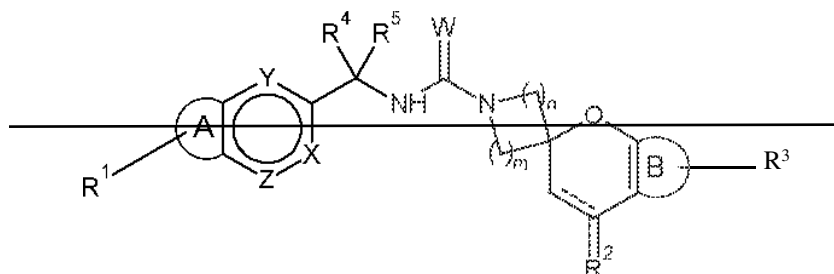


CLAIMS

1. A compound of formula (I),



(I)

5 wherein:

A is a five or six membered heterocycle;

B is a six membered carbocycle or heterocycle;

X is C or N;

Y is C or N;

10 Z is C or N;

W is O or S;

R¹ is H, Ci-alkyl, halogen or haloCi-alkyl;

R² is H or O;

R³ is H, Ci-alkyl, halogen, haloCi-alkyl or Ci-alkoxy;

15 R⁴ is H or Ci-alkyl;

R⁵ is H or Ci-alkyl;

n and m are independently 1 or 2;

= is a single or double bond;

or pharmaceutically acceptable salts, biologically active metabolites, pro drugs,

20 racemates, enantiomers, diastereomers, solvates and hydrates thereof.

2. A compound according to claim 1, wherein

A is five membered heterocycle, wherein the members of the ring are selected from the group consisting of carbon, nitrogen, oxygen, and sulphur;

B is a six-membered carbocycle or a heterocycle, wherein the members of the ring are selected from the group consisting of carbon, nitrogen, oxygen, and sulphur;

~~X is C;~~

~~Y is C;~~

~~5 Z is C or N;~~

~~WisOorS;~~

~~**R¹ is H, C₁₋₆alkyl, halogen or halo C₁₋₆alkyl;**~~

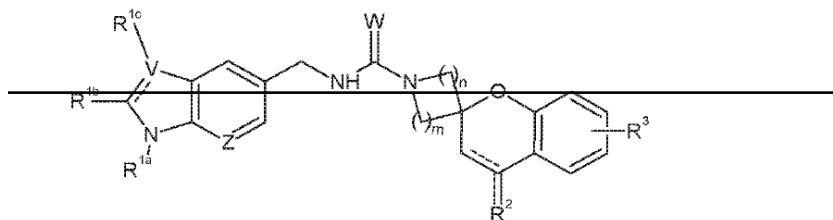
 ~~$\mathbb{R}^2$ is H or $\emptyset$;~~

~~R³ is H, C1-6alkyl, halogen, haloC1-6alkyl or C1-6alkoxy,~~

~~10 ————— $\mathbb{R}^4$ is $\mathbb{H}$:~~ ~~$\mathbb{R}^5$ is H;~~~~n and m are independently 1 or 2;~~

~~_____ is a single or double bond.~~

~~15 3. A compound of formula (II),~~

~~(iii)~~

~~20~~ ~~wherein~~

~~V is C or S;~~

~~Z is C or N;~~~~WisOorS;~~

~~R' is H, C1-6alkyl, or haloC1-6alkyl;~~

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~~Rib is H, C1-6alkyl, halogen, or haloC1-6alkyl;~~

~~Ric is H, C1-6alkyl, halogen, or haloC1-6alkyl when V is carbon; or Rⁱc is absent when V is sulphur;~~

~~R² is H or O;~~

~~5 — R³ is H, C1-alkyl, halogen, haloC1-alkyl, or C1-alkoxy;~~

~~n and m are independently 1 or 2;~~

~~= is a single or double bond;~~

~~or pharmaceutically acceptable salts, biologically active metabolites, pro-drugs, racemates, enantiomers, diastereomers, solvates and hydrates thereof.~~

1.0

4. A compound according to claim 3, wherein

~~V is C;~~

~~Z is C or N;~~

~~W is O;~~

~~15 — R^{1a} is H, C1-alkyl, or haloC1-6alkyl;~~

~~Rib is H, C1-6alkyl, halogen, or haloC1-6alkyl;~~

~~Ric is H, C1-6alkyl, halogen, or haloC1-6alkyl;~~

~~R² is H or O;~~

~~R³ is H, C1-6alkyl, halogen, or haloC1-alkyl;~~

~~20 — n and m are independently 1 or 2;~~

~~— is a single or double bond.~~

5. A compound according to any one of claims 1 or 4, selected from the group of:

~~25 — 6'-Fluoro-N-[(2-methyl-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;~~

