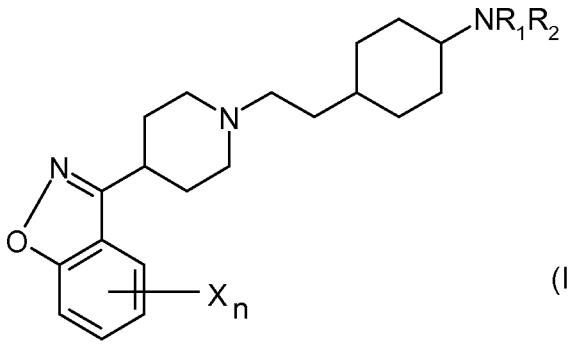
DUAL MODULATORS OF 5-HT2A AND D3 RECEPTORS

The present invention relates to compounds of the general formula (I)



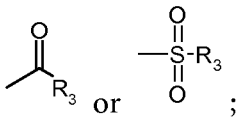
(I)

wherein:

X is independently halogen, cyano; C_{1-6}-alkyl, C_{1-6}-alkoxy or C_{1-6}-haloalkyl;

n is 0, 1, 2 or 3;

R^1 is H or C_{1-6}-alkyl;

R^2 is  or ;

R^3 is hydrogen, C_{1-6}-alkyl, C_{2-6}-alkenyl, C_{2-6}-alkynyl, C_{1-6}-alkoxy, C_{3-10}-cycloalkyl, aryl, 4 to 10 membered heterocycloalkyl, or 5 to 10 membered heteroaryl, which are optionally substituted by one to five substituents selected from the group consisting of:

halo,

cyano,

$-SO_2-C_{1-6}$-alkyl,

hydroxyl,

C_{1-6}-alkyl,

C_{1-6}-haloalkyl,

$-CO(O)-C_{1-6}$-alkyl,

C_{1-6}-alkoxy optionally substituted by one or more R^a,

C_{3-10}-cycloalkyl optionally substituted by one or more R^a,

4 to 10 membered heterocycloalkyl optionally substituted by one or more R^a,

aryl optionally substituted by one or more R^a,
5 to 10 membered heteroaryl optionally substituted by one or more R^a, and
$-NR^bR^c$, wherein R^b is H or C_{1-6}-alkyl and wherein R^c is H, C_{1-6}-alkyl or aryl optionally substituted by one or more R^a;
wherein R^a is selected from:
halo,
cyano,
oxo,
hydroxyl,
halobenzenesulfonyl,
C_{1-6}-alkyl
C_{1-6}-haloalkyl,
-NH(CO)-C_{1-6}-alkyl,
di(C_{1-6})alkylamino,
-O(CO)-C_{1-6}-alkyl,
C_{1-6}-alkylsulfonyl,
C_{1-6}-alkoxy
C_{1-6}-haloalkoxy,
4 to 10 membered heterocycloalkyl
aryl,
aryloxy, or
5 to 10 membered heteroaryl;
as well as pharmaceutically acceptable salts thereof.

It has been surprisingly found that the compounds of formula (I) according to the invention are dual modulators of the serotonin 5-HT_{2a} and dopamine D_3 receptors.

The compounds of the invention have high affinity for the dopamine D_3 and serotonin (5-Hydroxytryptamine; 5-HT) 5-HT_{2A} receptors and are effective in the treatment of psychotic disorders, as well as other diseases such as depression and anxiety, drug dependence, dementias and memory impairment. Psychotic disorders encompass a variety of diseases, which include schizophrenia, schizoaffective disorders, bipolar disease, mania, psychotic depression, and other psychoses involving paranoia and delusions.

In particular schizophrenia is characterized by complex symptomatology including positive symptoms, (i.e. delusions and hallucinations), and negative symptoms, (i.e. anhedonia, restricted fluency and productivity of thought and speech). In addition it is

now well recognized that cognitive impairment is the third major diagnostic category of schizophrenia, characterized by loss in working memory as well as other deficits. Other symptoms include aggressiveness, depression and anxiety (Stahl, S. M. (2000) Essential Psychopharmacology. Neuroscientific Basis and Practical Applications. Cambridge University Press, second edition, Cambridge, UK). The different categories and the clinical features of the disorder are defined in diagnostic schemes such as DSM-IV (Diagnostic and statistical manual of mental disorders, 4^{th} edition) or ICD-10 (International classification of diseases, 10^{th} edition). Currently used medications to treat schizophrenia, bipolar mania and other psychoses, include antipsychotics both typical (D_2/D_3 preferring) or the more recent atypicals, which exhibit polypharmacology interacting at multiple receptors (eg., D_1, D_2, D_3, D_4, 5-HT_{1A}, 5-HT_{2A}, 5-HT_{2C}, H_1, M_1, M_2, M_4, etc; Roth, B. L. et al. (2004) Magic shotguns versus magic bullets: selectively non-selective drugs for mood disorders and schizophrenia. Nat. Rev. Drug Discov. 3, 353-359). These antipsychotics, although relatively successful (some patients exhibit treatment resistance) at treating the positive symptoms of schizophrenia, are less effective at treating negative symptoms, cognitive deficits, and associated depression and anxiety, all of which lead to reduced patient quality of life and socioeconomic problems (Lieberman, J. A. et al. Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) Investigators. (2005) Effectiveness of antipsychotic drugs in patients with chronic schizophrenia. N. Engl. J. Med. 353, 1209-1223). Furthermore, patient compliance is compromised by prevalent side effects such as weight gain, extrapyramidal symptoms (EPS), and cardiovascular effects (Lieberman, J. A. et al. Clinical Antipsychotic Trials of Intervention Effectiveness (CATIE) Investigators. (2005) Effectiveness of antipsychotic drugs in patients with chronic schizophrenia. N. Engl. J. Med. 353, 1209-1223). In the current invention, compounds with high affinity and greater selectivity for D_3 and 5-HT_{2A} receptors are described and are proposed to treat psychoses and other diseases, with fewer associated side affects.

Dopamine, a major catecholamine neurotransmitter, is involved in the regulation of a variety of functions which include emotion, cognition, motor functions, and positive reinforcement, (Purves, D. et al. (2004) Neuroscience. Sinauer, third edition, Sunderland, Massachusetts). The biological activities of dopamine are mediated through G protein-coupled receptors (GPCRs) and in human, five different dopamine receptors D_1-D_5 have been identified, where the D_2-like receptors (D_2, D_3 and D_4) couple to the G-protein $G_{\alpha I}$ (Missale, C. et al.. (1998) Dopamine receptors: from structure to function. Physiol. Rev. 78, 189-225). The D_3 dopamine receptor is most highly expressed in the nucleus accumbens (Gurevich, E. V., Joyce, J. N. (1999) Distribution of dopamine D3 receptor

expressing neurons in the human forebrain: comparison with D2 receptor expressing neurons. Neuropsychopharmacology 20, 60-80), and is proposed to modulate the mesolimbic pathway consisting of neuronal projections from the ventral tegmental area, hippocampus and amygdala to the nucleus accumbens, which projects to the prefrontal and cingulate cortices as well as various thalamic nuclei. The limbic circuit is thought to be important for emotional behavior and thus D_3 receptor antagonists are proposed to modulate psychotic symptoms such as hallucinations, delusions and thought disorder (Joyce, J. N. and Millan, M. J., (2005) Dopamine D3 receptor antagonists as therapeutic agents. Drug Discovery Today, 1 Jul, Vol. 10, No. 13, 917-25), while these antagonists spare the D_2 modulated striatal extrapyramidal system (associated with EPS induction). In addition, it has been reported that drug naive schizophrenic patients show altered levels of D_3 receptor expression (Gurevich, E. V. et al. (1997) Mesolimbic dopamine D3 receptors and use of antipsychotics in patients with schizophrenia. A postmortem study. Arch. Gen. Psychiatry 54, 225-232) and dopamine release (Laruelle, M. (2000) Imaging dopamine dysregulation in schizophrenia: implication for treatment. Presented at Workshop Schizophr.: Pathol. Bases and Mech. Antipsychotic Action, Chicago), indicating that a disturbed homeostasis of dopamine plays an important role in the etiology of schizophrenic symptoms.

The neurotransmitter serotonin is implicated in several psychiatric conditions including schizophrenia (Kandel, E. R. et al. (eds.; 2000) Principles of Neural Science, 3rd edition Appleton & Lange, Norwalk, CT). The involvement of serotonin in psychotic disorders is suggested by multiple studies which include treatment in humans with the psychotropic drug Lysergic acid (LSD; a serotonin agonist) which can induce schizophrenia-like symptoms such as hallucinations (Leikin, J. B. et al. (1989) Clinical features and management of intoxication due to hallucinogenic drugs. Med. Toxicol. Adverse Drug Exp. 4, 324-350). Furthermore, altered brain distribution of serotonin receptors as well as an altered serotonergic tone, have been detected in schizophrenic patients (Harrison, P. J. (1999) Neurochemical alterations in schizophrenia affecting the putative receptor targets of atypical antipsychotics. Focus on dopamine (D1, D3, D4) and 5-HT2A receptors. Br. J. Psychiatry Suppl. 38, 12-22). In mammals serotonin exerts its biological activities through a family of 14 5-HT GPCRs (Barnes, N. M., Sharp, T. (1999) A review of central 5-HT receptors and their function. Neuropharmacology 38, 1083-1152). The 5-HT_{2A} receptor is most prominently expressed in the prefrontal cortex and at lower levels in the basal ganglia and the hippocampus in human brain (Pompeiano, M. et al. (1994) Distribution of the serotonin 5-HT2 receptor family mRNAs: comparison between 5-HT2A and 5-HT2C receptors. Brain Res. Mol. Brain Res. 23, 163-178; Pazos,

A., Probst, A., Palacios, J. M. (1987) Serotonin receptors in the human brain--IV. Autoradiographic mapping of serotonin-2 receptors. Neuroscience 21, 123-139), and is coupled predominantly to the G-protein $G_{\alpha q}$ (Roth, B. L. et al. (1998) 5-Hydroxytryptamine2-family receptors (5-hydroxytryptamine2A, 5-hydroxytryptamine2B, 5-hydroxytryptamine2C): where structure meets function. Pharmacol. Ther. 79, 231-257). Genetic linkage studies of a 5-HT_{2A} polymorphism to schizophrenia (Spurlock, G. et al. (1998) A family based association study of T102C polymorphism in 5HT2A and schizophrenia plus identification of new polymorphisms in the promoter. Mol. Psychiatry 3, 42-49), as well as responsiveness to antipsychotic drugs (Arranz, M. J. et al. (2000) Pharmacogenetic prediction of clozapine response. Lancet 355, 1615-1616), further suggests a role for the 5-HT_{2A} receptor both in the treatment and pathology of psychosis. In addition, dopaminergic neurotransmission appears to be under the afferent regulation of the 5-HT_{2A} receptor (Porras, G. et al. 5-HT2A and 5-HT2C/2B receptor subtypes modulate dopamine release induced in vivo by amphetamine and morphine in both the rat nucleus accumbens and striatum. Neuropsychopharmacology 26, 311-324 - 2002). Overall 5-HT_{2A} receptor antagonists are proposed to be suitable for the treatment of disorders associated with dysfunctional dopaminergic systems. Moreover, 5-HT_{2A} receptor antagonism has been recognized as beneficial for the treatment of psychosis (reviewed in de Angelis, L. (2002) 5-HT2A antagonists in psychiatric disorders. Curr. Opin. Investig. Drugs 3, 106-112) and indeed is one of the defining features of so-called atypical antipsychotic drugs which are characterized by a relatively high affinity for the 5-HT_{2A} - relative to the D_2 receptor (Meltzer, H. Y. et al. (1989) Classification of typical and atypical antipsychotic drugs on the basis of dopamine D-1, D-2 and serotonin2 pKi values. J. Pharmacol. Exp. Ther. 251, 238-246).

As mentioned hereinabove, the compounds of the invention have high affinity for the dopamine D_3 and serotonin 5-HT_{2A} receptors and are expected to be effective in the treatment of psychotic disorders which include schizophrenia, schizoaffective disorders, bipolar disease, mania, psychotic depression, and other psychoses involving paranoia and delusions (Reavill-C, et al. (2000) Pharmacological actions of a novel, high-affinity, and selective human dopamine D3 receptor antagonist, SB-277011-A. JPET 294:1154–1165; Harrison, P. J. (1999) Neurochemical alterations in schizophrenia affecting the putative receptor targets of atypical antipsychotics. Focus on dopamine (D1, D3, D4) and 5-HT2A receptors. Br. J. Psychiatry Suppl. 38, 12-22; de Angelis, L. (2002) 5-HT2A antagonists in psychiatric disorders. Curr. Opin. Investig. Drugs 3, 106-112; Joyce, J. N. and Millan, M. J., (2005) Dopamine D3 receptor antagonists as therapeutic agents. Drug

Discovery Today, 1 Jul, Vol. 10, No. 13, P. 917-25); drug dependency and abuse and withdrawal (Vorel, S. R. et al. (2002) Dopamine D3 receptor antagonism inhibits cocaine-seeking and cocaine-enhanced brain reward in rats. J. Neurosci., 22, 9595–9603; Campos, A. C. et al. (2003) The dopamine D3 receptor antagonist SB277011A antagonizes nicotine-enhanced brain-stimulation reward in rat. Soc. Neurosci. Abstr., 322.8; Ashby, et al. (2003) Acute administration of the selective D3 receptor antagonist SB-277011-A blocks the acquisition and expression of the conditioned place preference response to heroin in male rats. Synapse, 48, 154–156); anxiety, and depression (Reavill-C et al. (2000) Pharmacological actions of a novel, high-affinity, and selective human dopamine D3 receptor antagonist, SB-277011-A. JPET 294:1154–1165; Drescher, K. et al. (2002) In vivo effects of the selective dopamine D3 receptor antagonist A-437203. Am. Soc. Neurosci. 894.6).

Compounds of formula (I) may form acid addition salts with acids, such as conventional pharmaceutically acceptable acids, for example hydrochloride, hydrobromide, phosphate, acetate, fumarate, maleate, salicylate, sulphate, pyruvate, citrate, lactate, mandelate, tartarate, and methanesulphonate. Preferred are the hydrochloride salts. Also solvates and hydrates of compounds of formula I and their salts form part of the present invention.

Compounds of formula (I) can have one or more asymmetric carbon atoms and can exist in the form of optically pure enantiomers, mixtures of enantiomers such as, for example, racemates, optically pure diastereoisomers, mixtures of diastereoisomers, diastereoisomeric racemates or mixtures of diastereoisomeric racemates. The optically active forms can be obtained for example by resolution of the racemates, by asymmetric synthesis or asymmetric chromatography (chromatography with a chiral adsorbens or eluant). The invention embraces all of these forms.

It will be appreciated, that the compounds of general formula (I) in this invention may be derivatised at functional groups to provide derivatives which are capable of conversion back to the parent compound in vivo. Physiologically acceptable and metabolically labile derivatives, which are capable of producing the parent compounds of general formula I in vivo are also within the scope of this invention.

The following definitions of the general terms used in the present description apply irrespective of whether the terms in question appear alone or in combination. It must be noted that, as used in the specification and the appended claims, the singular forms "a", "an," and "the" include plural forms unless the context clearly dictates otherwise.

"Aryl" represents an aromatic carbocyclic group consisting of one individual ring, or one or more fused rings in which at least one ring is aromatic in nature. Preferred aryl groups are those having from 6 to 10 ring atoms. Preferred aryl groups include phenyl and naphthyl, as well as those specifically illustrated by the examples herein below.

"Aryloxy" denotes an aryl group as defined hereinabove and the aryl group is connected via an oxygen atom. An example of aryloxy is phenoxy.

"C_{1-6}-alkyl" denotes a straight- or branched-chain hydrocarbon group containing from 1 to 6 carbon atoms, for example, methyl, ethyl, propyl, isopropyl, isobutyl, sec-butyl, tert-butyl, pentyl, n-hexyl as well as those specifically illustrated by the examples herein below.

"Di(C_{1-6}-alkyl)amino" denotes a nitrogen atom substituted by two C_{1-6}-alkyl groups as defined hereinabove. Examples of di(C_{1-6}-alkyl)amino are dimethylamino, diethylamino, dipropylamino, methylethylamino as well as those groups which are sepcifically illustrated by the examples herein below.

"Halo" or "Halogen" denotes chlorine, iodine, fluorine and bromine.

"C_{1-6}-haloalkyl" denotes a C_{1-6}-alkyl group as defined above which is substituted by one or more halogen atom. Examples of C_{1-6}-haloalkyl include but are not limited to methyl, ethyl, propyl, isopropyl, isobutyl, sec-butyl, tert-butyl, pentyl or n-hexyl substituted by one or more Cl, F, Br or I atom(s) as well as those groups specifically illustrated by the examples herein below. Preferred C_1-C_7-haloalkyl are difluoro- or trifluoro-methyl or ethyl.

"C_{1-6}-alkylsulfonyl" denotes a sulfonyl group (SO_2) which is substituted by a C_{1-6}-alkyl group as defined above.

"C_{1-6}-alkoxy" denotes a group wherein the alkyl group is as defined above and the alkyl group is connected via an oxygen atom.

"C_{1-6}-haloalkoxy" denotes a C_{1-6}-alkoxy group as defined above which is substituted by one or more halogen atom. Examples of C_{1-6}-haloalkoxy include but are not limited to methoxy or ethoxy, substituted by one or more Cl, F, Br or I atom(s) as well as those groups specifically illustrated by the examples herein below. Prefered C_1-C_7 haloalkoxy are difluoro- or trifluoro-methoxy or ethoxy.

The term "lower alkenyl" denotes a straight- or branched-chain carbon group containing from 2-7, preferably from 2 – 4, carbon atoms, wherein at least one bond is a double bond.

The term "thioalkyl" denotes the group – SR wherein R is an alkyl group as defined above.

"C_{3-10}-cycloalkyl" denotes a monovalent saturated cyclic moiety, consisting of one, two or three carbon rings having 3 to 10 carbon atoms as ring members and includes but is not limited to cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl and polyspiro groups such as bicyclo[2.2.2]octanyl, bicyclo[2.2.1]heptanyl, bicyclo[3.2.1]octanyl or adamantanyl as well as those groups specifically illustrated by the examples herein below.

The term "thiophenyl" as used herein is synonymous with "thienyl" and denotes a thiophene substituent, i.e., C_4H_4S.

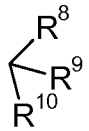
"5 to 10 membered heteroaryl" means a monocyclic, bicyclic or tricyclic radical of 5 to 10 ring atoms having at least one aromatic ring and furthermore containing one, two, or three ring heteroatoms selected from N, O, and S, the remaining ring atoms being C. Heteroaryl can optionally be substituted with one, two, three or four substituents, wherein each substituent is independently hydroxy, cyano, alkyl, alkoxy, thioalkyl, halo, haloalkyl, hydroxyalkyl, alkoxycarbonyl, amino, acetyl, -NHCOOC$(CH_3)_3$ or halogen substituted benzyl, or for the non aromatic part of cyclic ring also by oxo, unless otherwise specifically indicated. Examples of heteroaryl moieties include, but are not limited to, optionally substituted imidazolyl, optionally substituted thiophenyl, optionally substituted oxazolyl, optionally substituted isoxazolyl, optionally substituted thiazolyl, optionally substituted pyrazinyl, optionally substituted pyrrolyl, , optionally substituted pyridinyl, optionally substituted pyrimidinyl, optionally substituted pyridazinyl, optionally substituted indolyl, optionally substituted isoindolyl, optionally substituted 2,3-dihydroinidolyl, optionally substituted indazolyl, optionally substituted naphthyridinyl, optionally substituted isoquinolinyl, optionally substituted carbazol-9-yl, optionally substituted furanyl, optionally substituted benzofuranyl, optionally substituted quinolinyl, optionally substituted benzo[1,3]dioxolyl, optionally substituted benzo[1,2,3]thiadiazolyl, optionally substituted benzo[b]thiophenyl, optionally substituted 9H-thioxanthenyl, optionally substituted thieno[2,3-c]pyridinyl, optionally substituted 3H-imidazo[4,5,b]pyridinyl, optionally substituted phthalazinyl, optionally substituted 2,3-dihydrobenzo[1,4]dioxinyl, and the like or those which are specifically

exemplified herein. Preferred 5 to 10 membered heteroaryls are 5 or 6 membered heteroaryls.

