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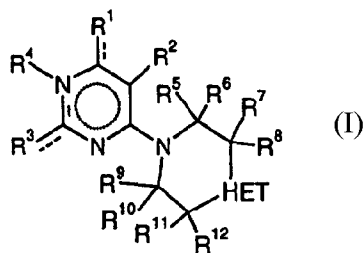
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(54) Title: TETRAHYDRO-HETEROCYCLOAZEPINYL PYRIMIDINE DERIVATIVES

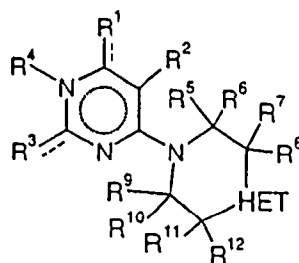


(57) Abstract: The invention relates to compounds of the general formula (I) wherein HET and R<sup>1</sup> to R<sup>12</sup> have the significances as defined in the specification, as well as their pharmaceutically acceptable salts. The invention further relates to medicaments containing such compounds and a process for the preparation of such compounds. The compounds of formula (I) are group (I) mGluR antagonists and are therefore useful for the control or prevention of acute and/or chronic neurological disorders.

WO 02/06288 A1

Tetrahydro-heterocycloazepinyl pyrimidine derivatives

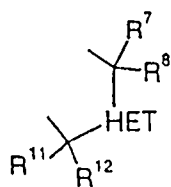
The present invention is concerned in a first aspect with nitro- and cyano-1,2,4,5-tetrahydro-heterocycloazepinyl pyrimidine derivatives of the general formula



wherein

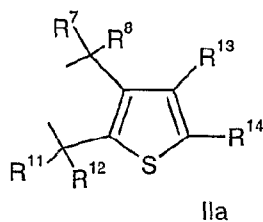
- 5     $R^1$                 signifies oxygen, hydroxy, lower alkoxy or 2,2,2-trifluoroethoxy;
- $R^2$                 signifies nitro or cyano;
- $R^3$                 signifies hydrogen, lower alkyl, oxygen, lower alkoxy, amino, lower alkyl-  
                                 amino or hydroxy-lower alkyl-amino;
- $R^4$                 signifies hydrogen, lower alkyl, lower alkenyl,  
10                        or is absent, if the adjacent nitrogen atom already is the origin of three  
                                 bonds as  $-N=$  or  $=N-$ ;

$R^5, R^6, R^9$  and  $R^{10}$         signify, independently from each other, hydrogen or lower alkyl;

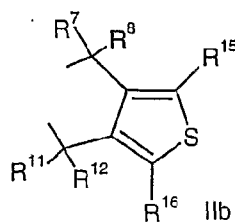


signifies

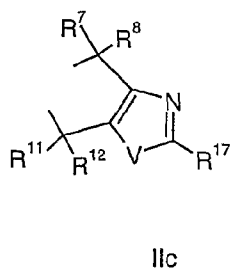
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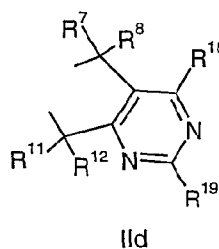
or



or



or



$R^7$ ,  $R^8$ ,  $R^{11}$  or  $R^{12}$  signify, independently from each other, hydrogen, lower alkyl, or hydroxy;

$R^{13}$  and  $R^{14}$  signify, independently from each other, hydrogen or lower alkyl;

5  $R^{15}$  and  $R^{16}$  signify, independently from each other, hydrogen or lower alkyl;

$R^{17}$  signifies hydrogen, lower alkyl, lower alkoxy, hydroxy or amino;

$R^{18}$  signifies hydrogen or hydroxy;

$R^{19}$  signifies hydrogen, lower alkyl, lower alkoxy, hydroxy or amino;

V signifies NH, S or O; and

10 the dotted line may be a bond,

as well as with their pharmaceutically acceptable salts in their racemic and optically active form.

It has surprisingly been found that the compounds of general formula I are antagonists at metabotropic glutamate receptors.