~~6-chloro-N-[(1-methyl-1H-indol-5-yl)methyl]-4'-oxo-3,4'-dihydrospiro[1-benzopyran-2,4'-piperidine]-1'-carboxamide;~~

~~6-chloro-N-[(1-methyl-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-~~

~~30 — 3,2'-[1]benzopyran]-1-carboxamide;~~

7¹-fluoro-N-[(1-methyl-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

N-[(1-methyl-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

5 — 6-chloro-N-[(1-methyl-1H-indol-5-yl)methyl]-3,4-dihydrospiro[1]-benzopyran-2,4'-piperidine]-1'-carboxamide;

N-[(3-chloro-1-methyl-1H-indol-5-yl)methyl]-6'-fluoro-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

10 — 6'-chloro-N-[(1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

6'-fluoro-N-[(1-methyl-1H-indol-5-yl)methyl]-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

6'-fluoro-N-[(1-methyl-1H-indol-5-yl)methyl]spiro[azetidine-3,2'-chromene]-1-carboxamide;

15 — N-[(1-methyl-1H-indol-5-yl)methyl]-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-

1-carboxamide;

6'-chloro-N-[(2-methyl-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

20 — 6',8'-difluoro-N-[(2-methyl-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

7'-chloro-N-[(2-chloro-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

7'-chloro-N-[(2-methyl-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

25 — 7'-fluoro-N-[(2-methyl-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-3,2'-

[1]benzopyran]-1-carboxamide;

N-[(2-methyl-1H-indol-5-yl)methyl]-4'-oxo-6-(trifluoromethyl)-3',4'-dihydrospiro[azetidine-3,2'-[1]benzopyran]-1-carboxamide;

~~N-[(1-methyl-1H-indol-5-yl)methyl]-4'-oxo-7'-(trifluoromethyl)-
3',4'-dihydrospiro[azetidine-3,2'-1]benzopyran]-1-carboxamide;~~

~~N-[(2-methyl-1H-indol-5-yl)methyl]-4'-oxo-7'-(trifluoromethyl)-
3',4'-dihydrospiro[azetidine-3,2'-1]benzopyran]-1-carboxamide;~~

5 ~~6,8'-dichloro-N-[(2-methyl-1H-indol-5-yl)methyl]-4'-oxo-3',4'-dihydrospiro[azetidine-
3,2'-1]benzopyran]-1-carboxamide;~~

~~7'-fluoro-4'-oxo-N-{[2-(trifluoromethyl)-1H-indol-5-yl]methyl}-
3',4'-dihydrospiro[azetidine-3,2'-1]benzopyran]-1-carboxamide;~~

10 ~~N-[2-(difluoromethyl)-1H-indol-5-yl]methyl]-7'-fluoro-4'-oxo-3',4'-
dihydrospiro[azetidine-3,2'-1]benzopyran]-1-carboxamide;~~

~~or pharmaceutically acceptable salts, biologically active metabolites, pro-drugs,
racemates, enantiomers, diastereomers, solvates and hydrates thereof~~

6. ~~A compound according to any one of claims 1 to 5, for use in the treatment or
prevention of a disease associated with a~~7 nicotinic acetylcholine receptor activity.

15 ~~7. A compound according to claim 6, wherein the disease is selected from the group of
psychotic disorders, including, but not limited to, schizophrenia, schizophreniform
disorder, schizoaffective disorder, delusional disorder, brief psychotic disorder, psychotic
disorder due to a general medical condition, substance-induced psychotic disorder or
psychotic disorder not otherwise specified, cognitive impairment, including,~~

20 ~~but not limited to, cognitive impairment as a result of stroke, Alzheimer's disease,
Huntington's disease, Pick disease, HIV associated dementia, frontotemporal dementia,
Lewy body dementia, vascular dementia, cerebrovascular disease or other dementia states
and dementia associated to other degenerative disorders, including, but not limited to,
amyotrophic lateral sclerosis, other acute or sub-acute conditions that may cause~~