"4 to 10 heterocycloalkyl" means a monovalent saturated moiety, consisting of one, two or three rings, incorporating one, two, or three heteroatoms (chosen from nitrogen, oxygen or sulfur). Heterocycloalkyl can optionally be substituted with one, two, three or four substituents, wherein each substituent is independently hydroxy, alkyl, alkoxy, thioalkyl, halo, haloalkyl, hydroxyalkyl, alkoxycarbonyl, amino, alkylamino, dialkylamino, aminocarbonyl, or carbonylamino, unless otherwise specifically indicated. Examples of heterocyclic moieties include, but are not limited to, piperidinyl, piperazinyl, homopiperazinyl, azepinyl, pyrrolidinyl, pyrazolidinyl, imidazolinyl, imidazolidinyl, oxazolidinyl, isoxazolidinyl, morpholinyl, thiazolidinyl, isothiazolidinyl, quinuclidinyl, quinolinyl, isoquinolinyl, benzimidazolyl, chromanyl, thiadiazolylidinyl, benzothiazolidinyl, benzoazolylidinyl, dihydrofuryl, tetrahydrofuryl, dihydropyranyl, tetrahydropyranyl, thiomorpholinyl, dioxothiomorpholinyl thiomorpholinylsulfoxide, thiomorpholinylsulfone, dihydroquinolinyl, dihydrisoquinolinyl, tetrahydroquinolinyl, tetrahydroisoquinolinyl, 1-oxo- thiomorpholin, 1,1-dioxo-thiomorpholin, 1,4-diazepane, 1,4-oxazepane as well as those groups specifically illustrated by the examples herein below. Preferred 5 to 10 membered heterocycloalkyls are 5 or 6 membered heterocycloalkyls.

"One or more" denotes herein, 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10 and preferably 1, 2, 3, 4 or 5 and still more preferably 1, 2 or 3.

"Oxo" denotes a group =O.

Where R^3 is the group , R^8 and R^9 can form a 3-, 4-, 5-, or 6-membered saturated ring, optionally comprising one or two heteroatoms selected from oxygen and nitrogen and R^{10} can be a substituent on the ring formed by R^8 and R^9. In such instances R^{10} can be, for example, halogen, cyano, hydroxyl, C_{1-6}alkyl, C_{1-6}haloalkyl, and C_{1-6}alkoxy.

"Pharmaceutically acceptable" such as pharmaceutically acceptable carrier, excipient, salts, etc., means pharmacologically acceptable, generally safe, substantially non-toxic to the subject to which the particular compound is administered, and neither biologically nor otherwise undesirable.

"Pharmaceutically acceptable salts" of a compound means salts that are pharmaceutically acceptable, as defined herein, and that possess the desired pharmacological activity of the parent compound. Such salts include acid addition salts formed with inorganic acids such as hydrochloric acid, hydrobromic acid, sulfuric acid, nitric acid, phosphoric acid, and the like; or formed with organic acids such as acetic acid, benzenesulfonic acid, benzoic, camphorsulfonic acid, citric acid, ethanesulfonic acid, fumaric acid, glucoheptonic acid, gluconic acid, glutamic acid, glycolic acid, hydroxynaphtoic acid, 2-hydroxyethanesulfonic acid, lactic acid, maleic acid, malic acid, malonic acid, mandelic acid, methanesulfonic acid, muconic acid, 2-naphthalenesulfonic acid, propionic acid, salicylic acid, succinic acid, tartaric acid, p-toluenesulfonic acid, trimethylacetic acid, and the like.

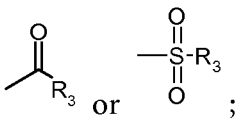
"Therapeutically effective amount" means an amount that is effective to prevent, alleviate or ameliorate symptoms of disease or prolong the survival of the subject being treated.

Also encompassed by the compounds of formula (I) are those compounds wherein

X is independently halogen, cyano; C_{1-6}-alkyl, C_{1-6}-alkoxy or C_{1-6}-haloalkyl;

n is 0, 1, 2 or 3;

R^1 is H or C_{1-6}-alkyl;

R^2 is  or ;

R^3 is hydrogen, C_{1-6}-alkyl, C_{2-6}-alkenyl, C_{2-6}-alkynyl, C_{1-6}-alkoxy, C_{3-10}-cycloalkyl, 4 to 10 membered heterocycloalkyl, or 5 to 10 membered heteroaryl, which are optionally substituted by one to five substituents selected from the group consisting of:

halo,

hydroxy,

C_{1-6}-alkyl,

C_{1-6}-haloalkyl,

-CO(O)-C_{1-6}-alkyl,

C_{1-6}-alkoxy optionally substituted by one or more R^a,

C_{3-10}-cycloalkyl optionally substituted by one or more R^a,

4 to 10 membered heterocycloalkyl optionally substituted by one or more R^a,

aryl optionally substituted by one or more R^a,

5 to 10 membered heteroaryl optionally substituted by one or more R^a, and

$-NR^bR^c$, wherein R^b is H or C_{1-6}-alkyl and wherein R^c is H, C_{1-6}-alkyl or aryl optionally substituted by one or more R^a;

wherein R^a is selected from:

halo,
cyano,
oxo,
hydroxy,
halobenzenesulfonyl,
C_{1-6}-alkyl
C_{1-6}-haloalkyl,
-NH(CO)-C_{1-6}-alkyl,
di(C_{1-6})alkylamino,
-O(CO)-C_{1-6}-alkyl,
C_{1-6}-alkylsulfonyl,
C_{1-6}-alkoxy
C_{1-6}-haloalkoxy,
4 to 10 membered heterocycloalkyl
aryl,
aryloxy, or
5 to 10 membered heteroaryl;

as well as pharmaceutically acceptable salts thereof.

Also encompassed by the compounds of formula (I) are those compounds wherein

X is fluorine or chlorine;

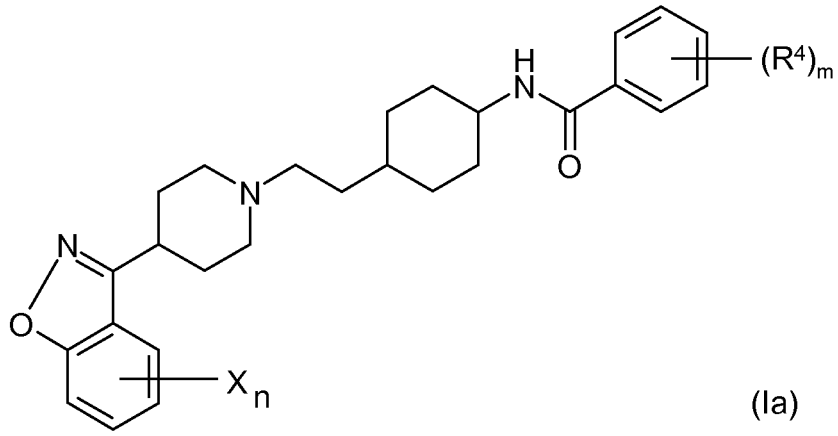
n is 0, 1 or 2;

R^1 is hydrogen;

R^2 is , and

wherein R^3 is as defined hereinabove for formula (I) as well as pharmaceutically acceptable salts thereof.

Also encompassed by the compounds of formula (I) are the compounds of formula (Ia)



(Ia)

wherein

X is fluorine or chlorine;

n is 0, 1 or 2;

m is 0, 1, 2 or 3;

R^4 is selected from the group consisting of:

halo,

cyano,

hydroxy,

C_{1-6}-alkyl,

C_{1-6}-haloalkyl,

di(C_{1-6})alkylamino,

-CO(O)-C_{1-6}-alkyl,

C_{1-6}-alkoxy optionally substituted by one or more R^a,

C_{3-10}-cycloalkyl optionally substituted by one or more R^a,

4 to 10 membered heterocycloalkyl optionally substituted by one or more R^a,

aryl optionally substituted by one or more R^a,

5 to 10 membered heteroaryl optionally substituted by one or more R^a,

and

$-NR^bR^c$,

wherein R^a, R^b and R^c are as defined hereinabove for formula (I) as well as pharmaceutically acceptable salts thereof.

Preferred compounds of formula (Ia) are the compounds wherein

X is fluorine or chlorine;

n is 1;

m is 0, 1 or 2;

R^4 is selected from the group consisting of:

halo,
C_{1-6}-alkoxy optionally substituted by one or more R^a,
6 membered heterocycloalkyl optionally substituted by one or more R^a, and
5 to 6 membered heteroaryl optionally substituted by one or more R^a,
wherein R^a is selected from halo, oxo, hydroxyl and C_{1-6}-alkyl,
as well as pharmaceutically acceptable salts thereof.

Especially preferred compounds of formula (Ia) are for example the following compounds:

3-Fluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide,

N-trans-(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-methoxy-benzamide

4-tert-Butoxy-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,

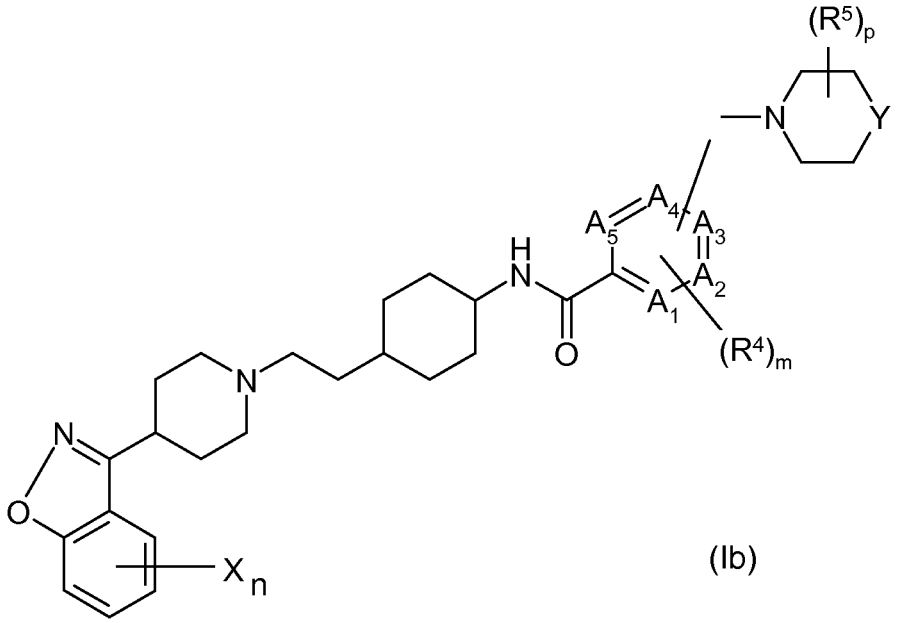
4-Chloro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,

N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-pyrrol-1-yl-benzamide,

Benzo[1,3]dioxole-5-carboxylic acid trans (4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide, and

Benzo[1,3]dioxole-5-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide.

Also encompassed by the compounds of formula (I) are the compounds of formula (Ib):



(Ib)

wherein

	X	is fluorine or chlorine;
	n	is 0, 1 or 2;
	m, p	are independently of each other 0, 1 or 2;
	R^4 and R^5	are selected from the group consisting of:
		halo,
		cyano,
		hydroxy,
		C_{1-6}-alkyl,
		C_{1-6}-haloalkyl,
		-CO(O)-C_{1-6}-alkyl,
		C_{1-6}-alkoxy optionally substituted by one or more R^a,
		C_{3-10}-cycloalkyl optionally substituted by one or more R^a,
		4 to 10 membered heterocycloalkyl optionally substituted by one or more R^a,
		aryl optionally substituted by one or more R^a,
		5 to 10 membered heteroaryl optionally substituted by one or more R^a, and
		$-NR^bR^c$,
		wherein R^a, R^b and R^c are as defined in claim 1;
	Y	is oxygen or -SO_2-;

one, two or three of A^1, A^2, A^3, A^4 and A^5 are nitrogen and the others are CR^6, or A^1, A^2, A^3, A^4 and A^5 are CR^6 wherein

each R^6 is independently hydrogen or R^7; and

each R^7 is independently C_{1-6}alkyl, C_{1-6}alkyloxy, hydroxyl, amino, C_{1-6}alkylamino, N,N-di-(C_{1-6}alkyl)-amino, halo, halo-C_{1-6}alkyl, halo-C_{1-6}alkoxy, hetero-C_{1-6}alkyl, C_{1-6}alkylsulfonyl, C_{1-6}alkylsulfanyl, cyano;

as well as pharmaceutically acceptable salts thereof.

Preferred compounds of formula (Ib) are the compounds wherein

X is fluorine;

n, m are 0 or1;

p is 0;

R^4 is selected from the group consisting of:

halo,

cyano,

hydroxy,

C_{1-6}-alkyl,

C_{1-6}-haloalkyl,

Y is oxygen or -SO_2-;

one or two of A^1, A^2, A^3, A^4 and A^5 are nitrogen and the others are CH_2;

as well as pharmaceutically acceptable salts thereof.

Especially preferred compounds of formula (Ib) are for example the following compounds:

N-trans-(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide,

N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide,

N-Trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-6-morpholin-4-yl-nicotinamide,

5-Morpholin-4-yl-pyrazine-2-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

6-Morpholin-4-yl-pyridazine-3-carboxylic acid-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

2-Morpholin-4-yl-pyrimidine-5-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

3-Fluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide,

4-(1,1-Dioxo-1,6-thiomorpholin-4-yl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,

N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-morpholin-4-yl-isonicotinamide,

N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-piperidin-1-yl-benzamide,

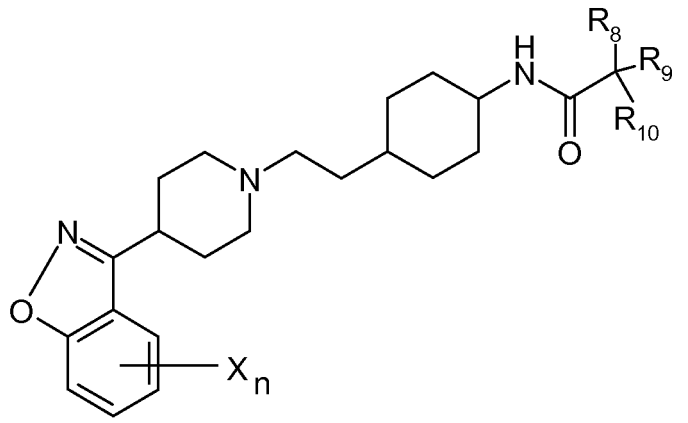
N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-piperidin-1-yl-benzamide,

4-(2,6-Dimethyl-morpholin-4-yl)-N-trans (4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,

4-(2,6-Dimethyl-morpholin-4-yl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide, and

4-(1,1-Dioxo-1,6,4-thiomorpholin-4-yl)-N trans -(4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide.

Also encompassed by the compounds of formula (I) are the compounds of formula (Ic):



(Ic)

wherein

X is fluorine or chlorine;

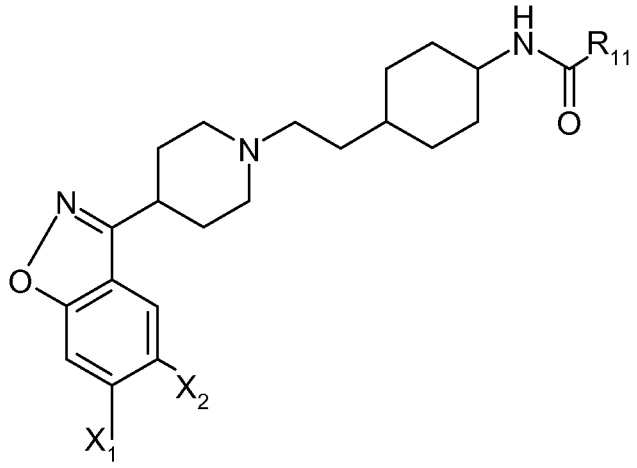
n is 0, 1 or 2;

R^8 and R^9 form a 3-, 4-, 5-, or 6-membered saturated ring, optionally comprising one or two heteroatoms selected from oxygen and nitrogen;

R^{10} can be a substituent on the ring formed by R^8 and R^9 and is selected from the group consisting of halogen, cyano, hydroxy, C_{1-6}-alkyl, C_{1-6}-haloalkyl and C_{1-6}-alkoxy;

as well as pharmaceutically acceptable salts thereof.

Also encompassed by the compounds of formula (I) are the compounds of formula (Id):



(Id)

wherein

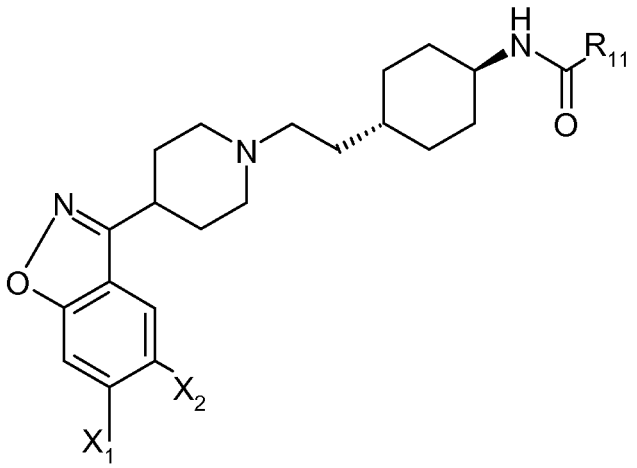
X_1 = H and X_2= fluoro or chloro; or

X_2 = H and X_1= fluoro or chloro; and

R^{11} is selected from the group consisting of C_{1-6}-alkyl and C_{1-6}-alkoxy, which are optionally substituted by halogen, hydroxy, C_{1-6}-alkyl, C_{1-6}-haloalkyl, C_{1-6}-alkoxy and C_{5-6}-cycloalkyl optionally substituted by C_{1-6}-alkyl or C_{1-6}-alkoxy;

as well as pharmaceutically acceptable salts thereof.

Special preference is given to the compounds of formula (Id'):



(Id')

wherein X_1, X_2, and R^{11} are as defined hereinabove for formula (Id) as well as pharmaceutically acceptable salts thereof.

Especially preferred compounds of formula (Id') are for example the following compounds:

4N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide,

Tetrahydro-pyran-4-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,

N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide,

N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,

Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine,

2,3-Dihydro-benzo[1,4]dioxine-2-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(3-methyl-pyrazol-1-yl)-acetamide,

3,3,3-Trifluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-propionamide,

2-(3,5-Dimethoxy-phenyl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3,3,3-trifluoro-2-hydroxy-propionamide,

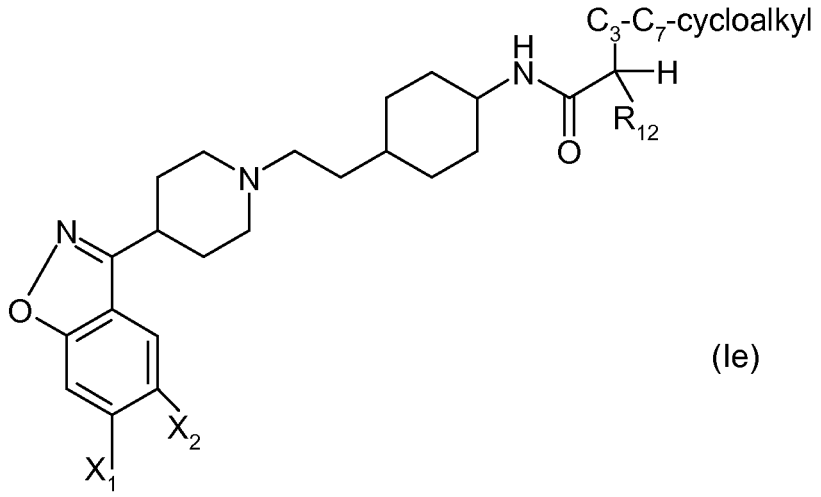
N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-pyran-2-yl)-acetamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-trans (4-methoxy-cyclohexyl)-acetamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(1,4-dioxa-spiro[4.5]dec-8-yl)-acetamide, and

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3,3-dimethoxy-propionamide.

