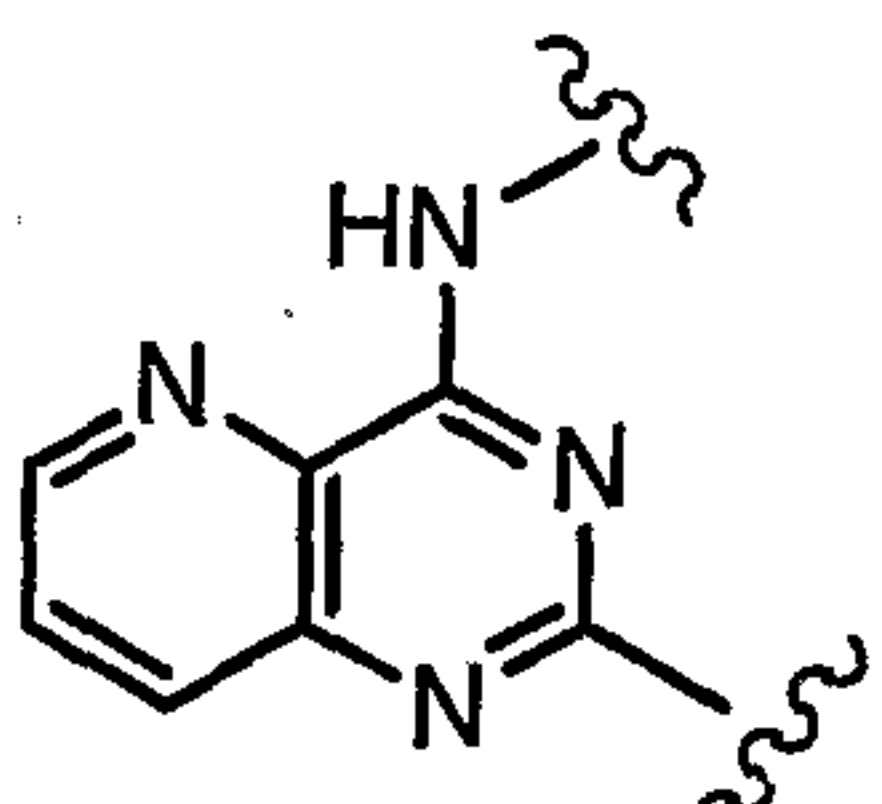
II-J



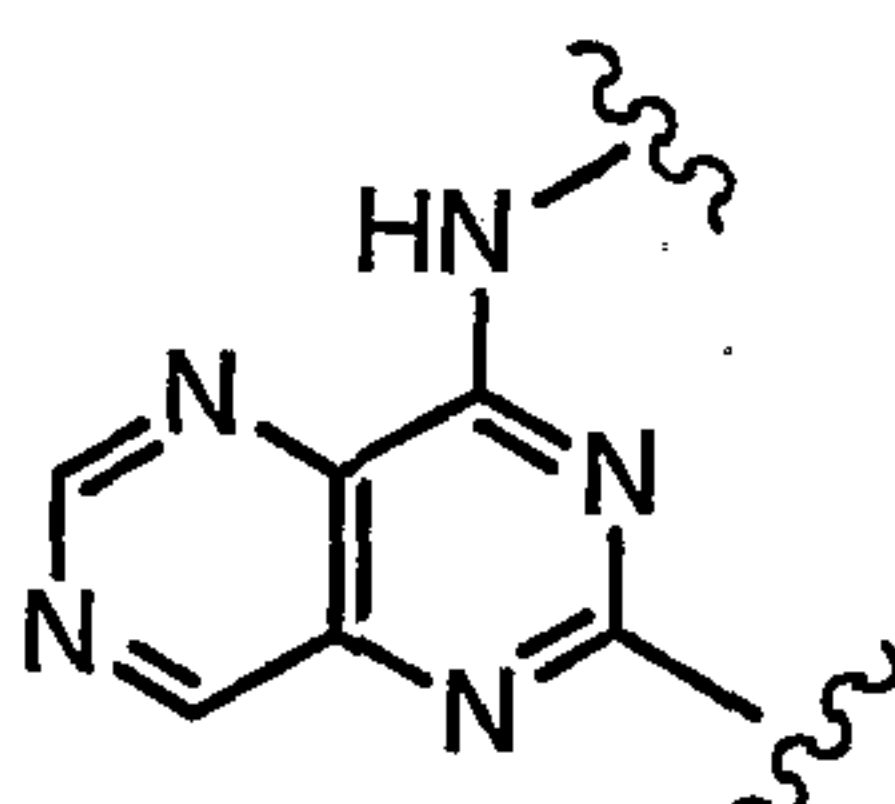
II-K



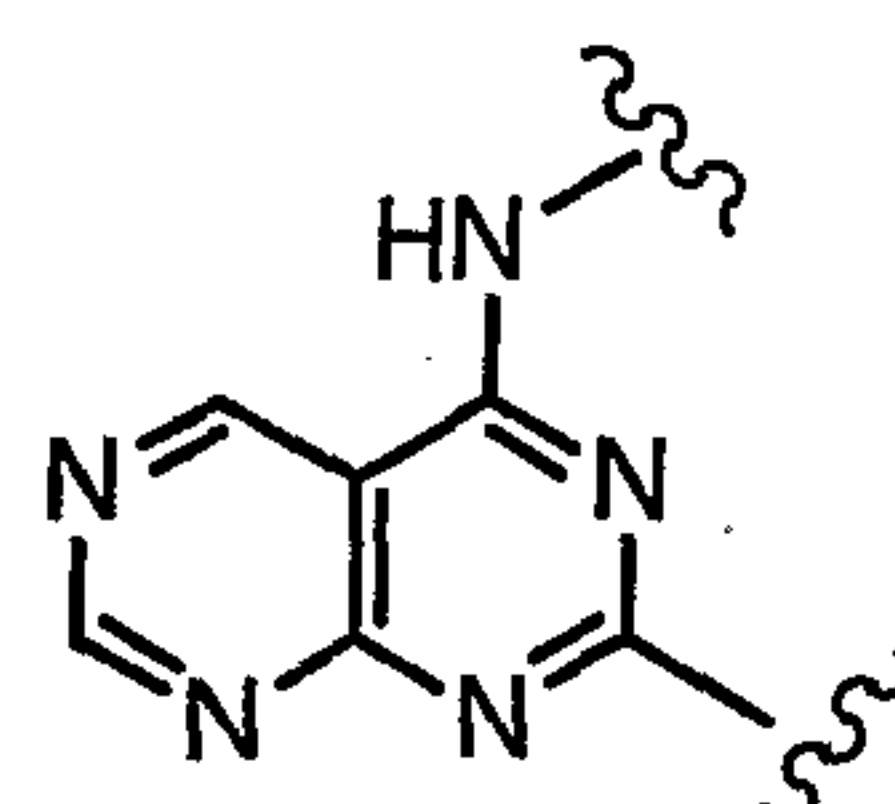
II-L



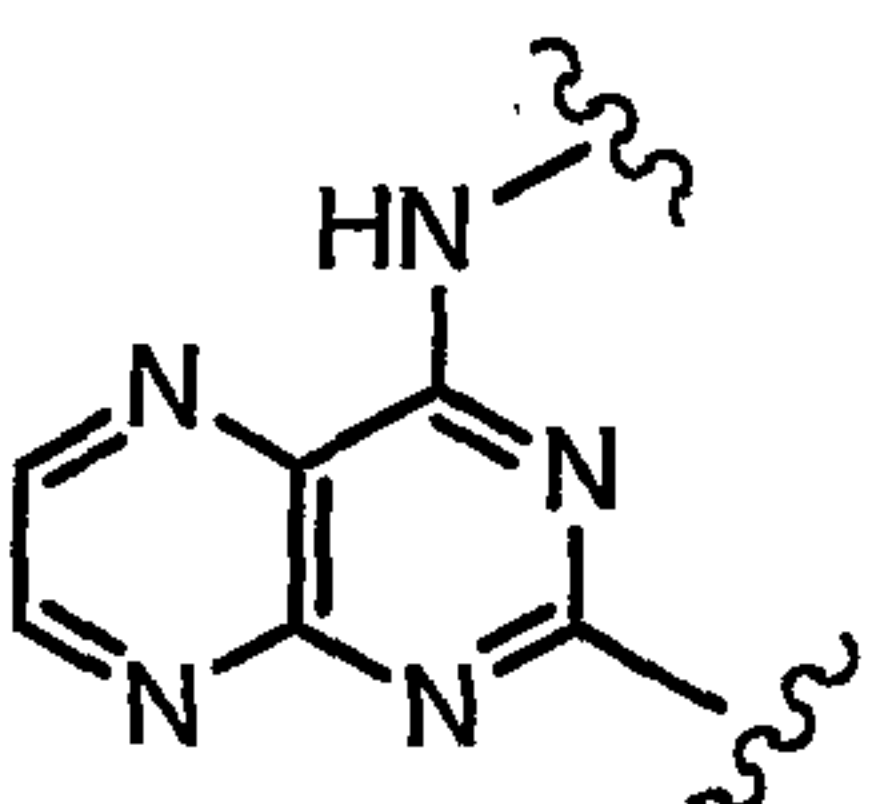
II-M



II-N



II-O



II-P

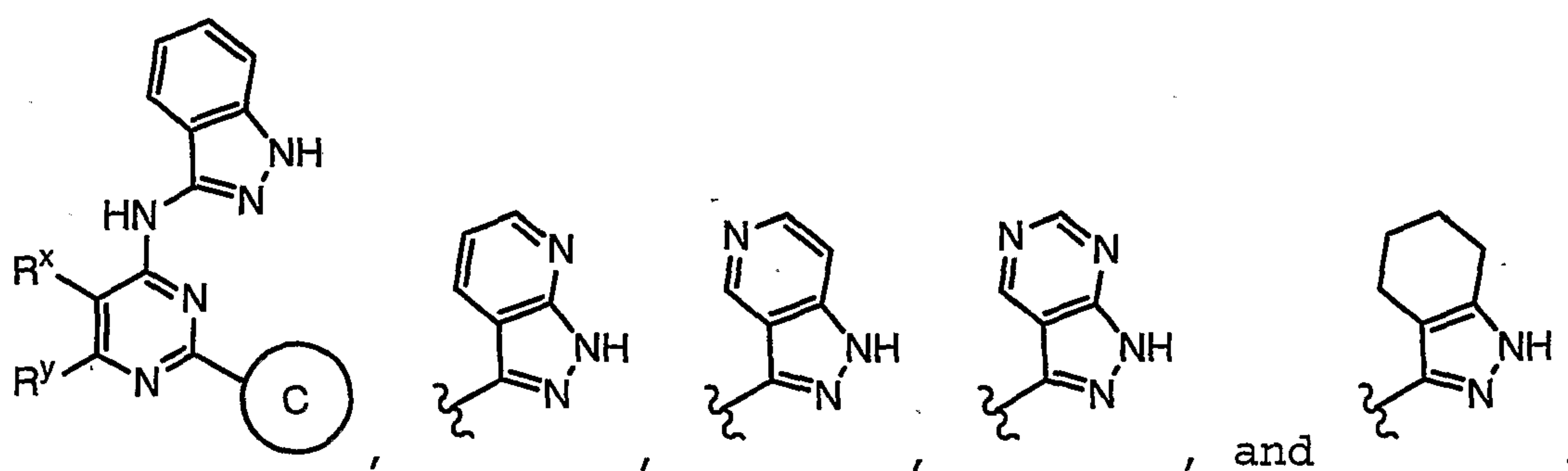
10 More preferred pyrimidine ring systems of formula II include II-A, II-B, II-C, II-F, and II-H, most preferably II-A, II-B, and II-H.

In the monocyclic pyrimidine ring system of formula II, preferred R^x groups include hydrogen, alkyl-
 15 or dialkylamino, acetamido, or a C_{1-4} aliphatic group such as methyl, ethyl, cyclopropyl, isopropyl or t-butyl. Preferred R^y groups include $T-R^3$ wherein T is a valence bond or a methylene, and R^3 is $-R$, $-N(R^4)_2$, or $-OR$. When R^3 is $-R$ or $-OR$, a preferred R is an optionally
 20 substituted group selected from C_{1-6} aliphatic, phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring. Examples of preferred R^y include 2-pyridyl, 4-pyridyl, piperidinyl, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, alkyl- or dialkylamino, acetamido, optionally substituted phenyl

such as phenyl or halo-substituted phenyl, and methoxymethyl.

In the bicyclic pyrimidine ring system of formula II, the ring formed when R^x and R^y are taken together may be substituted or unsubstituted. Suitable substituents include -R, halo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂, wherein R and R⁴ are as defined above. Preferred R^x/R^y ring substituents include -halo, -R, -OR, -COR, -CO₂R, -CON(R⁴)₂, -CN, or -N(R⁴)₂ wherein R is an optionally substituted C₁₋₆ aliphatic group.

The R^2 and $R^{2'}$ groups of formula II may be taken together to form a fused ring, thus providing a bicyclic ring system containing a pyrazole ring. Preferred fused rings include benzo, pyrido, pyrimido, and a partially unsaturated 6-membered carbocyclo ring. These are exemplified in the following formula II compounds having a pyrazole-containing bicyclic ring system:

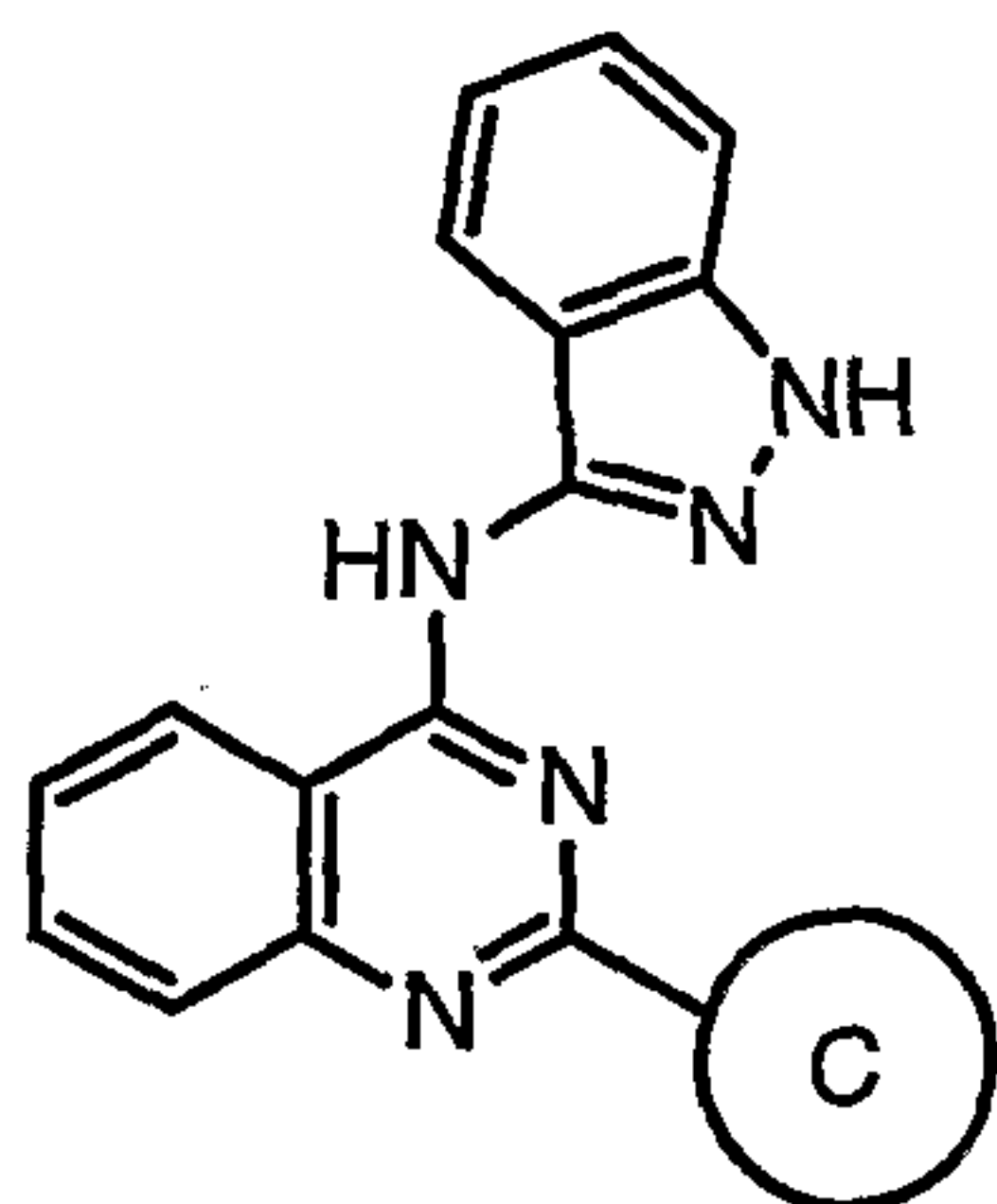


Preferred substituents on the $R^2/R^{2'}$ fused ring of formula II include one or more of the following: -halo, -N(R⁴)₂, -C₁₋₄ alkyl, -C₁₋₄ haloalkyl, -NO₂, -O(C₁₋₄ alkyl), -CO₂(C₁₋₄ alkyl), -CN, -SO₂(C₁₋₄ alkyl), -SO₂NH₂, -OC(O)NH₂, -NH₂SO₂(C₁₋₄ alkyl), -NHC(O)(C₁₋₄ alkyl),

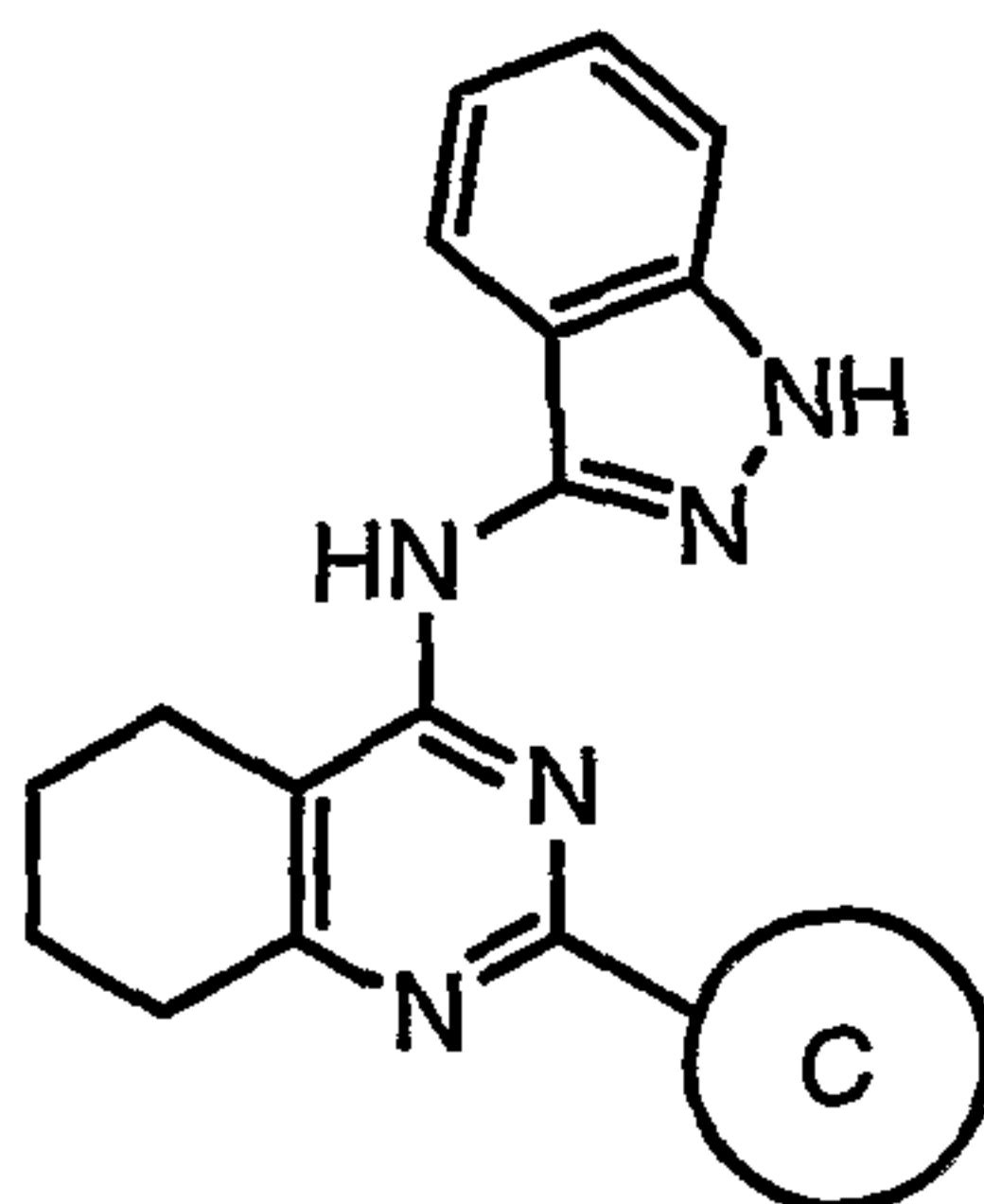
-C(O)NH₂, and -CO(C₁₋₄ alkyl), wherein the (C₁₋₄ alkyl) is a straight, branched, or cyclic alkyl group. Preferably, the (C₁₋₄ alkyl) group is methyl.

When the pyrazole ring system of formula II is monocyclic, preferred R² groups include hydrogen, a substituted or unsubstituted group selected from aryl, heteroaryl, or a C₁₋₆ aliphatic group. Examples of such preferred R² groups include methyl, t-butyl, -CH₂OCH₃, cyclopropyl, furanyl, thienyl, and phenyl. A preferred R^{2'} group is hydrogen.

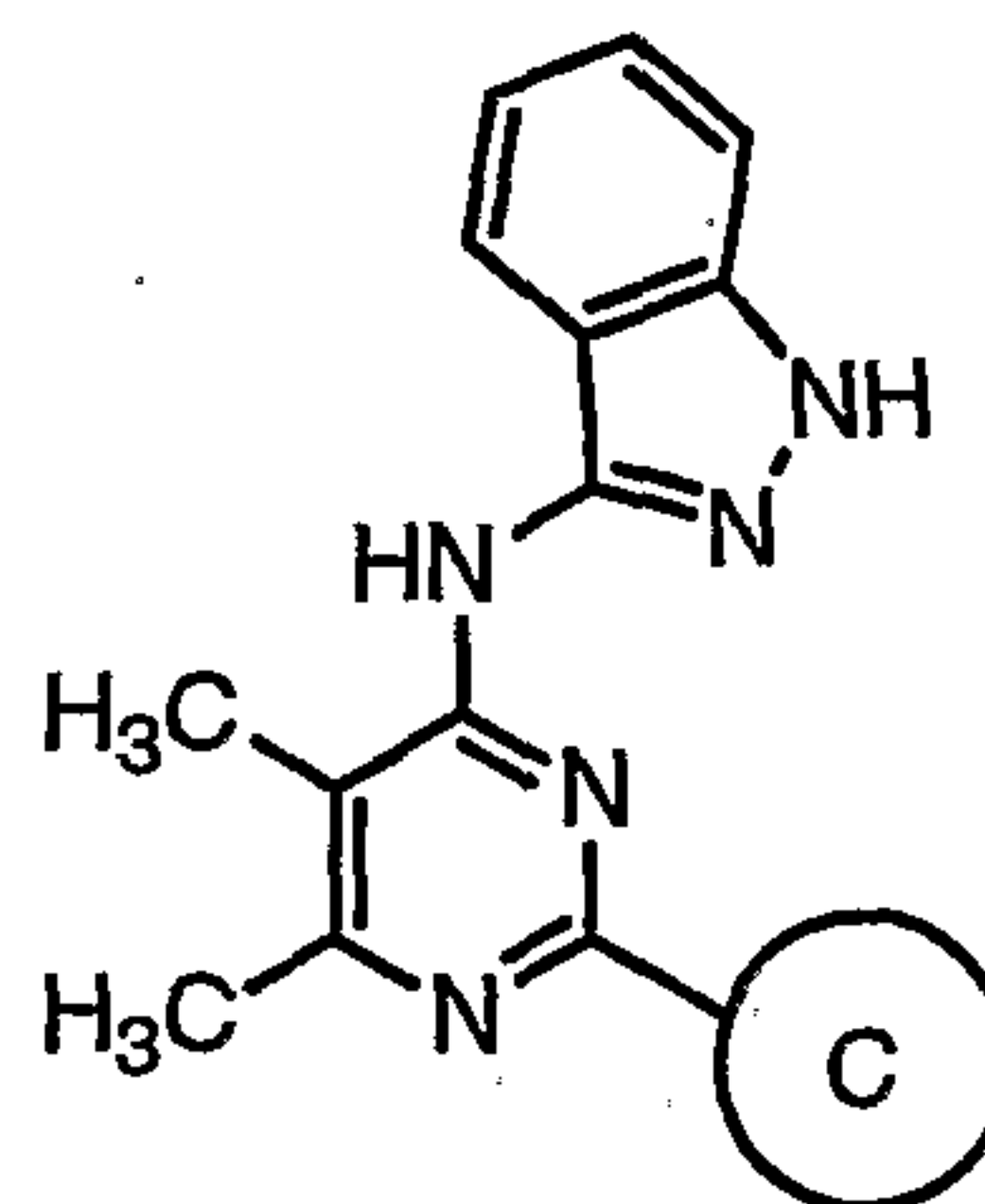
More preferred ring systems of formula II are the following, which may be substituted as described above, wherein R² and R^{2'} are taken together with the pyrazole ring to form an indazole ring; and R^x and R^y are each methyl, or R^x and R^y are taken together with the pyrimidine ring to form a quinazoline or tetrahydroquinazoline ring:



II-Aa



II-Ba



II-Ha

Particularly preferred are those compounds of formula II-Aa, II-Ba, or II-Ha wherein ring C is a phenyl ring and R¹ is halo, methyl, or trifluoromethyl.

Preferred formula II Ring C groups are phenyl and pyridinyl. When two adjacent substituents on Ring C are taken together to form a fused ring, Ring C is contained in a bicyclic ring system. Preferred fused rings include a benzo or pyrido ring. Such rings

preferably are fused at ortho and meta positions of Ring C. Examples of preferred bicyclic Ring C systems include naphthyl, quinolinyl and isoquinolinyl.

An important feature of the formula II compounds is the R^1 ortho substituent on Ring C. An ortho position on Ring C or Ring D is defined relative to the position where Ring A is attached. Preferred R^1 groups include -halo, an optionally substituted C_{1-6} aliphatic group, phenyl, $-COR^6$, $-OR^6$, $-CN$, $-SO_2R^6$, $-SO_2NH_2$, $-N(R^6)_2$, $-CO_2R^6$, $-CONH_2$, $-NHCOR^6$, $-OC(O)NH_2$, or $-NHSO_2R^6$. When R^1 is an optionally substituted C_{1-6} aliphatic group, the most preferred optional substituents are halogen. Examples of preferred R^1 groups include $-CF_3$, $-Cl$, $-F$, $-CN$, $-COCH_3$, $-OCH_3$, $-OH$, $-CH_2CH_3$, $-OCH_2CH_3$, $-CH_3$, $-CF_2CH_3$, cyclohexyl, t-butyl, isopropyl, cyclopropyl, $-C\equiv CH$, $-C\equiv C-CH_3$, $-SO_2CH_3$, $-SO_2NH_2$, $-N(CH_3)_2$, $-CO_2CH_3$, $-CONH_2$, $-NHCOCH_3$, $-OC(O)NH_2$, $-NHSO_2CH_3$, and $-OCF_3$.

On Ring C of formula II, preferred R^5 substituents, when present, include -halo, $-CN$, $-NO_2$, $-N(R^4)_2$, optionally substituted C_{1-6} aliphatic group, $-OR$, $-C(O)R$, $-CO_2R$, $-CONH(R^4)$, $-N(R^4)COR$, $-SO_2N(R^4)_2$, and $-N(R^4)SO_2R$. More preferred R^5 substituents include $-Cl$, $-F$, $-CN$, $-CF_3$, $-NH_2$, $-NH(C_{1-4} \text{ aliphatic})$, $-N(C_{1-4} \text{ aliphatic})_2$, $-O(C_{1-4} \text{ aliphatic})$, $C_{1-4} \text{ aliphatic}$, and $-CO_2(C_{1-4} \text{ aliphatic})$. Examples of such preferred R^5 substituents include $-Cl$, $-F$, $-CN$, $-CF_3$, $-NH_2$, $-NHMe$, $-NMe_2$, $-OEt$, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, and $-CO_2Et$.

Preferred formula II compounds have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring

system, the bicyclic ring system is selected from a naphthyl, quinolinyl or isoquinolinyl ring;

(b) R^x is hydrogen or C_{1-4} aliphatic and R^y is $T-R^3$, or R^x and R^y are taken together with their
 5 intervening atoms to form an optionally substituted 5-7 membered unsaturated or partially unsaturated ring having 0-2 ring nitrogens;

(c) R^1 is -halo, an optionally substituted C_{1-6} aliphatic group, phenyl, $-COR^6$, $-OR^6$, $-CN$, $-SO_2R^6$, $-SO_2NH_2$,
 10 $-N(R^6)_2$, $-CO_2R^6$, $-CONH_2$, $-NHCOR^6$, $-OC(O)NH_2$, or $-NHSO_2R^6$; and

(d) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are
 15 taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring.

More preferred compounds of formula II have one or more, and more preferably all, of the features
 20 selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring;

(b) R^x is hydrogen or methyl and R^y is $-R$, $N(R^4)_2$, or $-OR$, or R^x and R^y are taken together with their
 25 intervening atoms to form a 5-7 membered unsaturated or partially unsaturated carbocyclo ring optionally substituted with $-R$, halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$,
 30 $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$;

(c) R^1 is -halo, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic group, phenyl, or -CN;

(d) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, or
5 a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring; and

(e) each R^5 is independently selected from
10 -halo, -CN, -NO₂, -N(R^4)₂, optionally substituted C_{1-6} aliphatic group, -OR, -C(O)R, -CO₂R, -CONH(R^4), -N(R^4)COR, -SO₂N(R^4)₂, or -N(R^4)SO₂R.

Even more preferred compounds of formula II have one or more, and more preferably all, of the
15 features selected from the group consisting of:

(a) Ring C is a phenyl ring optionally substituted by - R^5 ;

(b) R^x is hydrogen or methyl and R^y is methyl, methoxymethyl, ethyl, cyclopropyl, isopropyl, t-butyl,
20 alkyl- or an optionally substituted group selected from 2-pyridyl, 4-pyridyl, piperidinyl, or phenyl, or R^x and R^y are taken together with their intervening atoms to form an optionally substituted benzo ring or partially unsaturated 6-membered carbocyclo ring;

25 (c) R^1 is -halo, a C_{1-4} aliphatic group optionally substituted with halogen, or -CN;

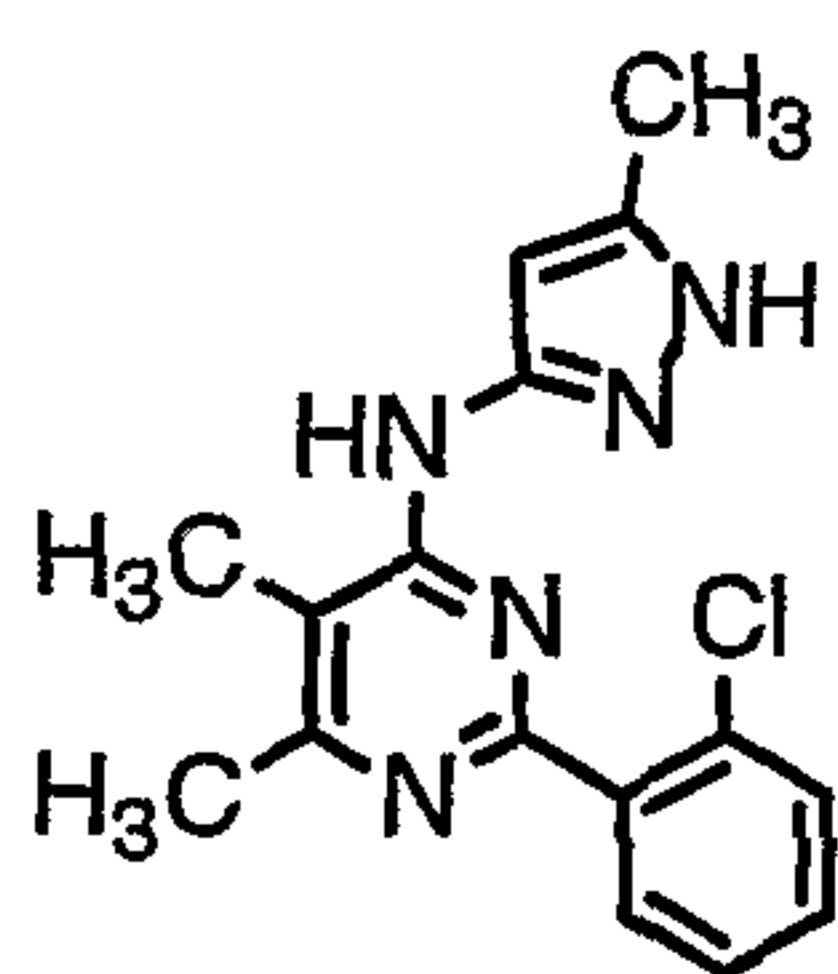
(d) R^2 and $R^{2'}$ are taken together with their intervening atoms to form a benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring
30 optionally substituted with -halo, -N(R^4)₂, - C_{1-4} alkyl, - C_{1-4} haloalkyl, -NO₂, -O(C_{1-4} alkyl), -CO₂(C_{1-4} alkyl), -CN, -SO₂(C_{1-4} alkyl), -SO₂NH₂, -OC(O)NH₂, -NH₂SO₂(C_{1-4} alkyl), -NHC(O)(C_{1-4} alkyl), -C(O)NH₂, or -CO(C_{1-4} alkyl), wherein

the (C₁₋₄ alkyl) is a straight, branched, or cyclic alkyl group; and

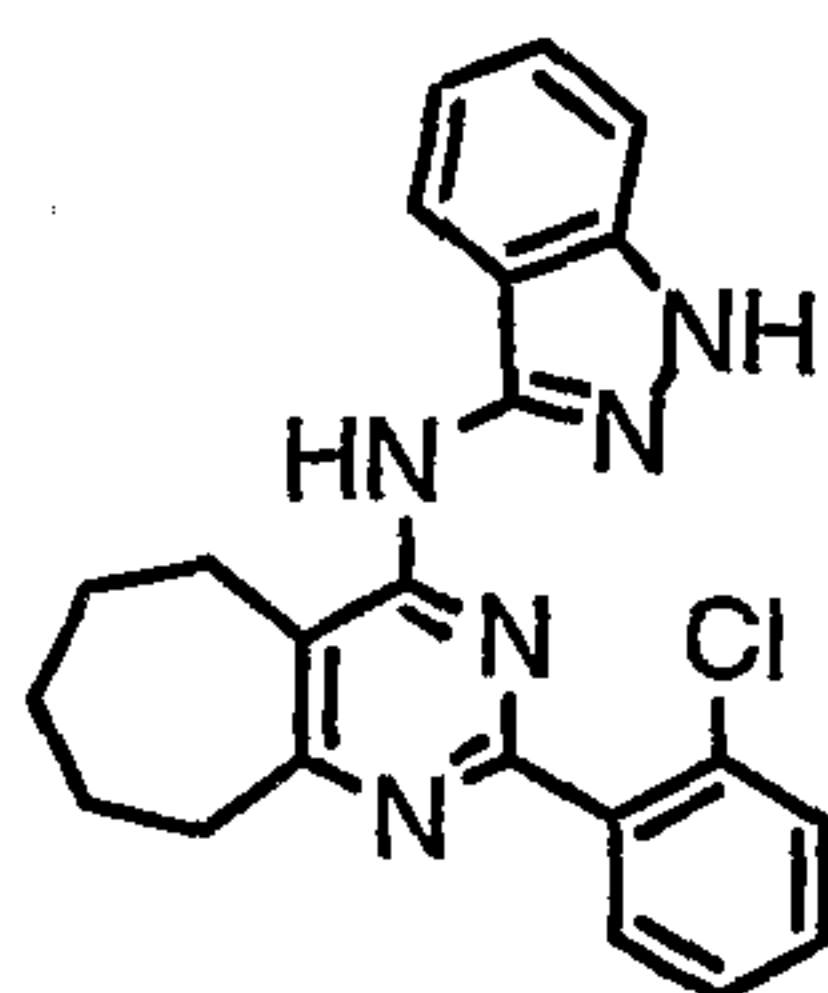
- (e) each R⁵ is independently selected from -Cl, -F, -CN, -CF₃, -NH₂, -NH(C₁₋₄ aliphatic), -N(C₁₋₄ aliphatic)₂, -O(C₁₋₄ aliphatic), C₁₋₄ aliphatic, and -CO₂(C₁₋₄ aliphatic).

Representative compounds of formula II are shown below in Table 1.

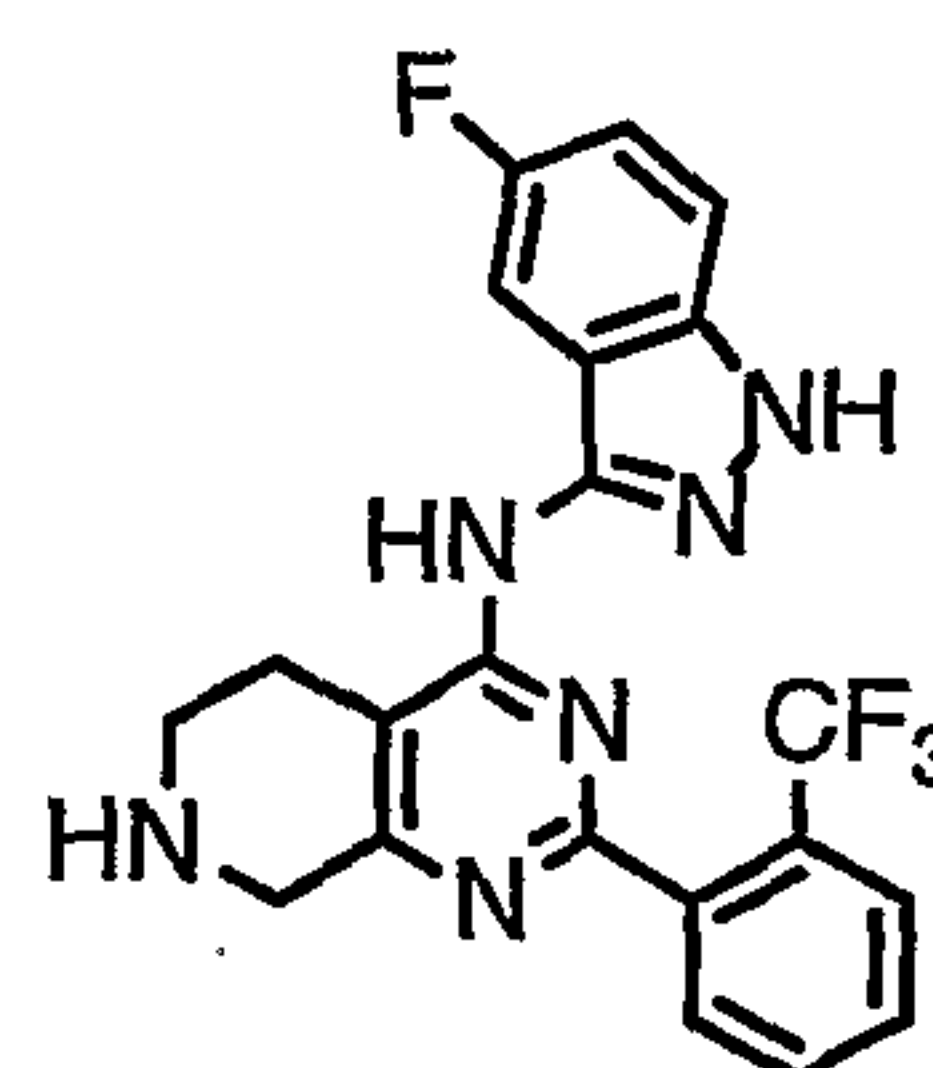
10 Table 1.



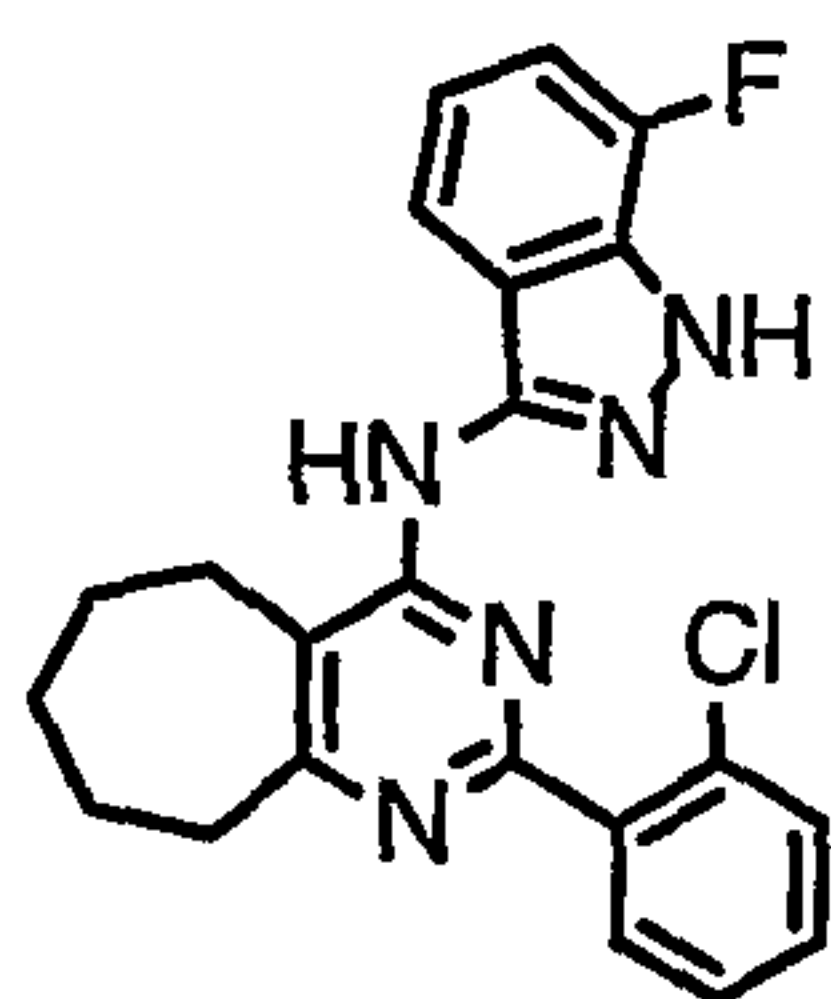
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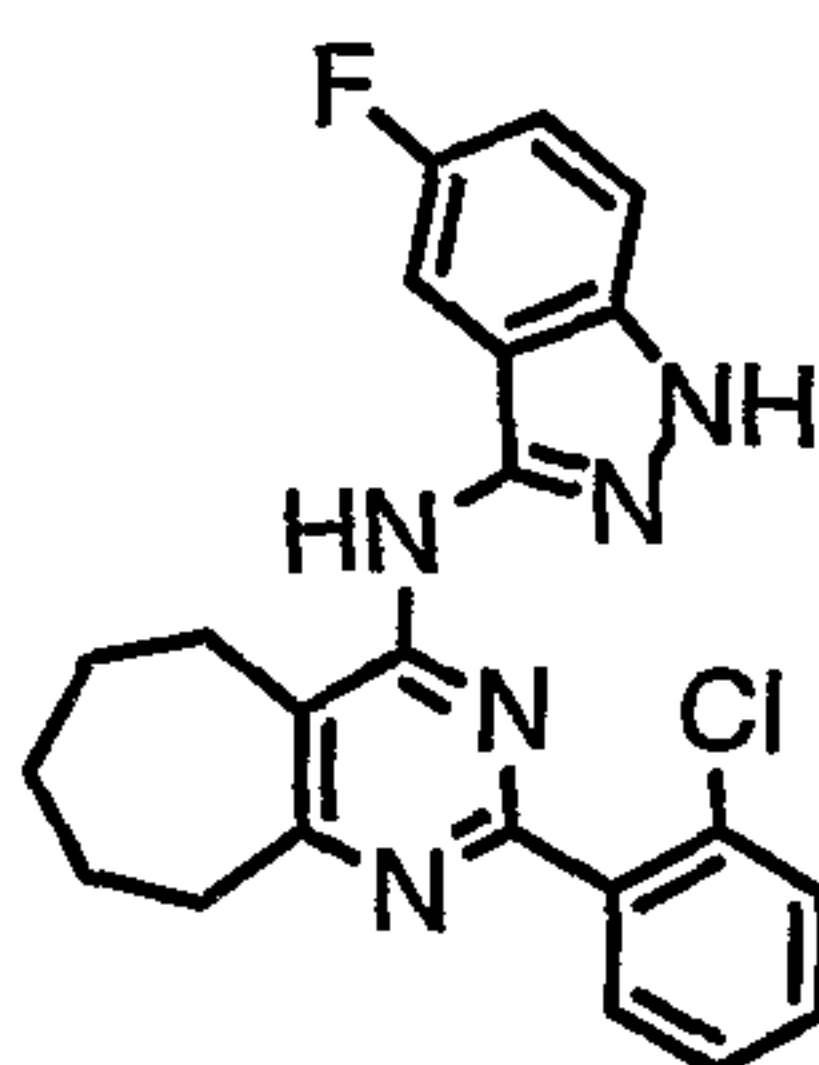
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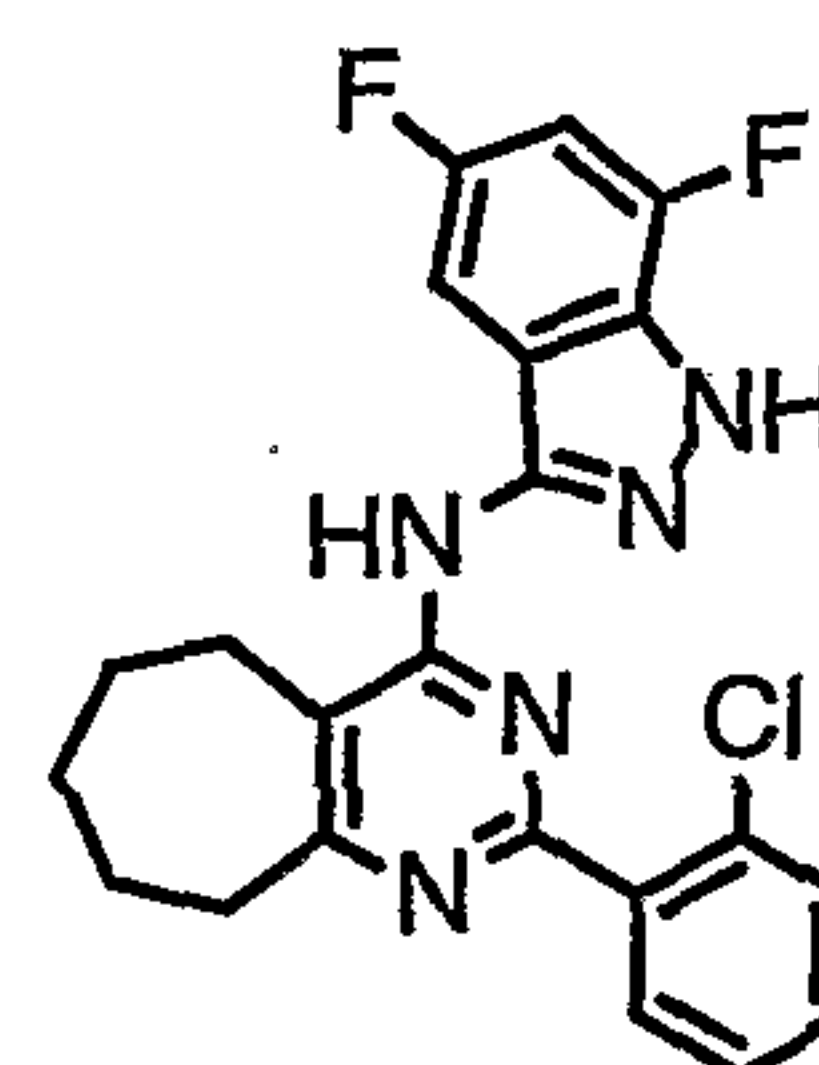
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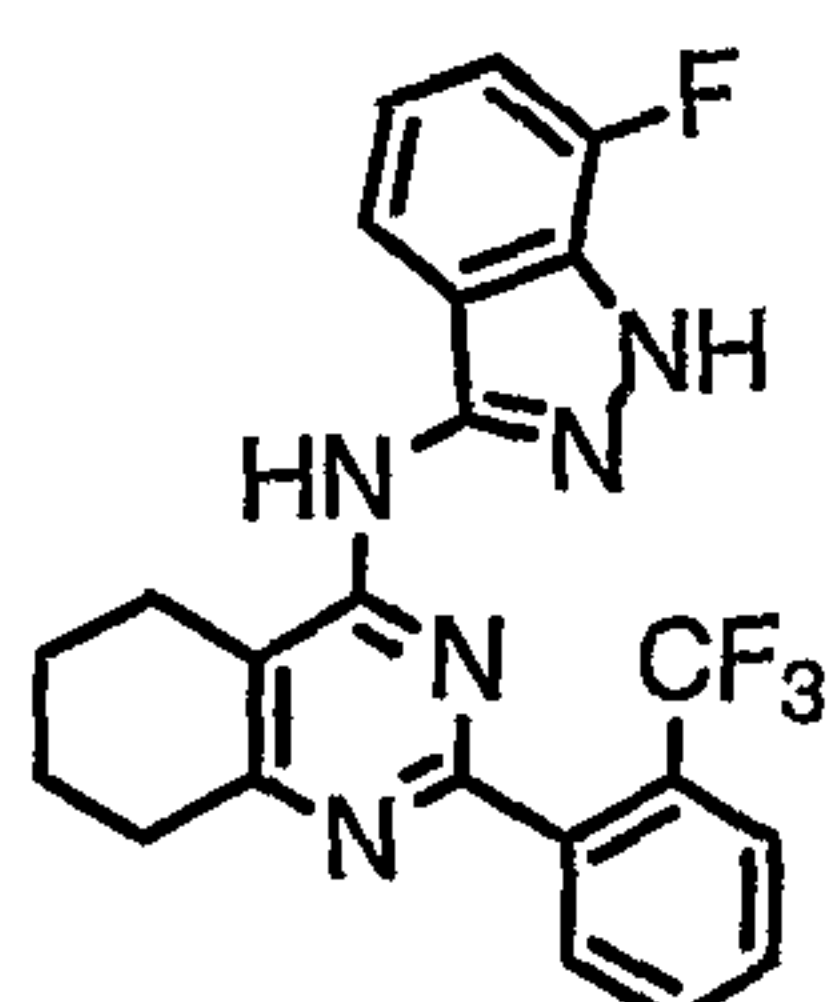
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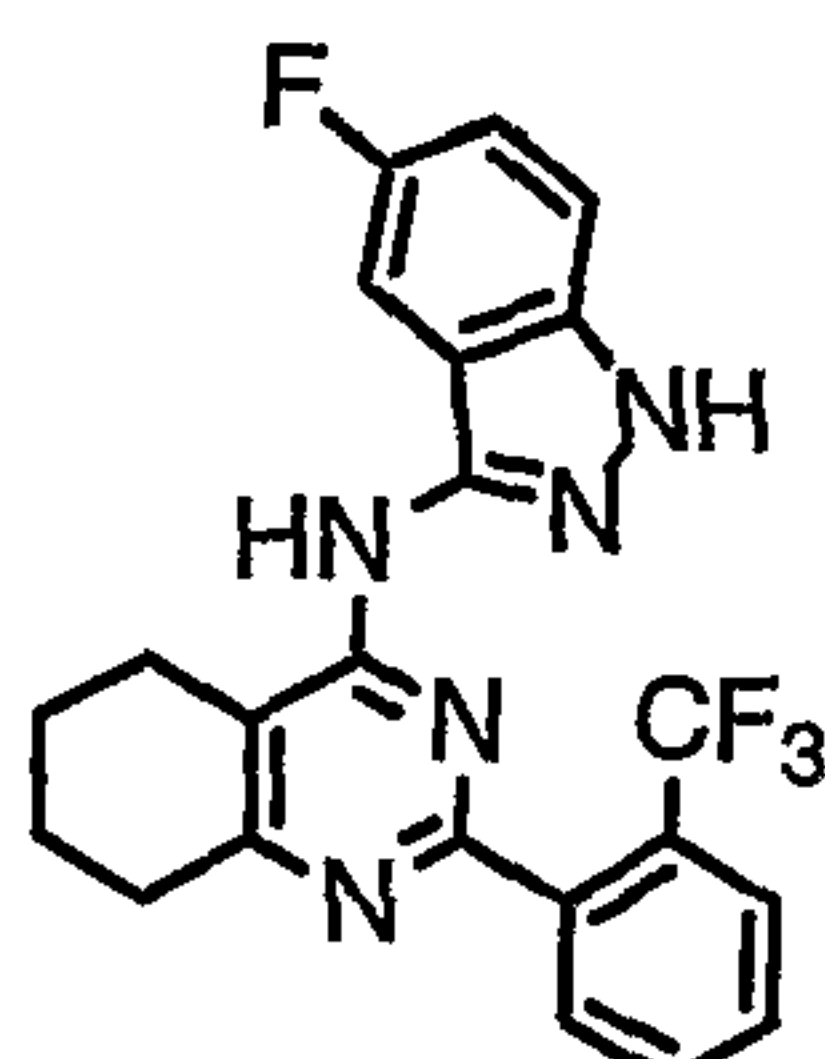
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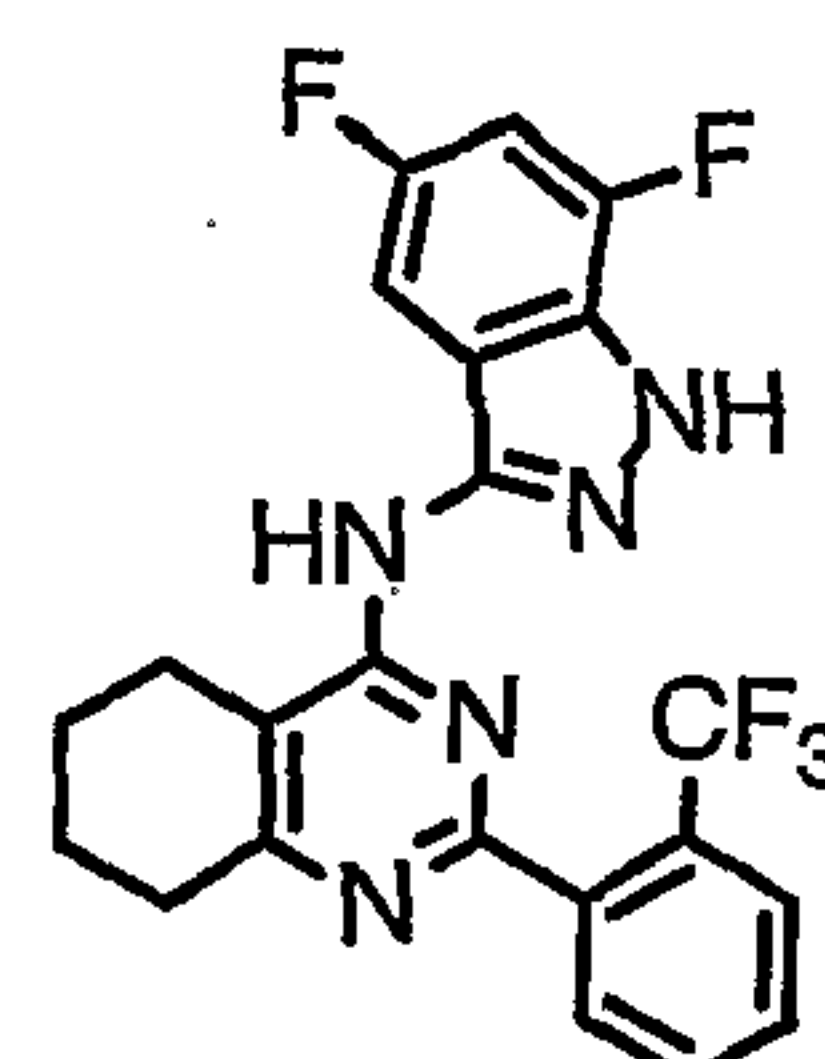
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II-7

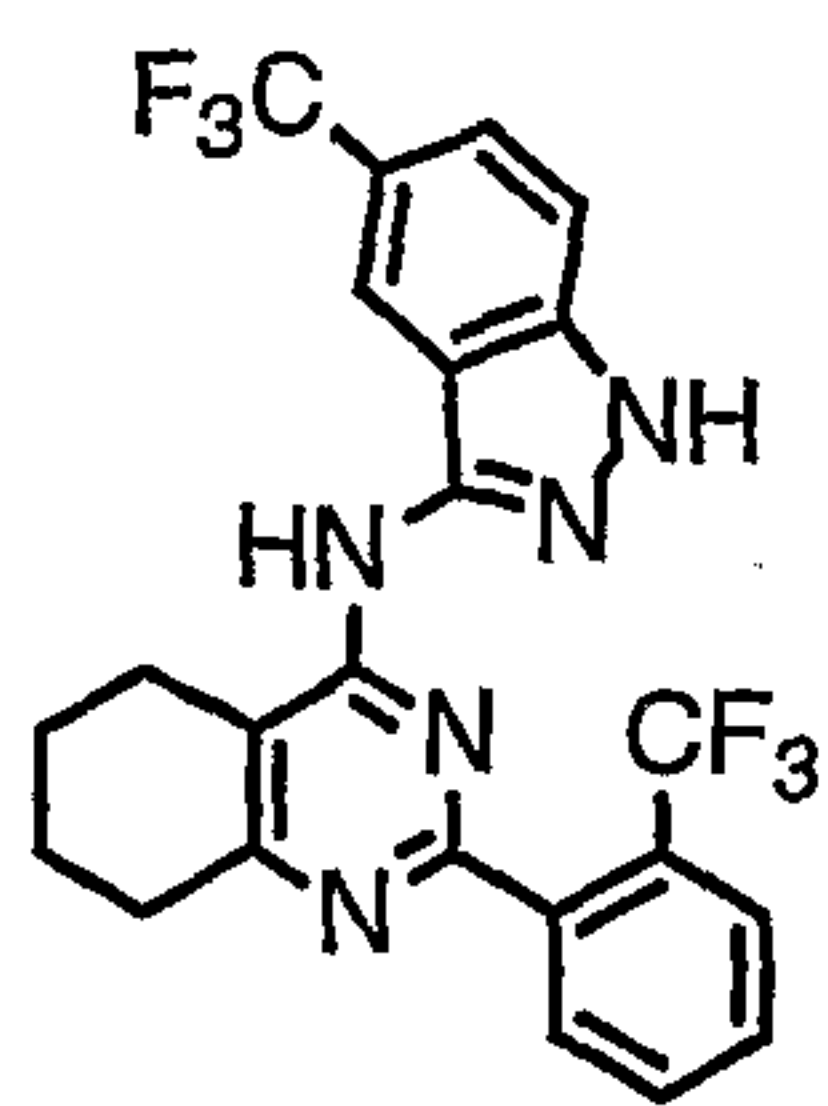


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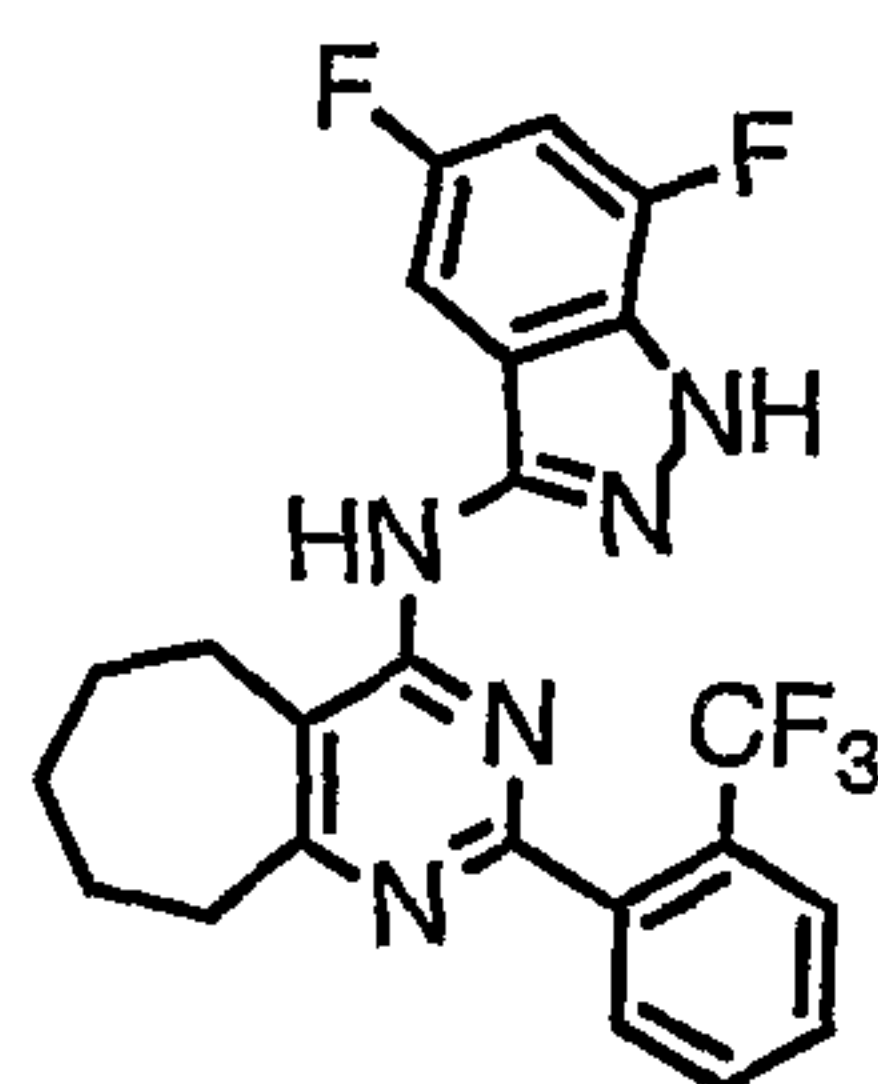


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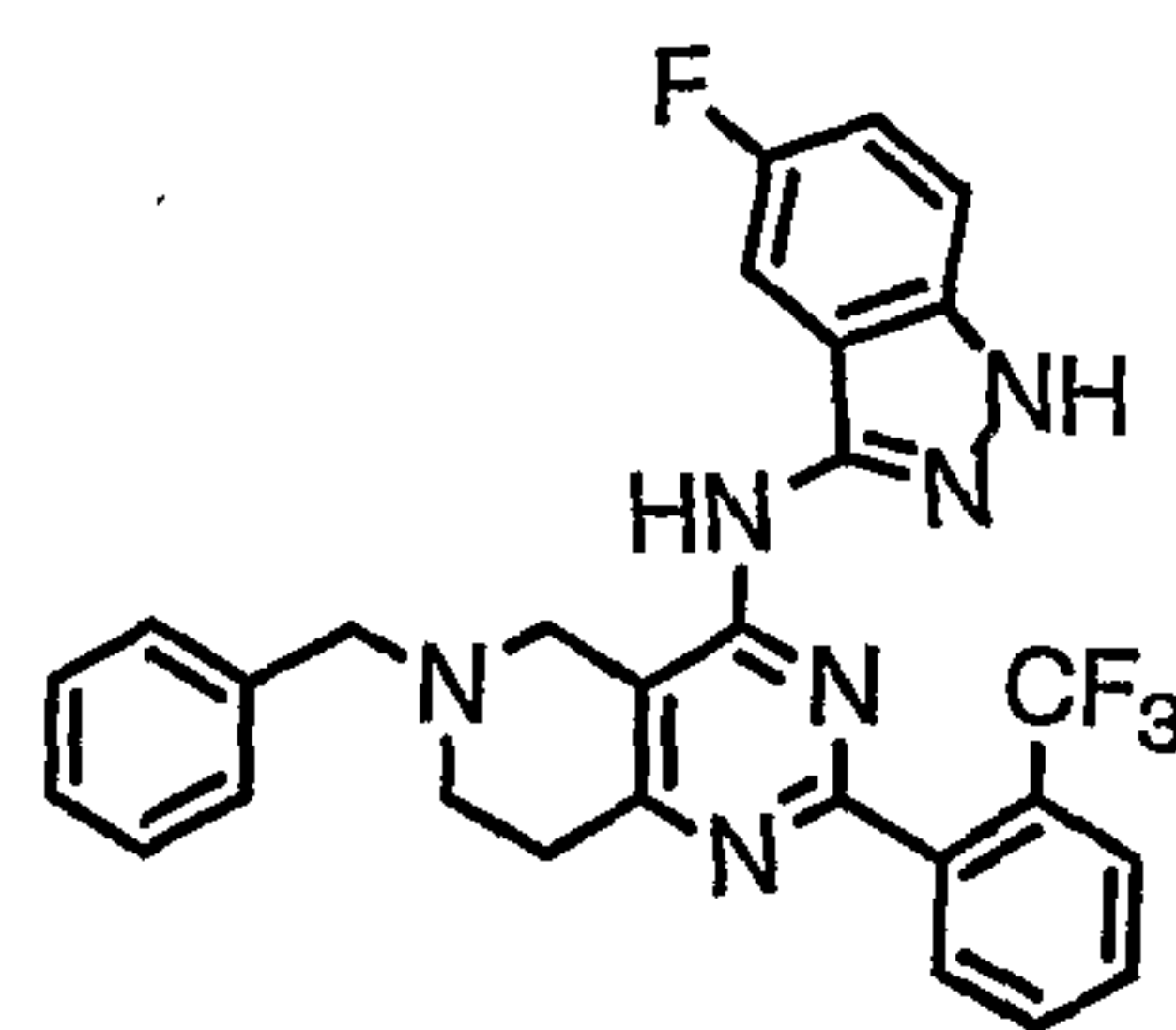
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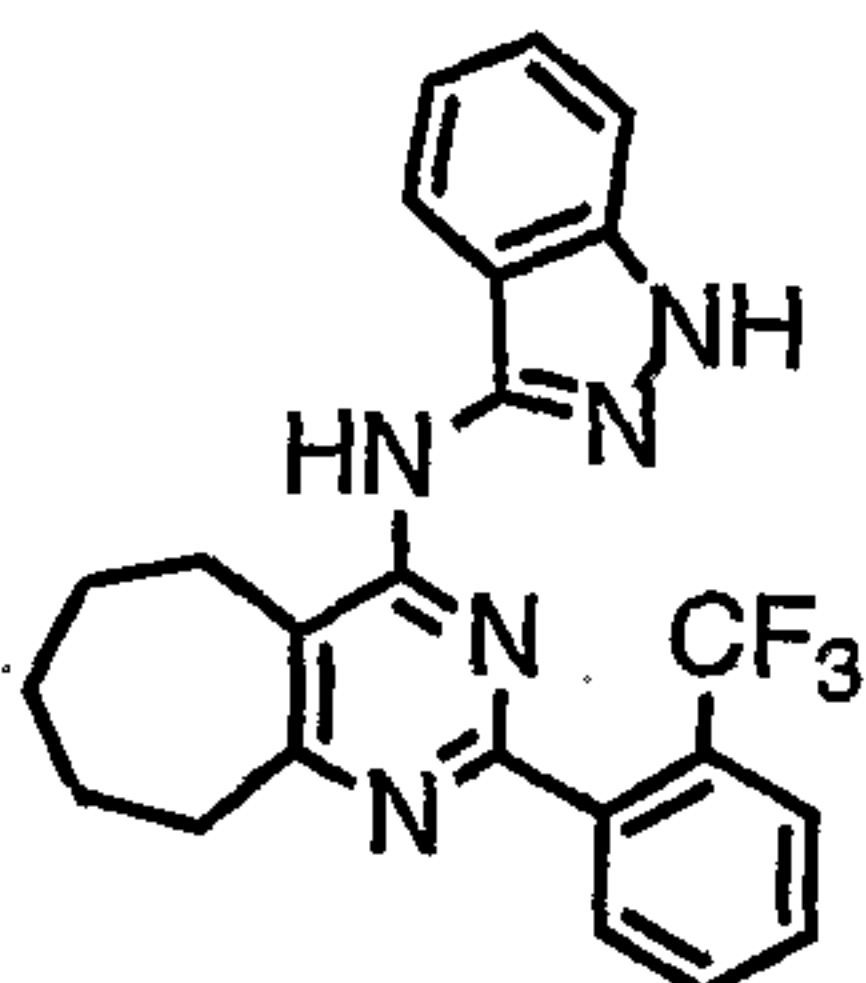
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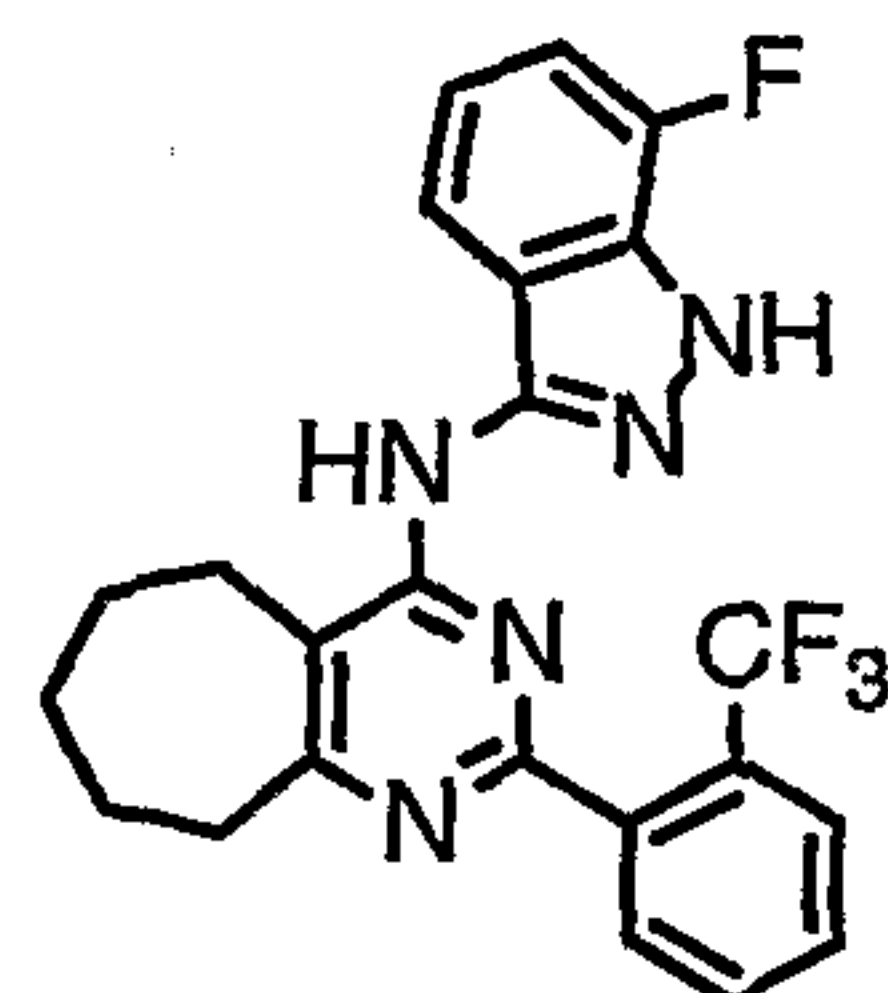
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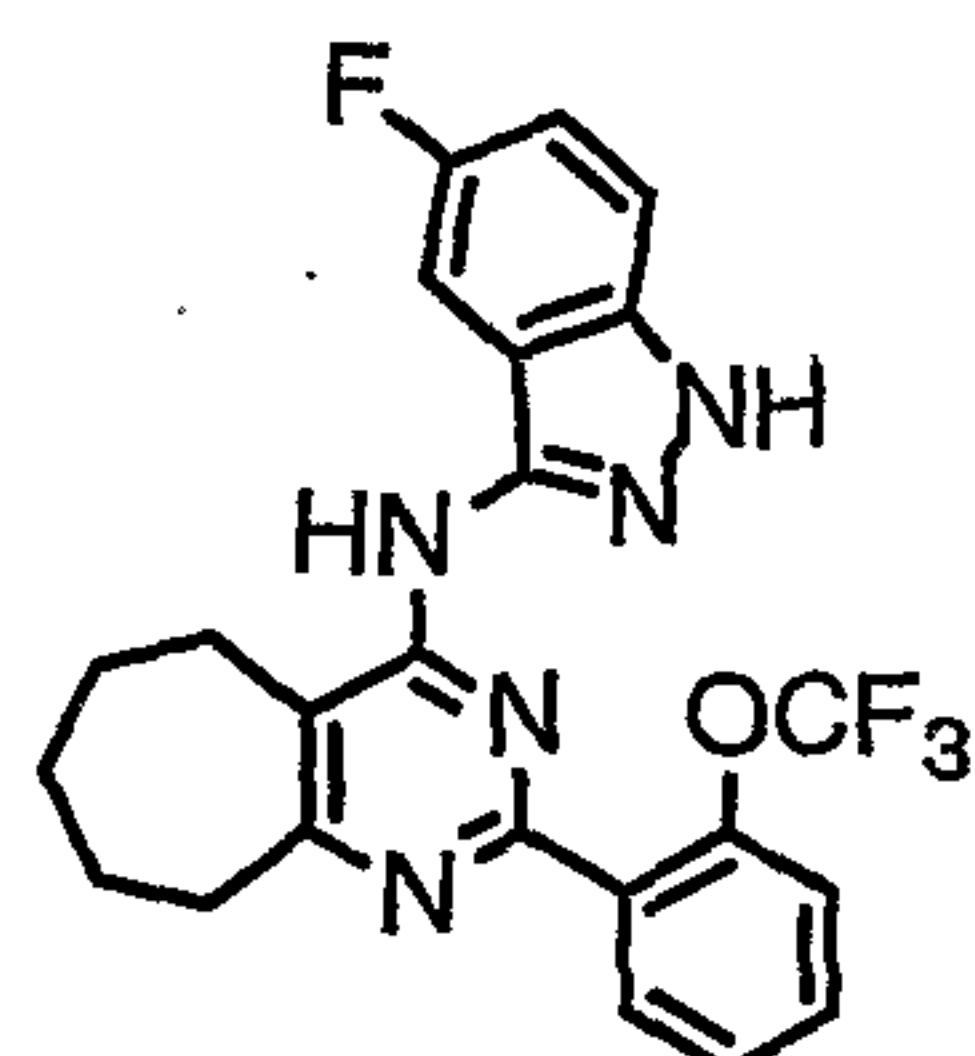
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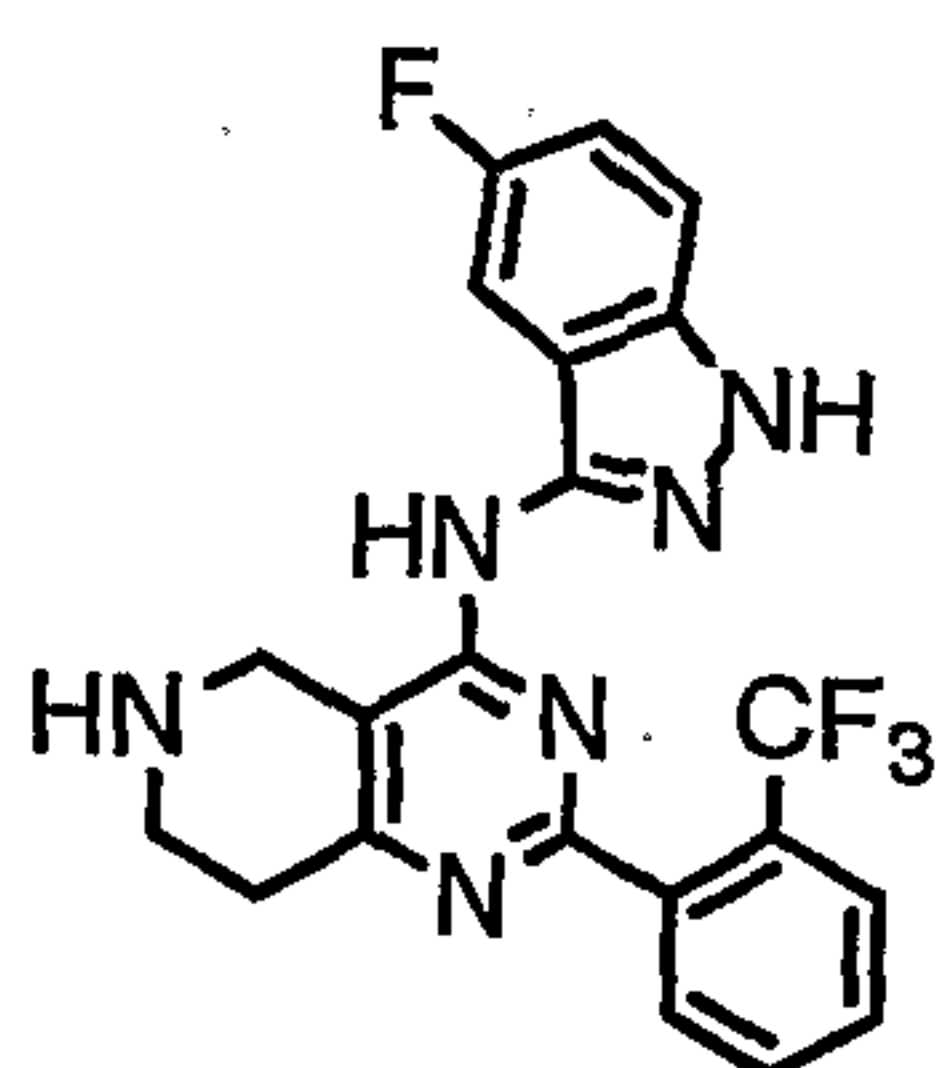
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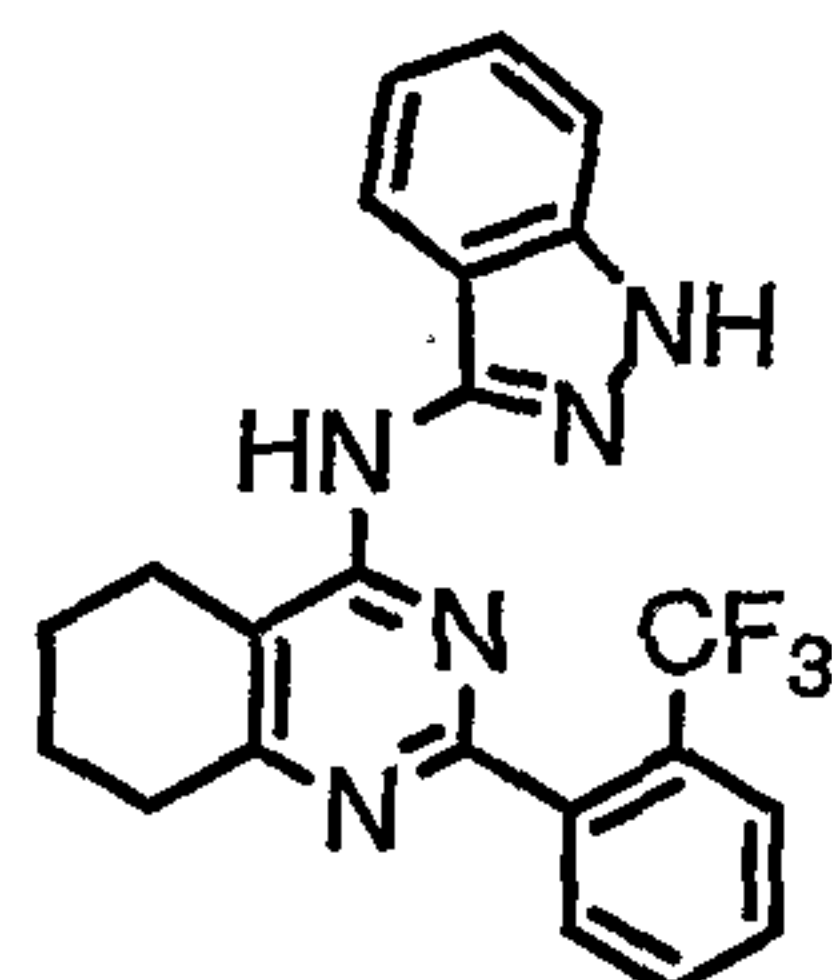
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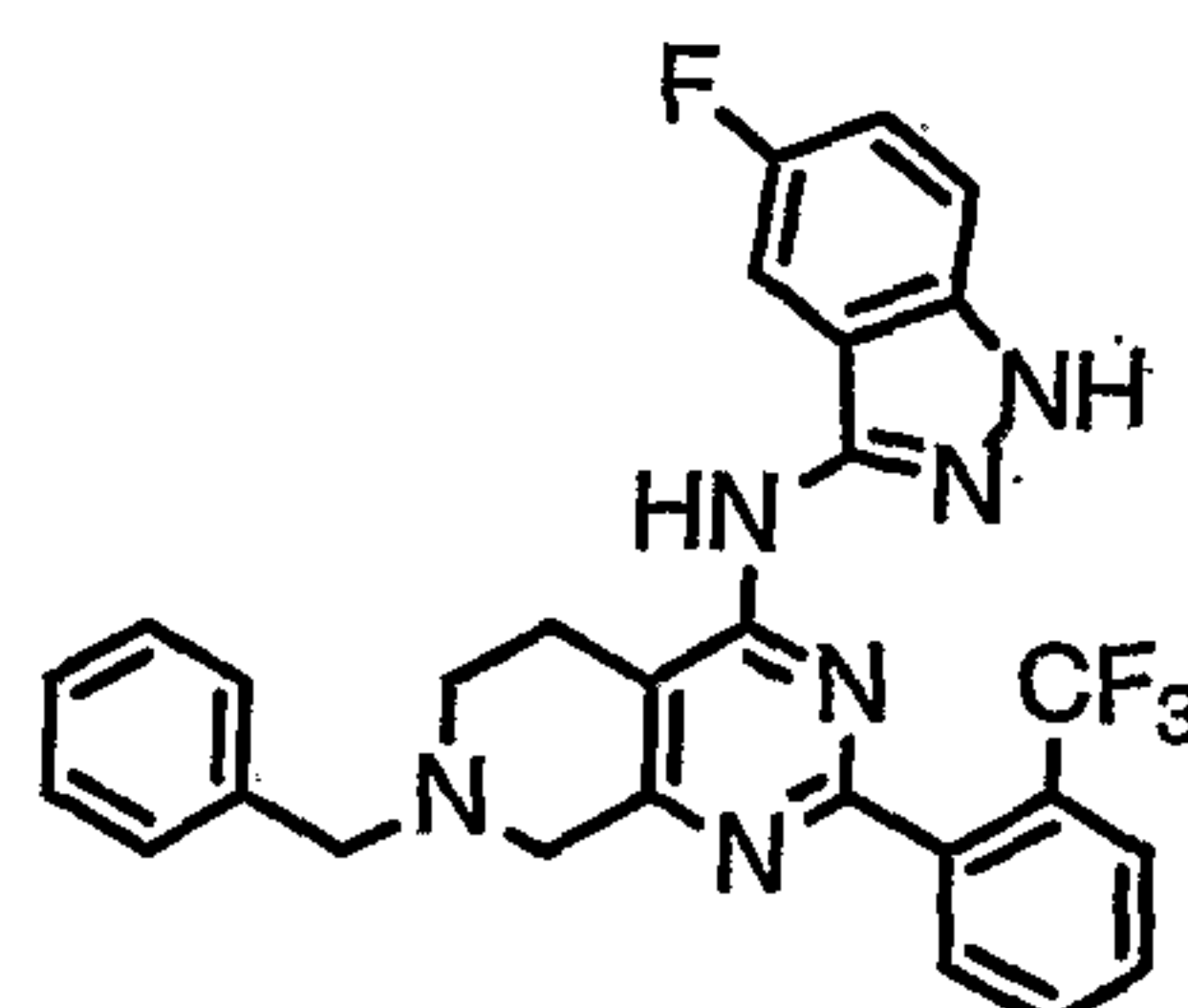
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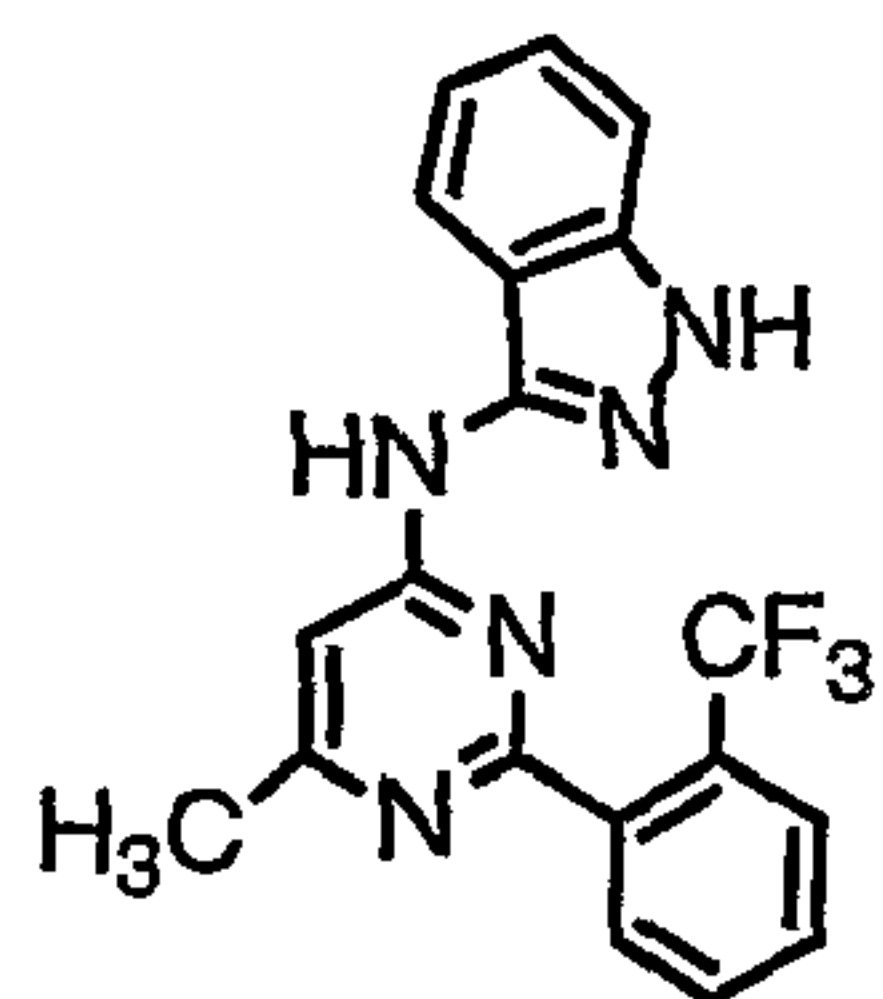
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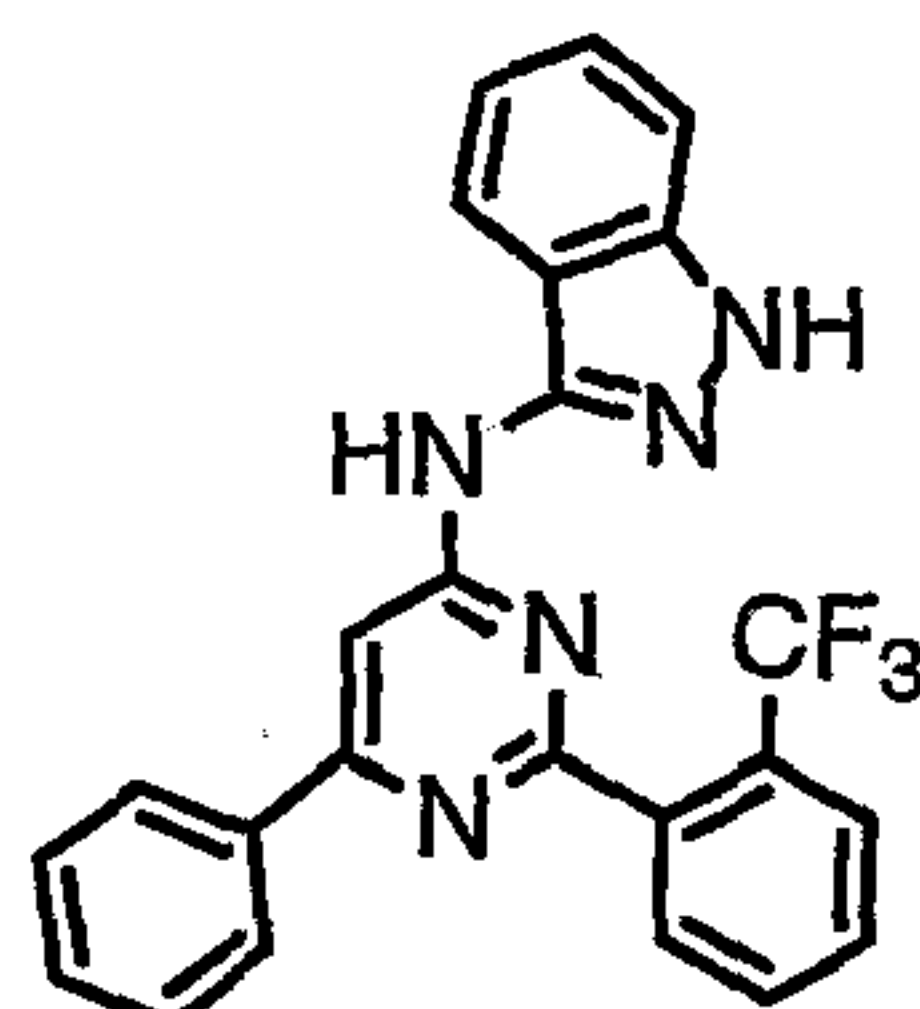
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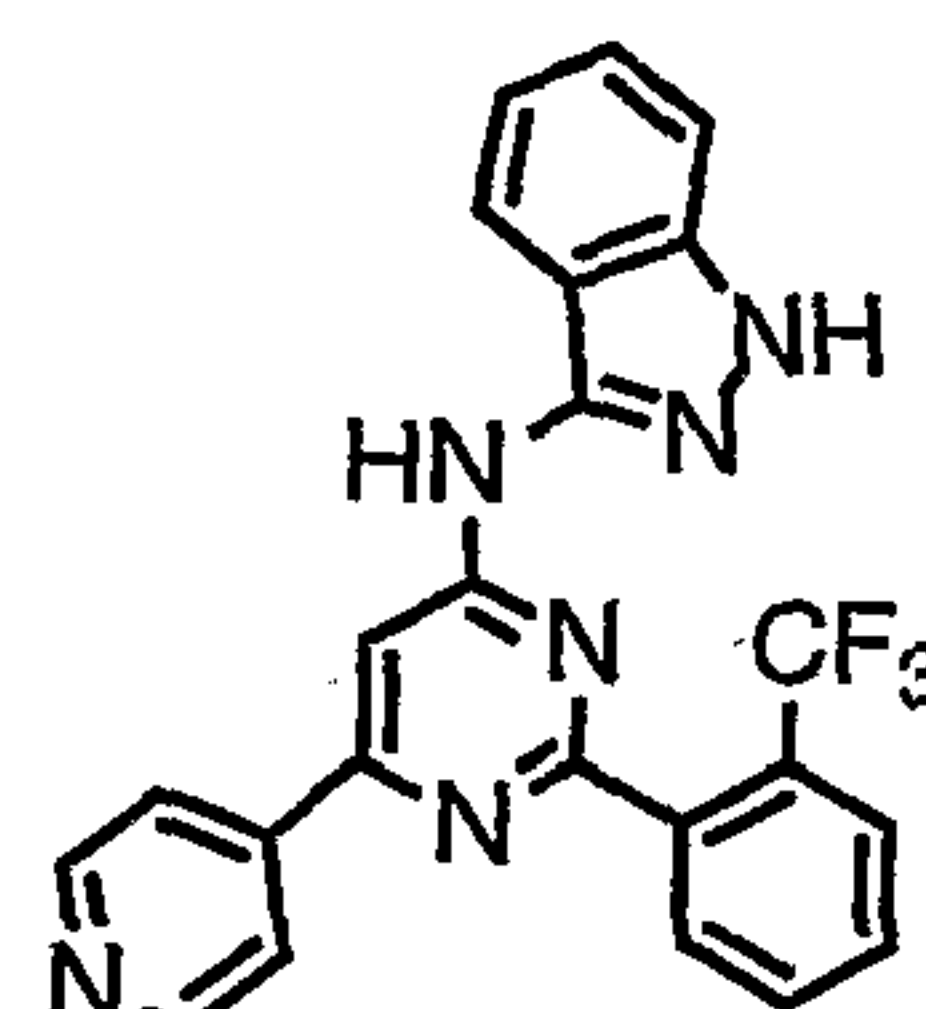
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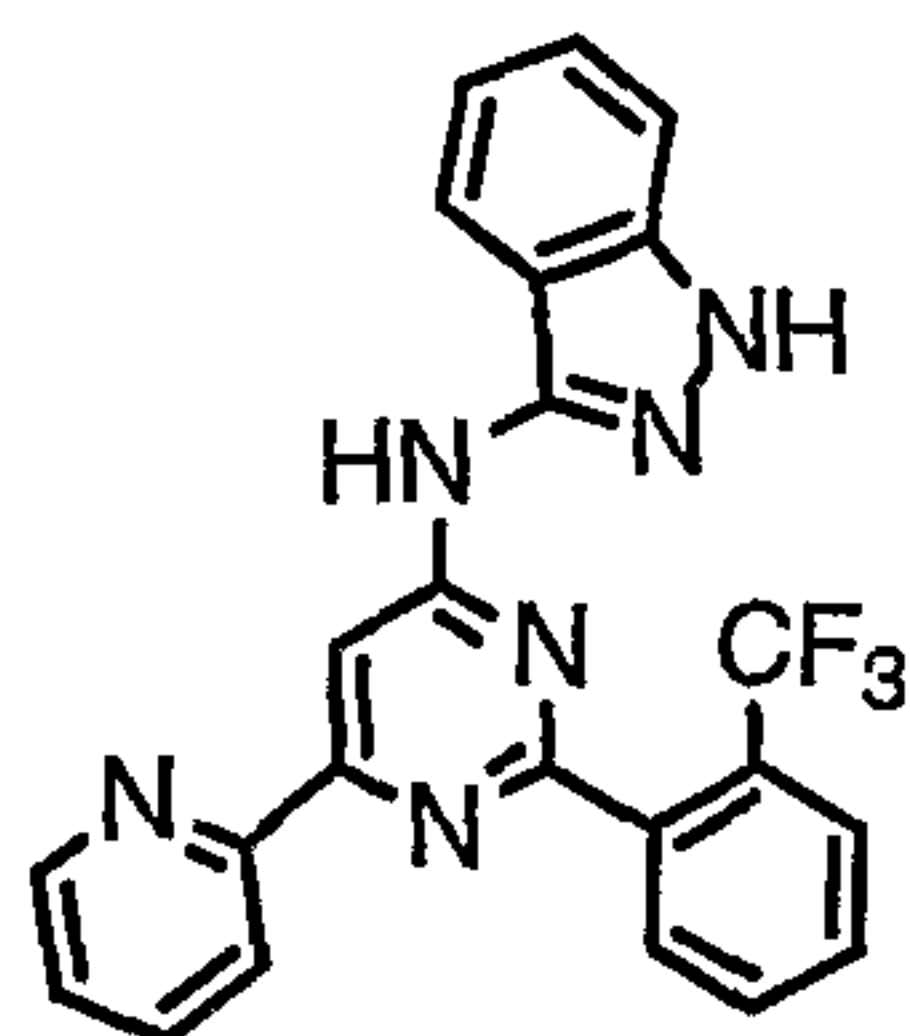
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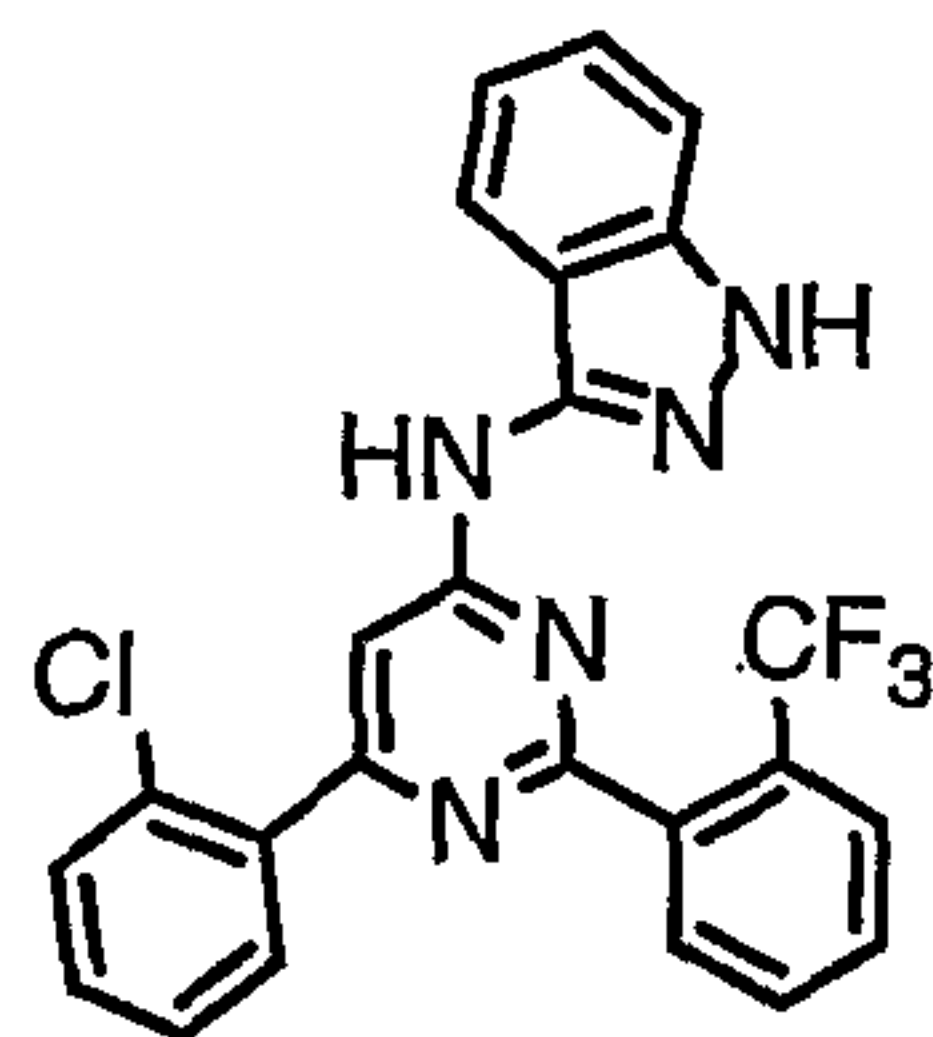
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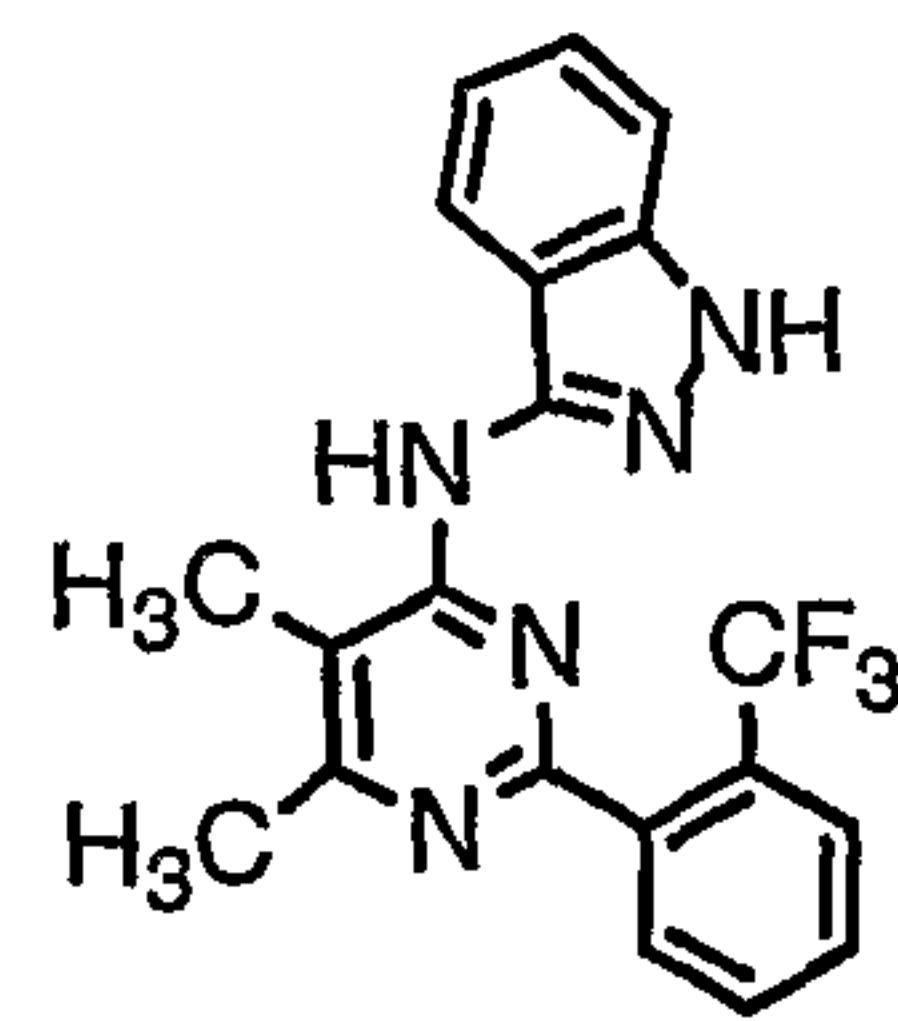
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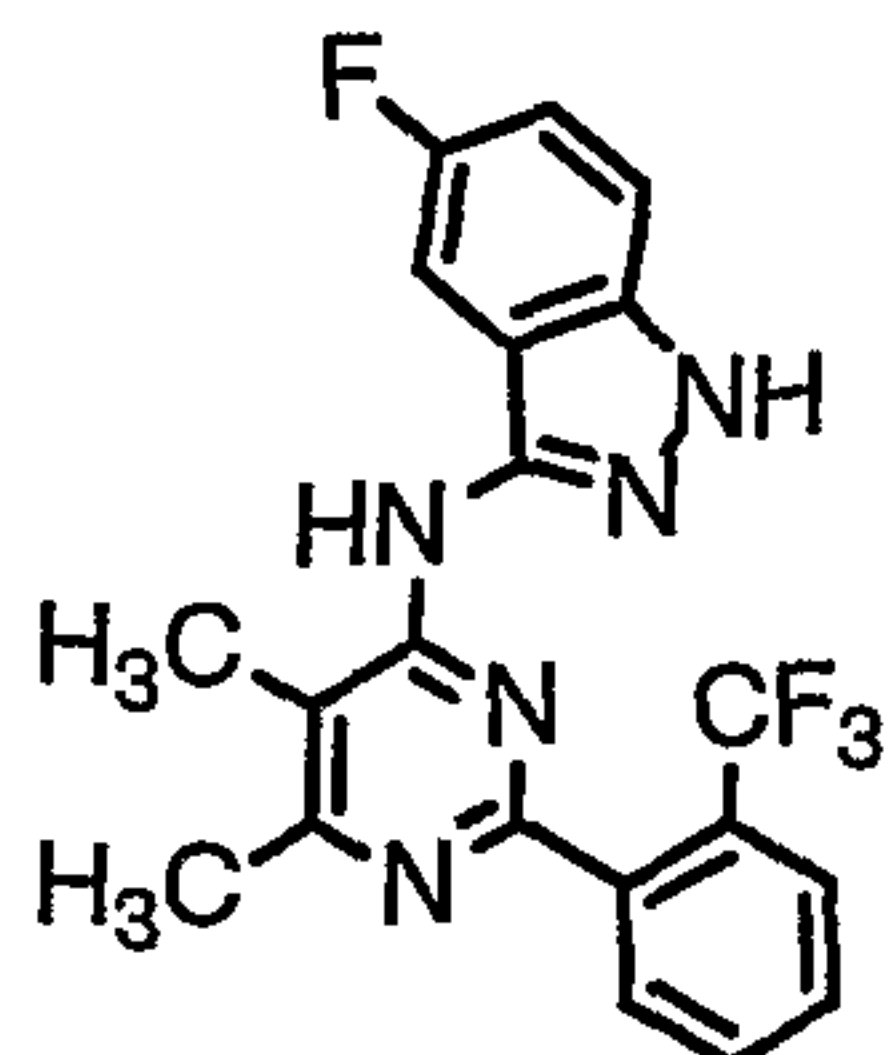
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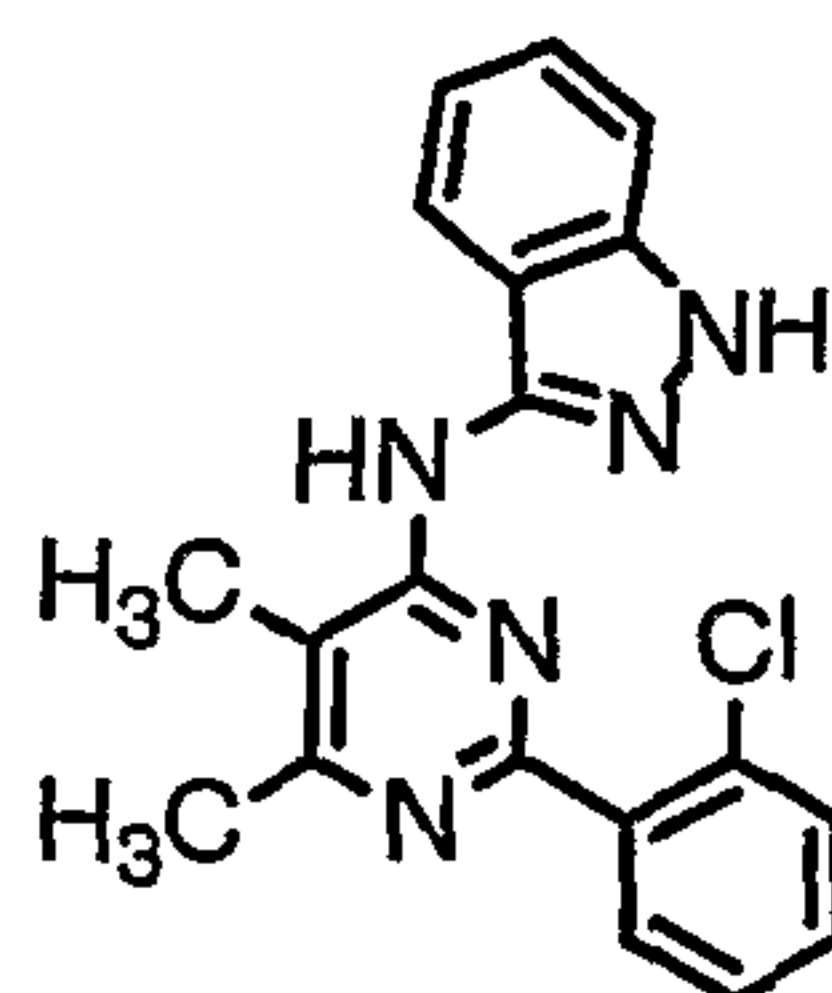
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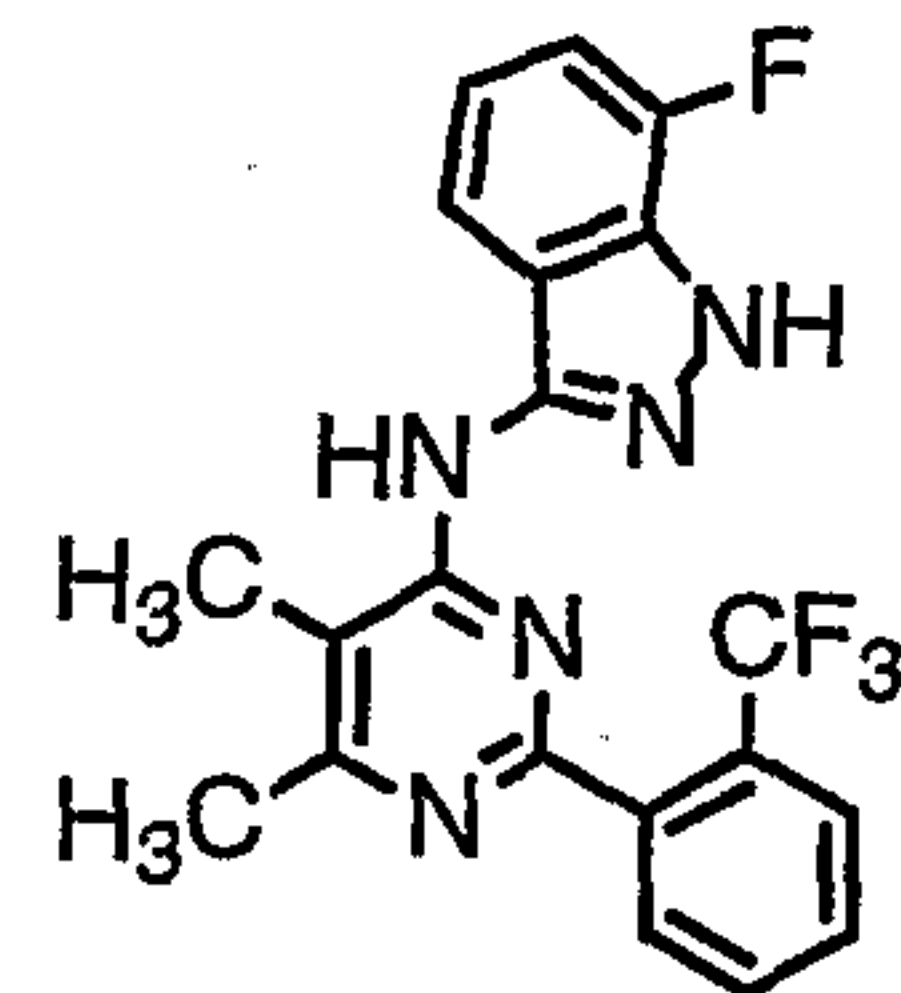
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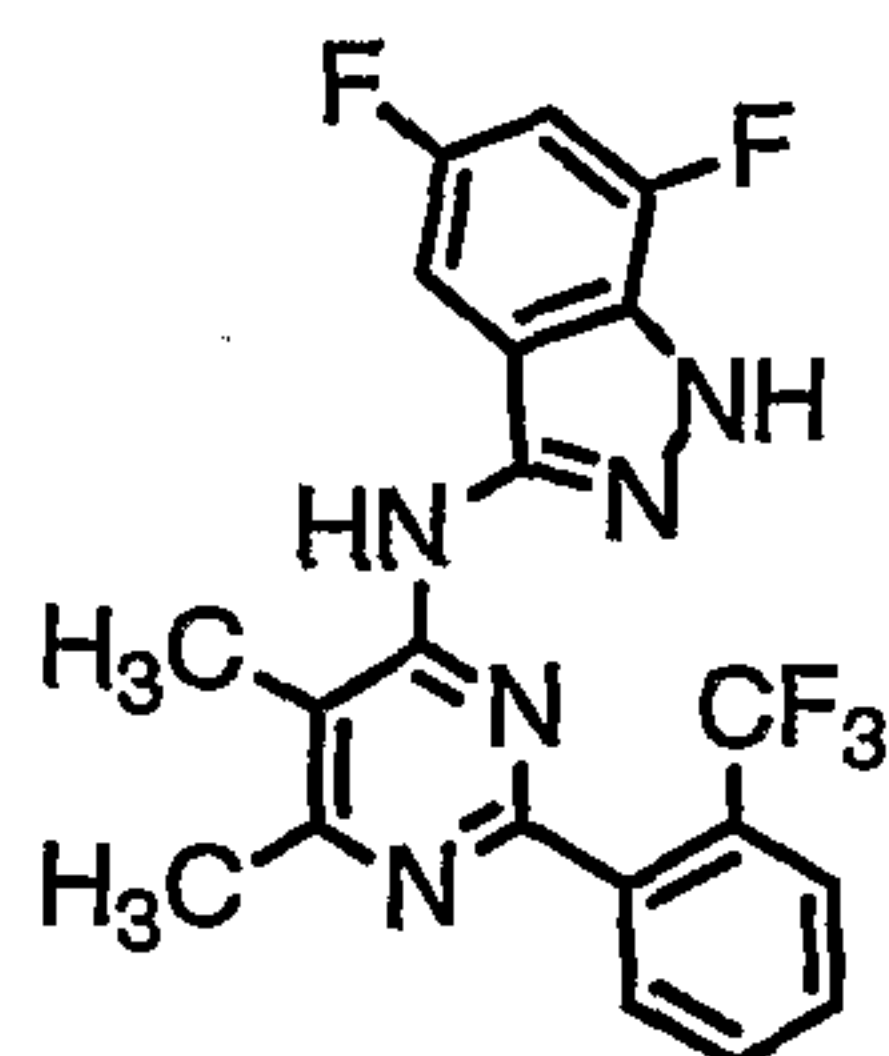
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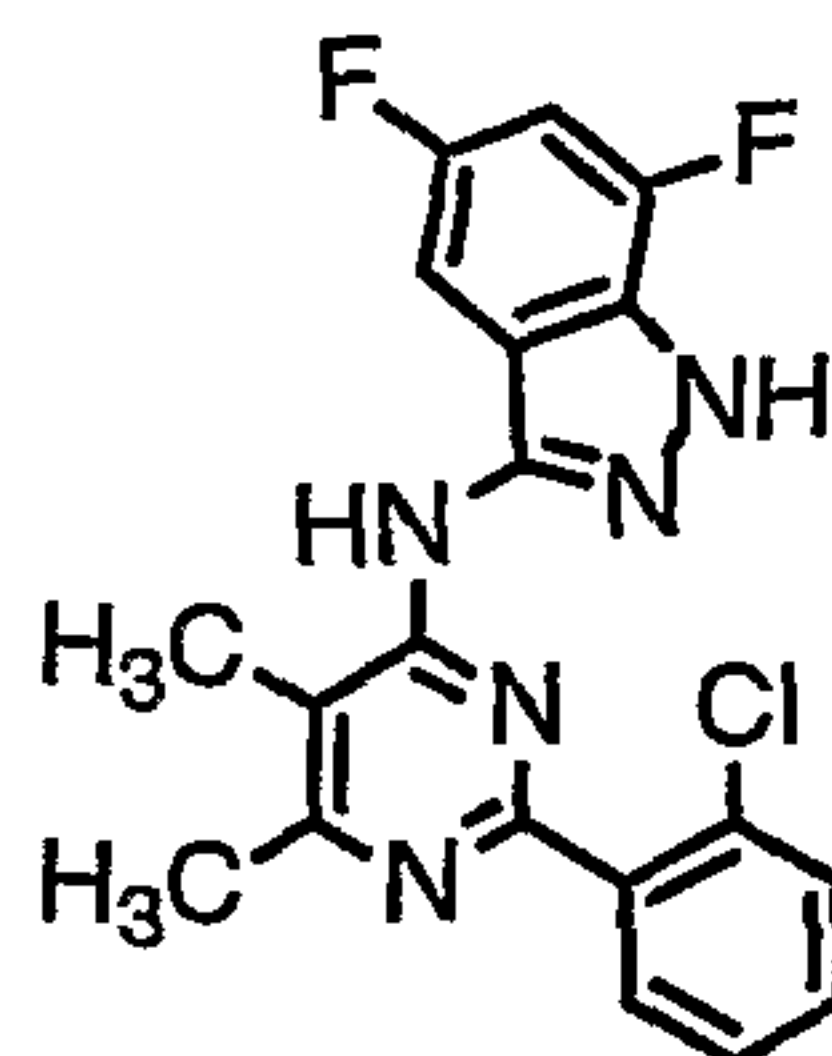
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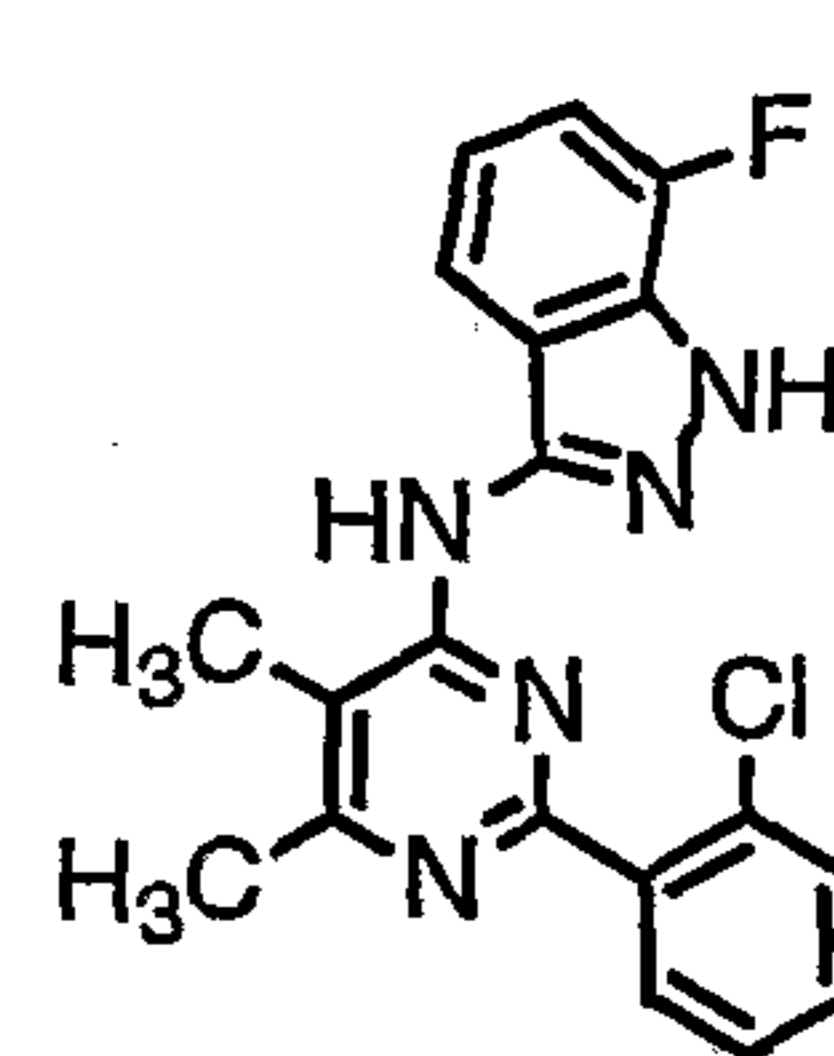
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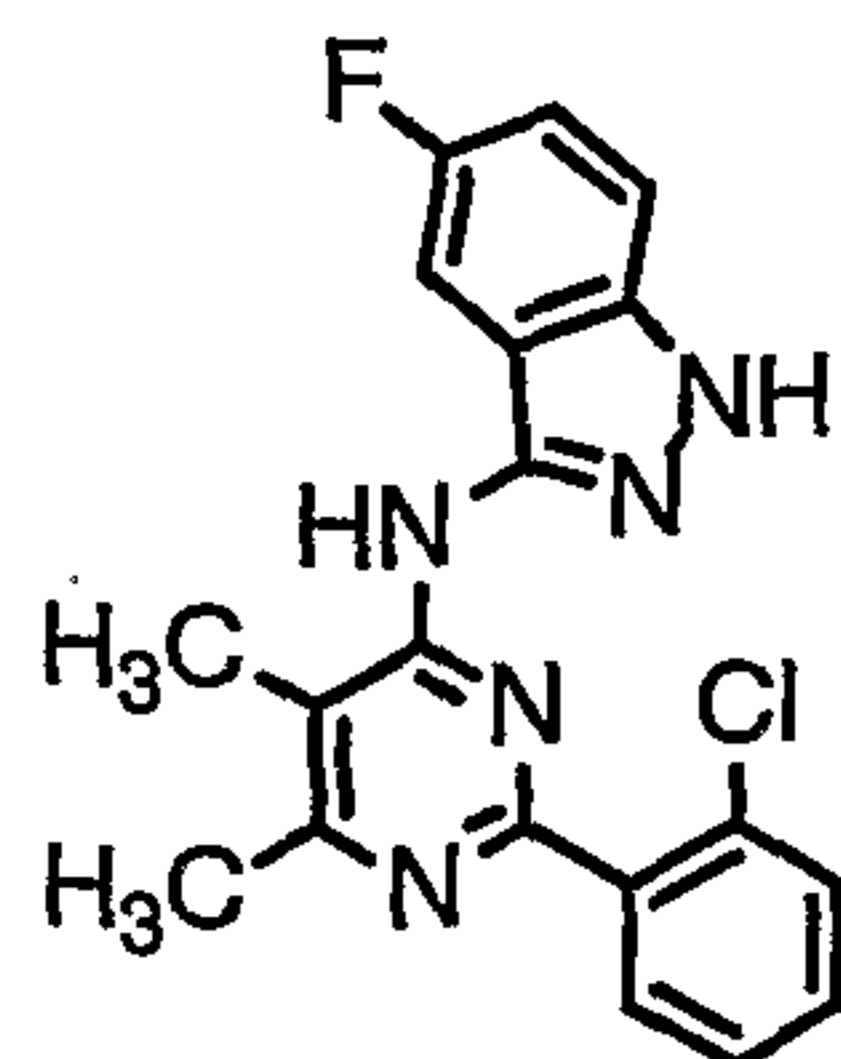
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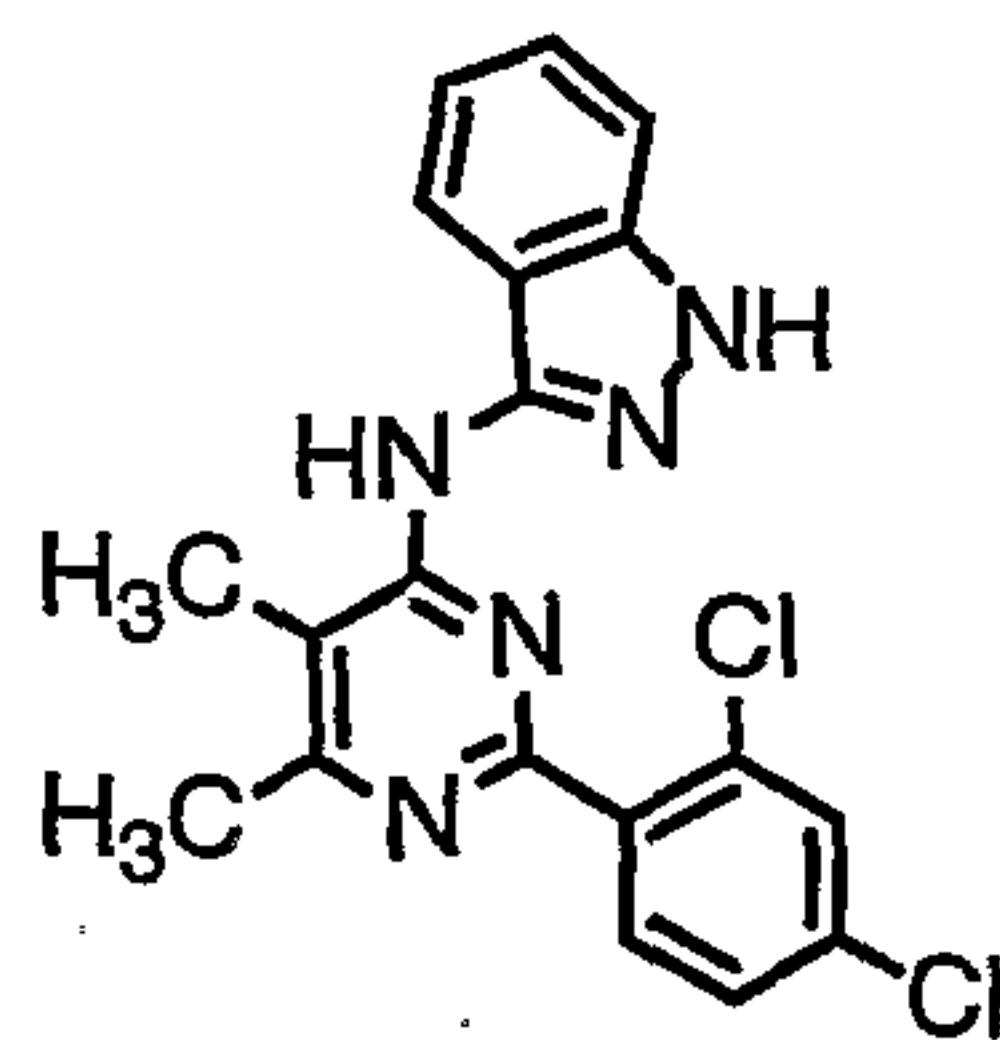
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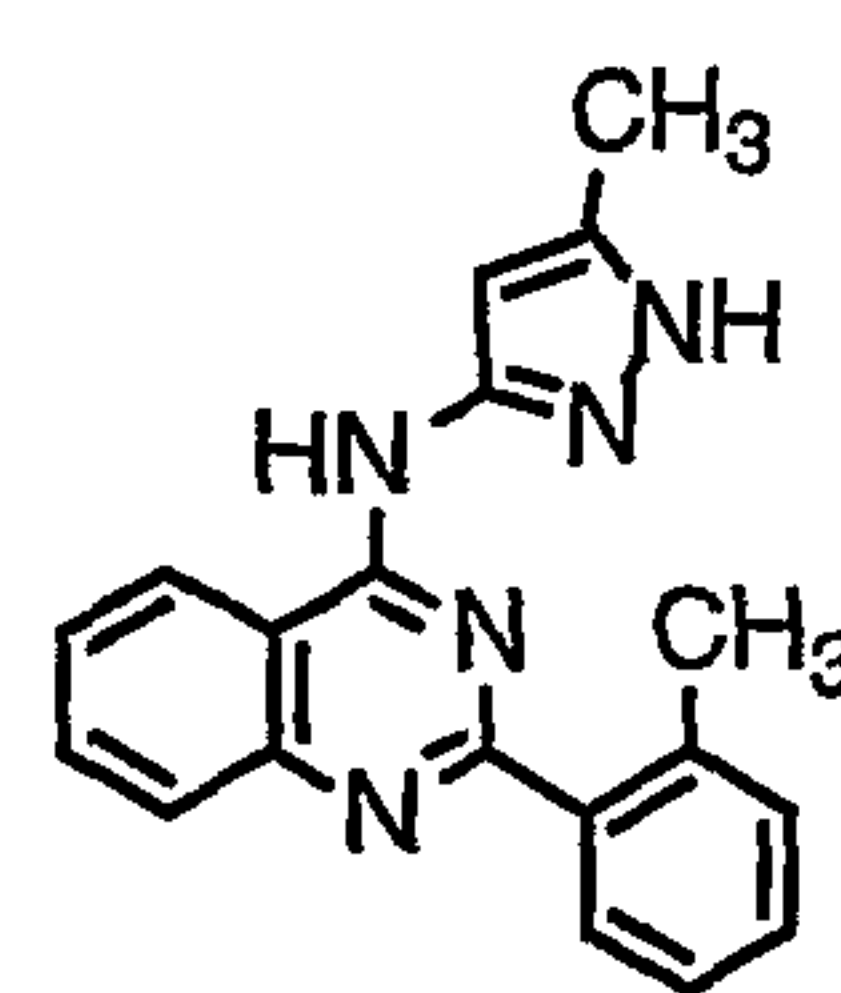
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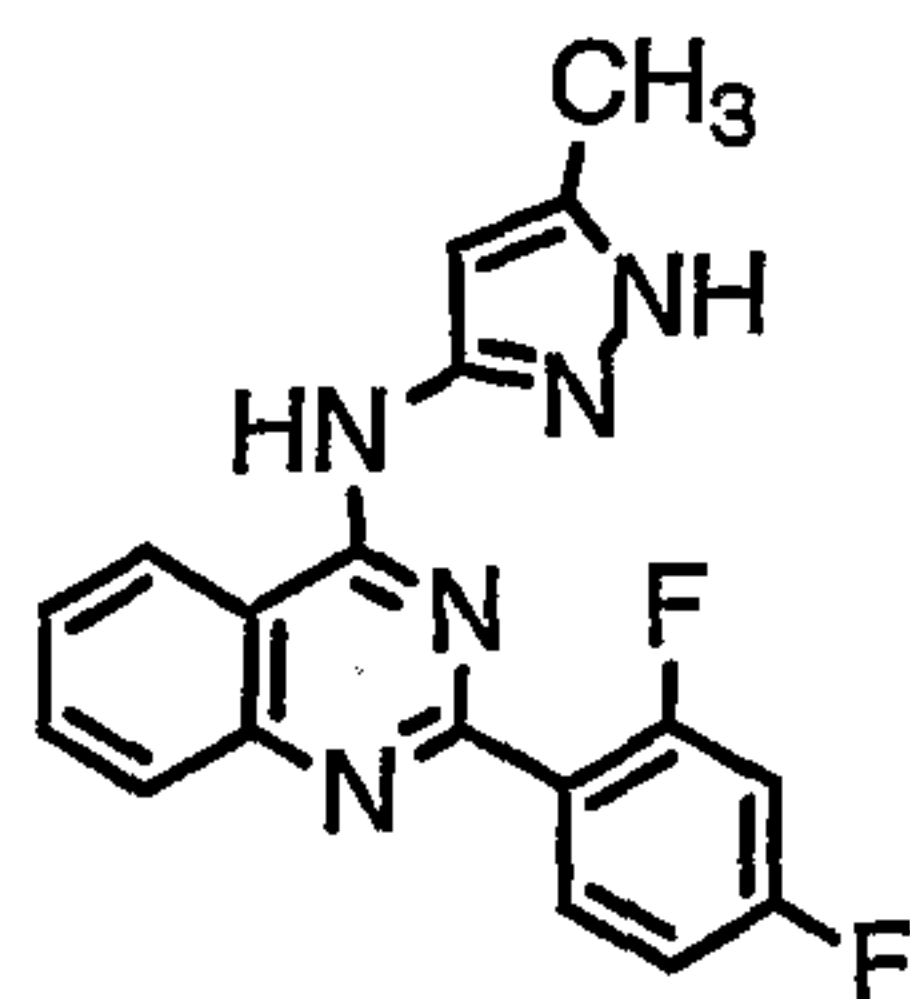
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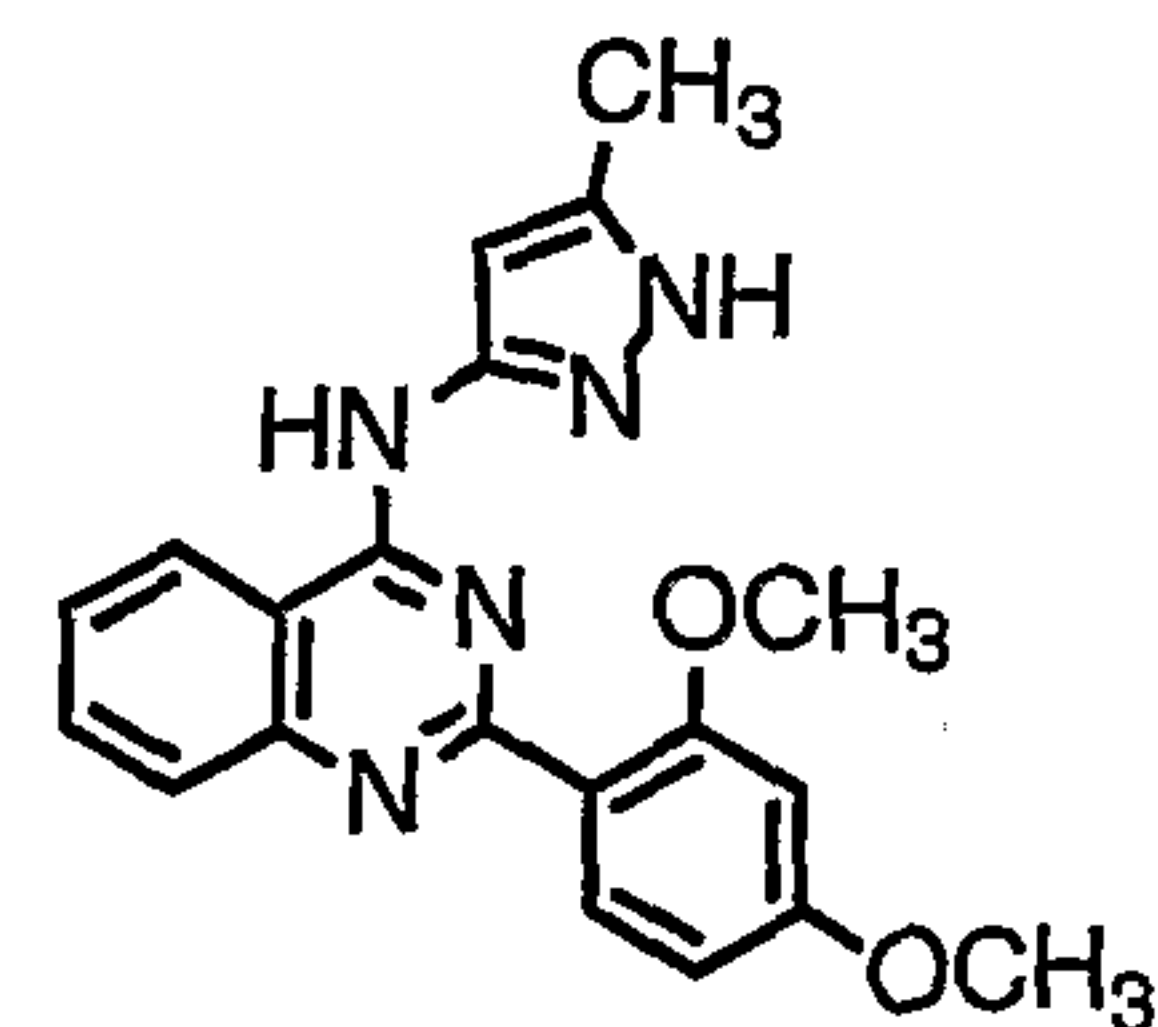
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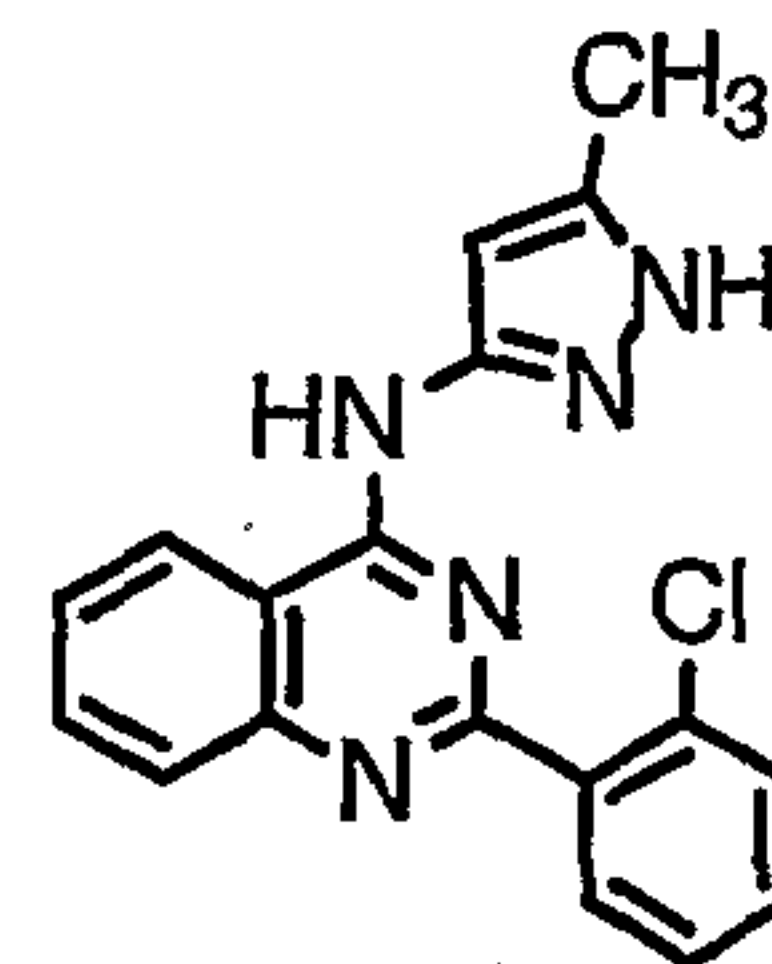
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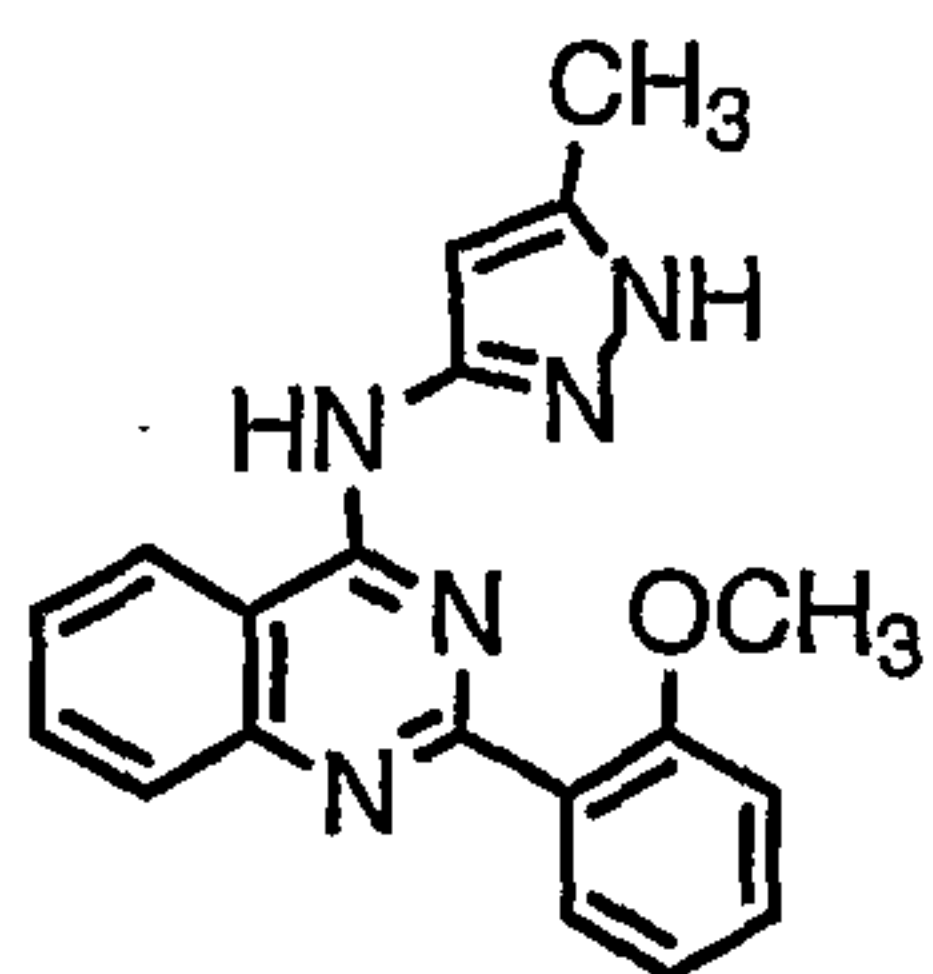
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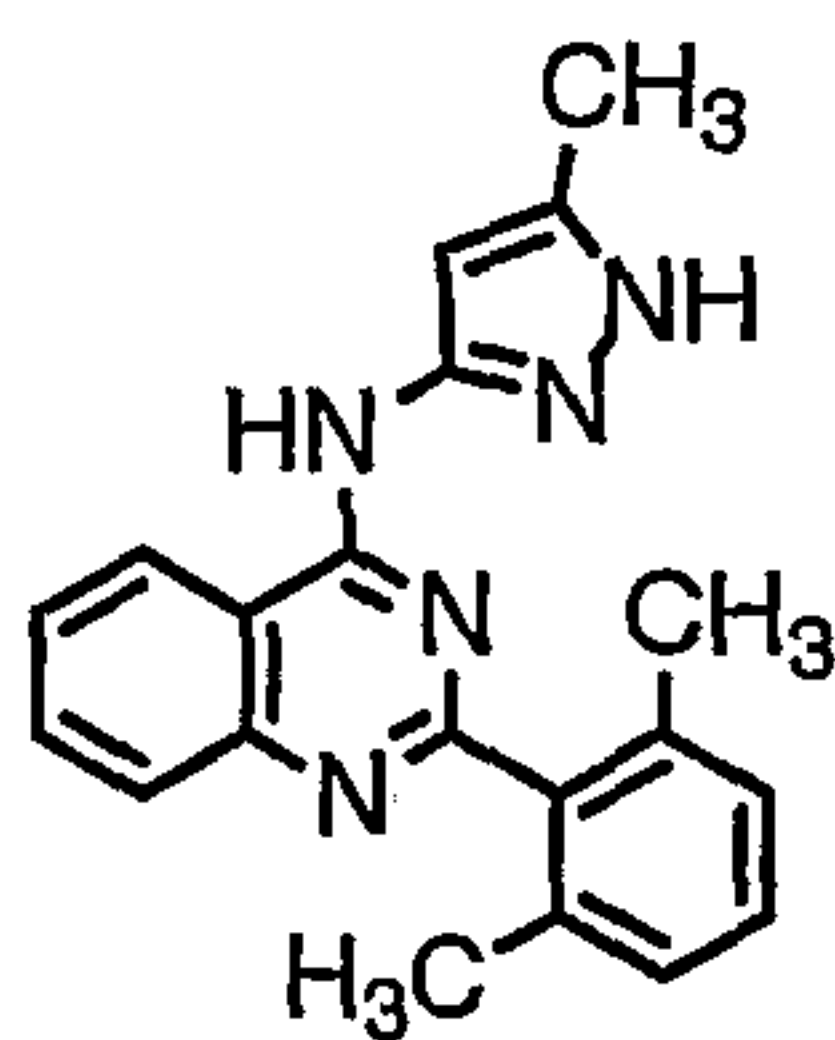
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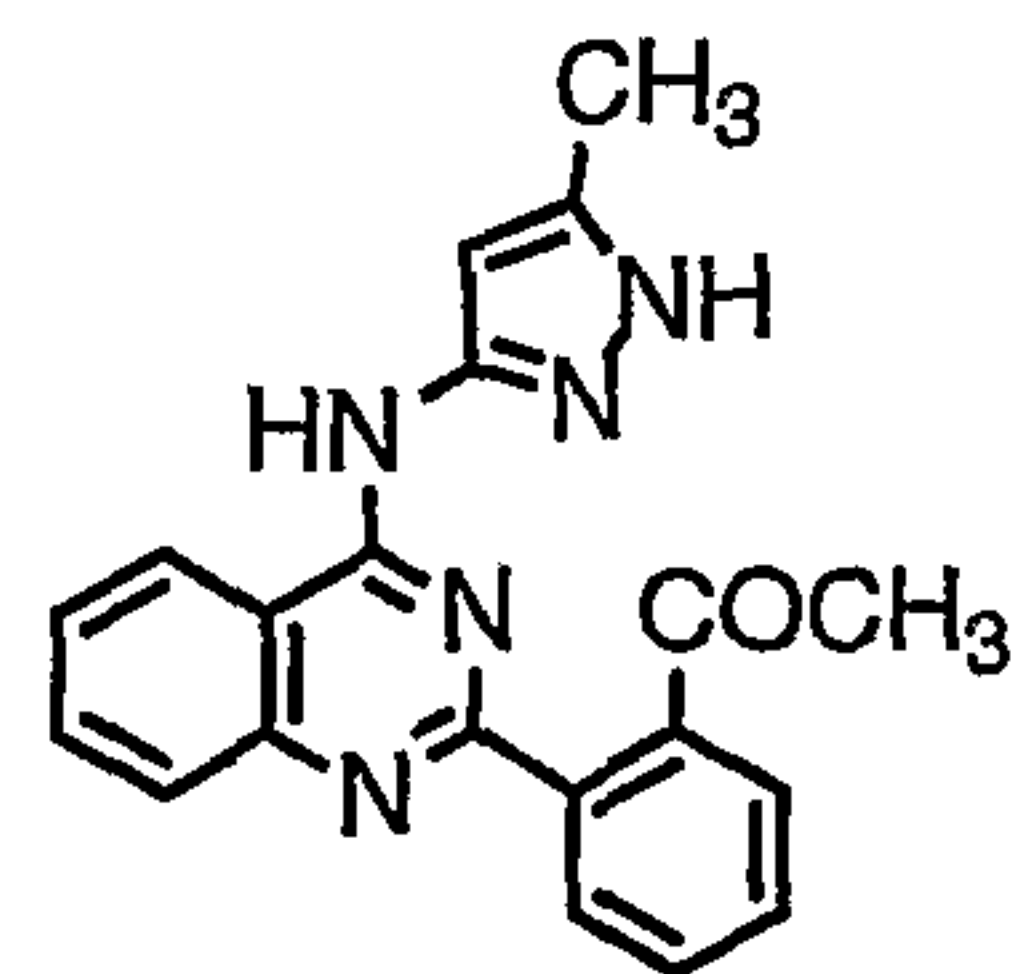
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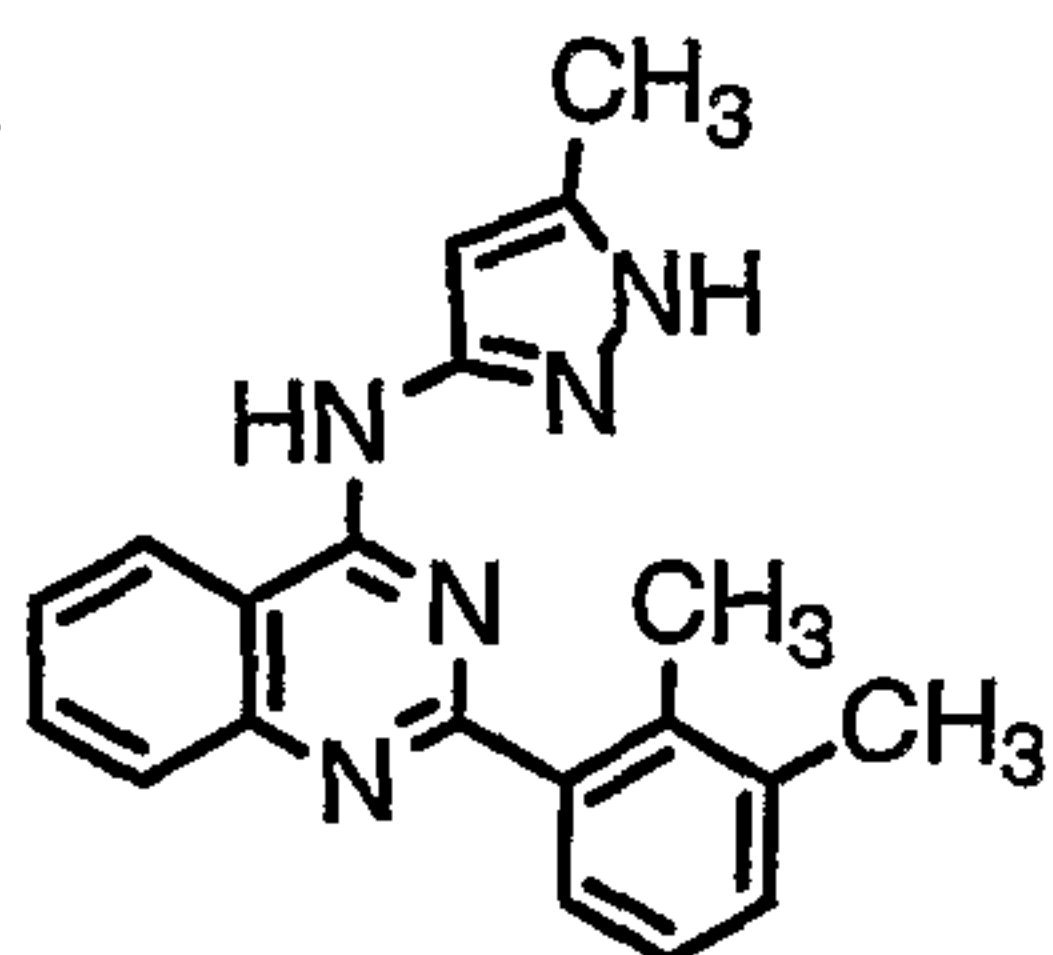
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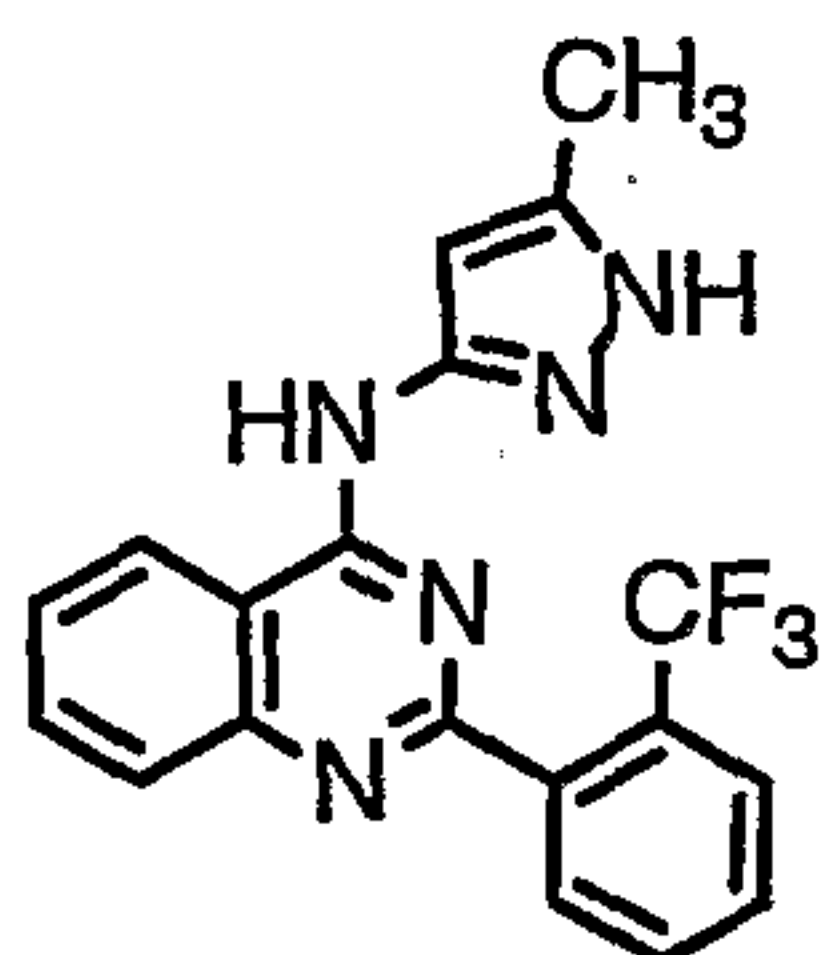
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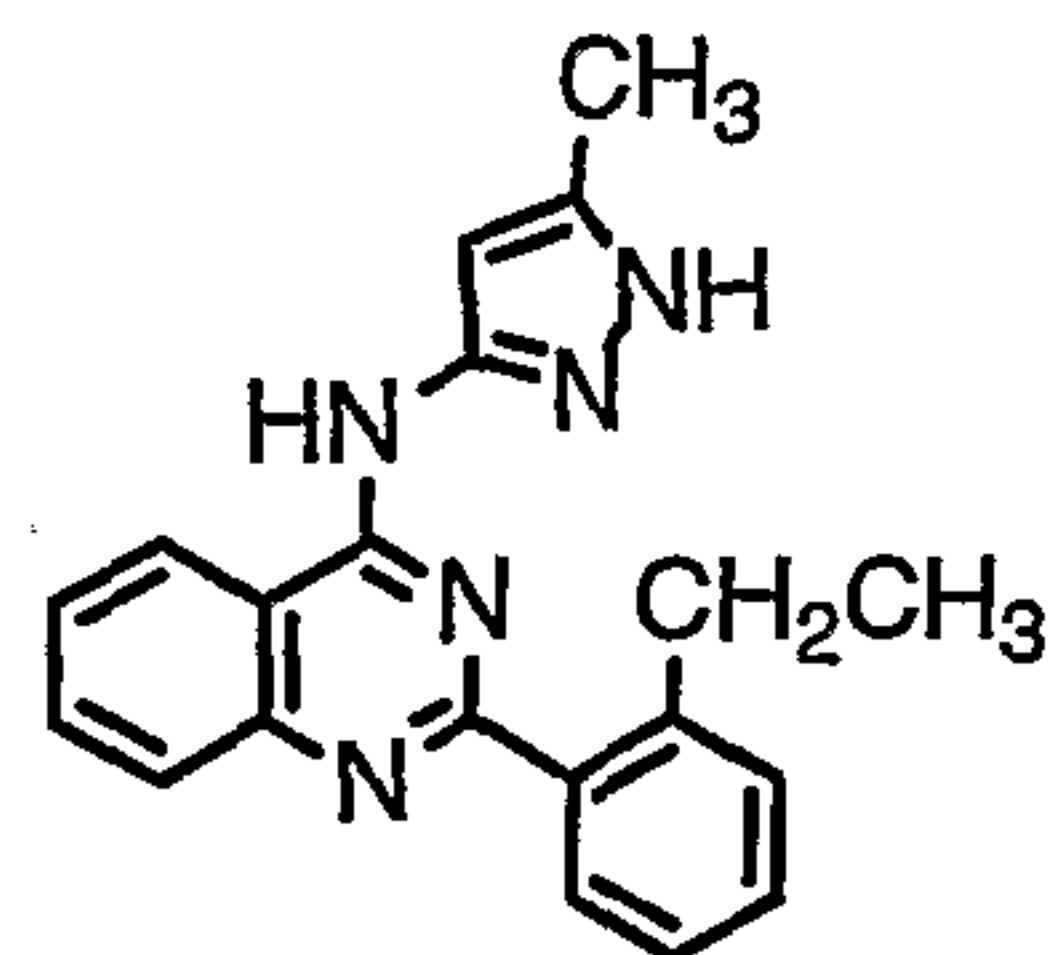
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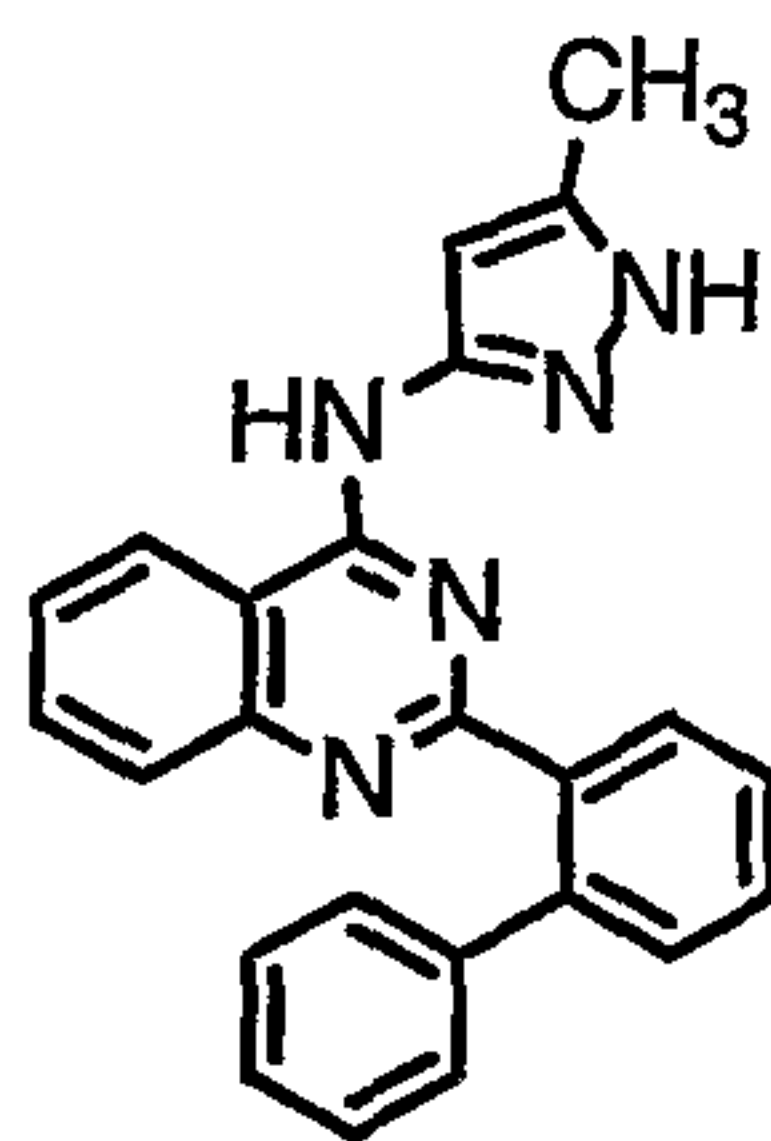
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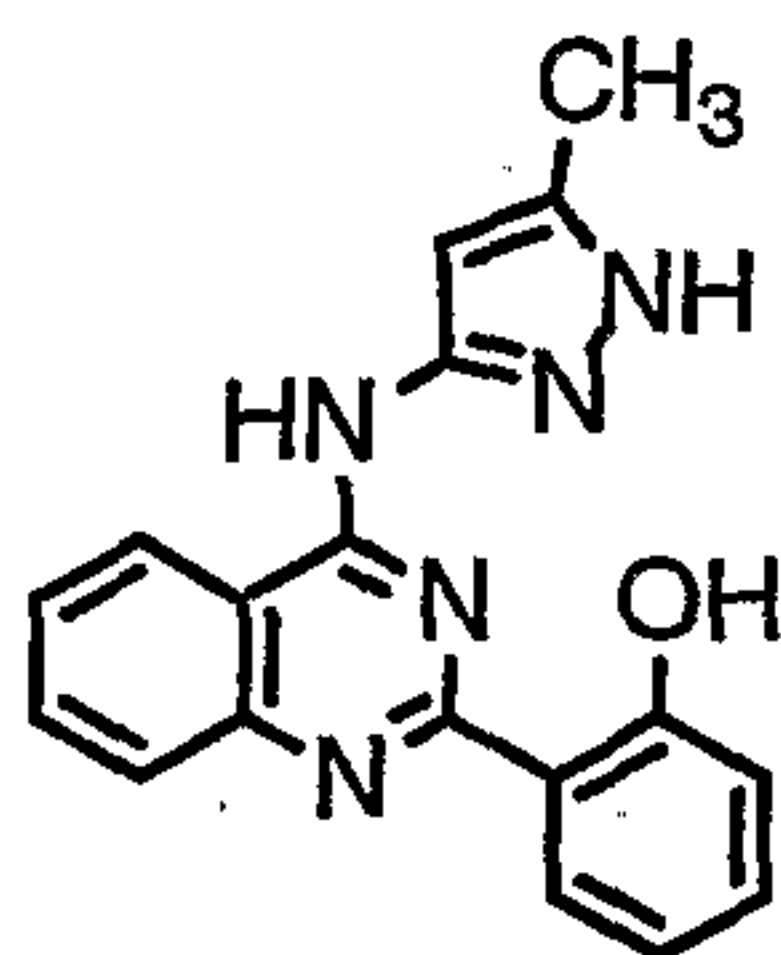
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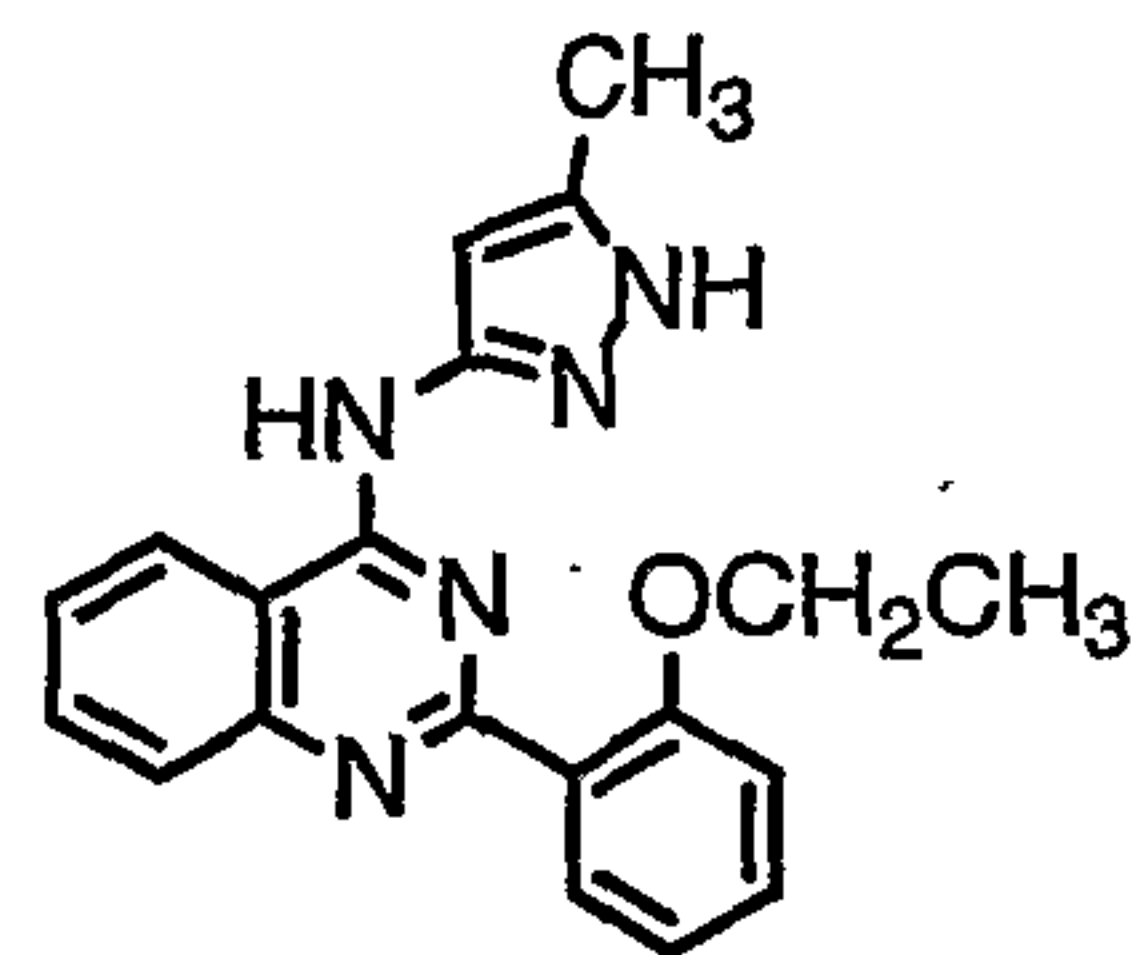
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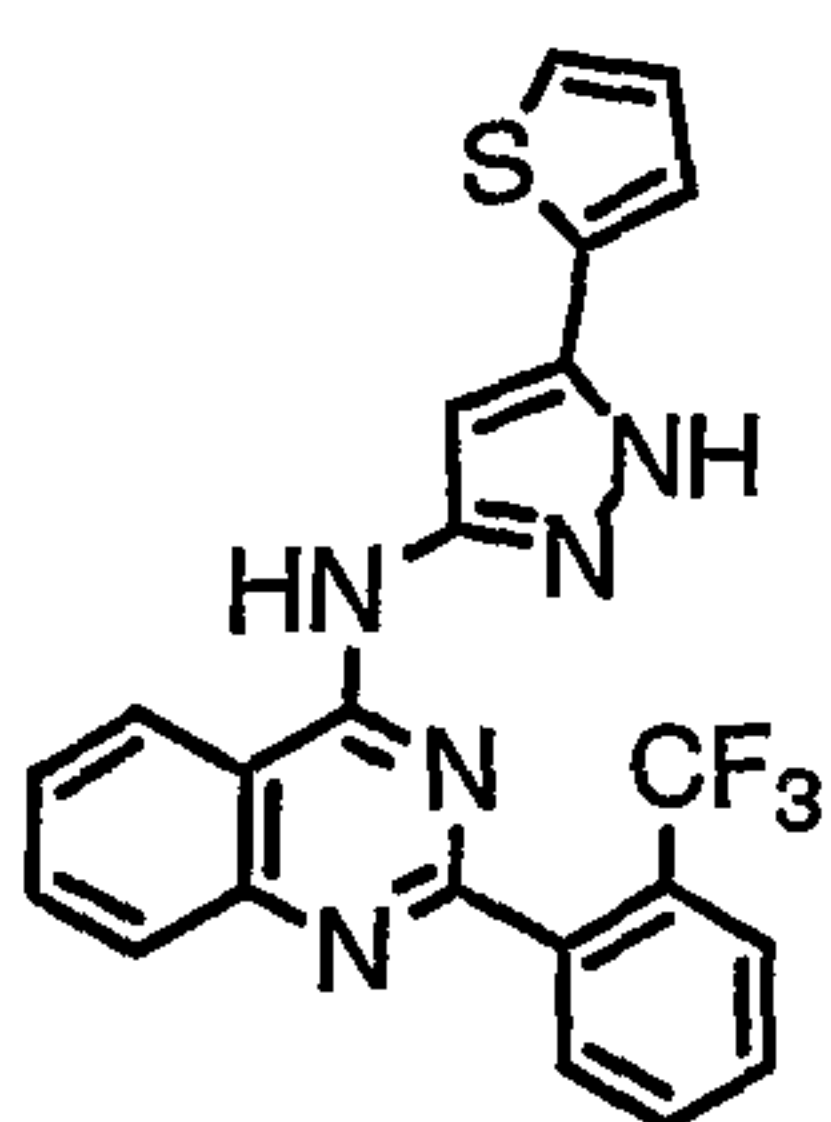
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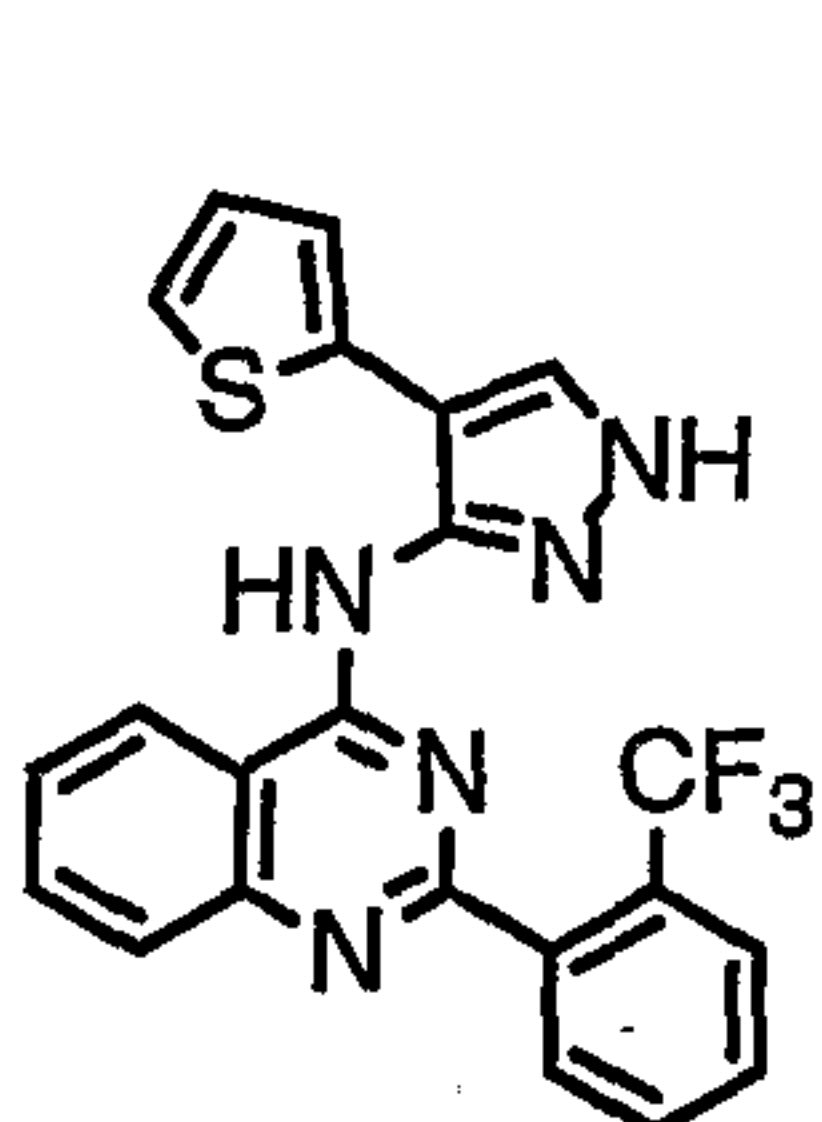
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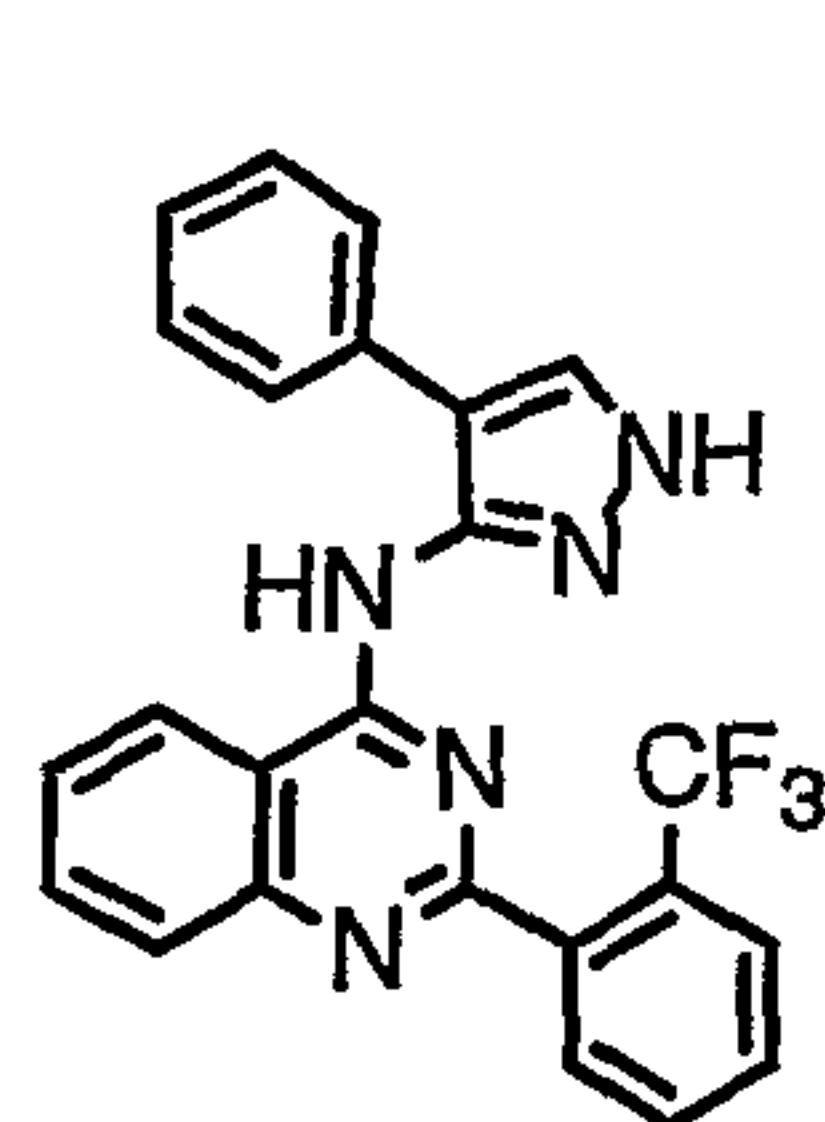
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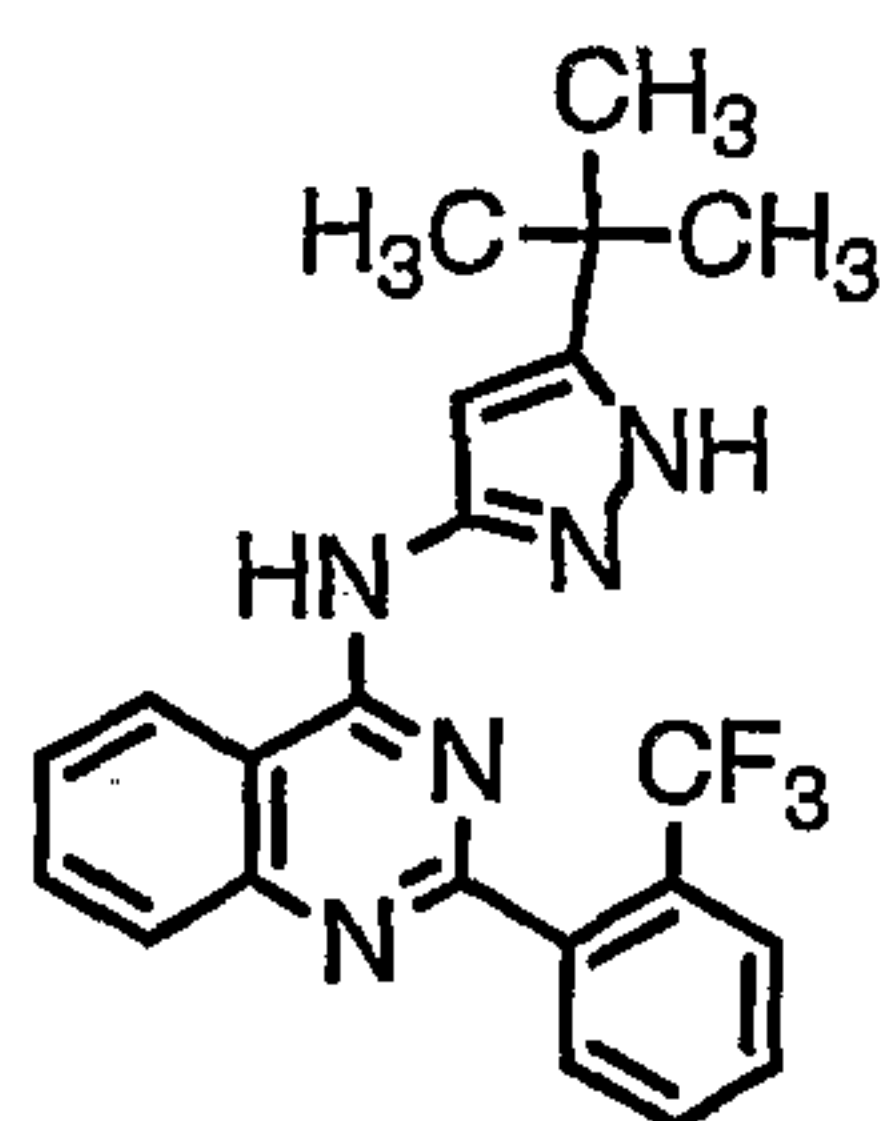
II-46



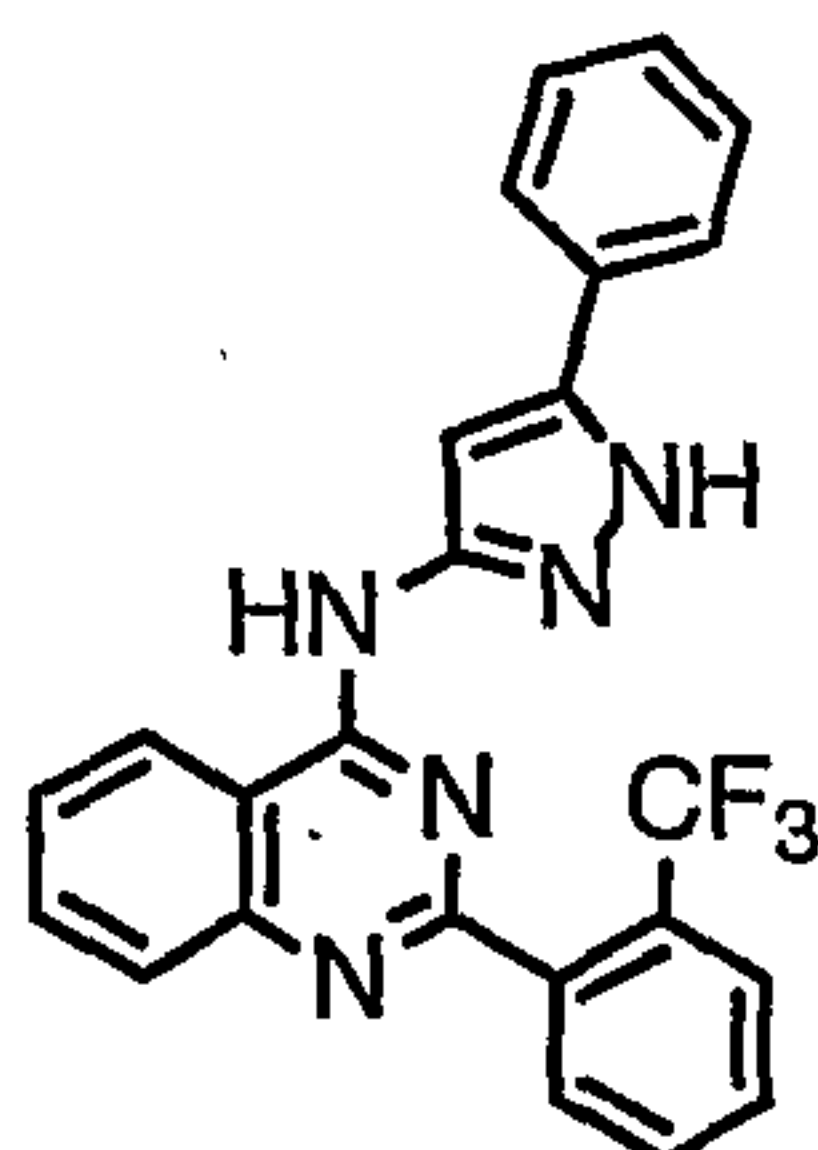
II-47



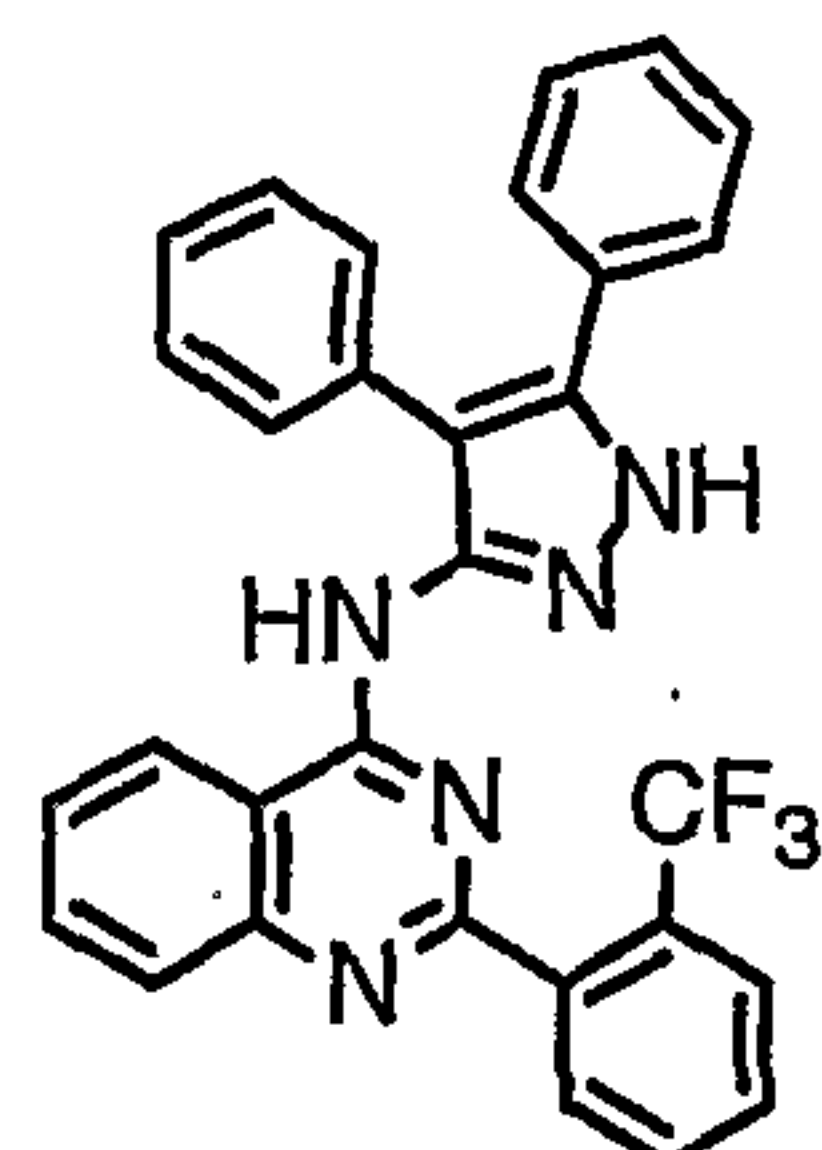
II-48



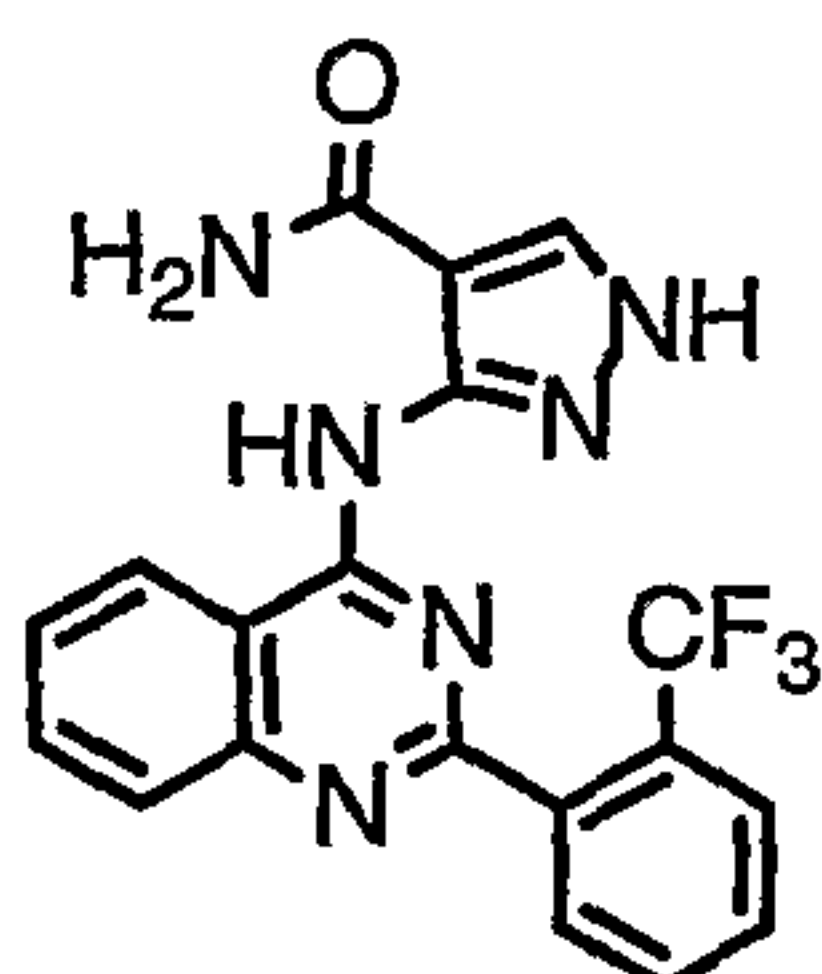
II-49



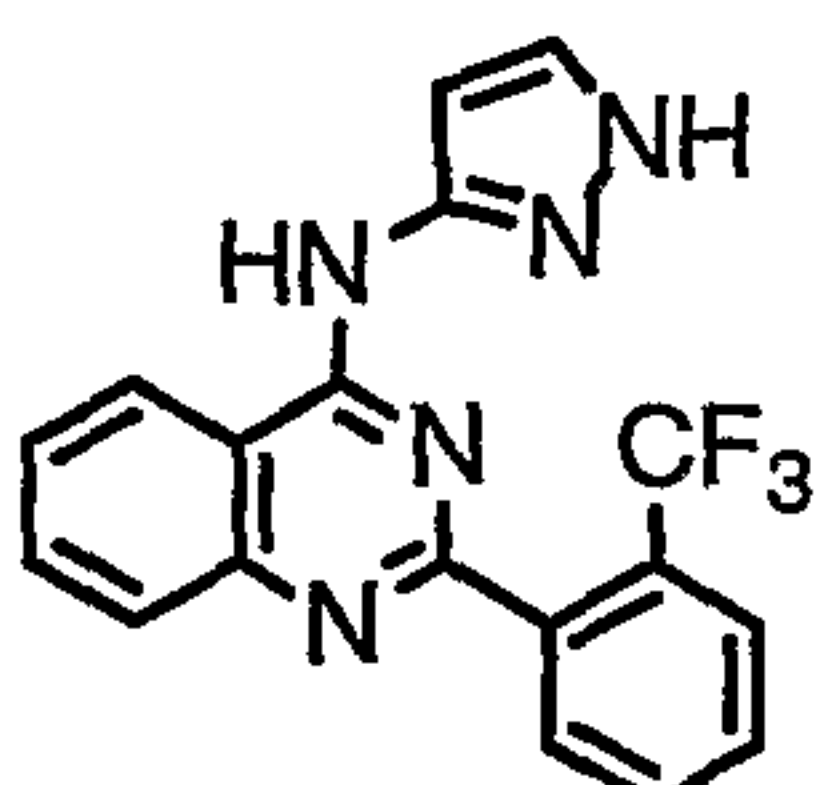
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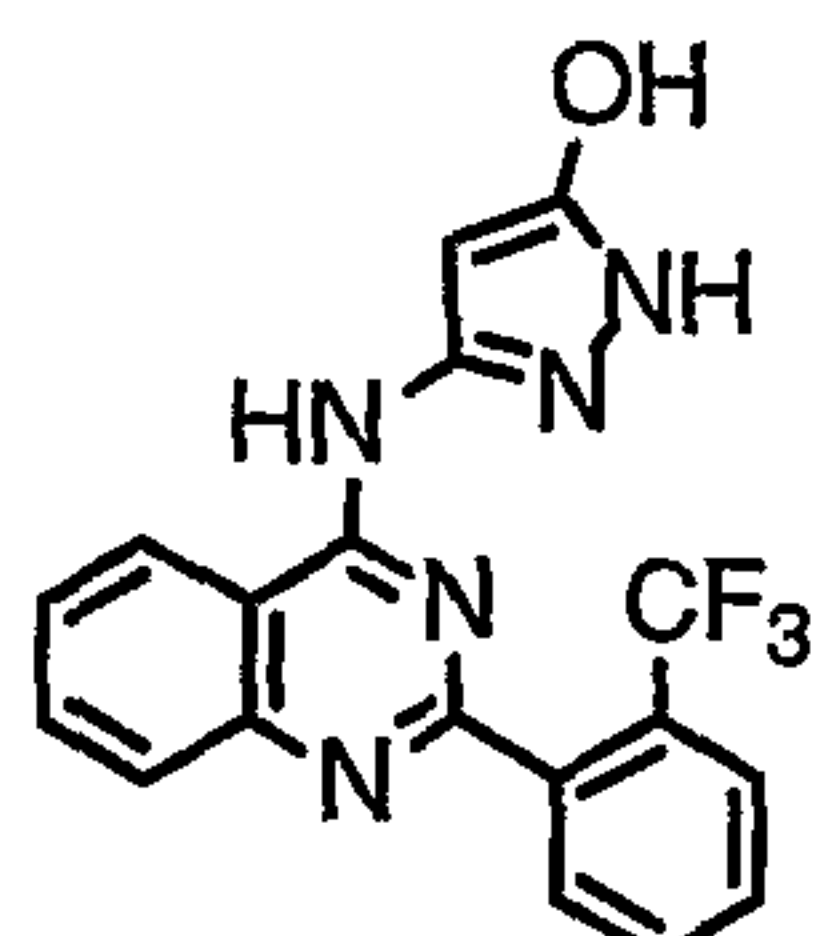
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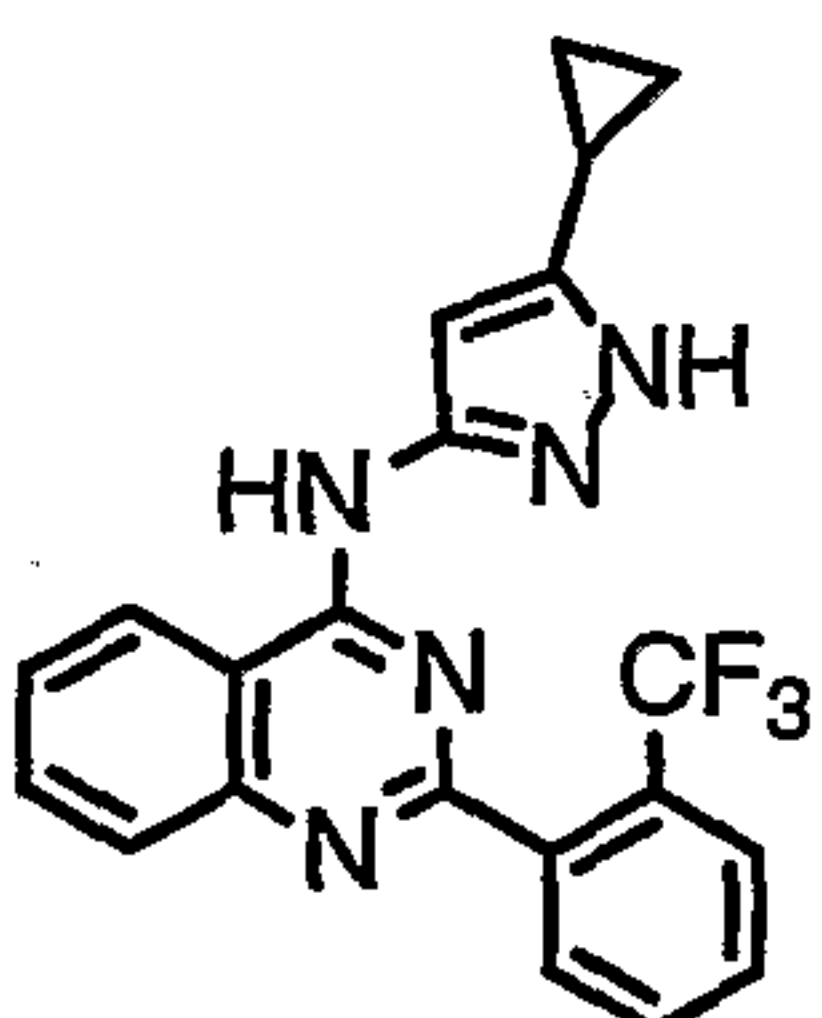
II-52



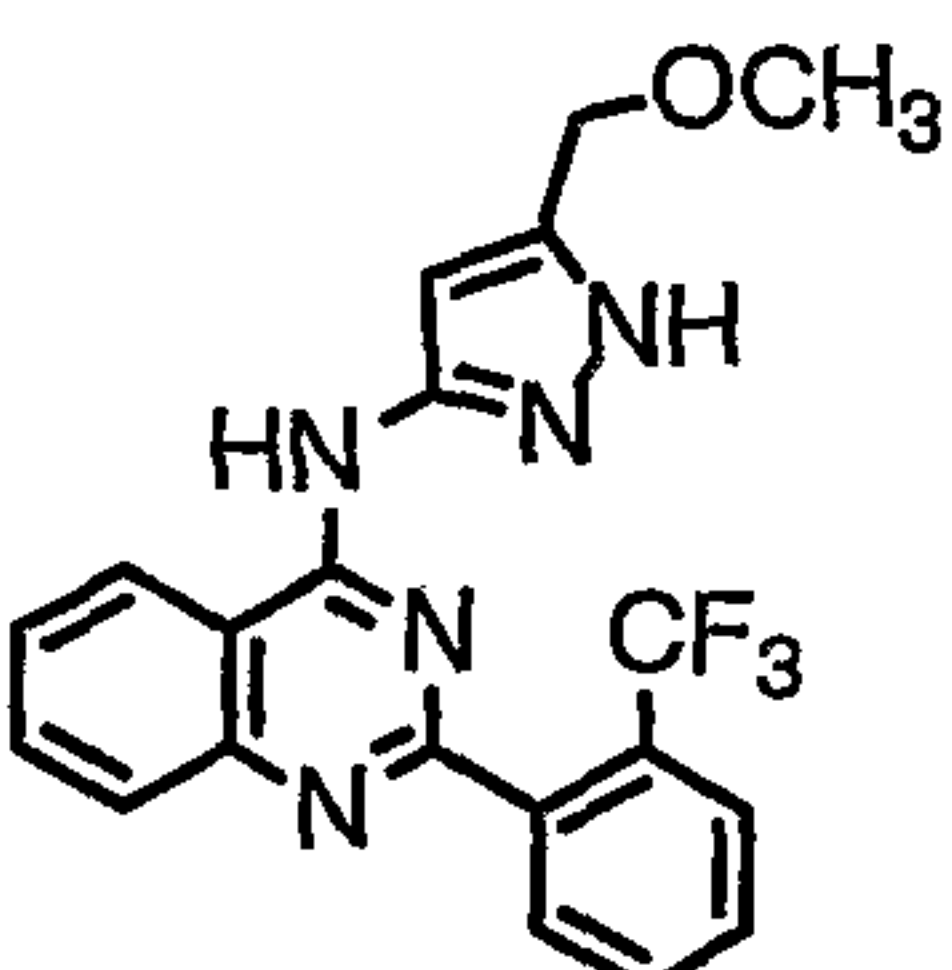
II-53



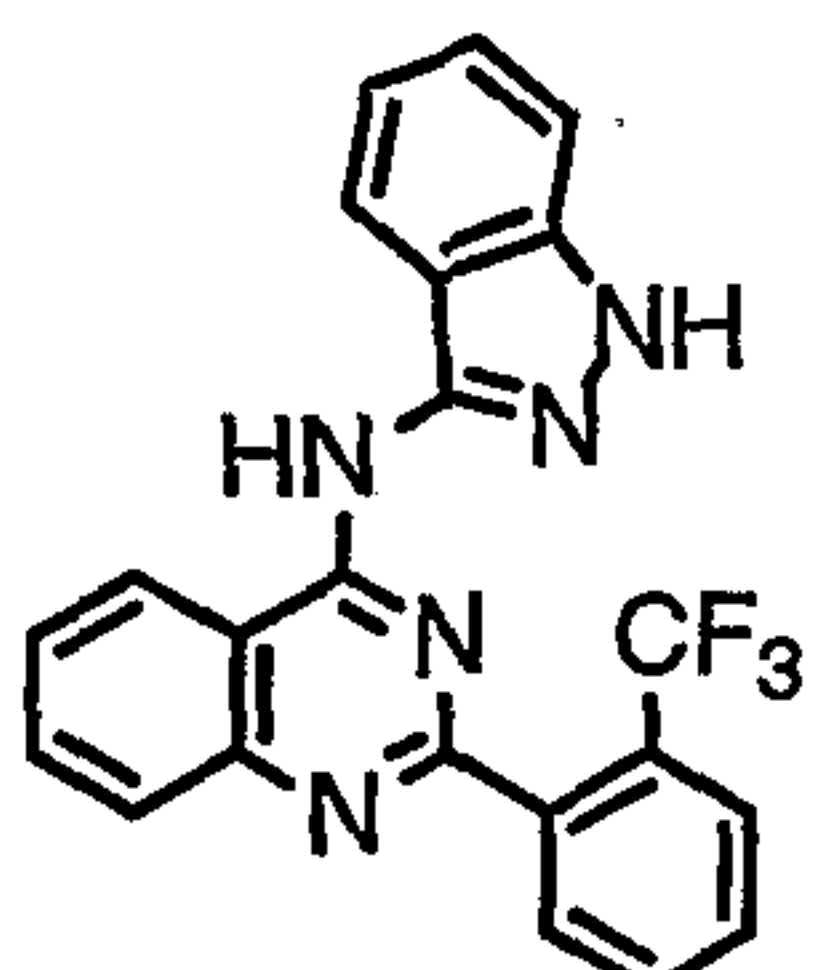
II-54



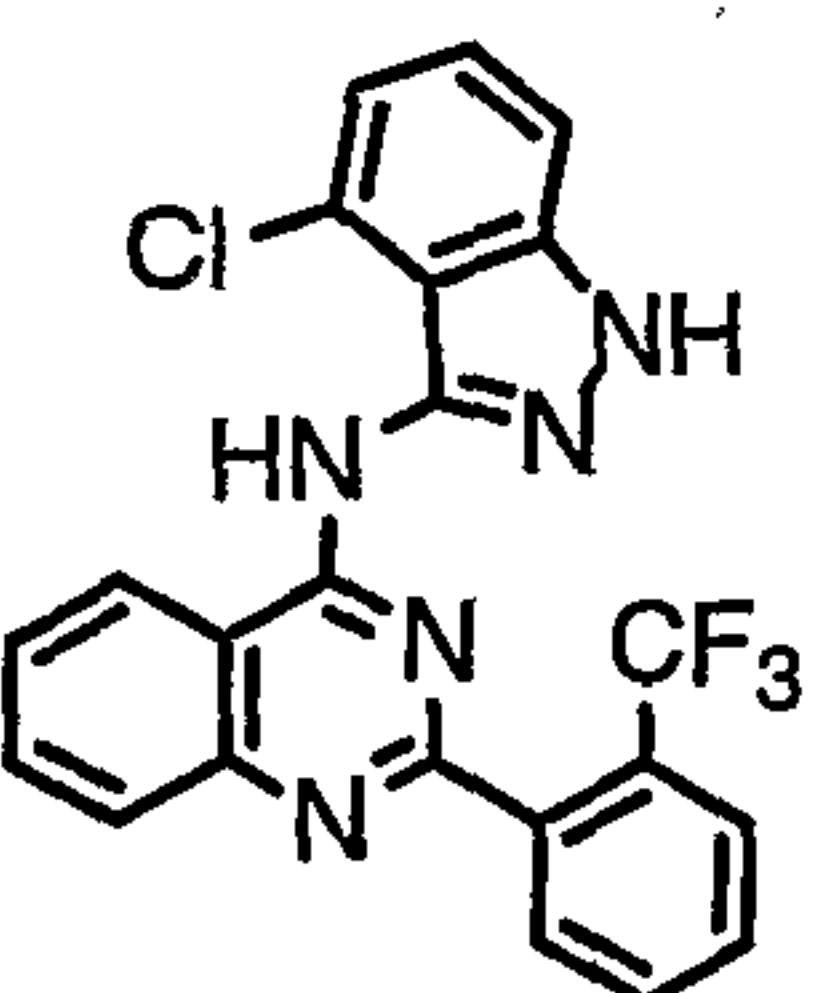
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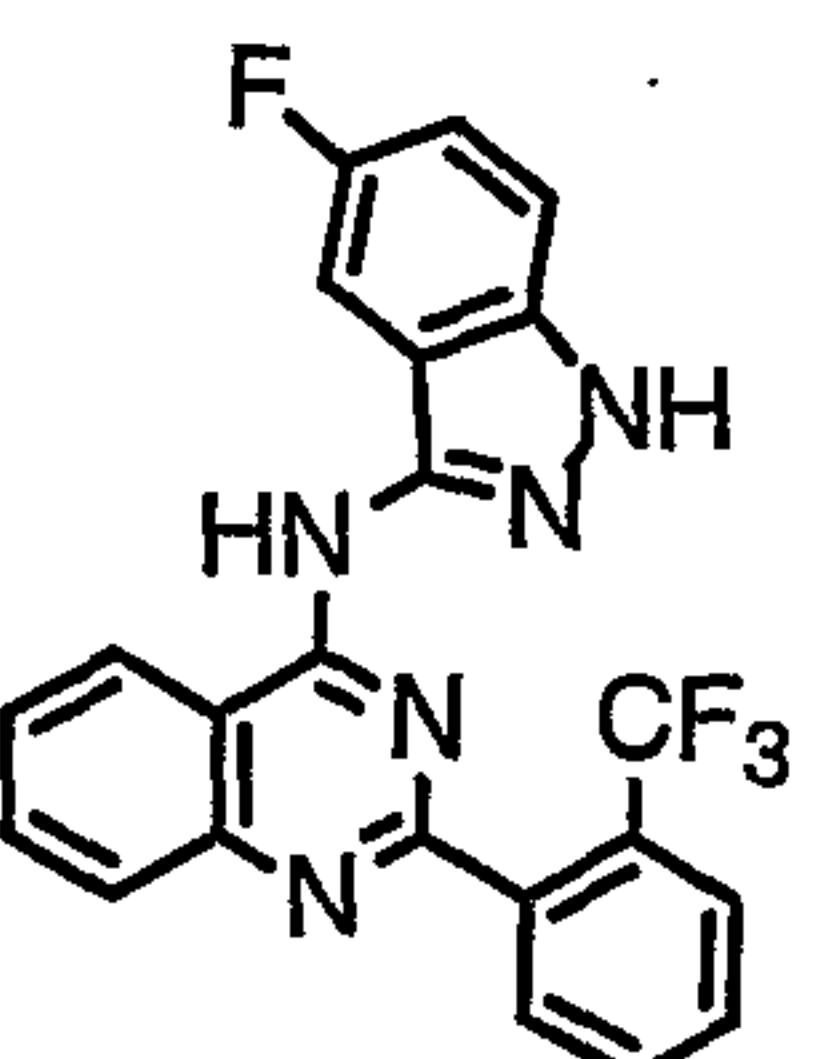
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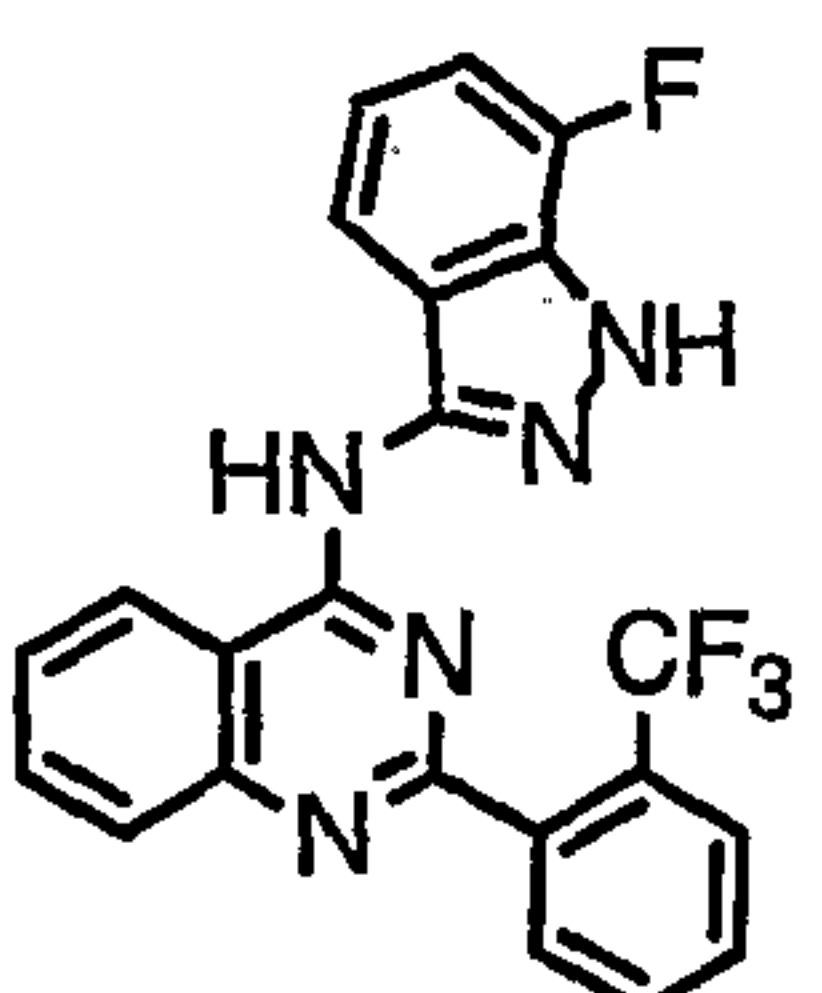
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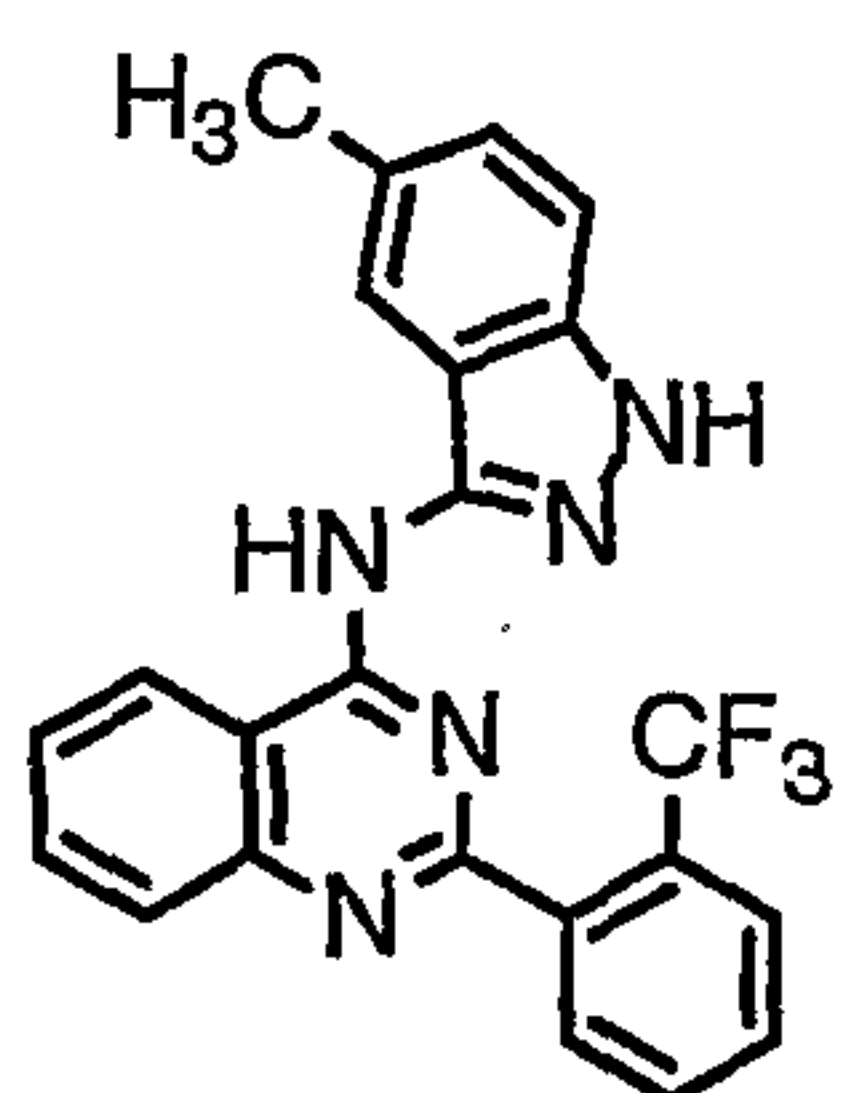
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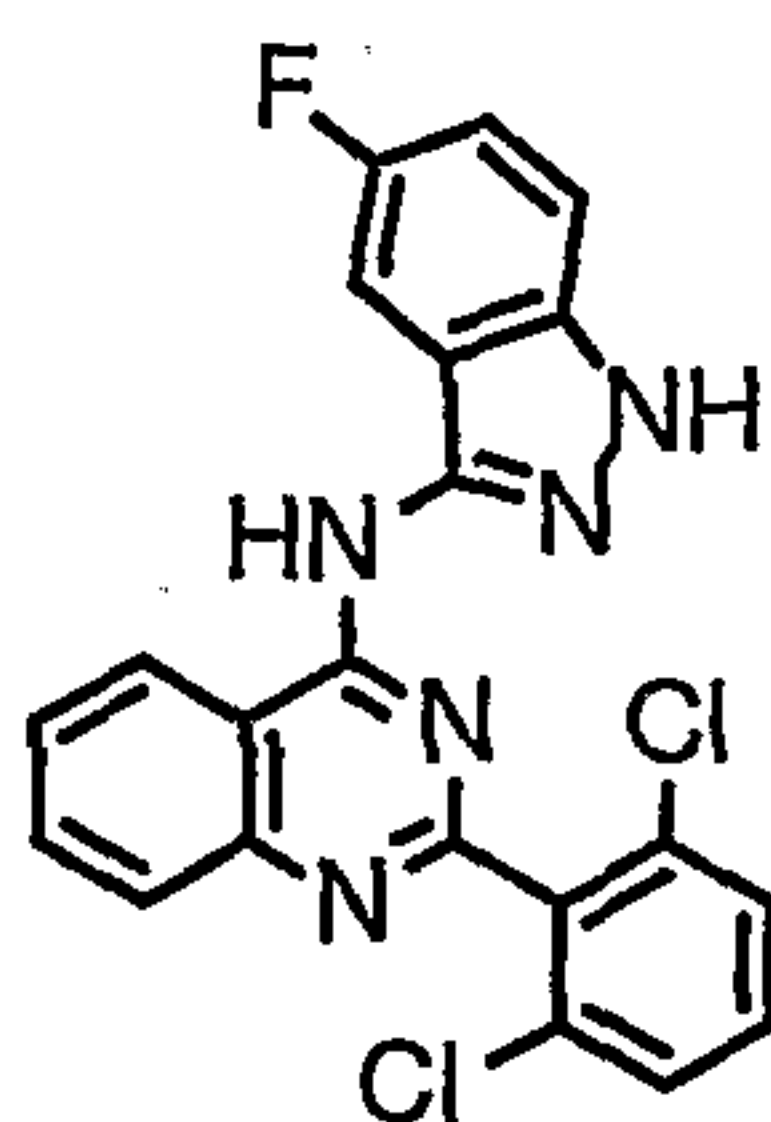
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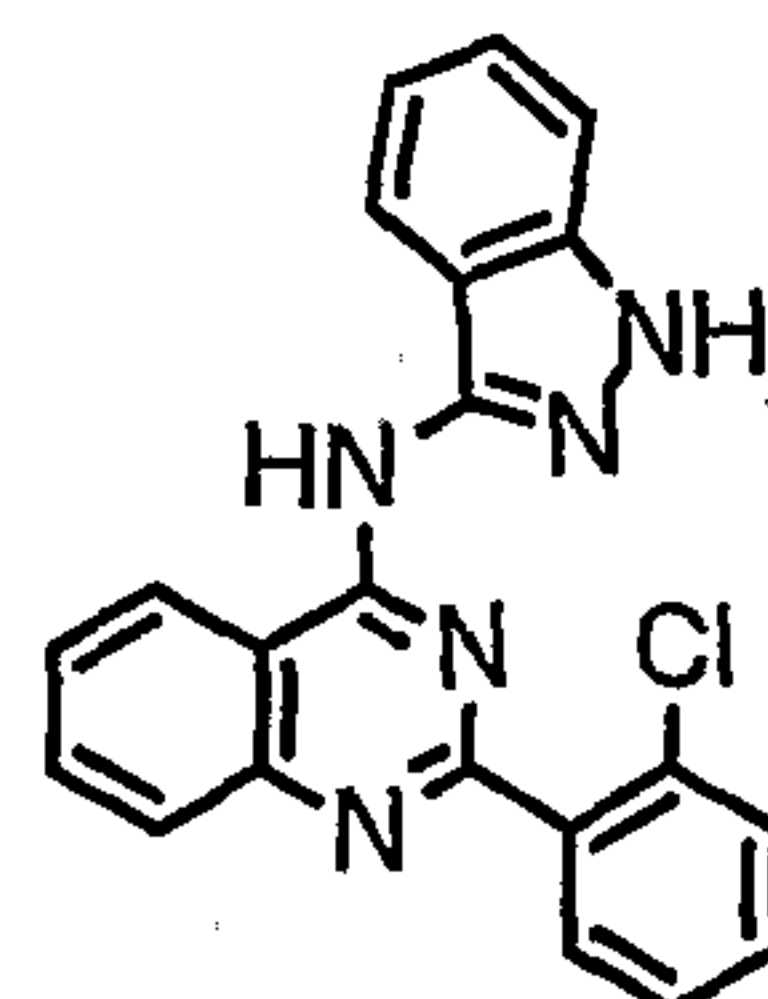
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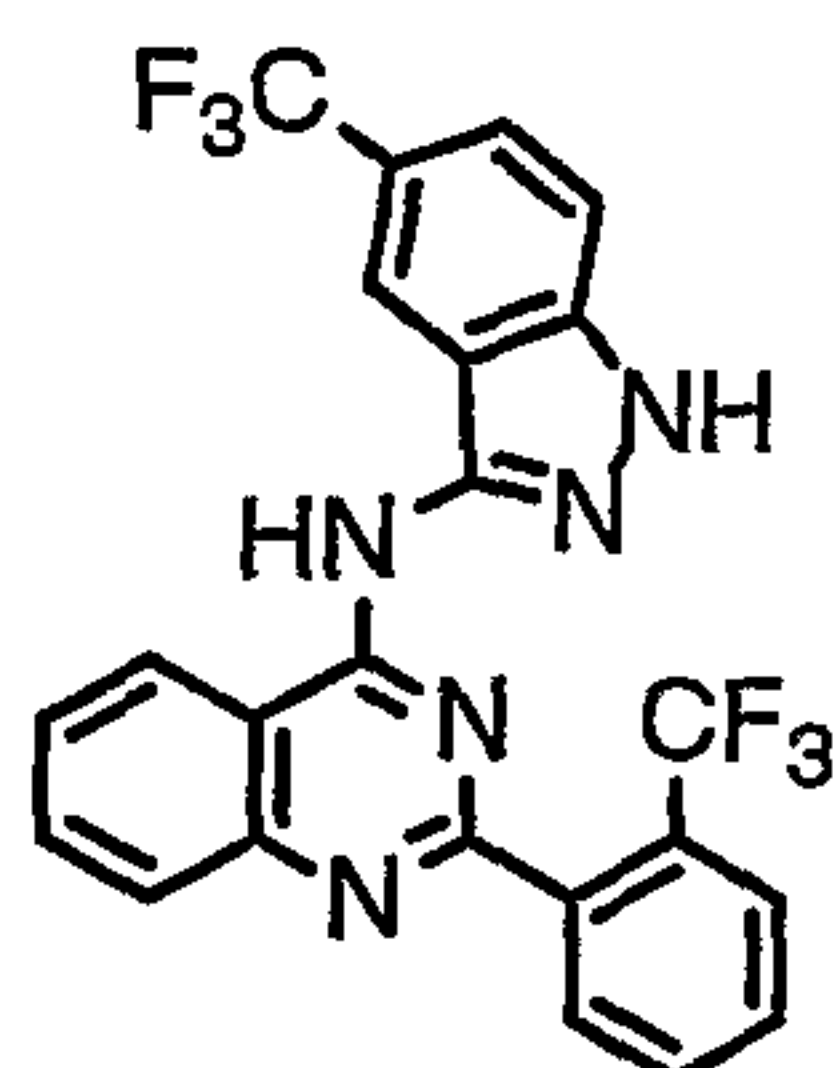
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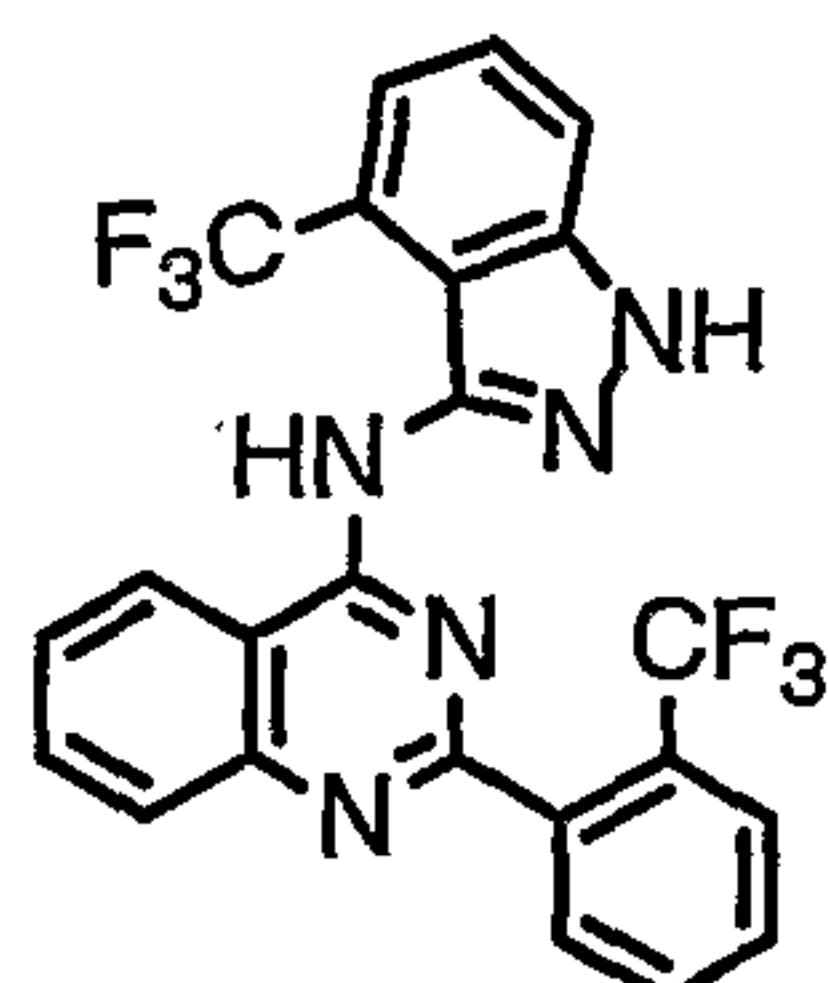
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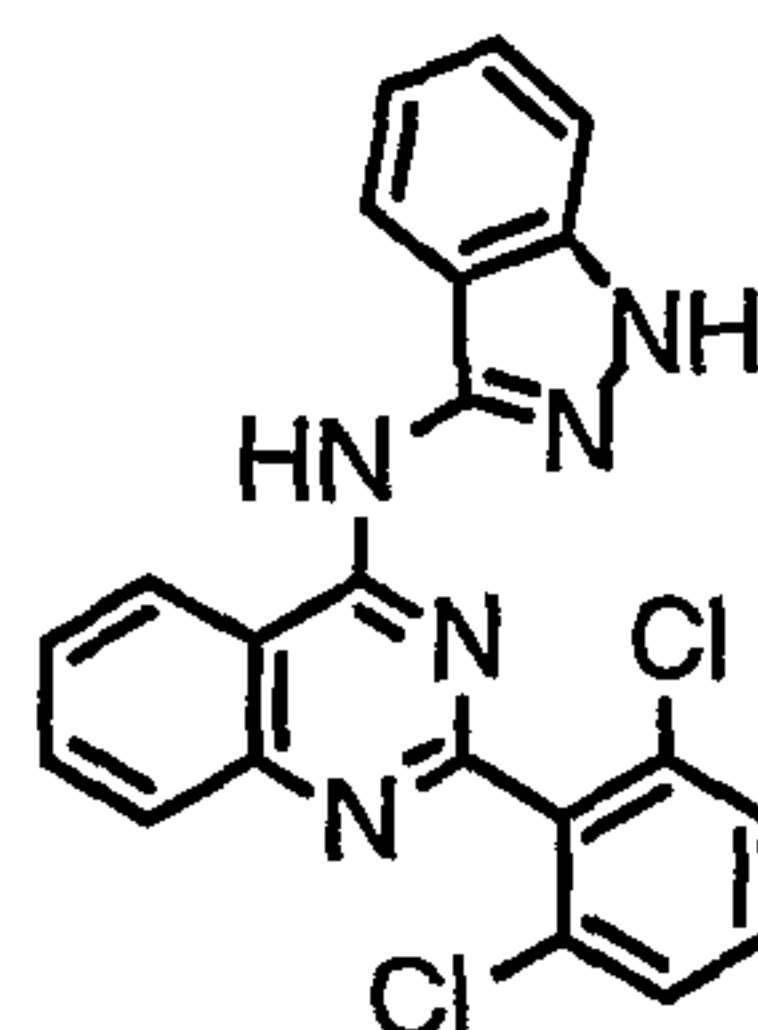
II-63



II-64

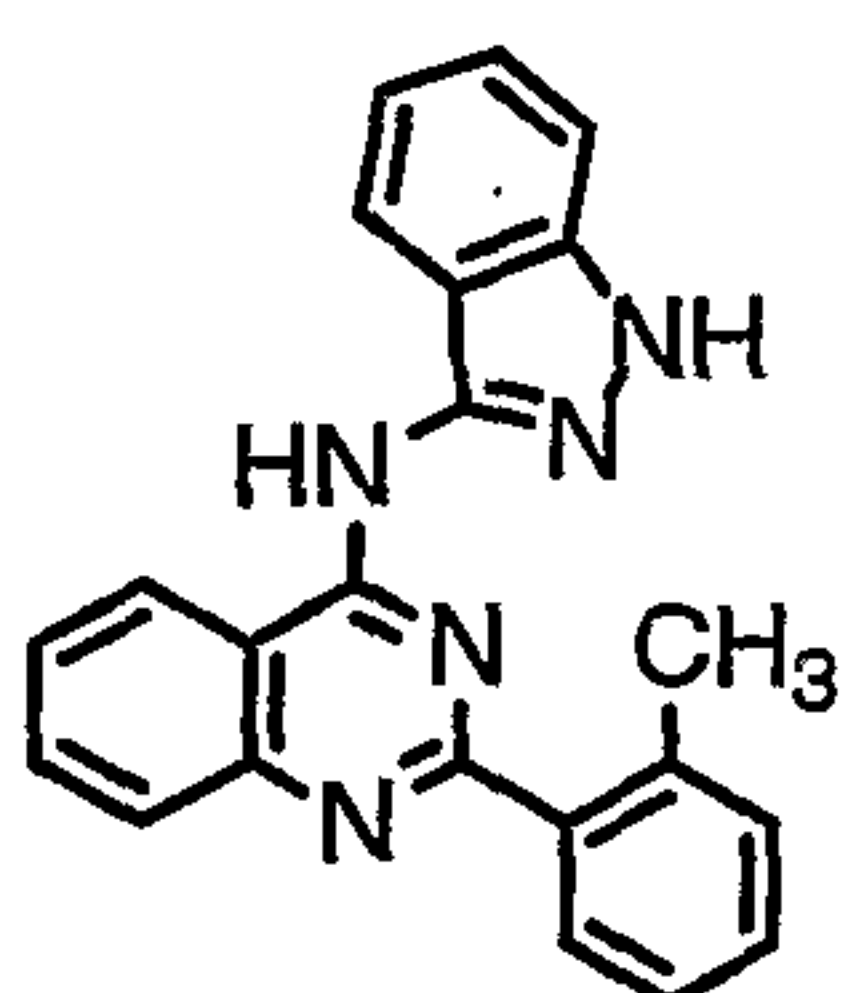


II-65

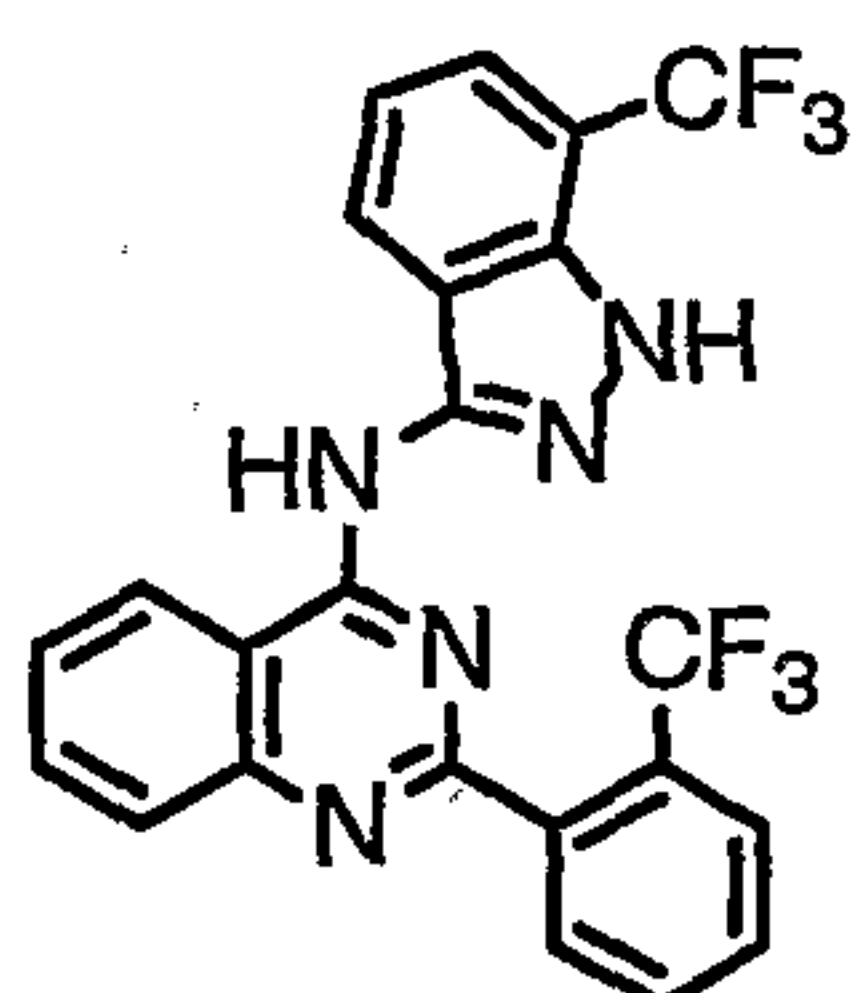


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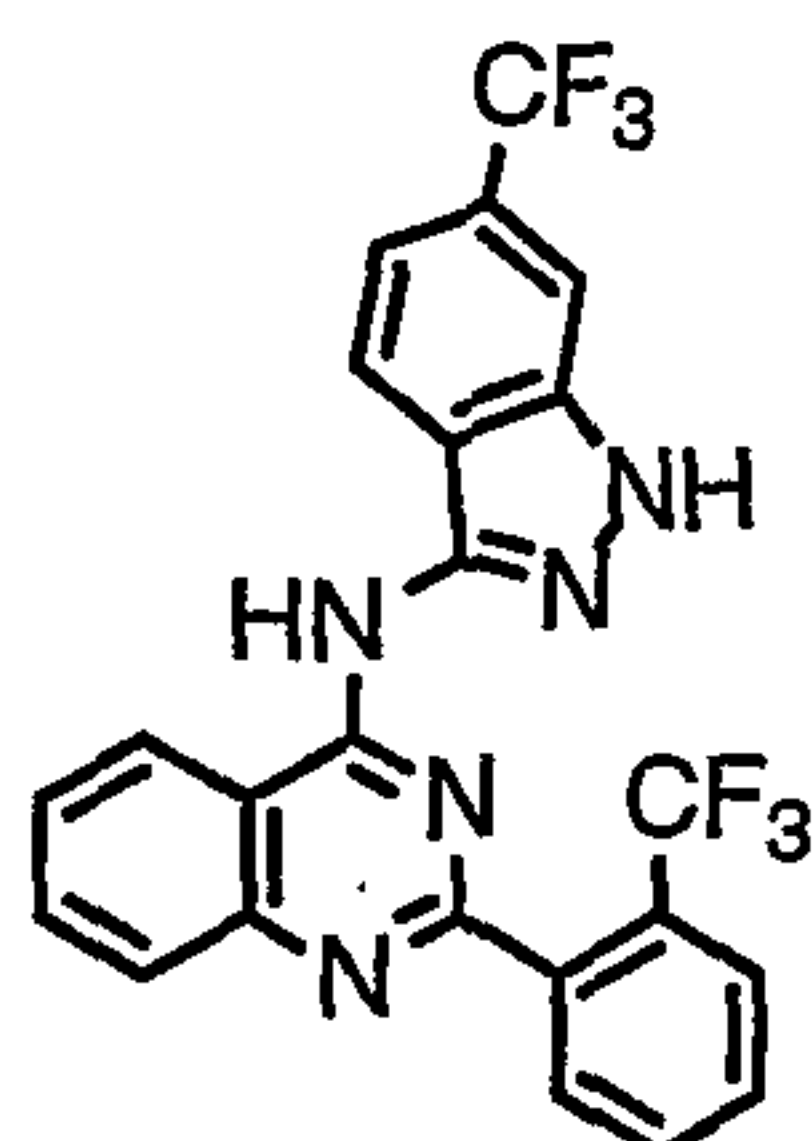
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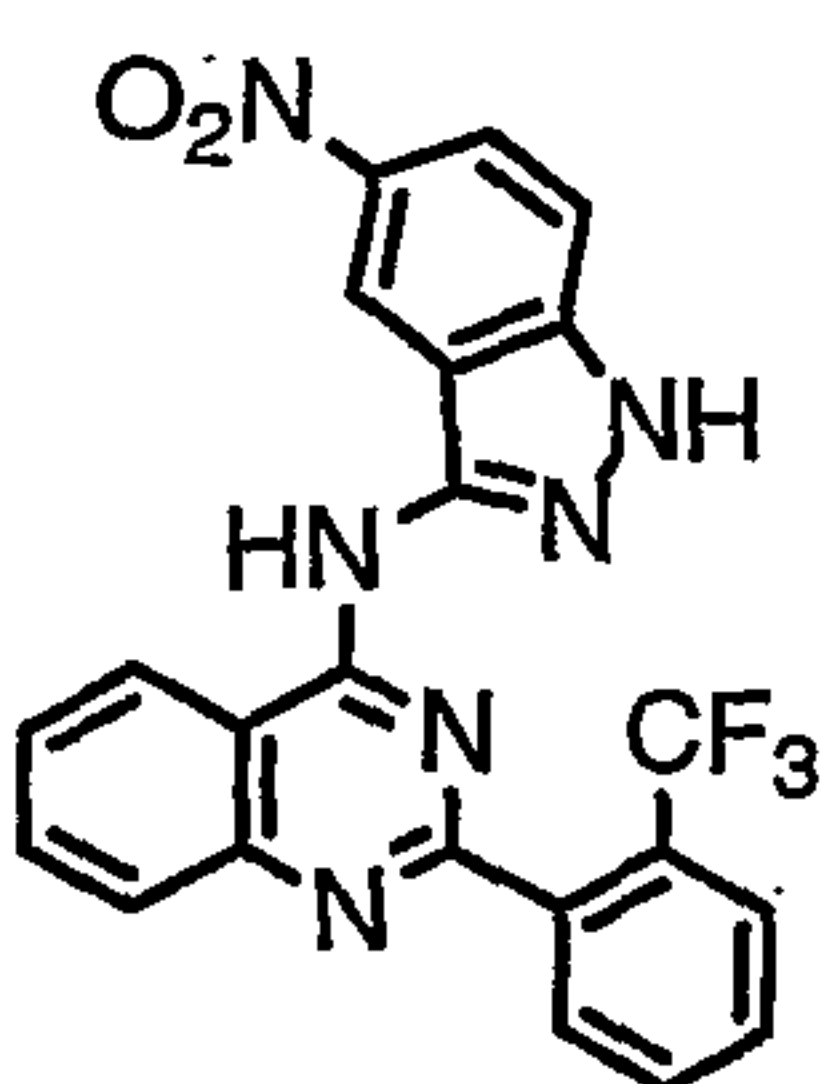
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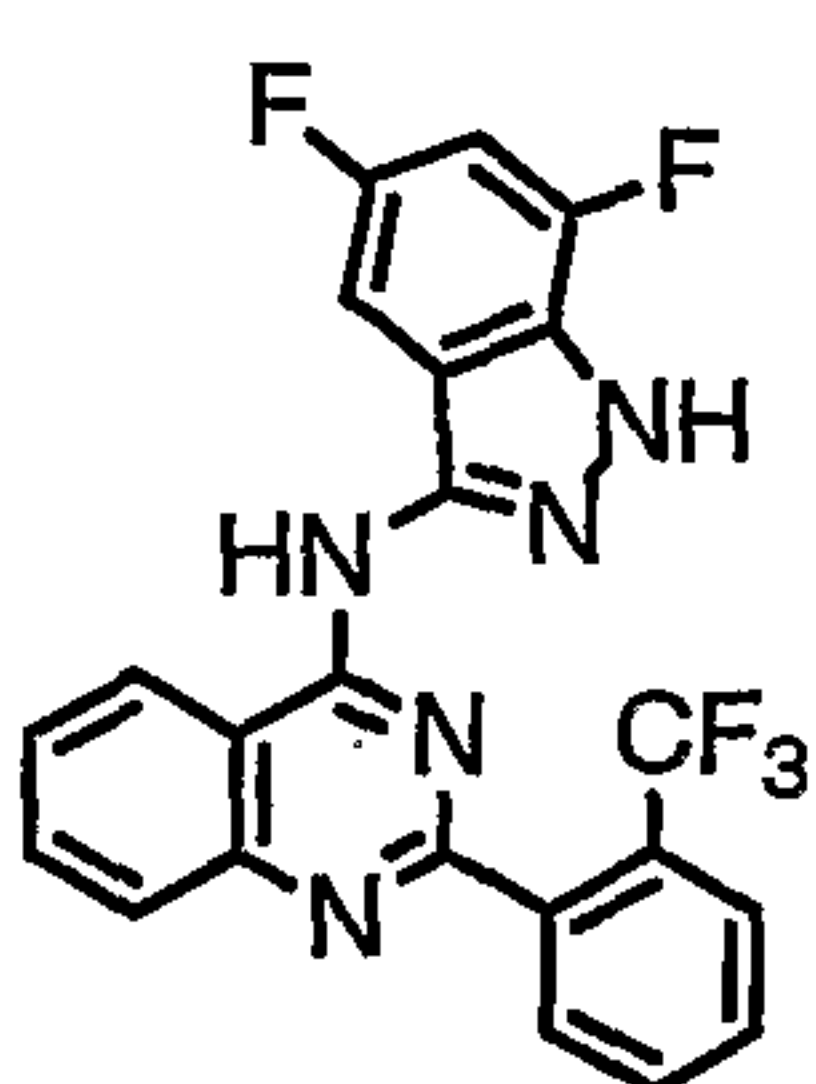
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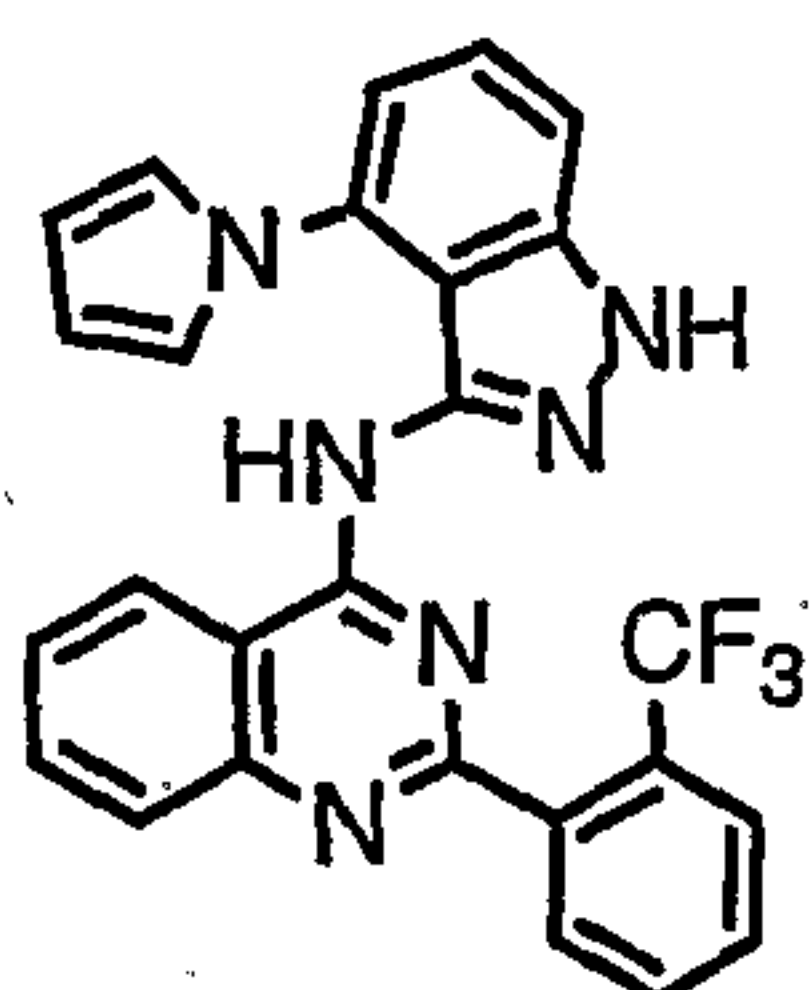
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II-70

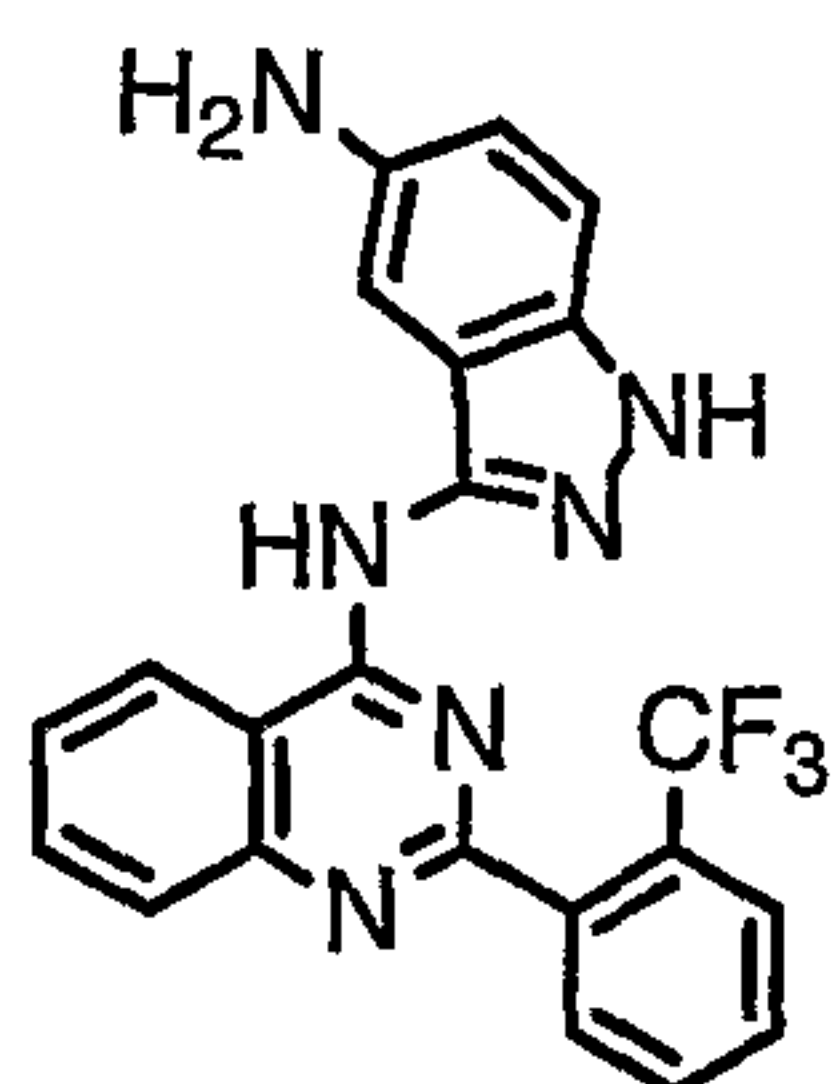


II-71

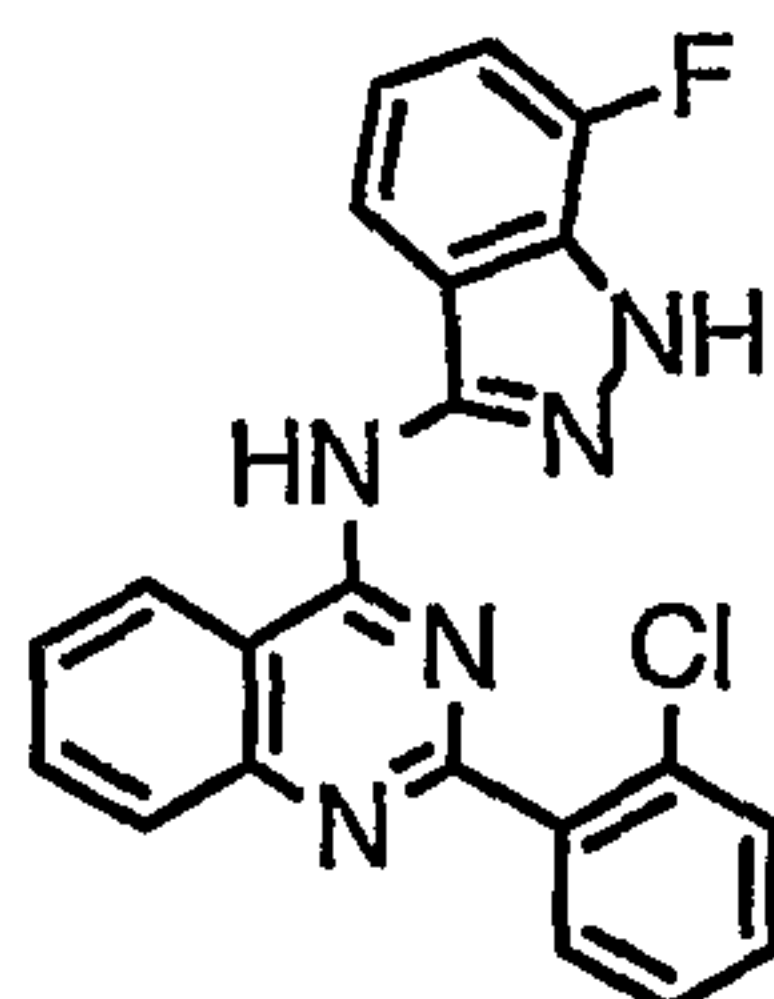


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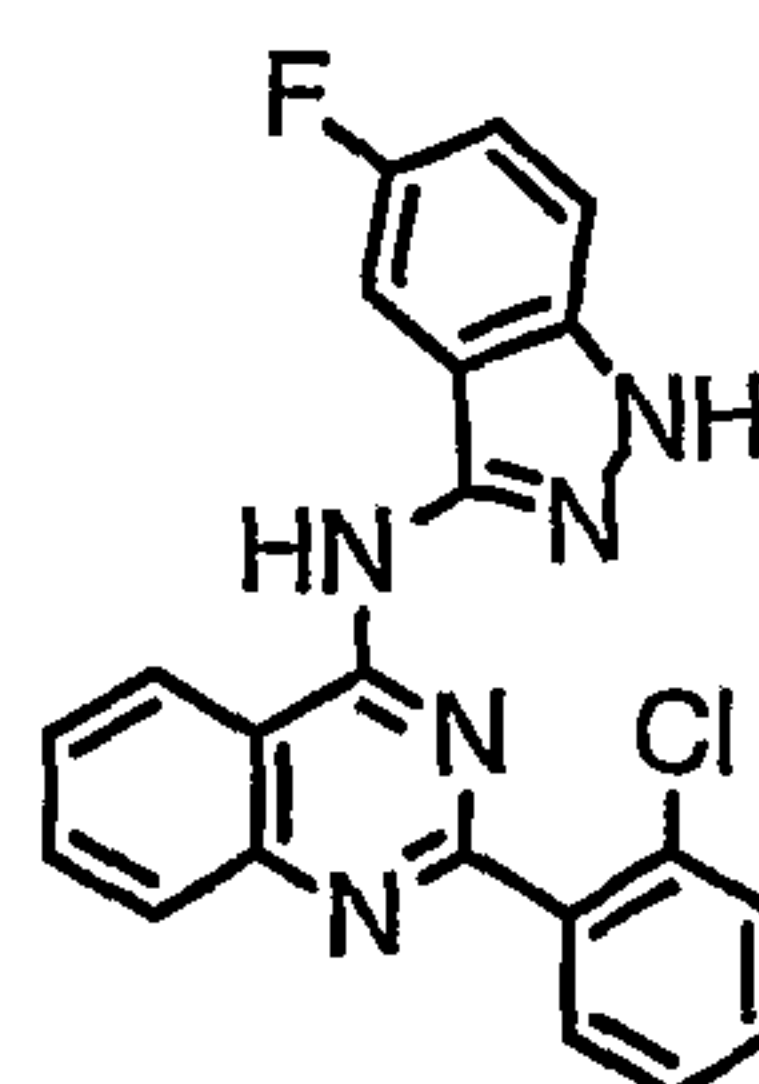
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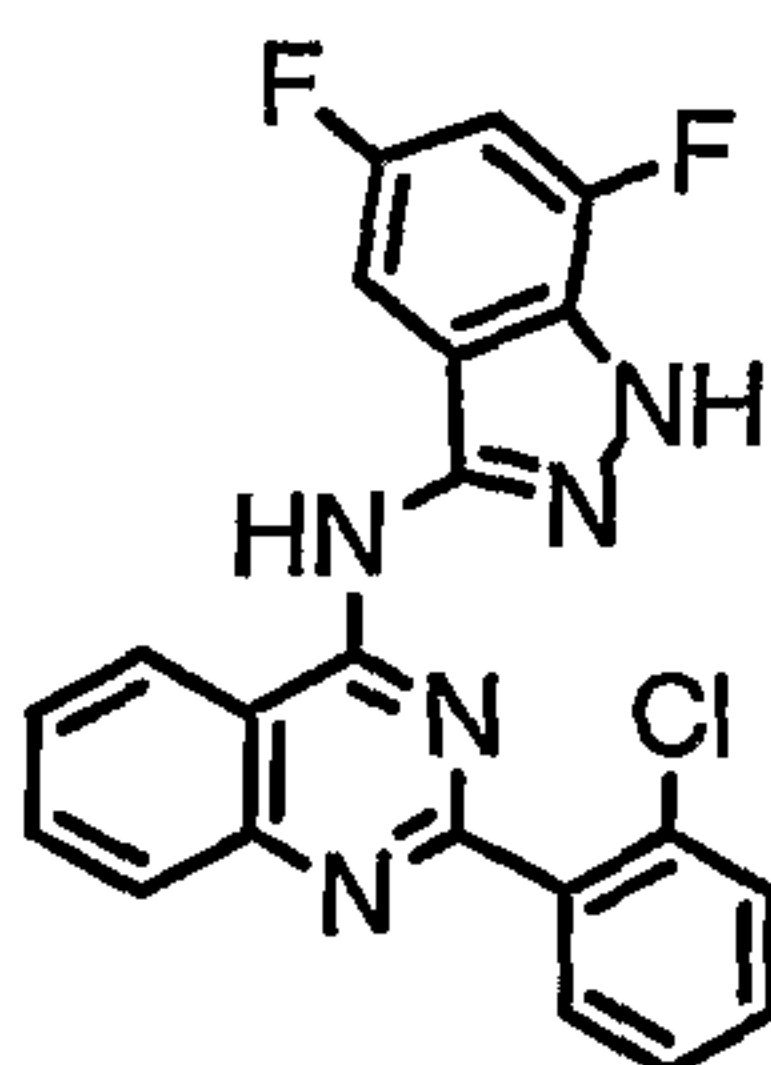
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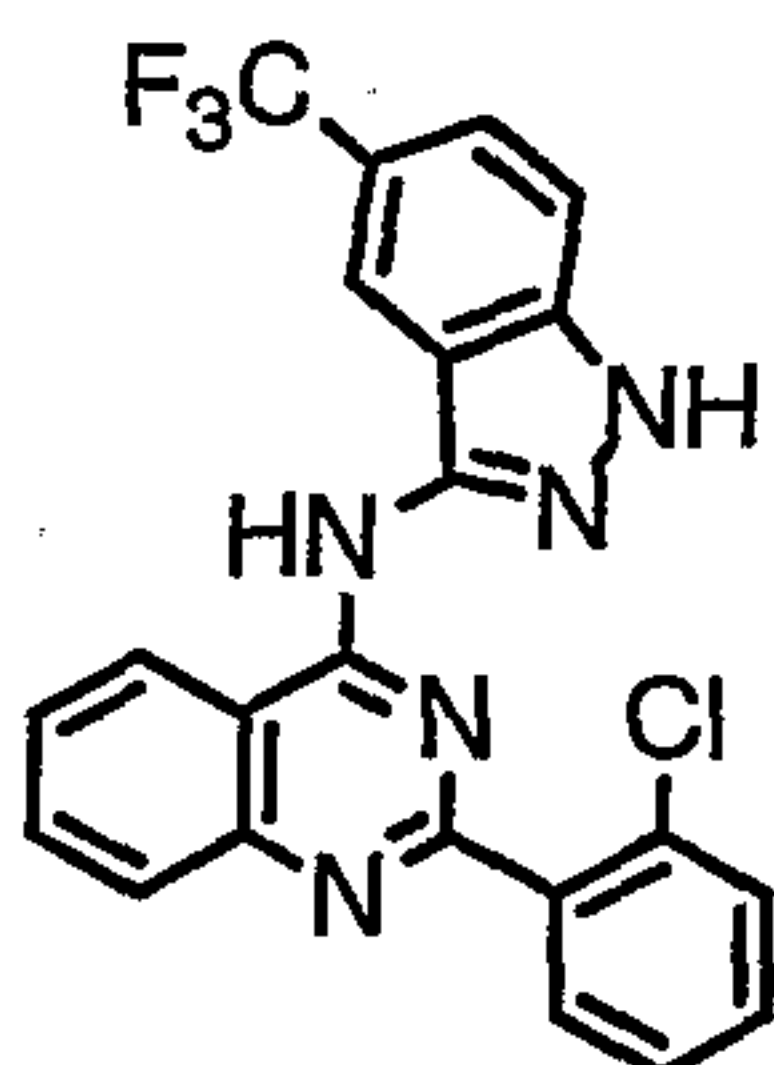
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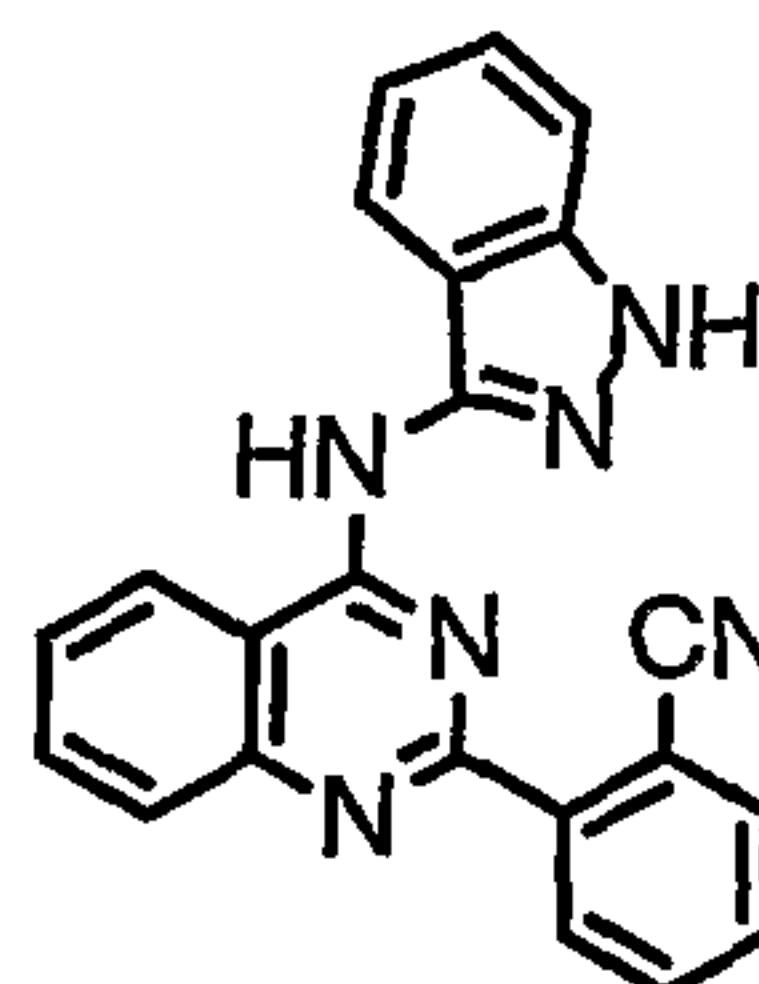
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II-76

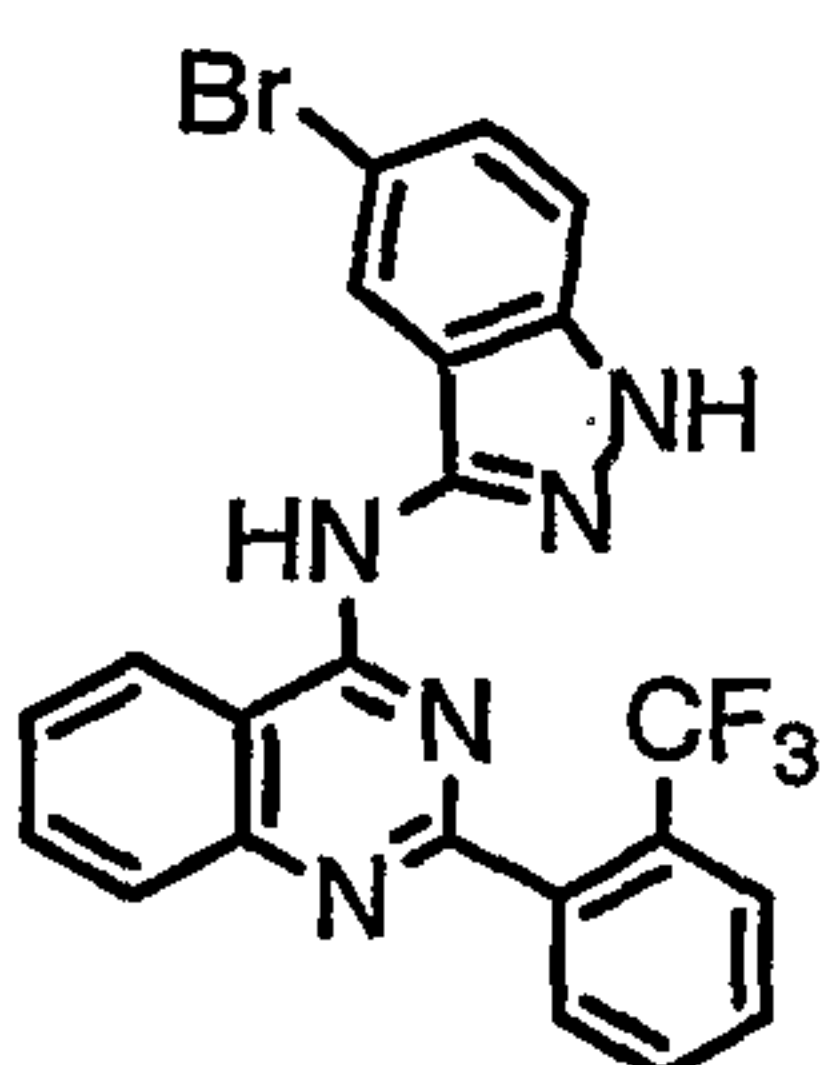


II-77

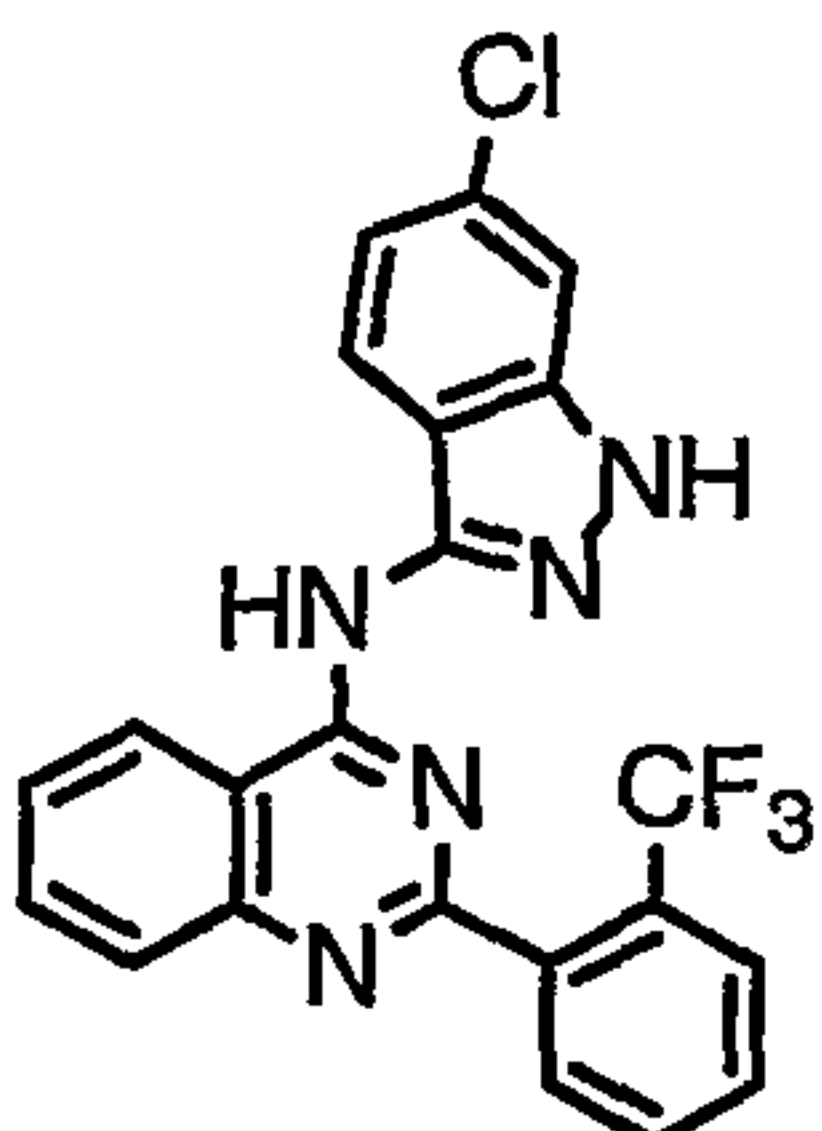


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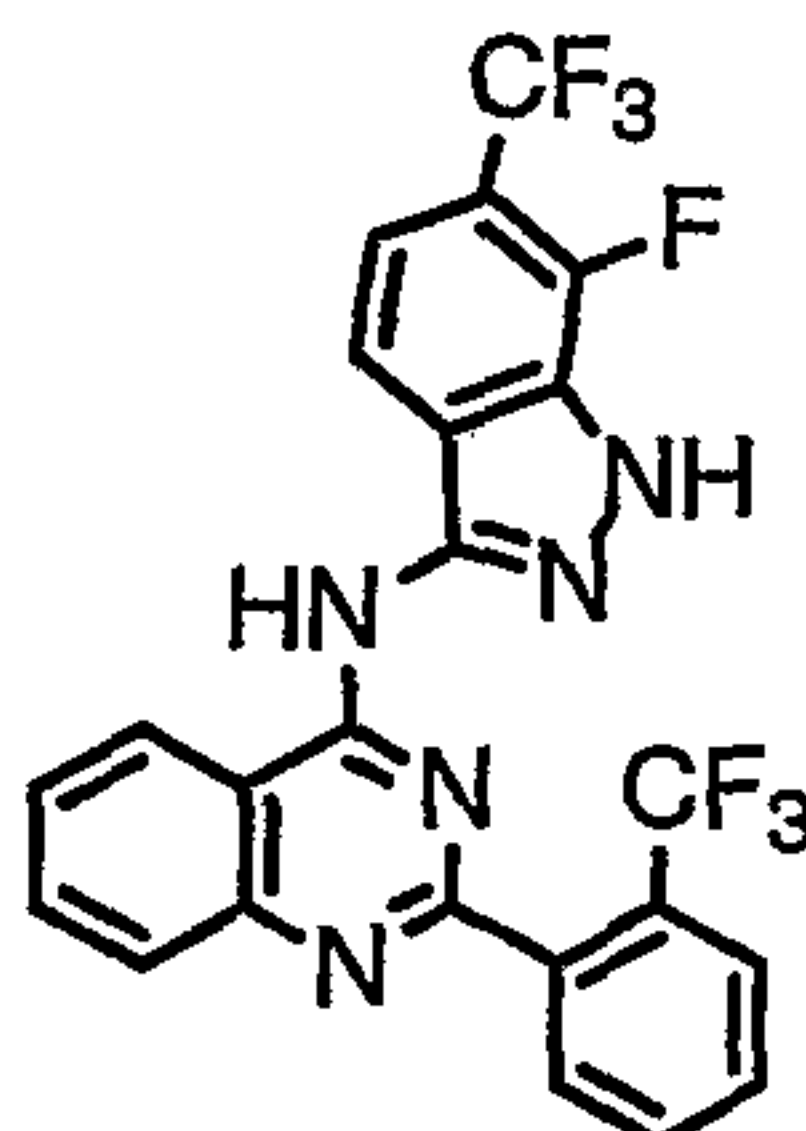
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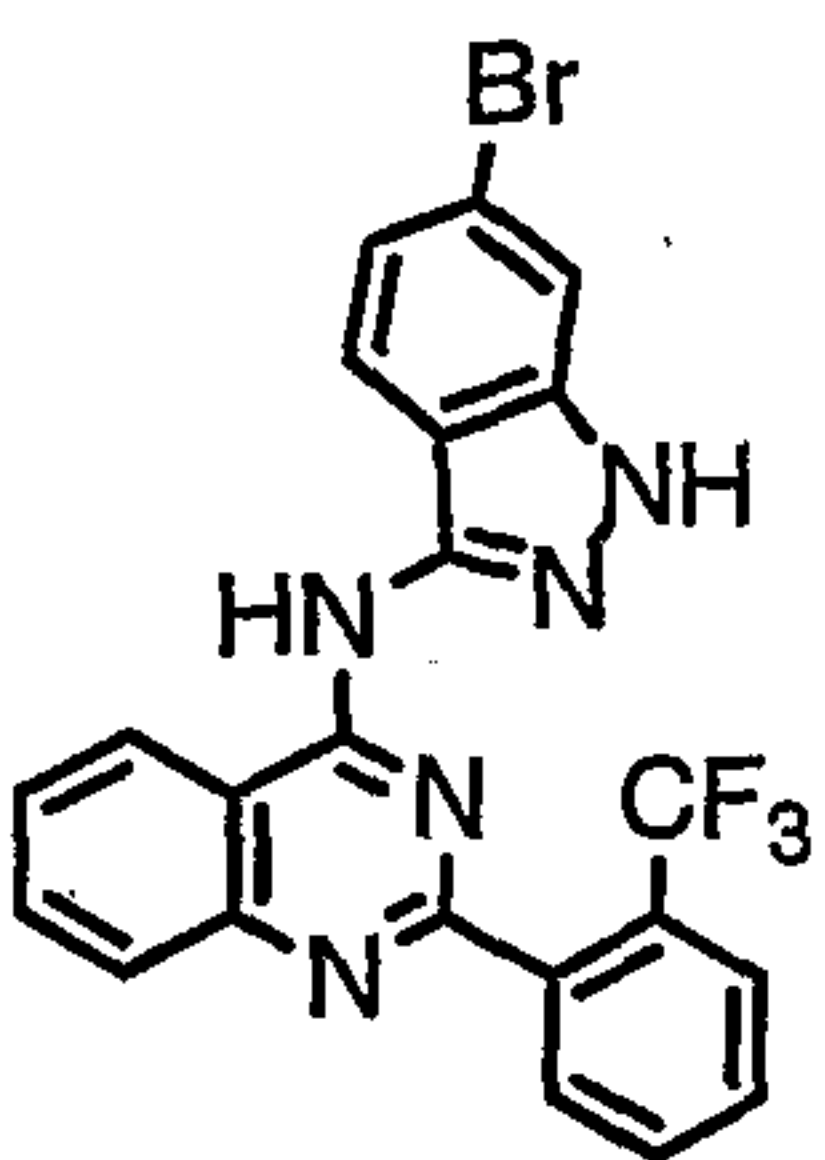
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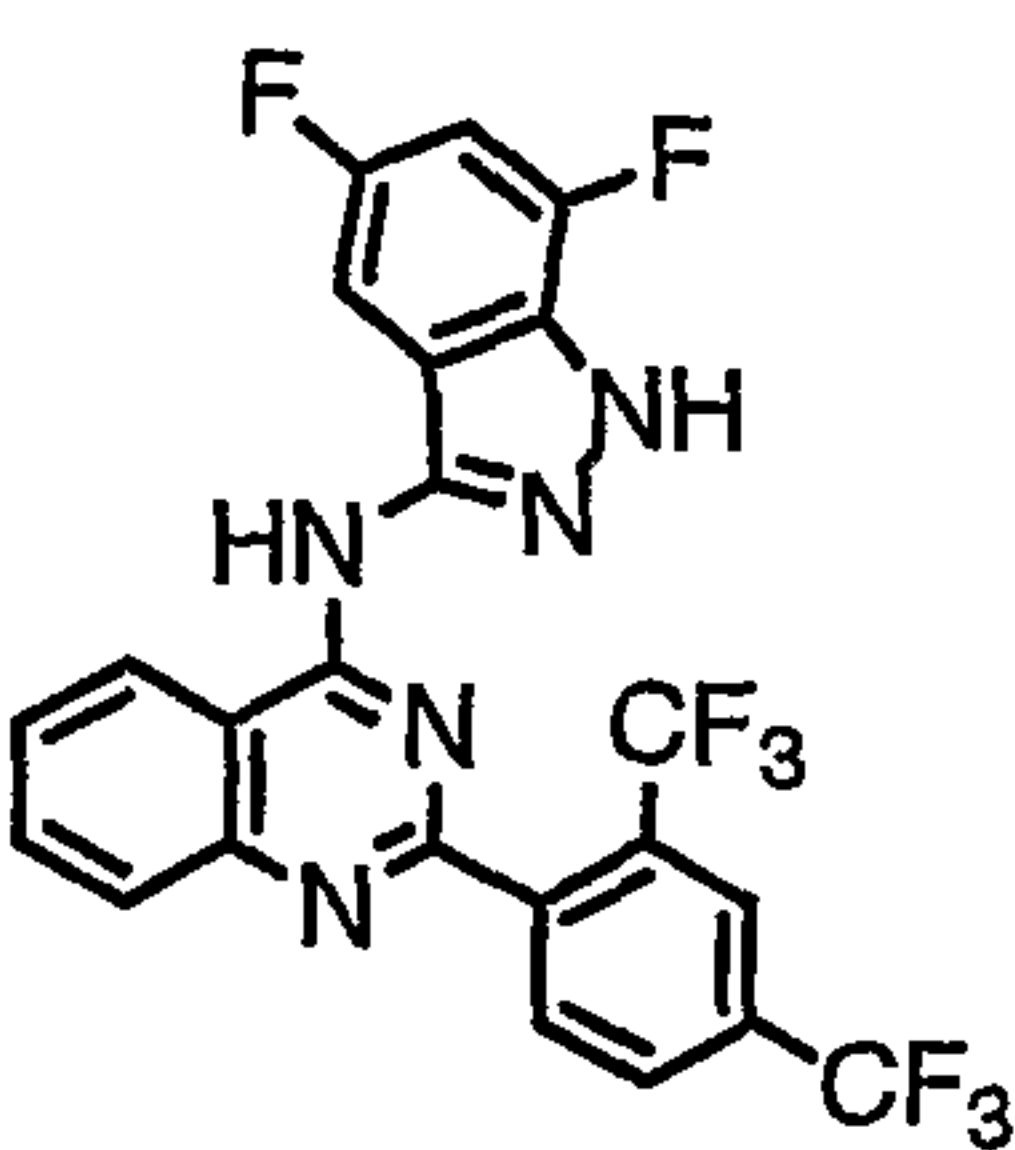
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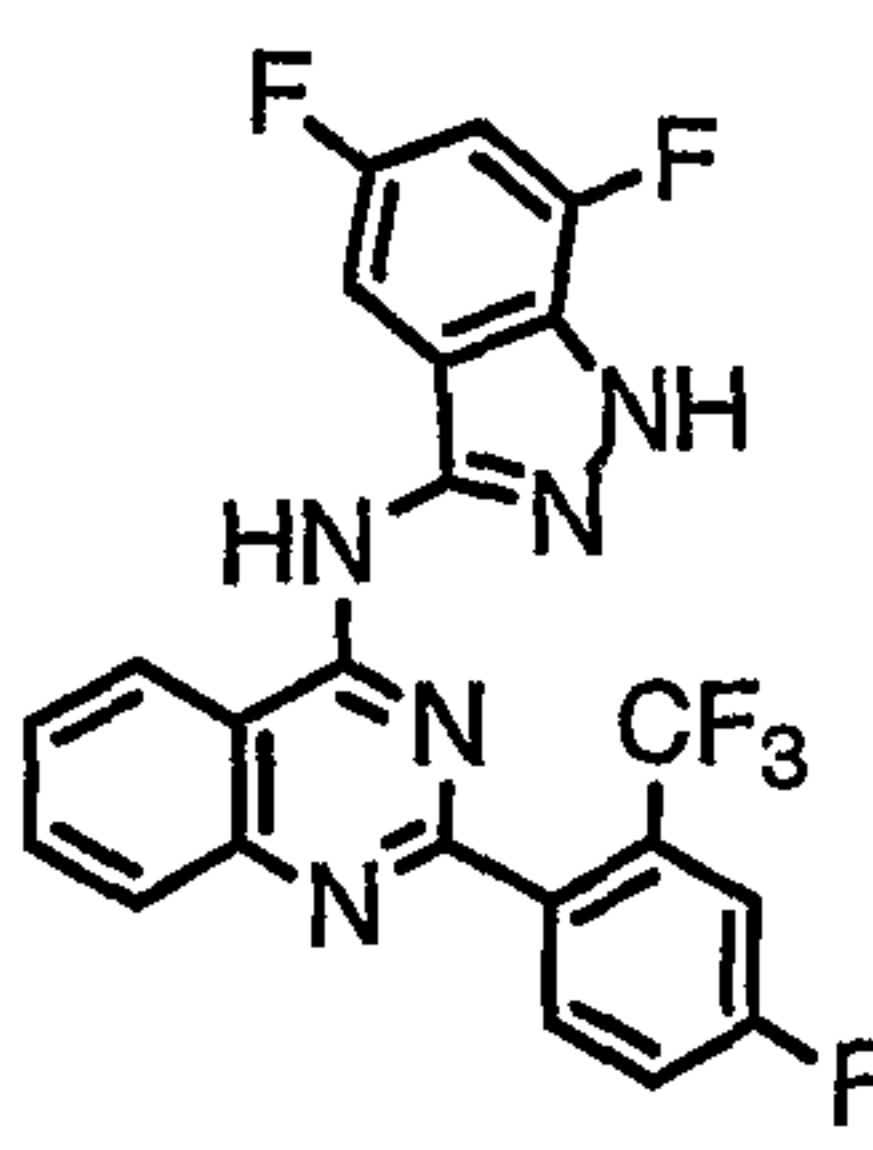
II-81



II-82

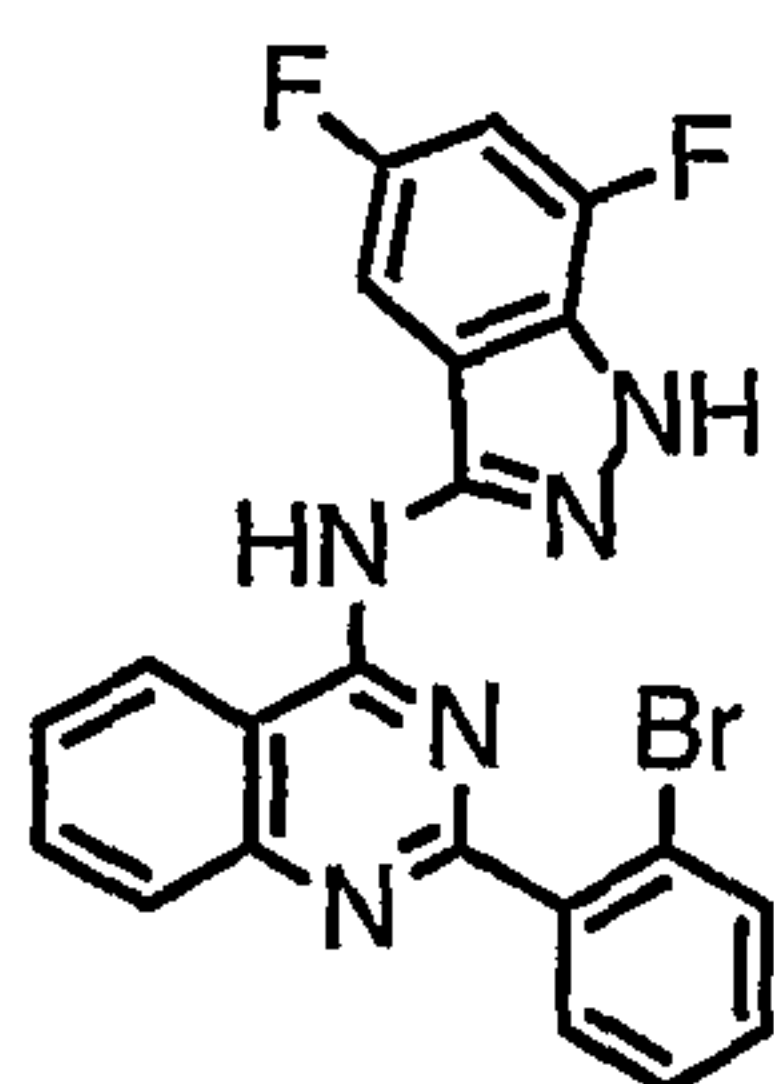


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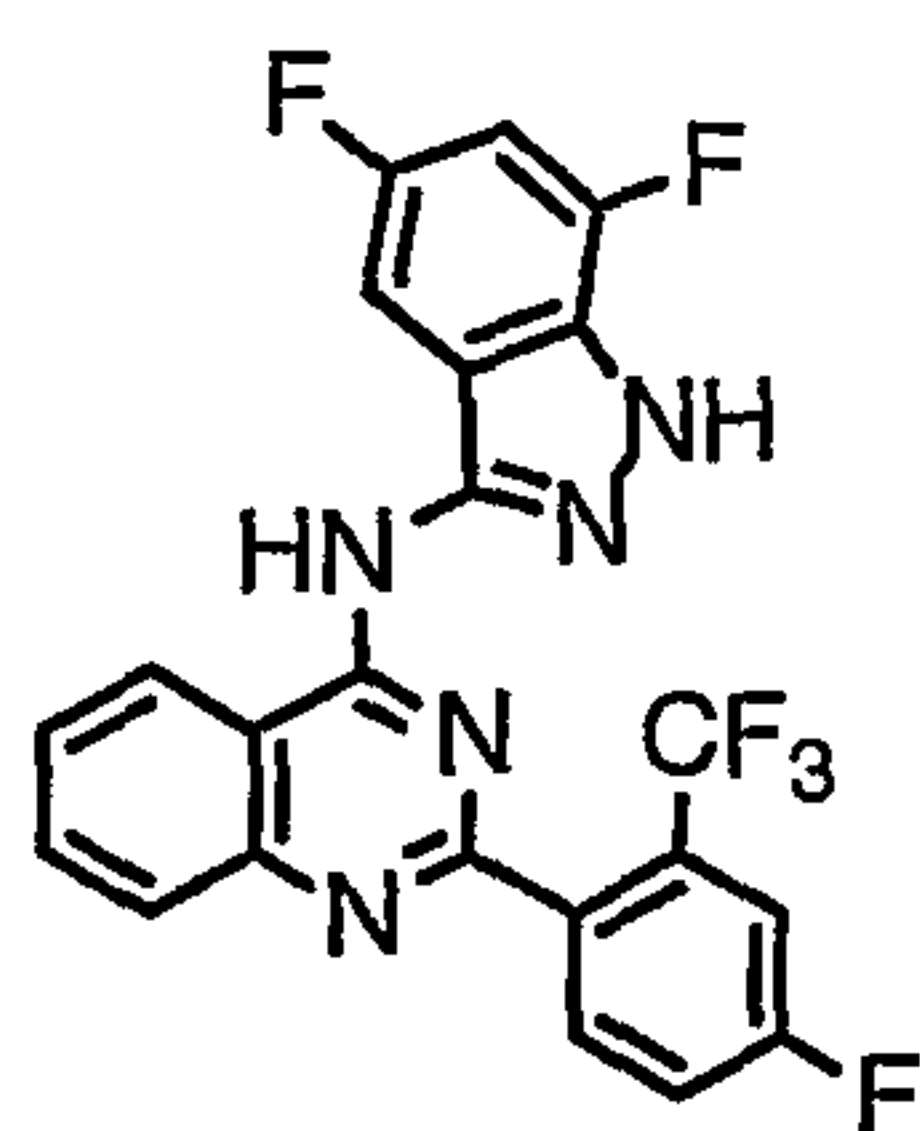


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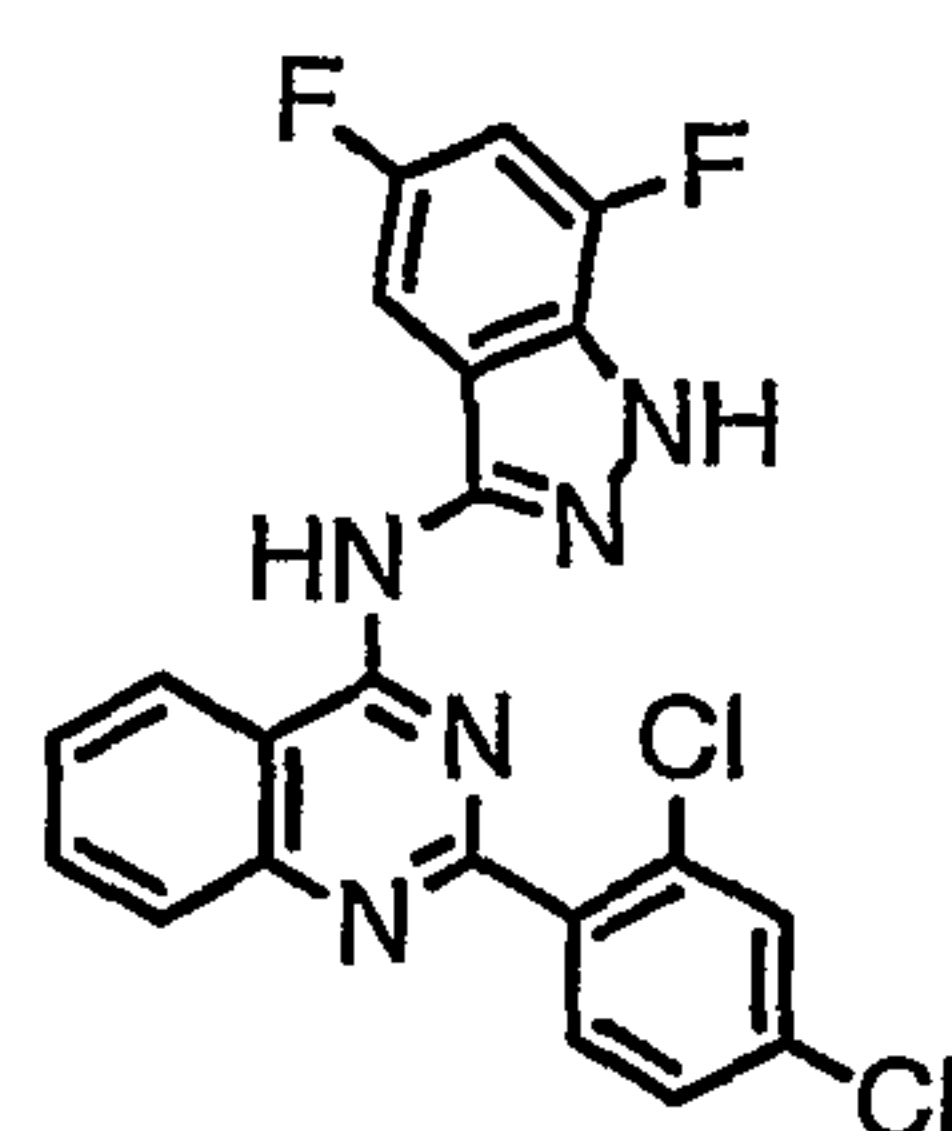
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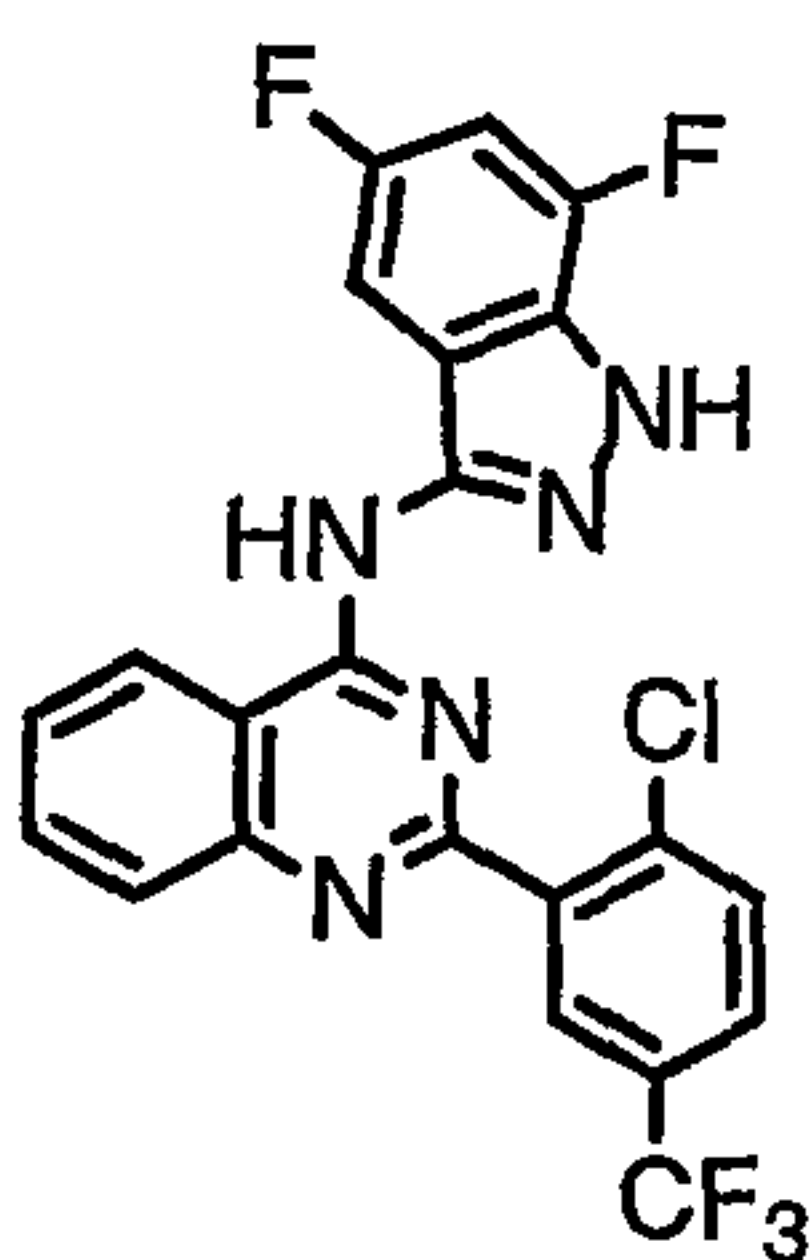
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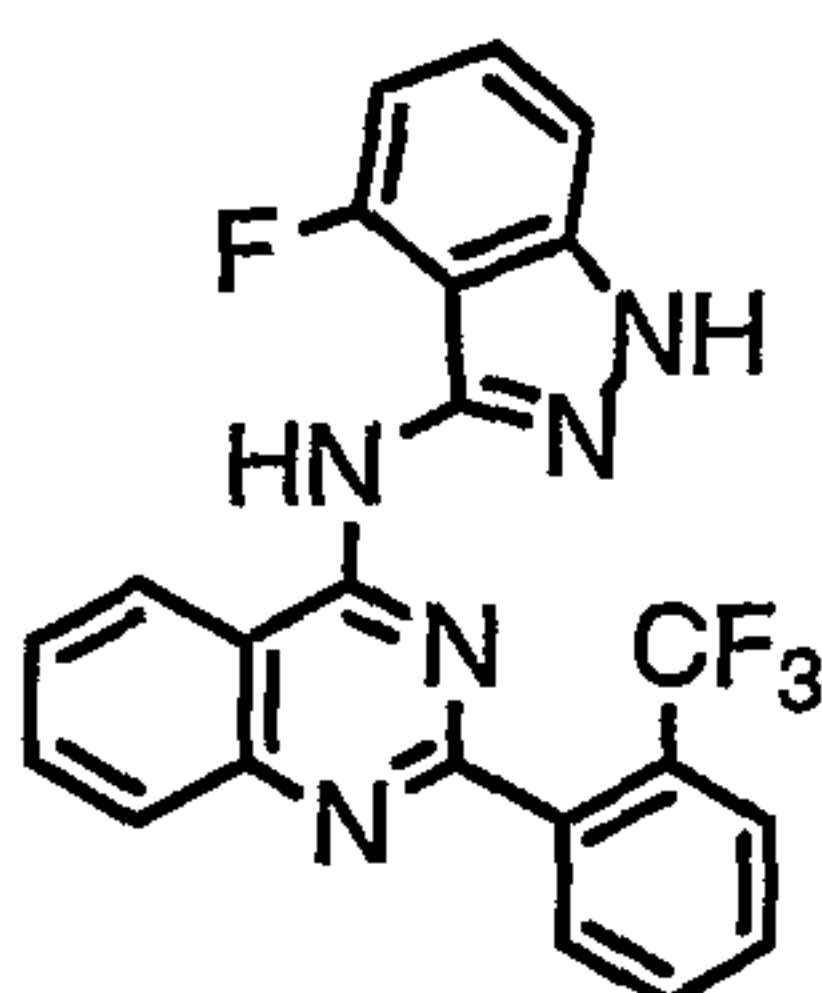
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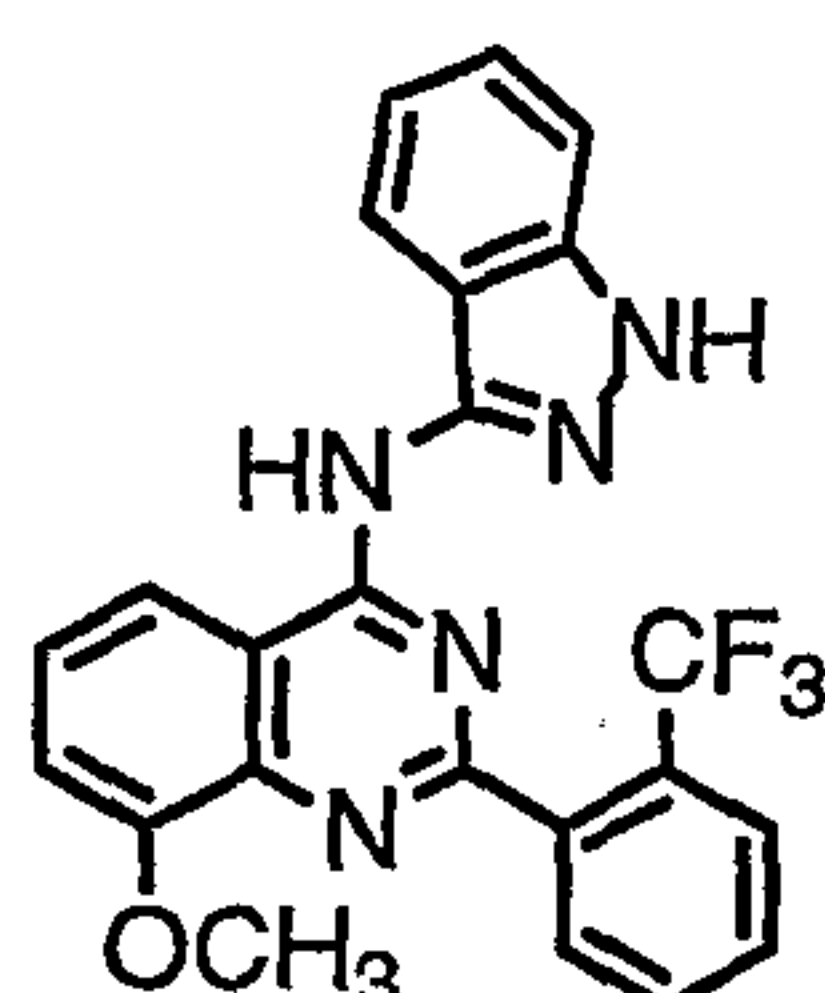
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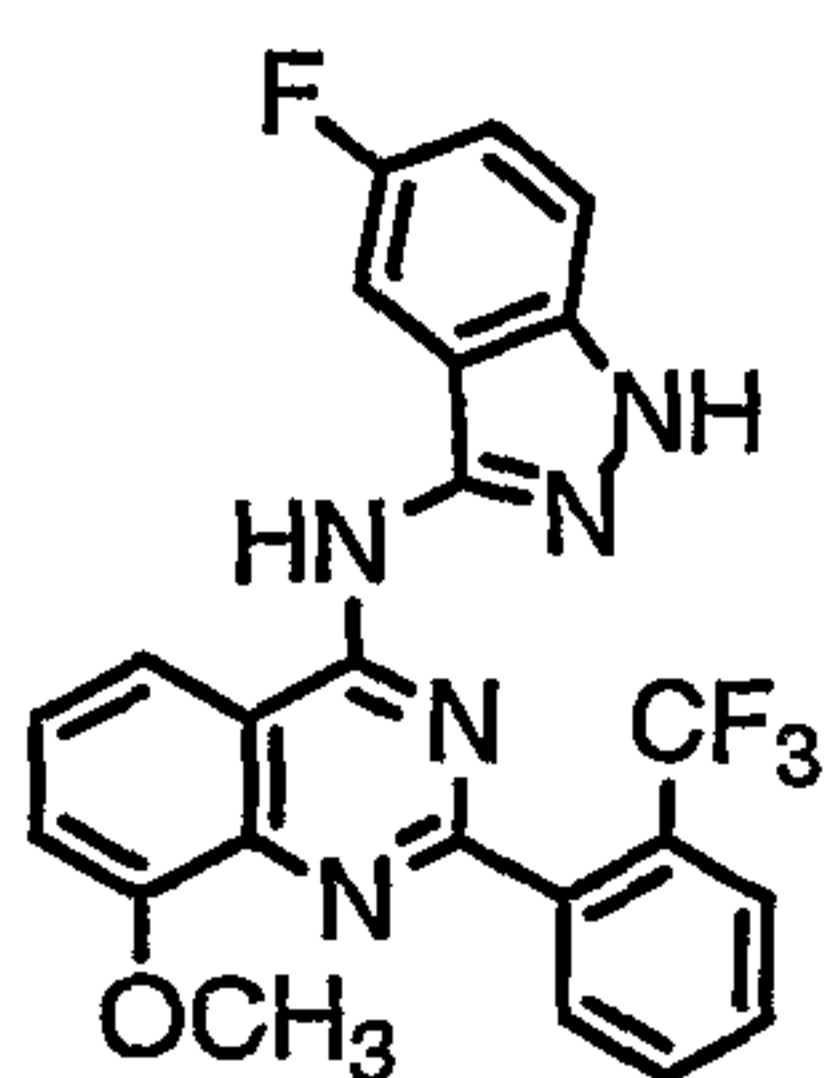
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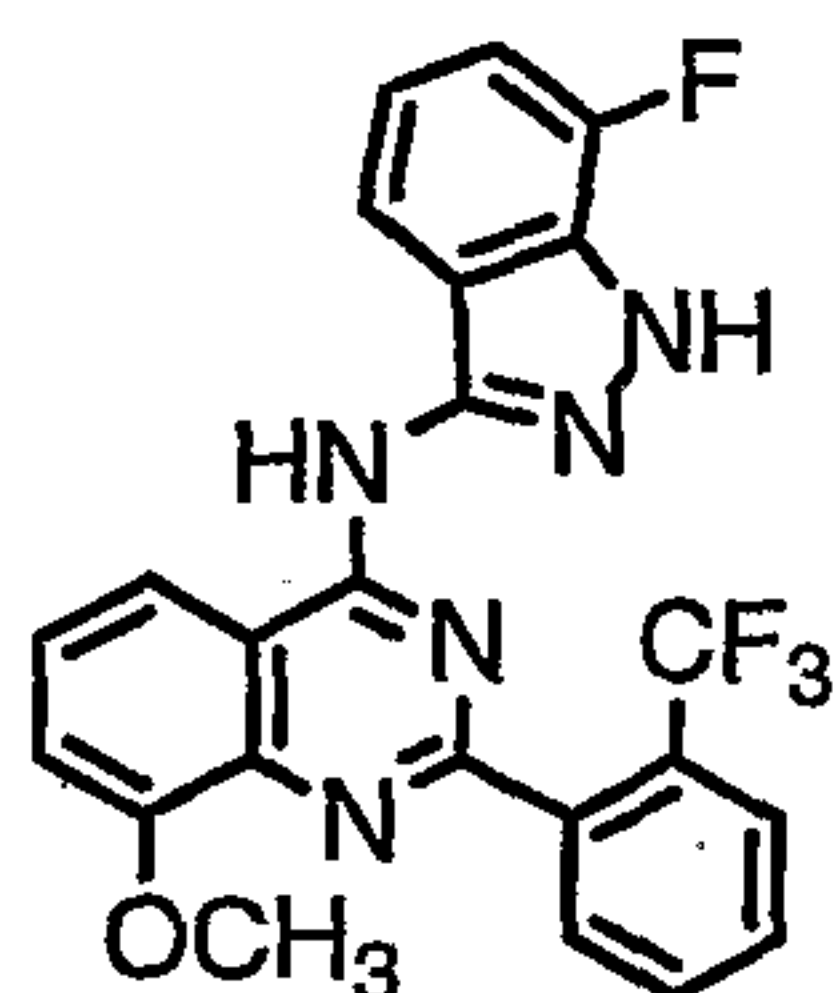
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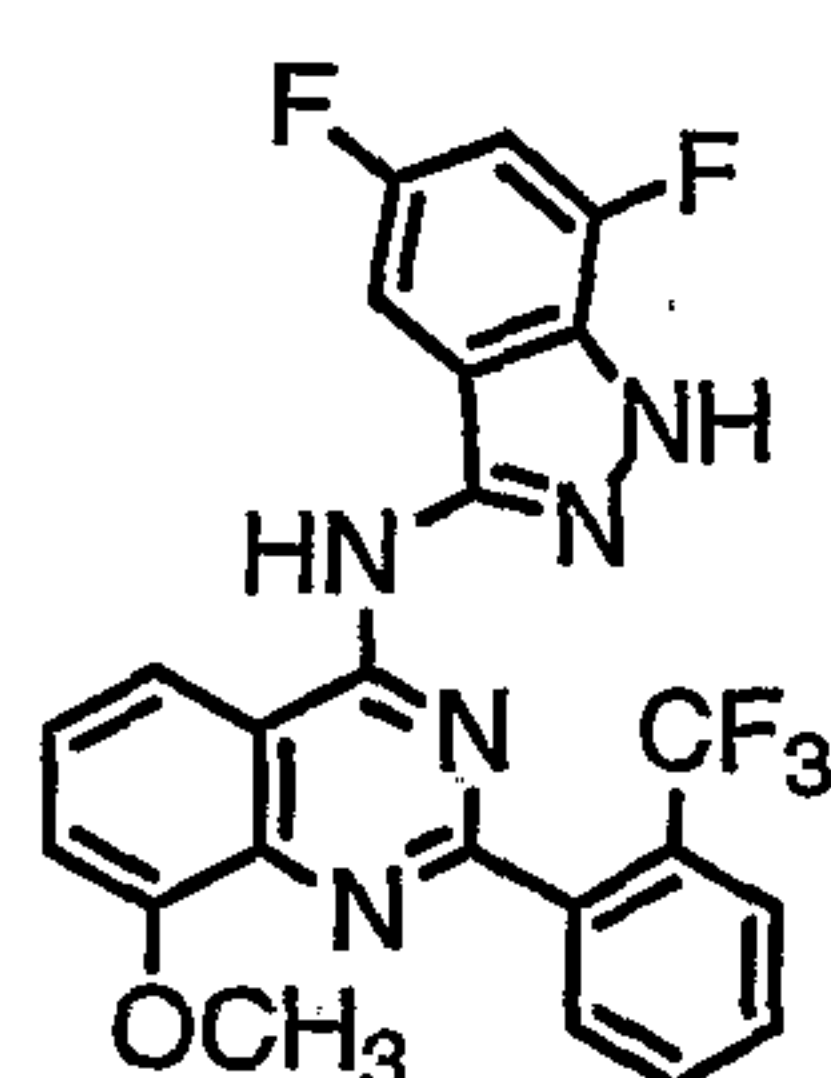
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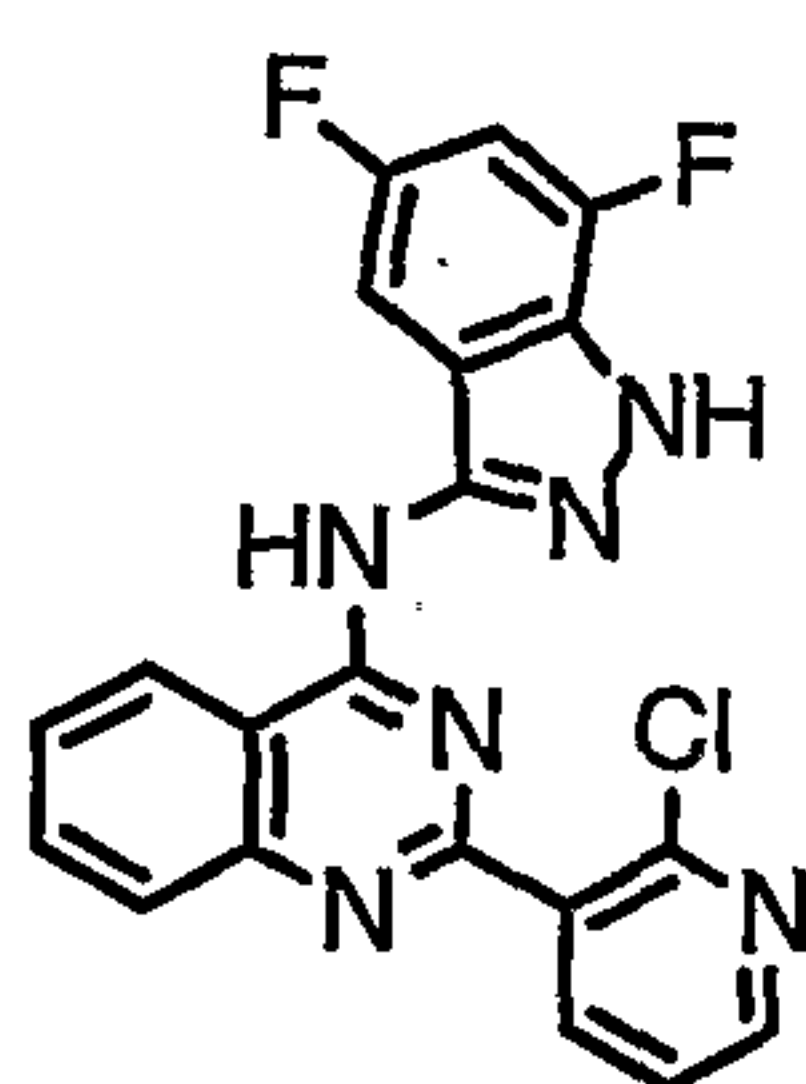
II-91



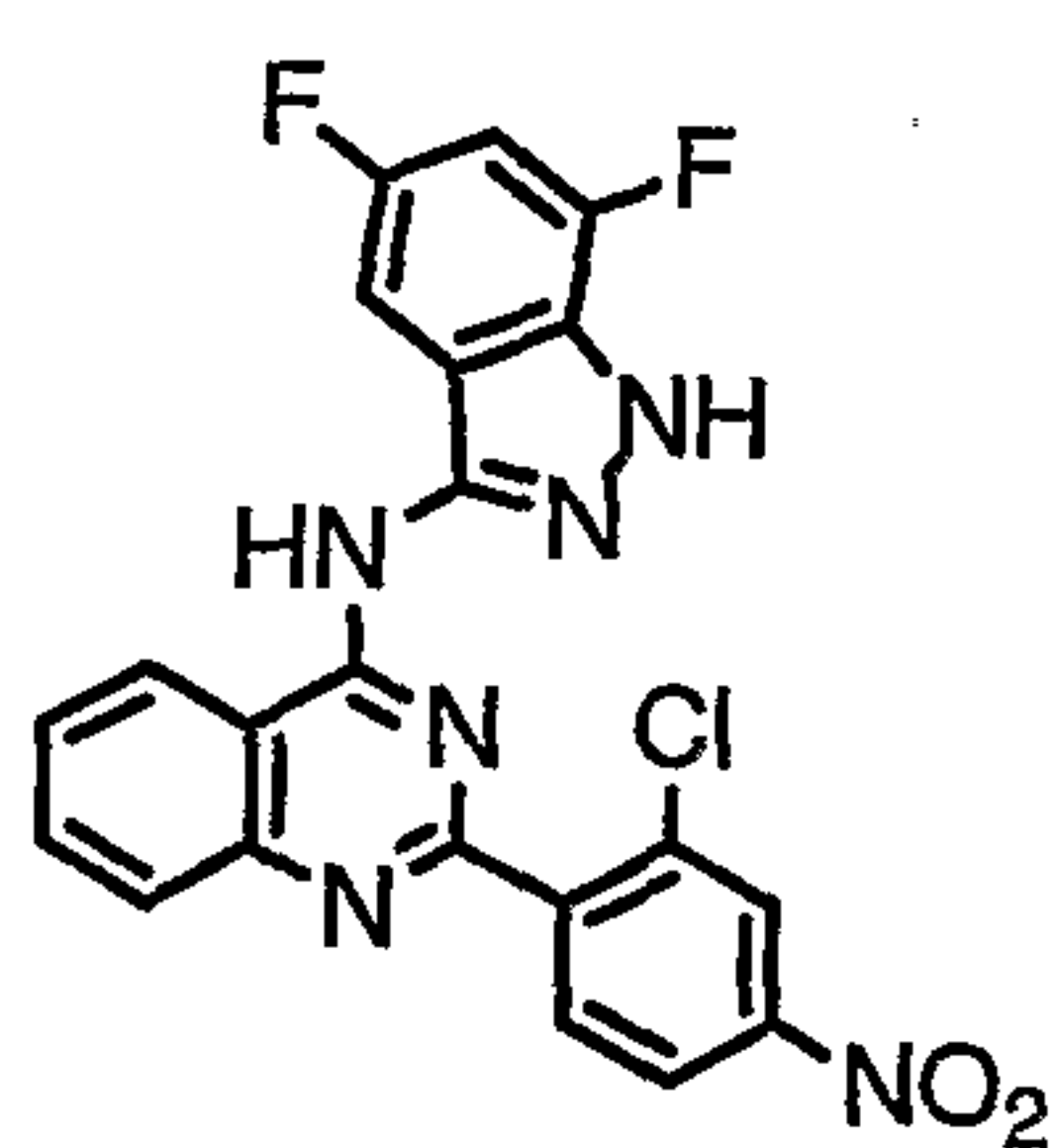
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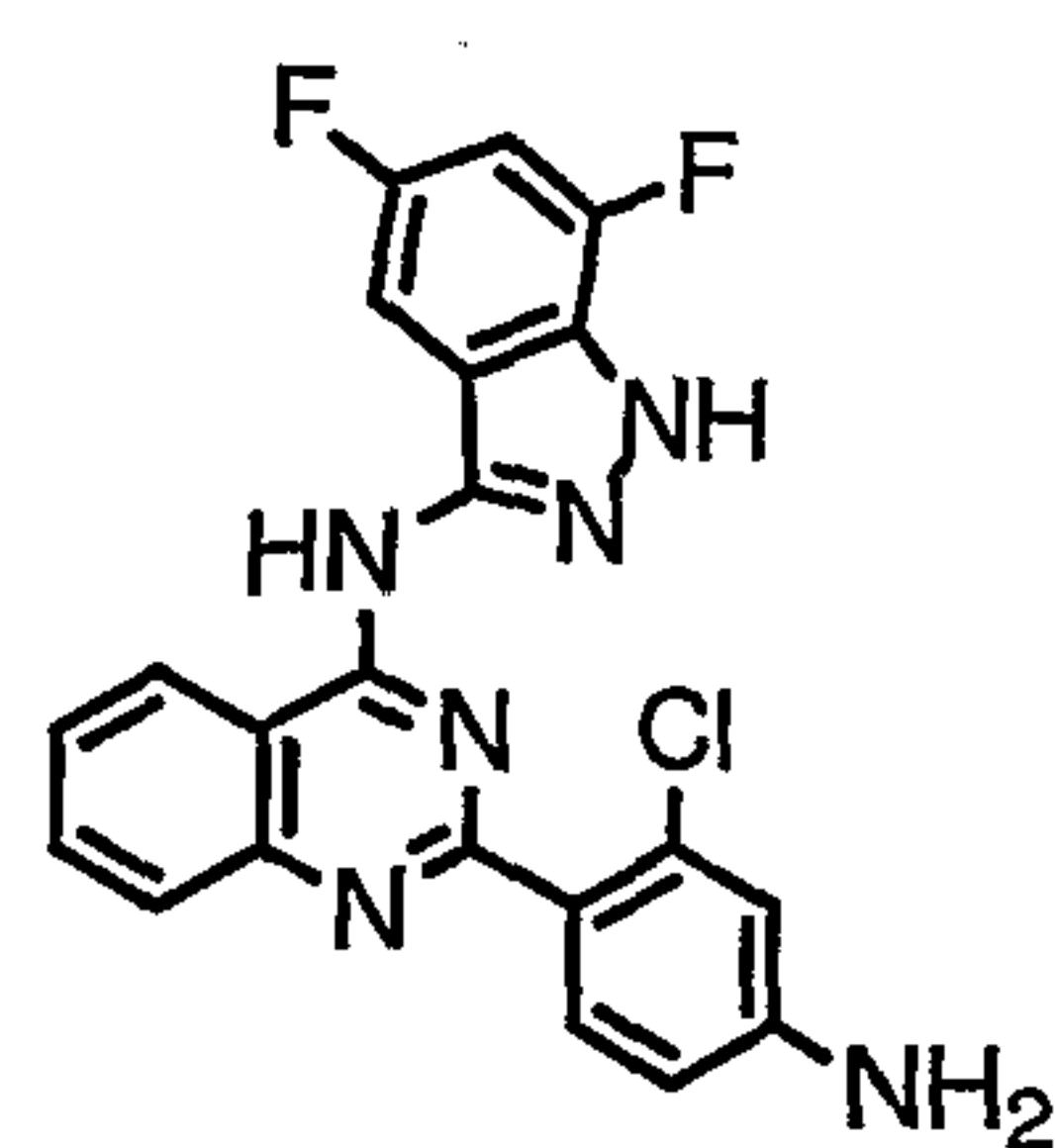
II-93



II-94



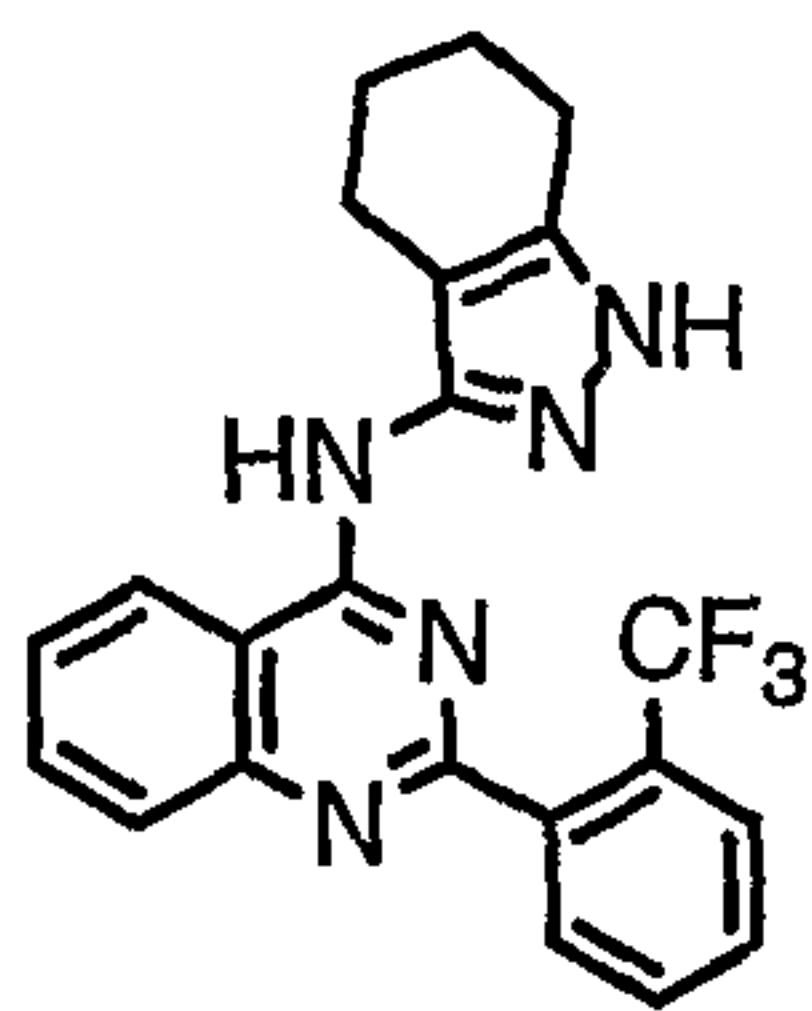
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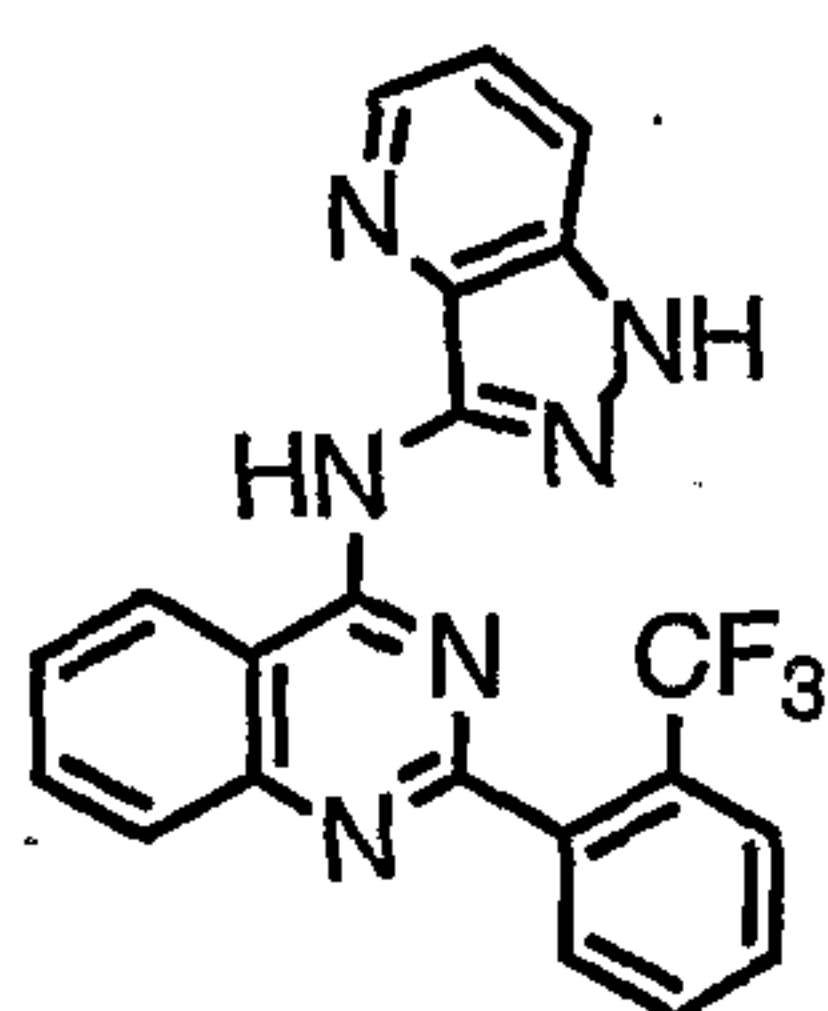
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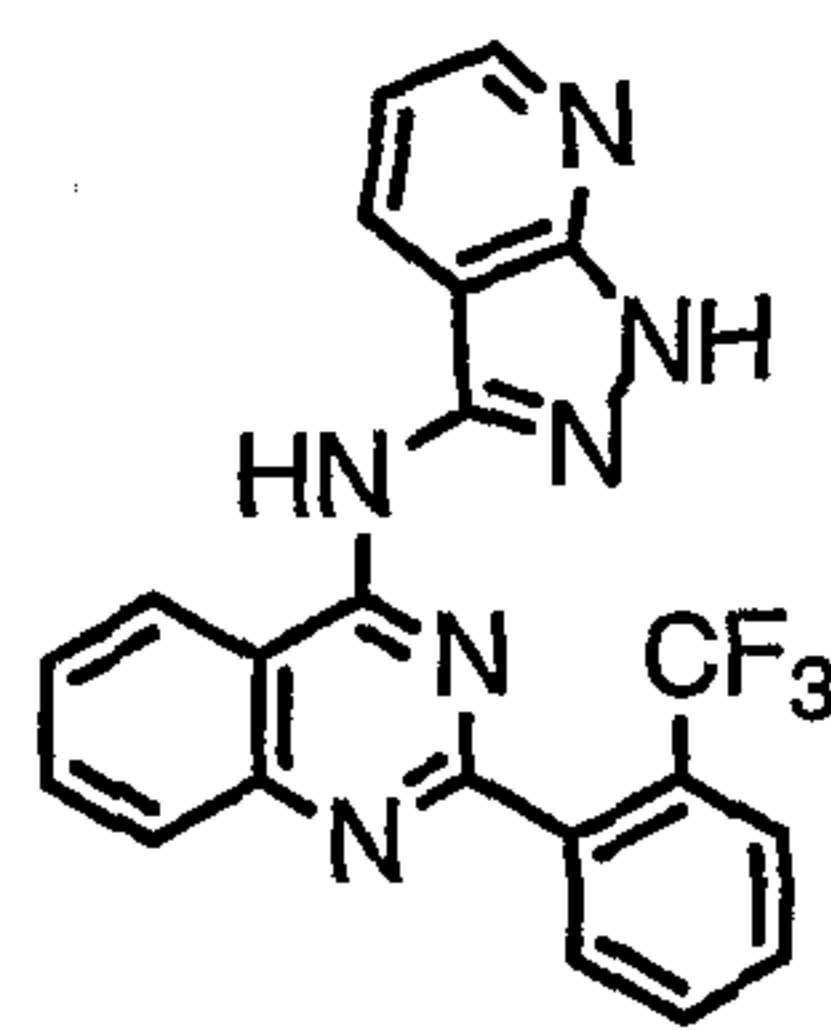
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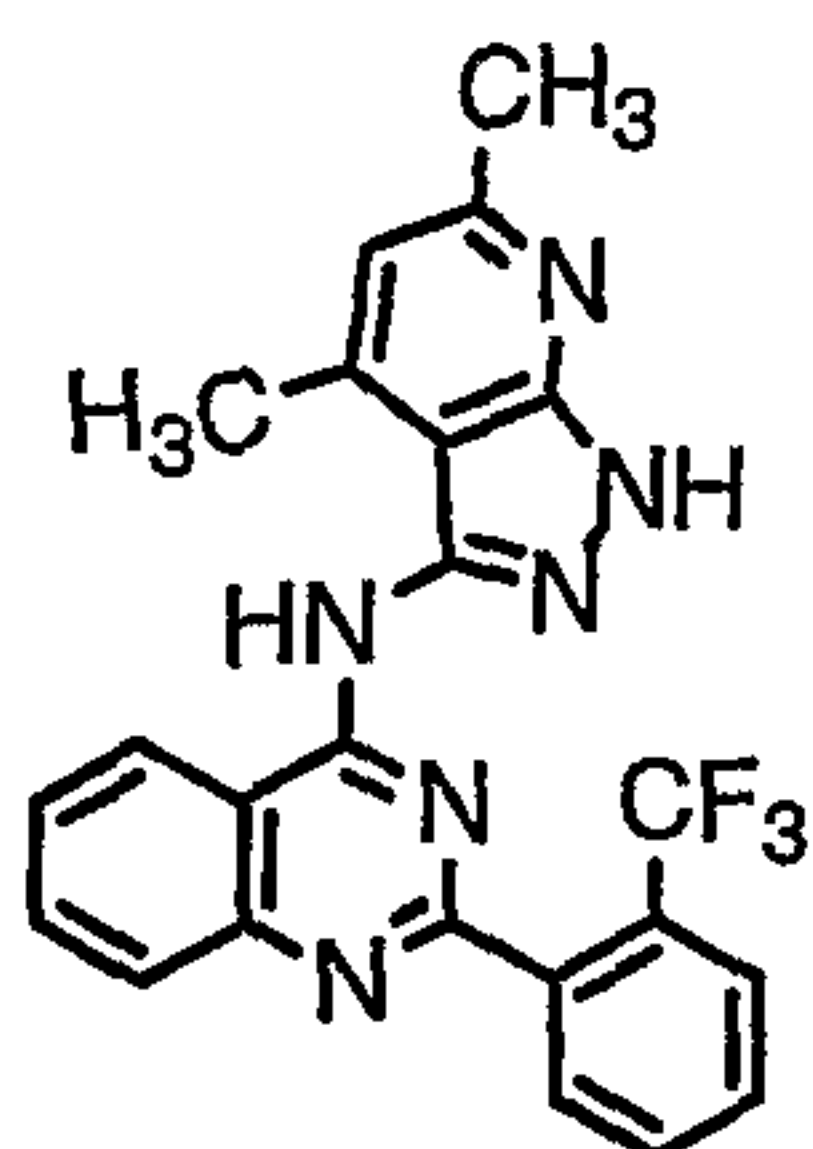
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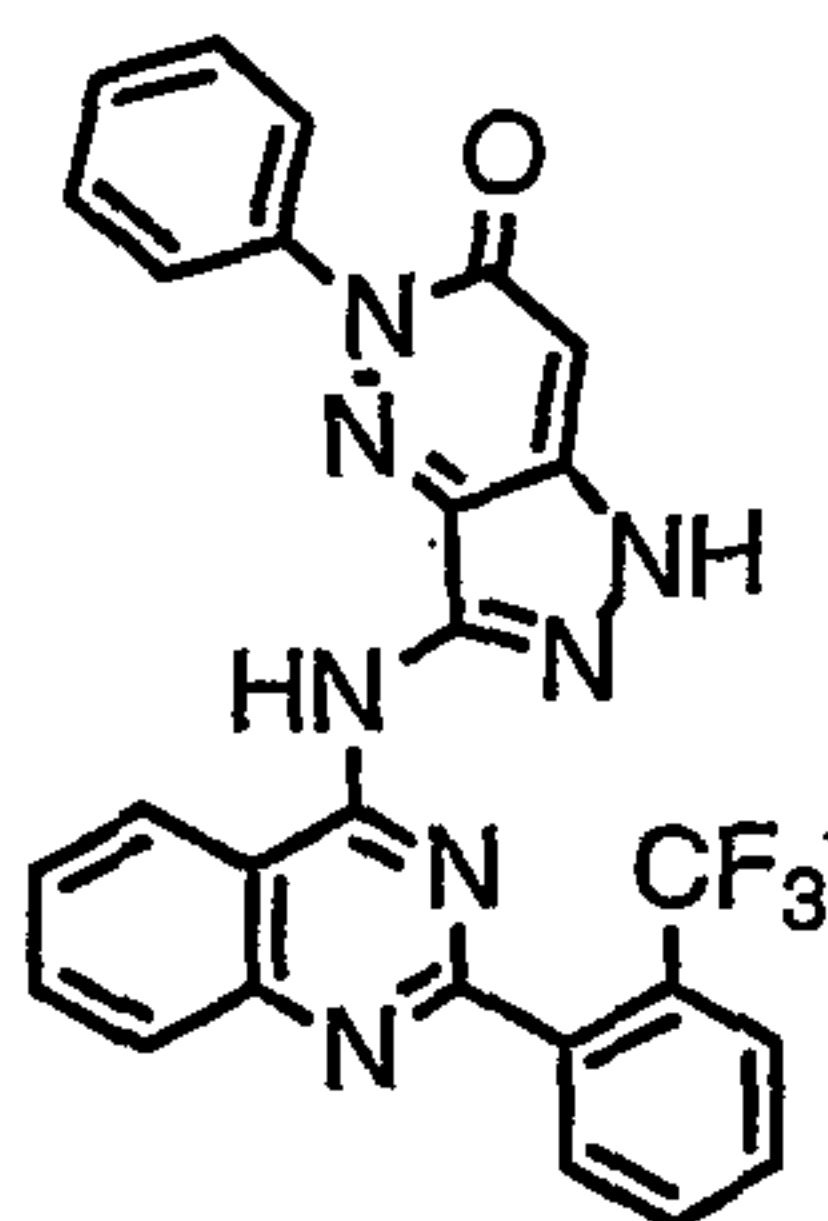
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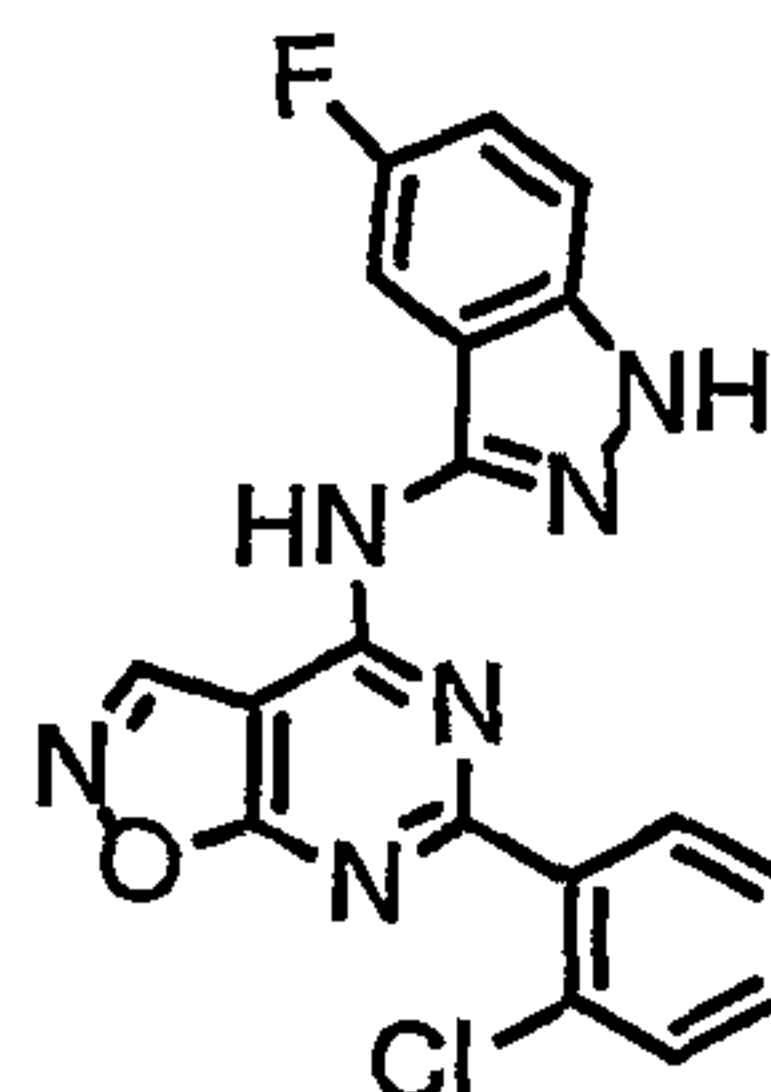
II-99



II-100

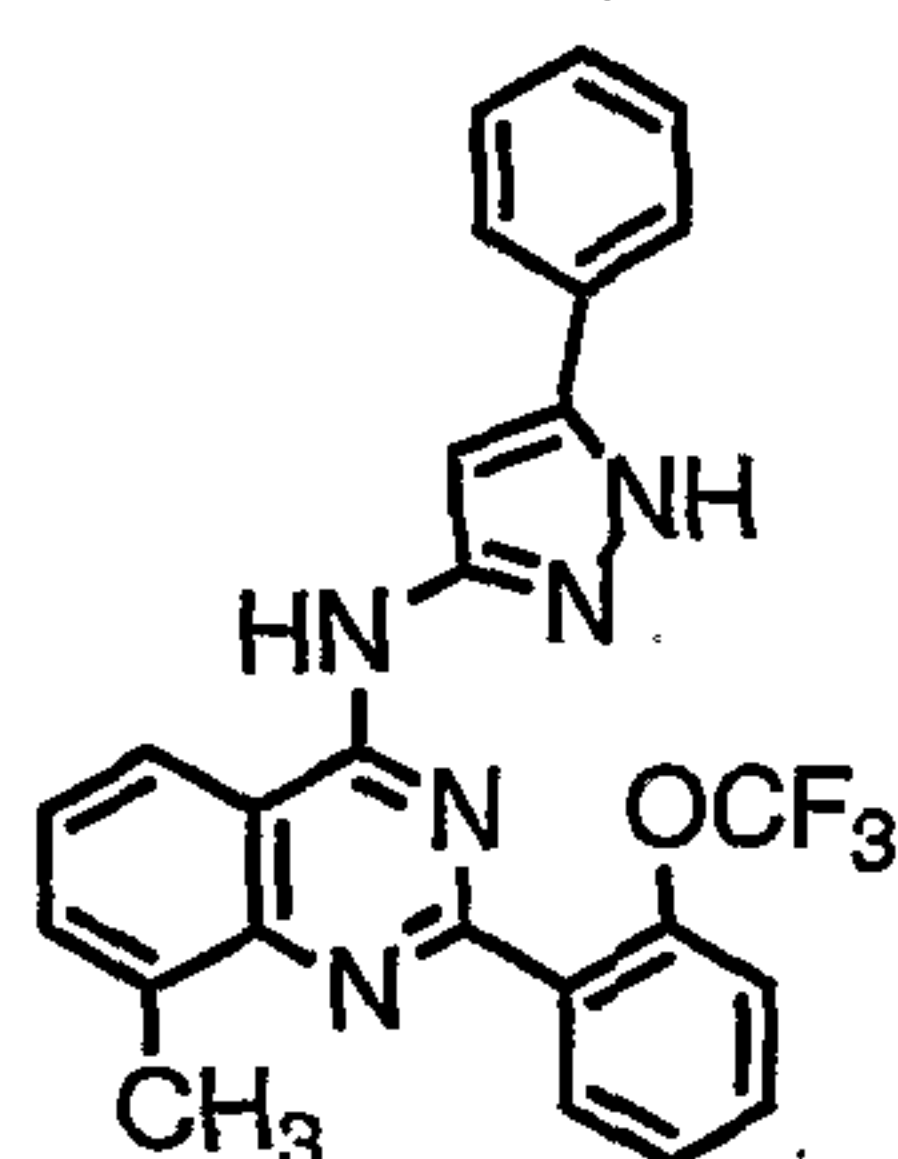


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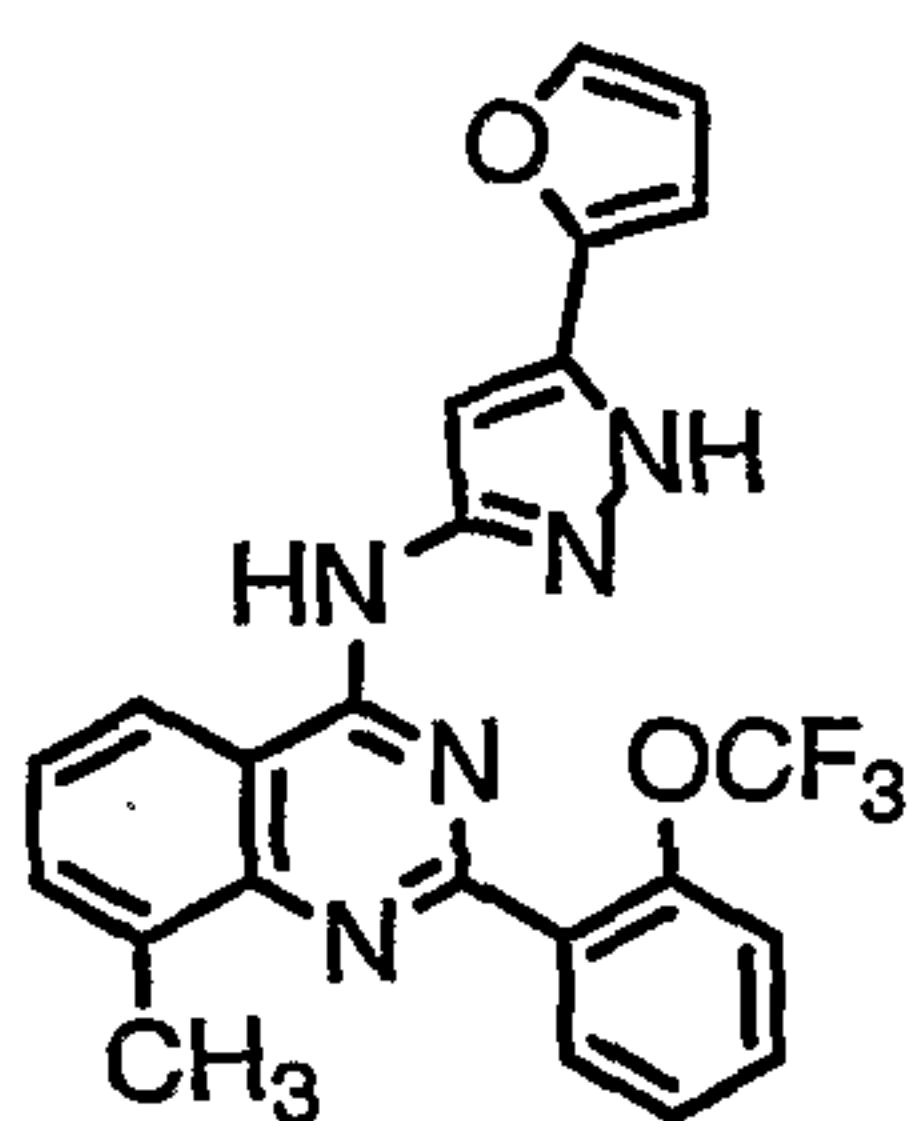


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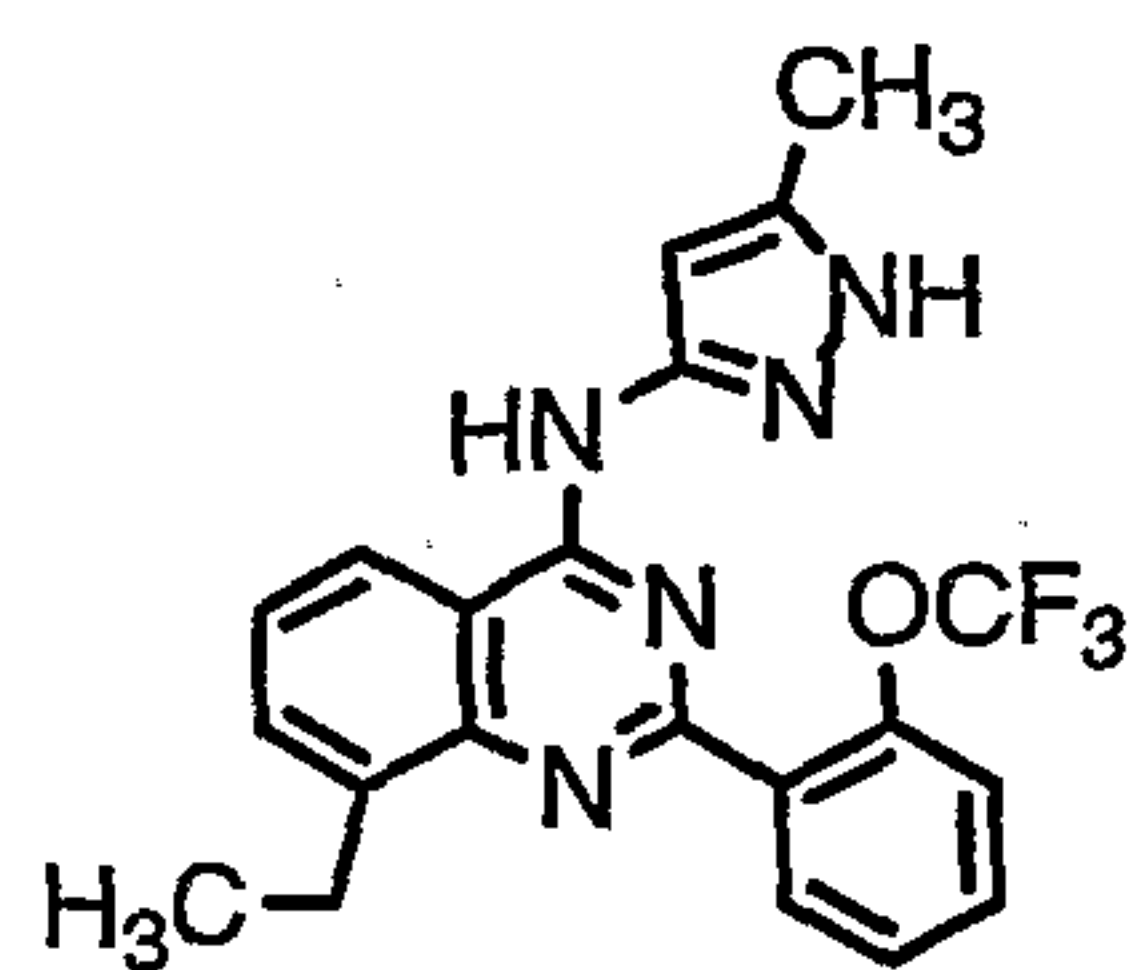
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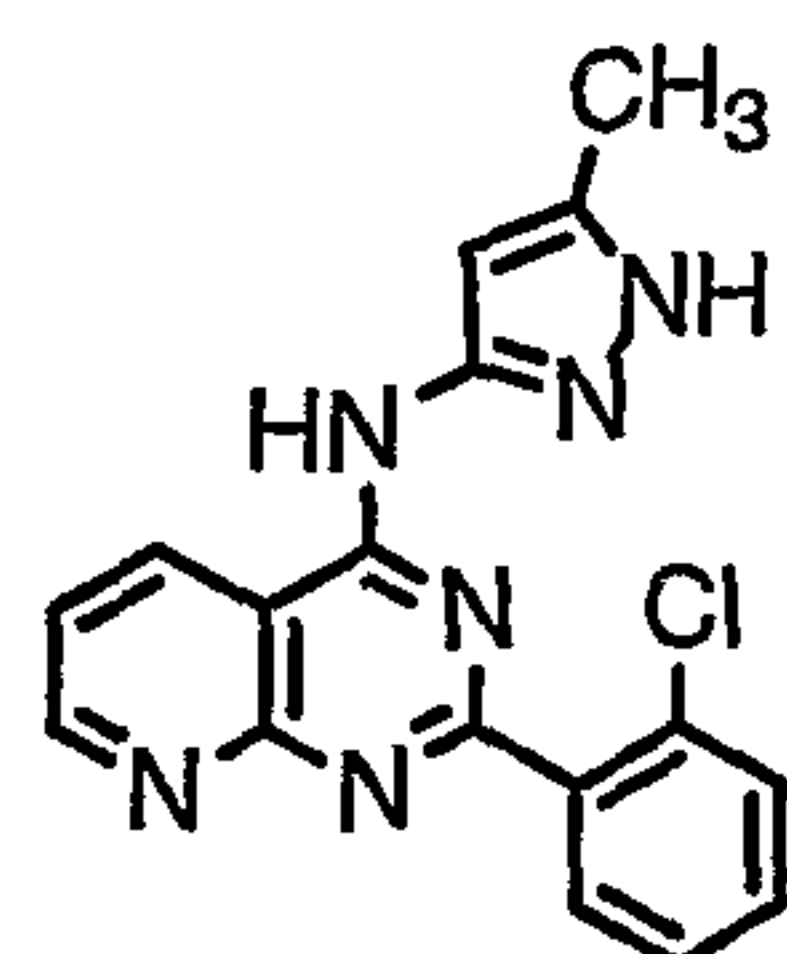
II-103



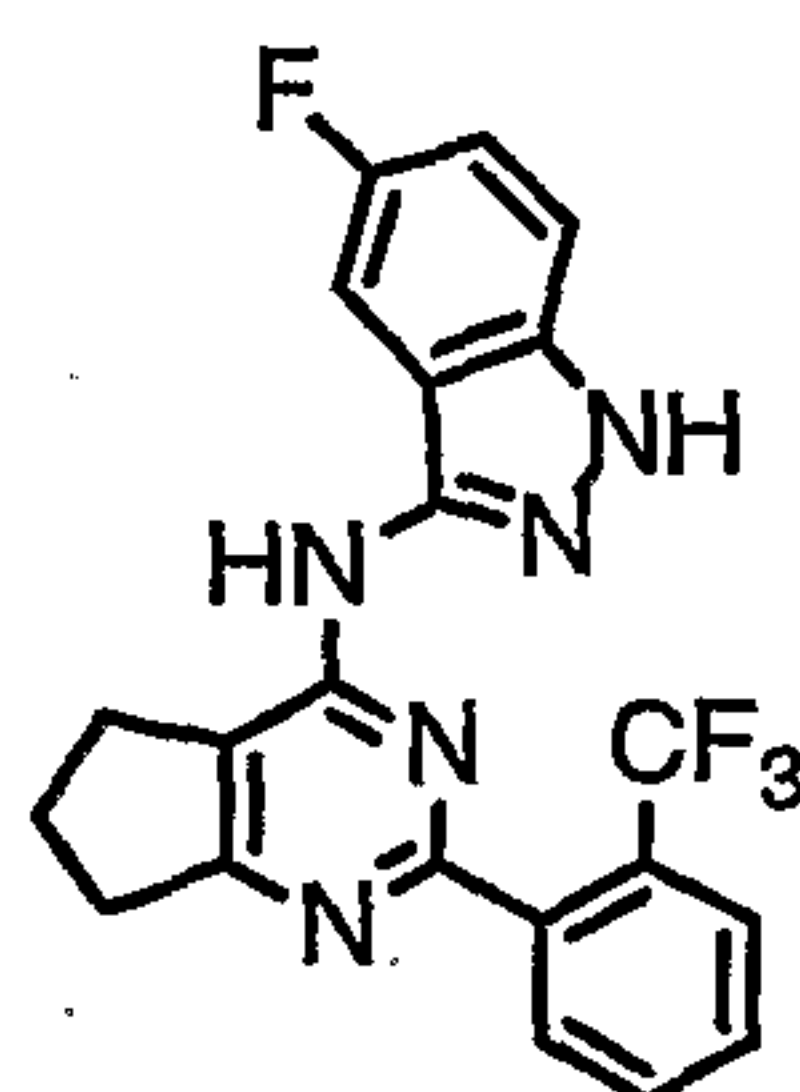
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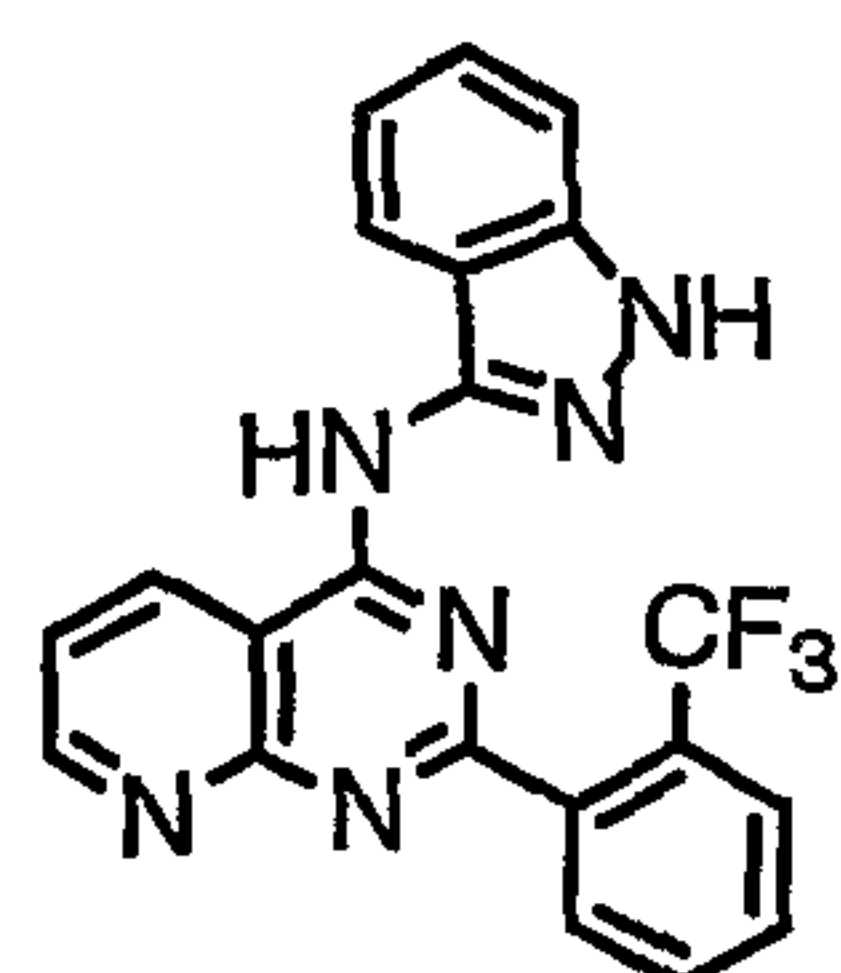
II-105



II-106

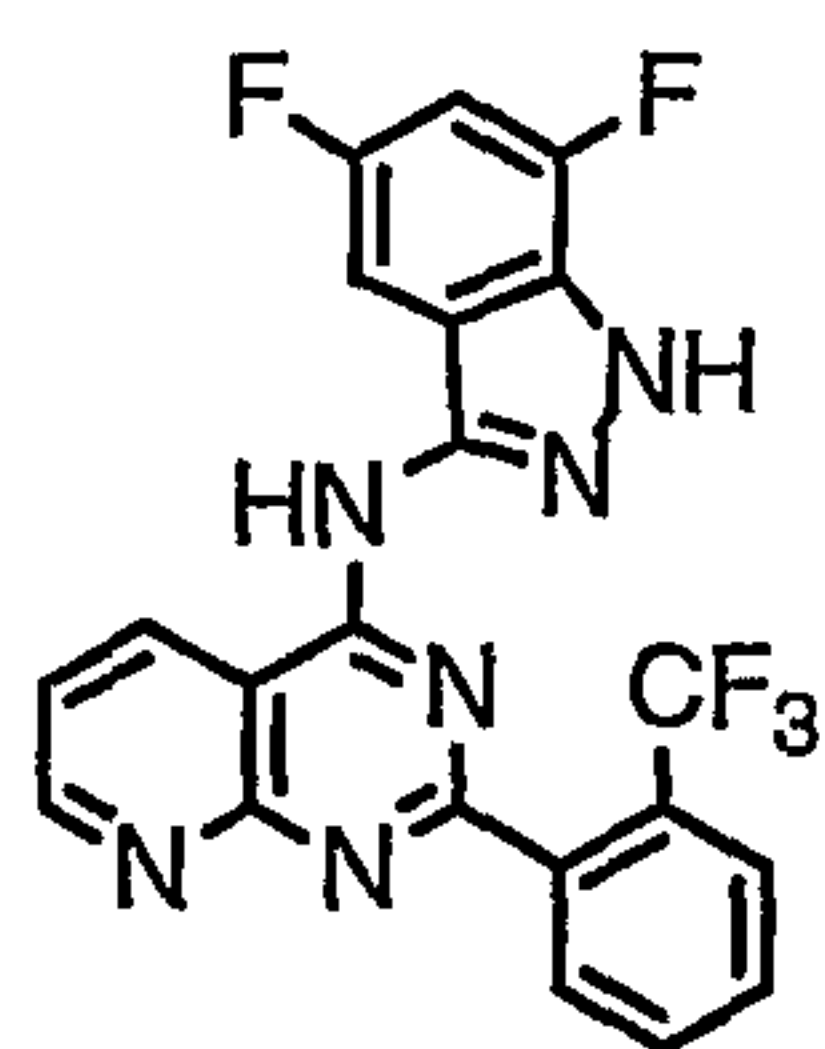


II-107

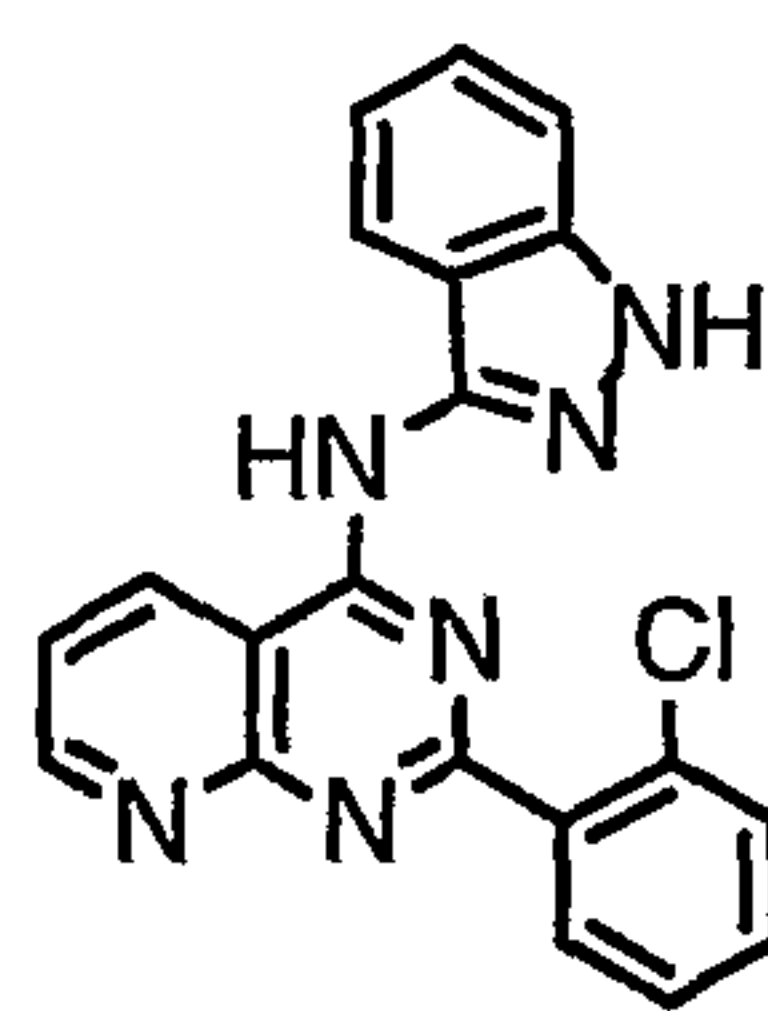


II-108

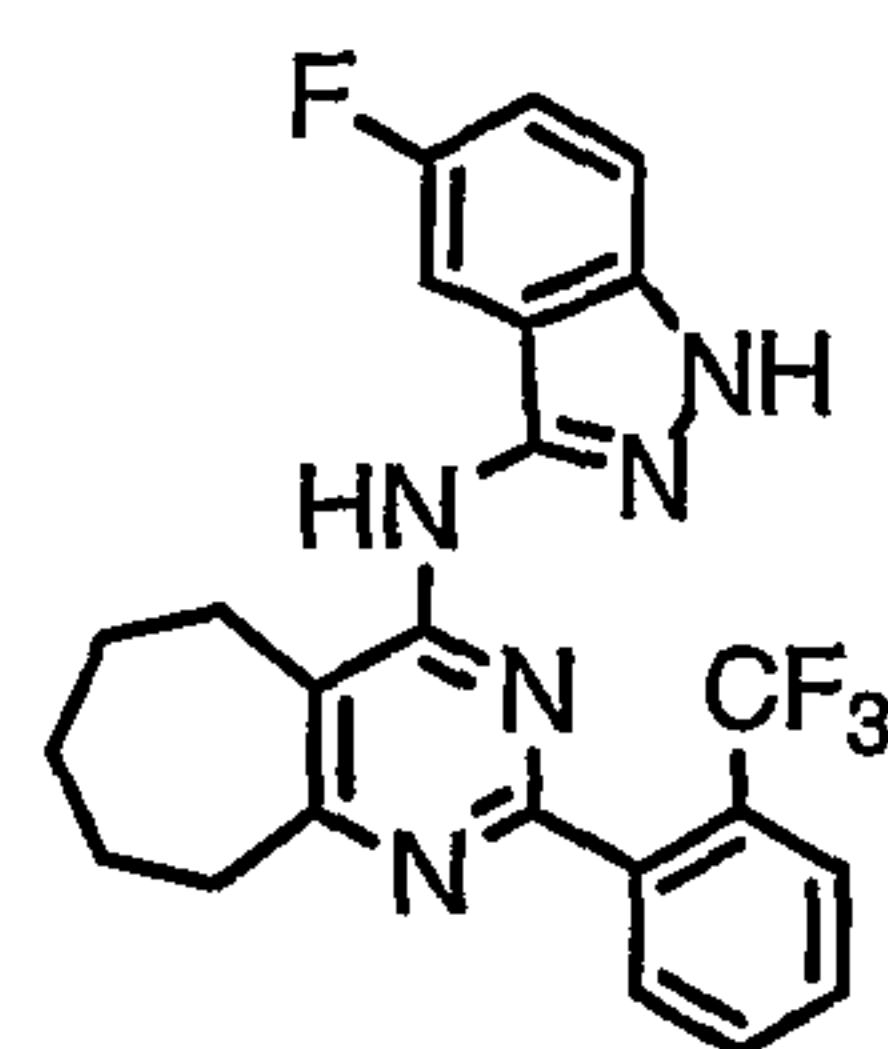
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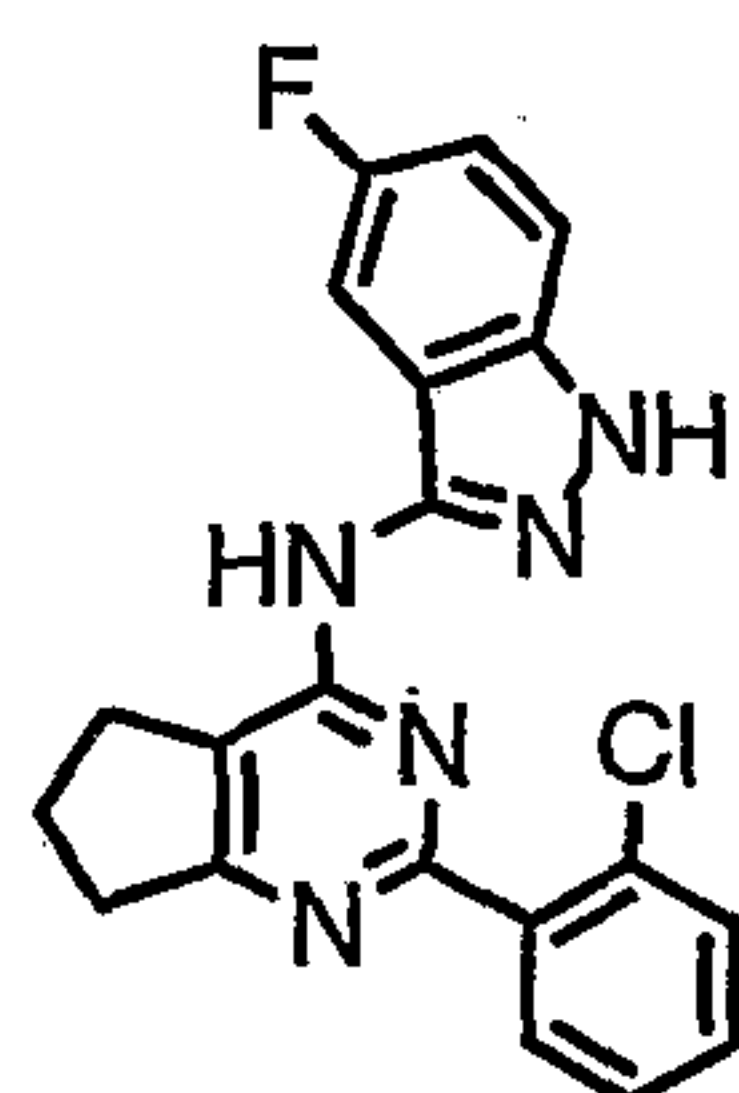
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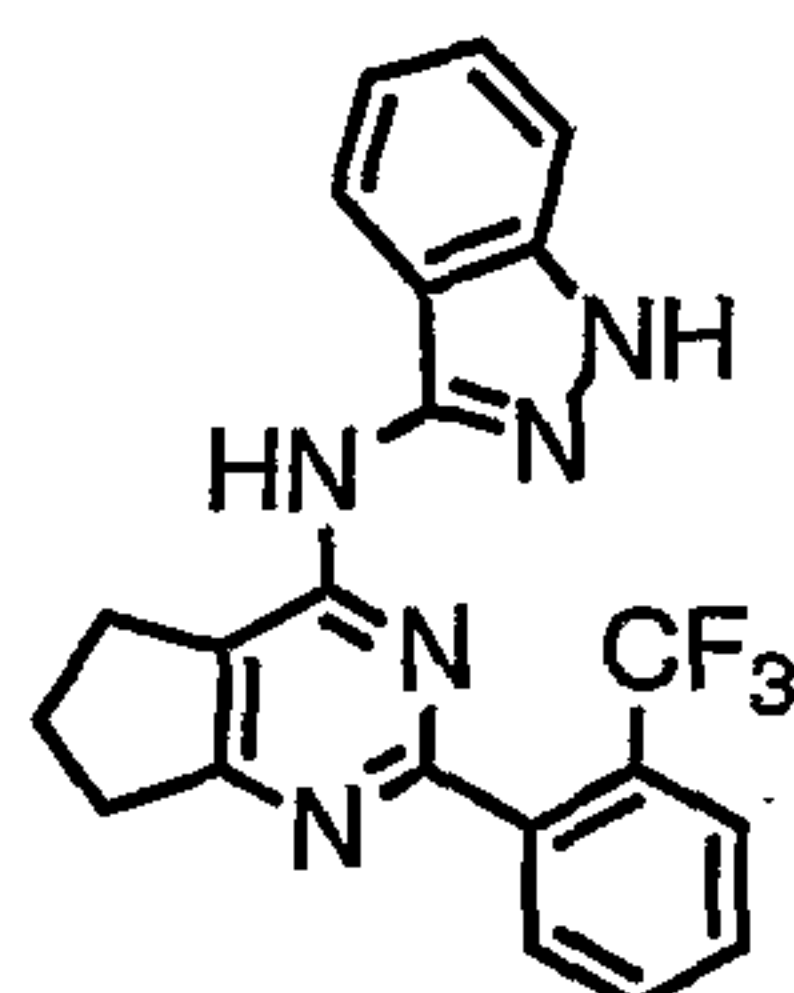
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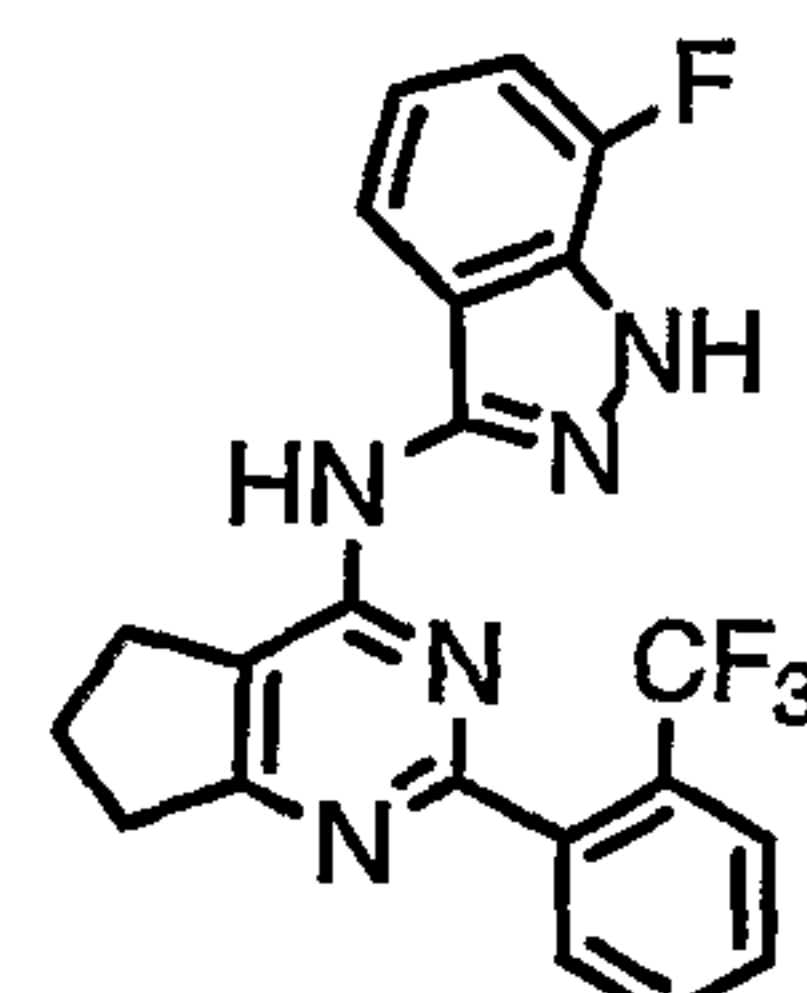
II-111



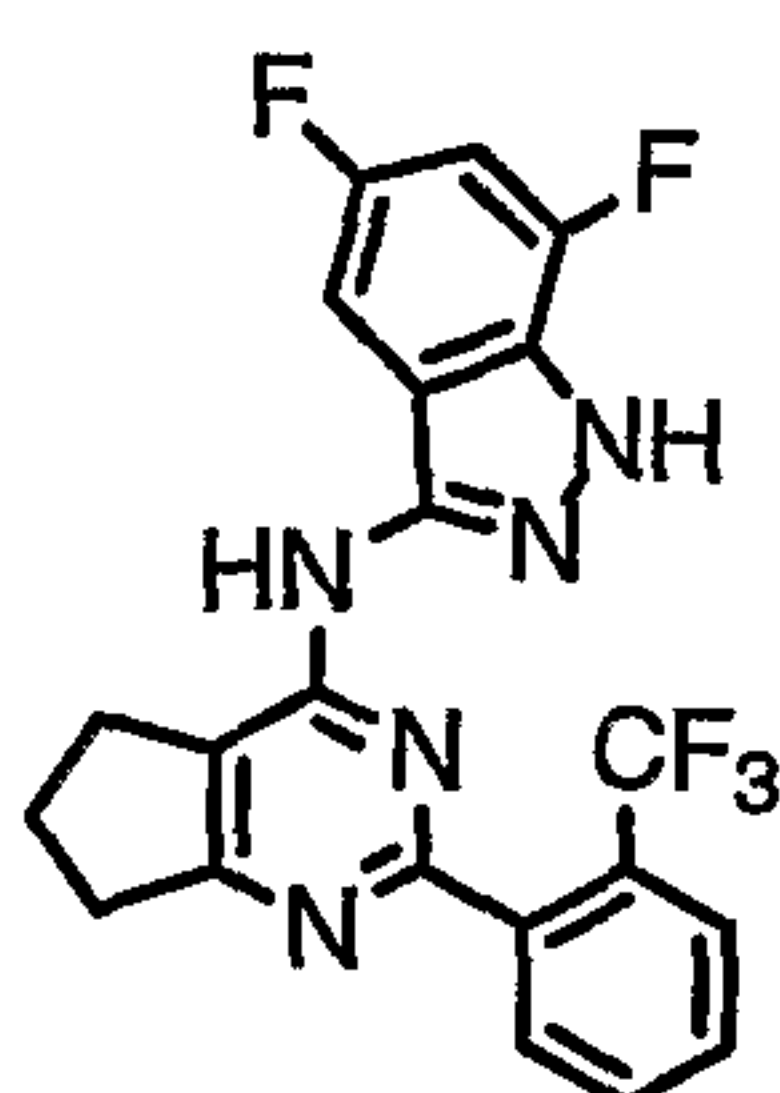
II-112



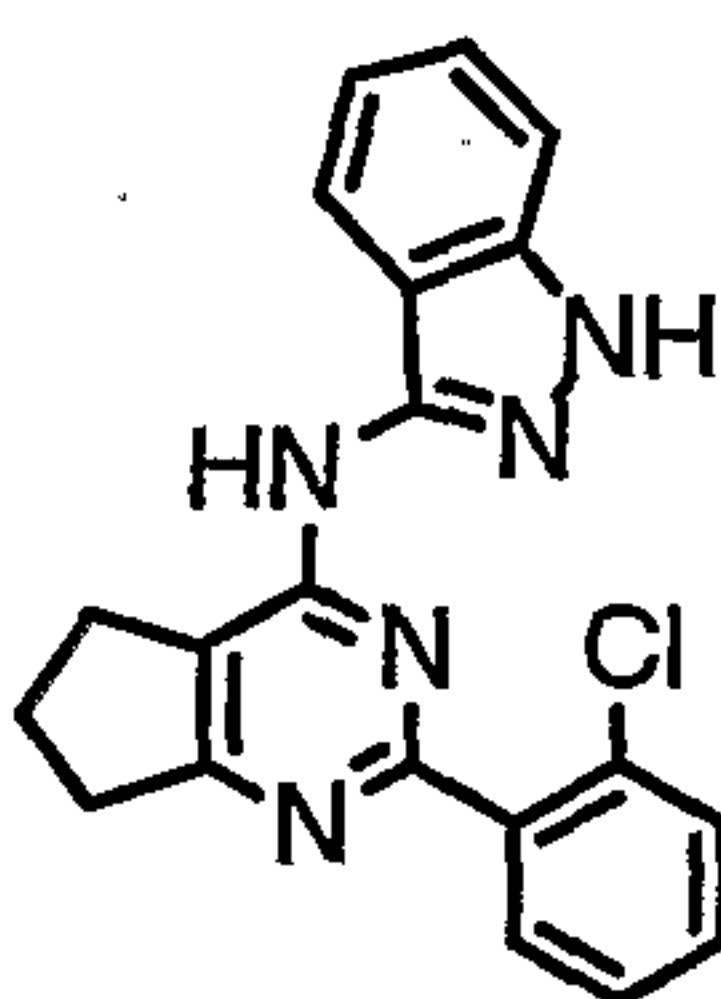
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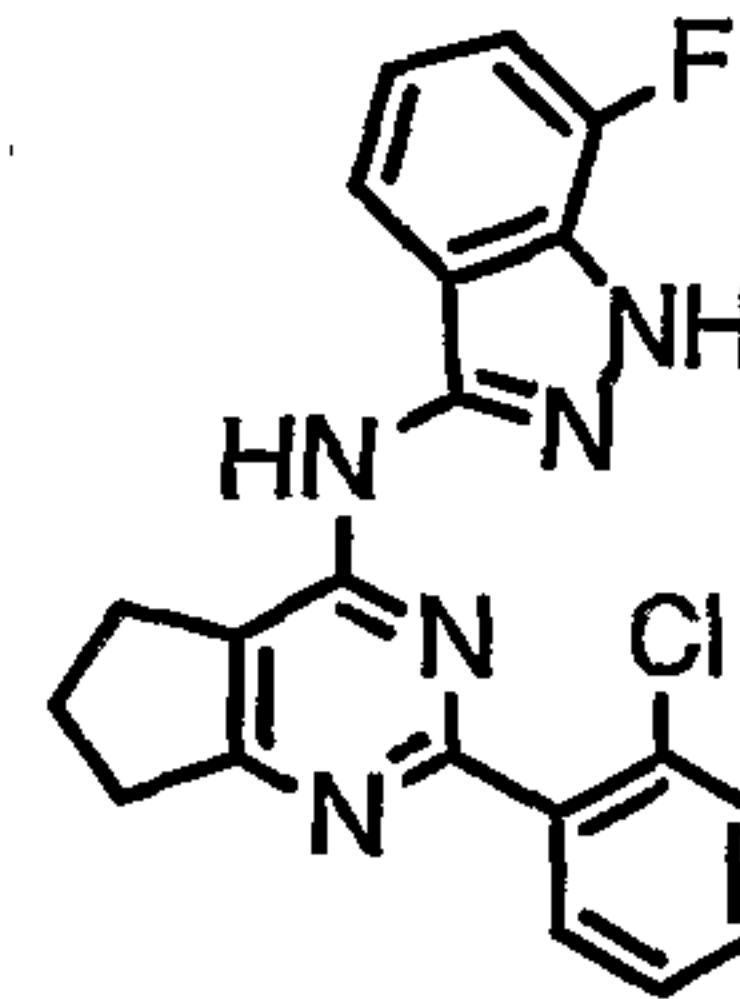
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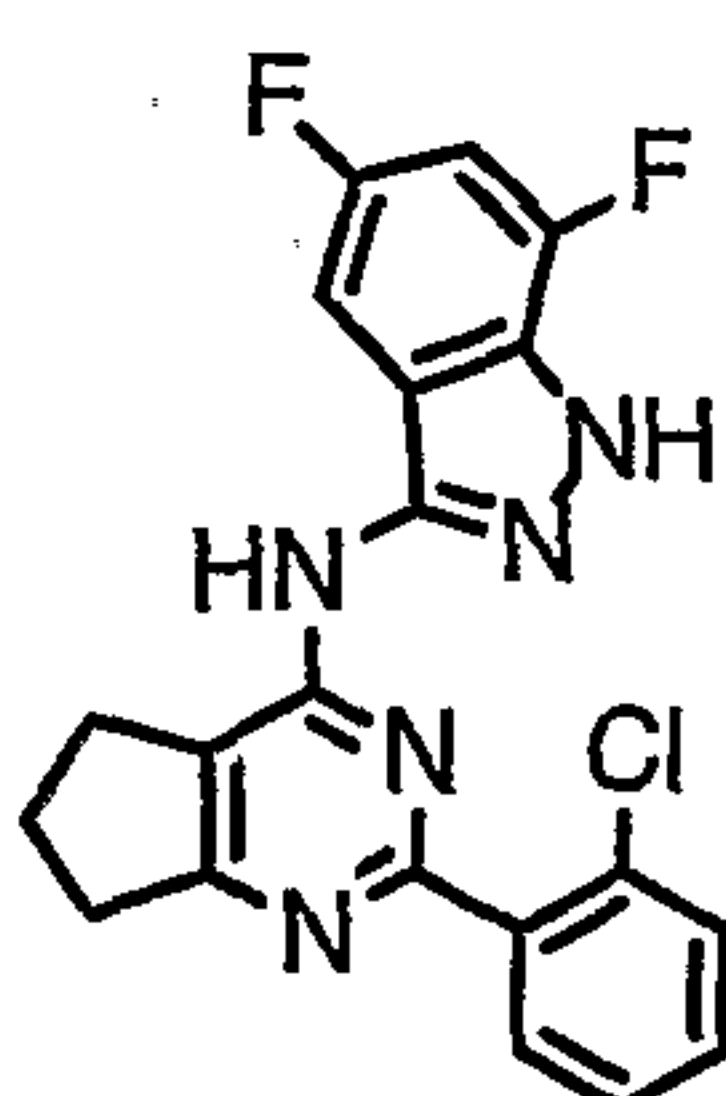
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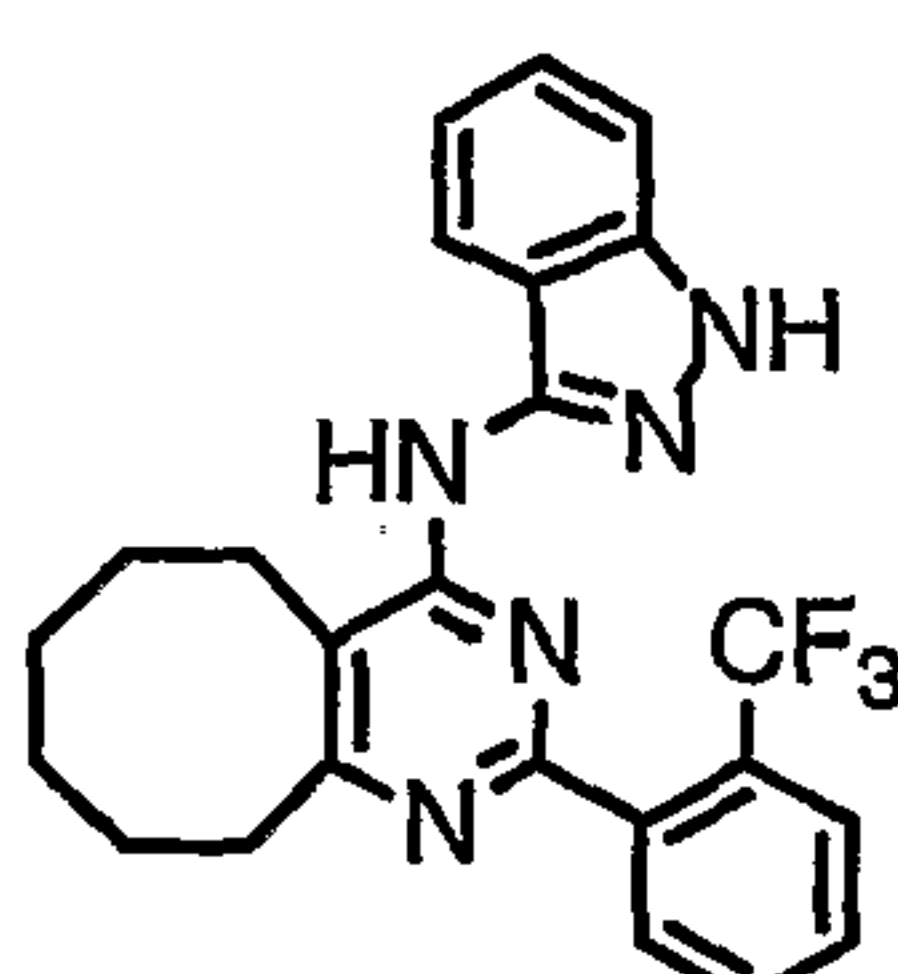
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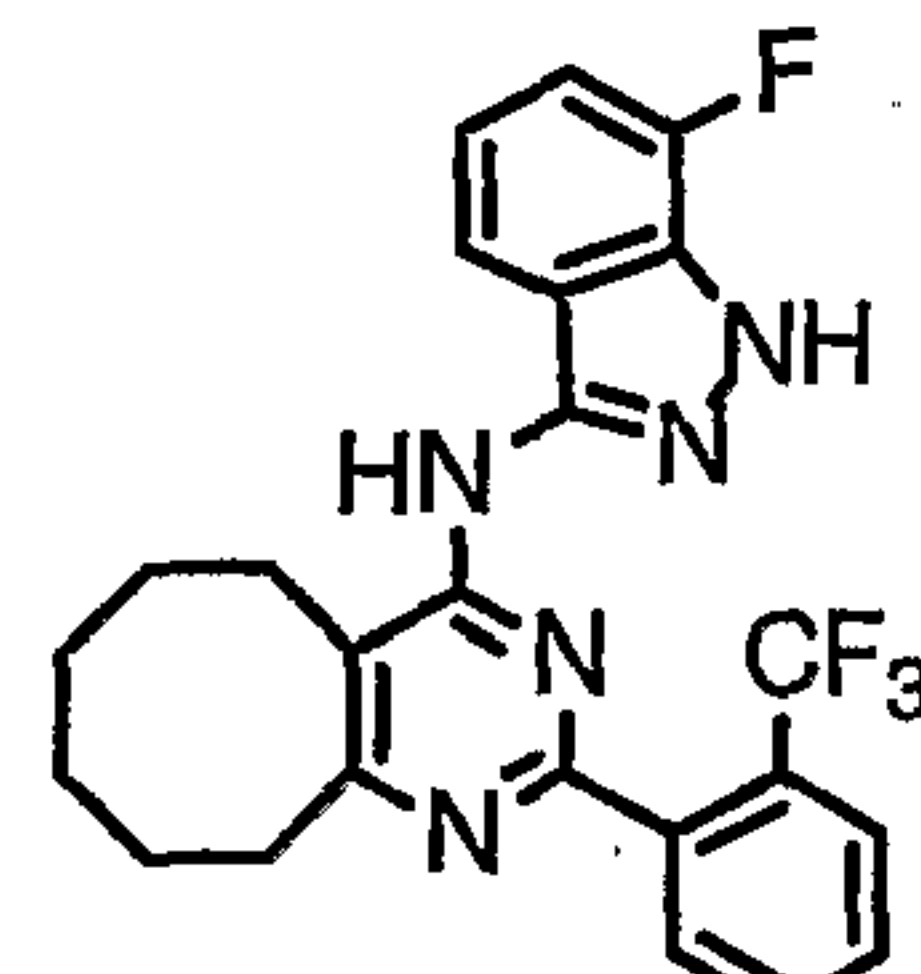
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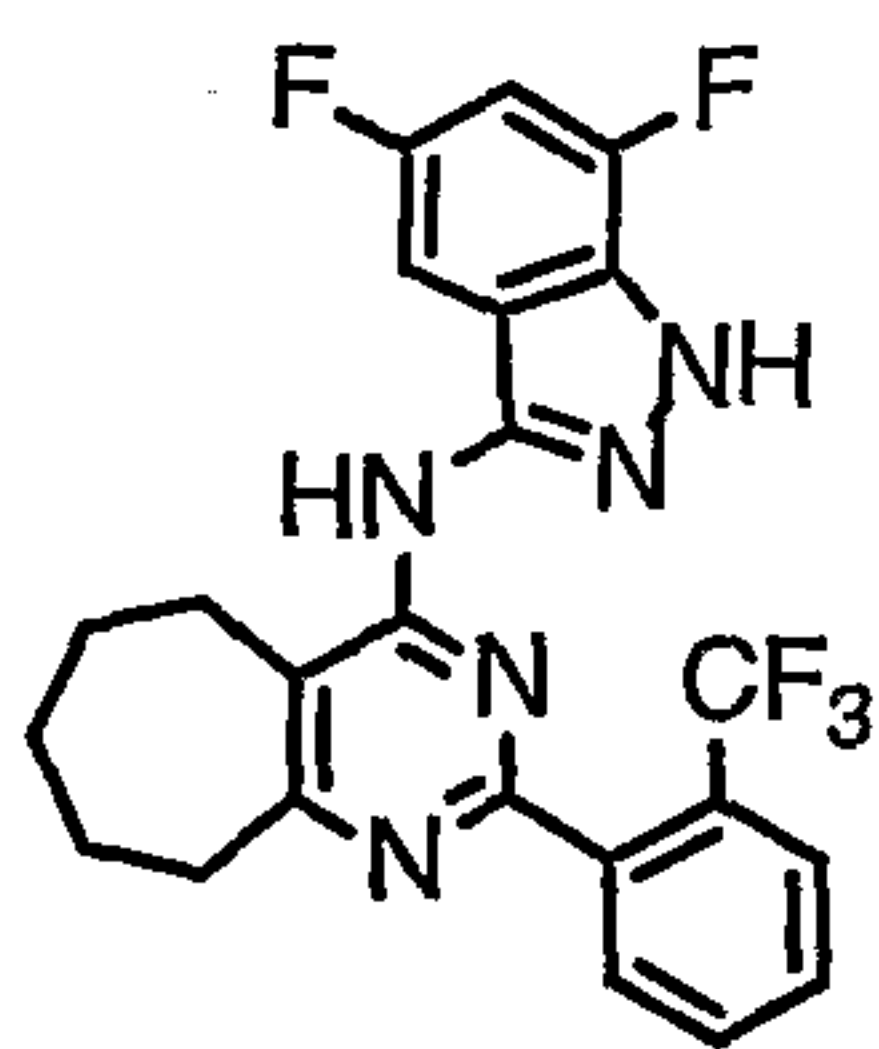
II-118



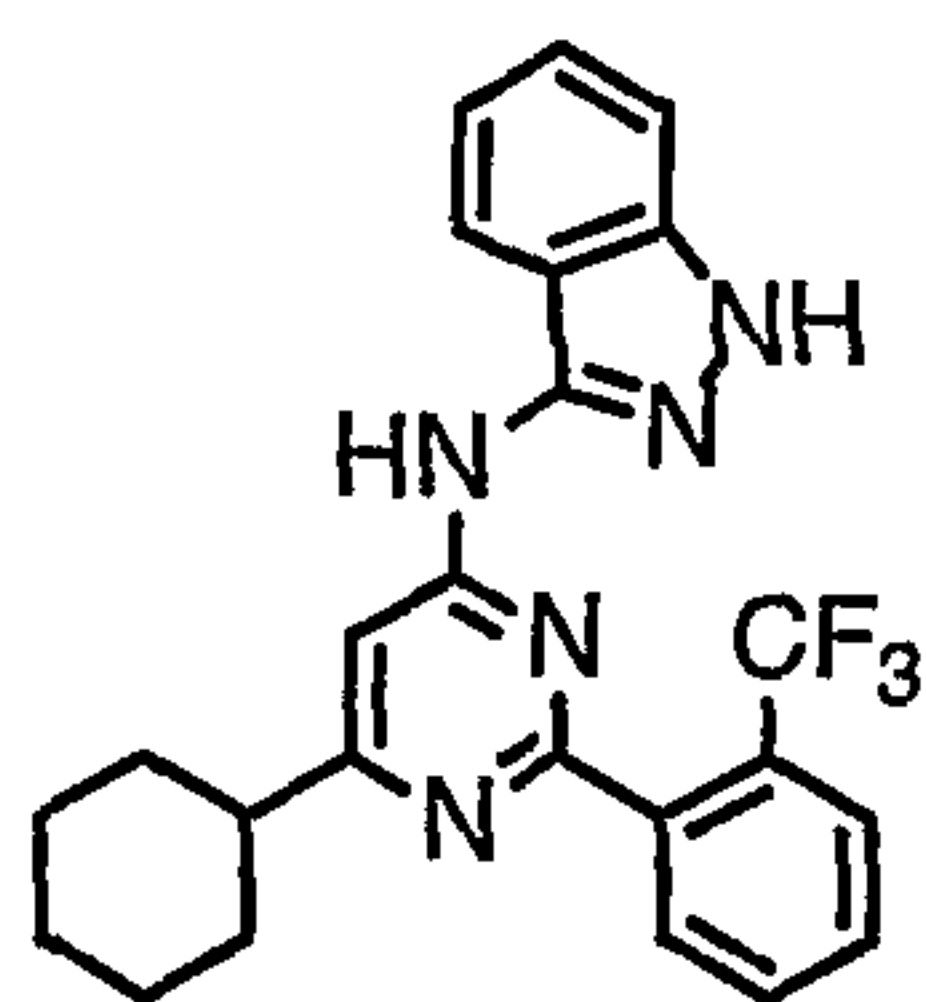
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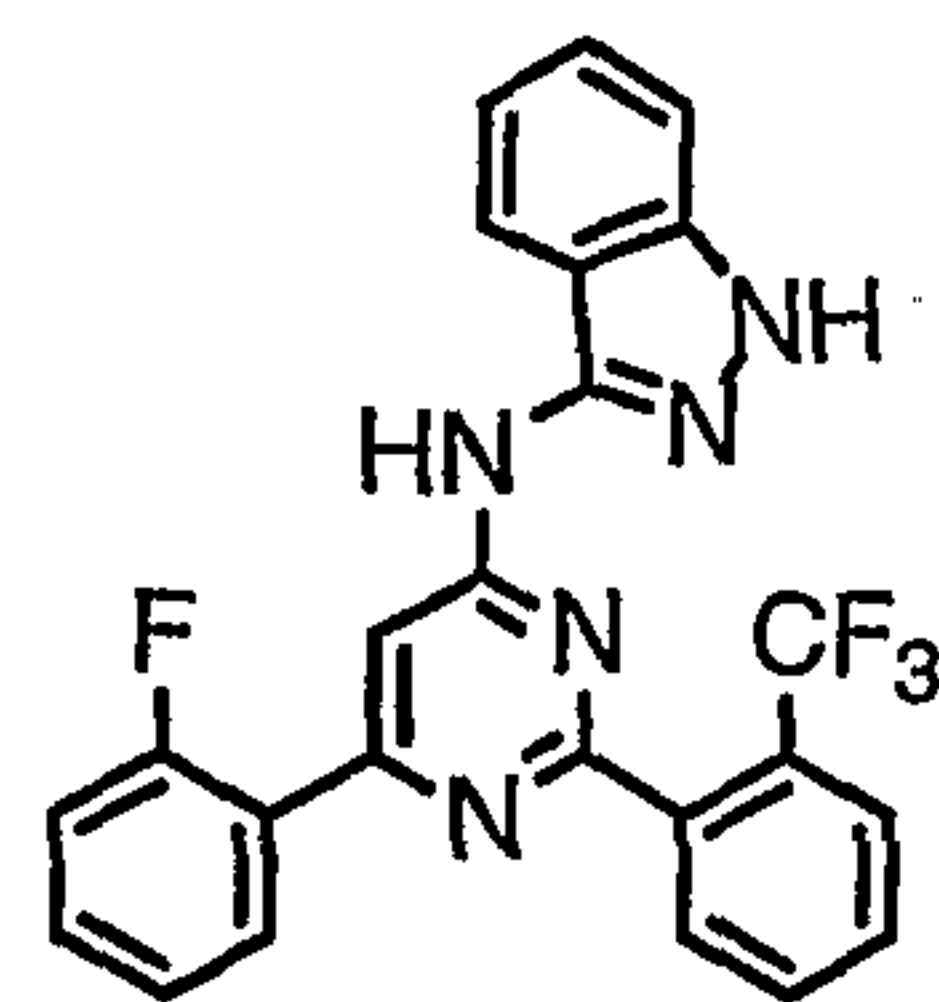
II-120



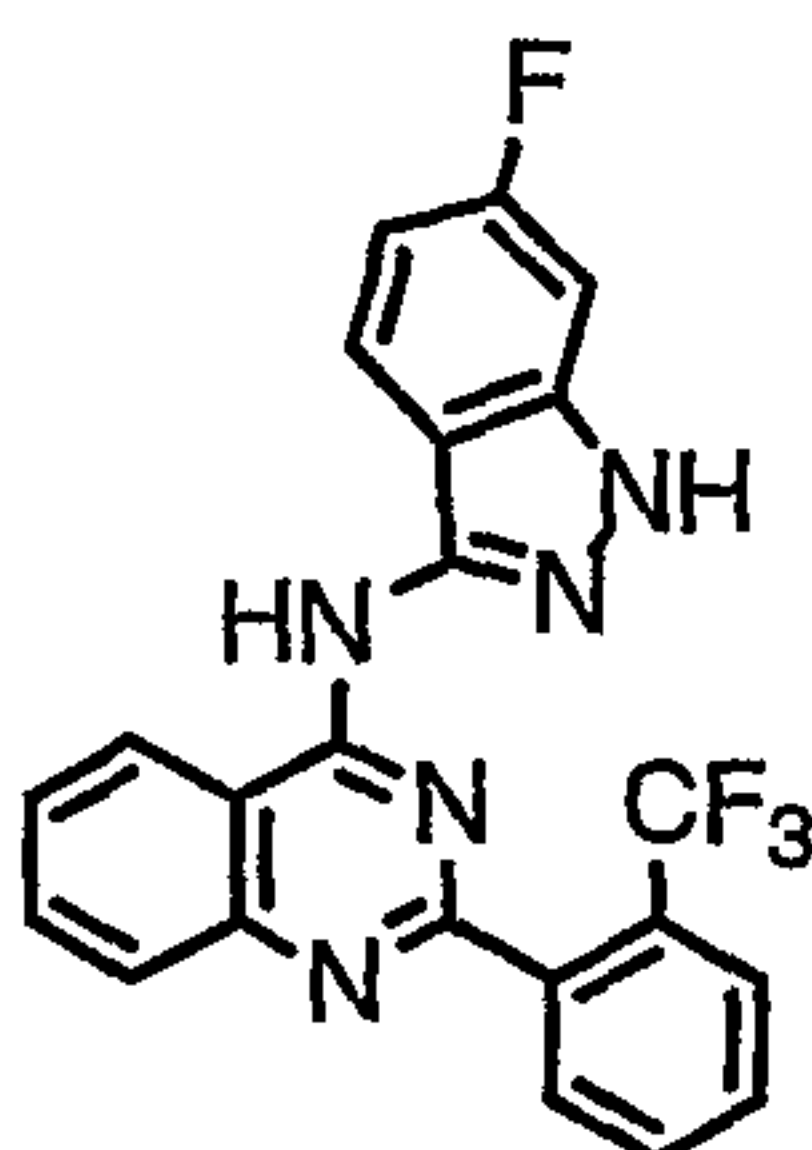
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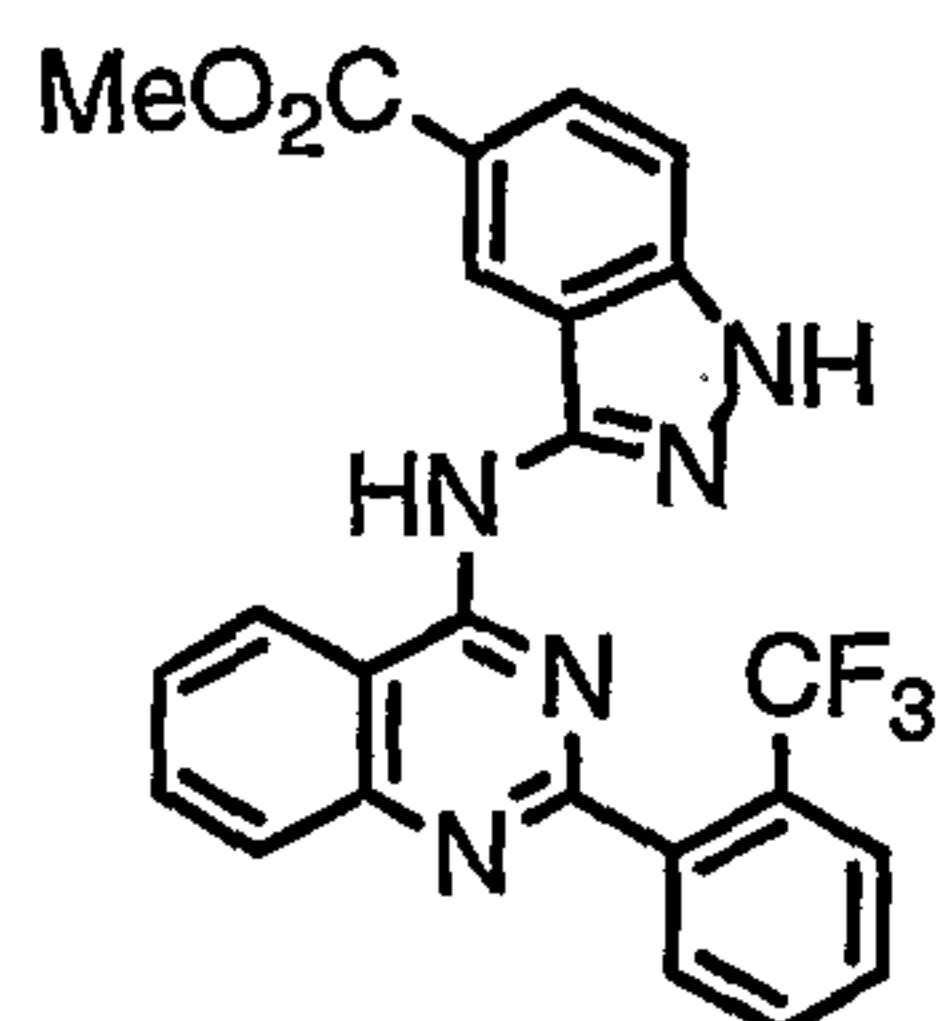
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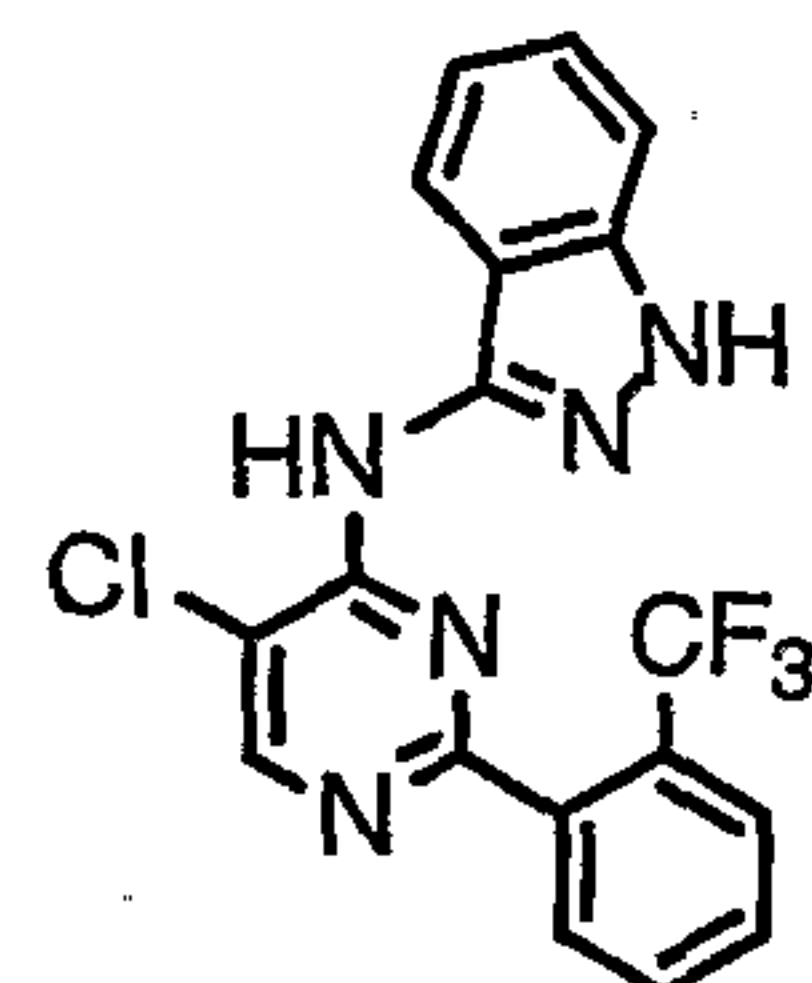
II-123



II-124

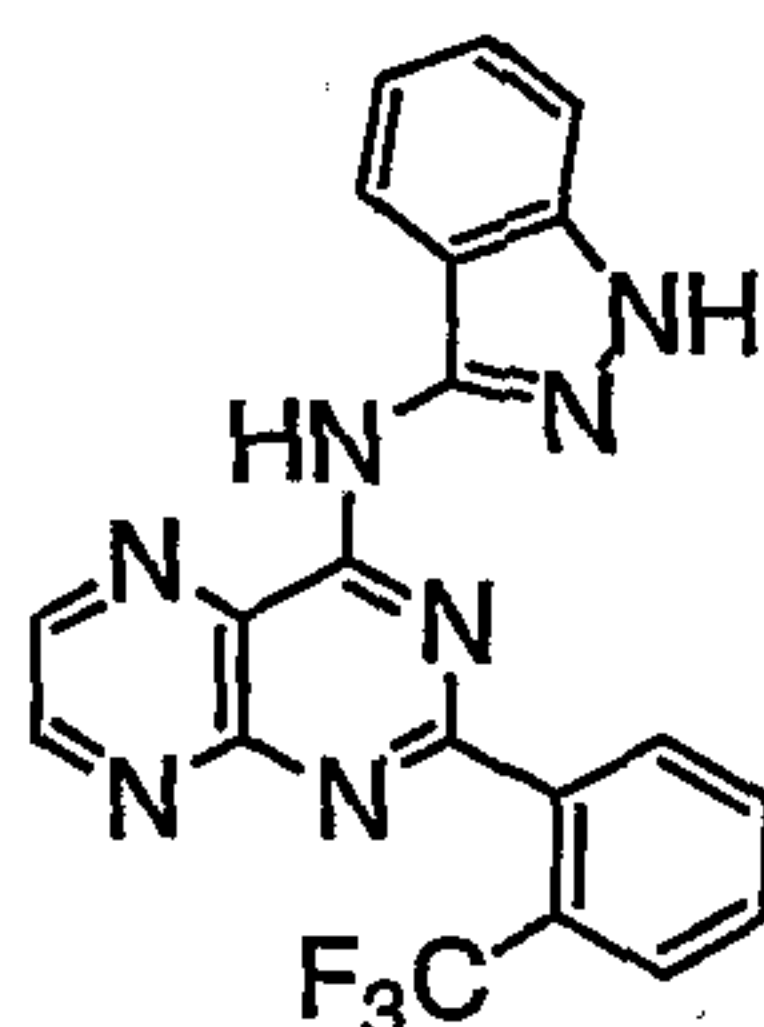


II-125

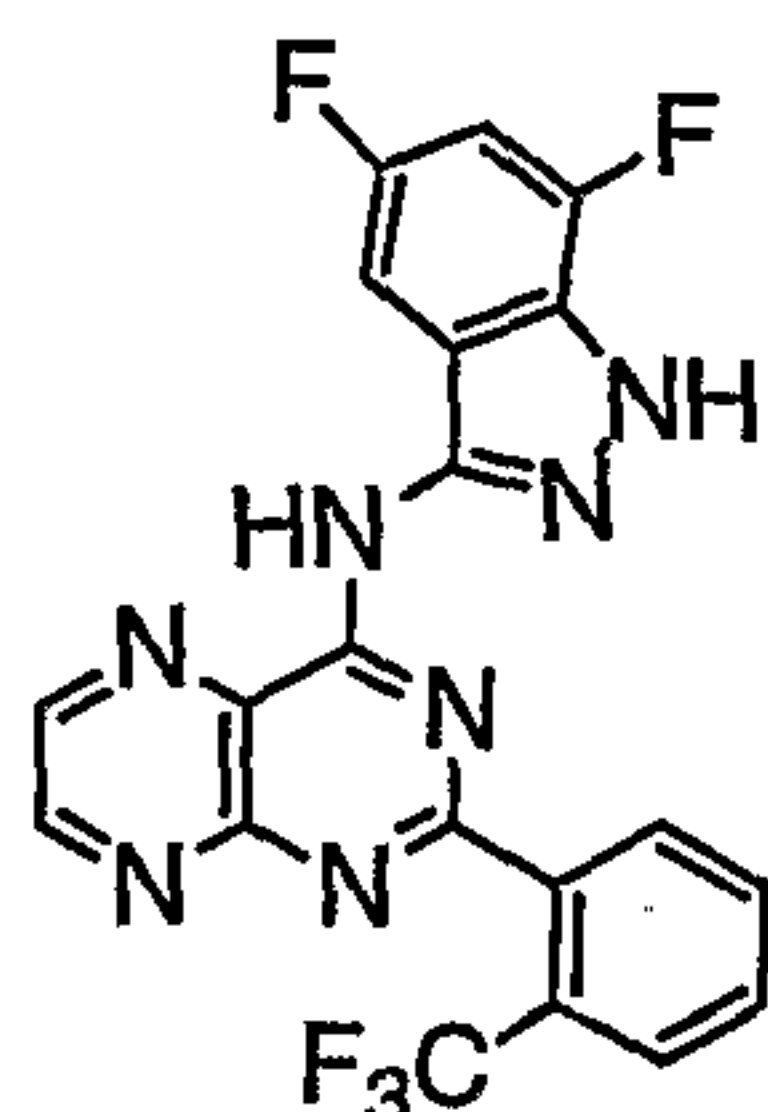


II-126

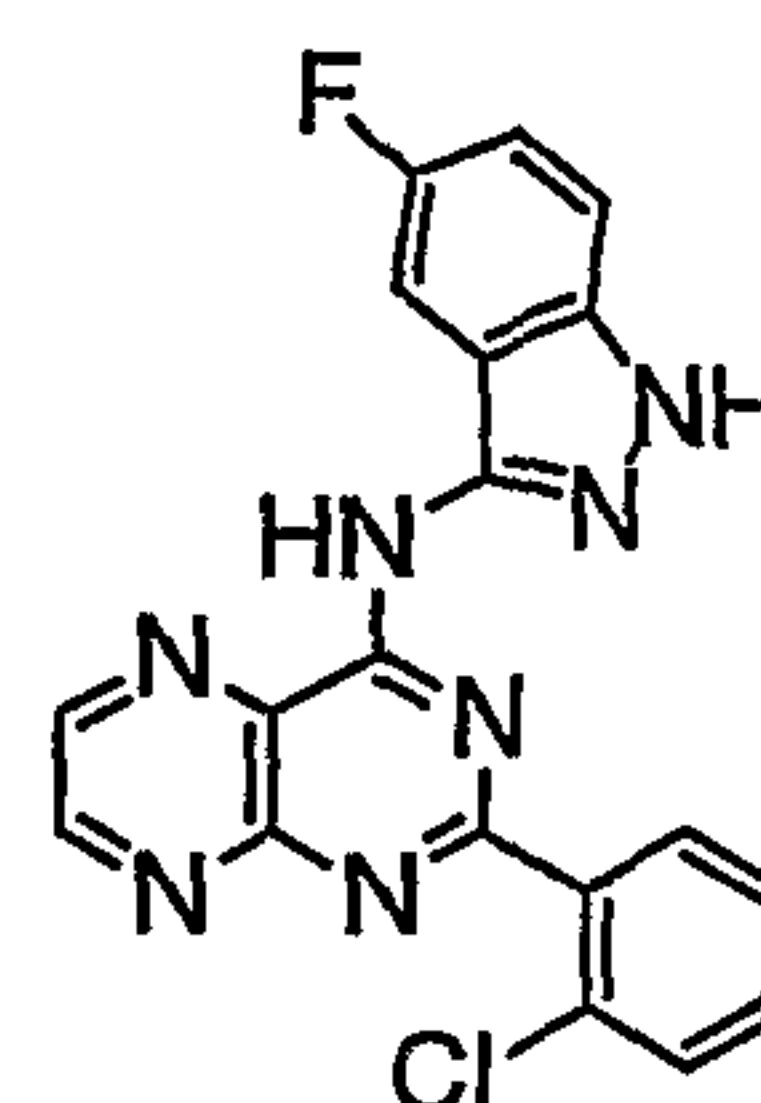
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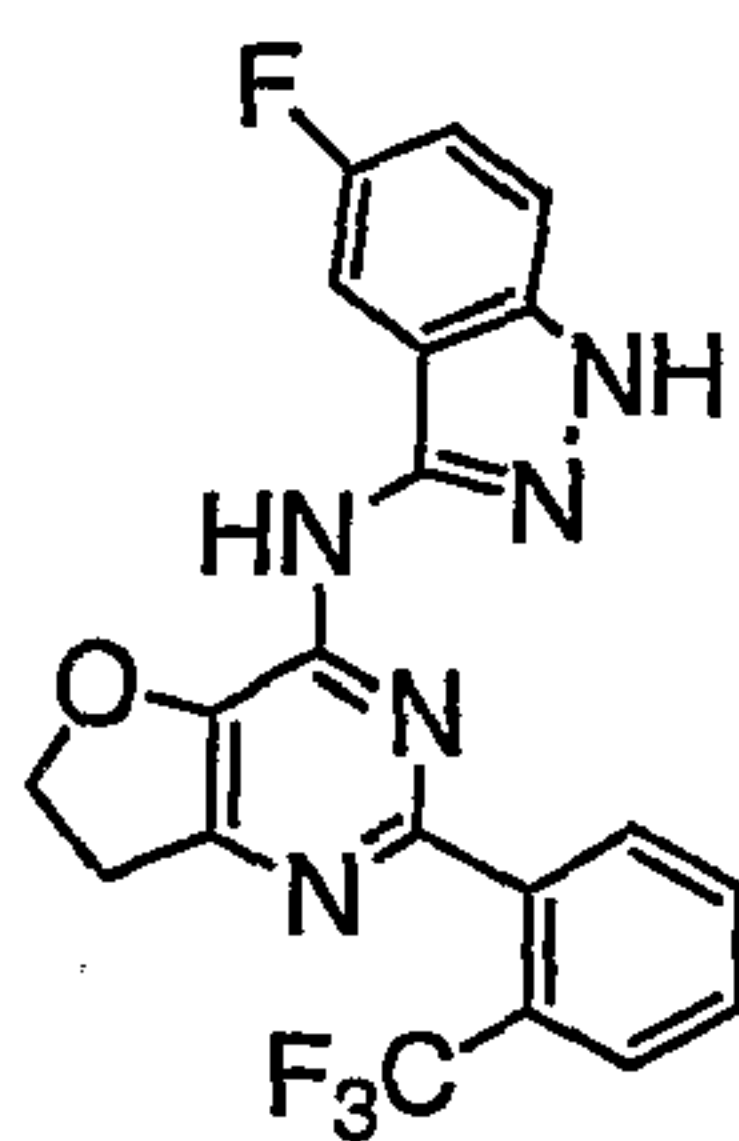
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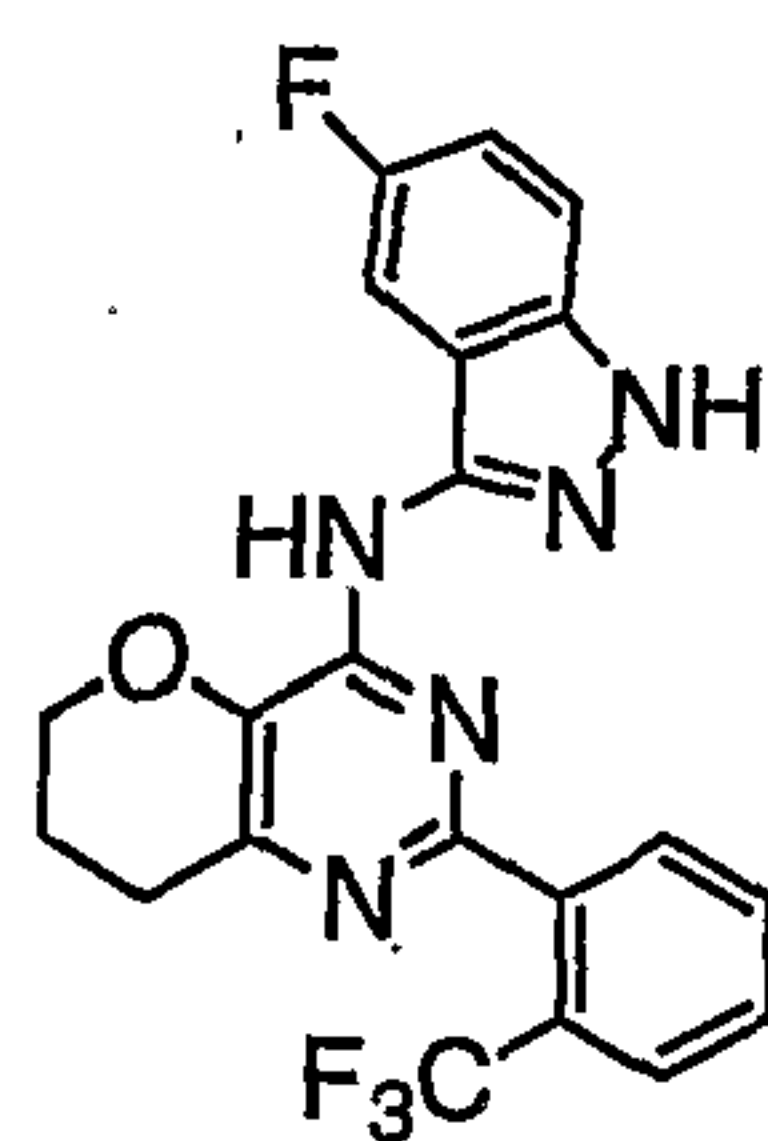
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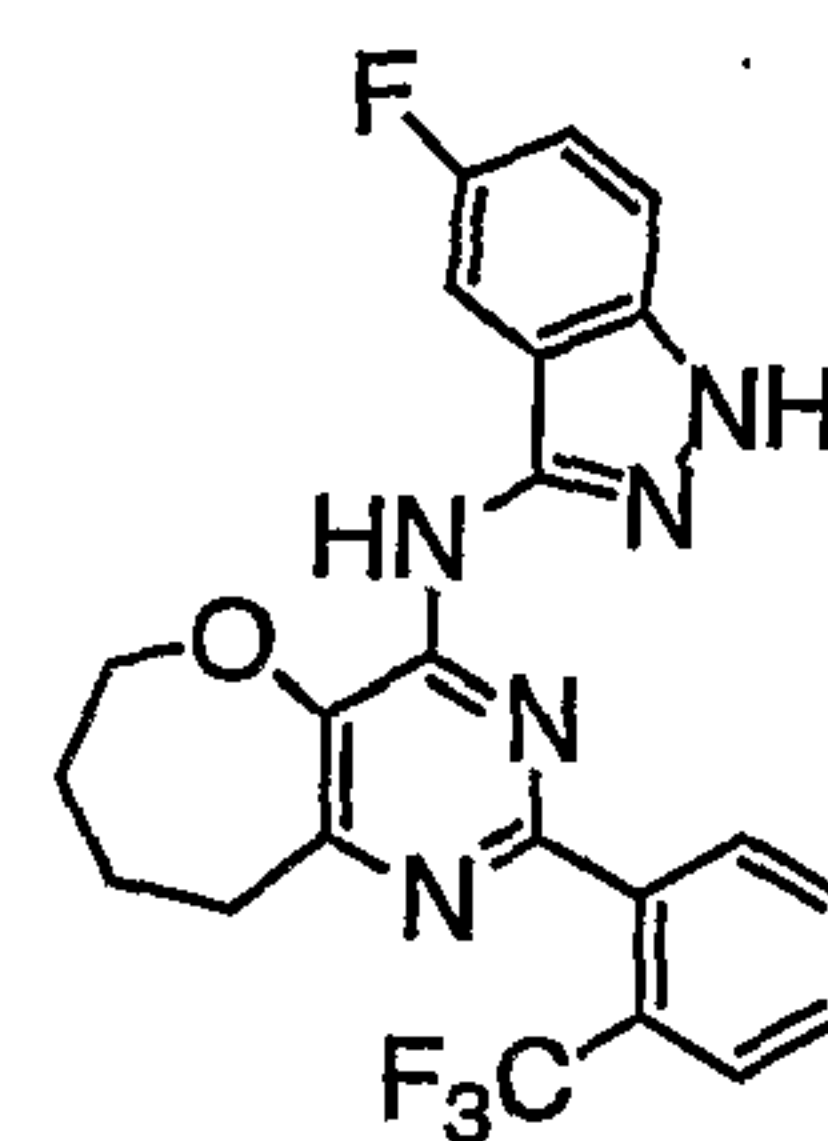
II-129



II-130

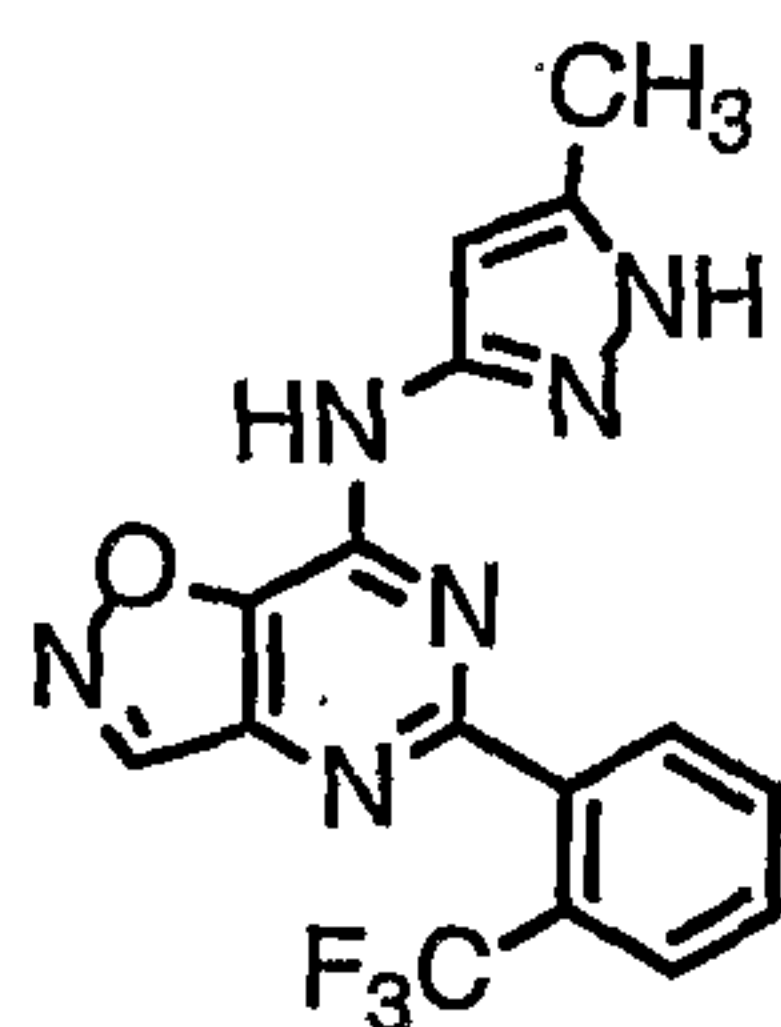


II-131

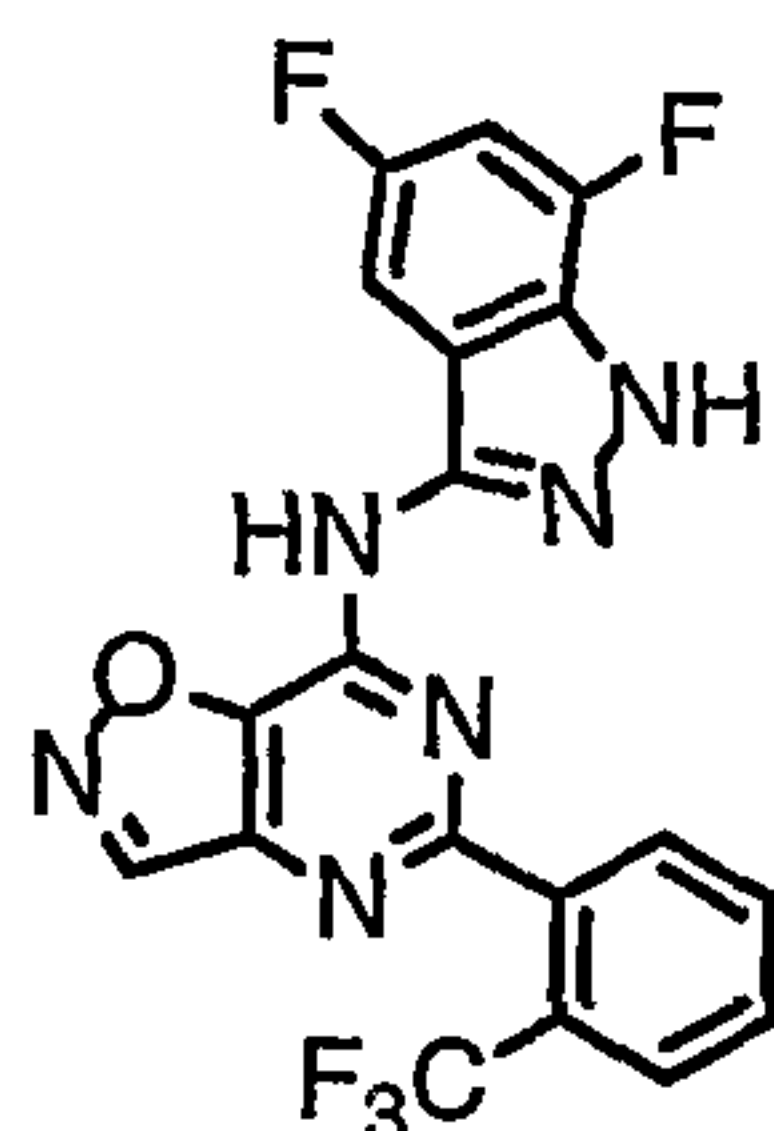


II-132

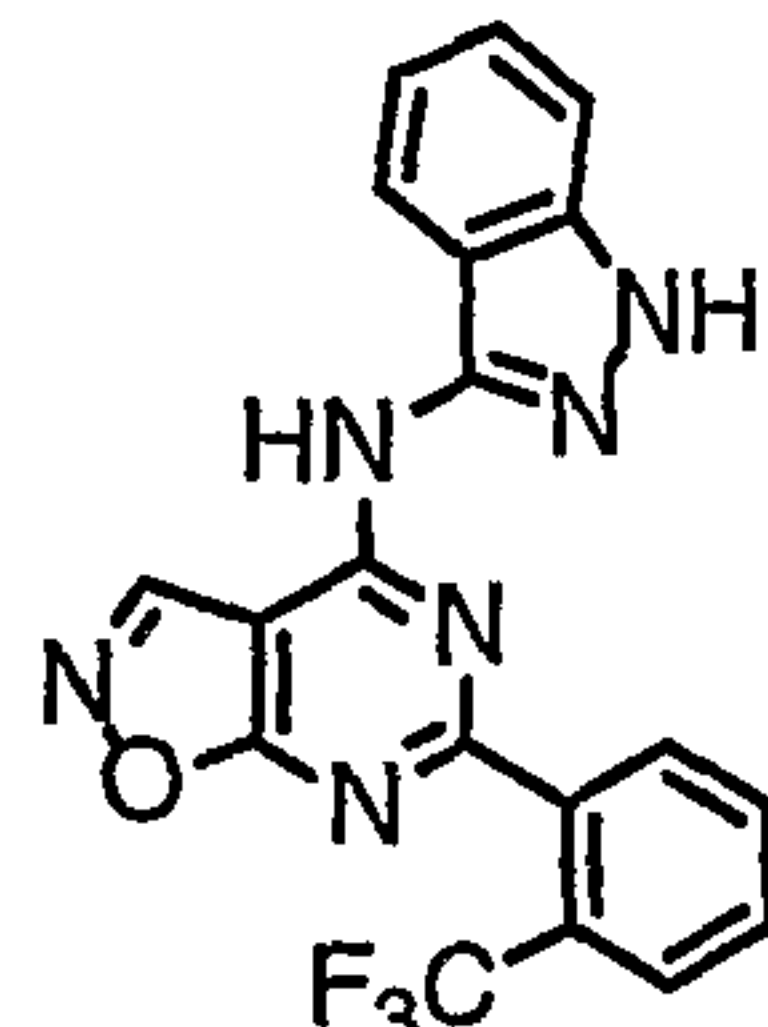
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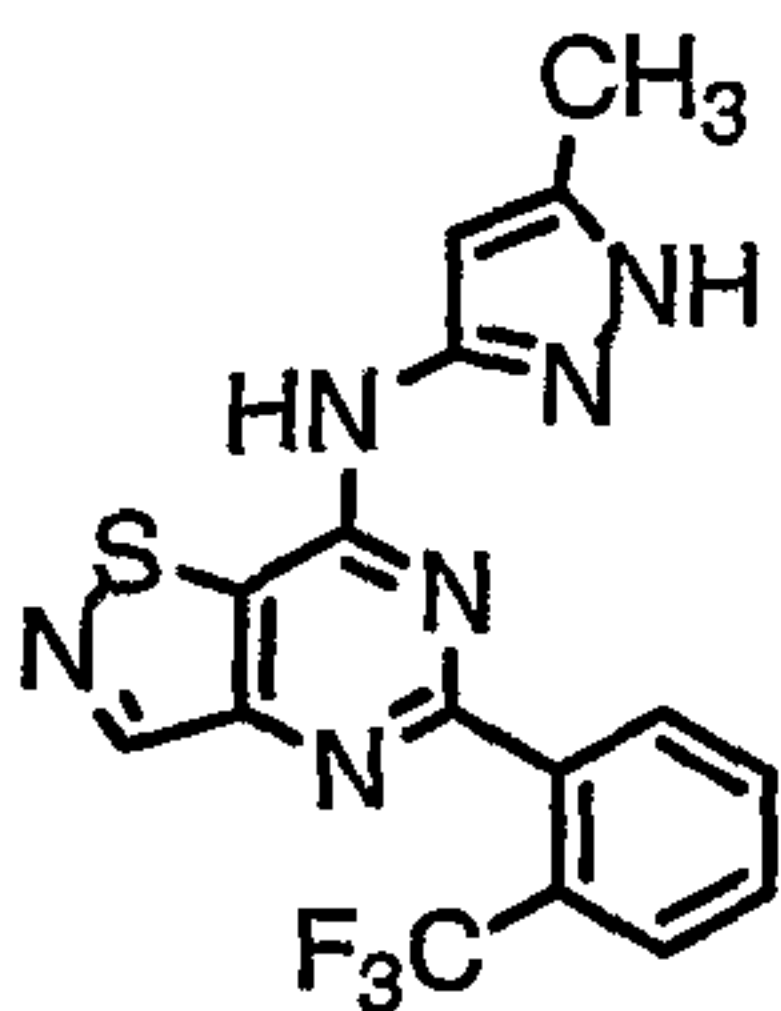
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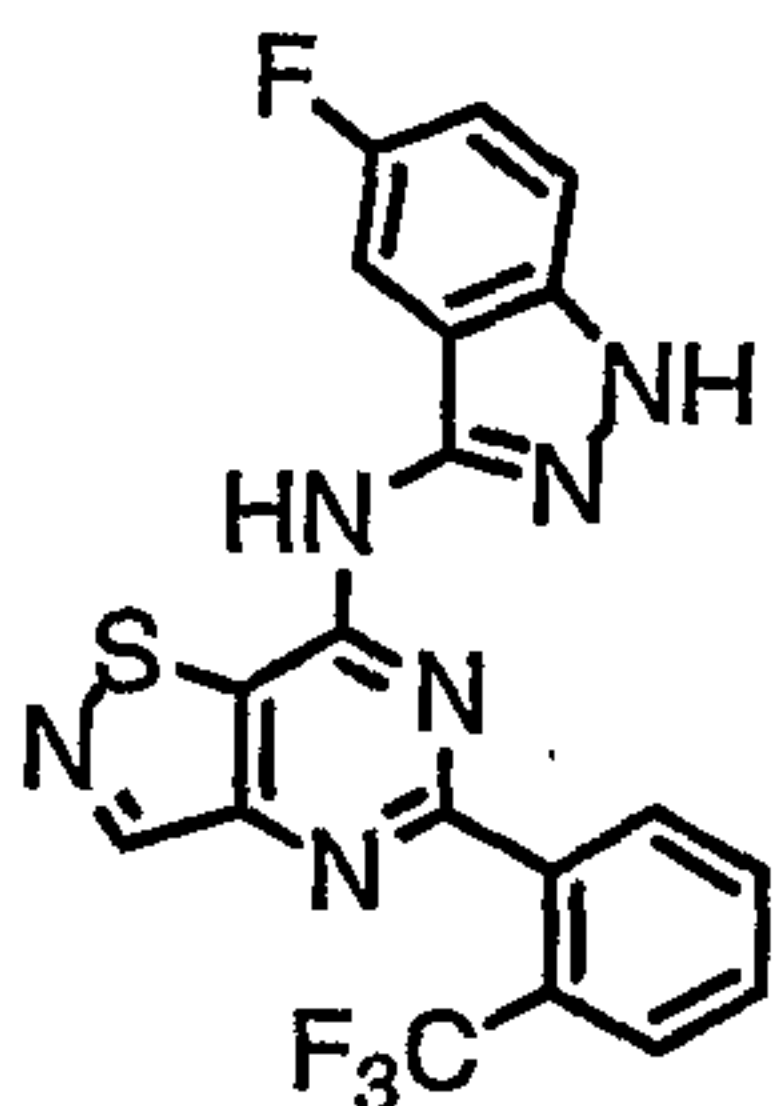
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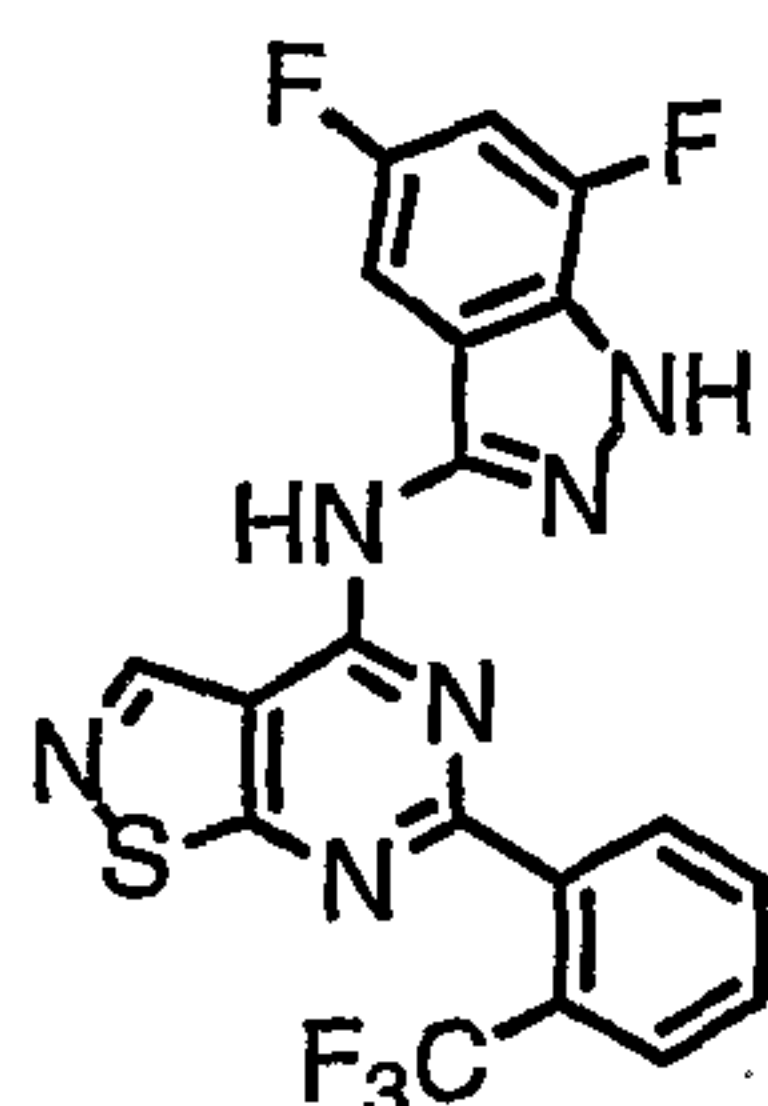
II-135