25 ~~cognitive decline, including, but not limited to, delirium, traumatic brain injury, senile
dementia, mild cognitive impairment, Down's syndrome, depression and cognitive deficit
related to other diseases, and dyskinetic disorders including, but not limited to,
Parkinson's disease, neuroleptic-induced parkinsonism, or tardive dyskinesias,
depression and mood disorders, including, but not limited to, depressive disorders and~~

episodes, bipolar disorders, cyclothymic disorder, and bipolar disorder not otherwise specified, other mood disorders, substance-induced mood disorder and mood disorder not otherwise specified, anxiety disorders, panic disorder and panic attacks, obsessive compulsive disorder, posttraumatic stress disorder, acute stress disorder, generalized

5 ——— anxiety disorder, anxiety disorder due to a general medical condition, substance induced anxiety disorder, phobias, and anxiety disorder not otherwise specified, substance related disorders, including, but not limited to, substance use or substance induced disorders, including, but not limited to, alcohol, nicotine, amphetamine, phenethylamine, opioid, cannabis, cocaine, caffeine, hallucinogen, inhalant,

10 ——— sedative, hypnotic, anxiolytic, polysubstance or other substance related disorders, sleep disorders, including, but not limited to, narcolepsy, dyssomnias, primary hypersomnia, breathing related sleep disorders, circadian rhythm sleep disorder and dyssomnia not otherwise specified, parasomnias, sleep terror disorder, sleepwalking disorder and parasomnia not otherwise specified, sleep disorders related to another

15 ——— mental disorder, sleep disorder due to a general medical condition and substance-induced sleep disorder, metabolic and eating disorders, including, but not limited to, anorexia nervosa, bulimia nervosa, obesity, compulsive eating disorder, binge eating disorder and eating disorder not otherwise specified, diabetes mellitus, ulcerative colitis, Crohn's disease, irritable bowel syndrome, autism spectrum disorders, including, but

20 ——— not limited to, autistic disorder, Asperger's disorder, Rett's disorder, childhood disintegrative disorder and pervasive developmental disorder not otherwise specified, attention deficit hyperactivity disorder, disruptive behaviour disorders, oppositional defiant disorder and disruptive behaviour disorder not otherwise specified, and tic disorders, including, but not limited to, Tourette's disorder, personality disorders, sexual

25 ——— dysfunctions such as sexual desire disorders, sexual arousal disorders, orgasmic disorders, sexual pain disorder, sexual dysfunction not otherwise specified, paraphilias, gender identity disorders, infertility, premenstrual syndrome and sexual disorders not otherwise specified, disorders of the respiratory system like cough, asthma, chronic obstructive pulmonary disease, lung inflammation, disorders of the cardiovascular

30 ——— system such as cardiac failure, heart arrhythmia, hypertension, inflammation, inflammatory and neuropathic pain, rheumatoid arthritis, osteoarthritis, allergy, sarcoidosis, psoriasis, ataxia, dystonia, systemic lupus erythematosus, mania, restless

~~legs syndrome, progressive supranuclear palsy, epilepsy, myoclonus, migraine, amnesia, chronic fatigue syndrome, cataplexy, brain ischemia, multiple sclerosis, encephalomyelitis, jetlag, cerebral amyloid angiopathy, and sepsis.~~

~~8. A compound according to claim 7, wherein the disease is selected from the group of~~
~~5 ——— cognitive impairment, schizophrenia, and autism.~~

~~9. Use of compound according to any one of claims 1 to 5, for the manufacture of a~~
~~medicament for the treatment or prevention of a disease associated with a7 nicotinic~~
~~acetylcholine receptor activity.~~