Also encompassed by the compounds of formula (I) are the compounds of formula (Ie):



(Ie)

wherein

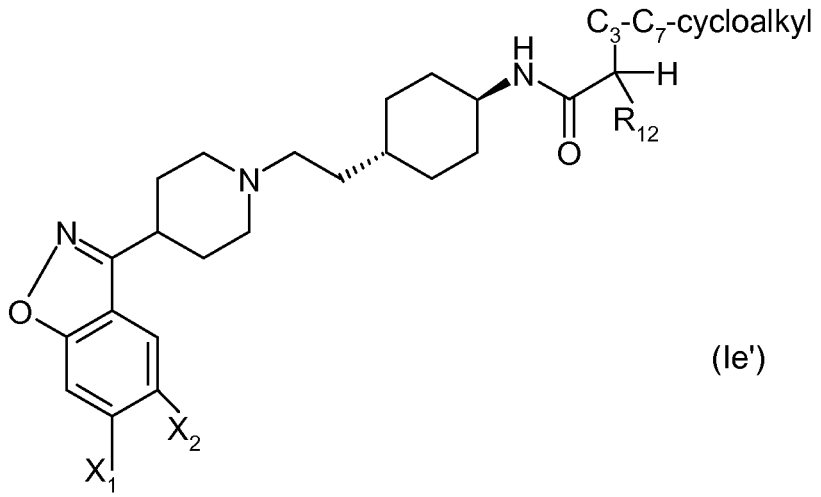
X_1 = H and X_2= fluoro or chloro; or

X_2 = H and X_1= fluoro or chloro; and

R^{12} is selected from the group consisting of halo, hydroxy, cyano, C_{1-6}-alkyl, C_{1-6}-haloalkyl and C_{1-6}-alkoxy;

as well as pharmaceutically acceptable salts thereof.

Special preference is given to the compounds of formula (Ie'):



(Ie')

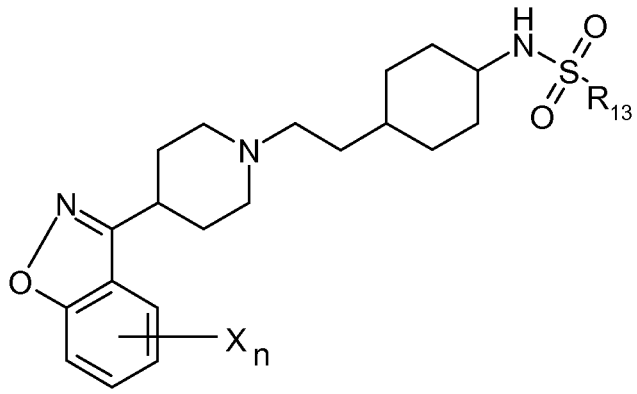
wherein X_1, X_2, and R^{12} are as defined hereinabove for formula (Ie) as well as pharmaceutically acceptable salts thereof.

Especially preferred compounds of formula (Ie') are for example the following compounds:

1-Hydroxy-cyclopropanecarboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide, and

1-Trifluoromethyl-cyclobutanecarboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide.

Also encompassed by the compounds of formula (I) are the compounds of formula (Ig):



(Ig)

wherein

X is fluorine or chlorine;

n is 0, 1 or 2;

R^{13} is selected from the group consisting of C_{1-6}-alkyl, C_{1-6}-haloalkyl, C_{1-6}-alkoxy, aryl optionally substituted by one or more R^a, and 5 to 10 membered heteroaryl optionally substituted by one or more R^a;

R^a halo, C_{1-6}-alkyl and C_{1-6}-alkoxy;

as well as pharmaceutically acceptable salts thereof.

Especially preferred compounds of formula (Ig) are for example the following compounds:

Ethanesulfonic acid (4-trans {2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

4-Chloro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzenesulfonamide,

N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-methoxy-benzenesulfonamide, and

Pyridine-3-sulfonic acid trans(4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide.

Special preference is also given to the following compounds:

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-cyano-propionamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-cyano-acetamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(R)-tetrahydro-furan-2-yl-acetamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-cyclopropyl-acetamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-hydroxy-acetamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methanesulfonyl-acetamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-[1,3]dioxan-2-yl-acetamide,

N-trans-(4-{2-[4-(5-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-cyclohexyl)-acetamide,

N-trans-(4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-methanesulfonamide,

N-trans-(4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,

N-trans-(4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-furan-2-yl)-acetamide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methoxy-acetamide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1R,3R)-3-methoxy-cyclopentyl)-acetamide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-cyclohexyl)-acetamide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-hydroxy-acetamide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-hydroxy-propionamide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-hydroxy-cyclohexyl)-acetamide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1R,3R)-3-hydroxy-cyclopentyl)-acetamide,

Tetrahydro-pyran-4-carboxylic acid trans-(4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-[1,3]dioxan-2-yl-acetamide,

N-trans-(4-{2-[4-(6-Methyl-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide.

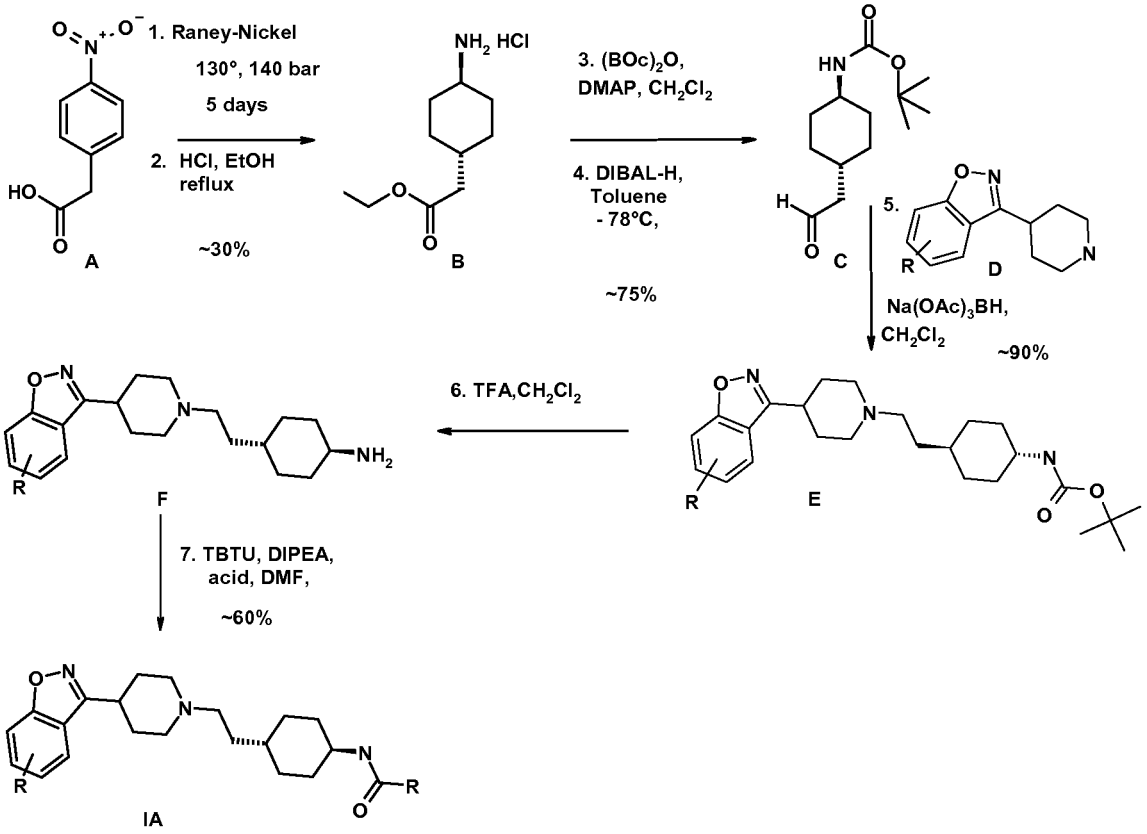
A further aspect of the present invention relates to pharmaceutical compositions containing the compounds of formulae (I), (Ia), (Ib), (Ic), (Id) (Id'), (Ie), (Ie') and (Ig) for the treatment of schizophrenia, cognitive disorders and drug addiction.

A further aspect of the present invention relates to the process for the manufacture of compounds of formula (I) as defined above.

The preparation of compounds of formula (I) of the present invention can be carried out in sequential or convergent synthetic routes. Syntheses of the invention are shown in the following schemes. The skills required for carrying out the reaction and purification of the resulting products are known to those skilled in the art. The substituents and indices used in the following description of the processes have the significance given herein before unless indicated to the contrary.

In more detail, the compounds of formula (I) can be manufactured by the methods given below, by the methods given in the examples or by analogous methods. Appropriate reaction conditions for the individual reaction steps are known to a person skilled in the art. Starting materials are either commercially available or can be prepared by methods analogous to the methods given below, by methods described in references cited in the description or in the examples, or by methods known in the art.

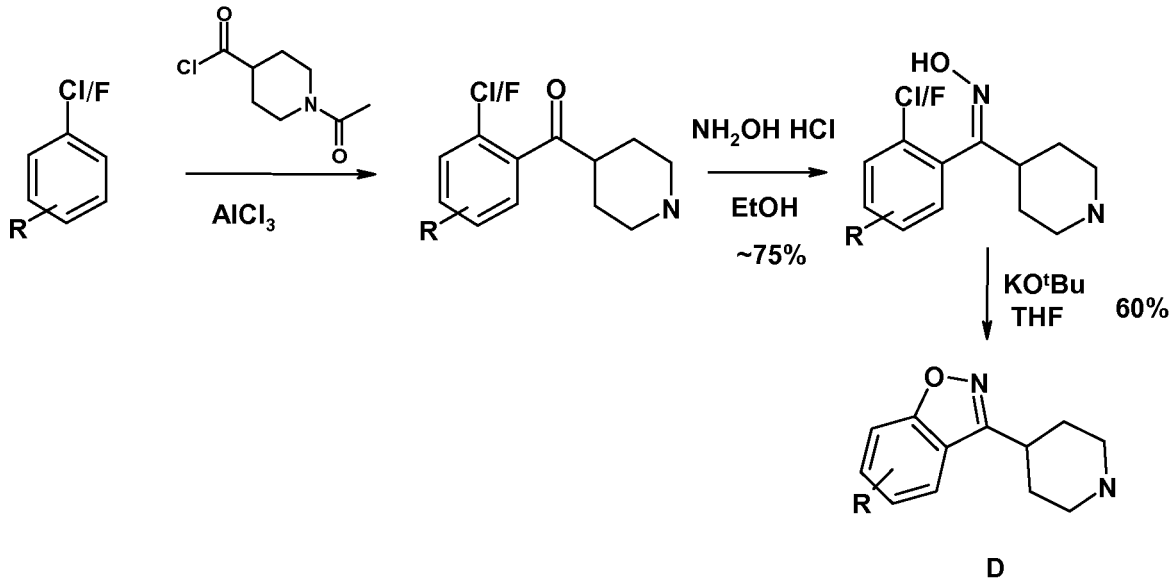
Scheme 1



4-(benzo-isoxazol-3-yl)-piperidin-1-yl trans -ethyl-cyclohexyl-amides or trans-1,4-cyclohexyl ethyl derivates of formula **IA** can be prepared as depicted in scheme 1 starting from 4-nitro-phenylacetic acid that was hydrogenated using raney nickel as a catalyst. The hydrogenation with nickel leads preferentially to the desired trans-isomer (according to Journal of Medicinal Chemistry , 1998, 41, 760-771). The ethyl ester can be prepared according to methods known to those skilled in the art and described in the mentioned literature (e.g by treatment with ethanol on the presence of an acid such as HCl). The HCl salt can be crystallized and then the cis/trans mixture can be resolved into the pure trans amino ester chloride B. Reaction with a protecting group such as tert-butyl dicarbonate in the presence of a base, like triethylamine, and a catalyst, like dimethylaminopyridine, and reduction with diisobutylaluminium hydride (DIBAL-H) in an appropriate solvent, e.g. toluene at -78°C gave the aldehyde C which can be used without purification in the next step. Reductive amination of aldehyde C with a substituted 4-(benzo[d]isoxazol-3-yl)-piperidine D can be performed using methods described in the literature, by methods described herein or by methods known in the art. The reductive amination can take place in the presence of a solvent, like 1,2-Dichloromethane, and/or a reducing agent, such as sodium triacetoxy borohydride, to

yield intermediate E. Removal of the Boc protective group under acidic conditions, such as trifluoroacetic acid, in a suitable solvent , e.g. THF, yields the trans-amino cyclohexyl ethyl intermediate F (usually the TFA salt). The coupling of the amine intermediate F with carboxylic acids (either commercially available or accessible by methods described in references or by methods known in the art) is widely described in literature (e.g. Comprehensive Organic Transformations: A Guide to Functional Group Preparations, 2nd Edition, Richard C. Larock. John Wiley & Sons , New York, NY. 1999) and can be accomplished by employing coupling reagents such as, e.g. N,N-carbonyldiimidazole (CDI), 1-hydroxy-1,2,3-benzotriazole (HOBT) or O-benzotriazol-1-yl-N,N,N,N-tetramethyluronium tetrafluoroborate (TBTU) in a suitable solvent, e.g. dimethylformamide (DMF) or dioxane, in the presence of a base (e.g. triethylamine or diisopropylethylamine) to yield compounds of formula IA. In other cases an acid chloride can also be used in the presence of a base (e.g. triethylamine or diisopropylethylamine) in a solvent, like dichloromethane.

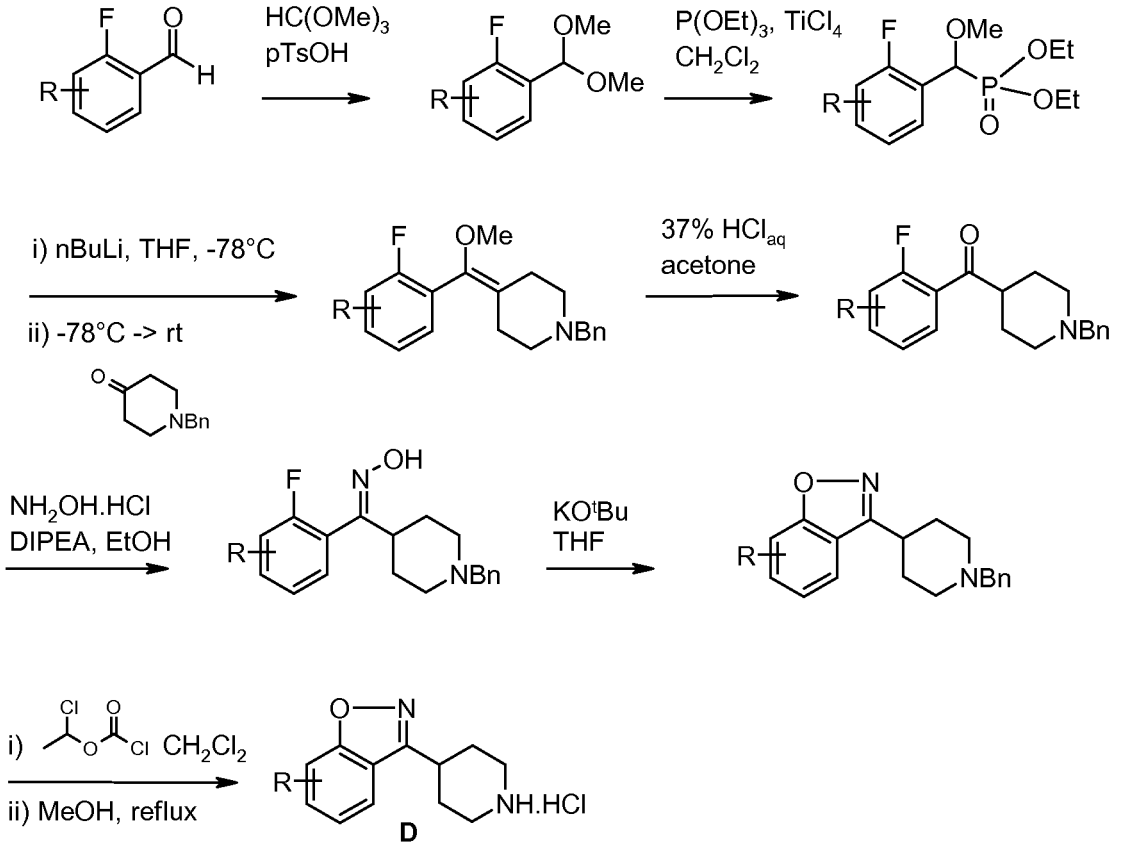
Scheme 2A



D

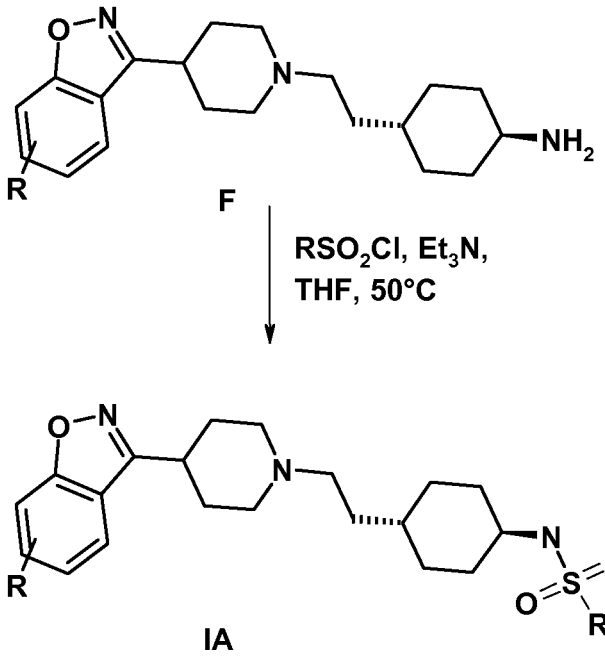
Some substituted 4-(benzo[d]isoxazol-3-yl)-piperidine of formula D can be obtained by Friedel-Crafts acylation of an adequate benzene derivative using an appropriate Lewis acid like alumminium chloride in the presence of 1-acetylisonipecotoyl chloride in a solvent like dichlorobenzene by heating to a temperature like 70°C as described on Journal of Medicinal Chemistry , 1985, 28, 761-769, Journal of Medicinal Chemistry , 1970, 13, 1-6 or US Patent No. 4,355,037.

Scheme 2B



Alternatively 4-(benzo[d]isoxazol-3-yl)-piperidines of formula D can be obtained starting from an appropriately substituted benzaldehyde containing a leaving group such as for example F in the ortho position (in analogy to WO02066446). The benzaldehyde can be converted to a dimethyl acetal with a reagent, such as trimethyl orthoformiate, in the presence a catalytic amount of an acid, such as pTsOH. Reaction of the acetal with triethylorthophosphite in presence of a Lewis acid, such as $TiCl_4$, in a solvent, such as CH_2Cl_2, leads to a phosphonate that can be deprotonated with a base, such as nBuLi, in a solvent, like THF, and reacted with 1-benzyl-piperidin-4-one to obtain an enol ether as depicted in Scheme 2B. Treatment of the enol ether with an acid, such as concentrated aqueous HCl, in a solvent, such as acetone, yields the corresponding ketone. Reaction of the ketone with $NH_2OH.HCl$ in the presence of a base, such as DIPEA, in a solvent, like EtOH, followed by deprotonation of the oxime with a base, such as KO^tBu, in THF and intramolecular cyclization leads to the benzo[d]isoxazole derivative. The 4-(benzo[d]isoxazol-3-yl)-piperidines of formula D are then obtained by debenzylation employing methods known in the art, for example reaction with α-chloroethyl chloroformate and subsequent treatment with refluxing MeOH.

Scheme 3



In other examples the intermediate F can also react with a sulfonyl chloride in the present of a base like triethylamine to give the corresponding sulfonyl derivative of the formula **IA**.

The ability of the compounds to bind to the 5-HT_{2A}, D_3 and D_2 receptors was determined using radioligand binding to cloned receptors selectively expressed in HEK-293 EBNA cells.

Membrane preparation for human D_2, human D_3 and human 5-HT_{2A} receptors

HEK-293 EBNA cells were transiently transfected with expression plasmids encoding for the human D_2 or D_3 dopamine- or for the human 5-HT_{2A} serotonin receptor, respectively. The cells were harvested 48 h post-transfection, washed three times with cold PBS and stored at -80°C prior to use. The pellet was suspended in cold 50 mM Tris-HCl buffer containing 10 mM EDTA (pH 7.4) and homogenized with a Polytron (Kinematica AG, Basel, Switzerland) for 20-30 sec at 12.000 rpm. After centrifugation at 48.000 X g for 30 min at 4°C, the pellet was resuspended in cold 10 mM Tris-HCl buffer containing 0.1 mM EDTA (pH 7.4), homogenized, and centrifuged as above. This pellet was further resuspended in a smaller volume of ice cold 10 mM Tris-HCl buffer containing 0.1 mM EDTA (pH 7.4) and homogenized with a Polytron for 20-30 sec at 12.000 rpm. The protein content of this homogenate was determined with the Bio-Rad

(Bradford) Protein Assay (Biorad Laboratories GmbH, München, Germany) according to the instructions of the manufacturer using gamma globulin as the standard. This homogenate was stored at -80°C in aliquots and thawed immediately prior to use.