II-136

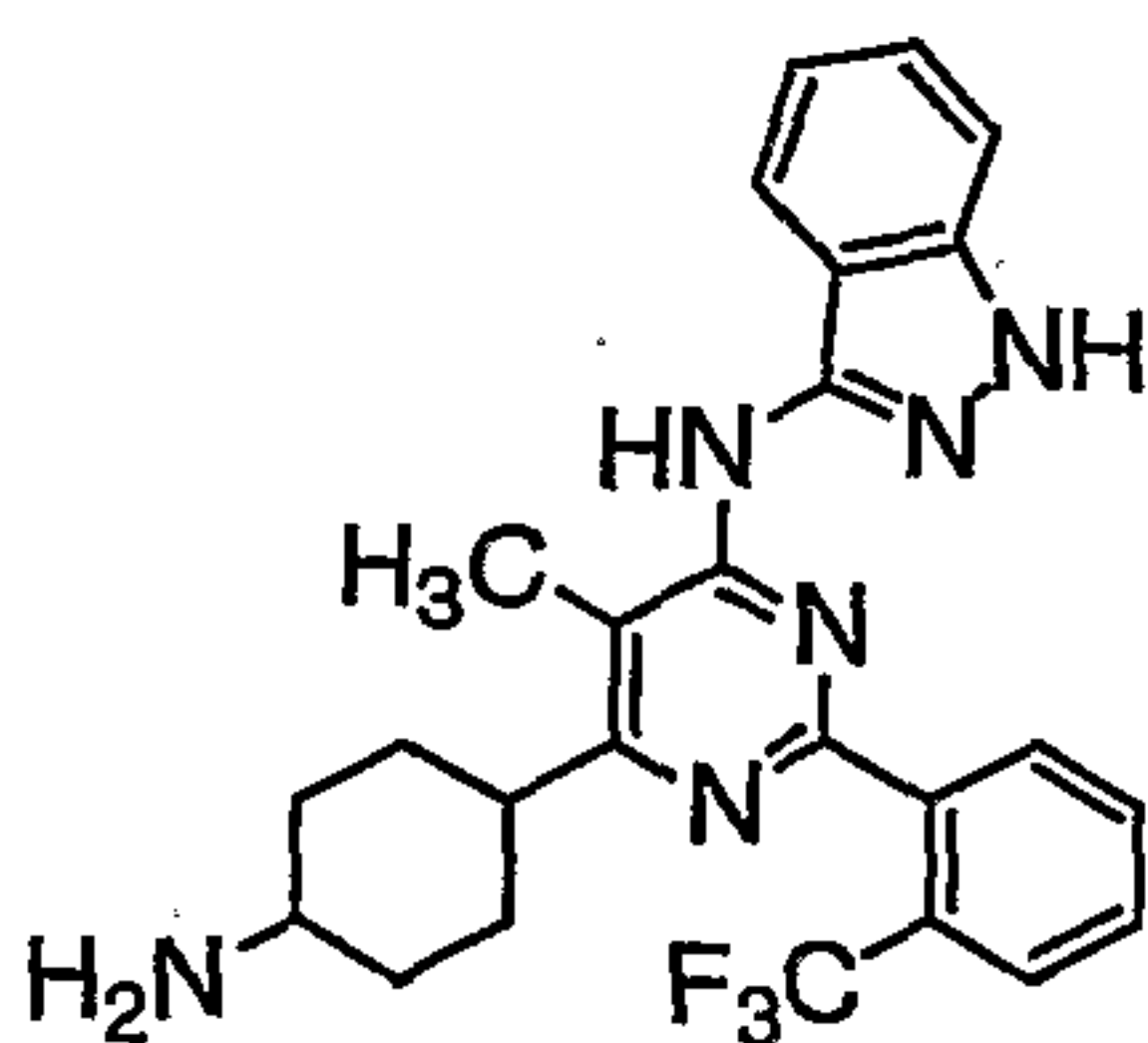


II-137

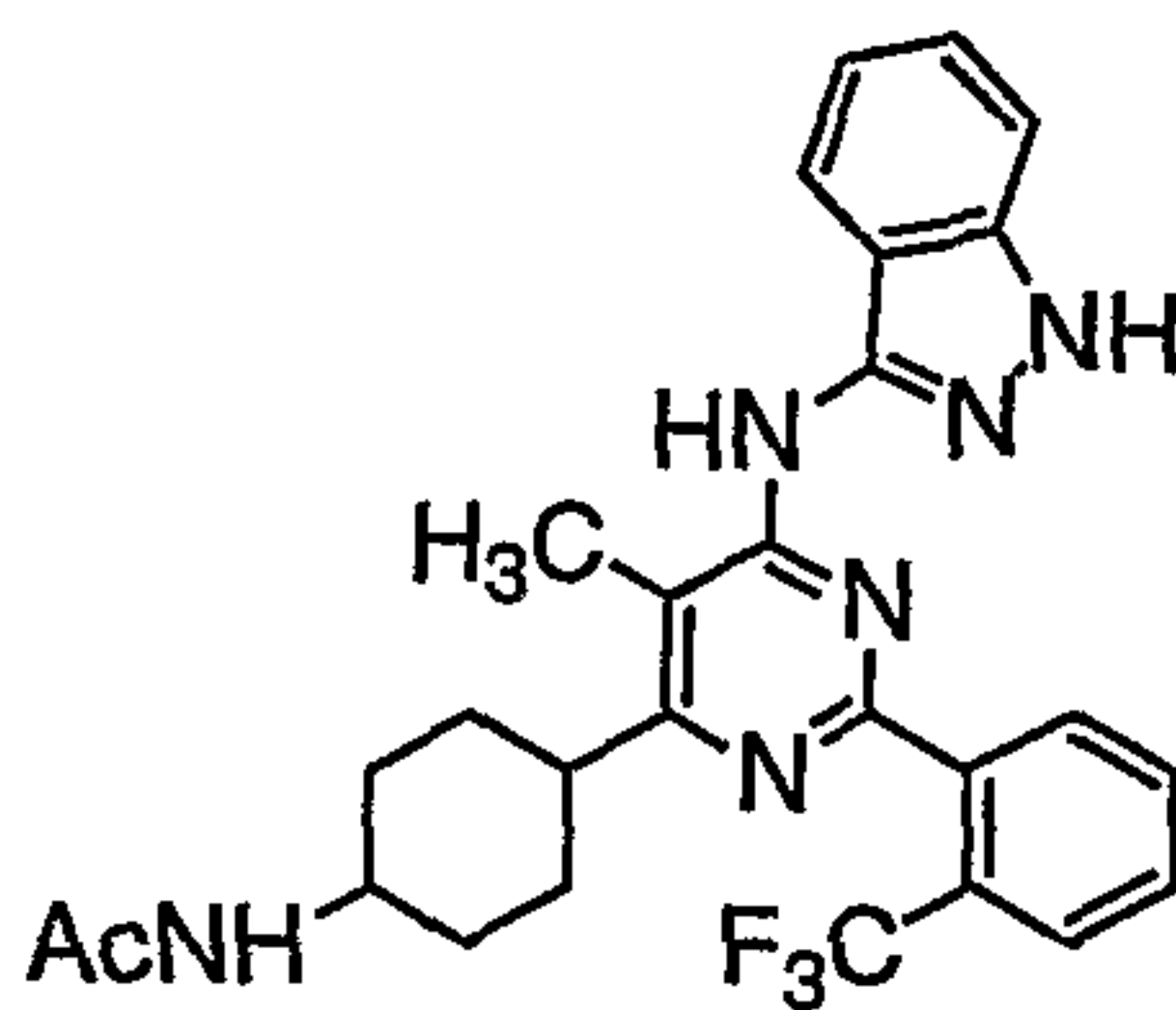


II-138

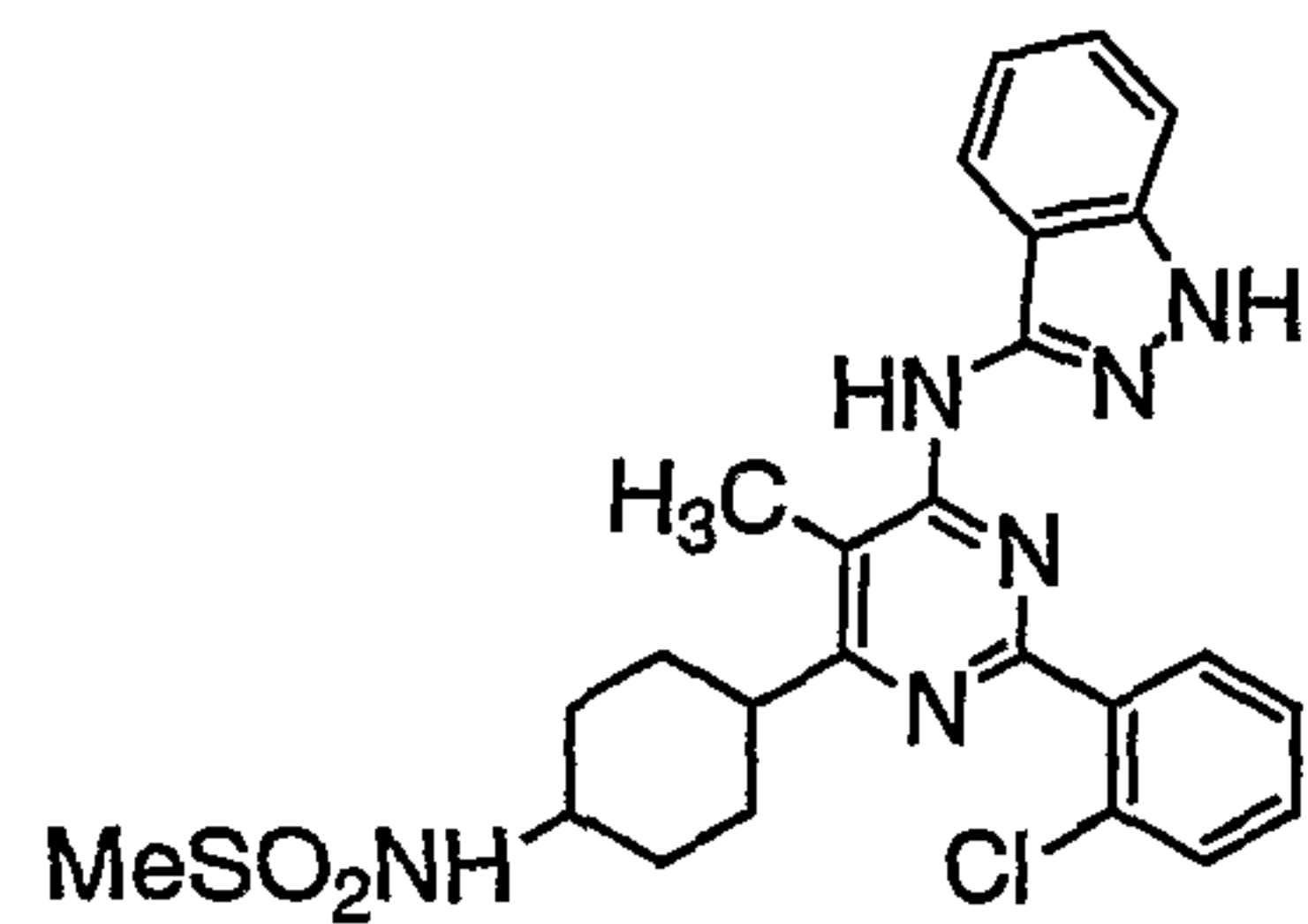
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II-139

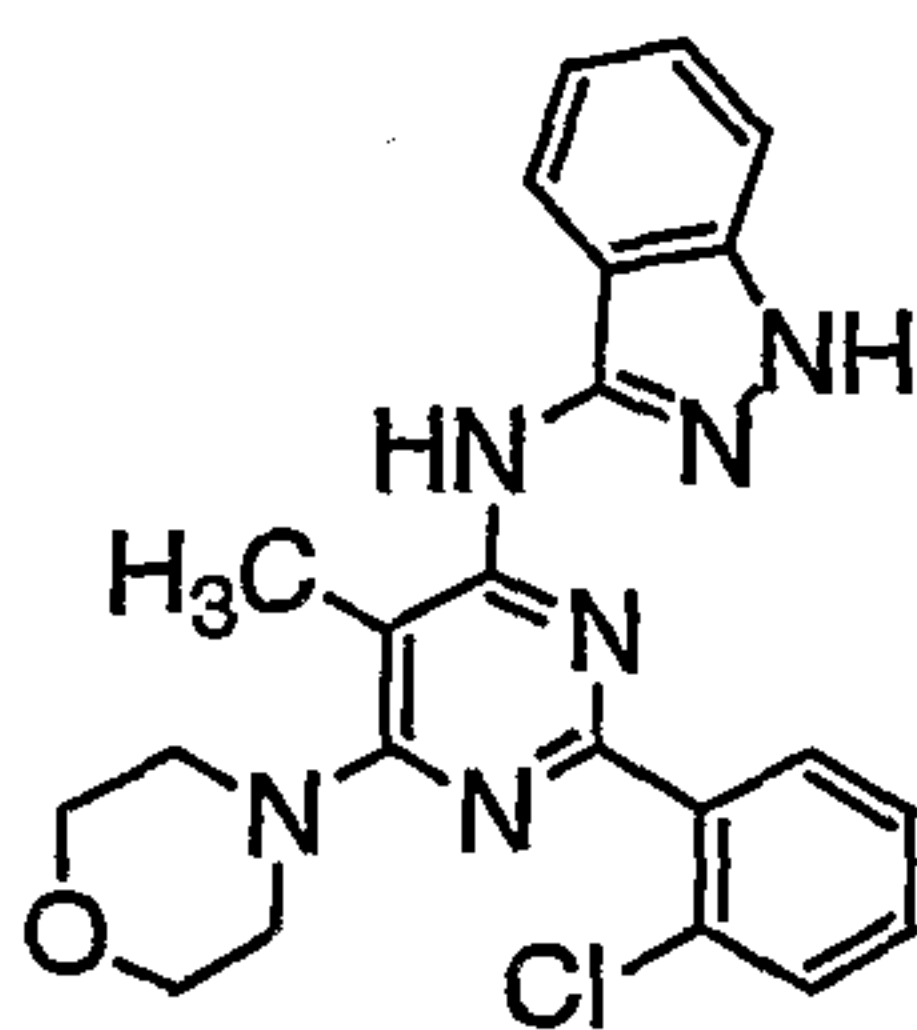


II-140

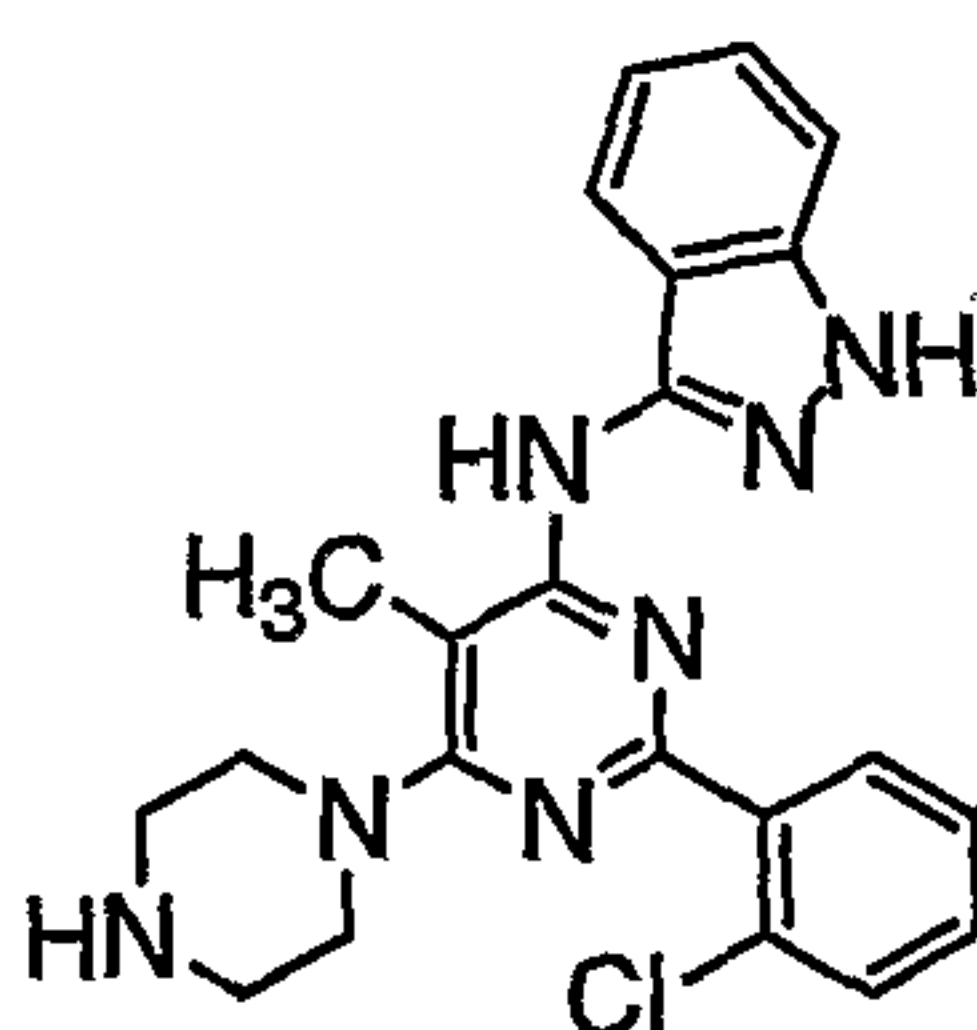


II-141

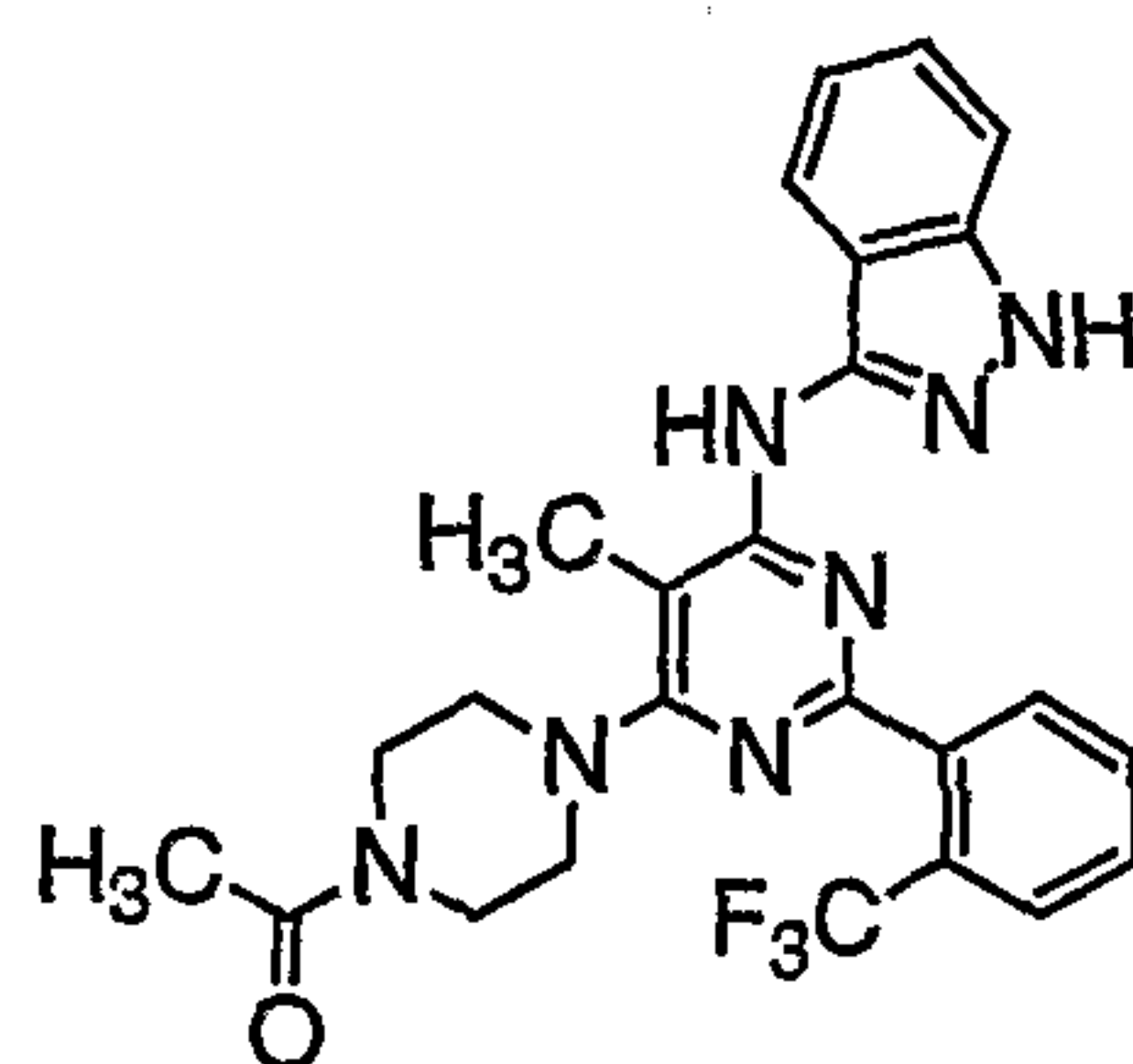
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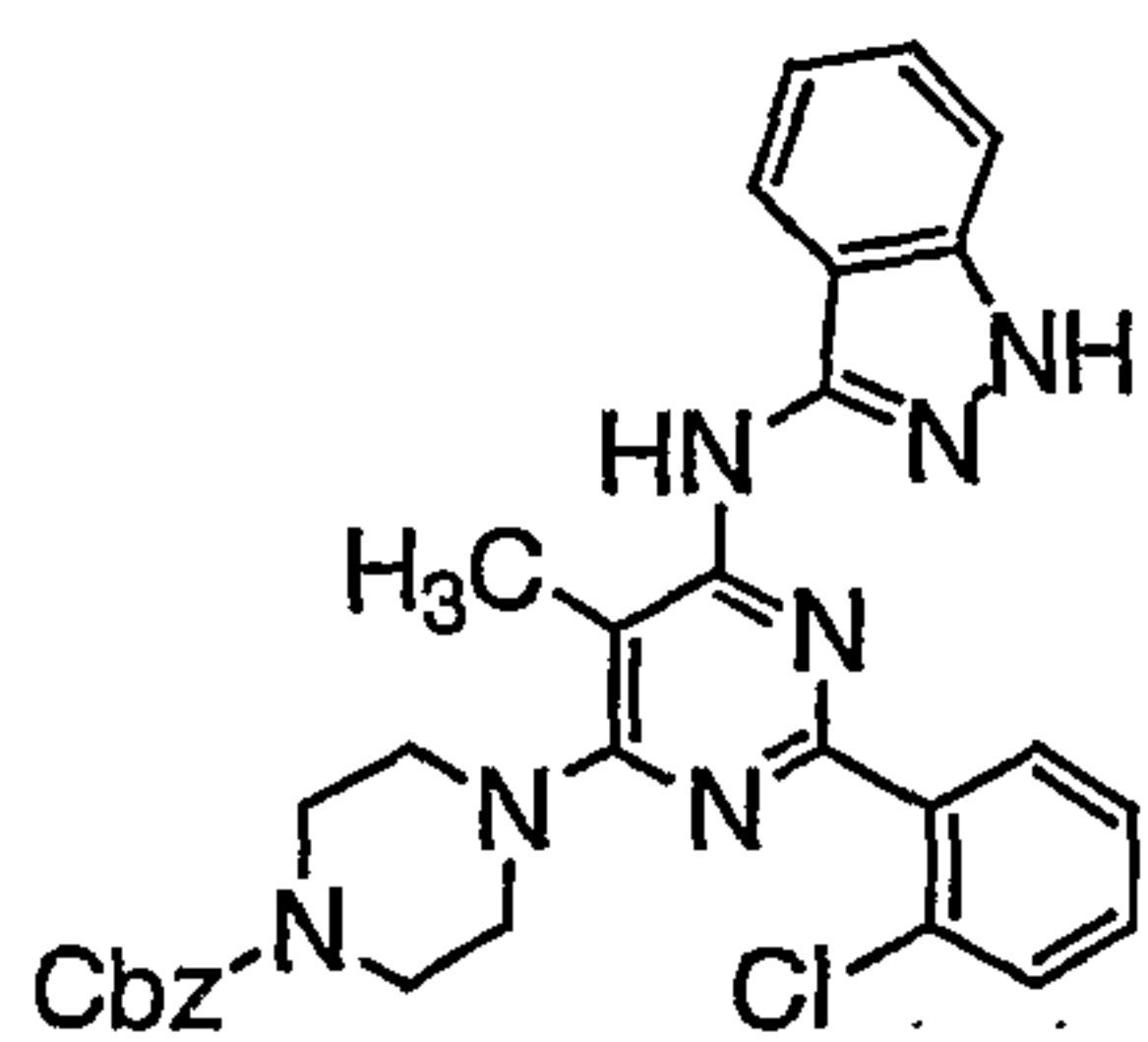
II-142



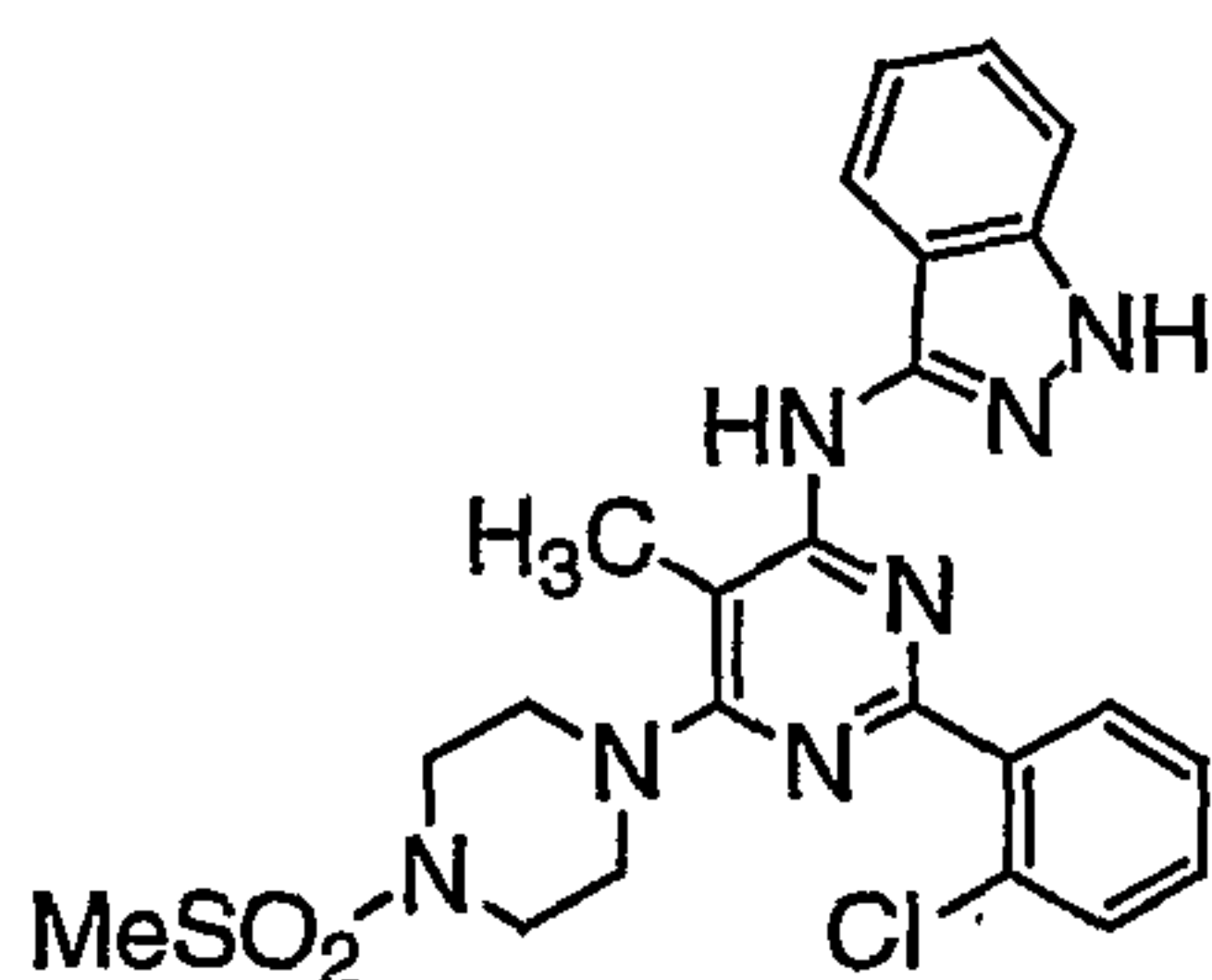
II-143



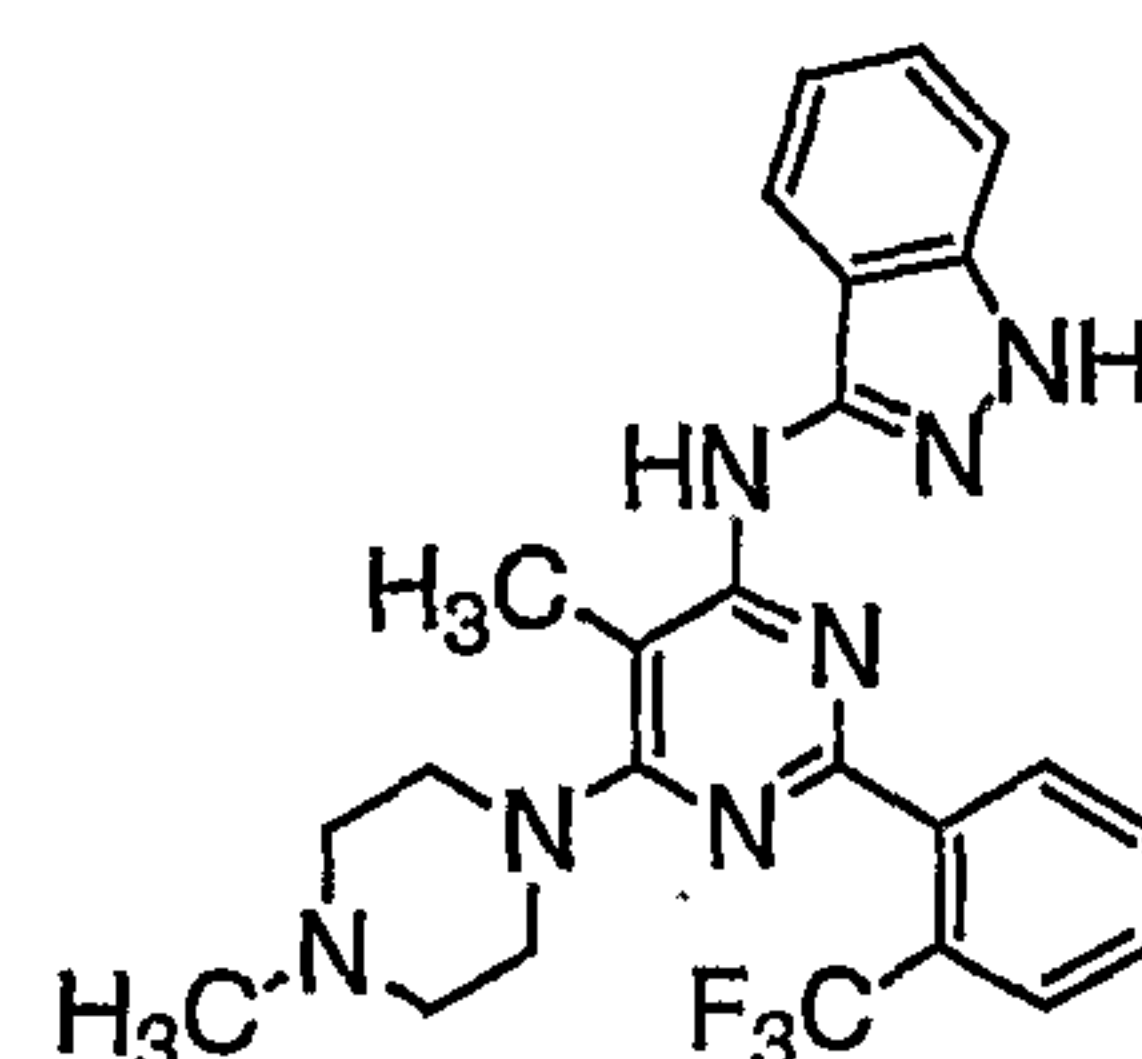
II-144



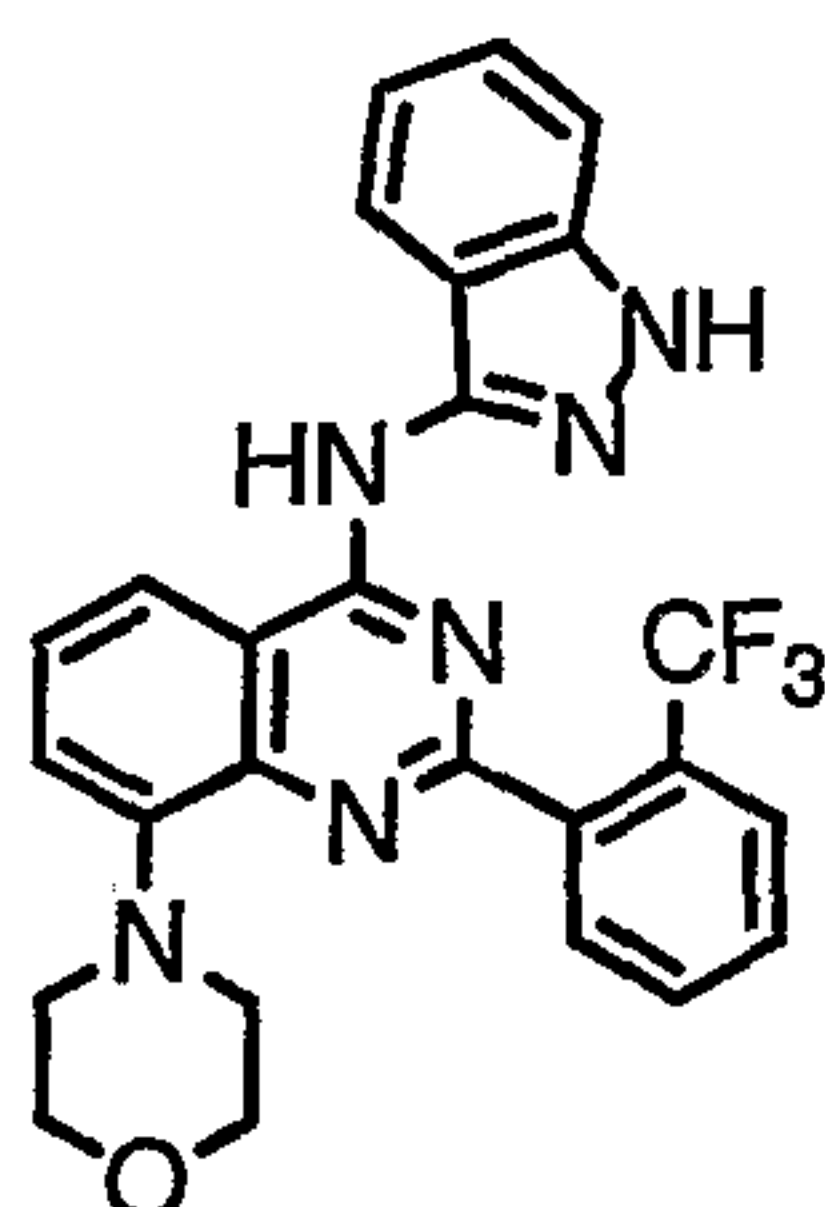
II-145



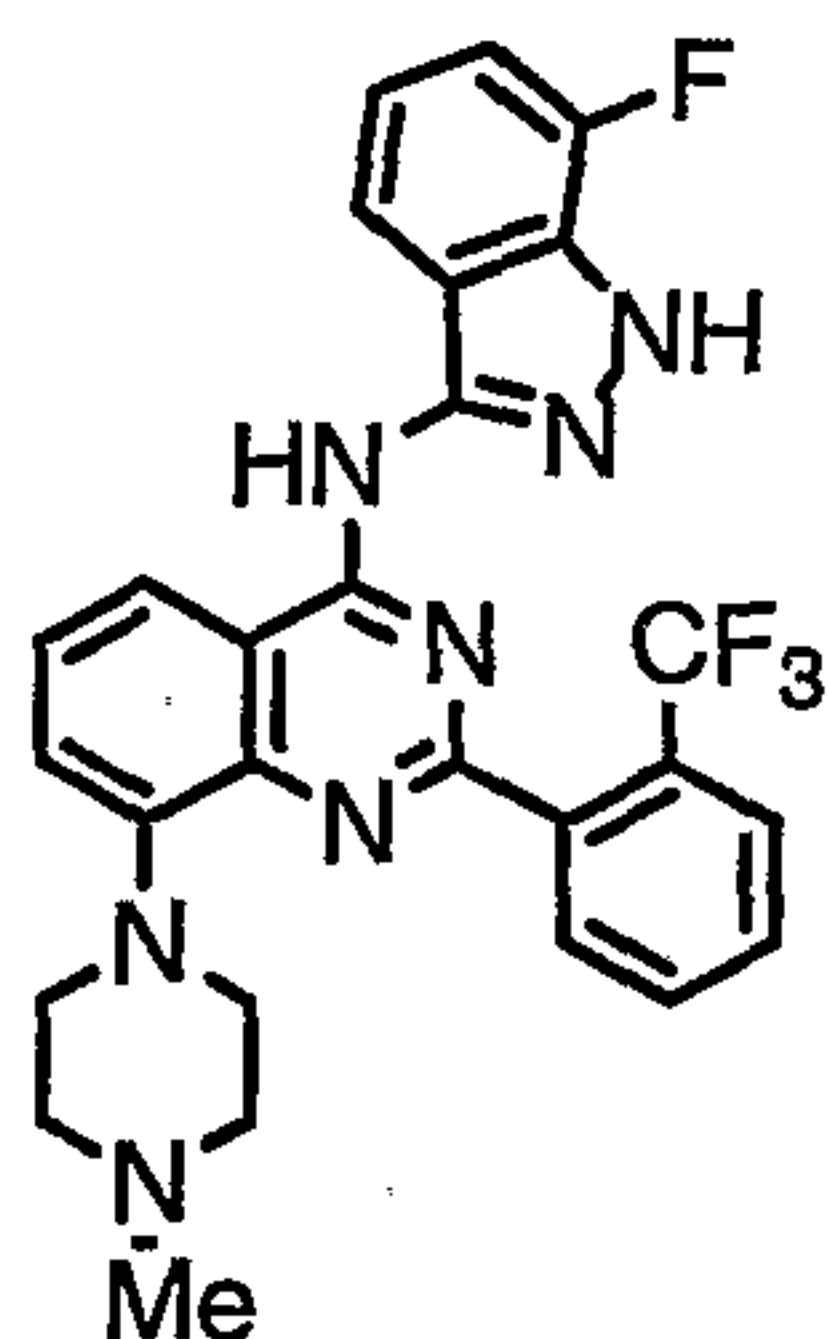
II-146



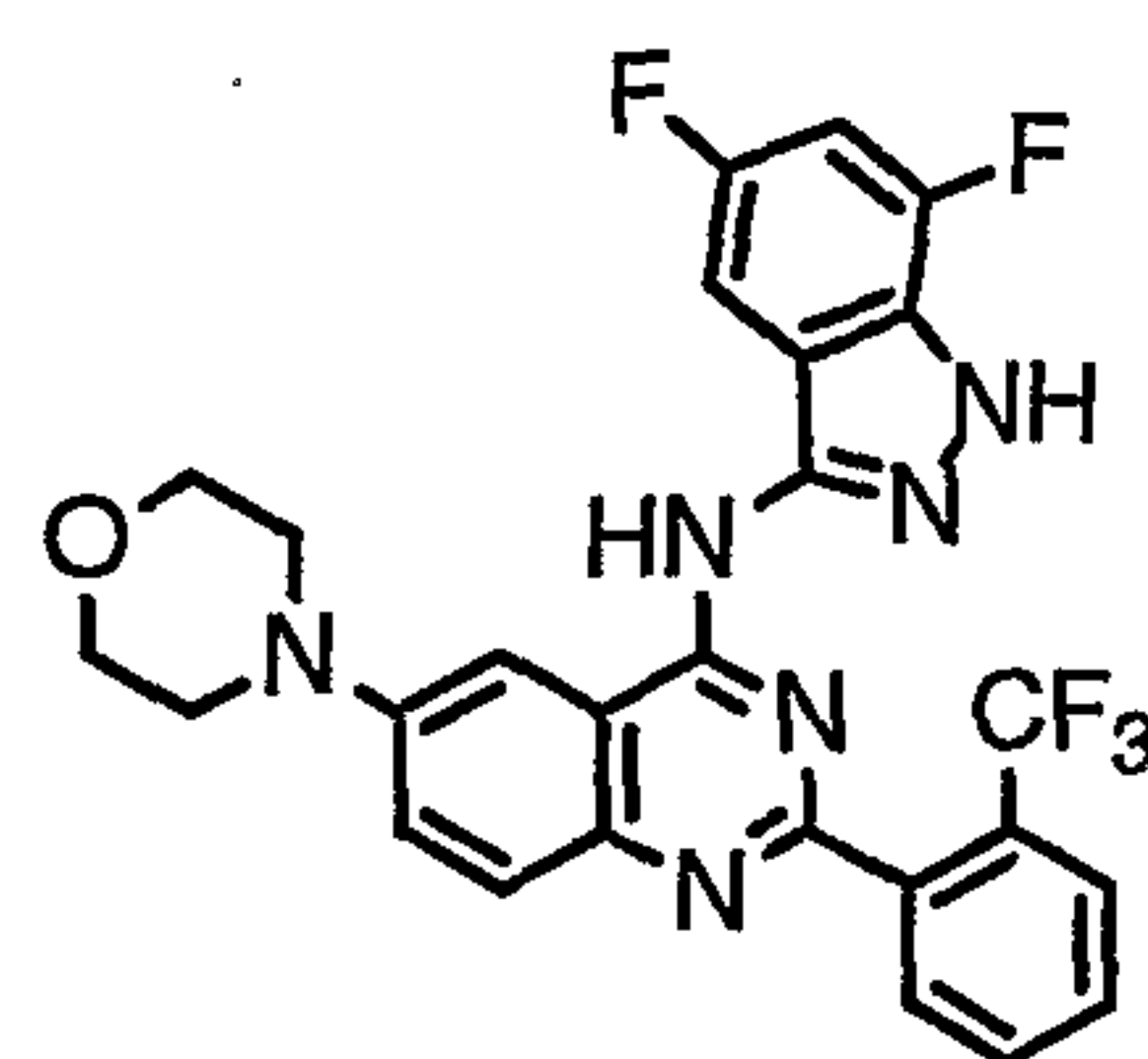
II-147



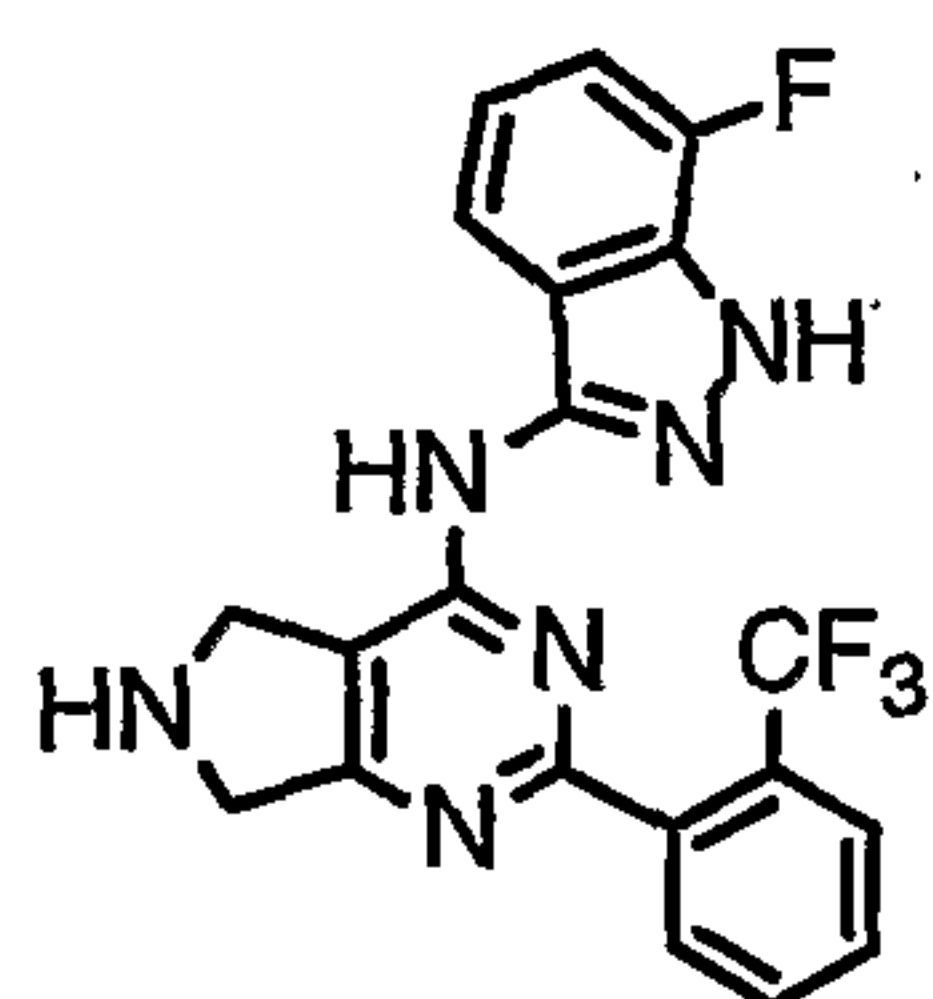
II-148



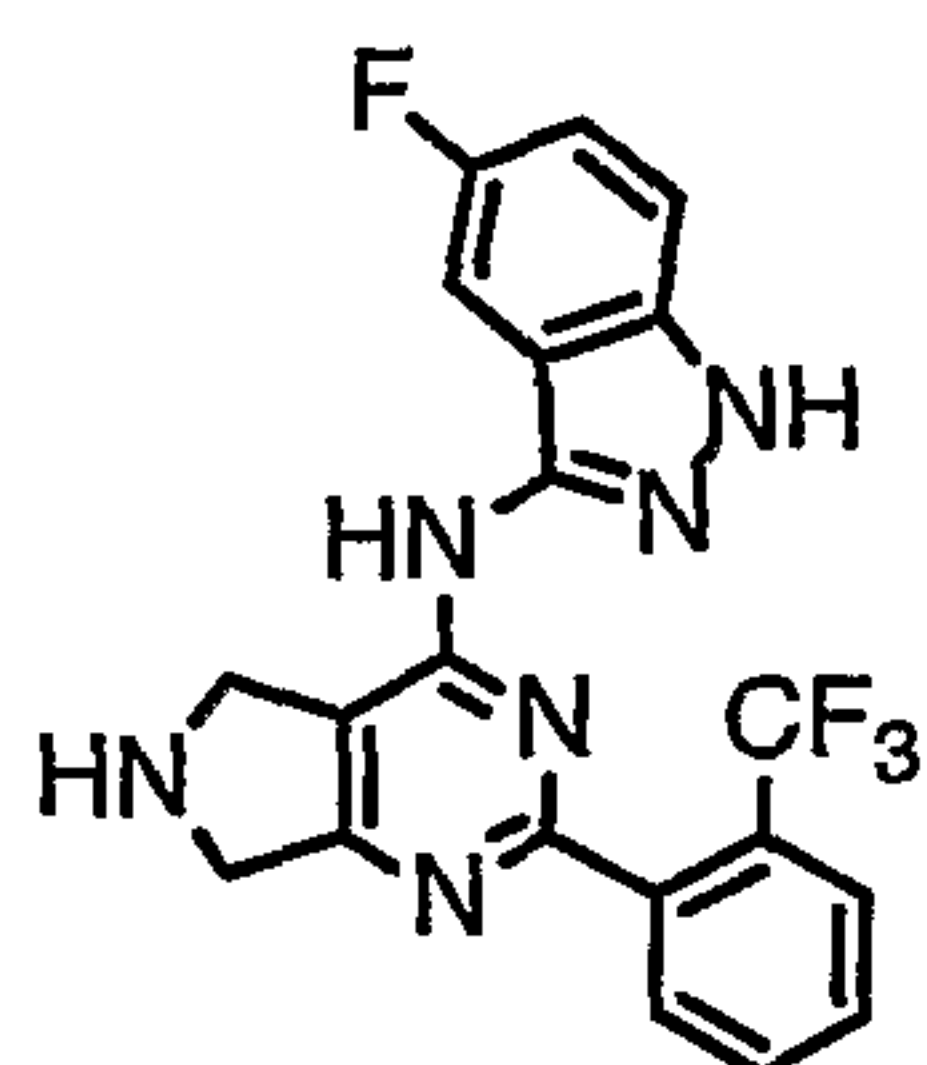
II-149



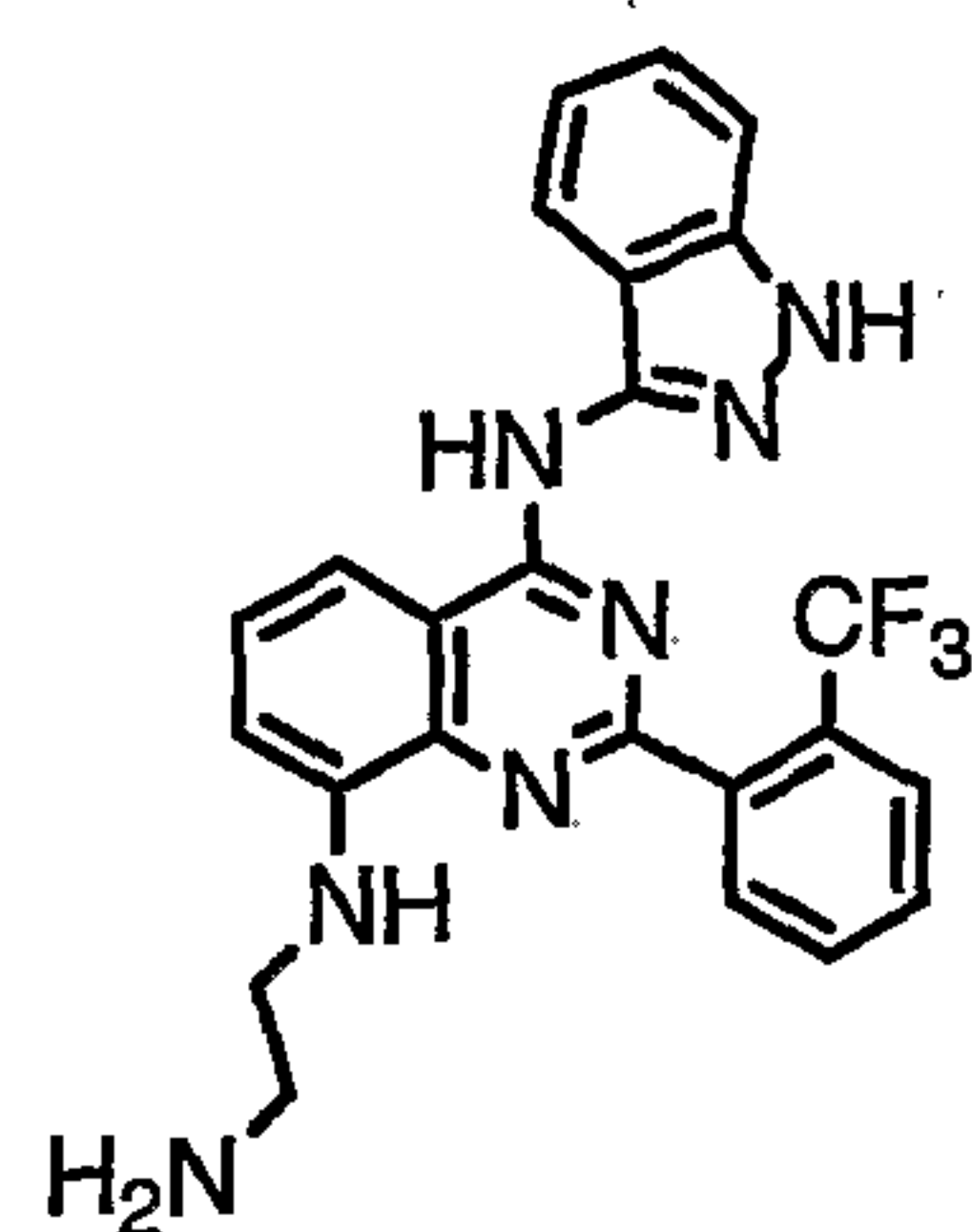
II-150



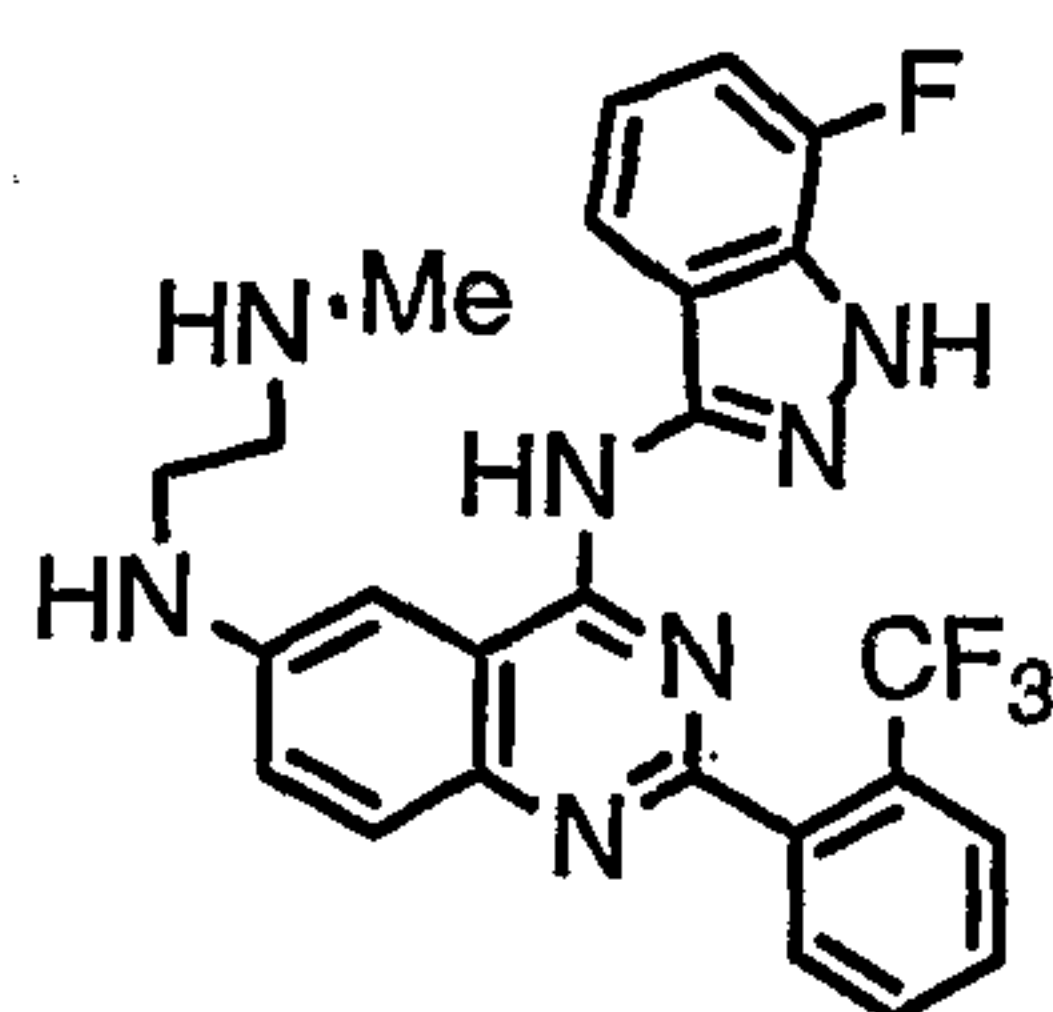
II-151



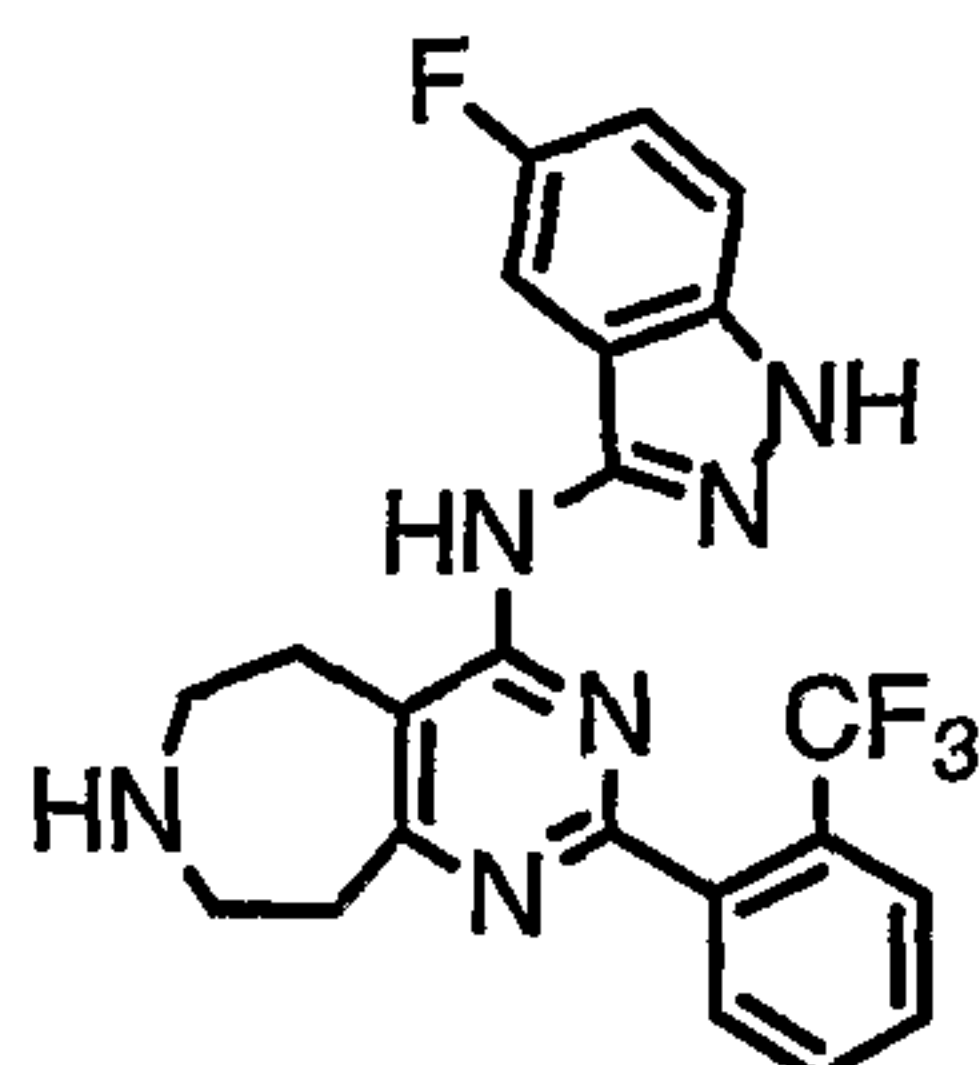
II-152



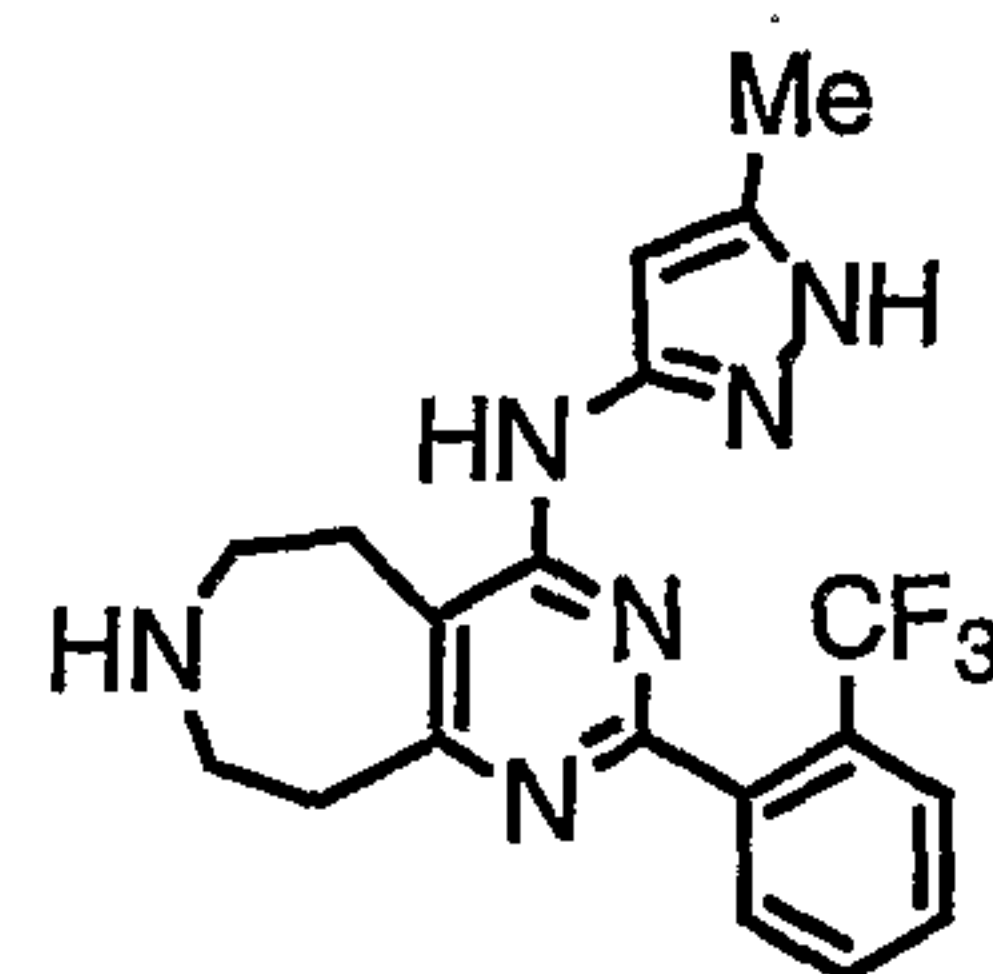
II-153



II-154



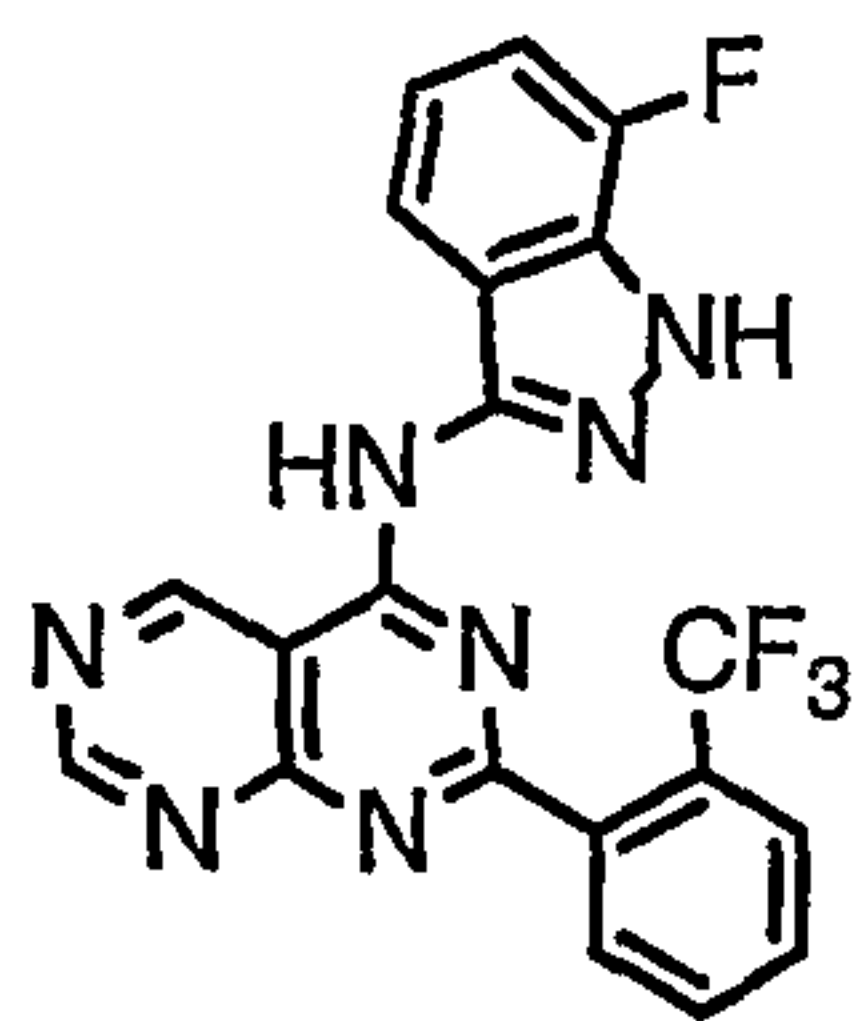
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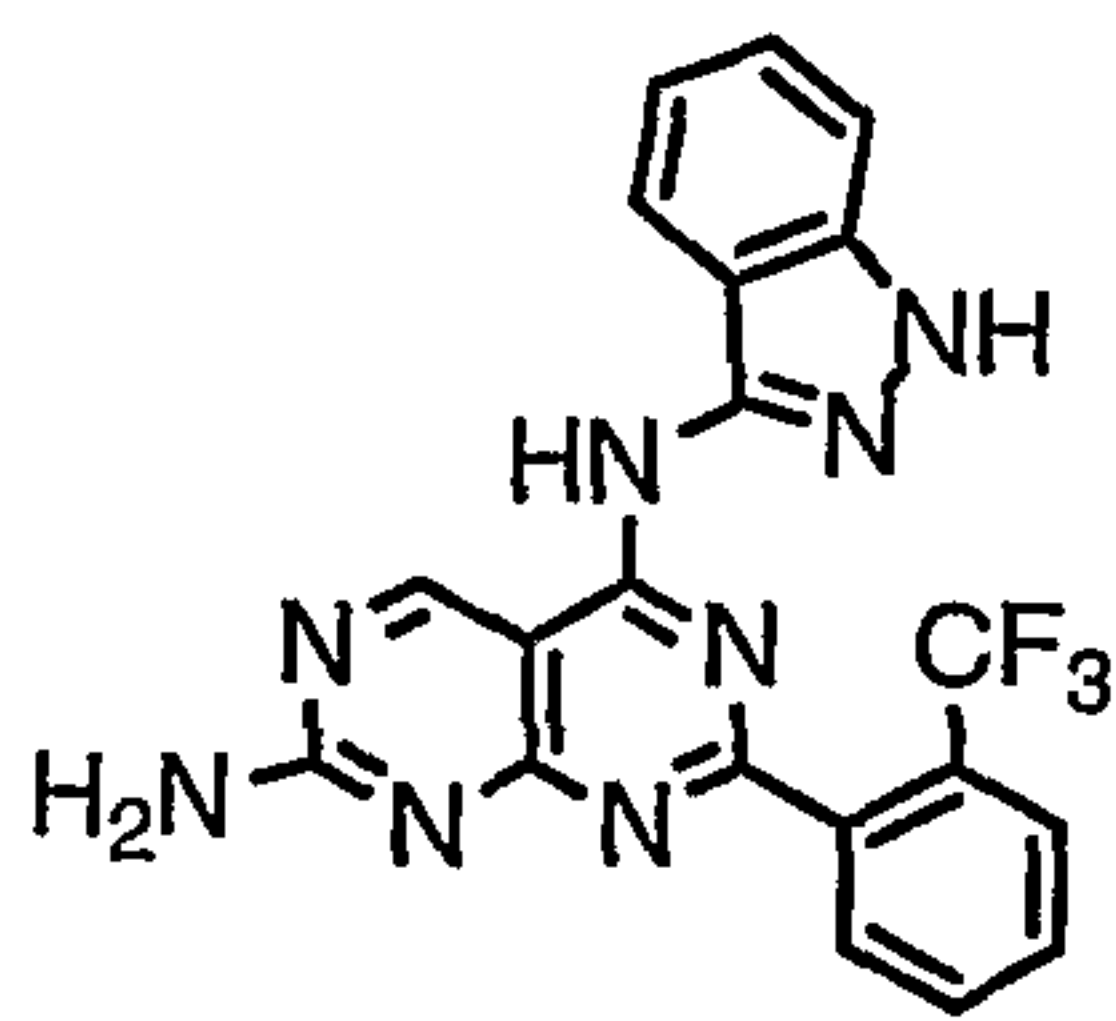
II-156

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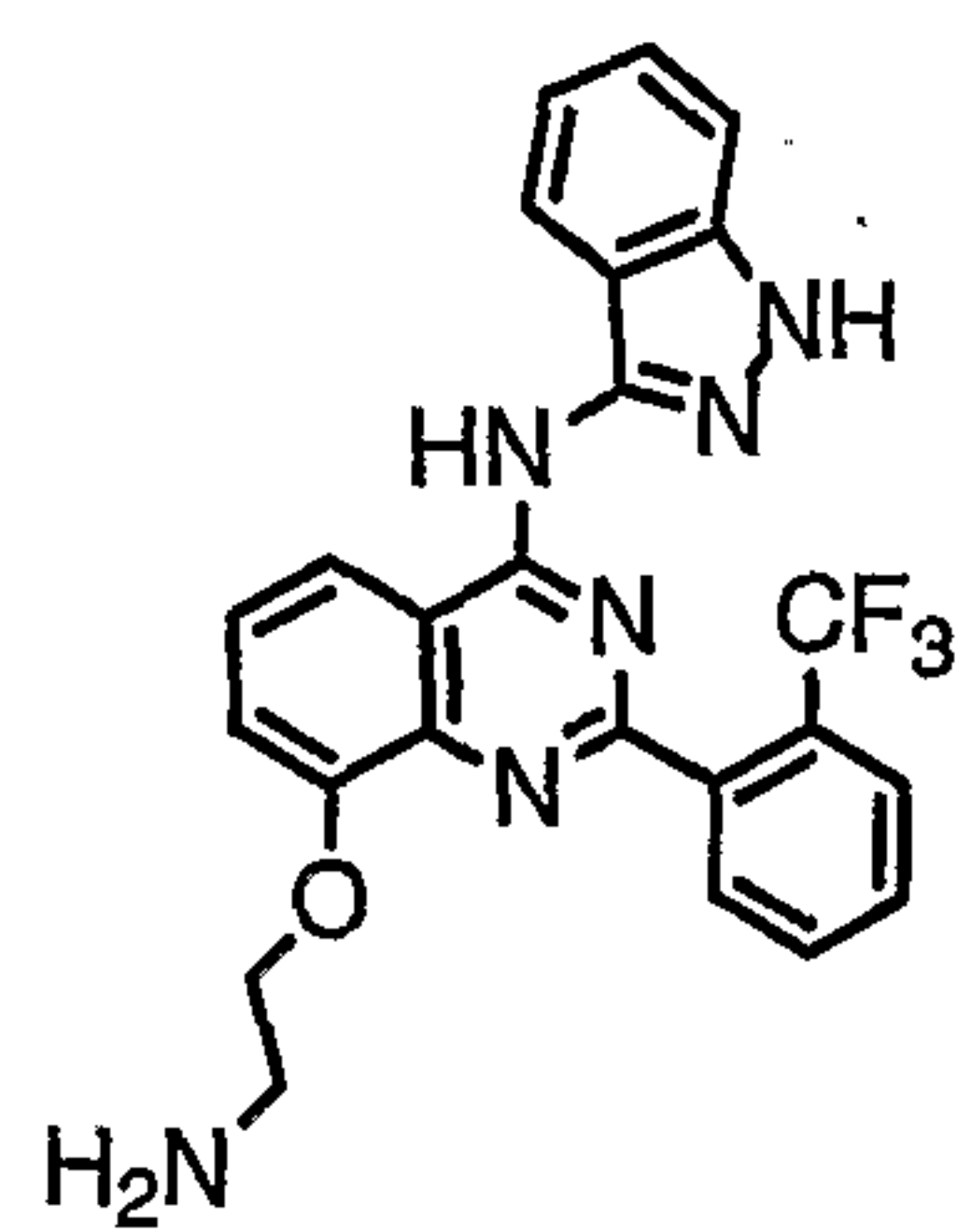
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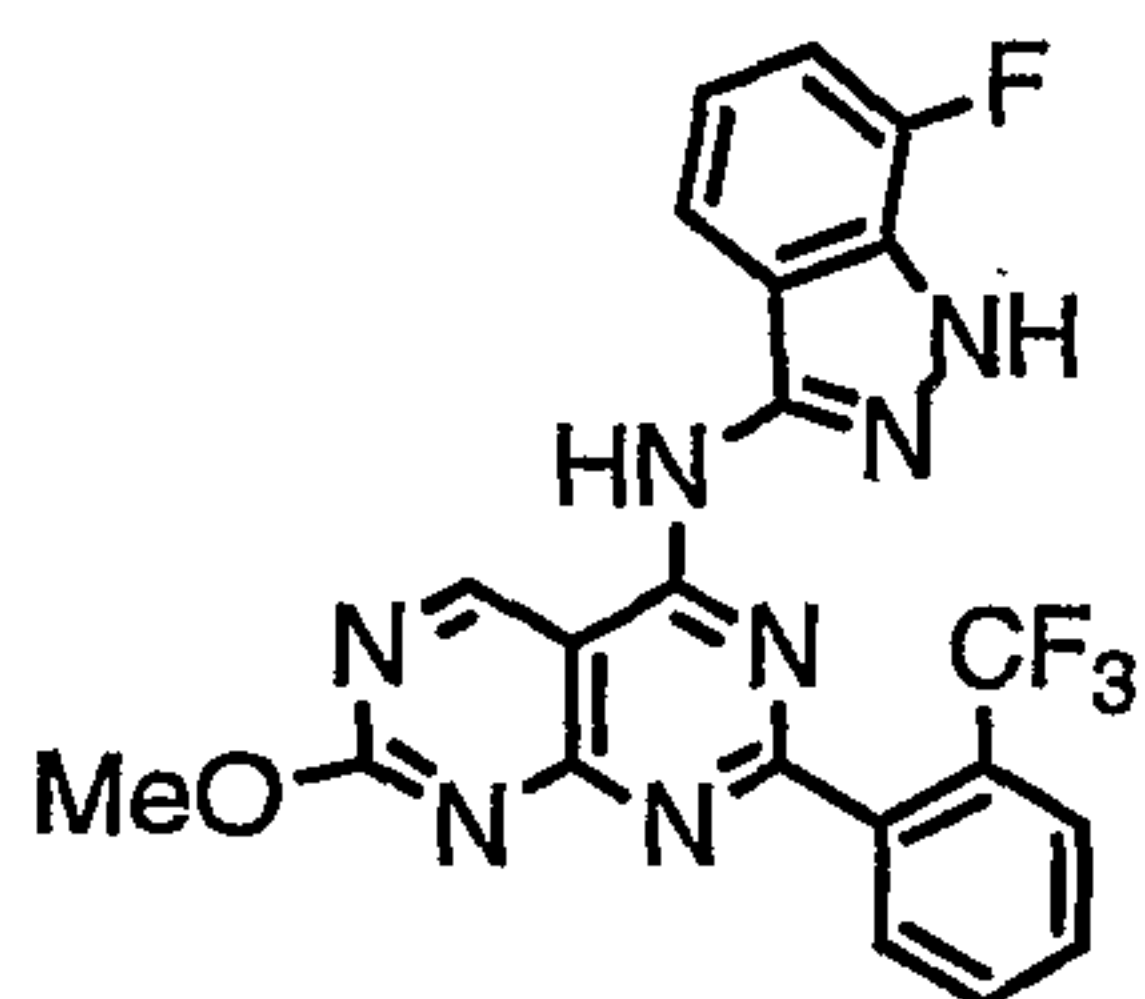
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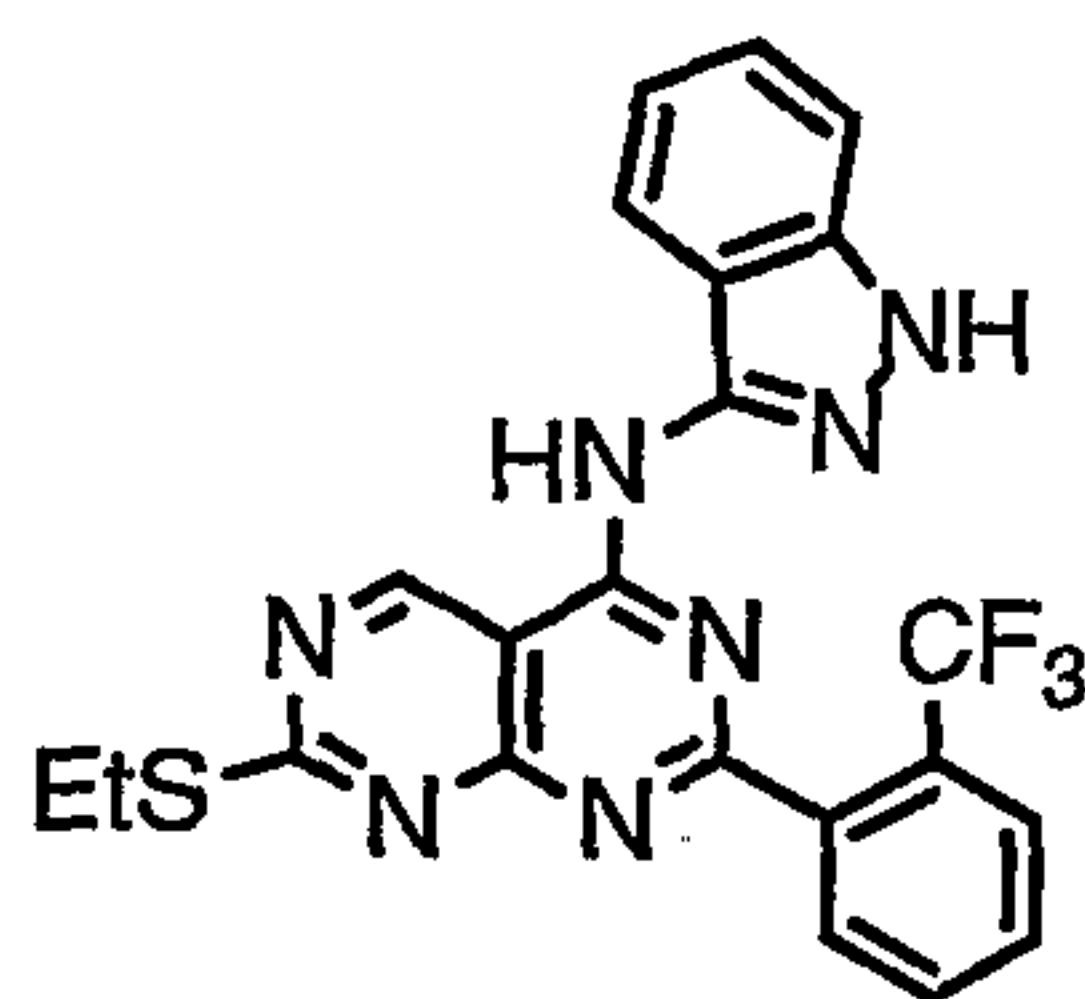
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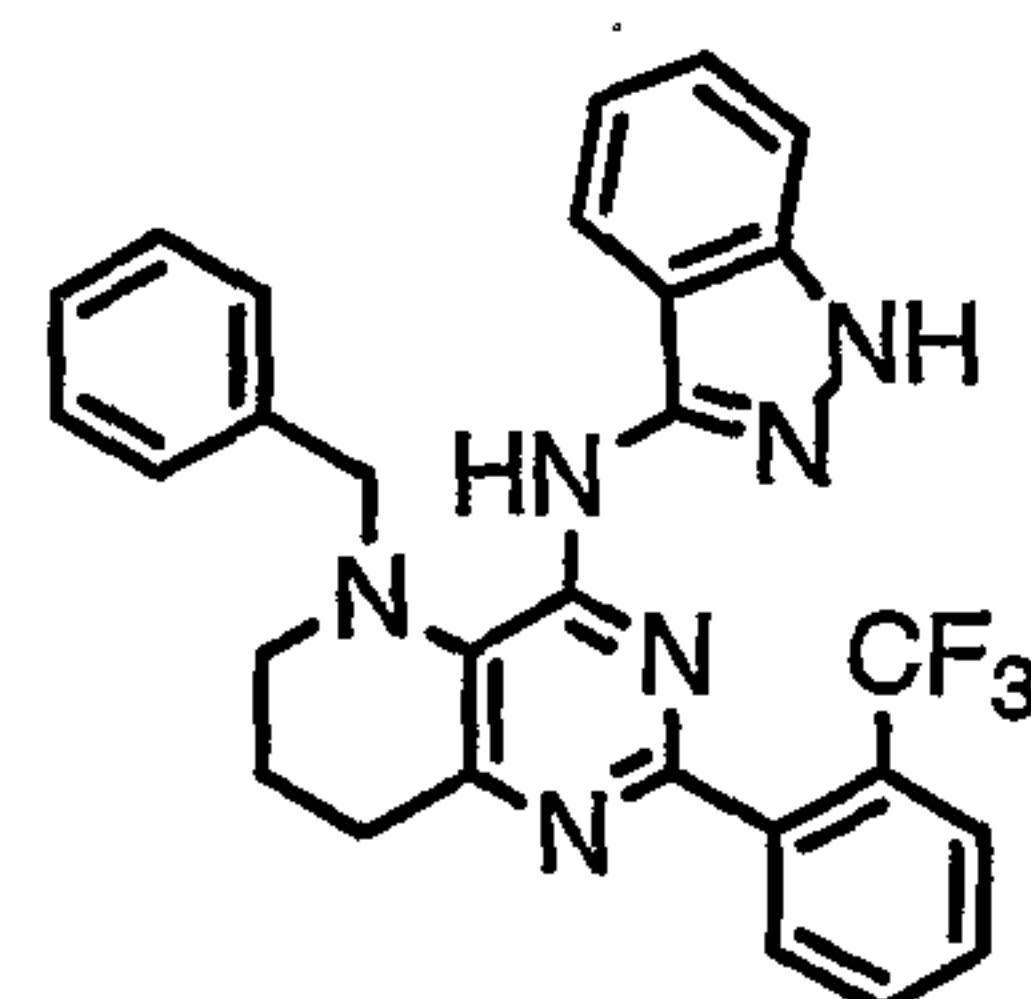
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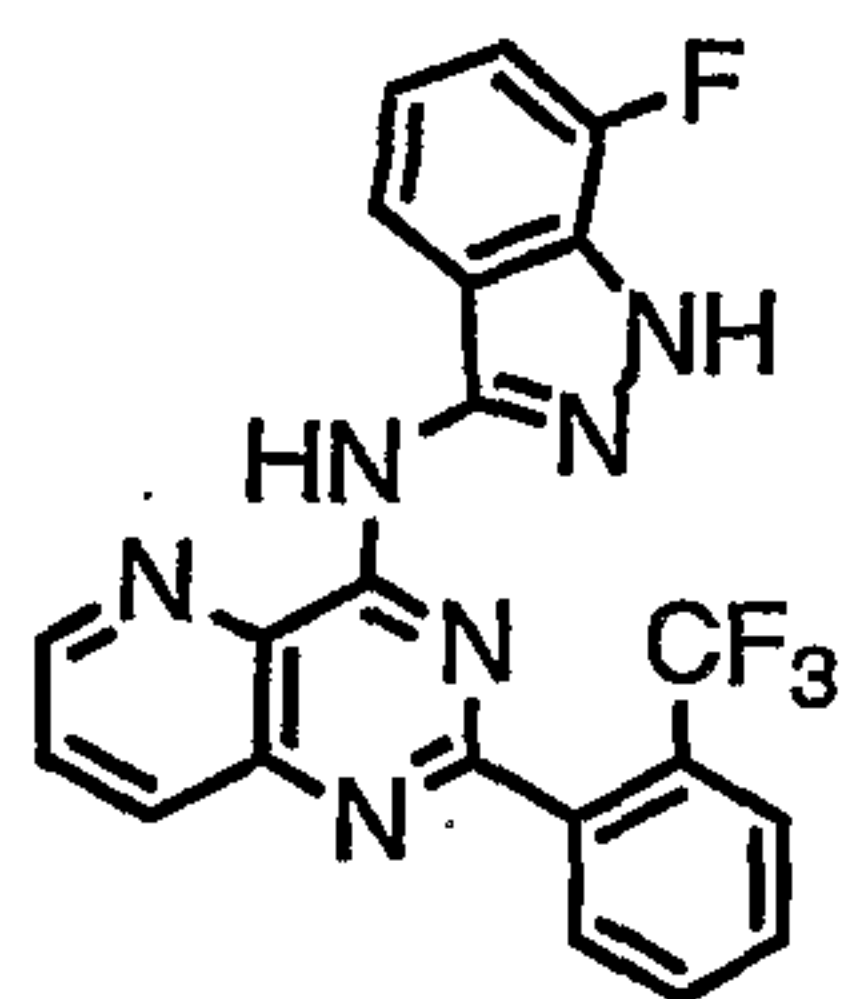
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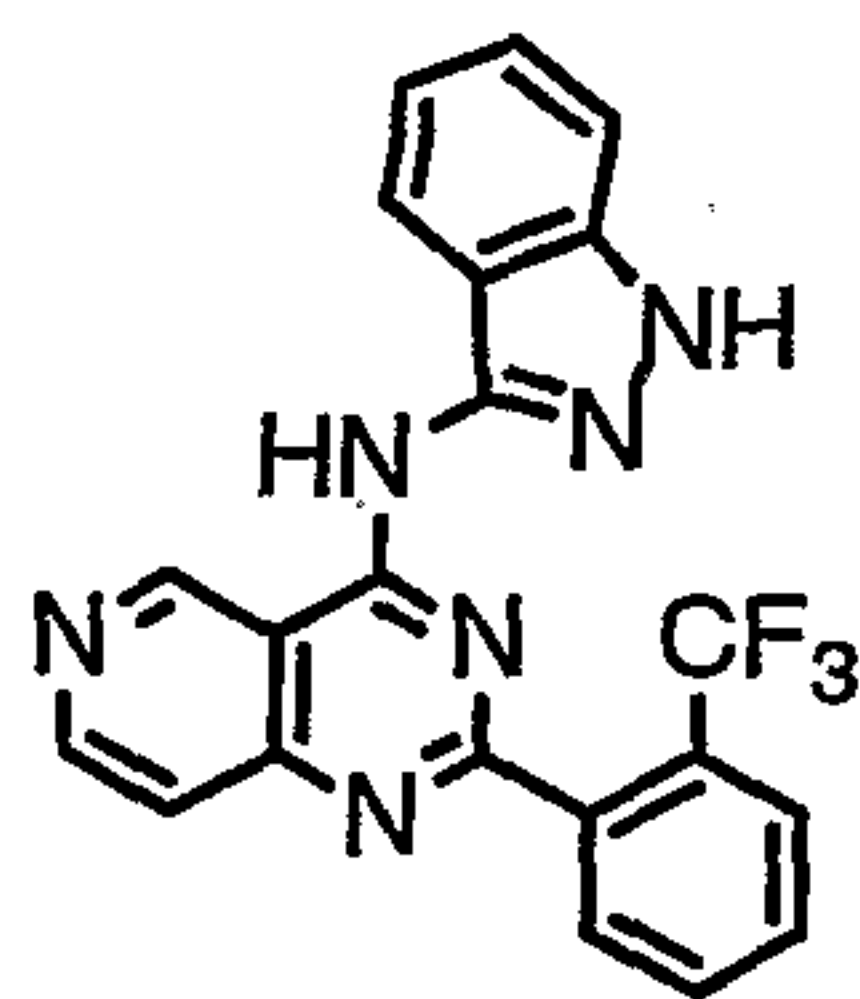
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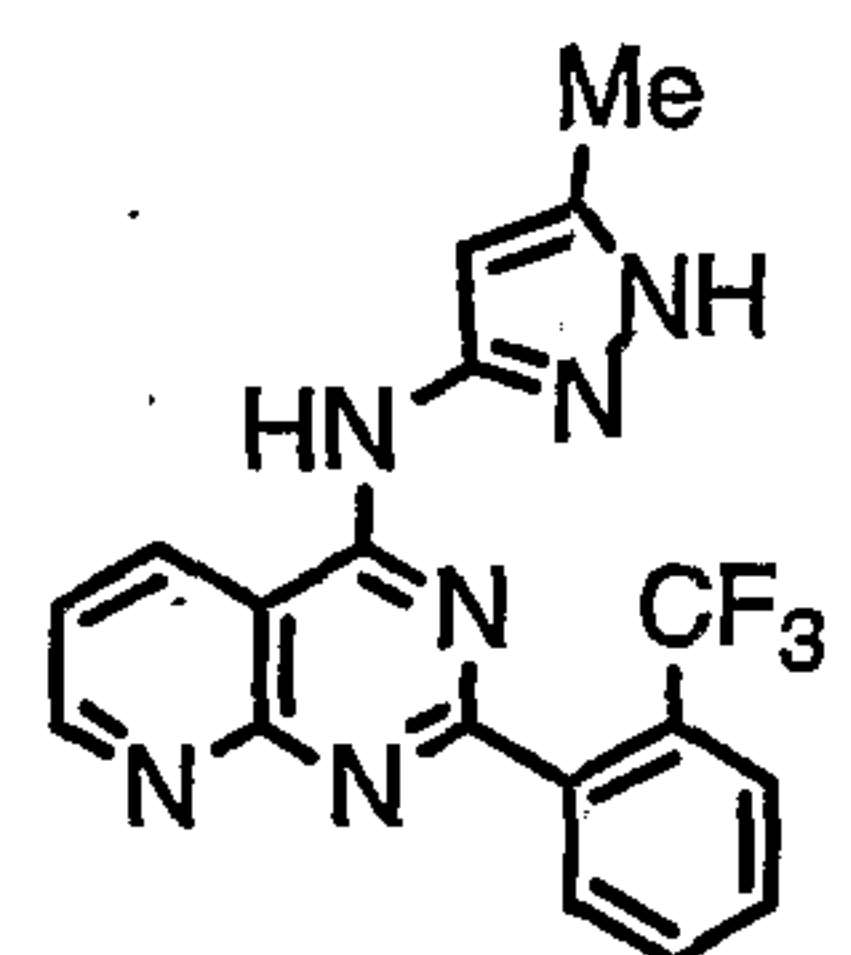
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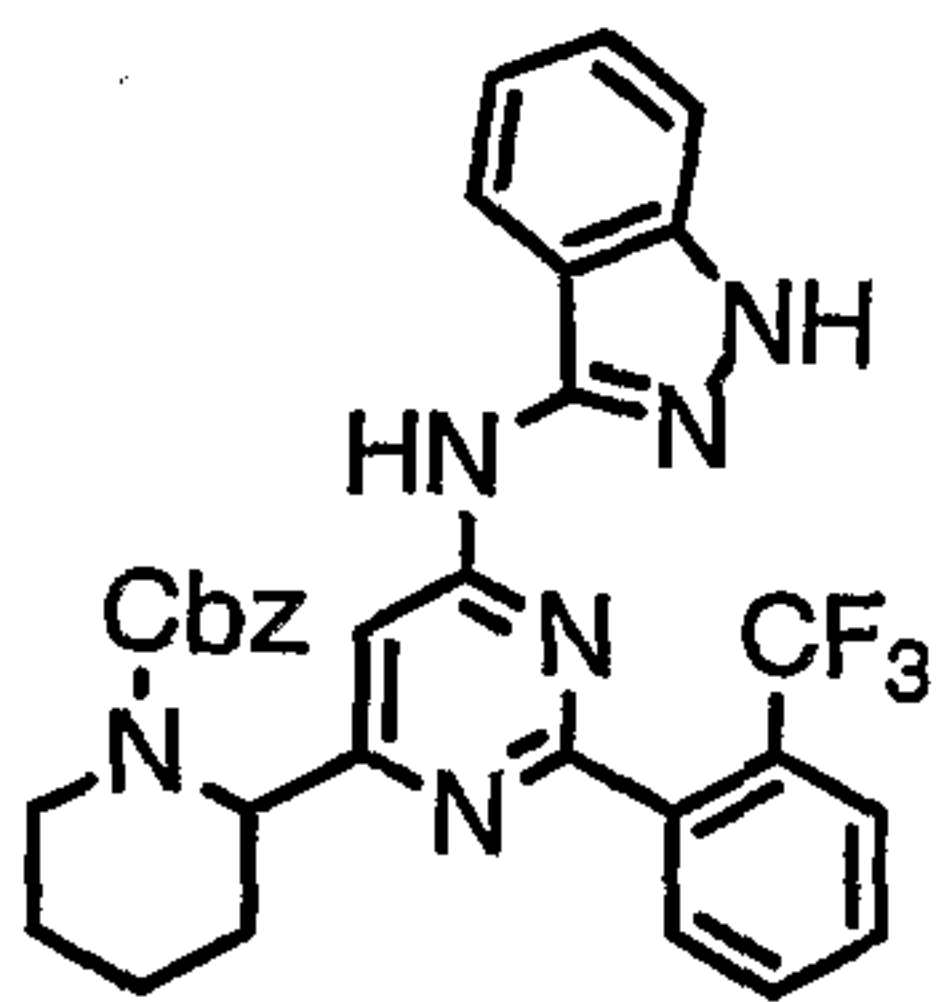
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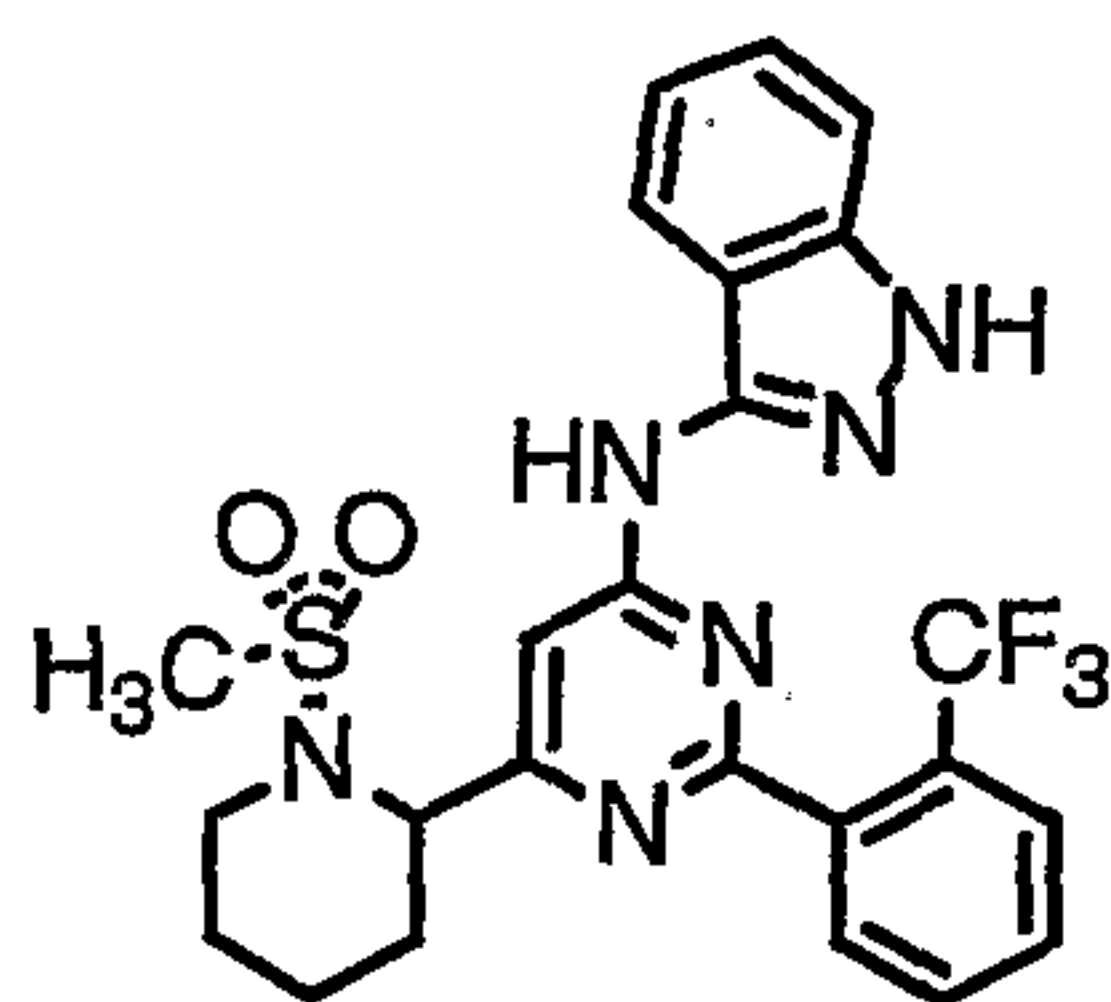
II-164



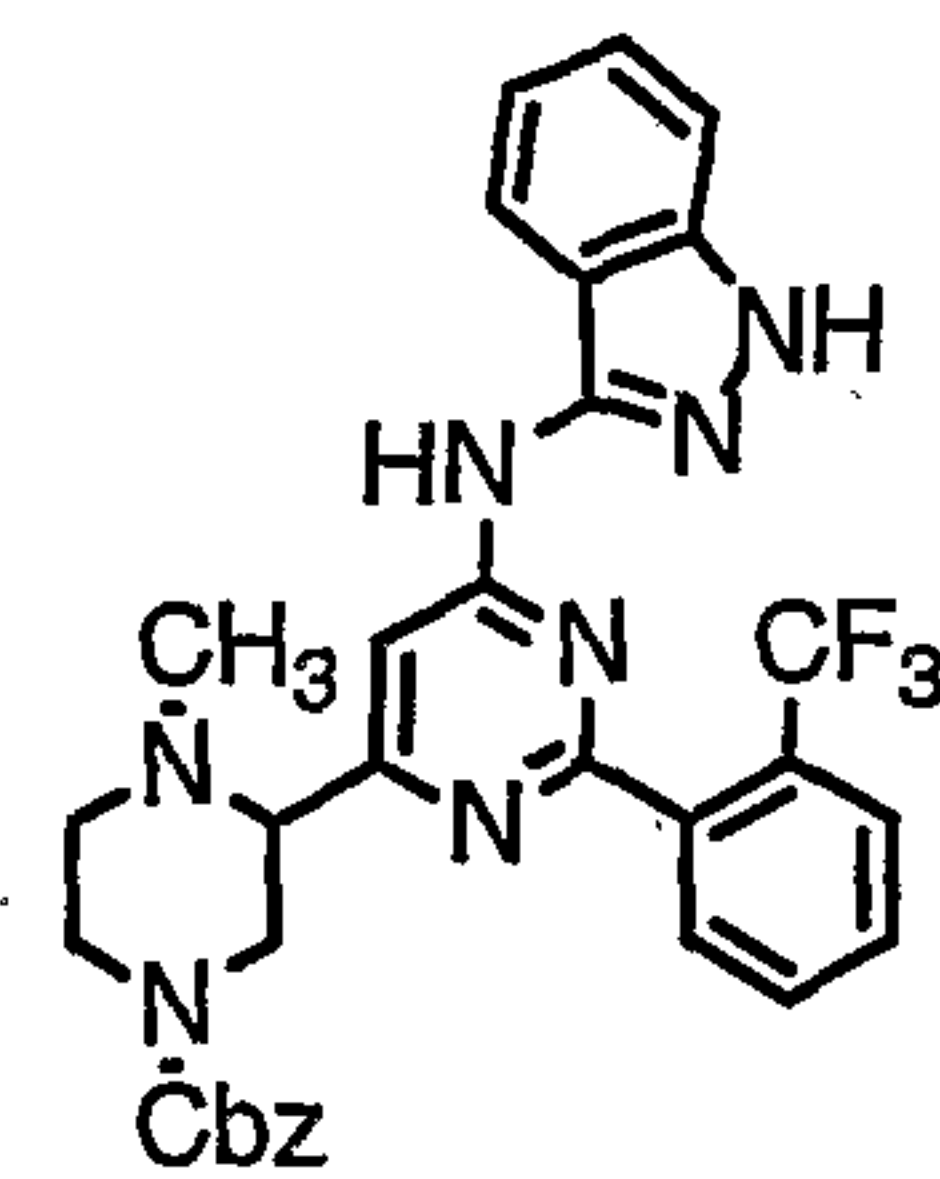
II-165



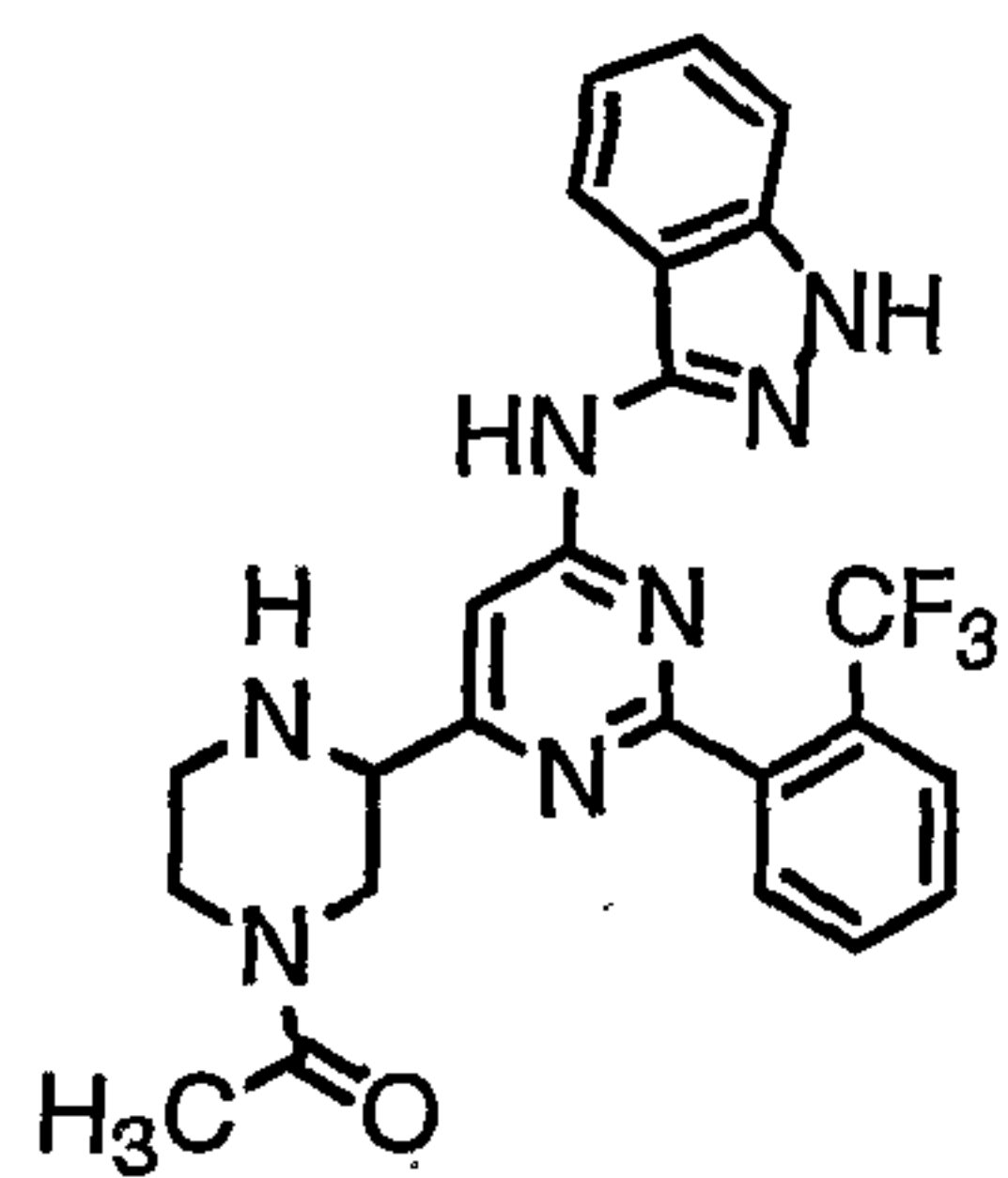
II-166



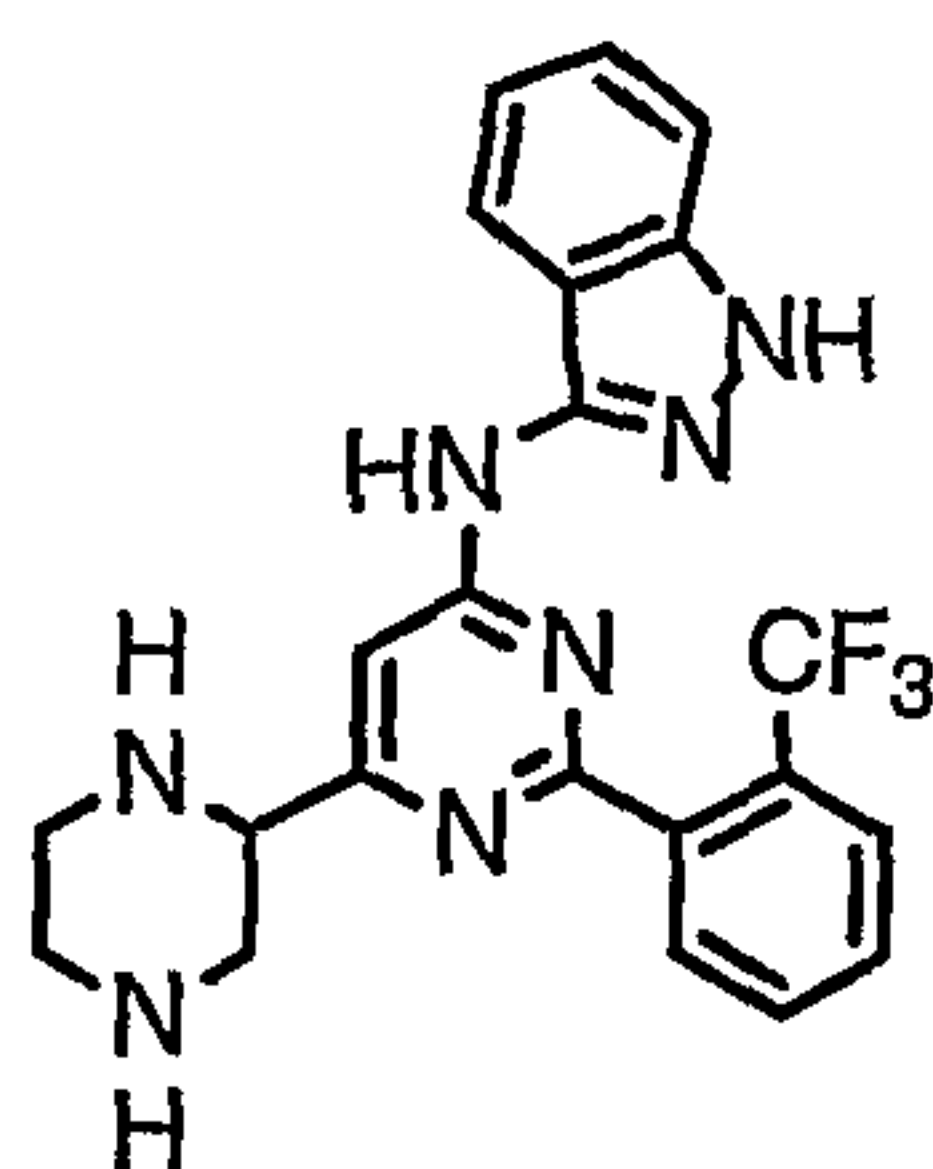
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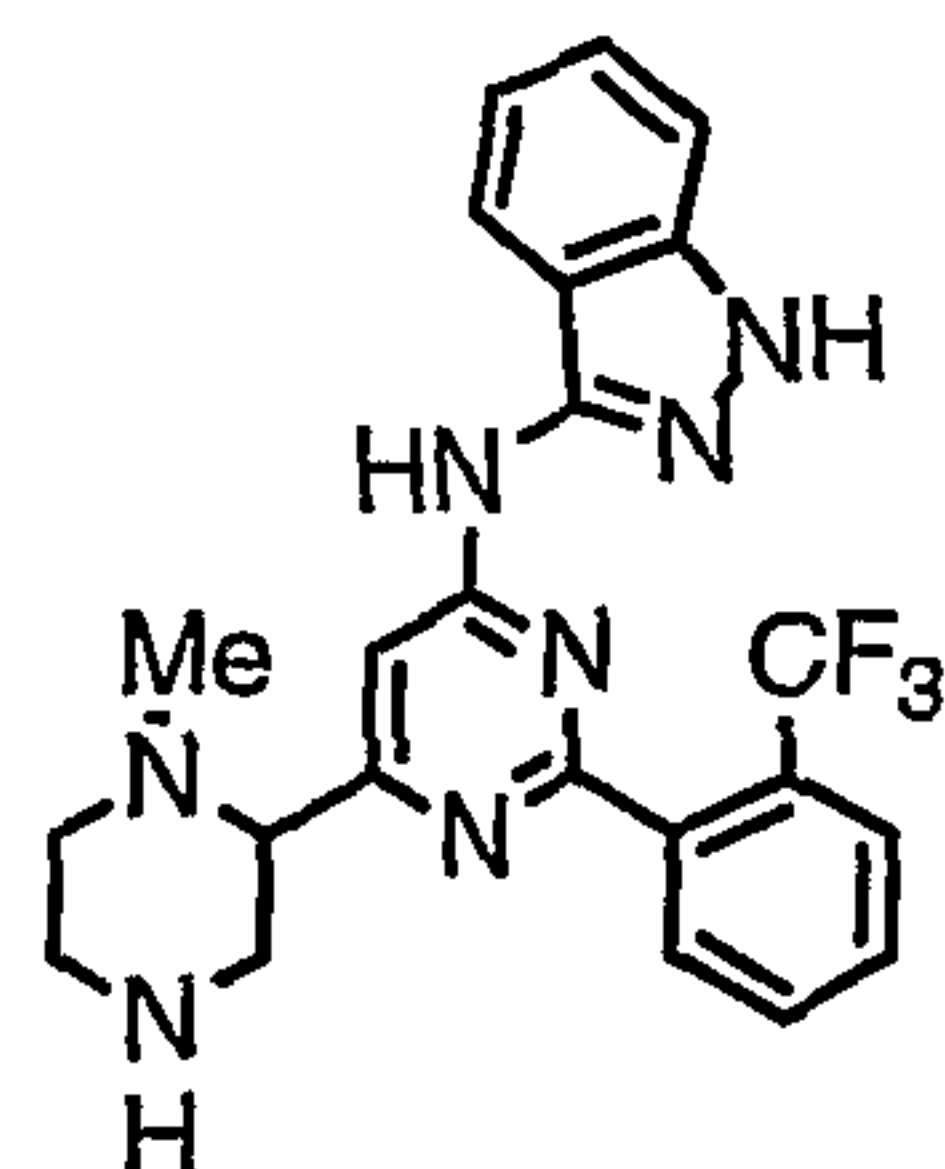
II-168



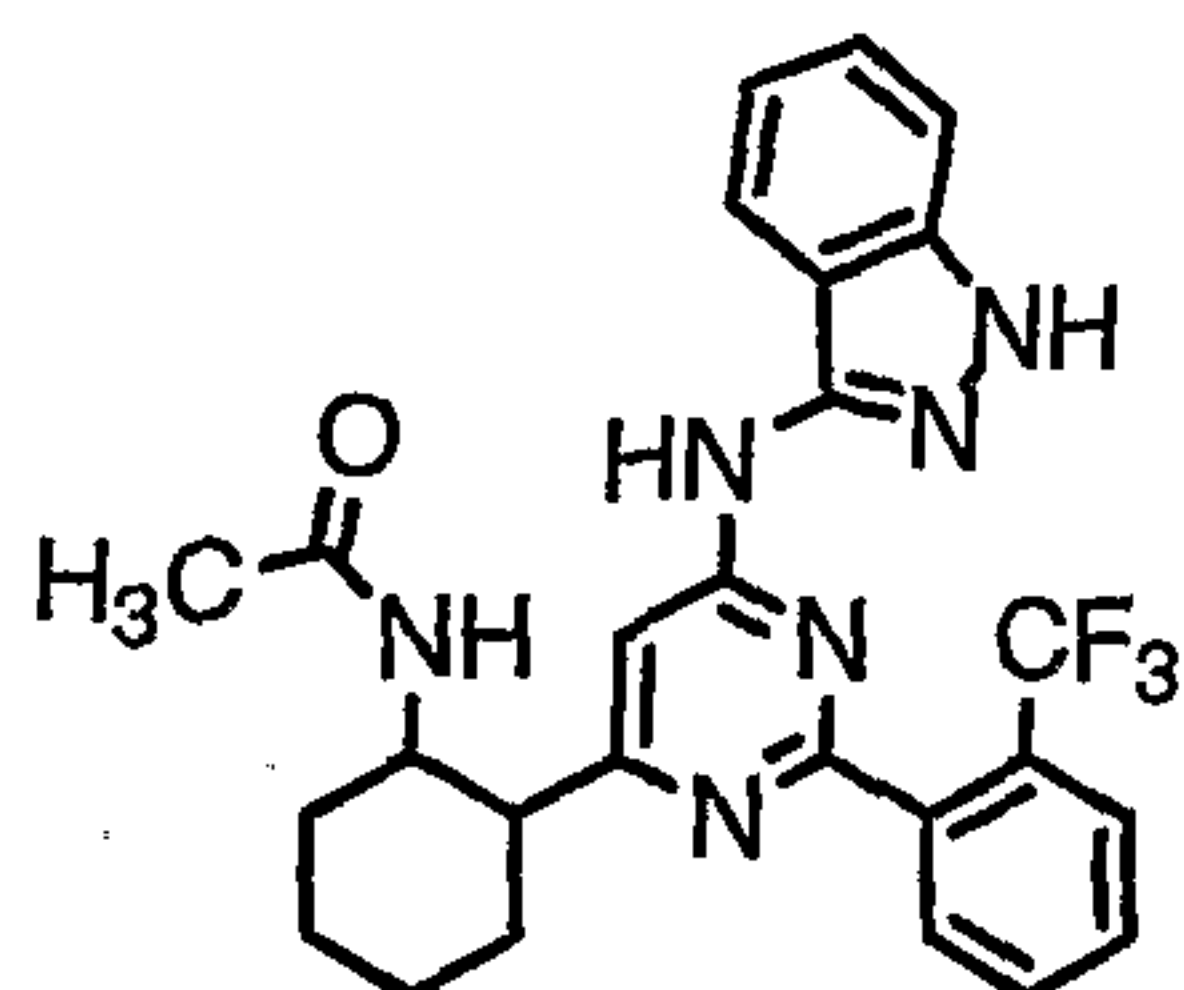
II-169



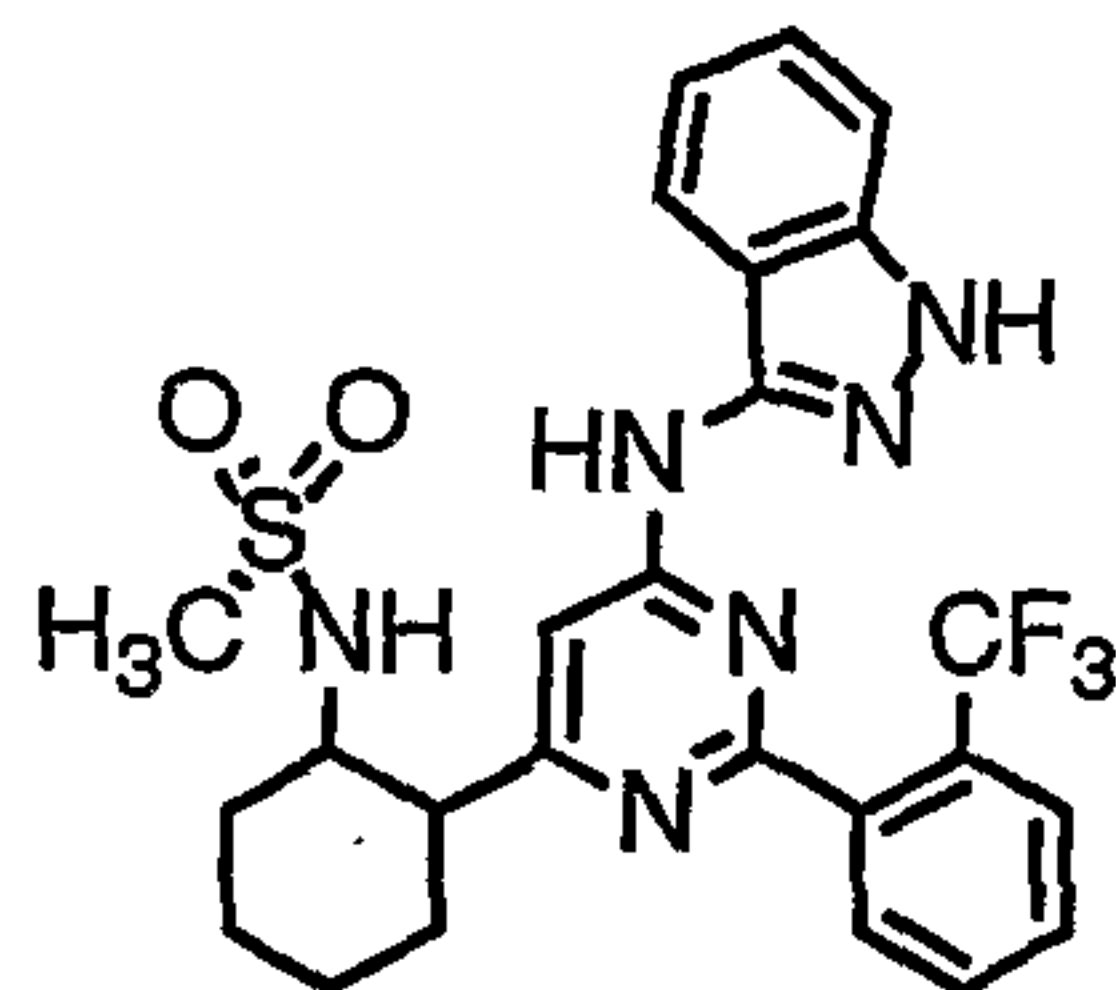
II-170



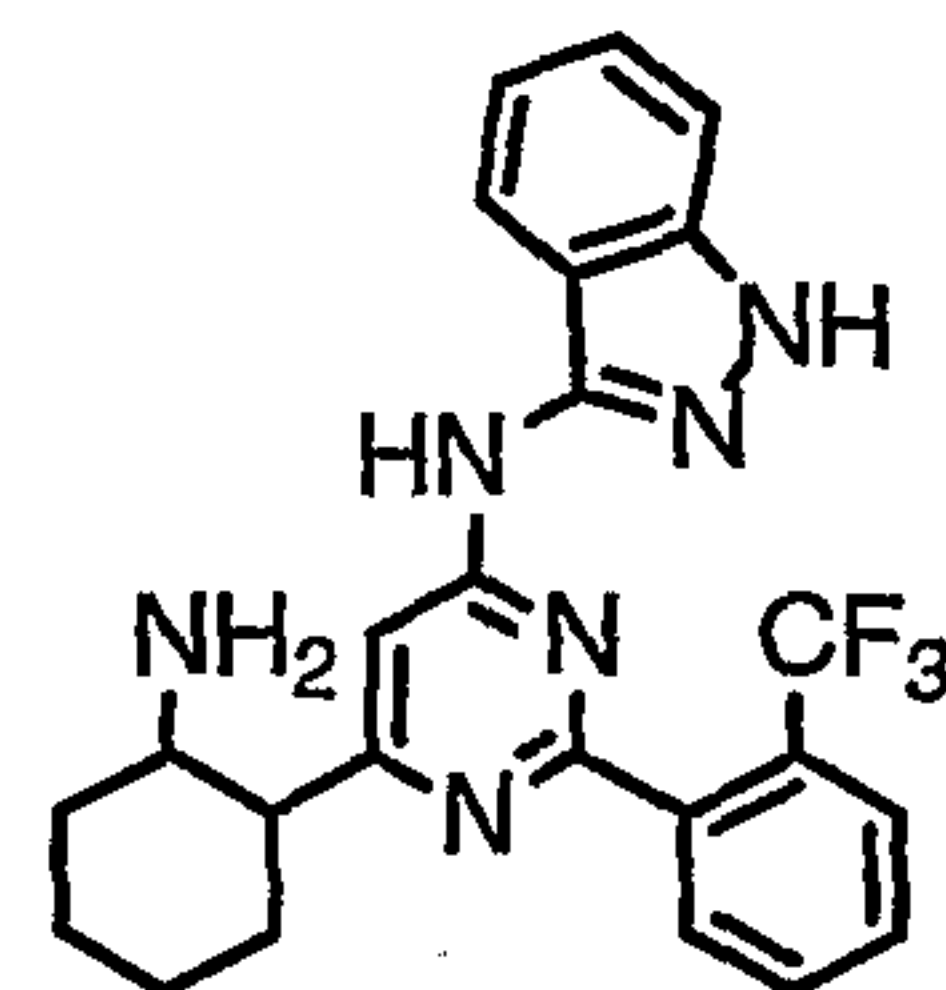
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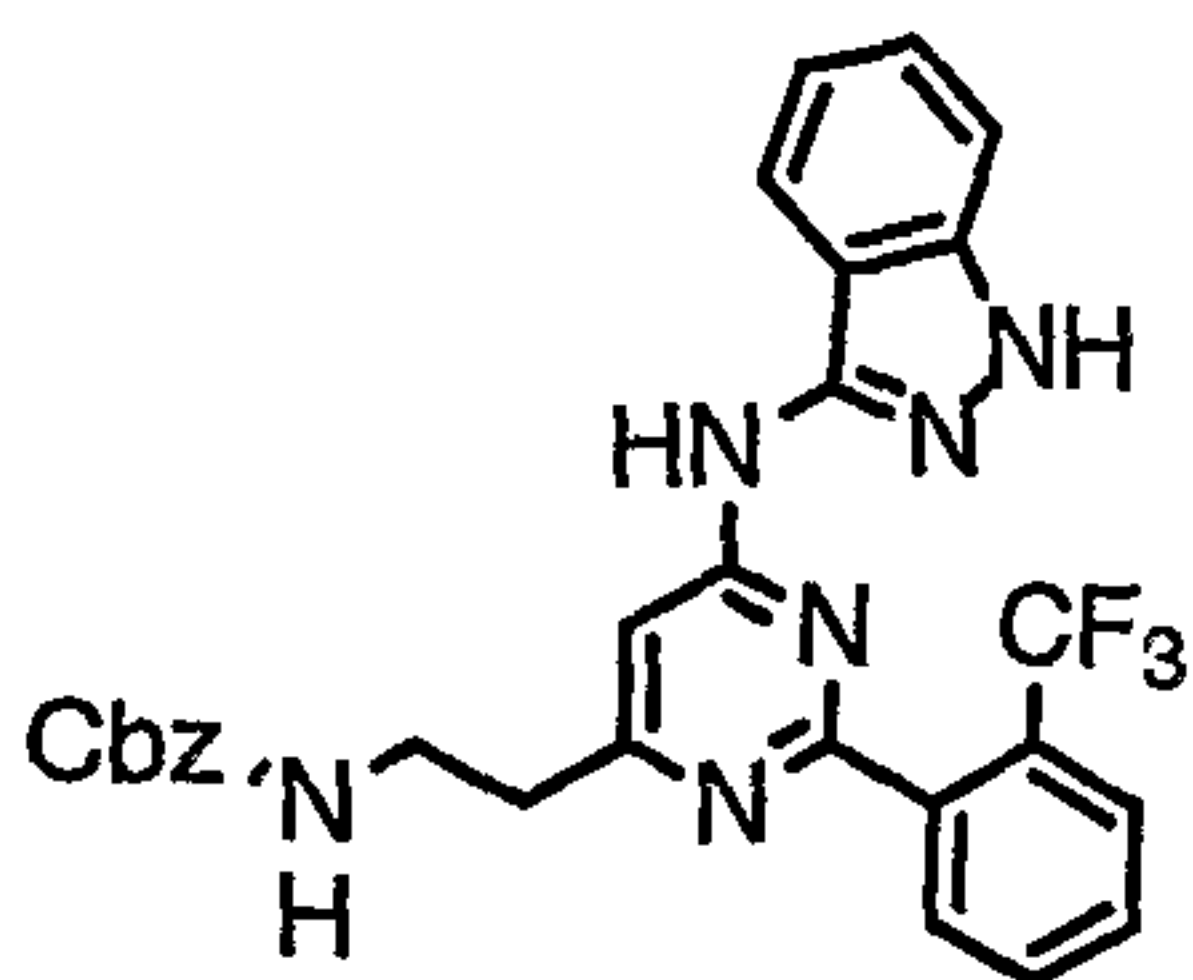
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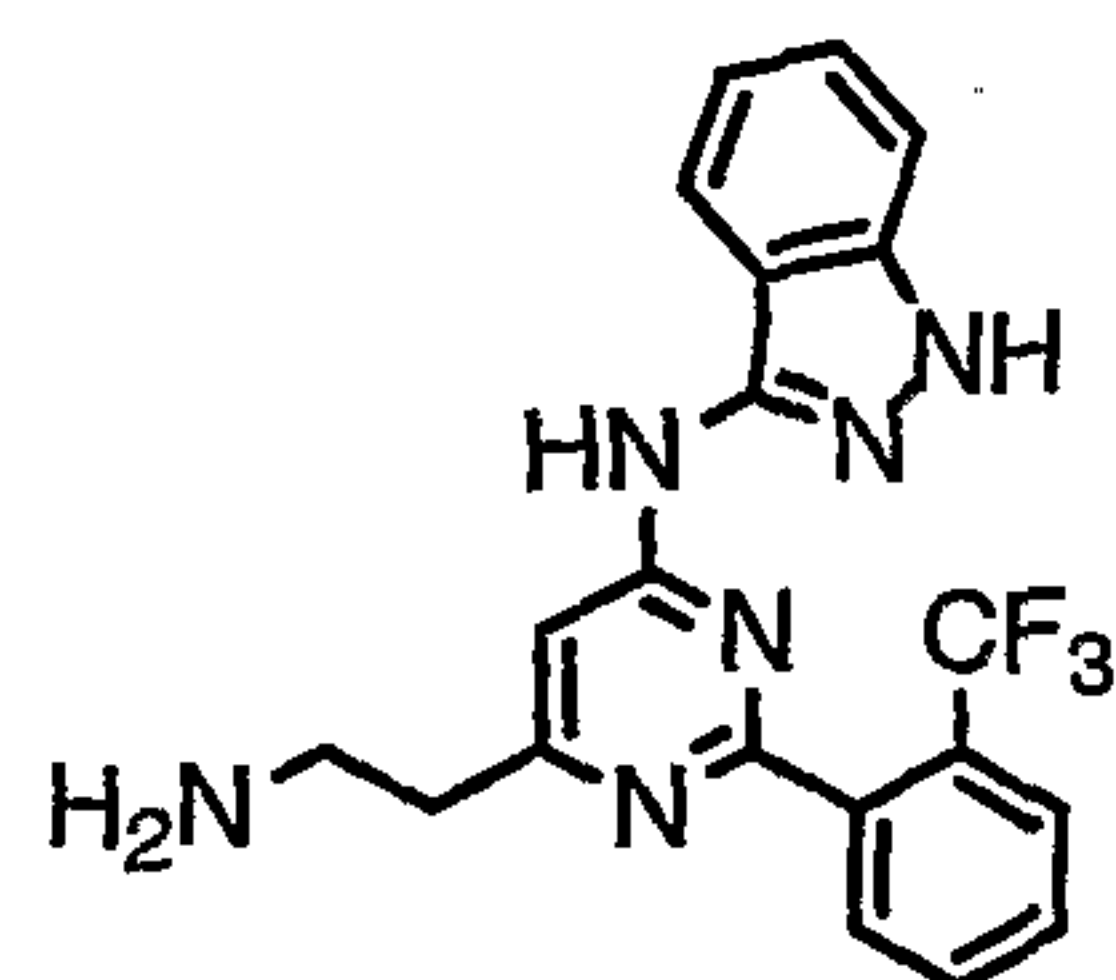
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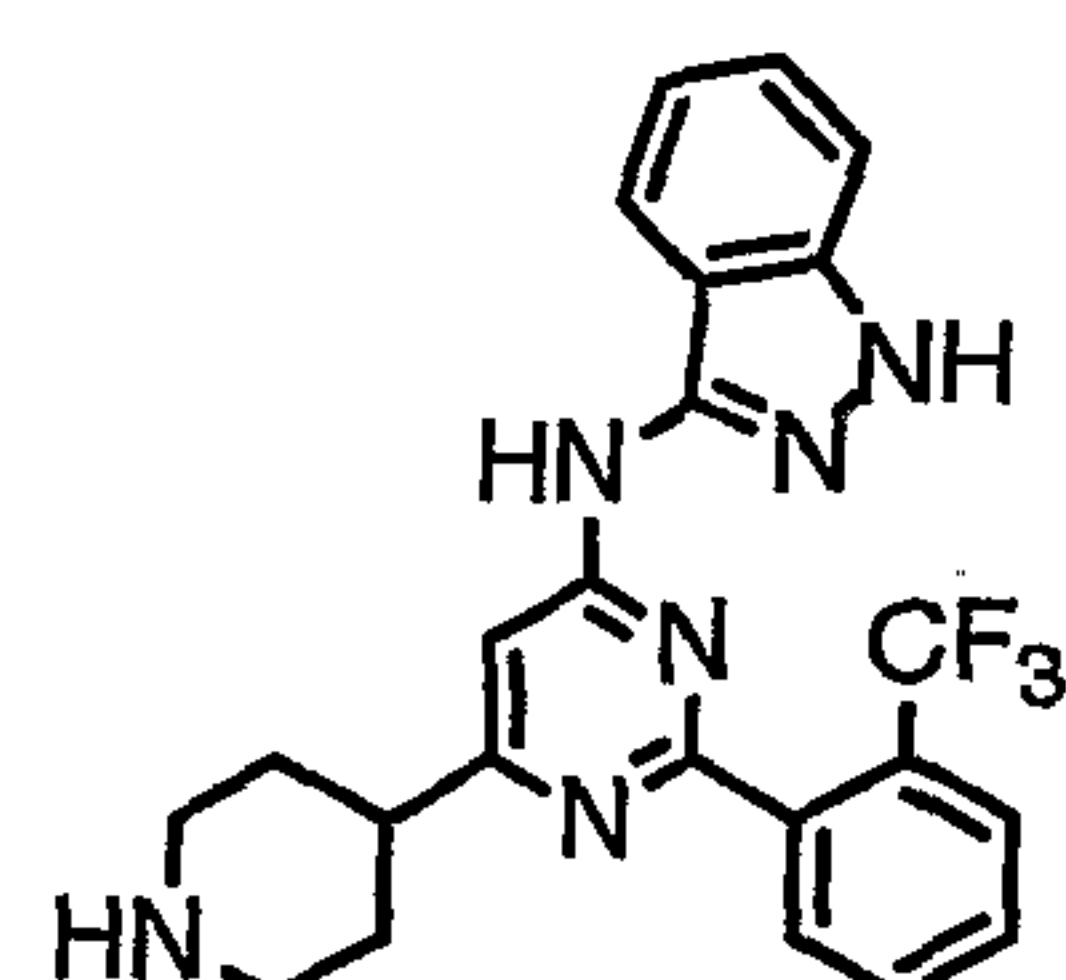
II-174



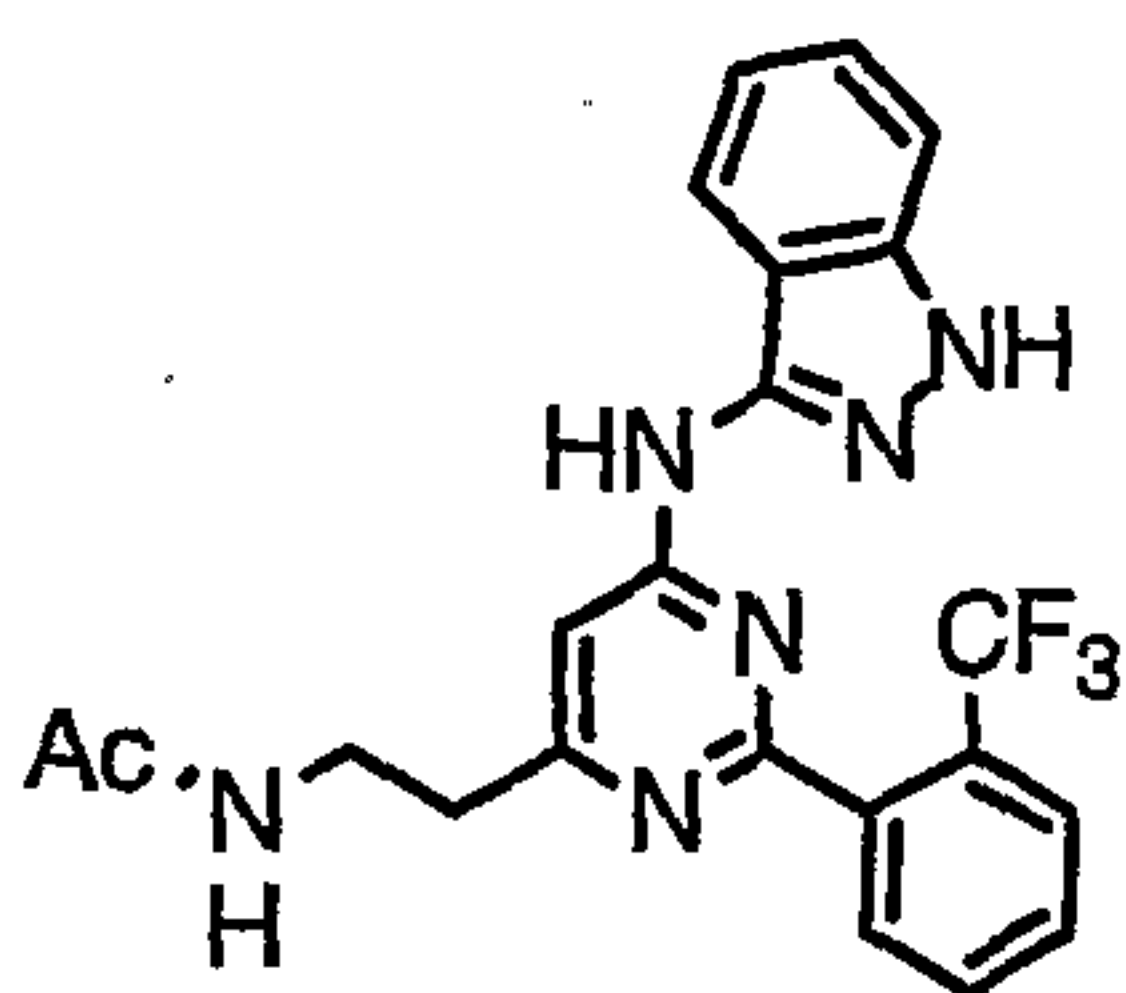
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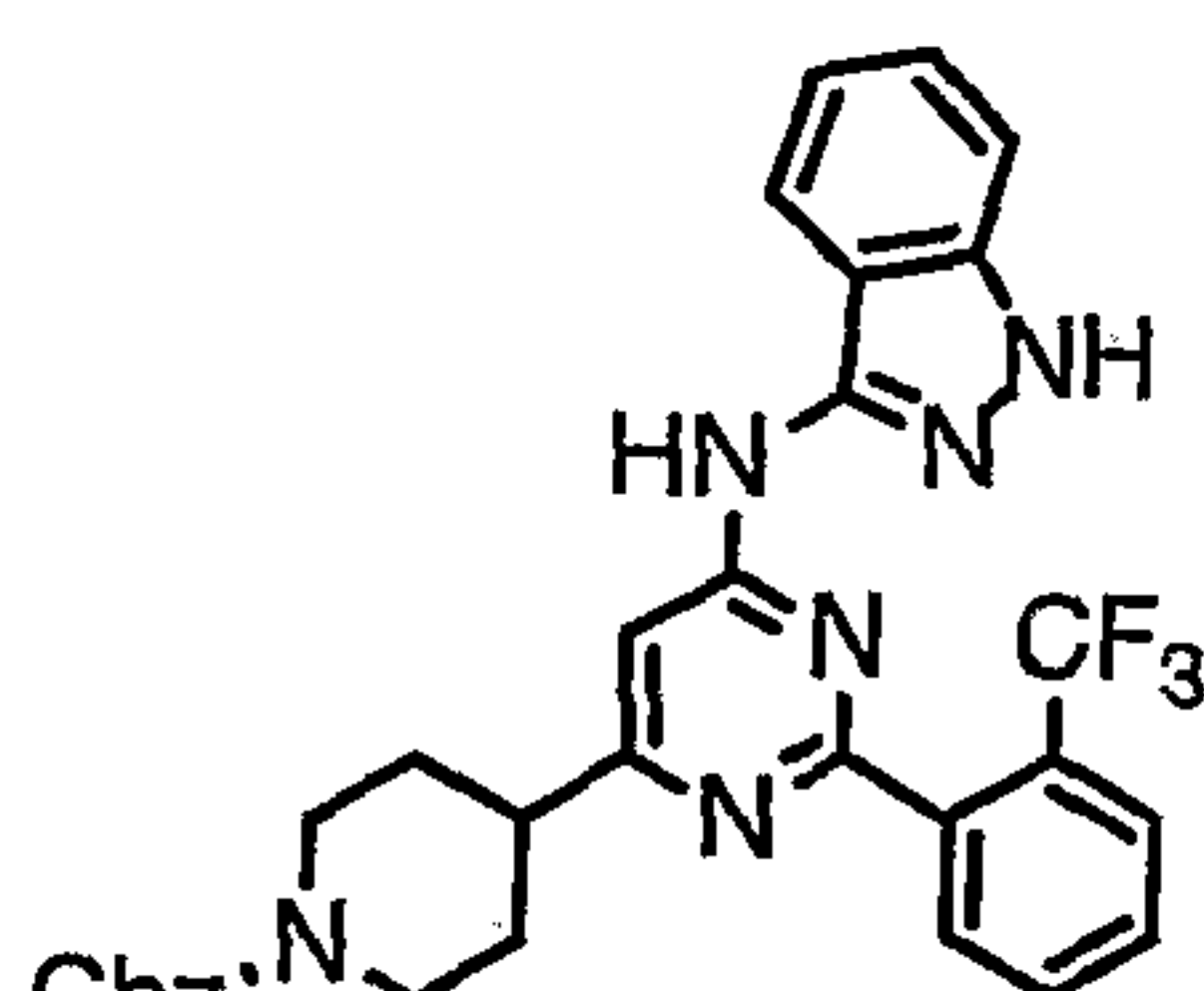
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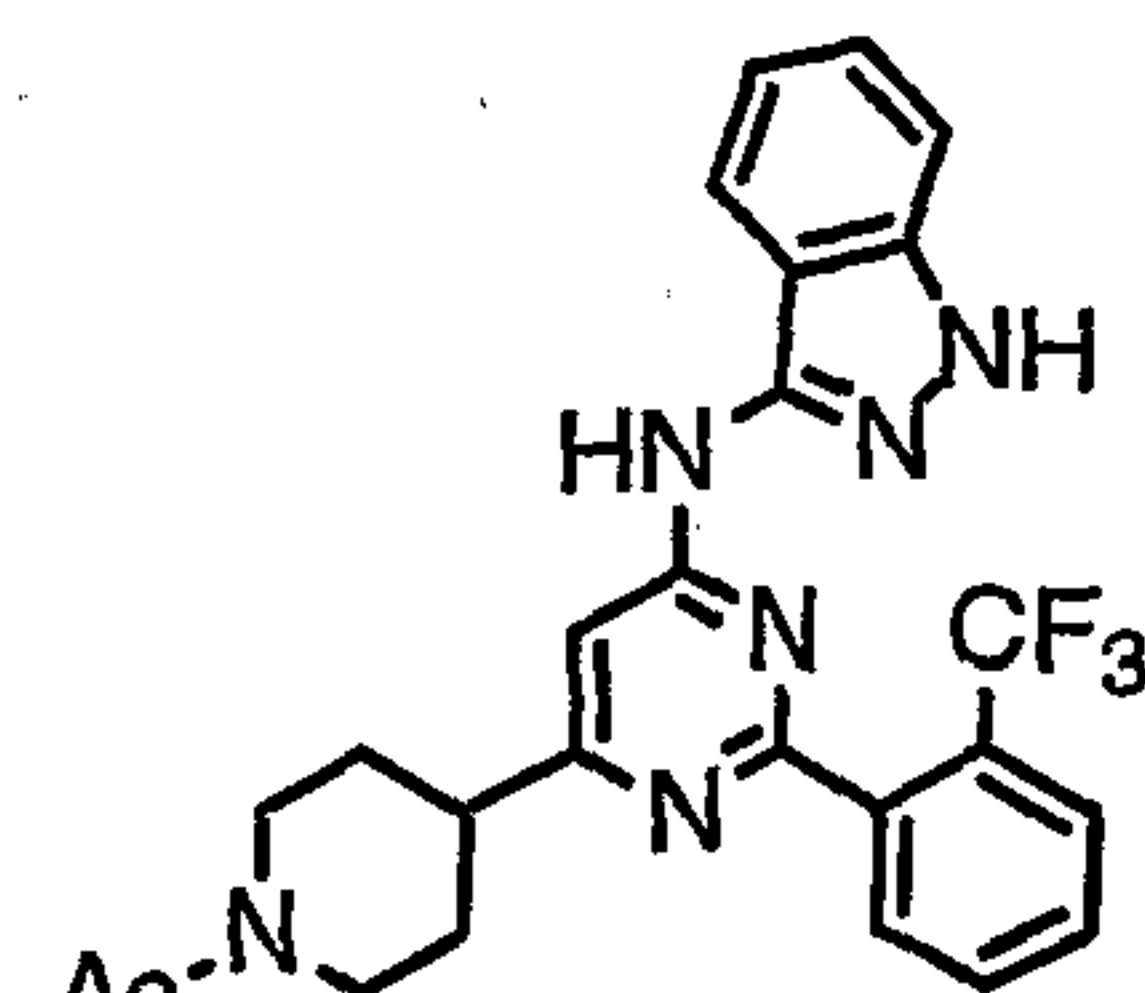
II-177



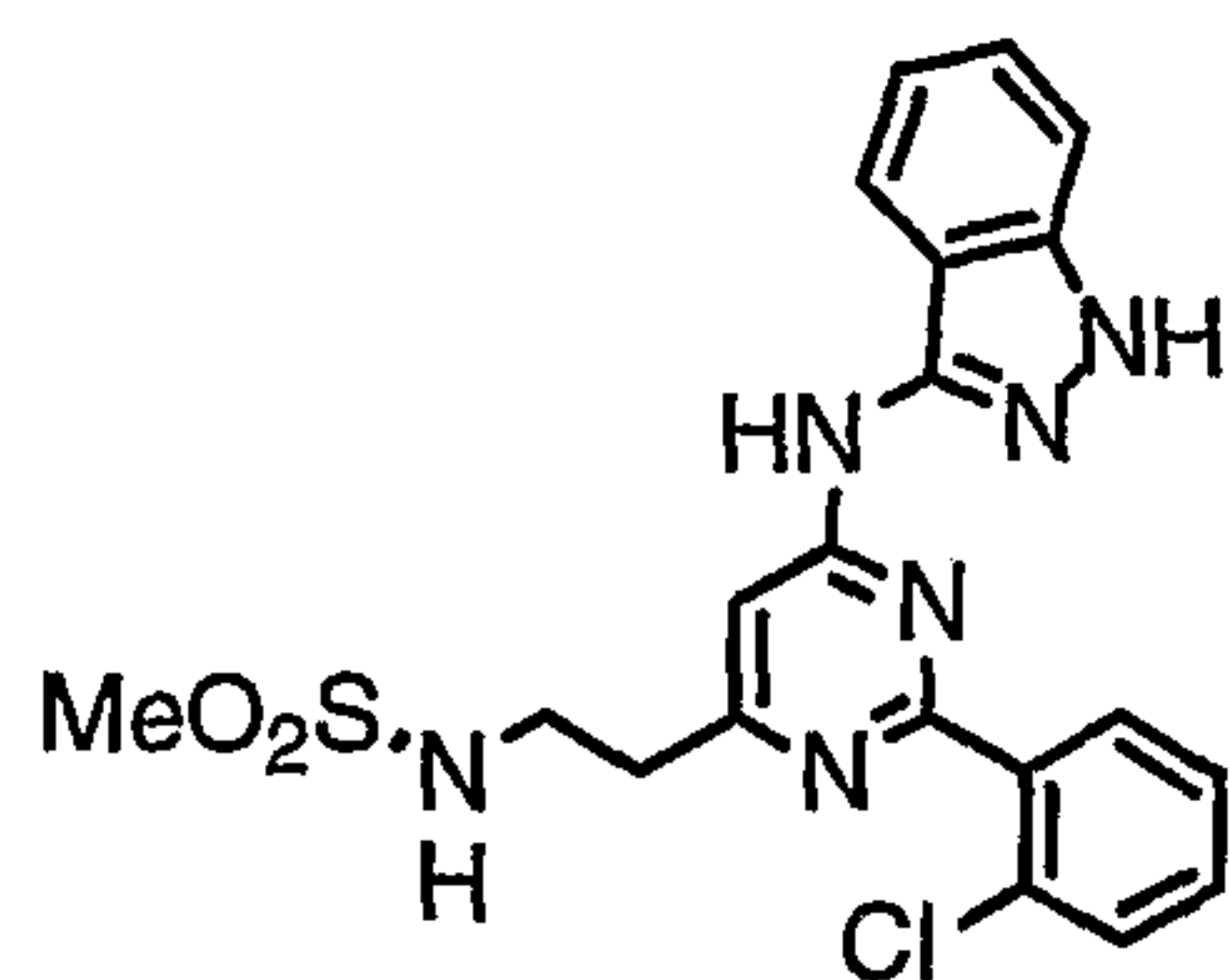
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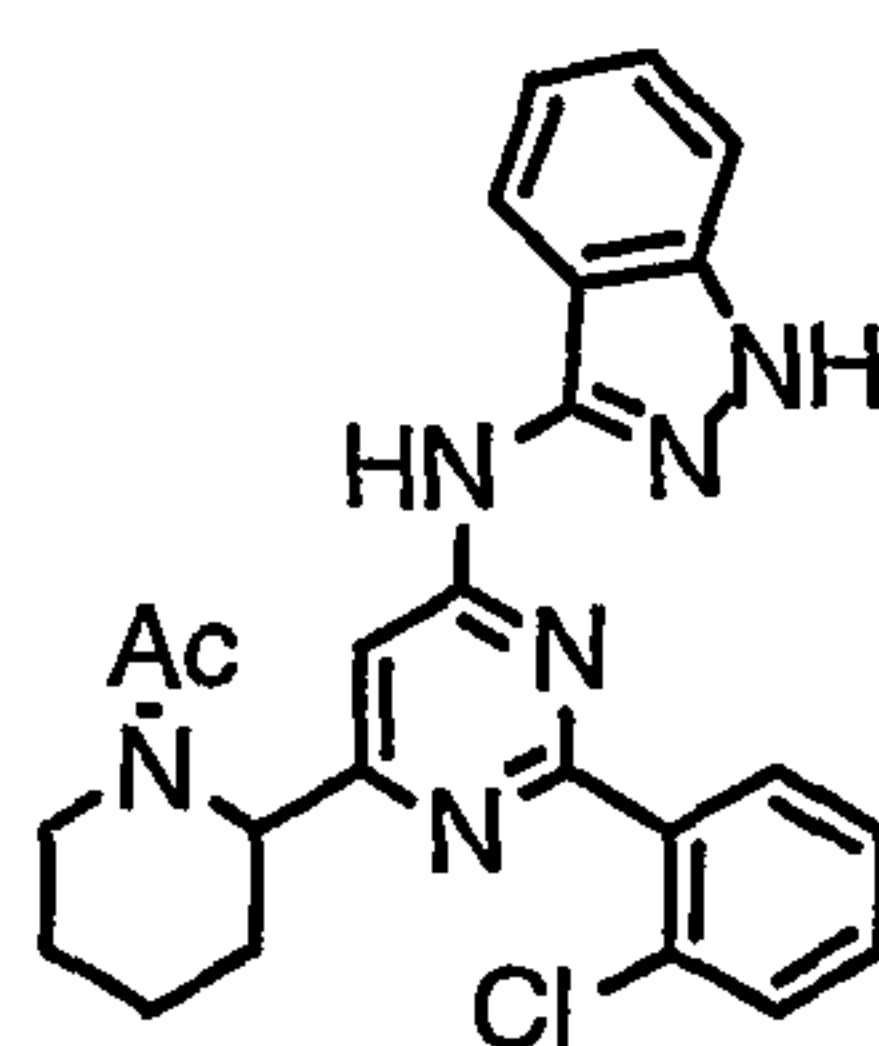
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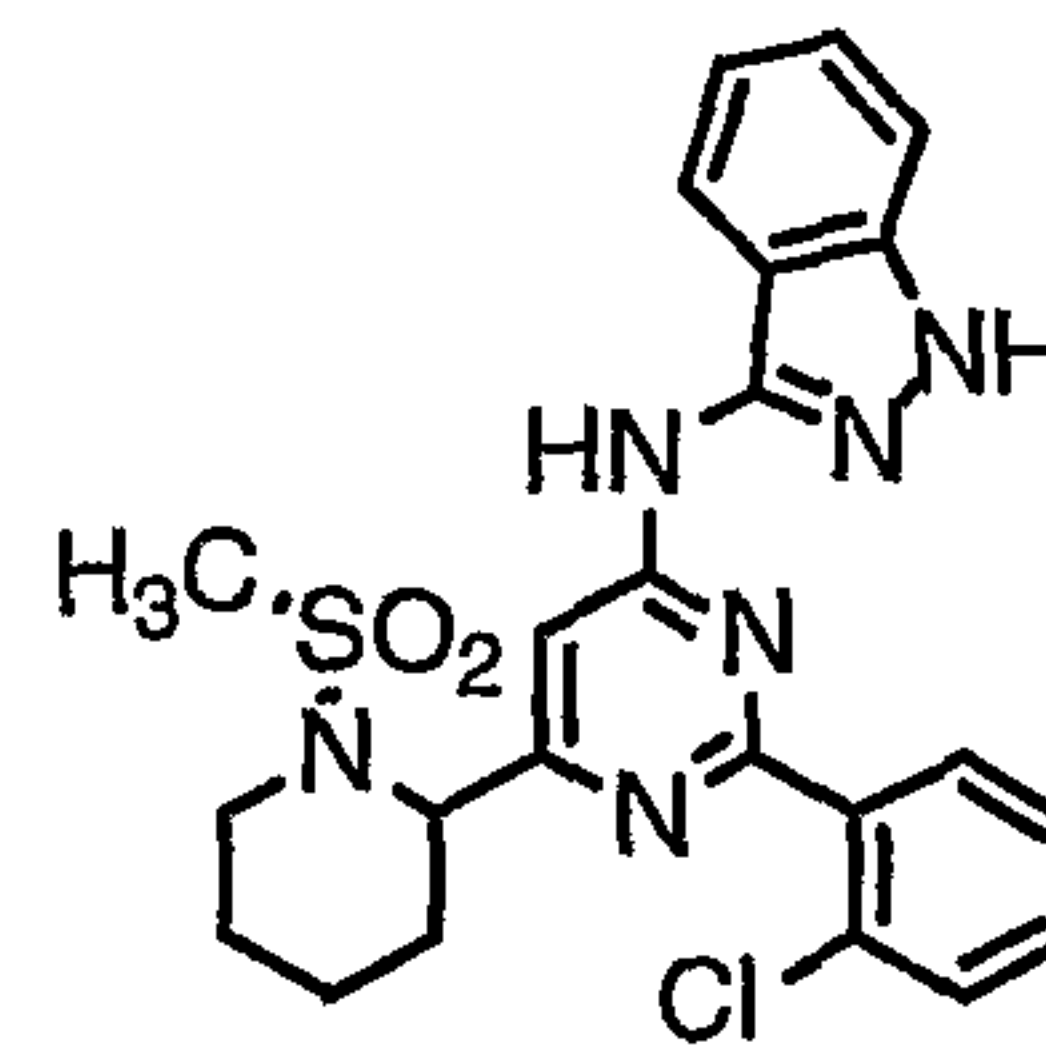
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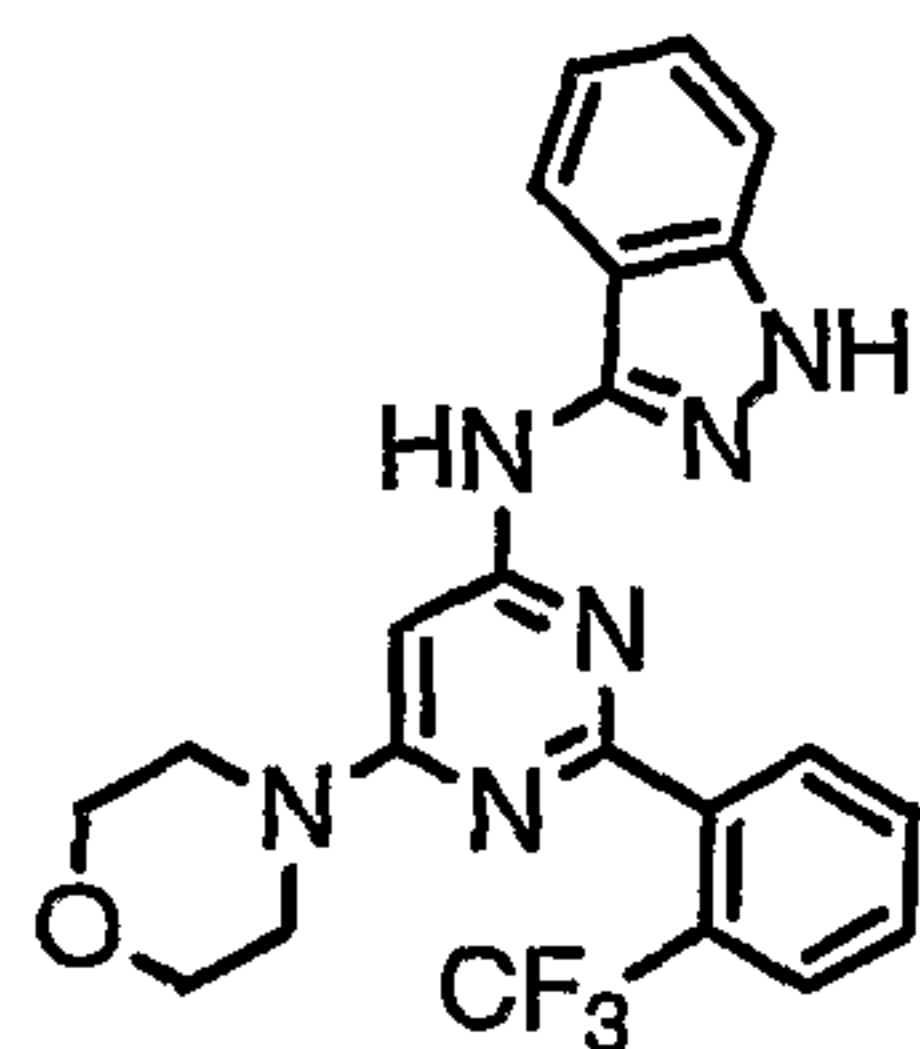
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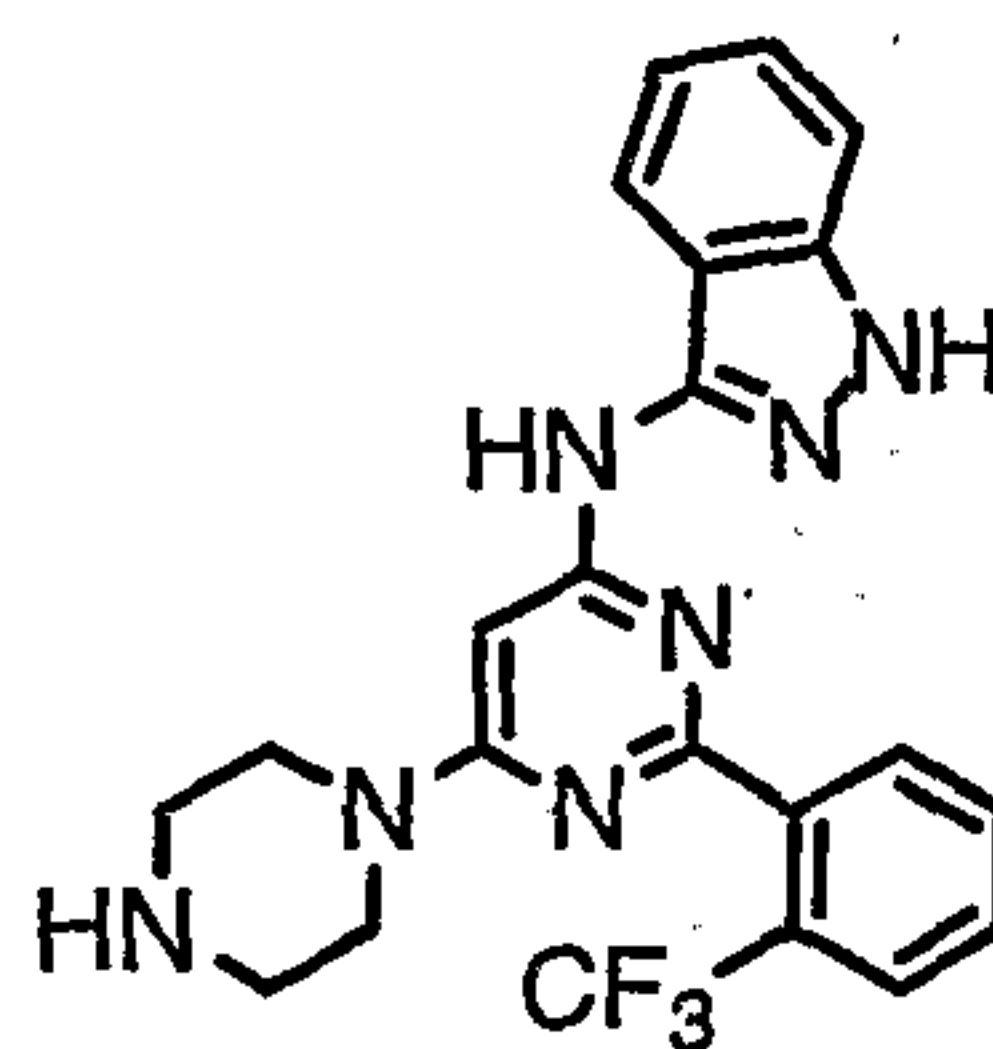
II-182



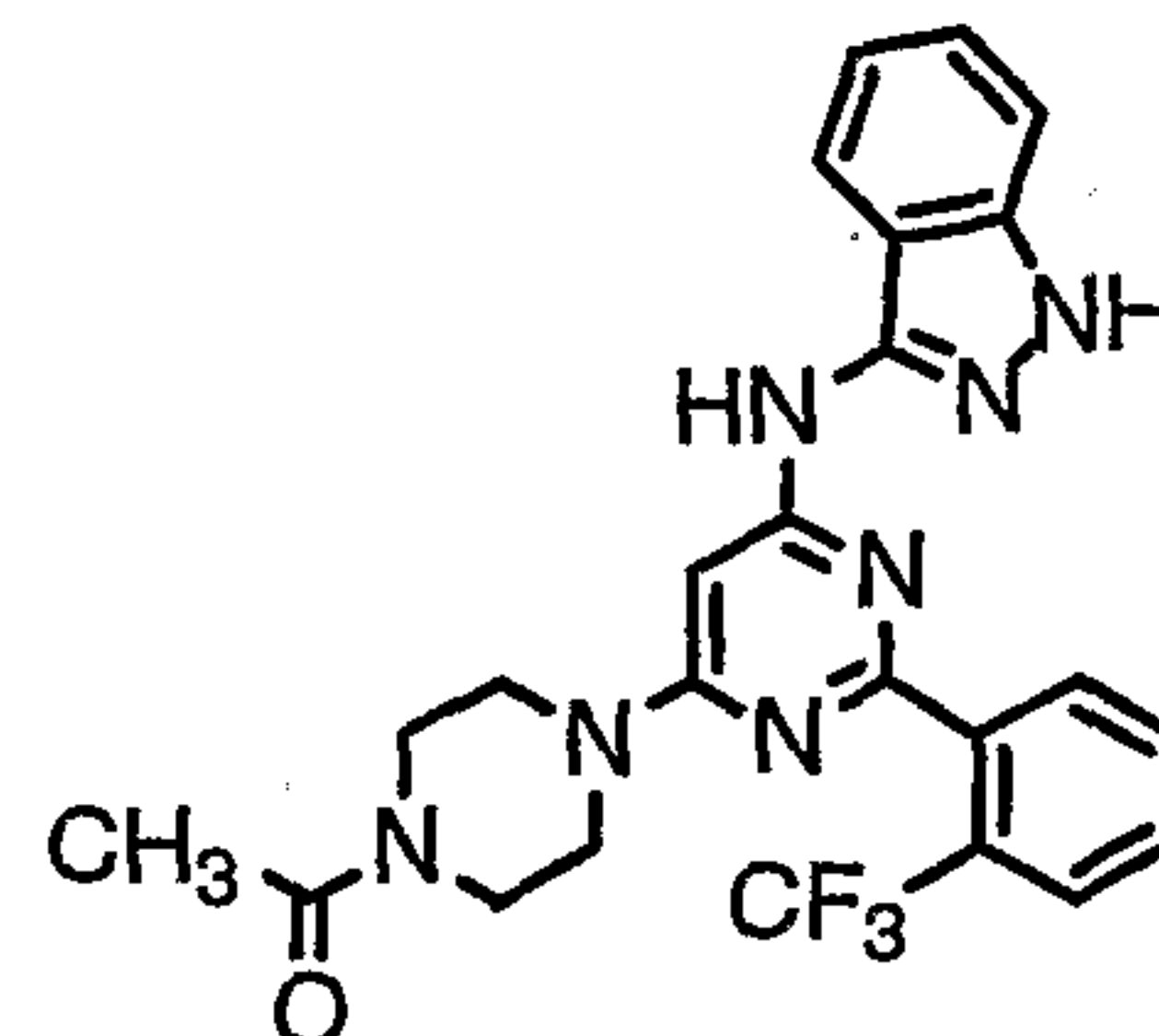
II-183



II-184

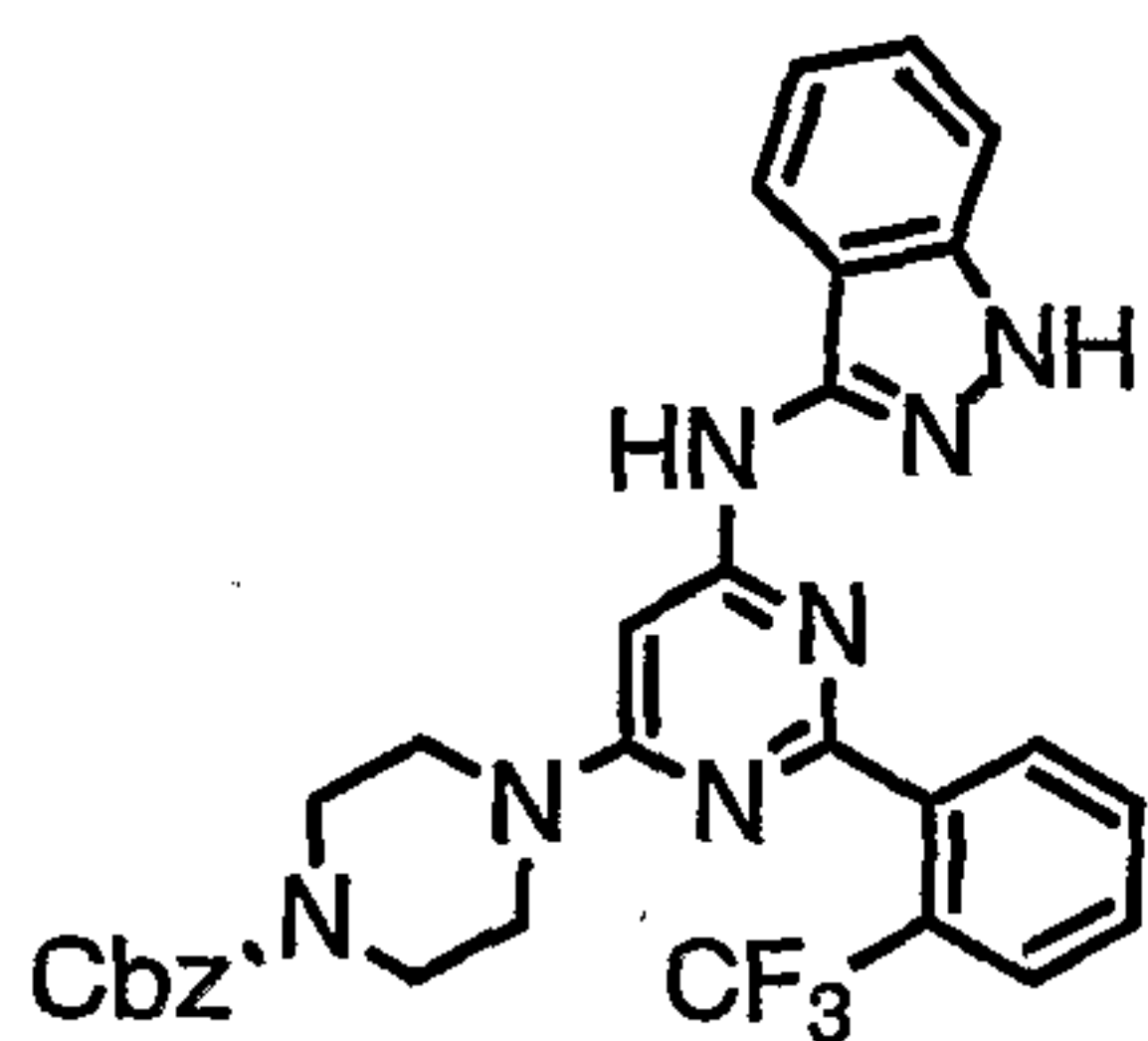


II-185

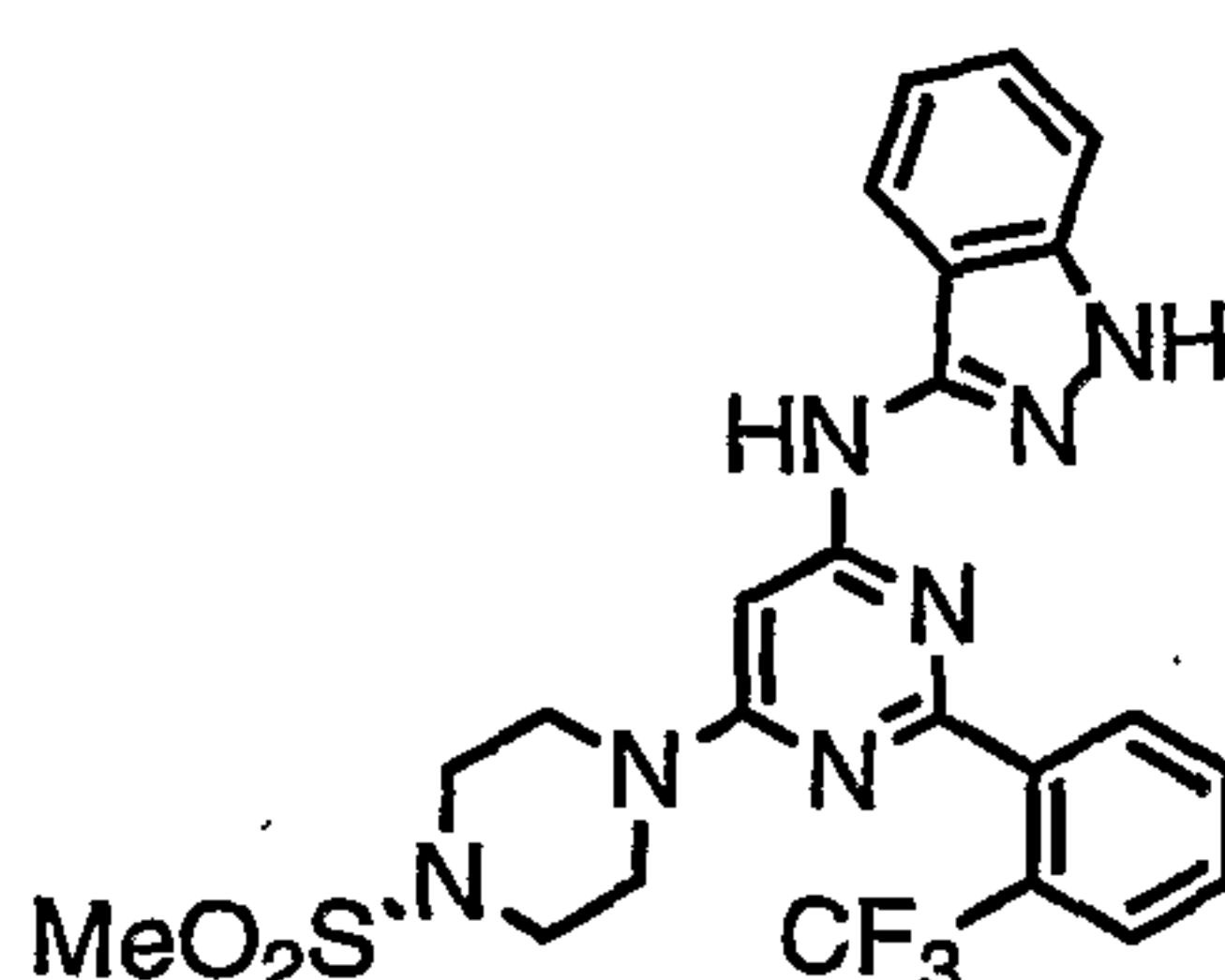


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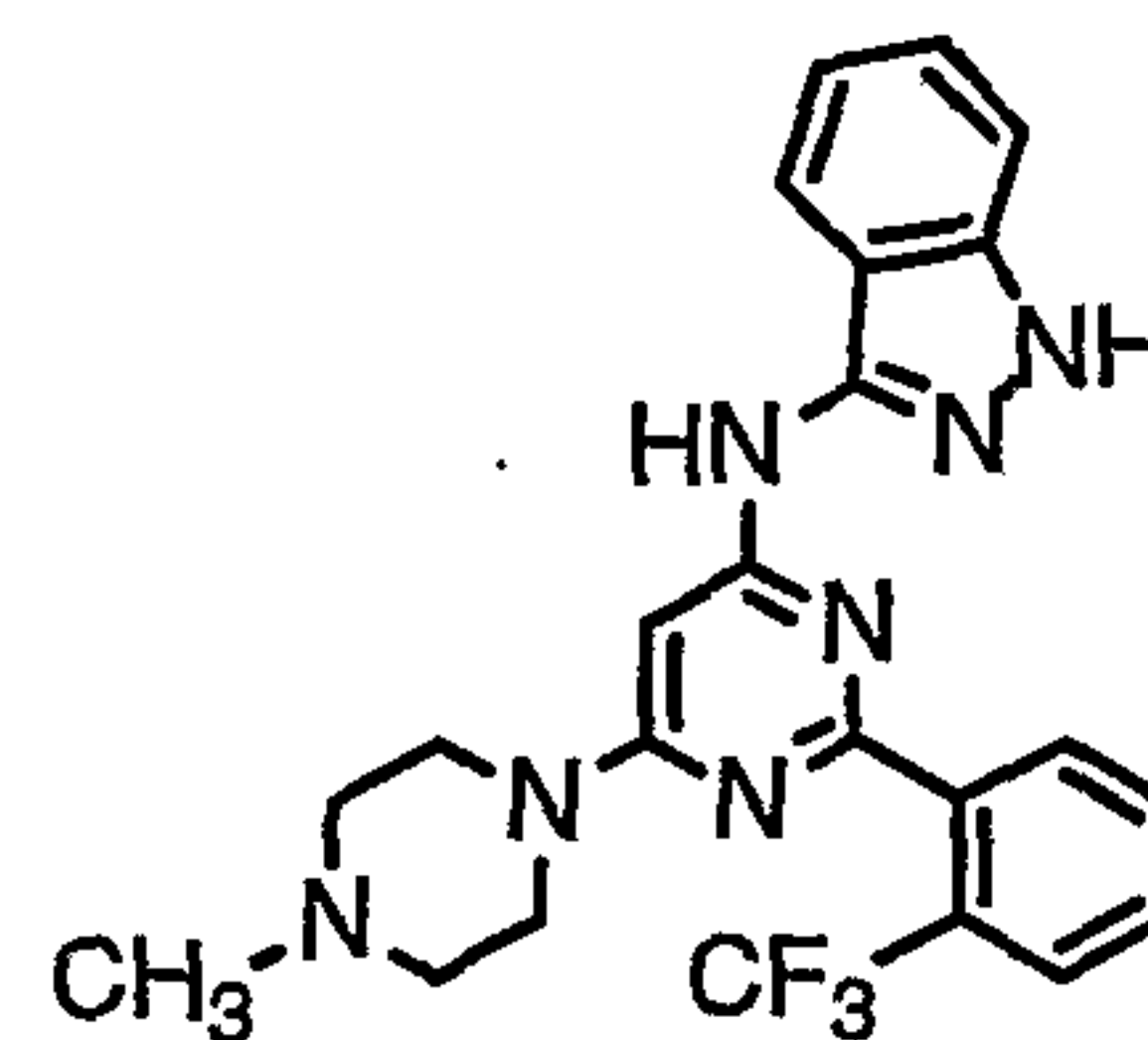
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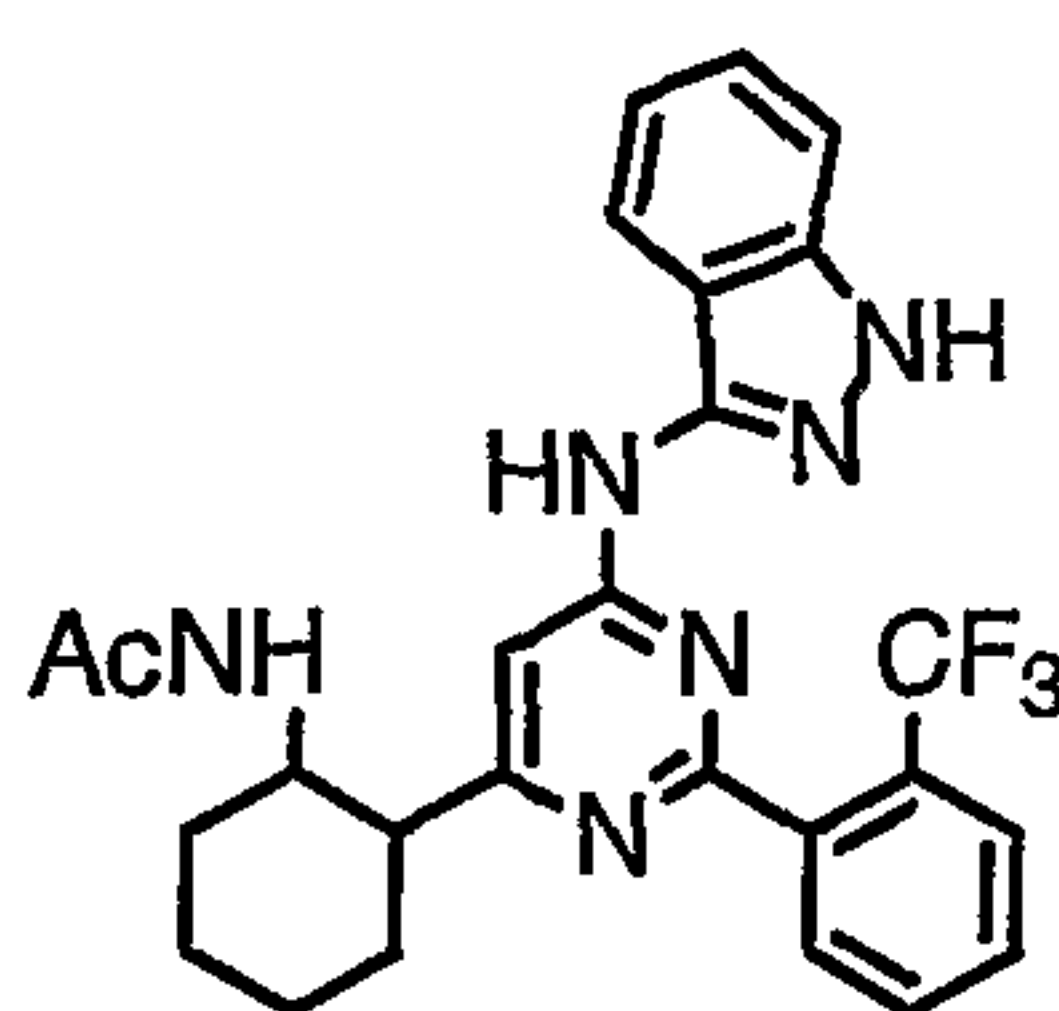
II-187



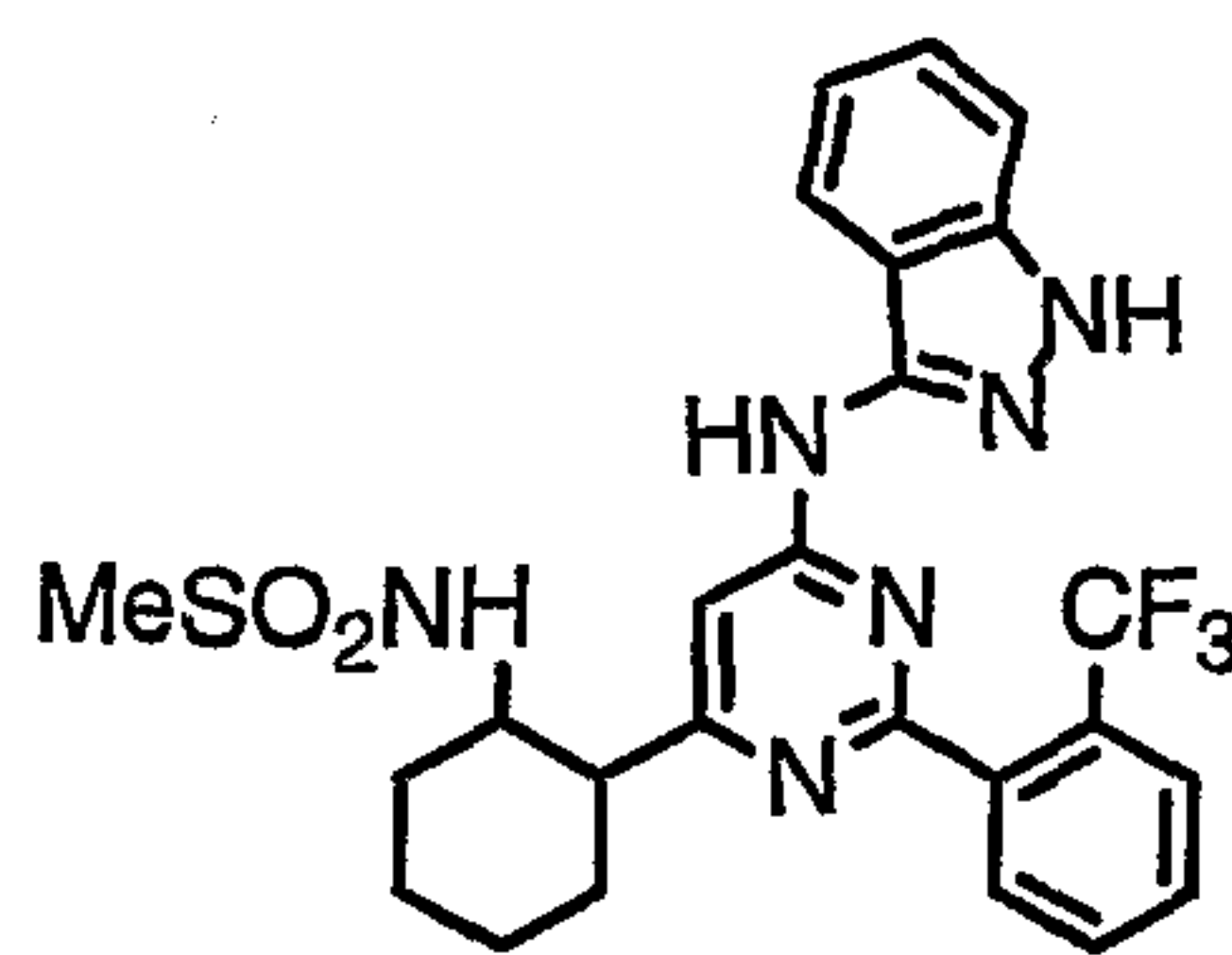
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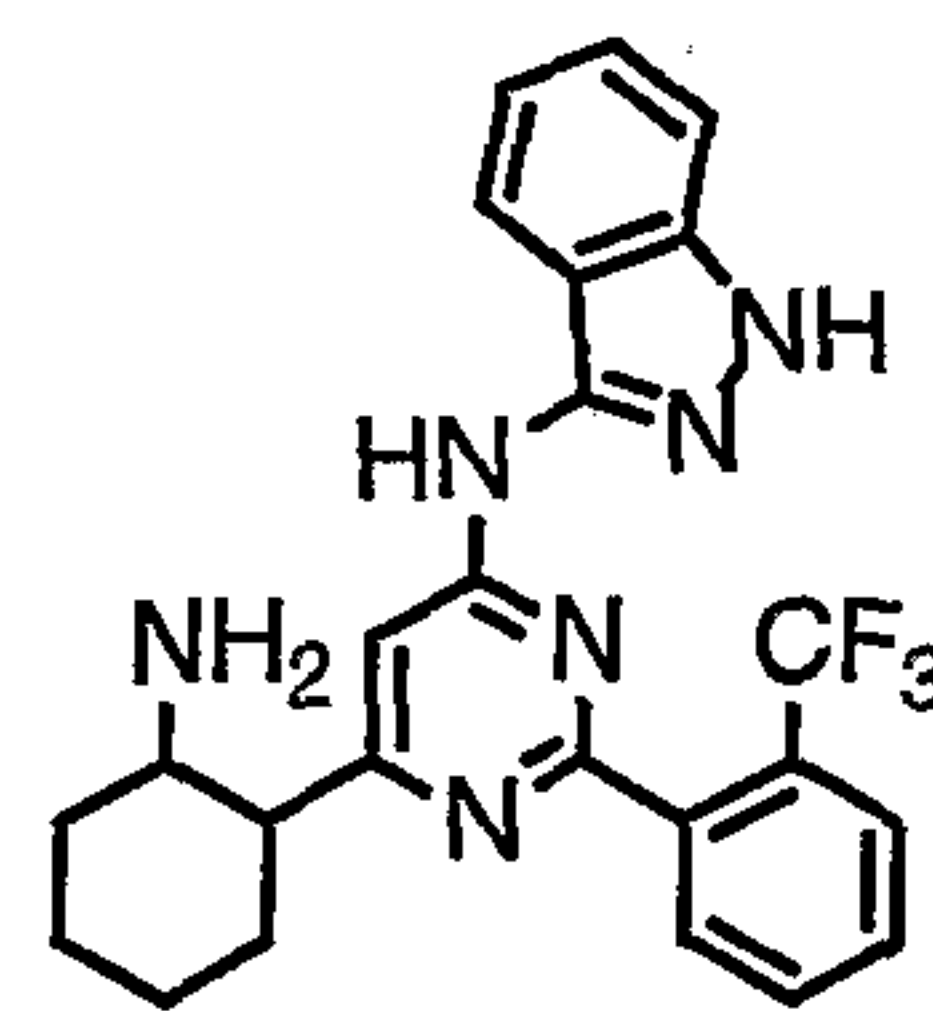
II-189



II-190

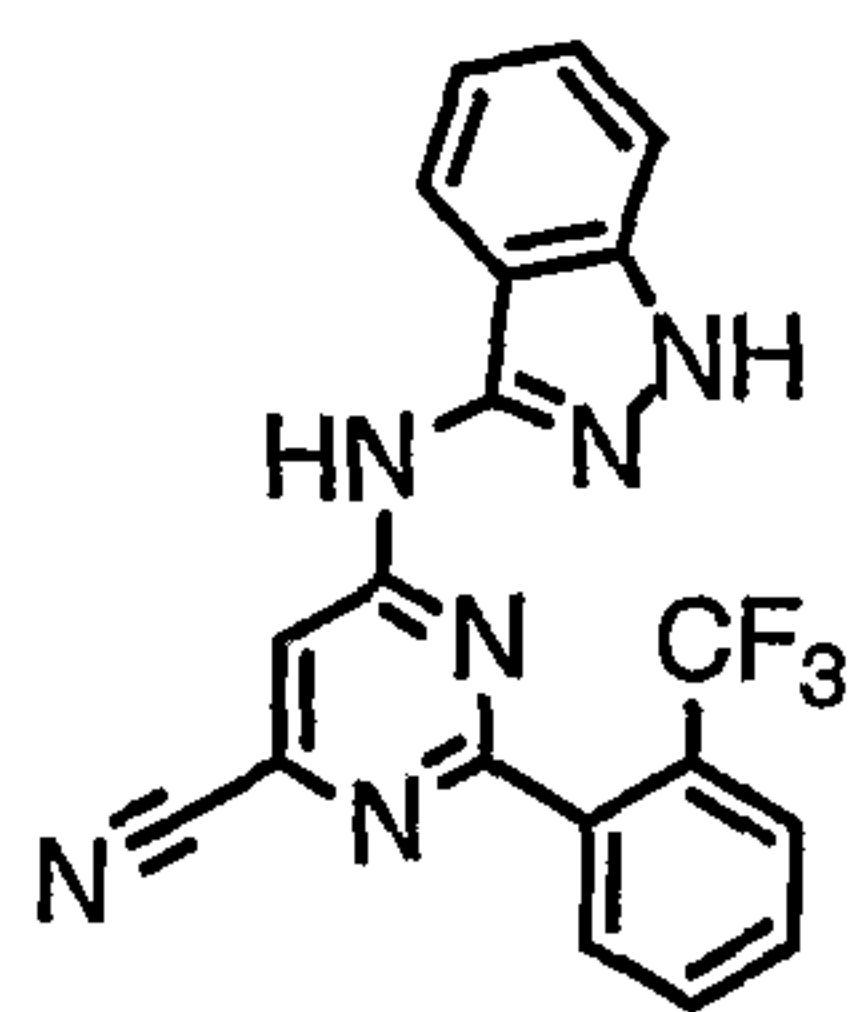


II-191

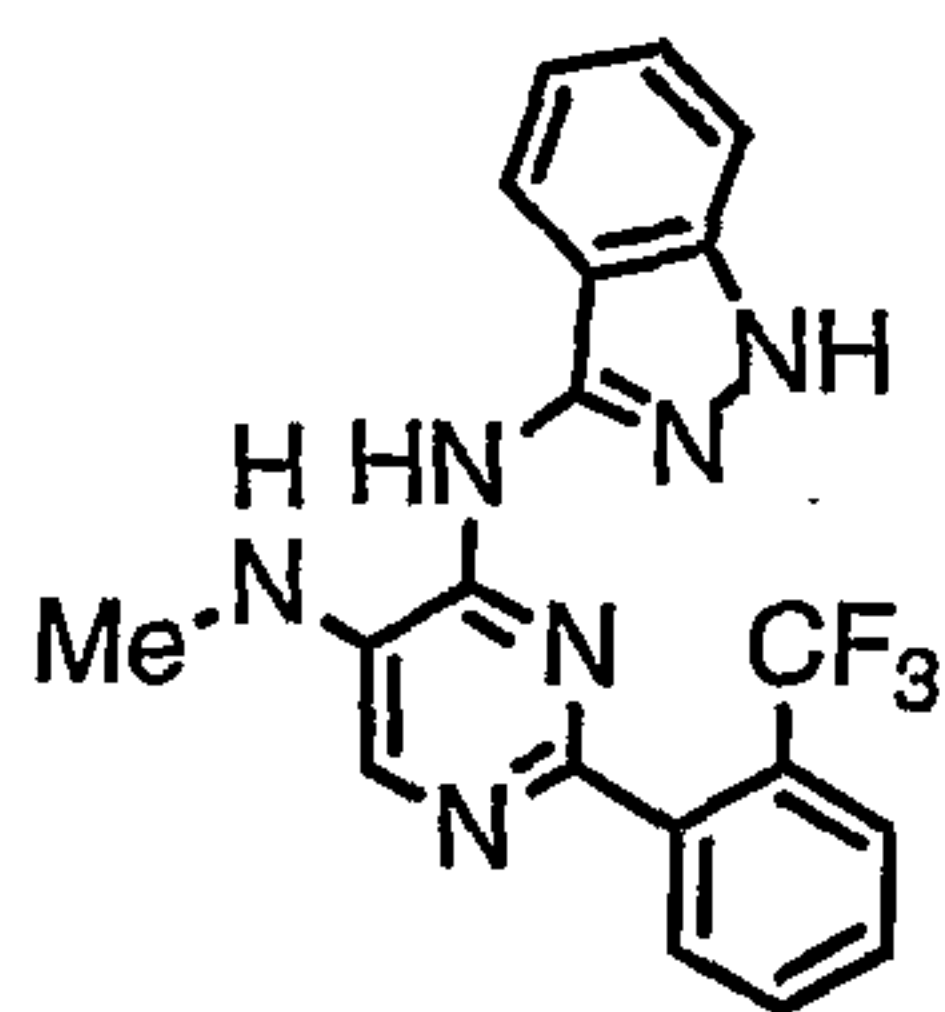


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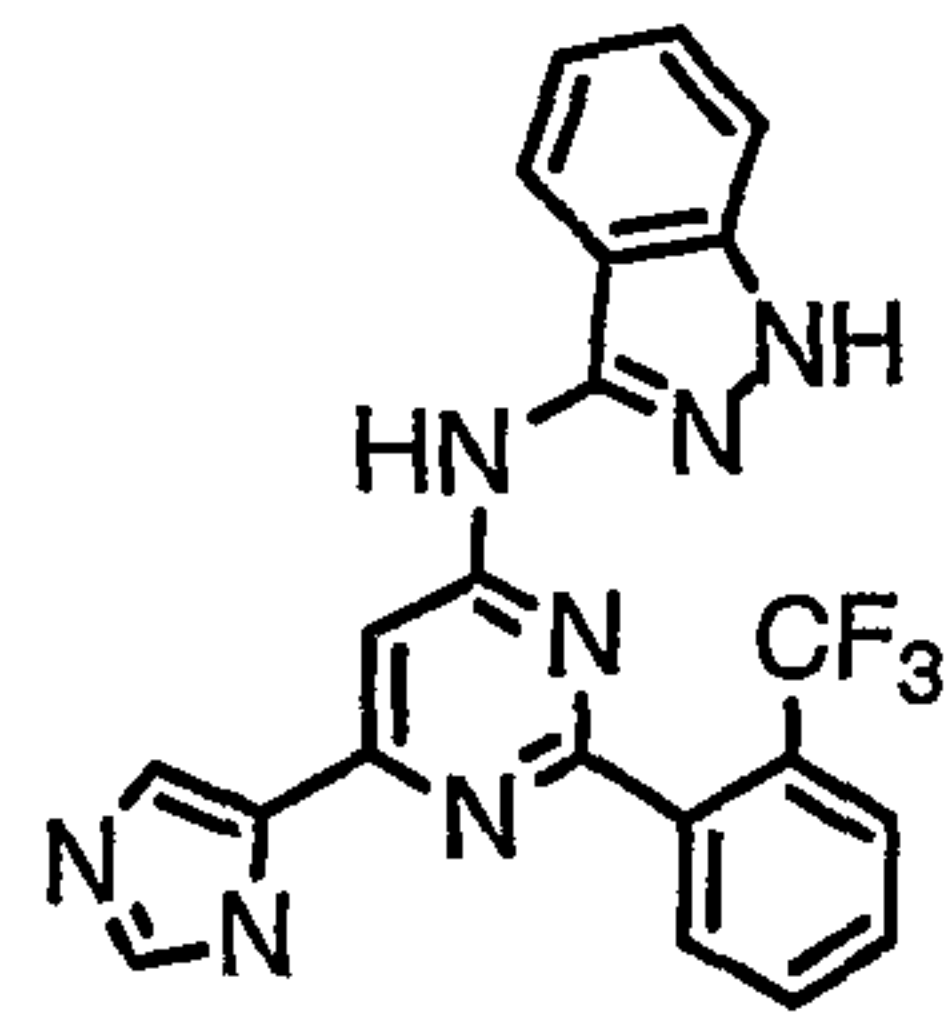
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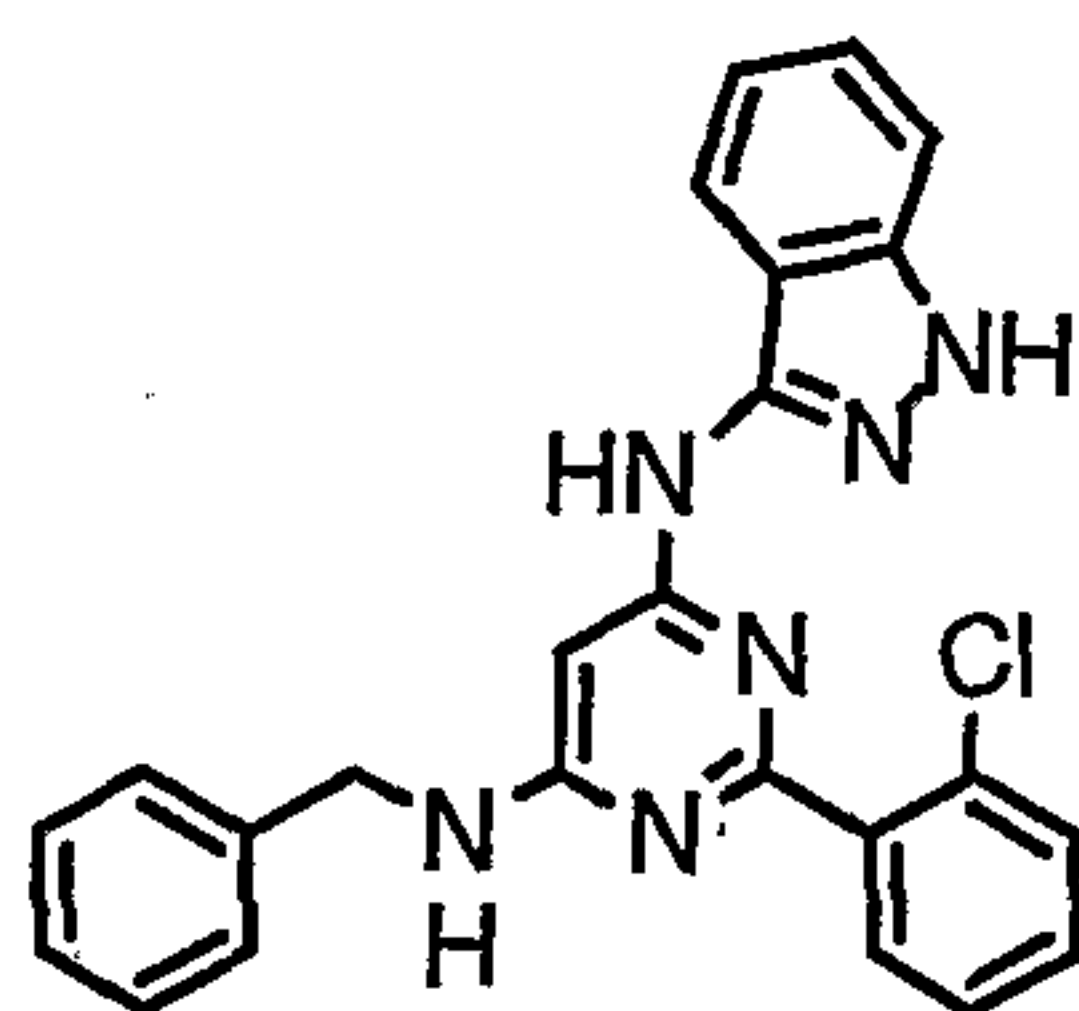
II-193



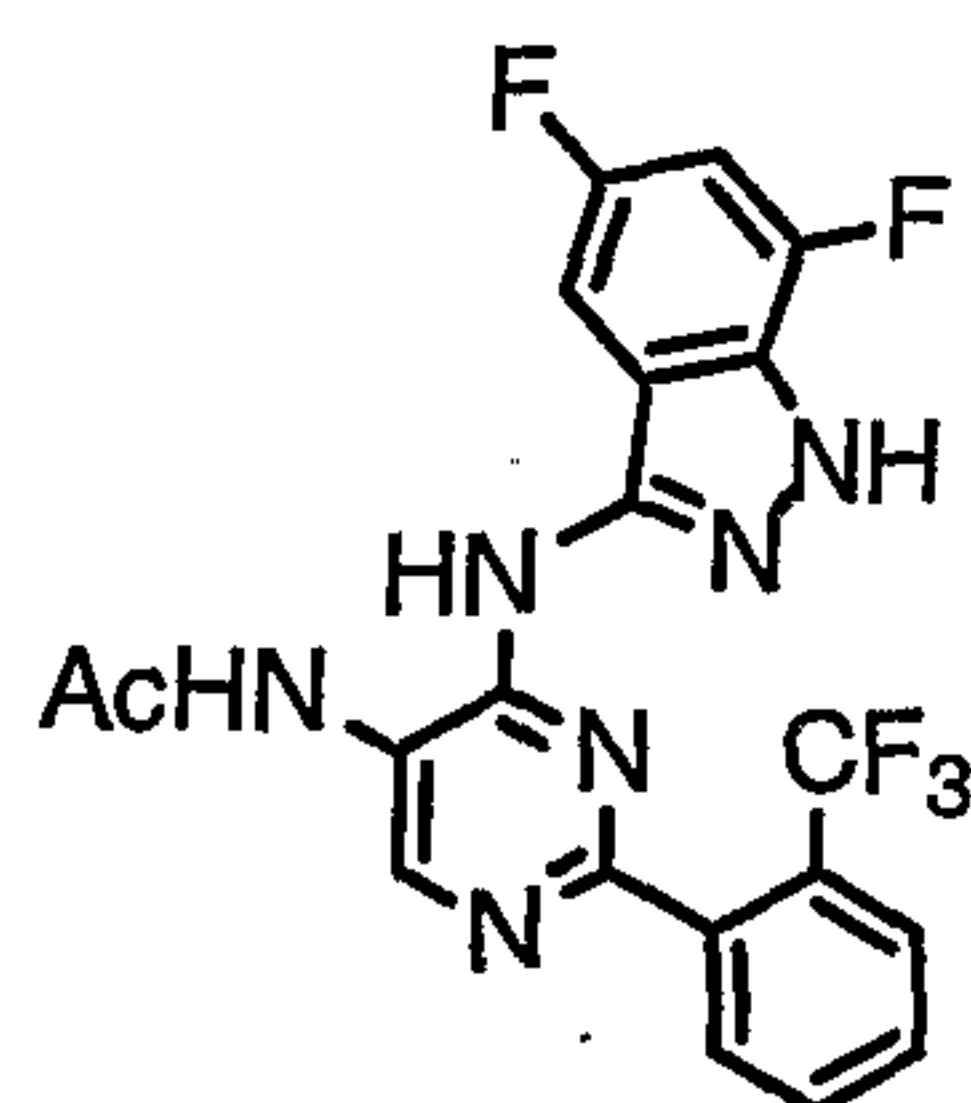
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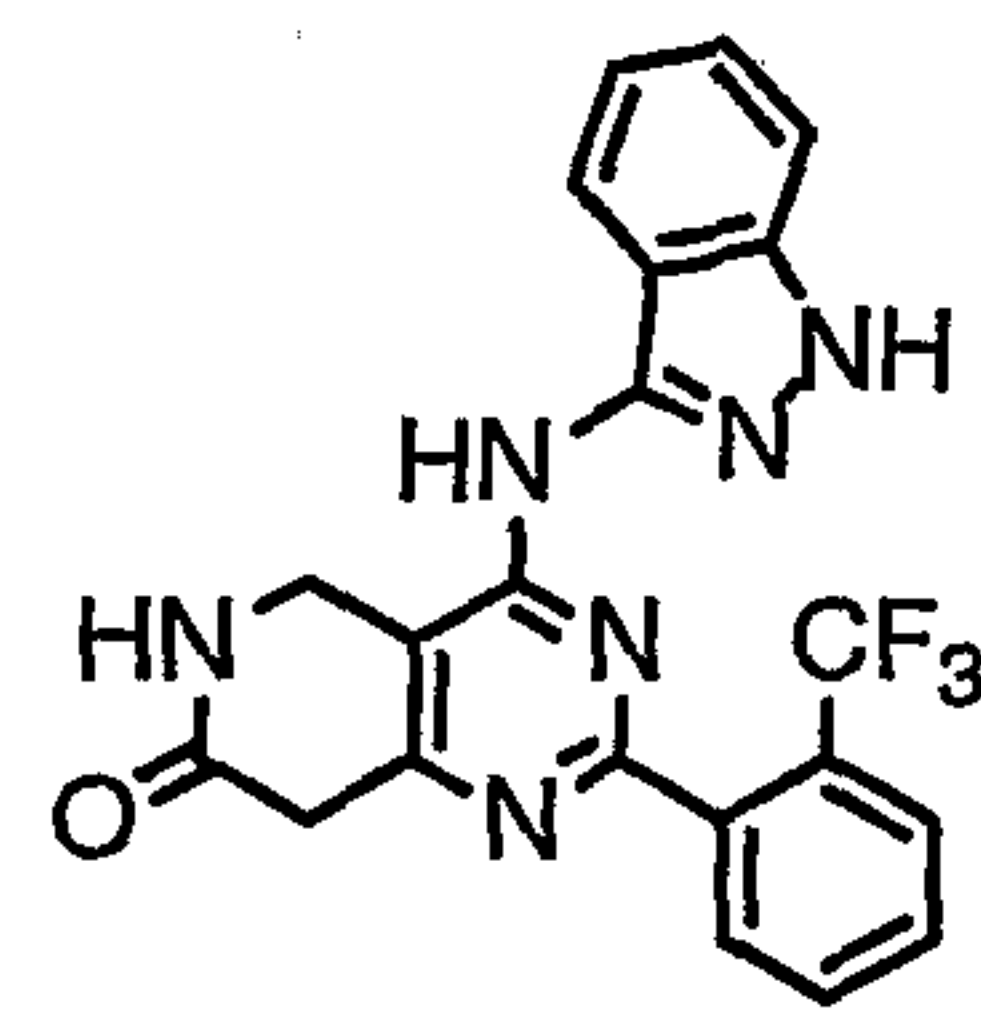
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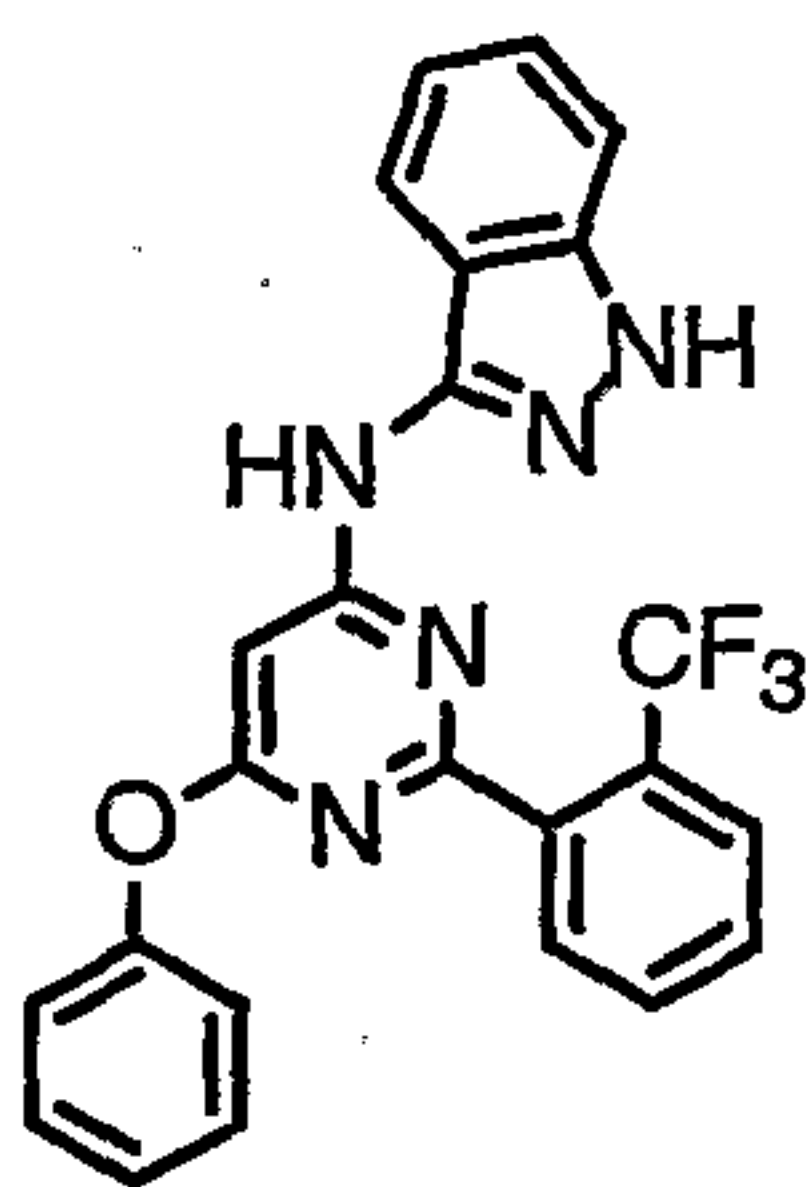
II-196



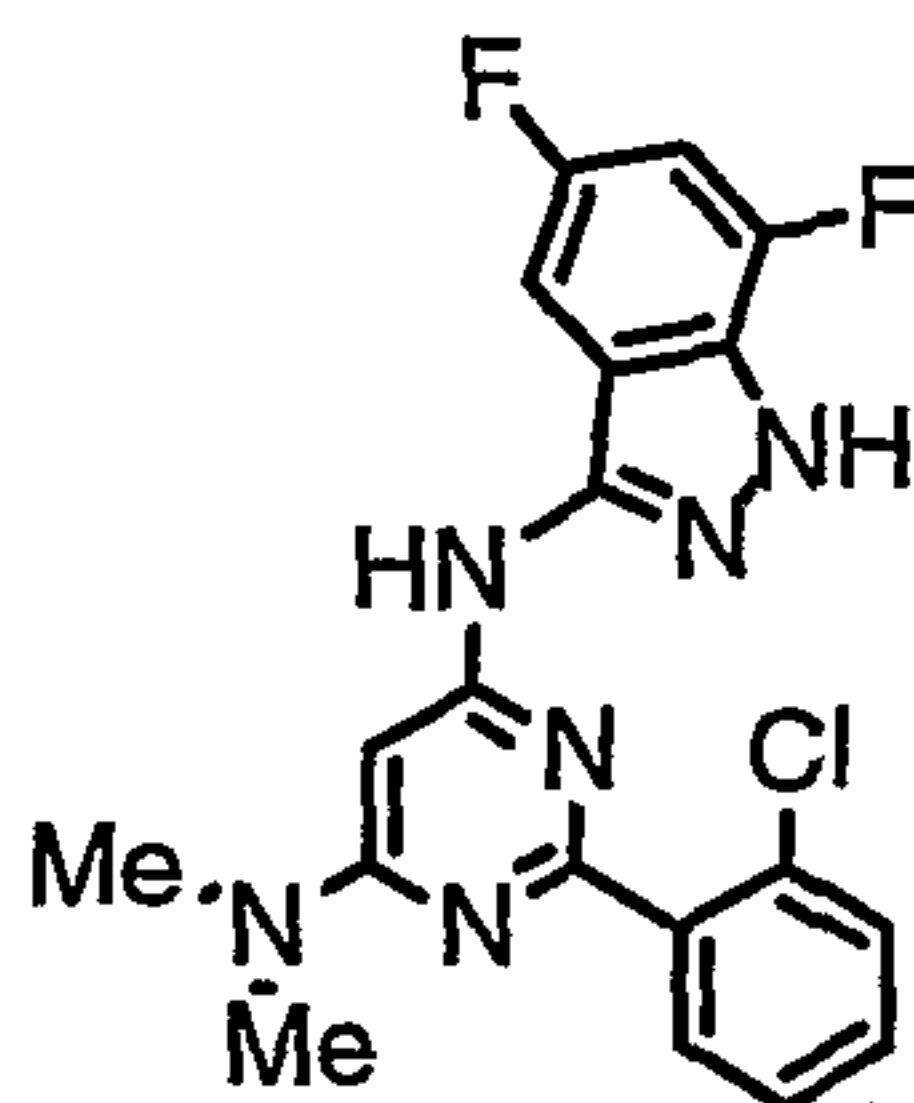
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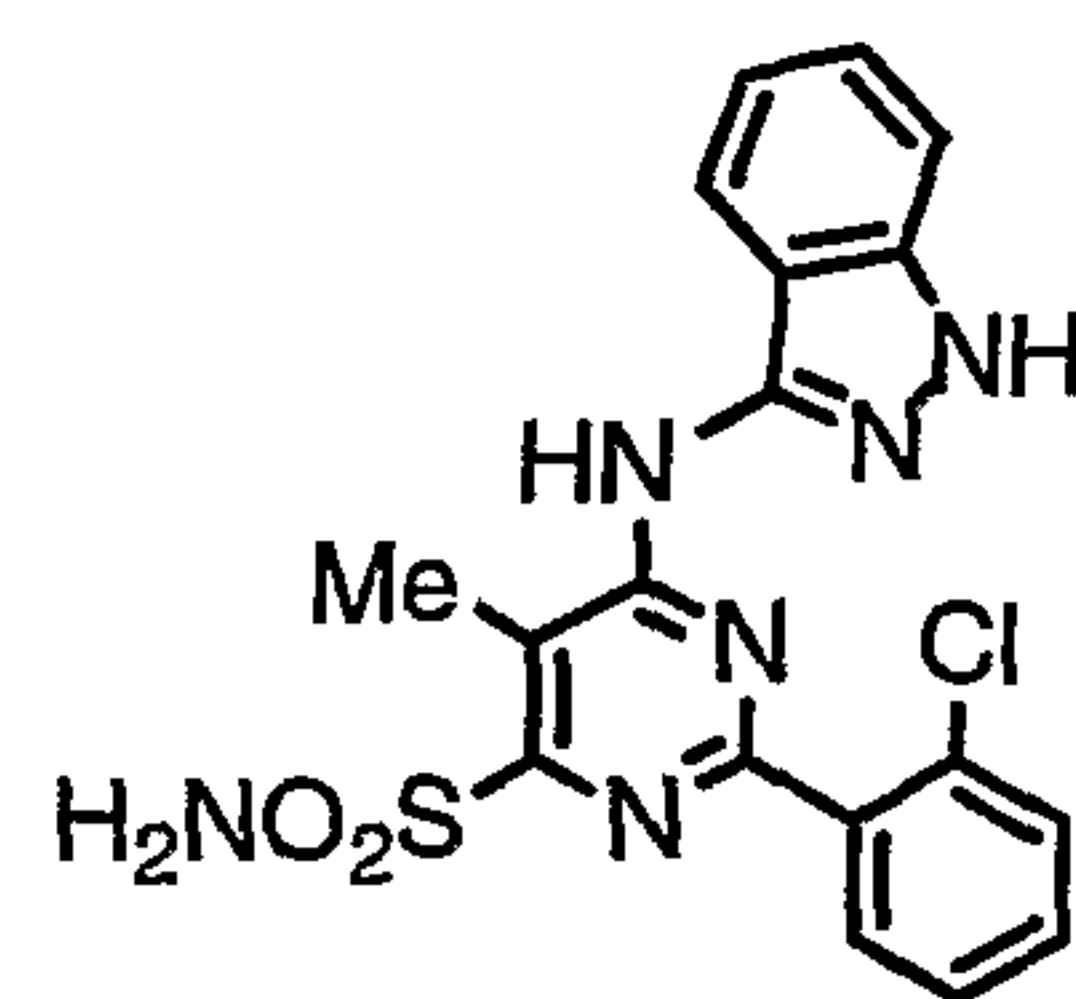
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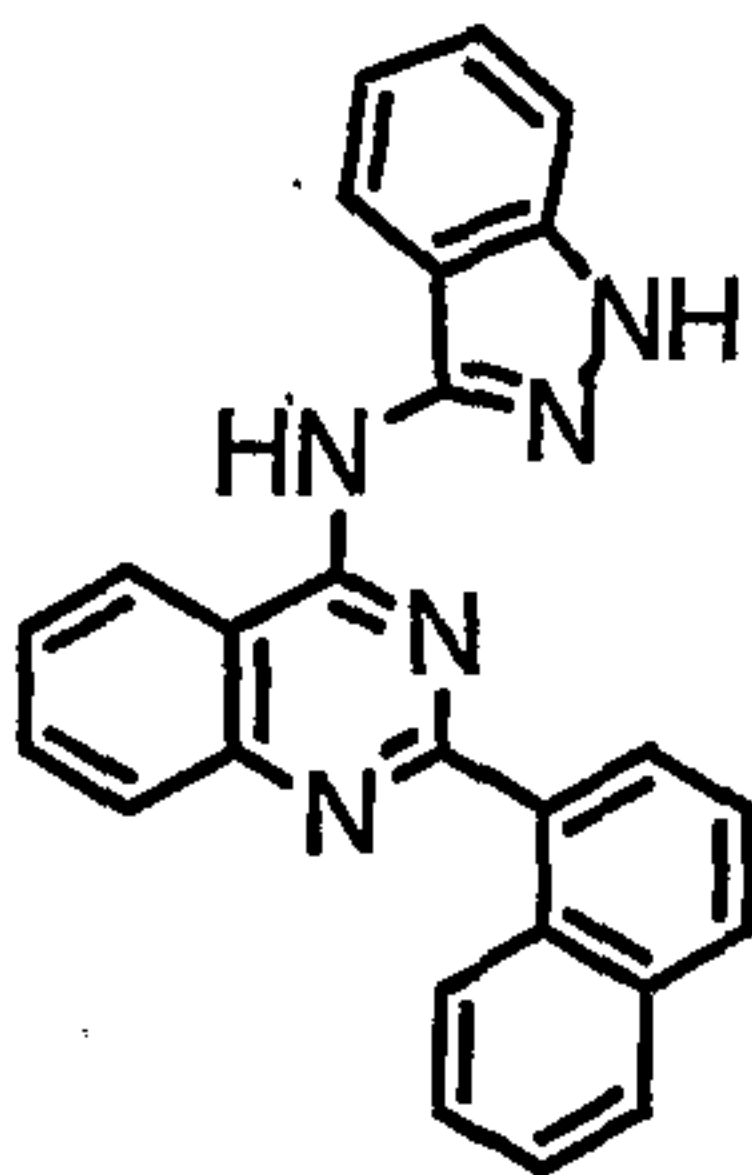
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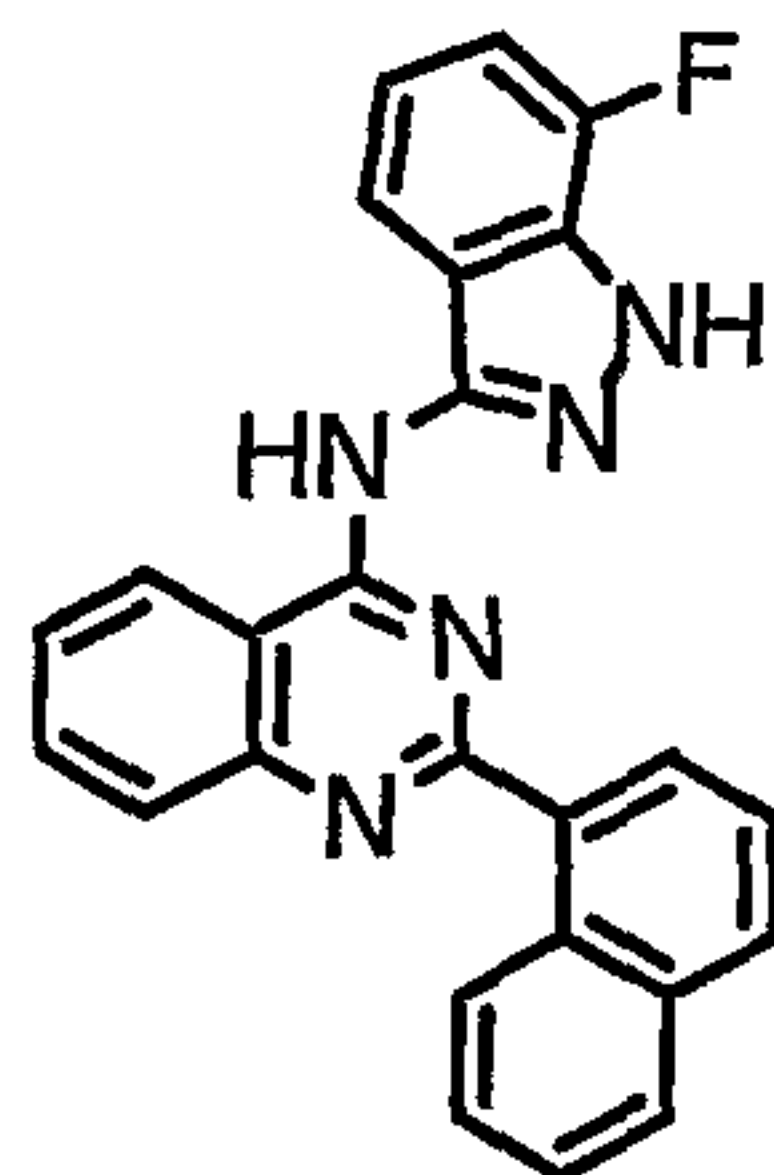
II-200



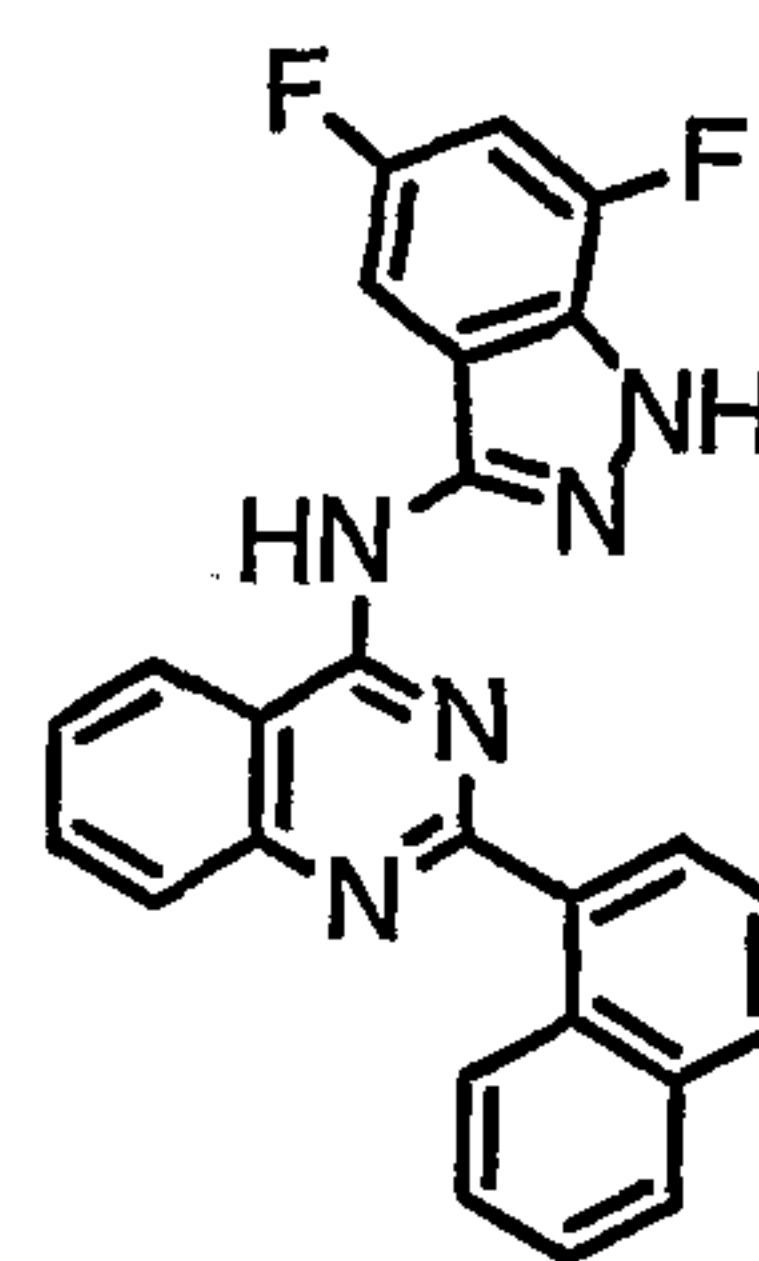
II-201



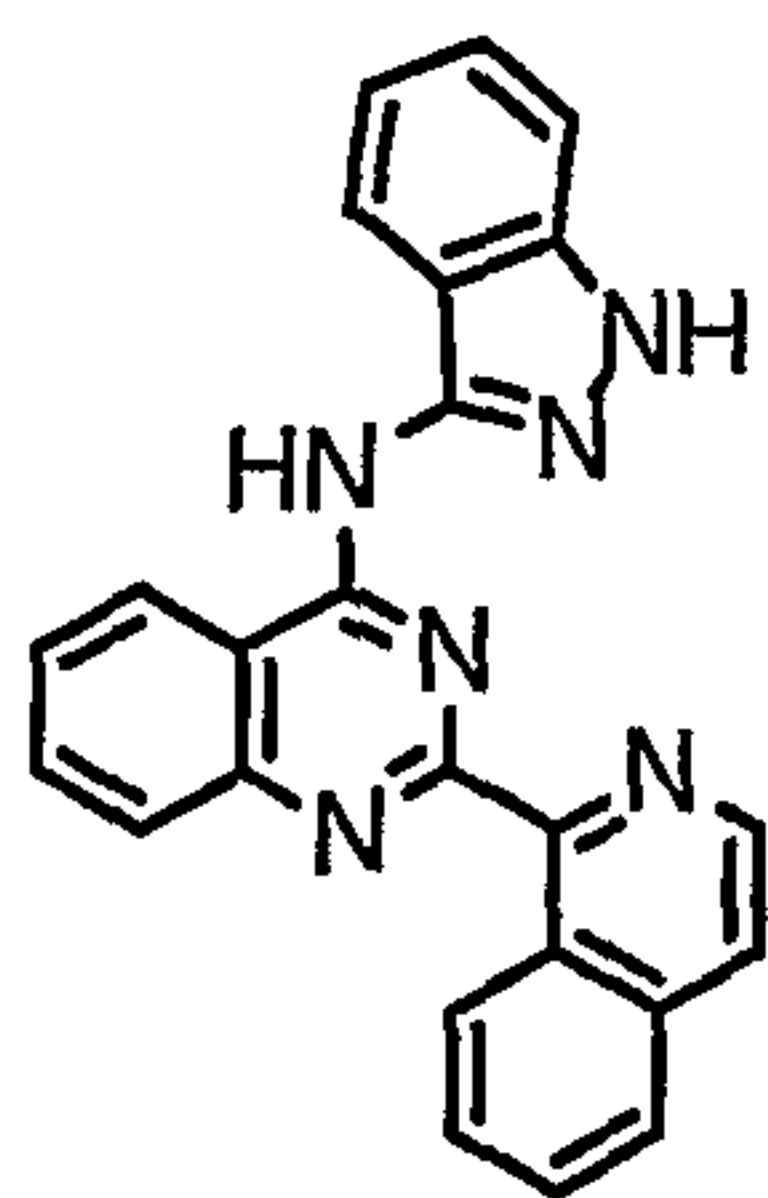
II-202



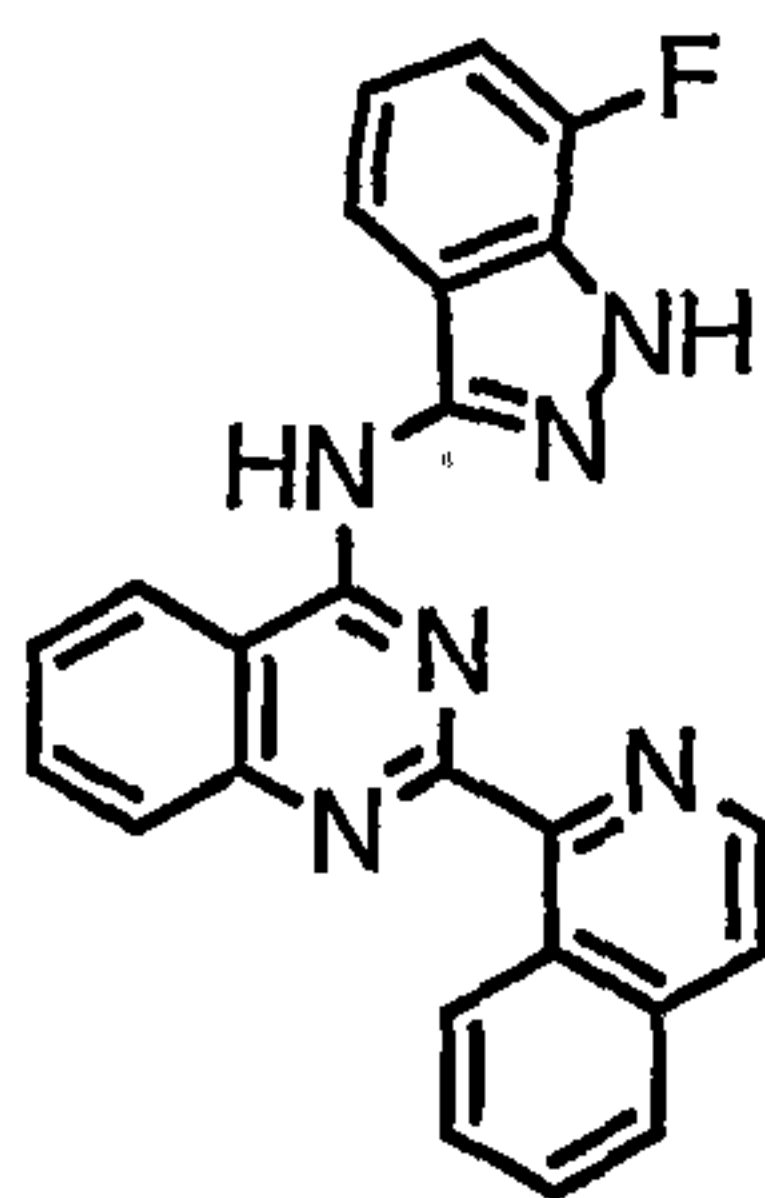
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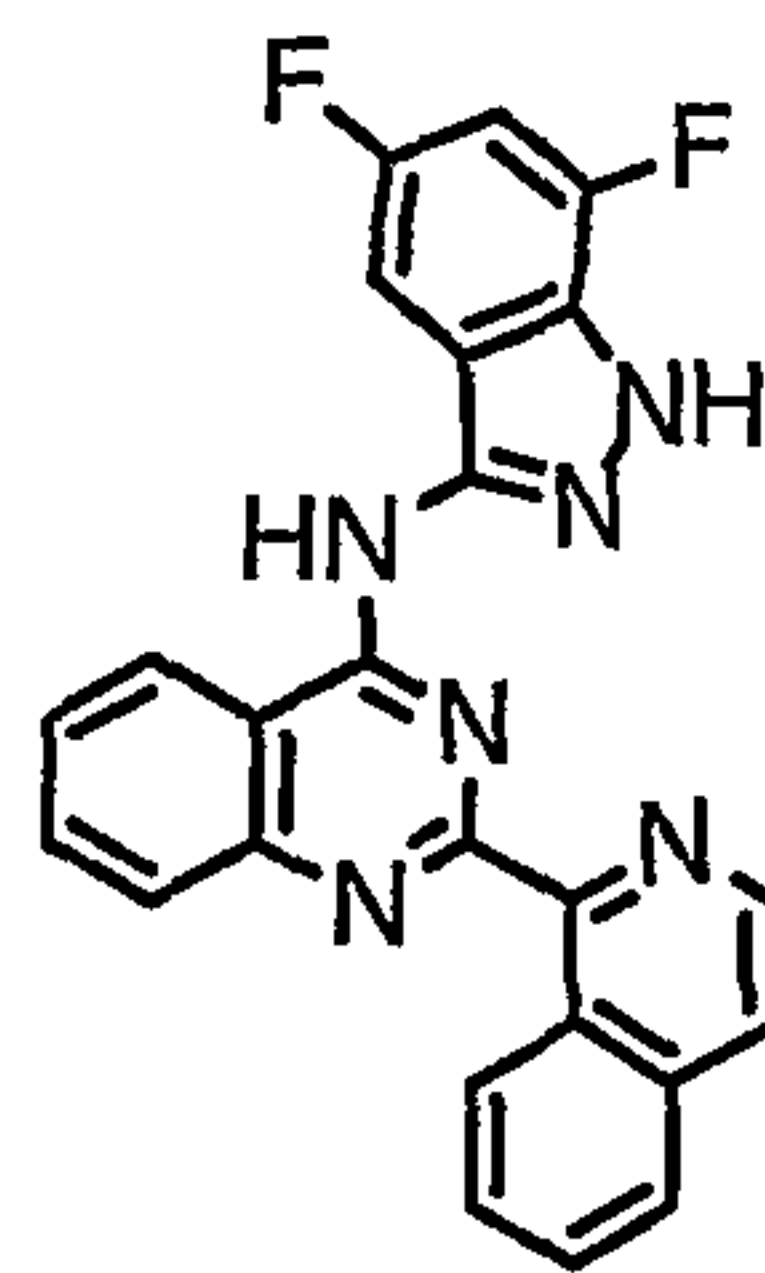
II-204



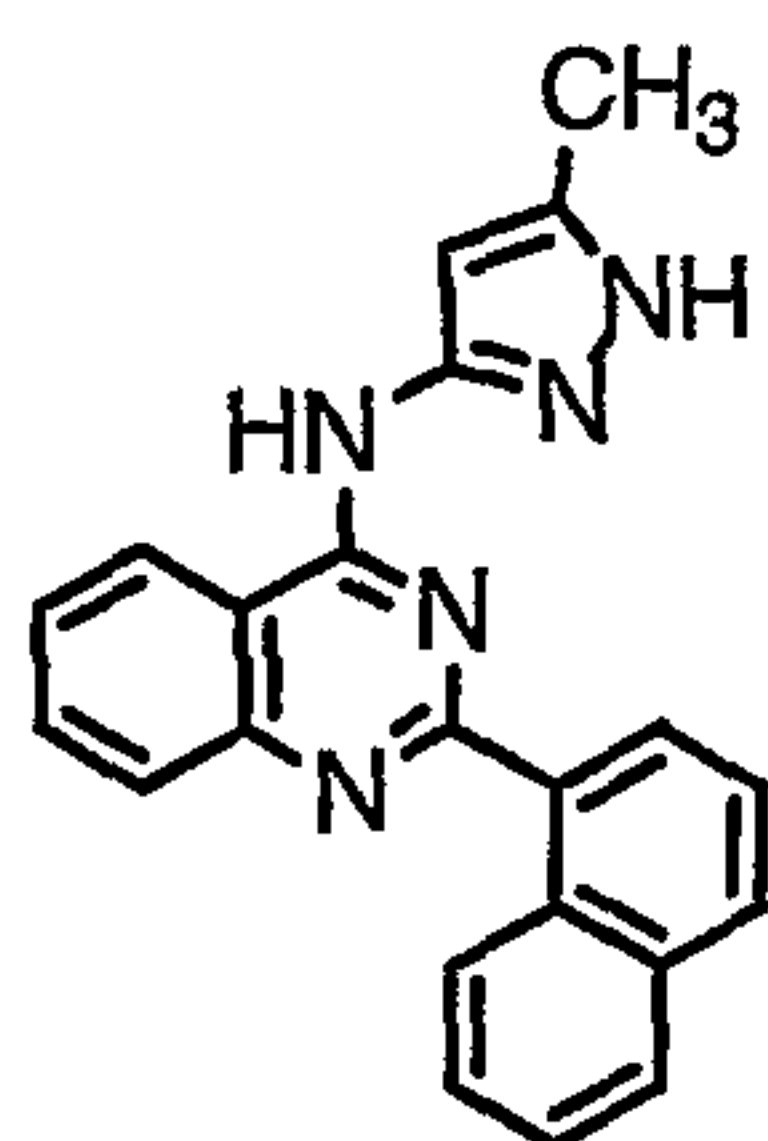
II-205



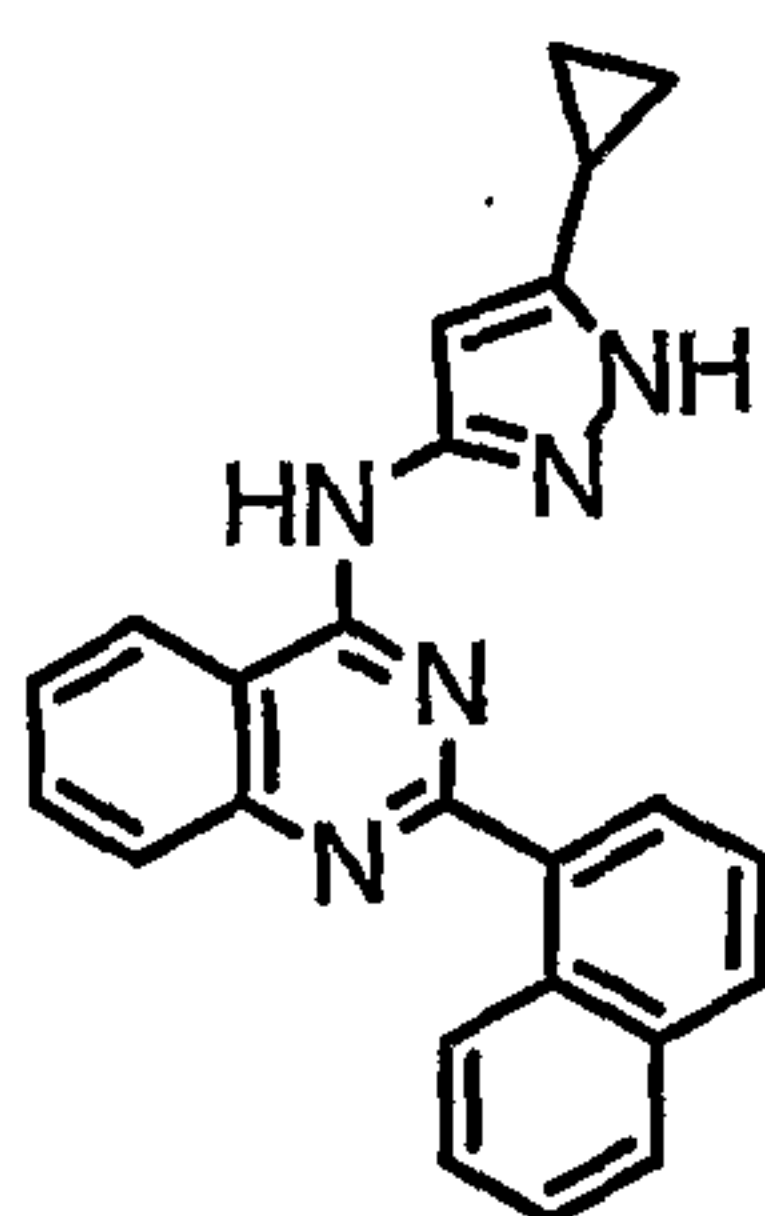
II-206



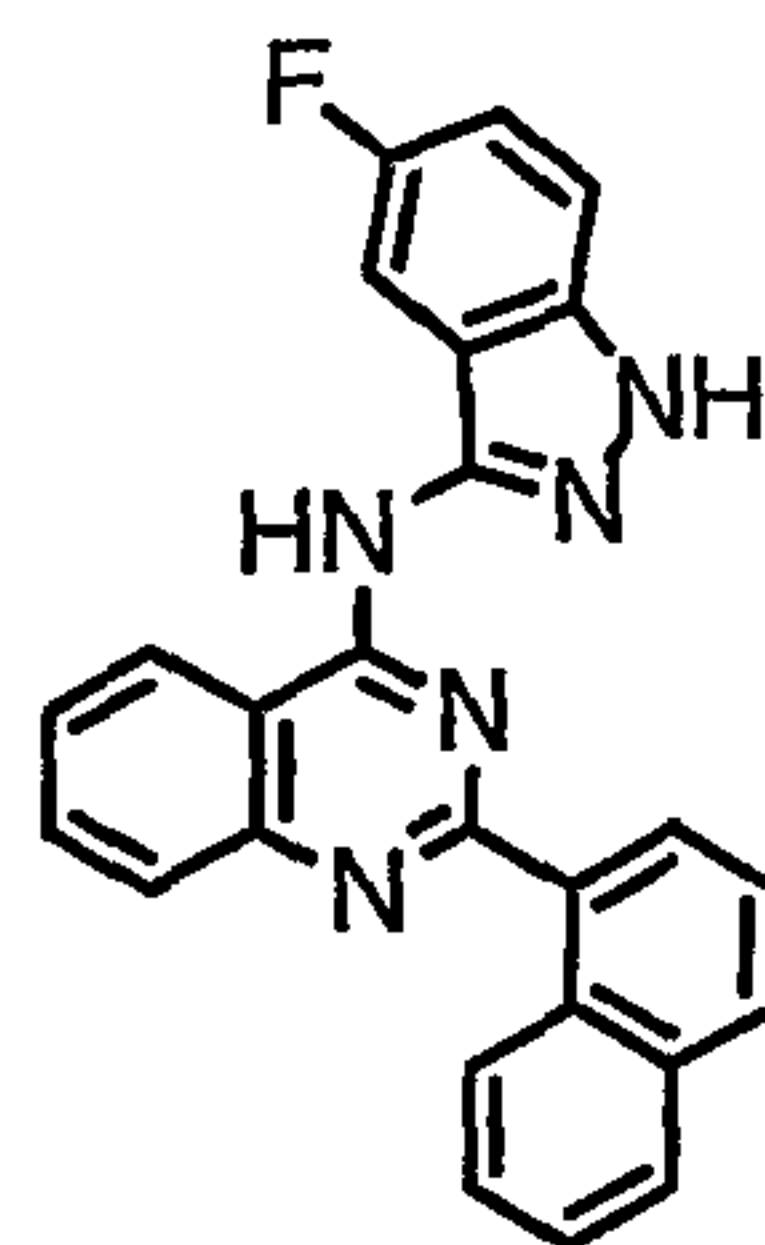
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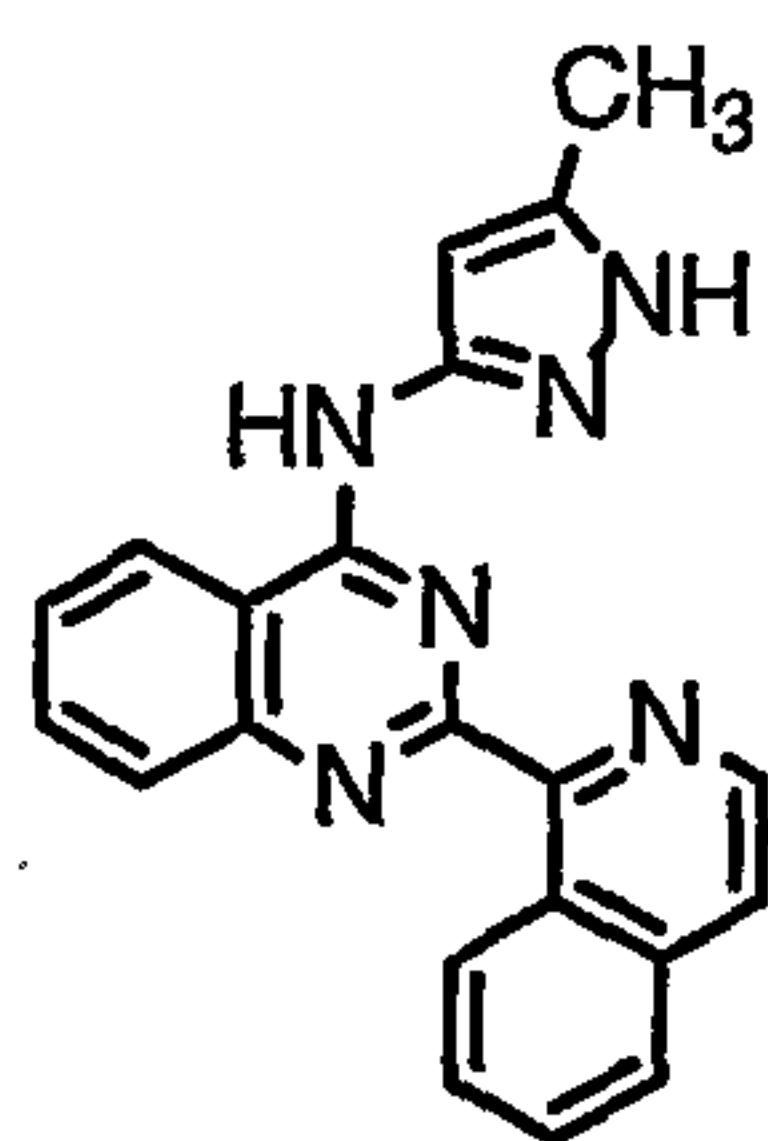
II-208



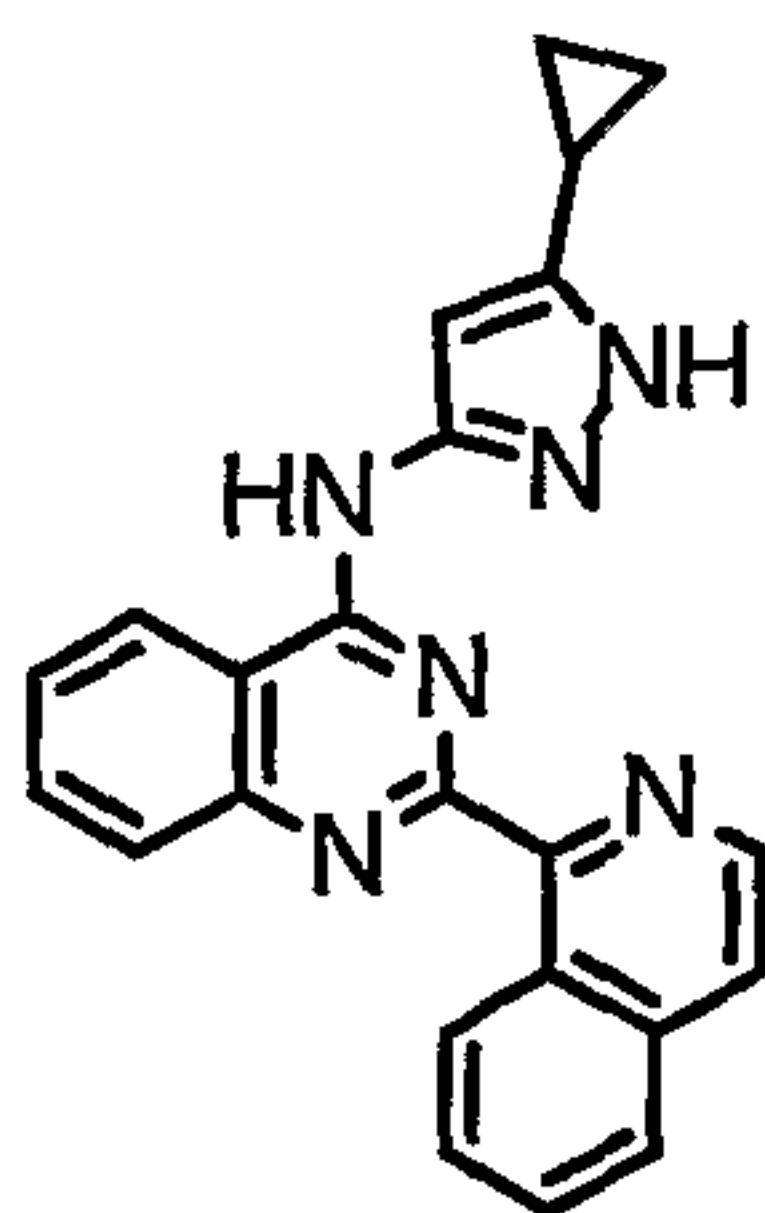
II-209



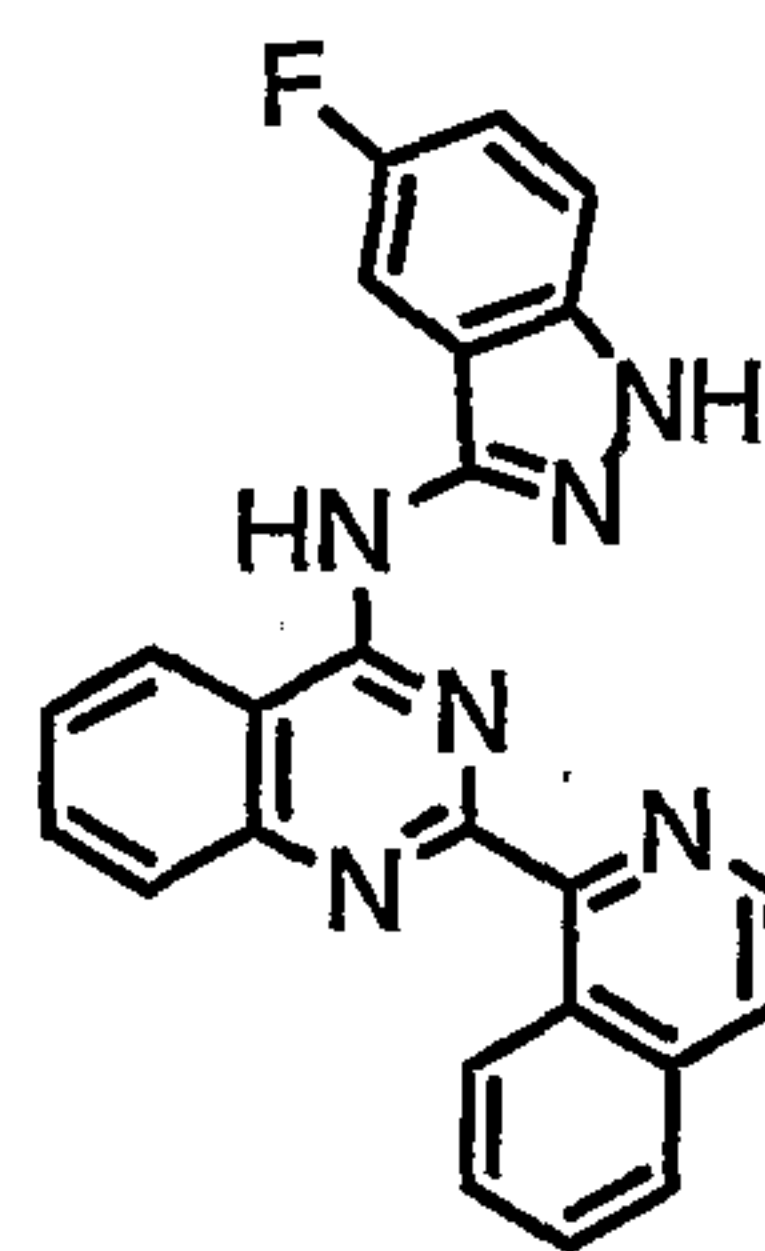
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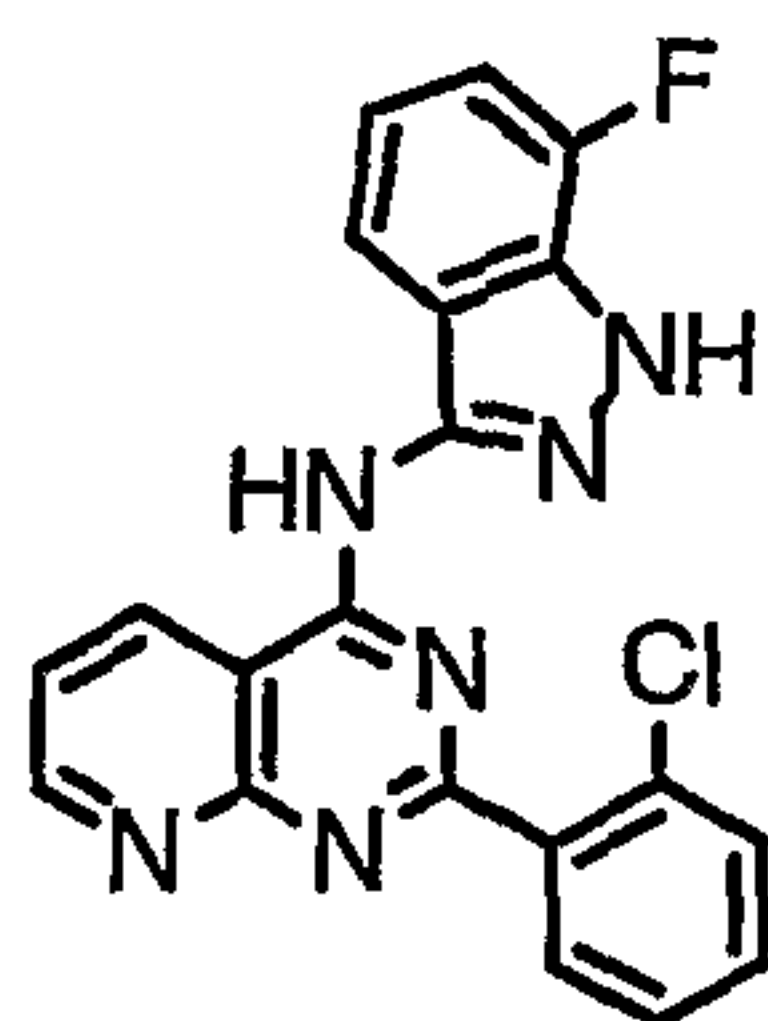
II-211



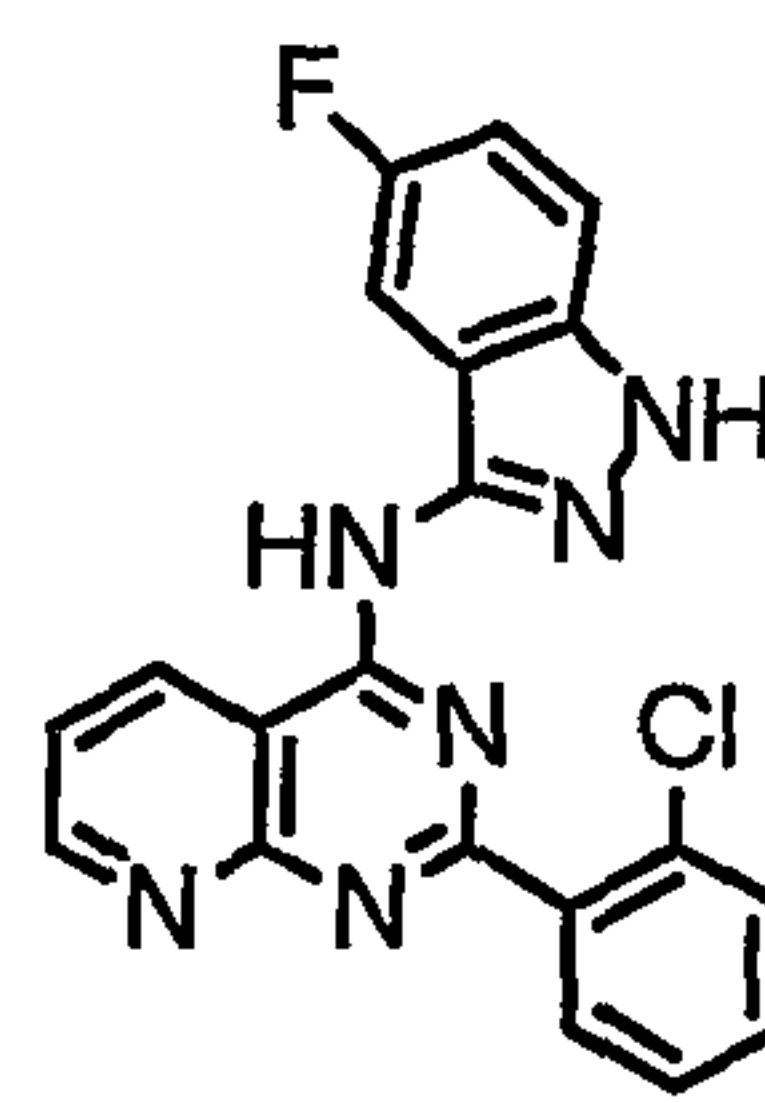
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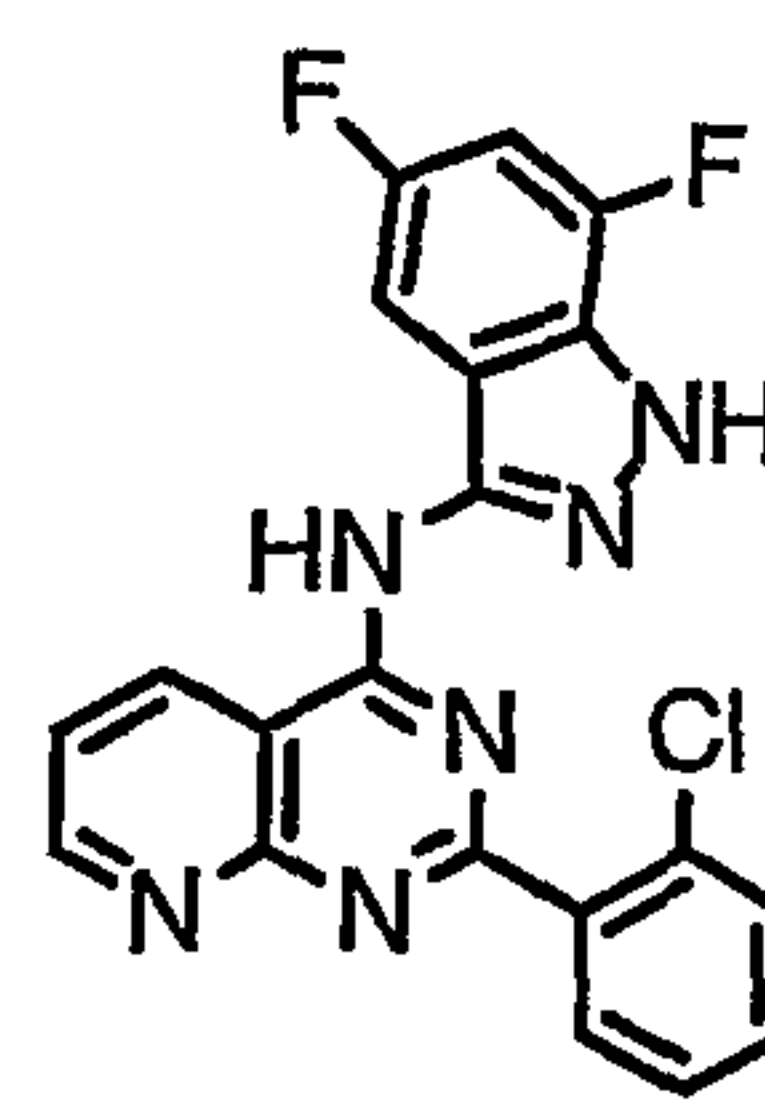
II-213



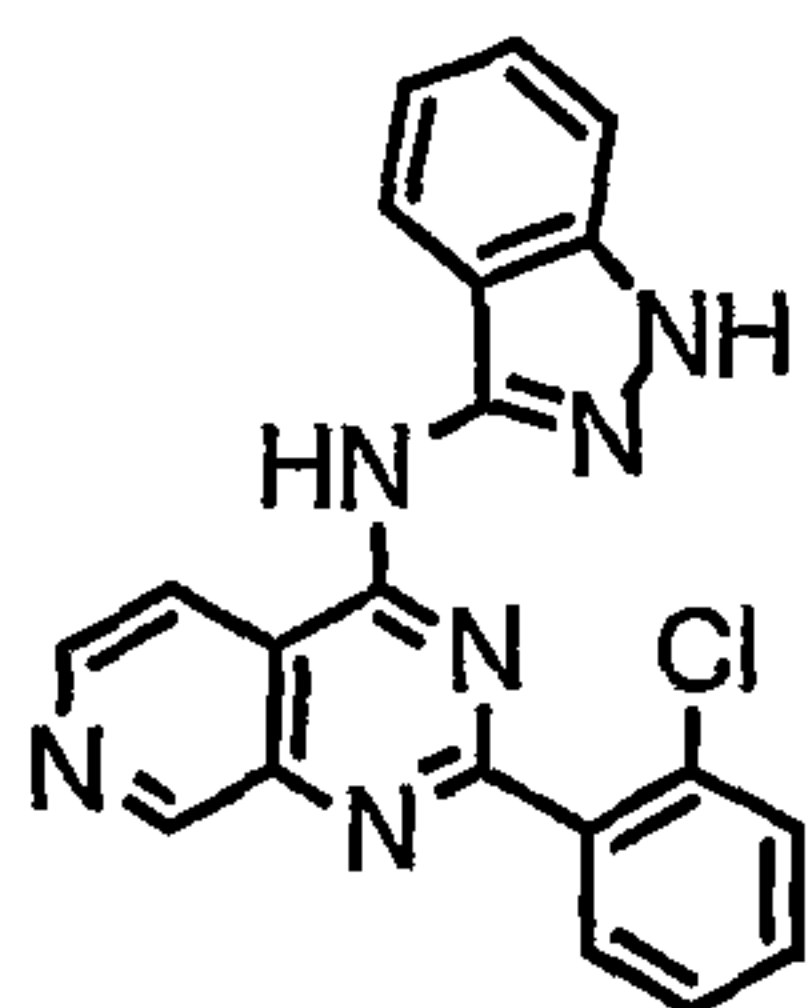
II-214



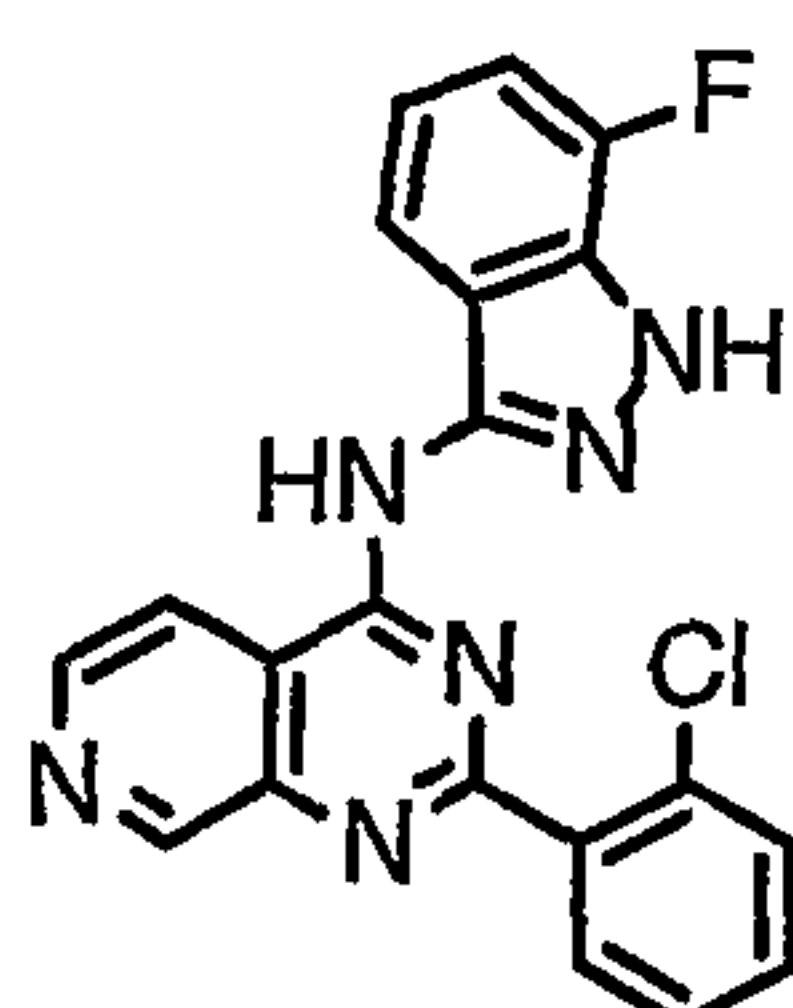
II-215



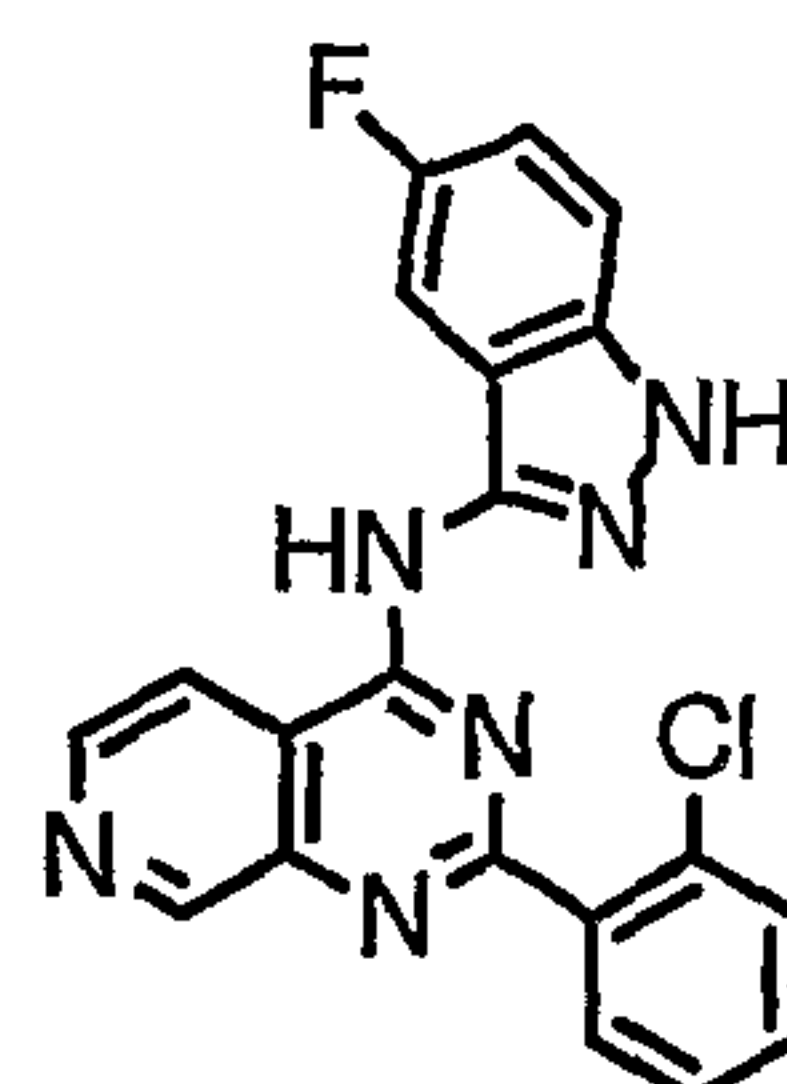
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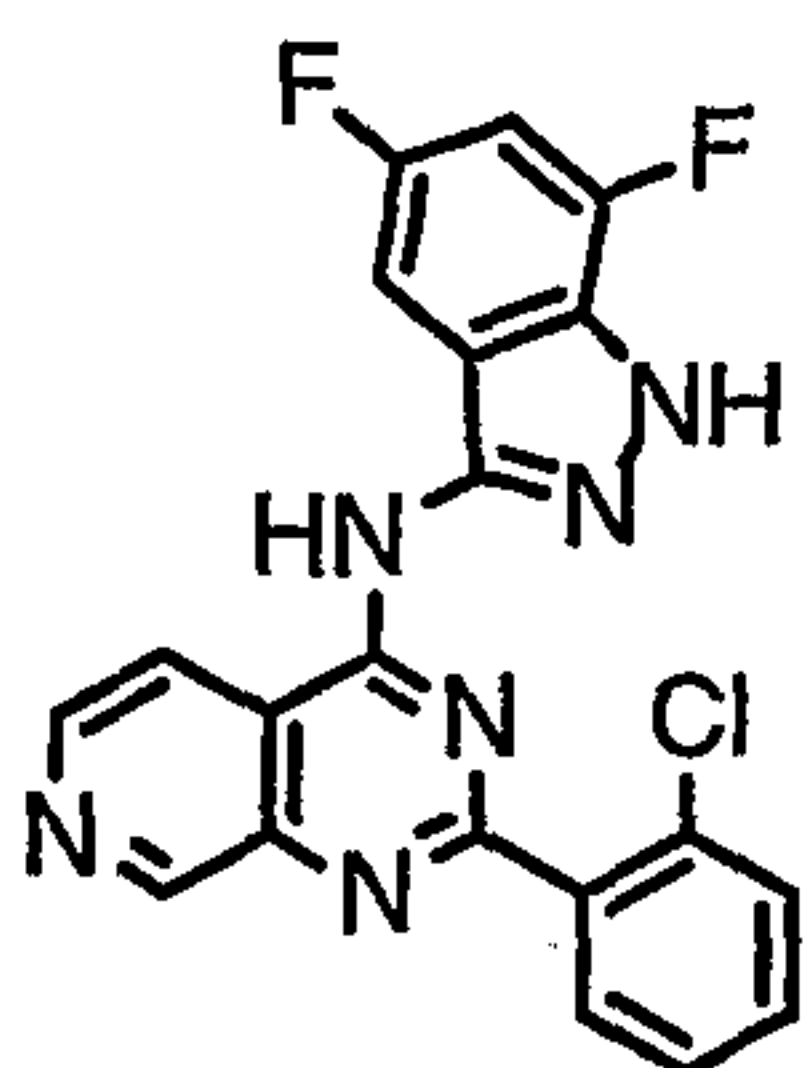
II-217



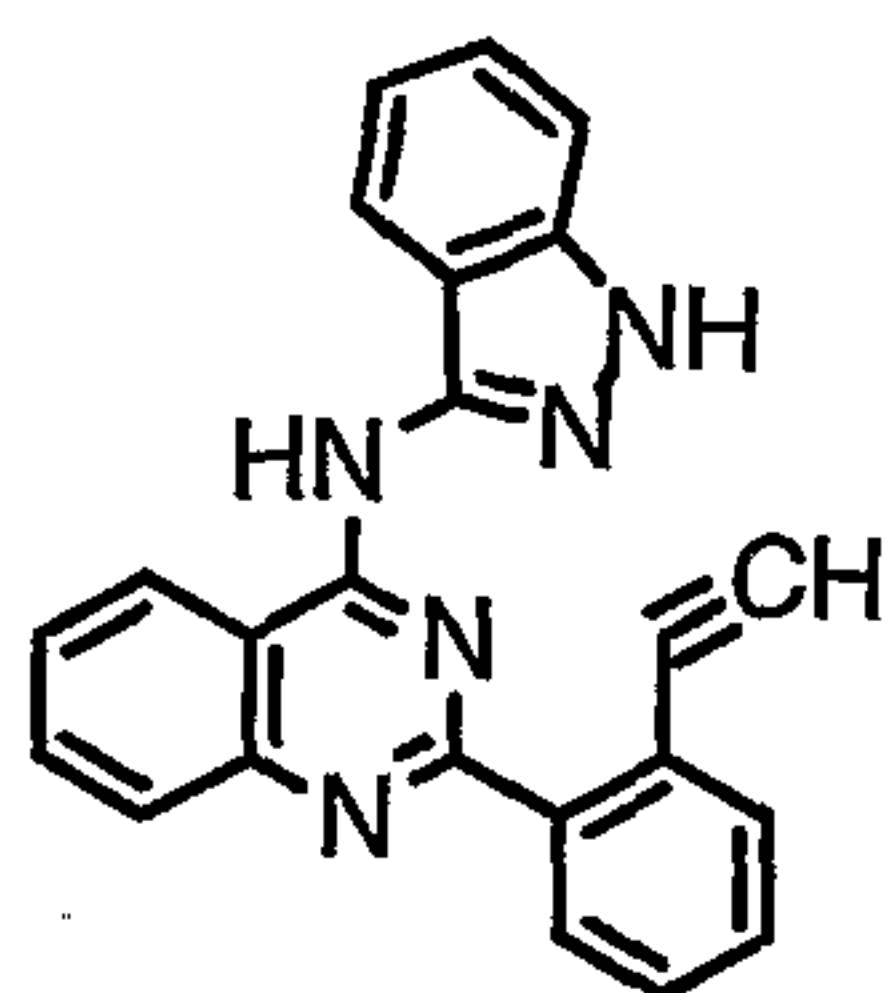
II-218



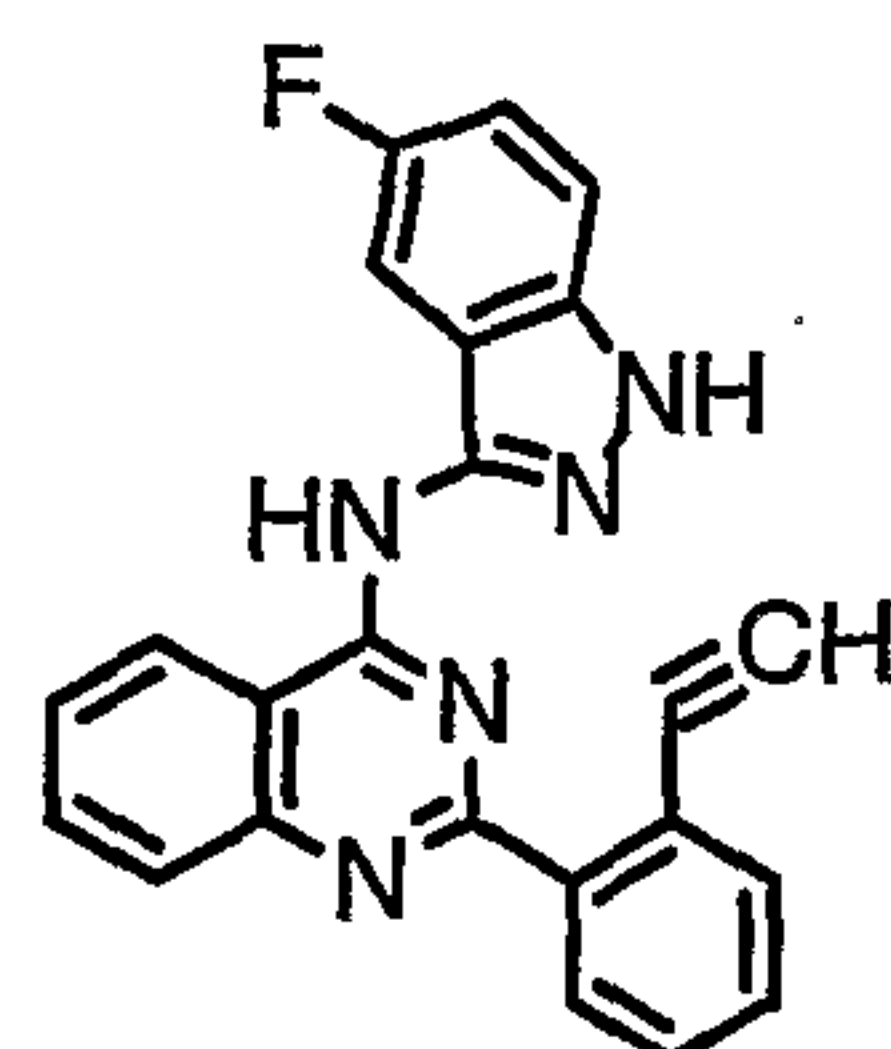
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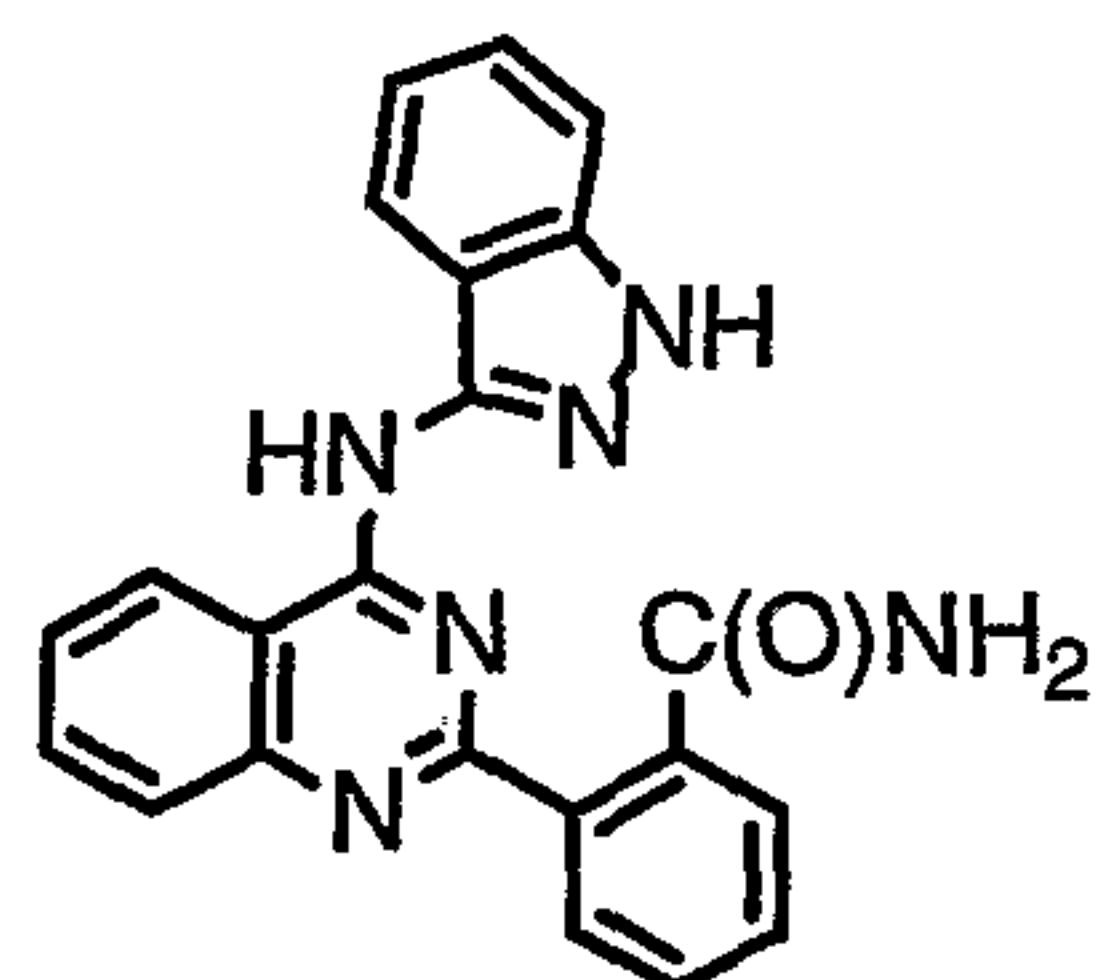
II-220



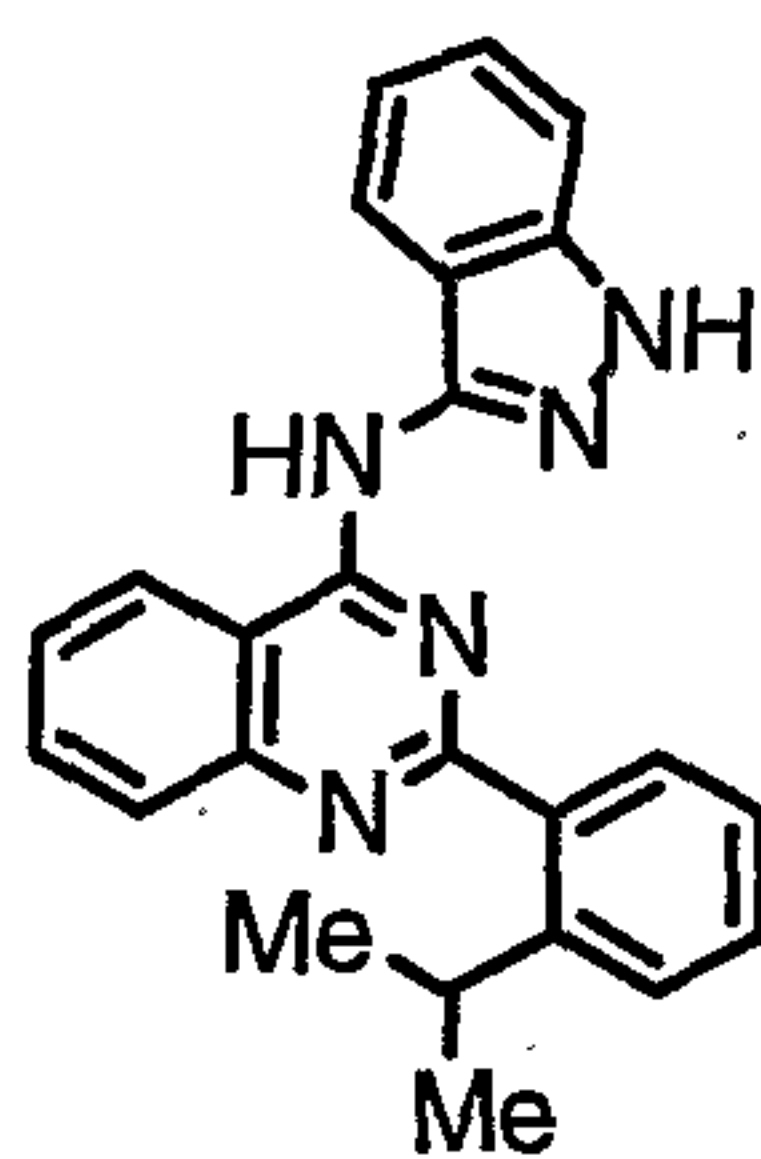
II-221



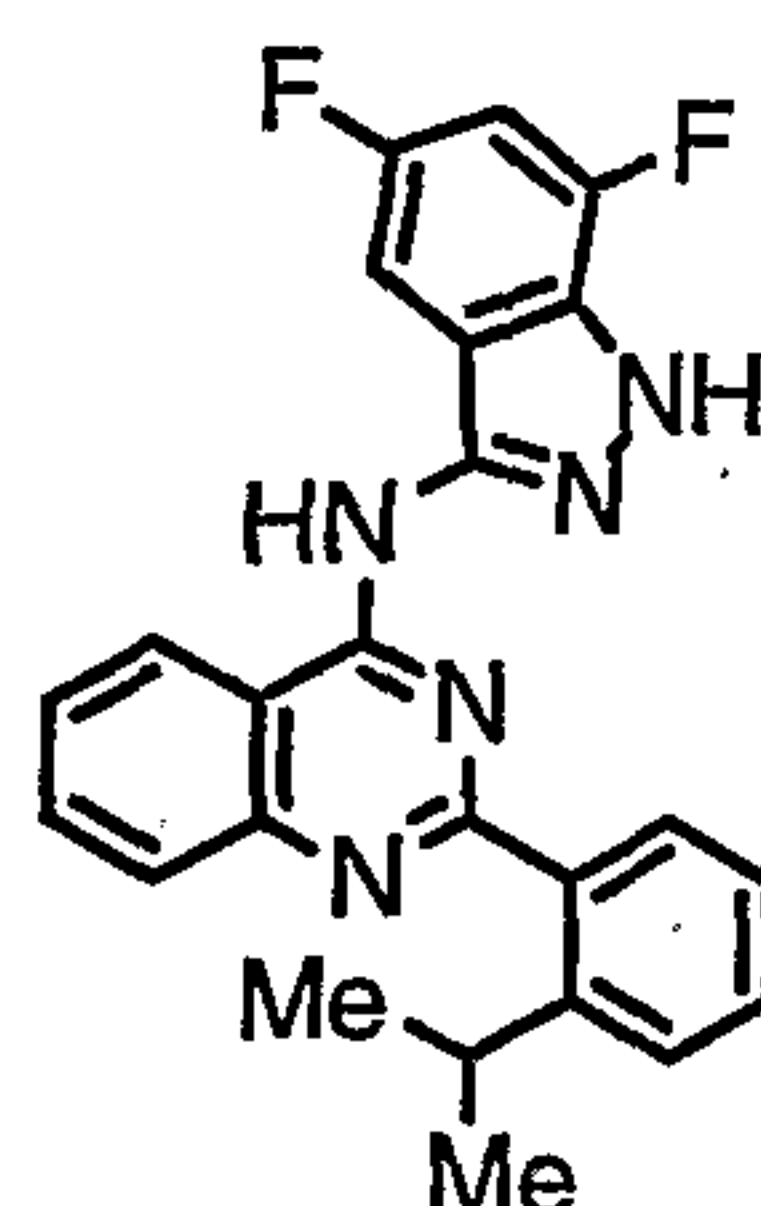
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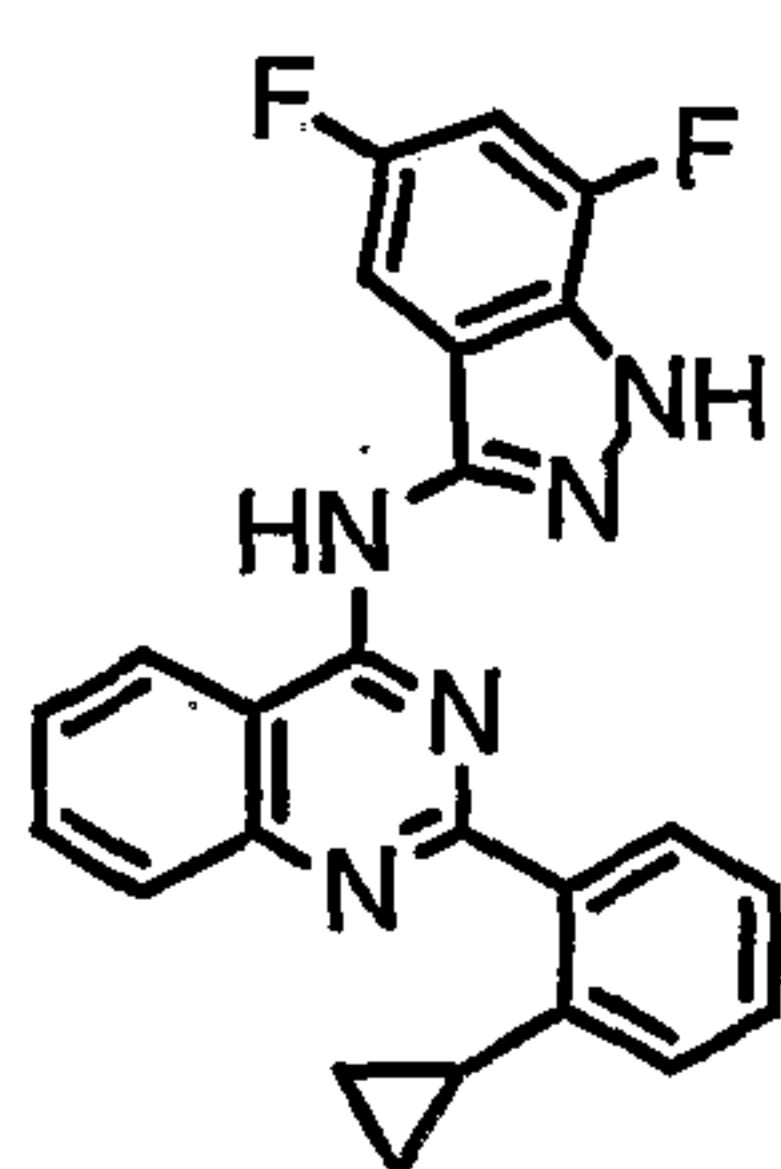
II-223



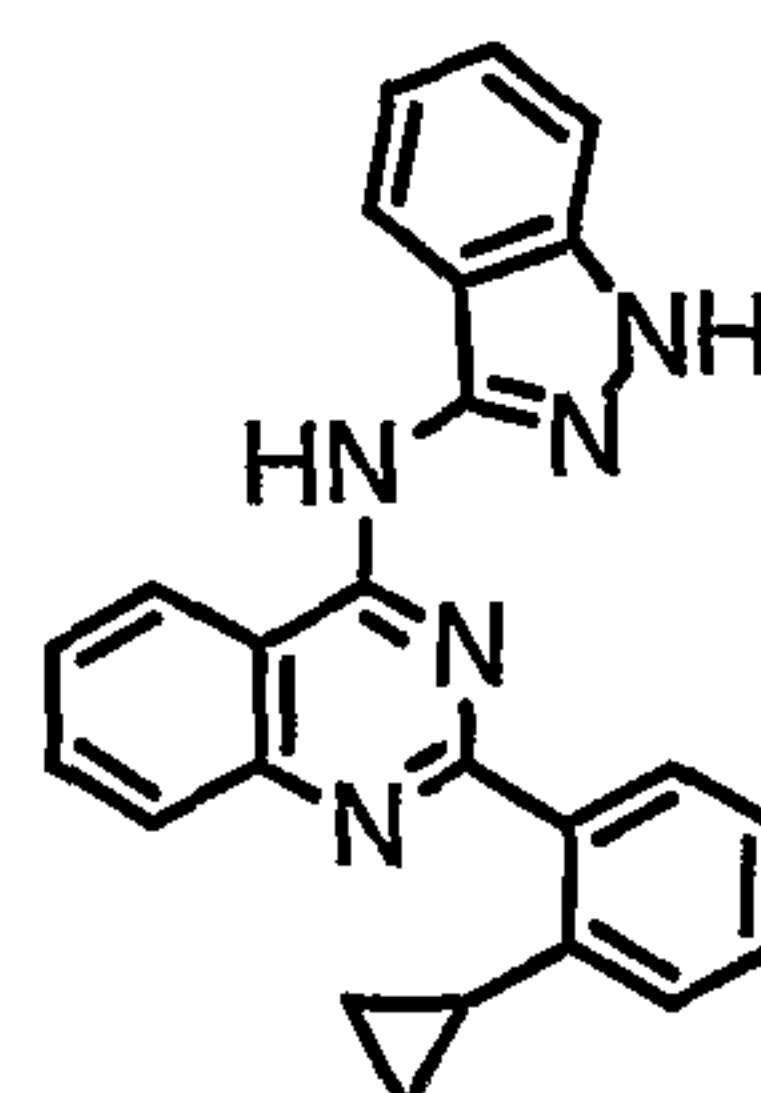
II-224



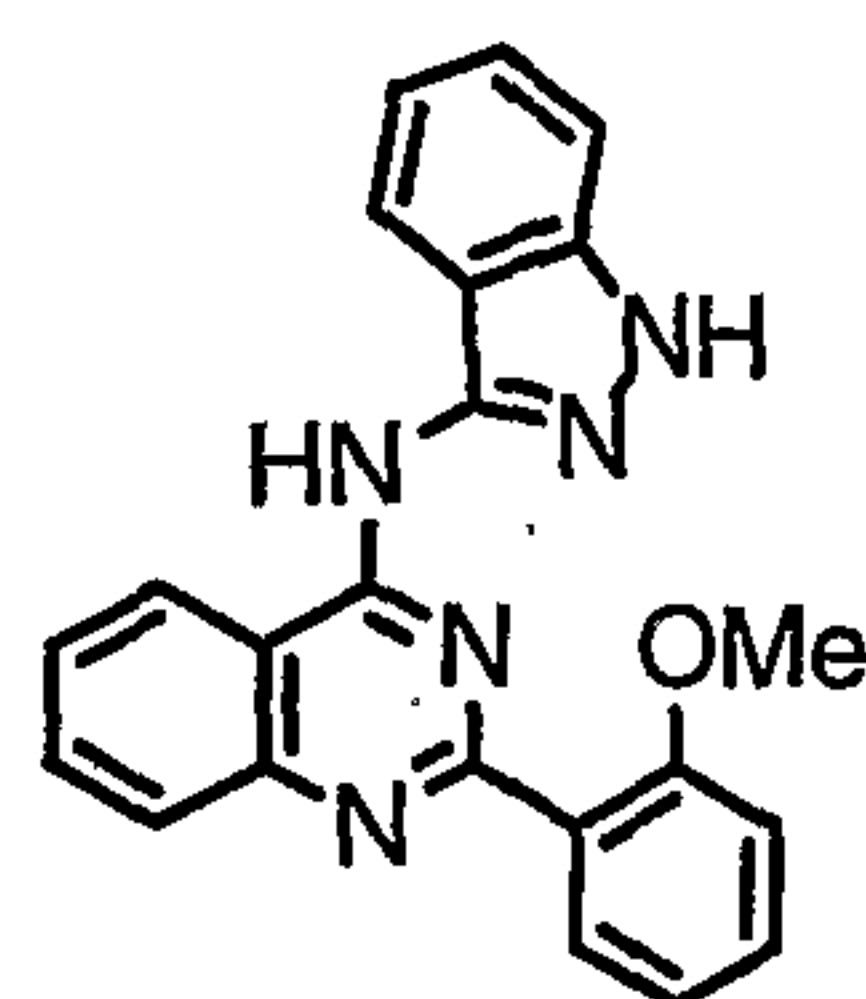
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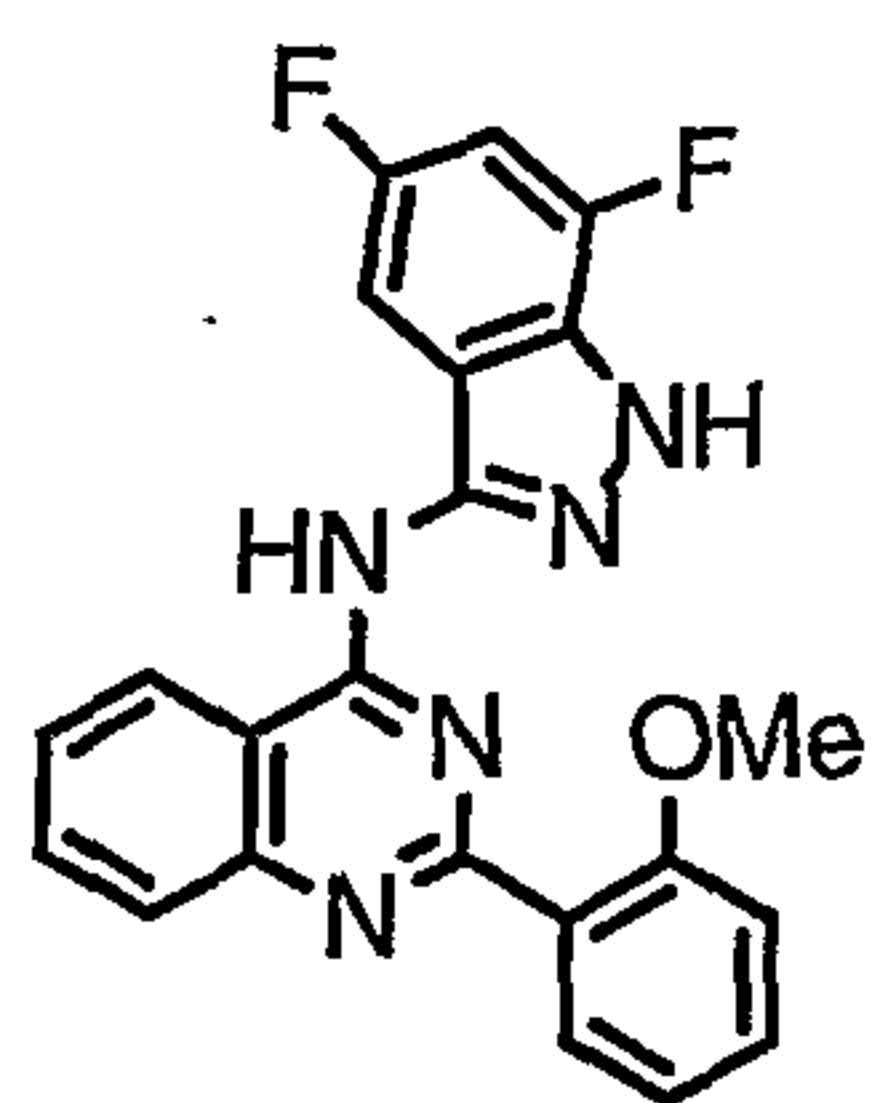
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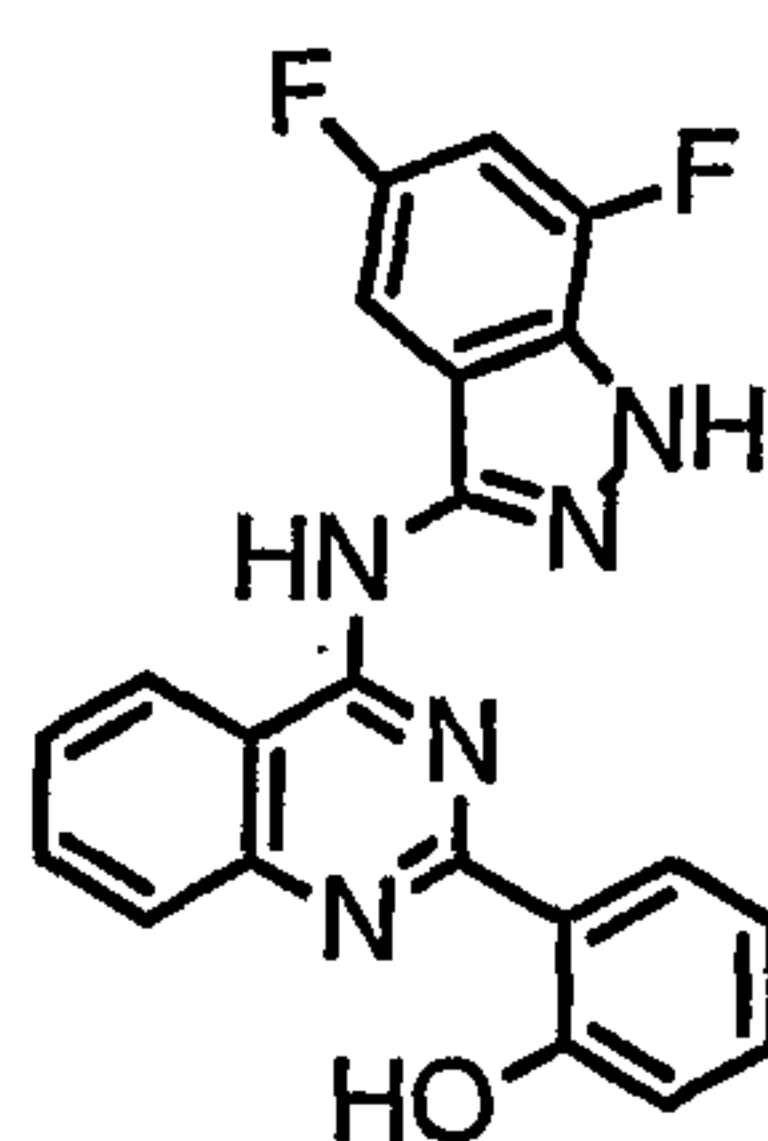
II-227



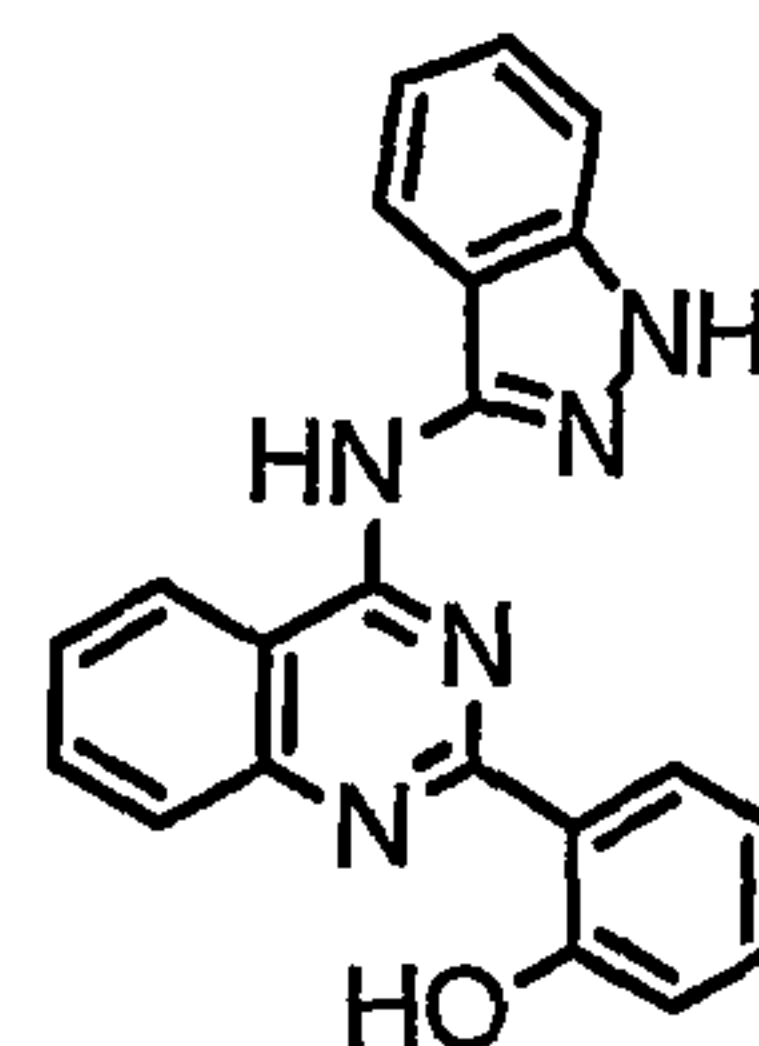
II-228



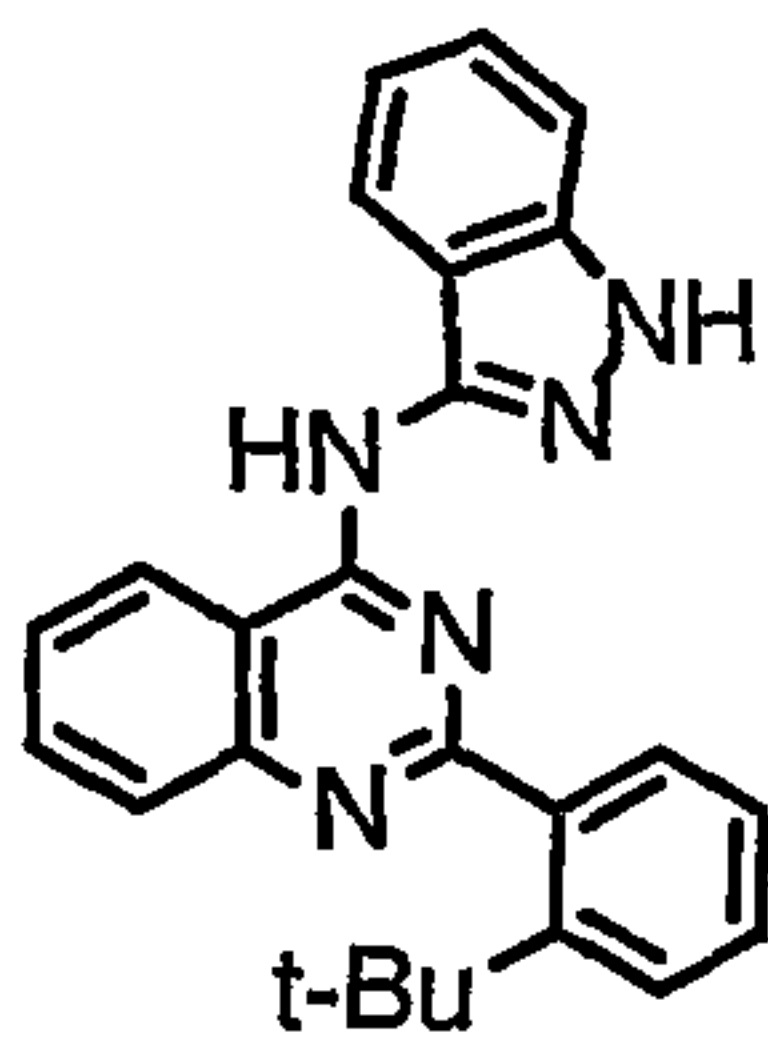
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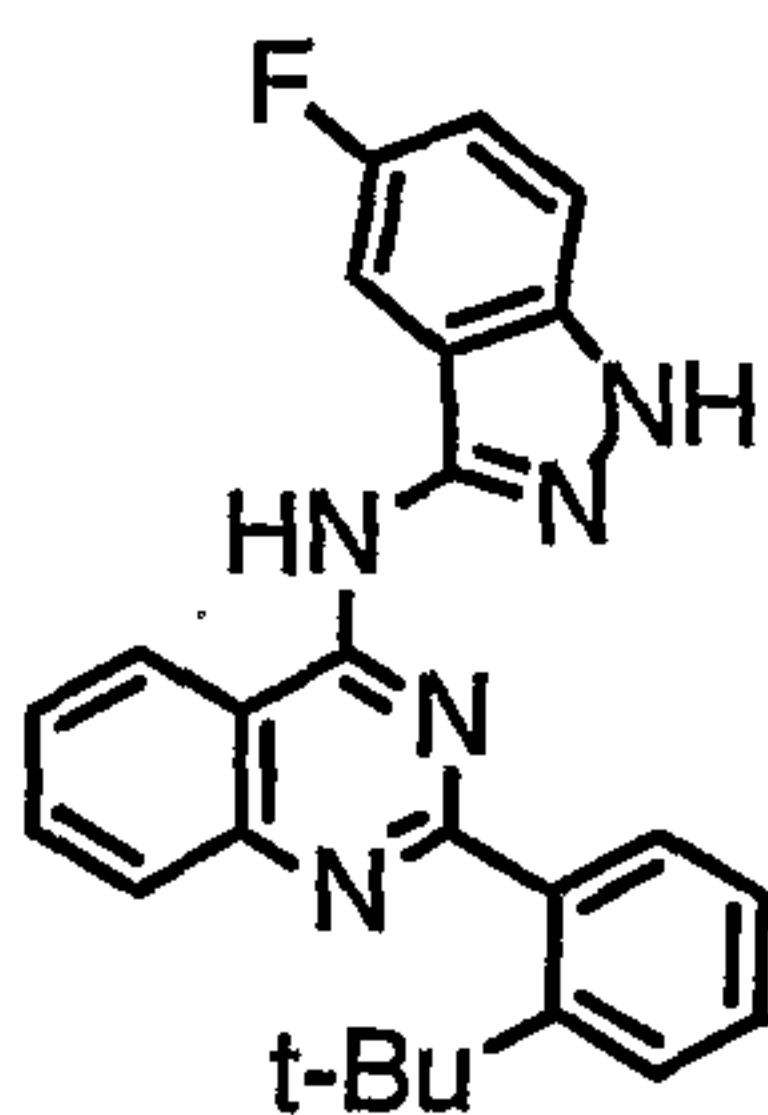
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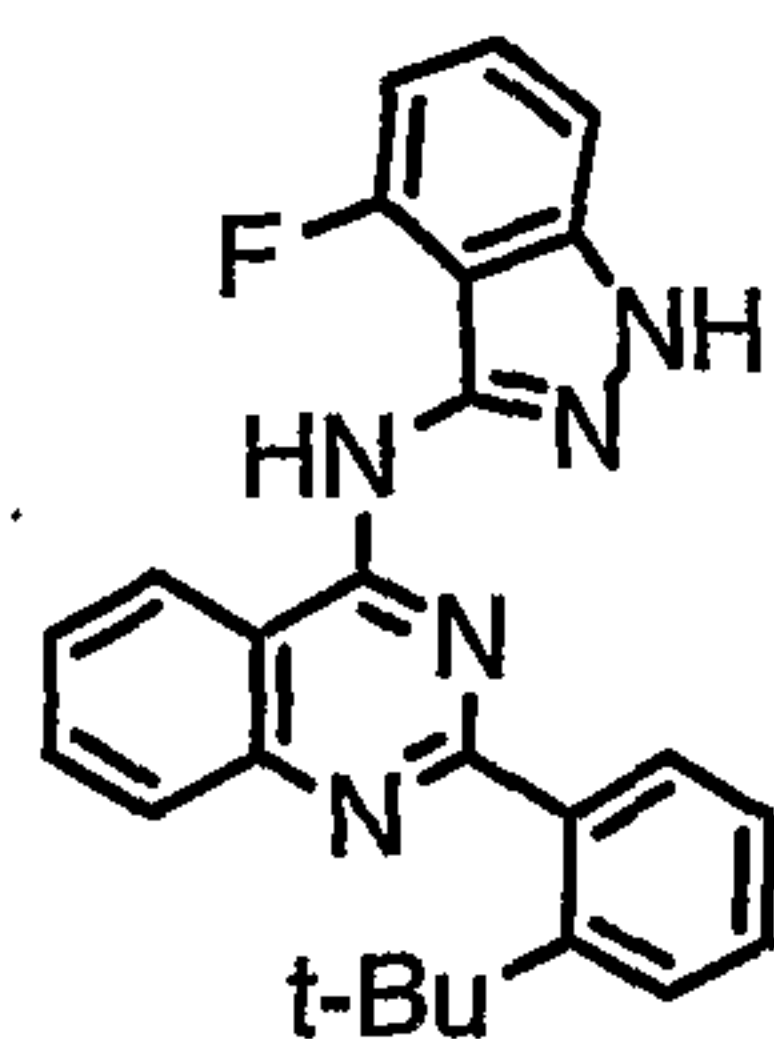
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II-232

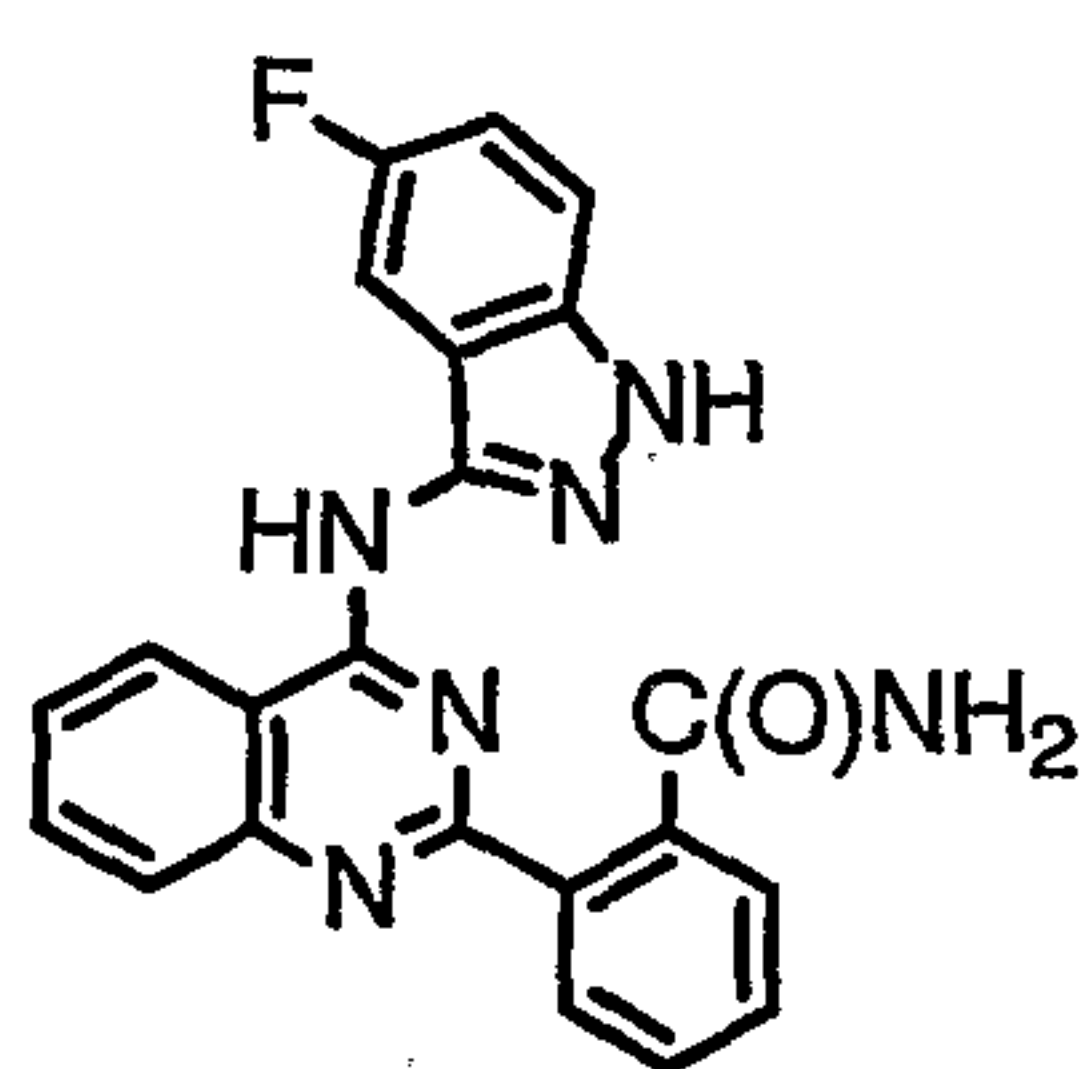


II-233

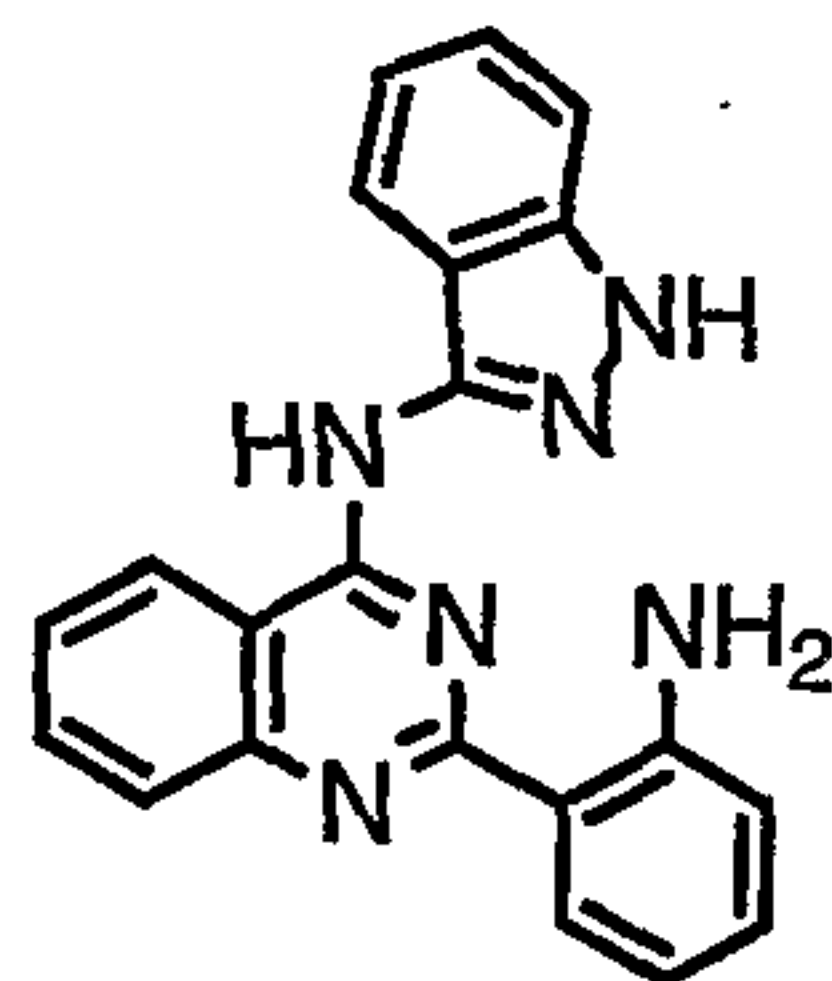


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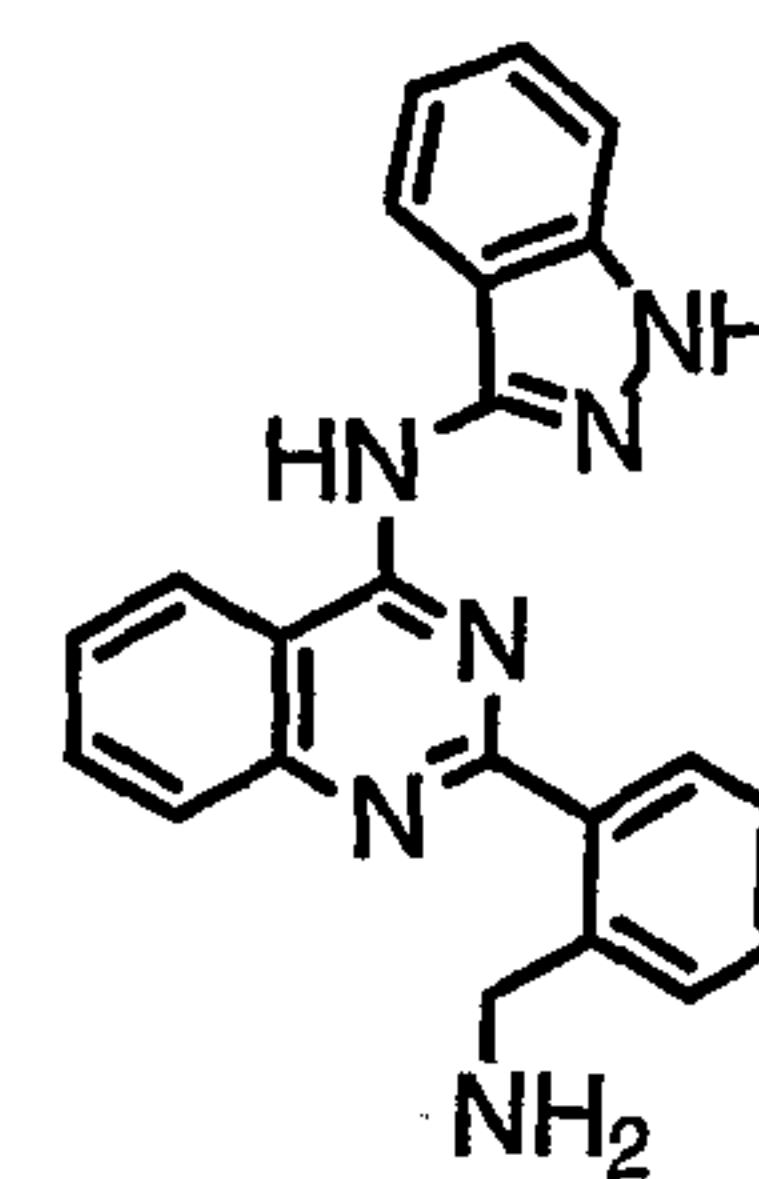
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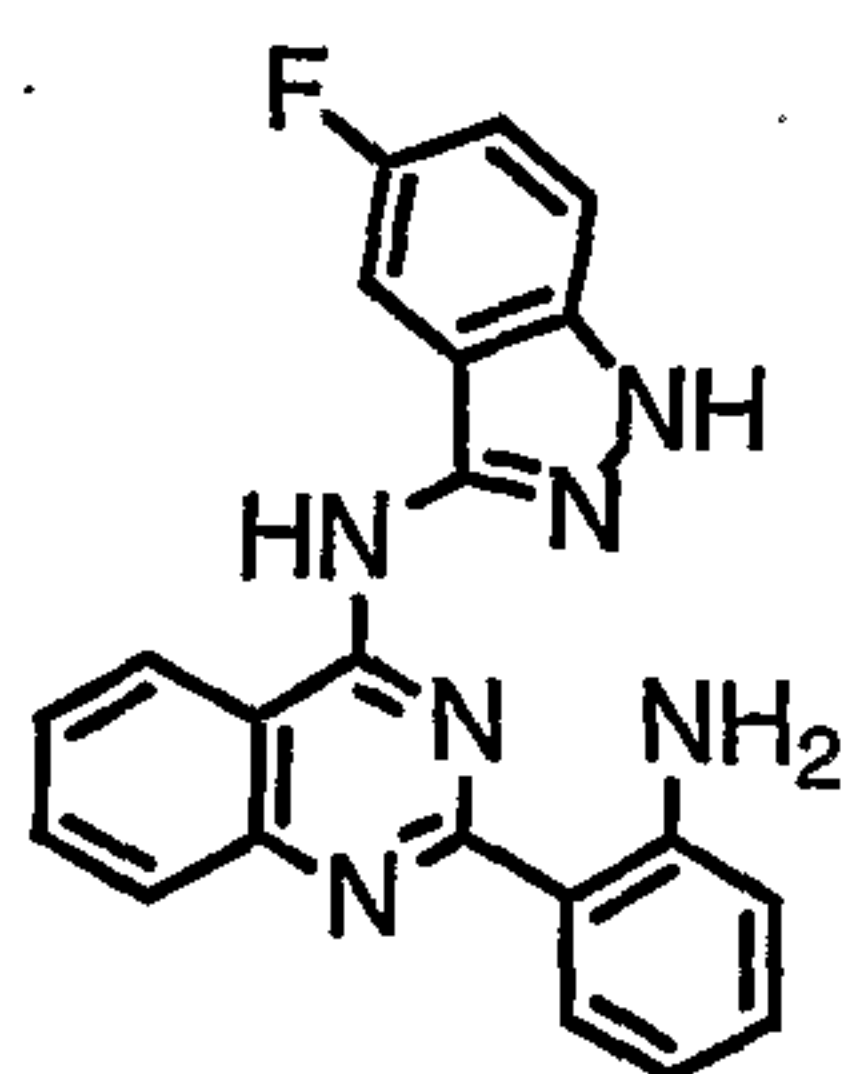
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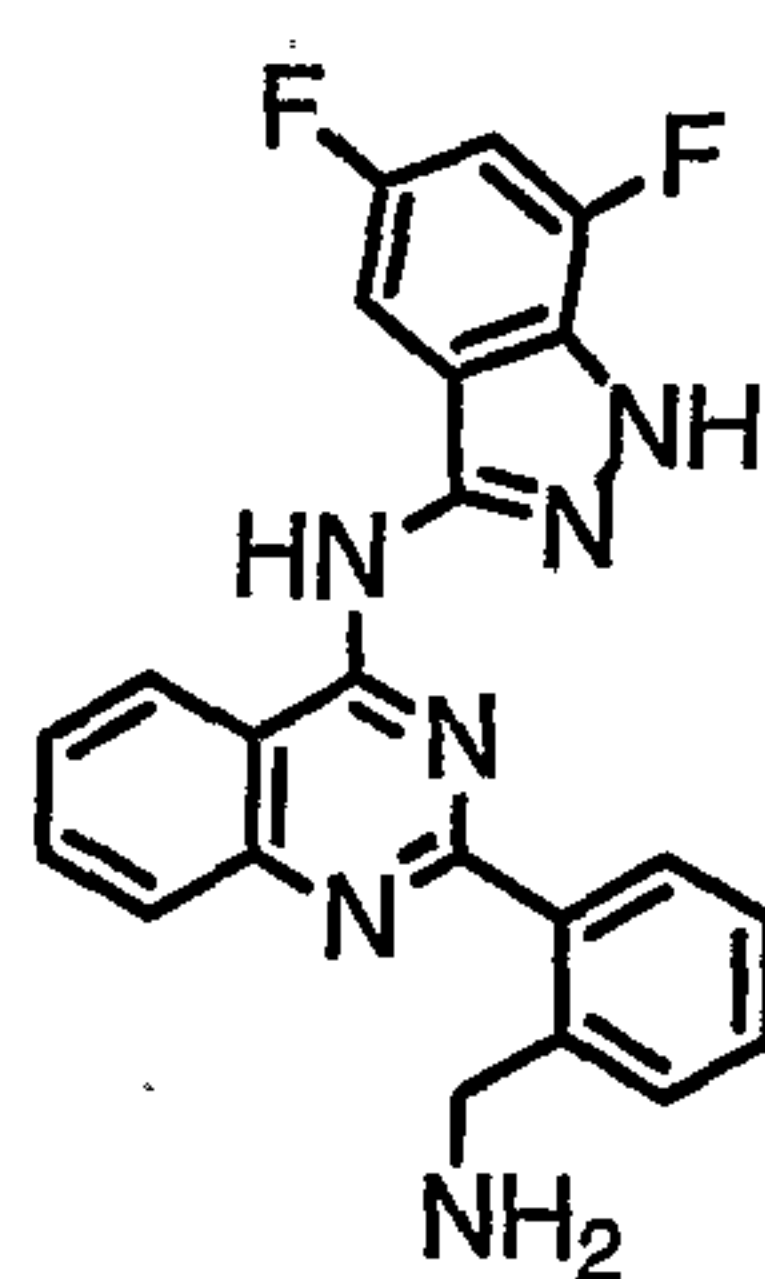
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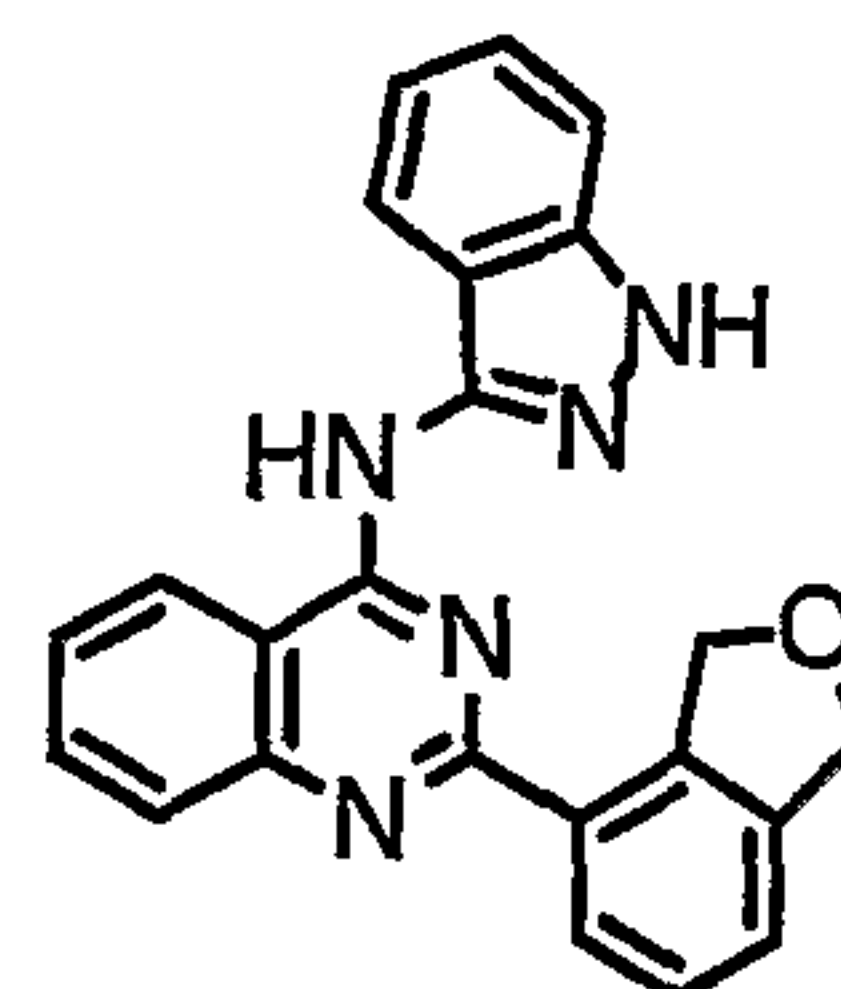
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II-238

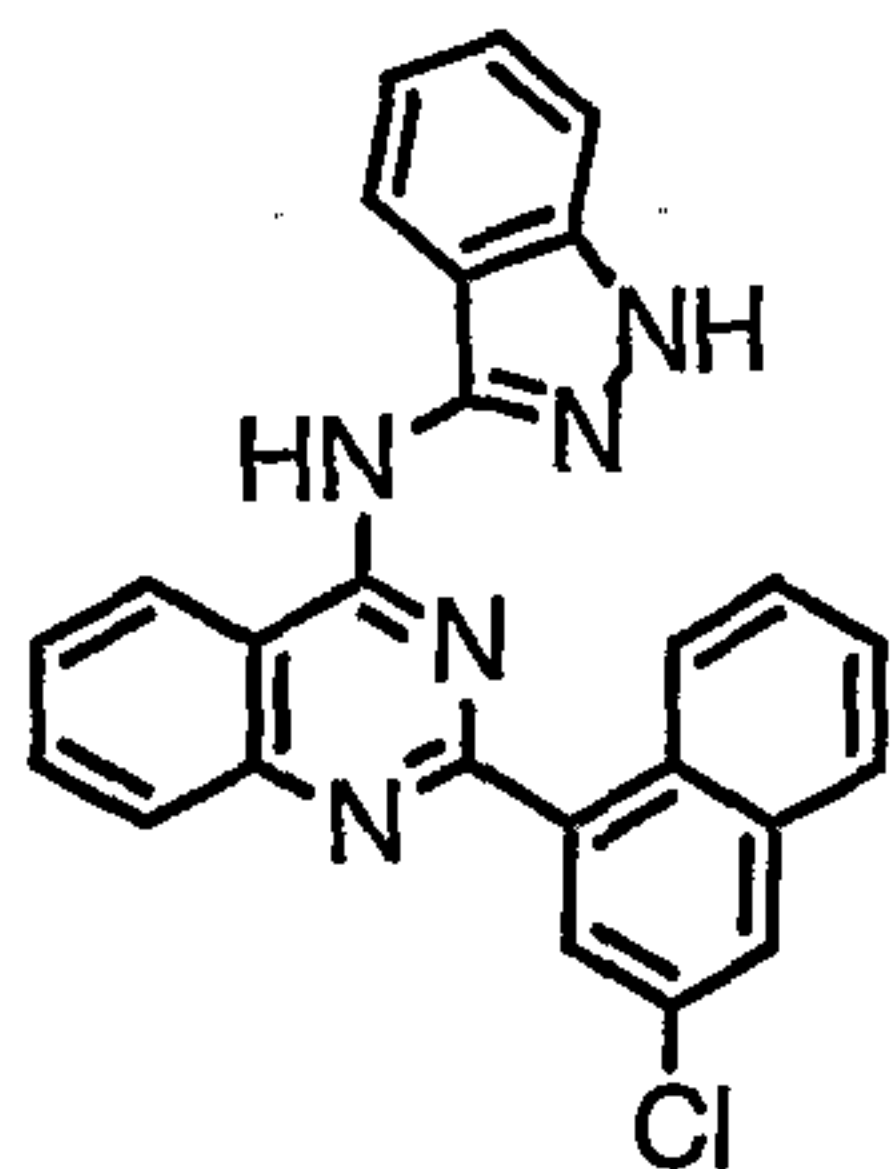


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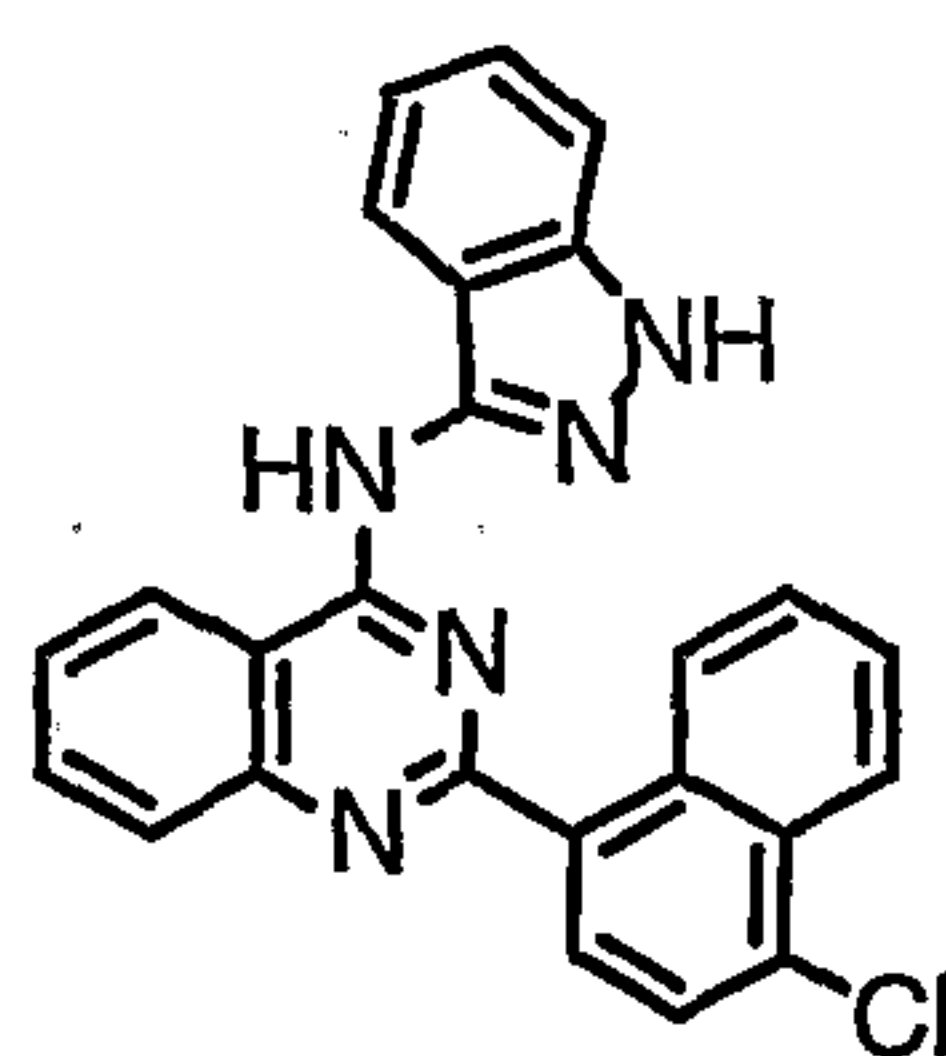


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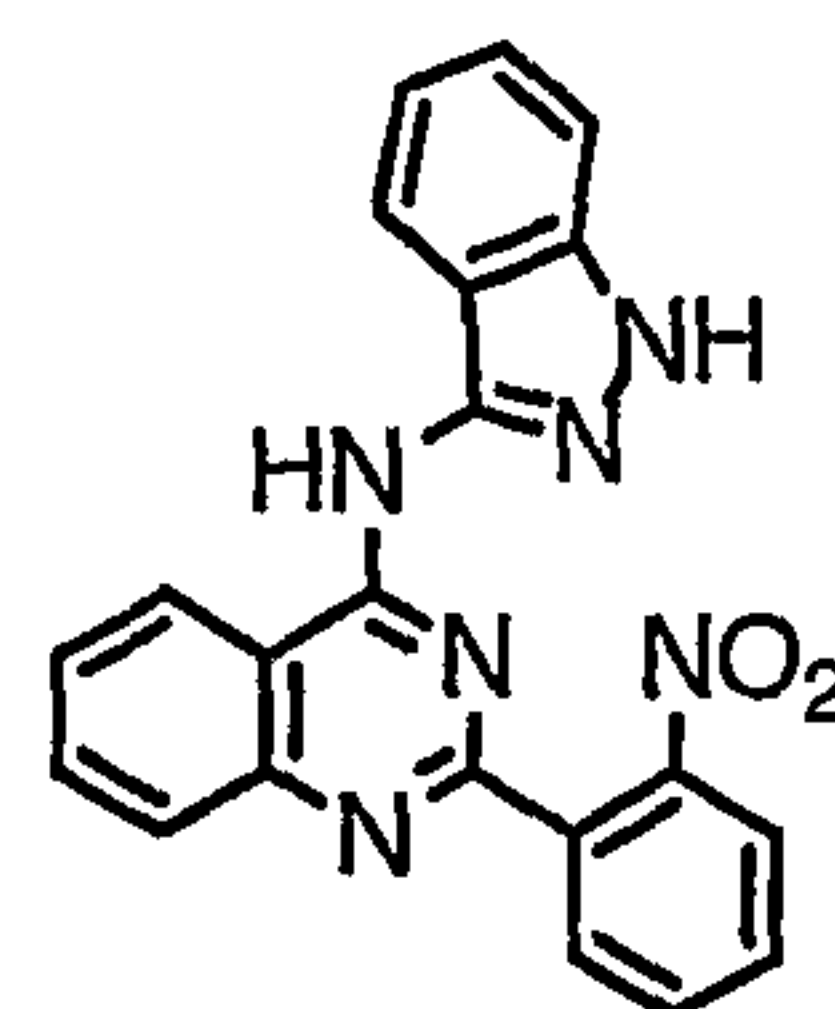
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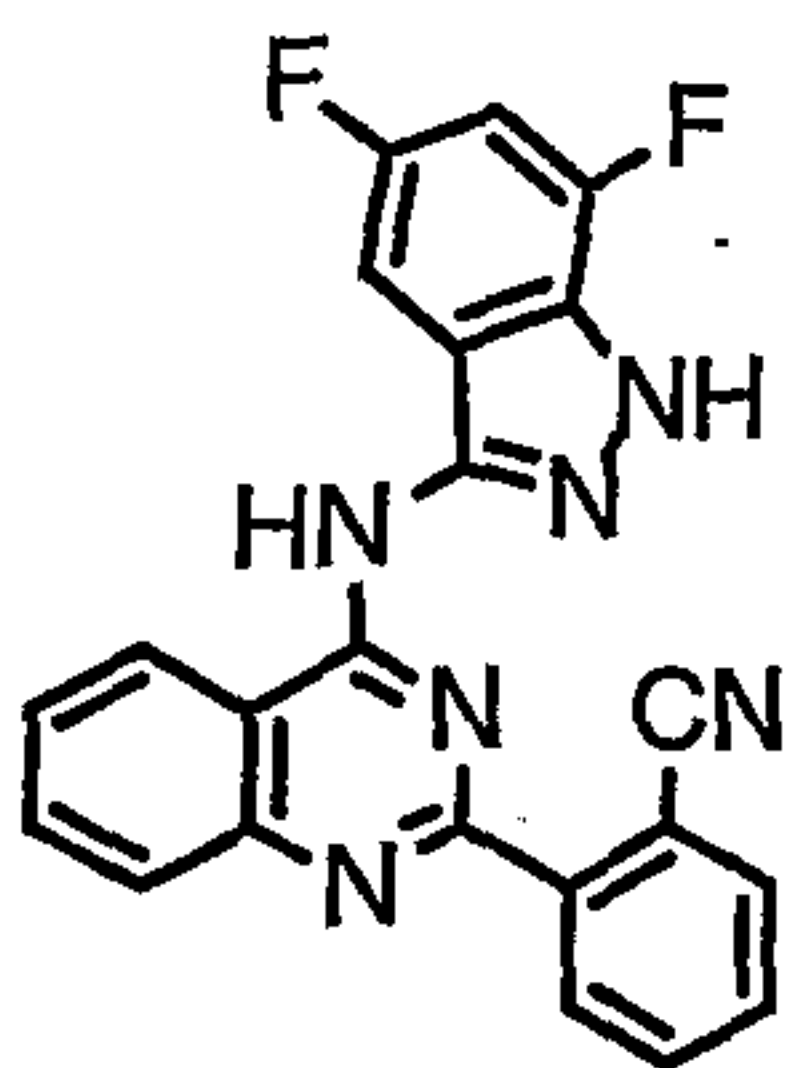
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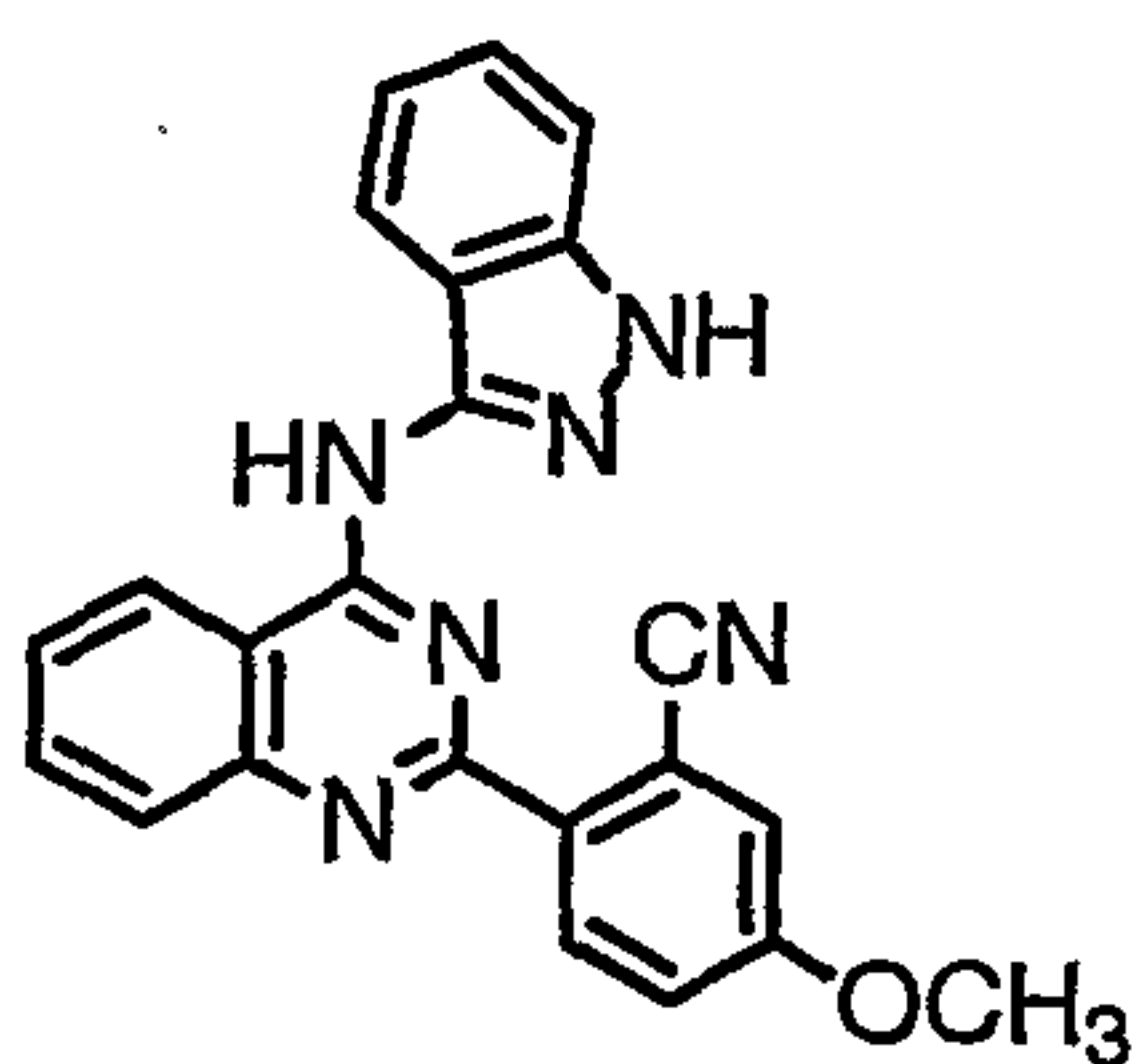
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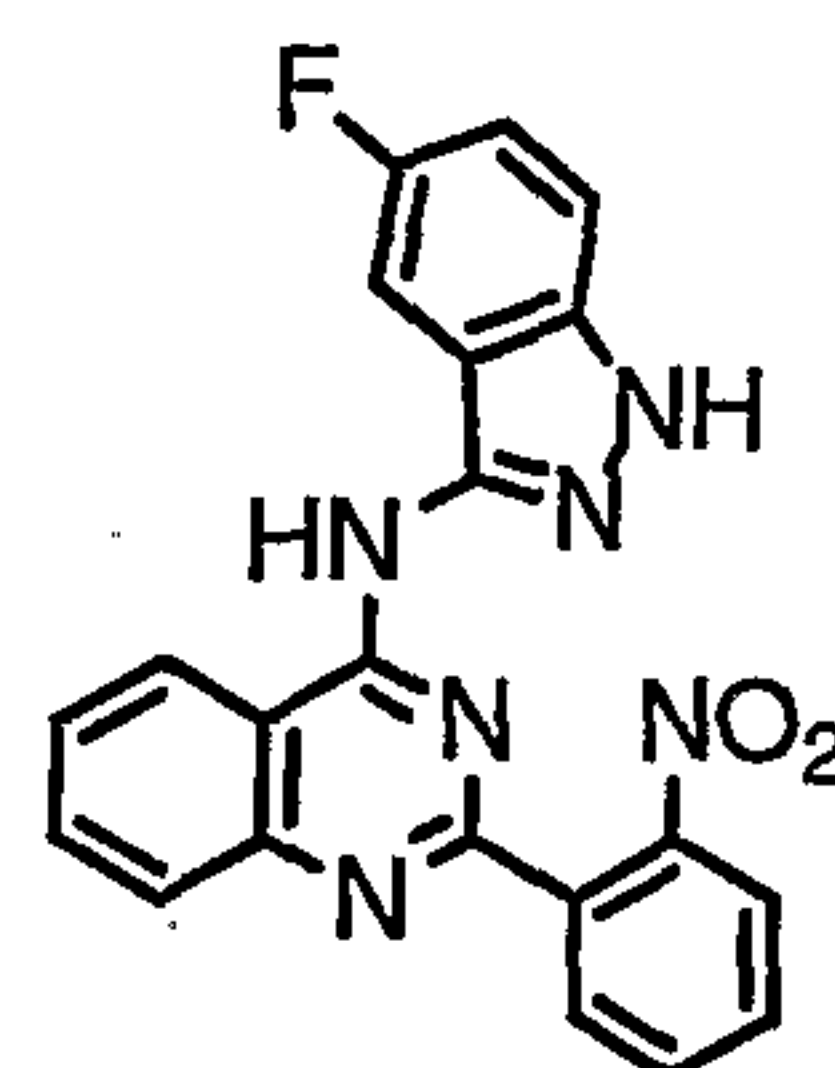
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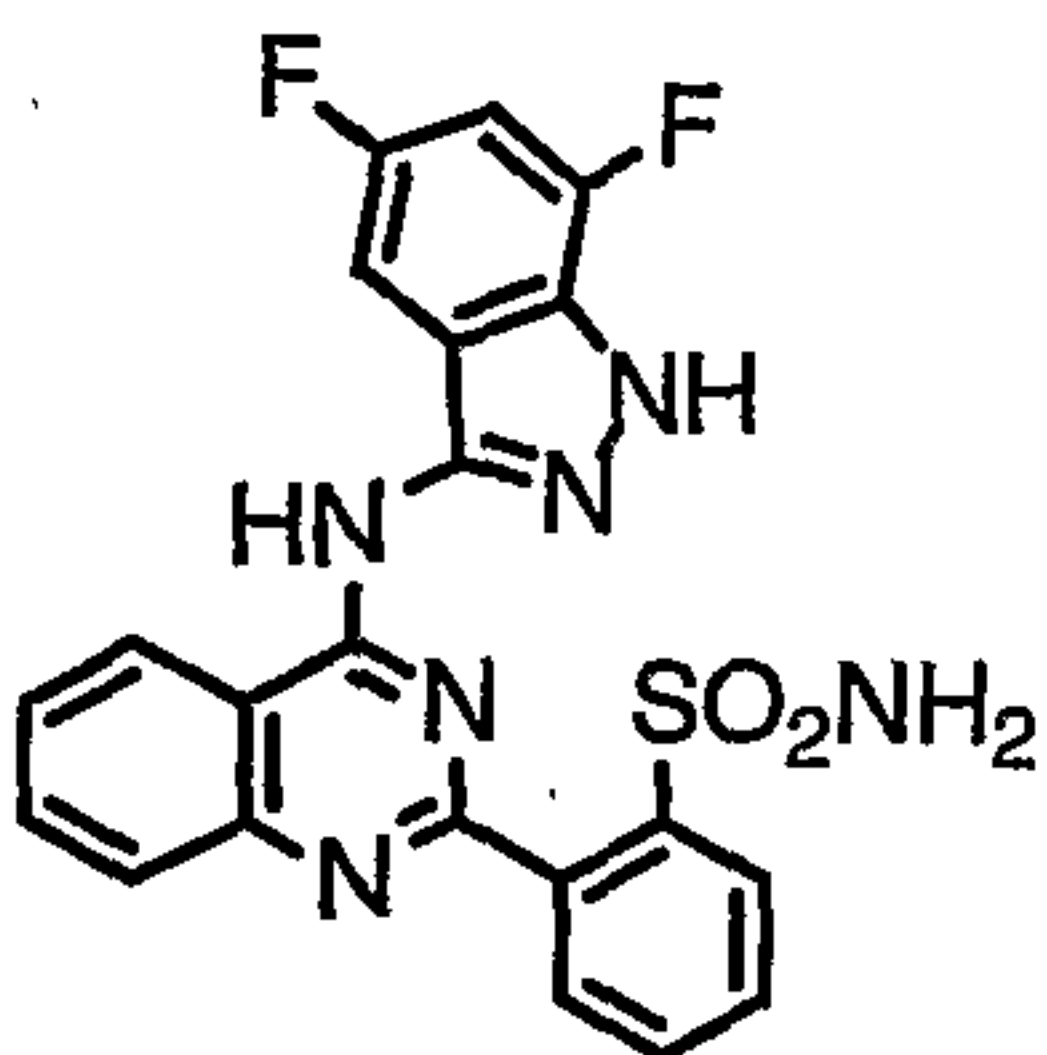
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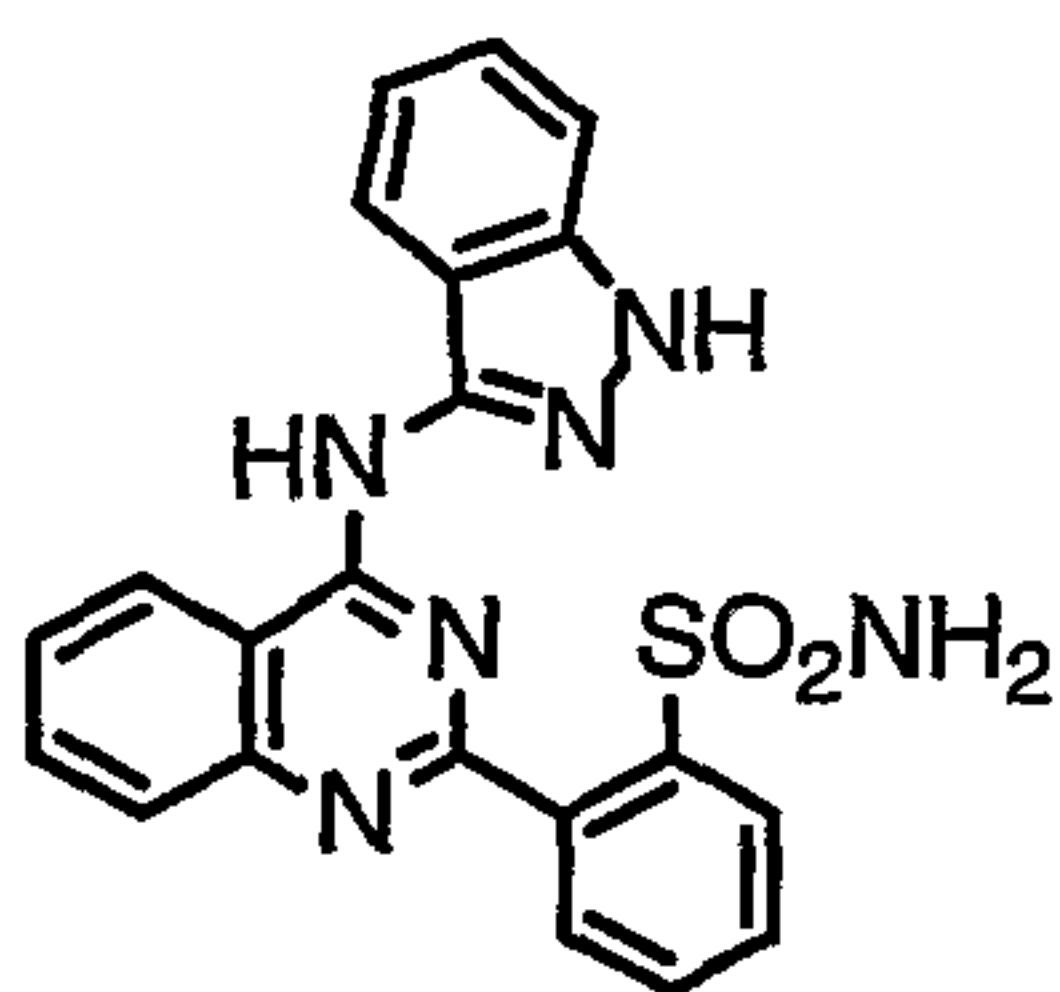
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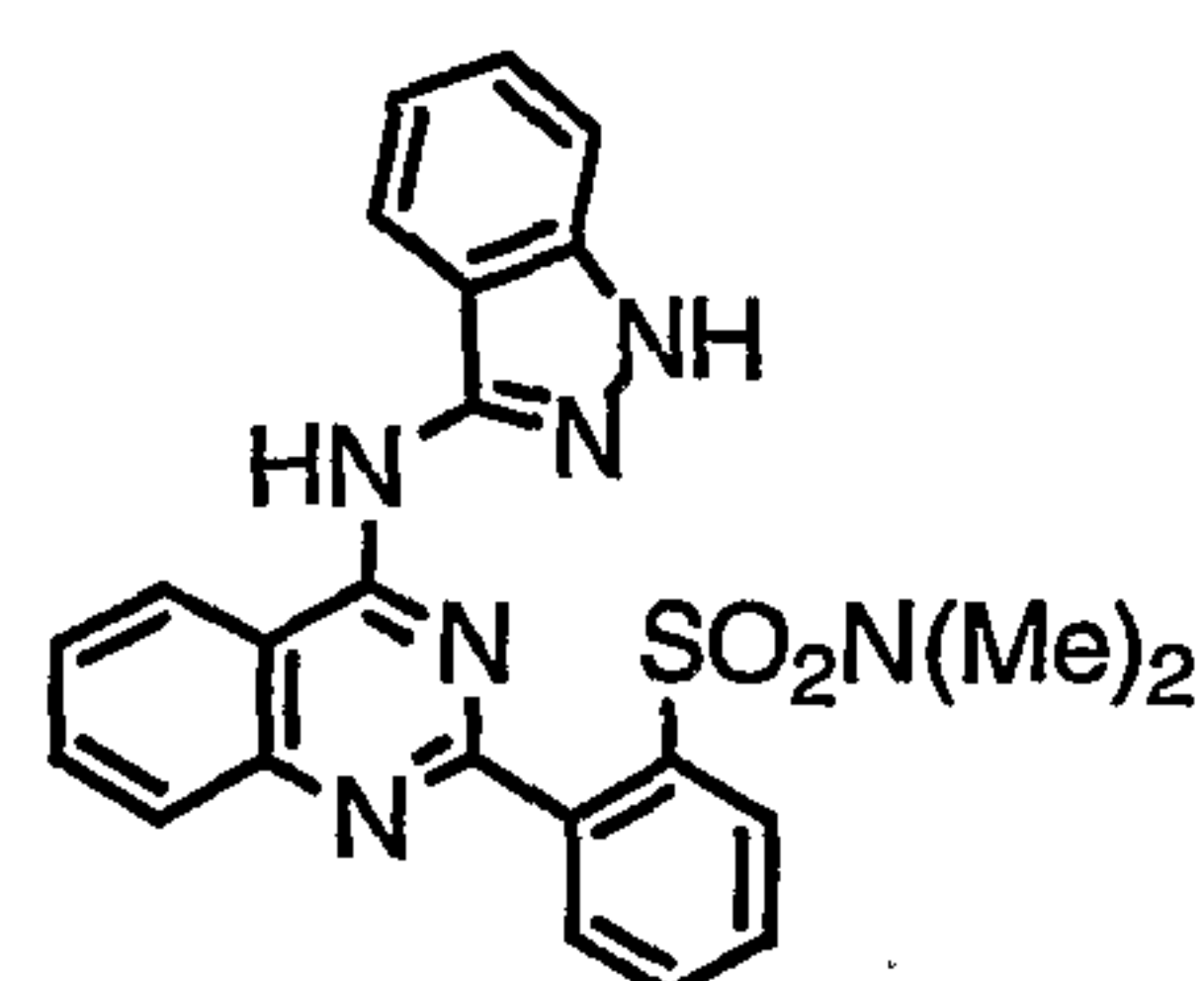
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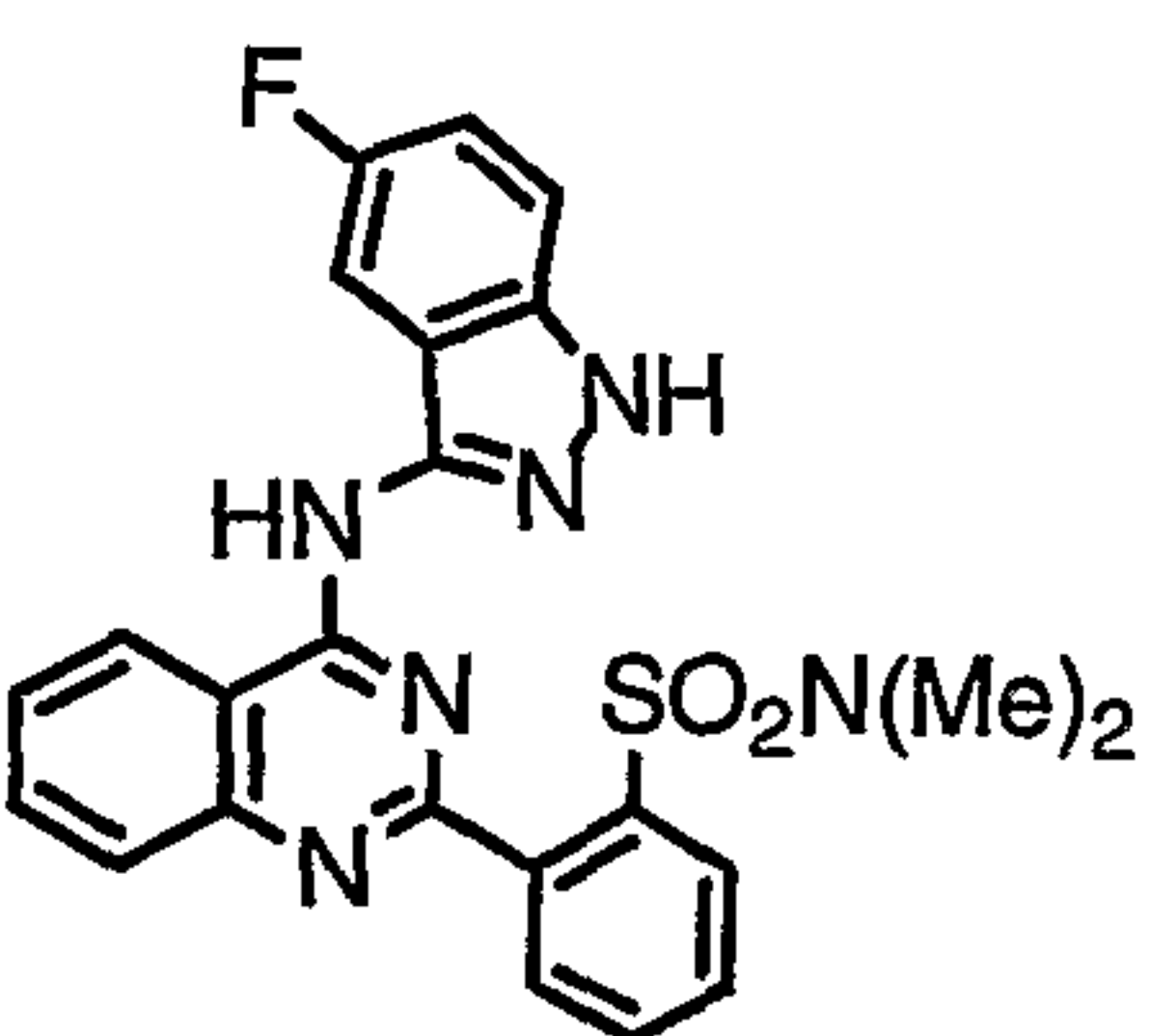
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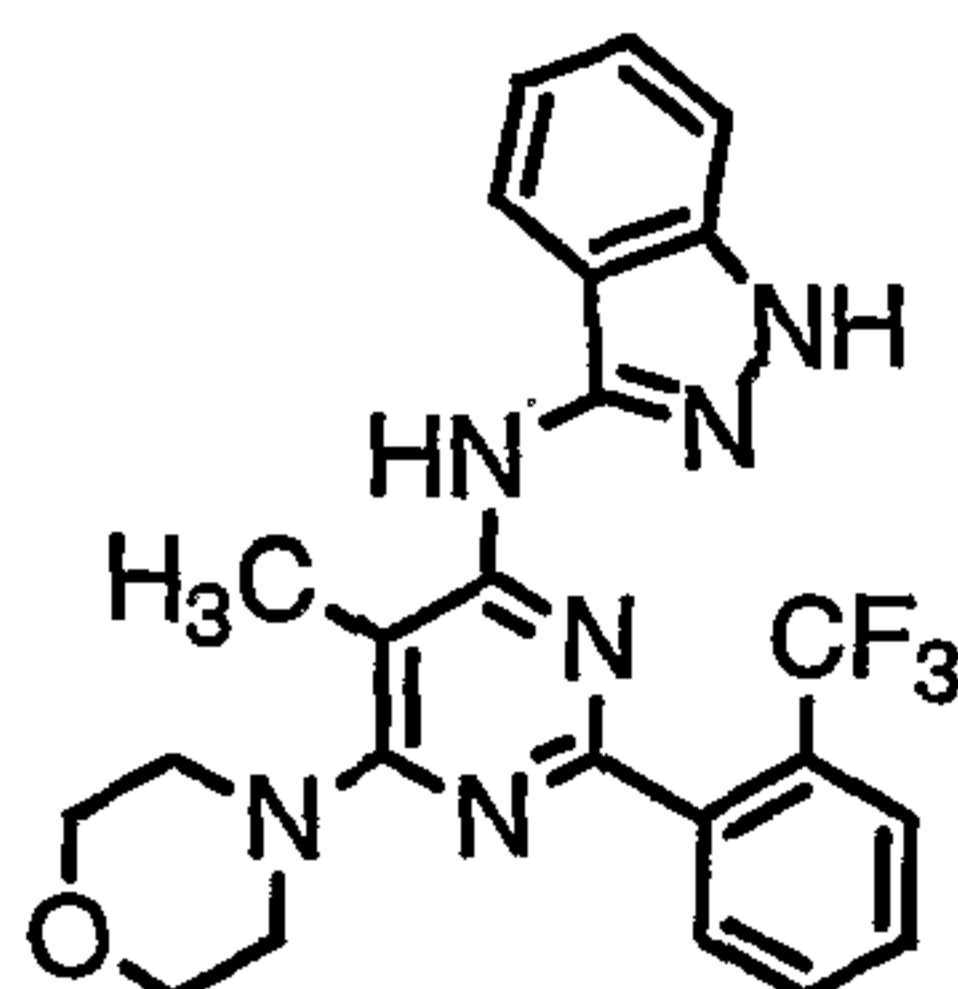
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II-249



II-250



II-251

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In another embodiment, this invention provides a composition comprising a compound of formula II and a pharmaceutically acceptable carrier.

One aspect of this invention relates to a method of inhibiting GSK-3 activity in a patient,

comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula II.

Another aspect relates to a method of treating
5 a disease that is alleviated by treatment with a GSK-3 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula II.

10 Another aspect relates to a method of enhancing glycogen synthesis and/or lowering blood levels of glucose in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula
15 II. This method is especially useful for diabetic patients.

Another aspect relates to a method of inhibiting the production of hyperphosphorylated Tau protein in a patient in need thereof, comprising
20 administering to said patient a therapeutically effective amount of a composition comprising a compound of formula II. This method is especially useful in halting or slowing the progression of Alzheimer's disease.

Another aspect relates to a method of
25 inhibiting the phosphorylation of β -catenin in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula II. This method is especially useful for treating schizophrenia.

30 One aspect of this invention relates to a method of inhibiting Aurora activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula II.

Another aspect relates to a method of treating a disease that is alleviated by treatment with an Aurora inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula II. This method is especially useful for treating cancer, such as colon, ovarian, and breast cancer.

One aspect of this invention relates to a method of inhibiting CDK-2 activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula II.

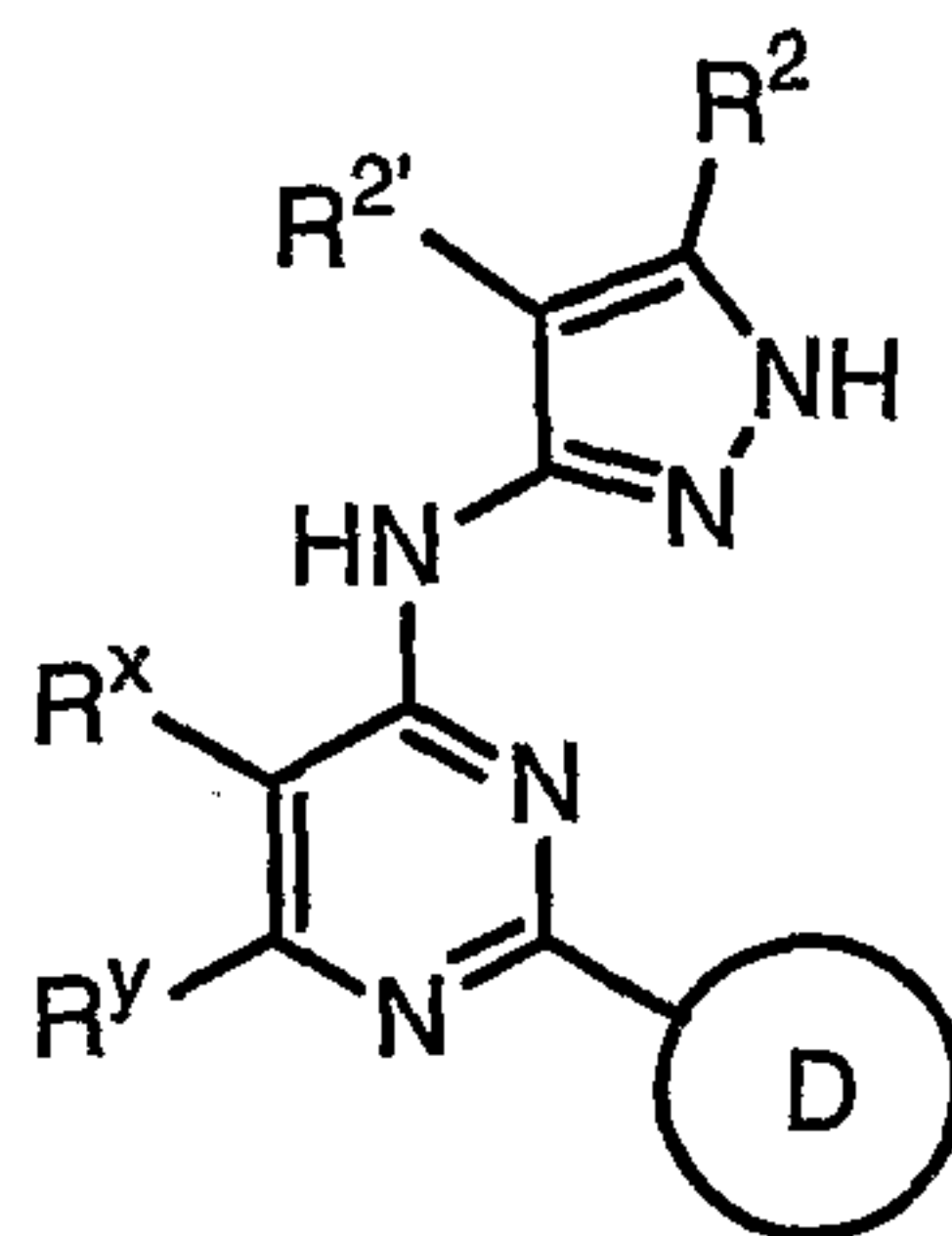
Another aspect relates to a method of treating a disease that is alleviated by treatment with a CDK-2 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula II. This method is especially useful for treating cancer, Alzheimer's disease, restenosis, angiogenesis, glomerulonephritis, cytomegalovirus, HIV, herpes, psoriasis, atherosclerosis, alopecia, and autoimmune diseases such as rheumatoid arthritis.

Another method relates to inhibiting GSK-3, Aurora, or CDK-2 activity in a biological sample, which method comprises contacting the biological sample with the GSK-3 or Aurora inhibitor of formula II, or a pharmaceutical composition thereof, in an amount effective to inhibit GSK-3, Aurora or CDK-2.

Each of the aforementioned methods directed to the inhibition of GSK-3, Aurora or CDK-2, or the treatment of a disease alleviated thereby, is preferably

carried out with a preferred compound of formula II, as described above.

Another embodiment of this invention relates to compounds of formula III:



III

or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by oxo or -R⁵, and at any substitutable ring nitrogen by -R⁴, provided that when Ring D is a six-membered aryl or heteroaryl ring, -R⁵ is hydrogen at each ortho carbon position of Ring D;

R^x and R^y are taken together with their intervening atoms to form a fused, benzo ring or a 5-8 membered carbocyclo ring, wherein any substitutable carbon on said fused ring formed by R^x and R^y is substituted by oxo or T-R³;

T is a valence bond or a C₁₋₄ alkylidene chain;

R² and R^{2'} are independently selected from -R, -T-W-R⁶, or R² and R^{2'} are taken together with their intervening atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring having 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur, wherein each

substitutable carbon on said fused ring formed by R^2 and $R^{2'}$ is substituted by halo, oxo, $-CN$, $-NO_2$, $-R^7$, or $-V-R^6$, and any substitutable nitrogen on said ring formed by R^2 and $R^{2'}$ is substituted by R^4 ;

- 5 R^3 is selected from $-R$, $-halo$, $=O$, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-COCH_2COR$, $-NO_2$, $-CN$, $-S(O)R$, $-S(O)_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$,
10 $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

- each R^4 is independently selected from $-R^7$, $-COR^7$, $-CO_2$ (optionally substituted C_{1-6} aliphatic), $-CON(R^7)_2$, or $-SO_2R^7$, or two R^4 on the same nitrogen are taken together to form a 5-8 membered heterocyclyl or
15 heteroaryl ring;

- each R^5 is independently selected from $-R$, halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic),
20 $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$;

- V is $-O-$, $-S-$, $-SO-$, $-SO_2-$, $-N(R^6)SO_2-$, $-SO_2N(R^6)-$, $-N(R^6)-$, $-CO-$, $-CO_2-$, $-N(R^6)CO-$, $-N(R^6)C(O)O-$, $-N(R^6)CON(R^6)-$, $-N(R^6)SO_2N(R^6)-$, $-N(R^6)N(R^6)-$,
25 $-C(O)N(R^6)-$, $-OC(O)N(R^6)-$, $-C(R^6)_2O-$, $-C(R^6)_2S-$, $-C(R^6)_2SO-$, $-C(R^6)_2SO_2-$, $-C(R^6)_2SO_2N(R^6)-$, $-C(R^6)_2N(R^6)-$, $-C(R^6)_2N(R^6)C(O)-$, $-C(R^6)_2N(R^6)C(O)O-$, $-C(R^6)=NN(R^6)-$, $-C(R^6)=N-O-$, $-C(R^6)_2N(R^6)N(R^6)-$, $-C(R^6)_2N(R^6)SO_2N(R^6)-$, or $-C(R^6)_2N(R^6)CON(R^6)-$;

W is $-C(R^6)_2O-$, $-C(R^6)_2S-$, $-C(R^6)_2SO-$, $-C(R^6)_2SO_2-$,
 $-C(R^6)_2SO_2N(R^6)-$, $-C(R^6)_2N(R^6)-$, $-CO-$, $-CO_2-$,
 $-C(R^6)OC(O)-$, $-C(R^6)OC(O)N(R^6)-$, $-C(R^6)_2N(R^6)CO-$,
 $-C(R^6)_2N(R^6)C(O)O-$, $-C(R^6)=NN(R^6)-$, $-C(R^6)=N-O-$,
5 $-C(R^6)_2N(R^6)N(R^6)-$, $-C(R^6)_2N(R^6)SO_2N(R^6)-$,
 $-C(R^6)_2N(R^6)CON(R^6)-$, or $-CON(R^6)-$;

each R^6 is independently selected from hydrogen or an
optionally substituted C_{1-4} aliphatic group, or two R^6
groups on the same nitrogen atom are taken together
10 with the nitrogen atom to form a 5-6 membered
heterocyclyl or heteroaryl ring; and
each R^7 is independently selected from hydrogen or an
optionally substituted C_{1-6} aliphatic group, or two R^7
on the same nitrogen are taken together with the
15 nitrogen to form a 5-8 membered heterocyclyl or
heteroaryl ring.

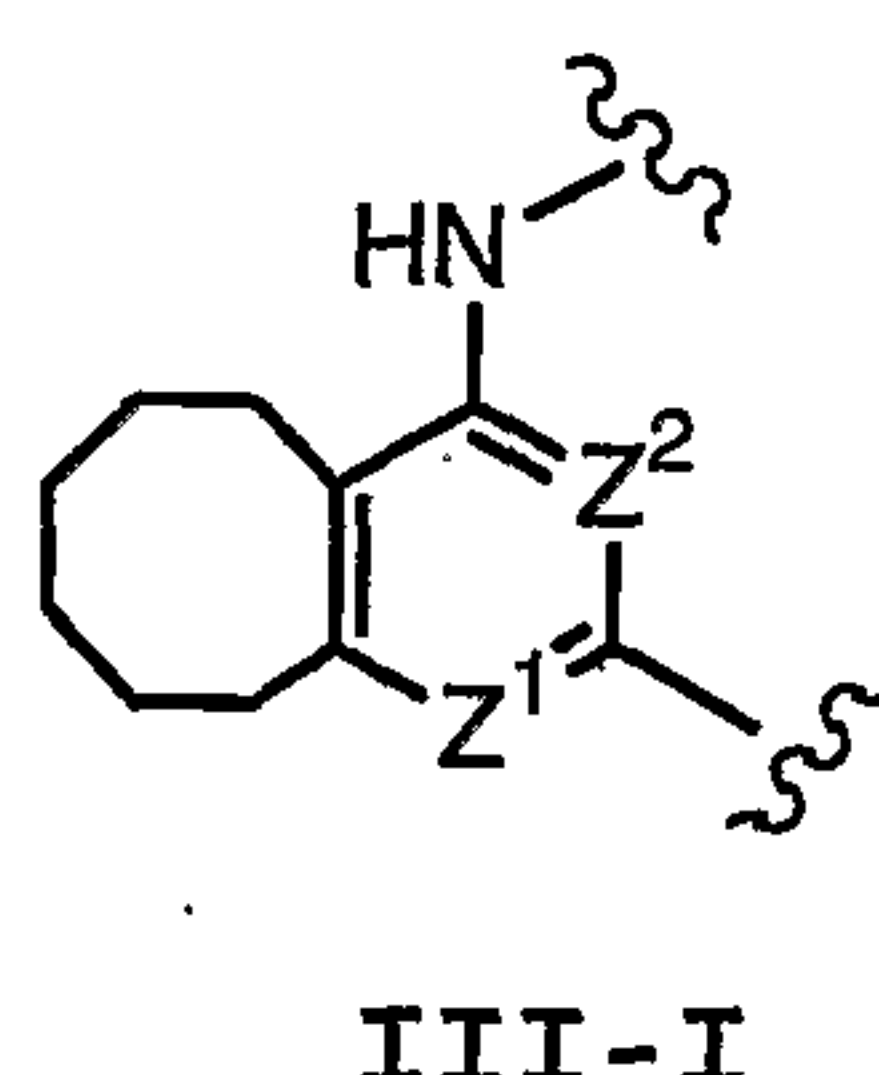
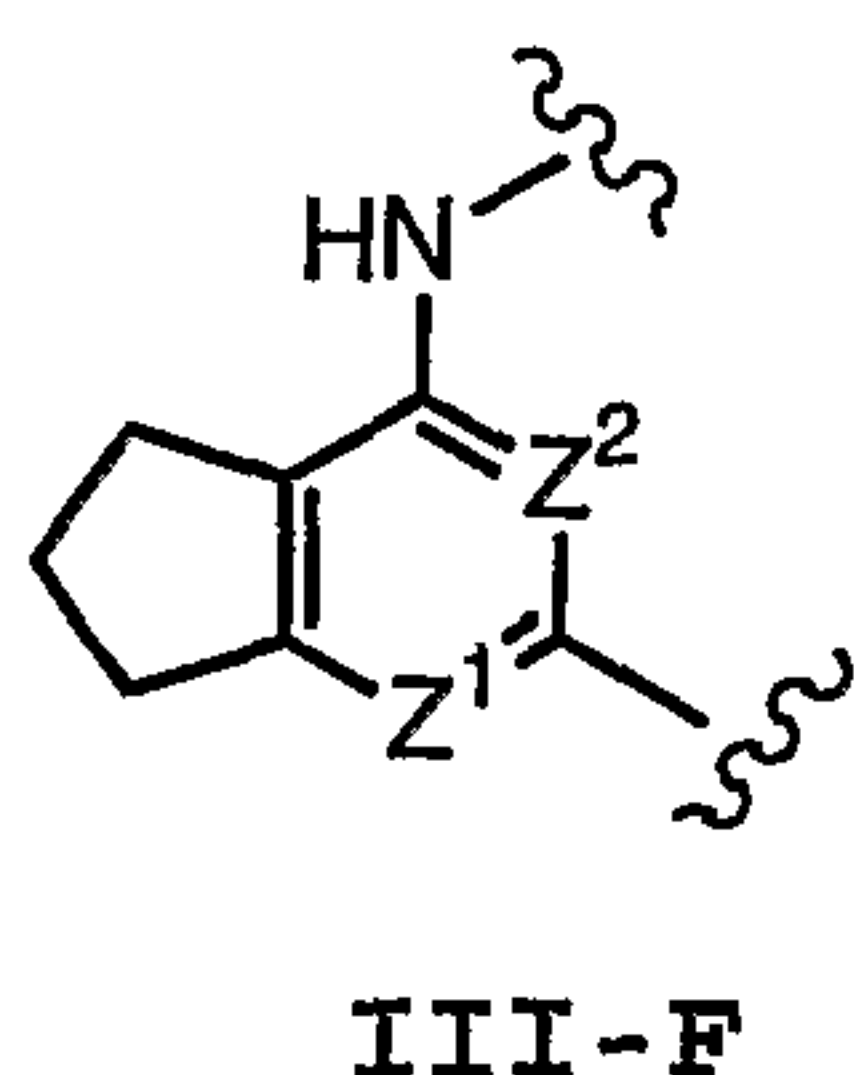
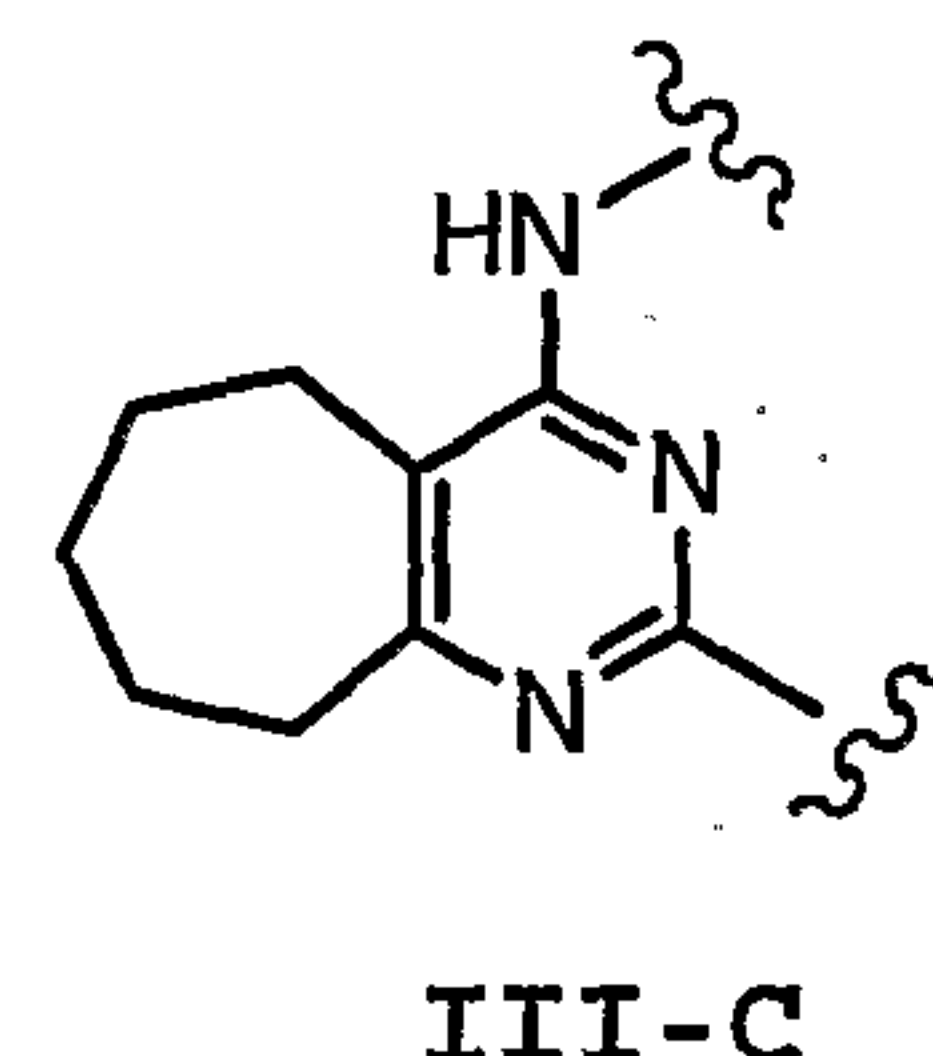
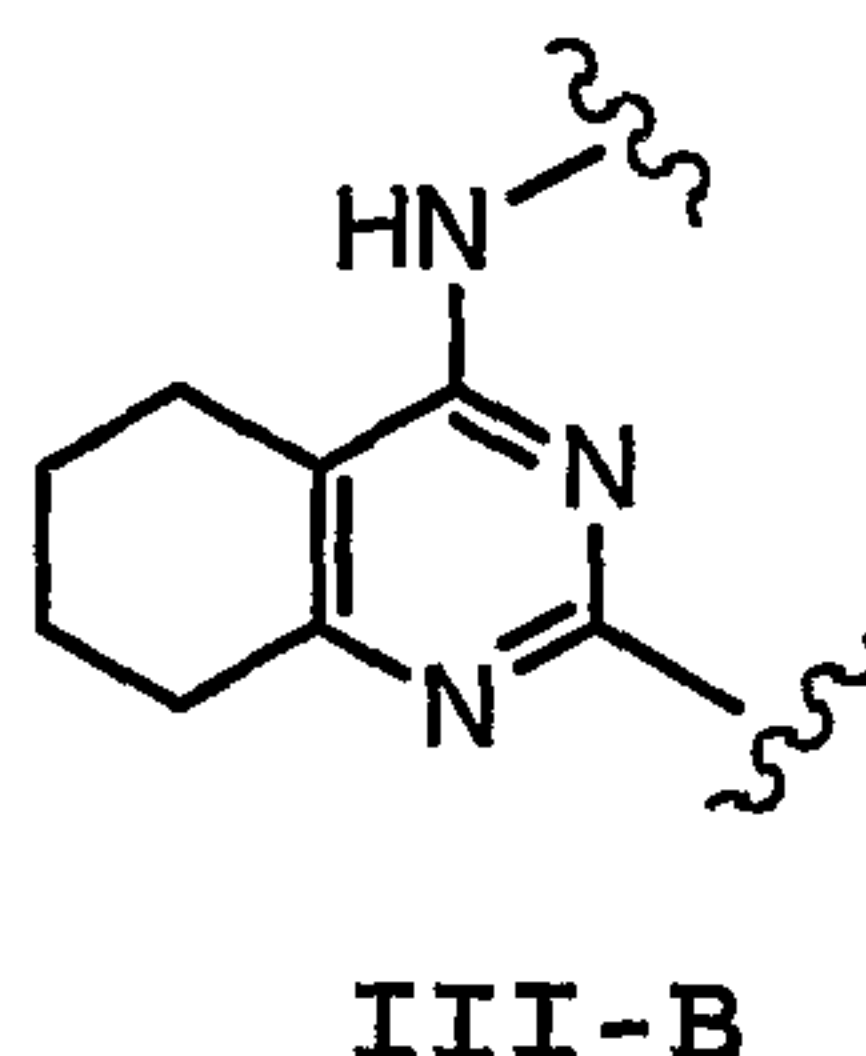
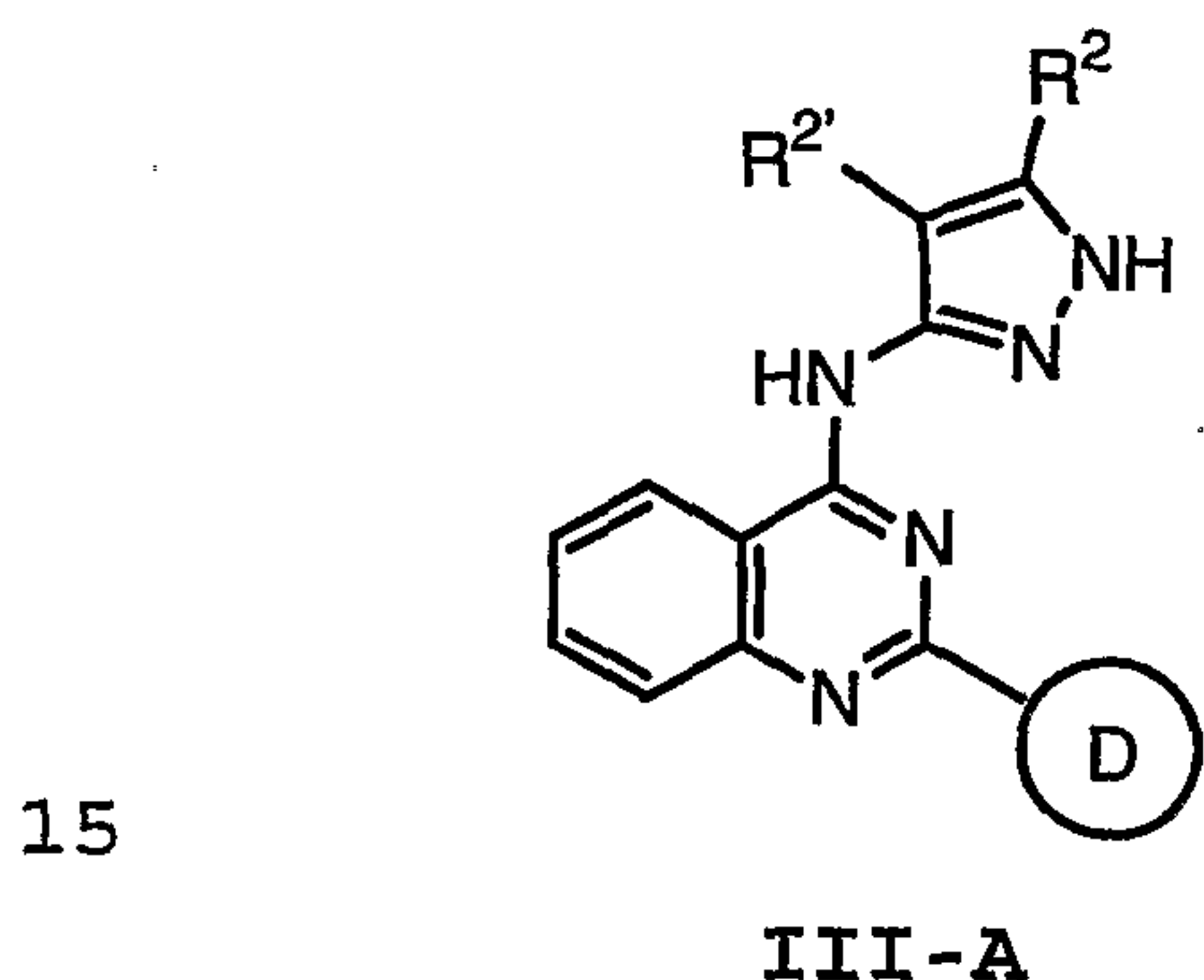
Preferred formula III Ring D monocyclic rings
include substituted and unsubstituted phenyl, pyridinyl,
piperidinyl, piperazinyl, pyrrolidinyl, thienyl,
20 azepanyl, and morpholinyl rings. When two adjacent
substituents on Ring D are taken together to form a fused
ring, the Ring D system is bicyclic. Preferred formula
III Ring D bicyclic rings include 1,2,3,4-
tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl,
25 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl,
isoquinolinyl, quinolinyl, and naphthyl. Examples of
more preferred bicyclic Ring D systems include naphthyl
and isoquinolinyl.

Preferred R^5 substituents on Ring D of formula
30 III include halo, oxo, CN, $-NO_2$, $-N(R^4)_2$, $-CO_2R$, $-CONH(R^4)$,
 $-N(R^4)COR$, $-SO_2N(R^4)_2$, $-N(R^4)SO_2R$, $-SR$, $-OR$, $-C(O)R$, or
substituted or unsubstituted group selected from 5-6
membered heterocyclyl, C_{6-10} aryl, or C_{1-6} aliphatic. More
preferred R^5 substituents include -halo, -CN, -oxo, -SR,

-OR, -N(R⁴)₂, -C(O)R, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. Examples of Ring D substituents include -OH, phenyl, methyl, CH₂OH, CH₂CH₂OH,

5 pyrrolidinyl, OPh, CF₃, C≡CH, Cl, Br, F, I, NH₂, C(O)CH₃, *i*-propyl, *tert*-butyl, SEt, OMe, N(Me)₂, methylene dioxy, and ethylene dioxy.

Preferred rings formed when the R^x and R^y groups of formula III are taken together to form a fused ring include a 5-, 6-, or 7-membered unsaturated or partially unsaturated carbocyclo ring, wherein any substitutable carbon on said fused ring is substituted by oxo or T-R³. Examples of preferred bicyclic ring systems are shown below.



20

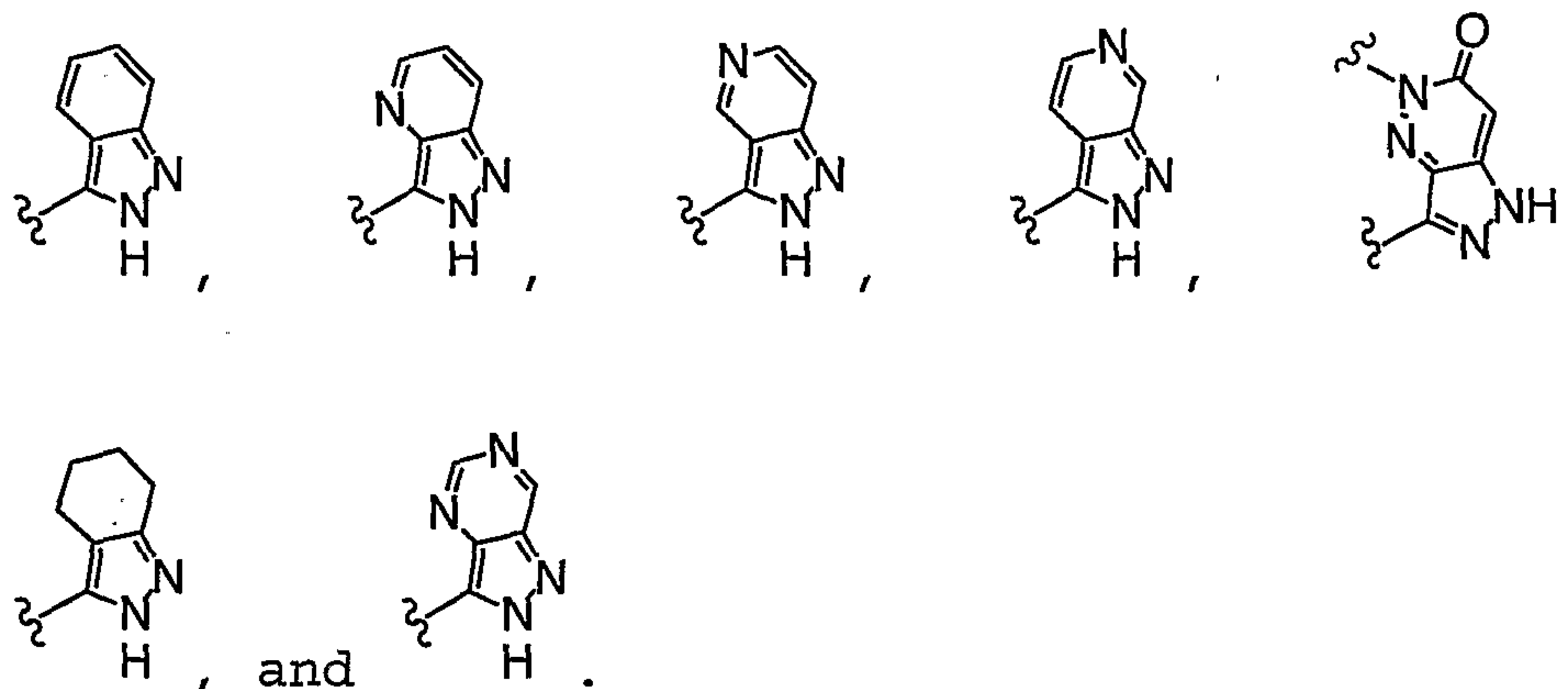
Preferred substituents on the R^x/R^y fused ring of formula III include -R, oxo, halo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂ (optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or

25

-OC(=O)N(R⁴)₂, wherein R and R⁴ are as defined above. More preferred substituents on the R^x/R^y fused ring include halo, CN, oxo, C₁₋₆ alkyl, C₁₋₆ alkoxy, (C₁₋₆ alkyl)carbonyl, (C₁₋₆ alkyl)sulfonyl, mono- or
 5 dialkylamino, mono- or dialkylaminocarbonyl, mono- or dialkylaminocarbonyloxy, or 5-6 membered heteroaryl. Examples of such preferred substituents include methoxy, methyl, isopropyl, methylsulfonyl, cyano, chloro, pyrrolyl, methoxy, ethoxy, ethylamino, acetyl, and
 10 acetamido.

Preferred R² substituents of formula III include hydrogen, C₁₋₄ aliphatic, alkoxycarbonyl, (un)substituted phenyl, hydroxyalkyl, alkoxyalkyl, aminocarbonyl, mono- or dialkylaminocarbonyl, aminoalkyl, alkylaminoalkyl,
 15 dialkylaminoalkyl, phenylaminocarbonyl, and (N-heterocyclyl)carbonyl. Examples of such preferred R² substituents include methyl, cyclopropyl, ethyl, isopropyl, propyl, t-butyl, cyclopentyl, phenyl, CO₂H, CO₂CH₃, CH₂OH, CH₂OCH₃, CH₂CH₂CH₂OH, CH₂CH₂CH₂OCH₃,
 20 CH₂CH₂CH₂OCH₂Ph, CH₂CH₂CH₂NH₂, CH₂CH₂CH₂NHCOOC(CH₃)₃, CONHCH(CH₃)₂, CONHCH₂CH=CH₂, CONHCH₂CH₂OCH₃, CONHCH₂Ph, CONH(cyclohexyl), CON(Et)₂, CON(CH₃)CH₂Ph, CONH(n-C₃H₇), CON(Et)CH₂CH₂CH₃, CONHCH₂CH(CH₃)₂, CON(n-C₃H₇)₂, CO(3-methoxymethylpyrrolidin-1-yl), CONH(3-tolyl), CONH(4-
 25 tollyl), CONHCH₃, CO(morpholin-1-yl), CO(4-methylpiperazin-1-yl), CONHCH₂CH₂OH, CONH₂, and CO(piperidin-1-yl).

When the R² and R^{2'} groups of formula III are taken together to form a ring, preferred R²/R^{2'} ring systems containing the pyrazole ring include benzo,
 30 pyrido, pyrimido, 3-oxo-2H-pyridazino, and a partially unsaturated 6-membered carbocyclo ring. Examples of such preferred R²/R^{2'} ring systems containing the pyrazole ring include the following:



5 Preferred substituents on the R²/R^{2'} fused ring
of formula III include one or more of the following:
-halo, -N(R⁴)₂, -C₁₋₄ alkyl, -C₁₋₄ haloalkyl, -NO₂, -O(C₁₋₄
alkyl), -CO₂(C₁₋₄ alkyl), -CN, -SO₂(C₁₋₄ alkyl), -SO₂NH₂,
-OC(O)NH₂, -NH₂SO₂(C₁₋₄ alkyl), -NHC(O)(C₁₋₄ alkyl),
10 -C(O)NH₂, and -CO(C₁₋₄ alkyl), wherein the (C₁₋₄ alkyl) is a
straight, branched, or cyclic alkyl group. Preferably,
the (C₁₋₄ alkyl) group is methyl.

Preferred formula III compounds have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring D is an optionally substituted ring selected from a phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1*H*-isoindolyl, 2,3-dihydro-1*H*-indolyl, isoquinolinyl, quinolinyl, or naphthyl ring;

(b) R^x and R^y are taken together with their intervening atoms to form an optionally substituted benzo ring or a 5-7 membered carbocyclo ring; and

(c) $R^{2'}$ is hydrogen or methyl and R^2 is T-W- R^6 or R, wherein W is $-C(R^6)_2O-$, $-C(R^6)_2N(R^6)-$, $-CO-$, $-CO_2-$, $-C(R^6)OC(O)-$, $-C(R^6)_2N(R^6)CO-$, $-C(R^6)_2N(R^6)C(O)O-$, or $-CON(R^6)-$, and R is an optionally substituted group

selected from C₁₋₆ aliphatic or phenyl, or R² and R^{2'} are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido, or partially unsaturated 6-membered carbocyclo ring.

5 More preferred compounds of formula III have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl,
 10 piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl;

(b) R^x and R^y are taken together with their
 15 intervening atoms to form a benzo ring or a 5-7 membered carbocyclo ring optionally substituted with -R, oxo, halo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic),
 20 -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂; and

(c) each R⁵ is independently selected from halo, oxo, CN, NO₂, -N(R⁴)₂, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, -N(R⁴)SO₂R, -SR, -OR, -C(O)R, or a substituted
 25 or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic.

Even more preferred compounds of formula III have one or more, and more preferably all, of the features selected from the group consisting of:

30 (a) R^x and R^y are taken together with their intervening atoms to form a benzo or 6-membered partially unsaturated carbocyclo ring optionally substituted with halo, CN, oxo, C₁₋₆ alkyl, C₁₋₆ alkoxy, (C₁₋₆ alkyl)carbonyl, (C₁₋₆ alkyl)sulfonyl, mono- or dialkylamino, mono- or

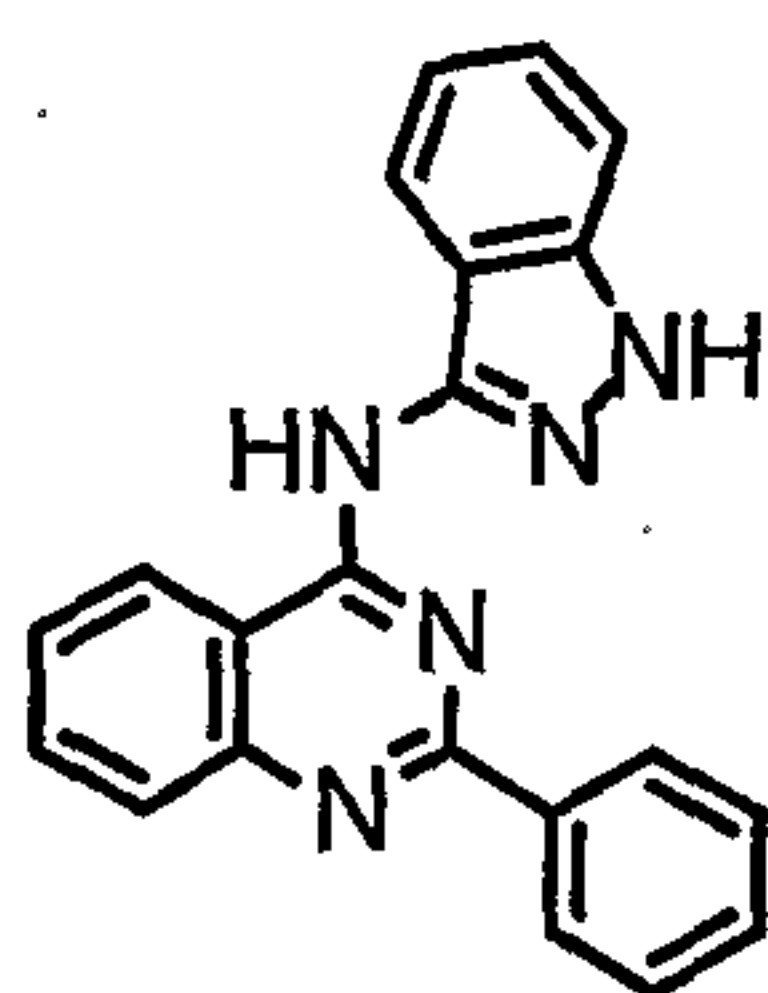
dialkylaminocarbonyl, mono- or dialkylaminocarbonyloxy, or 5-6 membered heteroaryl;

(b) each R^5 is independently selected from -halo, -CN, -oxo, -SR, -OR, $-N(R^4)_2$, $-C(O)R$, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C_{6-10} aryl, or C_{1-6} aliphatic; and

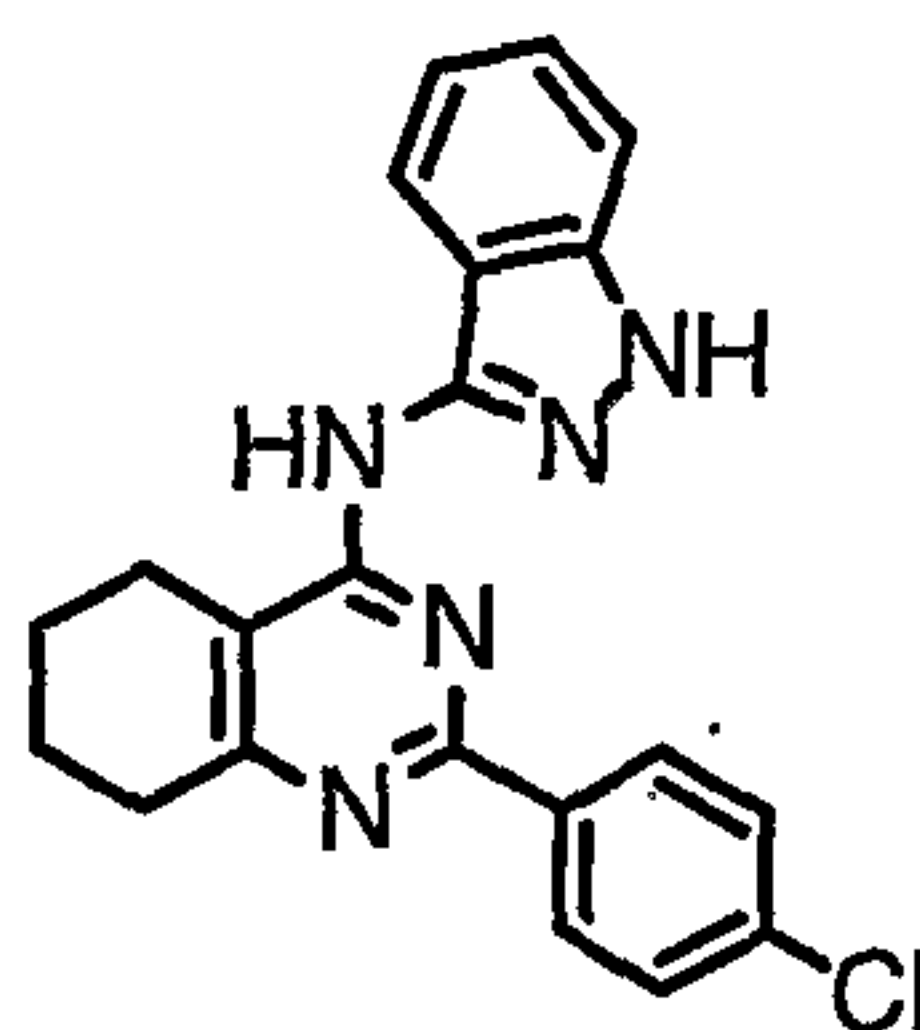
(c) $R^{2'}$ is hydrogen and R^2 is selected from $R^{2'}$ is hydrogen or methyl and R^2 is T-W- R^6 or R, wherein W is $-C(R^6)_2O-$, $-C(R^6)_2N(R^6)-$, $-CO-$, $-CO_2-$, $-C(R^6)OC(O)-$, $-C(R^6)_2N(R^6)CO-$, or $-CON(R^6)-$, and R is an optionally substituted group selected from C_{1-6} aliphatic or phenyl, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a benzo, pyrido, or partially unsaturated 6-membered carbocyclo ring optionally substituted with -halo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), $-CN$, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, or $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group.

Representative compounds of formula III are set forth in Table 2 below.