~~10. Use according to claim 9, wherein the disease is selected from the group of psychotic~~
~~10 ——— disorders, including, but not limited to, schizophrenia, schizophreniform disorder,~~
~~schizoaffective disorder, delusional disorder, brief psychotic disorder, psychotic disorder~~
~~due to a general medical condition, substance-induced psychotic disorder or psychotic~~
~~disorder not otherwise specified, cognitive impairment, including, but not limited to,~~
~~cognitive impairment as a result of stroke, Alzheimer's disease, Huntington's~~
~~1.5 ——— disease, Pick disease, HIV associated dementia, frontotemporal dementia, Lewy body~~
~~dementia, vascular dementia, cerebrovascular disease or other dementia states and~~
~~dementia associated to other degenerative disorders, including, but not limited to,~~
~~amyotrophic lateral sclerosis, other acute or sub-acute conditions that may cause~~
~~cognitive decline, including, but not limited to, delirium, traumatic brain injury, senile~~
~~20 ——— dementia, mild cognitive impairment, Down's syndrome, depression and cognitive~~
~~deficit related to other diseases, and dyskinetic disorders including, but not limited to,~~
~~Parkinson's disease, neuroleptic-induced parkinsonism, or tardive dyskinesia,~~
~~depression and mood disorders, including, but not limited to, depressive disorders and~~
~~episodes, bipolar disorders, cyclothymic disorder, and bipolar disorder not otherwise~~
~~25 ——— specified, other mood disorders, substance-induced mood disorder and mood disorder~~
~~not otherwise specified, anxiety disorders, panic disorder and panic attacks, obsessive~~
~~compulsive disorder, posttraumatic stress disorder, acute stress disorder, generalized~~
~~anxiety disorder, anxiety disorder due to a general medical condition, substance-induced~~
~~anxiety disorder, phobias, and anxiety disorder not otherwise specified, substance~~
~~30 ——— related disorders, including, but not limited to, substance use or substance induced~~

~~disorders, including, but not limited to, alcohol, nicotine, amphetamine, phenethylidine, opioid, cannabis, cocaine, caffeine, hallucinogen, inhalant, sedative, hypnotic, anxiolytic, polysubstance or other substance-related disorders, sleep disorders, including, but not limited to, narcolepsy, dyssomnias, primary~~
~~5 — hypersomnia, breathing-related sleep disorders, circadian rhythm sleep disorder and dyssomnia not otherwise specified, parasomnias, sleep terror disorder, sleepwalking disorder and parasomnia not otherwise specified, sleep disorders related to another mental disorder, sleep disorder due to a general medical condition and substance-induced sleep disorder, metabolic and eating disorders, including, but not limited to,~~
~~10 — anorexia nervosa, bulimia nervosa, obesity, compulsive eating disorder, binge eating disorder and eating disorder not otherwise specified, diabetes mellitus, ulcerative colitis, Crohn's disease, irritable bowel syndrome, autism spectrum disorders, including, but not limited to, autistic disorder, Asperger's disorder, Rett's disorder, childhood disintegrative disorder and pervasive developmental disorder not otherwise specified,~~
~~15 — attention deficit hyperactivity disorder, disruptive behaviour disorders, oppositional defiant disorder and disruptive behaviour disorder not otherwise specified, and tic disorders, including, but not limited to, Tourette's disorder, personality disorders, sexual dysfunctions such as sexual desire disorders, sexual arousal disorders, orgasmic disorders, sexual pain disorder, sexual dysfunction not otherwise specified, paraphilias,~~
~~20 — gender identity disorders, infertility, premenstrual syndrome and sexual disorders not otherwise specified, disorders of the respiratory system like cough, asthma, chronic obstructive pulmonary disease, lung inflammation, disorders of the cardiovascular system such as cardiac failure, heart arrhythmia, hypertension, inflammation, inflammatory and neuropathic pain, rheumatoid arthritis, osteoarthritis, allergy,~~
~~25 — sarcoidosis, psoriasis, ataxia, dystonia, systemic lupus erythematosus, mania, restless legs syndrome, progressive supranuclear palsy, epilepsy, myoclonus, migraine, amnesia, chronic fatigue syndrome, cataplexy, brain ischemia, multiple sclerosis, encephalomyelitis, jetlag, cerebral amyloid angiopathy, and sepsis.~~

~~11. Use according to claim 10, wherein the disease is cognitive impairment, schizophrenia,~~
~~30 — or autism.~~

~~12. A method for the treatment or prevention of a disease associated with a7 nicotinic acetylcholine receptor activity comprising administering to a mammal in need of such treatment or prevention an effective amount of at least one compound according to any one of claims 1 to 5.~~