Radioligand binding assay conditions

Aliquots of membrane preparations were thawed at RT, resupended in assay buffer (D_2, D_3: 50 mM Tris-HCl, 120 mM NaCl, 5 mM $MgCl_2$, 1 mM EDTA, 5 mM KCl, 1.5 mM $CaCl_2$, pH=7.4; 5-HT_{2A}: 50 mM Tris-HCl, 10 mM $MgCl_2$, 1 mM EGTA, pH=7.4), homogenized with a Polytron for 20-30 sec at 12.000 rpm and adjusted to a final concentration of approximately 7.5 µg protein / well (D_2, D_3) and 15 µg protein / well (5-HT_{2A}), respectively.

The binding affinity (Ki) of the compounds was determined using radioligand binding. Membranes were incubated in a total volume of 200 µl with a fixed concentration of radioligand (final concentration approximately 0.7 nM [^{3}H]-spiperone for D_2, 0.5 nM [^{3}H]-spiperone for D_3, and 1.1 nM [^{3}H]-ketanserin for 5-HT_{2A}) and ten concentrations of test compound in ranging between 10 µM –0.1 nM for 1 h at RT. At the end of the incubation, the reaction mixtures were filtered on to unifilter 96-well white microplates with bonded GF/C filters (Packard BioScience, Zürich, Switzerland; preincubated for 1 h in 0.1% polyethylenimine (PEI) in assay buffer) with a Filtermate 196 harvester (Packard BioScience) and washed 3 times with cold assay buffer. The nonspecific binding was determined with equally composed reaction mixtures in the presence of 10 µM unlabelled spiperone. Per well 45 µl of Microscint 40 (Perkin Elmer, Schwerzenbach, Switzerland) was added, plates for sealed, shaken for 20 min and counted for 3 min on a Topcount Microplate Scintillation Counter (Canberra Packard SA, Zürich, Switzerland) with quenching correction.

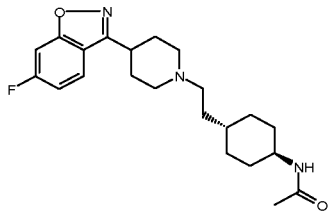
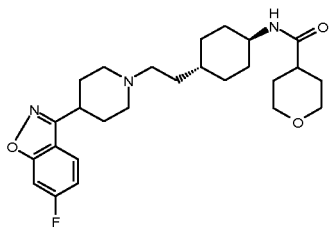
Data calculation

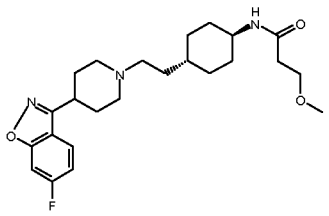
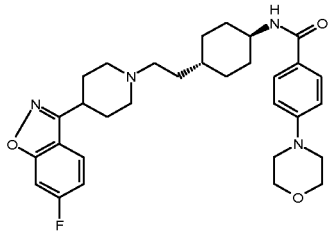
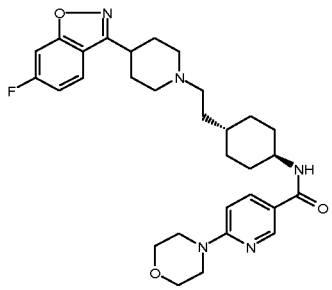
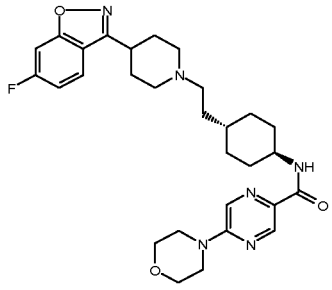
The CPM value for each duplicate of a concentration of competing compound was averaged (y1), then the % specific binding was calculated according to the equation (((y1 - non-specific)/(total binding-non-specific))x100). Graphs were plotted with the % specific binding using XLfit, a curve fitting program that iteratively plots the data using Levenburg Marquardt algorithm. The single site competition analysis equation used was $y = A + ((B-A)/(1+((x/C)^D)))$, where y is the % specific binding, A is the minimum y, B is the maximum y, C is the IC_{50}, x is the $\log_{10}$ of the concentration of the competing compound and D is the slope of the curve (the Hill Coefficient). From these curves the

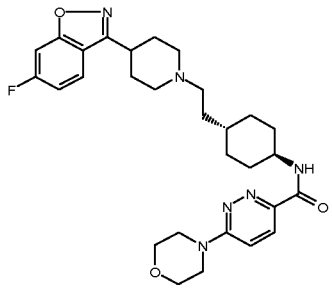
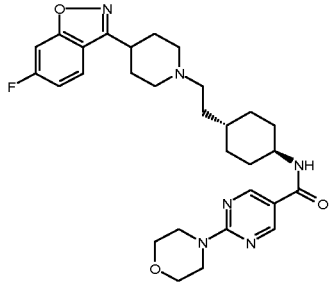
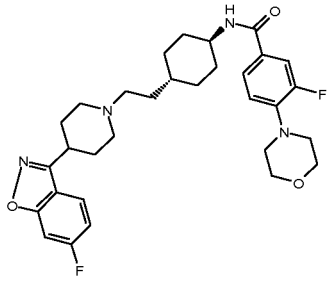
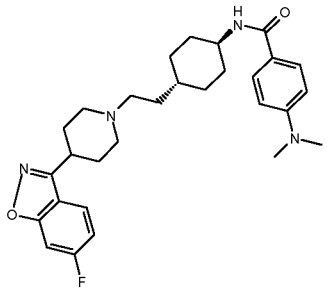
IC_{50} (inhibition concentration at which 50% specific binding of the radioligand was displaced) and Hill coefficient were determined. The affinity constant (Ki) was calculated using the Cheng-Prusoff equation Ki = (IC_{50}/1+([L]/Kd), where [L] is the concentration of radioligand and Kd is the dissociation constant of the radioligand at the receptor as determined by the saturation isotherm.

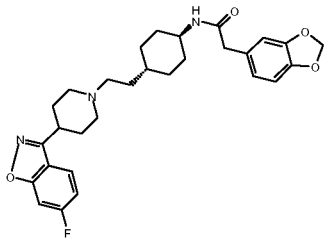
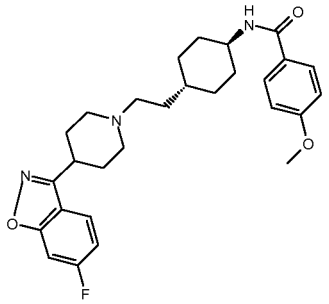
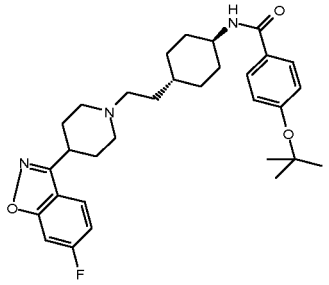
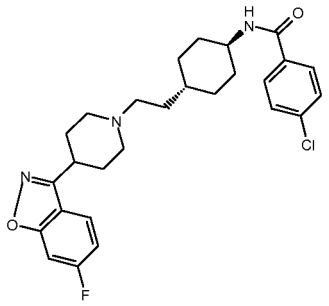
The compounds of the present invention are selective dual modulators of the serotonin 5-HT_{2a} and dopamine D_3 receptors as this is shown with the activity table hereinafter which gives the Ki values in μM for the serotonin 5-HT_{2a}, dopamine D_3 and dopamine D_2 receptors for some examples of the compounds of the present invention:

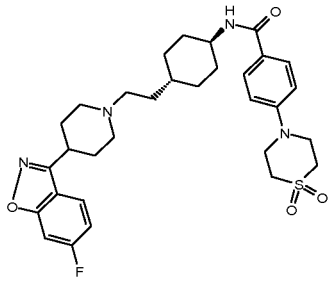
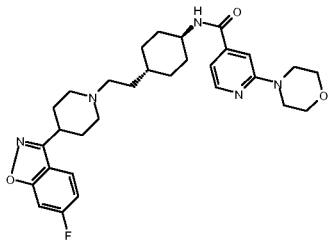
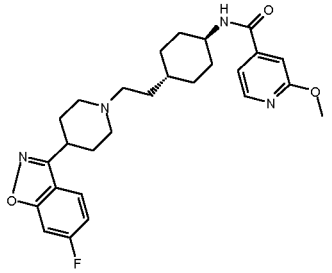
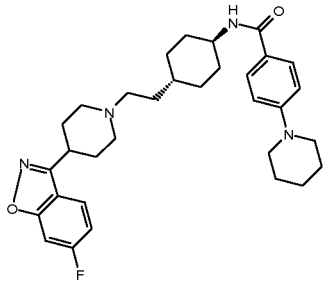
Activity table

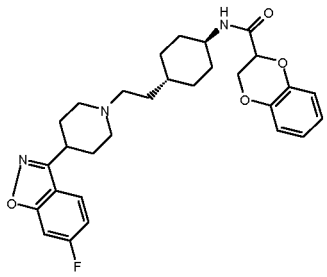
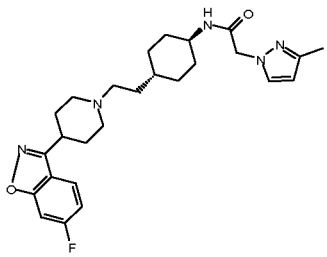
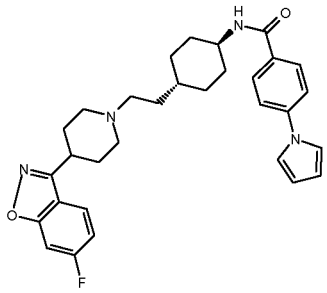
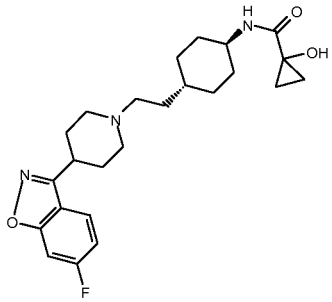
Ex.	Compound	Name	Ki 5-HT_{2a}: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
1		4N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide	0.002224	0.004964
2		Tetrahydro-pyran-4-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.001739	0.009744

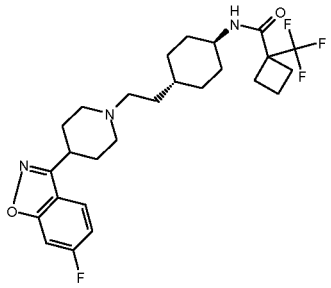
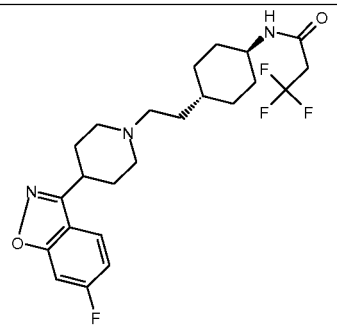
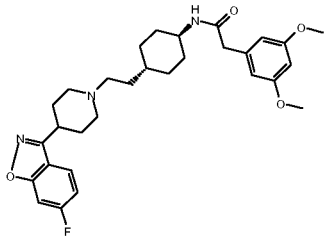
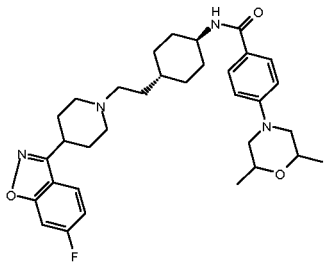
Ex.	Compound	Name	Ki 5-HT_{2a}: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
3		N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide	0.001809	0.004749
4		N-trans-(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide	0.009519	0.028161
4A		N-Trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-6-morpholin-4-yl-nicotinamide	0.002701	0.007948
4B		5-Morpholin-4-yl-pyrazine-2-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.00381	0.019443

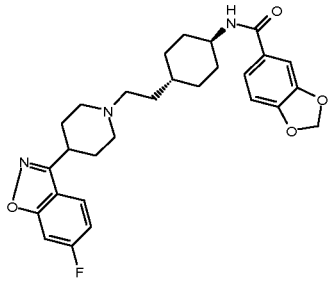
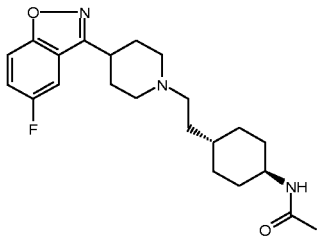
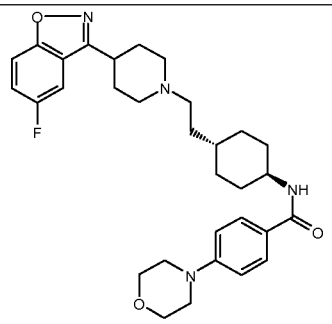
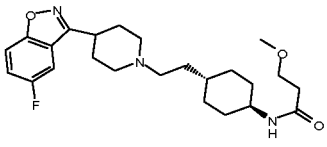
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
4C		6-Morpholin-4-yl-pyridazine-3-carboxylic acid-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.003181	0.025326
4D		2-Morpholin-4-yl-pyrimidine-5-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.002453	0.01534
5		3-Fluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide	0.01746	0.045277
6		3-Fluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide	0.011383	0.01152

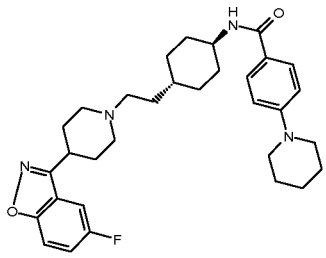
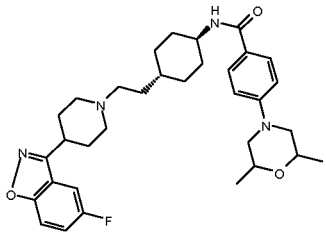
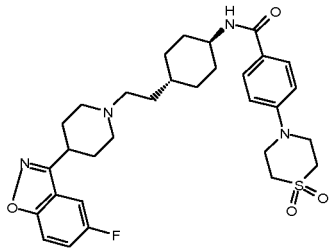
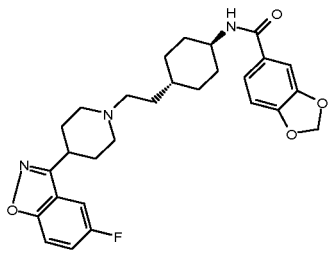
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
7		Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 3,4-(methylenedioxy) phenylacetic acid	0.002087	0.004015
8		N-trans-(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-methoxy-benzamide	0.003654	0.004525
9		4-tert-Butoxy-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	0.001724	0.003417
10		4-Chloro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	0.002666	0.003498

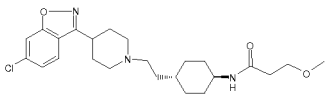
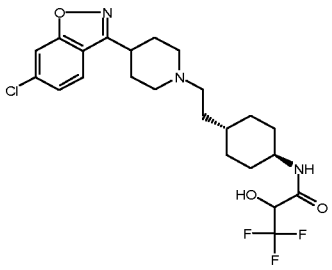
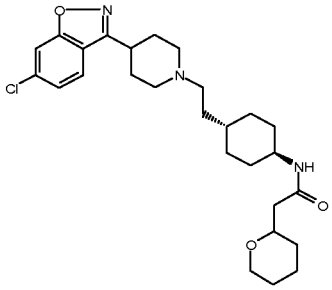
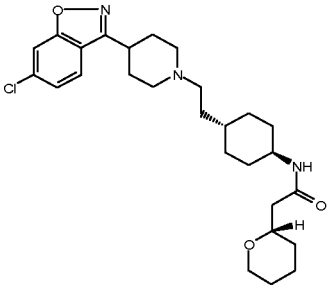
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
11		4-(1,1-Dioxo-1,6-thiomorpholin-4-yl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	0.002483	0.004674
12		N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-morpholin-4-yl-isonicotinamide	0.002459	0.005747
13		N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methoxy-isonicotinamide	0.001623	0.003738
14		N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-piperidin-1-yl-benzamide	0.002598	0.008685

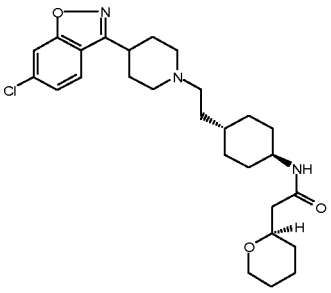
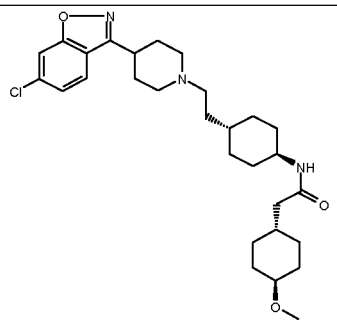
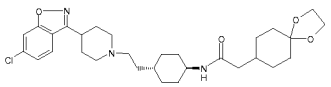
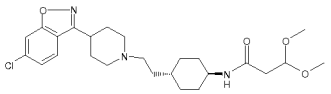
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
15		2,3-Dihydro-benzo[1,4]dioxine-2-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.00257	0.01266
16		N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(3-methyl-pyrazol-1-yl)-acetamide	0.002795	0.027618
17		N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-pyrrol-1-yl-benzamide	0.00245	0.002607
18		1-Hydroxy-cyclopropanecarboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.001444	0.005916

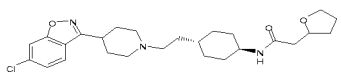
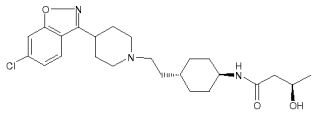
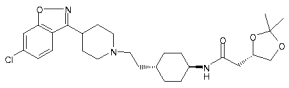
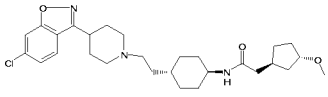
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
19		1-Trifluoromethyl-cyclobutanecarboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.002257	0.00774
20		3,3,3-Trifluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-propionamide	0.002782	0.005189
21		2-(3,5-Dimethoxy-phenyl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide	0.002953	0.008772
22		4-(2,6-Dimethyl-morpholin-4-yl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	0.021224	0.136625

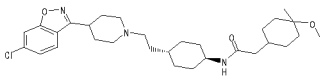
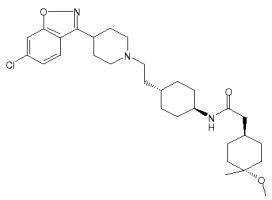
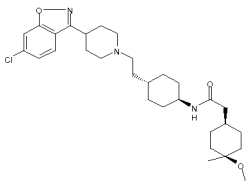
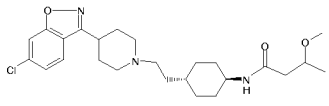
Ex.	Compound	Name	Ki 5-HT_{2a}: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
23		Benzo[1,3]dioxole-5-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.001714	0.002746
24		N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide	0.046865	0.002438
25		N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide	0.02232	0.009036
26		N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide	0.036954	0.003099

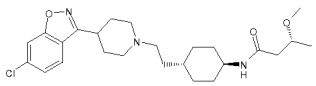
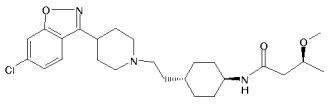
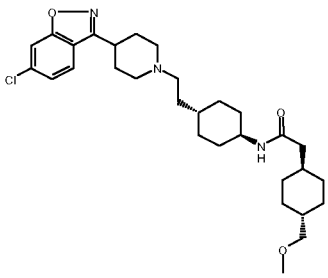
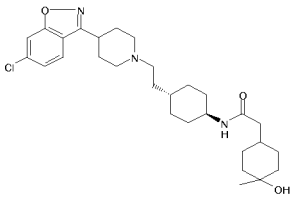
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
27		N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-piperidin-1-yl-benzamide	0.007004	0.0077
28		4-(2,6-Dimethyl-morpholin-4-yl)-N-trans (4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	0.099138	0.085773
29		4-(1,1-Dioxo-1,6,4-thiomorpholin-4-yl)-N trans -(4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	0.012352	0.005936
30		Benzo[1,3]dioxole-5-carboxylic acid trans (4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.011217	0.003861

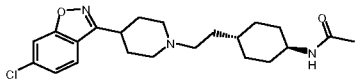
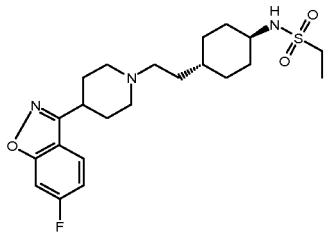
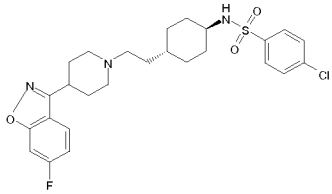
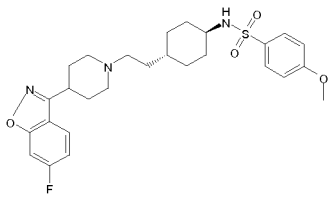
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
32		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide	0.01655	0.008497
33		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3,3,3-trifluoro-2-hydroxy-propionamide	0.021866	0.011029
34		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-pyran-2-yl)-acetamide	0.005829	0.010734
34A		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(R)-tetrahydro-pyran-2-yl-acetamide	0.01368	0.010734