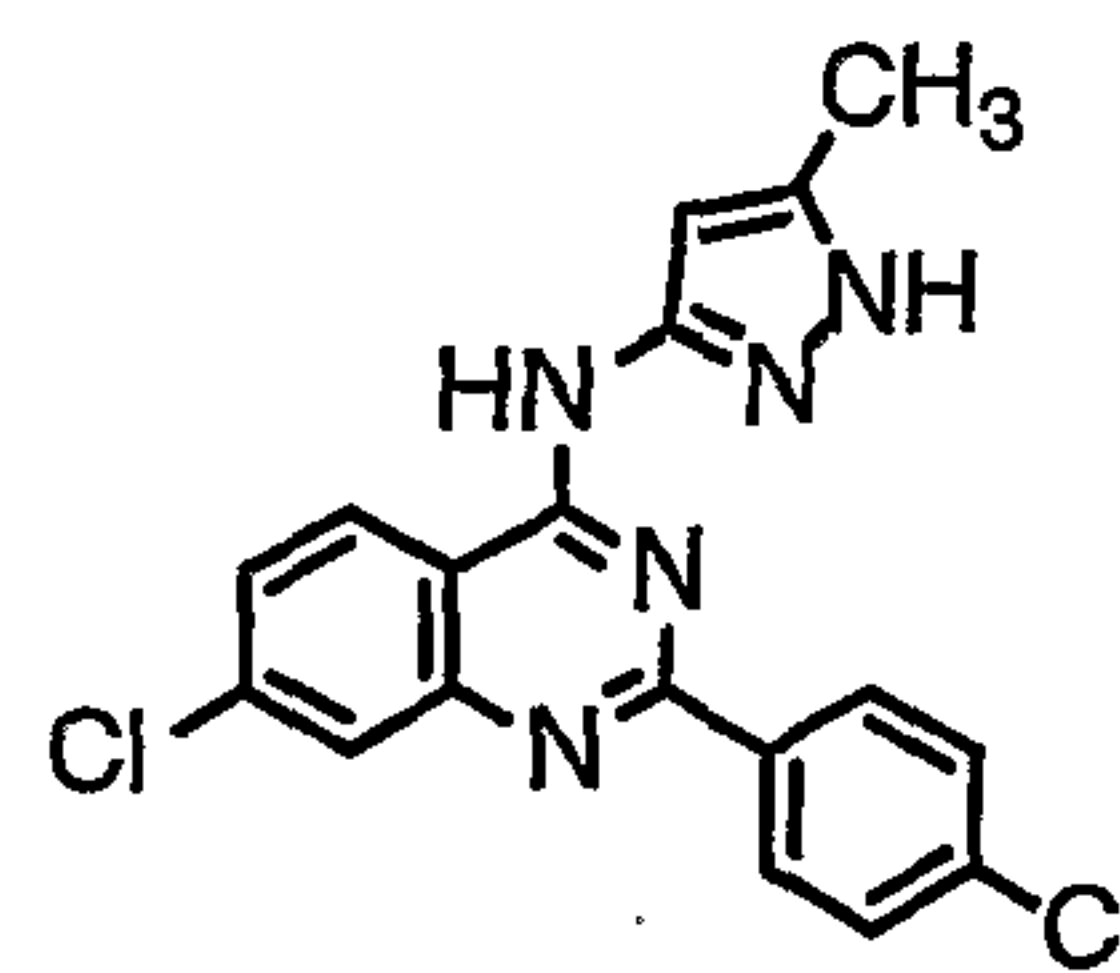
Table 2



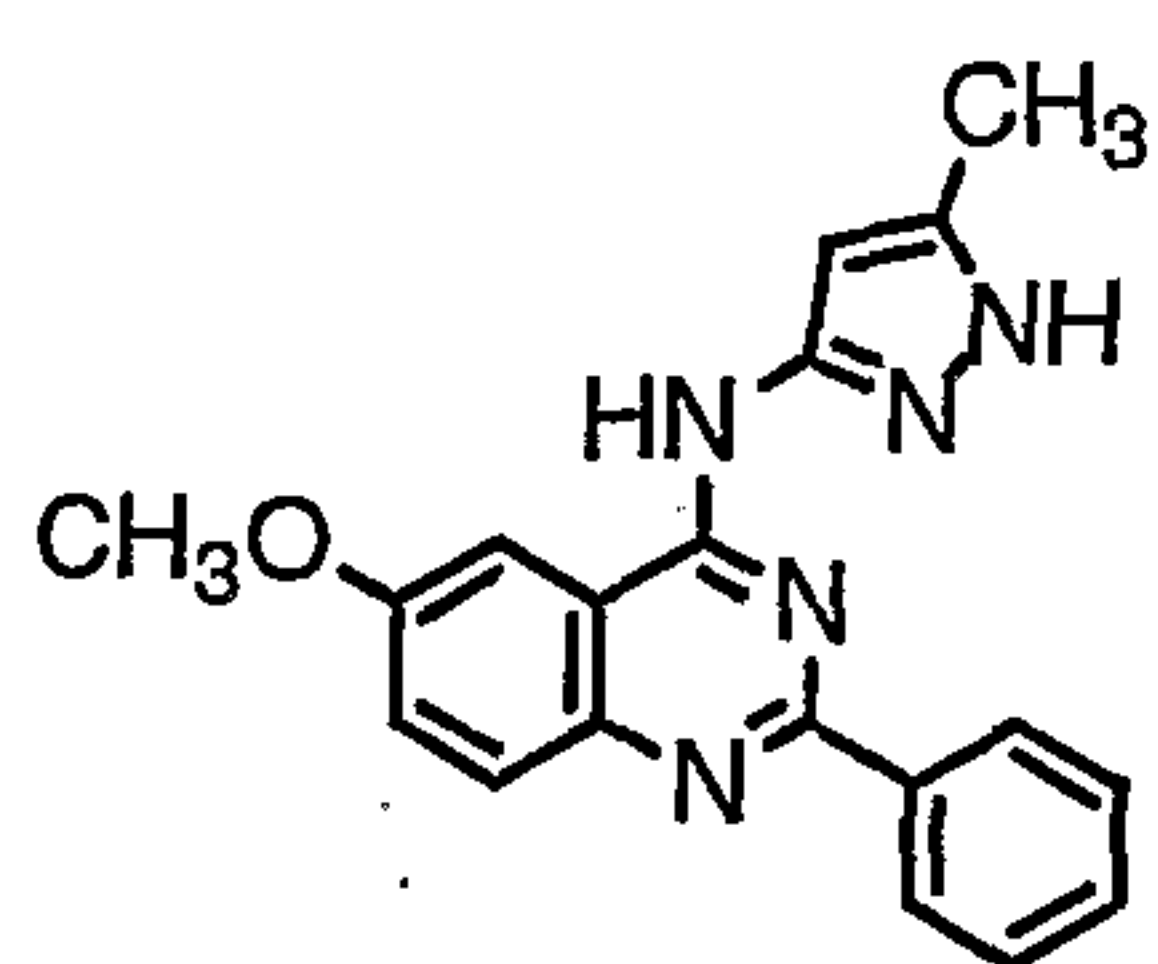
III-1



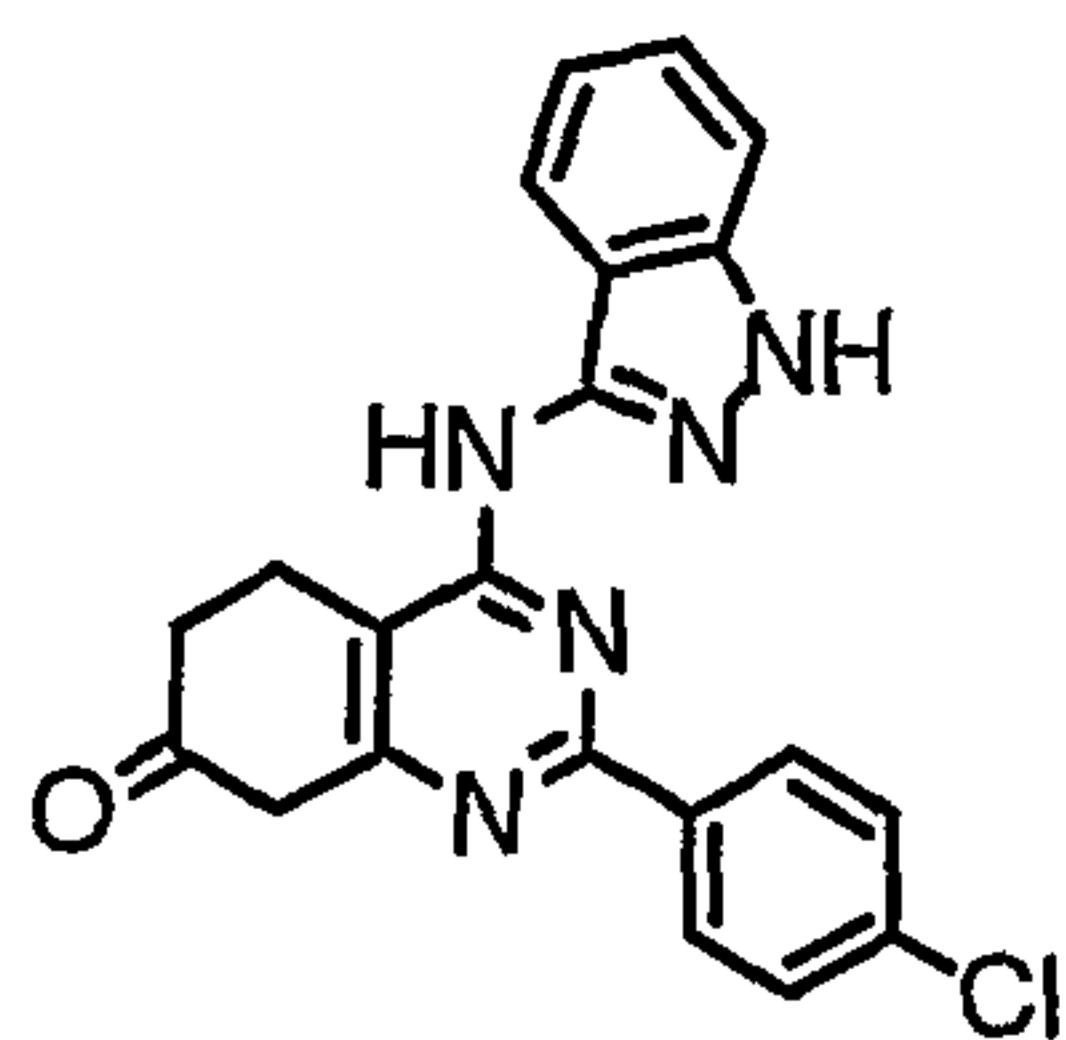
III-2



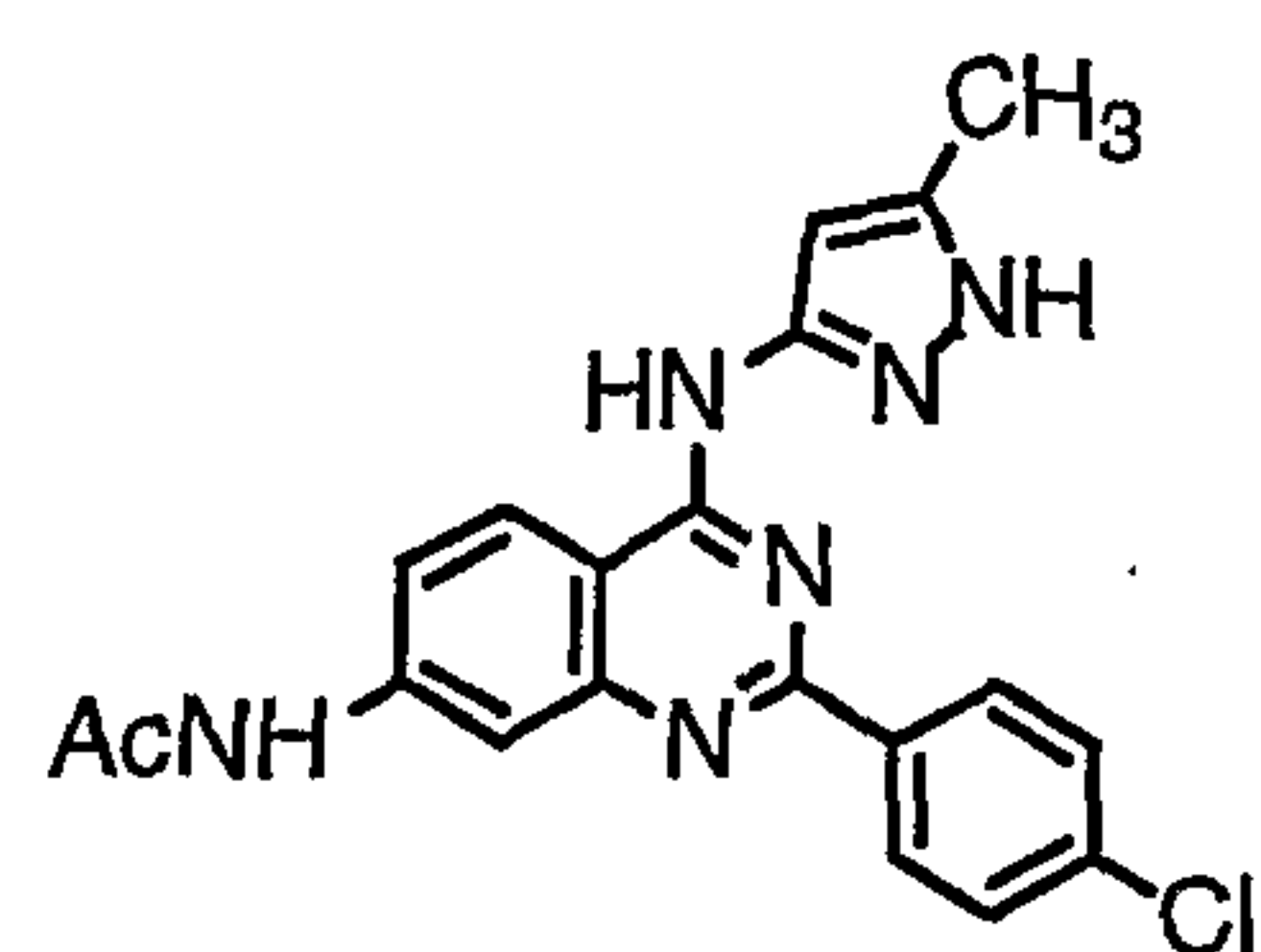
III-3



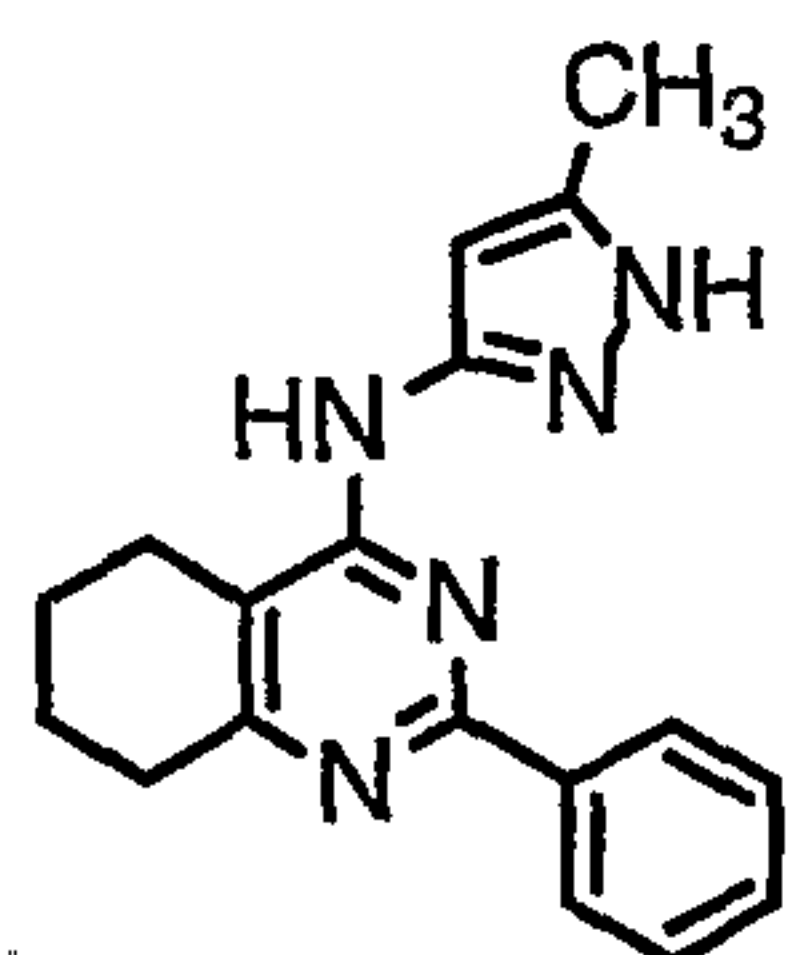
III-4



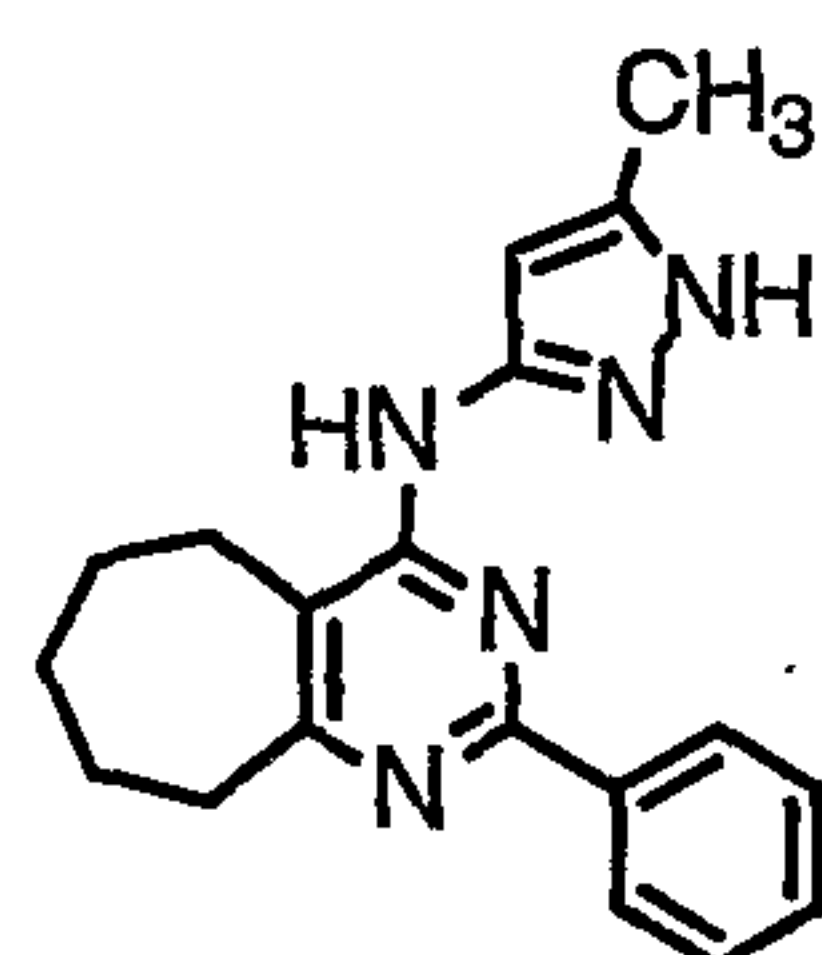
III-5



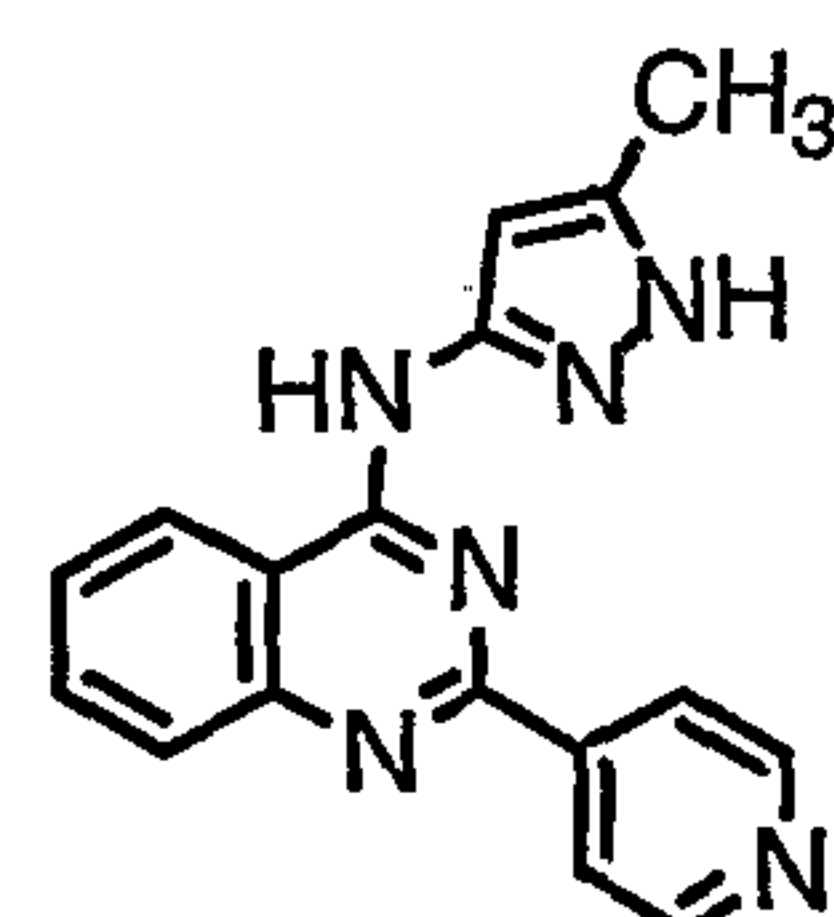
III-6



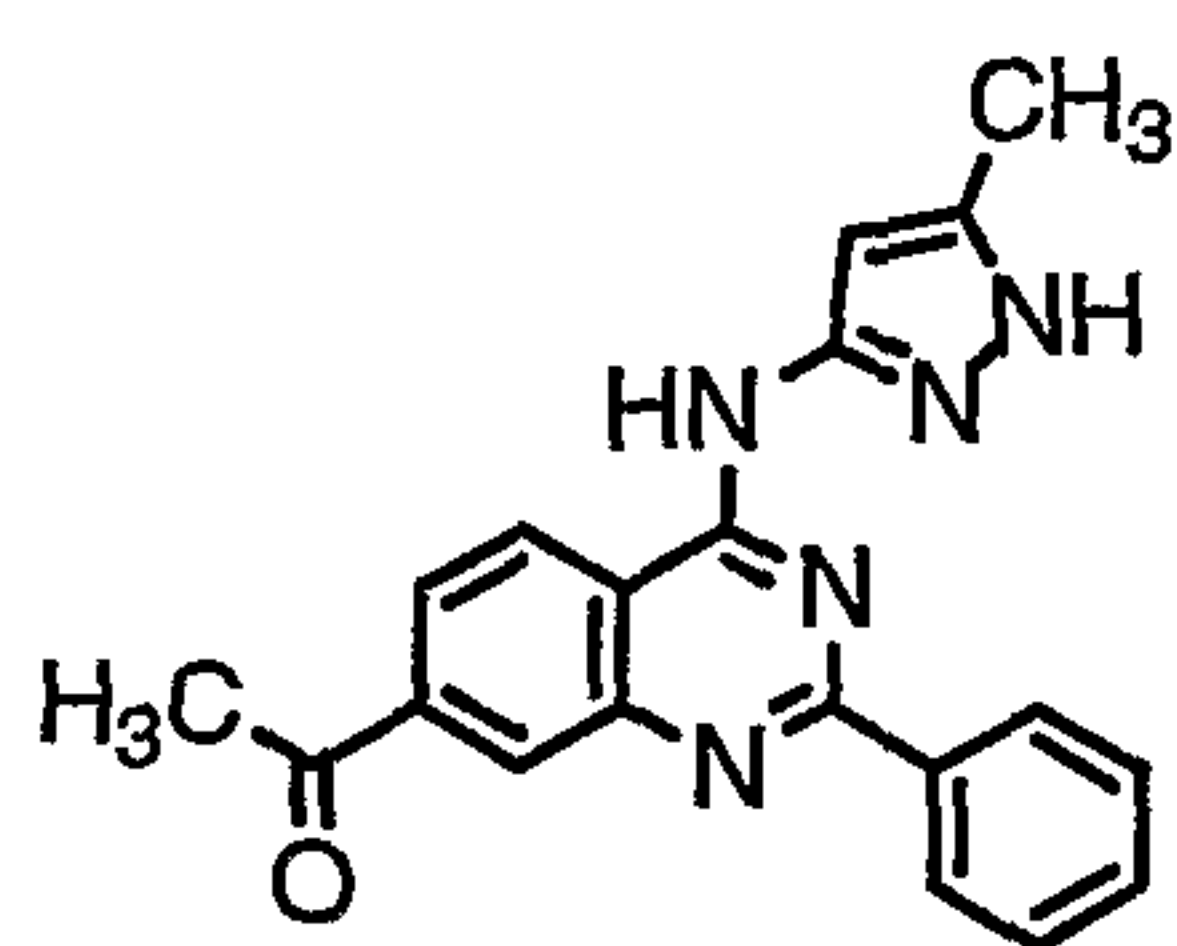
III-7



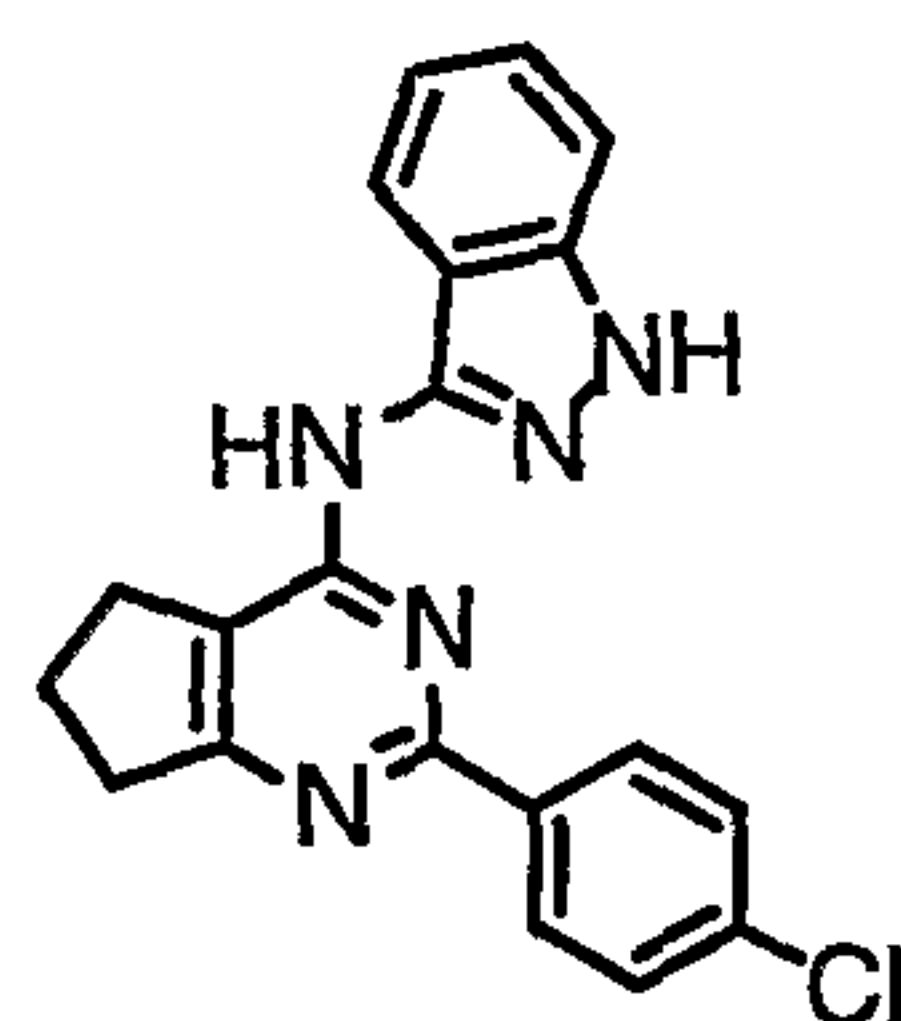
III-8



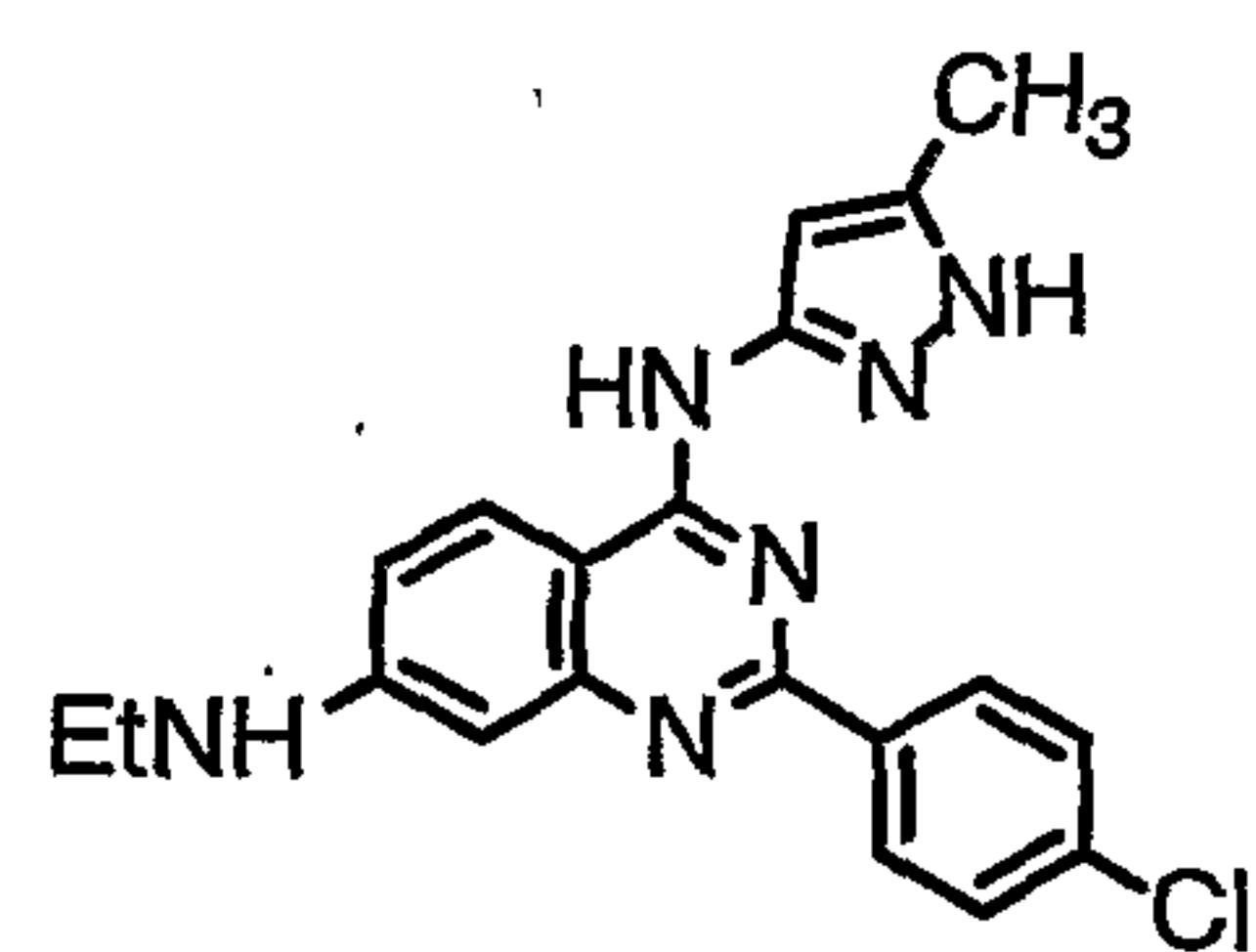
III-9



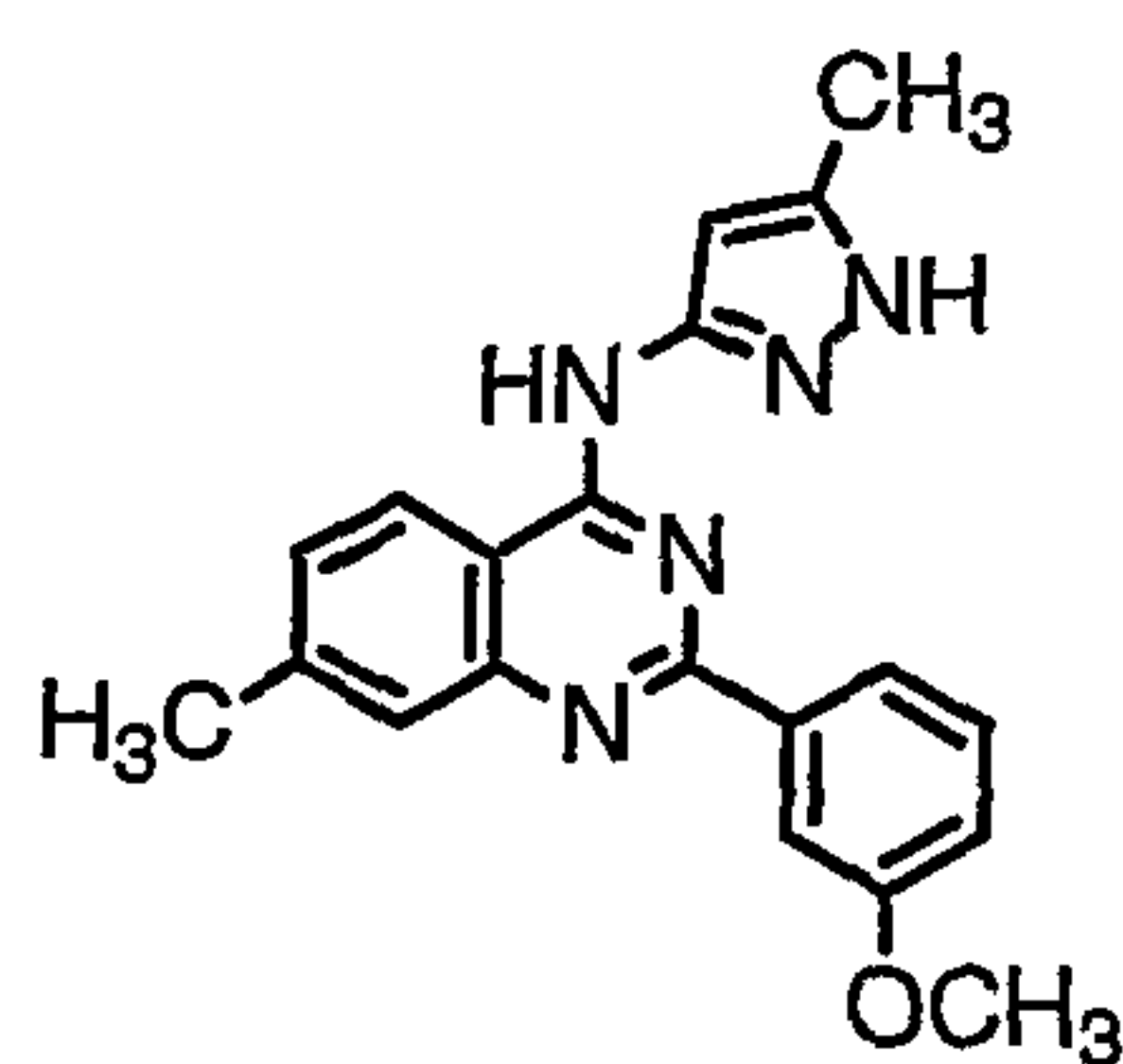
III-10



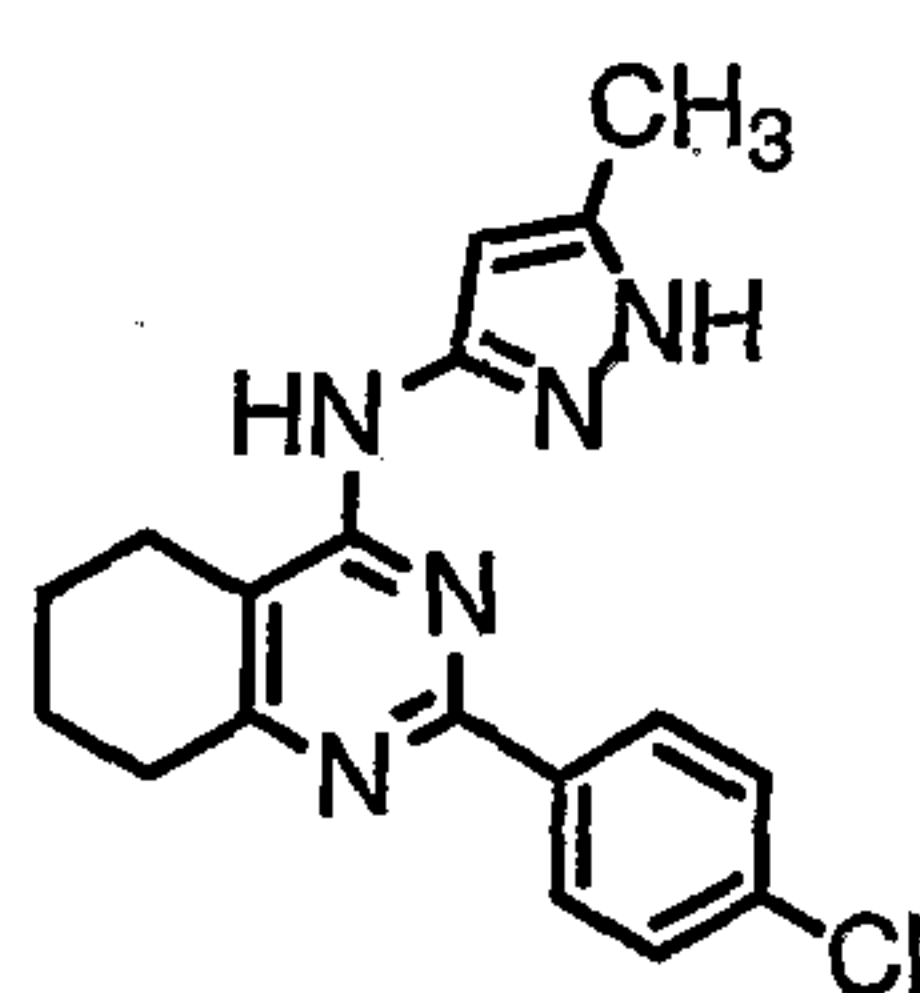
III-11



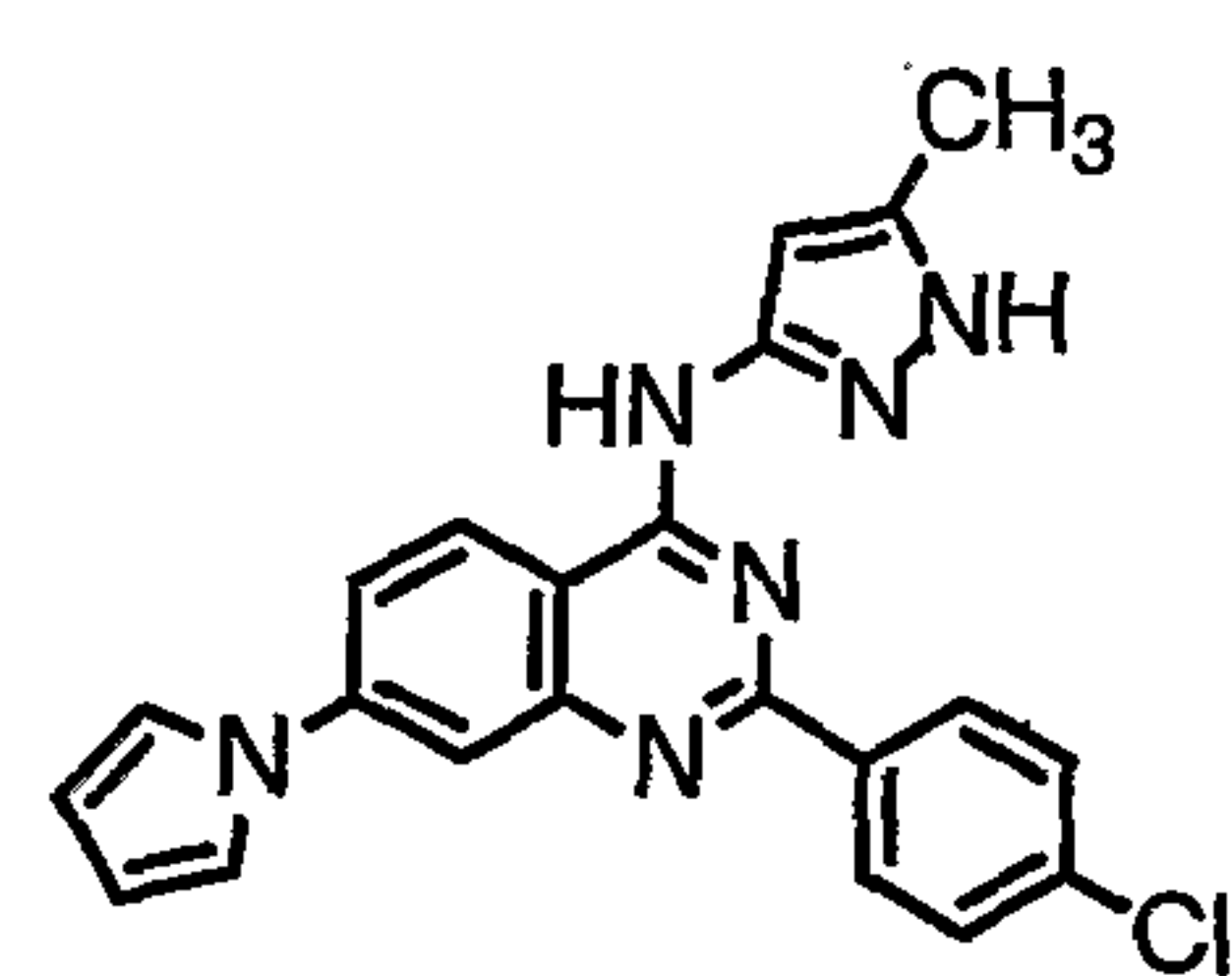
III-12



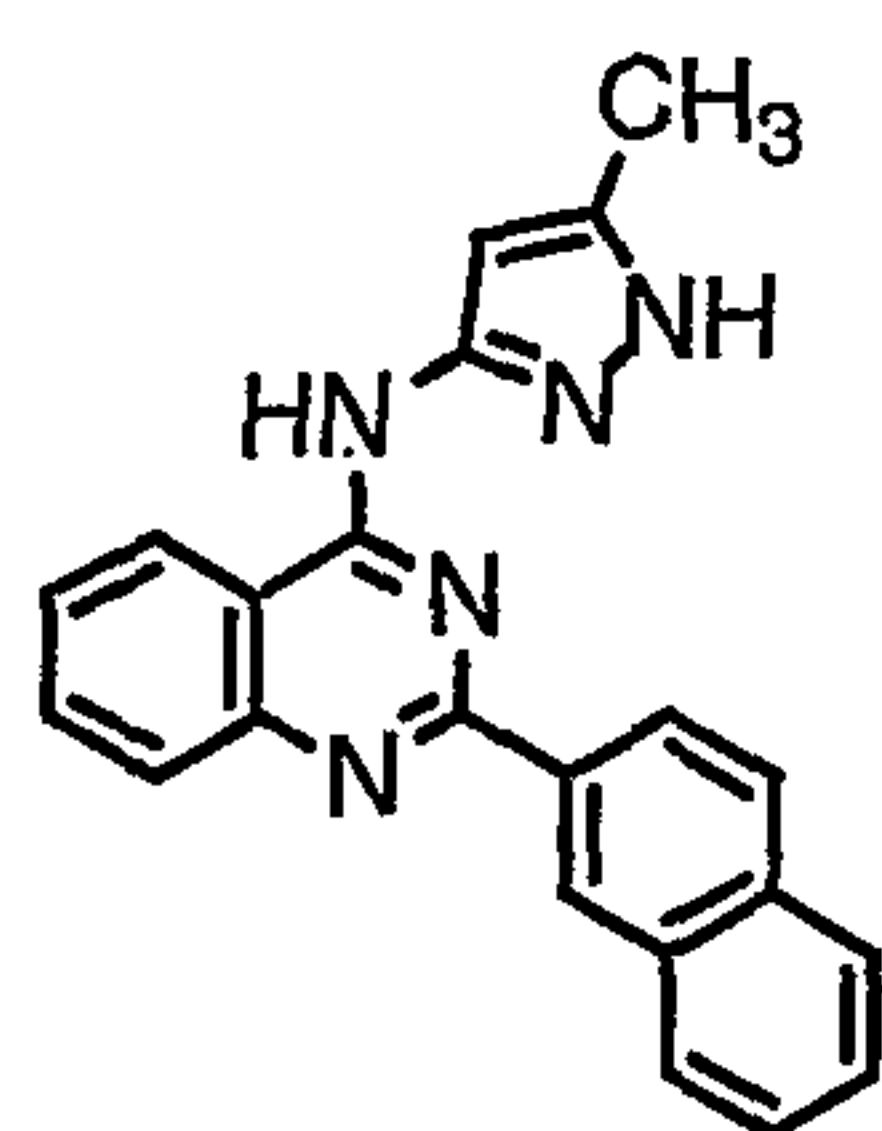
III-13



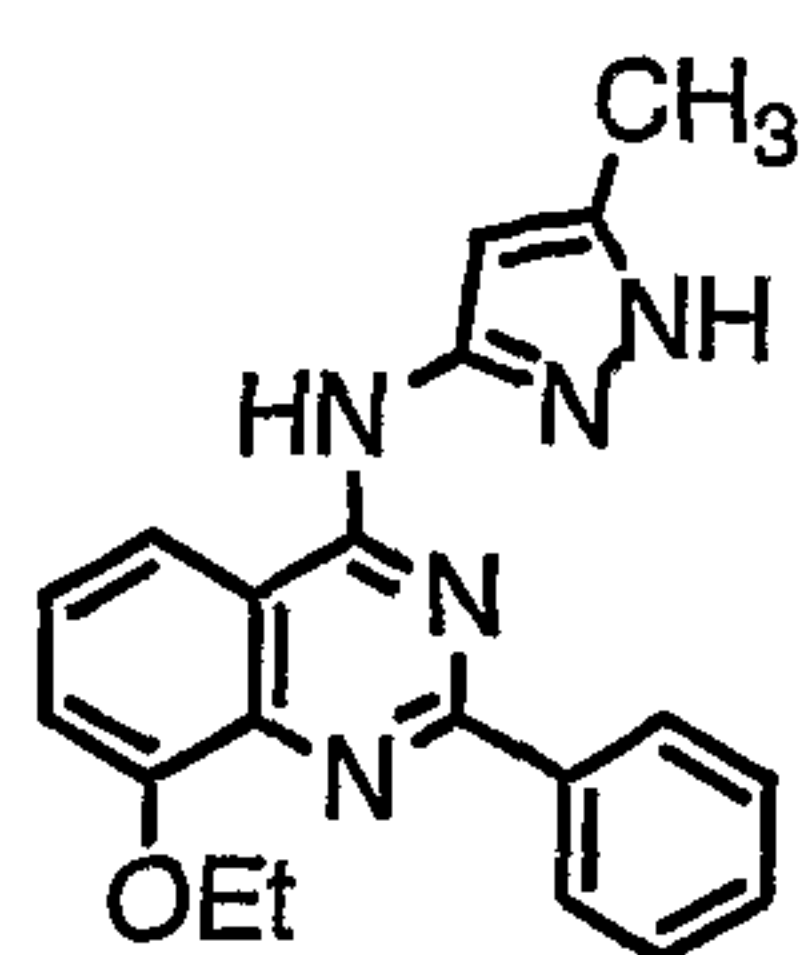
III-14



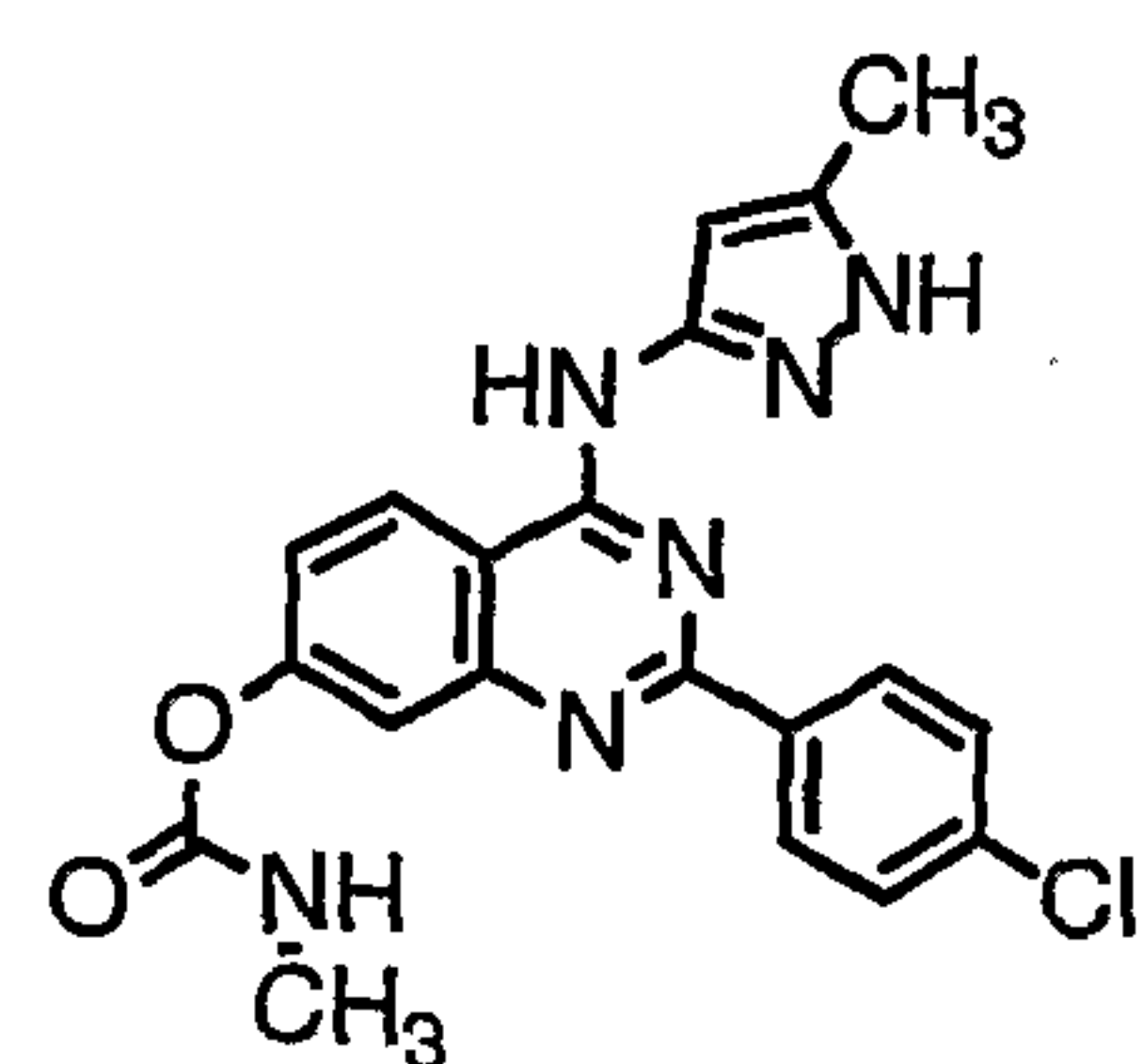
III-15



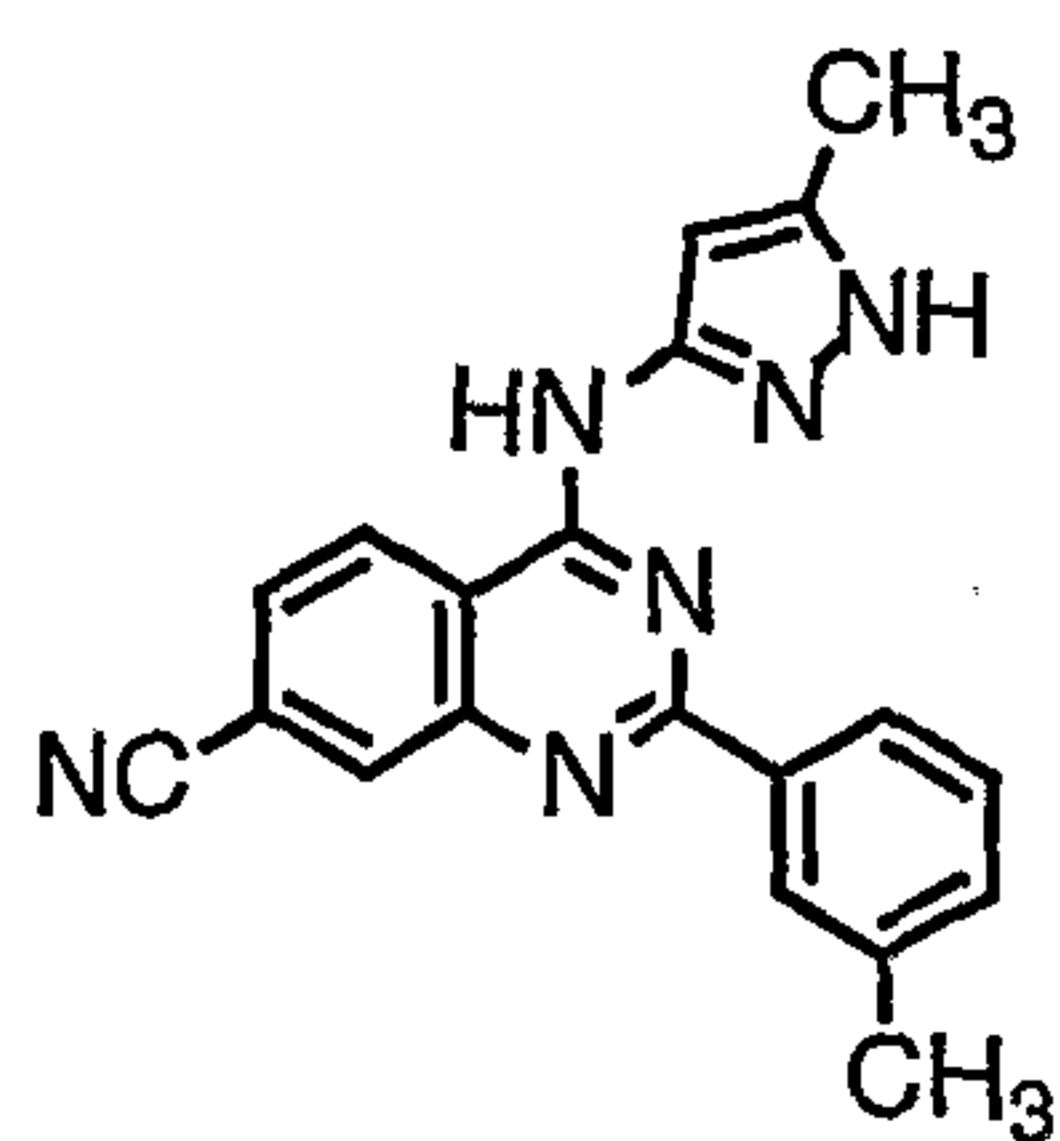
III-16



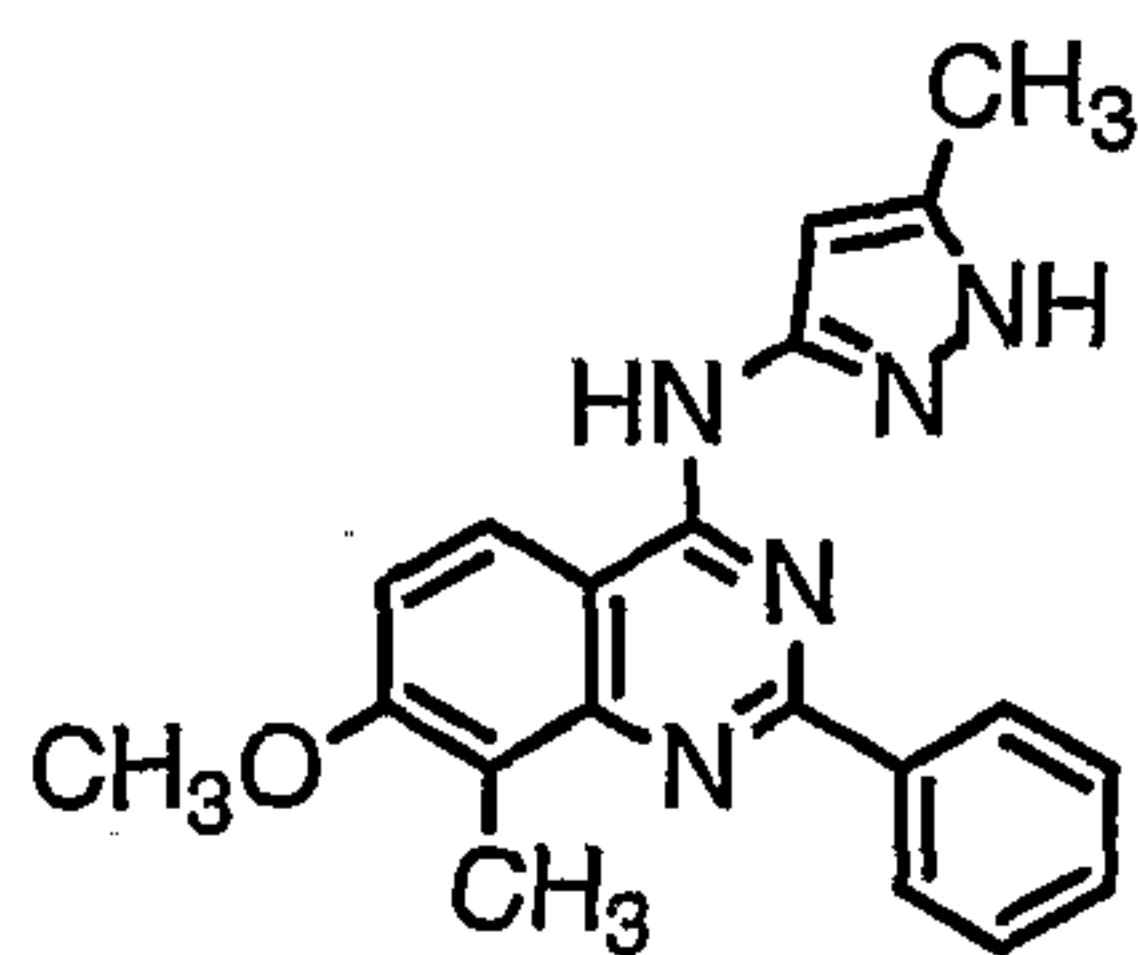
III-17



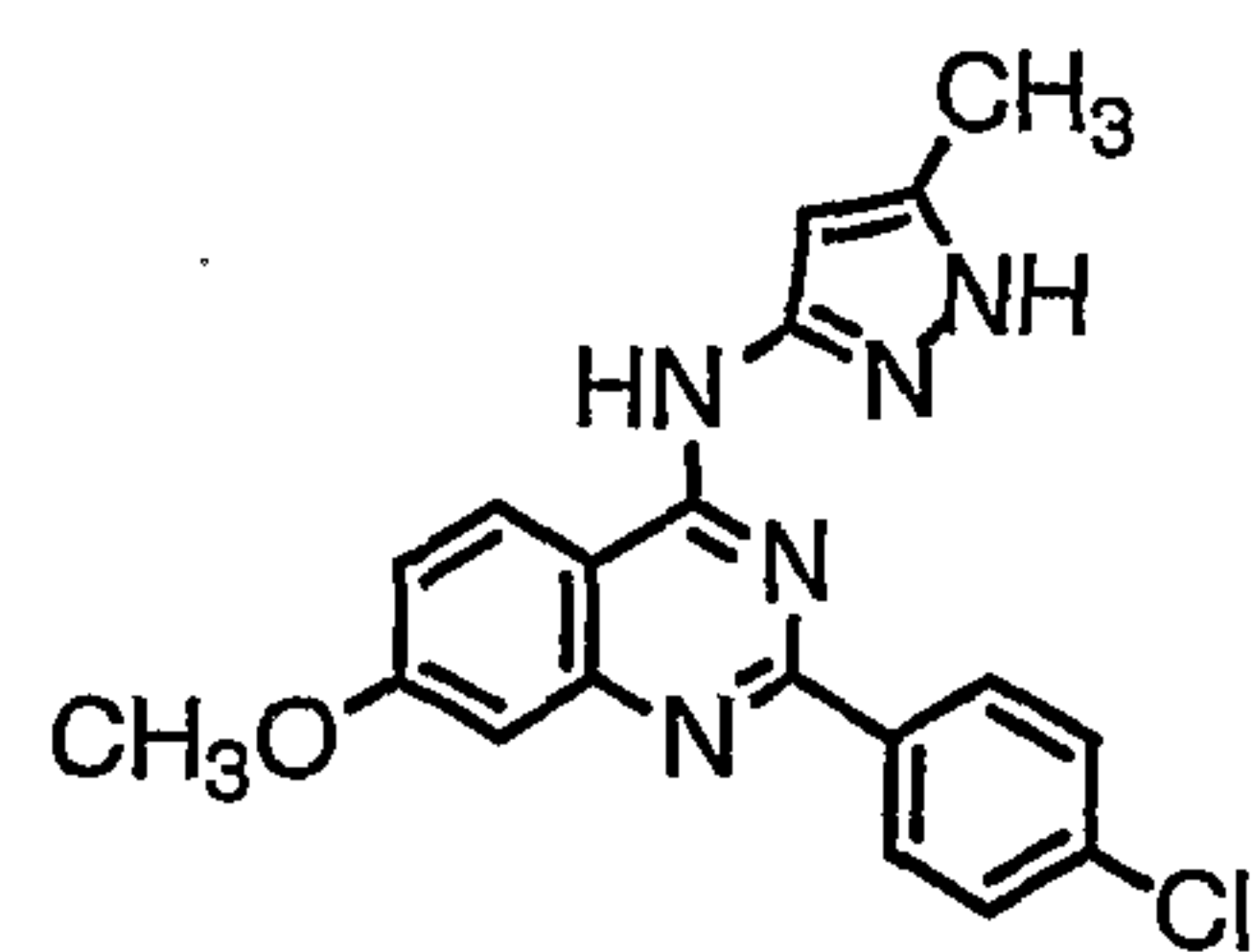
III-18



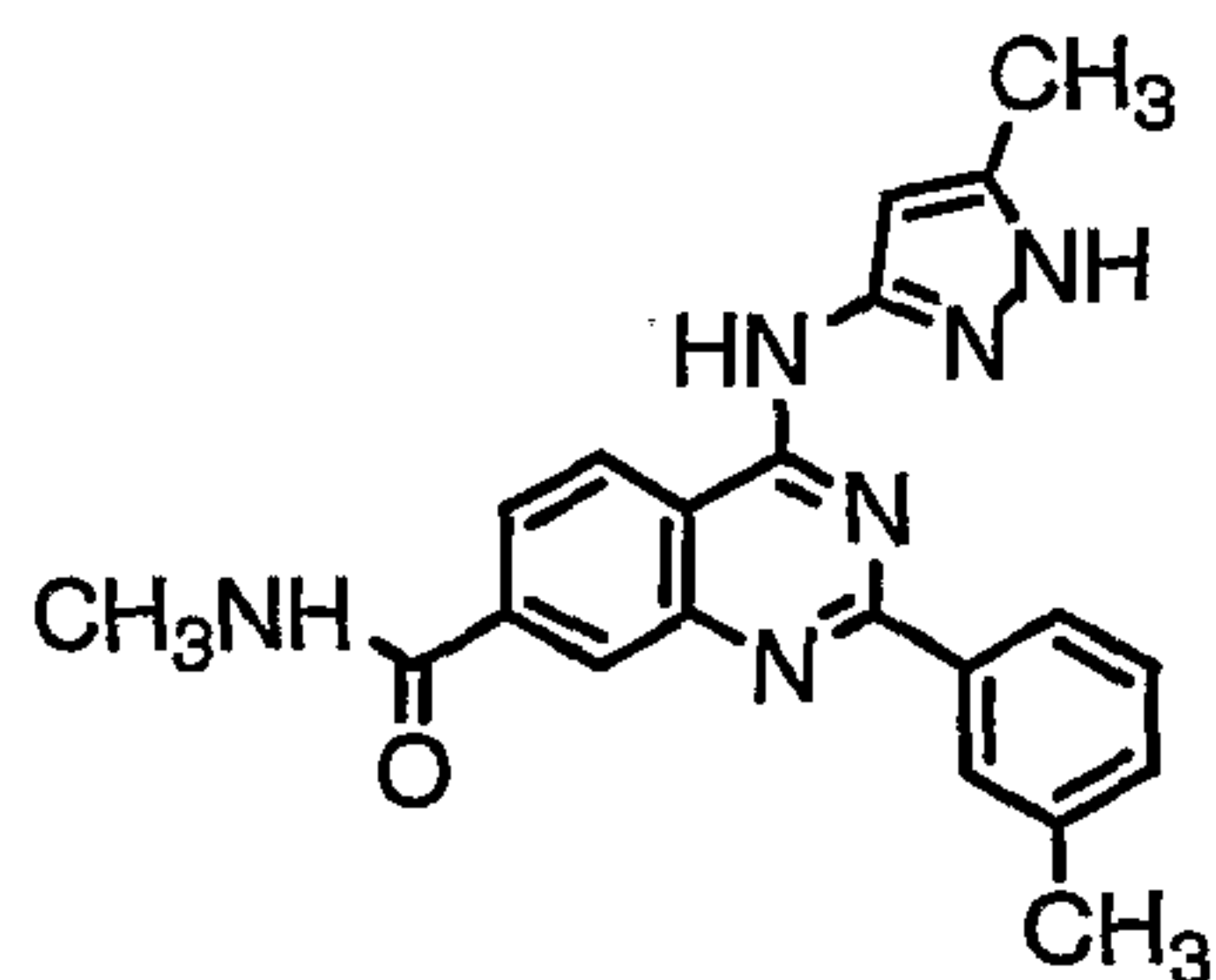
III-19



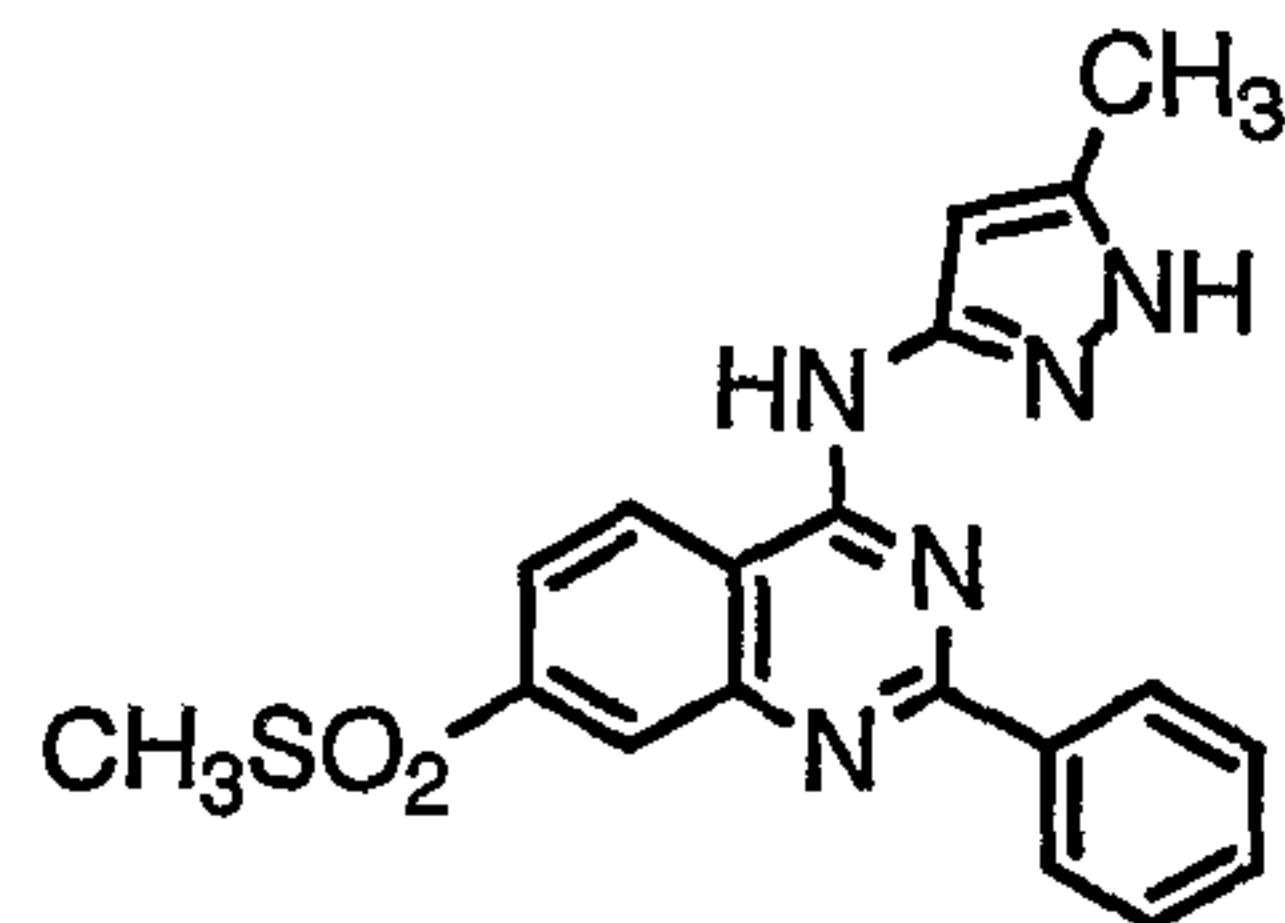
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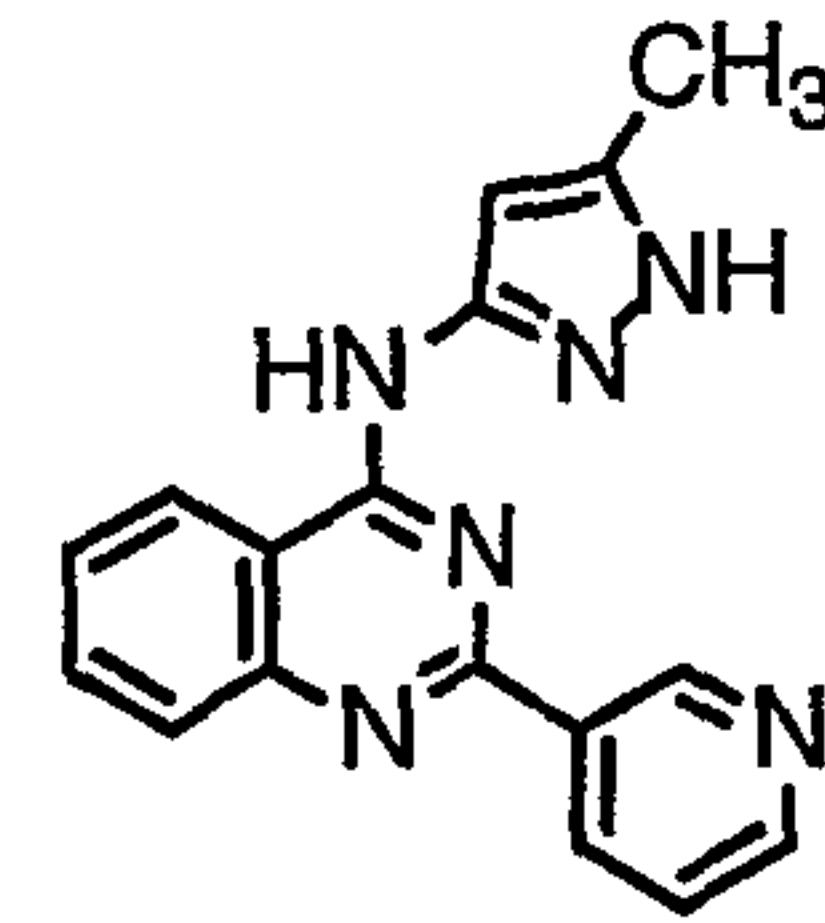
III-21



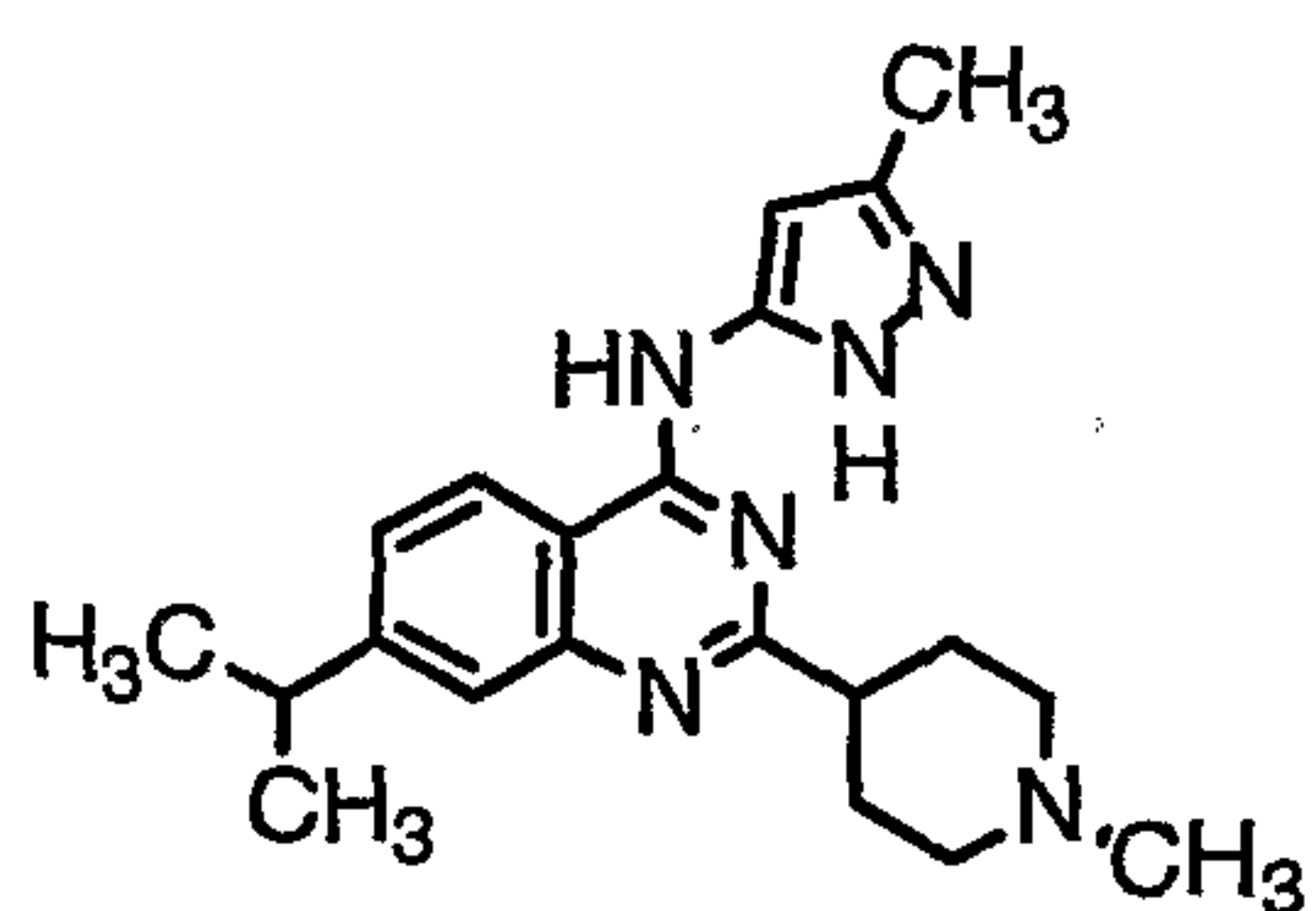
III-22



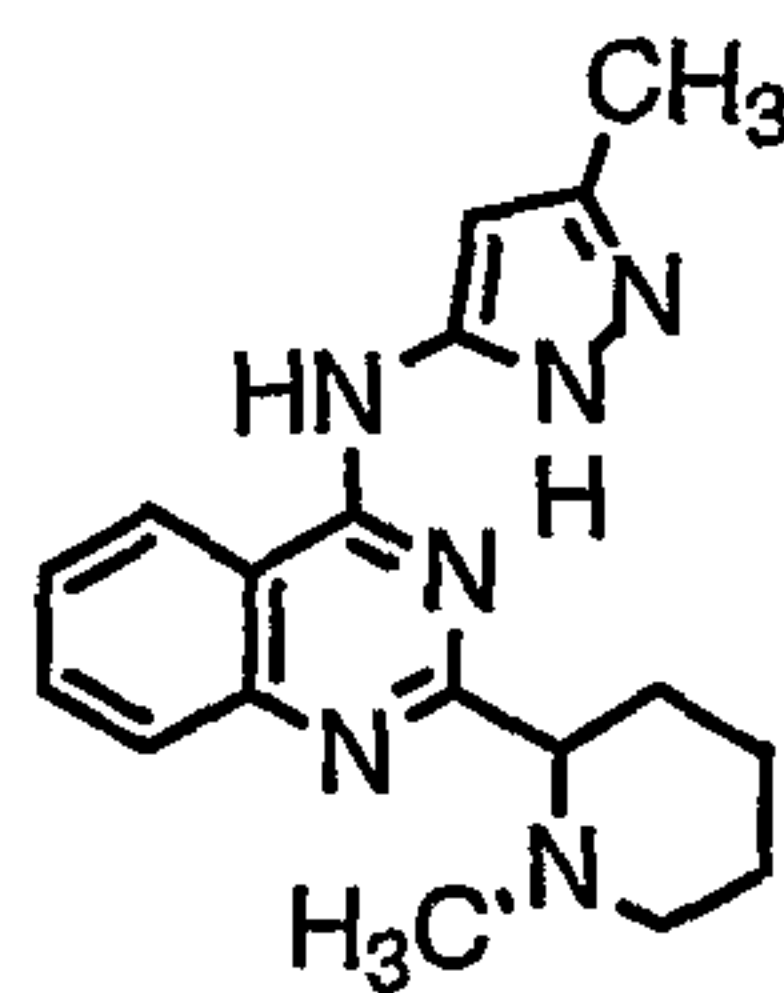
III-23



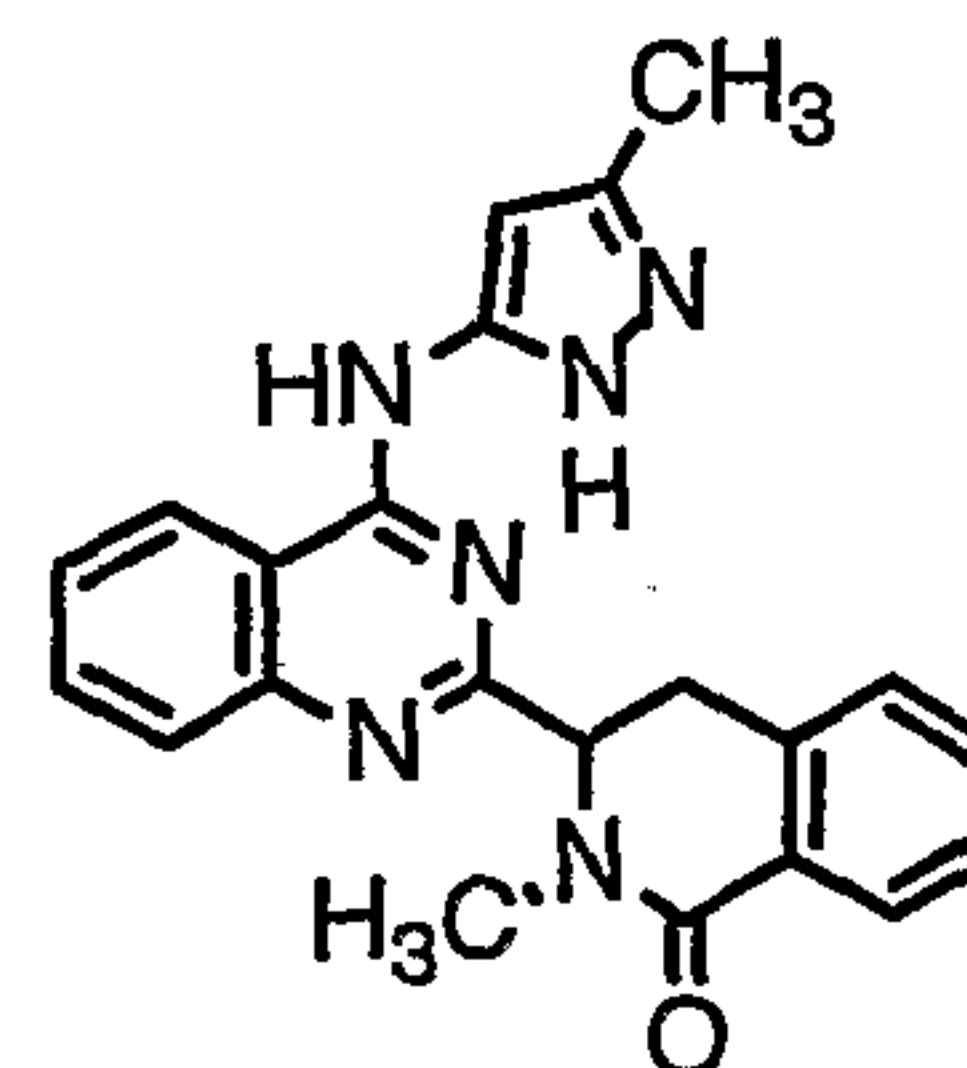
III-24



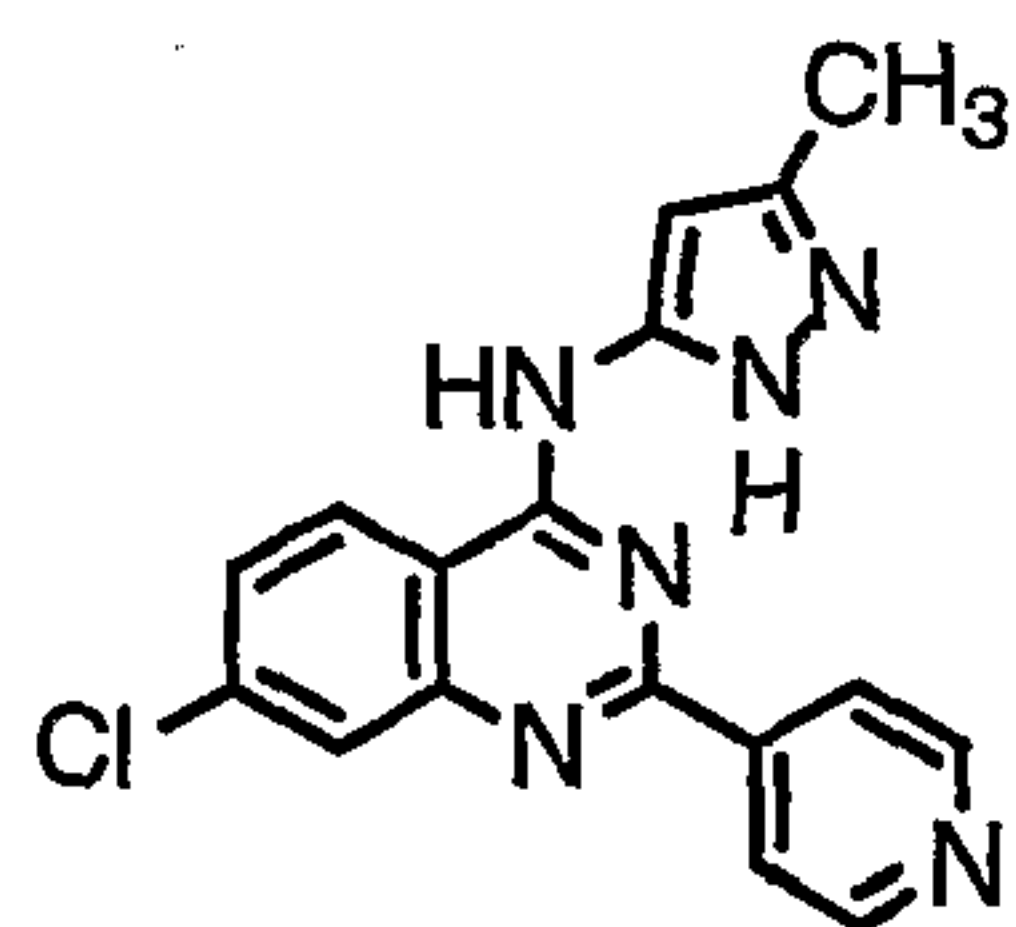
III-25



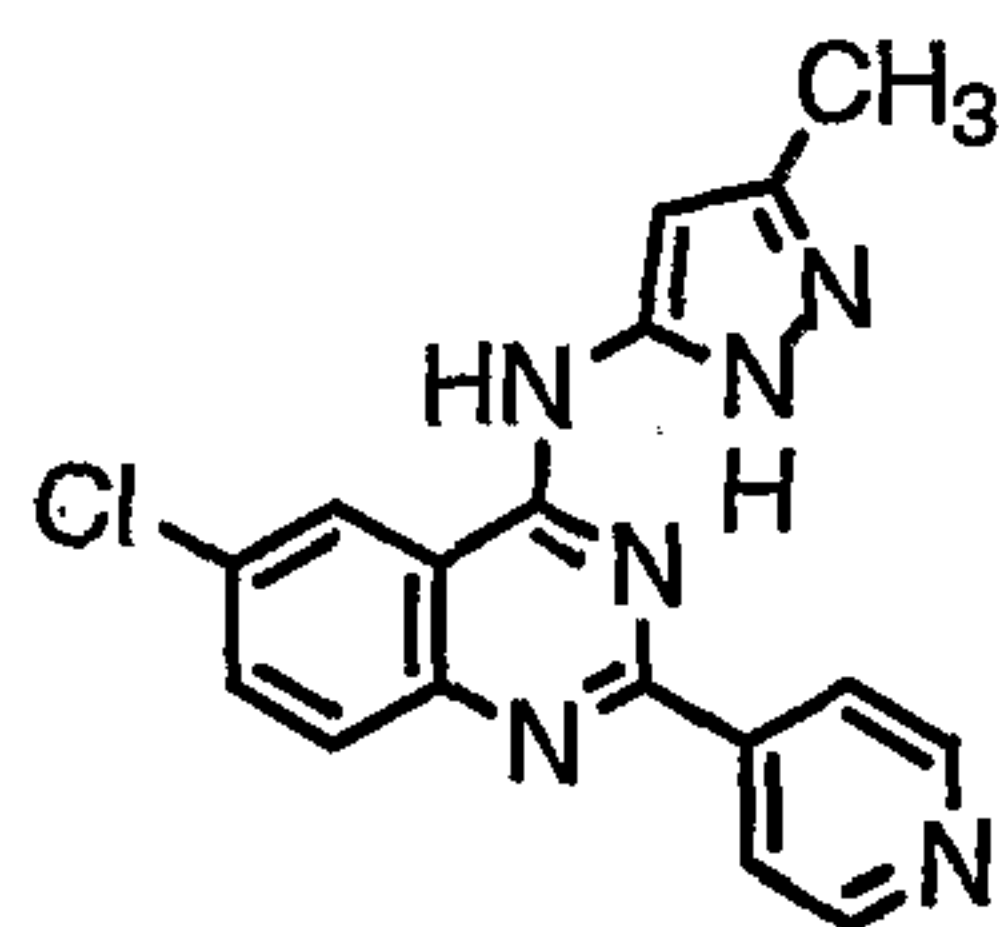
III-26



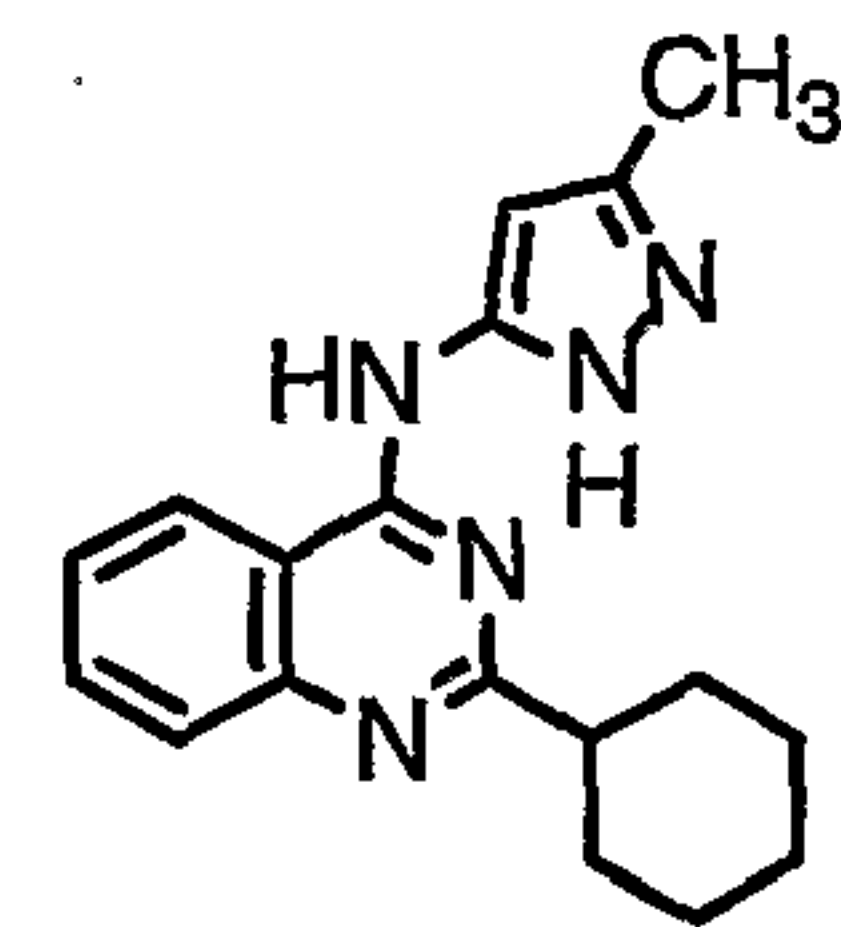
III-27



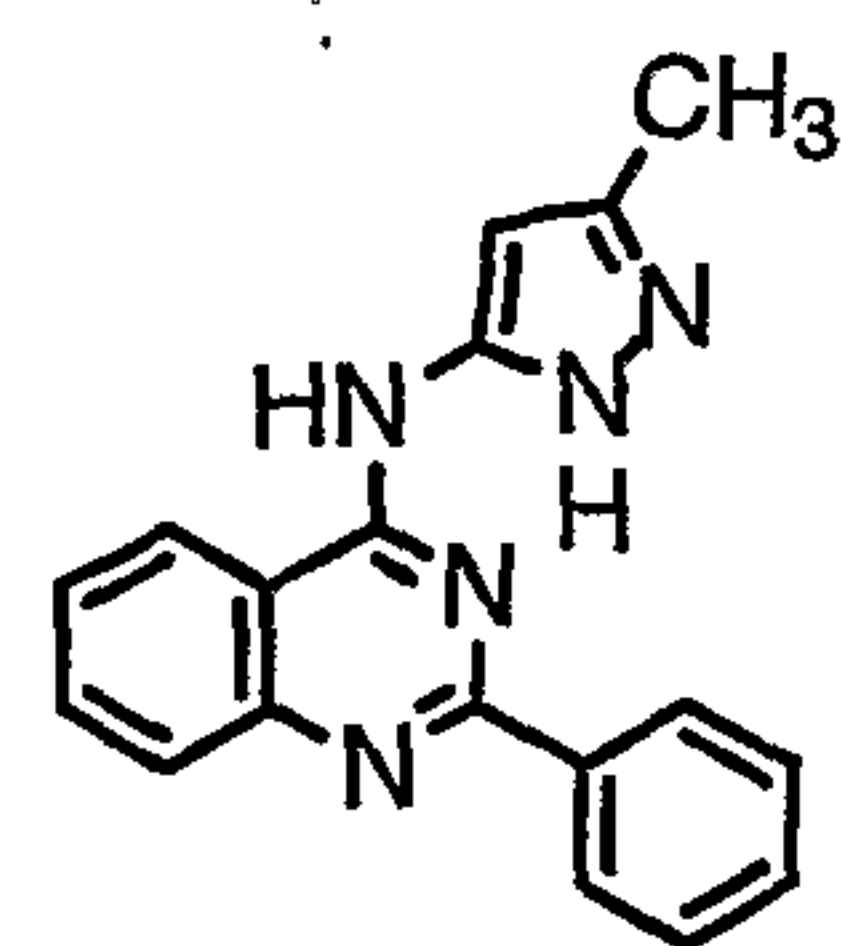
III-28



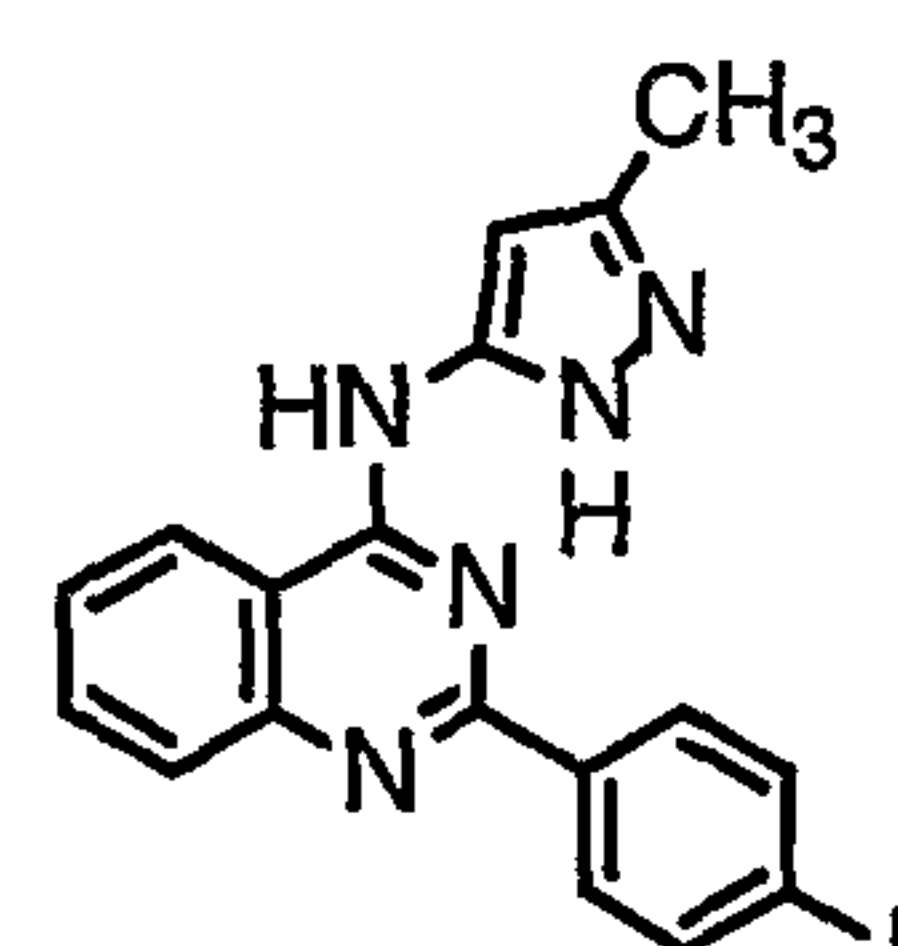
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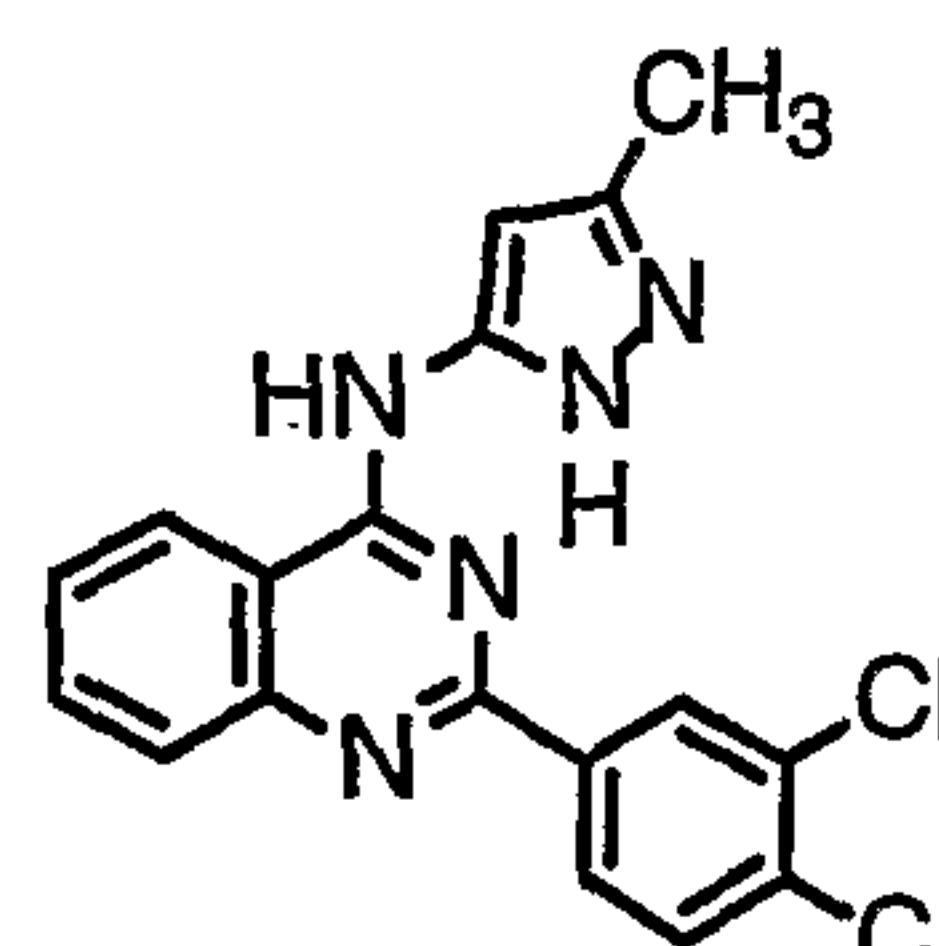
III-30



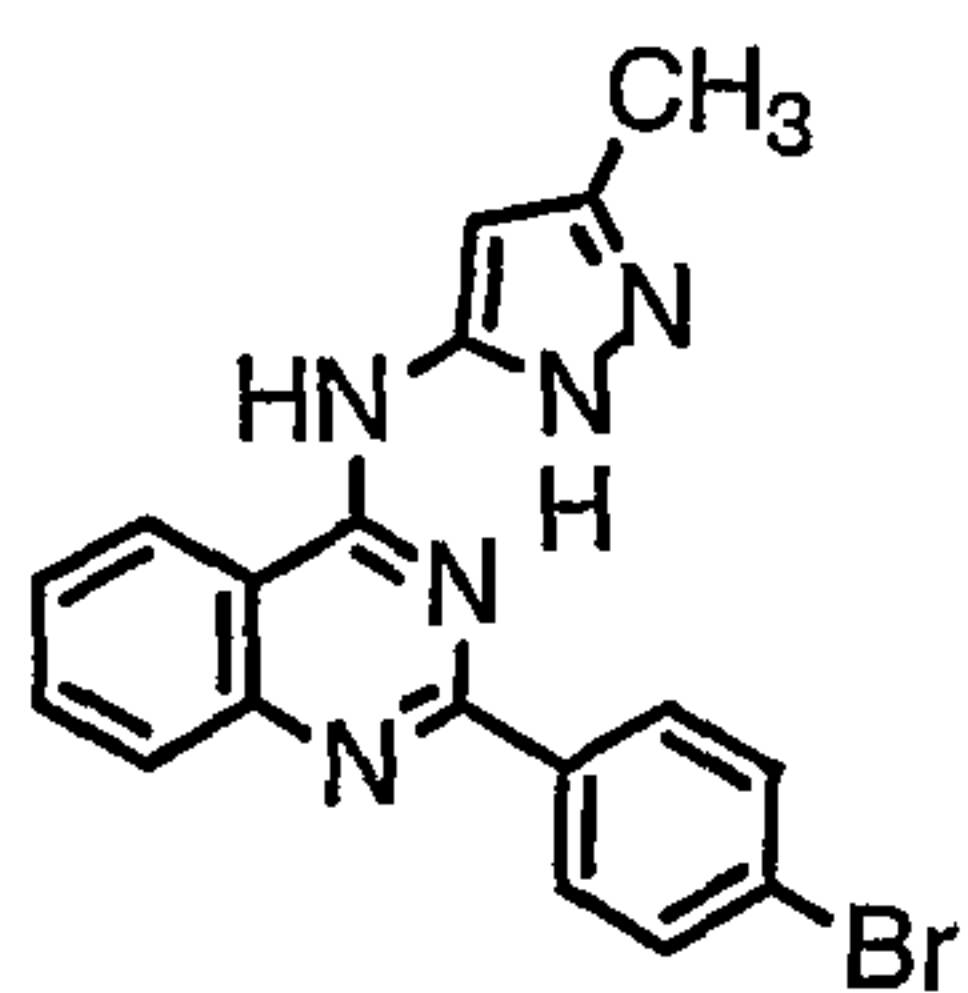
III-31



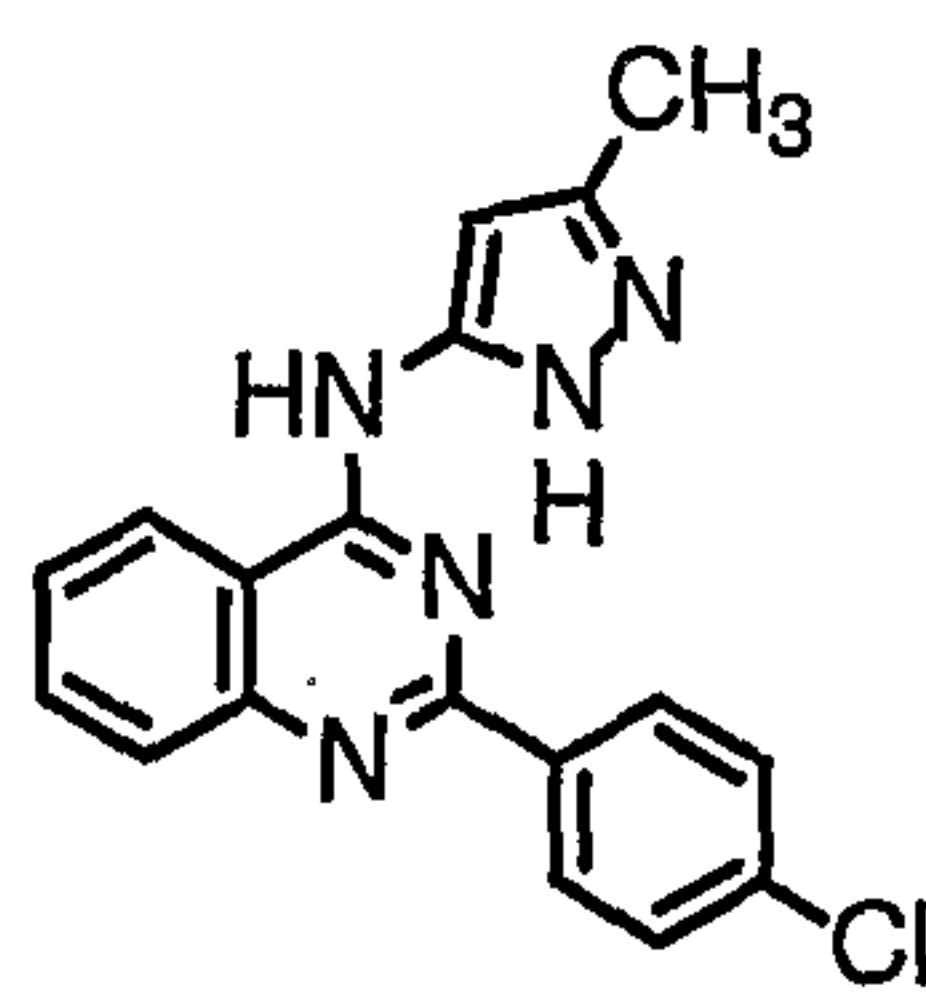
III-32



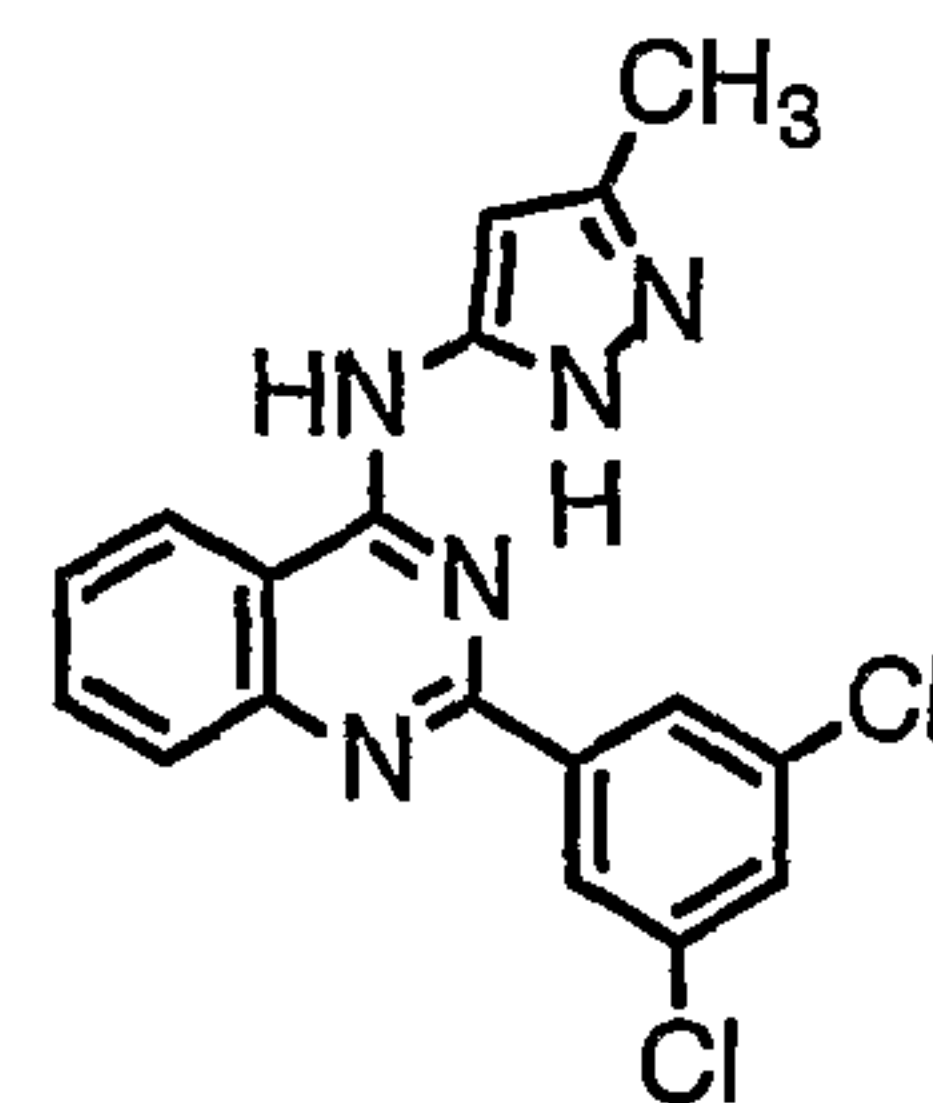
III-33



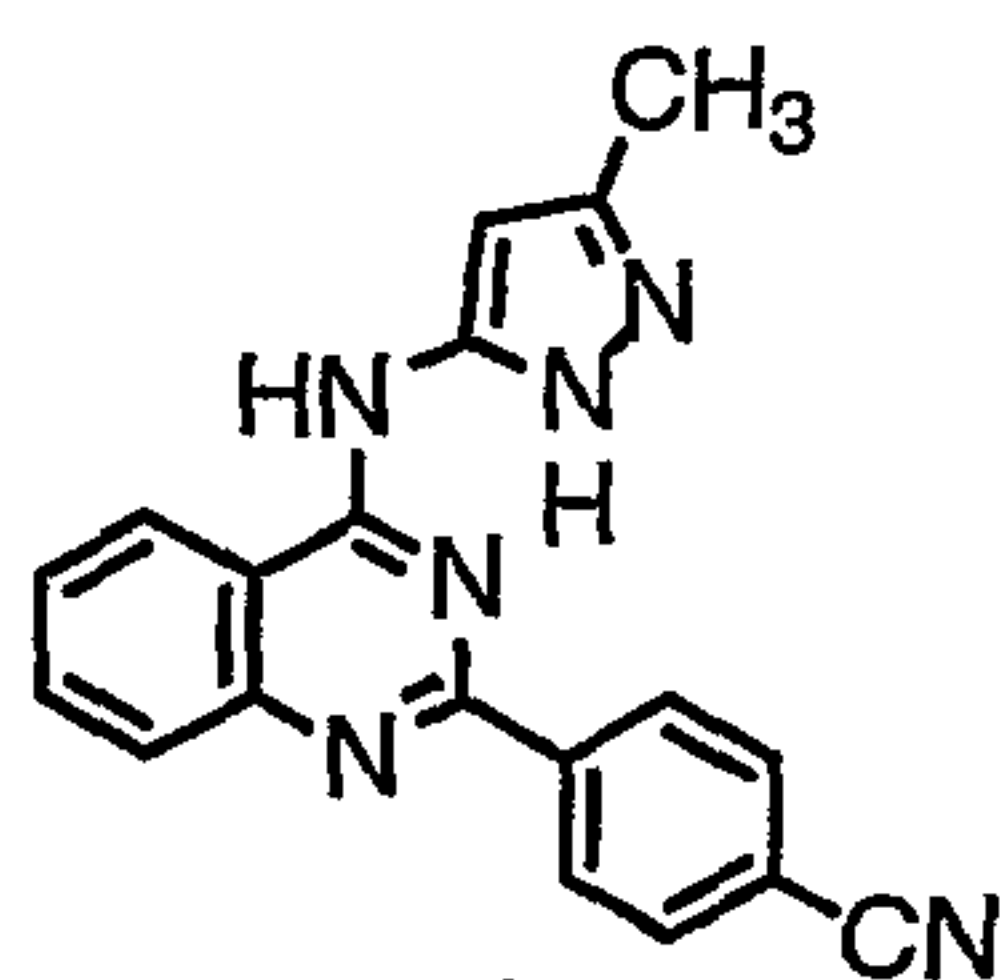
III-34



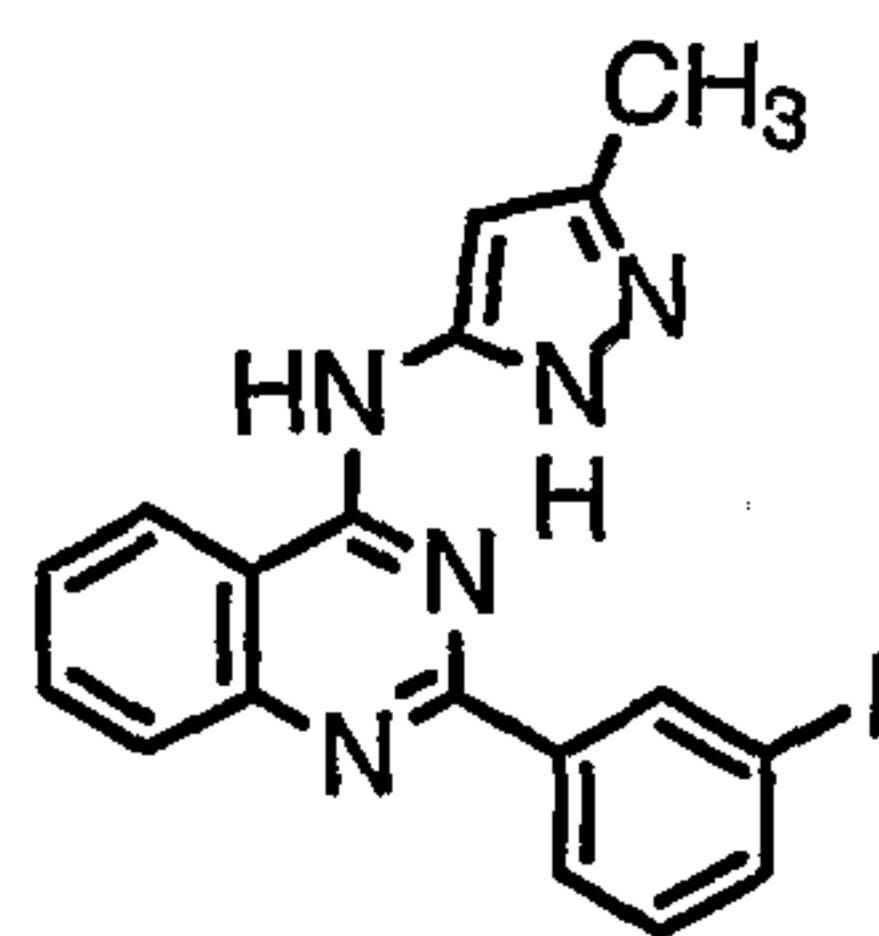
III-35



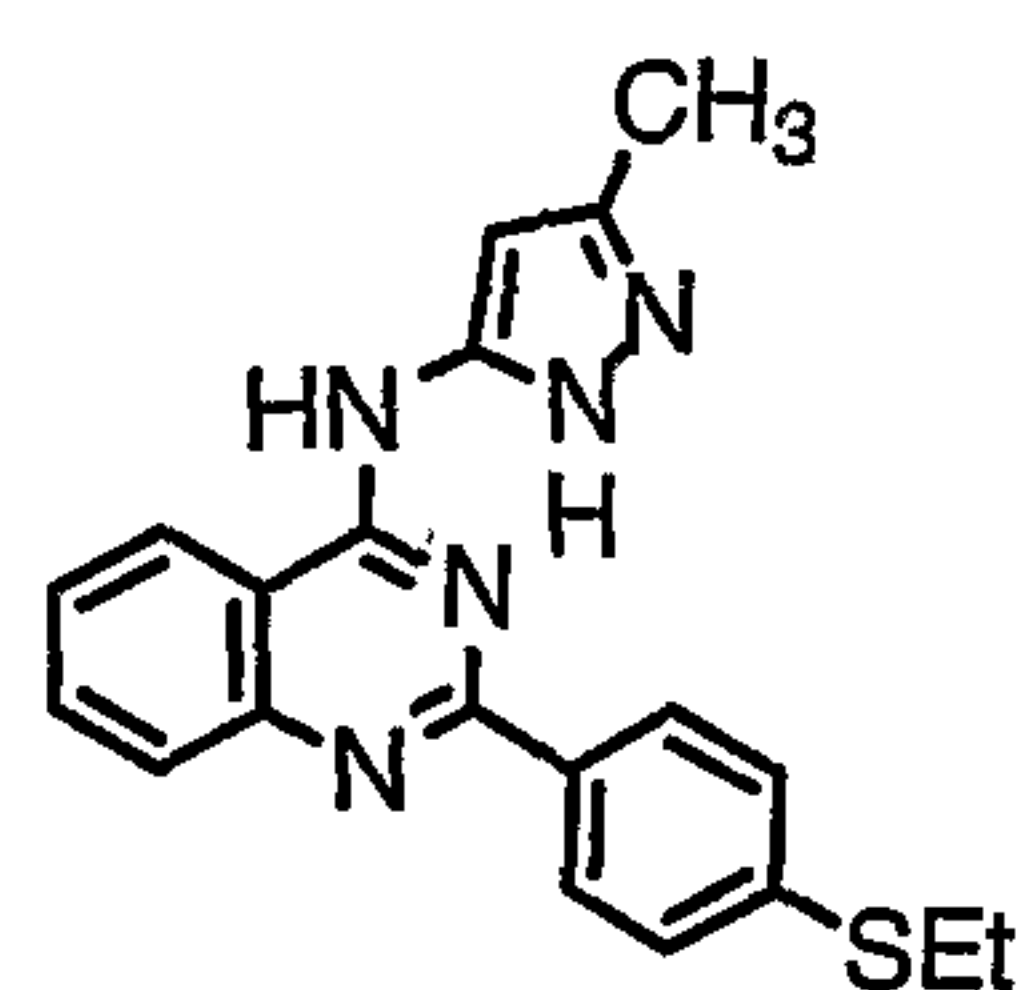
III-36



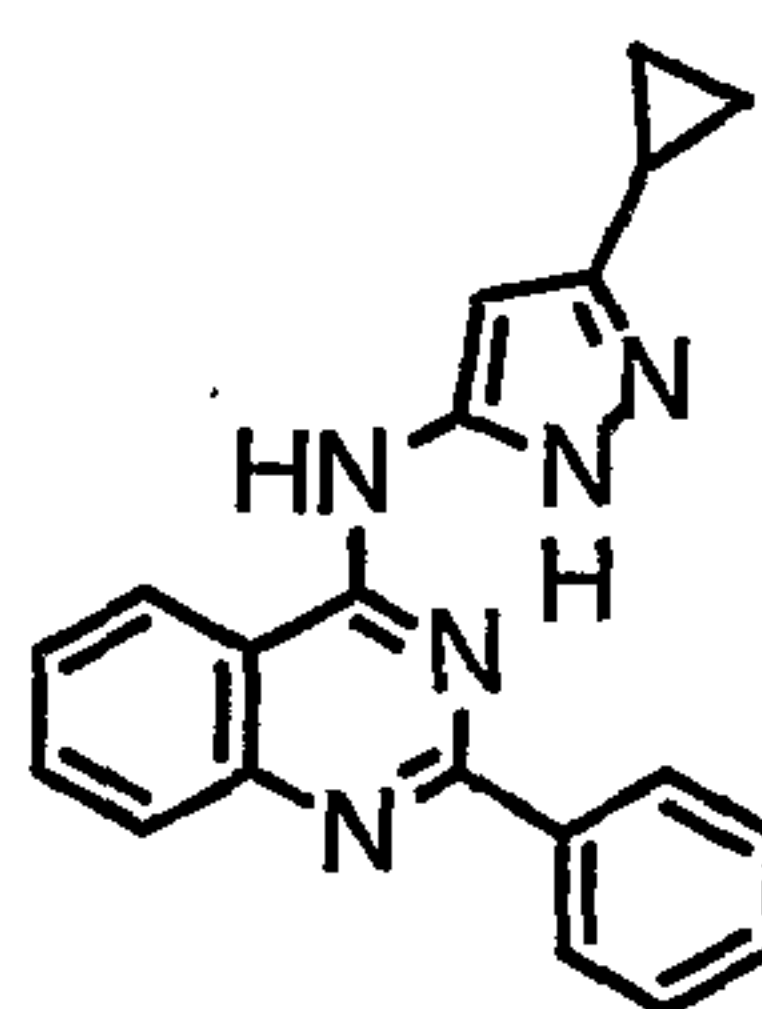
III-37



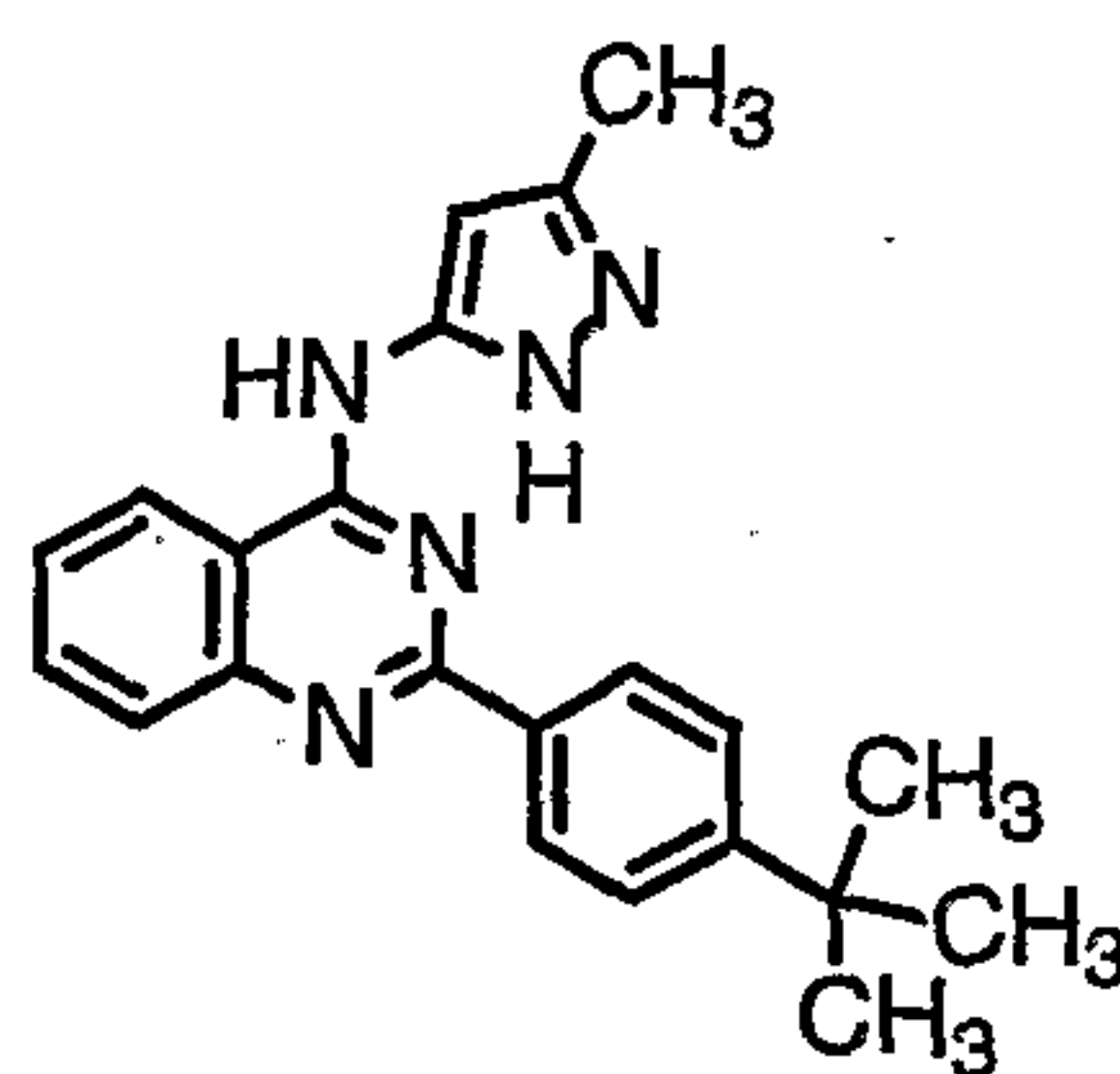
III-38



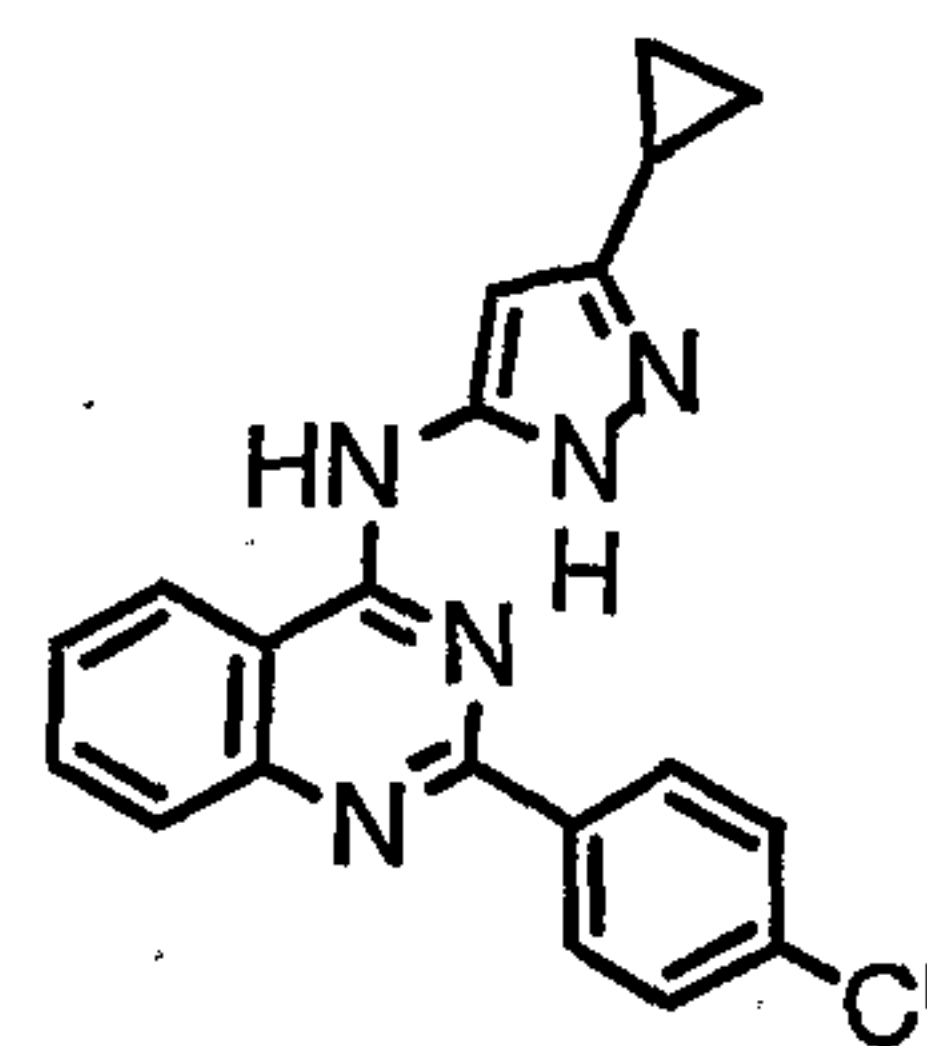
III-39



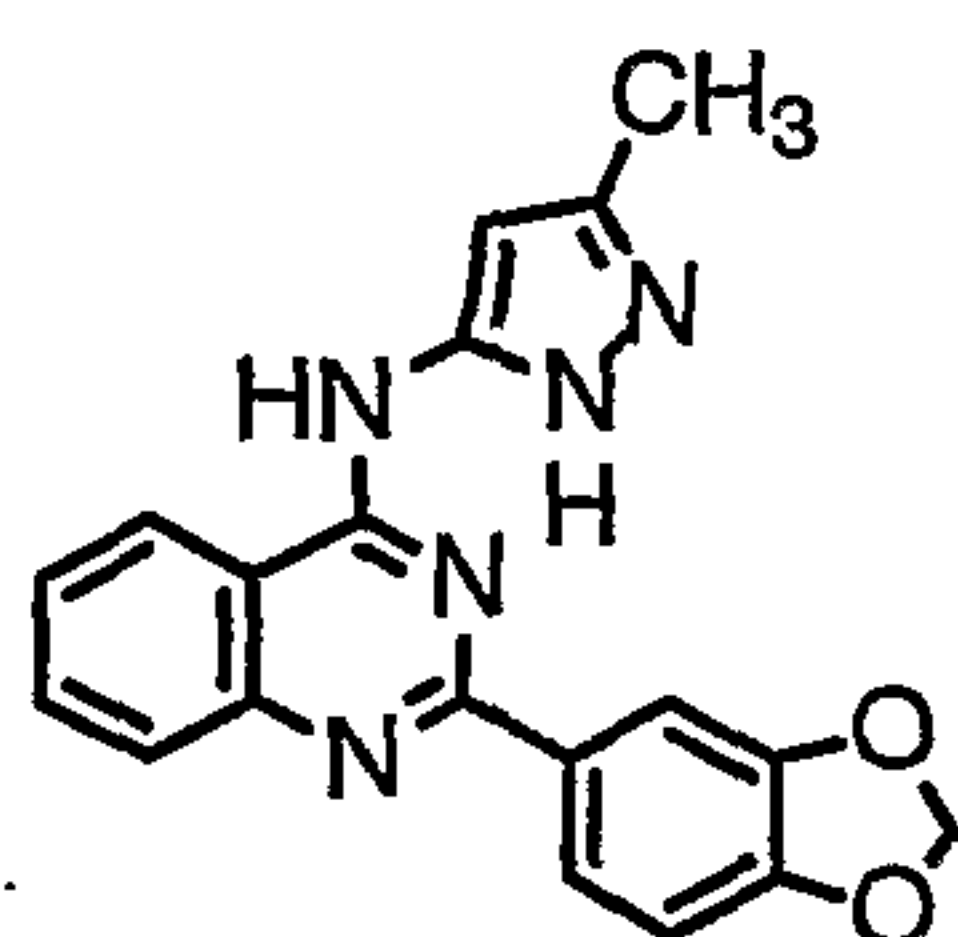
III-40



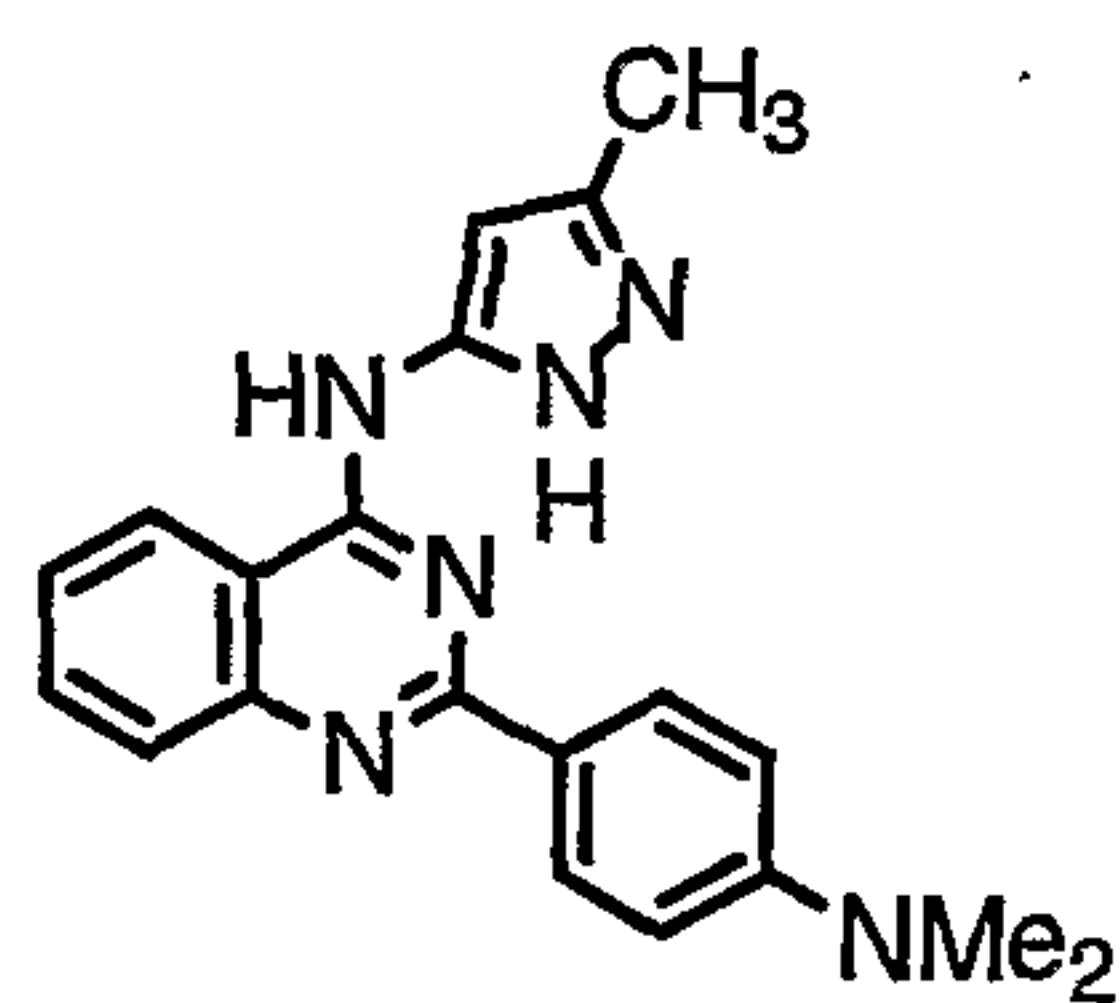
III-41



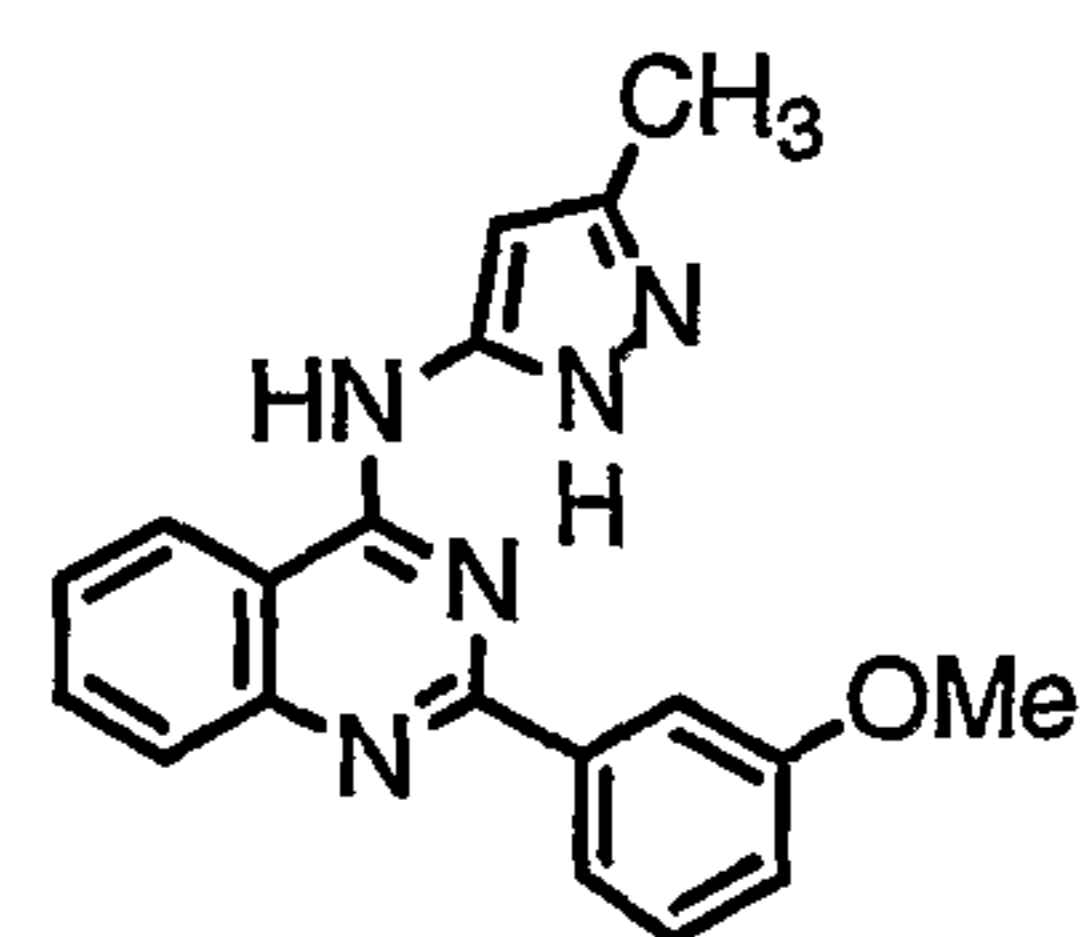
III-42



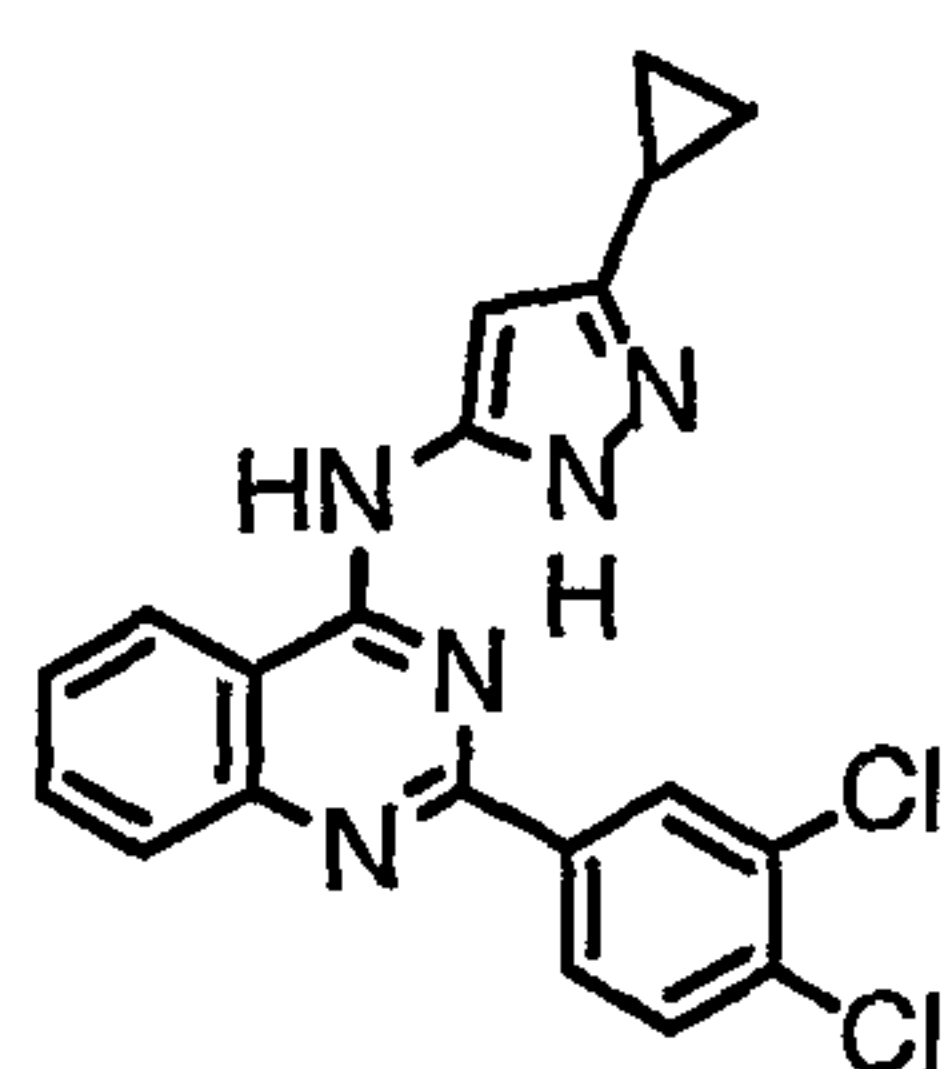
III-43



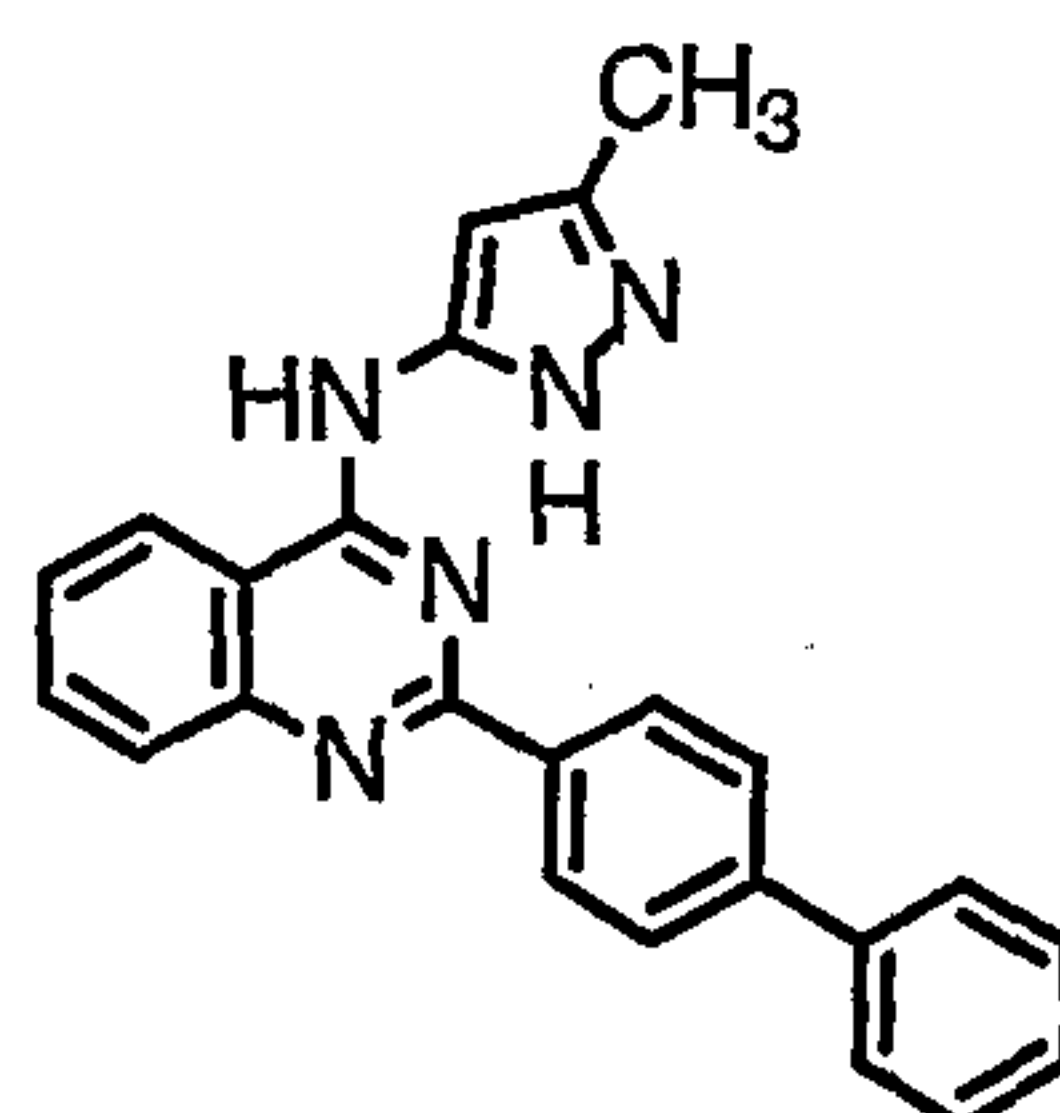
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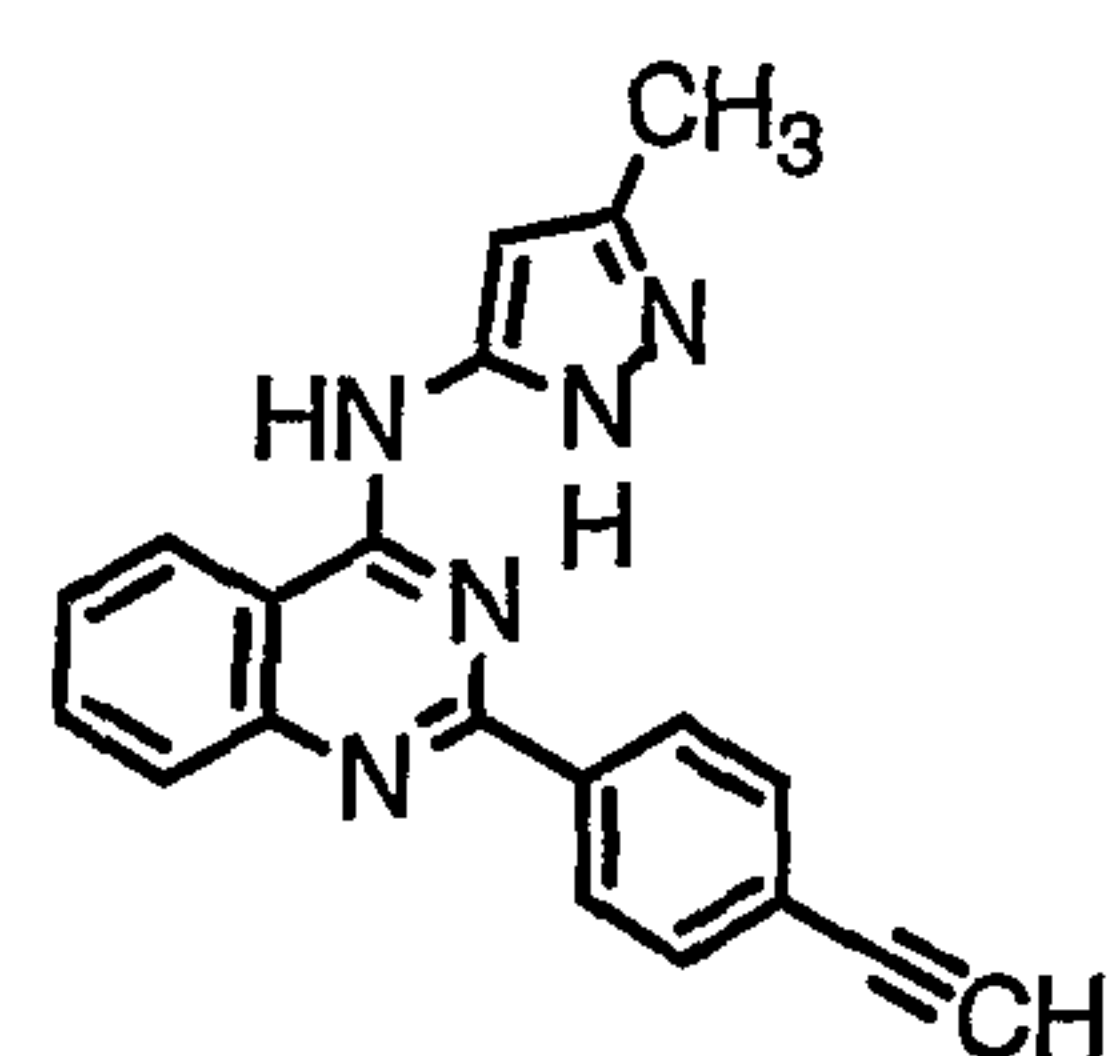
III-45



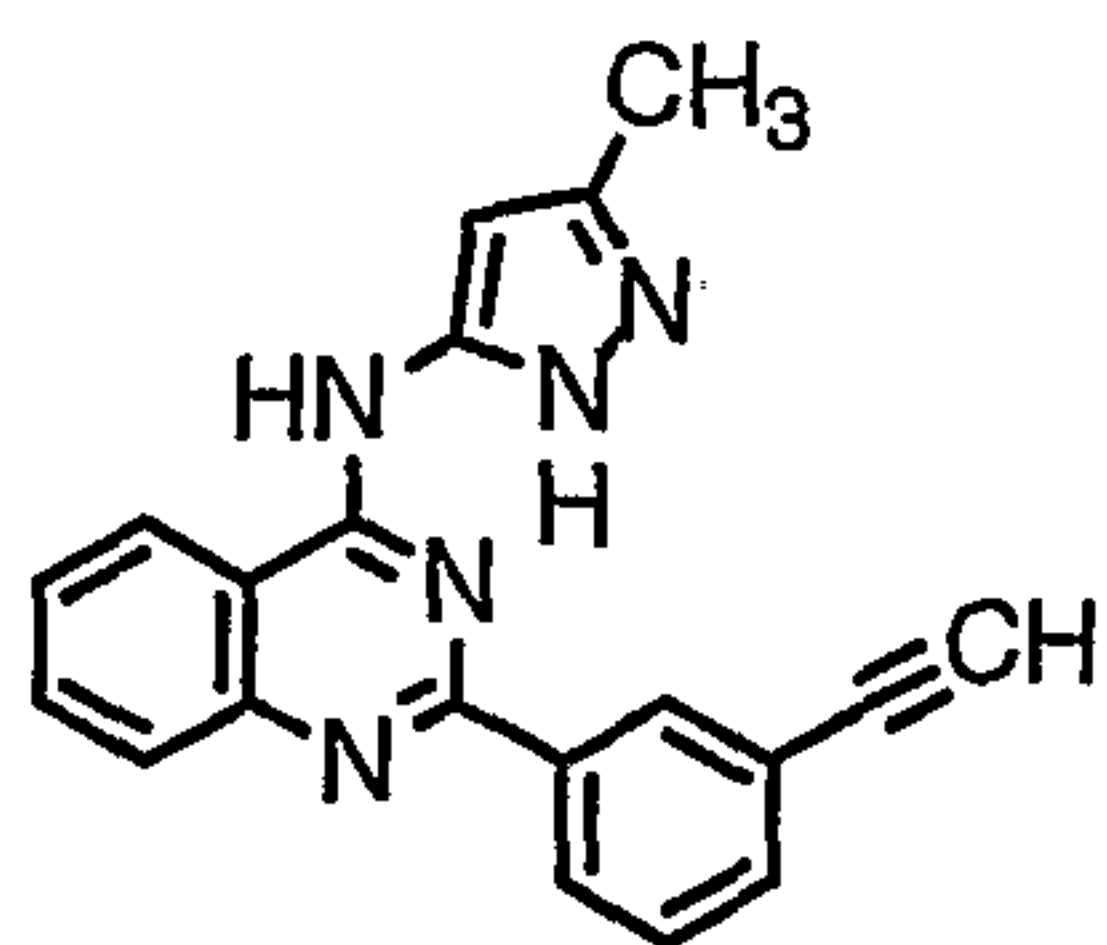
III-46



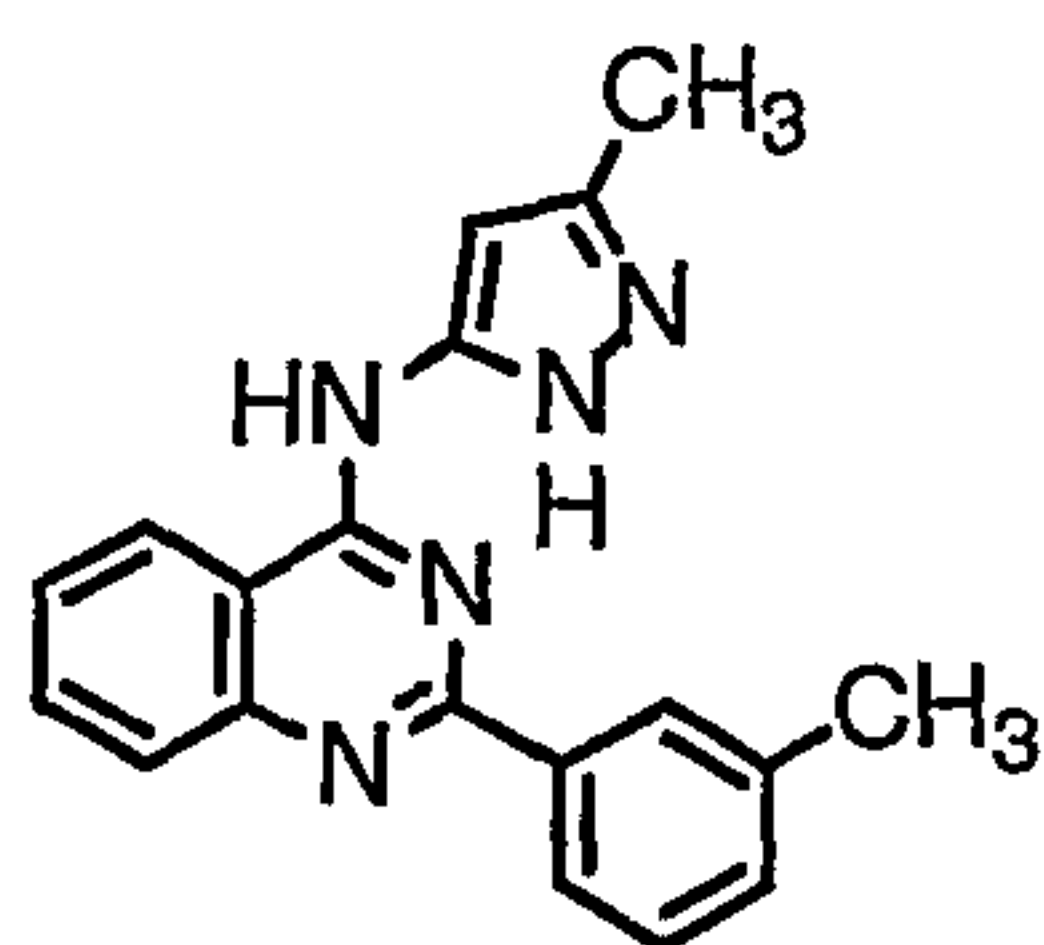
III-47



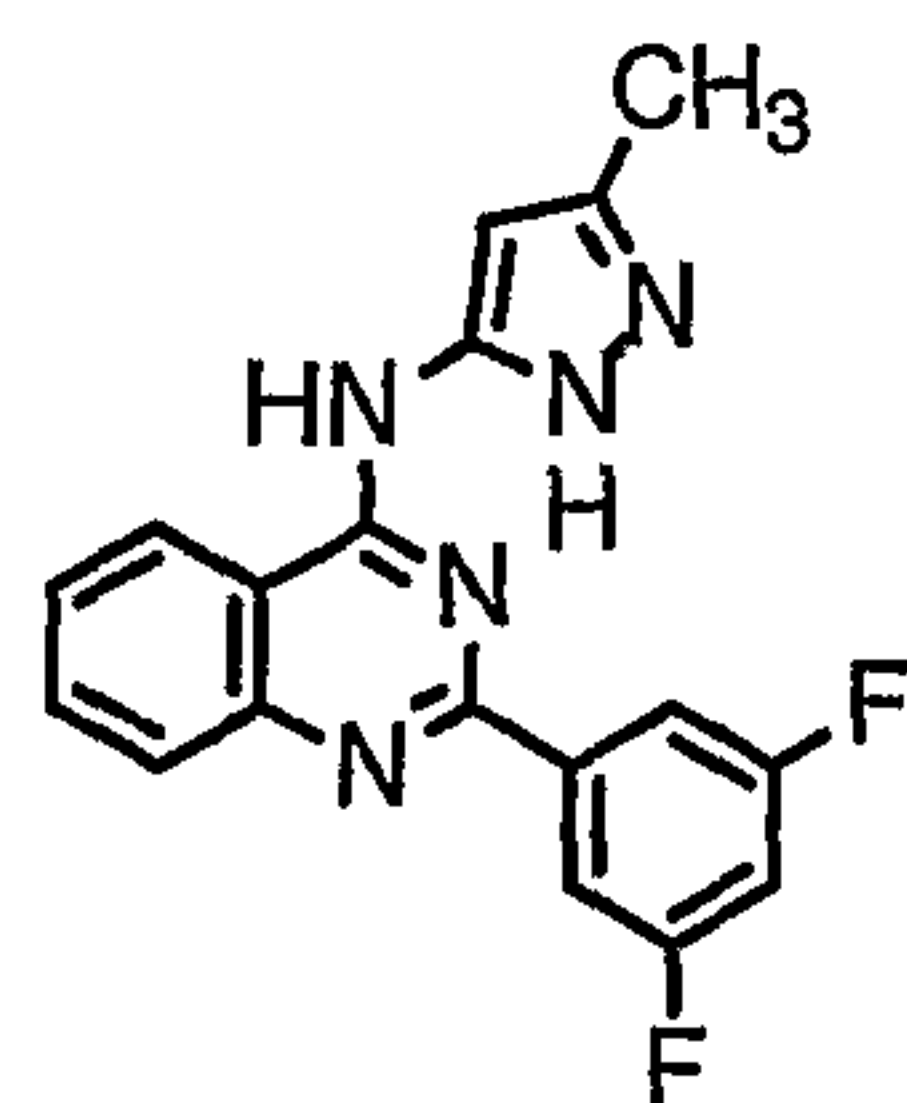
III-48



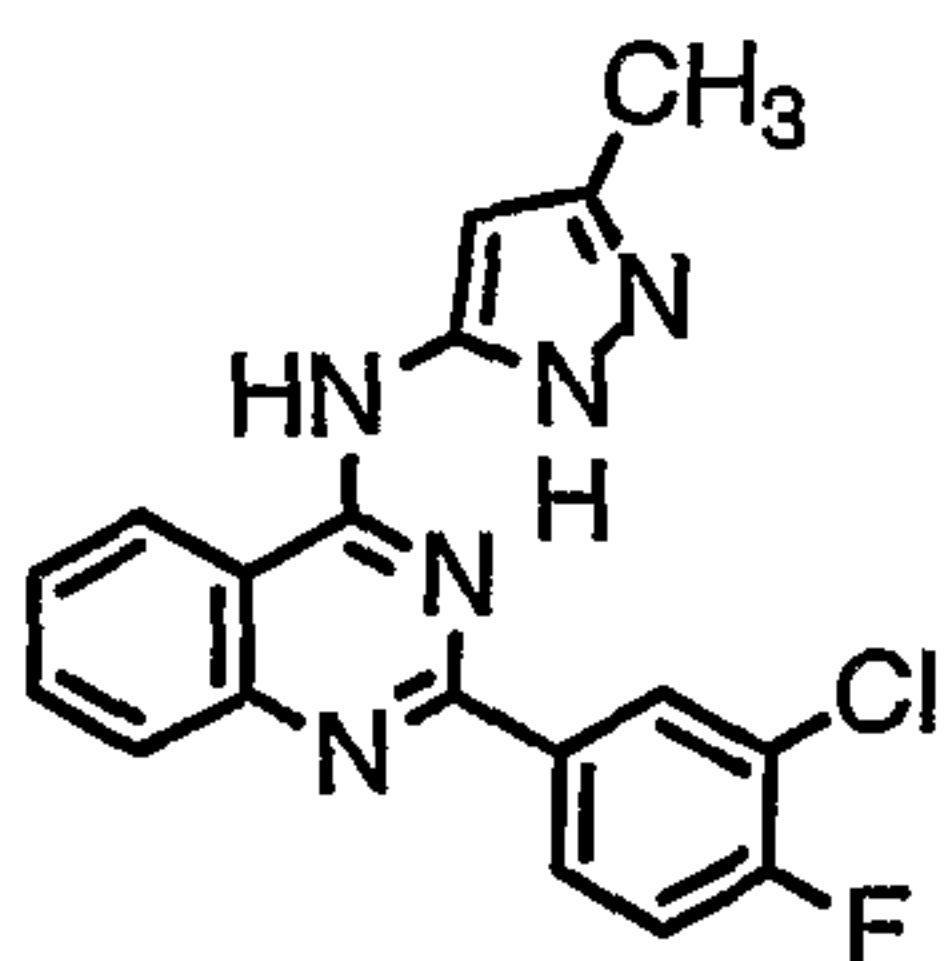
III-49



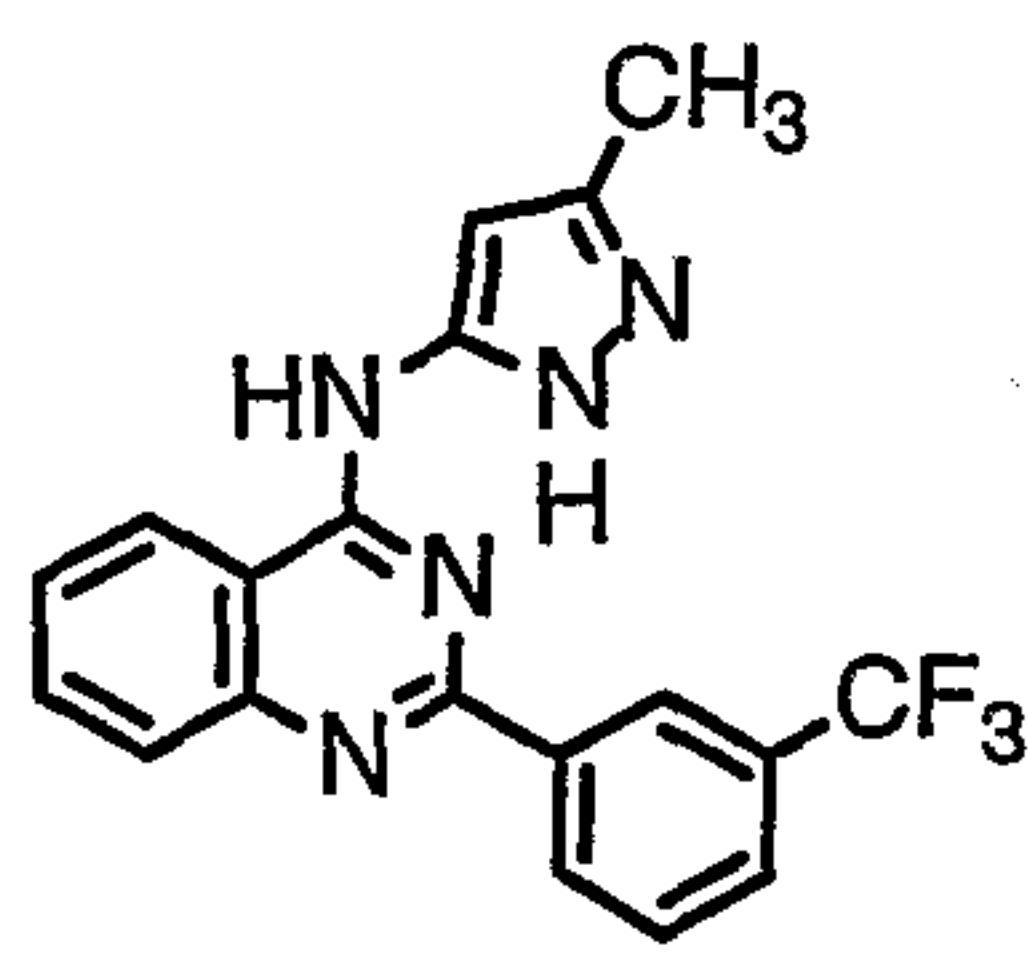
III-50



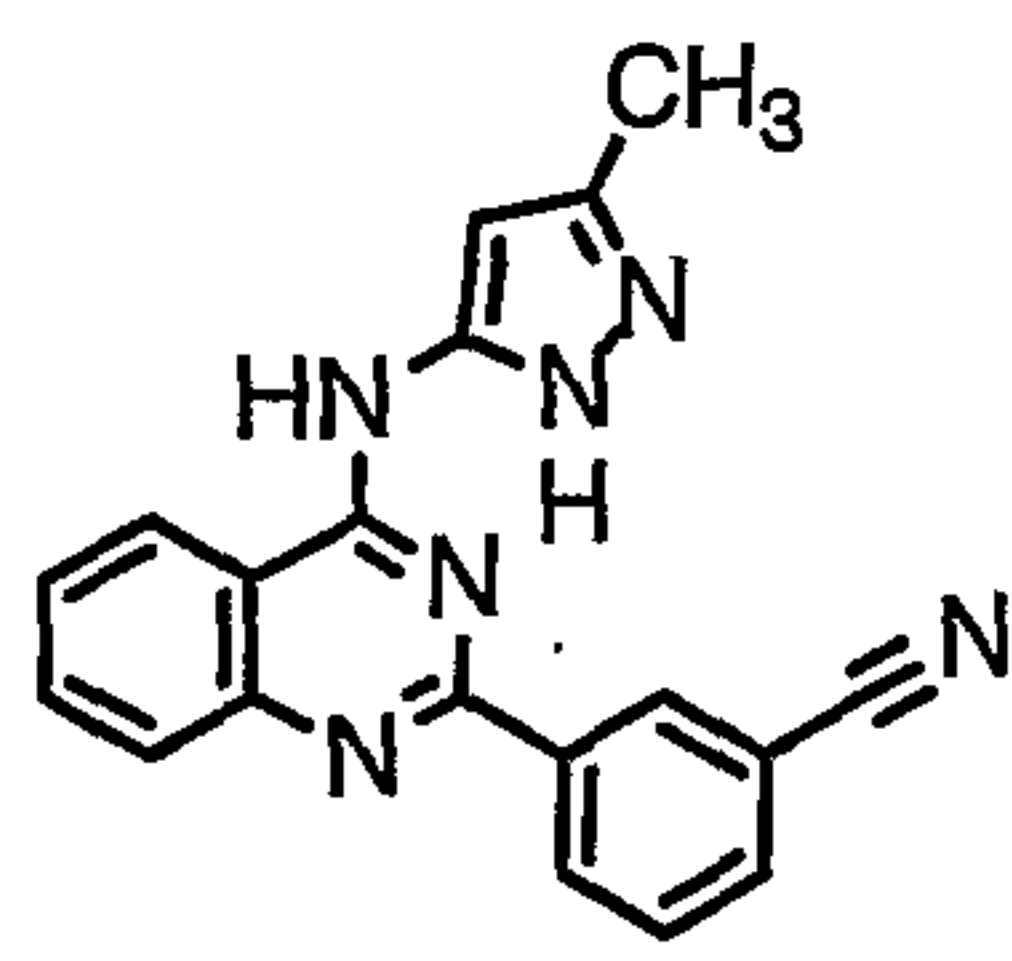
III-51



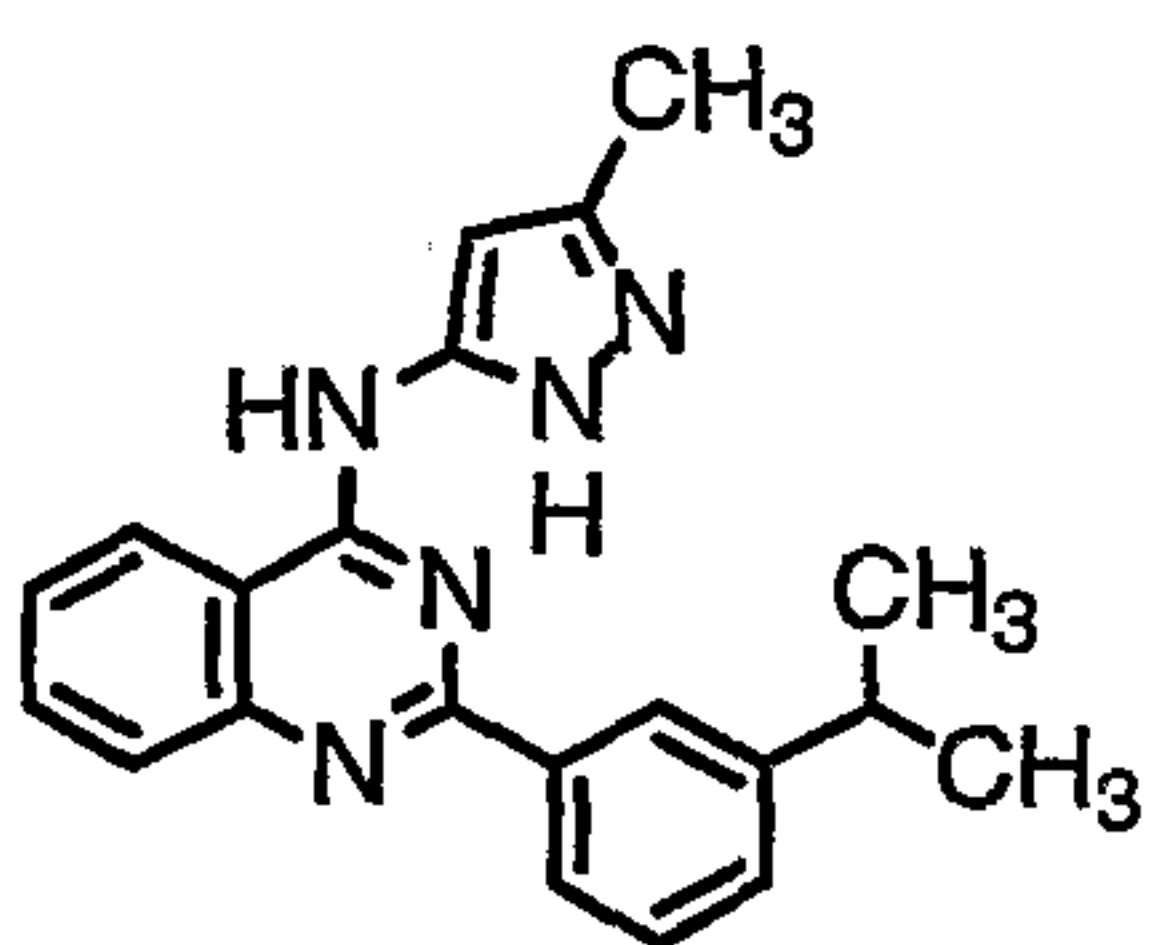
III-52



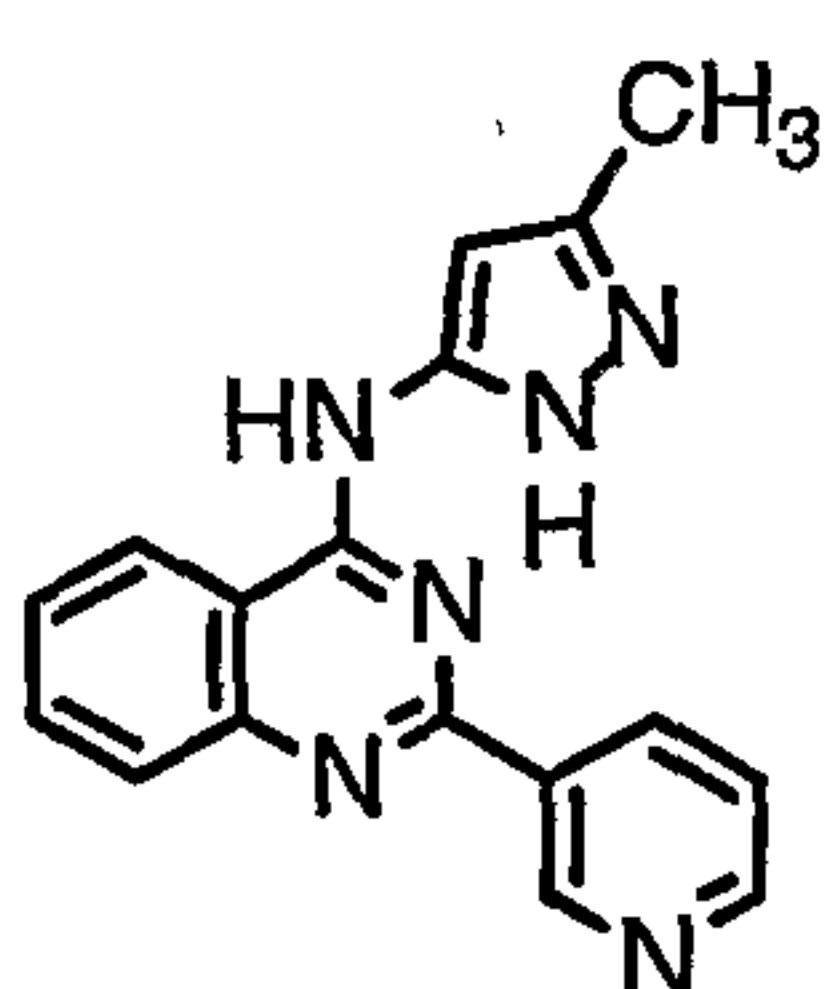
III-53



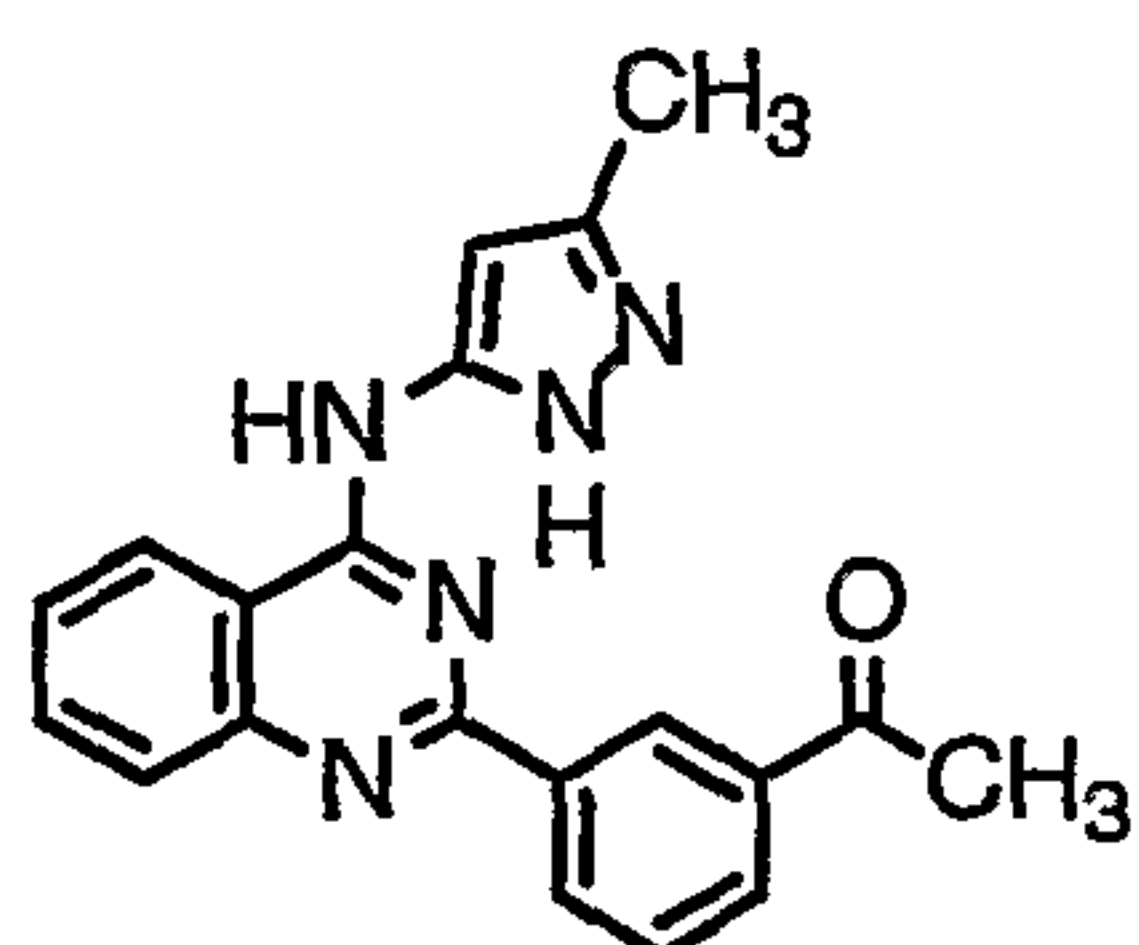
III-54



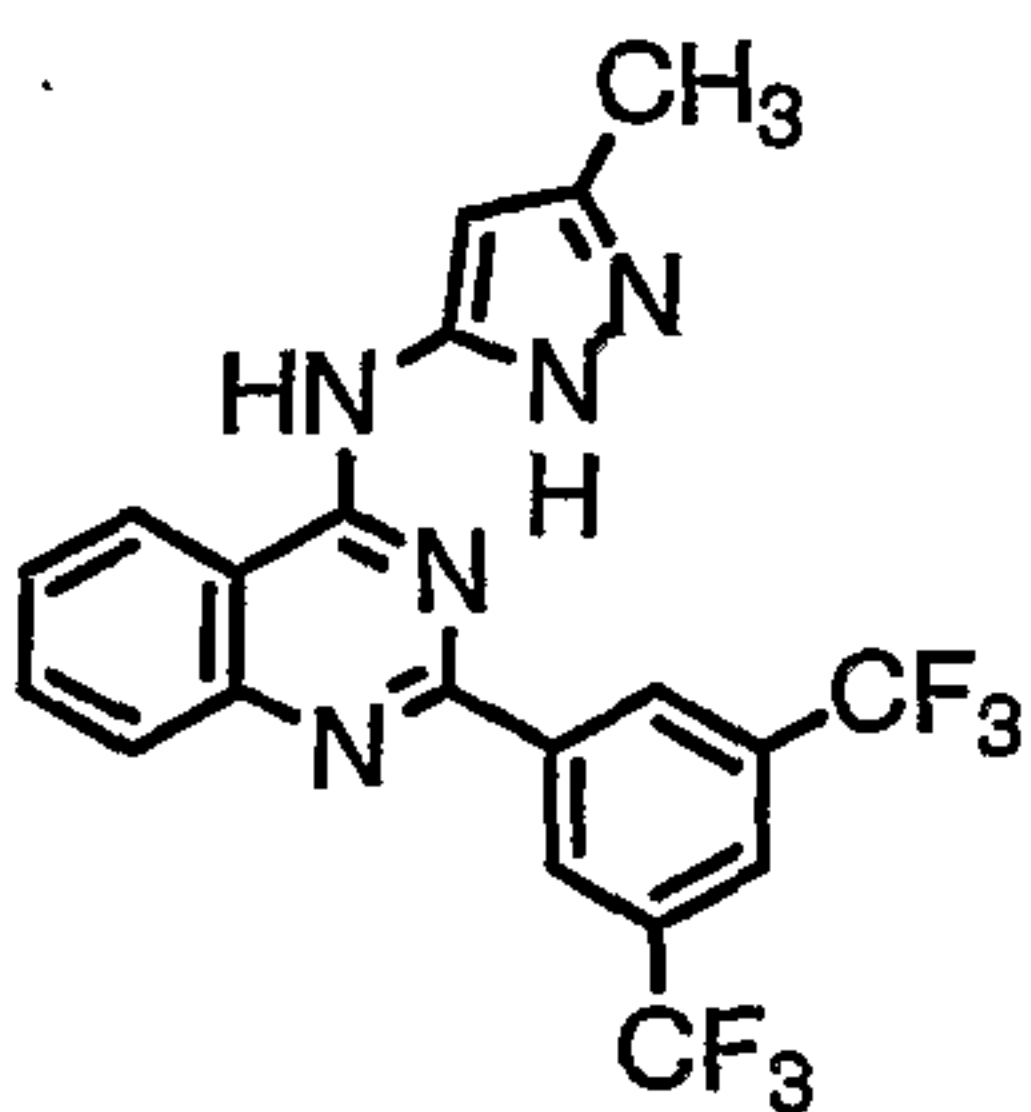
III-55



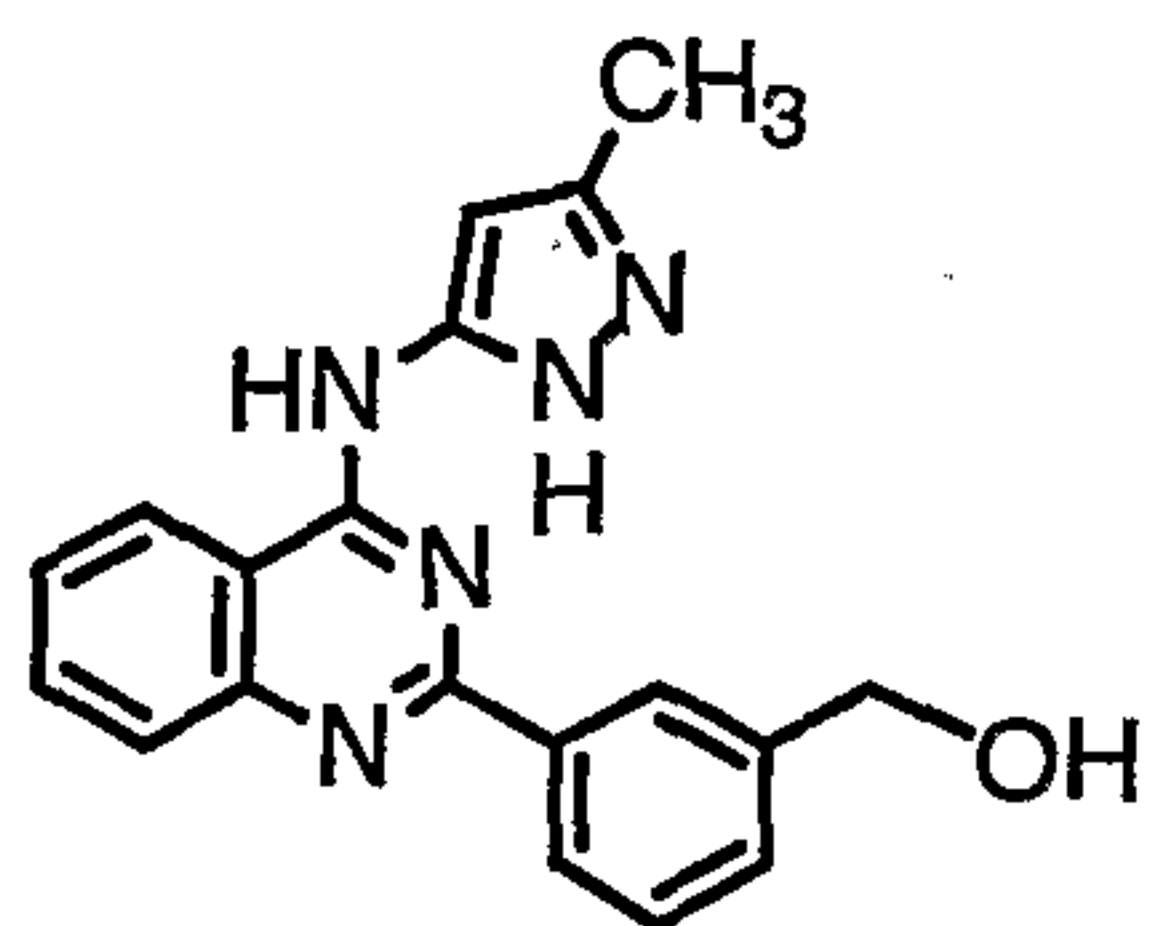
III-56



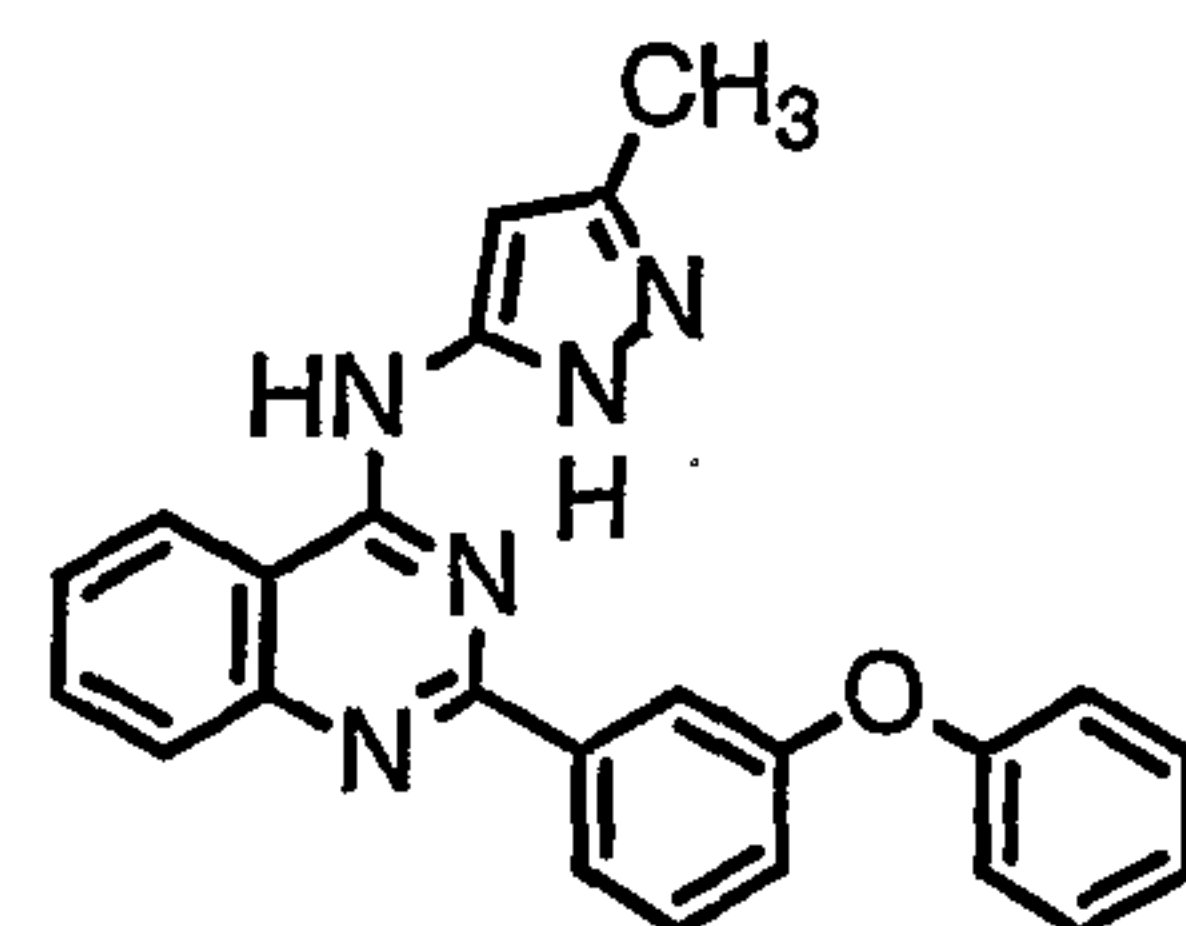
III-57



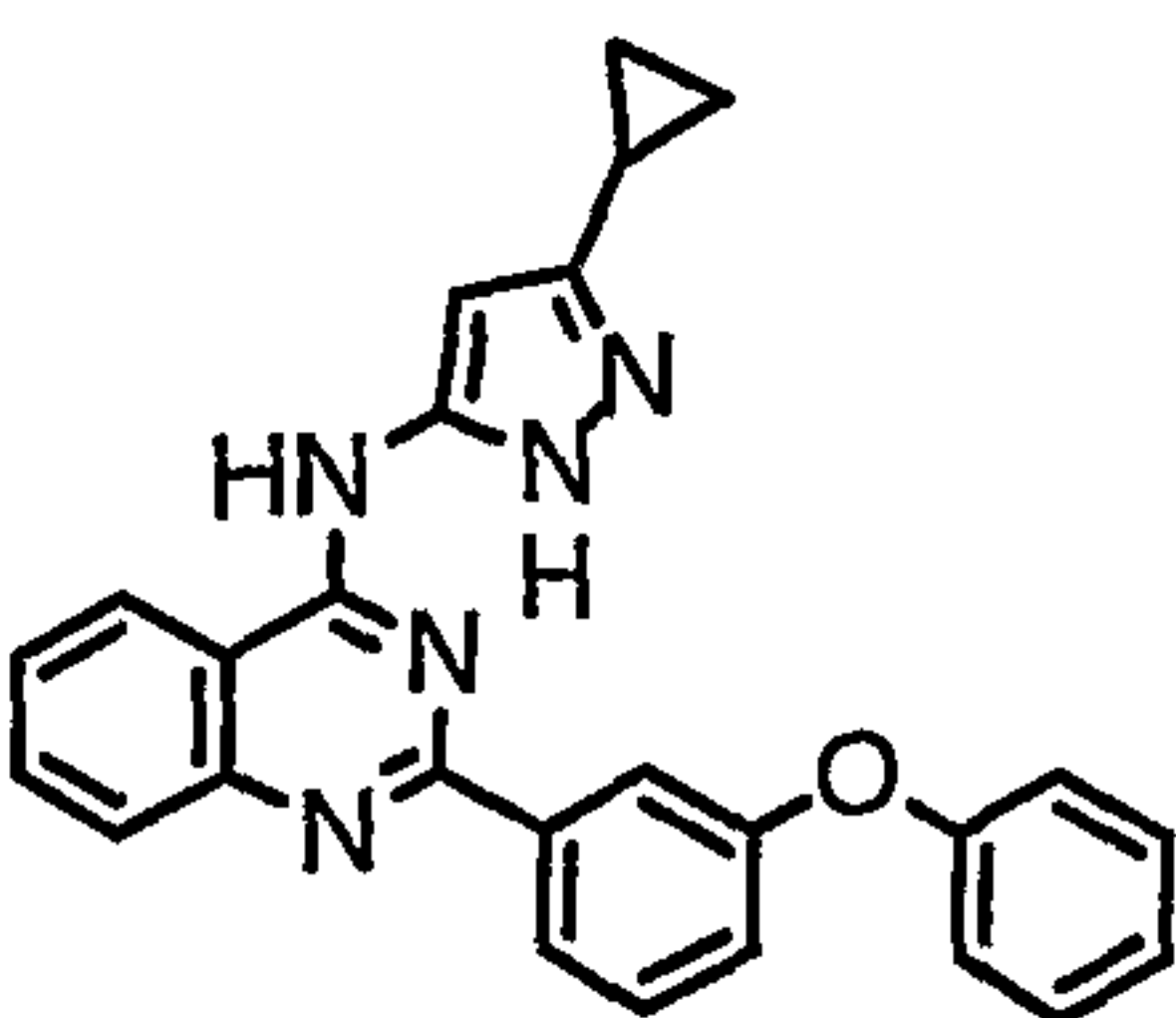
III-58



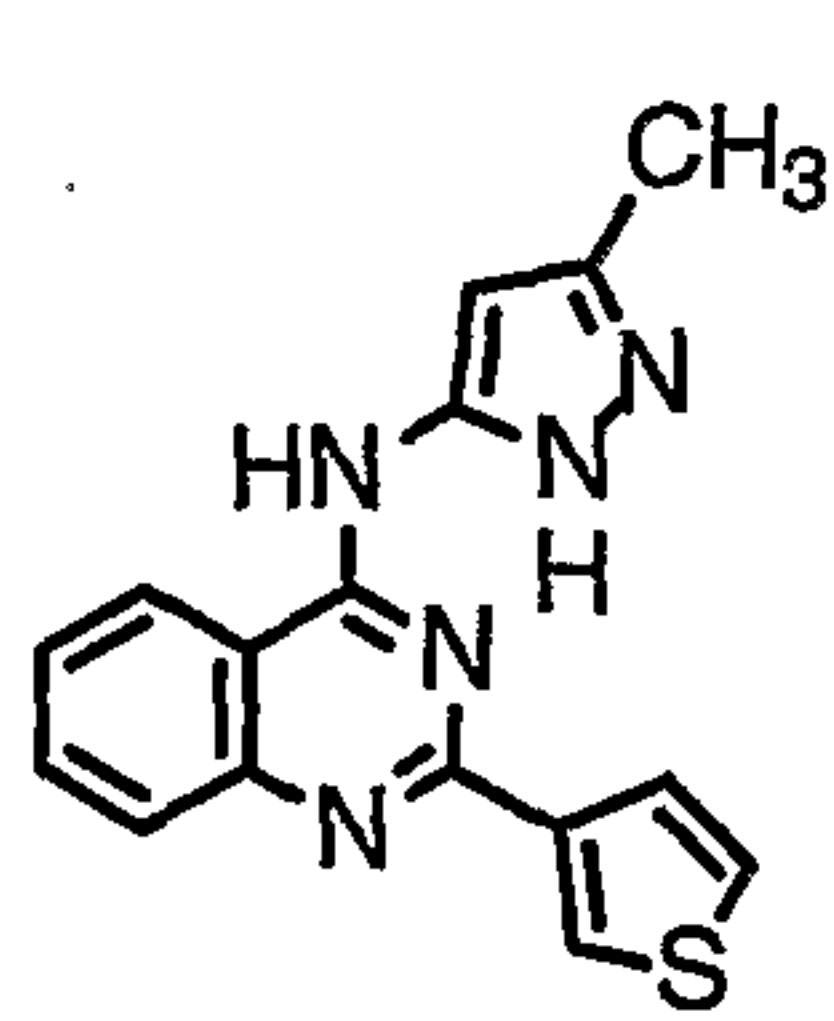
III-59



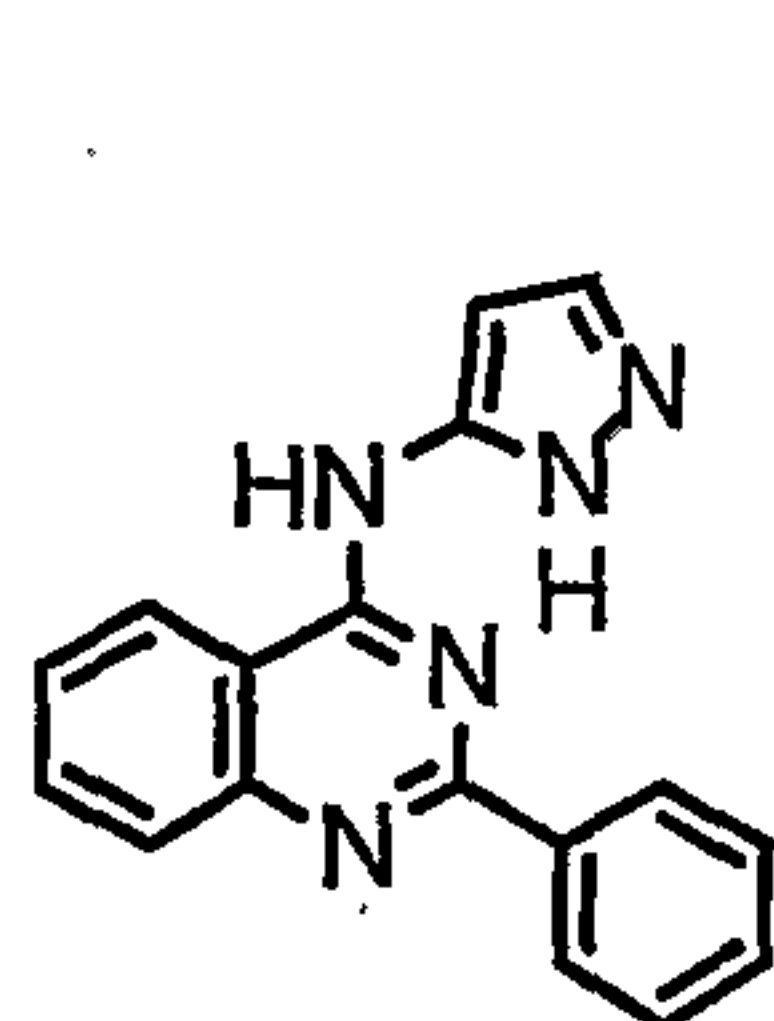
III-60



III-61



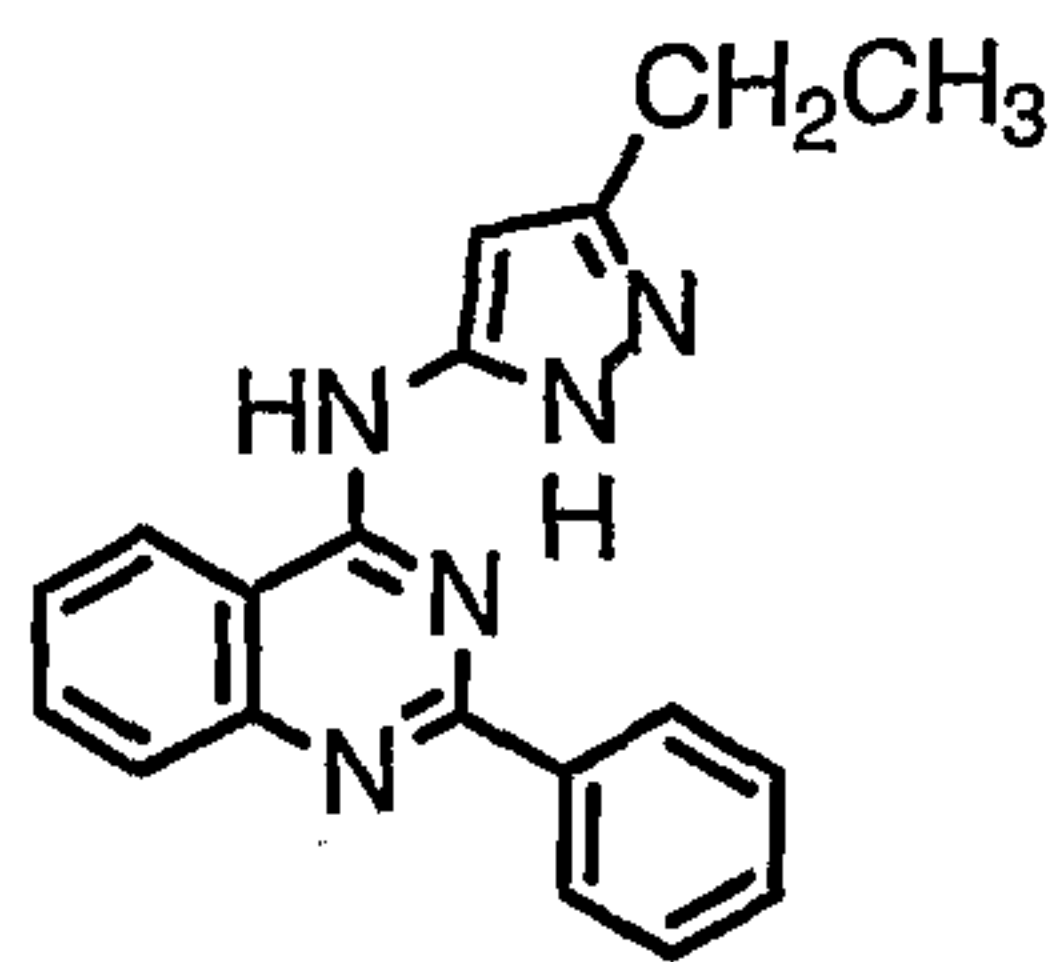
III-62



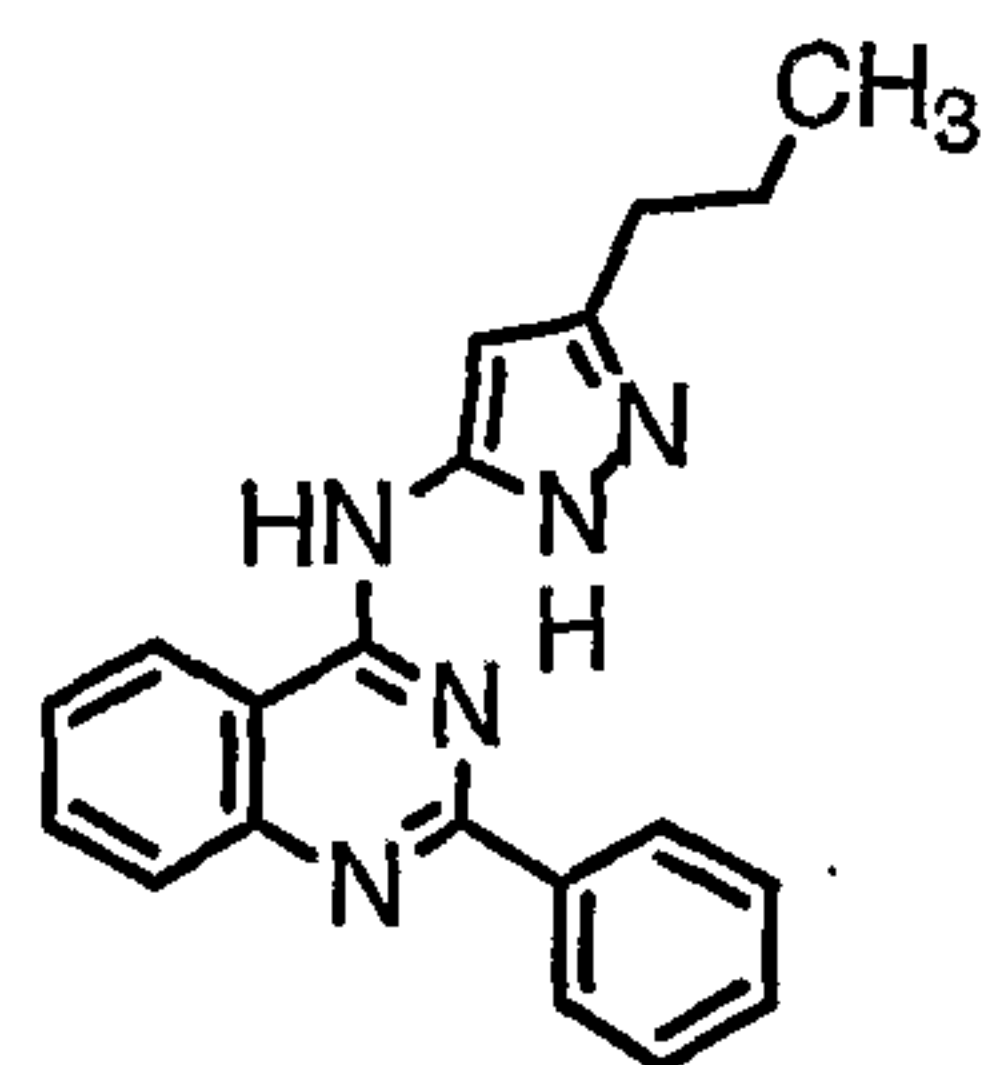
III-63



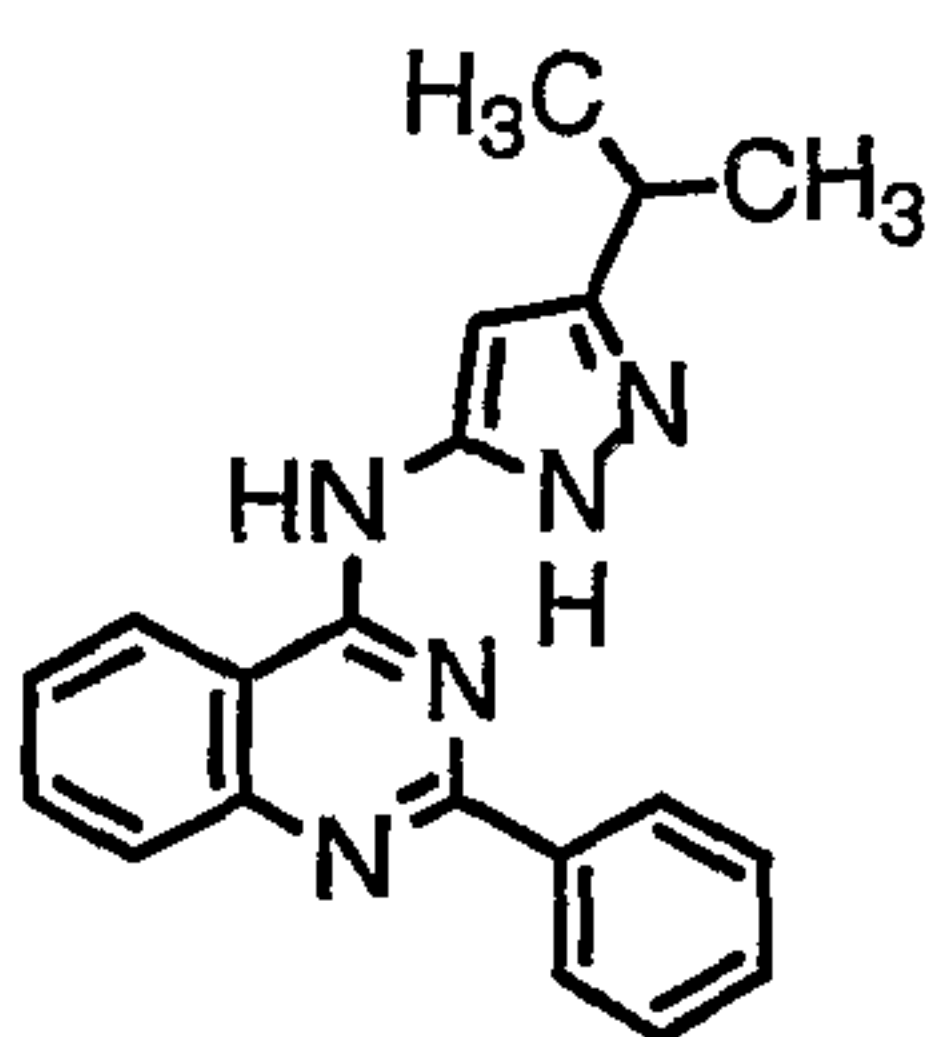
IIII-64



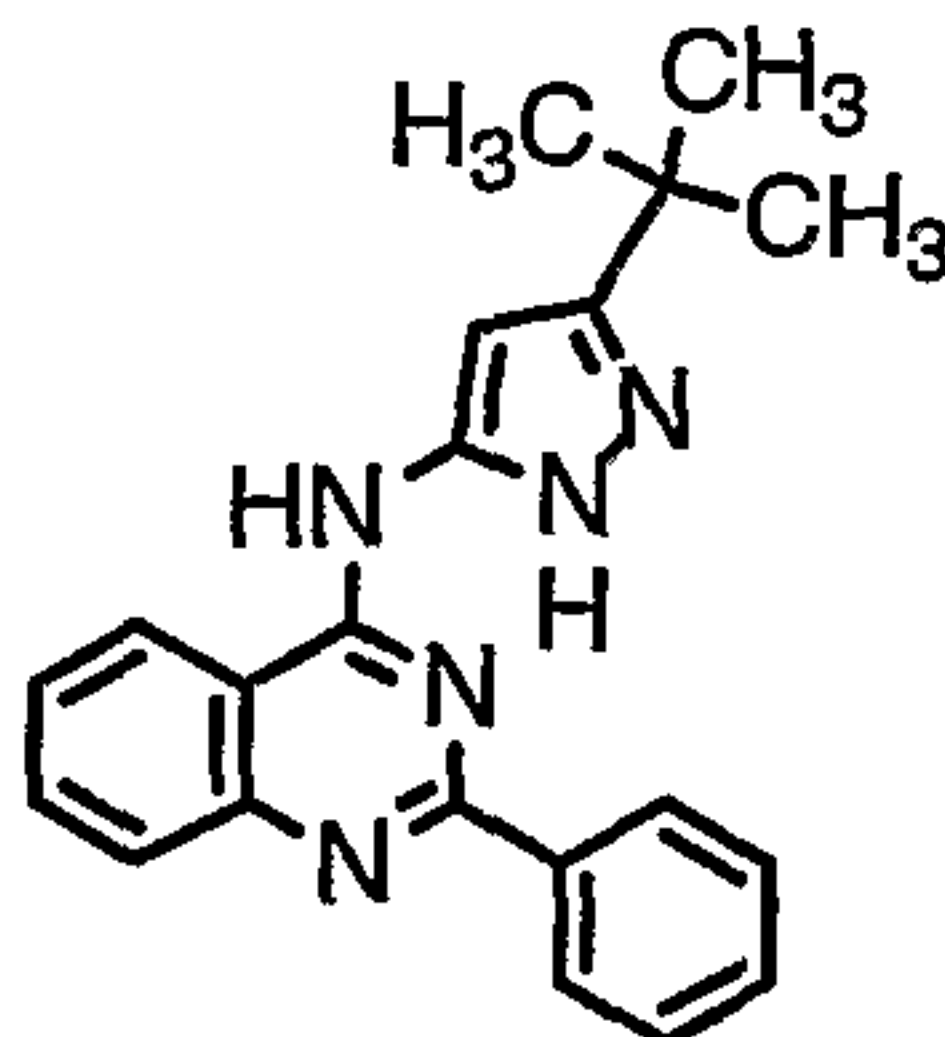
IIII-65



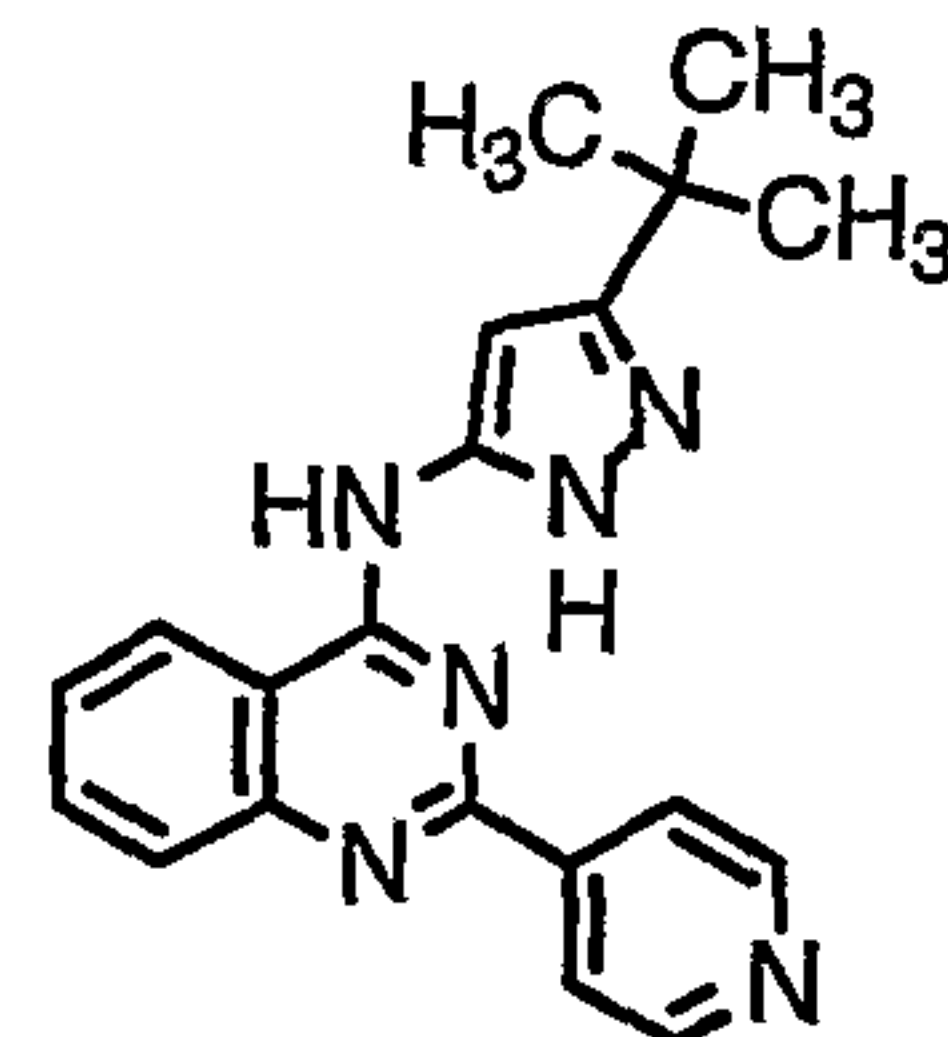
IIII-66



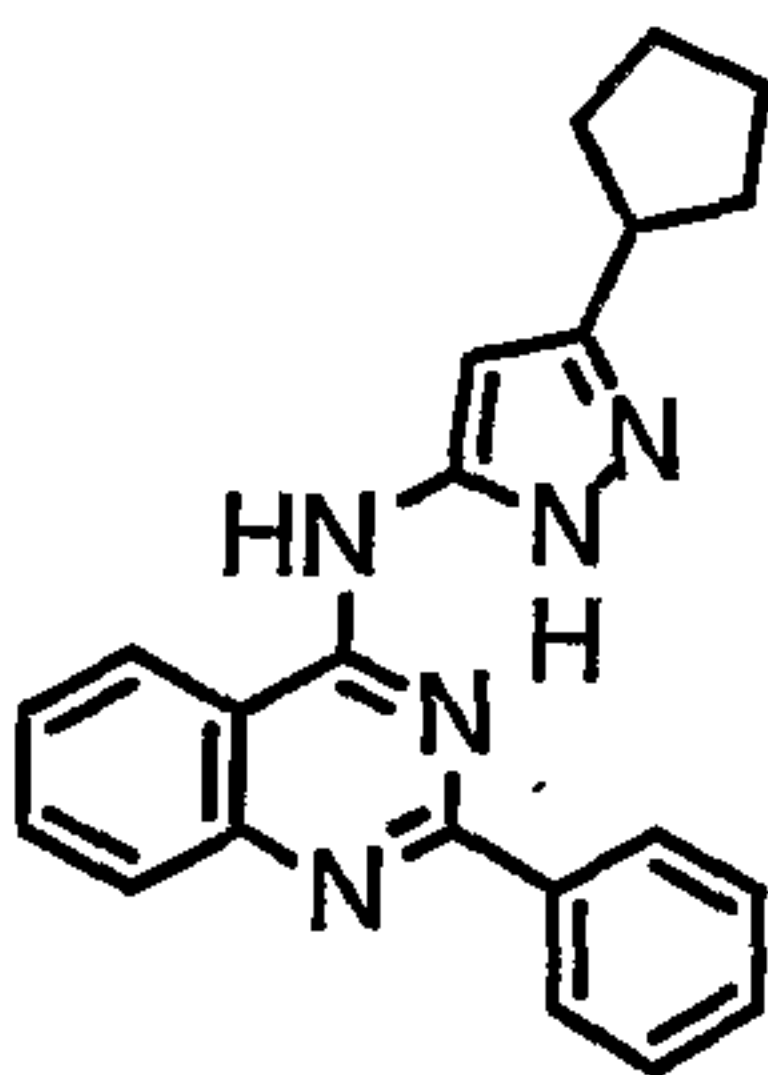
IIII-67



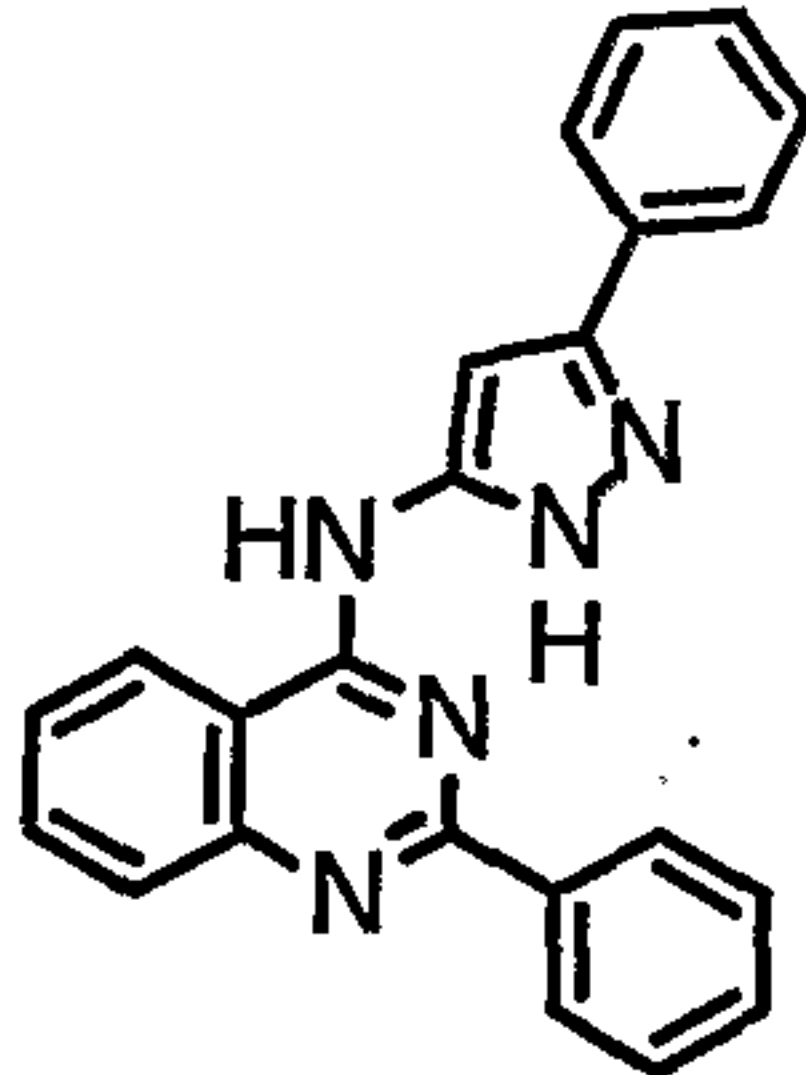
IIII-68



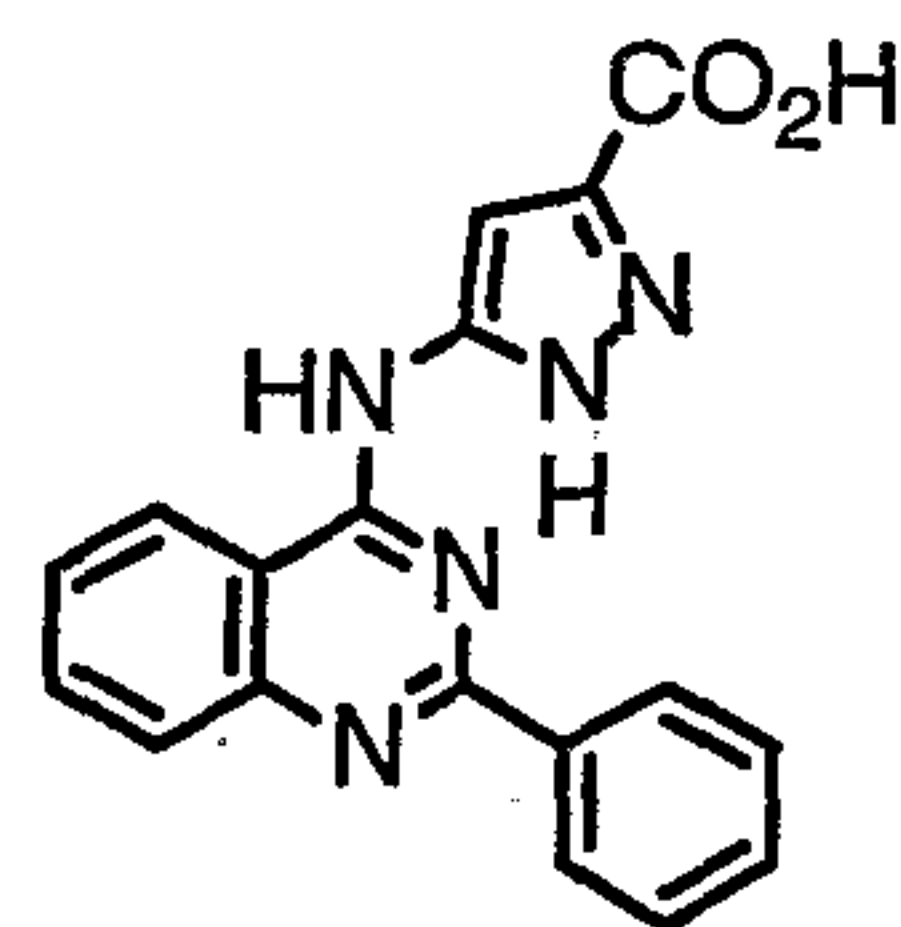
IIII-69



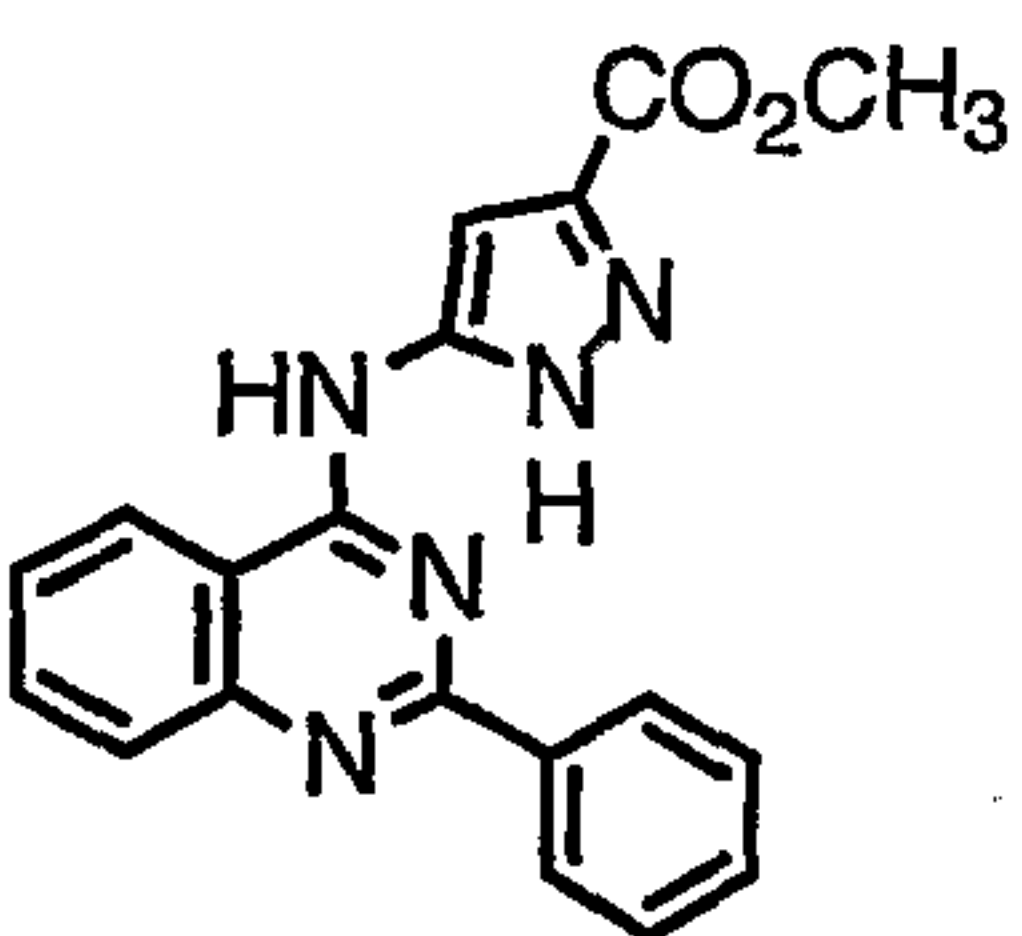
IIII-70



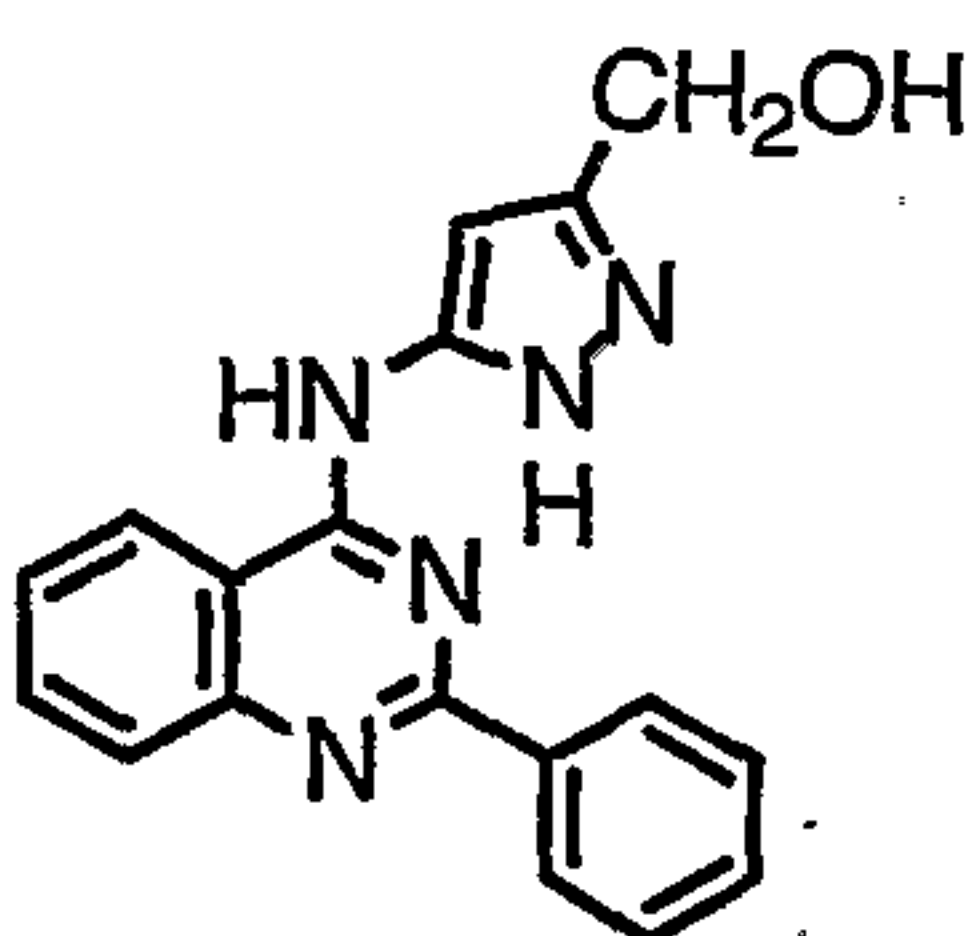
IIII-71



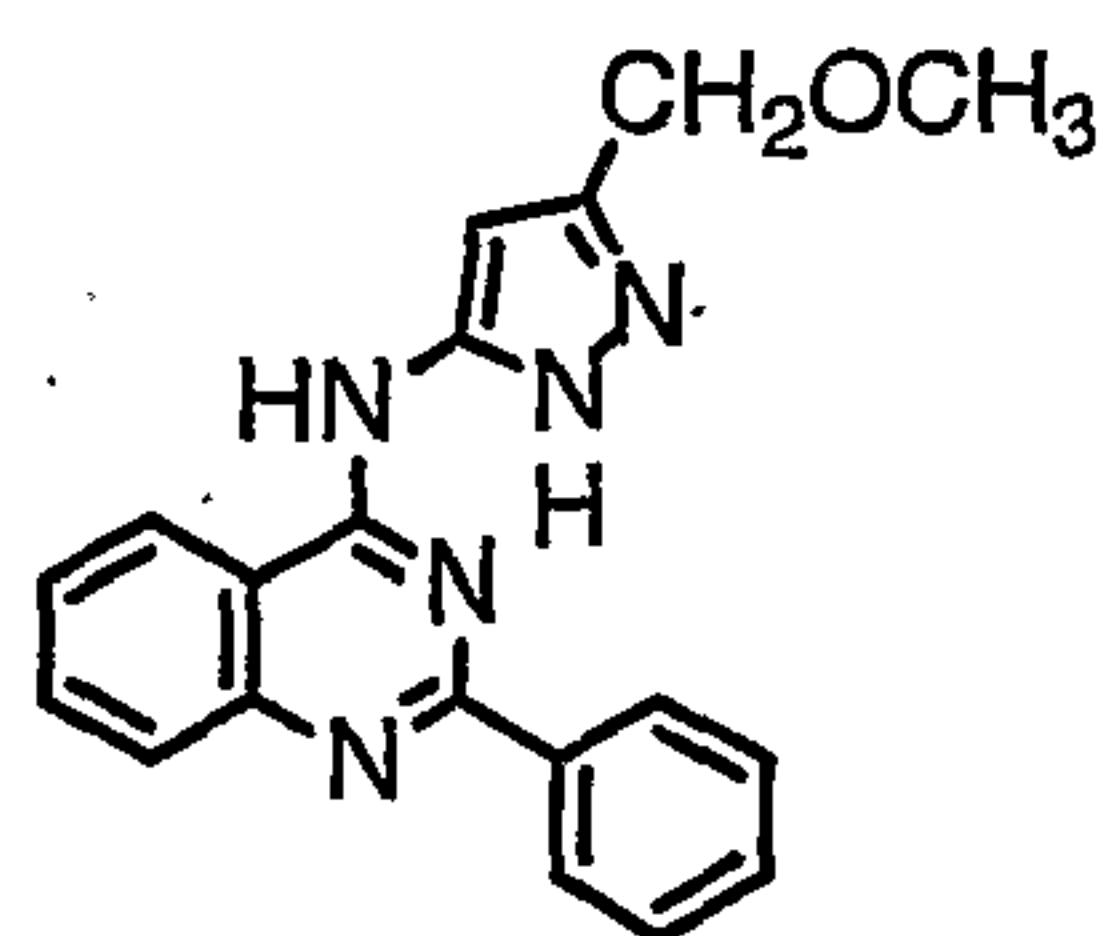
IIII-72



IIII-73



IIII-74

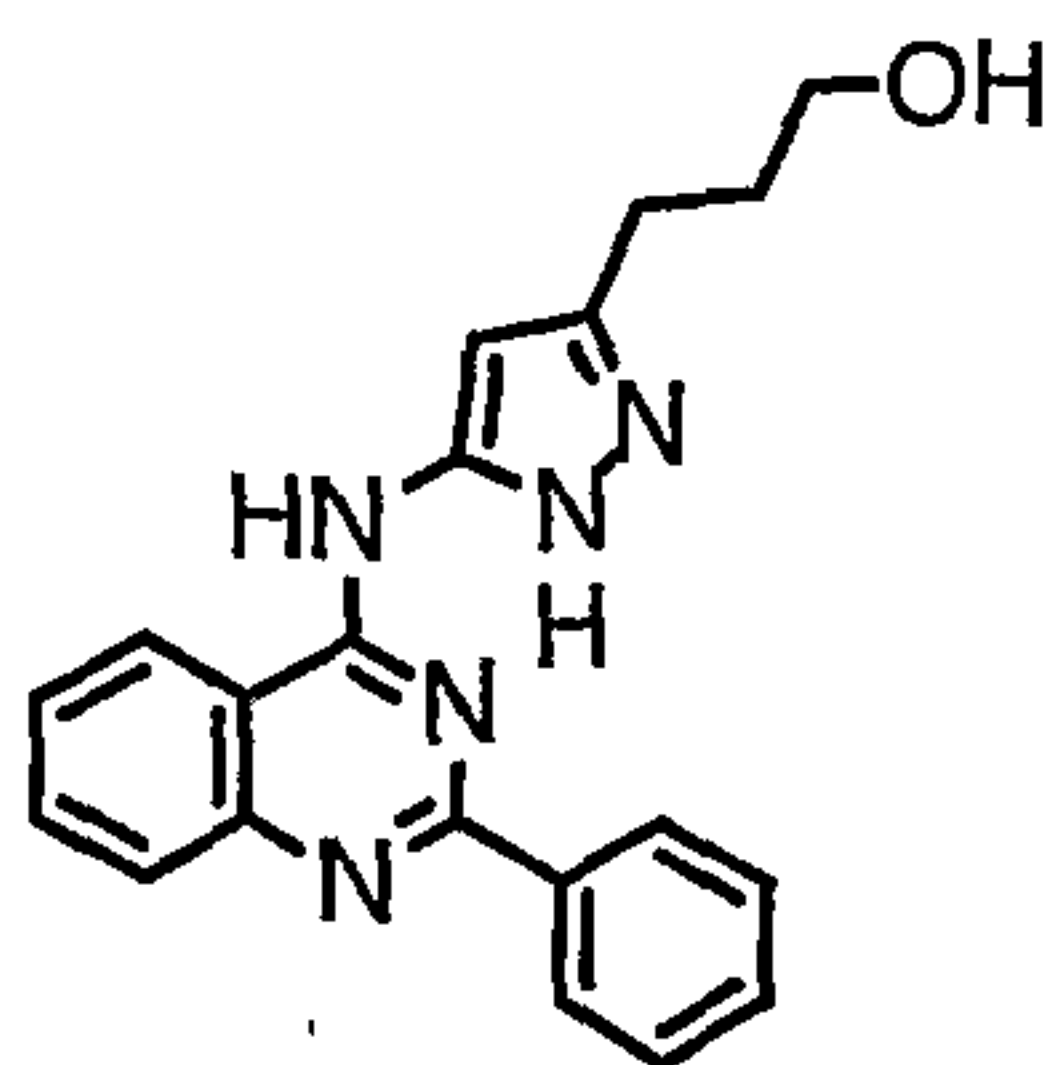


IIII-75

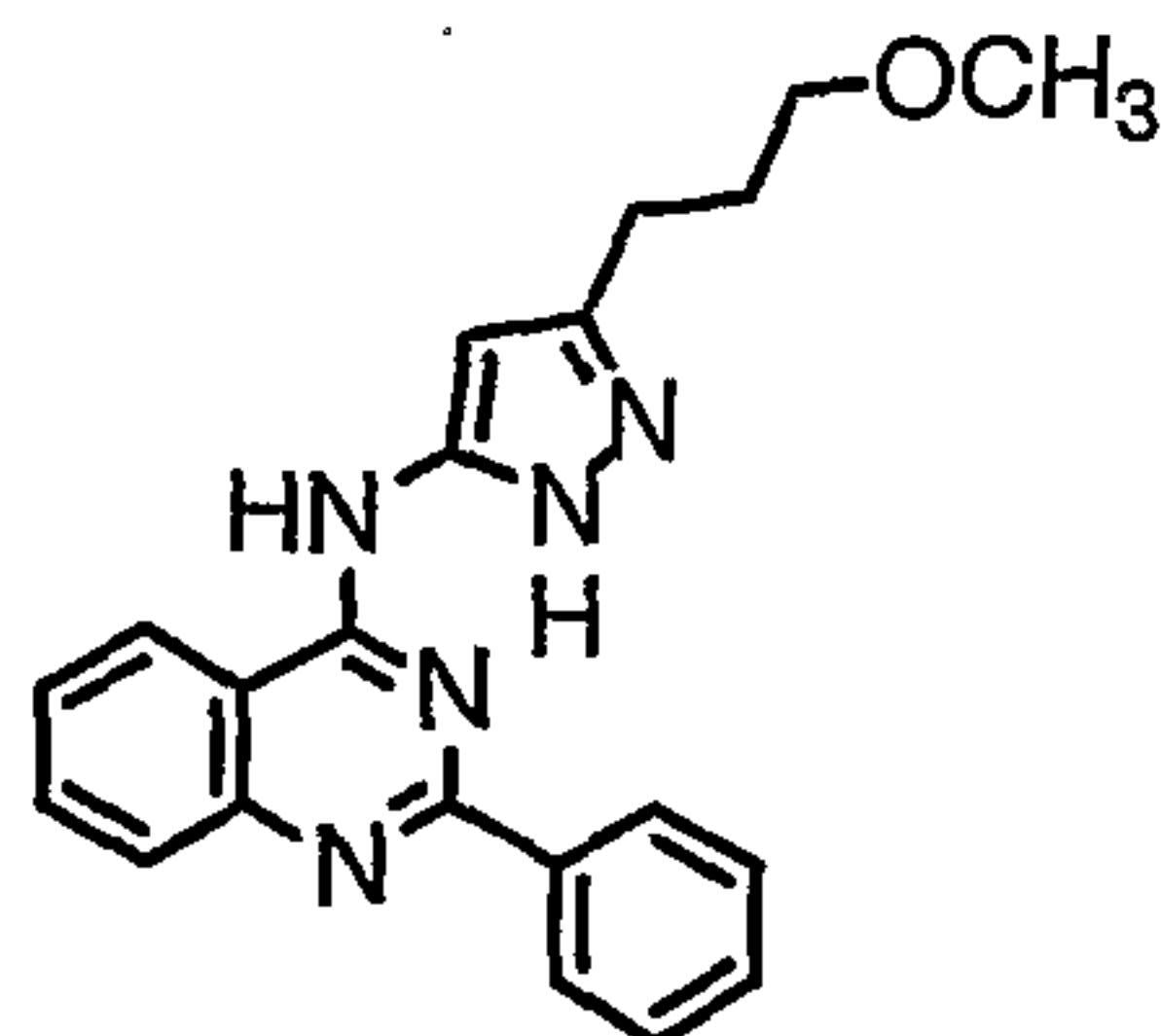
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10

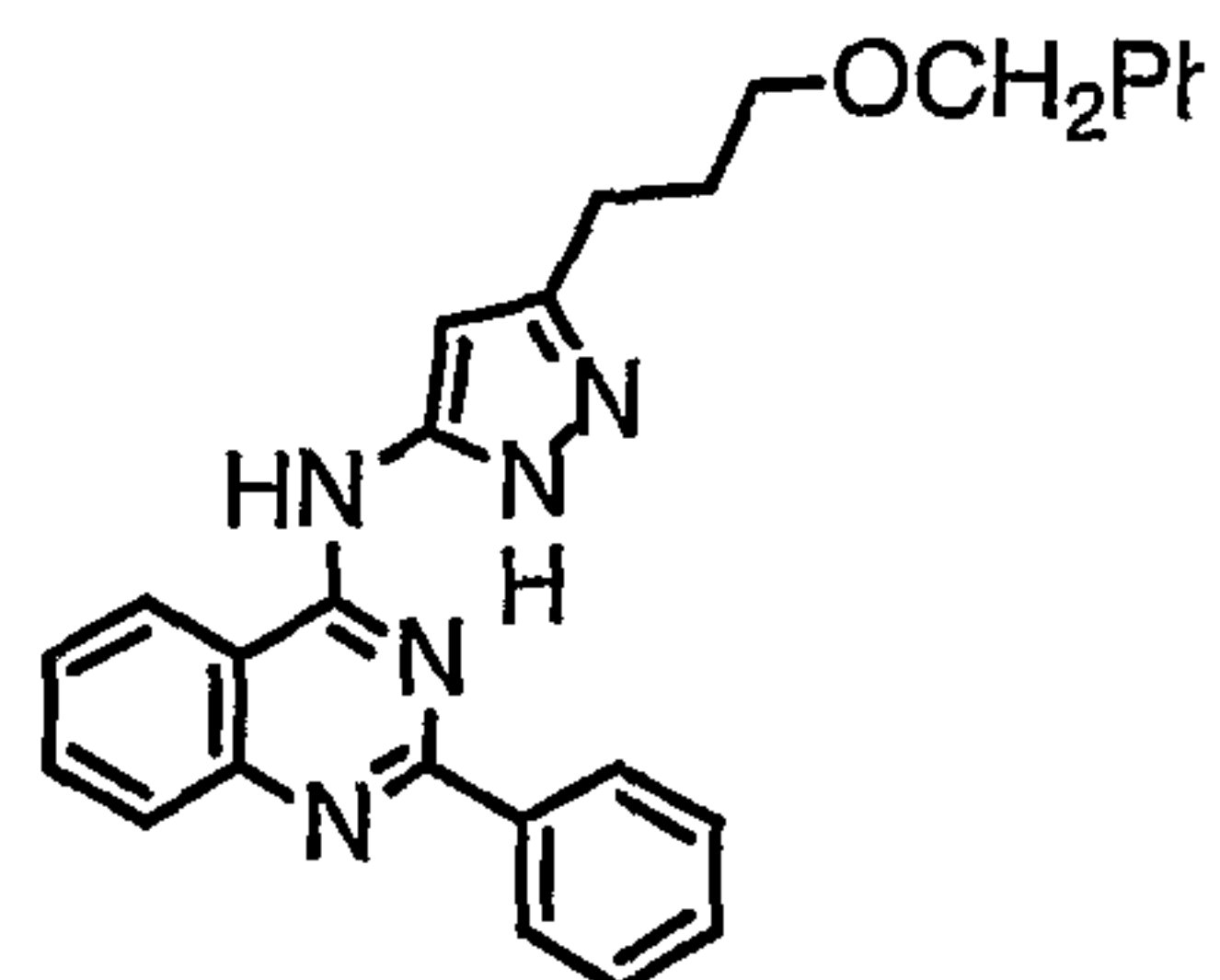
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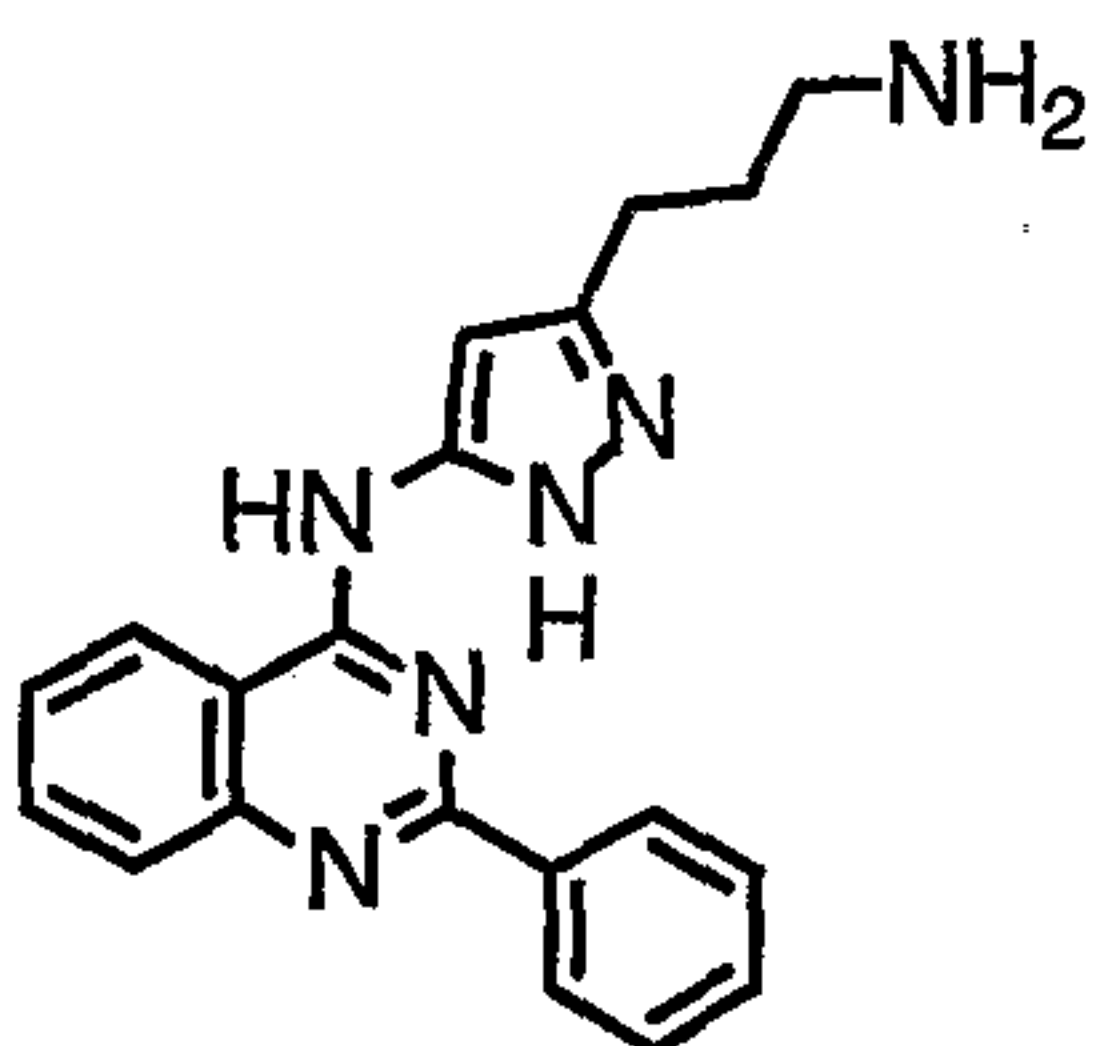
III-76



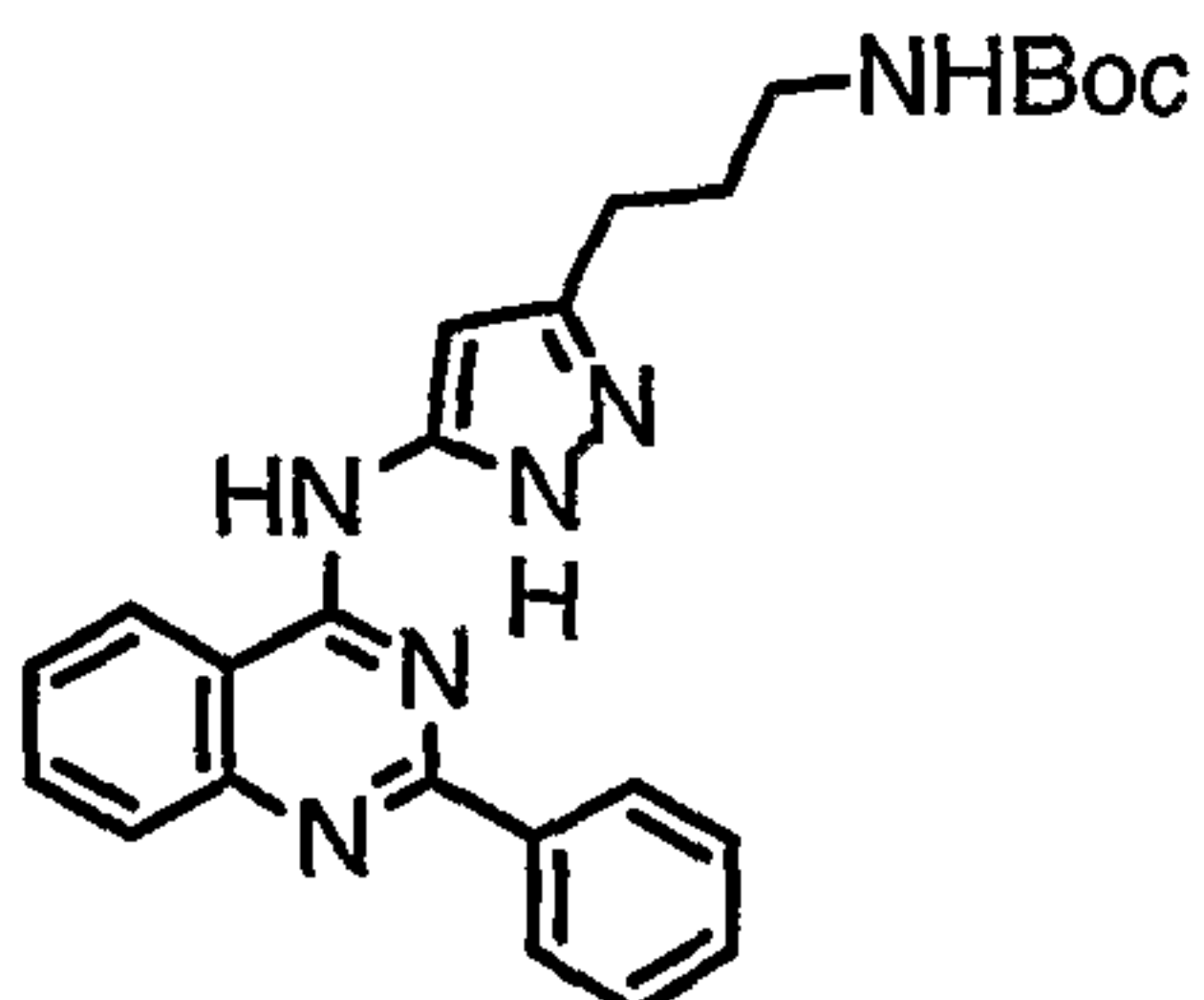
III-77



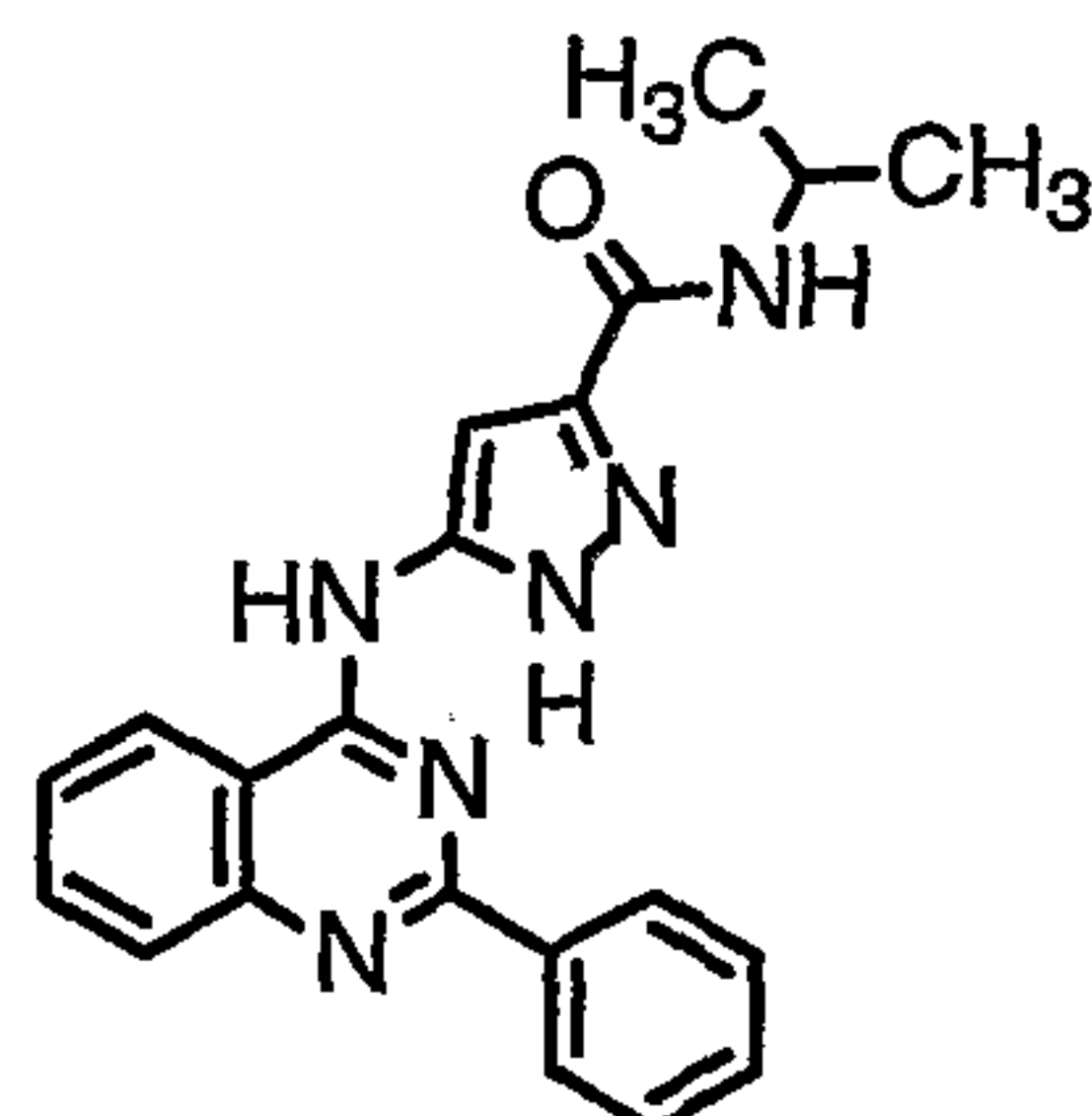
III-78



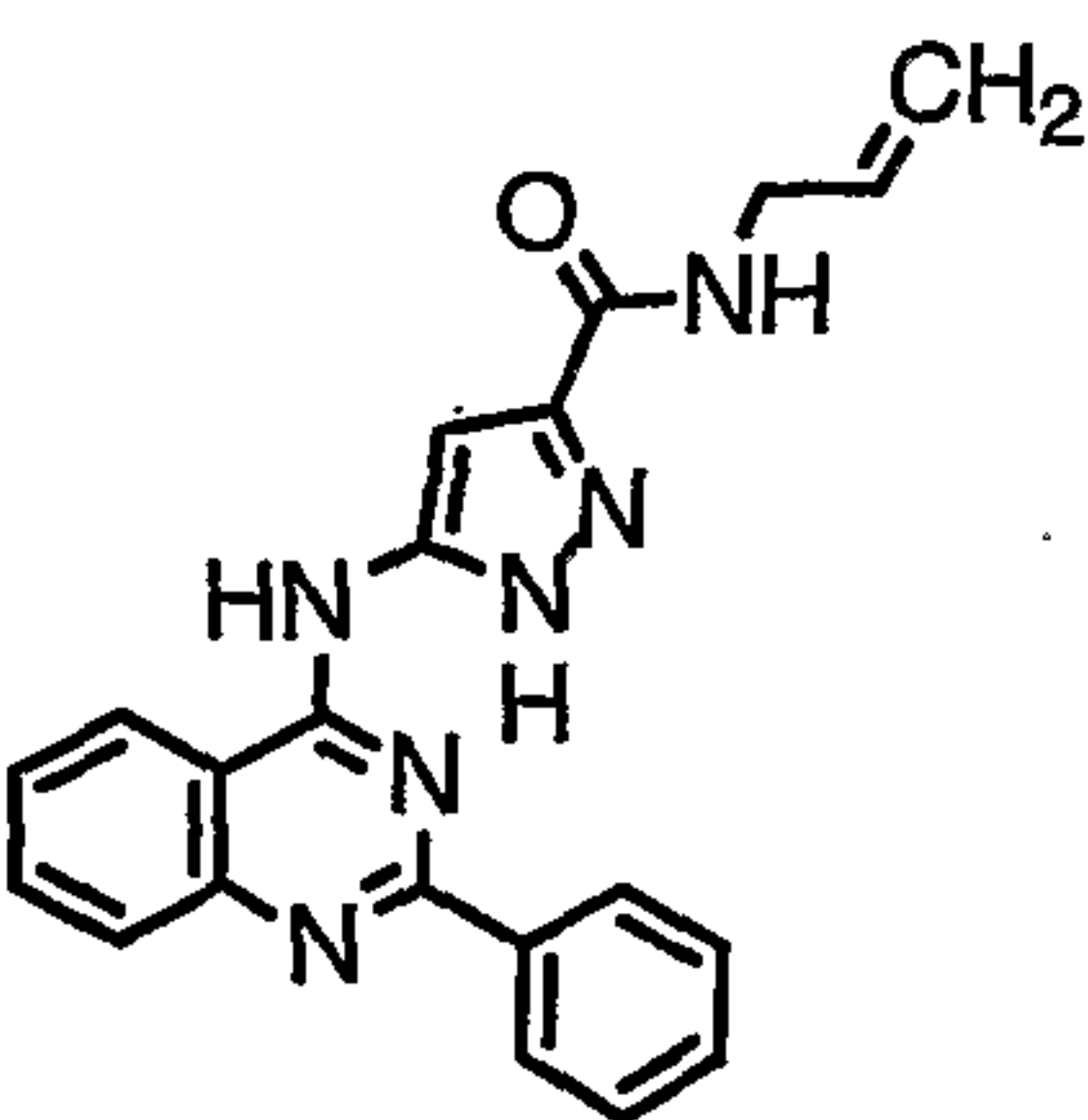
III-79



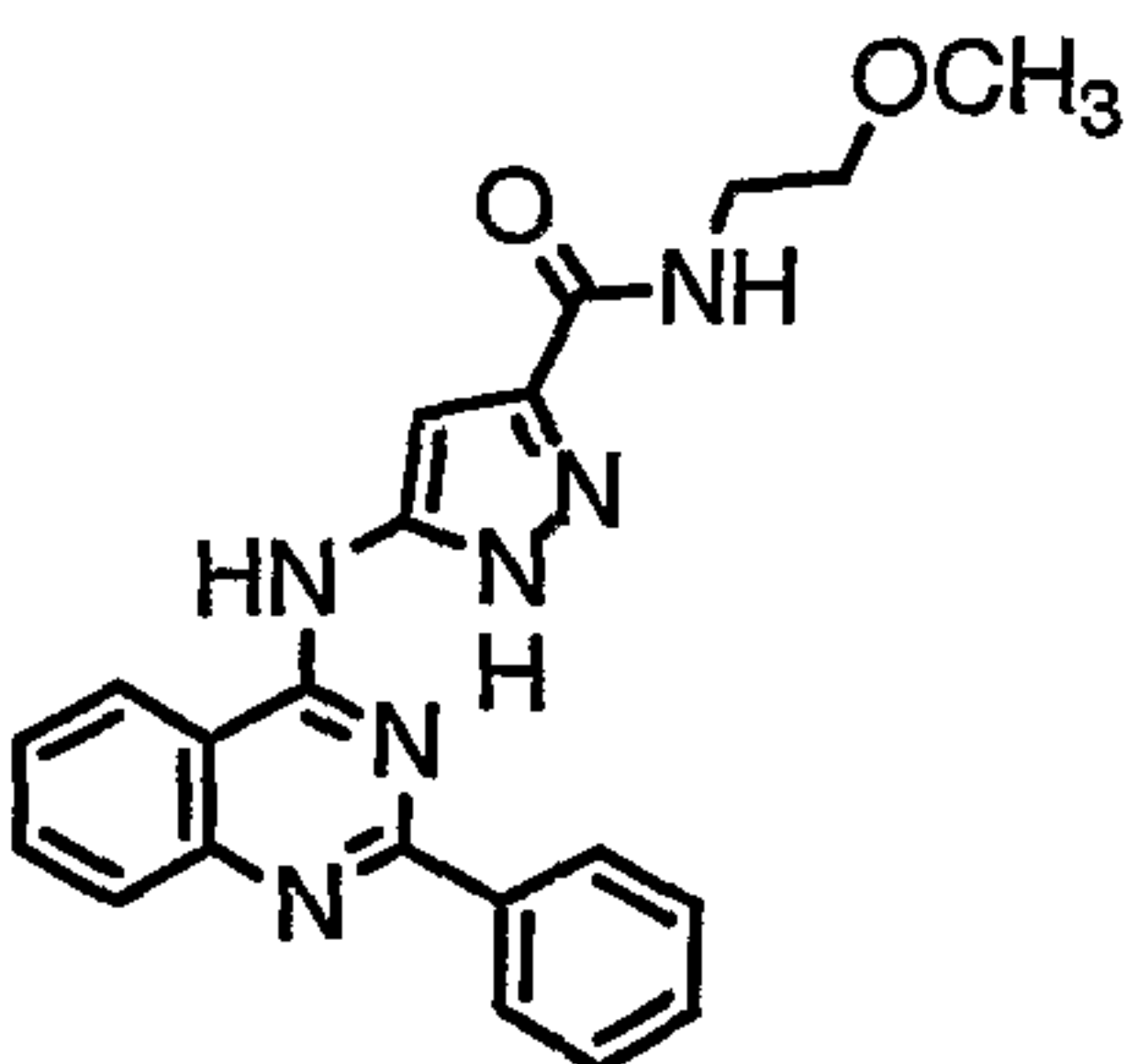
III-80



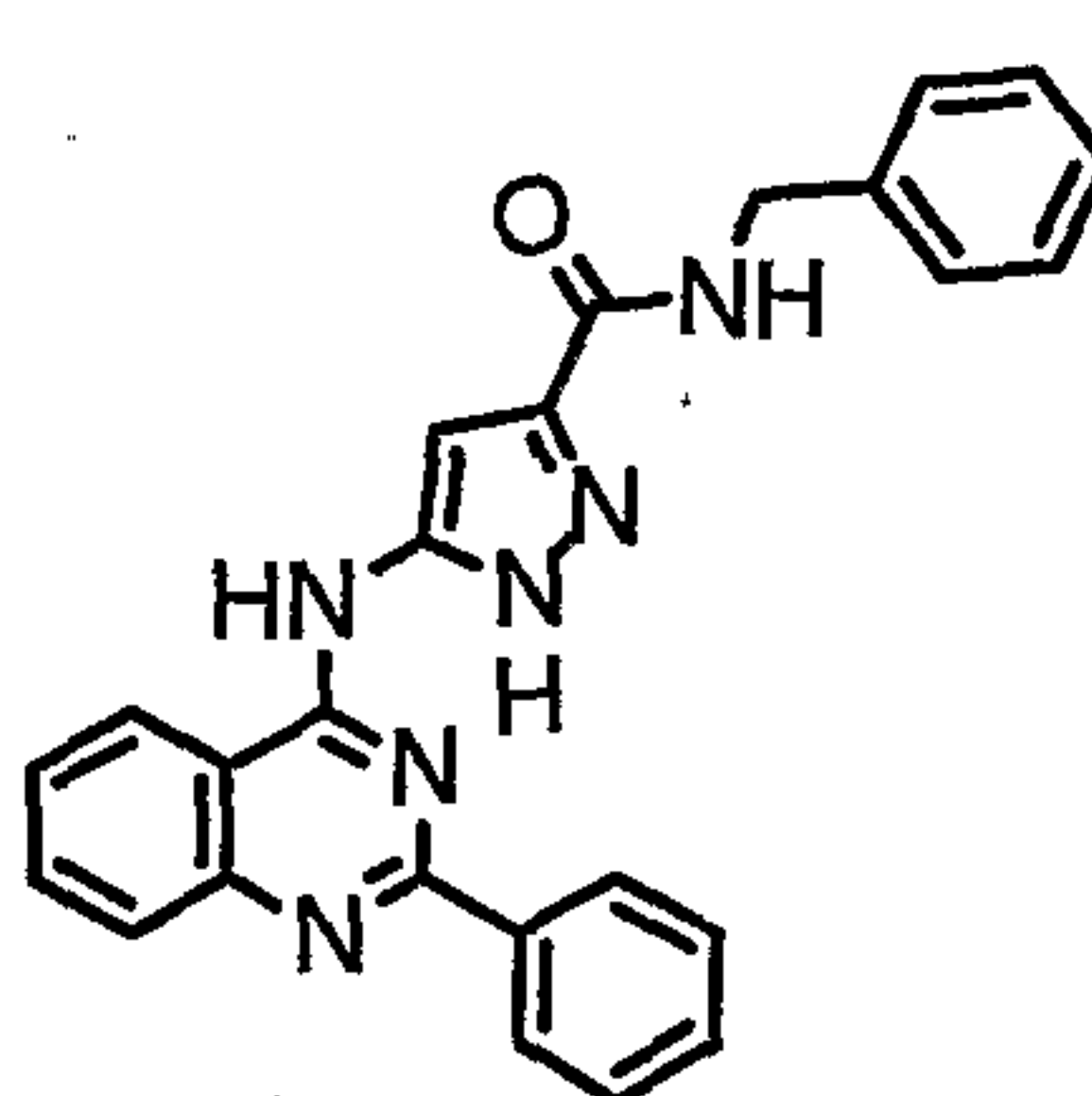
III-81



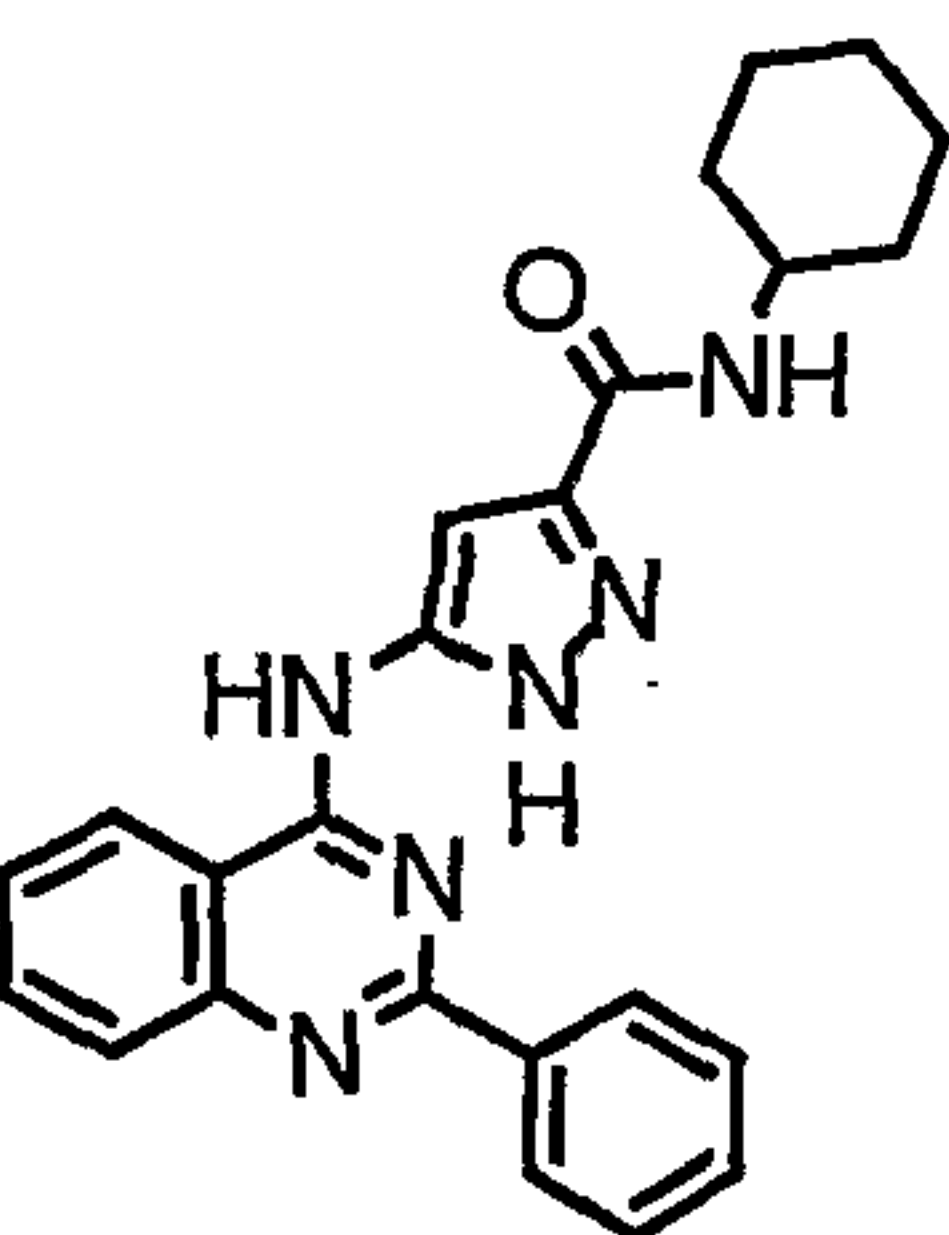
III-82



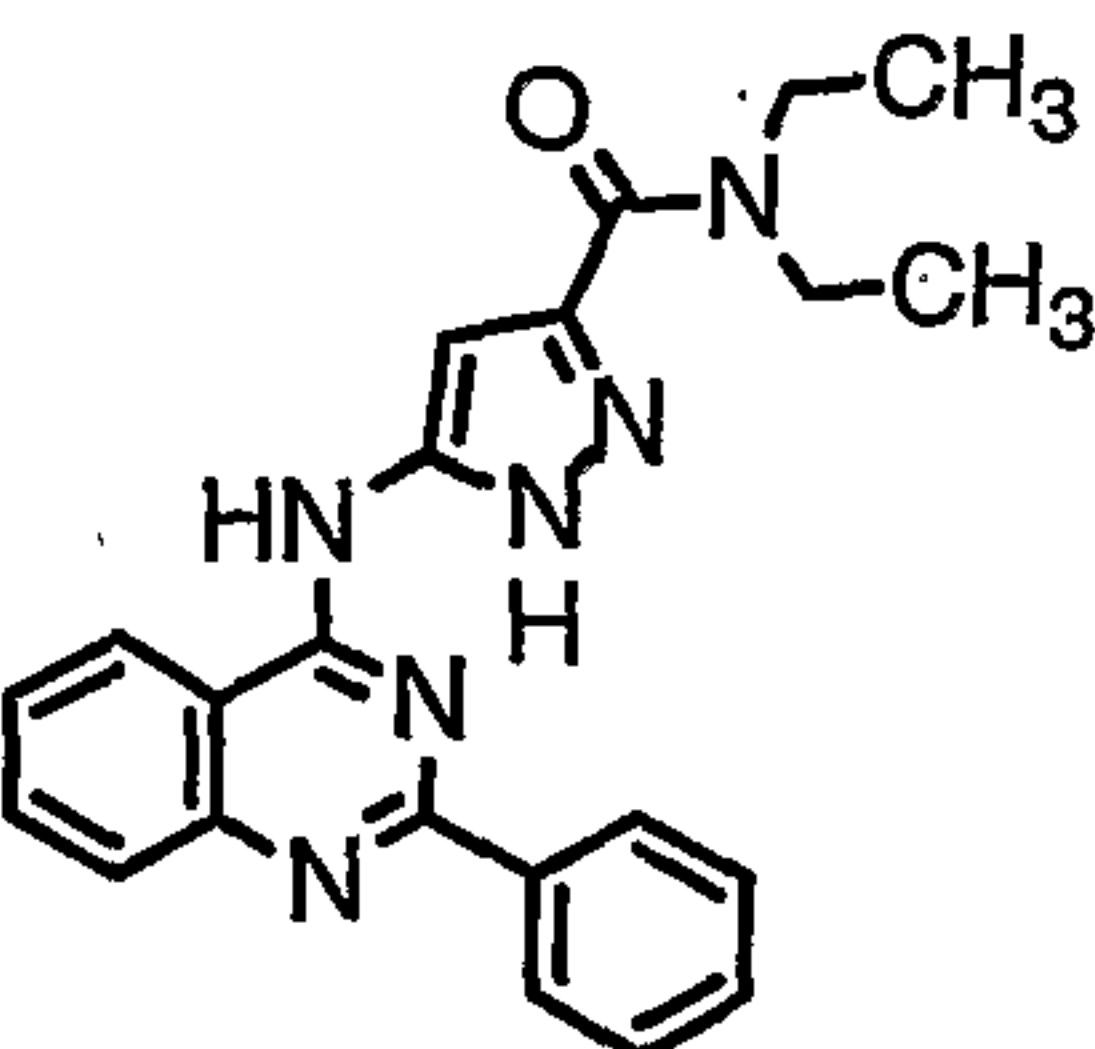
III-83



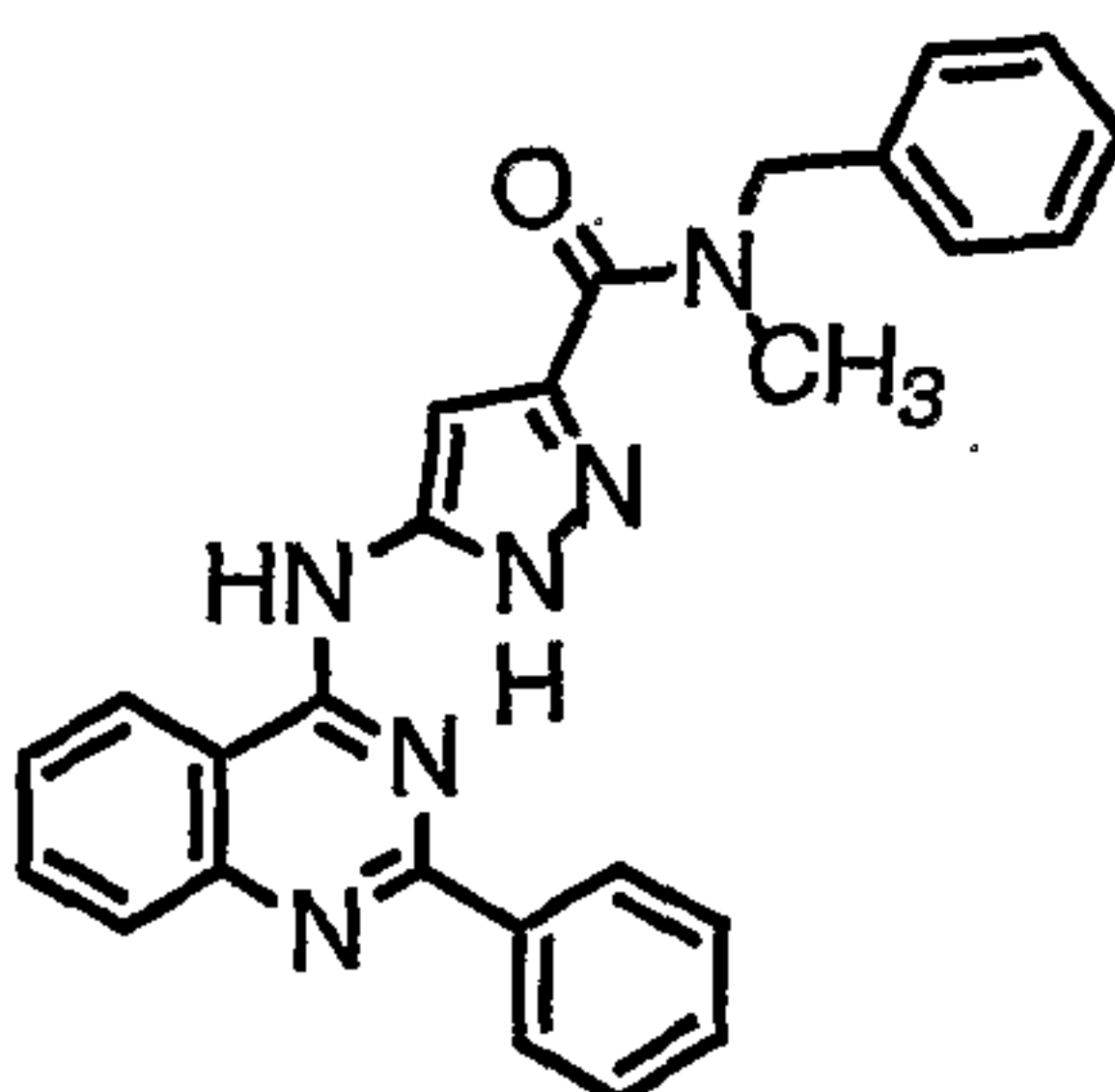
III-84



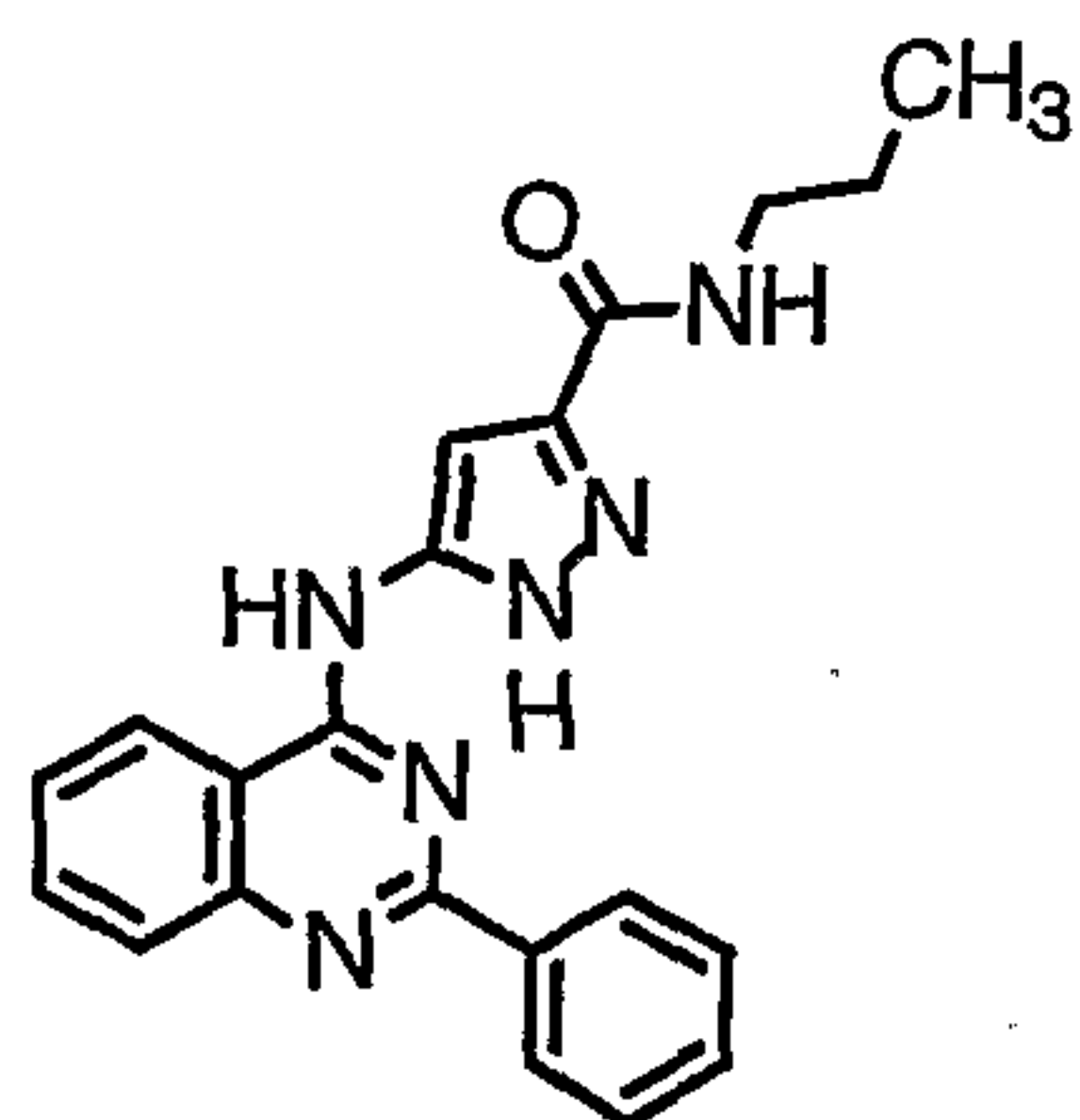
III-85



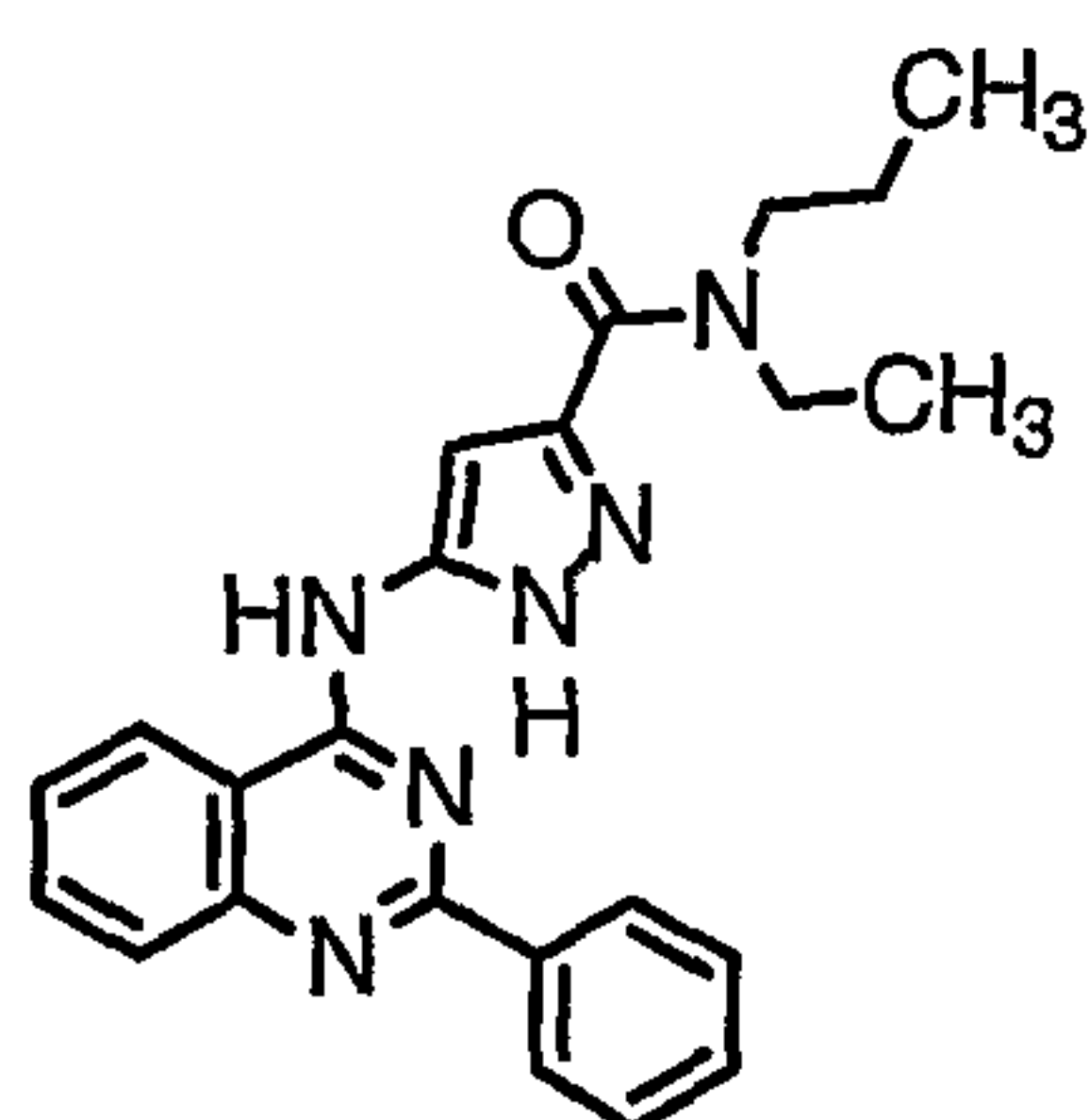
III-86



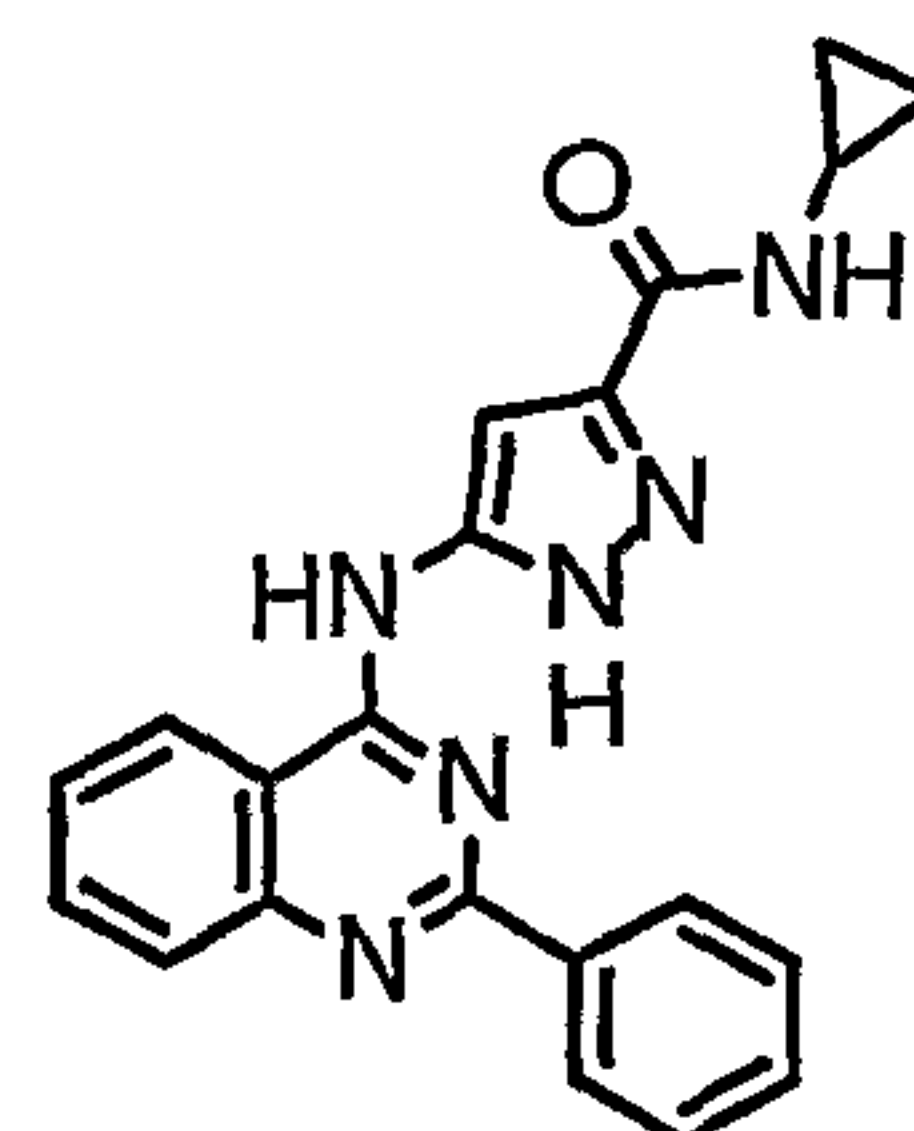
III-87



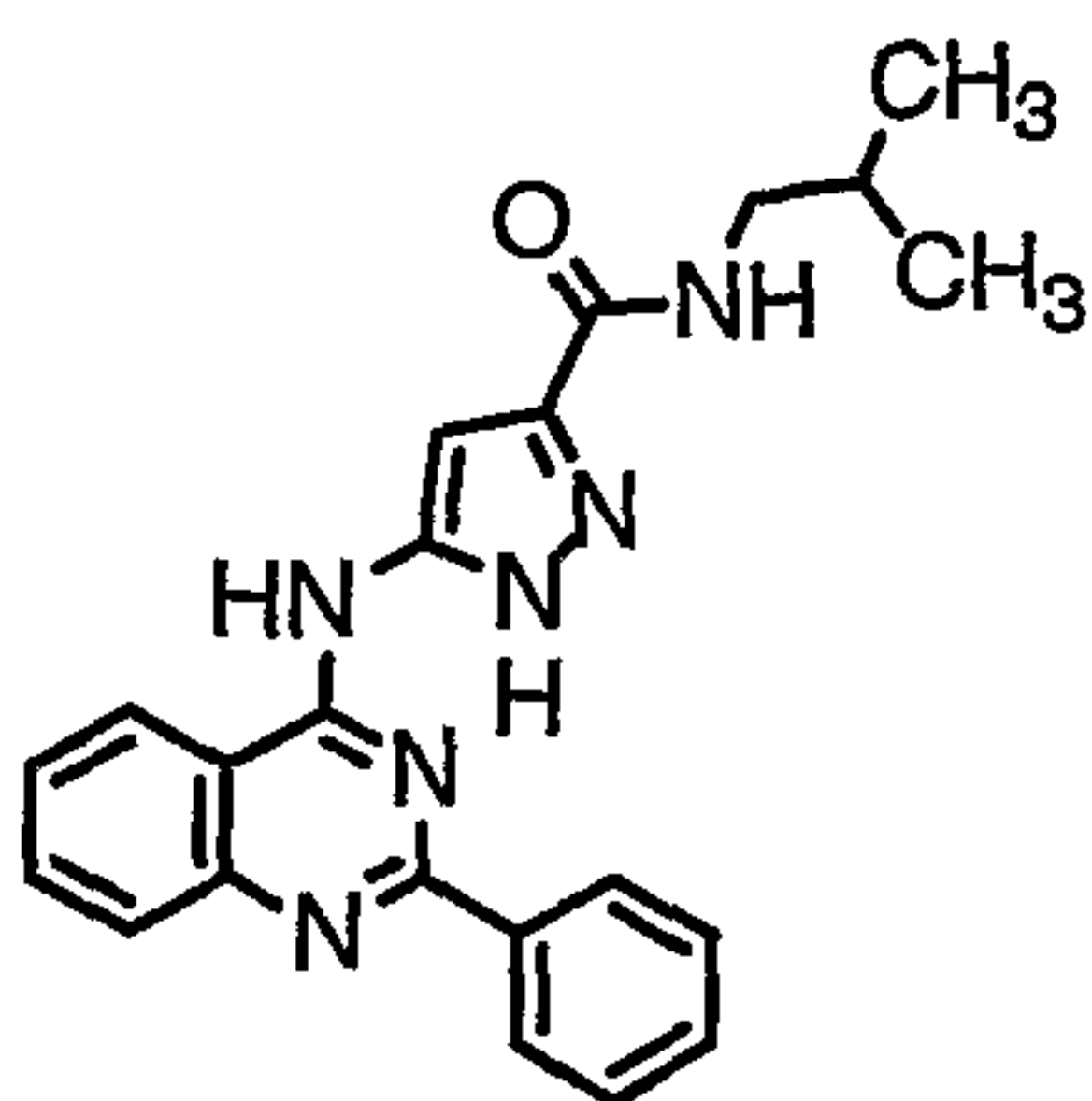
III-88



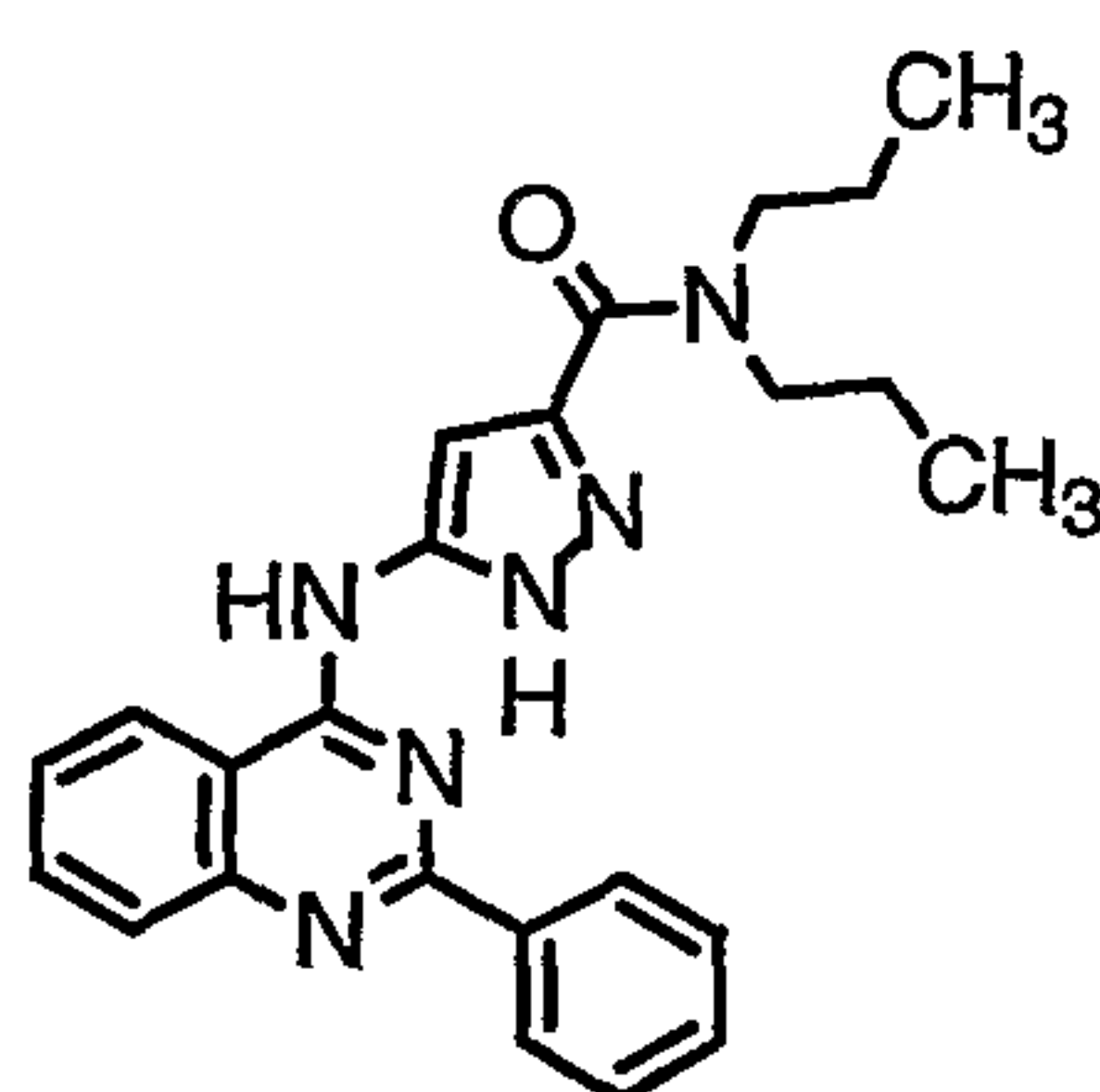
III-89



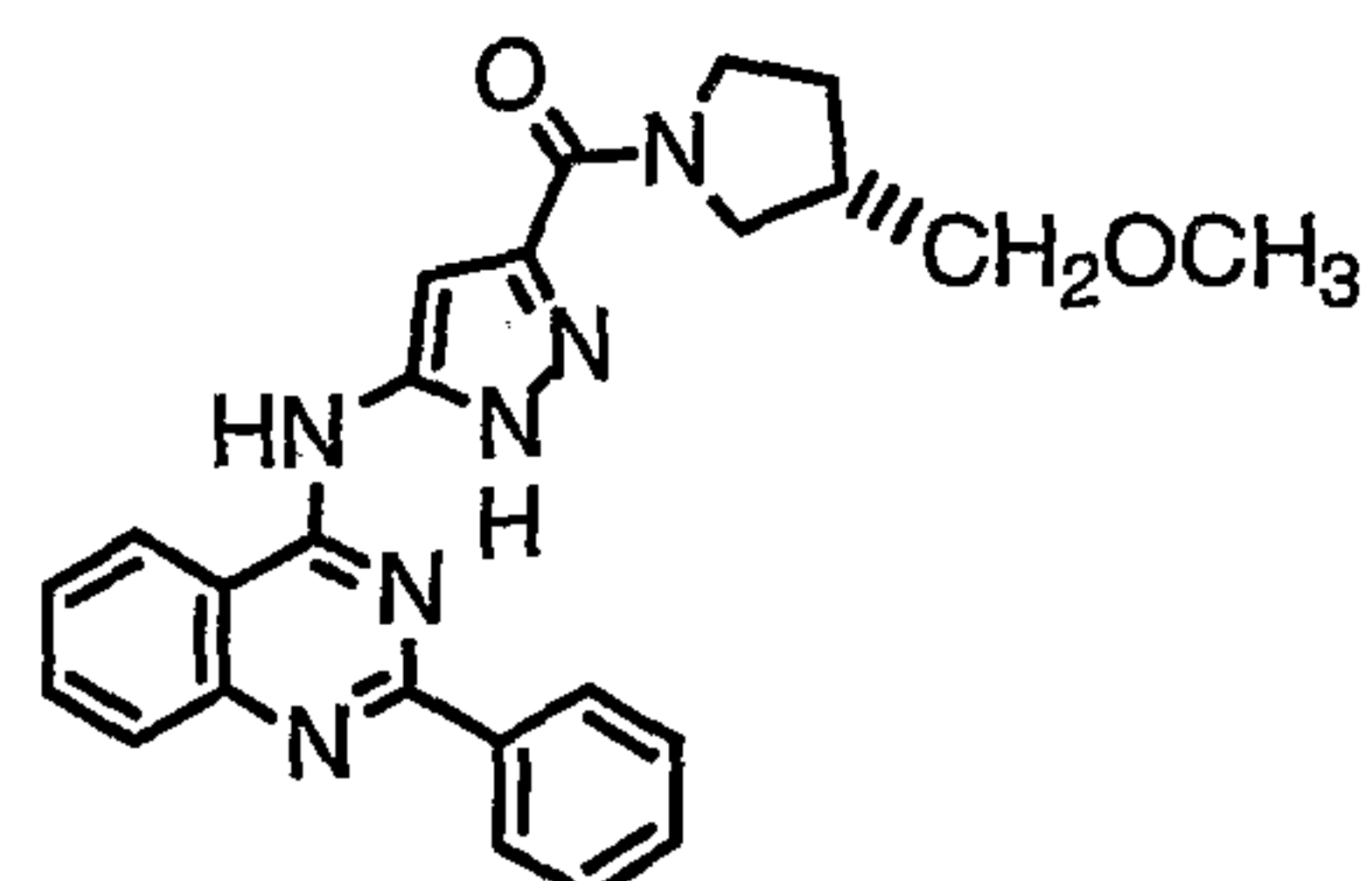
III-90



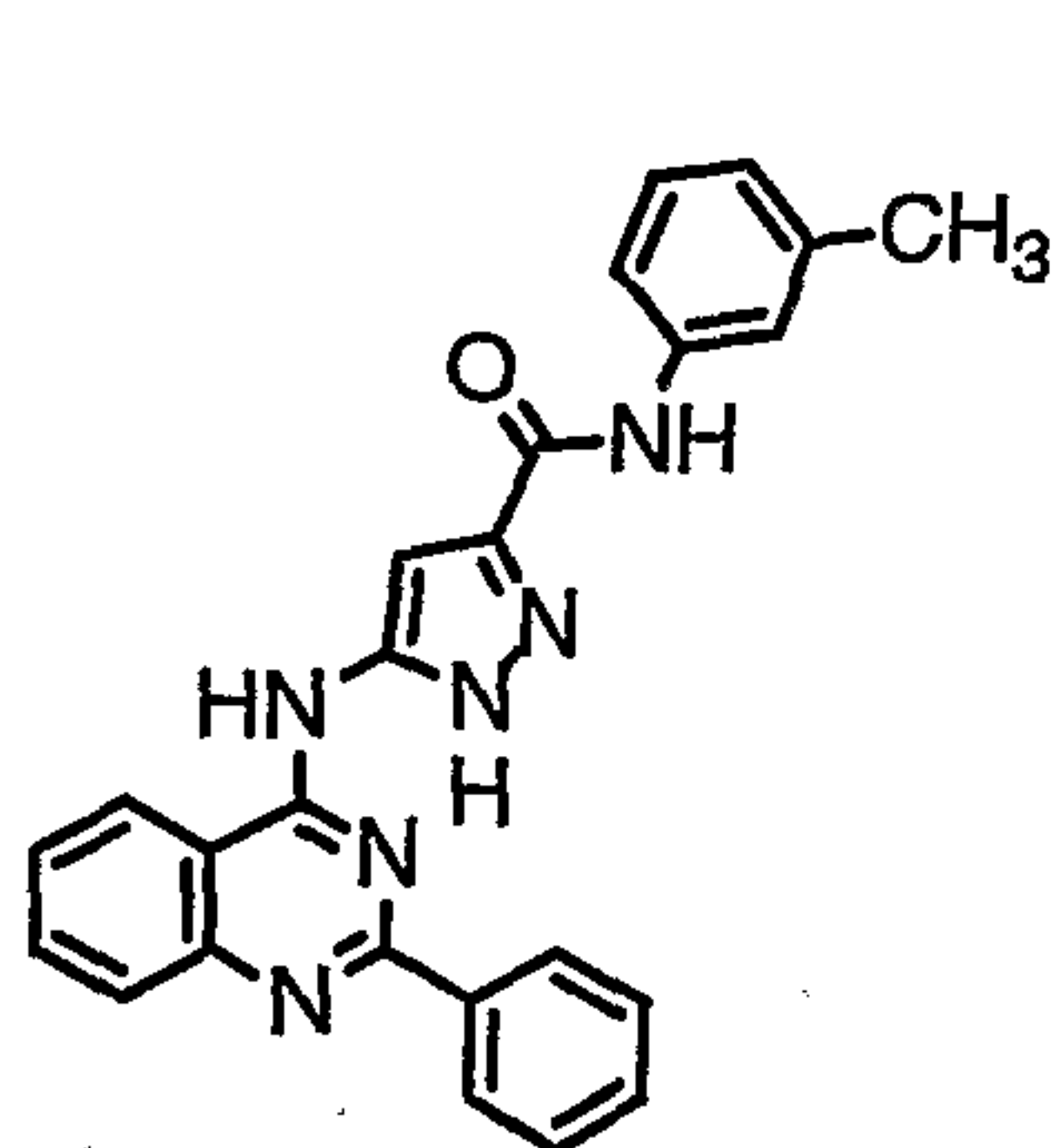
III-91



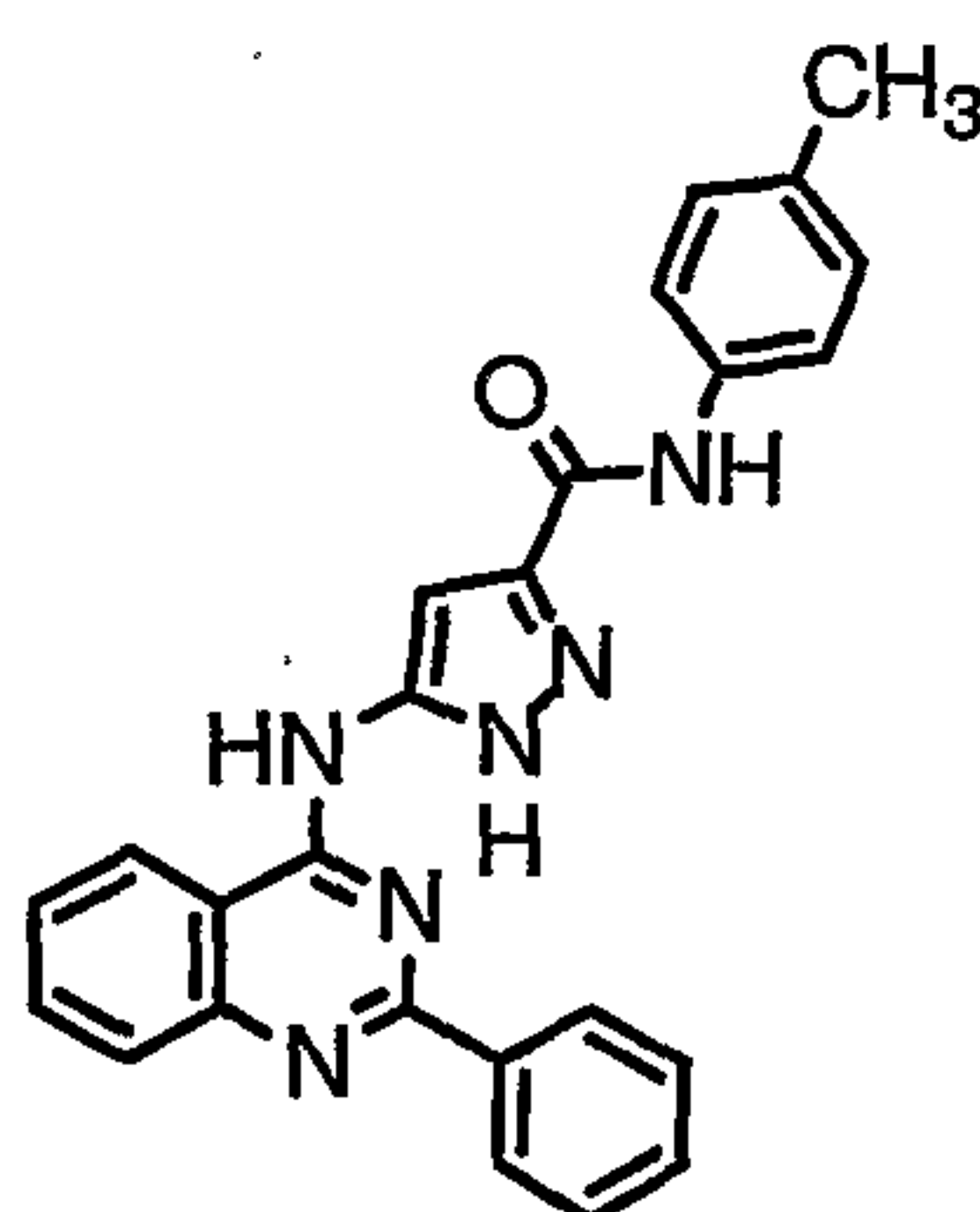
III-92



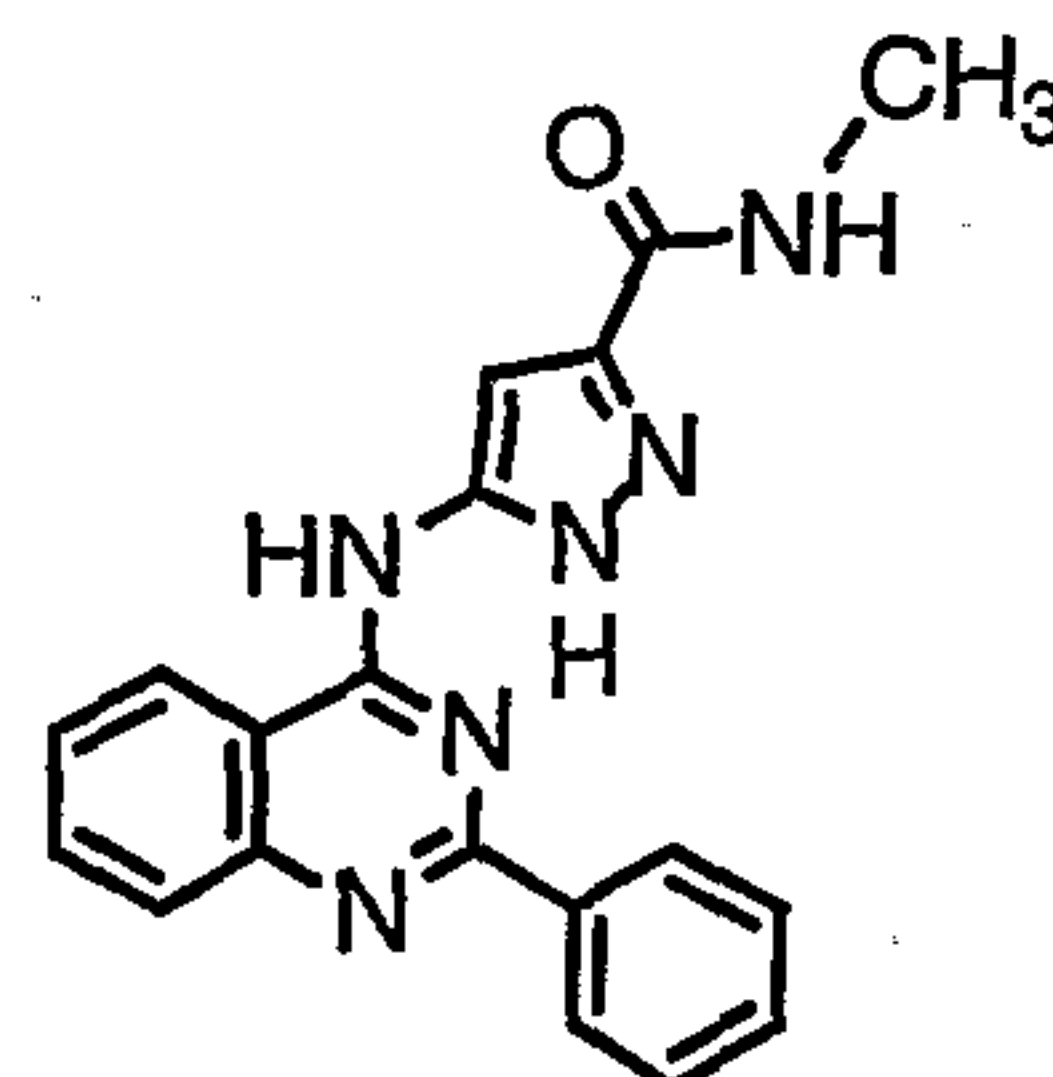
III-93



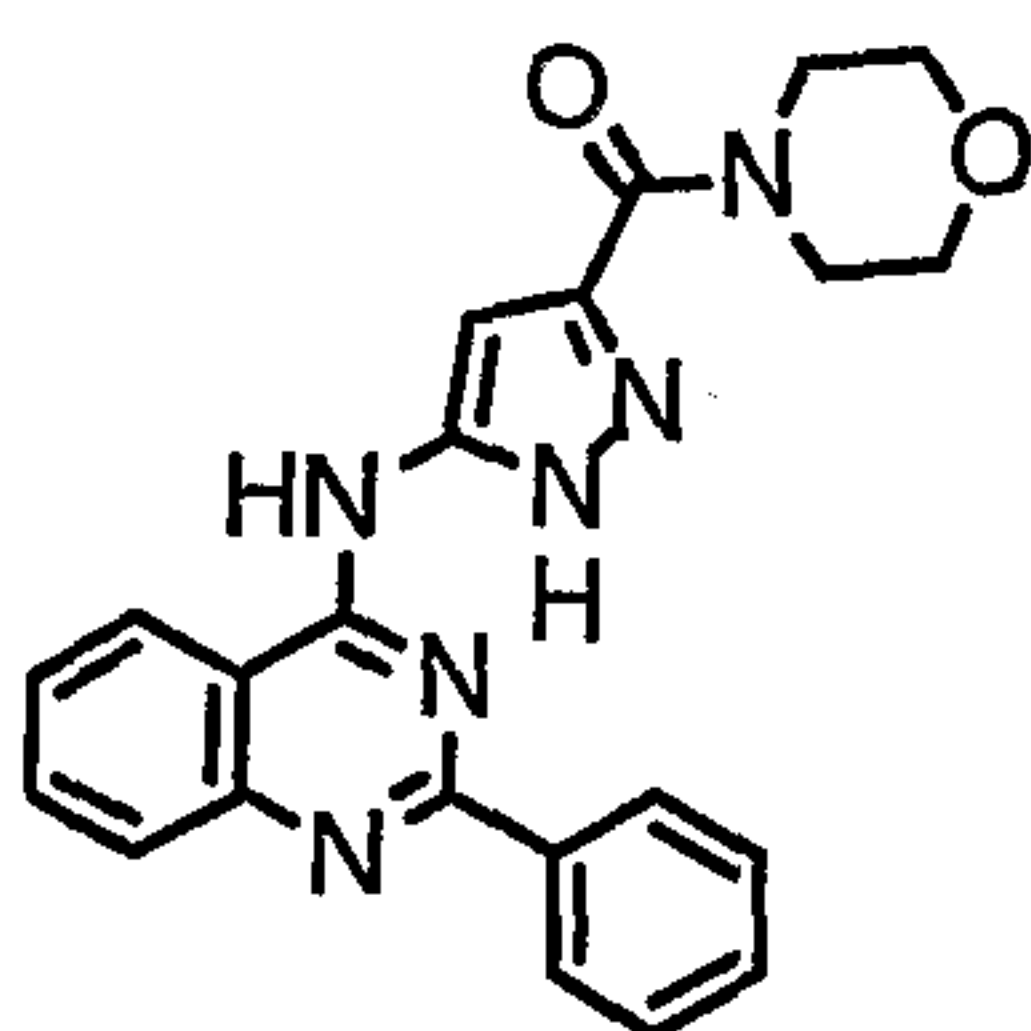
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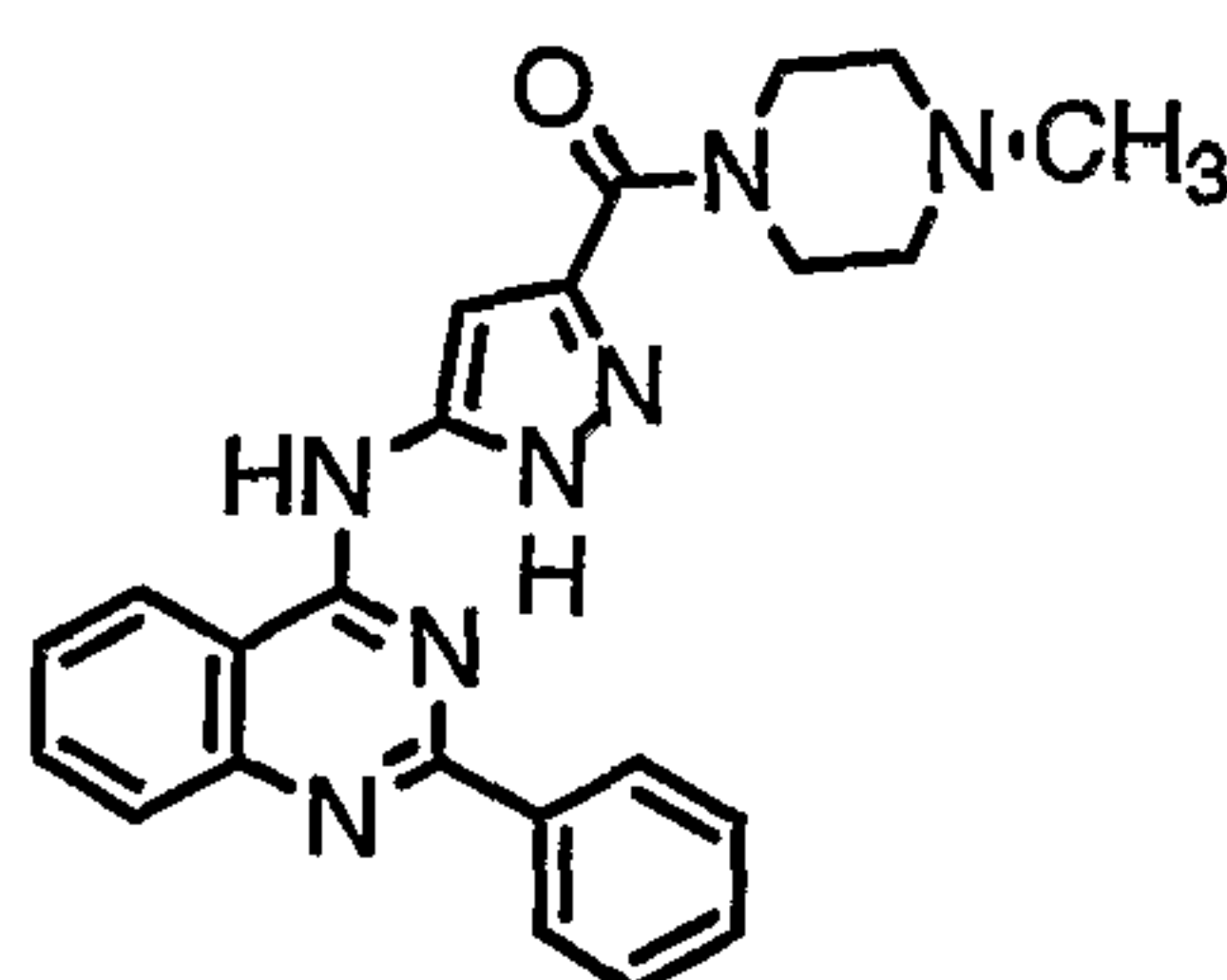
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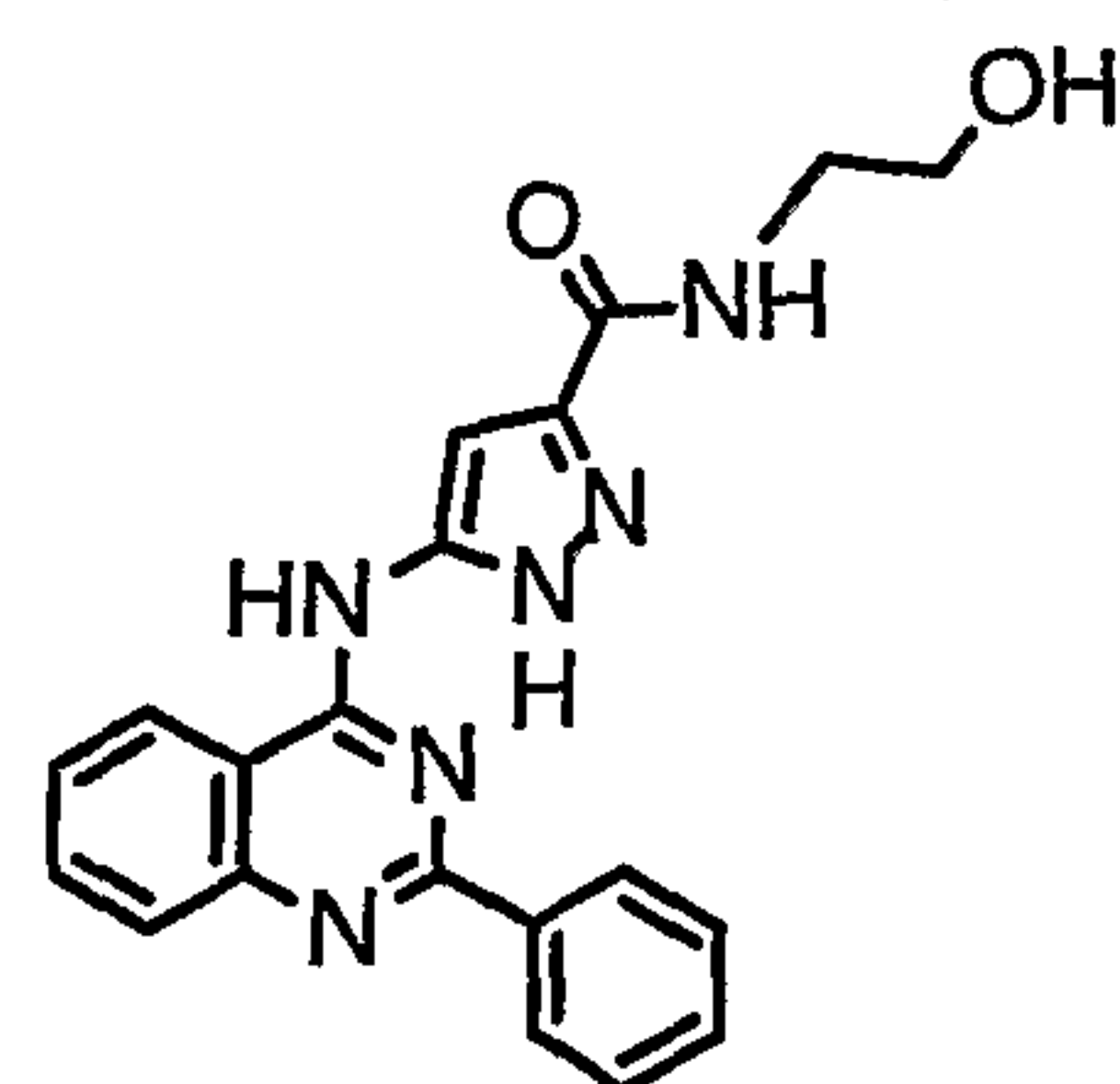
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III-97



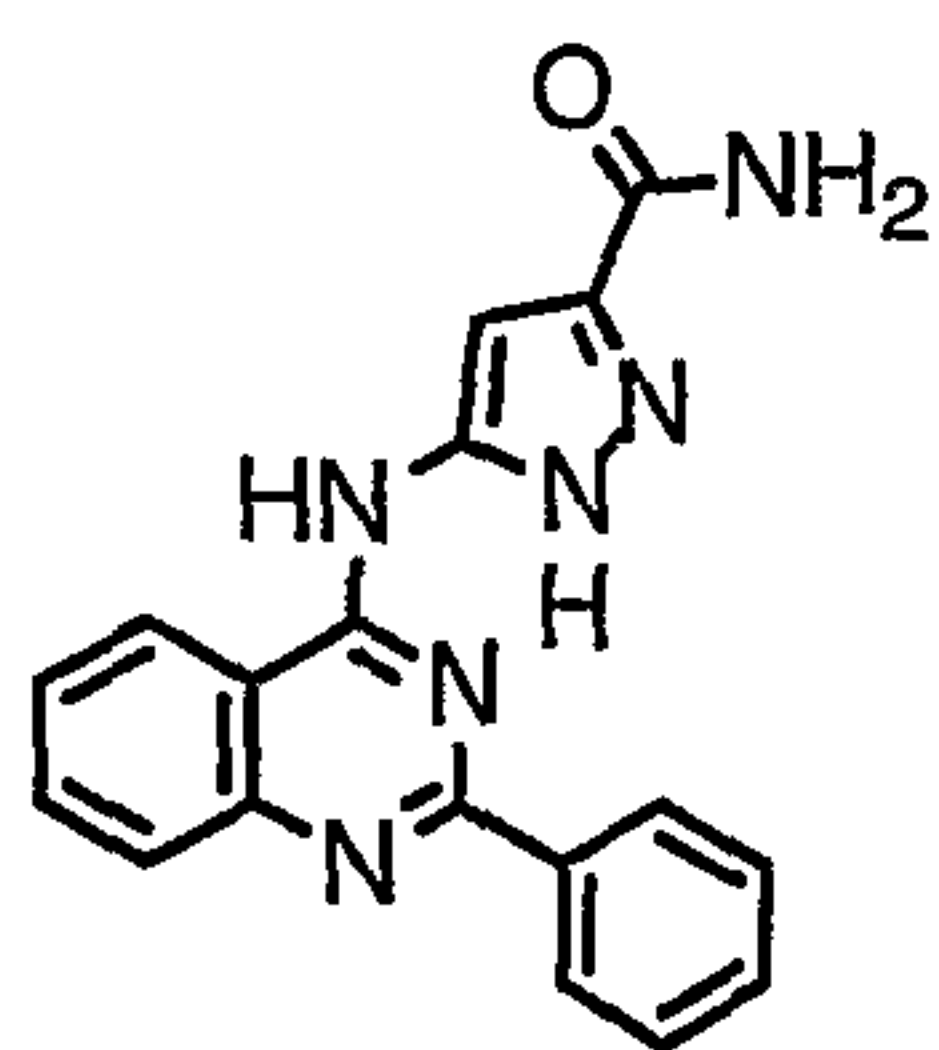
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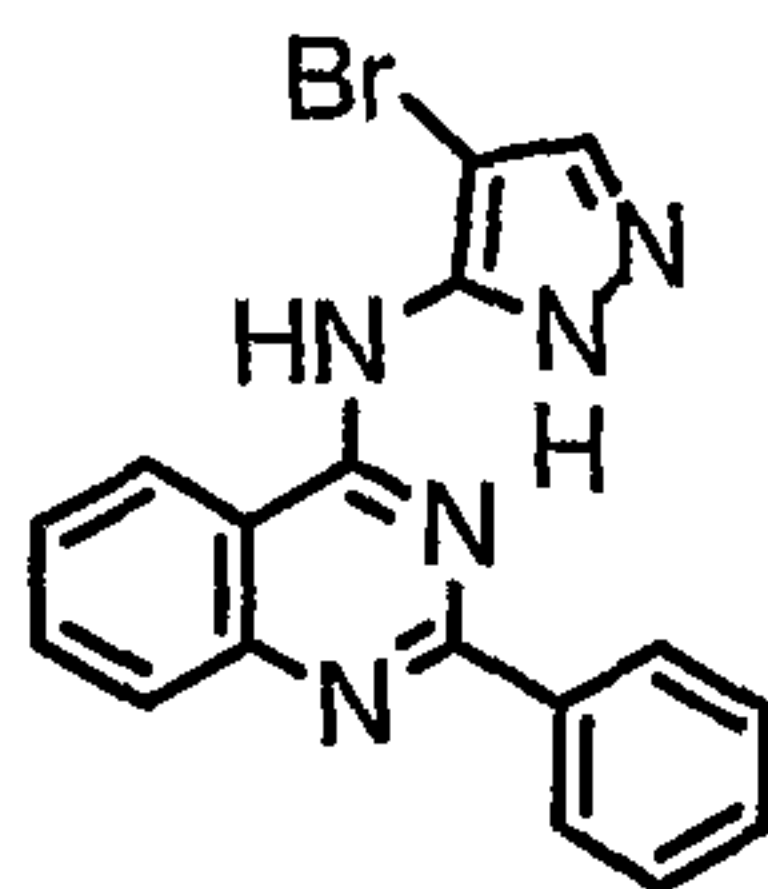
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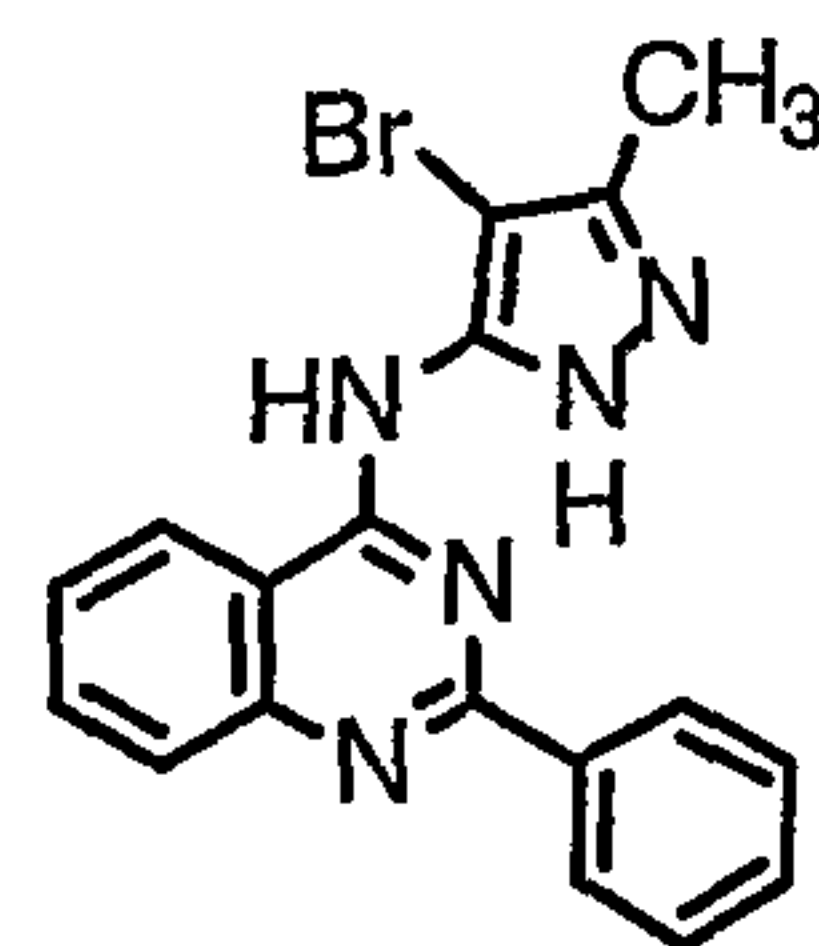
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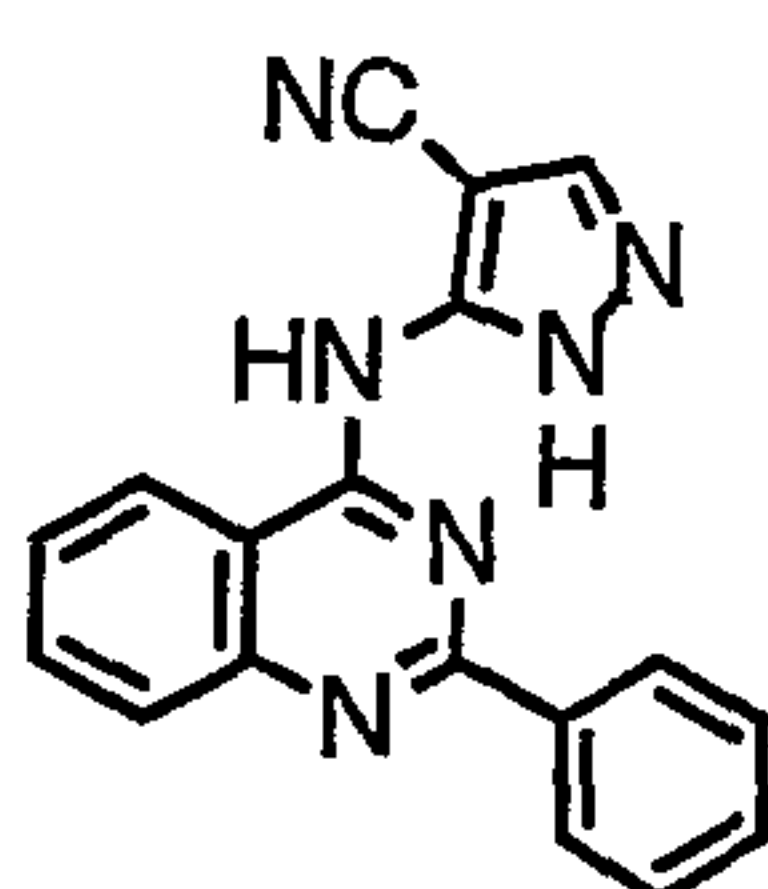
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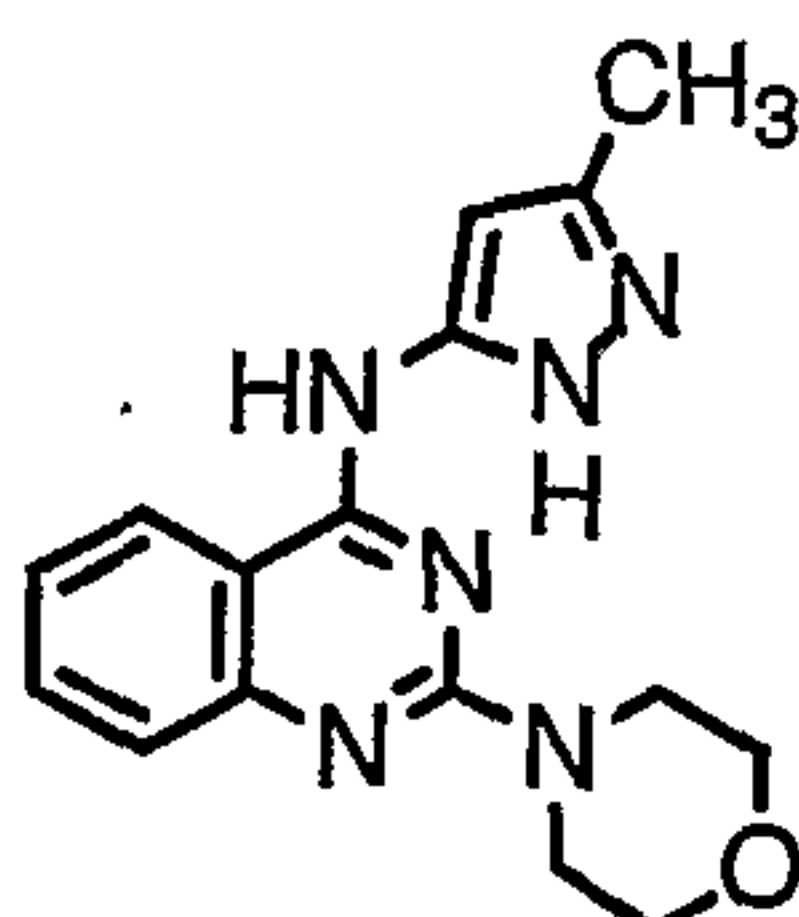
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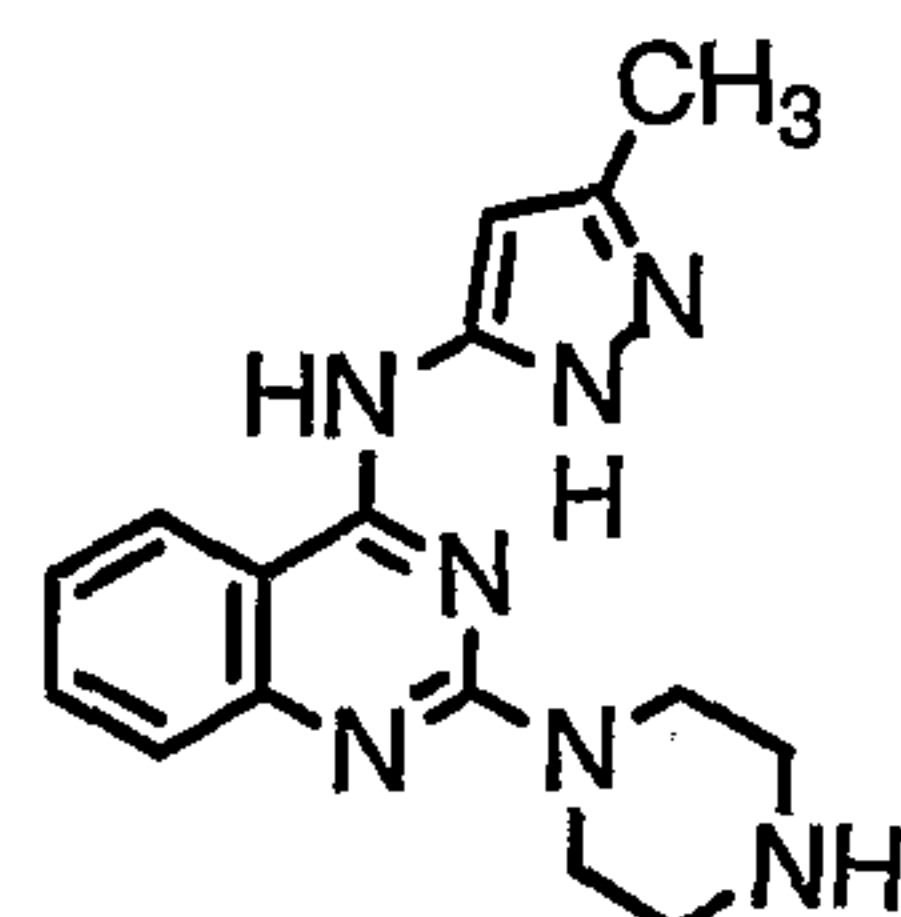
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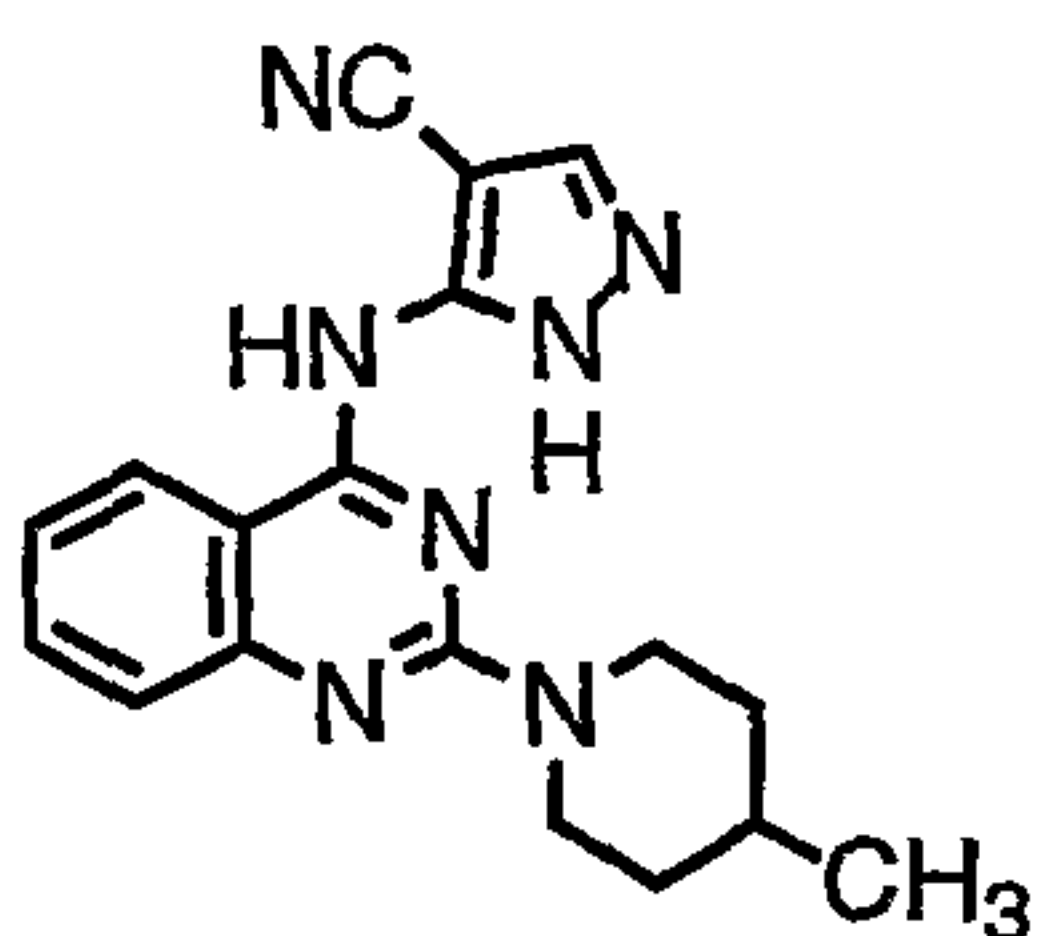
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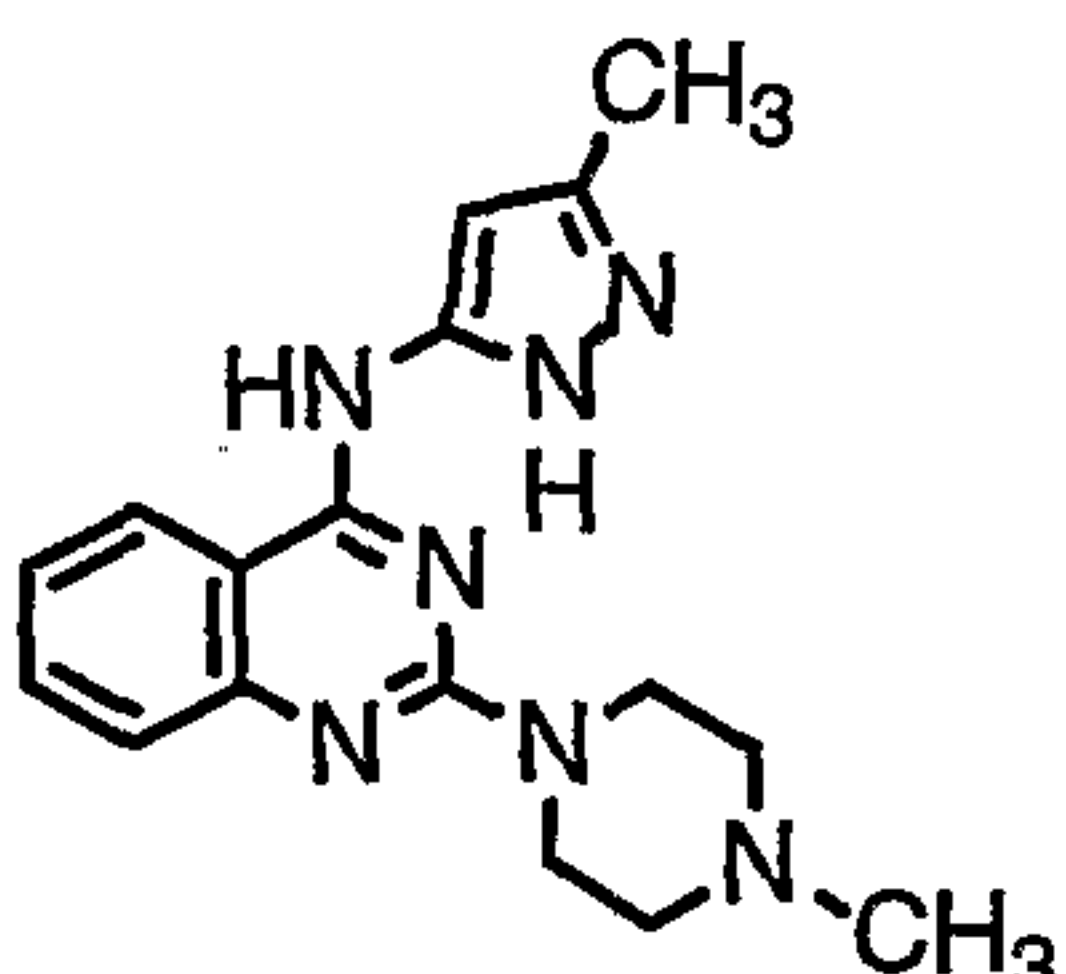
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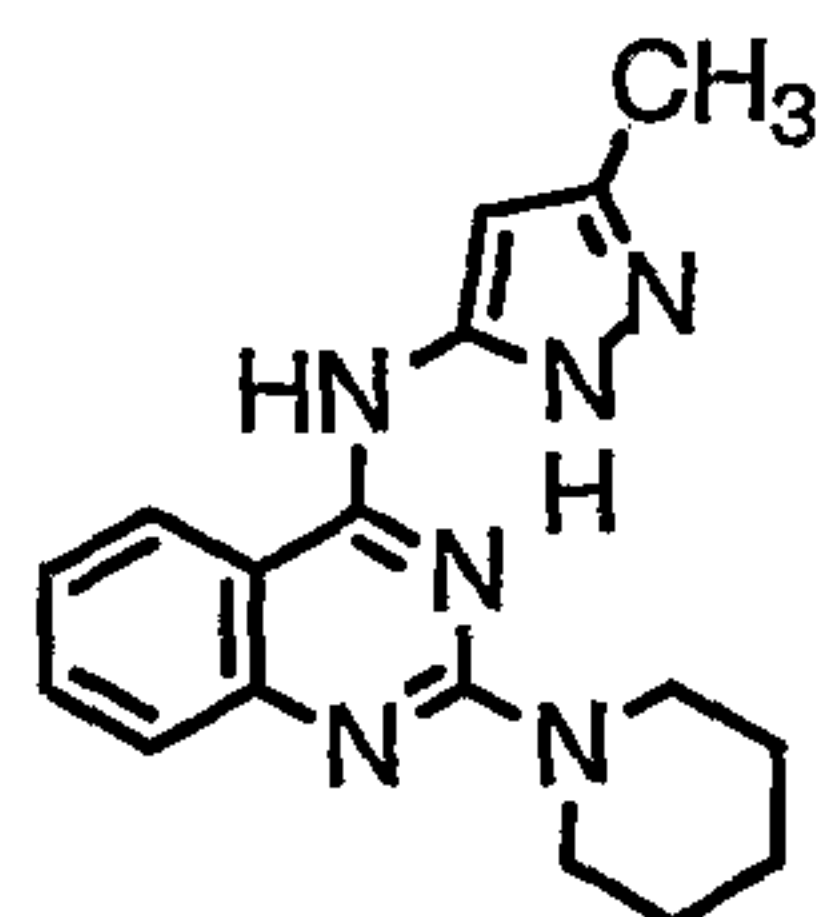
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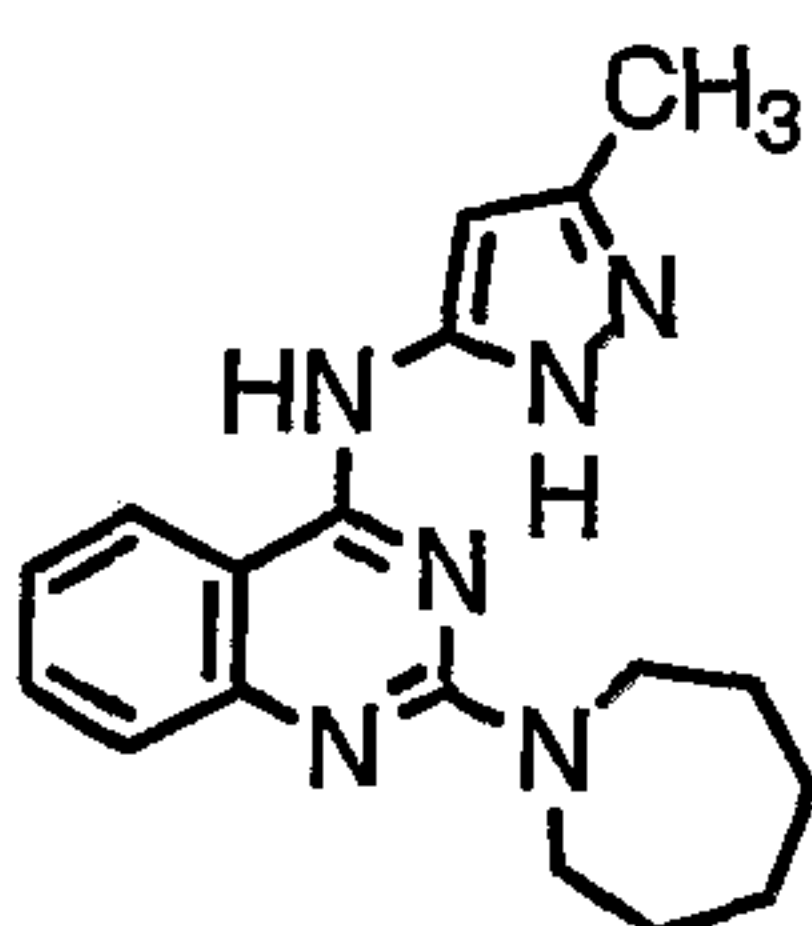
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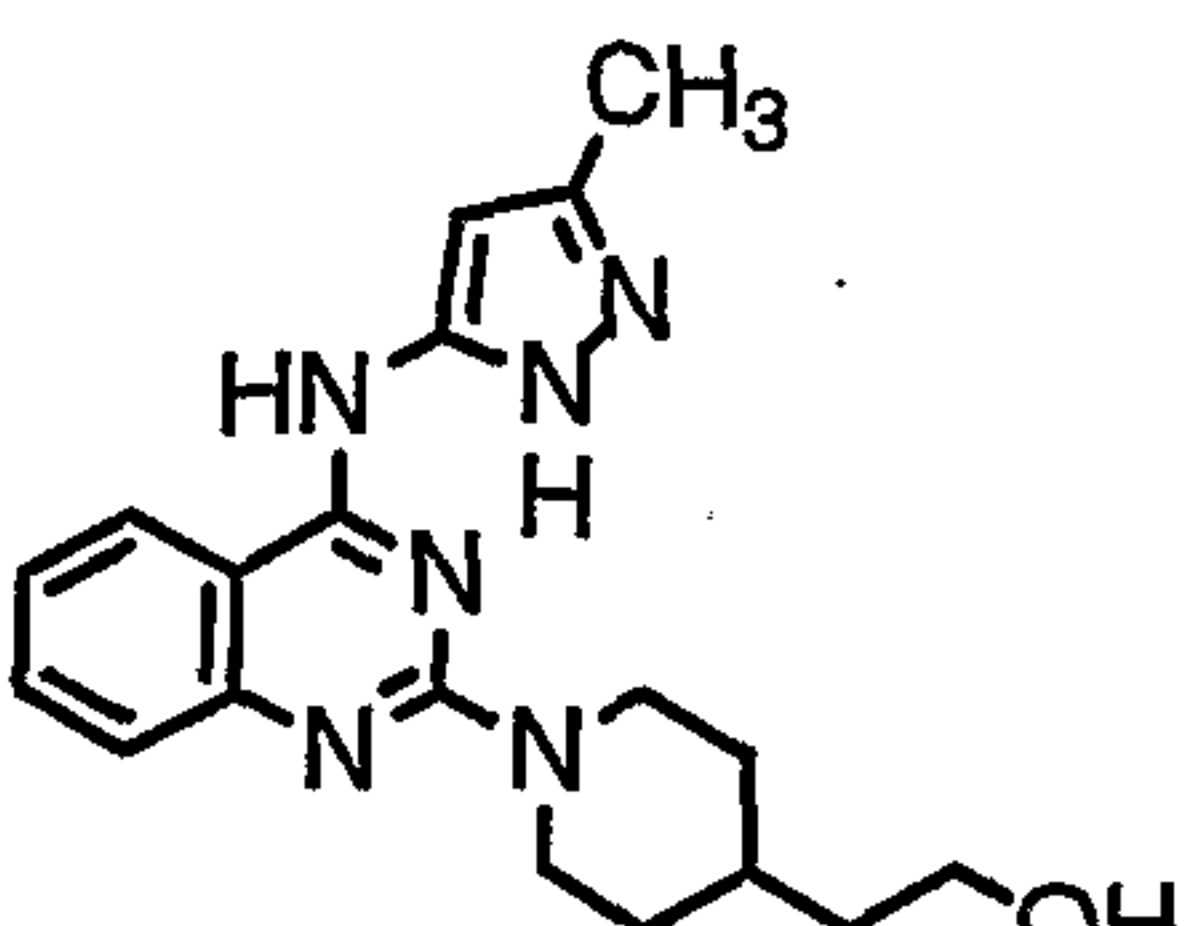
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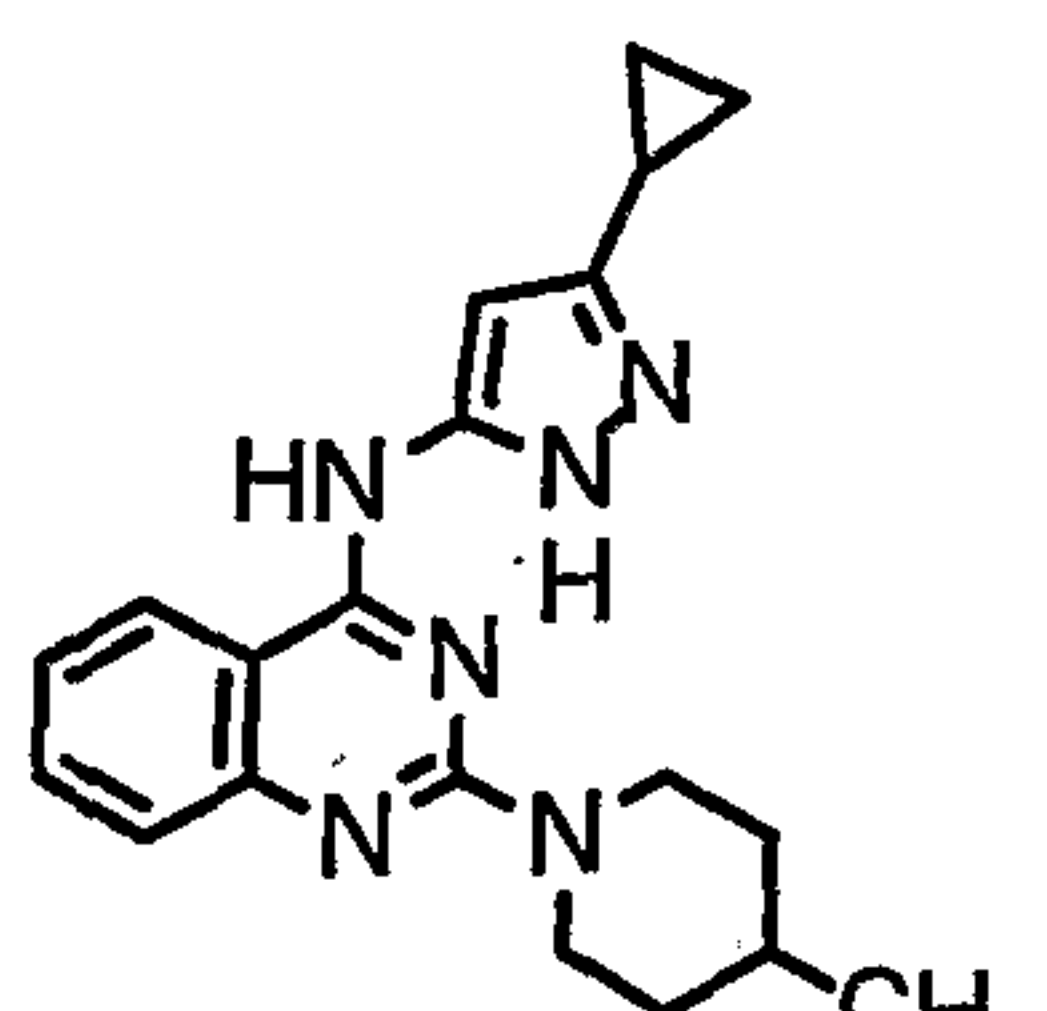
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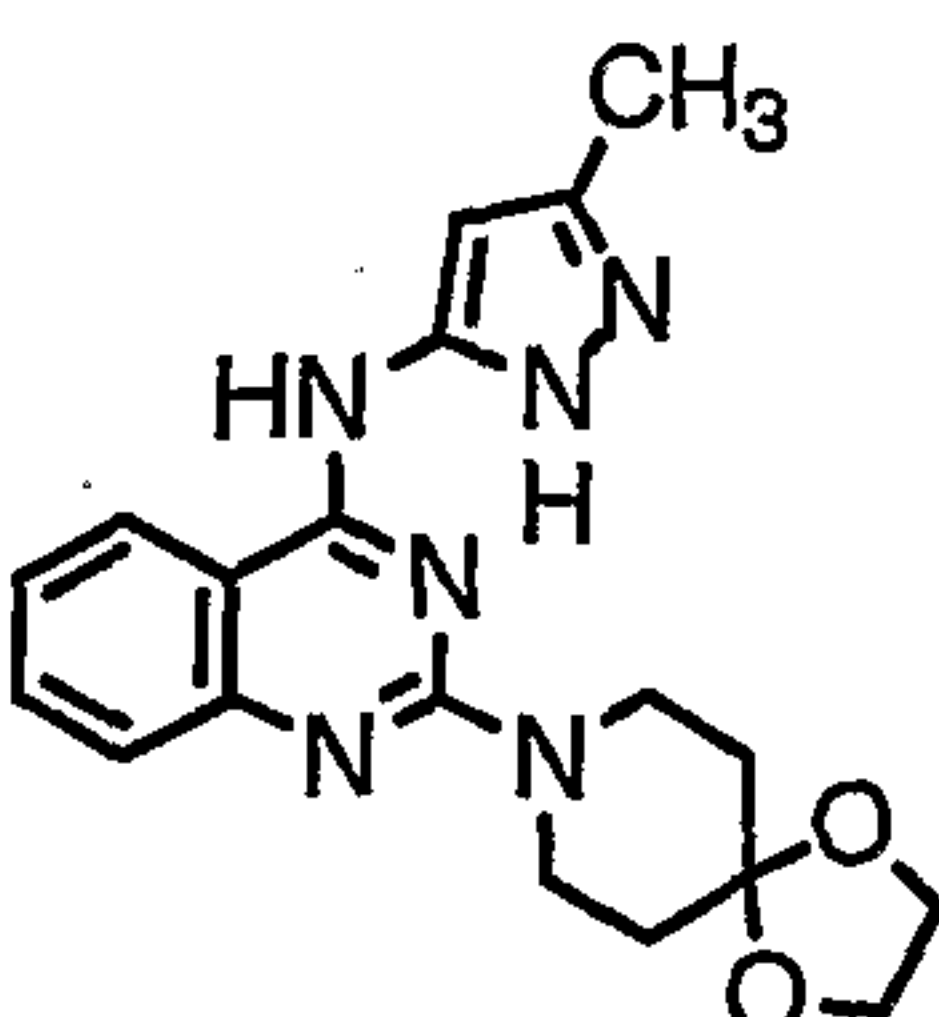
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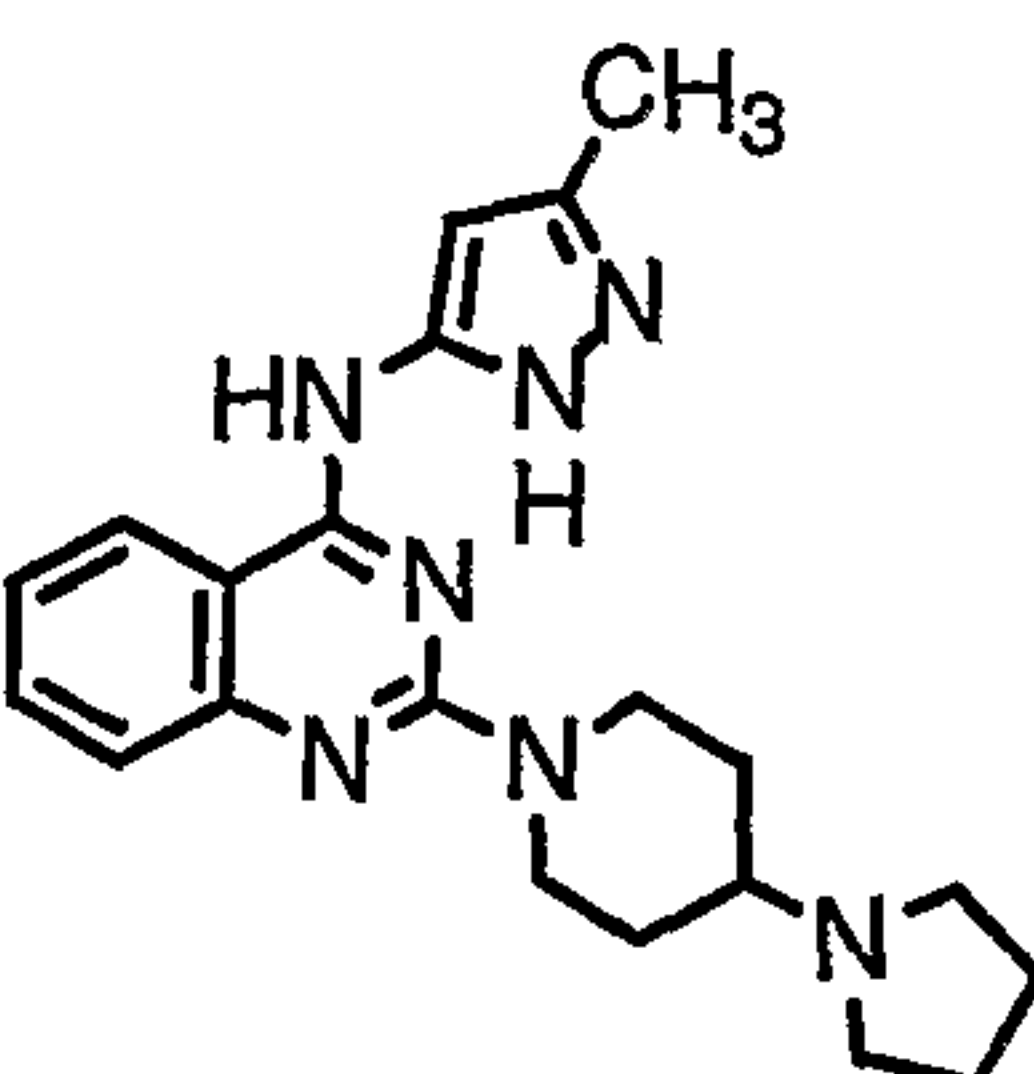
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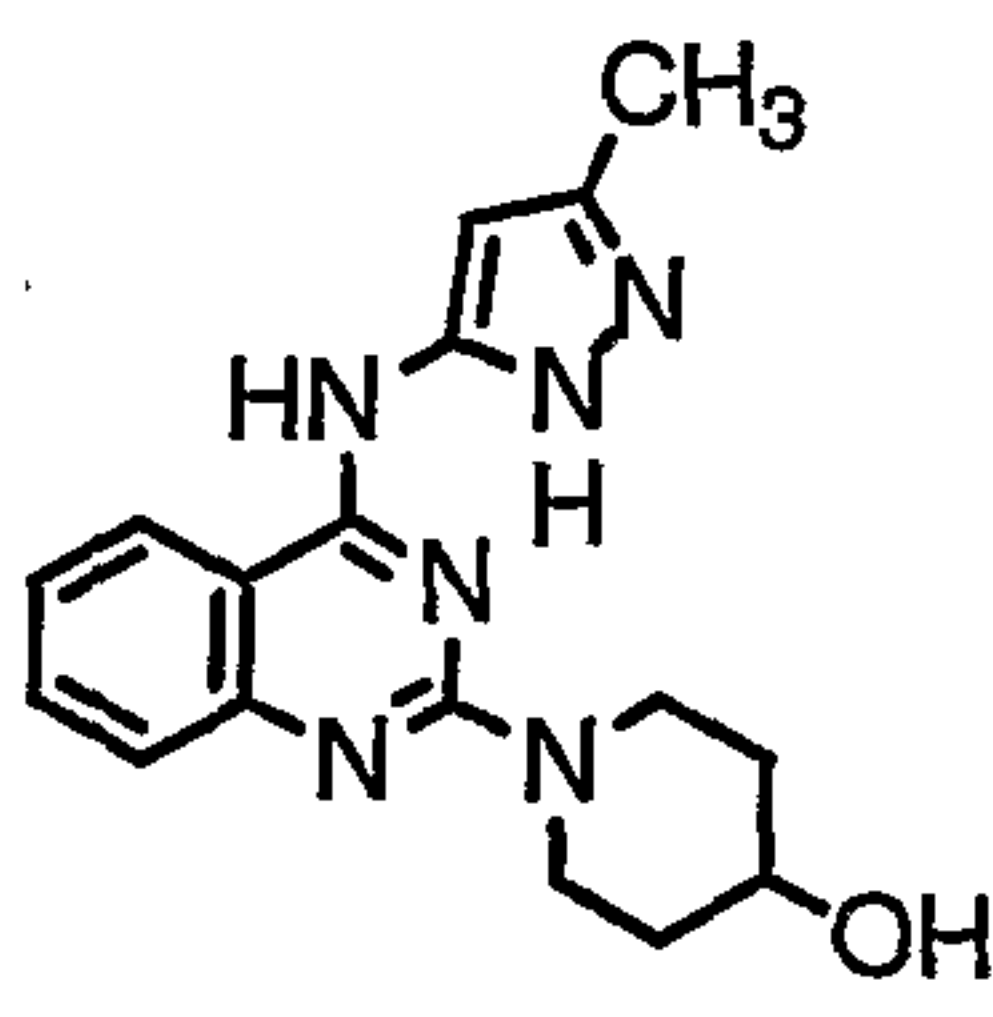
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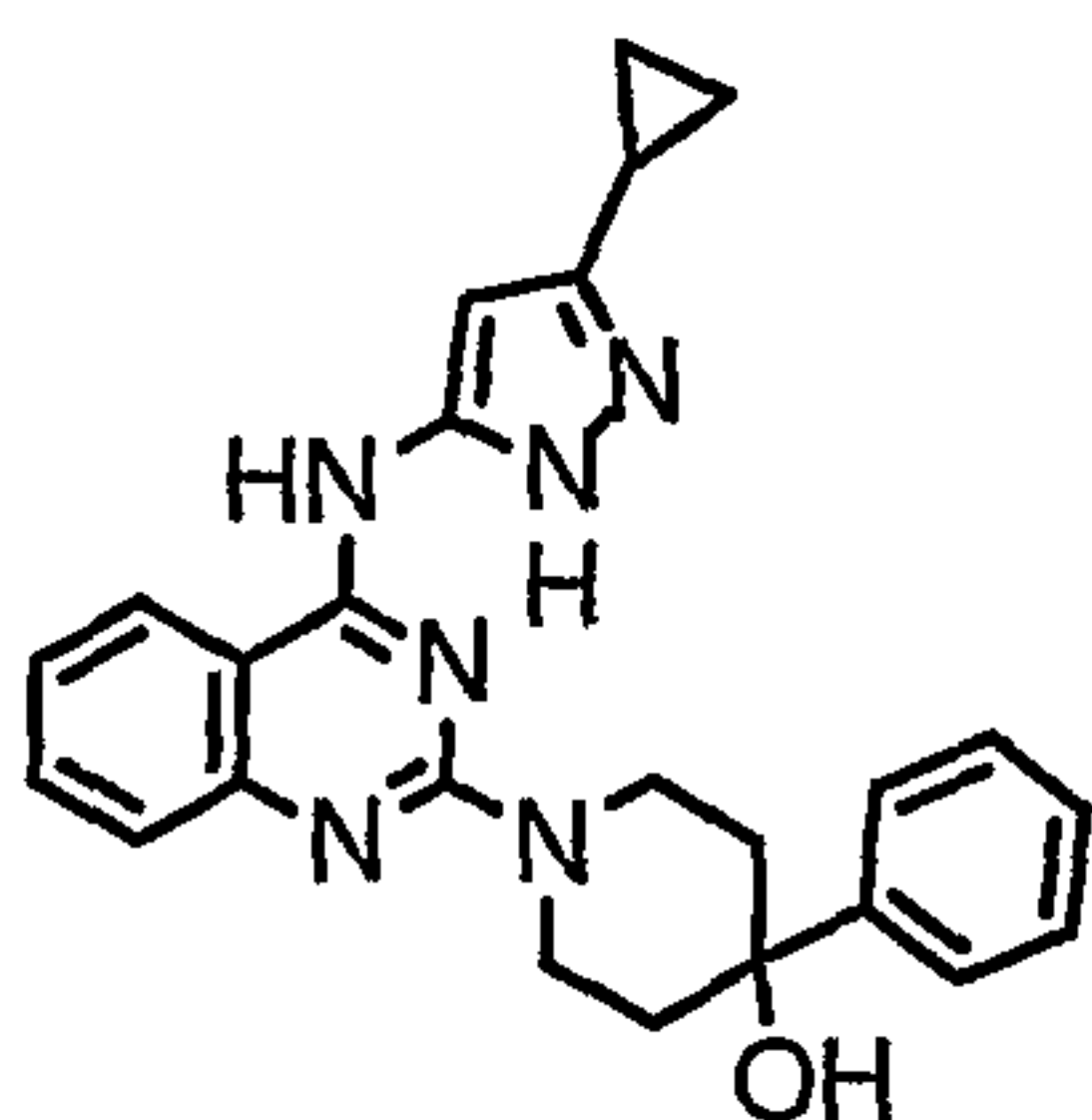
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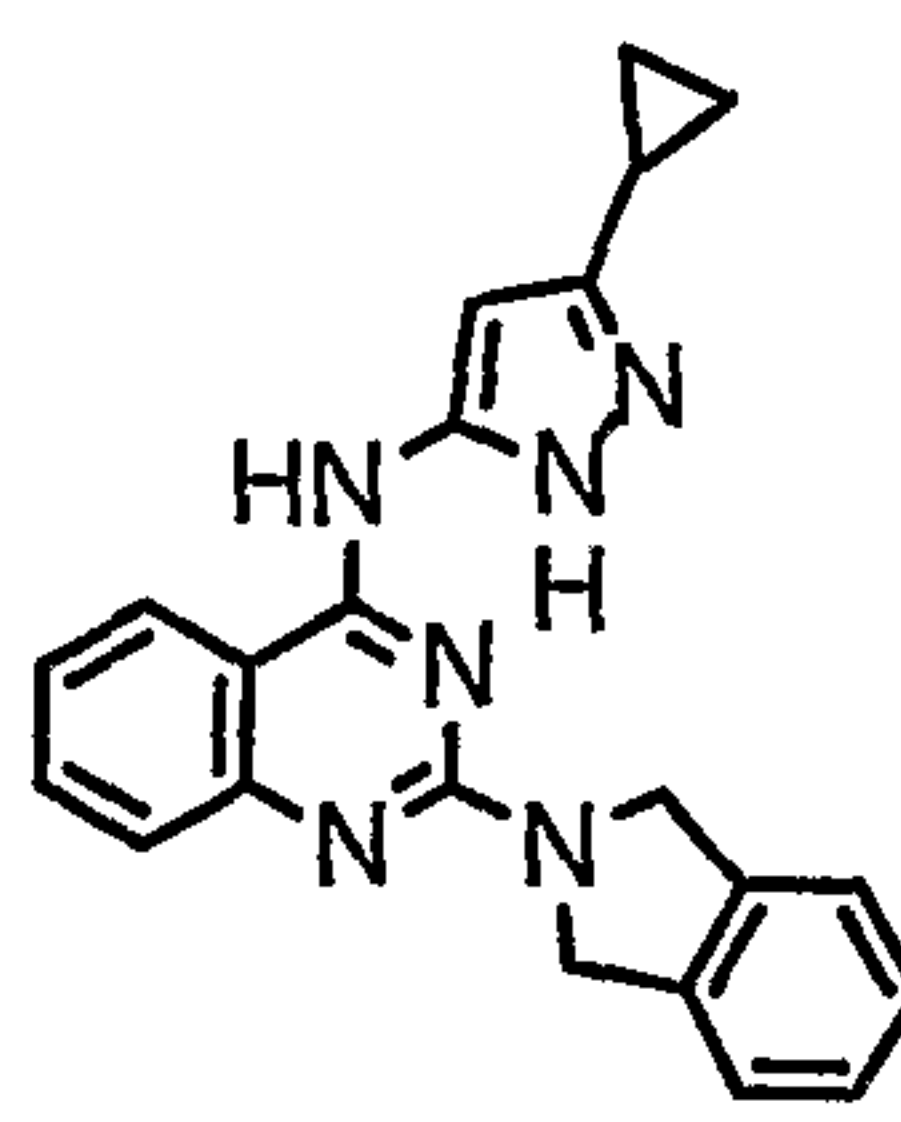
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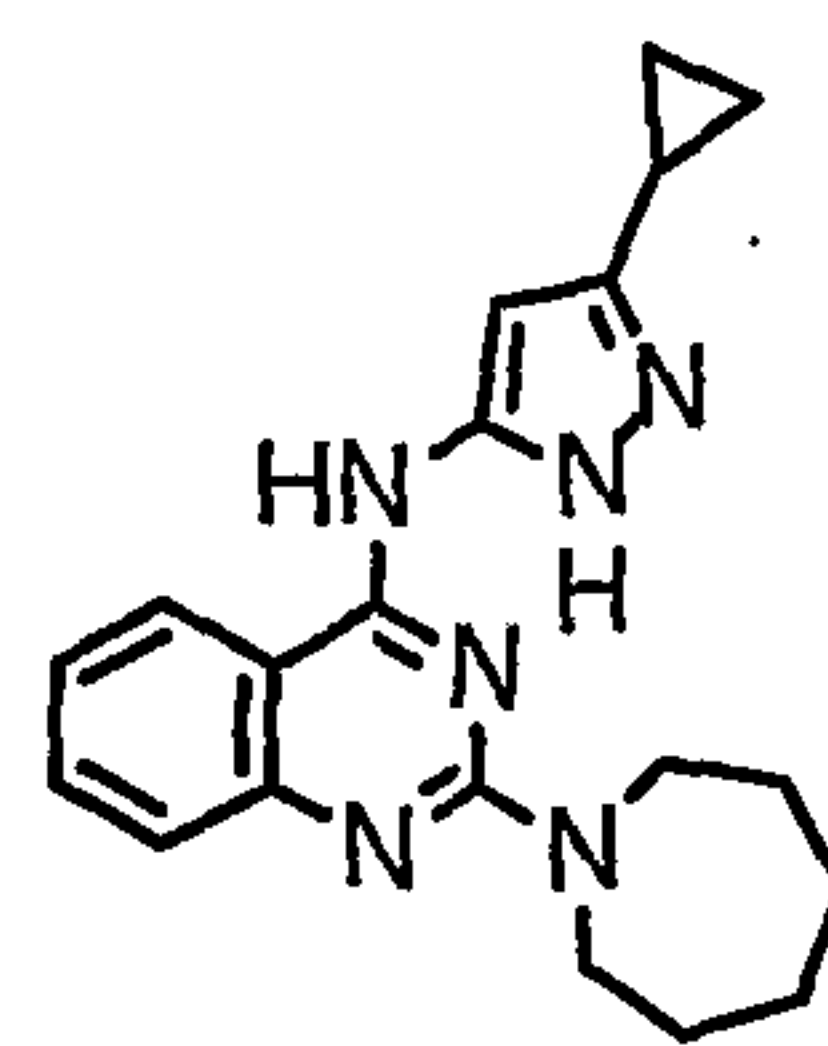
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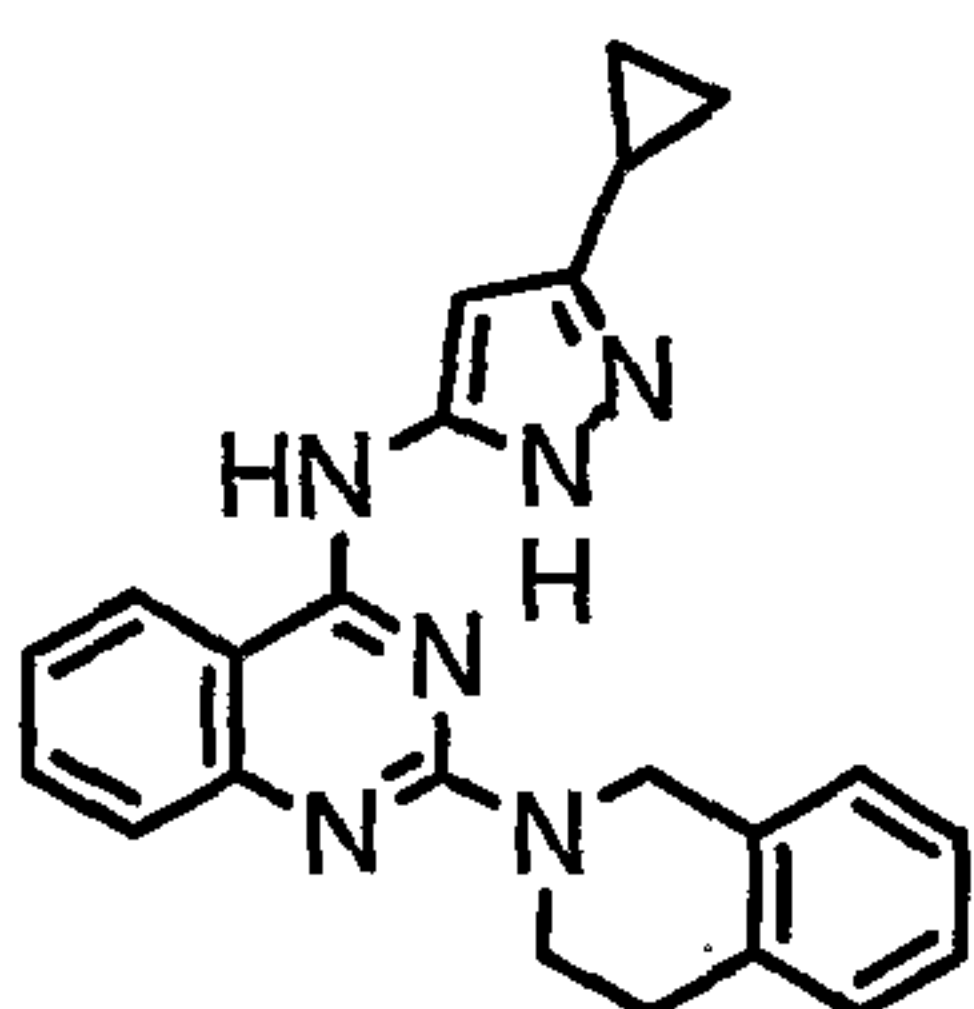
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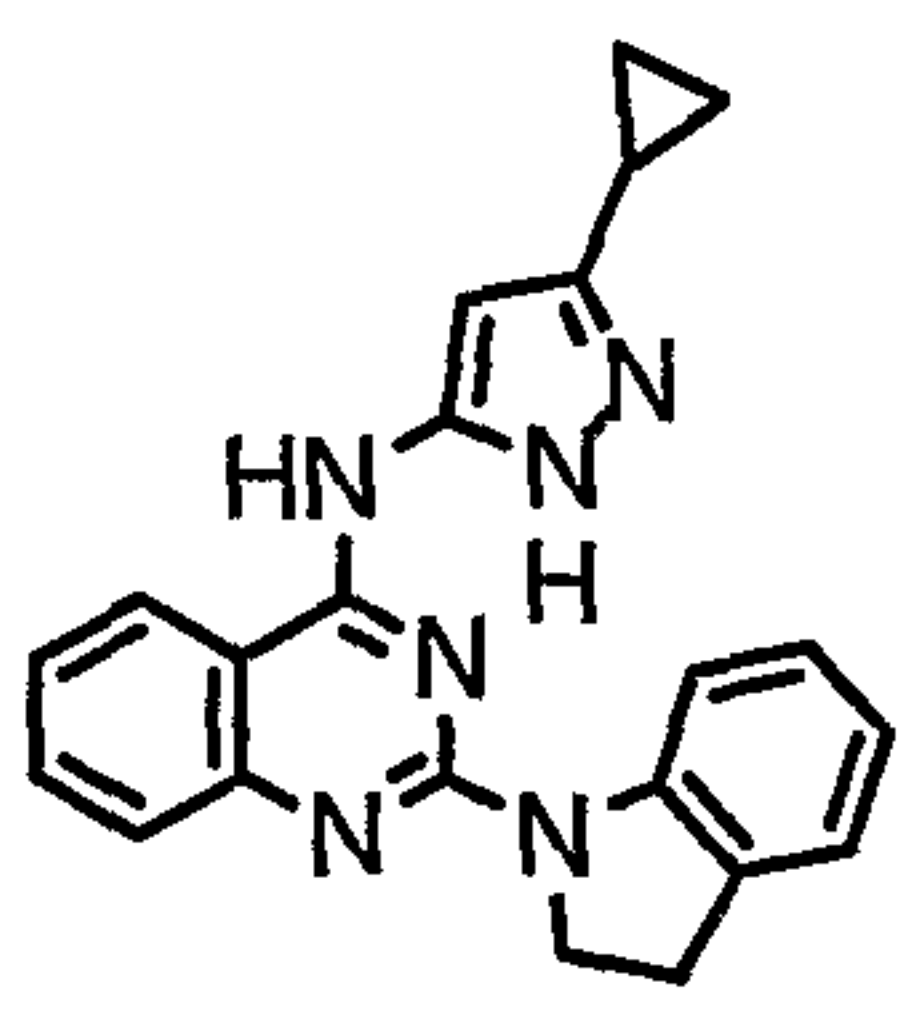
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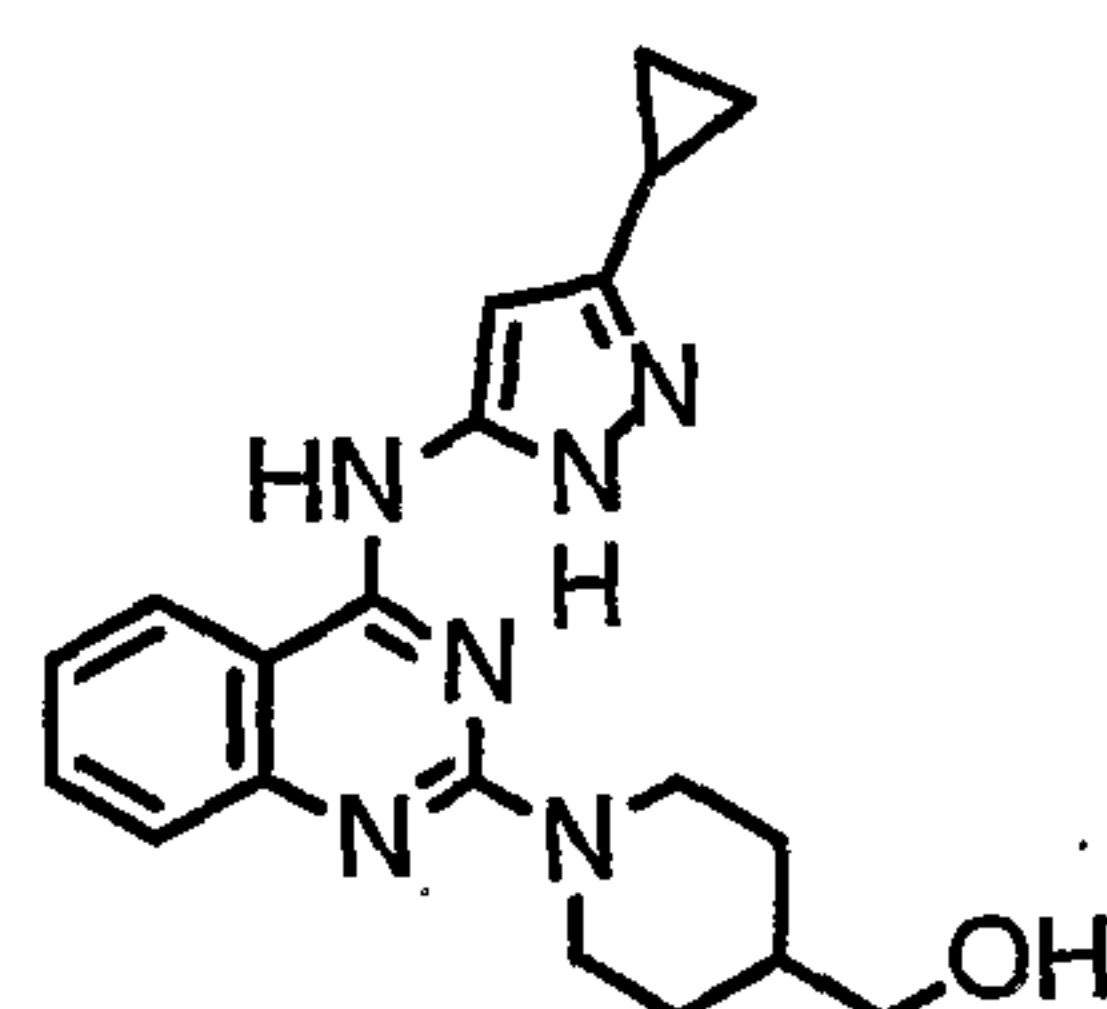
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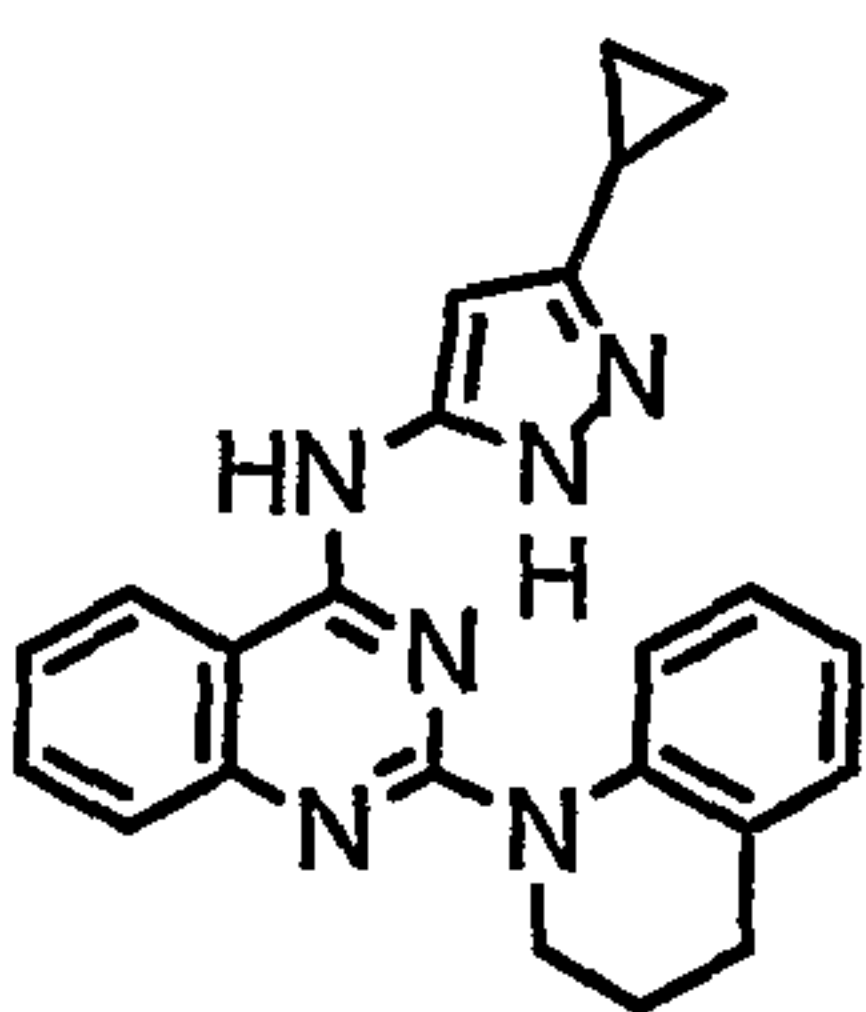
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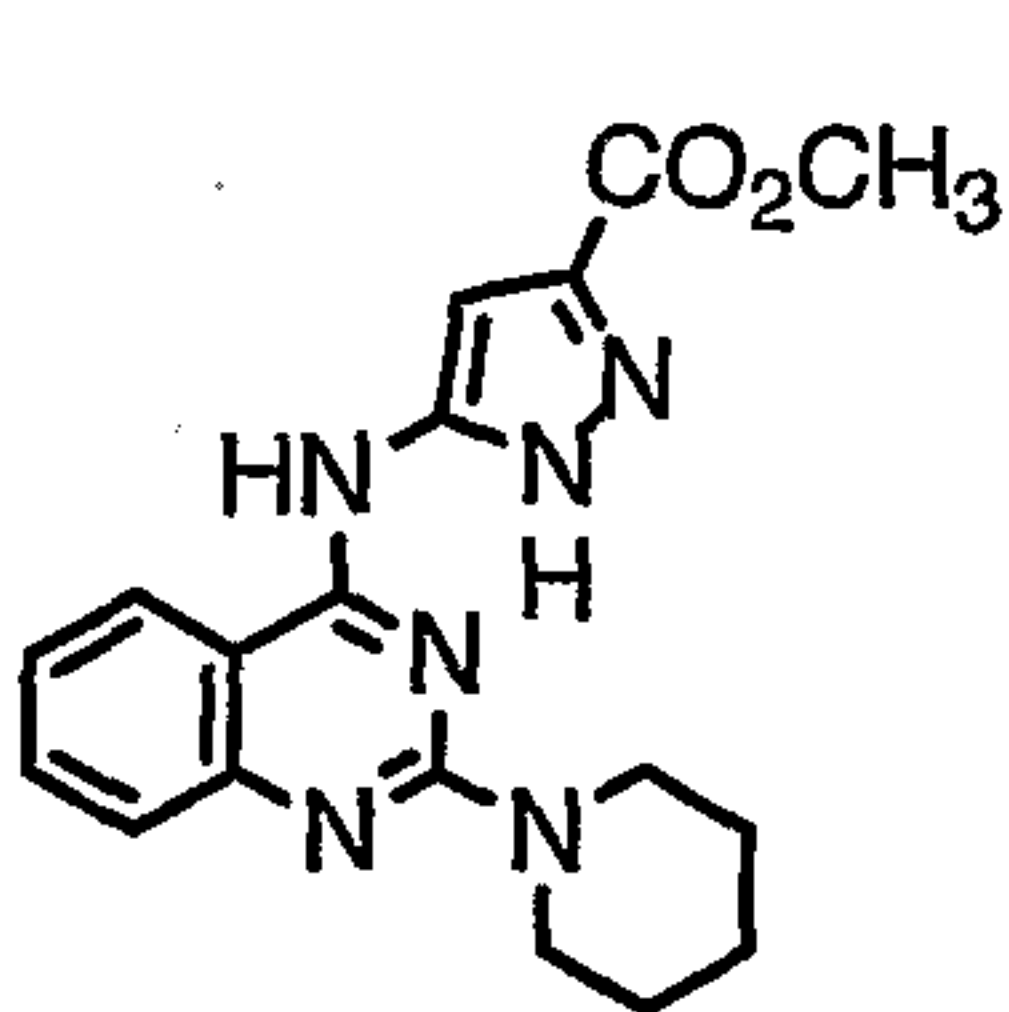
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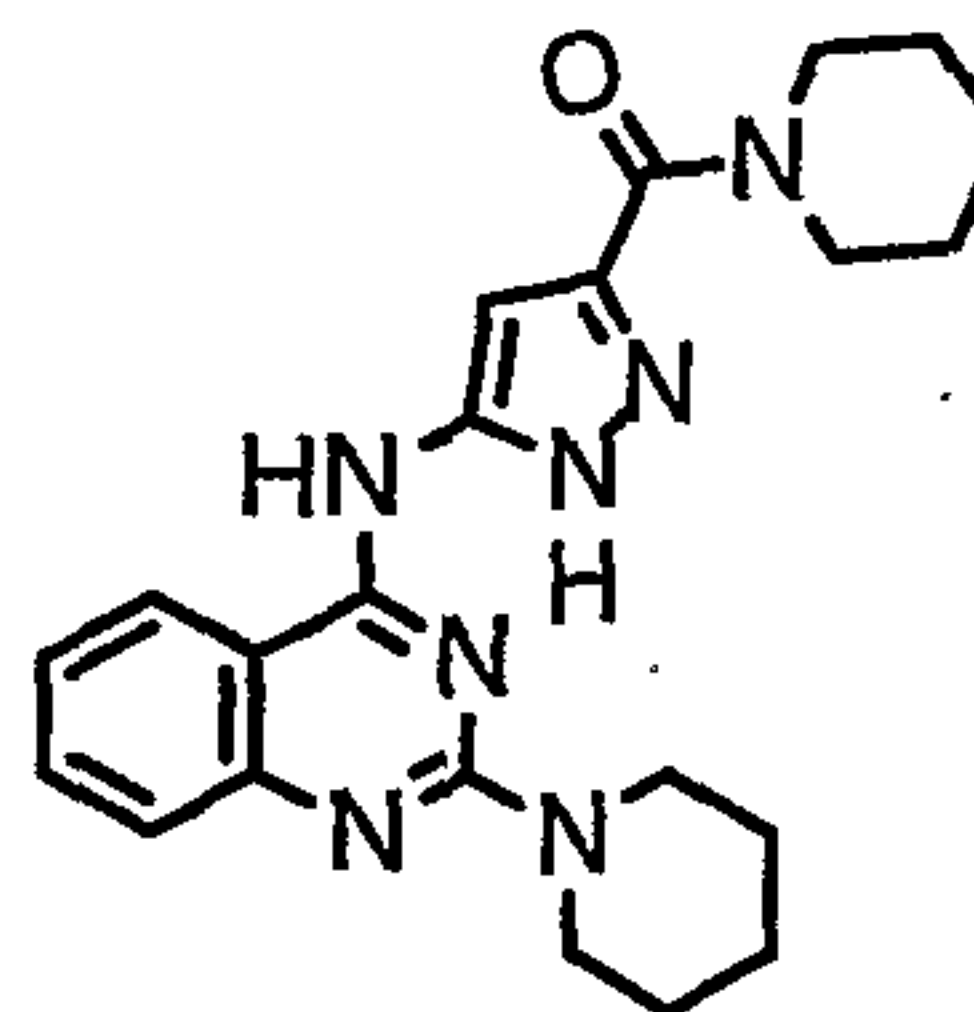
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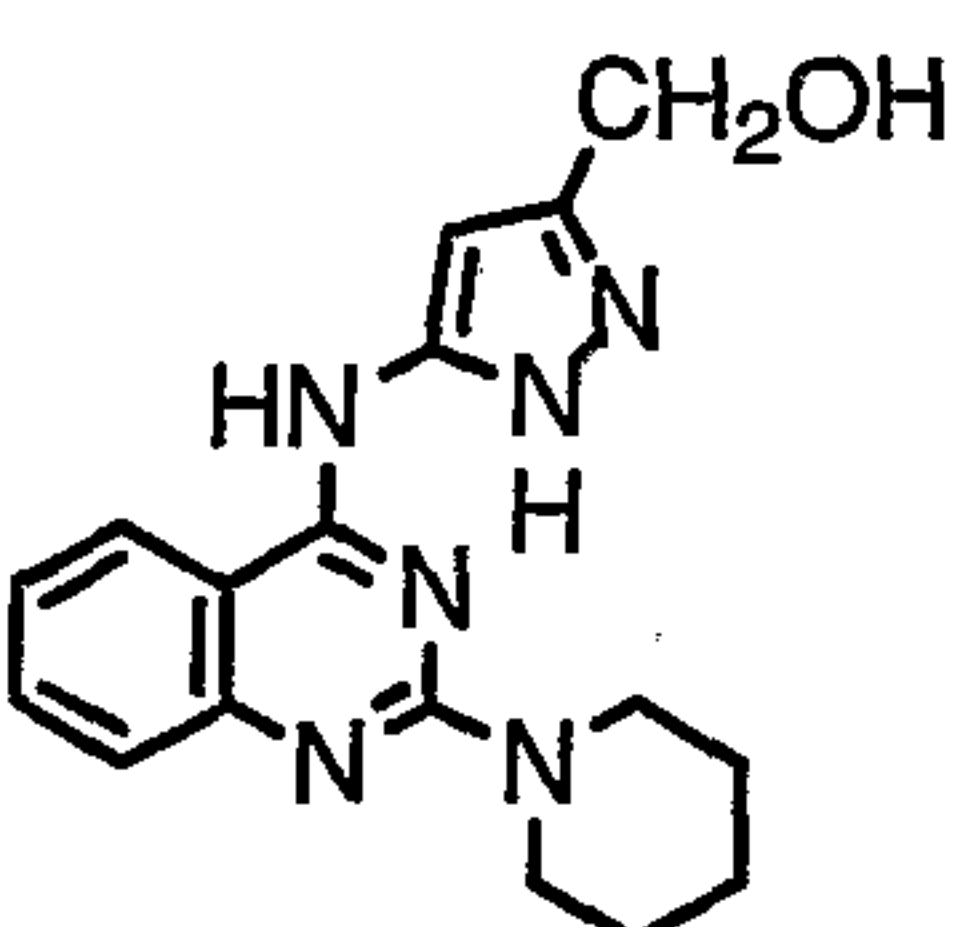
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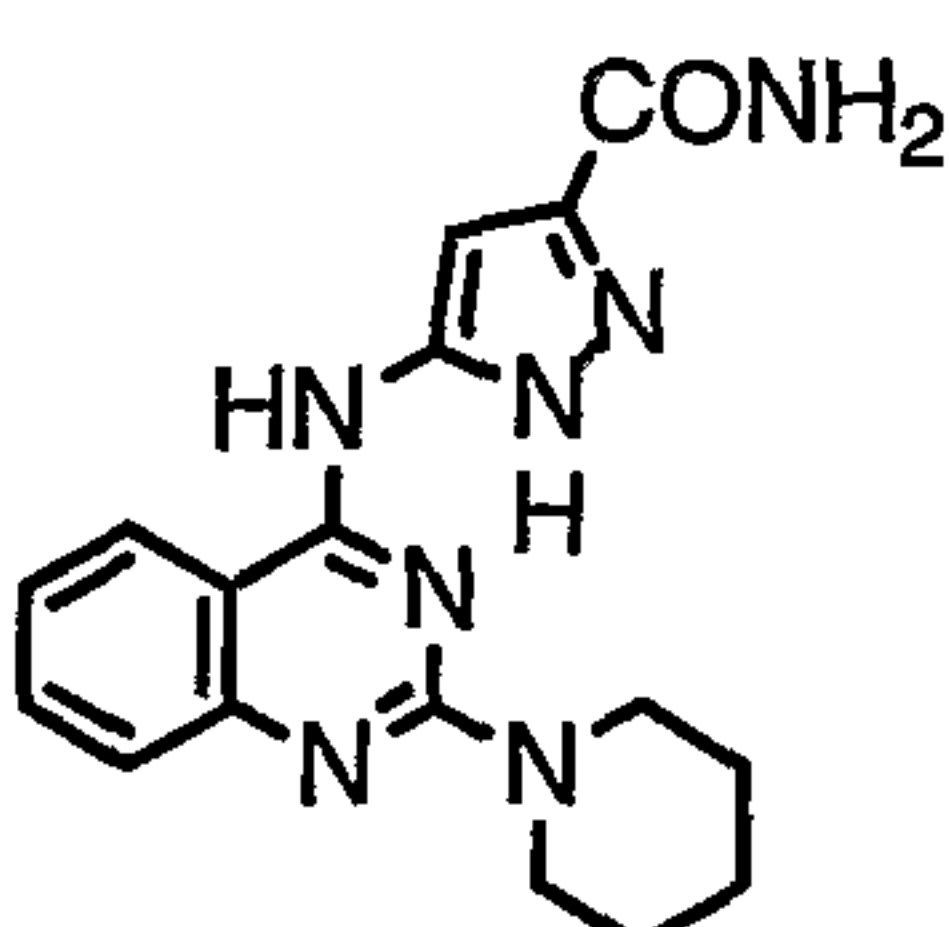
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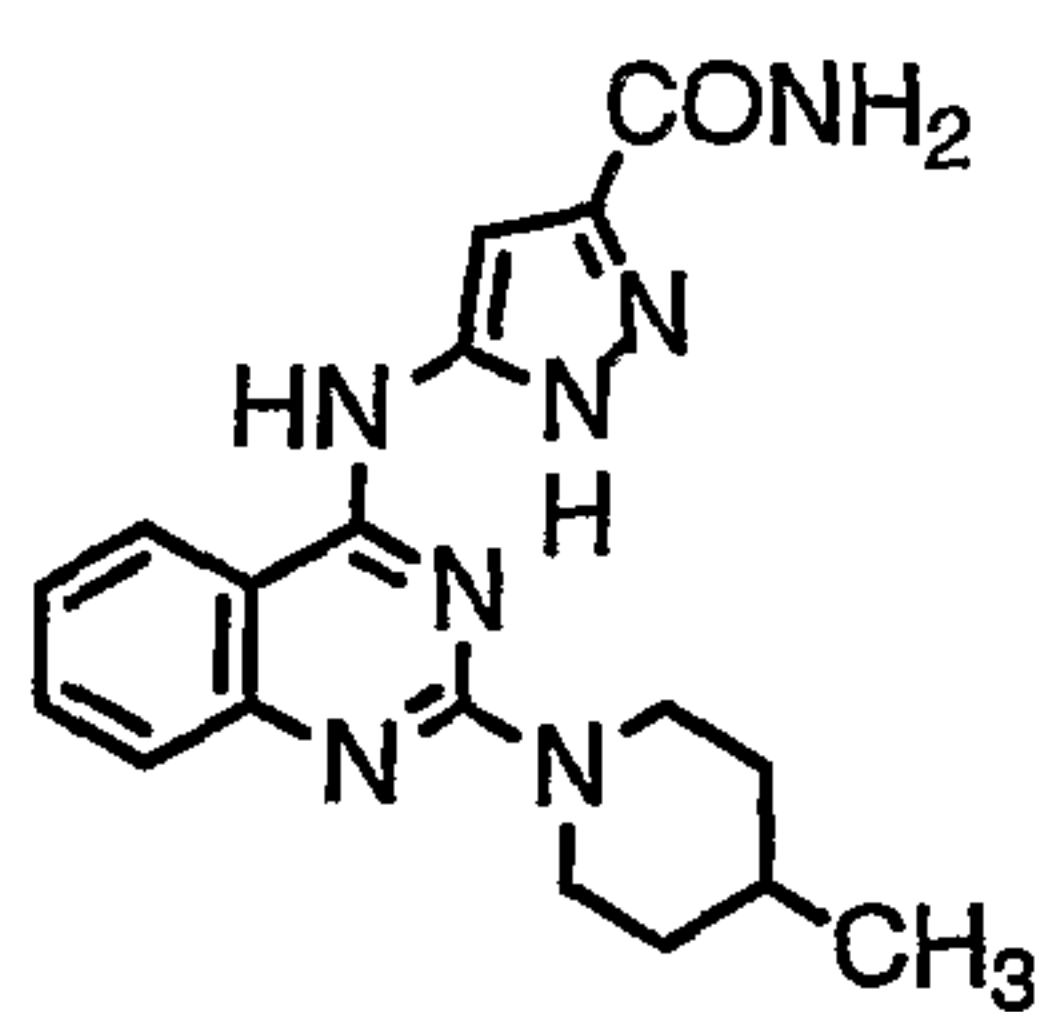
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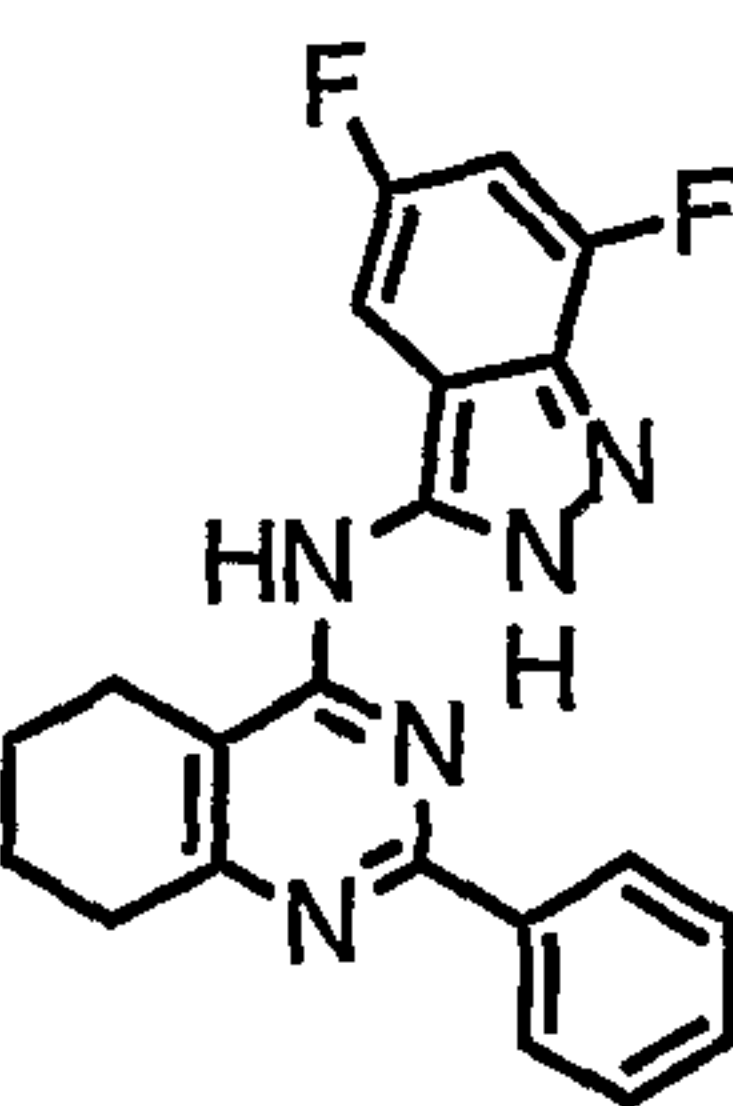
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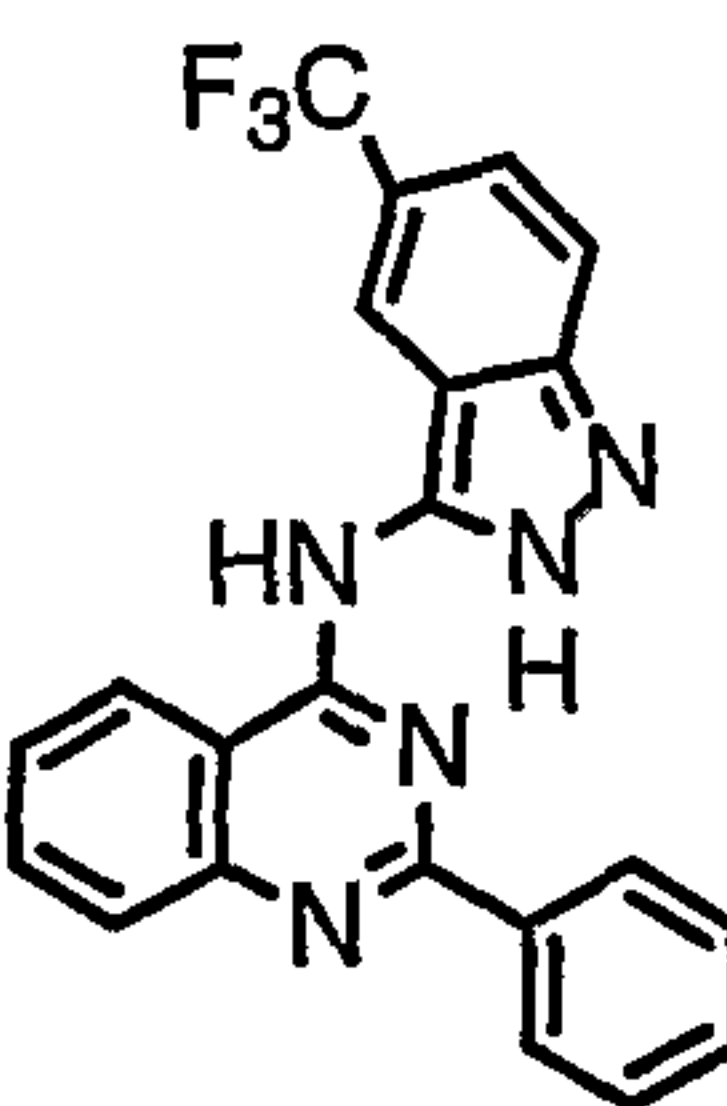
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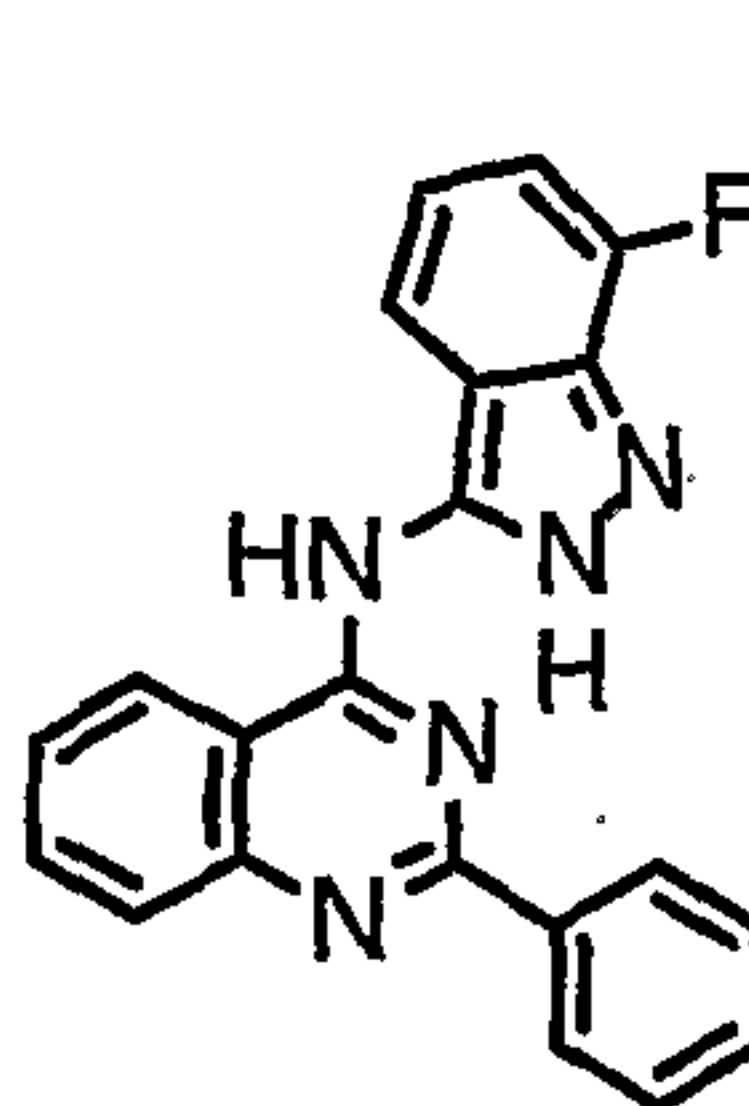
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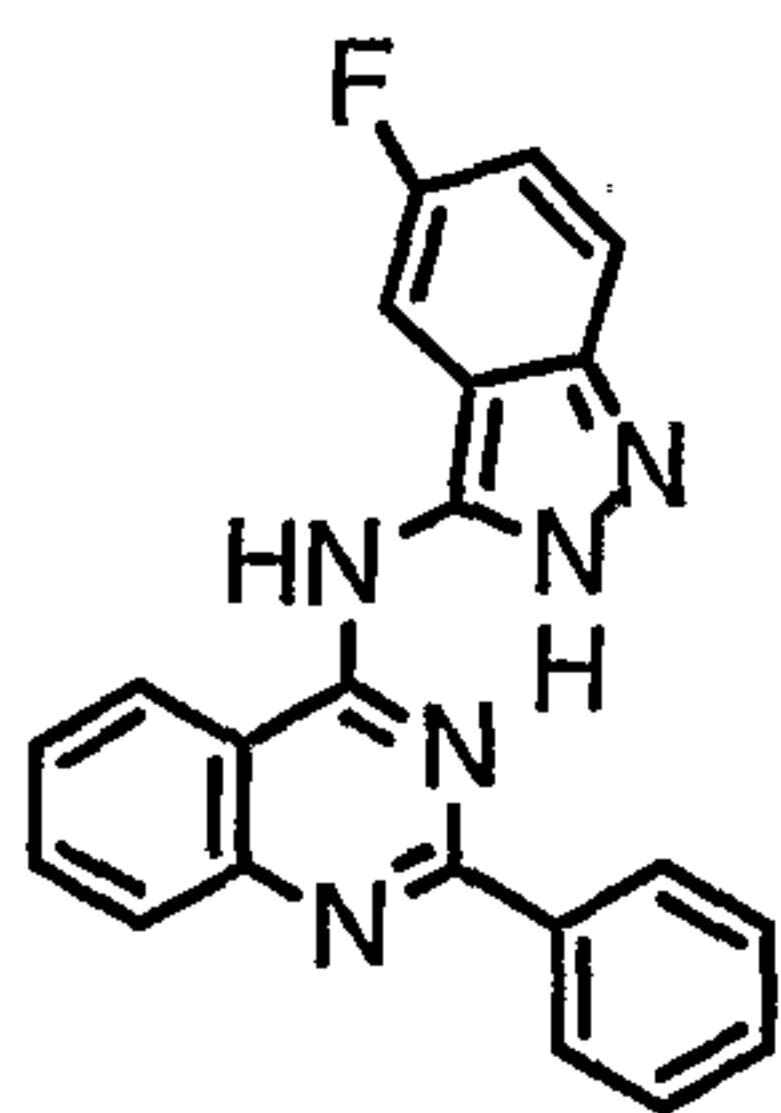
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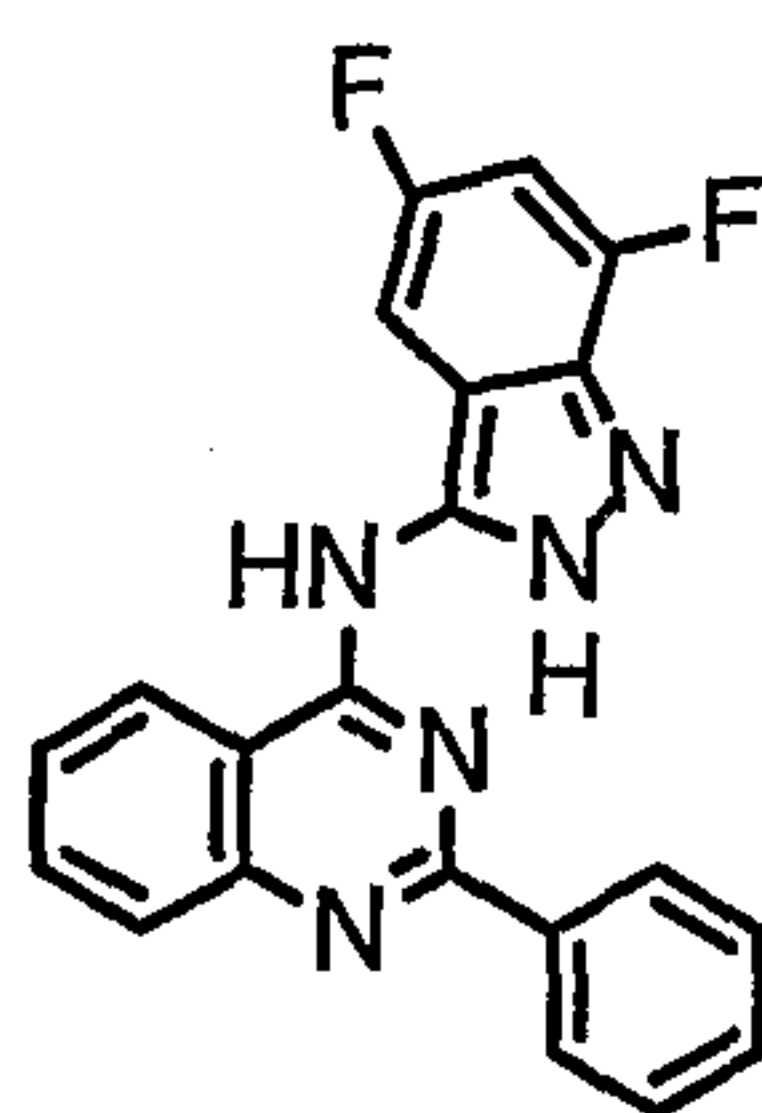
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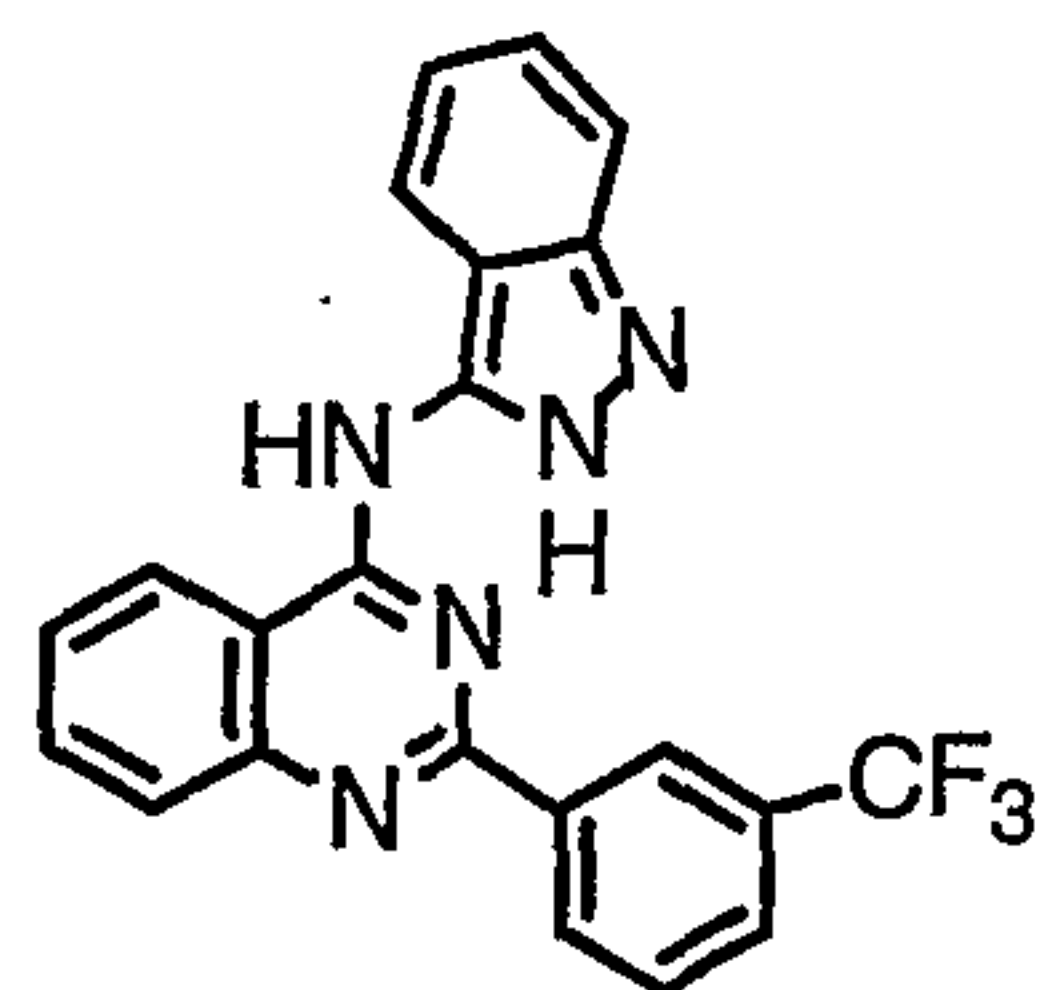
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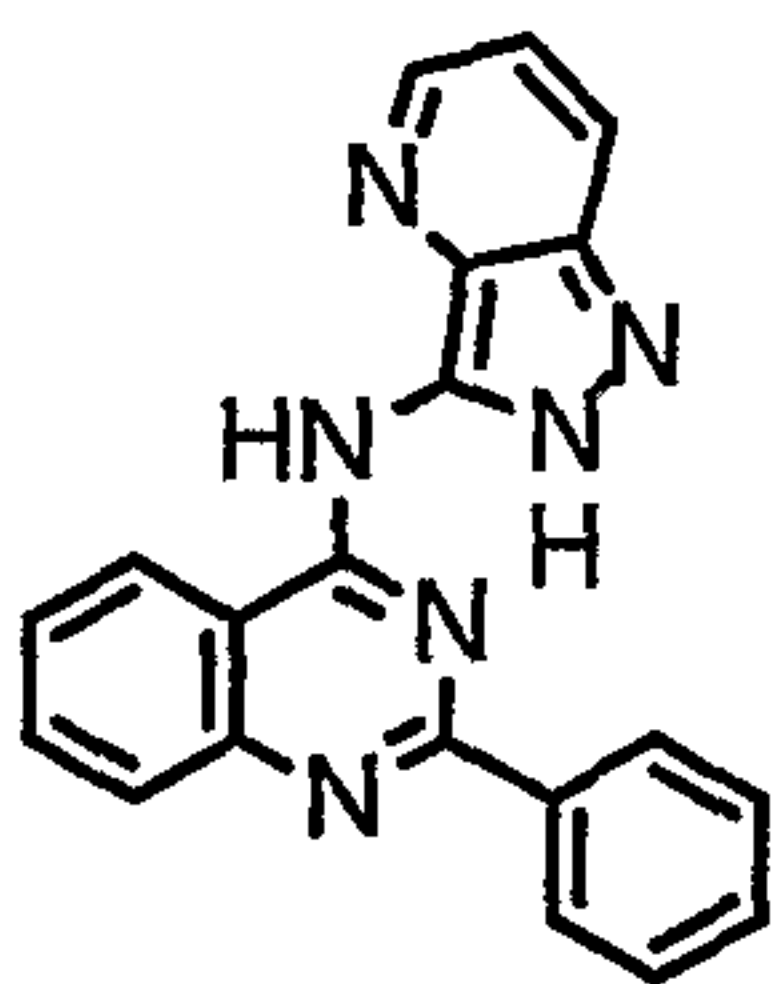
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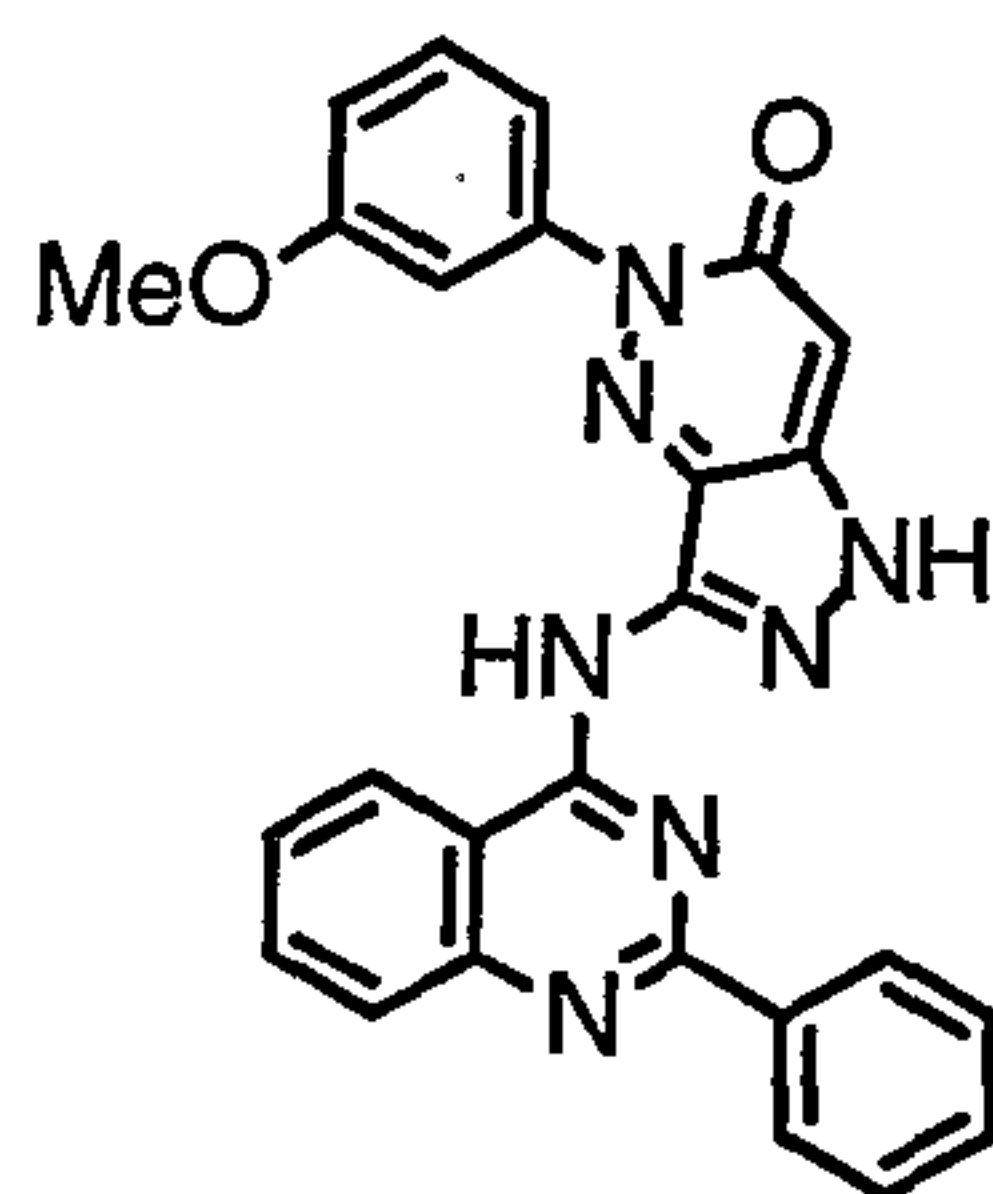
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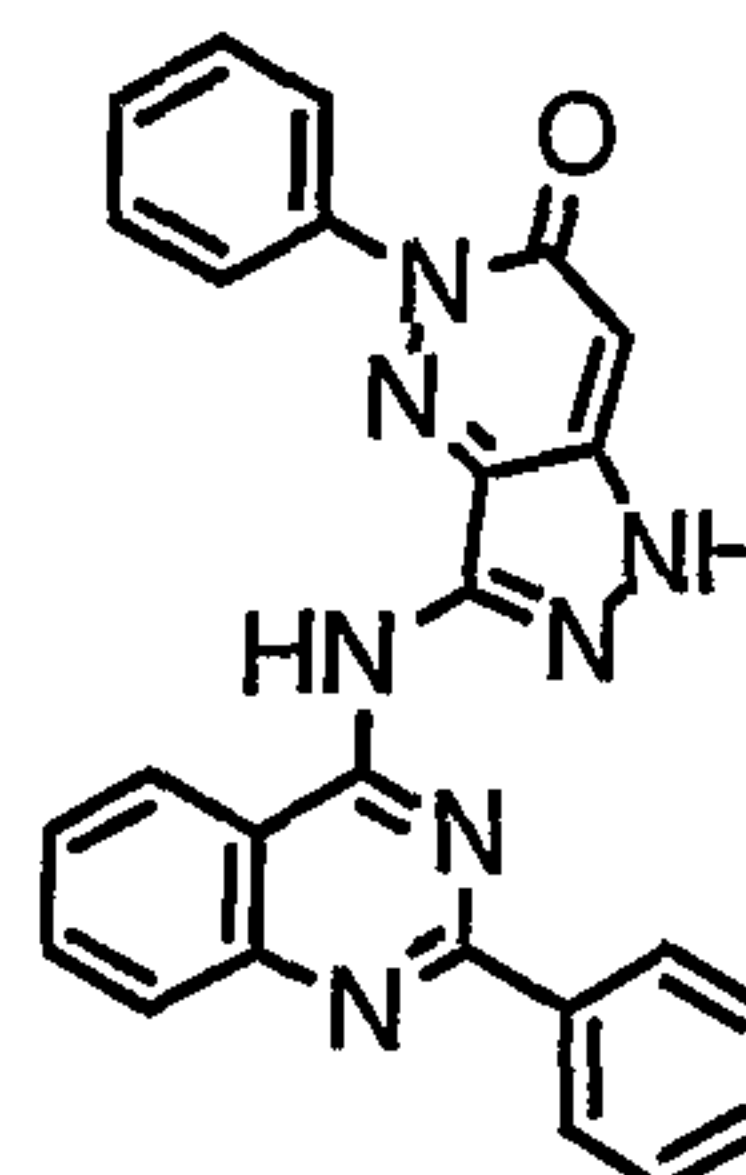
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III-133

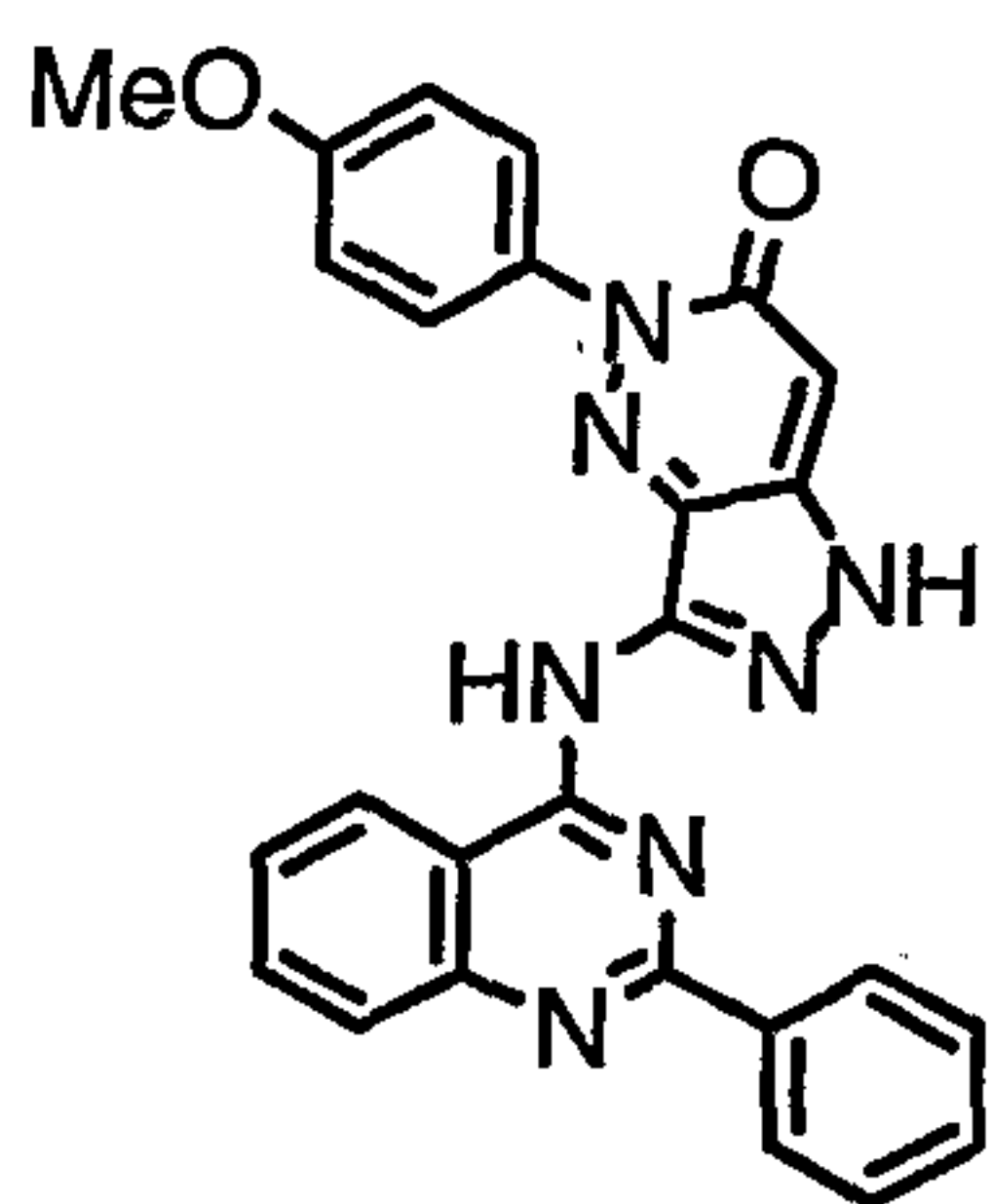


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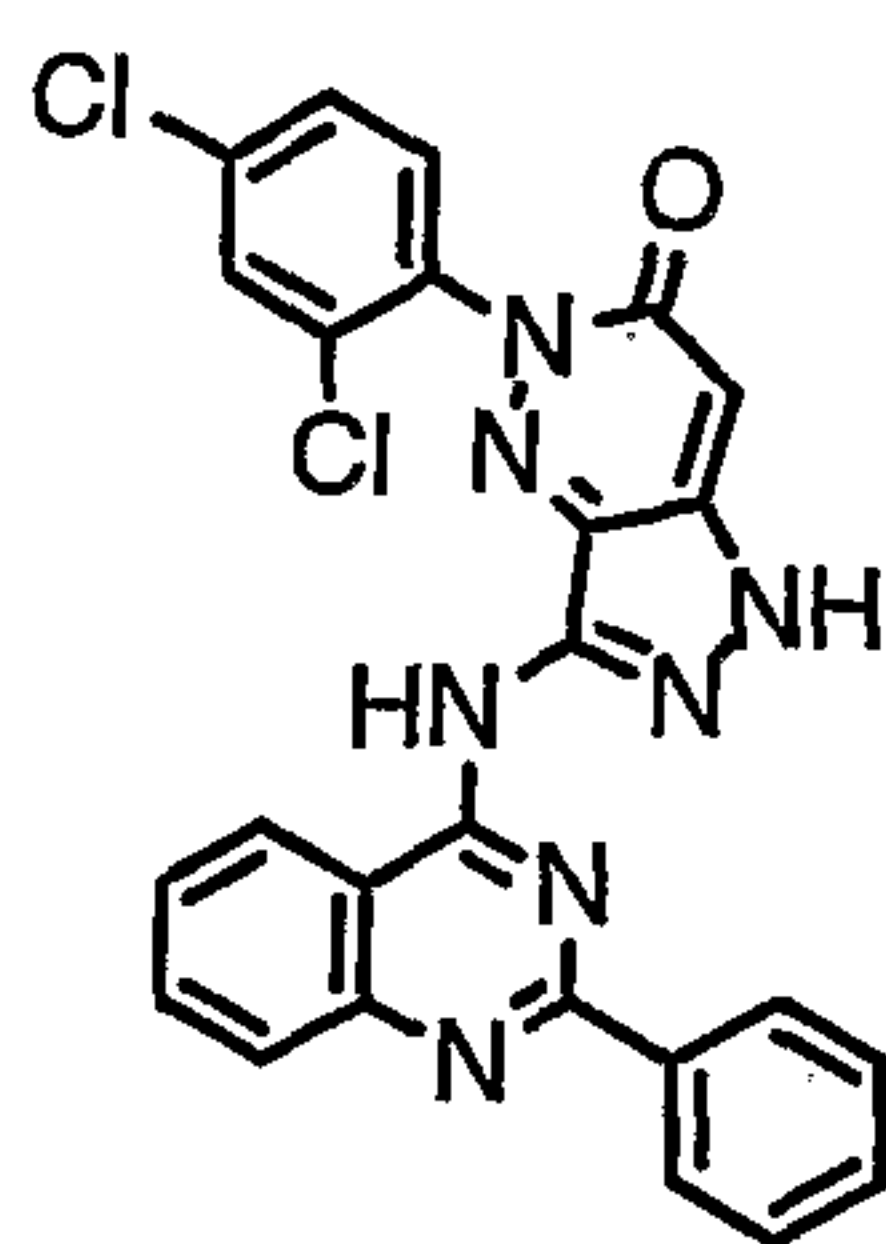


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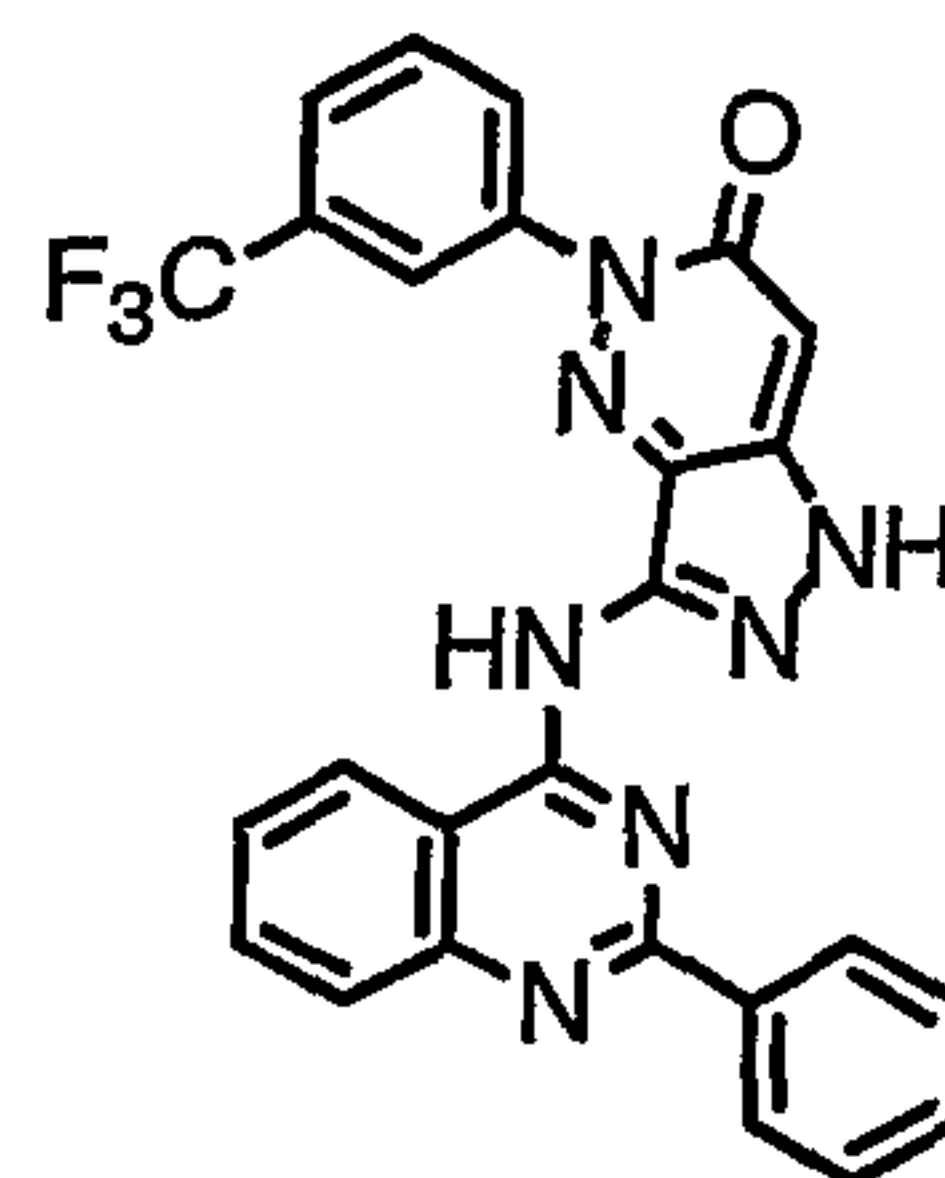
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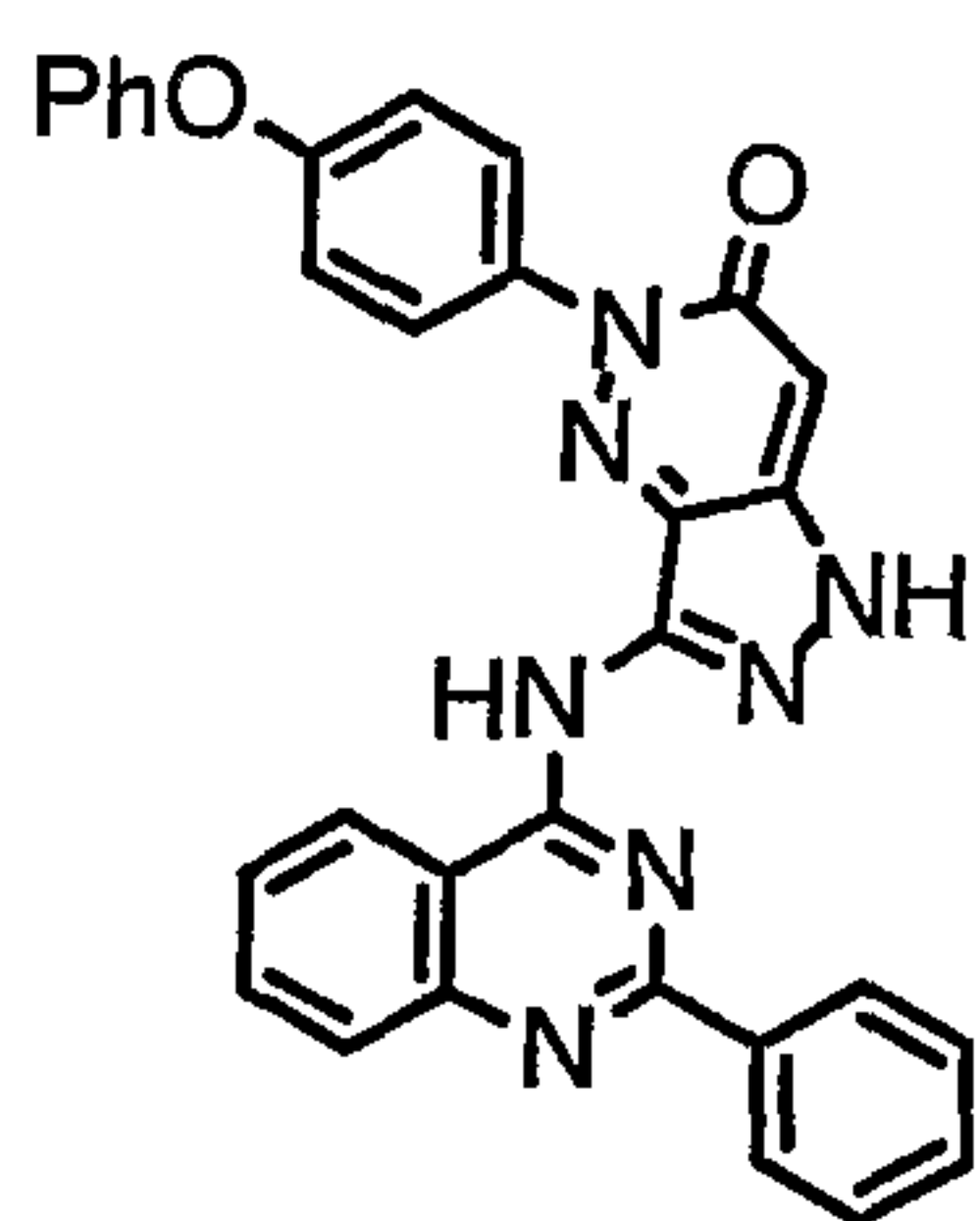
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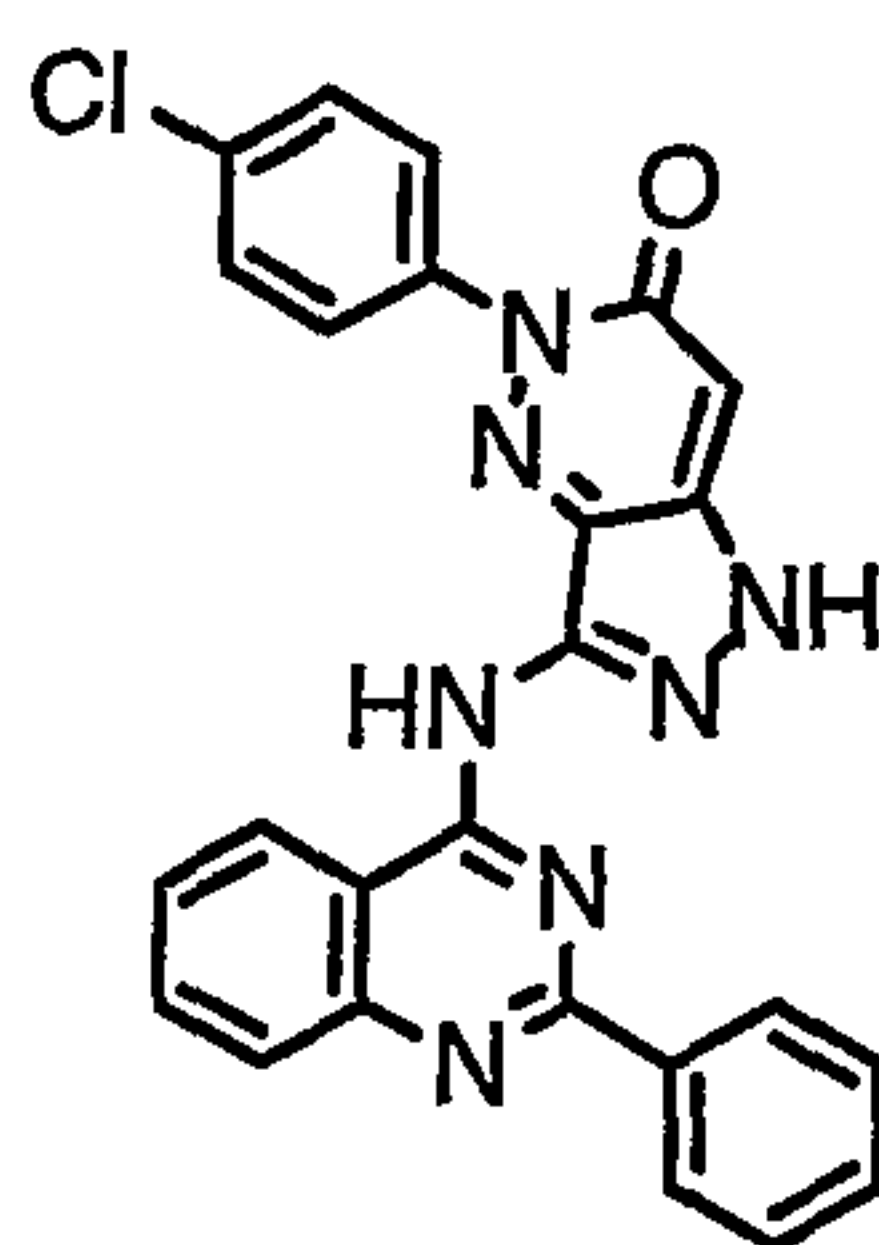
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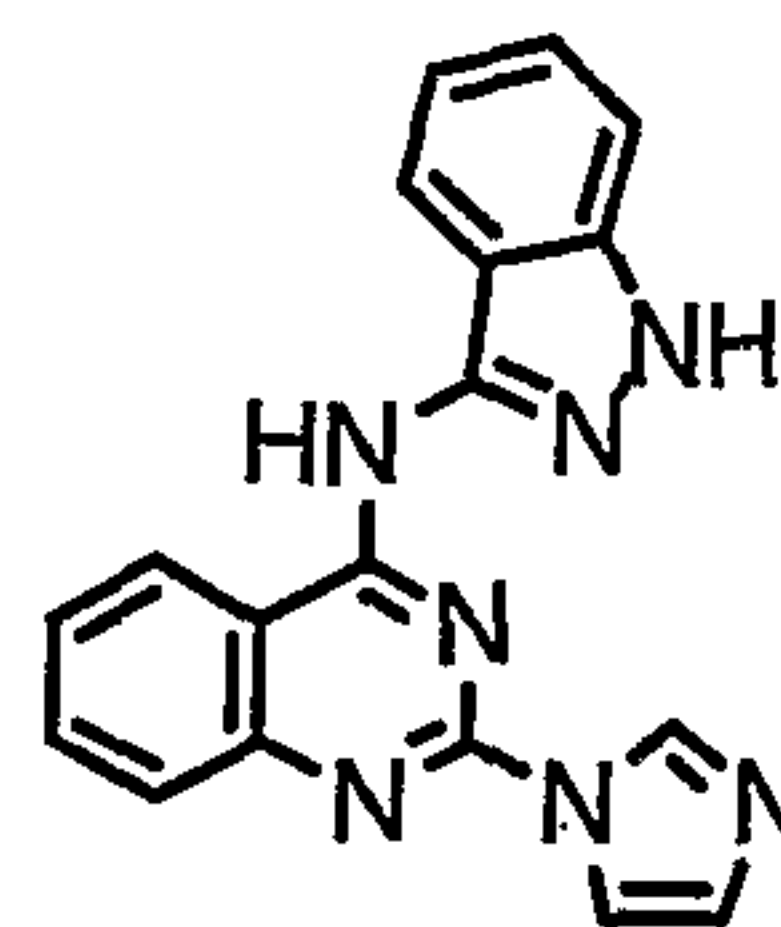
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III-139

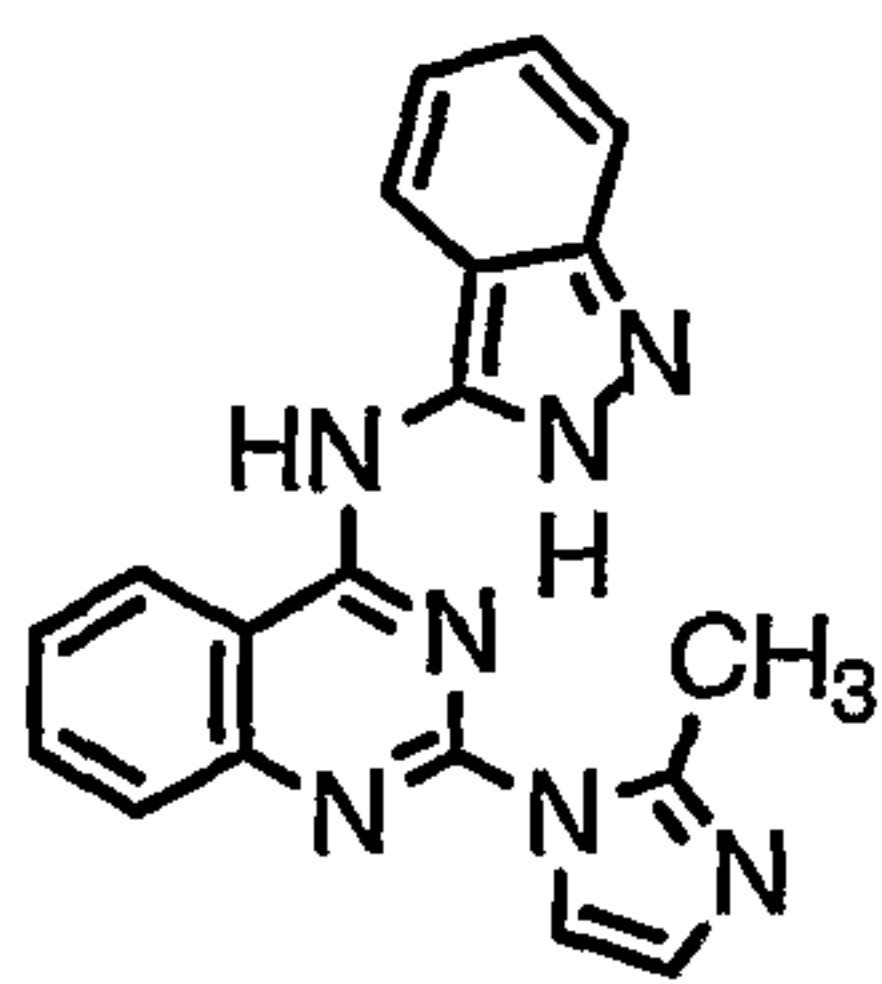


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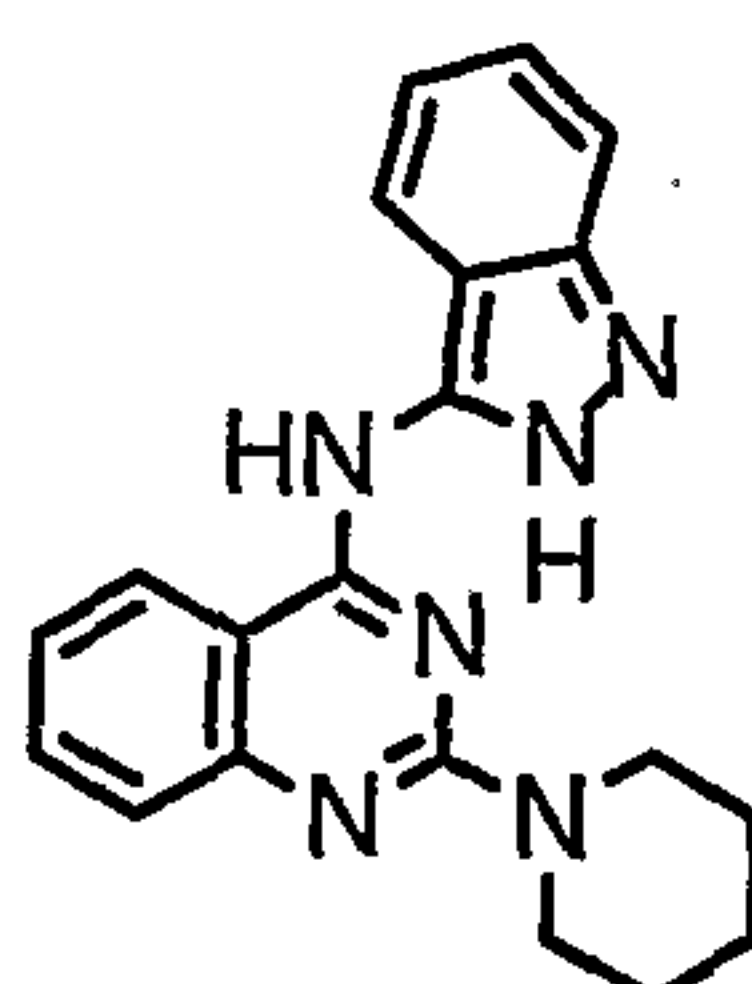


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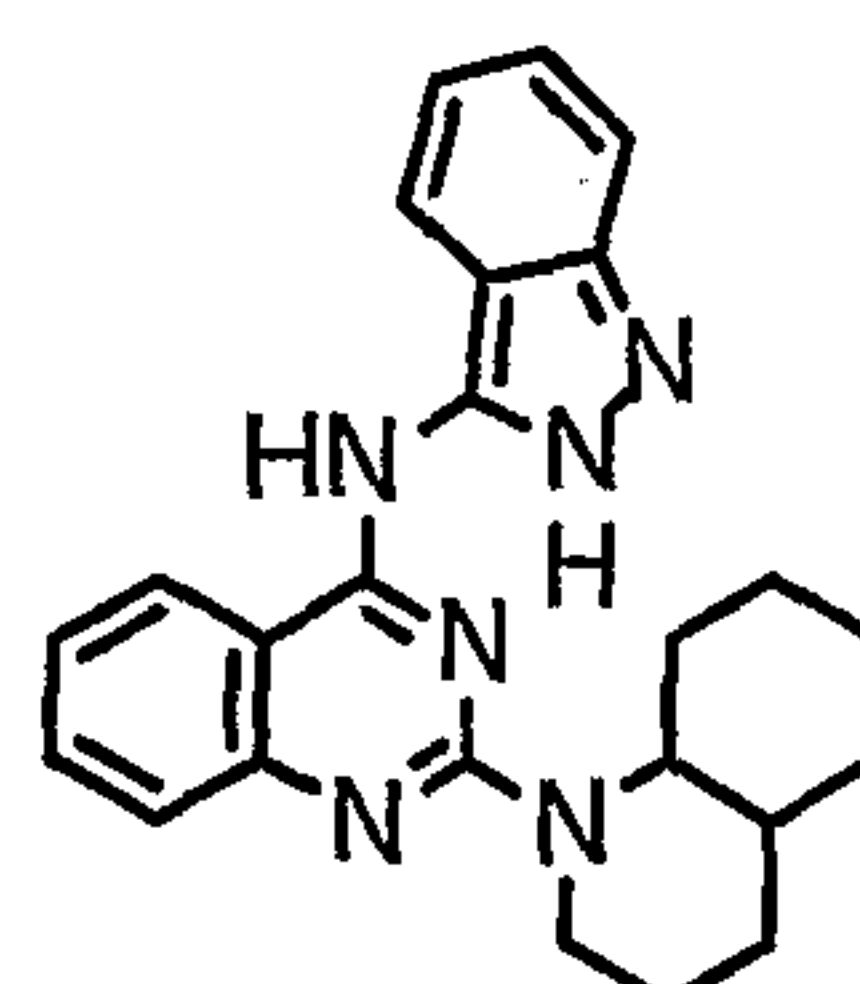
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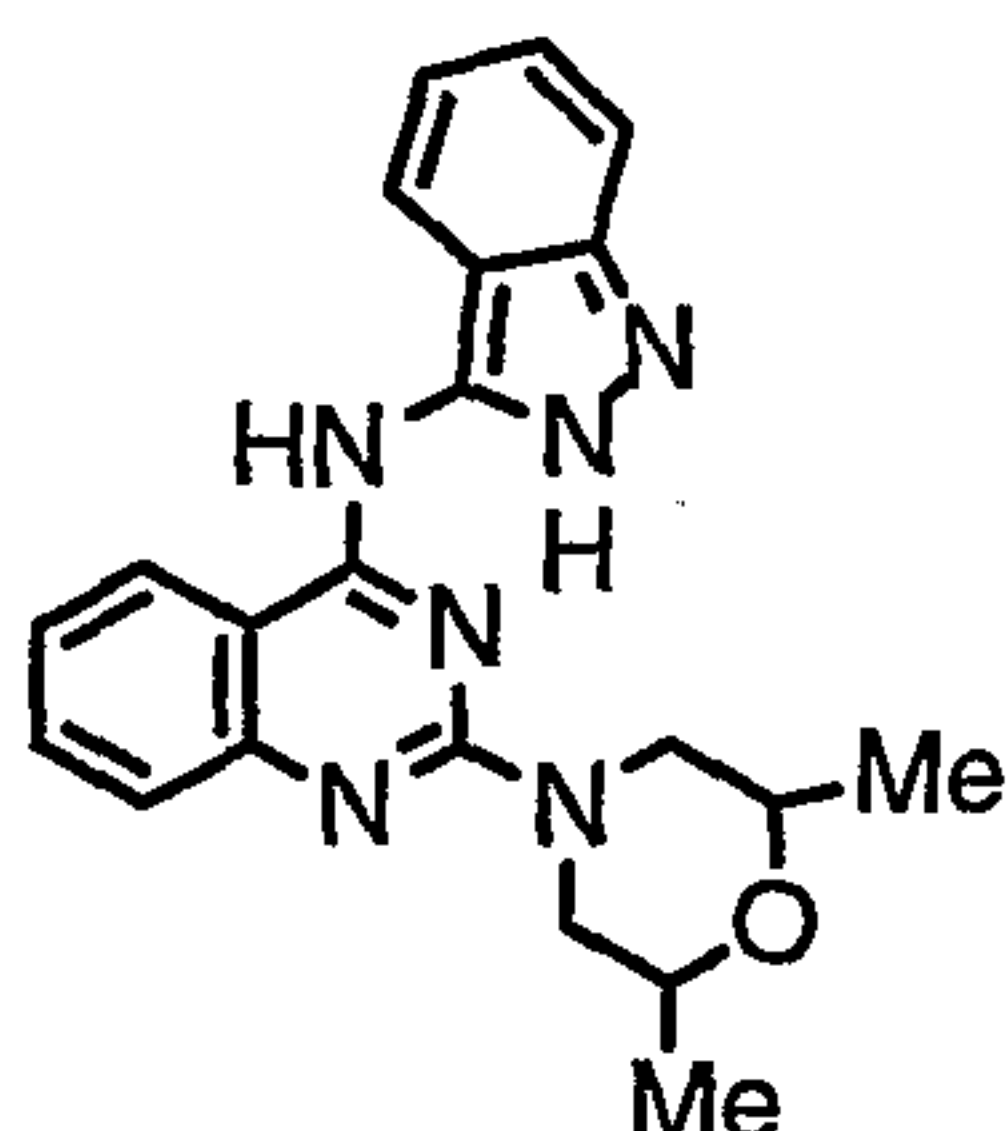
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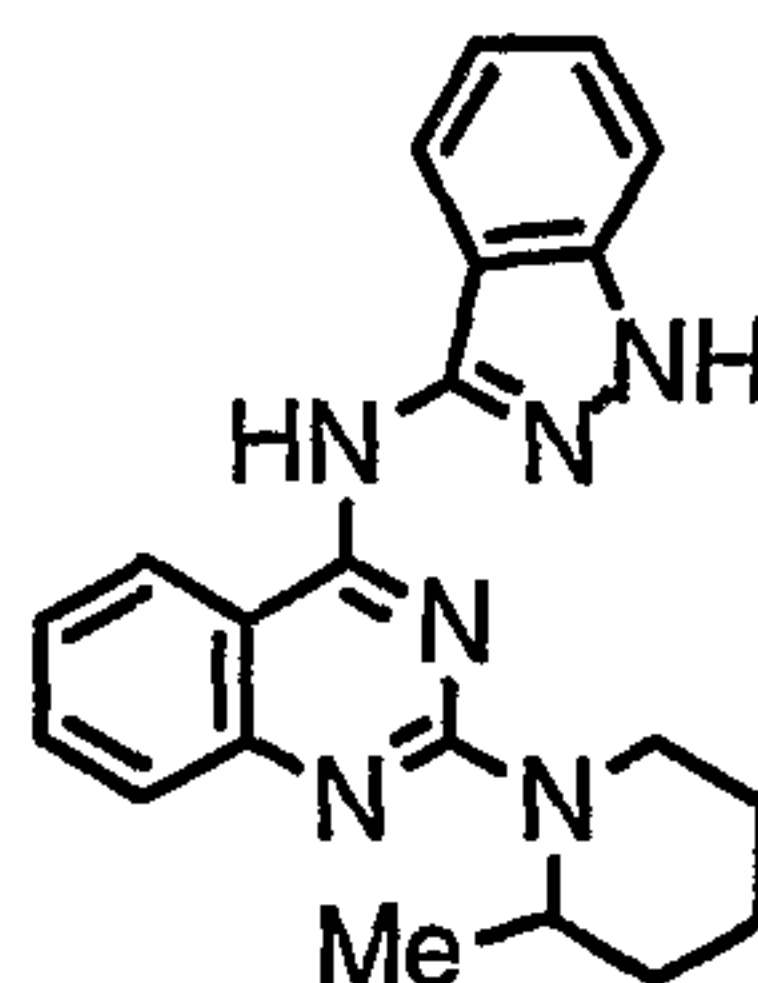
III-143



III-144



III-145



III-146

5

In another embodiment, this invention provides a composition comprising a compound of formula III and a pharmaceutically acceptable carrier.