~~5 ————— 13. A method according to claim 12, wherein the disease is selected from the group of psychotic disorders, including, but not limited to, schizophrenia, schizophreniform disorder, schizoaffective disorder, delusional disorder, brief psychotic disorder, psychotic disorder due to a general medical condition, substance induced psychotic disorder or psychotic disorder not otherwise specified, cognitive impairment, including,~~
~~10 ————— but not limited to, cognitive impairment as a result of stroke, Alzheimer's disease, Huntington's disease, Pick disease, HIV associated dementia, frontotemporal dementia, Lewy body dementia, vascular dementia, cerebrovascular disease or other dementia states and dementia associated to other degenerative disorders, including, but not limited to, amyotrophic lateral sclerosis, other acute or sub-acute conditions that may cause~~
~~15 ————— cognitive decline, including, but not limited to, delirium, traumatic brain injury, senile dementia, mild cognitive impairment, Down's syndrome, depression and cognitive deficit related to other diseases, and dyskinetic disorders including, but not limited to, Parkinson's disease, neuroleptic induced parkinsonism, or tardive dyskinesias,~~
~~20 ————— depression and mood disorders, including, but not limited to, depressive disorders and episodes, bipolar disorders, cyclothymic disorder, and bipolar disorder not otherwise specified, other mood disorders, substance induced mood disorder and mood disorder not otherwise specified, anxiety disorders, panic disorder and panic attacks, obsessive compulsive disorder, posttraumatic stress disorder, acute stress disorder, generalized anxiety disorder, anxiety disorder due to a general medical condition, substance induced~~
~~25 ————— anxiety disorder, phobias, and anxiety disorder not otherwise specified, substance related disorders, including, hut not limited to, substance use or substance induced disorders, including, but not limited to, alcohol , nicotine , amphetamine, phenacyclidine , opioid , cannabis , cocaine , caffeine , hallucinogen , inhalant, sedative , hypnotic , anxiolytic , polysubstance or other substance related disorders,~~
~~30 ————— sleep disorders, including, but not limited to, narcolepsy, dyssomnias, primary hypersomnia, breathing-related sleep disorders, circadian rhythm sleep disorder and~~

~~dyssomnia not otherwise specified, parasomnias, sleep terror disorder, sleepwalking disorder and parasomnia not otherwise specified, sleep disorders related to another mental disorder, sleep disorder due to a general medical condition and substance-induced sleep disorder, metabolic and eating disorders, including, but not limited to,~~
5 ~~anorexia nervosa, bulimia nervosa, obesity, compulsive eating disorder, binge eating disorder and eating disorder not otherwise specified, diabetes mellitus, ulcerative colitis, Crohn's disease, irritable bowel syndrome, autism spectrum disorders, including, but not limited to, autistic disorder, Asperger's disorder, Rett's disorder, childhood disintegrative disorder and pervasive developmental disorder not otherwise specified,~~
10 ~~attention deficit hyperactivity disorder, disruptive behaviour disorders, oppositional defiant disorder and disruptive behaviour disorder not otherwise specified, and tic disorders, including, but not limited to, Tourette's disorder, personality disorders, sexual dysfunctions such as sexual desire disorders, sexual arousal disorders, orgasmic disorders, sexual pain disorder, sexual dysfunction not otherwise specified, paraphilias,~~
15 ~~gender identity disorders, infertility, premenstrual syndrome and sexual disorders not otherwise specified, disorders of the respiratory system like cough, asthma, chronic obstructive pulmonary disease, lung inflammation, disorders of the cardiovascular system such as cardiac failure, heart arrhythmia, hypertension, inflammation, inflammatory and neuropathic pain, rheumatoid arthritis, osteoarthritis, allergy,~~
20 ~~sarcoidosis, psoriasis, ataxia, dystonia, systemic lupus erythematosus, mania, restless legs syndrome, progressive supranuclear palsy, epilepsy, myoclonus, migraine, amnesia, chronic fatigue syndrome, cataplexy, brain ischemia, multiple sclerosis, encephalomyelitis, jetlag, cerebral amyloid angiopathy, and sepsis.~~

~~14. A method according to claim 13, wherein the disease is selected from the group of~~
25 ~~cognitive impairment, schizophrenia, and autism.~~

~~15. A pharmaceutical composition comprising as active ingredient a compound according to any one of claims 1 to 5 and at least one pharmaceutically acceptable excipient.~~

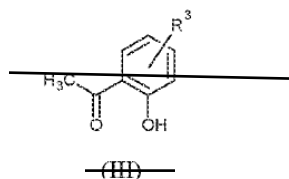
~~16. A pharmaceutical composition according to claim 15, wherein the composition further comprises at least one other active ingredient.~~

17. A pharmaceutical composition according to claim 16, wherein the other active ingredient(s) are selected from the group of acetylcholinesterase inhibitors, NMDA receptor antagonists, beta-secretase inhibitors, antipsychotics, GABAA receptor alpha5 subunit NAMs or PAMs, histamine H3 receptor antagonists, 5-HT6 receptor antagonists, M1 or M4 mAChR agonists or PAMs, mGluR2 antagonists or NAMs or PAMs, and levodopa.