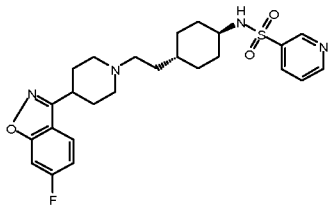
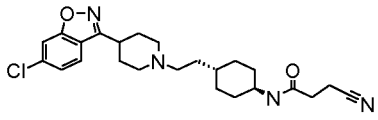
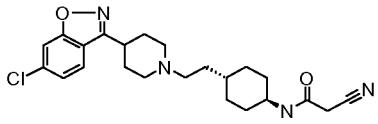
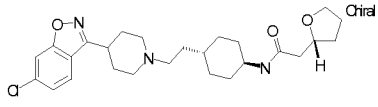
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
34B		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(S)-tetrahydro-pyran-2-yl-acetamide	0.015304	0.003708
35		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-trans (4-methoxy-cyclohexyl)-acetamide	0.009637	0.011578
36		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(1,4-dioxa-spiro[4.5]dec-8-yl)-acetamide	0.00831	0.012221
37		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3,3-dimethoxy-propionamide	0.01365	0.00903

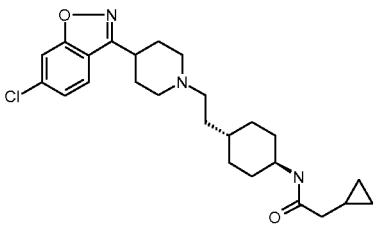
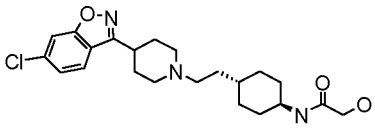
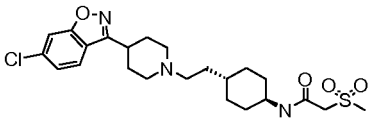
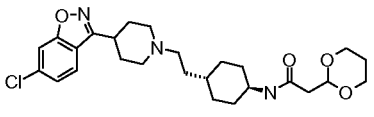
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
38		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-furan-2-yl)-acetamide	0.013	0.009
39		(R)-N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-hydroxy-butyramide	0.013	0.017
40		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((S)-2,2-dimethyl-[1,3]dioxolan-4-yl)-acetamide	0.025	0.006
41		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1S,3S)-3-methoxy-cyclopentyl)-acetamide	0.014	0.010

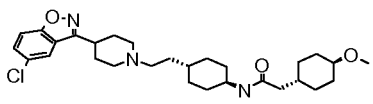
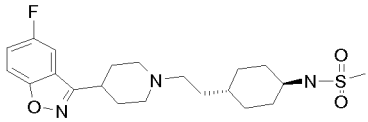
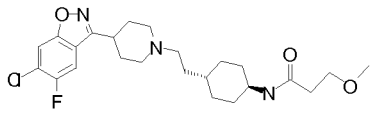
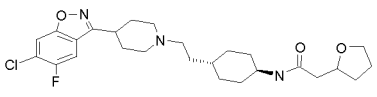
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
42		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-4-methyl-cyclohexyl)-acetamide	0.019	0.008
42A		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2- (4-trans-methoxy-4-methyl-cyclohexyl)-acetamide	0.016	0.006
42B		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2- (4-cis-methoxy-4-methyl-cyclohexyl)-acetamide	0.014	0.004
43		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide	0.013	0.010

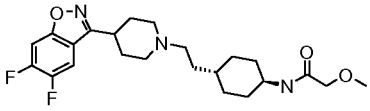
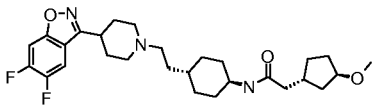
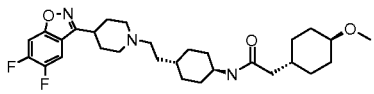
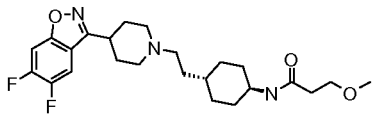
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
43A		(R)-N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide	0.016	0.015
43B		(S)-N-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide	0.016	0.006
44		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-trans (4-methoxymethyl-cyclohexyl)-acetamide	0.019	0.009
45		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-hydroxy-4-methyl-cyclohexyl)-acetamide	0.015	0.007

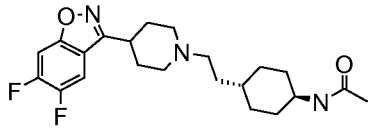
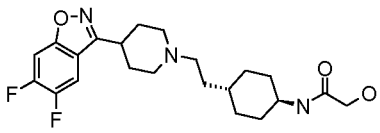
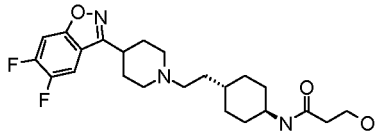
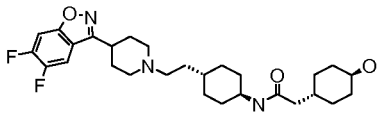
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
46		N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide	0.023745	0.008189
47		Ethanesulfonic acid (4-trans {2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.001664	0.005852
48		4-Chloro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzenesulfonamide	0.005132	0.005867
49		N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-methoxy-benzenesulfonamide	0.004394	0.003719

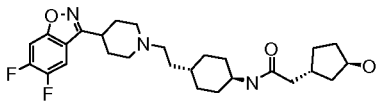
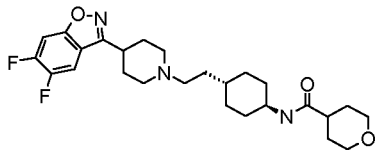
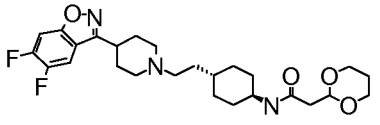
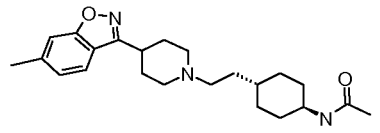
Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
50		Pyridine-3-sulfonic acid trans(4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.002476	0.00195
51		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-cyano-propionamide	0.023745	0.008189
52		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-cyano-acetamide	0.015582	0.008772
53		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(R)-tetrahydro-furan-2-yl-acetamide	0.006193	0.014446

Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
54		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-cyclopropyl-acetamide	0.013092	0.003206
55		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-hydroxy-acetamide	0.014991	0.01681
56		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methanesulfonyl-acetamide	0.015216	0.014784
57		N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-[1,3]dioxan-2-yl-acetamide	0.017625	0.00613

Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
58		N-trans-(4-{2-[4-(5-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-cyclohexyl)-acetamide	0.02467	0.008381
59		N-trans-(4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-methanesulfonamide	0.027483	0.00798
60		N-trans-(4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide	0.043968	0.01354
61		N-trans-(4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-furan-2-yl)-acetamide	0.031001	0.017732

Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
62		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methoxy-acetamide	0.01052	0.032674
63		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1R,3R)-3-methoxy-cyclopentyl)-acetamide	0.013209	0.019994
64		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-cyclohexyl)-acetamide	0.00767	0.017303
65		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide	0.012918	0.011356

Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
66		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide	0.017739	0.011368
67		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-hydroxy-acetamide	0.011782	0.01995
68		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-hydroxy-propionamide	0.024792	0.01172
69		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-hydroxy-cyclohexyl)-acetamide	0.007848	0.020912

Ex.	Compound	Name	Ki 5-HT$_{2a}$: Human (5HT2a)	Ki dopamine d3 receptor: human (D3)
70		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1R,3R)-3-hydroxy-cyclopentyl)-acetamide	0.011439	0.019756
71		Tetrahydro-pyran-4-carboxylic acid trans-(4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	0.00786	0.018169
72		N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-[1,3]dioxan-2-yl-acetamide	0.009394	0.013512
73		N-trans-(4-{2-[4-(6-Methyl-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide	0.016758	0.009275

The present invention also provides pharmaceutical compositions containing compounds of the invention, for example, compounds of formula I or pharmaceutically acceptable salts thereof and a pharmaceutically acceptable carrier. Such pharmaceutical compositions can be in the form of tablets, coated tablets, dragées, hard and soft gelatin

capsules, solutions, emulsions or suspensions. The pharmaceutical compositions also can be in the form of suppositories or injectable solutions.

The pharmaceutical compositions of the invention, in addition to one or more compounds of the invention, contain a pharmaceutically acceptable carrier. Suitable pharmaceutically acceptable carriers include pharmaceutically inert, inorganic or organic carriers. Lactose, corn starch or derivatives thereof, talc, stearic acid or its salts and the like can be used, for example, as such as carriers for tablets, coated tablets, dragées and hard gelatine capsules. Suitable carriers for soft gelatine capsules are, for example, vegetable oils, waxes, fats, semi-solid and liquid polyols and the like; depending on the nature of the active substance no carriers are, however, usually required in the case of soft gelatine capsules. Suitable carriers for the production of solutions and syrups are, for example, water, polyols, sucrose, invert sugar, glucose and the like. Adjuvants, such as alcohols, polyols, glycerol, vegetable oils and the like, can be used for aqueous injection solutions of water-soluble salts of compounds of formula I, but as a rule are not necessary. Suitable carriers for suppositories are, for example, natural or hardened oils, waxes, fats, semi-liquid or liquid polyols and the like.

In addition, the pharmaceutical compositions can contain preservatives, solubilizers, stabilizers, wetting agents, emulsifiers, sweeteners, colorants, flavorants, salts for varying the osmotic pressure, buffers, masking agents or antioxidants. They can also contain still other therapeutically valuable substances.

The present invention also provides a method for the manufacture of pharmaceutical compositions. Such process comprises bringing one or more compounds of formula I and/or pharmaceutically acceptable acid addition salts thereof and, if desired, one or more other therapeutically valuable substances into a galenical administration form together with one or more therapeutically inert carriers.

The compounds and compositions of the present invention can be administered in a conventional manner, for example, orally, rectally, or parenterally. The pharmaceutical compositions of the invention can be administered orally, for example, in the form of tablets, coated tablets, dragées, hard and soft gelatine capsules, solutions, emulsions, or suspensions. The pharmaceutical compositions also can be administered rectally, for example, in the form of suppositories, or parenterally, for example, in the form of injectable solutions.

As mentioned hereinabove, the compounds of the invention have high affinity for the dopamine D_3 and serotonin 5-HT_{2A} receptors and are expected to be effective in the treatment of psychotic disorders which include schizophrenia, schizoaffective disorders, bipolar disease, mania, psychotic depression, and other psychoses involving paranoia and delusions (Reavill-C, et al. (2000) Pharmacological actions of a novel, high-affinity, and selective human dopamine D3 receptor antagonist, SB-277011-A. JPET 294:1154–1165; Harrison, P. J. (1999) Neurochemical alterations in schizophrenia affecting the putative receptor targets of atypical antipsychotics. Focus on dopamine (D1, D3, D4) and 5-HT2A receptors. Br. J. Psychiatry Suppl. 38, 12-22; de Angelis, L. (2002) 5-HT2A antagonists in psychiatric disorders. Curr. Opin. Investig. Drugs 3, 106-112; Joyce, J. N. and Millan, M. J., (2005) Dopamine D3 receptor antagonists as therapeutic agents. Drug Discovery Today, 1 Jul, Vol. 10, No. 13, P. 917-25); drug dependency and abuse and withdrawal (Vorel, S. R. et al. (2002) Dopamine D3 receptor antagonism inhibits cocaine-seeking and cocaine-enhanced brain reward in rats. J. Neurosci., 22, 9595–9603; Campos, A. C. et al. (2003) The dopamine D3 receptor antagonist SB277011A antagonizes nicotine-enhanced brain-stimulation reward in rat. Soc. Neurosci. Abstr., 322.8; Ashby, et al. (2003) Acute administration of the selective D3 receptor antagonist SB-277011-A blocks the acquisition and expression of the conditioned place preference response to heroin in male rats. Synapse, 48, 154–156); anxiety, and depression (Reavill-C et al. (2000) Pharmacological actions of a novel, high-affinity, and selective human dopamine D3 receptor antagonist, SB-277011-A. JPET 294:1154–1165; Drescher, K. et al. (2002) In vivo effects of the selective dopamine D3 receptor antagonist A-437203. Am. Soc. Neurosci. 894.6).

The dosage at which compounds of the invention can be administered can vary within wide limits and will, of course, be fitted to the individual requirements in each particular case. In general, the effective dosage for oral or parenteral administration is between 0.01-20 mg/kg/day, with a dosage of 0.1-10 mg/ kg/day being preferred for all of the indications described. The daily dosage for an adult human being weighing 70 kg accordingly lies between 0.7-1400 mg per day, preferably between 7 and 700 mg per day.

The following examples are provided to further elucidate the invention:

Example 1

4N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide

Intermediate B

Trans-(4-amino-cyclohexyl)-acetic acid ethyl ester

Step 1

(4-Nitro-phenyl)-acetic acid (50g, 276 mmol) was added to a stirred solution of 22.08g of 50% sodium hydroxide solution in 450mL deionizated water. The clear yellow solution is transferred into a high-pressure autoclave that it charged with 30g (511 mmol) of water-wet sponge nickel catalyst. The autoclave is sealed, flushed with nitrogen and then pressurized to 115 bar with hydrogen. The reaction mixture is stirred and heated to 125°C for 48h. At that time the autoclave is cooled, vented and charged under nitrogen with another 30g (511 mmol) of the sponge nickel catalyst. The autoclave is flushed again with nitrogen and then pressurized to 115 bar and the vessel is heated to 130°C while stirring (a maximum pressure of 130 bars is observed). Hydrogenation is continued for 5 days to 130°C. The autoclave is then cooled, vented and flushed with nitrogen and the contents are removed and filtered through filter aid to remove catalyst. After removal of the solvent 74g of crude material was obtained. The intermediated is used directly in the next step without purification. MS (m/e): 158.3 ($M+H^+$)

Step 2

A solution of the trans-(4-amino-cyclohexyl)- acetic acid obtained (74g, 476mmol) is adjusted to pH 5 with 25% HCl. The mixture was evaporated to dryness and dried under vacuum overnight. The residue was suspended in 146mL of a 6.5N ethanolic HCl solution and 0.6L of ethanol were added to the mixture. After 4 h refluxing, the mixture is cooled and filtered and the filtrate is concentrated to dryness under vacuum. The residue is dissolved in ethanol, treated with ether and cooled overnight in the refrigerator.to give the trans- (4-Amino-cyclohexyl)-acetic acid ethyl ester hydrochloride (19.7 g, 32% on the two steps) as a white solid which was filtered and dried under vacuum. MS (m/e): 186.1 ($M+H^+$)

Intermediate C

Step 1

Trans-(4-tert-Butoxycarbonylamino-cyclohexyl)-acetic acid ethyl ester

To a solution of trans-(4-Amino-cyclohexyl)-acetic acid ethyl ester (1.28 g, 7 mmol), in dichloromethane (15mL), di-tert-butyl-dicarbonate (2,26 g, 10mmol), triethylamine

(0.699 mL, 7mmol) and 4-dimethylaminopyridine (0.042mL, 0.35mmol) were added. The mixture was stirred for 8h until TLC indicated completion of the reaction. Water was added and the solution was extracted three times with dichloromethane. The combined organic layers were washed with water and brine, dried over magnesium sulfate, filtered and evaporated. The crude product was purified by flash-chromatography on silica gel with hexane : ethyl acetate (4:2 to 3:2) to give 1.2 g (60%) of the product as a white solid. MS (m/e): 284.4 ($M-H^+$).

Step 2

Trans-[4-(2-Oxo-ethyl)-cyclohexyl]-carbamic acid tert-butyl ester

To a solution of trans-(4-tert-Butoxycarbonylamino-cyclohexyl)-acetic acid ethyl ester (1.04 g, 4 mmol), in toluene (10 mL) at -78°C a 1.2M solution of DIBAL-H (5.1mL, 6 mmol) in toluene was added. The mixture was stirred at -78°C until TLC after 0.5h indicated completion of the reaction. Water was added and the solution was extracted three times with dichloromethane. The combined organic layers were washed with water and brine, dried over magnesium sulfate, filtered and evaporated. The crude product was used without purification on the next step. MS (m/e): 242.3 ($M+H^+$).

Intermediate E

Trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-carbamic acid tert-butyl ester

A mixture of 6-fluoro-3-(4-piperidinyl)-1,2-benzisoxazole (4 g, 18.1 mmol), trans-[4-(2-Oxo-ethyl)-cyclohexyl]-carbamic acid tert-butyl ester (5.4 g, 22.7 mmol), in 1, 2 dichloroethane (55mL) was stirred for 4 h at room temperature and sodium triacetoxyborohydride (6.9 g, 32.7 mmol) was added slowly and the resulting solution was stirred for 12 hours until the TLC indicated completion of the reaction. The mixture was filtrated and concentrated to dryness and purified with column chromatography on silica gel using CH_2Cl_2 –CH_2Cl_2 /MeOH (1-9:1). The product fractions were concentrated to give 9.4 g (21 mmol, 100% yield) of a light brown solid. MS (m/e): 446.3 ($M+H^+$).

Intermediate F

Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt)

9.4 g (21 mmol) of (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-carbamic acid tert-butyl ester is solved in dichloromethane (100mL) and trifluoroacetic acid is added at 0°C (13.3 mL, 174mmol) and the mixture is stirred at room temperature overnight. $NaHCO_3$ is slowly added until pH 9 and the mixture extracted 3 times with dichloromethane and ethyl acetate. The solvent was evaporated to yield 5.5 g (16mmol, 77%) of a light brown solid that was used without purification on the next steps. MS (m/e): 346.5 ($M+H^+$).

4N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide

4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (0.03 g, 0.087 mmol) is suspended in dichloromethane (0.600mL) and triethylamine is added (0.013 mL, 0.096mmol) followed by acetylchloride (0.008 mL, 0.104 mmol) and the mixture was stirred for 30 minutes at room temperature until TLC indicated the end of the reaction. Sodium bicarbonate solution was added until pH 9 and the reaction extracted 3 times with dichloromethane. The organic phase was dried and purified with column chromatography on silica gel using CH_2Cl_2 –CH_2Cl_2 /MeOH (1-9:1). The product fractions were concentrated to give 0.022 g (0.056 mmol, 65% yield) of a white solid. MS (m/e): 388.5 ($M+H^+$).

Example 2

Tetrahydro-pyran-4-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide

Tetrahydro-pyran-4-carboxylic acid (0.013 g, 0.096 mmol), 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyl uronium tetrafluoroborate (0.026 g, 0.08 mmol) and (0.04 mL, 0.24 mmol) of N-ethyldiisopropylamine were stirred in 0.6mL of DMF for 0.5h at room temperature and Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) (trifluoro acetic acid salt) (0.030 g, 0.08 mmol) was added. The mixture was stirred for 12 hours at room temperature. The mixture was concentrated to dryness and the residue was taken up on methanol and purified with preparative HPLC on reversed phase eluting with acetonitrile/water. The combined producted fractions were evaporated under reduced pressure to yield 0.027 g of a off-white solid (0.06 mmol, 74%). MS (m/e): 458.5 ($M+H^+$).

According to the procedure described for the synthesis of example 2 further derivatives have been synthesized from the respective Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and the corresponding acid. They comprise examples 2 to 41 on Table 1.