10 One aspect of this invention relates to a method of inhibiting GSK-3 activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula III.

15 Another aspect relates to a method of treating a disease that is alleviated by treatment with a GSK-3 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition
20 comprising a compound of formula III.

Another aspect relates to a method of enhancing glycogen synthesis and/or lowering blood levels of glucose in a patient in need thereof, comprising administering to said patient a therapeutically effective
25 amount of a composition comprising a compound of formula

III. This method is especially useful for diabetic patients.

Another aspect relates to a method of inhibiting the production of hyperphosphorylated Tau protein in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula III. This method is especially useful in halting or slowing the progression of Alzheimer's disease.

Another aspect relates to a method of inhibiting the phosphorylation of β -catenin in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula III. This method is especially useful for treating schizophrenia.

One aspect of this invention relates to a method of inhibiting Aurora activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula III.

Another aspect relates to a method of treating a disease that is alleviated by treatment with an Aurora inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula III. This method is especially useful for treating cancer, such as colon, ovarian, and breast cancer.

One aspect of this invention relates to a method of inhibiting CDK-2 activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula III.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a CDK-2 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula III. This method is especially useful for treating cancer, Alzheimer's disease, restenosis, angiogenesis, glomerulonephritis, cytomegalovirus, HIV, herpes, psoriasis, atherosclerosis, alopecia, and autoimmune diseases such as rheumatoid arthritis.

One aspect of this invention relates to a method of inhibiting Src activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula III.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a Src inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula III. This method is especially useful for treating hypercalcemia, osteoporosis, osteoarthritis, cancer, symptomatic treatment of bone metastasis, and Paget's disease.

Another method relates to inhibiting GSK-3, Aurora, CDK-2, or Src activity in a biological sample, which method comprises contacting the biological sample with the GSK-3, Aurora, CDK-2, or Src inhibitor of formula III, or a pharmaceutical composition thereof, in an amount effective to inhibit GSK-3, Aurora, CDK-2, or Src.

Each of the aforementioned methods directed to the inhibition of GSK-3, Aurora, CDK-2, or Src, or the

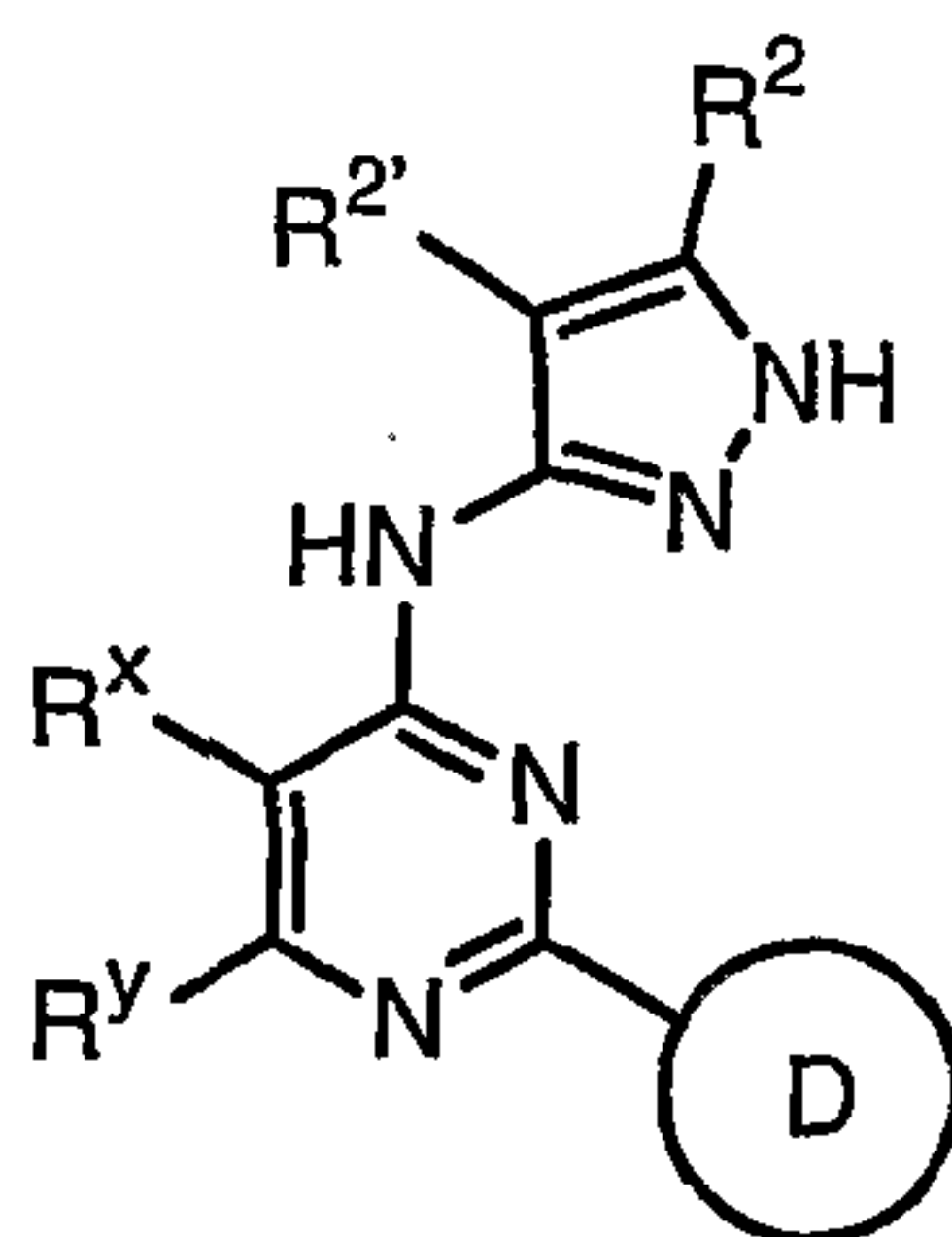
treatment of a disease alleviated thereby, is preferably carried out with a preferred compound of formula III, as described above.

Compounds of formula III, wherein $R^{2'}$ is
5 hydrogen and R^x and R^y are taken together with the pyrimidine ring to form an optionally substituted quinazoline ring system, are also inhibitors of ERK-2 and AKT protein kinases.

Accordingly, another method of this invention
10 relates to a method of inhibiting ERK-2 or AKT activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula III, wherein $R^{2'}$ is
15 hydrogen and R^x and R^y are taken together with the pyrimidine ring to form an optionally substituted quinazoline ring system.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a ERK-2 or AKT inhibitor, said method comprising the step of
20 administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula III, wherein $R^{2'}$ is hydrogen and R^x and R^y are taken together with the pyrimidine ring to form an optionally substituted
25 quinazoline ring system. This method is especially useful for treating cancer, stroke, hepatomegaly, cardiovascular disease, Alzheimer's disease, cystic fibrosis, viral disease, autoimmune diseases, restenosis, psoriasis, allergic disorders including asthma,
30 inflammation, and neurological disorders.

Another embodiment of this invention relates to compounds of formula IV:



IV

or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl,

5 heterocyclyl or carbocyclyl, said heteroaryl or heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by oxo or -R⁵, and at any substitutable ring nitrogen by -R⁴,
 10 provided that when Ring D is a six-membered aryl or heteroaryl ring, -R⁵ is hydrogen at each ortho carbon position of Ring D;

R^x and R^y are independently selected from T-R³, or R^x and R^y are taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-8 membered ring having 1-3 ring heteroatoms selected from oxygen, sulfur, or nitrogen, wherein any substitutable carbon on said fused ring is optionally and independently substituted by T-R³, and any substitutable nitrogen on said ring is substituted by R⁴;

T is a valence bond or a C₁₋₄ alkylidene chain;

R² and R^{2'} are independently selected from -R, -T-W-R⁶, or R² and R^{2'} are taken together with their intervening
 15 atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring containing 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur,

wherein said fused ring is optionally substituted by up to three groups independently selected from halo, oxo, -CN, -NO₂, -R⁷, or -V-R⁶;

R³ is selected from -R, -halo, =O, -OR, -C(=O)R, -CO₂R, -COCOR, -COCH₂COR, -NO₂, -CN, -S(O)R, -S(O)₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂;

each R is independently selected from hydrogen or an optionally substituted group selected from C₁₋₆ aliphatic, C₆₋₁₀ aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R⁴ is independently selected from -R⁷, -COR⁷,
 5 -CO₂(optionally substituted C₁₋₆ aliphatic), -CON(R⁷)₂, or -SO₂R⁷, or two R⁴ on the same nitrogen are taken together to form a 5-8 membered heterocyclyl or heteroaryl ring;

each R⁵ is independently selected from -R, halo, -OR,
 10 -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂;

15 V is -O-, -S-, -SO-, -SO₂-, -N(R⁶)SO₂-, -SO₂N(R⁶)-, -N(R⁶)-, -CO-, -CO₂-, -N(R⁶)CO-, -N(R⁶)C(O)O-, -N(R⁶)CON(R⁶)-, -N(R⁶)SO₂N(R⁶)-, -N(R⁶)N(R⁶)-, -C(O)N(R⁶)-, -OC(O)N(R⁶)-, -C(R⁶)₂O-, -C(R⁶)₂S-, -C(R⁶)₂SO-, -C(R⁶)₂SO₂-, -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-,
 20 -C(R⁶)₂N(R⁶)C(O)-, -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-, -C(R⁶)=N-O-, -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-, or -C(R⁶)₂N(R⁶)CON(R⁶)-;

W is $-C(R^6)_2O-$, $-C(R^6)_2S-$, $-C(R^6)_2SO-$, $-C(R^6)_2SO_2-$,
 $-C(R^6)_2SO_2N(R^6)-$, $-C(R^6)_2N(R^6)-$, $-CO-$, $-CO_2-$,
 $-C(R^6)OC(O)-$, $-C(R^6)OC(O)N(R^6)-$, $-C(R^6)_2N(R^6)CO-$,
 $-C(R^6)_2N(R^6)C(O)O-$, $-C(R^6)=NN(R^6)-$, $-C(R^6)=N-O-$,
5 $-C(R^6)_2N(R^6)N(R^6)-$, $-C(R^6)_2N(R^6)SO_2N(R^6)-$,
 $-C(R^6)_2N(R^6)CON(R^6)-$, or $-CON(R^6)-$;

each R^6 is independently selected from hydrogen or an
optionally substituted C_{1-4} aliphatic group, or two R^6
groups on the same nitrogen atom are taken together
10 with the nitrogen atom to form a 5-6 membered
heterocyclyl or heteroaryl ring; and

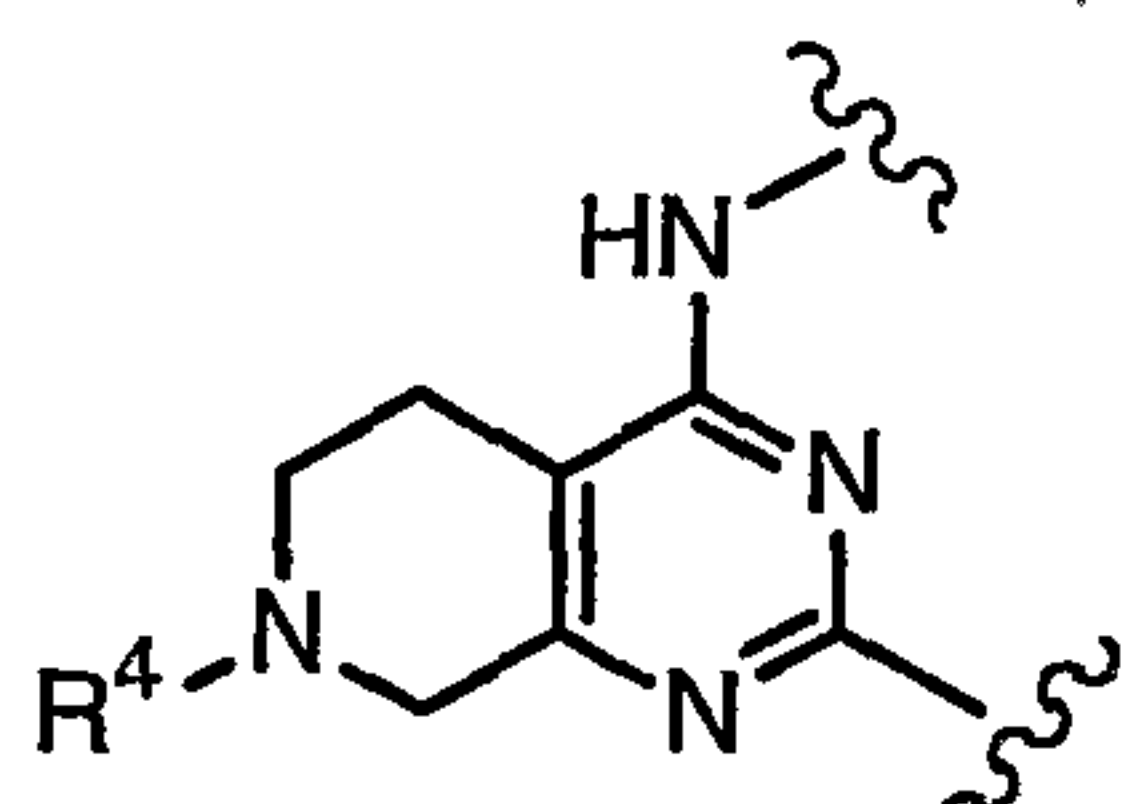
each R^7 is independently selected from hydrogen or an
optionally substituted C_{1-6} aliphatic group, or two R^7
on the same nitrogen are taken together with the
15 nitrogen to form a 5-8 membered heterocyclyl ring or
heteroaryl.

Preferred formula IV Ring D monocyclic rings
include substituted and unsubstituted phenyl, pyridinyl,
piperidinyl, piperazinyl, pyrrolidinyl, thienyl,
20 azepanyl, and morpholinyl rings. Preferred formula IV
Ring D bicyclic rings include 1,2,3,4-
tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl,
2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl,
isoquinolinyl, quinolinyl, and naphthyl. Examples of
25 more preferred Ring D bicyclic rings include naphthyl and
isoquinolinyl.

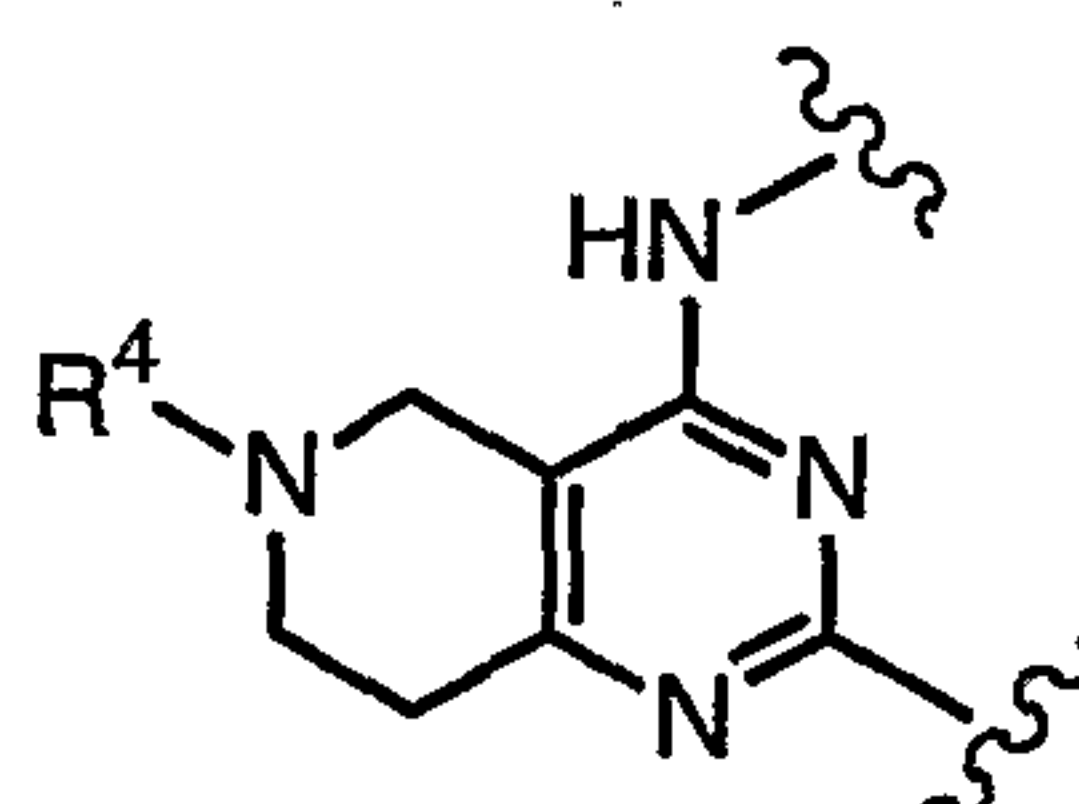
Preferred substituents on Ring D of formula IV
include halo, oxo, CN, $-NO_2$, $-N(R^4)_2$, $-CO_2R$, $-CONH(R^4)$,
 $-N(R^4)COR$, $-SO_2N(R^4)_2$, $-N(R^4)SO_2R$, $-SR$, $-OR$, $-C(O)R$, or
30 substituted or unsubstituted group selected from 5-6
membered heterocyclyl, C_{6-10} aryl, or C_{1-6} aliphatic. More
preferred R^5 substituents include -halo, -CN, -oxo, -SR,
-OR, $-N(R^4)_2$, $-C(O)R$, or a substituted or unsubstituted
group selected from 5-6 membered heterocyclyl, C_{6-10} aryl,

or C₁₋₆ aliphatic. Examples of Ring D substituents include -OH, phenyl, methyl, CH₂OH, CH₂CH₂OH, pyrrolidinyl, OPh, CF₃, C≡CH, Cl, Br, F, I, NH₂, C(O)CH₃, *i*-propyl, *tert*-butyl, SEt, OMe, N(Me)₂, methylene dioxy, and ethylene dioxy.

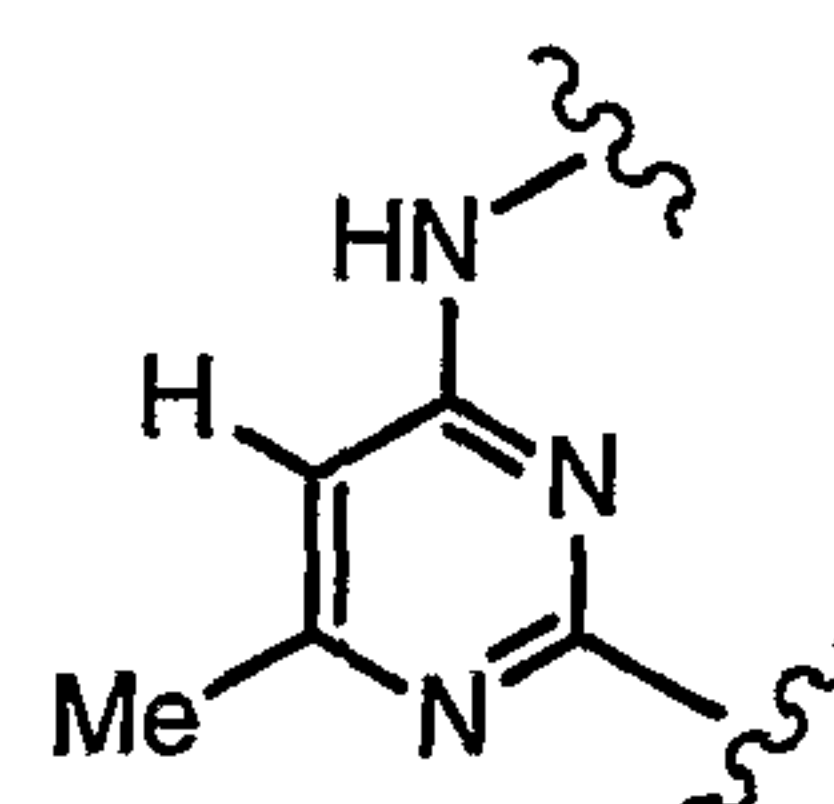
When the R^x and R^y groups of formula IV are taken together to form a fused ring, preferred R^x/R^y rings include a 5-, 6-, 7-, or 8-membered unsaturated or partially unsaturated ring having 1-2 heteroatoms. This provides a bicyclic ring system containing the pyrimidine ring. Examples of preferred pyrimidine ring systems of formula IV are the mono- and bicyclic systems shown below.



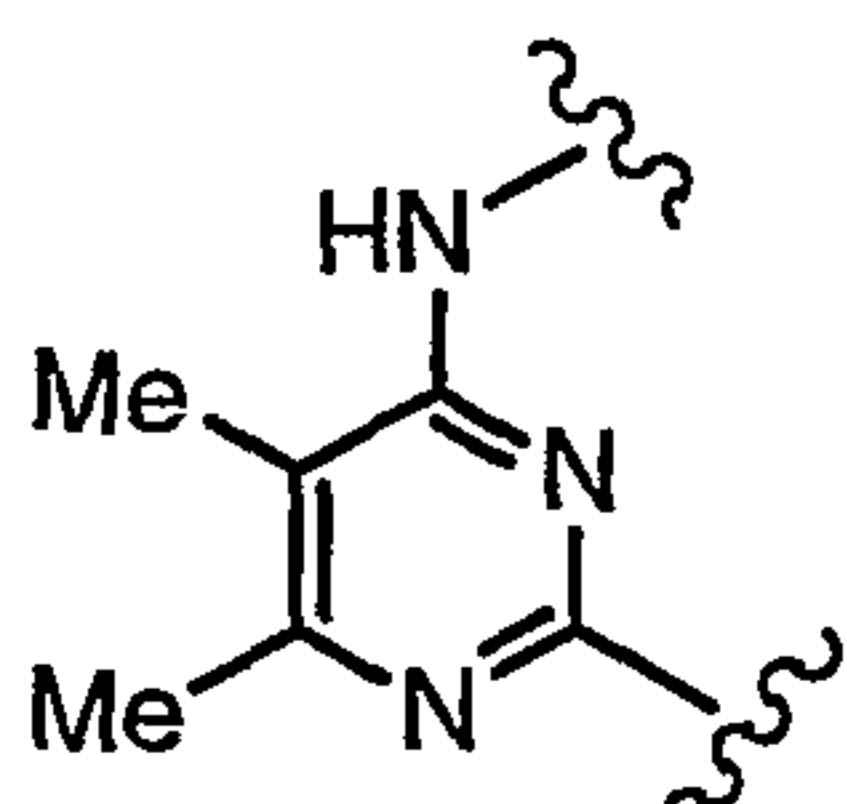
IV-D



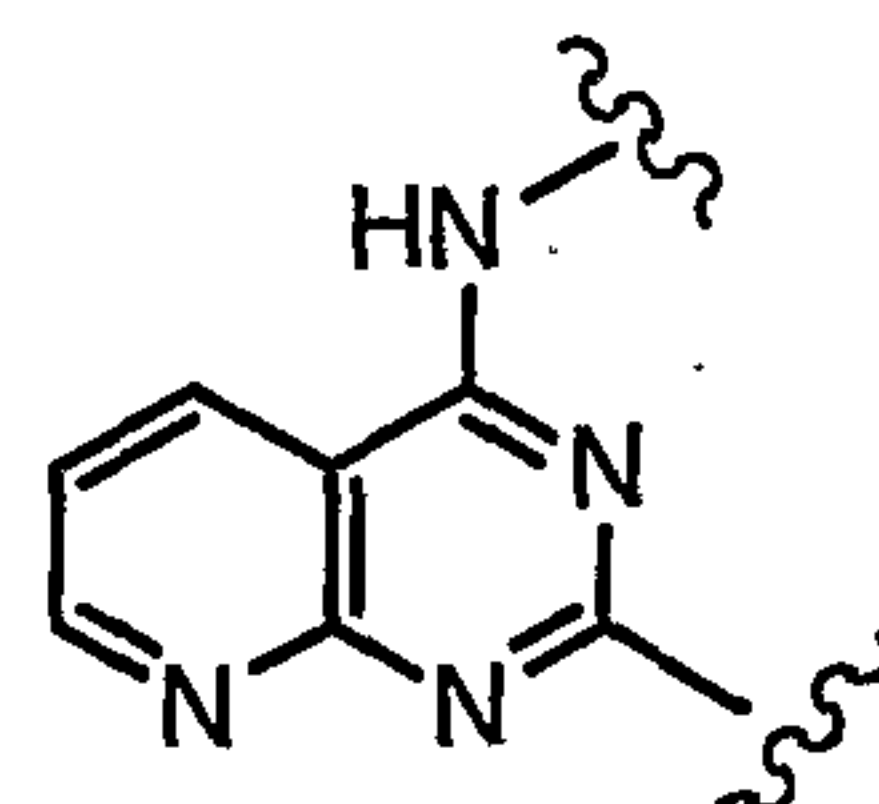
IV-E



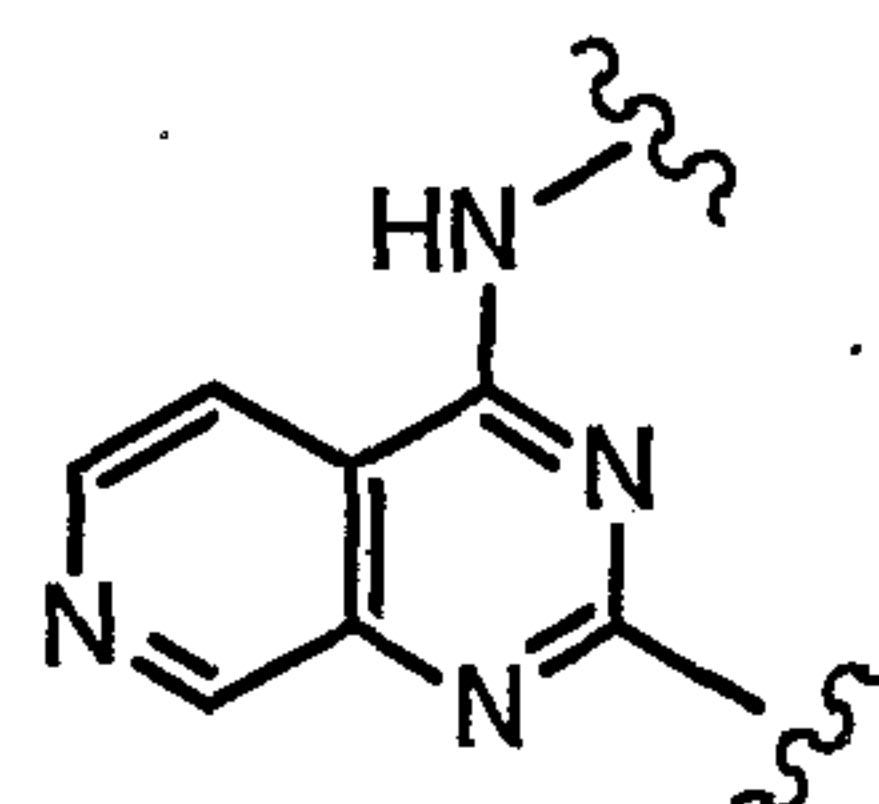
IV-G



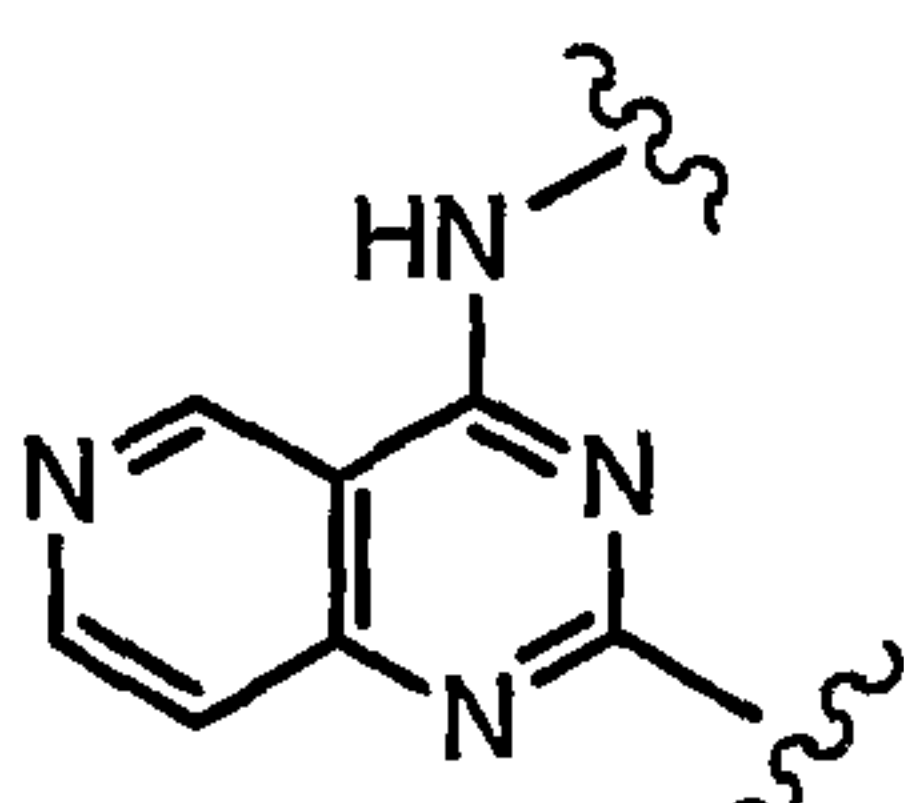
IV-H



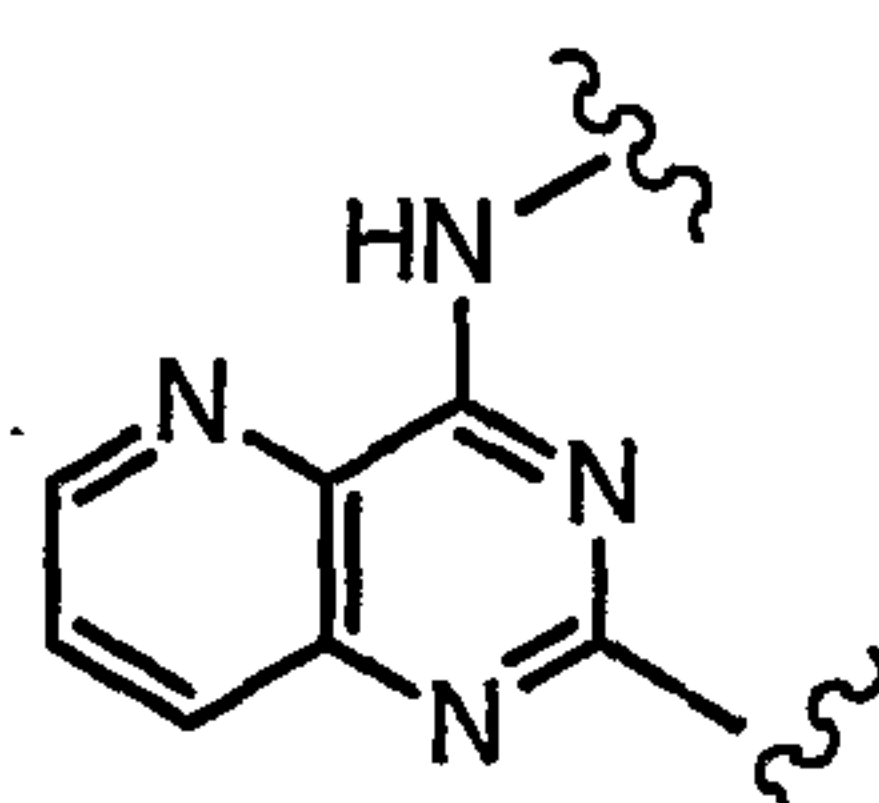
IV-J



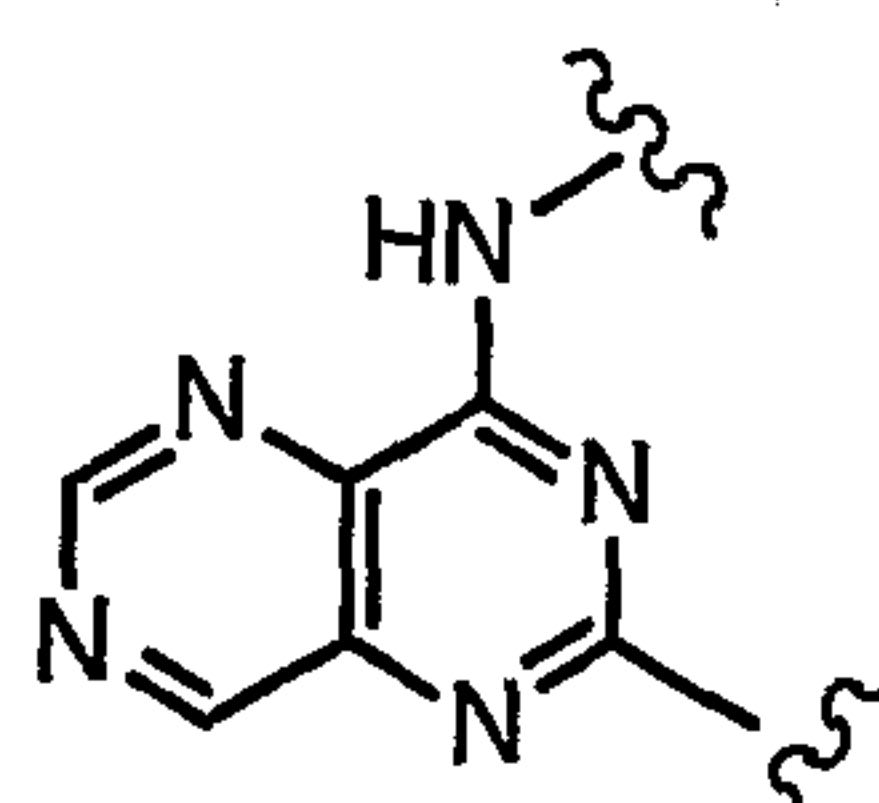
IV-K



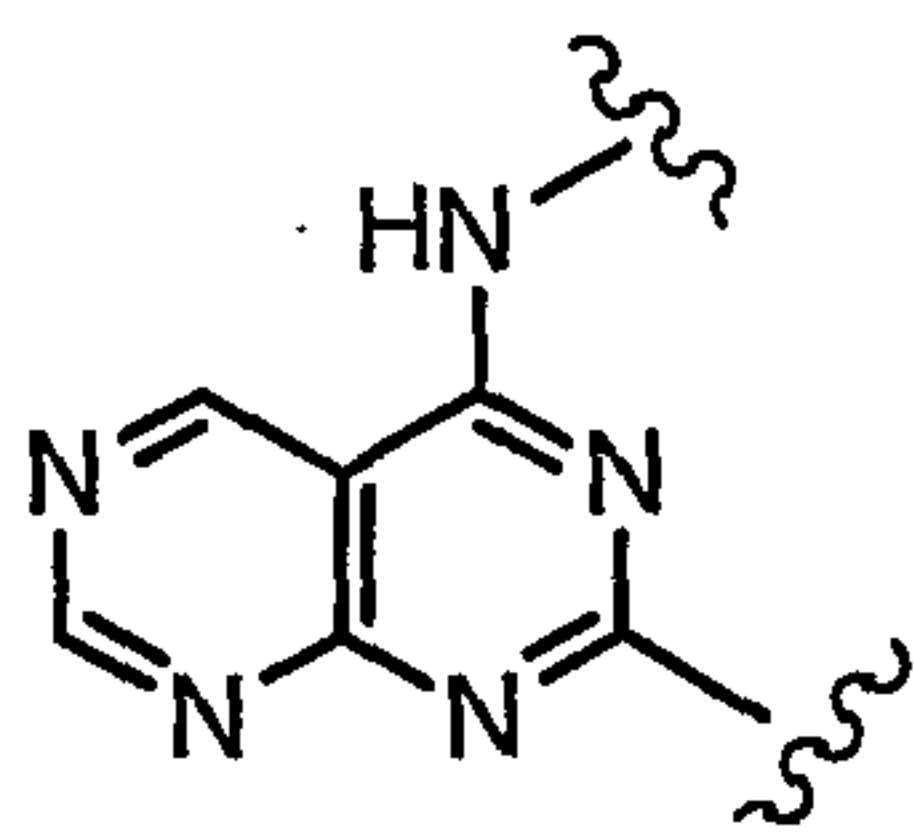
IV-L



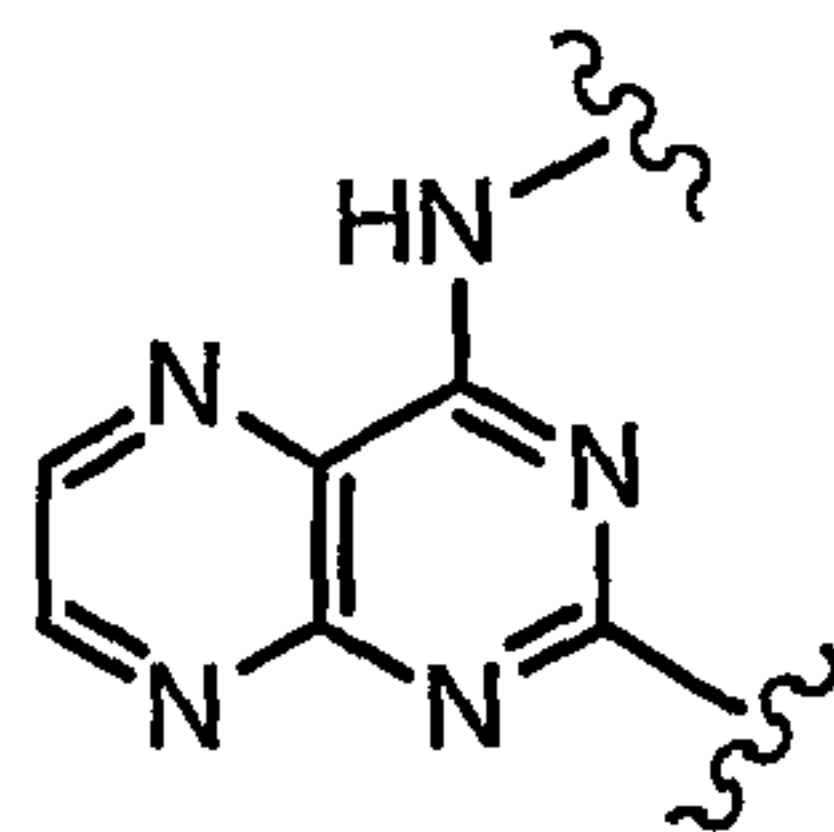
IV-M



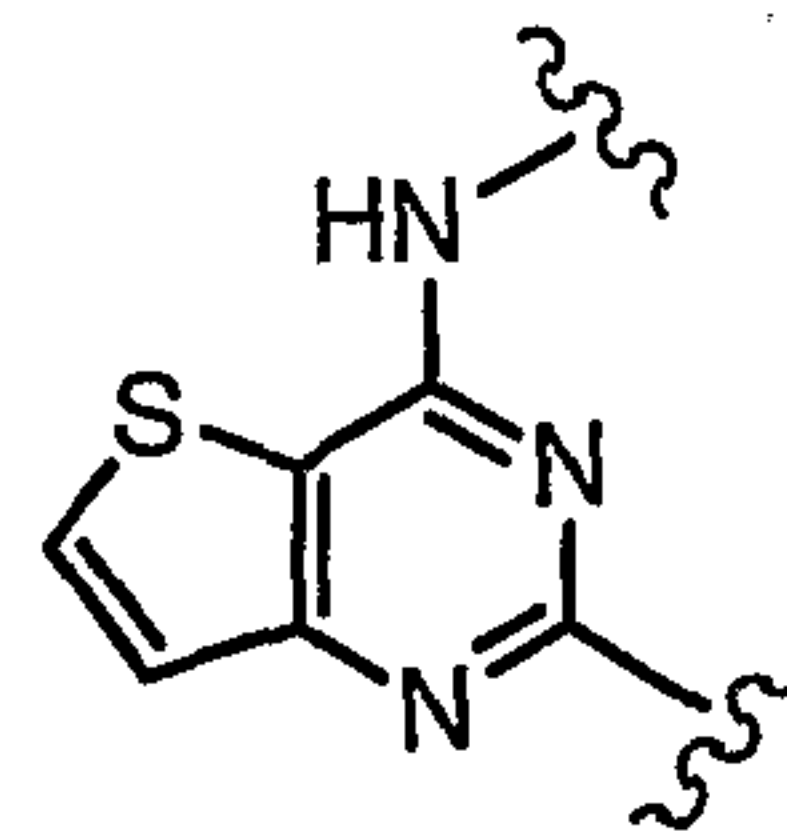
IV-N



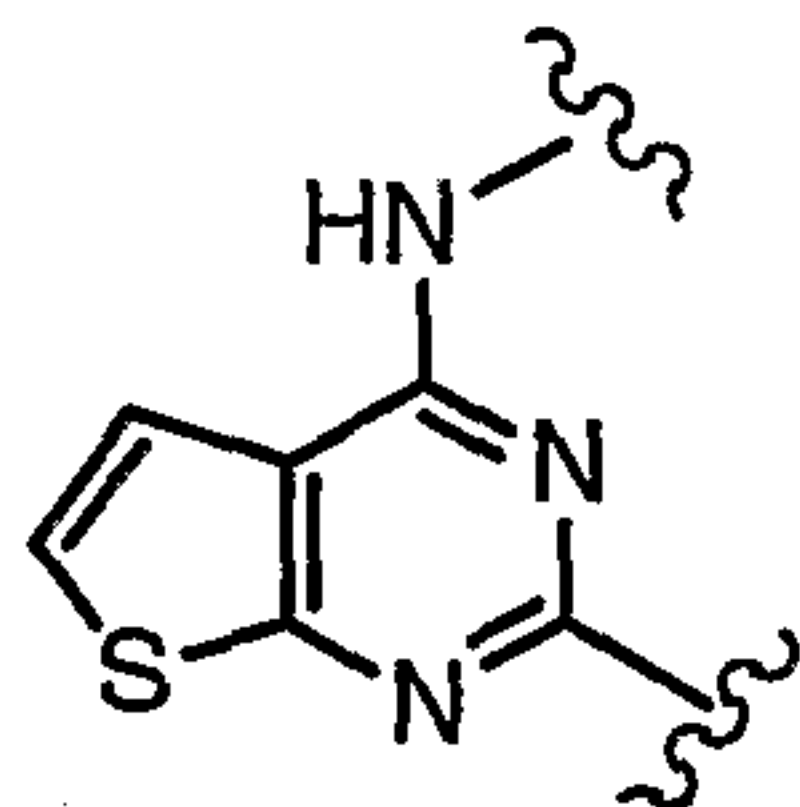
IV-O



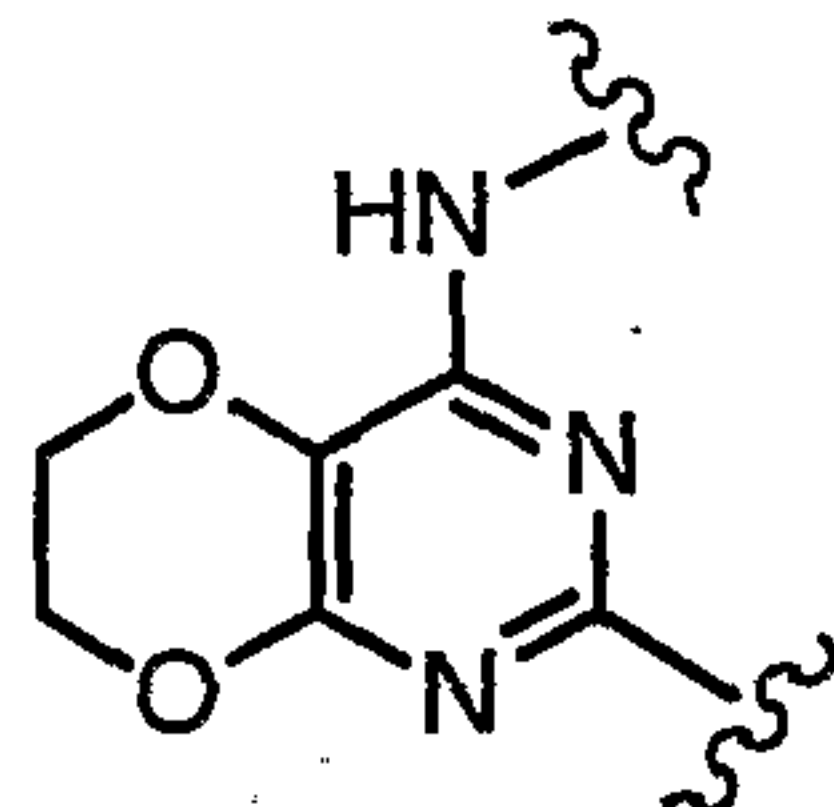
IV-P



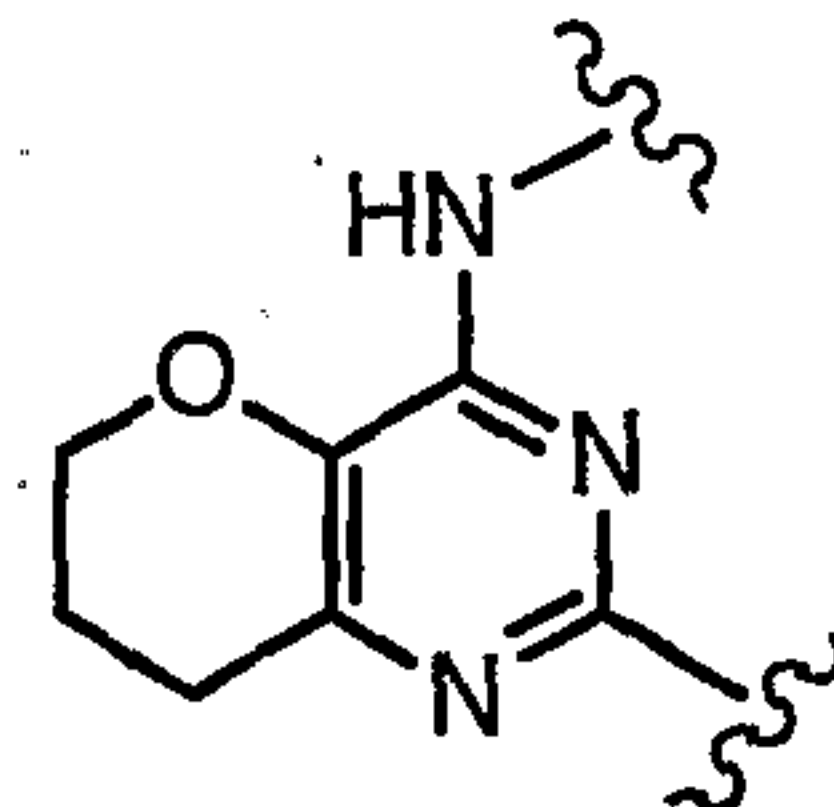
IV-Q



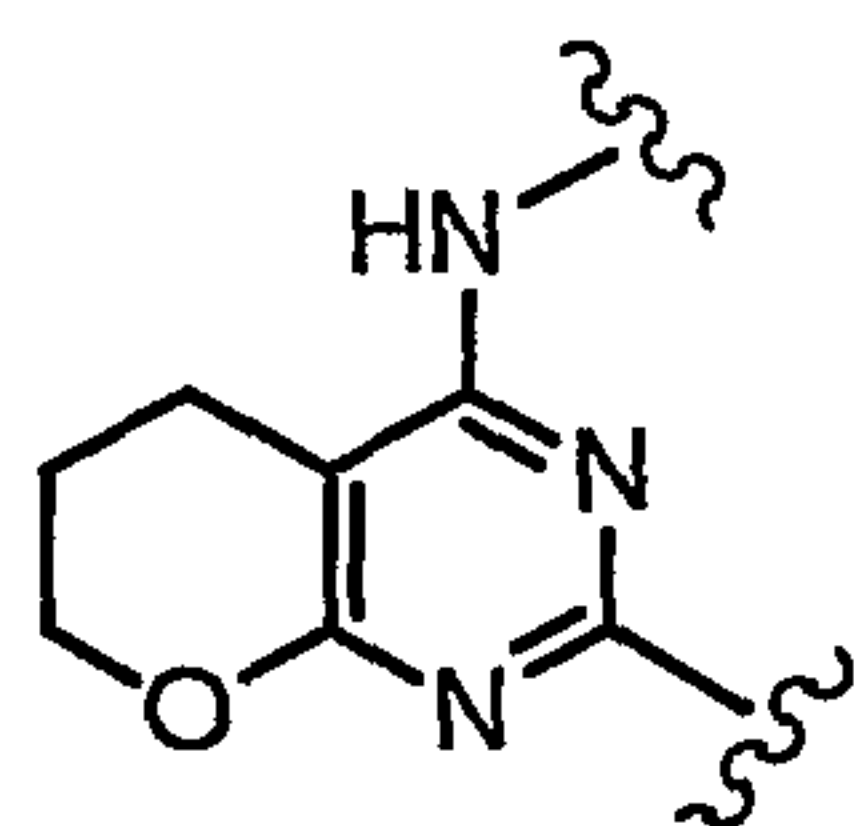
IV-R



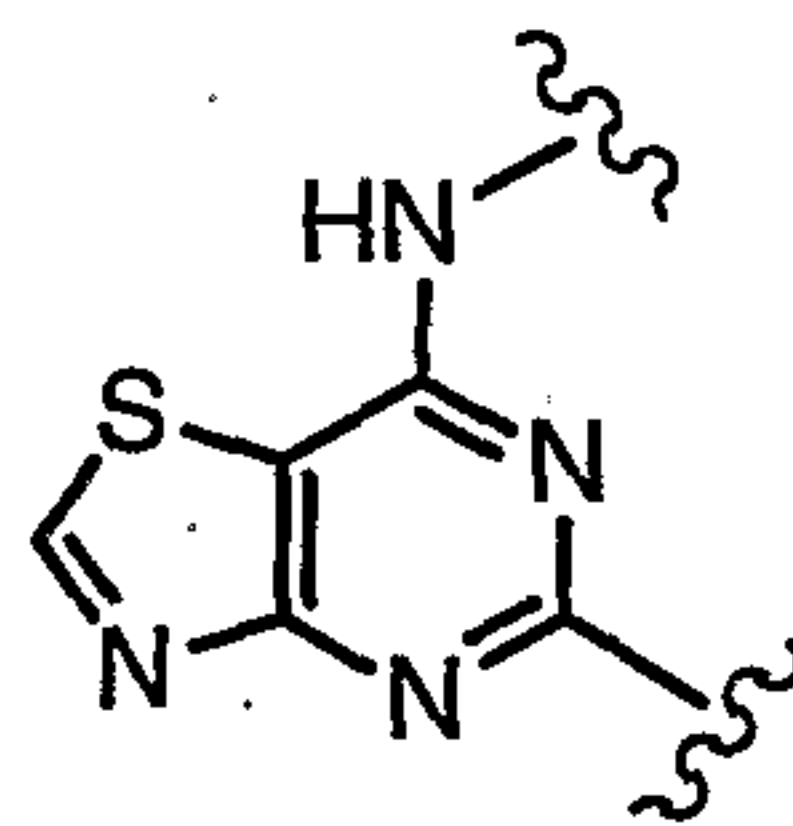
IV-S



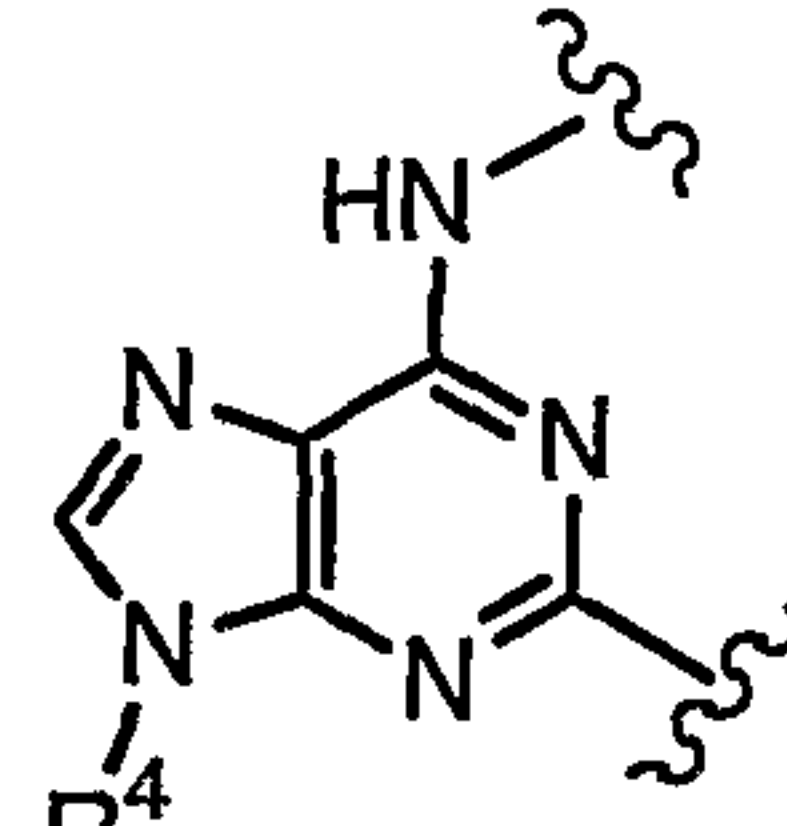
IV-T



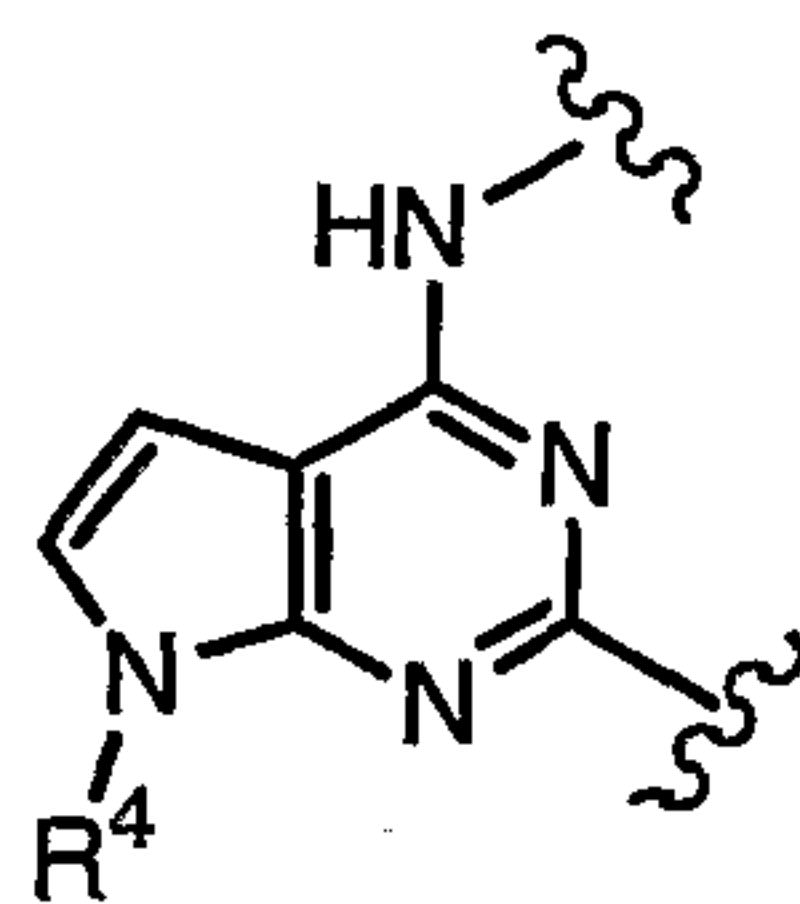
IV-U



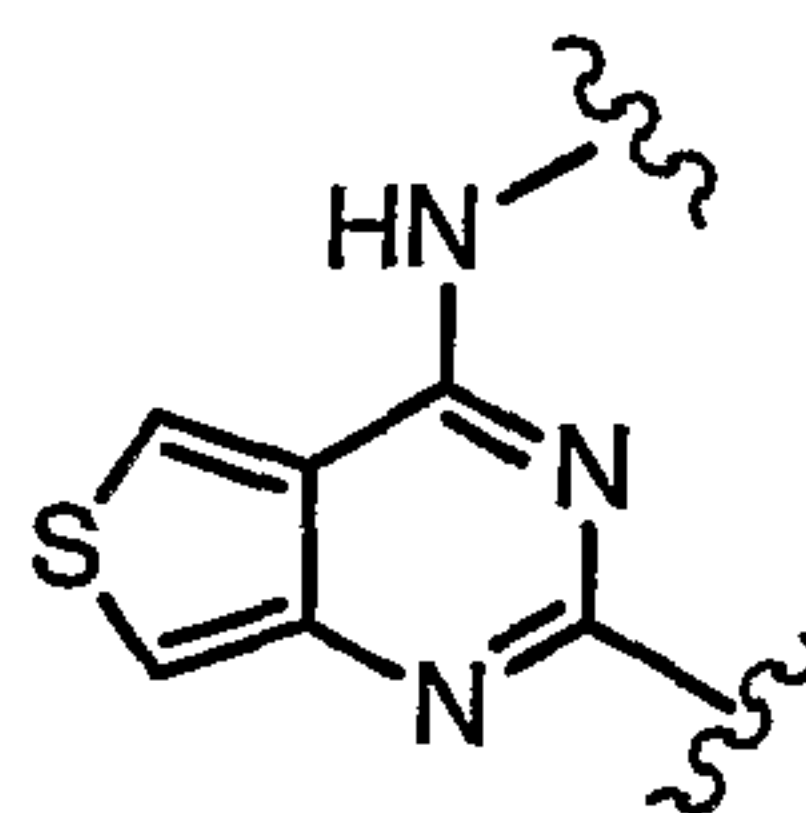
IV-V



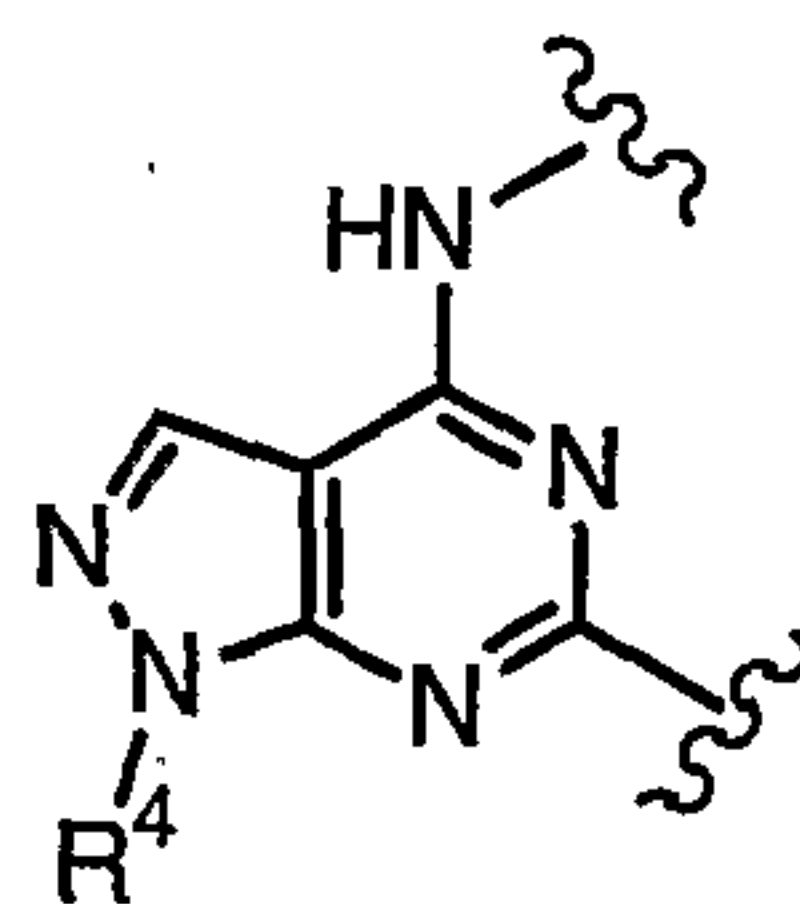
IV-W



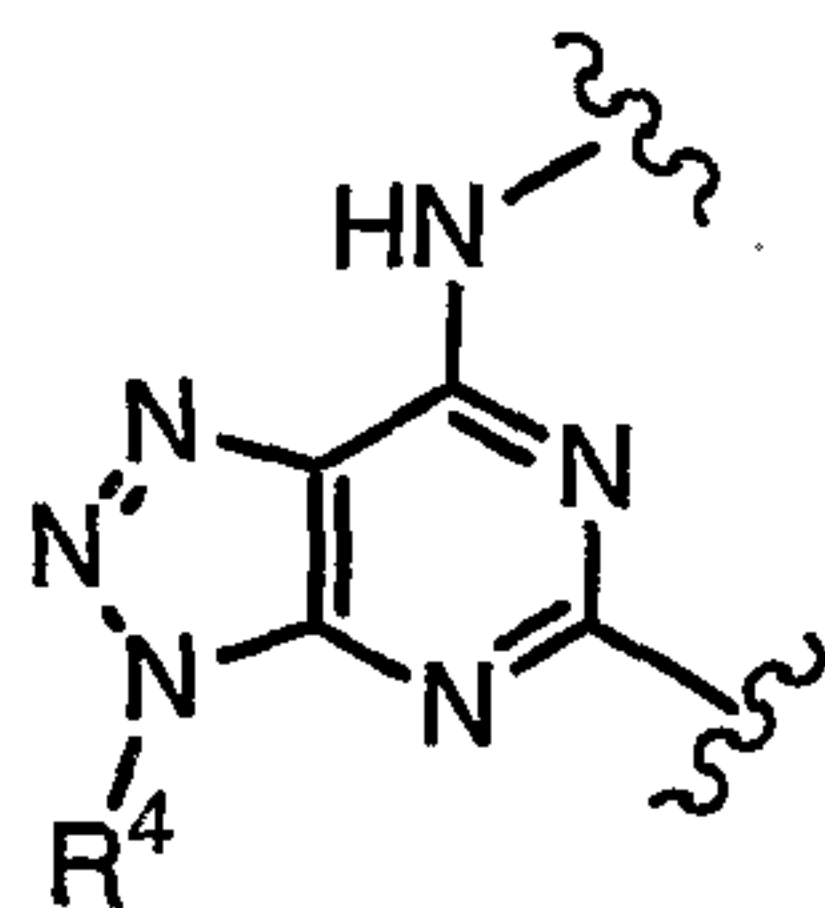
IV-X



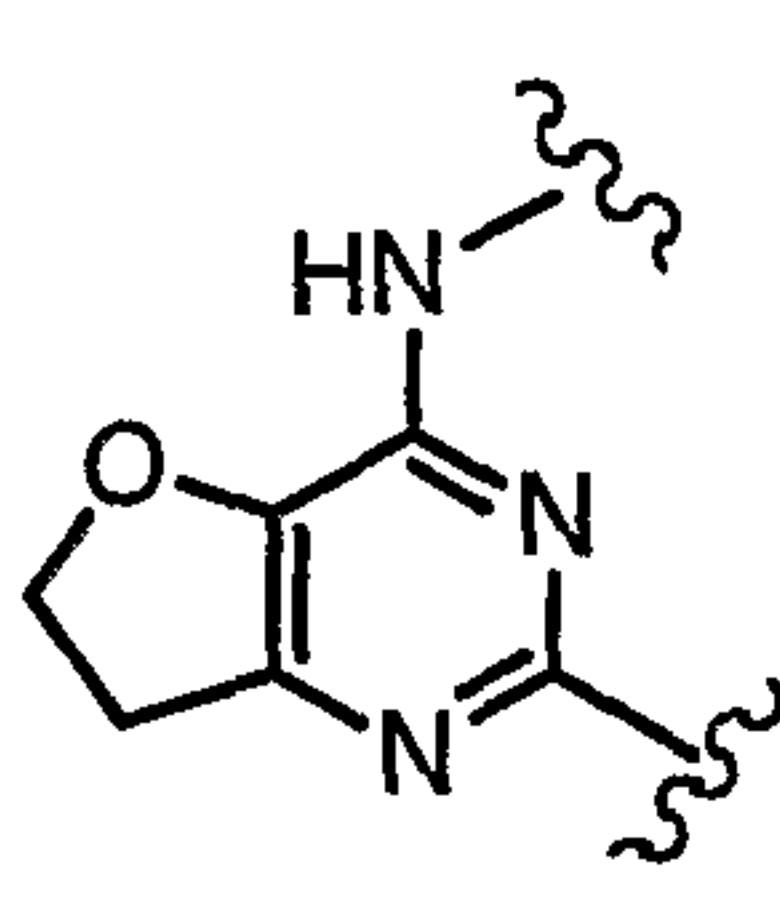
IV-Y



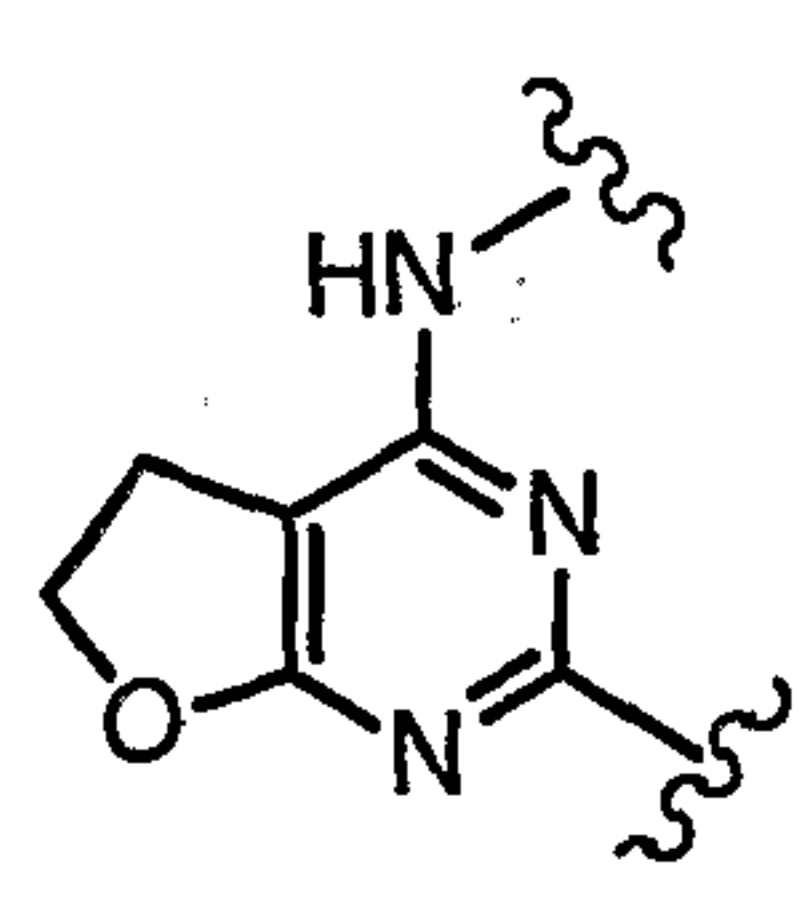
IV-Z



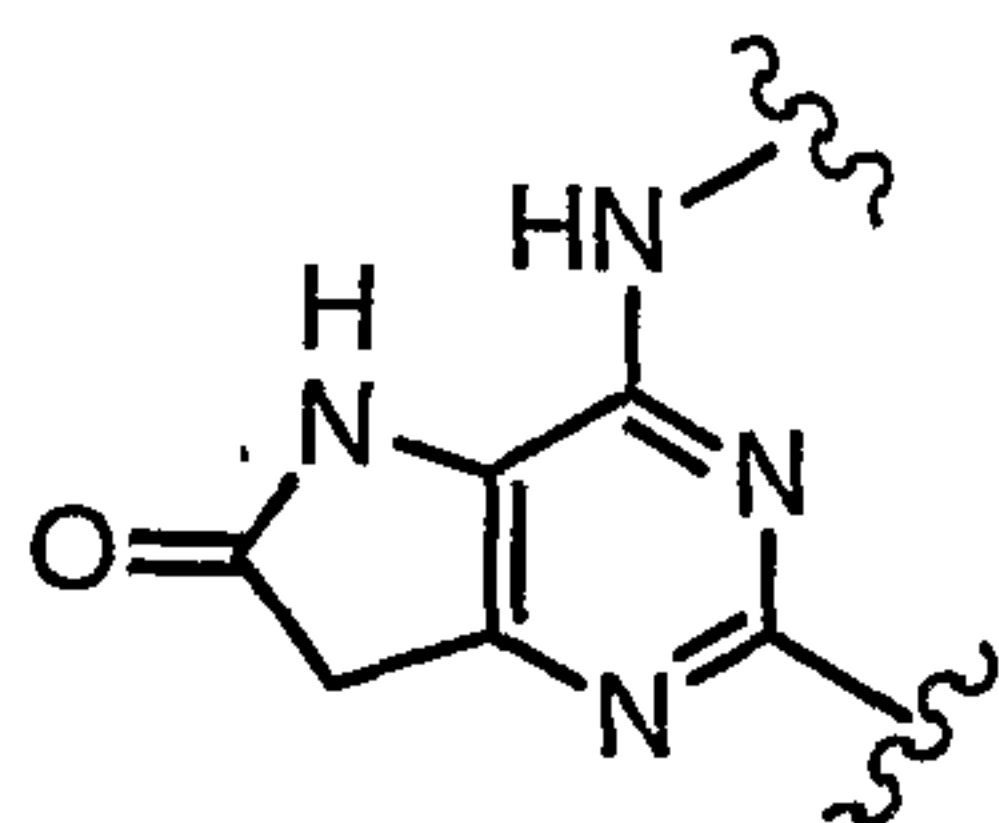
IV-AA



IV-BB



IV-CC



IV-DD

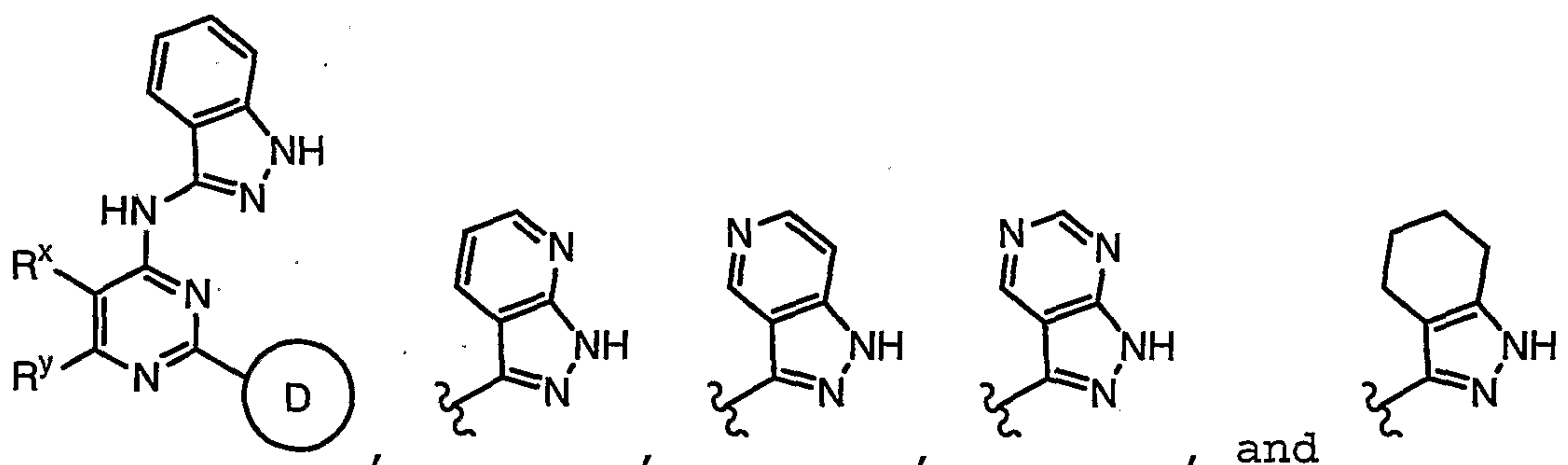
More preferred pyrimidine ring systems of
 5 formula IV include IV-E, IV-G, IV-H, IV-J, IV-K, IV-L,
 IV-M, IV-T, and IV-U.

In the monocyclic pyrimidine ring system of
 formula IV, preferred R^x groups include hydrogen, amino,
 nitro, alkyl- or dialkylamino, acetamido, or a C_{1-4}
 10 aliphatic group such as methyl, ethyl, cyclopropyl,
 isopropyl or t-butyl. Preferred R^y groups include $T-R^3$
 wherein T is a valence bond or a methylene, and R^3 is -R,
 $-N(R^4)_2$, or -OR. When R^3 is -R or -OR, a preferred R is
 an optionally substituted group selected from C_{1-6}
 15 aliphatic, phenyl, or a 5-6 membered heteroaryl or
 heterocyclyl ring. Examples of preferred R^y groups
 include 2-pyridyl, 4-pyridyl, piperidinyl, methyl, ethyl,
 cyclopropyl, isopropyl, t-butyl, alkyl- or dialkylamino,
 acetamido, optionally substituted phenyl such as phenyl,
 20 methoxyphenyl, trimethoxyphenyl, or halo-substituted
 phenyl, and methoxymethyl.

In the bicyclic pyrimidine ring system of
 formula IV, the ring formed when R^x and R^y are taken
 together may be substituted or unsubstituted. Suitable
 25 substituents include -R, halo, -OR, $-C(=O)R$, $-CO_2R$,
 $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$,
 $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally
 substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$,
 $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or
 30 $-OC(=O)N(R^4)_2$, wherein R and R^4 are as defined above for
 compounds of formula IV. Preferred R^x/R^y ring

substituents include -halo, -R, -OR, -COR, -CO₂R, -CON(R⁴)₂, -CN, or -N(R⁴)₂ wherein R is a substituted or unsubstituted C₁₋₆ aliphatic group.

The R² and R^{2'} groups of formula IV may be taken
 5 together to form a fused ring, thus providing a bicyclic ring system containing a pyrazole ring. Preferred fused rings include benzo, pyrido, pyrimido, and a partially unsaturated 6-membered carbocyclo ring. These are exemplified in the following formula IV compounds having
 10 a pyrazole-containing bicyclic ring system:



Preferred substituents on the R²/R^{2'} fused ring
 15 of formula IV include one or more of the following:
 -halo, -N(R⁴)₂, -C₁₋₄ alkyl, -C₁₋₄ haloalkyl, -NO₂, -O(C₁₋₄ alkyl), -CO₂(C₁₋₄ alkyl), -CN, -SO₂(C₁₋₄ alkyl), -SO₂NH₂, -OC(O)NH₂, -NH₂SO₂(C₁₋₄ alkyl), -NHC(O)(C₁₋₄ alkyl), -C(O)NH₂, and -CO(C₁₋₄ alkyl), wherein the (C₁₋₄ alkyl) is a
 20 straight, branched, or cyclic alkyl group. Preferably, the (C₁₋₄ alkyl) group is methyl.

When the pyrazole ring system of formula IV is monocyclic, preferred R² groups include hydrogen, a substituted or unsubstituted group selected from aryl,
 25 heteroaryl, or a C₁₋₆ aliphatic group. Examples of such preferred R² groups include methyl, t-butyl, -CH₂OCH₃, cyclopropyl, furanyl, thienyl, and phenyl. A preferred R^{2'} group is hydrogen.

Preferred formula IV compounds have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring D is an optionally substituted ring
5 selected from a phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or
10 naphthyl ring;

(b) R^x is hydrogen or C_{1-4} aliphatic and R^y is T- R^3 , or R^x and R^y are taken together with their intervening atoms to form an optionally substituted 5-7 membered unsaturated or partially unsaturated ring having 1-2 ring
15 heteroatoms; and

(c) $R^{2'}$ is hydrogen or methyl and R^2 is T-W- R^6 or R, wherein W is $-C(R^6)_2O-$, $-C(R^6)_2N(R^6)-$, $-CO-$, $-CO_2-$, $-C(R^6)OC(O)-$, $-C(R^6)_2N(R^6)CO-$, $-C(R^6)_2N(R^6)C(O)O-$, or $-CON(R^6)-$, and R is an optionally substituted group
20 selected from C_{1-6} aliphatic or phenyl, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido, or partially unsaturated 6-membered carbocyclo ring.

More preferred compounds of formula IV have one
25 or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-
30 tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl;

(b) R^x is hydrogen or methyl and R^y is -R, $N(R^4)_2$, or -OR, or R^x and R^y are taken together with their

intervening atoms to form a 5-7 membered unsaturated or partially unsaturated ring having 1-2 ring nitrogens, wherein said ring is optionally substituted with -R, halo, oxo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂; and

(c) each R⁵ is independently selected from halo, oxo, CN, NO₂, -N(R⁴)₂, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, -N(R⁴)SO₂R, -SR, -OR, -C(O)R, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic.

Even more preferred compounds of formula IV have one or more, and more preferably all, of the features selected from the group consisting of:

(a) R^x and R^y are taken together with their intervening atoms to form a 6-membered unsaturated or partially unsaturated ring having 1-2 ring nitrogens, optionally substituted with halo, CN, oxo, C₁₋₆ alkyl, C₁₋₆ alkoxy, (C₁₋₆ alkyl)carbonyl, (C₁₋₆ alkyl)sulfonyl, mono- or dialkylamino, mono- or dialkylaminocarbonyl, mono- or dialkylaminocarbonyloxy, or 5-6 membered heteroaryl;

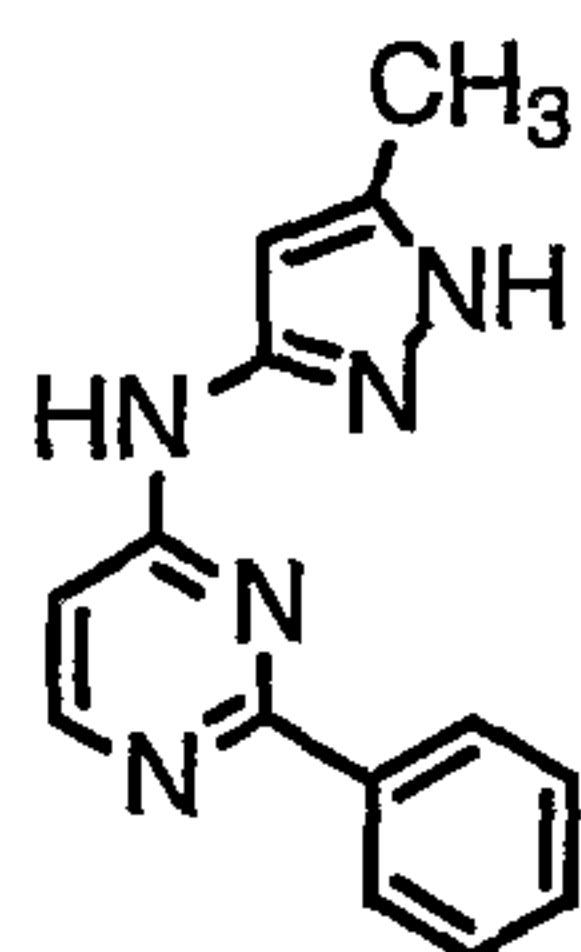
(b) each R⁵ is independently selected from -halo, -CN, -oxo, -SR, -OR, -N(R⁴)₂, -C(O)R, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic; and

(c) R^{2'} is hydrogen and R² is T-W-R⁶ or R, wherein W is -C(R⁶)₂O-, -C(R⁶)₂N(R⁶)-, -CO-, -CO₂-, -C(R⁶)OC(O)-, -C(R⁶)₂N(R⁶)CO-, or -CON(R⁶)-, and R is an optionally substituted group selected from C₁₋₆ aliphatic or phenyl, or R² and R^{2'} are taken together with their intervening atoms to form a benzo, pyrido, or partially unsaturated 6-membered carbocyclo ring optionally

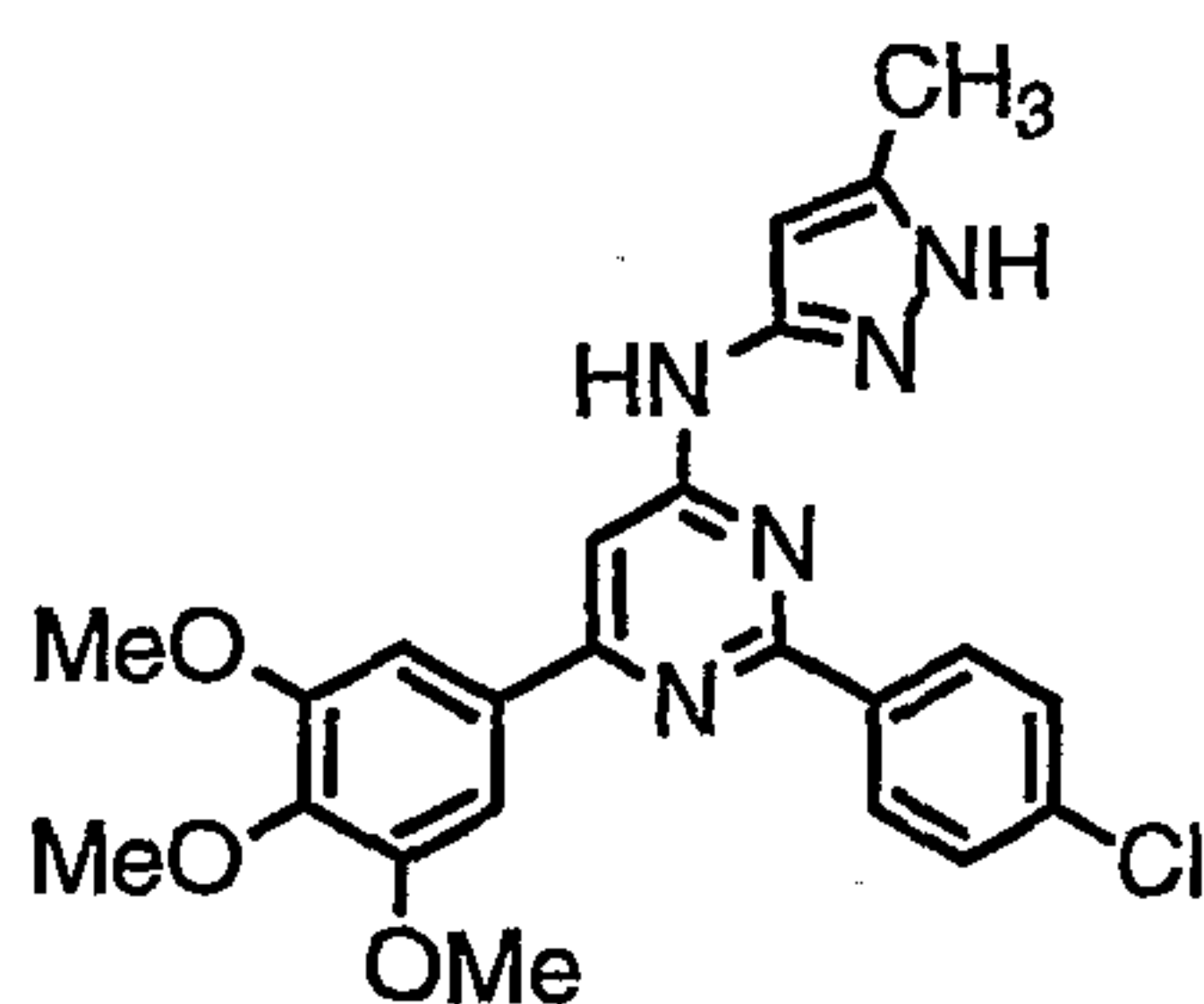
substituted with -halo, oxo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), $-CN$, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, or $-CO(C_{1-4}$ alkyl), wherein
 5 the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group.

Representative compounds of formula IV are set forth in Table 3 below.

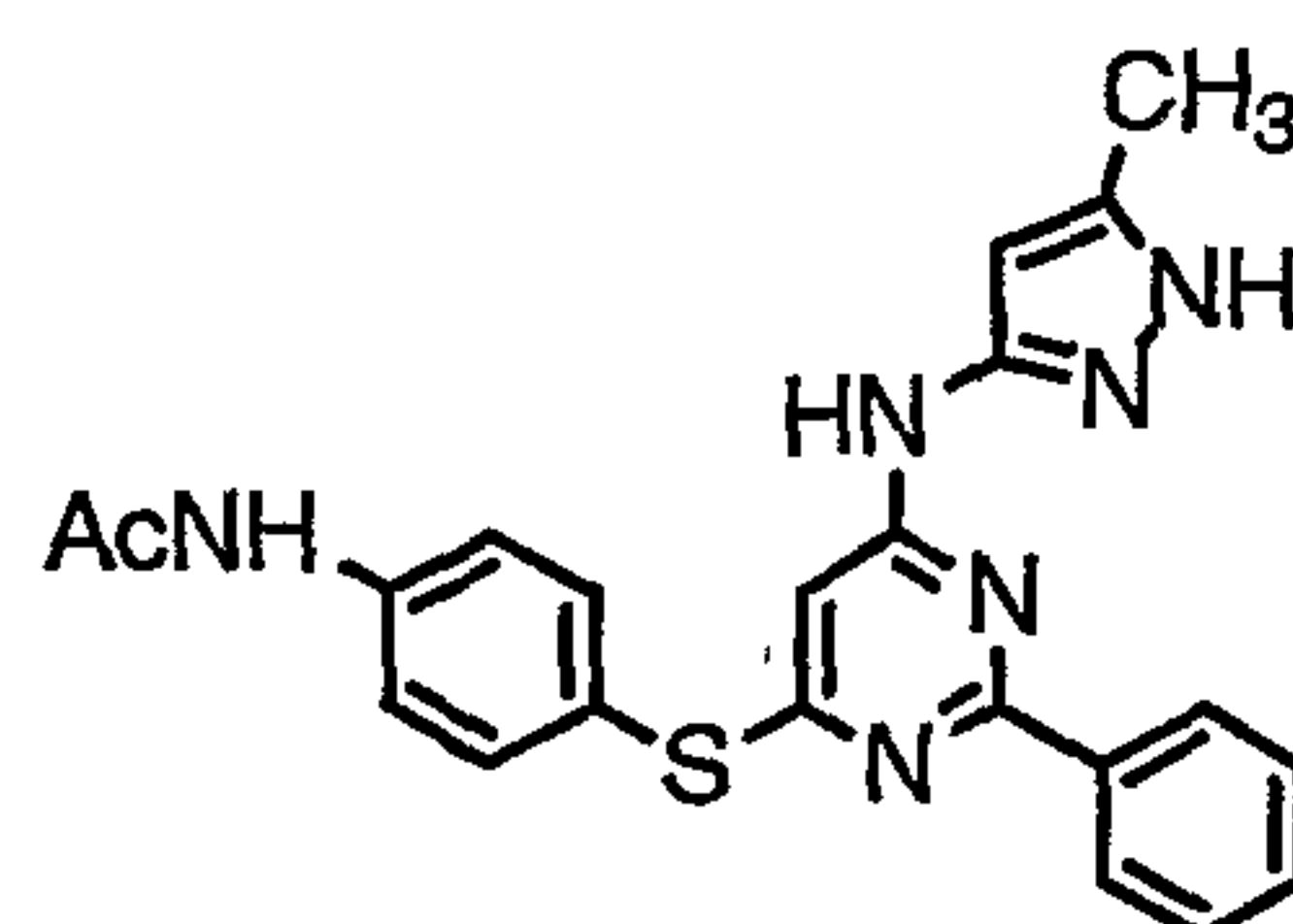
10 Table 3.



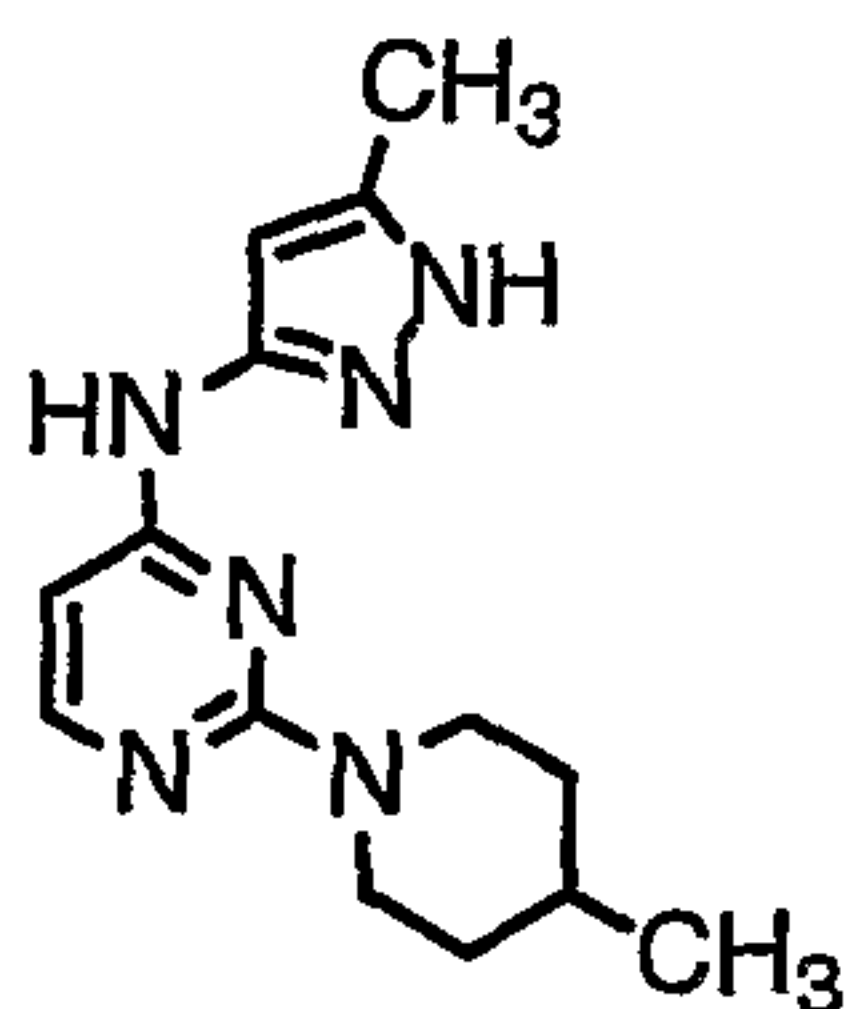
IV-1



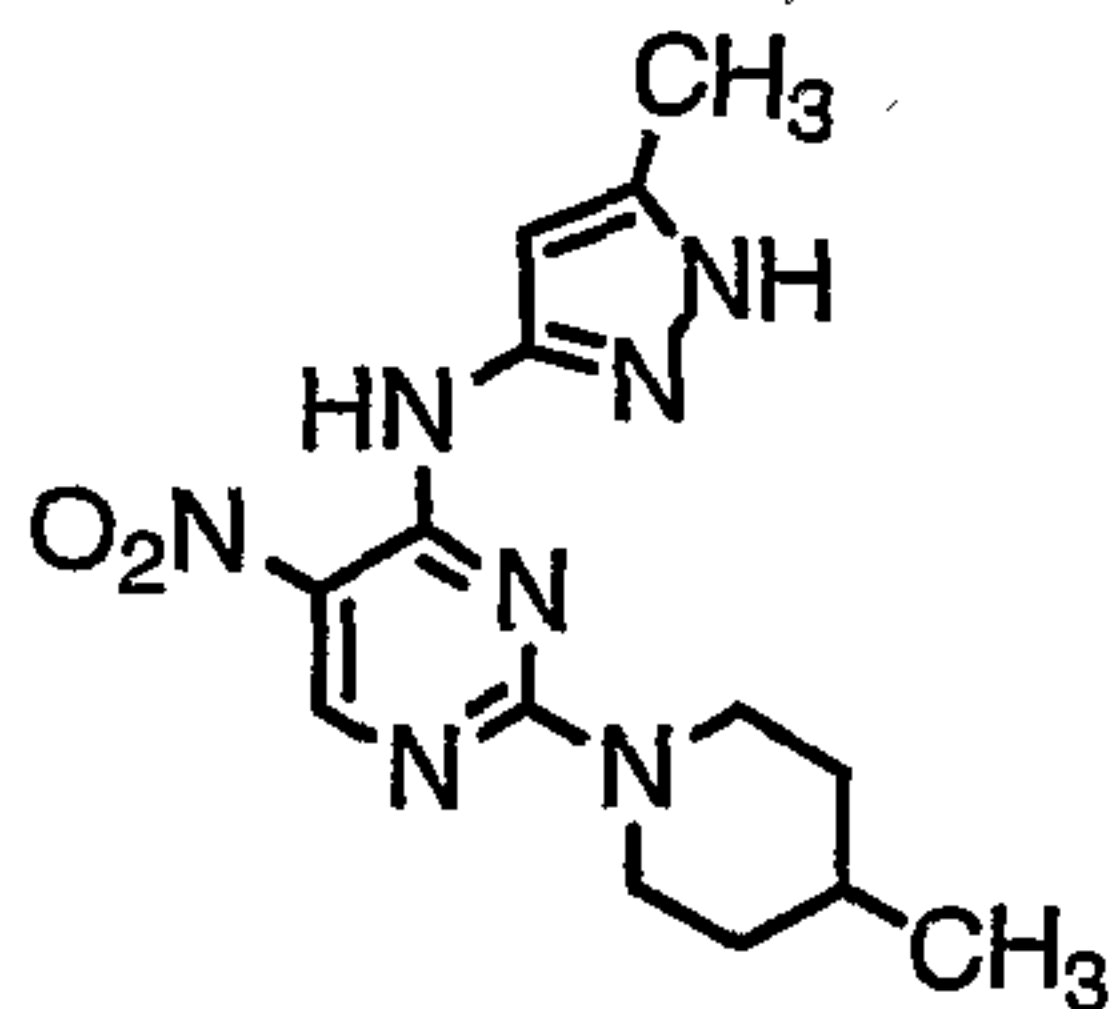
IV-2



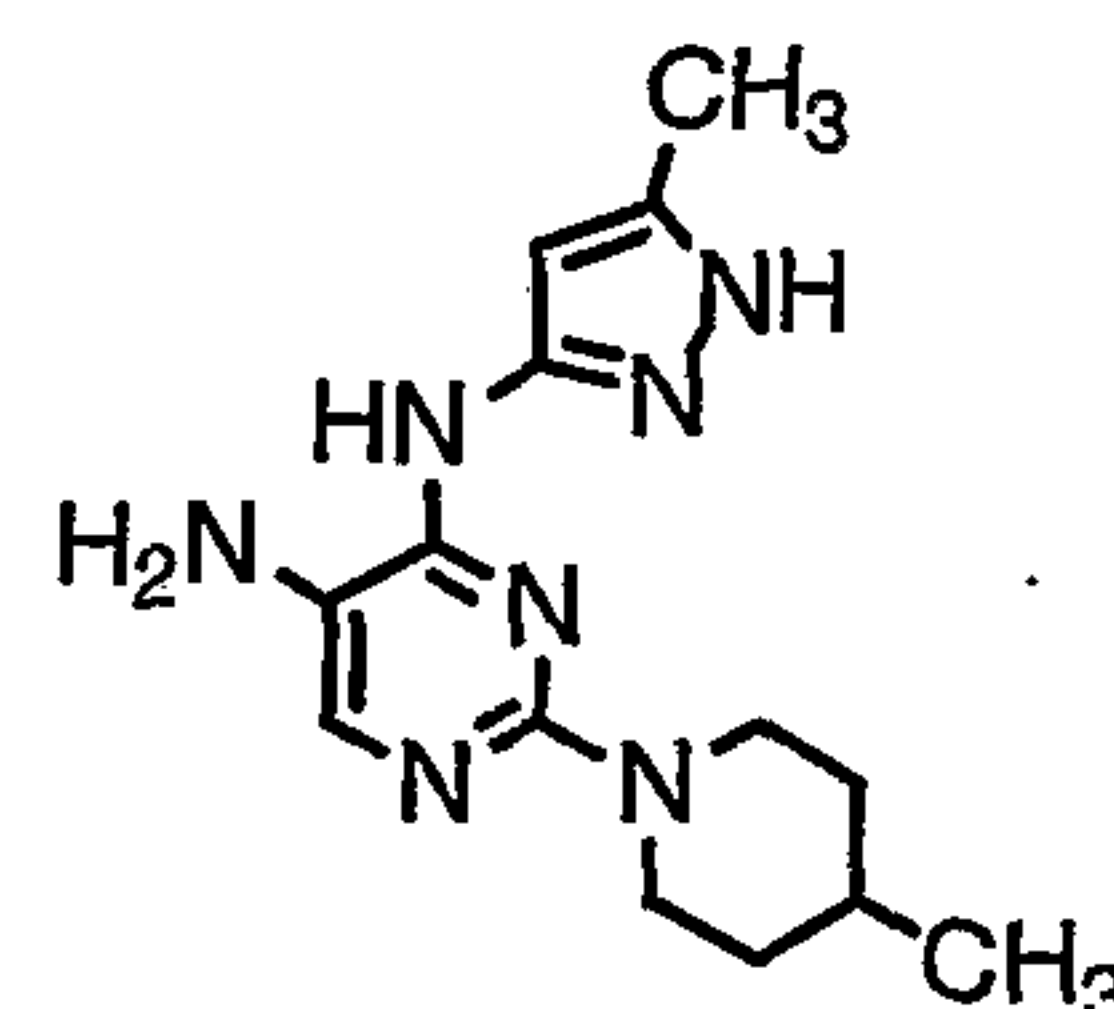
IV-3



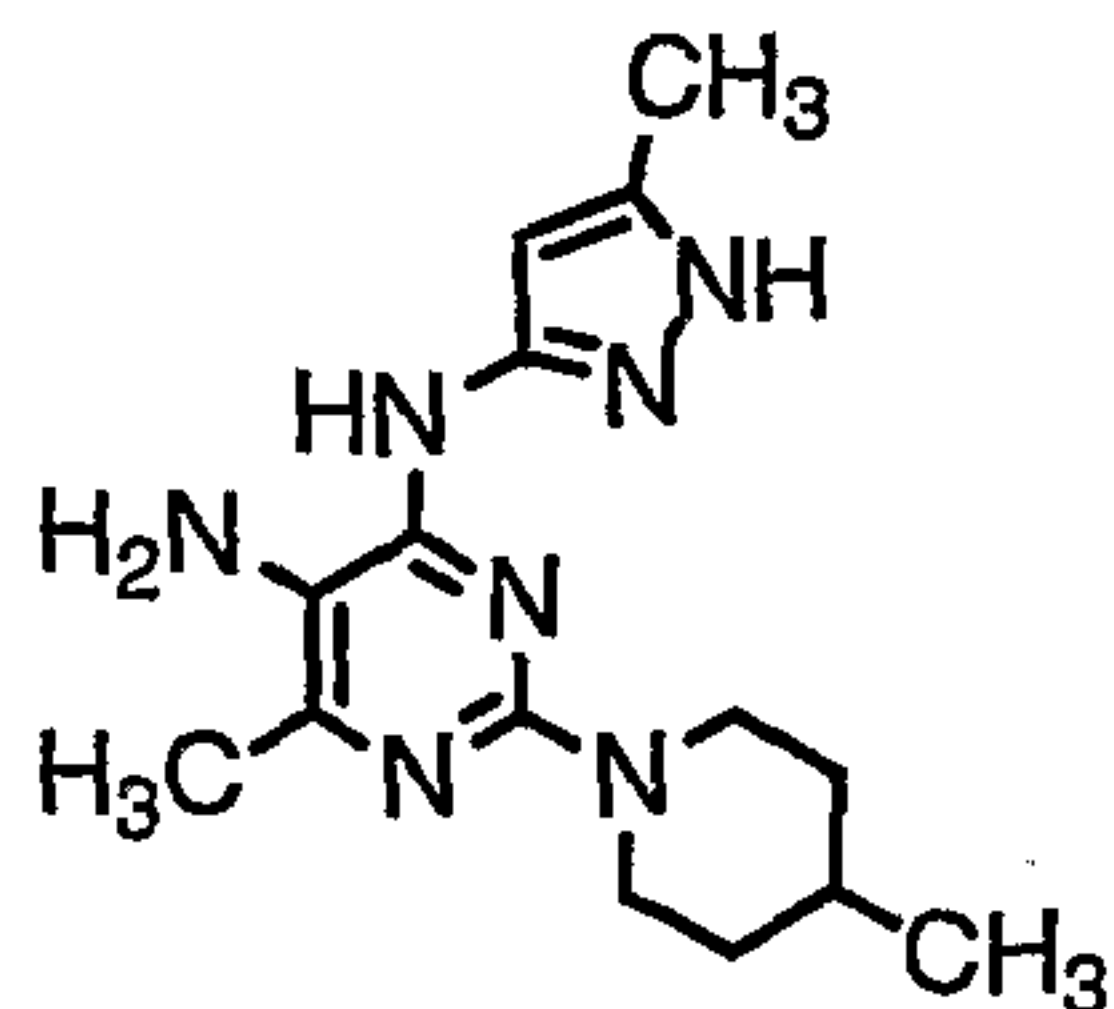
IV-4



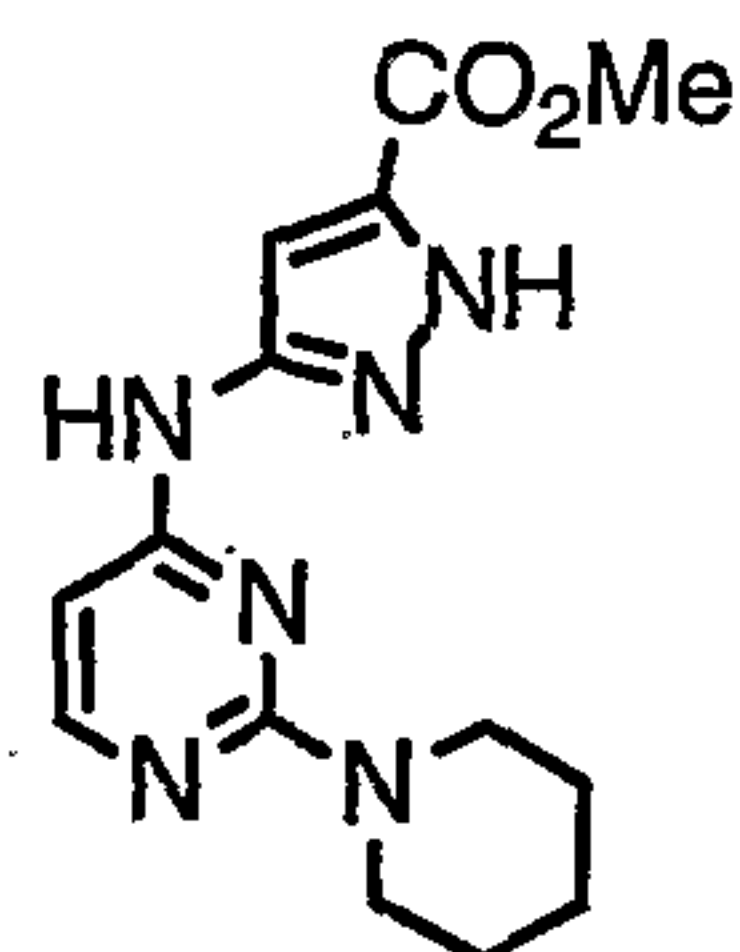
IV-5



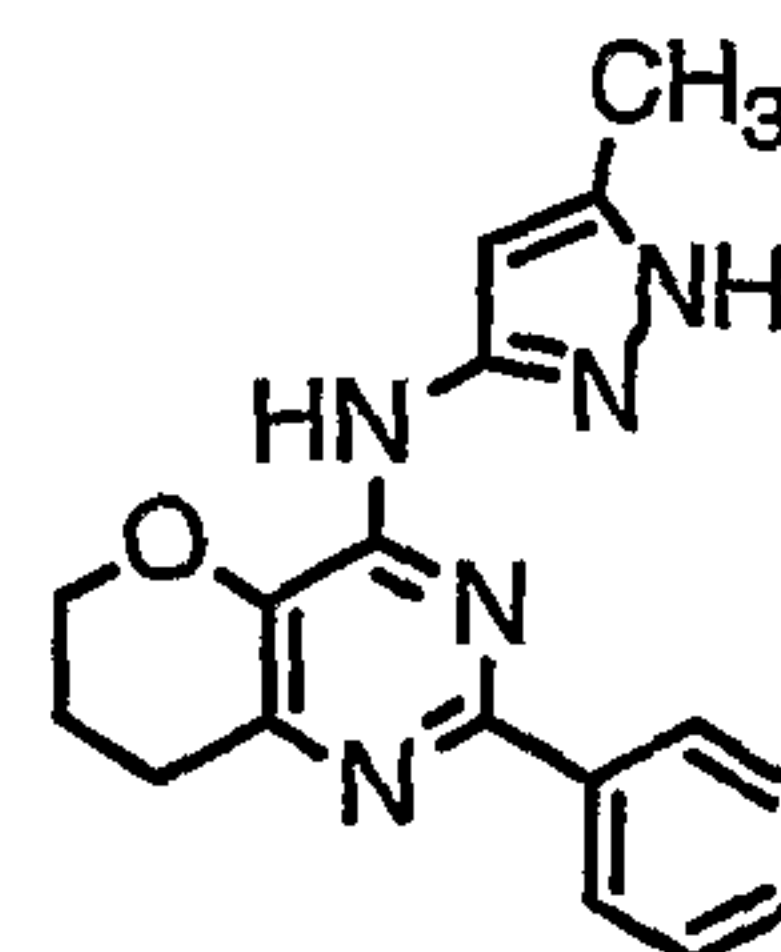
IV-6



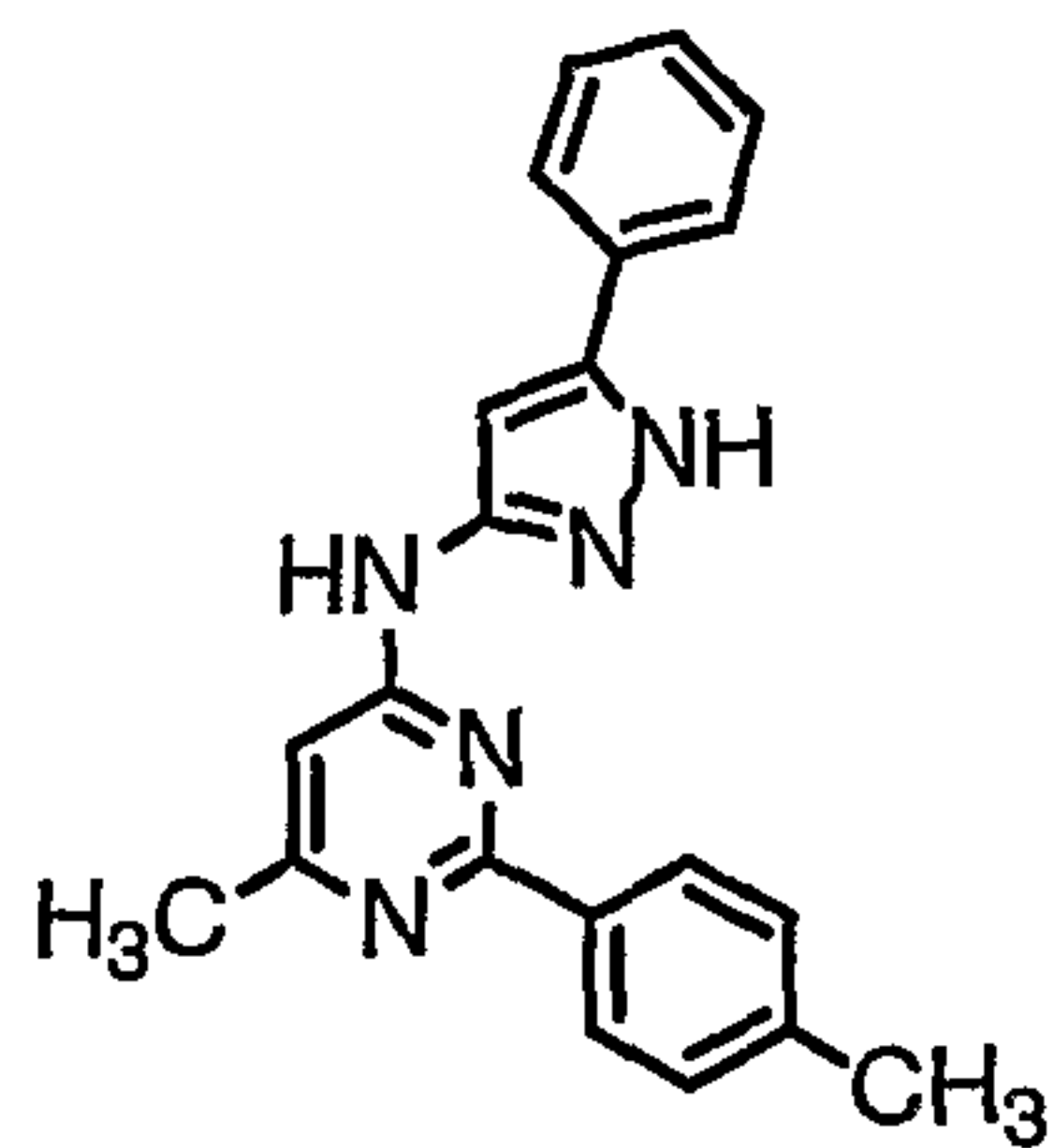
IV-7



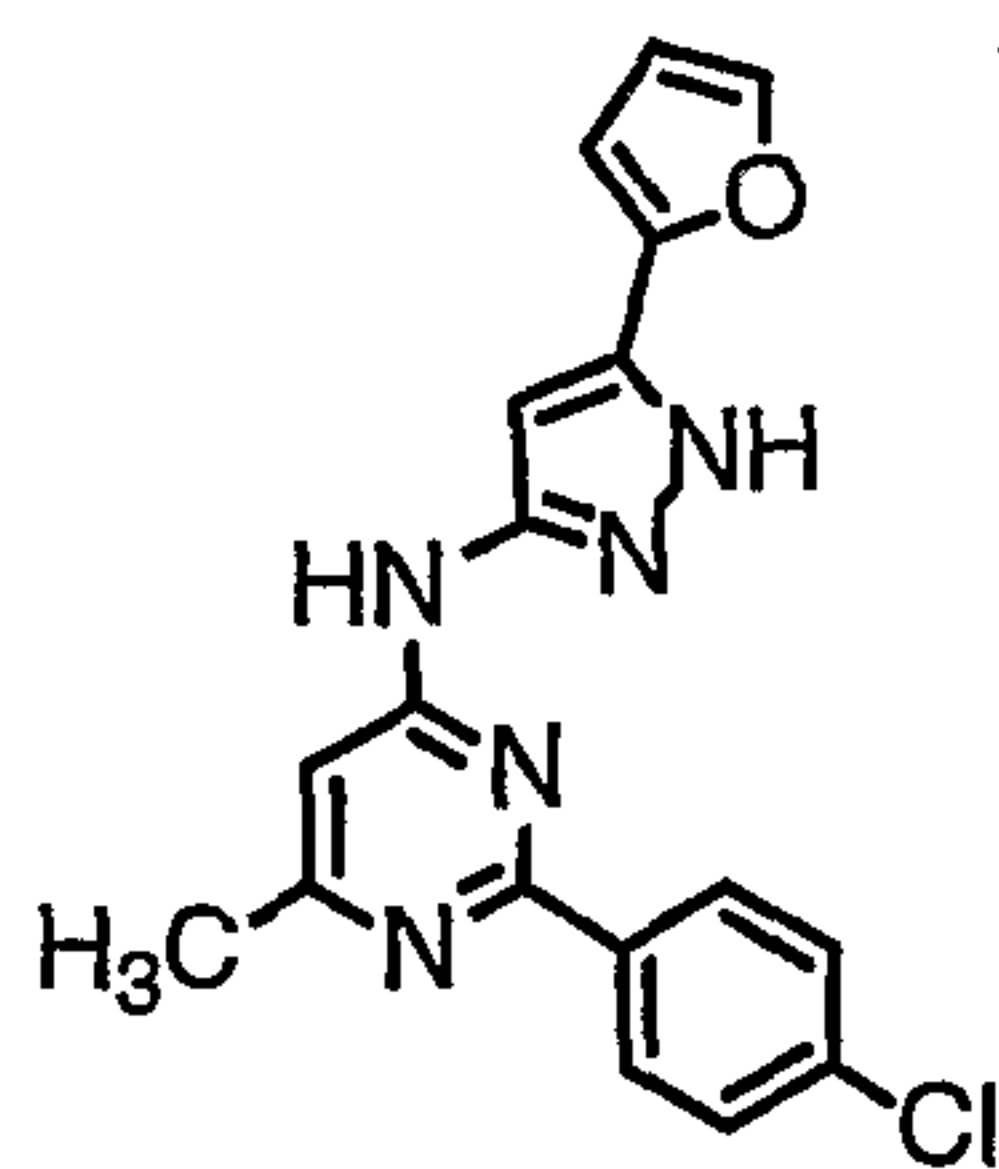
IV-8



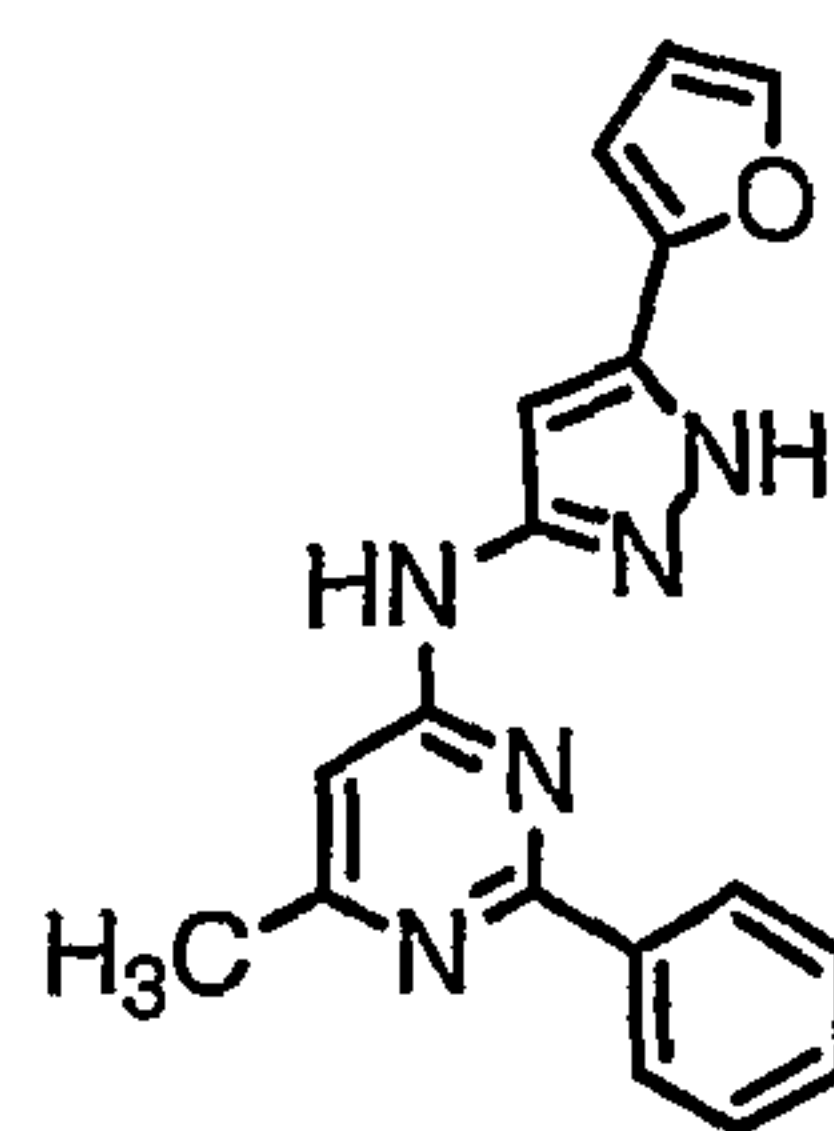
IV-9



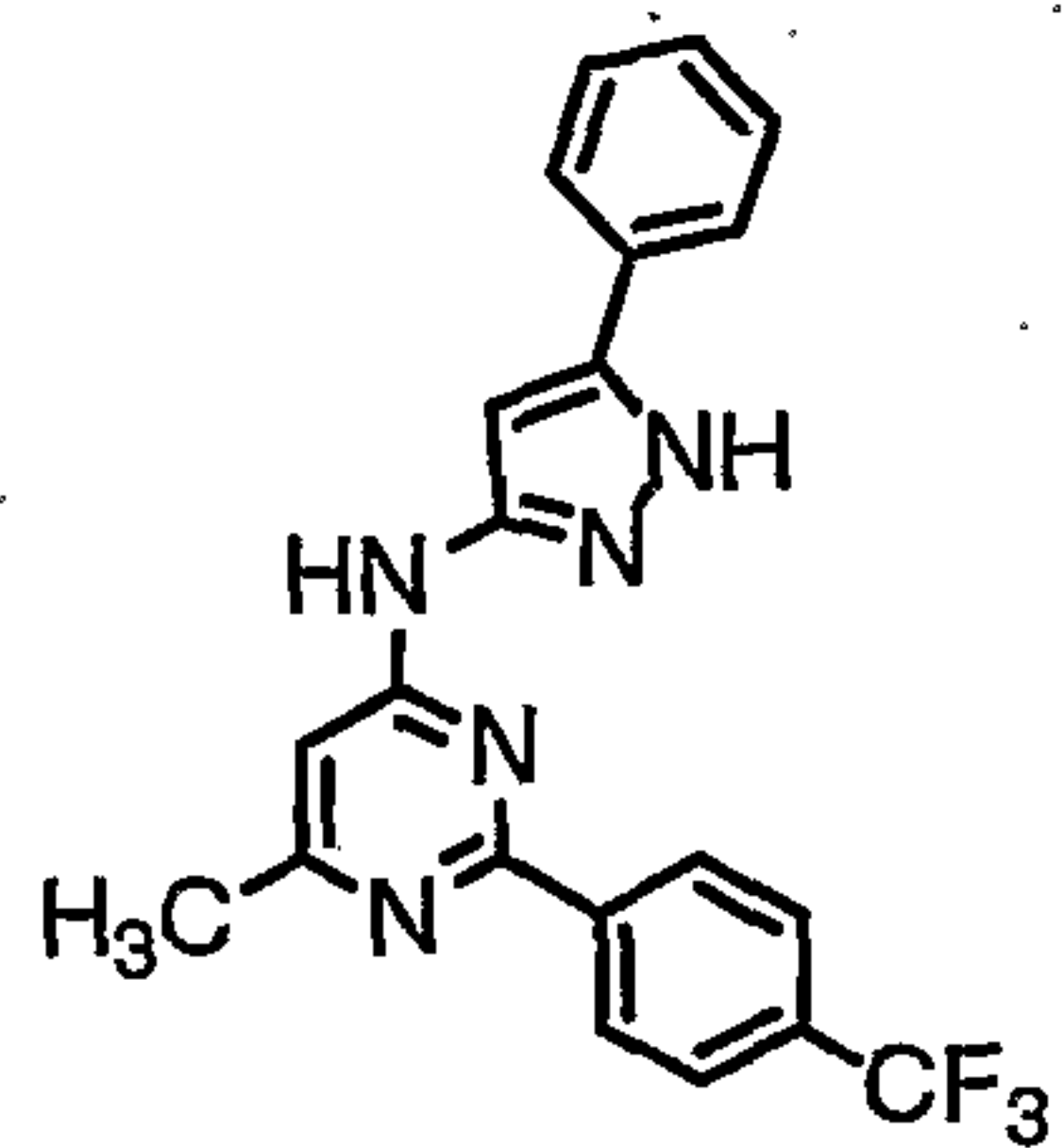
IV-10



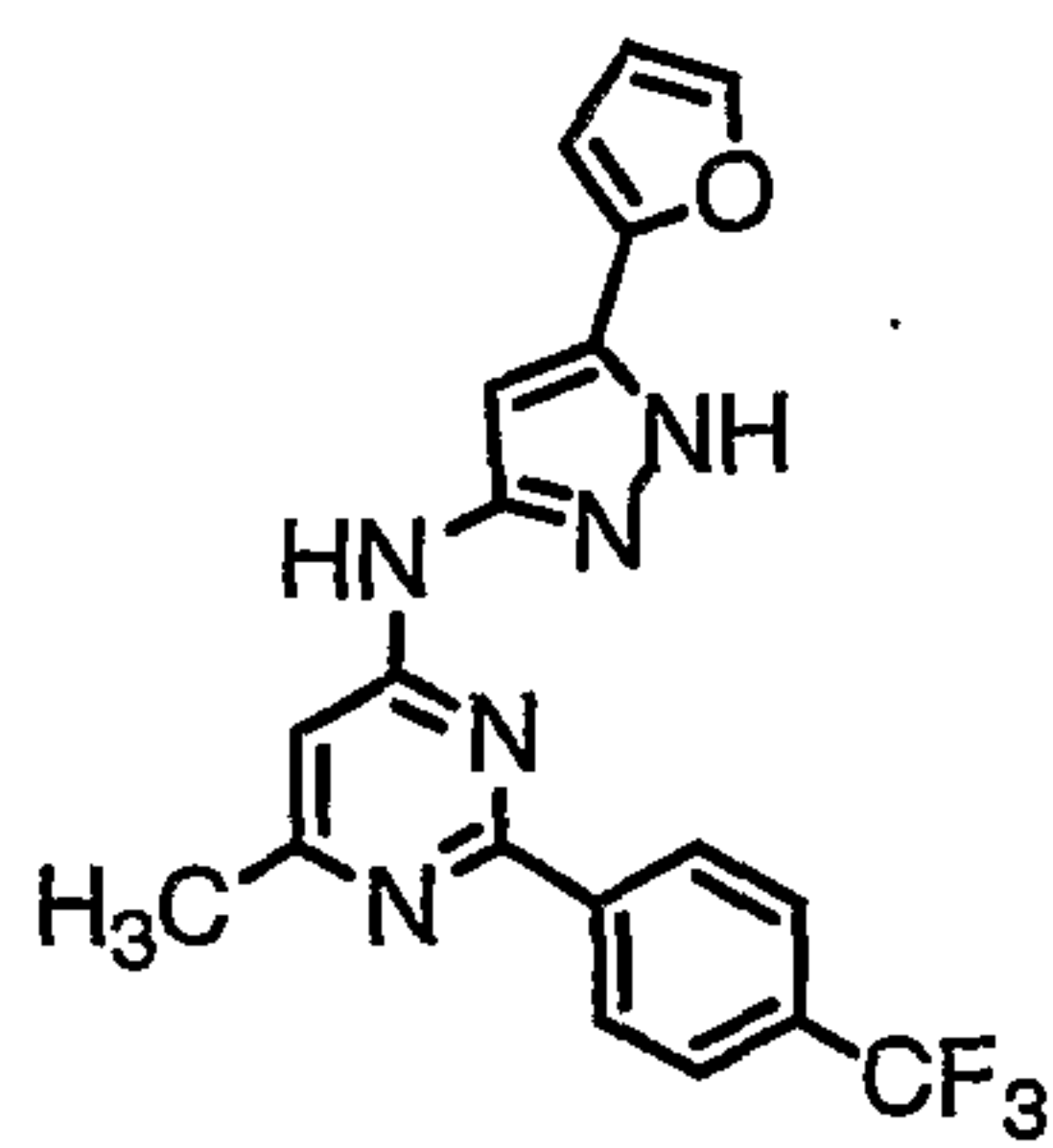
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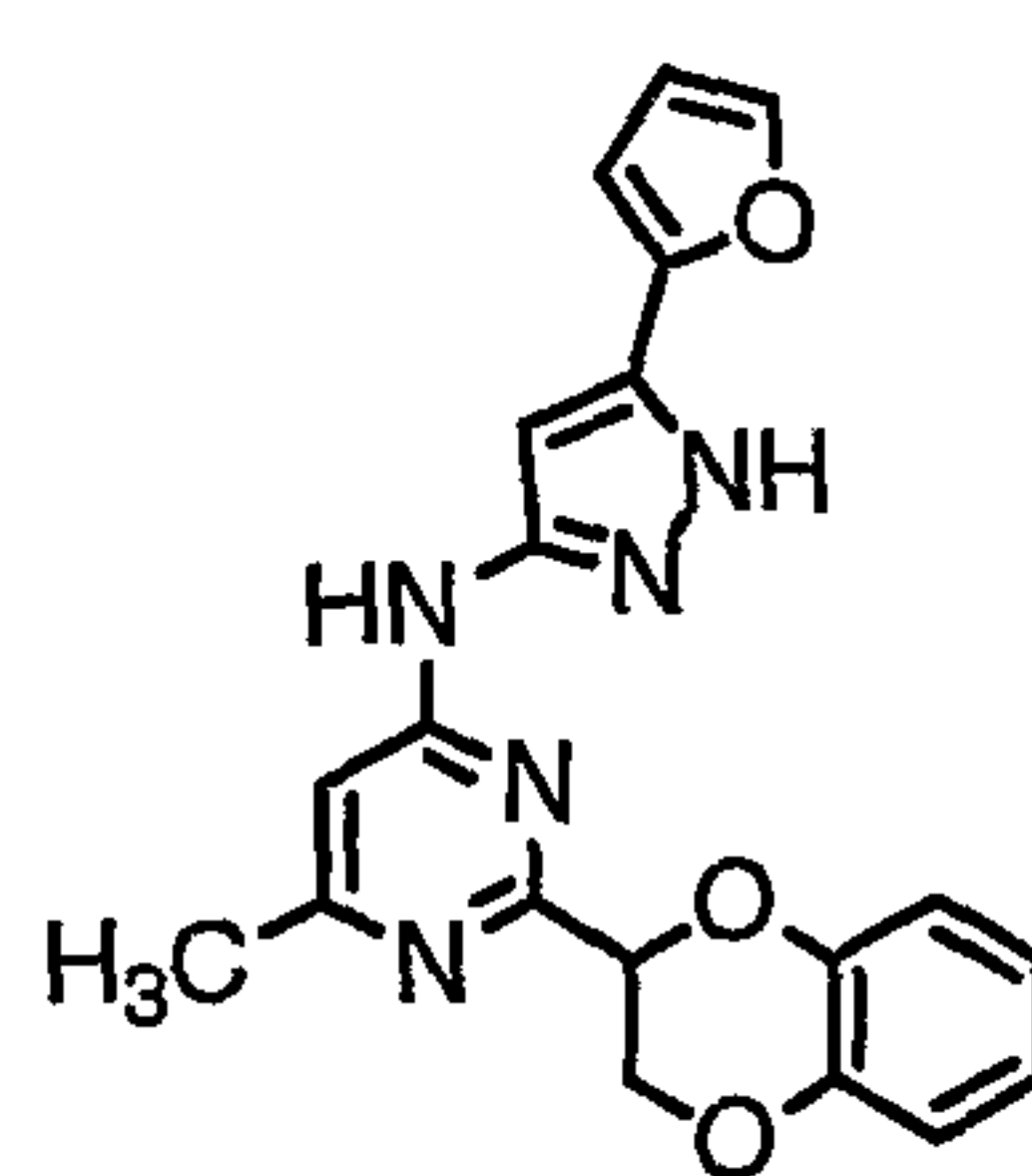
IV-12



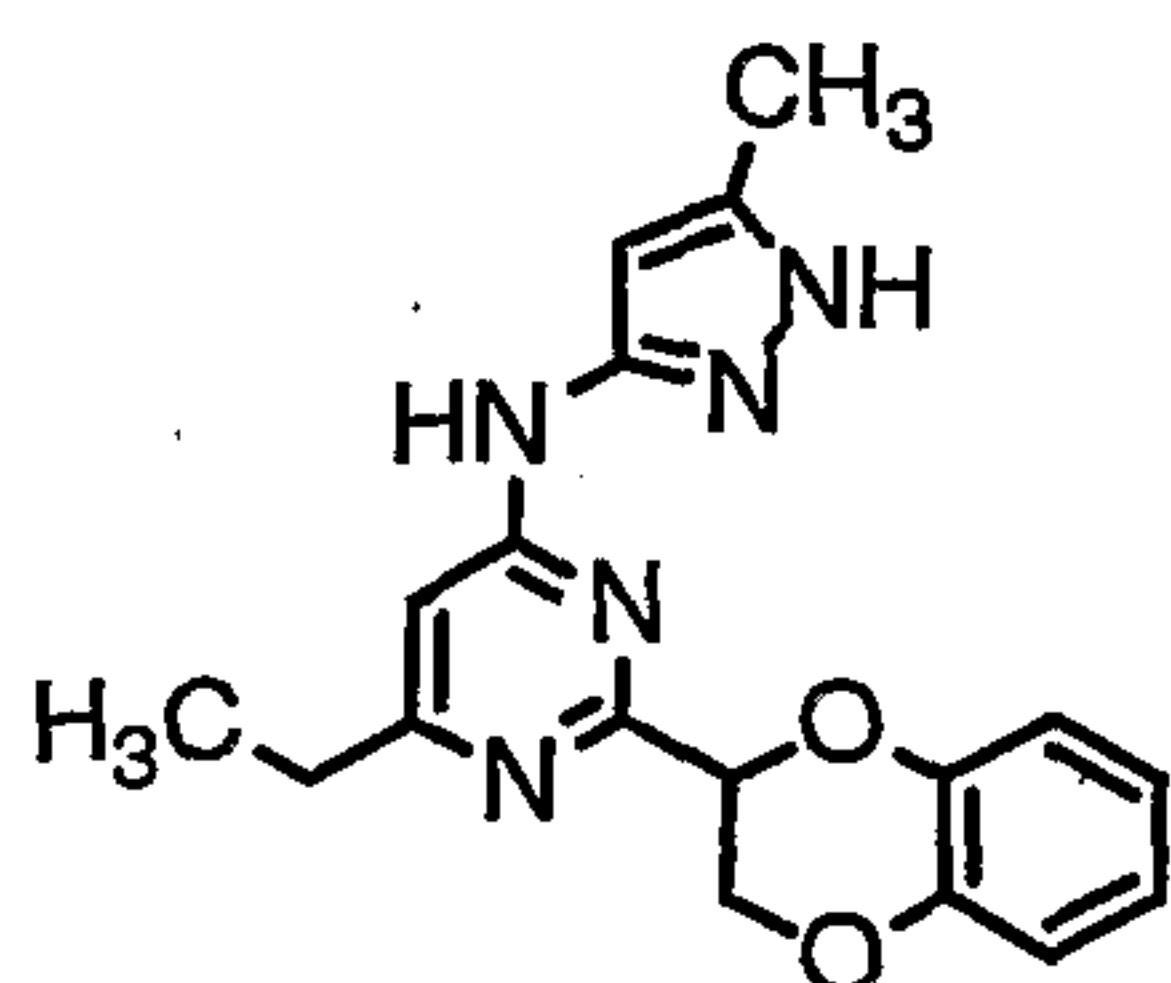
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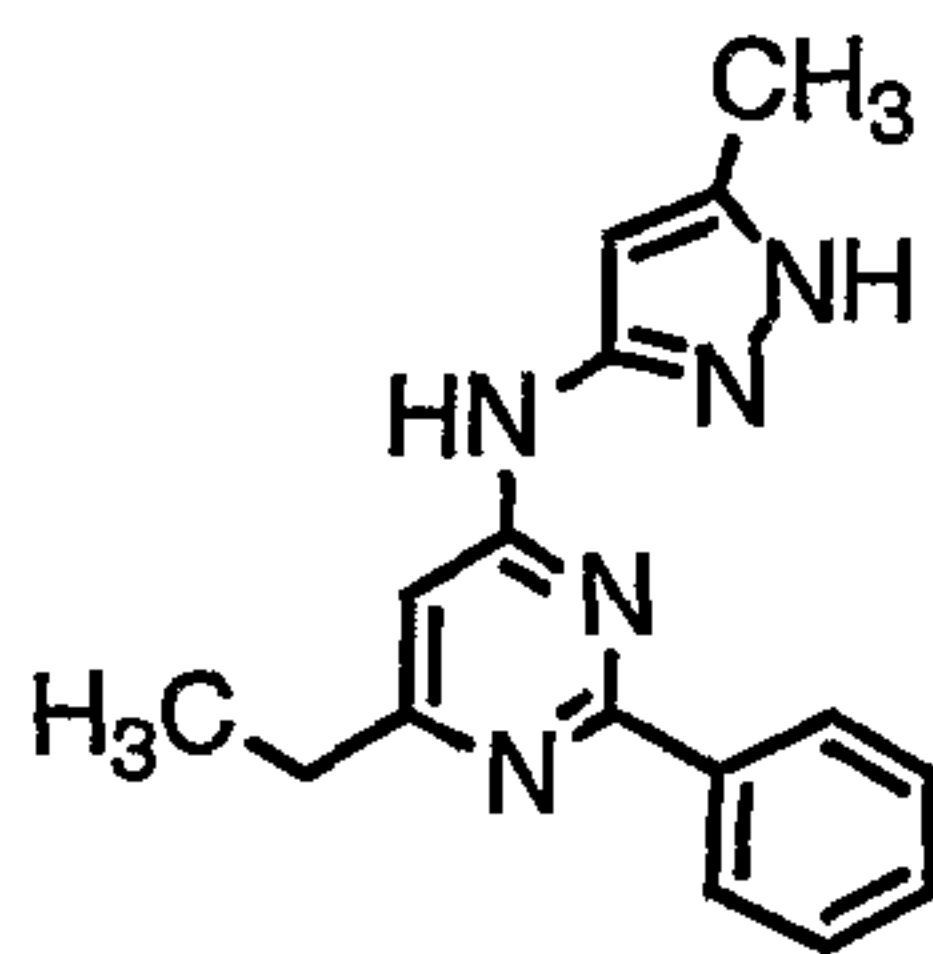
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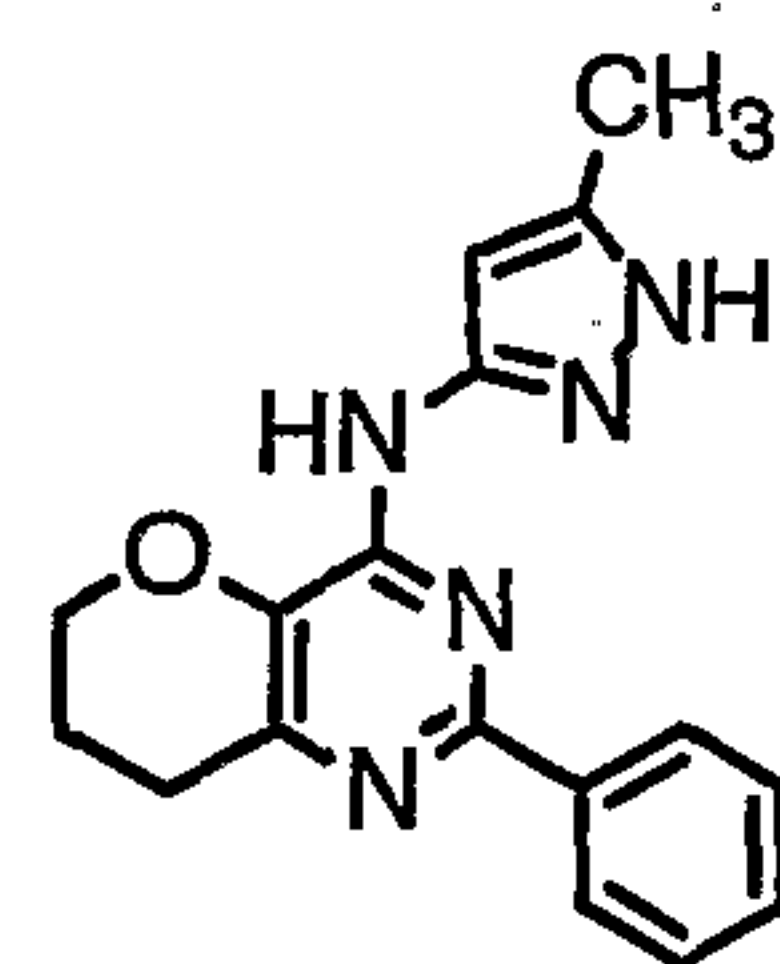
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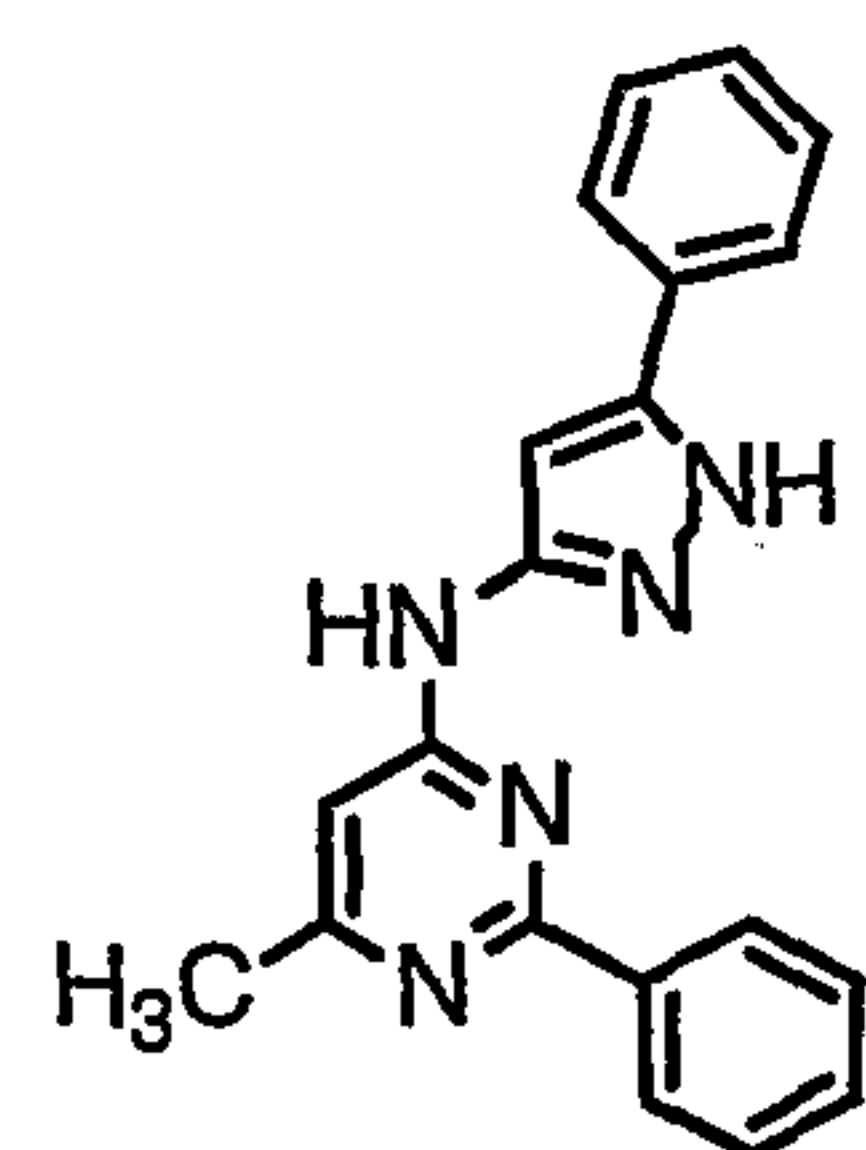
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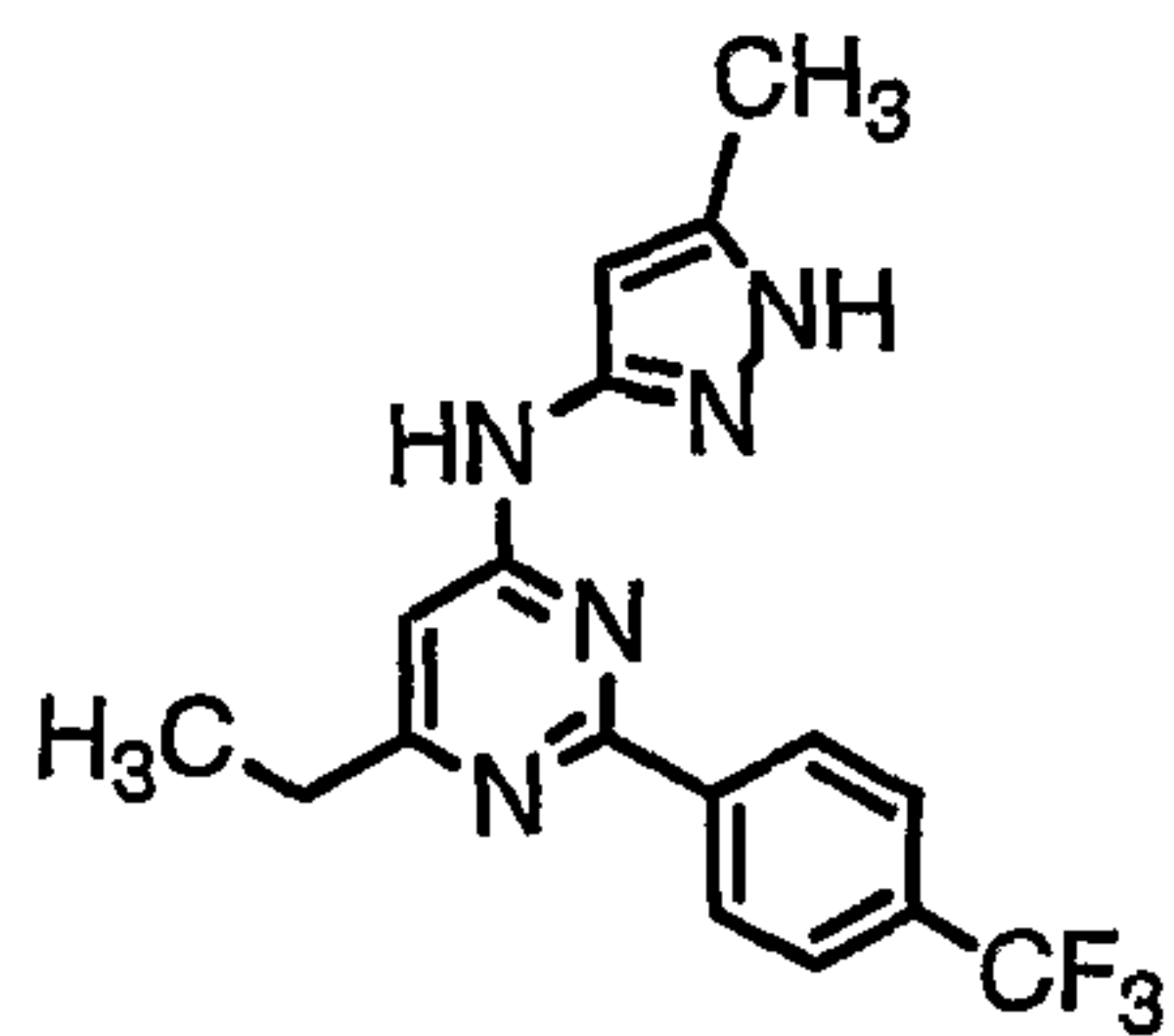
IV-17



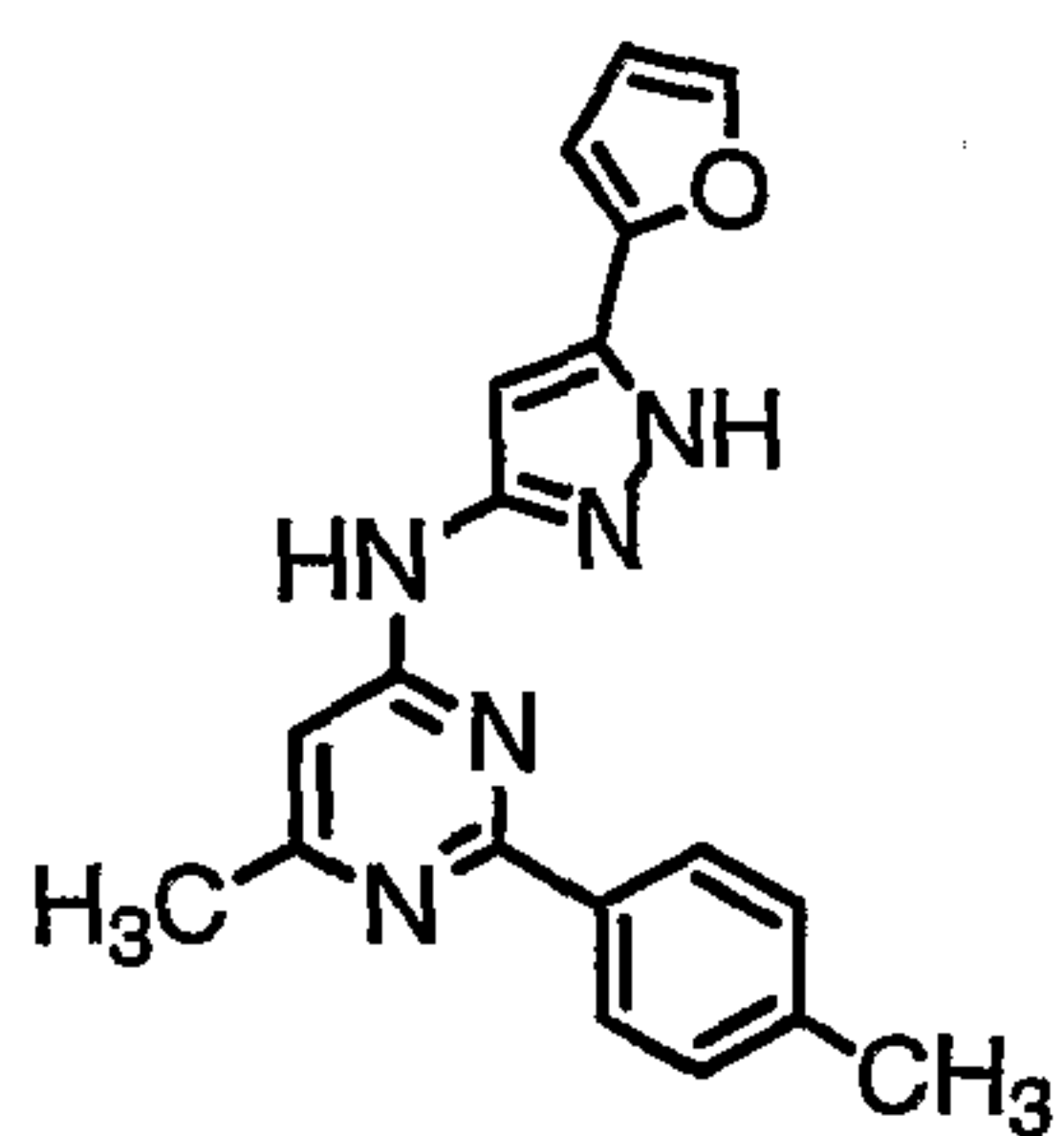
IV-18



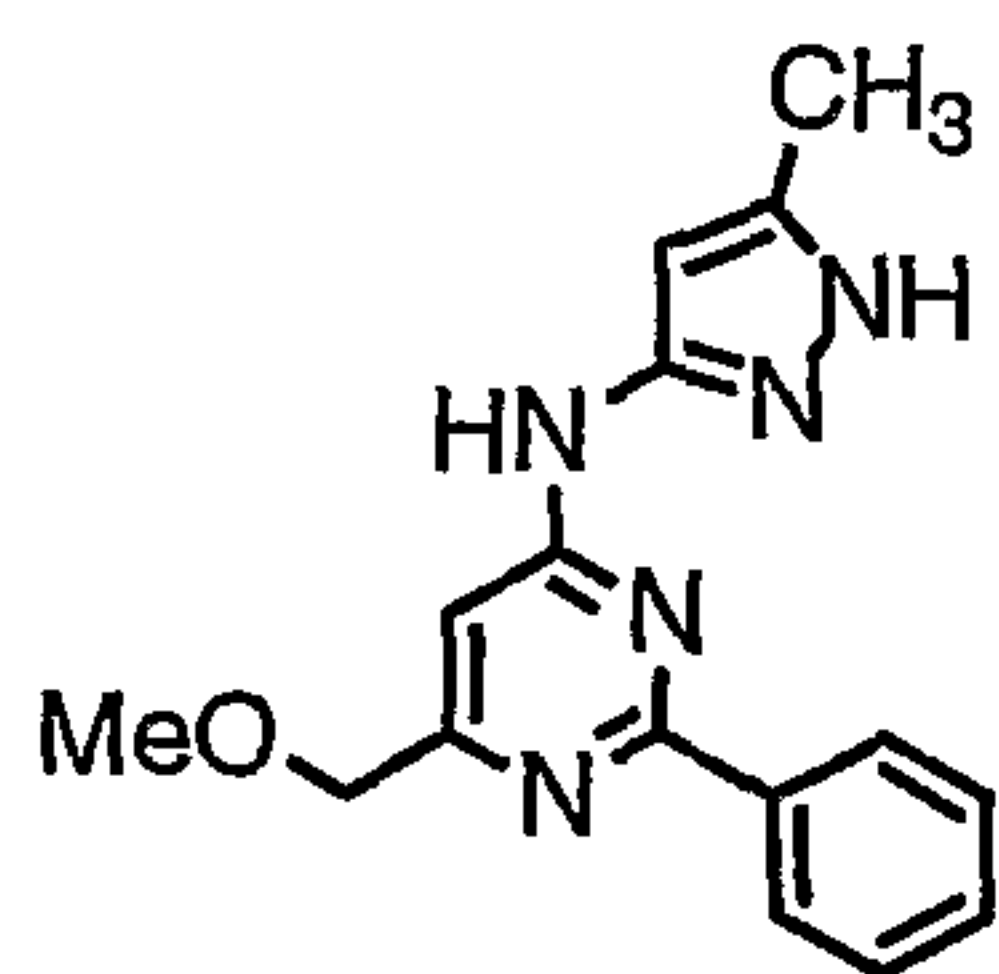
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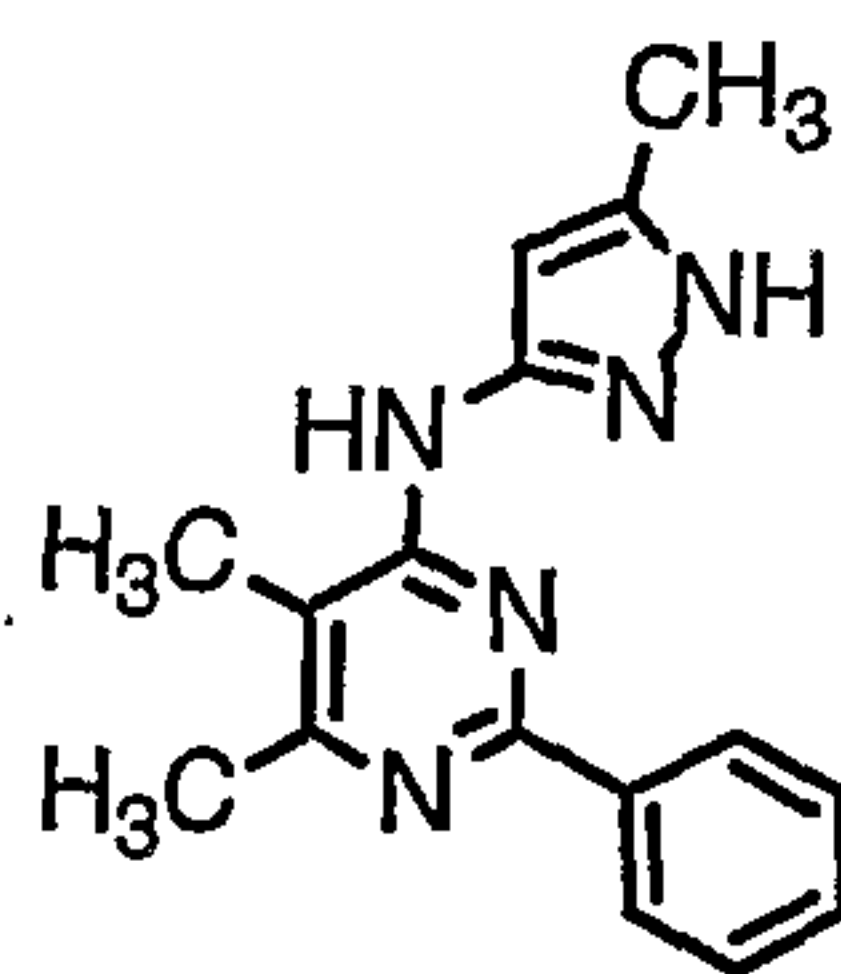
IV-20



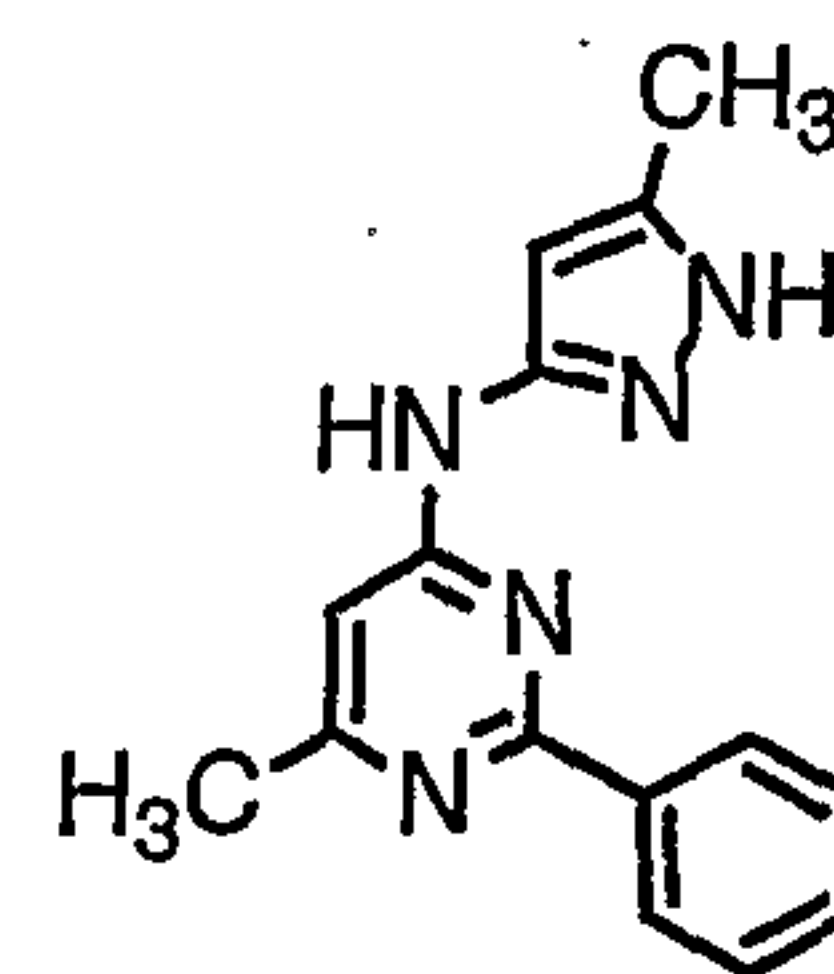
IV-21



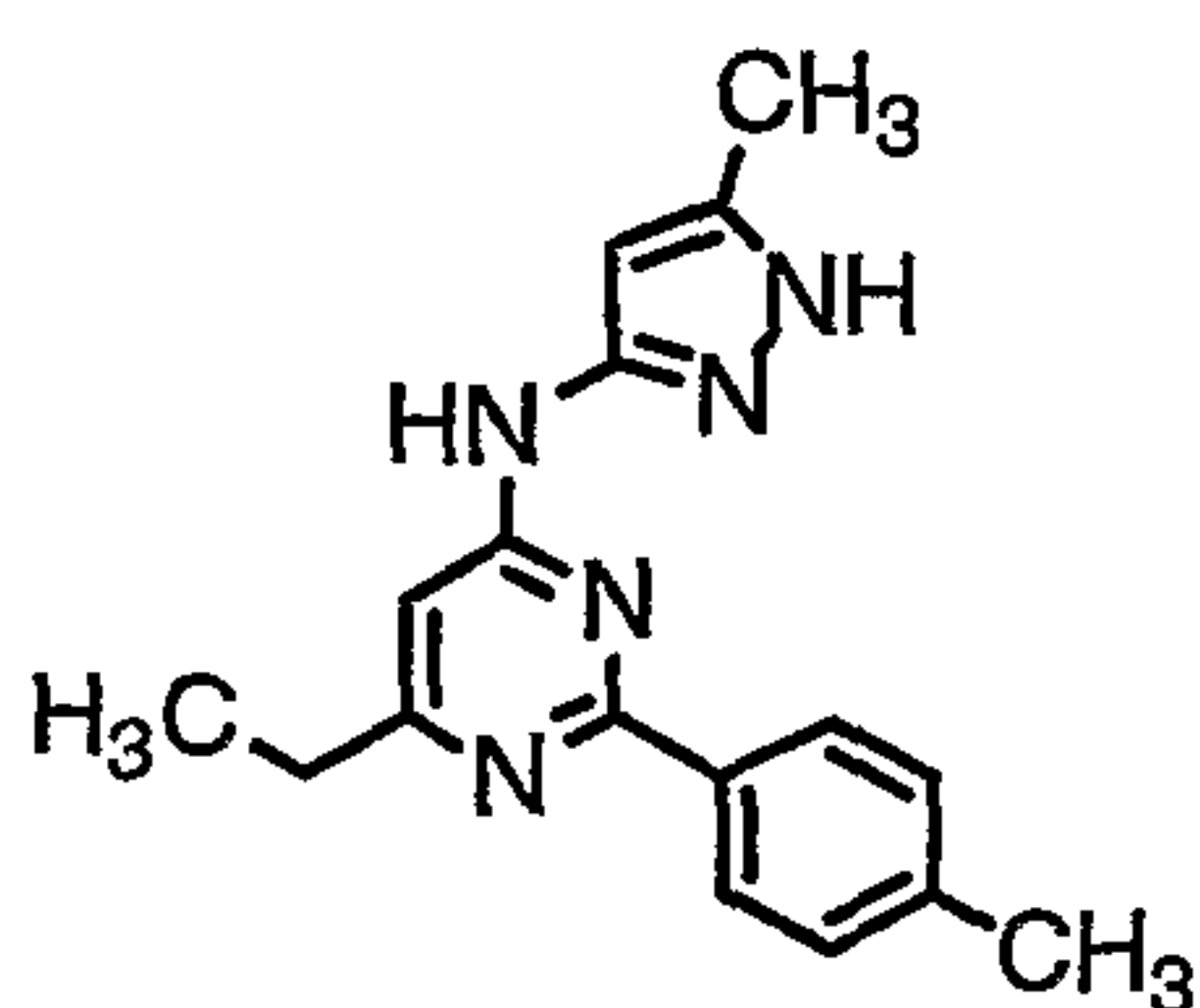
IV-22



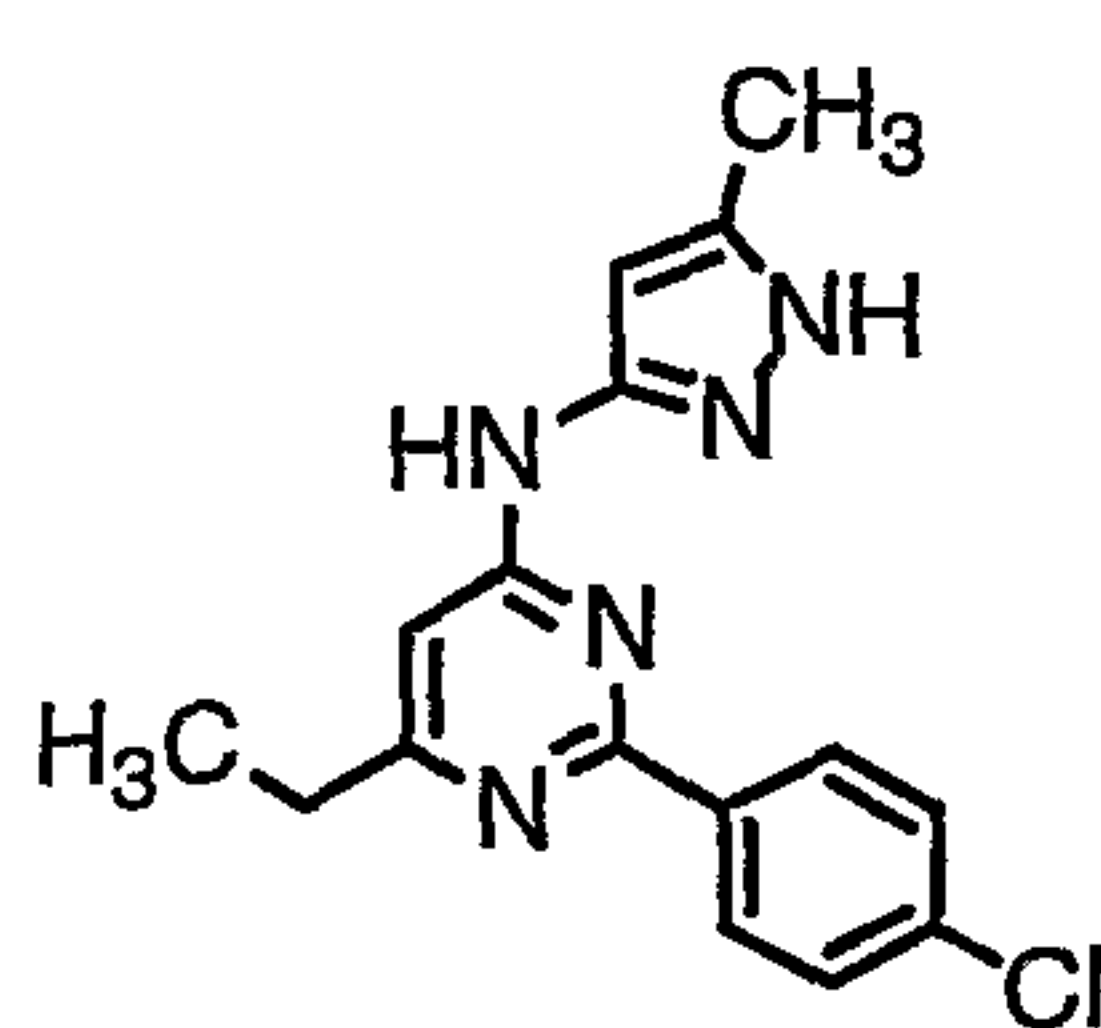
IV-23



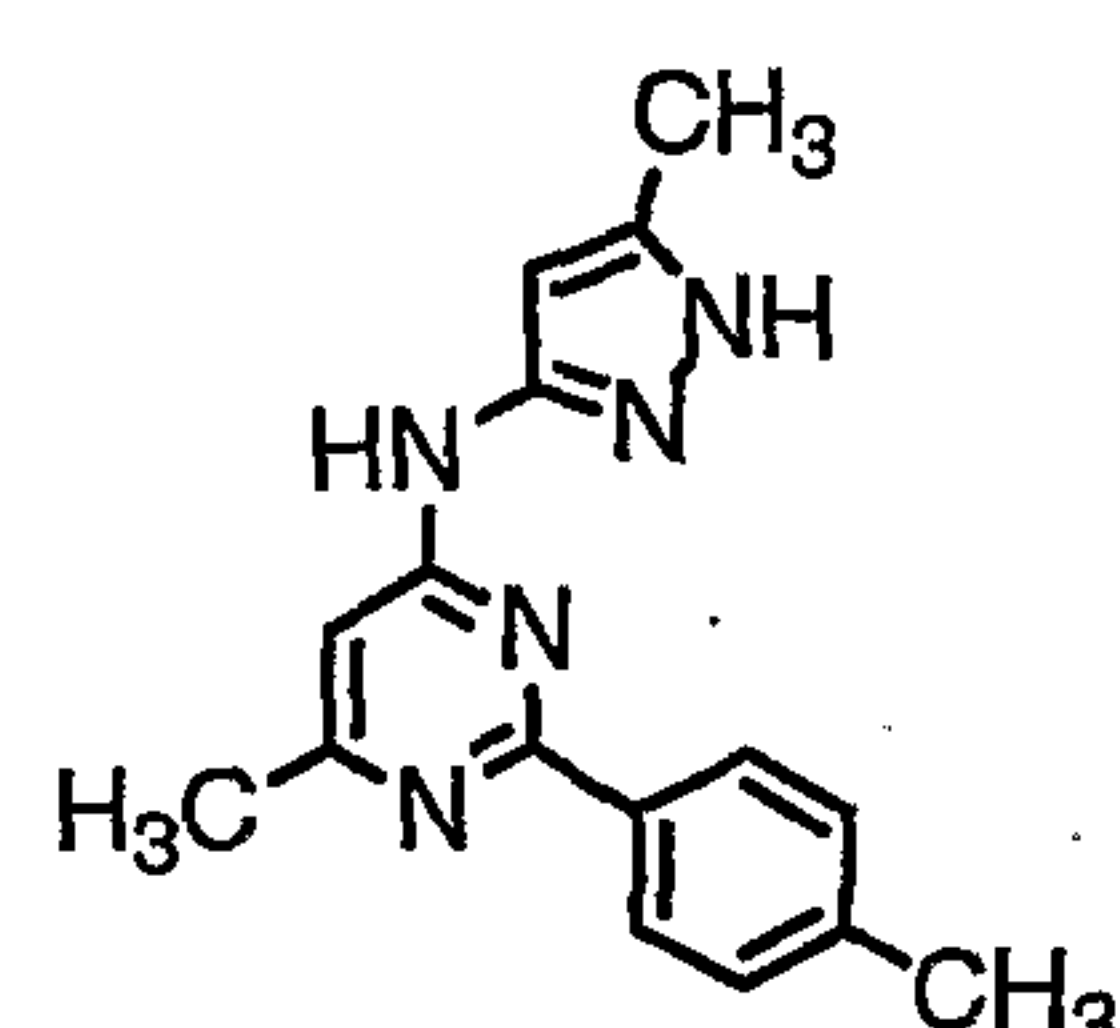
IV-24



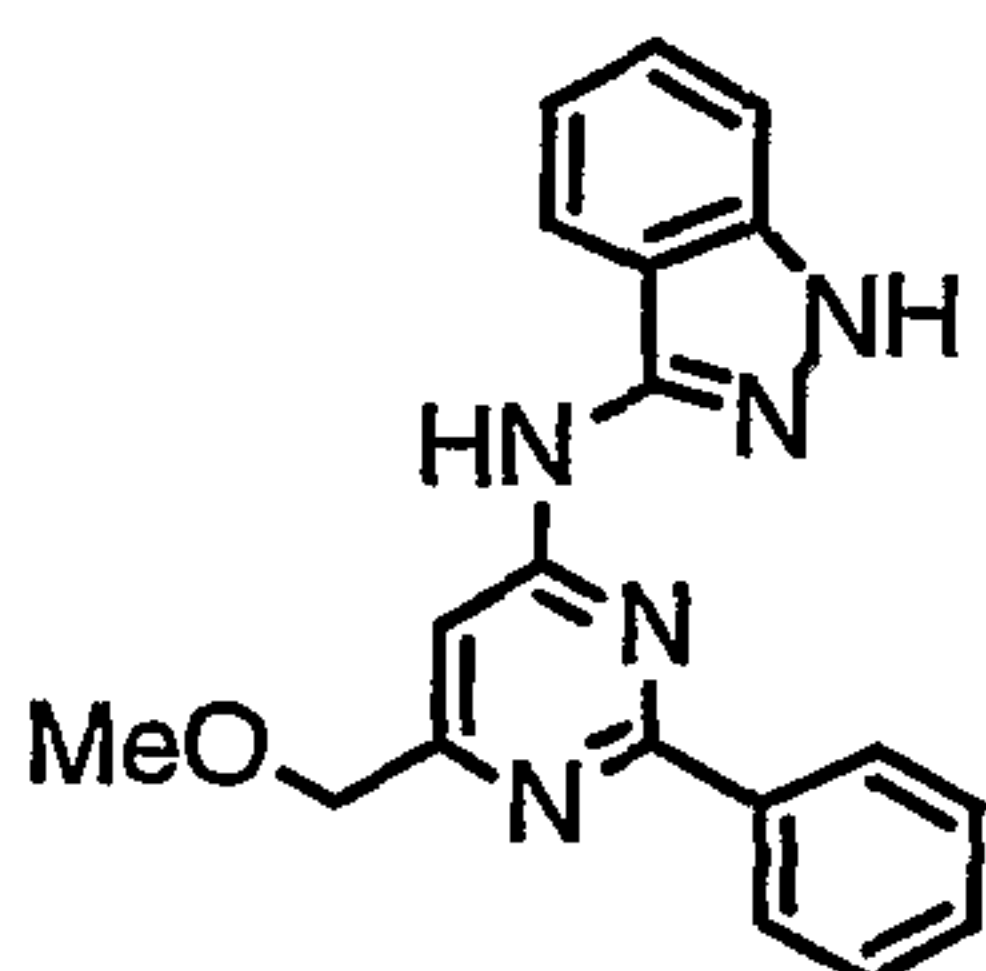
IV-25



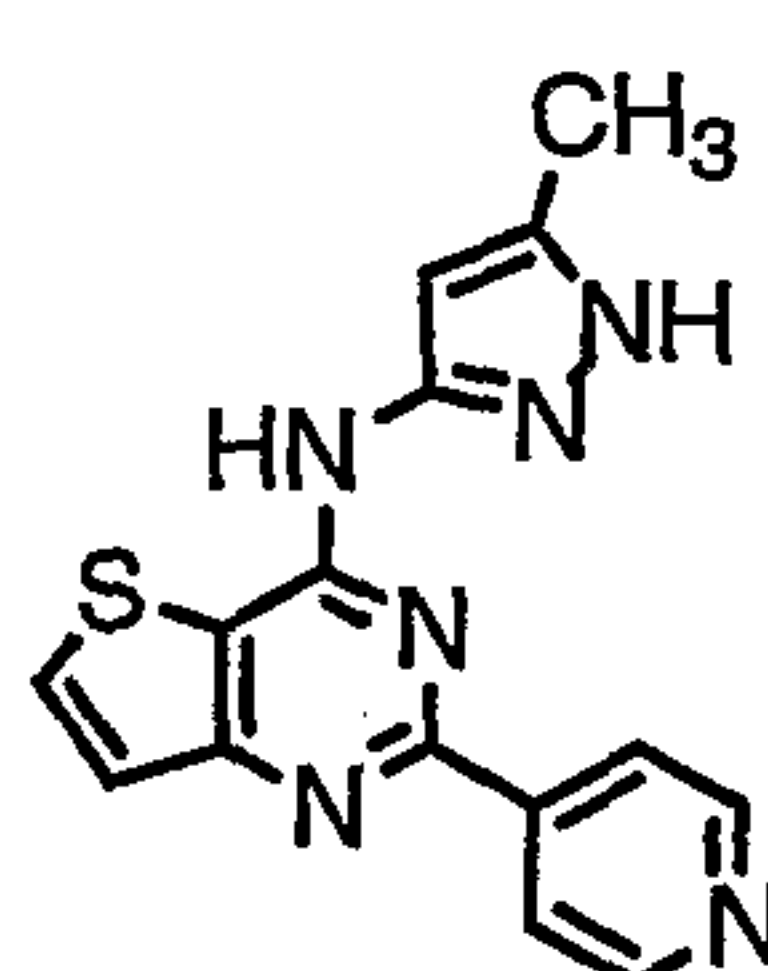
IV-26



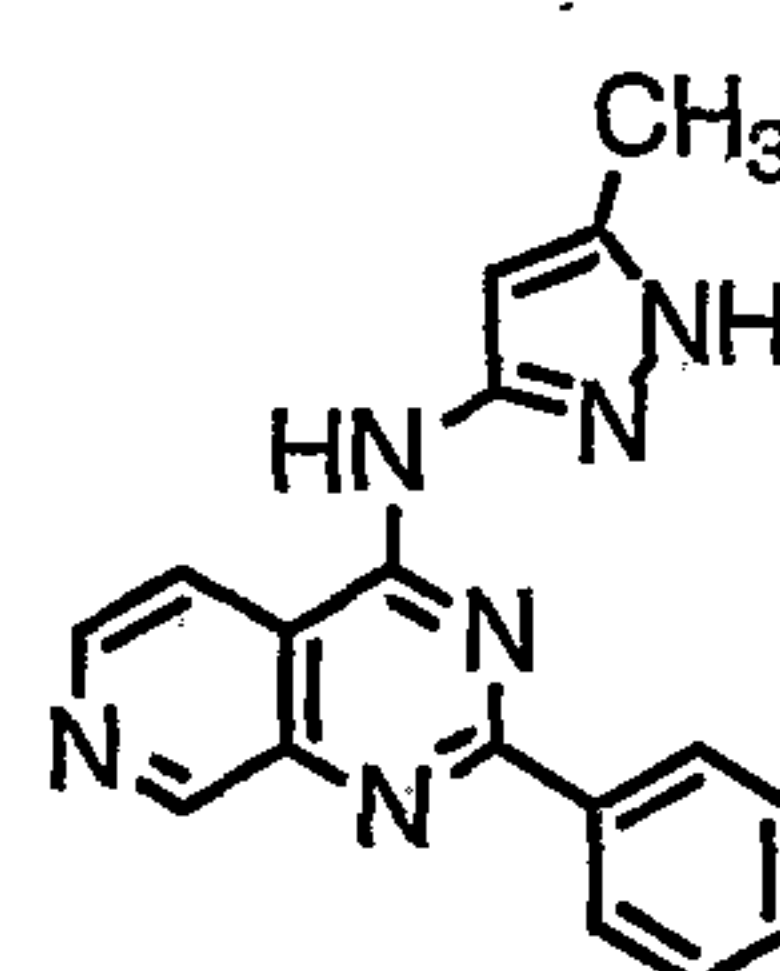
IV-27



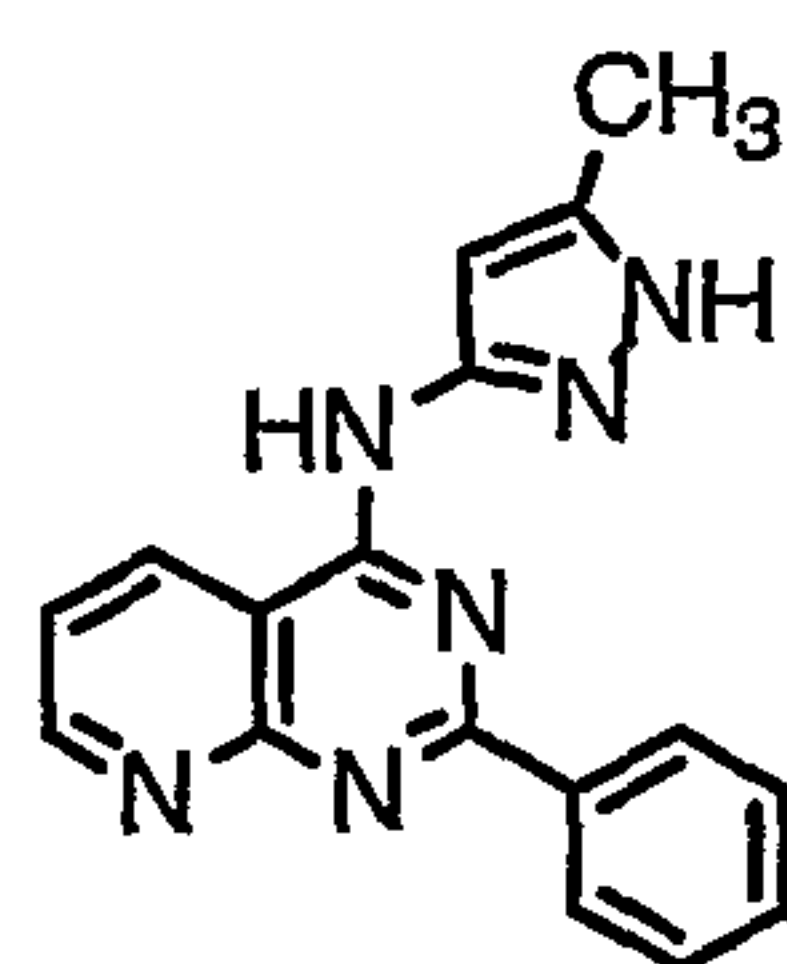
IV-28



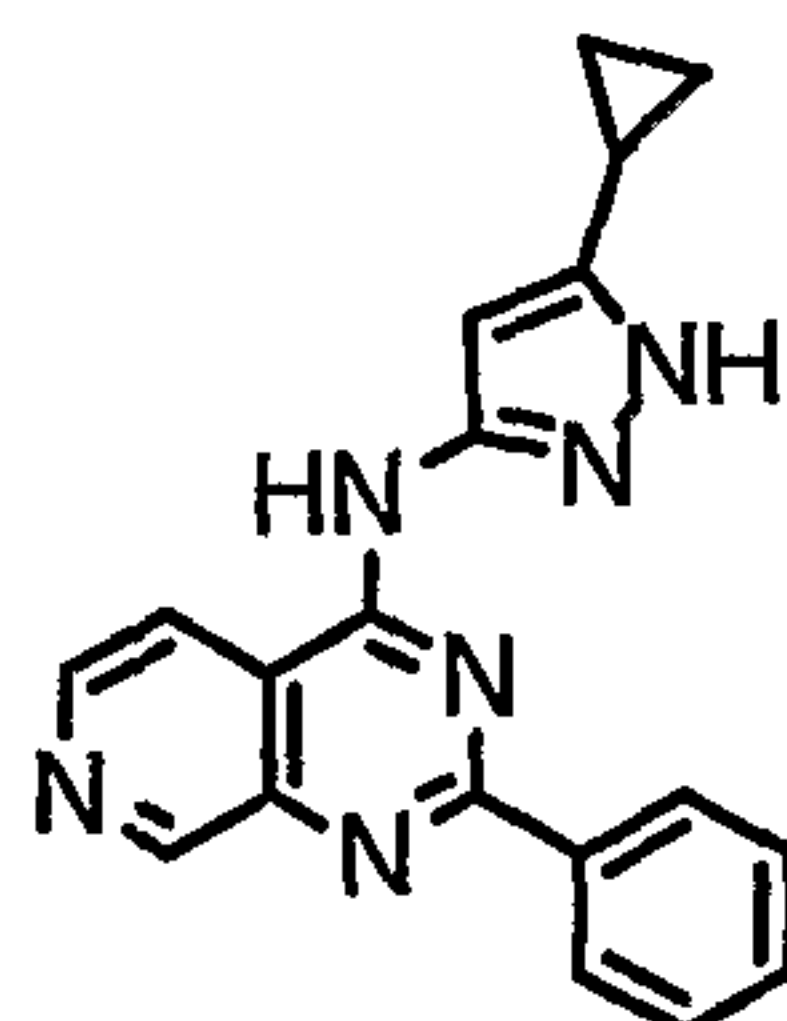
IV-29



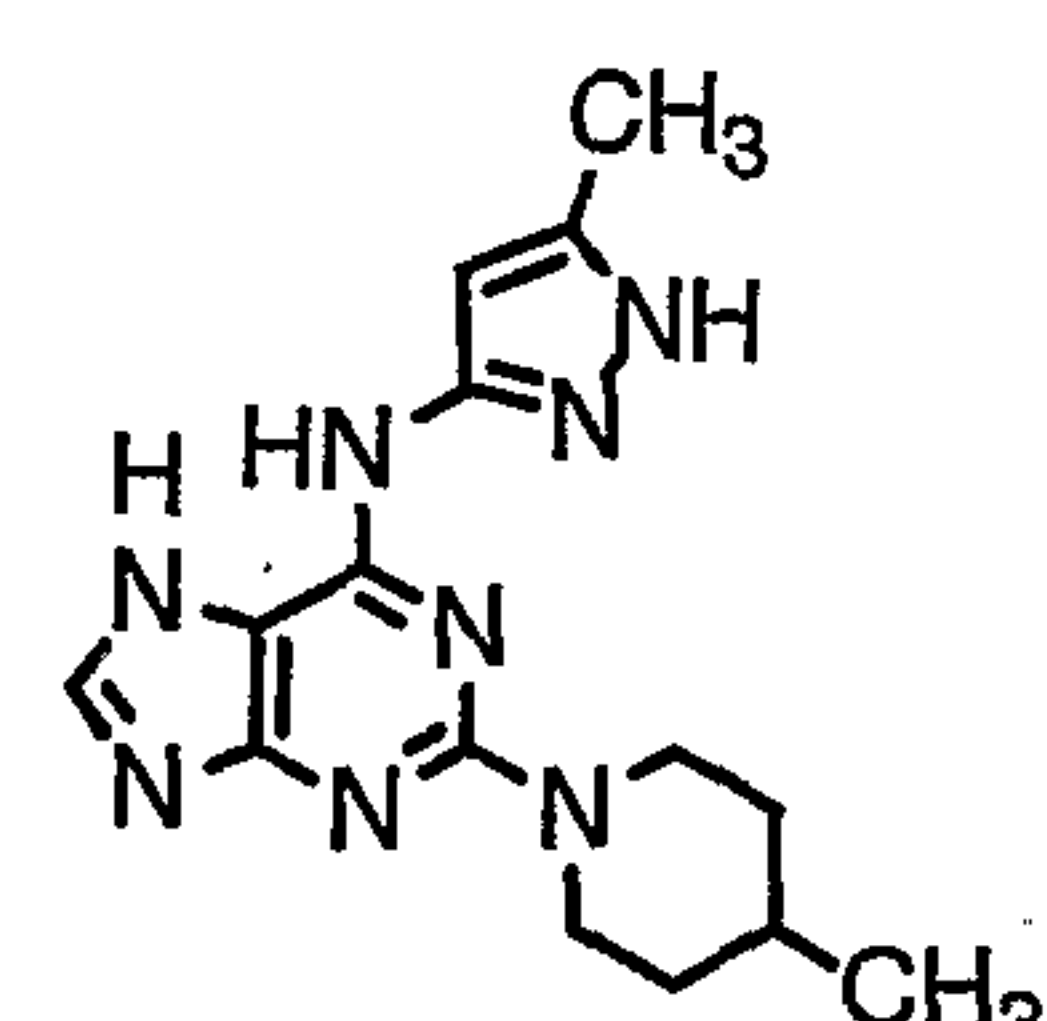
IV-30



IV-31



IV-32



IV-33

In another embodiment, this invention provides
 15 a composition comprising a compound of formula IV and a
 pharmaceutically acceptable carrier.

One aspect of this invention relates to a
 method of inhibiting GSK-3 activity in a patient,
 comprising administering to the patient a therapeutically

effective amount of a composition comprising a compound of formula IV.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a GSK-3 inhibitor, said method comprising the step of
5 administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula IV.

Another aspect relates to a method of enhancing
10 glycogen synthesis and/or lowering blood levels of glucose in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula IV. This method is especially useful for diabetic
15 patients.

Another aspect relates to a method of inhibiting the production of hyperphosphorylated Tau protein in a patient in need thereof, comprising administering to said patient a therapeutically effective
20 amount of a composition comprising a compound of formula IV. This method is especially useful in halting or slowing the progression of Alzheimer's disease.

Another aspect relates to a method of inhibiting the phosphorylation of β -catenin in a patient
25 in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula IV. This method is especially useful for treating schizophrenia.

One aspect of this invention relates to a
30 method of inhibiting Aurora activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula IV.

Another aspect relates to a method of treating a disease that is alleviated by treatment with an Aurora inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula IV. This method is especially useful for treating cancer, such as colon, ovarian, and breast cancer.

One aspect of this invention relates to a method of inhibiting CDK-2 activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula IV.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a CDK-2 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula IV. This method is especially useful for treating cancer, Alzheimer's disease, restenosis, angiogenesis, glomerulonephritis, cytomegalovirus, HIV, herpes, psoriasis, atherosclerosis, alopecia, and autoimmune diseases such as rheumatoid arthritis.

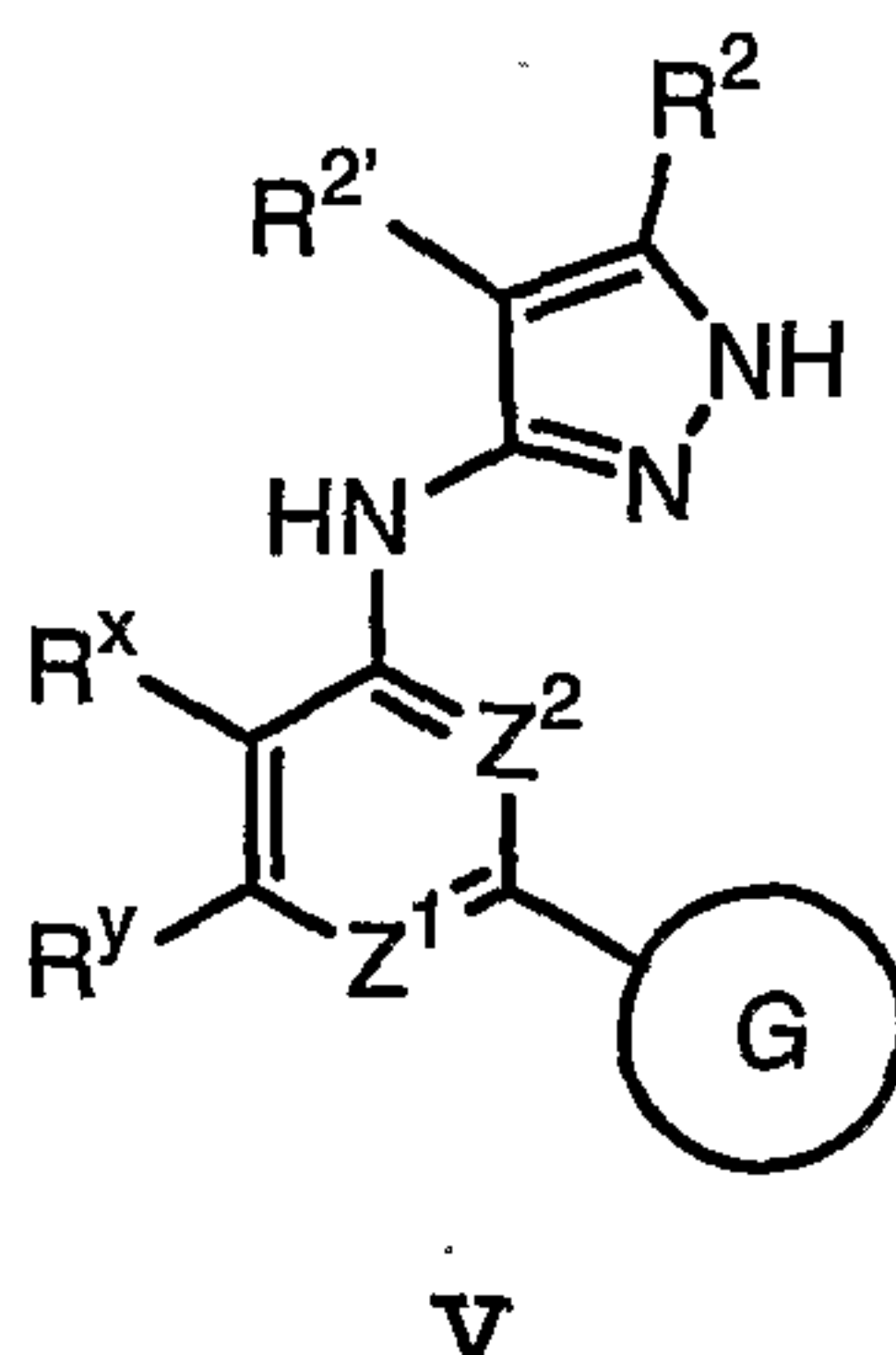
Another method relates to inhibiting GSK-3, Aurora, or CDK-2 activity in a biological sample, which method comprises contacting the biological sample with the GSK-3 or Aurora inhibitor of formula IV, or a pharmaceutical composition thereof, in an amount effective to inhibit GSK-3, Aurora or CDK-2.

Each of the aforementioned methods directed to the inhibition of GSK-3, Aurora or CDK-2, or the treatment of a disease alleviated thereby, is preferably

carried out with a preferred compound of formula IV, as described above.

Another embodiment of this invention relates to compounds of formula V:

5



or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

Z^1 is N, CR^a , or CH and Z^2 is N or CH, provided that one of Z^1 and Z^2 is nitrogen;

G is Ring C or Ring D;

Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from $-R^1$, any substitutable non-ortho carbon position on Ring C is independently substituted by $-R^5$, and two adjacent substituents on Ring C are optionally taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-6 membered ring having 0-3 heteroatoms selected from oxygen, sulfur or nitrogen, said fused ring being optionally substituted by halo, oxo, or $-R^8$;

Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or heterocyclyl ring having 1-4 ring heteroatoms selected

from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by oxo or -R⁵, and at any substitutable ring nitrogen by -R⁴, provided that when Ring D is a six-membered aryl or heteroaryl ring, -R⁵ is hydrogen at each ortho carbon position of Ring D;

R¹ is selected from -halo, -CN, -NO₂, T-V-R⁶, phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C₁₋₆ aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or -R⁸, said C₁₋₆ aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R¹ and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^x and R^y are independently selected from T-R³, or R^x and R^y are taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-8 membered ring having 0-3 ring heteroatoms selected from oxygen, sulfur, or nitrogen, wherein any substitutable carbon on said fused ring formed by R^x and R^y is substituted by oxo or T-R³, and any substitutable nitrogen on said ring formed by R^x and R^y is substituted by R⁴;

T is a valence bond or a C₁₋₄ alkylidene chain;

R² and R^{2'} are independently selected from -R, -T-W-R⁶, or R² and R^{2'} are taken together with their intervening atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring having 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur, wherein each substitutable carbon on said fused ring formed by R² and R^{2'} is substituted by halo, oxo, -CN, -NO₂, -R⁷, or -V-R⁶, and any substitutable nitrogen on said ring formed by R² and R^{2'} is substituted by R⁴;

R^3 is selected from $-R$, $-\text{halo}$, $-\text{OR}$, $-\text{C}(=\text{O})\text{R}$, $-\text{CO}_2\text{R}$,
 $-\text{COCOR}$, $-\text{COCH}_2\text{COR}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{S}(\text{O})\text{R}$, $-\text{S}(\text{O})_2\text{R}$, $-\text{SR}$,
 $-\text{N}(\text{R}^4)_2$, $-\text{CON}(\text{R}^7)_2$, $-\text{SO}_2\text{N}(\text{R}^7)_2$, $-\text{OC}(=\text{O})\text{R}$, $-\text{N}(\text{R}^7)\text{COR}$,
 $-\text{N}(\text{R}^7)\text{CO}_2$ (optionally substituted C_{1-6} aliphatic),
 $-\text{N}(\text{R}^4)\text{N}(\text{R}^4)_2$, $-\text{C}=\text{NN}(\text{R}^4)_2$, $-\text{C}=\text{N}-\text{OR}$, $-\text{N}(\text{R}^7)\text{CON}(\text{R}^7)_2$,
 $-\text{N}(\text{R}^7)\text{SO}_2\text{N}(\text{R}^7)_2$, $-\text{N}(\text{R}^4)\text{SO}_2\text{R}$, or $-\text{OC}(=\text{O})\text{N}(\text{R}^7)_2$;

each R is independently selected from hydrogen or an
optionally substituted group selected from C_{1-6}
aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10
ring atoms, or a heterocyclyl ring having 5-10 ring
atoms;

each R^4 is independently selected from $-\text{R}^7$, $-\text{COR}^7$,
 $-\text{CO}_2$ (optionally substituted C_{1-6} aliphatic), $-\text{CON}(\text{R}^7)_2$,
or $-\text{SO}_2\text{R}^7$, or two R^4 on the same nitrogen are taken
together to form a 5-8 membered heterocyclyl or
5 heteroaryl ring;

each R^5 is independently selected from $-R$, halo , $-\text{OR}$,
 $-\text{C}(=\text{O})\text{R}$, $-\text{CO}_2\text{R}$, $-\text{COCOR}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{S}(\text{O})\text{R}$, $-\text{SO}_2\text{R}$, $-\text{SR}$,
 $-\text{N}(\text{R}^4)_2$, $-\text{CON}(\text{R}^4)_2$, $-\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{OC}(=\text{O})\text{R}$, $-\text{N}(\text{R}^4)\text{COR}$,
10 $-\text{N}(\text{R}^4)\text{CO}_2$ (optionally substituted C_{1-6} aliphatic),
 $-\text{N}(\text{R}^4)\text{N}(\text{R}^4)_2$, $-\text{C}=\text{NN}(\text{R}^4)_2$, $-\text{C}=\text{N}-\text{OR}$, $-\text{N}(\text{R}^4)\text{CON}(\text{R}^4)_2$,
 $-\text{N}(\text{R}^4)\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{N}(\text{R}^4)\text{SO}_2\text{R}$, or $-\text{OC}(=\text{O})\text{N}(\text{R}^4)_2$, or R^5 and
an adjacent substituent taken together with their
intervening atoms form said ring fused to Ring C;

V is $-\text{O}-$, $-\text{S}-$, $-\text{SO}-$, $-\text{SO}_2-$, $-\text{N}(\text{R}^6)\text{SO}_2-$, $-\text{SO}_2\text{N}(\text{R}^6)-$,
15 $-\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$, $-\text{N}(\text{R}^6)\text{CO}-$, $-\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$,
 $-\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{O})\text{N}(\text{R}^6)-$, $-\text{OC}(\text{O})\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$,
 $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$, $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{R}^6)=\text{NN}(\text{R}^6)-$,
20 $-\text{C}(\text{R}^6)=\text{N}-\text{O}-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, or
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$;

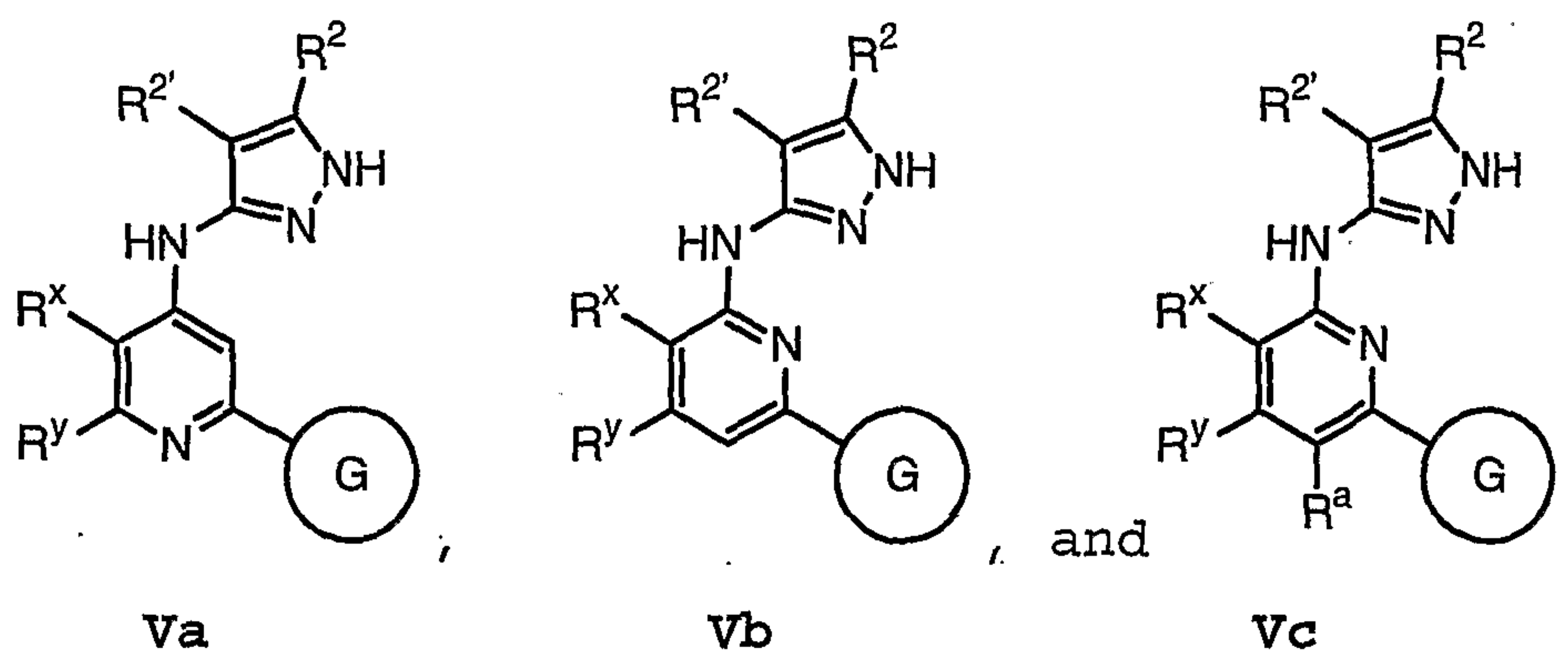
W is $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$, $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$,
 $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$,

-C(R⁶)OC(O)-, -C(R⁶)OC(O)N(R⁶)-, -C(R⁶)₂N(R⁶)CO-,
 -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-, -C(R⁶)=N-O-,
 -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-,
 -C(R⁶)₂N(R⁶)CON(R⁶)-, or -CON(R⁶)-;

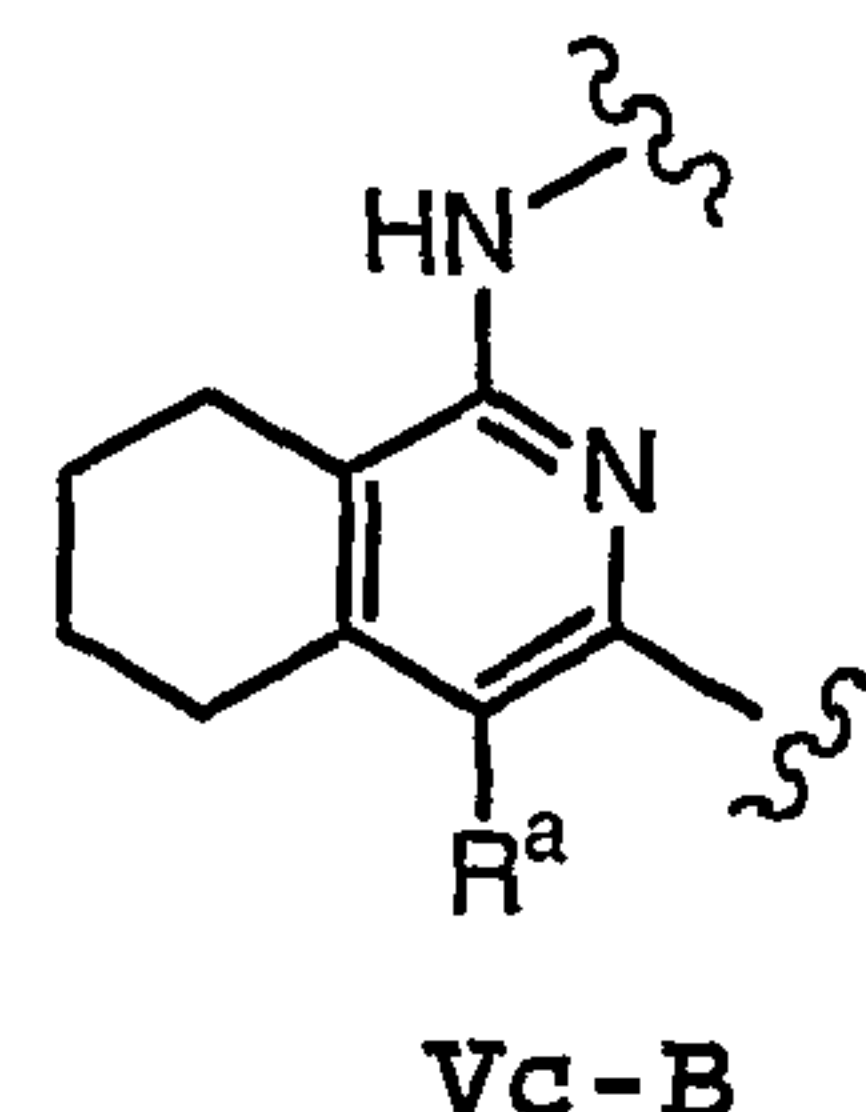
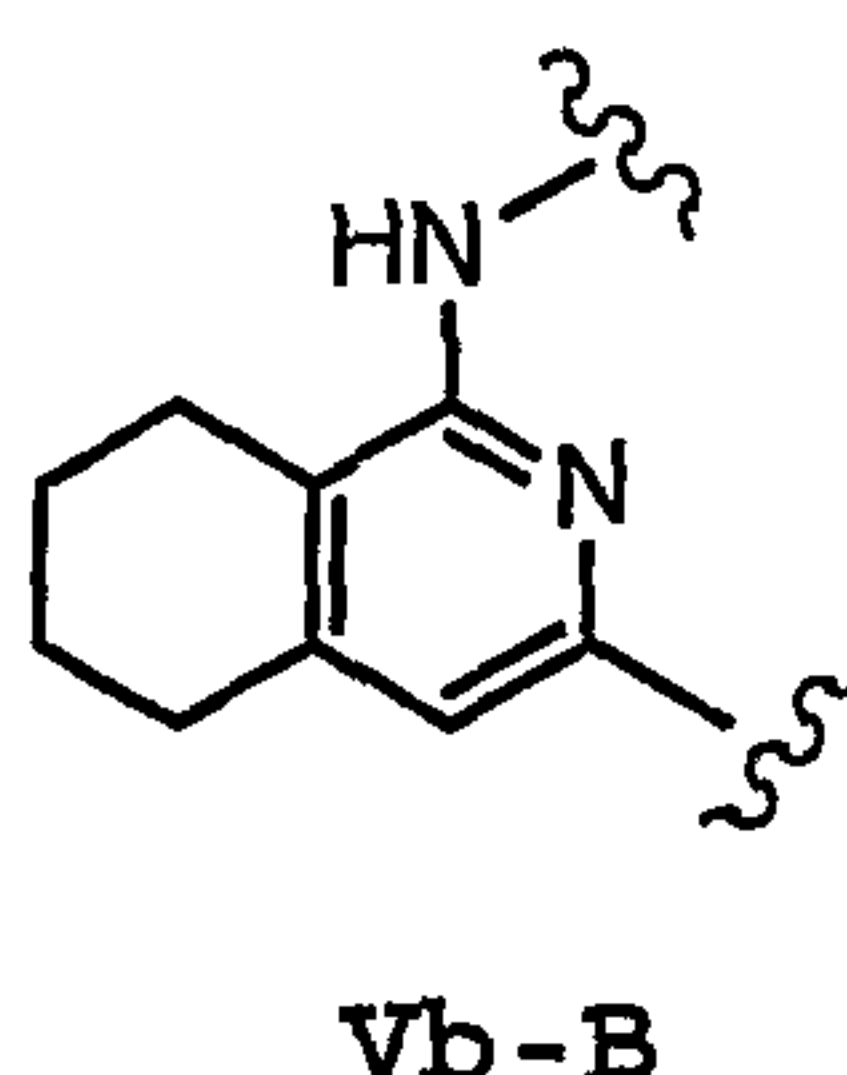
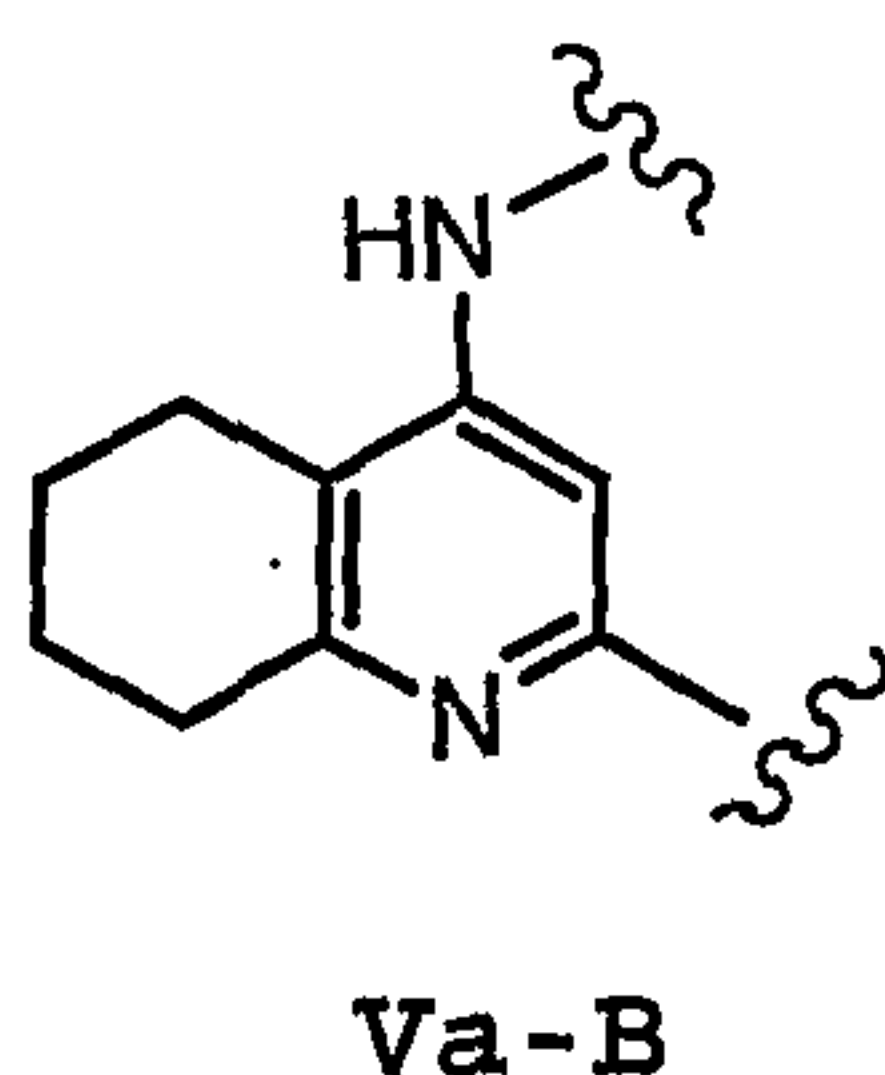
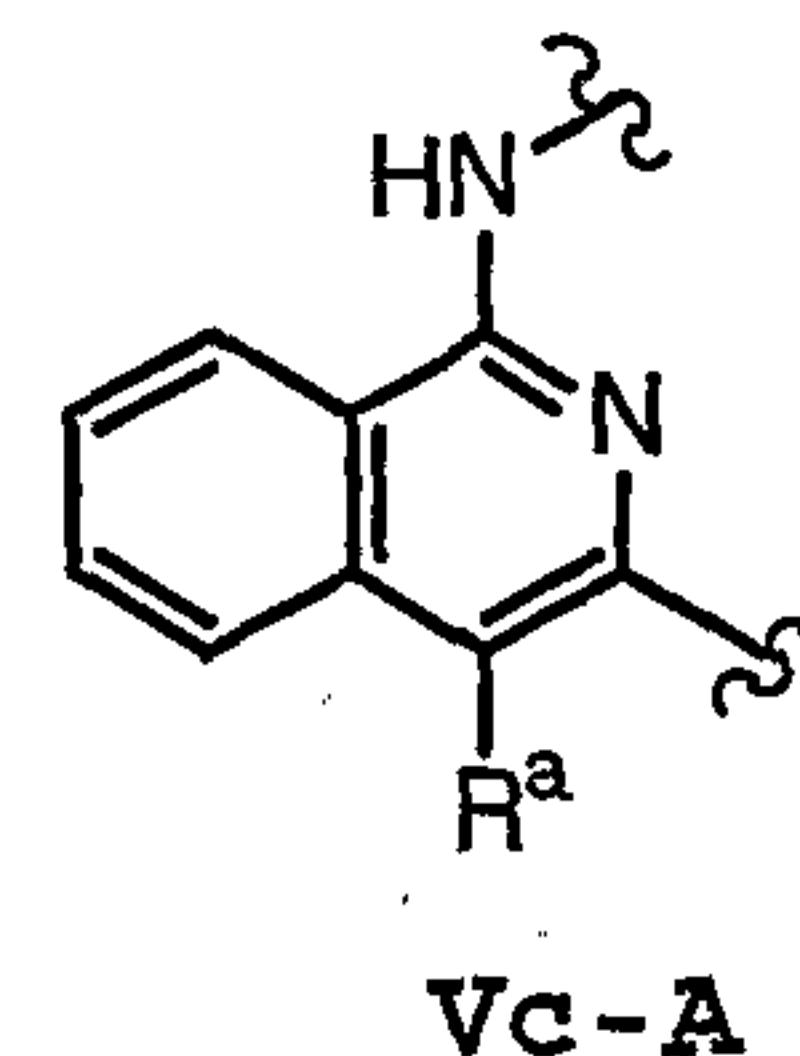
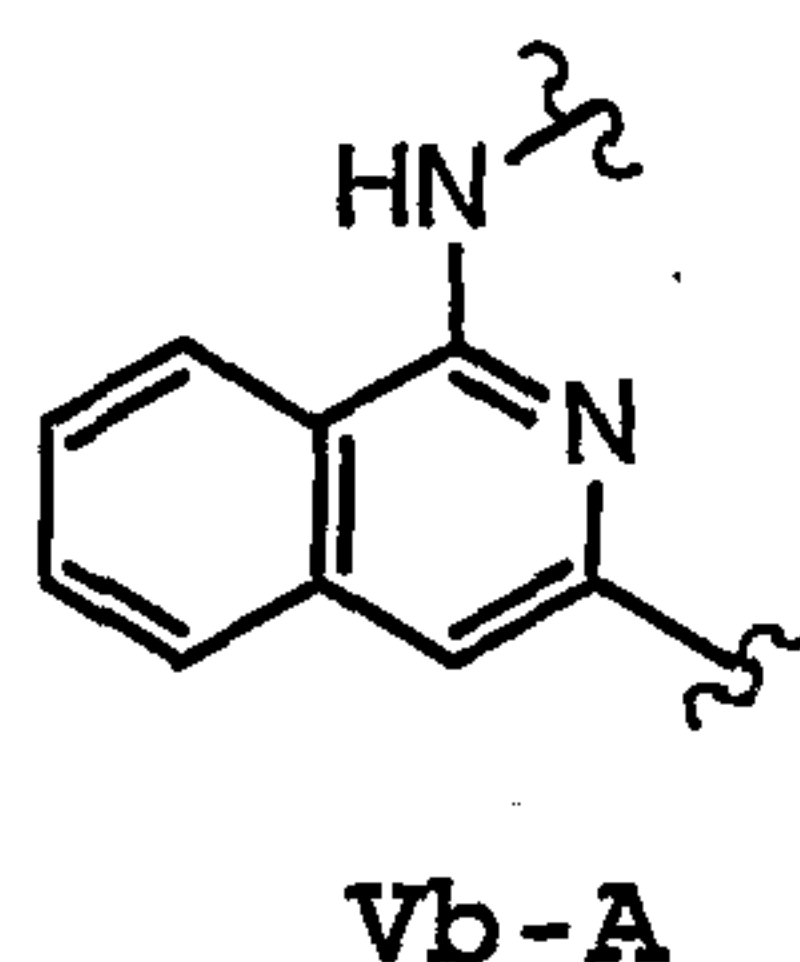
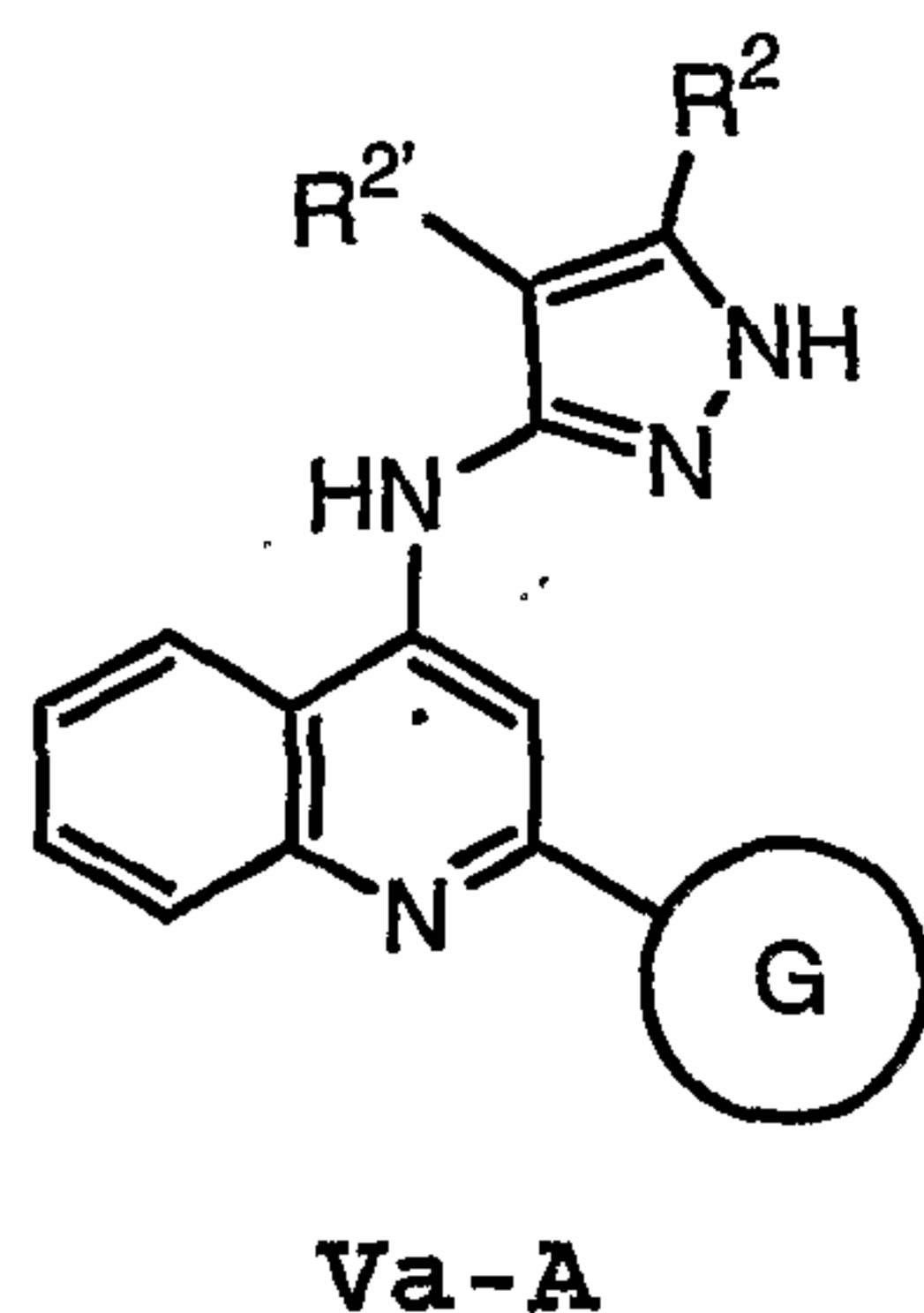
- 5 each R⁶ is independently selected from hydrogen, an optionally substituted C₁₋₄ aliphatic group, or two R⁶ groups on the same nitrogen atom are taken together with the nitrogen atom to form a 5-6 membered heterocyclyl or heteroaryl ring;
- 10 each R⁷ is independently selected from hydrogen or an optionally substituted C₁₋₆ aliphatic group, or two R⁷ on the same nitrogen are taken together with the nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring;
- 15 each R⁸ is independently selected from an optionally substituted C₁₋₄ aliphatic group, -OR⁶, -SR⁶, -COR⁶, -SO₂R⁶, -N(R⁶)₂, -N(R⁶)N(R⁶)₂, -CN, -NO₂, -CON(R⁶)₂, or -CO₂R⁶; and
- R^a is selected from halo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, -OC(=O)N(R⁴)₂, or an optionally substituted group
- 20 selected from C₁₋₆ aliphatic, C₆₋₁₀ aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms.
- 25

Compounds of formula V may be represented by specifying Z¹ and Z² as shown below:

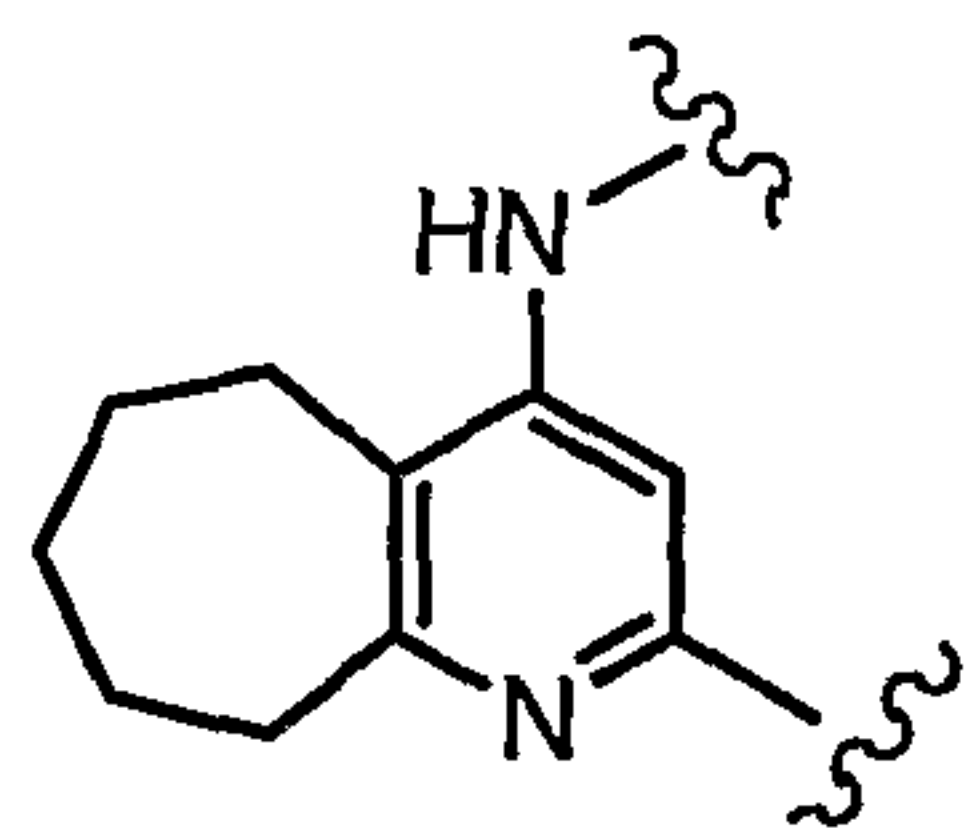
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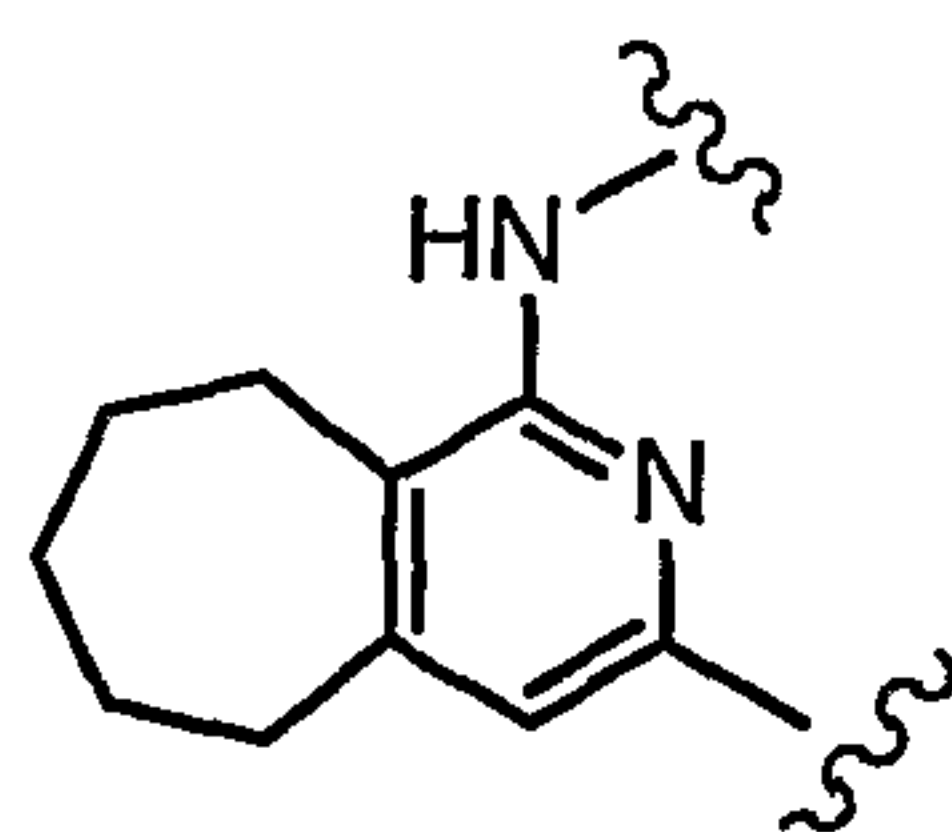
When the R^x and R^y groups of formula V are taken
 5 together to form a fused ring, preferred R^x/R^y rings
 include a 5-, 6-, 7-, or 8-membered unsaturated or
 partially unsaturated ring having 0-2 heteroatoms,
 wherein said R^x/R^y ring is optionally substituted. This
 provides a bicyclic ring system containing a pyridine
 10 ring. Examples of preferred bicyclic ring systems of
 formula V are shown below.



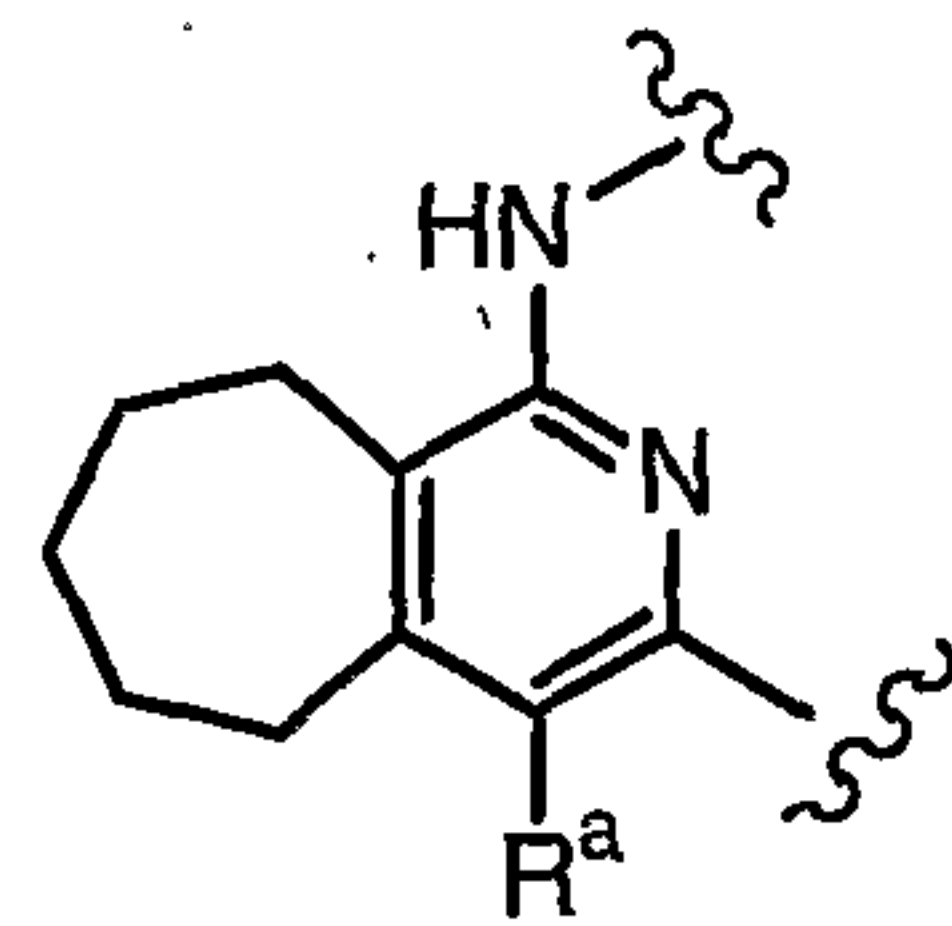
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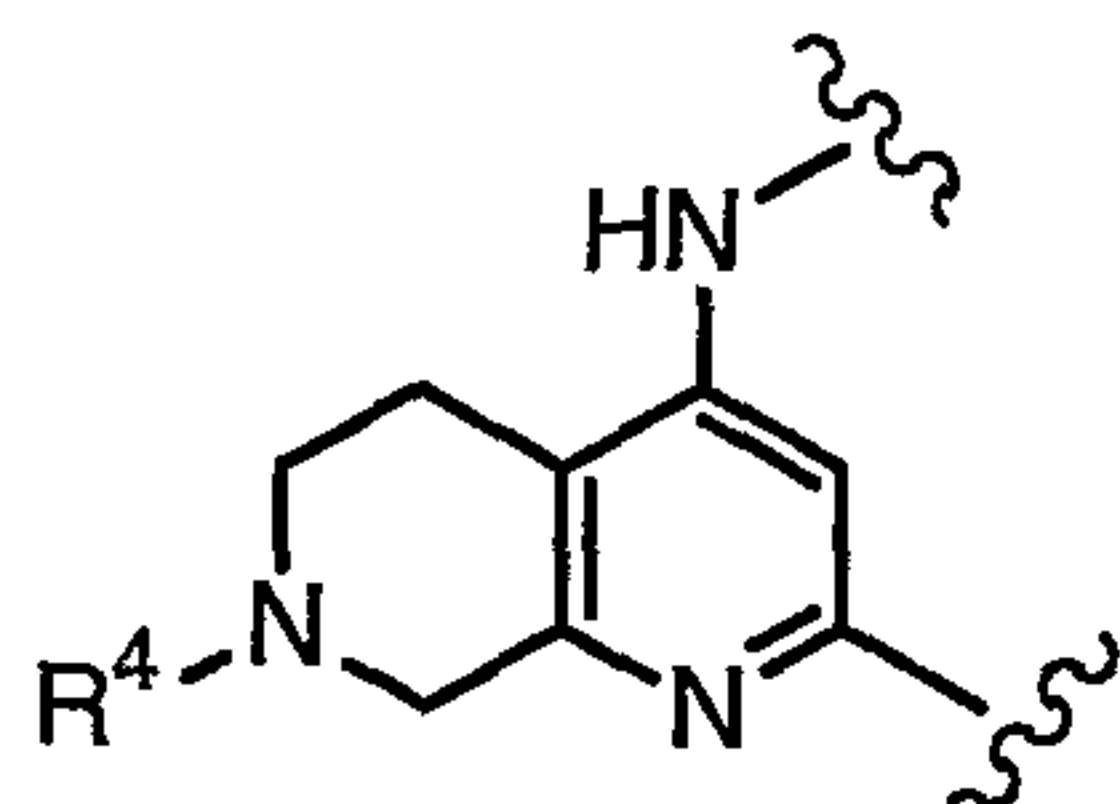
Va-C



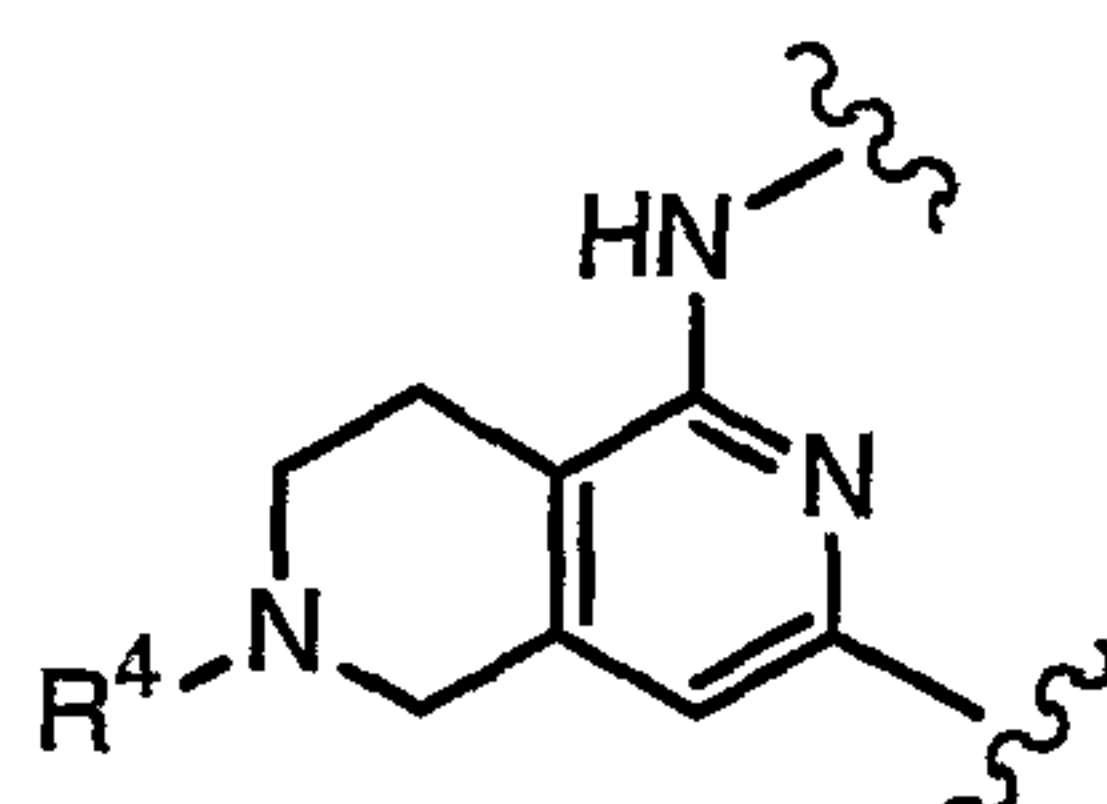
Vb-C



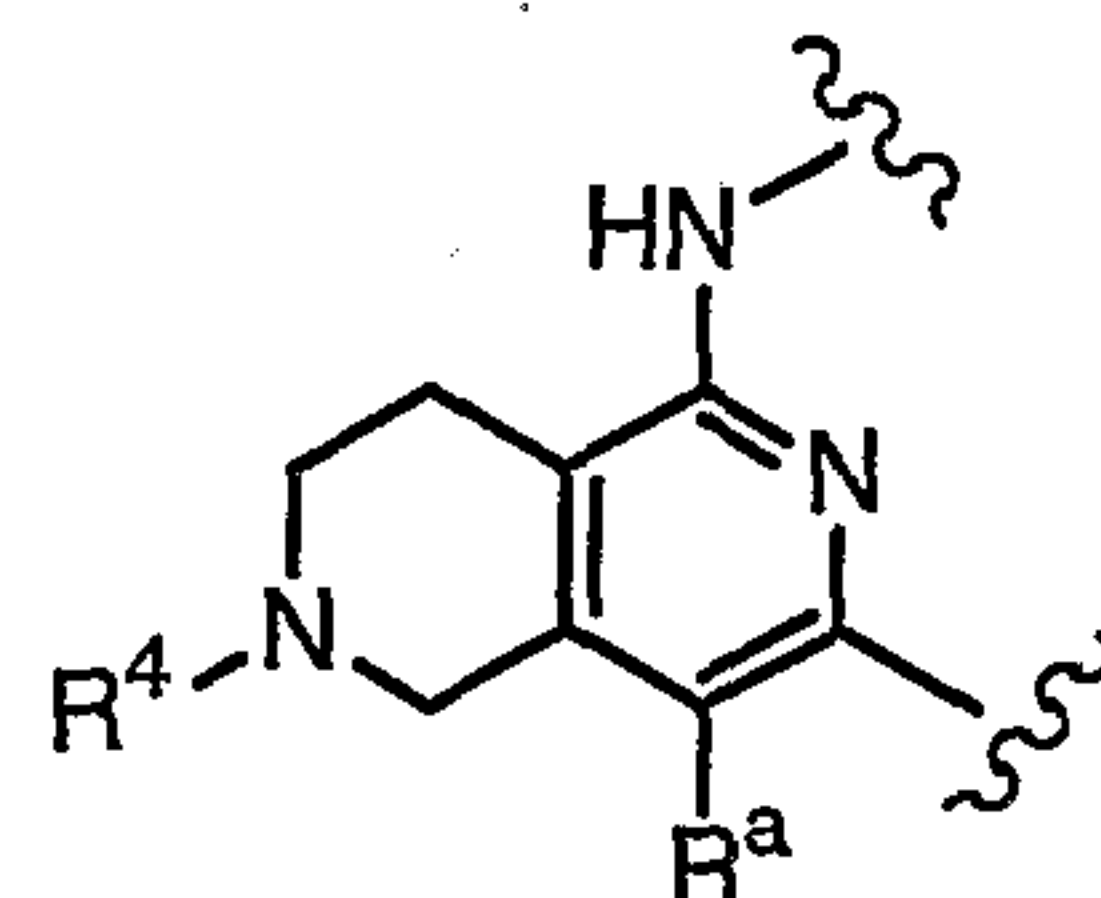
Vc-C



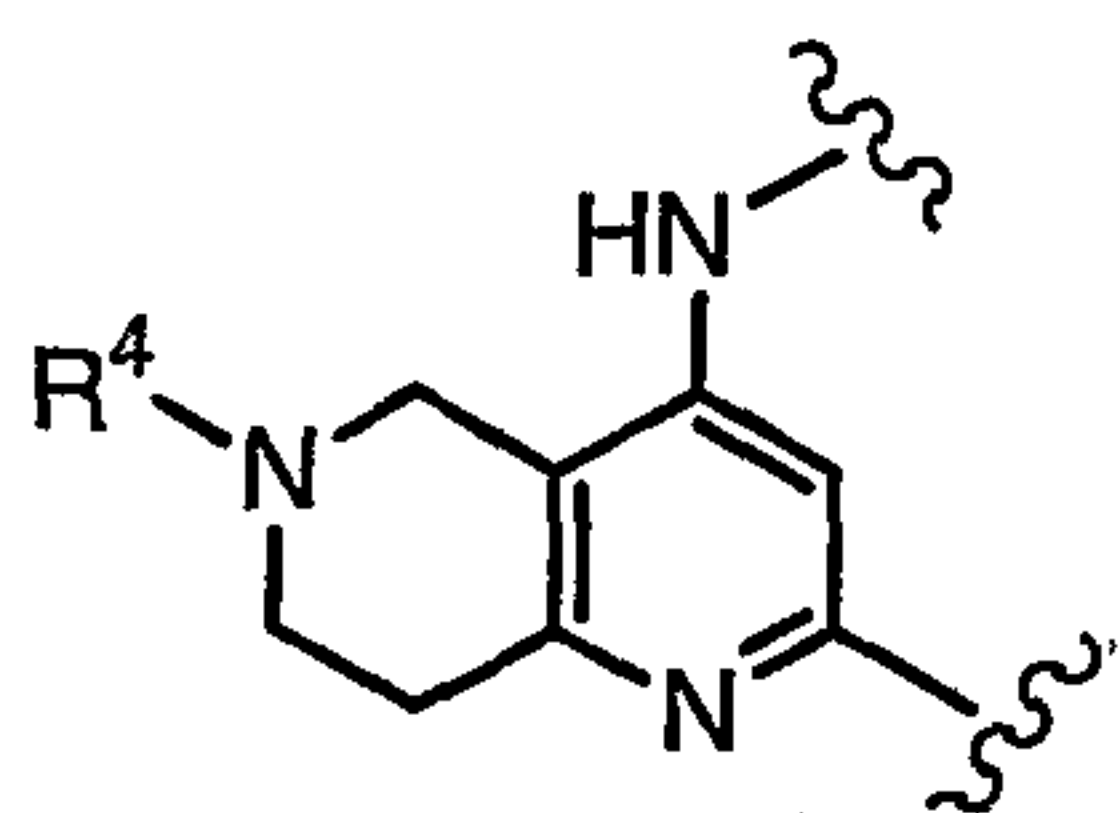
Va-D



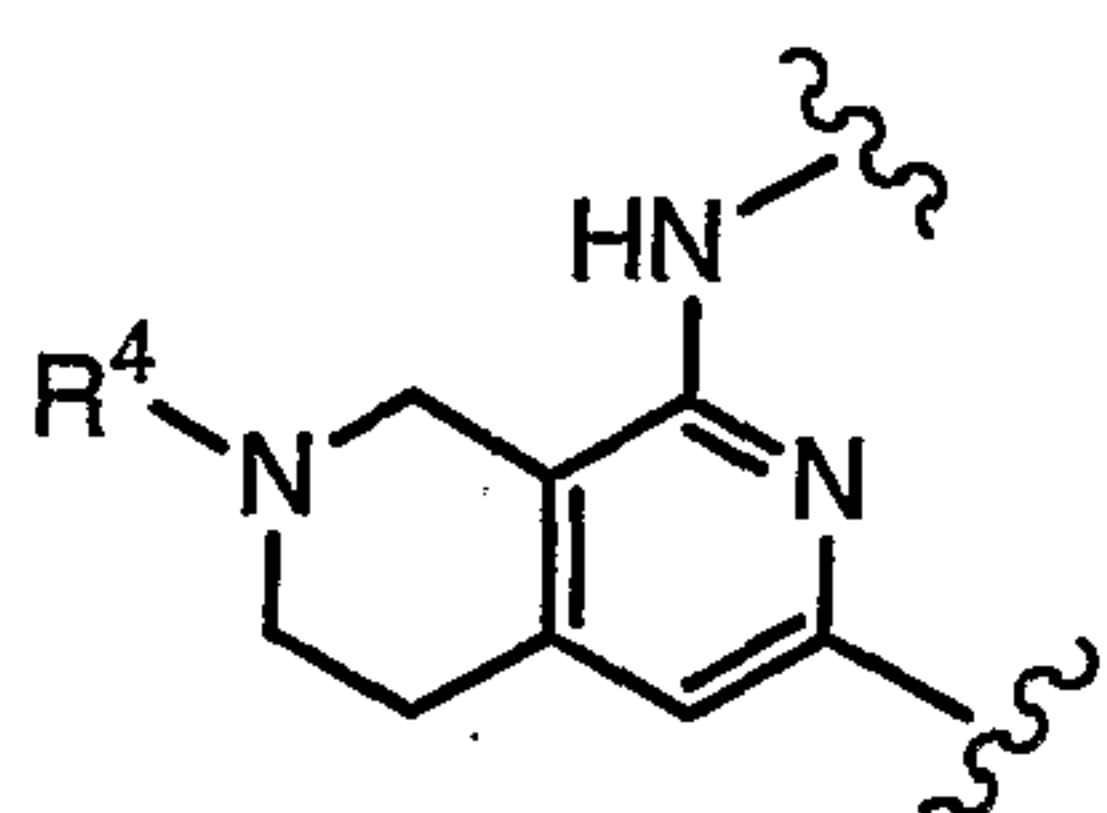
Vb-D



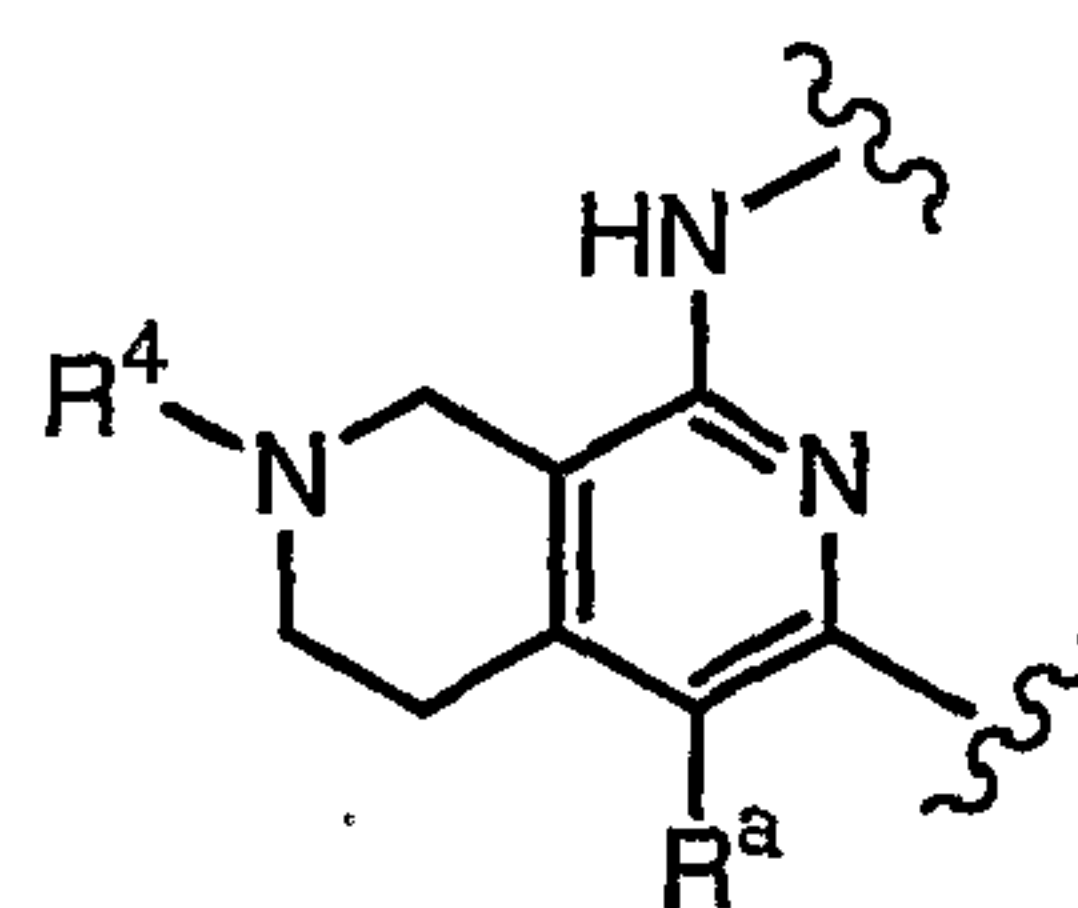
Vc-D



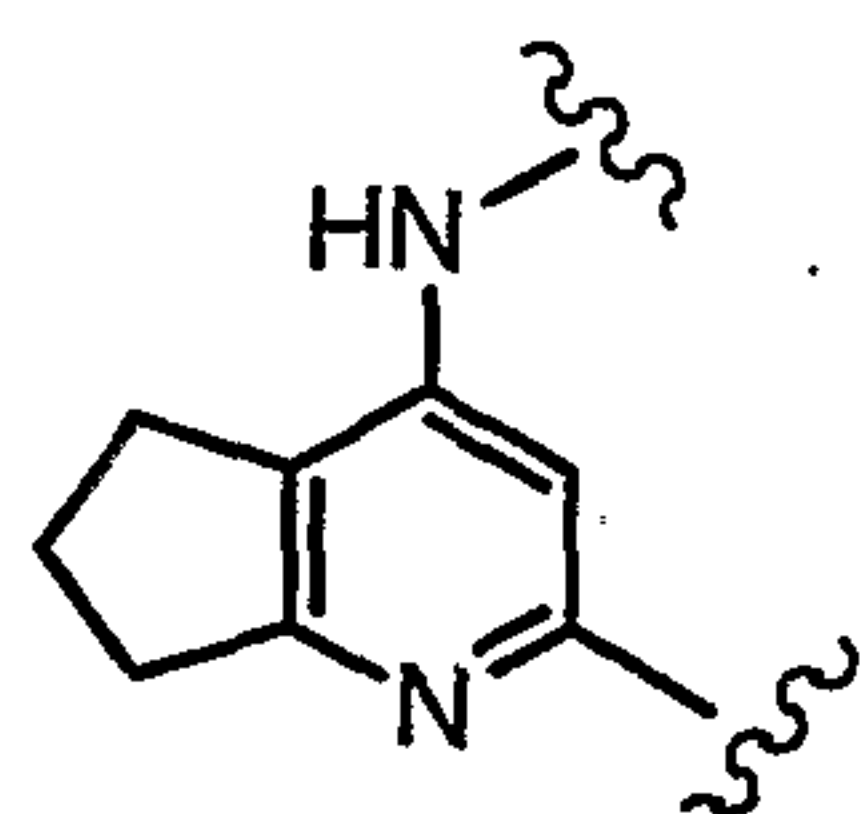
Va-E



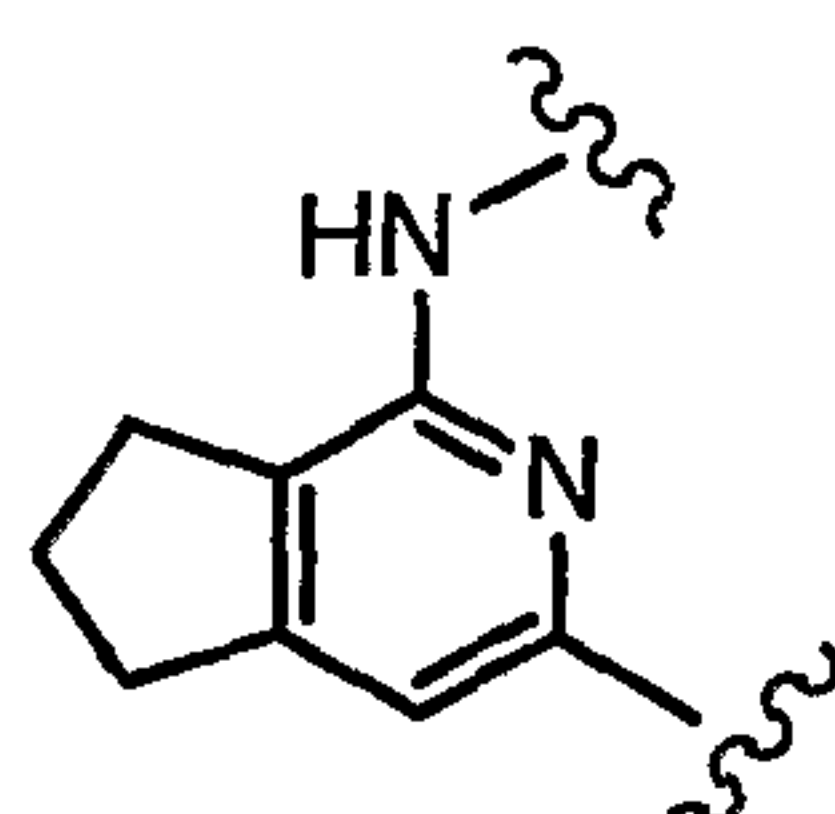
Vb-E



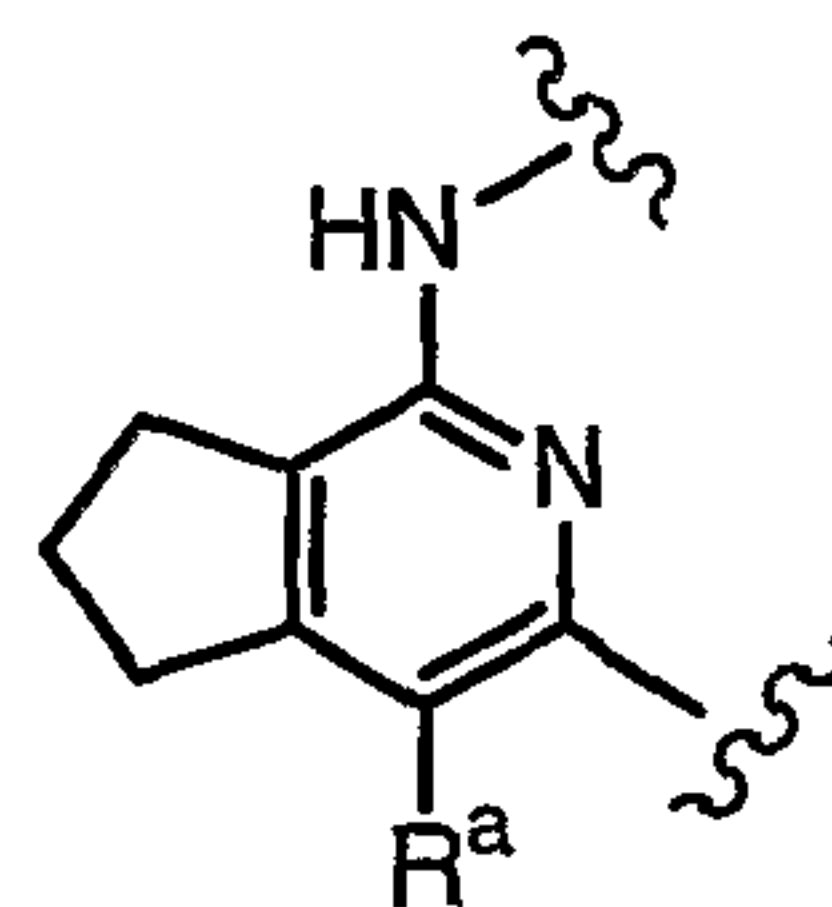
Vc-E



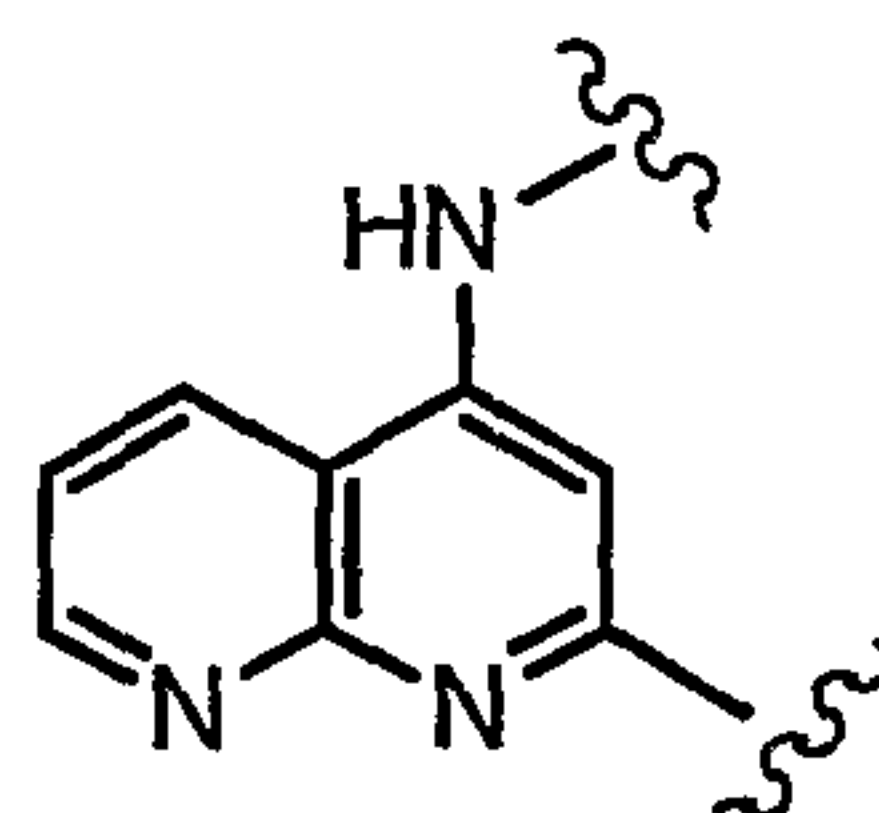
Va-F



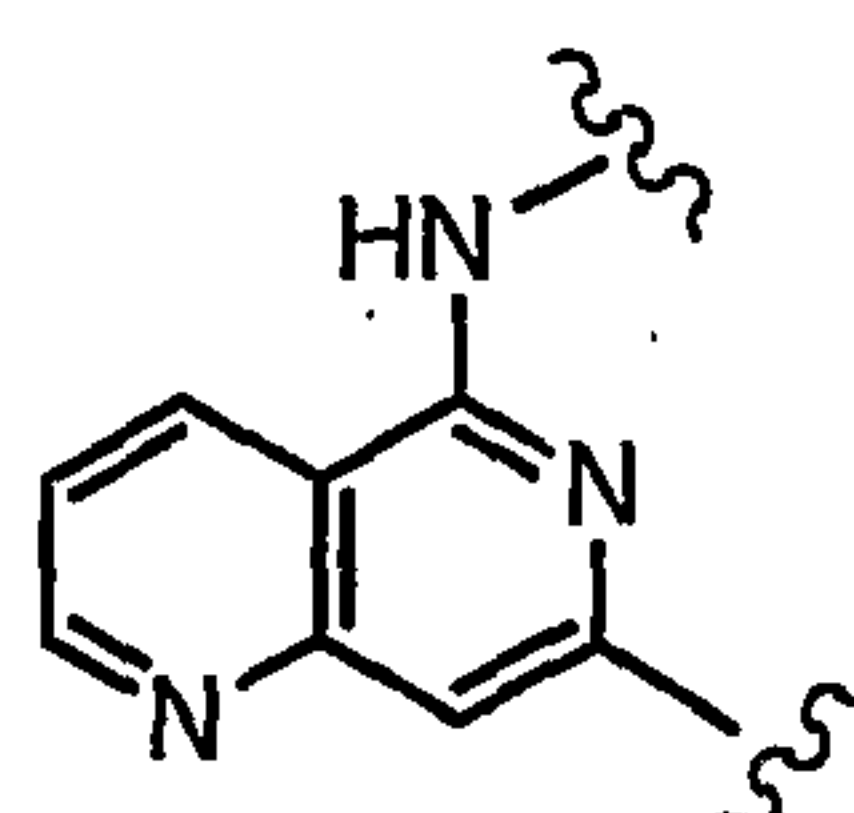
Vb-F



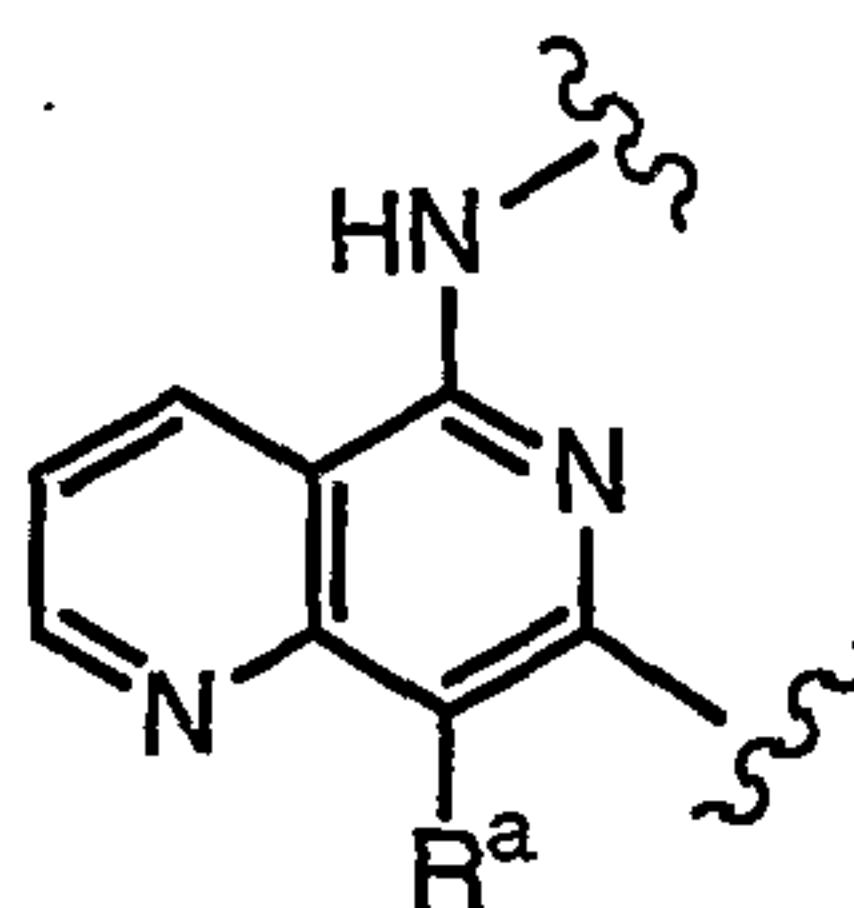
Vc-F



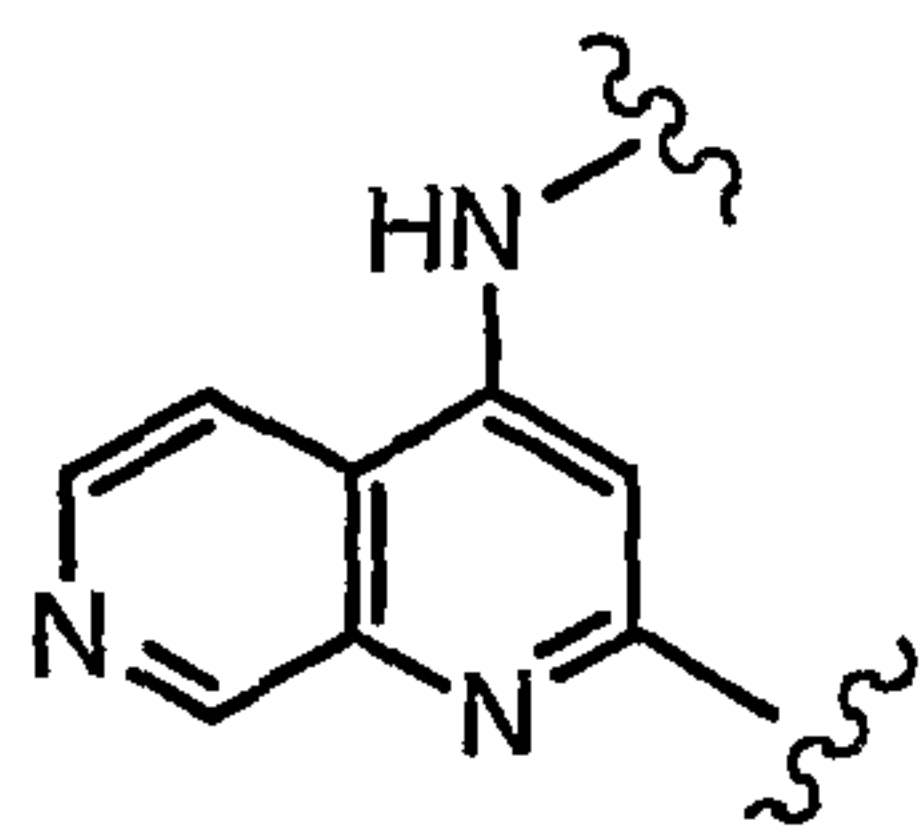
Va-J



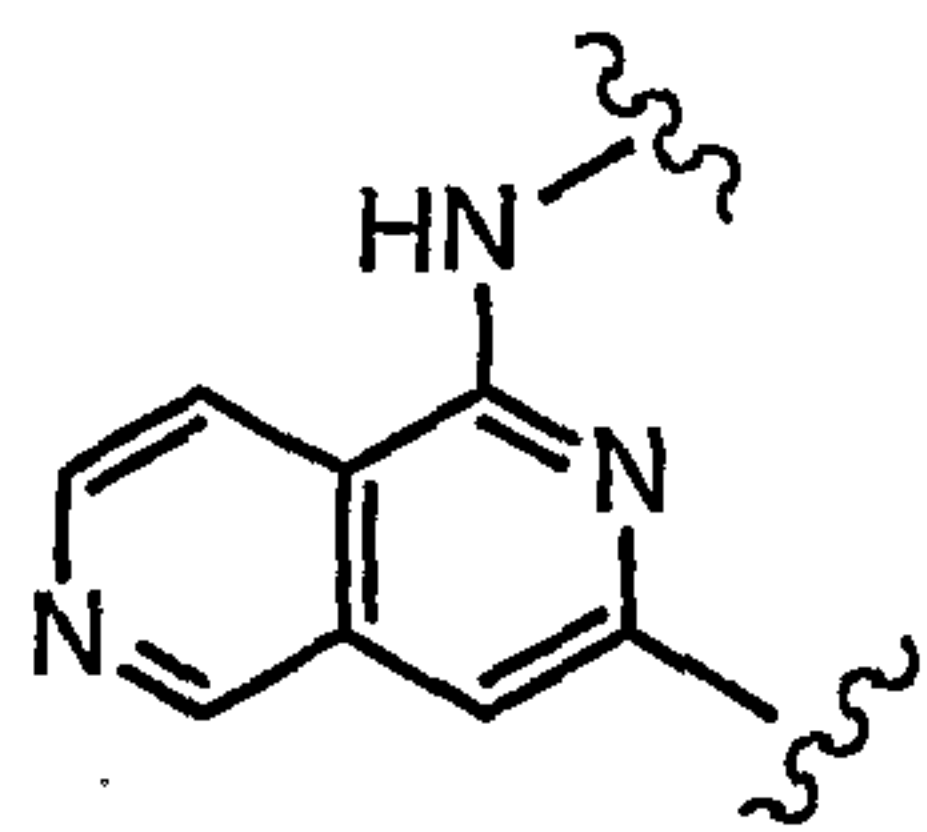
Vb-J



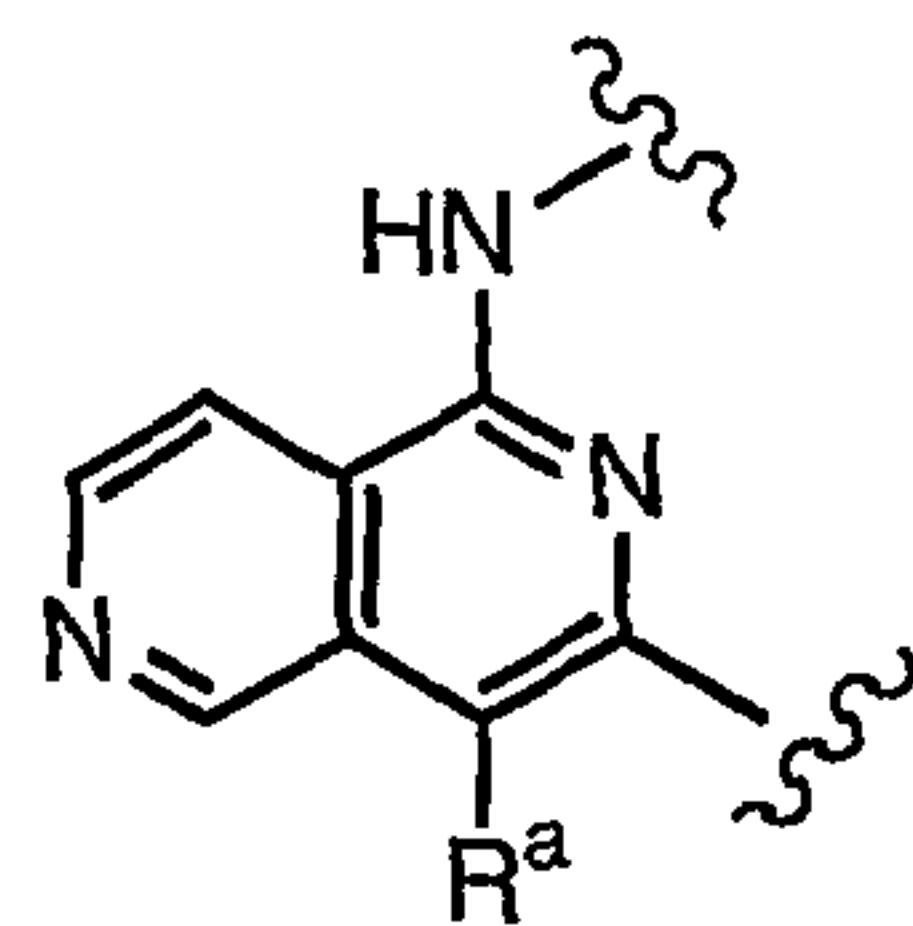
Vc-J



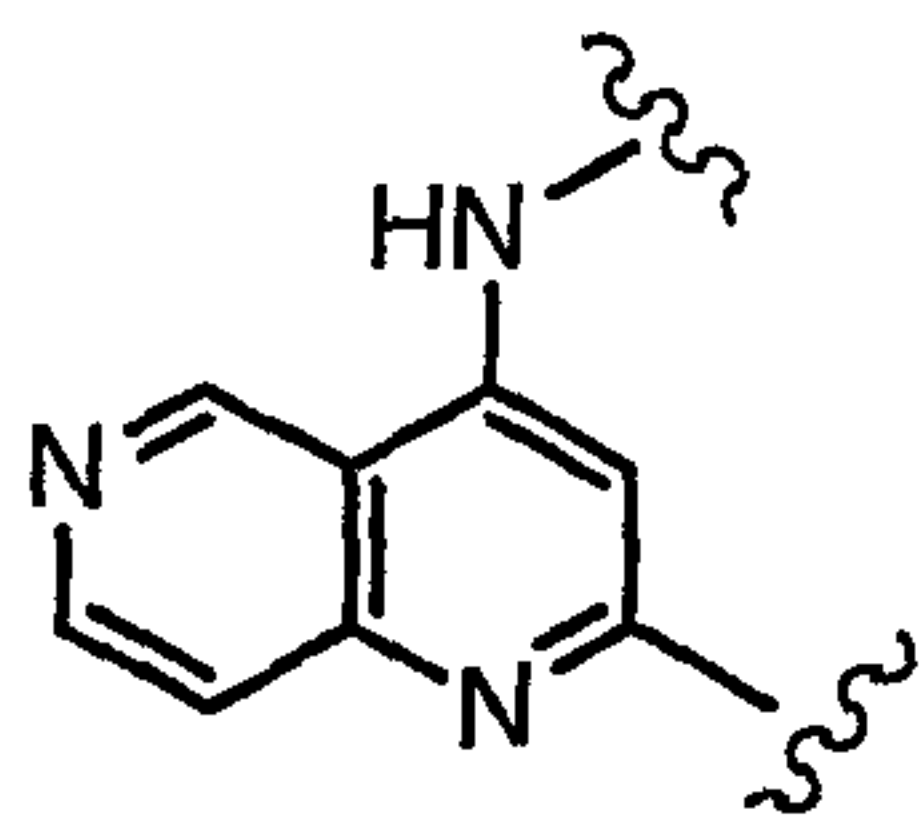
Va-K



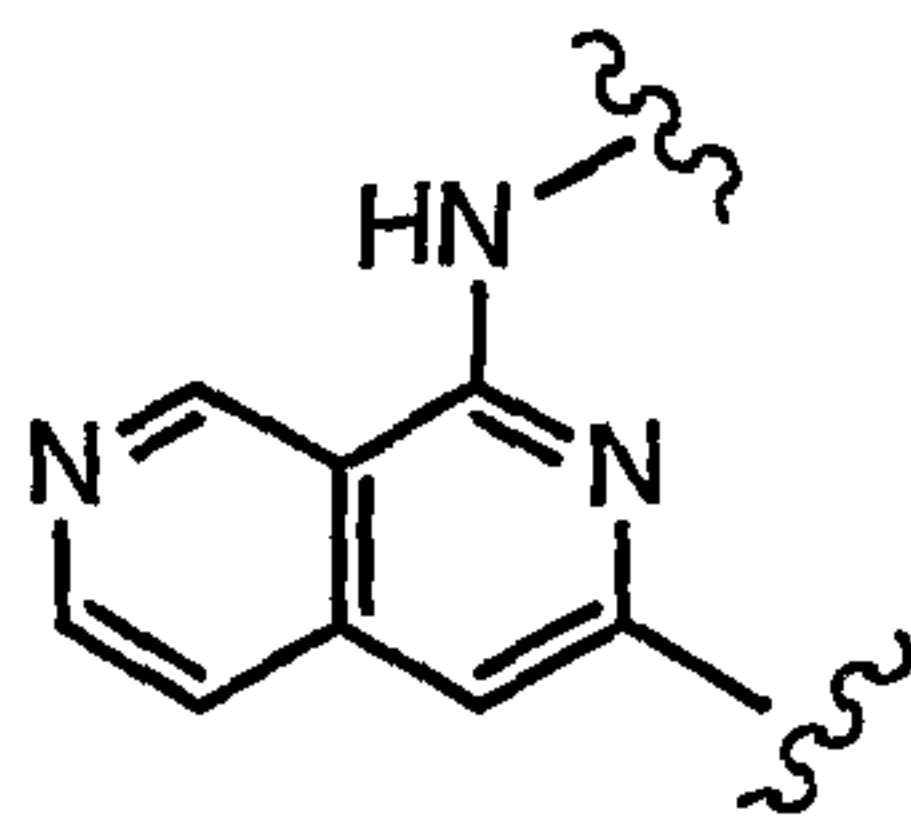
Vb-K



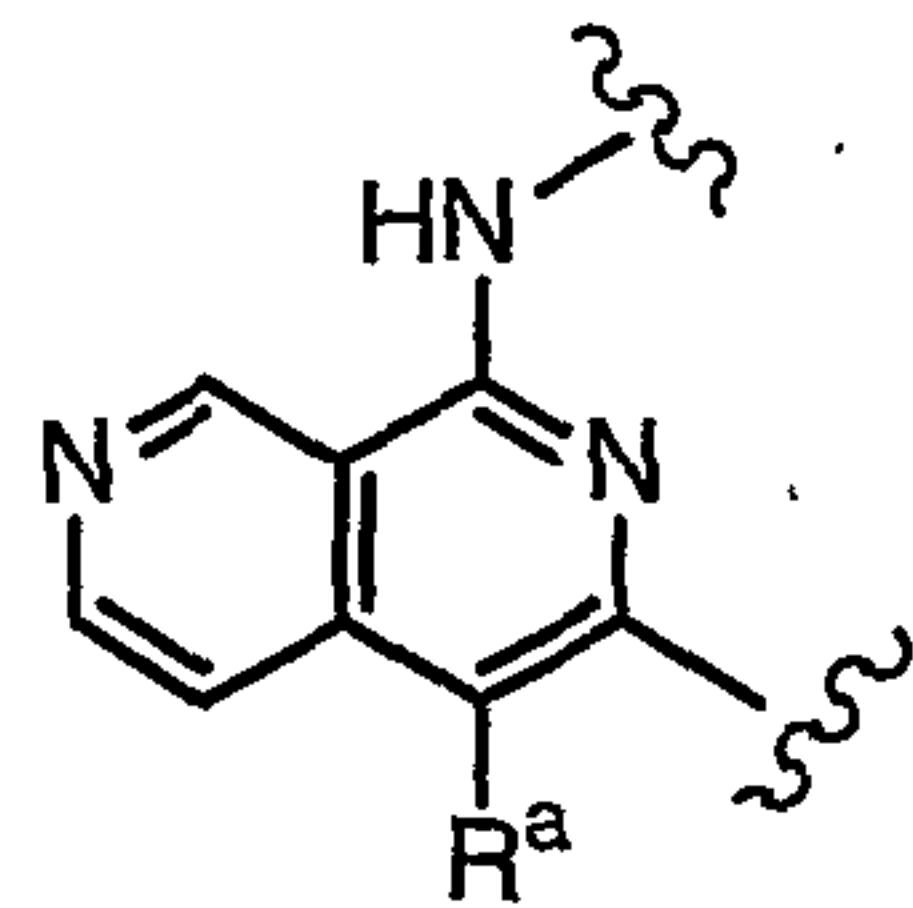
Vc-K



Va-L

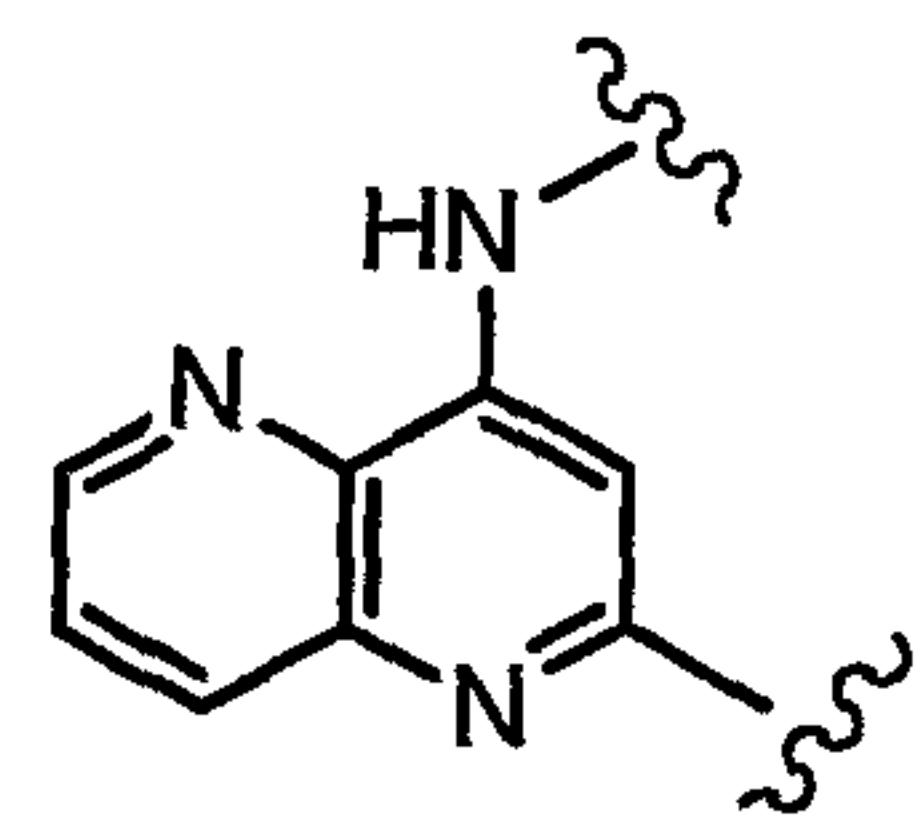


Vb-L

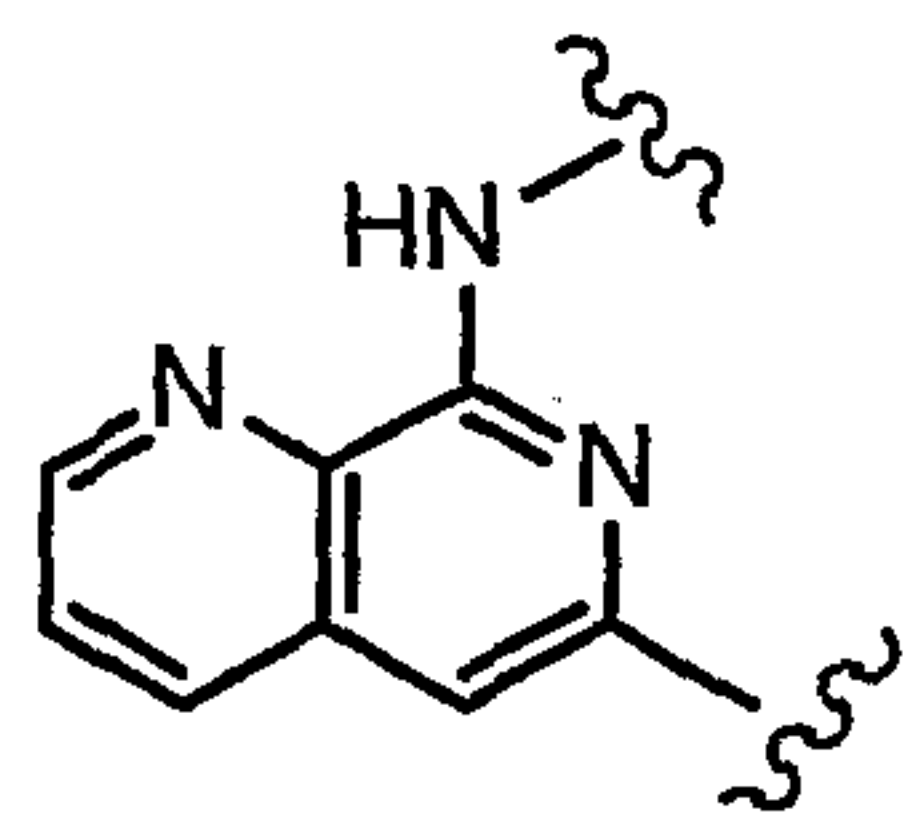


Vc-L

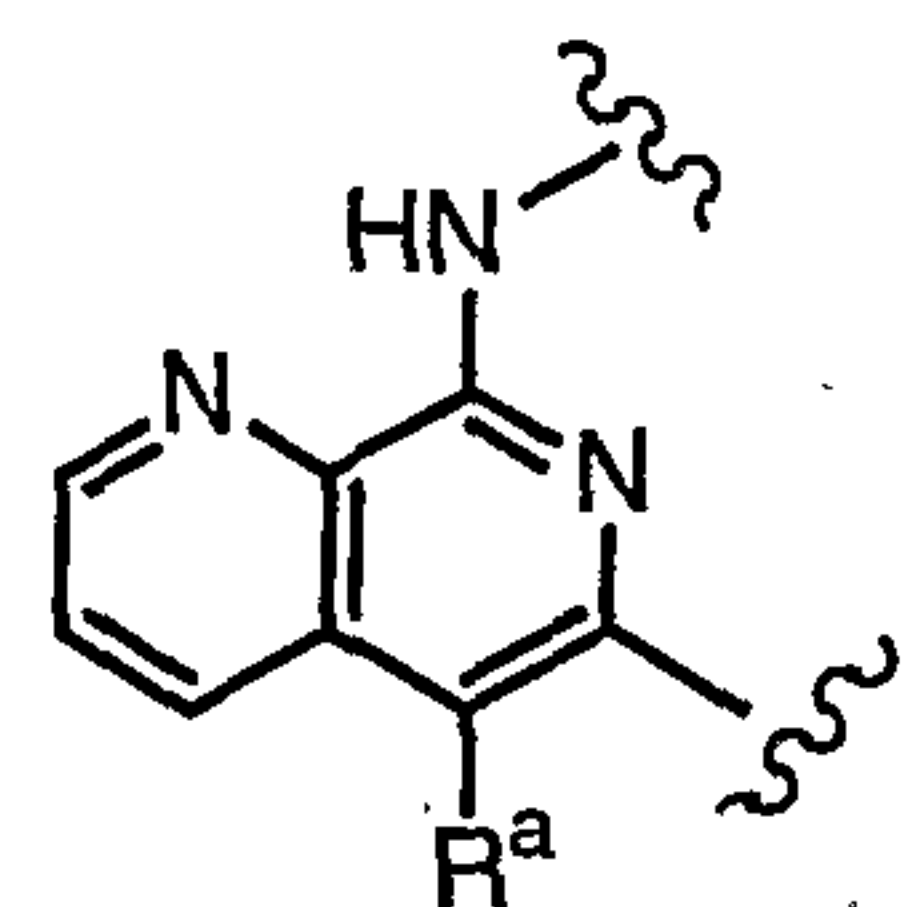
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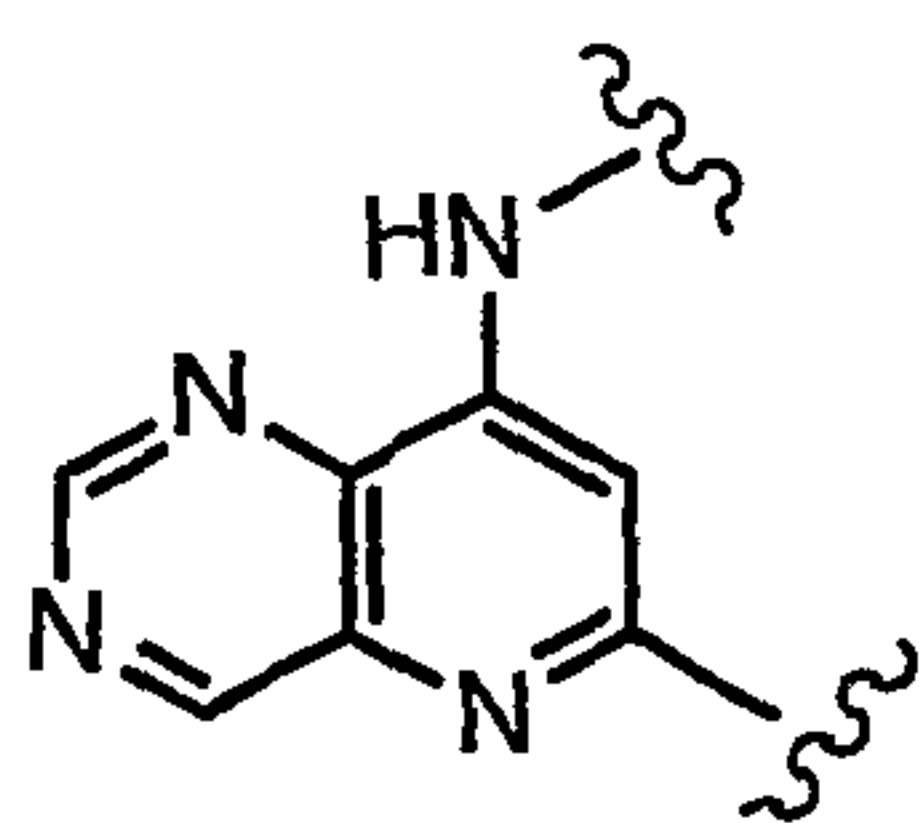
Va-M



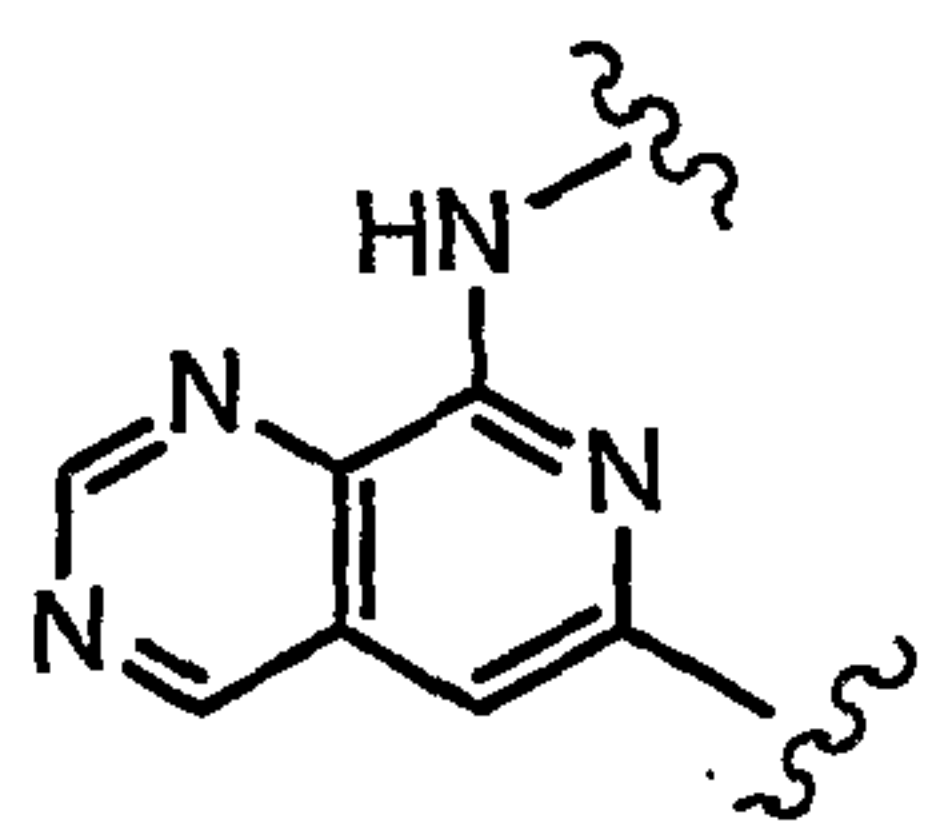
Vb-M



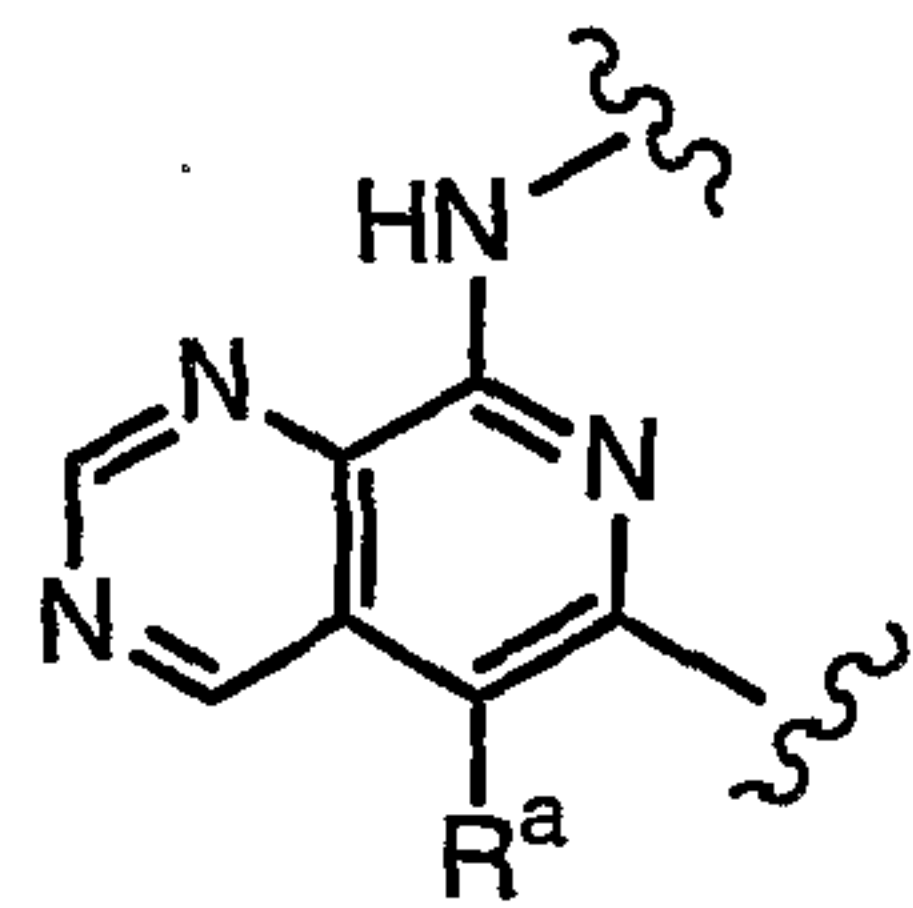
Vc-M



Va-N

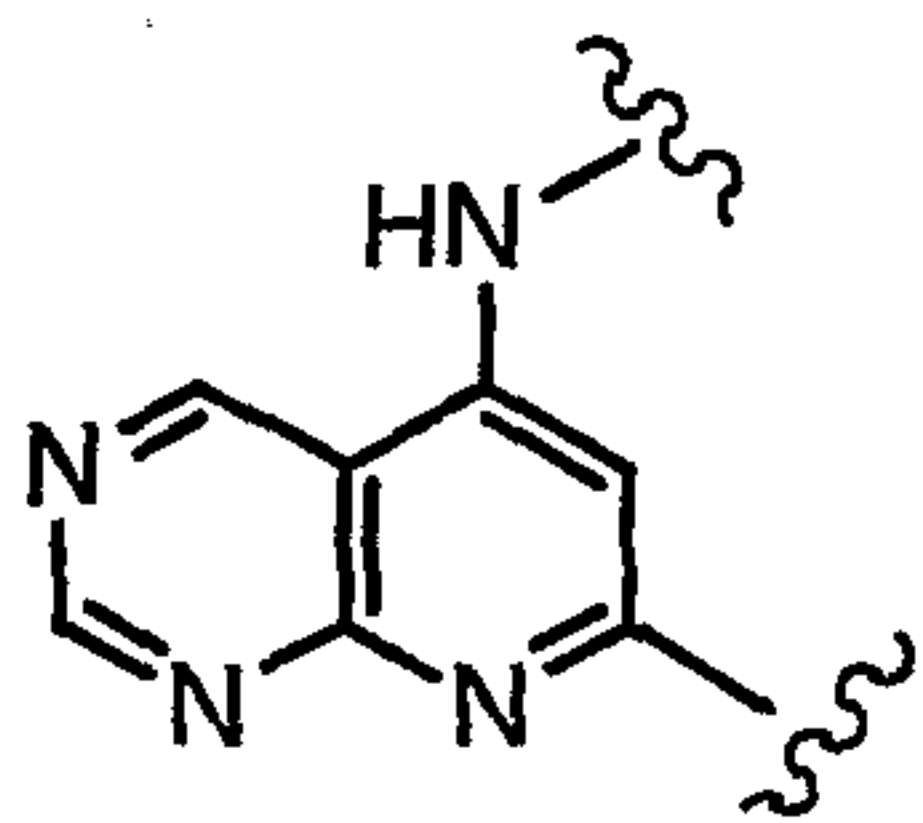


Vb-N

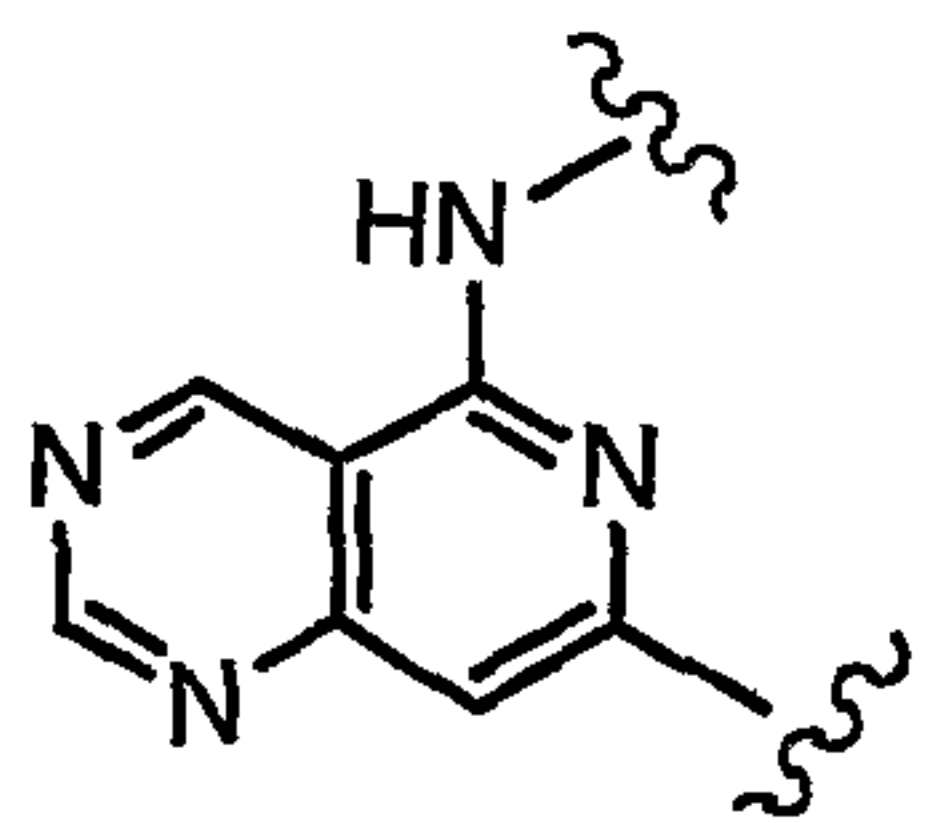


Vc-N

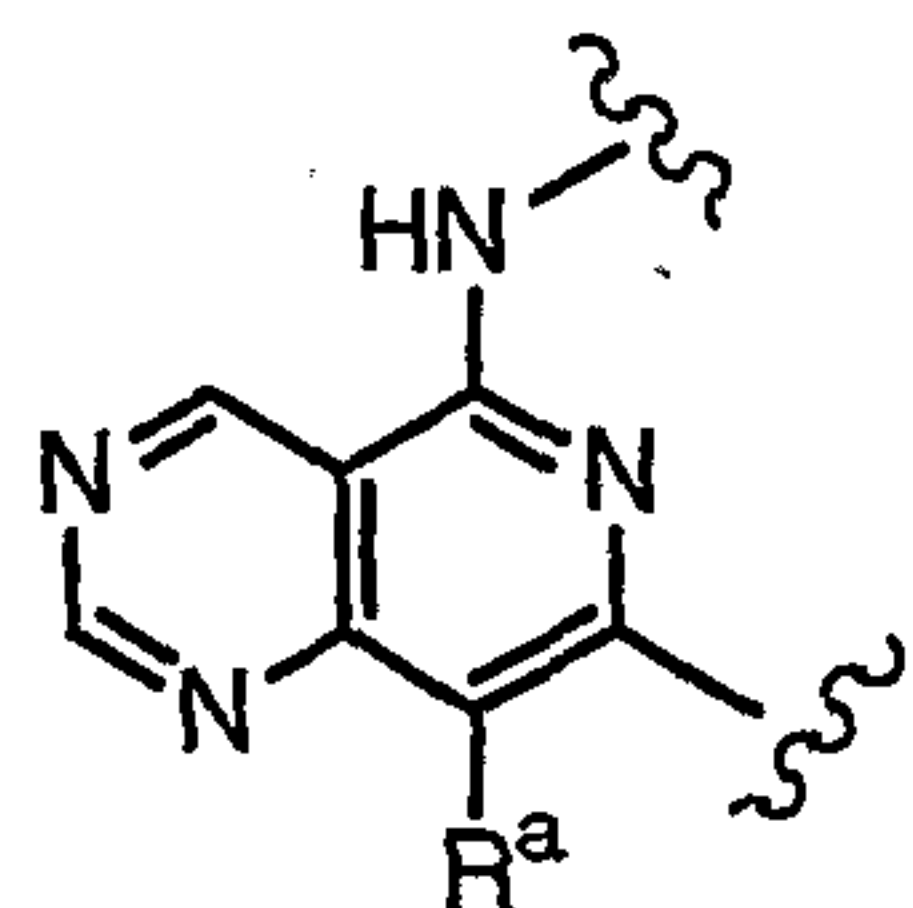
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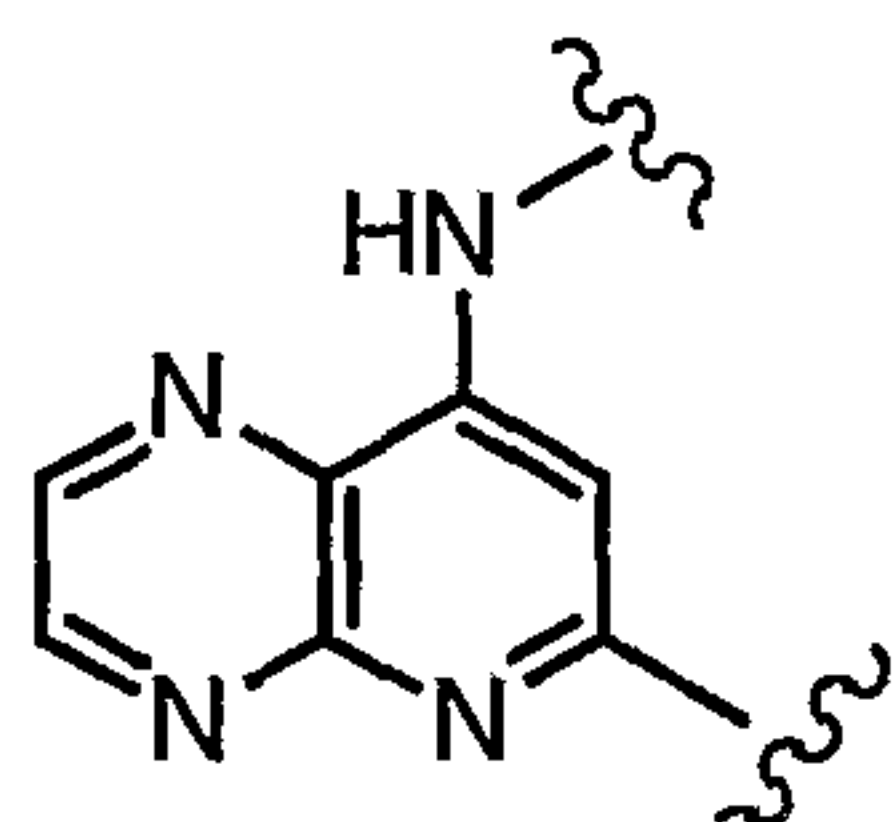
Va-O



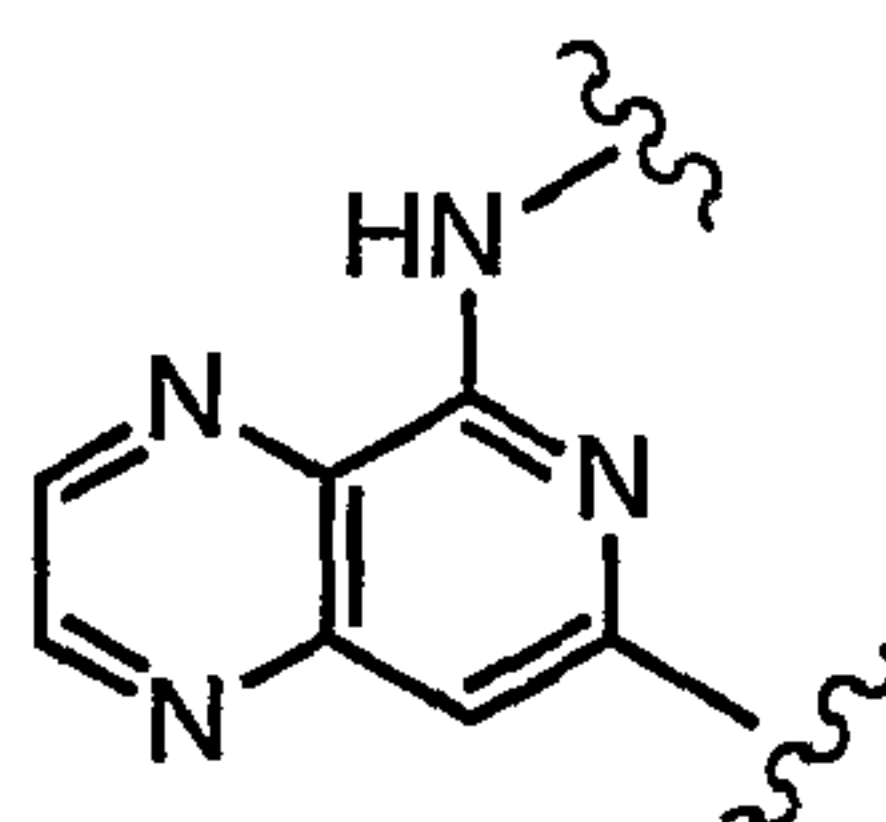
Vb-O



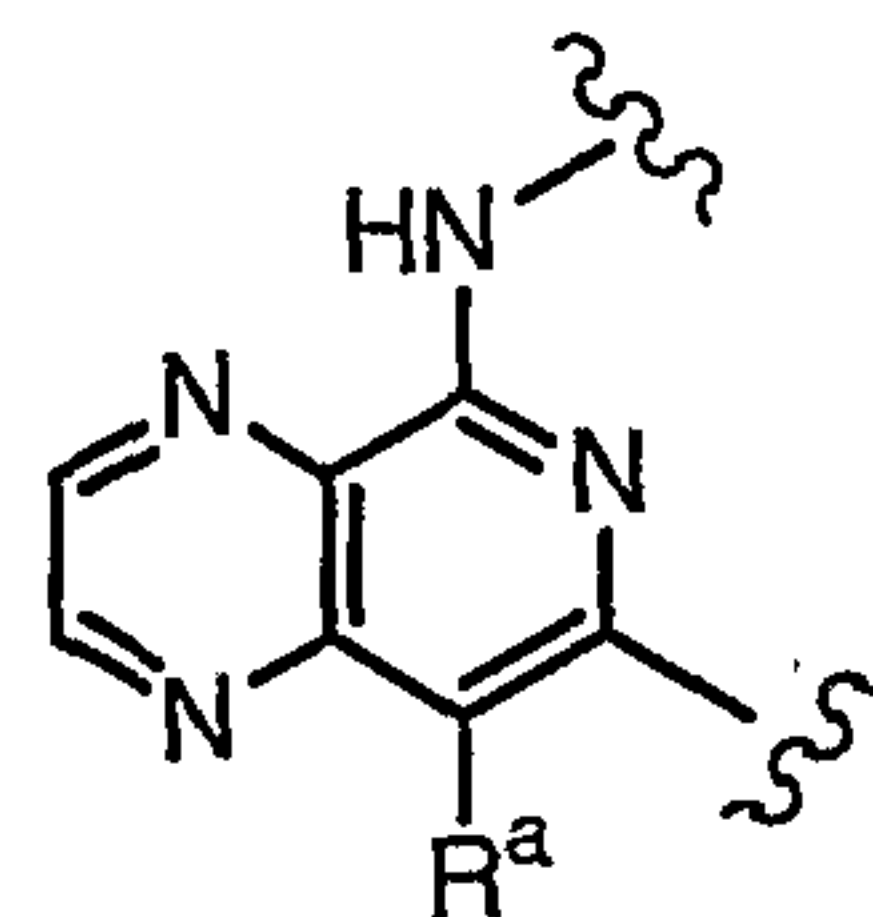
Vc-O



Va-P



Vb-P



Vc-P

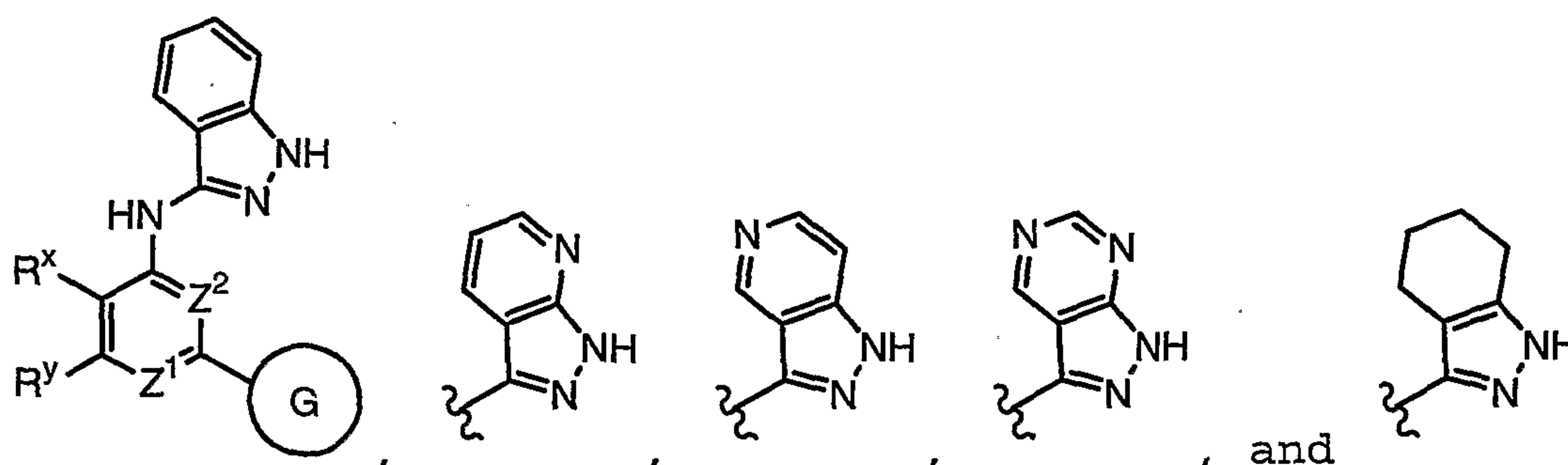
More preferred bicyclic ring systems of formula
 5 V include Va-A, Vb-A, Vc-A, Va-B, Vb-B, Vc-B, Va-D, Vb-D, Vc-D, Va-E, Vb-E, Vc-E, Va-J, Vb-J, Vc-J, Va-K, Vb-K, Vc-K, Va-L, Vb-L, Vc-L, Va-M, Vb-M, and Vc-M, most preferably Va-A, Vb-A, Vc-A, Va-B, Vb-B, and Vc-B.

In the monocyclic pyridine ring system of
 10 formula V, preferred R^x groups include hydrogen, alkyl- or dialkylamino, acetamido, or a C_{1-4} aliphatic group such as methyl, ethyl, cyclopropyl, isopropyl or t-butyl. Preferred R^y groups include $T-R^3$ wherein T is a valence bond or a methylene, and R^3 is $-R$, $-N(R^4)_2$, or $-OR$. When
 15 R^3 is $-R$ or $-OR$, a preferred R is an optionally substituted group selected from C_{1-6} aliphatic, phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring. Examples of preferred R^y include 2-pyridyl, 4-pyridyl, piperidinyl, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, alkyl- or
 20 dialkylamino, acetamido, optionally substituted phenyl such as phenyl or halo-substituted phenyl, and methoxymethyl.

In the bicyclic ring system of formula V, the ring formed when R^x and R^y are taken together may be
 25 substituted or unsubstituted. Suitable substituents include $-R$, halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$,
 30 $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$, wherein R and R^4 are as defined above.

Preferred R^x/R^y ring substituents include -halo, -R, -OR, -COR, -CO₂R, -CON(R⁴)₂, -CN, or -N(R⁴)₂ wherein R is an optionally substituted C₁₋₆ aliphatic group.

The R^2 and $R^{2'}$ groups of formula V may be taken together to form a fused ring, thus providing a bicyclic ring system containing a pyrazole ring. Preferred fused rings include benzo, pyrido, pyrimido, and a partially unsaturated 6-membered carbocyclo ring. These are exemplified in the following formula V compounds having a pyrazole-containing bicyclic ring system:

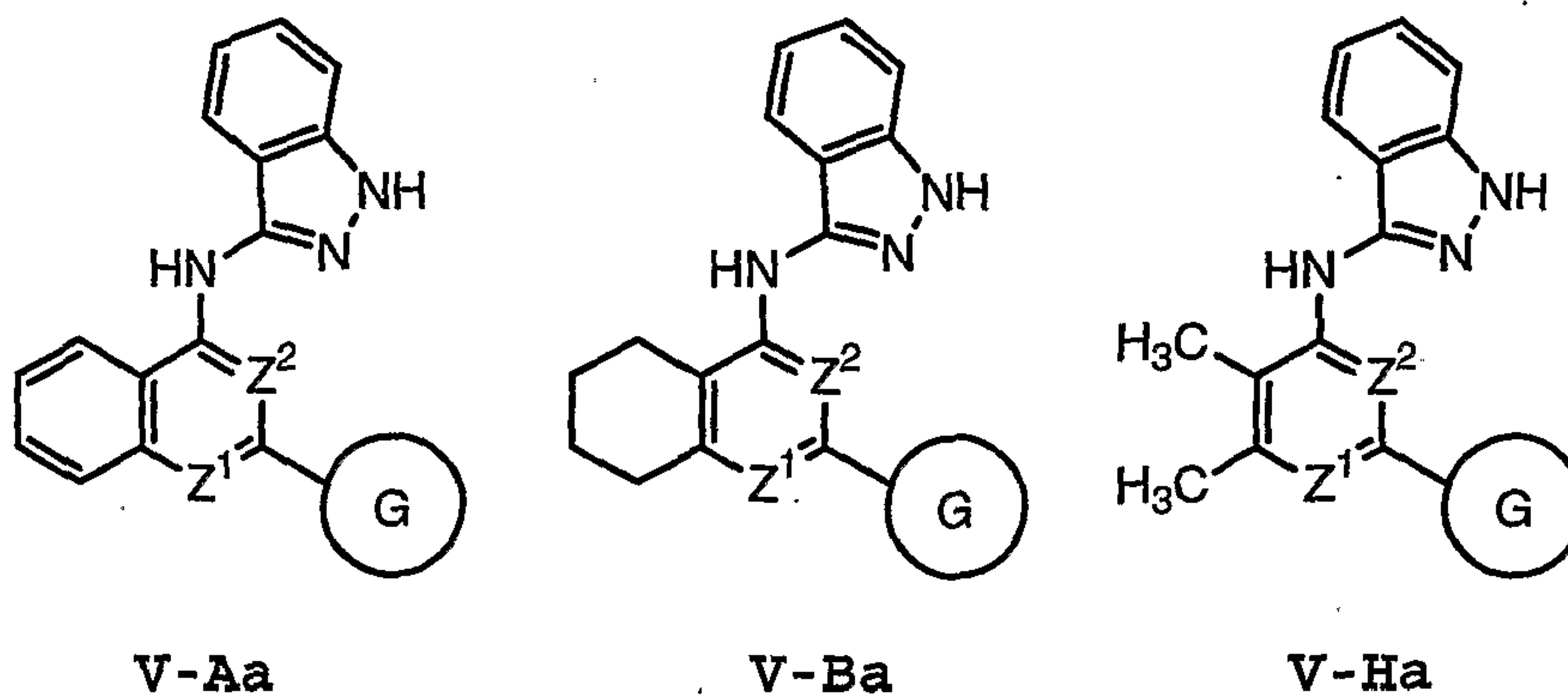


Preferred substituents on the $R^2/R^{2'}$ fused ring of formula V include one or more of the following: -halo, -N(R⁴)₂, -C₁₋₄ alkyl, -C₁₋₄ haloalkyl, -NO₂, -O(C₁₋₄ alkyl), -CO₂(C₁₋₄ alkyl), -CN, -SO₂(C₁₋₄ alkyl), -SO₂NH₂, -OC(O)NH₂, -NH₂SO₂(C₁₋₄ alkyl), -NHC(O)(C₁₋₄ alkyl), -C(O)NH₂, and -CO(C₁₋₄ alkyl), wherein the (C₁₋₄ alkyl) is a straight, branched, or cyclic alkyl group. Preferably, the (C₁₋₄ alkyl) group is methyl.

When the pyrazole ring system is monocyclic, preferred R^2 groups include hydrogen, C₁₋₄ aliphatic, alkoxycarbonyl, (un)substituted phenyl, hydroxyalkyl, alkoxyalkyl, aminocarbonyl, mono- or dialkylaminocarbonyl, aminoalkyl, alkylaminoalkyl, dialkylaminoalkyl, phenylaminocarbonyl, and (N-heterocyclyl)carbonyl. Examples of such preferred R^2 substituents include methyl, cyclopropyl, ethyl,

isopropyl, propyl, t-butyl, cyclopentyl, phenyl, CO₂H, CO₂CH₃, CH₂OH, CH₂OCH₃, CH₂CH₂CH₂OH, CH₂CH₂CH₂OCH₃, CH₂CH₂CH₂OCH₂Ph, CH₂CH₂CH₂NH₂, CH₂CH₂CH₂NHCOOC(CH₃)₃, CONHCH(CH₃)₂, CONHCH₂CH=CH₂, CONHCH₂CH₂OCH₃, CONHCH₂Ph, 5 CONH(cyclohexyl), CON(Et)₂, CON(CH₃)CH₂Ph, CONH(n-C₃H₇), CON(Et)CH₂CH₂CH₃, CONHCH₂CH(CH₃)₂, CON(n-C₃H₇)₂, CO(3-methoxymethylpyrrolidin-1-yl), CONH(3-tolyl), CONH(4-tolyl), CONHCH₃, CO(morpholin-1-yl), CO(4-methylpiperazin-1-yl), CONHCH₂CH₂OH, CONH₂, and CO(piperidin-1-yl). A 10 preferred R^{2'} group is hydrogen.

More preferred ring systems of formula V are the following, which may be substituted as described above, wherein R² and R^{2'} are taken together with the pyrazole ring to form an optionally substituted indazole 15 ring; and R^x and R^y are each methyl, or R^x and R^y are taken together with the pyridine ring to form an optionally substituted quinoline, isoquinoline, tetrahydroquinoline or tetrahydroisoquinoline ring:



20

When G is Ring C, preferred formula V Ring C groups are phenyl and pyridinyl. When two adjacent substituents on Ring C are taken together to form a fused 25 ring, Ring C is contained in a bicyclic ring system. Preferred fused rings include a benzo or pyrido ring. Such rings preferably are fused at ortho and meta positions of Ring C. Examples of preferred bicyclic Ring C systems include naphthyl and isoquinolinyl. Preferred

R^1 groups include -halo, an optionally substituted C_{1-6} aliphatic group, phenyl, $-COR^6$, $-OR^6$, $-CN$, $-SO_2R^6$, $-SO_2NH_2$, $-N(R^6)_2$, $-CO_2R^6$, $-CONH_2$, $-NHCOR^6$, $-OC(O)NH_2$, or $-NHSO_2R^6$.

When R^1 is an optionally substituted C_{1-6} aliphatic group, the most preferred optional substituents are halogen. Examples of preferred R^1 groups include $-CF_3$, $-Cl$, $-F$, $-CN$, $-COCH_3$, $-OCH_3$, $-OH$, $-CH_2CH_3$, $-OCH_2CH_3$, $-CH_3$, $-CF_2CH_3$, cyclohexyl, t-butyl, isopropyl, cyclopropyl, $-C\equiv CH$, $-C\equiv C-CH_3$, $-SO_2CH_3$, $-SO_2NH_2$, $-N(CH_3)_2$, $-CO_2CH_3$, $-CONH_2$, $-NHCOCH_3$, $-OC(O)NH_2$, $-NHSO_2CH_3$, and $-OCF_3$.

On Ring C preferred R^5 substituents, when present, include -halo, $-CN$, $-NO_2$, $-N(R^4)_2$, optionally substituted C_{1-6} aliphatic group, $-OR$, $-C(O)R$, $-CO_2R$, $-CONH(R^4)$, $-N(R^4)COR$, $-SO_2N(R^4)_2$, and $-N(R^4)SO_2R$. More preferred R^5 substituents include $-Cl$, $-F$, $-CN$, $-CF_3$, $-NH_2$, $-NH(C_{1-4} \text{ aliphatic})$, $-N(C_{1-4} \text{ aliphatic})_2$, $-O(C_{1-4} \text{ aliphatic})$, $C_{1-4} \text{ aliphatic}$, and $-CO_2(C_{1-4} \text{ aliphatic})$. Examples of such preferred R^5 substituents include $-Cl$, $-F$, $-CN$, $-CF_3$, $-NH_2$, $-NHMe$, $-NMe_2$, $-OEt$, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, and $-CO_2Et$.

When G is Ring D, preferred formula V Ring D monocyclic rings include substituted and unsubstituted phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, and morpholinyl rings. When two adjacent substituents on Ring D are taken together to form a fused ring, the Ring D system is bicyclic. Preferred formula V Ring D bicyclic rings include 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, and naphthyl. Examples of more preferred bicyclic Ring D systems include naphthyl and isoquinolinyl.

Preferred substituents on Ring D of formula V include one or more of the following: halo, oxo, CN, $-NO_2$,

-N(R⁴)₂, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, -N(R⁴)SO₂R, -SR, -OR, -C(O)R, or substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. More preferred Ring D substituents include

5 -halo, -CN, -oxo, -SR, -OR, -N(R⁴)₂, -C(O)R, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. Examples of Ring D substituents include -OH, phenyl, methyl, CH₂OH, CH₂CH₂OH, pyrrolidinyl, OPh, CF₃, C≡CH, Cl,

10 Br, F, I, NH₂, C(O)CH₃, *i*-propyl, *tert*-butyl, SEt, OMe, N(Me)₂, methylene dioxy, and ethylene dioxy.

Preferred formula V compounds have one or more, and more preferably all, of the features selected from the group consisting of:

15 (a) Ring C is a phenyl or pyridinyl ring, optionally substituted by -R⁵, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is selected from a naphthyl, quinolinyl or isoquinolinyl ring, and R¹ is

20 -halo, an optionally substituted C₁₋₆ aliphatic group, phenyl, -COR⁶, -OR⁶, -CN, -SO₂R⁶, -SO₂NH₂, -N(R⁶)₂, -CO₂R⁶, -CONH₂, -NHCOR⁶, -OC(O)NH₂, or -NHSO₂R⁶; or Ring D is an optionally substituted ring selected from a phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl,

25 thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1*H*-isoindolyl, 2,3-dihydro-1*H*-indolyl, isoquinolinyl, quinolinyl, or naphthyl ring;

(b) R^x is hydrogen or C₁₋₄ aliphatic and R^y is T-R³, or R^x and R^y are taken together with their intervening atoms to form an optionally substituted 5-7 membered unsaturated or partially unsaturated ring having 0-2 ring nitrogens; and

30

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring.

More preferred compounds of formula V have one or more, and more preferably all, of the features selected from the group consisting of:

10 (a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R^1 is -halo, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic group, phenyl, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl;

(b) R^x is hydrogen or methyl and R^y is -R, $N(R^4)_2$, or -OR, or R^x and R^y are taken together with their intervening atoms to form a benzo ring or a 5-7 membered partially unsaturated carbocyclo ring, said benzo or carbocyclo ring optionally substituted with -R, halo, -OR, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, -CN, $-S(O)R$, $-SO_2R$, -SR, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$;

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken together

with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring; and

(d) Ring D is substituted by oxo or R^5 , wherein
5 each R^5 is independently selected from -halo, -CN, -NO₂,
-N(R^4)₂, optionally substituted C₁₋₆ aliphatic group, -OR,
-C(O)R, -CO₂R, -CONH(R^4), -N(R^4)COR, -SO₂N(R^4)₂, or
-N(R^4)SO₂R.

Even more preferred compounds of formula V have
10 one or more, and more preferably all, of the features
selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring,
optionally substituted by - R^5 , wherein when Ring C and two
adjacent substituents thereon form a bicyclic ring
15 system, the bicyclic ring system is a naphthyl ring, and
 R^1 is -halo, a C₁₋₄ aliphatic group optionally substituted
with halogen, or -CN; or Ring D is an optionally
substituted ring selected from phenyl, pyridinyl,
piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl,
20 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-
tetrahydroquinolinyl, isoquinolinyl, quinolinyl, or
naphthyl;

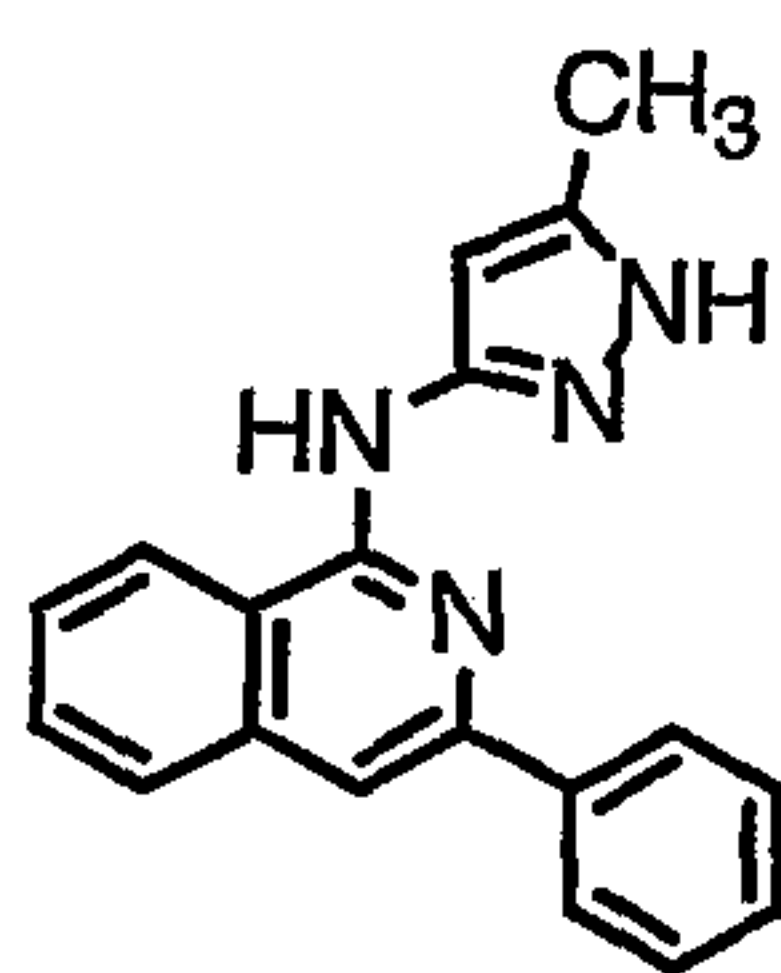
(b) R^x is hydrogen or methyl and R^y is methyl,
methoxymethyl, ethyl, cyclopropyl, isopropyl, t-butyl,
25 alkyl- or an optionally substituted group selected from
2-pyridyl, 4-pyridyl, piperidinyl, or phenyl, or R^x and R^y
are taken together with their intervening atoms to form a
benzo ring or a 6-membered partially unsaturated
carbocyclo ring optionally substituted with halo, CN,
30 oxo, C₁₋₆ alkyl, C₁₋₆ alkoxy, (C₁₋₆ alkyl)carbonyl, (C₁₋₆
alkyl)sulfonyl, mono- or dialkylamino, mono- or
dialkylaminocarbonyl, mono- or dialkylaminocarbonyloxy,
or 5-6 membered heteroaryl;

(c) R^2 and $R^{2'}$ are taken together with their intervening atoms to form a benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring optionally substituted with -halo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), $-CN$, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, or $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group; and

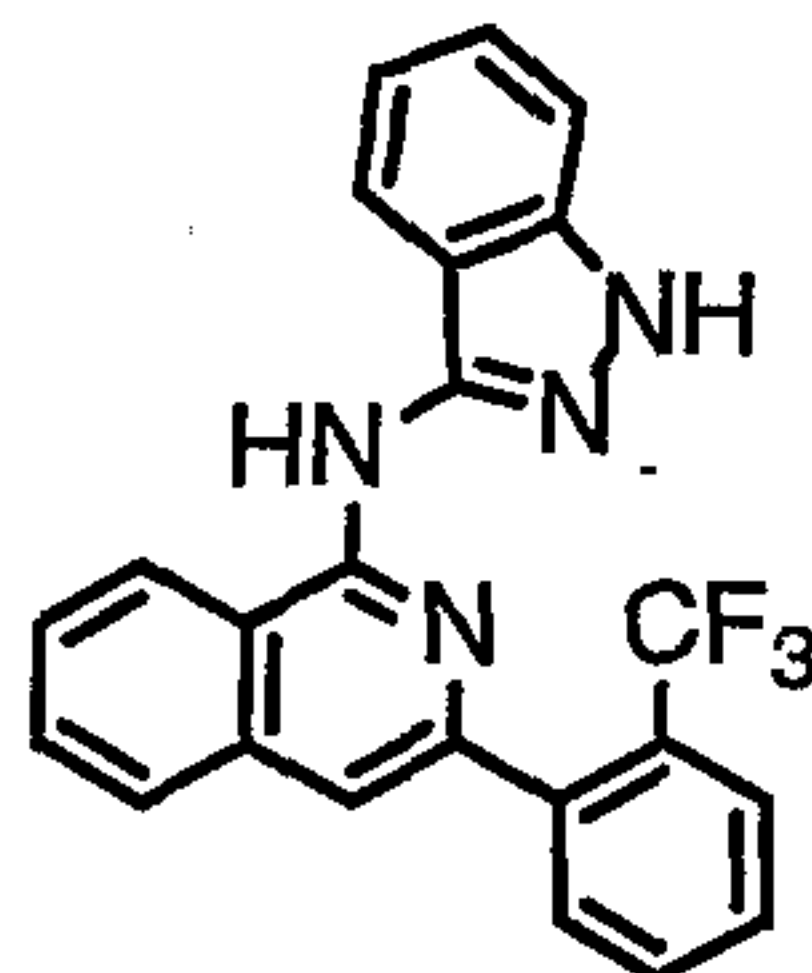
(d) Ring D is substituted by oxo or R^5 , wherein each R^5 is independently selected from $-Cl$, $-F$, $-CN$, $-CF_3$, $-NH_2$, $-NH(C_{1-4}$ aliphatic), $-N(C_{1-4}$ aliphatic) $_2$, $-O(C_{1-4}$ aliphatic), C_{1-4} aliphatic, and $-CO_2(C_{1-4}$ aliphatic).

Representative compounds of formula V are set forth in Table 4 below.

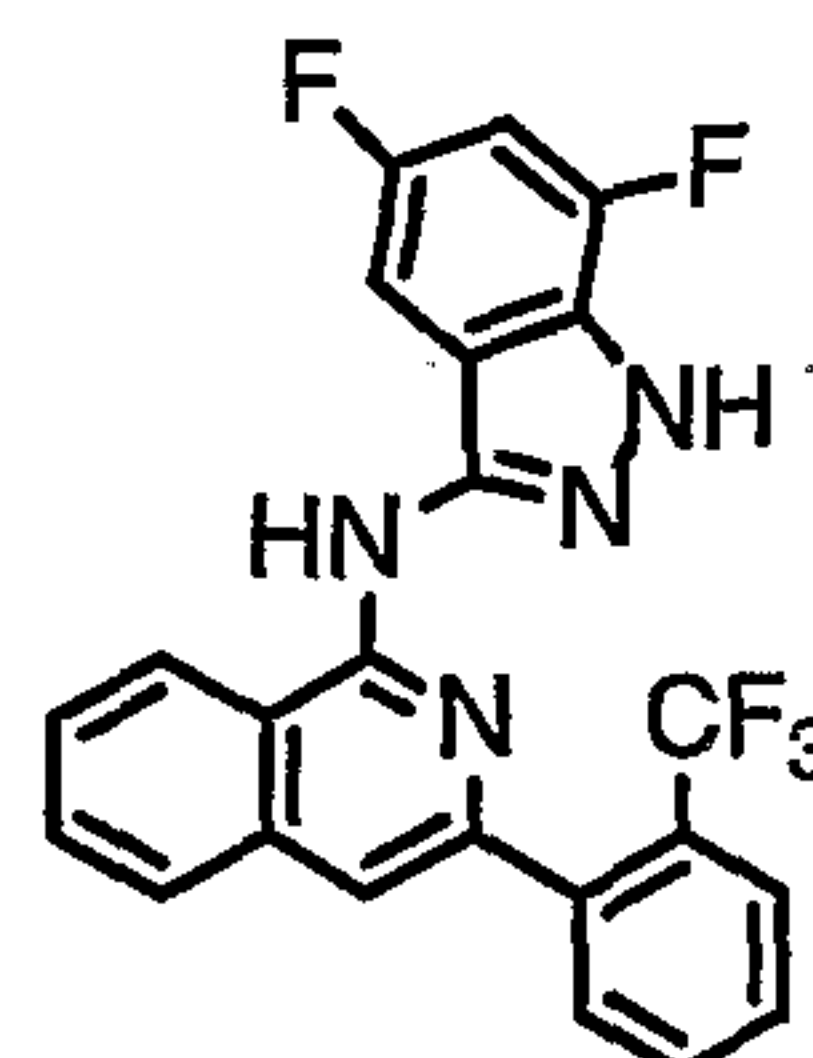
Table 4.



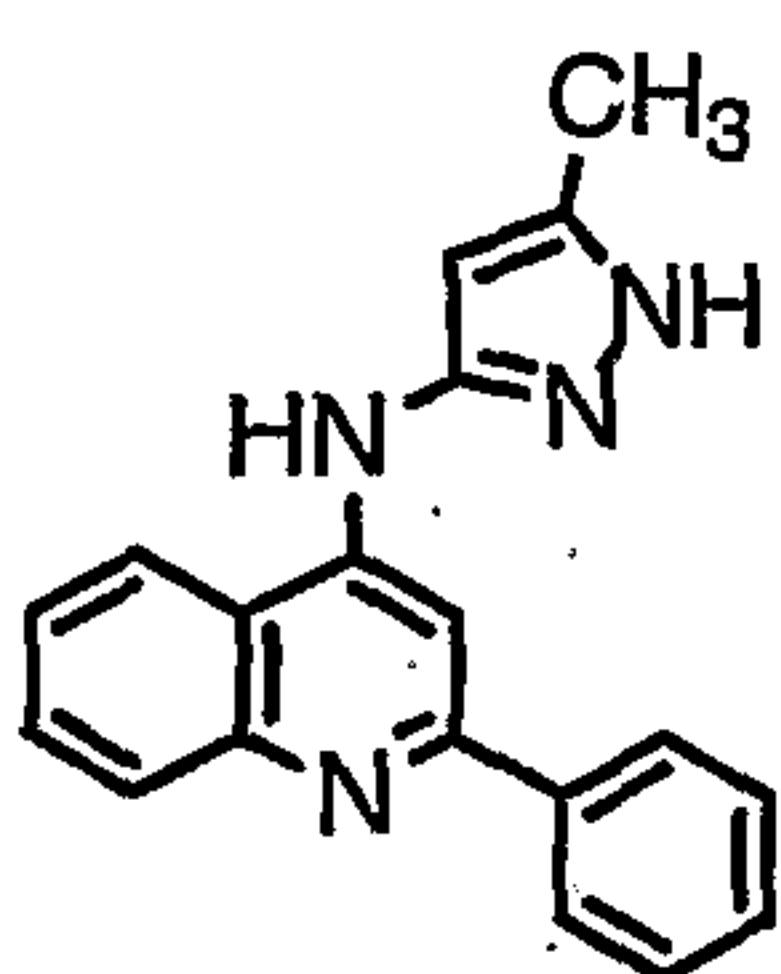
V-1



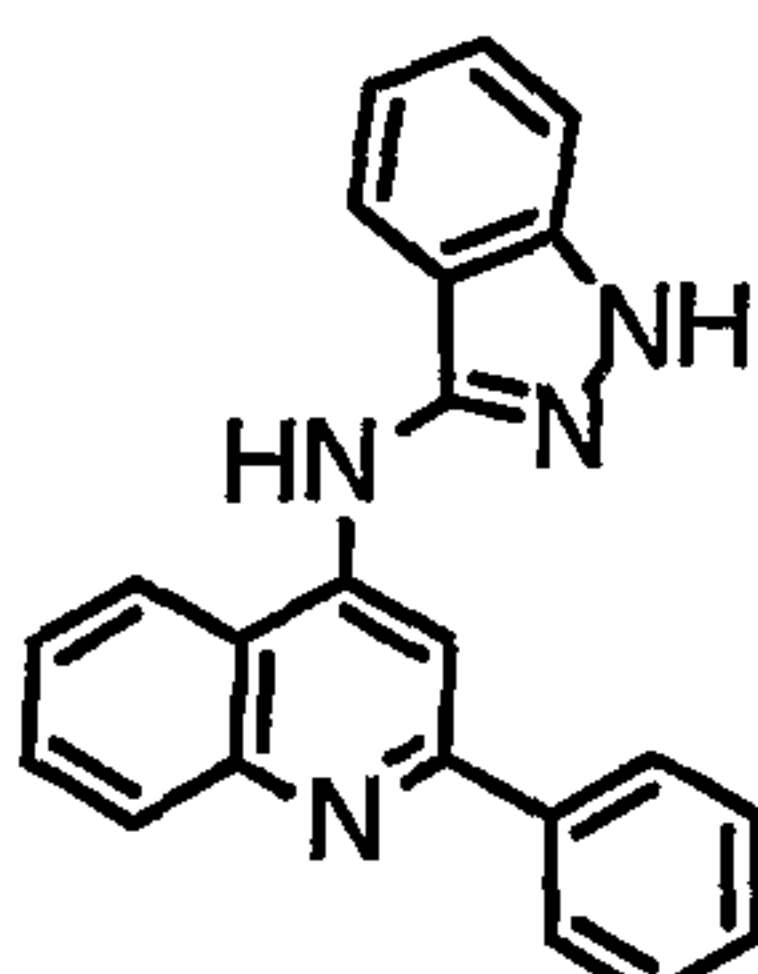
V-2



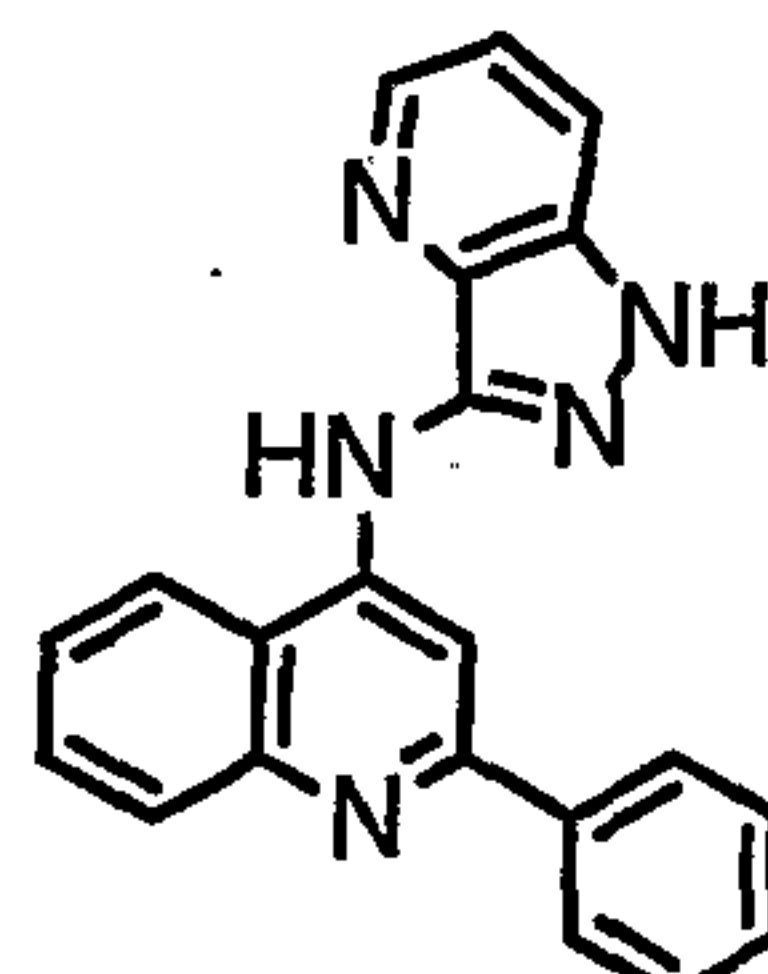
V-3



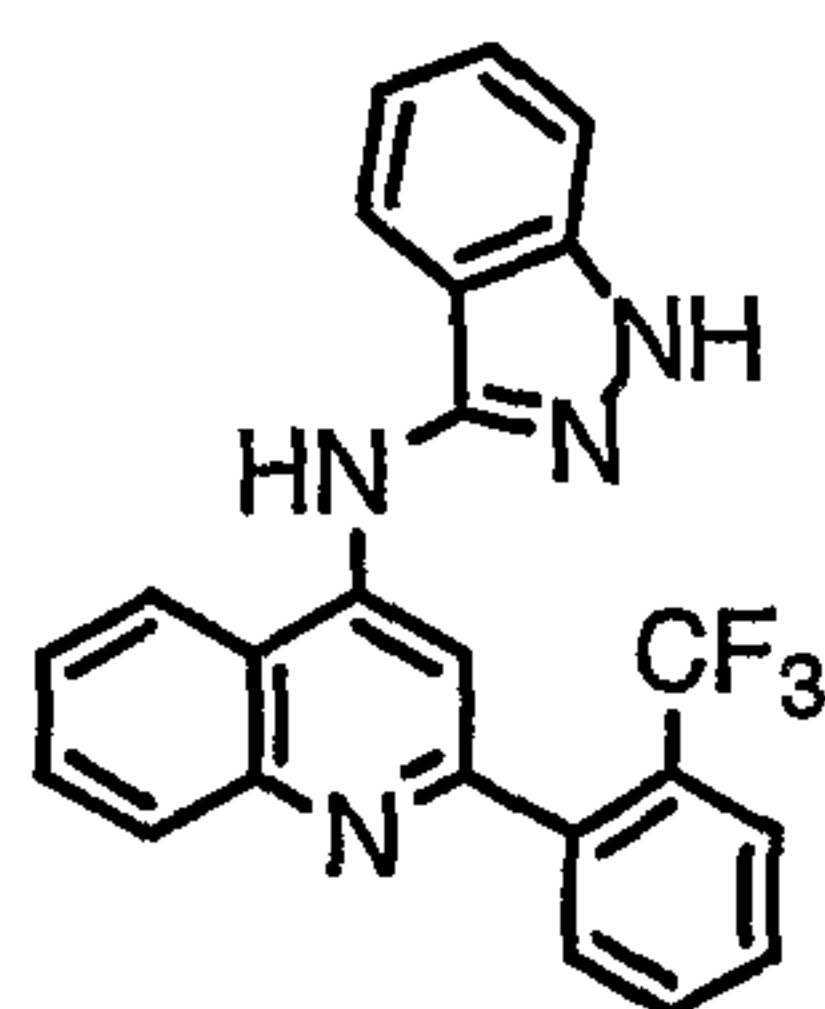
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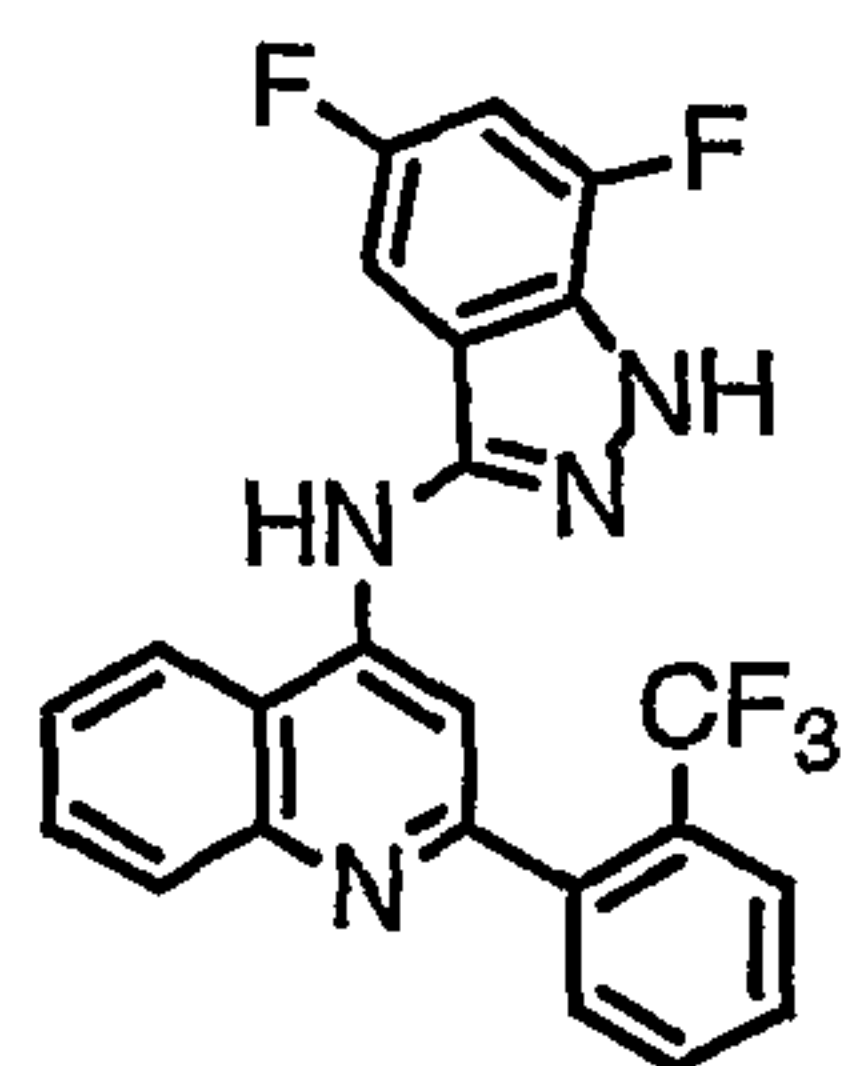
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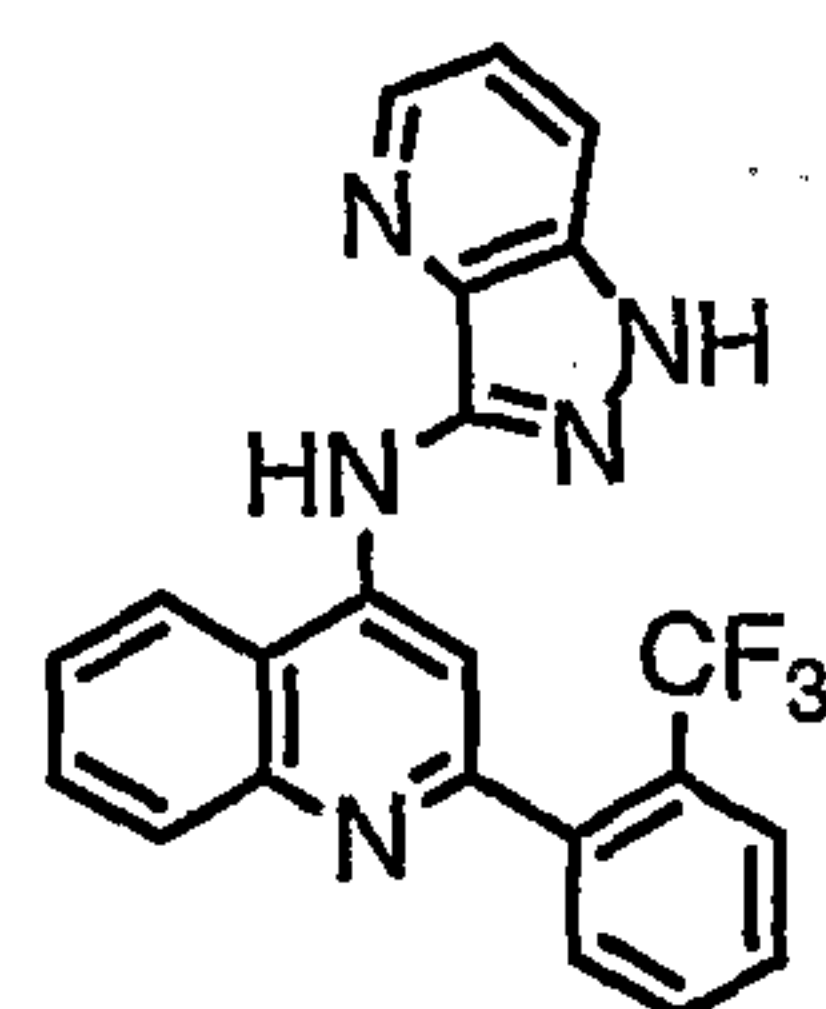
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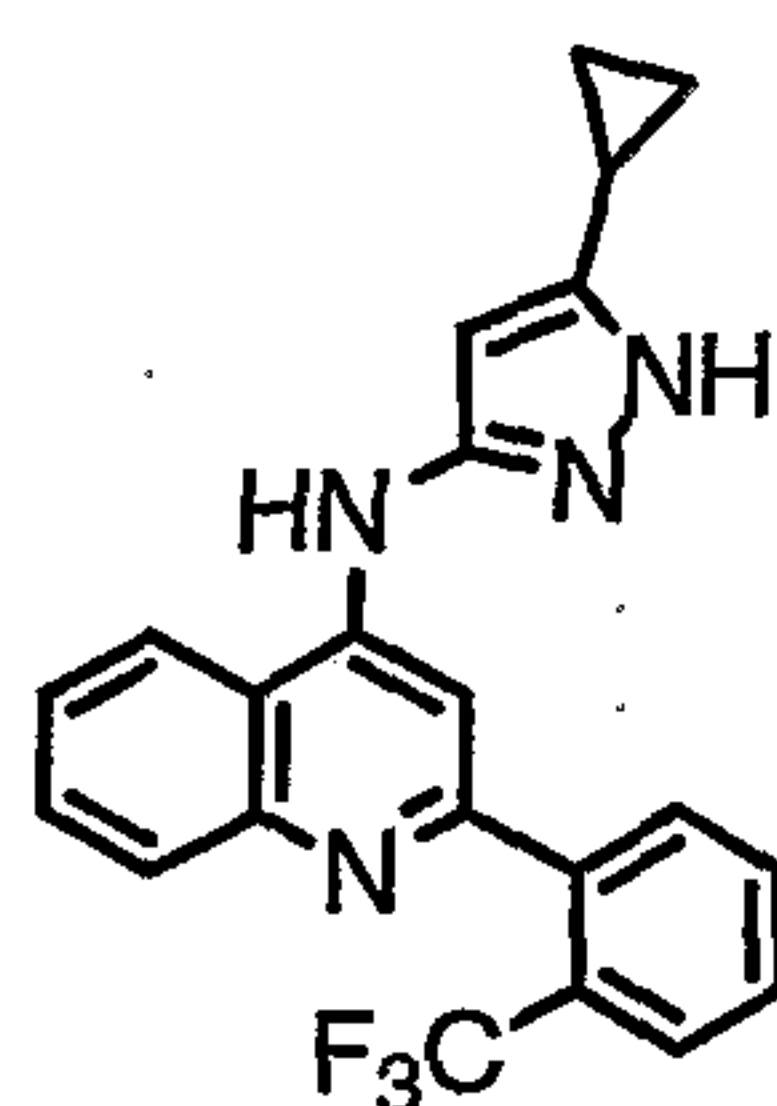
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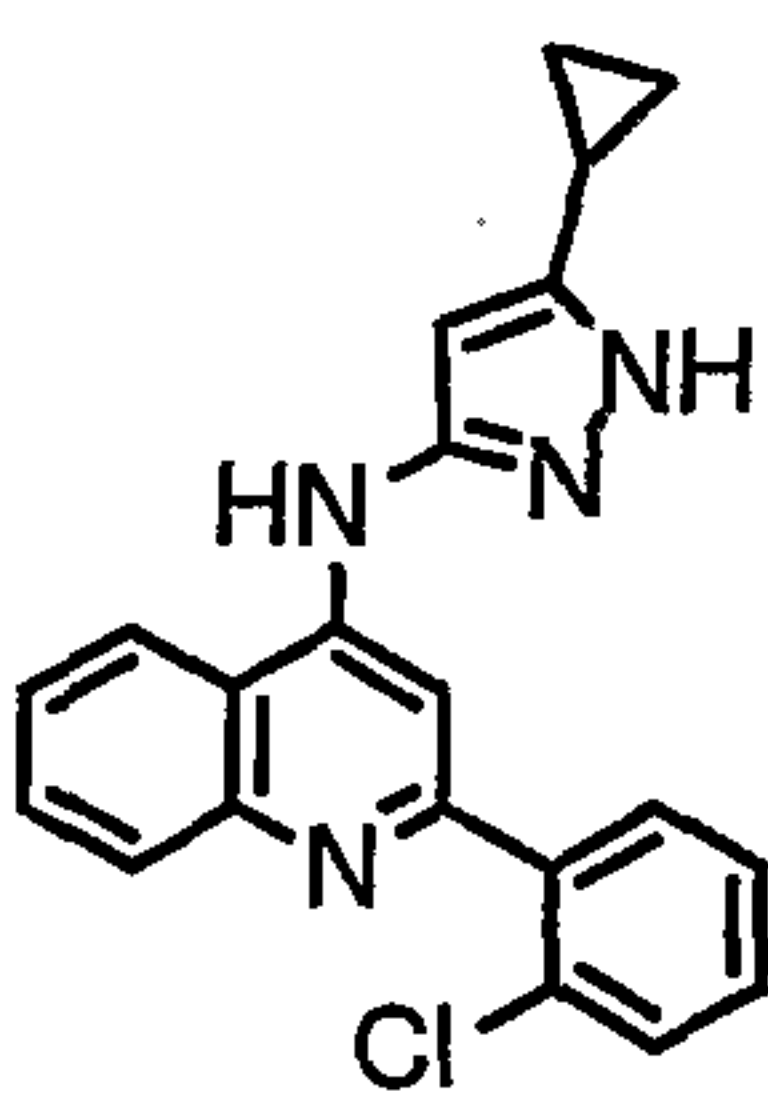
V-8



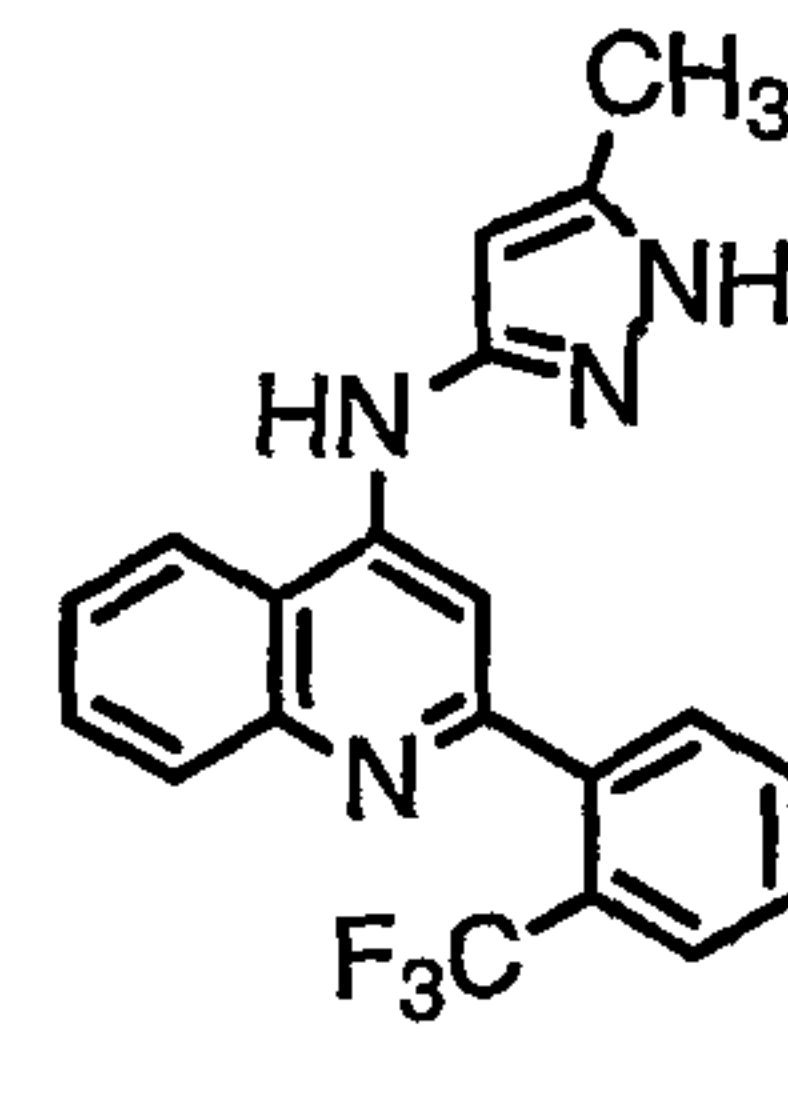
V-9



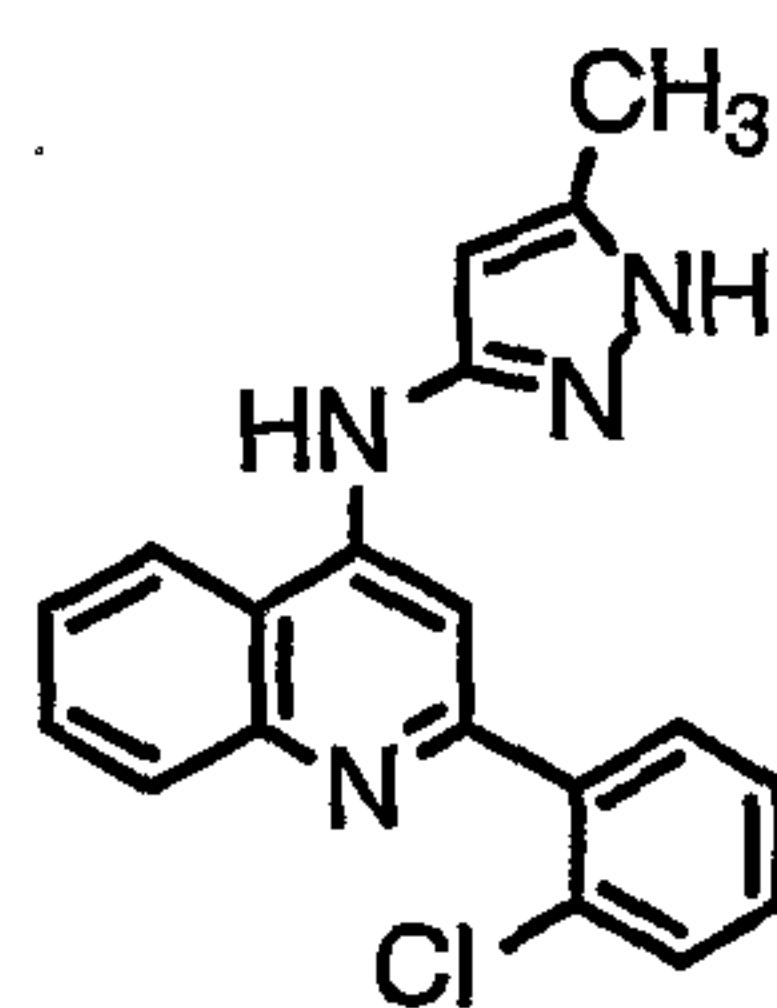
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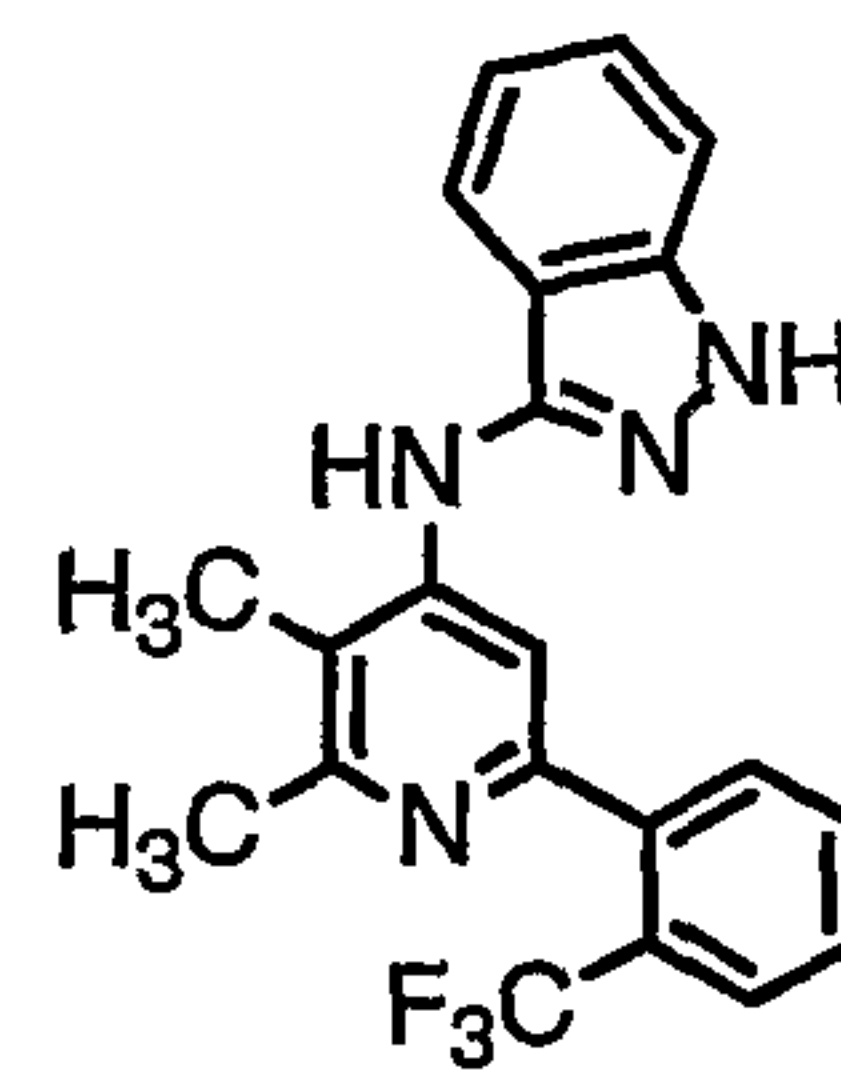
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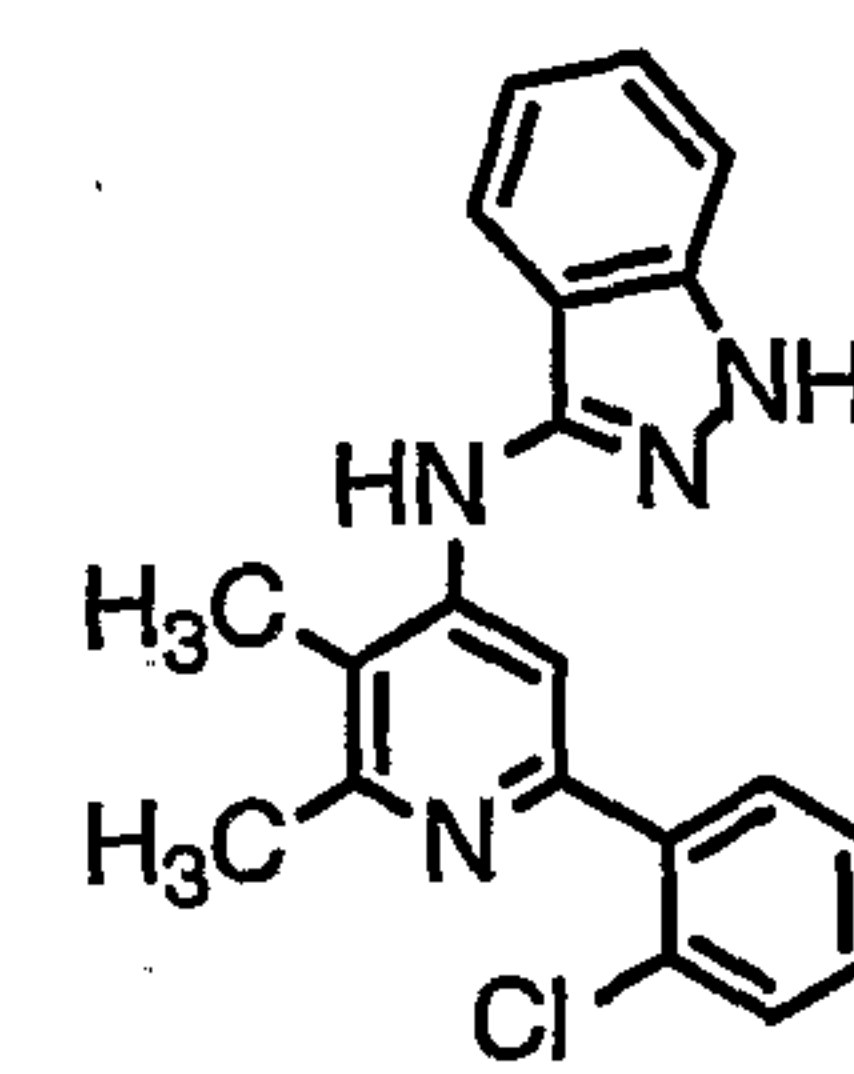
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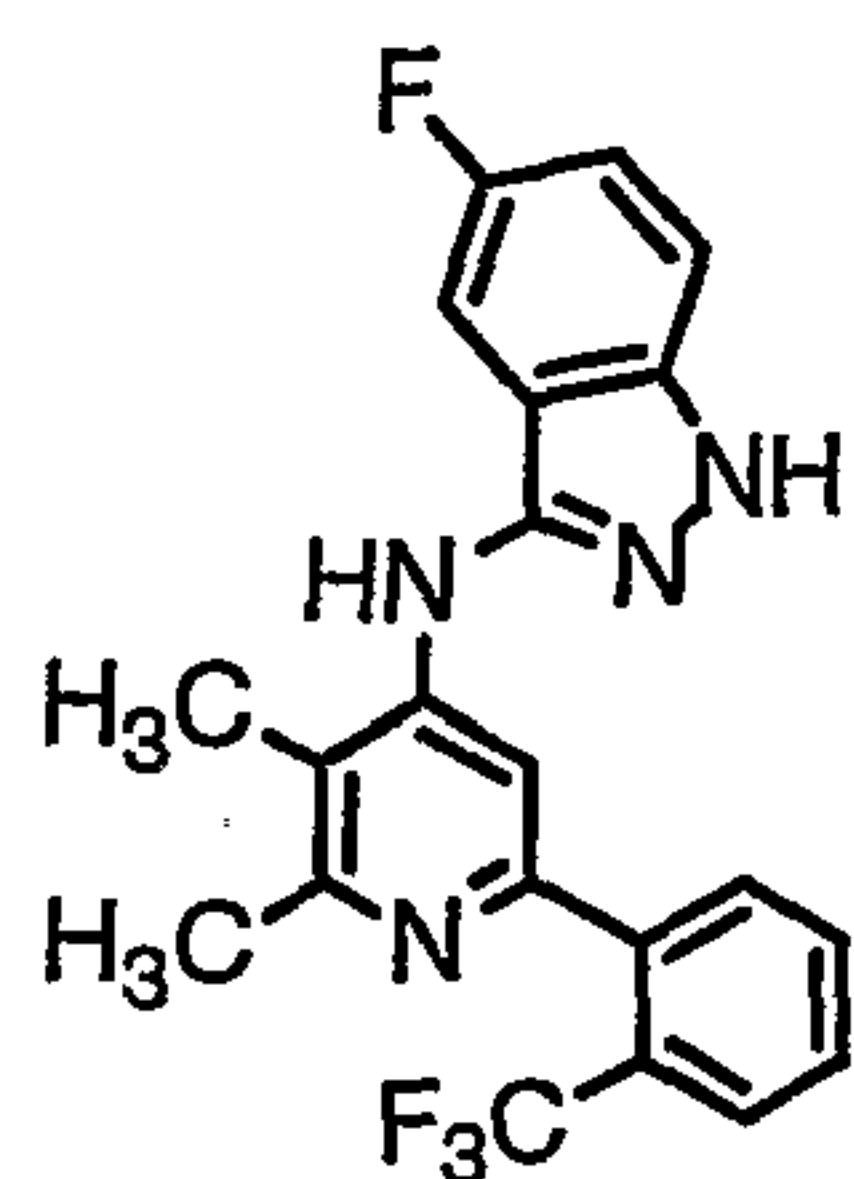
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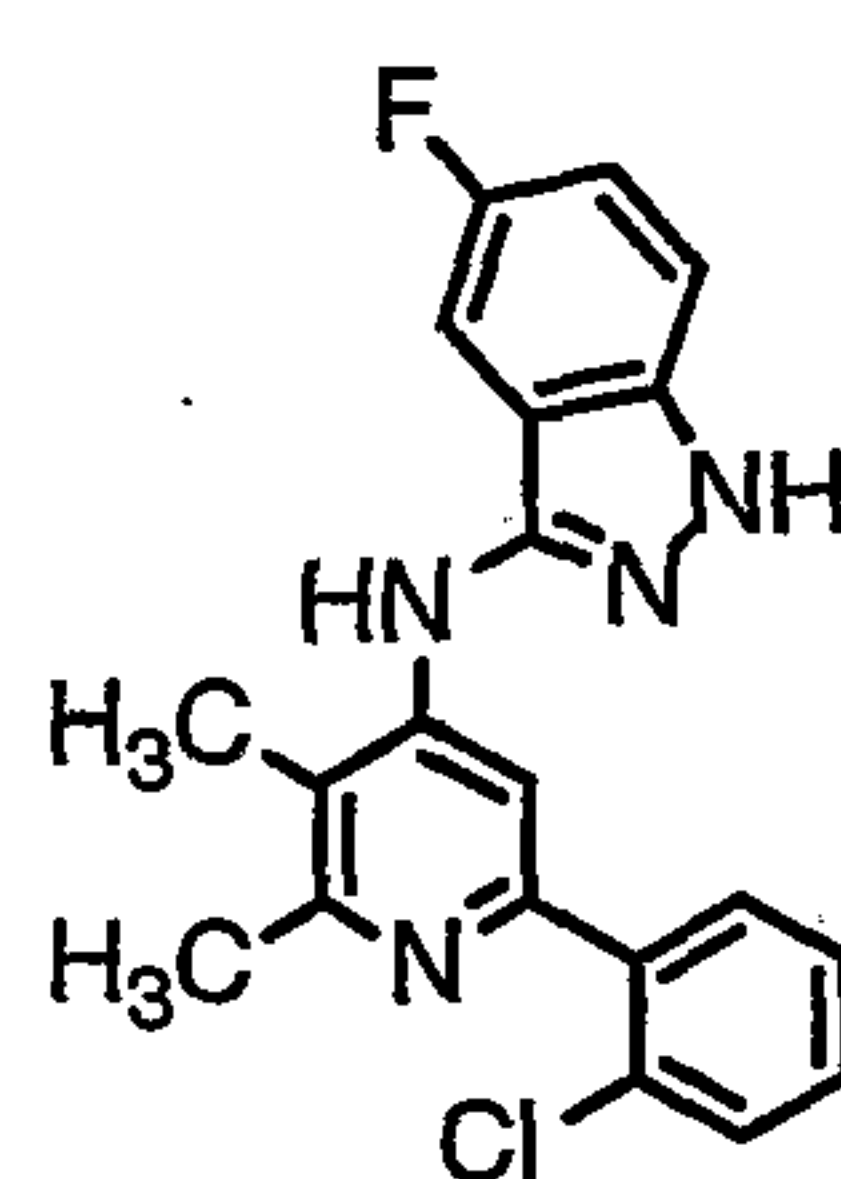
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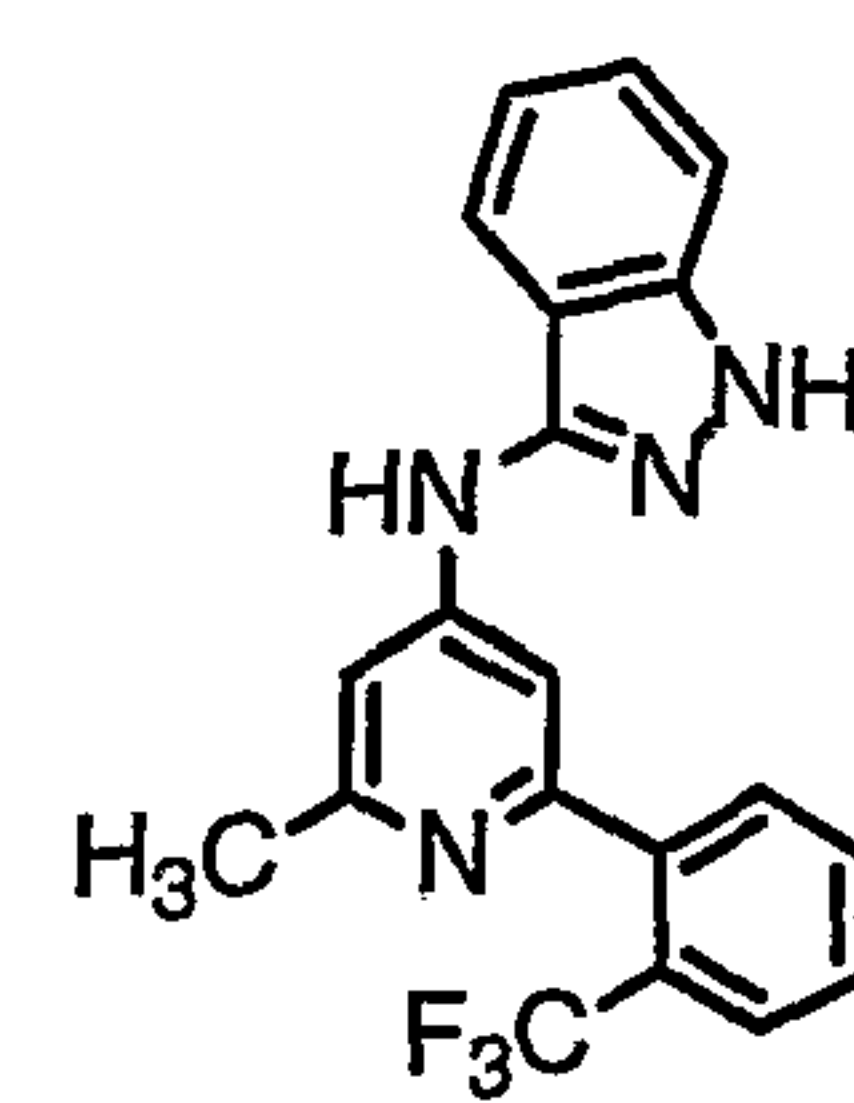
V-15



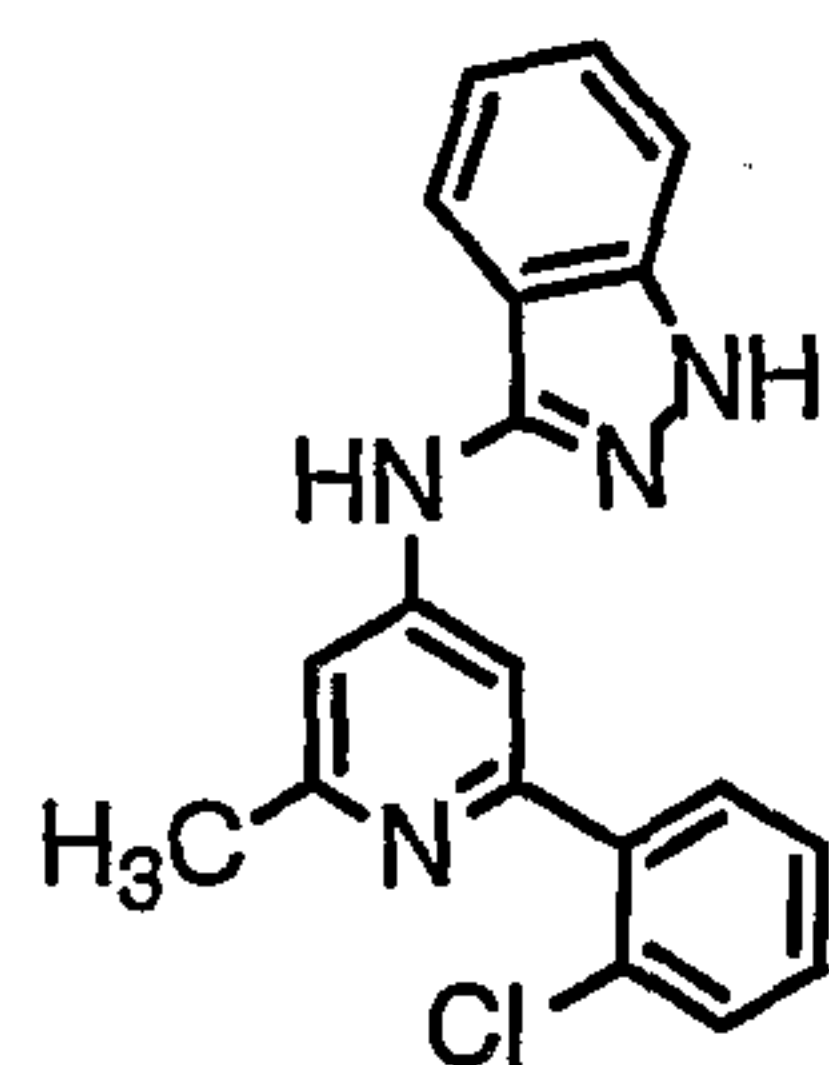
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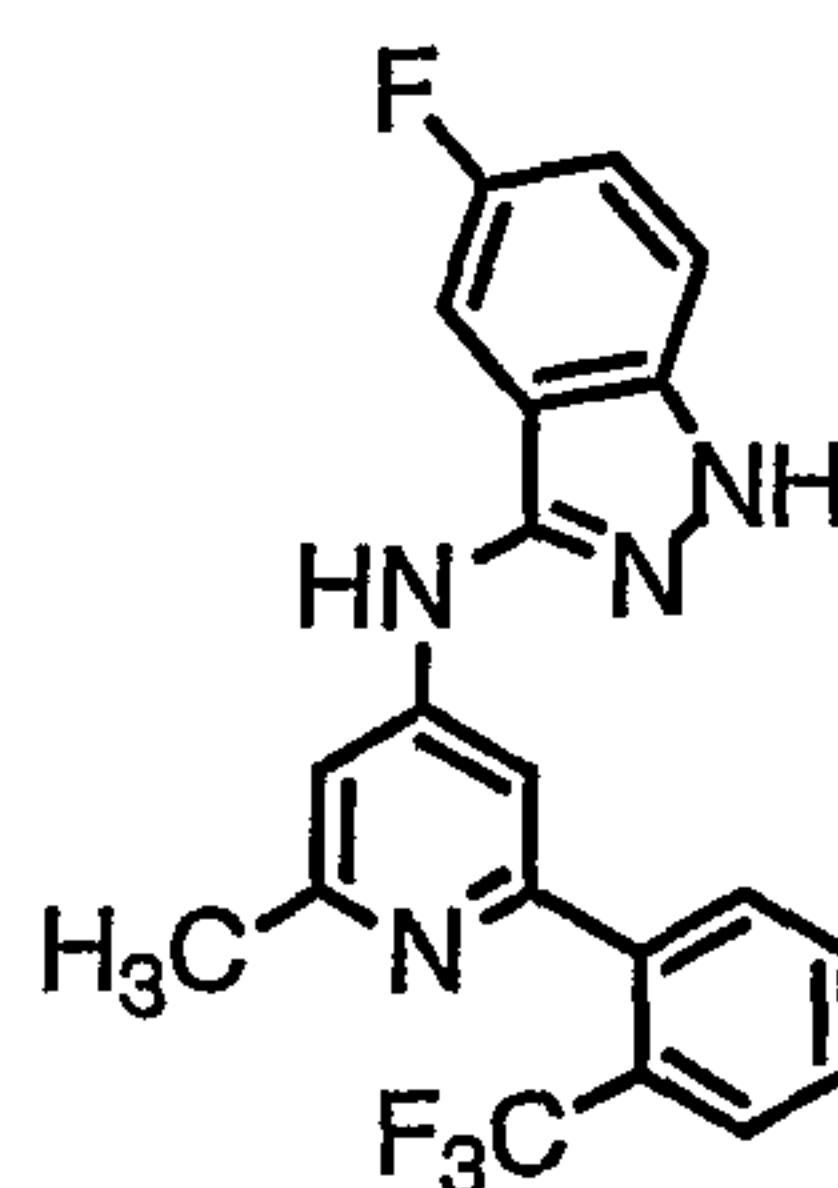
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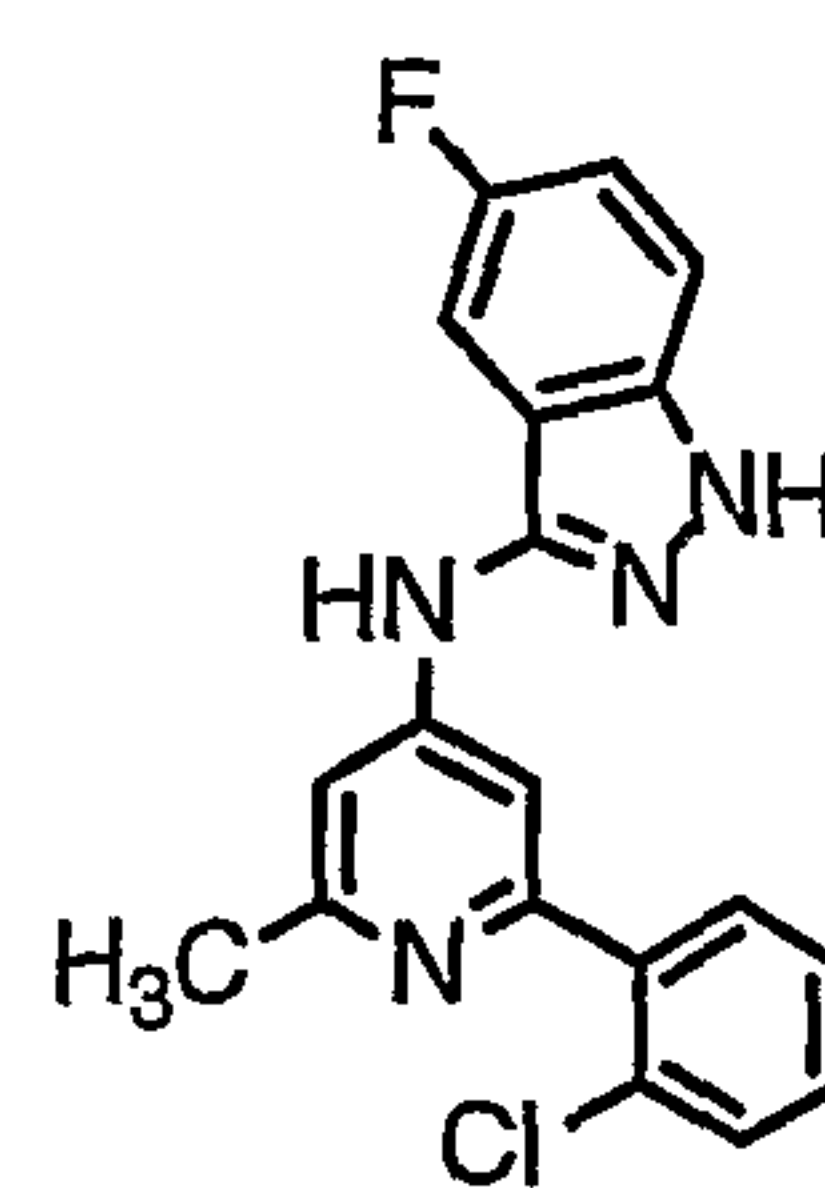
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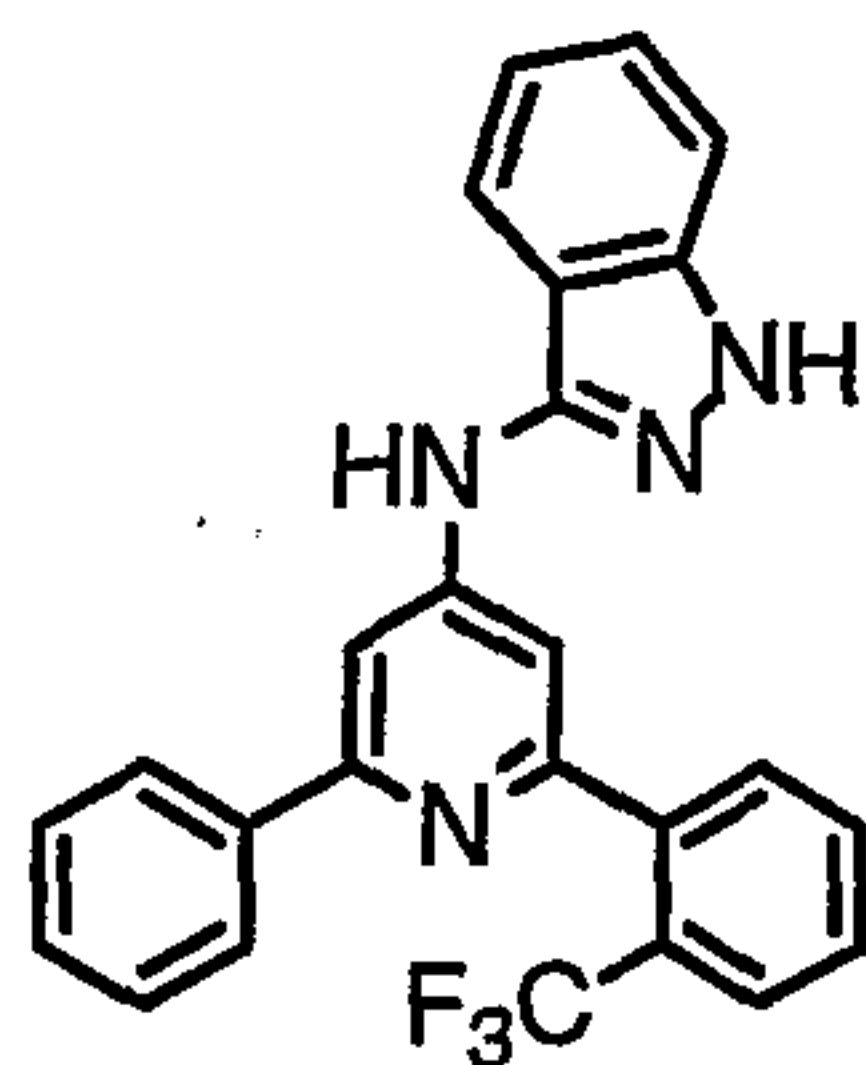
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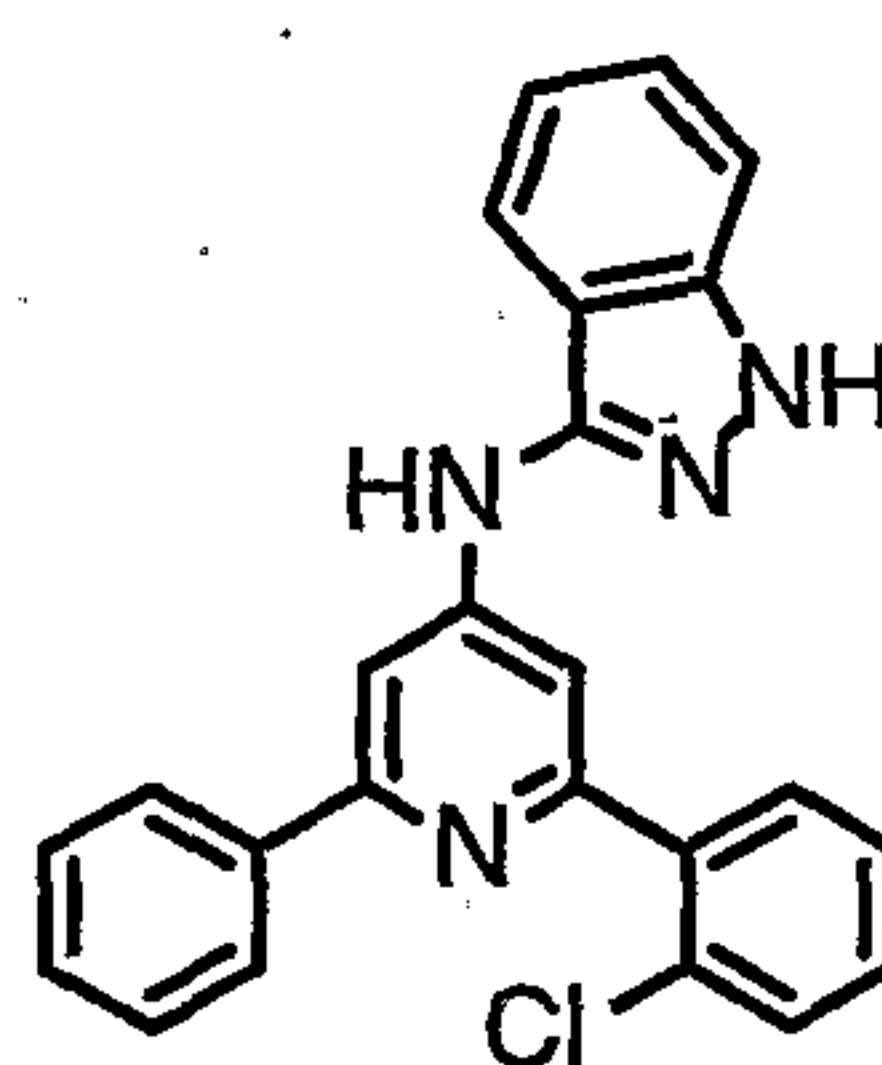
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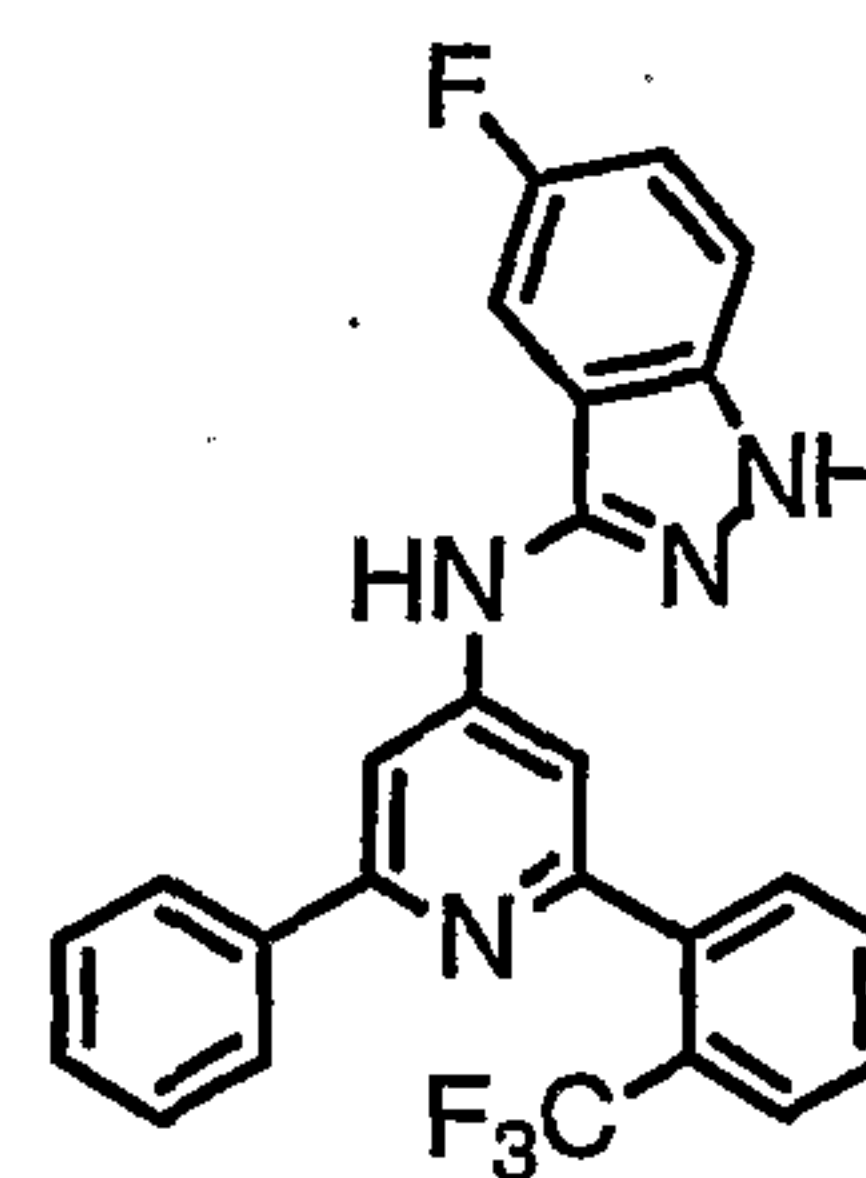
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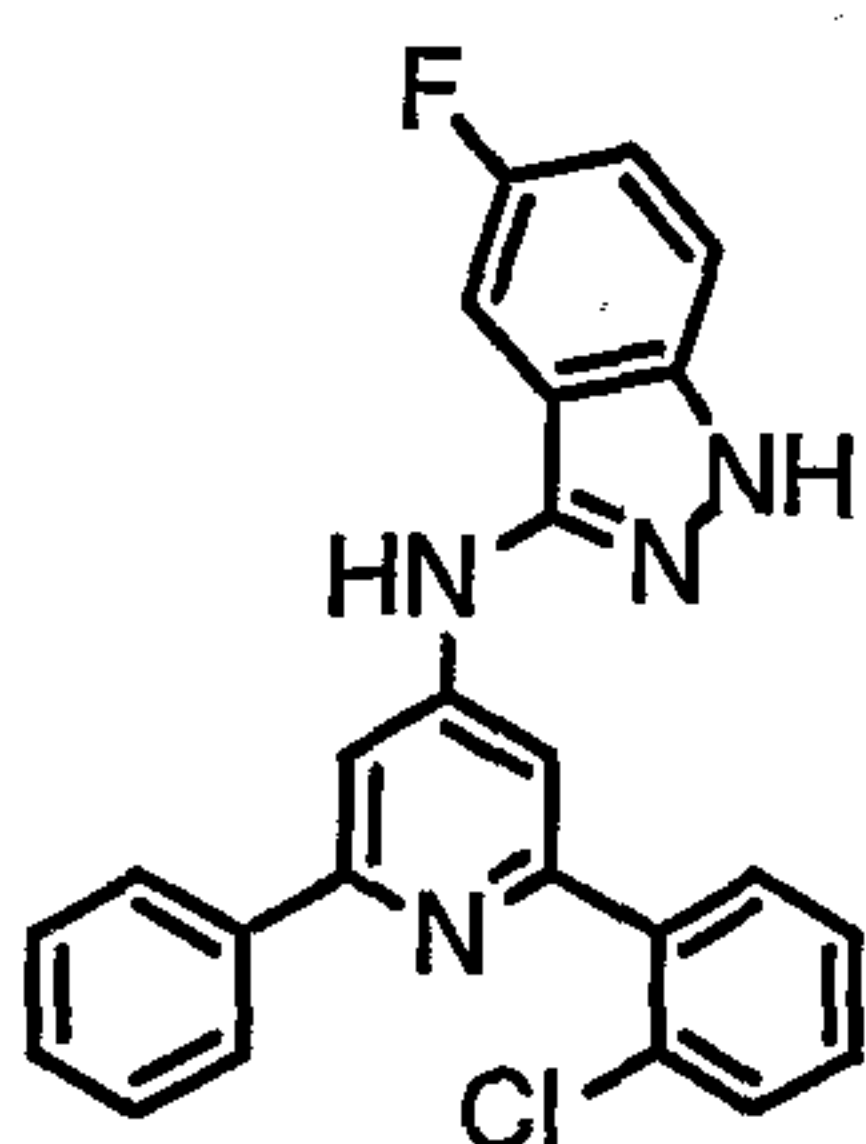
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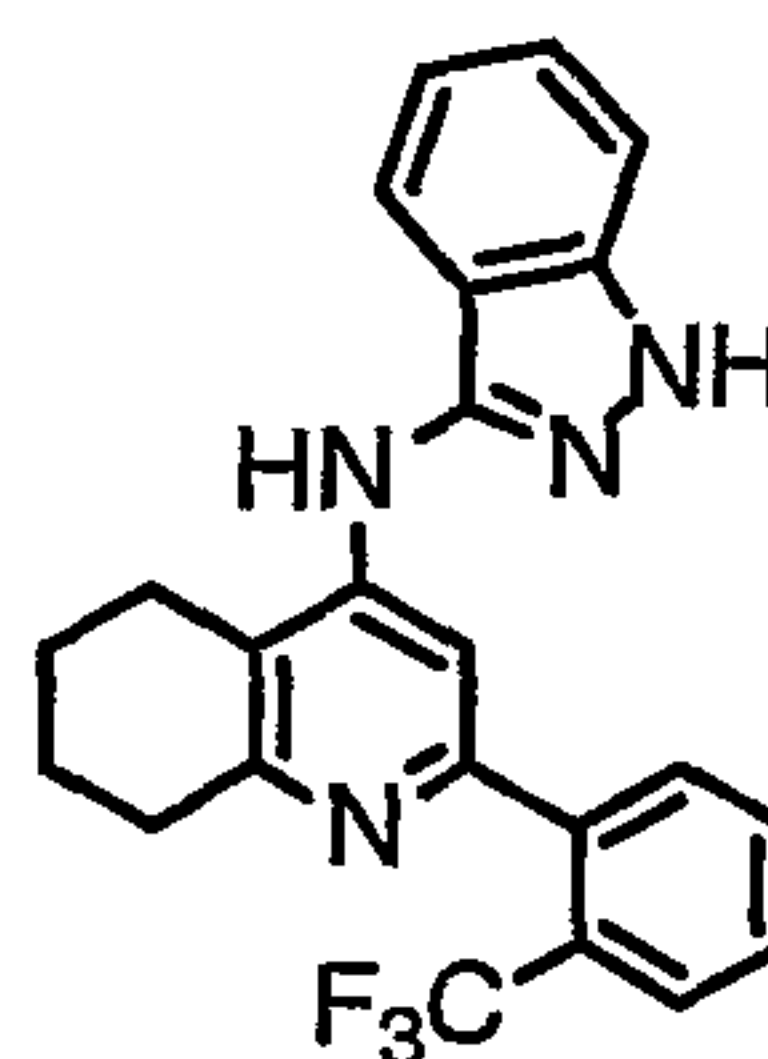
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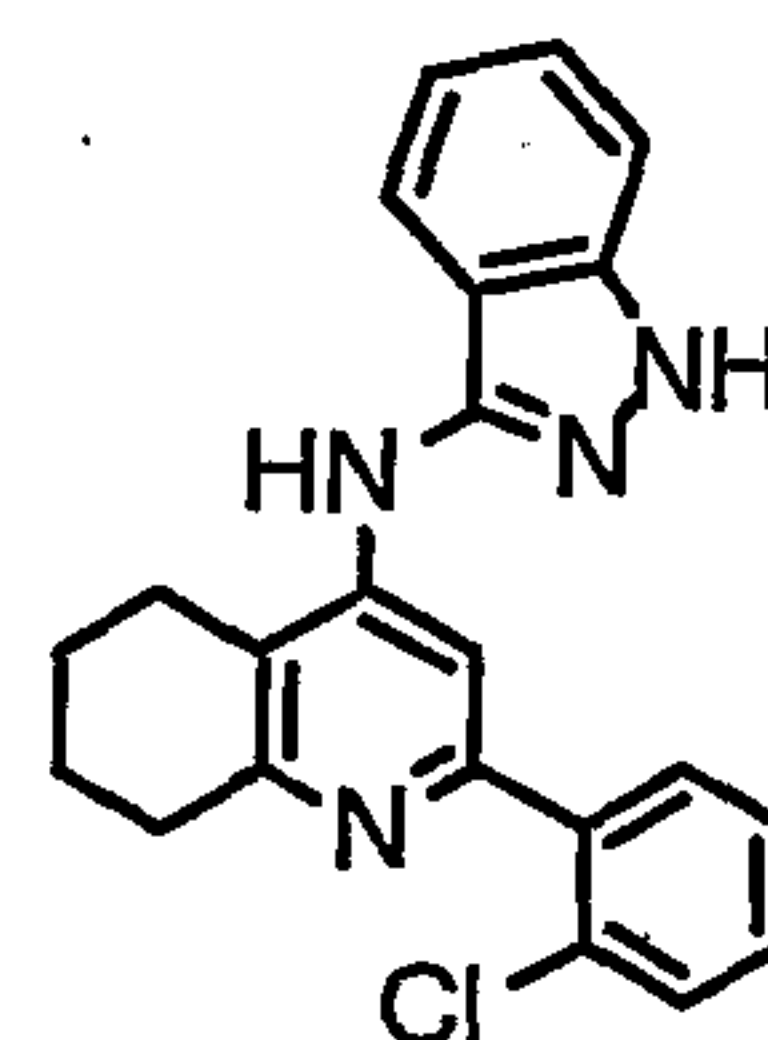
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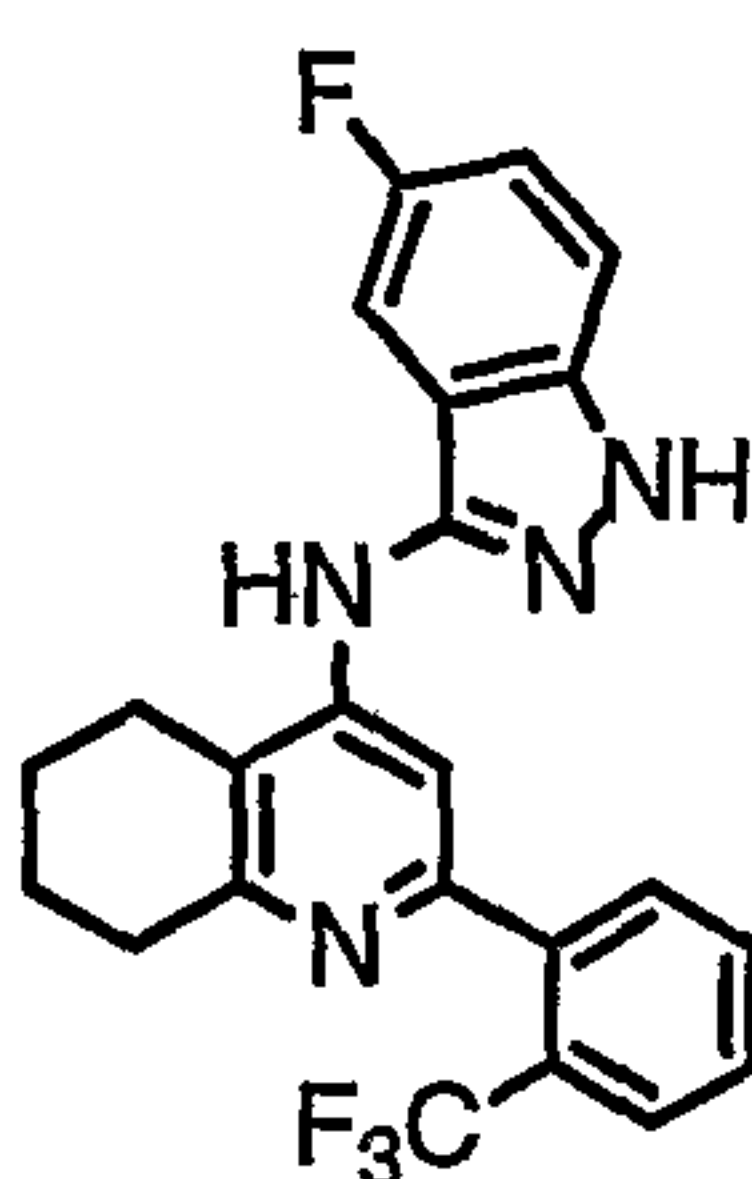
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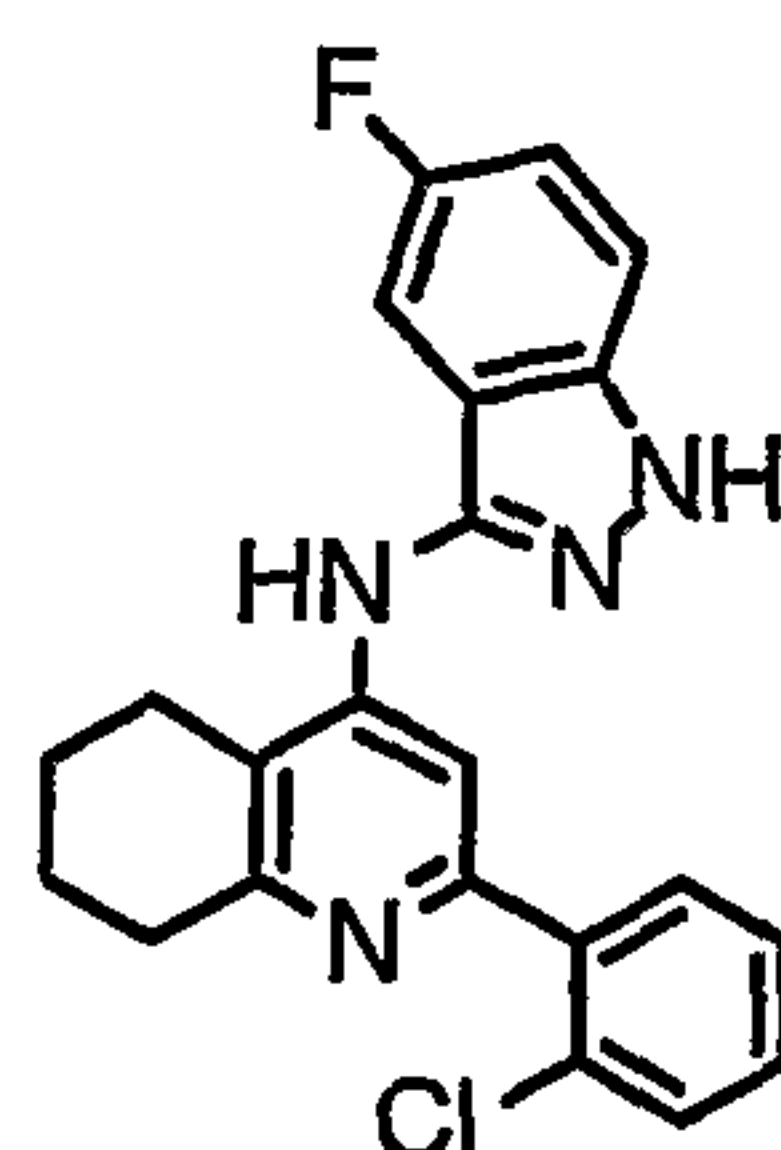
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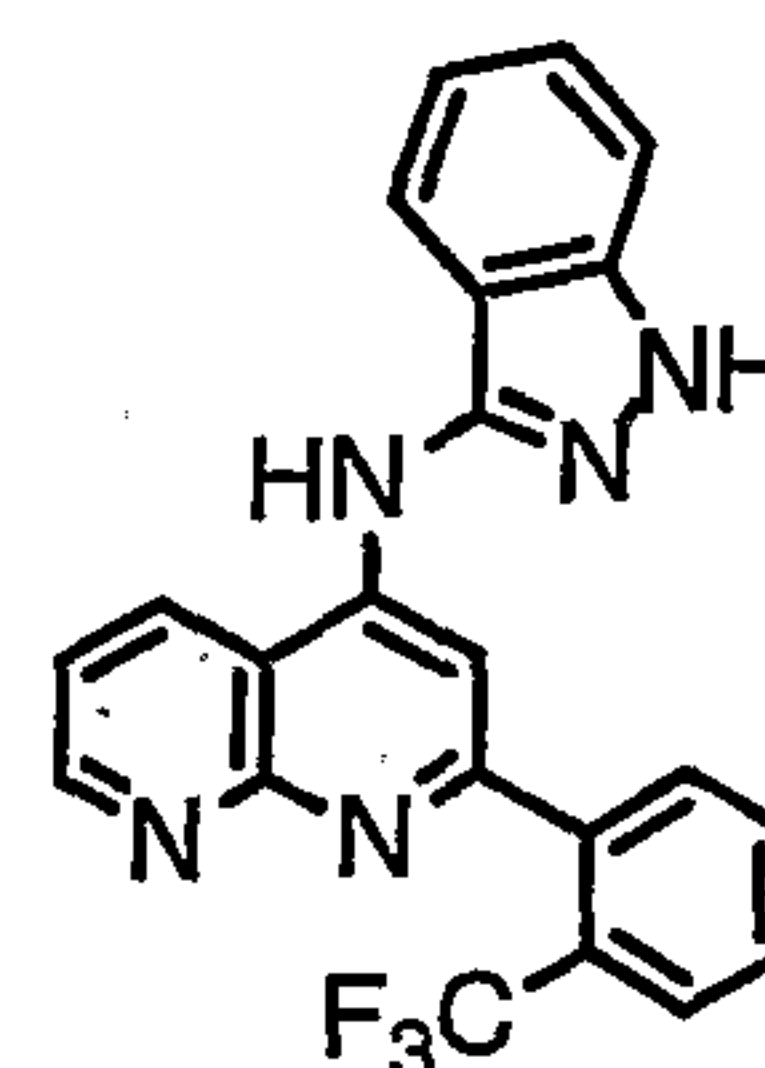
V-27