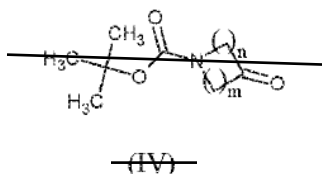
18. Combination of a compound according to any one of claims 1 to 5 and at least one other active ingredient for use in the treatment or prevention of a disease associated with a nicotinic acetylcholine receptor activity.

19. Combination according to claim 18, wherein the other active ingredient(s) are selected from the group of acetylcholinesterase inhibitors, NMDA receptor antagonists, beta-secretase inhibitors, antipsychotics, GABAA receptor alpha5 subunit NAMs or PAMs, histamine H3 receptor antagonists, 5-HT6 receptor antagonists, M1 or M4 mAChR agonists or PAMs, mGluR2 antagonists or NAMs or PAMs, and levodopa.

20 Process for the manufacture of compounds of formula (II) according to claim 3, characterized by reacting a compound of formula (III)

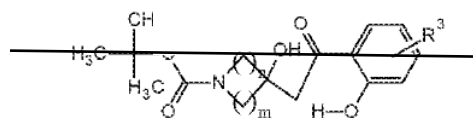


—wherein the meaning of R^3 is described above for compound of formula (II)—with a compound of formula (IV)



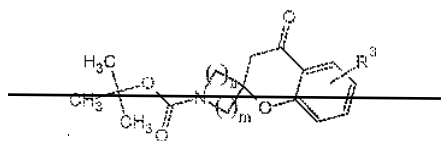
—wherein the meaning of n and m is described above for compound of formula (II)—
—either in two separated steps via formula (VII)

9.2



(VII)

—wherein the meaning of n and m is described above for compound of formula (II), or directly in one step to provide a compound of formula (V)



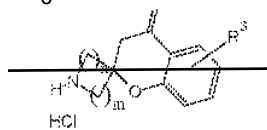
(V)

5

—wherein the meaning of R^3 , n and m is as described above for formula (II) which is then reacted with

a.) — hydrogen chloride to provide formula (VI)

θ

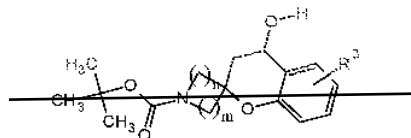


(VI)

10

—wherein the meaning of R^3 , n and m is as described above for formula (II),

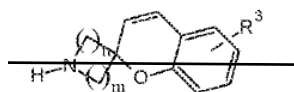
—.) — complex hydrides to provide formula (VIII)



(VIII)

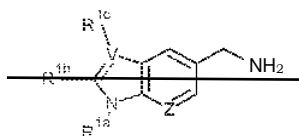
15 — wherein the meaning of R^3 , n and m is as described above for formula (II) — then compound of formula (VIII) is reduced with triethylphosphine to provide formula (IX)

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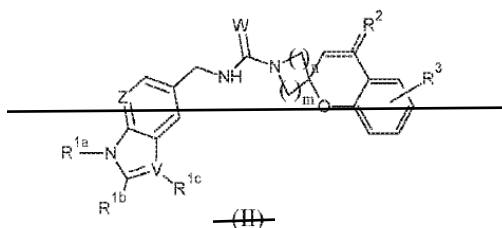
(IX)

—wherein the meaning of R^3 , n and m is as described above for formula (II)—then the obtained derivative of formula (IX) or formula (VI)—is reacted with formula (X)



(X)

5 ————— wherein the meaning of R^1a , R^1b , R^1c , V , and Z is as described above for formula (II)
 —providing formula (II)



(II)

10 ————— wherein the meaning of R^1a , R^1b , R^1c , R^2 , R^3 , V , Z , n , m , and V are as described above
 for formula (II).

21. A compound of 1,2-dimethyl-1H-pyrrolo[2,3-b]pyridin-5-yl-methanamine.
 22. A compound of {3-chloro-1-methyl-1H-pyrrolo[2,3-b]pyridin-5-yl}-methanamine.
 23. A compound of {3-Bromo-1-methyl-1H-pyrrolo[2,3-b]pyridin-5-yl}-methanamine.
 15 ————— 24. A compound of 3',4'-Dihydrospiro[azetidine-3,2'-pyrano[3,2-b]pyridin]-4'-one hydrochloride.

1. An invention not claimed in any divisional application.