Table 1

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
2	Tetrahydro-pyran-4-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	457.59	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and Tetrahydro-pyran-4-carboxylic acid	458.5
3	N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide	431.55	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 3-methoxy-propionic acid	432.2
4	N-trans-(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide	534.68	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4-morpholin-4-yl-benzoic acid	535.5
4A	N-Trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-6-morpholin-4-yl-nicotinamide	535.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 6-morpholino nicotinic acid	536.0

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
4B	5-Morpholin-4-yl-pyrazine-2-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	536.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 5-Morpholin-4-yl-pyrazine-2-carboxylic acid (ester prepared by substitution of Chloro derivative using Morpholine with TEA in Dioxane at 45°C during 16 hours)	537.2
4C	6-Morpholin-4-yl-pyridazine-3-carboxylic acid-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	536.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 6-Morpholin-4-yl-pyridazine-3-carboxylic acid (ester prepared by substitution of Chloro derivative using Morpholine with TEA in Dioxane at 45°C during 16 hours	537.5

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
4D	2-Morpholin-4-yl-pyrimidine-5-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	536.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 2-morpholin-4-yl-pyrimidine-5-carboxylic acid (commercial available)	537.7
5	3-Fluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide	552.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 3-Fluoro-4-morpholin-4-yl-benzoic acid (prepared by LiOH hydrolysis of the methyl ester commercial available)	553.5
6	4-Dimethylamino-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	492.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4-Dimethylamino benzoic acid	493.1

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
7	2-Benzo[1,3]dioxol-5-yl-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide	507.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 3,4-(methylenedioxy) phenylacetic acid	508.4
8	N-trans-(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-methoxy-benzamide	479.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4-methoxy-benzoic acid	480.3
9	4-tert-Butoxy-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	521.7	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4- tert-Butoxy-benzoic acid	522.7
10	4-Chloro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	484.01	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4- tert-chloro-benzoic acid	484.4

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
11	4-(1,1-Dioxo-1,6-thiomorpholin-4-yl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	582.74	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4-(1,1-Dioxo-1, 6-thiomorpholin-4-yl)-benzoic acid	583.2
12	N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-morpholin-4-yl-isonicotinamide	535.66	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 2-morpholin-4-yl-isonicotinic acid	536.5
13	N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methoxy-isonicotinamide	480.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 2-methoxy-isonicotic acid	481.4
14	N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-piperidin-1-yl-benzamide	532.7	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4-piperidin-1-yl-benzoic acid	533.3

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
15	2,3-Dihydro-benzo[1,4]dioxine-2-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	507.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 2,3-Dihydro-benzo[1,4]dioxine-2-carboxylic acid	508.4
16	N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(3-methyl-pyrazol-1-yl)-acetamide	467.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and (3-Methyl-pyrazol-1-yl)-acetic acid	468.4
17	N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-pyrrol-1-yl-benzamide	514.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4-pyrrol-1-yl-benzoic acid	515.0
18	1-Hydroxy-cyclopropanecarboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	429.5	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 1-Hydroxy-cyclopropanecarboxylic acid	430.3

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
19	1-Trifluoromethyl-cyclobutanecarboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	495.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 1-Trifluoromethyl-cyclobutanecarboxylic acid	496.1
20	3,3,3-Trifluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-propionamide	455.5	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 3,3,3-Trifluoro propionic acid	456.3
21	2-(3,5-Dimethoxy-phenyl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide	523.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 2-(3,5-Dimethoxy-phenyl)-acetic acid	524.3
22	4-(2,6-Dimethyl-morpholin-4-yl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	562.7	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4-(2,6-Dimethyl-morpholin-4-yl)-benzoic acid	563.5

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
23	Benzo[1,3]dioxole-5-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	498.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and Benzo[1,3]dioxole-5-carboxylic acid	499.5

Example 24

N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide

Intermediate E

Trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-carbamic acid tert-butyl ester

A mixture of 5-fluoro-3-(4-piperidinyl)-1,2-benzisoxazole (1.3 g, 5 mmol), trans-[4-(2-Oxo-ethyl)-cyclohexyl]-carbamic acid tert-butyl ester (example 1, intermediate C) (1.6 g, 6 mmol), triethylamine (0.64 mL, 5 mmol) in 1, 2 dichloroethane (27mL) was stirred for 4 h at room temperature and sodium triacetoxyborohydride (1.9 g, 9 mmol) was added slowly and the resulting solution was stirred for 12 hours until the TLC indicated completion of the reaction. The mixture was filtrated and concentrated to dryness and purified with column chromatography on silica gel using CH_2Cl_2 –CH_2Cl_2 /MeOH (1-9:1). The product fractions were concentrated to give 2.3 g (5.1 mmol, 100% yield) of a off-white solid. MS (m/e): 446.3 ($M+H^+$).

Intermediate F

Trans 4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine; compound with trifluoro-acetic acid

2.3 g (5 mmol) of trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-carbamic acid tert-butyl ester is solved in dichloromethane (15mL) and trifluoroacetic acid is added at 0°C (10.7 mL, 46mmol) and the mixture is stirred at room temperature overnight. $NaHCO_3$ is slowly added until pH 9 and the mixture extracted 3 times with dichloromethane and ethyl acetate. The solvent was evaporated to yield 1.86 g (5.3mmol, 100%) of a white solid that was used without purification on the next steps. MS (m/e): 346.3 ($M+H^+$).

N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide

Prepared as described on example 1 from Trans 4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine in dichloromethane with triethylamine and acetylchloride. MS (m/e): 388.3 ($M+H^+$).

Example 25

N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide

4-morpholinobenzoic acid (0.153 g, 0.74 mmol), 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyl uronium tetrafluoroborate (0.026 g, 0.69 mmol) and (0.350 mL, 2.02 mmol) of N-ethyldiisopropylamine were stirred in 5mL of DMF for 0.5h at room temperature and Trans 4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro acetic acid salt) (0.300 g, 0.69 mmol) was added. The mixture was stirred for 12 hours at room temperature. The mixture was concentrated to dryness and the residue was taken up on methanol and purified with chromatography eluting with CH_2Cl_2 –CH_2Cl_2 /MeOH (1-9:1).. The combined producted fractions were evaporated under reduced pressure to yield 0.24 g of an off-white solid (0.5 mmol, 70%). MS (m/e): 535.3 ($M+H^+$).

Example 26

N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide

Prepared as described on example 25 using 3-methoxy-propionic acid and), 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyl uronium tetrafluoroborate, N-

ethyldiisopropylamine in DMF and Trans 4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoroacetic acid salt) to yield 0.023 g of a white solid (0.05 mmol, 37%). MS (m/e): 332.4 ($M+H^+$).

Example 27

N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-piperidin-1-yl-benzamide

Prepared as described on example 26 using 4-piperidin-1-yl-benzoic acid, 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyl uronium tetrafluoroborate, N-ethyldiisopropylamine in DMF and Trans 4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoroacetic acid salt). The mixture was stirred for 12 hours at room temperature. The mixture was concentrated to dryness and the residue was taken up on methanol and purified with preparative HPLC on reversed phase eluting with acetonitrile/water. The combined producted fractions were evaporated under reduced pressure to yield 0.028 g of a off-white solid (0.05 mmol, 49%). MS (m/e): 533.0 ($M+H^+$).

According to the procedure described for the synthesis of example 26 further derivatives have been synthesized from the respective Trans 4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoroacetic acid salt) and the corresponding acid. They comprise examples 28 to 30 on Table 2.

Table 2

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
28	4-(2,6-Dimethyl-morpholin-4-yl)-N-trans (4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	562.7	Trans 4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoroacetic acid salt) and 4-morpholinobenzoic acid	563.0

Ex.	Systematic name	MW	Starting materials	MW found $(M+H)^+$
29	4-(1,1-Dioxo-1 ,6,4-thiomorpholin-4-yl)-N trans -(4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide	582.7	Trans 4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoroacetic acid salt) and 4-(1,1-Dioxo thiomorpholino) benzoic acid	583.2
30	Benzo[1,3]dioxole-5-carboxylic acid trans (4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	493.5	Trans 4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoroacetic acid salt) and Benzo[1,3]dioxole-5-carboxylic acid	494.4

Example 32

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide

Intermediate D

1-[4-(2,4-Dichloro-benzoyl)-piperidin-1-yl]-ethanone

Aluminium chloride (11, 24g, 84 mmol) is added portionwise to 23 mL of dichlorobenzene (200 mmol). To this suspension 8g of 1-acetylisonipecotoyl chloride (42 mmol) was added also portionwise . The mixture was stirred 10 minutes at room temperature and then at 90°C for 4 hours until TLC indicated completion of the reaction that changed from a yellow/orange solution changed into dark orange upon heating.. Water was added and the solution was extracted three times with dichloromethane. The combined organic layers were washed with water and brine, dried over magnesium sulfate, filtered and evaporated. The crude product was purified by flash-chromatography

on silica gel with hexane : ethyl acetate (1:0 to 0:1) to give 6.3 g (50%) of the product as an orange oil. MS (m/e): 300.2 (M^+).

1-(4-{(2,4-Dichloro-phenyl)-[(E)-hydroxyimino]-methyl}-piperidin-1-yl)-ethanone

1-[4-(2,4-Dichloro-benzoyl)-piperidin-1-yl]-ethanone (5.6 g, 19 mmol) was solved in ethanol (140 mL) . Hydroxylamine (5.2g, 75mmol) was added followed by N,N-diisopropyl ethyl amine (12.8 mL, 75 mmol) and the reaction was refluxed to 100°C for 12-20 hours until TLC indicated completion of the reaction.Water was added and and the solution was extracted three times with dichloromethane. The combined organic layers were washed with water and brine, dried over magnesium sulfate, filtered and evaporated. The crude product was purified by flash-chromatography on silica gel with hexane : ethyl acetate (1:0 to 0:1) to give 2.15 g (37 %) of the product as a white solid and 1.12 g of the starting material that was recovered. MS (m/e): 315.1 ($M+H^+$).

1-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethanone

1-(4-{(2,4-Dichloro-phenyl)-[(E)-hydroxyimino]-methyl}-piperidin-1-yl)-ethanone (2.15g, 7 mmol) was solved in THF (34mL) and potassium tert-butoxide was added (0.844g, 7.5 mmol) . The mixture was stirred for 2 hours until TLC indicated the end of the reaction. The solvent was removed and the mixture purified by flash-cromatography on silica gel with hexane : ethyl acetate (1:0 to 0:1). The combined producted fractions were evaporated under reduced pressure to yield 1.45 g of a colourless oil (75%). MS (m/e): 279.1 ($M+H^+$).

6-Chloro-3-piperidin-4-yl-benzo[d]isoxazole hydrochloride

1-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethanone (1.45g, 5.3 mmol) was diluted with an aqueous solution of HCl 6N (13.8 mL, 16 mmol) and the mixture was refluxed overnight. After cooling , 2X20mL of ether was added and the mixture extracted. A solution of NaOH was added to the aqueous phase until pH 11 and the mixture was extracted with ethyl acetate three times . The combined ethyl acetate fractions were dried and evaporated under reduced pressure to yield 1.14 g of a light brown solid (93%). MS (m/e): 236.9 ($M+H^+$).

Intermediate E

Trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-carbamic acid tert-butyl ester

Prepared as described for intermediate F (example 1) from a mixture 6-Chloro-3-piperidin-4-yl-benzo[d]isoxazole hydrochloride (0.942 g, 4 mmol), trans-[4-(2-Oxo-ethyl)-cyclohexyl]-carbamic acid tert-butyl ester (1.06 g, 4 mmol) and sodium triacetoxyborohydride (1.51g, 7 mmol) in 1, 2 dichloroethane (9.8mL) The product fractions were concentrated to give 1.2 g (2.6 mmol, 64.3% yield) of a light brown solid. MS (m/e): 462.4 ($M+H^+$).

Intermediate F

Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt)

Prepared as described for example 1 from Trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-carbamic acid tert-butyl ester and trifluoroacetic acid at 0°C. The product was obtained as a light yellow solid (0.197g, 52%). MS (m/e): 362.4 ($M+H^+$).

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide

Prepared as described for example 2 from 3-methoxy-propionic acid , 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyl uronium tetrafluoroborate , N-ethyldiisopropylamine and Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro acetic acid salt) in DMF for 12 hours at room temperature. The mixture was concentrated to dryness and the residue was taken up on methanol and purified with chromatography eluting with CH_2Cl_2 –CH_2Cl_2 /MeOH (1-9:1). The combined producted fractions were evaporated under reduced pressure to yield 0.022 g of an off-white solid (0.05 mmol, 45%). MS (m/e): 448.3($M+H^+$).

According to the procedure described for the synthesis of example 32 further derivatives have been synthesized from Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine and the corresponding acids: commercially available, or obtained by methods known on the art (e.g. hydrolysis of the corresponding ester) or by methods described hereinbefore (see Table 3).

Table 3

Ex. No	Systematic name	MW	Starting materials	MW found (M+H)+
33	N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3,3,3-trifluoro-2-hydroxy-propionamide	487.9	Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and 3,3,3-trifluoro-2-hydroxy- propionic acid (commercially available)	488.1
34 34A 34B	N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-pyran-2-yl)-acetamide	488.0	Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and 2-(tetrahydro-pyran-2-yl)-acetic acid (commercially available) Note : Chiral separation yields both enantiomers.	488.3
34A	N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(R)-tetrahydro-pyran-2-yl-acetamide	488.0	Separation of racemic mixture by chiral column	488.4

34B	N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(S)-tetrahydro-pyran-2-yl-acetamide	488.0	Separation of racemic mixture by chiral column	488.4
35	N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-trans (4-methoxy-cyclohexyl)-acetamide	516.12	Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and Trans (4-Methoxy-cyclohexyl)-acetic acid (prepared from Methyl 4-hydroxyphenyl acetate and Nickel-aluminum alloy in MeOH and posterior methylation with NaH, MeI and ester hydrolysis with LiOH)	516.5
36	N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(1,4-dioxa-spiro[4.5]dec-8-yl)-acetamide	544.1	Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and (1,4-Dioxa-spiro[4.5]dec-8-yl)-acetic acid (prepared by hydrolysis of the ethyl ester commercially available)	544.0

37	N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3,3-dimethoxy-propionamide	478.0	Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and 3,3-dimethoxy-propionic acid (prepared by hydrolysis of the commercially available methyl ester)	478.1
38	N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-furan-2-yl)-acetamide	474.0	Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and 2-(tetrahydro-furan-2-yl)-acetic acid (prepared by hydrolysis of the commercial available methyl ester)	474.1
39	(R)-N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-hydroxy-butyramide	448.0	Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and (R)- 3-hydroxy-butyric acid	448.1

40	N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((S)-2,2-dimethyl-[1,3]dioxolan-4-yl)-acetamide	504.0	Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and –(4S) -2,2-dimethyl-[1,3]dioxolan-4-yl)-acetic acid potassium salt (prepared by KO^tSiMe_3 conversion of methyl ester to the anhydrous acid salt following Tet. Letters, 25(51), 1984, 5831-5834)	504.0
41	N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1S,3S)-3-methoxy-cyclopentyl)-acetamide	502.1	Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and ((1S,3S)-3-Methoxy-cyclopentyl)-acetic acid potassium salt (prepared by KO^tSiMe_3 conversion of methyl ester to the anhydrous acid of the corresponding methyl ester synthesized following Helvetica Chimica Acta, Vol 75, 1992, 1945-1950)	502.1

Example 42

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-4-methyl-cyclohexyl)-acetamide

8-Methyl-1,4-dioxa-spiro (4,5) decan-8-ol

Prepared by treatment of 1,4,- cyclohexanedione monoethylene acetal with methyl lithium in ether or MeMg I according to the procedure described on Journal of Organic Chemistry, 71(22), 2006, 8424-8430.

4-Methoxy-4-methyl-cyclohexanone

Prepared from reaction of 8-Methyl-1,4-dioxa-spiro (4,5) decan-8-ol (11.7g, 68 mmol) , NaH (137 mmol), MeI (273 mmol) and Me4NBr (17 mmol) in tetrahydrofuran (150mL) at room temperature to obtain the o-methylated 1,4-dioxa spiro compound followed by treatment with 25% HCl (13.5 mL) in acetone to obtain (9.48g, 97.6%) of the desired 4-Methoxy-4-methyl-cyclohexanone as an oil.

(4-Methoxy-4 methyl-cyclohexylidene)–acetic acid methyl ester

A mixture of trimethyl phosphonoacetate (9.11 mL, 56 mmol) and (40mL, 64 mmol) of n-BuLi (1.6N) in DME (60 mL) is stirred for 10 minutes at 0°C. 4-Hydroxy-4-methyl-cyclohexanone (8g, 56 mmol) was added and the mixture stirred 2.5 hours at 0°C until TCL indicated complexion of the reaction. Product was obtained after extraction with dichloromethane (7.71g, 69%).

(4-cis/trans -Methoxy-4-methyl-cyclohexyl) acetic acid methyl ester

Prepared from (4-Methoxy-4 methyl-cyclohexexylidene)–acetic acid methyl ester (7g, 35 mmol) with Pd/C (10%) (35 mmol) in ethyl acetate under hydrogen overnight at room temperature. MS (m/e): 201.2 ($M+H^+$).

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-cis,trans-methoxy-4-methyl-cyclohexyl)-acetamide

(4-cis/trans-Methoxy-4-methyl-cyclohexyl) acetic acid (anhydrous potassium salt) was prepared by conversion of (4-cis/trans-Methoxy-4-methyl-cyclohexyl) acetic acid methyl

ester (0.157g, 1 mmol) to the anhydrous acid salt using potassium trimethylsilanolate KO^tSiMe_3 (0.202g, 2mmol) and stirring with 2 mL of dichloromethane overnight following Tet. Letters, 25(51), 1984, 5831-5834. The solvent was evaporated and the obtained salt was solved on DMF (2 mL) and reacted as described for example 32 , with Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro acetic acid salt) (0.300g, 1 mol) 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyl uronium tetrafluoroborate (0.328 g, 1 mmol) and (0.530 mL, 3 mmol) of N-ethyldiisopropylamine for 12 hours at room temperature. MS (m/e): 530.0 ($M+H^+$).

Example 42A

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-trans-methoxy-4-methyl-cyclohexyl)-acetamide

Obtained from separation using a chiral column (chiralpak AD) of the cis and trans mixture of N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-4-methyl-cyclohexyl)-acetamide. MS (m/e): 530.0 ($M+H^+$).

Example 42B

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-cis-methoxy-4-methyl-cyclohexyl)-acetamide

Obtained from separation using a chiral column (chiralpak AD) of the cis and trans mixture of N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-cis-methoxy-4-methyl-cyclohexyl)-acetamide. MS (m/e): 530.1 ($M+H^+$).

Example 43

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide

Prepared as described for example 32 from 3-methoxy-butyric acid and Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro acetic acid salt) in DMF for 4-12 hours at room temperature. MS (m/e): 462.3 ($M+H^+$).

Example 43A

(R)-N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide

Obtained from separation using a chiral column (chiralpak AD) of N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide. MS (m/e): 462.5 ($M+H^+$).

Example 43B

(S)-N-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide

Obtained from separation using a chiral column (chiralpak AD) of N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide. MS (m/e): 462.5 ($M+H^+$).

Example 44

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-trans (4-methoxymethyl-cyclohexyl)-acetamide

8-Methoxymethyl-1,4-dioxa-spiro[4.5]decane

1,4-Dioxaspiro[4.5]decane-8-methanol (2g, 1 mmol) (commercial available or prepared as in Bioorganic & Medicinal Chemistry, 13(23), 6309-6323; 2005) is methylated using MeI (1.81mL, 29 mmol) and NaH (0.813g, 20 mmol) in tetrahydrofuran to obtain after 2 hours of stirring at room temperature 1.4g (7.8 mmol) of the desired compound. MS (m/e): 187.3 ($M+H^+$).

(4-Methoxymethyl-cyclohexylidene)-acetic acid methyl ester

4-Methoxymethyl-cyclohexanone was obtained by treatment of 8-Methoxymethyl-1,4-dioxa-spiro[4.5]decane (1.45 g, 8 mmol) with HCl 1N (15.6 mL, 16 mmol) in acetone (35mL) . Acetone was removed and the product was extracted with dichloromethane .The crude 4-Methoxymethyl-cyclohexanone was solved in 1 mL of dimethoxyethane and added into a mixture previously prepared by adding n-BuLi (3,54 mL, 6 mmol) to methyl diethylphosphonoacetate ((1.03g, 5 mmol) in DME by stirring for 10 minutes at

0°C. After 2 hours TLC indicated formation of the (4-Methoxymethyl-cyclohexylidene)-acetic acid methyl ester (0.552g, 2.7 mmol) . MS (m/e): 199.1 ($M+H^+$).

(4-Methoxymethyl-cyclohexyl)-acetic acid methyl ester

Prepared from (4-Methoxymethyl-cyclohexylidene)-acetic acid methyl ester (0.550g, 3 mol) by hydrogenation using Pd/C (10%) (0.295g, 0.3 mmol) in ethylacetate (15 mL).1/3 cis/ trans mixture.