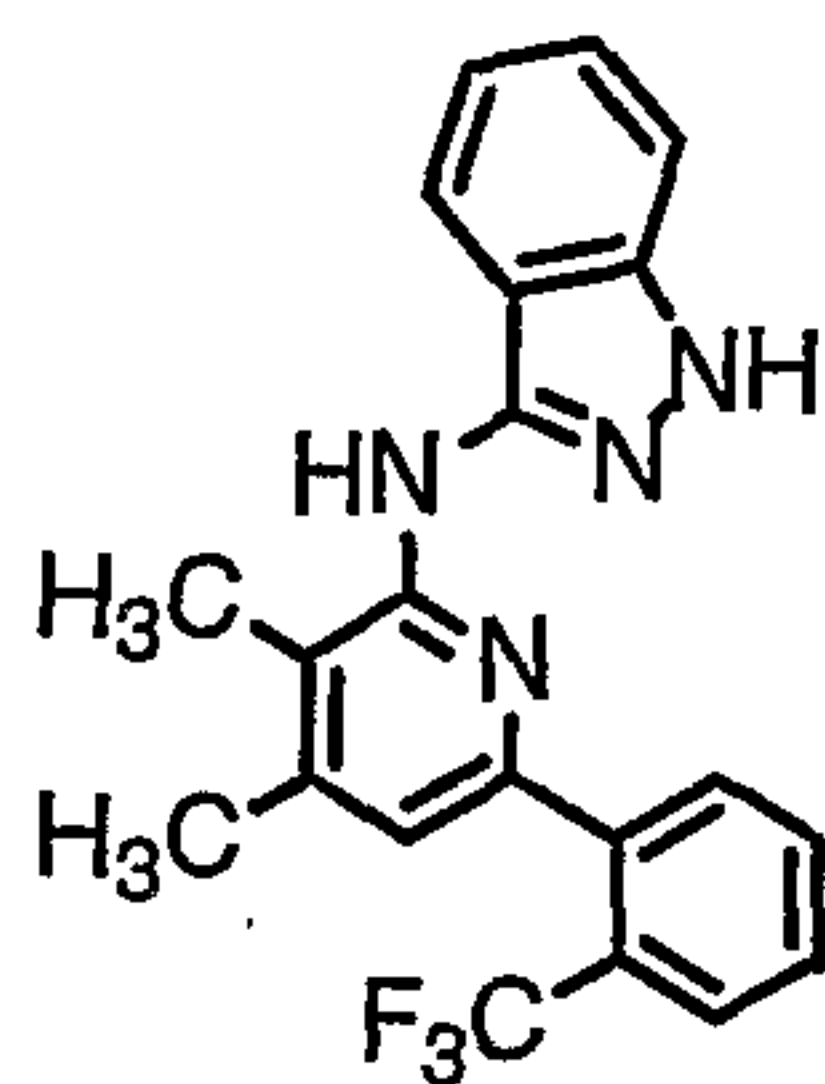
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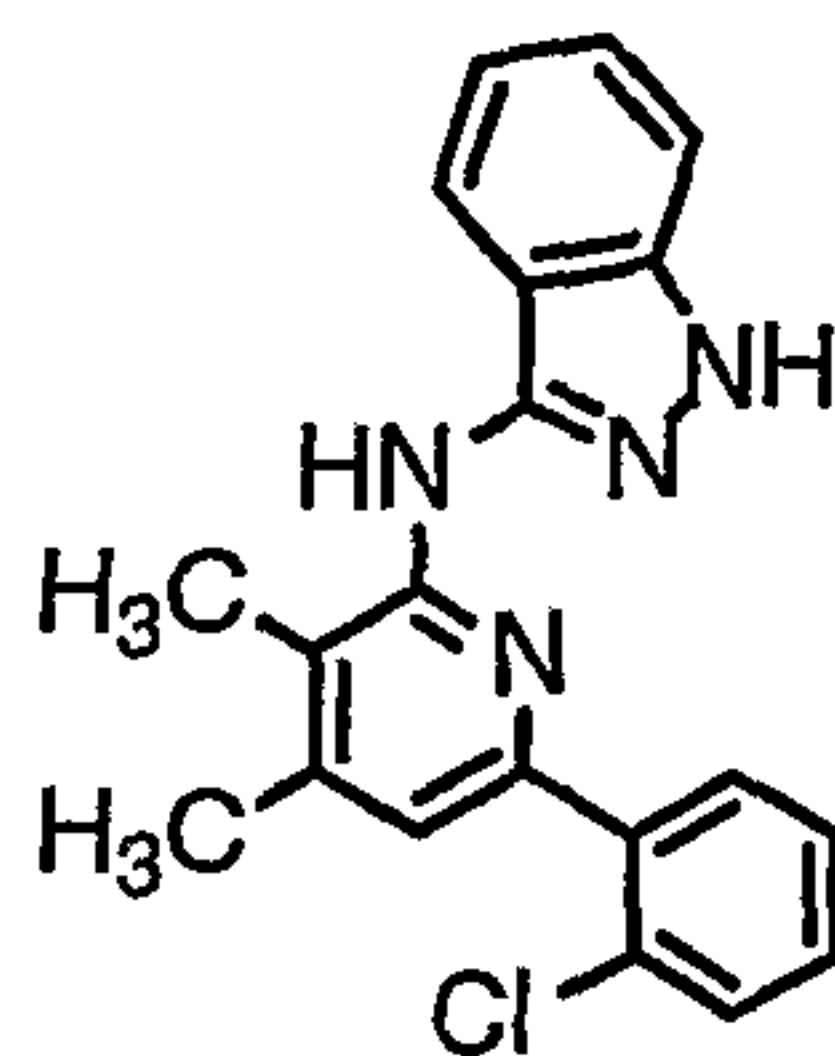
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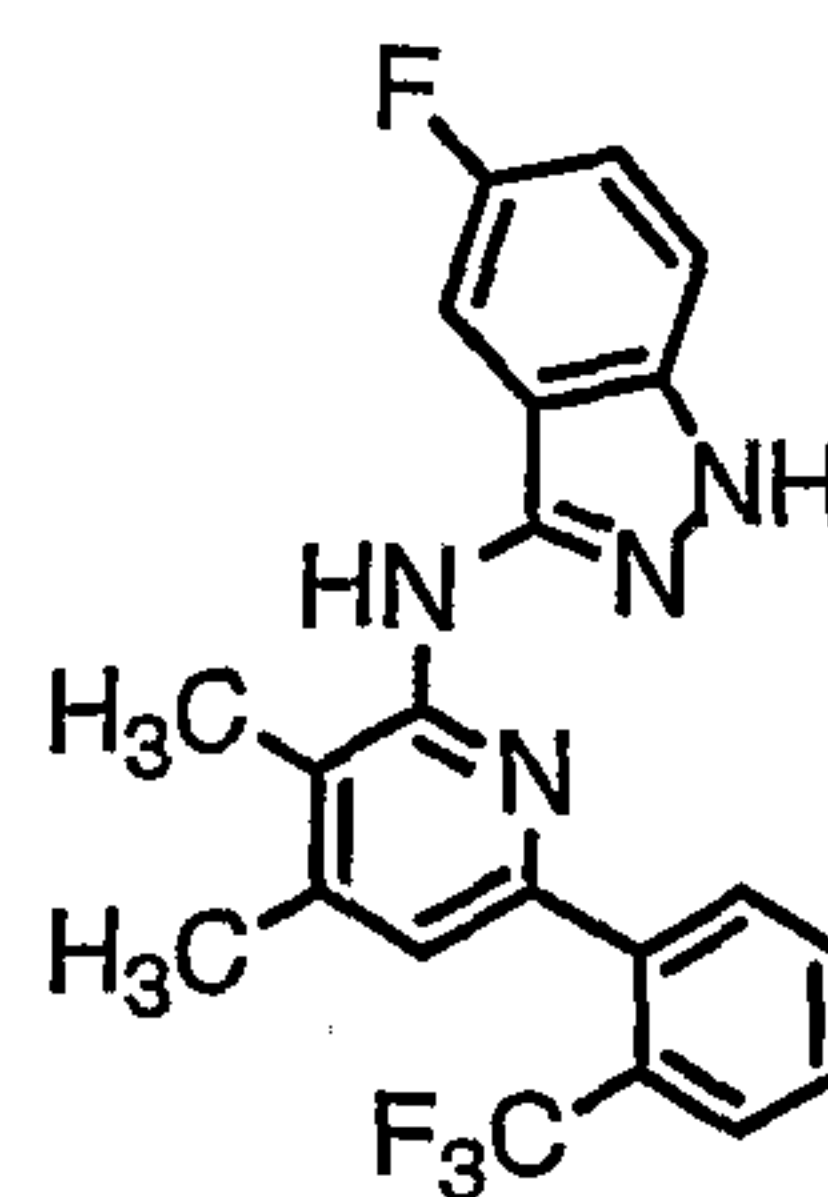
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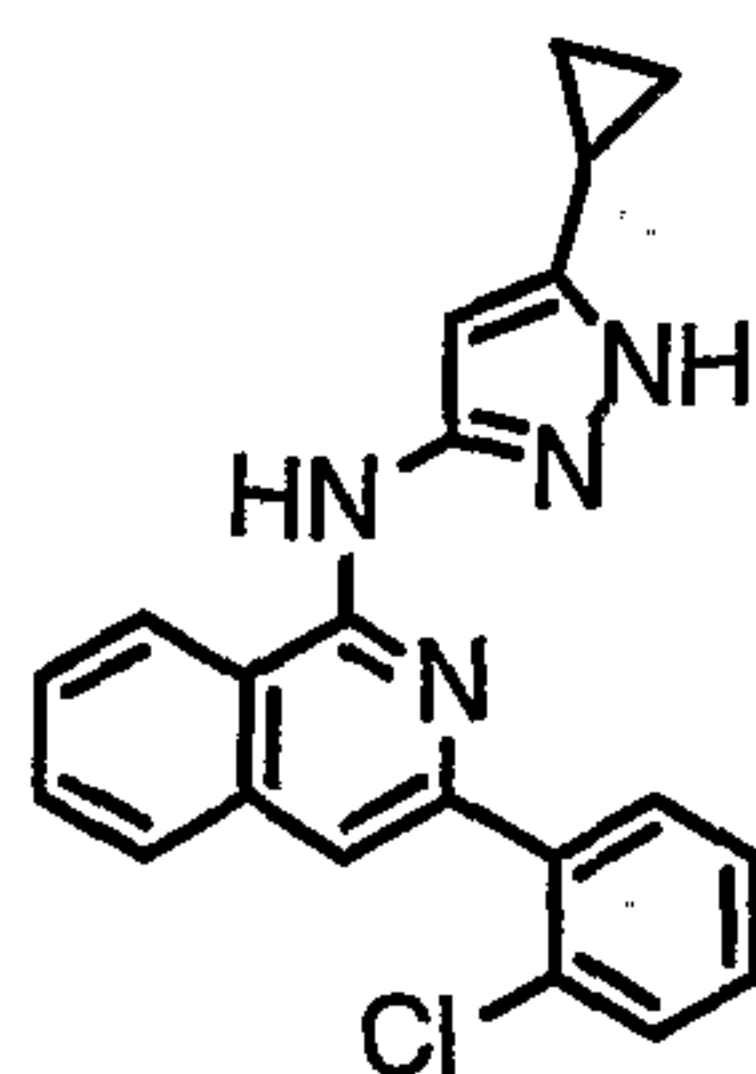
V-31



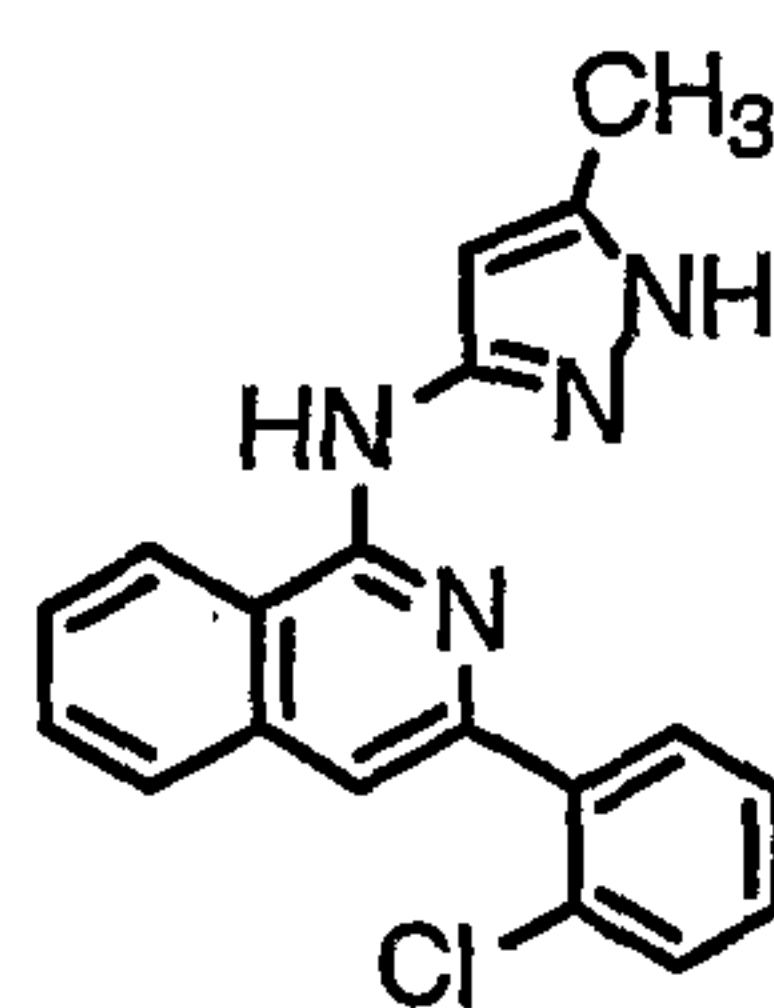
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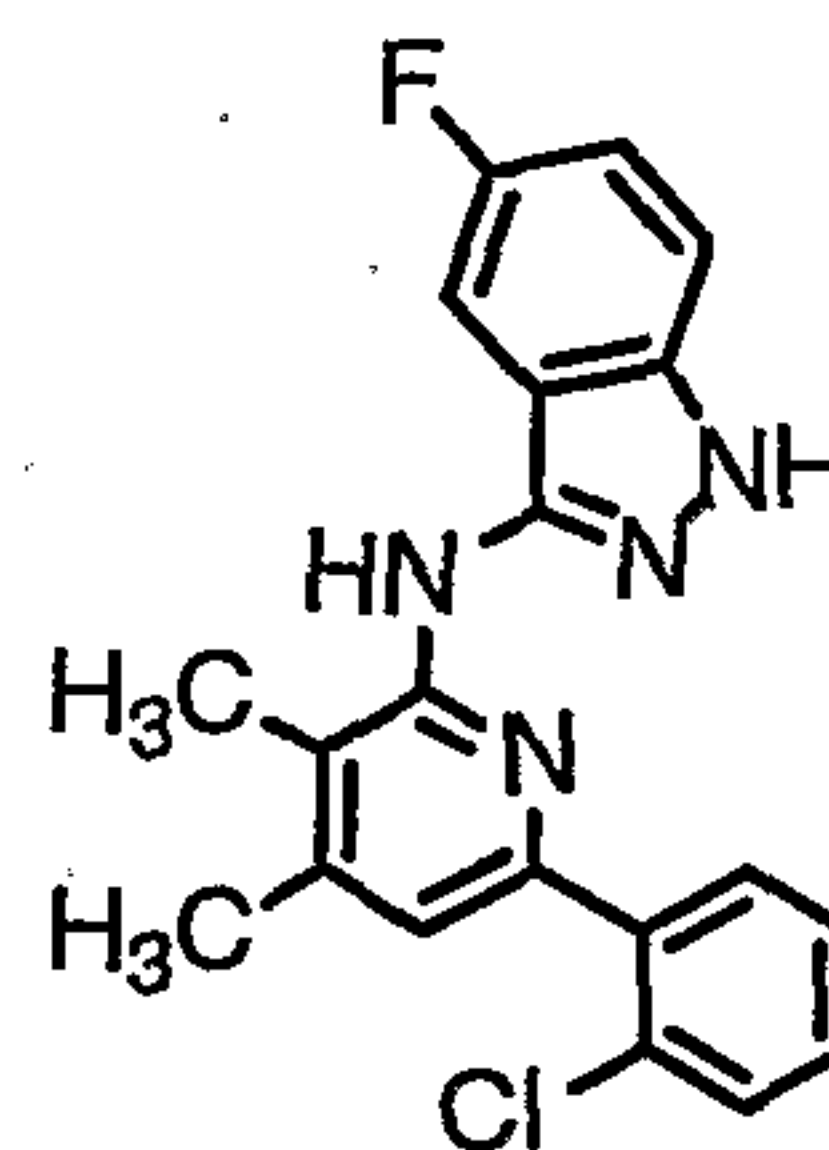
V-33



V-34

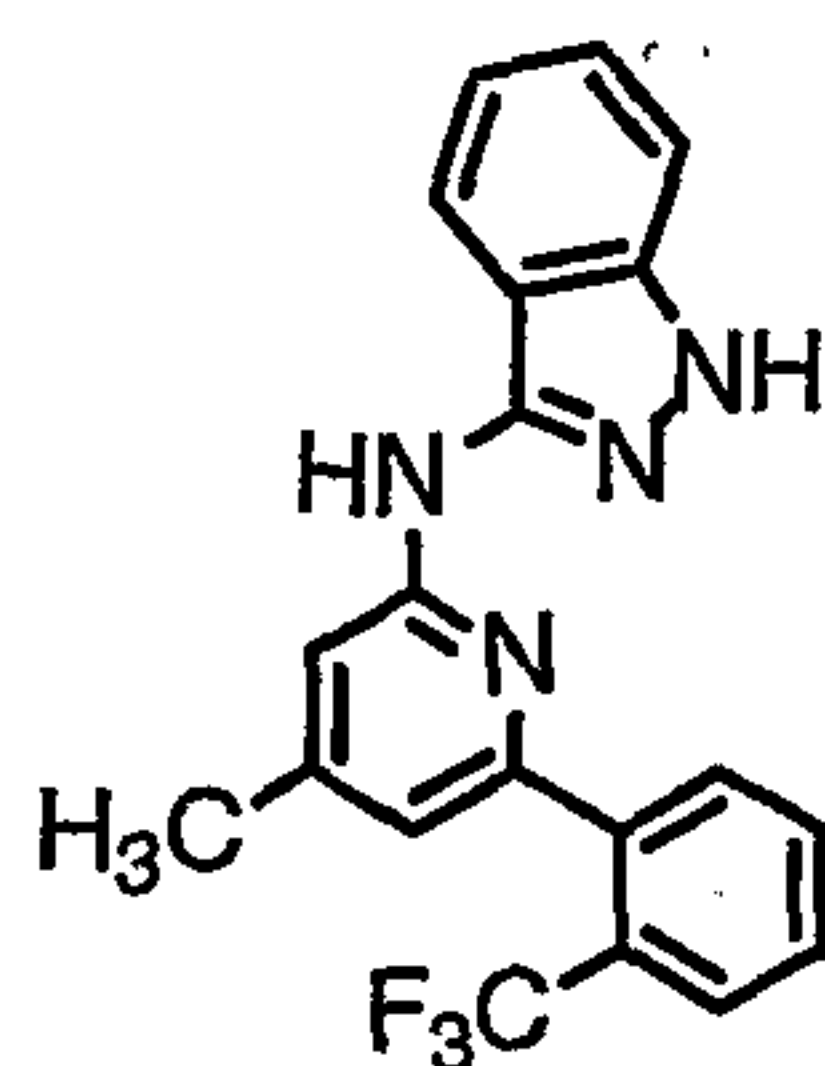


V-35

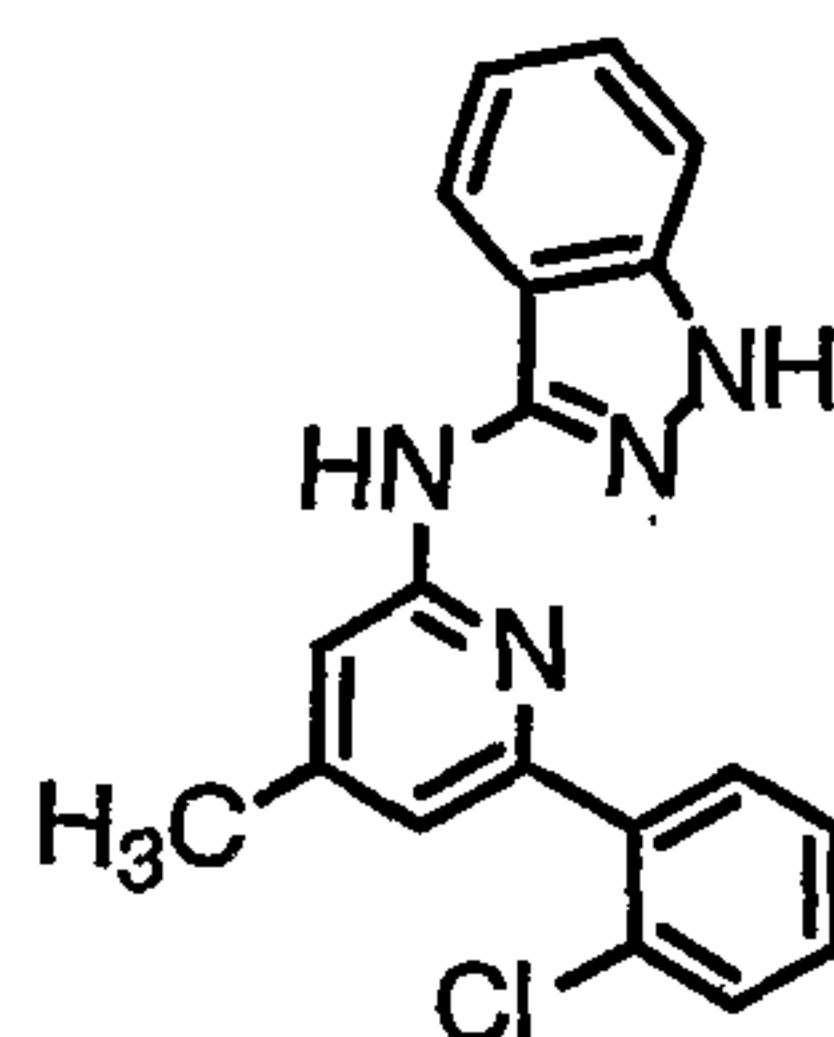


V-36

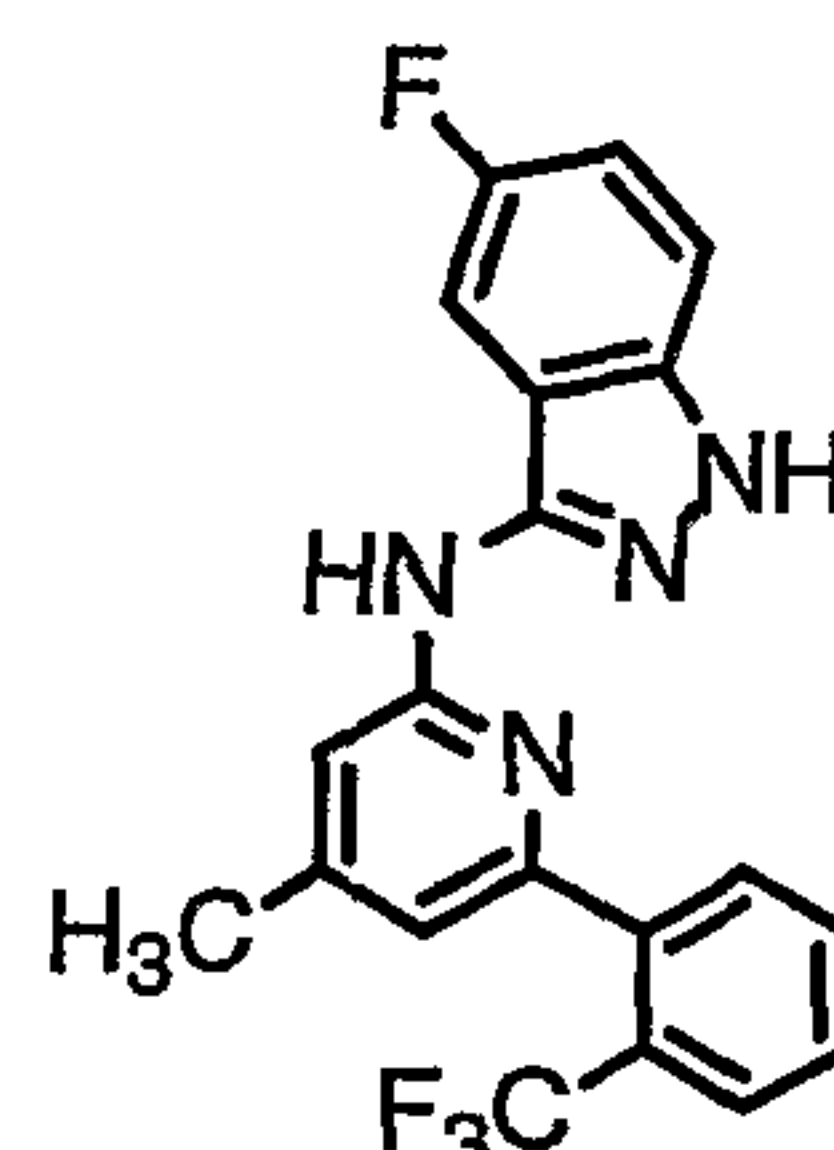
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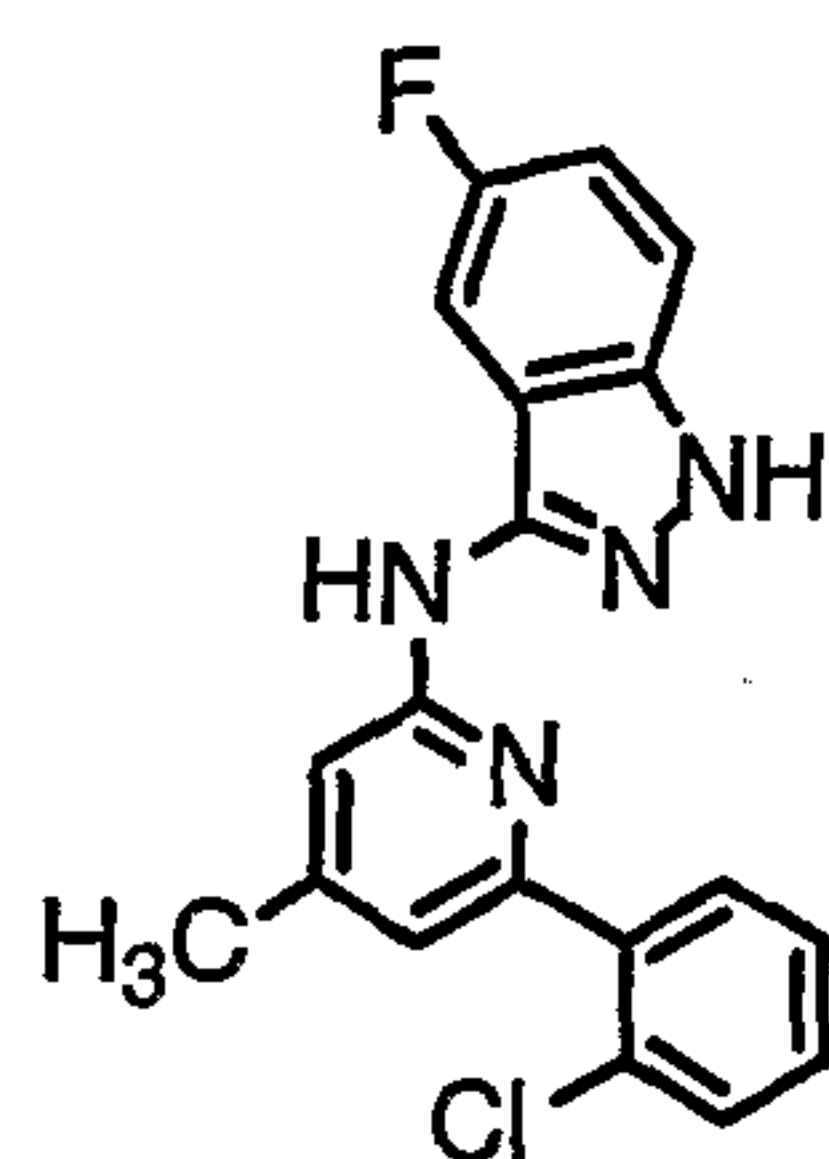
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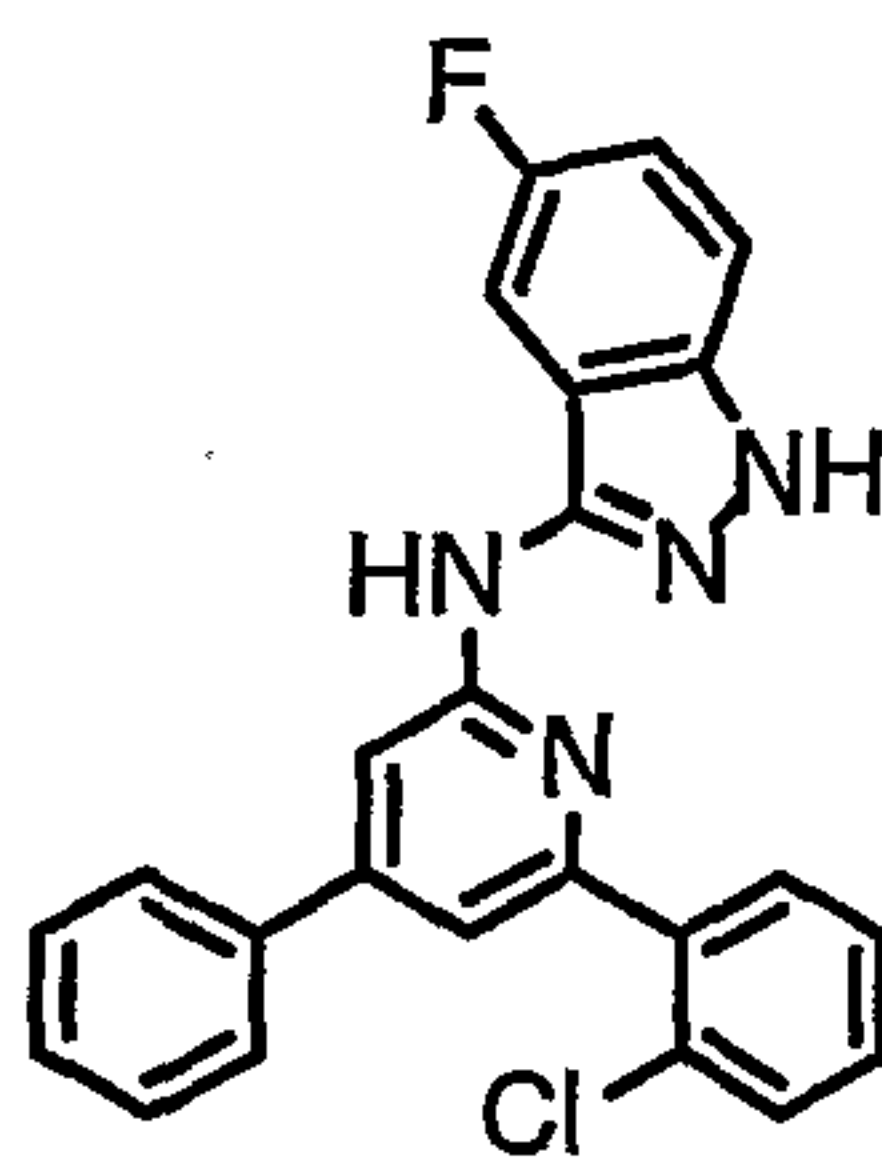
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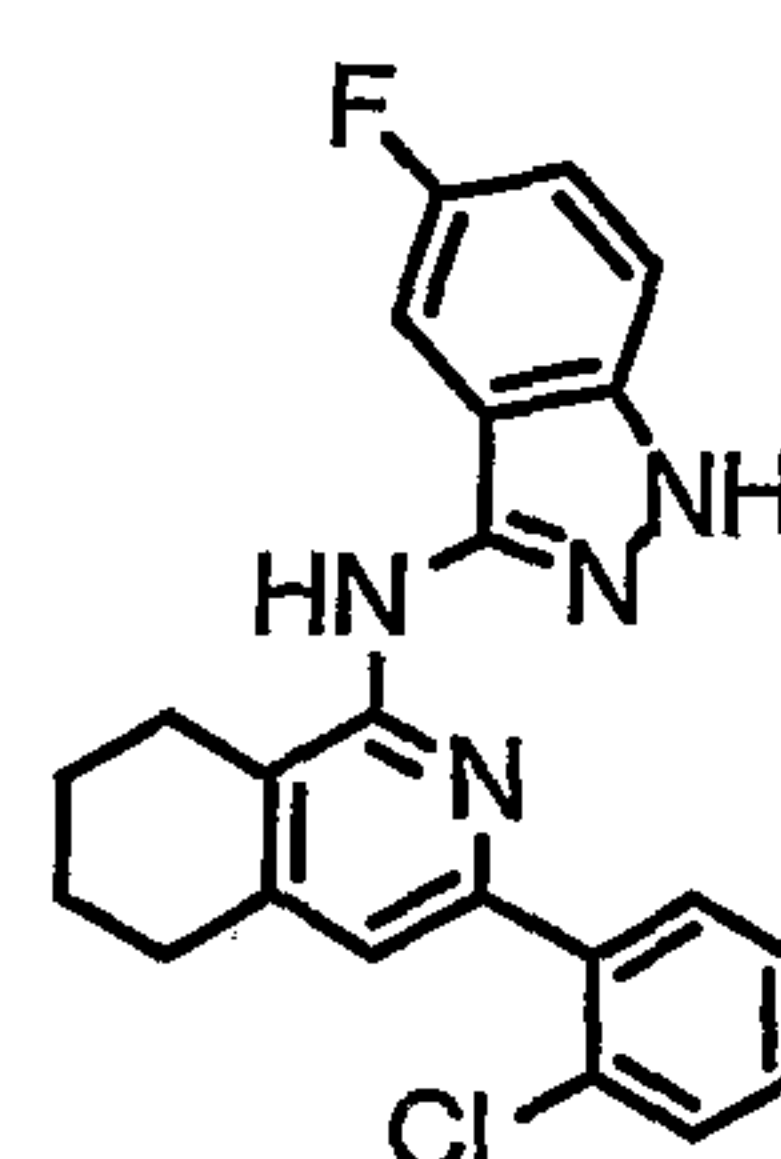
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V-40

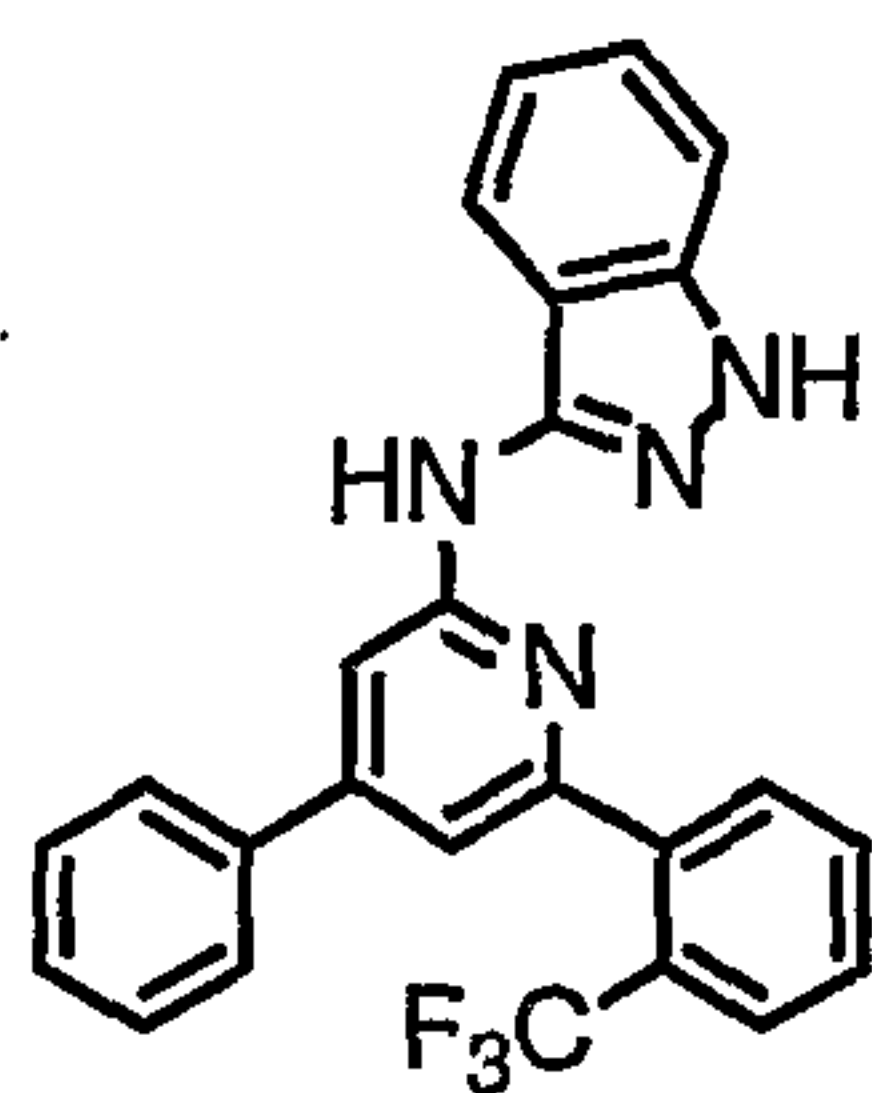


V-41

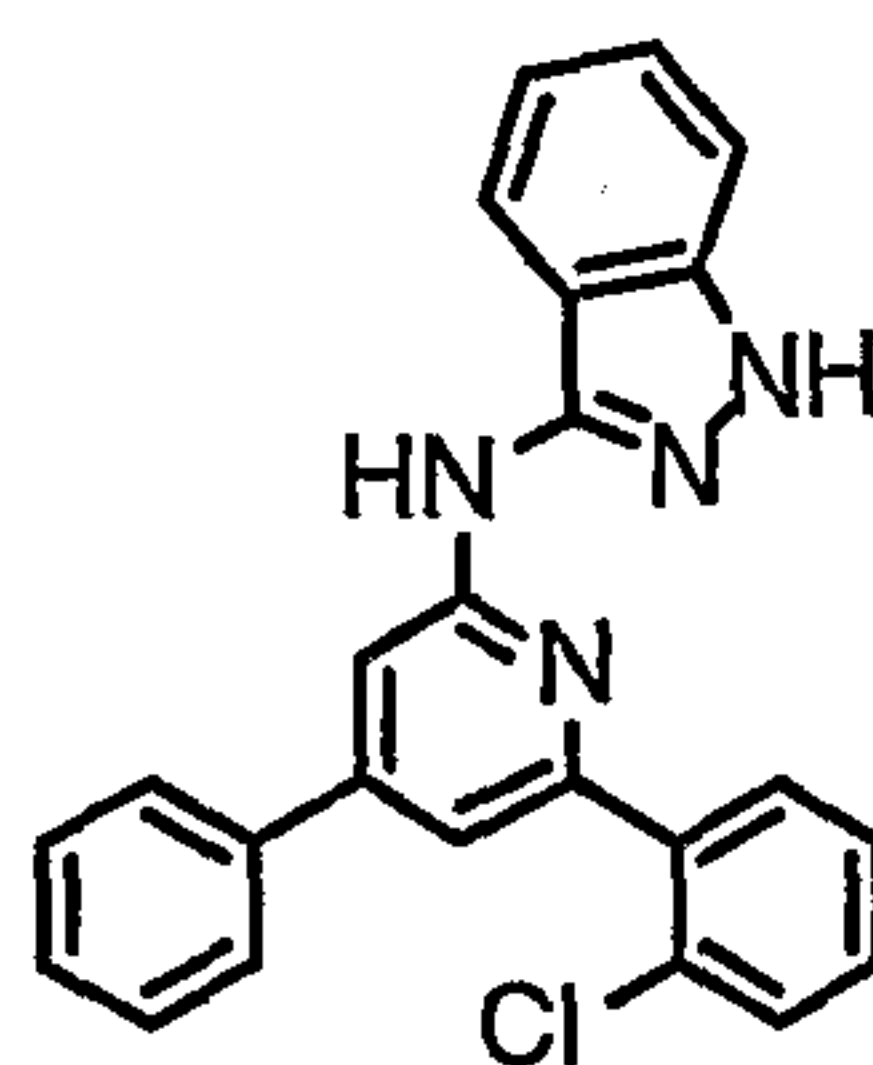


V-42

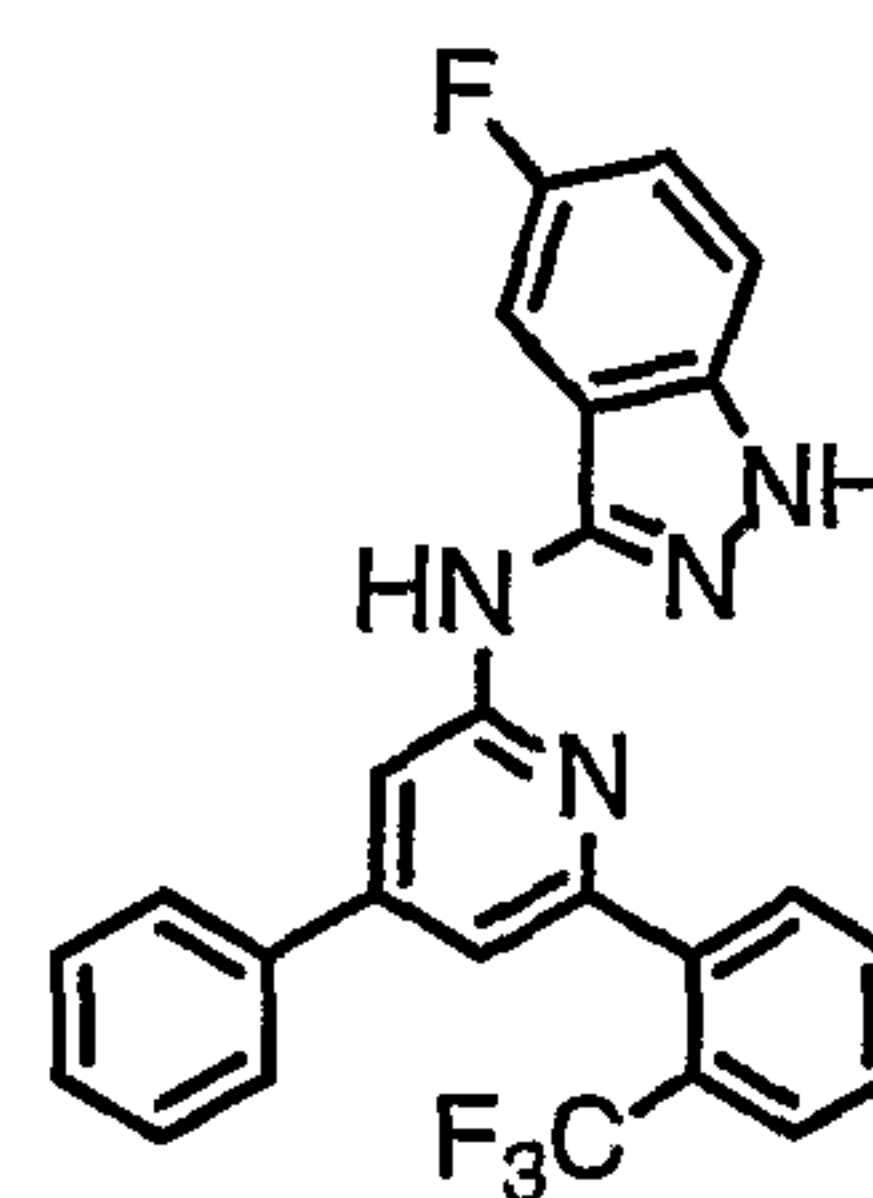
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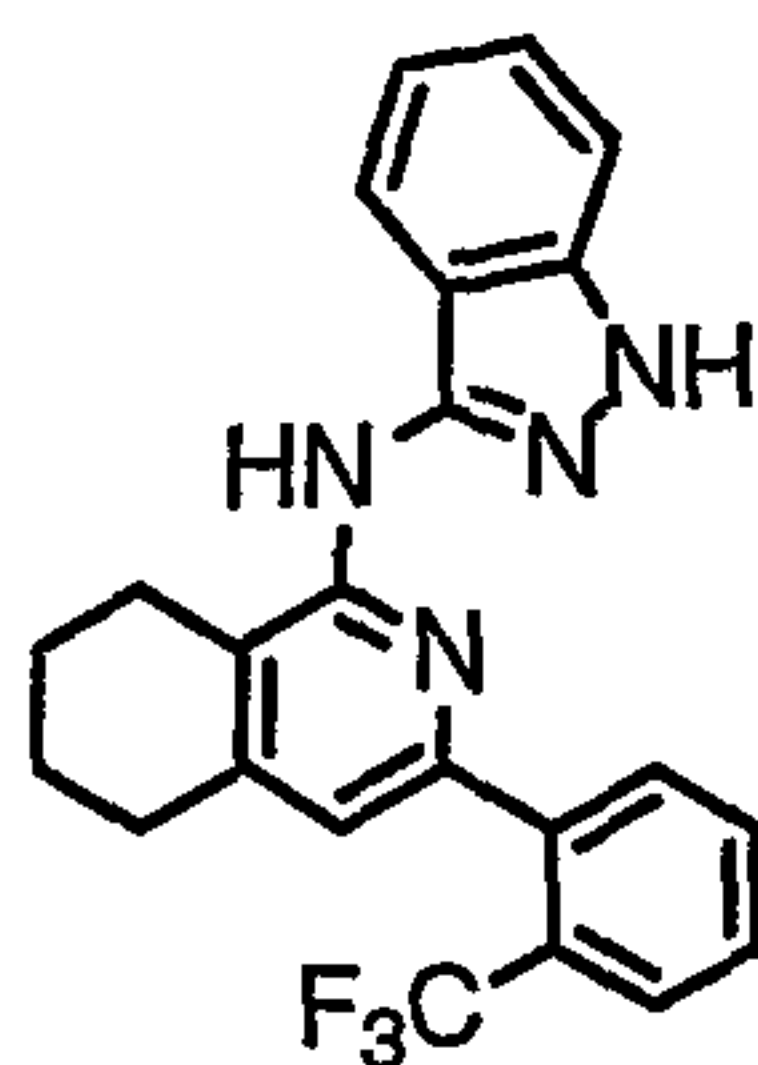
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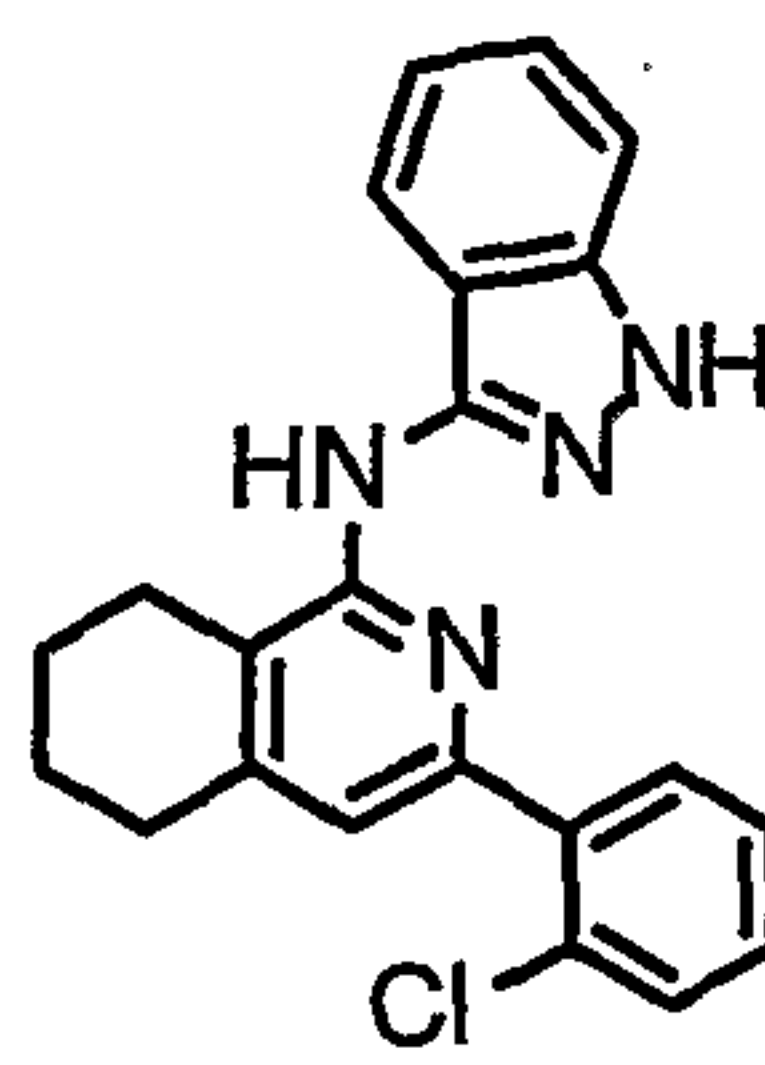
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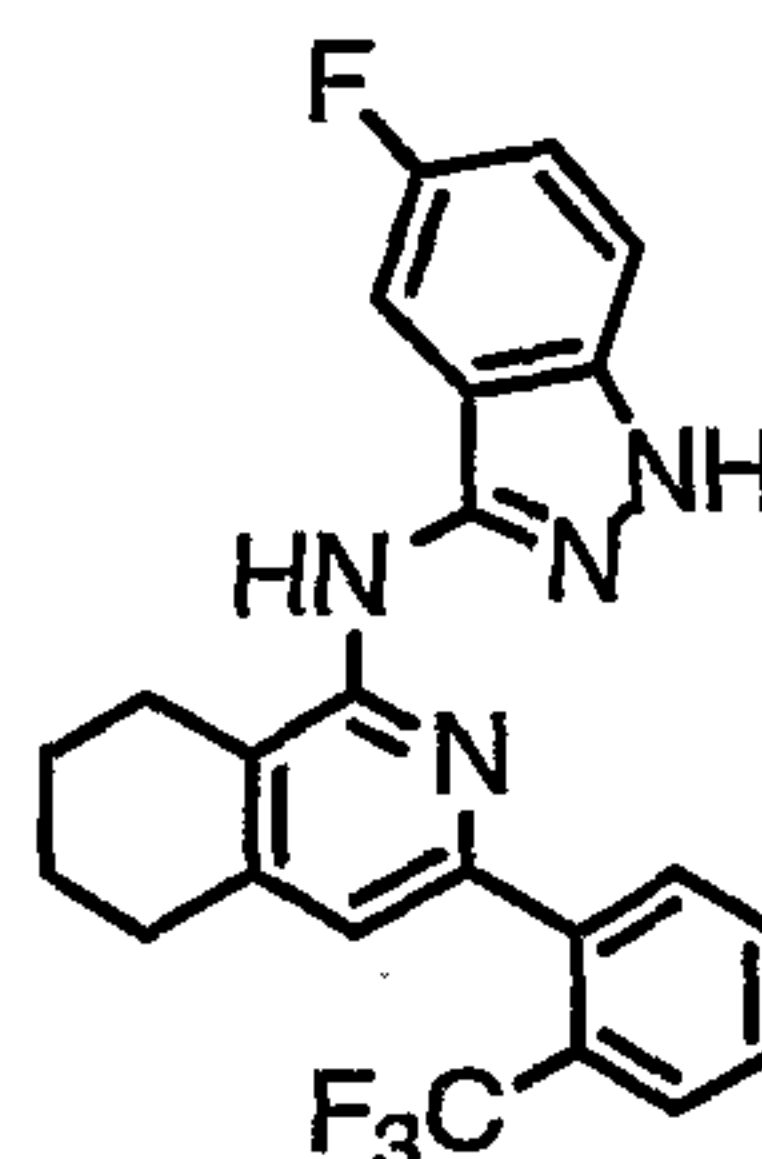
V-45



V-46

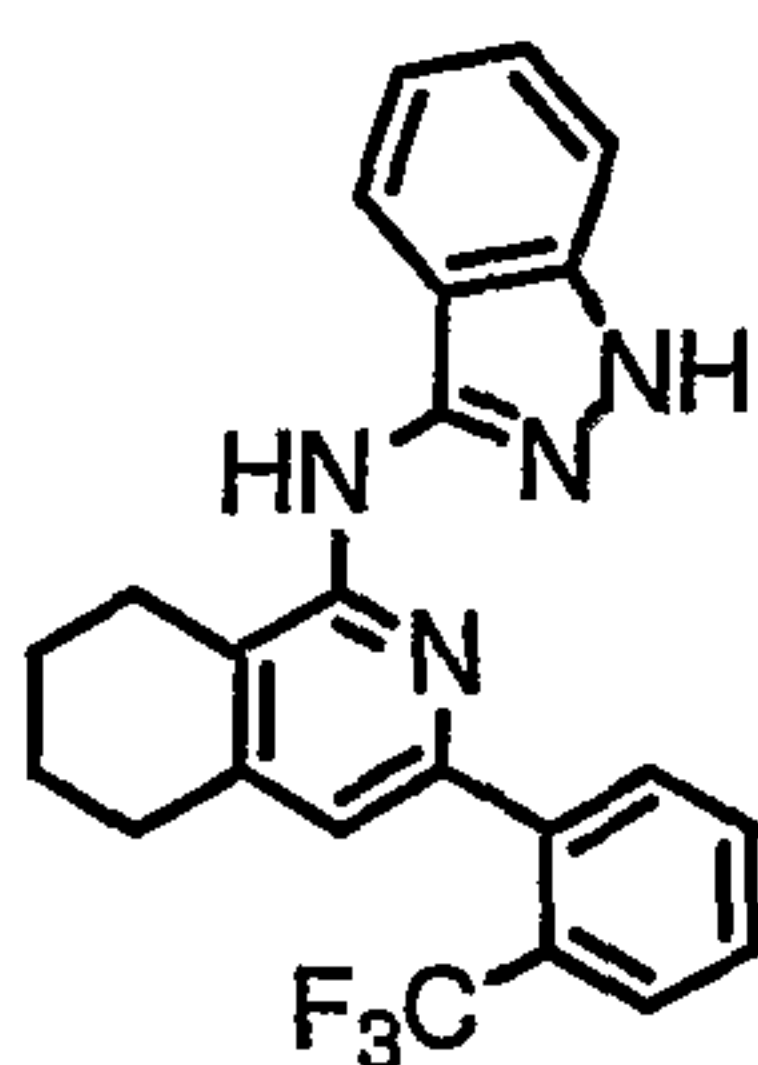


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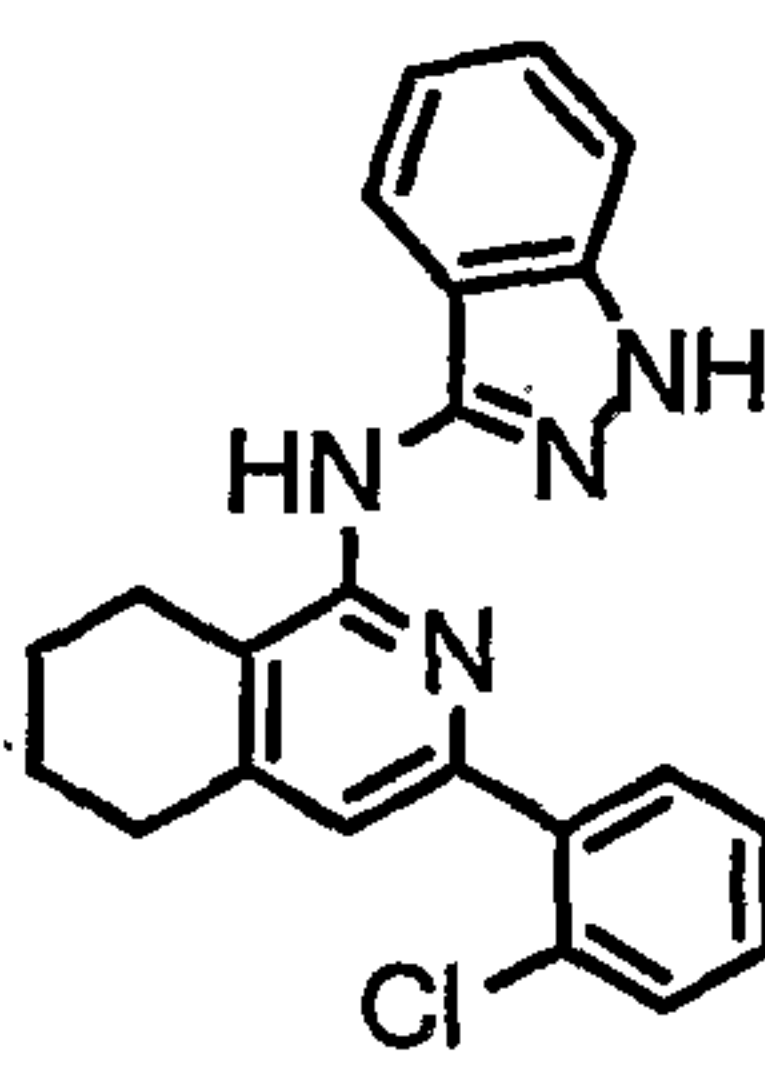


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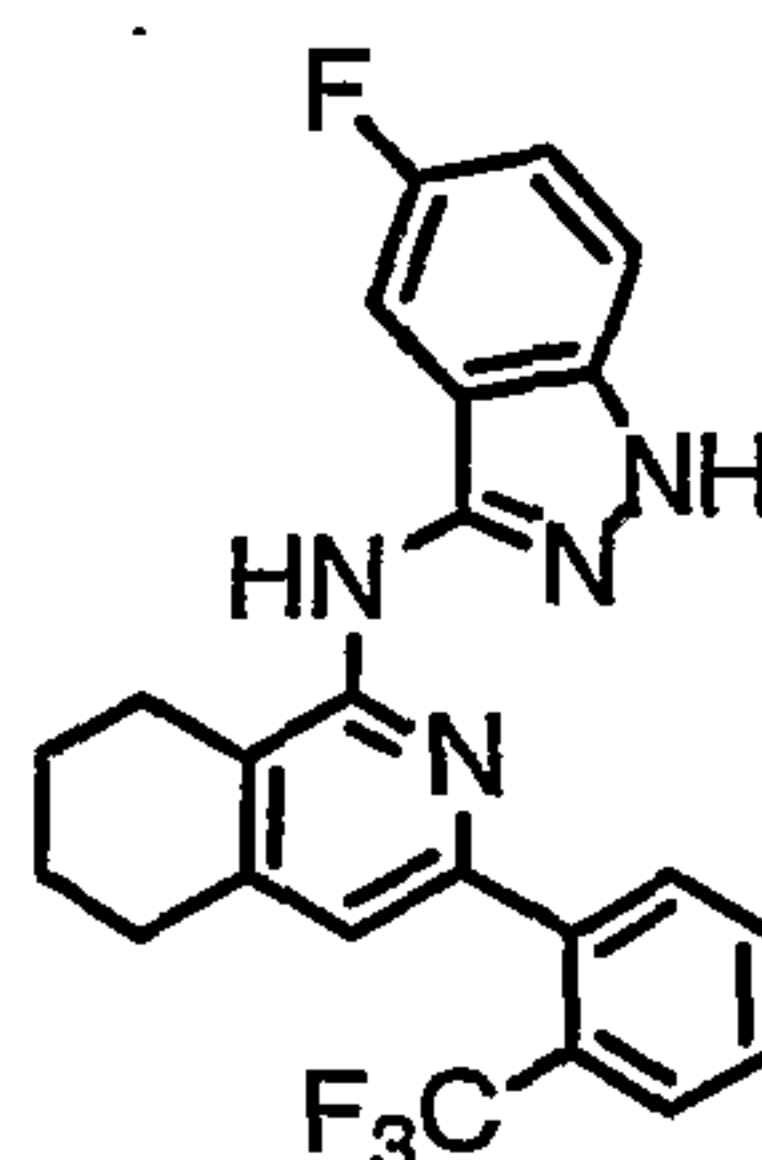
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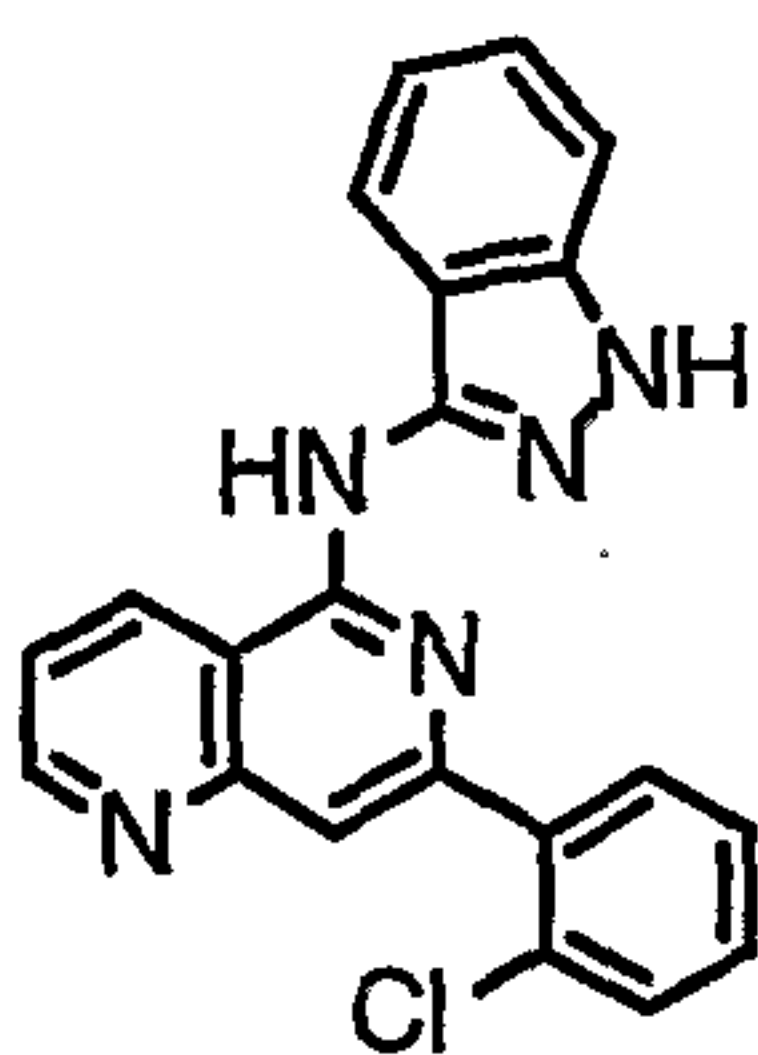
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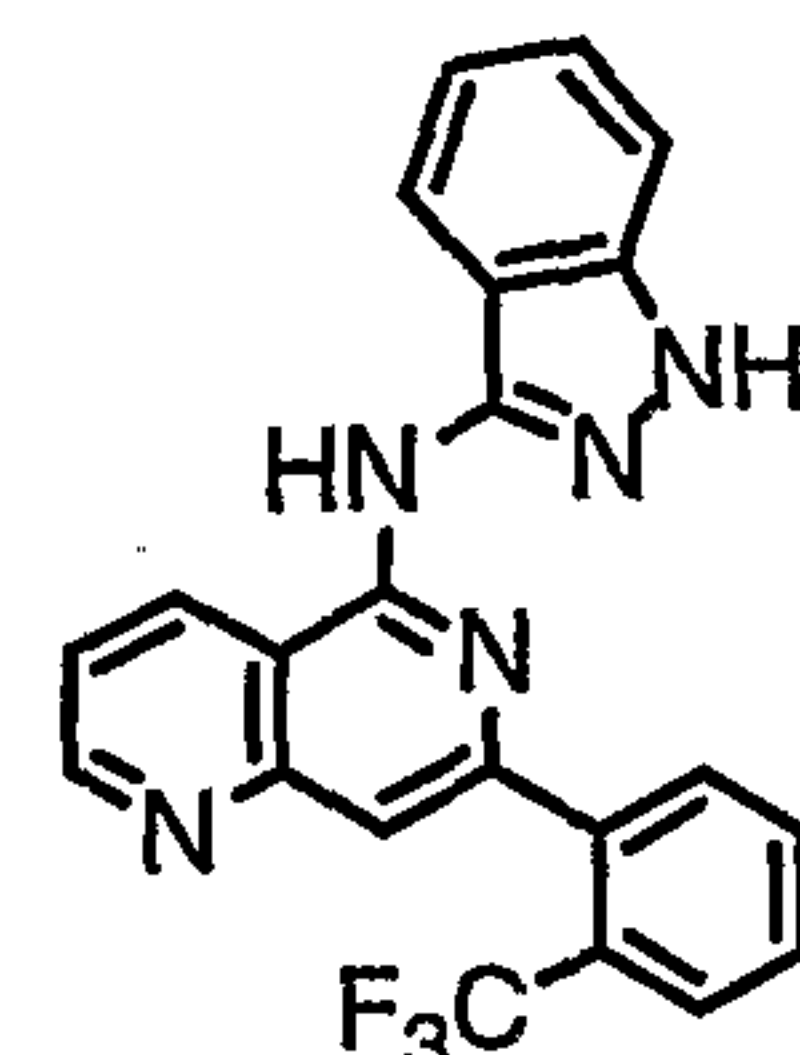
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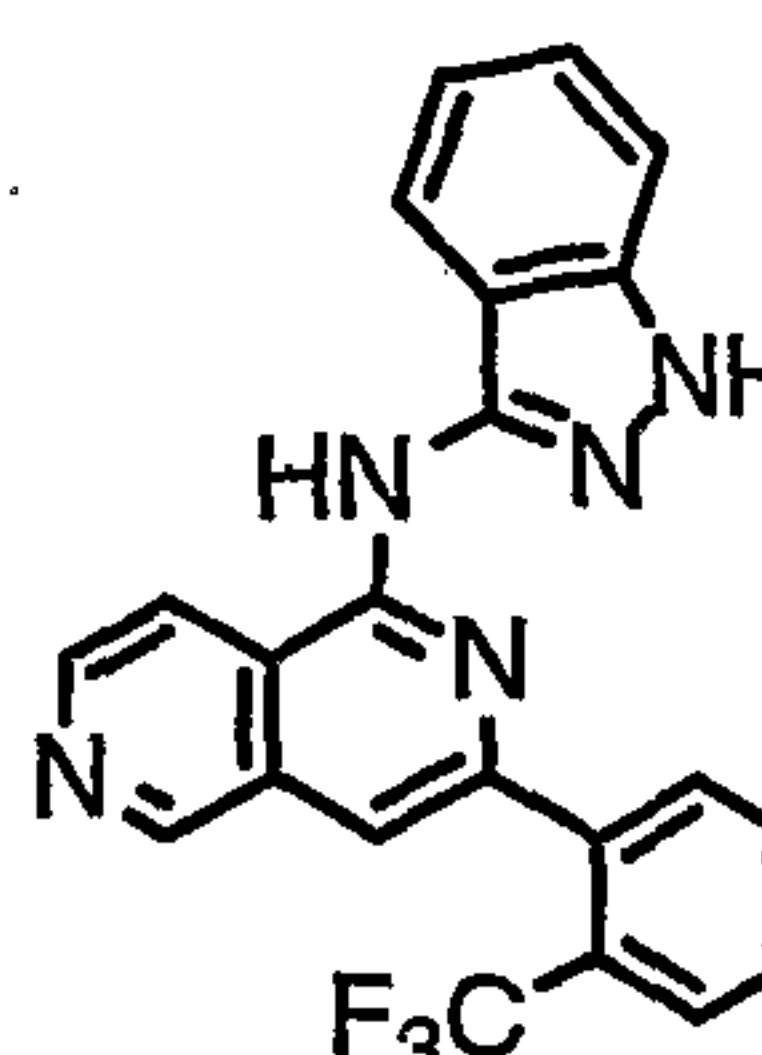
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V-52

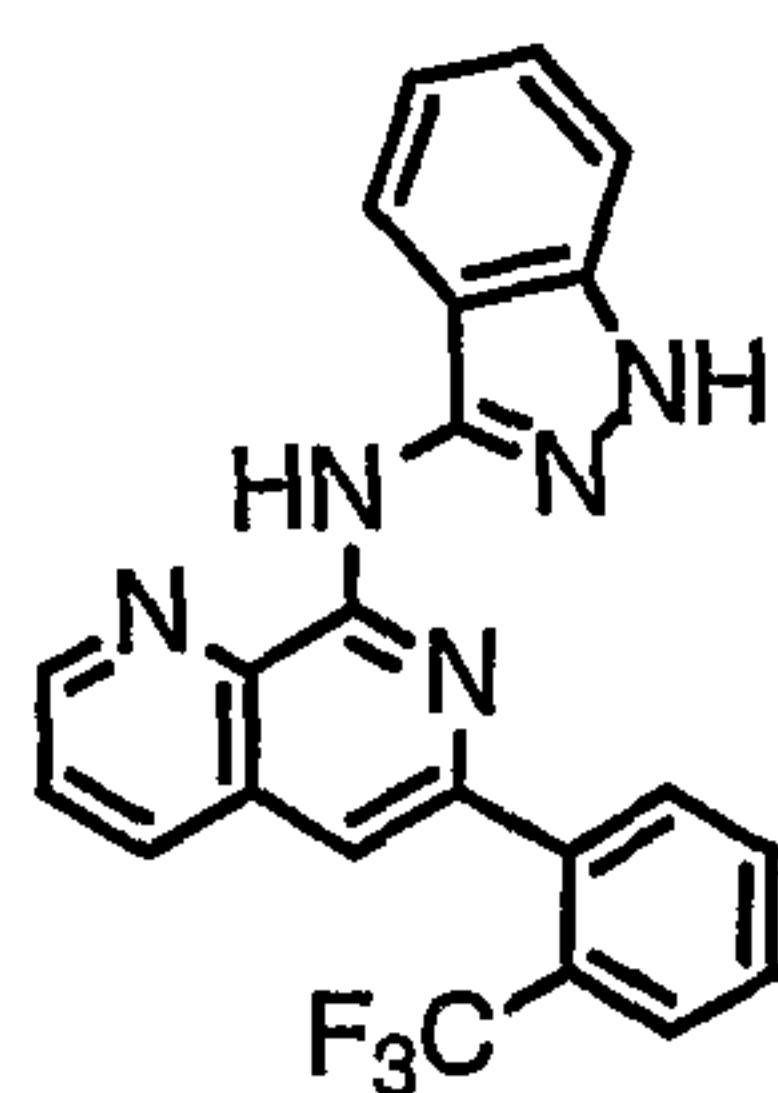


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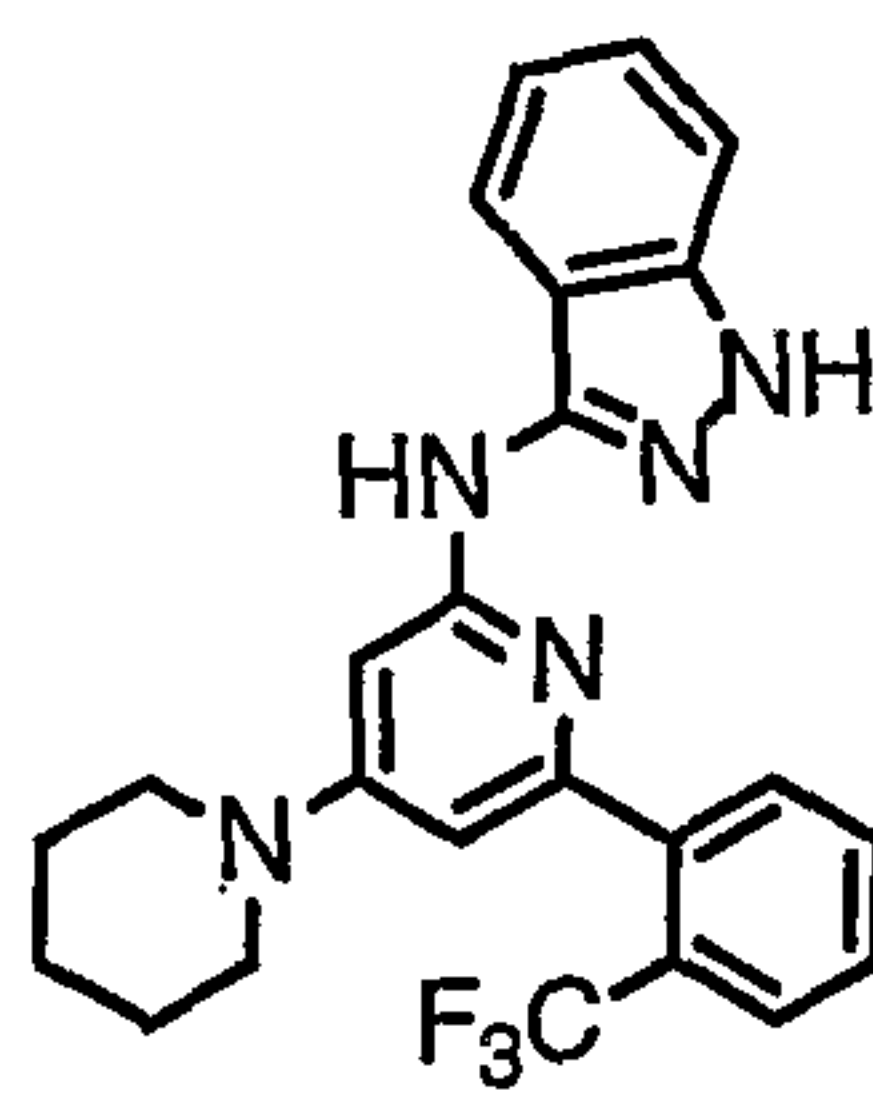


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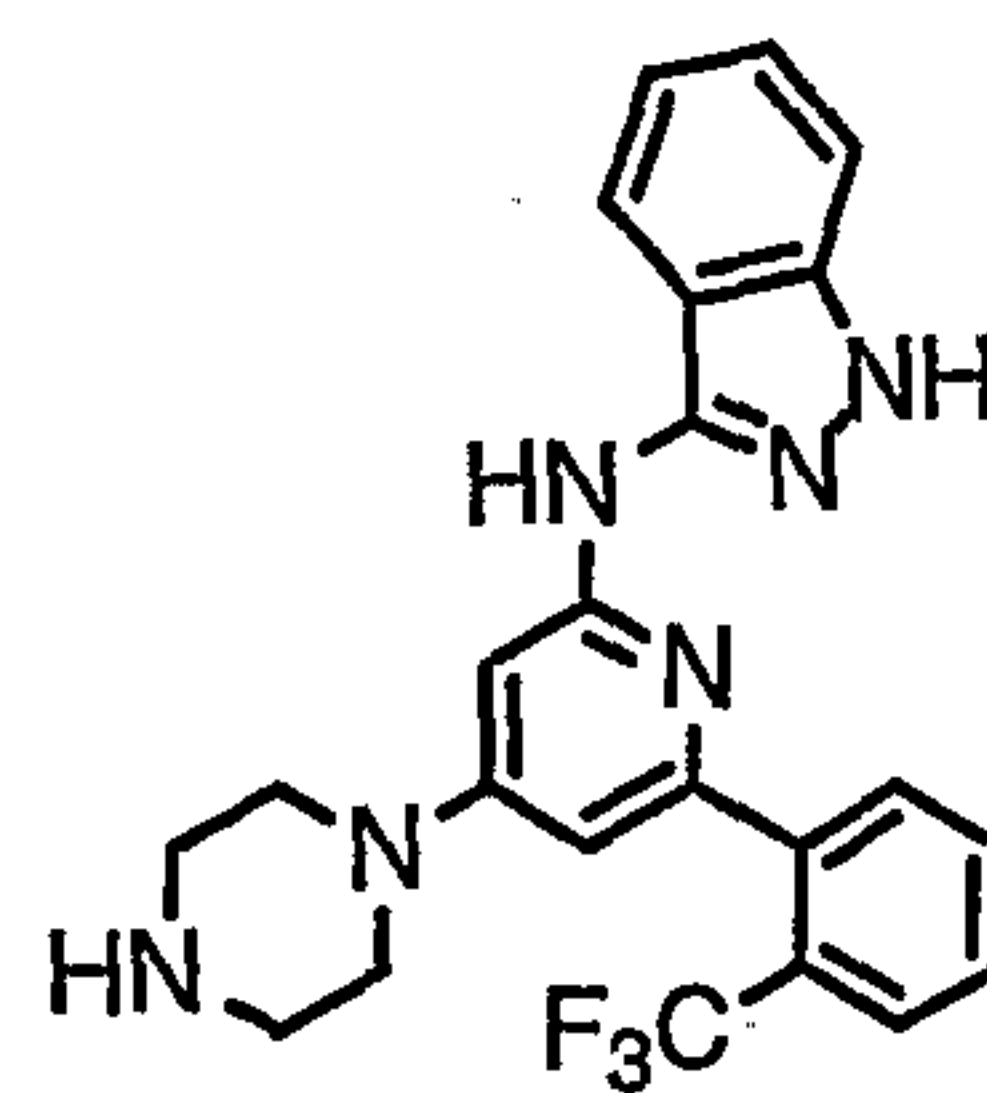
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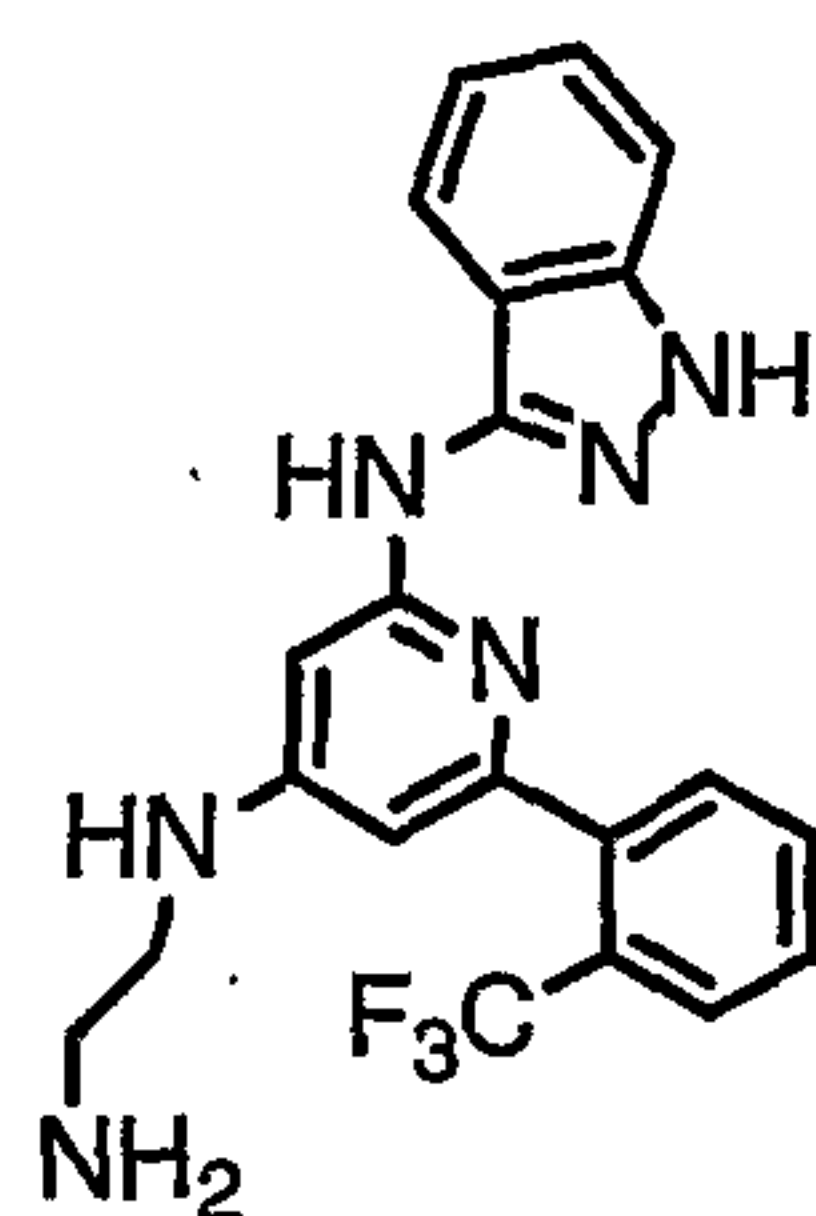
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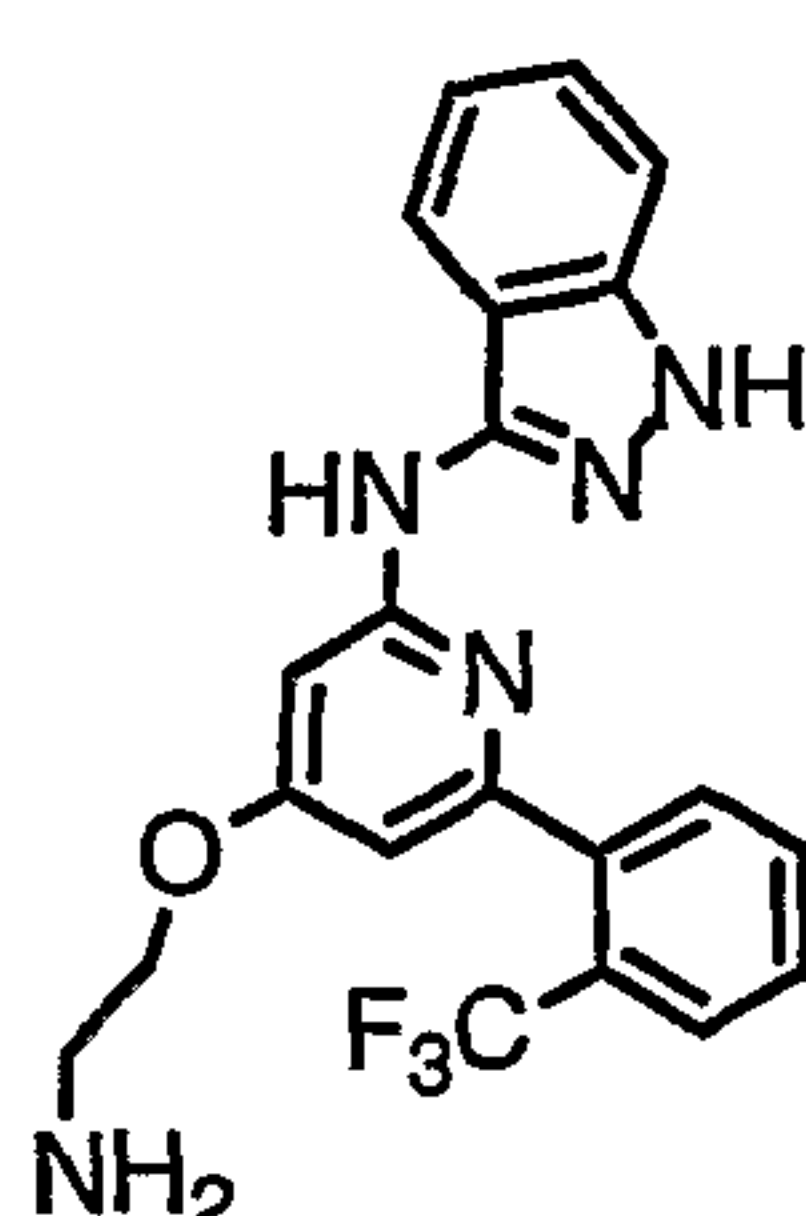
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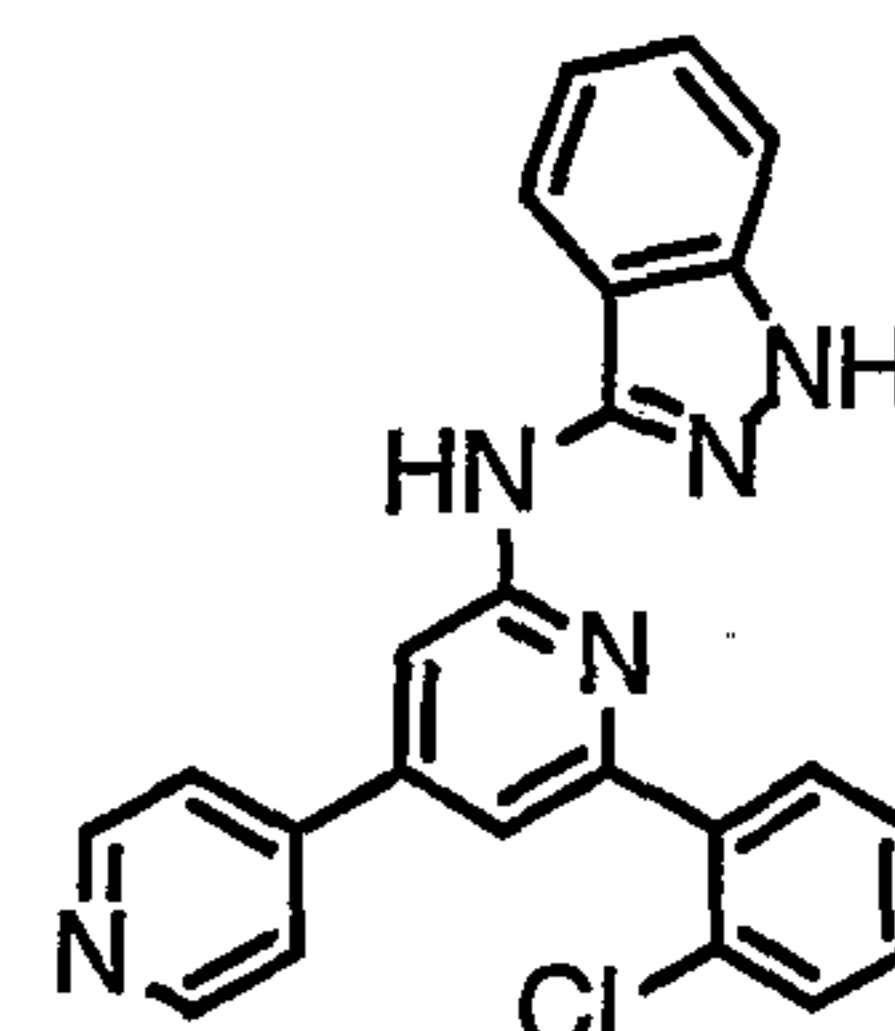
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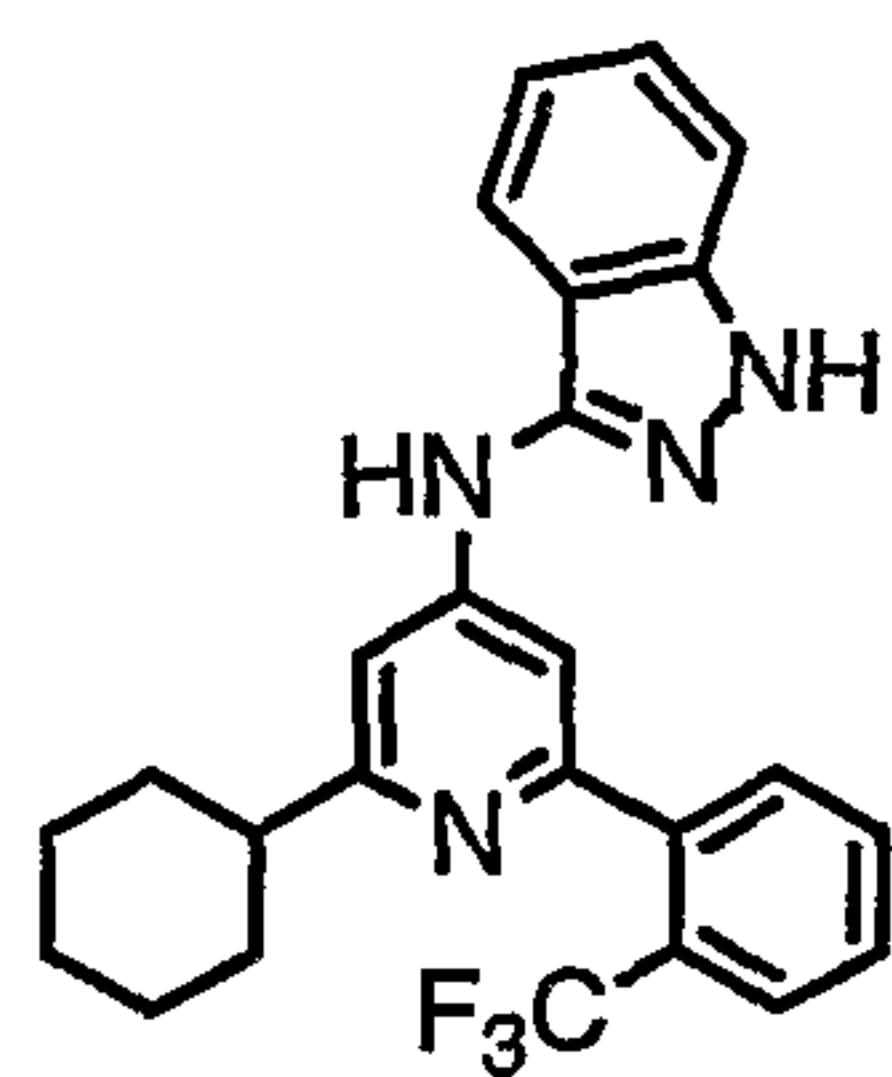
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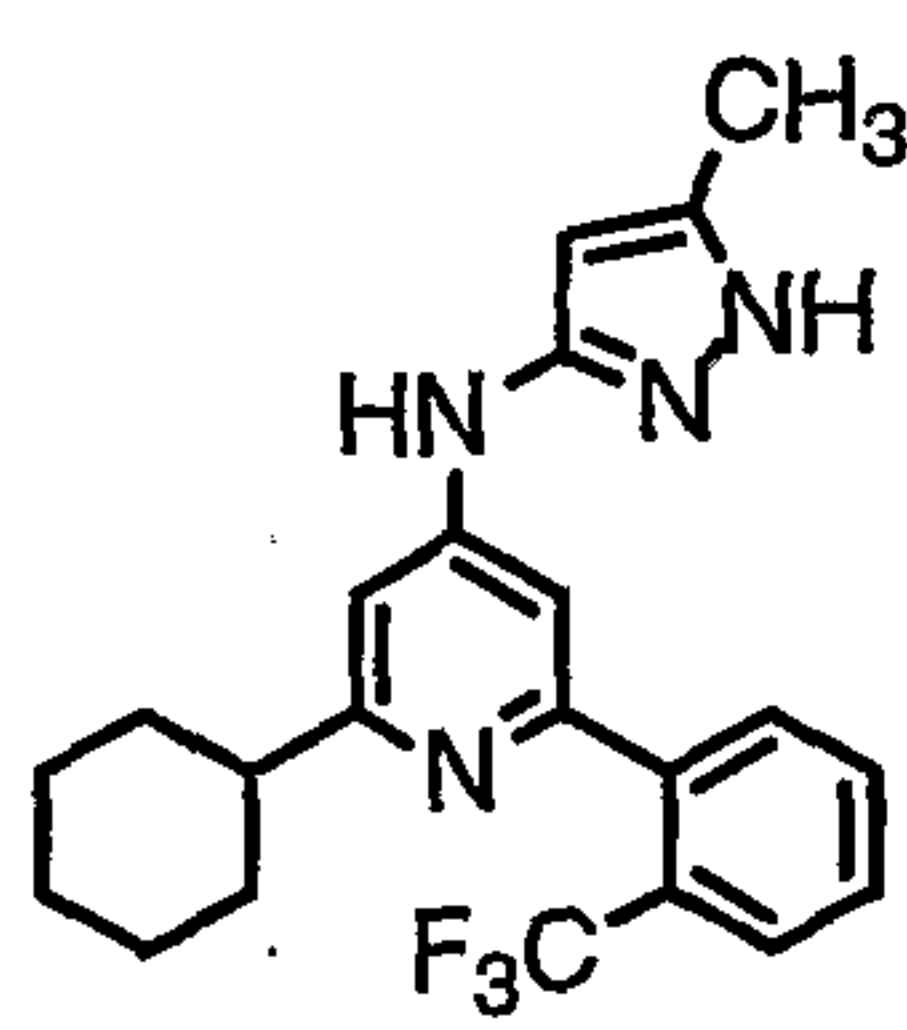
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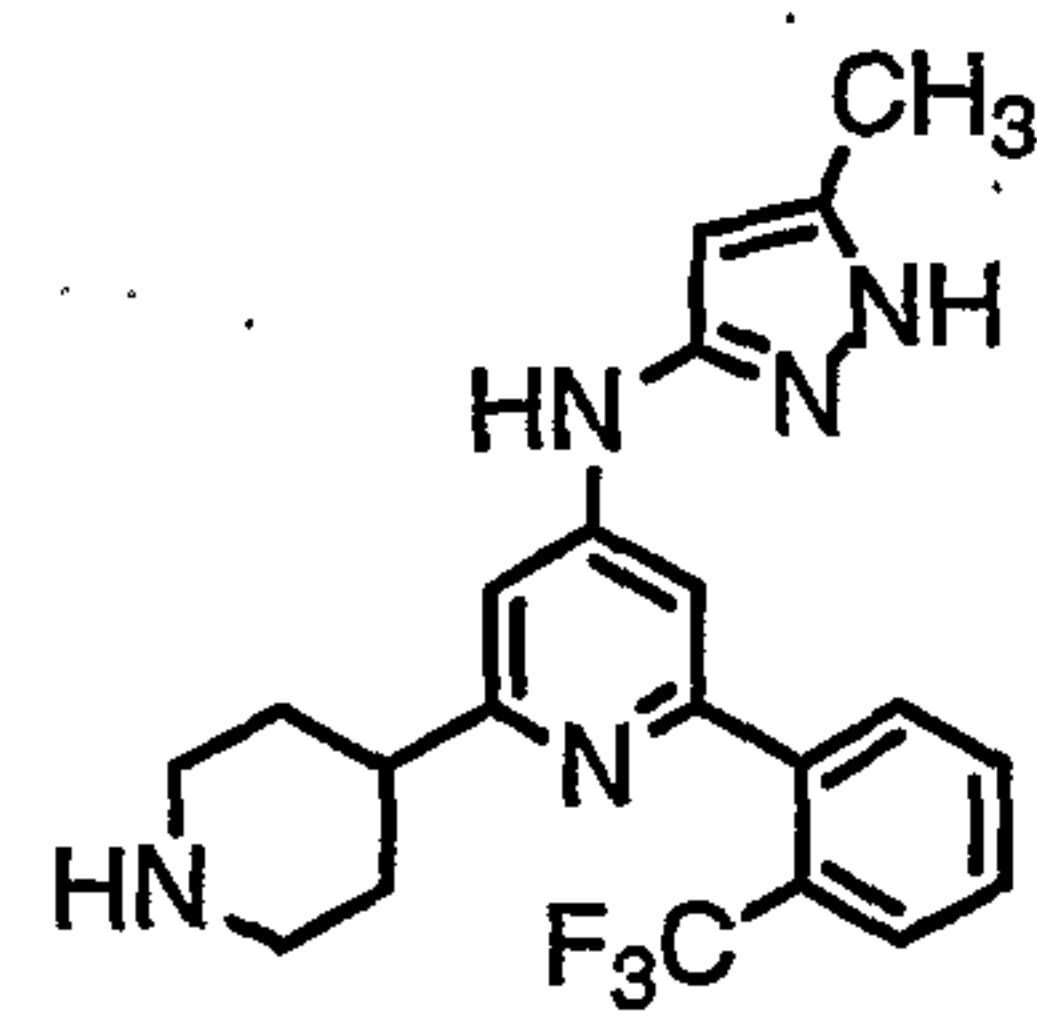
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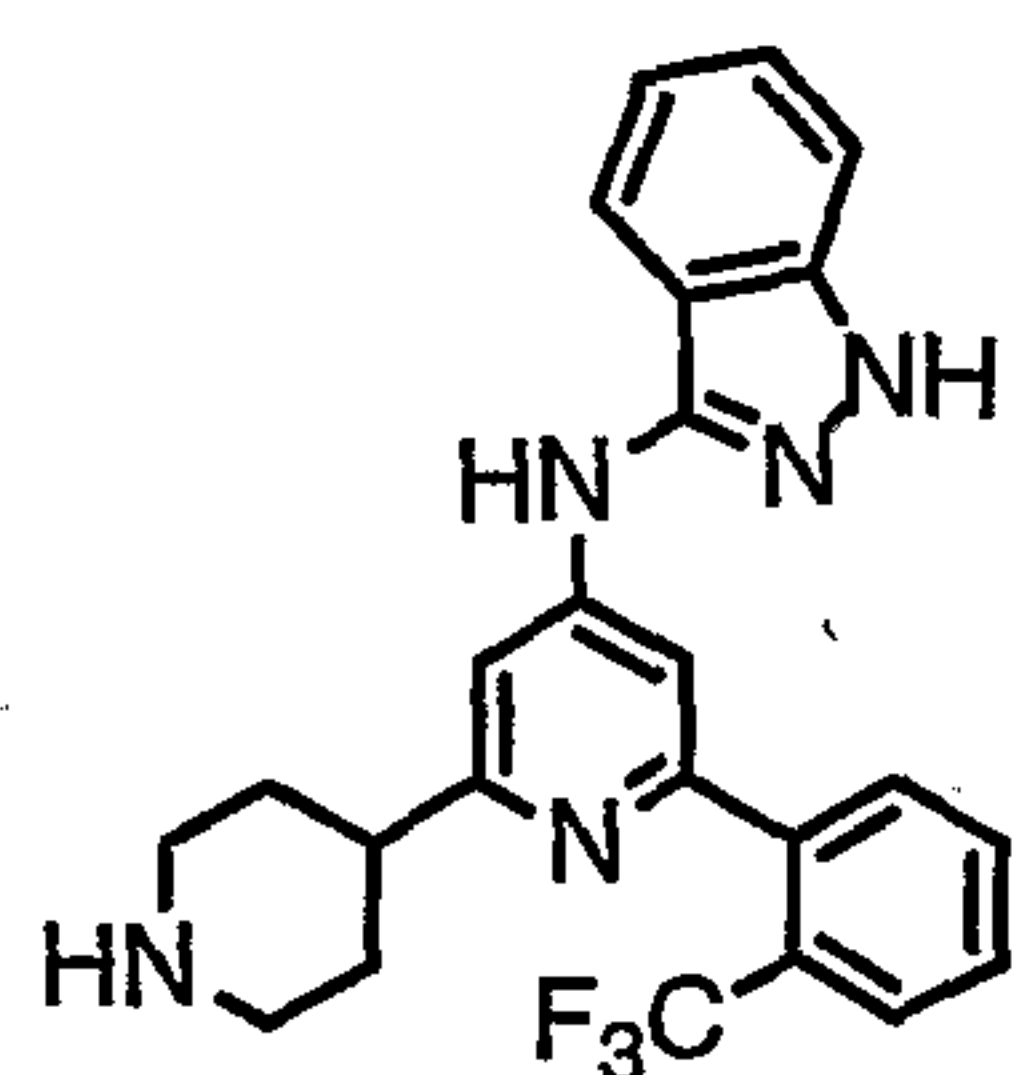
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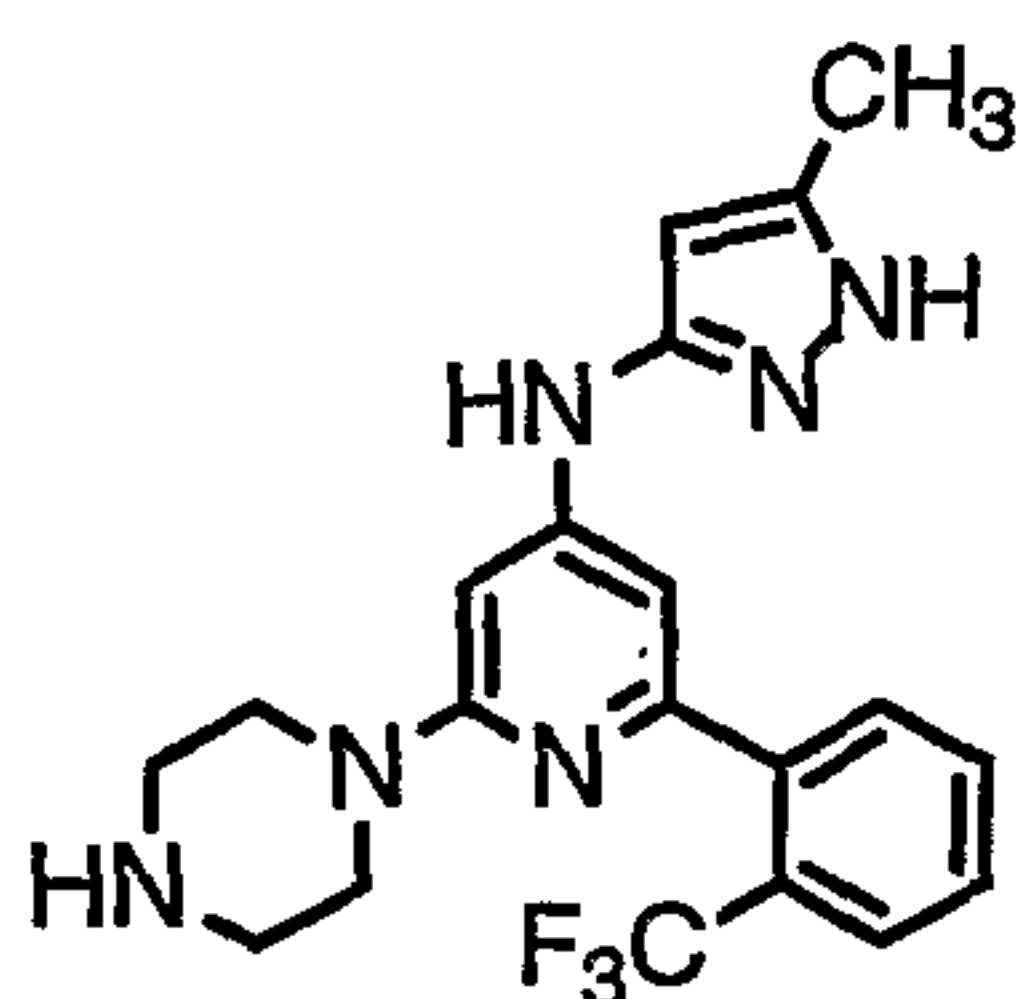
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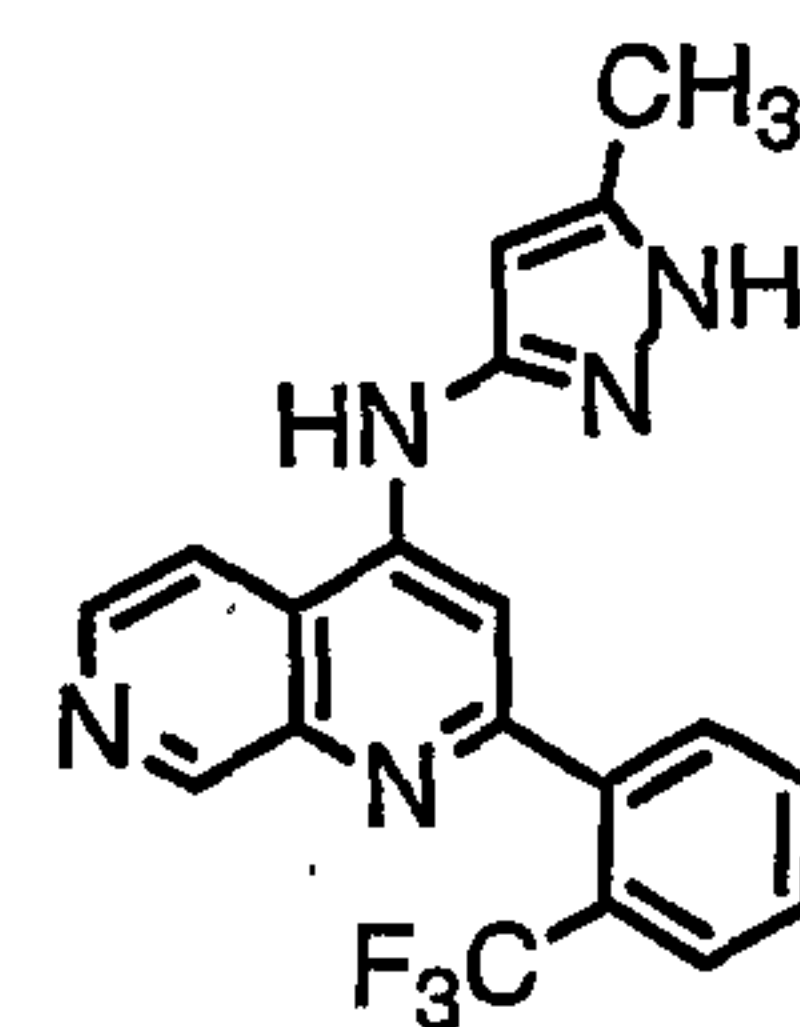
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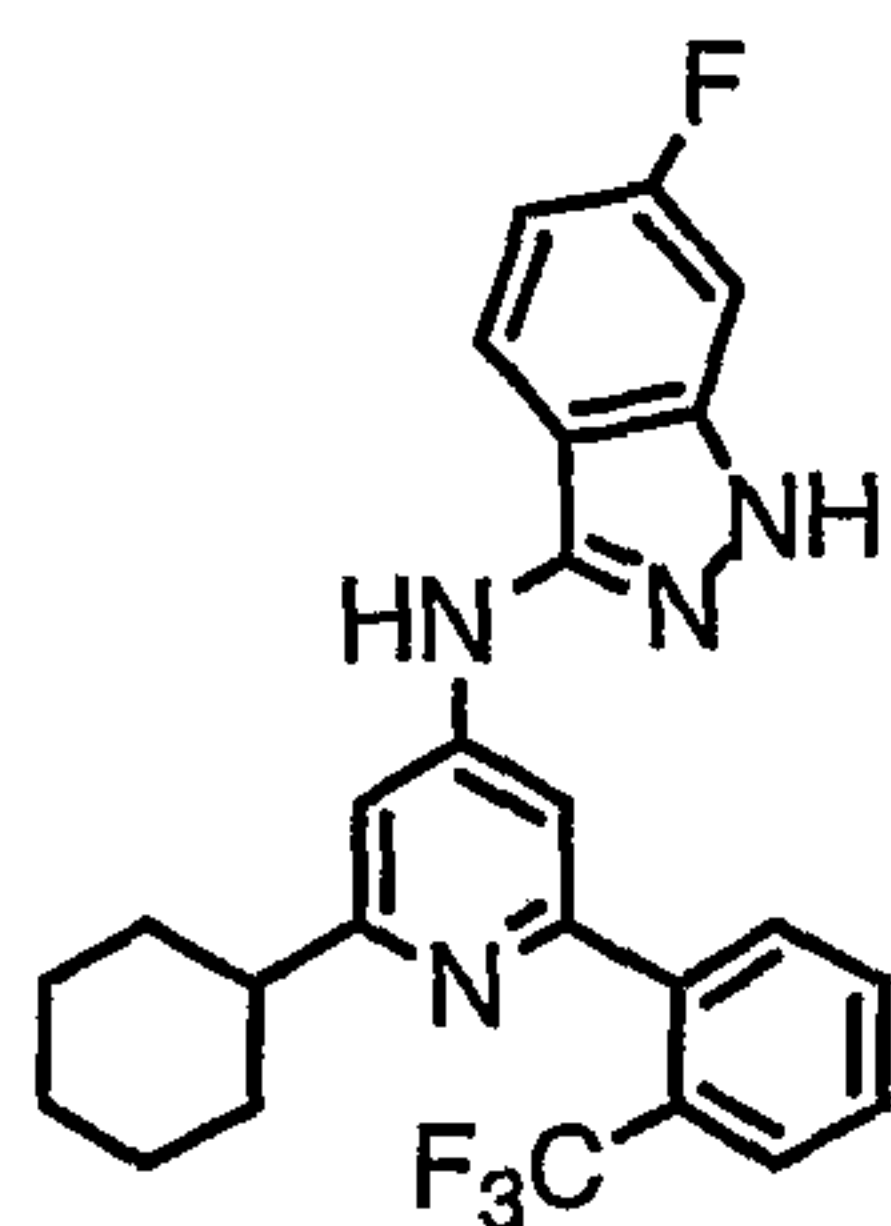
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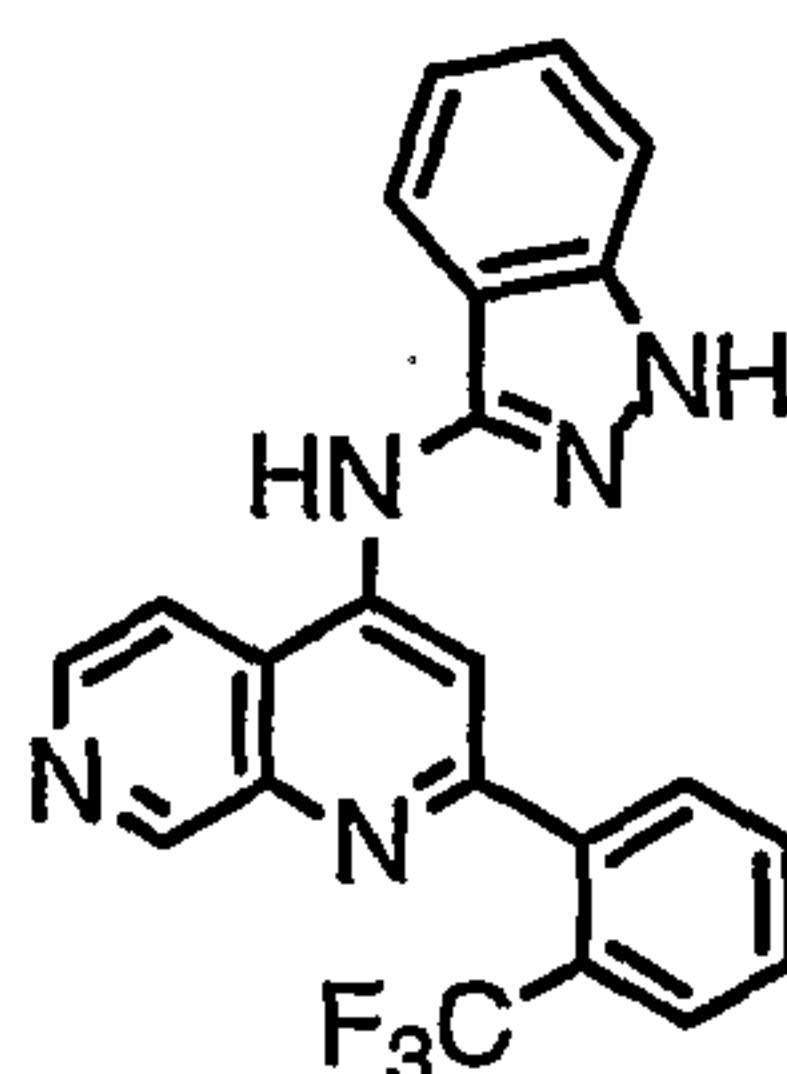
V-65



V-66



V-67



V-68

In another embodiment, this invention provides
 5 a composition comprising a compound of formula V and a pharmaceutically acceptable carrier.

One aspect of this invention relates to a method of inhibiting GSK-3 activity in a patient, comprising administering to the patient a therapeutically
 10 effective amount of a composition comprising a compound of formula V.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a GSK-3 inhibitor, said method comprising the step of
 15 administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula V.

Another aspect relates to a method of enhancing glycogen synthesis and/or lowering blood levels of
 20 glucose in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula V. This method is especially useful for diabetic patients.

25 Another aspect relates to a method of inhibiting the production of hyperphosphorylated Tau protein in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula

V. This method is especially useful in halting or slowing the progression of Alzheimer's disease.

Another aspect relates to a method of inhibiting the phosphorylation of β -catenin in a patient
5 in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula V. This method is especially useful for treating schizophrenia.

One aspect of this invention relates to a
10 method of inhibiting Aurora activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula V.

Another aspect relates to a method of treating
15 a disease that is alleviated by treatment with an Aurora inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula V. This method is
20 especially useful for treating cancer, such as colon, ovarian, and breast cancer.

One aspect of this invention relates to a method of inhibiting CDK-2 activity in a patient, comprising administering to the patient a therapeutically
25 effective amount of a composition comprising a compound of formula V.

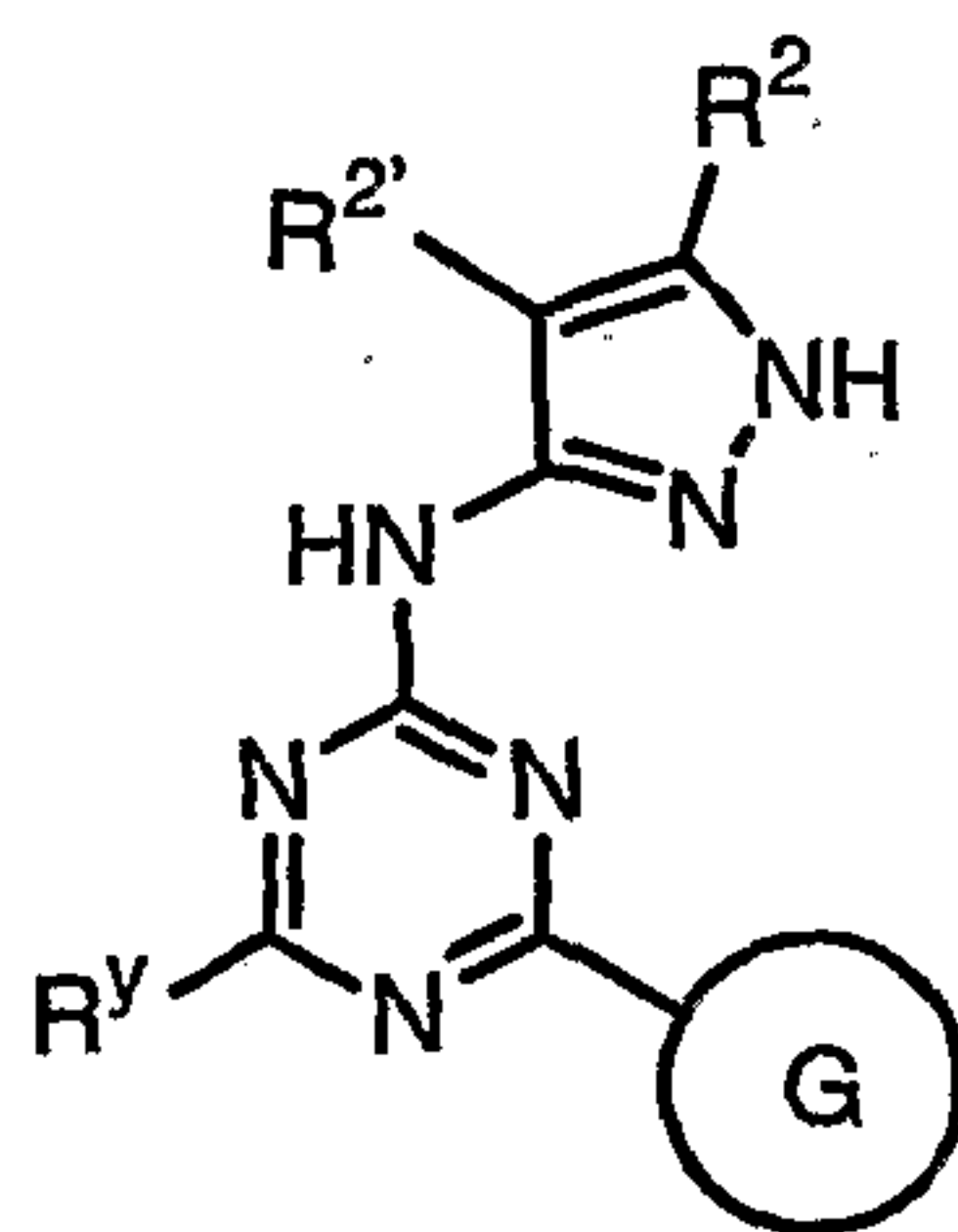
Another aspect relates to a method of treating a disease that is alleviated by treatment with a CDK-2 inhibitor, said method comprising the step of
30 administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula V. This method is especially useful for treating cancer, Alzheimer's disease, restenosis, angiogenesis, glomerulonephritis,

cytomegalovirus, HIV, herpes, psoriasis, atherosclerosis, alopecia, and autoimmune diseases such as rheumatoid arthritis.

Another method relates to inhibiting GSK-3, Aurora, or CDK-2 activity in a biological sample, which method comprises contacting the biological sample with the GSK-3 or Aurora inhibitor of formula V, or a pharmaceutical composition thereof, in an amount effective to inhibit GSK-3, Aurora or CDK-2.

Each of the aforementioned methods directed to the inhibition of GSK-3, Aurora or CDK-2, or the treatment of a disease alleviated thereby, is preferably carried out with a preferred compound of formula V, as described above.

Another embodiment of this invention relates to compounds of formula VI:



VI

or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

G is Ring C or Ring D;

Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from $-R^1$, any substitutable non-ortho carbon position on Ring C is independently substituted by $-R^5$, and two adjacent substituents on Ring C are optionally taken together with their

intervening atoms to form a fused, unsaturated or partially unsaturated, 5-6 membered ring having 0-3 heteroatoms selected from oxygen, sulfur or nitrogen, said fused ring being optionally substituted by halo, oxo, or $-R^8$;

Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by oxo or $-R^5$, and at any substitutable ring nitrogen by $-R^4$, provided that when Ring D is a six-membered aryl or heteroaryl ring, $-R^5$ is hydrogen at each ortho carbon position of Ring D;

R^1 is selected from -halo, -CN, $-NO_2$, T-V- R^6 , phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C_{1-6} aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or $-R^8$, said C_{1-6} aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R^1 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^Y is T- $R^{3'}$;

T is a valence bond or a C_{1-4} alkylidene chain;

R^2 and $R^{2'}$ are independently selected from -R, -T-W- R^6 , or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring having 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur, wherein each substitutable carbon on said fused ring formed by R^2 and $R^{2'}$ is substituted by halo, oxo, -CN, $-NO_2$, $-R^7$, or

-V-R⁶, and any substitutable nitrogen on said ring formed by R² and R^{2'} is substituted by R⁴;

R^{3'} is an optionally substituted group selected from C₁₋₆ aliphatic, C₃₋₁₀ carbocyclyl, C₆₋₁₀ aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R is independently selected from hydrogen or an optionally substituted group selected from C₁₋₆ aliphatic, C₆₋₁₀ aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R⁴ is independently selected from -R⁷, -COR⁷,
-CO₂(optionally substituted C₁₋₆ aliphatic), -CON(R⁷)₂,
5 or -SO₂R⁷, or two R⁴ on the same nitrogen are taken together to form a 5-8 membered heterocyclyl or heteroaryl ring;

each R⁵ is independently selected from -R, halo, -OR,
-C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR,
10 -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR,
-N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic),
-N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂,
-N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂, or R⁵ and
an adjacent substituent taken together with their
15 intervening atoms form said ring fused to Ring C;

V is -O-, -S-, -SO-, -SO₂-, -N(R⁶)SO₂-, -SO₂N(R⁶)-,
-N(R⁶)-, -CO-, -CO₂-, -N(R⁶)CO-, -N(R⁶)C(O)O-,
-N(R⁶)CON(R⁶)-, -N(R⁶)SO₂N(R⁶)-, -N(R⁶)N(R⁶)-,
-C(O)N(R⁶)-, -OC(O)N(R⁶)-, -C(R⁶)₂O-, -C(R⁶)₂S-,
20 -C(R⁶)₂SO-, -C(R⁶)₂SO₂-, -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-,
-C(R⁶)₂N(R⁶)C(O)-, -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-,
-C(R⁶)=N-O-, -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-, or
-C(R⁶)₂N(R⁶)CON(R⁶)-;

W is -C(R⁶)₂O-, -C(R⁶)₂S-, -C(R⁶)₂SO-, -C(R⁶)₂SO₂-,
25 -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-, -CO-, -CO₂-,

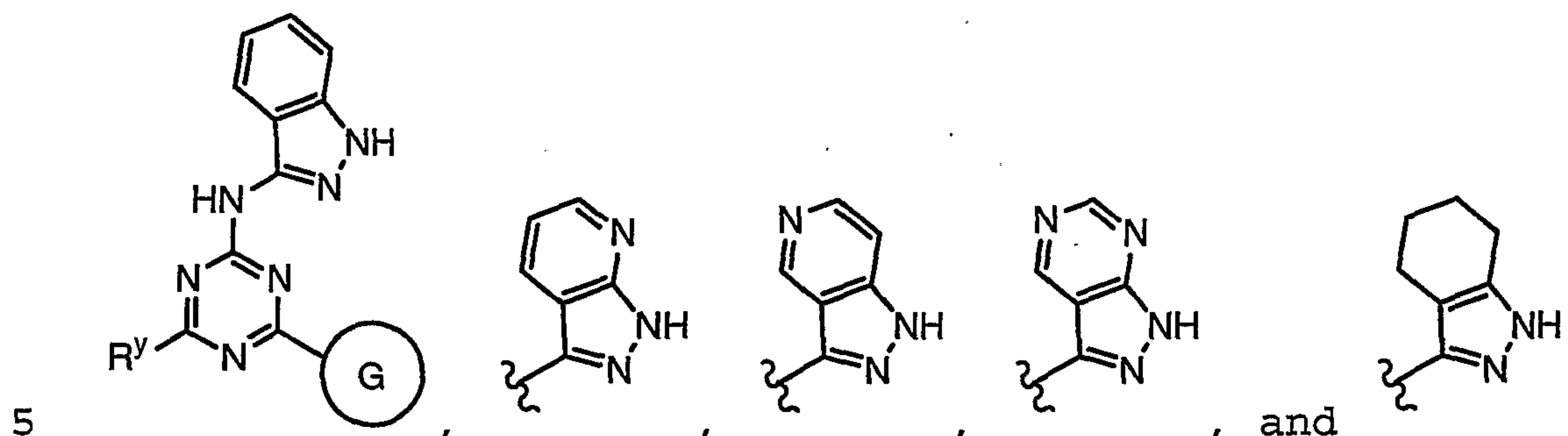
-C(R⁶)OC(O)-, -C(R⁶)OC(O)N(R⁶)-, -C(R⁶)₂N(R⁶)CO-,
 -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-, -C(R⁶)=N-O-,
 -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-,
 -C(R⁶)₂N(R⁶)CON(R⁶)-, or -CON(R⁶)-;

- 5 each R⁶ is independently selected from hydrogen, an optionally substituted C₁₋₄ aliphatic group, or two R⁶ groups on the same nitrogen atom are taken together with the nitrogen atom to form a 5-6 membered heterocyclyl or heteroaryl ring;
- 10 each R⁷ is independently selected from hydrogen or an optionally substituted C₁₋₆ aliphatic group, or two R⁷ on the same nitrogen are taken together with the nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring; and
- 15 each R⁸ is independently selected from an optionally substituted C₁₋₄ aliphatic group, -OR⁶, -SR⁶, -COR⁶, -SO₂R⁶, -N(R⁶)₂, -N(R⁶)N(R⁶)₂, -CN, -NO₂, -CON(R⁶)₂, or -CO₂R⁶.

- Preferred R^y groups of formula VI include T-R^{3'}
- 20 wherein T is a valence bond or a methylene, and R^{3'} is an optionally substituted group selected from C₁₋₆ aliphatic, C₃₋₁₀ carbocyclyl, C₆₋₁₀ aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms. A preferred R^{3'} group is an optionally substituted
- 25 group selected from C₃₋₆ carbocyclyl, phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring. Examples of preferred R^y include 2-pyridyl, 4-pyridyl, piperidinyl, morpholinyl, cyclopropyl, cyclohexyl, and optionally substituted phenyl such as phenyl or halo-substituted
- 30 phenyl.

The R² and R^{2'} groups of formula VI may be taken together to form a fused ring, thus providing a bicyclic ring system containing a pyrazole ring. Preferred fused rings include benzo, pyrido, pyrimido, and a partially

unsaturated 6-membered carbocyclo ring. These are exemplified in the following formula VI compounds having a pyrazole-containing bicyclic ring system:



Preferred substituents on the $R^2/R^{2'}$ fused ring include one or more of the following: -halo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), $-CN$, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, and $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group. Preferably, the $(C_{1-4}$ alkyl) group is methyl.

When the pyrazole ring system is monocyclic, preferred R^2 groups of formula VI include hydrogen, C_{1-4} aliphatic, alkoxycarbonyl, (un)substituted phenyl, hydroxyalkyl, alkoxyalkyl, aminocarbonyl, mono- or dialkylaminocarbonyl, aminoalkyl, alkylaminoalkyl, dialkylaminoalkyl, phenylaminocarbonyl, and (N-heterocyclyl)carbonyl. Examples of such preferred R^2 substituents include methyl, cyclopropyl, ethyl, isopropyl, propyl, t-butyl, cyclopentyl, phenyl, CO_2H , CO_2CH_3 , CH_2OH , CH_2OCH_3 , $CH_2CH_2CH_2OH$, $CH_2CH_2CH_2OCH_3$, $CH_2CH_2CH_2OCH_2Ph$, $CH_2CH_2CH_2NH_2$, $CH_2CH_2CH_2NHCOOC(CH_3)_3$, $CONHCH(CH_3)_2$, $CONHCH_2CH=CH_2$, $CONHCH_2CH_2OCH_3$, $CONHCH_2Ph$, $CONH(cyclohexyl)$, $CON(Et)_2$, $CON(CH_3)CH_2Ph$, $CONH(n-C_3H_7)$, $CON(Et)CH_2CH_2CH_3$, $CONHCH_2CH(CH_3)_2$, $CON(n-C_3H_7)_2$, $CO(3-methoxymethylpyrrolidin-1-yl)$, $CONH(3-tolyl)$, $CONH(4-$

tolyl), CONHCH₃, CO(morpholin-1-yl), CO(4-methylpiperazin-1-yl), CONHCH₂CH₂OH, CONH₂, and CO(piperidin-1-yl). A preferred R^{2'} group is hydrogen.

When G is Ring C, preferred formula VI Ring C groups are phenyl and pyridinyl. When two adjacent substituents on Ring C are taken together to form a fused ring, Ring C is contained in a bicyclic ring system. Preferred fused rings include a benzo or pyrido ring. Such rings preferably are fused at ortho and meta positions of Ring C. Examples of preferred bicyclic Ring C systems include naphthyl and isoquinolinyl. Preferred R¹ groups include -halo, an optionally substituted C₁₋₆ aliphatic group, phenyl, -COR⁶, -OR⁶, -CN, -SO₂R⁶, -SO₂NH₂, -N(R⁶)₂, -CO₂R⁶, -CONH₂, -NHCOR⁶, -OC(O)NH₂, or -NHSO₂R⁶. When R¹ is an optionally substituted C₁₋₆ aliphatic group, the most preferred optional substituents are halogen. Examples of preferred R¹ groups include -CF₃, -Cl, -F, -CN, -COCH₃, -OCH₃, -OH, -CH₂CH₃, -OCH₂CH₃, -CH₃, -CF₂CH₃, cyclohexyl, t-butyl, isopropyl, cyclopropyl, -C≡CH, -C≡C-CH₃, -SO₂CH₃, -SO₂NH₂, -N(CH₃)₂, -CO₂CH₃, -CONH₂, -NHCOCH₃, -OC(O)NH₂, -NHSO₂CH₃, and -OCF₃.

On Ring C preferred R⁵ substituents, when present, include -halo, -CN, -NO₂, -N(R⁴)₂, optionally substituted C₁₋₆ aliphatic group, -OR, -C(O)R, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, and -N(R⁴)SO₂R. More preferred R⁵ substituents include -Cl, -F, -CN, -CF₃, -NH₂, -NH(C₁₋₄ aliphatic), -N(C₁₋₄ aliphatic)₂, -O(C₁₋₄ aliphatic), C₁₋₄ aliphatic, and -CO₂(C₁₋₄ aliphatic). Examples of such preferred R⁵ substituents include -Cl, -F, -CN, -CF₃, -NH₂, -NHMe, -NMe₂, -OEt, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, and -CO₂Et.

When G is Ring D, preferred formula VI Ring D monocyclic rings include substituted and unsubstituted phenyl, pyridinyl, piperidinyl, piperazinyl,

pyrrolidinyl, thienyl, azepanyl, and morpholinyl rings. When two adjacent substituents on Ring D are taken together to form a fused ring, the Ring D system is bicyclic. Preferred formula VI Ring D bicyclic rings include 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, and naphthyl. Examples of more preferred bicyclic Ring D systems include naphthyl and isoquinolinyl.

Preferred substituents on formula VI Ring D include one or more of the following: halo, oxo, CN, -NO₂, -N(R⁴)₂, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, -N(R⁴)SO₂R, -SR, -OR, -C(O)R, or substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. More preferred Ring D substituents include -halo, -CN, -oxo, -SR, -OR, -N(R⁴)₂, -C(O)R, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. Examples of Ring D substituents include -OH, phenyl, methyl, CH₂OH, CH₂CH₂OH, pyrrolidinyl, OPh, CF₃, C≡CH, Cl, Br, F, I, NH₂, C(O)CH₃, *i*-propyl, *tert*-butyl, SEt, OMe, N(Me)₂, methylene dioxy, and ethylene dioxy.

Preferred formula VI compounds have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring C is selected from a phenyl or pyridinyl ring, optionally substituted by -R⁵, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is selected from a naphthyl, quinolinyl or isoquinolinyl ring, and R¹ is -halo, an optionally substituted C₁₋₆ aliphatic group, phenyl, -COR⁶, -OR⁶, -CN, -SO₂R⁶, -SO₂NH₂, -N(R⁶)₂, -CO₂R⁶, -CONH₂, -NHCOR⁶, -OC(O)NH₂, or -NH₂SO₂R⁶; or Ring D is an optionally substituted ring selected from a

phenyl, pyridinyl, piperidinyl, piperazinyl,
pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-
tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl,
2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl,
5 isoquinolinyl, quinolinyl, or naphthyl ring;

(b) R^Y is $T-R^{3'}$, wherein T is a valence bond or
a methylene; and

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a
substituted or unsubstituted group selected from aryl,
10 heteroaryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are
taken together with their intervening atoms to form a
substituted or unsubstituted benzo, pyrido, pyrimido or
partially unsaturated 6-membered carbocyclo ring.

More preferred compounds of formula VI have one
15 or more, and more preferably all, of the features
selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring,
optionally substituted by $-R^5$, wherein when Ring C and two
adjacent substituents thereon form a bicyclic ring
20 system, the bicyclic ring system is a naphthyl ring, and
 R^1 is -halo, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic
group, phenyl, or -CN; or Ring D is an optionally
substituted ring selected from phenyl, pyridinyl,
piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl,
25 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-
tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-
dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or
naphthyl;

(b) R^Y is $T-R^{3'}$, wherein T is a valence bond or
30 a methylene and $R^{3'}$ is an optionally substituted group
selected from C_{1-6} aliphatic, C_{3-6} carbocyclyl, C_{6-10} aryl, a
heteroaryl ring having 5-10 ring atoms, or a heterocyclyl
ring having 5-10 ring atoms;

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring; and

(d) Ring D is substituted by oxo or R^5 , wherein each R^5 is independently selected from -halo, -CN, -NO₂, -N(R^4)₂, optionally substituted C_{1-6} aliphatic group, -OR, -C(O)R, -CO₂R, -CONH(R^4), -N(R^4)COR, -SO₂N(R^4)₂, or -N(R^4)SO₂R.

Even more preferred compounds of formula VI have one or more, and more preferably all, of the features selected from the group consisting of:

(a) R^Y is T- $R^{3'}$, wherein T is a valence bond or a methylene and $R^{3'}$ is an optionally substituted group selected from C_{1-4} aliphatic, C_{3-6} carbocyclyl, phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring;

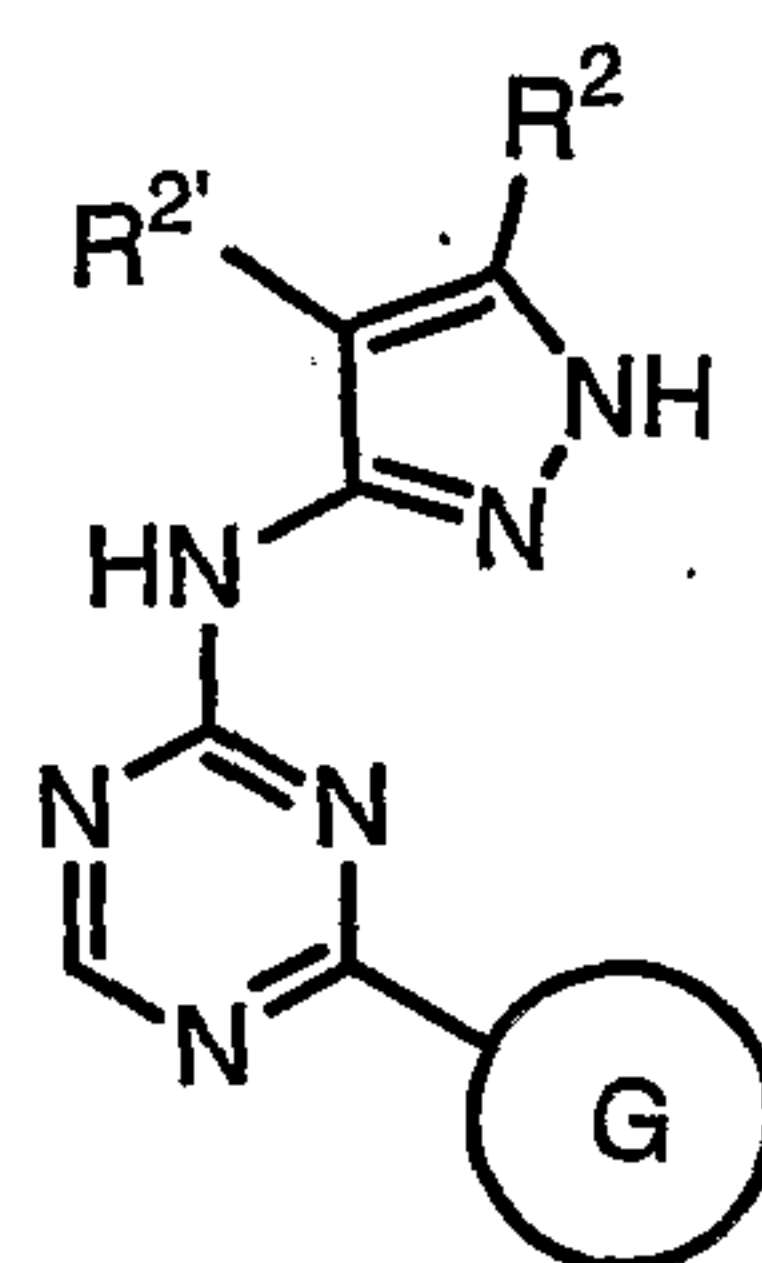
(b) Ring C is a phenyl or pyridinyl ring, optionally substituted by - R^5 , wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R^1 is -halo, a C_{1-4} aliphatic group optionally substituted with halogen, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, isoquinolinyl, quinolinyl, or naphthyl;

(c) R^2 and $R^{2'}$ are taken together with their intervening atoms to form a benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring optionally substituted with -halo, -N(R^4)₂, - C_{1-4} alkyl, - C_{1-4} haloalkyl, -NO₂, -O(C_{1-4} alkyl), -CO₂(C_{1-4} alkyl), -CN,

-SO₂(C₁₋₄ alkyl), -SO₂NH₂, -OC(O)NH₂, -NH₂SO₂(C₁₋₄ alkyl), -NHC(O)(C₁₋₄ alkyl), -C(O)NH₂, or -CO(C₁₋₄ alkyl), wherein the (C₁₋₄ alkyl) is a straight, branched, or cyclic alkyl group; and

- 5 (d) Ring D is substituted by oxo or R⁵, wherein each R⁵ is independently selected from -Cl, -F, -CN, -CF₃, -NH₂, -NH(C₁₋₄ aliphatic), -N(C₁₋₄ aliphatic)₂, -O(C₁₋₄ aliphatic), C₁₋₄ aliphatic, and -CO₂(C₁₋₄ aliphatic).

Another embodiment of this invention relates to
10 compounds of formula VIa:



VIa

or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

G is Ring C or Ring D;

- 15 Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from -R¹, any substitutable non-ortho carbon position on Ring C is independently
20 substituted by -R⁵, and two adjacent substituents on Ring C are optionally taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-6 membered ring having 0-3 heteroatoms selected from oxygen, sulfur or nitrogen,
25 said fused ring being optionally substituted by halo, oxo, or -R⁸;

Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by oxo or -R⁵, and at any substitutable ring nitrogen by -R⁴, provided that when Ring D is a six-membered aryl or heteroaryl ring, -R⁵ is hydrogen at each ortho carbon position of Ring D;

R¹ is selected from -halo, -CN, -NO₂, T-V-R⁶, phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C₁₋₆ aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or -R⁸, said C₁₋₆ aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R¹ and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

T is a valence bond or a C₁₋₄ alkylidene chain;

R² and R^{2'} are taken together with their intervening atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring having 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur, wherein each substitutable carbon on said fused ring formed by R² and R^{2'} is substituted by halo, oxo, -CN, -NO₂, -R⁷, or -V-R⁶, and any substitutable nitrogen on said ring formed by R² and R^{2'} is substituted by R⁴;

each R is independently selected from hydrogen or an optionally substituted group selected from C₁₋₆ aliphatic, C₆₋₁₀ aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R^4 is independently selected from $-R^7$, $-\text{COR}^7$,
 $-\text{CO}_2$ (optionally substituted C_{1-6} aliphatic), $-\text{CON}(\text{R}^7)_2$,
 or $-\text{SO}_2\text{R}^7$, or two R^4 on the same nitrogen are taken
 together to form a 5-8 membered heterocyclyl or
 5 heteroaryl ring;

each R^5 is independently selected from $-R$, halo, $-\text{OR}$,
 $-\text{C}(=\text{O})\text{R}$, $-\text{CO}_2\text{R}$, $-\text{COCOR}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{S}(\text{O})\text{R}$, $-\text{SO}_2\text{R}$, $-\text{SR}$,
 $-\text{N}(\text{R}^4)_2$, $-\text{CON}(\text{R}^4)_2$, $-\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{OC}(=\text{O})\text{R}$, $-\text{N}(\text{R}^4)\text{COR}$,
 $-\text{N}(\text{R}^4)\text{CO}_2$ (optionally substituted C_{1-6} aliphatic),
 10 $-\text{N}(\text{R}^4)\text{N}(\text{R}^4)_2$, $-\text{C}=\text{NN}(\text{R}^4)_2$, $-\text{C}=\text{N}-\text{OR}$, $-\text{N}(\text{R}^4)\text{CON}(\text{R}^4)_2$,
 $-\text{N}(\text{R}^4)\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{N}(\text{R}^4)\text{SO}_2\text{R}$, or $-\text{OC}(=\text{O})\text{N}(\text{R}^4)_2$, or R^5 and
 an adjacent substituent taken together with their
 intervening atoms form said ring fused to Ring C;
 V is $-\text{O}-$, $-\text{S}-$, $-\text{SO}-$, $-\text{SO}_2-$, $-\text{N}(\text{R}^6)\text{SO}_2-$, $-\text{SO}_2\text{N}(\text{R}^6)-$,
 15 $-\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$, $-\text{N}(\text{R}^6)\text{CO}-$, $-\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$,
 $-\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{O})\text{N}(\text{R}^6)-$, $-\text{OC}(\text{O})\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$,
 $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$, $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{R}^6)=\text{NN}(\text{R}^6)-$,
 20 $-\text{C}(\text{R}^6)=\text{N}-\text{O}-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, or
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$;

W is $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$, $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$,
 $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$,
 $-\text{C}(\text{R}^6)\text{OC}(\text{O})-$, $-\text{C}(\text{R}^6)\text{OC}(\text{O})\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CO}-$,
 25 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{R}^6)=\text{NN}(\text{R}^6)-$, $-\text{C}(\text{R}^6)=\text{N}-\text{O}-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$, or $-\text{CON}(\text{R}^6)-$;

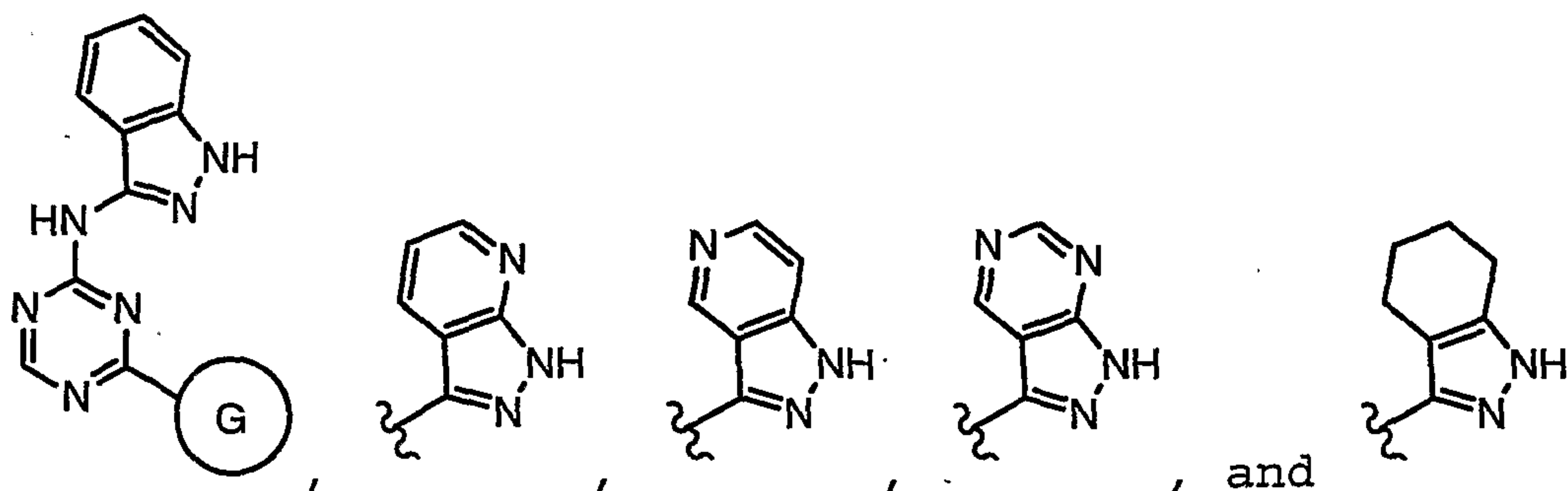
each R^6 is independently selected from hydrogen, an
 optionally substituted C_{1-4} aliphatic group, or two R^6
 30 groups on the same nitrogen atom are taken together
 with the nitrogen atom to form a 5-6 membered
 heterocyclyl or heteroaryl ring;

each R^7 is independently selected from hydrogen or an
 optionally substituted C_{1-6} aliphatic group, or two R^7

on the same nitrogen are taken together with the nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring; and

each R^6 is independently selected from an optionally substituted C_{1-4} aliphatic group, $-OR^6$, $-SR^6$, $-COR^6$, $-SO_2R^6$, $-N(R^6)_2$, $-N(R^6)N(R^6)_2$, $-CN$, $-NO_2$, $-CON(R^6)_2$, or $-CO_2R^6$.

Preferred rings formed by the R^2 and $R^{2'}$ groups of formula VIa include benzo, pyrido, pyrimido, and a partially unsaturated 6-membered carbocyclo ring. These are exemplified in the following formula VIa compounds having a pyrazole-containing bicyclic ring system:



15

Preferred substituents on the $R^2/R^{2'}$ fused ring include one or more of the following: $-\text{halo}$, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), $-CN$, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, and $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group. Preferably, the $(C_{1-4}$ alkyl) group is methyl.

When G is Ring C, preferred formula VIa Ring C groups are phenyl and pyridinyl. When two adjacent substituents on Ring C are taken together to form a fused ring, Ring C is contained in a bicyclic ring system. Preferred fused rings include a benzo or pyrido ring. Such rings preferably are fused at ortho and meta

positions of Ring C. Examples of preferred bicyclic Ring C systems include naphthyl and isoquinolinyl. Preferred R^1 groups include -halo, an optionally substituted C_{1-6} aliphatic group, phenyl, $-\text{COR}^6$, $-\text{OR}^6$, $-\text{CN}$, $-\text{SO}_2\text{R}^6$, $-\text{SO}_2\text{NH}_2$,
 5 $-\text{N}(\text{R}^6)_2$, $-\text{CO}_2\text{R}^6$, $-\text{CONH}_2$, $-\text{NHCOR}^6$, $-\text{OC}(\text{O})\text{NH}_2$, or $-\text{NHSO}_2\text{R}^6$.
 When R^1 is an optionally substituted C_{1-6} aliphatic group, the most preferred optional substituents are halogen. Examples of preferred R^1 groups include $-\text{CF}_3$, $-\text{Cl}$, $-\text{F}$,
 $-\text{CN}$, $-\text{COCH}_3$, $-\text{OCH}_3$, $-\text{OH}$, $-\text{CH}_2\text{CH}_3$, $-\text{OCH}_2\text{CH}_3$, $-\text{CH}_3$, $-\text{CF}_2\text{CH}_3$,
 10 cyclohexyl, t-butyl, isopropyl, cyclopropyl, $-\text{C}\equiv\text{CH}$,
 $-\text{C}\equiv\text{C}-\text{CH}_3$, $-\text{SO}_2\text{CH}_3$, $-\text{SO}_2\text{NH}_2$, $-\text{N}(\text{CH}_3)_2$, $-\text{CO}_2\text{CH}_3$, $-\text{CONH}_2$,
 $-\text{NHCOCCH}_3$, $-\text{OC}(\text{O})\text{NH}_2$, $-\text{NHSO}_2\text{CH}_3$, and $-\text{OCF}_3$.

On Ring C preferred R^5 substituents, when present, include -halo, $-\text{CN}$, $-\text{NO}_2$, $-\text{N}(\text{R}^4)_2$, optionally
 15 substituted C_{1-6} aliphatic group, $-\text{OR}$, $-\text{C}(\text{O})\text{R}$, $-\text{CO}_2\text{R}$,
 $-\text{CONH}(\text{R}^4)$, $-\text{N}(\text{R}^4)\text{COR}$, $-\text{SO}_2\text{N}(\text{R}^4)_2$, and $-\text{N}(\text{R}^4)\text{SO}_2\text{R}$. More preferred R^5 substituents include $-\text{Cl}$, $-\text{F}$, $-\text{CN}$, $-\text{CF}_3$,
 $-\text{NH}_2$, $-\text{NH}(\text{C}_{1-4} \text{ aliphatic})$, $-\text{N}(\text{C}_{1-4} \text{ aliphatic})_2$, $-\text{O}(\text{C}_{1-4} \text{ aliphatic})$, $\text{C}_{1-4} \text{ aliphatic}$, and $-\text{CO}_2(\text{C}_{1-4} \text{ aliphatic})$.
 20 Examples of such preferred R^5 substituents include $-\text{Cl}$,
 $-\text{F}$, $-\text{CN}$, $-\text{CF}_3$, $-\text{NH}_2$, $-\text{NHMe}$, $-\text{NMe}_2$, $-\text{OEt}$, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, and $-\text{CO}_2\text{Et}$.

When G is Ring D, preferred formula VIa Ring D monocyclic rings include substituted and unsubstituted
 25 phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, and morpholinyl rings.
 When two adjacent substituents on Ring D are taken together to form a fused ring, the Ring D system is bicyclic. Preferred formula VIa Ring D bicyclic rings
 30 include 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, and naphthyl. Examples of more preferred bicyclic Ring D systems include naphthyl and isoquinolinyl.

Preferred substituents on the formula **Via** Ring D include one or more of the following: halo, oxo, CN, -NO₂, -N(R⁴)₂, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, -N(R⁴)SO₂R, -SR, -OR, -C(O)R, or substituted or

5 unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. More preferred Ring D substituents include -halo, -CN, -oxo, -SR, -OR, -N(R⁴)₂, -C(O)R, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆

10 aliphatic. Examples of Ring D substituents include -OH, phenyl, methyl, CH₂OH, CH₂CH₂OH, pyrrolidinyl, OPh, CF₃, C≡CH, Cl, Br, F, I, NH₂, C(O)CH₃, *i*-propyl, *tert*-butyl, SEt, OMe, N(Me)₂, methylene dioxy, and ethylene dioxy.

Preferred formula **Via** compounds have one or

15 more, and more preferably all, of the features selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by -R⁵, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring

20 system, the bicyclic ring system is selected from a naphthyl, quinolinyl or isoquinolinyl ring, and R¹ is -halo, an optionally substituted C₁₋₆ aliphatic group, phenyl, -COR⁶, -OR⁶, -CN, -SO₂R⁶, -SO₂NH₂, -N(R⁶)₂, -CO₂R⁶, -CONH₂, -NHCOR⁶, -OC(O)NH₂, or -NHSO₂R⁶; or Ring D is an

25 optionally substituted ring selected from a phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1*H*-isoindolyl, 2,3-dihydro-1*H*-indolyl,

30 isoquinolinyl, quinolinyl, or naphthyl ring; and

(b) R² and R^{2'} are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring.

More preferred compounds of formula VIa have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R^1 is -halo, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic group, phenyl, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl;

(b) R^2 and $R^{2'}$ are taken together with their intervening atoms to form a benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring optionally substituted with -halo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), -CN, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, and $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group; and

(c) Ring D is substituted by oxo or R^5 , wherein each R^5 is independently selected from -halo, -CN, $-NO_2$, $-N(R^4)_2$, optionally substituted C_{1-6} aliphatic group, -OR, $-C(O)R$, $-CO_2R$, $-CONH(R^4)$, $-N(R^4)COR$, $-SO_2N(R^4)_2$, or $-N(R^4)SO_2R$.

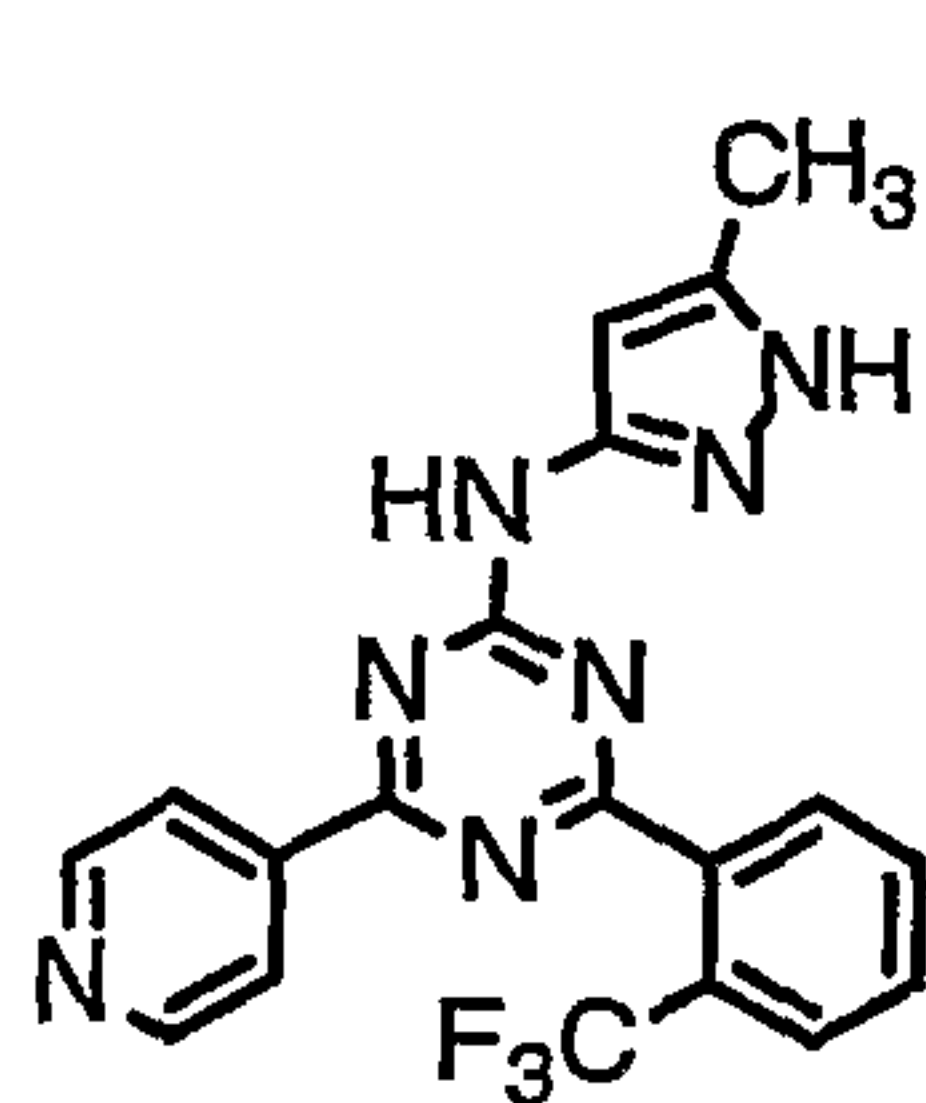
Even more preferred compounds of formula VIa have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two

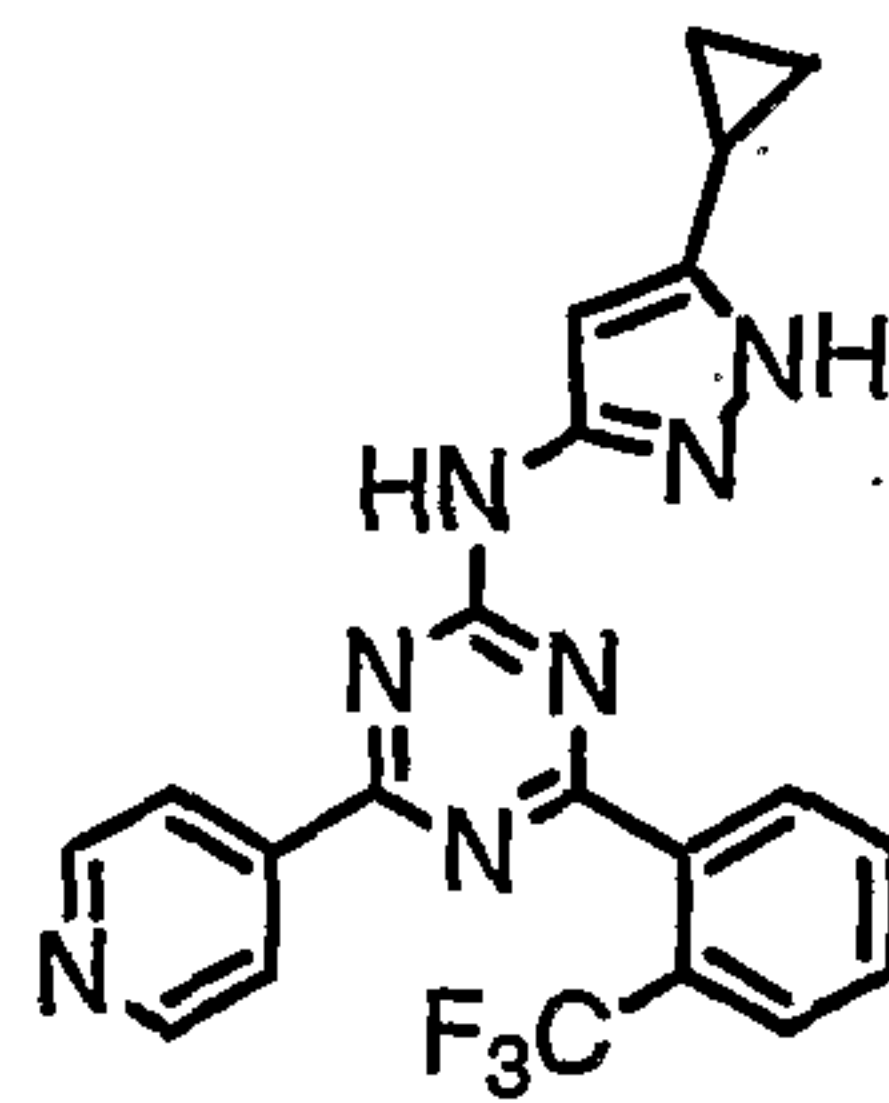
- adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R^1 is -halo, a C_{1-4} aliphatic group optionally substituted with halogen, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, isoquinolinyl, quinolinyl, or naphthyl;
- (b) R^2 and $R^{2'}$ are taken together with their intervening atoms to form a benzo, pyrido, or partially unsaturated 6-membered carbocyclic ring optionally substituted with -halo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), -CN, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, or $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group; and
- (d) Ring D is substituted by oxo or R^5 , wherein each R^5 is independently selected from -Cl, -F, -CN, $-CF_3$, $-NH_2$, $-NH(C_{1-4}$ aliphatic), $-N(C_{1-4}$ aliphatic) $_2$, $-O(C_{1-4}$ aliphatic), C_{1-4} aliphatic, and $-CO_2(C_{1-4}$ aliphatic).

Representative compounds of formula VI and IVa are set forth in Table 5 below.

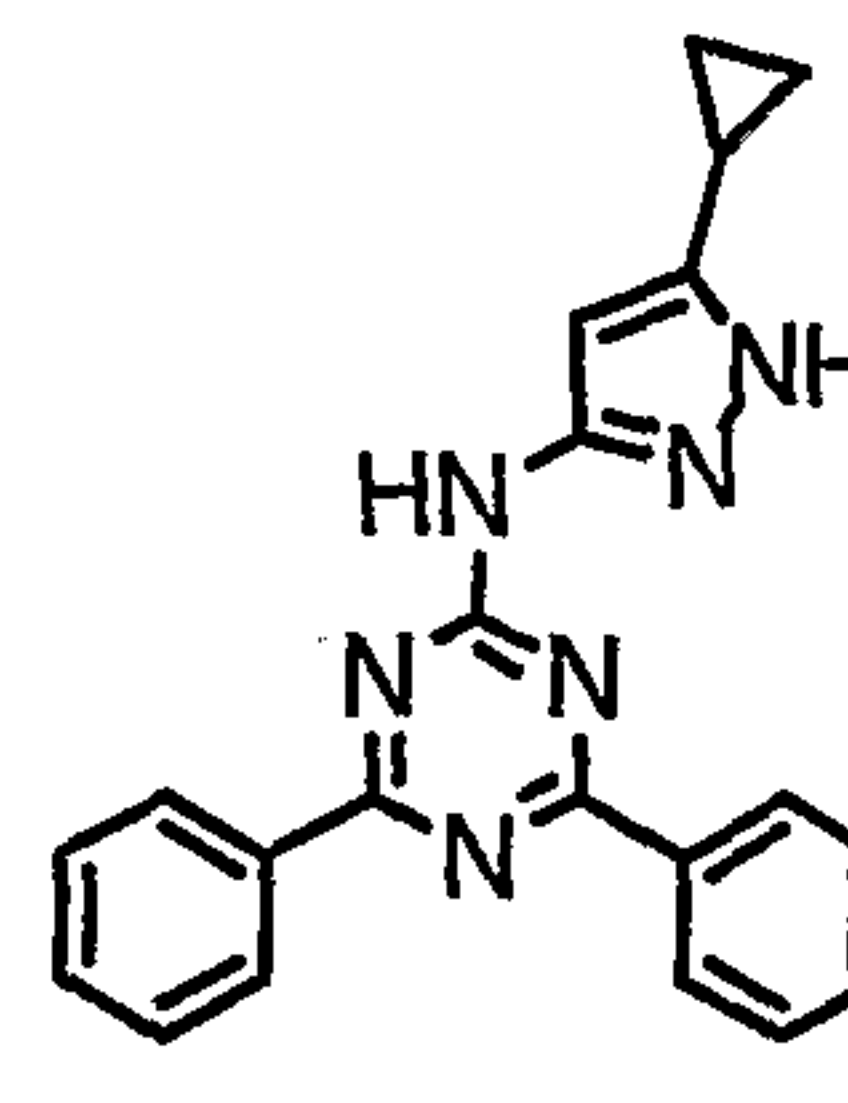
Table 5.



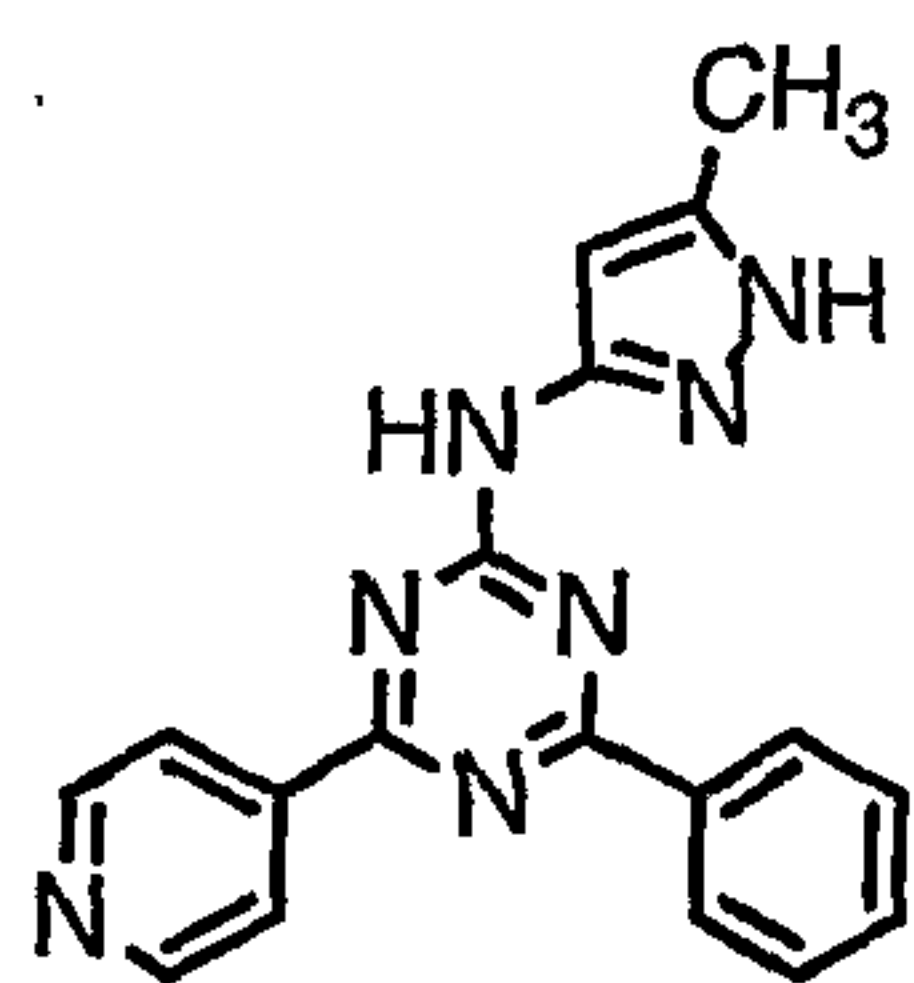
VI-1



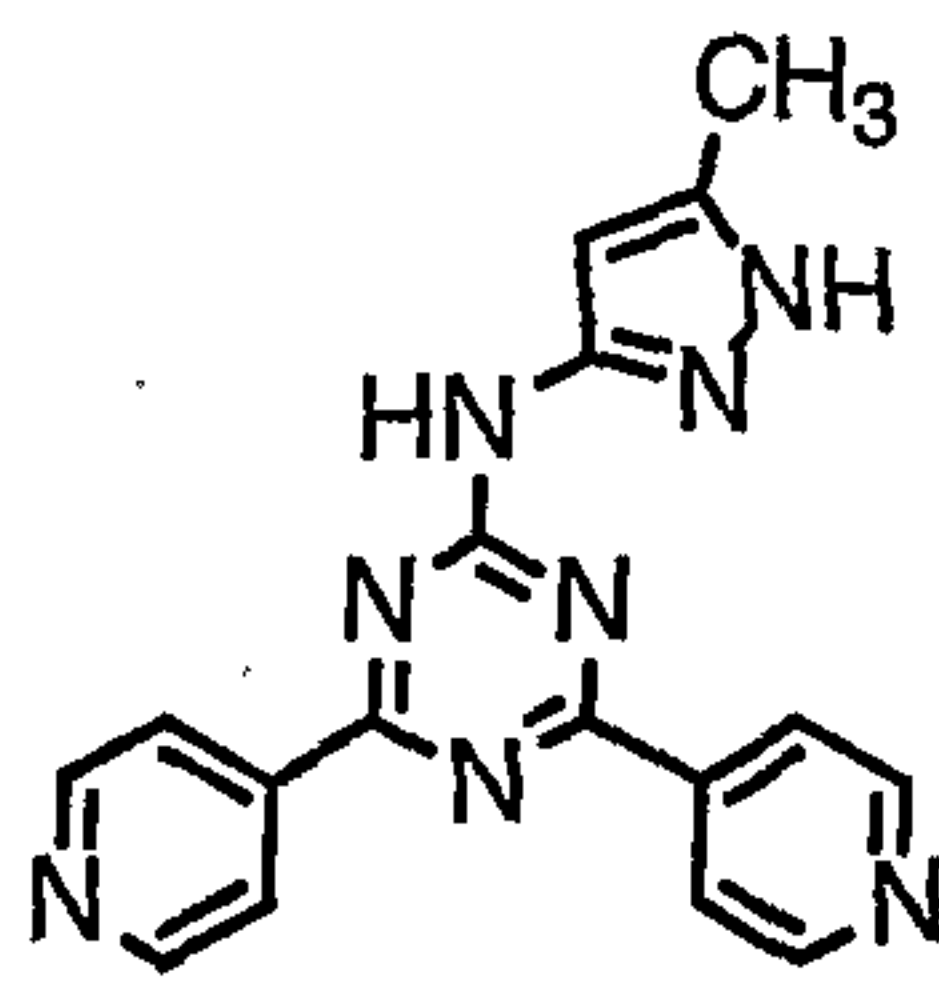
VI-2



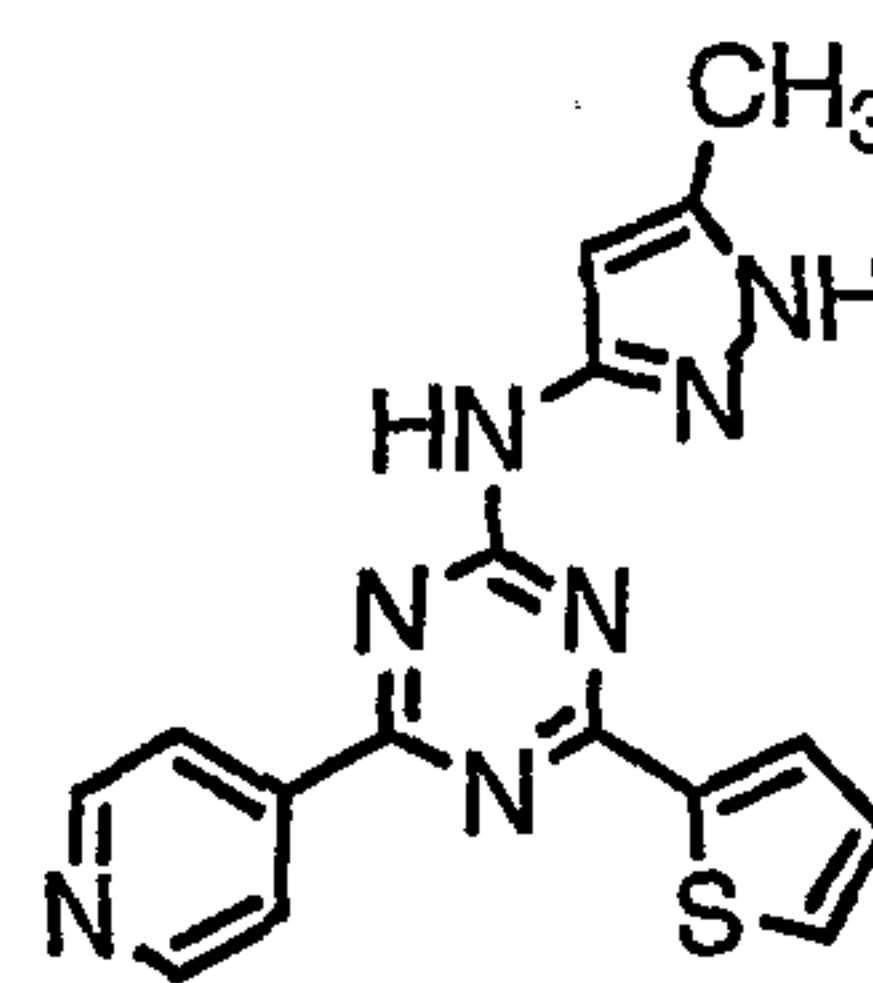
VI-3



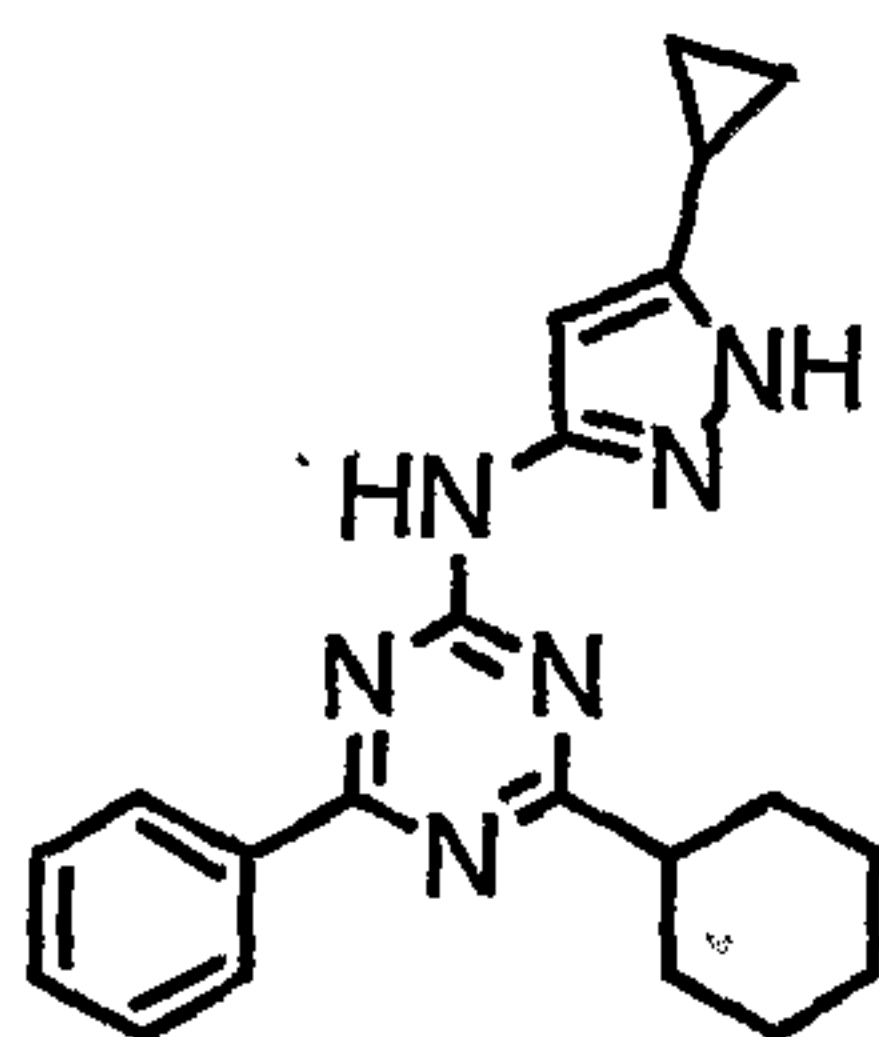
VI-4



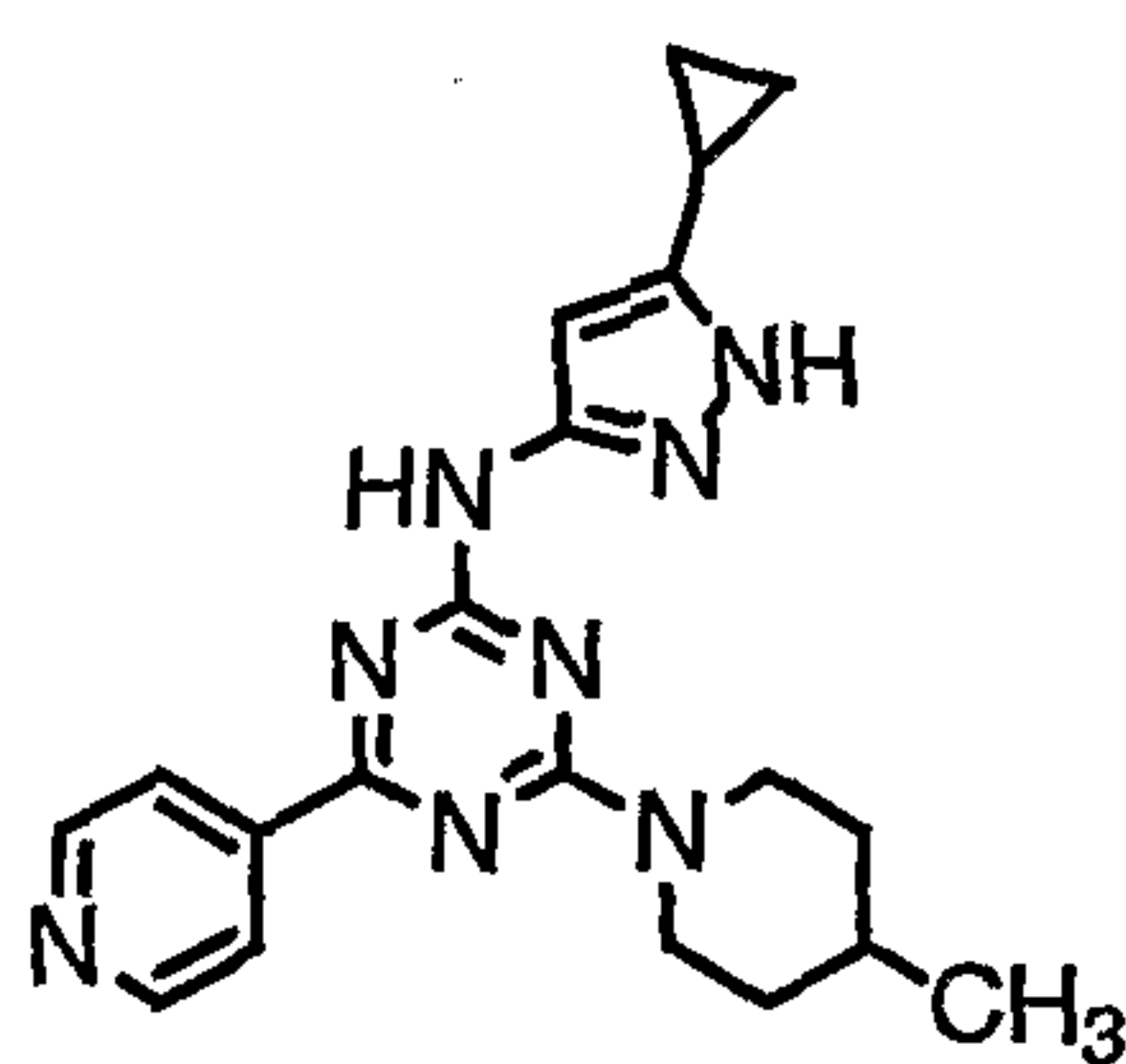
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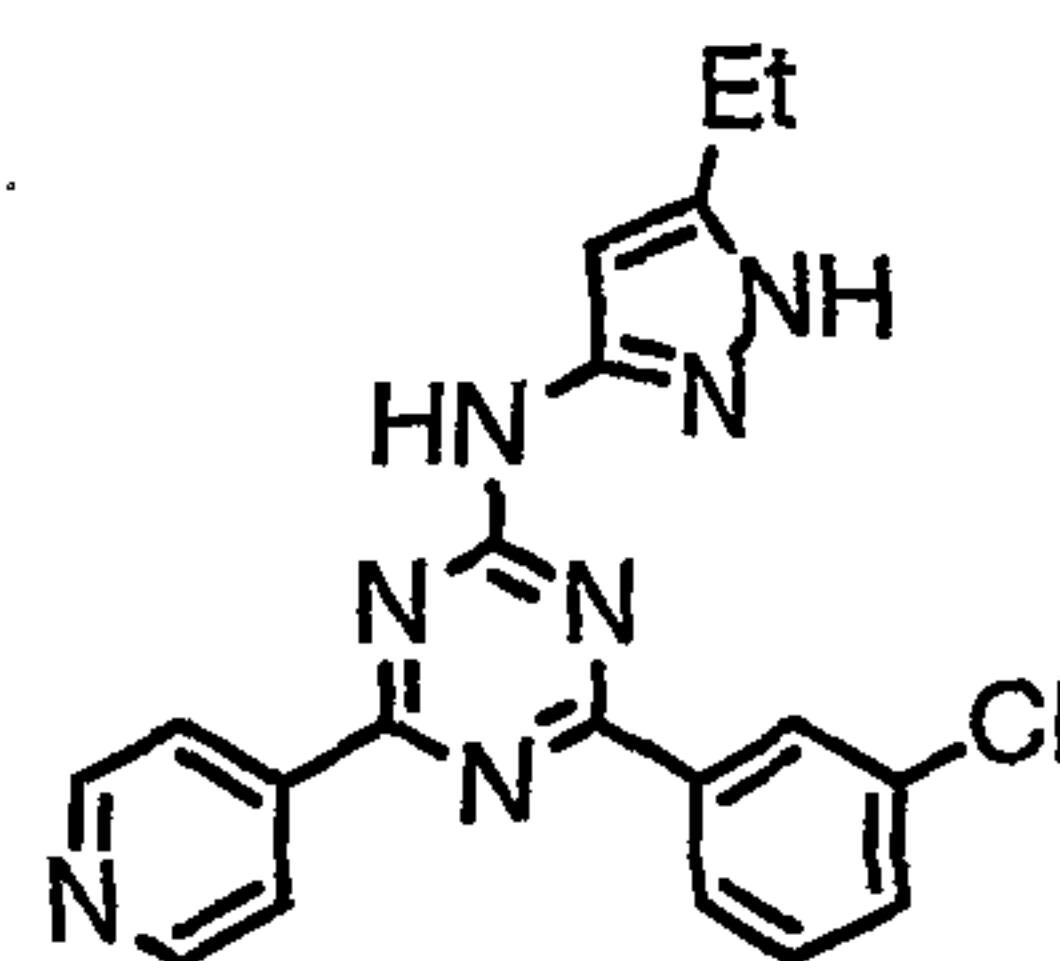
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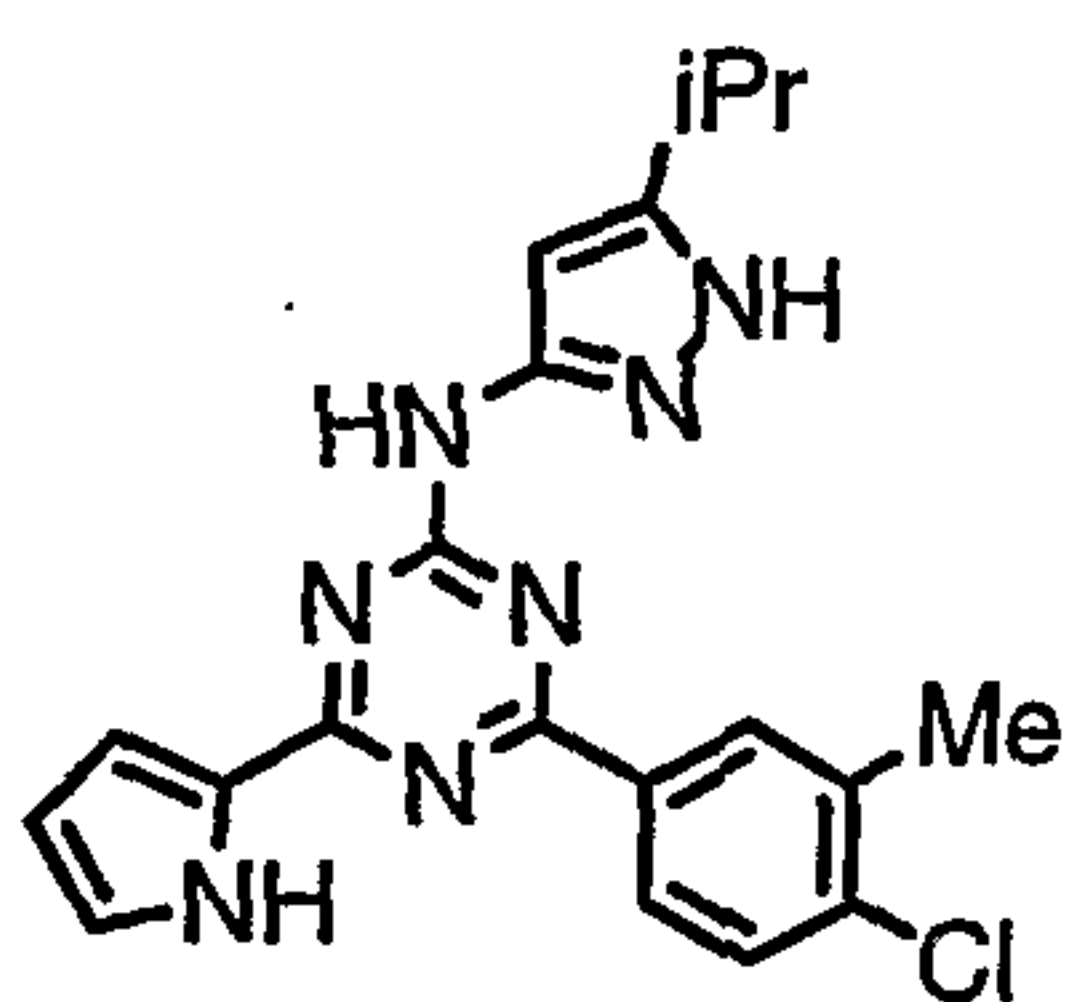
VI-7



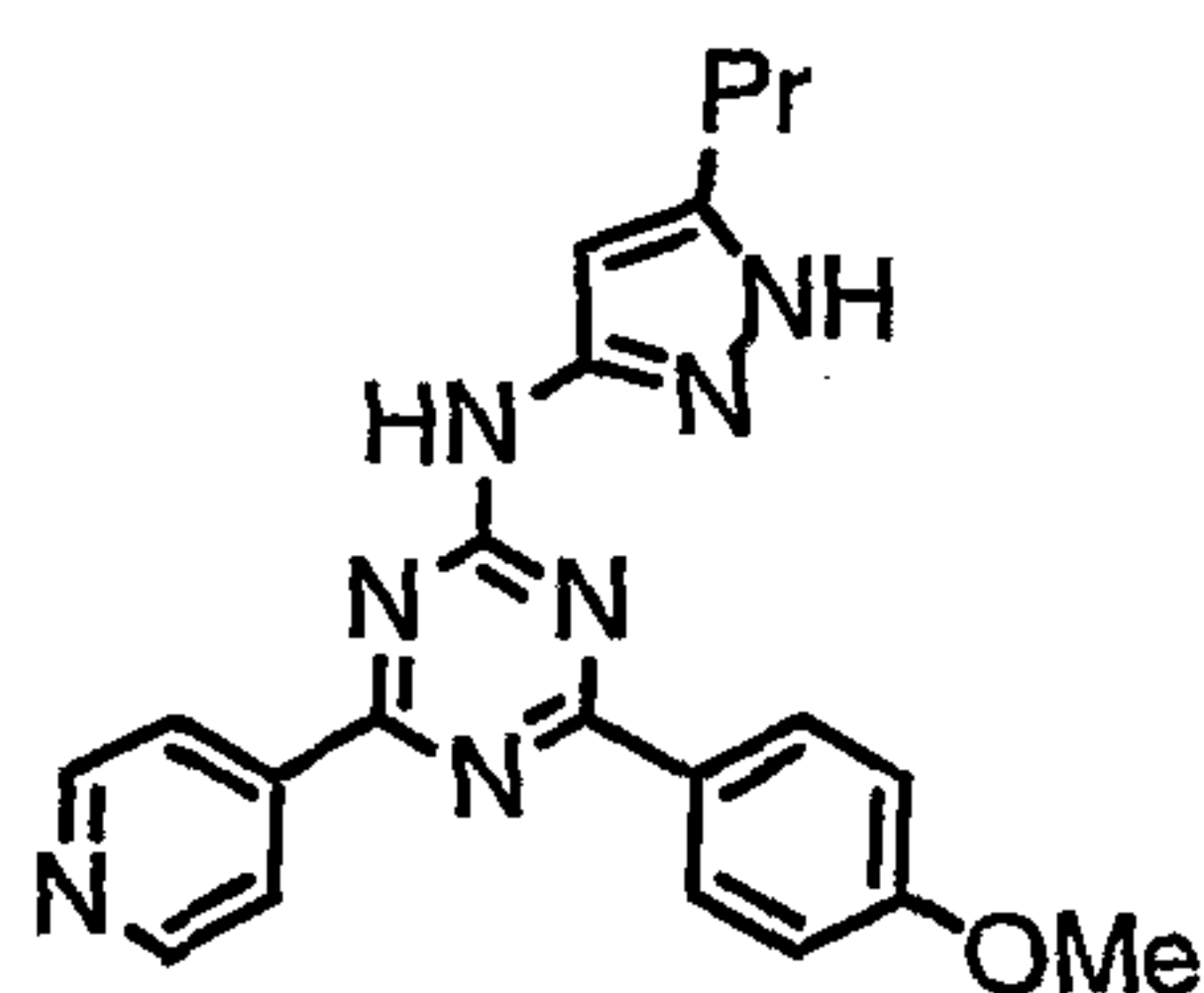
VI-8



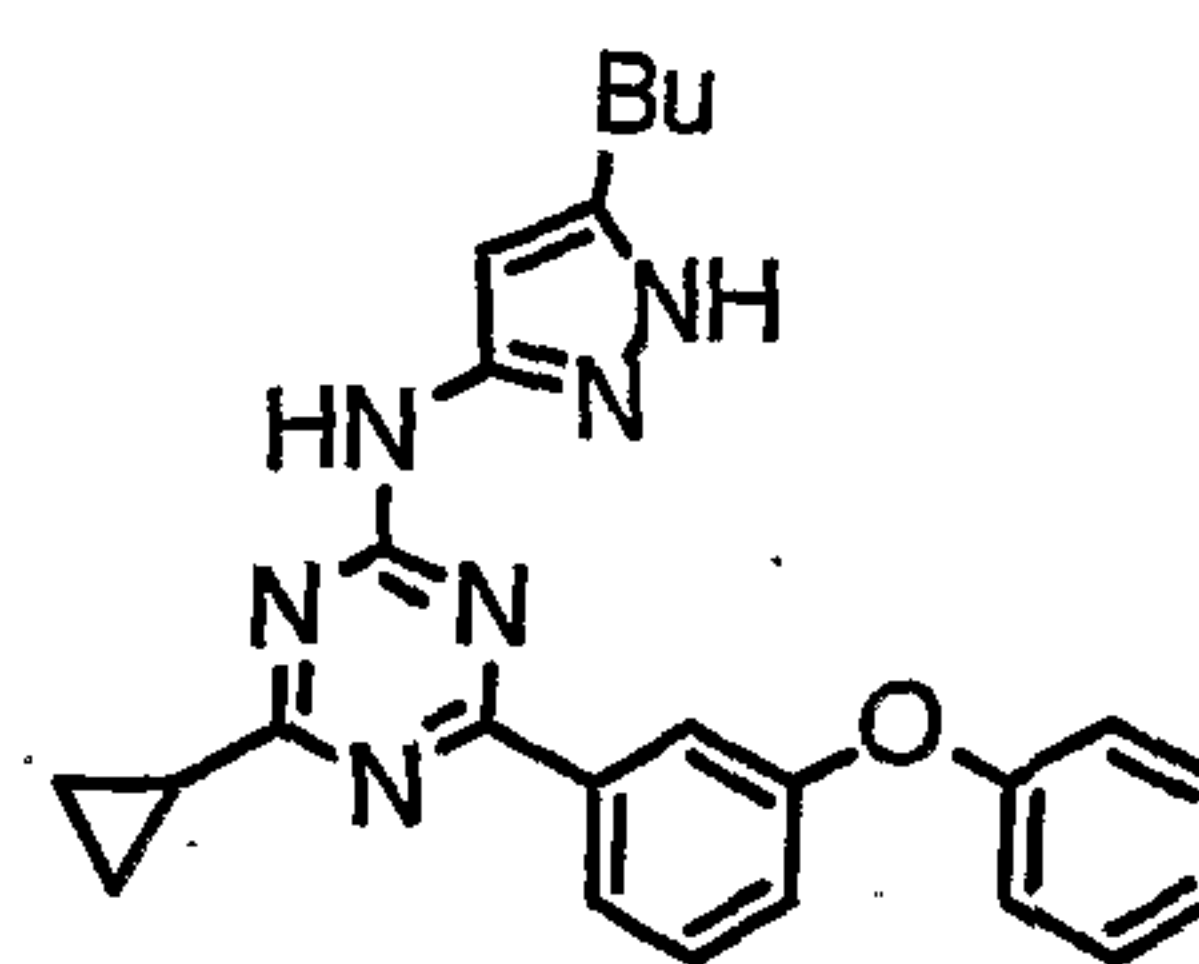
VI-9



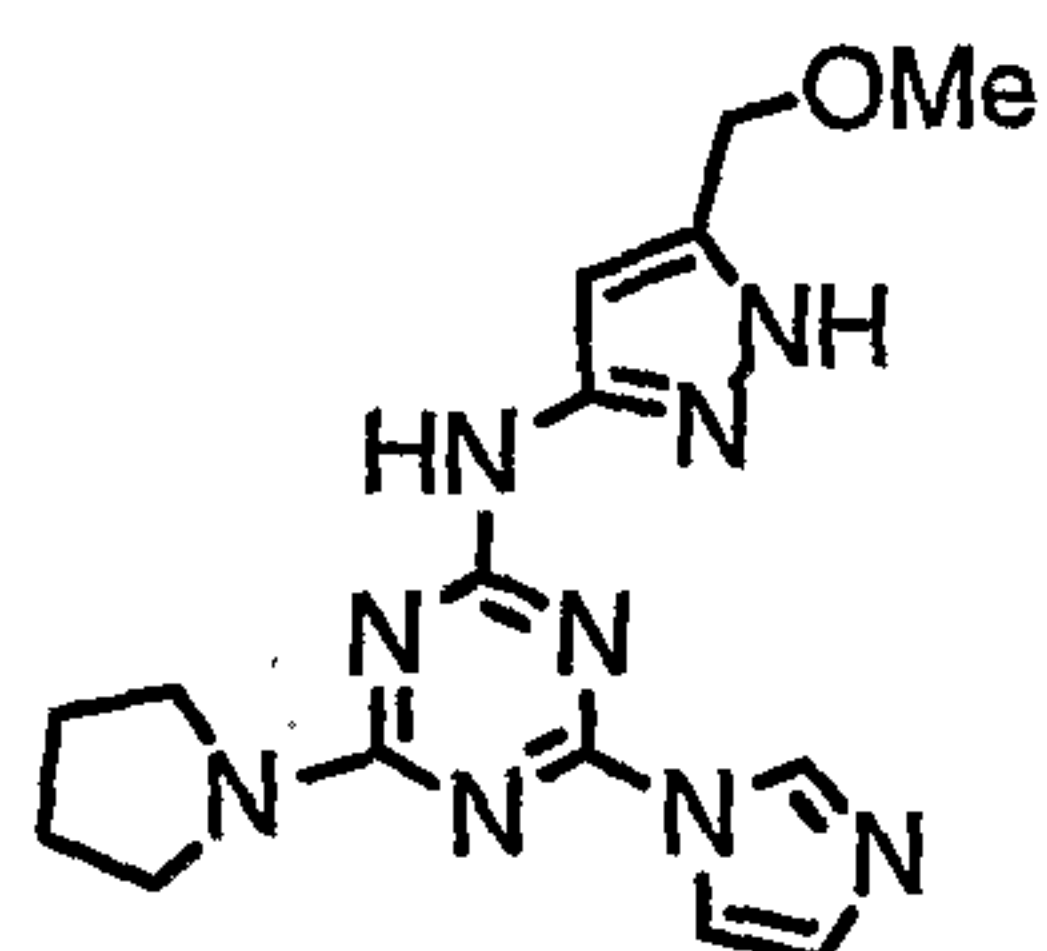
VI-10



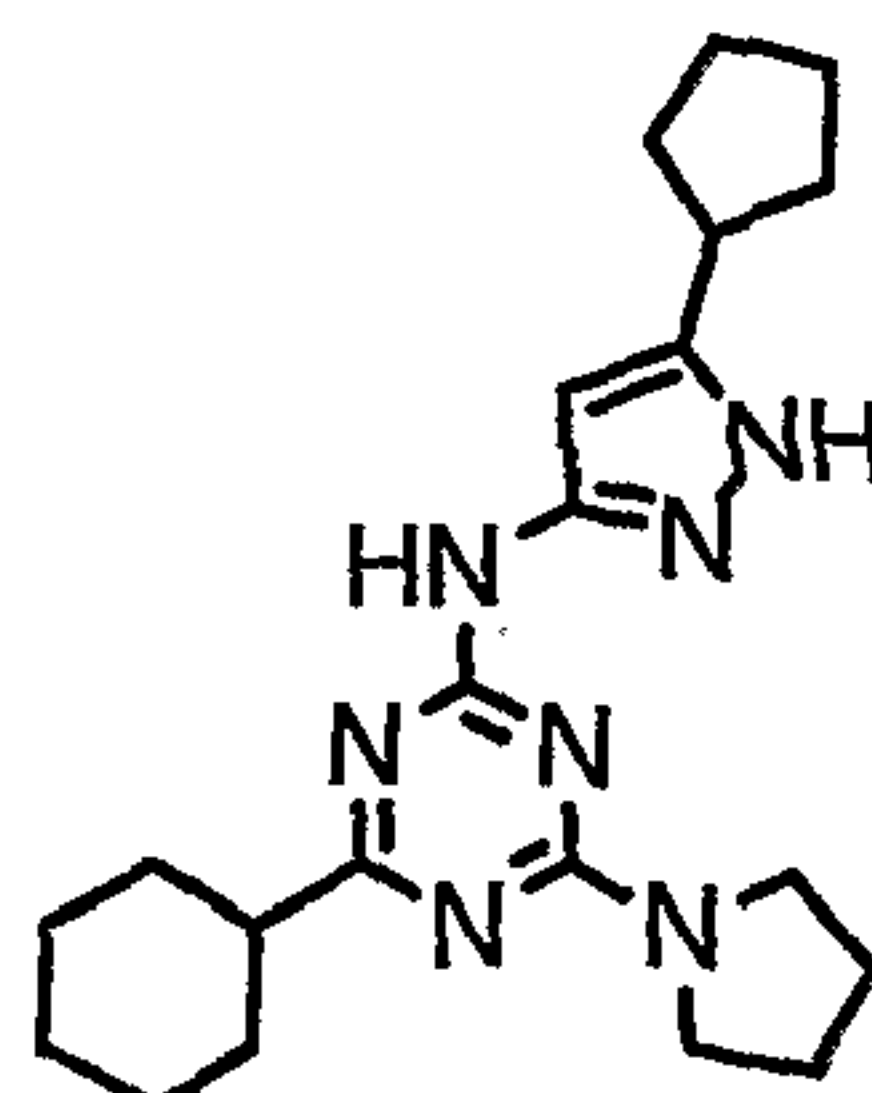
VI-11



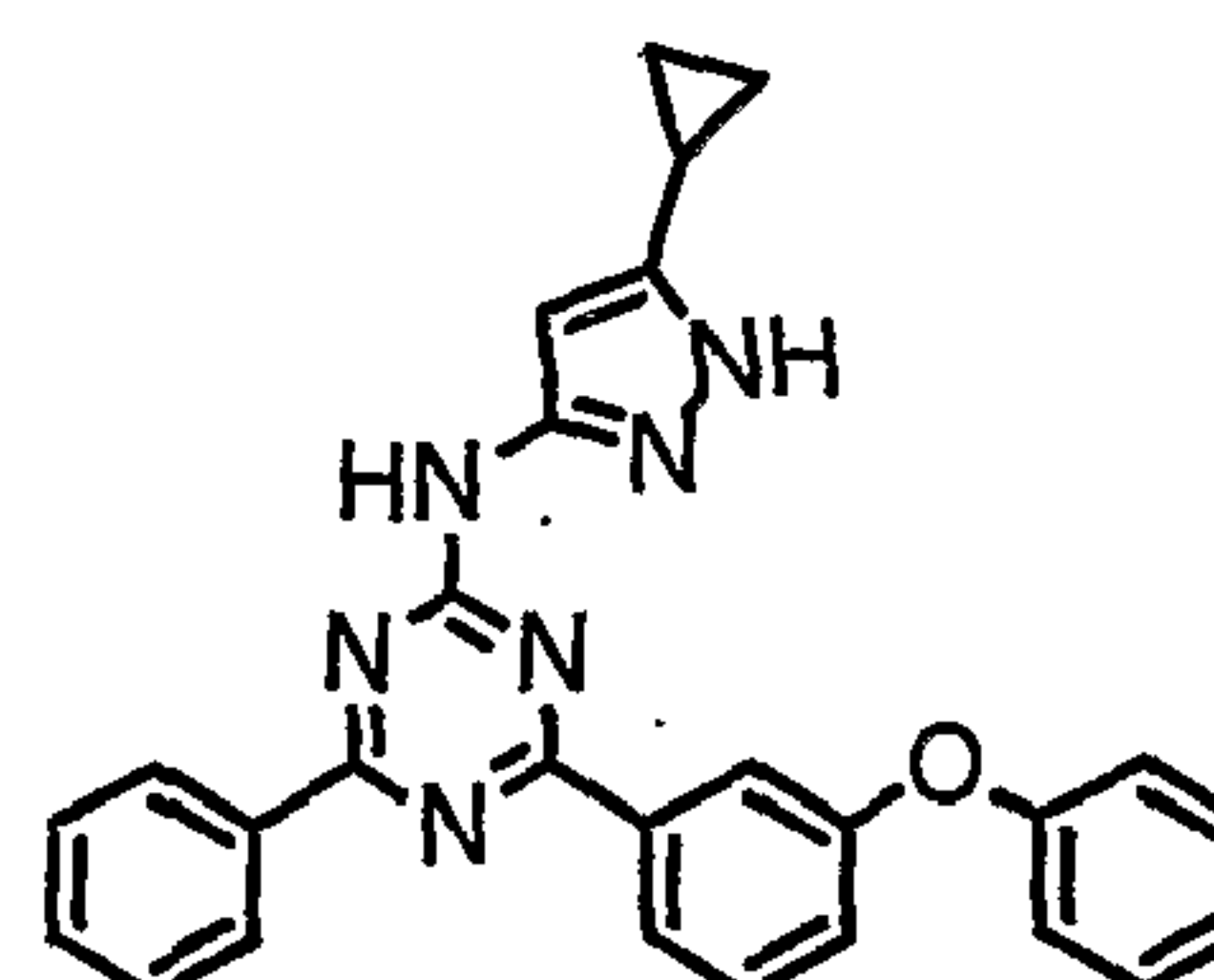
VI-12



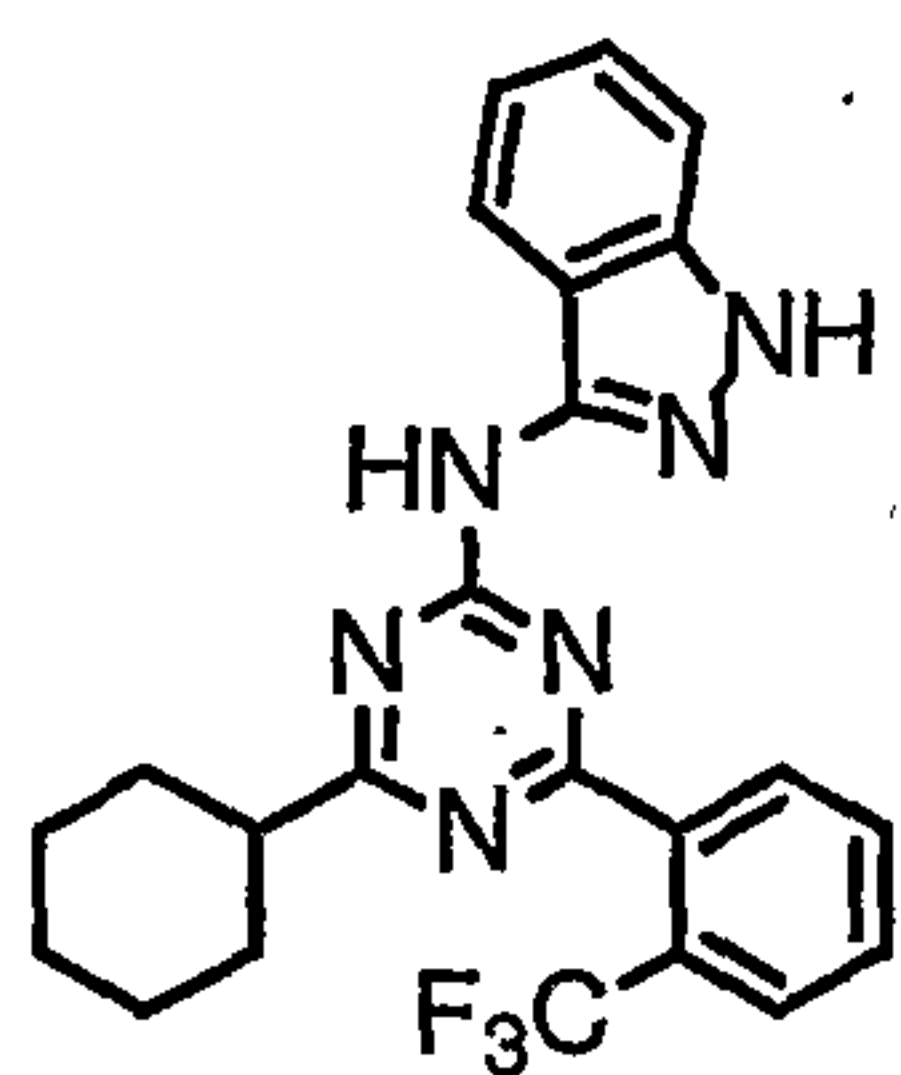
VI-13



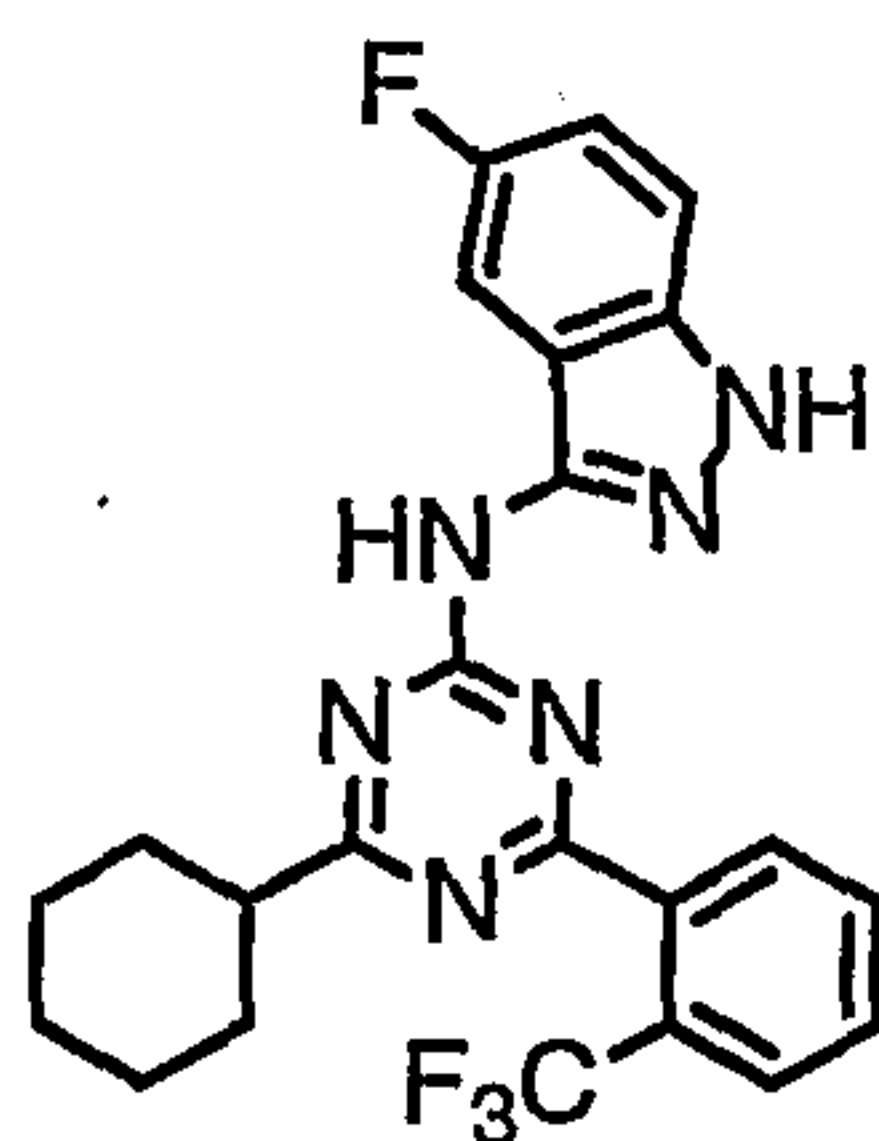
VI-14



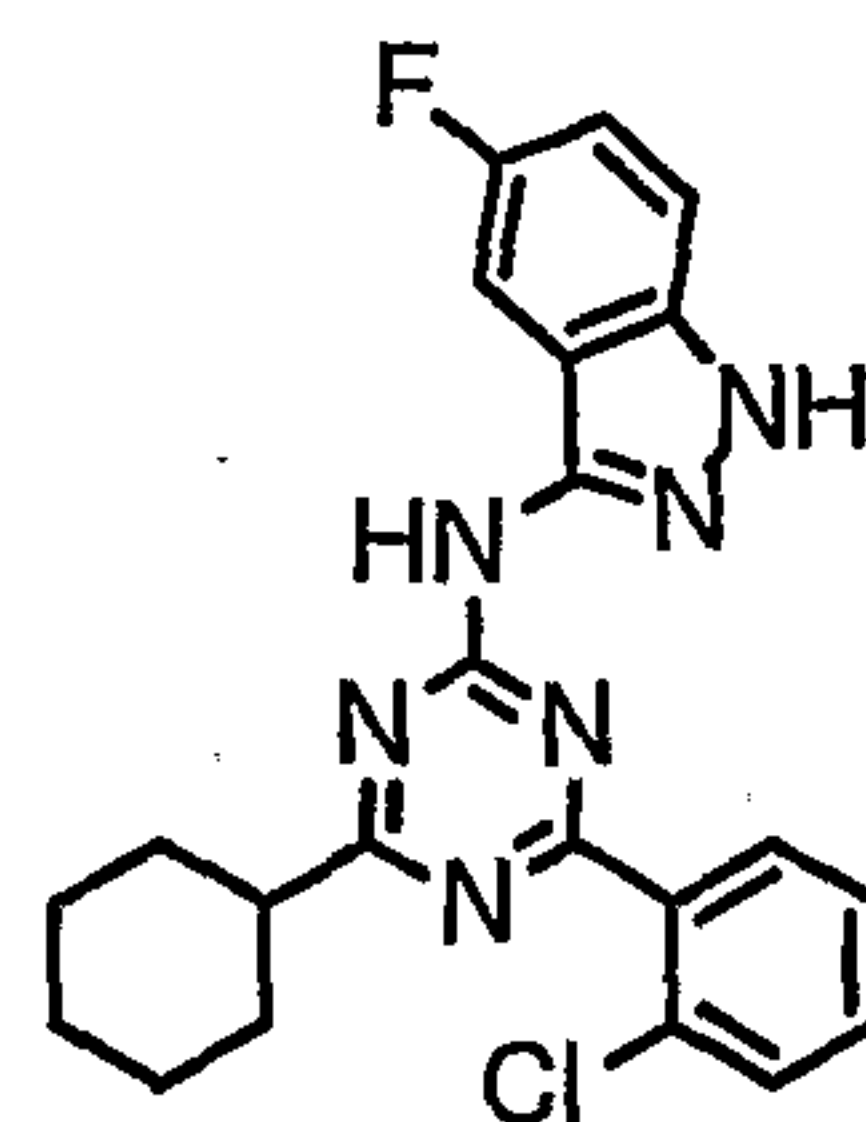
VI-15



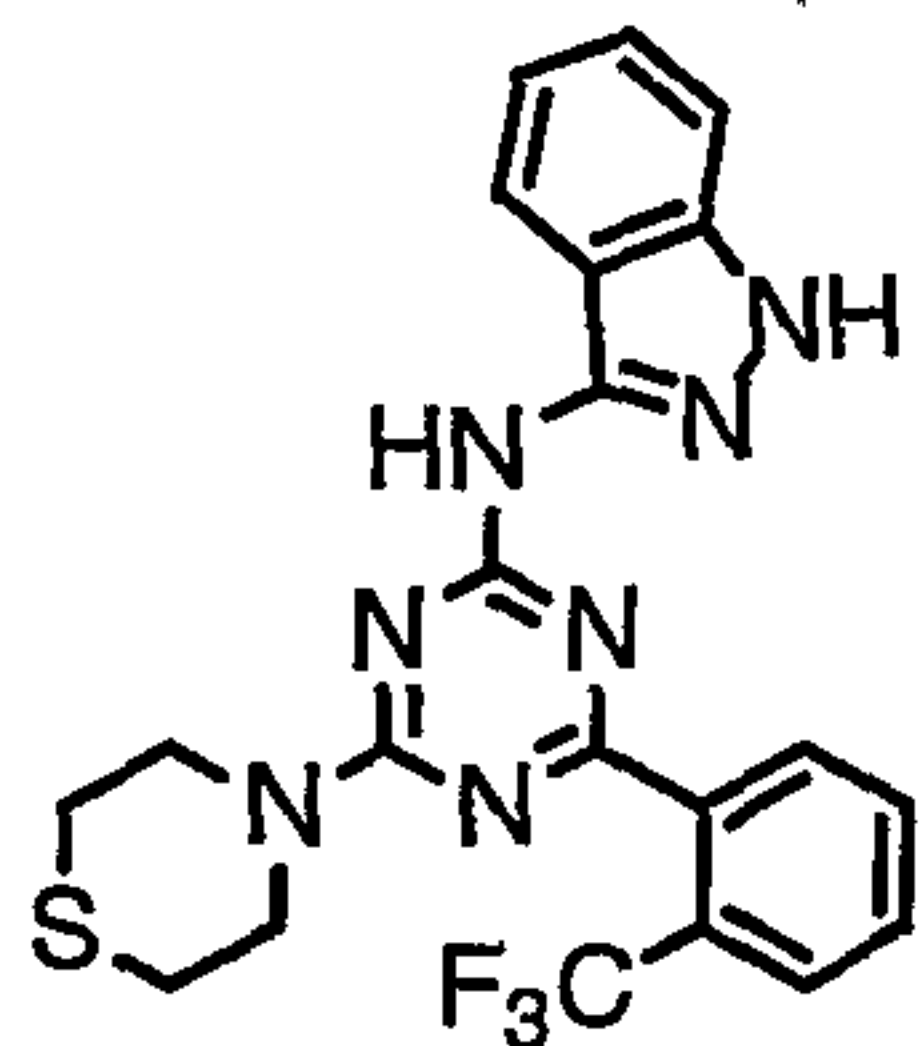
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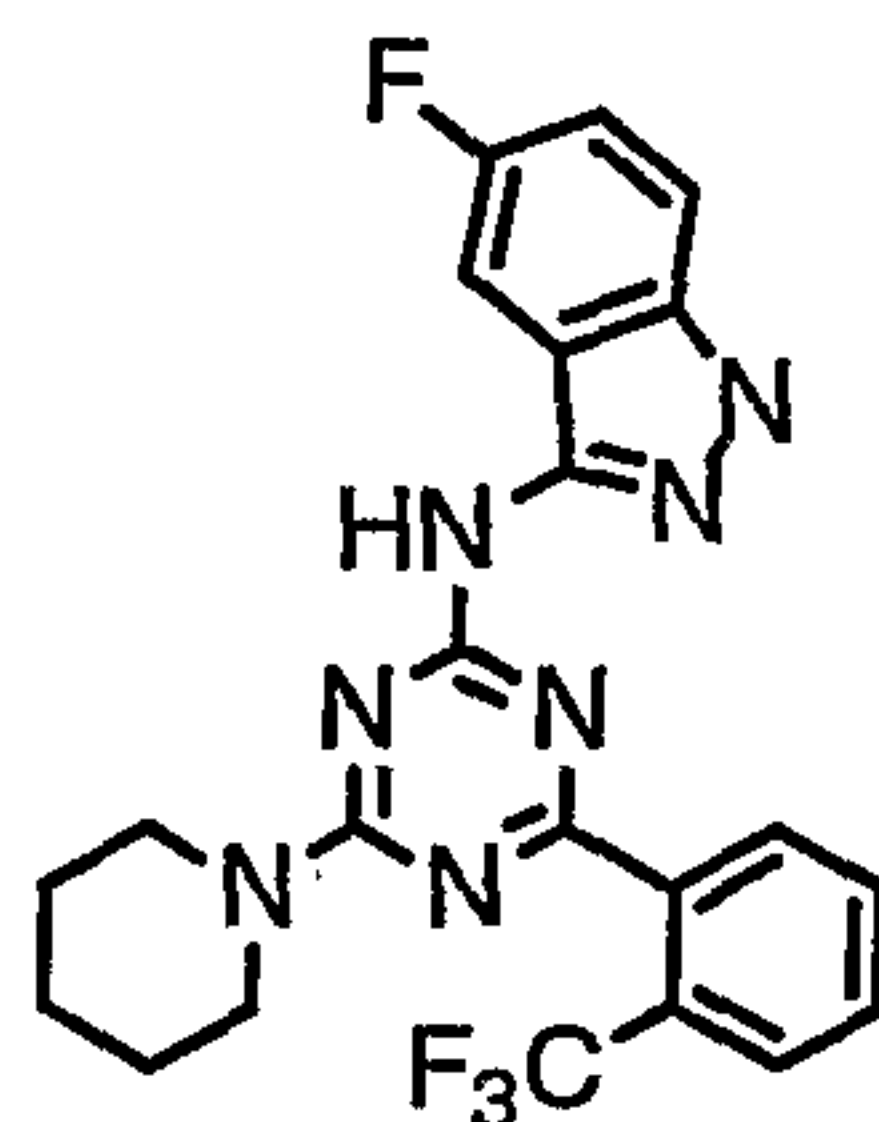
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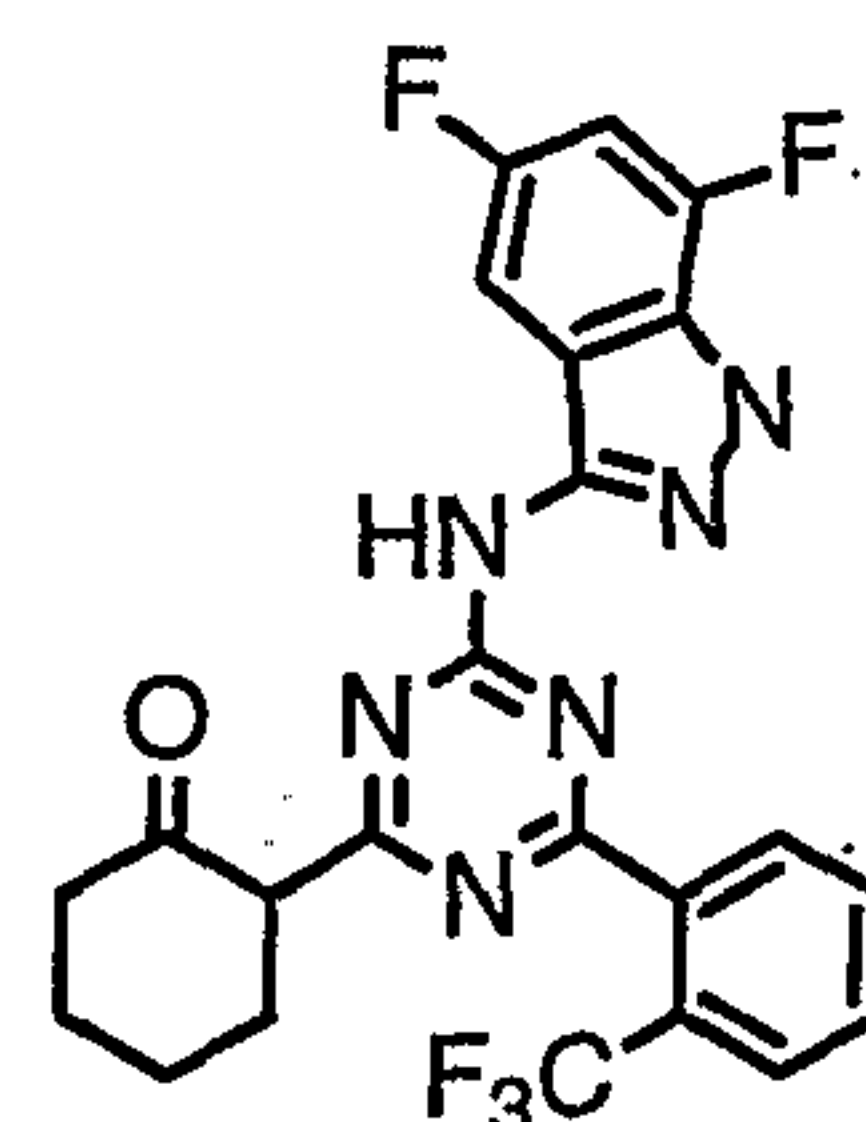
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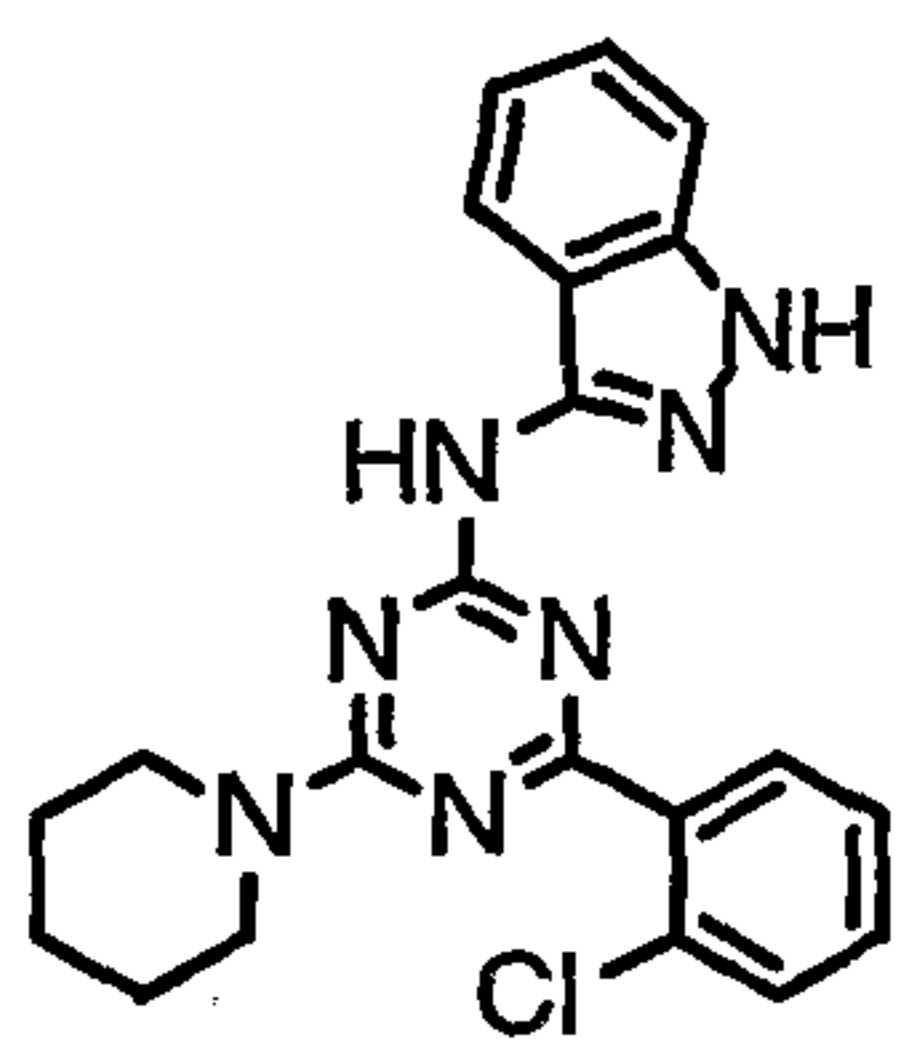
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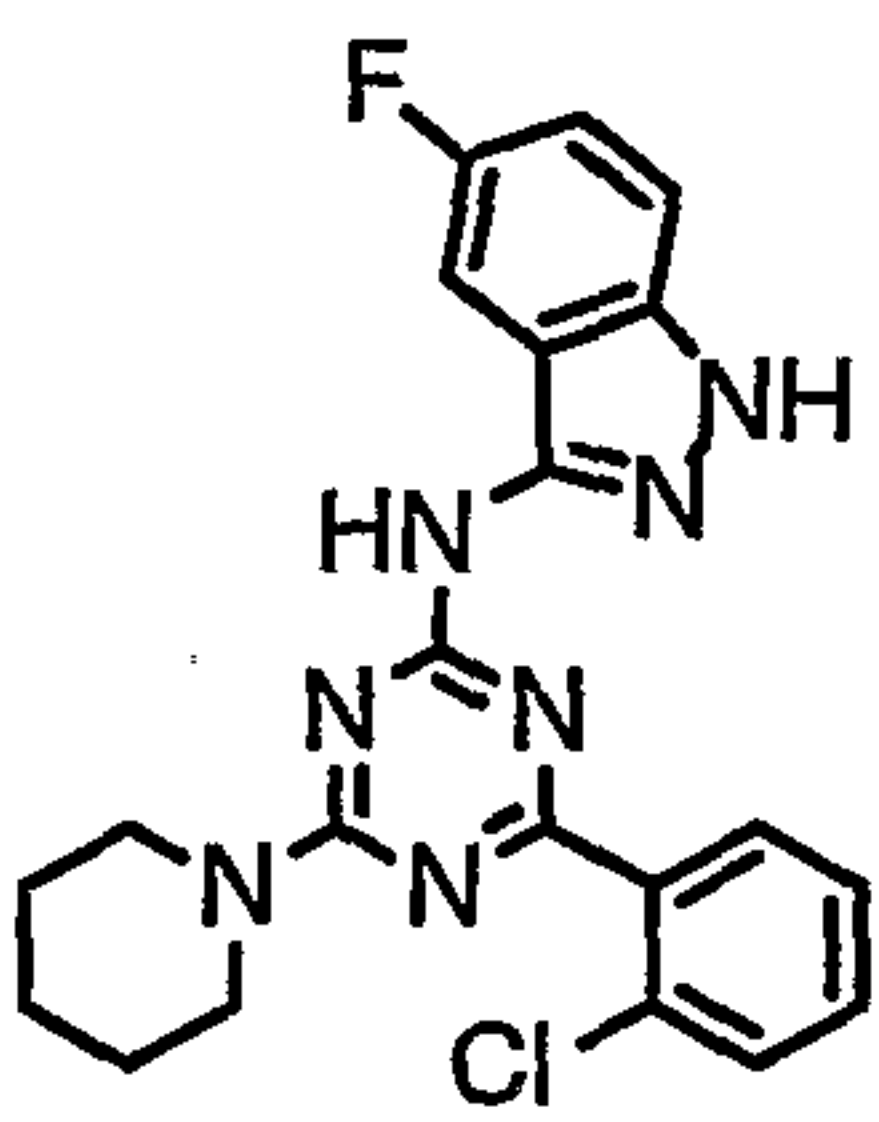
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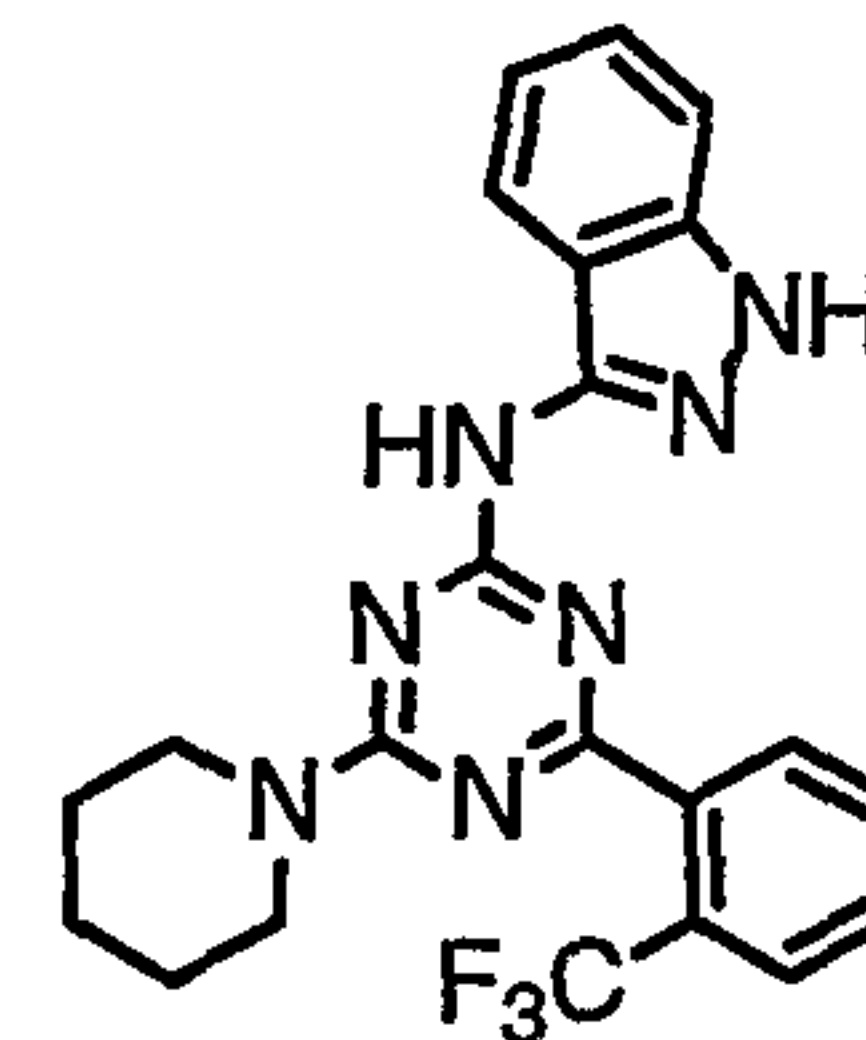
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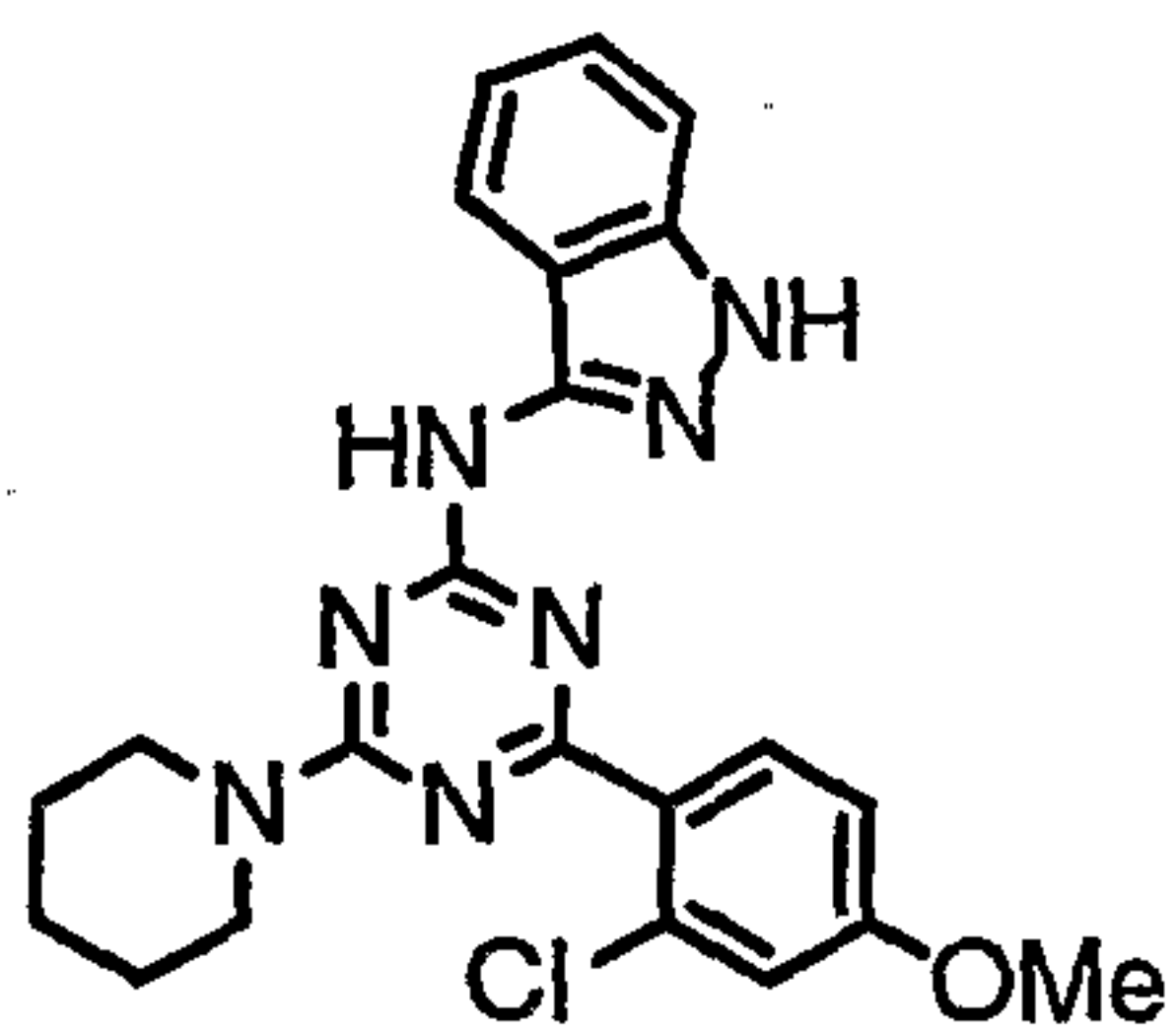
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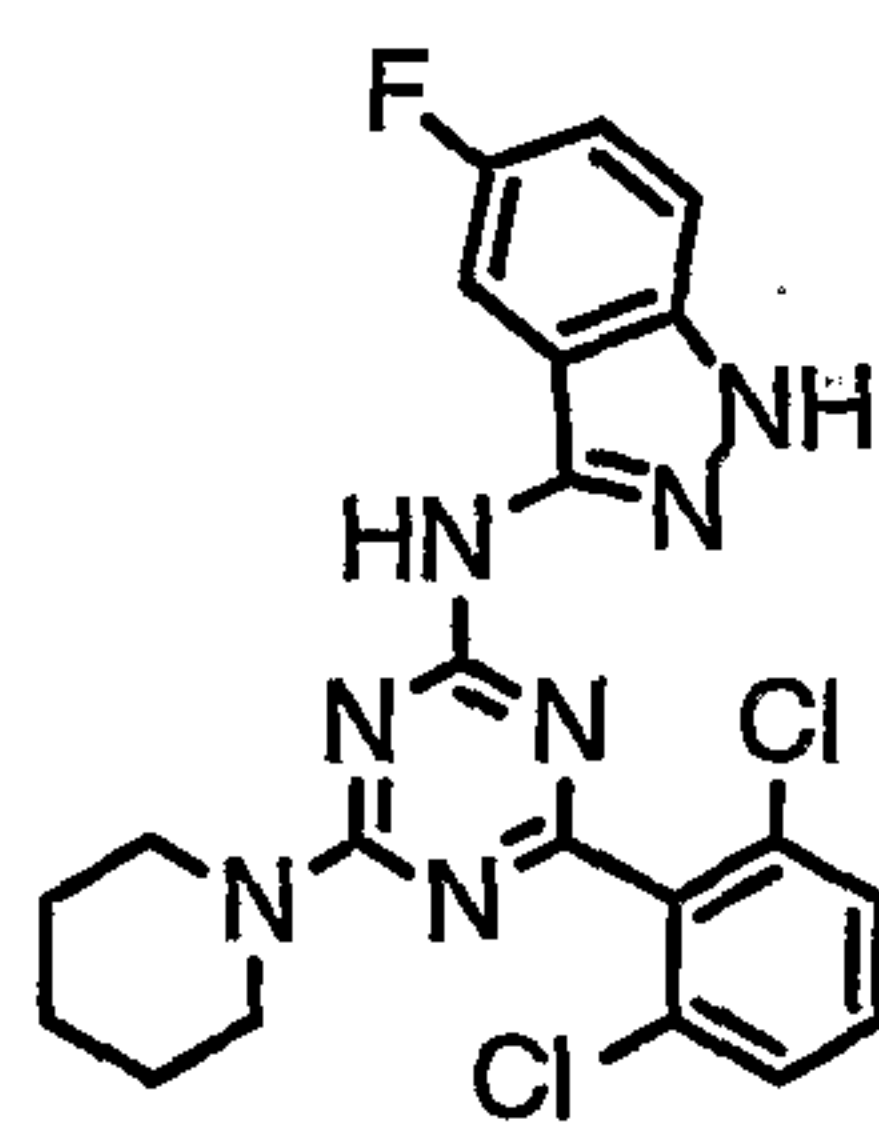
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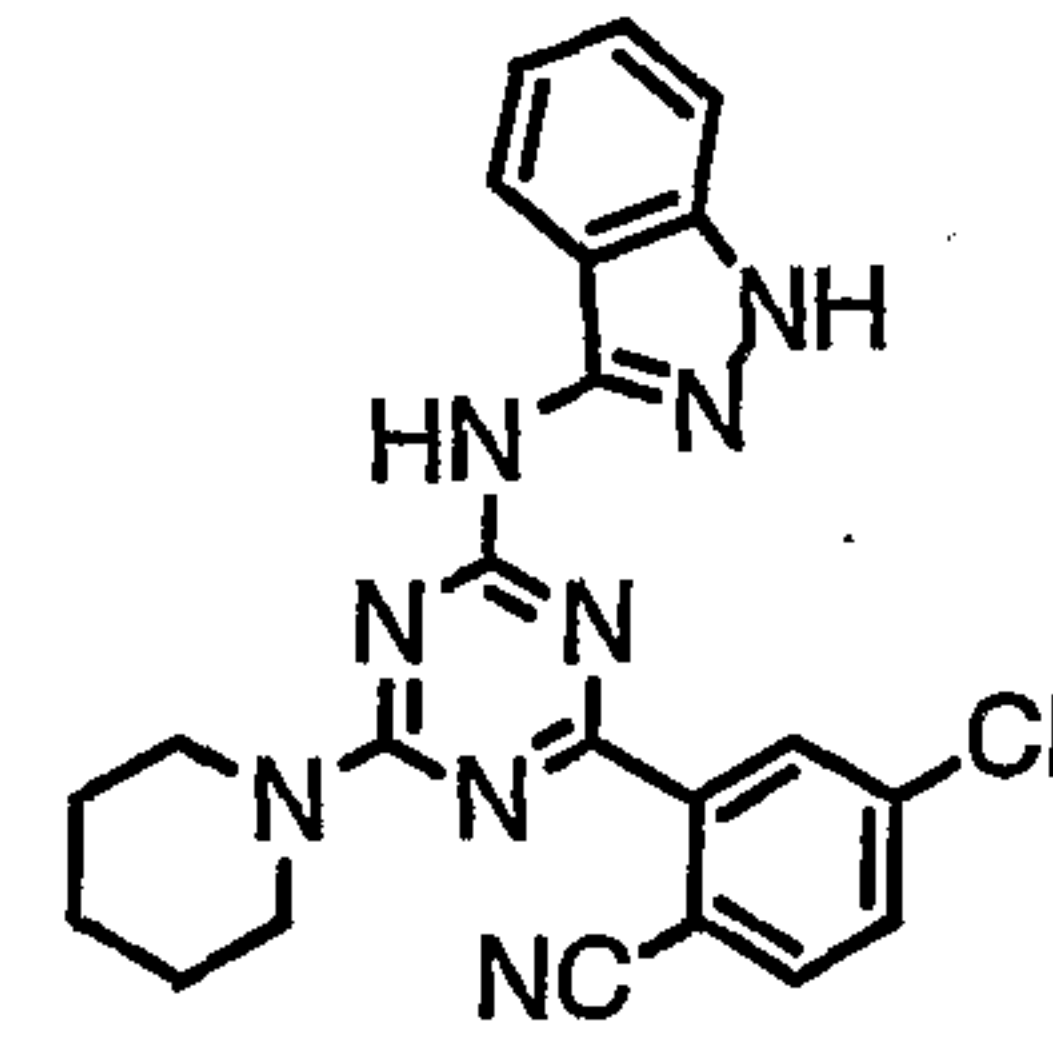
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VI-25

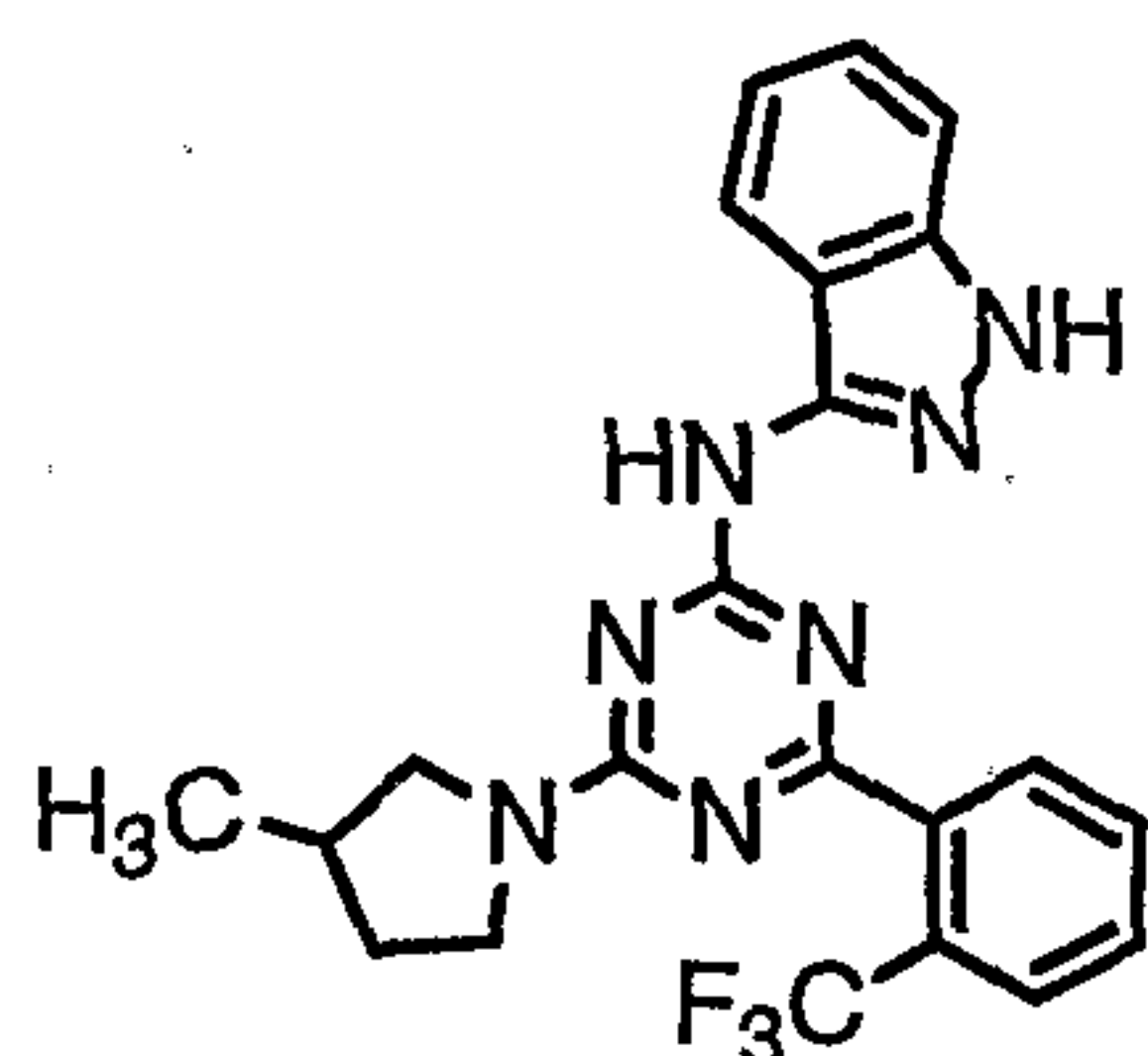


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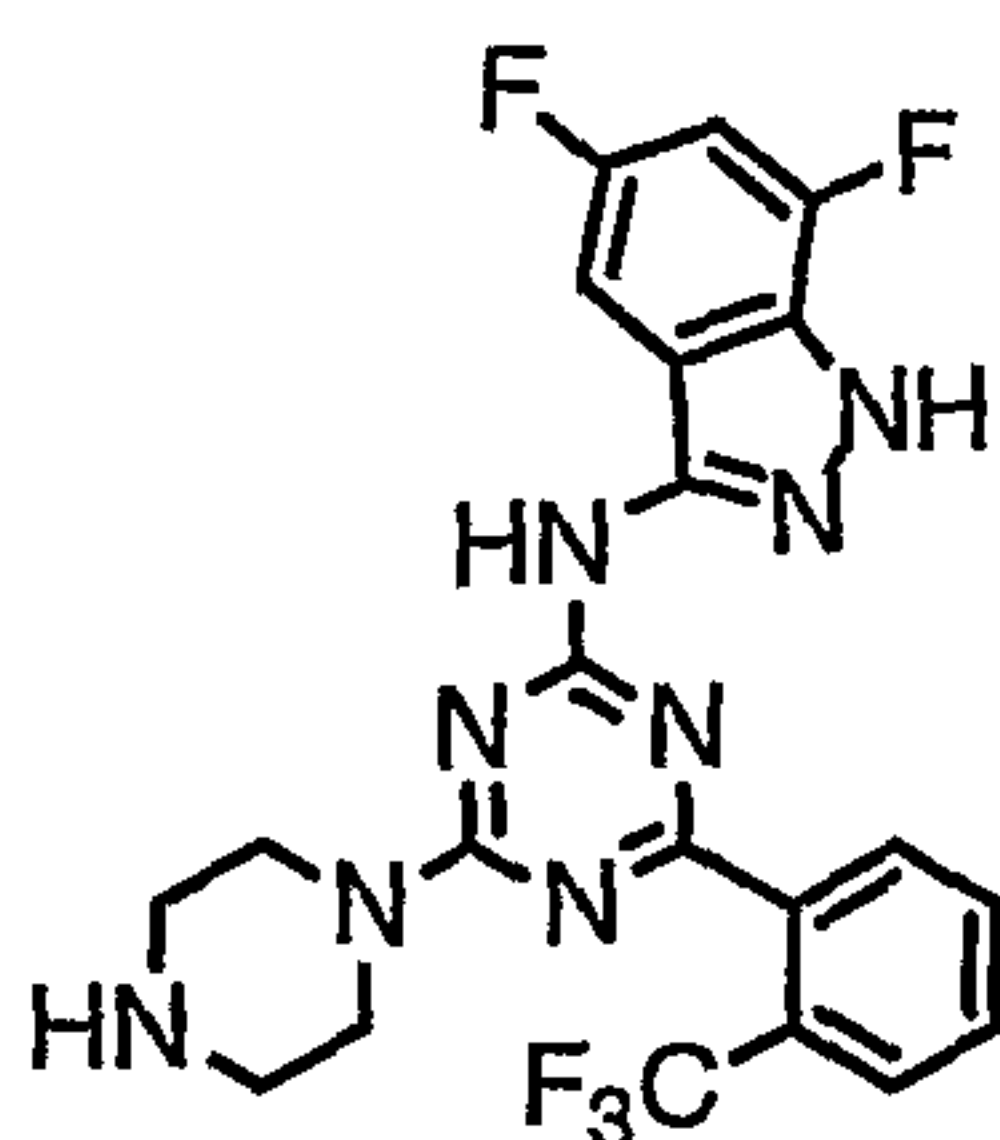


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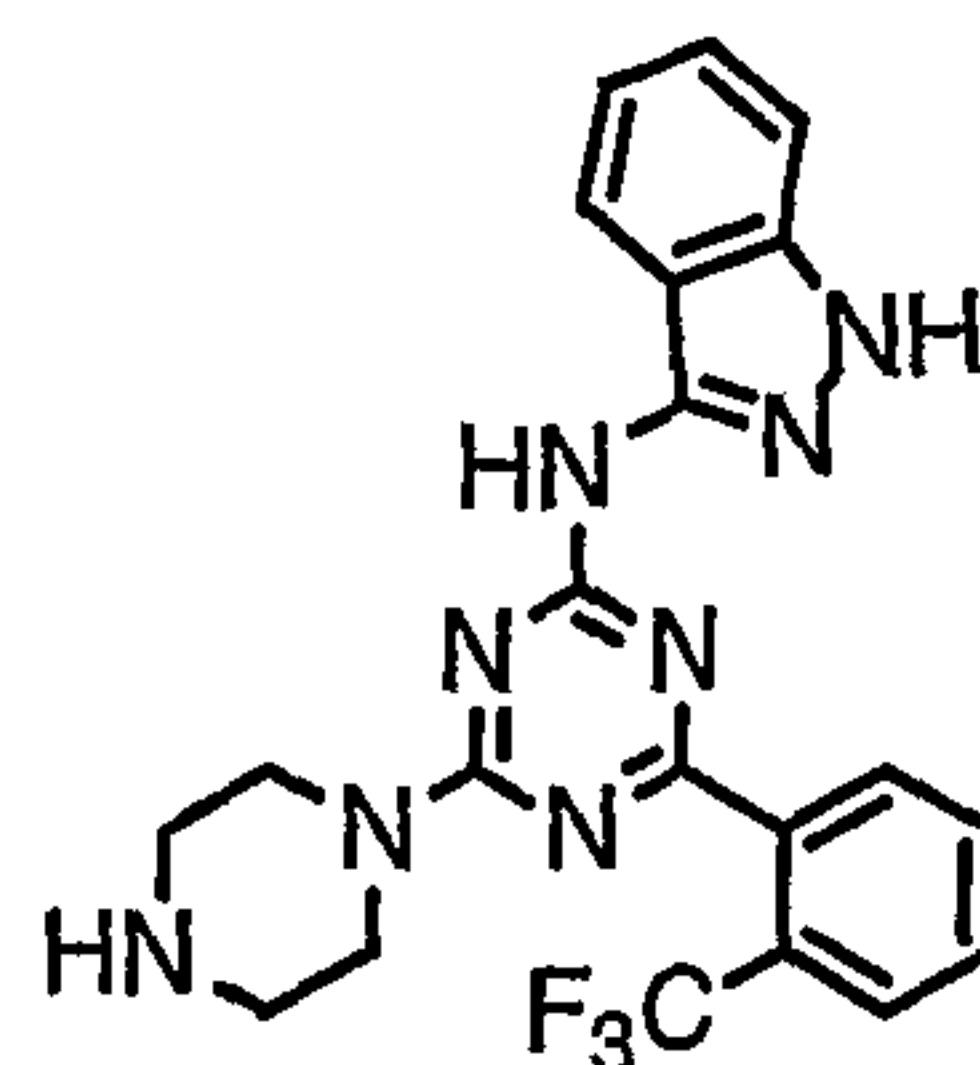
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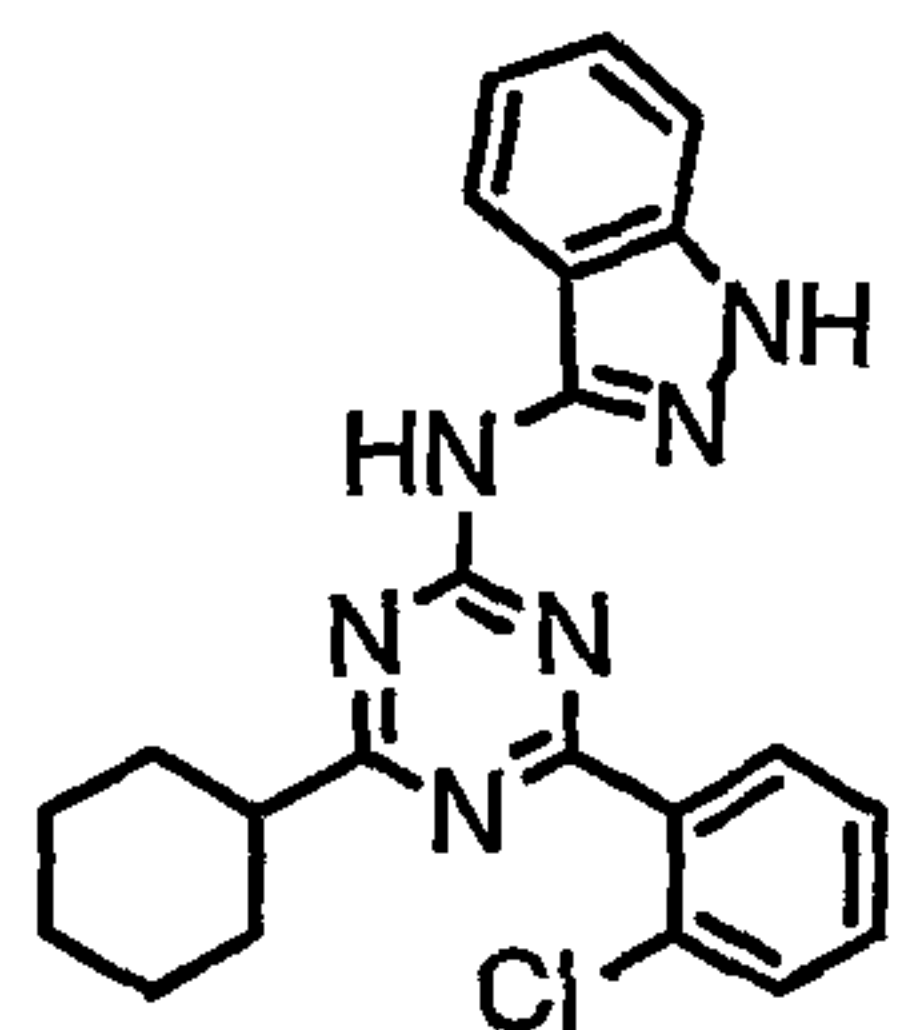
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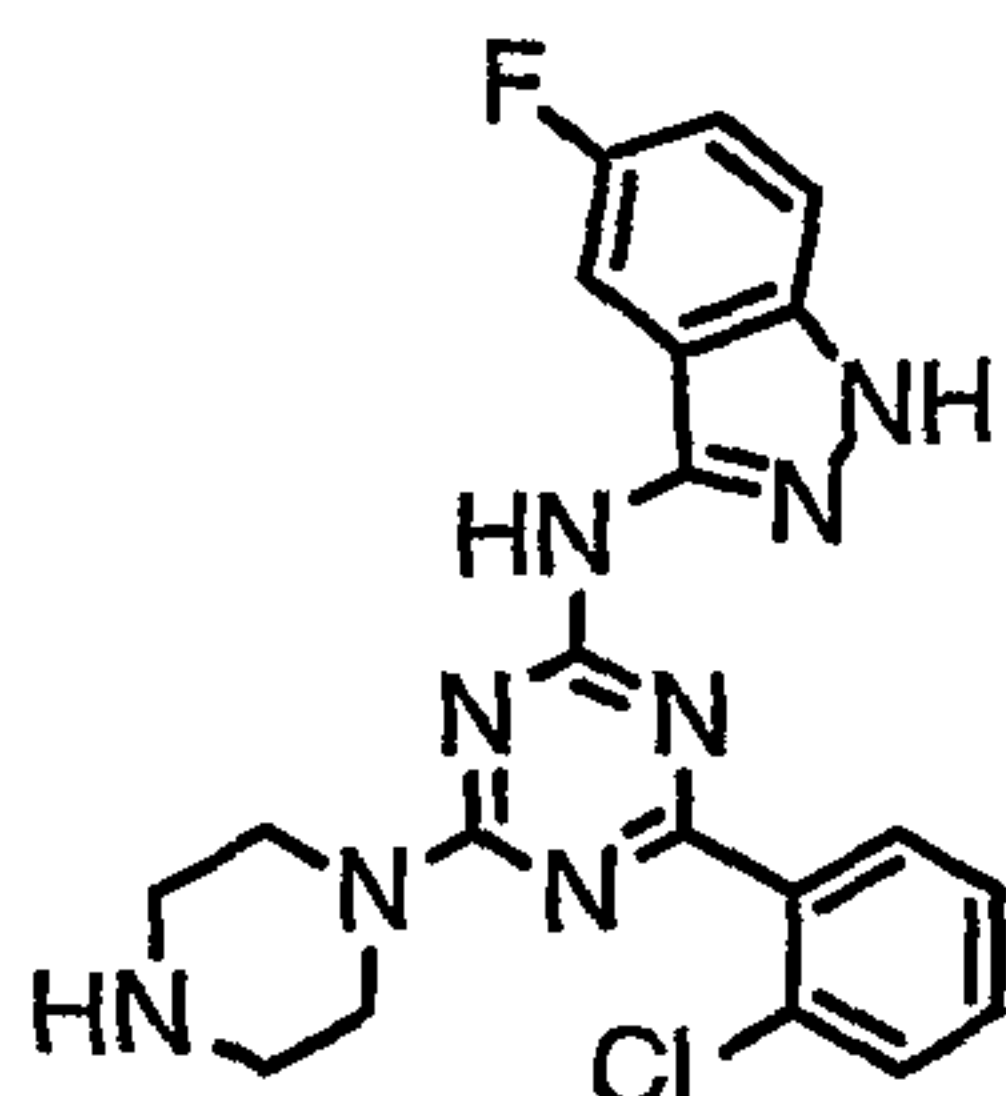
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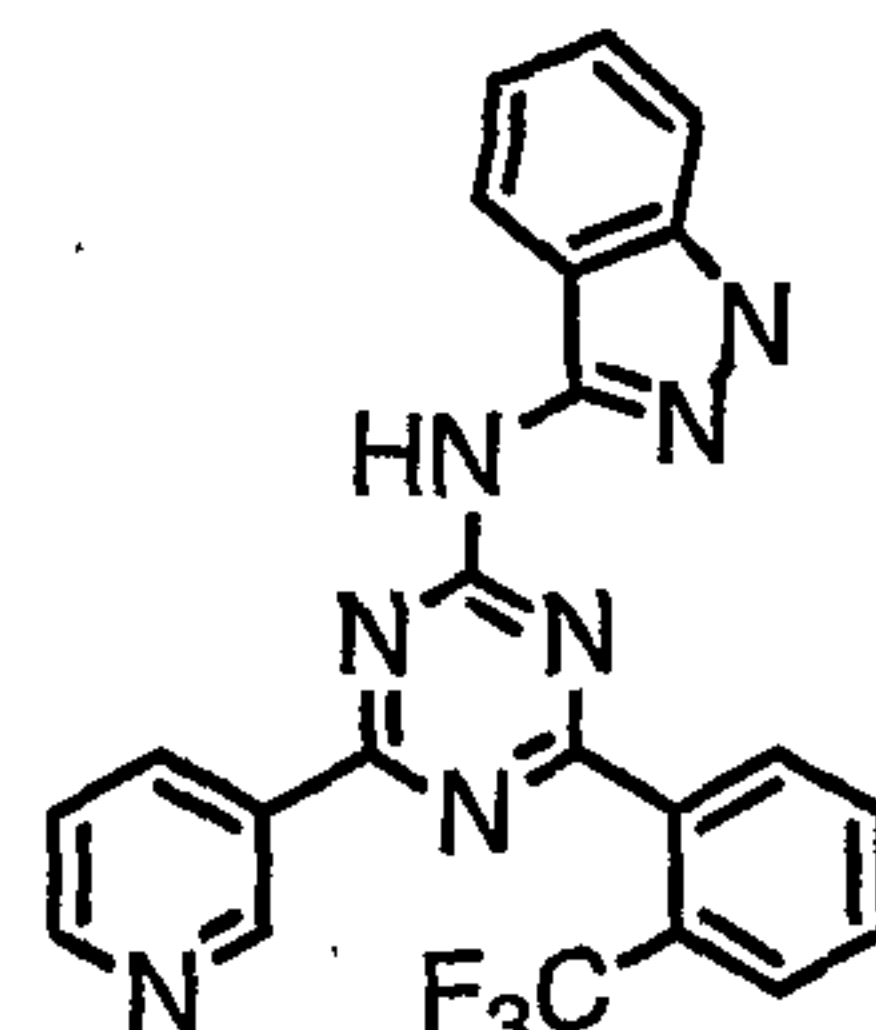
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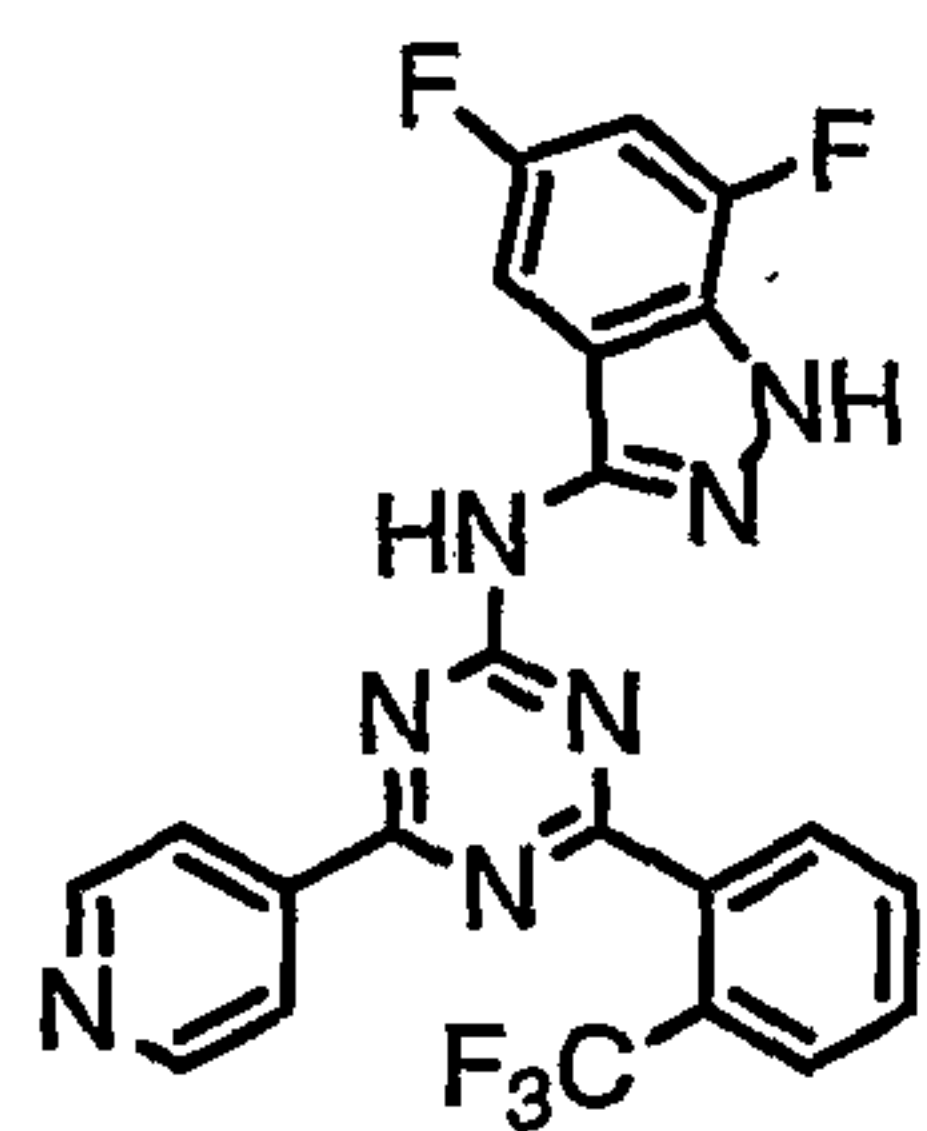
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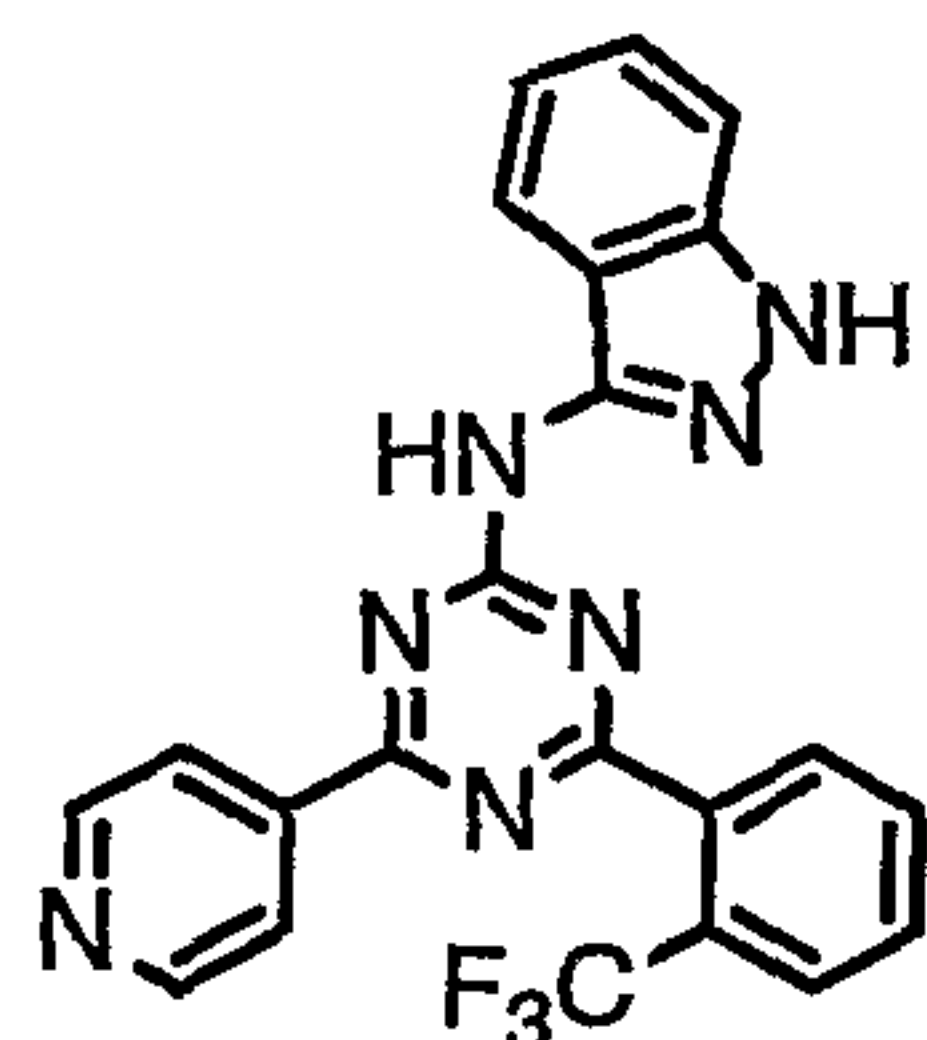
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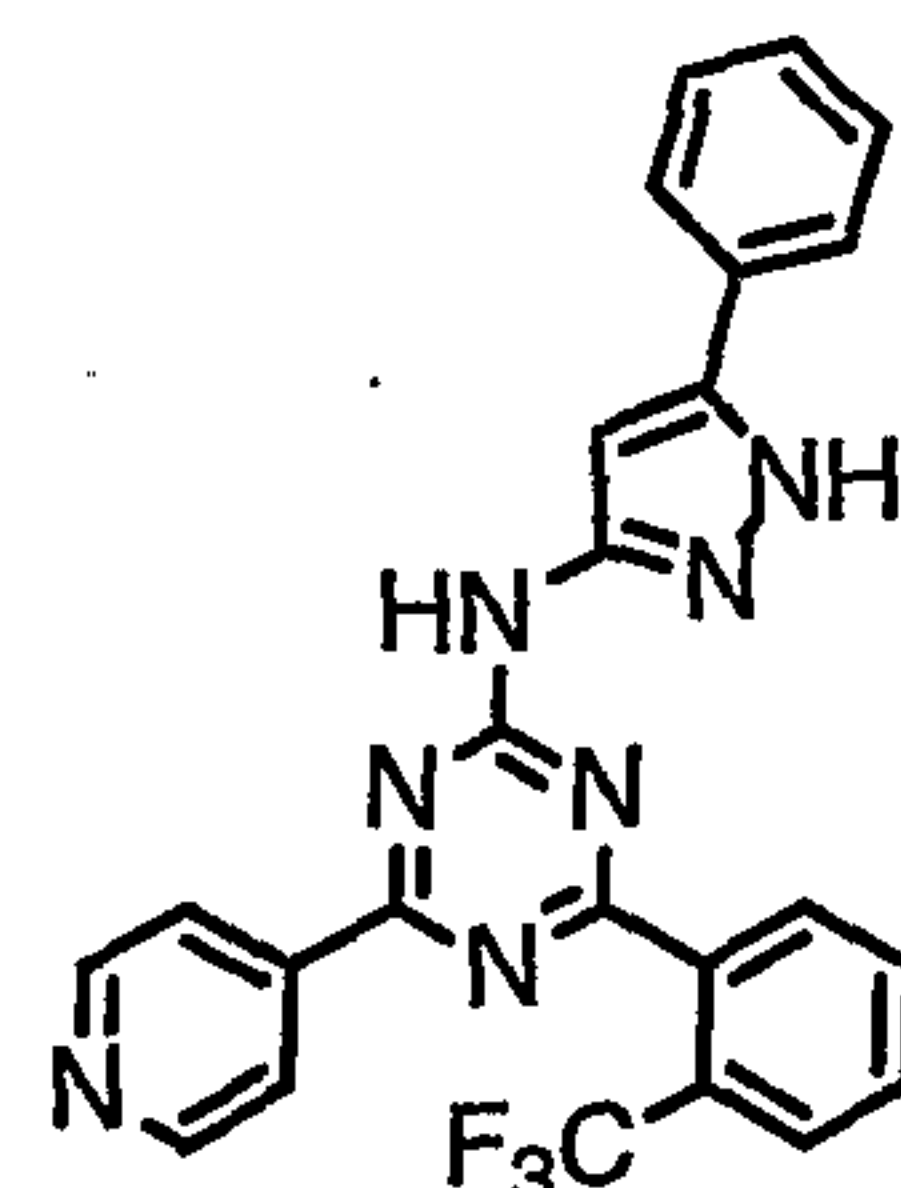
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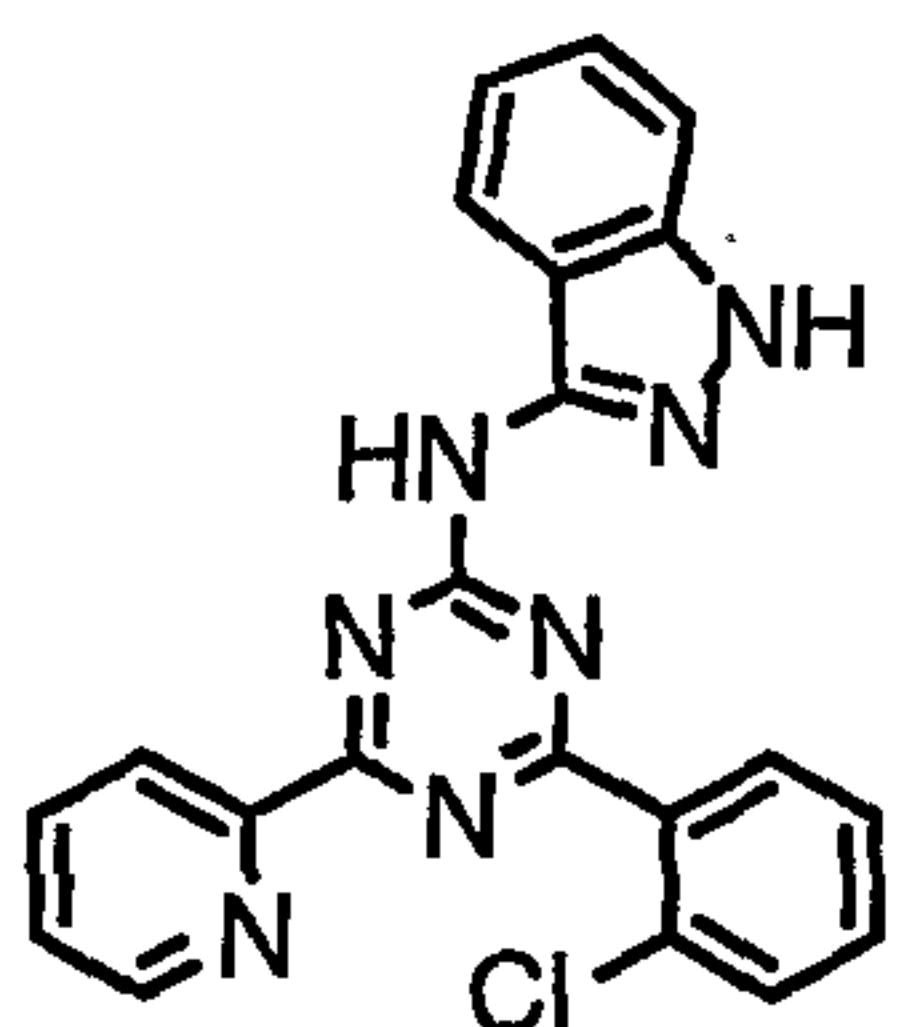
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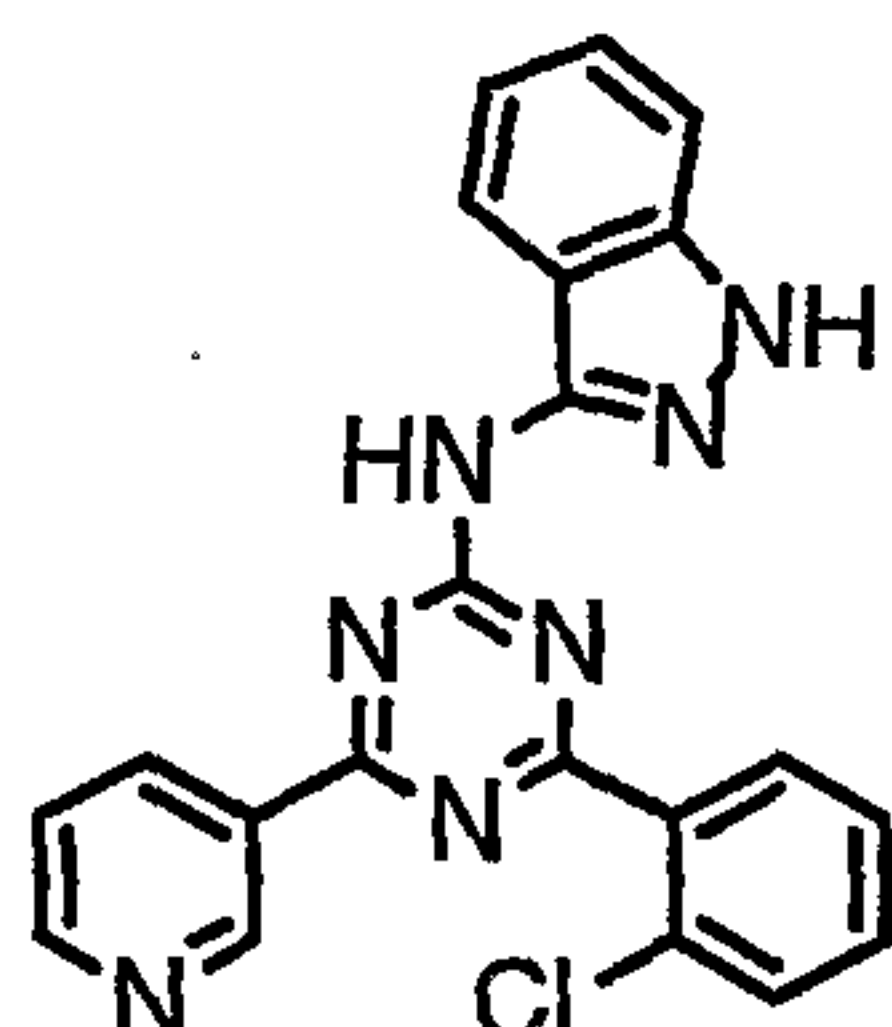
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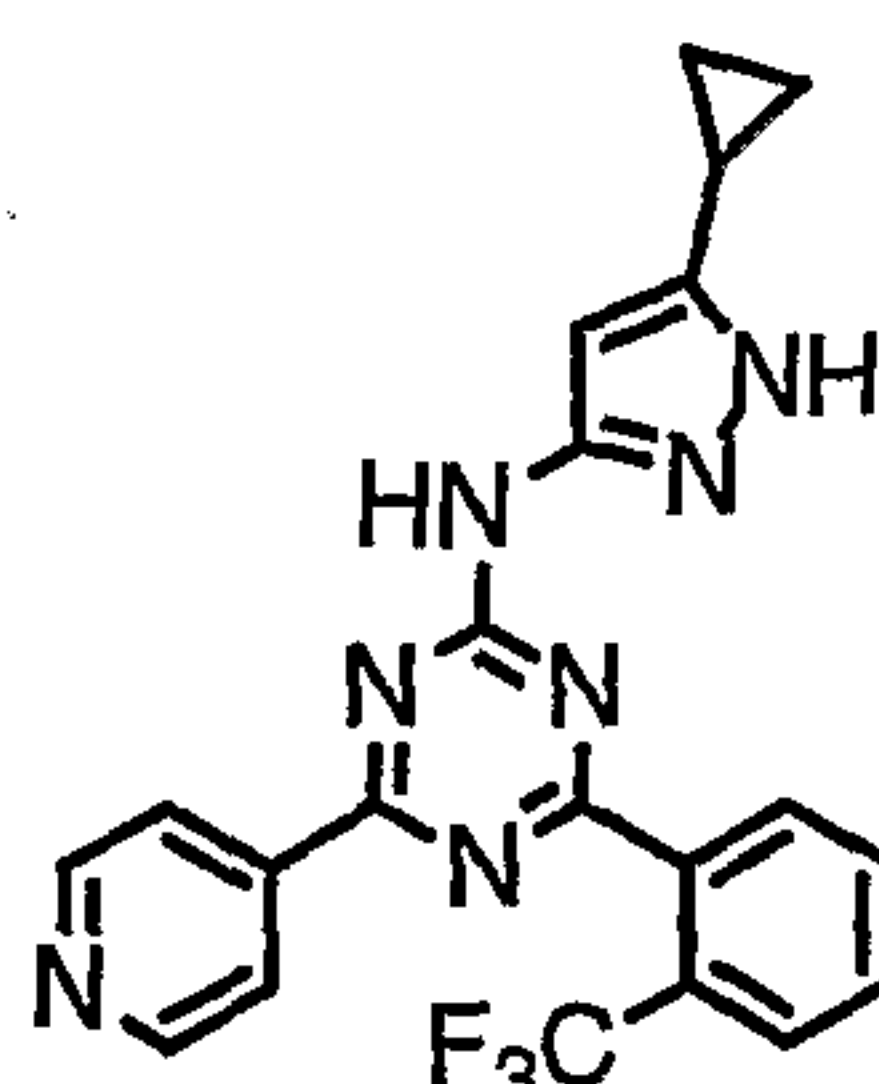
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VI-37

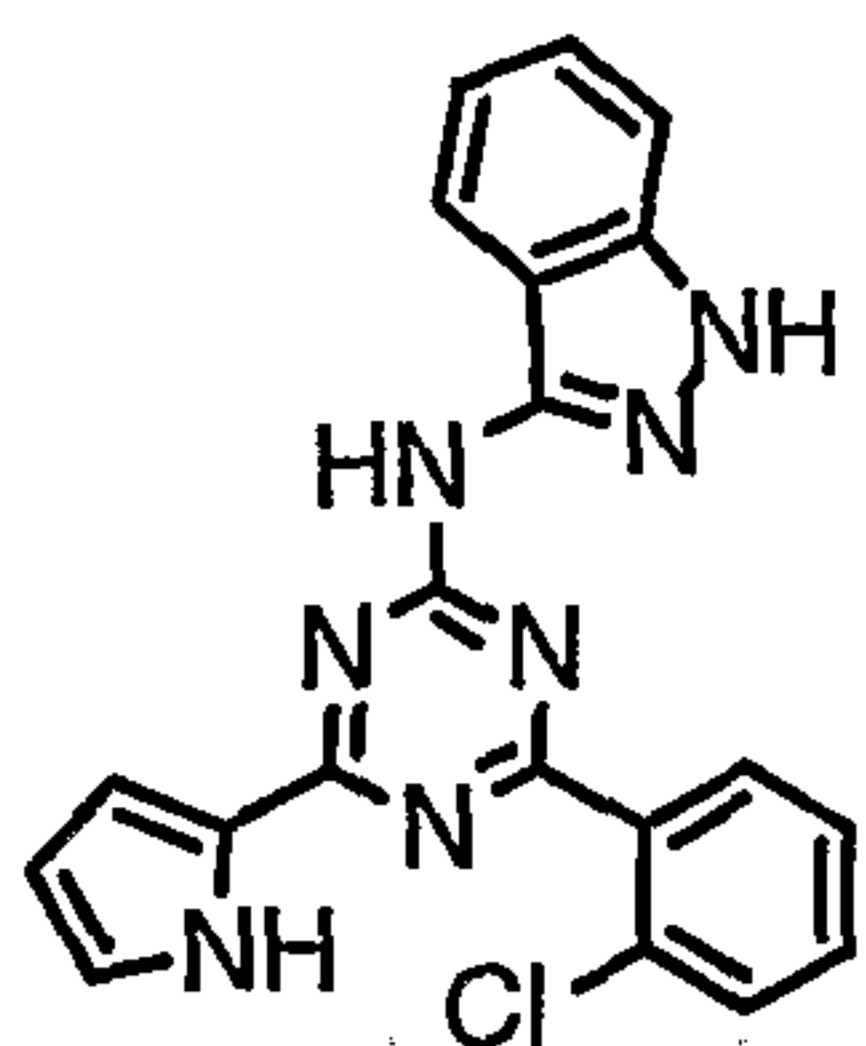


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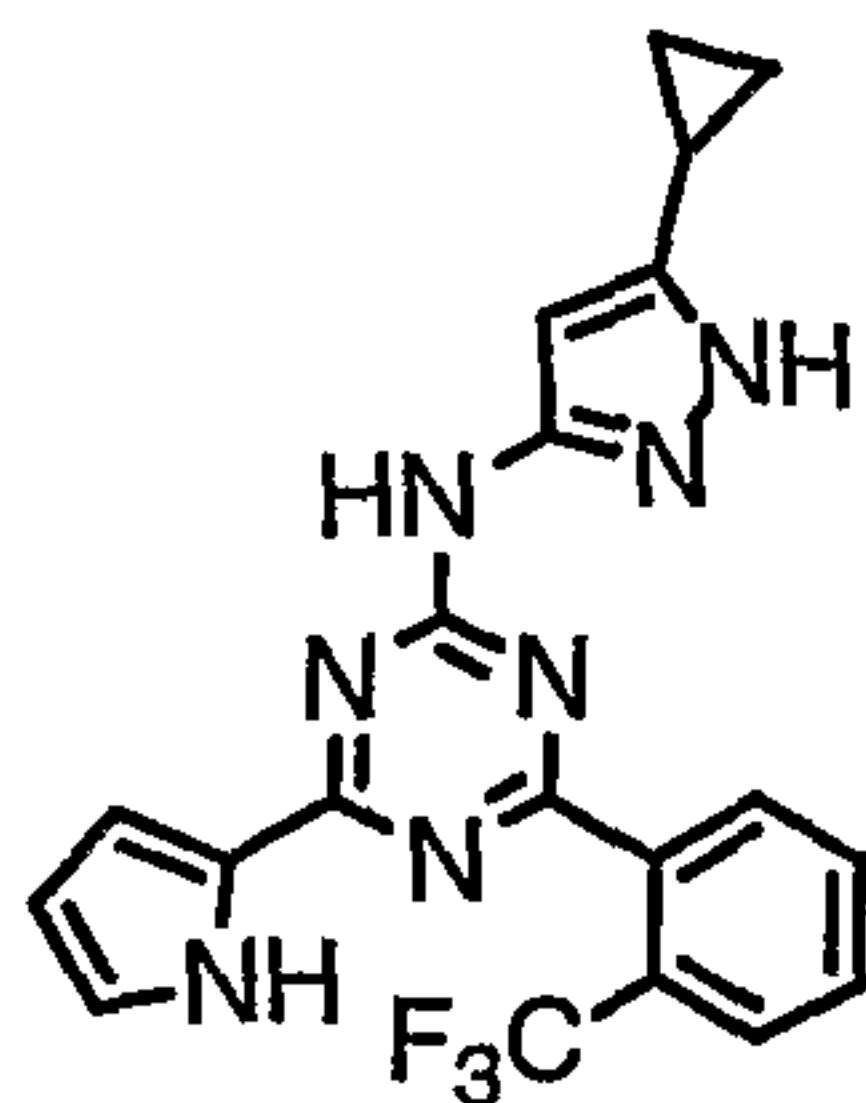


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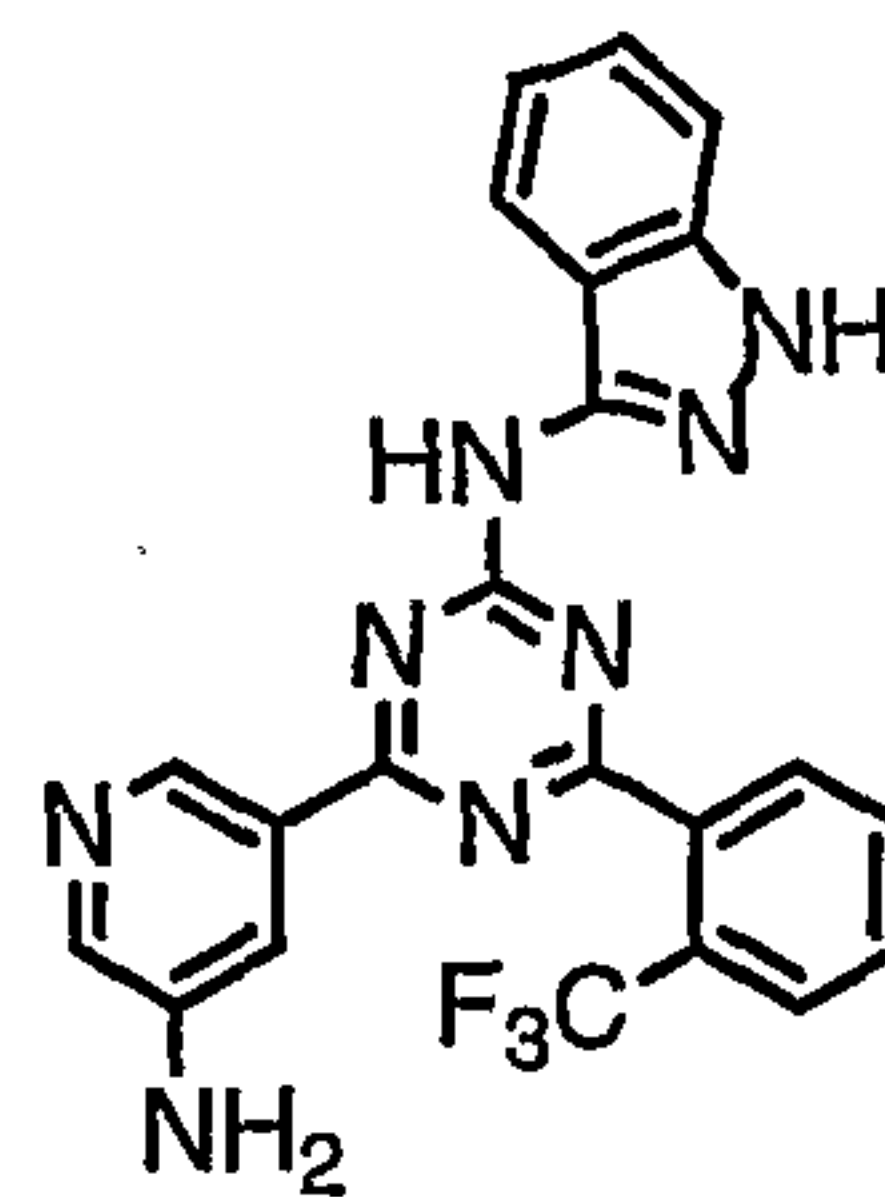
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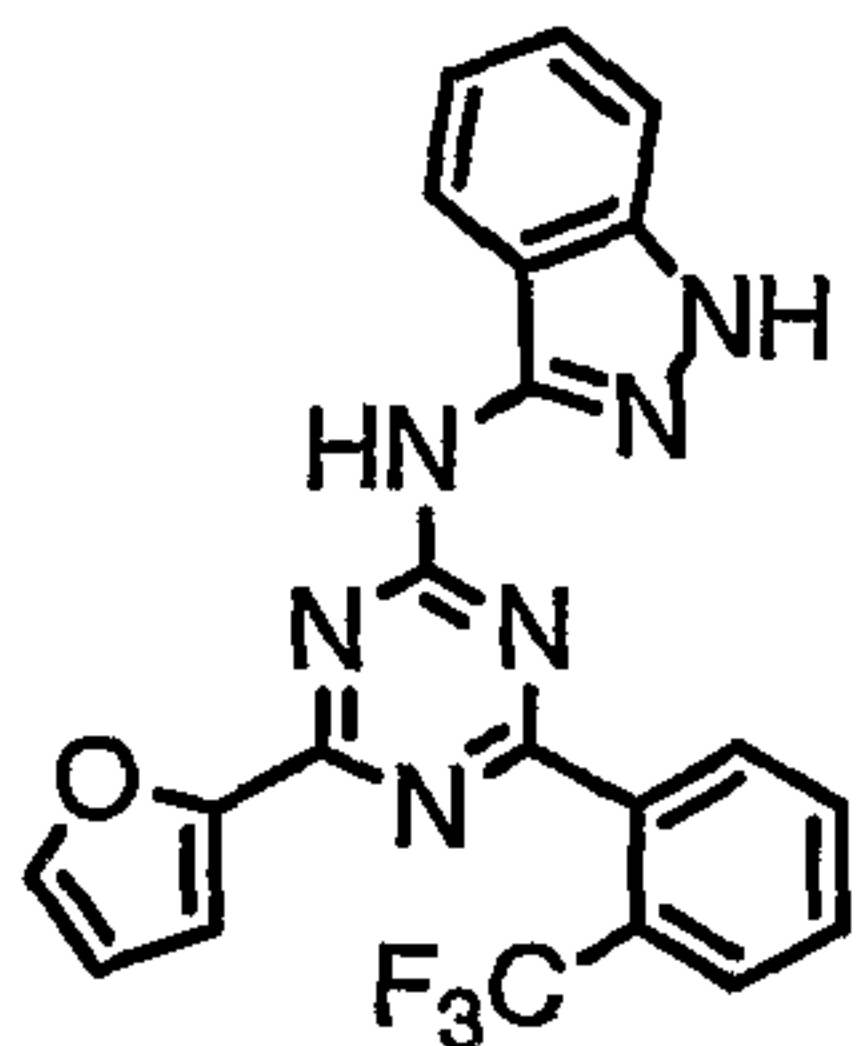
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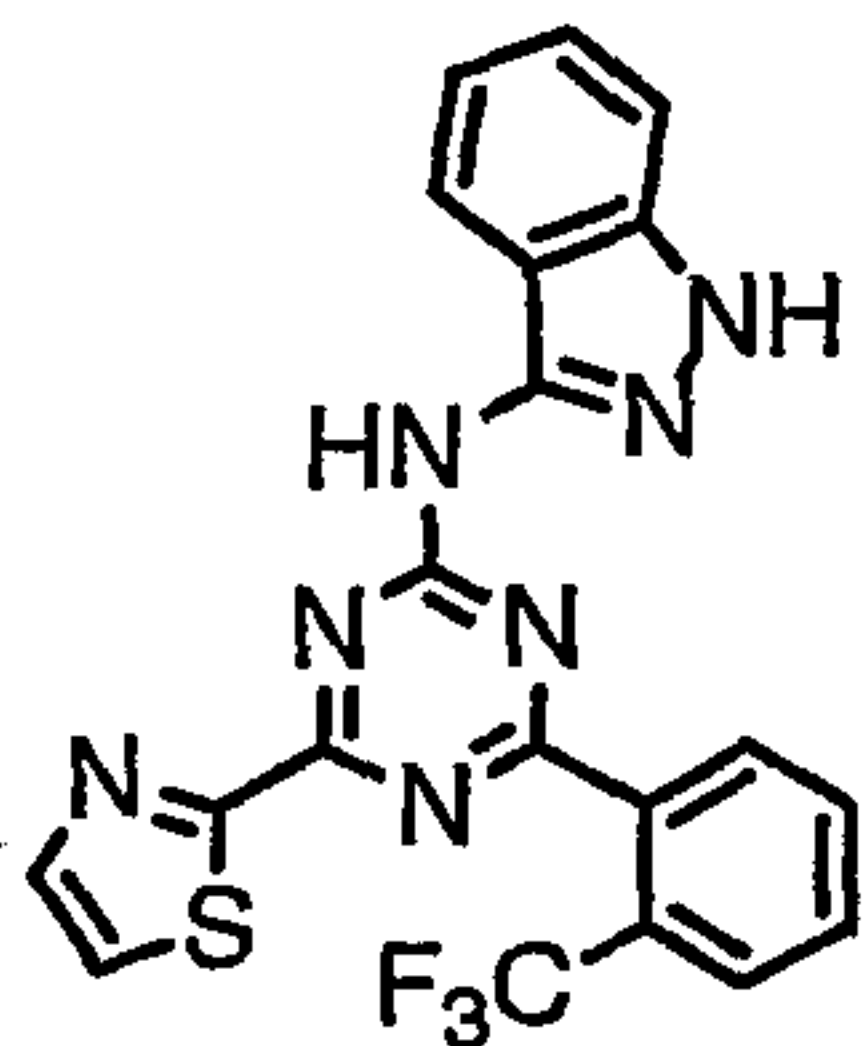
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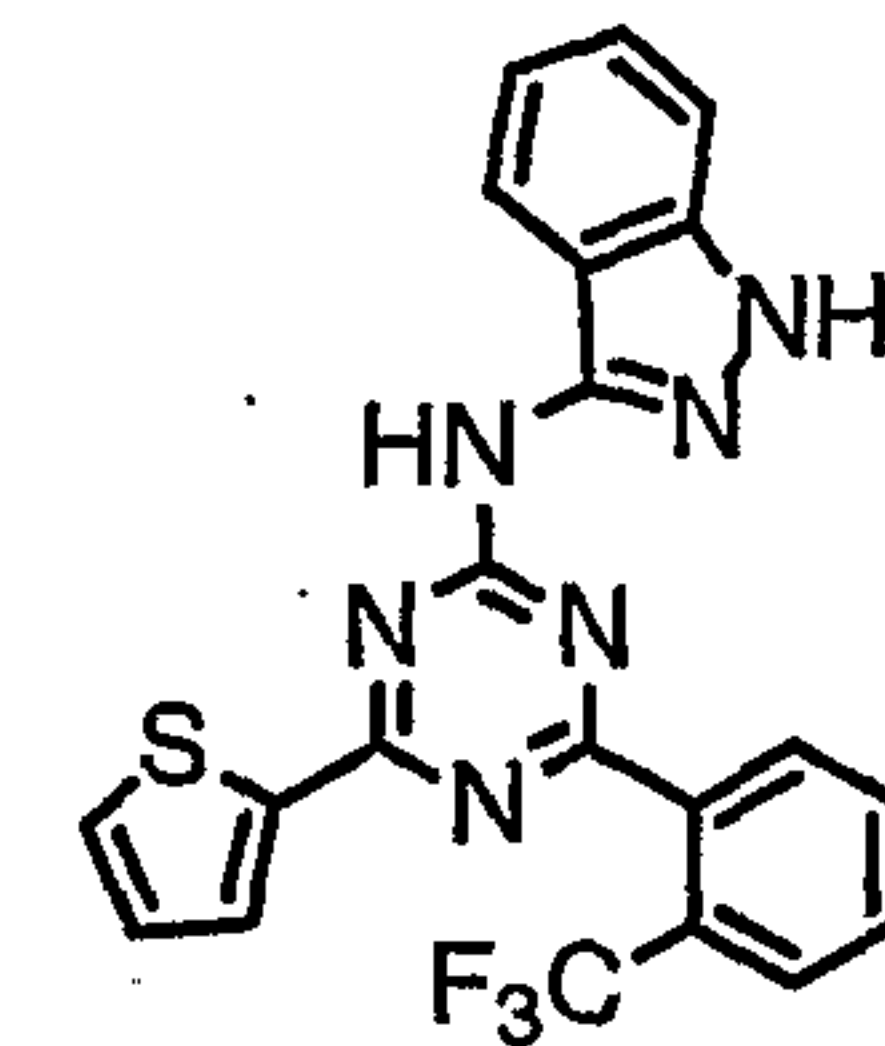
VI-42



VI-43

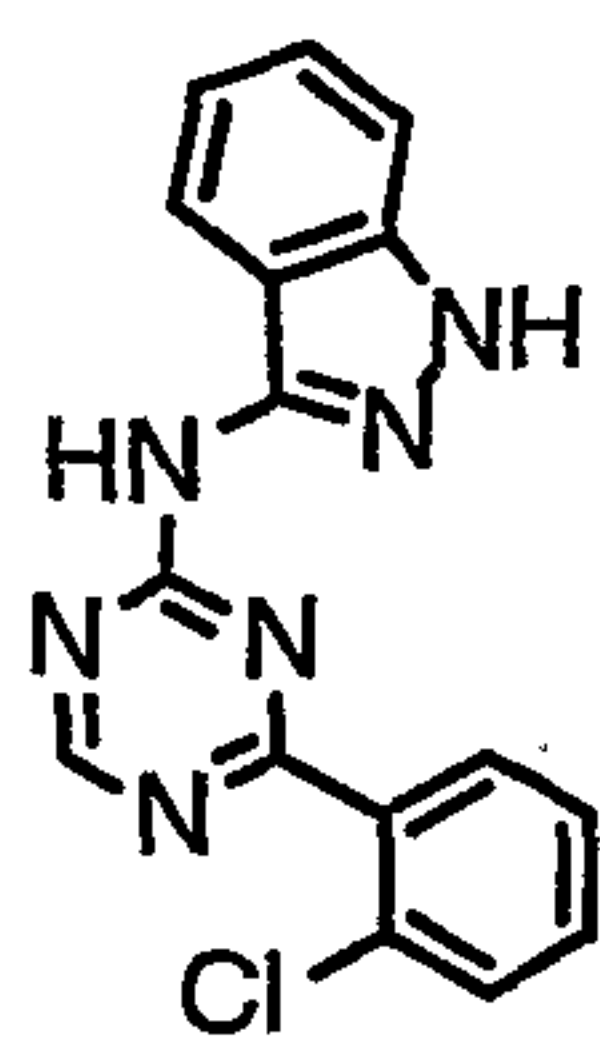


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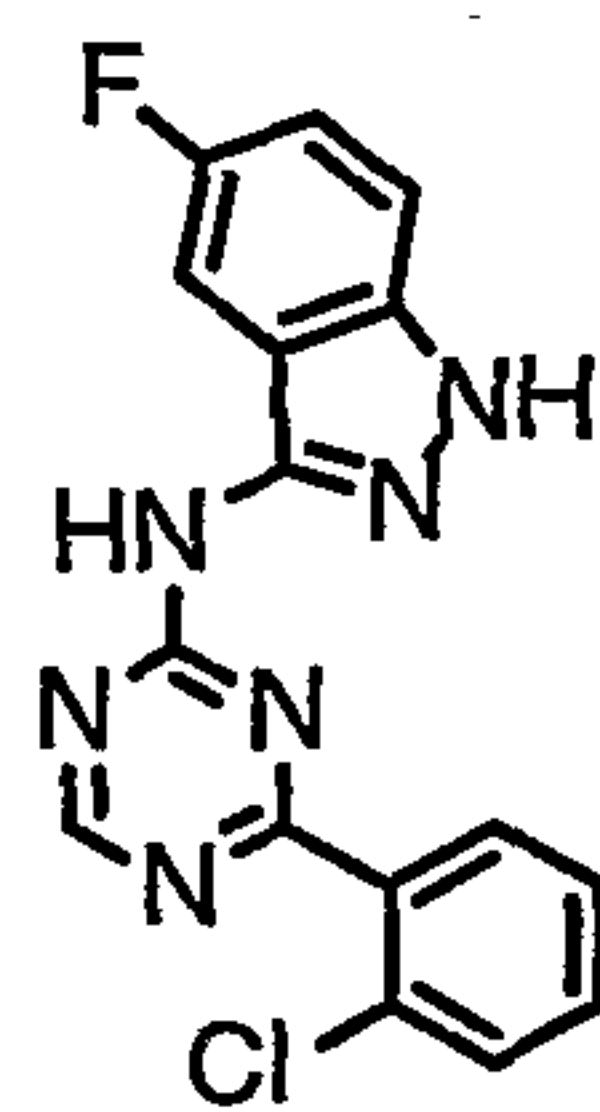


VI-45

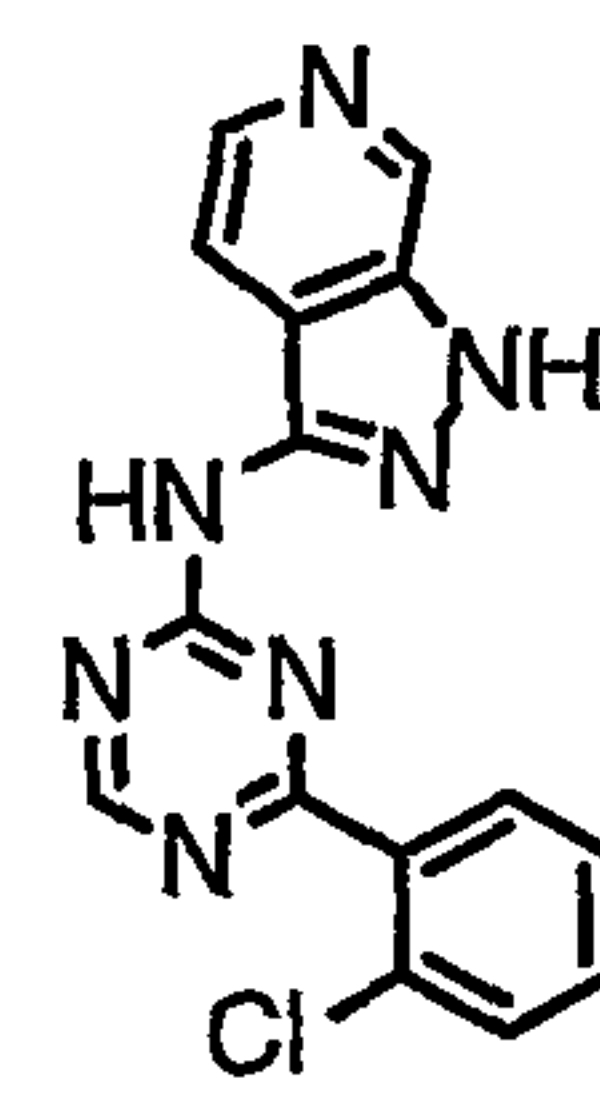
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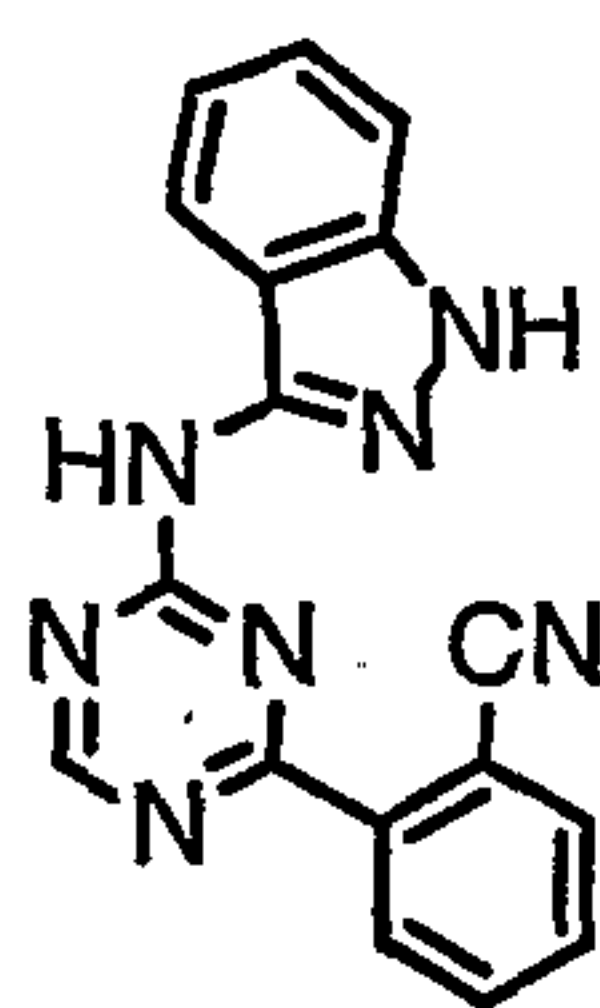
VIa-1



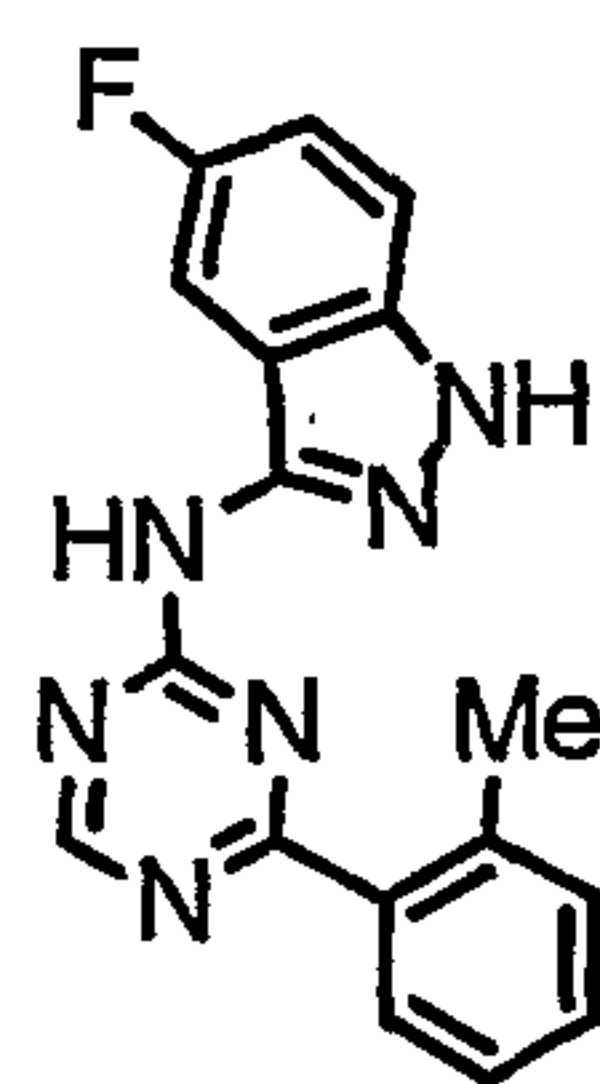
VIa-2



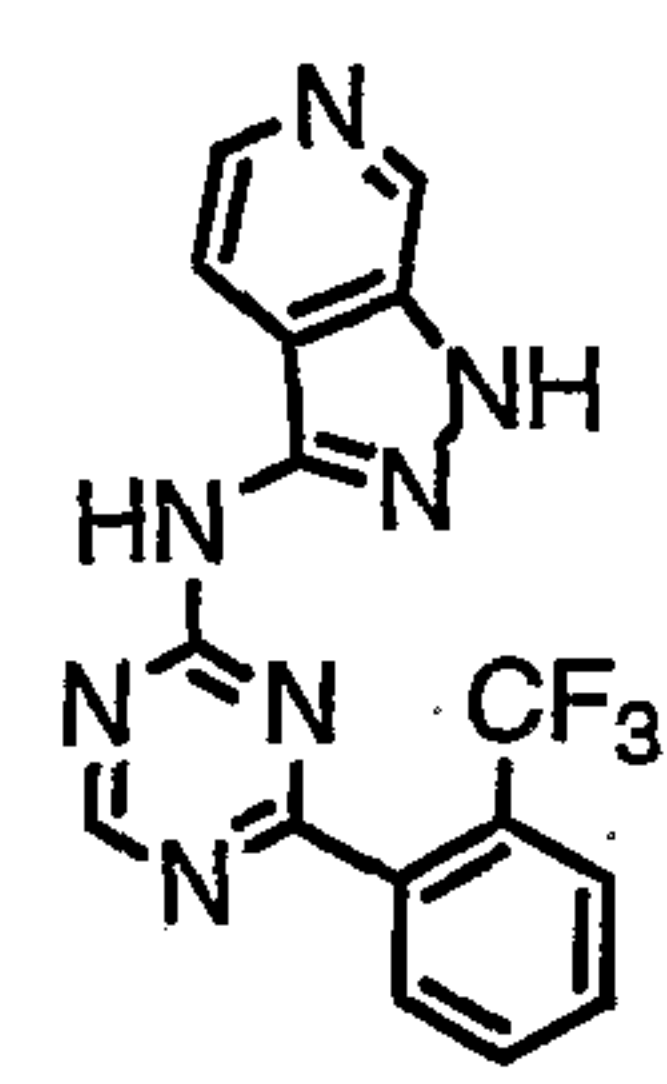
VIa-3



VIa-4

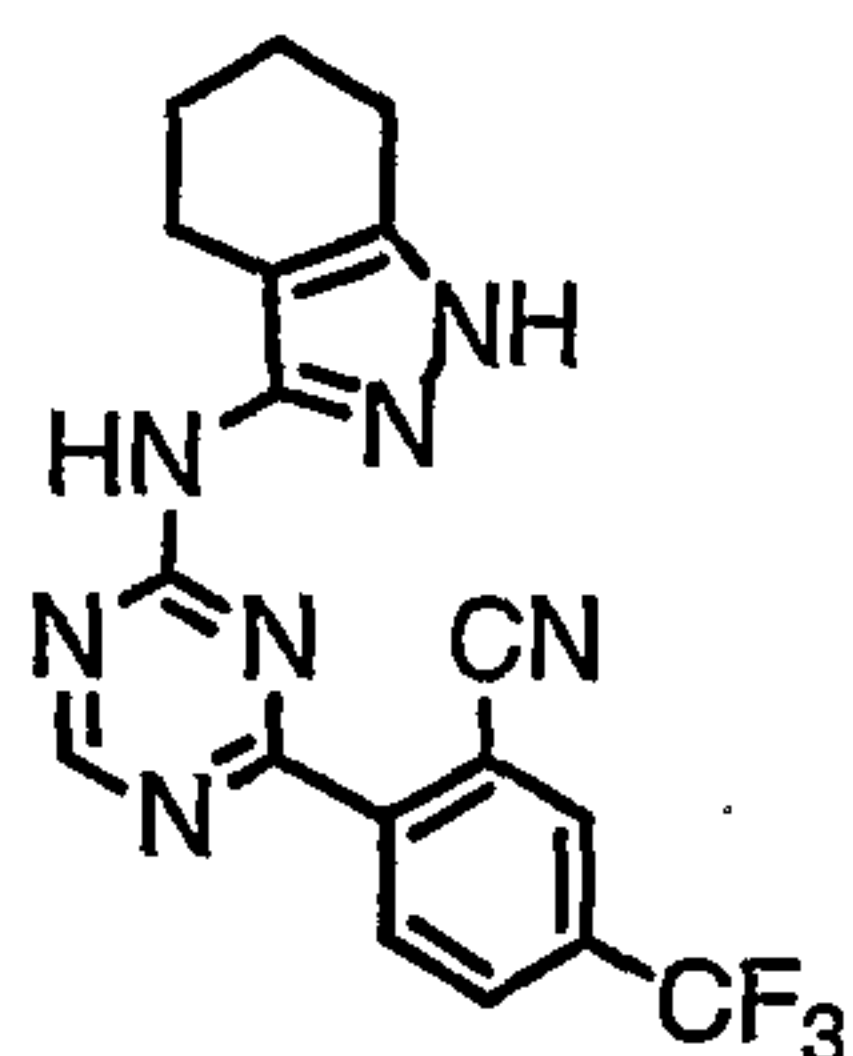


VIa-5

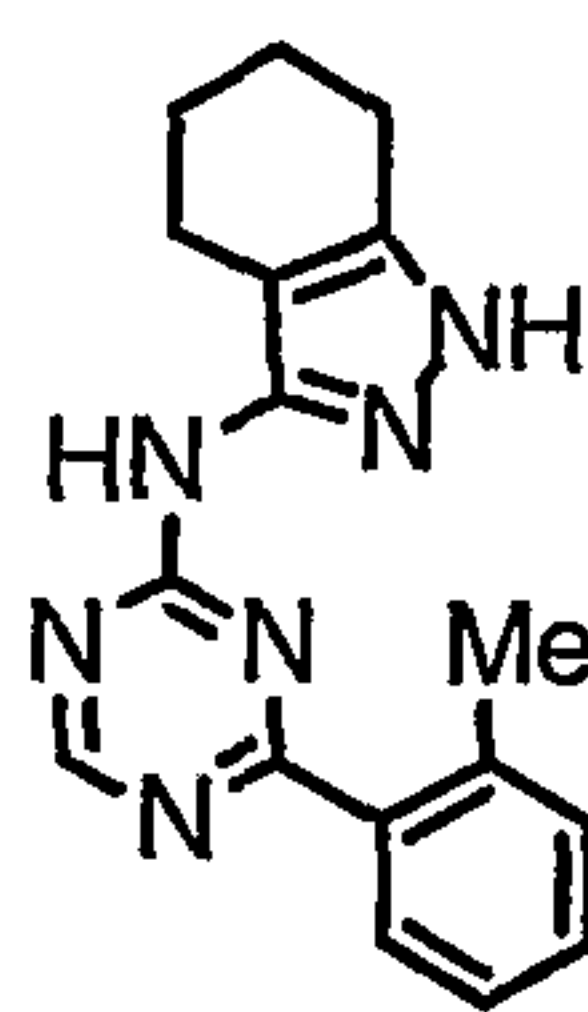


VIa-6

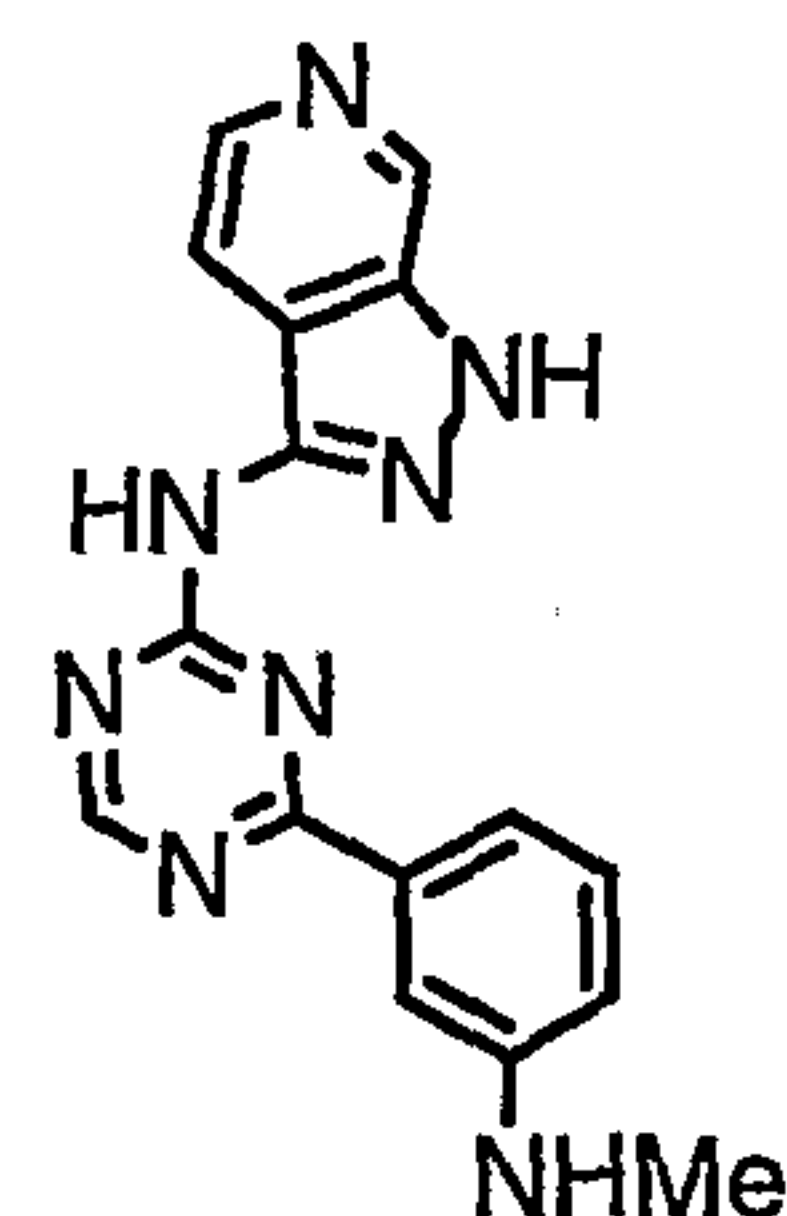
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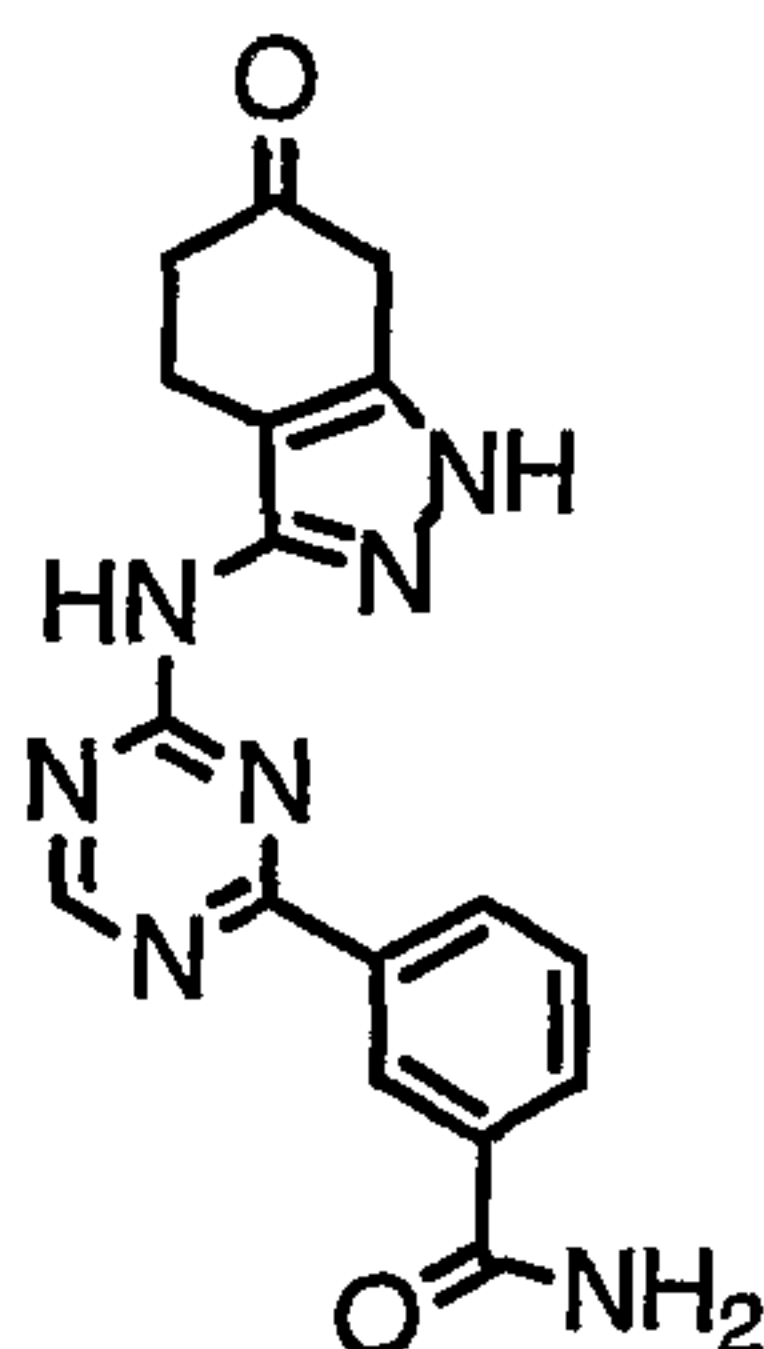
VIA-7



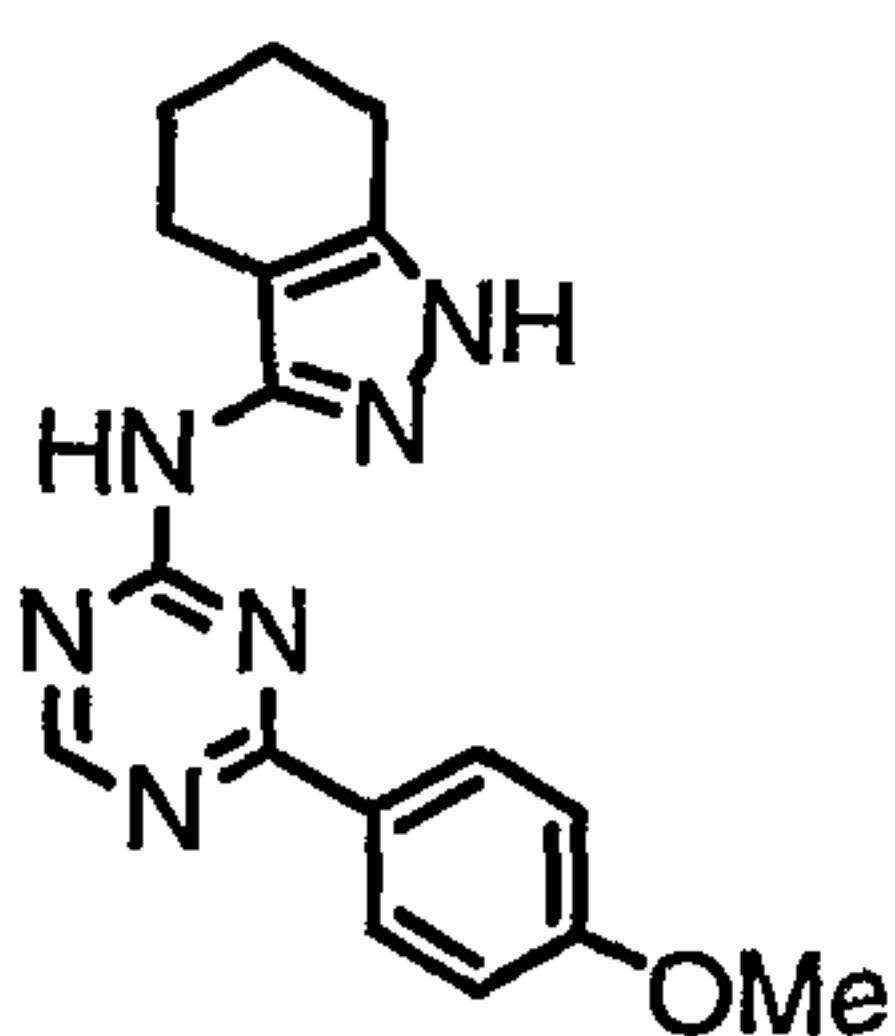
VIA-8



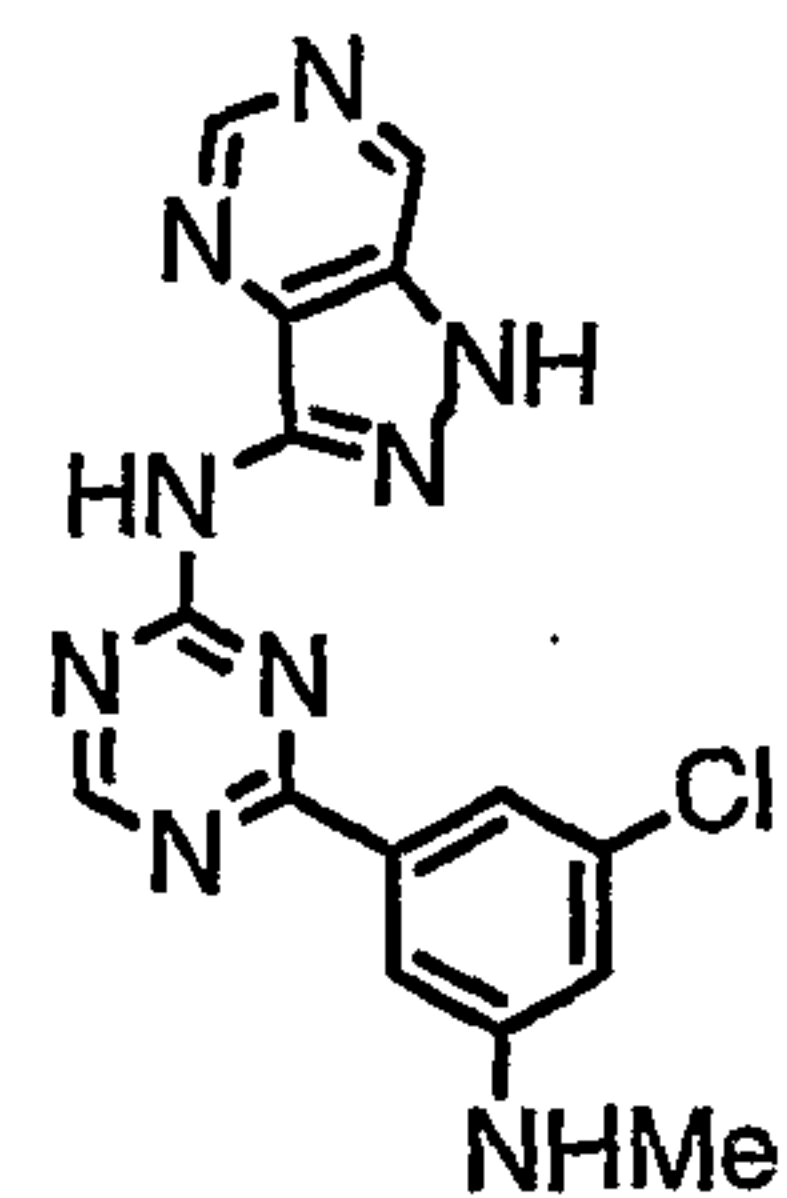
VIA-9



VIA-10



VIA-11



VIA-12

5

In another embodiment, this invention provides a composition comprising a compound of formula VI or VIA and a pharmaceutically acceptable carrier.

10

One aspect of this invention relates to a method of inhibiting GSK-3 activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula VI or VIA.

15

Another aspect relates to a method of treating a disease that is alleviated by treatment with a GSK-3 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula VI or VIA.

20

Another aspect relates to a method of enhancing glycogen synthesis and/or lowering blood levels of glucose in a patient in need thereof, comprising administering to said patient a therapeutically effective

amount of a composition comprising a compound of formula VI or VIa. This method is especially useful for diabetic patients.

Another aspect relates to a method of
5 inhibiting the production of hyperphosphorylated Tau protein in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula VI or VIa. This method is especially useful in halting
10 or slowing the progression of Alzheimer's disease.

Another aspect relates to a method of inhibiting the phosphorylation of β -catenin in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition
15 comprising a compound of formula VI or VIa. This method is especially useful for treating schizophrenia.

One aspect of this invention relates to a method of inhibiting Aurora activity in a patient, comprising administering to the patient a therapeutically
20 effective amount of a composition comprising a compound of formula VI or VIa.

Another aspect relates to a method of treating a disease that is alleviated by treatment with an Aurora inhibitor, said method comprising the step of
25 administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula VI or VIa. This method is especially useful for treating cancer, such as colon, ovarian, and breast cancer.

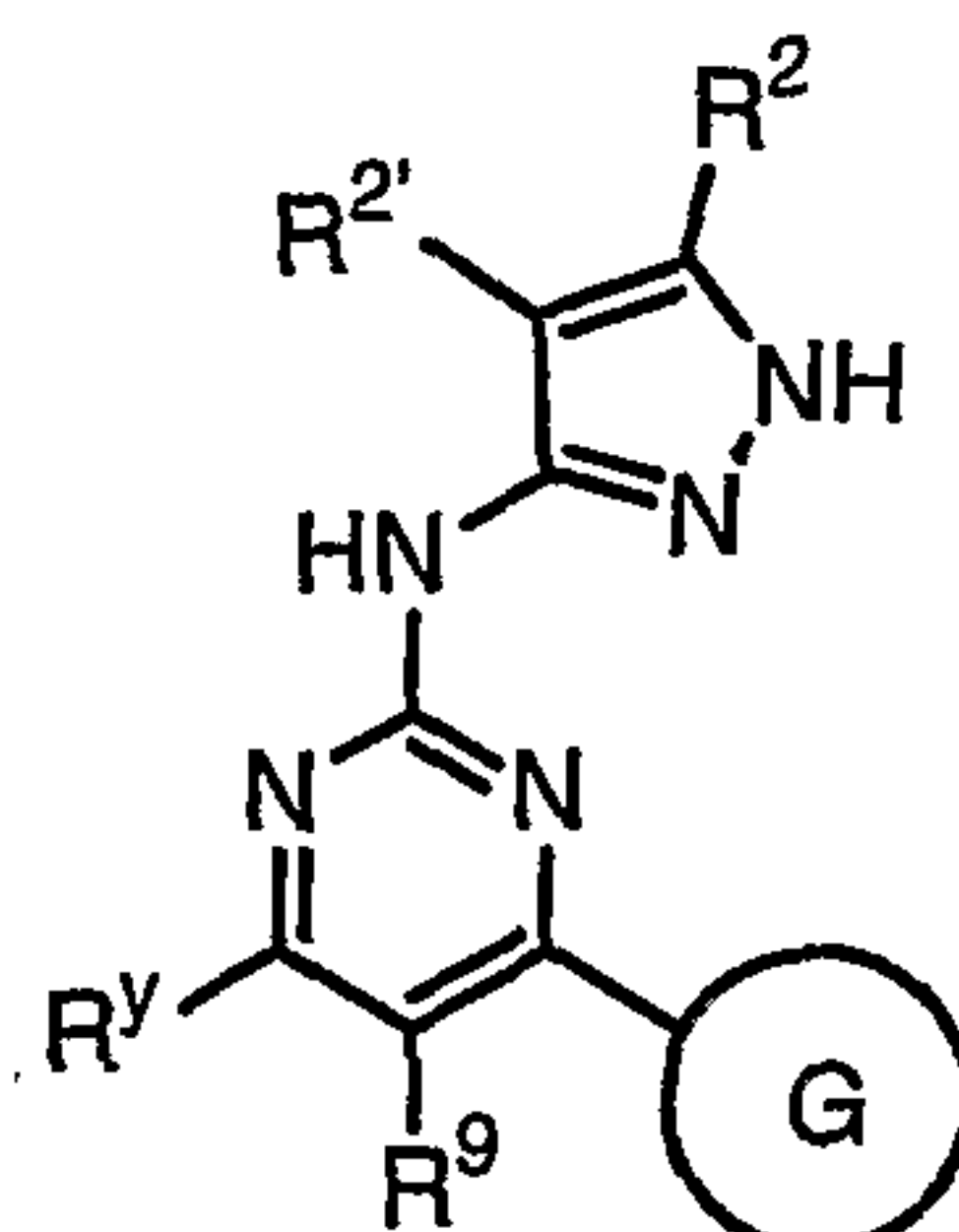
30 One aspect of this invention relates to a method of inhibiting CDK-2 activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula VI or VIa.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a CDK-2 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula VI or VIa. This method is especially useful for treating cancer, Alzheimer's disease, restenosis, angiogenesis, glomerulonephritis, cytomegalovirus, HIV, herpes, psoriasis, atherosclerosis, alopecia, and autoimmune diseases such as rheumatoid arthritis.

Another method relates to inhibiting GSK-3, Aurora, or CDK-2 activity in a biological sample, which method comprises contacting the biological sample with the GSK-3 or Aurora inhibitor of formula VI or VIa, or a pharmaceutical composition thereof, in an amount effective to inhibit GSK-3, Aurora or CDK-2.

Each of the aforementioned methods directed to the inhibition of GSK-3, Aurora or CDK-2, or the treatment of a disease alleviated thereby, is preferably carried out with a preferred compound of formula VI or VIa, as described above.

Another embodiment of this invention relates to compounds of formula VII:



VII

or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

G is Ring C or Ring D;

Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from $-R^1$, any substitutable non-ortho carbon position on Ring C is independently substituted by $-R^5$, and two adjacent substituents on Ring C are optionally taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-6 membered ring having 0-3 heteroatoms selected from oxygen, sulfur or nitrogen, said fused ring being optionally substituted by halo, oxo, or $-R^8$;

Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by oxo or $-R^5$, and at any substitutable ring nitrogen by $-R^4$, provided that when Ring D is a six-membered aryl or heteroaryl ring, $-R^5$ is hydrogen at each ortho carbon position of Ring D;

R^1 is selected from -halo, -CN, $-\text{NO}_2$, T-V- R^6 , phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C_{1-6} aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or $-R^8$, said C_{1-6} aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R^1 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^y is hydrogen or $T-R^{3''}$;

T is a valence bond, hydrogen, or a C_{1-4} alkylidene chain;

R^2 and $R^{2'}$ are independently selected from $-R$, $-T-W-R^6$, or

R^2 and $R^{2'}$ are taken together with their intervening atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring having 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur, wherein each substitutable carbon on said fused ring formed by R^2 and $R^{2'}$ is substituted by halo, oxo, $-CN$, $-NO_2$, $-R^7$, or $-V-R^6$, and any substitutable nitrogen on said ring formed by R^2 and $R^{2'}$ is substituted by R^4 ;

$R^{3''}$ is selected from an optionally substituted group selected from C_{3-10} carbocyclyl, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

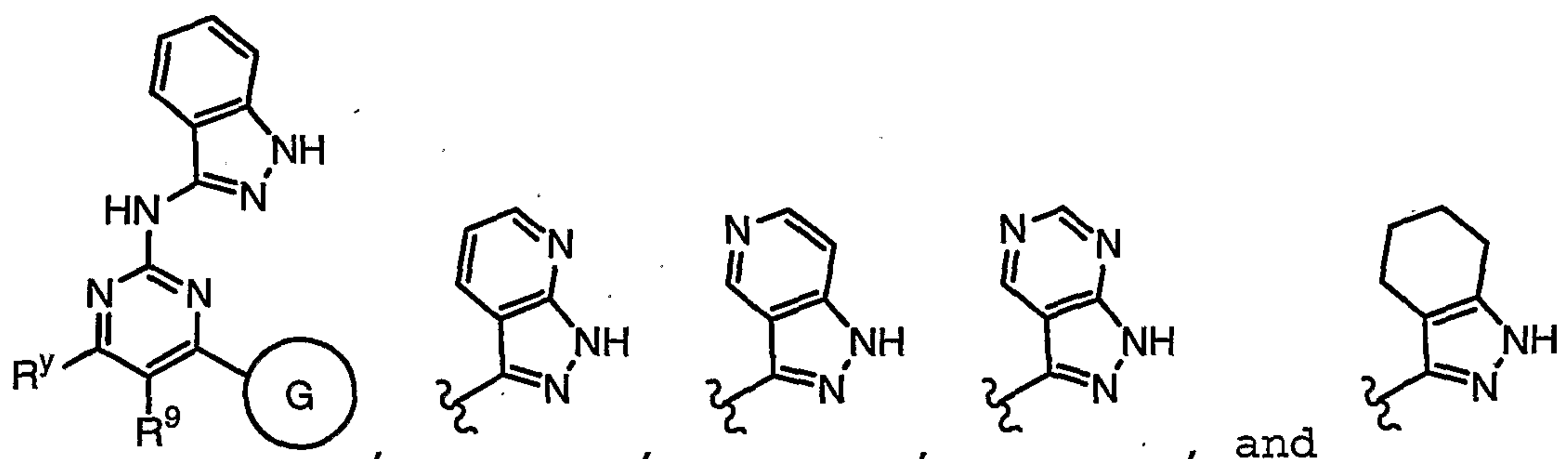
10 each R^4 is independently selected from $-R^7$, $-COR^7$, $-CO_2$ (optionally substituted C_{1-6} aliphatic), $-CON(R^7)_2$, or $-SO_2R^7$, or two R^4 on the same nitrogen are taken together to form a 5-8 membered heterocyclyl or heteroaryl ring;

15 each R^5 is independently selected from $-R$, halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$,
20 $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$, or R^5 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

- V is -O-, -S-, -SO-, -SO₂-, -N(R⁶)SO₂-, -SO₂N(R⁶)-,
 -N(R⁶)-, -CO-, -CO₂-, -N(R⁶)CO-, -N(R⁶)C(O)O-,
 -N(R⁶)CON(R⁶)-, -N(R⁶)SO₂N(R⁶)-, -N(R⁶)N(R⁶)-,
 -C(O)N(R⁶)-, -OC(O)N(R⁶)-, -C(R⁶)₂O-, -C(R⁶)₂S-,
 5 -C(R⁶)₂SO-, -C(R⁶)₂SO₂-, -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-,
 -C(R⁶)₂N(R⁶)C(O)-, -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-,
 -C(R⁶)=N-O-, -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-, or
 -C(R⁶)₂N(R⁶)CON(R⁶)-;
- W is -C(R⁶)₂O-, -C(R⁶)₂S-, -C(R⁶)₂SO-, -C(R⁶)₂SO₂-,
 10 -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-, -CO-, -CO₂-,
 -C(R⁶)OC(O)-, -C(R⁶)OC(O)N(R⁶)-, -C(R⁶)₂N(R⁶)CO-,
 -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-, -C(R⁶)=N-O-,
 -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-,
 -C(R⁶)₂N(R⁶)CON(R⁶)-, or -CON(R⁶)-;
- 15 each R⁶ is independently selected from hydrogen, an
 optionally substituted C₁₋₄ aliphatic group, or two R⁶
 groups on the same nitrogen atom are taken together
 with the nitrogen atom to form a 5-6 membered
 heterocyclyl or heteroaryl ring;
- 20 each R⁷ is independently selected from hydrogen or an
 optionally substituted C₁₋₆ aliphatic group, or two R⁷
 on the same nitrogen are taken together with the
 nitrogen to form a 5-8 membered heterocyclyl or
 heteroaryl ring;
- 25 each R⁸ is independently selected from an optionally
 substituted C₁₋₄ aliphatic group, -OR⁶, -SR⁶, -COR⁶,
 -SO₂R⁶, -N(R⁶)₂, -N(R⁶)N(R⁶)₂, -CN, -NO₂, -CON(R⁶)₂, or
 -CO₂R⁶; and
- R⁹ is selected from -R, halo, -OR, -C(=O)R, -CO₂R, -COCOR,
 30 -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂,
 -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally
 substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂,
 -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or
 -OC(=O)N(R⁴)₂.

Preferred R^Y groups of formula VII include $T-R^{3''}$ wherein T is a valence bond or a methylene. Preferred $R^{3''}$ groups include an optionally substituted group selected from C_{3-6} carbocyclyl, phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring. Examples of preferred R^Y include 2-pyridyl, 4-pyridyl, piperidinyl, cyclopropyl, and an optionally substituted phenyl such as phenyl or halo-substituted phenyl.

The R^2 and $R^{2'}$ groups of formula VII may be taken together to form a fused ring, thus providing a bicyclic ring system containing a pyrazole ring. Preferred fused rings include benzo, pyrido, pyrimido, and a partially unsaturated 6-membered carbocyclo ring. These are exemplified in the following formula VII compounds having a pyrazole-containing bicyclic ring system:



Preferred substituents on the $R^2/R^{2'}$ fused ring include one or more of the following: -halo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), $-CN$, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, and $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group. Preferably, the $(C_{1-4}$ alkyl) group is methyl.

When the pyrazole ring system of formula VII is monocyclic, preferred R^2 groups include hydrogen, C_{1-4}

aliphatic, alkoxycarbonyl, (un)substituted phenyl, hydroxyalkyl, alkoxyalkyl, aminocarbonyl, mono- or dialkylaminocarbonyl, aminoalkyl, alkylaminoalkyl, dialkylaminoalkyl, phenylaminocarbonyl, and (N-

5 heterocyclyl)carbonyl. Examples of such preferred R^2 substituents include methyl, cyclopropyl, ethyl, isopropyl, propyl, t-butyl, cyclopentyl, phenyl, CO_2H , CO_2CH_3 , CH_2OH , CH_2OCH_3 , $\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$, $\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_3$, $\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_2\text{Ph}$, $\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$, $\text{CH}_2\text{CH}_2\text{CH}_2\text{NHCOOC}(\text{CH}_3)_3$,

10 $\text{CONHCH}(\text{CH}_3)_2$, $\text{CONHCH}_2\text{CH}=\text{CH}_2$, $\text{CONHCH}_2\text{CH}_2\text{OCH}_3$, CONHCH_2Ph , $\text{CONH}(\text{cyclohexyl})$, $\text{CON}(\text{Et})_2$, $\text{CON}(\text{CH}_3)\text{CH}_2\text{Ph}$, $\text{CONH}(\text{n-C}_3\text{H}_7)$, $\text{CON}(\text{Et})\text{CH}_2\text{CH}_2\text{CH}_3$, $\text{CONHCH}_2\text{CH}(\text{CH}_3)_2$, $\text{CON}(\text{n-C}_3\text{H}_7)_2$, $\text{CO}(3\text{-methoxymethylpyrrolidin-1-yl})$, $\text{CONH}(3\text{-tolyl})$, $\text{CONH}(4\text{-tolyl})$, CONHCH_3 , $\text{CO}(\text{morpholin-1-yl})$, $\text{CO}(4\text{-methylpiperazin-1-yl})$, $\text{CONHCH}_2\text{CH}_2\text{OH}$, CONH_2 , and $\text{CO}(\text{piperidin-1-yl})$. A

15 preferred R^2 group is hydrogen.

When G is Ring C, preferred formula VII Ring C groups are phenyl and pyridinyl. When two adjacent substituents on Ring C are taken together to form a fused

20 ring, Ring C is contained in a bicyclic ring system. Preferred fused rings include a benzo or pyrido ring. Such rings preferably are fused at ortho and meta positions of Ring C. Examples of preferred bicyclic Ring C systems include naphthyl and isoquinolinyl. Preferred

25 R^1 groups include -halo, an optionally substituted C_{1-6} aliphatic group, phenyl, $-\text{COR}^6$, $-\text{OR}^6$, $-\text{CN}$, $-\text{SO}_2\text{R}^6$, $-\text{SO}_2\text{NH}_2$, $-\text{N}(\text{R}^6)_2$, $-\text{CO}_2\text{R}^6$, $-\text{CONH}_2$, $-\text{NHCOR}^6$, $-\text{OC}(\text{O})\text{NH}_2$, or $-\text{NHSO}_2\text{R}^6$. When R^1 is an optionally substituted C_{1-6} aliphatic group, the most preferred optional substituents are halogen.

30 Examples of preferred R^1 groups include $-\text{CF}_3$, $-\text{Cl}$, $-\text{F}$, $-\text{CN}$, $-\text{COCH}_3$, $-\text{OCH}_3$, $-\text{OH}$, $-\text{CH}_2\text{CH}_3$, $-\text{OCH}_2\text{CH}_3$, $-\text{CH}_3$, $-\text{CF}_2\text{CH}_3$, cyclohexyl, t-butyl, isopropyl, cyclopropyl, $-\text{C}\equiv\text{CH}$, $-\text{C}\equiv\text{C}-\text{CH}_3$, $-\text{SO}_2\text{CH}_3$, $-\text{SO}_2\text{NH}_2$, $-\text{N}(\text{CH}_3)_2$, $-\text{CO}_2\text{CH}_3$, $-\text{CONH}_2$, $-\text{NHCOCH}_3$, $-\text{OC}(\text{O})\text{NH}_2$, $-\text{NHSO}_2\text{CH}_3$, and $-\text{OCF}_3$.

On Ring C preferred R^5 substituents, when present, include -halo, -CN, -NO₂, -N(R⁴)₂, optionally substituted C₁₋₆ aliphatic group, -OR, -C(O)R, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, and -N(R⁴)SO₂R. More preferred R^5 substituents include -Cl, -F, -CN, -CF₃, -NH₂, -NH(C₁₋₄ aliphatic), -N(C₁₋₄ aliphatic)₂, -O(C₁₋₄ aliphatic), C₁₋₄ aliphatic, and -CO₂(C₁₋₄ aliphatic). Examples of such preferred R^5 substituents include -Cl, -F, -CN, -CF₃, -NH₂, -NHMe, -NMe₂, -OEt, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, and -CO₂Et.

When G is Ring D, preferred formula VII Ring D monocyclic rings include substituted and unsubstituted phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, and morpholinyl rings. When two adjacent substituents on Ring D are taken together to form a fused ring, the Ring D system is bicyclic. Preferred formula VII Ring D bicyclic rings include 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, and naphthyl. Examples of more preferred bicyclic Ring D systems include naphthyl and isoquinolinyl.

Preferred substituents on Ring D include one or more of the following: halo, oxo, CN, -NO₂, -N(R⁴)₂, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, -N(R⁴)SO₂R, -SR, -OR, -C(O)R, or substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. More preferred Ring D substituents include -halo, -CN, -oxo, -SR, -OR, -N(R⁴)₂, -C(O)R, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. Examples of Ring D substituents include -OH, phenyl, methyl, CH₂OH, CH₂CH₂OH, pyrrolidinyl, OPh, CF₃, C≡CH, Cl,

Br, F, I, NH₂, C(O)CH₃, *i*-propyl, *tert*-butyl, SEt, OMe, N(Me)₂, methylene dioxy, and ethylene dioxy.

Preferred formula VII compounds have one or more, and more preferably all, of the features selected
5 from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by -R⁵, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is selected from a
10 naphthyl, quinolinyl or isoquinolinyl ring, and R¹ is -halo, an optionally substituted C₁₋₆ aliphatic group, phenyl, -COR⁶, -OR⁶, -CN, -SO₂R⁶, -SO₂NH₂, -N(R⁶)₂, -CO₂R⁶, -CONH₂, -NHCOR⁶, -OC(O)NH₂, or -NHSO₂R⁶; or Ring D is an optionally substituted ring selected from a phenyl,
15 pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl ring;

20 (b) R^y is T-R³", wherein T is a valence bond or a methylene; and

(c) R^{2'} is hydrogen and R² is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C₁₋₆ aliphatic group, or R² and R^{2'} are
25 taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring.

More preferred compounds of formula VII have one or more, and more preferably all, of the features
30 selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by -R⁵, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and

R^1 is -halo, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic group, phenyl, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl;

(b) R^Y is $T-R^{3''}$, wherein T is a valence bond or a methylene and $R^{3''}$ is an optionally substituted group selected from C_{3-6} carbocyclyl, phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring;

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring; and

(d) Ring D is substituted by oxo or R^5 , wherein each R^5 is independently selected from -halo, -CN, -NO₂, -N(R^4)₂, optionally substituted C_{1-6} aliphatic group, -OR, -C(O)R, -CO₂R, -CONH(R^4), -N(R^4)COR, -SO₂N(R^4)₂, or -N(R^4)SO₂R.

Even more preferred compounds of formula VII have one or more, and more preferably all, of the features selected from the group consisting of:

(a) R^Y is $T-R^{3''}$, wherein T is a valence bond or a methylene and $R^{3''}$ is an optionally substituted group selected from phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring;

(b) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and

R^1 is -halo, a C_{1-4} aliphatic group optionally substituted with halogen, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, isoquinolinyl, quinolinyl, or naphthyl;

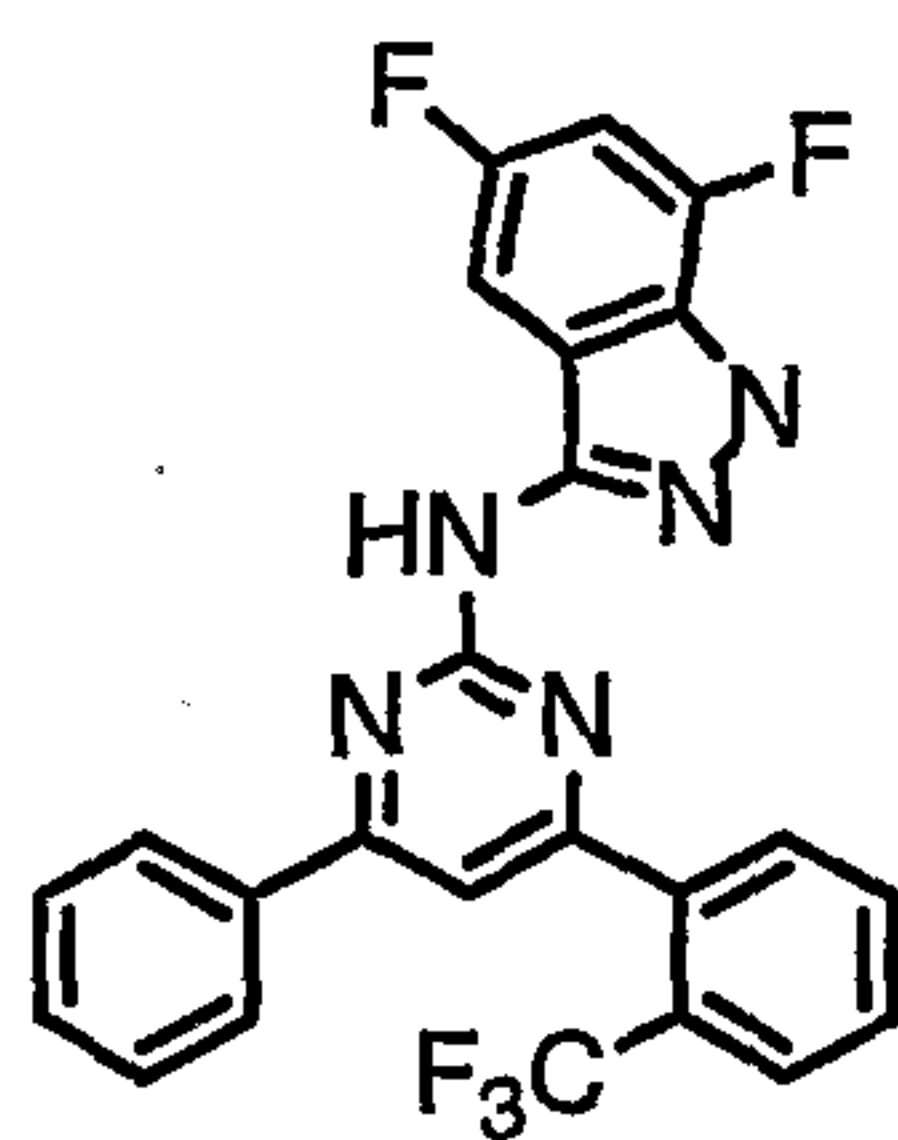
(c) R^2 and $R^{2'}$ are taken together with their intervening atoms to form a benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring optionally substituted with -halo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), -CN, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, or $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group; and

(d) Ring D is substituted by oxo or R^5 , wherein each R^5 is independently selected from -Cl, -F, -CN, $-CF_3$, $-NH_2$, $-NH(C_{1-4}$ aliphatic), $-N(C_{1-4}$ aliphatic) $_2$, $-O(C_{1-4}$ aliphatic), C_{1-4} aliphatic, and $-CO_2(C_{1-4}$ aliphatic).

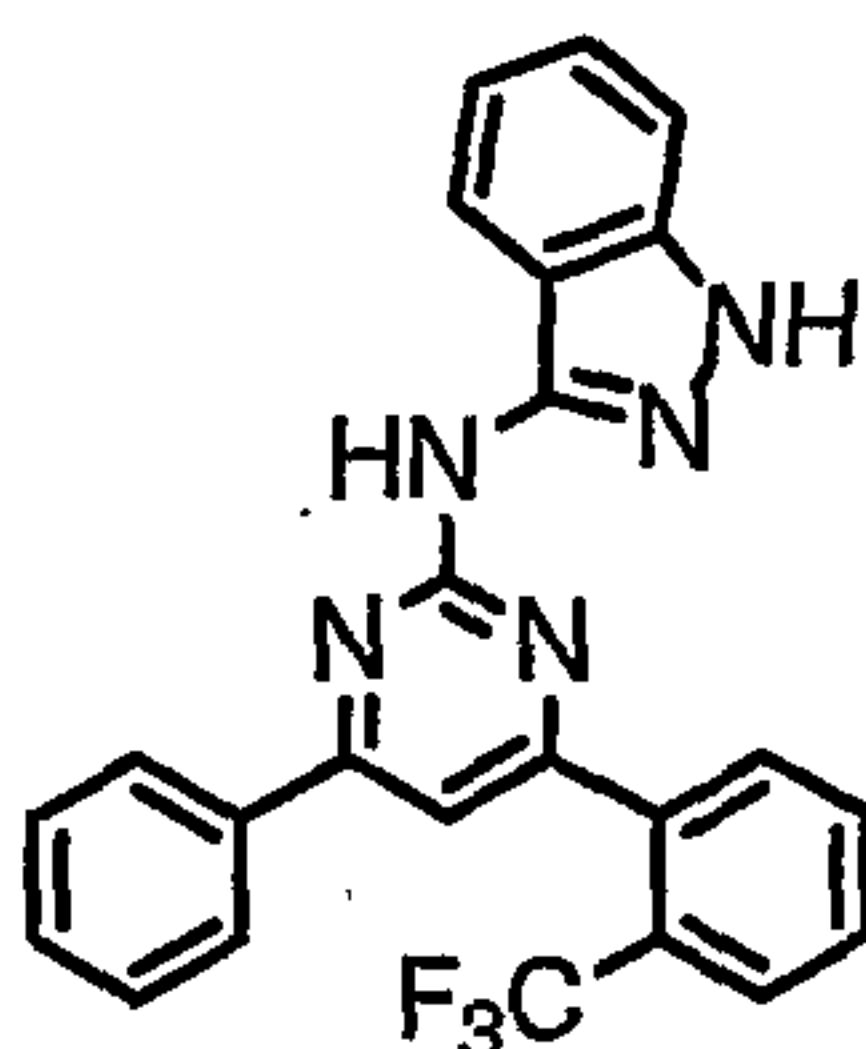
Representative compounds of formula VII are set forth in Table 6 below.

Table 6.

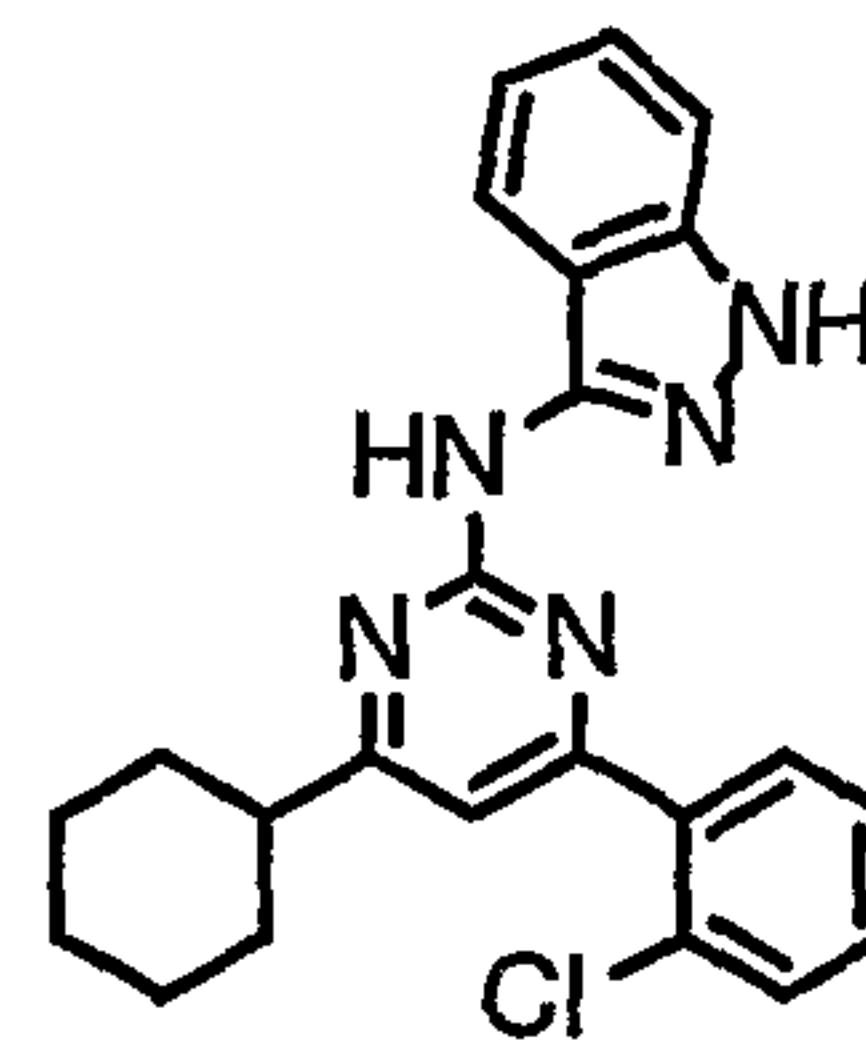
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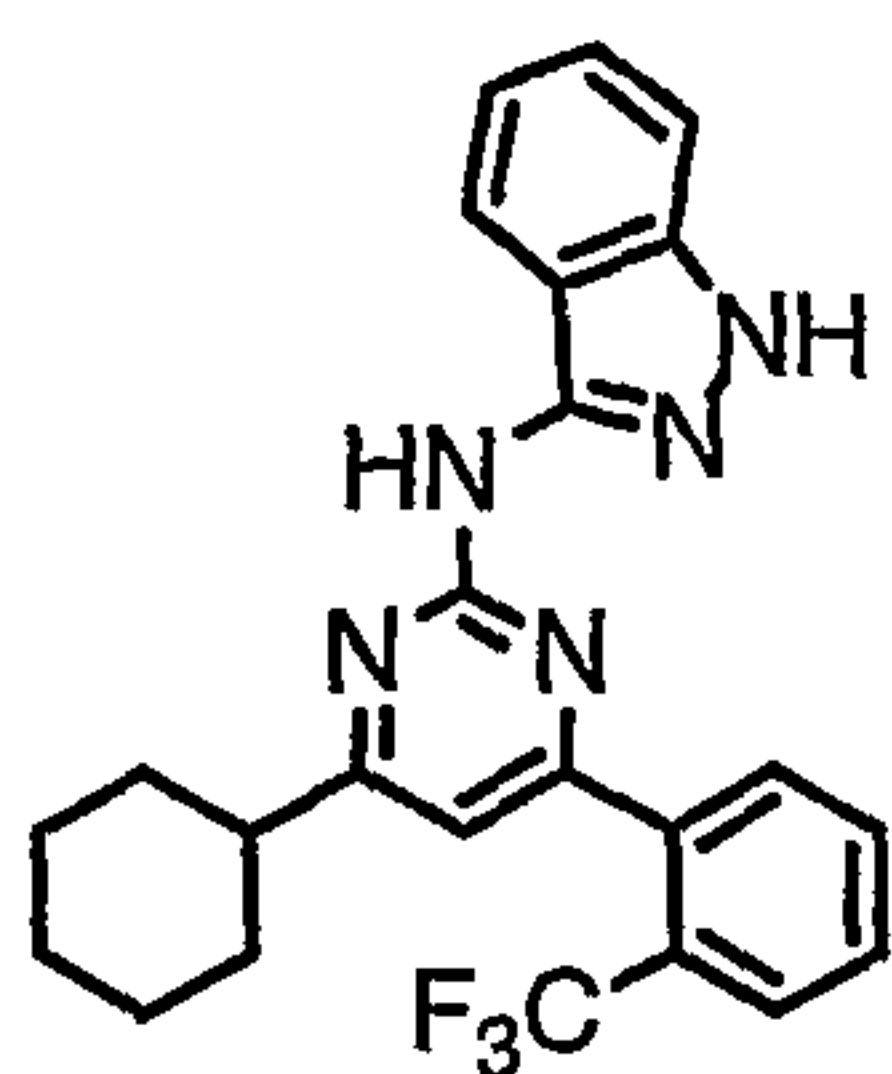
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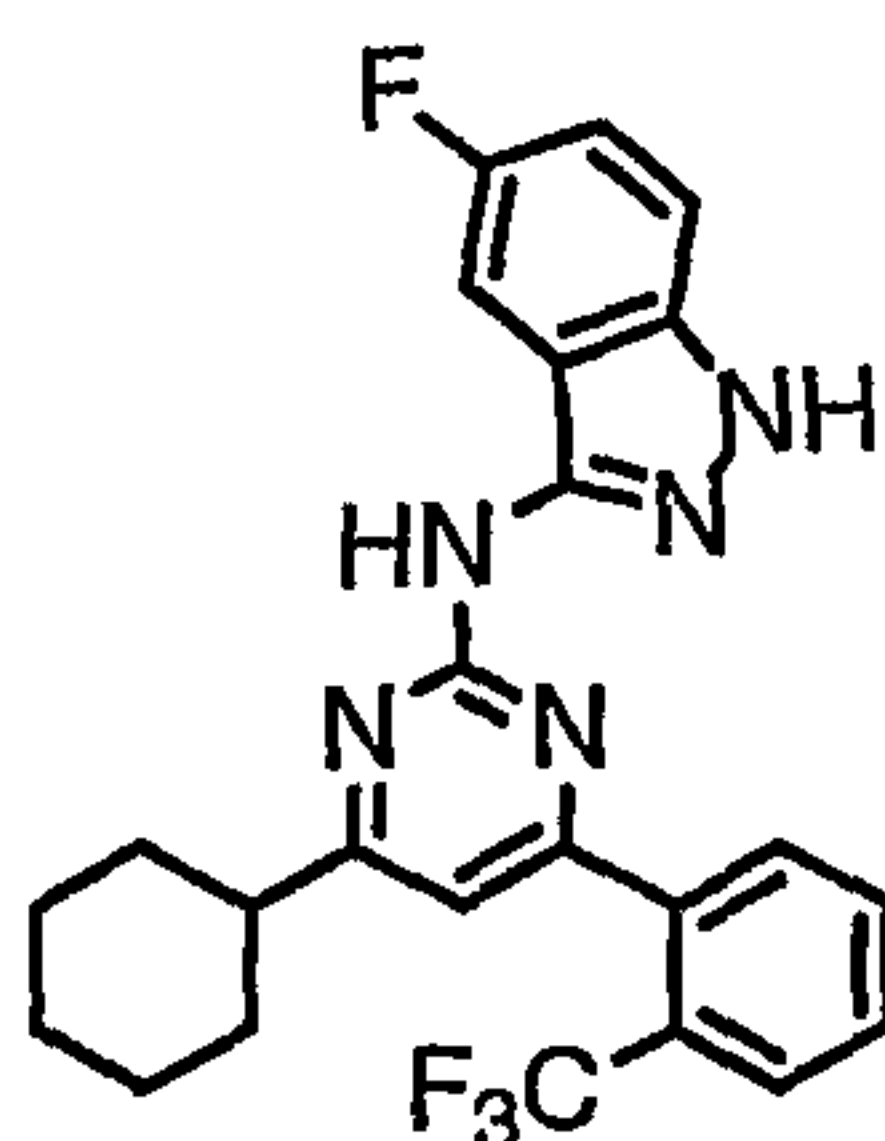
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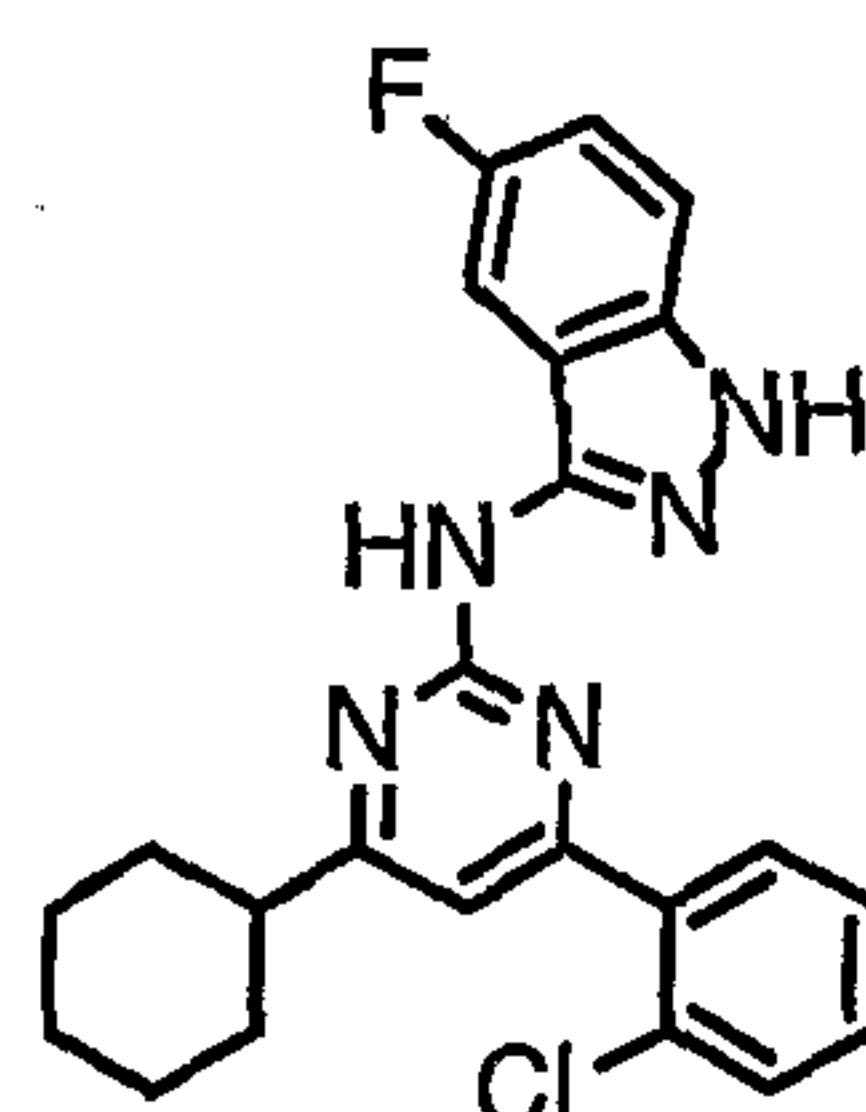
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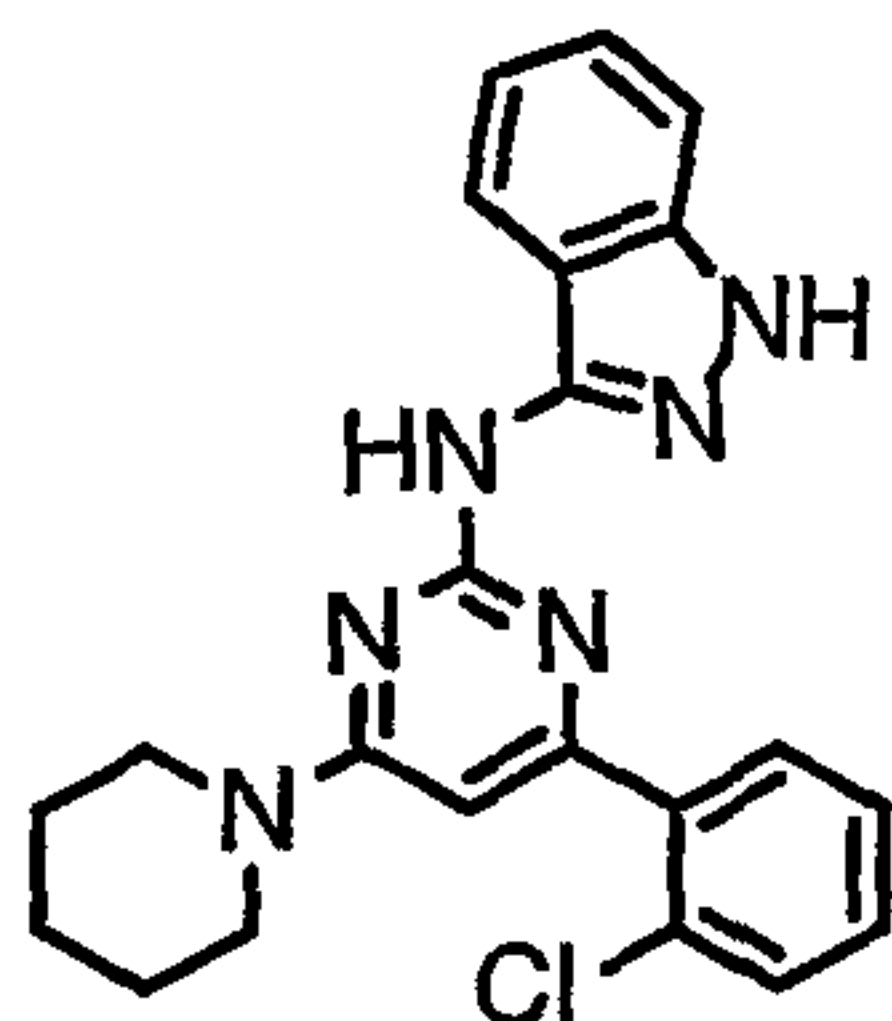
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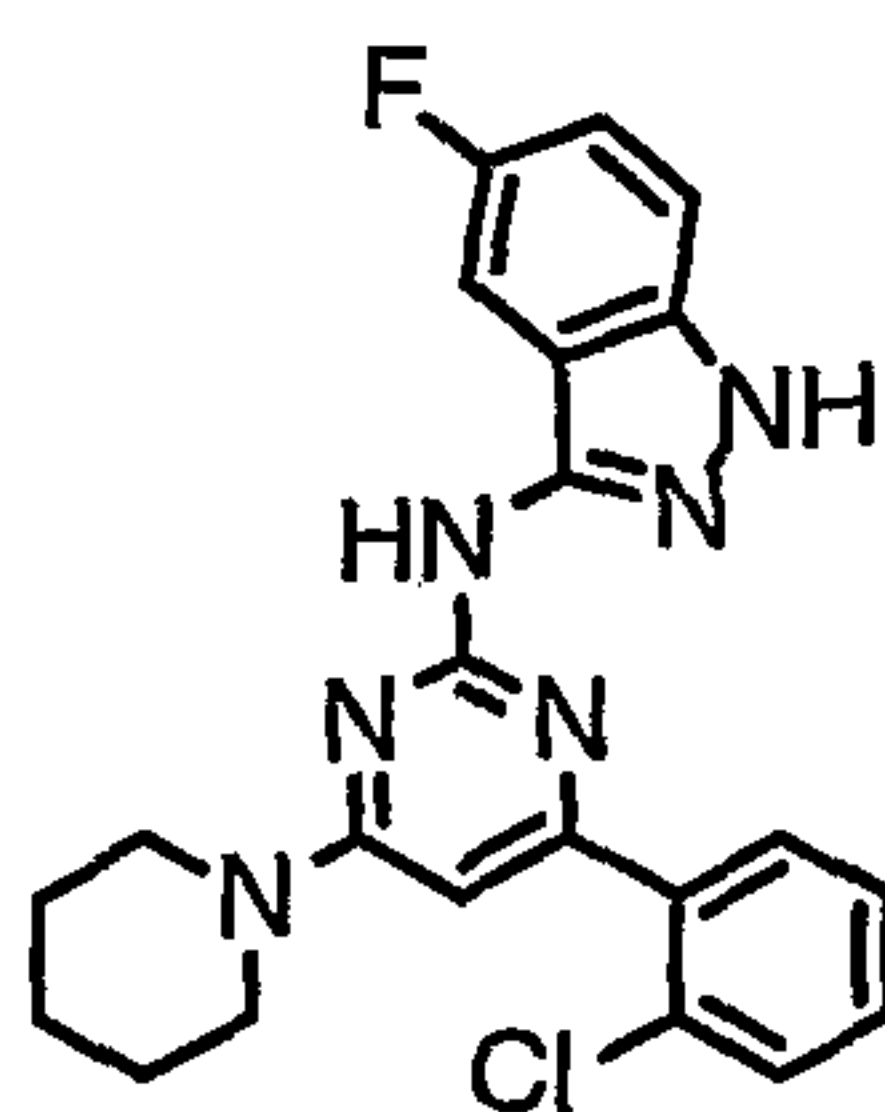
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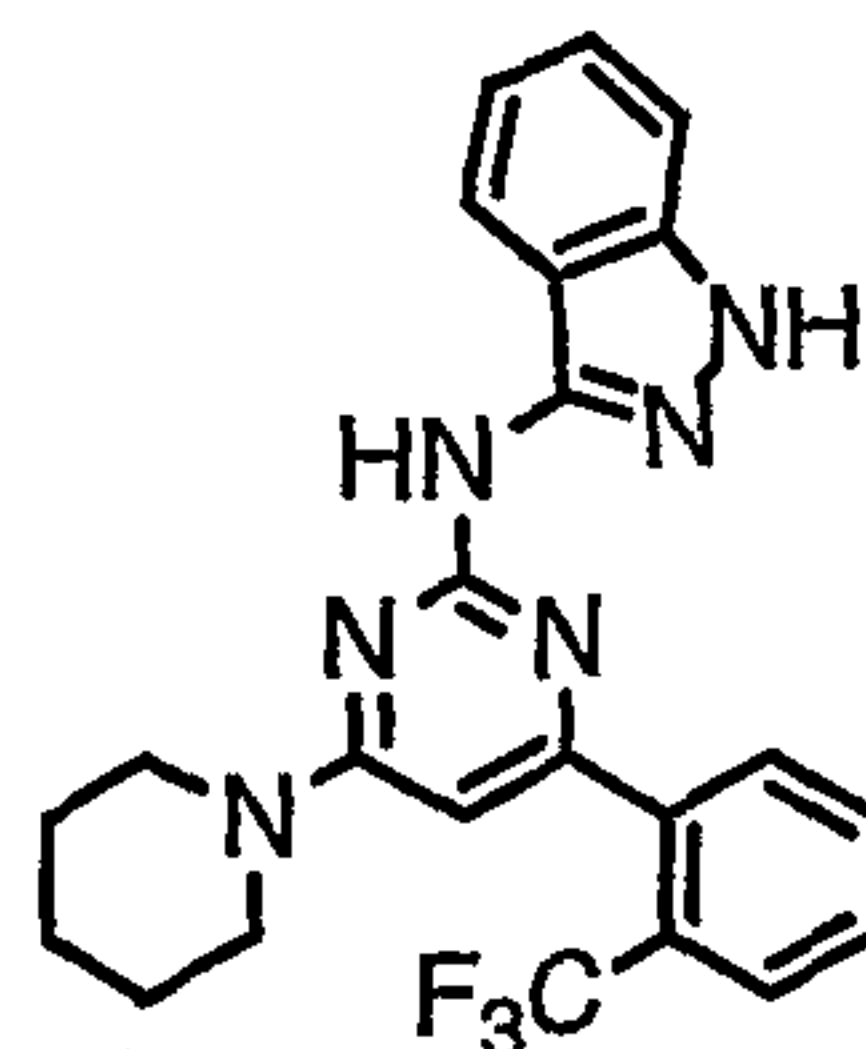
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VII-7

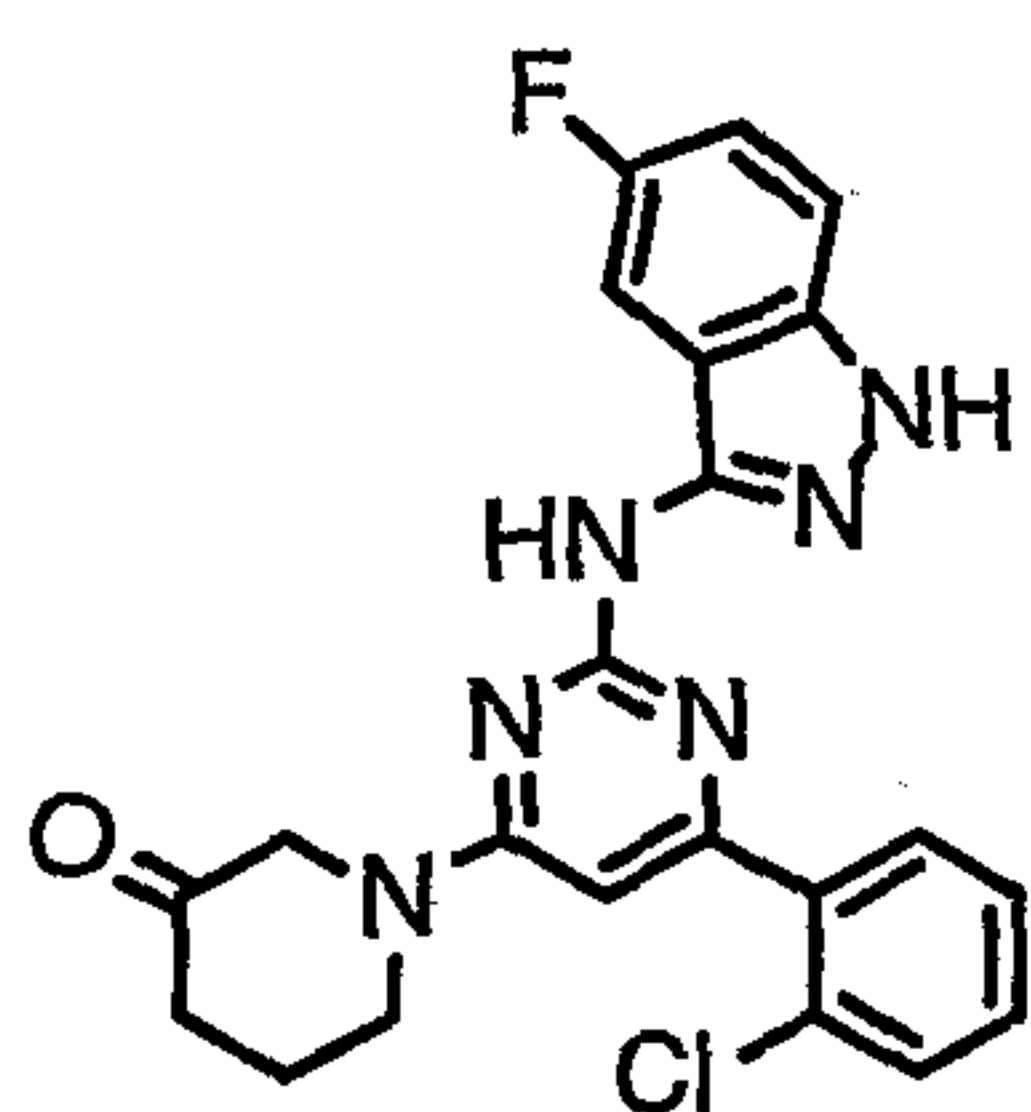


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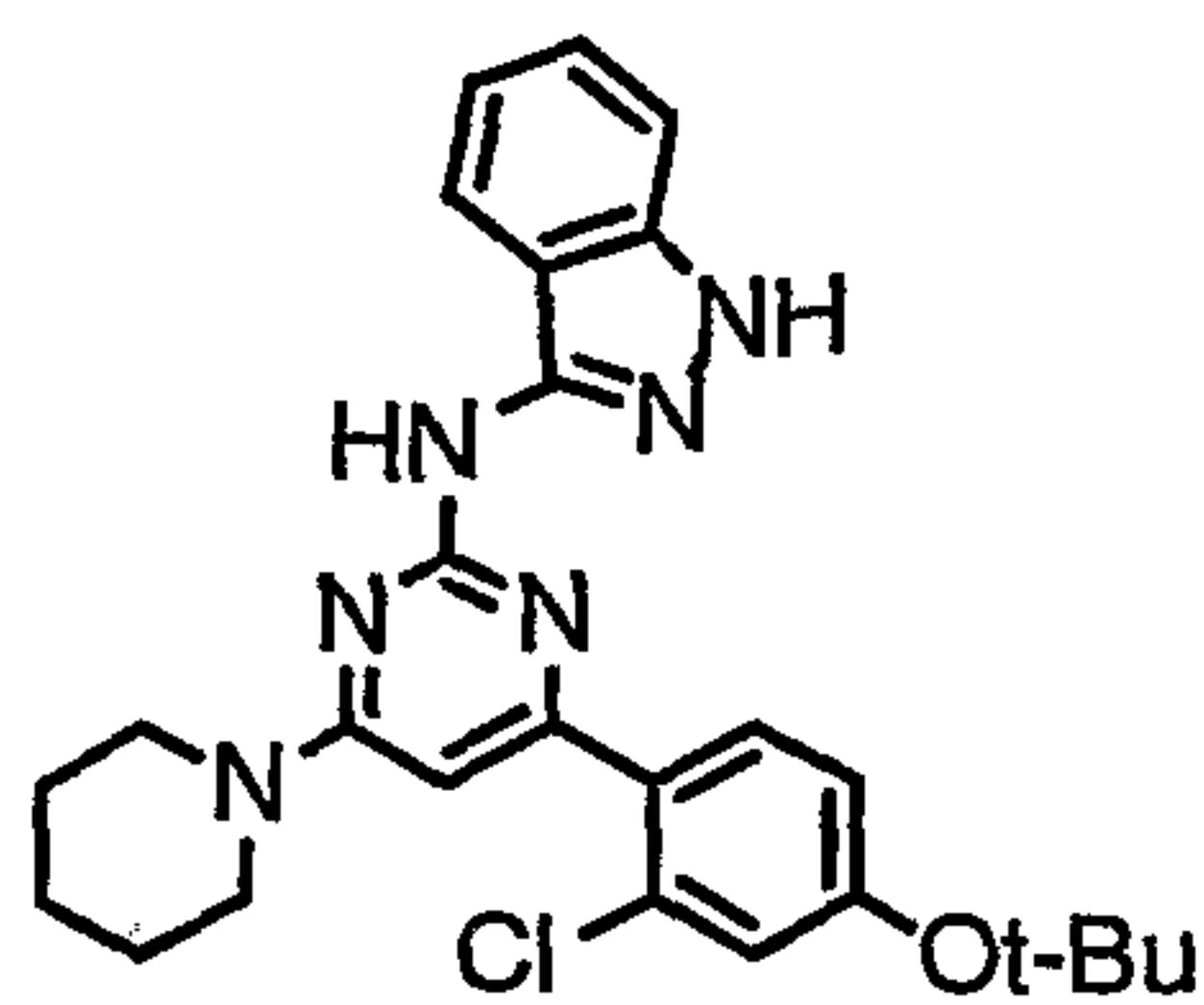


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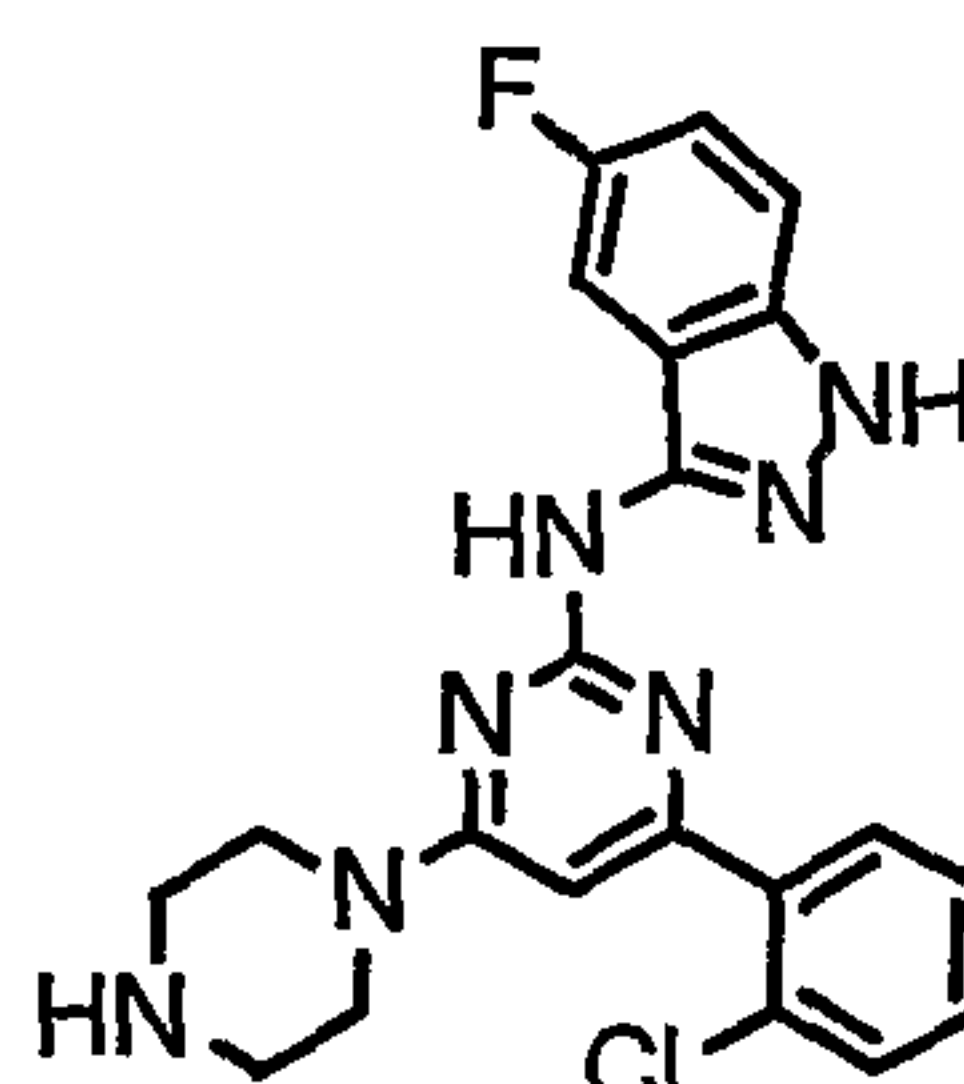
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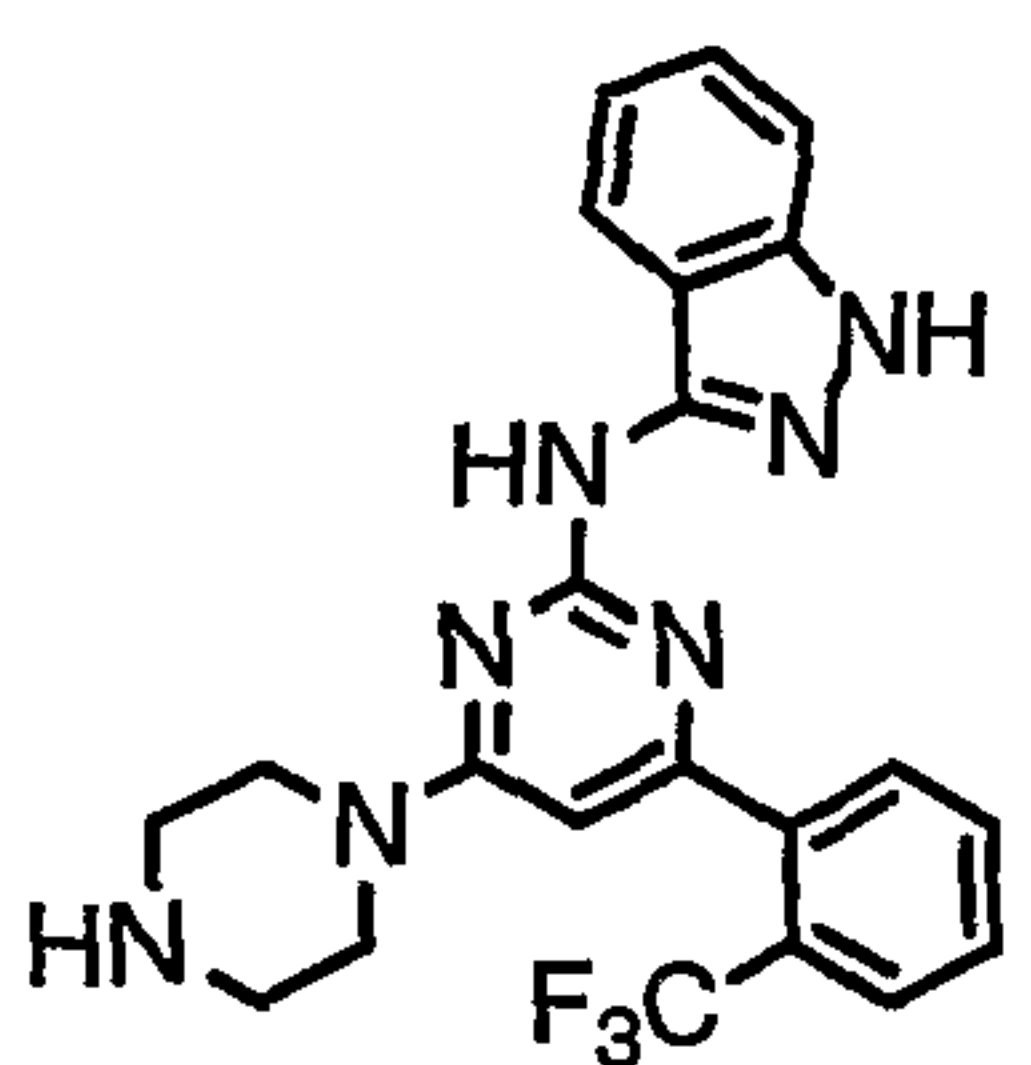
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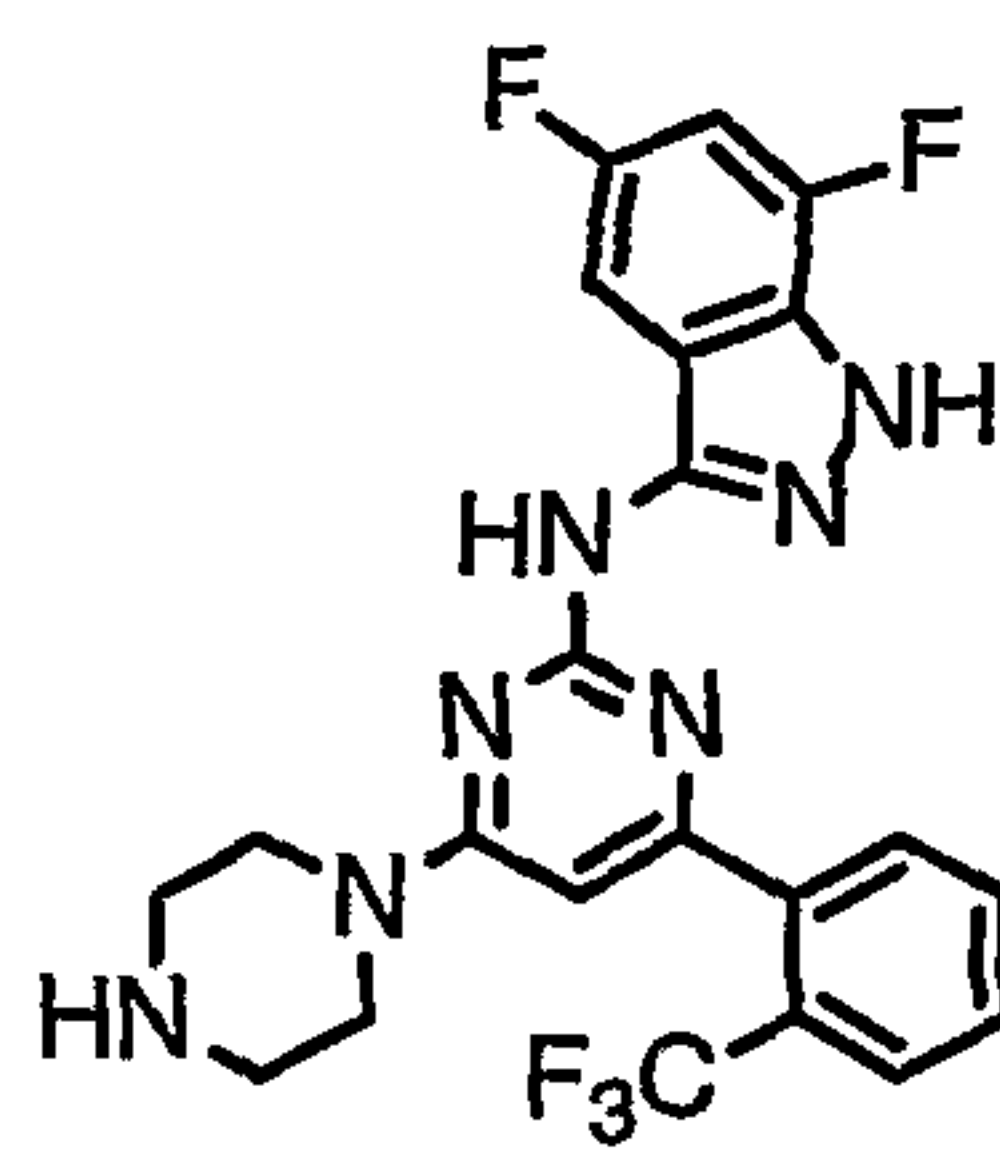
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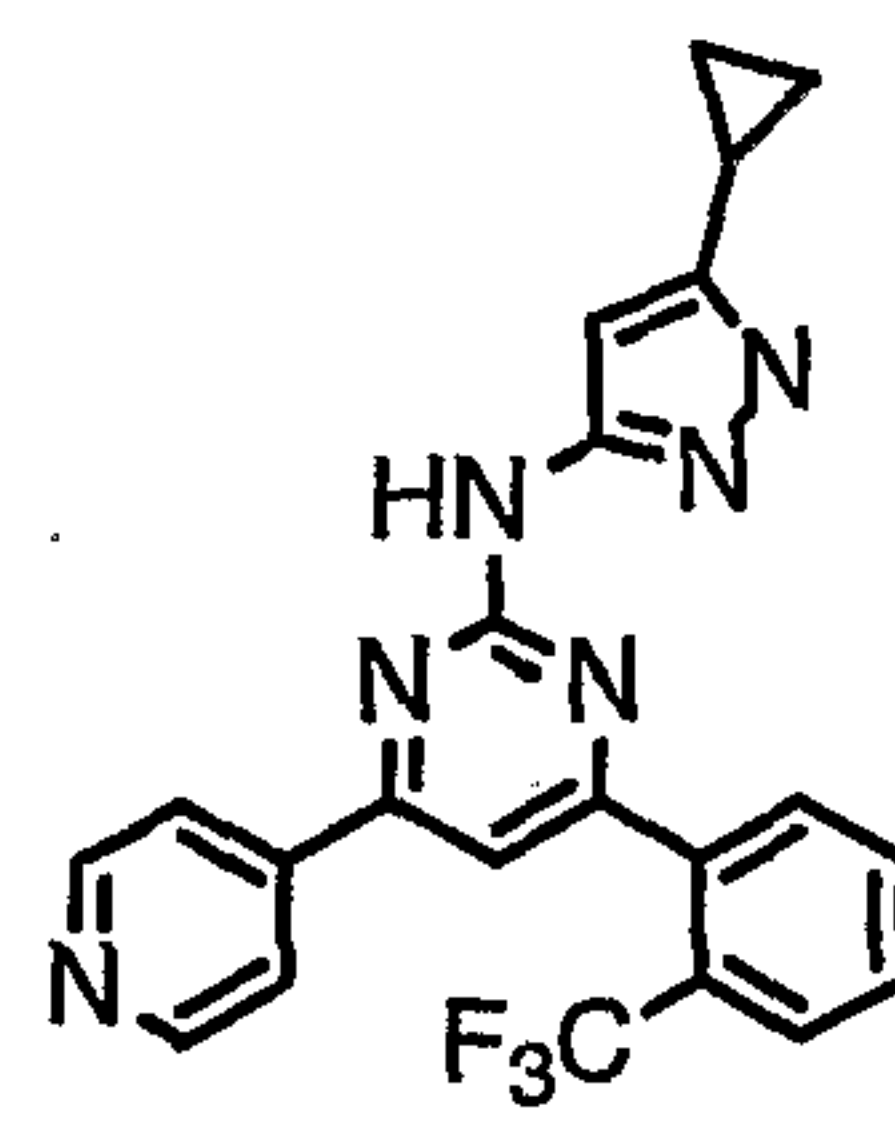
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VII-13

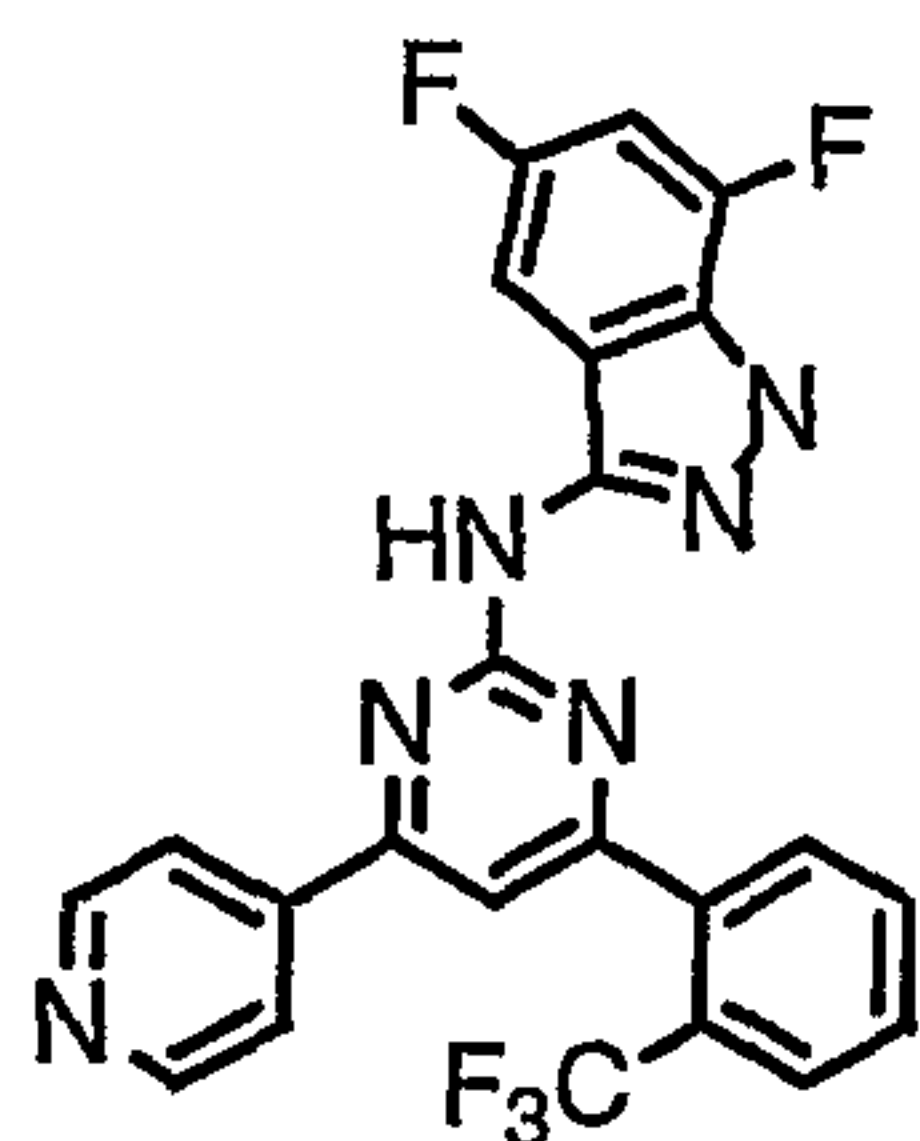


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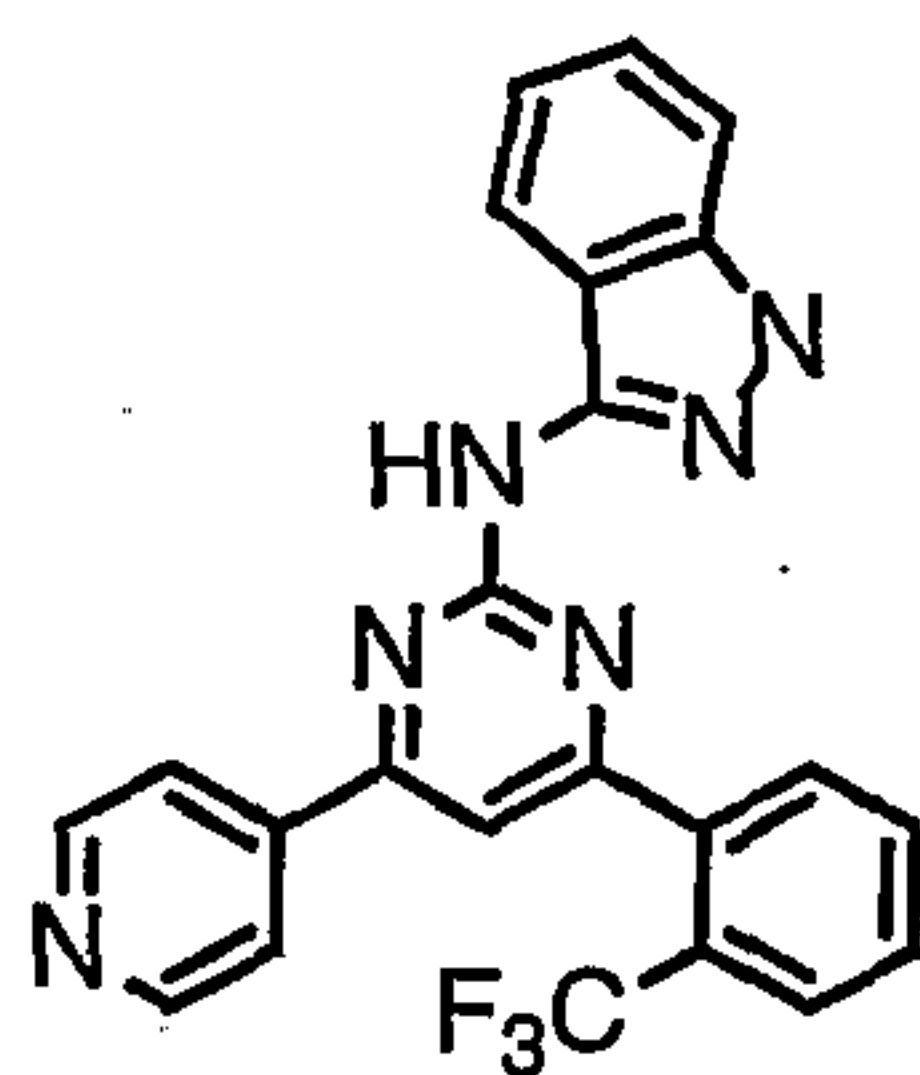


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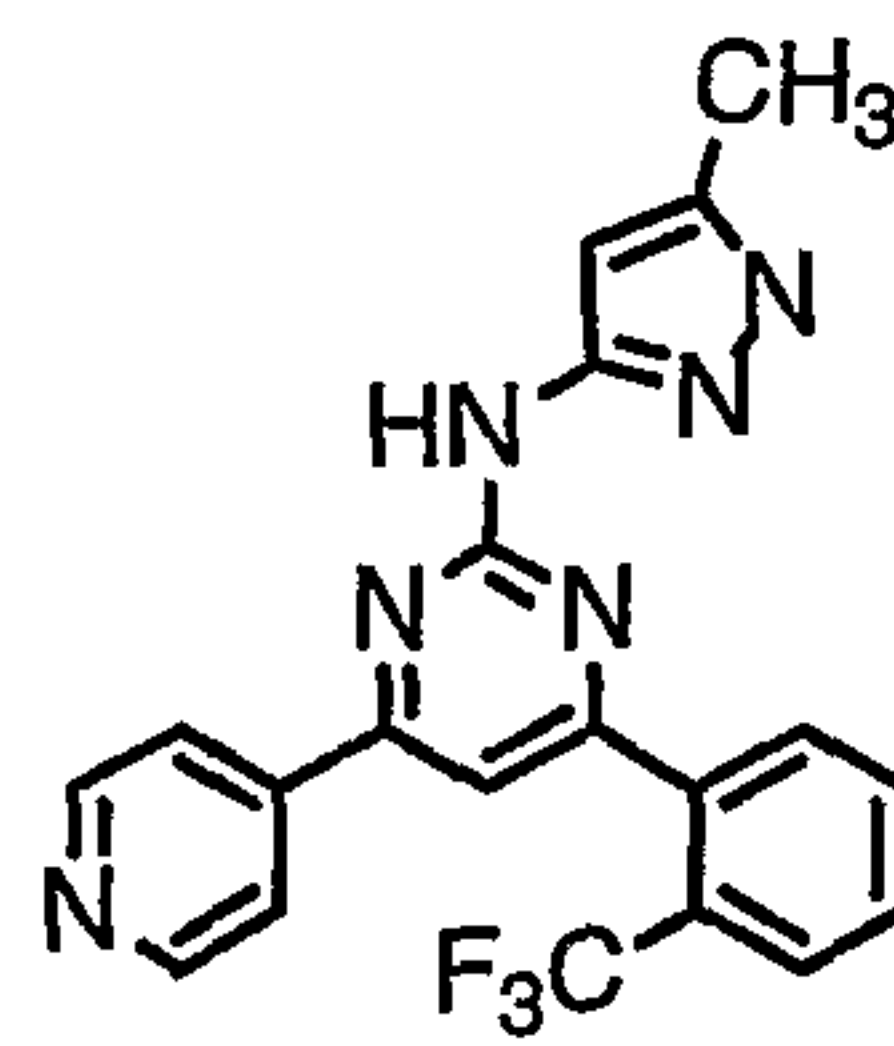
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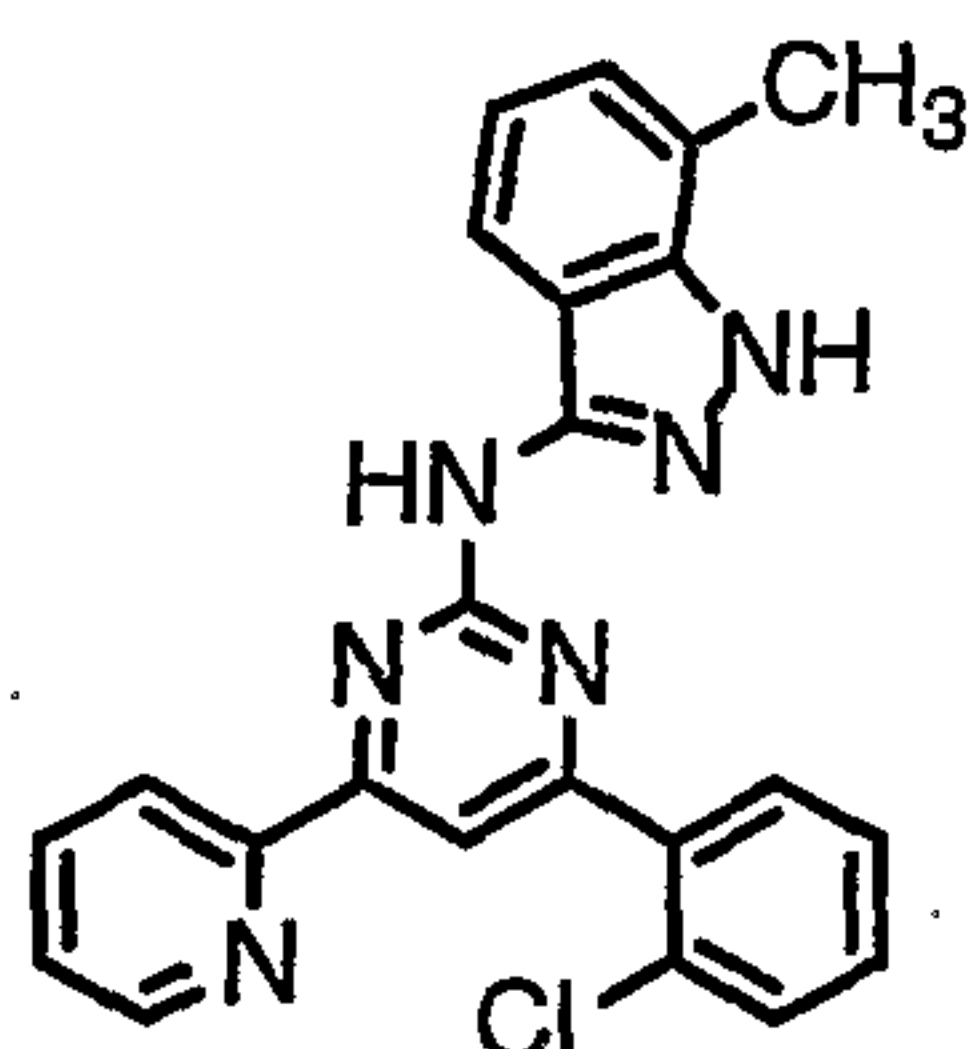
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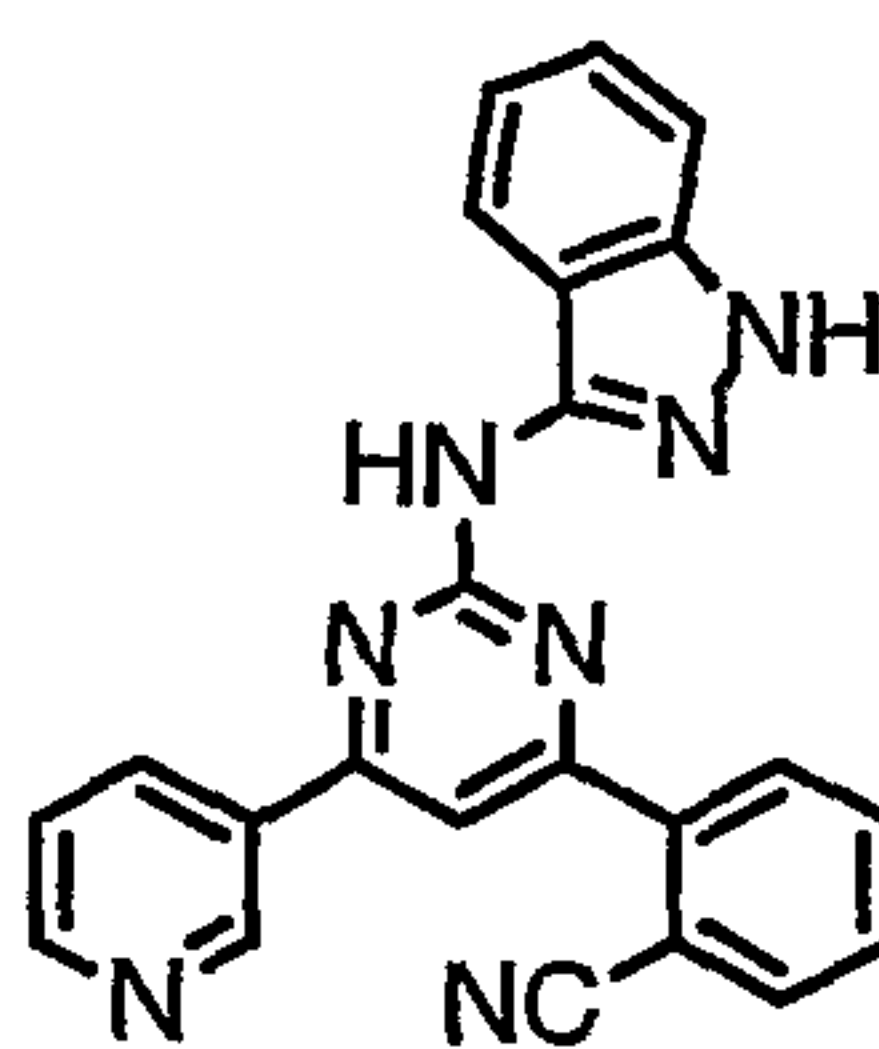
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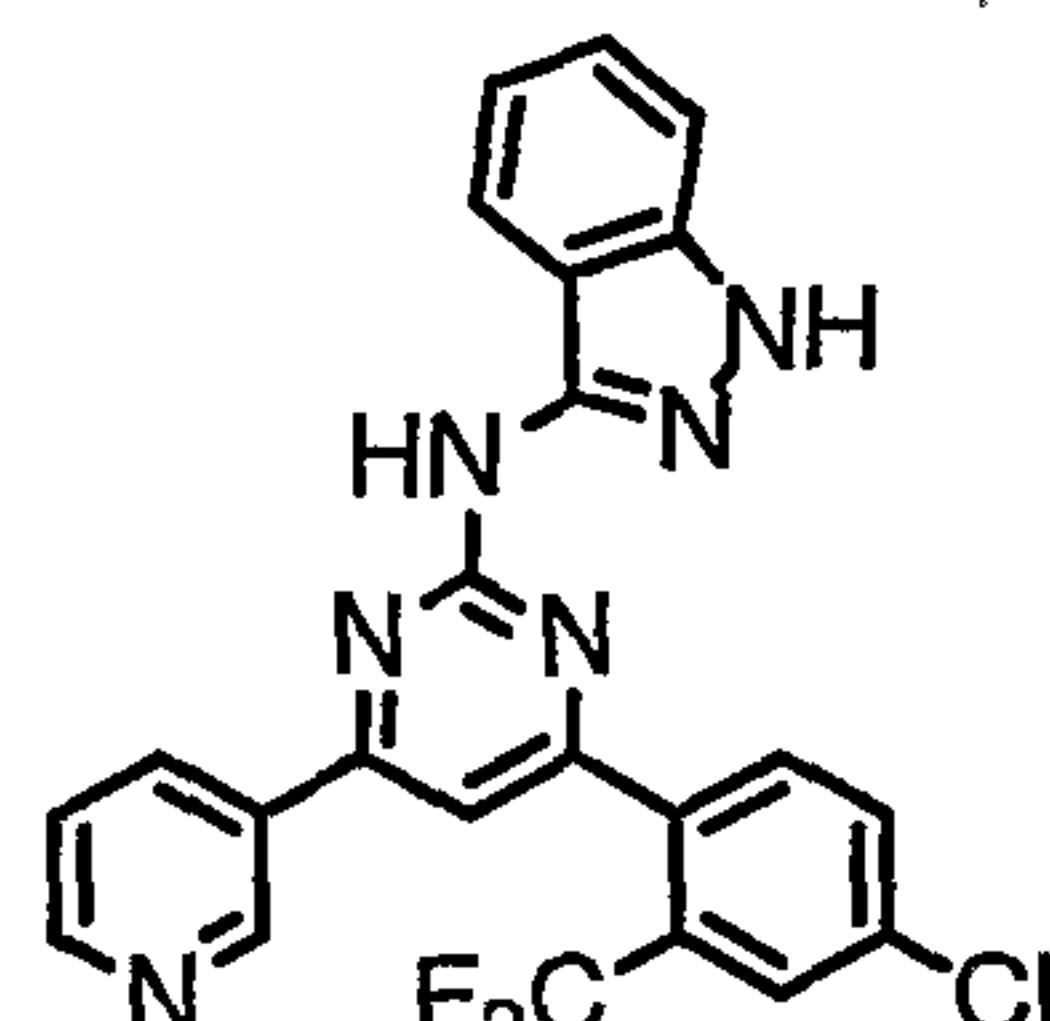
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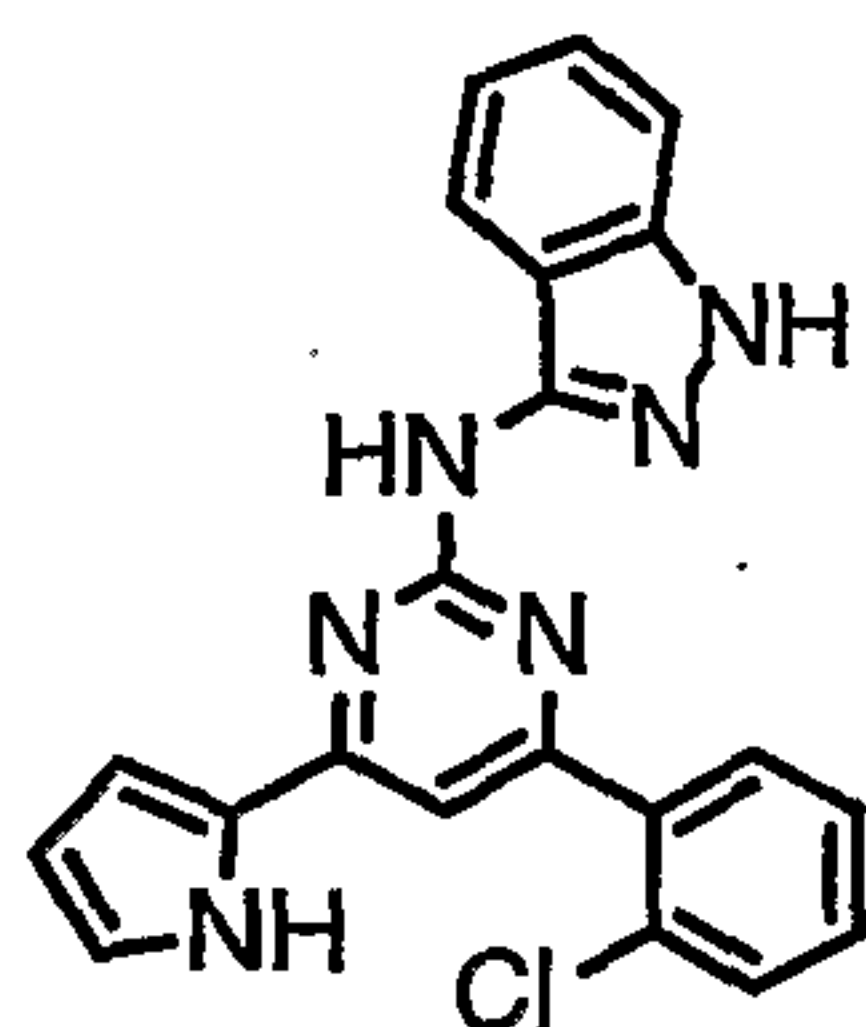
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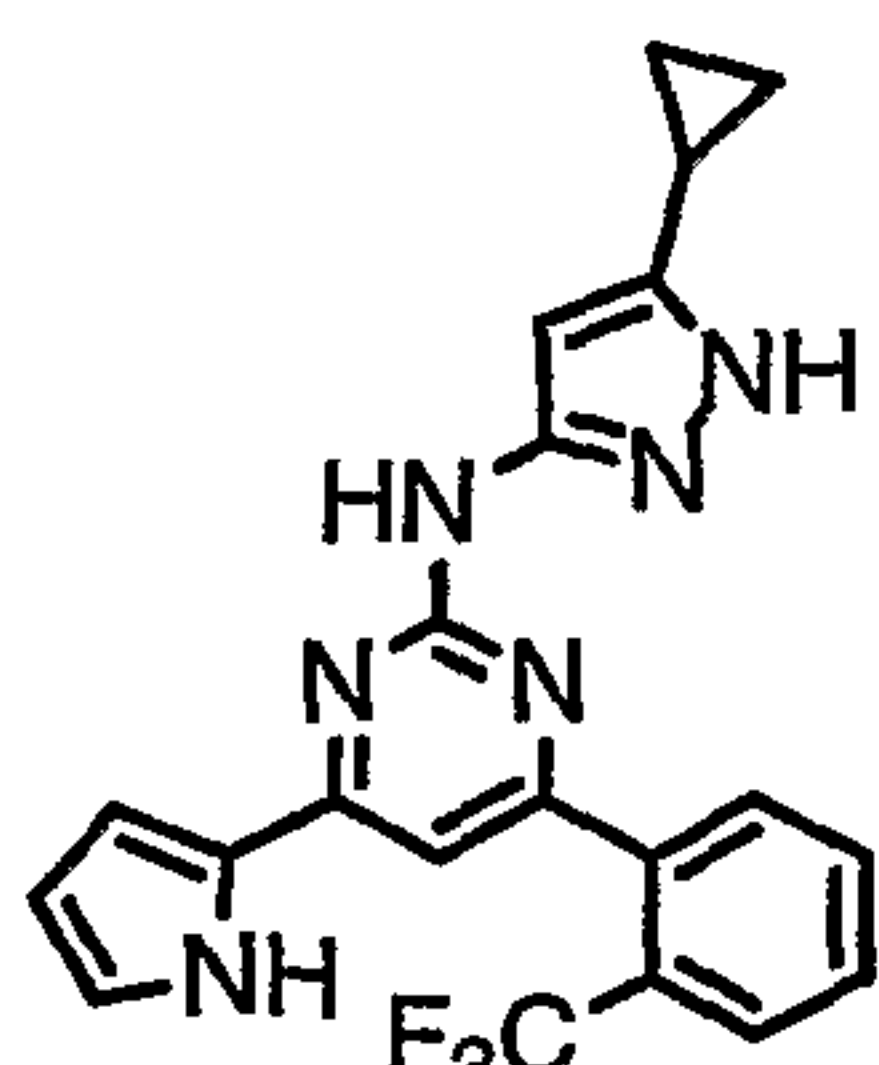
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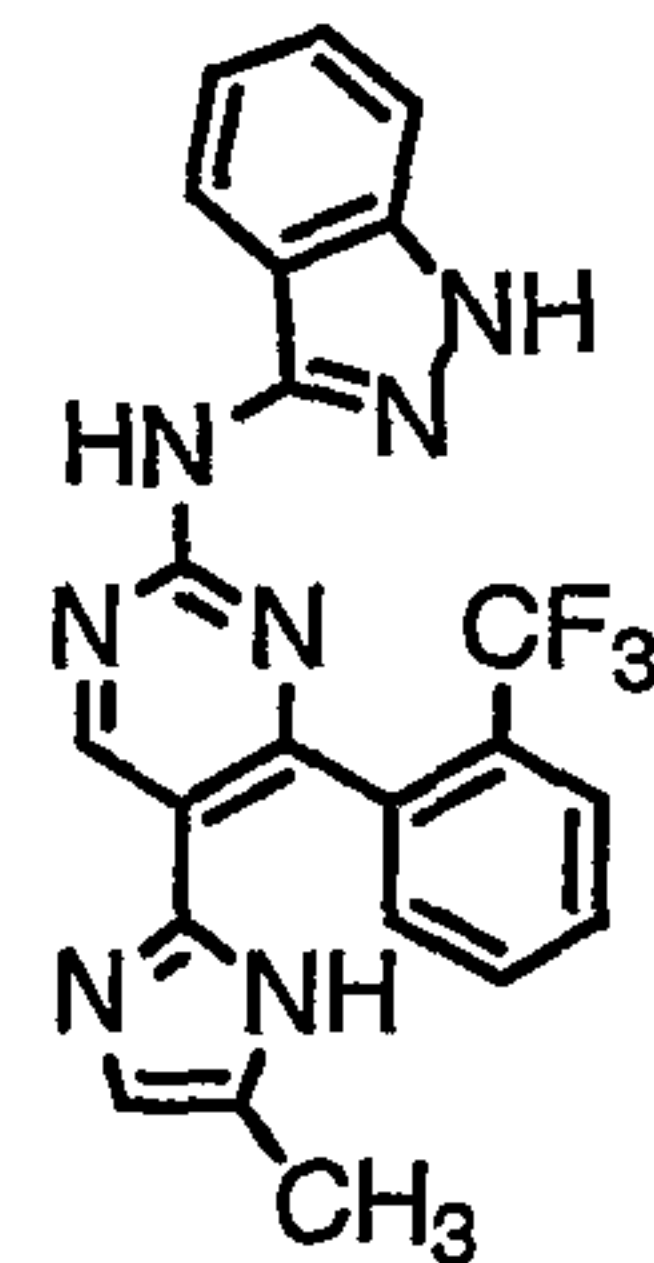
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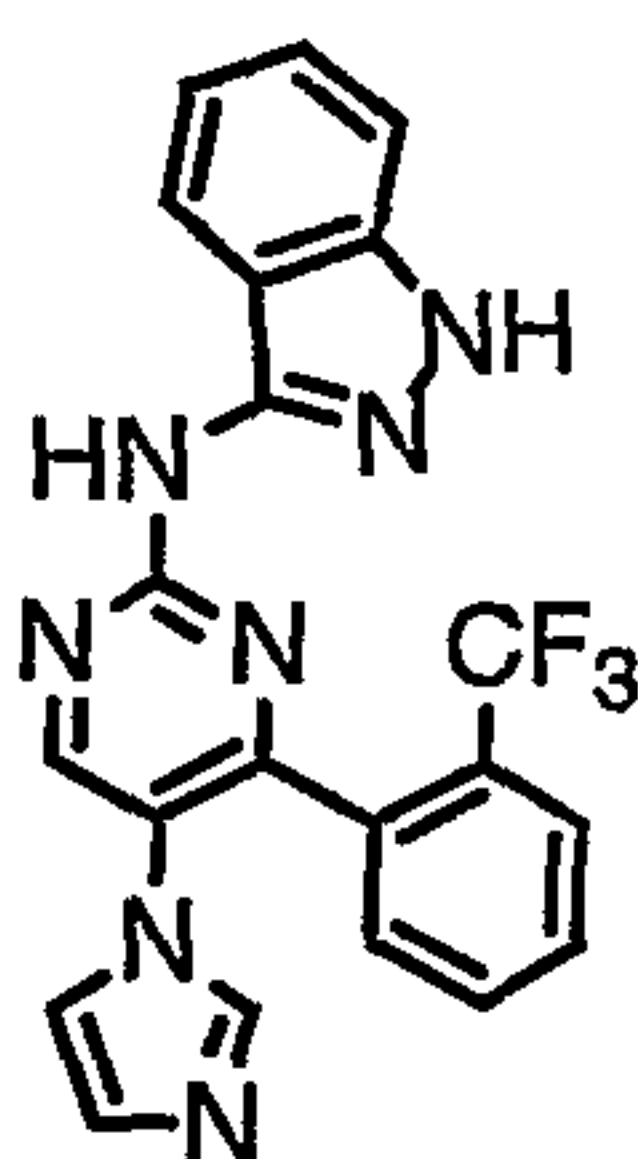
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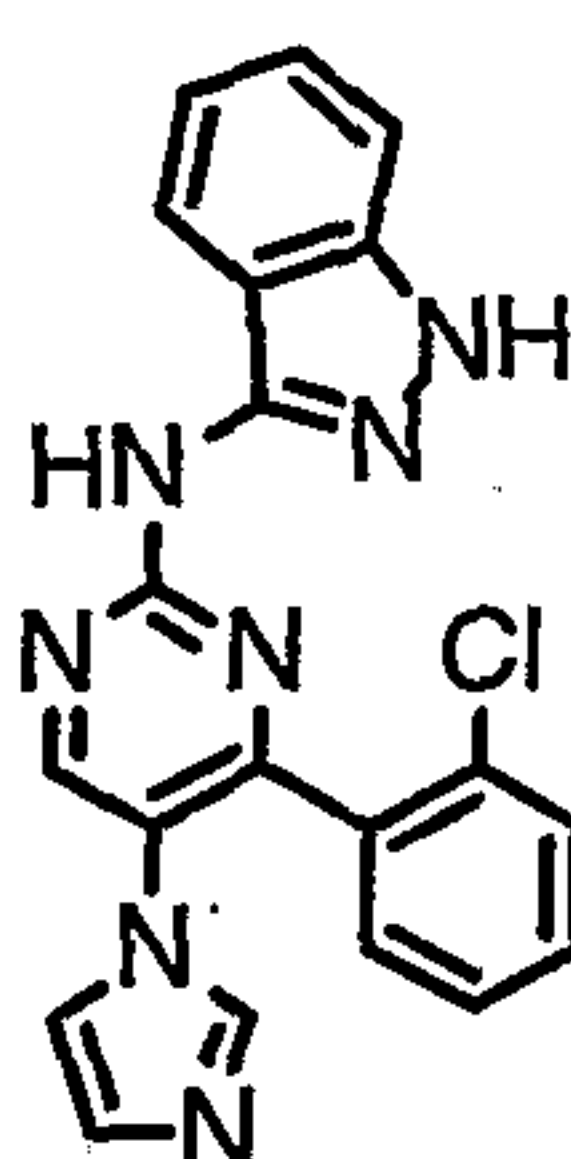
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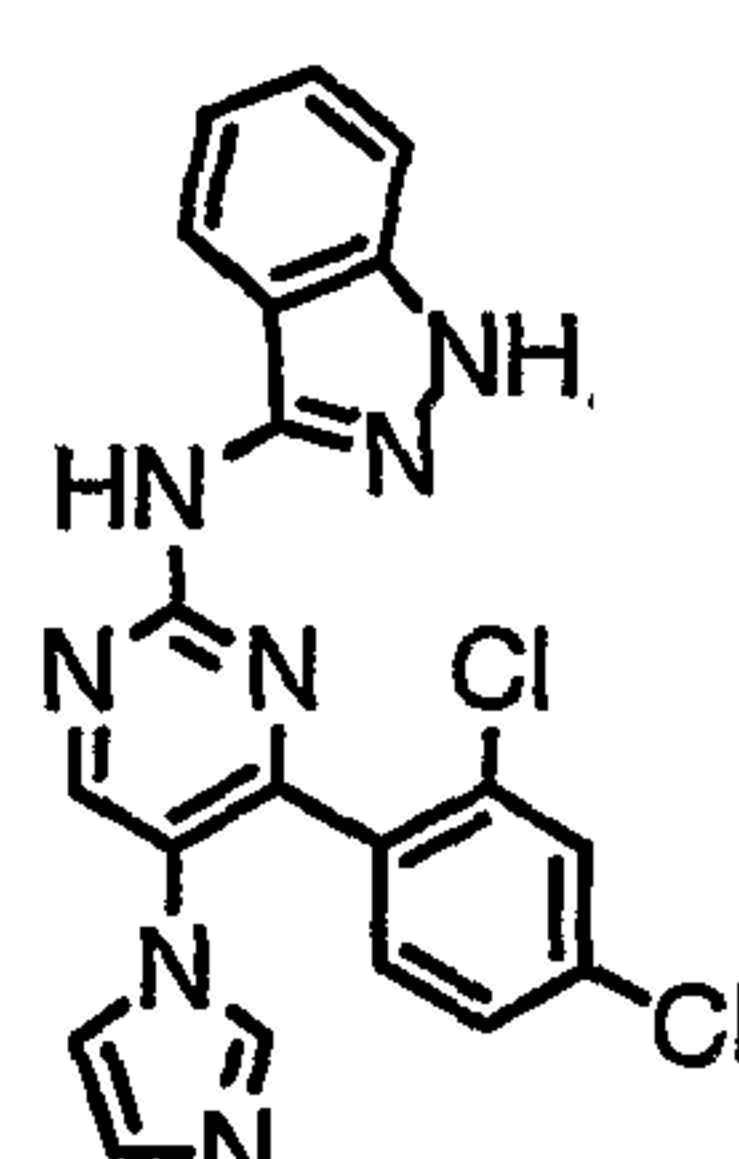
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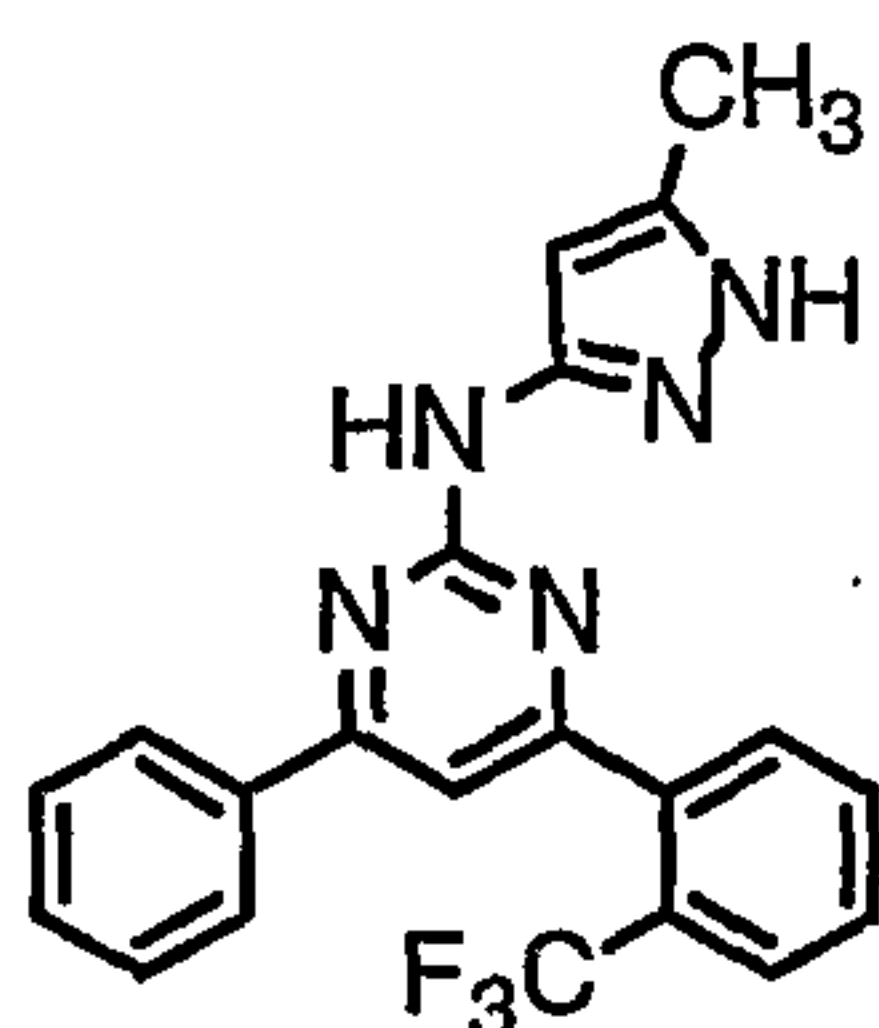
VII-25



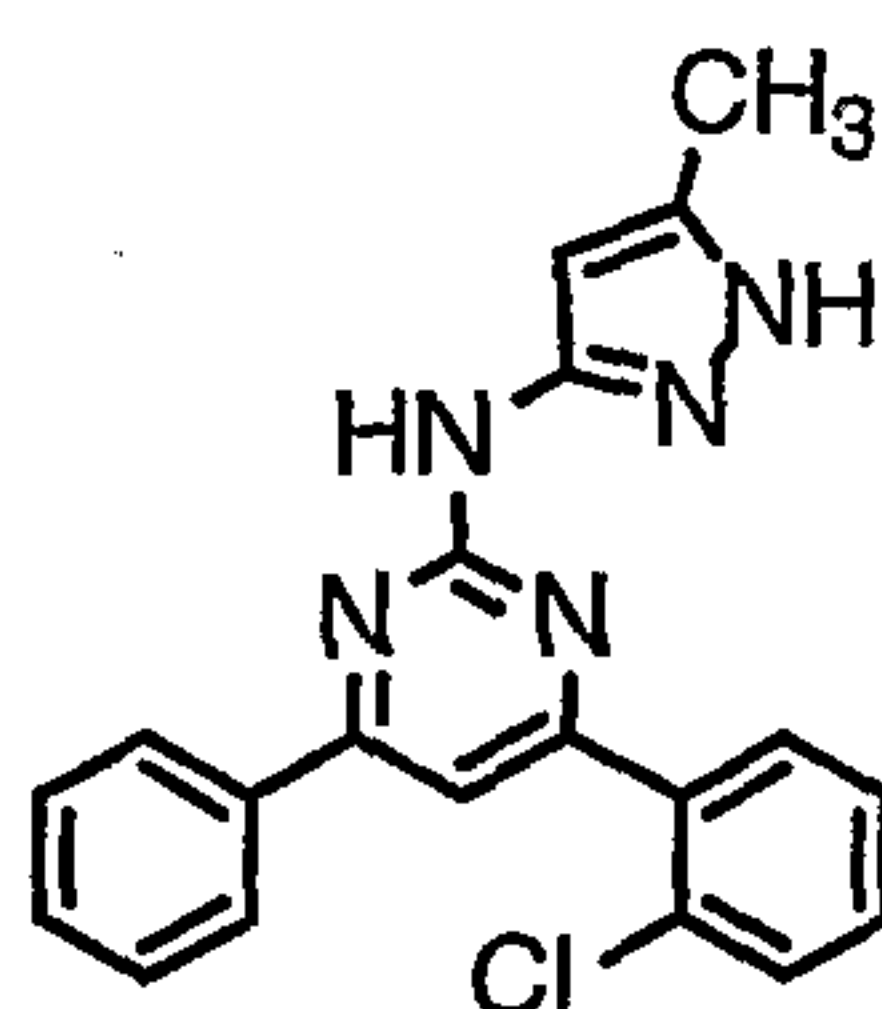
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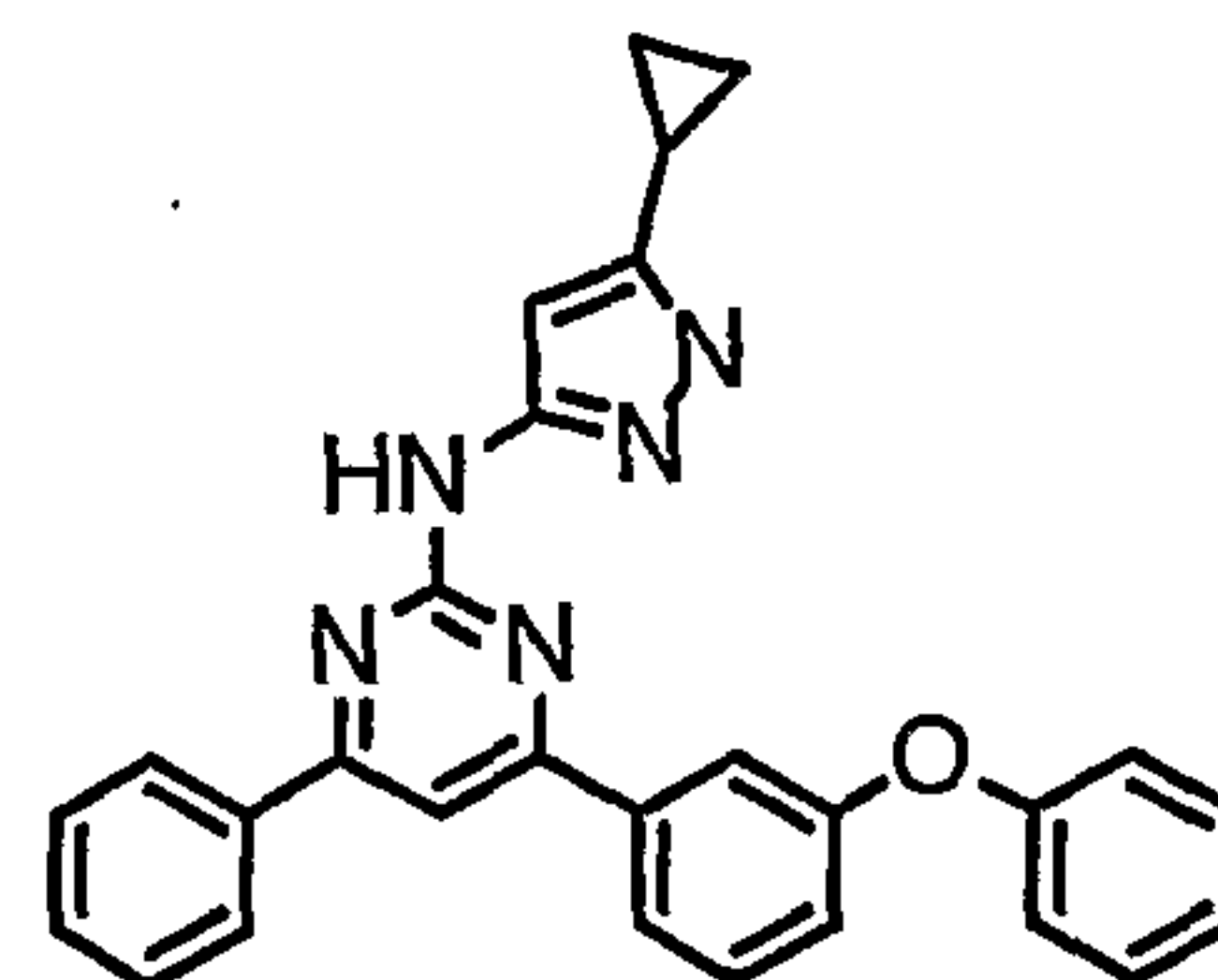
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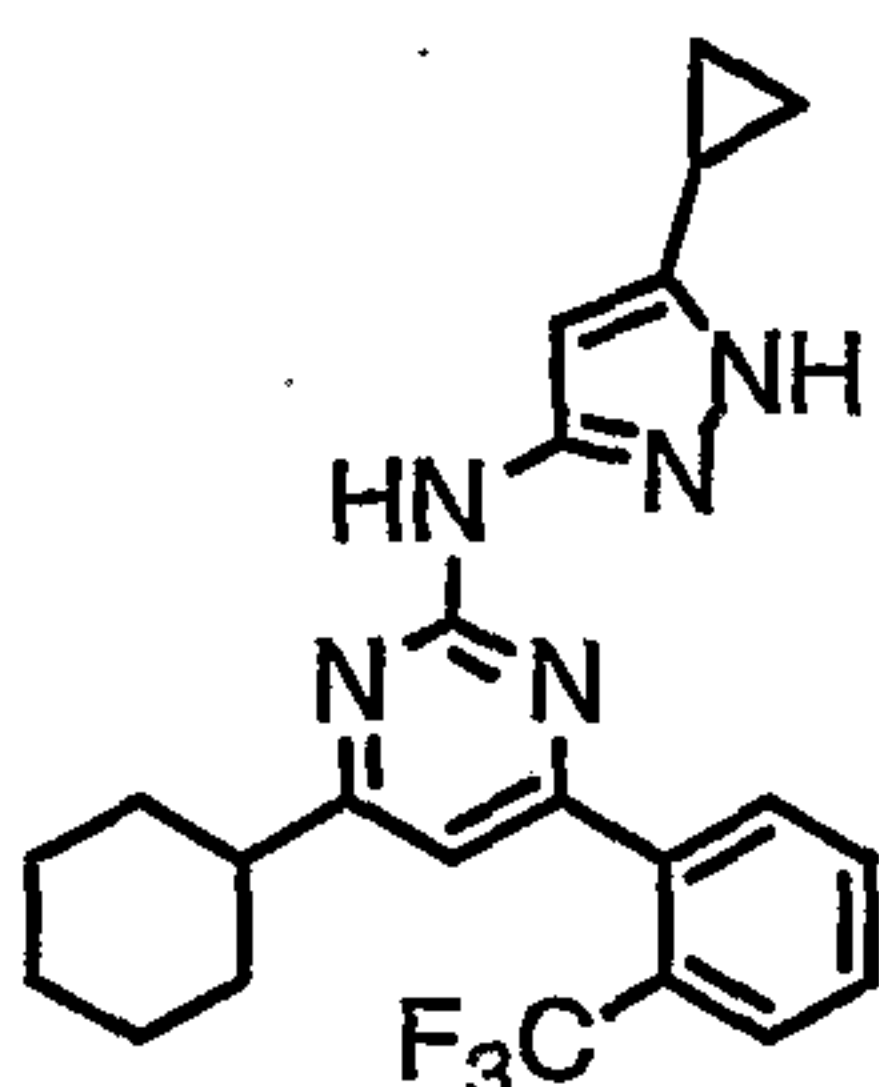
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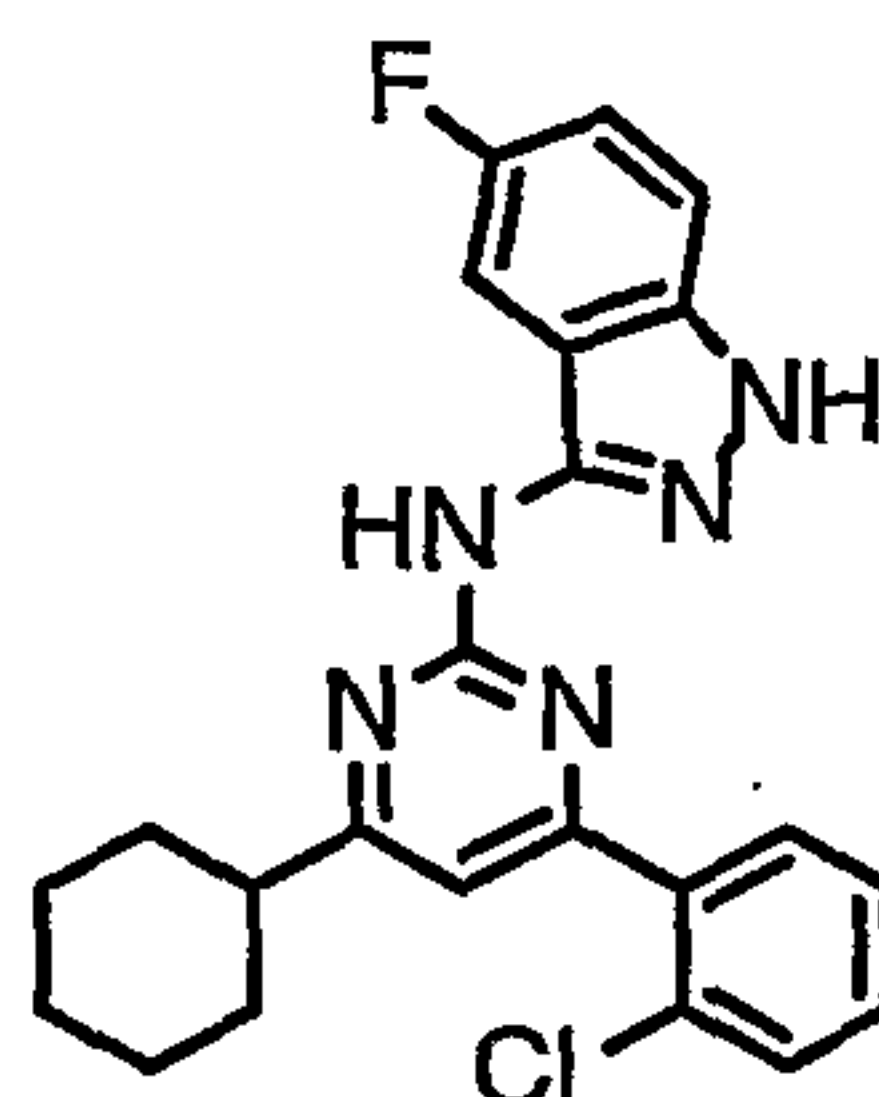
VII-29



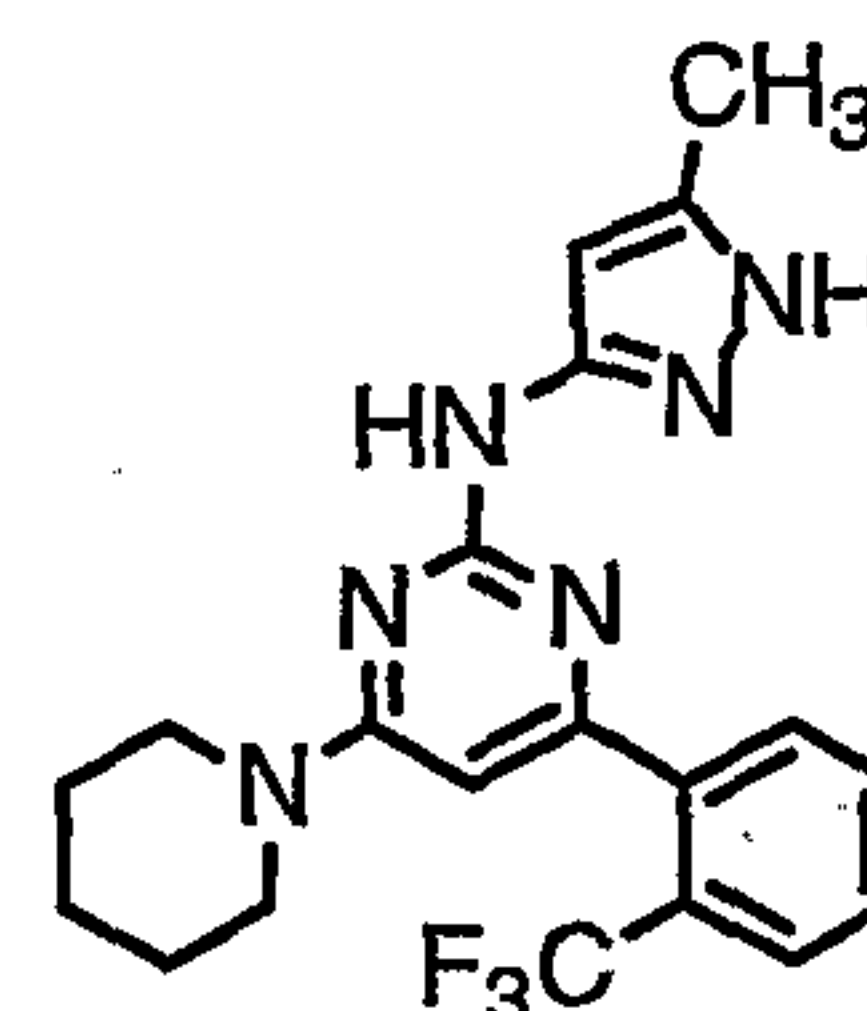
VII-30



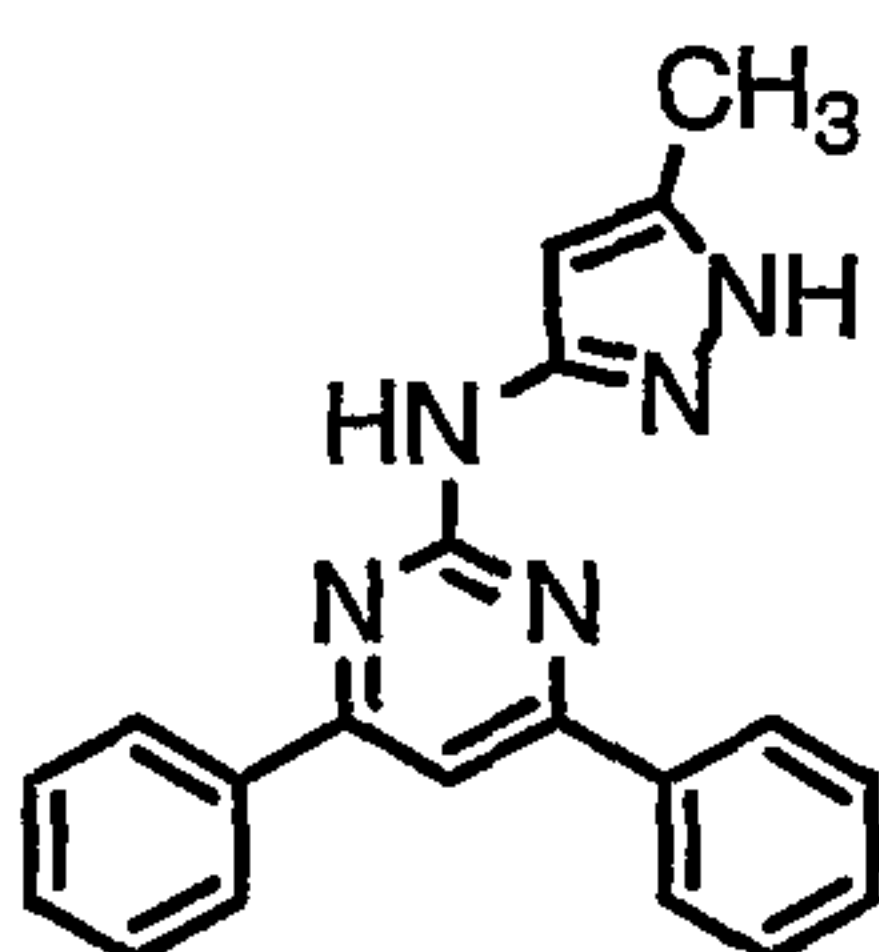
VII-31



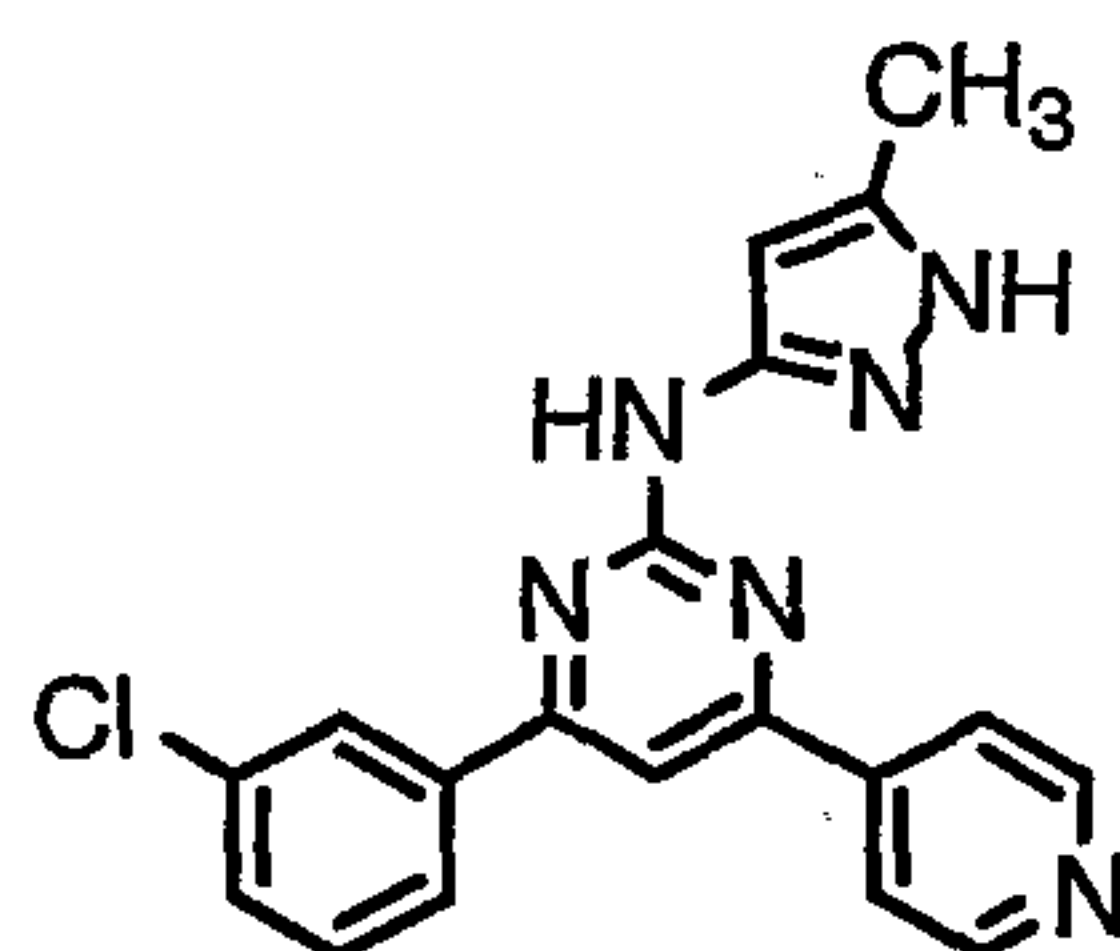
VII-32



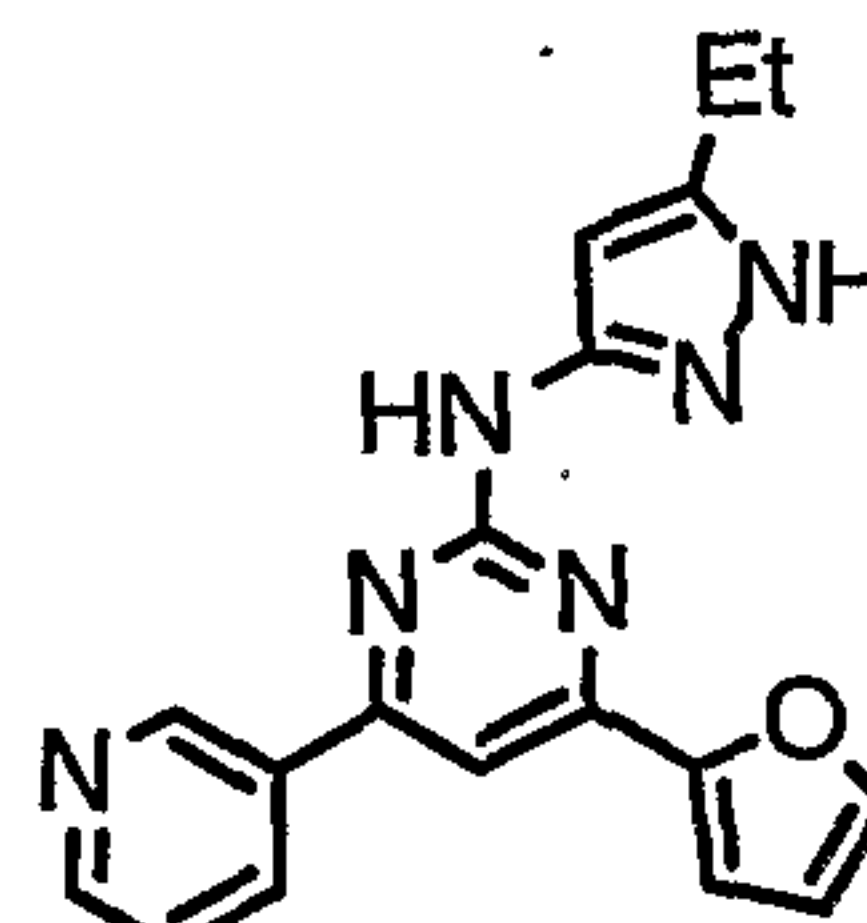
VII-33



VII-34



VII-35



VII-36

10 In another embodiment, this invention provides a composition comprising a compound of formula VII and a pharmaceutically acceptable carrier.

One aspect of this invention relates to a method of inhibiting GSK-3 activity in a patient,
15 comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula VII.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a GSK-3
20 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a

therapeutically effective amount of a composition comprising a compound of formula VII.

Another aspect relates to a method of enhancing glycogen synthesis and/or lowering blood levels of glucose in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula VII. This method is especially useful for diabetic patients.

Another aspect relates to a method of inhibiting the production of hyperphosphorylated Tau protein in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula VII. This method is especially useful in halting or slowing the progression of Alzheimer's disease.

Another aspect relates to a method of inhibiting the phosphorylation of β -catenin in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula VII. This method is especially useful for treating schizophrenia.

One aspect of this invention relates to a method of inhibiting Aurora activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula VII.

Another aspect relates to a method of treating a disease that is alleviated by treatment with an Aurora inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula VII. This method is

especially useful for treating cancer, such as colon, ovarian, and breast cancer.

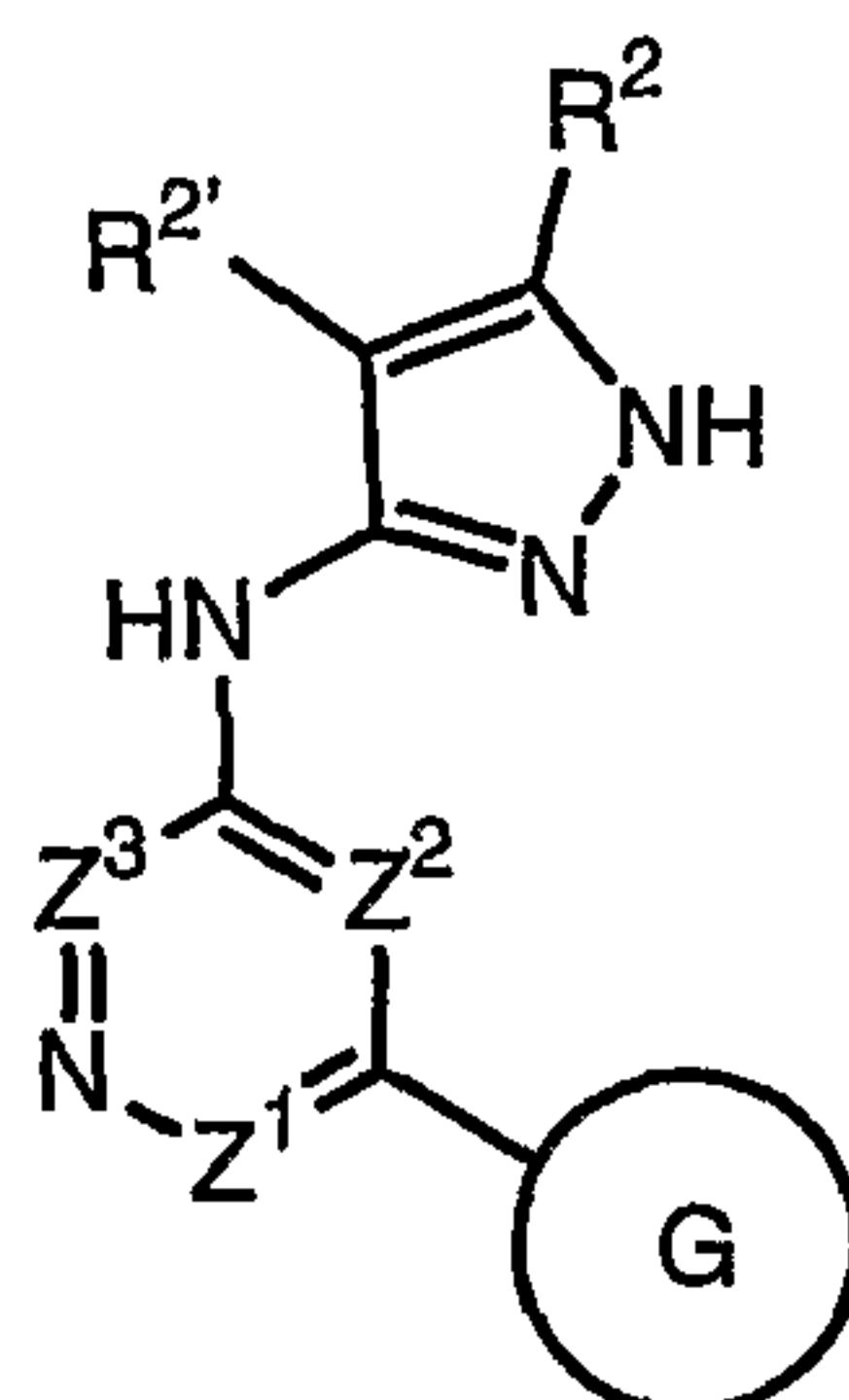
One aspect of this invention relates to a method of inhibiting CDK-2 activity in a patient,
5 comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula VII.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a CDK-2
10 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula VII. This method is especially useful for treating cancer, Alzheimer's
15 disease, restenosis, angiogenesis, glomerulonephritis, cytomegalovirus, HIV, herpes, psoriasis, atherosclerosis, alopecia, and autoimmune diseases such as rheumatoid arthritis.

Another method relates to inhibiting GSK-3, Aurora, or CDK-2 activity in a biological sample, which
20 method comprises contacting the biological sample with the GSK-3 or Aurora inhibitor of formula VII, or a pharmaceutical composition thereof, in an amount effective to inhibit GSK-3, Aurora or CDK-2.

25 Each of the aforementioned methods directed to the inhibition of GSK-3, Aurora or CDK-2, or the treatment of a disease alleviated thereby, is preferably carried out with a preferred compound of formula VII, as described above.

30 Another embodiment of this invention relates to compounds of formula VIII:



VIII

or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

Z^1 is N or CR^9 , Z^2 is N or CH, and Z^3 is N or CR^x , provided that one of Z^1 and Z^3 is nitrogen;

G is Ring C or Ring D;

- 5 Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from $-R^1$, any substitutable non-ortho carbon position on Ring C is independently substituted by $-R^5$, and two adjacent substituents on
- 10 Ring C are optionally taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-6 membered ring having 0-3 heteroatoms selected from oxygen, sulfur or nitrogen,
- 15 said fused ring being optionally substituted by halo, oxo, or $-R^8$;

- Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or
- 20 heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by halo, oxo, or $-R^5$, and at any substitutable ring nitrogen by $-R^4$, provided that when Ring D is a six-membered aryl

or heteroaryl ring, $-R^5$ is hydrogen at each ortho carbon position of Ring D;

R^1 is selected from -halo, -CN, $-NO_2$, T-V- R^6 , phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C_{1-6} aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or $-R^8$, said C_{1-6} aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R^1 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^x is T- R^3 ;

T is a valence bond or a C_{1-4} alkylidene chain;

R^2 and $R^{2'}$ are independently selected from -R, -T-W- R^6 , or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring having 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur, wherein each substitutable carbon on said fused ring formed by R^2 and $R^{2'}$ is substituted by halo, oxo, -CN, $-NO_2$, $-R^7$, or -V- R^6 , and any substitutable nitrogen on said ring formed by R^2 and $R^{2'}$ is substituted by R^4 ;

R^3 is selected from -R, -halo, -OR, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-COCH_2COR$, $-NO_2$, -CN, $-S(O)R$, $-S(O)_2R$, -SR, $-N(R^4)_2$, $-CON(R^7)_2$, $-SO_2N(R^7)_2$, $-OC(=O)R$, $-N(R^7)COR$, $-N(R^7)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^7)CON(R^7)_2$, $-N(R^7)SO_2N(R^7)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^7)_2$;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R^4 is independently selected from $-R^7$, $-\text{COR}^7$,
 $-\text{CO}_2$ (optionally substituted C_{1-6} aliphatic), $-\text{CON}(\text{R}^7)_2$,
 or $-\text{SO}_2\text{R}^7$, or two R^4 on the same nitrogen are taken
 together to form a 5-8 membered heterocyclyl or
 5 heteroaryl ring;

each R^5 is independently selected from $-R$, halo, $-\text{OR}$,
 $-\text{C}(=\text{O})\text{R}$, $-\text{CO}_2\text{R}$, $-\text{COCOR}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{S}(\text{O})\text{R}$, $-\text{SO}_2\text{R}$, $-\text{SR}$,
 $-\text{N}(\text{R}^4)_2$, $-\text{CON}(\text{R}^4)_2$, $-\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{OC}(=\text{O})\text{R}$, $-\text{N}(\text{R}^4)\text{COR}$,
 $-\text{N}(\text{R}^4)\text{CO}_2$ (optionally substituted C_{1-6} aliphatic),
 10 $-\text{N}(\text{R}^4)\text{N}(\text{R}^4)_2$, $-\text{C}=\text{NN}(\text{R}^4)_2$, $-\text{C}=\text{N}-\text{OR}$, $-\text{N}(\text{R}^4)\text{CON}(\text{R}^4)_2$,
 $-\text{N}(\text{R}^4)\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{N}(\text{R}^4)\text{SO}_2\text{R}$, or $-\text{OC}(=\text{O})\text{N}(\text{R}^4)_2$, or R^5 and
 an adjacent substituent taken together with their
 intervening atoms form said ring fused to Ring C;
 V is $-\text{O}-$, $-\text{S}-$, $-\text{SO}-$, $-\text{SO}_2-$, $-\text{N}(\text{R}^6)\text{SO}_2-$, $-\text{SO}_2\text{N}(\text{R}^6)-$,
 15 $-\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$, $-\text{N}(\text{R}^6)\text{CO}-$, $-\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$,
 $-\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{O})\text{N}(\text{R}^6)-$, $-\text{OC}(\text{O})\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$,
 $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$, $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{R}^6)=\text{NN}(\text{R}^6)-$,
 20 $-\text{C}(\text{R}^6)=\text{N}-\text{O}-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, or
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$;

W is $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$, $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$,
 $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$,
 $-\text{C}(\text{R}^6)\text{OC}(\text{O})-$, $-\text{C}(\text{R}^6)\text{OC}(\text{O})\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CO}-$,
 25 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{R}^6)=\text{NN}(\text{R}^6)-$, $-\text{C}(\text{R}^6)=\text{N}-\text{O}-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$, or $-\text{CON}(\text{R}^6)-$;

each R^6 is independently selected from hydrogen, an
 optionally substituted C_{1-4} aliphatic group, or two R^6
 30 groups on the same nitrogen atom are taken together
 with the nitrogen atom to form a 5-6 membered
 heterocyclyl or heteroaryl ring;

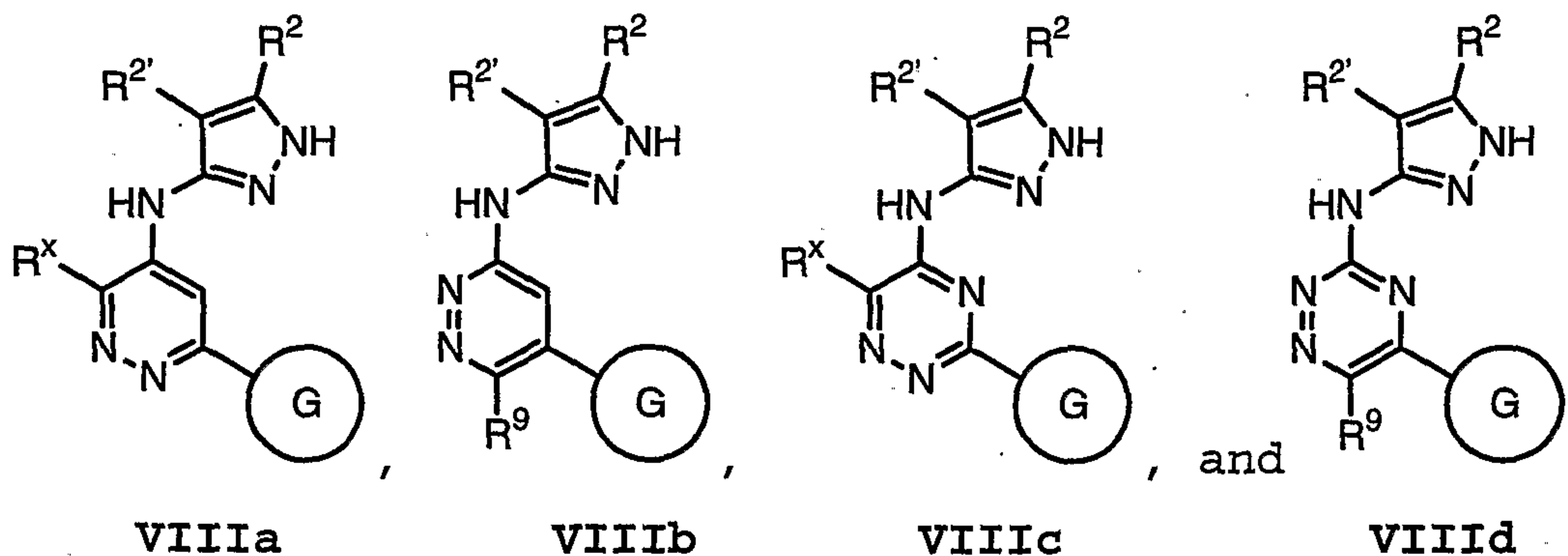
each R^7 is independently selected from hydrogen or an
 optionally substituted C_{1-6} aliphatic group, or two R^7

on the same nitrogen are taken together with the nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring;

each R^8 is independently selected from an optionally substituted C_{1-4} aliphatic group, $-OR^6$, $-SR^6$, $-COR^6$, $-SO_2R^6$, $-N(R^6)_2$, $-N(R^6)N(R^6)_2$, $-CN$, $-NO_2$, $-CON(R^6)_2$, or $-CO_2R^6$; and

R^9 is selected from $-R$, halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$.

Accordingly, the present invention relates to compounds of formula VIIIa, VIIIb, VIIIc and VIId as shown below:

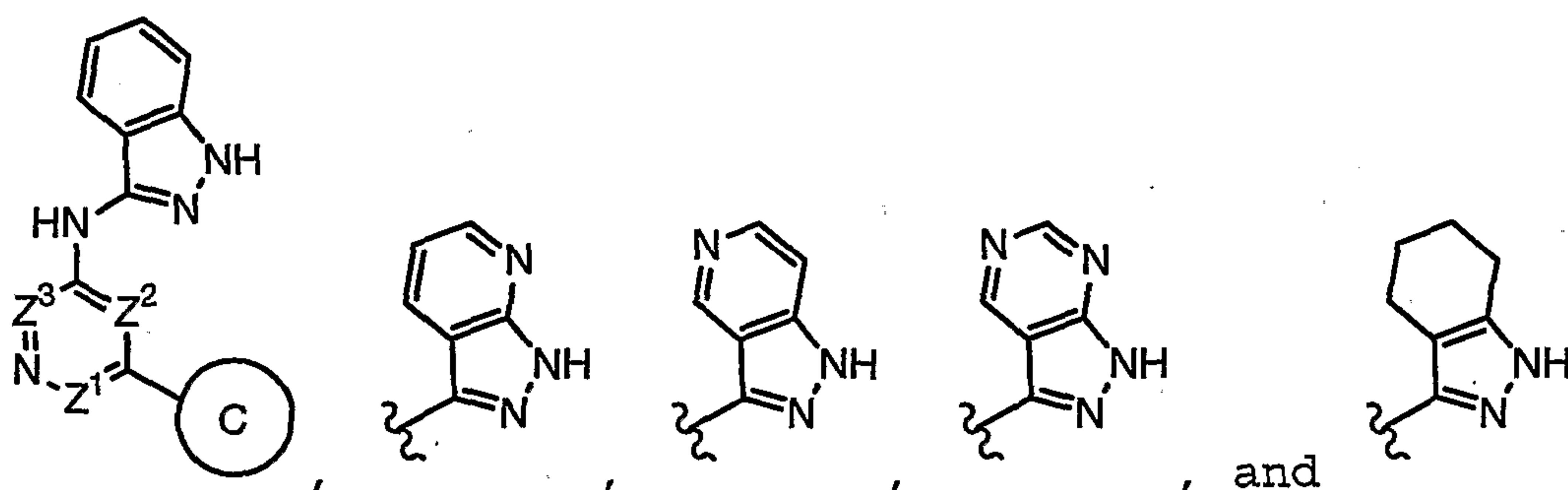


Preferred R^x groups of formula VIII include $T-R^3$ wherein T is a valence bond or a methylene and R^3 is CN , $-R$, or $-OR$. When R^3 is $-R$, preferred R^3 groups include an optionally substituted group selected from C_{1-6} aliphatic, phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring. When R^3 is $-OR$, preferred R groups include an optionally substituted group C_{1-6} aliphatic group such as alkyl- or dialkylaminoalkyl and aminoalkyl. Examples of

preferred R^x include acetamido, CN, piperidinyl, piperazinyl, phenyl, pyridinyl, imidazol-1-yl, imidazol-2-yl, cyclohexyl, cyclopropyl, methyl, ethyl, isopropyl, t-butyl, $NH_2CH_2CH_2NH$, and $NH_2CH_2CH_2O$.

5 Preferred R^9 groups of formula VIII, when present, include R, OR, and $N(R^4)_2$. Examples of preferred R^9 include methyl, ethyl, NH_2 , $NH_2CH_2CH_2NH$, $N(CH_3)_2CH_2CH_2NH$, $N(CH_3)_2CH_2CH_2O$, (piperidin-1-yl) CH_2CH_2O , and $NH_2CH_2CH_2O$.

The R^2 and $R^{2'}$ groups of formula VIII may be
 10 taken together to form a fused ring, thus providing a bicyclic ring system containing a pyrazole ring. Preferred fused rings include benzo, pyrido, pyrimido, and a partially unsaturated 6-membered carbocyclo ring. These are exemplified in the following formula VIII
 15 compounds having a pyrazole-containing bicyclic ring system:



20 Preferred substituents on the formula VIII $R^2/R^{2'}$ fused ring include one or more of the following:
 -halo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), $-CN$, $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl),
 25 $-C(O)NH_2$, and $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group. Preferably, the $(C_{1-4}$ alkyl) group is methyl.

When the pyrazole ring system of formula VIII is monocyclic, preferred R^2 groups include hydrogen, C_{1-4}

aliphatic, alkoxycarbonyl, (un)substituted phenyl, hydroxyalkyl, alkoxyalkyl, aminocarbonyl, mono- or dialkylaminocarbonyl, aminoalkyl, alkylaminoalkyl, dialkylaminoalkyl, phenylaminocarbonyl, and (N-heterocyclyl)carbonyl. Examples of such preferred R² substituents include methyl, cyclopropyl, ethyl, isopropyl, propyl, t-butyl, cyclopentyl, phenyl, CO₂H, CO₂CH₃, CH₂OH, CH₂OCH₃, CH₂CH₂CH₂OH, CH₂CH₂CH₂OCH₃, CH₂CH₂CH₂OCH₂Ph, CH₂CH₂CH₂NH₂, CH₂CH₂CH₂NHCOOC(CH₃)₃, CONHCH(CH₃)₂, CONHCH₂CH=CH₂, CONHCH₂CH₂OCH₃, CONHCH₂Ph, CONH(cyclohexyl), CON(Et)₂, CON(CH₃)CH₂Ph, CONH(n-C₃H₇), CON(Et)CH₂CH₂CH₃, CONHCH₂CH(CH₃)₂, CON(n-C₃H₇)₂, CO(3-methoxymethylpyrrolidin-1-yl), CONH(3-tolyl), CONH(4-tolyl), CONHCH₃, CO(morpholin-1-yl), CO(4-methylpiperazin-1-yl), CONHCH₂CH₂OH, CONH₂, and CO(piperidin-1-yl). A preferred R^{2'} group is hydrogen.

When G is Ring C, preferred formula VIII Ring C groups are phenyl and pyridinyl. When two adjacent substituents on Ring C are taken together to form a fused ring, Ring C is contained in a bicyclic ring system. Preferred fused rings include a benzo or pyrido ring. Such rings preferably are fused at ortho and meta positions of Ring C. Examples of preferred bicyclic Ring C systems include naphthyl and isoquinolinyl. Preferred R¹ groups include -halo, an optionally substituted C₁₋₆ aliphatic group, phenyl, -COR⁶, -OR⁶, -CN, -SO₂R⁶, -SO₂NH₂, -N(R⁶)₂, -CO₂R⁶, -CONH₂, -NHCOR⁶, -OC(O)NH₂, or -NHSO₂R⁶. When R¹ is an optionally substituted C₁₋₆ aliphatic group, the most preferred optional substituents are halogen. Examples of preferred R¹ groups include -CF₃, -Cl, -F, -CN, -COCH₃, -OCH₃, -OH, -CH₂CH₃, -OCH₂CH₃, -CH₃, -CF₂CH₃, cyclohexyl, t-butyl, isopropyl, cyclopropyl, -C≡CH, -C≡C-CH₃, -SO₂CH₃, -SO₂NH₂, -N(CH₃)₂, -CO₂CH₃, -CONH₂, -NHCOCH₃, -OC(O)NH₂, -NHSO₂CH₃, and -OCF₃.

On Ring C preferred R^5 substituents, when present, include -halo, -CN, -NO₂, -N(R⁴)₂, optionally substituted C₁₋₆ aliphatic group, -OR, -C(O)R, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, and -N(R⁴)SO₂R. More preferred R^5 substituents include -Cl, -F, -CN, -CF₃, -NH₂, -NH(C₁₋₄ aliphatic), -N(C₁₋₄ aliphatic)₂, -O(C₁₋₄ aliphatic), C₁₋₄ aliphatic, and -CO₂(C₁₋₄ aliphatic). Examples of such preferred R^5 substituents include -Cl, -F, -CN, -CF₃, -NH₂, -NHMe, -NMe₂, -OEt, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, and -CO₂Et.

When G is Ring D, preferred formula VIII Ring D monocyclic rings include substituted and unsubstituted phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, and morpholinyl rings. When two adjacent substituents on Ring D are taken together to form a fused ring, the Ring D system is bicyclic. Preferred formula VIII Ring D bicyclic rings include 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, and naphthyl. Examples of more preferred bicyclic Ring D systems include naphthyl and isoquinolinyl.

Preferred R^5 substituents on Ring D of formula VIII include halo, oxo, CN, -NO₂, -N(R⁴)₂, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, -N(R⁴)SO₂R, -SR, -OR, -C(O)R, or substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. More preferred R^5 substituents include -halo, -CN, -oxo, -SR, -OR, -N(R⁴)₂, -C(O)R, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C₆₋₁₀ aryl, or C₁₋₆ aliphatic. Examples of Ring D substituents include -OH, phenyl, methyl, CH₂OH, CH₂CH₂OH, pyrrolidinyl, OPh, CF₃, C≡CH, Cl, Br, F, I, NH₂,

C(O)CH₃, *i*-propyl, *tert*-butyl, SEt, OMe, N(Me)₂, methylene dioxy, and ethylene dioxy.

Preferred formula VIII compounds have one or more, and more preferably all, of the features selected
5 from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by -R⁵, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is selected from a
10 naphthyl, quinolinyl or isoquinolinyl ring, and R¹ is -halo, an optionally substituted C₁₋₆ aliphatic group, phenyl, -COR⁶, -OR⁶, -CN, -SO₂R⁶, -SO₂NH₂, -N(R⁶)₂, -CO₂R⁶, -CONH₂, -NHCOR⁶, -OC(O)NH₂, or -NHSO₂R⁶; or Ring D is an optionally substituted ring selected from a phenyl,
15 pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl ring;

20 (b) R^x is T-R³ wherein T is a valence bond or a methylene; and

(c) R^{2'} is hydrogen and R² is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C₁₋₆ aliphatic group, or R² and R^{2'} are
25 taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring.

More preferred compounds of formula VIII have one or more, and more preferably all, of the features
30 selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by -R⁵, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and

R^1 is -halo, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic group, phenyl, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl;

(b) R^x is T- R^3 wherein T is a valence bond or a methylene and R^3 is CN, -R or -OR;

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring; and

(d) each R^5 is independently selected from -halo, -CN, -NO₂, -N(R^4)₂, optionally substituted C_{1-6} aliphatic group, -OR, -C(O)R, -CO₂R, -CONH(R^4), -N(R^4)COR, -SO₂N(R^4)₂, or -N(R^4)SO₂R.

Even more preferred compounds of formula VIII have one or more, and more preferably all, of the features selected from the group consisting of:

(a) R^x is T- R^3 wherein T is a valence bond or a methylene and R^3 is -R or -OR wherein R is an optionally substituted group selected from C_{1-6} aliphatic, phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring;

(b) Ring C is a phenyl or pyridinyl ring, optionally substituted by - R^5 , wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R^1 is -halo, a C_{1-4} aliphatic group optionally substituted with halogen, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl,

piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, isoquinolinyl, quinolinyl, or naphthyl;

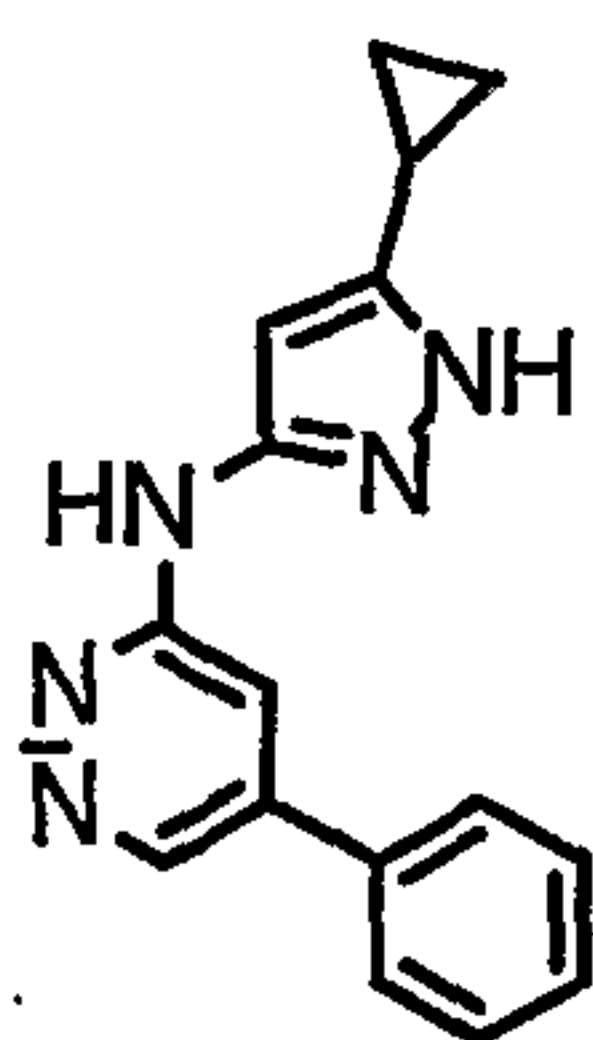
5 (c) R^2 and $R^{2'}$ are taken together with their intervening atoms to form a benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring optionally substituted with -halo, $-N(R^4)_2$, $-C_{1-4}$ alkyl, $-C_{1-4}$ haloalkyl, $-NO_2$, $-O(C_{1-4}$ alkyl), $-CO_2(C_{1-4}$ alkyl), $-CN$,
 10 $-SO_2(C_{1-4}$ alkyl), $-SO_2NH_2$, $-OC(O)NH_2$, $-NH_2SO_2(C_{1-4}$ alkyl), $-NHC(O)(C_{1-4}$ alkyl), $-C(O)NH_2$, or $-CO(C_{1-4}$ alkyl), wherein the $(C_{1-4}$ alkyl) is a straight, branched, or cyclic alkyl group;

(d) each R^5 is independently selected from $-Cl$,
 15 $-F$, $-CN$, $-CF_3$, $-NH_2$, $-NH(C_{1-4}$ aliphatic), $-N(C_{1-4}$ aliphatic) $_2$, $-O(C_{1-4}$ aliphatic), C_{1-4} aliphatic, and $-CO_2(C_{1-4}$ aliphatic); and

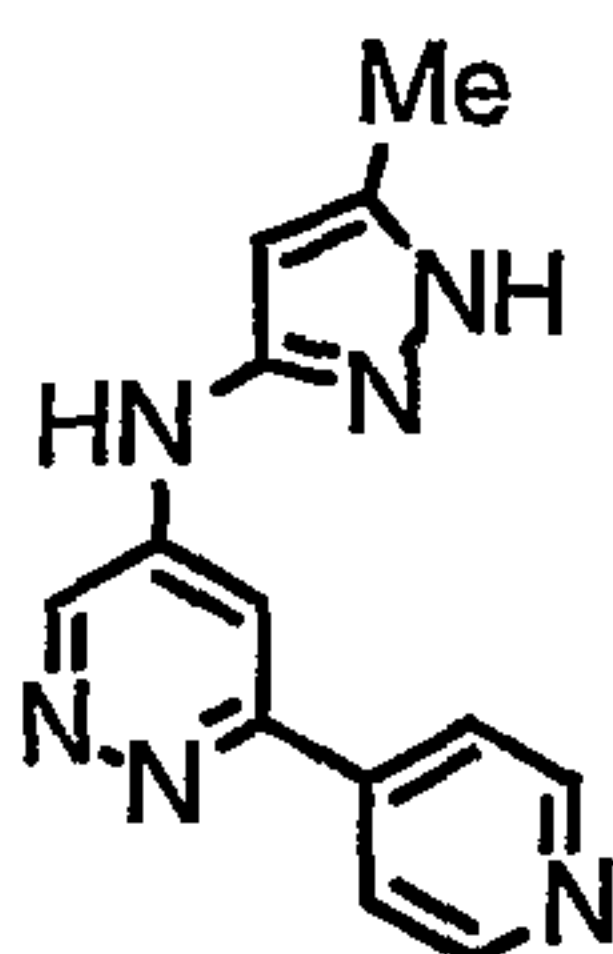
(e) R^9 is R , OR , or $N(R^4)_2$.

Representative compounds of formula VIII are
 20 set forth in Table 7 below.

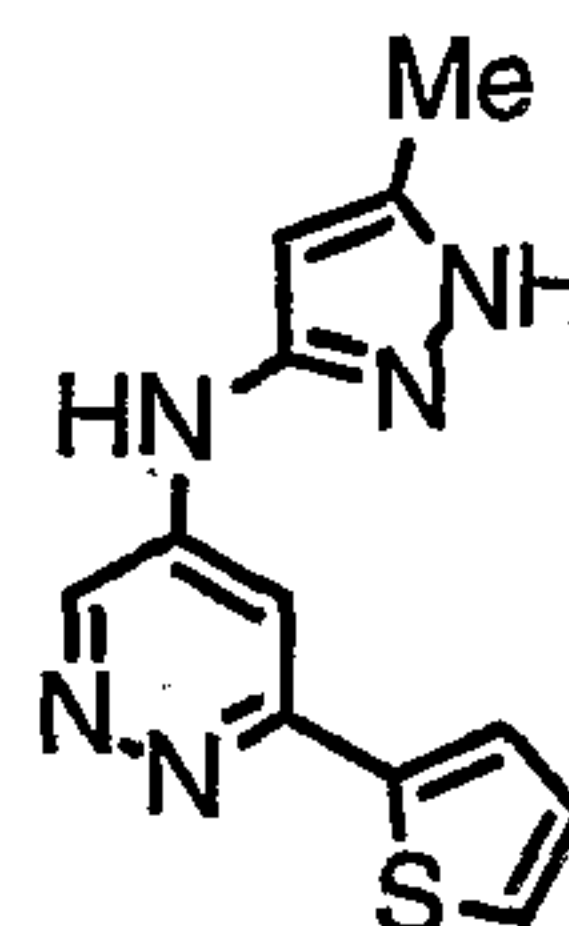
Table 7.



VIII-1

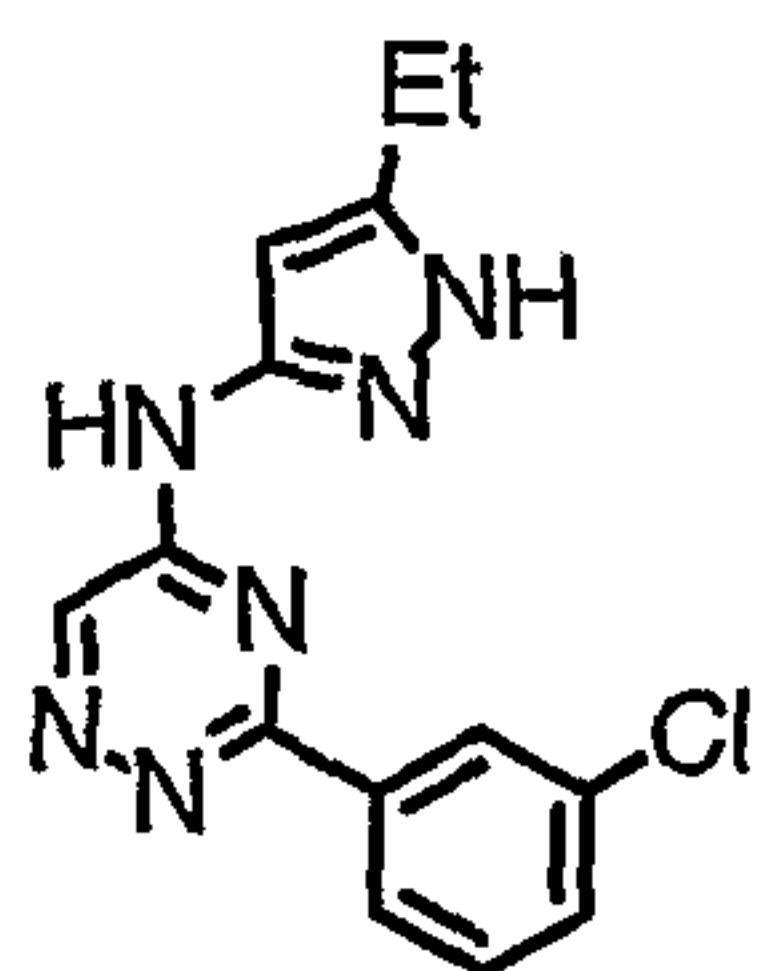


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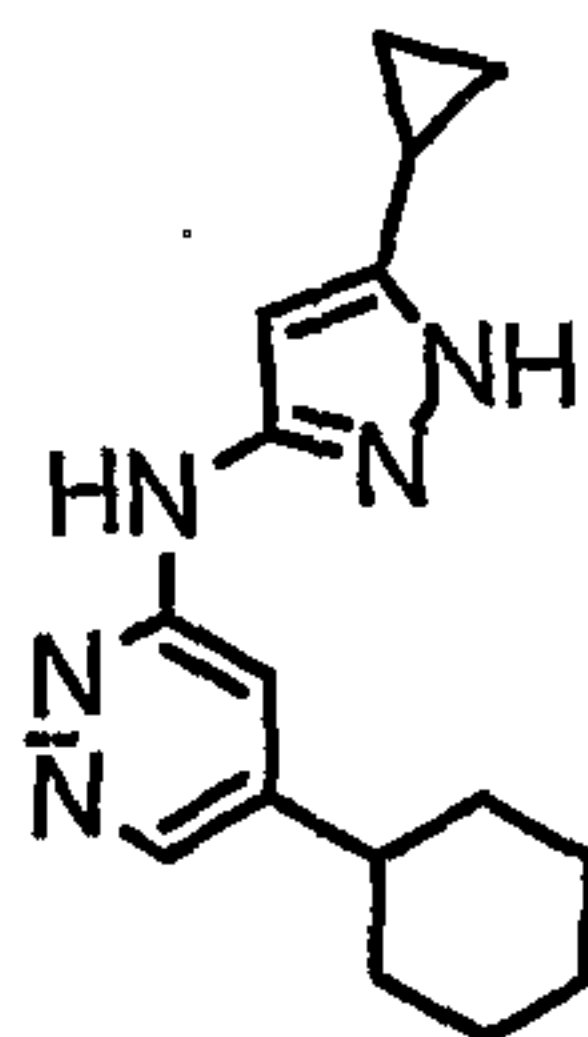


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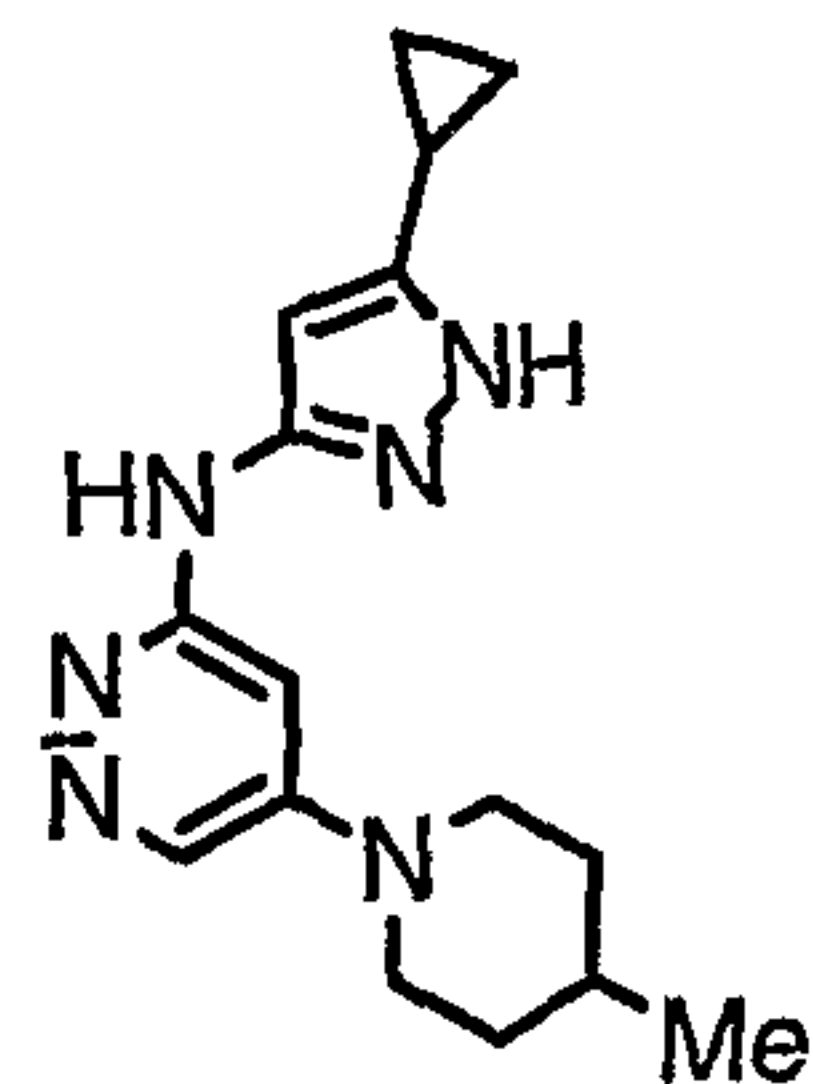
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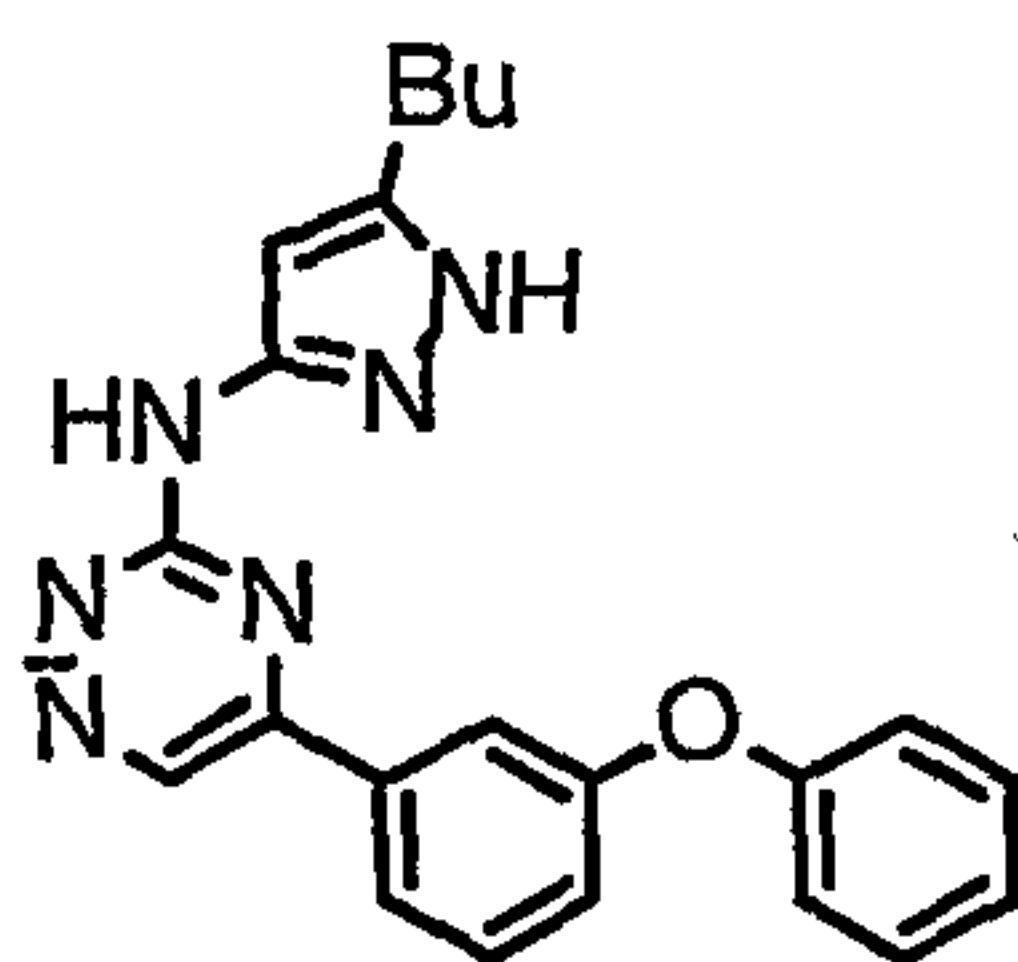
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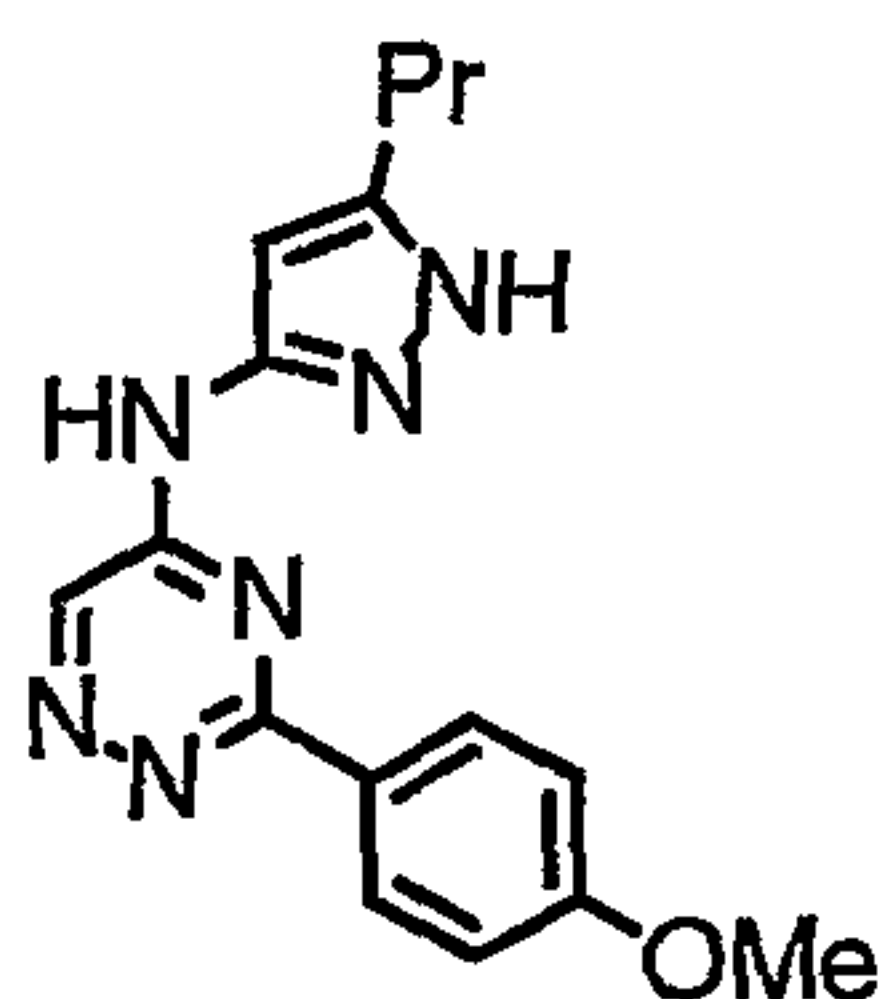
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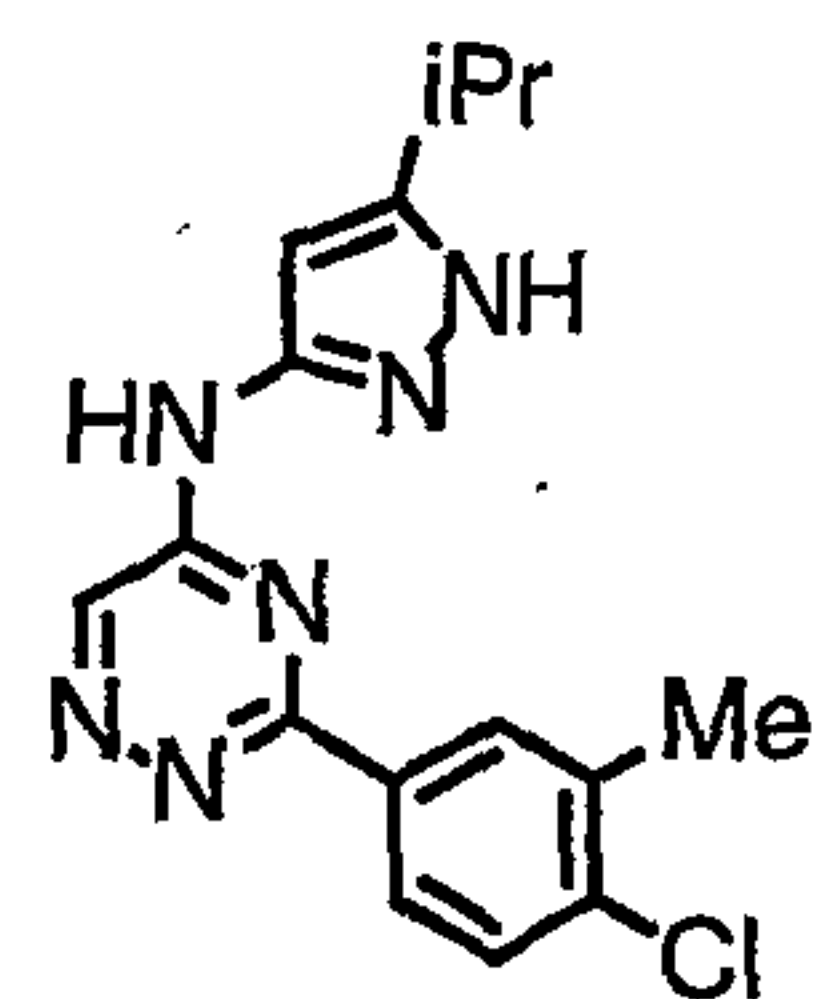
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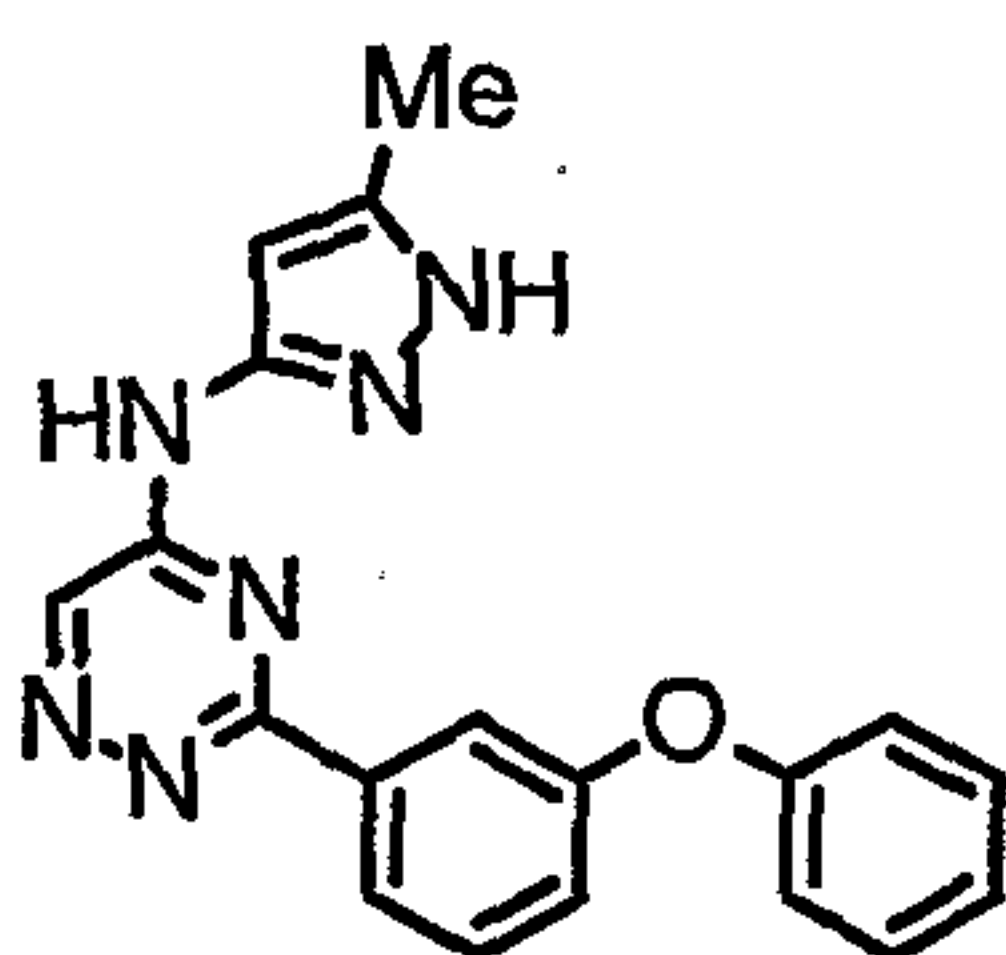
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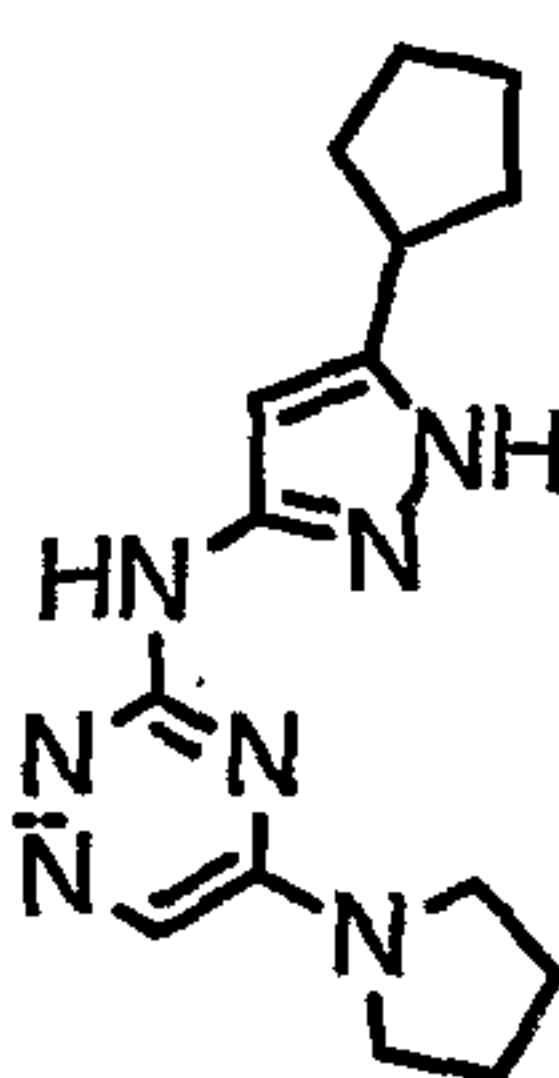
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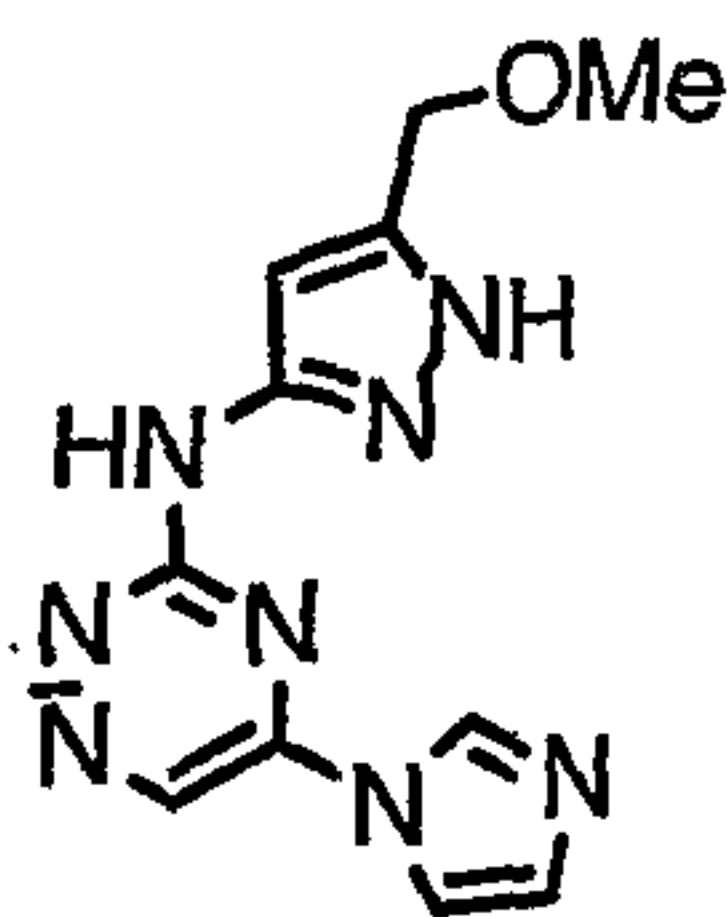
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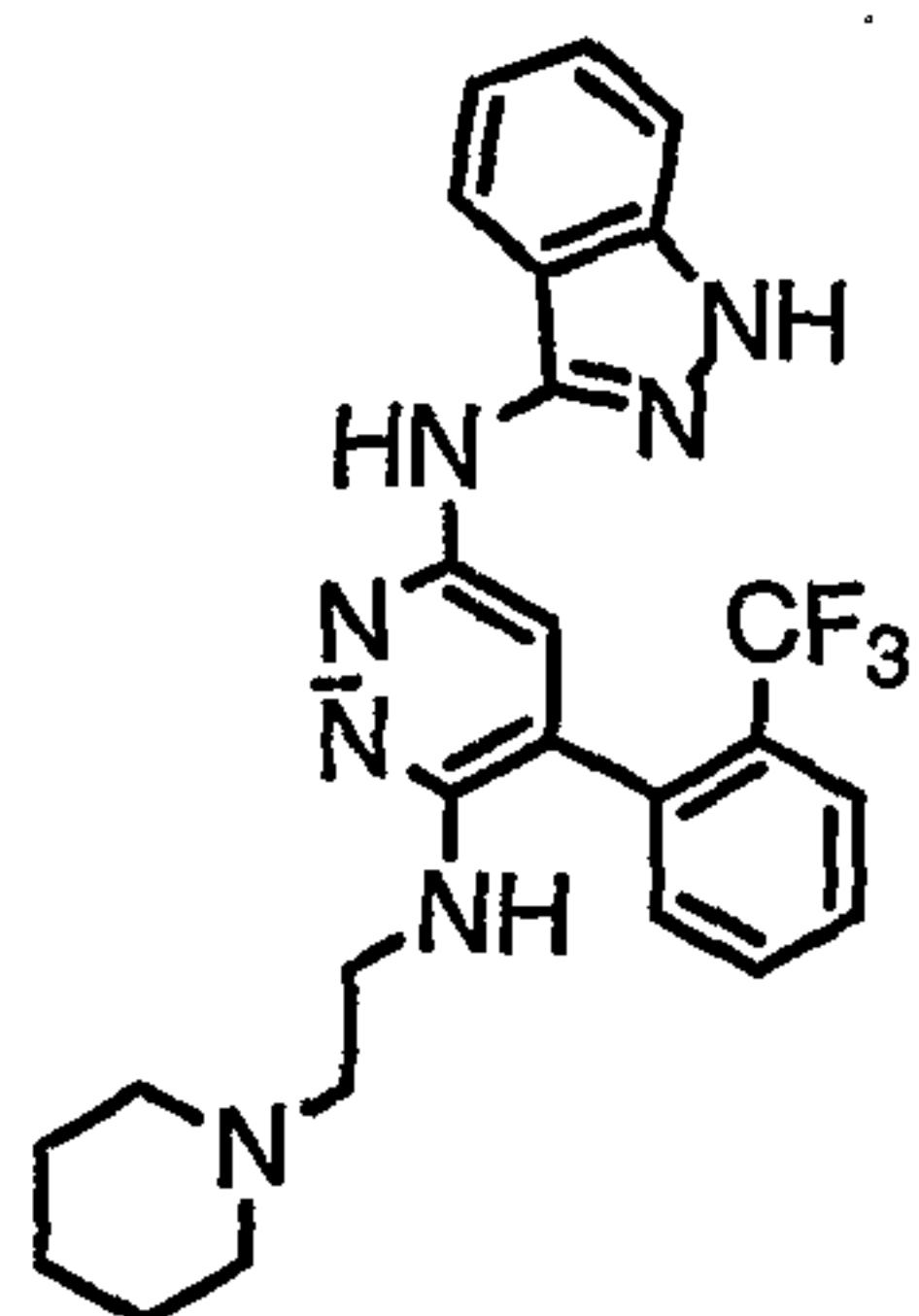
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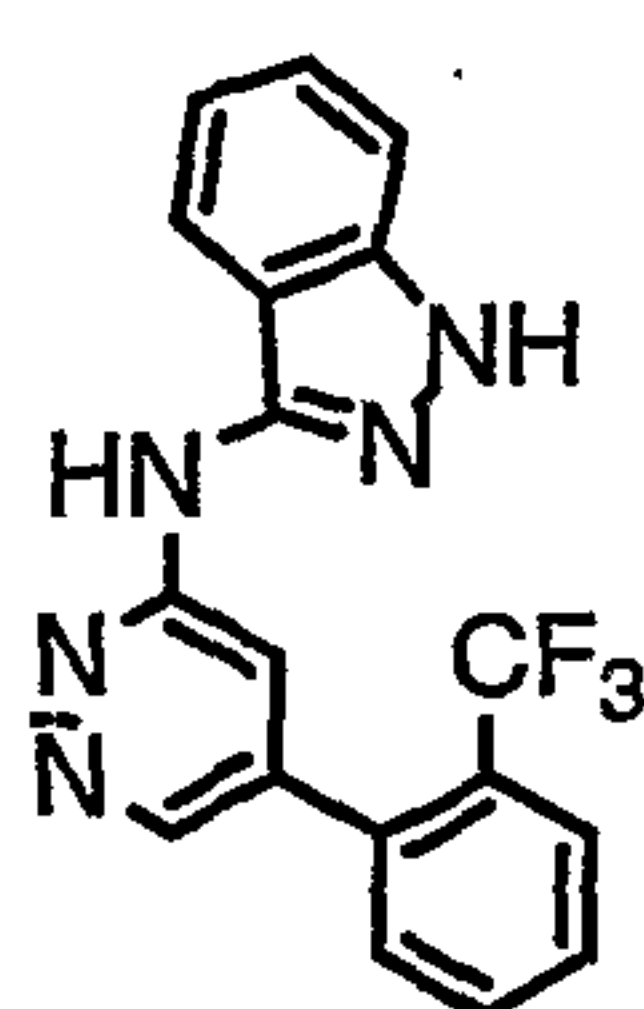
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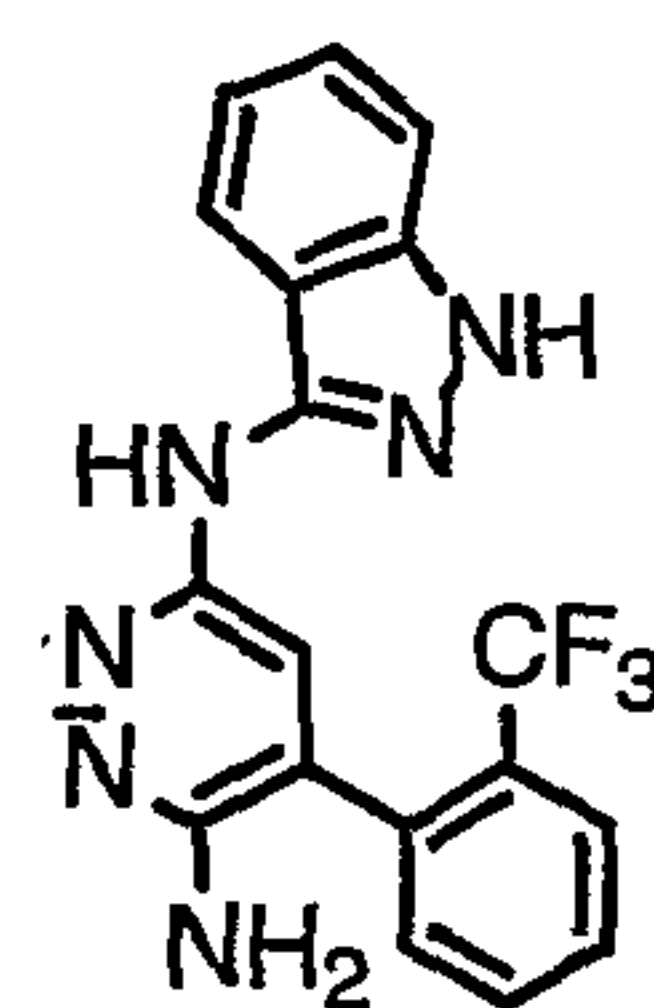
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VIII-13



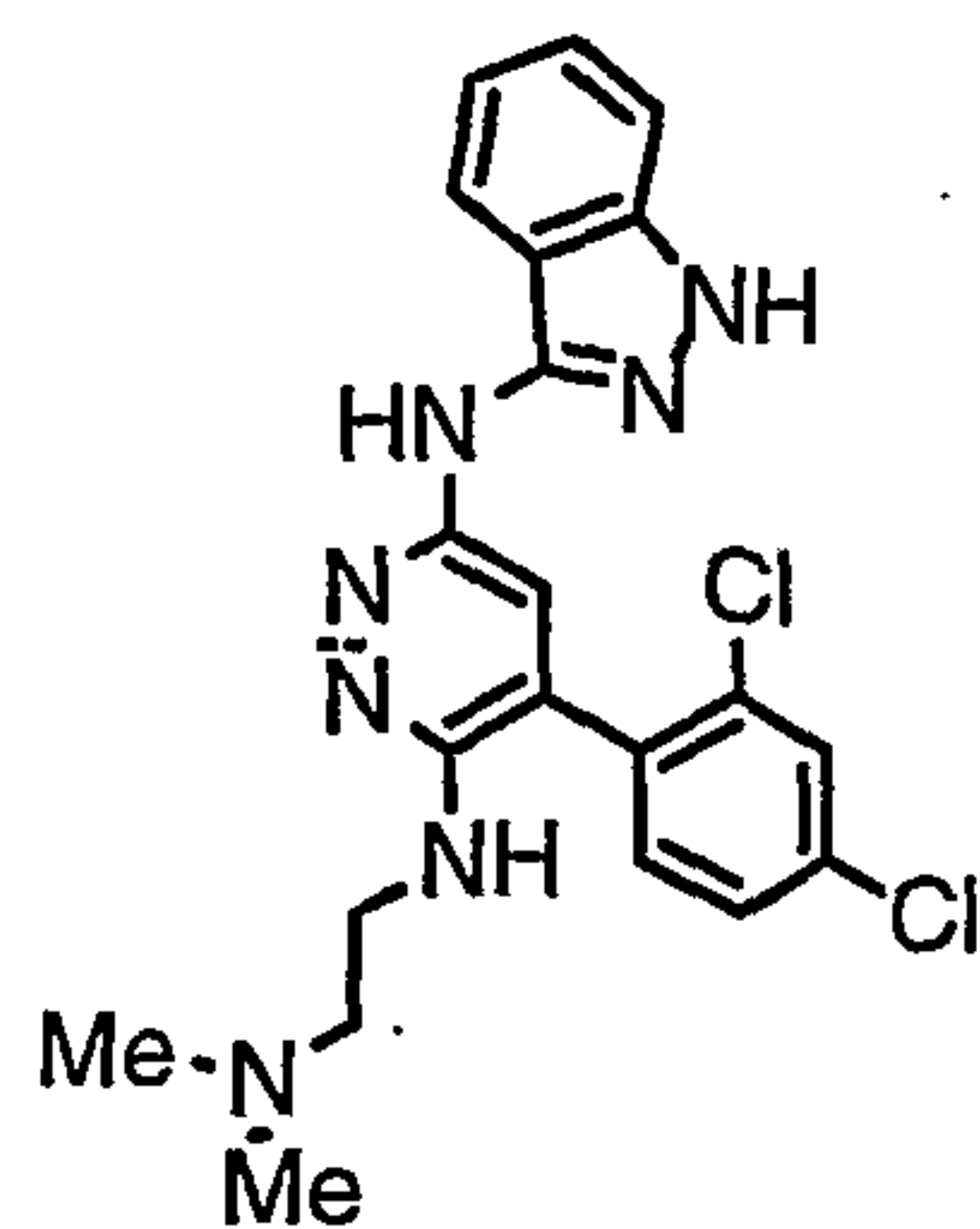
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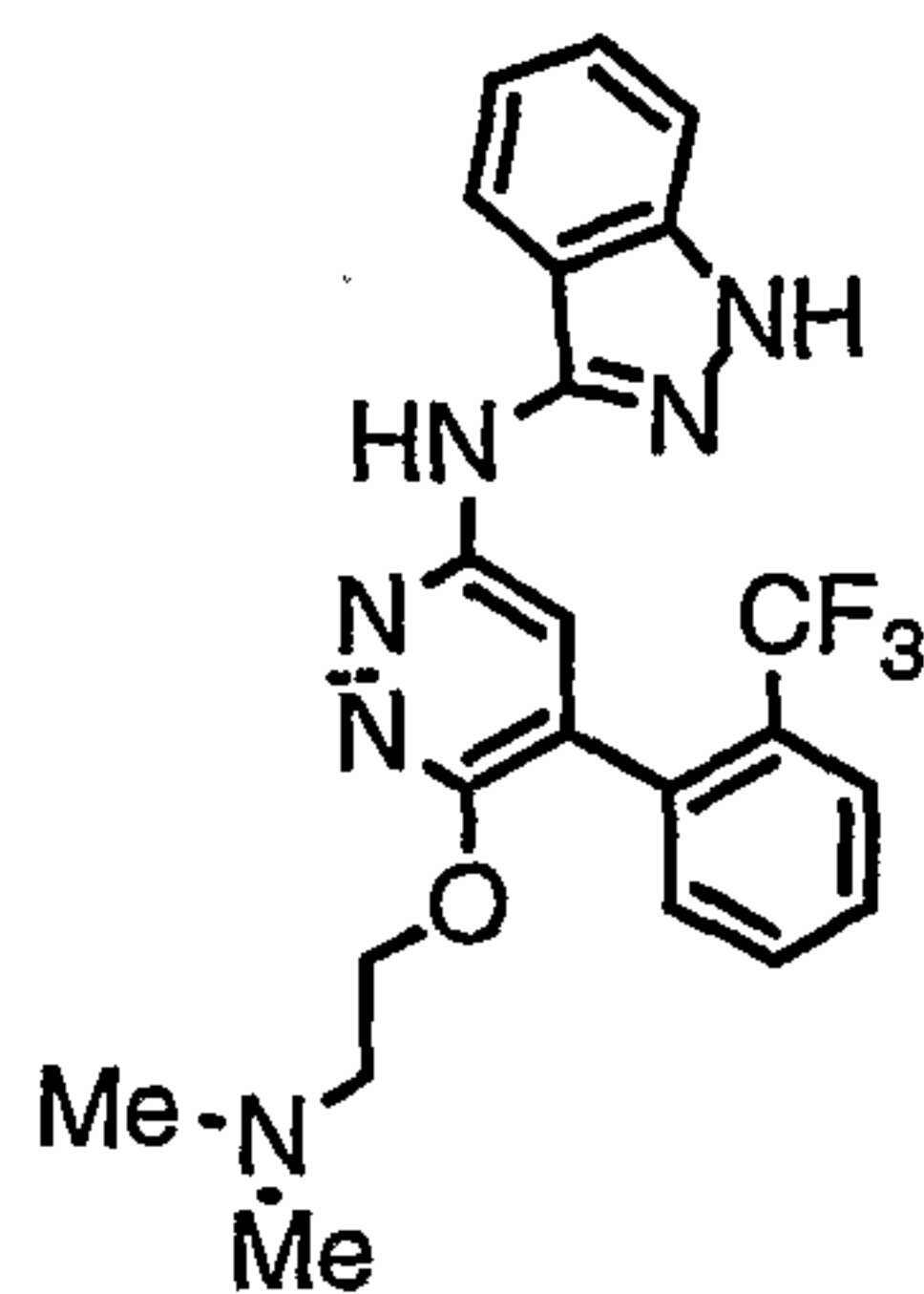
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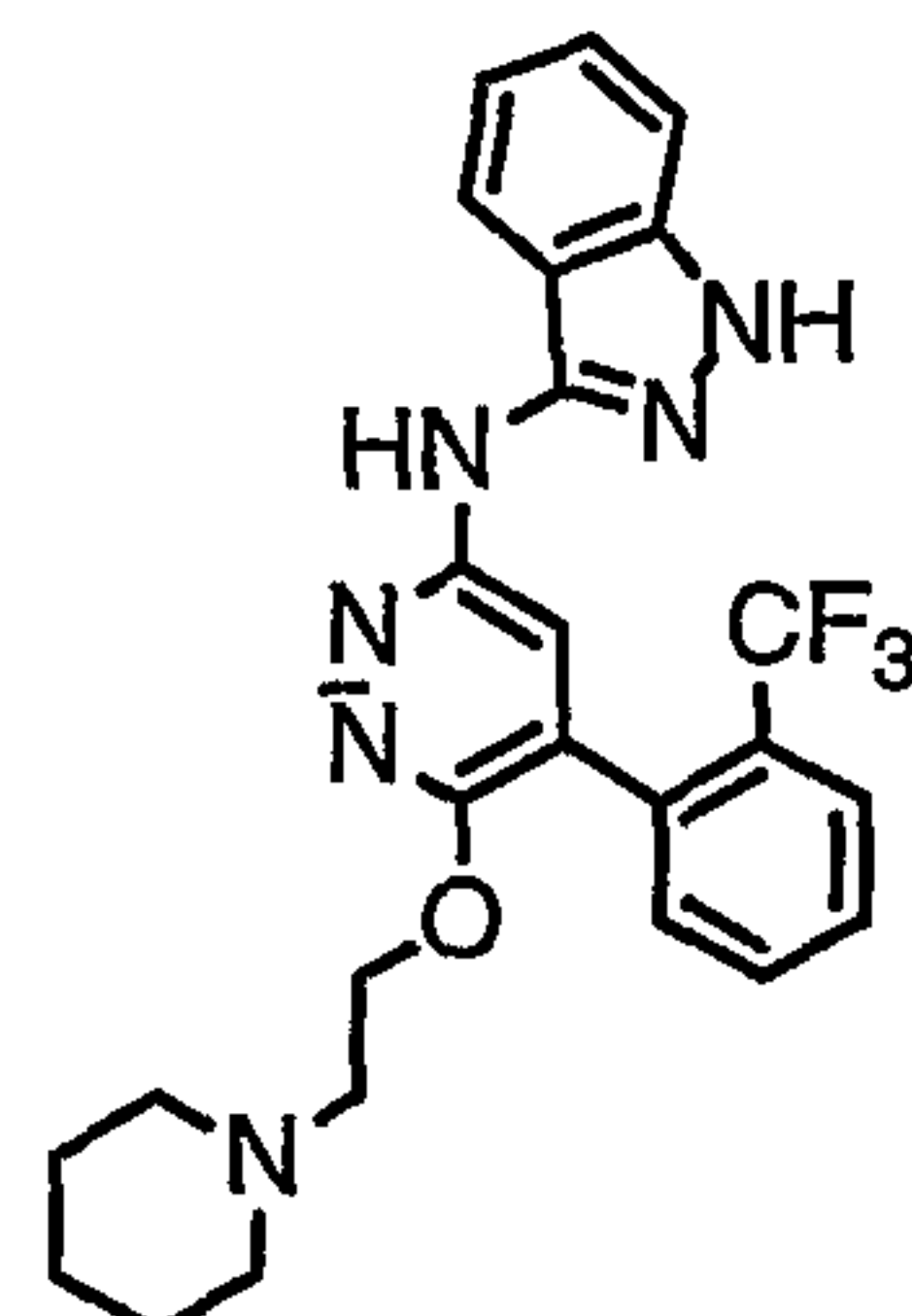
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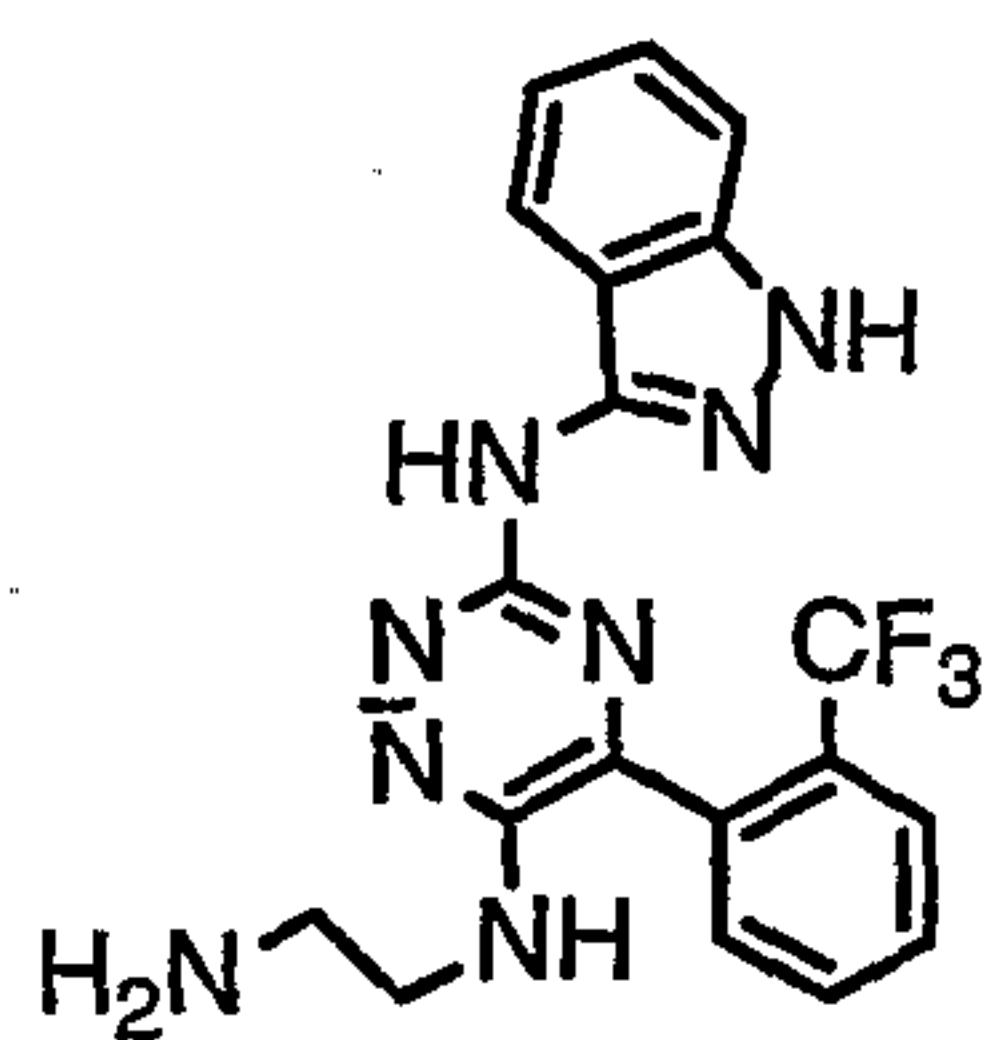
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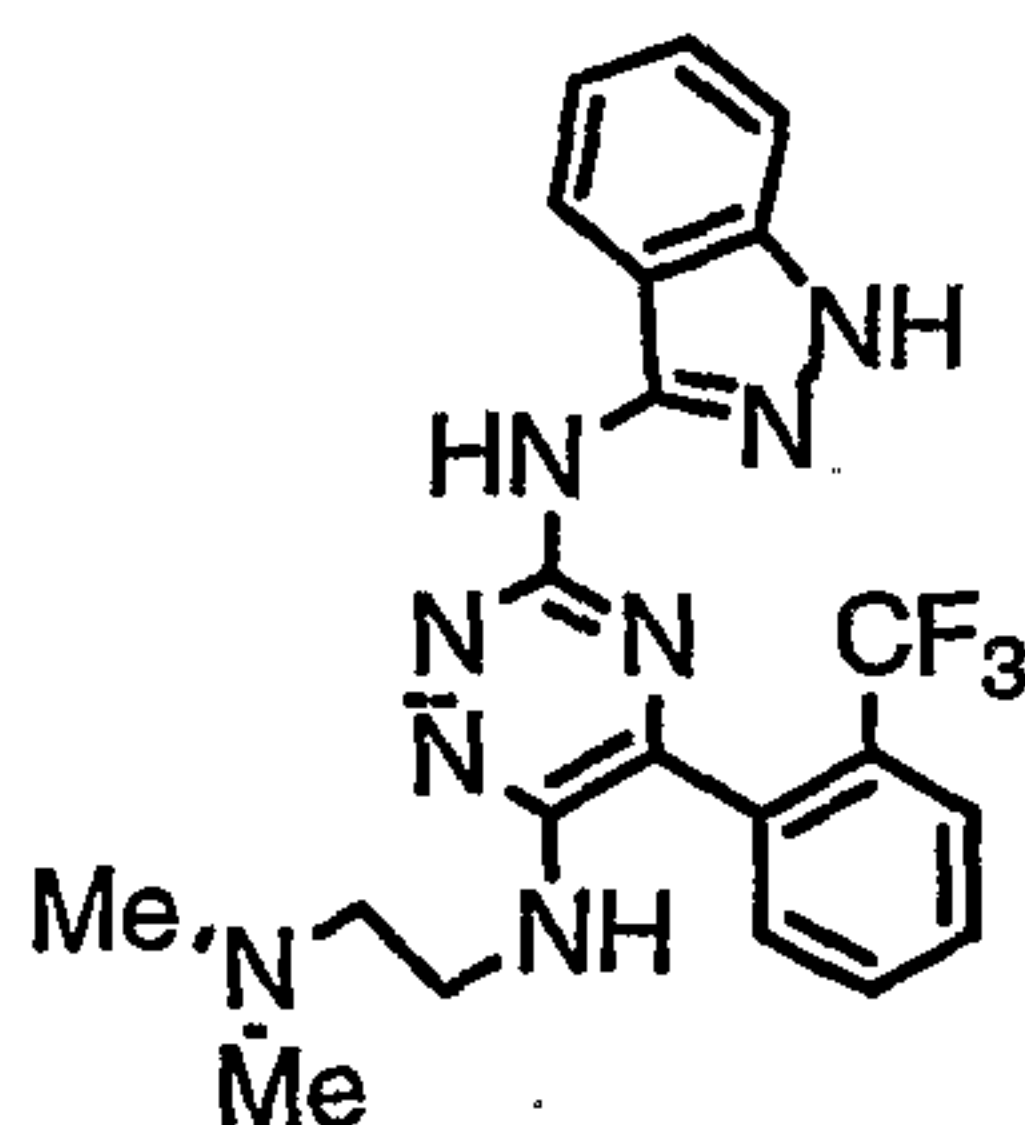
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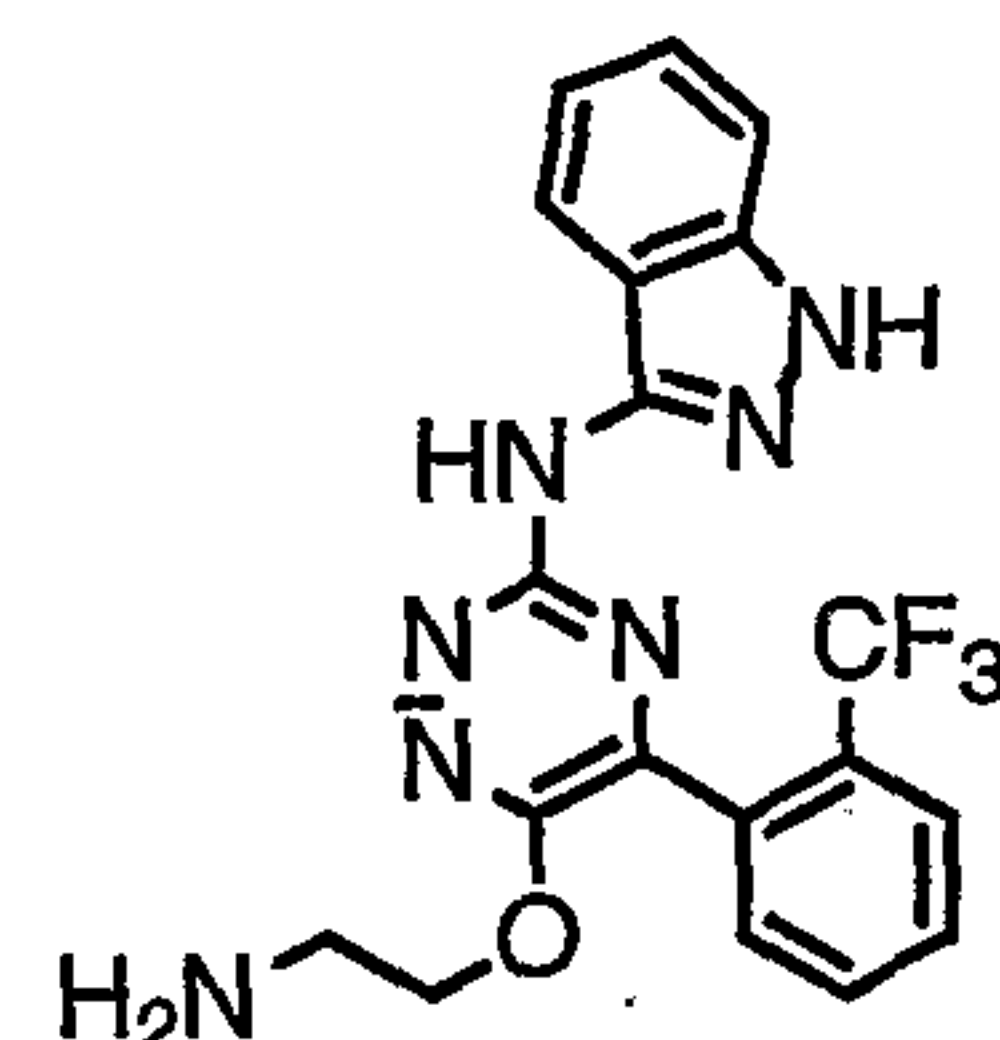
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VIII-19

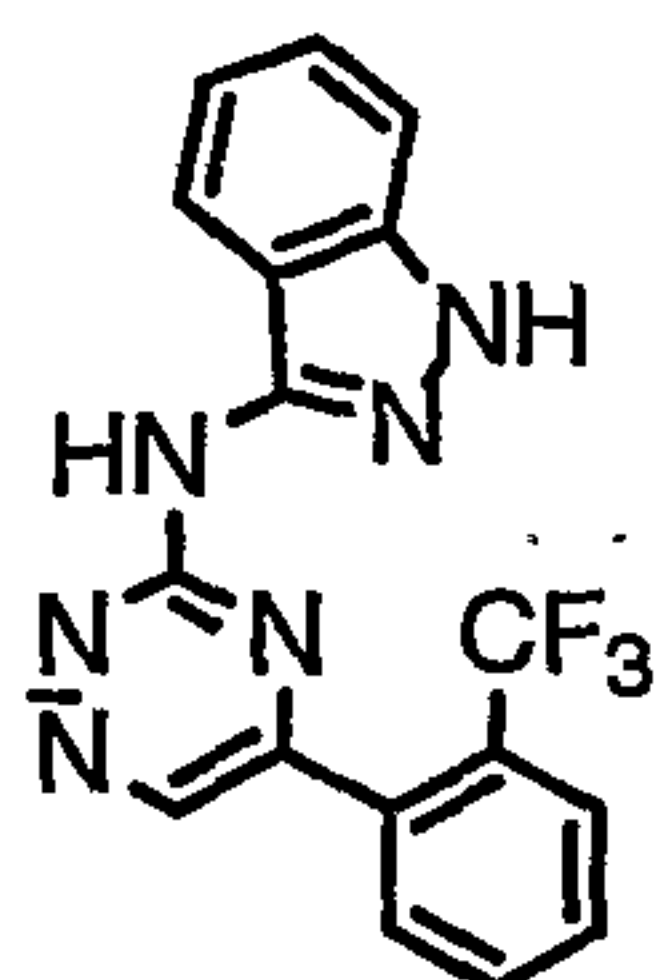


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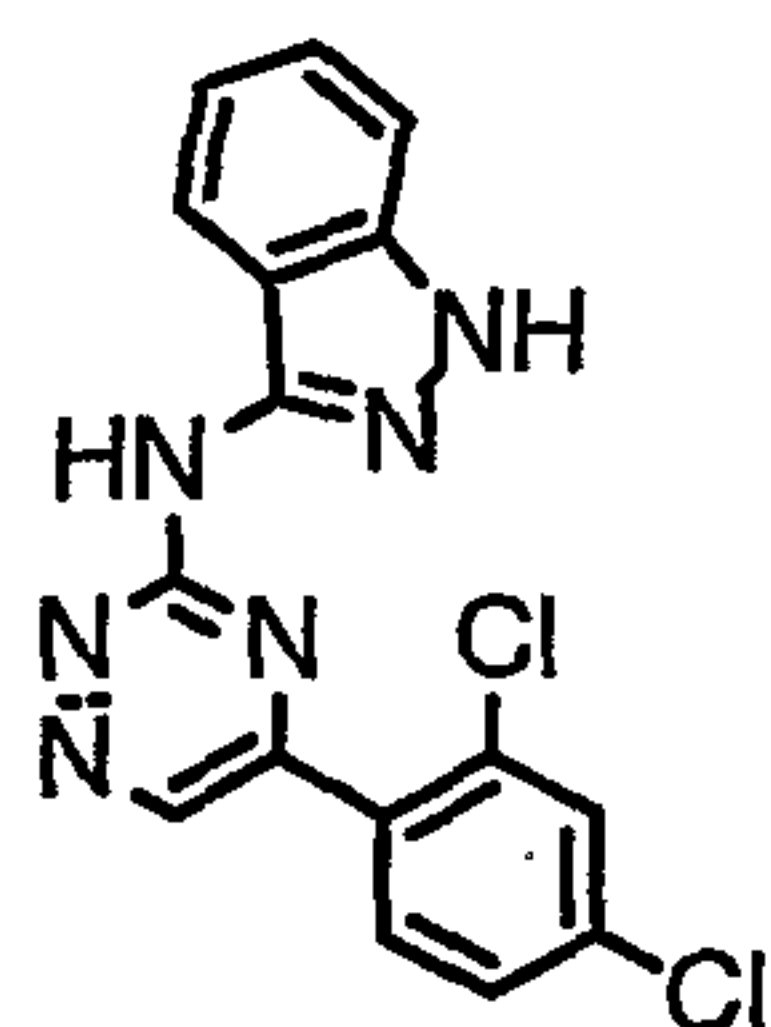


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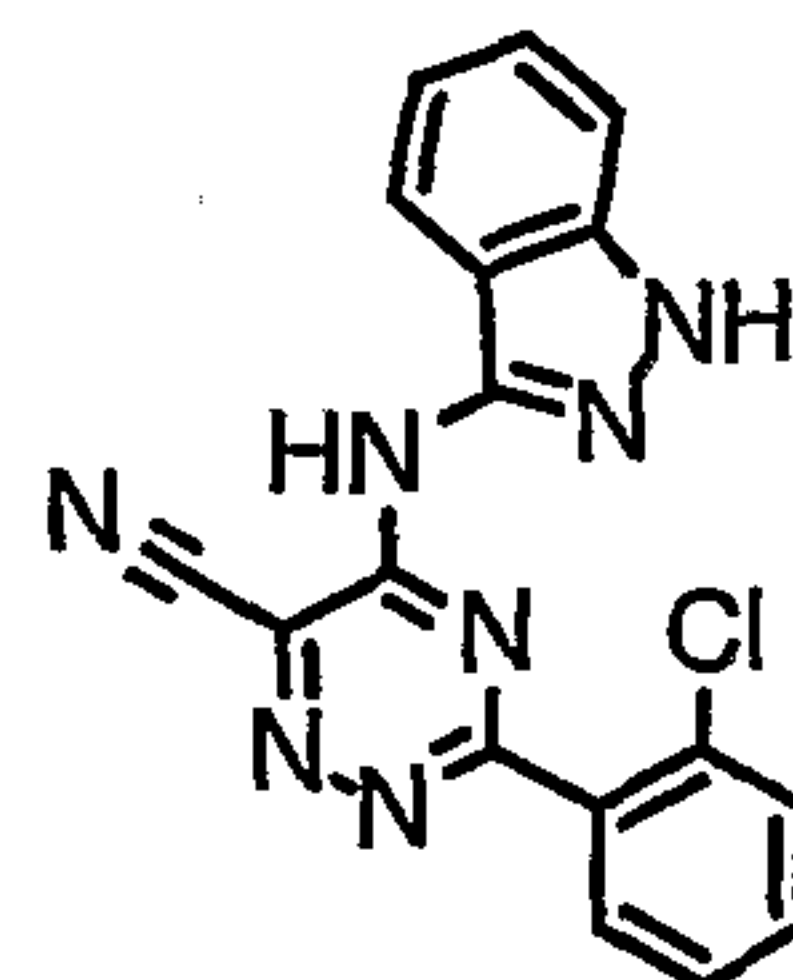
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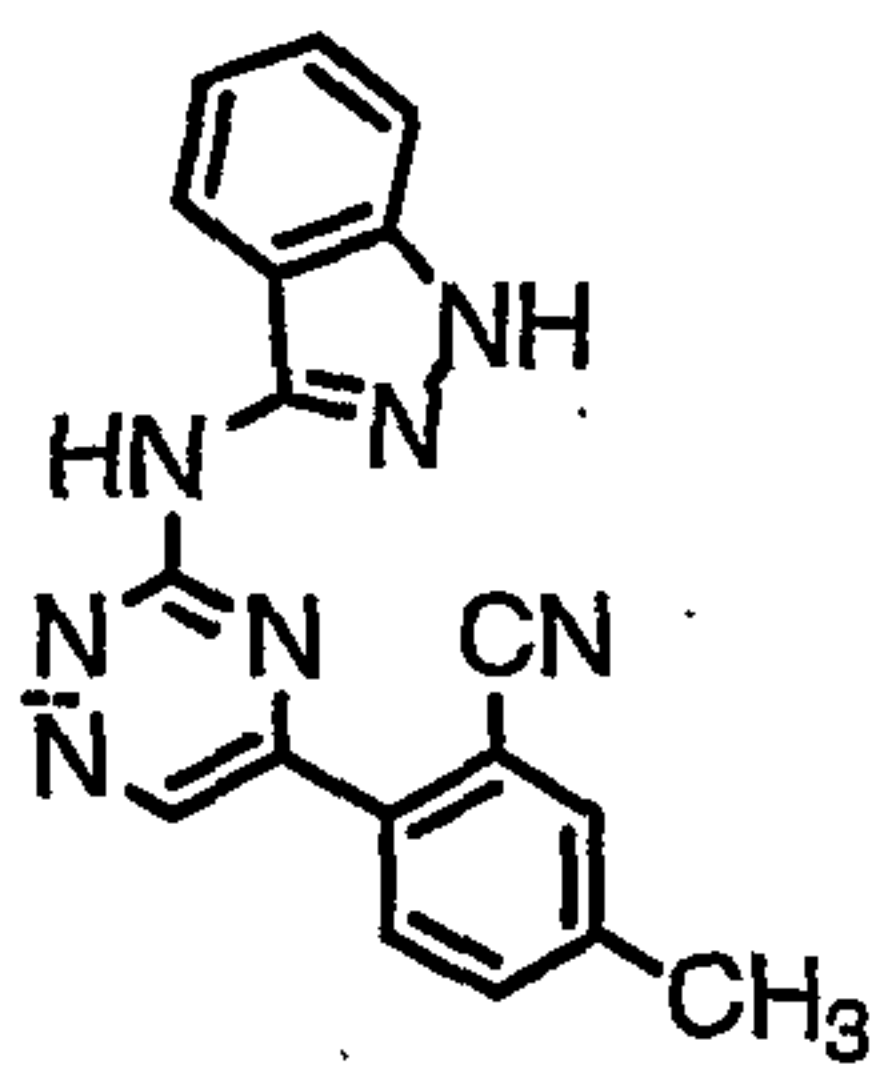
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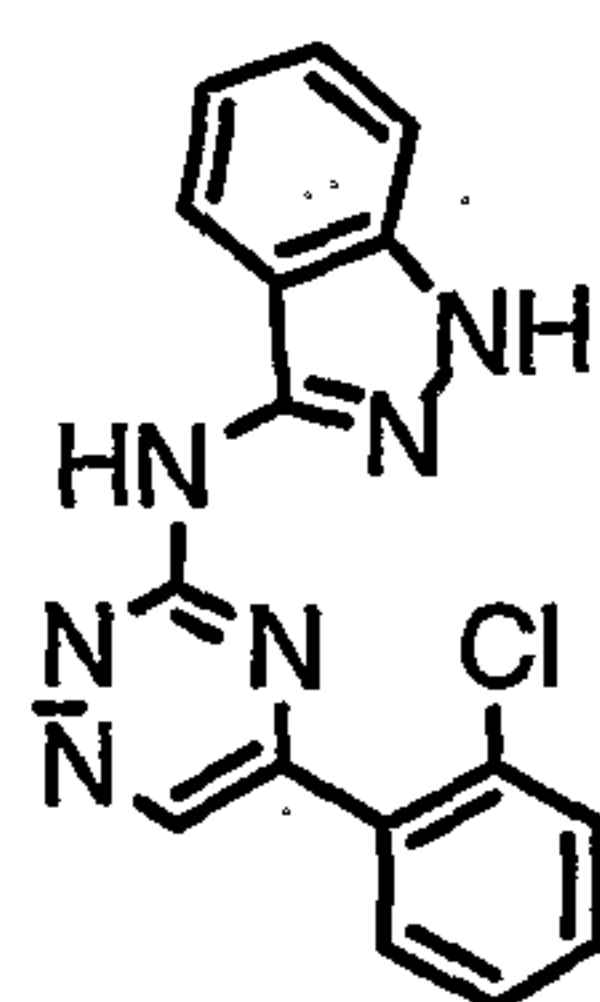
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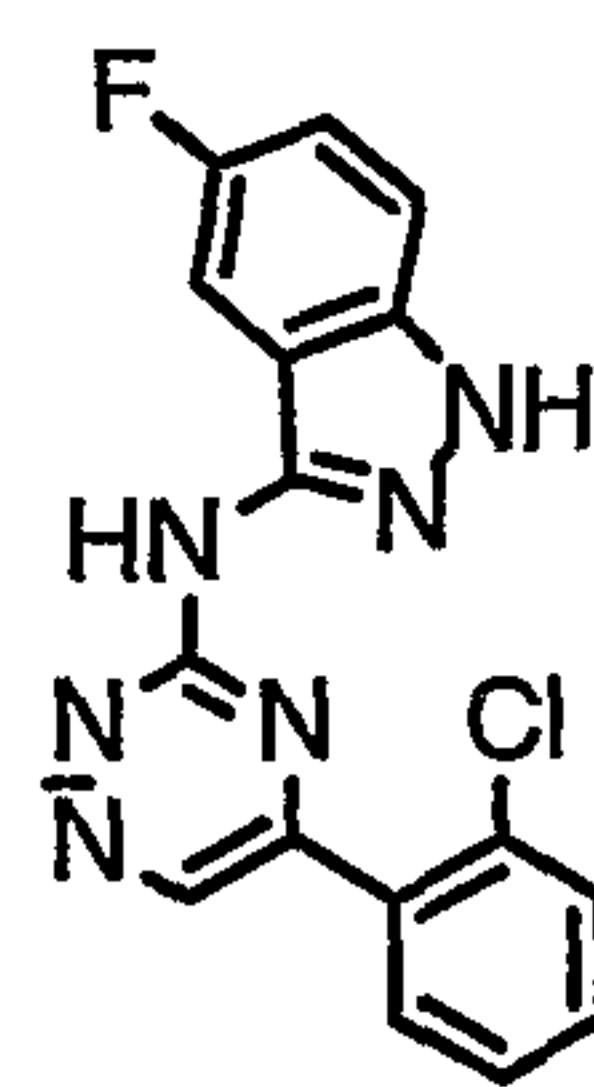
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VIII-25

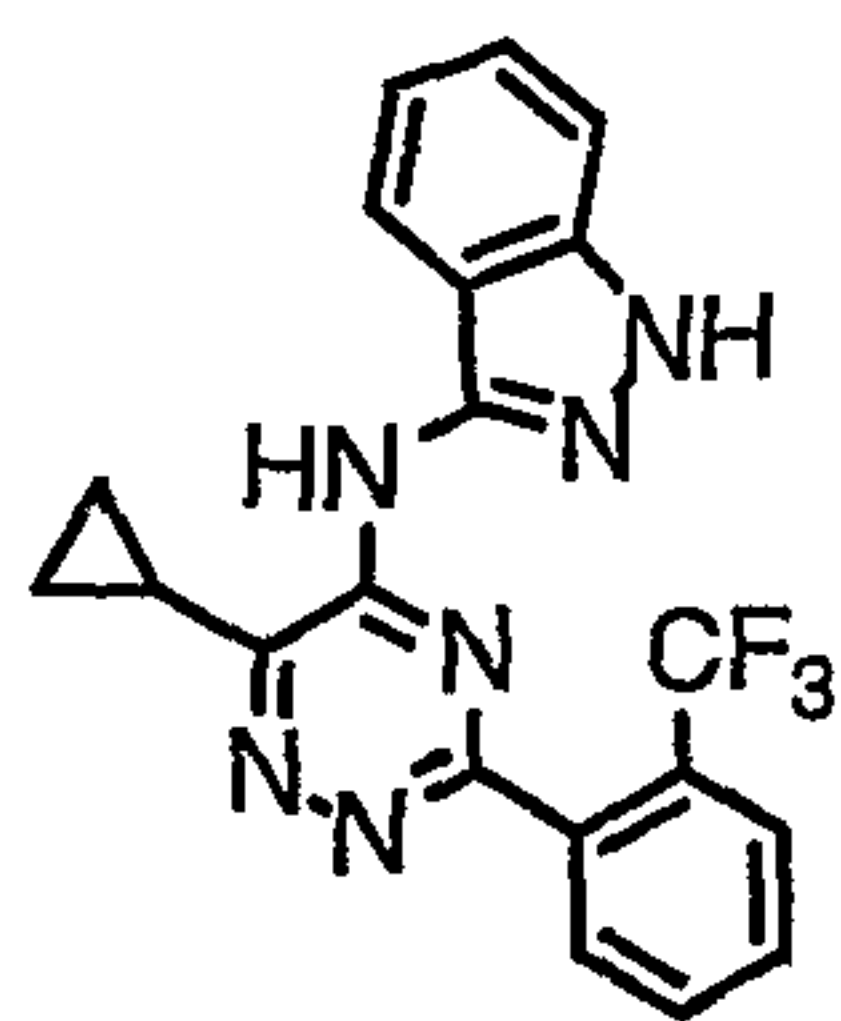


VIII-26

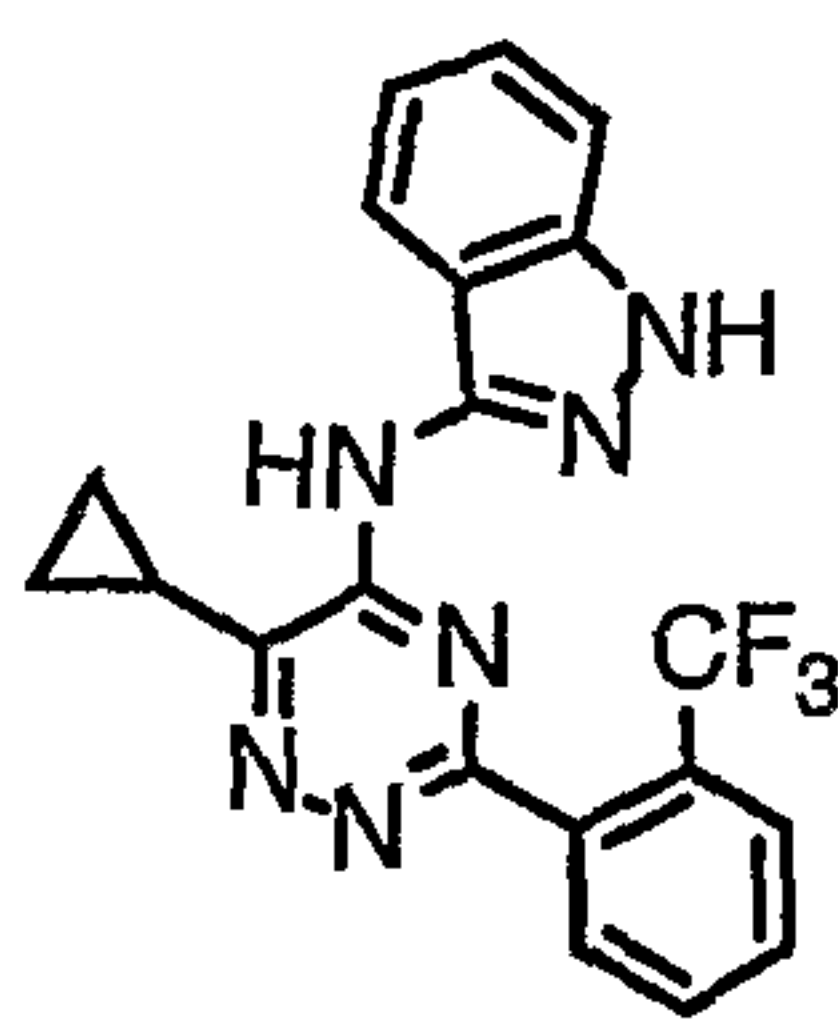


VIII-27

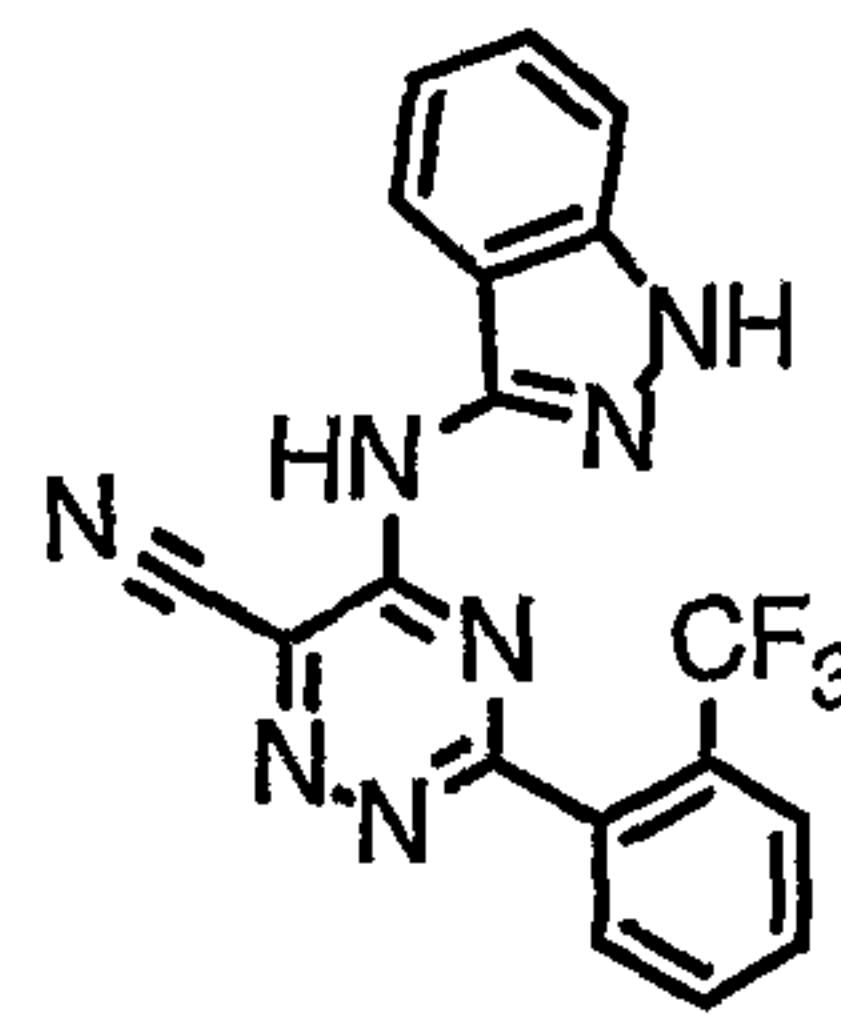
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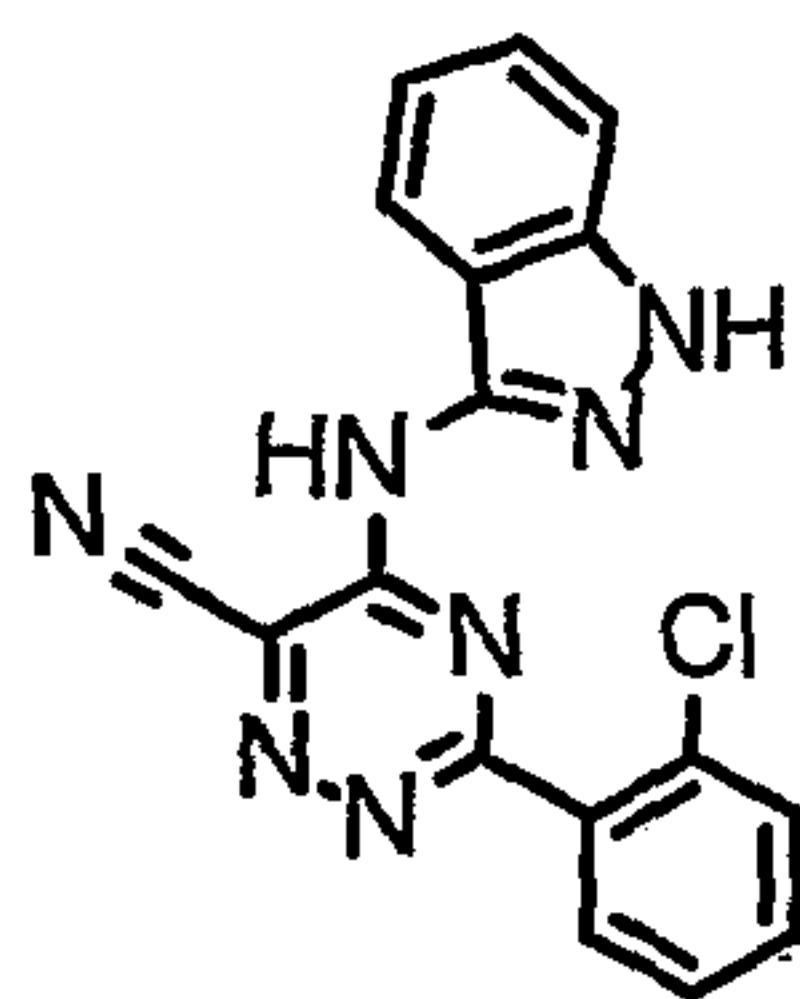
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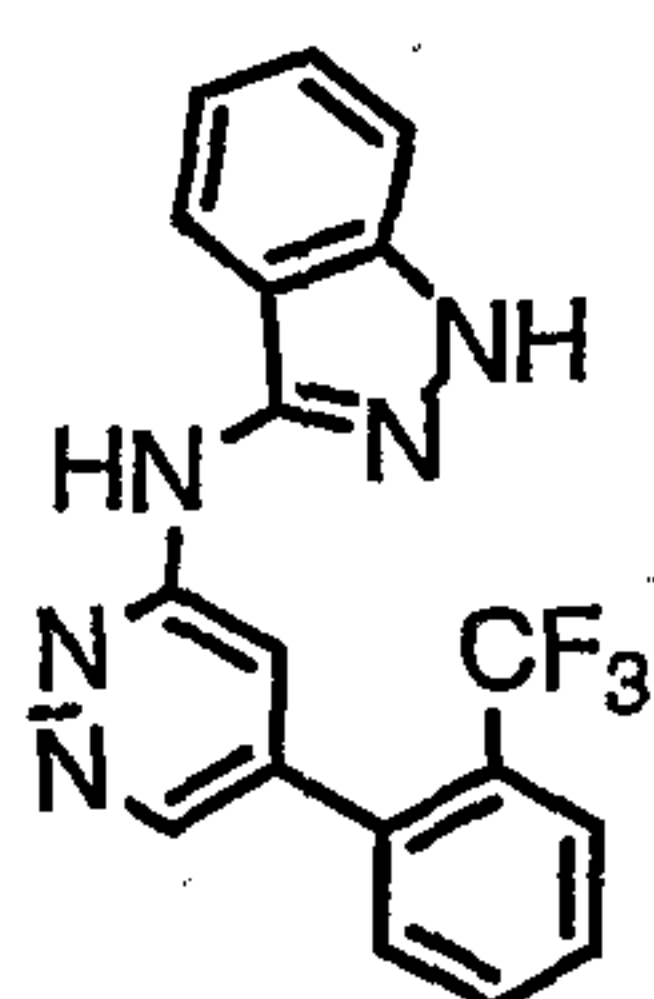
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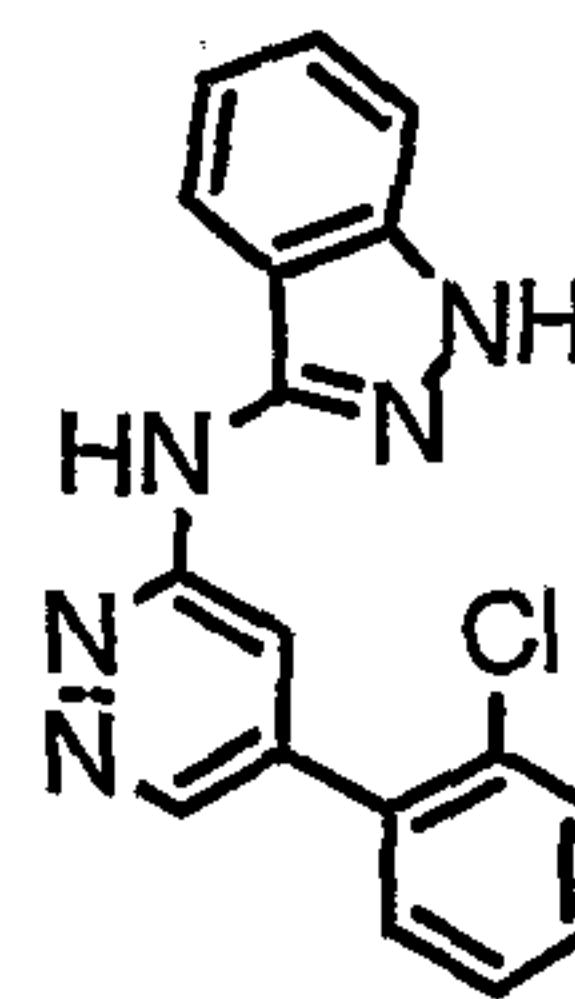
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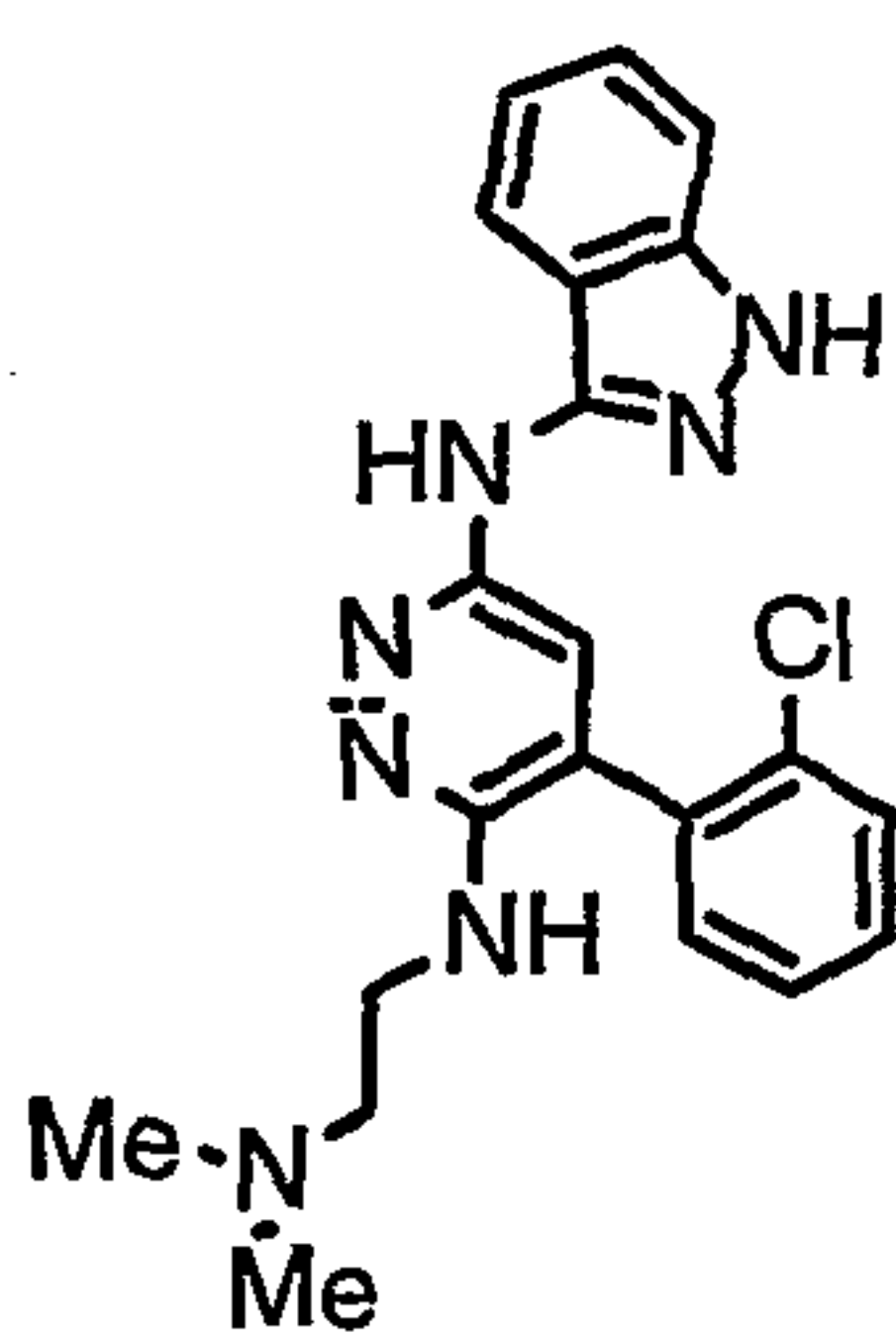
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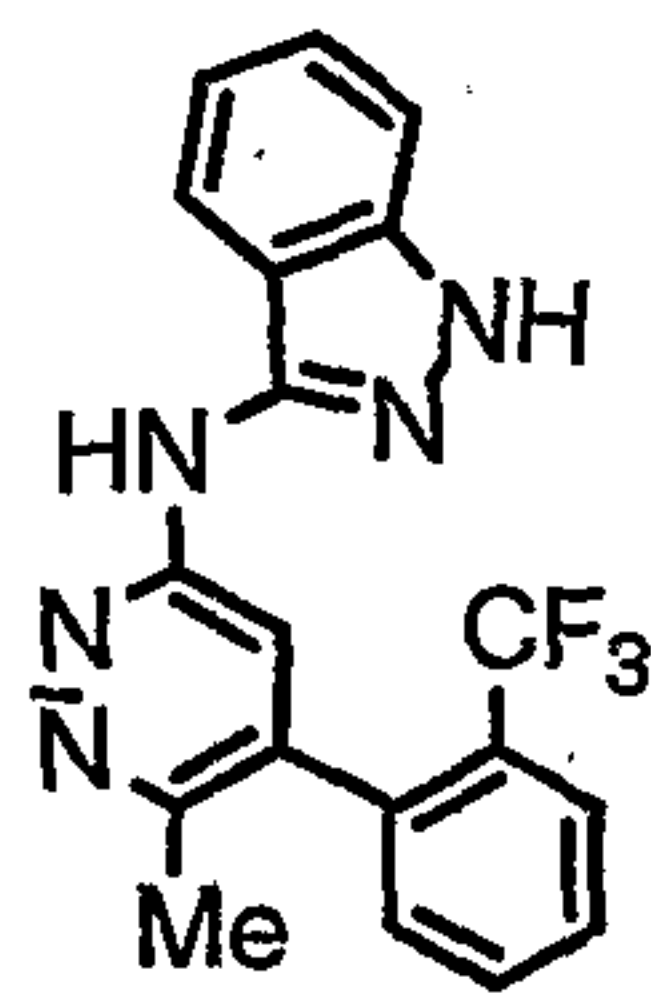
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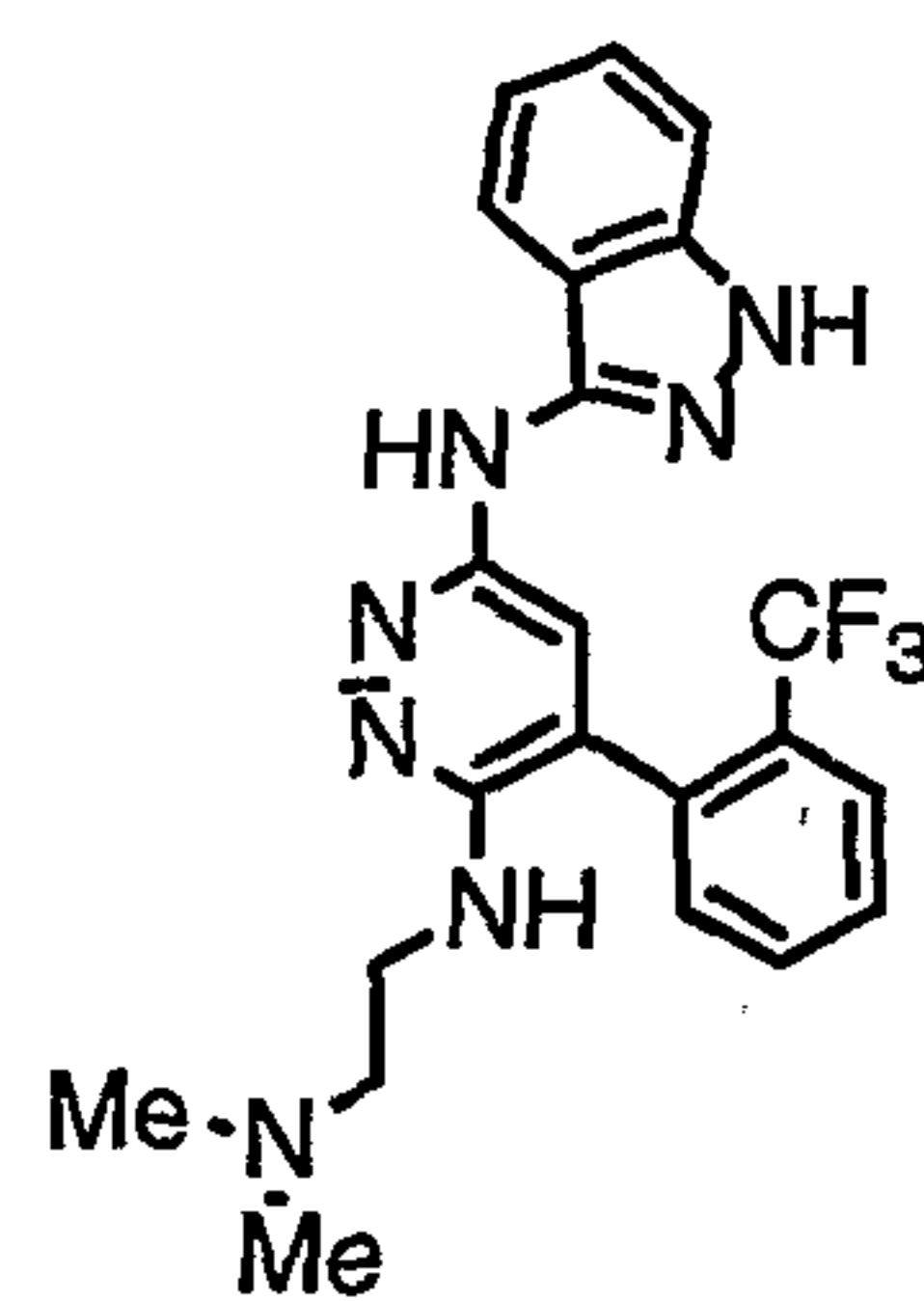
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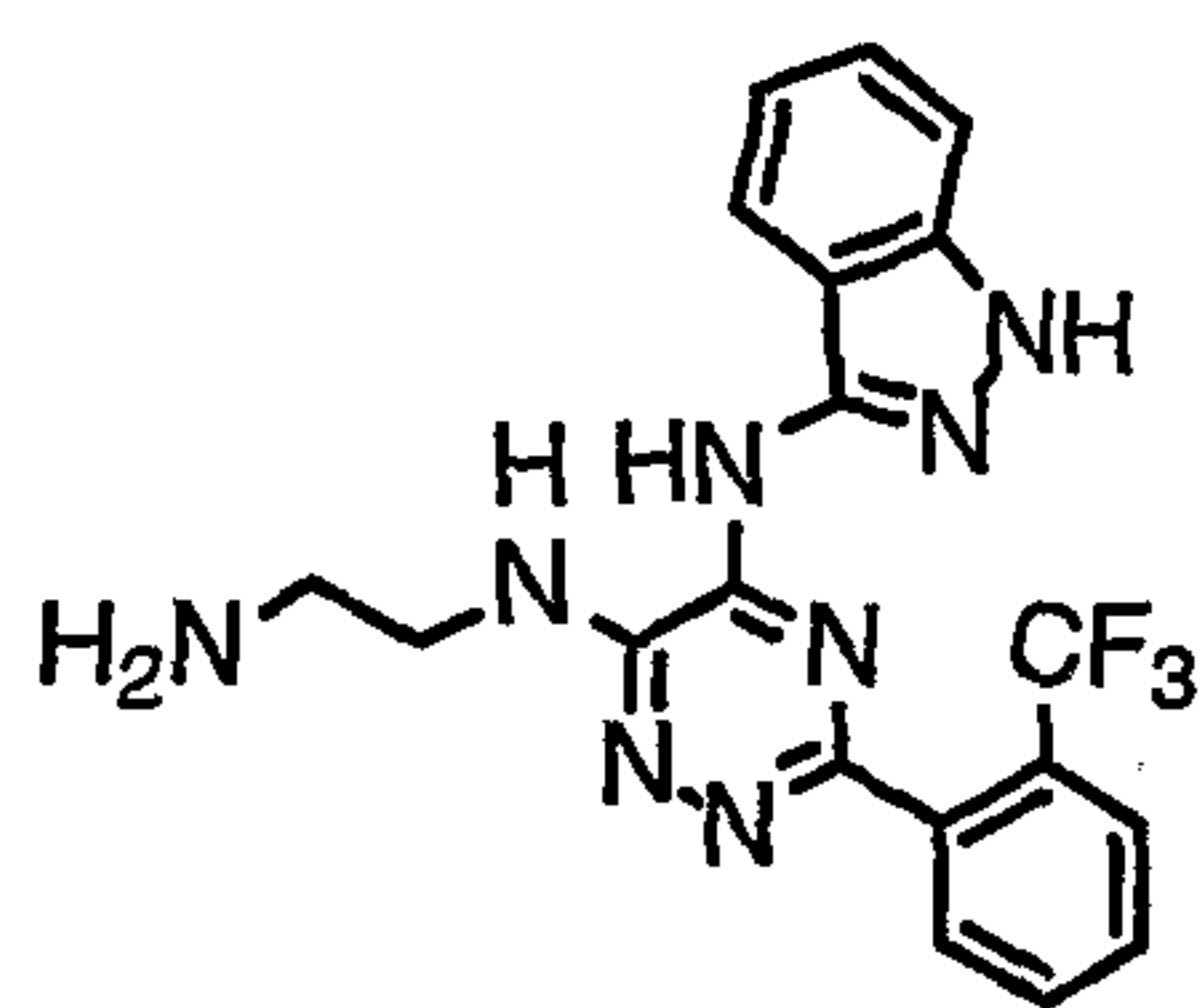
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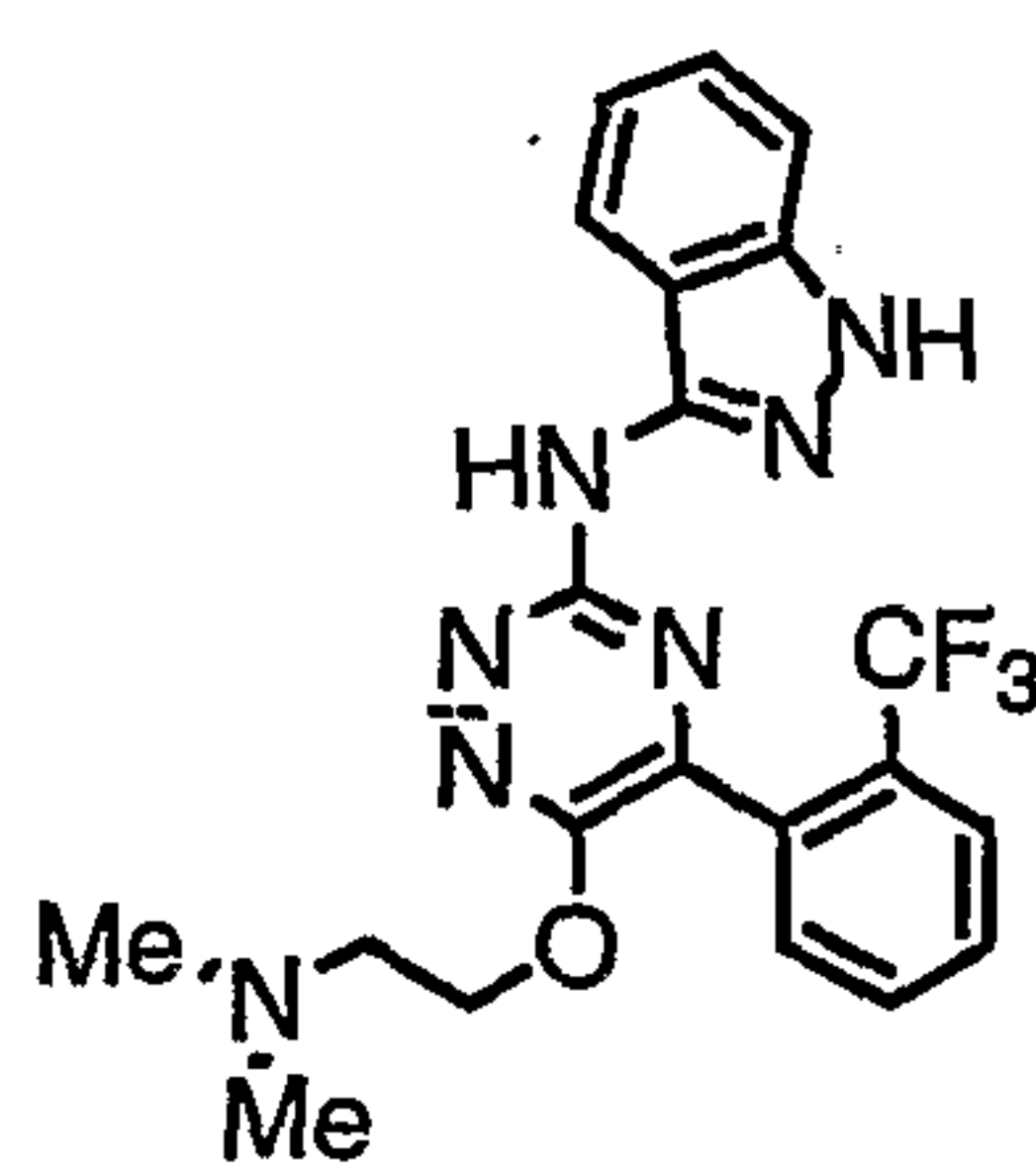
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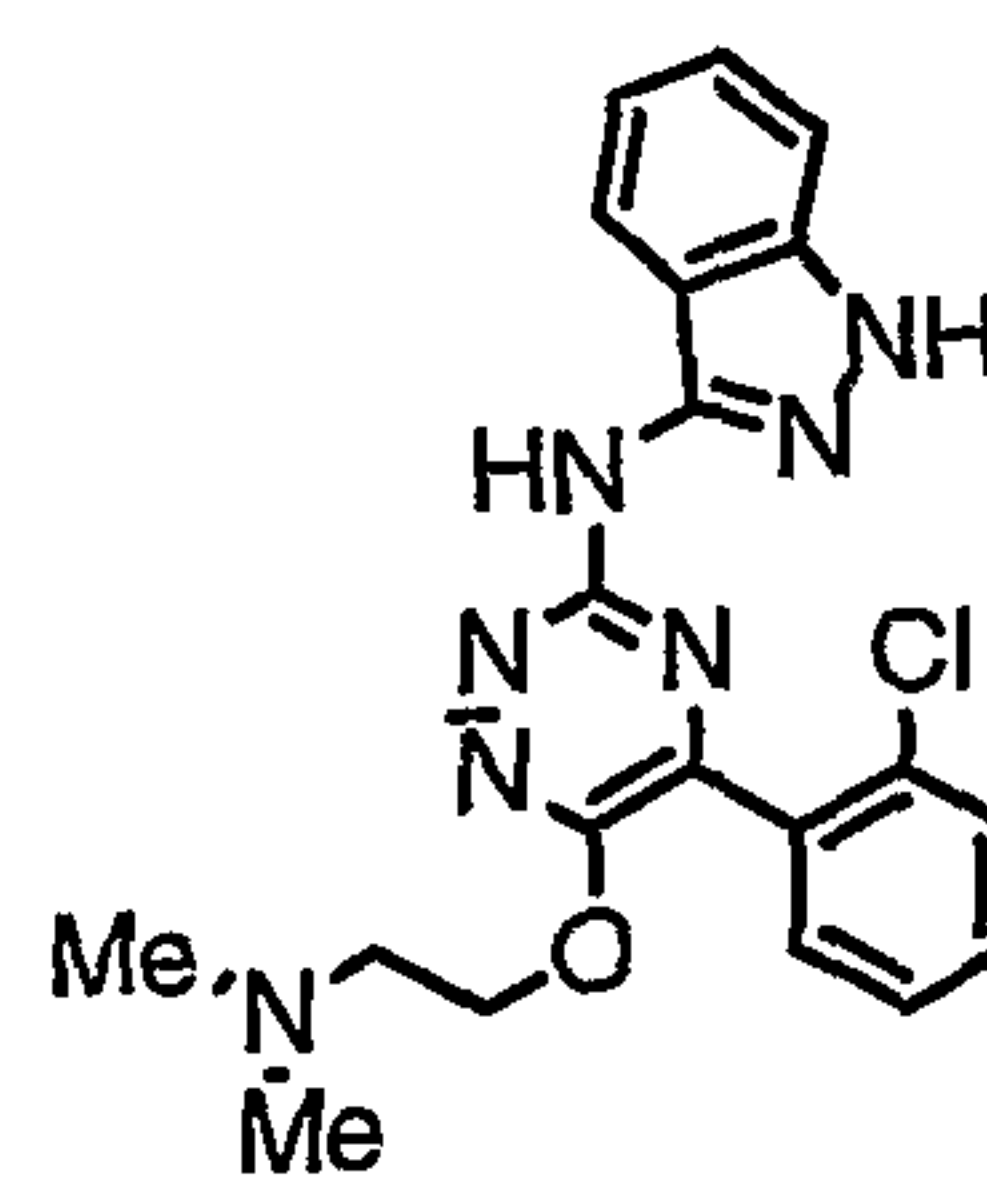
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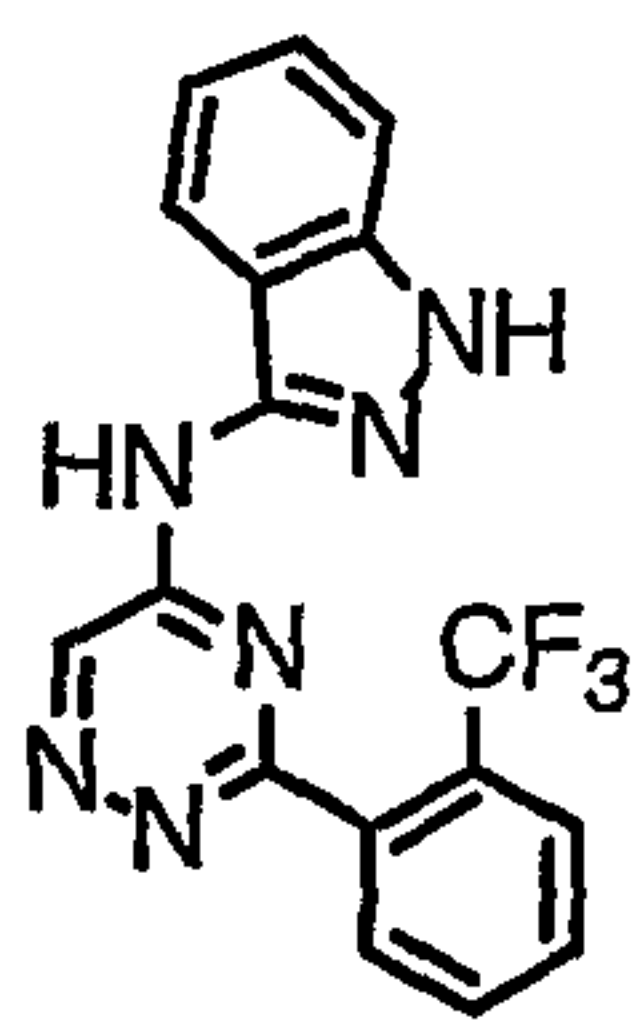
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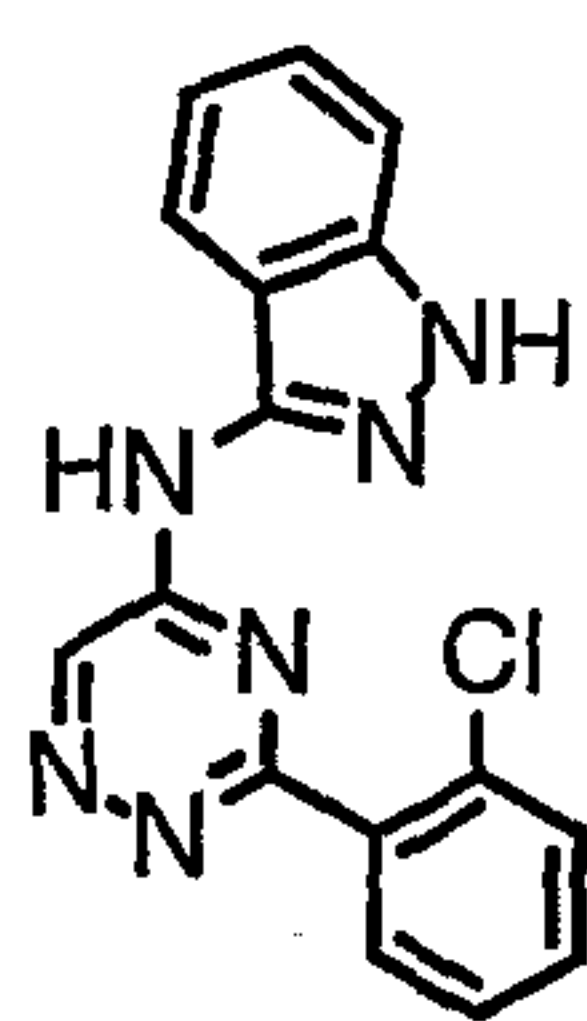
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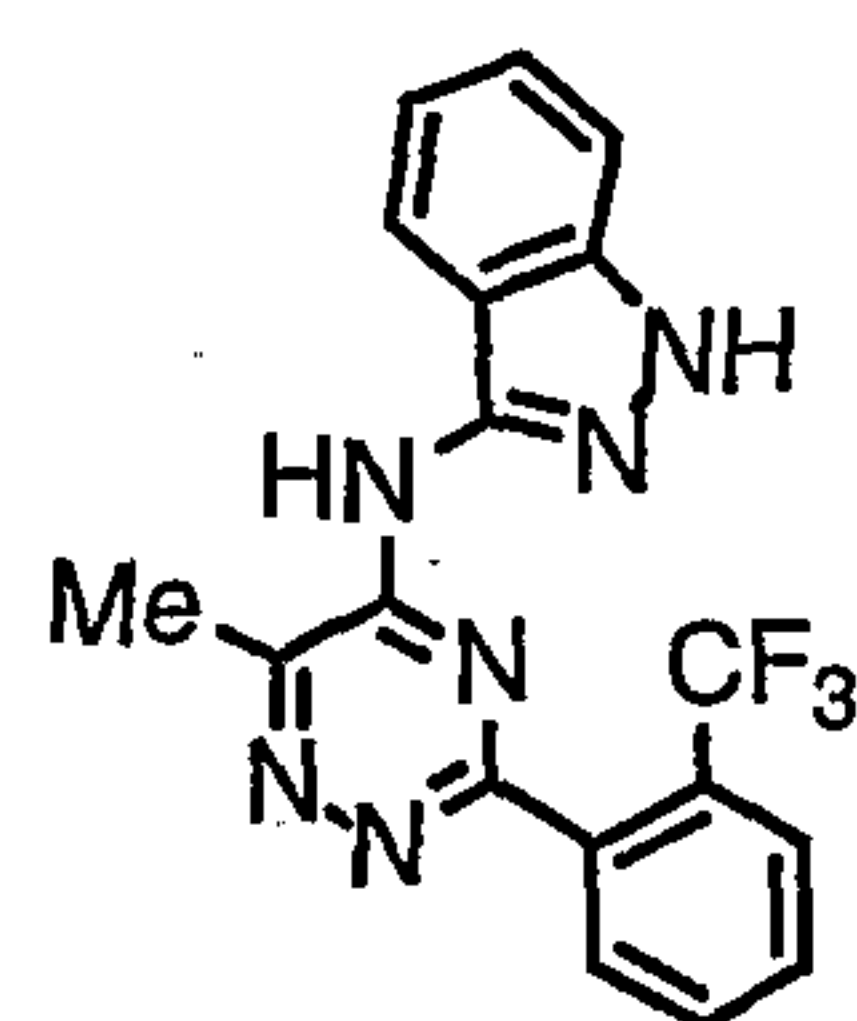
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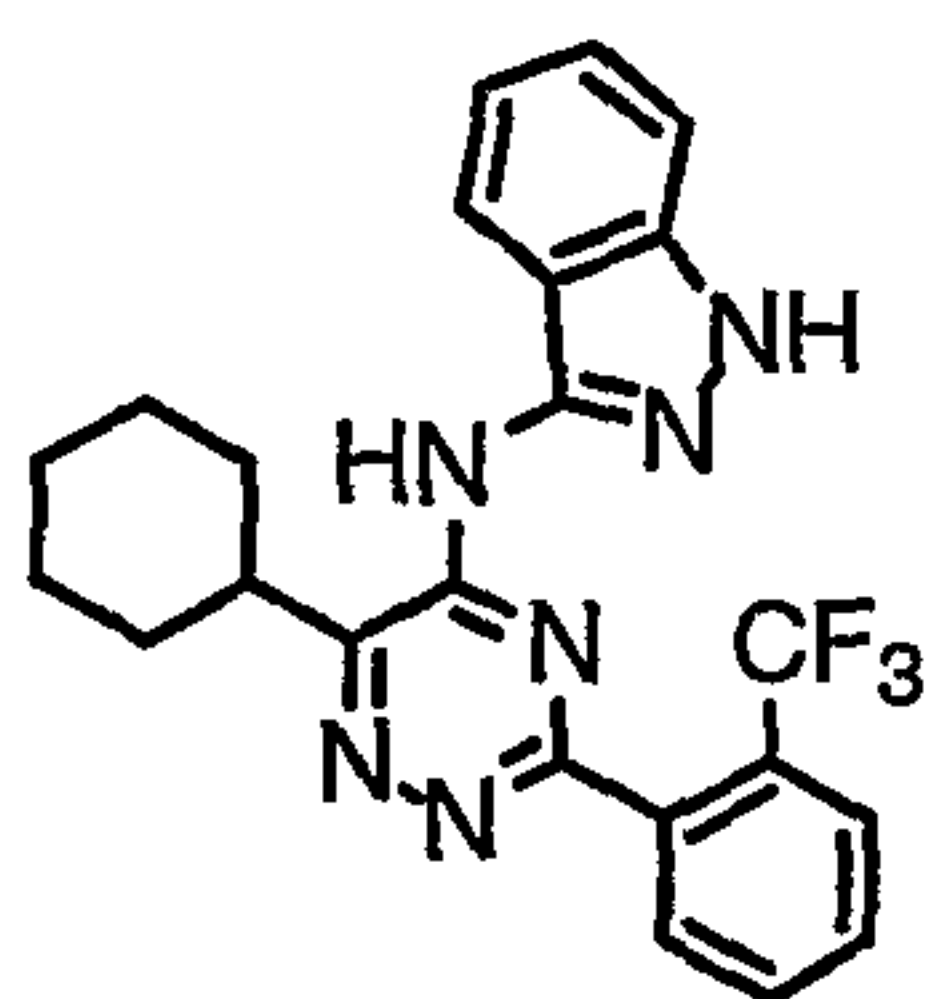
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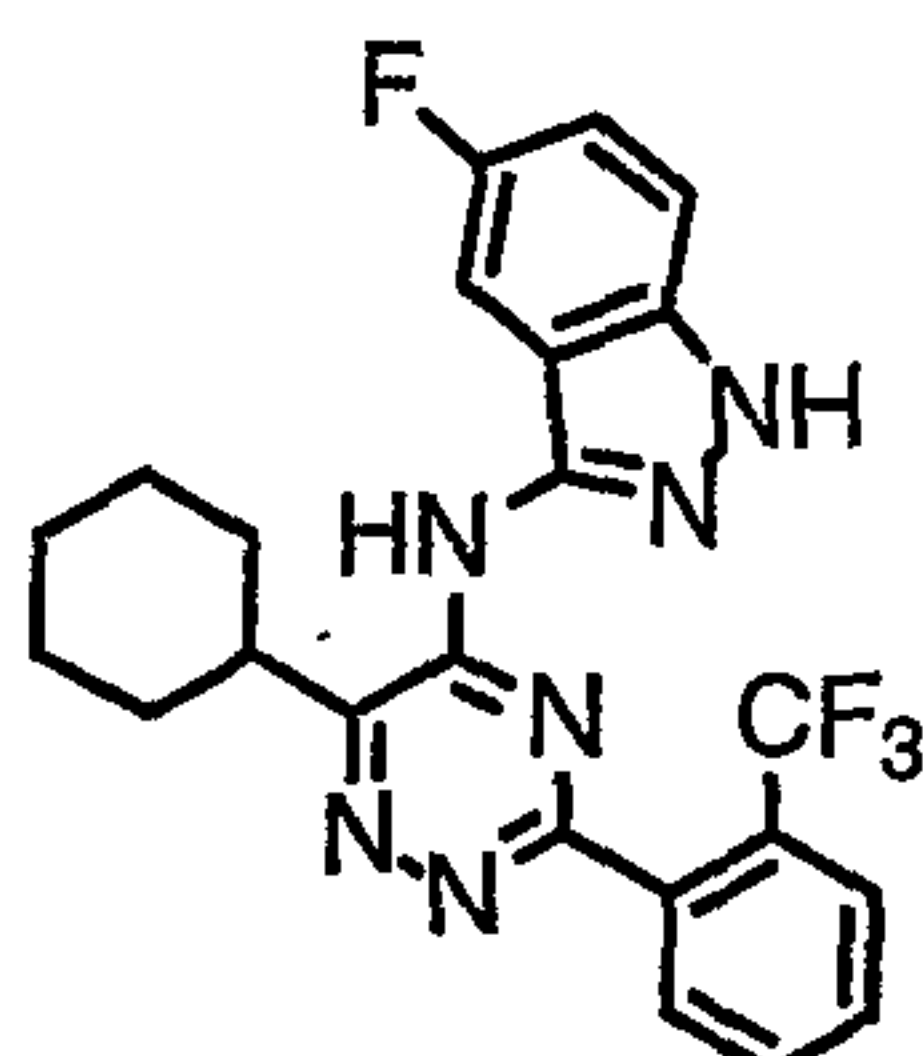
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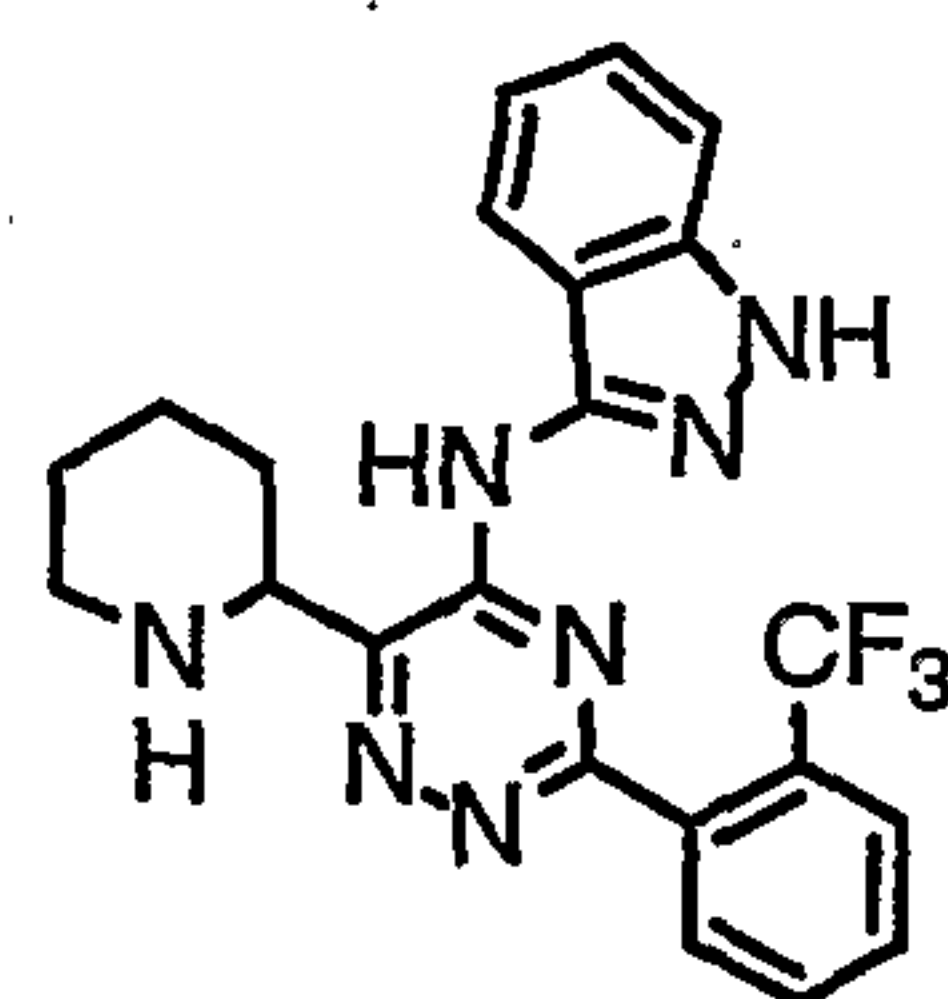
VIII-42



VIII-43

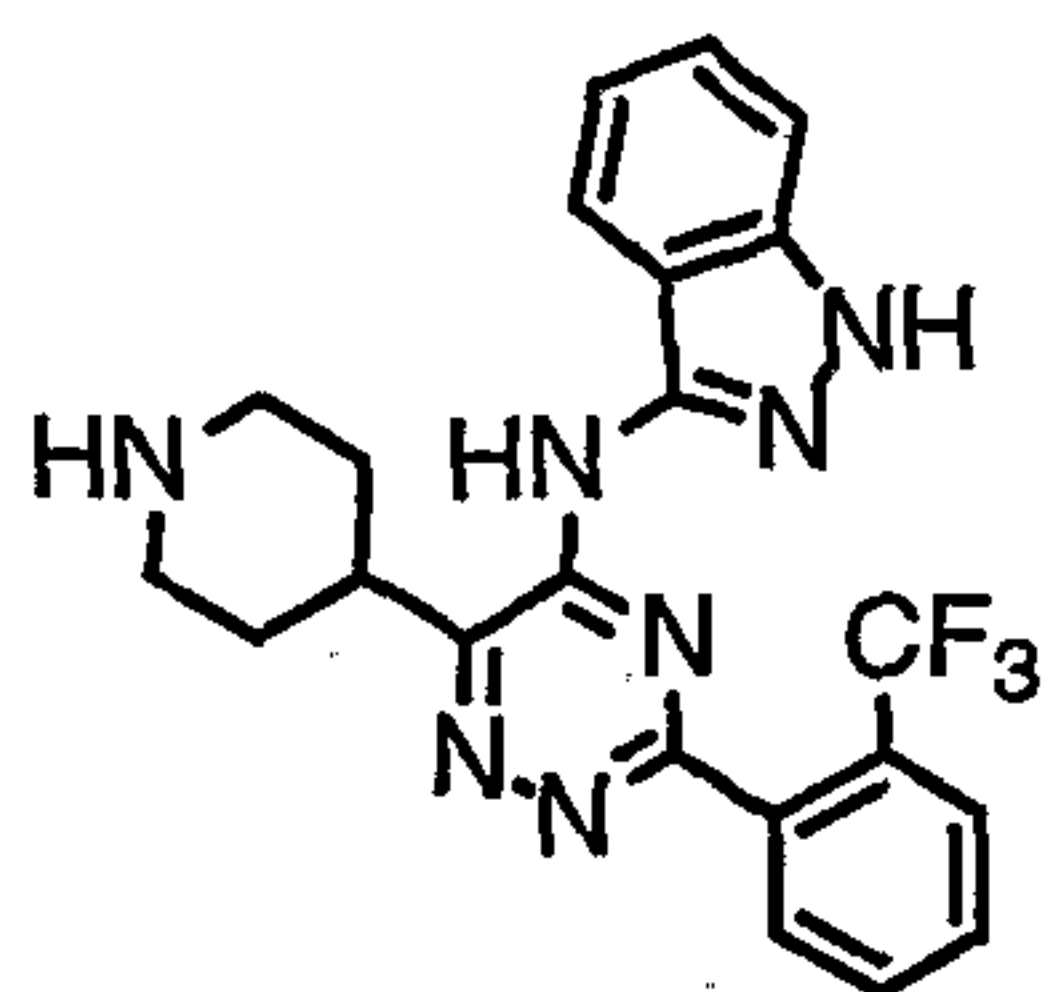


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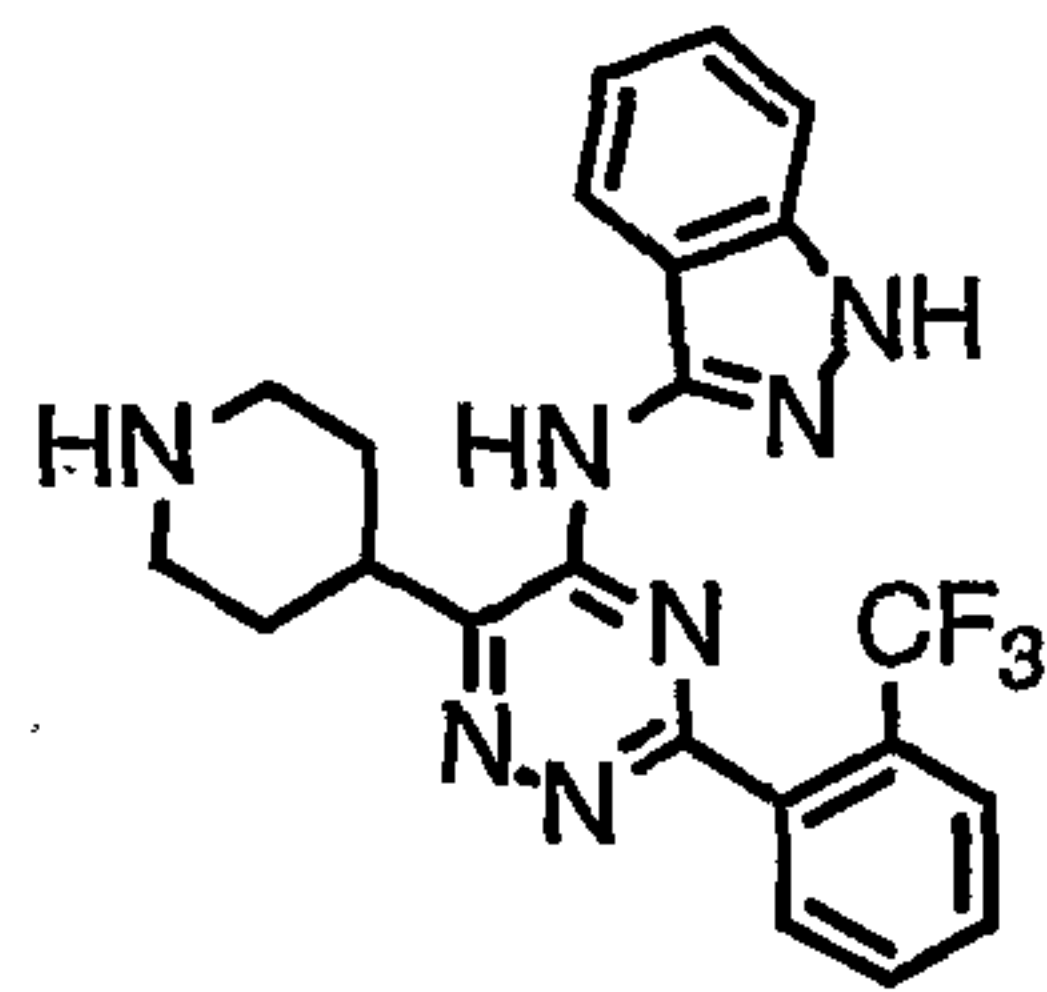


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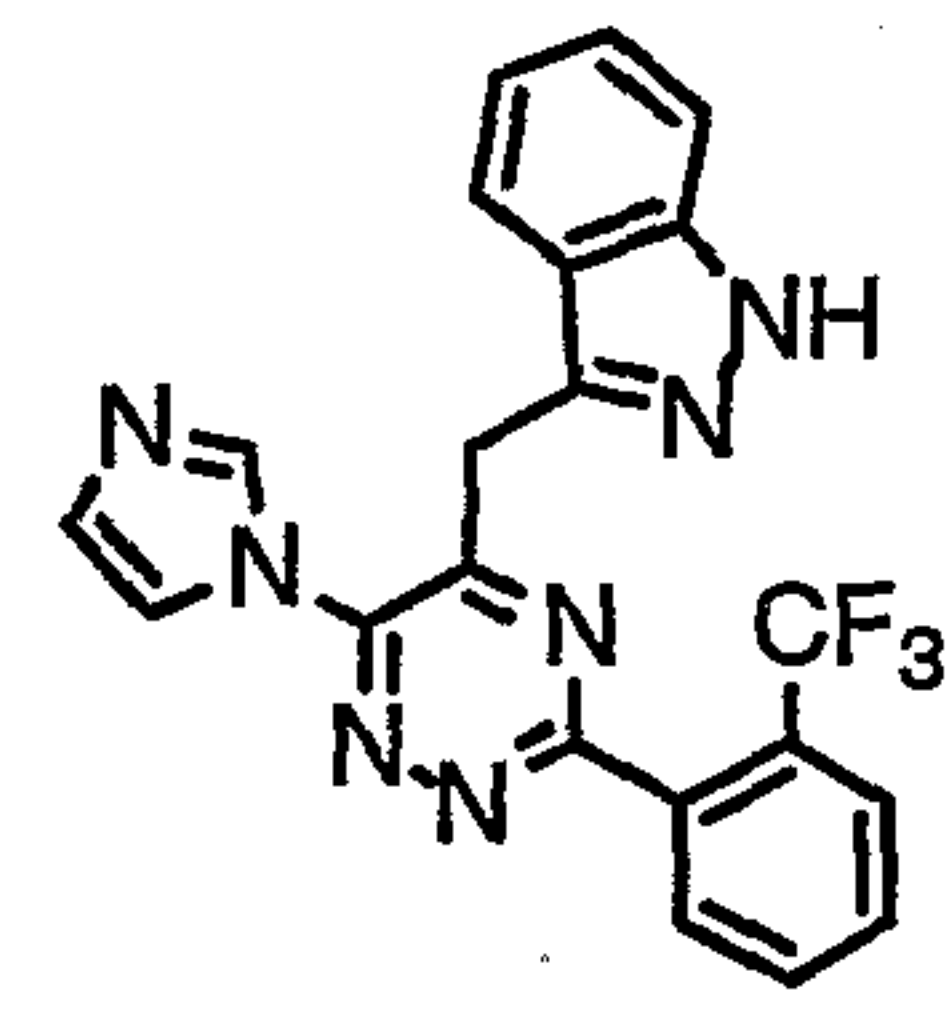
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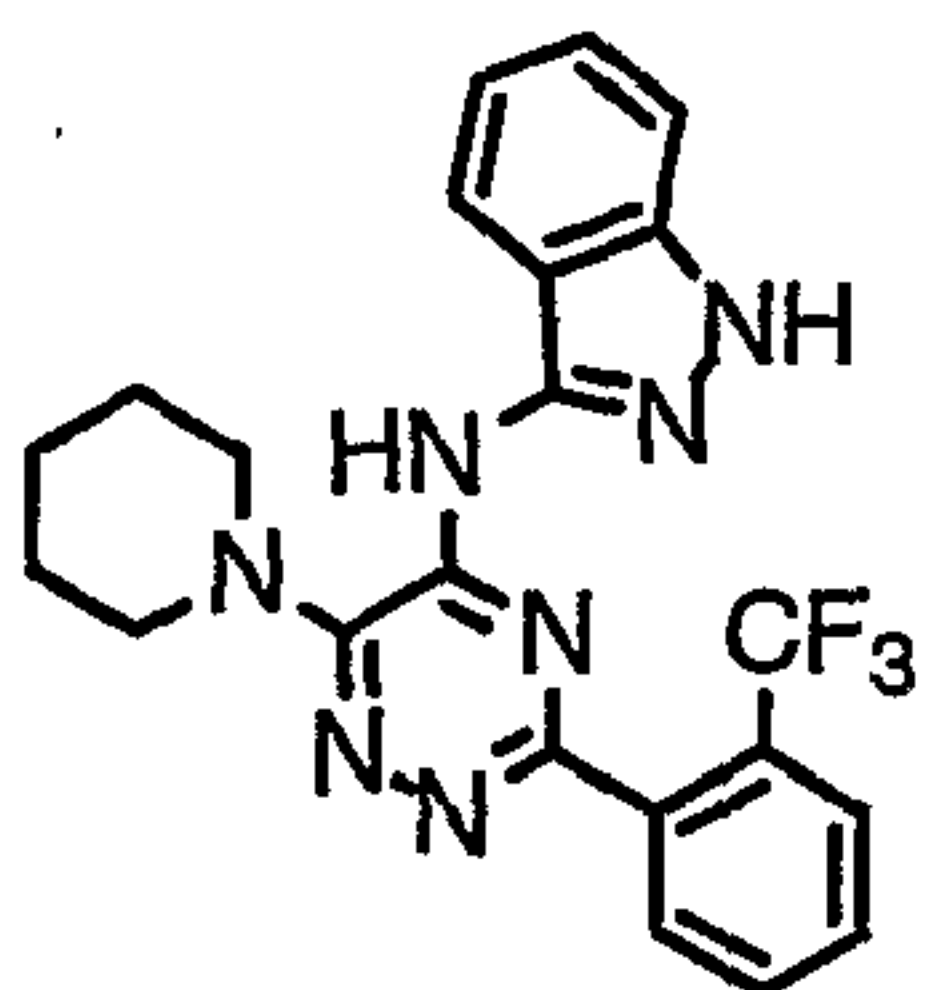
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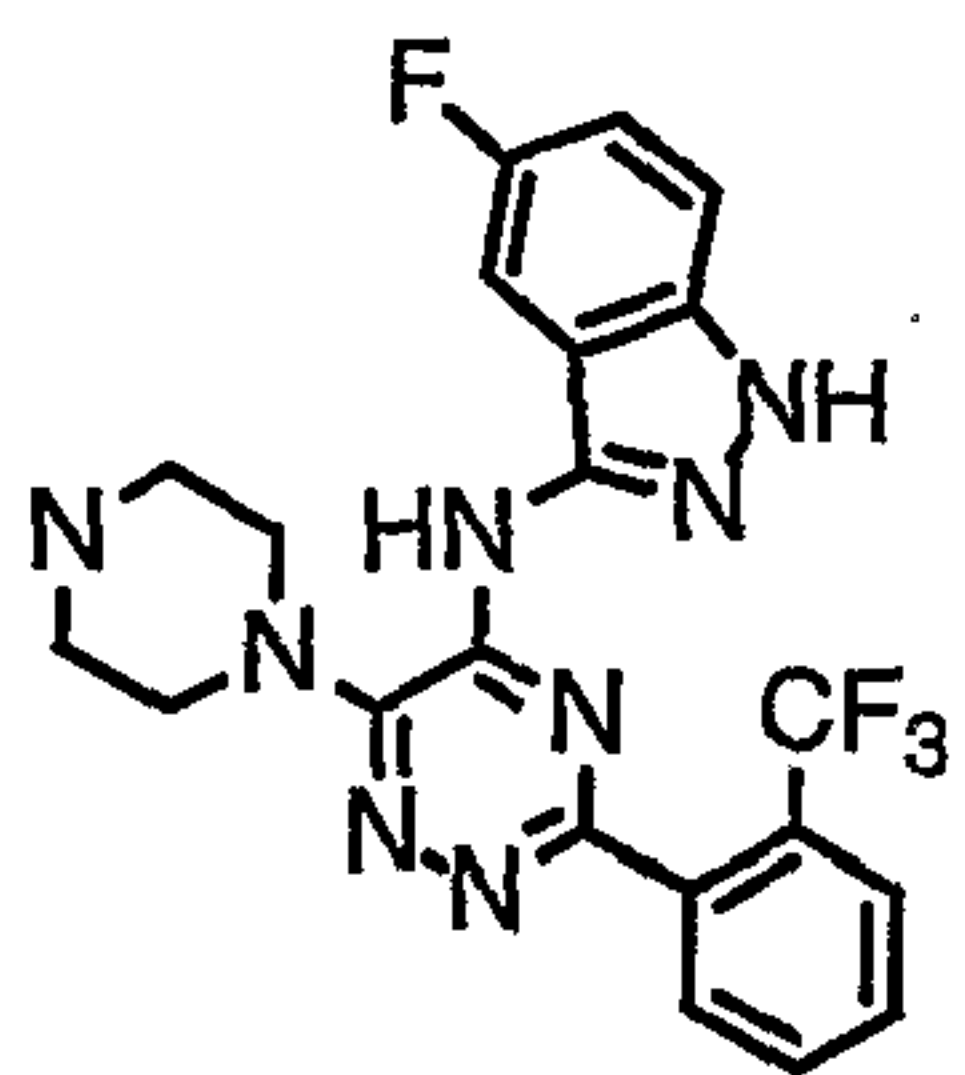
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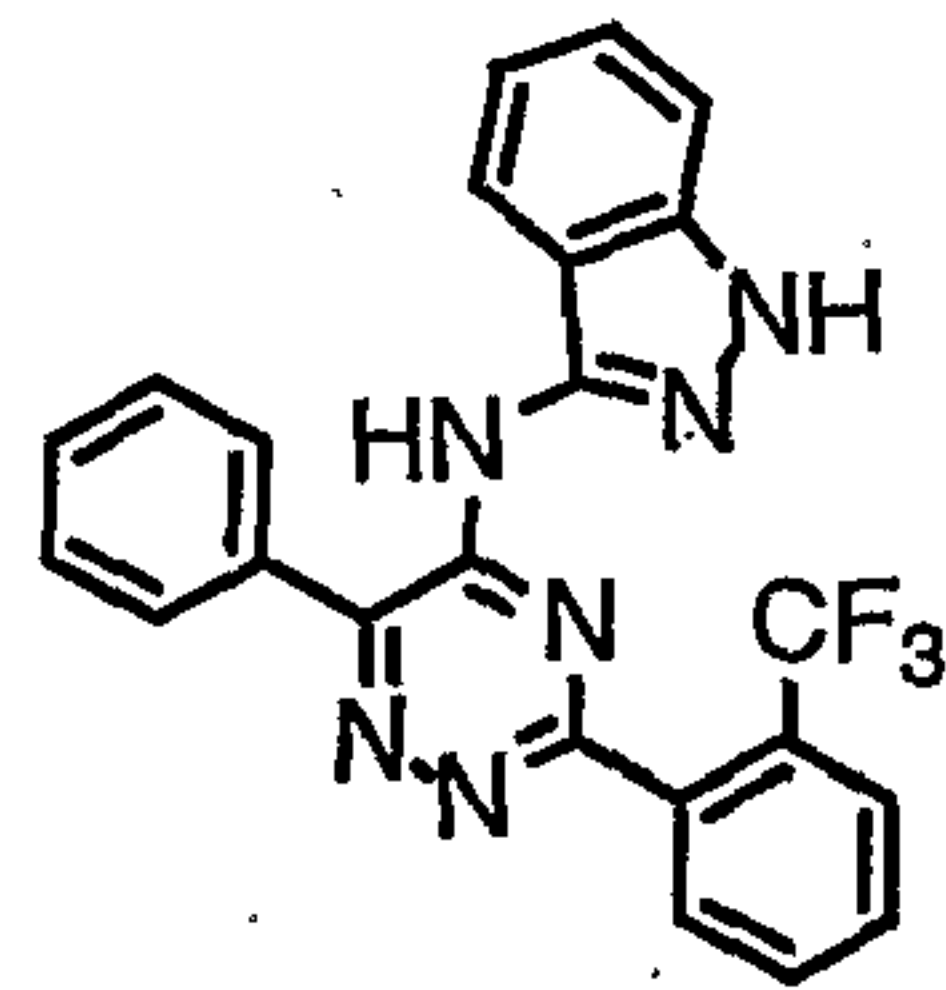
VIII-48



VIII-49

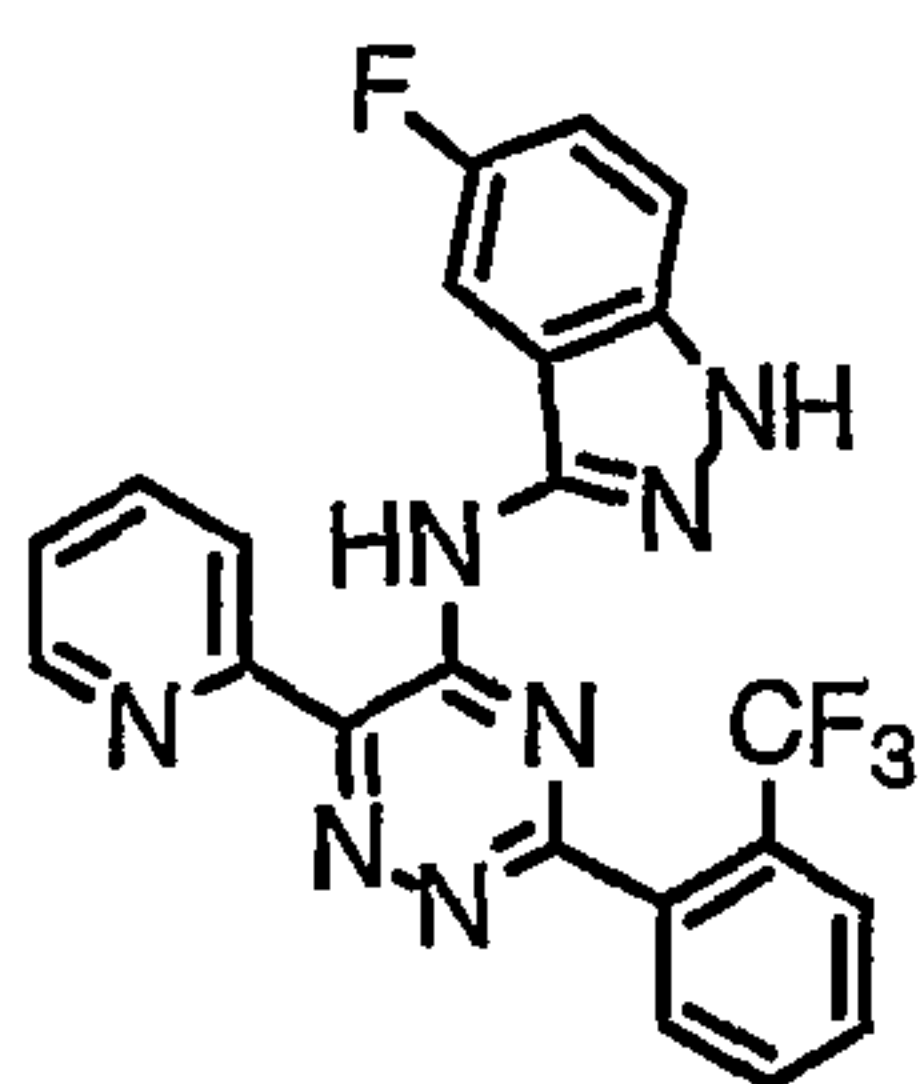


VIII-50

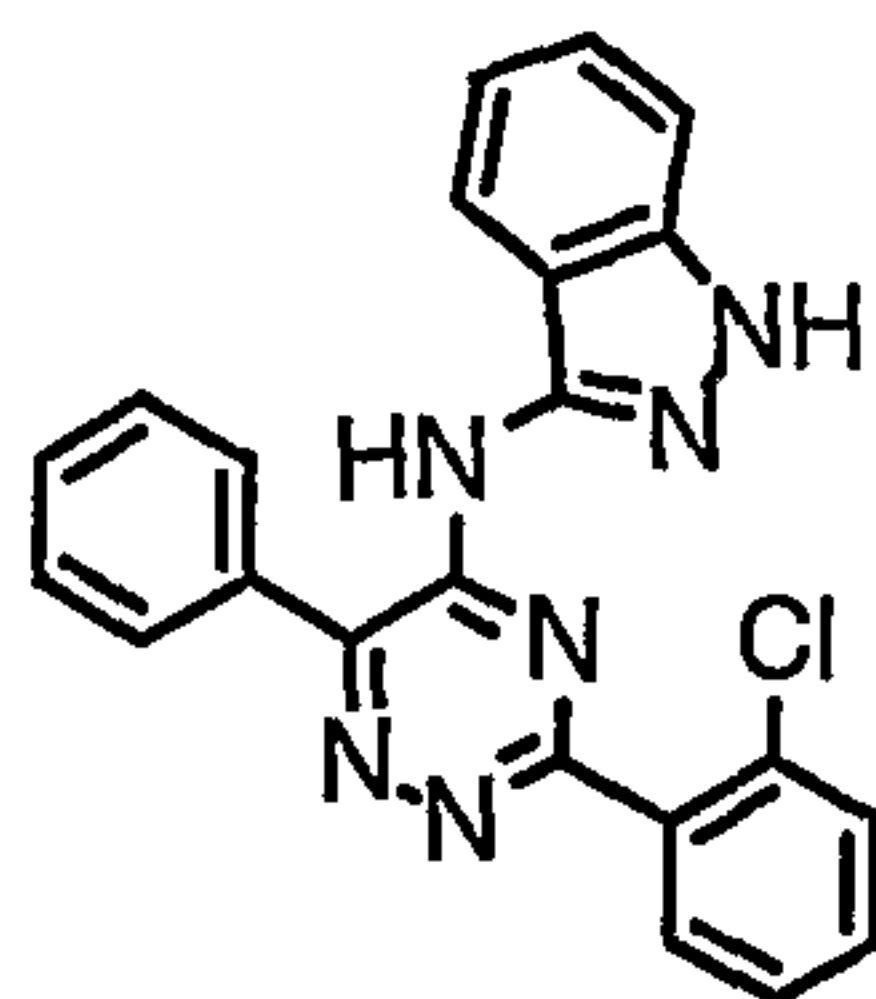


VIII-51

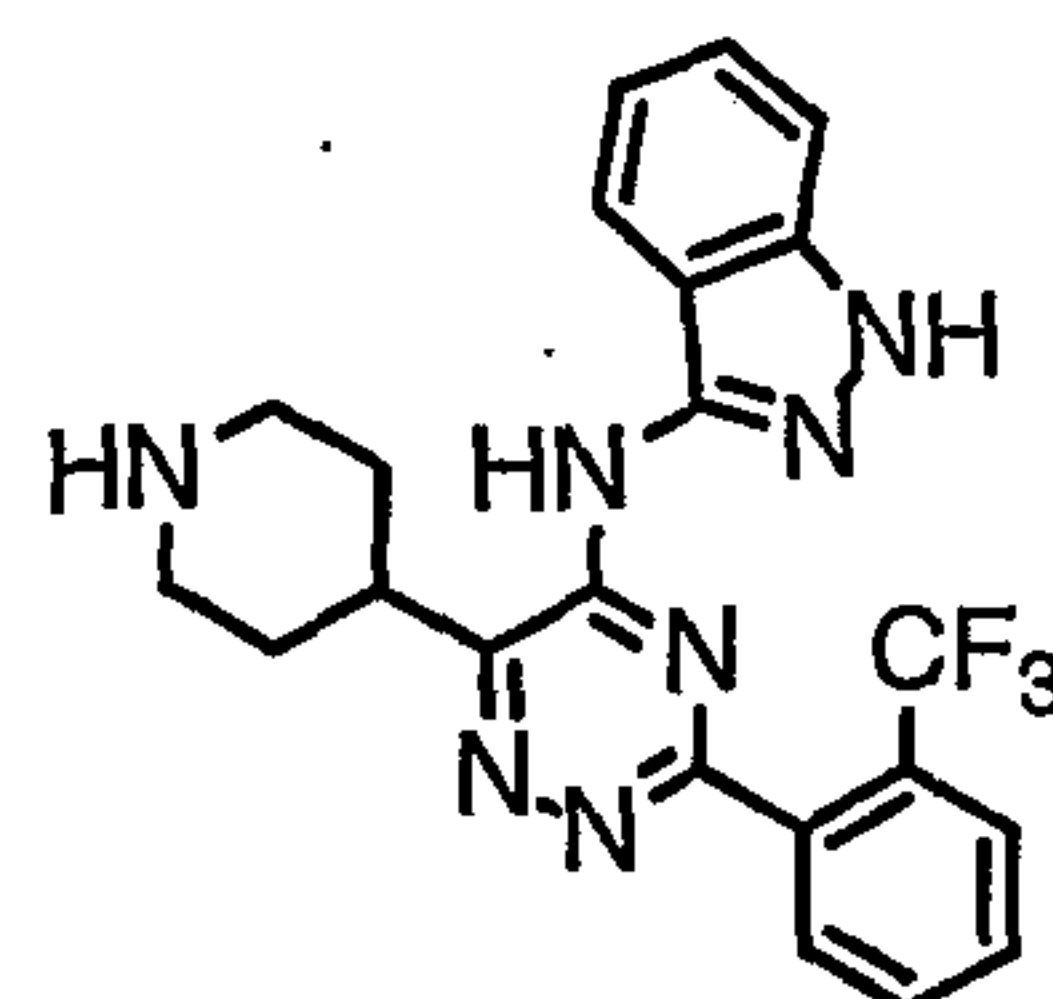
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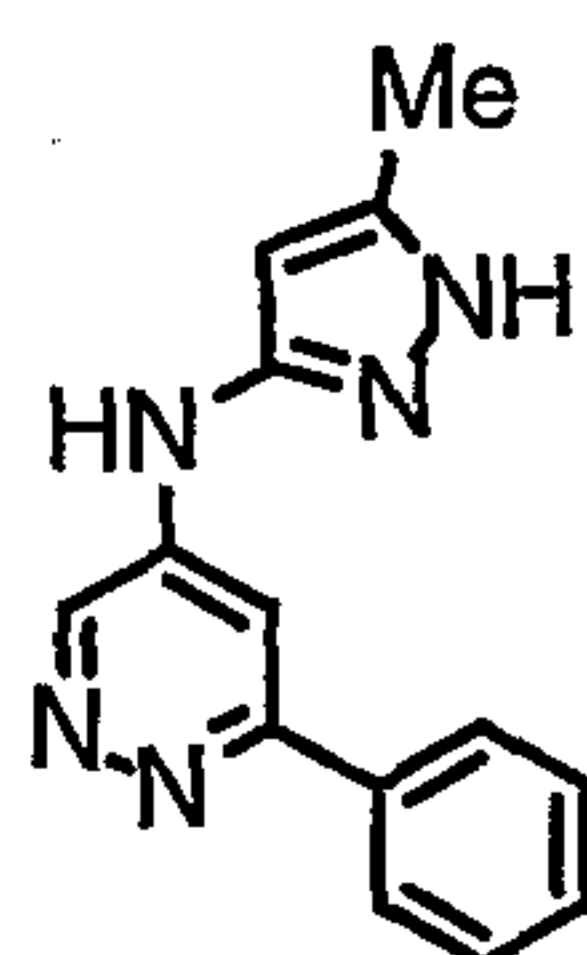
VIII-52



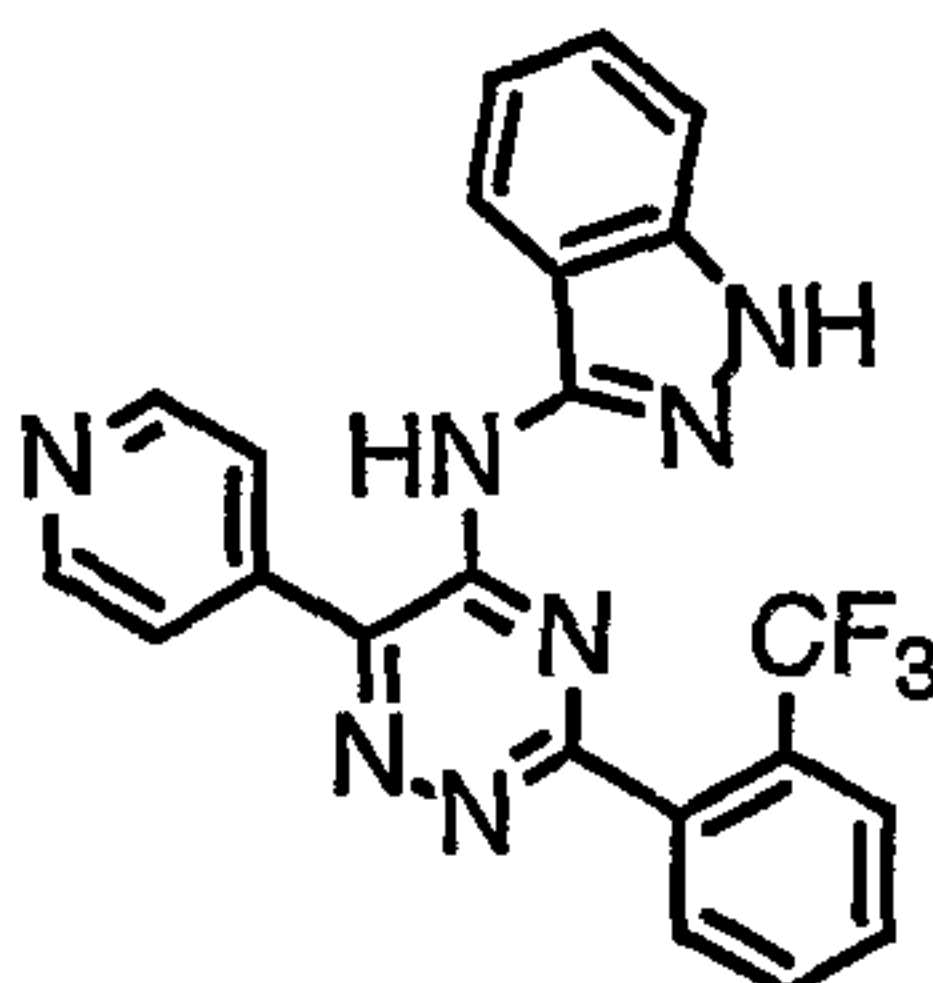
VIII-53



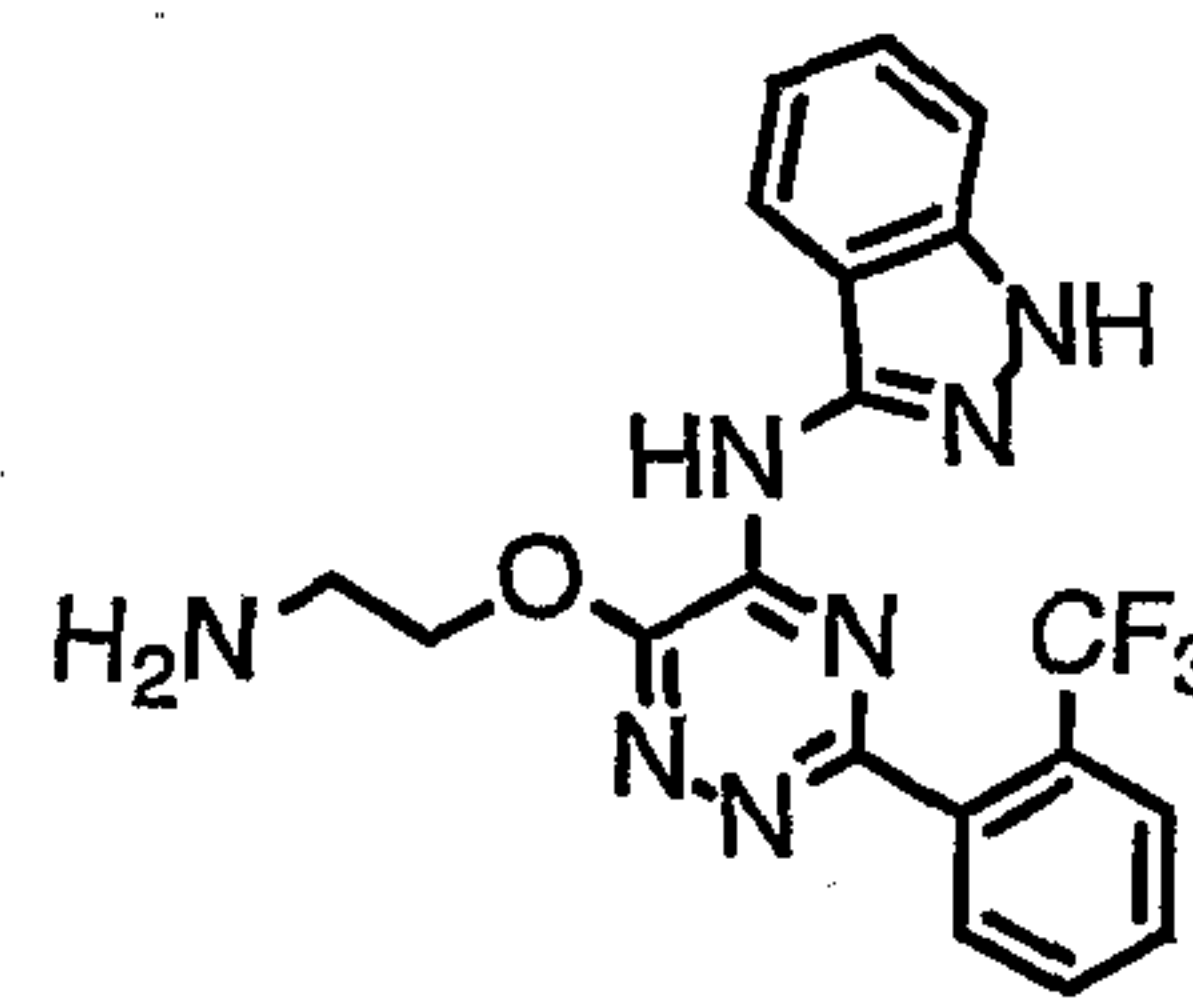
VIII-54



VIII-55



VIII-56



VIII-57

5

In another embodiment, this invention provides a composition comprising a compound of formula VIII and a pharmaceutically acceptable carrier.

10

One aspect of this invention relates to a method of inhibiting GSK-3 activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula VIII.

15

Another aspect relates to a method of treating a disease that is alleviated by treatment with a GSK-3 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula VIII.

20

Another aspect relates to a method of enhancing glycogen synthesis and/or lowering blood levels of glucose in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula

25

VIII. This method is especially useful for diabetic patients.

Another aspect relates to a method of inhibiting the production of hyperphosphorylated Tau protein in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula VIII. This method is especially useful in halting or slowing the progression of Alzheimer's disease.

Another aspect relates to a method of inhibiting the phosphorylation of β -catenin in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula VIII. This method is especially useful for treating schizophrenia.

One aspect of this invention relates to a method of inhibiting Aurora activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula VIII.

Another aspect relates to a method of treating a disease that is alleviated by treatment with an Aurora inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula VIII. This method is especially useful for treating cancer, such as colon, ovarian, and breast cancer.

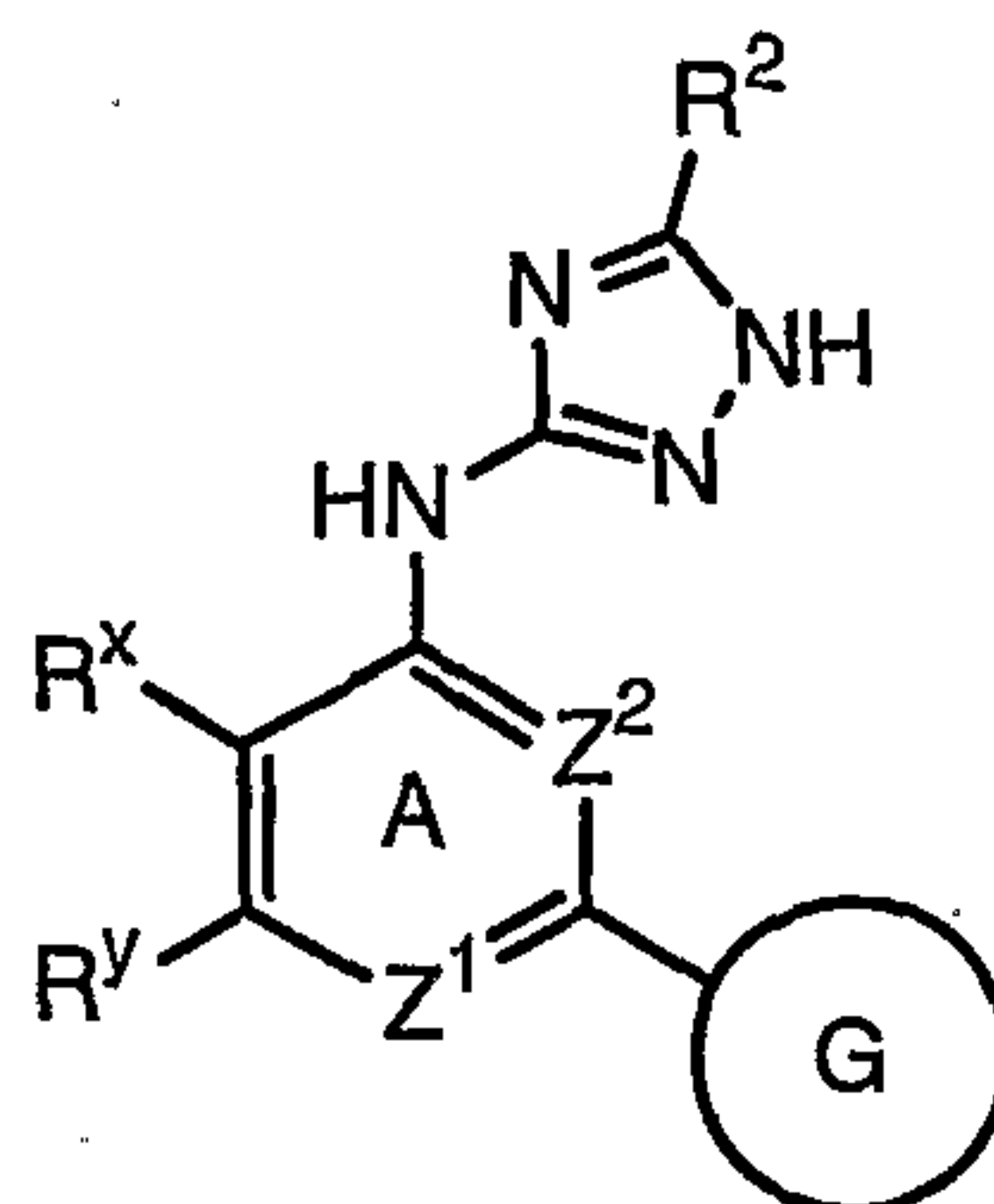
One aspect of this invention relates to a method of inhibiting CDK-2 activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula VIII.

Another aspect relates to a method of treating a disease that is alleviated by treatment with a CDK-2 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula VIII. This method is especially useful for treating cancer, Alzheimer's disease, restenosis, angiogenesis, glomerulonephritis, cytomegalovirus, HIV, herpes, psoriasis, atherosclerosis, alopecia, and autoimmune diseases such as rheumatoid arthritis.

Another method relates to inhibiting GSK-3, Aurora, or CDK-2 activity in a biological sample, which method comprises contacting the biological sample with the GSK-3 or Aurora inhibitor of formula VIII, or a pharmaceutical composition thereof, in an amount effective to inhibit GSK-3, Aurora or CDK-2.

Each of the aforementioned methods directed to the inhibition of GSK-3, Aurora or CDK-2, or the treatment of a disease alleviated thereby, is preferably carried out with a preferred compound of formula VIII, as described above.

The above formula I compounds contain a pyrazole ring bearing the R^2 and $R^{2'}$ substituents. In their search for further inhibitors of the protein kinases GSK and Aurora, applicants sought to replace the pyrazole moiety of formula I with other heteroaromatic rings. One of the more effective pyrazole ring replacements was found to be a triazole ring. Inhibitors having this triazole ring are otherwise structurally similar to the formula I compounds and are represented by the general formula IX:



IX

or a pharmaceutically acceptable derivative or prodrug
 5 thereof, wherein:

Z^1 is nitrogen or CR^9 and Z^2 is nitrogen or CH, provided
 that at least one of Z^1 and Z^2 is nitrogen;

G is Ring C or Ring D;

Ring C is selected from a phenyl, pyridinyl, pyrimidinyl,
 10 pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring,
 wherein said Ring C has one or two ortho substituents
 independently selected from $-R^1$, any substitutable non-
 ortho carbon position on Ring C is independently
 substituted by $-R^5$, and two adjacent substituents on
 15 Ring C are optionally taken together with their
 intervening atoms to form a fused, unsaturated or
 partially unsaturated, 5-6 membered ring having 0-3
 heteroatoms selected from oxygen, sulfur or nitrogen,
 said fused ring being optionally substituted by halo,
 20 oxo, or $-R^8$;

Ring D is a 5-7 membered monocyclic ring or 8-10 membered
 bicyclic ring selected from aryl, heteroaryl,
 heterocyclyl or carbocyclyl, said heteroaryl or
 heterocyclyl ring having 1-4 ring heteroatoms selected
 25 from nitrogen, oxygen or sulfur, wherein Ring D is
 substituted at any substitutable ring carbon by oxo or
 $-R^5$, and at any substitutable ring nitrogen by $-R^4$,
 provided that when Ring D is a six-membered aryl or

heteroaryl ring, $-R^5$ is hydrogen at each ortho carbon position of Ring D;

R^1 is selected from -halo, -CN, $-NO_2$, T-V- R^6 , phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C_{1-6} aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or $-R^8$, said C_{1-6} aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R^1 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^x and R^y are independently selected from T- R^3 , or R^x and R^y are taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-8 membered ring having 0-3 ring heteroatoms selected from oxygen, sulfur, or nitrogen, wherein any substitutable carbon on said fused ring formed by R^x and R^y is substituted by oxo or T- R^3 , and any substitutable nitrogen on said ring formed by R^x and R^y is substituted by R^4 ;

T is a valence bond or a C_{1-4} alkylidene chain;

R^2 is -R or -T-W- R^6 ;

R^3 is selected from -R, -halo, -OR, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-COCH_2COR$, $-NO_2$, -CN, $-S(O)R$, $-S(O)_2R$, -SR, $-N(R^4)_2$, $-CON(R^7)_2$, $-SO_2N(R^7)_2$, $-OC(=O)R$, $-N(R^7)COR$, $-N(R^7)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^7)CON(R^7)_2$, $-N(R^7)SO_2N(R^7)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^7)_2$;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R^4 is independently selected from $-R^7$, $-\text{COR}^7$,
 $-\text{CO}_2$ (optionally substituted C_{1-6} aliphatic), $-\text{CON}(R^7)_2$,
 or $-\text{SO}_2R^7$, or two R^4 on the same nitrogen are taken
 together to form a 5-8 membered heterocyclyl or
 5 heteroaryl ring;

each R^5 is independently selected from $-R$, halo, $-\text{OR}$,
 $-\text{C}(=\text{O})R$, $-\text{CO}_2R$, $-\text{COCOR}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{S}(\text{O})R$, $-\text{SO}_2R$, $-\text{SR}$,
 $-\text{N}(R^4)_2$, $-\text{CON}(R^4)_2$, $-\text{SO}_2\text{N}(R^4)_2$, $-\text{OC}(=\text{O})R$, $-\text{N}(R^4)\text{COR}$,
 $-\text{N}(R^4)\text{CO}_2$ (optionally substituted C_{1-6} aliphatic),
 10 $-\text{N}(R^4)\text{N}(R^4)_2$, $-\text{C}=\text{NN}(R^4)_2$, $-\text{C}=\text{N}-\text{OR}$, $-\text{N}(R^4)\text{CON}(R^4)_2$,
 $-\text{N}(R^4)\text{SO}_2\text{N}(R^4)_2$, $-\text{N}(R^4)\text{SO}_2R$, or $-\text{OC}(=\text{O})\text{N}(R^4)_2$, or R^5 and
 an adjacent substituent taken together with their
 intervening atoms form said ring fused to Ring C;
 V is $-\text{O}-$, $-\text{S}-$, $-\text{SO}-$, $-\text{SO}_2-$, $-\text{N}(R^6)\text{SO}_2-$, $-\text{SO}_2\text{N}(R^6)-$,
 15 $-\text{N}(R^6)-$, $-\text{CO}-$, $-\text{CO}_2-$, $-\text{N}(R^6)\text{CO}-$, $-\text{N}(R^6)\text{C}(\text{O})\text{O}-$,
 $-\text{N}(R^6)\text{CON}(R^6)-$, $-\text{N}(R^6)\text{SO}_2\text{N}(R^6)-$, $-\text{N}(R^6)\text{N}(R^6)-$,
 $-\text{C}(\text{O})\text{N}(R^6)-$, $-\text{OC}(\text{O})\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{O}-$, $-\text{C}(R^6)_2\text{S}-$,
 $-\text{C}(R^6)_2\text{SO}-$, $-\text{C}(R^6)_2\text{SO}_2-$, $-\text{C}(R^6)_2\text{SO}_2\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)-$,
 $-\text{C}(R^6)_2\text{N}(R^6)\text{C}(\text{O})-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(R^6)=\text{NN}(R^6)-$,
 20 $-\text{C}(R^6)=\text{N}-\text{O}-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{SO}_2\text{N}(R^6)-$, or
 $-\text{C}(R^6)_2\text{N}(R^6)\text{CON}(R^6)-$;

W is $-\text{C}(R^6)_2\text{O}-$, $-\text{C}(R^6)_2\text{S}-$, $-\text{C}(R^6)_2\text{SO}-$, $-\text{C}(R^6)_2\text{SO}_2-$,
 $-\text{C}(R^6)_2\text{SO}_2\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)-$, $-\text{CO}-$, $-\text{CO}_2-$,
 $-\text{C}(R^6)\text{OC}(\text{O})-$, $-\text{C}(R^6)\text{OC}(\text{O})\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{CO}-$,
 25 $-\text{C}(R^6)_2\text{N}(R^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(R^6)=\text{NN}(R^6)-$, $-\text{C}(R^6)=\text{N}-\text{O}-$,
 $-\text{C}(R^6)_2\text{N}(R^6)\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{SO}_2\text{N}(R^6)-$,
 $-\text{C}(R^6)_2\text{N}(R^6)\text{CON}(R^6)-$, or $-\text{CON}(R^6)-$;

each R^6 is independently selected from hydrogen, an
 optionally substituted C_{1-4} aliphatic group, or two R^6
 30 groups on the same nitrogen atom are taken together
 with the nitrogen atom to form a 5-6 membered
 heterocyclyl or heteroaryl ring;

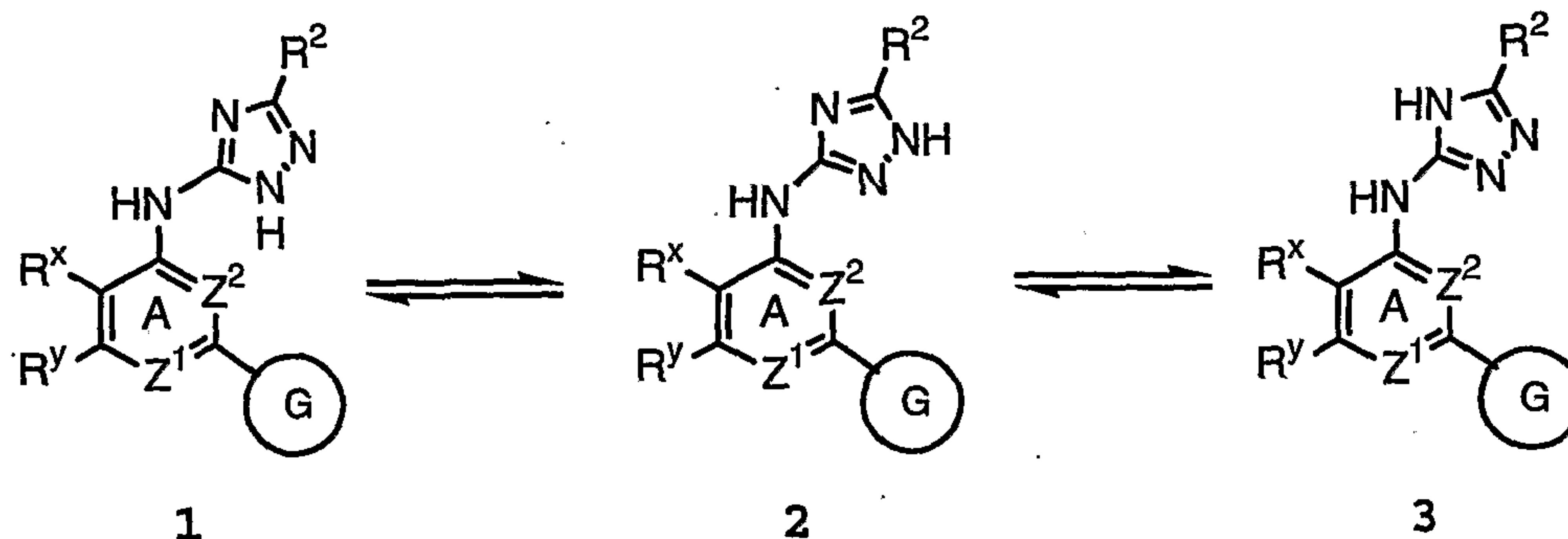
each R^7 is independently selected from hydrogen or an
 optionally substituted C_{1-6} aliphatic group, or two R^7

on the same nitrogen are taken together with the nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring;

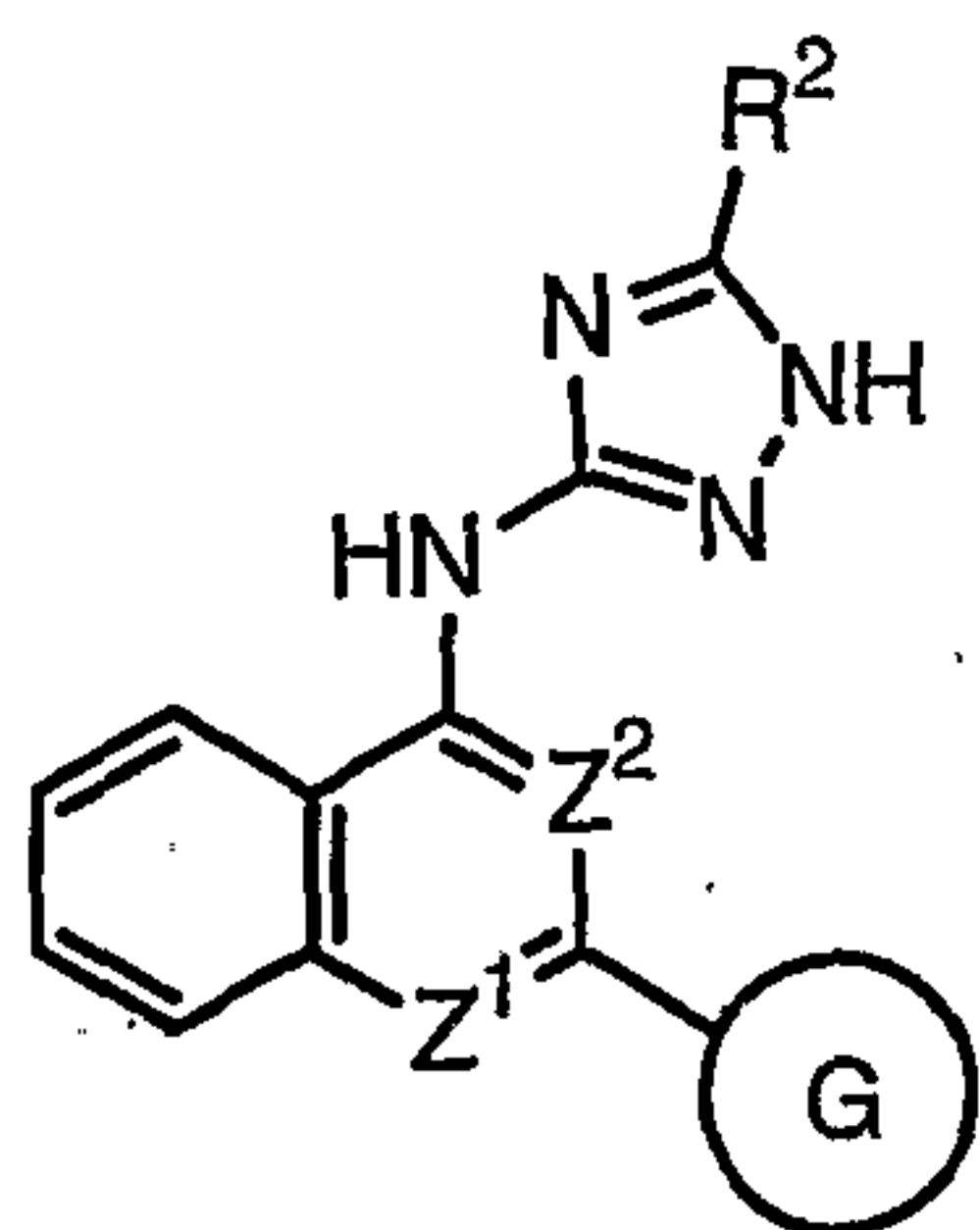
each R^8 is independently selected from an optionally substituted C_{1-4} aliphatic group, $-OR^6$, $-SR^6$, $-COR^6$, $-SO_2R^6$, $-N(R^6)_2$, $-N(R^6)N(R^6)_2$, $-CN$, $-NO_2$, $-CON(R^6)_2$, or $-CO_2R^6$; and

R^9 is selected from $-R$, halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$.

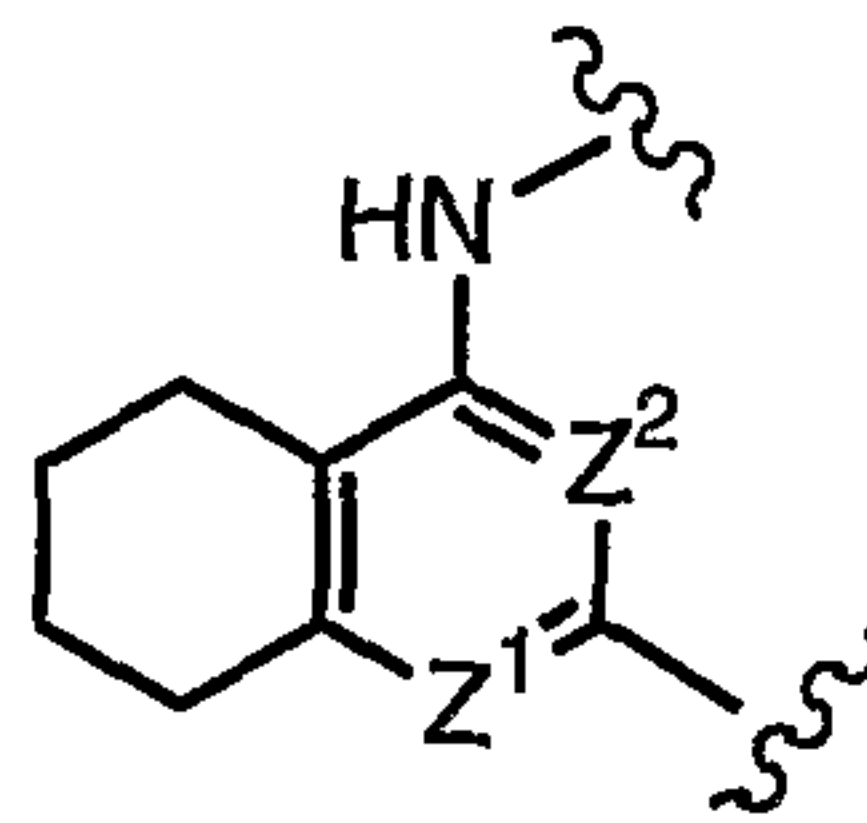
Compounds of formula IX may exist in alternative tautomeric forms, as in tautomers 1-3 shown below. Unless otherwise indicated, the representation of any of these tautomers is meant to include the other two.



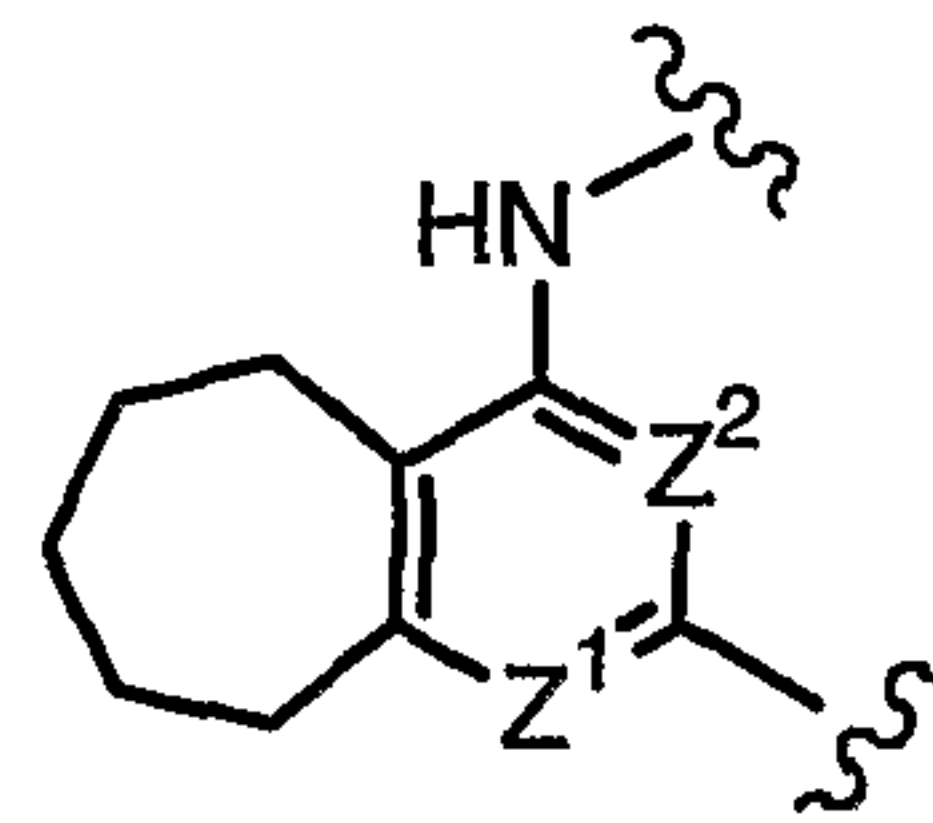
The R^x and R^y groups of formula IX may be taken together to form a fused ring, providing a bicyclic ring system containing Ring A. Preferred R^x/R^y rings include a 5-, 6-, 7-, or 8-membered unsaturated or partially unsaturated ring having 0-2 heteroatoms, wherein said R^x/R^y ring is optionally substituted. Examples of Ring A systems are shown below by compounds IX-A through IX-DD, wherein Z^1 is nitrogen or $C(R^9)$ and Z^2 is nitrogen or $C(H)$.



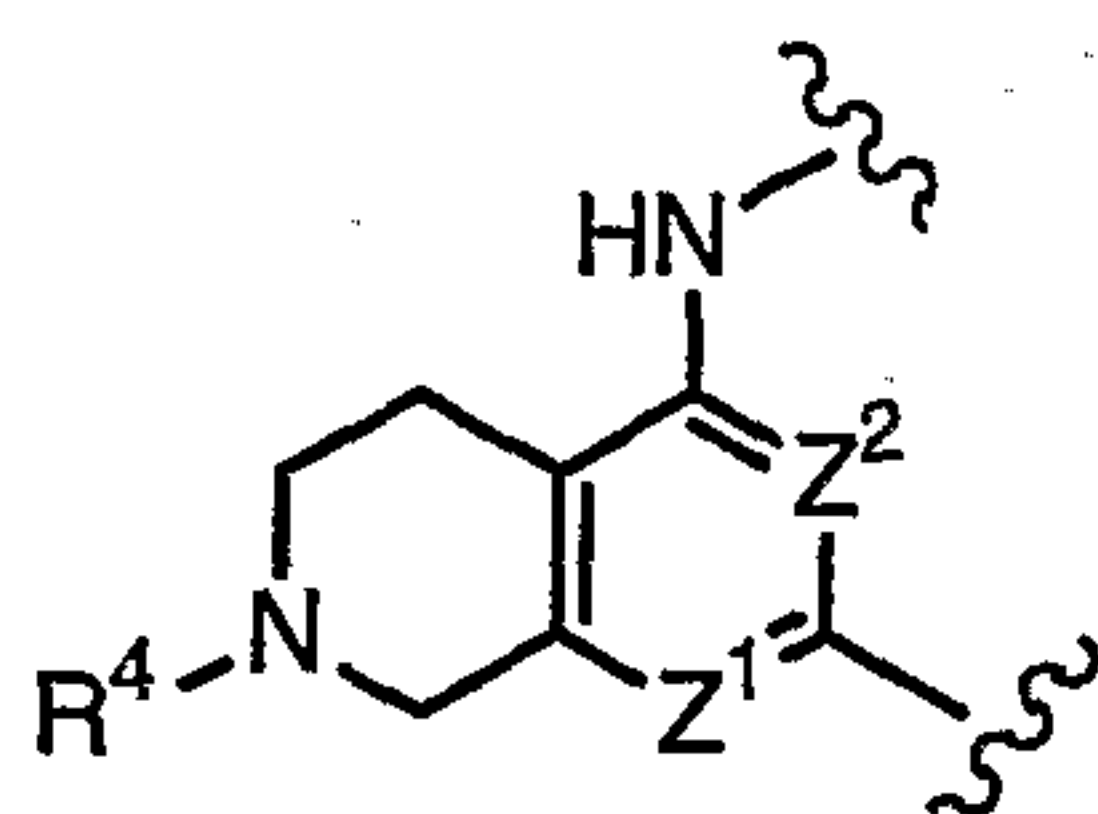
IX-A



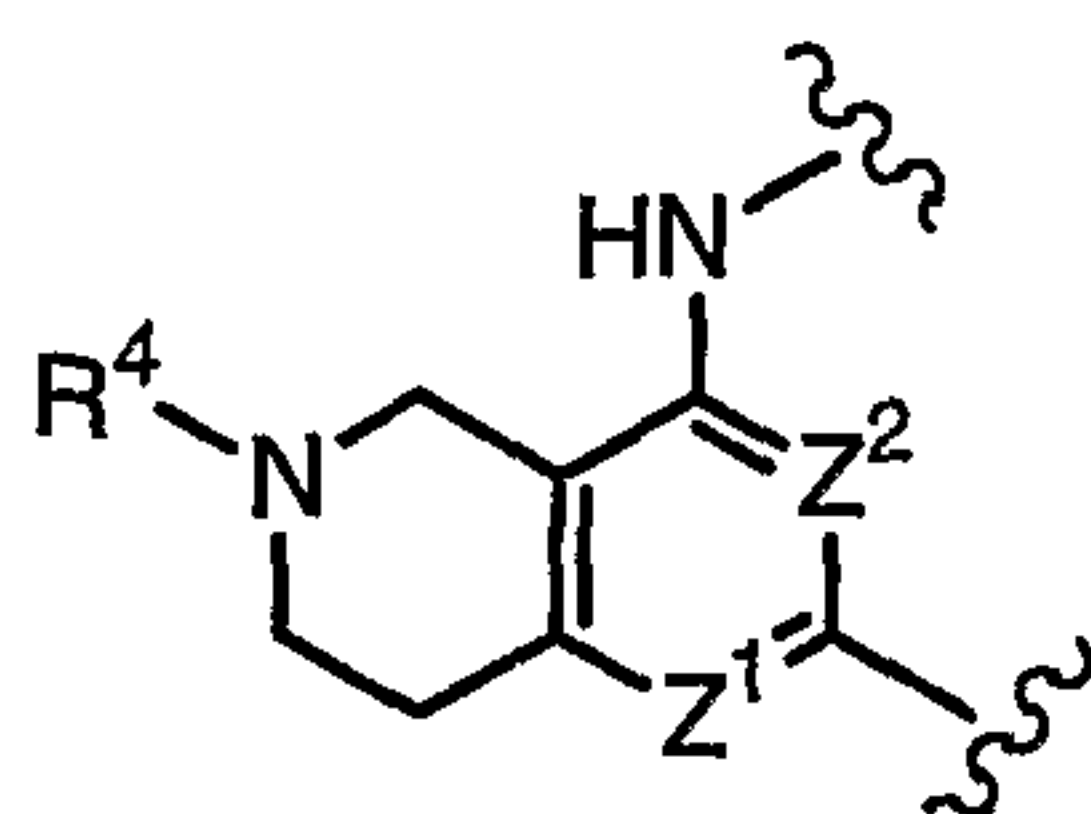
IX-B



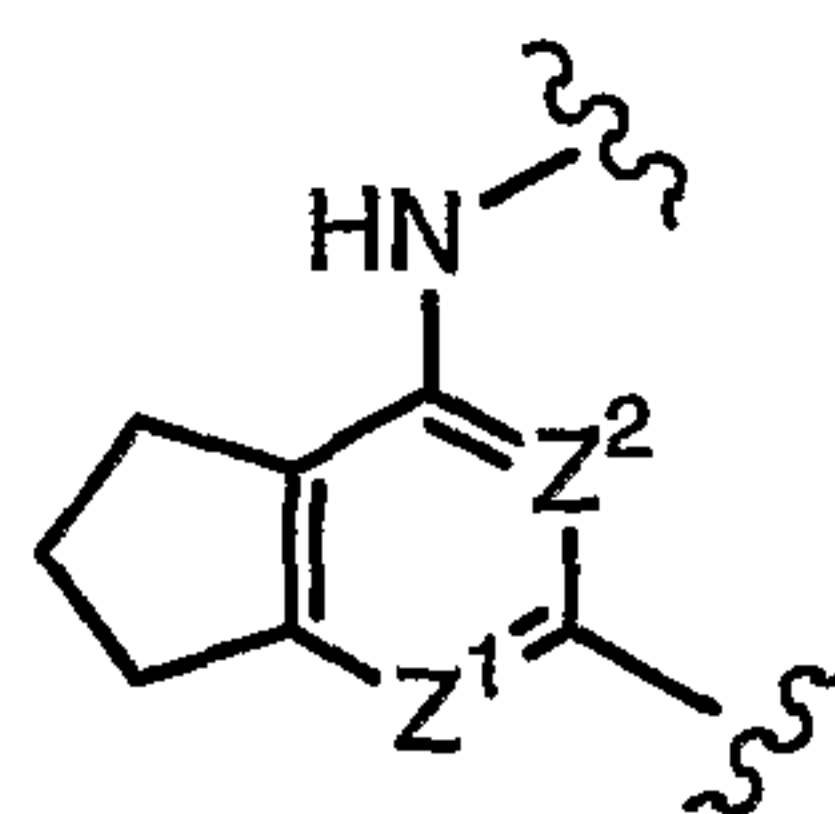
IX-C



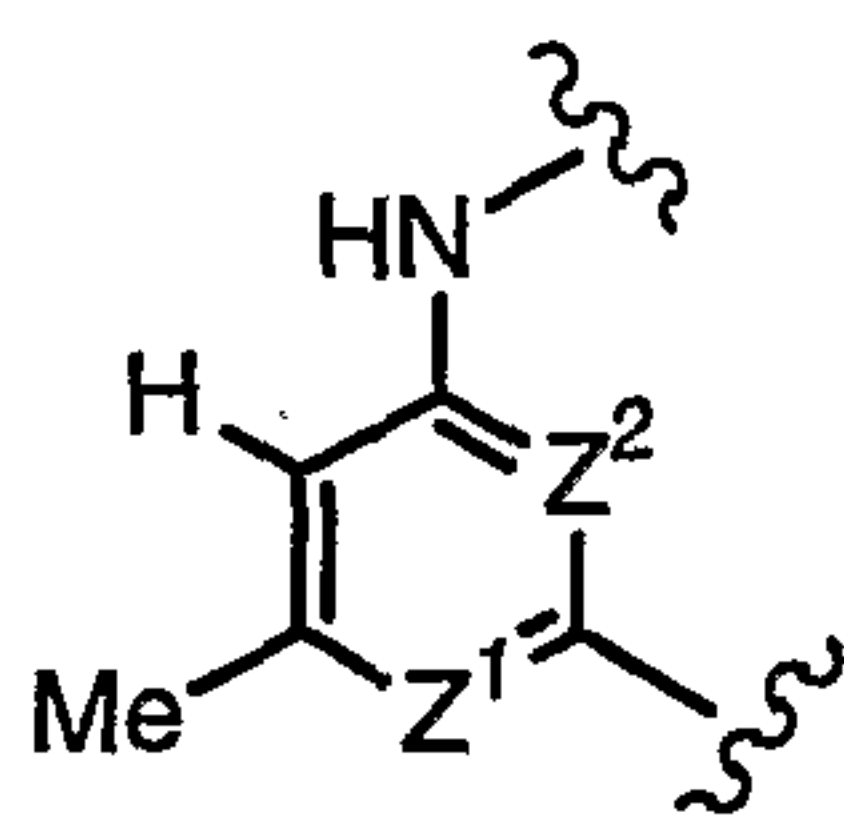
IX-D



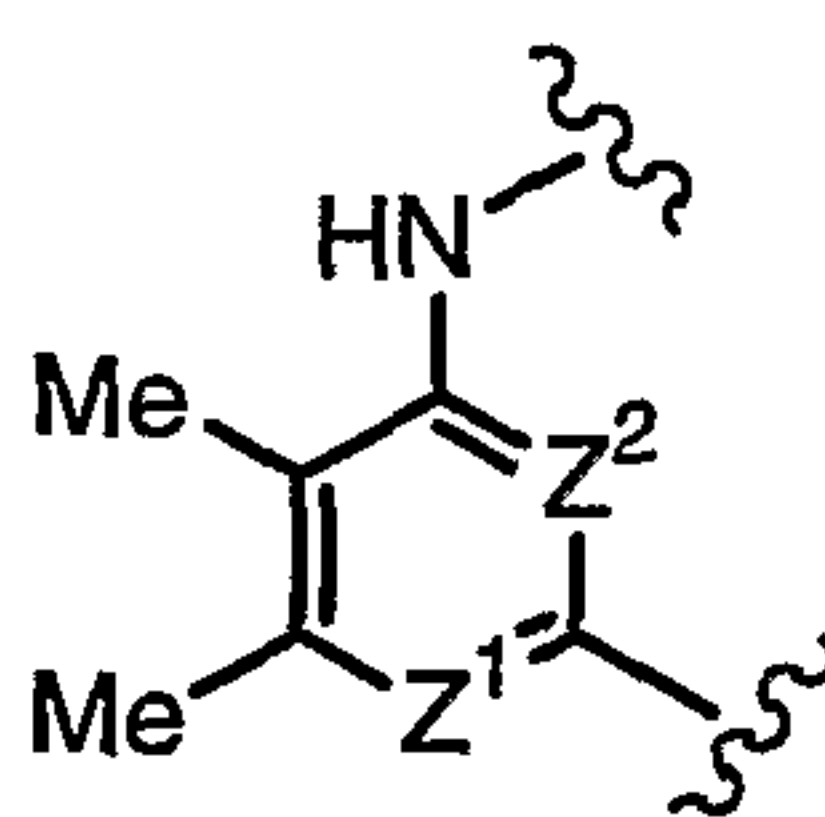
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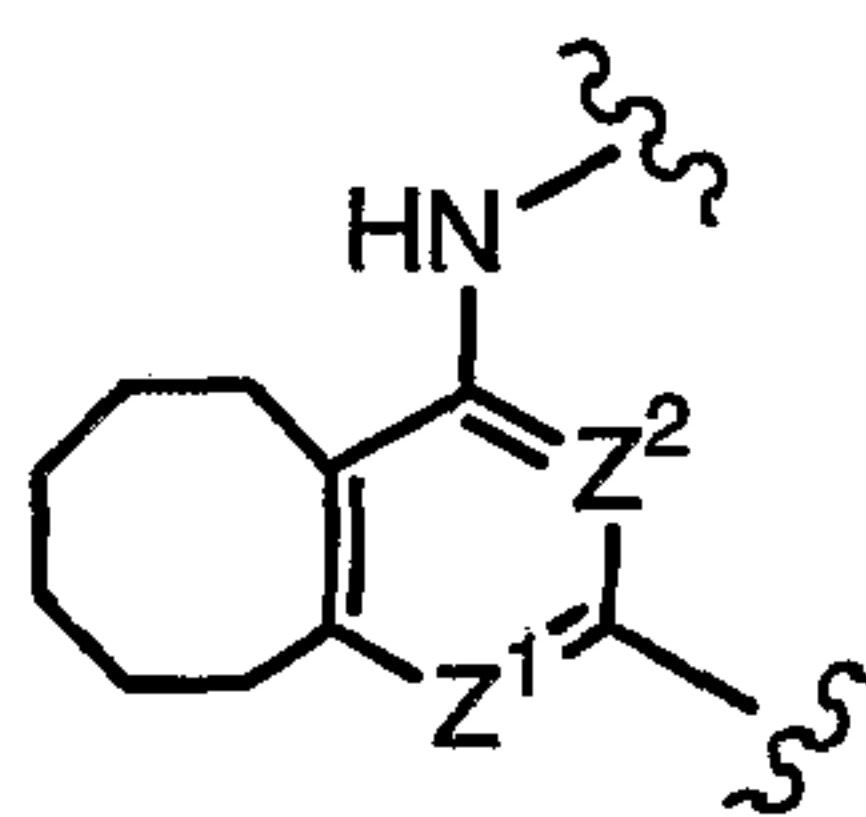
IX-F



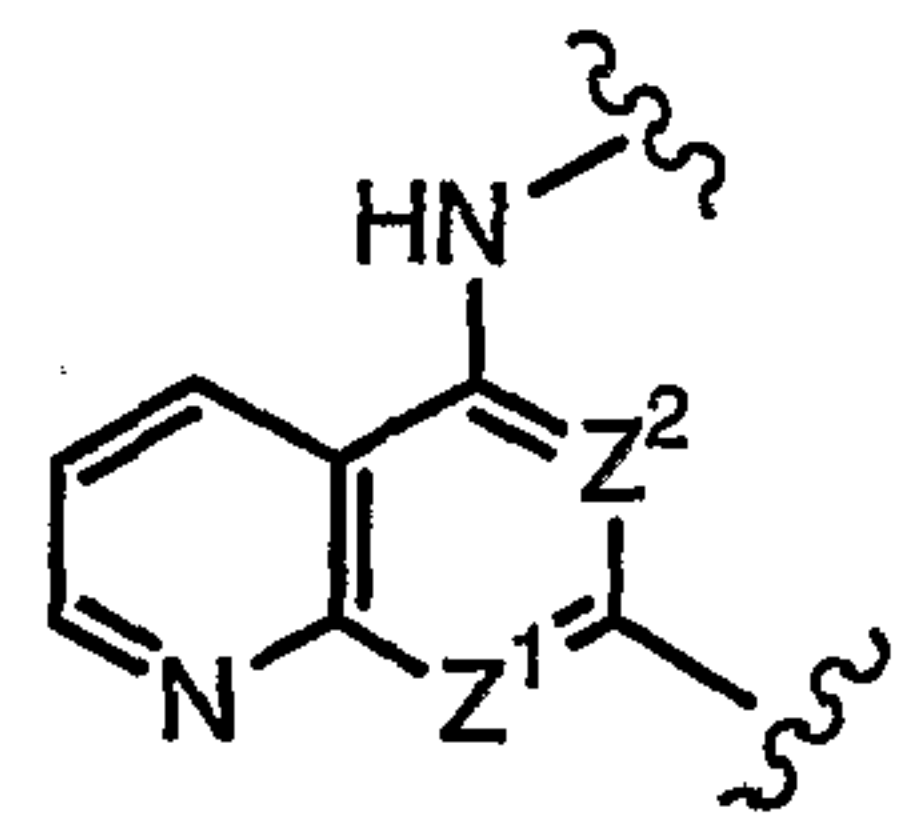
IX-G



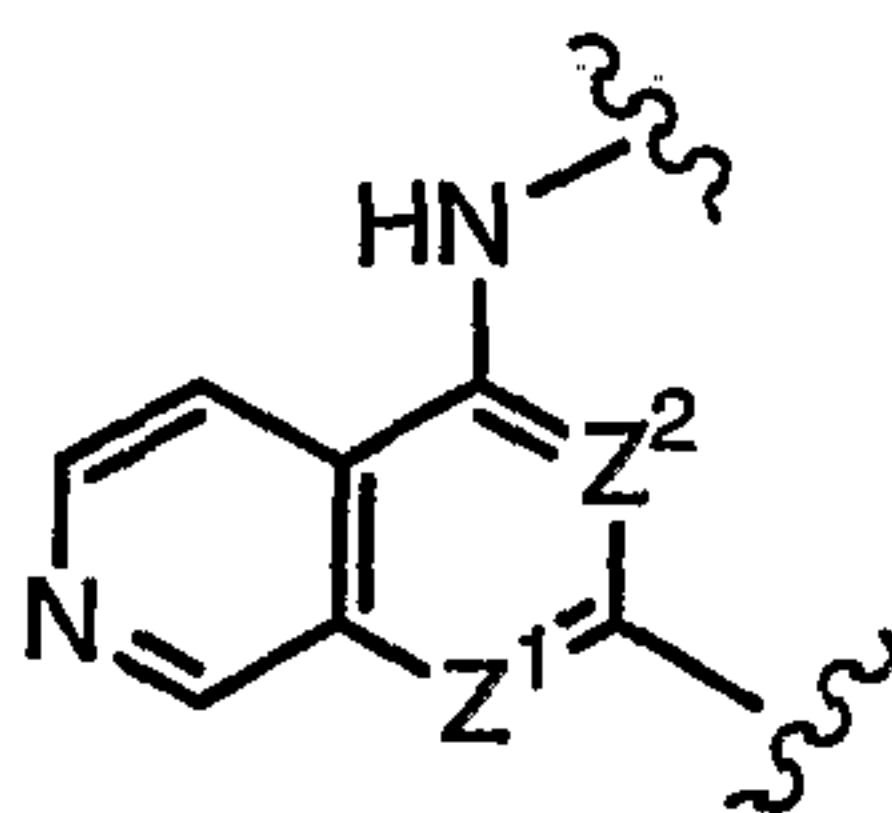
IX-H



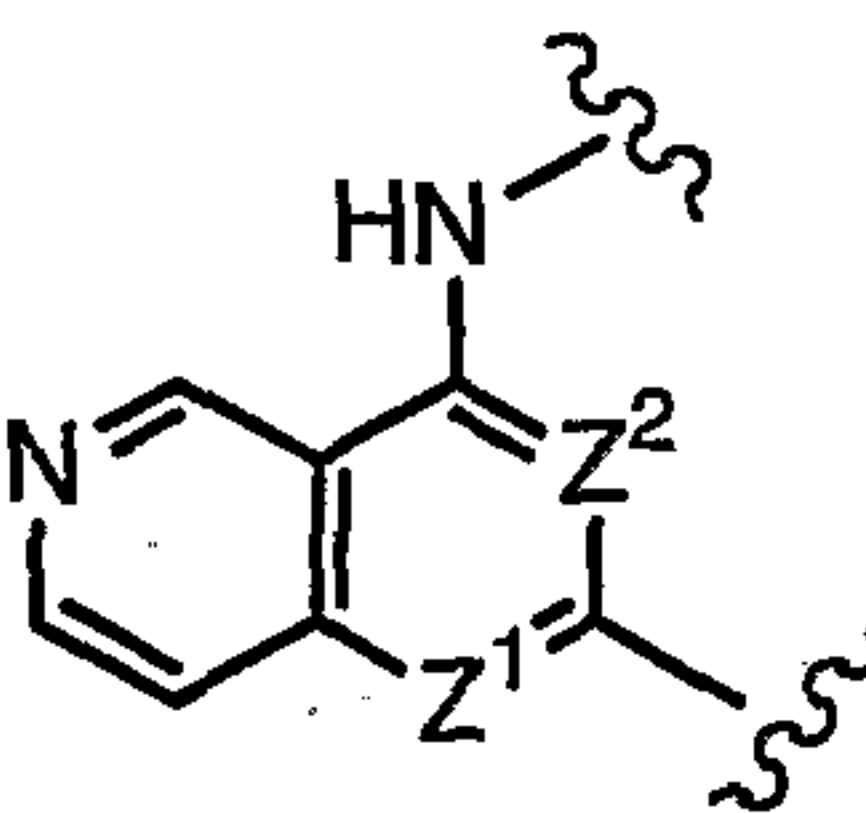
IX-I



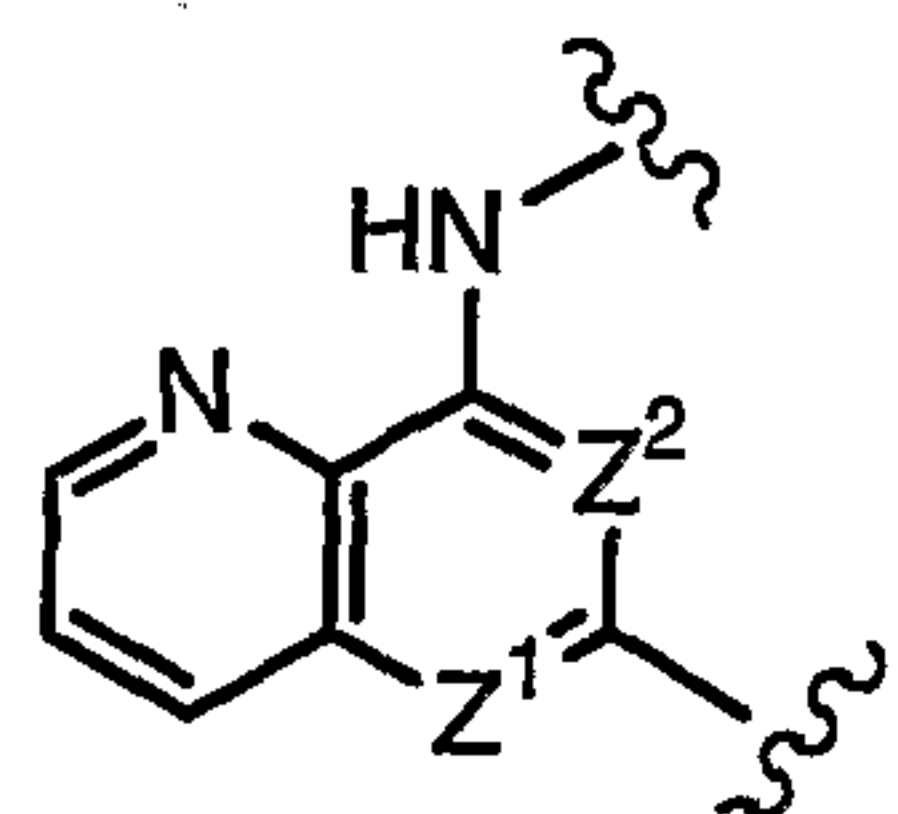
IX-J



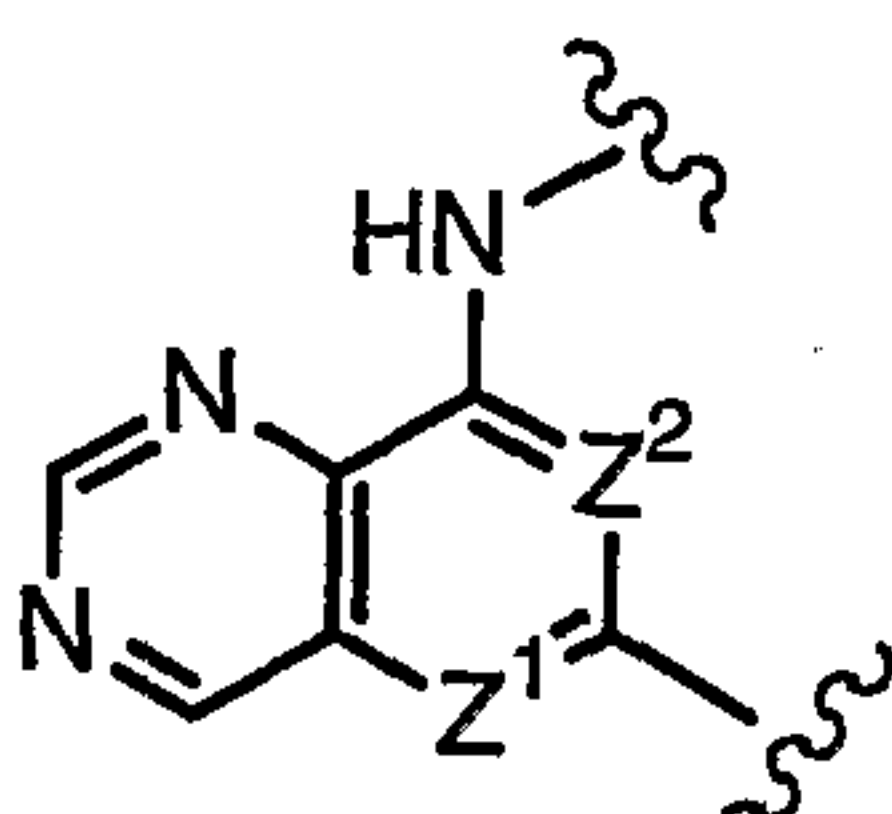
IX-K



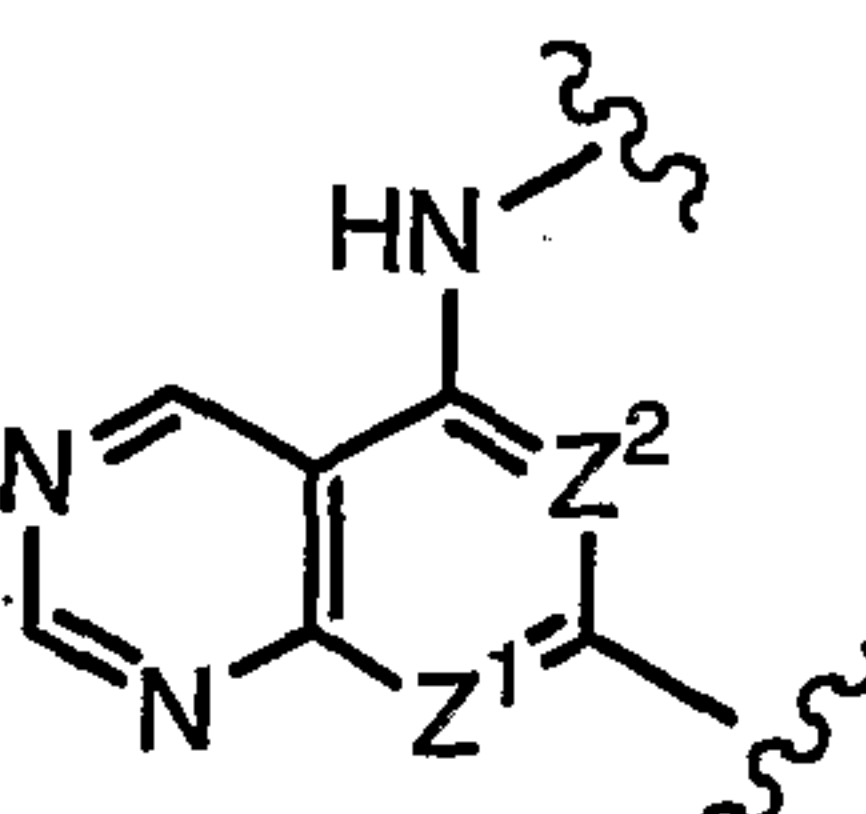
IX-L



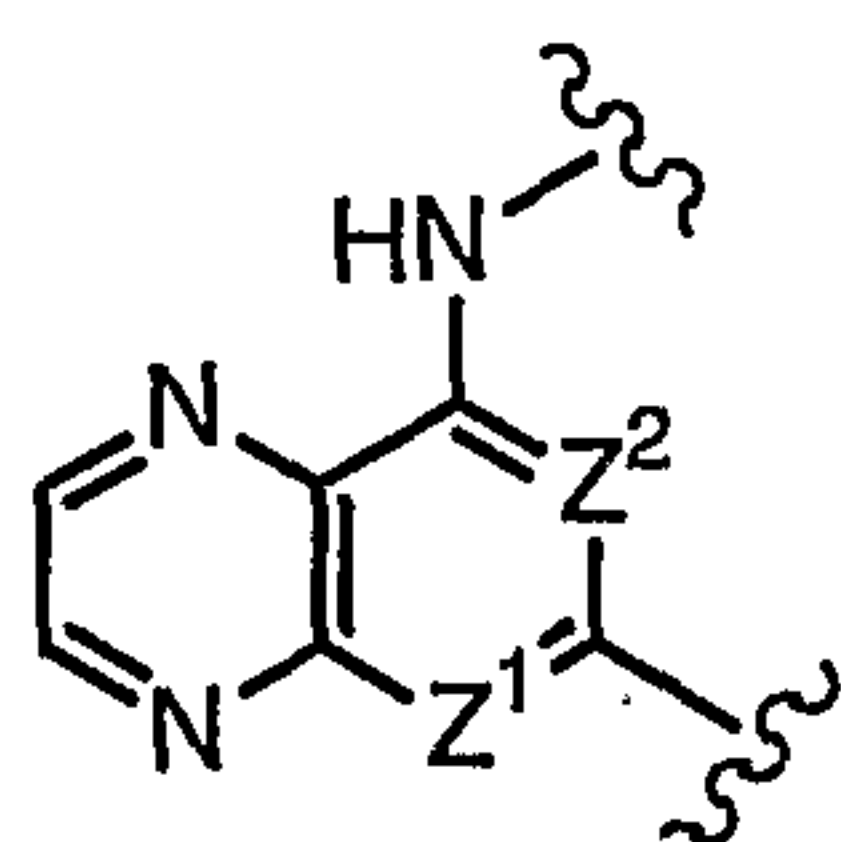
IX-M



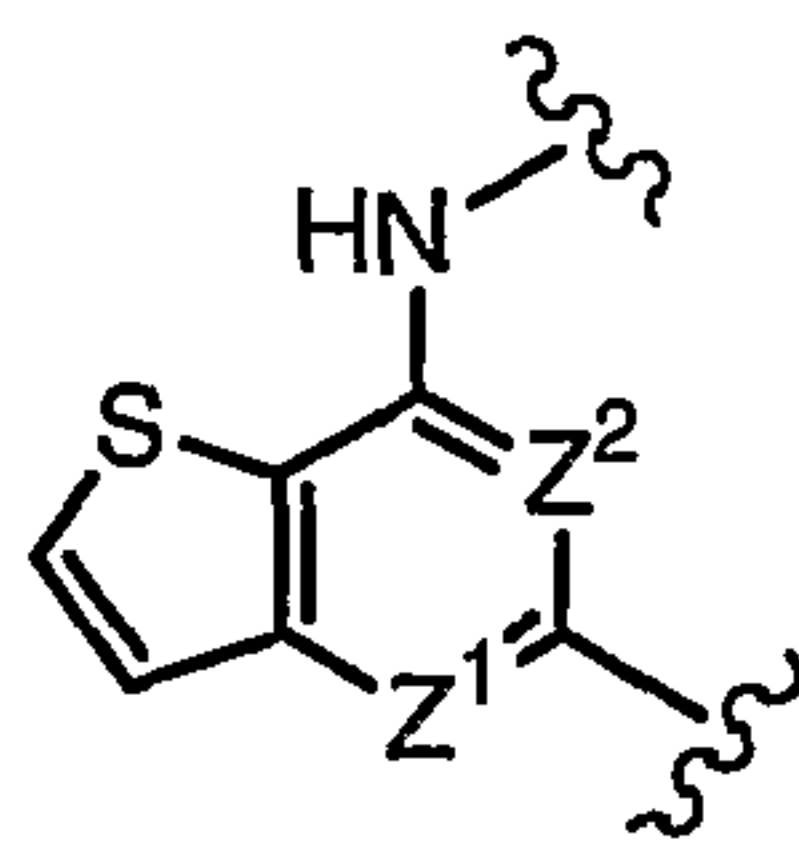
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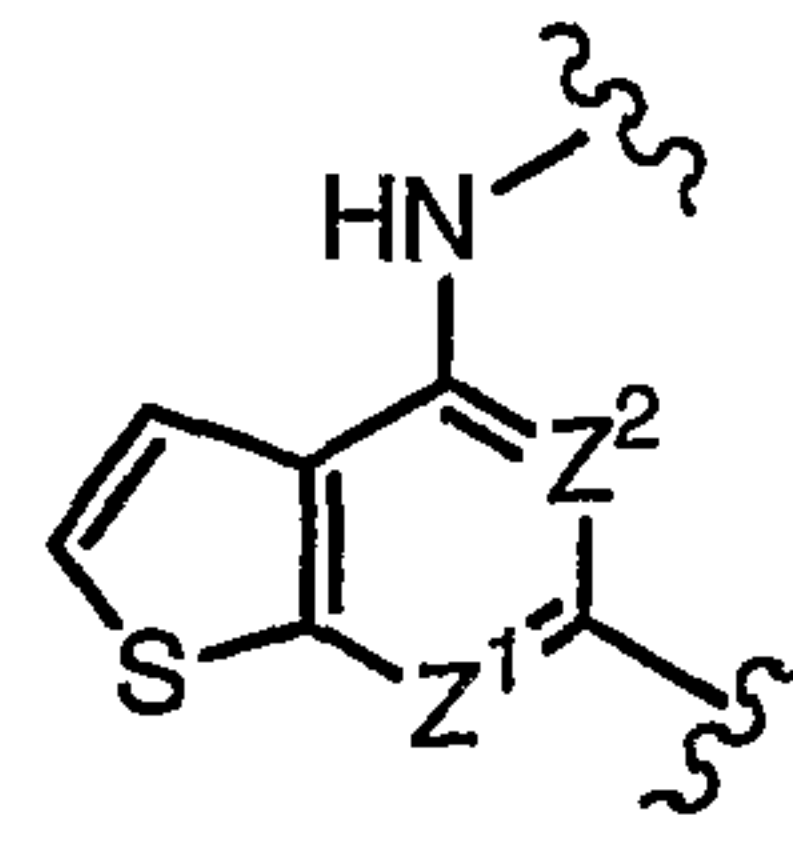
IX-O



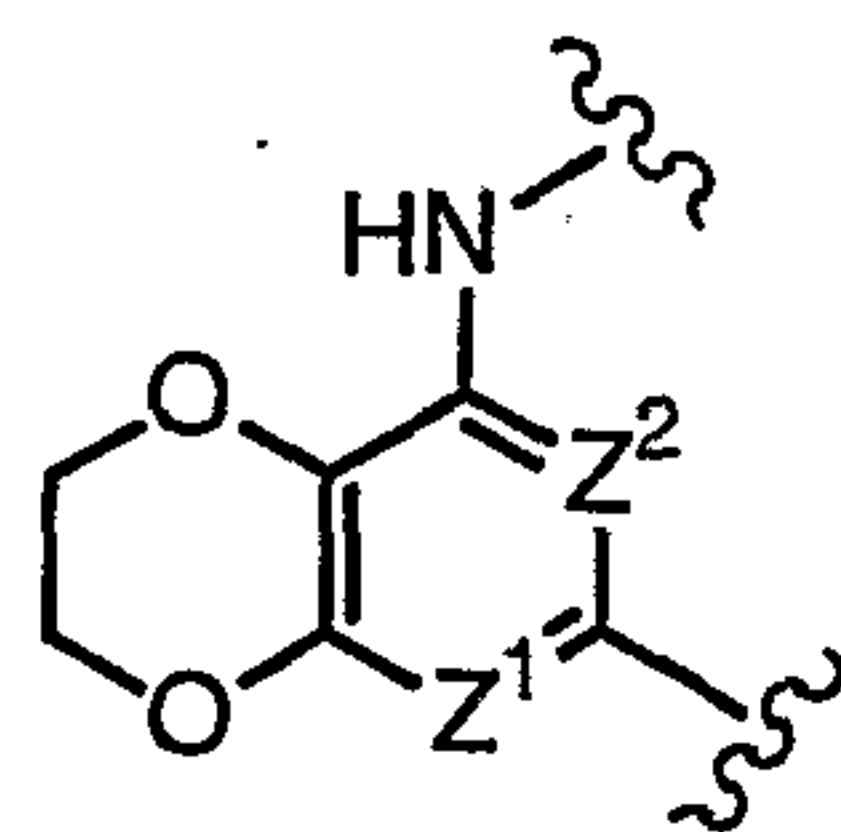
IX-P



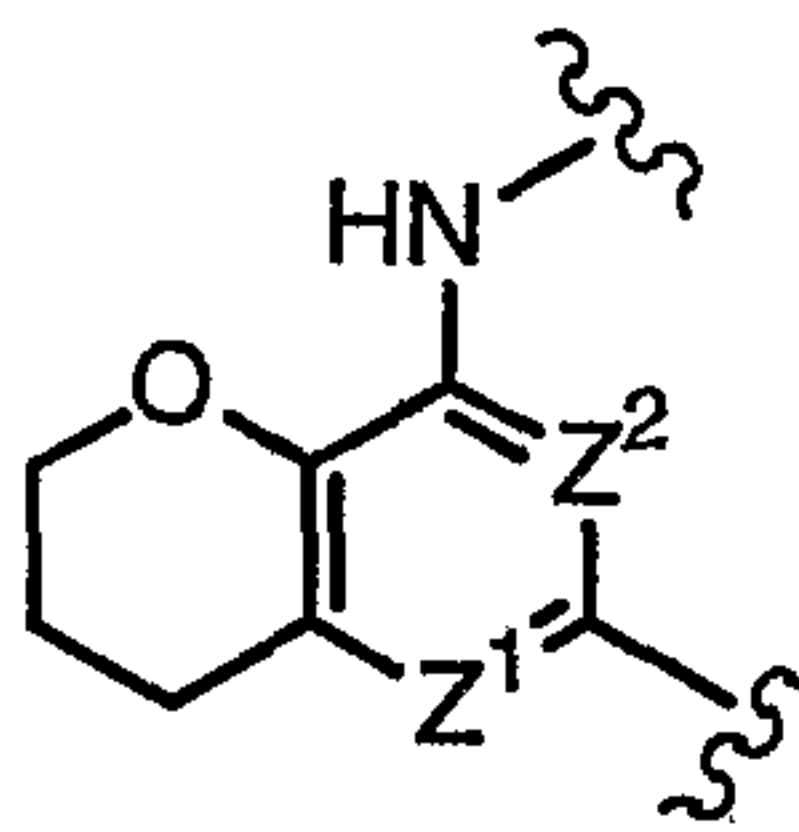
IX-Q



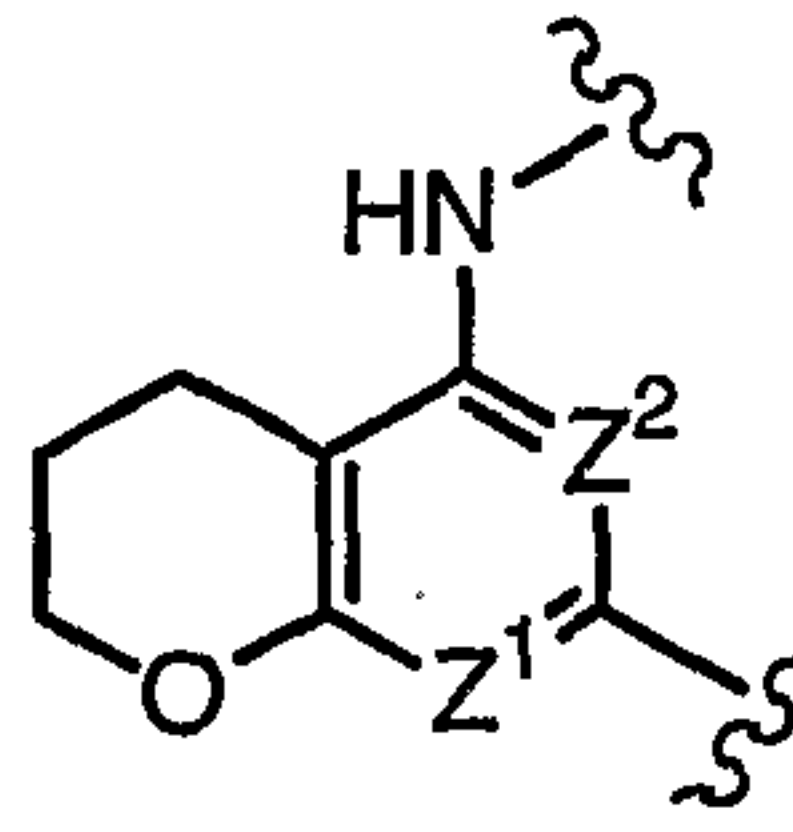
IX-R



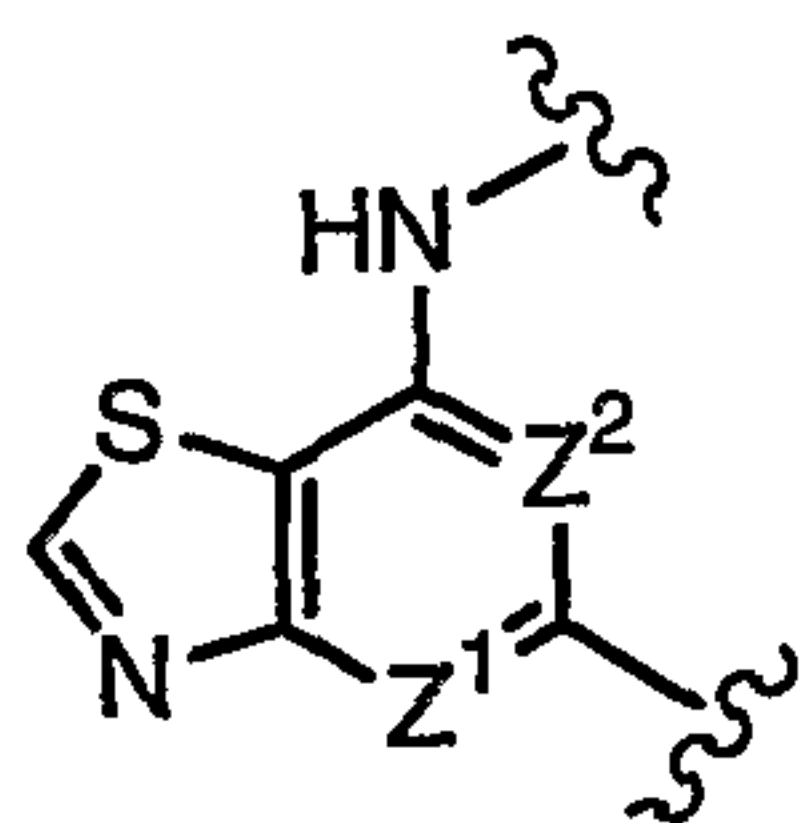
IX-S



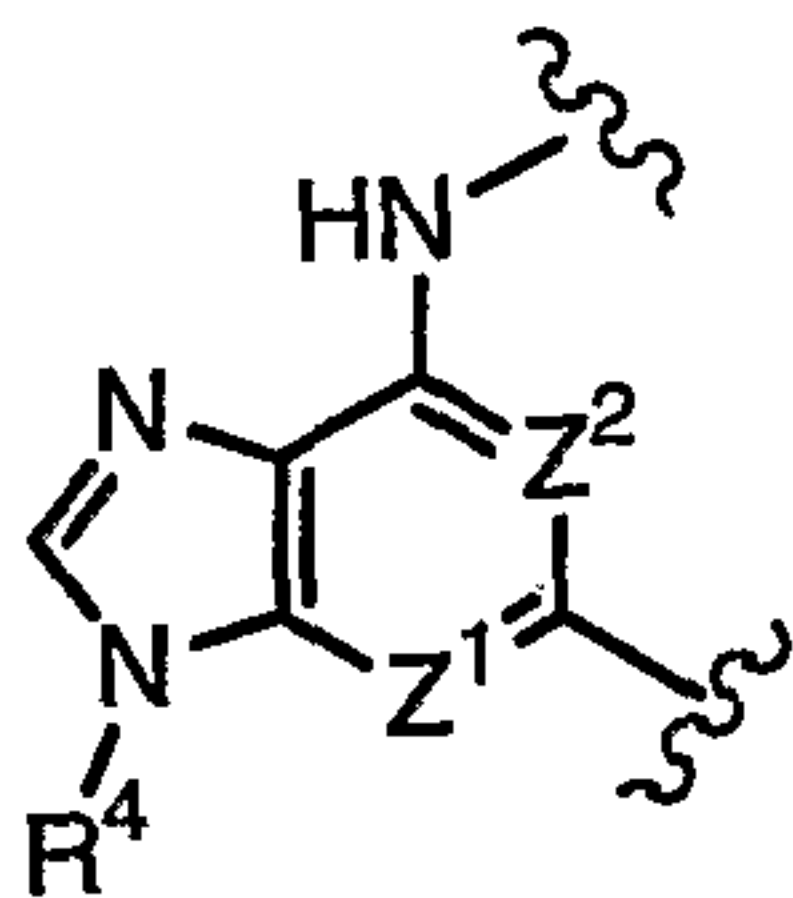
IX-T



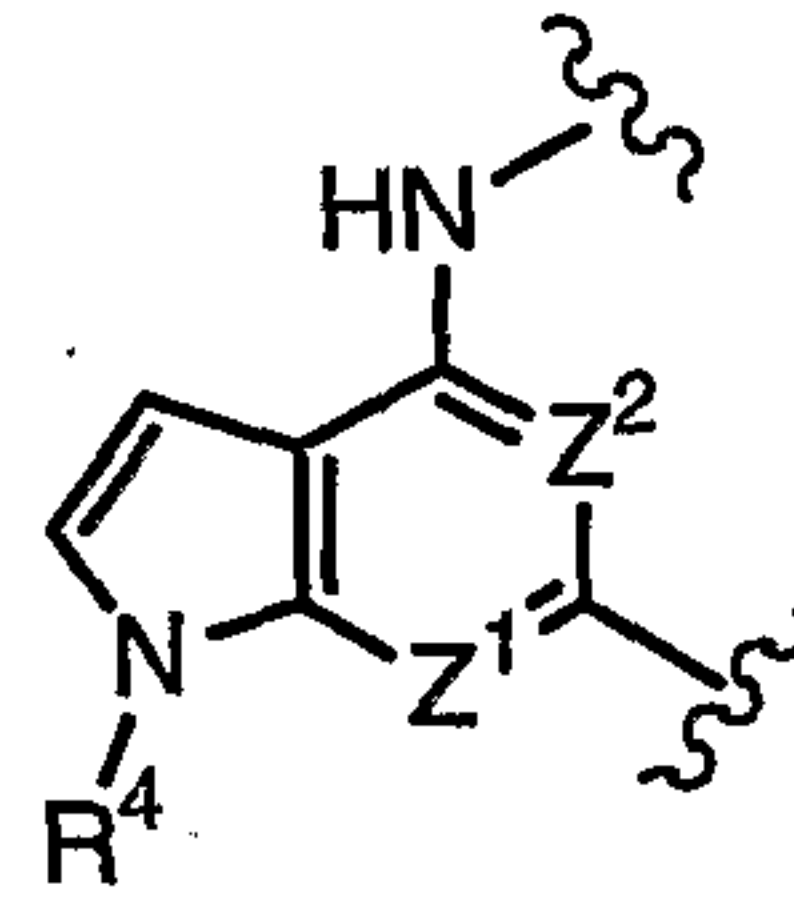
IX-U



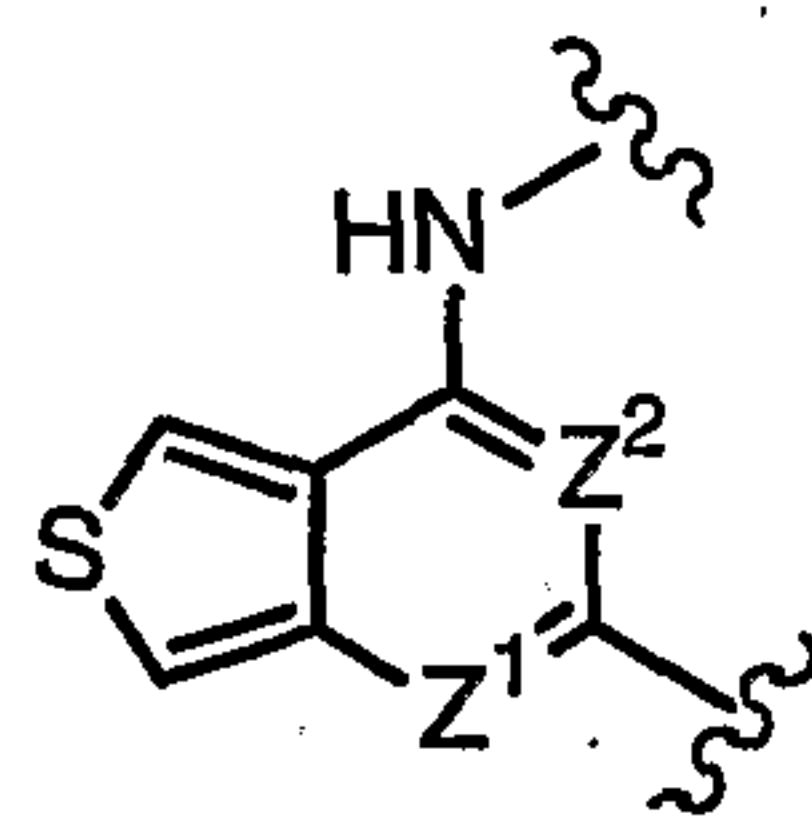
IX-V



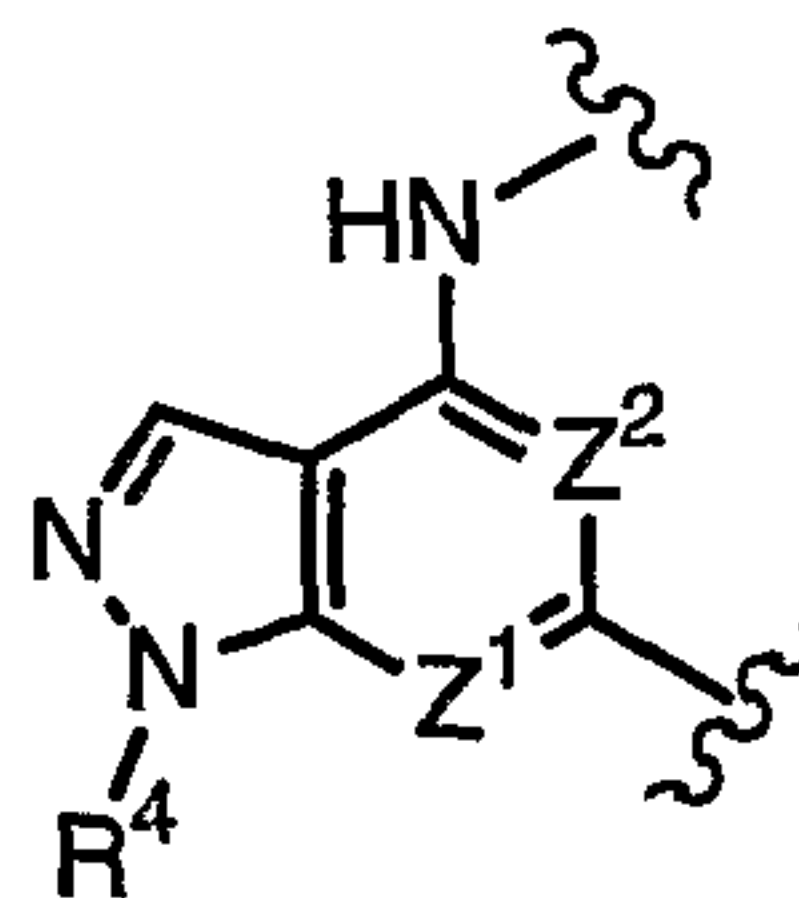
IX-W



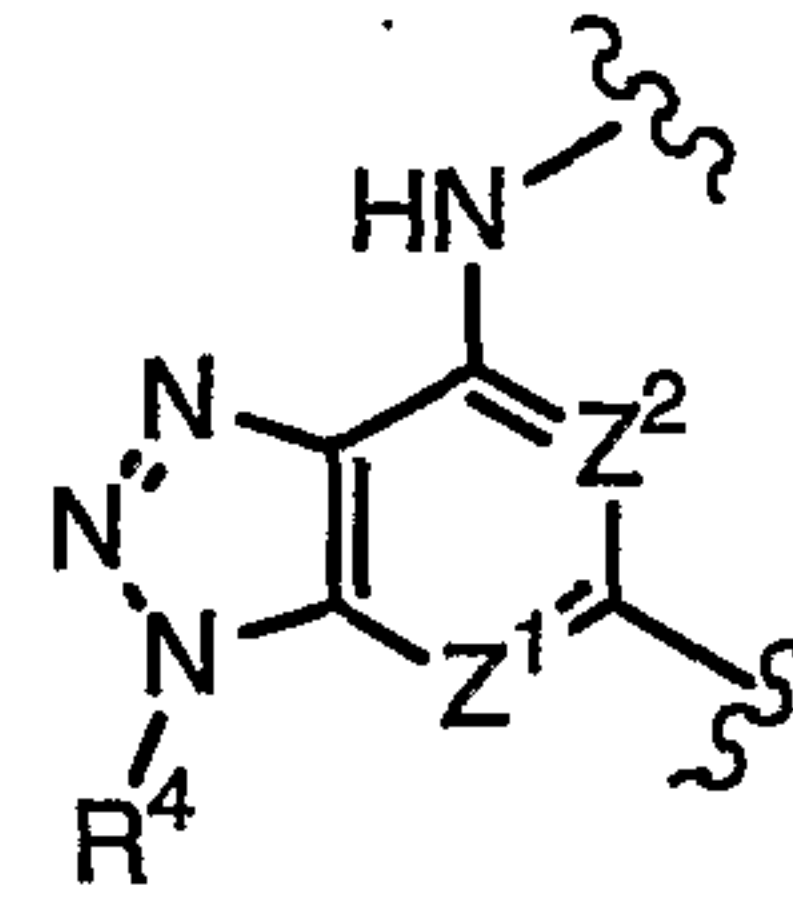
IX-X



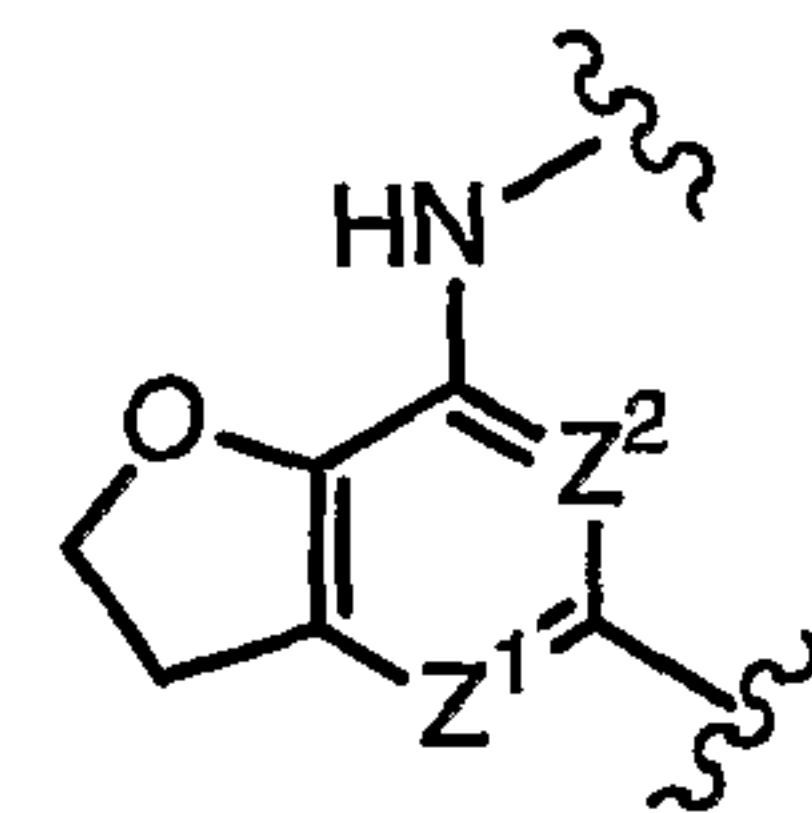
IX-Y



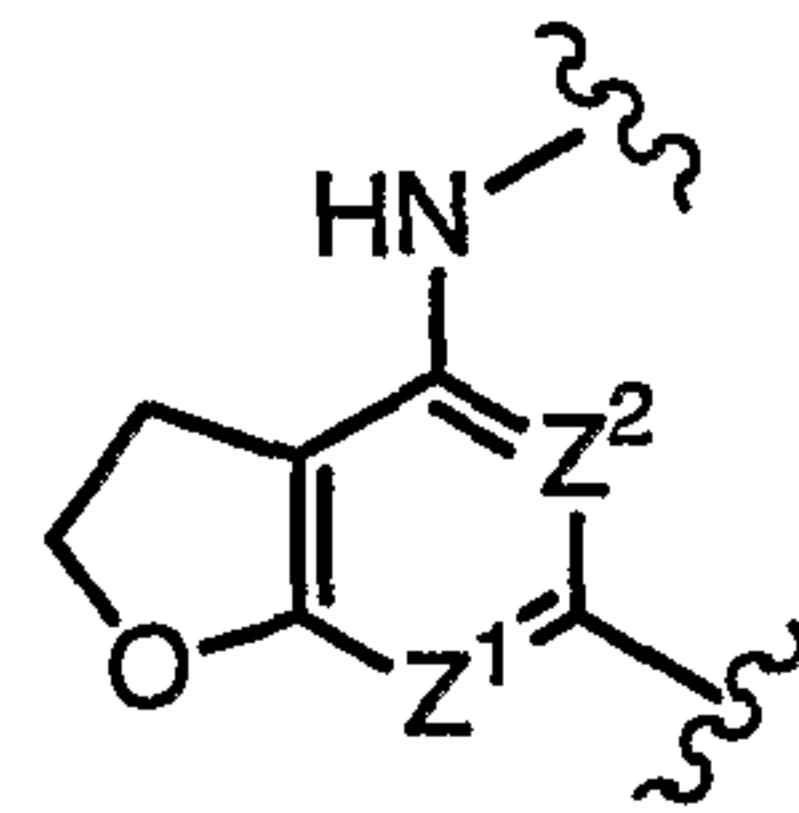
IX-Z



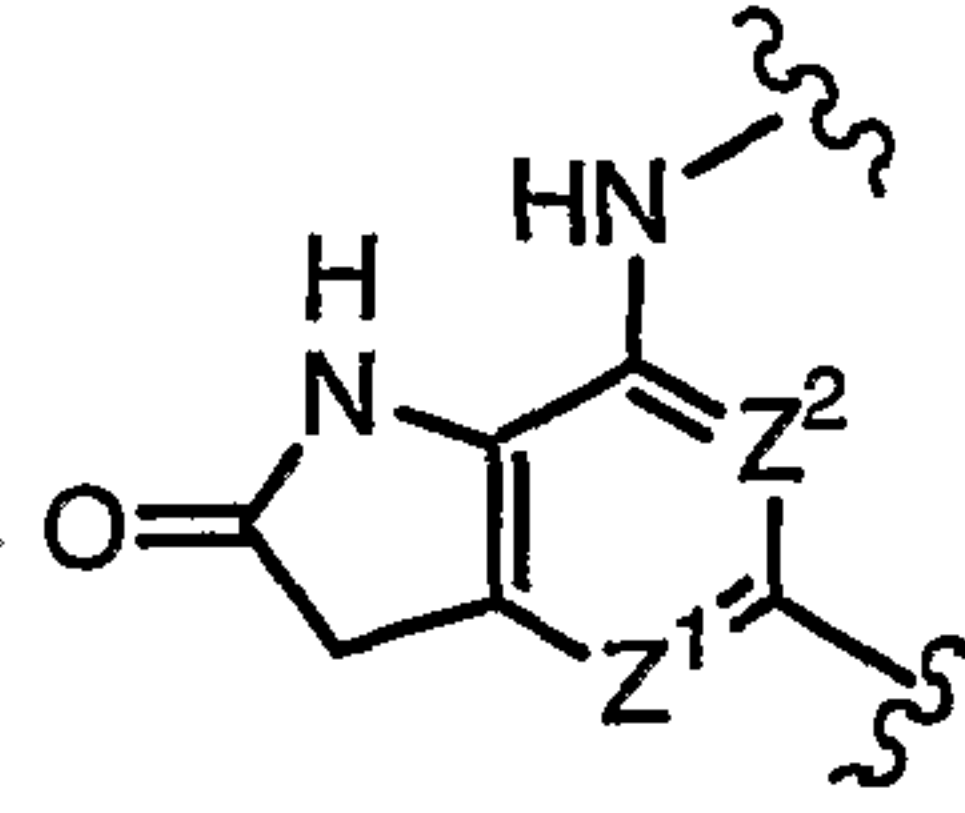
IX-AA



IX-BB



IX-CC



IX-DD

Preferred bicyclic Ring A systems of formula IX include IX-A, IX-B, IX-C, IX-D, IX-E, IX-F, IX-G, IX-H, IX-I, IX-J, IX-K, IX-L, and IX-M, more preferably IX-A,

IX-B, IX-C, IX-F, and IX-H, and most preferably IX-A, IX-B, and IX-H.

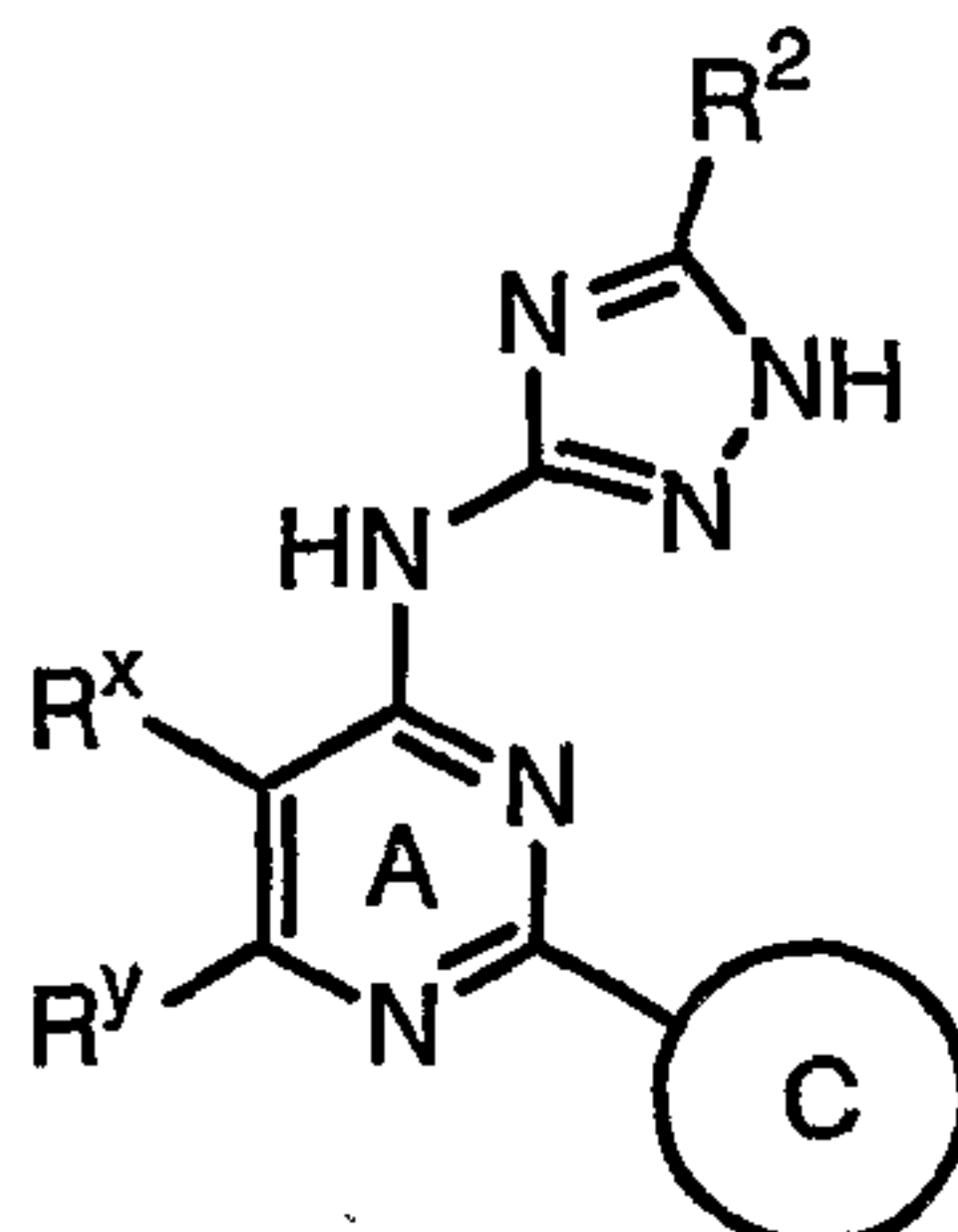
In the monocyclic Ring A system of formula IX, preferred R^x groups include hydrogen, alkyl- or
 5 dialkylamino, acetamido, or a C_{1-4} aliphatic group such as methyl, ethyl, cyclopropyl, isopropyl or t-butyl. Preferred R^y groups, when present, include T- R^3 wherein T is a valence bond or a methylene, and R^3 is -R, -N(R^4)₂, or -OR. Examples of preferred R^y include 2-pyridyl, 4-
 10 pyridyl, piperidinyl, methyl, ethyl, cyclopropyl, isopropyl, t-butyl, alkyl- or dialkylamino, acetamido, optionally substituted phenyl such as phenyl or halo-substituted phenyl, and methoxymethyl.

In the bicyclic Ring A system of formula IX,
 15 the ring formed by R^x and R^y taken together may be substituted or unsubstituted. Suitable substituents include -R, halo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R^4)₂, -CON(R^4)₂, -SO₂N(R^4)₂, -OC(=O)R, -N(R^4)COR, -N(R^4)CO₂(optionally substituted C_{1-6}
 20 aliphatic), -N(R^4)N(R^4)₂, -C=NN(R^4)₂, -C=N-OR, -N(R^4)CON(R^4)₂, -N(R^4)SO₂N(R^4)₂, -N(R^4)SO₂R, or -OC(=O)N(R^4)₂, wherein R and R^4 are as defined above. Preferred R^x/R^y ring substituents include -halo, -R, -OR, -COR, -CO₂R, -CON(R^4)₂, -CN, or -N(R^4)₂ wherein R is an
 25 optionally substituted C_{1-6} aliphatic group.

Preferred R^2 groups of formula IX include hydrogen, C_{1-4} aliphatic, alkoxycarbonyl, (un)substituted phenyl, hydroxyalkyl, alkoxyalkyl, aminocarbonyl, mono- or dialkylaminocarbonyl, aminoalkyl, alkylaminoalkyl,
 30 dialkylaminoalkyl, phenylaminocarbonyl, and (N-heterocyclyl)carbonyl. Examples of such preferred R^2 substituents include methyl, cyclopropyl, ethyl, isopropyl, propyl, t-butyl, cyclopentyl, phenyl, CO₂H, CO₂CH₃, CH₂OH, CH₂OCH₃, CH₂CH₂CH₂OH, CH₂CH₂CH₂OCH₃,

CH₂CH₂CH₂OCH₂Ph, CH₂CH₂CH₂NH₂, CH₂CH₂CH₂NHCOOC(CH₃)₃,
 CONHCH(CH₃)₂, CONHCH₂CH=CH₂, CONHCH₂CH₂OCH₃, CONHCH₂Ph,
 CONH(cyclohexyl), CON(Et)₂, CON(CH₃)CH₂Ph, CONH(n-C₃H₇),
 CON(Et)CH₂CH₂CH₃, CONHCH₂CH(CH₃)₂, CON(n-C₃H₇)₂, CO(3-
 5 methoxymethylpyrrolidin-1-yl), CONH(3-tolyl), CONH(4-
 tolyl), CONHCH₃, CO(morpholin-1-yl), CO(4-methylpiperazin-
 1-yl), CONHCH₂CH₂OH, CONH₂, and CO(piperidin-1-yl). A
 more preferred R² group for formula IX compounds is
 hydrogen.

10 An embodiment that is particularly useful for
 treating GSK3-mediated diseases relates to compounds of
 formula X wherein ring A is a pyrimidine ring:



15

X

or a pharmaceutically acceptable derivative or prodrug
 thereof, wherein;
 Ring C is selected from a phenyl, pyridinyl, pyrimidinyl,
 pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring,
 wherein said Ring C has one or two ortho substituents
 20 independently selected from -R¹, any substitutable non-
 ortho carbon position on Ring C is independently
 substituted by -R⁵, and two adjacent substituents on
 Ring C are optionally taken together with their
 intervening atoms to form a fused, unsaturated or
 25 partially unsaturated, 5-6 membered ring having 0-3
 heteroatoms selected from oxygen, sulfur or nitrogen,

said fused ring being optionally substituted by halo, oxo, or $-R^8$;

R^1 is selected from -halo, -CN, $-NO_2$, $T-V-R^6$, phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C_{1-6} aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or $-R^8$, said C_{1-6} aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R^1 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^x and R^y are independently selected from $T-R^3$, or R^x and R^y are taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-8 membered ring having 0-3 ring heteroatoms selected from oxygen, sulfur, or nitrogen, wherein any substitutable carbon on said fused ring formed by R^x and R^y is substituted by oxo or $T-R^3$, and any substitutable nitrogen on said ring formed by R^x and R^y is substituted by R^4 ;

T is a valence bond or a C_{1-4} alkylidene chain;

R^2 is $-R$ or $-T-W-R^6$;

R^3 is selected from $-R$, -halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-COCH_2COR$, $-NO_2$, $-CN$, $-S(O)R$, $-S(O)_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^7)_2$, $-SO_2N(R^7)_2$, $-OC(=O)R$, $-N(R^7)COR$, $-N(R^7)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^7)CON(R^7)_2$, $-N(R^7)SO_2N(R^7)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^7)_2$;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R^4 is independently selected from $-R^7$, $-\text{COR}^7$,
 $-\text{CO}_2$ (optionally substituted C_{1-6} aliphatic), $-\text{CON}(\text{R}^7)_2$,
 or $-\text{SO}_2\text{R}^7$, or two R^4 on the same nitrogen are taken
 together to form a 5-8 membered heterocyclyl or
 5 heteroaryl ring;

each R^5 is independently selected from $-\text{R}$, halo, $-\text{OR}$,
 $-\text{C}(=\text{O})\text{R}$, $-\text{CO}_2\text{R}$, $-\text{COCOR}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{S}(\text{O})\text{R}$, $-\text{SO}_2\text{R}$, $-\text{SR}$,
 $-\text{N}(\text{R}^4)_2$, $-\text{CON}(\text{R}^4)_2$, $-\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{OC}(=\text{O})\text{R}$, $-\text{N}(\text{R}^4)\text{COR}$,
 $-\text{N}(\text{R}^4)\text{CO}_2$ (optionally substituted C_{1-6} aliphatic),
 10 $-\text{N}(\text{R}^4)\text{N}(\text{R}^4)_2$, $-\text{C}=\text{NN}(\text{R}^4)_2$, $-\text{C}=\text{N}-\text{OR}$, $-\text{N}(\text{R}^4)\text{CON}(\text{R}^4)_2$,
 $-\text{N}(\text{R}^4)\text{SO}_2\text{N}(\text{R}^4)_2$, $-\text{N}(\text{R}^4)\text{SO}_2\text{R}$, or $-\text{OC}(=\text{O})\text{N}(\text{R}^4)_2$, or R^5 and
 an adjacent substituent taken together with their
 intervening atoms form said ring fused to Ring C;
 V is $-\text{O}-$, $-\text{S}-$, $-\text{SO}-$, $-\text{SO}_2-$, $-\text{N}(\text{R}^6)\text{SO}_2-$, $-\text{SO}_2\text{N}(\text{R}^6)-$,
 15 $-\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$, $-\text{N}(\text{R}^6)\text{CO}-$, $-\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$,
 $-\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{O})\text{N}(\text{R}^6)-$, $-\text{OC}(\text{O})\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$,
 $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$, $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{R}^6)=\text{NN}(\text{R}^6)-$,
 20 $-\text{C}(\text{R}^6)=\text{N}-\text{O}-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$, or
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$;

W is $-\text{C}(\text{R}^6)_2\text{O}-$, $-\text{C}(\text{R}^6)_2\text{S}-$, $-\text{C}(\text{R}^6)_2\text{SO}-$, $-\text{C}(\text{R}^6)_2\text{SO}_2-$,
 $-\text{C}(\text{R}^6)_2\text{SO}_2\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)-$, $-\text{CO}-$, $-\text{CO}_2-$,
 $-\text{C}(\text{R}^6)\text{OC}(\text{O})-$, $-\text{C}(\text{R}^6)\text{OC}(\text{O})\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CO}-$,
 25 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{R}^6)=\text{NN}(\text{R}^6)-$, $-\text{C}(\text{R}^6)=\text{N}-\text{O}-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{N}(\text{R}^6)-$, $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{SO}_2\text{N}(\text{R}^6)-$,
 $-\text{C}(\text{R}^6)_2\text{N}(\text{R}^6)\text{CON}(\text{R}^6)-$, or $-\text{CON}(\text{R}^6)-$;

each R^6 is independently selected from hydrogen, an
 optionally substituted C_{1-4} aliphatic group, or two R^6
 30 groups on the same nitrogen atom are taken together
 with the nitrogen atom to form a 5-6 membered
 heterocyclyl or heteroaryl ring;

each R^7 is independently selected from hydrogen or an
 optionally substituted C_{1-6} aliphatic group, or two R^7

on the same nitrogen are taken together with the nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring; and

each R^8 is independently selected from an optionally substituted C_{1-4} aliphatic group, $-OR^6$, $-SR^6$, $-COR^6$,
5 $-SO_2R^6$, $-N(R^6)_2$, $-N(R^6)N(R^6)_2$, $-CN$, $-NO_2$, $-CON(R^6)_2$, or $-CO_2R^6$.

Compounds of formula **X** are structurally similar to compounds of formula **II** except for the replacement of
10 the pyrazole ring moiety by the triazole ring moiety. Preferred R^2 , R^x , R^y and Ring C groups of formula **X** are as described above for the formula **II** compounds. Preferred formula **X** compounds have one or more, and more preferably all, of the features selected from the group consisting
15 of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is selected from a
20 naphthyl, quinolinyl or isoquinolinyl ring;

(b) R^x is hydrogen or C_{1-4} aliphatic and R^y is $T-R^3$, or R^x and R^y are taken together with their intervening atoms to form an optionally substituted 5-7 membered unsaturated or partially unsaturated ring having 0-2 ring
25 nitrogens;

(c) R^1 is -halo, an optionally substituted C_{1-6} aliphatic group, phenyl, $-COR^6$, $-OR^6$, $-CN$, $-SO_2R^6$, $-SO_2NH_2$, $-N(R^6)_2$, $-CO_2R^6$, $-CONH_2$, $-NHCOR^6$, $-OC(O)NH_2$, or $-NH SO_2R^6$; and

30 (d) R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C_{1-6} aliphatic group.

More preferred compounds of formula **X** have one or more, and more preferably all, of the features selected from the group consisting of:

- (a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring;
- (b) R^x is hydrogen or methyl and R^y is $-R$, $N(R^4)_2$, or $-OR$, or R^x and R^y are taken together with their intervening atoms to form a benzo ring or a 5-7 membered carbocyclo ring, wherein said ring formed by R^x and R^y is optionally substituted with $-R$, halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$;
- (c) R^1 is $-halo$, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic group, phenyl, or $-CN$;
- (d) R^2 is hydrogen or a substituted or unsubstituted group selected from aryl or a C_{1-6} aliphatic group; and
- (e) each R^5 is independently selected from $-halo$, $-CN$, $-NO_2$, $-N(R^4)_2$, optionally substituted C_{1-6} aliphatic group, $-OR$, $-C(O)R$, $-CO_2R$, $-CONH(R^4)$, $-N(R^4)COR$, $-SO_2N(R^4)_2$, or $-N(R^4)SO_2R$.

Even more preferred compounds of formula **X** have one or more, and more preferably all, of the features selected from the group consisting of:

- (a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring;

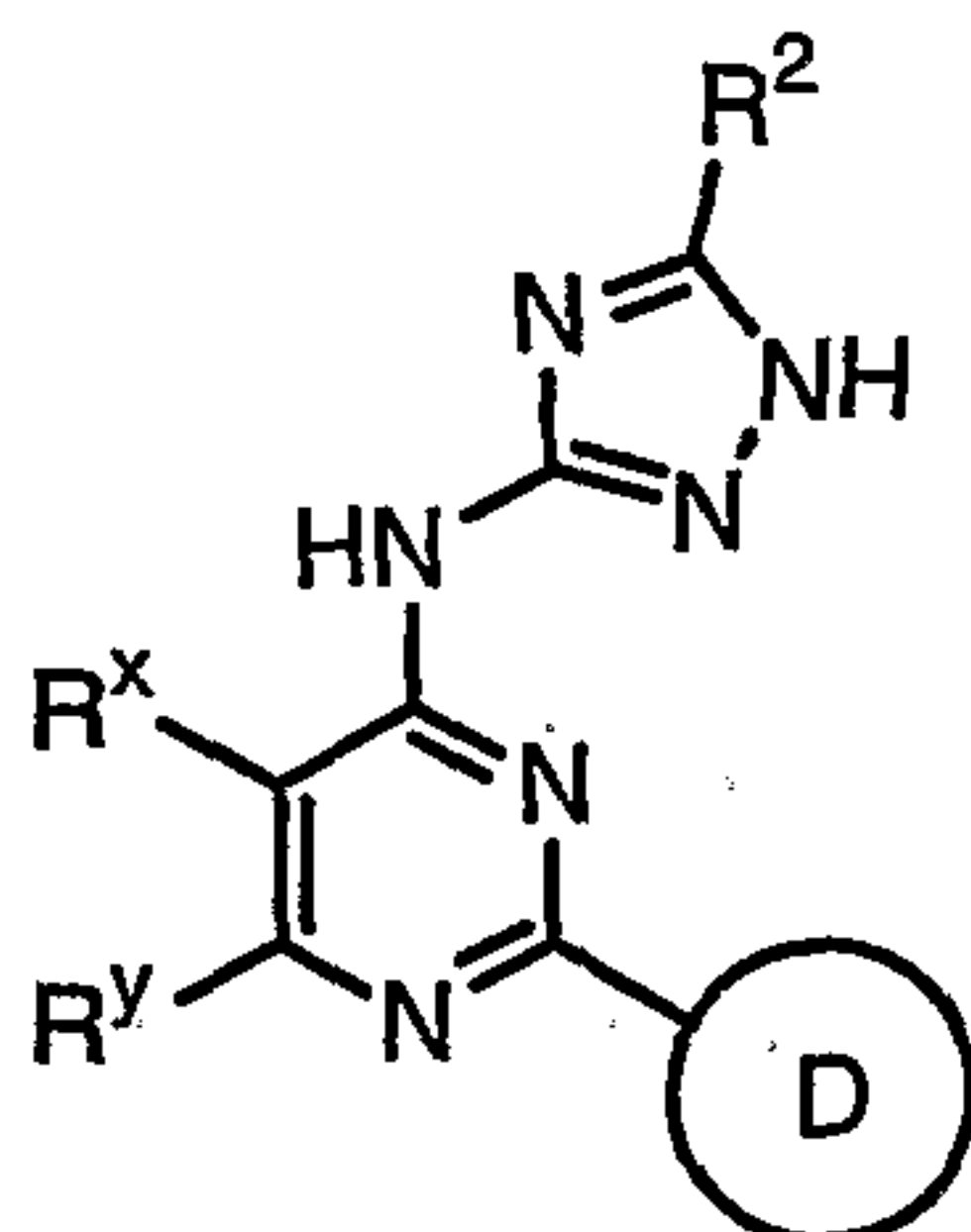
(b) R^x is hydrogen or methyl and R^y is methyl, methoxymethyl, ethyl, cyclopropyl, isopropyl, t-butyl, alkyl- or an optionally substituted group selected from 2-pyridyl, 4-pyridyl, piperidinyl, or phenyl, or R^x and R^y are taken together with their intervening atoms to form an optionally substituted benzo ring or a 6-membered carbocyclo ring;

(c) R^1 is -halo, a C_{1-4} aliphatic group optionally substituted with halogen, or -CN;

(d) R^2 is hydrogen or a C_{1-6} aliphatic group; and

(e) each R^5 is independently selected from -Cl, -F, -CN, -CF₃, -NH₂, -NH(C_{1-4} aliphatic), -N(C_{1-4} aliphatic)₂, -O(C_{1-4} aliphatic), C_{1-4} aliphatic, and -CO₂(C_{1-4} aliphatic).

Another embodiment of this invention relates to compounds of formula **XI**:



XI

20

or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by oxo or -R⁵, and at any substitutable ring nitrogen by -R⁴,

25

provided that when Ring D is a six-membered aryl or heteroaryl ring, $-R^5$ is hydrogen at each ortho carbon position of Ring D;

R^x and R^y are taken together with their intervening atoms to form a fused benzo ring or 5-8 membered carbocyclic ring, wherein any substitutable carbon on said fused ring formed by R^x and R^y is substituted by oxo or $T-R^3$;

T is a valence bond or a C_{1-4} alkylidene chain;

R^2 is $-R$ or $-T-W-R^6$;

- 5 R^3 is selected from $-R$, $-\text{halo}$, $=O$, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-COCH_2COR$, $-NO_2$, $-CN$, $-S(O)R$, $-S(O)_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$,
10 $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

- each R^4 is independently selected from $-R^7$, $-COR^7$, $-CO_2$ (optionally substituted C_{1-6} aliphatic), $-CON(R^7)_2$, or $-SO_2R^7$, or two R^4 on the same nitrogen are taken together to form a 5-8 membered heterocyclyl or
15 heteroaryl ring;

- each R^5 is independently selected from $-R$, halo , $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic),
20 $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$;

V is $-O-$, $-S-$, $-SO-$, $-SO_2-$, $-N(R^6)SO_2-$, $-SO_2N(R^6)-$, $-N(R^6)-$, $-CO-$, $-CO_2-$, $-N(R^6)CO-$, $-N(R^6)C(O)O-$, $-N(R^6)CON(R^6)-$, $-N(R^6)SO_2N(R^6)-$, $-N(R^6)N(R^6)-$,

$-C(O)N(R^6)-$, $-OC(O)N(R^6)-$, $-C(R^6)_2O-$, $-C(R^6)_2S-$,
 $-C(R^6)_2SO-$, $-C(R^6)_2SO_2-$, $-C(R^6)_2SO_2N(R^6)-$, $-C(R^6)_2N(R^6)-$,
 $-C(R^6)_2N(R^6)C(O)-$, $-C(R^6)_2N(R^6)C(O)O-$, $-C(R^6)=NN(R^6)-$,
 $-C(R^6)=N-O-$, $-C(R^6)_2N(R^6)N(R^6)-$, $-C(R^6)_2N(R^6)SO_2N(R^6)-$, or
5 $-C(R^6)_2N(R^6)CON(R^6)-$;

W is $-C(R^6)_2O-$, $-C(R^6)_2S-$, $-C(R^6)_2SO-$, $-C(R^6)_2SO_2-$,
 $-C(R^6)_2SO_2N(R^6)-$, $-C(R^6)_2N(R^6)-$, $-CO-$, $-CO_2-$,
 $-C(R^6)OC(O)-$, $-C(R^6)OC(O)N(R^6)-$, $-C(R^6)_2N(R^6)CO-$,
 $-C(R^6)_2N(R^6)C(O)O-$, $-C(R^6)=NN(R^6)-$, $-C(R^6)=N-O-$,
10 $-C(R^6)_2N(R^6)N(R^6)-$, $-C(R^6)_2N(R^6)SO_2N(R^6)-$,
 $-C(R^6)_2N(R^6)CON(R^6)-$, or $-CON(R^6)-$;

each R^6 is independently selected from hydrogen or an
optionally substituted C_{1-4} aliphatic group, or two R^6
groups on the same nitrogen atom are taken together
15 with the nitrogen atom to form a 5-6 membered
heterocyclyl or heteroaryl ring; and

each R^7 is independently selected from hydrogen or an
optionally substituted C_{1-6} aliphatic group, or two R^7
on the same nitrogen are taken together with the
20 nitrogen to form a 5-8 membered heterocyclyl or
heteroaryl ring.

Compounds of formula **XI** are structurally
similar to compounds of formula **III** except for the
replacement of the pyrazole ring moiety by the triazole
25 ring moiety. Preferred R^2 , R^x , R^y , and Ring D groups of
formula **XI** are as described above for the formula **III**
compounds. Preferred formula **XI** compounds have one or
more, and more preferably all, of the features selected
from the group consisting of:

30 (a) Ring D is an optionally substituted ring
selected from a phenyl, pyridinyl, piperidinyl,
piperazinyl, pyrrolidinyl, thienyl, azepanyl,
morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-
tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-

dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl ring;

(b) R^x and R^y are taken together with their intervening atoms to form an optionally substituted benzo ring or 5-7 membered carbocyclo ring; and

(c) R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C_{1-6} aliphatic group.

More preferred compounds of formula XI have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl;

(b) R^x and R^y are taken together with their intervening atoms to form a benzo ring or 5-7 membered carbocyclo ring, wherein said ring formed by R^x and R^y is optionally substituted with -R, oxo, halo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C_{1-6} aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂;

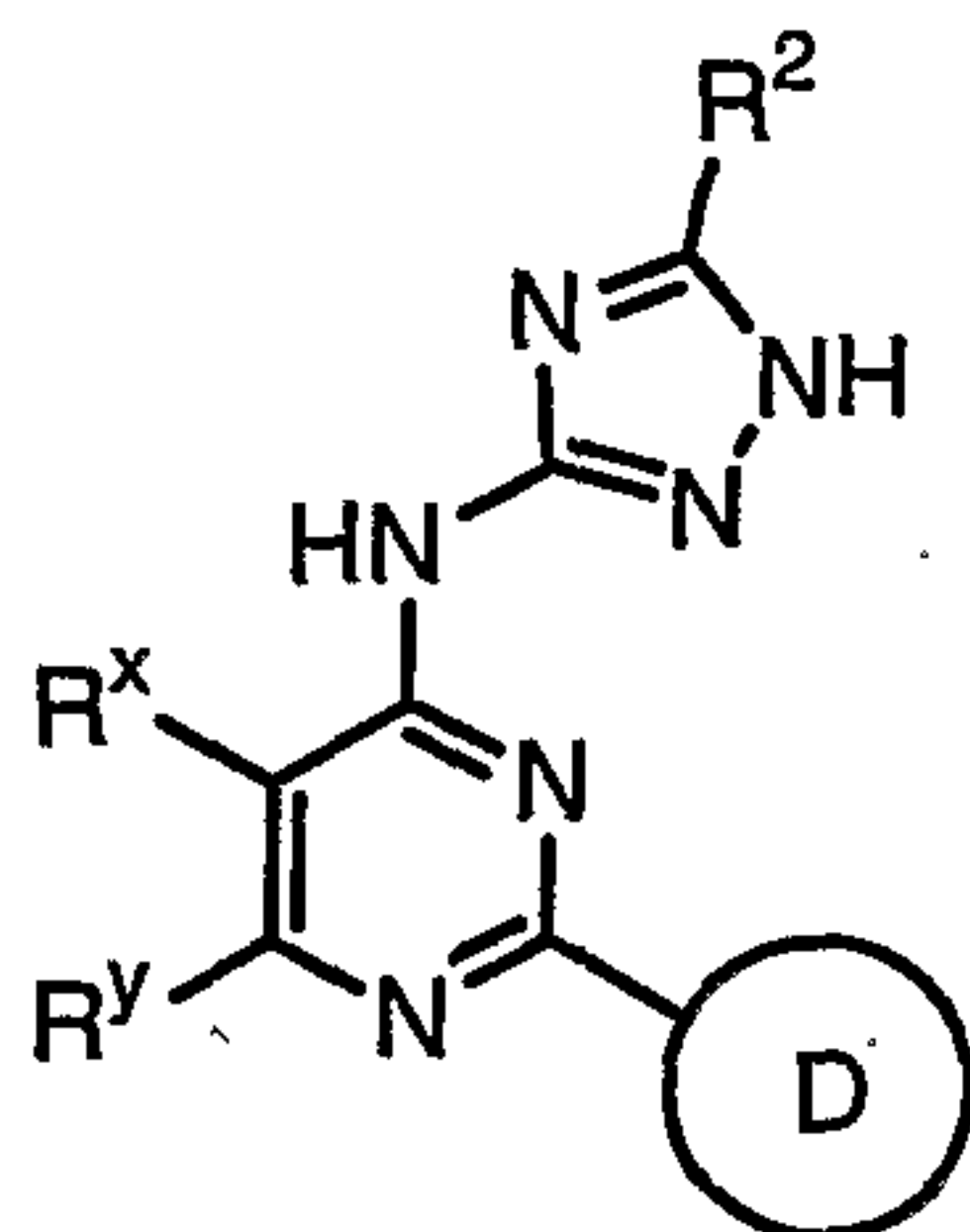
(c) R^2 is hydrogen or a substituted or unsubstituted group selected from aryl or a C_{1-6} aliphatic group; and

(d) each R^5 is independently selected from halo, oxo, CN, NO₂, -N(R⁴)₂, -CO₂R, -CONH(R⁴), -N(R⁴)COR, -SO₂N(R⁴)₂, -N(R⁴)SO₂R, -SR, -OR, -C(O)R, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C_{6-10} aryl, or C_{1-6} aliphatic.

Even more preferred compounds of formula **XI** have one or more, and more preferably all, of the features selected from the group consisting of:

- (a) R^x and R^y are taken together with their
 5 intervening atoms to form a benzo ring or 6-membered carbocyclo ring, wherein said ring formed by R^x and R^y is optionally substituted with halo, CN, oxo, C_{1-6} alkyl, C_{1-6} alkoxy, (C_{1-6} alkyl)carbonyl, (C_{1-6} alkyl)sulfonyl, mono- or dialkylamino, mono- or dialkylaminocarbonyl, mono- or
 10 dialkylaminocarbonyloxy, or 5-6 membered heteroaryl;
 (b) each R^5 is independently selected from -halo, -CN, -oxo, -SR, -OR, $-N(R^4)_2$, $-C(O)R$, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C_{6-10} aryl, or C_{1-6} aliphatic; and
 15 (c) R^2 is hydrogen or a C_{1-6} aliphatic group.

Another embodiment of this invention relates to compounds of formula **XII**:



XII

or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

- Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or
 25 heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or sulfur, wherein Ring D is substituted at any substitutable ring carbon by oxo or

$-R^5$, and at any substitutable ring nitrogen by $-R^4$, provided that when Ring D is a six-membered aryl or heteroaryl ring, $-R^5$ is hydrogen at each ortho carbon position of Ring D;

R^x and R^y are independently selected from $T-R^3$, or R^x and R^y are taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-8 membered ring having 1-3 ring heteroatoms selected from oxygen, sulfur, or nitrogen, wherein any substitutable carbon on said fused ring is optionally and independently substituted by $T-R^3$, and any substitutable nitrogen on said ring is substituted by R^4 ;

T is a valence bond or a C_{1-4} alkylidene chain;

5 R^2 is $-R$ or $-T-W-R^6$;

R^3 is selected from $-R$, $-\text{halo}$, $=O$, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-COCH_2COR$, $-NO_2$, $-CN$, $-S(O)R$, $-S(O)_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R^4 is independently selected from $-R^7$, $-COR^7$, $-CO_2$ (optionally substituted C_{1-6} aliphatic), $-CON(R^7)_2$, or $-SO_2R^7$, or two R^4 on the same nitrogen are taken together to form a 5-8 membered heterocyclyl or
10 heteroaryl ring;

each R^5 is independently selected from $-R$, halo , $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$,

-N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic),
 -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂,
 -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂;

V is -O-, -S-, -SO-, -SO₂-, -N(R⁶)SO₂-, -SO₂N(R⁶)-,
 5 -N(R⁶)-, -CO-, -CO₂-, -N(R⁶)CO-, -N(R⁶)C(O)O-,
 -N(R⁶)CON(R⁶)-, -N(R⁶)SO₂N(R⁶)-, -N(R⁶)N(R⁶)-,
 -C(O)N(R⁶)-, -OC(O)N(R⁶)-, -C(R⁶)₂O-, -C(R⁶)₂S-,
 -C(R⁶)₂SO-, -C(R⁶)₂SO₂-, -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-,
 -C(R⁶)₂N(R⁶)C(O)-, -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-,
 10 -C(R⁶)=N-O-, -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-, or
 -C(R⁶)₂N(R⁶)CON(R⁶)-;

W is -C(R⁶)₂O-, -C(R⁶)₂S-, -C(R⁶)₂SO-, -C(R⁶)₂SO₂-,
 -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-, -CO-, -CO₂-,
 -C(R⁶)OC(O)-, -C(R⁶)OC(O)N(R⁶)-, -C(R⁶)₂N(R⁶)CO-,
 15 -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-, -C(R⁶)=N-O-,
 -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-,
 -C(R⁶)₂N(R⁶)CON(R⁶)-, or -CON(R⁶)-;

each R⁶ is independently selected from hydrogen or an
 optionally substituted C₁₋₄ aliphatic group, or two R⁶
 20 groups on the same nitrogen atom are taken together
 with the nitrogen atom to form a 5-6 membered
 heterocyclyl or heteroaryl ring; and

each R⁷ is independently selected from hydrogen or an
 optionally substituted C₁₋₆ aliphatic group, or two R⁷
 25 on the same nitrogen are taken together with the
 nitrogen to form a 5-8 membered heterocyclyl ring or
 heteroaryl.

Compounds of formula XII are structurally
 similar to compounds of formula IV except for the
 30 replacement of the pyrazole ring moiety by the triazole
 ring moiety. Preferred R², R^x, R^y, and Ring D groups of
 formula XII are as described above for the formula IV
 compounds. Preferred formula XII compounds have one or

more, and more preferably all, of the features selected from the group consisting of:

(a) Ring D is an optionally substituted ring selected from a phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl ring;

(b) R^x is hydrogen or C_{1-4} aliphatic and R^y is T- R^3 , or R^x and R^y are taken together with their intervening atoms to form an optionally substituted 5-7 membered unsaturated or partially unsaturated ring having 1-2 ring heteroatoms; and

(c) R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C_{1-6} aliphatic group.

More preferred compounds of formula XII have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl;

(b) R^x is hydrogen or methyl and R^y is -R, $N(R^4)_2$, or -OR, or R^x and R^y are taken together with their intervening atoms to form a 5-7 membered unsaturated or partially unsaturated ring having 1-2 ring nitrogens, wherein said ring is optionally substituted with -R, halo, oxo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C_{1-6} aliphatic),

$-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$,
 $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^4)_2$;

(c) R^2 is hydrogen or a substituted or unsubstituted group selected from aryl or a C_{1-6} aliphatic
5 group; and

(d) each R^5 is independently selected from halo, oxo, CN, NO_2 , $-N(R^4)_2$, $-CO_2R$, $-CONH(R^4)$, $-N(R^4)COR$,
 $-SO_2N(R^4)_2$, $-N(R^4)SO_2R$, $-SR$, $-OR$, $-C(O)R$, or a substituted
or unsubstituted group selected from 5-6 membered
10 heterocyclyl, C_{6-10} aryl, or C_{1-6} aliphatic.

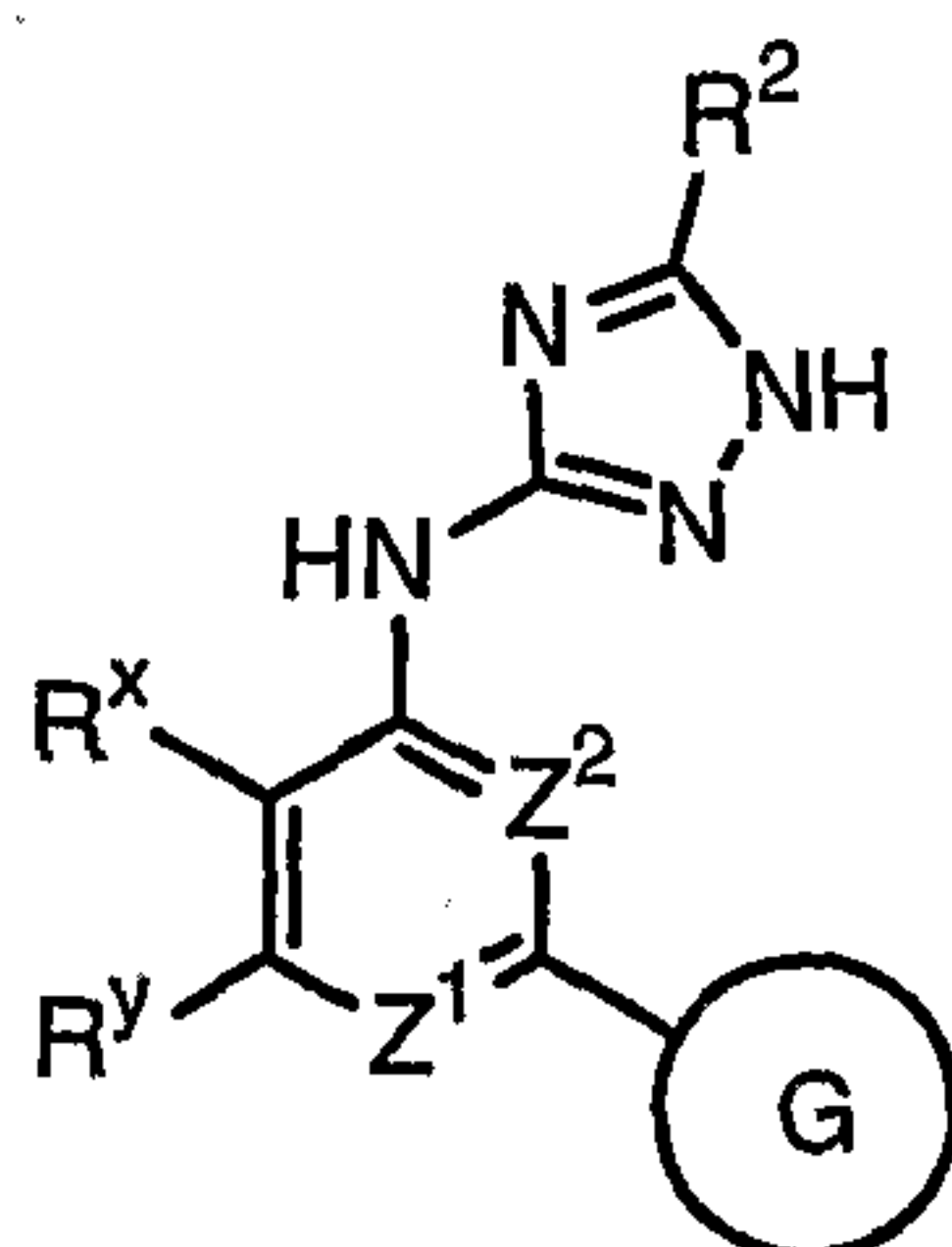
Even more preferred compounds of formula XII have one or more, and more preferably all, of the features selected from the group consisting of:

(a) R^x and R^y are taken together with their
15 intervening atoms to form a 6-membered unsaturated or partially unsaturated ring having 1-2 ring nitrogens, optionally substituted with halo, CN, oxo, C_{1-6} alkyl, C_{1-6} alkoxy, (C_{1-6} alkyl)carbonyl, (C_{1-6} alkyl)sulfonyl, mono- or dialkylamino, mono- or dialkylaminocarbonyl, mono- or
20 dialkylaminocarbonyloxy, or 5-6 membered heteroaryl;

(b) each R^5 is independently selected from -halo, -CN, -oxo, -SR, -OR, $-N(R^4)_2$, $-C(O)R$, or a substituted or unsubstituted group selected from 5-6 membered heterocyclyl, C_{6-10} aryl, or C_{1-6} aliphatic; and

25 (c) R^2 is hydrogen or a C_{1-6} aliphatic group.

Another embodiment of this invention relates to compounds of formula XIII:



XIII

or a pharmaceutically acceptable derivative or prodrug thereof, wherein:

Z^1 is nitrogen, CR^a , or CH, and Z^2 is nitrogen or CH; provided that one of Z^1 and Z^2 is nitrogen;

G is Ring C or Ring D;

Ring C is selected from a phenyl, pyridinyl, pyrimidinyl,

5 pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring,

wherein said Ring C has one or two ortho substituents

independently selected from $-R^1$, any substitutable non-

ortho carbon position on Ring C is independently

substituted by $-R^5$, and two adjacent substituents on

10 Ring C are optionally taken together with their

intervening atoms to form a fused, unsaturated or

partially unsaturated, 5-6 membered ring having 0-3

heteroatoms selected from oxygen, sulfur or nitrogen,

said fused ring being optionally substituted by halo,

15 oxo, or $-R^8$;

Ring D is a 5-7 membered monocyclic ring or 8-10 membered

bicyclic ring selected from aryl, heteroaryl,

heterocyclyl or carbocyclyl, said heteroaryl or

heterocyclyl ring having 1-4 ring heteroatoms selected

20 from nitrogen, oxygen or sulfur, wherein Ring D is

substituted at any substitutable ring carbon by oxo or

$-R^5$, and at any substitutable ring nitrogen by $-R^4$,

provided that when Ring D is a six-membered aryl or

heteroaryl ring, $-R^5$ is hydrogen at each ortho carbon position of Ring D;

R^1 is selected from -halo, -CN, $-NO_2$, T-V- R^6 , phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C_{1-6} aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or $-R^8$, said C_{1-6} aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R^1 and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^x and R^y are independently selected from T- R^3 , or R^x and R^y are taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-8 membered ring having 0-3 ring heteroatoms selected from oxygen, sulfur, or nitrogen, wherein any substitutable carbon on said fused ring formed by R^x and R^y is substituted by oxo or T- R^3 , and any substitutable nitrogen on said ring formed by R^x and R^y is substituted by R^4 ;

T is a valence bond or a C_{1-4} alkylidene chain;

R^2 is -R or -T-W- R^6 ;

R^3 is selected from -R, -halo, -OR, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-COCH_2COR$, $-NO_2$, -CN, $-S(O)R$, $-S(O)_2R$, -SR, $-N(R^4)_2$, $-CON(R^7)_2$, $-SO_2N(R^7)_2$, $-OC(=O)R$, $-N(R^7)COR$, $-N(R^7)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^7)CON(R^7)_2$, $-N(R^7)SO_2N(R^7)_2$, $-N(R^4)SO_2R$, or $-OC(=O)N(R^7)_2$;

each R is independently selected from hydrogen or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R^4 is independently selected from $-R^7$, $-\text{COR}^7$,
 $-\text{CO}_2$ (optionally substituted C_{1-6} aliphatic), $-\text{CON}(R^7)_2$,
 or $-\text{SO}_2R^7$, or two R^4 on the same nitrogen are taken
 together to form a 5-8 membered heterocyclyl or
 5 heteroaryl ring;

each R^5 is independently selected from $-R$, halo, $-\text{OR}$,
 $-\text{C}(=\text{O})R$, $-\text{CO}_2R$, $-\text{COCOR}$, $-\text{NO}_2$, $-\text{CN}$, $-\text{S}(\text{O})R$, $-\text{SO}_2R$, $-\text{SR}$,
 $-\text{N}(R^4)_2$, $-\text{CON}(R^4)_2$, $-\text{SO}_2\text{N}(R^4)_2$, $-\text{OC}(=\text{O})R$, $-\text{N}(R^4)\text{COR}$,
 $-\text{N}(R^4)\text{CO}_2$ (optionally substituted C_{1-6} aliphatic),
 10 $-\text{N}(R^4)\text{N}(R^4)_2$, $-\text{C}=\text{NN}(R^4)_2$, $-\text{C}=\text{N}-\text{OR}$, $-\text{N}(R^4)\text{CON}(R^4)_2$,
 $-\text{N}(R^4)\text{SO}_2\text{N}(R^4)_2$, $-\text{N}(R^4)\text{SO}_2R$, or $-\text{OC}(=\text{O})\text{N}(R^4)_2$, or R^5 and
 an adjacent substituent taken together with their
 intervening atoms form said ring fused to Ring C;
 V is $-\text{O}-$, $-\text{S}-$, $-\text{SO}-$, $-\text{SO}_2-$, $-\text{N}(R^6)\text{SO}_2-$, $-\text{SO}_2\text{N}(R^6)-$,
 15 $-\text{N}(R^6)-$, $-\text{CO}-$, $-\text{CO}_2-$, $-\text{N}(R^6)\text{CO}-$, $-\text{N}(R^6)\text{C}(\text{O})\text{O}-$,
 $-\text{N}(R^6)\text{CON}(R^6)-$, $-\text{N}(R^6)\text{SO}_2\text{N}(R^6)-$, $-\text{N}(R^6)\text{N}(R^6)-$,
 $-\text{C}(\text{O})\text{N}(R^6)-$, $-\text{OC}(\text{O})\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{O}-$, $-\text{C}(R^6)_2\text{S}-$,
 $-\text{C}(R^6)_2\text{SO}-$, $-\text{C}(R^6)_2\text{SO}_2-$, $-\text{C}(R^6)_2\text{SO}_2\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)-$,
 $-\text{C}(R^6)_2\text{N}(R^6)\text{C}(\text{O})-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(R^6)=\text{NN}(R^6)-$,
 20 $-\text{C}(R^6)=\text{N}-\text{O}-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{SO}_2\text{N}(R^6)-$, or
 $-\text{C}(R^6)_2\text{N}(R^6)\text{CON}(R^6)-$;

W is $-\text{C}(R^6)_2\text{O}-$, $-\text{C}(R^6)_2\text{S}-$, $-\text{C}(R^6)_2\text{SO}-$, $-\text{C}(R^6)_2\text{SO}_2-$,
 $-\text{C}(R^6)_2\text{SO}_2\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)-$, $-\text{CO}-$, $-\text{CO}_2-$,
 $-\text{C}(R^6)\text{OC}(\text{O})-$, $-\text{C}(R^6)\text{OC}(\text{O})\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{CO}-$,
 25 $-\text{C}(R^6)_2\text{N}(R^6)\text{C}(\text{O})\text{O}-$, $-\text{C}(R^6)=\text{NN}(R^6)-$, $-\text{C}(R^6)=\text{N}-\text{O}-$,
 $-\text{C}(R^6)_2\text{N}(R^6)\text{N}(R^6)-$, $-\text{C}(R^6)_2\text{N}(R^6)\text{SO}_2\text{N}(R^6)-$,
 $-\text{C}(R^6)_2\text{N}(R^6)\text{CON}(R^6)-$, or $-\text{CON}(R^6)-$;

each R^6 is independently selected from hydrogen, an
 optionally substituted C_{1-4} aliphatic group, or two R^6
 30 groups on the same nitrogen atom are taken together
 with the nitrogen atom to form a 5-6 membered
 heterocyclyl or heteroaryl ring;

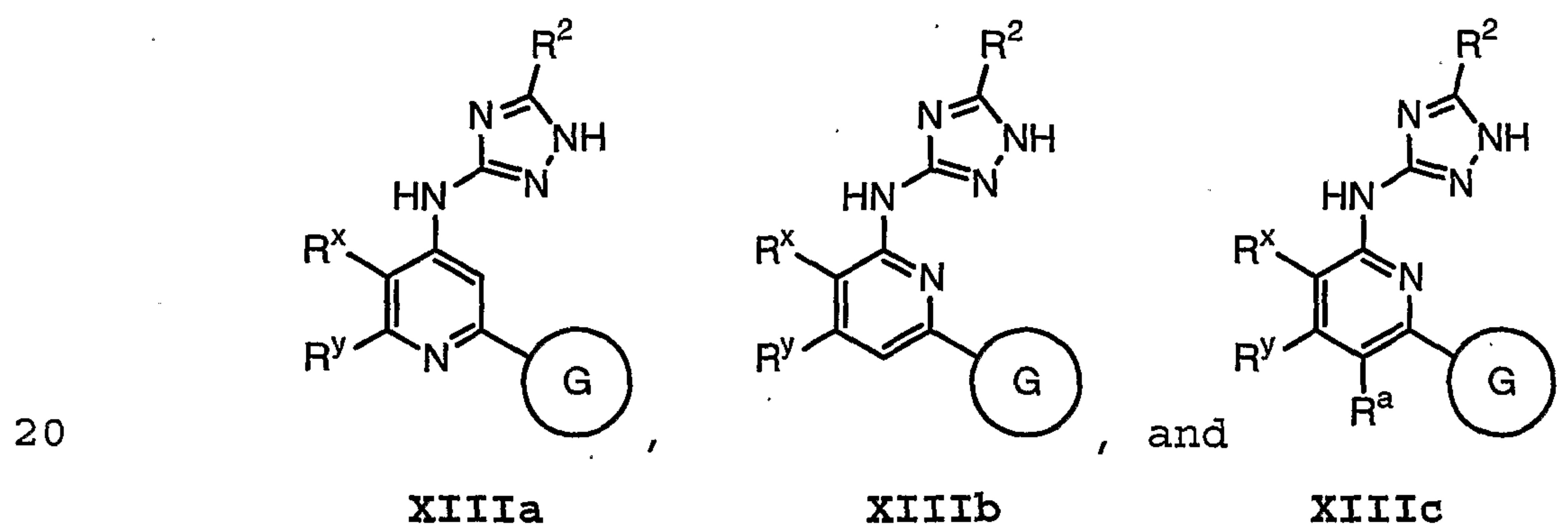
each R^7 is independently selected from hydrogen or an
 optionally substituted C_{1-6} aliphatic group, or two R^7

on the same nitrogen are taken together with the nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring;

each R^8 is independently selected from an optionally substituted C_{1-4} aliphatic group, $-OR^6$, $-SR^6$, $-COR^6$, $-SO_2R^6$, $-N(R^6)_2$, $-N(R^6)N(R^6)_2$, $-CN$, $-NO_2$, $-CON(R^6)_2$, or $-CO_2R^6$; and

R^a is selected from halo, $-OR$, $-C(=O)R$, $-CO_2R$, $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$, $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$, $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, $-OC(=O)N(R^4)_2$, or an optionally substituted group selected from C_{1-6} aliphatic, C_{6-10} aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms.

Compounds of formula **XIII** may be represented by specifying Z^1 and Z^2 as shown below:



Compounds of formula **XIII** are structurally similar to compounds of formula **V** except for the replacement of the pyrazole ring moiety by the triazole ring moiety. Preferred R^2 , R^x , R^y , R^a , and Ring G groups of formula **XIII** are as described above for the formula **V** compounds. Preferred formula **XIII** compounds have one or

more, and more preferably all, of the features selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is selected from a naphthyl, quinolinyl or isoquinolinyl ring, and R^1 is -halo, an optionally substituted C_{1-6} aliphatic group, phenyl, $-COR^6$, $-OR^6$, $-CN$, $-SO_2R^6$, $-SO_2NH_2$, $-N(R^6)_2$, $-CO_2R^6$, $-CONH_2$, $-NHCOR^6$, $-OC(O)NH_2$, or $-NHSO_2R^6$; or Ring D is an optionally substituted ring selected from a phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1H-isoindolyl, 2,3-dihydro-1H-indolyl, isoquinolinyl, quinolinyl, or naphthyl ring;

(b) R^x is hydrogen or C_{1-4} aliphatic and R^y is $T-R^3$, or R^x and R^y are taken together with their intervening atoms to form an optionally substituted 5-7 membered unsaturated or partially unsaturated ring having 0-2 ring nitrogens; and

(c) R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C_{1-6} aliphatic group.

More preferred compounds of formula XIII have one or more, and more preferably all, of the features selected from the group consisting of:

(a) Ring C is a phenyl or pyridinyl ring, optionally substituted by $-R^5$, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R^1 is -halo, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic group, phenyl, or $-CN$; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl,

piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl,
 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-
 tetrahydroquinolinyl, 2,3-dihydro-1*H*-isoindolyl, 2,3-
 dihydro-1*H*-indolyl, isoquinolinyl, quinolinyl, or
 5 naphthyl;

(b) R^x is hydrogen or methyl and R^y is $-R$,
 $N(R^4)_2$, or $-OR$, or R^x and R^y are taken together with their
 intervening atoms to form a benzo ring or a 5-7 membered
 carbocyclo ring, wherein said ring formed by R^x and R^y is
 10 optionally substituted with $-R$, halo, $-OR$, $-C(=O)R$, $-CO_2R$,
 $-COCOR$, $-NO_2$, $-CN$, $-S(O)R$, $-SO_2R$, $-SR$, $-N(R^4)_2$, $-CON(R^4)_2$,
 $-SO_2N(R^4)_2$, $-OC(=O)R$, $-N(R^4)COR$, $-N(R^4)CO_2$ (optionally
 substituted C_{1-6} aliphatic), $-N(R^4)N(R^4)_2$, $-C=NN(R^4)_2$,
 $-C=N-OR$, $-N(R^4)CON(R^4)_2$, $-N(R^4)SO_2N(R^4)_2$, $-N(R^4)SO_2R$, or
 15 $-OC(=O)N(R^4)_2$;

(c) R^2 is hydrogen or a substituted or
 unsubstituted group selected from aryl, or a C_{1-6}
 aliphatic group; and

(d) each R^5 is independently selected from
 20 $-halo$, $-CN$, $-NO_2$, $-N(R^4)_2$, optionally substituted C_{1-6}
 aliphatic group, $-OR$, $-C(O)R$, $-CO_2R$, $-CONH(R^4)$, $-N(R^4)COR$,
 $-SO_2N(R^4)_2$, or $-N(R^4)SO_2R$, and, when Ring G is Ring D, Ring
 D is substituted by oxo or R^5 .

Even more preferred compounds of formula **XIII**
 25 have one or more, and more preferably all, of the
 features selected from the group consisting of:

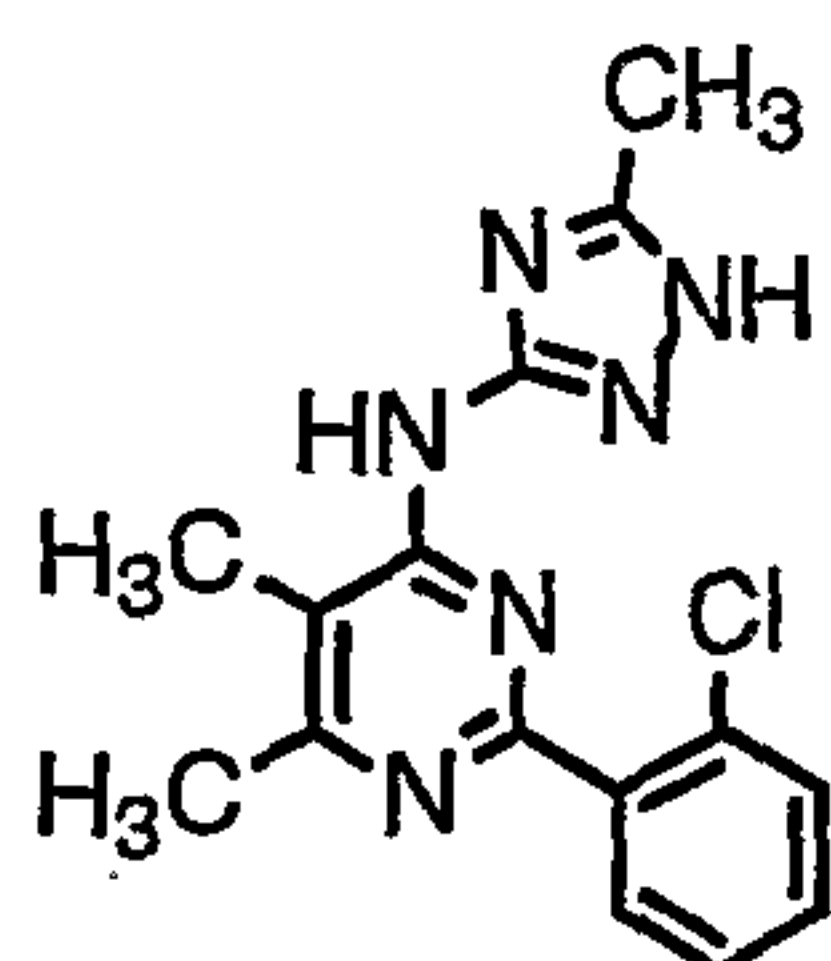
(a) R^x is hydrogen or methyl and R^y is methyl,
 methoxymethyl, ethyl, cyclopropyl, isopropyl, t-butyl,
 alkyl- or an optionally substituted group selected from
 30 2-pyridyl, 4-pyridyl, piperidinyl, or phenyl, or R^x and R^y
 are taken together with their intervening atoms to form a
 benzo ring or a 6-membered carbocyclo ring wherein said
 ring formed by R^x and R^y is optionally substituted with
 halo, CN, oxo, C_{1-6} alkyl, C_{1-6} alkoxy, (C_{1-6} alkyl)carbonyl,

(C₁₋₆ alkyl)sulfonyl, mono- or dialkylamino, mono- or dialkylaminocarbonyl, mono- or dialkylaminocarbonyloxy, or 5-6 membered heteroaryl;

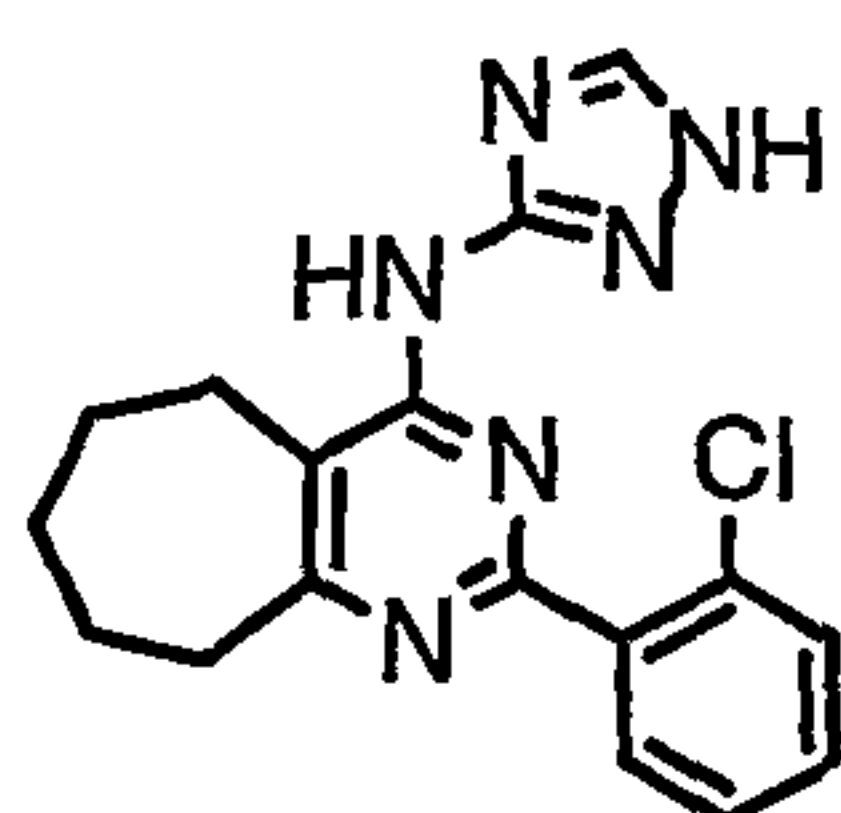
- (b) Ring C is a phenyl or pyridinyl ring, optionally substituted by -R⁵, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R¹ is -halo, a C₁₋₄ aliphatic group optionally substituted with halogen, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, isoquinolinyl, quinolinyl, or naphthyl;
- (c) R² is hydrogen or a C₁₋₆ aliphatic group; and
- (d) each R⁵ is independently selected from -Cl, -F, -CN, -CF₃, -NH₂, -NH(C₁₋₄ aliphatic), -N(C₁₋₄ aliphatic)₂, -O(C₁₋₄ aliphatic), C₁₋₄ aliphatic, and -CO₂(C₁₋₄ aliphatic), and when Ring G is Ring D, Ring D is substituted by oxo or R⁵.

Representative compounds of formula IX are shown below in Table 8.

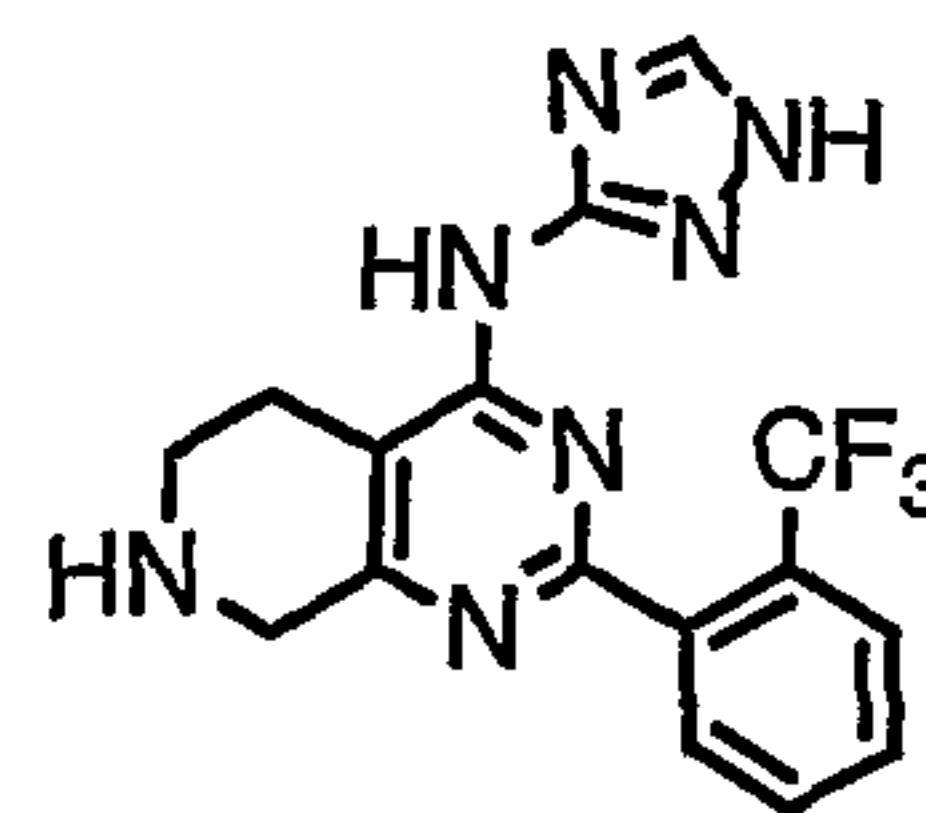
Table 8.