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-trans (4-methoxymethyl-cyclohexyl)-acetamide

Prepared from KO^tSiMe_3 and (4-Methoxymethyl-cyclohexyl)-acetic acid methyl ester to its potassium salt as described on example 42 and reaction of the salt with Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro acetic acid salt) , 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyl uronium tetrafluoroborate and N-ethyldiisopropylamine for 12 hours at room temperature. Addition of ether and filtration yields the major trans isomer as a white solid. MS (m/e): 530.2 ($M+H^+$).

Example 45

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-hydroxy-4-methyl-cyclohexyl)-acetamide

(4-Oxo-cyclohexyl)-acetic acid

Prepared from LiOH hydrolysis of (4-Oxo-Cyclohexyl)-acetic acid methyl ester (commercially available).

(4-Hydroxy-4-methyl-cyclohexyl)-acetic acid

Prepared using an excess of MeMgBr (26 mmol) in THF (20 ml) with (4-Oxo-cyclohexyl)-acetic acid (13 mmol) as described on Journal of American Society 93 (1), 1971, 121-129.

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-hydroxy-4-methyl-cyclohexyl)-acetamide

Prepared as described for example 32 from (4-Hydroxy-4-methyl-cyclohexyl)-acetic acid and Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro acetic acid salt) in DMF for 4-12 hours at room temperature. MS (m/e): 516.1 ($M+H^+$).

Example 46

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide

Prepared as described on example 1 from Trans 4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro acetic acid salt) in dichloromethane with triethylamine and acetylchloride. MS (m/e): 404.4 ($M+H^+$).

Example 47

Ethanesulfonic acid (4-trans {2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide.

Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) (intermediate F , example 1) (0.038 g, 0.11 mmol) was solved in THF (0.6 mL) , ethanesulfonyl chloride was added followed by triethylamine (0.018 mL, 0.13 mmol) and the solution was stirred overnight . The mixture was concentrated to dryness and the residue was taken up on methanol and purified with preparative HPLC on reversed phase eluting with acetonitrile/water. The combined producted fractions were evaporated under reduced pressure to yield (0.023 g, 49%) of the product as a white solid. MS (m/e):: 438.1 ($M+H^+$).

According to the procedure described for the synthesis of example 47 further derivatives have been synthesized from the respective Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and the corresponding sulfonyl chloride. They comprise examples 48 to 50 in table 4 hereinafter.

Table 4

Ex. No	Systematic name	MW	Starting materials	MW found $(M+H)^+$
48	4-Chloro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzenesulfonamide	520.1	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and benzenesulfonyl chloride	520.3
49	N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-methoxy-benzenesulfonamide	515.7	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and 4-methoxy-benzene sulfonyl chloride	516.3
50	Pyridine-3-sulfonic acid trans(4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide	487.6	Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (could be obtained as the trifluoroacetic acid salt) and pyridine-3-sulfonyl chloride hydrochloride	488.2

Example 51

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-cyano-acetamide

Prepared in analogy of example 32 from trans 4-{2-[4-(6-chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro acetic acid salt) and cyanoacetic acid with triethyl amine as the base. MS (m/e): 429.4 ($M+H^+$).

Example 52

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-cyano-propionamide

Prepared in analogy to example 40 from trans-4-{2-[4-(6-chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (trifluoro-acetic acid salt) and 3-cyanopropionic acid potassium salt (prepared by KO^tSiMe_3 conversion of the methyl ester to the anhydrous acid salt following Tett. Letters, 25(51), 1984, 5831-5834). MS (m/e): 443.2 ($M+H^+$).

Example 53

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(R)-tetrahydro-furan-2-yl-acetamide

Obtained from separation using a chiral column (chiralpak AD) of N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-furan-2-yl)-acetamide (*Example 38*). MS (m/e): 474.2 ($M+H^+$).

Example 54

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-cyclopropyl-acetamide

The title compound, MS: m/e = 444.3 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans 4-{2-[4-(6-chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (hydrochloric acid salt) and cyclopropylacetic acid.

Example 55

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-hydroxy-acetamide

The title compound, MS: m/e = 420.2 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans 4-{2-[4-(6-chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (hydrochloric acid salt) and glycolic acid.

Example 56

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methanesulfonyl-acetamide

The title compound, MS: m/e = 482.1/484.0 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans 4-{2-[4-(6-chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (hydrochloric acid salt) and methanesulfonylacetic acid.

Example 57

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-[1,3]dioxan-2-yl-acetamide

Step 1: [1,3]Dioxan-2-yl-acetic acid methyl ester

Propane-1,-3-diol (2.45 ml, 36 mmol) was dissolved in 100 ml THF and cooled to 0-5 °C. Sodium hydride (1.43 g, 40 mmol, 55%) was added and the reaction mixture stirred for 15 minutes at 0-5 °C. Propyonic acid methyl ester (2.97 ml, 36 mmol) dissolved in 10 ml THF was added drop wise and stirred for 3 hours at 0-5°C. The reaction mixture was quenched with 2N HCl-solution and extracted two times with ethyl acetate. The organic extracts were washed with brine, dried with sodium sulfate, filtered and evaporated. The crude product was purified by flash chromatography on silica gel (dichloromethane). The desired compound was obtained as a colourless liquid (2.96 g, 52%).

Step 2: N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-[1,3]dioxan-2-yl-acetamide

[1,3]Dioxan-2-yl-acetic acid methyl ester (130 mg, 0.81 mmol) (*Step 1*) was dissolved in 2 ml THF, 1 ml methanol and 1 ml water. Lithium hydroxide monohydrate (102 mg, 2.43

mmol) was added and the reaction mixture stirred for 16 hours at room temperature. The organic solvent was evaporated and the aqueous mixture was acidified with 2N HCl to pH 1. The mixture was evaporated to dryness and trans 4-{2-[4-(6-chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine (as a hydrochloric acid salt) (150 mg, 0.41 mmol) (*Example 32, Intermediate F*) in 1 ml DMF was added. N,N-Diisopropylethylamine (205 µl, 1.22 mmol) and 2-(1H-benzotriazol-1-yl)-1,1,3,3-tetramethyl uronium tetrafluoroborate [TBTU] (157 mg, 0.49 mmol) were added and the reaction stirred for 2 hours at room temperature. The reaction mixture was quenched with saturated $NaHCO_3$-solution and extracted with dichloromethane. The organic extract was washed with brine, dried with sodium sulfate, filtered and evaporated. The crude product was purified by flash chromatography on silica gel (dichloromethane / methanol 100:0 -> 90:10 gradient). The desired compound was obtained as a light yellow solid (61 mg, 33%), MS: m/e = 490.3 ($M+H^+$).

Example 58

N-trans-(4-{2-[4-(5-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-cyclohexyl)-acetamide

Step 1: 5-Chloro-3-piperidin-4-yl-benzo[d]isoxazole hydrochloride

The title compound can be prepared in accordance with literature described in the patent WO02066446 (Example 46 and 48) by using 5-chloro-2-fluorobenzaldehyde as starting material.

Step 2: Trans-(4-{2-[4-(5-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-carbamic acid tert-butyl ester

The title compound, MS: m/e = 462.3 ($M+H^+$), was prepared in accordance with the general method of example 1, intermediate E from a mixture of 5-chloro-3-piperidin-4-yl-benzo[d]isoxazole hydrochloride and trans-[4-(2-oxo-ethyl)-cyclohexyl]-carbamic acid tert-butyl ester (Example 1, Intermediate C).

Step 3: Trans-4-{2-[4-(5-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride

Trans-(4-{2-[4-(5-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-carbamic acid tert-butyl ester (1.35 g, 2.92 mmol) was dissolved in 2 ml dichloromethane and 4N HCl in dioxane (8.8 ml, 38.8 mmol) was added. The white suspension was stirred for 4 hours at room temperature, diluted with diisopropylether and filtered. The crystals

were washed with diisopropylether and dried for 2 hours at 50°C and <20 mbar, to get the desired salt as a white solid (1.65 g, quant.) [MS: m/e = 362.2 ($M+H^+$)].

Step 4: N-trans-(4-{2-[4-(5-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-cyclohexyl)-acetamide

Prepared as described for Example 40 from trans-4-{2-[4-(5-chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 58, step 3) and trans-(4-methoxy-cyclohexyl)-acetic acid potassium salt (prepared from methyl 4-hydroxyphenyl acetate and Nickel-aluminum alloy in MeOH and posterior methylation with NaH, MeI and by KO^tSiMe_3 conversion of the methyl ester to the anhydrous acid salt following Tett. Letters, 25(51), 1984, 5831-5834). MS: m/e = 516.0/517.1 ($M+H^+$).

Example 59

N-trans-(4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-methanesulfonamide

Step 1: Trans-4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride

The title compound, MS: m/e = 346.2 ($M+H^+$), was prepared in accordance with the general method of example 58, step 1, 2 and 3 starting from 2,5-difluorobenzaldehyde.

Step 1: N-trans-(4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-methanesulfonamide

The title compound, MS: m/e = 424.2 ($M+H^+$), was prepared in accordance with the general method of example 47 from trans-4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride and methansulfonyl chloride.

Example 60

N-trans-(4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide

Step 1: Trans-4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride

The title compound, MS: m/e = 380.3/382.3 ($M+H^+$), was prepared in accordance with the general method of example 58, step 1, 2 and 3 starting from 4-chloro-2,5-difluorobenzaldehyde.

Step 2: N-trans-(4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide

The title compound, MS: m/e = 466.1/468.3 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans-4-{2-[4-(6-chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride and 3-methoxypropionic acid.

Example 61

N-trans-(4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-furan-2-yl)-acetamide

The title compound, MS: m/e = 492.3 ($M+H^+$), was prepared in accordance with the general method of example 60 from trans-4-{2-[4-(6-chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride and 2-(tetrahydro-furan-2-yl)-acetic acid (prepared by hydrolysis of the commercial available methyl ester).

Example 62

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methoxy-acetamide

Step 1: Trans- 4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride

The title compound, MS: m/e = 364.4 ($M+H^+$), was prepared in accordance with the general method of example 58, step 1, 2 and 3 starting from 2,4,5-trifluorobenzaldehyde.

Step 2: N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methoxy-acetamide

The title compound, MS: m/e = 436.3/437.4 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans-4-{2-[4-(6-chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride and methoxyacetic acid.

Example 63

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1R,3R)-3-methoxy-cyclopentyl)-acetamide

The title compound, MS: m/e = 504.3 ($M+H^+$), was prepared in accordance with the general method of example 40 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and rac-trans-(3-methoxy-cyclopentyl)-acetic acid potassium salt (prepared from rac-trans-(3-hydroxy-cyclopentyl)-acetic acid methyl ester (*Helvetica Chimica Acta – Vol. 75 (1992) Page 1945 and 1950)* and posterior methylation with NaH, MeI and by KO^tSiMe_3 conversion of the methyl ester to the anhydrous acid salt following Tett. Letters, 25(51), 1984, 5831-5834).

Example 64

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-cyclohexyl)-acetamide

The title compound, MS: m/e = 518.4 ($M+H^+$), was prepared in accordance with the general method of example 40 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and trans-(4-methoxy-cyclohexyl)-acetic acid potassium salt (prepared from methyl 4-hydroxyphenyl acetate and Nickel-aluminum alloy in MeOH and posterior methylation with NaH, MeI and by KO^tSiMe_3 conversion of the methyl ester to the anhydrous acid salt following Tett. Letters, 25(51), 1984, 5831-5834).

Example 65

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide

The title compound, MS: m/e = 450.3 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and 3-methoxypropionic acid.

Example 66

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide

The title compound, MS: m/e = 406.3 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and acetic acid.

Example 67

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-hydroxy-acetamide

The title compound, MS: m/e = 422.2 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and glycolic acid.

Example 68

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-hydroxy-propionamide

The title compound, MS: m/e = 436.0 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and 3-hydroxypropionic acid.

Example 69

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-hydroxy-cyclohexyl)-acetamide

The title compound, MS: m/e = 504.1 ($M+H^+$), was prepared in accordance with the general method of example 40 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and trans-(4-hydroxy-cyclohexyl)-acetic acid potassium salt (prepared from methyl 4-hydroxyphenyl acetate and Nickel-aluminum alloy in MeOH and by KO^tSiMe_3 conversion of the methyl ester to the anhydrous acid salt following Tett. Letters, 25(51), 1984, 5831-5834).

Example 70

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1R,3R)-3-hydroxy-cyclopentyl)-acetamide

The title compound, MS: m/e = 490.4 ($M+H^+$), was prepared in accordance with the general method of example 40 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and rac-trans-(3-hydroxy-cyclopentyl)-acetic acid potassium salt (prepared as described in literature *Helvetica Chimica Acta – Vol. 75 (1992) Page 1945 and 1950* and by KO^tSiMe_3 conversion of the methyl ester to the anhydrous acid salt following Tett. Letters, 25(51), 1984, 5831-5834).

Example 71

Tetrahydro-pyran-4-carboxylic acid trans-(4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide

The title compound, MS: m/e = 476.3 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and tetrahydro-pyran-4-carboxylic acid.

Example 72

N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-[1,3]dioxan-2-yl-acetamide

The title compound, MS: m/e = 492.3 ($M+H^+$), was prepared in accordance with the general method of example 40 from trans-4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride (example 62, step 1) and [1,3]Dioxan-2-yl-acetic acid potassium salt (prepared as described in example 57, step 1 and by KO^tSiMe_3 conversion of the methyl ester to the anhydrous acid salt following Tett. Letters, 25(51), 1984, 5831-5834).

Example 73

N-trans-(4-{2-[4-(6-Methyl-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide

Step 1: Trans-4-{2-[4-(6-Methyl-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride

The title compound, MS: m/e = 342.3 ($M+H^+$), was prepared in accordance with the general method of example 58, step 1, 2 and 3 starting from 2-fluoro-4-methylbenzaldehyde.

Step 2: N-trans-(4-{2-[4-(6-Methyl-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide

The title compound, MS: m/e = 384.3 ($M+H^+$), was prepared in accordance with the general method of example 32 from trans-4-{2-[4-(6-methyl-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine hydrochloride and acetic acid.

Example A

Film coated tablets containing the following ingredients can be manufactured in a conventional manner:

Ingredients	Per tablet	
Kernel:		
Compound of formula (I)	10.0 mg	200.0 mg
Microcrystalline cellulose	23.5 mg	43.5 mg
Lactose hydrous	60.0 mg	70.0 mg
Povidone K30	12.5 mg	15.0 mg
Sodium starch glycolate	12.5 mg	17.0 mg
Magnesium stearate	1.5 mg	4.5 mg
(Kernel Weight)	120.0 mg	350.0 mg
Film Coat:		
Hydroxypropyl methyl cellulose	3.5 mg	7.0 mg
Polyethylene glycol 6000	0.8 mg	1.6 mg
Talc	1.3 mg	2.6 mg
Iron oxide (yellow)	0.8 mg	1.6 mg
Titanium dioxide	0.8 mg	1.6 mg

The active ingredient can be sieved and mixed with microcrystalline cellulose, and the mixture can be granulated with a solution of polyvinylpyrrolidone in water. The granulate can be mixed with sodium starch glycolate and magnesiumstearate and compressed to yield kernels of 120 or 350 mg respectively. The kernels then can be lacquered with an aqueous solution / suspension of the above mentioned film coat.

Example B

Capsules containing the following ingredients can be manufactured in a conventional manner:

Ingredients	Per capsule
Compound of formula (I)	25.0 mg
Lactose	150.0 mg
Maize starch	20.0 mg
Talc	5.0 mg

The components can be sieved and mixed and filled into capsules of size 2.

Example C

Injection solutions can have the following composition:

Compound of formula (I)	3.0 mg
Gelatine	150.0 mg
Phenol	4.7 mg
Sodium carbonate	to obtain a final pH of 7
Water for injection solutions	ad 1.0 ml

Example D

Soft gelatin capsules containing the following ingredients can be manufactured in a conventional manner:

Capsule contents	
Compound of formula (I)	5.0 mg
Yellow wax	8.0 mg
Hydrogenated Soya bean oil	8.0 mg

Partially hydrogenated plant oils	34.0 mg
Soya bean oil	110.0 mg
Weight of capsule contents	165.0 mg
Gelatin capsule	
Gelatin	75.0 mg
Glycerol 85 %	32.0 mg
Karion 83	8.0 mg (dry matter)
Titanium dioxide	0.4 mg
Iron oxide yellow	1.1 mg

The active ingredient can be dissolved in a warm melting of the other ingredients and the mixture can be filled into soft gelatin capsules of appropriate size. The filled soft gelatin capsules then can be treated according to the usual procedures.

Example E

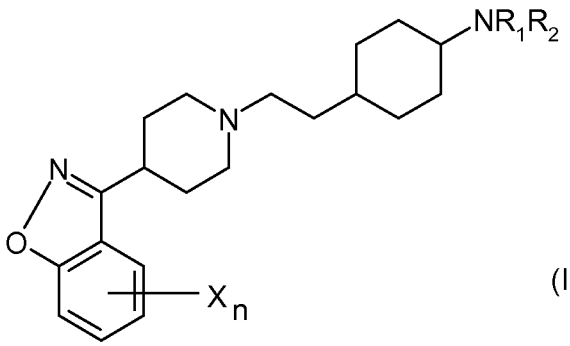
Sachets containing the following ingredients can be manufactured in a conventional manner:

Compound of formula (I)	50.0 mg
Lactose, fine powder	1015.0 mg
Microcrystalline cellulose (AVICEL PH 102)	1400.0 mg
Sodium carboxymethyl cellulose	14.0 mg
Polyvinylpyrrolidone K 30	10.0 mg
Magnesium stearate	10.0 mg
Flavoring additives	1.0 mg

The active ingredient can be mixed with lactose, microcrystalline cellulose and sodium carboxymethyl cellulose and granulated with a mixture of polyvinylpyrrolidone in water. The granulate can be mixed with magnesium stearate and the flavoring additives and be filled into sachets.

Claims

1. A compound of formula (I):



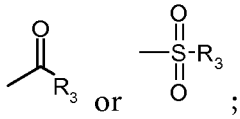
(I)

wherein:

X is independently halogen, cyano; C_{1-6}-alkyl, C_{1-6}-alkoxy or C_{1-6}-haloalkyl;

n is 0, 1, 2 or 3;

R^1 is H or C_{1-6}-alkyl;

R^2 is  or ;

R^3 is hydrogen, C_{1-6}-alkyl, C_{2-6}-alkenyl, C_{2-6}-alkynyl, C_{1-6}-alkoxy, C_{3-10}-cycloalkyl, aryl, 4 to 10 membered heterocycloalkyl, or 5 to 10 membered heteroaryl, which are optionally substituted by one to five substituents selected from the group consisting of:

halo,

cyano,

$-SO_2-C_{1-6}$-alkyl,

hydroxyl,

C_{1-6}-alkyl,

C_{1-6}-haloalkyl,

$-CO(O)-C_{1-6}$-alkyl,

C_{1-6}-alkoxy optionally substituted by one or more R^a,

C_{3-10}-cycloalkyl optionally substituted by one or more R^a,

4 to 10 membered heterocycloalkyl optionally substituted by one or more R^a,

aryl optionally substituted by one or more R^a,

5 to 10 membered heteroaryl optionally substituted by one or more R^a, and

$-NR^bR^c$, wherein R^b is H or C_{1-6}-alkyl and wherein R^c is H, C_{1-6}-alkyl or aryl optionally substituted by one or more R^a;

wherein R^a is selected from:

halo,

cyano,
oxo,
hydroxyl,
halobenzenesulfonyl,
C_{1-6}-alkyl
C_{1-6}-haloalkyl,
-NH(CO)-C_{1-6}-alkyl,
di(C_{1-6})alkylamino,
-O(CO)-C_{1-6}-alkyl,
C_{1-6}-alkylsulfonyl,
C_{1-6}-alkoxy
C_{1-6}-haloalkoxy,
4 to 10 membered heterocycloalkyl
aryl,
aryloxy, or
5 to 10 membered heteroaryl;

as well as pharmaceutically acceptable salts thereof.