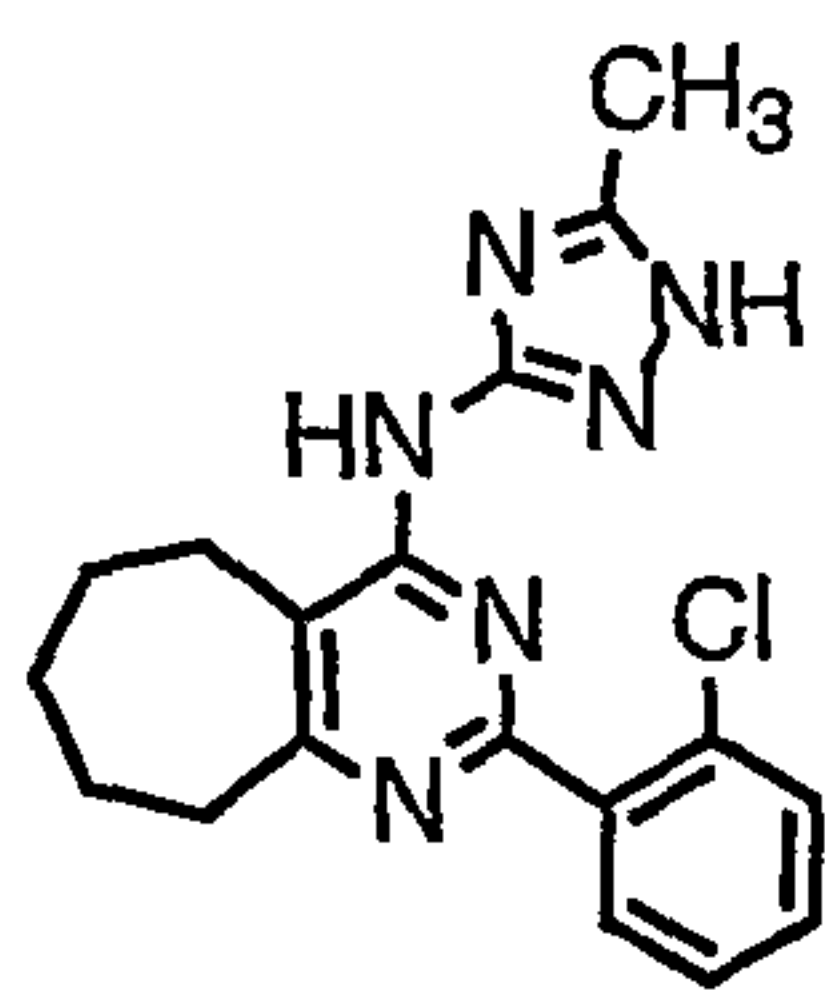
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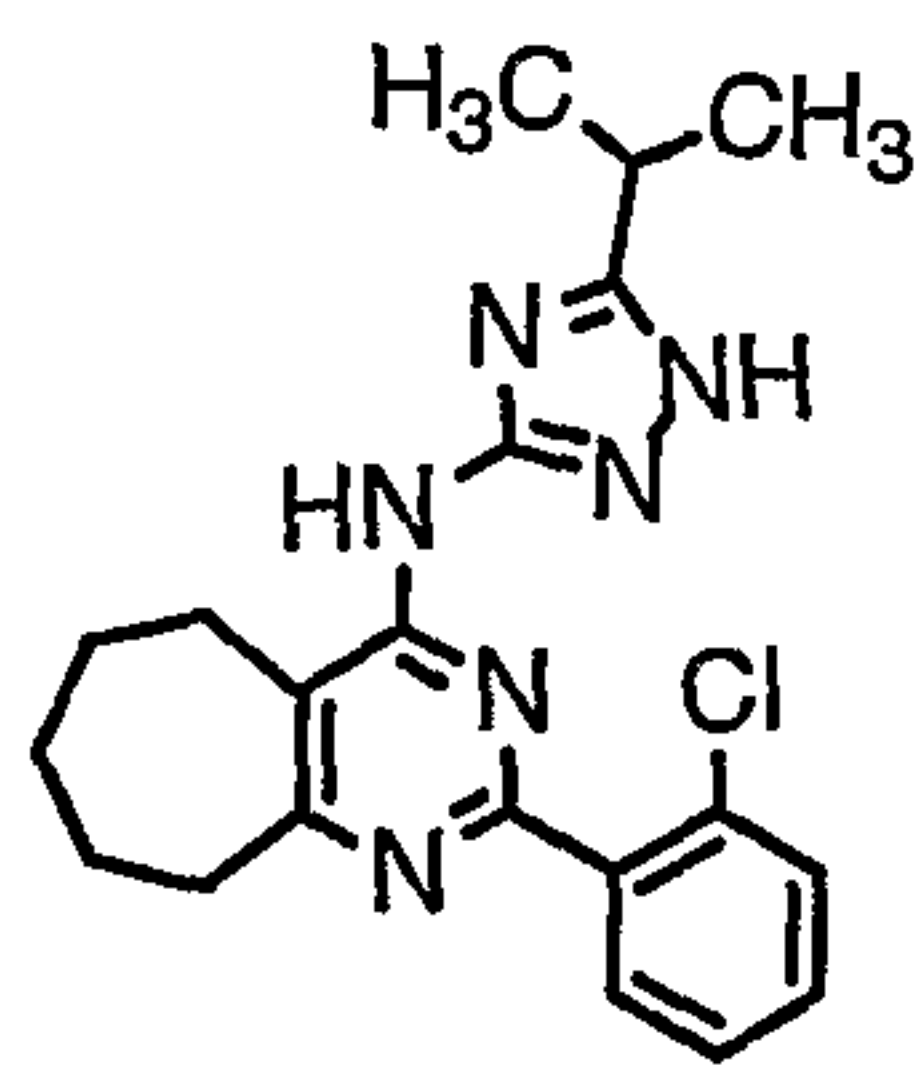
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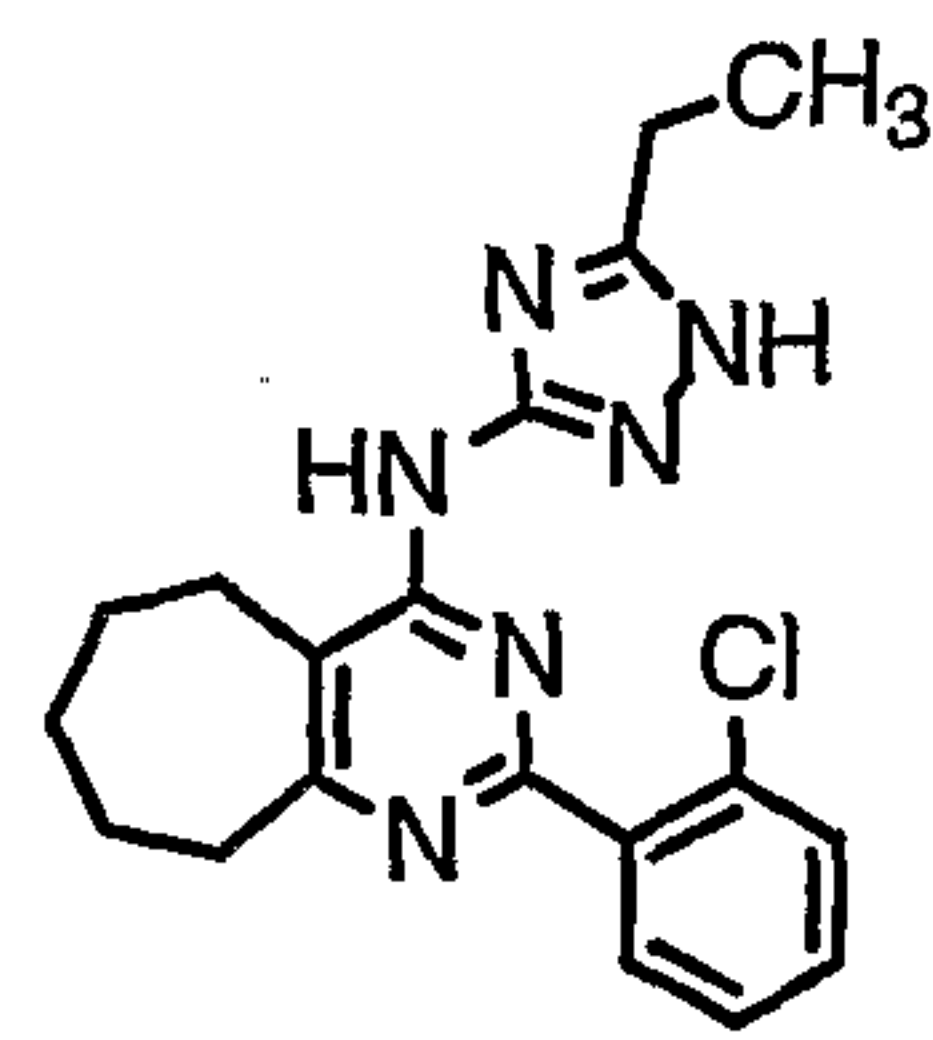
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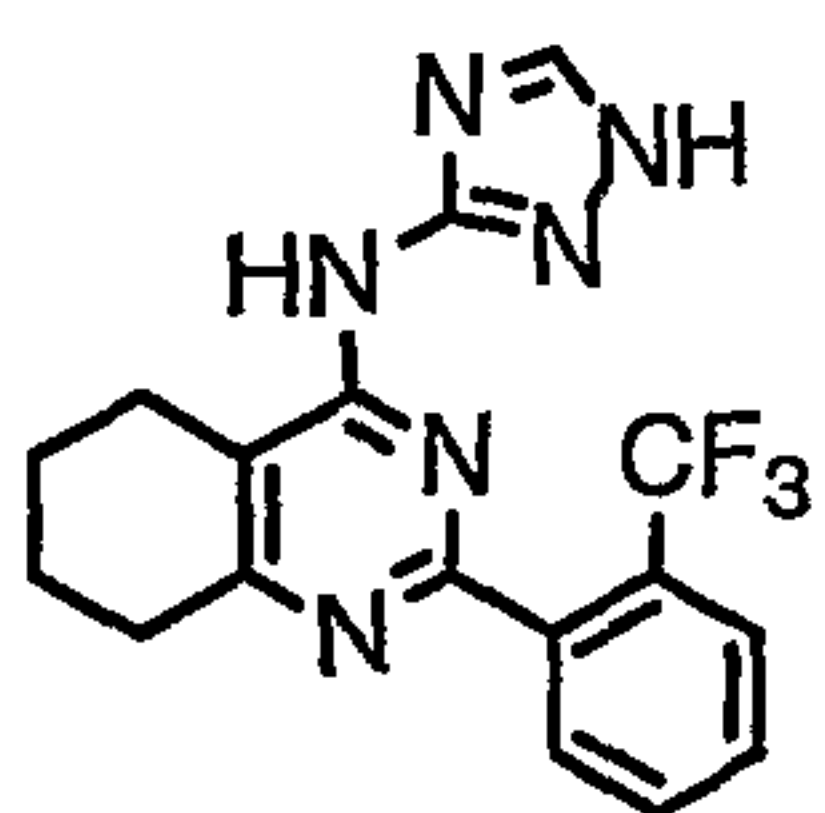
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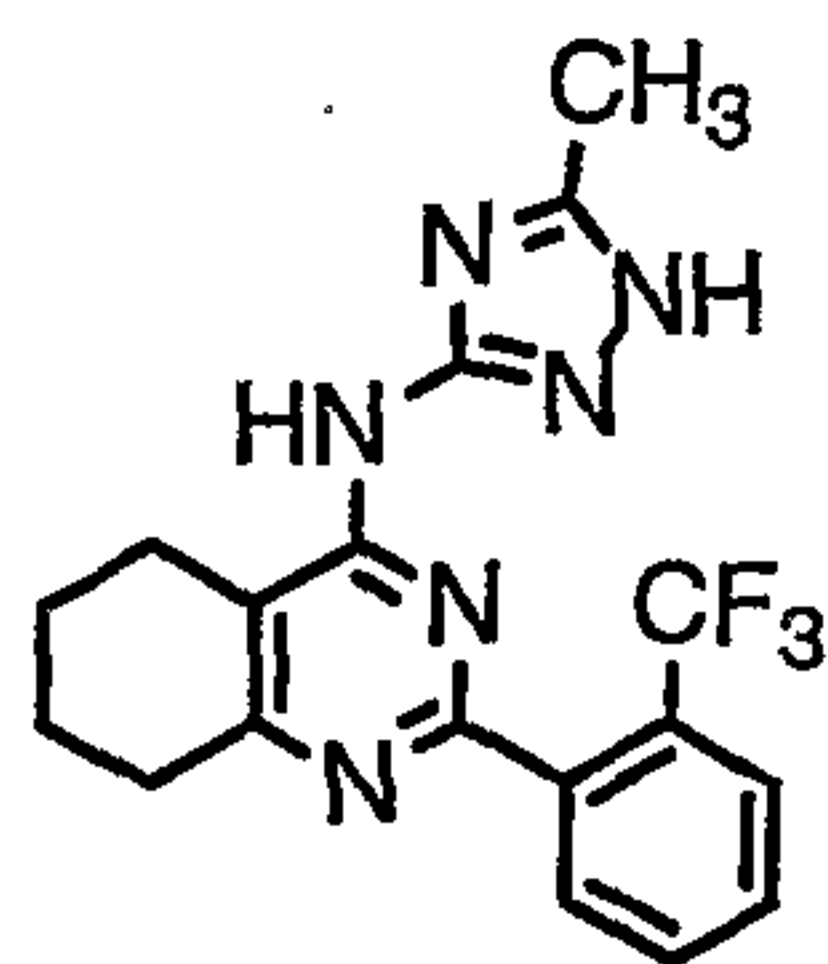
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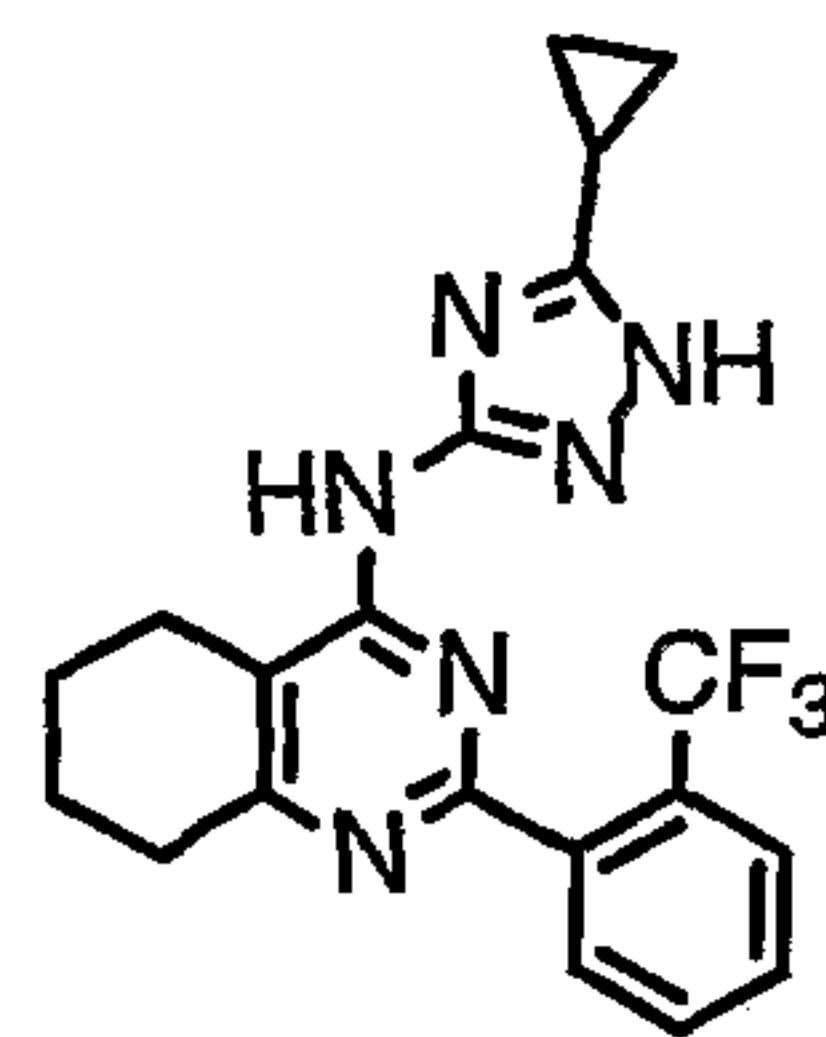
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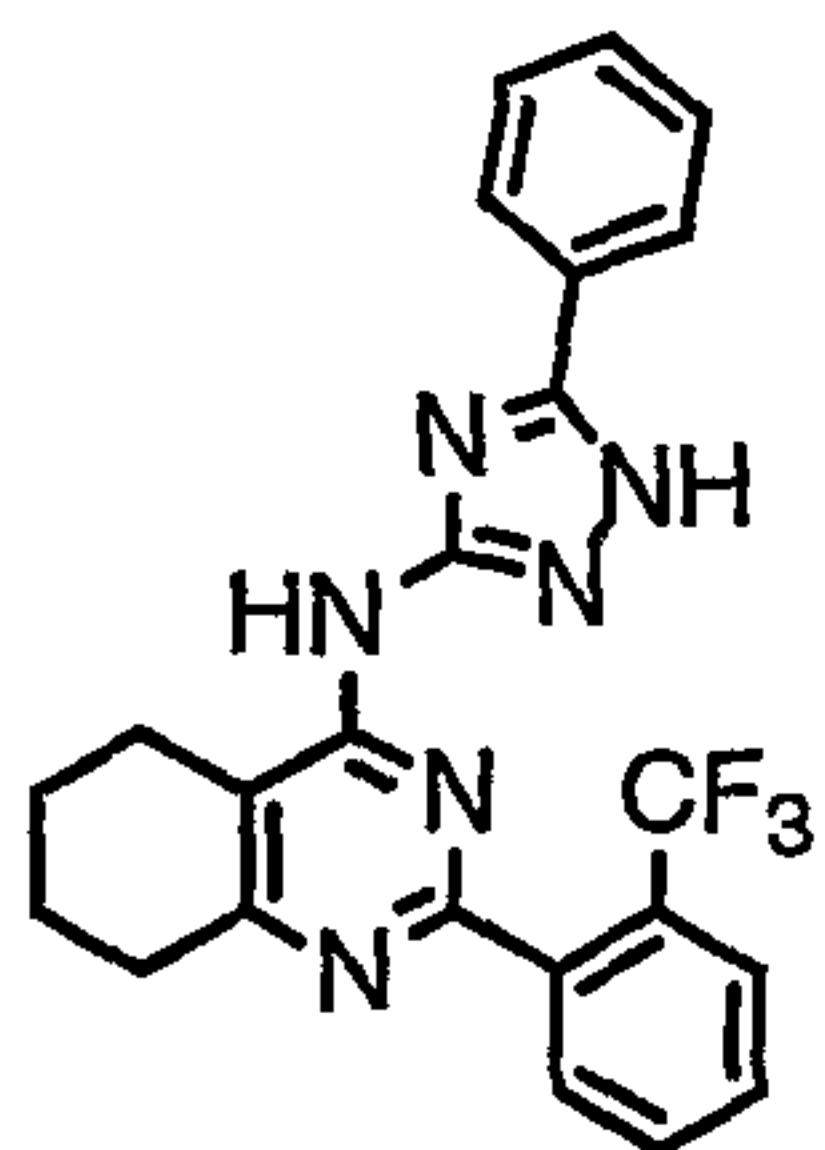
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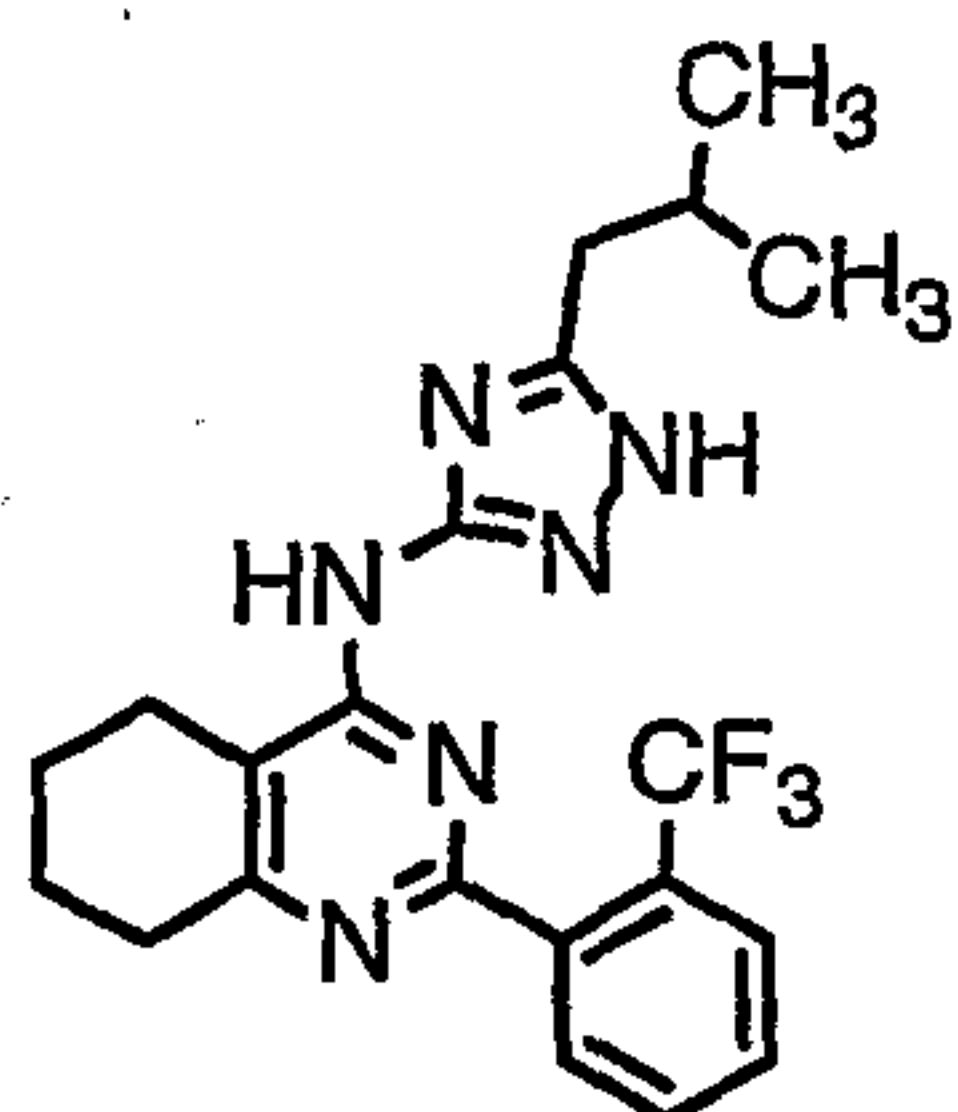
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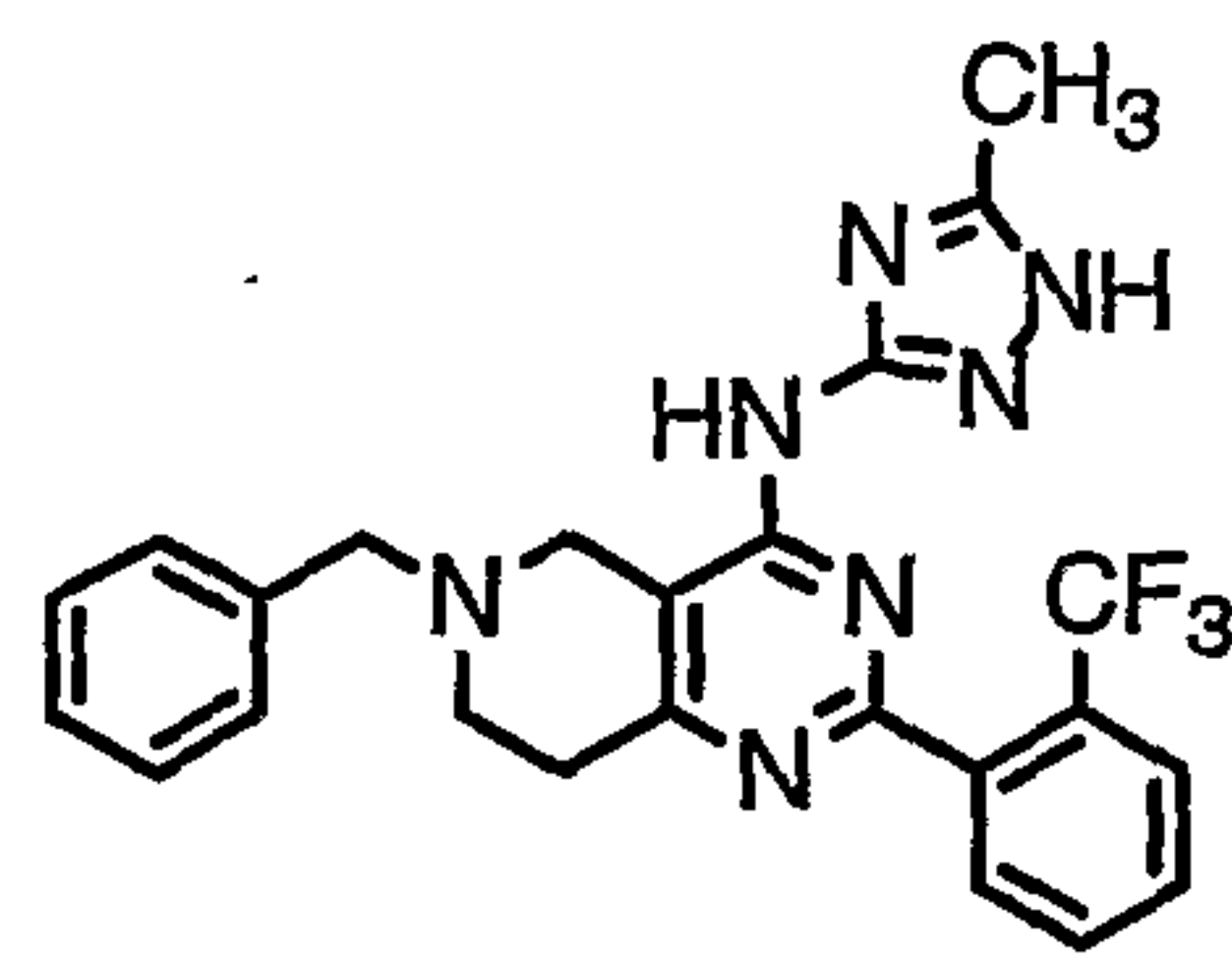
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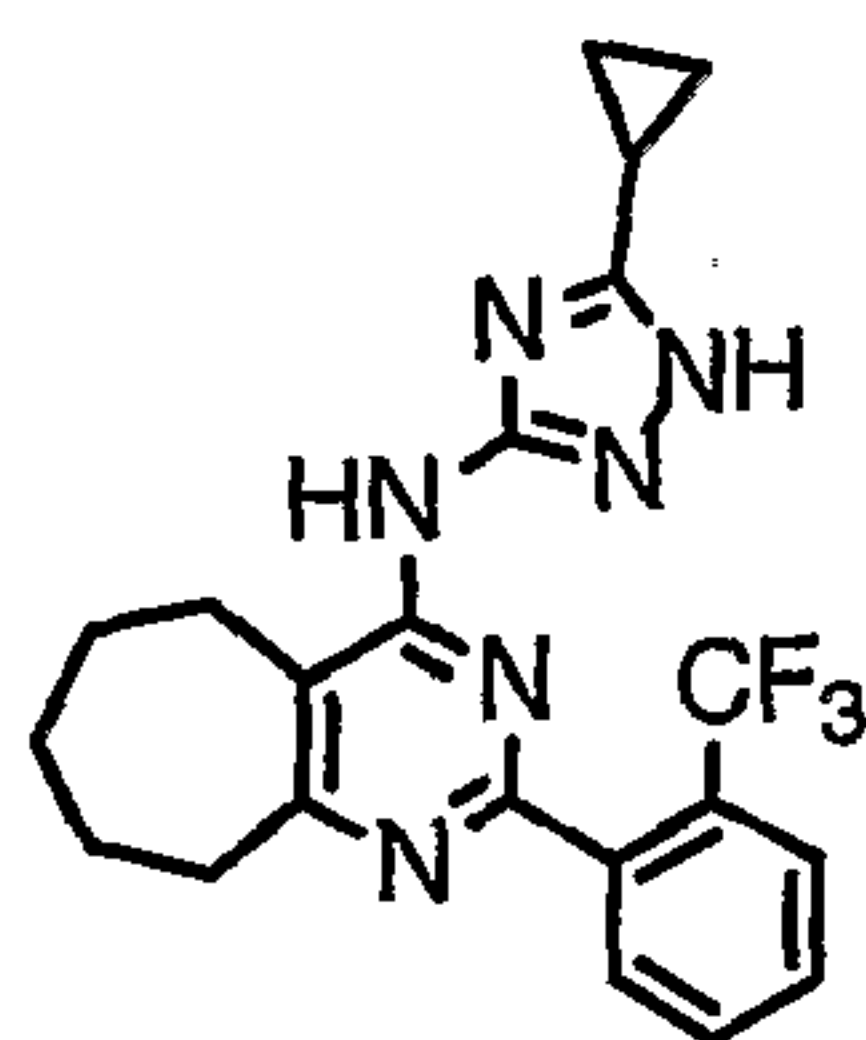
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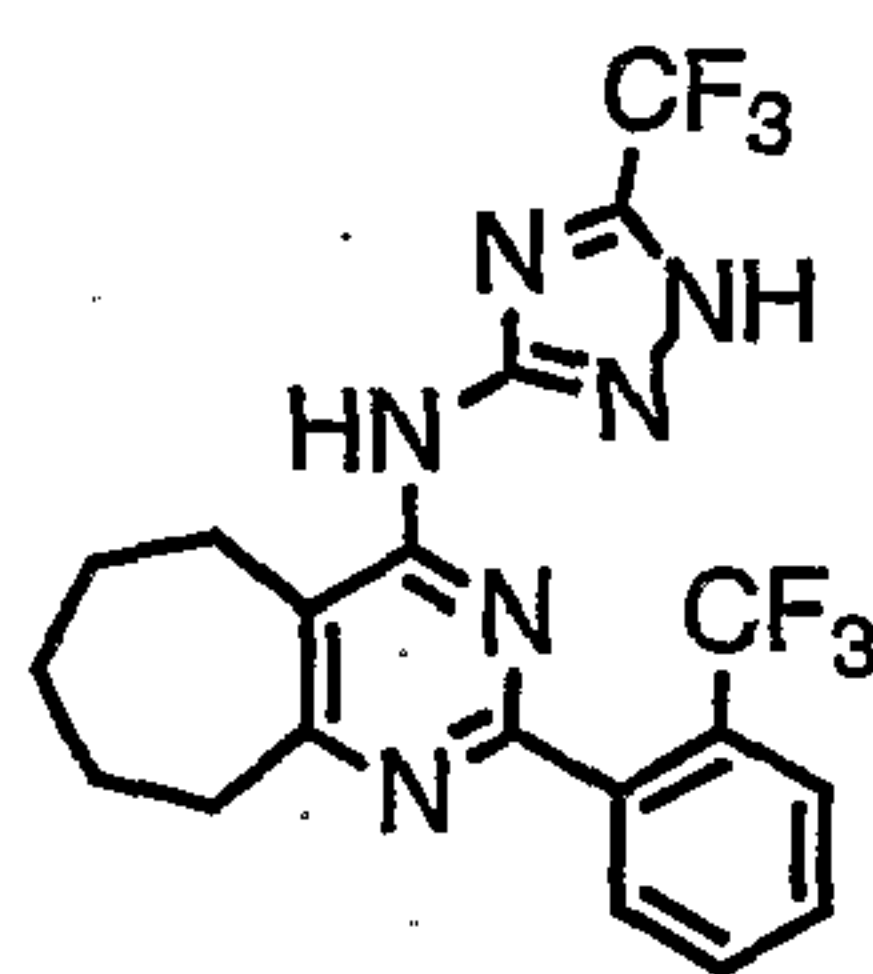
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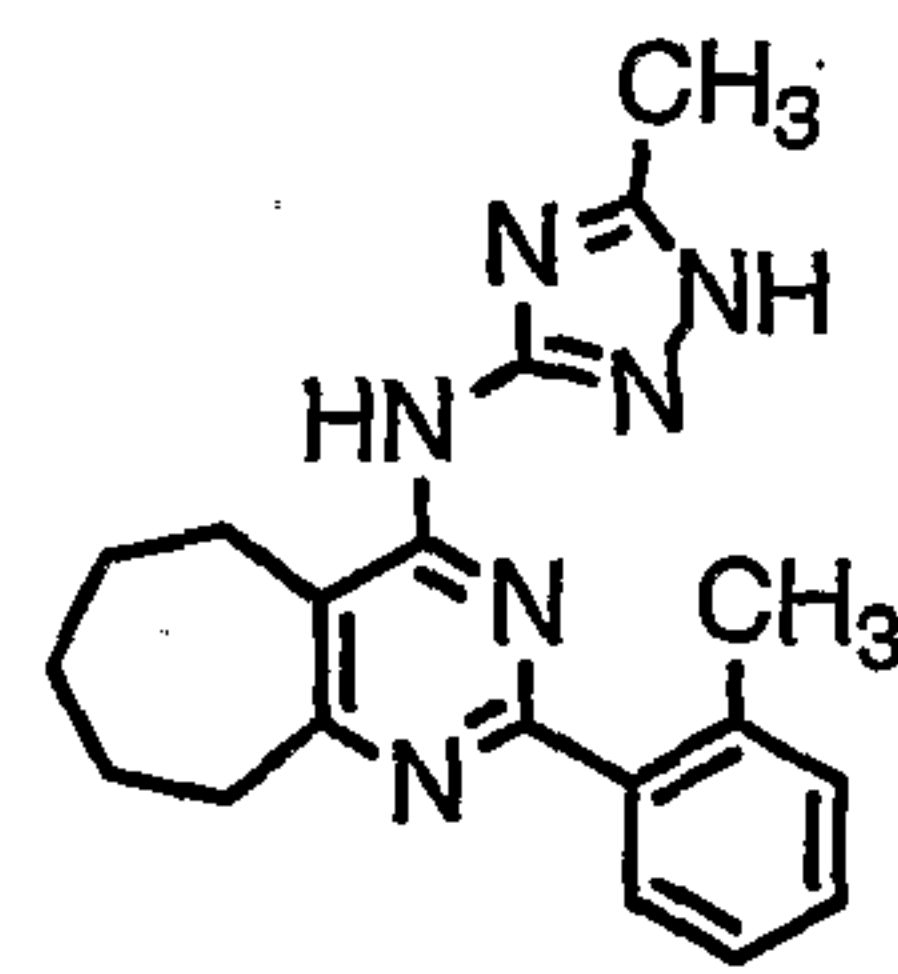
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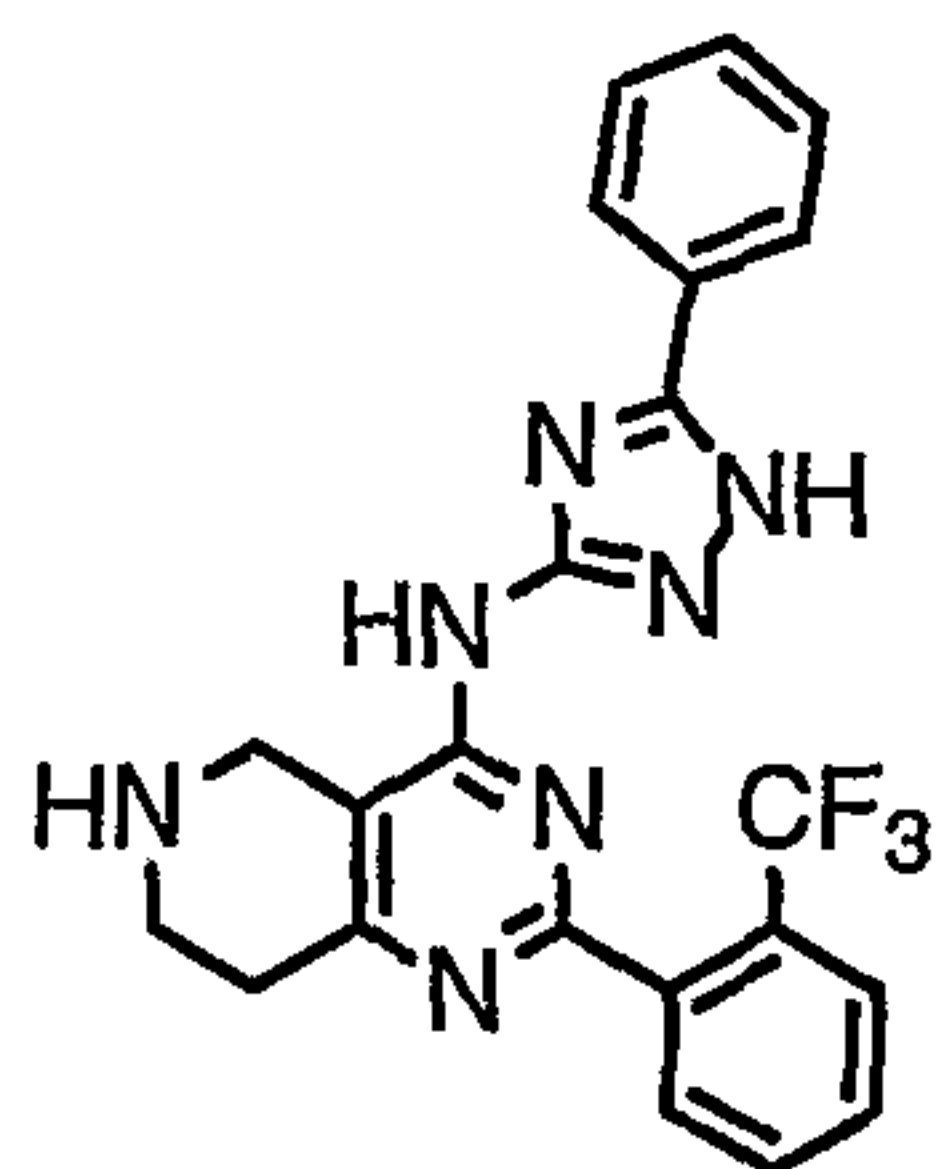


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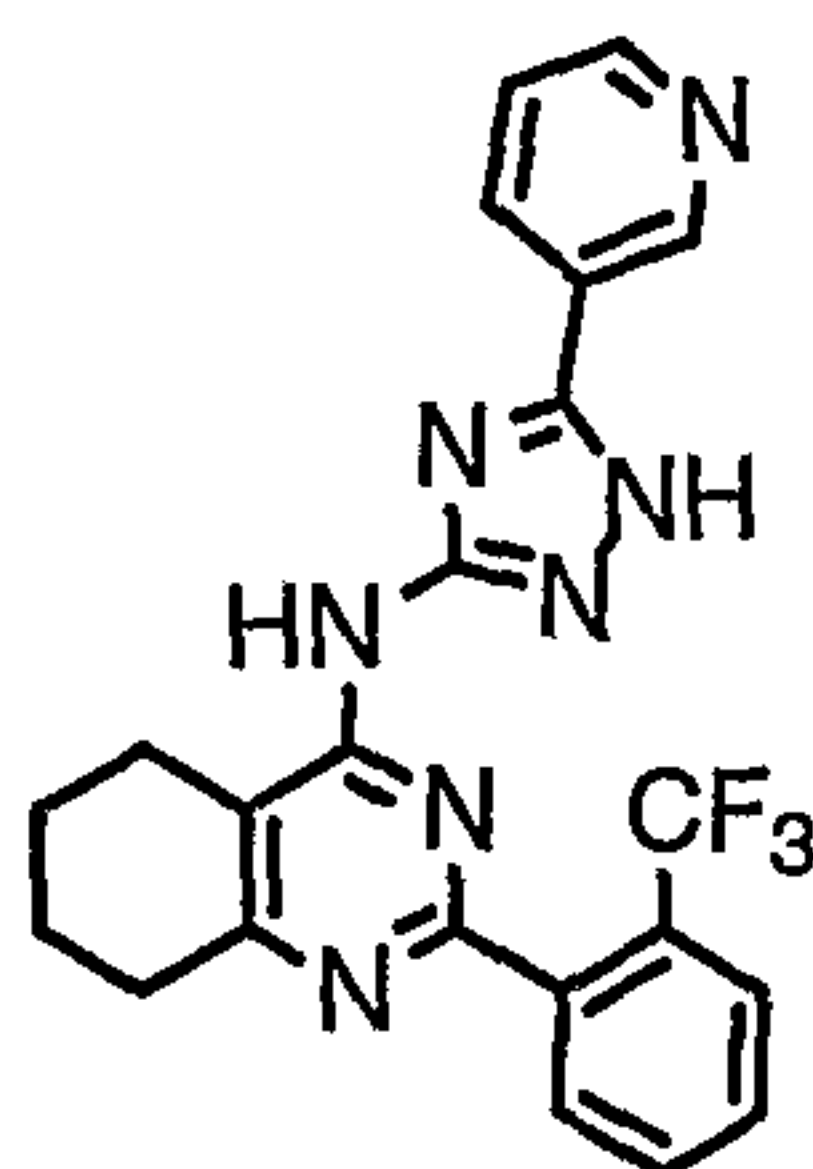


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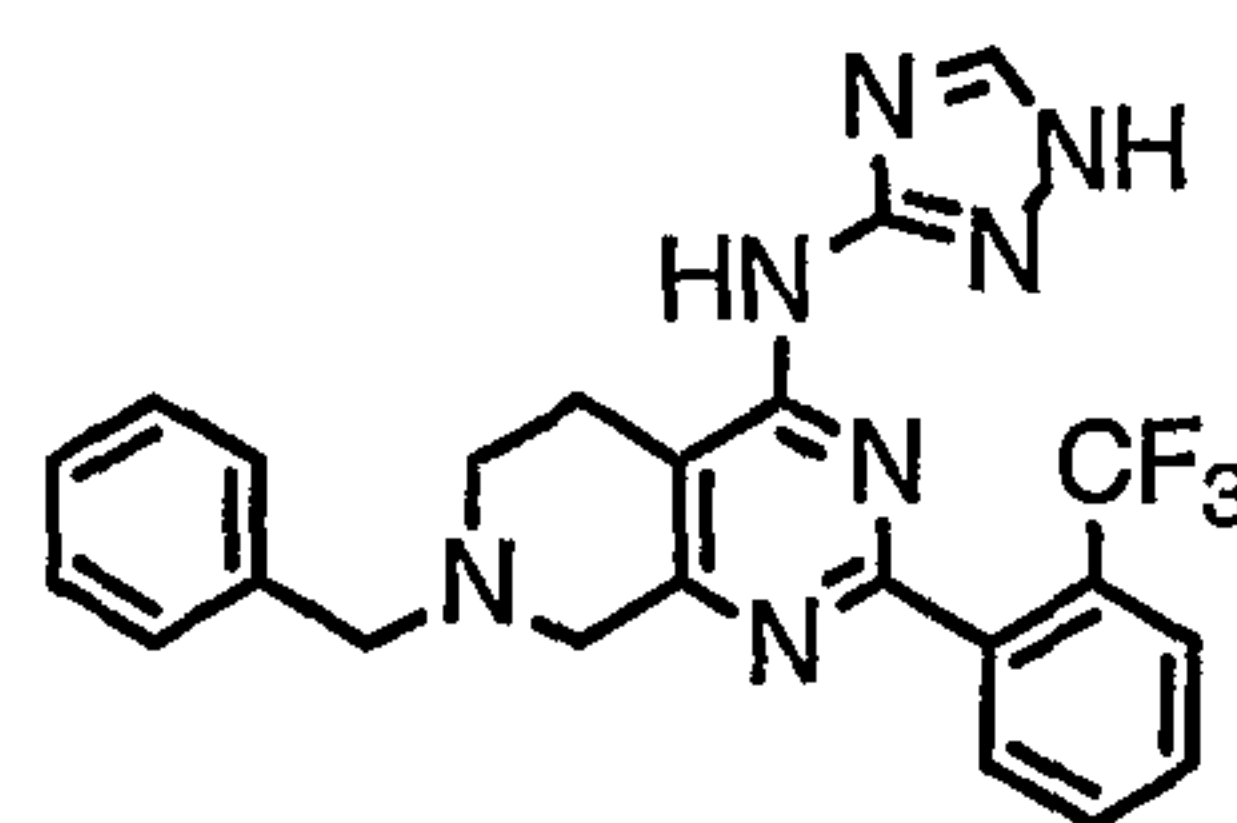
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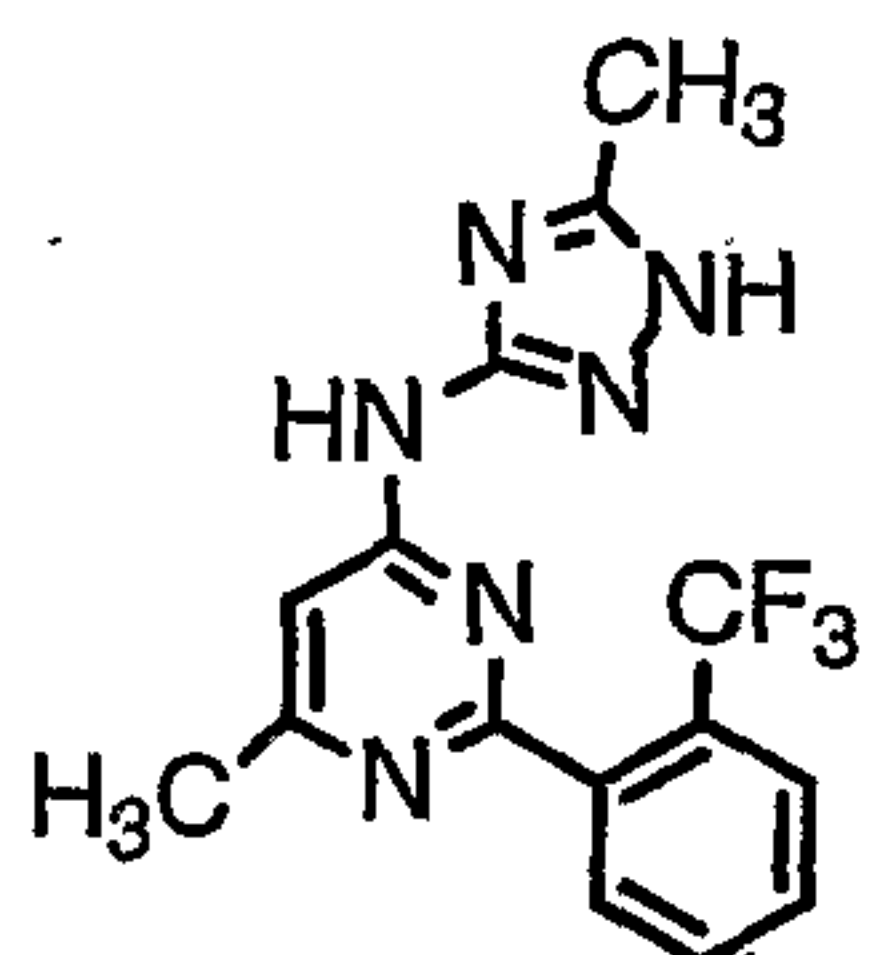
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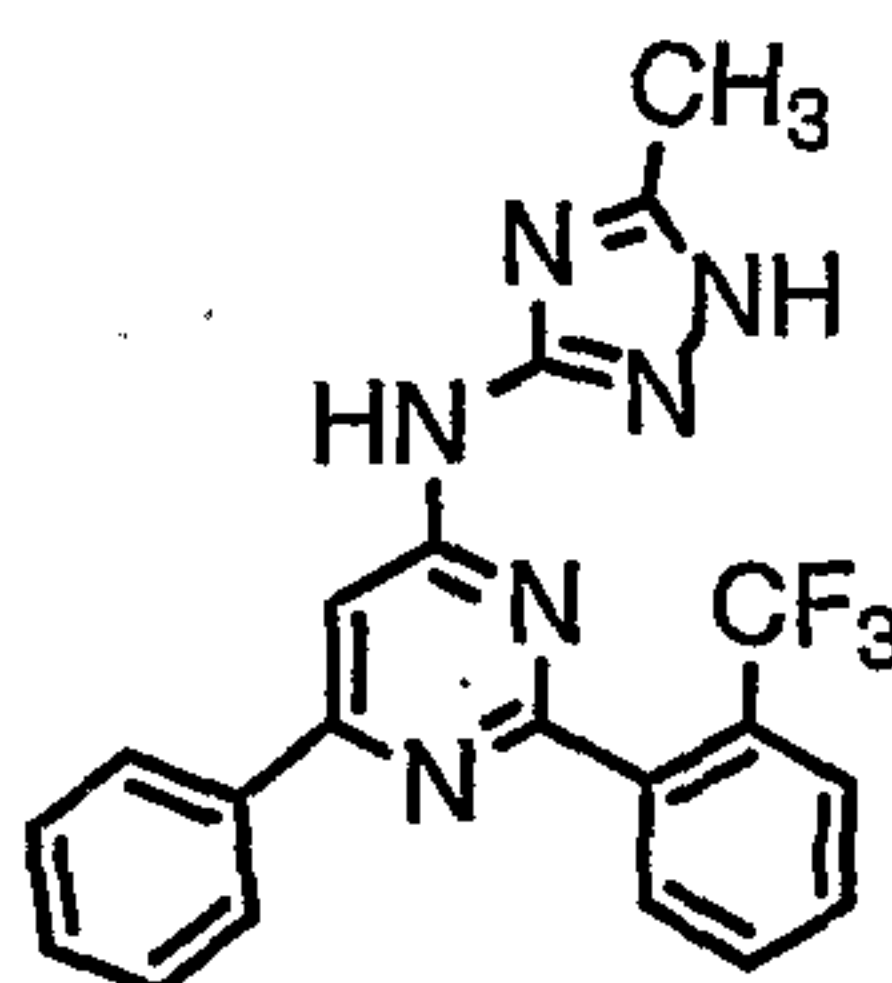
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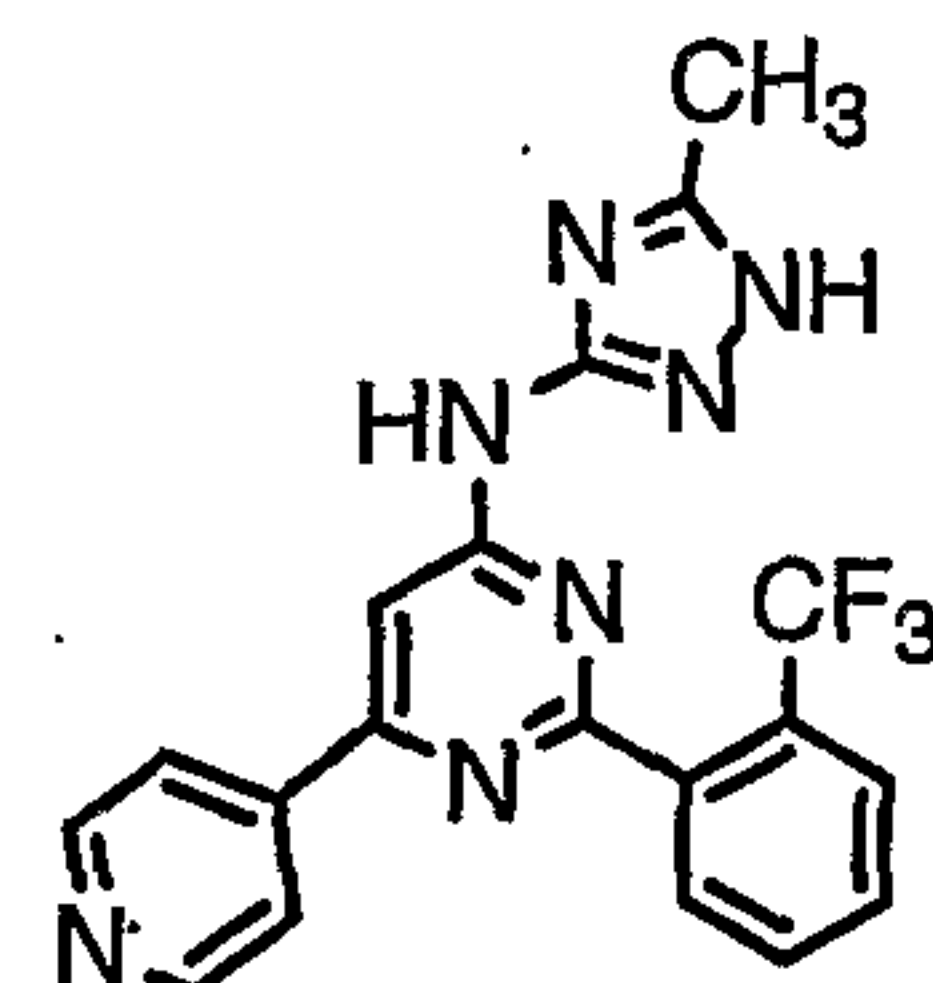
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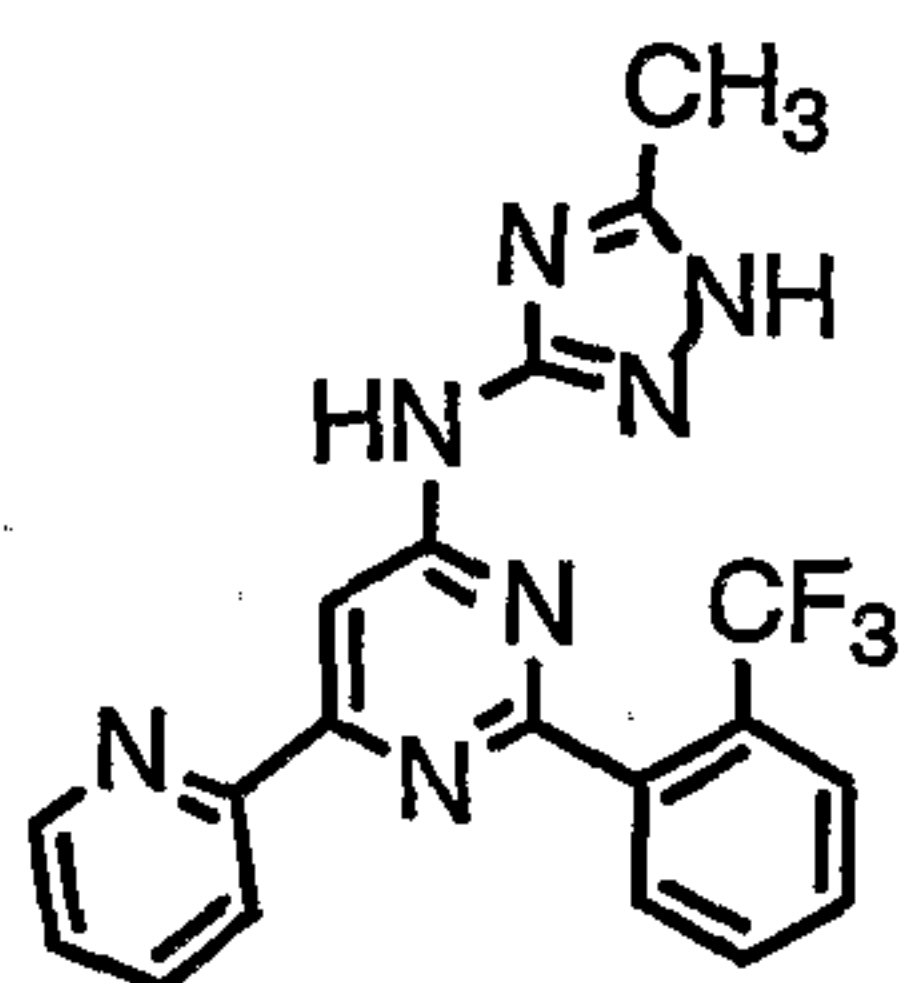
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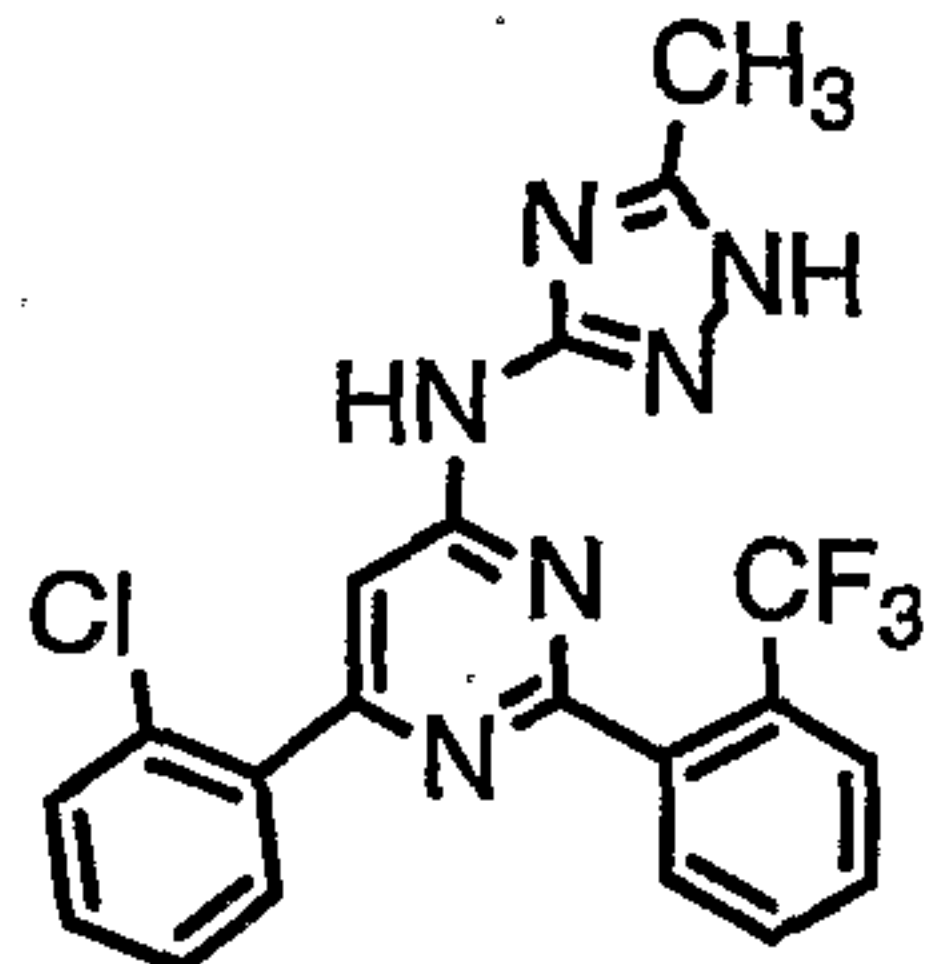
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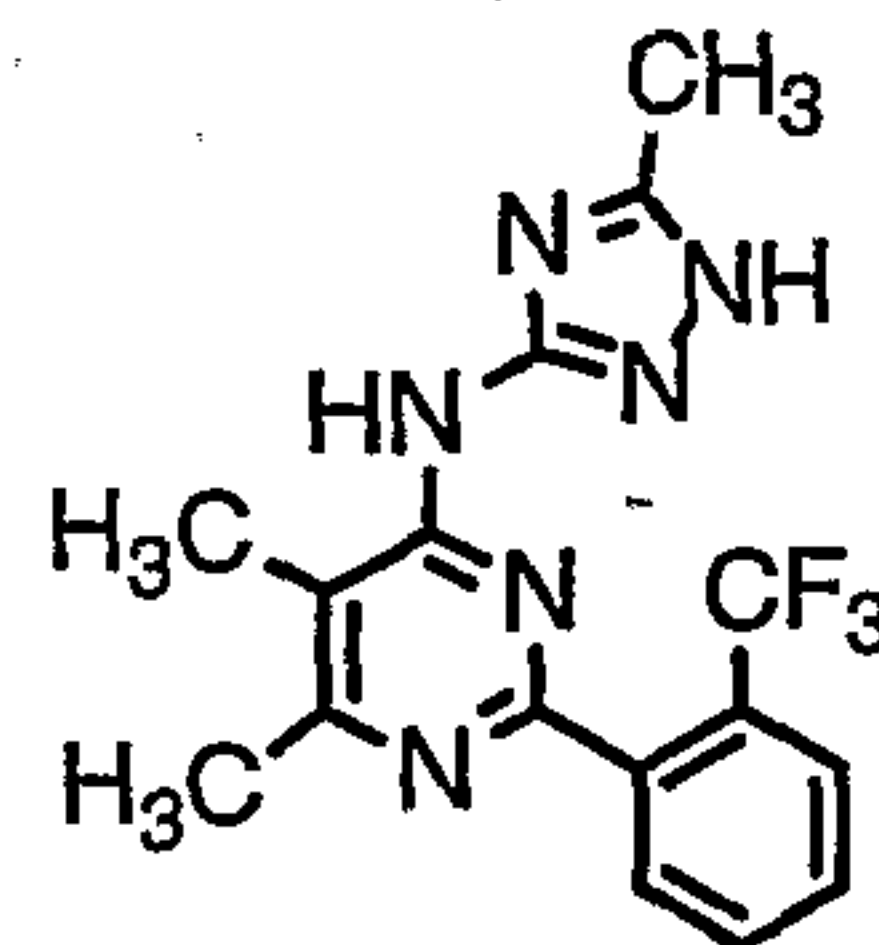
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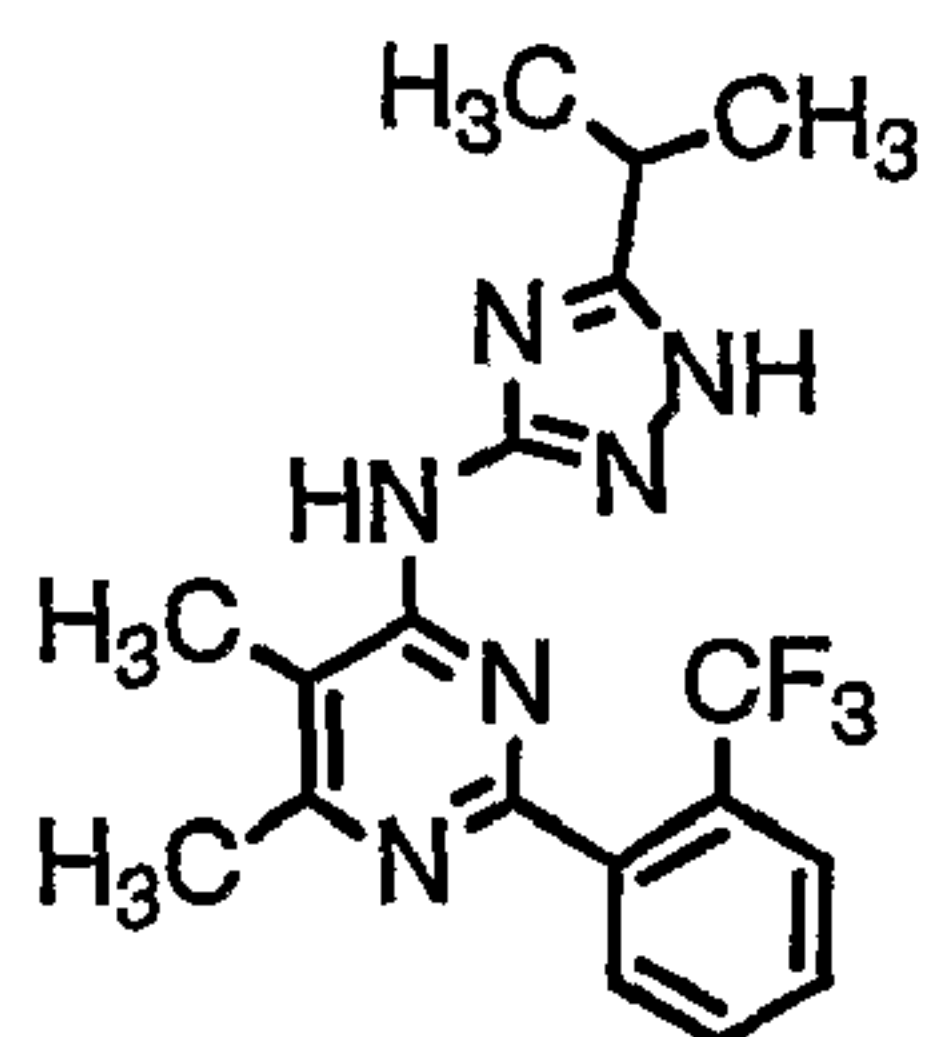
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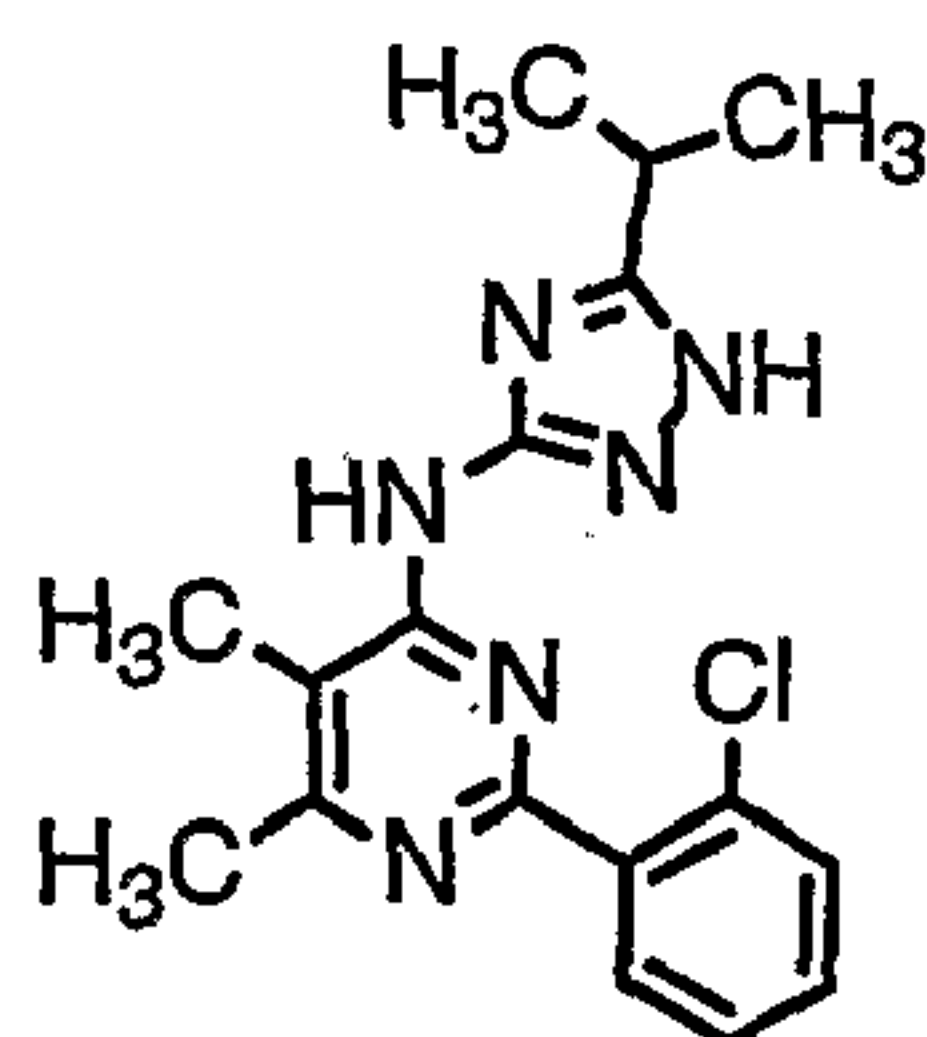
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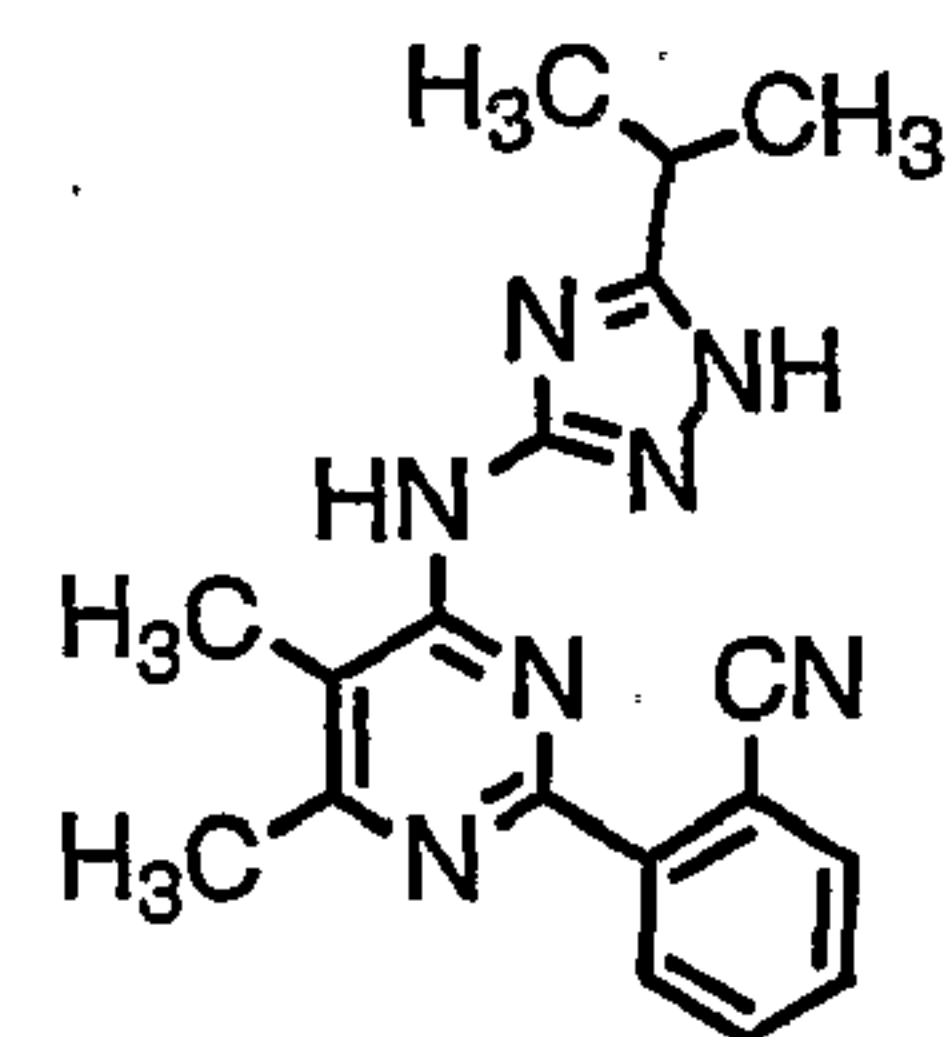
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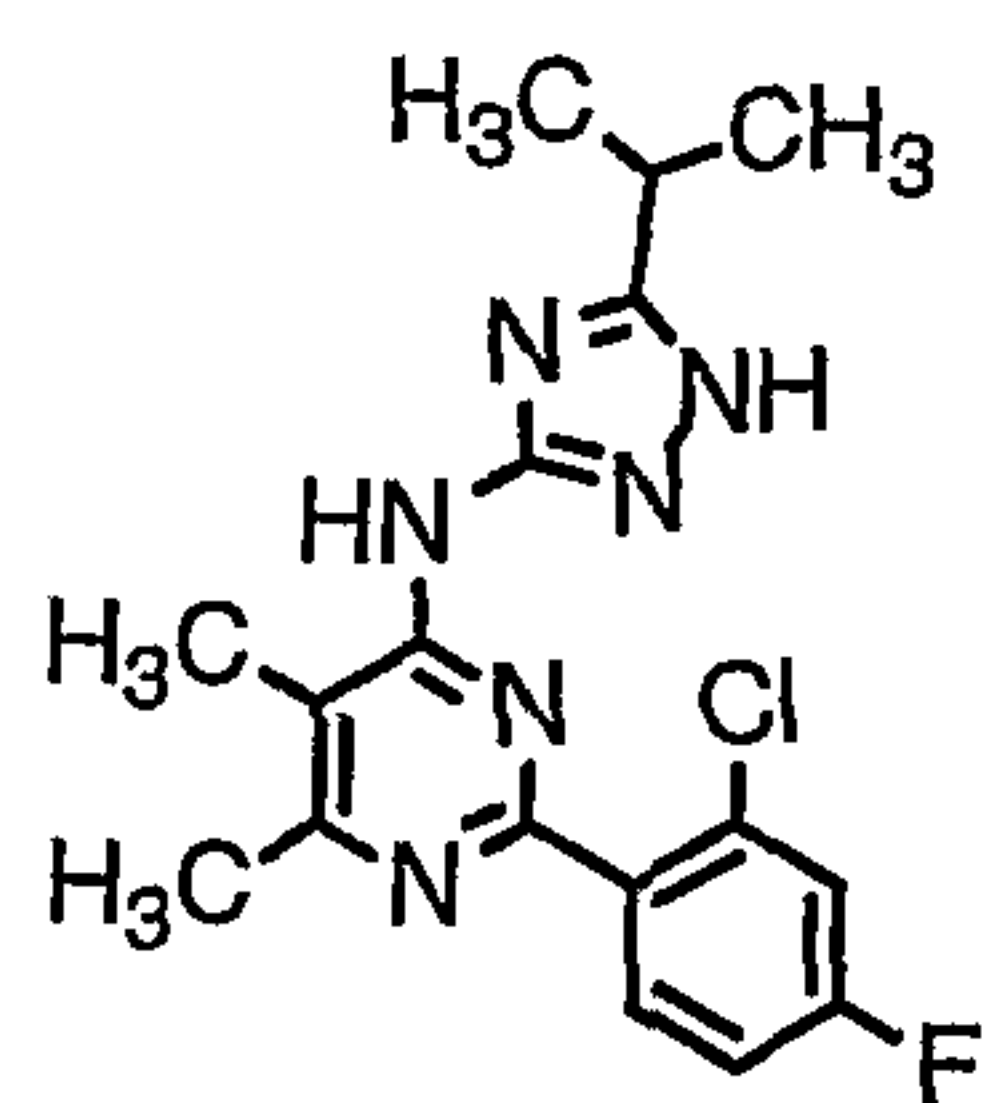
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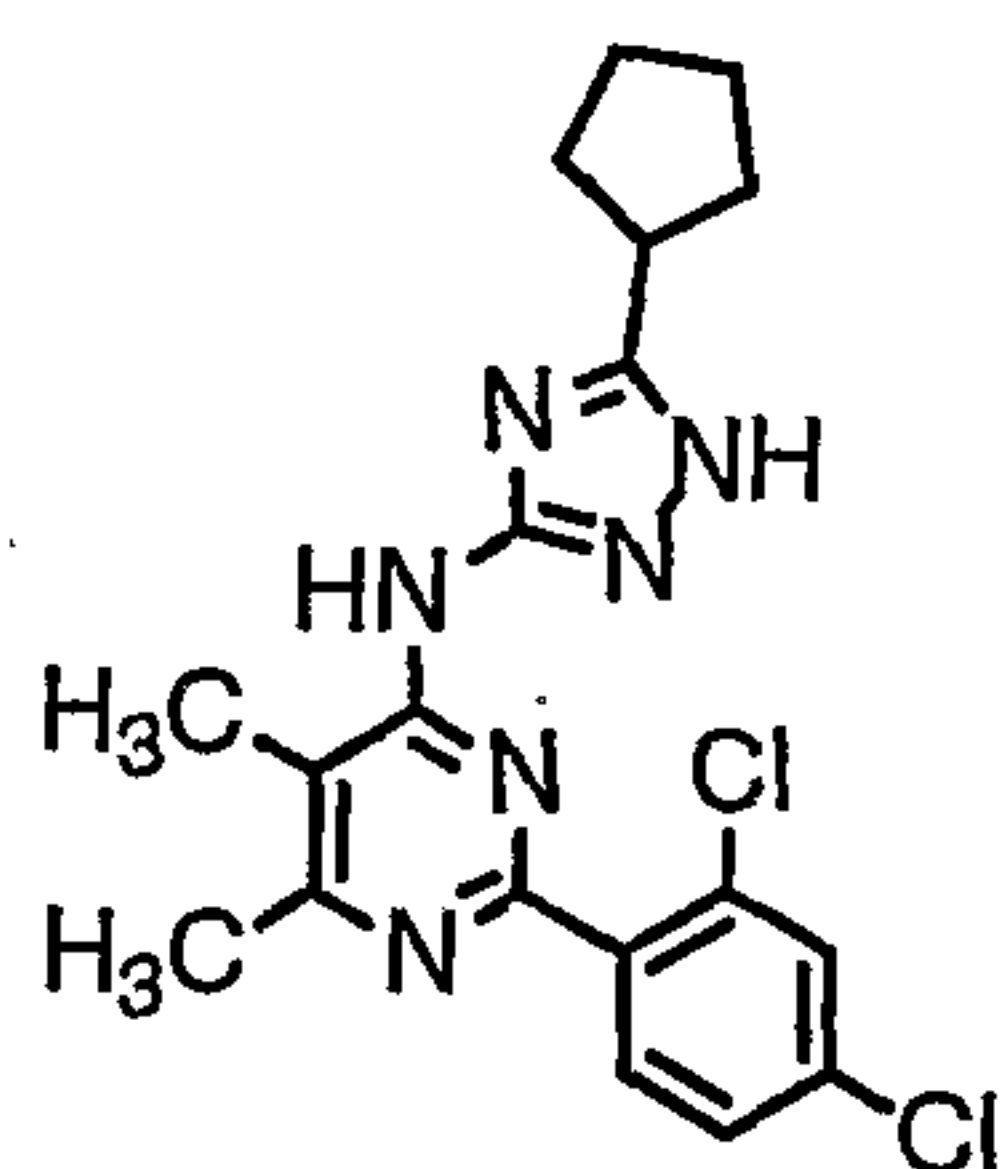
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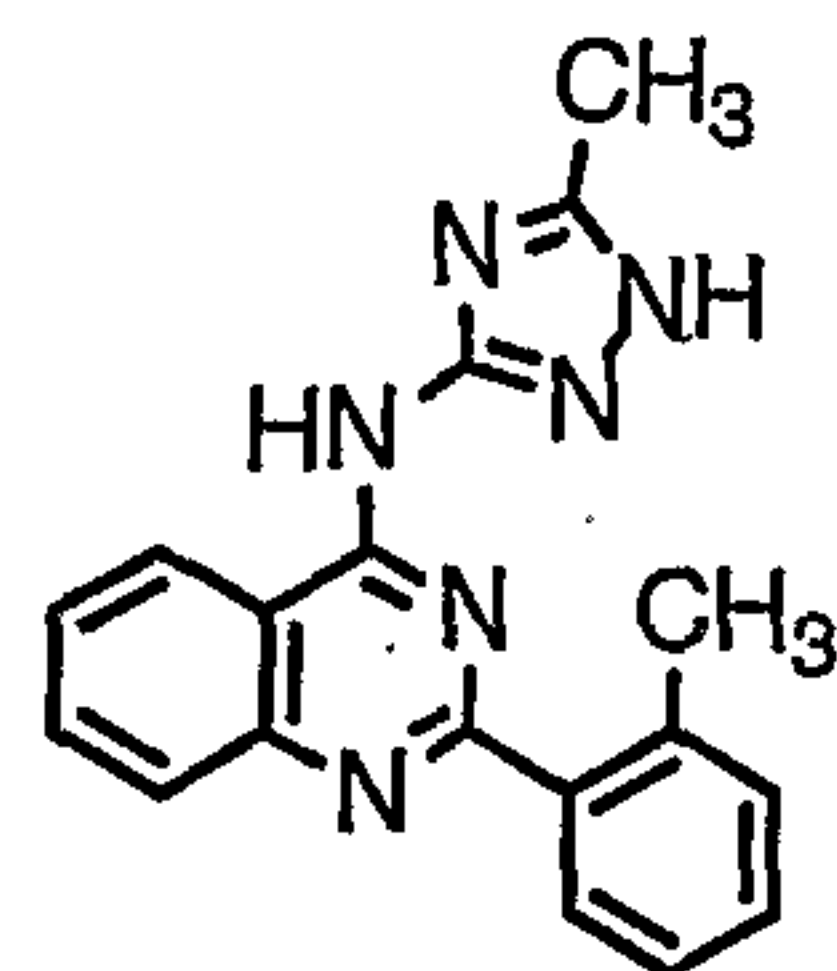
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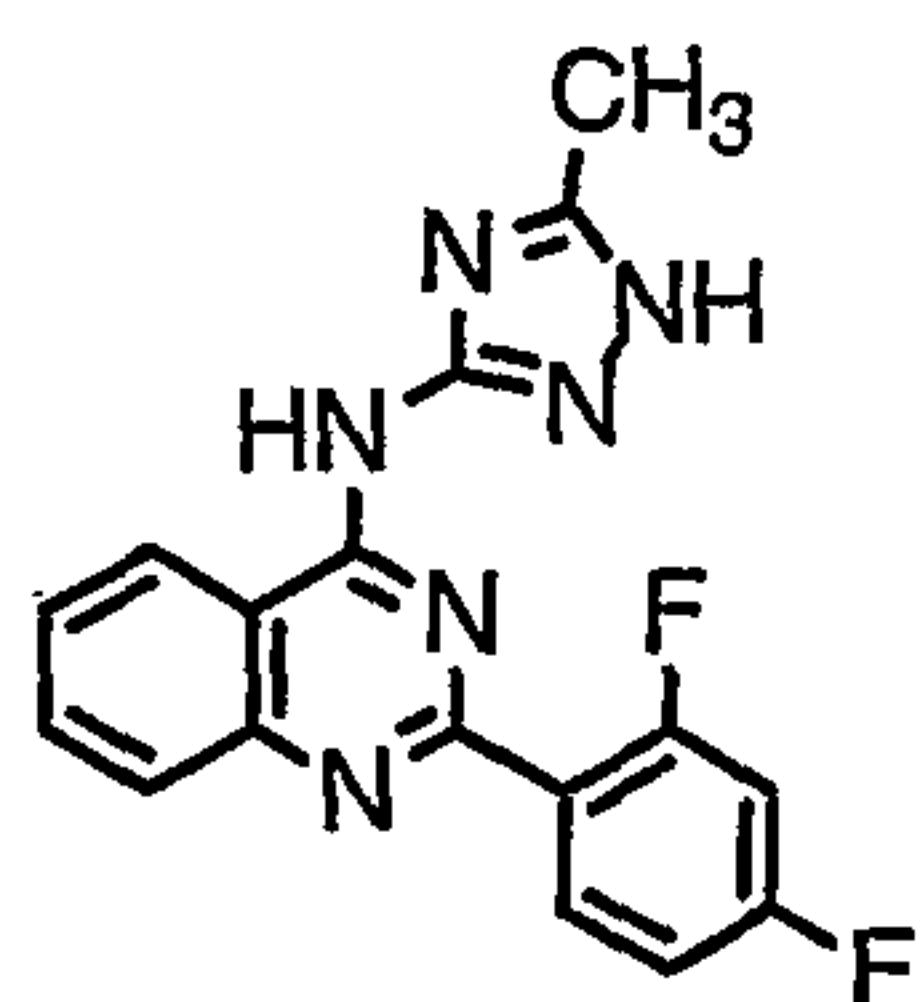
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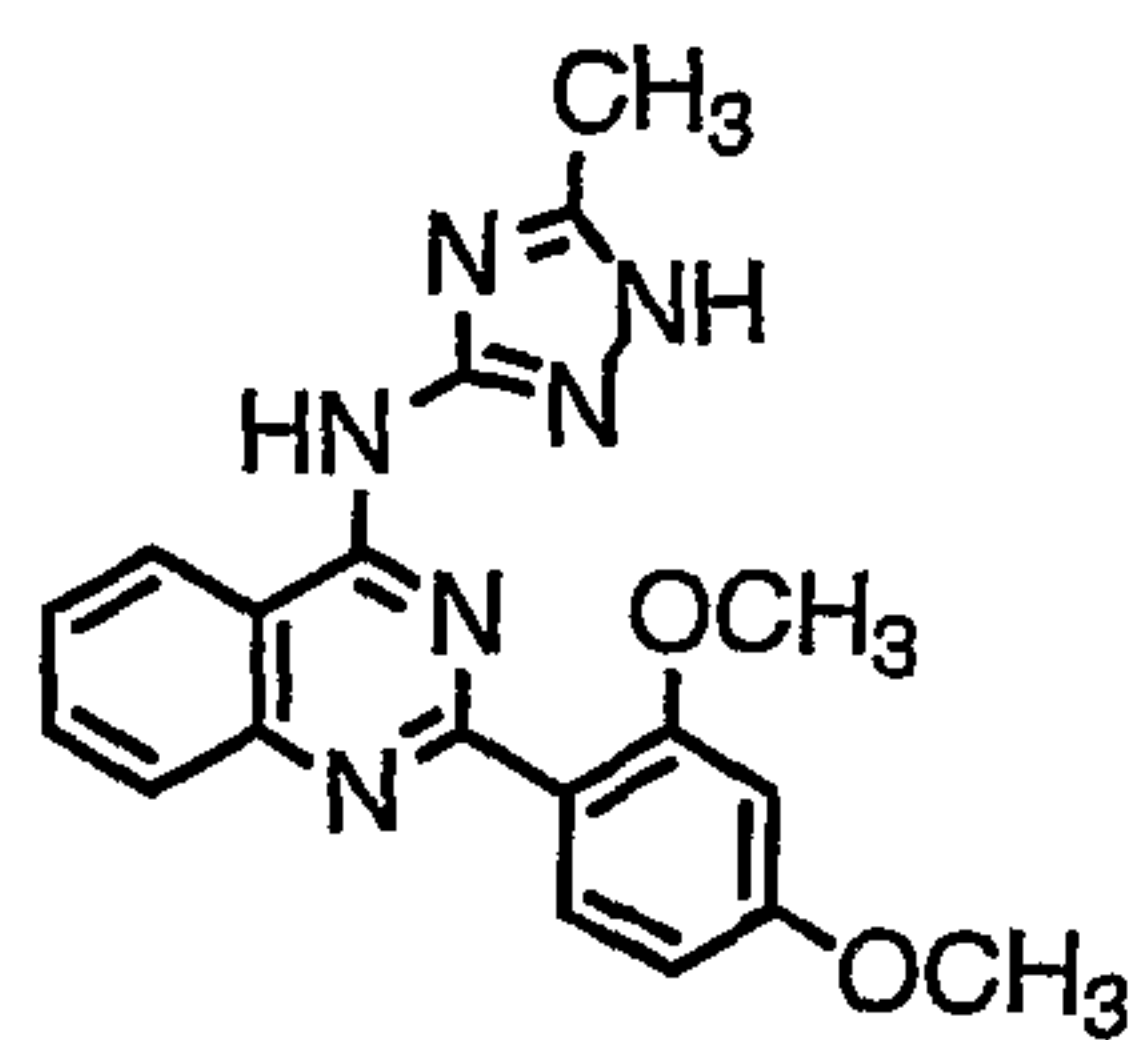
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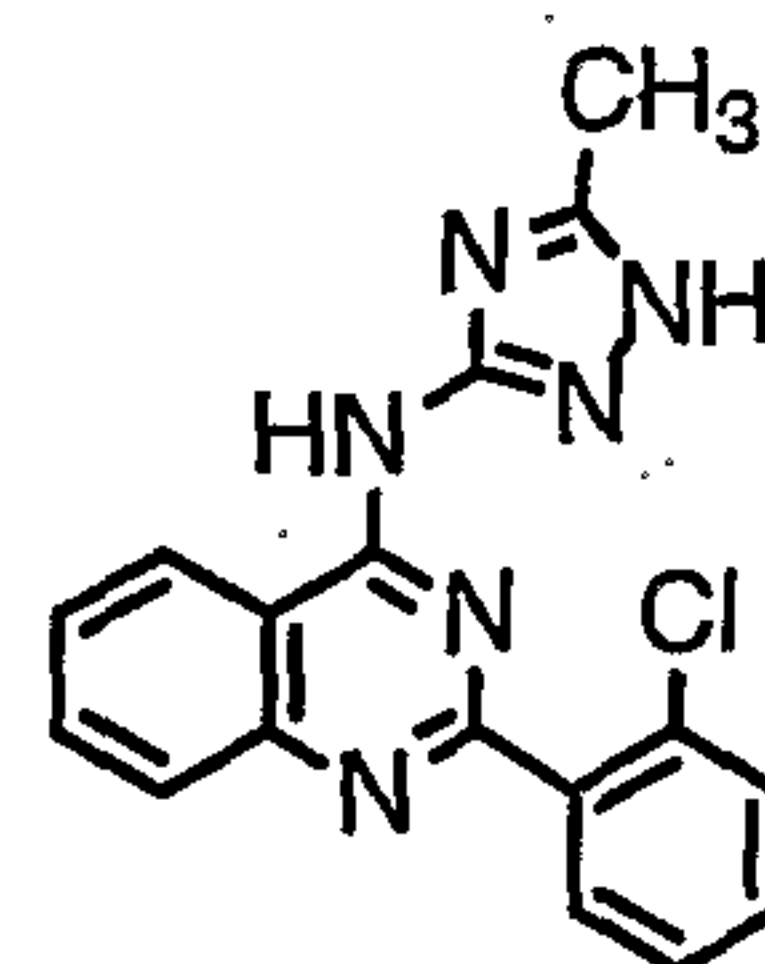
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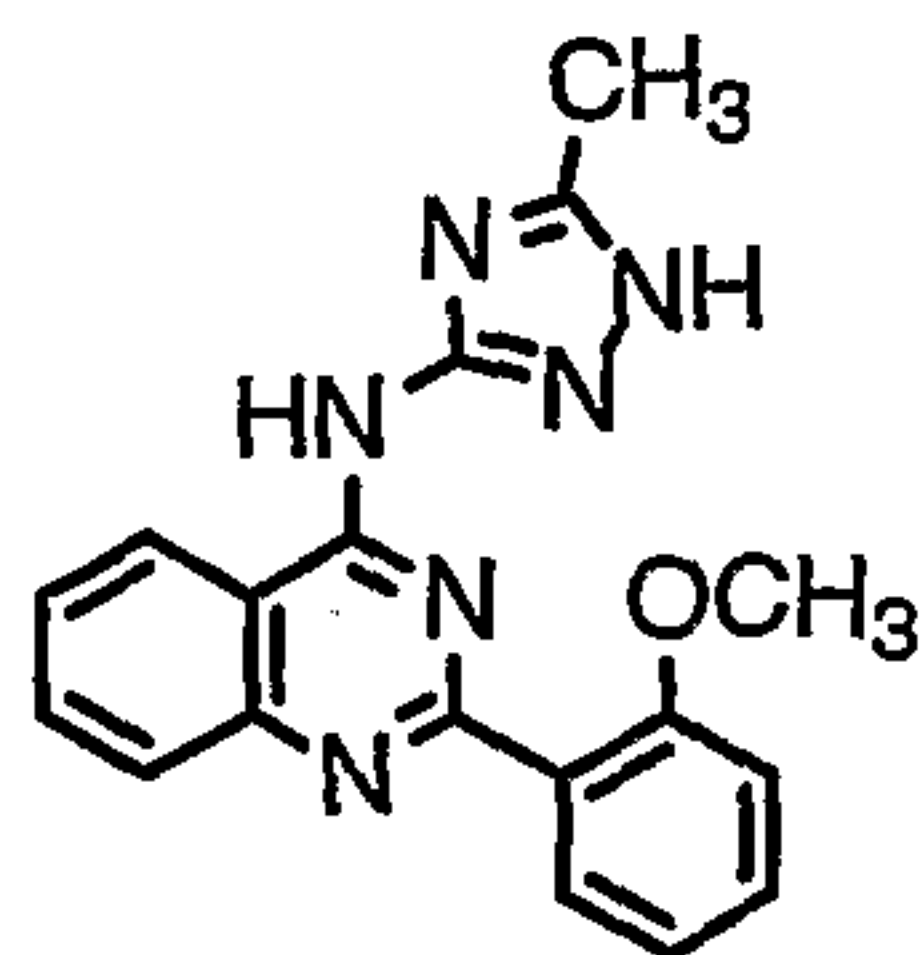
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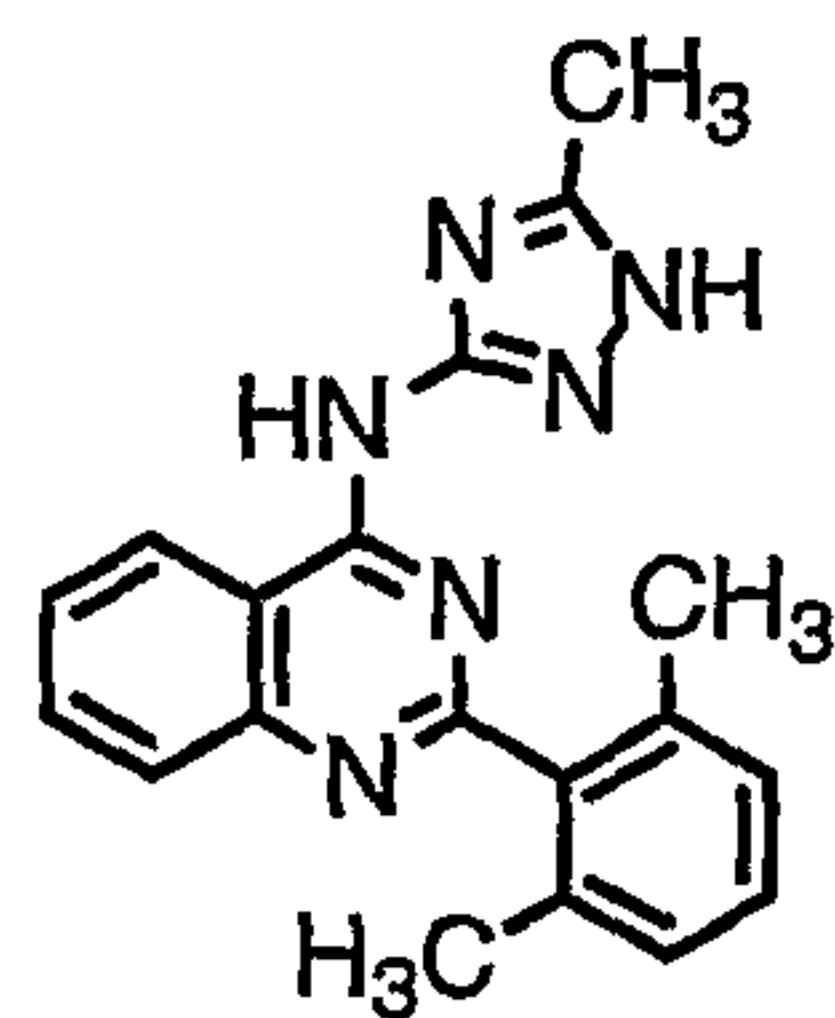
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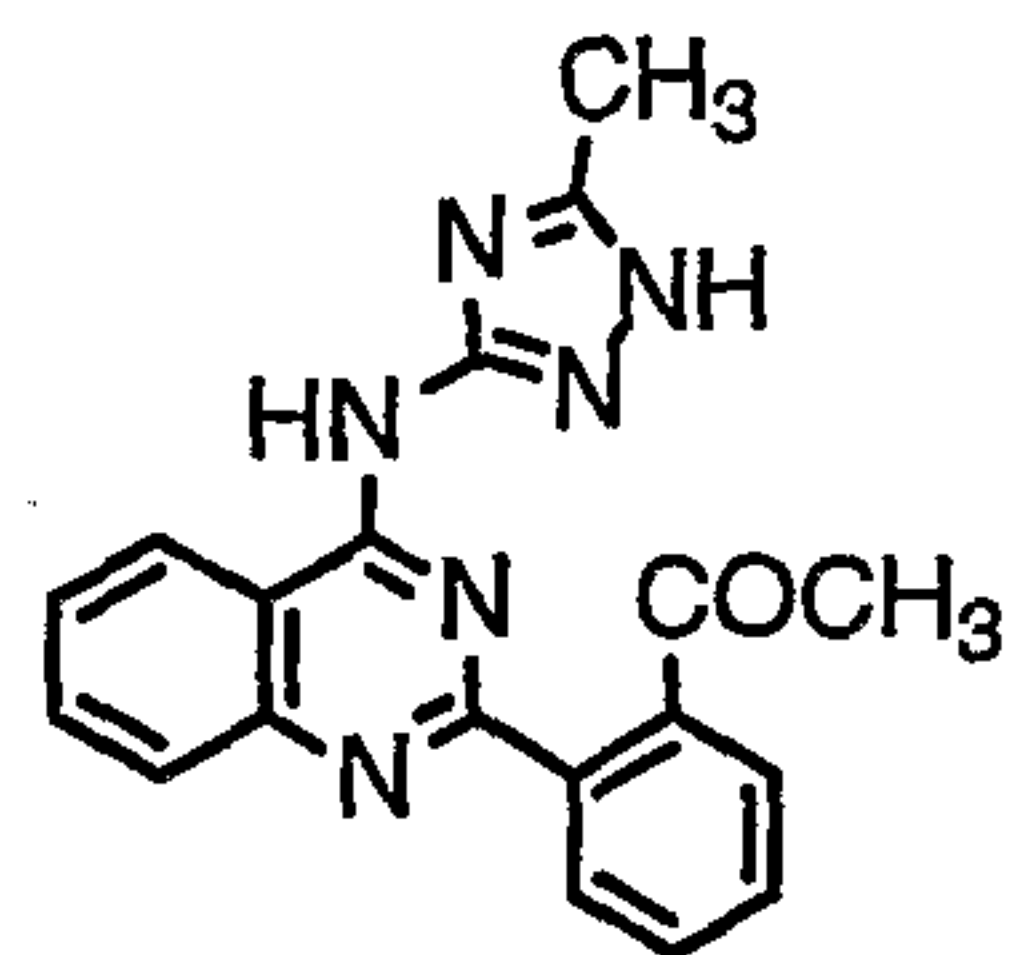
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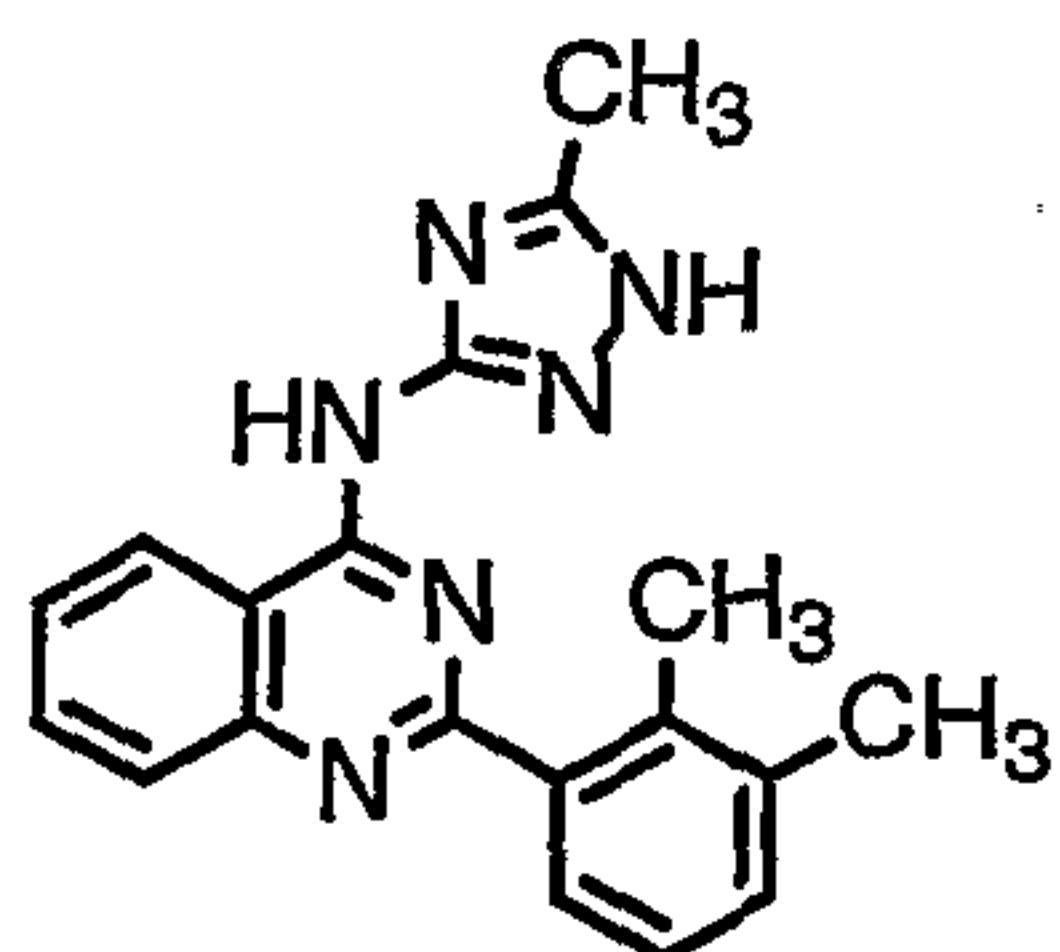
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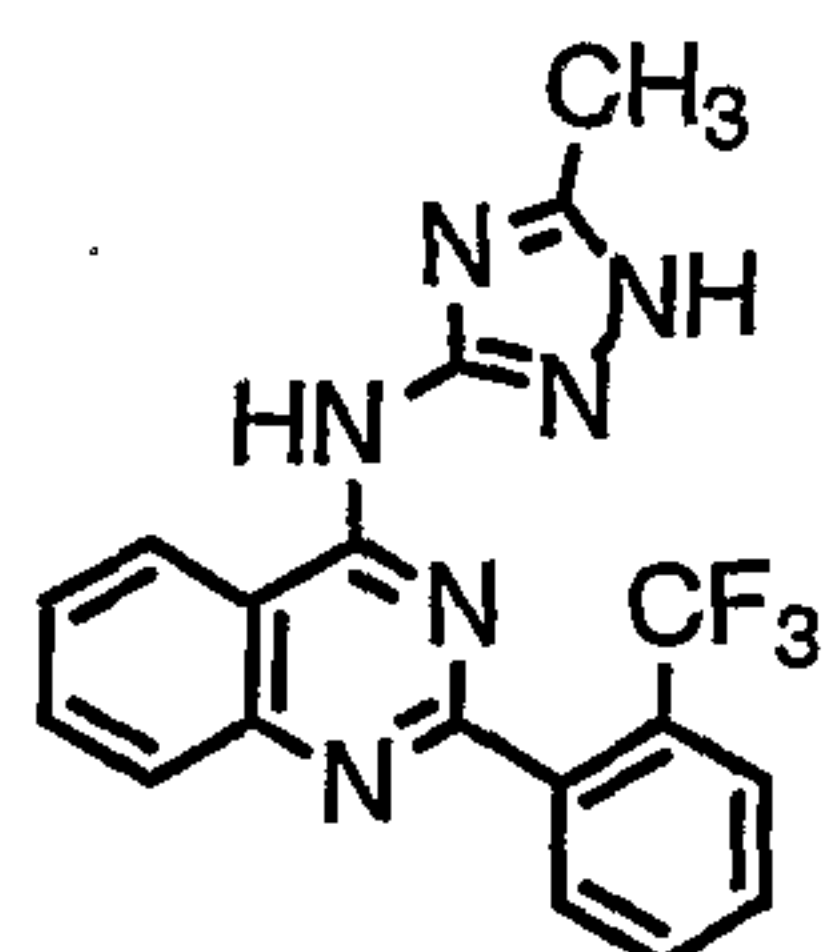
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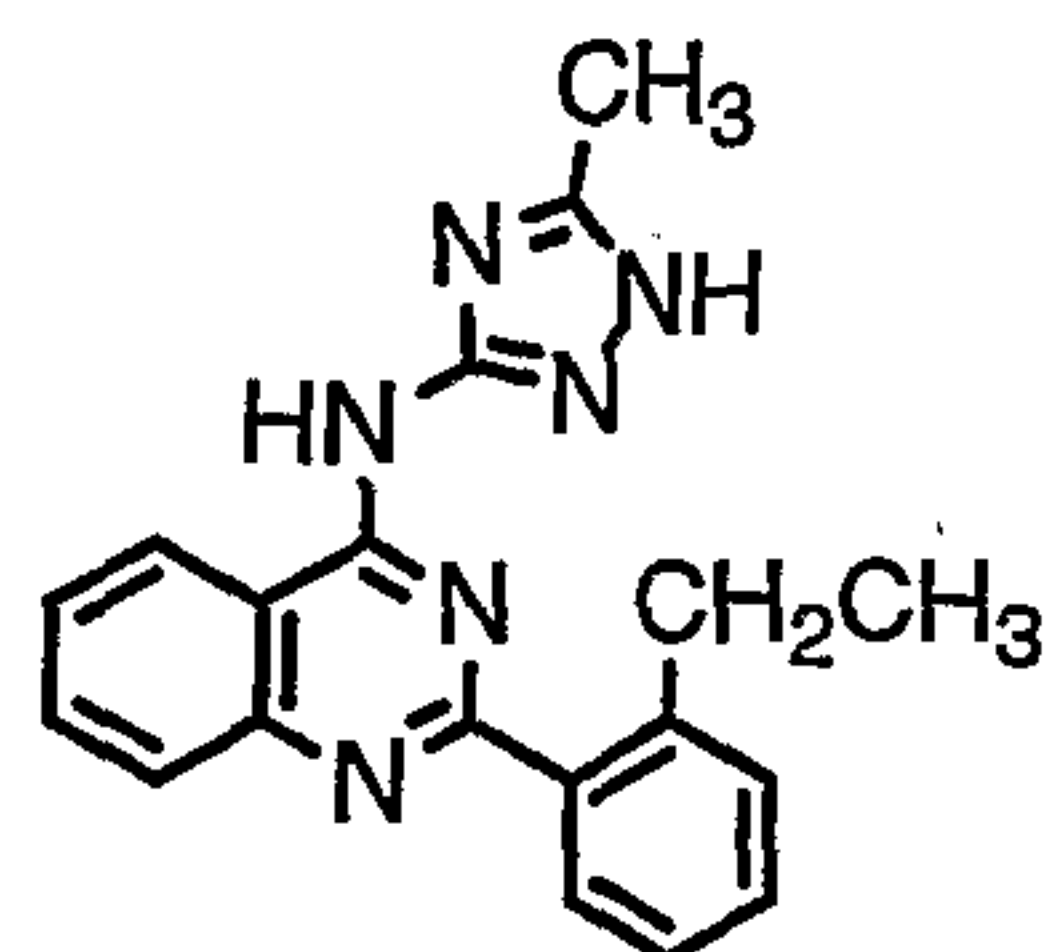
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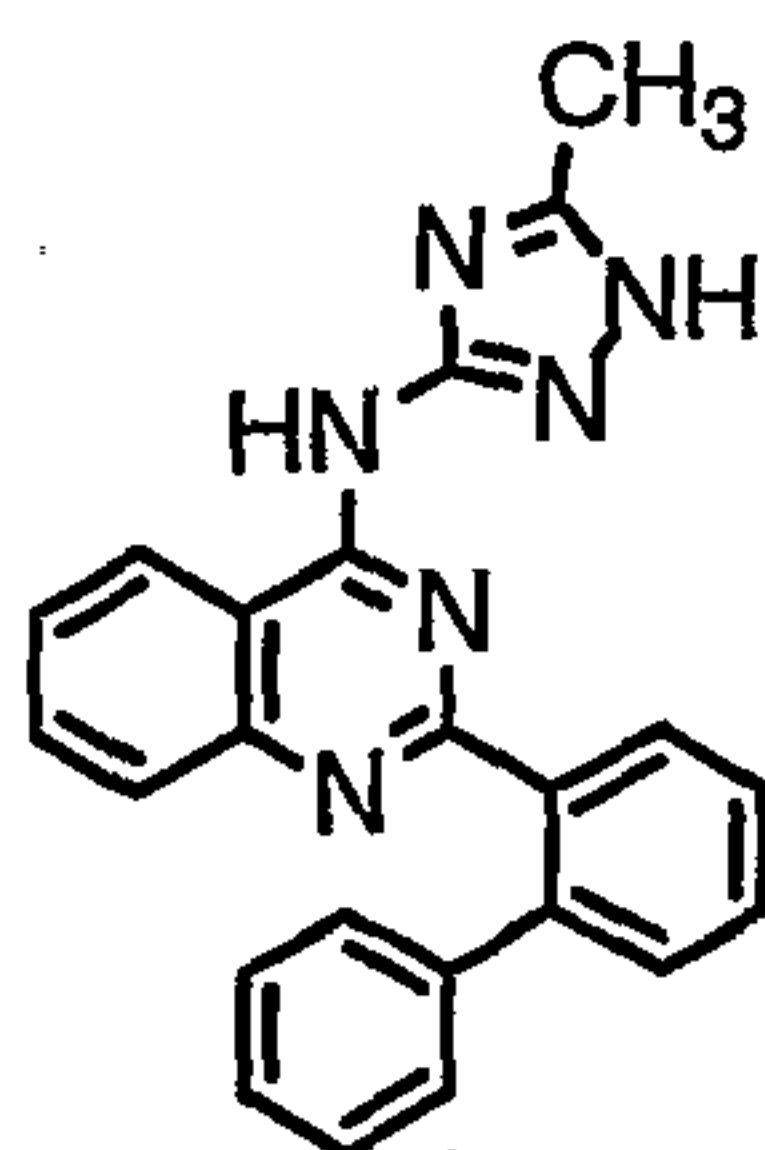
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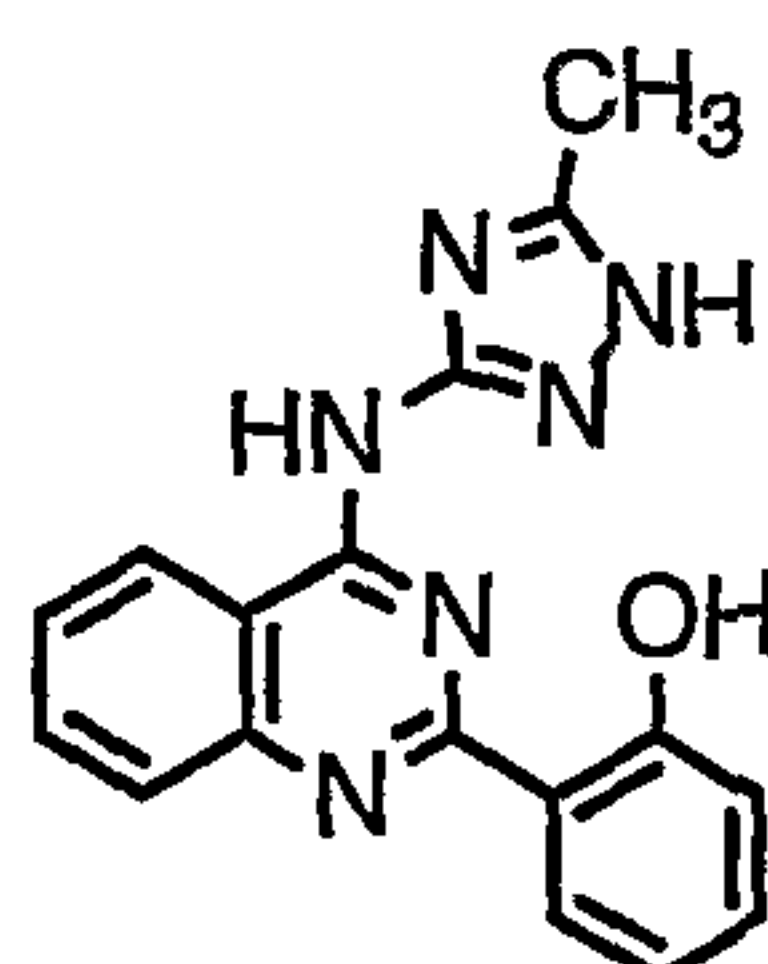
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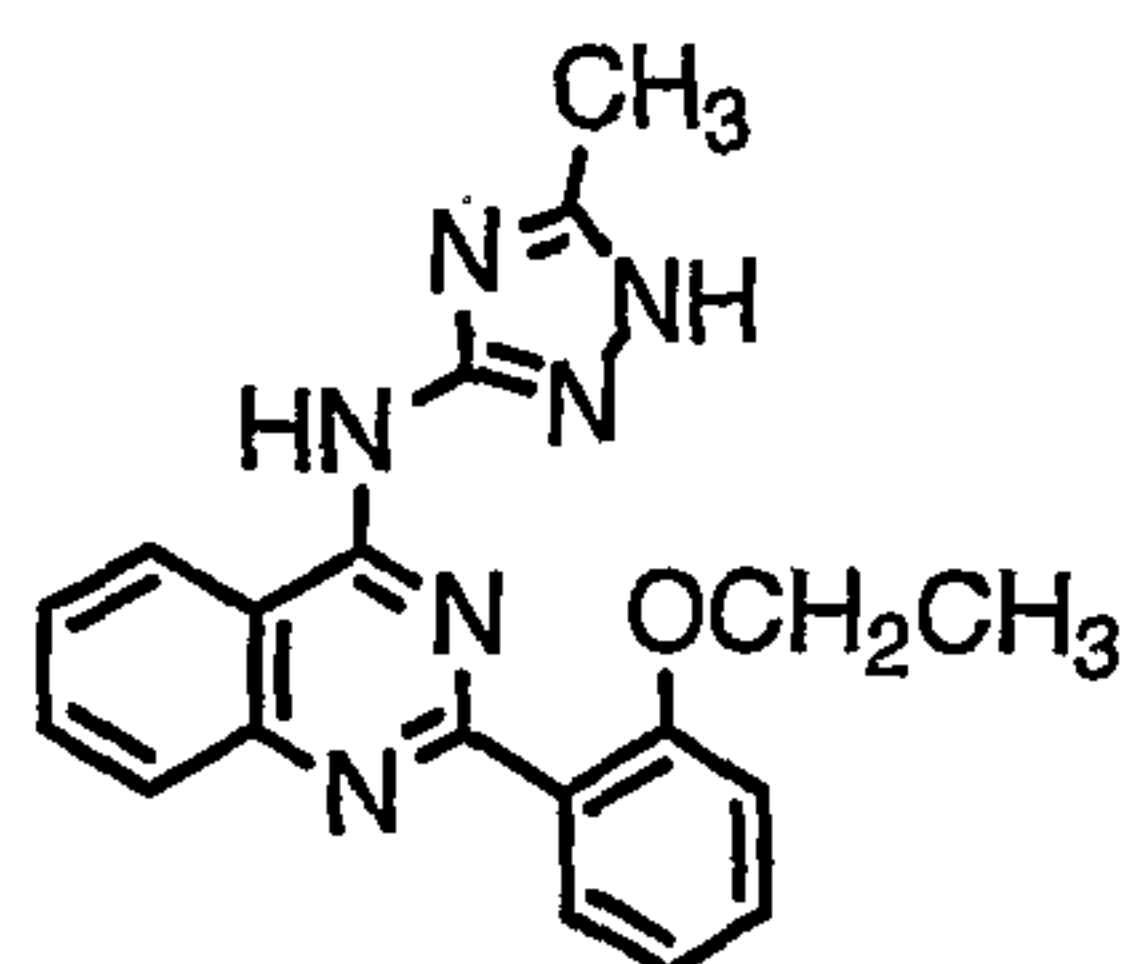
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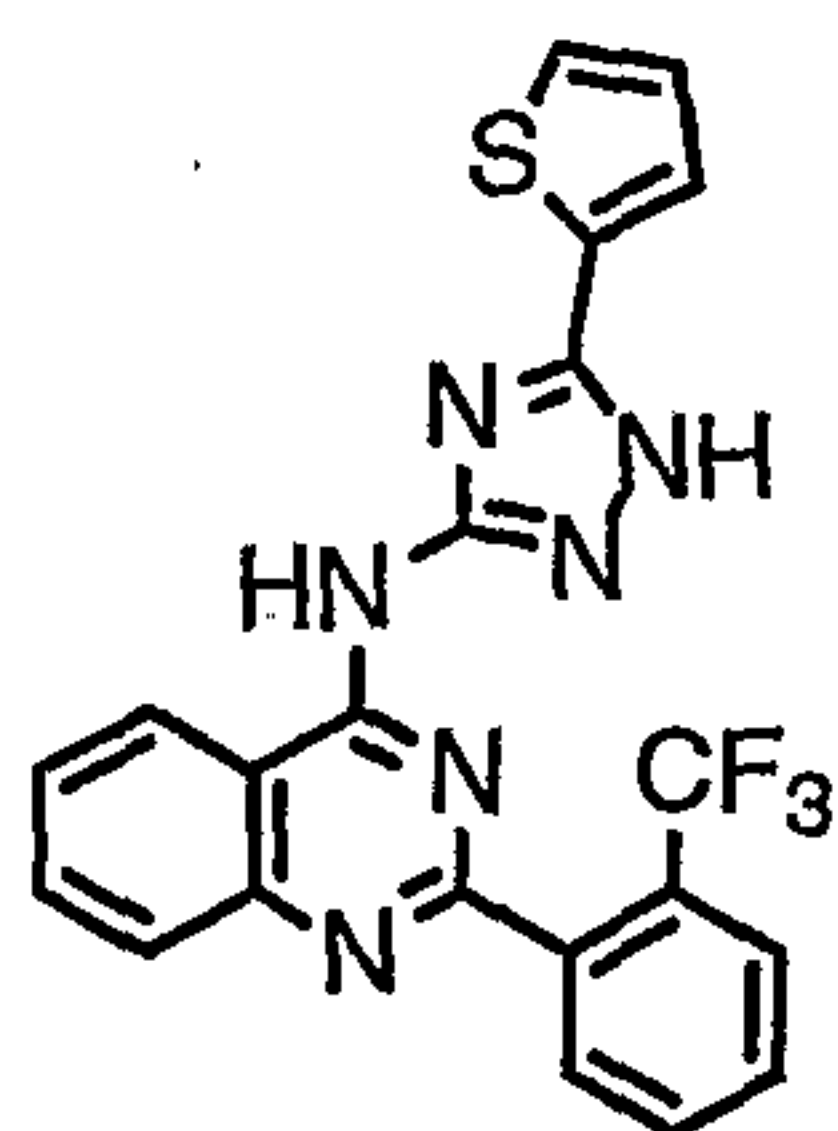
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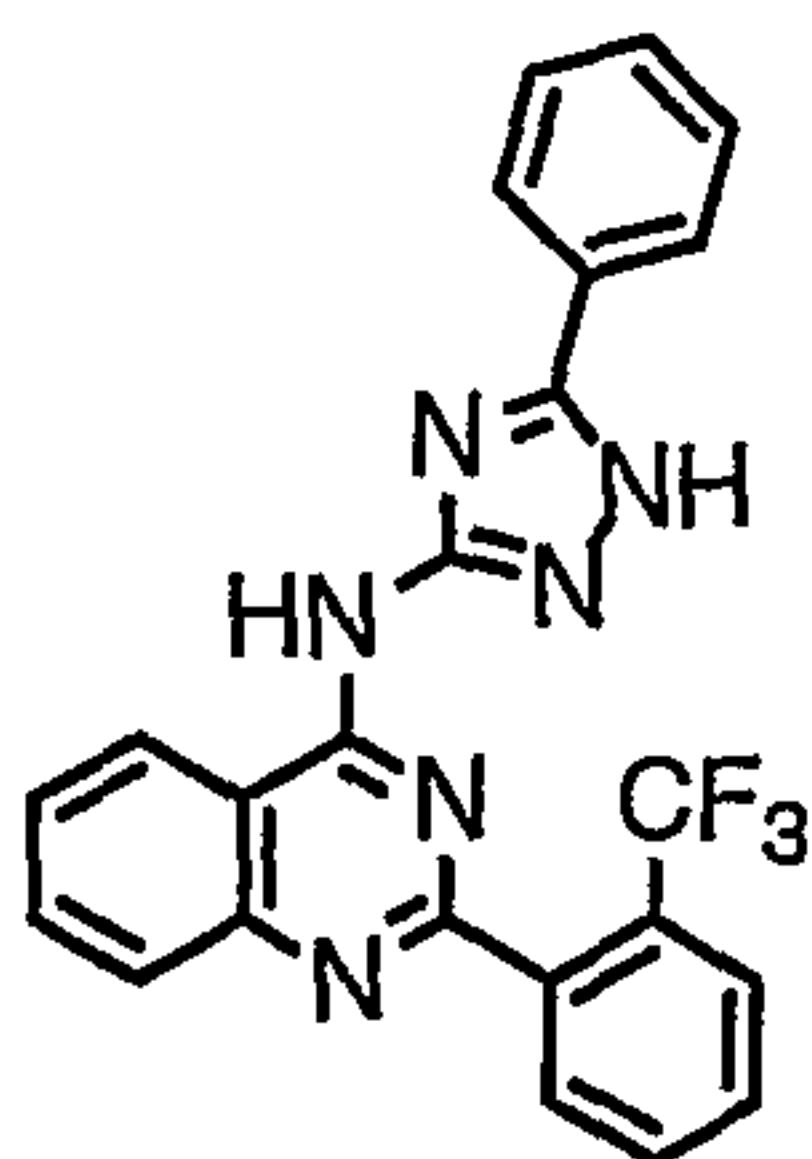
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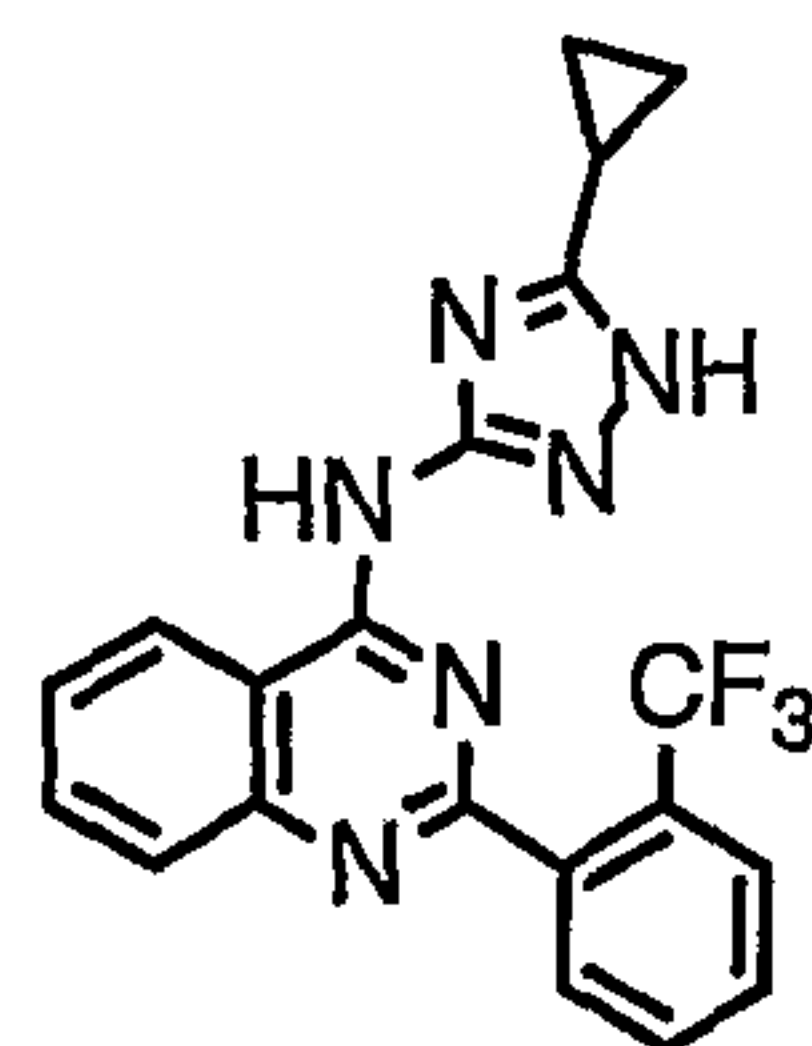
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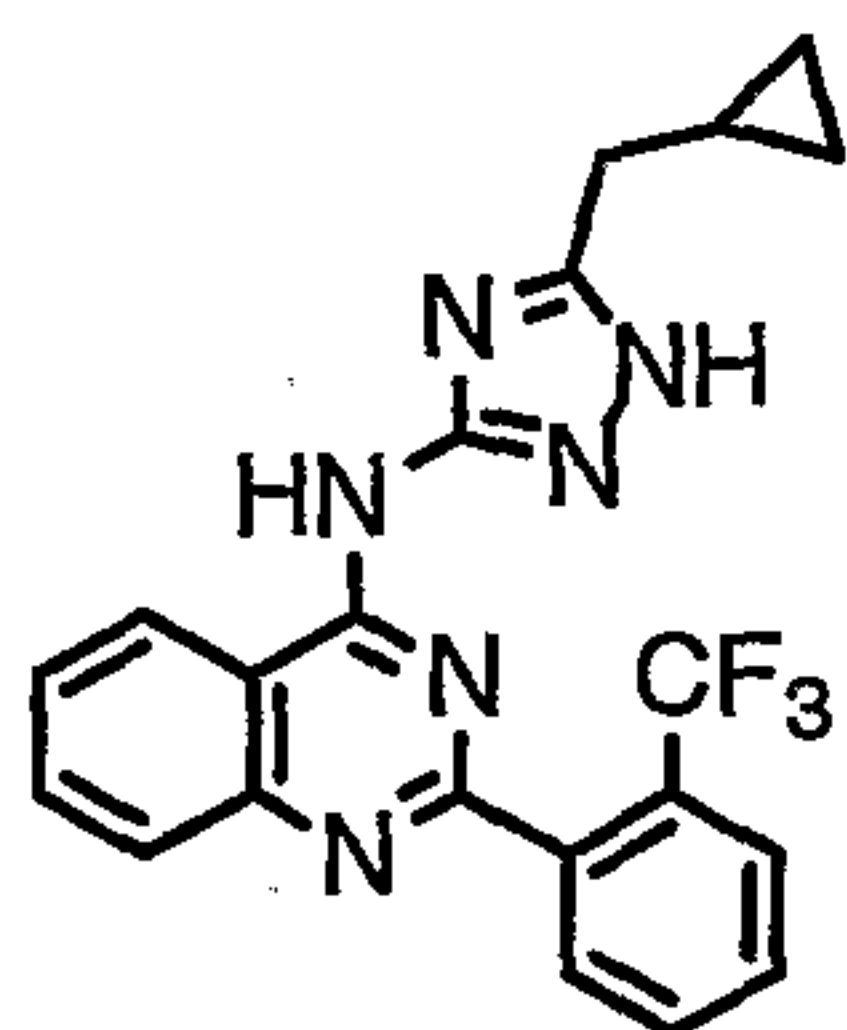
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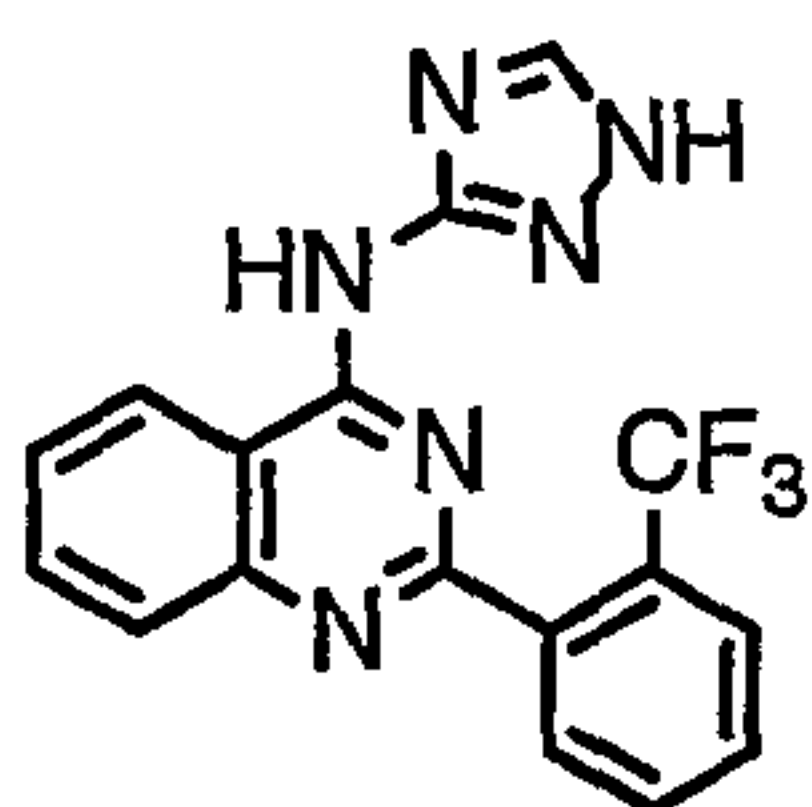
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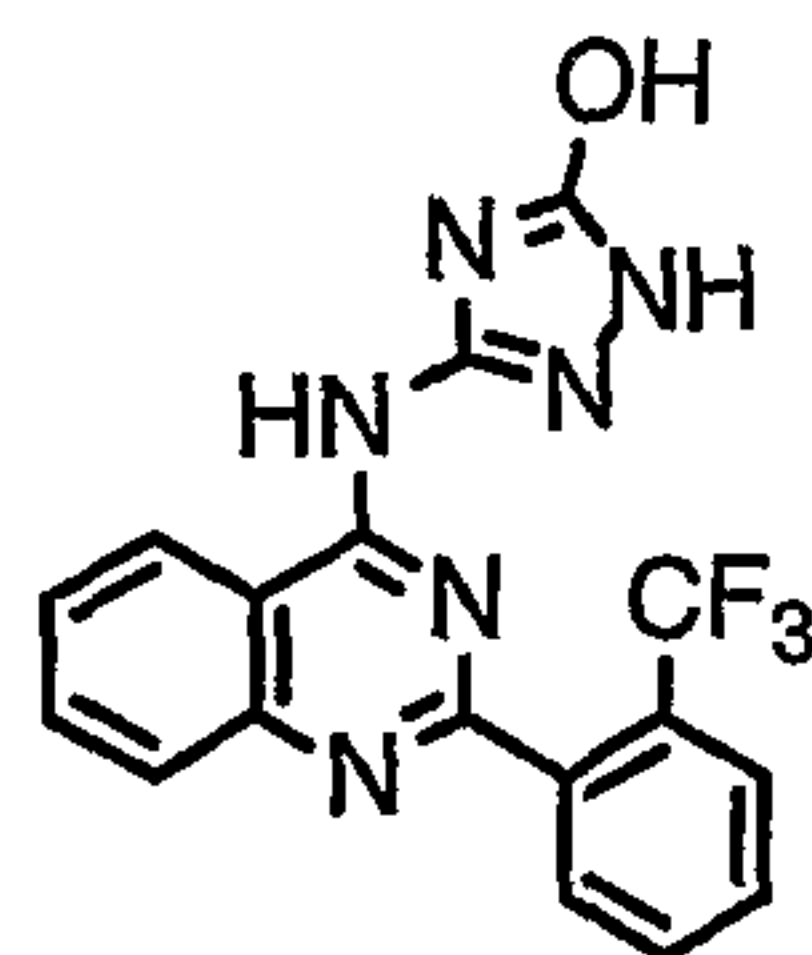
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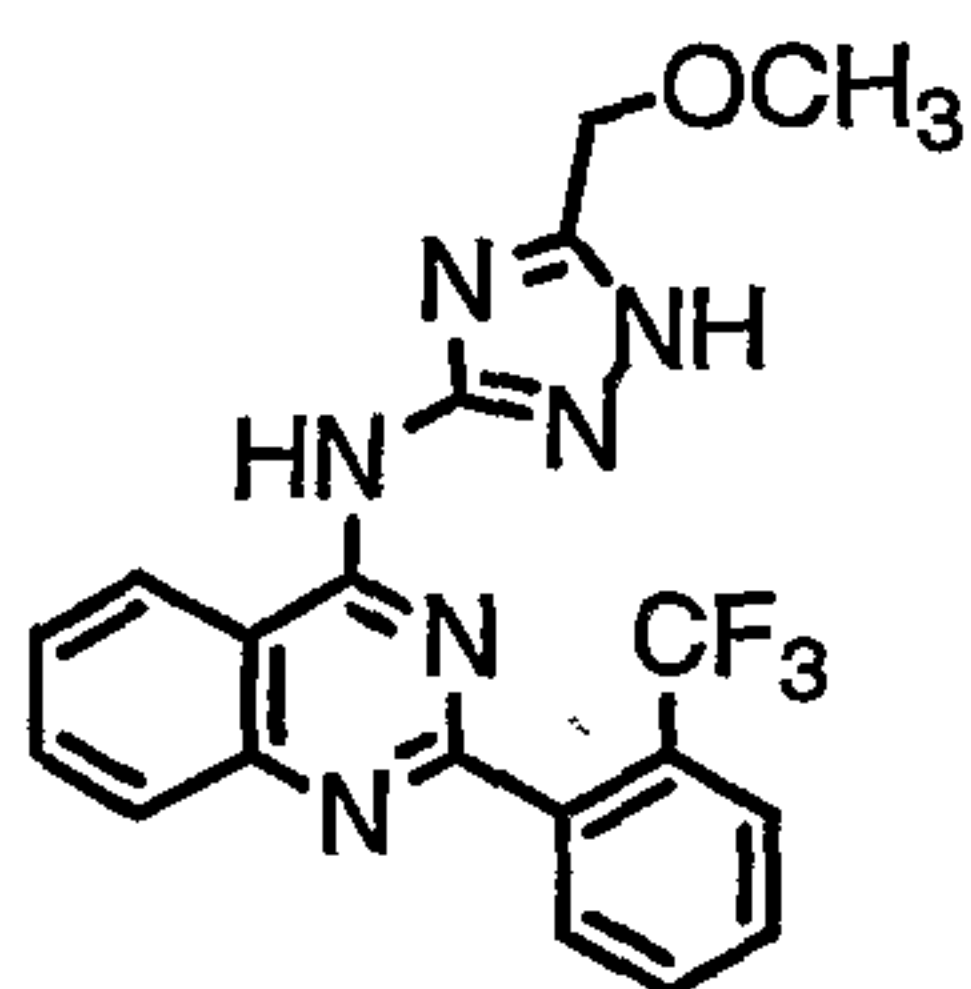
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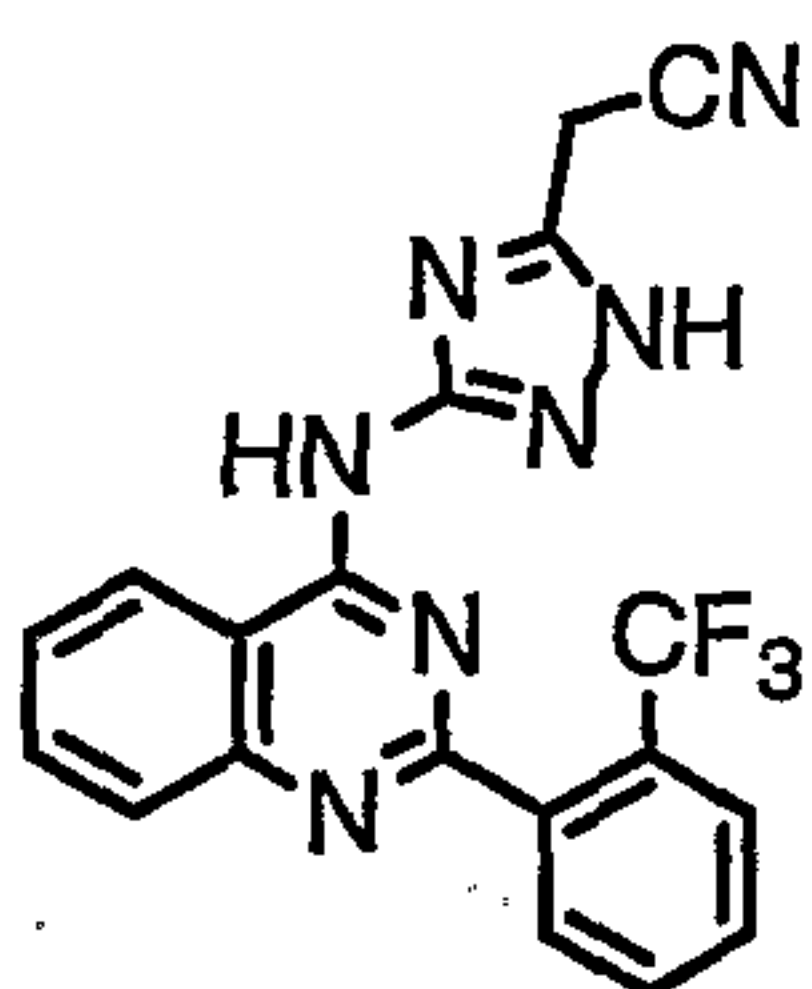
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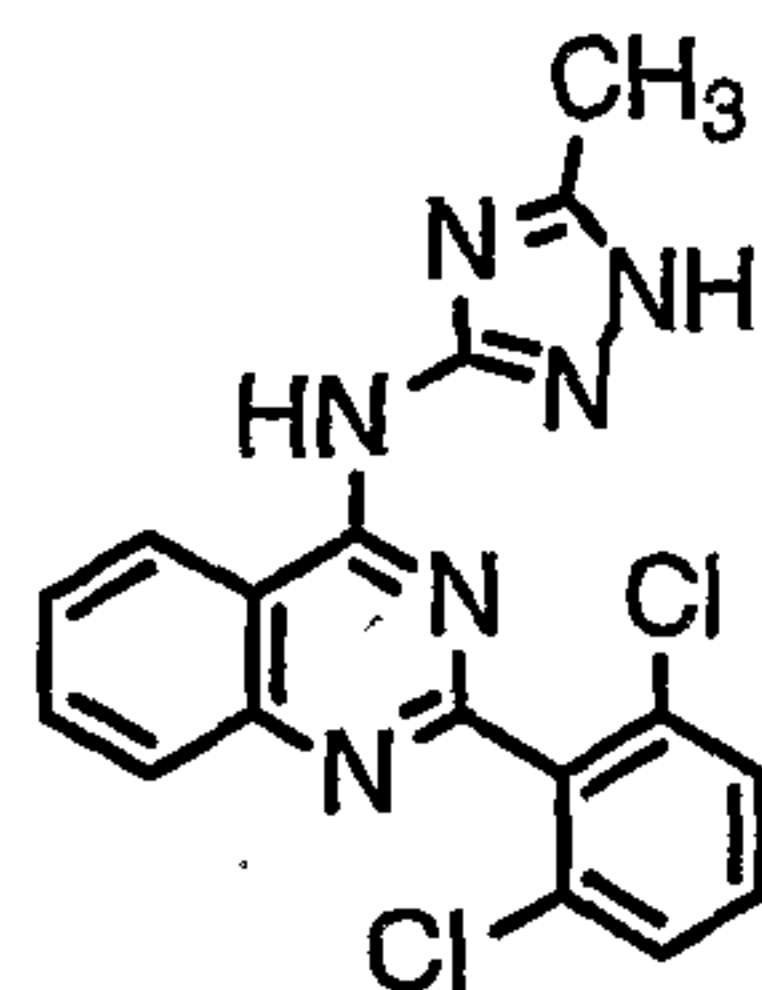
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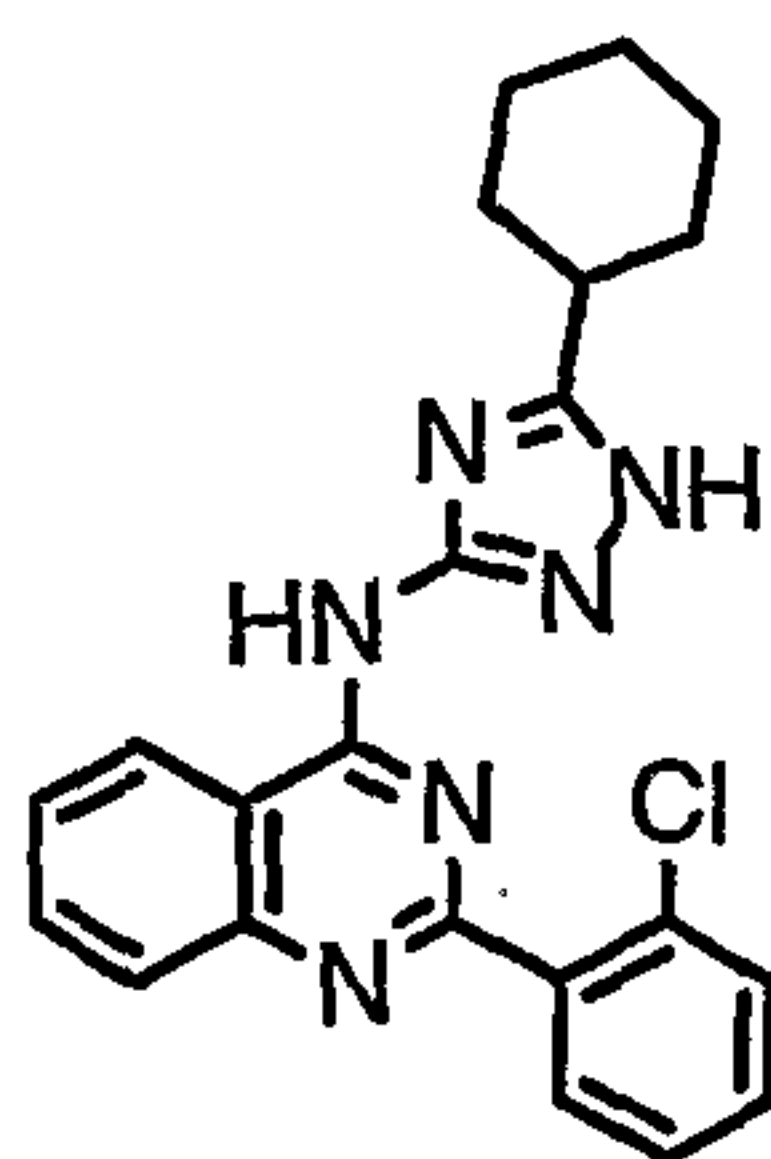
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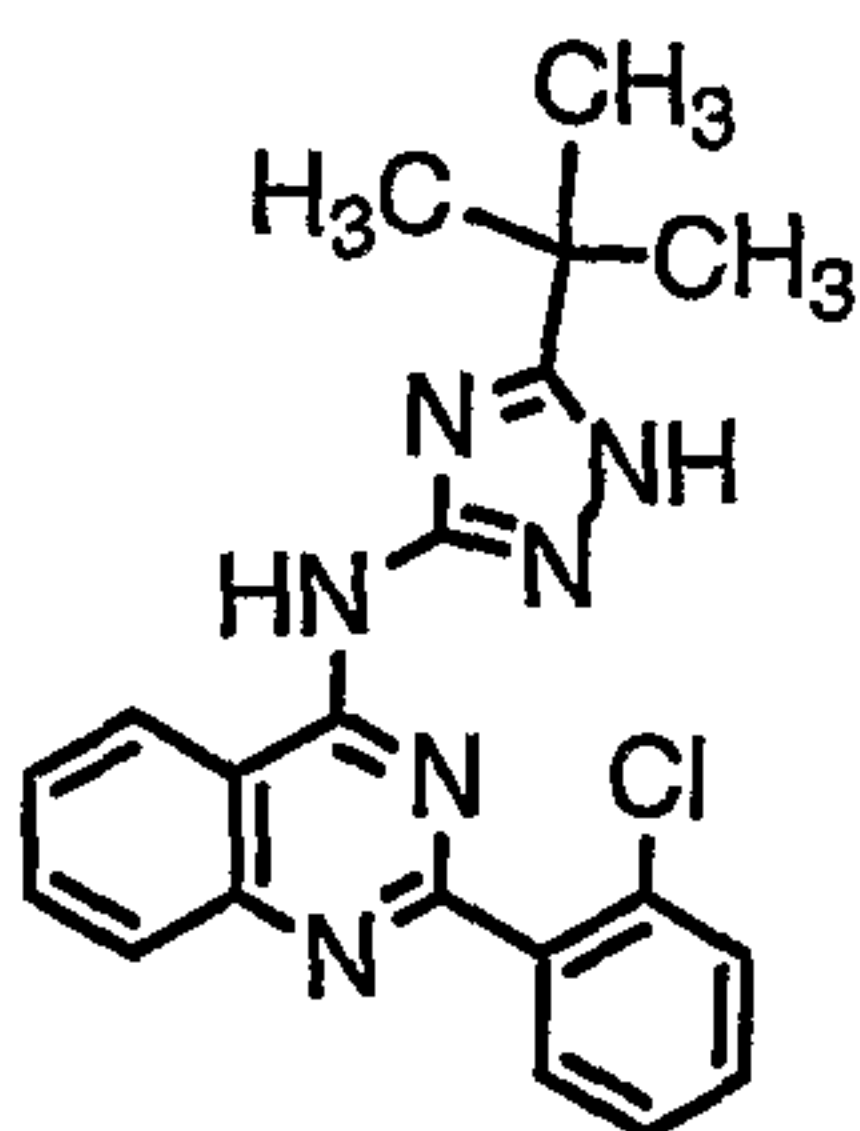
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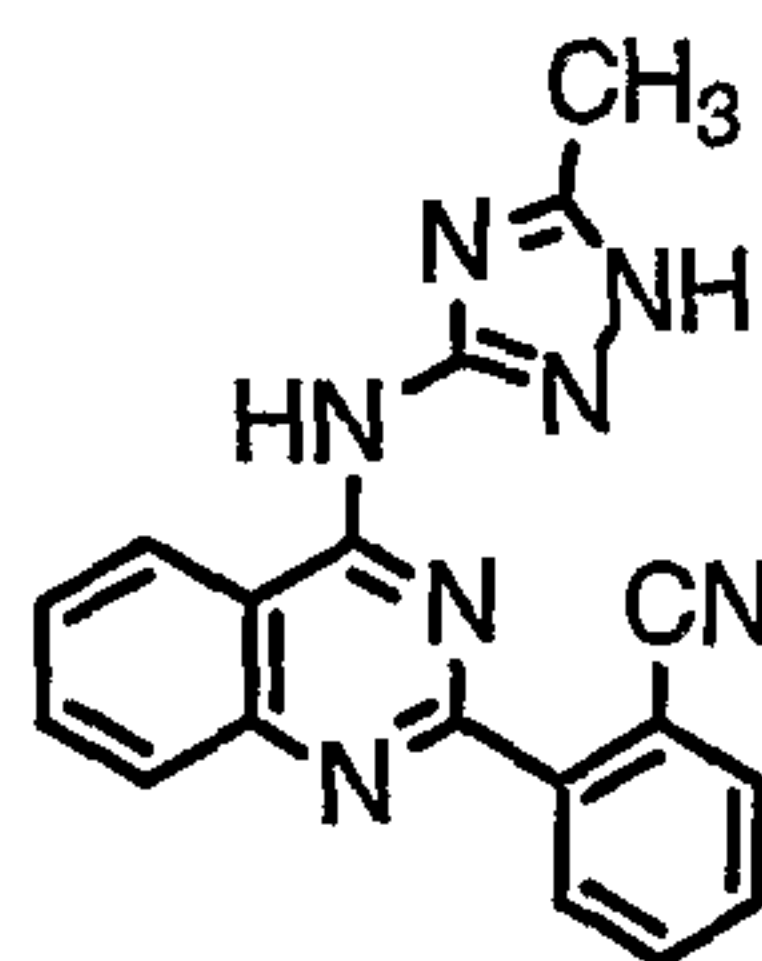
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IX-52



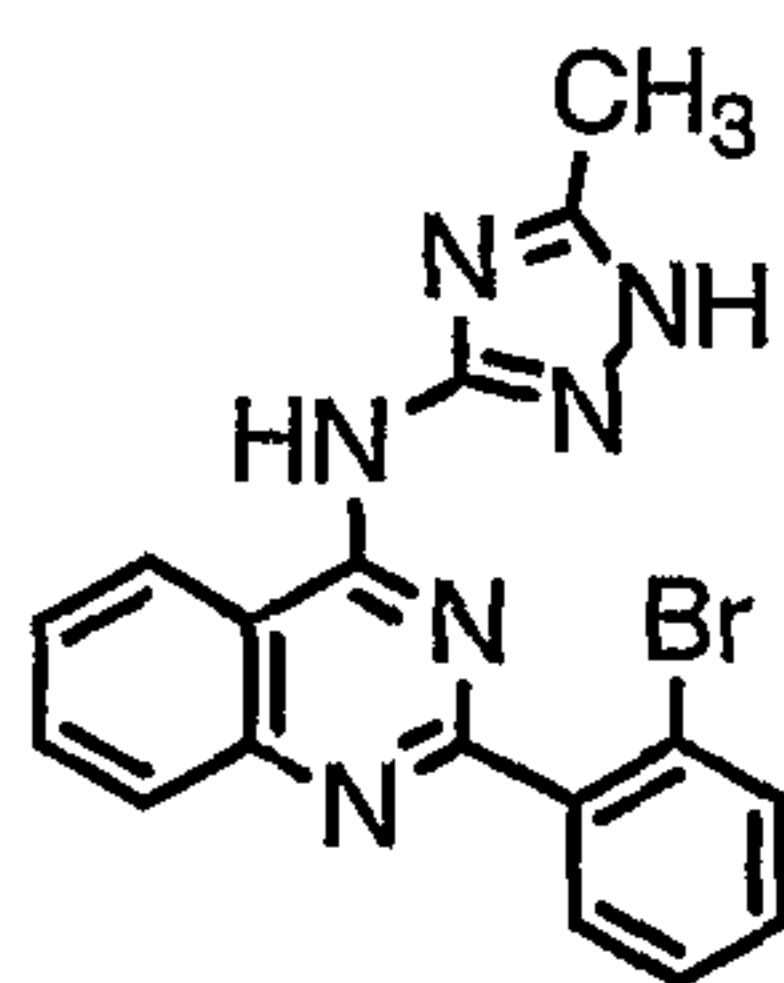
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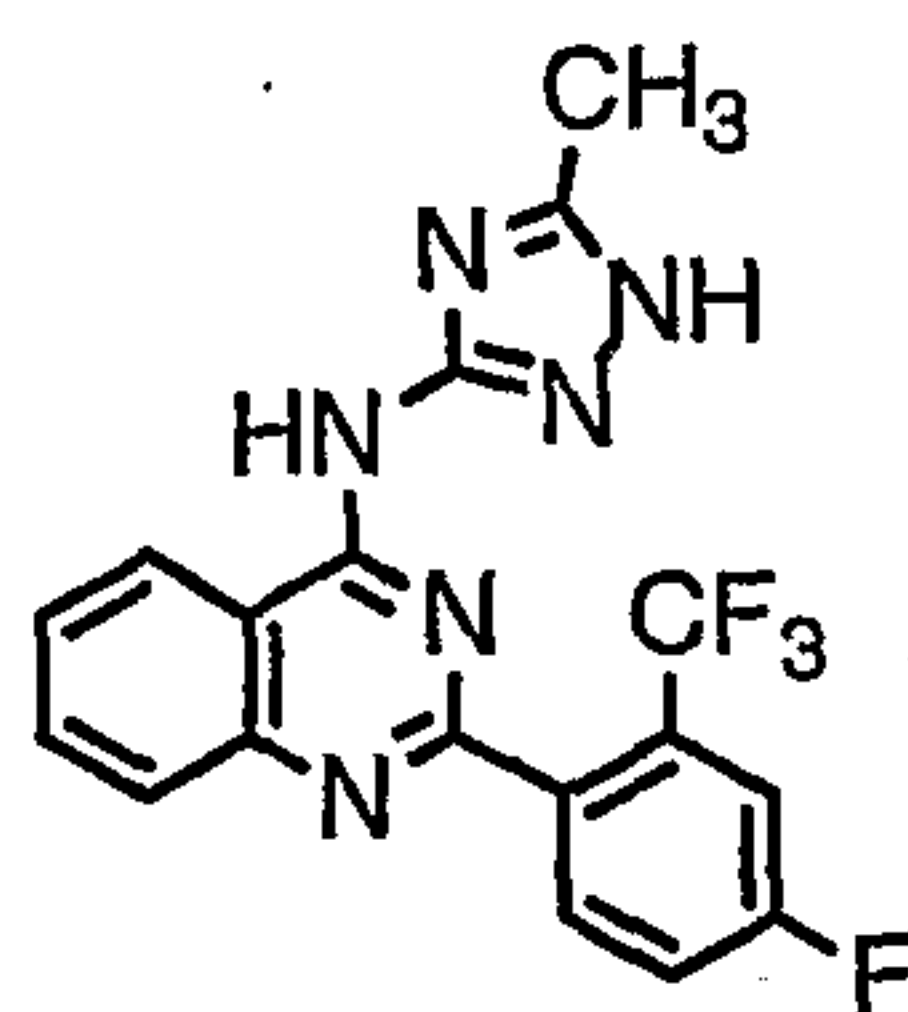
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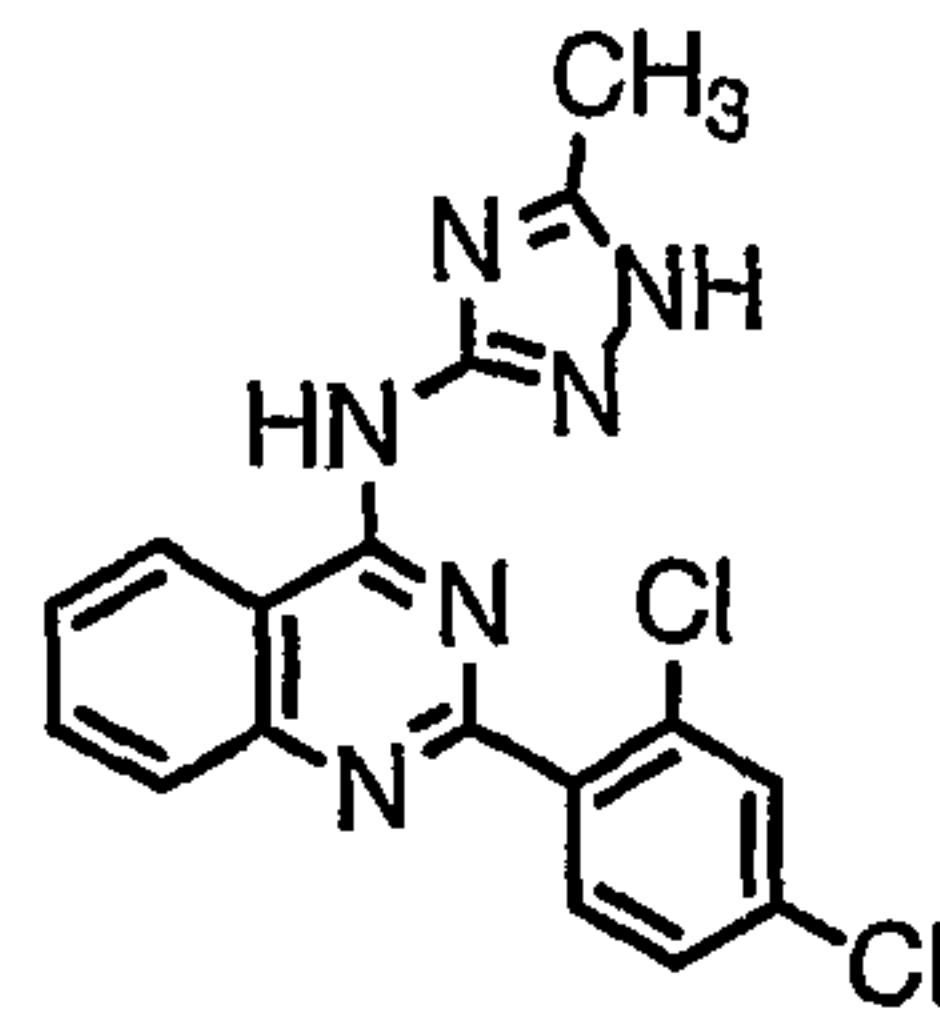
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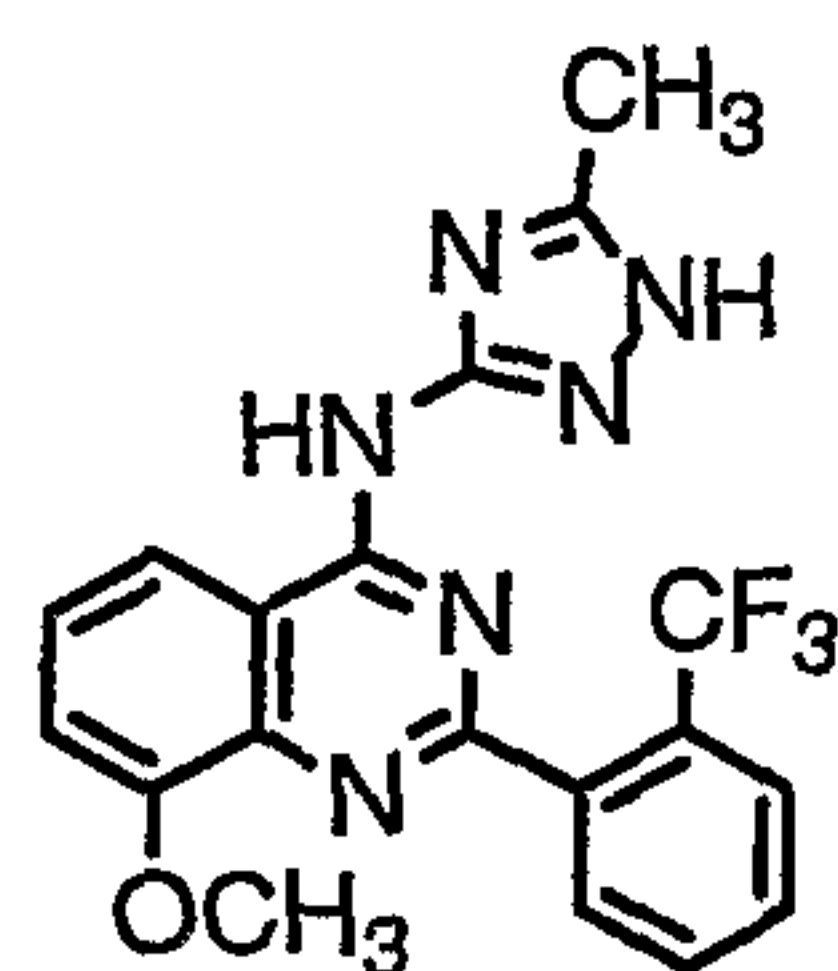
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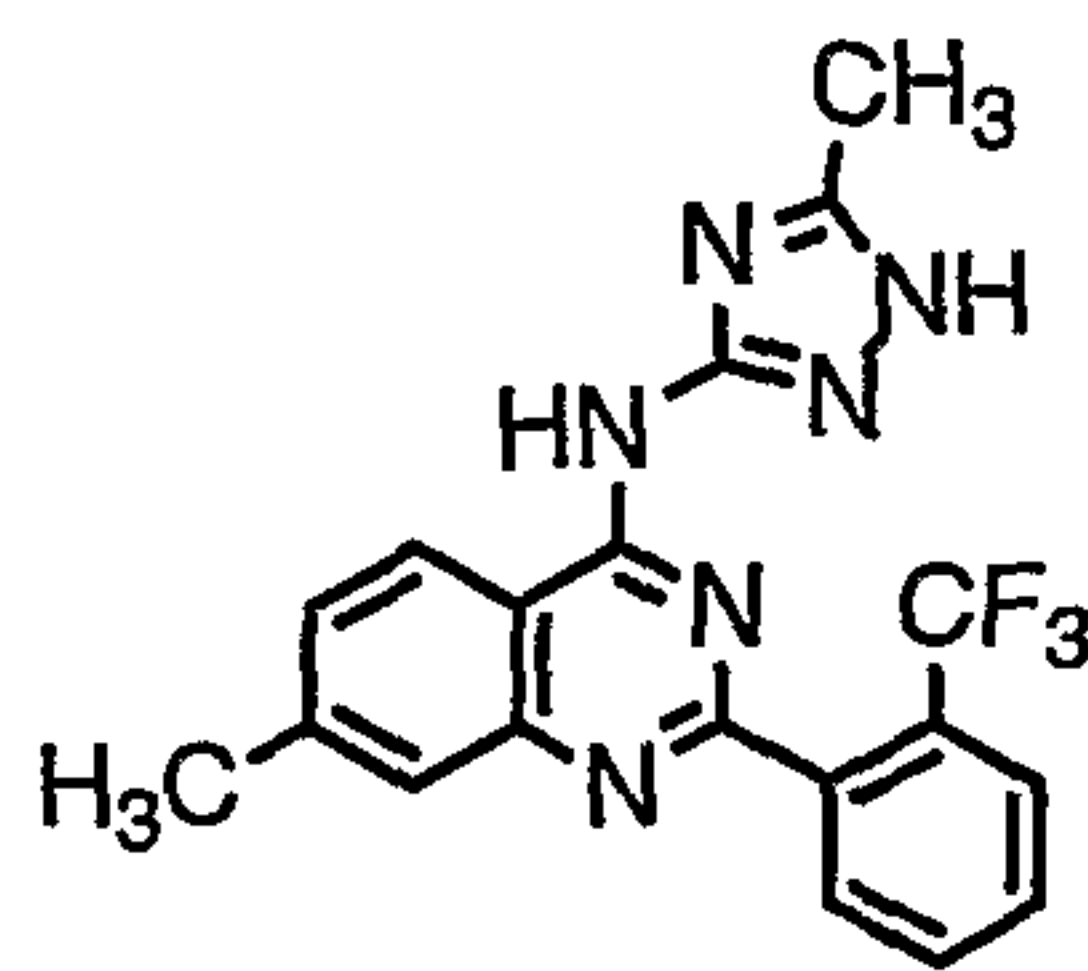
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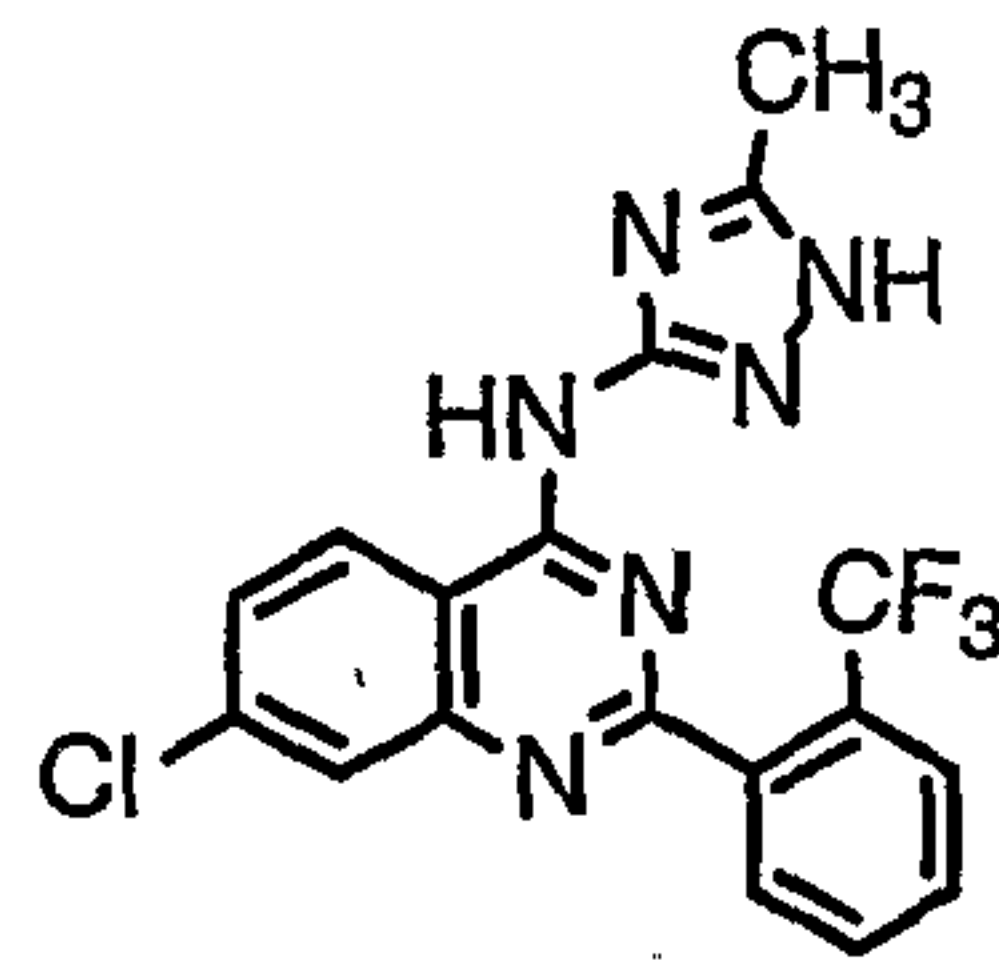
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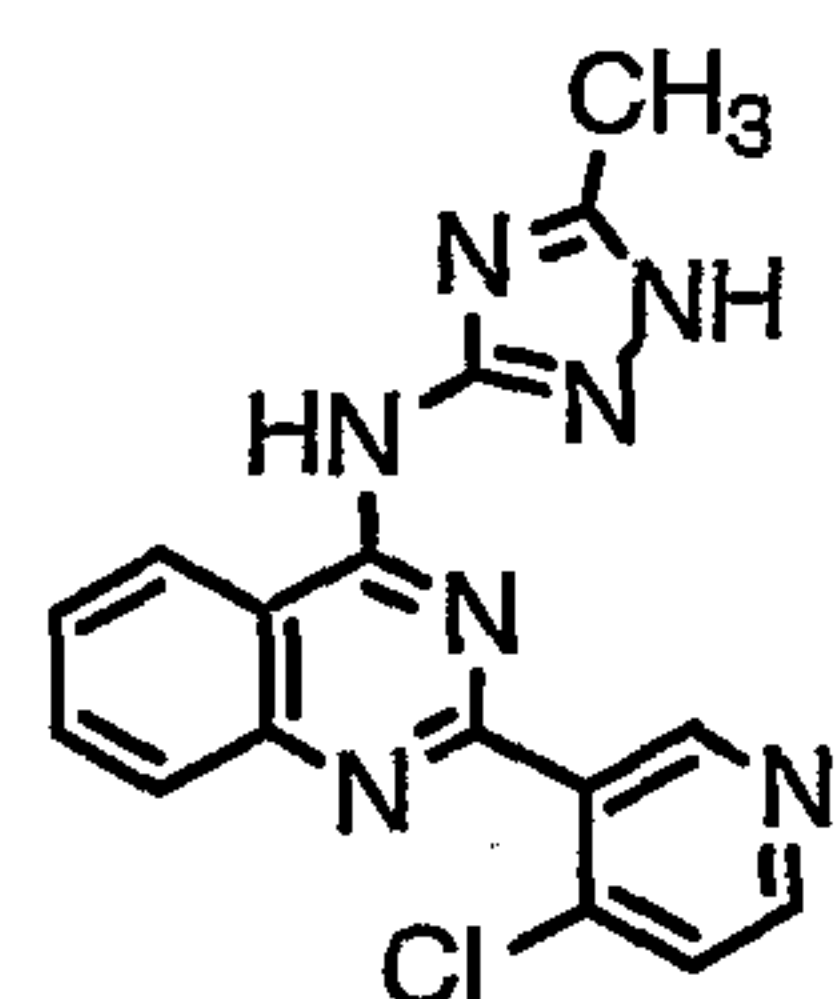
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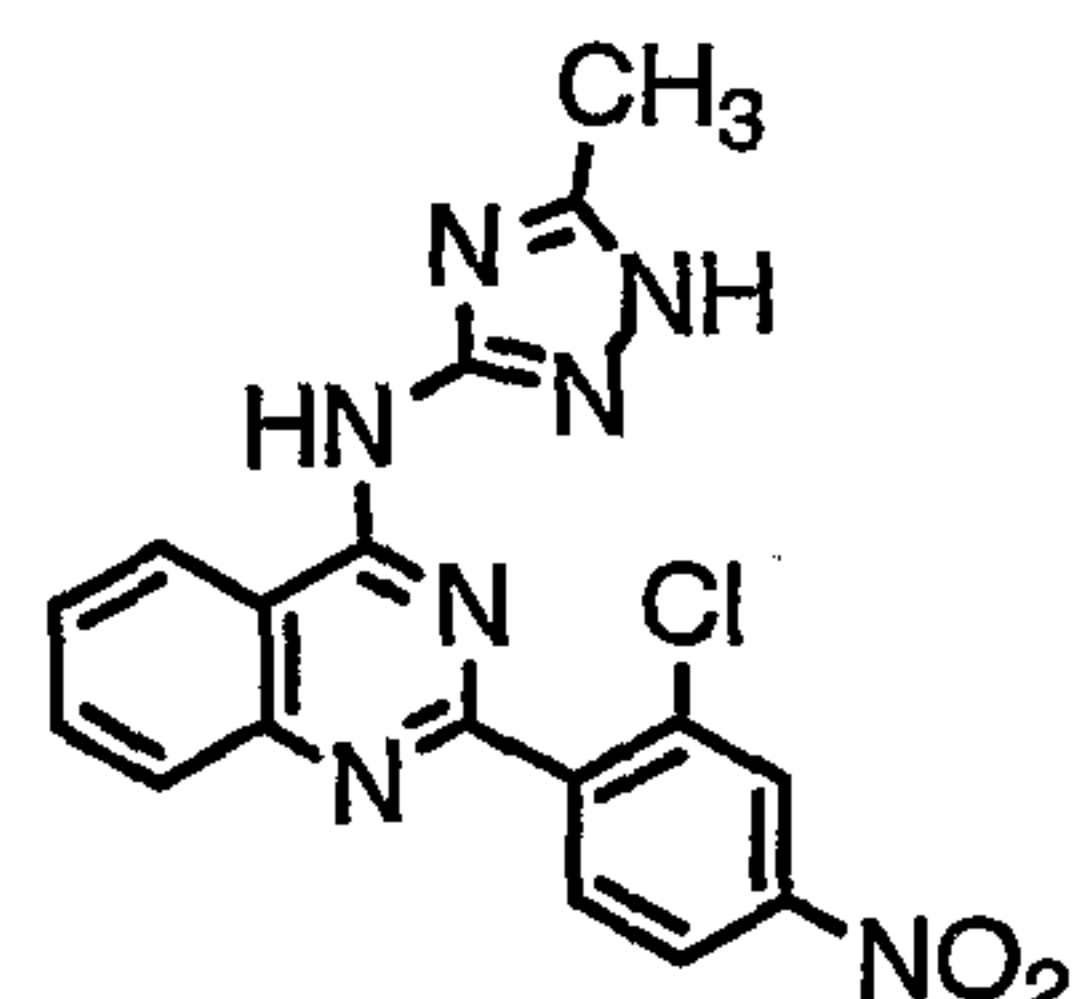
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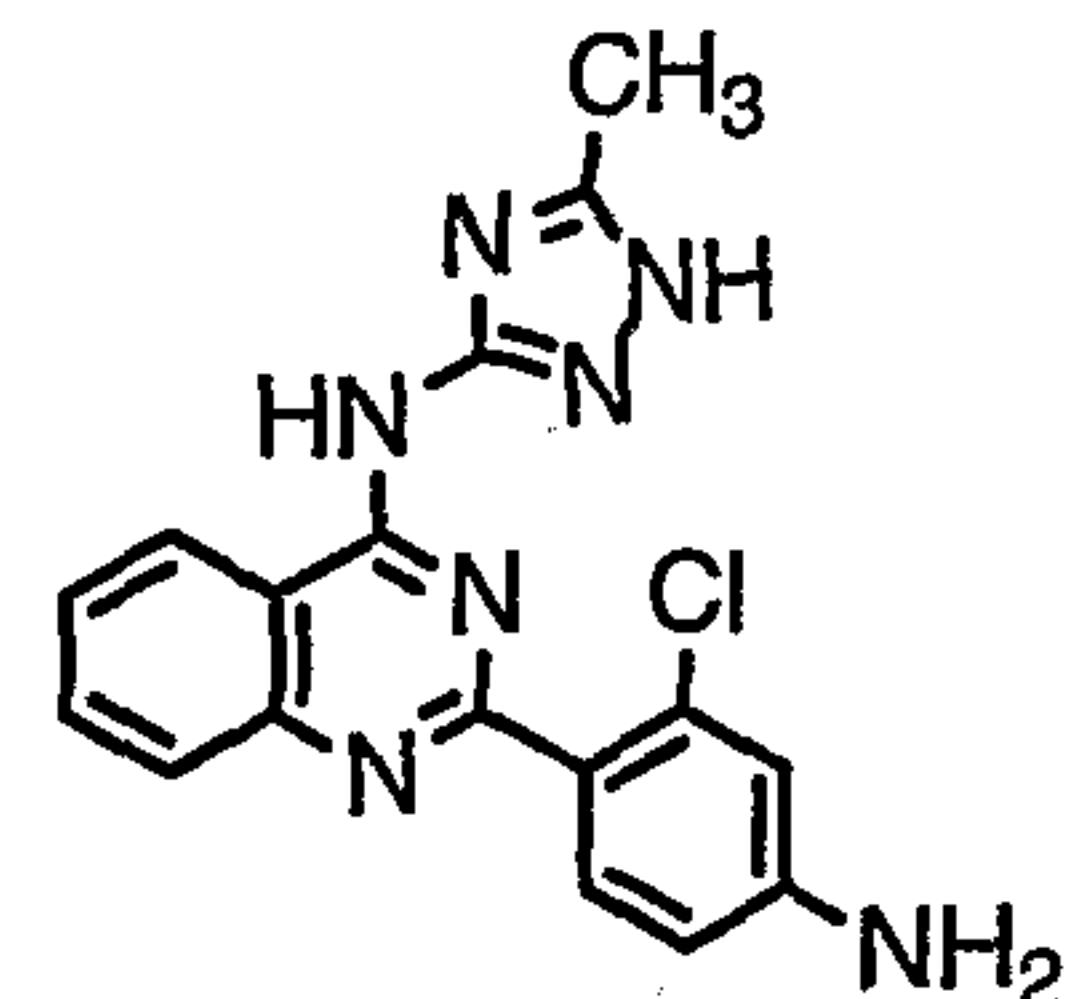
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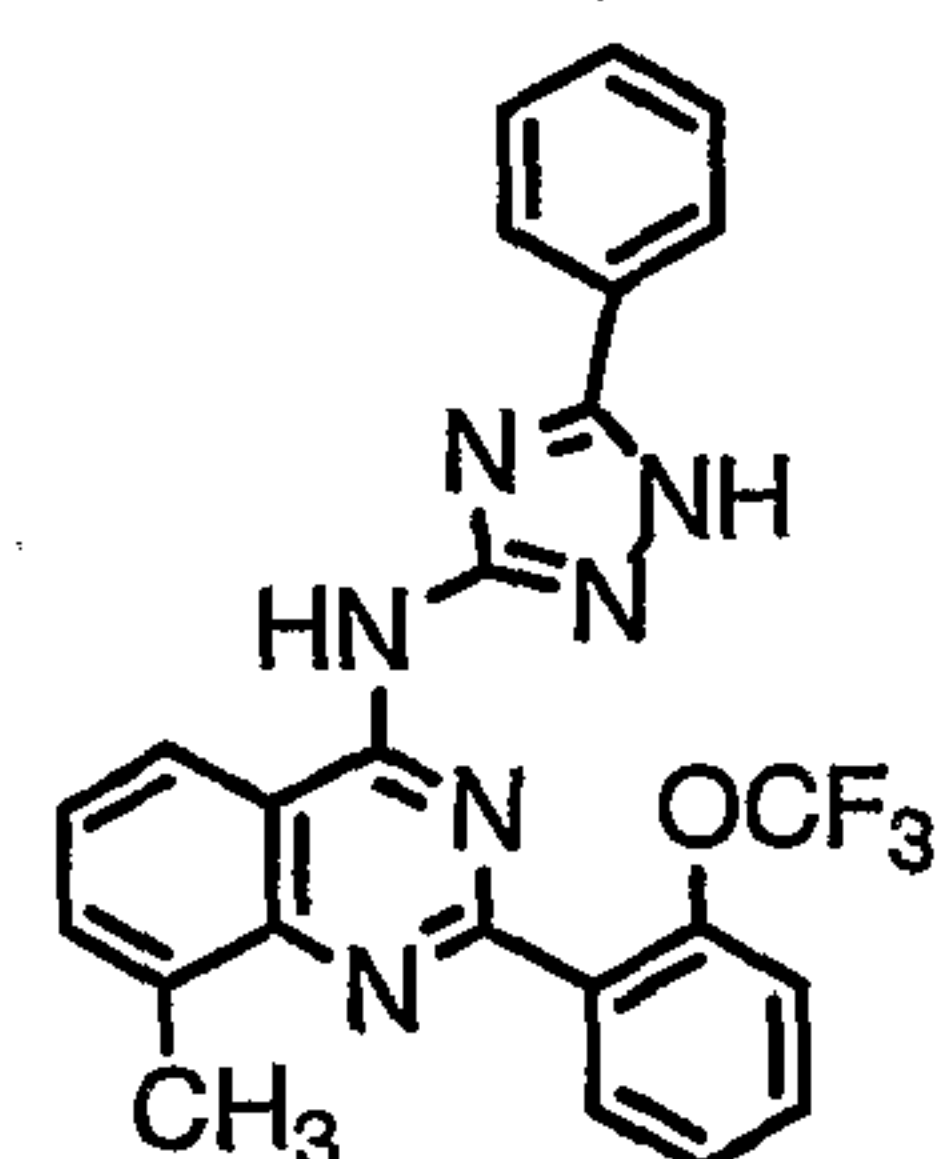
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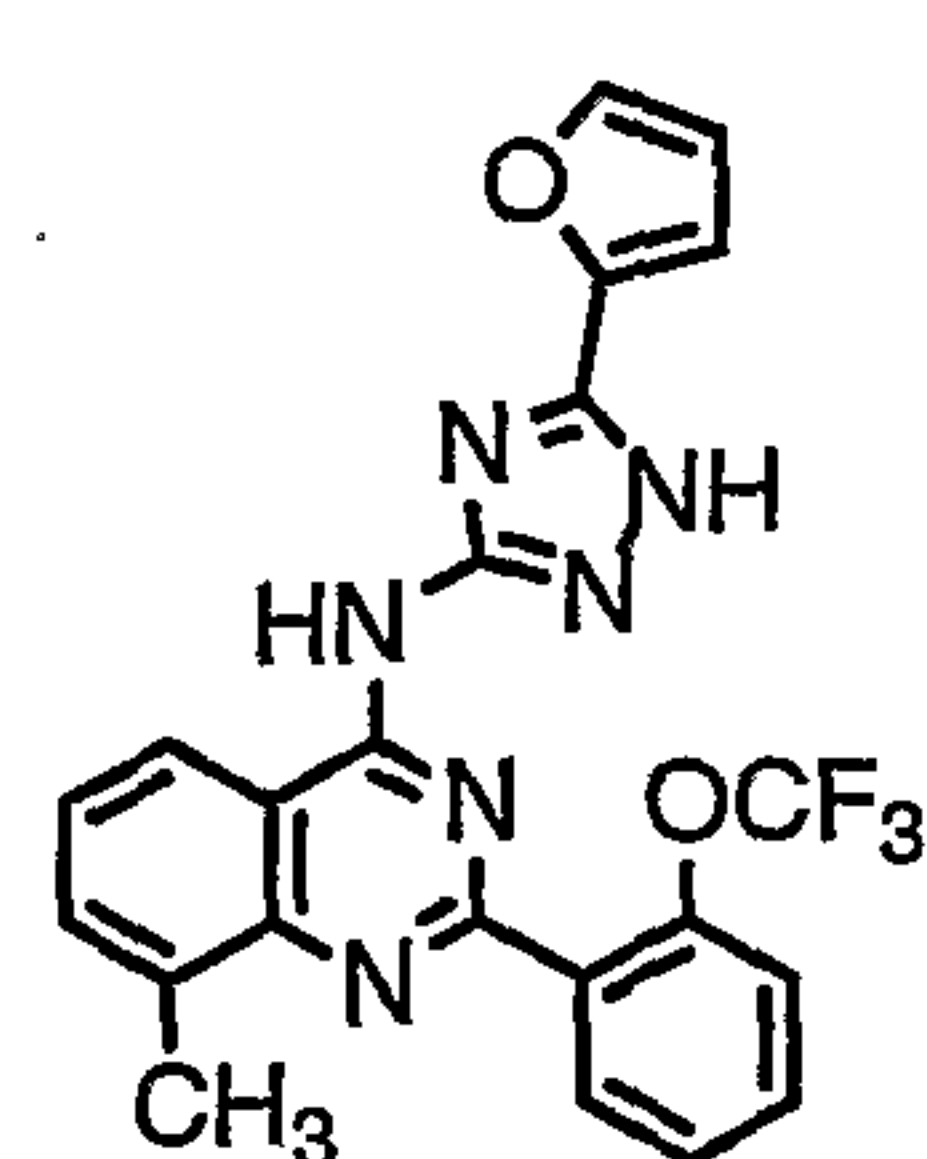
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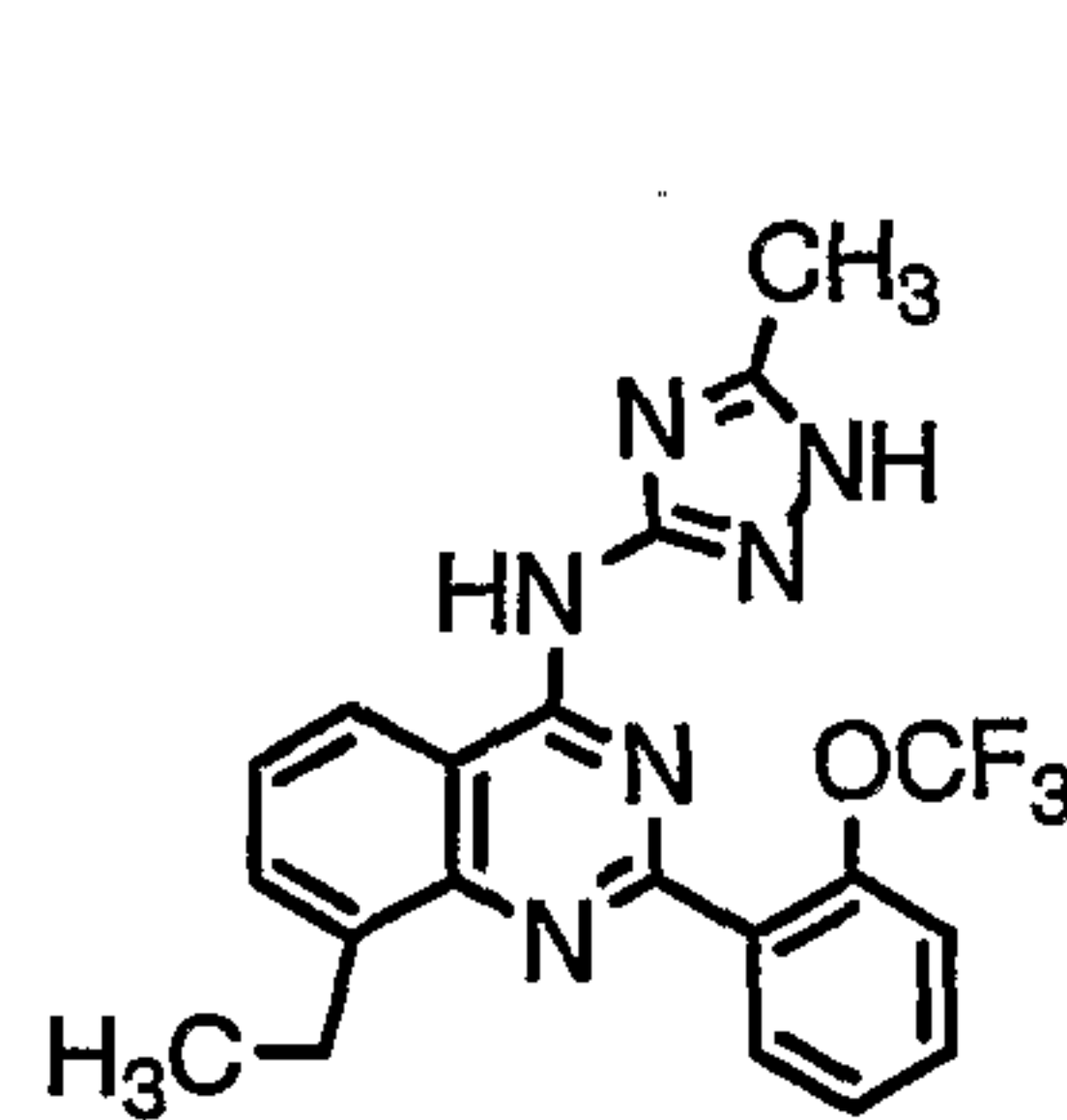
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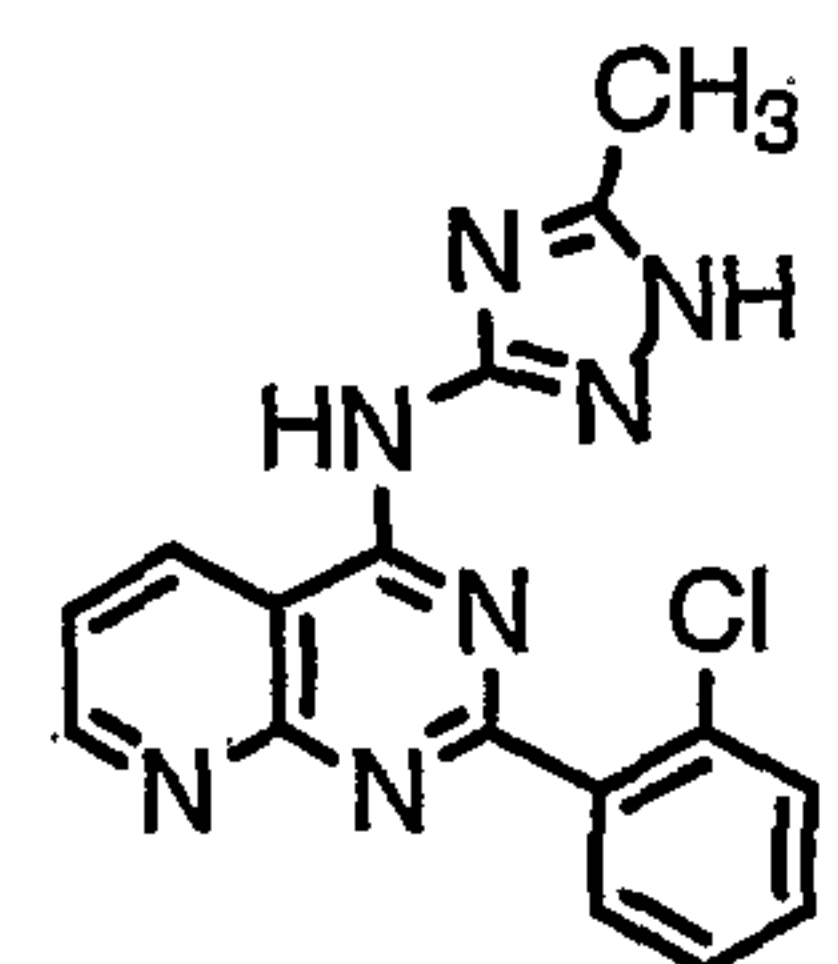
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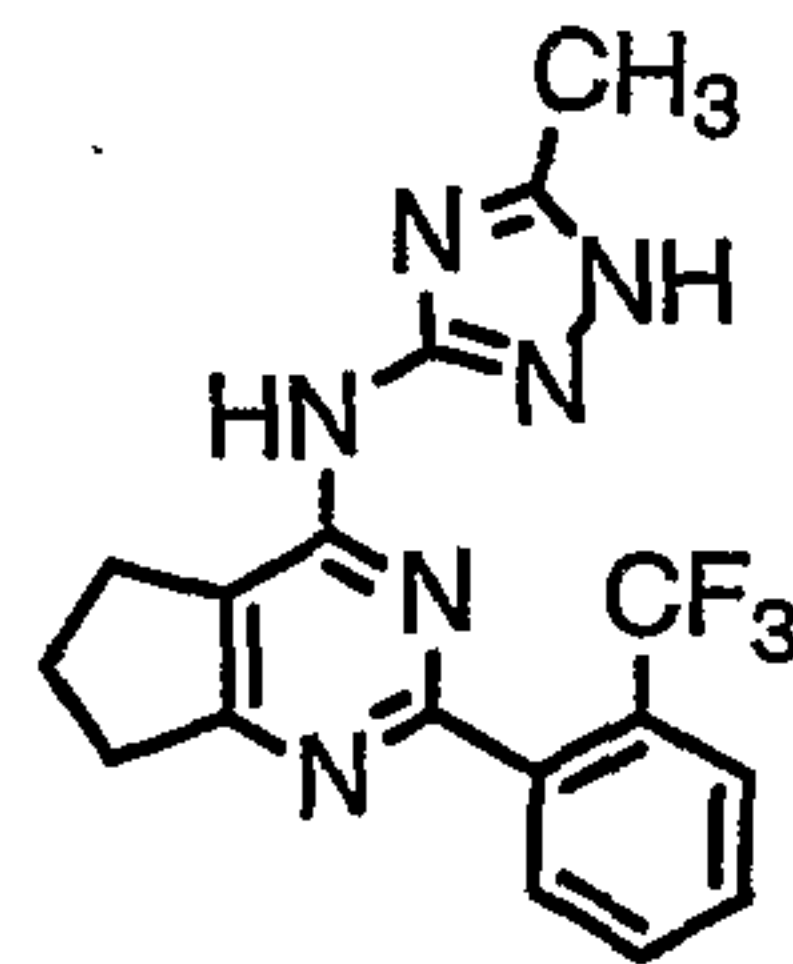
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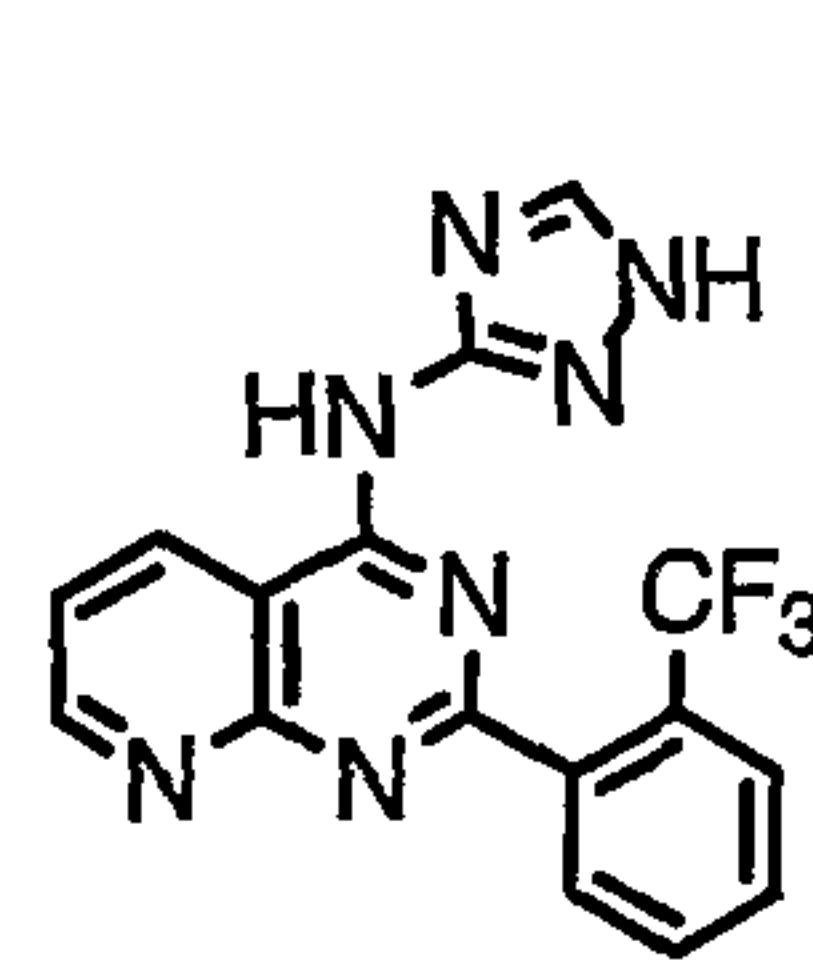
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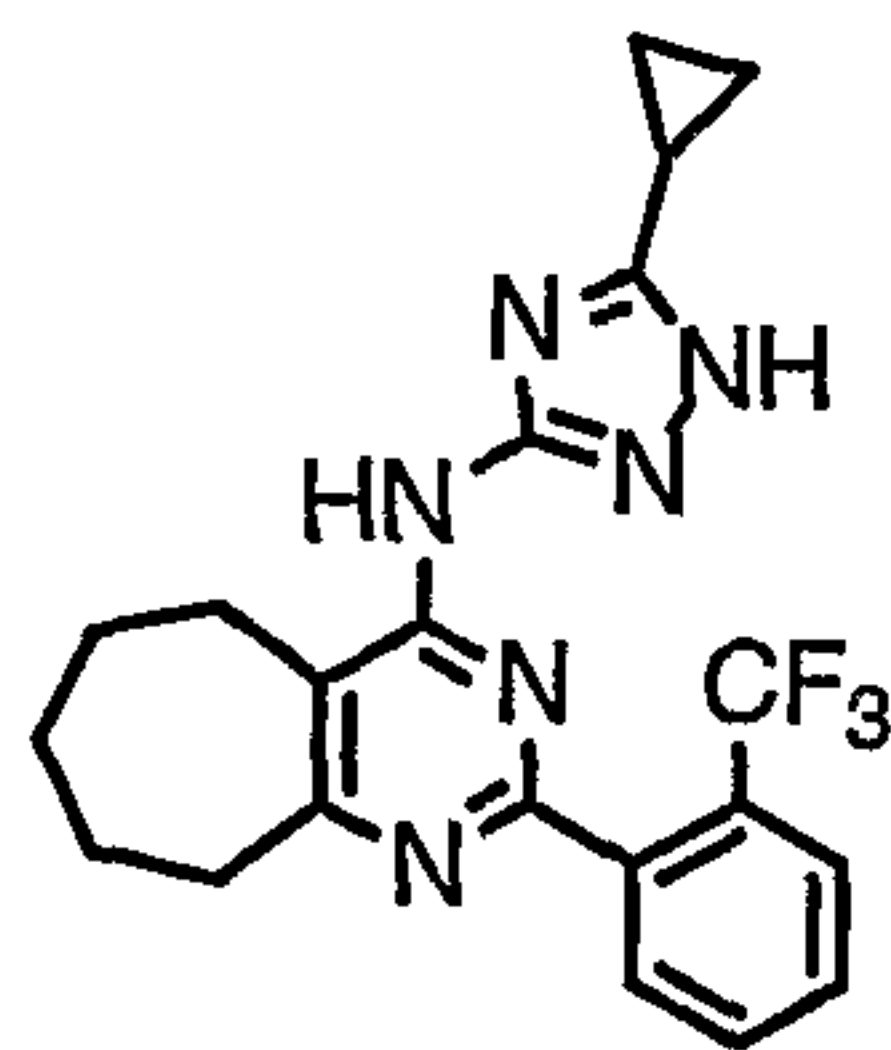
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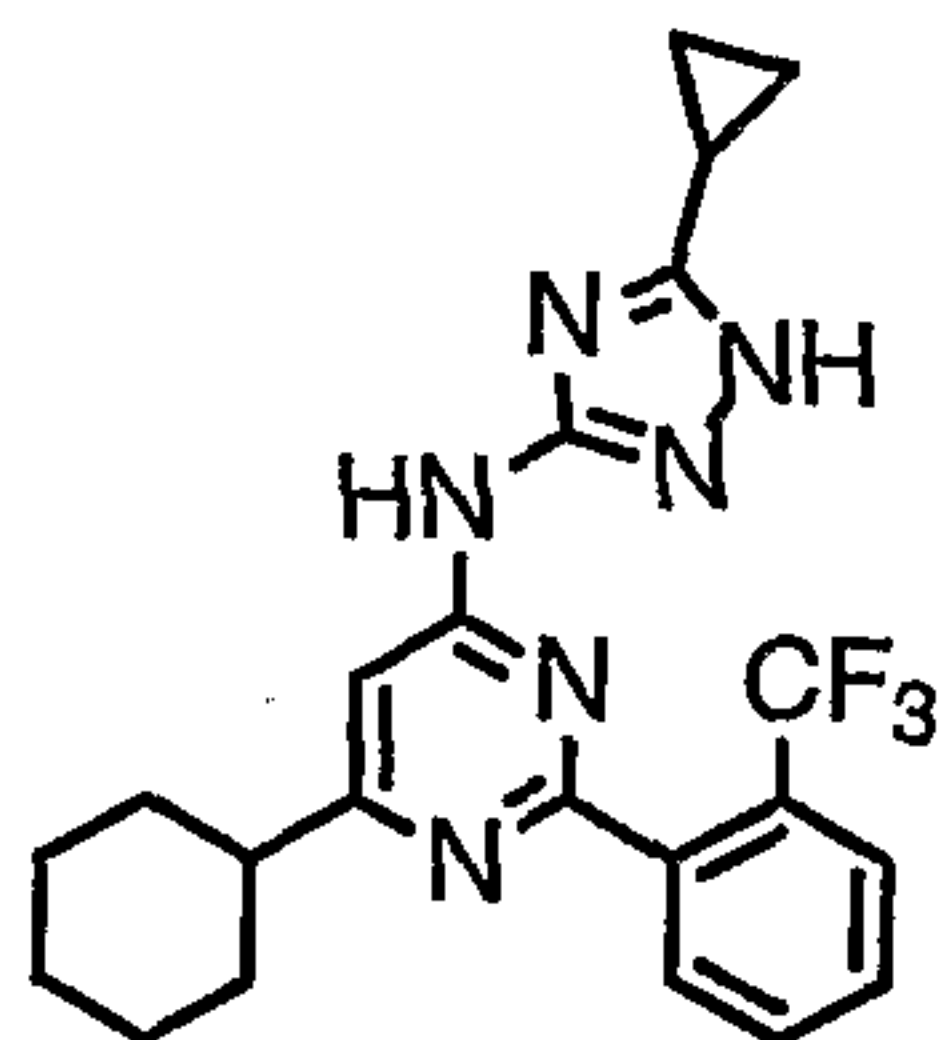
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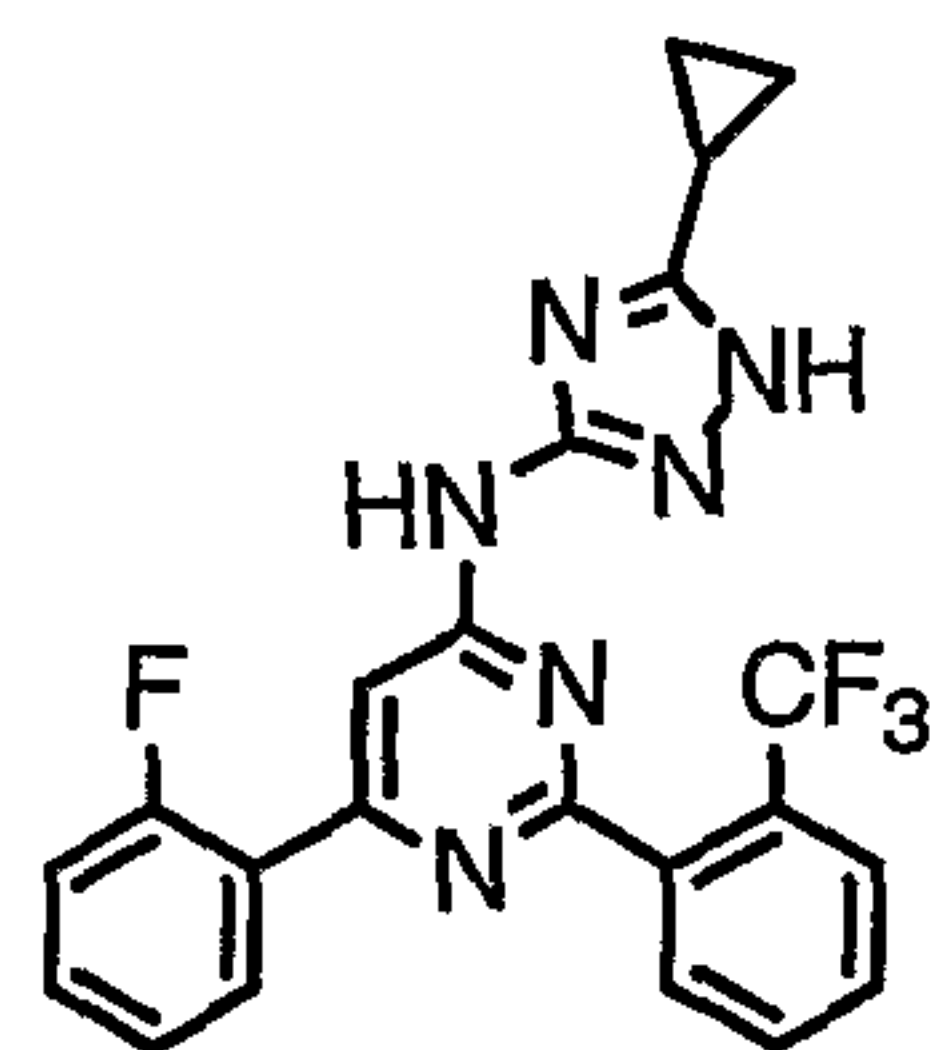
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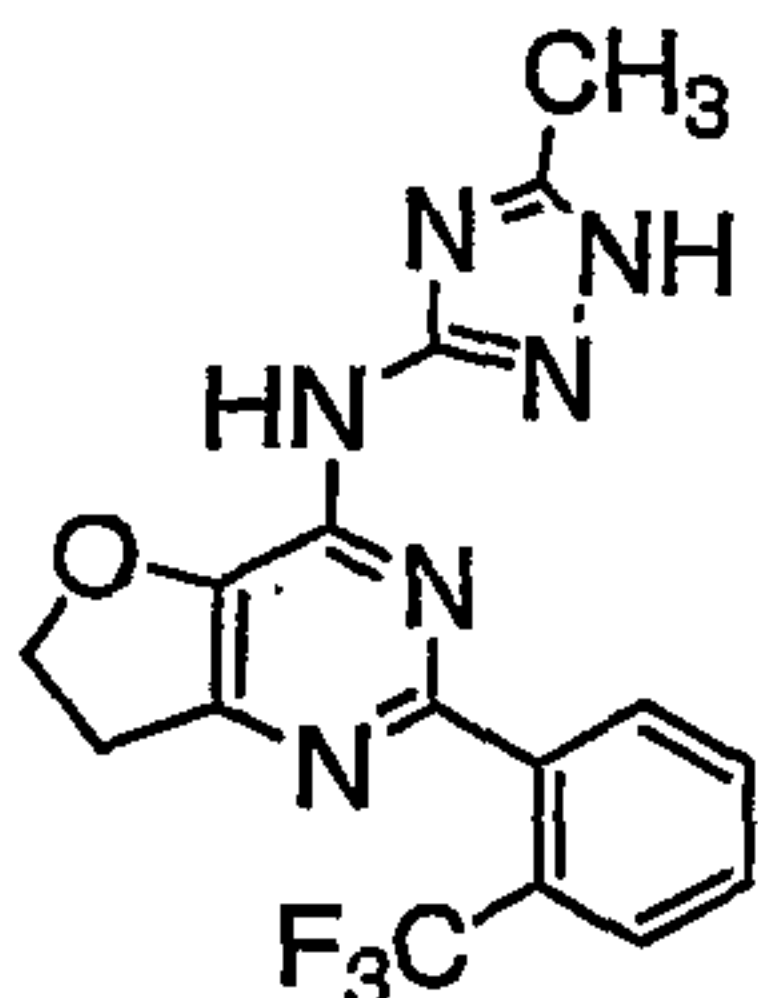
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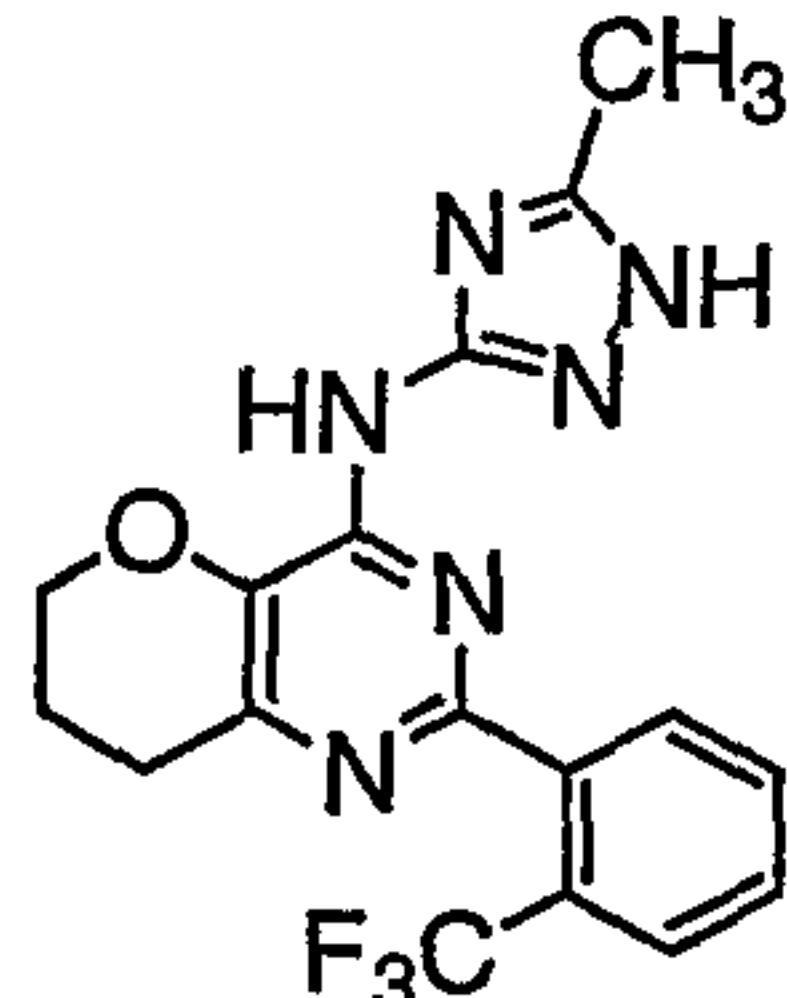
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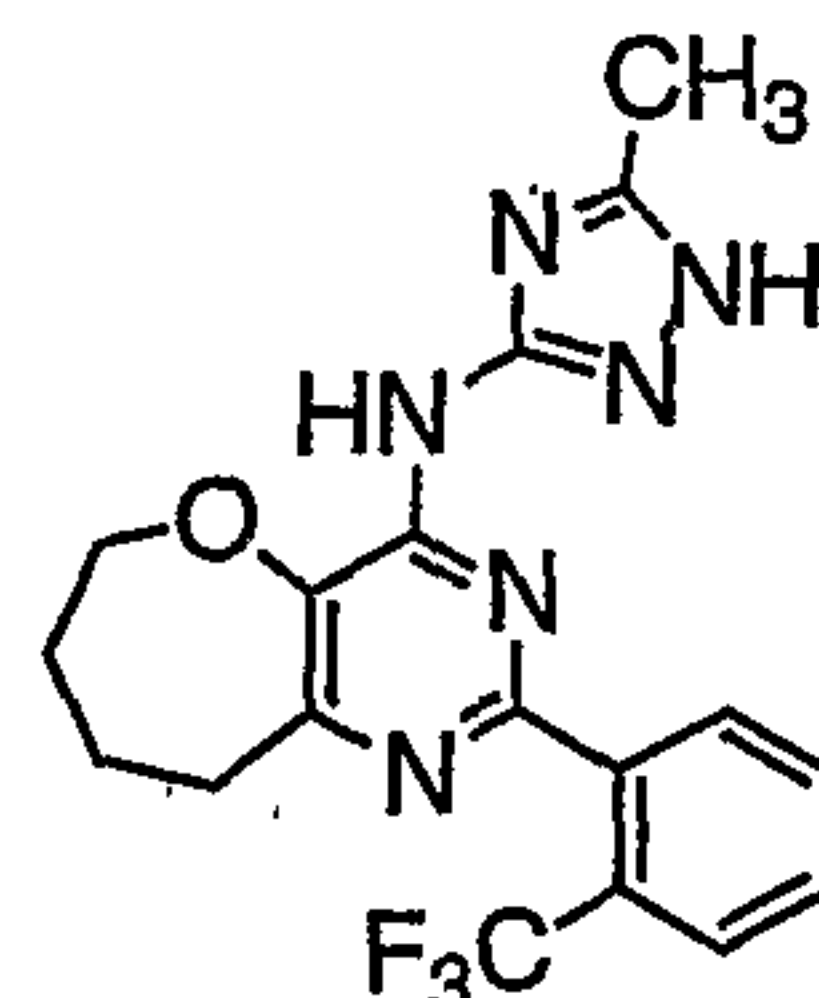
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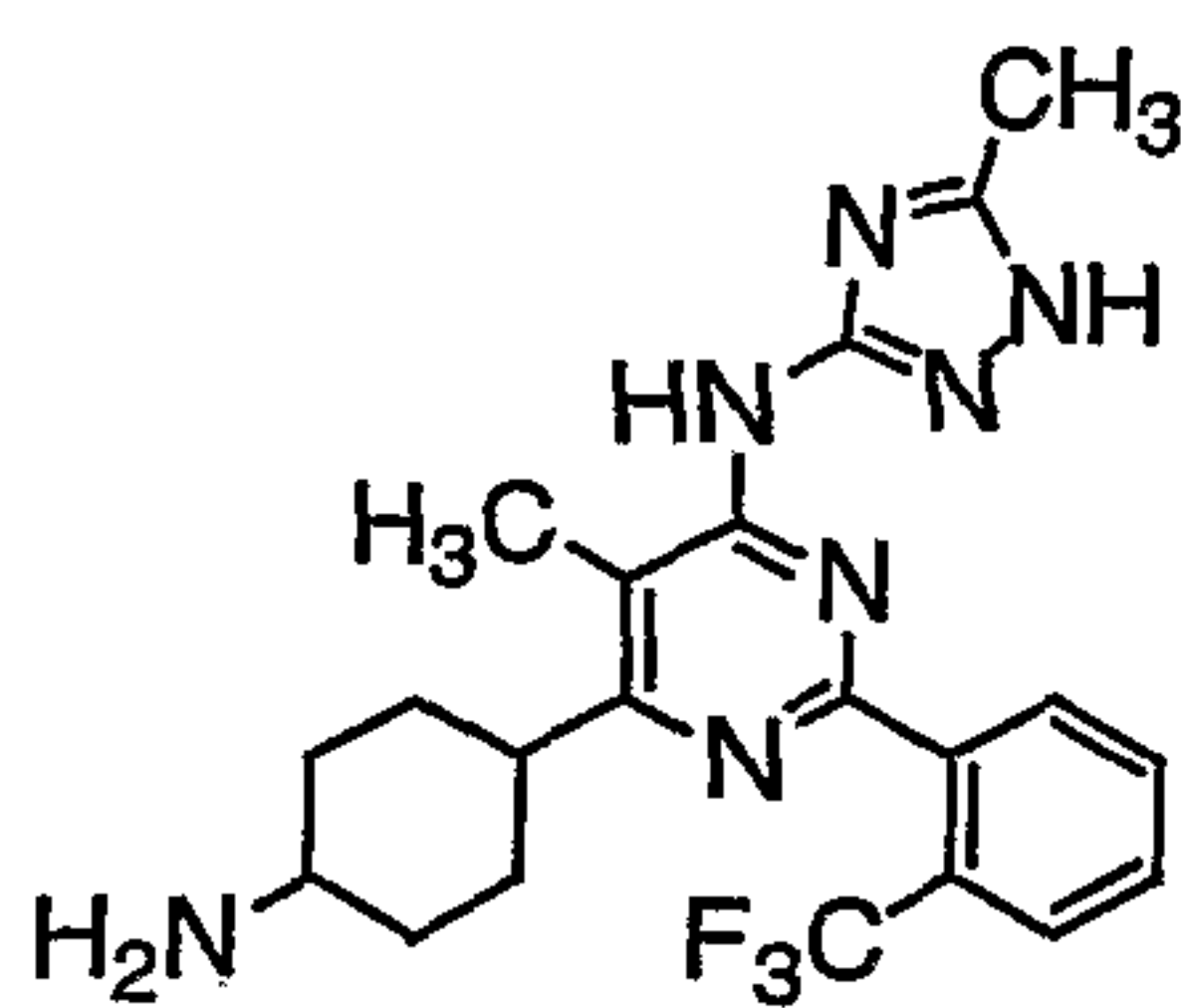


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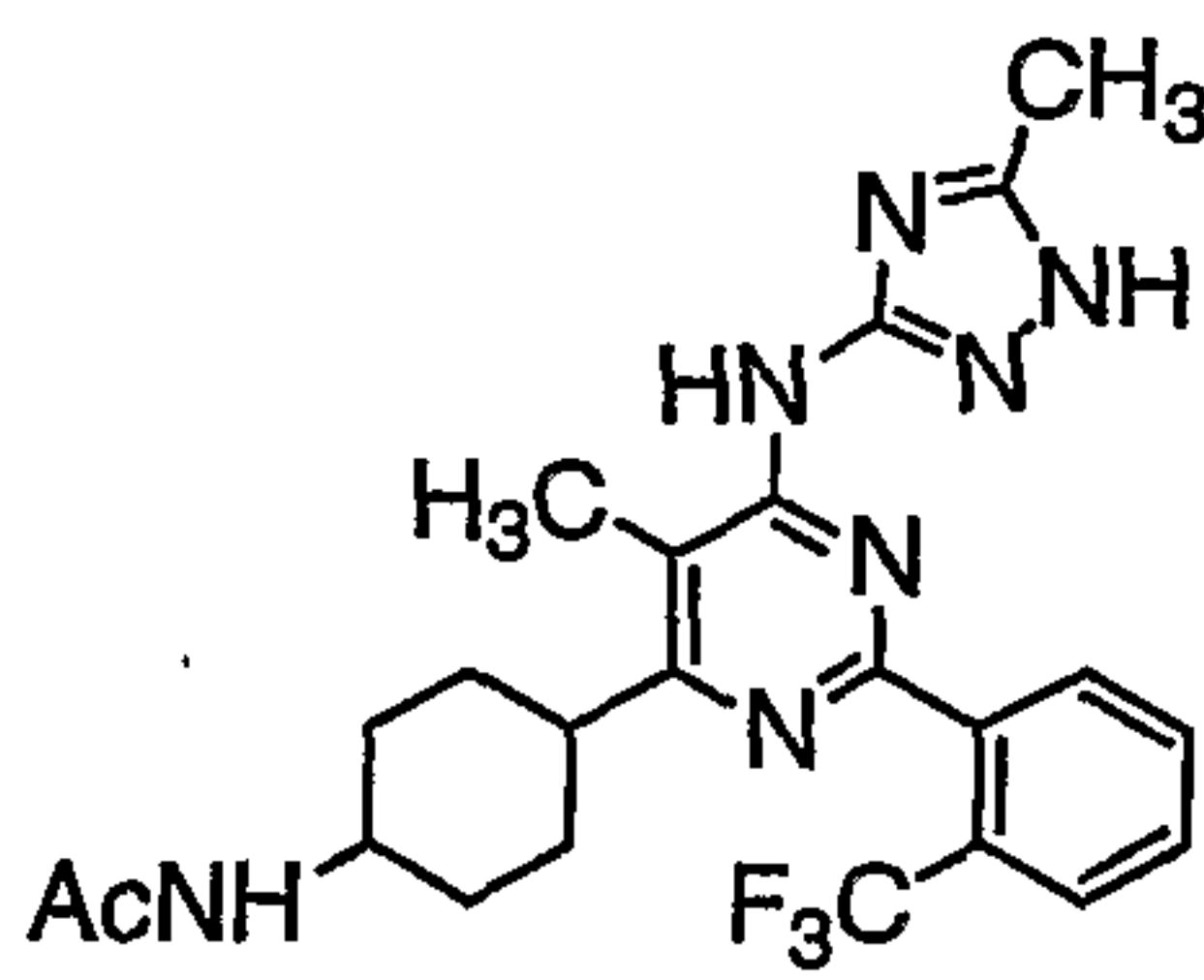


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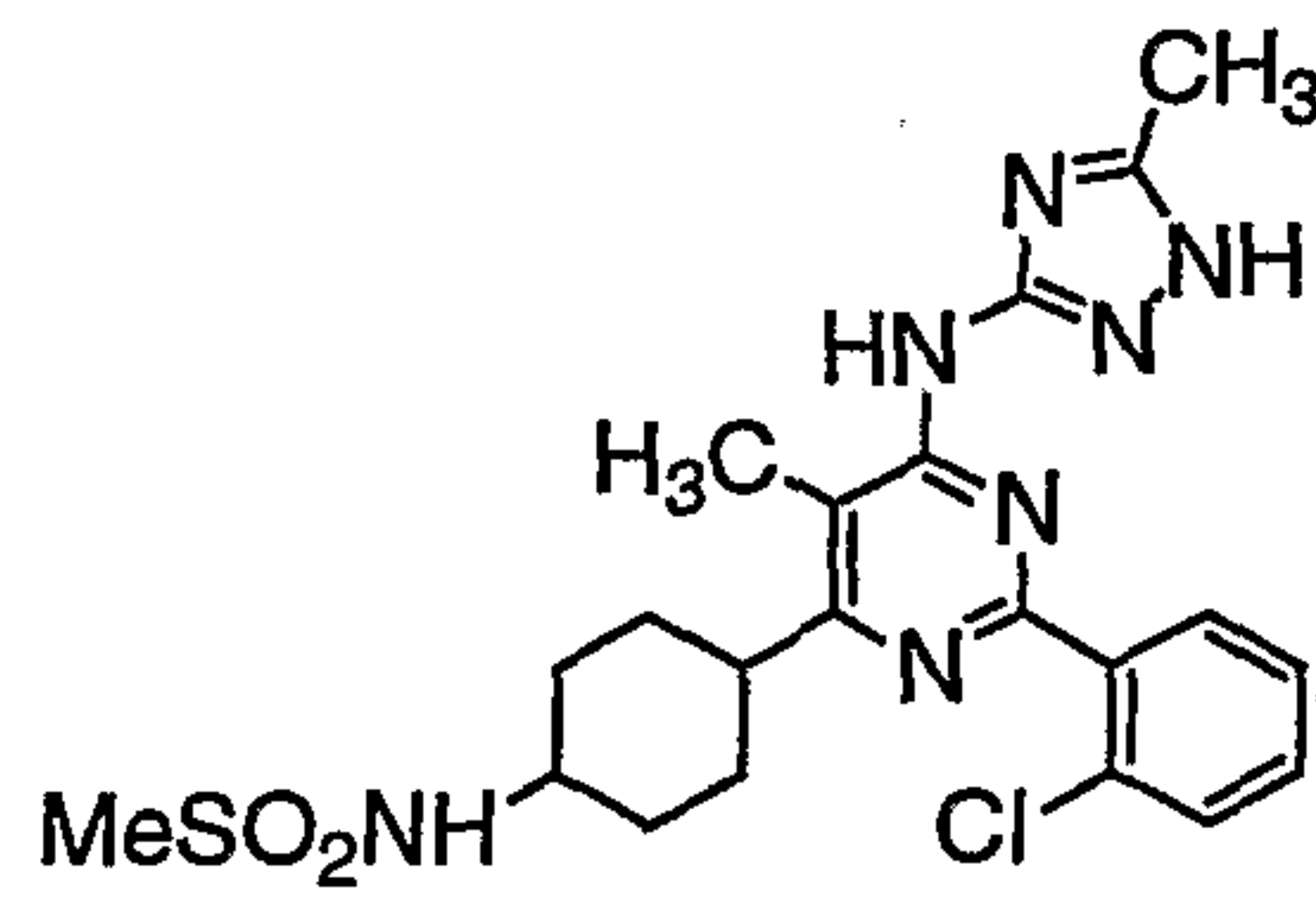
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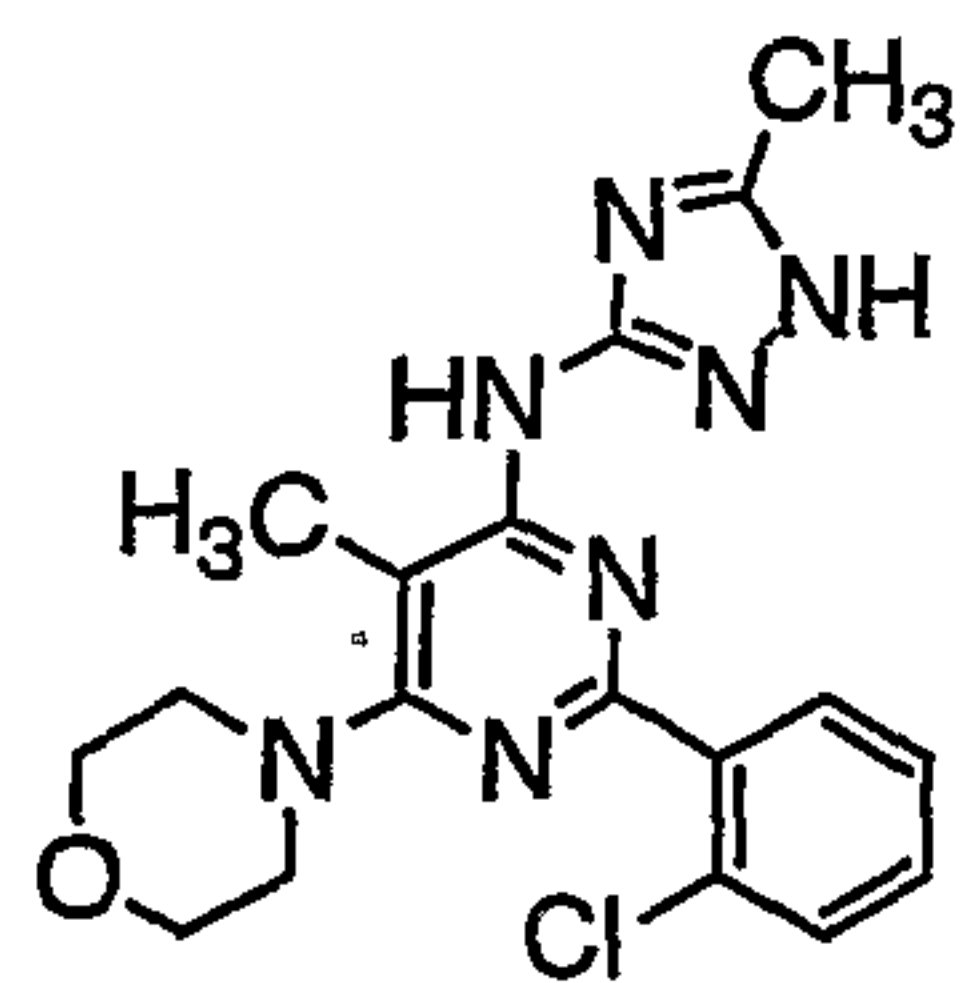


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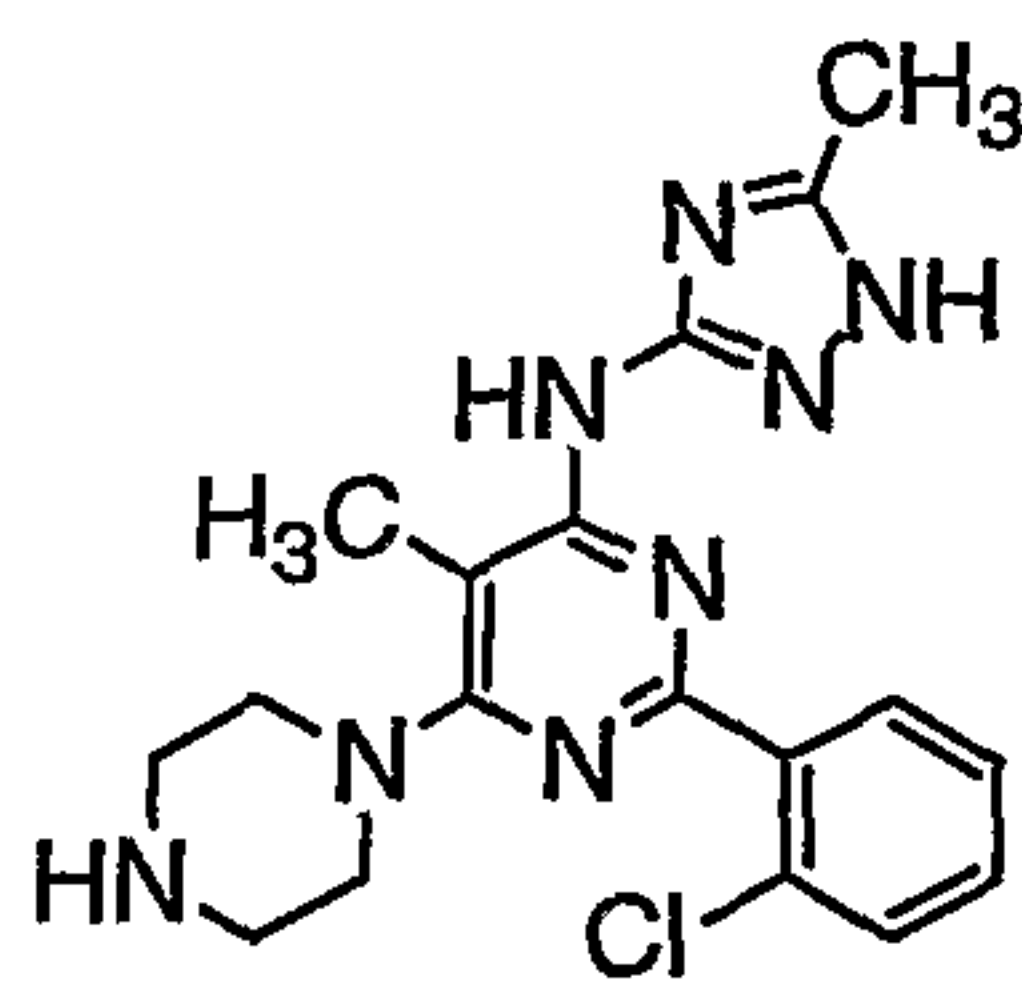


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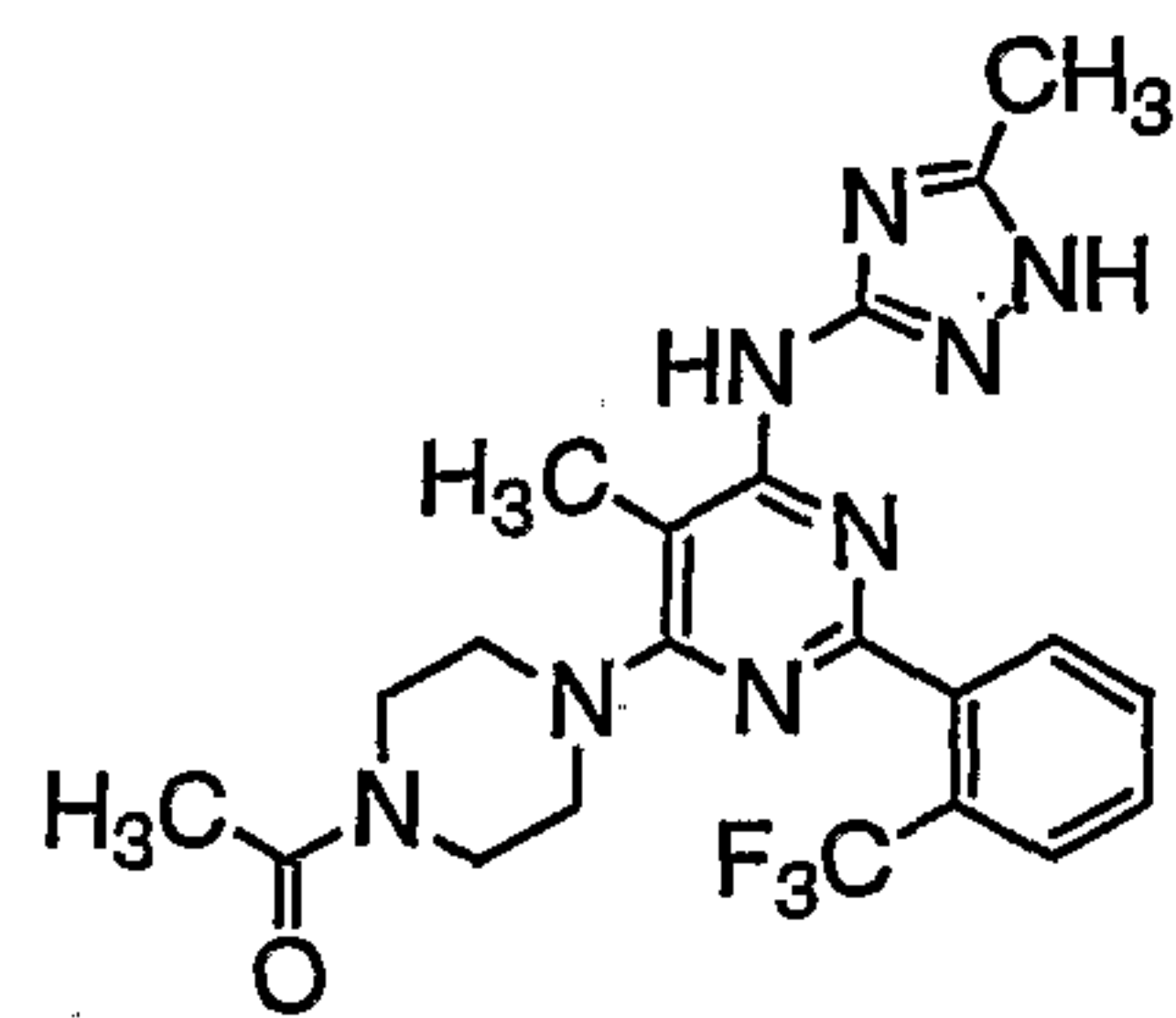
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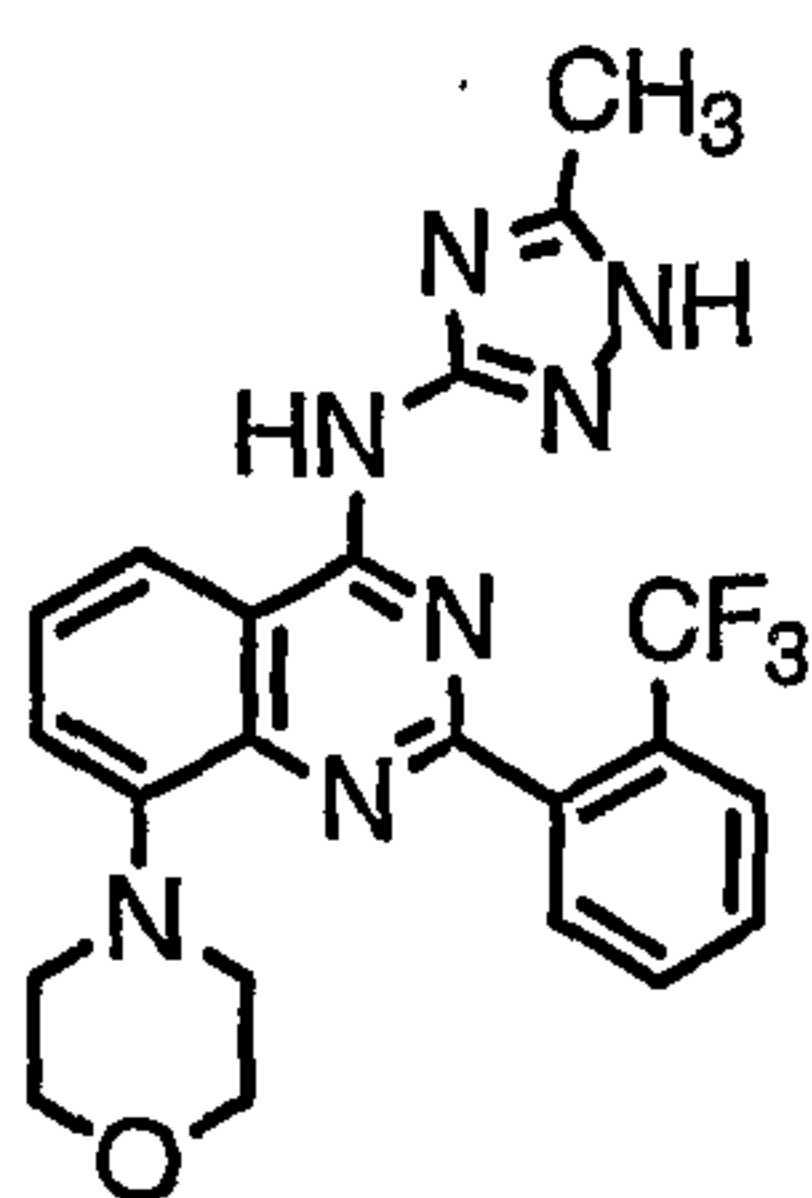
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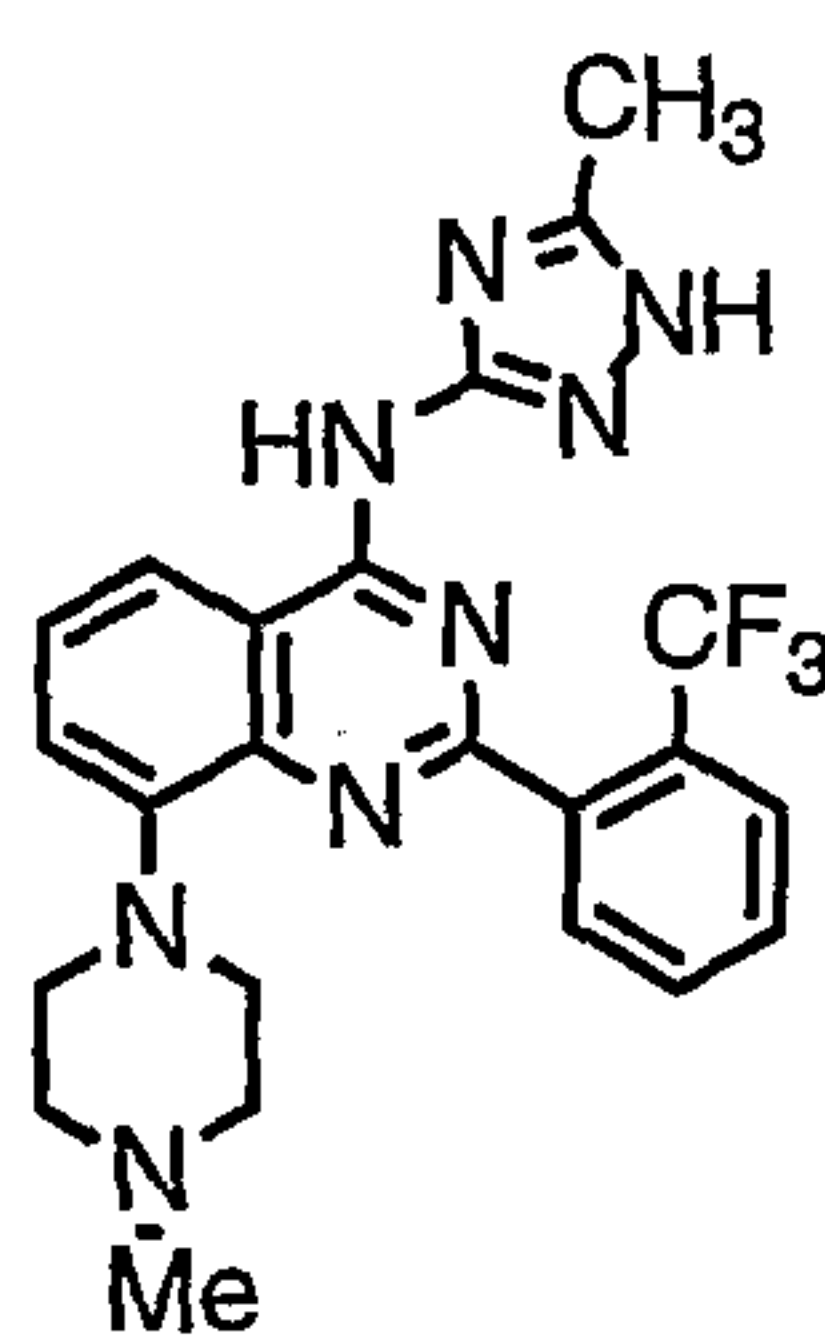
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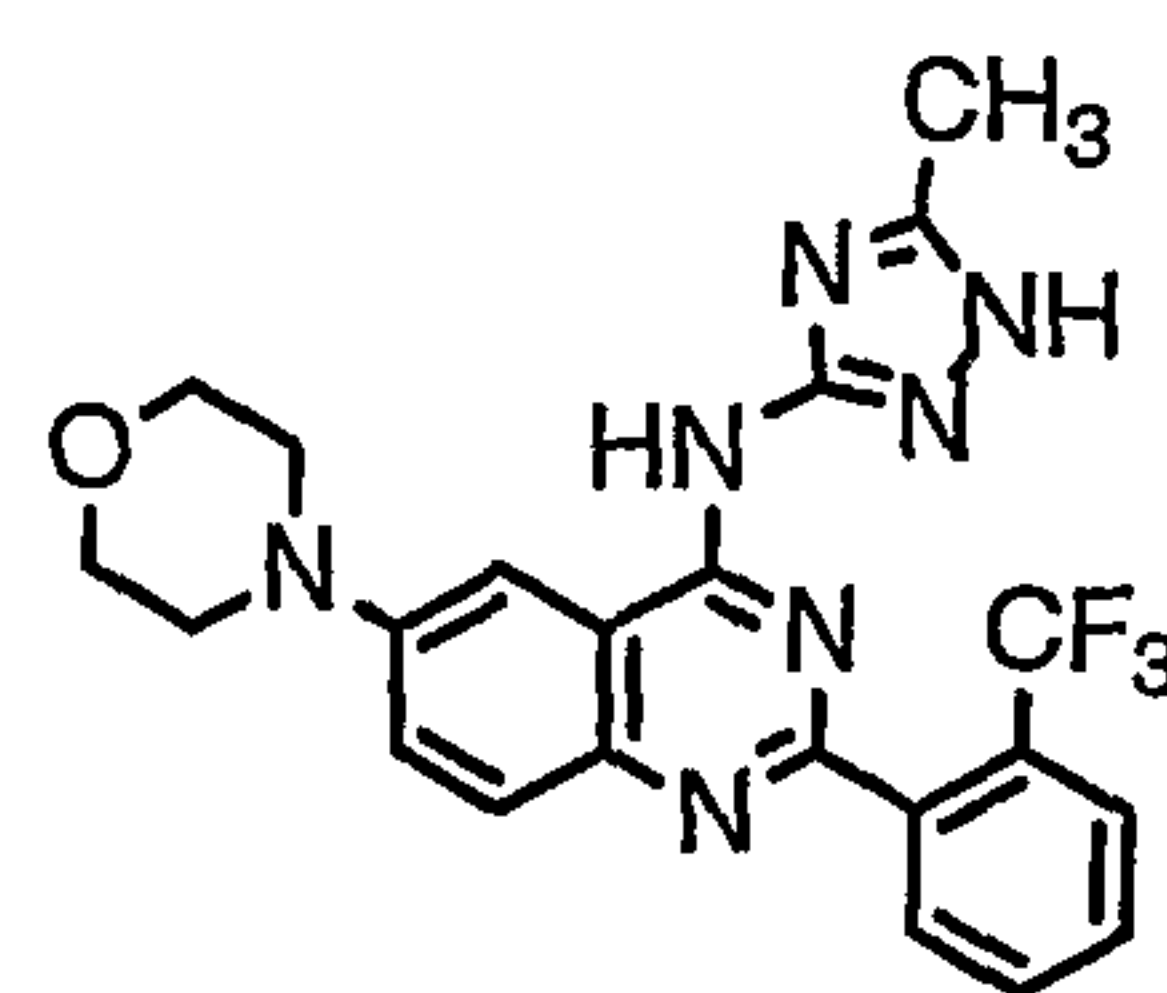
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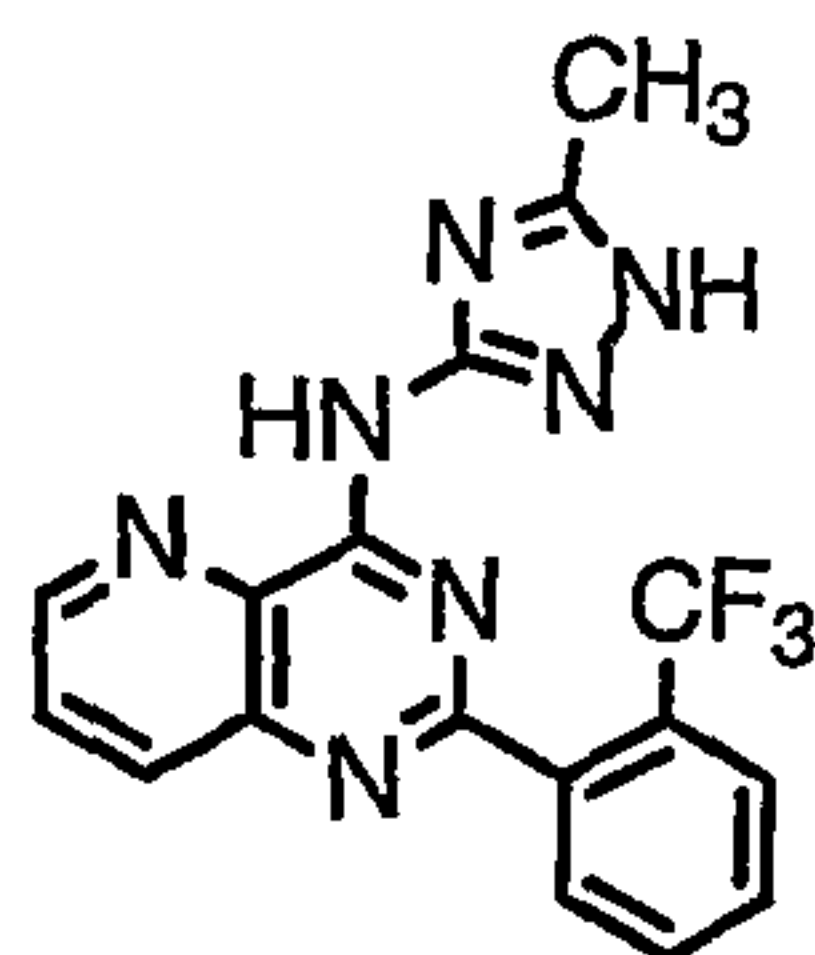
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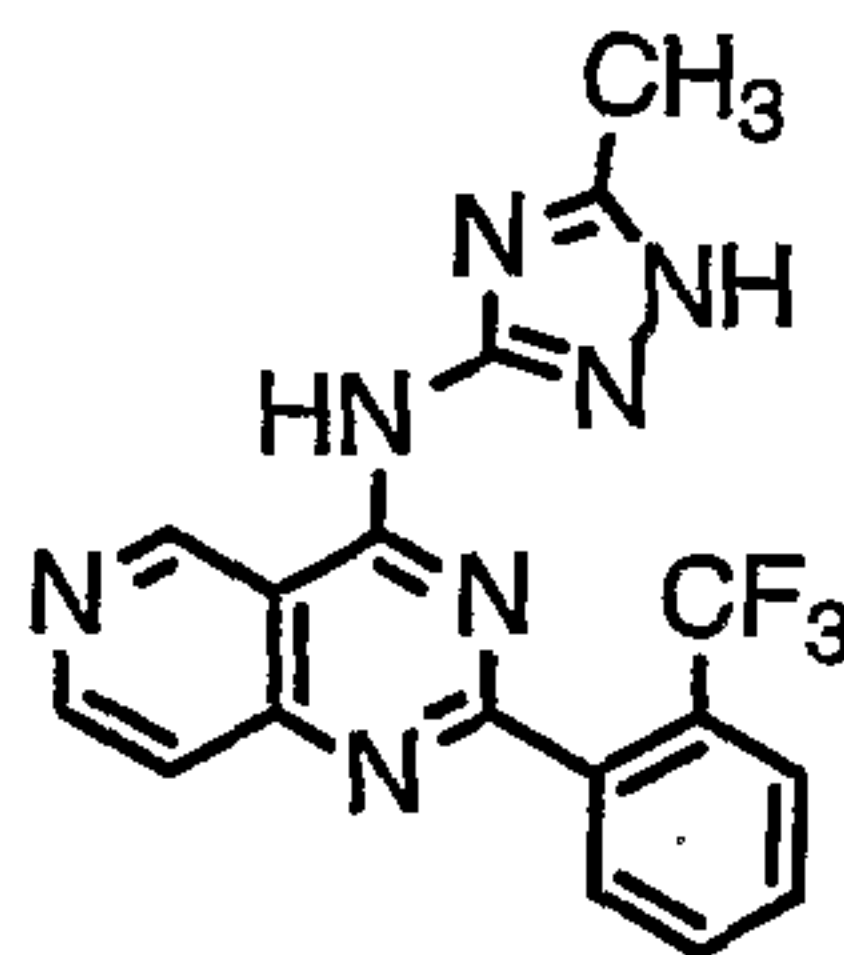
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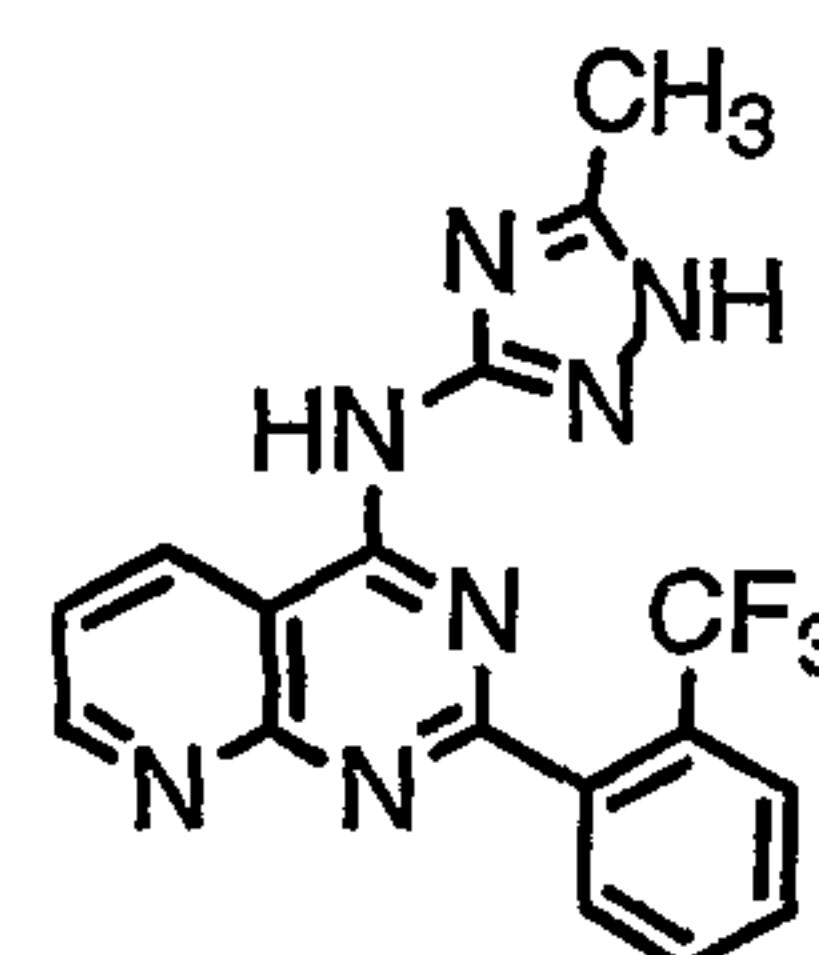
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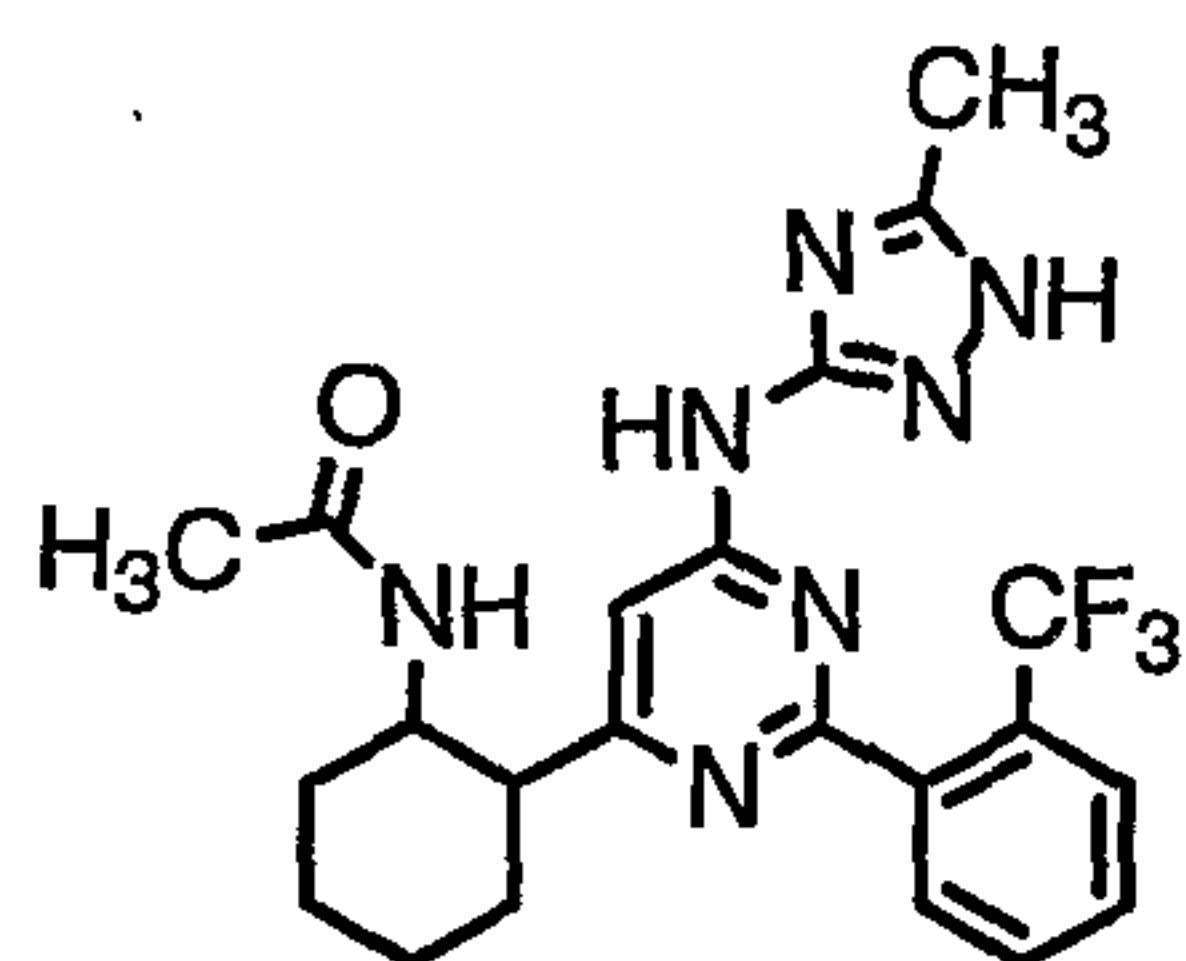
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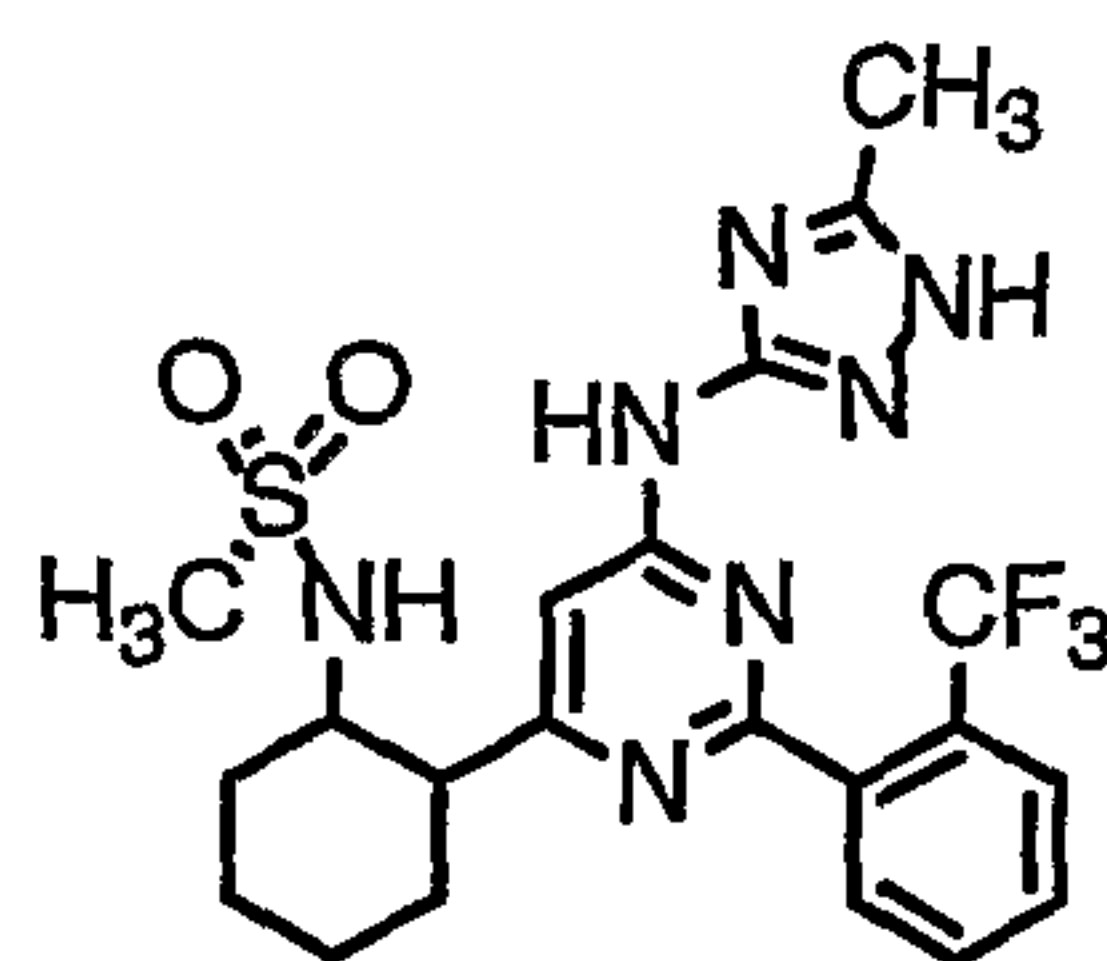
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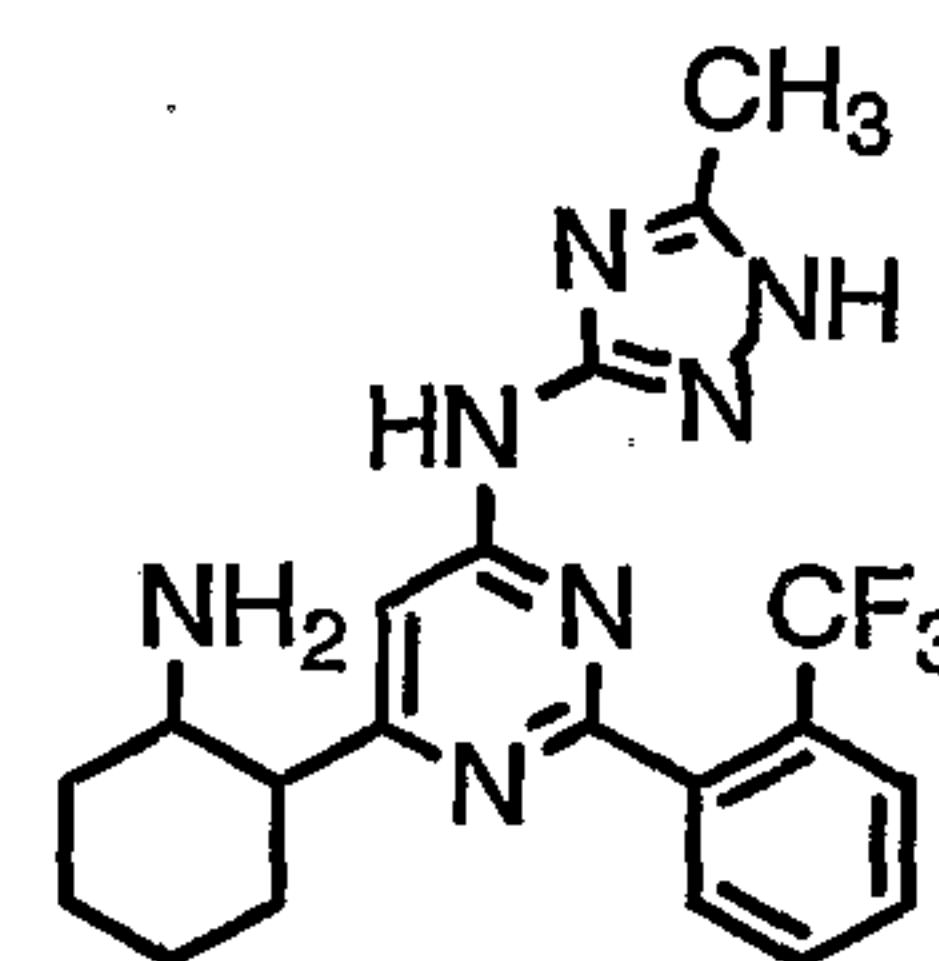
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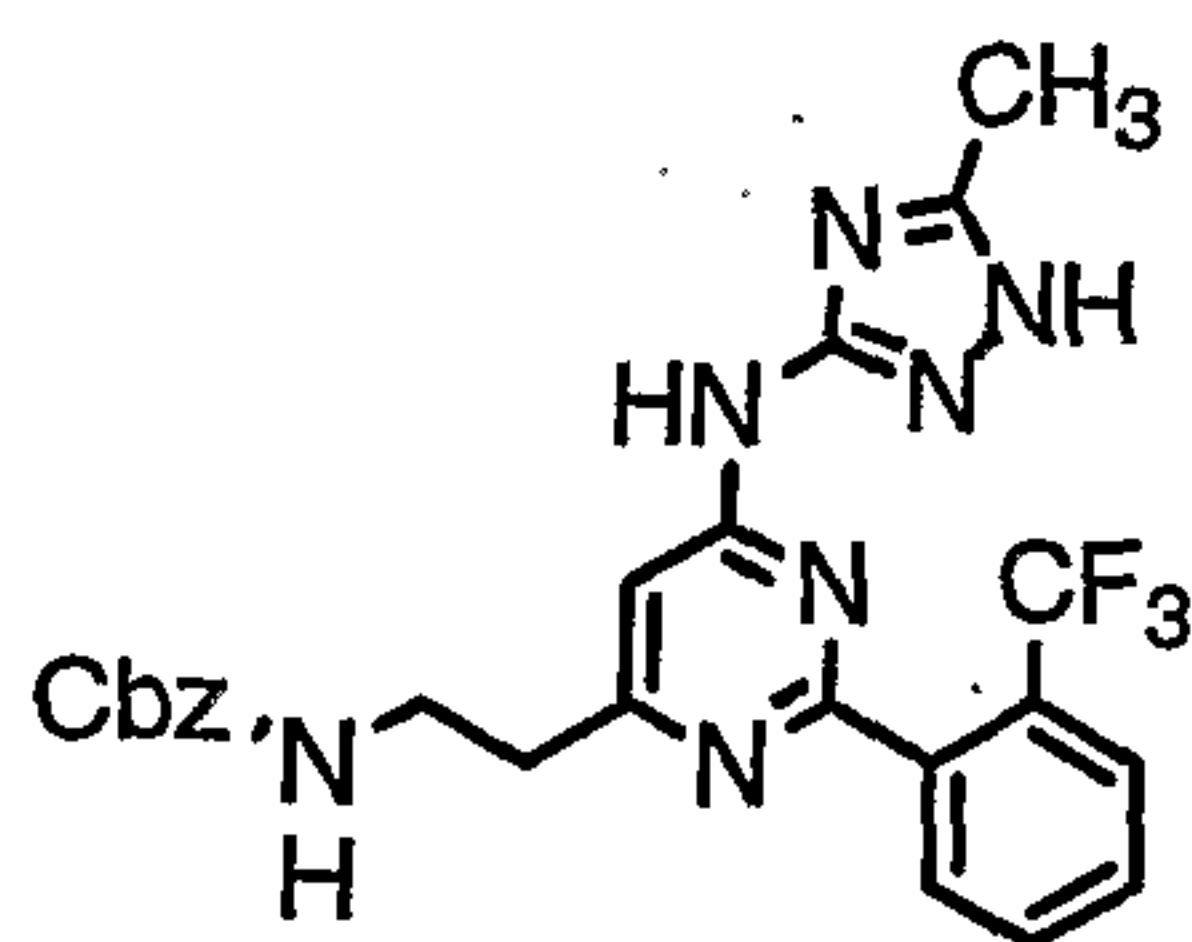
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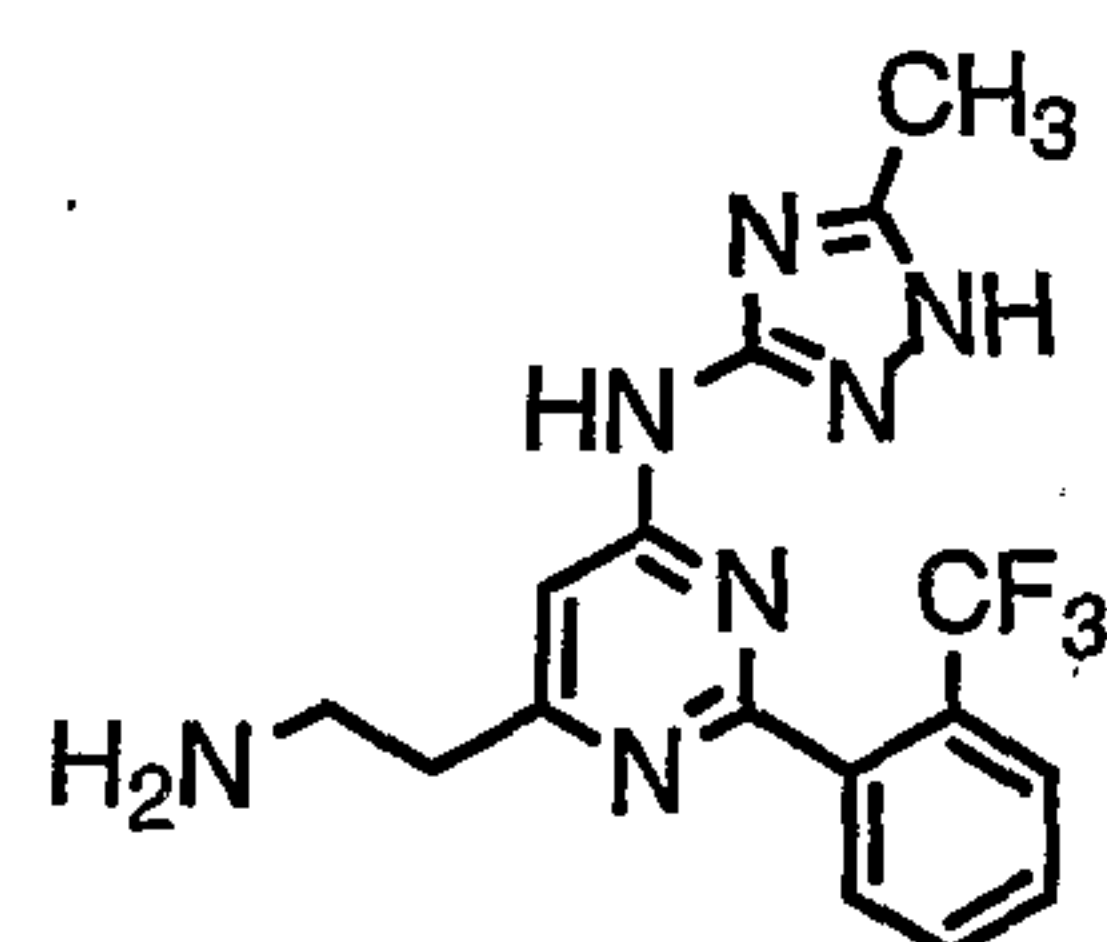
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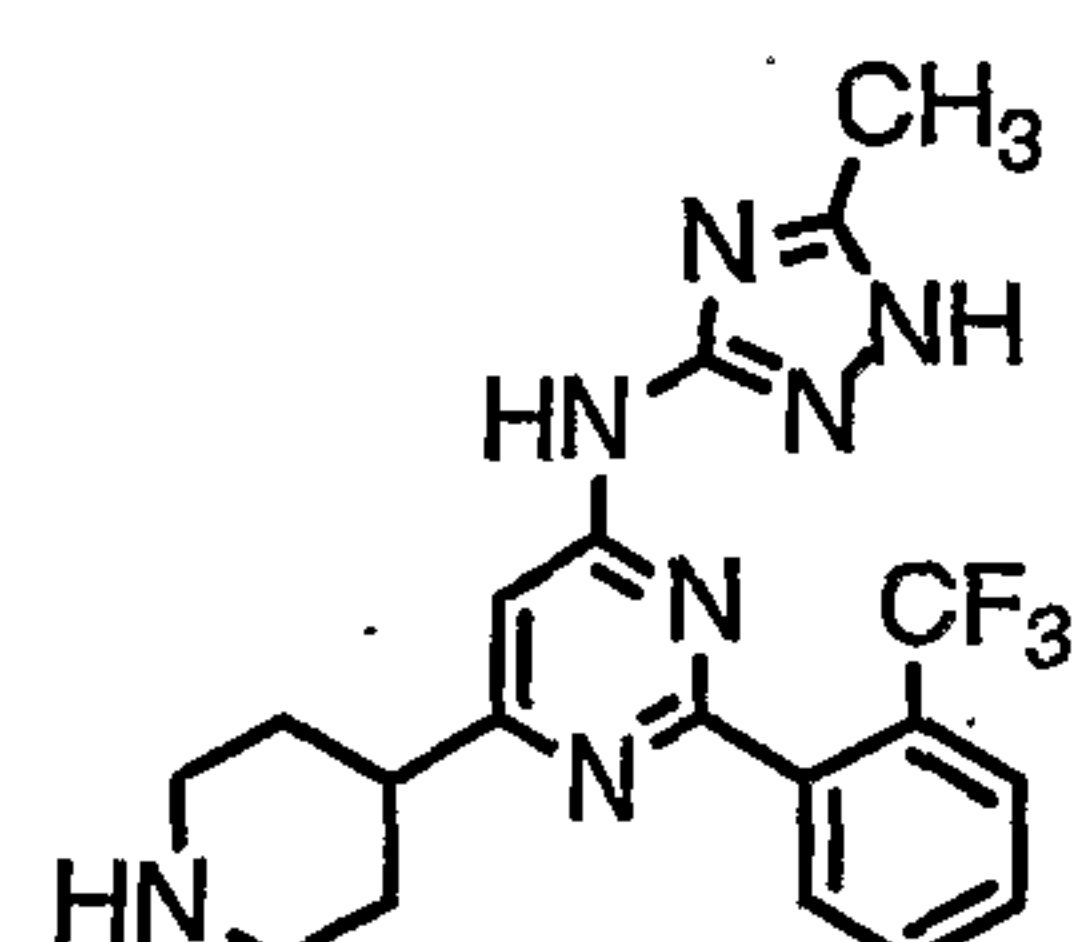
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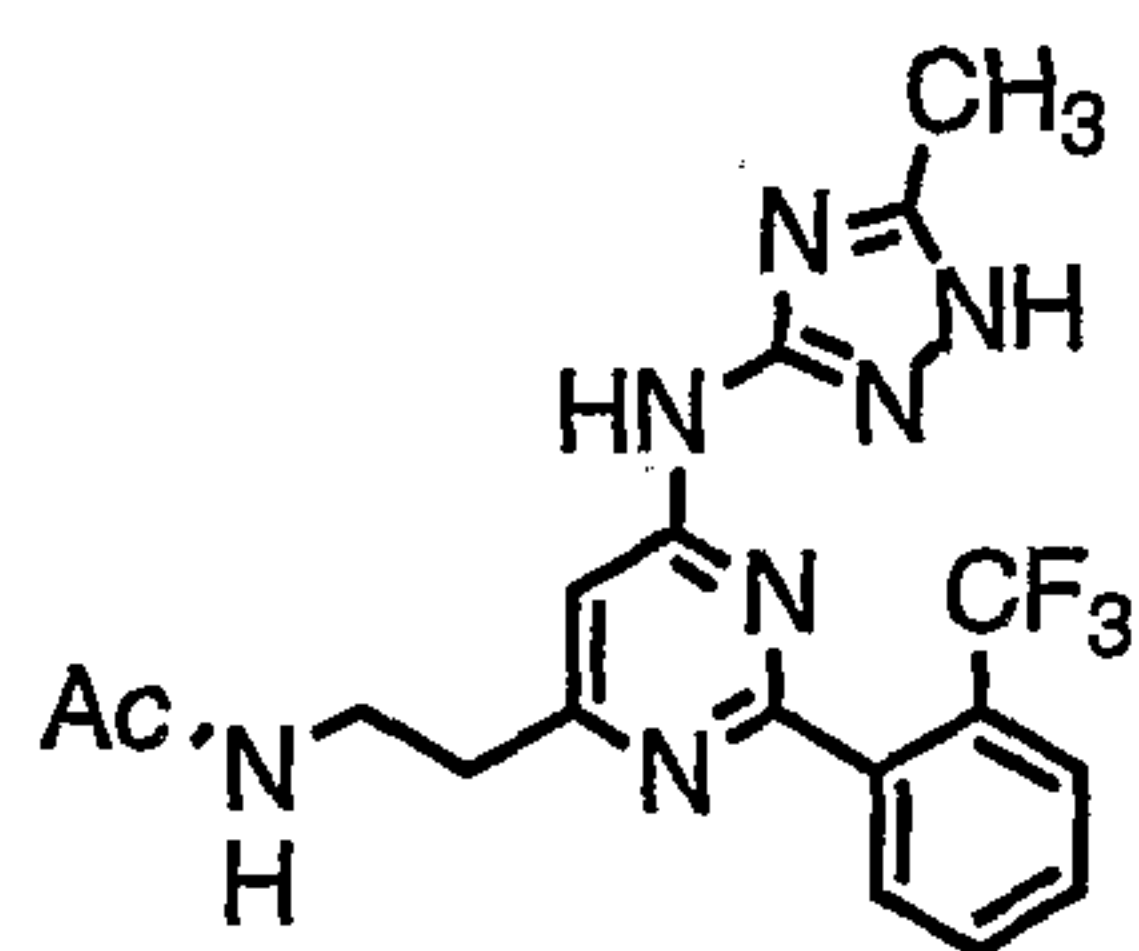
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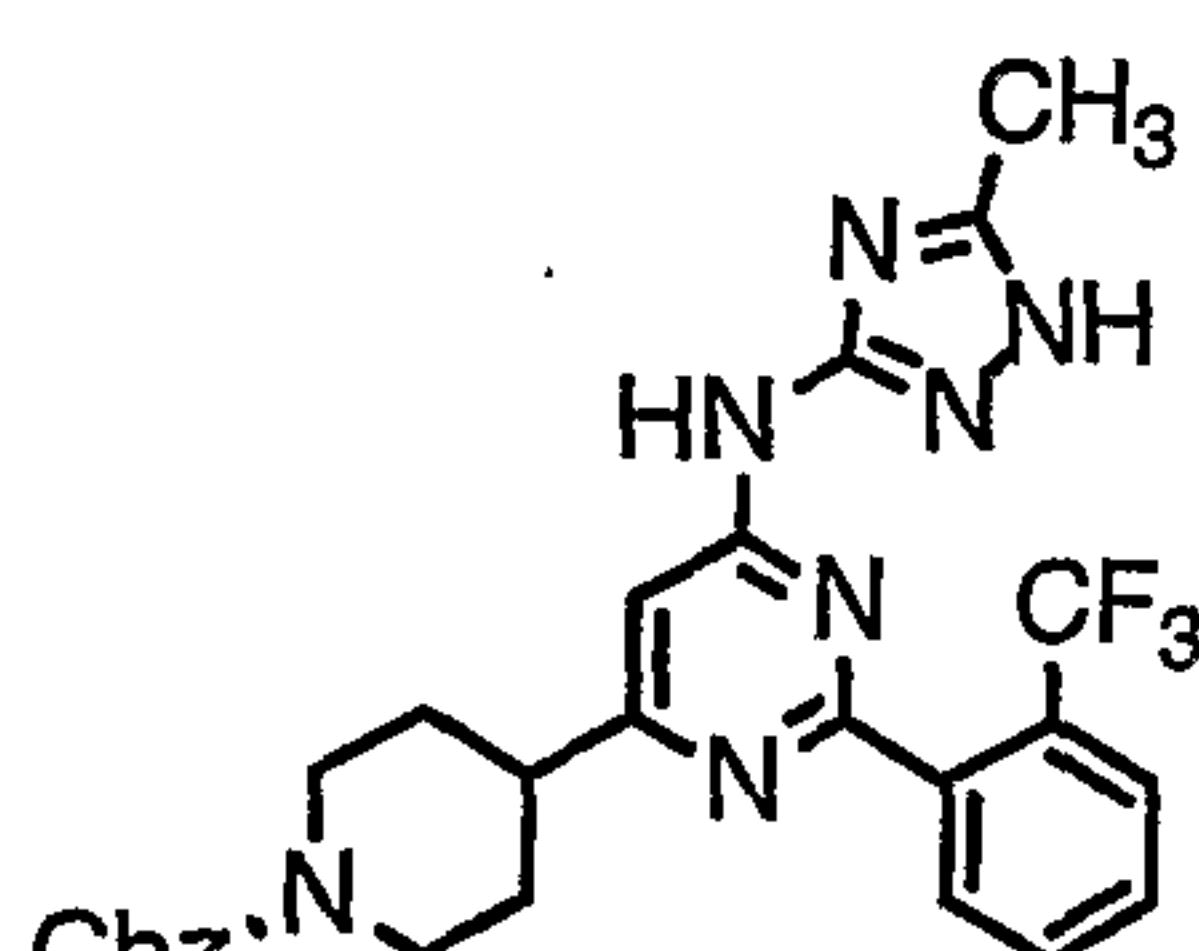
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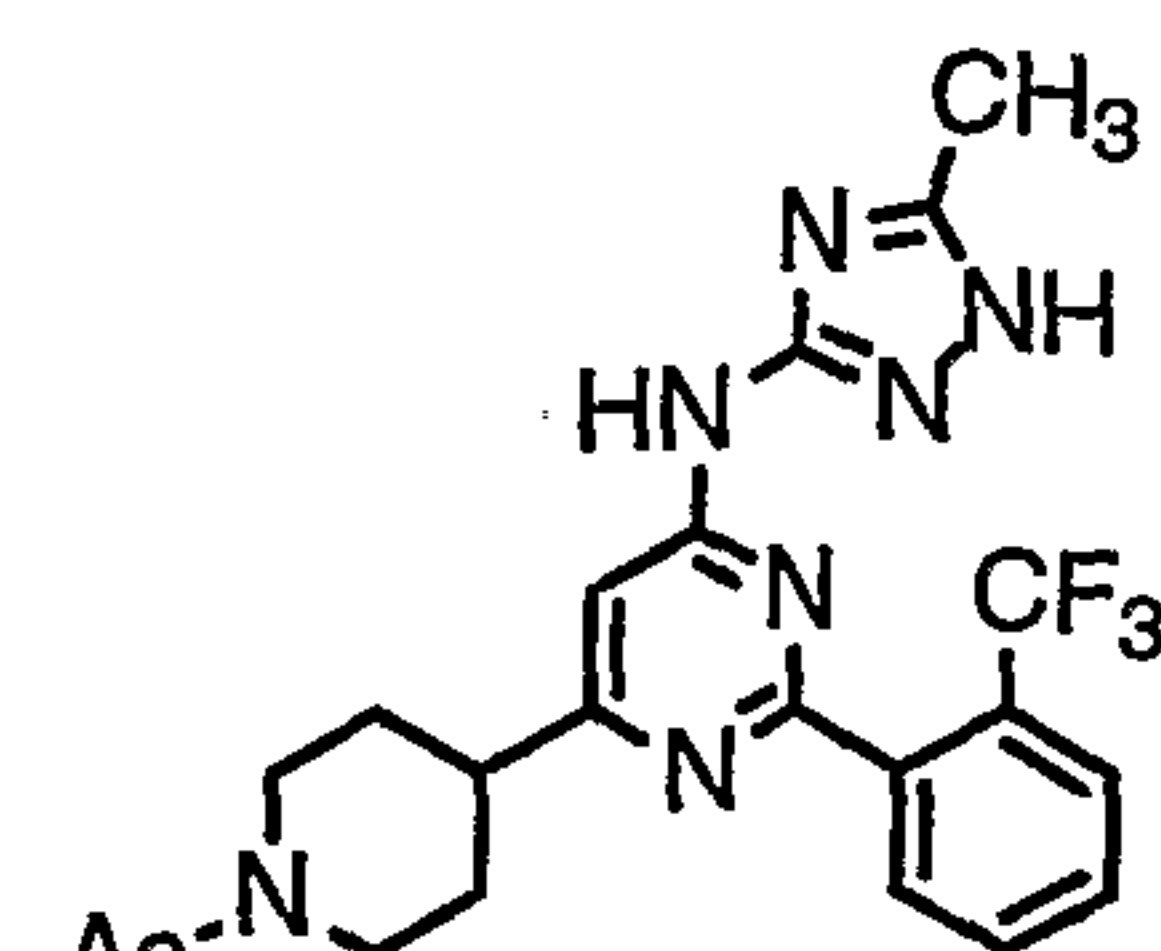
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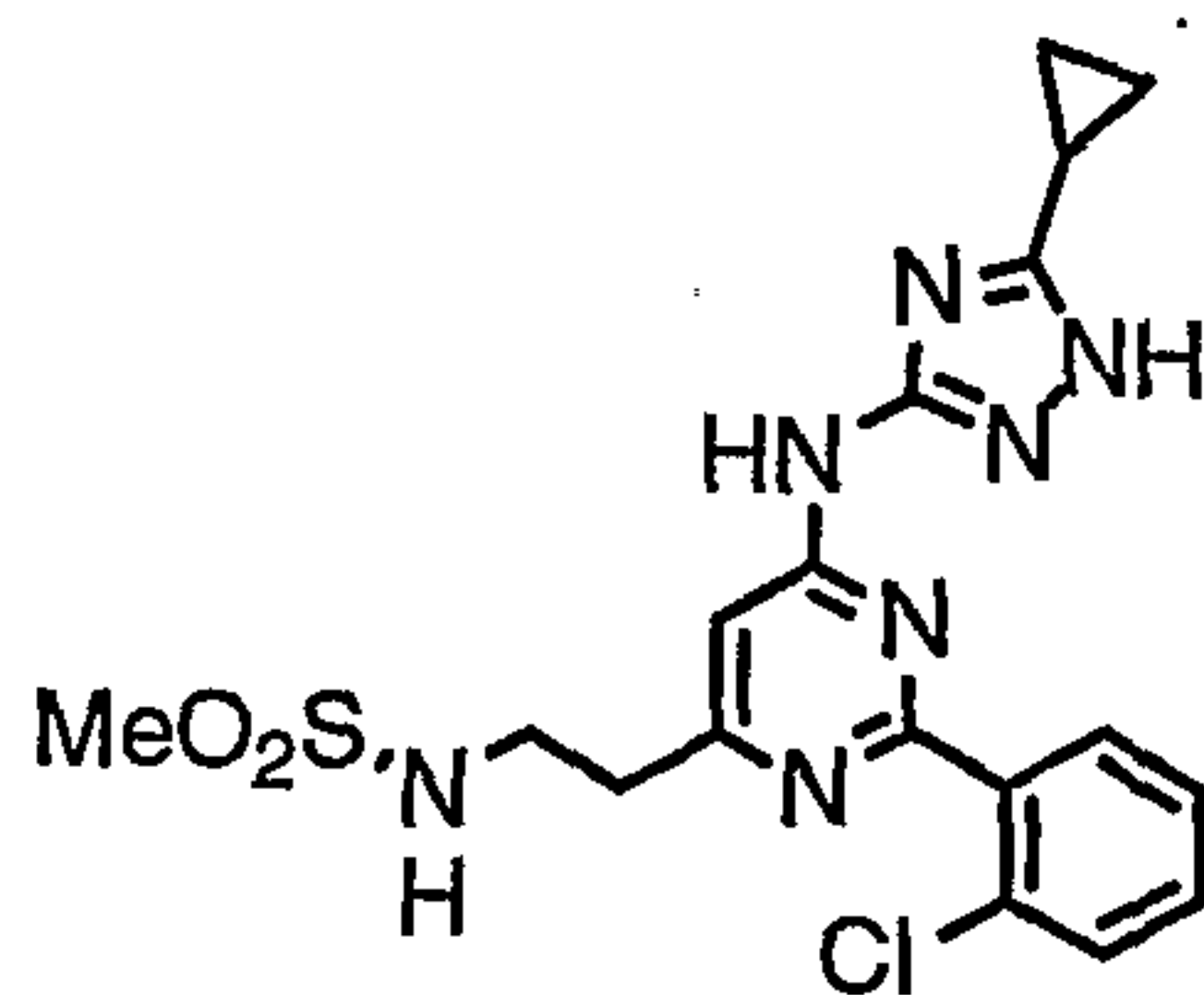
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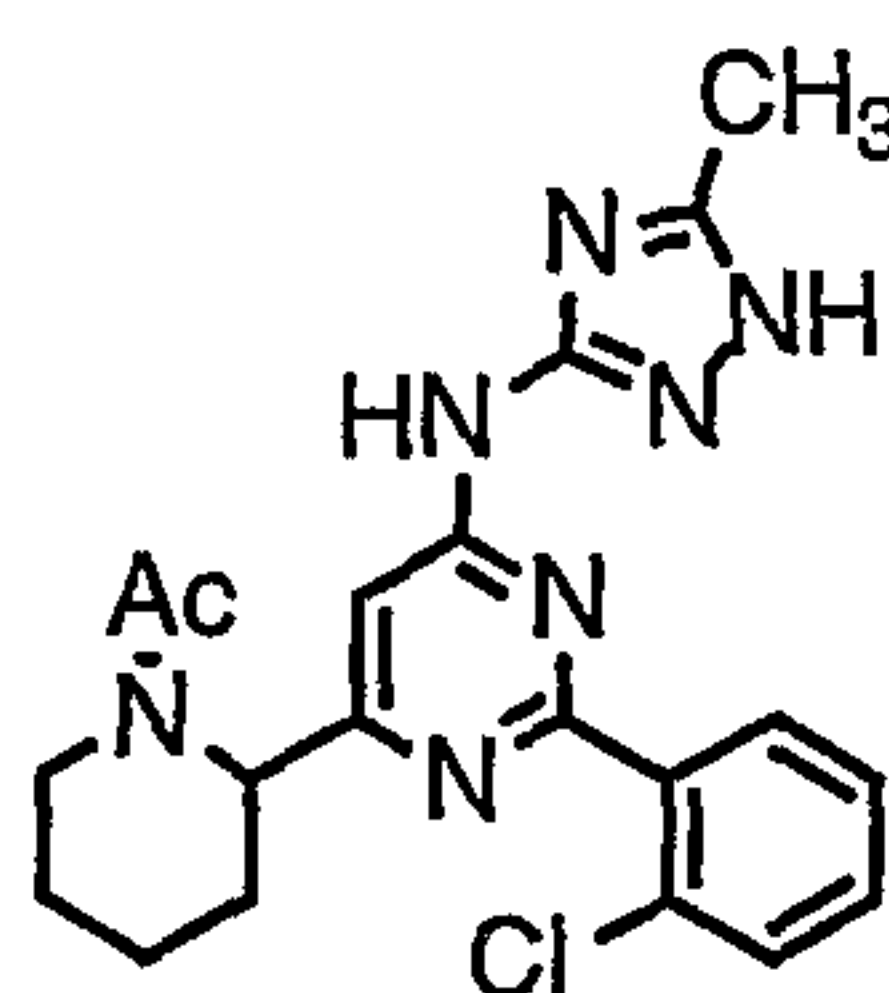
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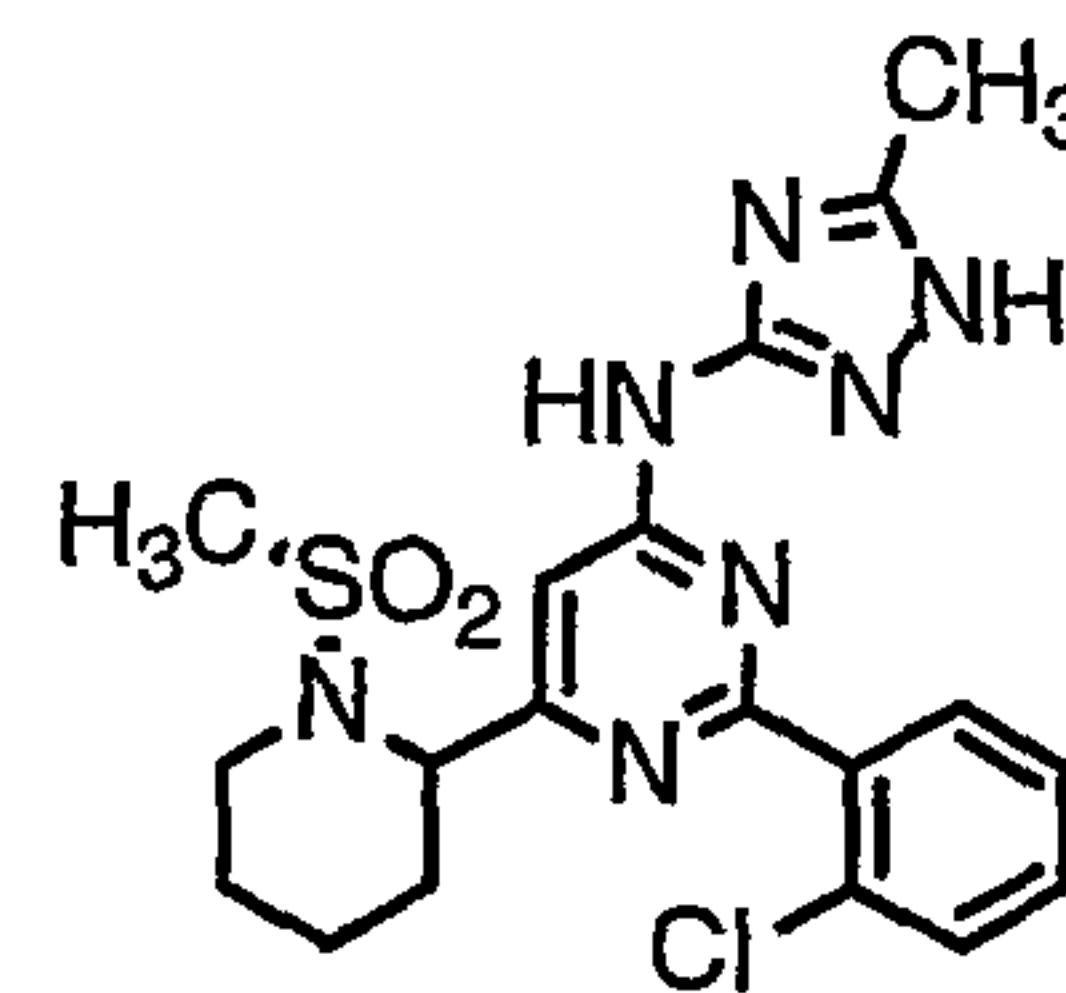
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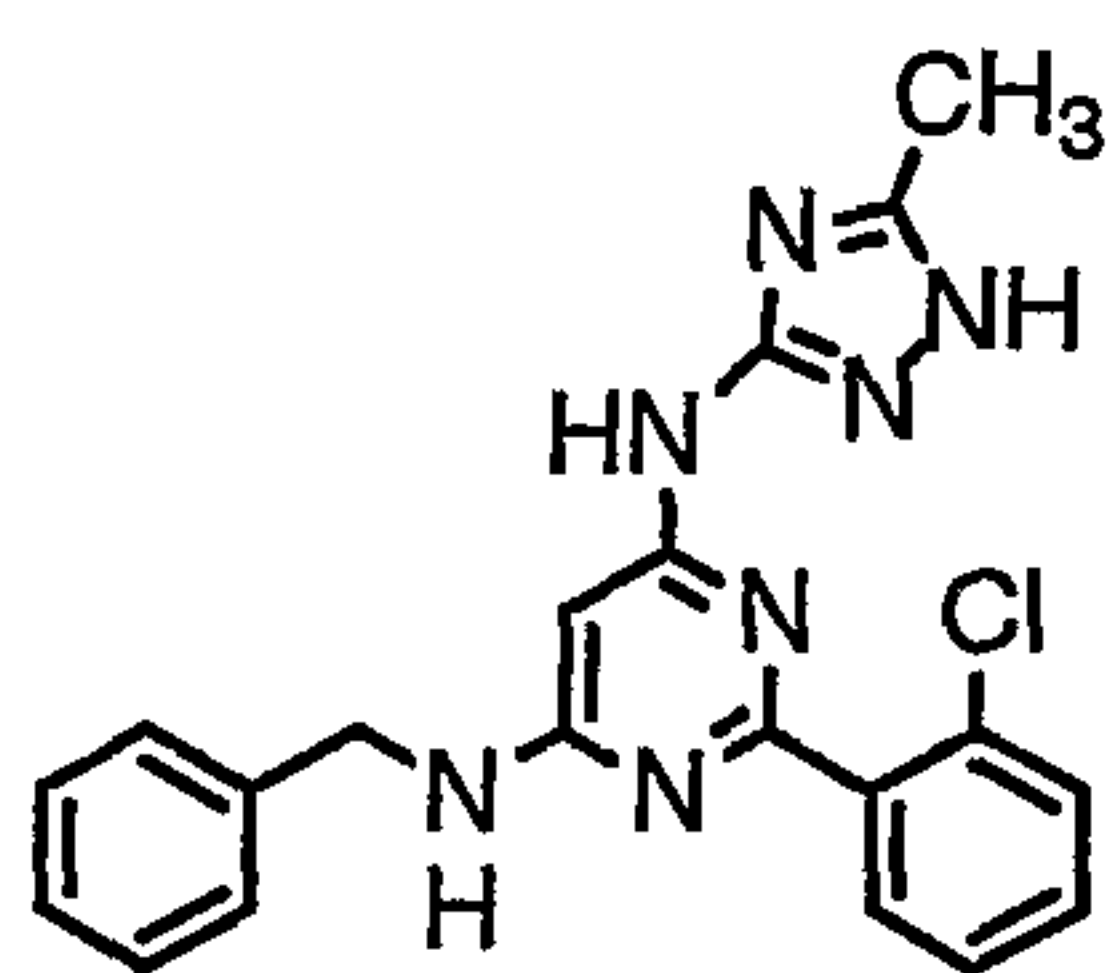
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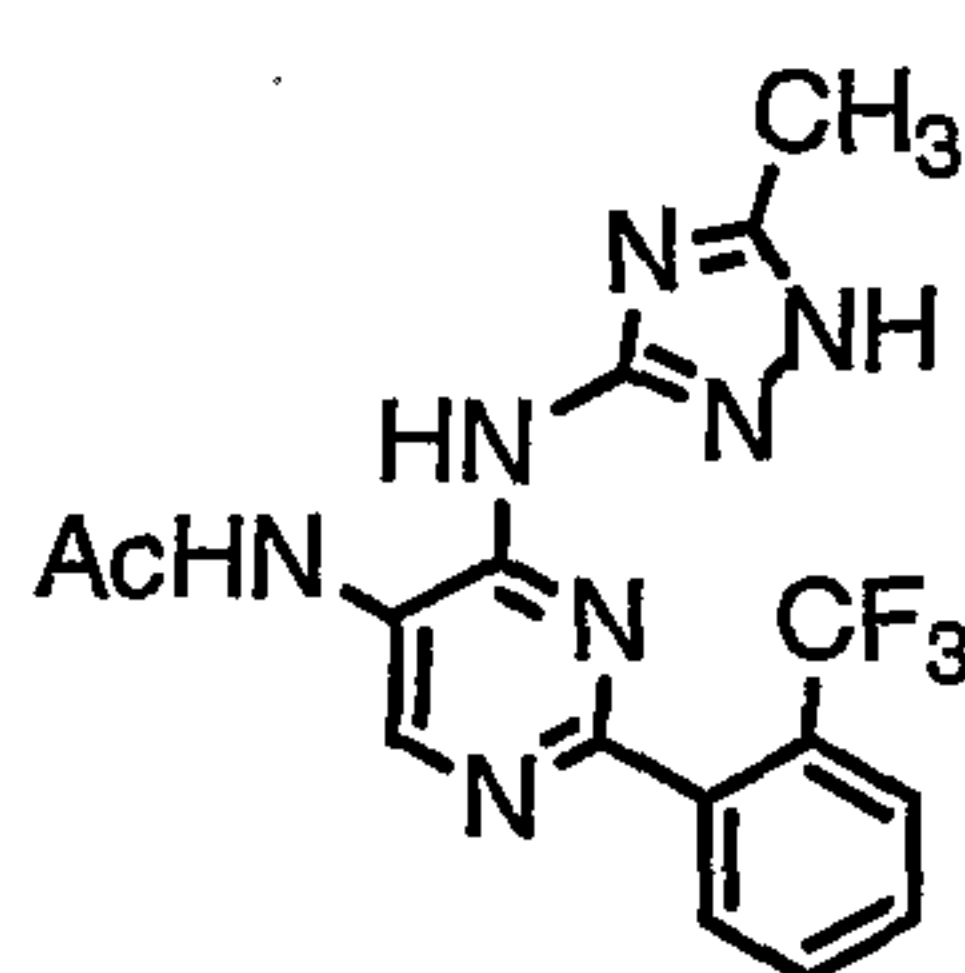
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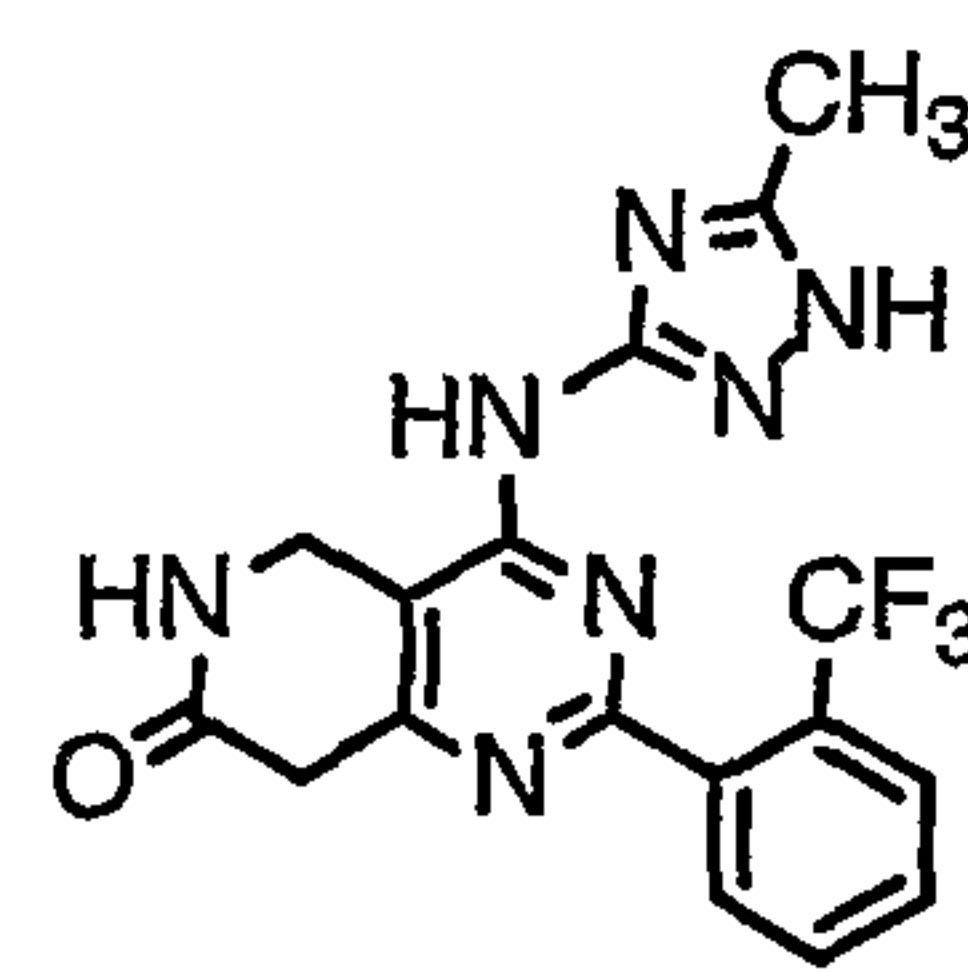
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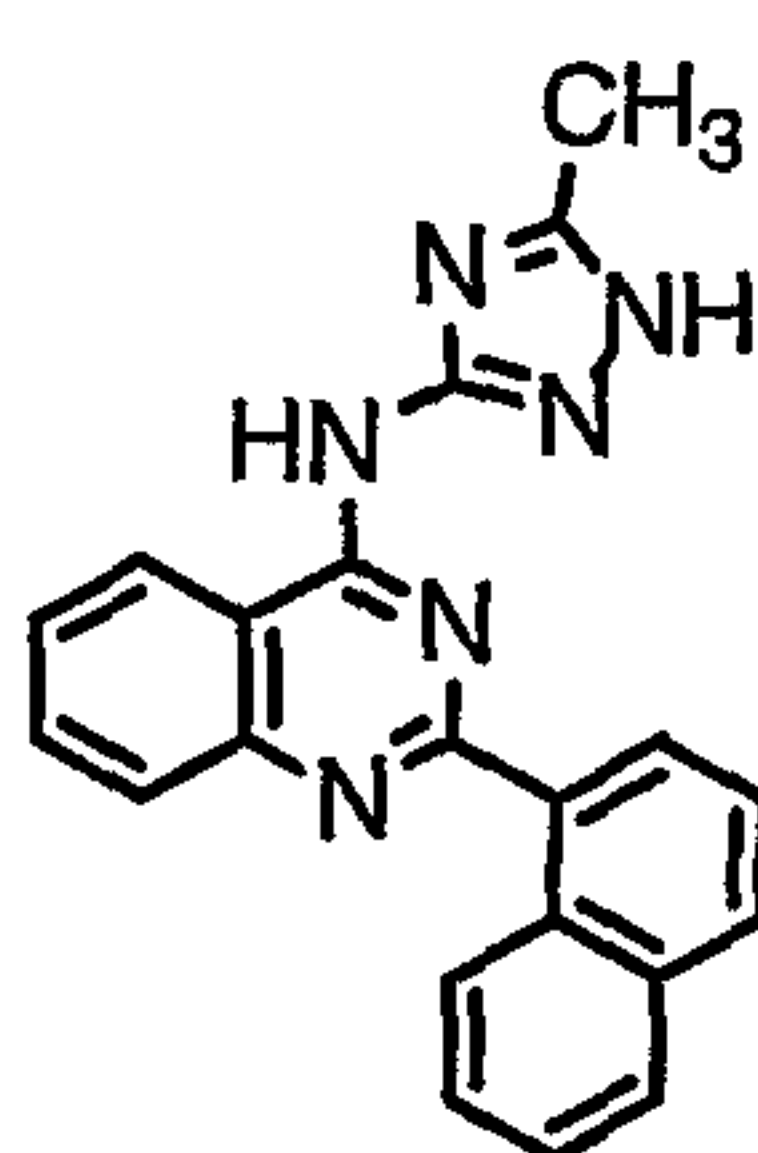
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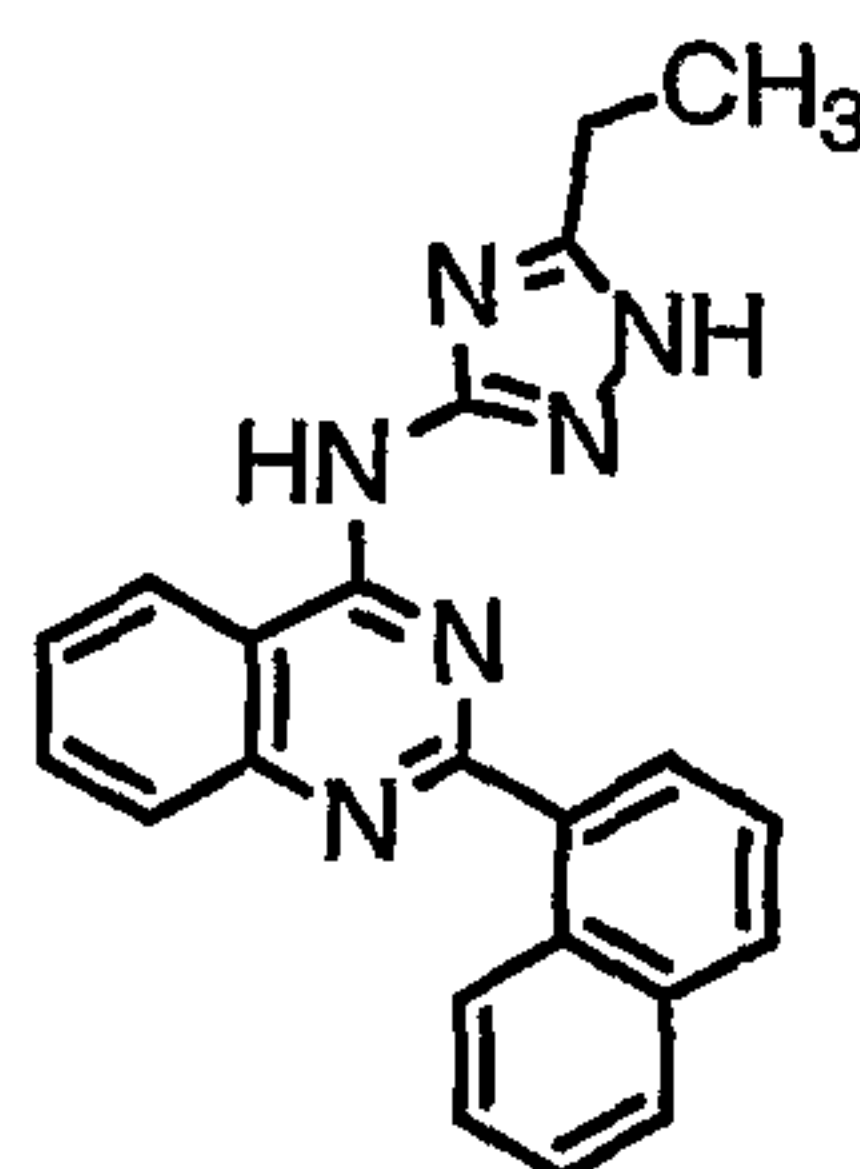
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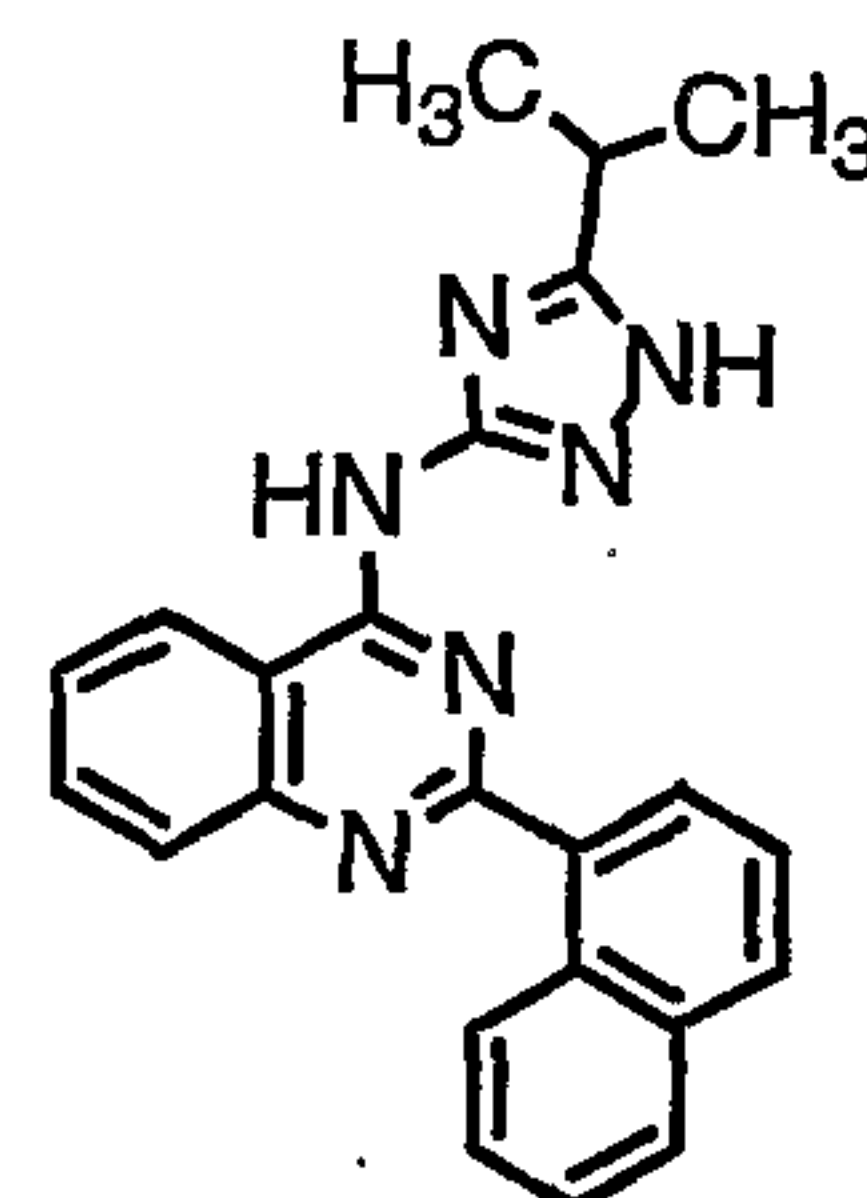
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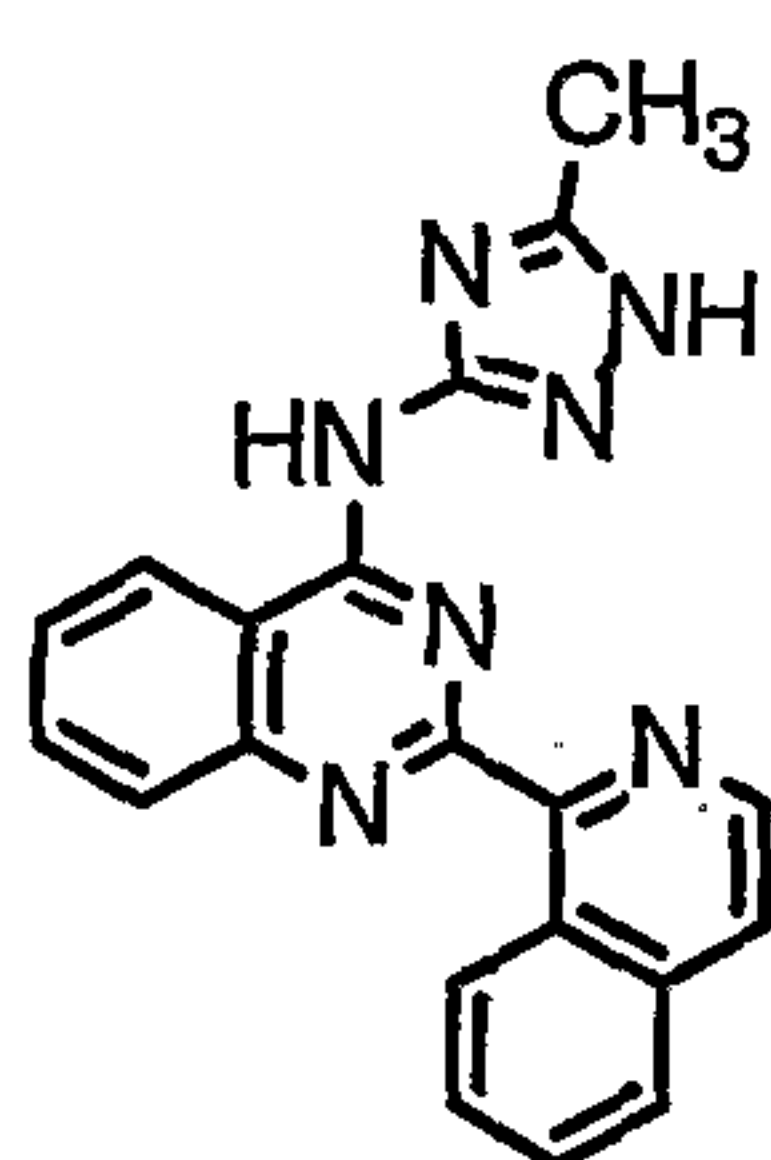
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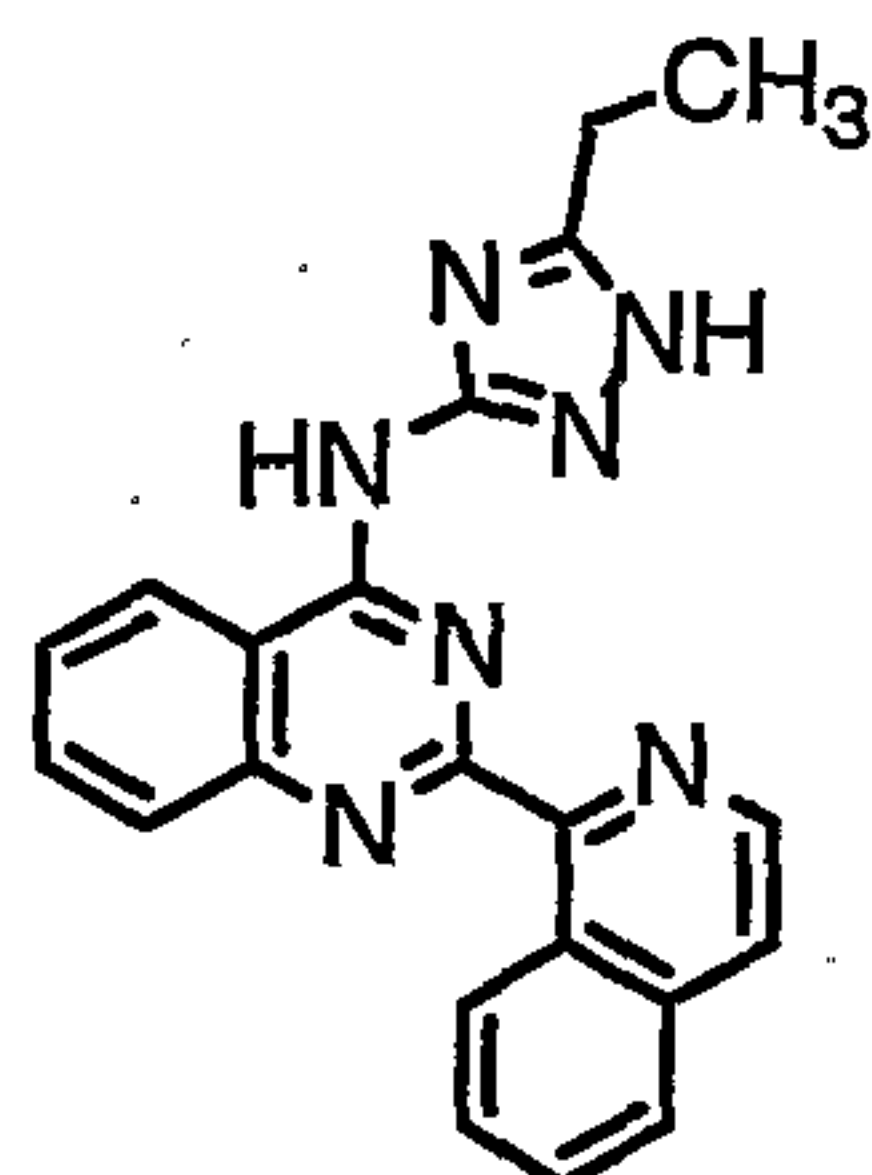
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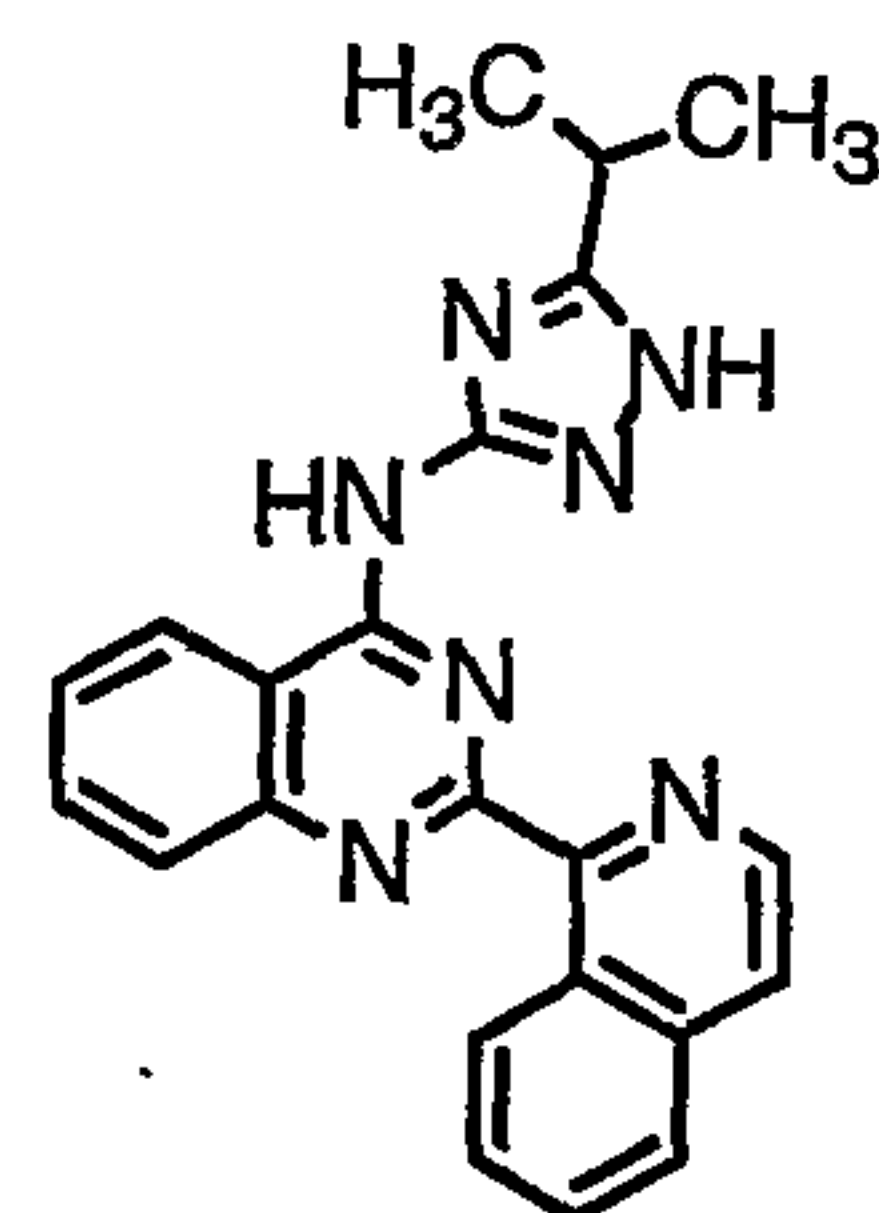
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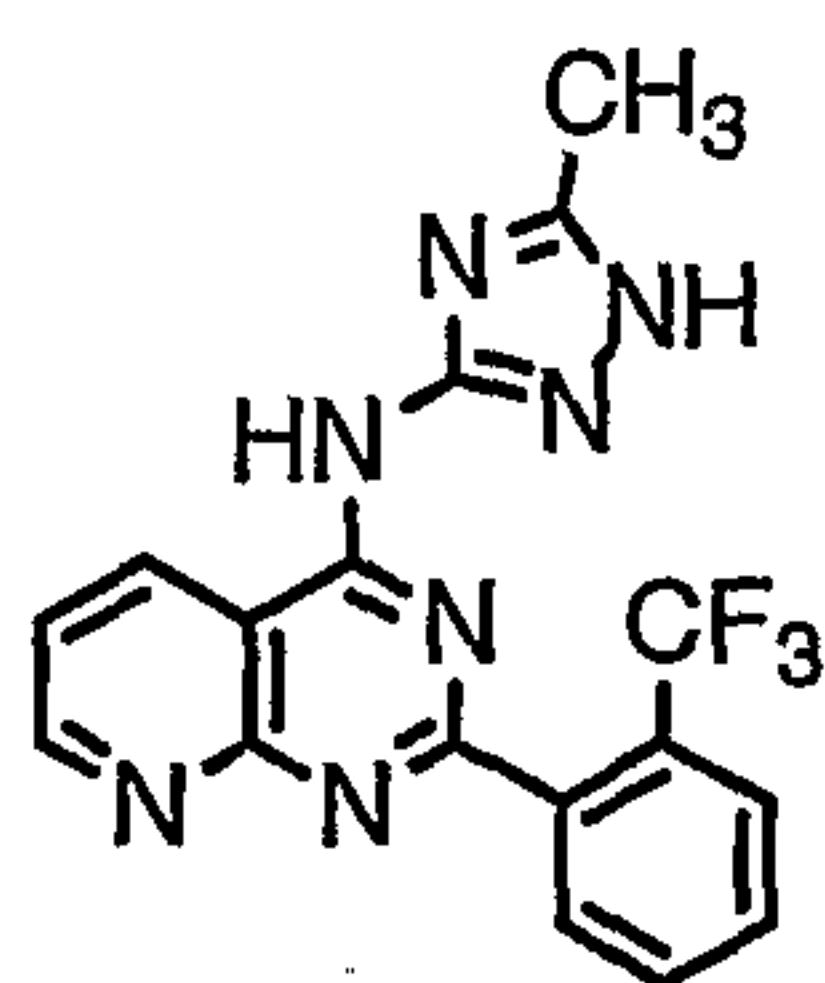
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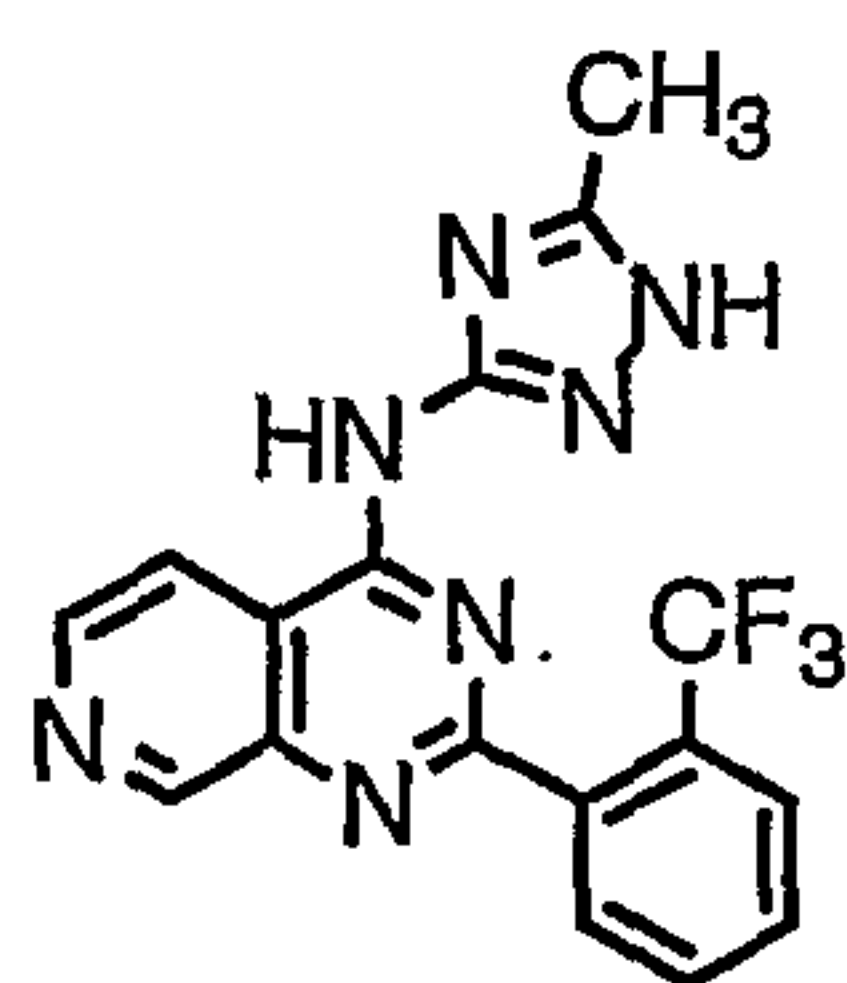
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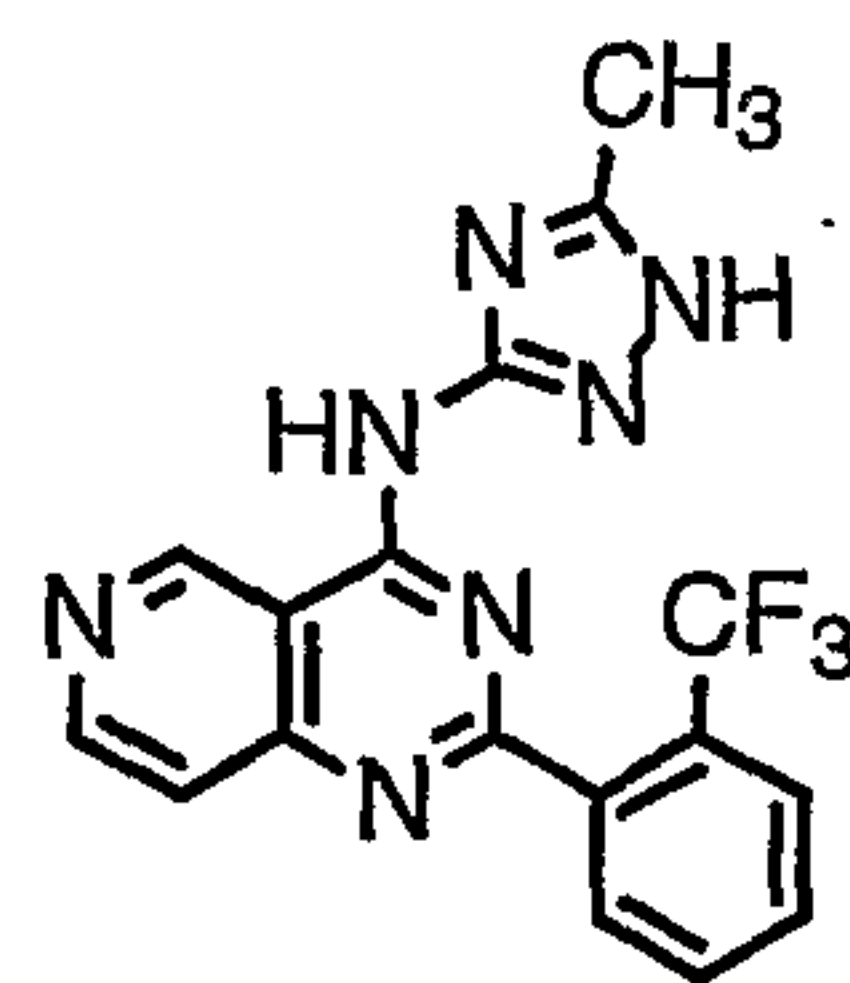
IX-108



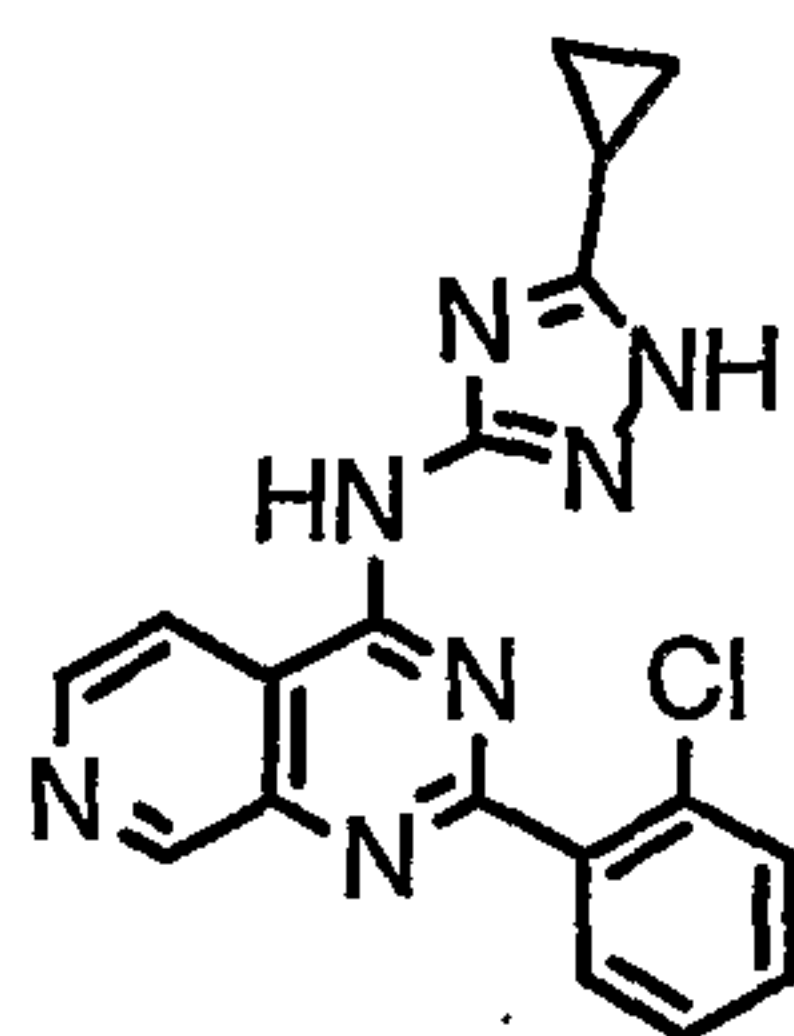
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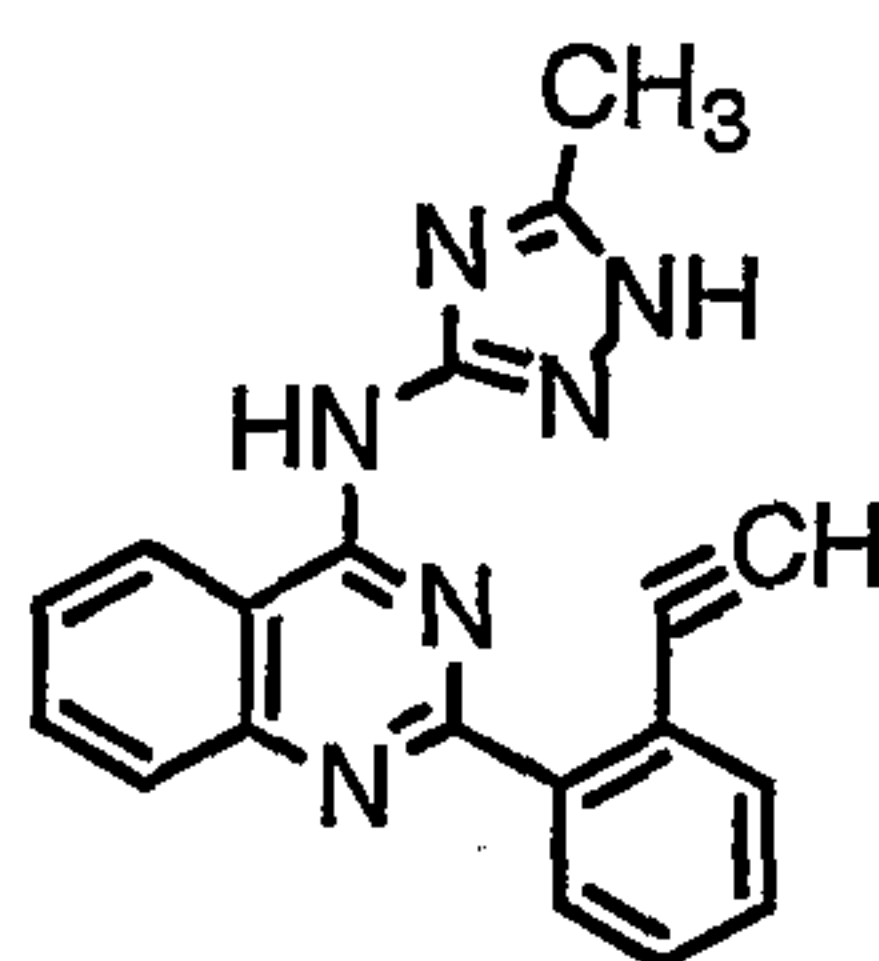
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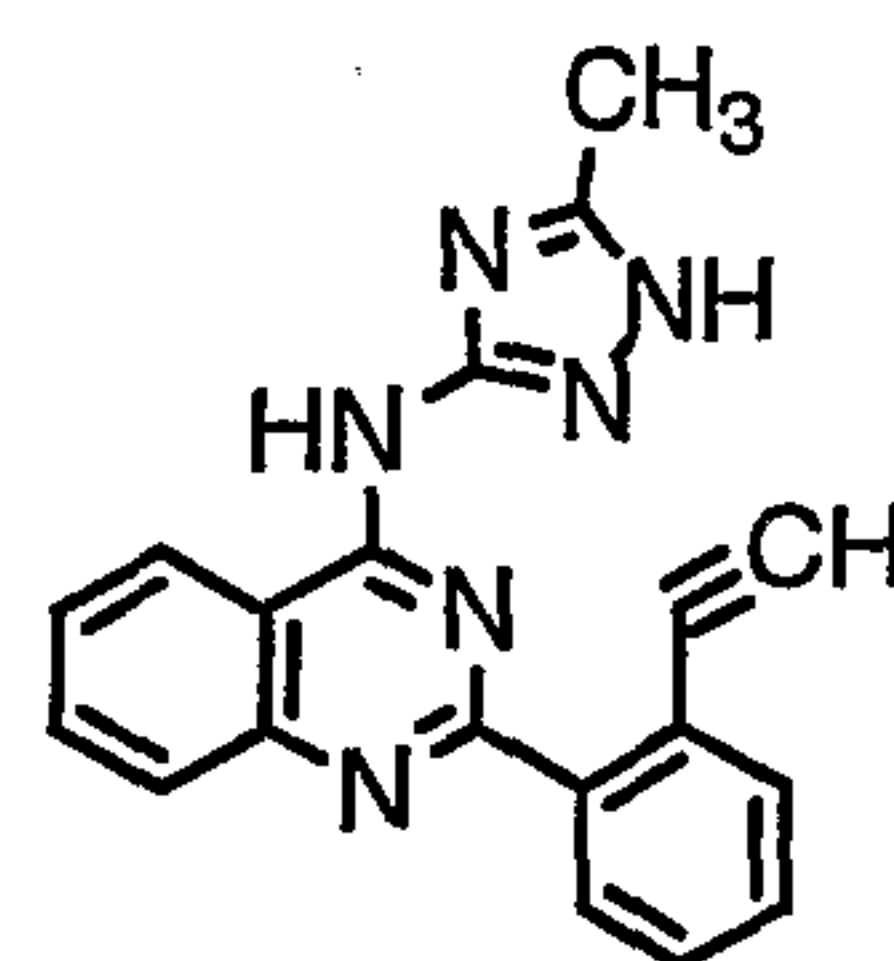
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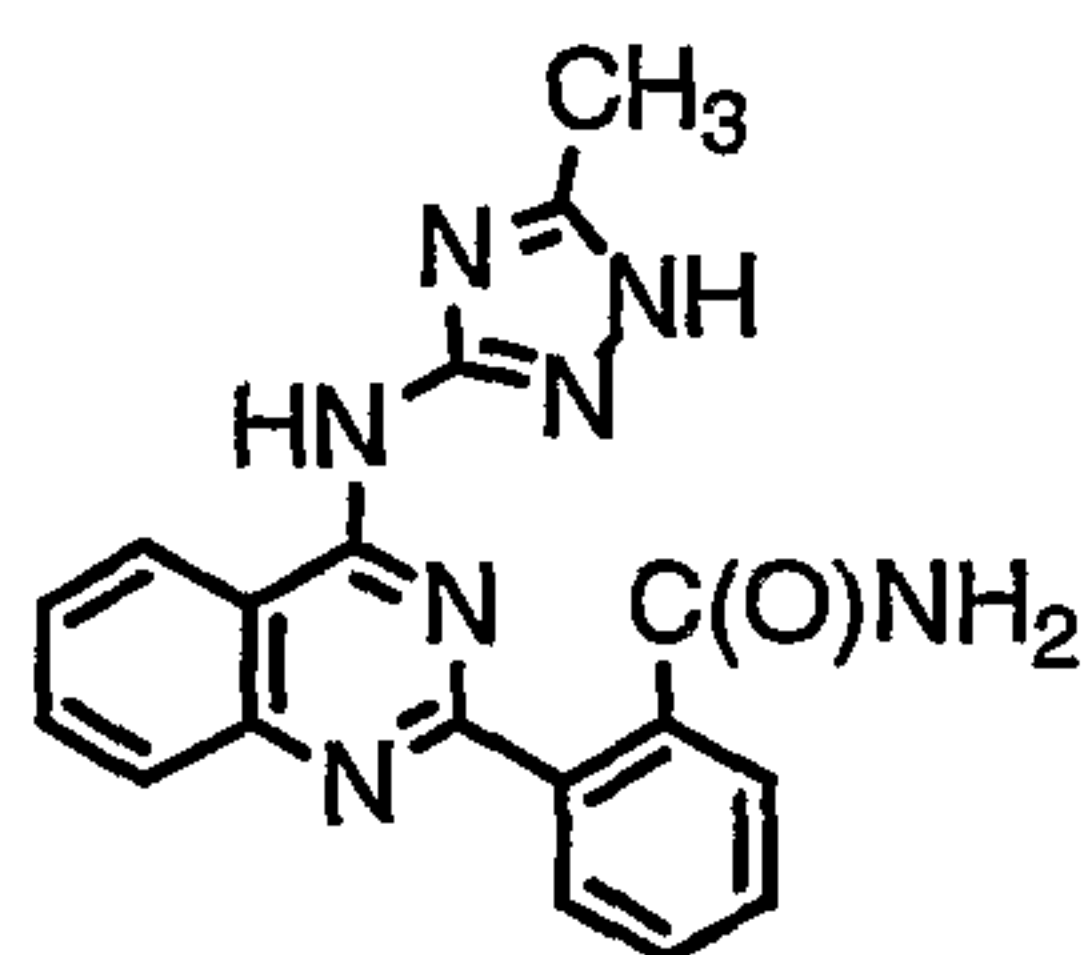
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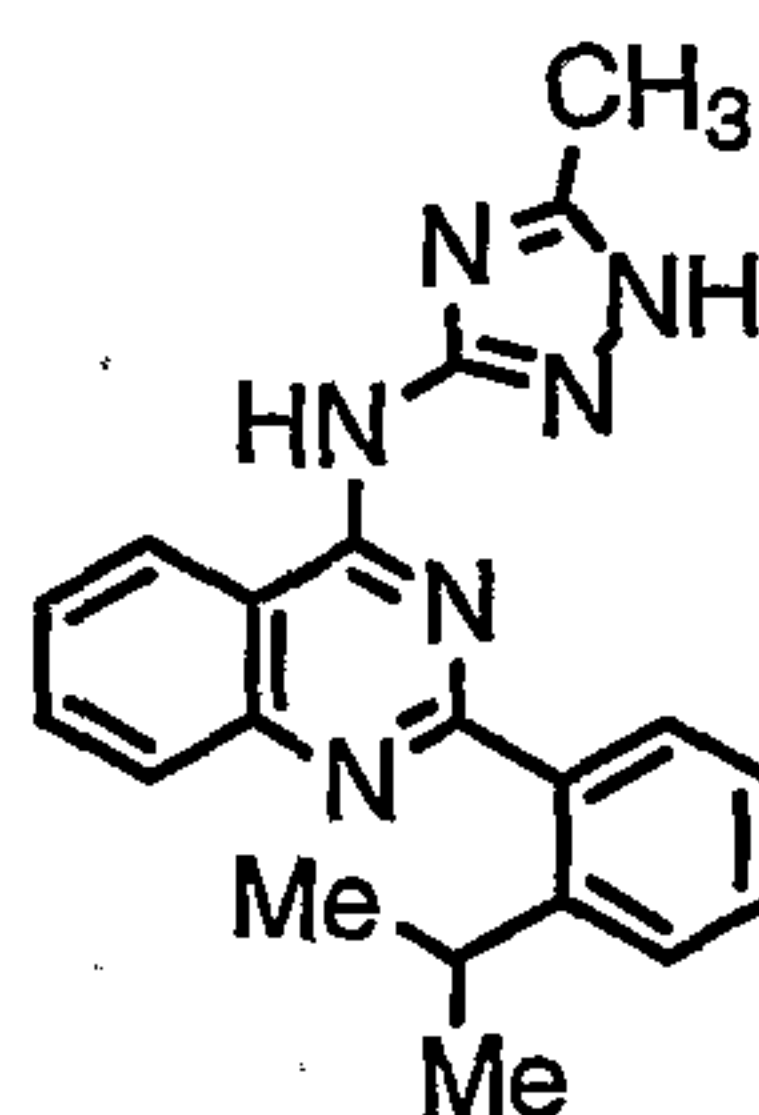
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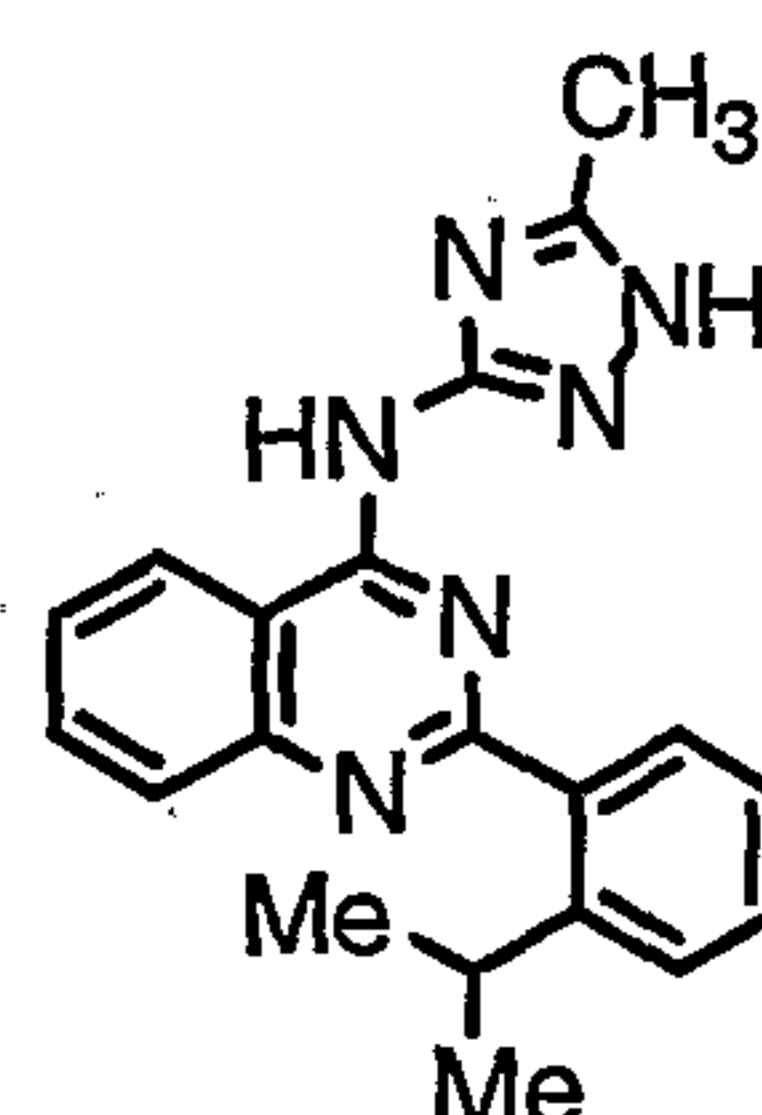
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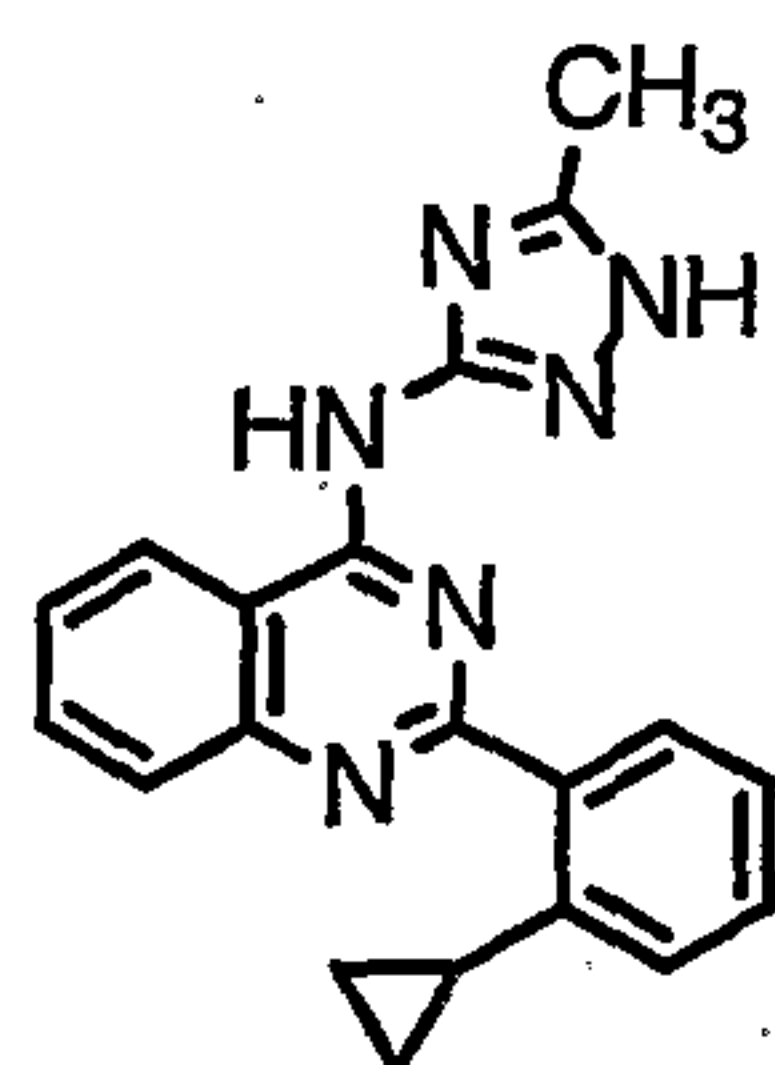
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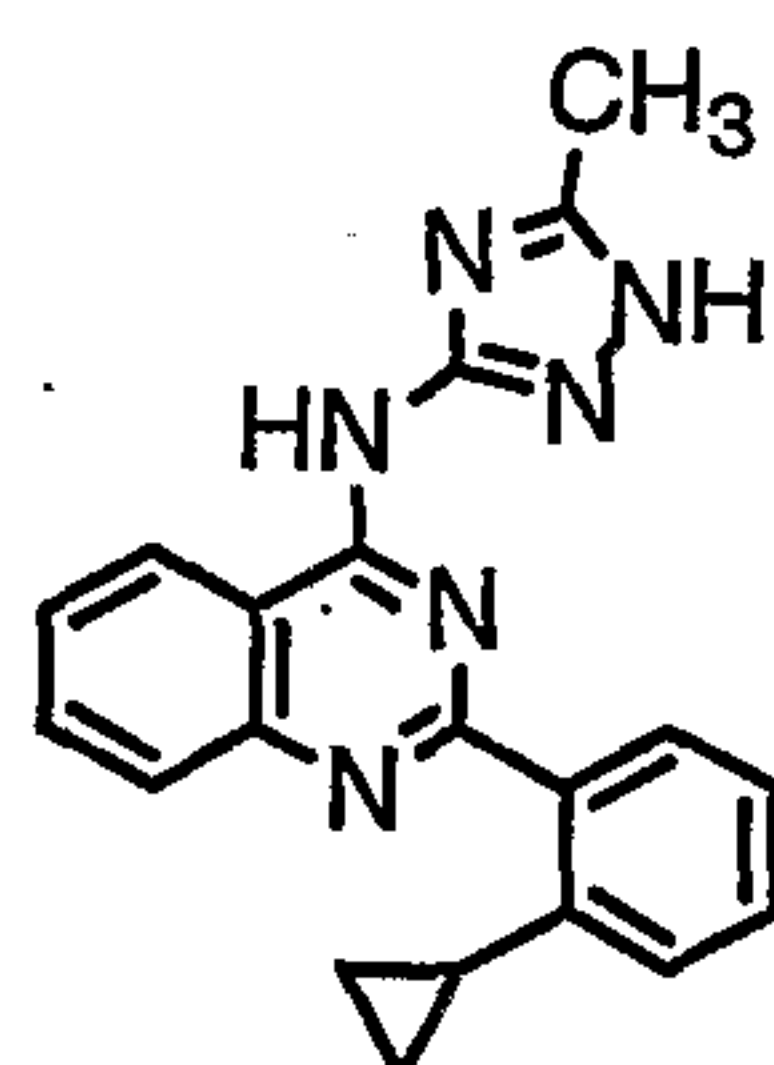
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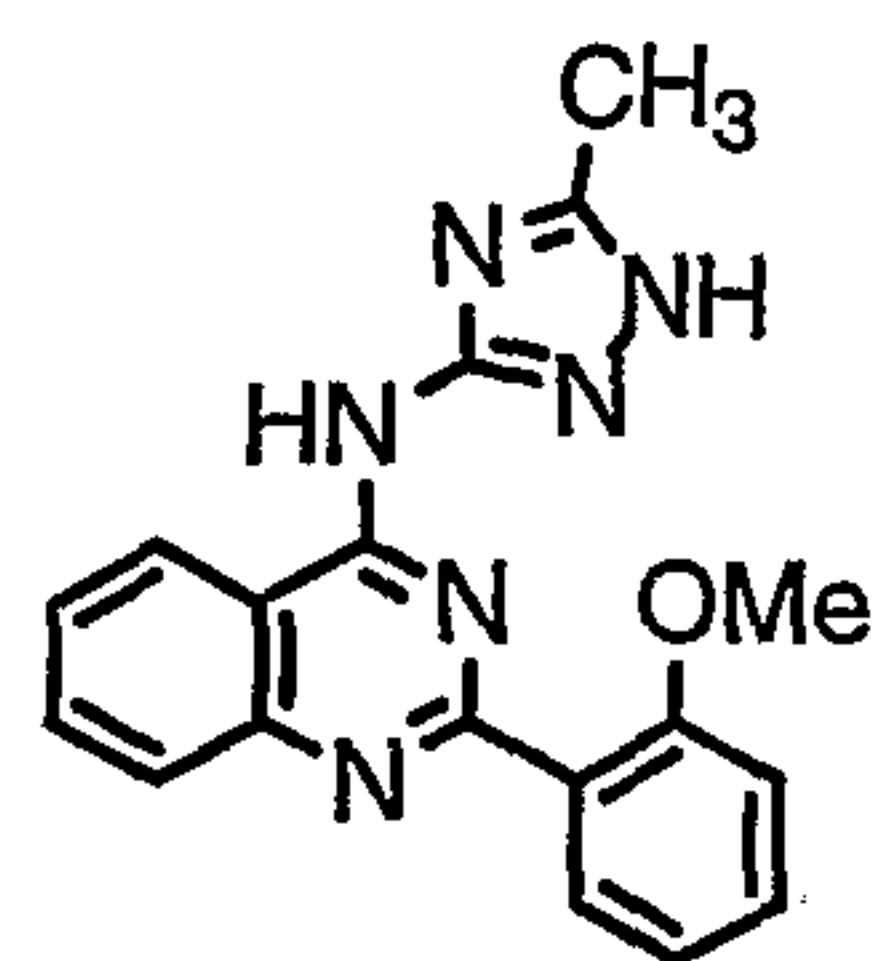
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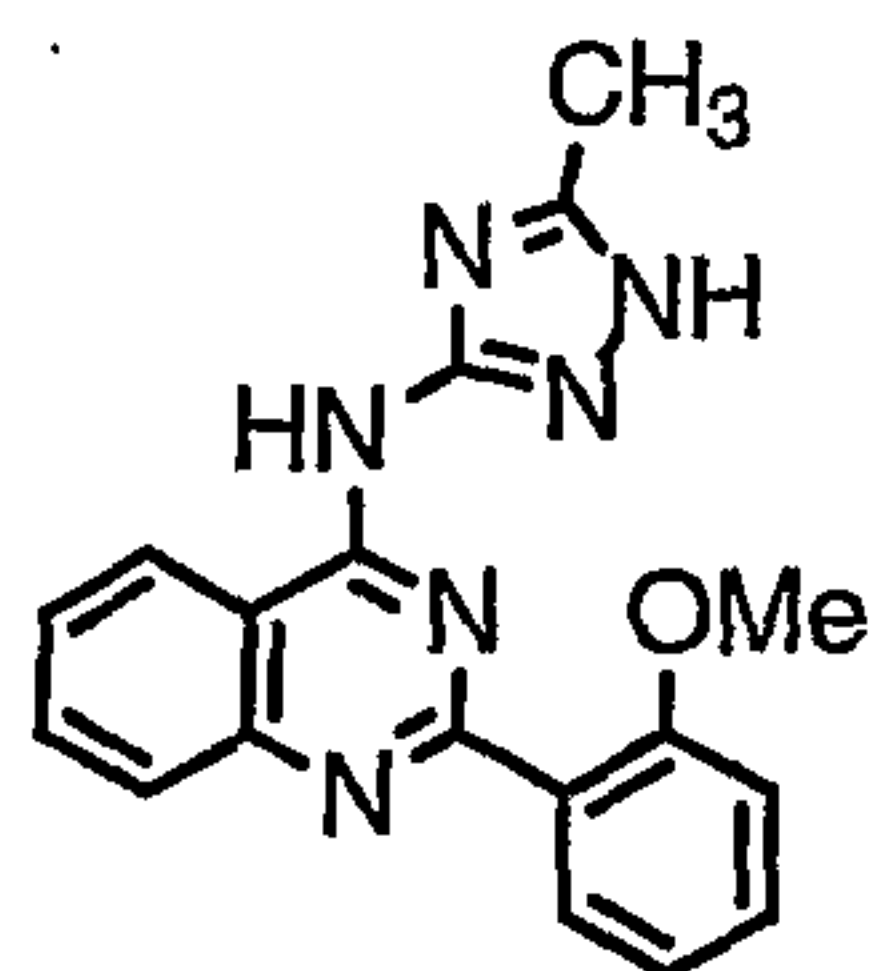
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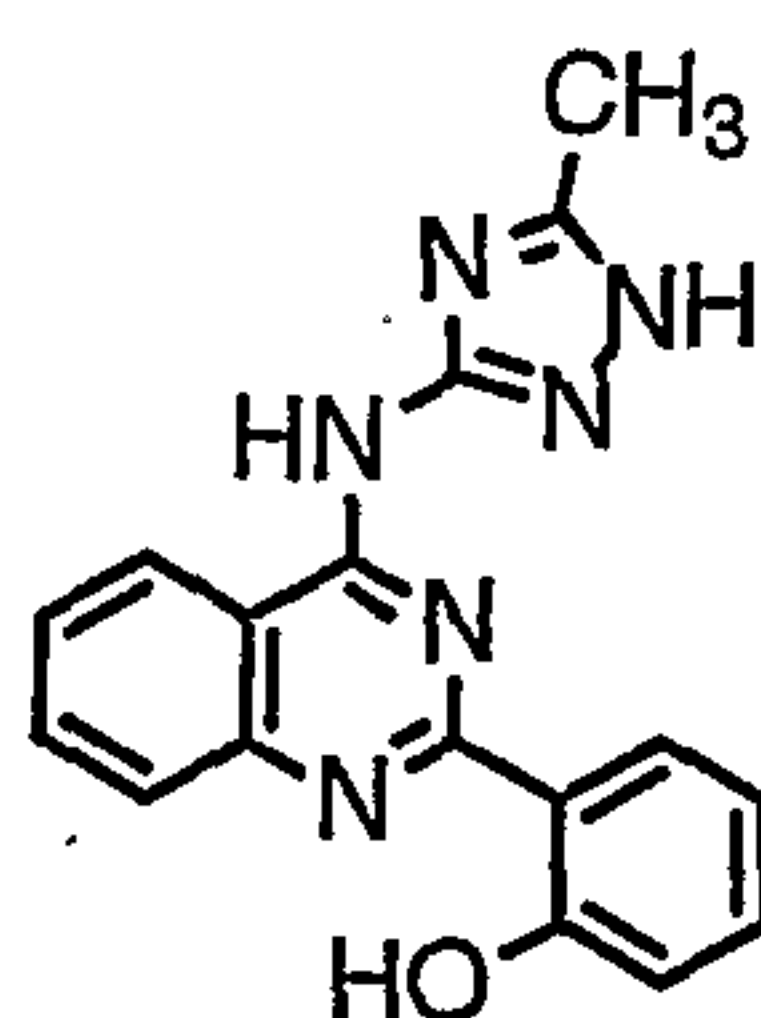
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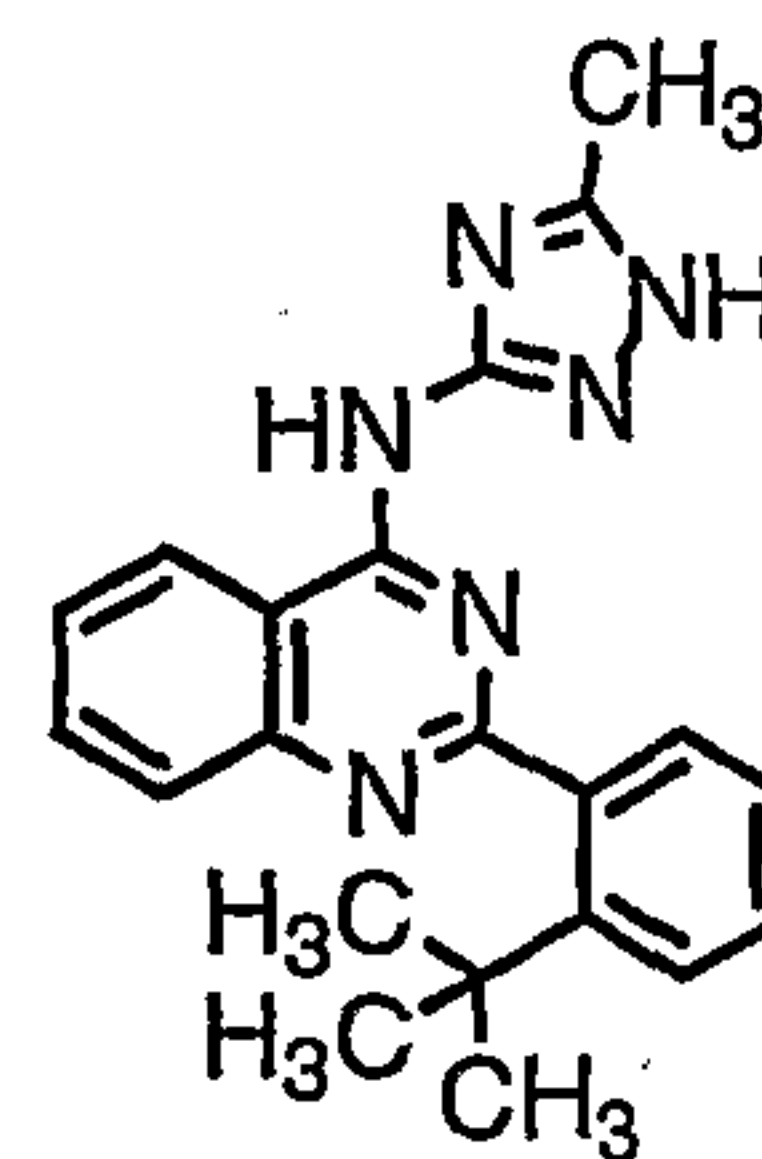
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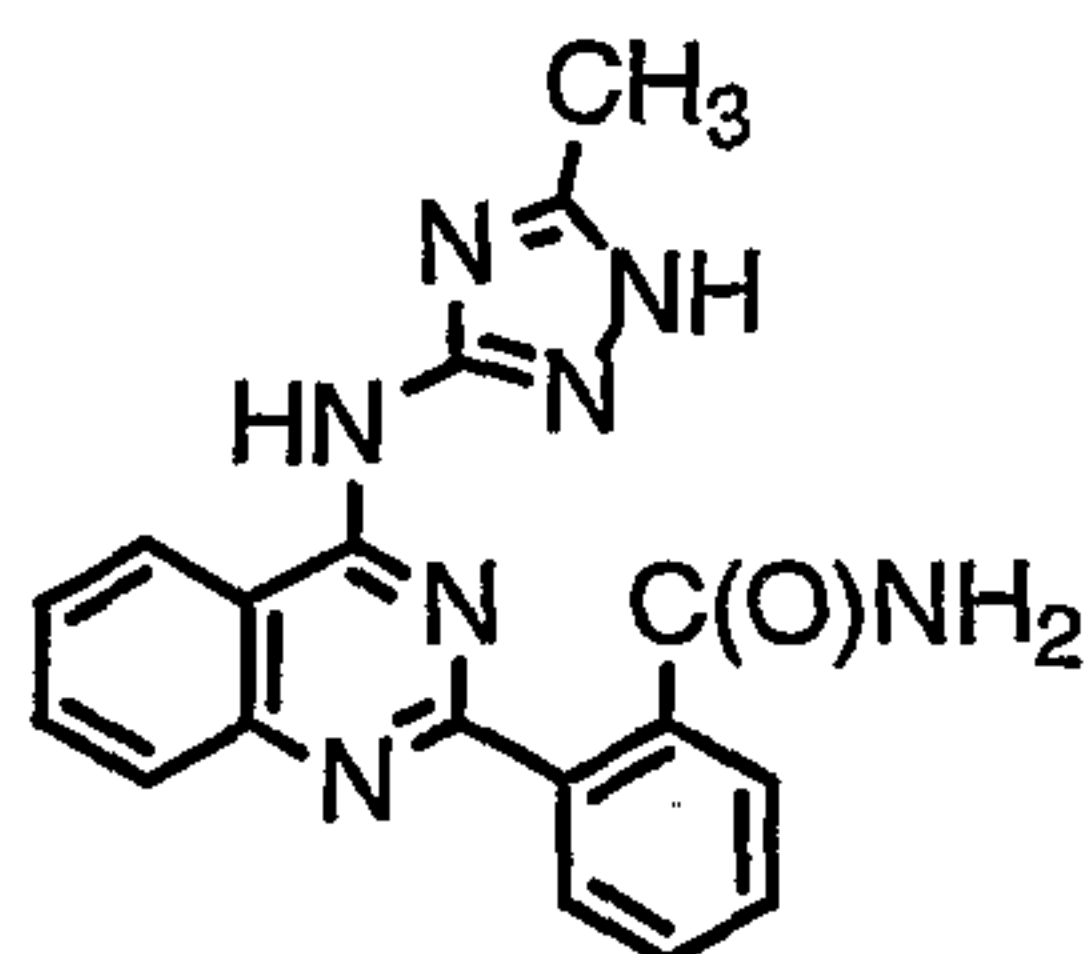
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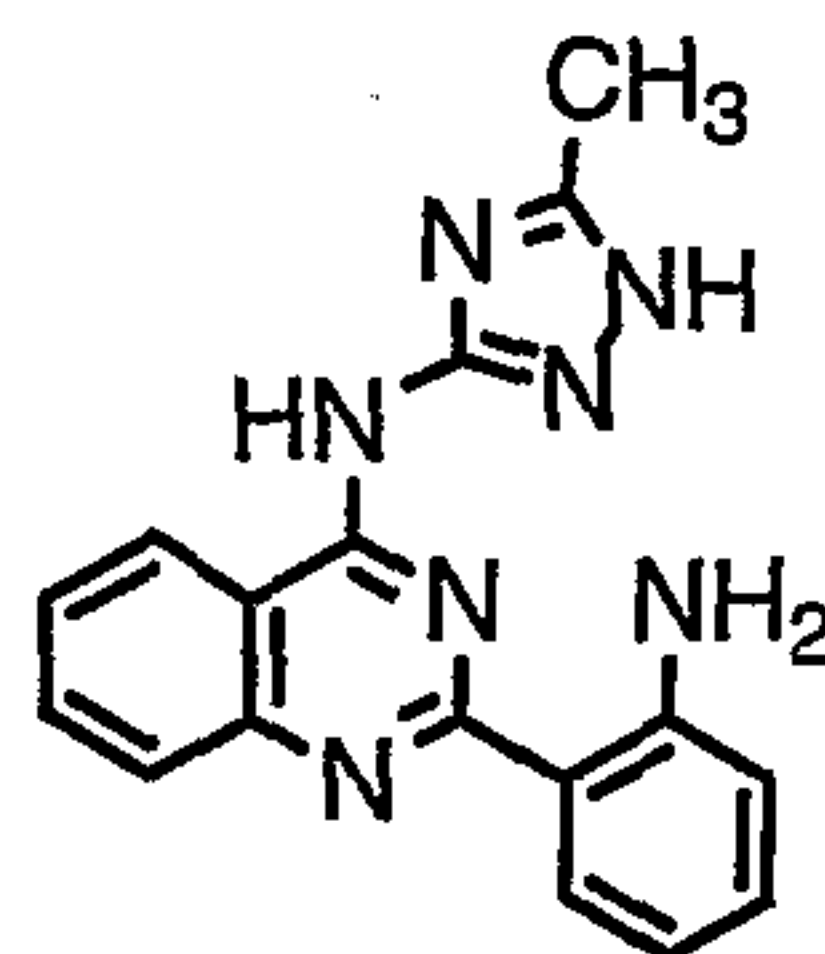
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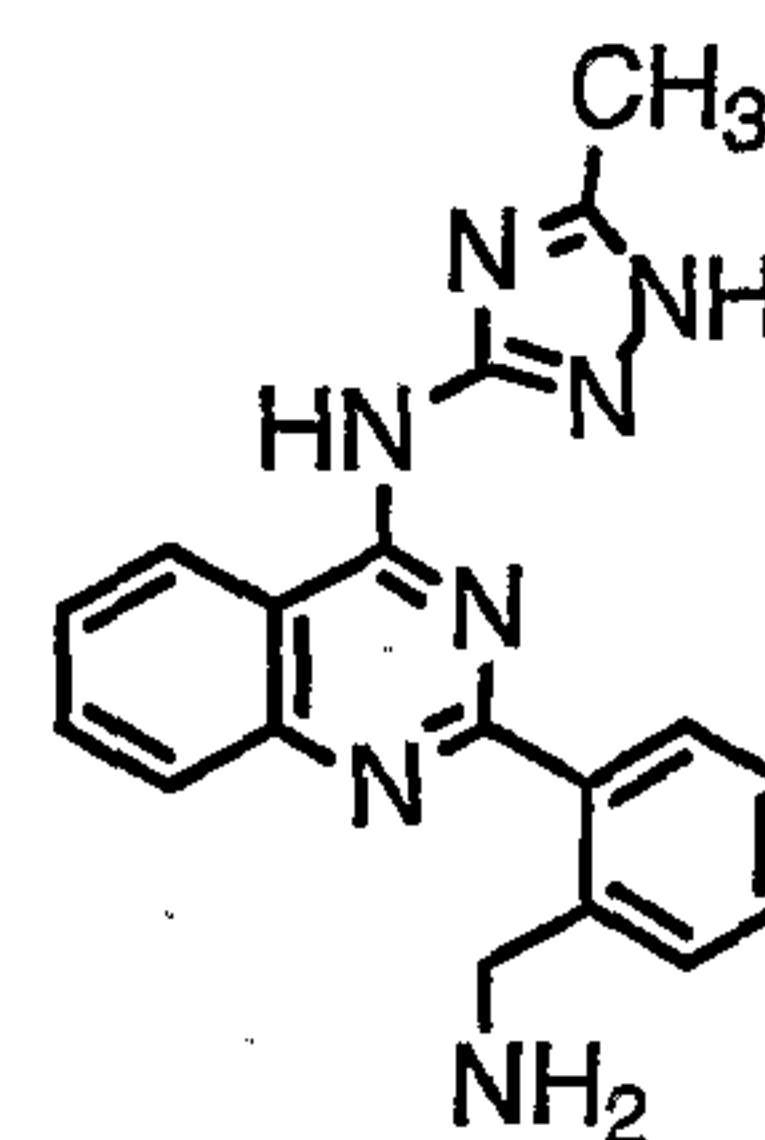
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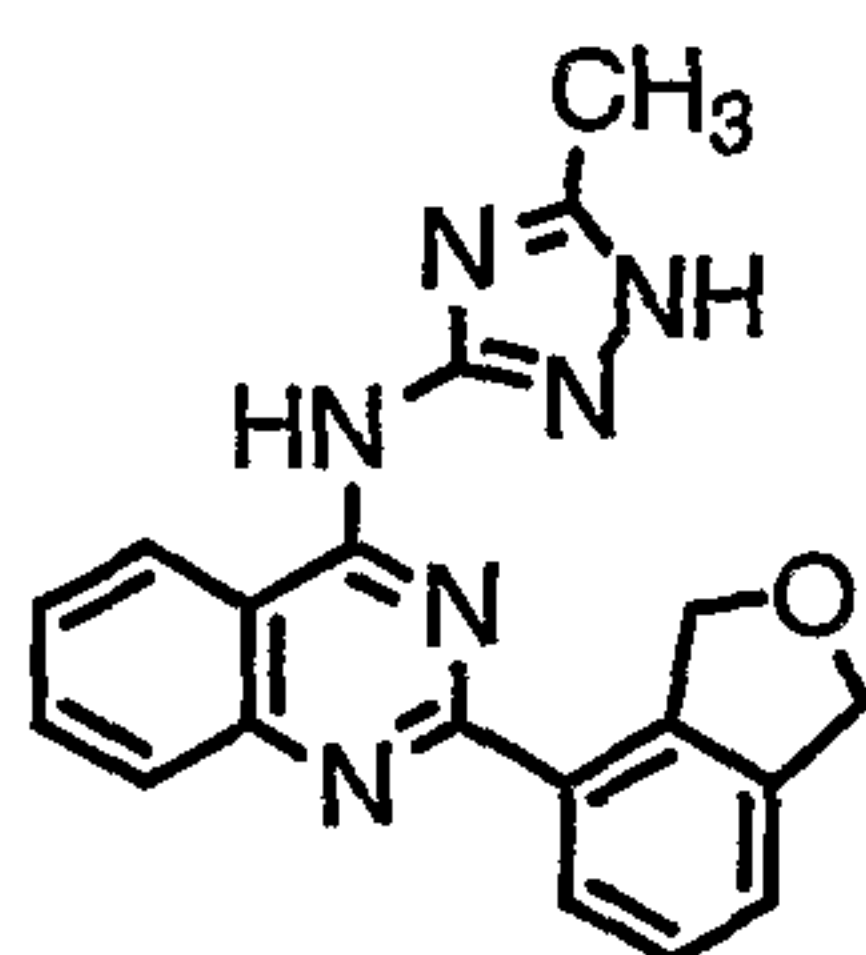
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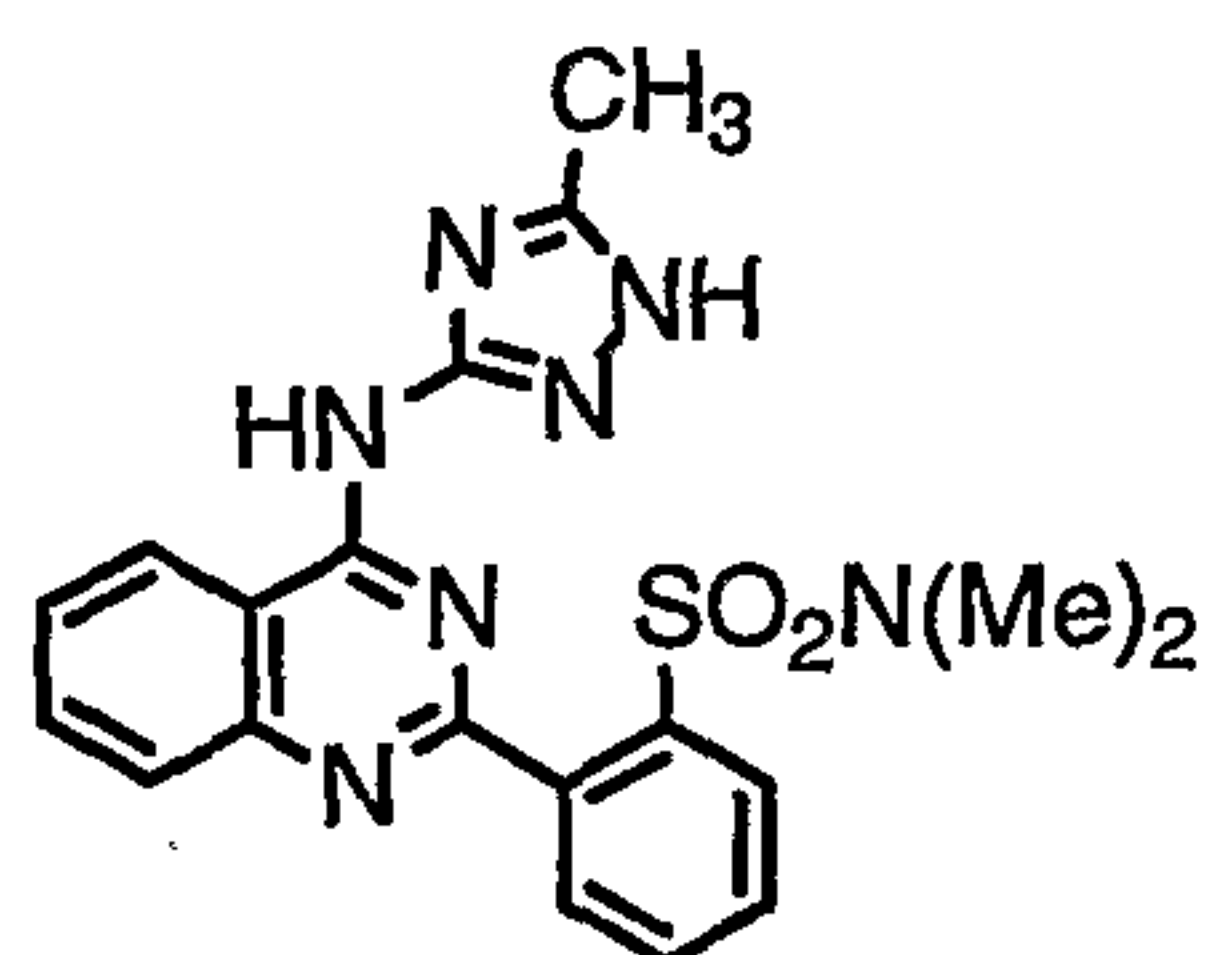
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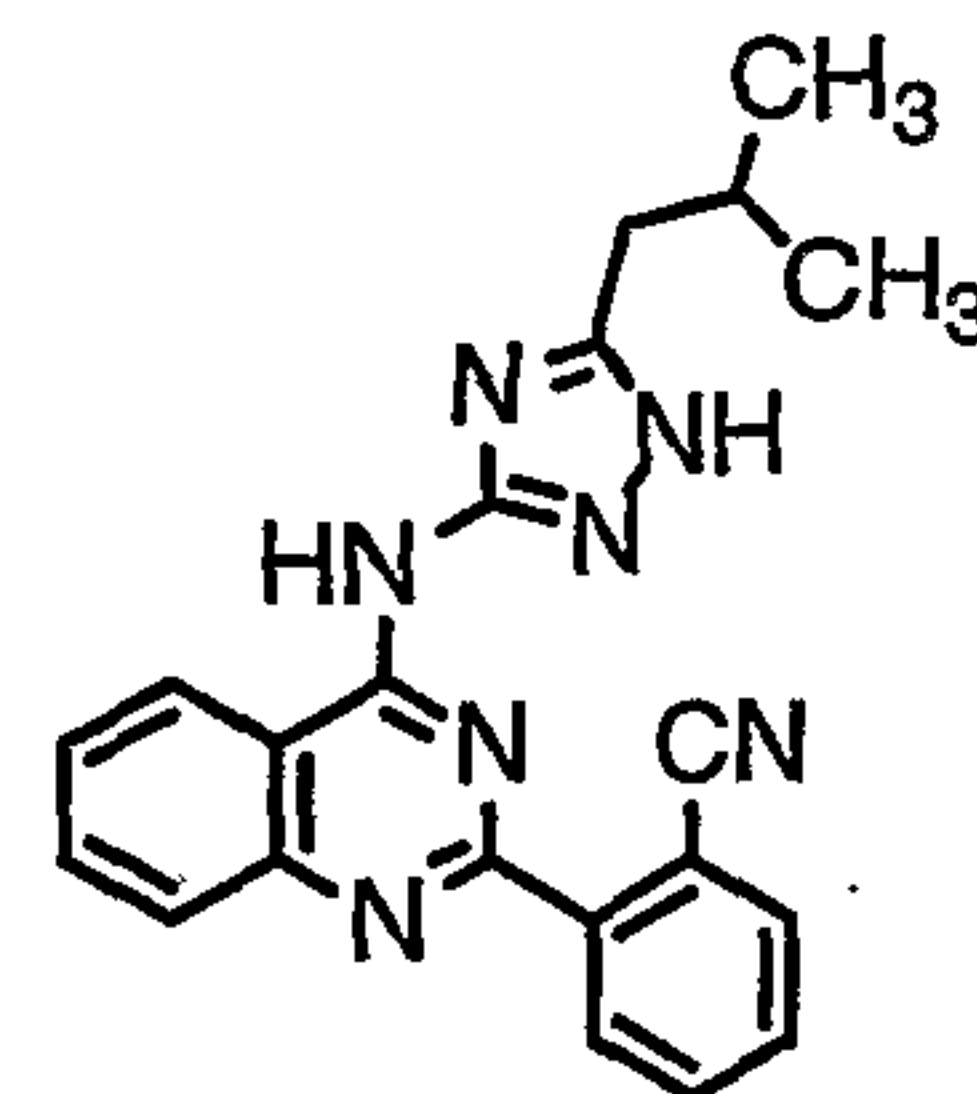
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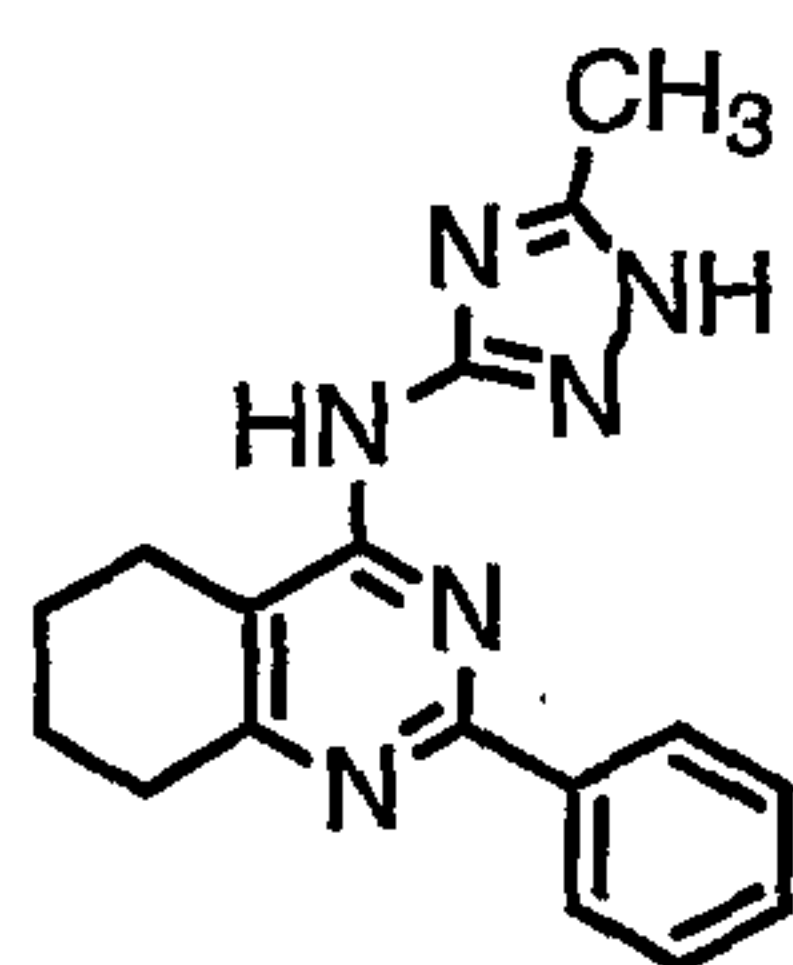
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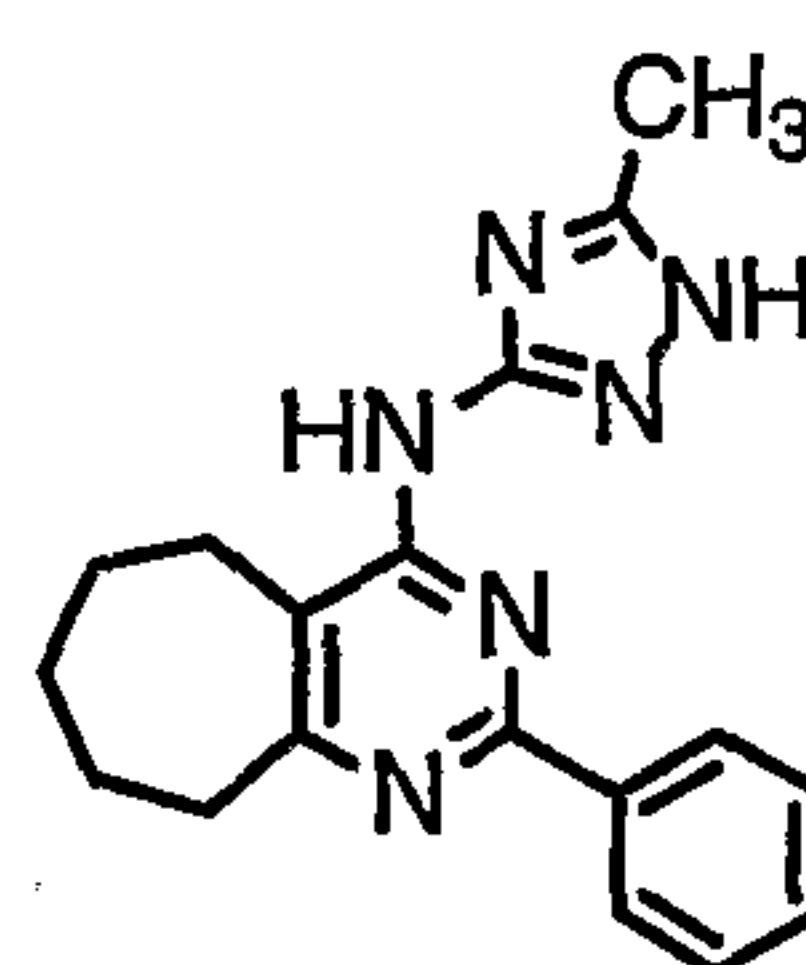
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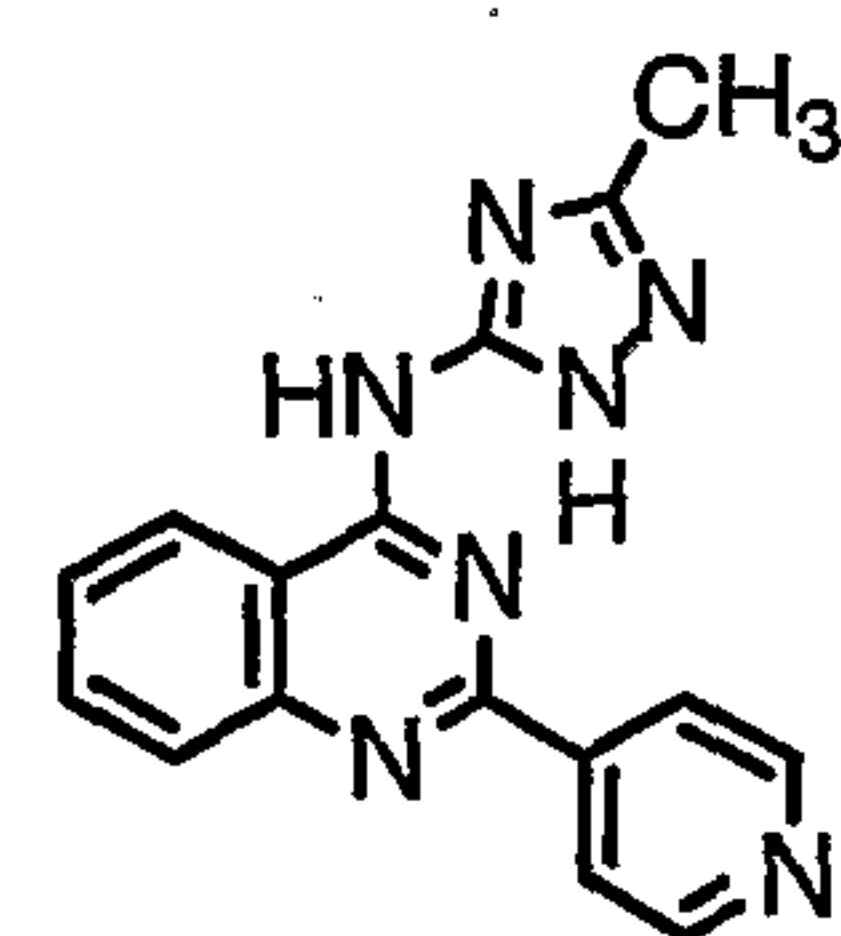
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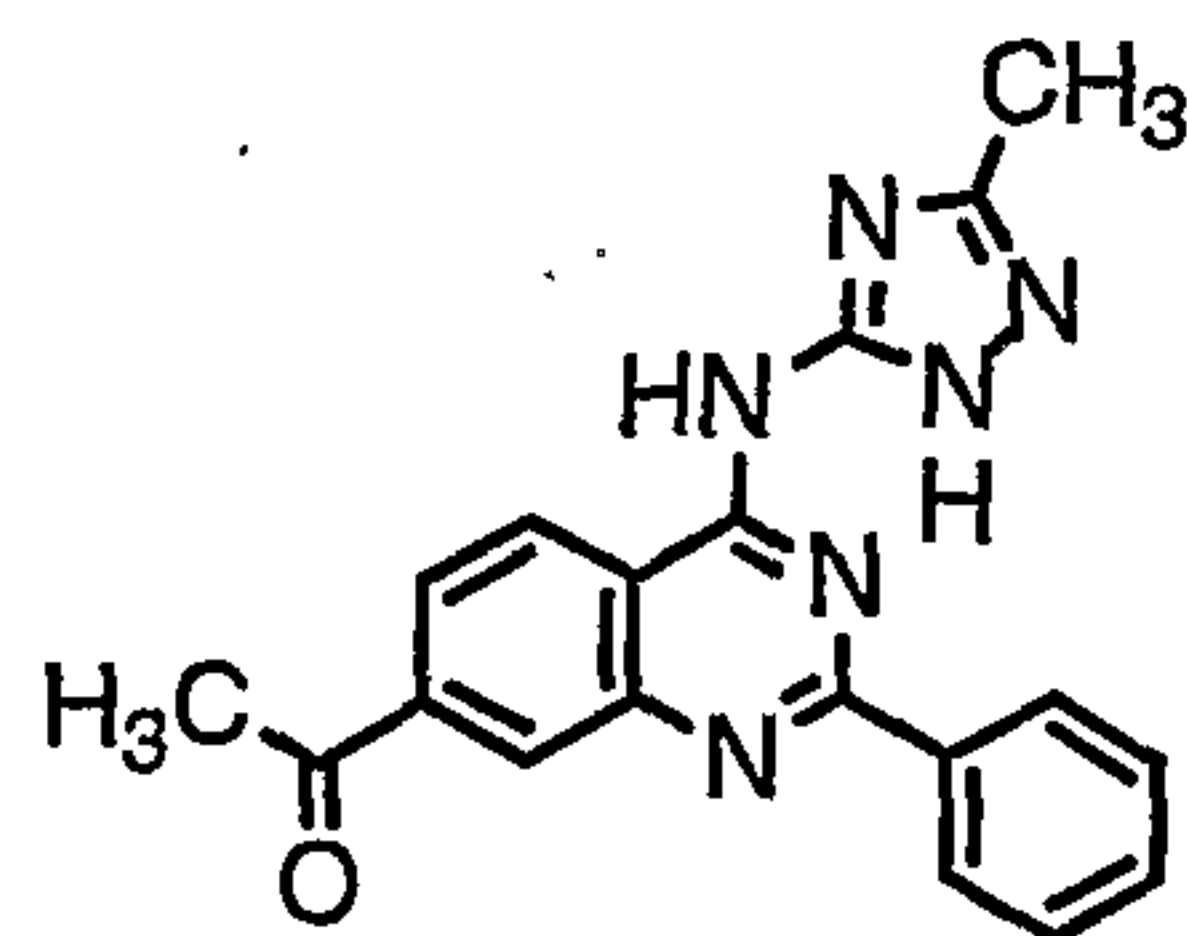
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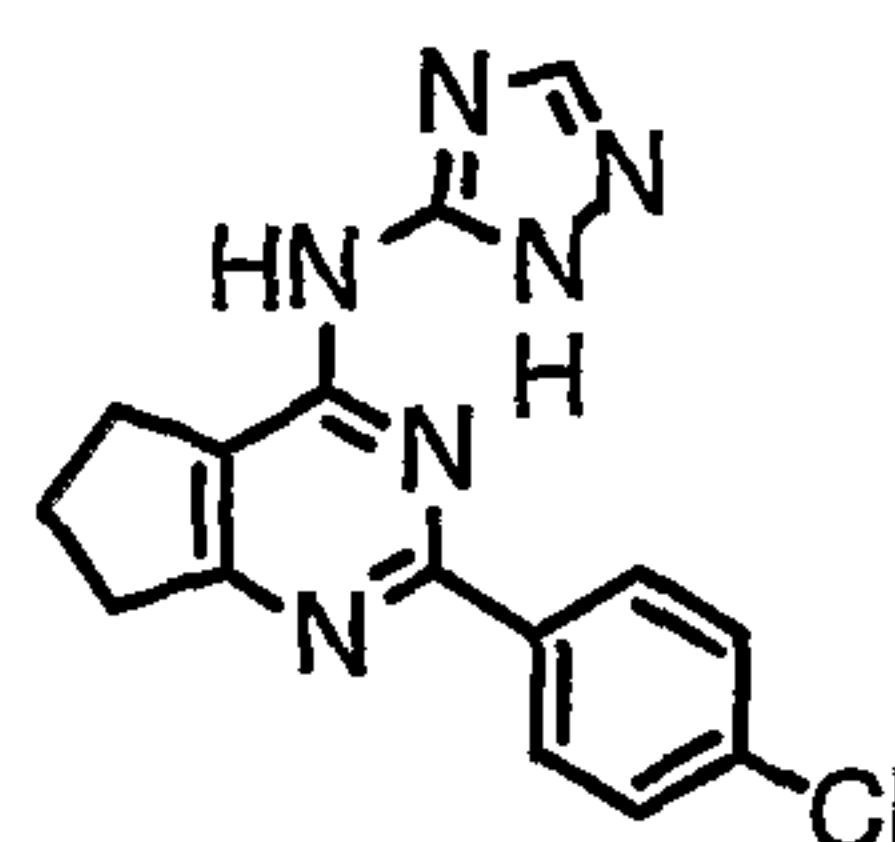
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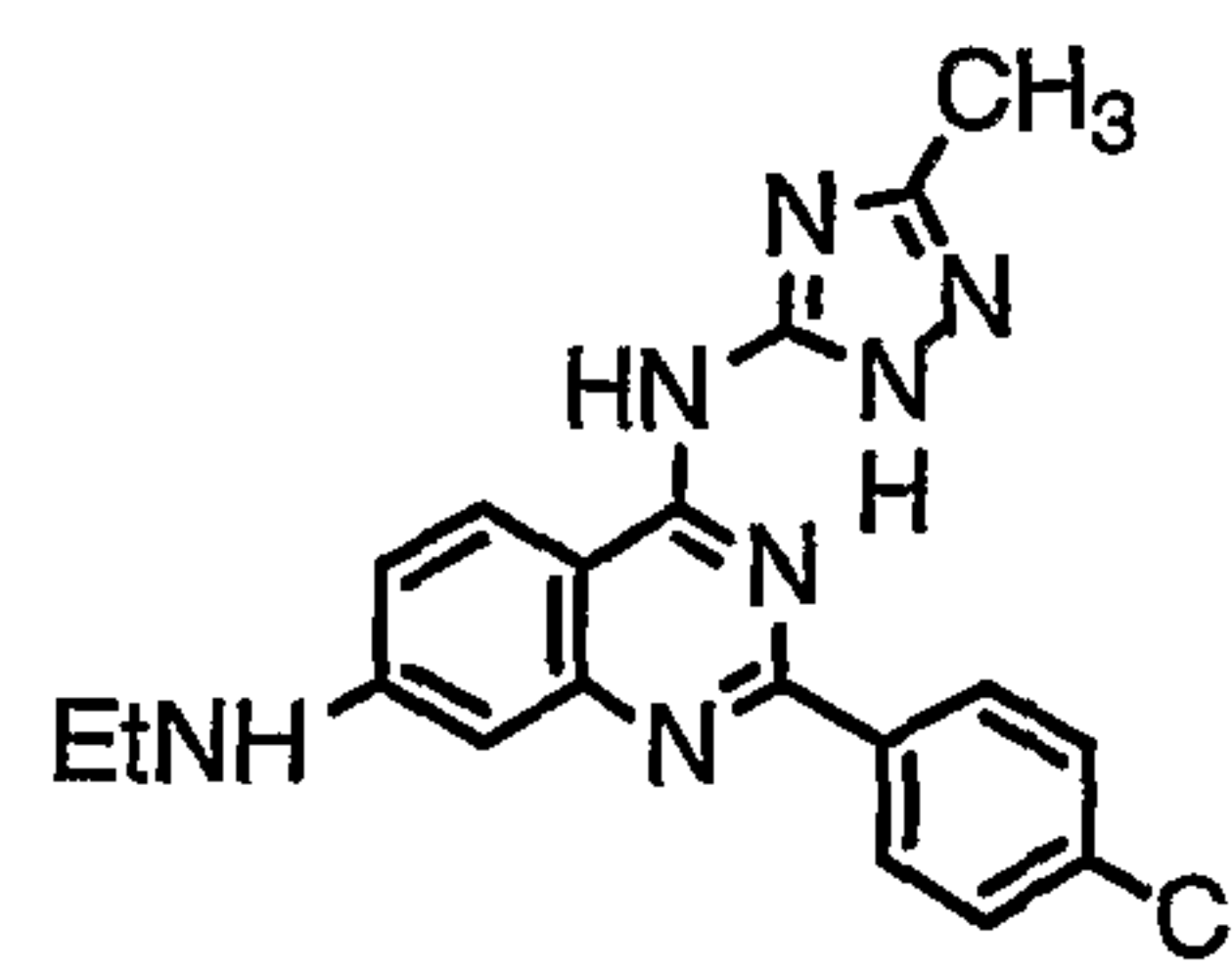
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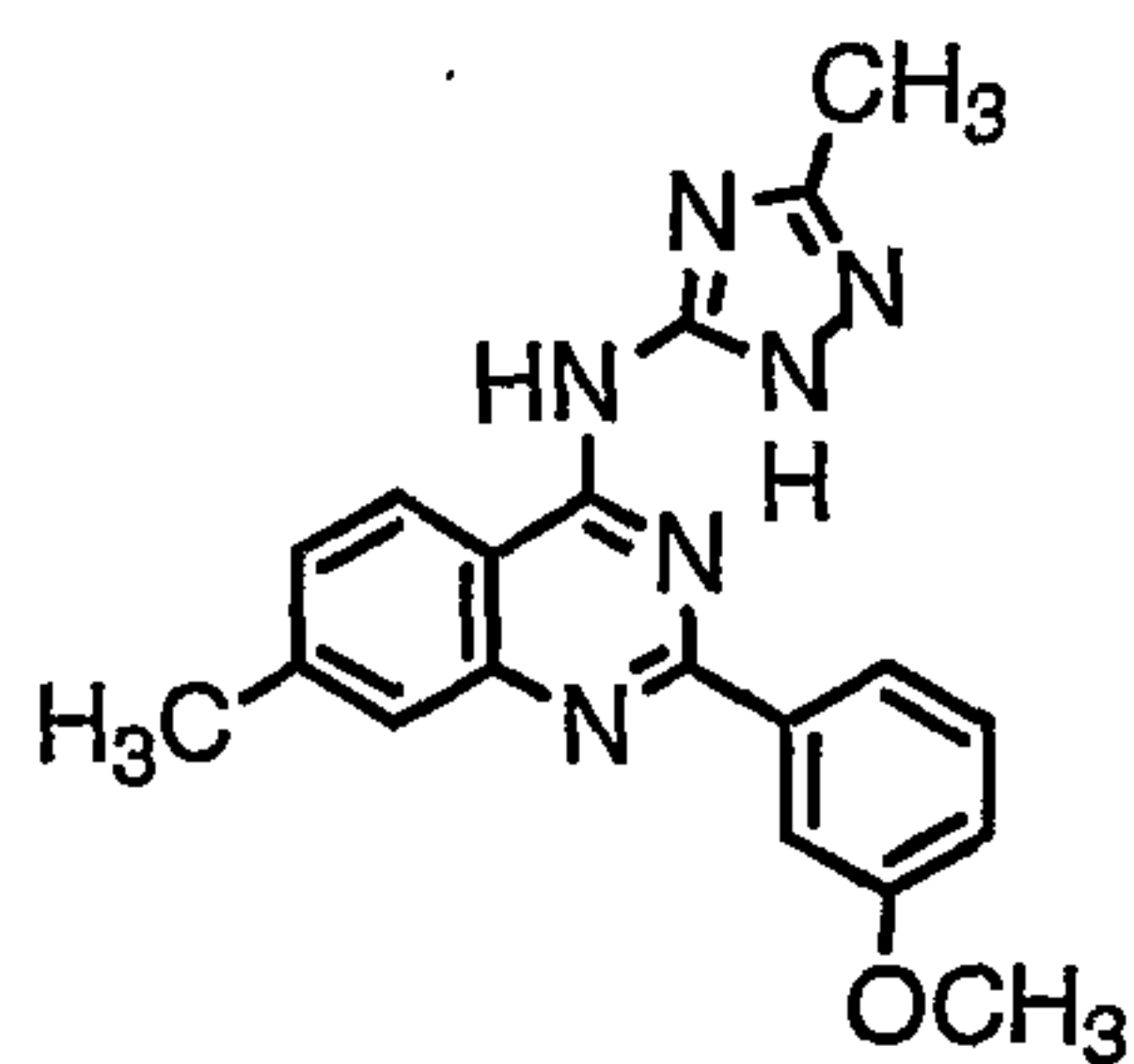
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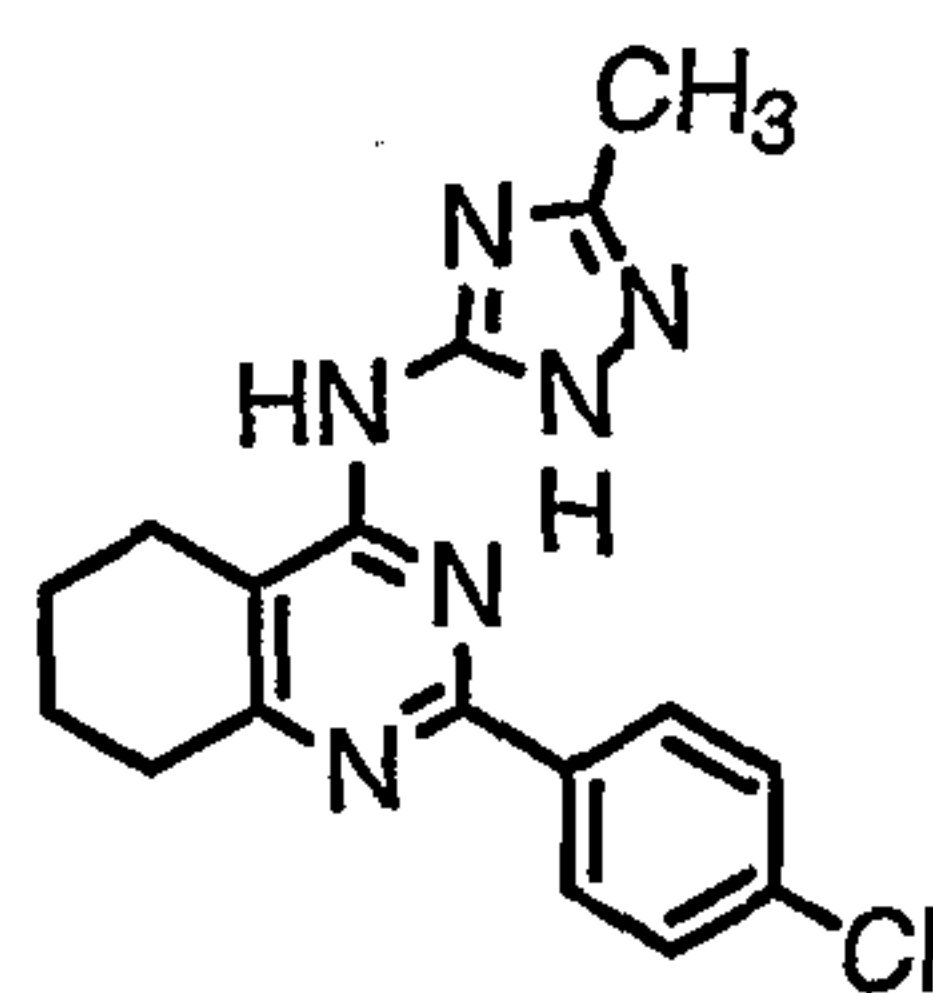
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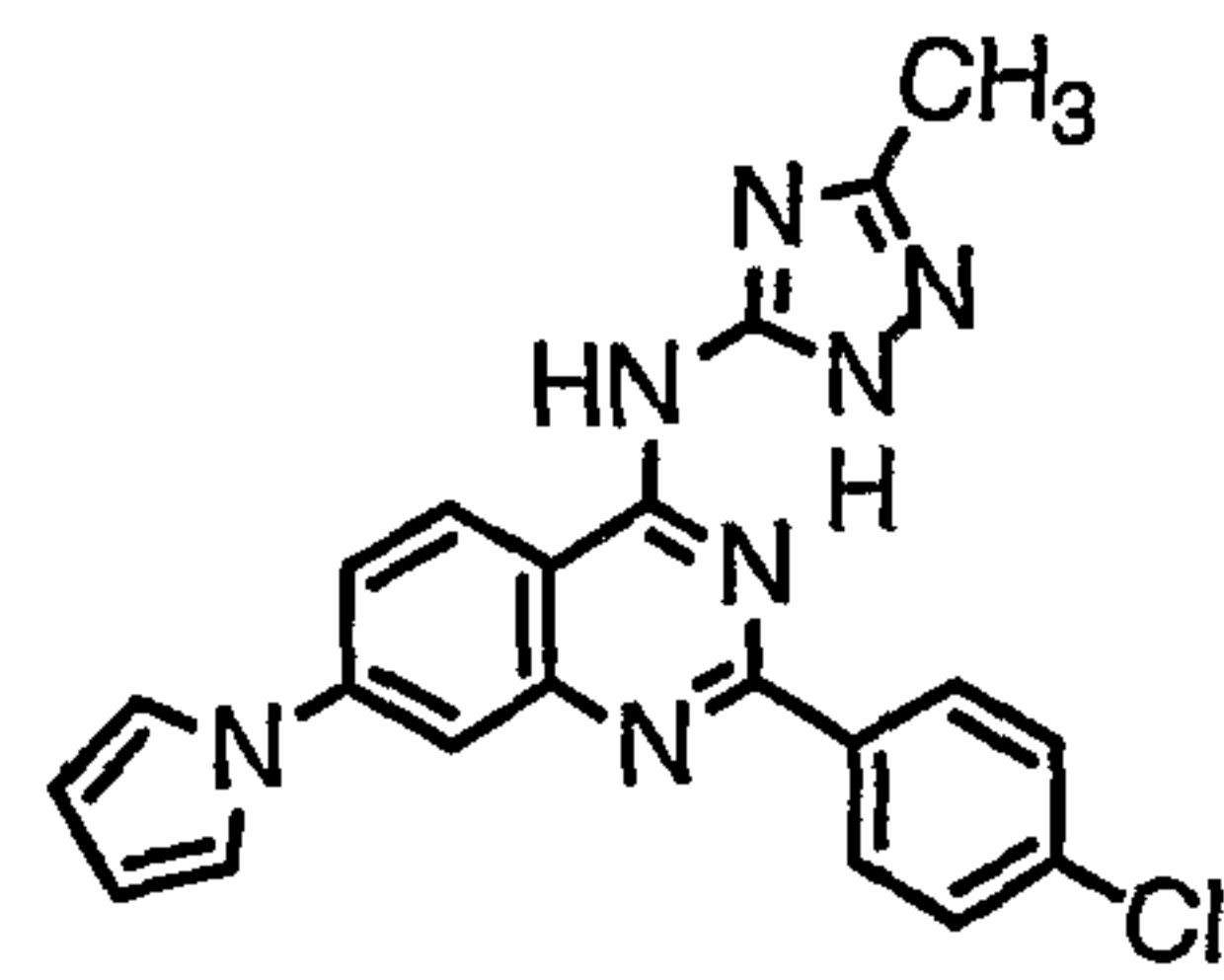
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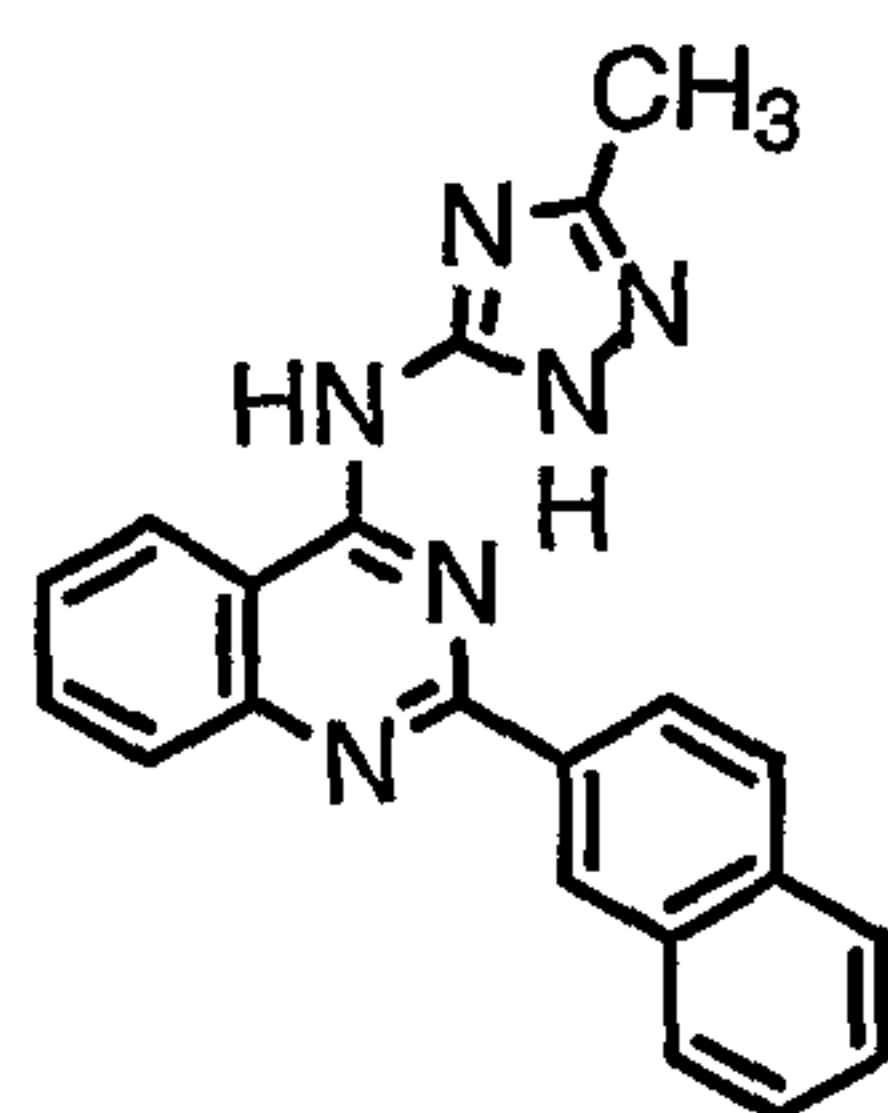
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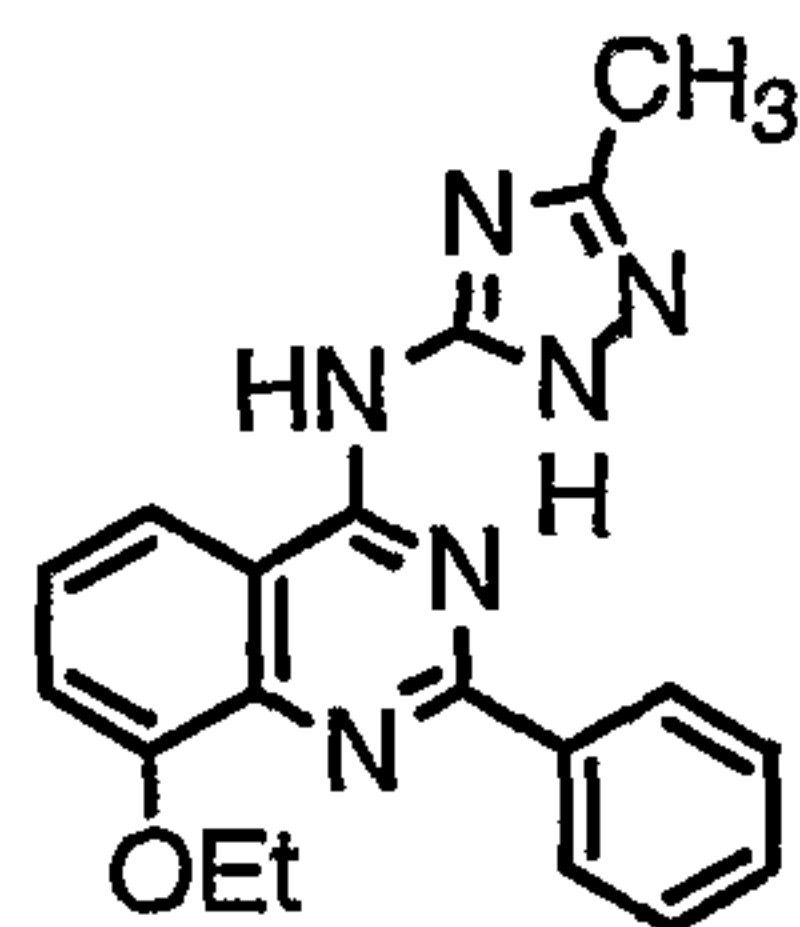
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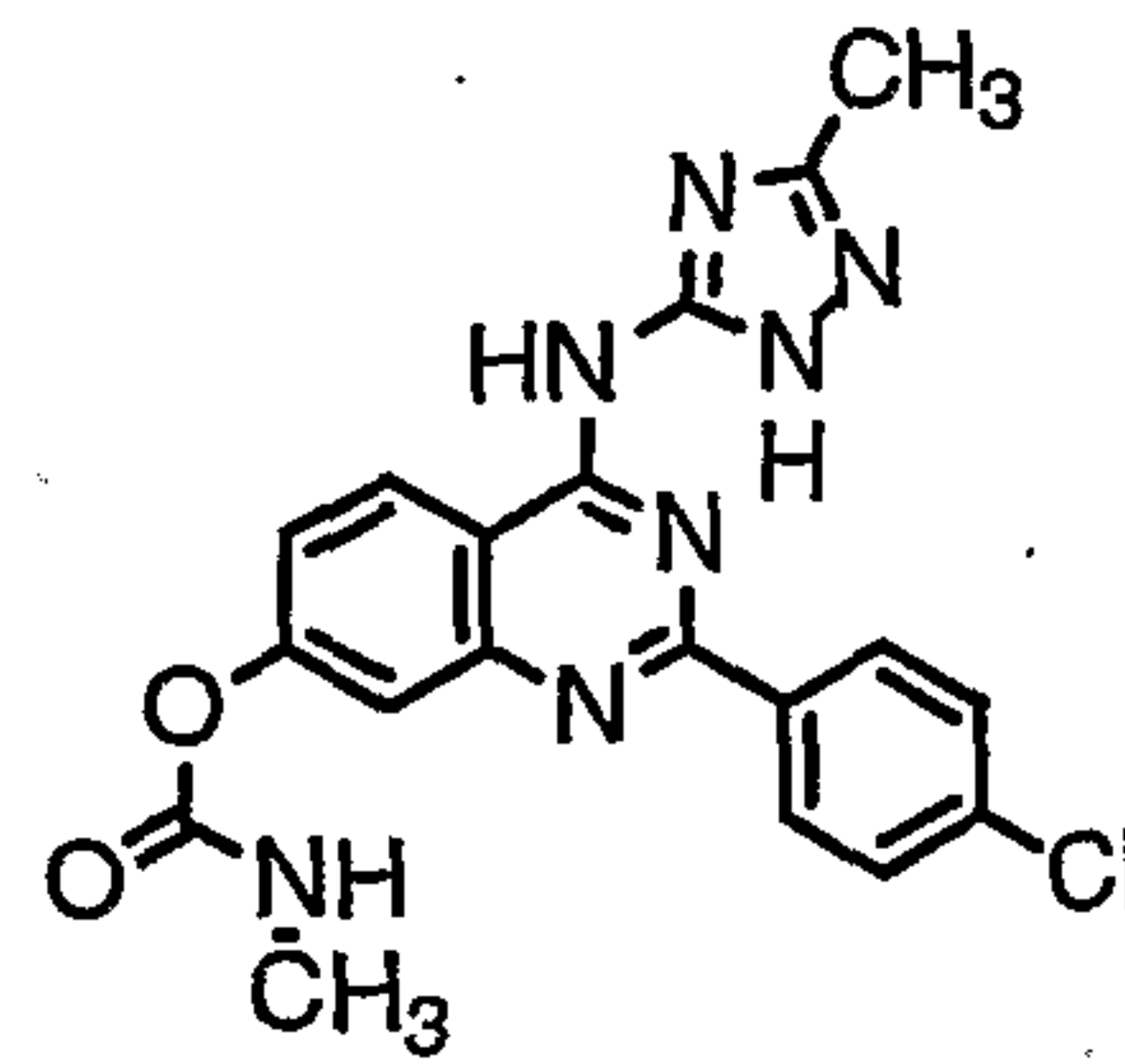
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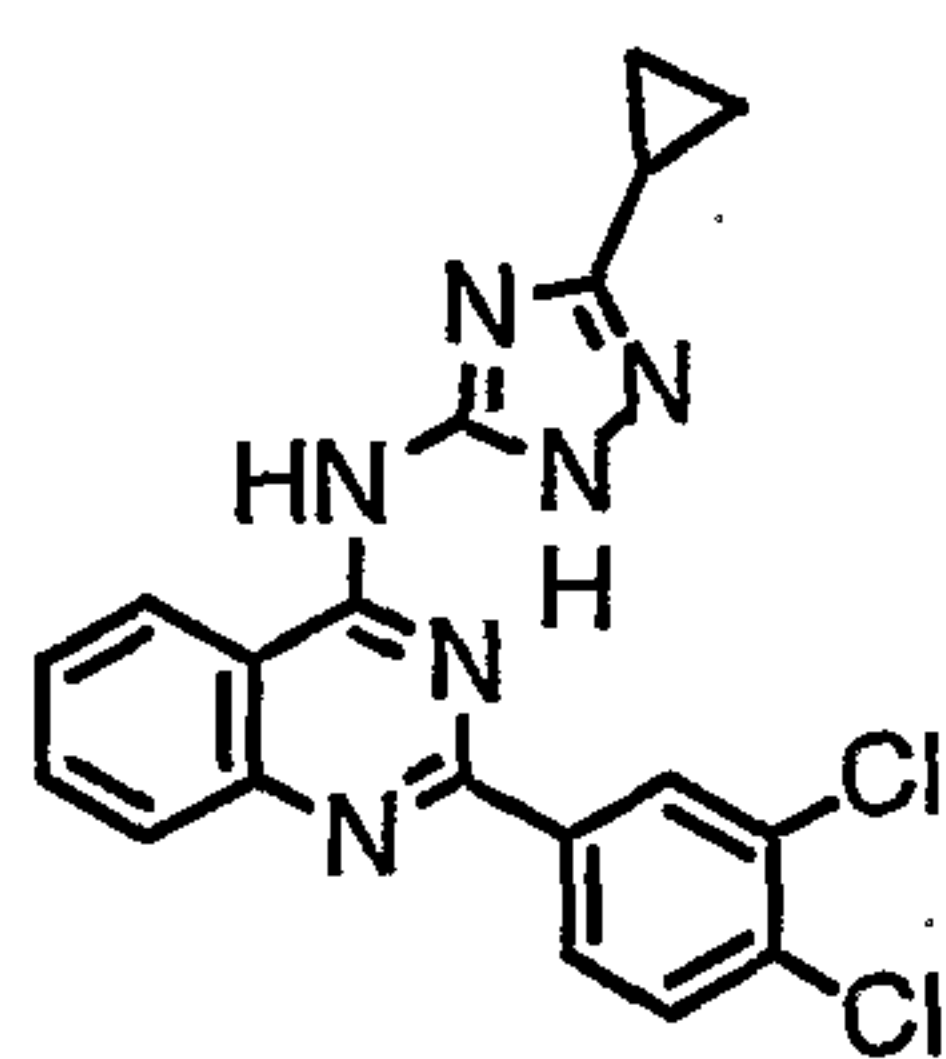
IX-139



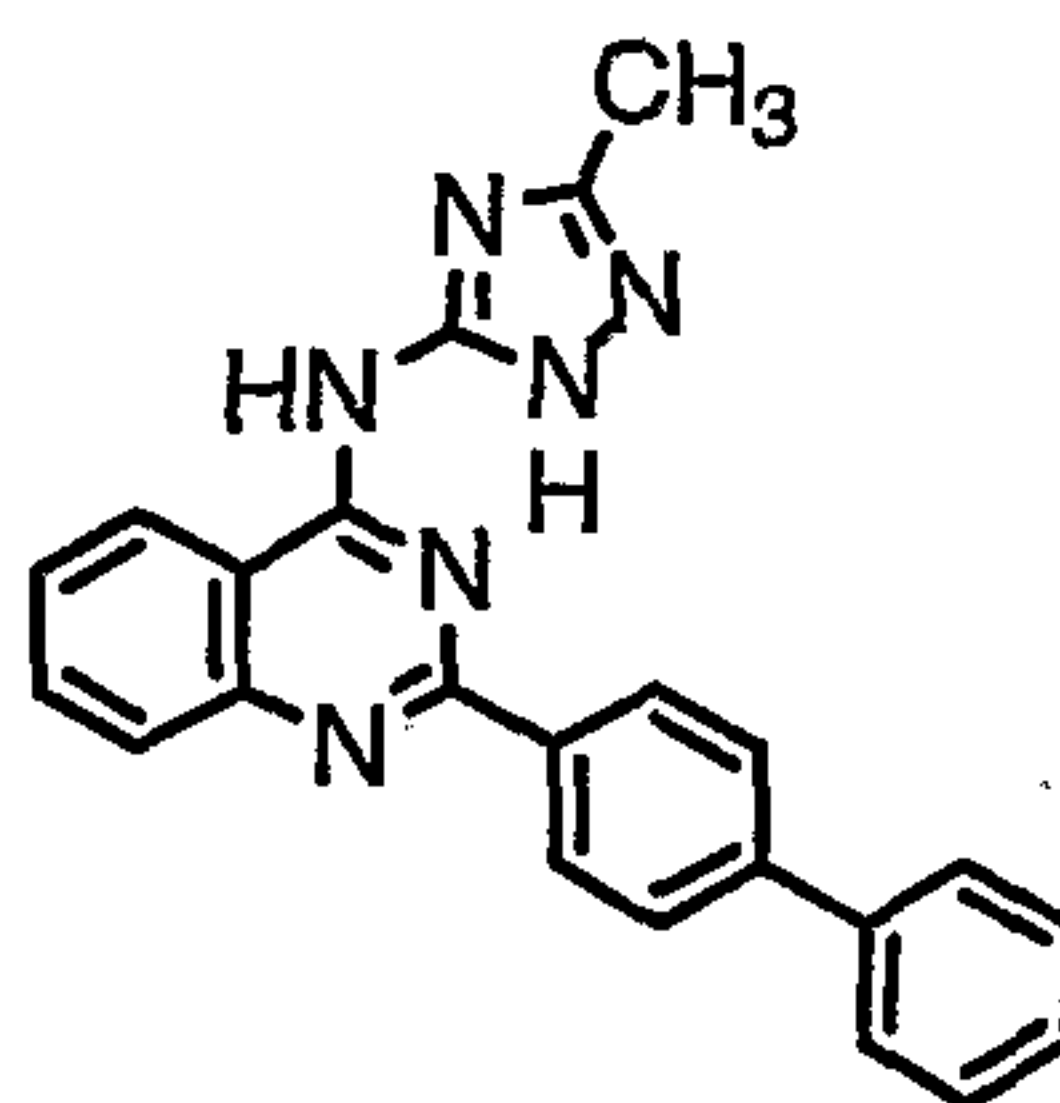
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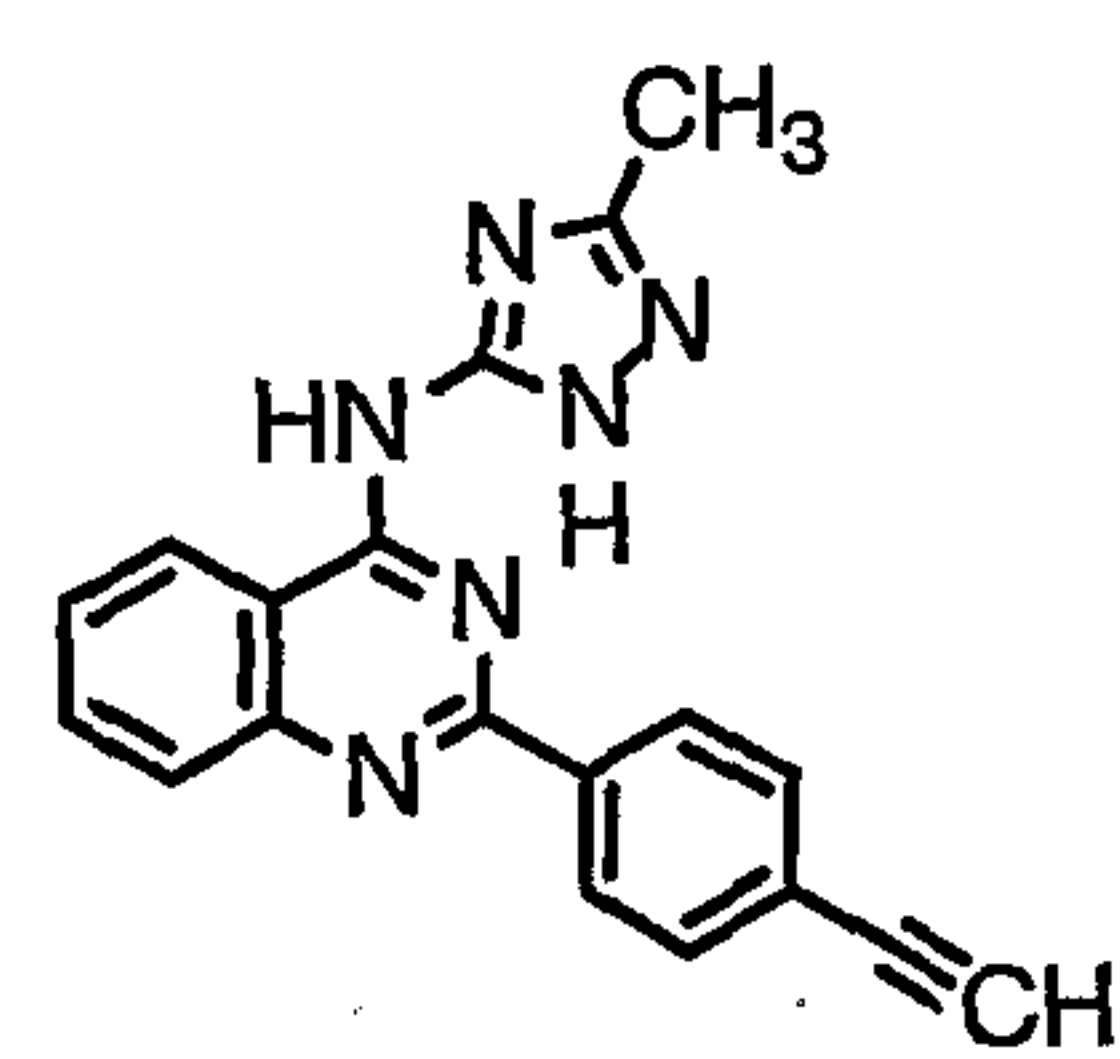
IX-141



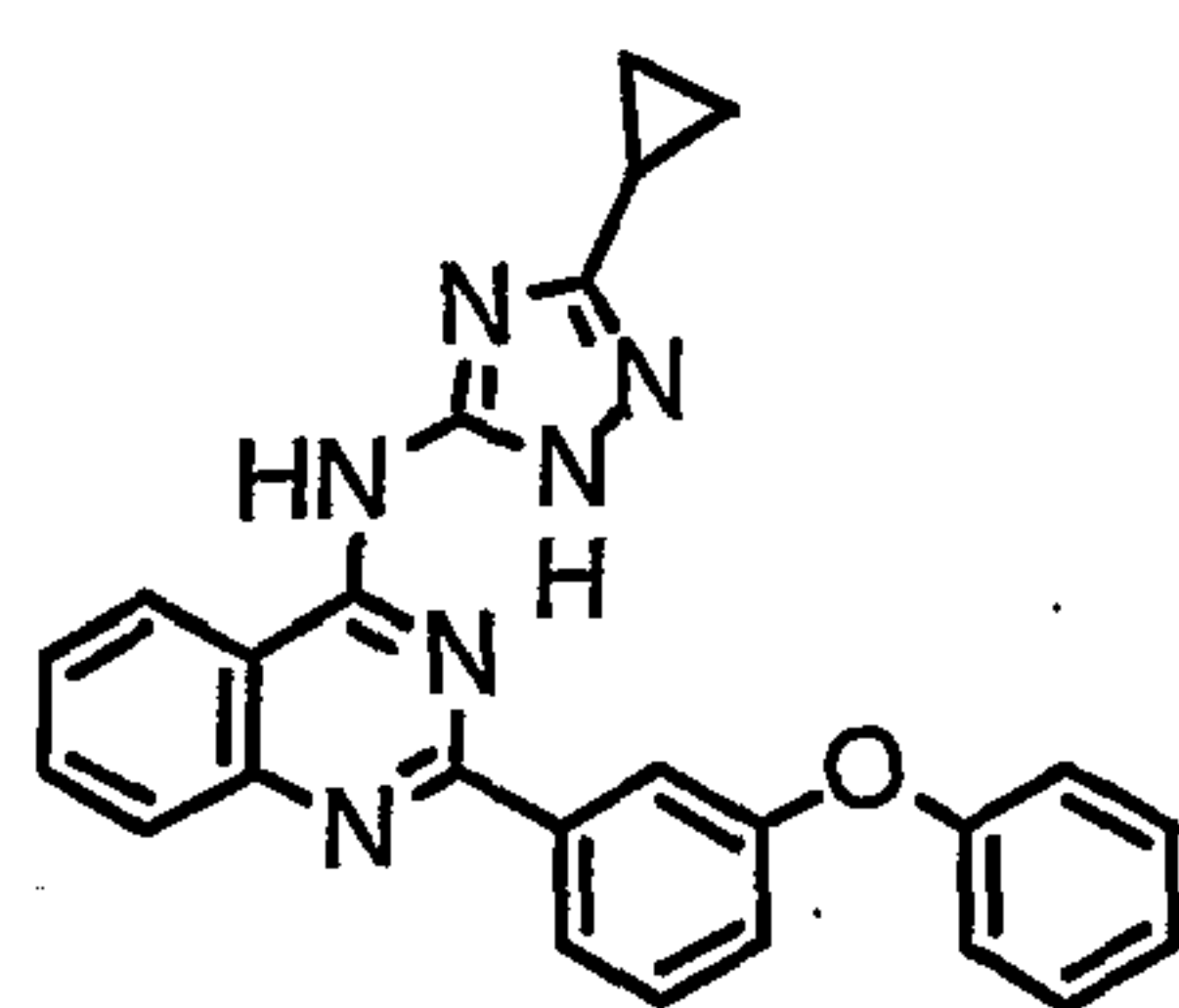
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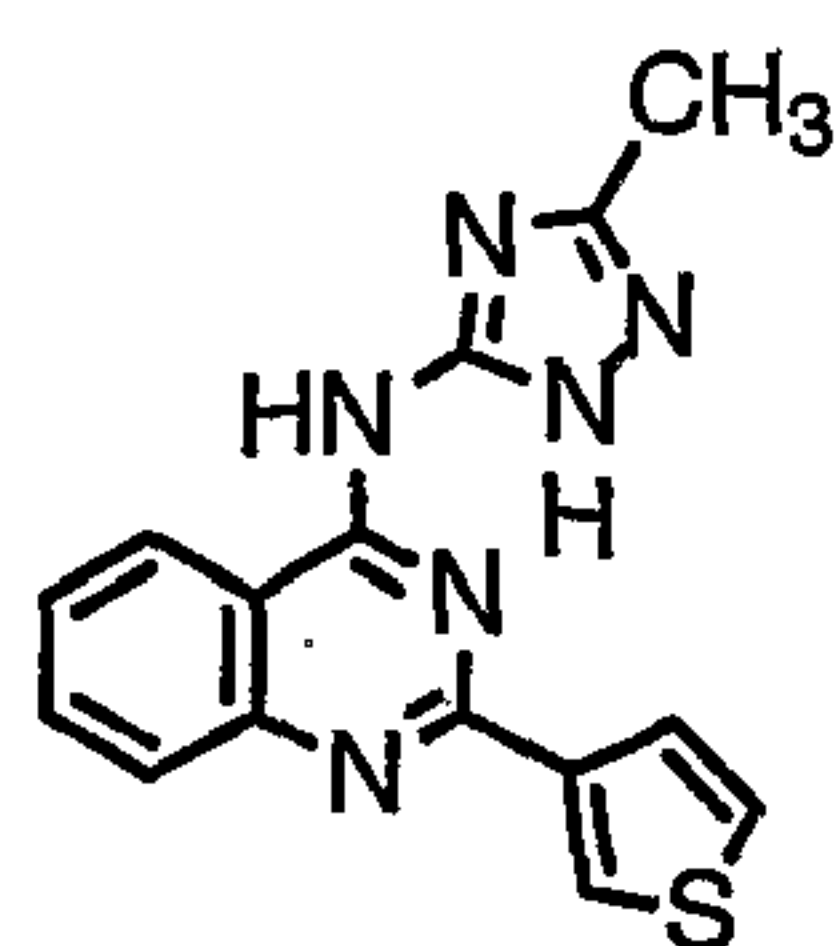
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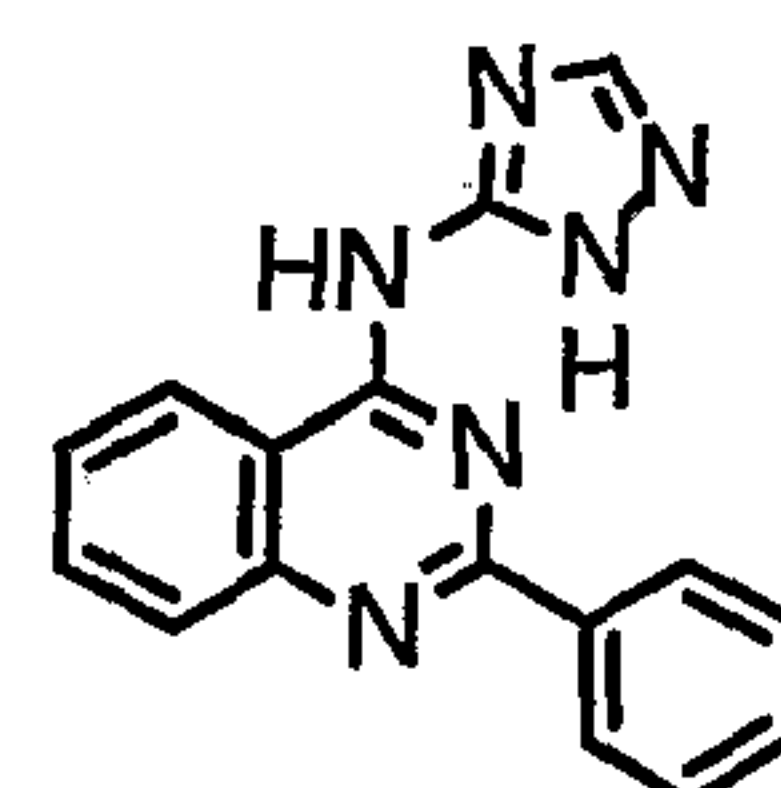
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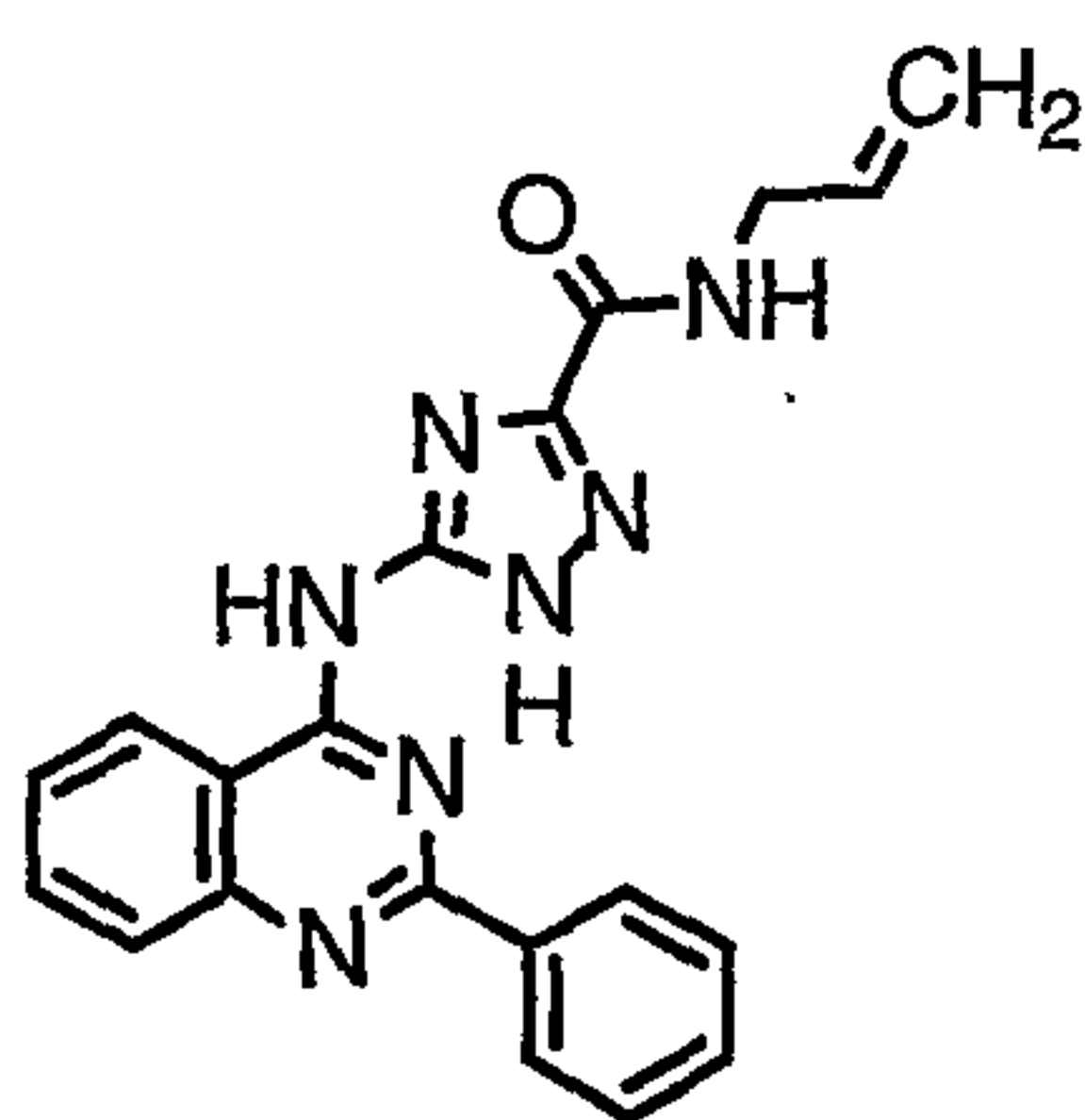
IX-145



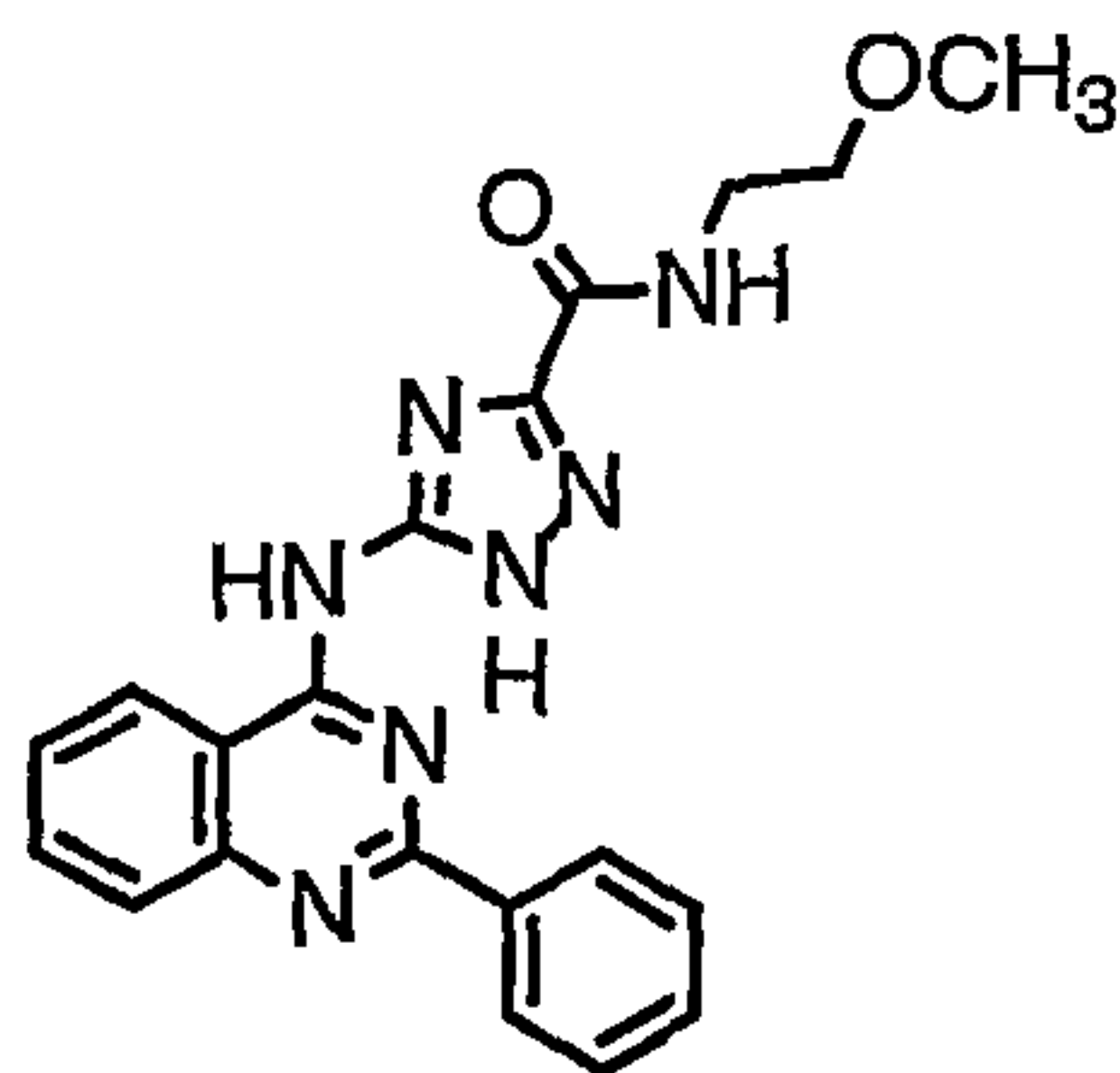
IX-146



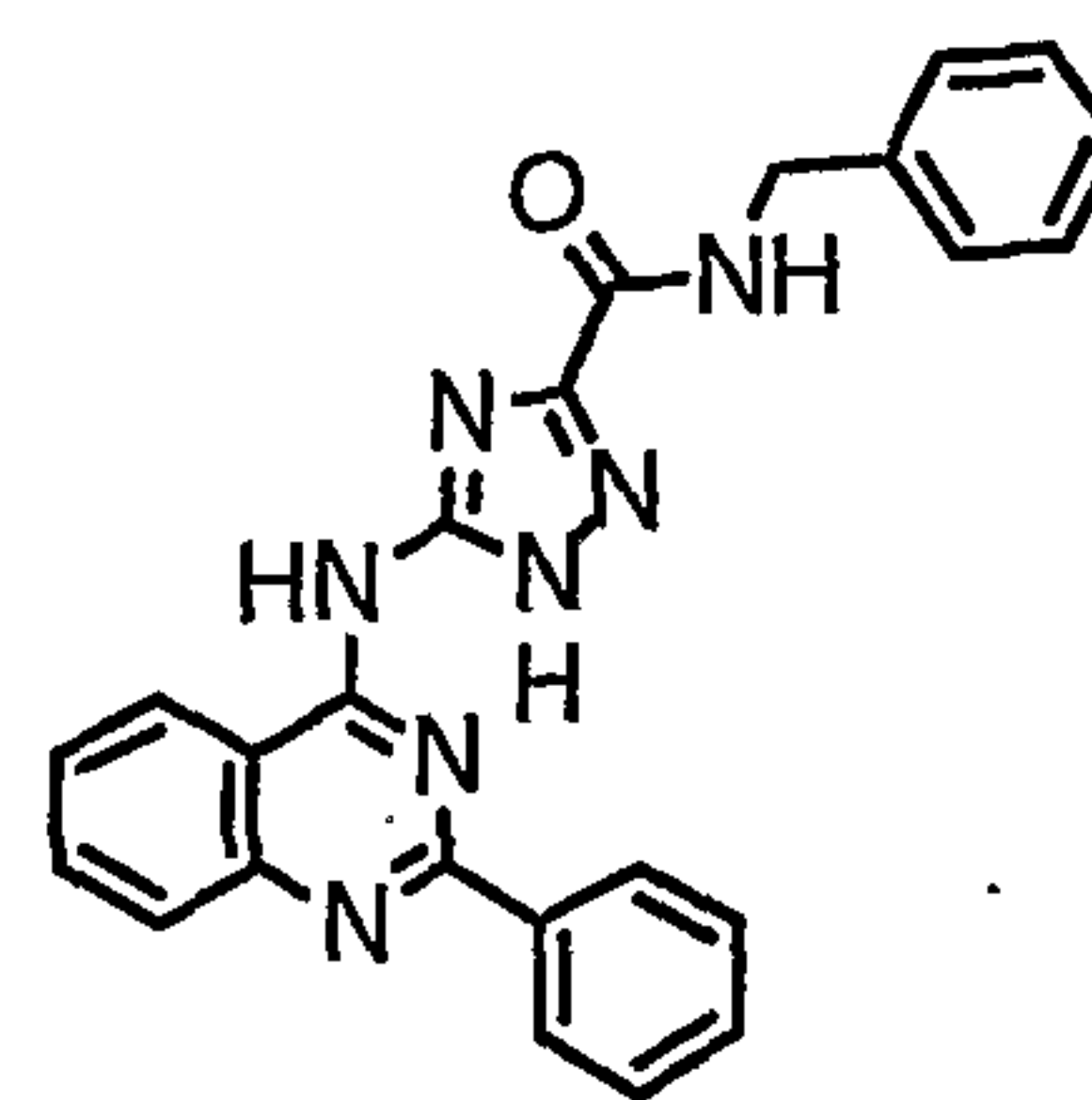
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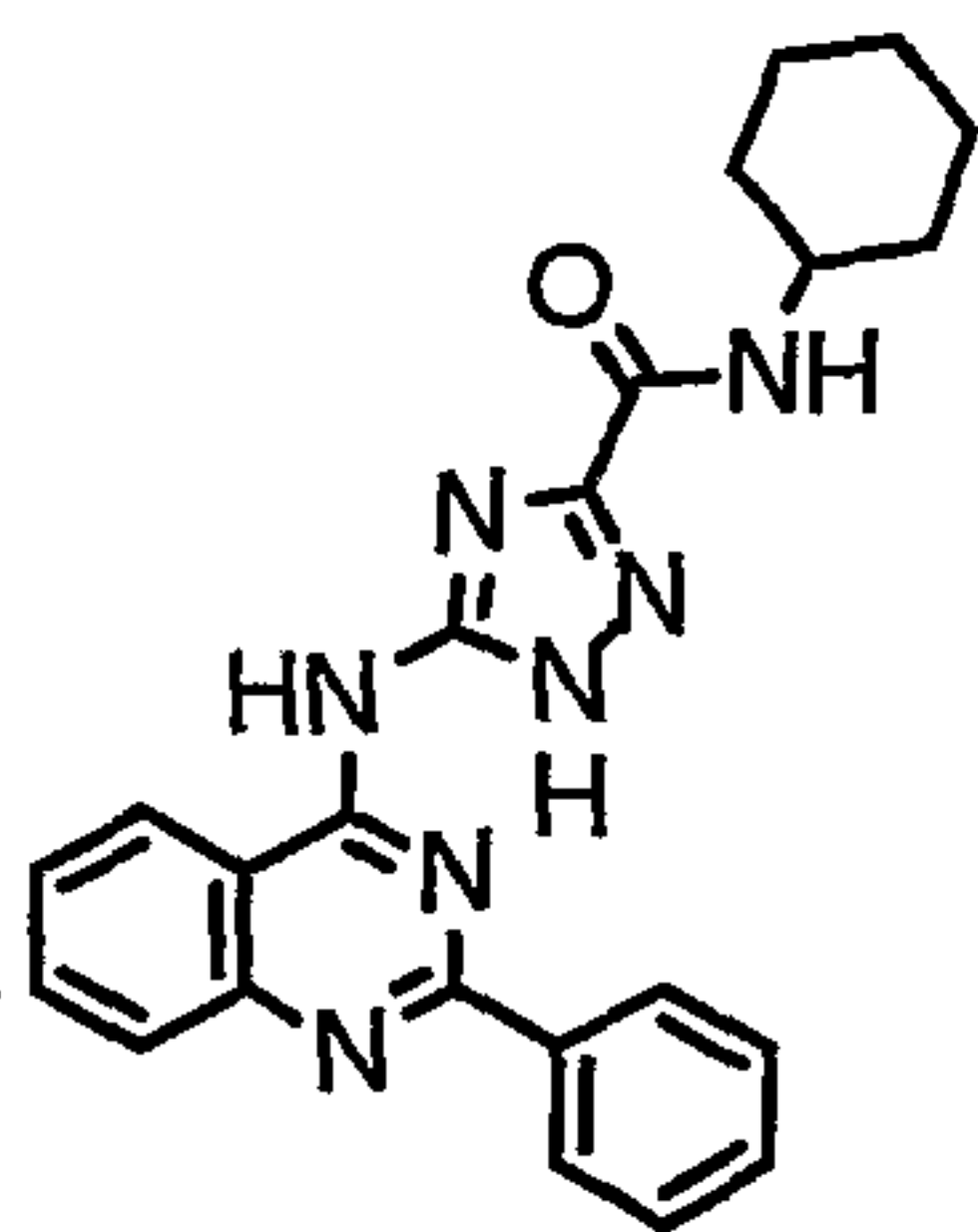
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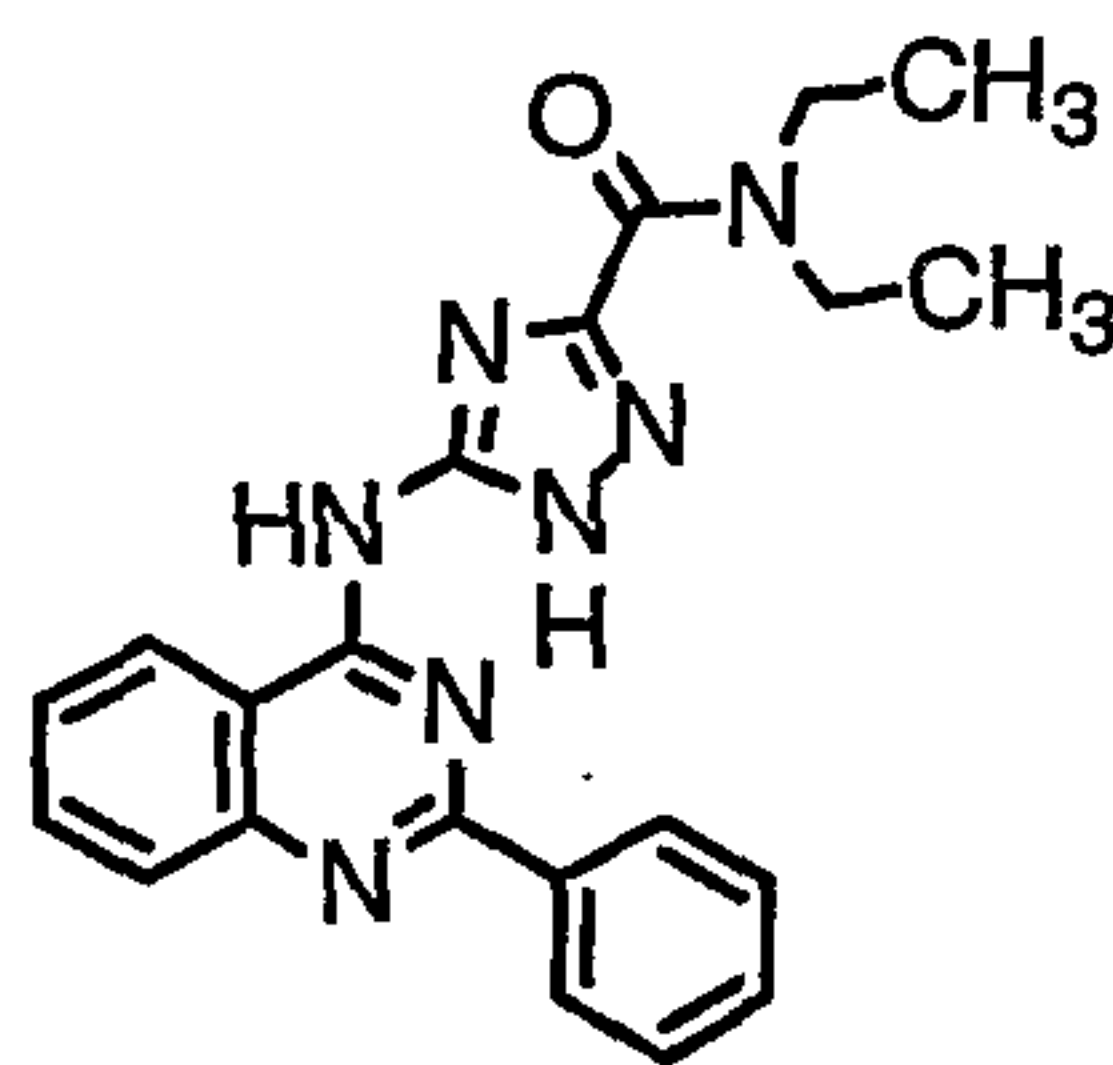
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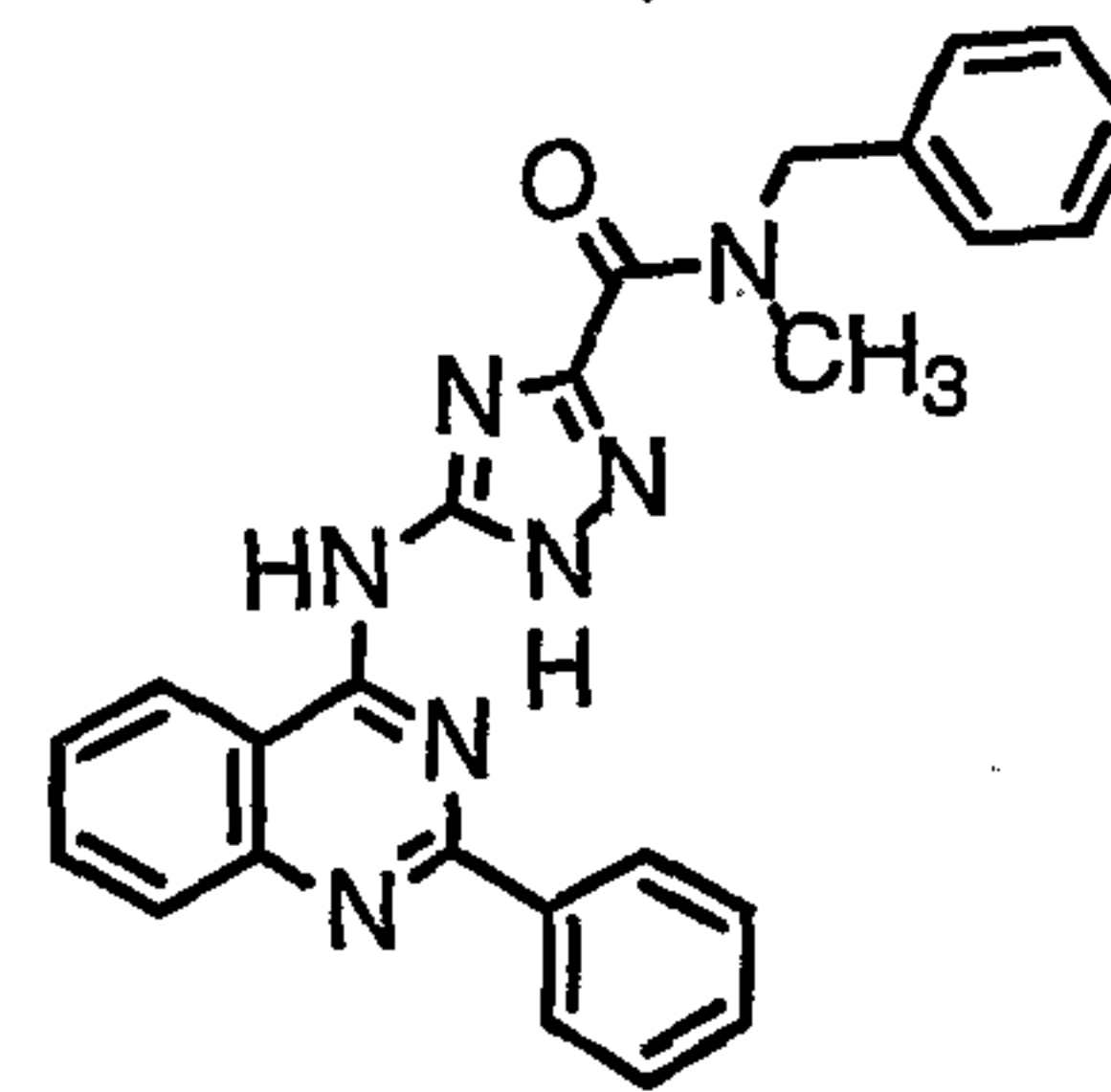
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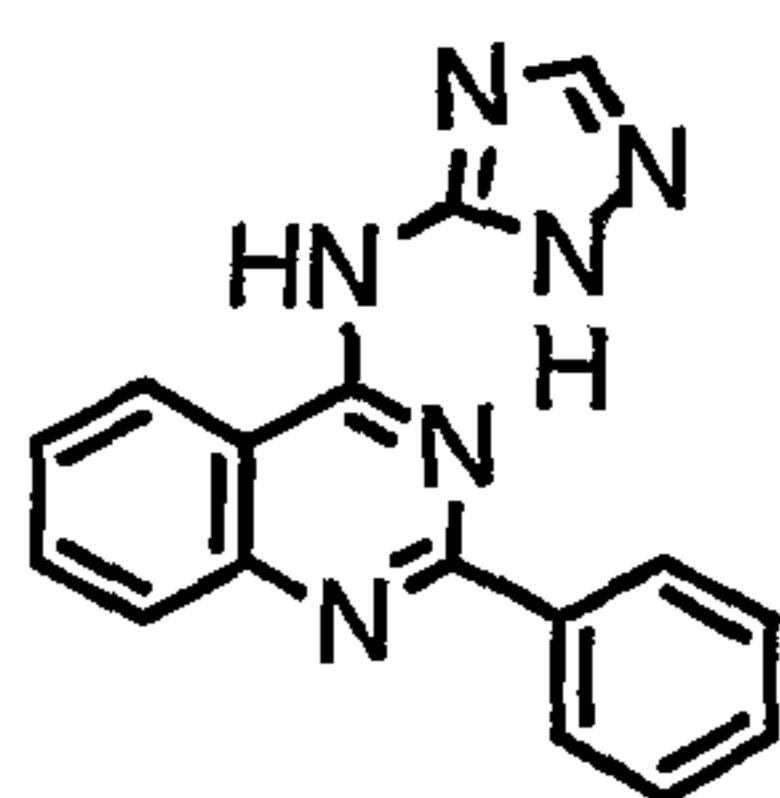
IX-151



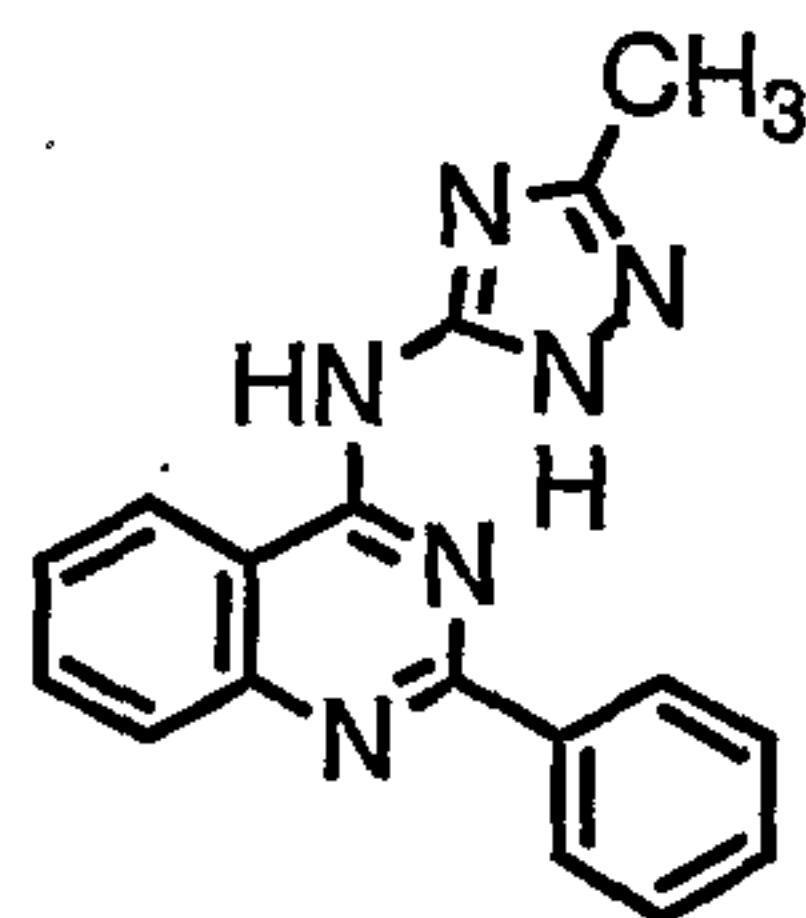
IX-152



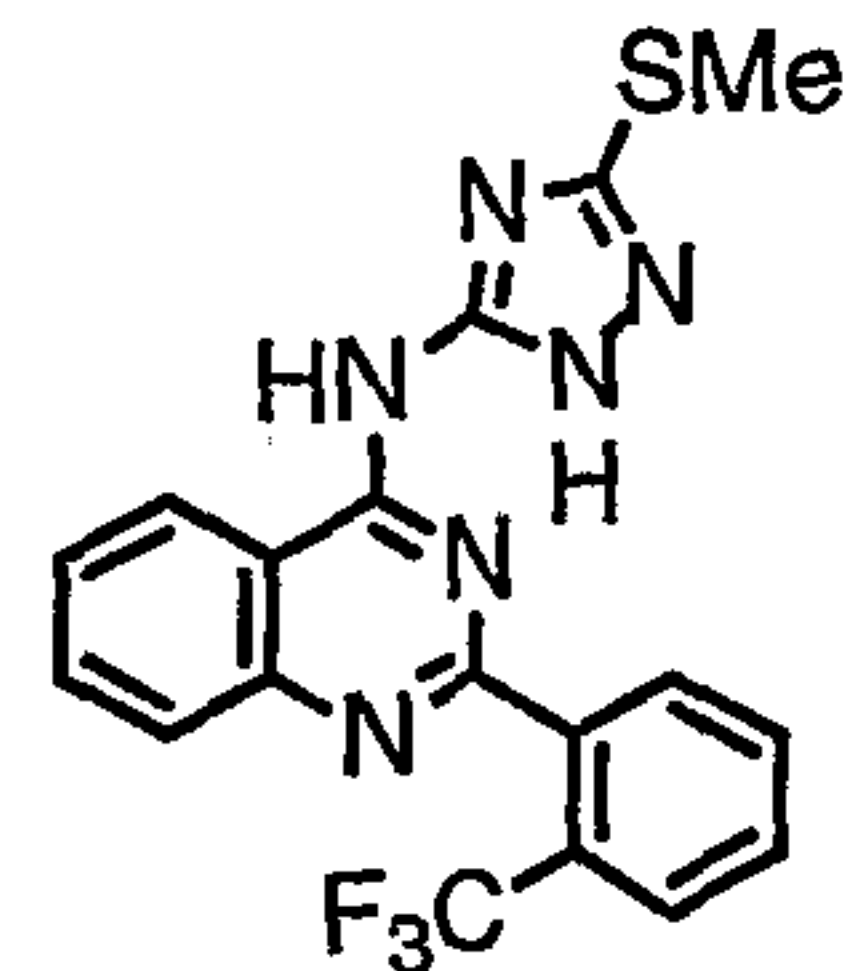
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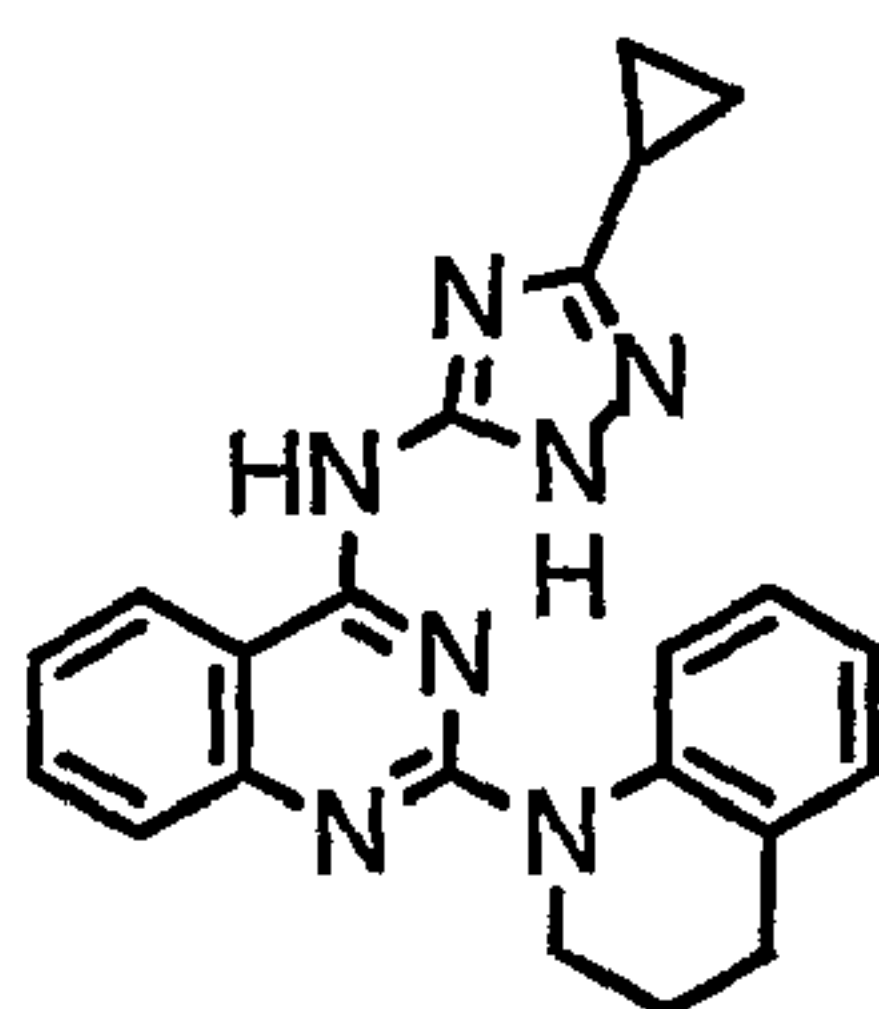
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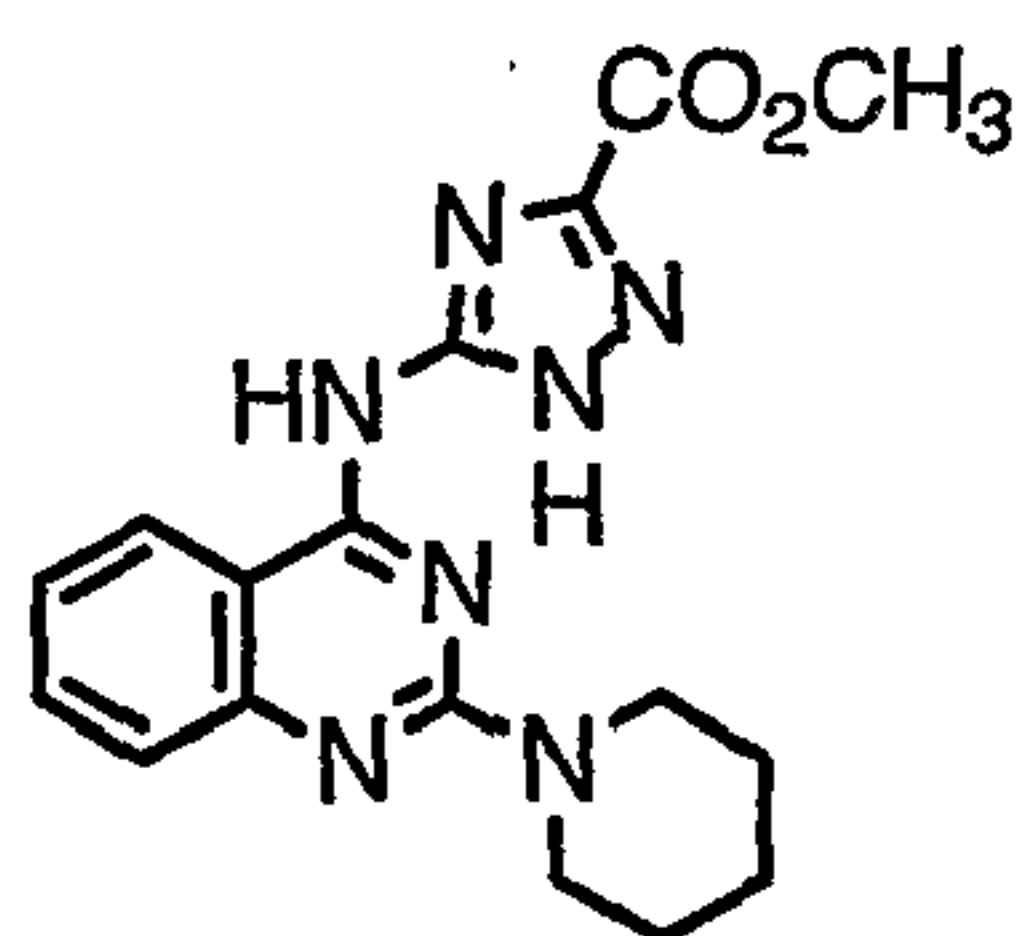
IX-155



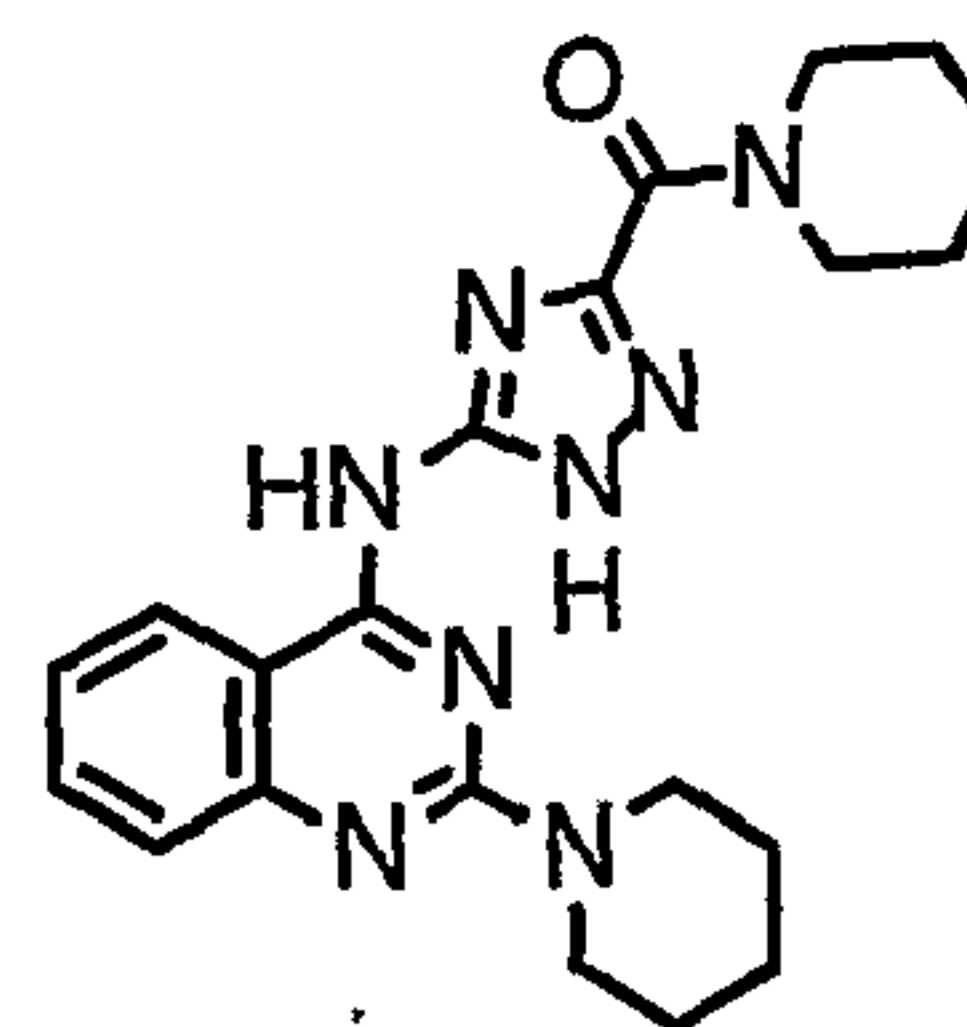
IX-156



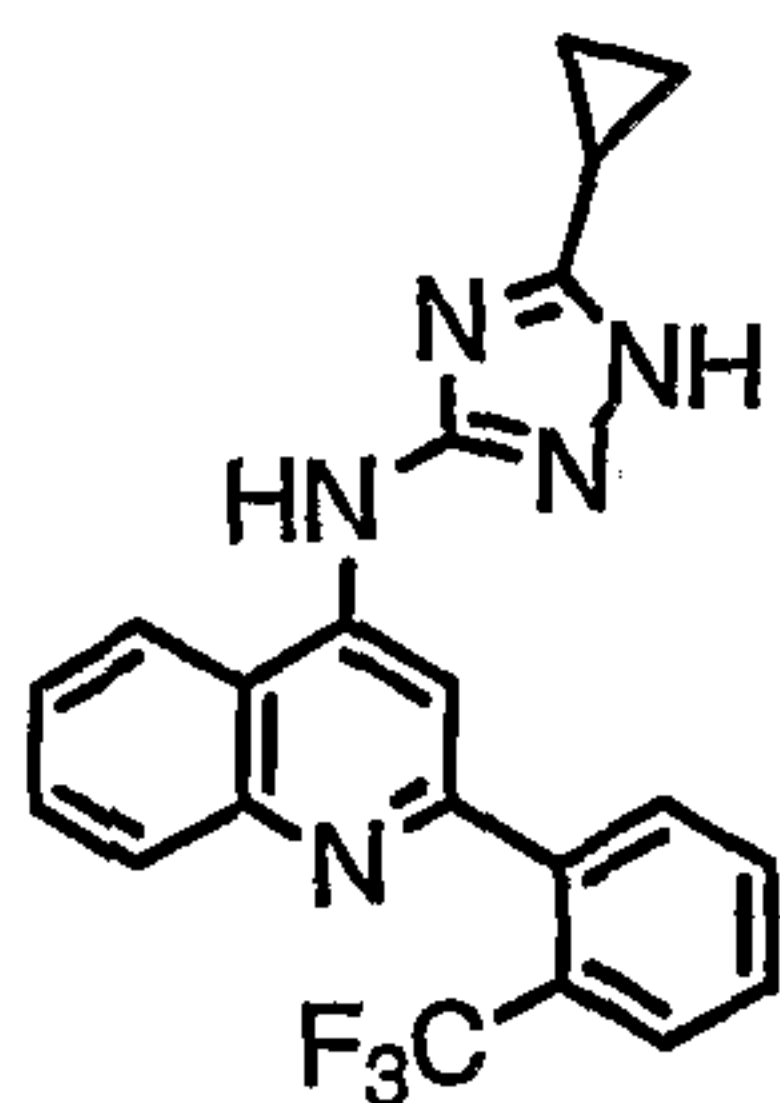
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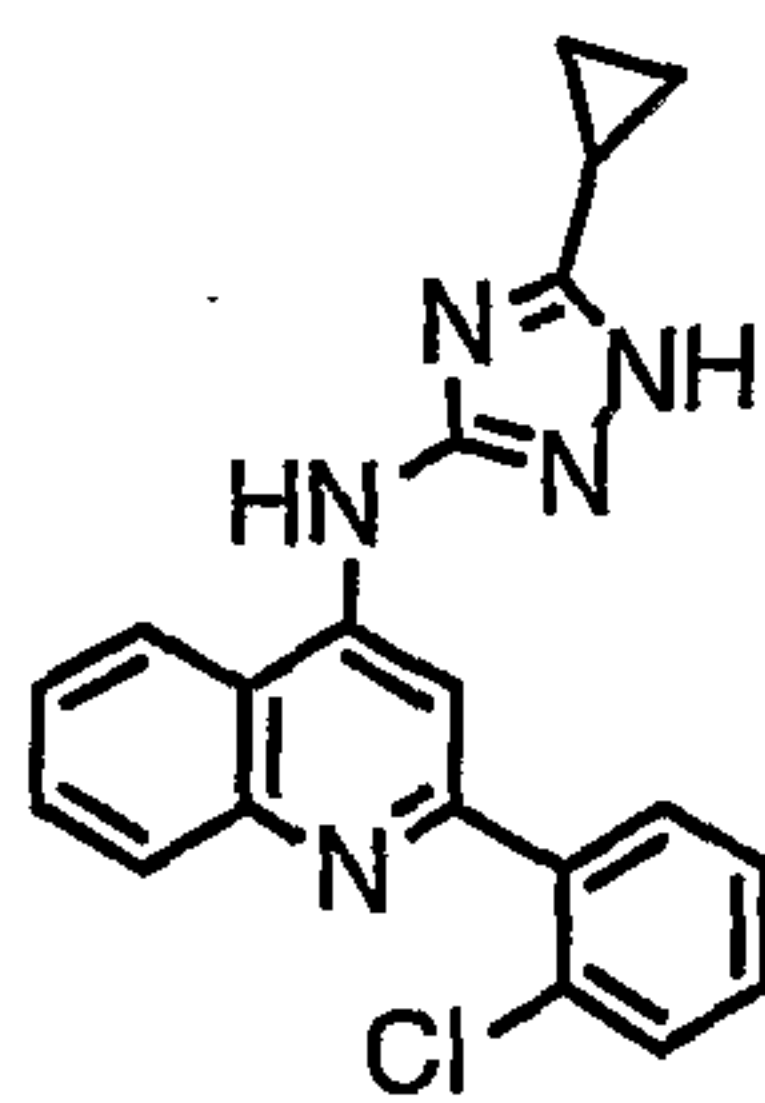
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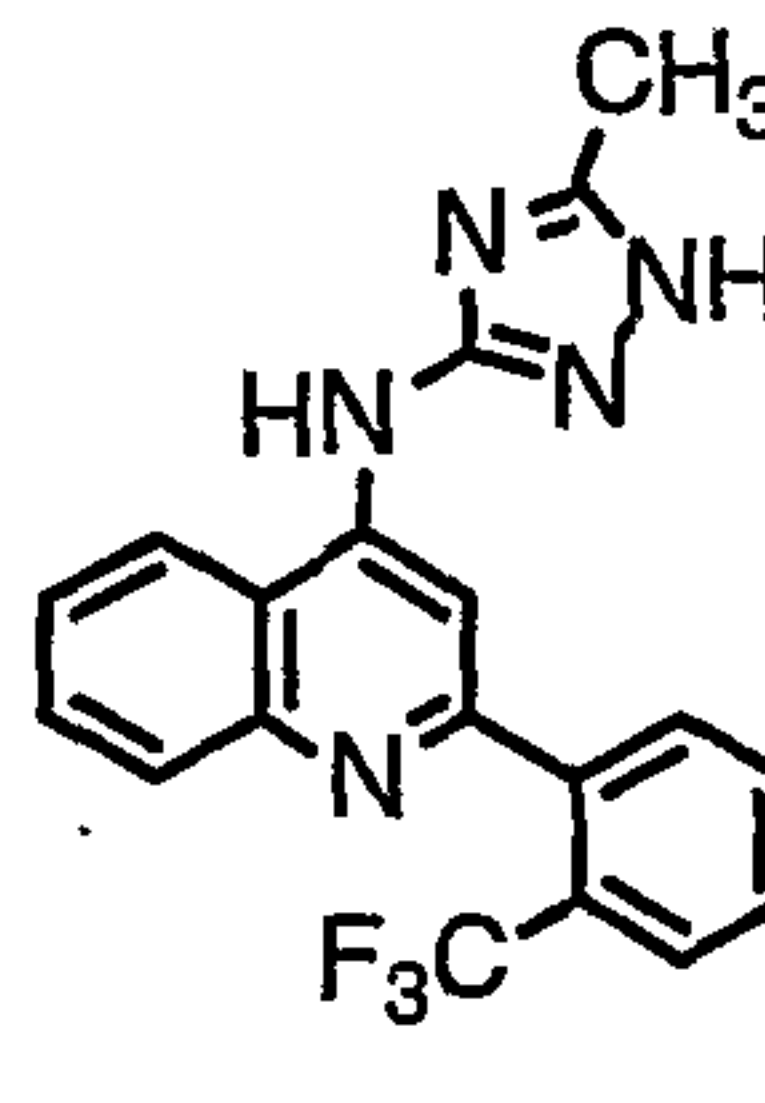
IX-159



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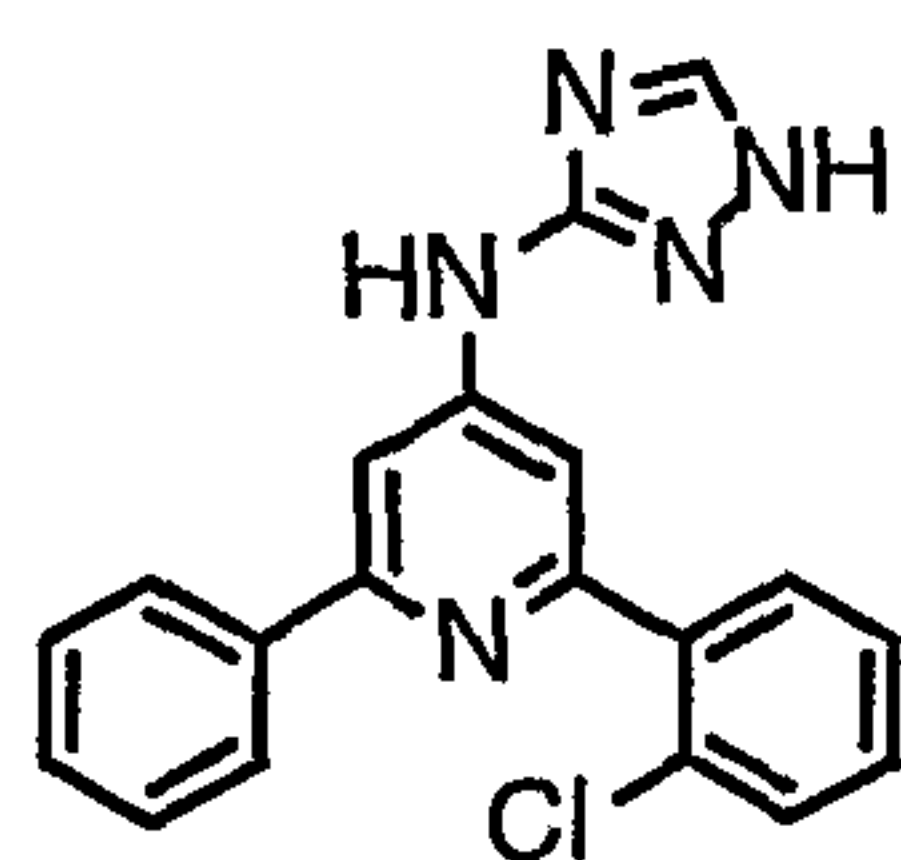
IX-161



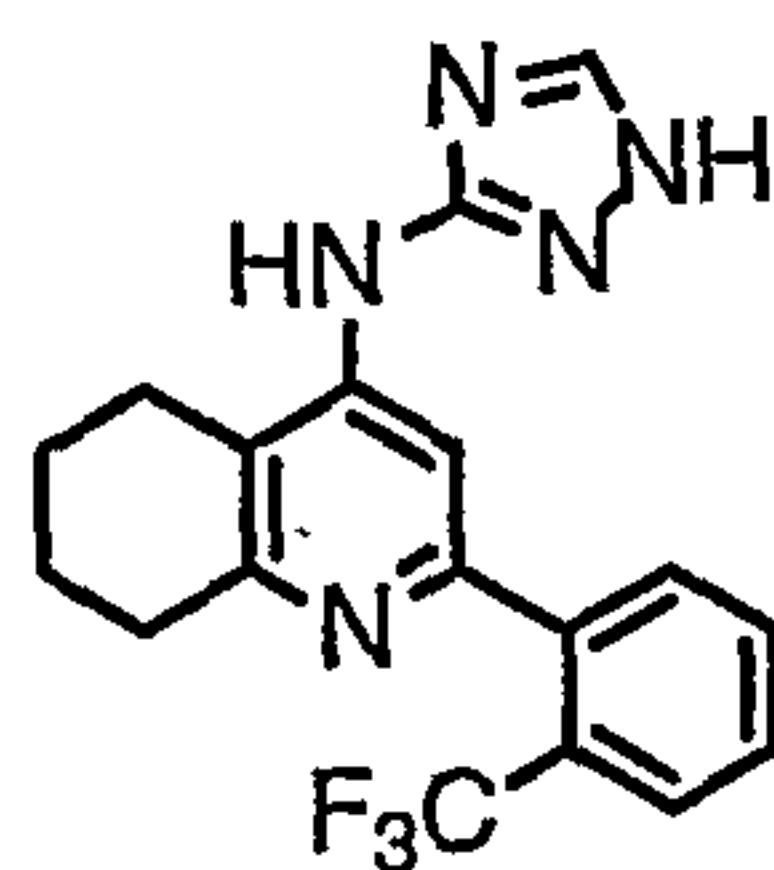
IX-162

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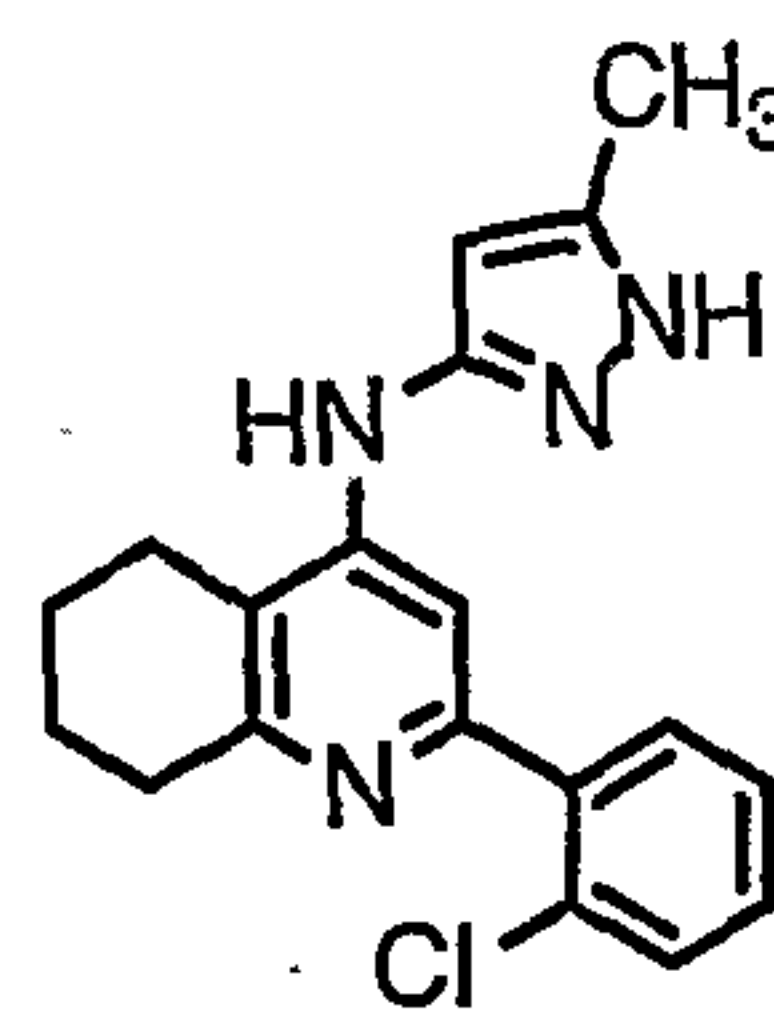
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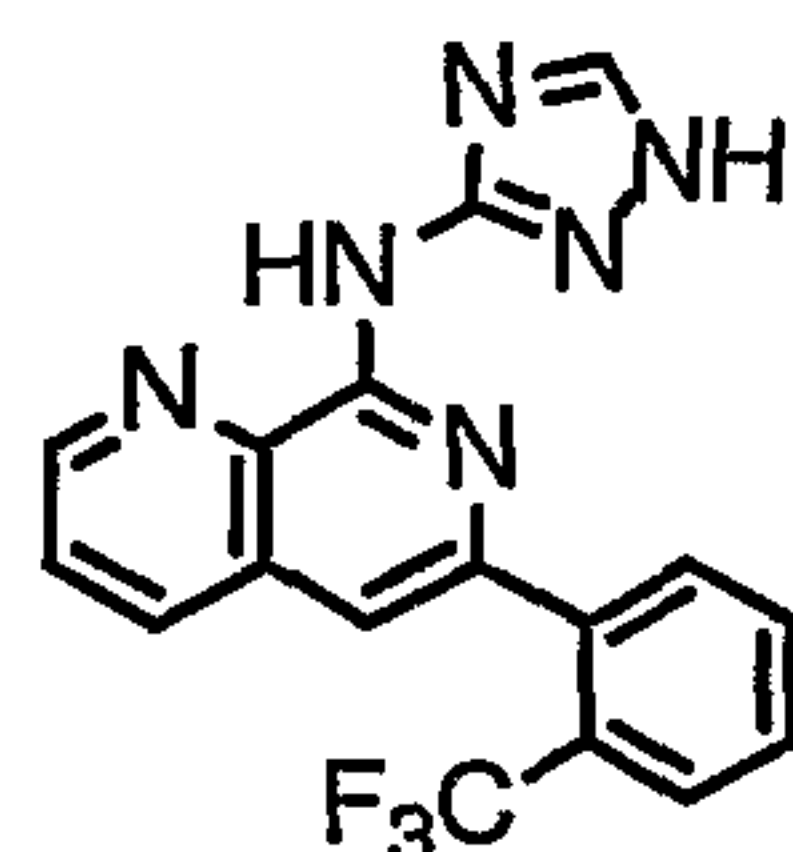
IX-163



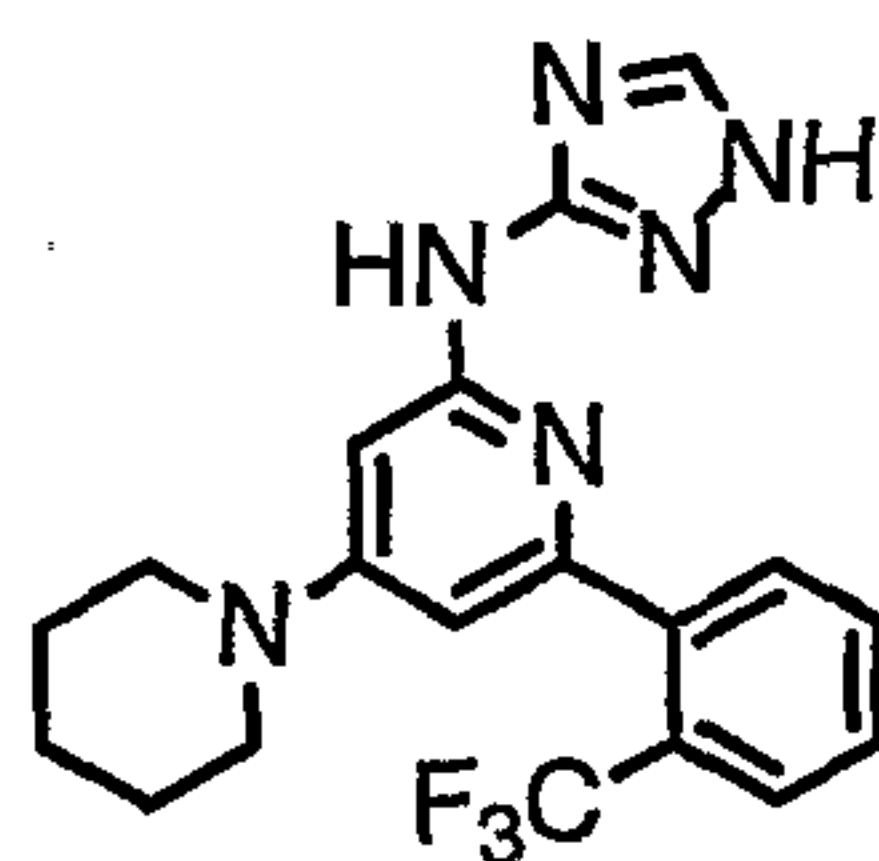
IX-164



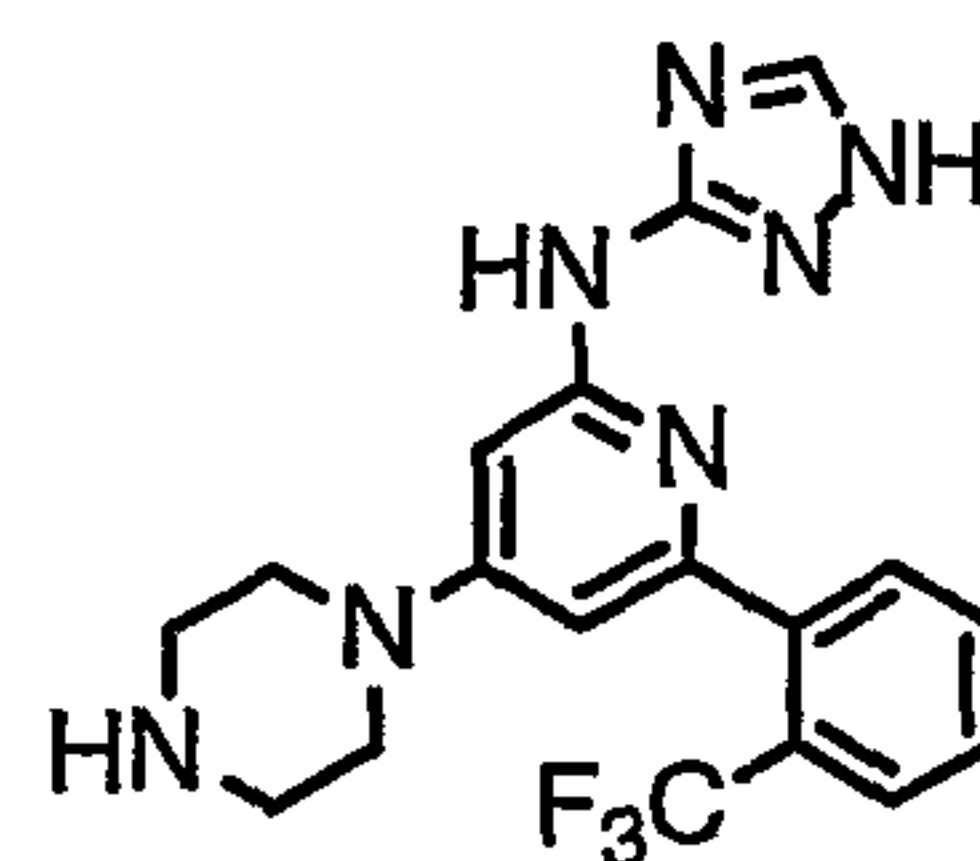
IX-165



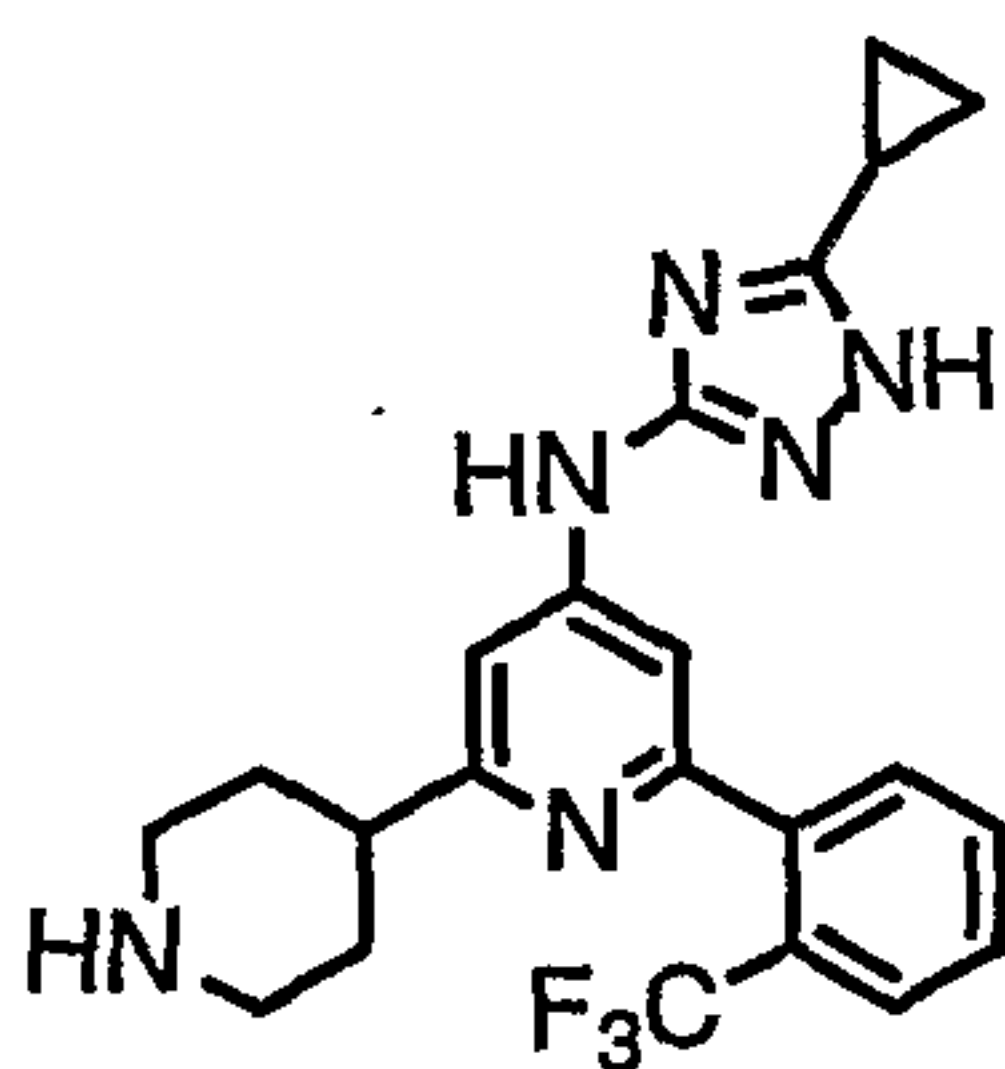
IX-166



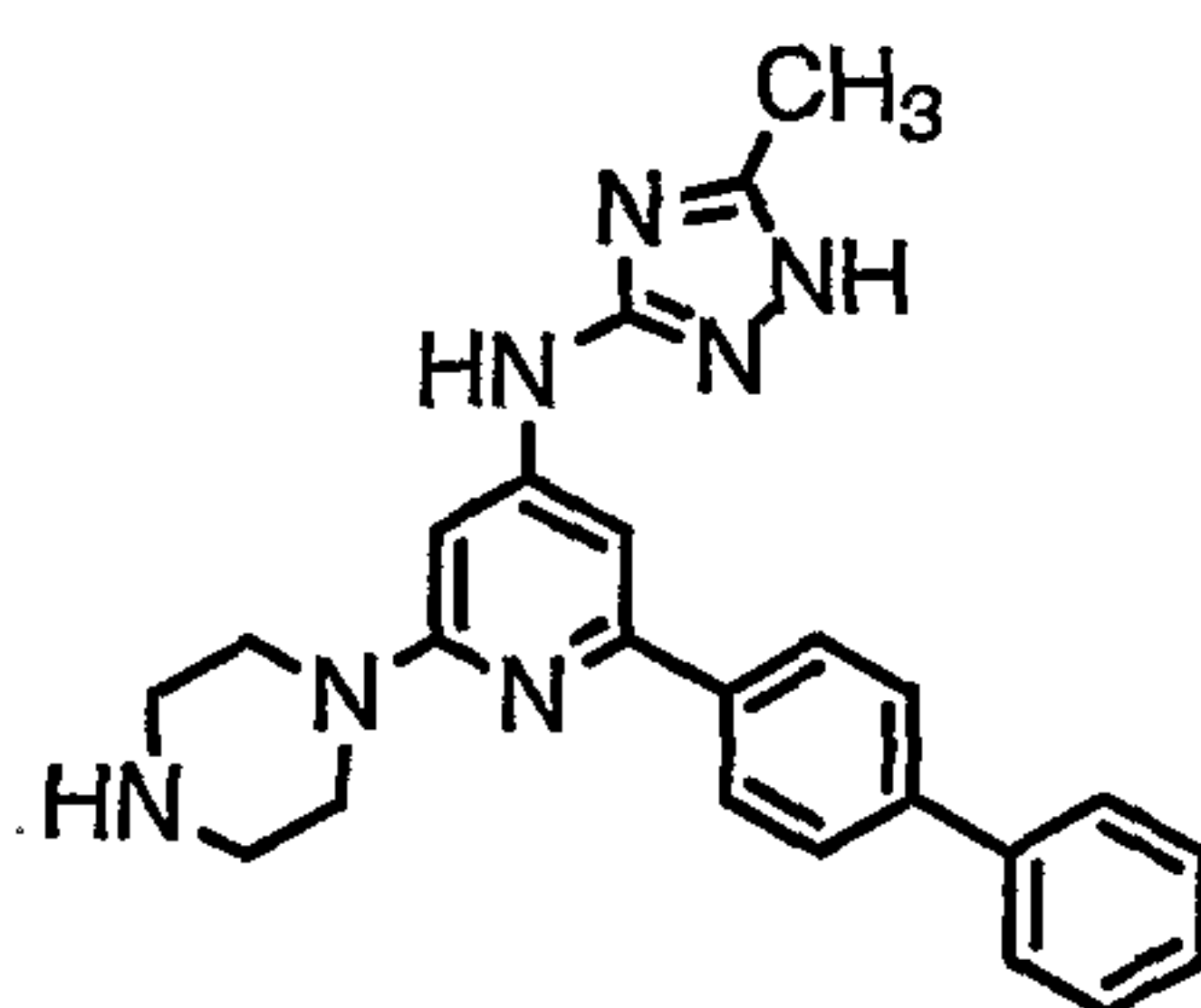
IX-167



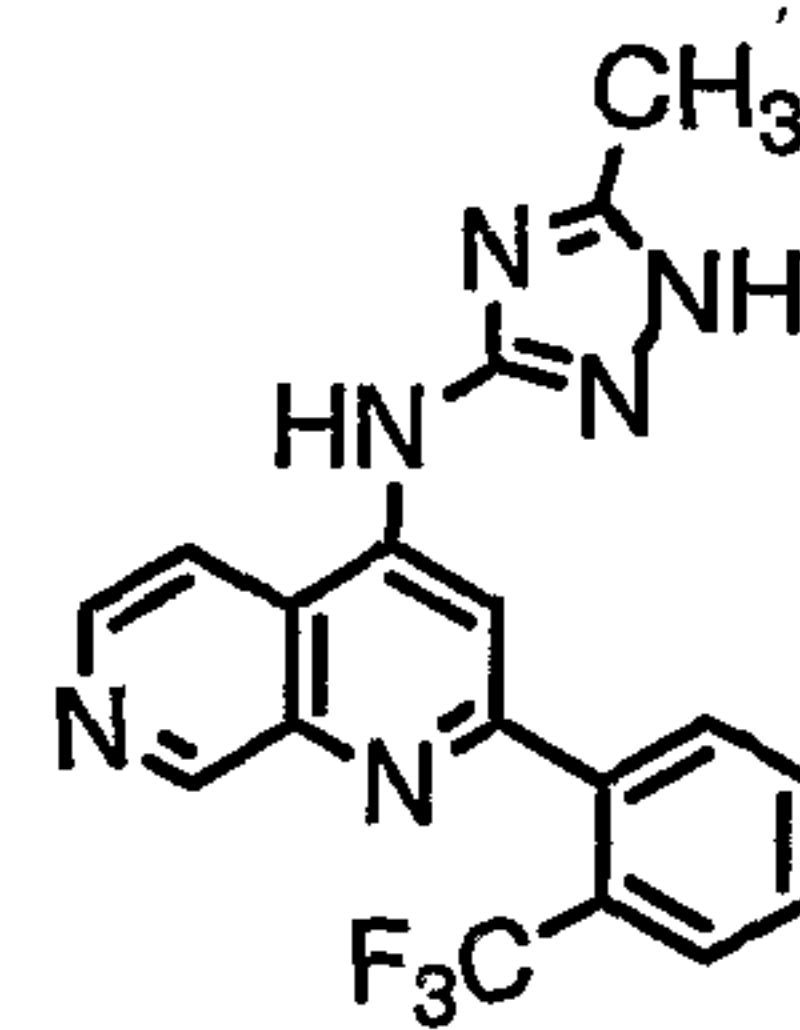
IX-168



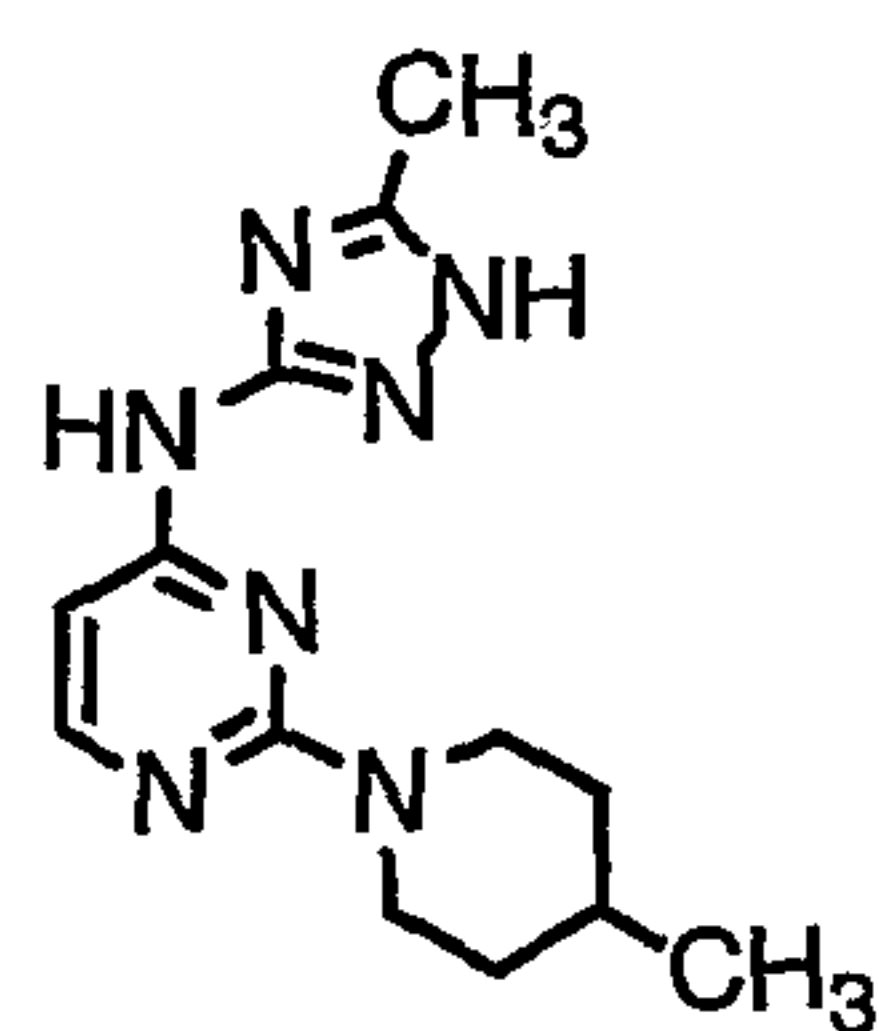
IX-169



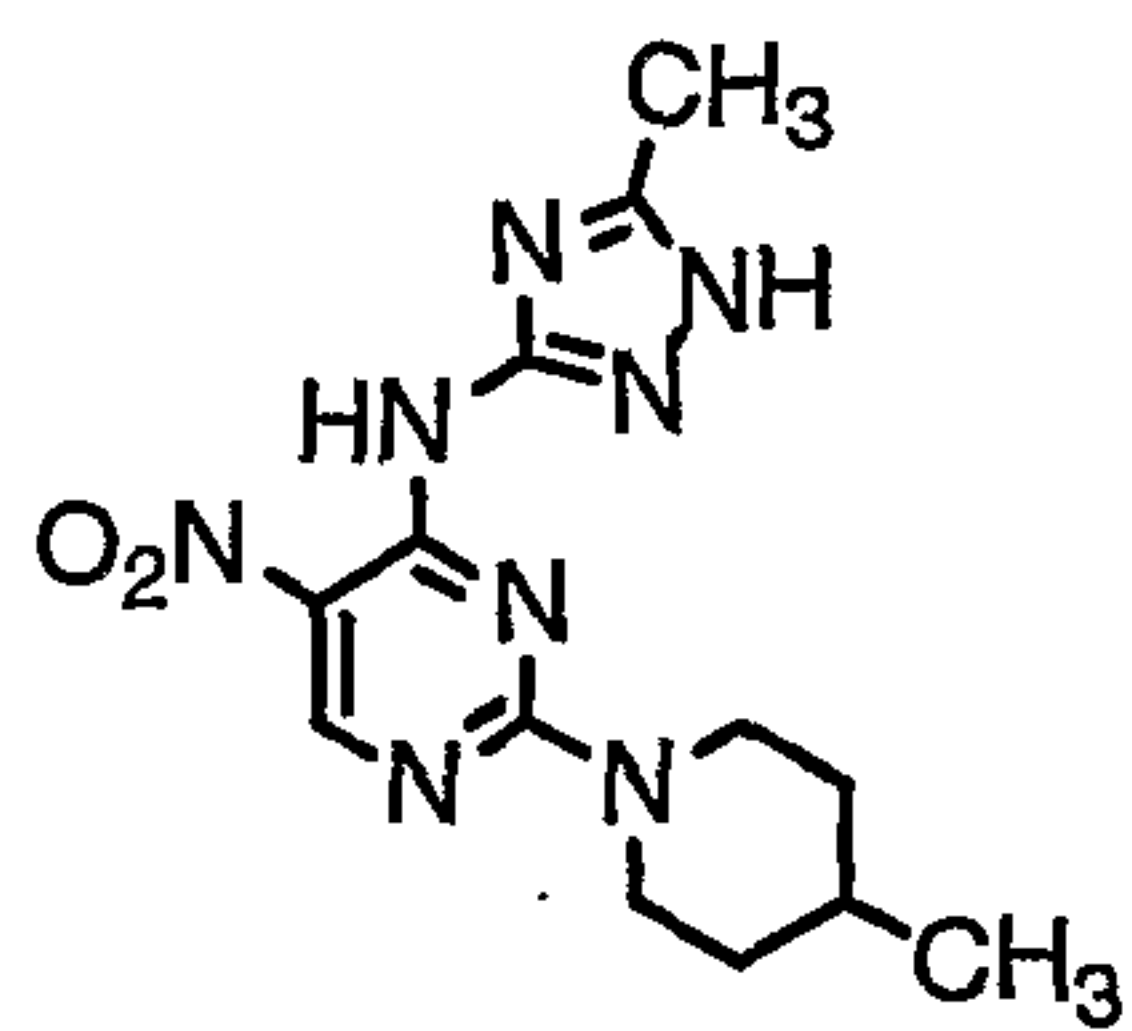
IX-170



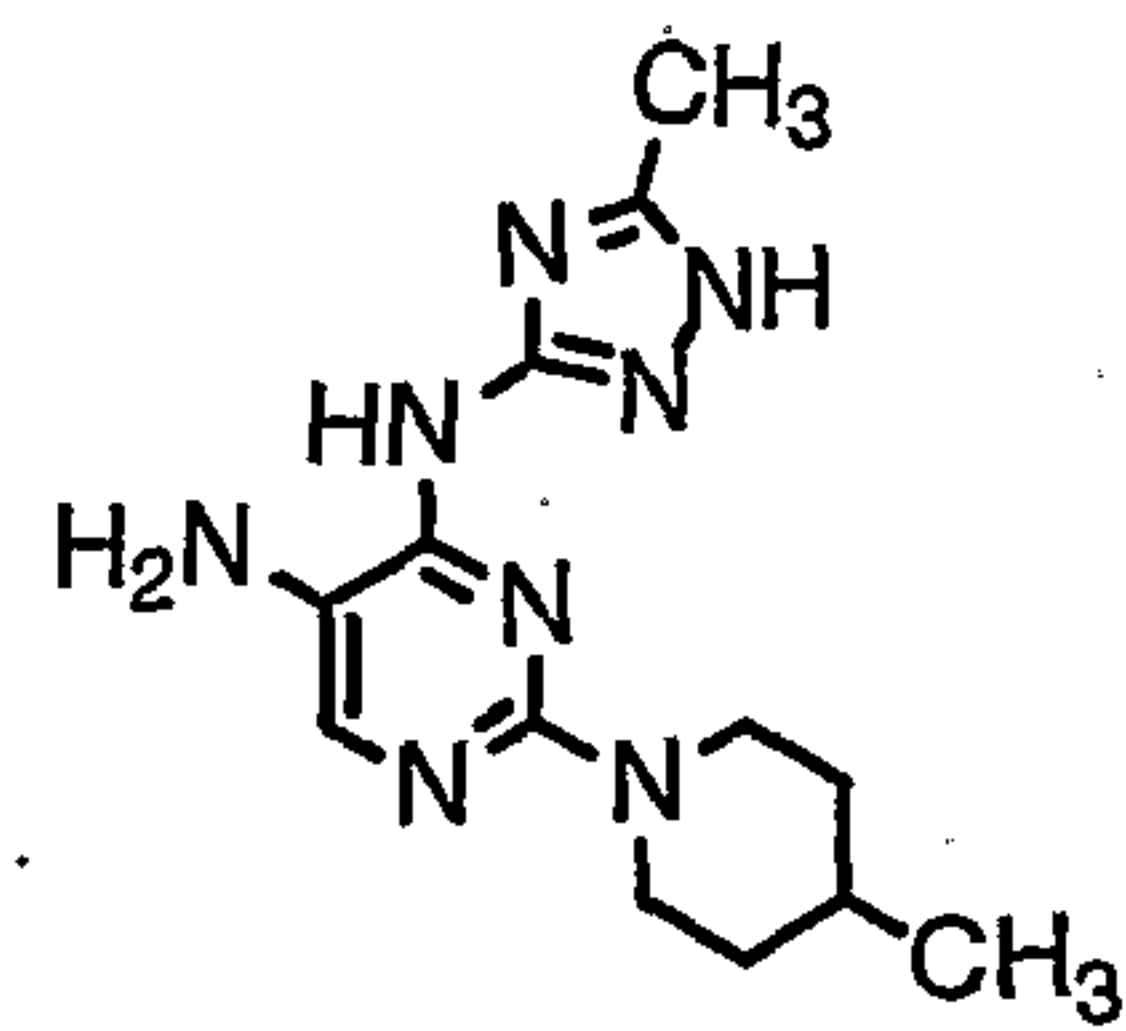
IX-171



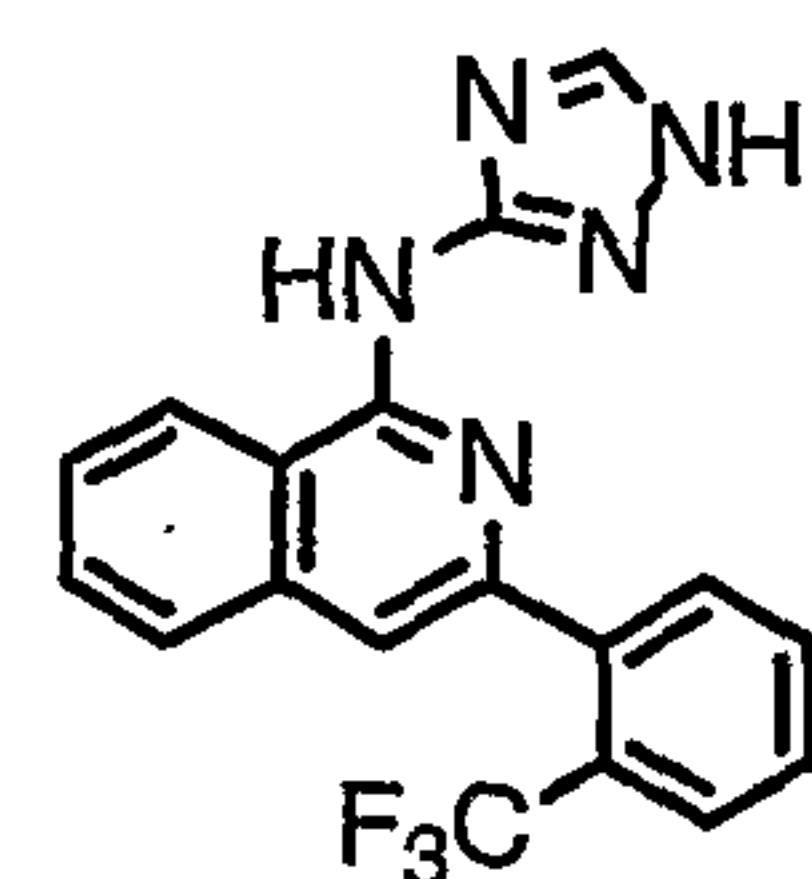
IX-172



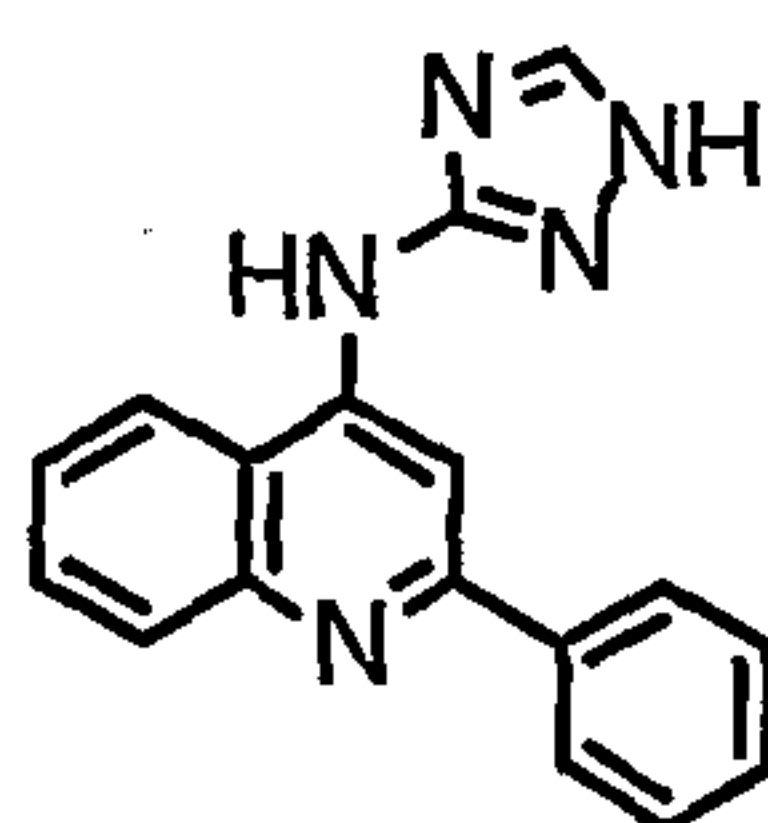
IX-173



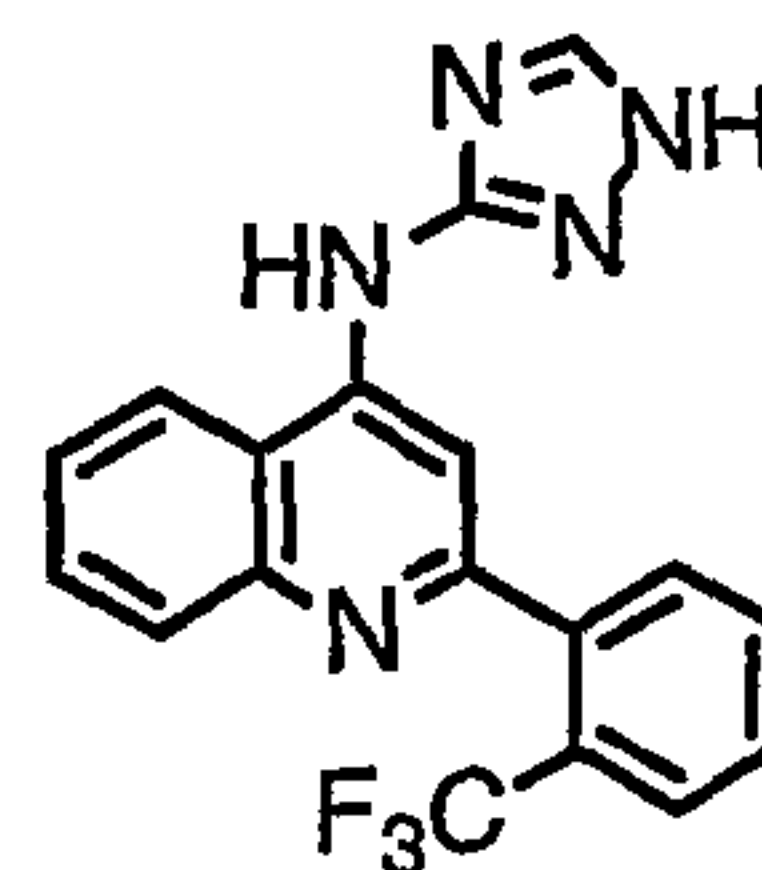
IX-174



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In another embodiment, this invention provides a composition comprising a compound of formula IX and a pharmaceutically acceptable carrier.

5 One aspect of this invention relates to a method of inhibiting GSK-3 activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula IX.

10 Another aspect relates to a method of treating a disease that is alleviated by treatment with a GSK-3 inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition
15 comprising a compound of formula IX.

 Another aspect relates to a method of enhancing glycogen synthesis and/or lowering blood levels of glucose in a patient in need thereof, comprising administering to said patient a therapeutically effective
20 amount of a composition comprising a compound of formula IX. This method is especially useful for diabetic patients.

 Another aspect relates to a method of inhibiting the production of hyperphosphorylated Tau
25 protein in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition comprising a compound of formula IX. This method is especially useful in halting or slowing the progression of Alzheimer's disease.

30 Another aspect relates to a method of inhibiting the phosphorylation of β -catenin in a patient in need thereof, comprising administering to said patient a therapeutically effective amount of a composition

comprising a compound of formula IX. This method is especially useful for treating schizophrenia.

One aspect of this invention relates to a method of inhibiting Aurora activity in a patient, comprising administering to the patient a therapeutically effective amount of a composition comprising a compound of formula IX.

Another aspect relates to a method of treating a disease that is alleviated by treatment with an Aurora inhibitor, said method comprising the step of administering to a patient in need of such a treatment a therapeutically effective amount of a composition comprising a compound of formula IX. This method is especially useful for treating cancer, such as colon, ovarian, and breast cancer.

Another method relates to inhibiting GSK-3 or Aurora activity in a biological sample, which method comprises contacting the biological sample with the GSK-3 or Aurora inhibitor of formula IX, or a pharmaceutical composition thereof, in an amount effective to inhibit GSK-3 or Aurora.

Each of the aforementioned compositions and methods directed to the inhibition of GSK-3 or Aurora, or the treatment of a disease alleviated thereby, is preferably carried out with a preferred compound of formula IX, as described above.

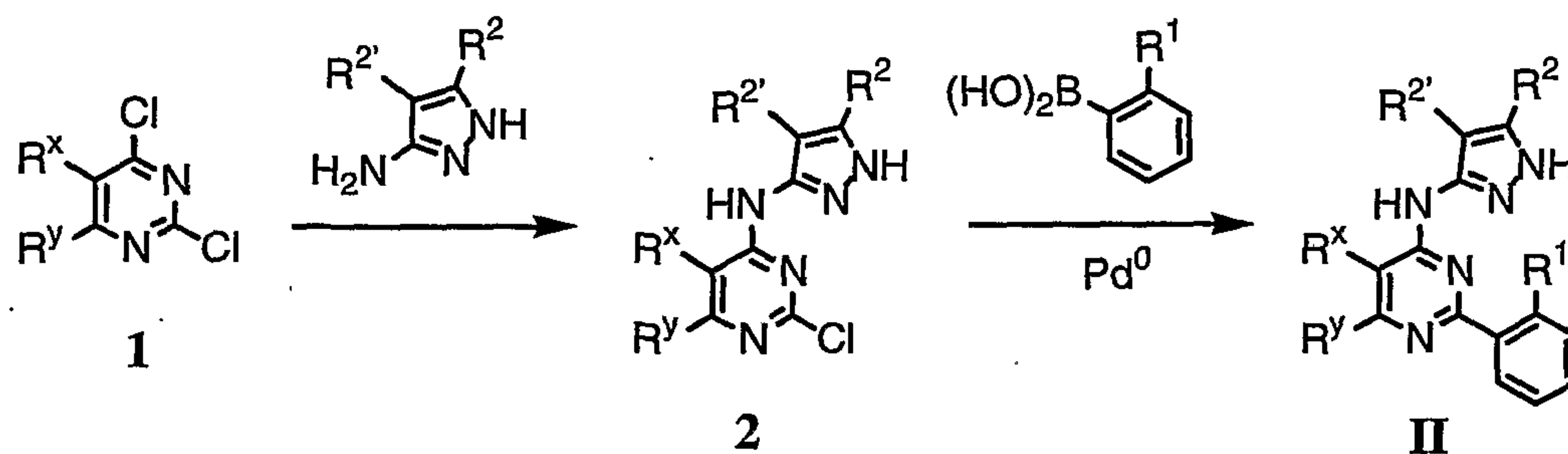
The compounds of this invention may be prepared as illustrated by the Synthetic Methods below, by the Synthetic Examples described herein and by general methods known to those skilled in the art.

General Synthetic Methods

The general synthetic methods below provide a series of general reaction routes that were used to

prepare compounds of this invention. Methods A-F below are particularly useful for preparing formula II compounds. In most cases, Ring C is drawn as a phenyl ring bearing an ortho R^1 substituent. However, it will be apparent to one skilled in the art that compounds having other Ring C groups may be obtained in a similar manner. Methods analogous to methods A-F are also useful for preparing other compounds of this invention. Methods F-I below are particularly useful for preparing compounds of formula III or IV.

Method A



Method A is a general route for the preparation of compounds wherein ring C is an aryl or heteroaryl ring. Preparation of the starting dichloropyrimidine 1 may be achieved in a manner similar to that described in *Chem. Pharm. Bull.*, 30, 9, 1982, 3121-3124. The chlorine in position 4 of intermediate 1 may be replaced by an aminopyrazole or aminoindazole to provide intermediate 2 in a manner similar to that described in *J. Med. Chem.*, 38, 3547-3557 (1995). Ring C is then introduced using a boronic ester under palladium catalysis (see *Tetrahedron*, 48, 37, 1992, 8117-8126). This method is illustrated by the following procedure.

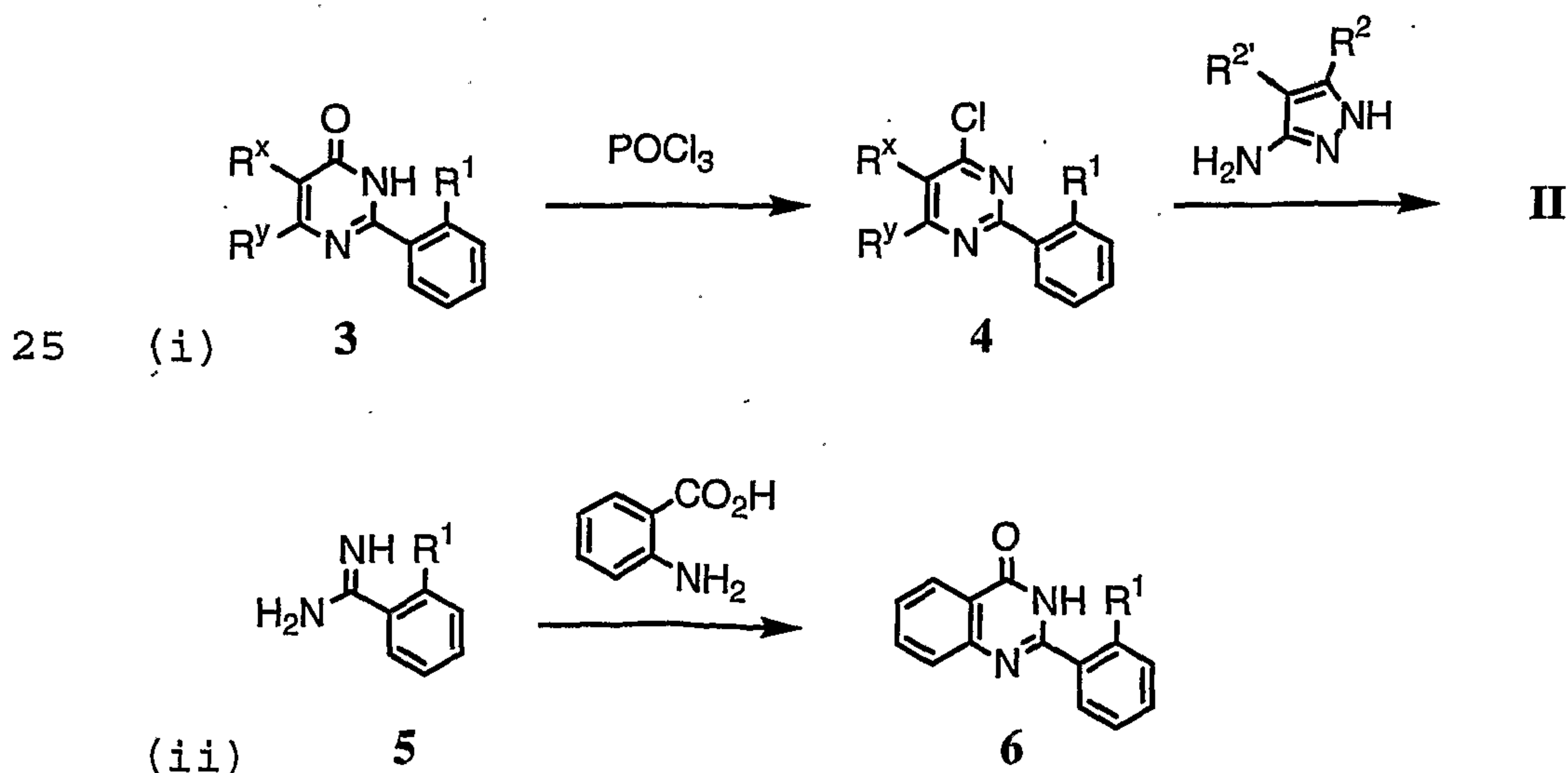
A suspension of 1H-quinazoline-2,4-dione (10.0 g, 61.7 mmol) in POCl₃ (60 mL, 644 mmol) and N,N-dimethylaniline (8mL, 63.1 mmol) is heated under reflux

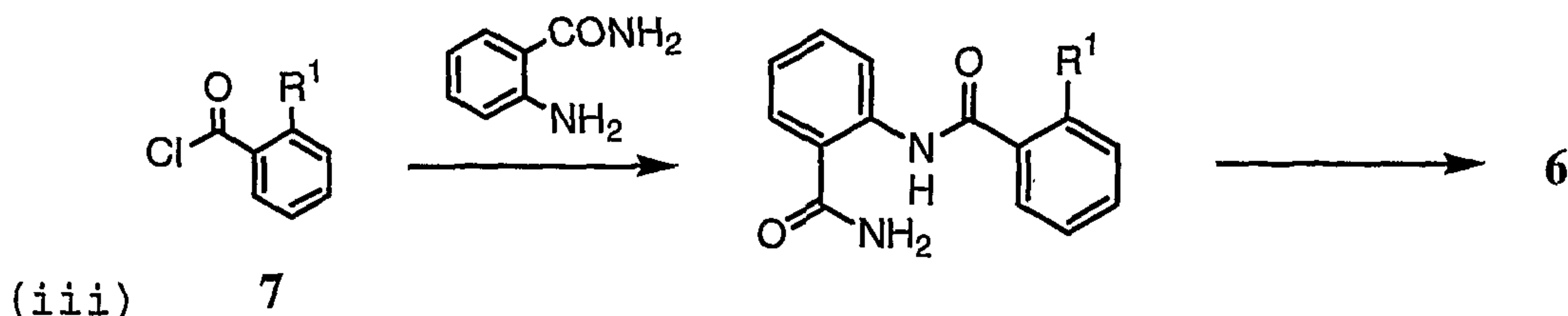
for 2 h. Excess POCl₃ is evaporated under vacuum, the residue is poured into ice, and the precipitate is collected by filtration. The crude solid 2,4-dichloroquinazoline product may be used without further purification.

To a solution of 2,4-dichloro-quinazoline (3.3 g, 16.6 mmol) in anhydrous ethanol (150 mL) is added 5-methyl-1H-pyrazol-3-yl amine (3.2 g, 32.9 mmol). The mixture is stirred at room temperature for 4 h, and the resulting precipitate is collected by filtration, washed with ethanol, and dried under vacuum to afford (2-chloro-quinazolin-4-yl)-(5-methyl-1H-pyrazol-3-yl)-amine.

To a solution of (2-chloro-quinazolin-4-yl)-(5-methyl-1H-pyrazol-3-yl)-amine (50 mg, 0.19 mmol) in DMF (1.0 mL) is added the desired arylboronic acid (0.38 mmol), 2M Na₂CO₃ (0.96 mmol), and tri-*t*-butylphosphine (0.19 mmol). Under nitrogen, PdCl₂(dppf) (0.011 mmol) is added in one portion. The reaction mixture is then heated at 80°C for 5 to 10 hours, cooled to room temperature, and poured into water (2 mL). The resulting precipitate is collected by filtration, washed with water, and purified by HPLC.

Method B





Methods B through F describe routes where the
 5 pyrazole ring system is introduced after Ring C and the
 pyrimidine ring portion are first constructed. A
 versatile intermediate is the 4-chloropyrimidine 4, which
 is readily obtained from pyrimidinone 3 as shown in
 Method B(i). This reaction sequence is generally
 10 applicable for a variety of Ring C groups including
 aliphatic, aryl, heteroaryl, or heterocyclyl. See *J.*
Med. Chem., 38, 3547-3557 (1995).

For quinazoline ring systems (where R^x and R^y
 are taken together to form a benzo ring), the useful
 15 intermediate 6 may be obtained by condensing an
 anthranilic acid or its derivative with a benzamidine as
 shown in Method B(ii) or by condensing a benzoylchloride
 with an anthranilamide as shown in Method B(iii). Many
 substituted anthranilic acid, anthranilamide, benzamidine
 20 and benzoylchloride starting materials may be obtained by
 known methods. See *Aust. J. Chem.*, 38, 467-474 and *J.*
Med. Chem., 38, 3547-3557 (1995). Method B(iii) is
 illustrated by the following procedure.

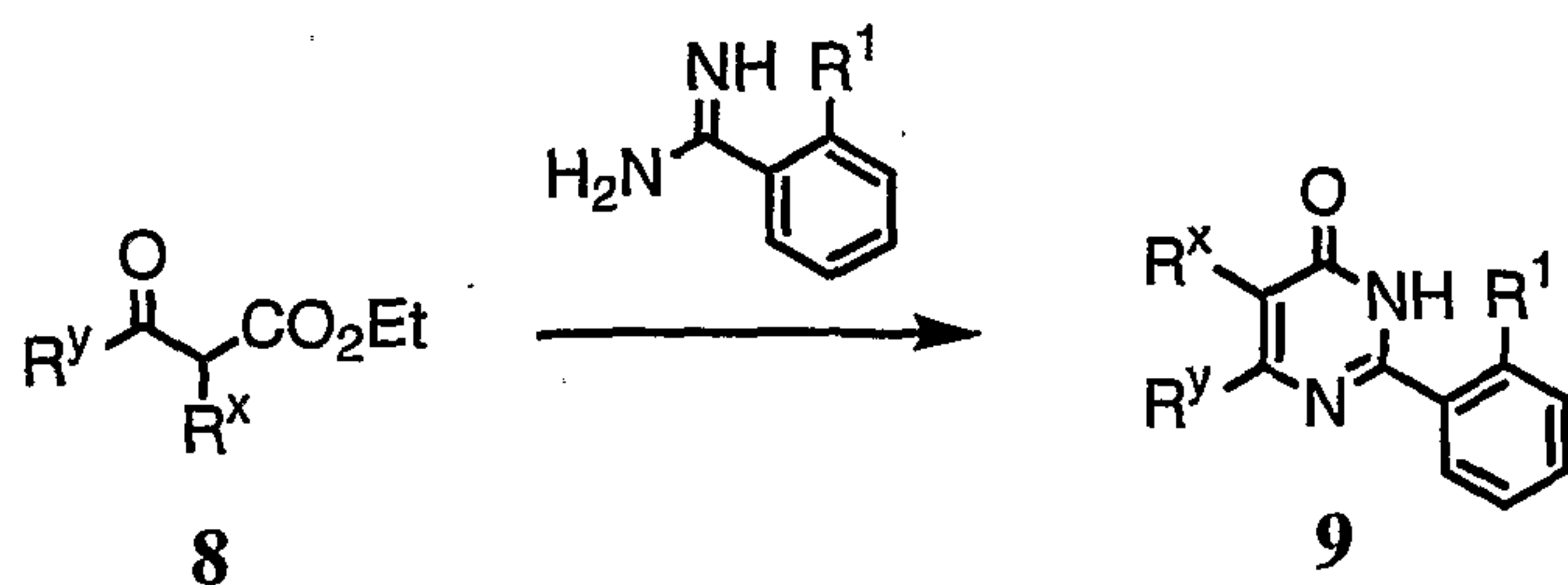
To a solution of anthranilamide (33 mmol) in
 25 THF and CH_2Cl_2 (1:1, 70 mL) is added the desired
 benzoylchloride (33 mmol), and triethylamine (99 mmol) at
 room temperature. The mixture is stirred for about 14
 hours. The resulting precipitate is collected by
 filtration, washed with CH_2Cl_2 and water, and dried under
 30 vacuum. The crude 2-benzoylamino benzamide may be used
 directly for the next step without further purification.

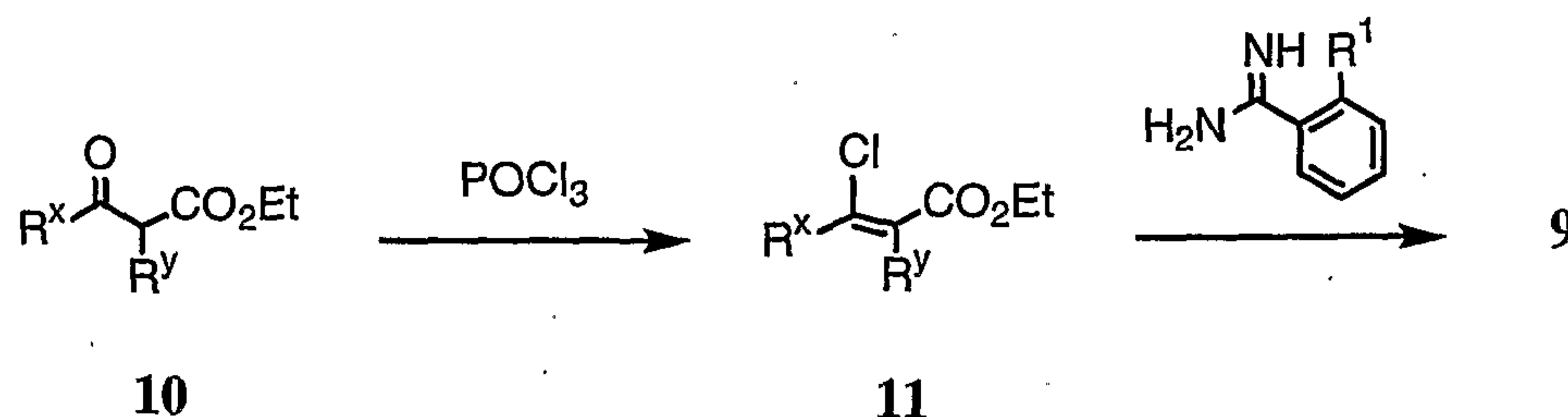
To a solution of the above crude product (13 mmol) in ethanol (50 mL) is added NaOEt (26 mmol) at room temperature. The mixture is heated under reflux for 48 to 96 h. The solvent is evaporated and the residue is
5 neutralized using concentrated HCl to pH 7. The product is then collected by filtration and dried under vacuum to provide 2-phenyl-3H-quinazolin-4-one that may be used without further purification.

To a suspension of the above product (12 mmol)
10 in POCl₃ (120 mmol) is added tri-*n*-propylamine (24 mmol). The mixture is heated under reflux for 1h. After removal of the excess POCl₃ by evaporation, the residue is dissolved in ethyl acetate, and washed with 1N NaOH (twice) and water (twice). The organic layer is dried
15 over MgSO₄, the solvent is evaporated under vacuum, and the crude product is purified by flash chromatography (eluting with 10% of ethyl acetate in hexanes) to give 4-chloro-2-aryl quinazoline.

To a solution of 4-chloro-2-aryl quinazoline
20 (0.16 mmol) in DMF (or THF, ethanol) (1 mL) is added the desired aminopyrazole or aminoindazole (0.32 mmol). The mixture is heated in DMF (or THF under reflux) at 100 to 110°C for 16 h (or in ethanol at 130-160°C for 16 hours) and then poured into water (2 mL). The precipitate is
25 collected by filtration and purified by HPLC.

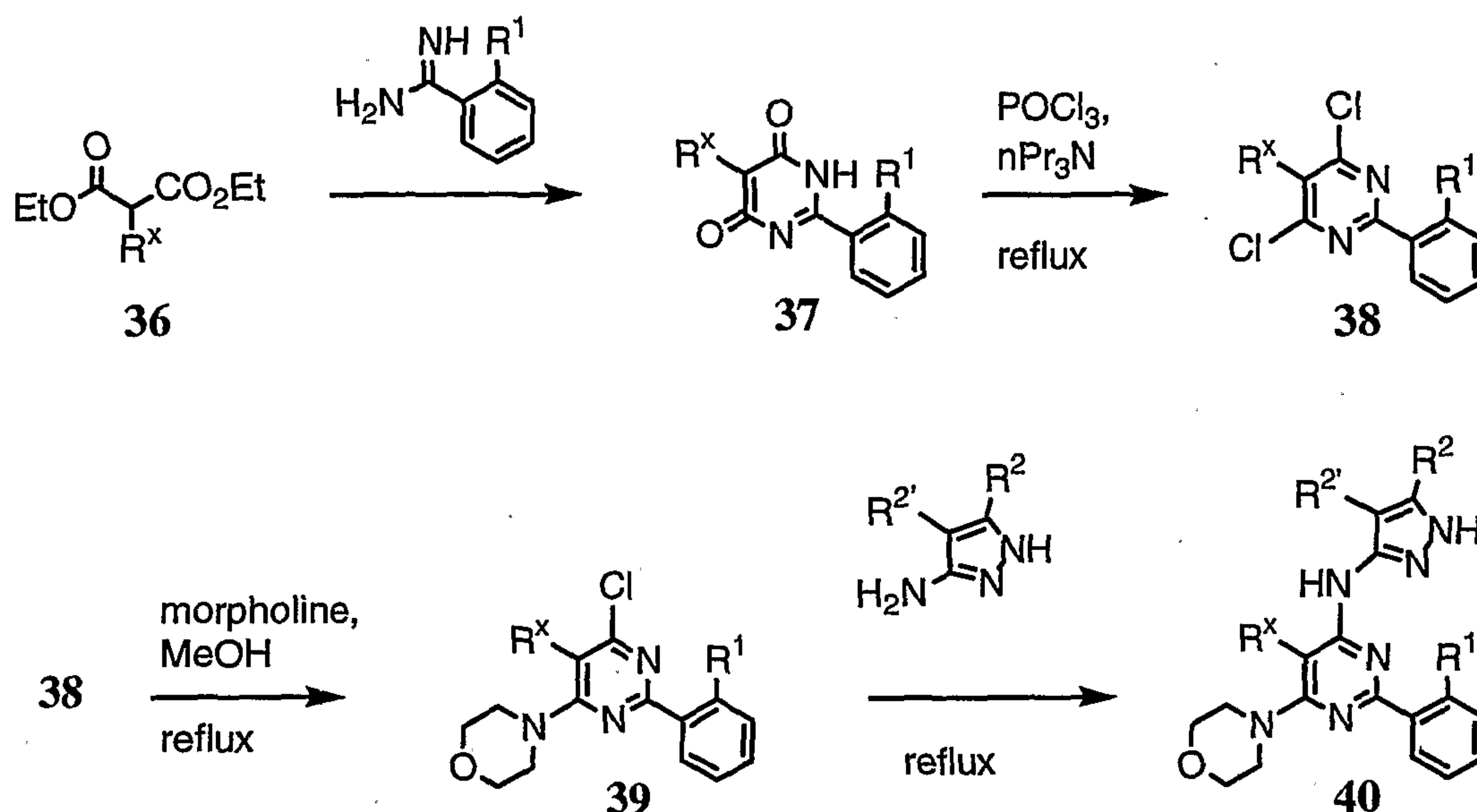
Method C



Method D(i)

Methods C and D(i) above employ β -ketoesters 8 and 10, respectively, as pyrimidinone precursors. The substitution pattern of the R^x and R^y groups on the pyrimidinone ring will be reversed if a chlorocrotonate 11 (Synth. Comm, (1986), 997-1002), instead of the corresponding β -ketoester 10, is condensed with the desired benzamidine. These methods are illustrated by the following general procedure.

To a solution of a β -ketoester (5.2 mmol) and amidinium chloride (5.7 mmol) in ethanol (5 mL) is added sodium ethoxide (7.8 mmol). The mixture is heated under reflux for 7-14 hours. After evaporation the resulting residue is dissolved in water, acidified with concentrated HCl to pH 6, and then filtered to obtain a solid product 2-aryl-3H-pyrimidin-4-one (yield 75-87%), which may be purified by flash column chromatography if needed. To this pyrimidinone (3.7 mmol) is added $POCl_3$ (4 mL) and $n\text{-Pr}_3N$ (1.4 mL). The mixture is heated under reflux for 1 hour. After evaporation of the excess $POCl_3$, the residue is dissolved in ethyl acetate, washed with 1N NaOH solution (three times) and $NaHCO_3$ (once), and dried over $MgSO_4$. The solvent is removed under vacuum and the residue is purified by flash column chromatography eluting with 10% of ethyl acetate in hexanes to give 2-aryl-4-chloro-pyrimidine as a pale yellow syrup. This crude product may be treated with a 3-aminopyrazole or 3-aminoindazole as described above.

Method D(ii)

5 Method D(ii) above shows a general route for the preparation of the present compounds, such as compound 40, wherein R^y is $\text{N}(\text{R}^4)_2$. See *Il Farmaco*, 52(1) 61-65 (1997). Displacement of the 6-chloro group is exemplified here using morpholine. This method is
 10 illustrated by the following procedure.

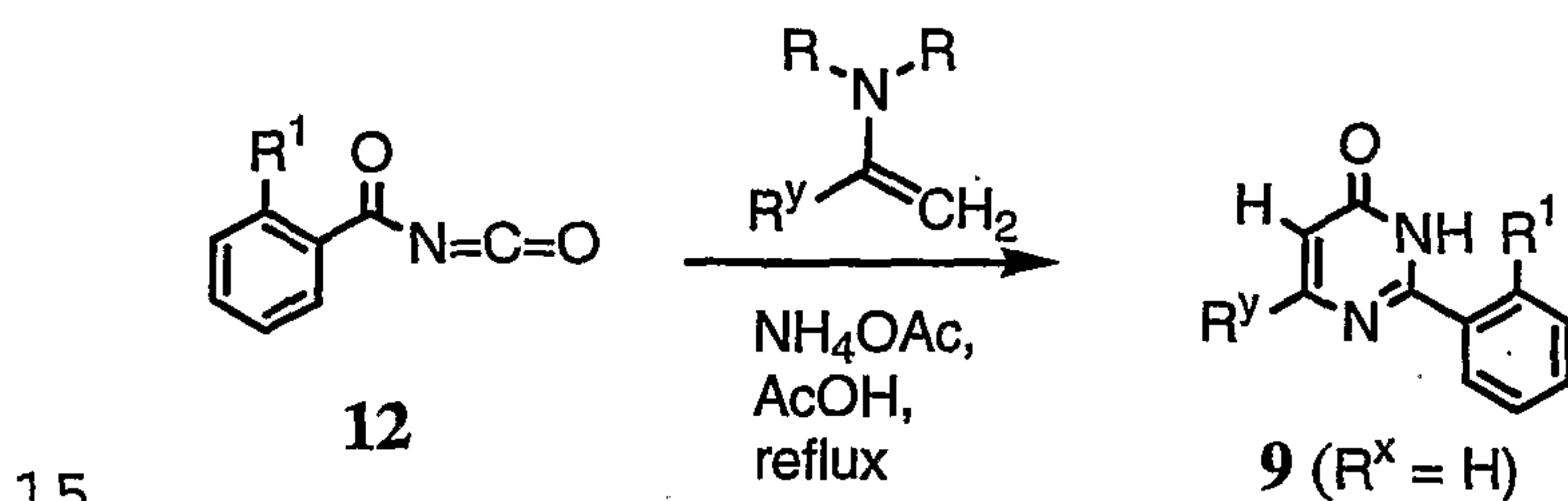
To a solution of 2-methylmalonic acid diethyl ester (5 mmol) and sodium ethoxide (15 mmol) is added the appropriate amidine salt (5 mmol) in ethanol (10 mL) and the reaction heated at reflux for 2-24 hours. The
 15 residue is dissolved in water and acidified with 2N HCl. The resulting precipitate is filtered off and further purified by flash chromatography (yield 5-35%) to afford the pyrimidinedione 37. To 37 (1.6 mmol) is added POCl_3 (32 mmol) and tri-n-propylamine (6.4 mmol) and the
 20 reaction refluxed is for 1h. After evaporation of excess POCl_3 , the residue is dissolved in ethyl acetate, basified with 1N NaOH, separated and the aqueous phase twice more extracted with ethyl acetate. The combined organics are dried (sodium sulfate) and evaporated. Purification by

flash chromatography provides the dichloropyrimidine (38) as a yellow oil in 23% yield.

A solution of 38 (0.33 mmol) in methanol (5 mL) is treated with an amine, exemplified here using morpholine (0.64 mmol) and refluxed 1 hour. After evaporation of solvent, the residue is purified by flash chromatography to provide the mono-chloropyrimidine 39 as a colorless oil in 75% yield.

The mono-chloropyrimidine, 39, (0.19 mmol) may be treated with a 3-aminopyrazole or 3-aminoindazole compound in a manner substantially similar those described above in Methods A and B.

Method E

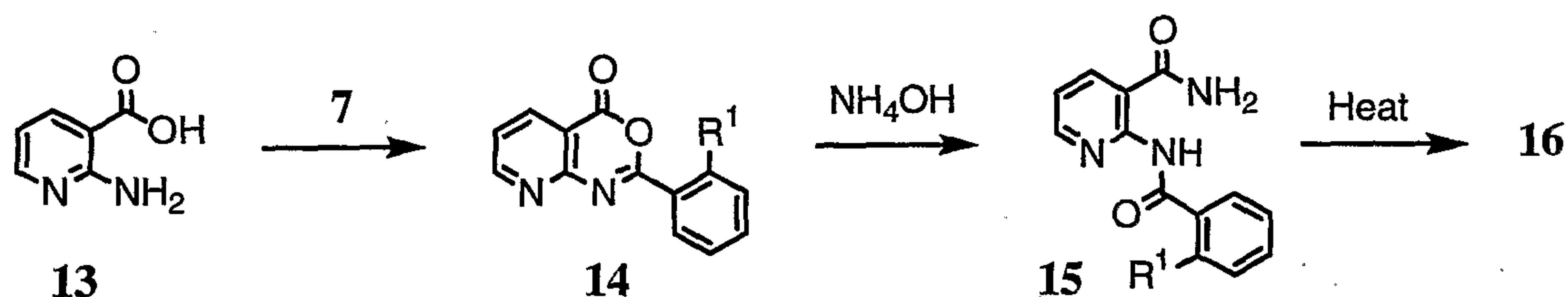


As shown by Method E, an acyl isocyanate 12 may be condensed with an enamine to provide pyrimidinone 9 (J. Org. Chem (1993), 58, 414-418; J. Med. Chem., (1992), 35, 1515-1520; J. Org. Chem., 1996, 31, 313-314). This method is illustrated by the following general procedure.

The enamine is prepared according to W. White, et al, J. Org Chem. (1967), 32, 213-214. The acyl isocyanate is prepared according to G Bradley, et al, J Med. Chem. (1992), 35, 1515-1520. The coupling reaction then follows the procedure of S Kawamura, et al, J. Org. Chem, (1993), 58, 414-418. To the enamine (10 mmol) in tetrahydrofuran (30 mL) at 0°C under nitrogen is added dropwise over 5 min a solution of acyl isocyanate (10 mmol) in tetrahydrofuran (5 mL). After stirring for 0.5 h, acetic acid (30 mL) is added, followed by ammonium

acetate (50 mmol). The mixture is refluxed for 2 h with continuous removal of tetrahydrofuran. The reaction is cooled to room temperature and is poured into water (100 mL). The precipitate is filtered, washed with water and ether and dried to provide the 2-aryl-3H-pyrimidin-4-one.

Method F



Method F shows a general route for the preparation of the present compounds wherein R^x and R^y are taken together to form a 5-8 membered partially unsaturated saturated or unsaturated ring having 1-3 heteroatoms. The condensation of a 2-amino-carboxylic acid, such as 2-amino-nicotinic acid 13, and an acid chloride 7 provides an oxazinone 14. Treatment of 14 with ammonium hydroxide will furnish the benzamide 15 which may be cyclized to a 2-(substituted)-pyrido[2,3-d][1,3]pyrimidin-4-one 16. This method is illustrated by the following procedure.

2-(Trifluoromethyl)benzoyl chloride (4.2 ml, 29.2 mmol) is added dropwise to a solution of 2-aminonicotinic acid (2.04g, 14.76 mmol) in 20 ml of pyridine. The reaction mixture is heated at 158 C for 30 min then cooled to room temperature. The reaction is poured into 200 ml of water and an oil forms which solidifies upon stirring. The solid is collected by vacuum filtration and washed with water and diethyl ether. The product is dried to give 2-(2-trifluoromethyl-phenyl)-pyrido[2,3-d][1,3]oxazin-4-one

(2.56 g, 60% yield) which may be used in the next step without further purification.

2-(2-Trifluoromethyl-phenyl)-pyrido[2,3-d][1,3]oxazin-4-one (2.51g) is stirred in 30% ammonium hydroxide (25 ml) at room temperature overnight. The resulting precipitate is filtered and rinsed with water and diethyl ether. The precipitate is dried under vacuum at 50 C overnight to give 2-(2-trifluoromethyl-benzoylamino)-nicotinamide (850 mg, 33% yield)

2-(2-Trifluoromethyl-benzoylamino)-nicotinamide (800mg, 2.6mmol) is dissolved in 10ml of ethanol. Potassium ethoxide (435mg, 5.2mmol) is added to the solution which is heated to reflux for 16 h. The reaction mixture is evaporated *in vacuo* to afford a gummy residue that is dissolved in water and acidified with 10% sodium hydrogen sulfate to pH 7. The resulting precipitate is filtered and dried under vacuum at 50 C to give 2-(2-trifluoromethyl-phenyl)-3H-pyrido[2,3-d]pyrimidin-4-one.

20

Method G

Method G is analogous to Method B(i) above. This method is illustrated by the following general procedure.

2-(3,4-Dichloro-phenyl)-3H-quinazolin-4-one (1g, 3.43 mmol) is suspended in phosphorus oxychloride (4 mL) and the reaction mixture was stirred at 110°C for 3 hours. The solvents are then evaporated and the residue is treated carefully with an ice cold aqueous saturated solution of NaHCO₃. The solid is collected by filtration and washed with ether to give 4-chloro-2-(3,5-dichloro-phenyl)-quinazoline as a white solid (993 mg, 93%).

30

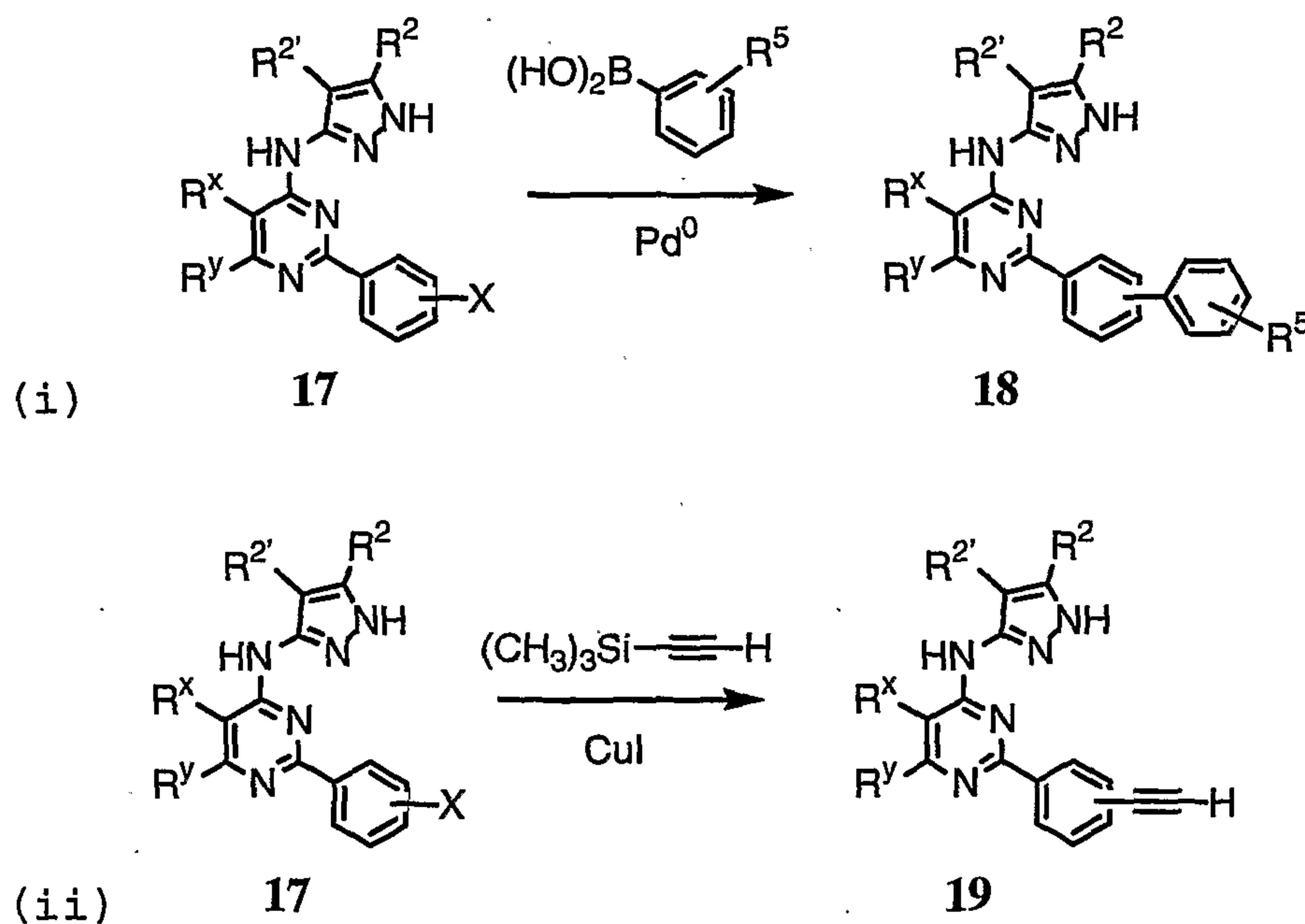
To 4-chloro-2-(3,5-dichloro-phenyl)-quinazoline (400mg, 1.29 mmol) in THF (30 mL) is added 3-amino-5-

methyl pyrazole (396 mg, 2.58 mmol) and the reaction mixture is heated at 65°C overnight. The solvents are then evaporated and the residue triturated with ethyl acetate, filtered and washed with a minimum amount of ethanol to give [2-(3,4-dichlorophenyl)-quinazolin-4-yl]-(5-methyl-2H-pyrazol-3-yl)-amine as a white solid (311 mg 65%): mp 274°C; ¹H NMR (DMSO) δ 2.34 (3H, s), 6.69 (1H, s), 7.60 (1H, m), 7.84 (1H, d), 7.96 (2H, d), 8.39 (1H, dd), 8.60 (1H, d), 8.65 (1H, d), 10.51 (1H, s), 12.30 (1H, s); IR (solid) 1619, 1600, 1559, 1528, 1476, 1449, 1376, 1352, 797, 764, 738; MS 370.5 (M+H)⁺.

The THF solvent used in the previous step may be replaced by other organic solvents such as ethanol, N,N-dimethylformamide, or dioxane.

15

Method H



20

Method H shows routes in which a Ring D aryl group bearing a halogen (X is Br or I) may be converted to other formula III compounds. Method H(i) shows a phenylboronic acid coupling to Ring D to provide compound 18 and Method H(ii) shows an acetylene coupling to provide compound 19. Substituent X in compound 17 may be

bromine or iodine. These methods are illustrated by the following procedures.

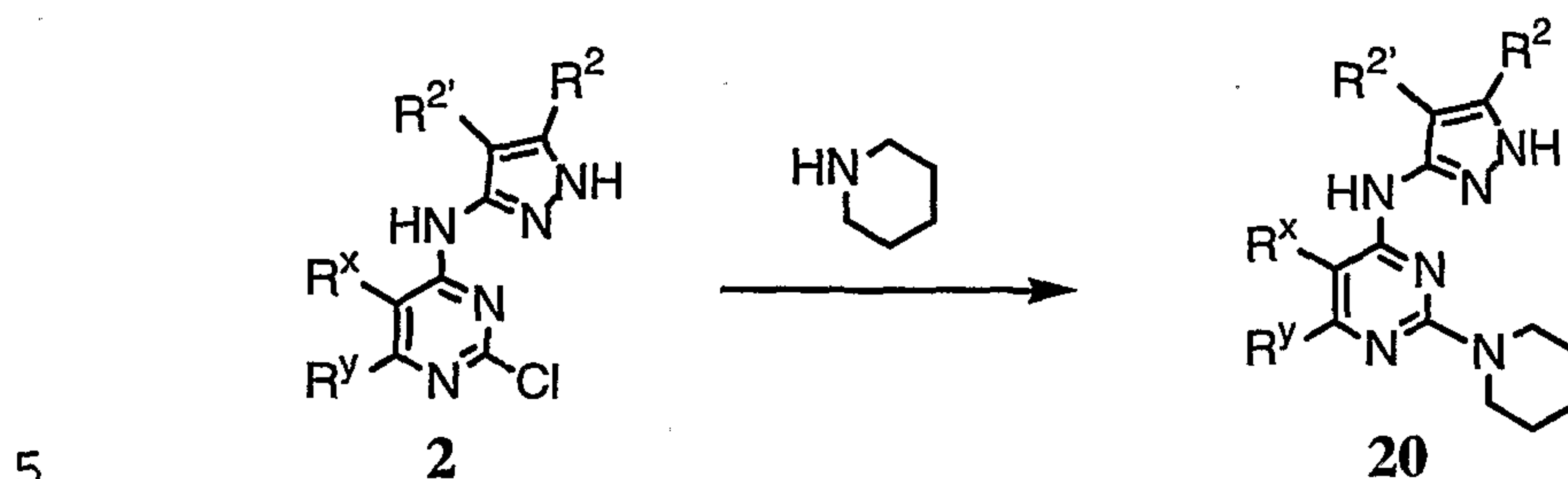
Method H(i). To a mixture of [2-(4-bromophenyl)-quinazolin-4-yl]-(5-methyl-2H-pyrazol-3-yl)-amine (196 mg, 0.51 mmol) and phenylboronic acid (75 mg, 0.62 mmol) in THF/water (1/1, 4 mL) is added Na₂CO₃ (219 mg, 2.06 mmol), triphenylphosphine (9mg, 1/15 mol%) and palladium acetate (1 mg, 1/135 mol%). The mixture is heated at 80°C overnight, the solvents are evaporated and the residue is purified by flash chromatography (gradient of CH₂Cl₂/MeOH) to give (2-biphenyl-4-yl-quinazolin-4-yl)-(5-methyl-2H-pyrazol-3-yl)-amine as a yellow solid (99 mg, 51%): ¹H NMR (DMSO) δ 2.37 (3H, s), 6.82 (1H, s), 7.39-7.57 (4H, m), 7.73-7.87 (6H, m), 8.57 (2H, d), 8.67 (1H, d), 10.42 (1H, s), 12.27 (1H, s); MS 378.2 (M+H)⁺

Method H(ii). To a mixture of [2-(4-bromophenyl)-quinazolin-4-yl]-(5-methyl-2H-pyrazol-3-yl)-amine (114 mg, 0.3 mmol), and trimethylsilylacetylene (147 mg, 1.5 mmol) in DMF (2 mL) is added CuI (1.1 mg, 1/50 mol%), Pd(PPh₃)₂Cl₂ (4.2 mg, 1/50 mol%) and triethylamine (121 mg, 0.36 mmol). The mixture is heated at 120°C overnight and the solvent is evaporated. The residue is triturated in ethyl acetate and the precipitate is collected by filtration.

To the above precipitate suspended in THF (3 mL) is added tetrabutylammonium fluoride (1M in THF, 1.1eq). The reaction mixture is stirred at room temperature for two hours and the solvent is evaporated. The residue is purified by flash chromatography (gradient of CH₂Cl₂/MeOH) to give [2-(4-ethynylphenyl)-quinazolin-4-yl]-(5-methyl-2H-pyrazol-3-yl)-amine as a white solid (68 mg, 70%): ¹H NMR (DMSO) δ 2.34 (3H, s), 4.36 (1H, s), 6.74 (1H, s), 7.55 (1H, m), 7.65 (2H, d), 7.84 (2H, m), 8.47

(2H, d), 8.65 (1H, d), 10.43 (1H, s), 12.24 (1H, s); MS
326.1 (M+H)⁺

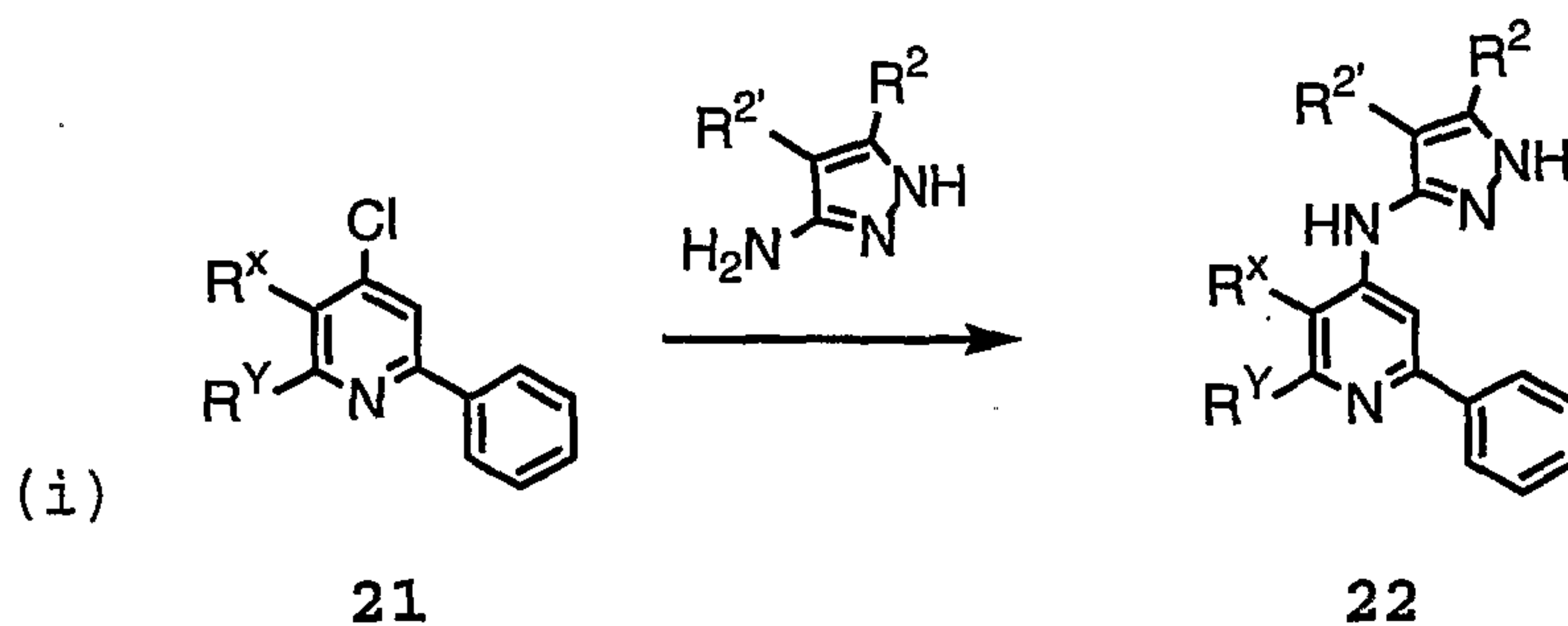
Method I



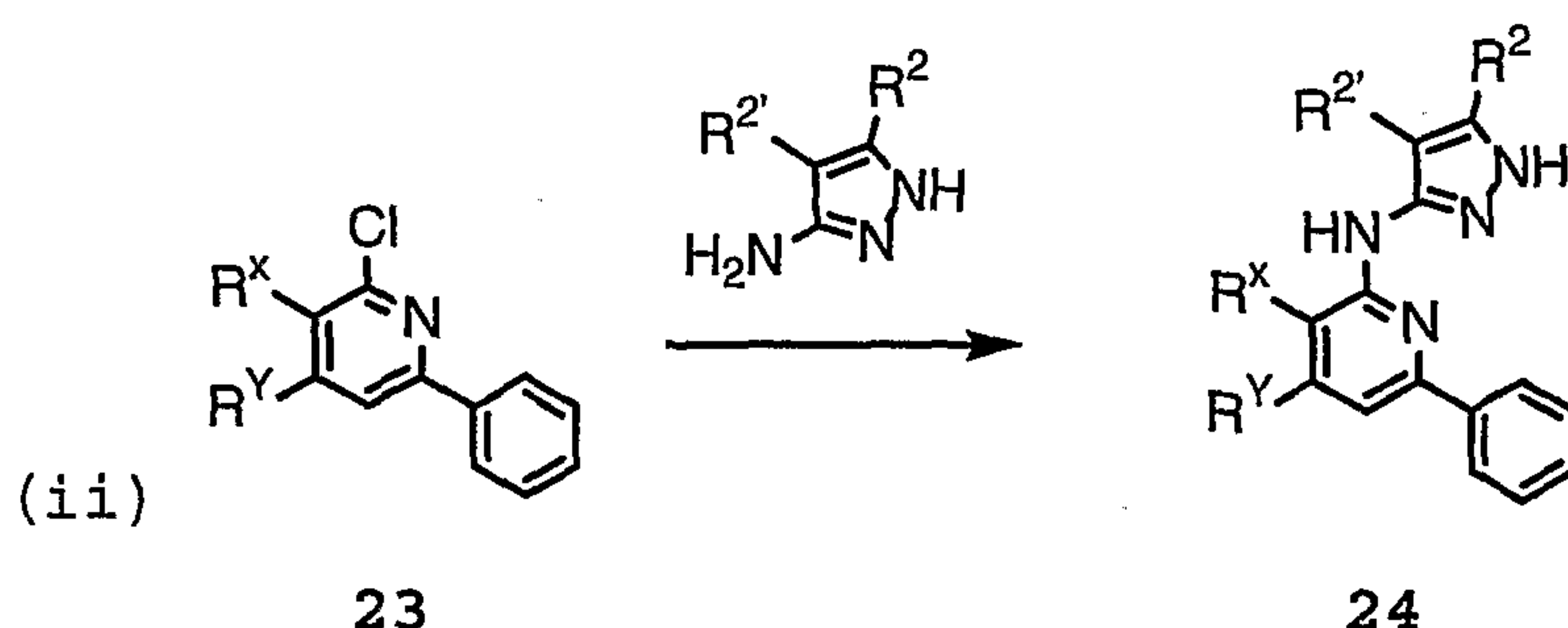
Method I above shows a general route for the preparation of the present compounds wherein ring D is a heteroaryl or heterocyclyl ring directly attached to the pyrimidine 2-position via a nitrogen atom. Displacement of the 2-chloro group, exemplified here using piperidine, may be carried out in a manner similar to that described in *J. Med. Chem.*, **38**, 2763-2773 (1995) and *J. Chem. Soc.*, 1766-1771 (1948). This method is illustrated by the following procedure.

To a solution of (2-chloro-quinazolin-4-yl)-(1H-indazol-3-yl)-amine (1 equivalent, 0.1-0.2 mmol) in N, N-dimethylacetamide (1 ml) is added the desired amine (3 equivalents). The resulting mixture is maintained at 100°C for 6 h and then purified by reverse-phase HPLC.

Method J



25



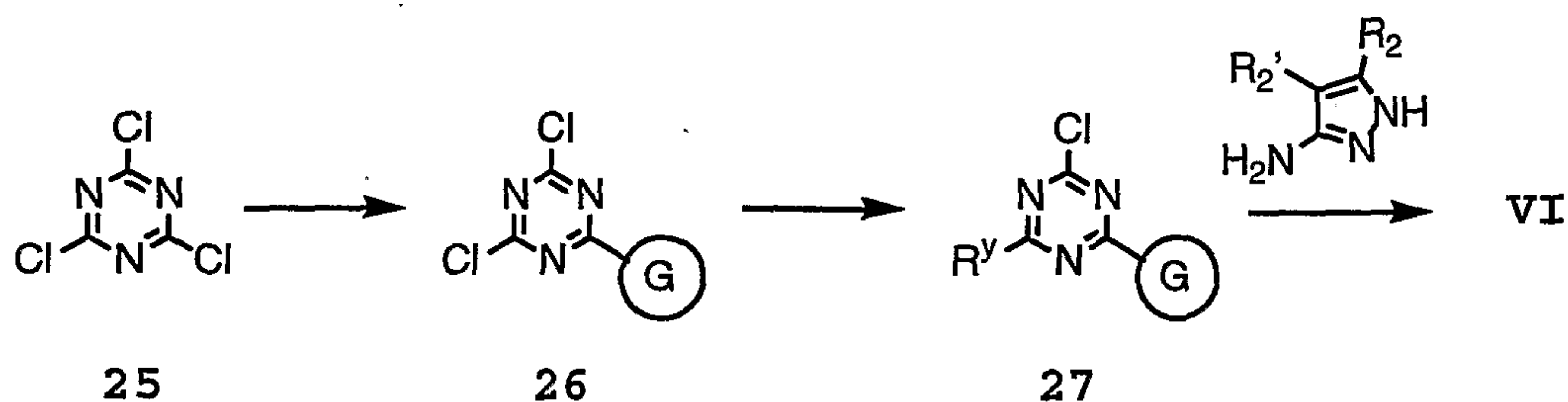
Method J above shows the preparation of compounds of formula V via the displacement of a chloro group from an appropriately substituted pyridyl ring. Method J(i) is a route for preparing compounds of formula Va (see *Indian J. Chem. Sect.B*, 35, 8, 1996, 871-873). Method J(ii) is a route for preparing compounds of formula Vb (see *Bioorg. Med. Chem.*, 6, 12, 1998, 2449-2458). For convenience, the chloropyridines 21 and 23 are shown with a phenyl substituent corresponding to Ring D of formula V. It would be apparent to one skilled in the art that Method J is also useful for preparing compounds of formula V wherein Ring D is heteroaryl, heterocyclyl, carbocyclyl or other aryl rings. Method J is illustrated by the following procedures.

Method J(i). (5-Methyl-2H-pyrazol-3-yl)-(2-phenyl-quinolin-4-yl)-amine. To 4-chloro-2-phenylquinoline (J. Het. Chem., 20, 1983, 121-128) (0.53g, 2.21 mmol) in diphenylether (5 mL) was added 3-amino-5-methylpyrazole (0.43g, 4.42 mmol) and the mixture was heated at 200°C overnight with stirring. To the cooled mixture was added petroleum ether (20 mL) and the resulting crude precipitate was filtered and further washed with petroleum ether. The crude solid was purified by flash chromatography (SiO₂, gradient DCM-MeOH) to give the title compound as a white solid: mp 242-244°C; ¹H NMR (DMSO) δ 2.27(3H, s), 6.02(1H, s), 7.47(2H, d), 7.53-7.40(2H, br m), 7.67(1H, m), 7.92(1H, m), 8.09(2H, d),

8.48 (2H, m), 9.20 (1H, s), 12.17 (1H, br s); IR (solid) 1584, 1559, 1554, 1483, 1447, 1430, 1389; MS 301.2 (M+H)⁺

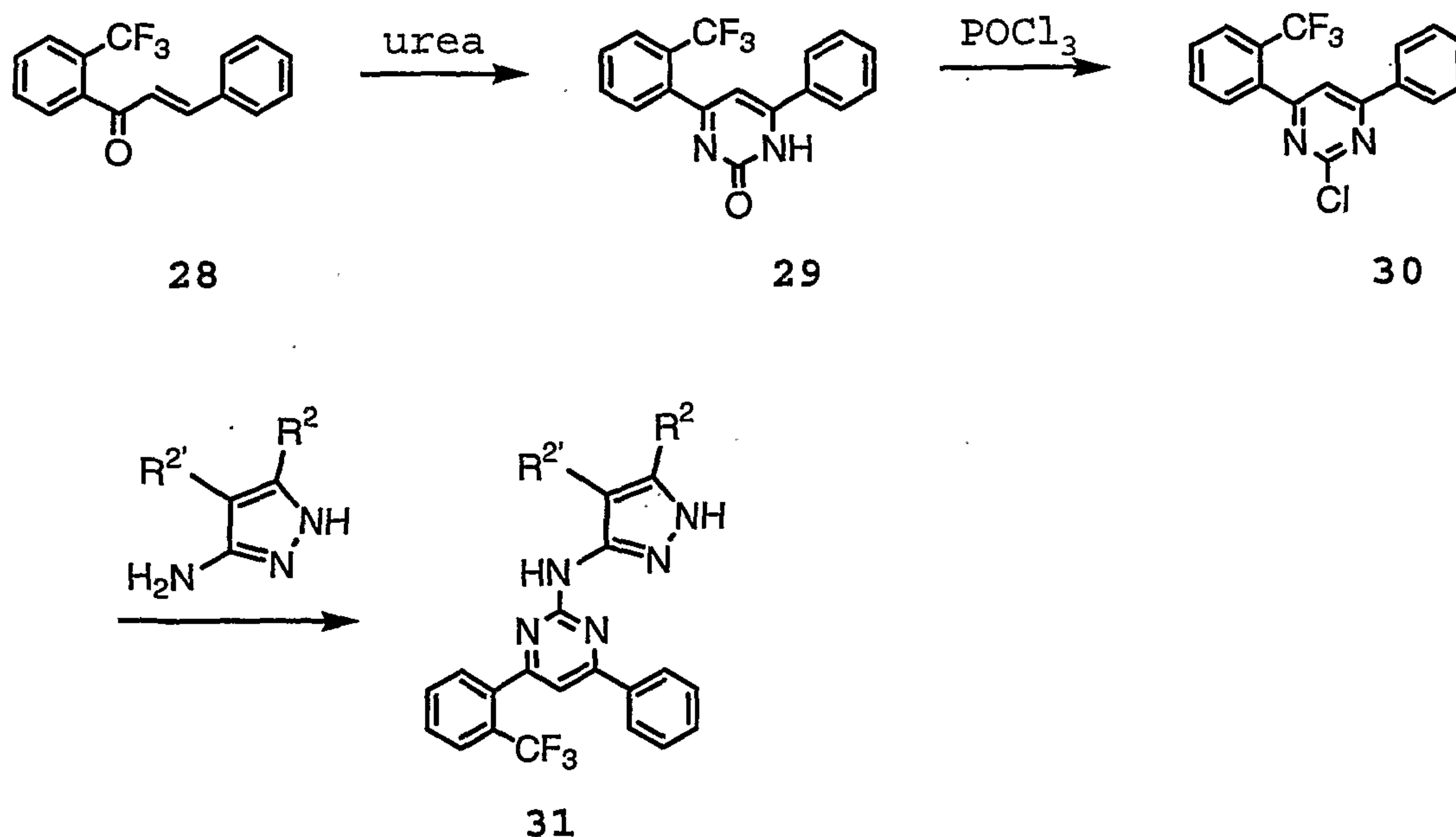
Method J(ii). (5-Methyl-2H-pyrazol-3-yl)-(3-phenyl-isoquinolin-1-yl)-amine. To 1-chloro-3-phenylisoquinoline (J. Het. Chem., 20, 1983, 121-128) (0.33g, 1.37 mmol) in dry DMF (5 mL) was added 3-amino-5-methylpyrazole (0.27g, 2.74 mmol) and potassium carbonate (0.57g, 4.13 mmol) and the mixture was heated under reflux for 6 hours. The mixture was cooled and the bulk of DMF was evaporated. The residue was extracted twice with ethyl acetate and the combined organic layers were washed with brine, dried (MgSO₄), filtered and concentrated. The crude was purified by flash chromatography (SiO₂, gradient DCM-MeOH) to give the title compound as a colourless oil; ¹H NMR (MeOD) δ 2.23 (3H, s), 5.61 (1H, s), 7.41 (1H, m), 7.52 (2H, m), 7.62 (1H, m), 7.81 (1H, m), 8.07 (1H, d), 8.19 (2H, m), 8.29 (1H, s), 8.54 (1H, d); MS 301.2 (M+H)⁺

20 Method K



Method K shows a route for the preparation of compounds of formula VI. A versatile starting material is 2,4,6-trichloro-[1,3,5]triazine 25 in which the chlorine substituents may be sequentially displaced. The displacement of one of the chlorines by an aryl Grignard reagent or an aryl boronic acid is described in PCT patent application WO 01/25220 and *Helv. Chim. Acta*, 33, 1365 (1950). The displacement of one of the chlorines by a heteroaryl ring is described in WO 01/25220; *J. Het.*

Method L



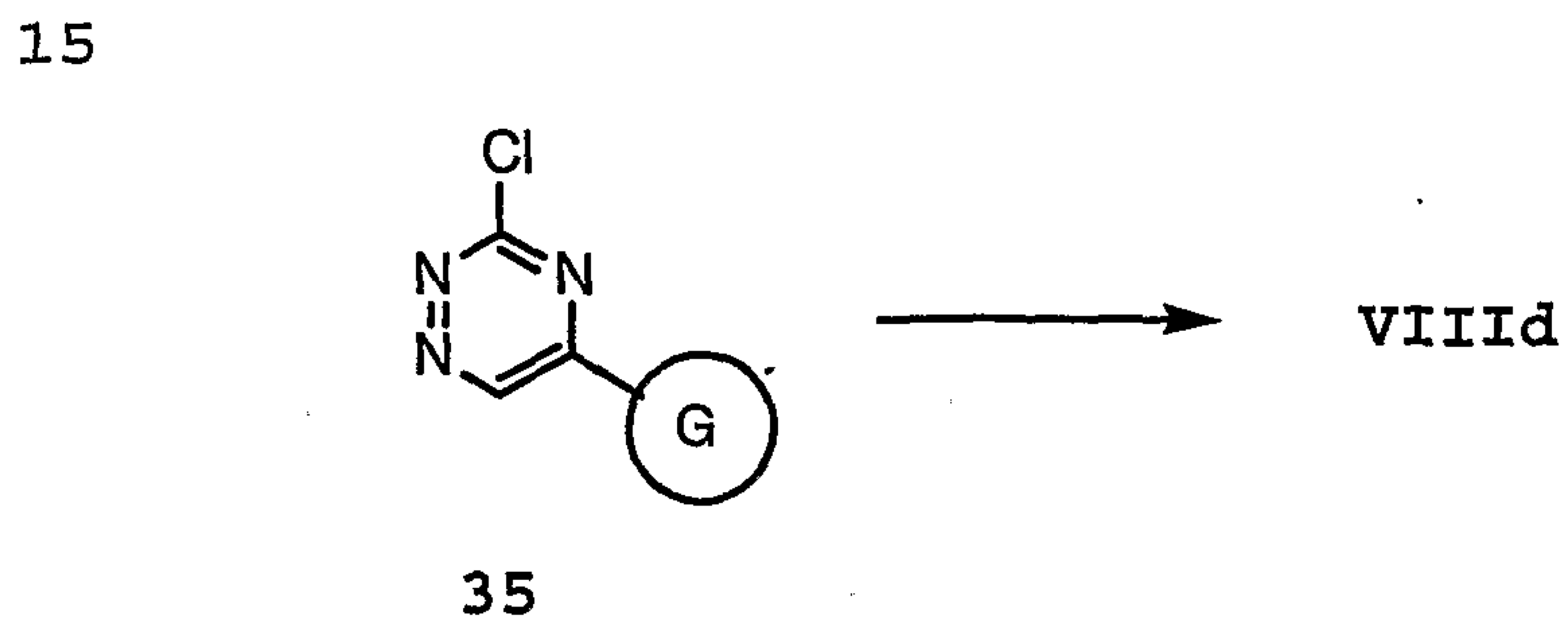
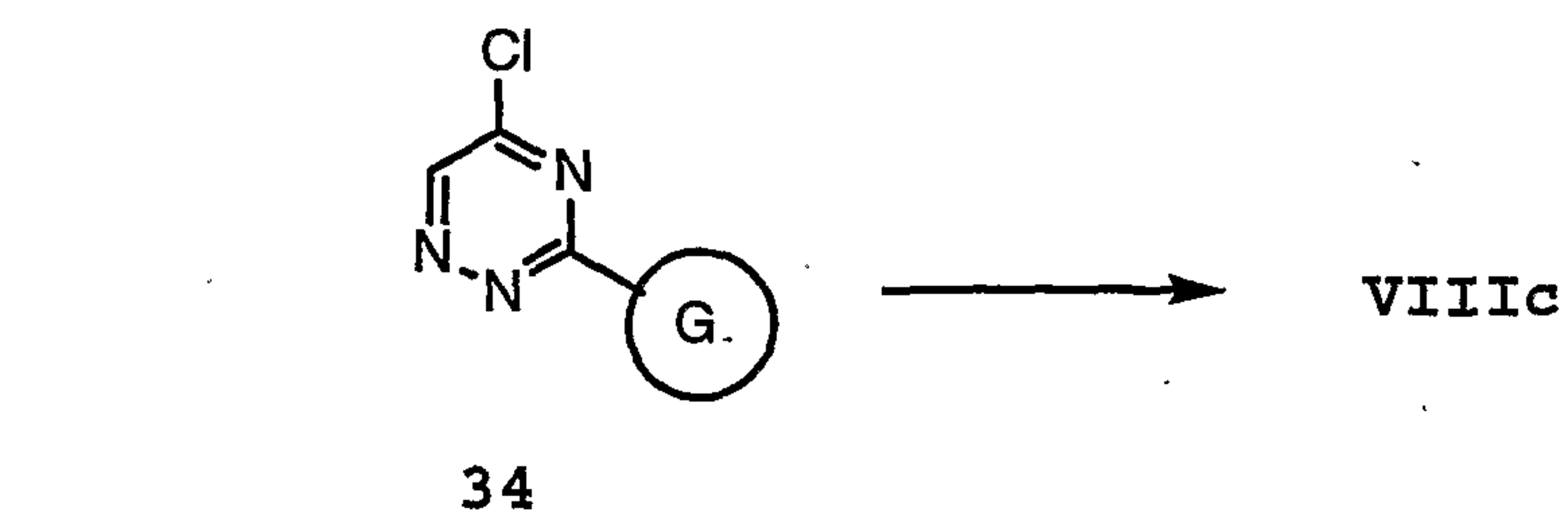
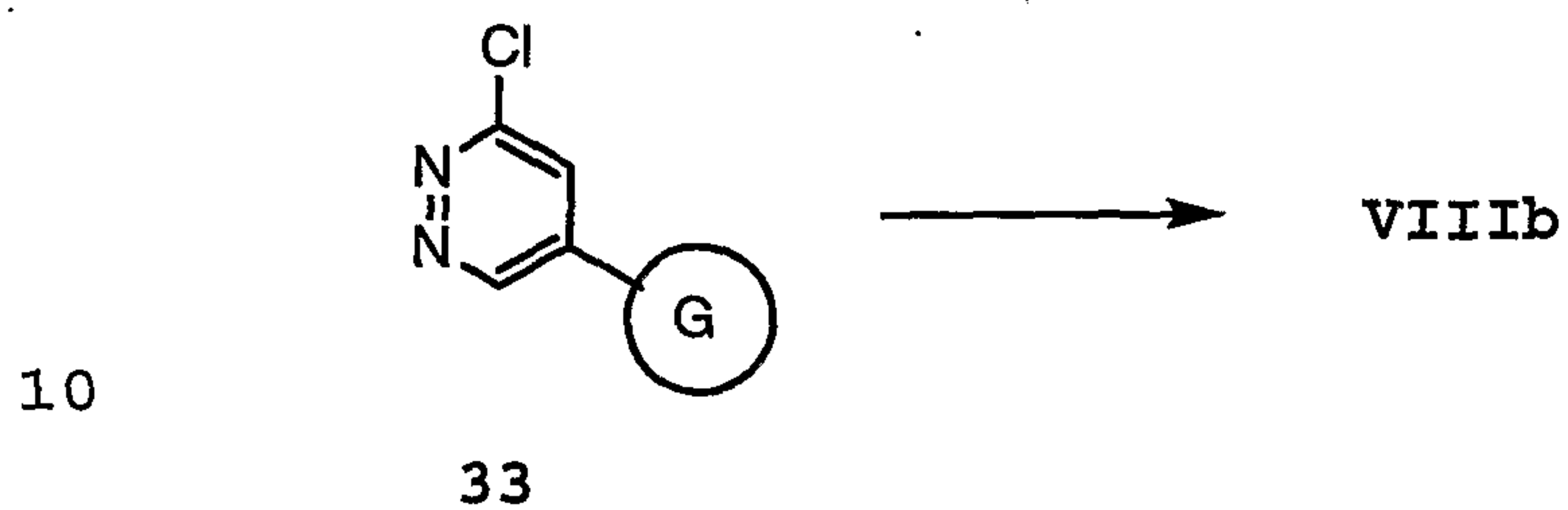
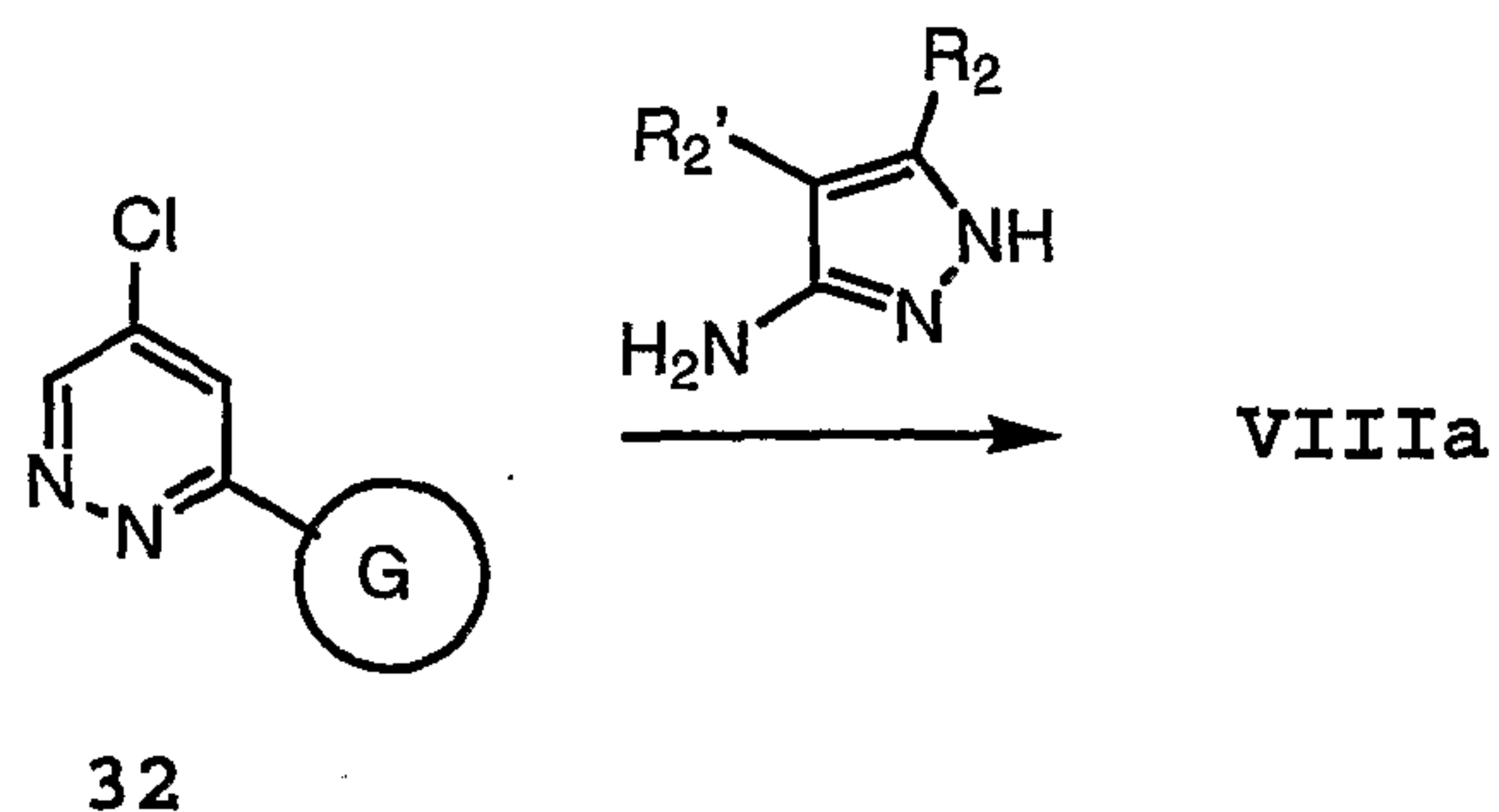
- 238 -

trifluoromethylphenyl and phenyl rings of compound 28. Substituted chalcones may be prepared by known methods, for example as described in the *Indian J. Chemistry*, 32B, 449 (1993). Condensation of a chalcone with urea provides the pyrimidinone 29, which may be treated with POCl₃ to give the chloropyrimidine 30. See *J. Chem. Eng. Data*, 30(4) 512 (1985) and *Egypt. J. Chem.*, 37(3), 283 (1994). In an alternative approach to compound 30, one of the aryl rings attached to the pyrimidine is introduced by displacement of the 4-chloro group of 2,4-dichloro-(6-aryl)-pyrimidine by an aryl boronic acid using a palladium catalyst such as (Ph₃P)₄Pd in the presence of a base such as sodium carbonate as described in *Bioorg. Med. Lett.*, 9(7), 1057 (1999). Displacement of the chlorine of compound 30 by an appropriate aminopyrazole provides compounds of this invention, such as 31. The last step of this method is illustrated by the following procedure.

[4-(4-Methylpiperidin-1-yl)-pyrimidin-2-yl]-(5-methyl-2H-pyrazol-3-yl)-amine. To a solution of 2-chloro-4-(4-methylpiperidin-1-yl)-pyrimidine (prepared using a procedure similar to the one reported in *Eur. J. Med. Chem.*, 26(7) 729(1991)) (222 mg, 1.05 mmol) in BuOH (5 mL) was added 3-amino-5-methyl-2H-pyrazole (305mg, 3.15 mmol) and the reaction mixture was then heated under reflux overnight. The solvent was evaporated and the residue dissolved in a mixture ethanol/water (1/3, 4 mL). Potassium carbonate (57mg, 0.41 mmol) was added and the mixture was stirred at room temperature for 2 hours. The resulting suspension was filtered, washed with water twice and rinsed with ether twice to give the title compound as a white solid (143mg, 50%): mp 193-195°C; ¹H NMR (DMSO) δ 0.91 (3H, d), 1.04 (2H, m), 1.67 (3H, m), 2.16 (3H, s), 2.83 (2H, t), 4.31 (2H, m), 6.19 (2H, m),

7.87 (1H, d), 8.80 (1H, br s), 11.71 (1H, s); IR (solid) 1627, 1579, 1541, 1498, 1417, 1388, 1322, 1246; MS 273.3 (M+H)⁺.

5 Method M

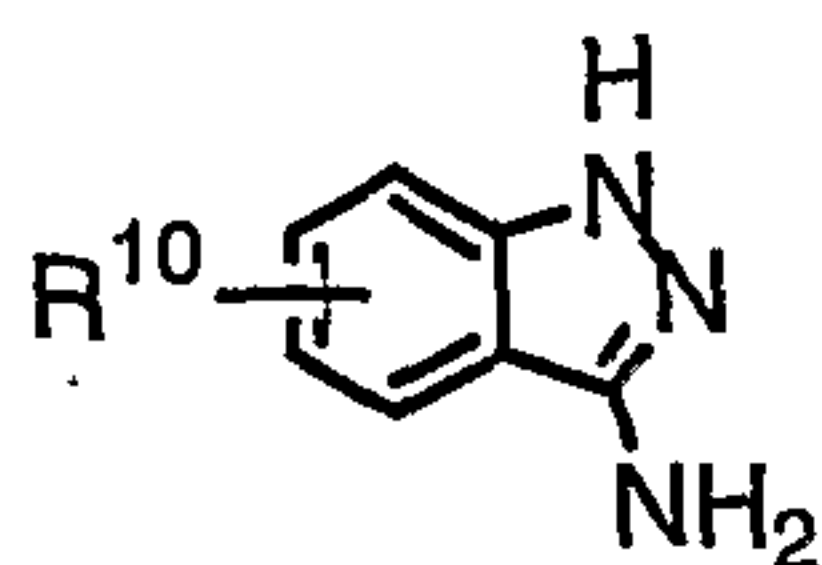


Method M provides routes for obtaining compounds of formula VIII. A general procedure for displacing the chlorine of a 4-chloro-6-substituted-pyridazine, 32, with an appropriately substituted

pyrazole to provide **VIIIa** is described in *J. Het. Chem.*, 20, 1473 (1983). Analogous reactions may be carried out as follows: (a) with 3-chloro-5-substituted-pyridazine, **33**, to provide **VIIIb** is described in *J. Med. Chem.*, 41(3), 311 (1998); (b) with 5-chloro-3-substituted-[1,2,4]triazine, **34**, to provide **VIIIc** is described in *Heterocycles*, 26(12), 3259 (1987); and (c) with 3-chloro-5-substituted-[1,2,4]triazine, **35**, to provide **VIIId** is described in *Pol. J. Chem.*, 57, 7, (1983); *Indian J. Chem. Sect. B*, 26, 496 (1987); and *Agric. Biol. Chem.*, 54(12), 3367 (1990). An alternative procedure to compounds of formula **VIIIc** is described in *Indian J. Chem. Sect. B*, 29(5), 435 (1990).

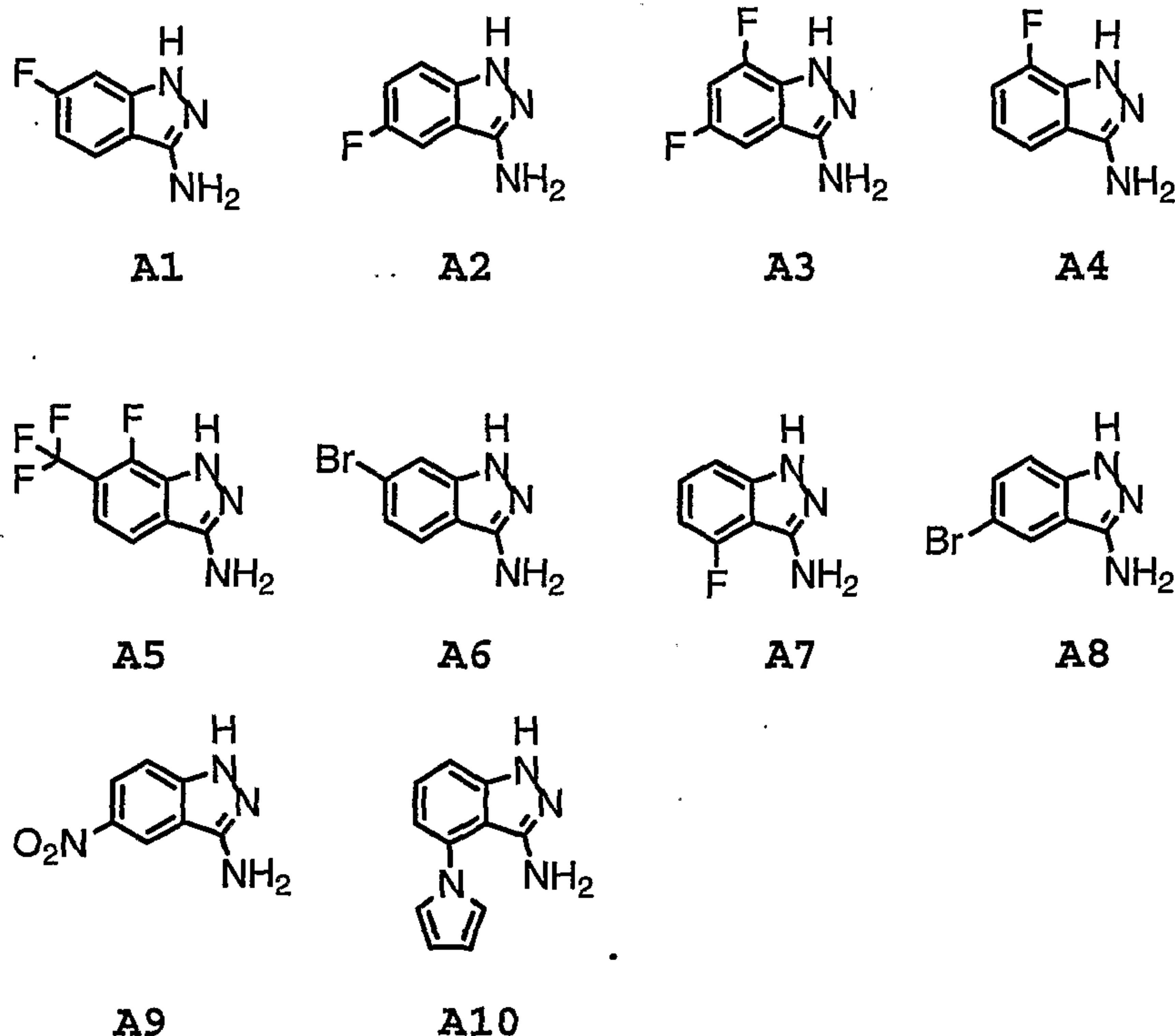
Compounds of formula **IX** are prepared by methods substantially similar to those described above for the pyrazole-containing compounds of formula **I**. Methods A-J may be used to prepare the triazole-containing compounds of formula **IX** by replacing the amino-pyrazole compound with an amino-triazole compound. Such methods are specifically exemplified by Synthetic Examples 415-422 set forth below. The amino-triazole intermediate may be obtained by methods described in *J. Org. Chem. USSR*, 27, 952-957 (1991).

Certain synthetic intermediates that are useful for preparing the protein kinase inhibitors of this invention are new. Accordingly, another aspect of this invention relates to a 3-aminoindazole compound of formula **A**:

**A**

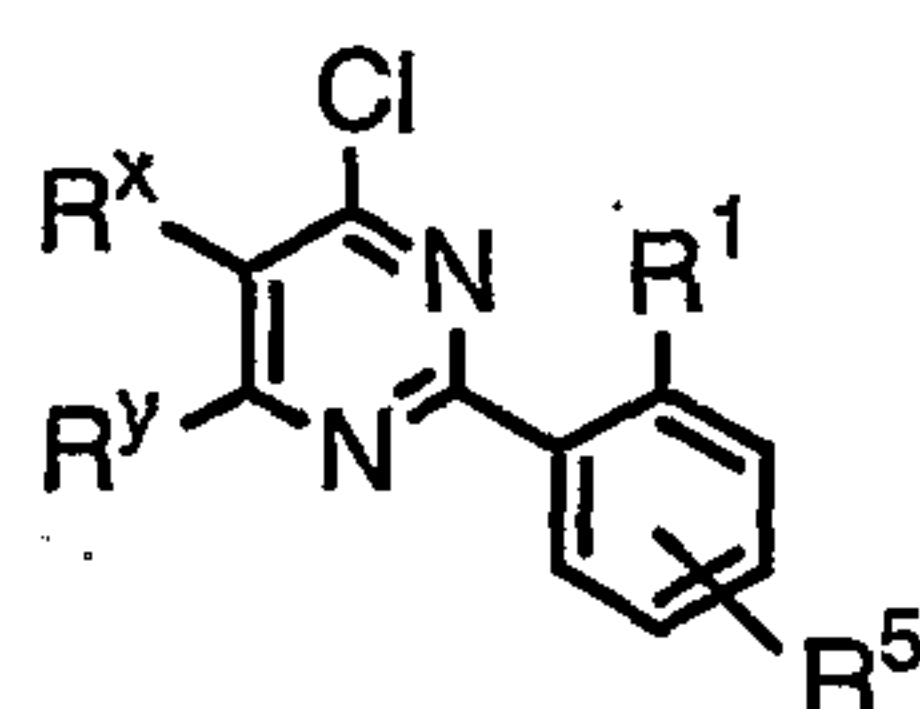
where R^{10} is one to three substituents that are each independently selected from fluoro, bromo, C_{1-6} haloalkyl,

nitro, or 1-pyrrolyl. Examples of such compounds include the following:



10

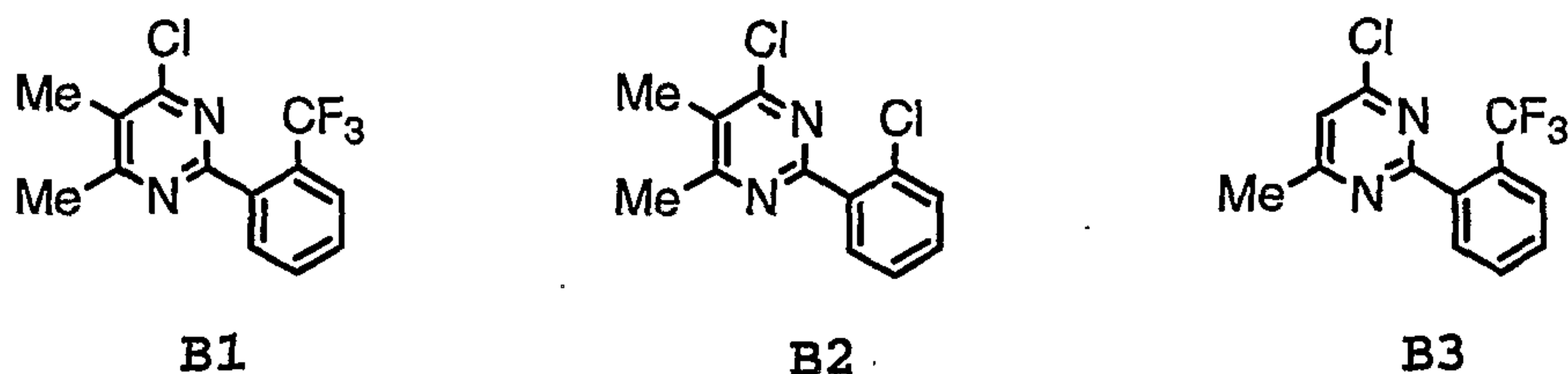
Another aspect of this invention relates to a 4-chloropyrimidine compound of formula B:

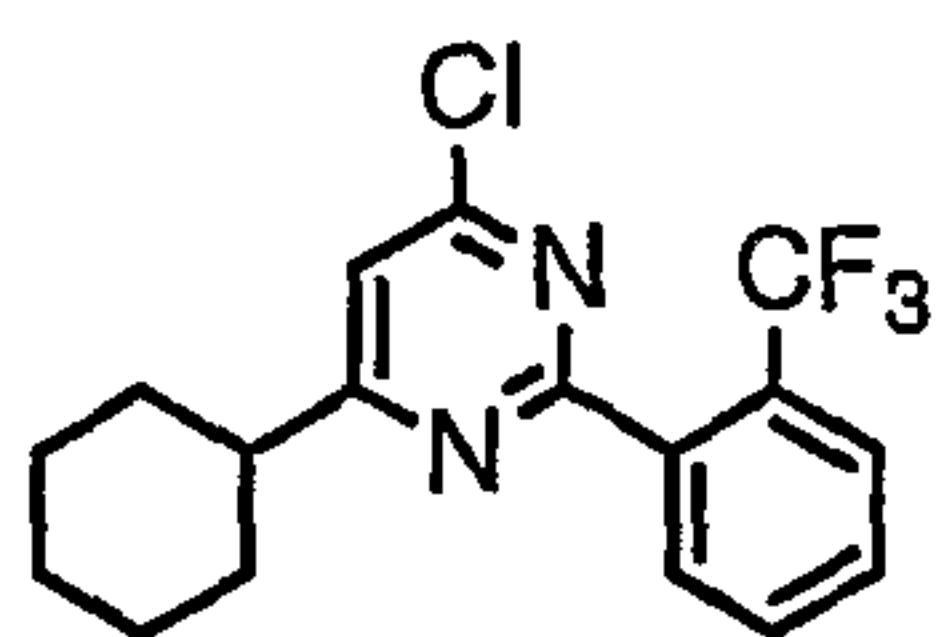


B

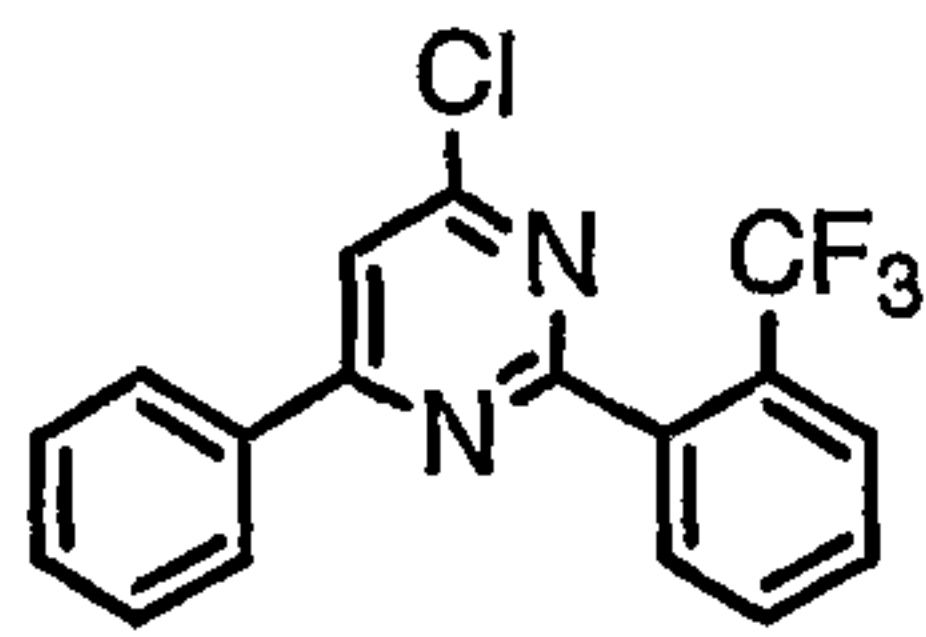
15 wherein R^x and R^y are as defined above; R^1 is selected from Cl, F, CF_3 , CN, or NO_2 ; and is one to three substituents that are each independently selected from H, Cl, F, CF_3 , NO_2 , or CN; provided that R^1 and R^5 are not simultaneously Cl. Examples of compounds of formula B

20 are shown below:

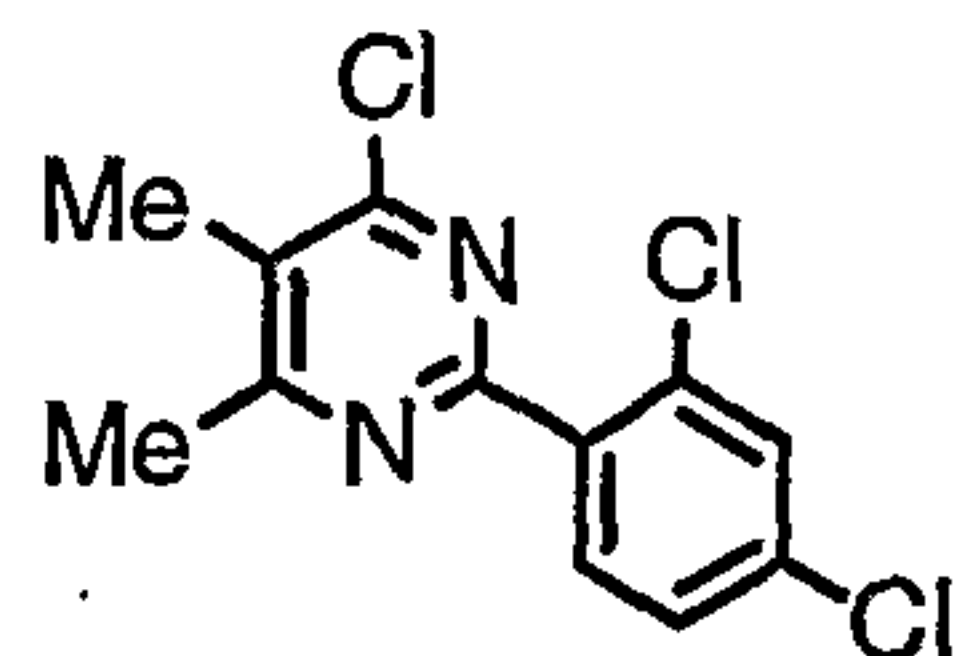




B4

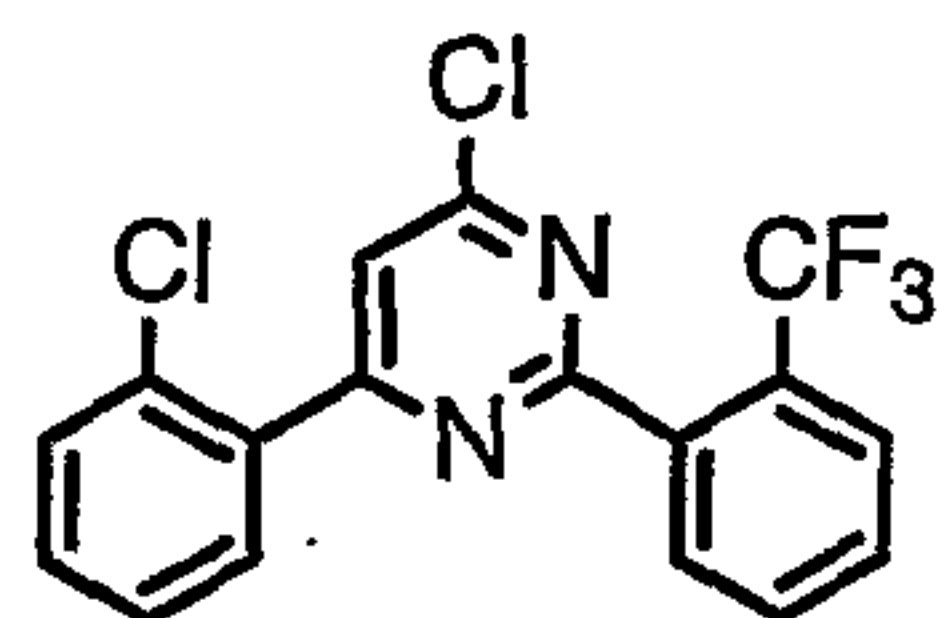


B5

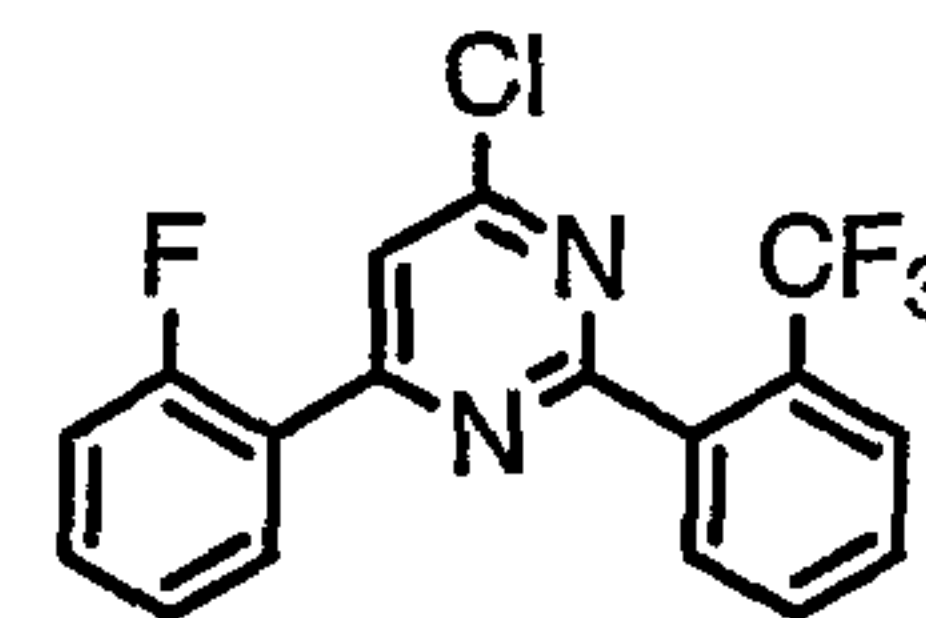


B6

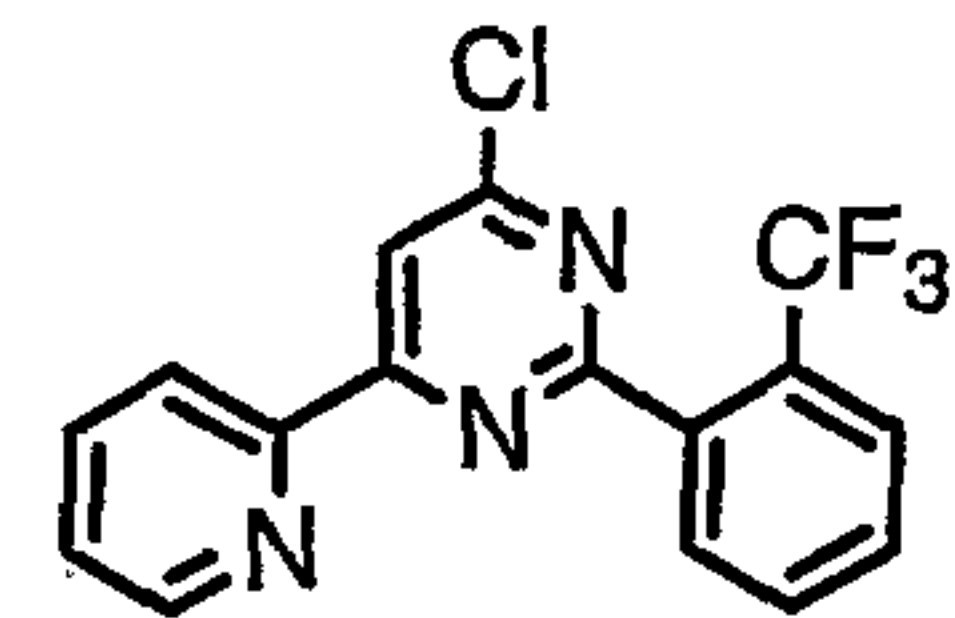
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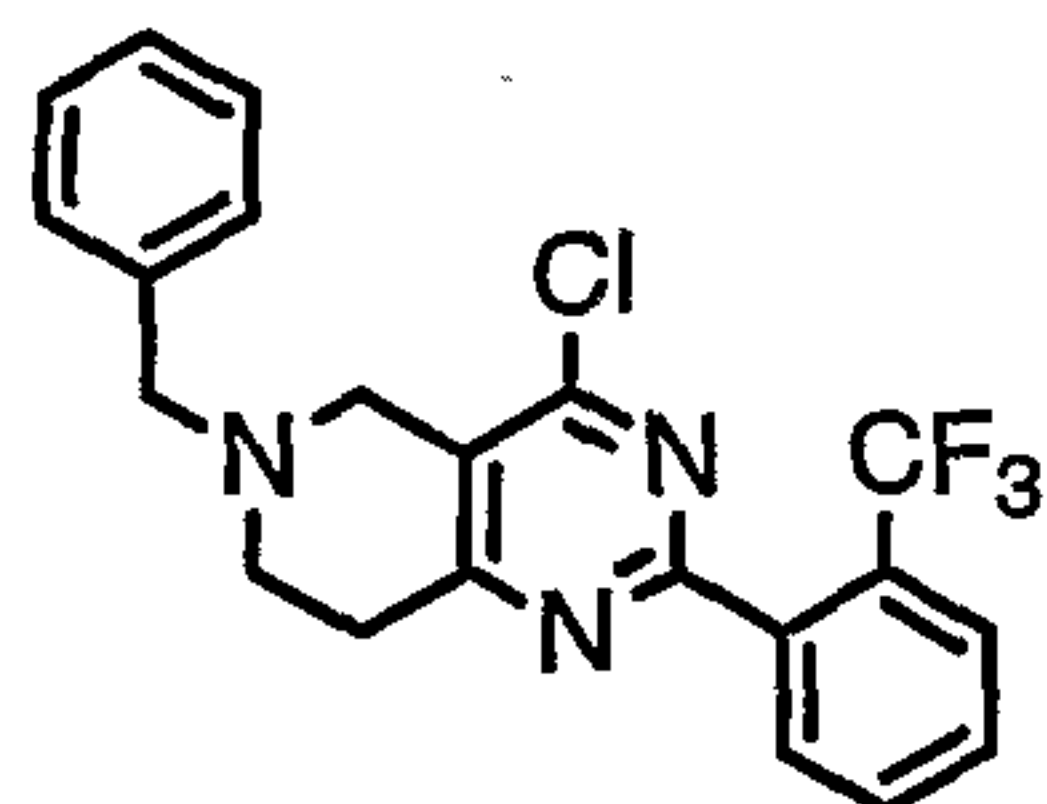
B7



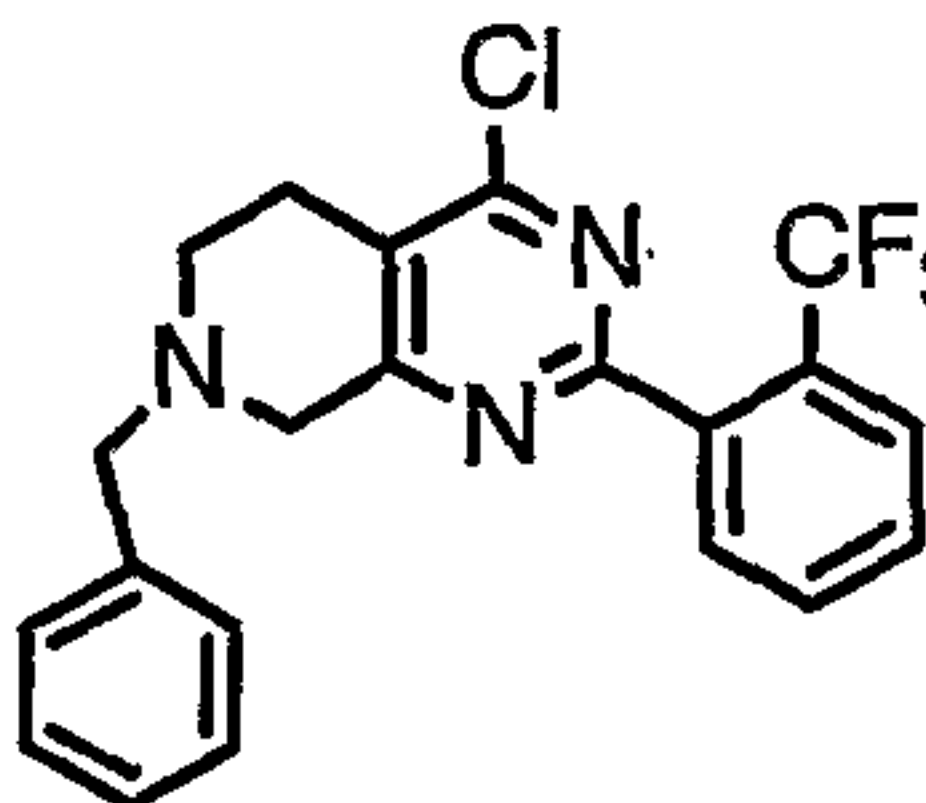
B8



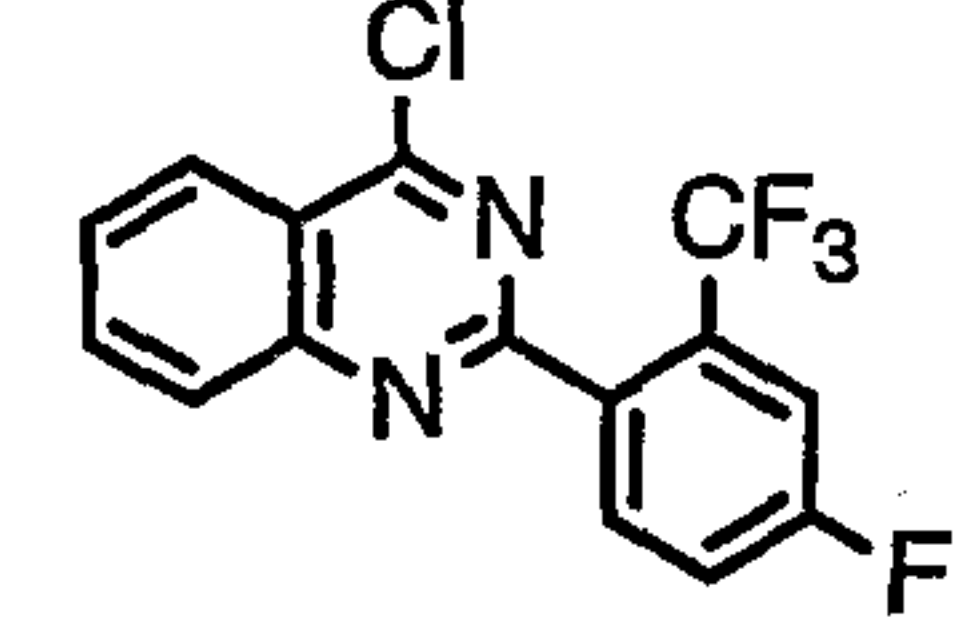
B9



B10

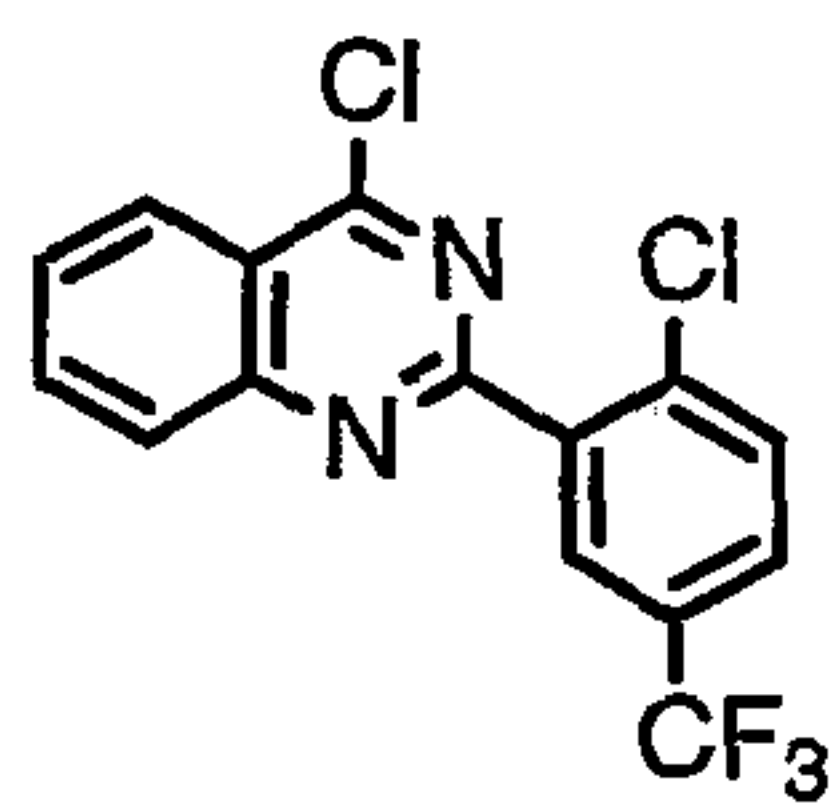


B11

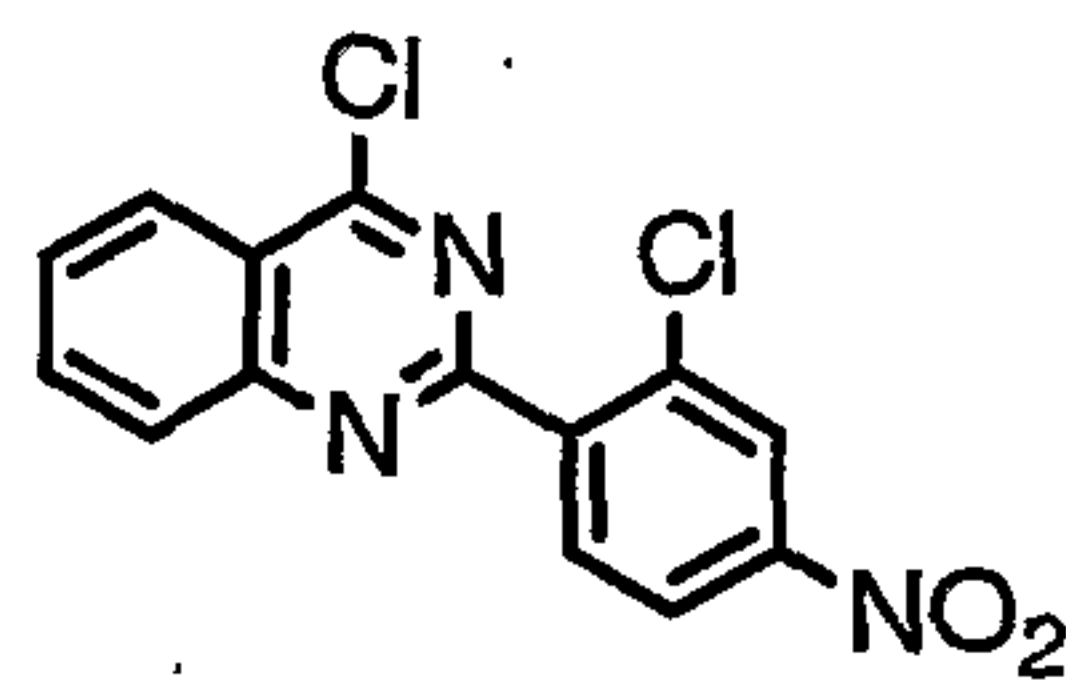


B12

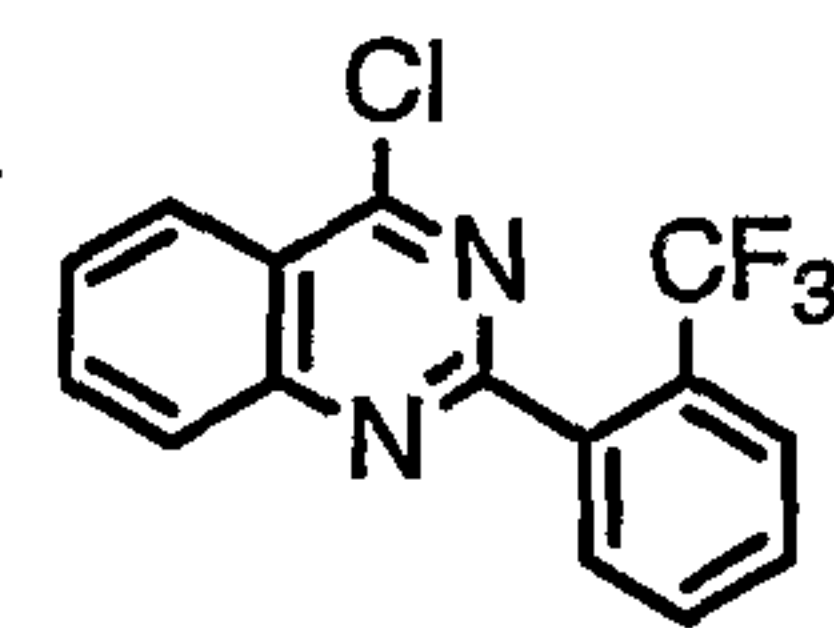
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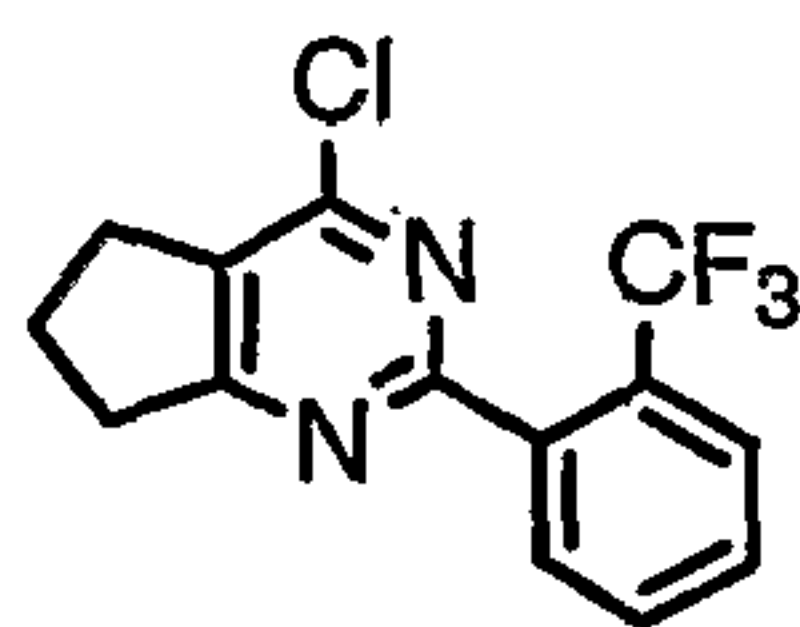
B13



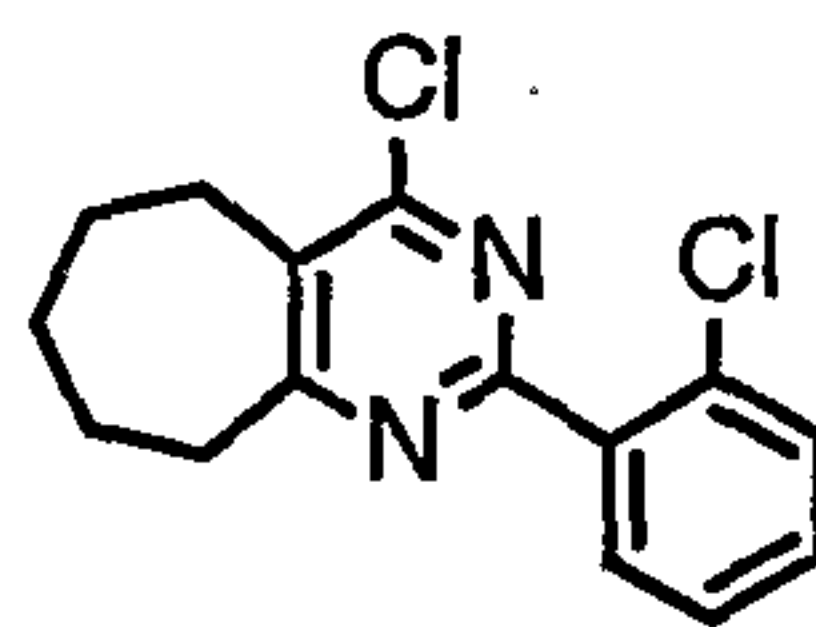
B14



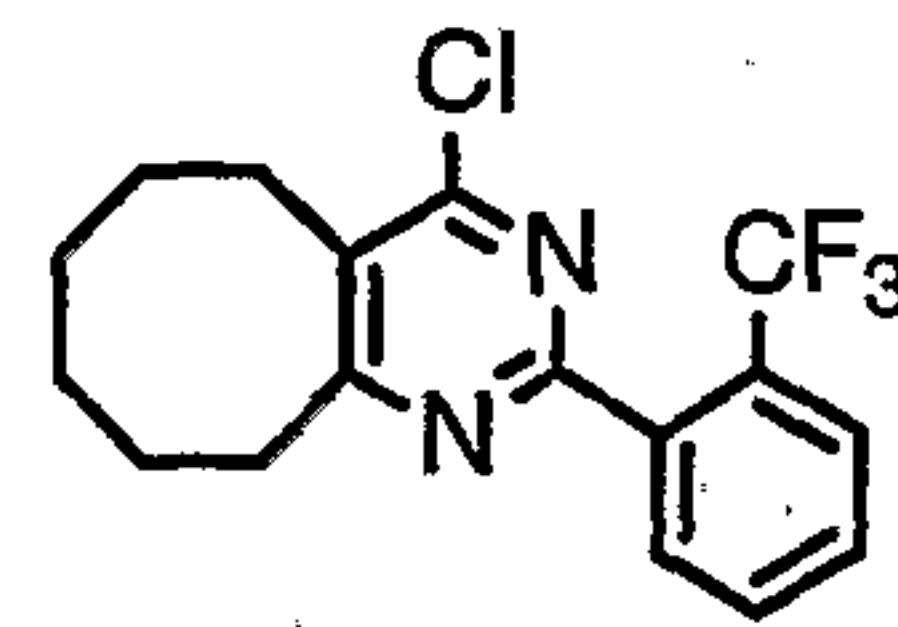
B15



B16

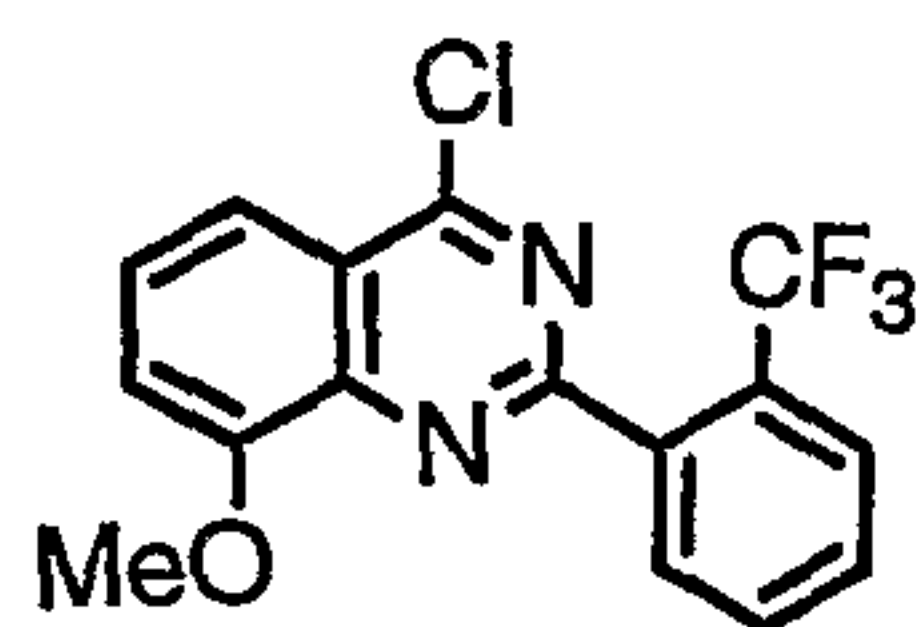


B17

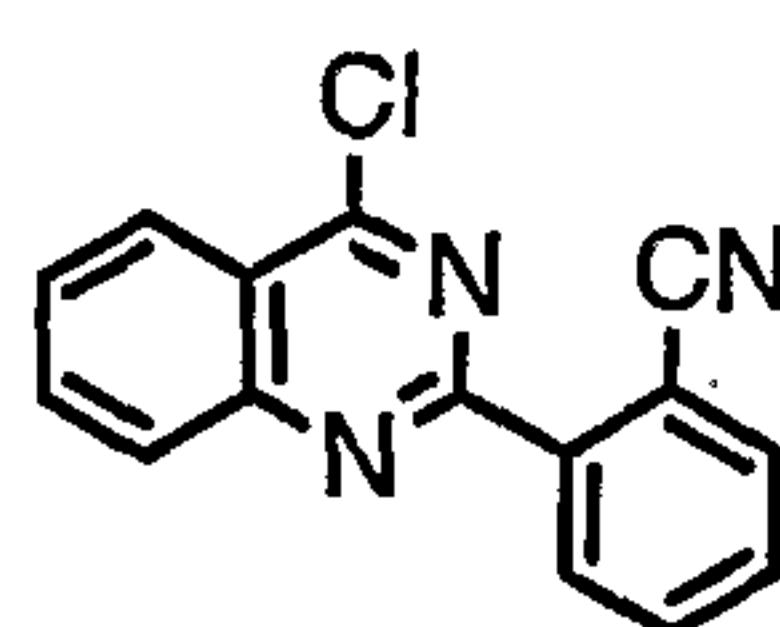


B18

15

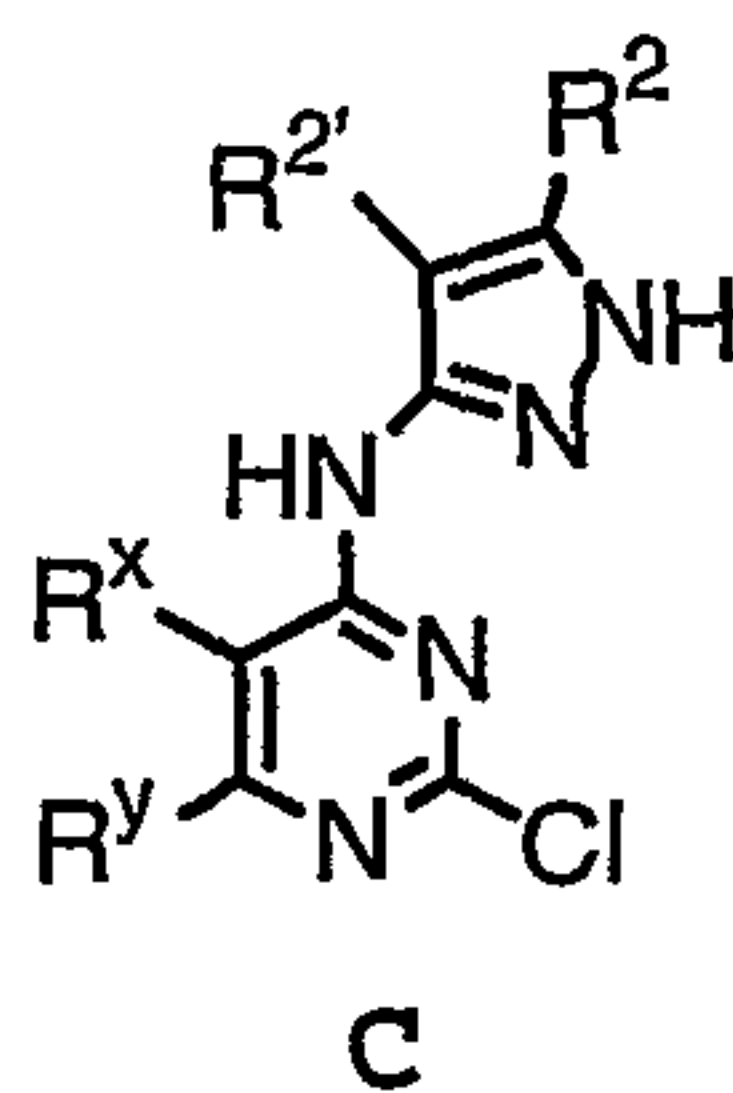


B19



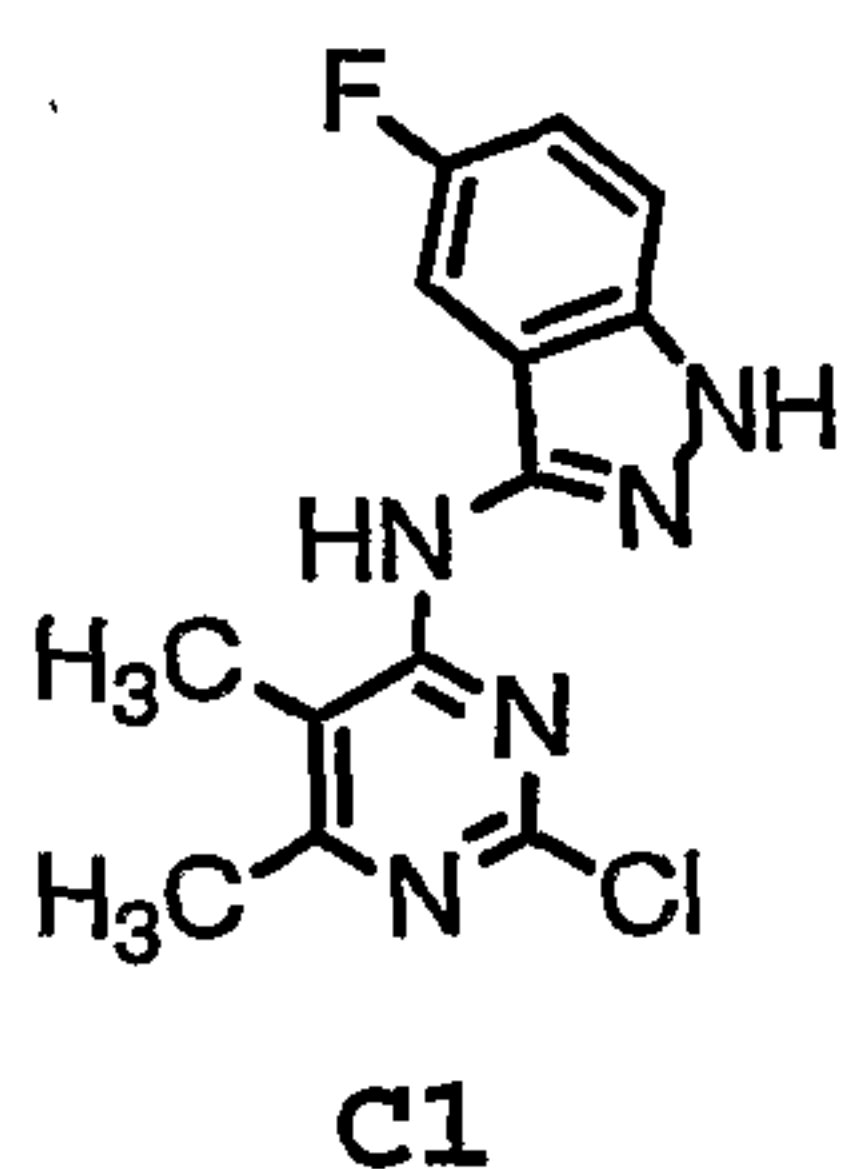
B20

Another aspect of this invention relates to compounds of formula C:

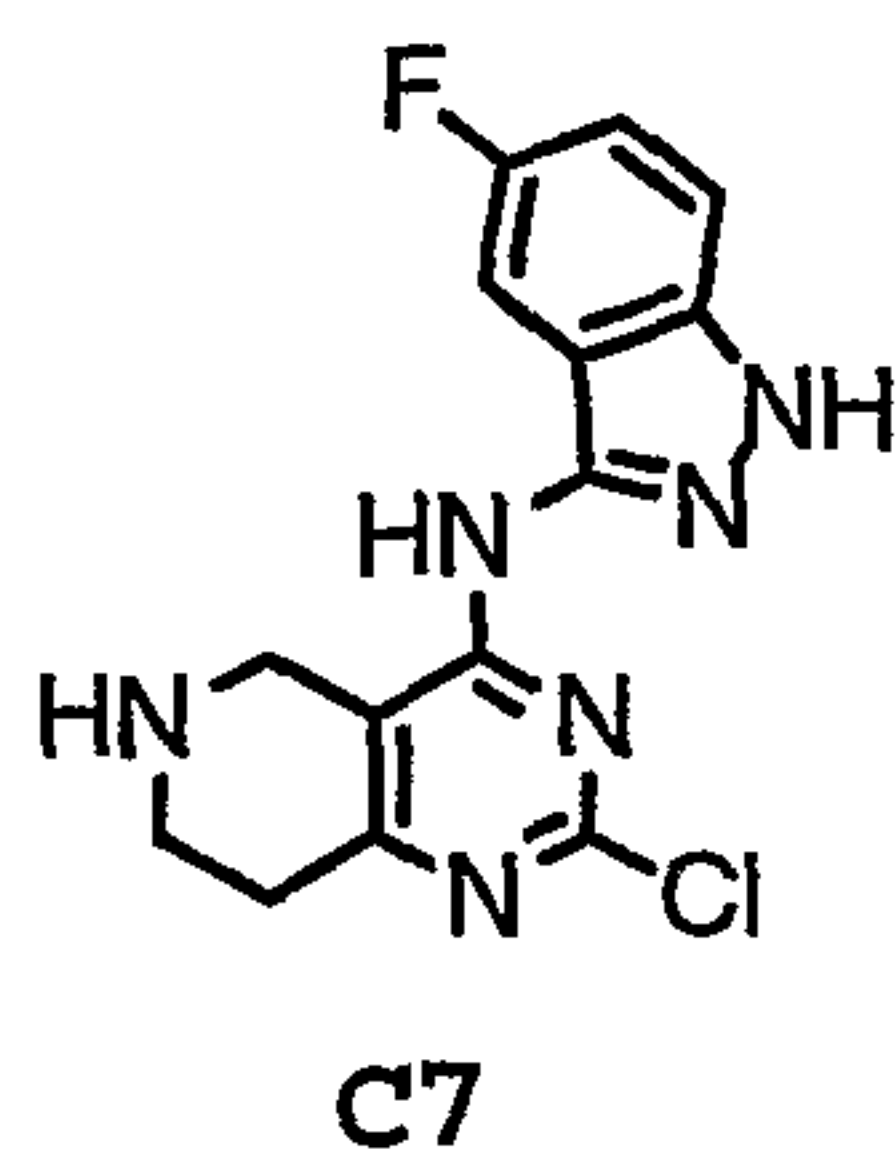
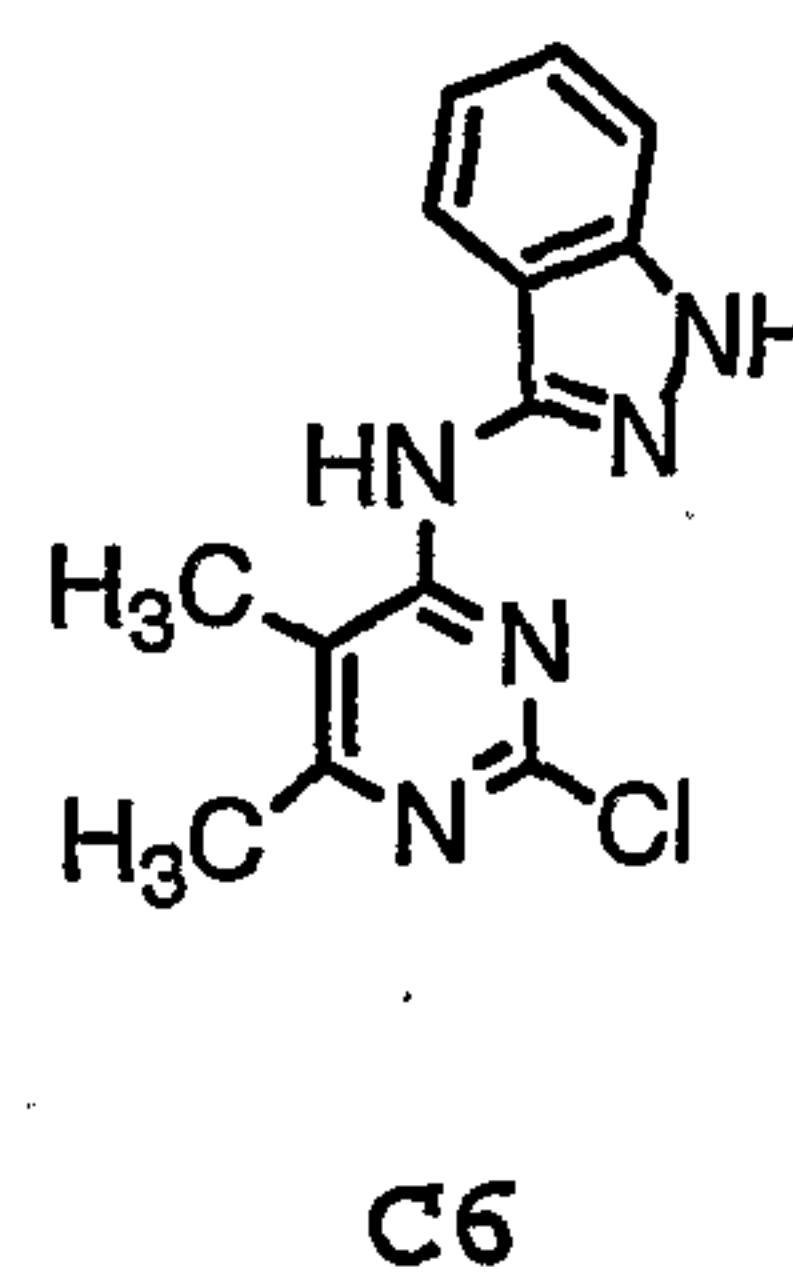
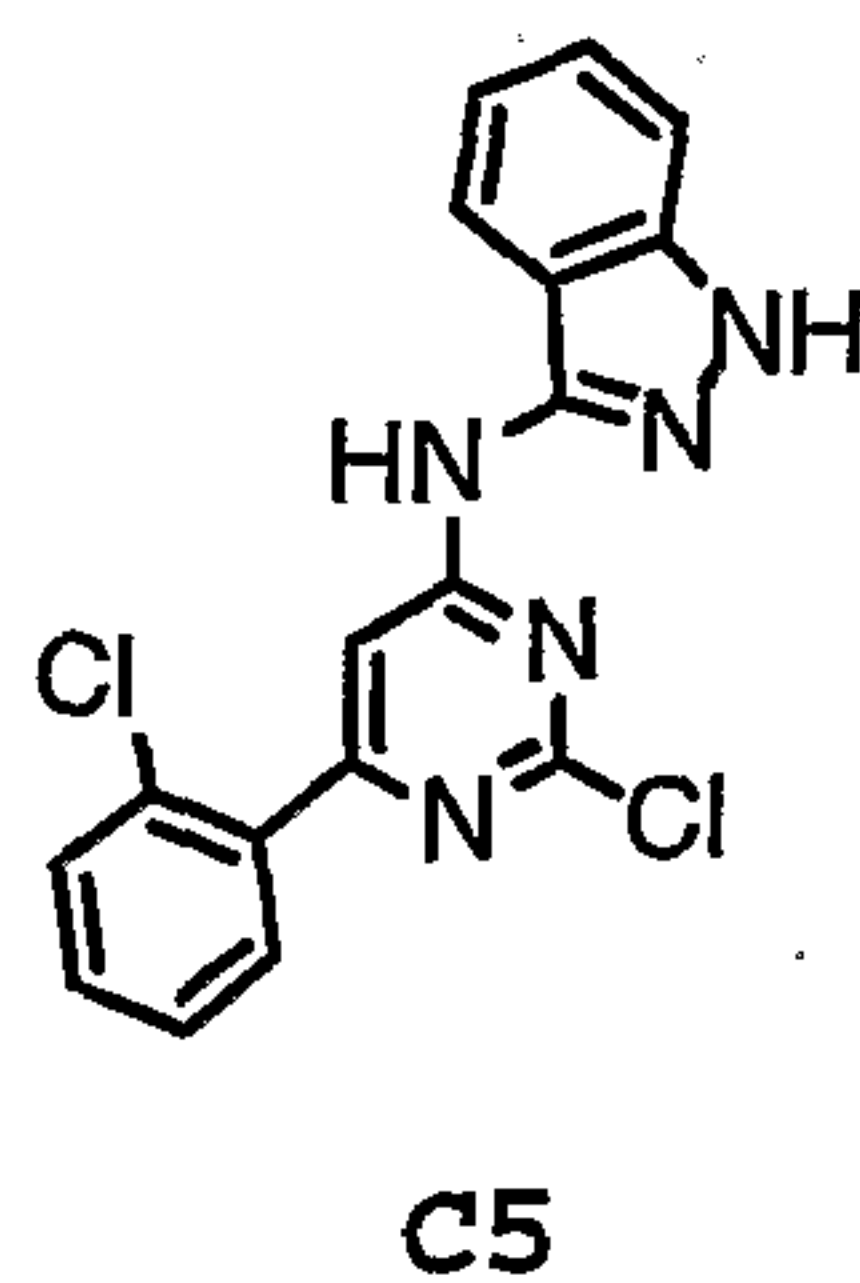
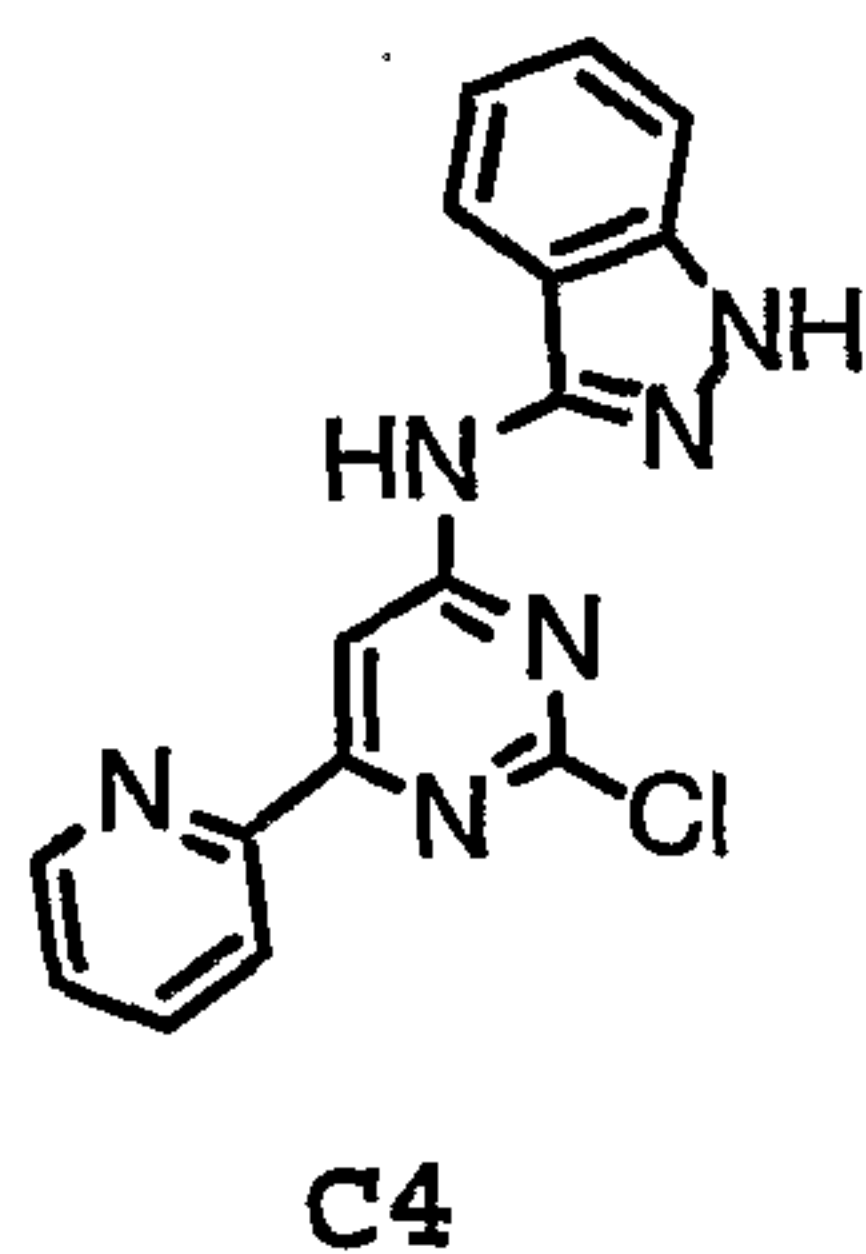
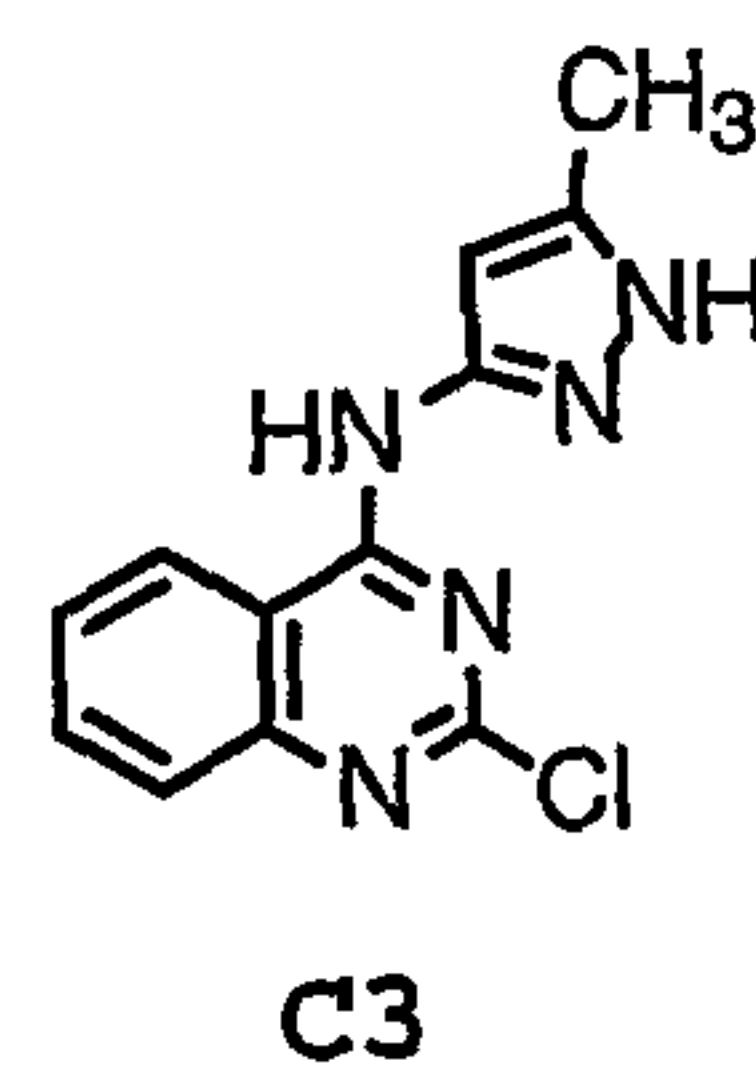
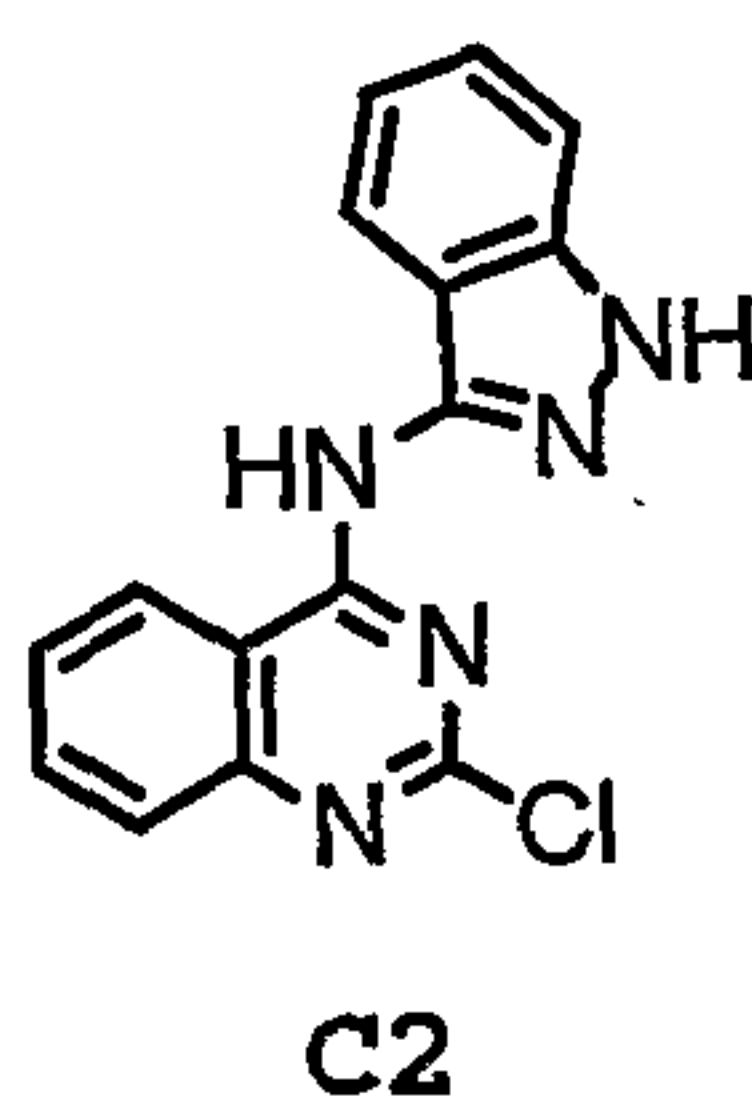


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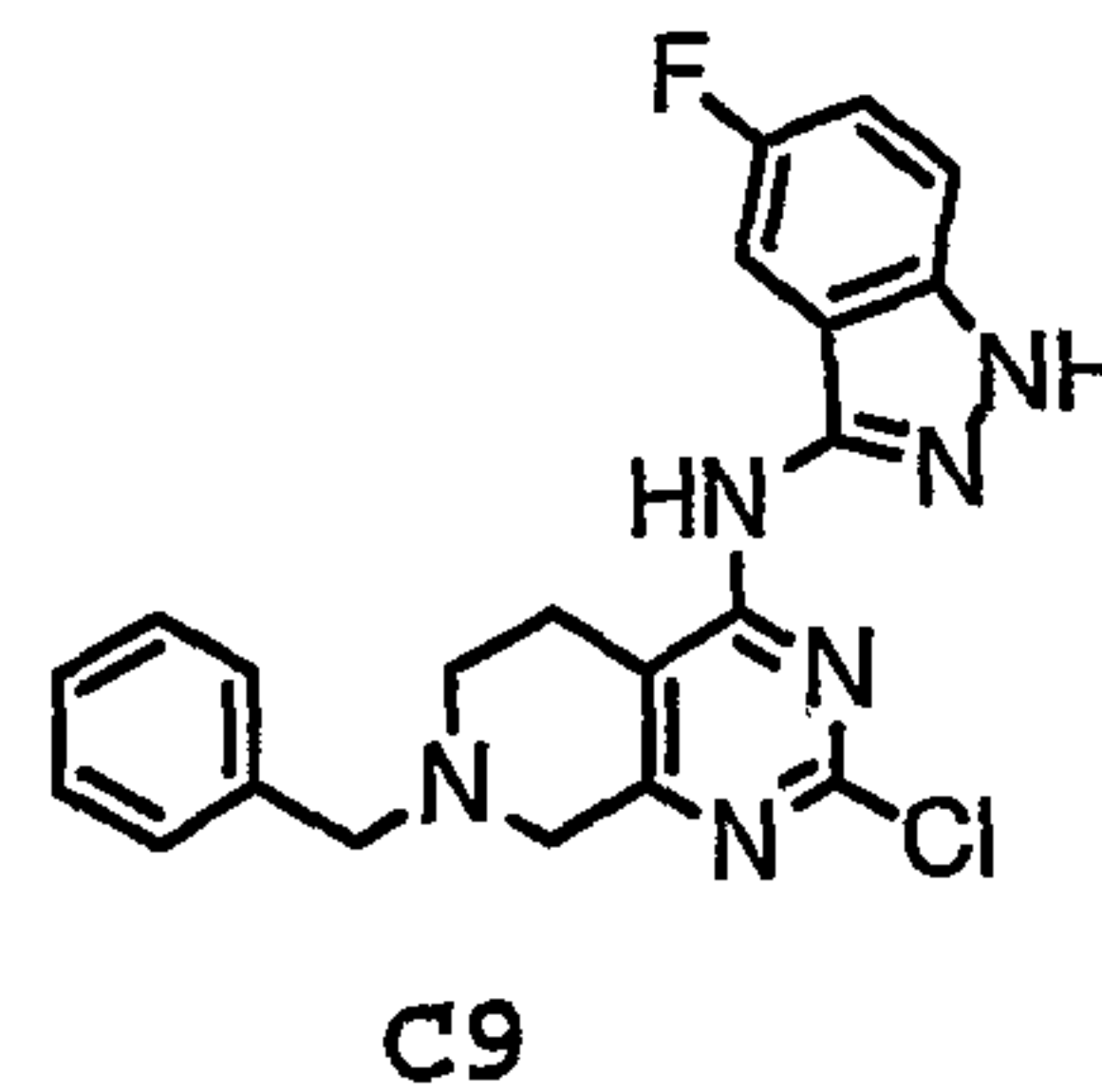
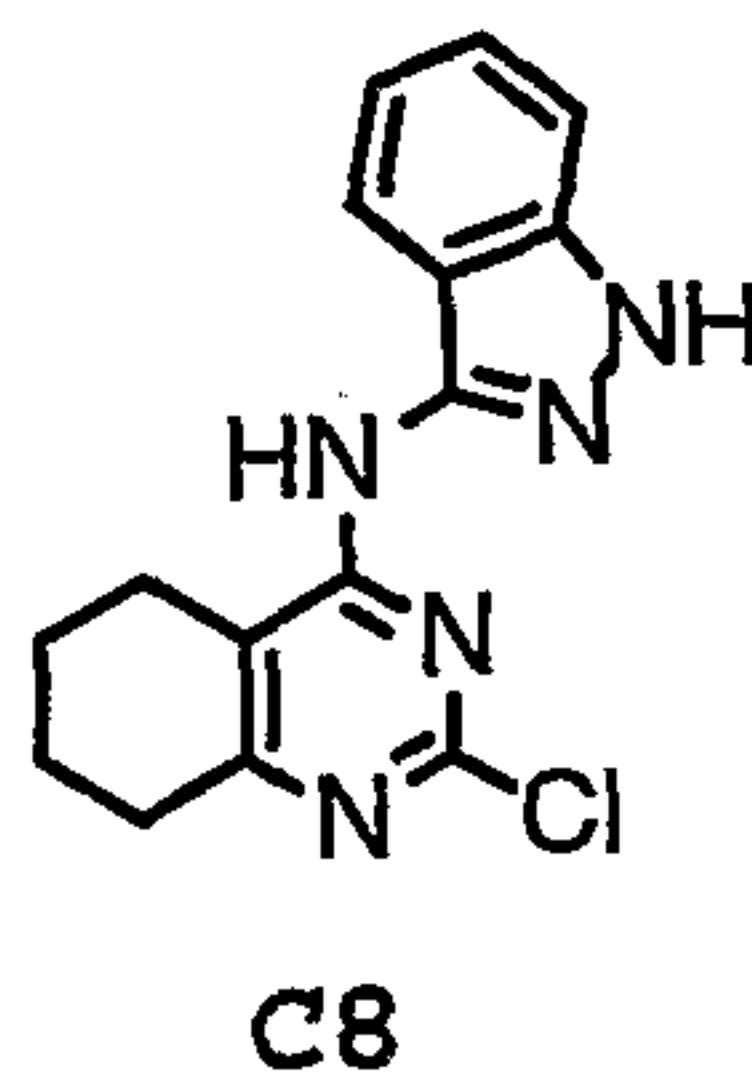
wherein R^x , R^y , R^2 , and $R^{2'}$ are as defined above. Examples of compounds of formula C are shown below:

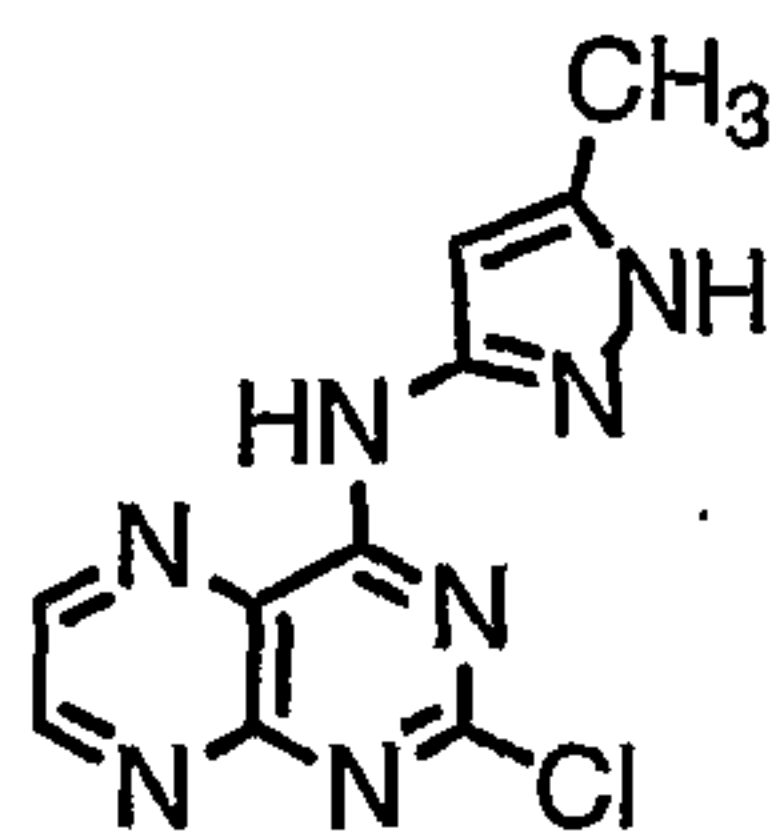


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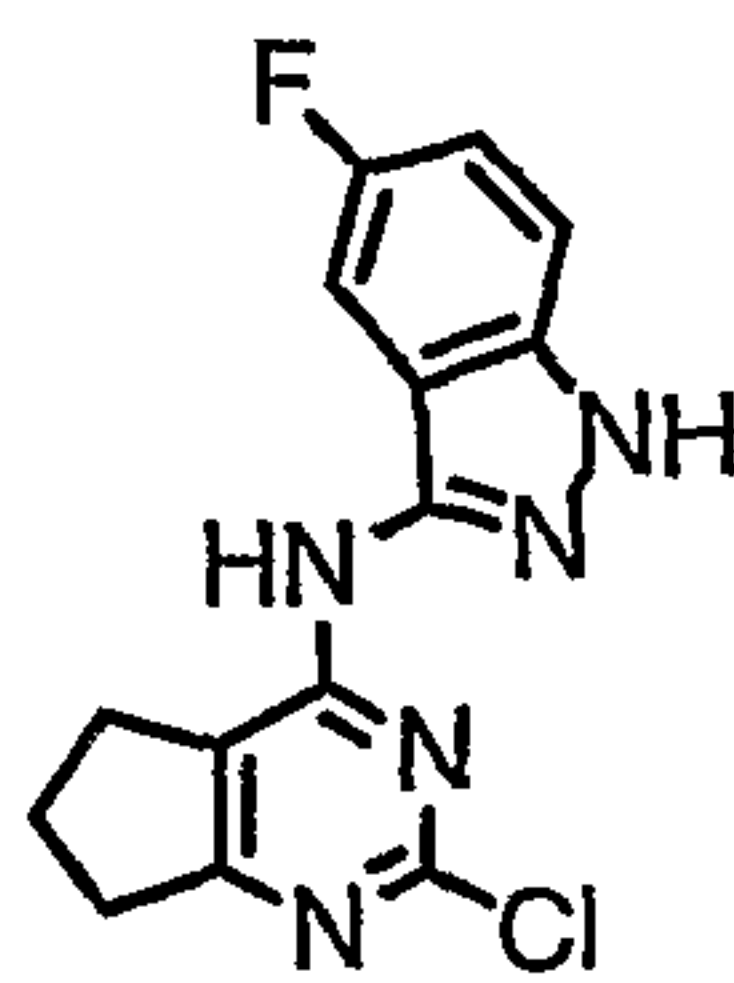


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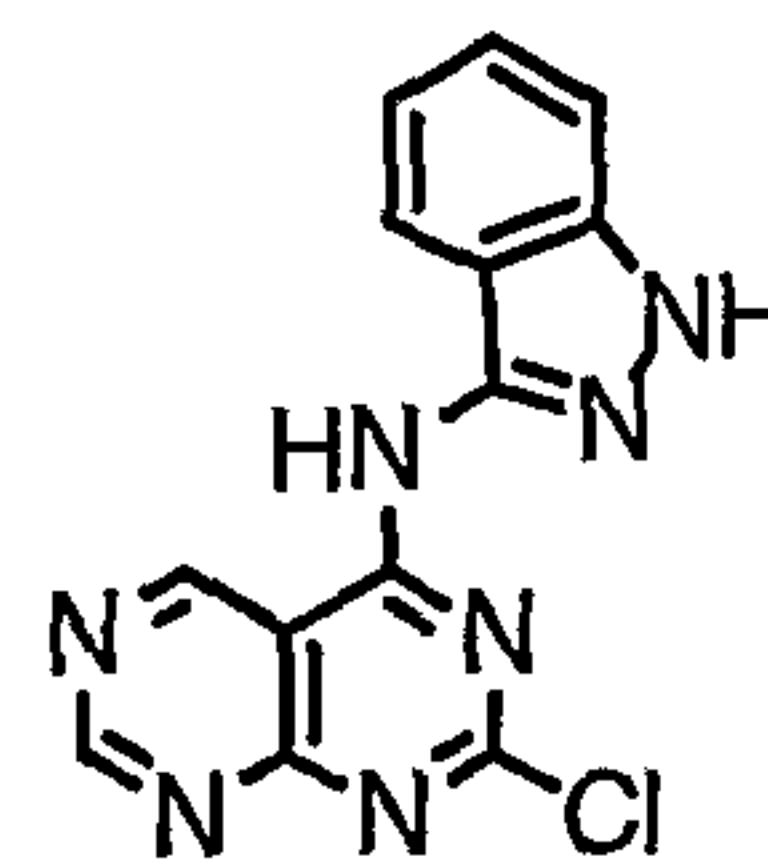




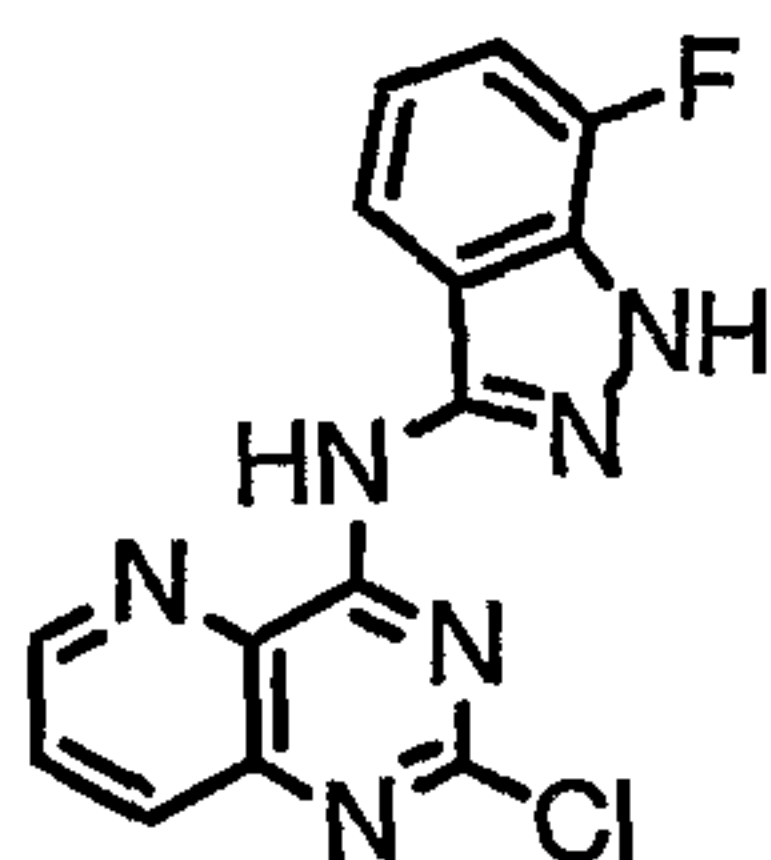
C10



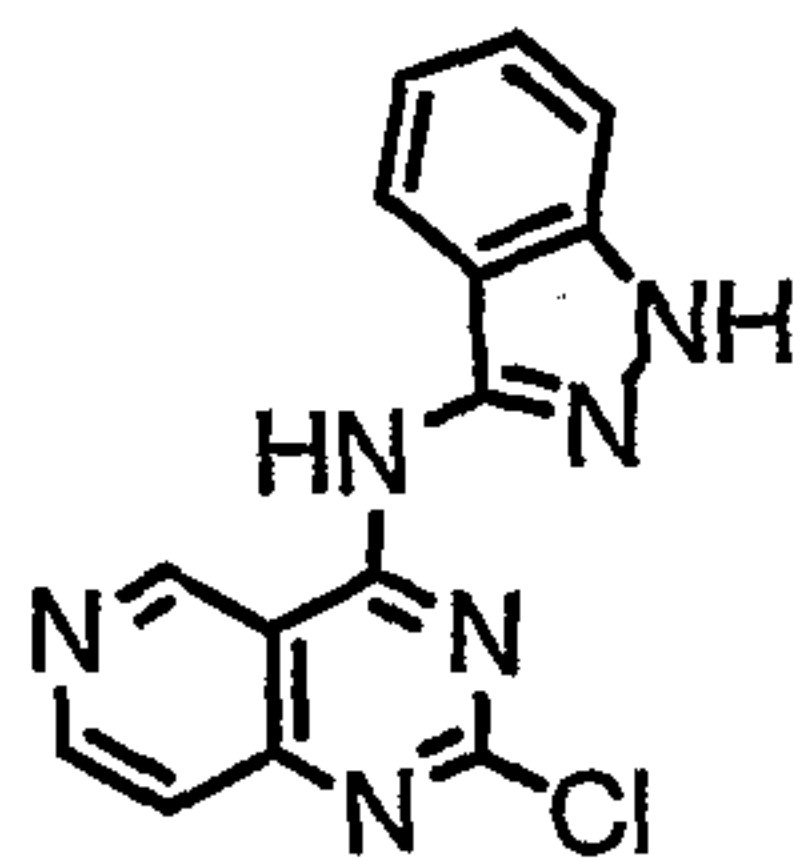
C11



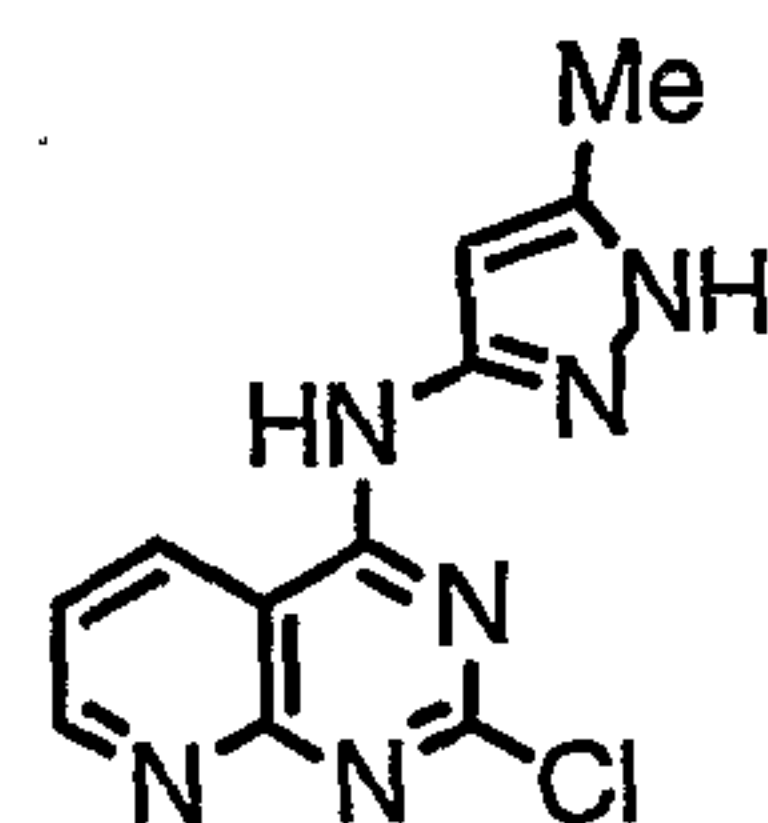
C12



C13



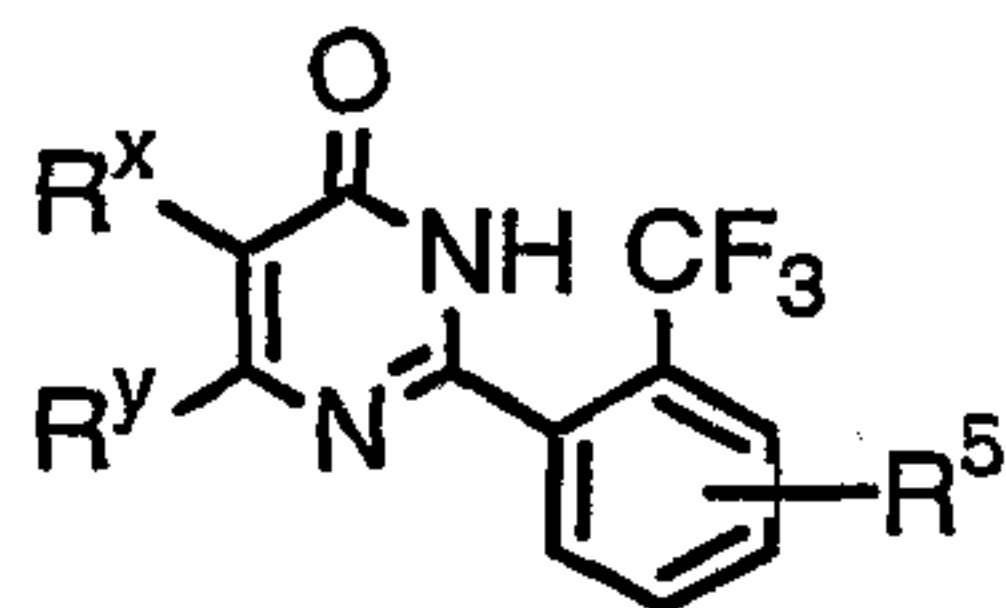
C14



C15

5

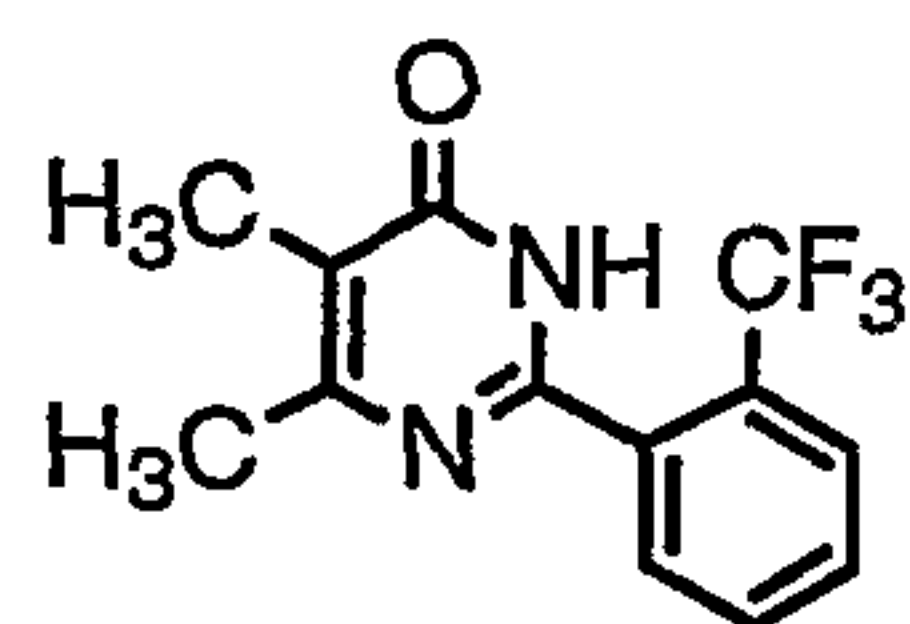
Yet another aspect of this invention relates to compounds of formula D:



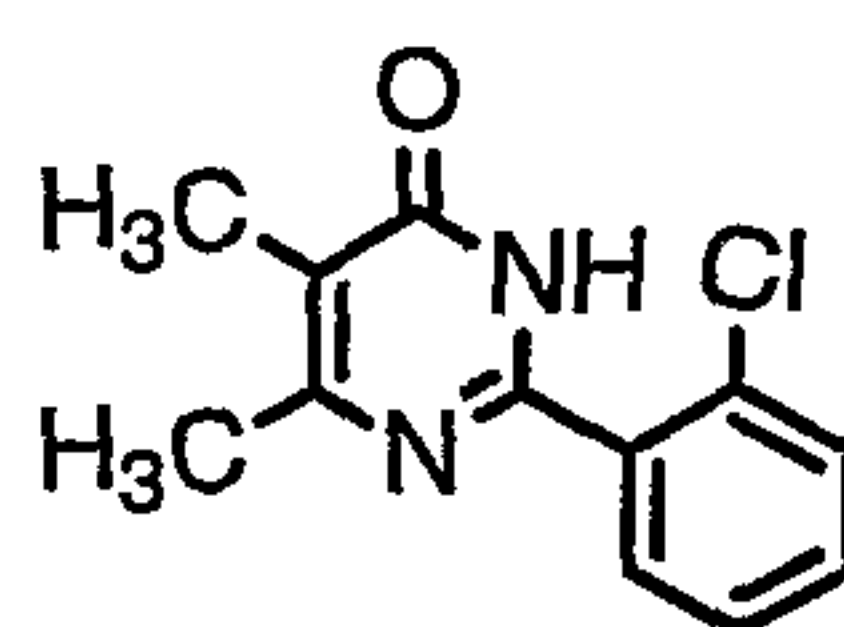
D

10

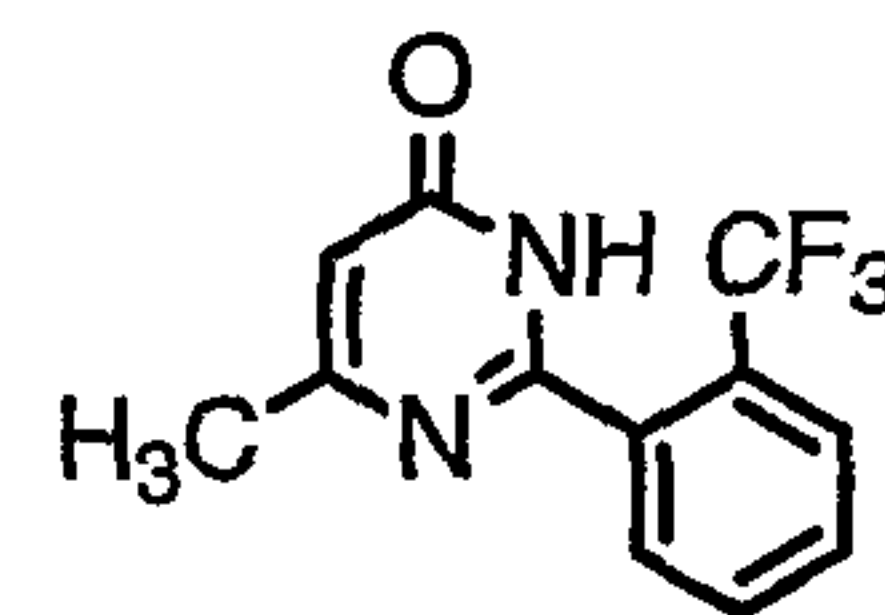
where R^5 , R^x and R^y are as defined above. Examples of formula D compounds and other useful pyrimidinone intermediates are shown below:



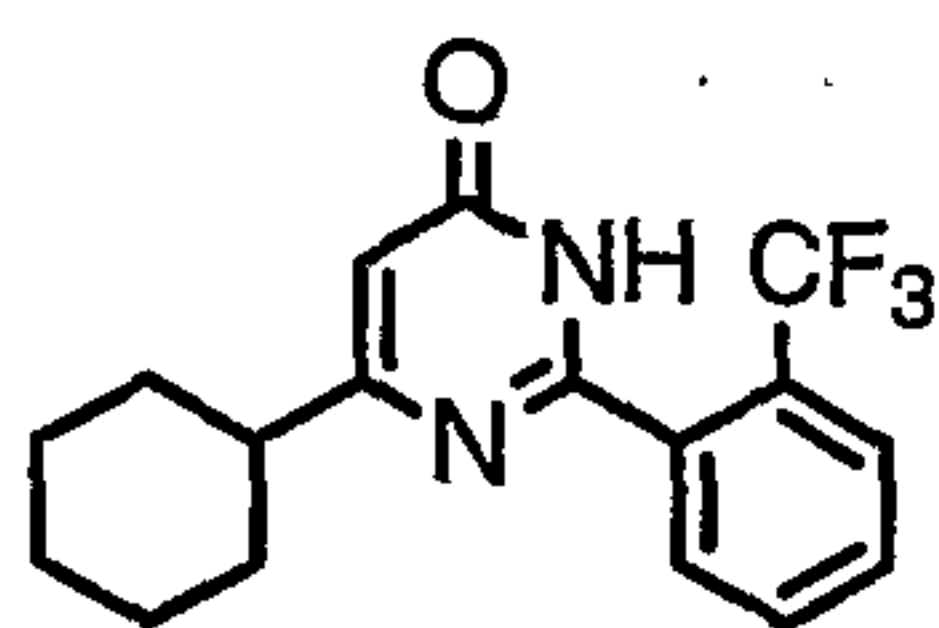
D1



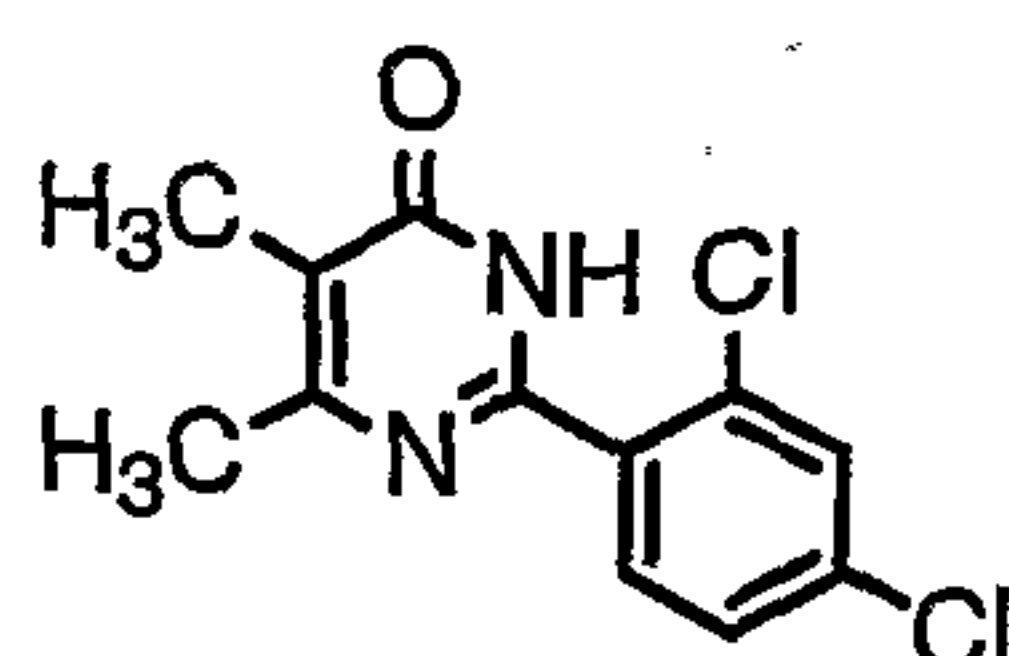
D2



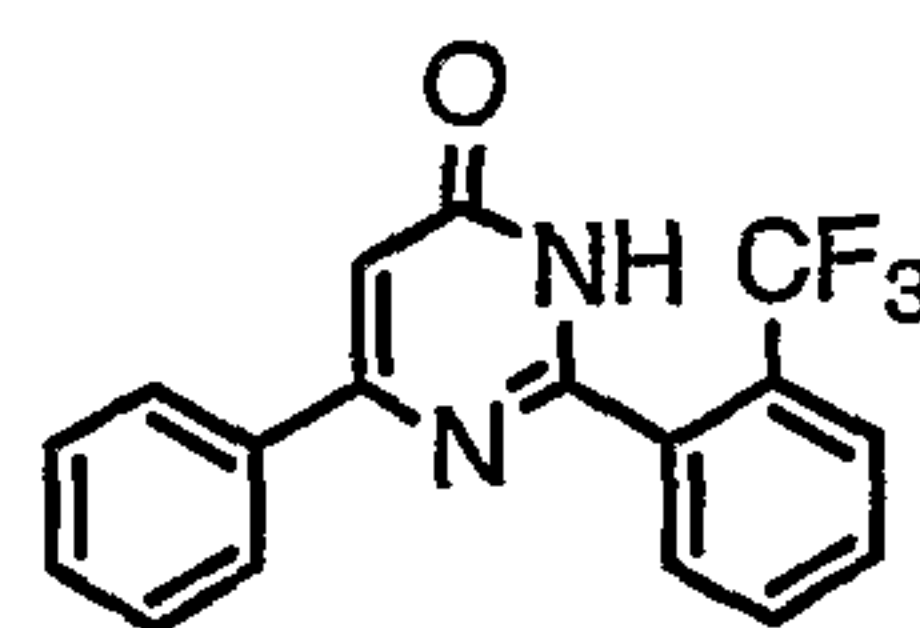
D3



D4

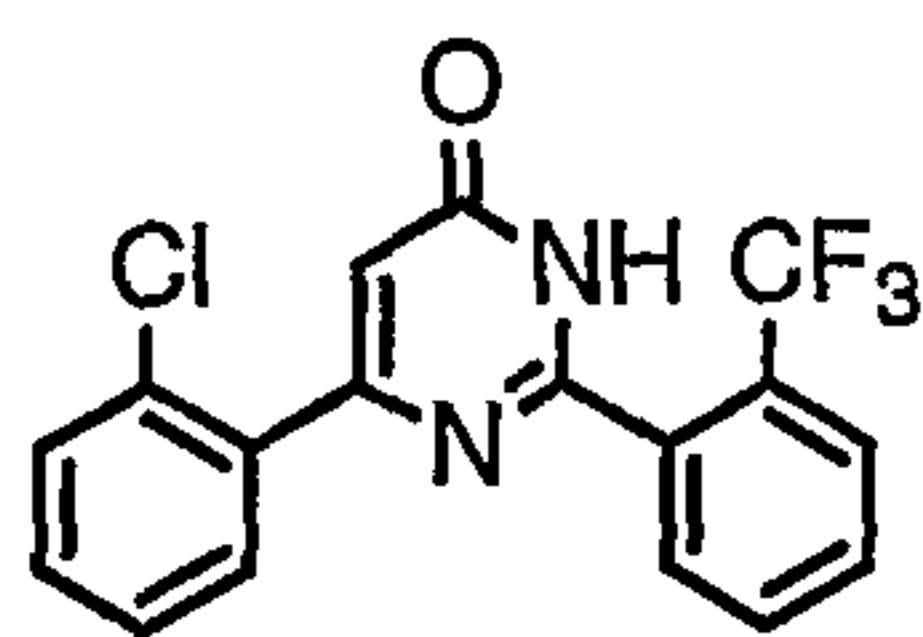


D5

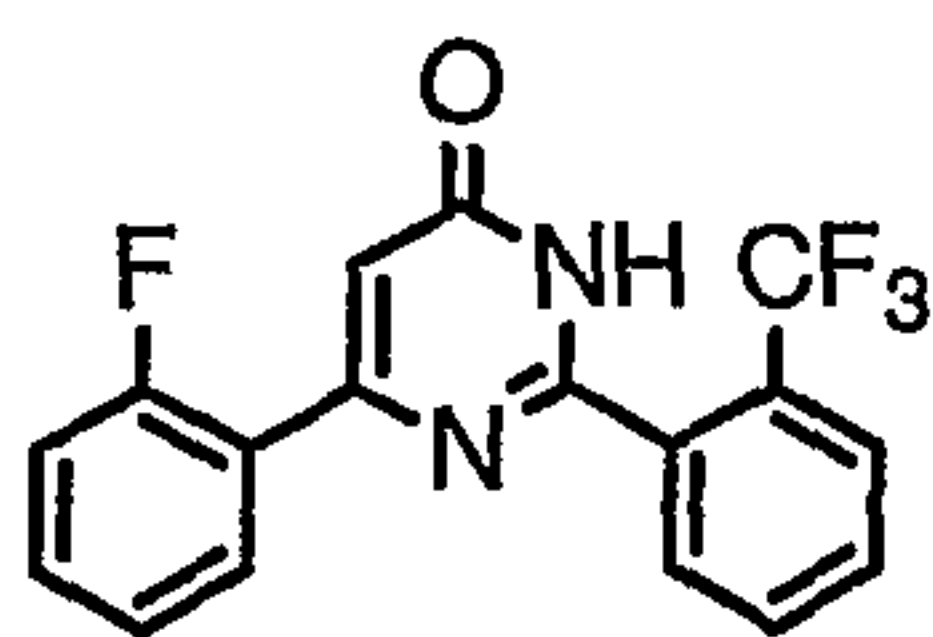


D6

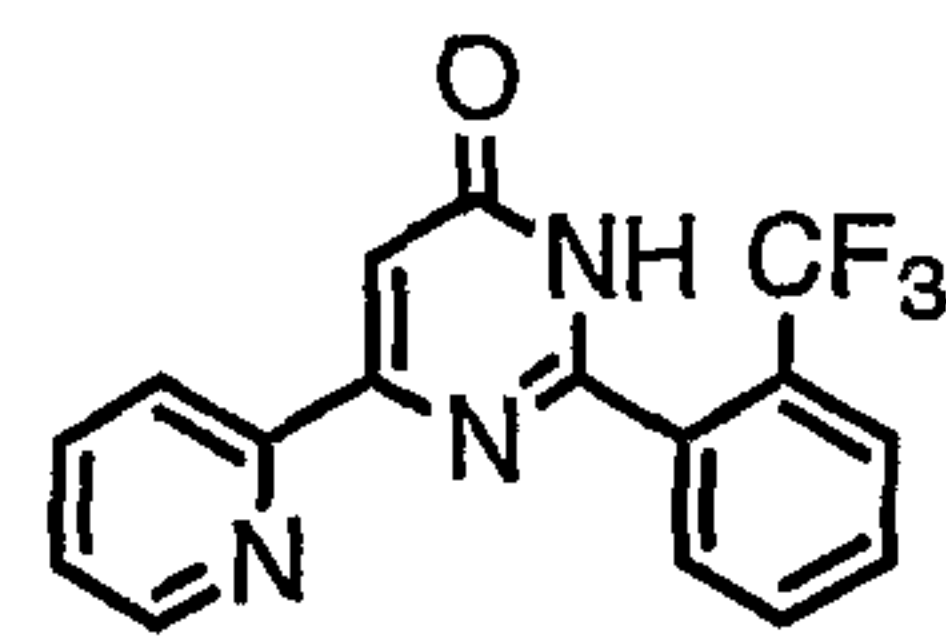
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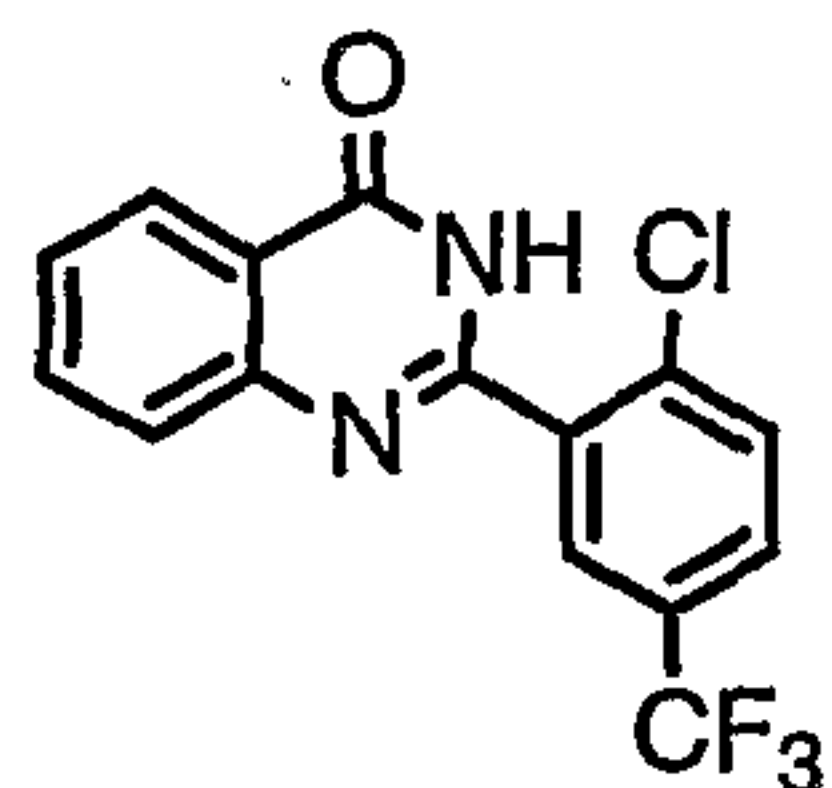
D7



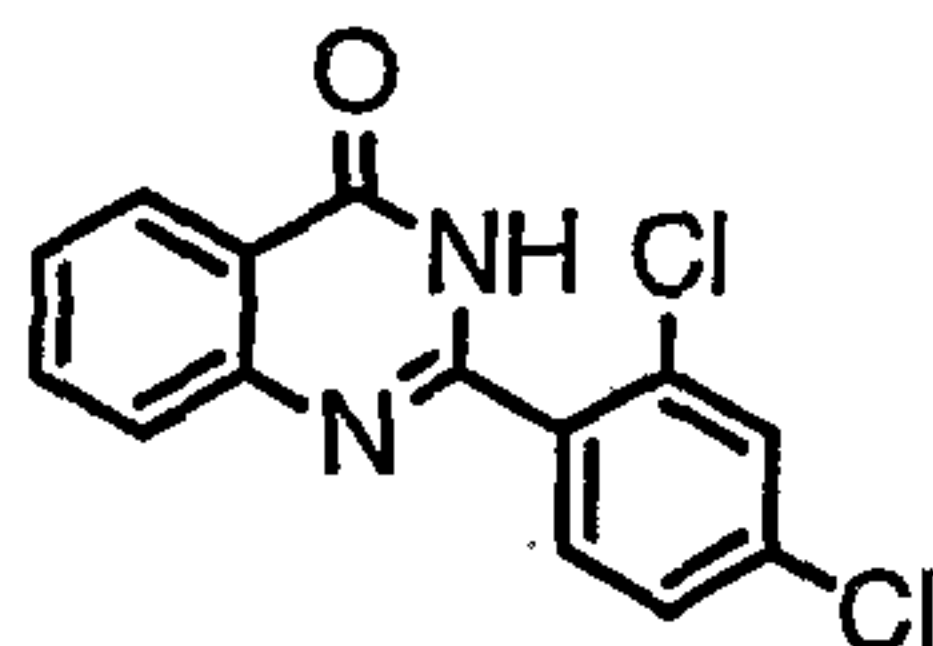
D8



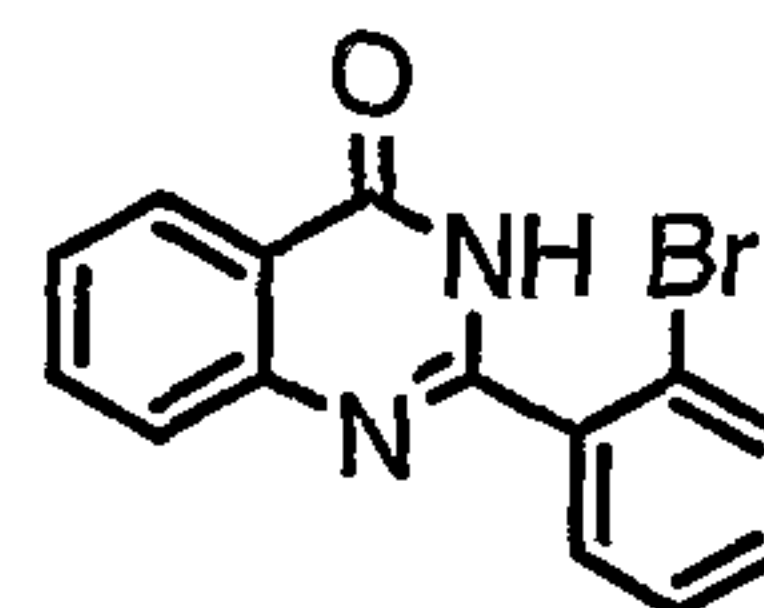
D9



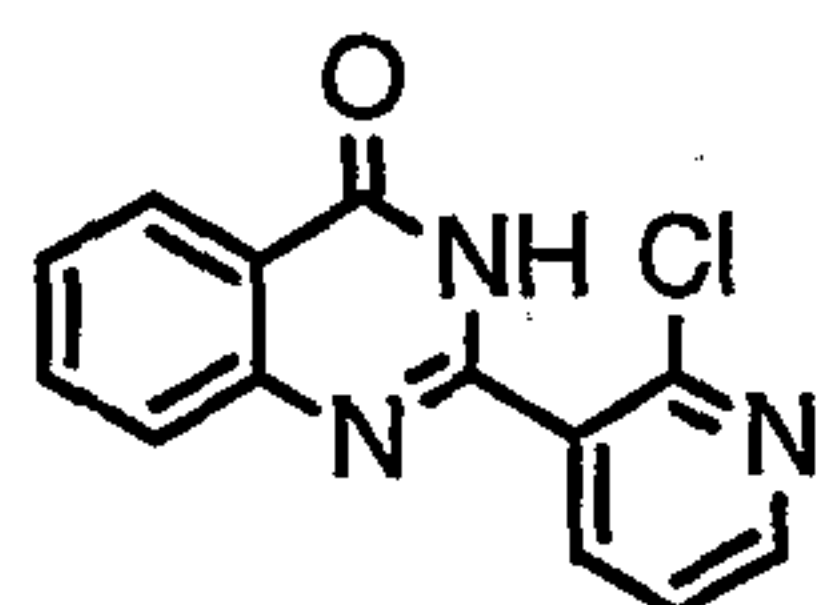
D10



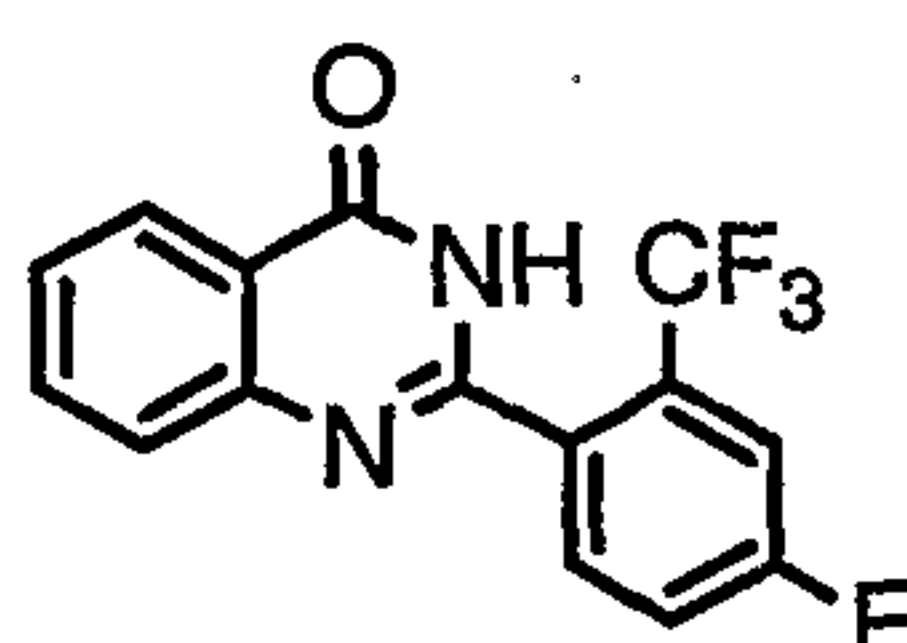
D11



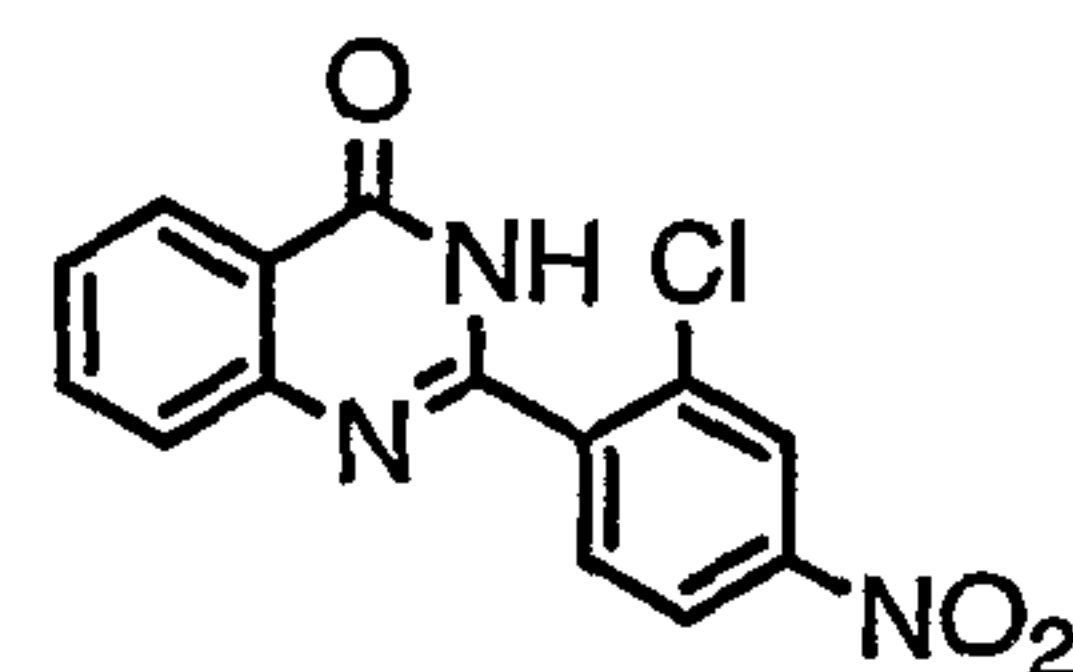
D12



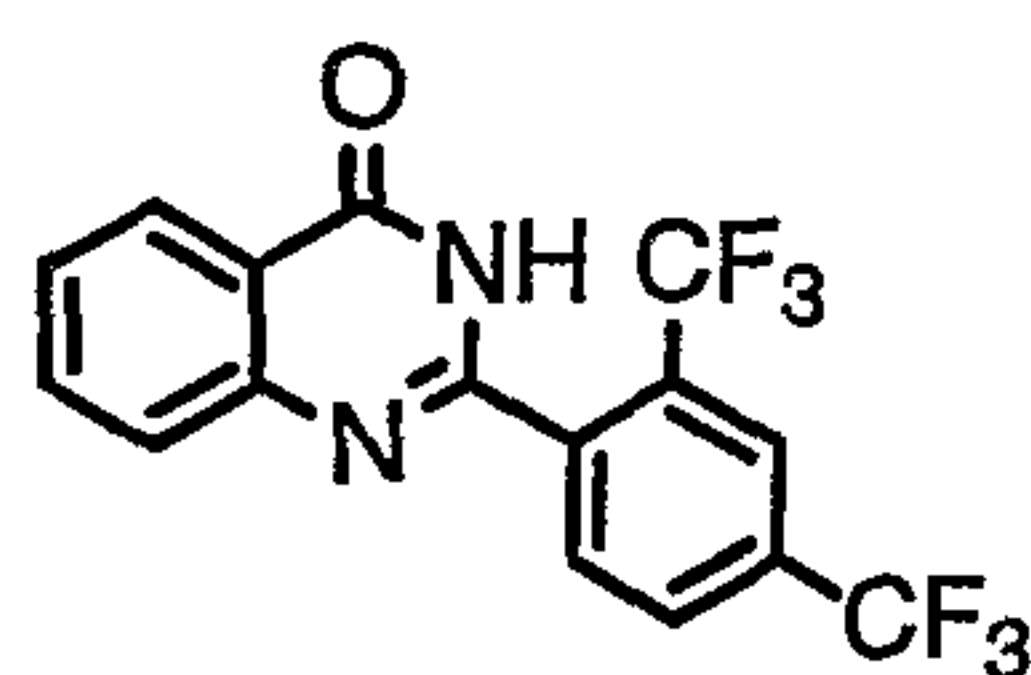
D13



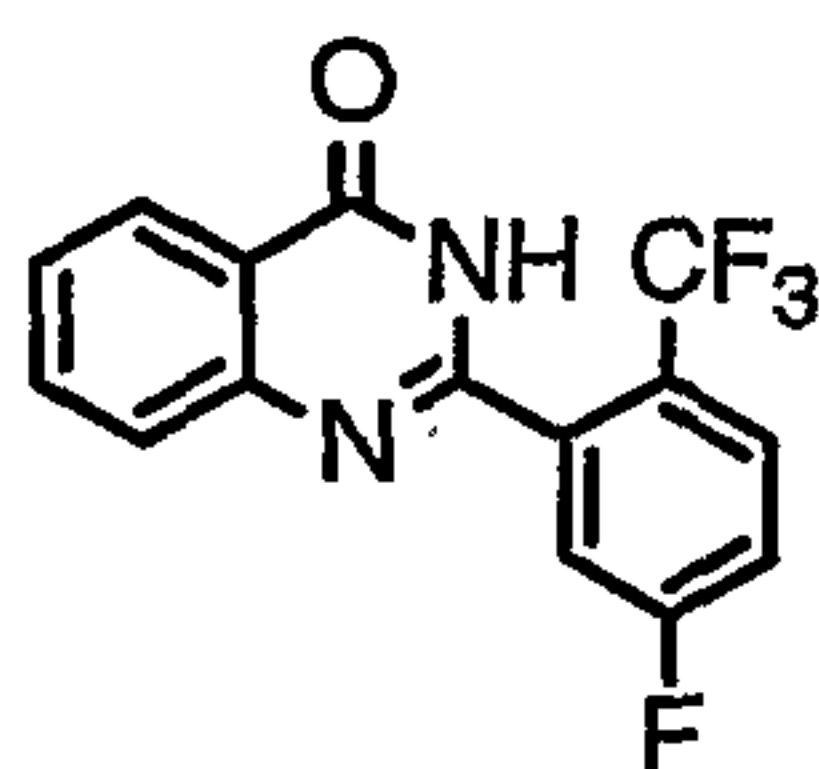
D14



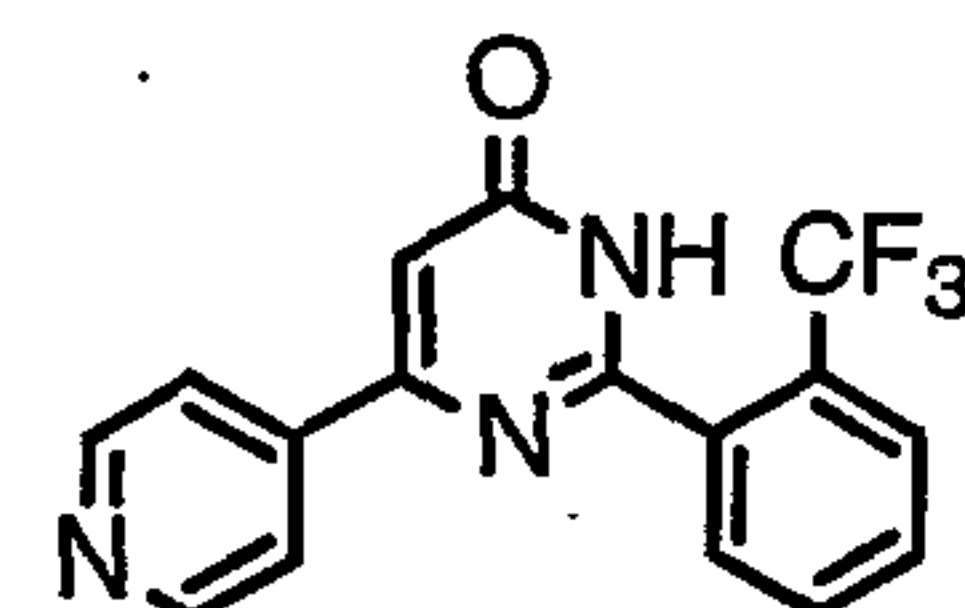
D15



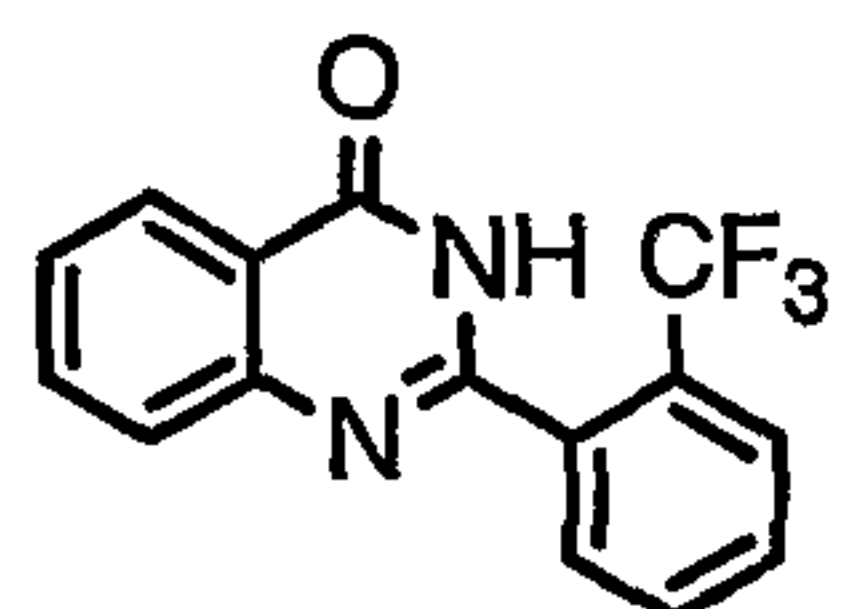
D16



D17



D18



D20

In order that the invention described herein may be more fully understood, the following examples are set forth. It should be understood that these examples are for illustrative purposes only and are not to be construed as limiting this invention in any manner.

SYNTHETIC EXAMPLES

The following HPLC methods were used in the analysis of the compounds as specified in the Synthetic Examples set forth below. As used herein, the term "R_t" refers to the retention time observed for the compound using the HPLC method specified.

HPLC-Method A:

10 Column: C18, 3 um, 2.1 X 50 mm, "Lighting" by Jones Chromatography.
Gradient: 100% water (containing 1% acetonitrile, 0.1% TFA) to 100% acetonitrile (containing 0.1% TFA) over 4.0 min, hold at 100% acetonitrile for 1.4 min
15 and return to initial conditions. Total run time 7.0 min. Flow rate: 0.8 mL/min.

HPLC-Method B:

Column: C18, 5 um, 4.6 X 150 mm "Dynamax" by Rainin
20 Gradient: 100% water (containing 1% acetonitrile, 0.1% TFA) to 100% acetonitrile (containing 0.1% TFA) over 20 min, hold at 100% acetonitrile for 7.0 min and return to initial conditions. Total run time 31.5 min. Flow rate: 1.0 mL/min.

25

HPLC-Method C:

Column: Cyano, 5 um, 4.6 X 150 mm "Microsorb" by Varian.
Gradient: 99% water (0.1% TFA), 1% acetonitrile
30 (containing 0.1% TFA) to 50% water (0.1% TFA), 50% acetonitrile (containing 0.1% TFA) over 20 min, hold for 8.0 min and return to initial conditions. Total run time 30 min. Flow rate: 1.0 mL/min.

HPLC-Method D:

Column: Waters (YMC) ODS-AQ 2.0x50mm, S5, 120A.

Gradient: 90% water (0.2% Formic acid), 10%
acetonitrile (containing 0.1% Formic acid) to 10%
5 water (0.1% formic acid), 90% acetonitrile
(containing 0.1% formic acid) over 5.0 min, hold for
0.8 min and return to initial conditions. Total run
time 7.0 min.

Flow rate: 1.0 mL/min.

10

HPLC-Method E:

Column: 50x2.0mm Hypersil C18 BDS;5 μ m

Gradient: elution 100% water (0.1% TFA), to 5% water
(0.1% TFA), 95% acetonitrile (containing 0.1% TFA)
15 over 2.1 min, returning to initial conditions after
2.3 min.

Flow rate: 1 mL/min.

Example 1 [2-(2-Clorophenyl)-5,6-dimethylpyrimidin-4-yl]-
20 (5-Methyl-2H-pyrazol-3-yl)-amine (II-1): ^1H NMR (500 MHz,
DMSO- d_6) δ 10.4 (s, br, 1H), 7.74 (m, 2H), 7.68 (m, 1H),
7.60 (m, 1H), 6.39 (s, 1H), 2.52 (s, 3H), 2.30 (s, 3H),
2.22 (s, 3H); MS 314.1 (M+H).

25 Example 2 [2-(2-Chloro-phenyl)-6,7,8,9-tetrahydro-5H-
cycloheptapyrimidin-4-yl]-(1H-indazol-3-yl)-amine (II-2):
Prepared in 30% yield. ^1H NMR (500MHz, DMSO- d_6) δ 1.72 (m,
4H), 1.91 (m, 2H), 3.02 (m, 4H), 7.05 (t, 1H), 7.33 (t,
1H), 7.39 (m, 1H), 7.47 (d, 1H), 7.55 (m, 3H), 7.59 (d,
30 1H), 10.4 (m, 1H), 13.11 (br. s, 1H); EI-MS 390.2 (M+H);
HPLC-Method A, R_t 2.99 min.

Example 3 (5-Fluoro-1H-indazol-3-yl)-[2-(2-
trifluoromethyl-phenyl)-5,6,7,8-tetrahydro-pyrido[3,4-

DEMANDES OU BREVETS VOLUMINEUX

**LA PRÉSENTE PARTIE DE CETTE DEMANDE OU CE BREVETS
COMPREND PLUS D'UN TOME.**

CECI EST LE TOME __1__ DE __2__

NOTE: Pour les tomes additionels, veuillez contacter le Bureau Canadien des Brevets.

JUMBO APPLICATIONS / PATENTS

**THIS SECTION OF THE APPLICATION / PATENT CONTAINS MORE
THAN ONE VOLUME.**

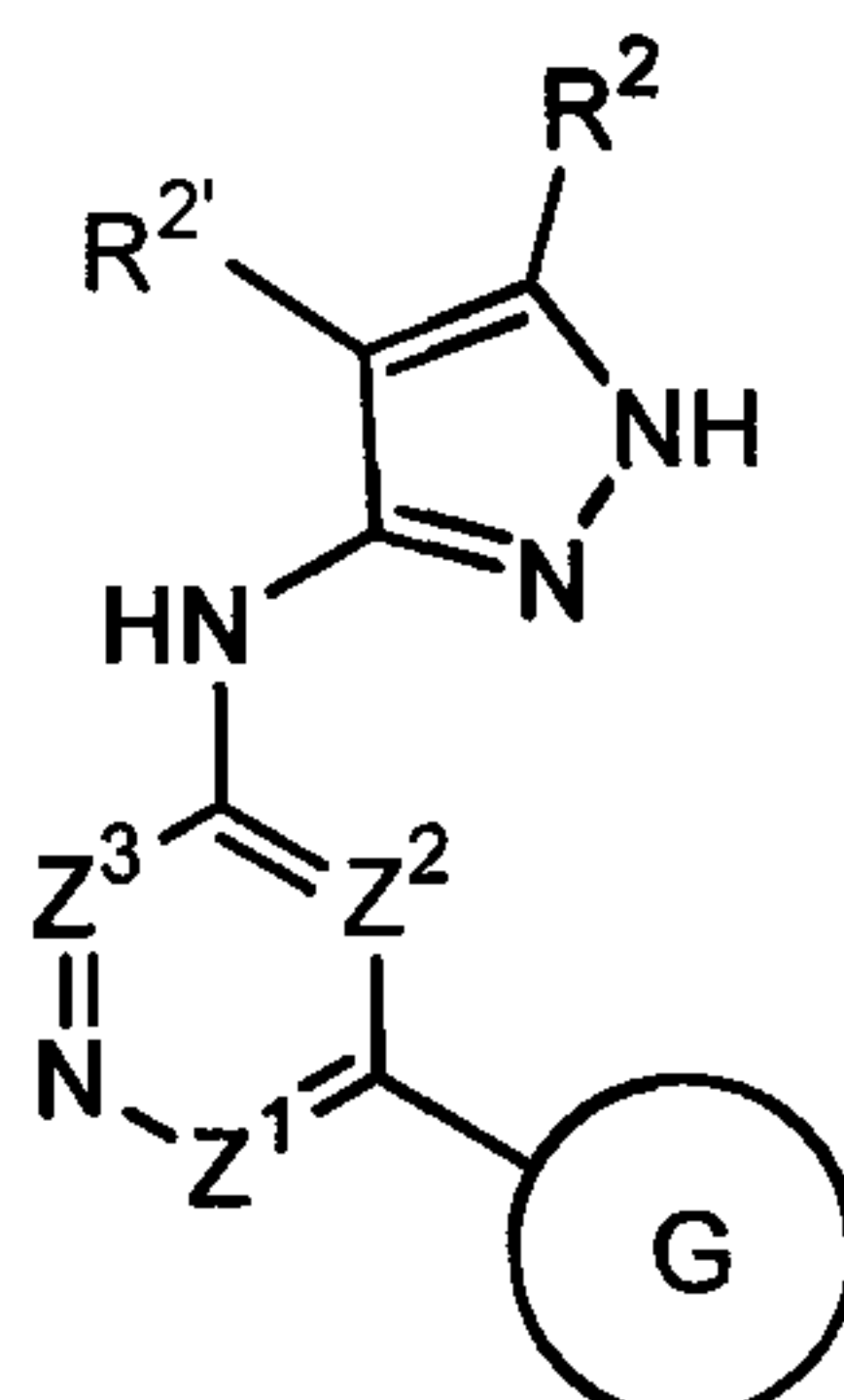
THIS IS VOLUME __1__ OF __2__

NOTE: For additional volumes please contact the Canadian Patent Office.

79580-26

CLAIMS:

1. A compound of formula **VIII**:

**VIII**

- 5 or a pharmaceutically acceptable salt thereof, wherein:

Z^1 is N or C- R^9 , Z^2 is N or CH, and Z^3 is N or C- R^x , provided that one of Z^1 and Z^3 is nitrogen;

G is Ring C or Ring D;

- 10 Ring C is selected from a phenyl, pyridinyl, pyrimidinyl, pyridazinyl, pyrazinyl, or 1,2,4-triazinyl ring, wherein said Ring C has one or two ortho substituents independently selected from $-R^1$, any non-ortho carbon position on Ring C is optionally and independently substituted by $-R^5$, and two adjacent substituents on Ring C are optionally taken together with their intervening atoms to form a fused, unsaturated or partially unsaturated, 5-6 membered ring having
- 15 0-3 heteroatoms selected from oxygen, sulfur or nitrogen, said fused ring being optionally substituted by halo, oxo, or $-R^8$;

- Ring D is a 5-7 membered monocyclic ring or 8-10 membered bicyclic ring selected from aryl, heteroaryl, heterocyclyl or carbocyclyl, said heteroaryl or heterocyclyl ring having 1-4 ring heteroatoms selected from nitrogen, oxygen or
- 20 sulfur, wherein Ring D is substituted at any substitutable ring carbon by halo, oxo, or $-R^5$, and at any substitutable ring nitrogen by $-R^4$, provided that when Ring D is a six-membered aryl or heteroaryl ring, $-R^5$ is hydrogen at each ortho carbon position of Ring D;

79580-26

R¹ is selected from -halo, -CN, -NO₂, T-V-R⁶, phenyl, 5-6 membered heteroaryl ring, 5-6 membered heterocyclyl ring, or C₁₋₆ aliphatic group, said phenyl, heteroaryl, and heterocyclyl rings each optionally substituted by up to three groups independently selected from halo, oxo, or -R⁸, said C₁₋₆ aliphatic group optionally substituted with halo, cyano, nitro, or oxygen, or R¹ and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

R^x is T-R³;

T is a valence bond or a C₁₋₄ alkylidene chain;

R² and R^{2'} are independently selected from -R, -T-W-R⁶, or R² and R^{2'} are taken together with their intervening atoms to form a fused, 5-8 membered, unsaturated or partially unsaturated, ring having 0-3 ring heteroatoms selected from nitrogen, oxygen, or sulfur, wherein each substitutable carbon on said fused ring formed by R² and R^{2'} is substituted by halo, oxo, -CN, -NO₂, -R⁷, or -V-R⁶, and any substitutable nitrogen on said ring formed by R² and R^{2'} is substituted by R⁴;

R³ is selected from -R, -halo, -OR, -C(=O)R, -CO₂R, -COCOR, -COCH₂COR, -NO₂, -CN, -S(O)R, -S(O)₂R, -SR, -N(R⁴)₂, -CON(R⁷)₂, -SO₂N(R⁷)₂, -OC(=O)R, -N(R⁷)COR, -N(R⁷)CO₂(optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁷)CON(R⁷)₂, -N(R⁷)SO₂N(R⁷)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁷)₂;

each R is independently selected from hydrogen or an optionally substituted group selected from C₁₋₆ aliphatic, C₆₋₁₀ aryl, a heteroaryl ring having 5-10 ring atoms, or a heterocyclyl ring having 5-10 ring atoms;

each R⁴ is independently selected from -R⁷, -COR⁷, -CO₂(optionally substituted C₁₋₆ aliphatic), -CON(R⁷)₂, or -SO₂R⁷, or two R⁴ on the same nitrogen are taken together to form a 5-8 membered heterocyclyl or heteroaryl ring;

each R⁵ is independently selected from -R, halo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R, -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR, -N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂, -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or

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-OC(=O)N(R⁴)₂, or R⁵ and an adjacent substituent taken together with their intervening atoms form said ring fused to Ring C;

V is -O-, -S-, -SO-, -SO₂-, -N(R⁶)SO₂-, -SO₂N(R⁶)-, -N(R⁶)-, -CO-, -CO₂-,
 -N(R⁶)CO-, -N(R⁶)C(O)O-, -N(R⁶)CON(R⁶)-, -N(R⁶)SO₂N(R⁶)-, -N(R⁶)N(R⁶)-,
 5 -C(O)N(R⁶)-, -OC(O)N(R⁶)-, -C(R⁶)₂O-, -C(R⁶)₂S-, -C(R⁶)₂SO-, -C(R⁶)₂SO₂-,
 -C(R⁶)₂SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)-, -C(R⁶)₂N(R⁶)C(O)-, -C(R⁶)₂N(R⁶)C(O)O-,
 -C(R⁶)=NN(R⁶)-, -C(R⁶)=N-O-, -C(R⁶)₂N(R⁶)N(R⁶)-, -C(R⁶)₂N(R⁶)SO₂N(R⁶)-, or
 -C(R⁶)₂N(R⁶)CON(R⁶)-;

W is -C(R⁶)₂O-, -C(R⁶)₂S-, -C(R⁶)₂SO-, -C(R⁶)₂SO₂-, -C(R⁶)₂SO₂N(R⁶)-,
 10 -C(R⁶)₂N(R⁶)-, -CO-, -CO₂-, -C(R⁶)OC(O)-, -C(R⁶)OC(O)N(R⁶)-, -C(R⁶)₂N(R⁶)CO-,
 -C(R⁶)₂N(R⁶)C(O)O-, -C(R⁶)=NN(R⁶)-, -C(R⁶)=N-O-, -C(R⁶)₂N(R⁶)N(R⁶)-,
 -C(R⁶)₂N(R⁶)SO₂N(R⁶)-, -C(R⁶)₂N(R⁶)CON(R⁶)-, or -CON(R⁶)-;

each R⁶ is independently selected from hydrogen, an optionally substituted
 C₁₋₄ aliphatic group, or two R⁶ groups on the same nitrogen atom are taken
 15 together with the nitrogen atom to form a 5-6 membered heterocyclyl or heteroaryl
 ring;

each R⁷ is independently selected from hydrogen or an optionally substituted
 C₁₋₆ aliphatic group, or two R⁷ on the same nitrogen are taken together with the
 nitrogen to form a 5-8 membered heterocyclyl or heteroaryl ring;

20 each R⁸ is independently selected from an optionally substituted C₁₋₄ aliphatic
 group, -OR⁶, -SR⁶, -COR⁶, -SO₂R⁶, -N(R⁶)₂, -N(R⁶)N(R⁶)₂, -CN, -NO₂, -CON(R⁶)₂,
 or -CO₂R⁶; and

R⁹ is selected from -R, halo, -OR, -C(=O)R, -CO₂R, -COCOR, -NO₂, -CN, -S(O)R,
 -SO₂R, -SR, -N(R⁴)₂, -CON(R⁴)₂, -SO₂N(R⁴)₂, -OC(=O)R, -N(R⁴)COR,
 25 -N(R⁴)CO₂(optionally substituted C₁₋₆ aliphatic), -N(R⁴)N(R⁴)₂, -C=NN(R⁴)₂,
 -C=N-OR, -N(R⁴)CON(R⁴)₂, -N(R⁴)SO₂N(R⁴)₂, -N(R⁴)SO₂R, or -OC(=O)N(R⁴)₂.

2. The compound according to claim 1, or a pharmaceutically
 acceptable salt thereof, having one or more features selected from the group
 consisting of:

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(a) Ring C is an optionally substituted ring selected from phenyl or pyridinyl, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is selected from a naphthyl, quinolinyl or isoquinolinyl ring, and R^1 is -halo, an optionally substituted C_{1-6} aliphatic group, phenyl, $-COR^6$, $-OR^6$, $-CN$, $-SO_2R^6$, $-SO_2NH_2$, $-N(R^6)_2$, $-CO_2R^6$, $-CONH_2$, $-NHCOR^6$, $-OC(O)NH_2$, or $-NHSO_2R^6$; or Ring D is an optionally substituted ring selected from a phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1*H*-isoindolyl, 2,3-dihydro-1*H*-indolyl, isoquinolinyl, quinolinyl, or naphthyl ring;

(b) R^x is $T-R^3$ wherein T is a valence bond or a methylene; and

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring.

3. The compound according to claim 2, or a pharmaceutically acceptable salt thereof, wherein:

(a) Ring C is an optionally substituted ring selected from phenyl or pyridinyl, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is selected from a naphthyl, quinolinyl or isoquinolinyl ring, and R^1 is -halo, an optionally substituted C_{1-6} aliphatic group, phenyl, $-COR^6$, $-OR^6$, $-CN$, $-SO_2R^6$, $-SO_2NH_2$, $-N(R^6)_2$, $-CO_2R^6$, $-CONH_2$, $-NHCOR^6$, $-OC(O)NH_2$, or $-NHSO_2R^6$; or Ring D is an optionally substituted ring selected from a phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, thienyl, azepanyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1*H*-isoindolyl, 2,3-dihydro-1*H*-indolyl, isoquinolinyl, quinolinyl, or naphthyl ring;

(b) R^x is $T-R^3$ wherein T is a valence bond or a methylene; and

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, heteroaryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken

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together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring.

4. The compound according to claim 2, or a pharmaceutically acceptable salt thereof, having one or more features selected from the group consisting of:

(a) Ring C is an optionally substituted ring selected from phenyl or pyridinyl, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R^1 is -halo, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic group, phenyl, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1*H*-isoindolyl, 2,3-dihydro-1*H*-indolyl, isoquinolinyl, quinolinyl, or naphthyl;

(b) R^x is $T-R^3$ wherein T is a valence bond or a methylene and R^3 is CN, -R or -OR;

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group selected from aryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken together with their intervening atoms to form a substituted or unsubstituted benzo, pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring; and

(d) each R^5 is independently selected from -halo, -CN, -NO₂, -N(R^4)₂, an optionally substituted C_{1-6} aliphatic group, -OR, -C(O)R, -CO₂R, -CONH(R^4), -N(R^4)COR, -SO₂N(R^4)₂, or -N(R^4)SO₂R.

5. The compound according to claim 4, or a pharmaceutically acceptable salt thereof, wherein:

(a) Ring C is an optionally substituted ring selected from phenyl or pyridinyl, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R^1 is -halo, a C_{1-6} haloaliphatic group, a C_{1-6} aliphatic group, phenyl, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl,

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pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl,
1,2,3,4-tetrahydroquinolinyl, 2,3-dihydro-1*H*-isoindolyl, 2,3-dihydro-1*H*-indolyl,
isoquinolinyl, quinolinyl, or naphthyl;

(b) R^x is $T-R^3$ wherein T is a valence bond or a methylene and R^3 is CN,

5 -R or -OR;

(c) $R^{2'}$ is hydrogen and R^2 is hydrogen or a substituted or unsubstituted group
selected from aryl, or a C_{1-6} aliphatic group, or R^2 and $R^{2'}$ are taken together with
their intervening atoms to form a substituted or unsubstituted benzo, pyrido,
pyrimido or partially unsaturated 6-membered carbocyclo ring; and

10 (d) each R^5 is independently selected from -halo, -CN, -NO₂, -N(R^4)₂, an optionally
substituted C_{1-6} aliphatic group, -OR, -C(O)R, -CO₂R, -CONH(R^4), -N(R^4)COR,
-SO₂N(R^4)₂, or -N(R^4)SO₂R.

6. The compound according to claim 4, or a pharmaceutically
acceptable salt thereof, having one or more features selected from the group
15 consisting of:

(a) R^x is $T-R^3$ wherein T is a valence bond or a methylene and R^3 is -R or -OR
wherein R is an optionally substituted group selected from C_{1-6} aliphatic, phenyl,
or a 5-6 membered heteroaryl or heterocyclyl ring;

(b) Ring C is an optionally substituted ring selected from phenyl or pyridinyl,
20 wherein when Ring C and two adjacent substituents thereon form a bicyclic ring
system, the bicyclic ring system is a naphthyl ring, and R^1 is -halo, a C_{1-4} aliphatic
group optionally substituted with halogen, or -CN; or Ring D is an optionally
substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl,
pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl,
25 1,2,3,4-tetrahydroquinolinyl, isoquinolinyl, quinolinyl, or naphthyl;

(c) R^2 and $R^{2'}$ are taken together with their intervening atoms to form a benzo,
pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring optionally
substituted with -halo, -N(R^4)₂, - C_{1-4} alkyl, - C_{1-4} haloalkyl, -NO₂, -O(C_{1-4} alkyl),
-CO₂(C_{1-4} alkyl), -CN, -SO₂(C_{1-4} alkyl), -SO₂NH₂, -OC(O)NH₂, -NH₂SO₂(C_{1-4} alkyl),

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-NHC(O)(C₁₋₄ alkyl), -C(O)NH₂, or -CO(C₁₋₄ alkyl), wherein the (C₁₋₄ alkyl) is a straight, branched, or cyclic alkyl group;

(d) each R⁵ is independently selected from -Cl, -F, -CN, -CF₃, -NH₂, -NH(C₁₋₄ aliphatic), -N(C₁₋₄ aliphatic)₂, -O(C₁₋₄ aliphatic), C₁₋₄ aliphatic, and
5 -CO₂(C₁₋₄ aliphatic); and

(e) R⁹ is R, OR, or N(R⁴)₂.

7. The compound according to claim 6, or a pharmaceutically acceptable salt thereof, wherein:

(a) R^x is T-R³ wherein T is a valence bond or a methylene and R³ is -R or -OR
10 wherein R is an optionally substituted group selected from C₁₋₆ aliphatic, phenyl, or a 5-6 membered heteroaryl or heterocyclyl ring;

(b) Ring C is an optionally substituted ring selected from phenyl or pyridinyl, wherein when Ring C and two adjacent substituents thereon form a bicyclic ring system, the bicyclic ring system is a naphthyl ring, and R¹ is -halo, a C₁₋₄ aliphatic
15 group optionally substituted with halogen, or -CN; or Ring D is an optionally substituted ring selected from phenyl, pyridinyl, piperidinyl, piperazinyl, pyrrolidinyl, morpholinyl, 1,2,3,4-tetrahydroisoquinolinyl, 1,2,3,4-tetrahydroquinolinyl, isoquinolinyl, quinolinyl, or naphthyl;

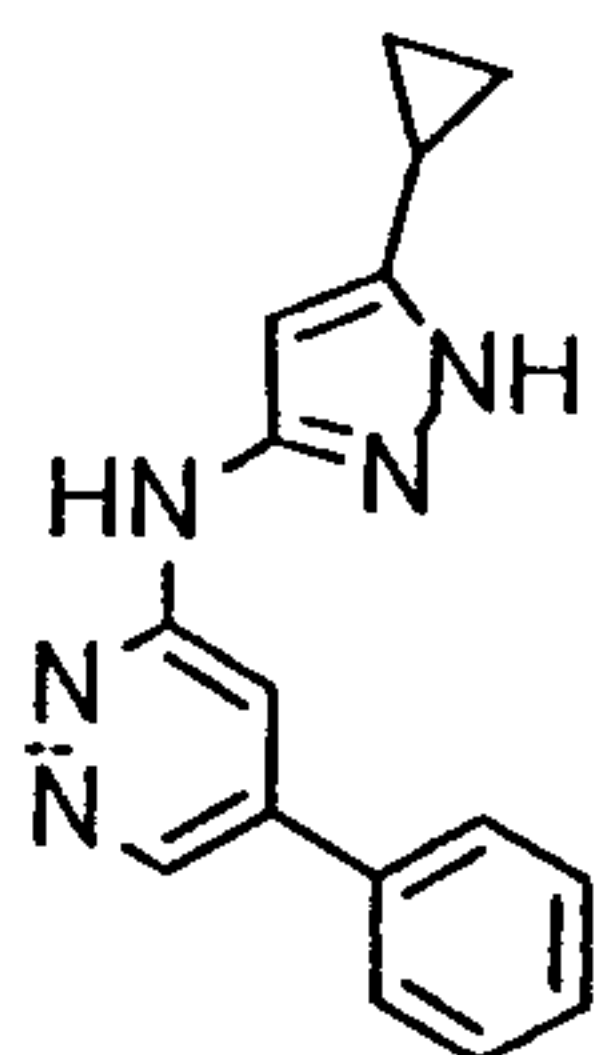
(c) R² and R^{2'} are taken together with their intervening atoms to form a benzo,
20 pyrido, pyrimido or partially unsaturated 6-membered carbocyclo ring optionally substituted with -halo, -N(R⁴)₂, -C₁₋₄ alkyl, -C₁₋₄ haloalkyl, -NO₂, -O(C₁₋₄ alkyl), -CO₂(C₁₋₄ alkyl), -CN, -SO₂(C₁₋₄ alkyl), -SO₂NH₂, -OC(O)NH₂, -NH₂SO₂(C₁₋₄ alkyl), -NHC(O)(C₁₋₄ alkyl), -C(O)NH₂, or -CO(C₁₋₄ alkyl), wherein the (C₁₋₄ alkyl) is a straight, branched, or cyclic alkyl group;

(d) each R⁵ is independently selected from -Cl, -F, -CN, -CF₃, -NH₂,
25 -NH(C₁₋₄ aliphatic), -N(C₁₋₄ aliphatic)₂, -O(C₁₋₄ aliphatic), C₁₋₄ aliphatic, and -CO₂(C₁₋₄ aliphatic); and

(e) R⁹ is R, OR, or N(R⁴)₂.

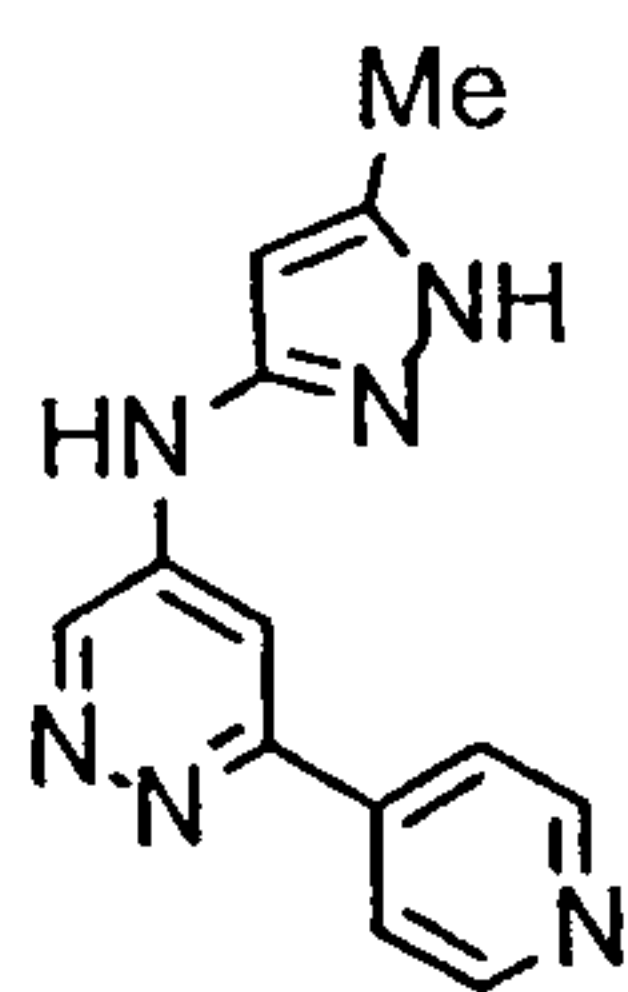
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8. The compound:



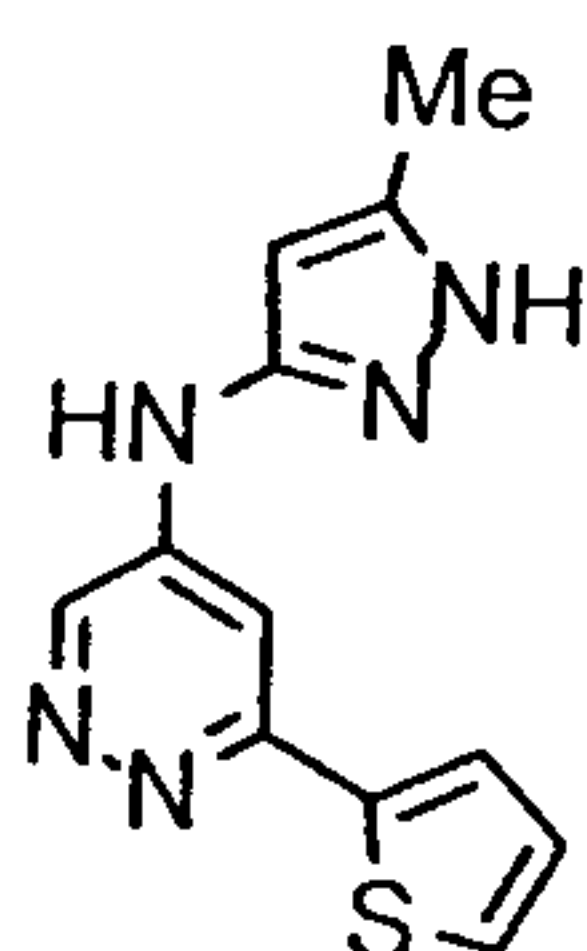
5 VIII-1, or a pharmaceutically acceptable salt thereof.

9. The compound:



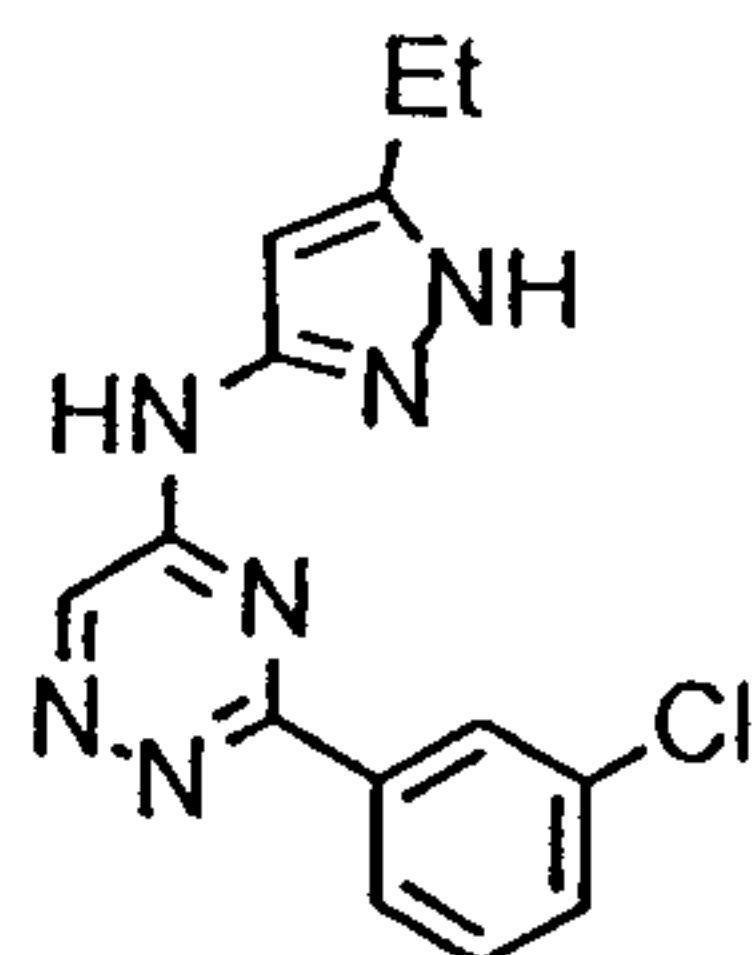
10 VIII-2, or a pharmaceutically acceptable salt thereof.

10. The compound:



15 VIII-3, or a pharmaceutically acceptable salt thereof.

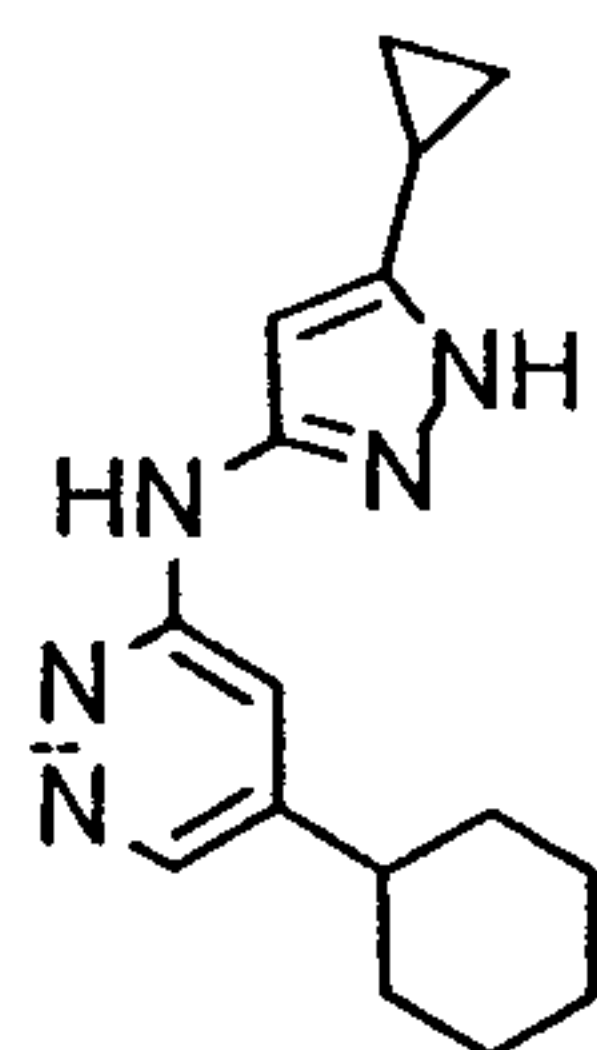
11. The compound:



20 VIII-4, or a pharmaceutically acceptable salt thereof.

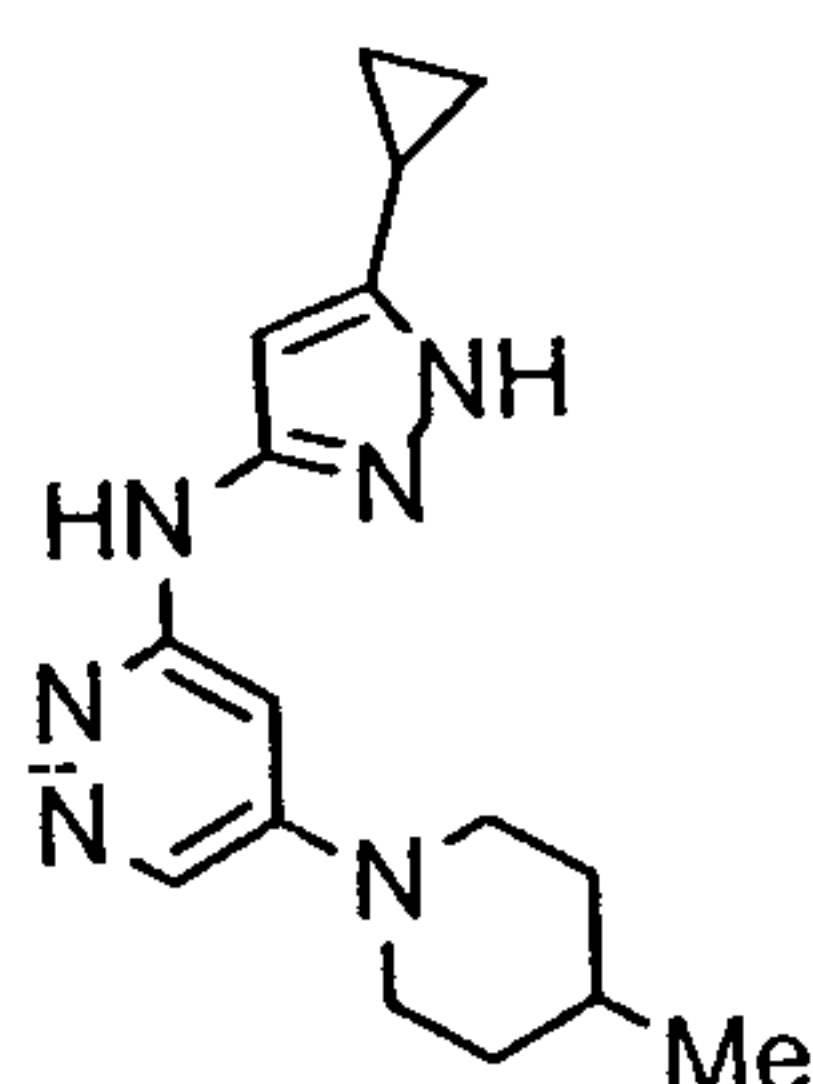
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12. The compound:



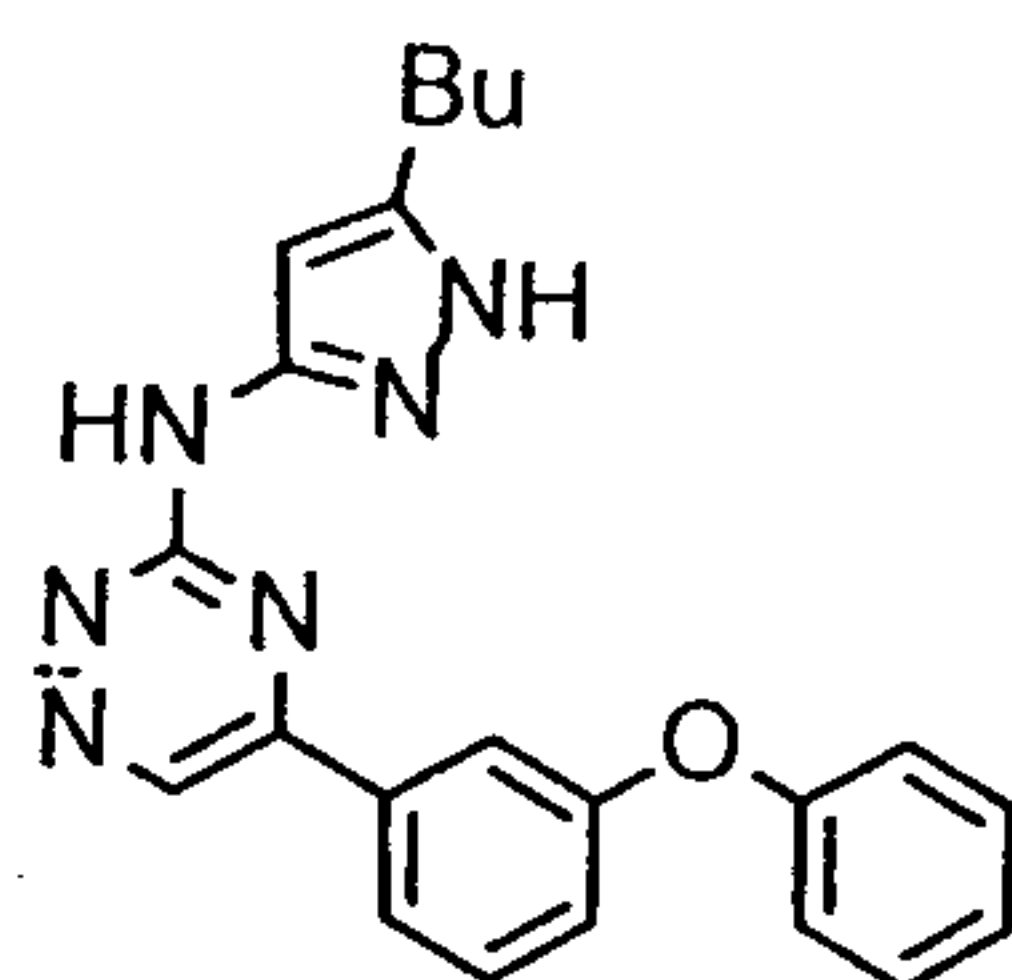
5 VIII-5, or a pharmaceutically acceptable salt thereof.

13. The compound:



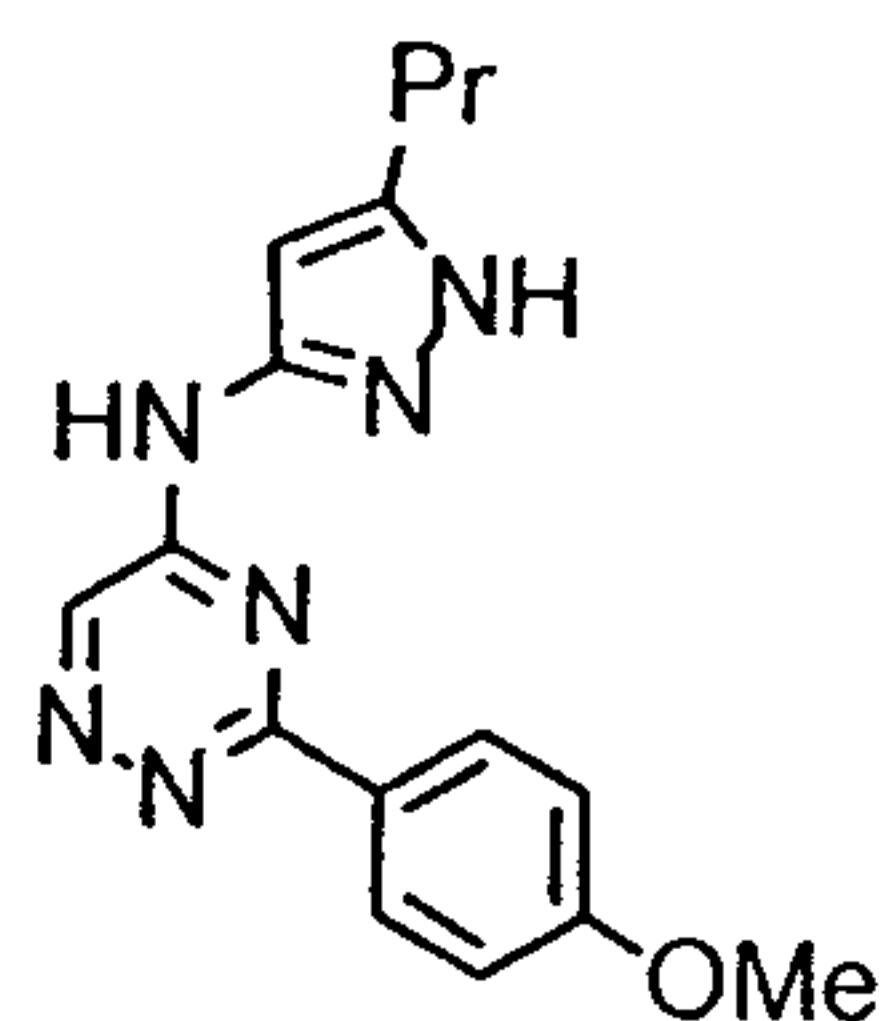
10 VIII-6, or a pharmaceutically acceptable salt thereof.

14. The compound:



15 VIII-7, or a pharmaceutically acceptable salt thereof.

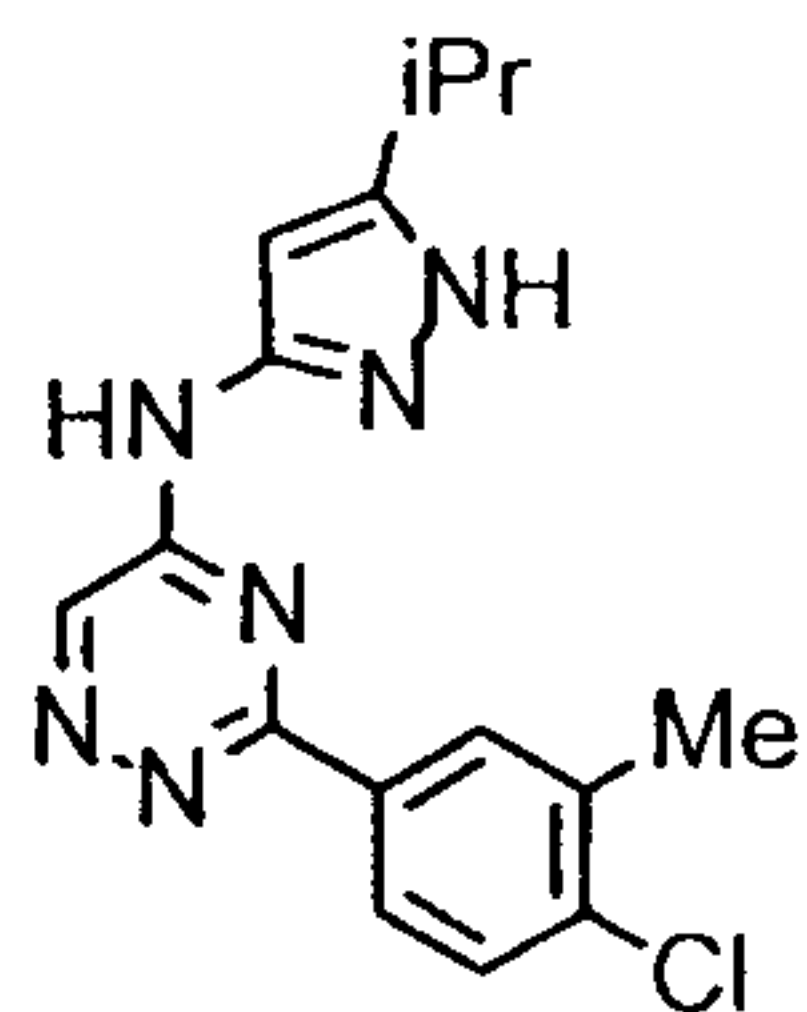
15. The compound:



20 VIII-8, or a pharmaceutically acceptable salt thereof.

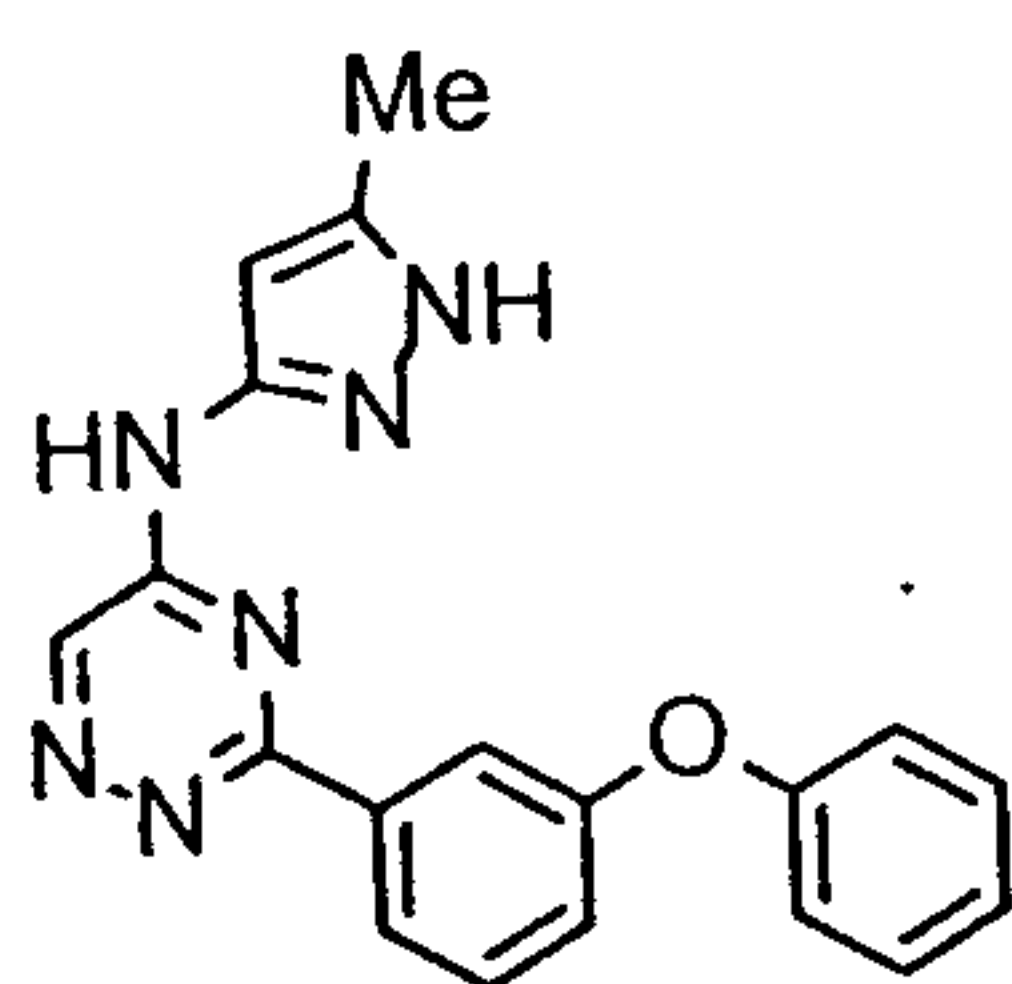
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16. The compound:



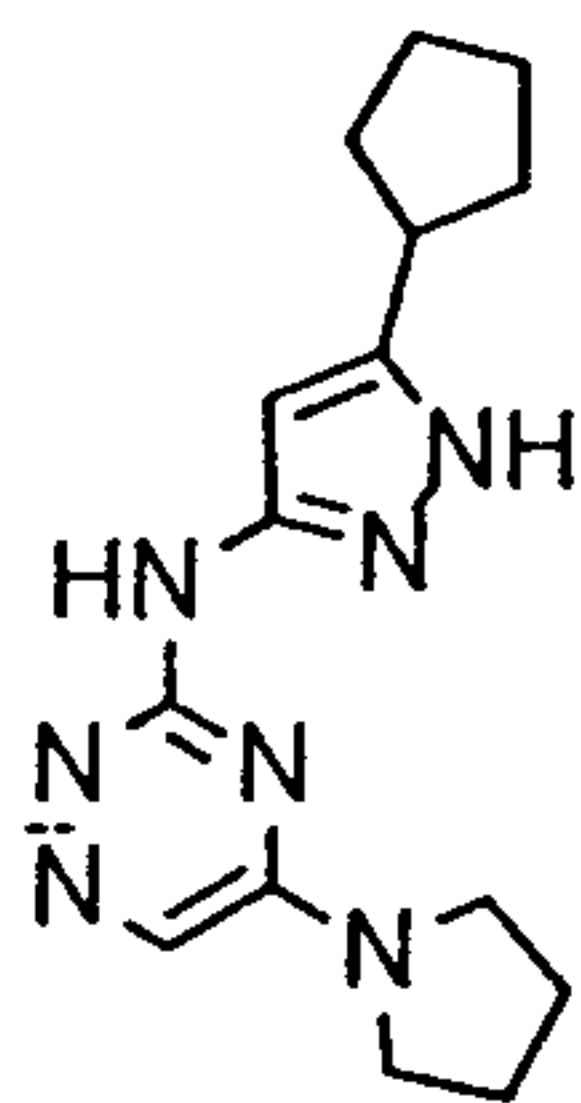
5 VIII-9, or a pharmaceutically acceptable salt thereof.

17. The compound:



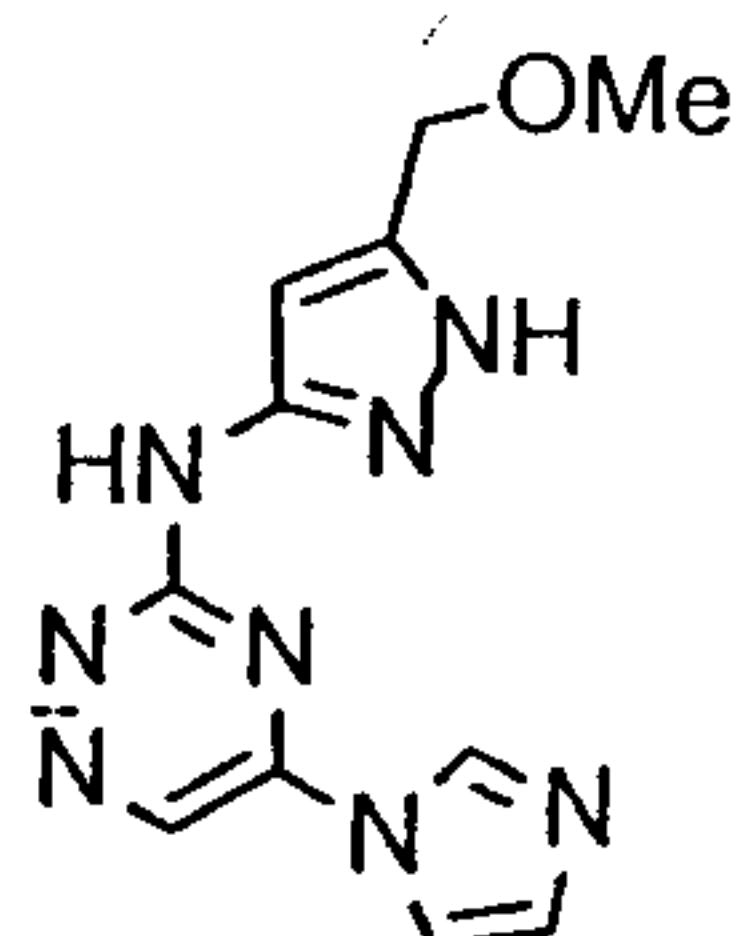
10 VIII-10, or a pharmaceutically acceptable salt thereof.

18. The compound:



15 VIII-11, or a pharmaceutically acceptable salt thereof.

19. The compound:

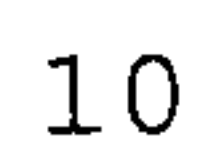


20 VIII-12, or a pharmaceutically acceptable salt thereof.

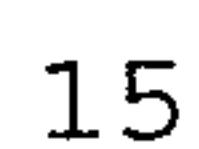
20.



21. The compound:



22. The compound:



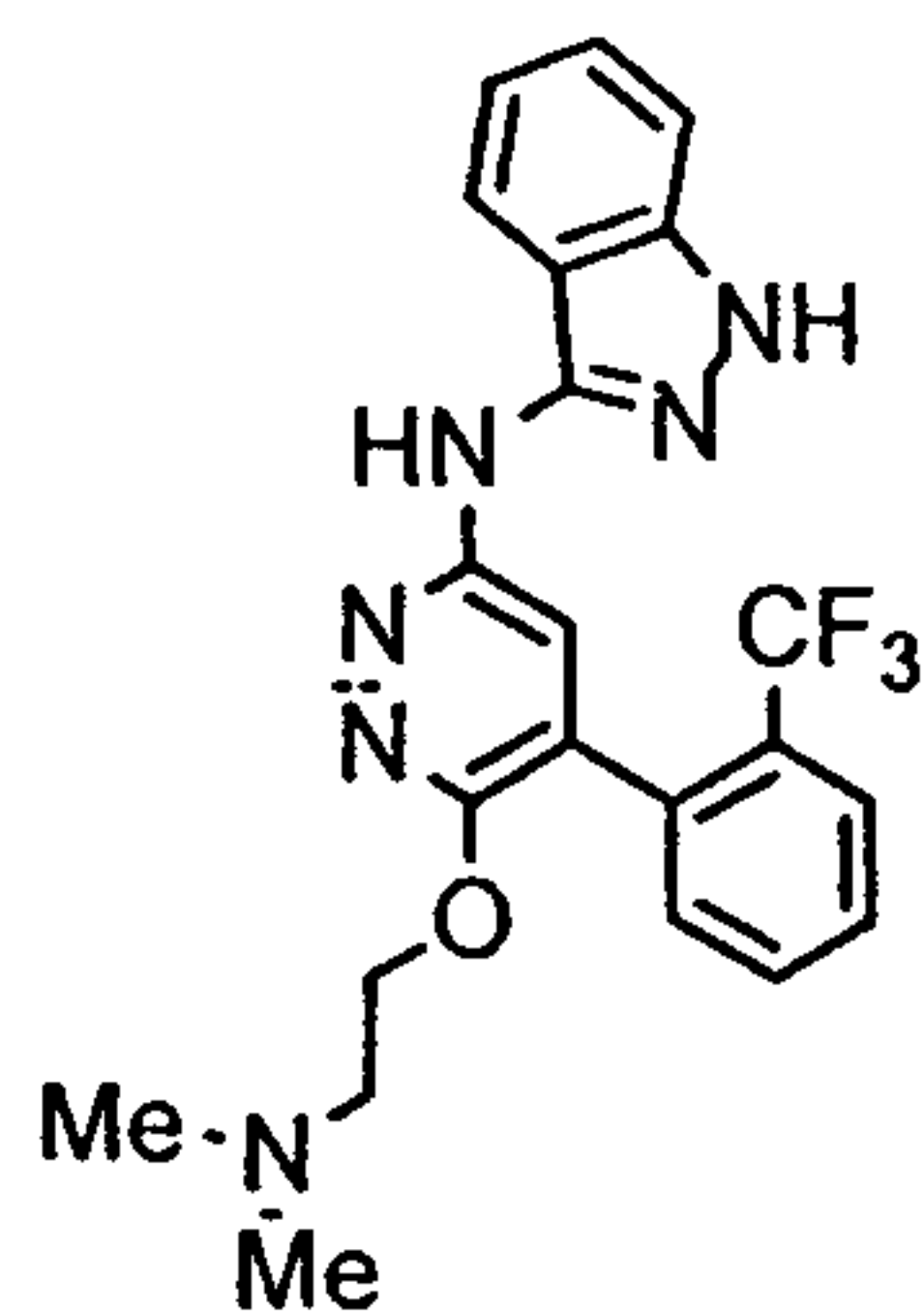
23. The compound:



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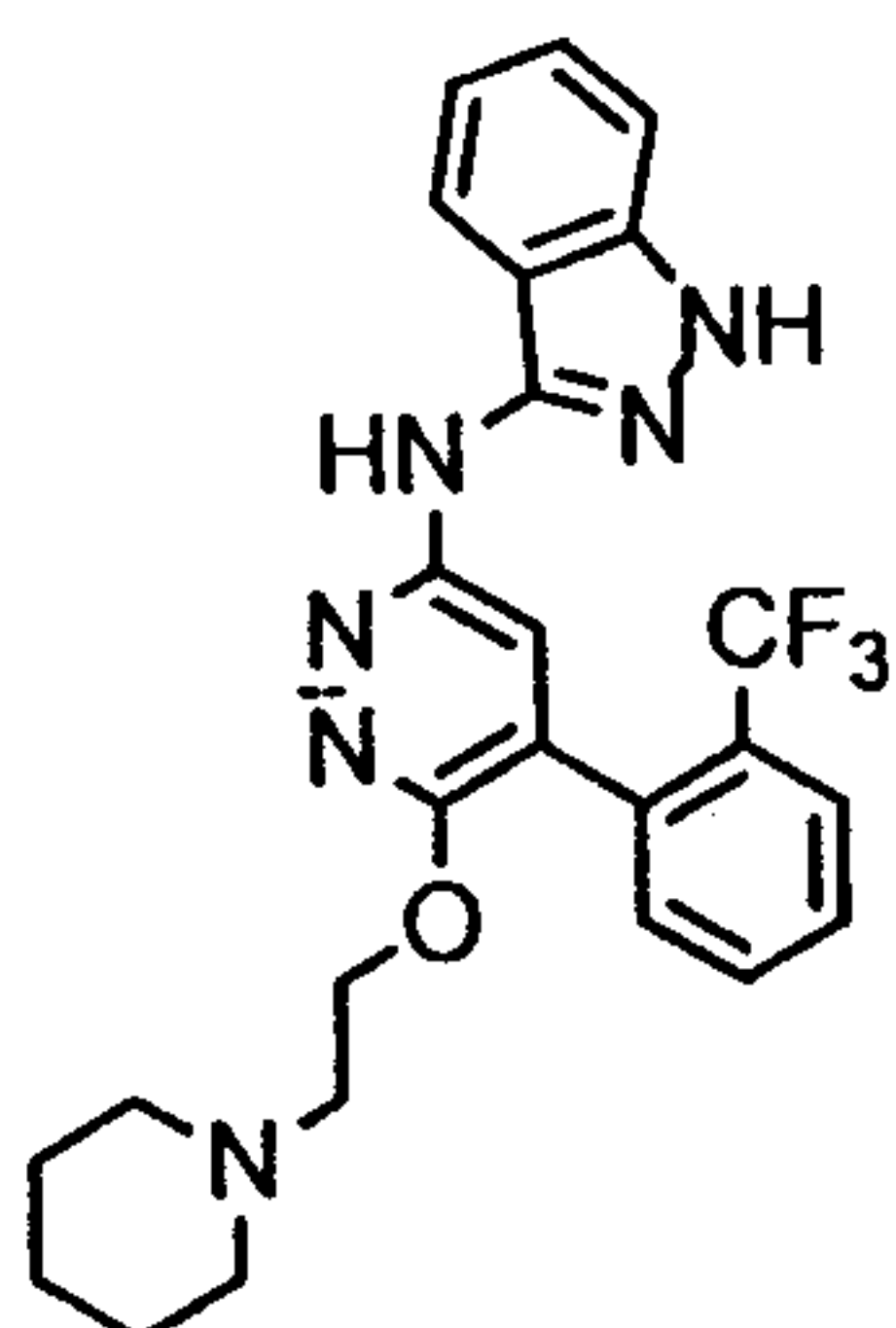
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24. The compound:



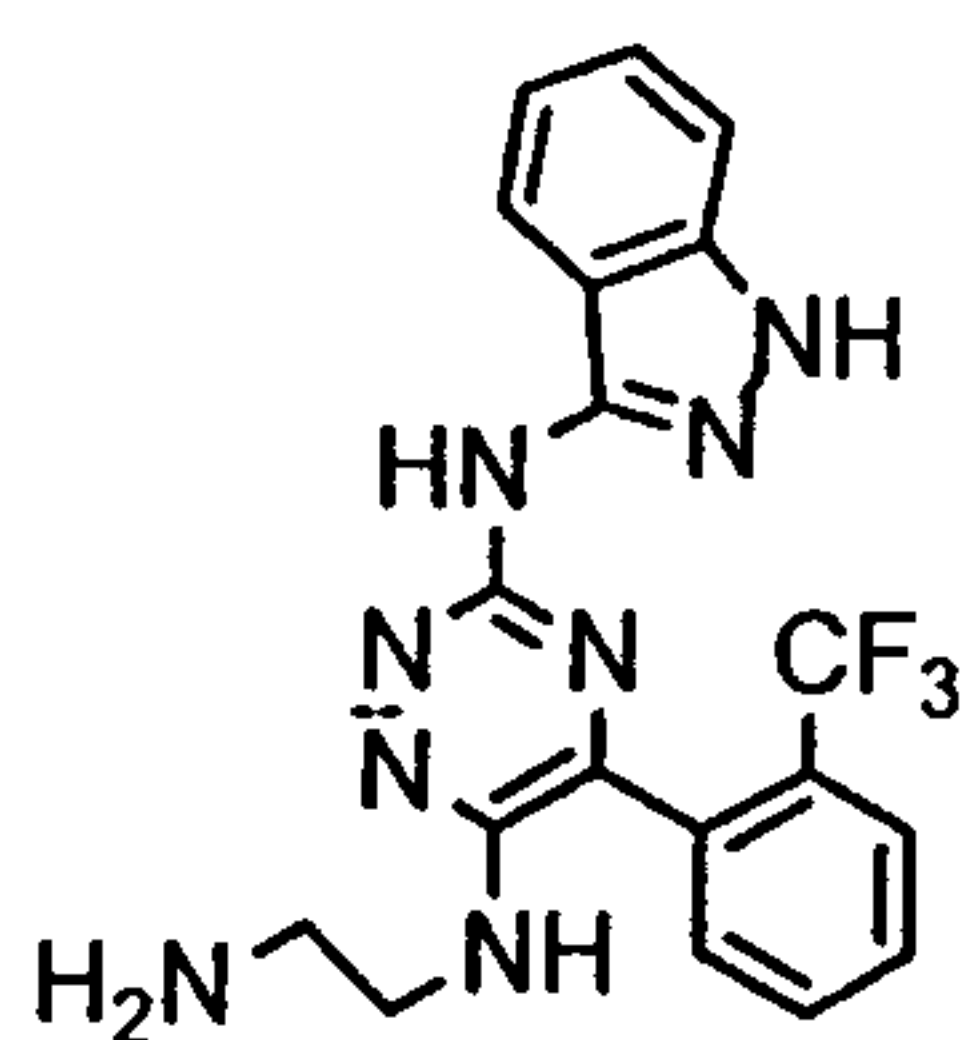
VIII-17, or a pharmaceutically acceptable salt thereof.

25. The compound:



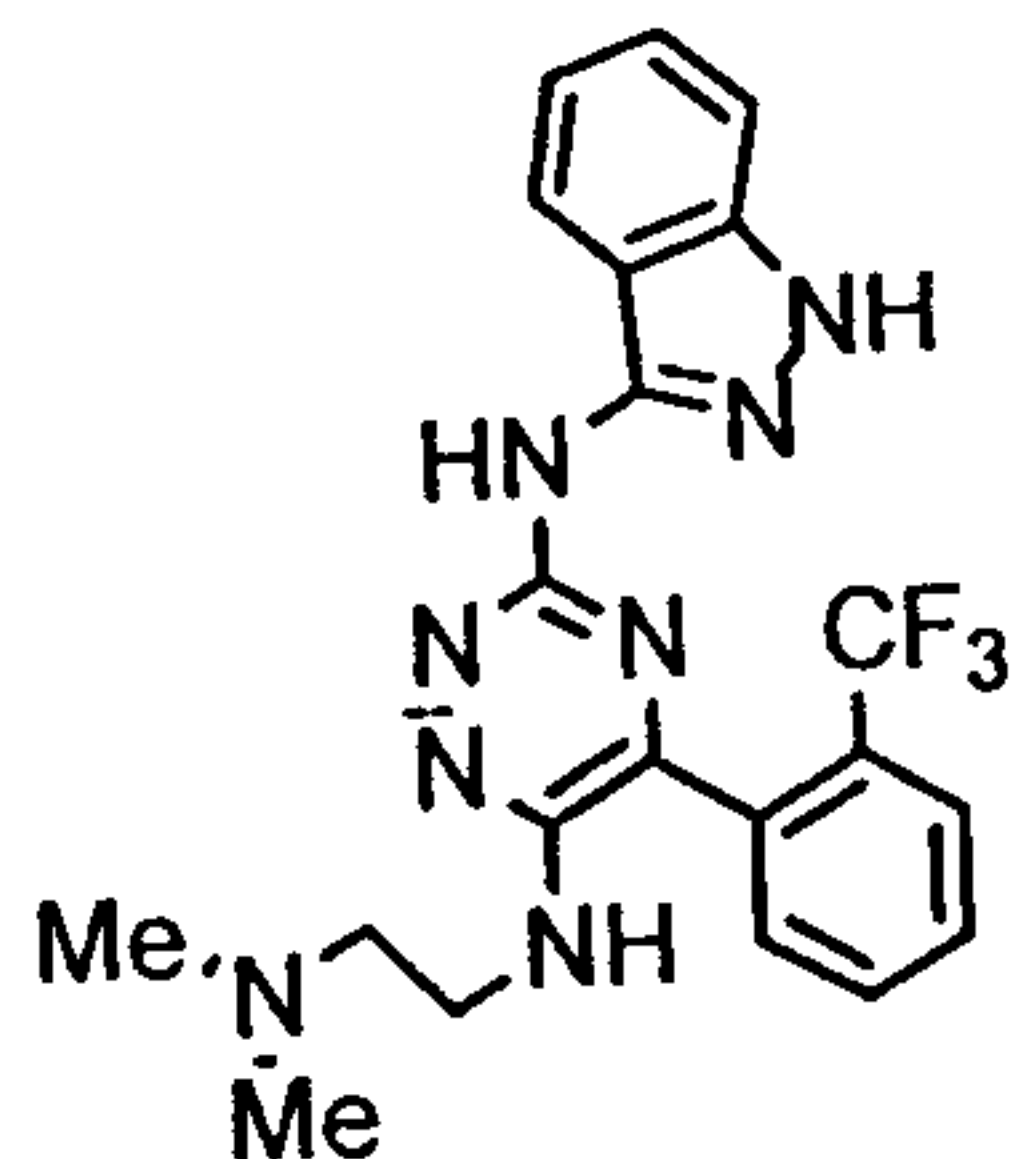
VIII-18, or a pharmaceutically acceptable salt thereof.

26. The compound:



VIII-19, or a pharmaceutically acceptable salt thereof.

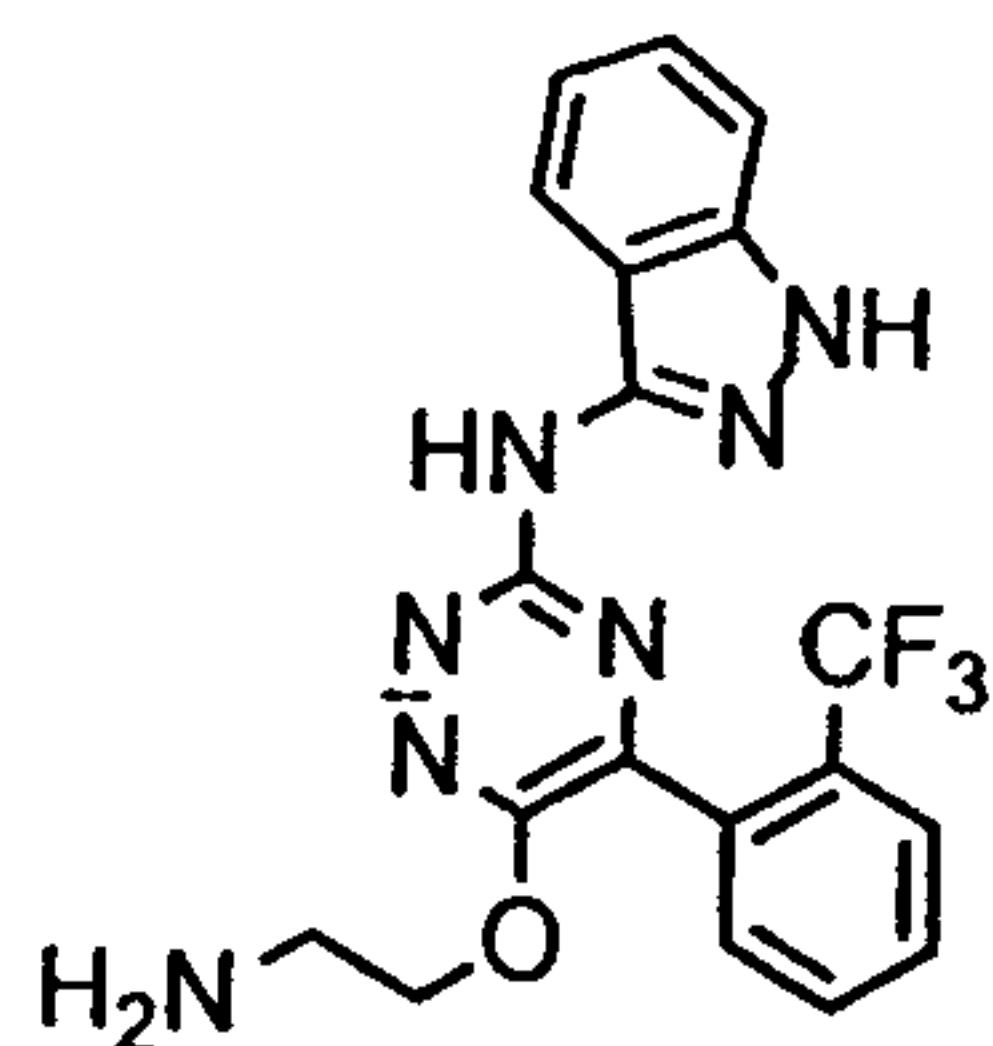
27. The compound:



VIII-20, or a pharmaceutically acceptable salt thereof.

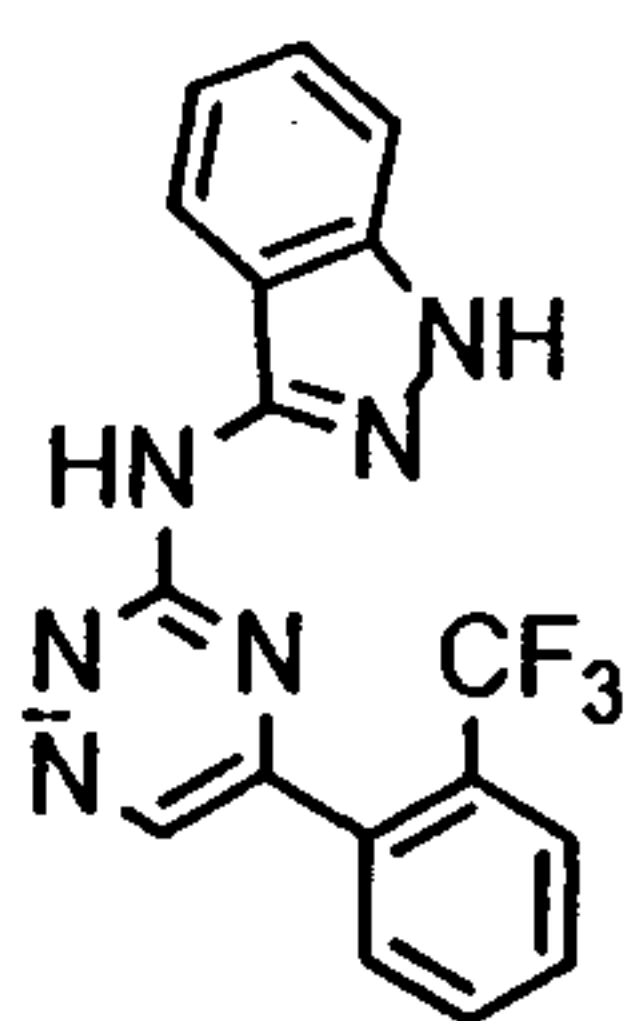
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28. The compound:



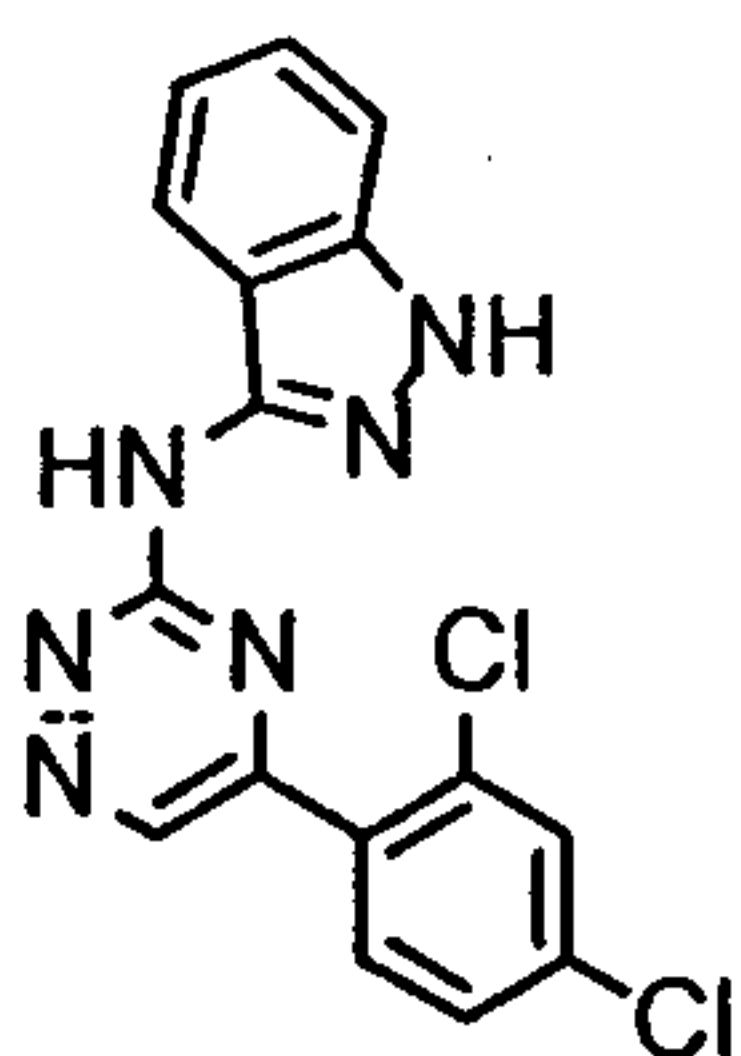
5 VIII-21, or a pharmaceutically acceptable salt thereof.

29. The compound:



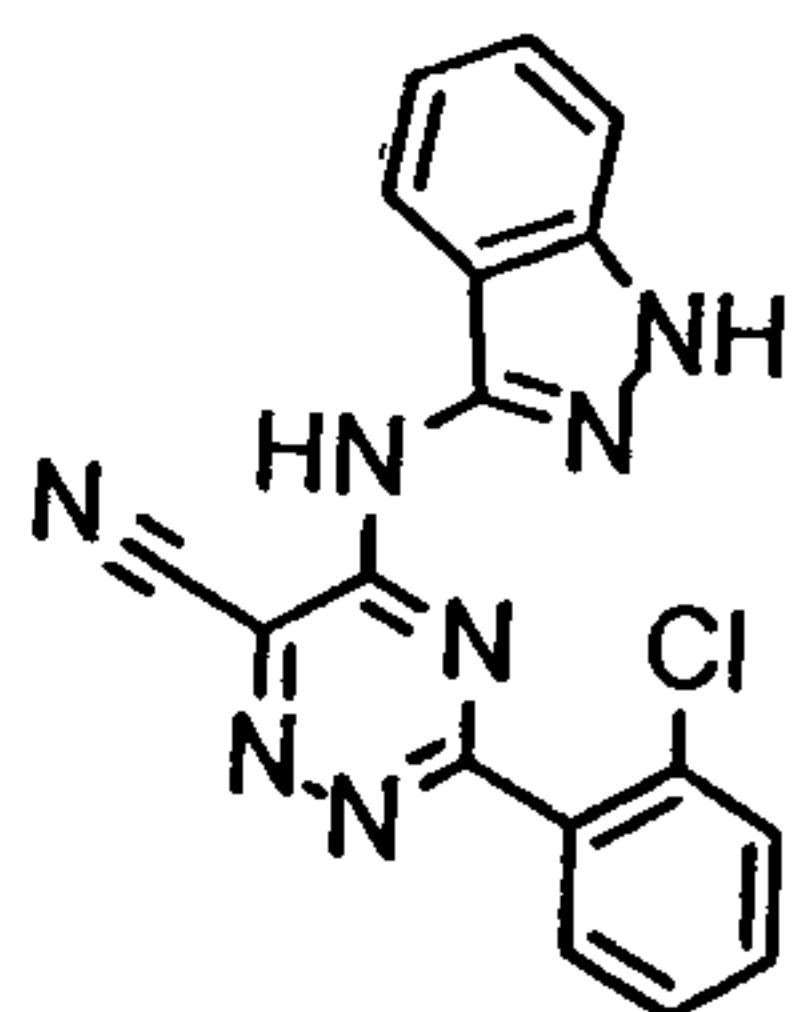
10 VIII-22, or a pharmaceutically acceptable salt thereof.

30. The compound:



15 VIII-23, or a pharmaceutically acceptable salt thereof.

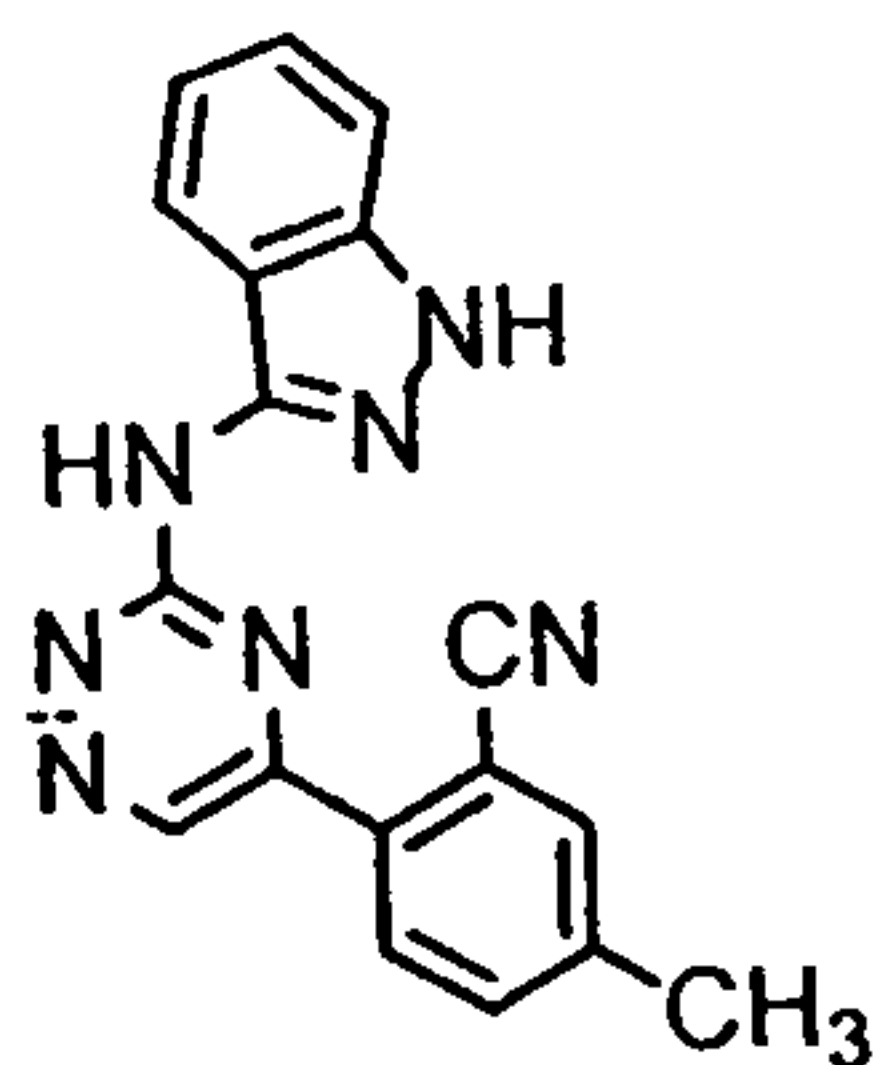
31. The compound:



20 VIII-24, or a pharmaceutically acceptable salt thereof.

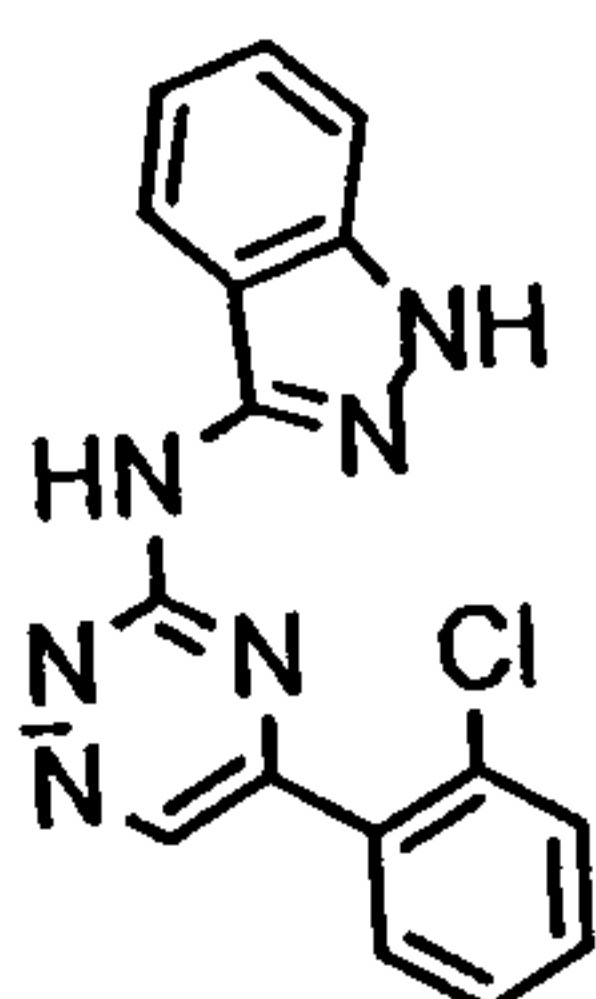
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32. The compound:



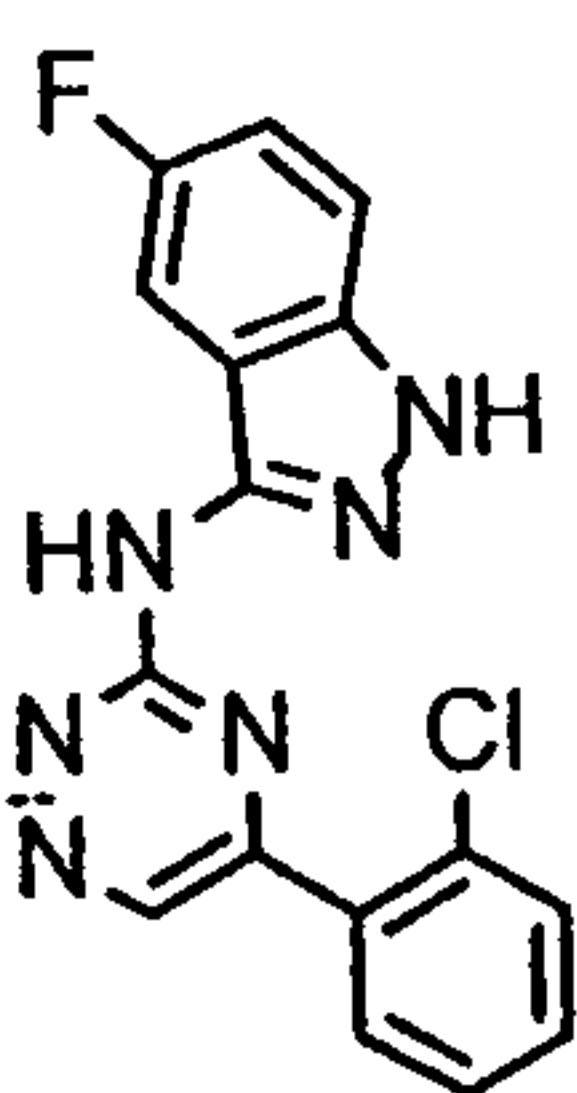
5 VIII-25, or a pharmaceutically acceptable salt thereof.

33. The compound:



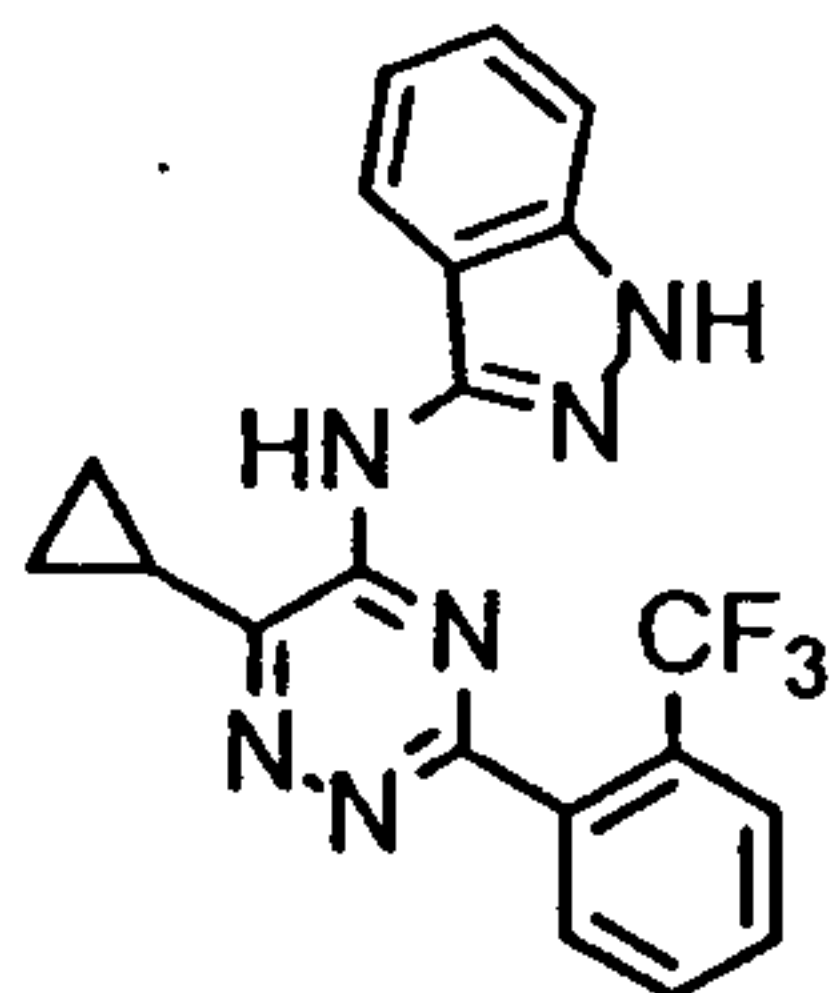
10 VIII-26, or a pharmaceutically acceptable salt thereof.

34. The compound:



15 VIII-27, or a pharmaceutically acceptable salt thereof.

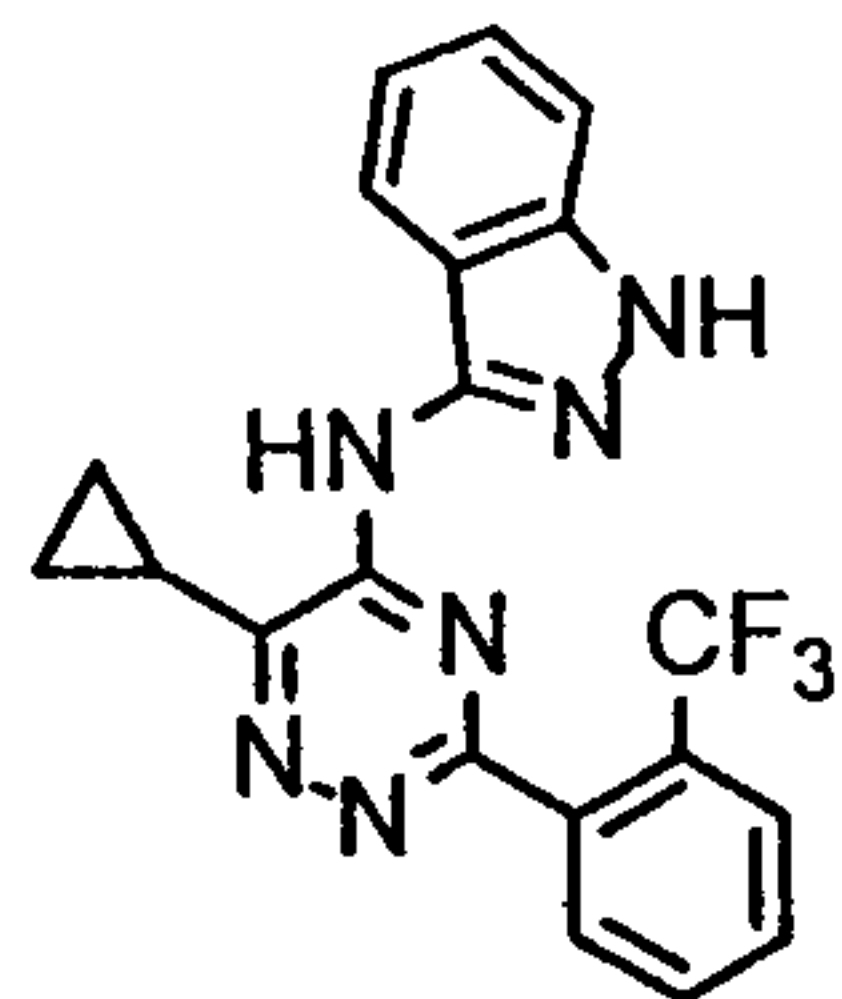
35. The compound:



20 VIII-28, or a pharmaceutically acceptable salt thereof.

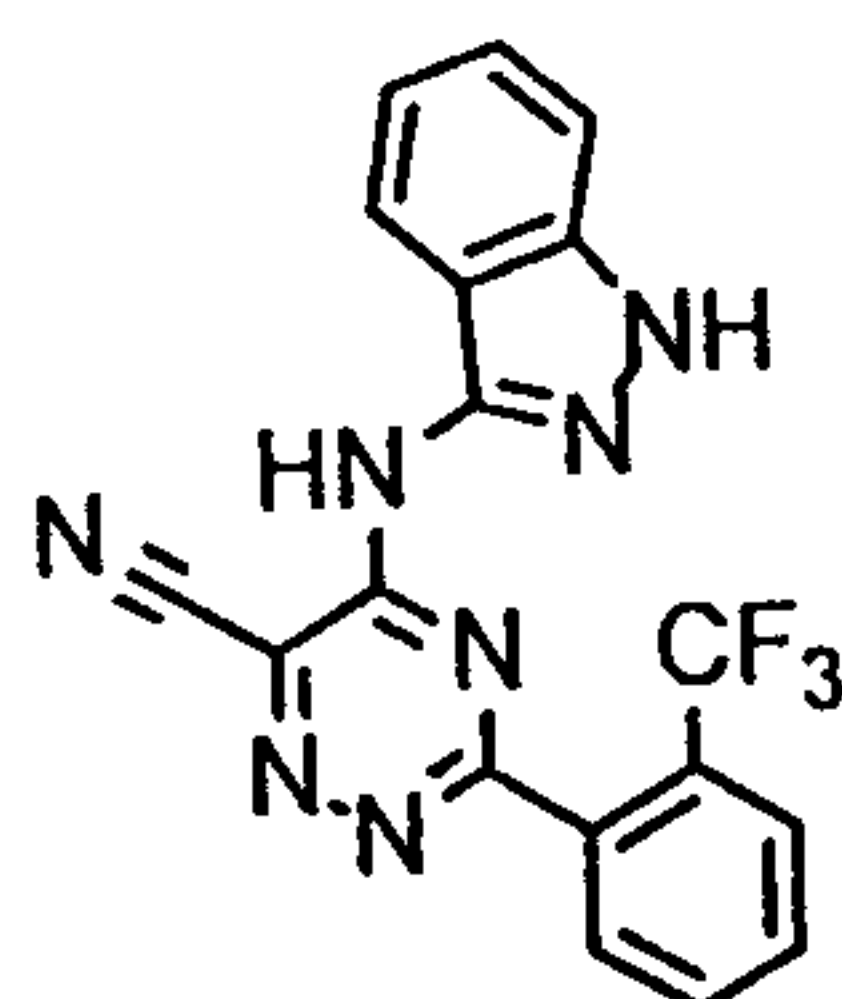
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36. The compound:



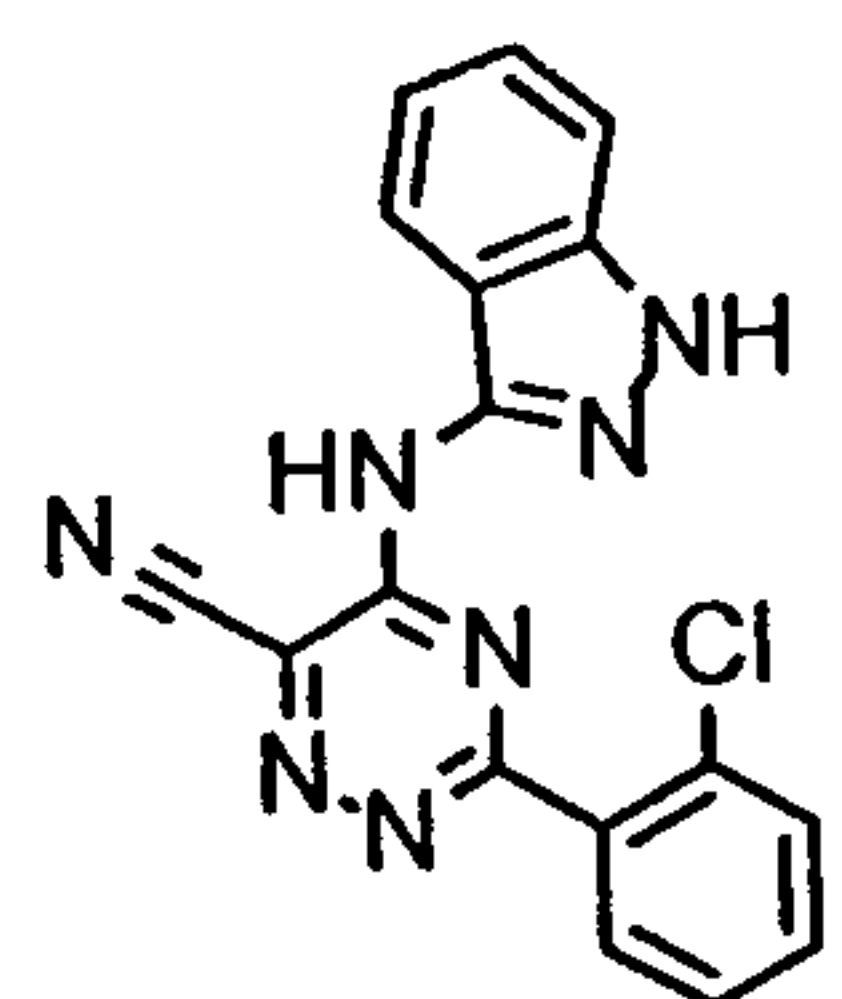
5 VIII-29, or a pharmaceutically acceptable salt thereof.

37. The compound:



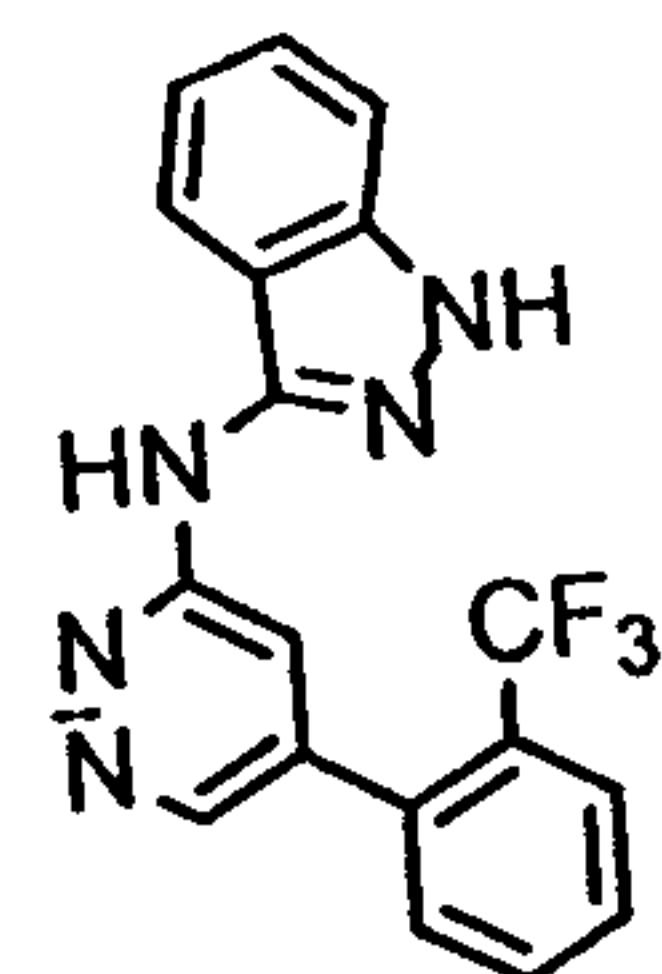
10 VIII-30, or a pharmaceutically acceptable salt thereof.

38. The compound:



15 VIII-31, or a pharmaceutically acceptable salt thereof.

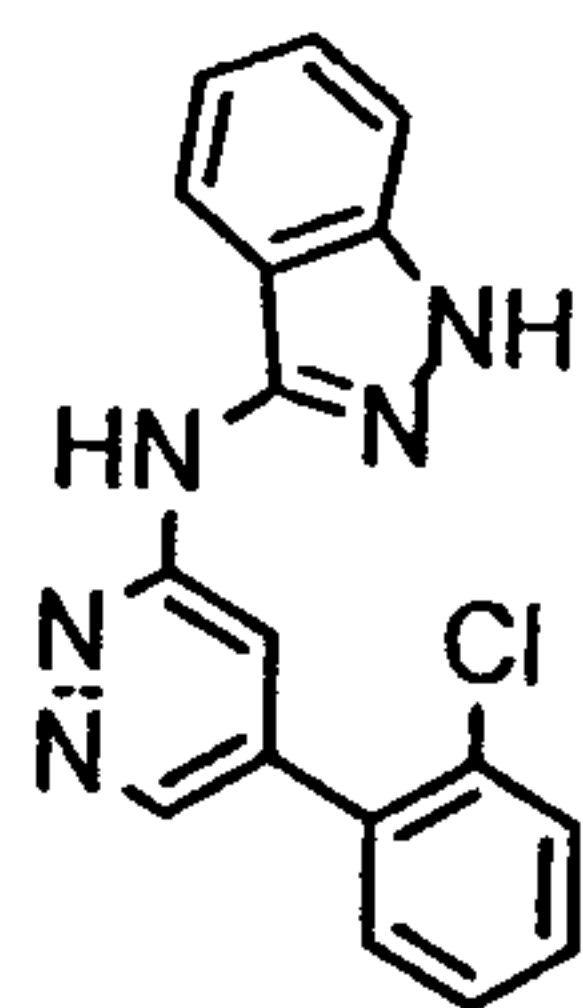
39. The compound:



20 VIII-32, or a pharmaceutically acceptable salt thereof.

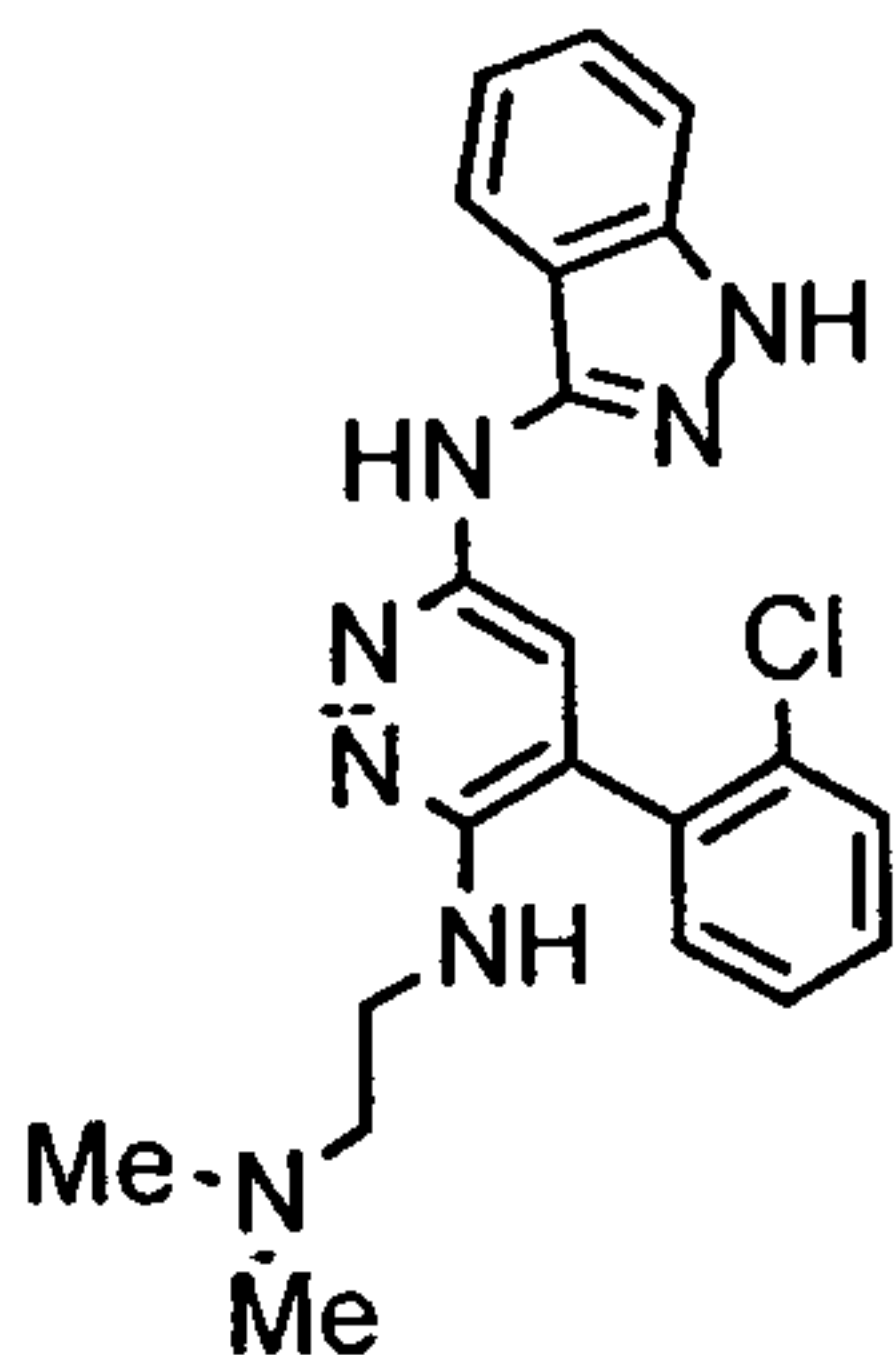
79580-26

40. The compound:



5 VIII-33, or a pharmaceutically acceptable salt thereof.

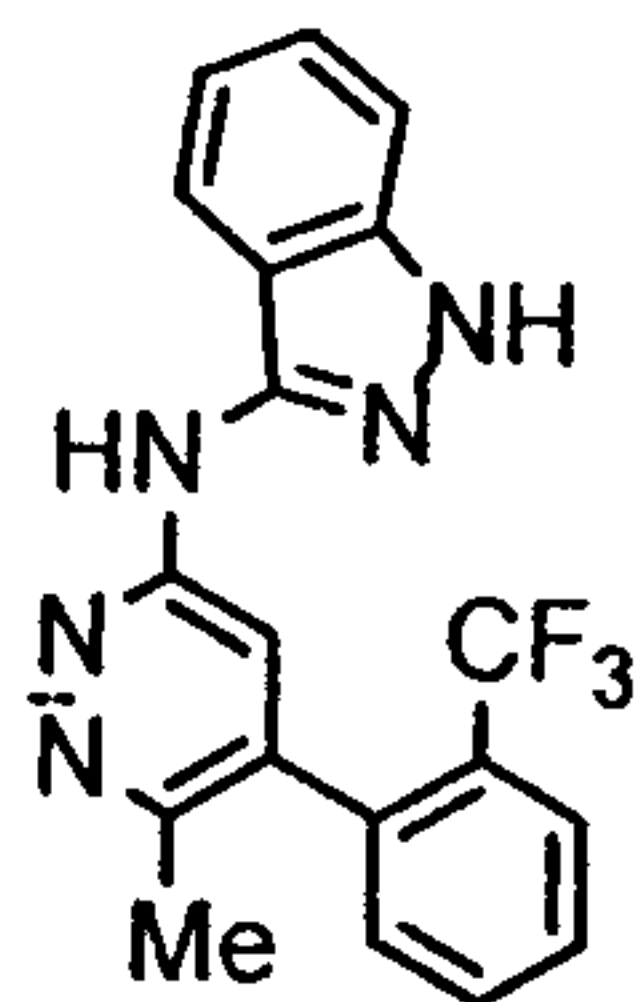
41. The compound:



10

VIII-34, or a pharmaceutically acceptable salt thereof.

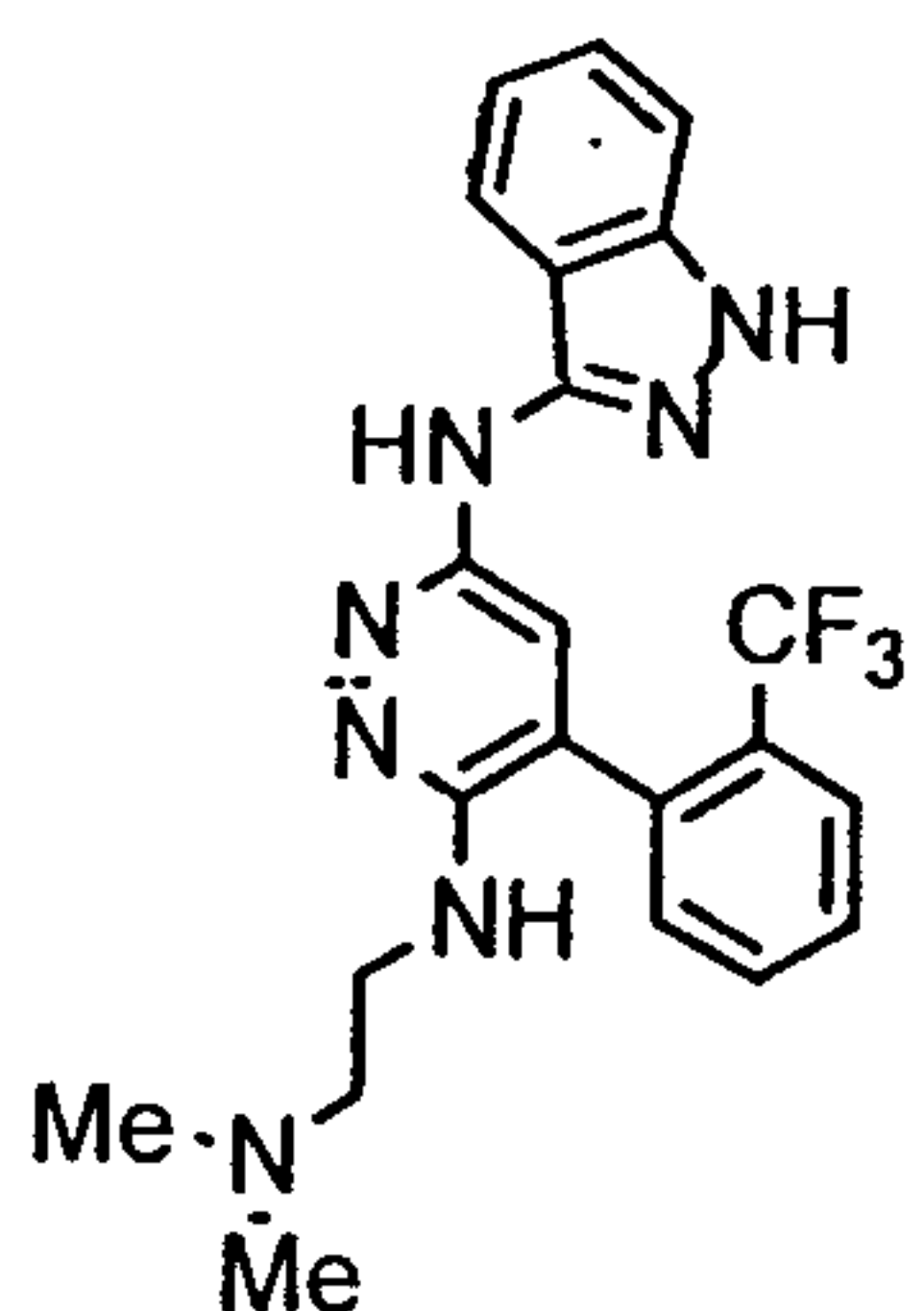
42. The compound:



15

VIII-35, or a pharmaceutically acceptable salt thereof.

43. The compound:

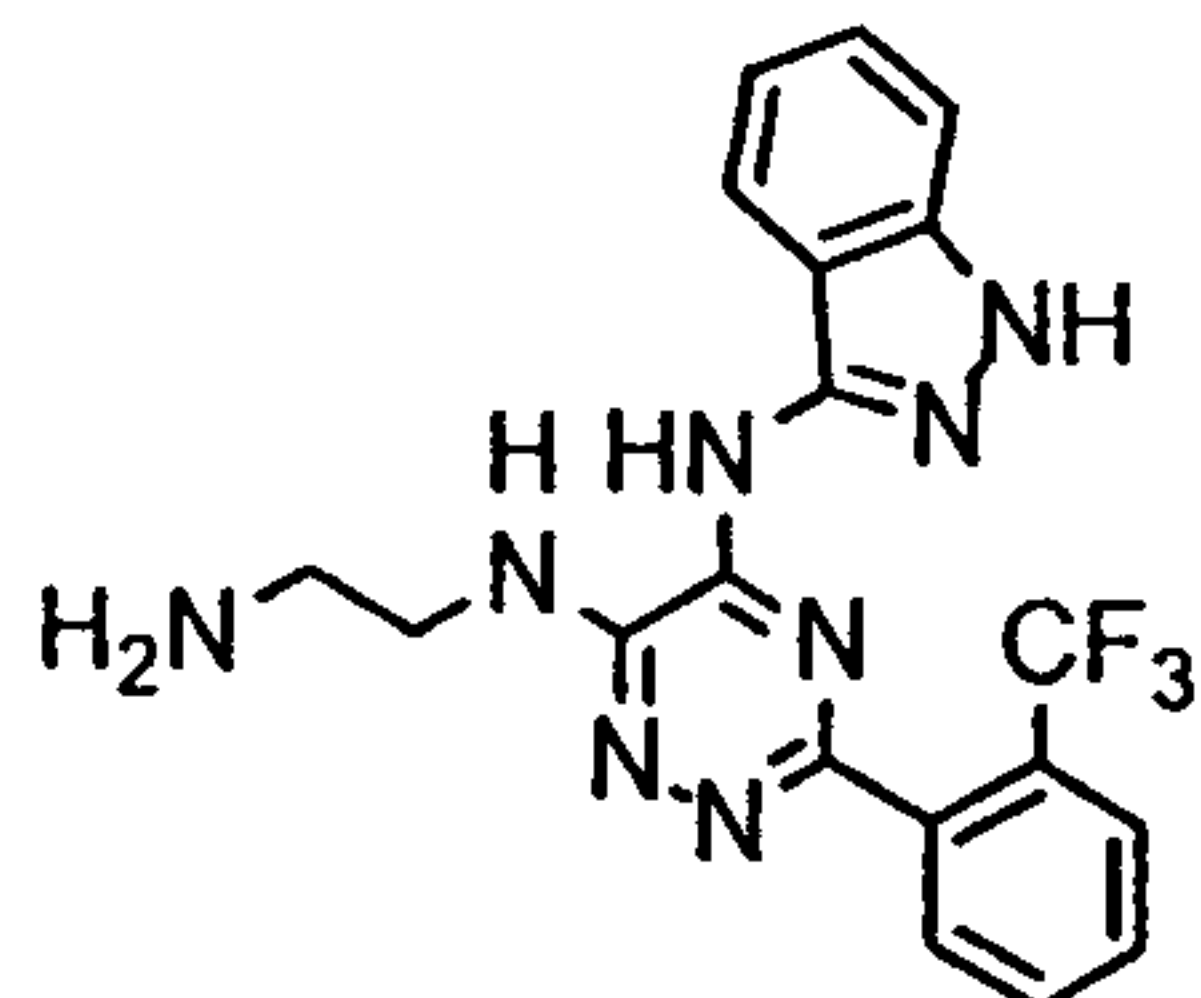


20

VIII-36, or a pharmaceutically acceptable salt thereof.

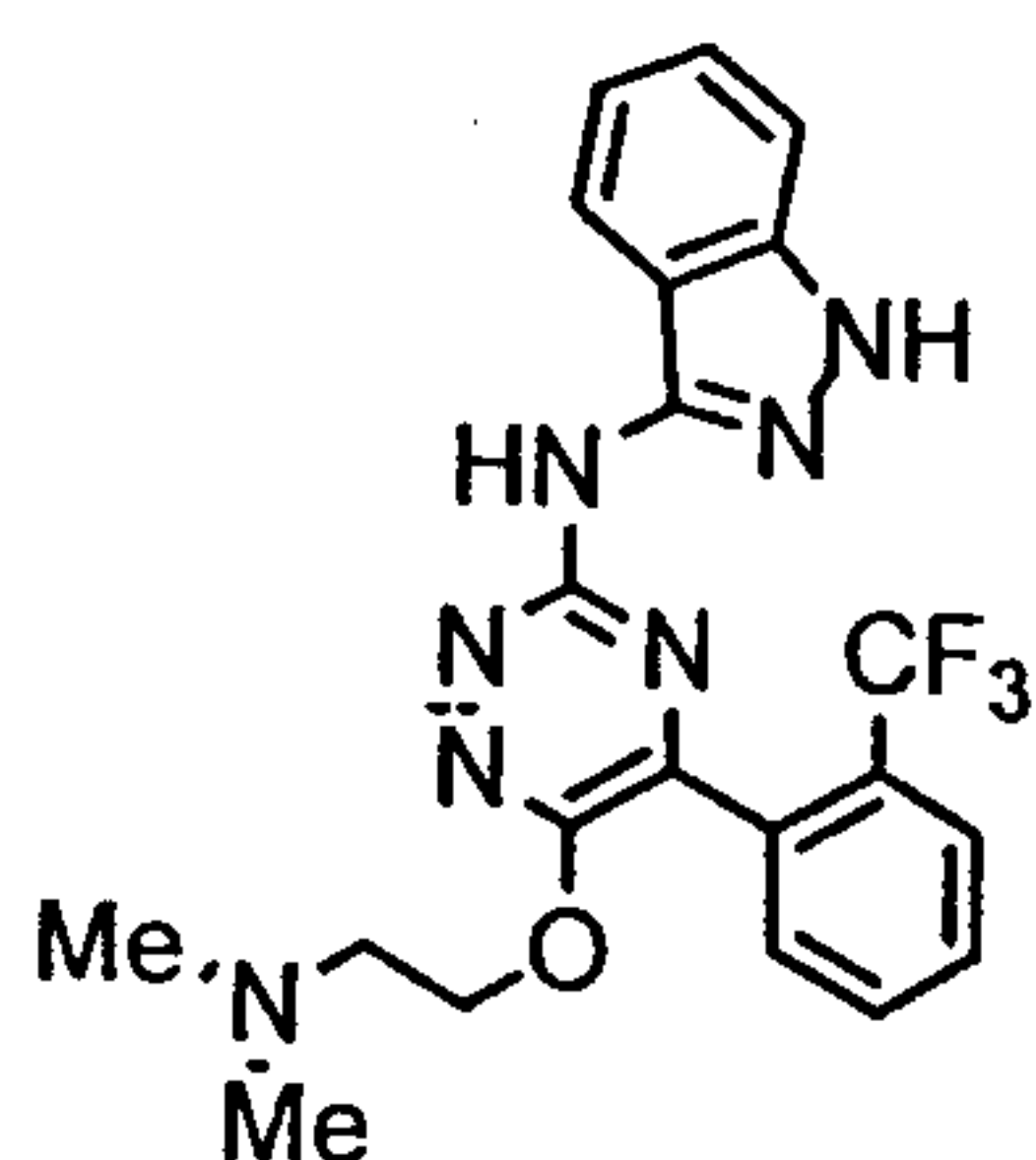
79580-26

44. The compound:



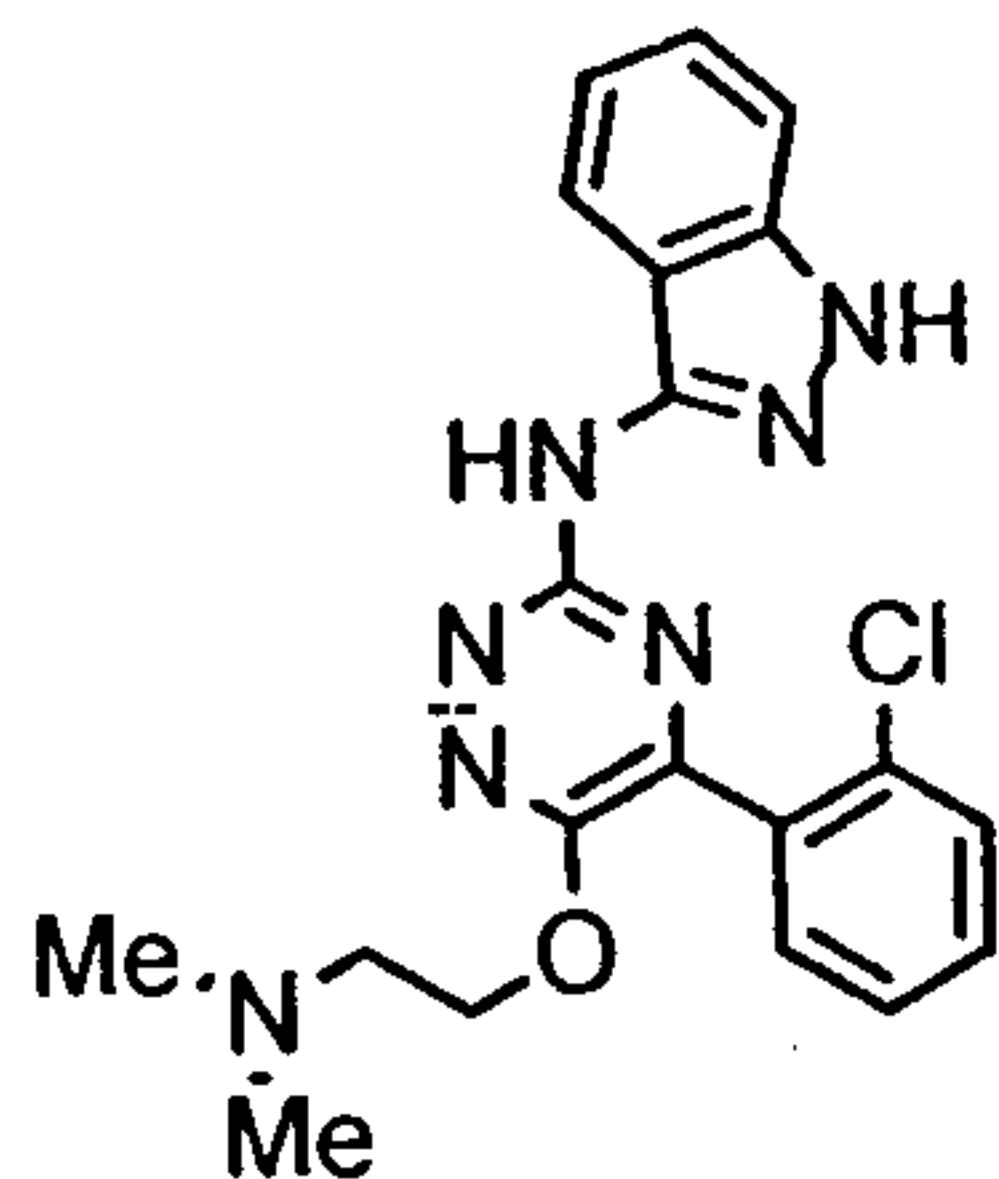
5 VIII-37, or a pharmaceutically acceptable salt thereof.

45. The compound:



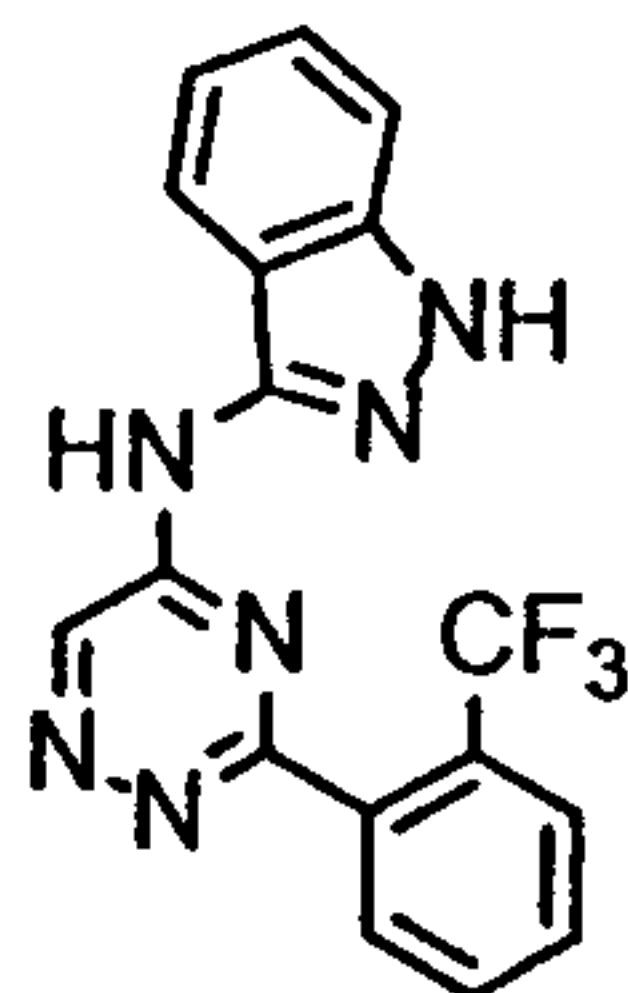
10 VIII-38, or a pharmaceutically acceptable salt thereof.

46. The compound:



15 VIII-39, or a pharmaceutically acceptable salt thereof.

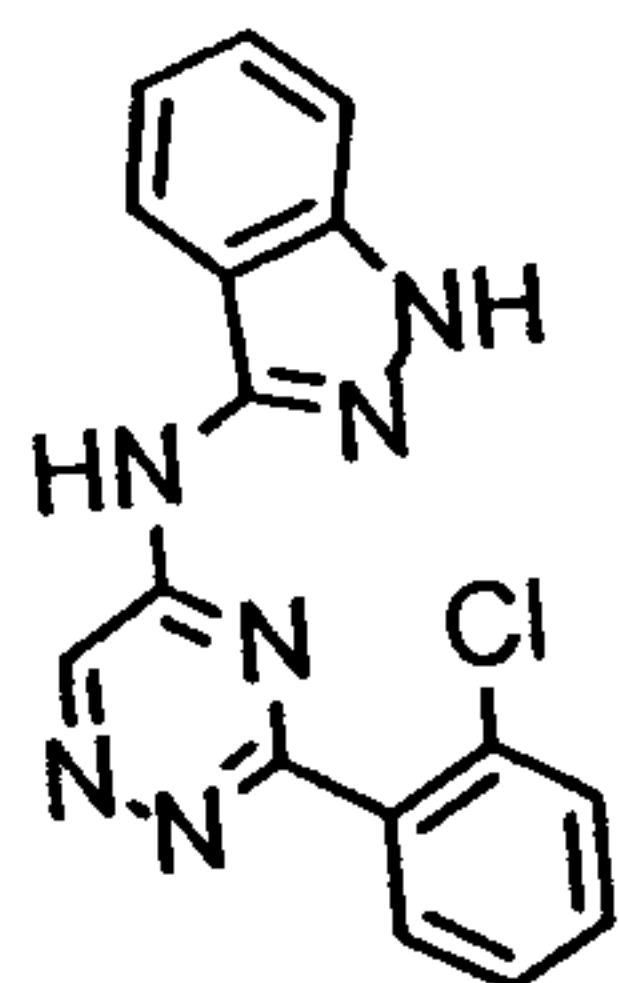
47. The compound:



20 VIII-40, or a pharmaceutically acceptable salt thereof.

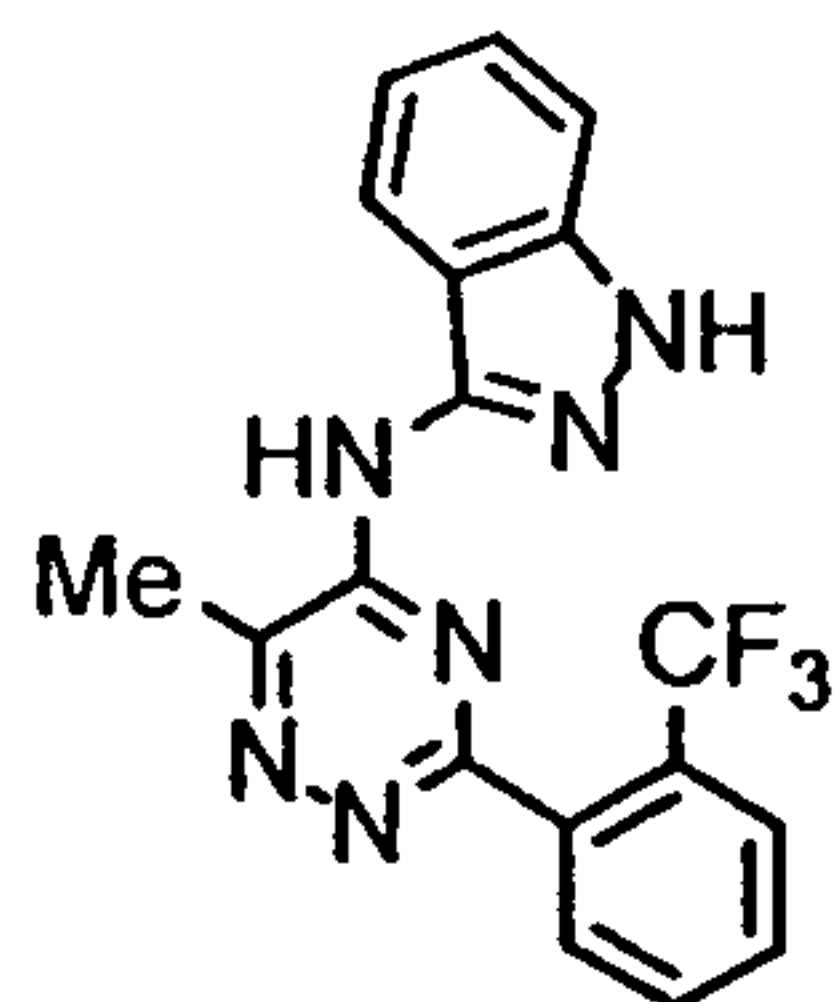
79580-26

48. The compound:



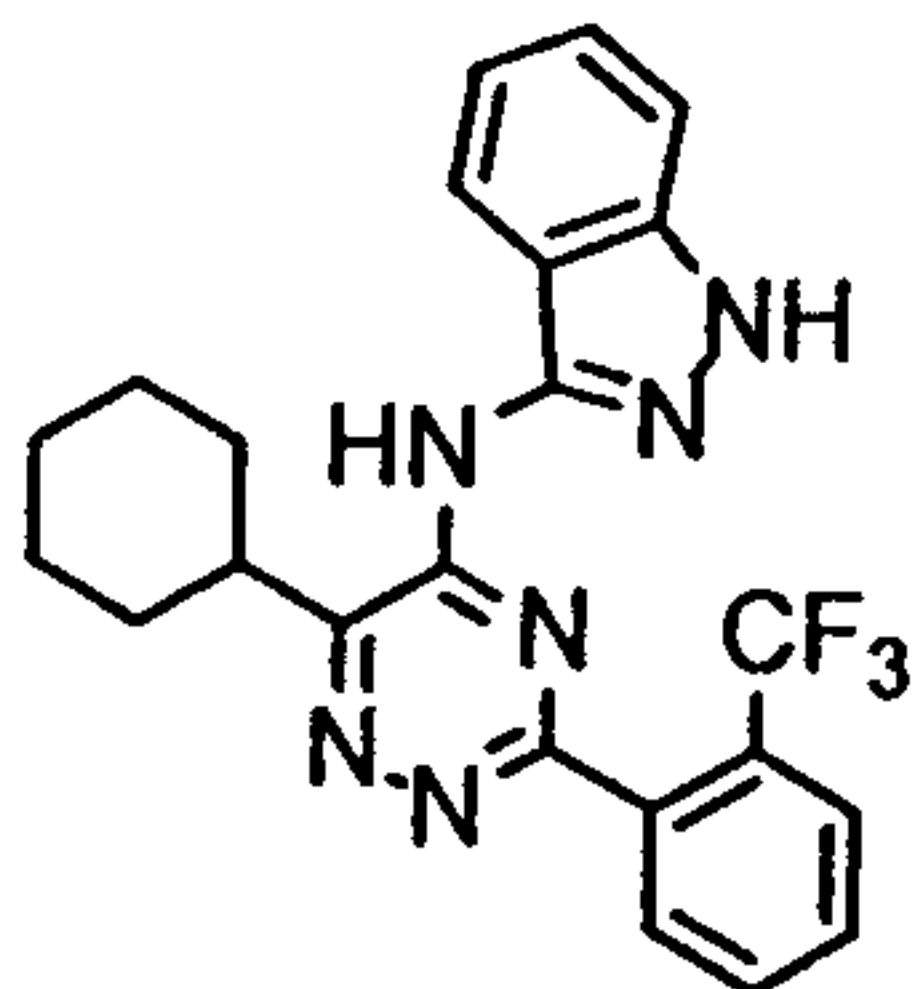
5 VIII-41, or a pharmaceutically acceptable salt thereof.

49. The compound:



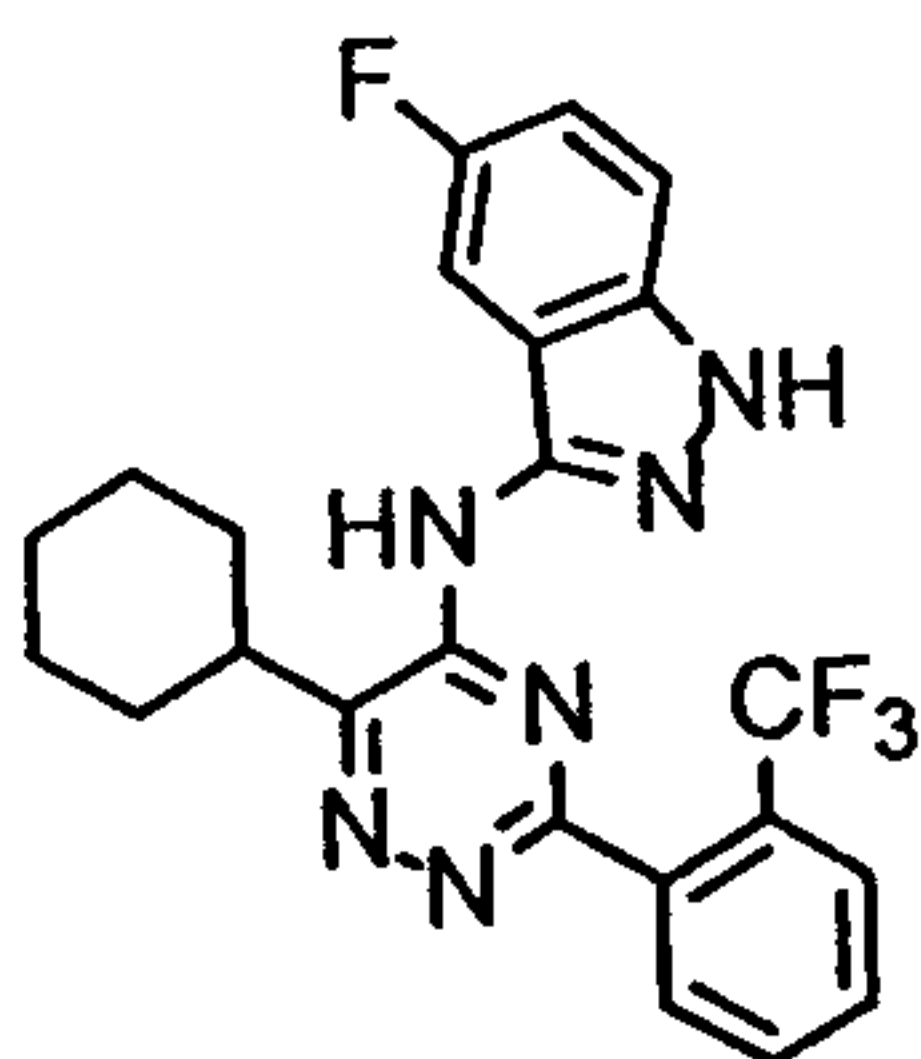
10 VIII-42, or a pharmaceutically acceptable salt thereof.

50. The compound:



15 VIII-43, or a pharmaceutically acceptable salt thereof.

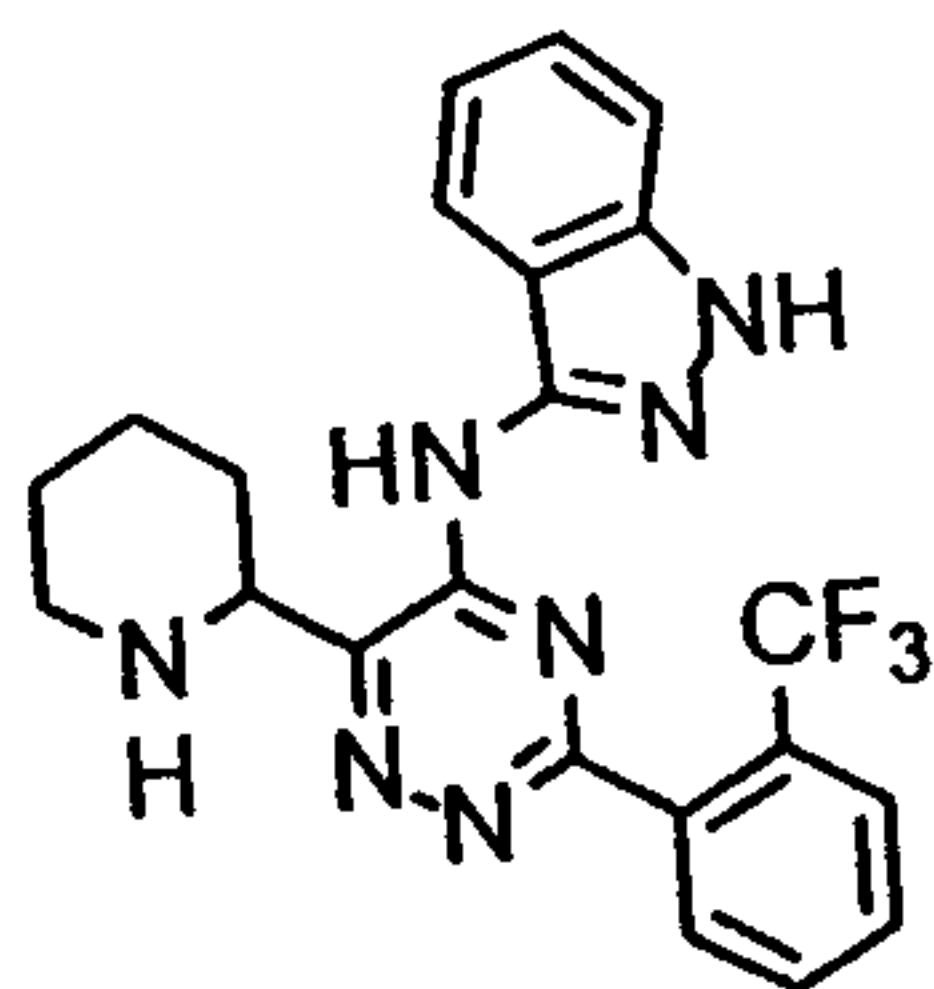
51. The compound:



20 VIII-44, or a pharmaceutically acceptable salt thereof.

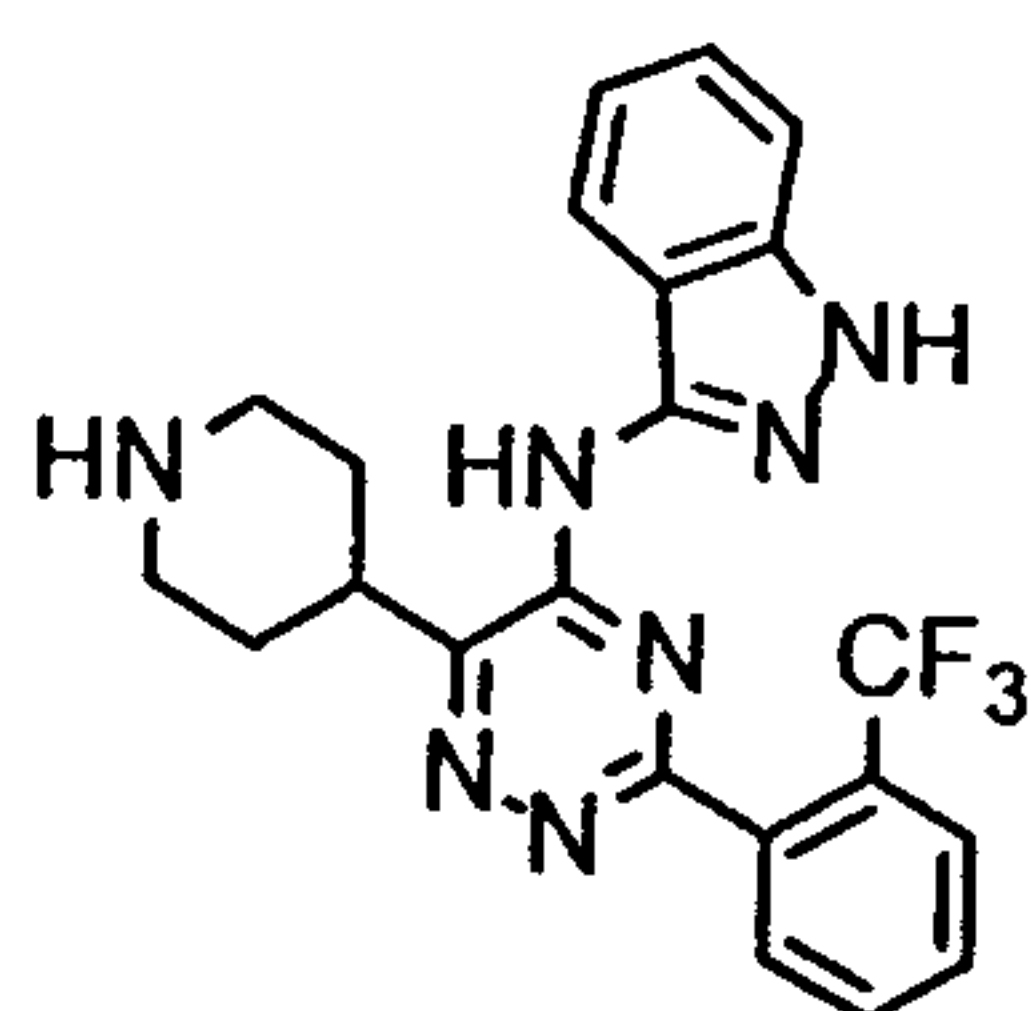
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52. The compound:



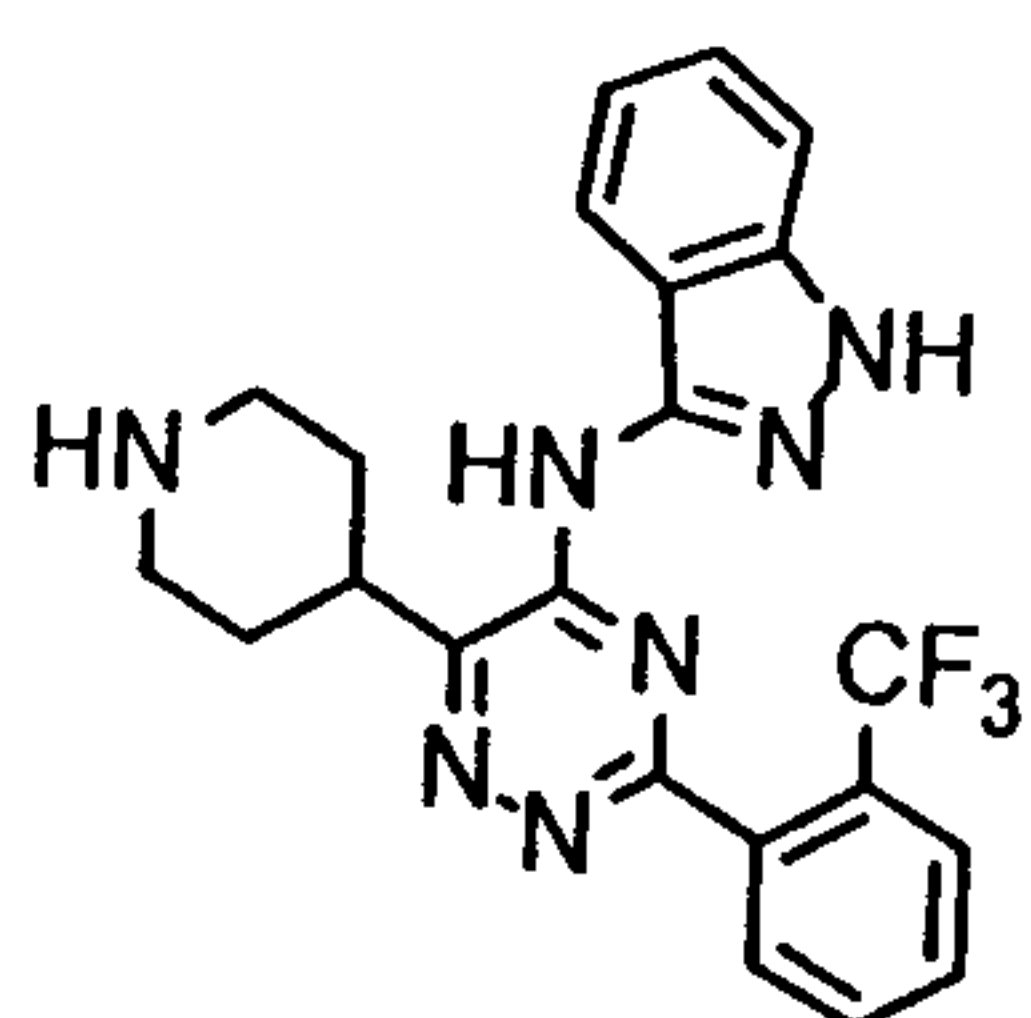
5 VIII-45, or a pharmaceutically acceptable salt thereof.

53. The compound:



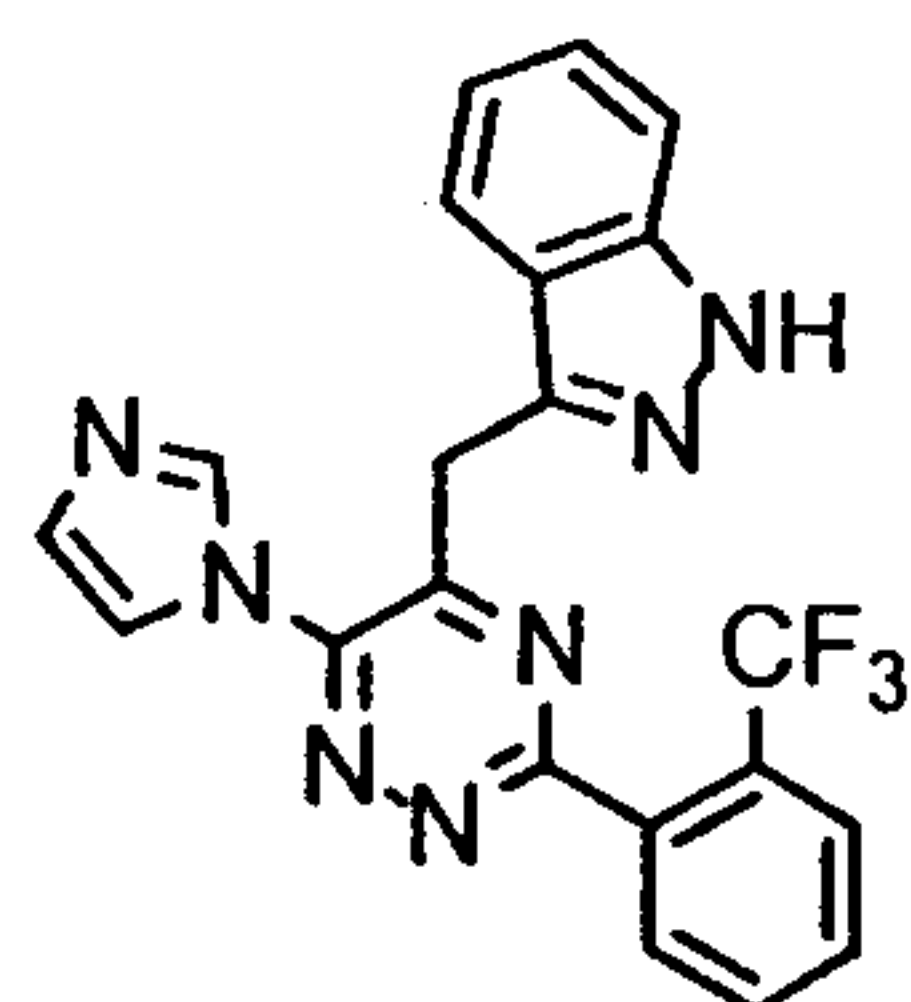
10 VIII-46, or a pharmaceutically acceptable salt thereof.

54. The compound:



15 VIII-47, or a pharmaceutically acceptable salt thereof.

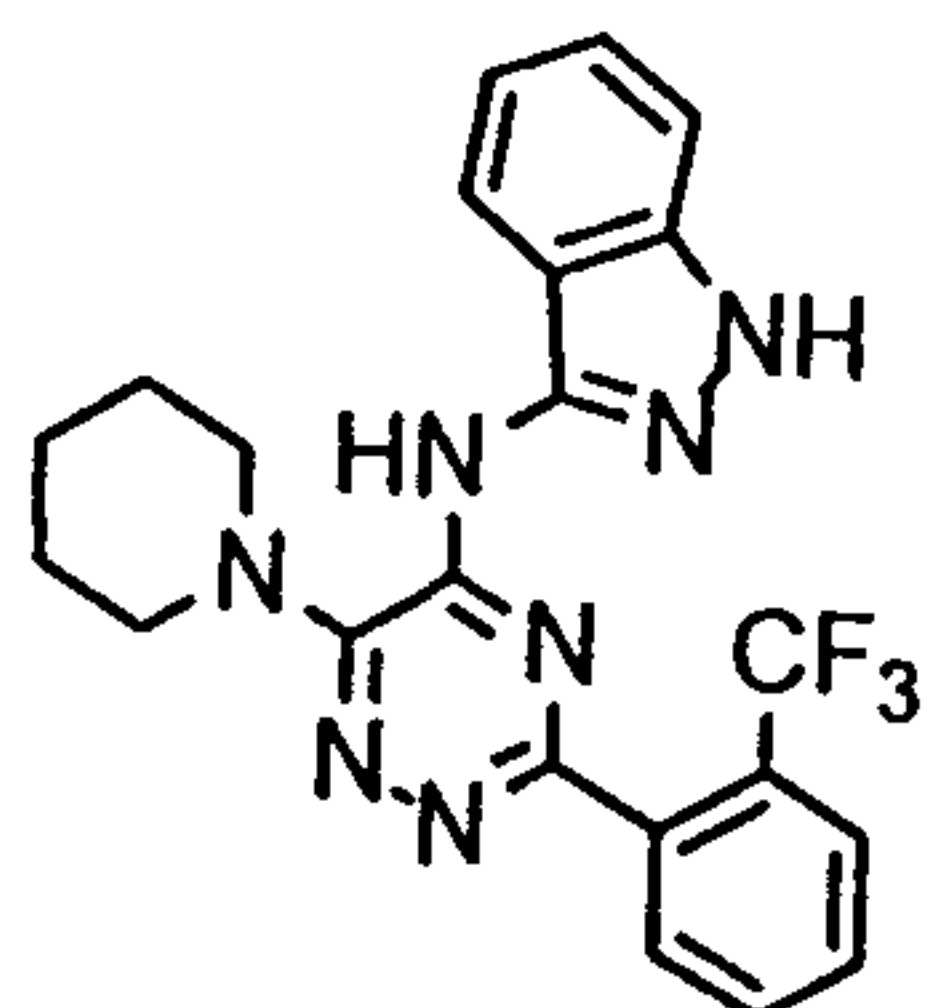
55. The compound:



20 VIII-48, or a pharmaceutically acceptable salt thereof.

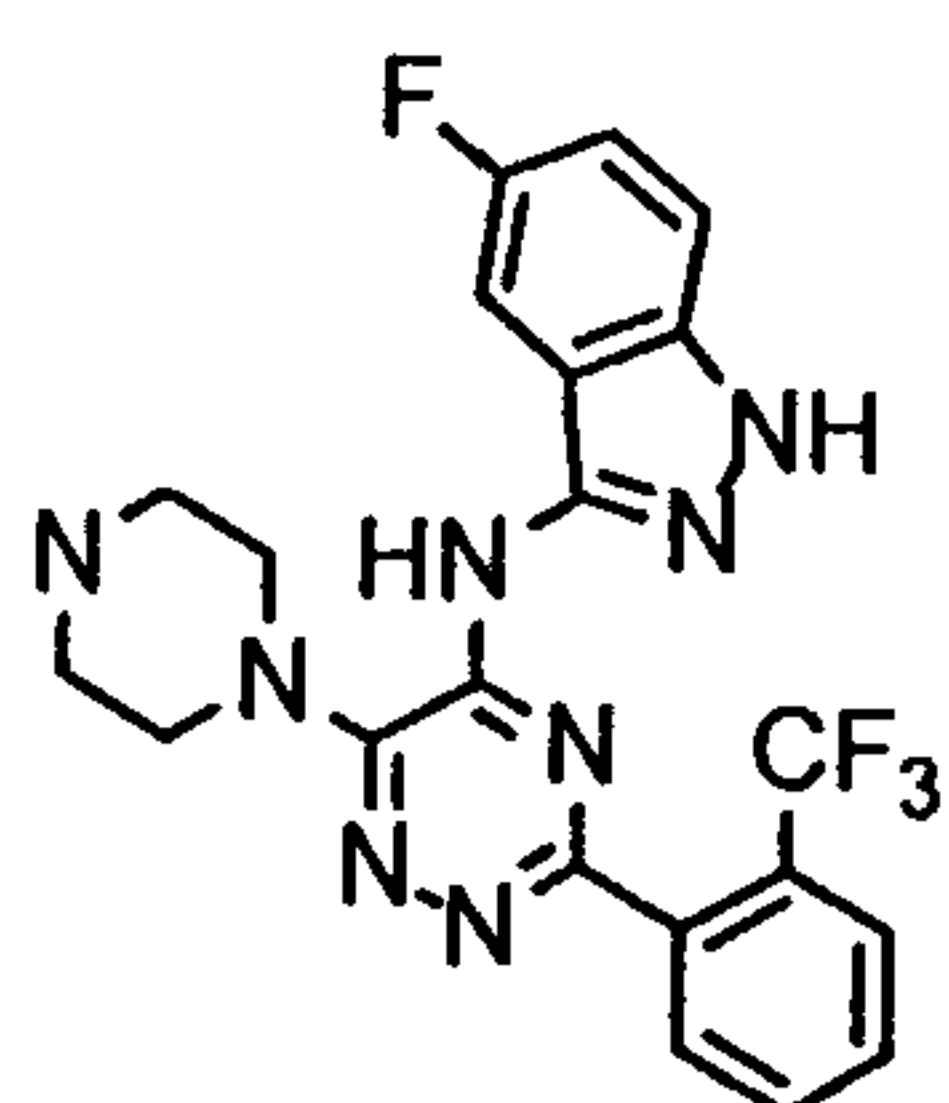
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56. The compound:



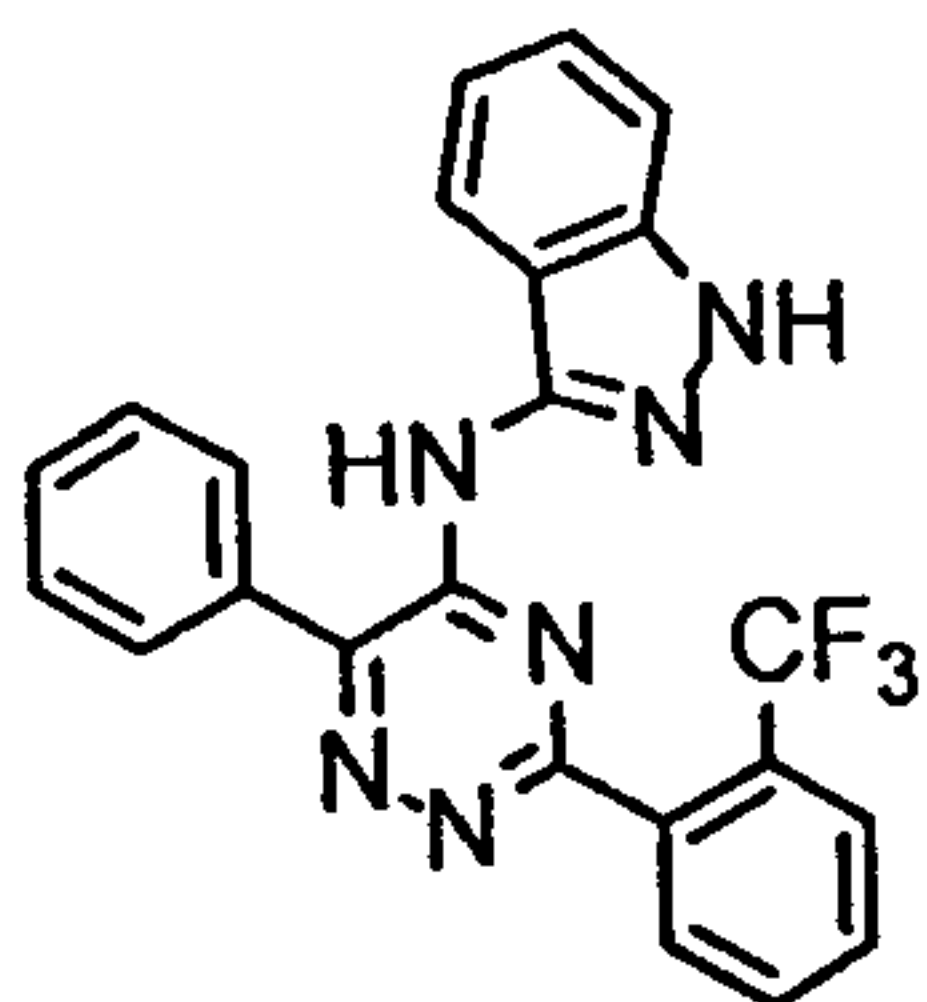
5 VIII-49, or a pharmaceutically acceptable salt thereof.

57. The compound:



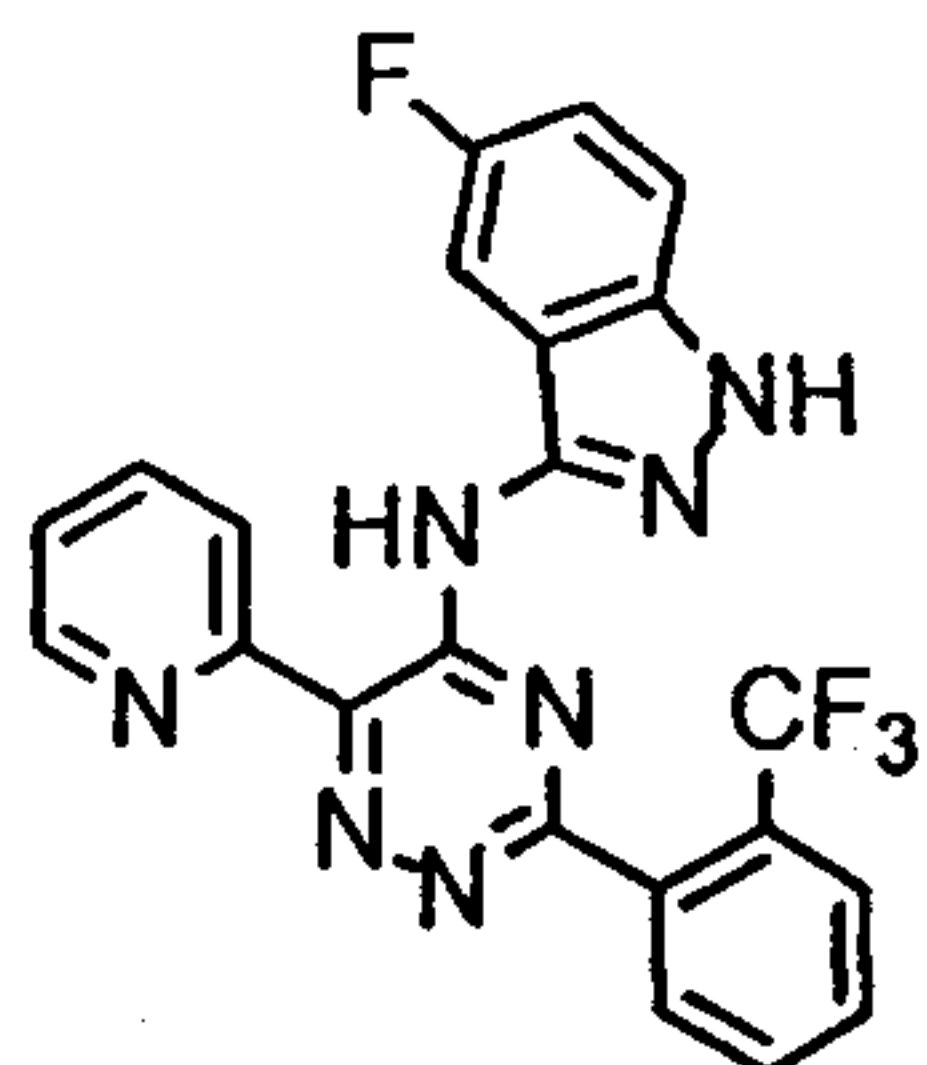
10 VIII-50, or a pharmaceutically acceptable salt thereof.

58. The compound:



15 VIII-51, or a pharmaceutically acceptable salt thereof.

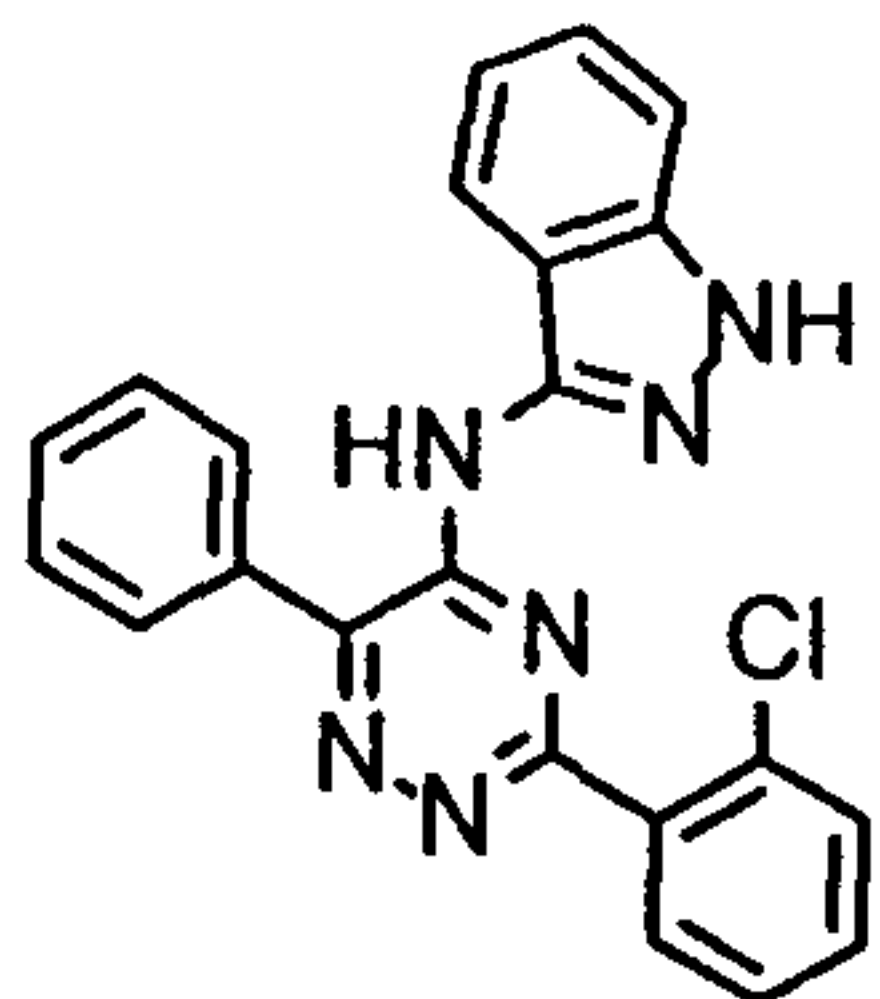
59. The compound:



20 VIII-52, or a pharmaceutically acceptable salt thereof.

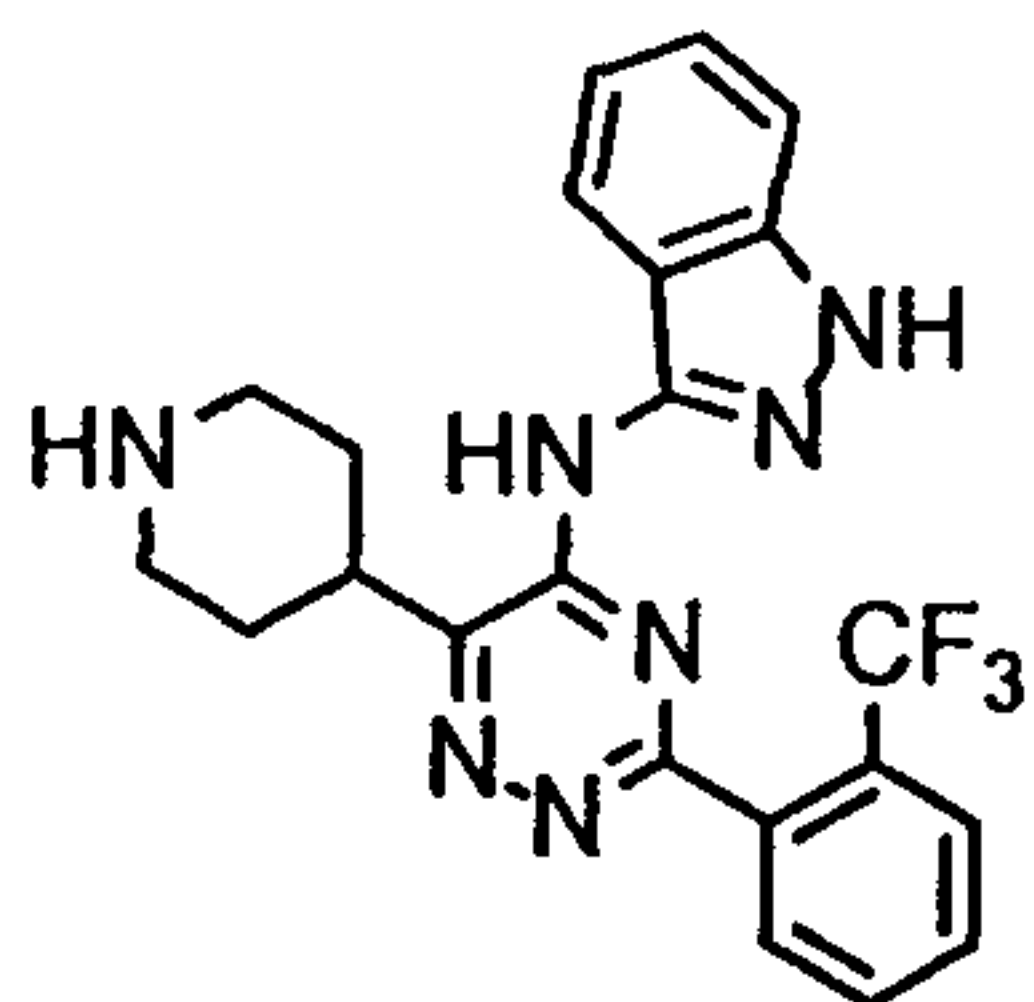
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60. The compound:



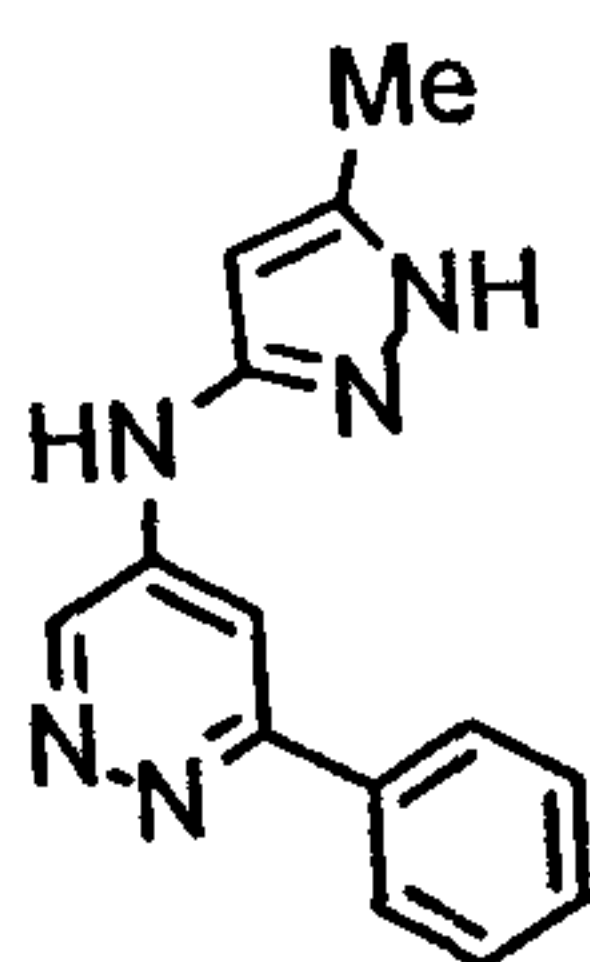
5 VIII-53, or a pharmaceutically acceptable salt thereof.

61. The compound:



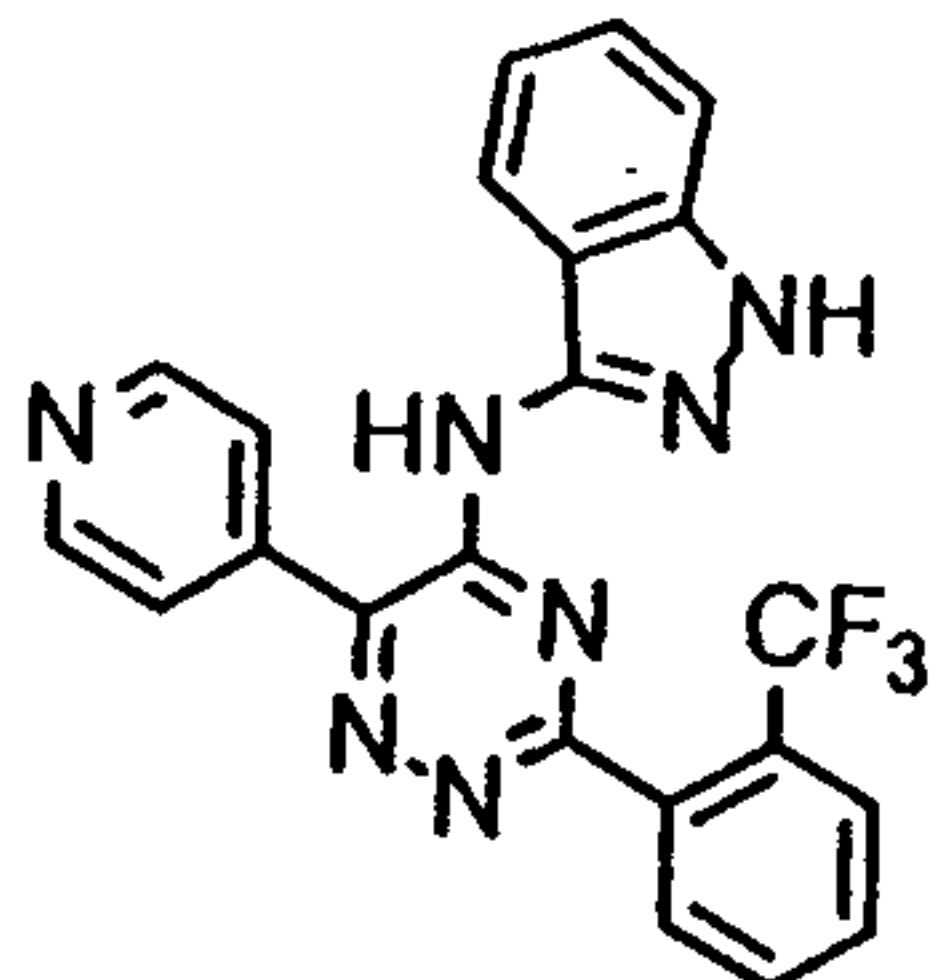
10 VIII-54, or a pharmaceutically acceptable salt thereof.

62. The compound:



15 VIII-55, or a pharmaceutically acceptable salt thereof.

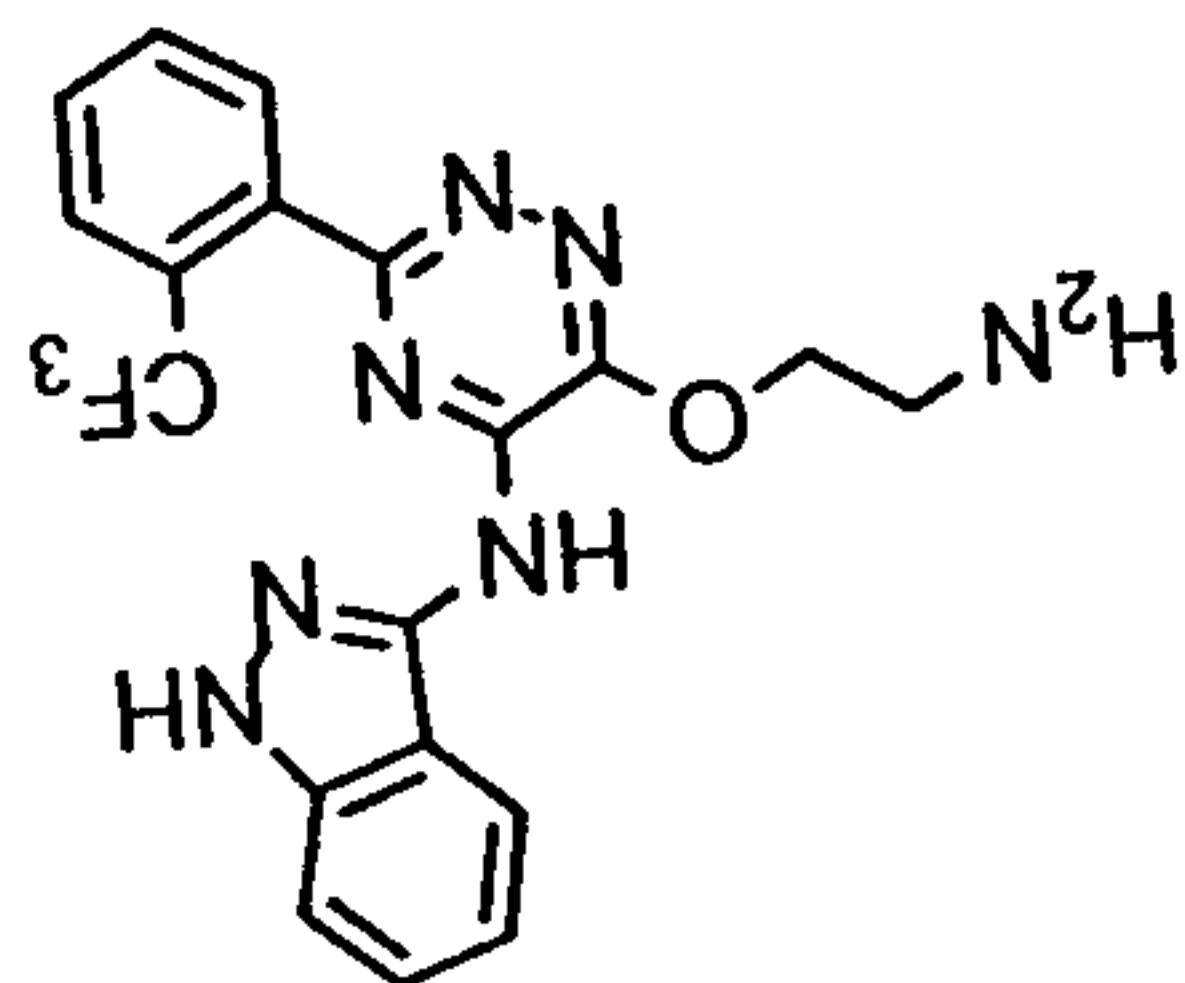
63. The compound:



20 VIII-56, or a pharmaceutically acceptable salt thereof.

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64. The compound:



5 VIII-57, or a pharmaceutically acceptable salt thereof.

65. A composition comprising a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, and a pharmaceutically acceptable carrier.

10 66. The composition according to claim 65 for use in the inhibition of glycogen synthase kinase-3 (GSK-3) activity in a patient.

67. The composition according to claim 65 for use in the inhibition of Aurora activity in a patient.

68. The composition according to claim 65 for use in the treatment of a disease that is alleviated by treatment with a GSK-3 inhibitor.

15 69. The composition according to claim 68, comprising a further therapeutic agent in addition to the compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof.

70. The composition according to claim 68, wherein said disease is diabetes.

20 71. The composition according to claim 68, wherein said disease is Alzheimer's disease.

72. The composition according to claim 68, wherein said disease is schizophrenia.

25 73. The composition according to claim 65 for use in the enhancement of glycogen synthesis in a patient.

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74. The composition according to claim 65 for use in lowering blood levels of glucose in a patient.

75. The composition according to claim 65 for use in the inhibition of the production of hyperphosphorylated Tau protein in a patient.

5 76. The composition according to claim 65 for use in the inhibition of the phosphorylation of β -catenin in a patient.

77. The composition according to claim 65 for use in the treatment of a disease that is alleviated by treatment with an aurora inhibitor.

10 78. The composition according to claim 77, comprising a further therapeutic agent in addition to the compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof.

79. The composition according to claim 77, wherein said disease is cancer.

15 80. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for use in the inhibition of GSK-3 activity in a patient.

81. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for use in the inhibition of Aurora activity in a patient.

20 82. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for use in the treatment of a disease that is alleviated by treatment with a GSK-3 inhibitor.

25 83. The use according to claim 82 wherein the compound is used in combination with a further therapeutic agent.

84. The use according to claim 82, wherein said disease is diabetes.

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85. The use according to claim 82, wherein said disease is Alzheimer's disease.

86. The use according to claim 82, wherein said disease is schizophrenia.

5 87. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for use in the enhancement of glycogen synthesis in a patient.

88. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for
10 use in lowering blood levels of glucose in a patient.

89. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for use in the inhibition of the production of hyperphosphorylated Tau protein in a patient.

15 90. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for use in the inhibition of the phosphorylation of β -catenin in a patient.

91. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for
20 use in the treatment of a disease that is alleviated by treatment with an aurora inhibitor.

92. The use according to claim 91, wherein the compound is used in combination with a further therapeutic agent.

93. The use according to claim 91, wherein said disease is cancer.

25 94. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the inhibition of GSK-3 activity in a patient.

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95. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the inhibition of Aurora activity in a patient.

96. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the treatment of a disease that is alleviated by treatment with a GSK-3 inhibitor.

97. The use according to claim 96, wherein the compound is used in combination with a further therapeutic agent.

98. The use according to claim 96, wherein said disease is diabetes.

99. The use according to claim 96, wherein said disease is Alzheimer's disease.

100. The use according to claim 96, wherein said disease is schizophrenia.

101. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the enhancement of glycogen synthesis in a patient.

102. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in lowering blood levels of glucose in a patient.

103. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the inhibition of the production of hyperphosphorylated Tau protein in a patient.

104. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the inhibition of the phosphorylation of β -catenin in a patient.

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105. Use of a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof, in the treatment of a disease that is alleviated by treatment with an aurora inhibitor.

106. The use according to claim 105, wherein the compound is used in combination with a further therapeutic agent.

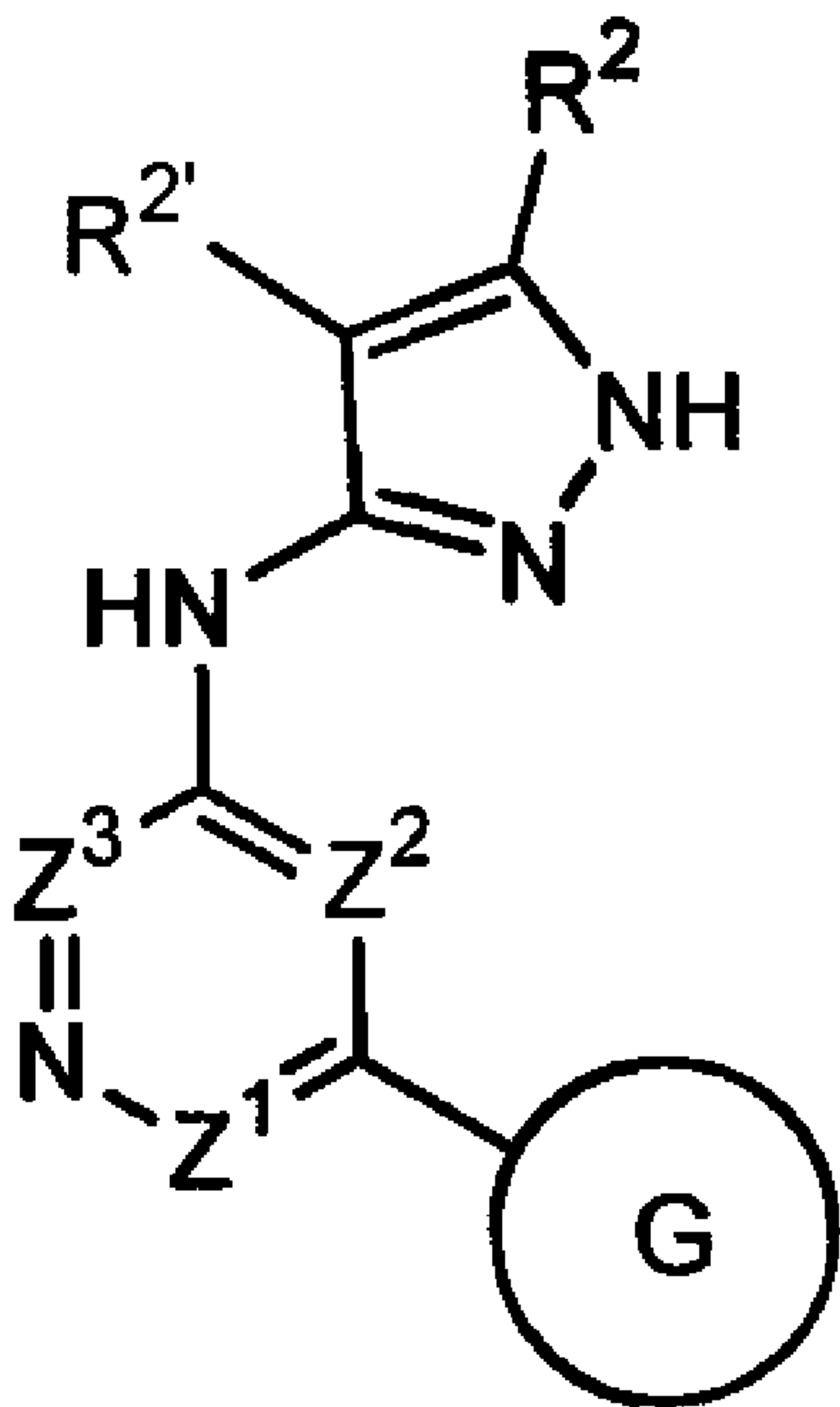
107. The use according to claim 105, wherein said disease is cancer.

108. A method of inhibiting GSK-3 or Aurora activity in a biological sample comprising contacting said biological sample with a compound as defined in any one of claims 1 to 64, or a pharmaceutically acceptable salt thereof.

10

SMART & BIGGAR
OTTAWA, CANADA

PATENT AGENTS



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