2. The compound of formula (I) according to claim 1, wherein:

X is fluorine or chlorine;

n is 0, 1 or 2;

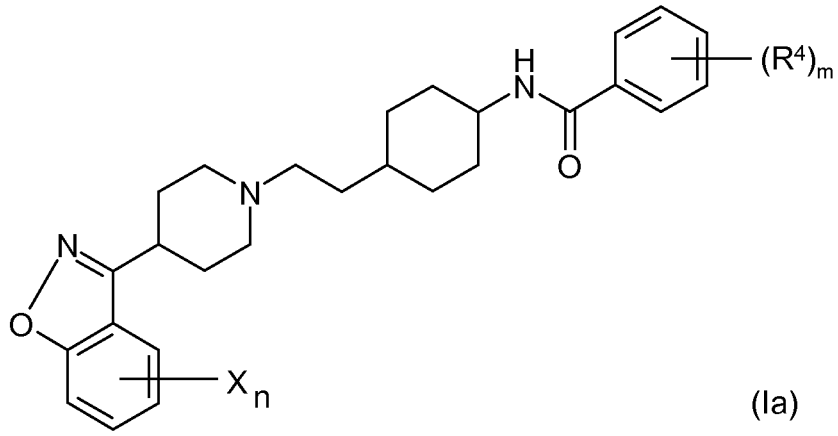
R^1 is hydrogen;

R^2 is , and

wherein R^3 is as defined in claim 1;

as well as pharmaceutically acceptable salts thereof.

3. A compound of formula (Ia) according to claim 1:



(Ia)

wherein

X is fluorine or chlorine;

n is 0, 1 or 2;

m is 0, 1, 2 or 3;

R^4 is selected from the group consisting of:

halo,

cyano,

hydroxy,

C_{1-6}-alkyl,

C_{1-6}-haloalkyl,

di(C_{1-6})alkylamino,

-CO(O)-C_{1-6}-alkyl,

C_{1-6}-alkoxy optionally substituted by one or more R^a,

C_{3-10}-cycloalkyl optionally substituted by one or more R^a,

4 to 10 membered heterocycloalkyl optionally substituted by one or more R^a,

aryl optionally substituted by one or more R^a,

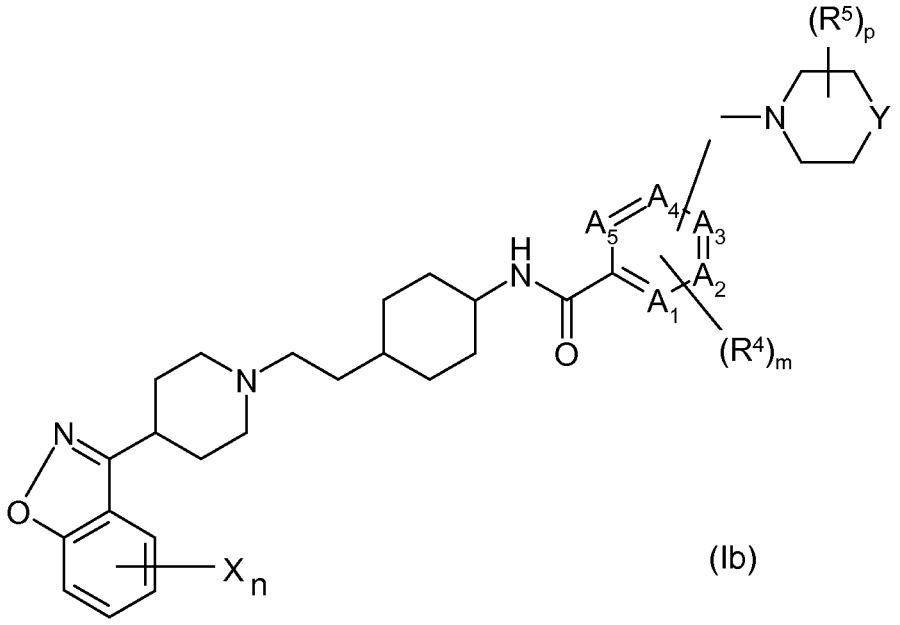
5 to 10 membered heteroaryl optionally substituted by one or more R^a, and

$-NR^bR^c$,

wherein R^a, R^b and R^c are as defined in claim 1;

as well as pharmaceutically acceptable salts thereof.

4. A compound of formula (Ib) according to claim 1:



(Ib)

wherein

X is fluorine or chlorine;

n is 0, 1 or 2;

m, p are independently of each other 0, 1 or 2;

R^4 and R^5 are selected from the group consisting of:

halo,

cyano,

hydroxy,

C_{1-6}-alkyl,

C_{1-6}-haloalkyl,

-CO(O)-C_{1-6}-alkyl,

C_{1-6}-alkoxy optionally substituted by one or more R^a,

C_{3-10}-cycloalkyl optionally substituted by one or more R^a,

4 to 10 membered heterocycloalkyl optionally substituted by one or more R^a,

aryl optionally substituted by one or more R^a,

5 to 10 membered heteroaryl optionally substituted by one or more R^a, and

$-NR^bR^c$,

wherein R^a, R^b and R^c are as defined in claim 1;

Y is oxygen or $-SO_2-$;

one, two or three of A^1, A^2, A^3, A^4 and A^5 are nitrogen and the others are CR^6, or A^1, A^2, A^3, A^4 and A^5 are CR^6 wherein

each R^6 is independently hydrogen or R^7; and

each R^7 is independently C_{1-6}alkyl, C_{1-6}alkyloxy, hydroxyl, amino, C_{1-6}alkylamino, N,N-di-(C_{1-6}alkyl)-amino, halo, halo-C_{1-6}alkyl, halo-C_{1-6}alkoxy, hetero-C_{1-6}alkyl, C_{1-6}alkylsulfonyl, C_{1-6}alkylsulfanyl, cyano;

as well as pharmaceutically acceptable salts thereof.

5. A compound of formula (Ib) according to claim 4, wherein

X is fluorine;

n, m are 0 or1;

p is 0;

R^4 is selected from the group consisting of:

halo,

cyano,

hydroxy,

C_{1-6}-alkyl,

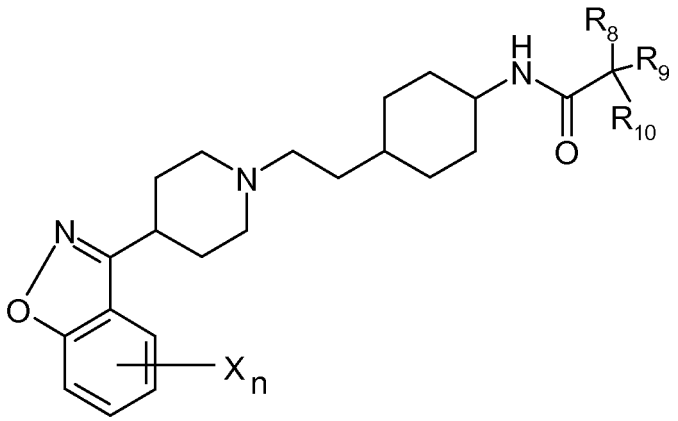
C_{1-6}-haloalkyl,

Y is oxygen or -SO_2-;

one or two of A^1, A^2, A^3, A^4 and A^5 are nitrogen and the others are CH_2;

as well as pharmaceutically acceptable salts thereof.

6. A compound of formula (Ic) according to claim 1:



(Ic)

wherein

X is fluorine or chlorine;

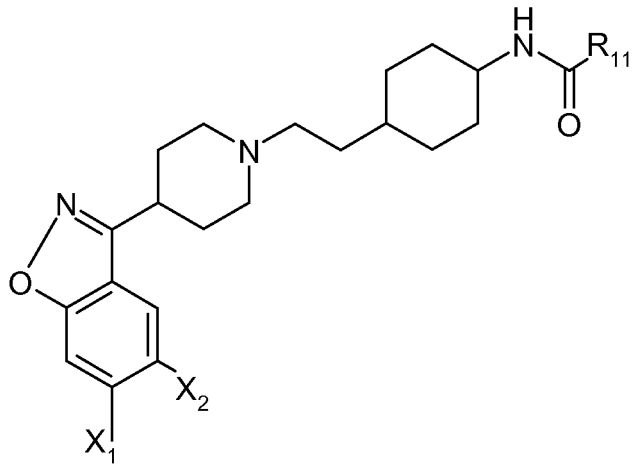
n is 0, 1 or 2;

R^8 and R^9 form a 3-, 4-, 5-, or 6-membered saturated ring, optionally comprising one or two heteroatoms selected from oxygen and nitrogen;

R^{10} can be a substituent on the ring formed by R^8 and R^9 and is selected from the group consisting of halogen, cyano, hydroxy, C_{1-6}-alkyl, C_{1-6}-haloalkyl and C_{1-6}-alkoxy;

as well as pharmaceutically acceptable salts thereof.

7. A compound of formula (Id) according to claim 1:



(Id)

wherein

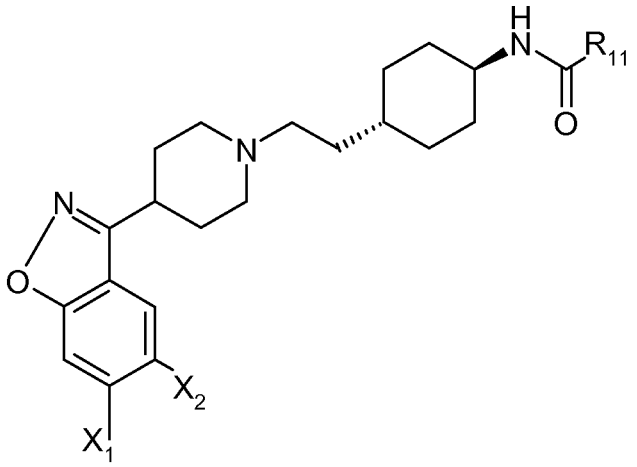
X_1 = H and X_2= fluoro or chloro; or

X_2 = H and X_1= fluoro or chloro; and

R^{11} is selected from the group consisting of C_{1-6}-alkyl and C_{1-6}-alkoxy, which are optionally substituted by halogen, hydroxy, C_{1-6}-alkyl, C_{1-6}-haloalkyl, C_{1-6}-alkoxy and C_{5-6}-cycloalkyl optionally substituted by C_{1-6}-alkyl or C_{1-6}-alkoxy;

as well as pharmaceutically acceptable salts thereof.

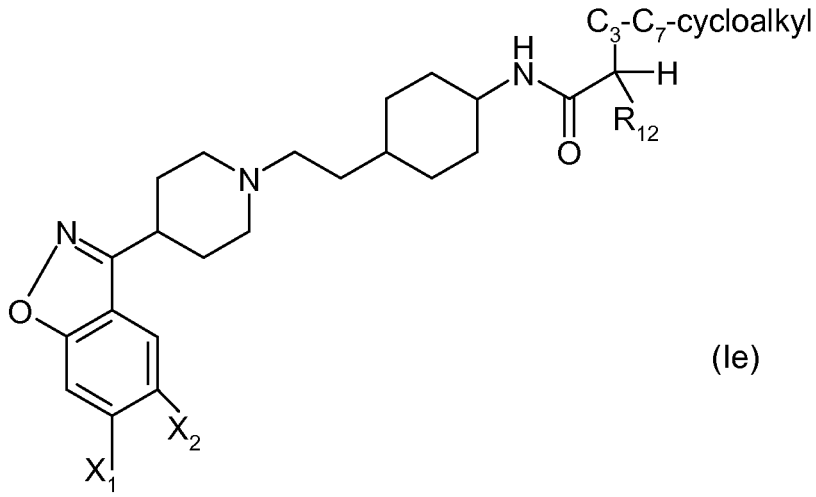
8. A compound of formula (Id') according to claim 7:



(Id')

wherein X_1, X_2, and R^{11} are as defined in claim 7;
as well as pharmaceutically acceptable salts thereof.

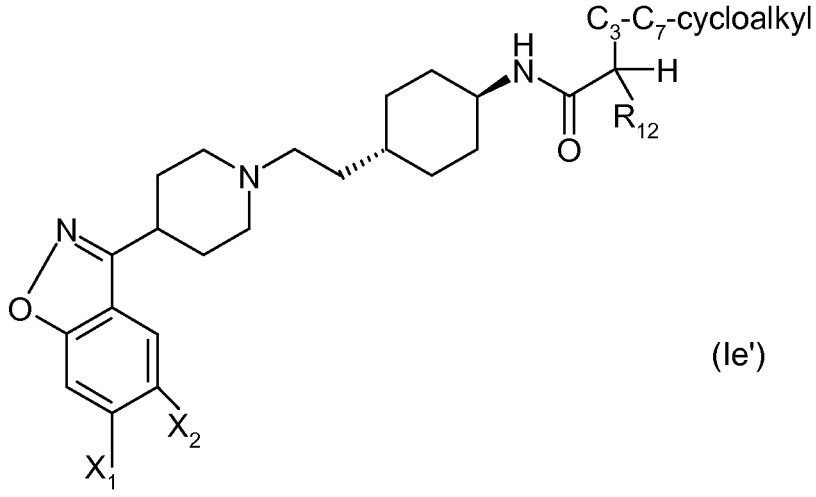
9. A compound of formula (Ie) according to claim 1:



(Ie)

wherein
X_1 = H and X_2= fluoro or chloro; or
X_2 = H and X_1= fluoro or chloro; and
R^{12} is selected from the group consisting of halo, hydroxy, cyano, C_{1-6}-alkyl, C_{1-6}-haloalkyl and C_{1-6}-alkoxy;
as well as pharmaceutically acceptable salts thereof.

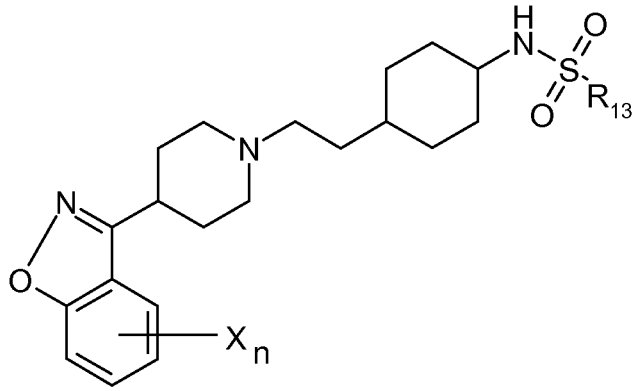
10. A compound of formula (Ie') according to claim 9:



(Ie')

wherein X_1, X_2, and R^{12} are as defined in claim 9;
as well as pharmaceutically acceptable salts thereof.

11. A compound of formula (Ig) according to claim 1:



(Ig)

wherein

X is fluorine or chlorine;

n is 0, 1 or 2;

R^{13} is selected from the group consisting of C_{1-6}-alkyl, C_{1-6}-haloalkyl, C_{1-6}-alkoxy, aryl optionally substituted by one or more R^a, and 5 to 10 membered heteroaryl optionally substituted by one or more R^a;

R^a halo, C_{1-6}-alkyl and C_{1-6}-alkoxy;

as well as pharmaceutically acceptable salts thereof.

12. A compound of formula (I) according to claim 1, wherein it is selected from the group consisting of:

4N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide

Tetrahydro-pyran-4-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,

N-trans-(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide,

N-Trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-6-morpholin-4-yl-nicotinamide,

5-Morpholin-4-yl-pyrazine-2-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

6-Morpholin-4-yl-pyridazine-3-carboxylic acid-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

2-Morpholin-4-yl-pyrimidine-5-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,
3-Fluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide,
3-Fluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide,
Trans 4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexylamine,
N-trans-(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-methoxy-benzamide,
4-tert-Butoxy-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,
4-Chloro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,
4-(1,1-Dioxo-1,6-thiomorpholin-4-yl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,
N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-morpholin-4-yl-isonicotinamide,
N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methoxy-isonicotinamide,
N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-piperidin-1-yl-benzamide,
2,3-Dihydro-benzo[1,4]dioxine-2-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,
N-trans (4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(3-methyl-pyrazol-1-yl)-acetamide,
N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-pyrrol-1-yl-benzamide,
1-Hydroxy-cyclopropanecarboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,
1-Trifluoromethyl-cyclobutanecarboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,
3,3,3-Trifluoro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-propionamide,
2-(3,5-Dimethoxy-phenyl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide,

4-(2,6-Dimethyl-morpholin-4-yl)-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,
Benzo[1,3]dioxole-5-carboxylic acid trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,
N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide,
N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-morpholin-4-yl-benzamide,
N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,
N-trans (4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-piperidin-1-yl-benzamide,
4-(2,6-Dimethyl-morpholin-4-yl)-N-trans (4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,
4-(1,1-Dioxo-1,6,4-thiomorpholin-4-yl)-N trans -(4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzamide,
Benzo[1,3]dioxole-5-carboxylic acid trans (4-{2-[4-(5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,
N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,
N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3,3,3-trifluoro-2-hydroxy-propionamide,
N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-pyran-2-yl)-acetamide,
N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(R)-tetrahydro-pyran-2-yl-acetamide,
N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(S)-tetrahydro-pyran-2-yl-acetamide,
N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-trans (4-methoxy-cyclohexyl)-acetamide,
N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(1,4-dioxa-spiro[4.5]dec-8-yl)-acetamide,
N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3,3-dimethoxy-propionamide,
N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-furan-2-yl)-acetamide,

(R)-N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-hydroxy-butyramide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((S)-2,2-dimethyl-[1,3]dioxolan-4-yl)-acetamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1S,3S)-3-methoxy-cyclopentyl)-acetamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-4-methyl-cyclohexyl)-acetamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2- (4-trans-methoxy-4-methyl-cyclohexyl)-acetamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2- (4-cis-methoxy-4-methyl-cyclohexyl)-acetamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide,

(R)-N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide,

(S)-N-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-butyramide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-trans (4-methoxymethyl-cyclohexyl)-acetamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-hydroxy-4-methyl-cyclohexyl)-acetamide,

N-trans (4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide,

Ethanesulfonic acid (4-trans {2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

4-Chloro-N-trans (4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-benzenesulfonamide,

N-trans(4-{2-[4-(6-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-4-methoxy-benzenesulfonamide, and

Pyridine-3-sulfonic acid trans(4-{2-[4-(6-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-cyano-propionamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-cyano-acetamide,

N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(R)-tetrahydro-furan-2-yl-acetamide,
N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-cyclopropyl-acetamide,
N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-hydroxy-acetamide,
N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methanesulfonyl-acetamide,
N-trans-(4-{2-[4-(6-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-[1,3]dioxan-2-yl-acetamide,
N-trans-(4-{2-[4-(5-Chloro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-cyclohexyl)-acetamide,
N-trans-(4-{2-[4-(5-Fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-methanesulfonamide,
N-trans-(4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,
N-trans-(4-{2-[4-(6-Chloro-5-fluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(tetrahydro-furan-2-yl)-acetamide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-methoxy-acetamide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1R,3R)-3-methoxy-cyclopentyl)-acetamide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-methoxy-cyclohexyl)-acetamide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-methoxy-propionamide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-hydroxy-acetamide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-3-hydroxy-propionamide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-(4-hydroxy-cyclohexyl)-acetamide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-((1R,3R)-3-hydroxy-cyclopentyl)-acetamide,

Tetrahydro-pyran-4-carboxylic acid trans-(4-{2-[4-(5,6-difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-amide,
N-trans-(4-{2-[4-(5,6-Difluoro-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-2-[1,3]dioxan-2-yl-acetamide,
N-trans-(4-{2-[4-(6-Methyl-benzo[d]isoxazol-3-yl)-piperidin-1-yl]-ethyl}-cyclohexyl)-acetamide.

13. A medicament containing one or more compounds as claimed in any one of claims 1 to 12 and pharmaceutically acceptable excipients for the treatment and/or the prevention of cognitive disorders, drug addiction, depression, anxiety, drug dependence, dementias, memory impairment, psychotic disorders comprising schizophrenia, schizoaffective disorders, bipolar disease, mania, psychotic depression, and psychoses comprising paranoia and delusions.

14. A compound in accordance with any one of claims 1 to 12 as well as its pharmaceutically acceptable salt for use in the treatment or prevention of cognitive disorders, drug addiction, depression, anxiety, drug dependence, dementias, memory impairment, psychotic disorders comprising schizophrenia, schizoaffective disorders, bipolar disease, mania, psychotic depression, and psychoses comprising paranoia and delusions.

15. A compound in accordance with any one of claims 1 to 12 as well as its pharmaceutically acceptable salt for use in the treatment or prevention of cognitive disorders, drug addiction, depression, anxiety, drug dependence, dementias, memory impairment, psychotic disorders comprising schizophrenia, schizoaffective disorders, bipolar disease, mania, psychotic depression, and psychoses comprising paranoia and delusions.

16. The use of a compound in accordance with any one of claims 1 to 12 as well as its pharmaceutically acceptable salt for the manufacture of medicaments for the treatment and/or the prevention of cognitive disorders, drug addiction, depression, anxiety, drug dependence, dementias, memory impairment, psychotic disorders comprising schizophrenia, schizoaffective disorders, bipolar disease, mania, psychotic depression, and psychoses comprising paranoia and delusions.

17. The invention as hereinbefore described.

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