In the central nervous system (CNS) the transmission of stimuli takes place by the interaction of a neurotransmitter sent out by a neuron, with another neuroreceptor.

L-glutamic acid, the most commonly occurring neurotransmitter in the CNS, plays a critical role in a large number of physiological processes. The glutamate-dependent  
5 stimulus receptors are divided into two main groups. The first main group forms ligand-controlled ion channels. The metabotropic glutamate receptors (mGluR) belong to the second main group and, furthermore, belong to the family of G-protein-coupled receptors.

At present, eight different members of these mGluRs are known and some of these even have sub-types. On the basis of structural parameters, the different second messenger  
10 signaling pathways and their different affinity to low-molecular weight chemical compounds, these eight receptors can be sub-divided into three sub-groups:

mGluR1 and mGluR5 belong to group I, mGluR2 and mGluR3 belong to group II and mGluR4, mGluR6, mGluR7 and mGluR8 belong to group III.

Ligands of metabotropic glutamate receptors belonging to the first group can be used  
15 for the treatment or prevention of acute and/or chronic neurological disorders such as epilepsy, stroke, chronic and acute pain, psychosis, schizophrenia, Alzheimer's disease, cognitive disorders and memory deficits.

Other treatable indications in this connection are restricted brain function caused by bypass operations or transplants, poor blood supply to the brain, spinal cord injuries, head  
20 injuries, hypoxia caused by pregnancy, cardiac arrest and hypoglycaemia. Further treatable indications are Huntington's chorea, amyotrophic lateral sclerosis (ALS), dementia caused by AIDS, eye injuries, retinopathy, idiopathic parkinsonism or parkinsonism caused by medicaments as well as conditions which lead to glutamate-deficiency functions, such as e.g. muscle spasms, convulsions, migraine, urinary incontinence, nicotine addiction, opiate  
25 addiction, psychoses, anxiety, vomiting, dyskinesia and depression.

Objects of the present invention are compounds of formula I and their pharmaceutically acceptable salts per se and as pharmaceutically active substances, their manufacture, medicaments based on a compound in accordance with the invention and their production as well as the use of the compounds in accordance with the invention in  
30 the control or prevention of illnesses of the aforementioned kind, and, respectively, for the production of corresponding medicaments. Furthermore, the use of radiolabeled mGluR1

receptor antagonists of formula I in a binding assay is also an object of the present invention.

Preferred compounds of formula I in the scope of the present invention are those, in which R<sup>2</sup> is NO<sub>2</sub>.

5 Further preferred are compounds of formula I in the scope of the present invention, wherein

R<sup>1</sup> is =O or lower alkoxy and

HET represents a thiophene group.

The following are examples of such compounds:

10 [rac]-6-(4-Hydroxy-4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-2-methyl-5-nitro-3H-pyrimidin-4-one,

2-Methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one,

6-(6-Ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-5,6,7,8-tetrahydro-4H-thieno[2,3-d]azepine, or

15 3-Ethyl-2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one.

Also preferred are compounds of formula I in the scope of the present invention, wherein

20 R<sup>1</sup> is =O or lower alkoxy, and

HET represents a thiazole group.

The following are examples of such compounds:

2-Methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one,

25 6-(6-Ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-2-methyl-5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine,

3-Ethyl-2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one,

6-(2-Amino-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-2-methyl-5-nitro-3H-pyrimidin-4-one,

30 6-(2-Amino-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3-ethyl-2-methyl-5-nitro-3H-pyrimidin-4-one, or

2-Methyl-5-nitro-6-(4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3H-pyrimidin-4-one.

Further preferred compounds of formula I in the scope of the present invention are those, in which

- 5         $R^1$  is hydroxy and  
      HET represents a pyrimidine group.

The following are examples of such compounds:

- 7-(6-Hydroxy-2-methyl-5-nitro-pyrimidin-4-yl)-2-methyl-6,7,8,9-tetrahydro-5H-pyrimido[4,5-d]azepin-4-ol, or  
10        2-Methyl-5-nitro-6-(5,6,8,9-tetrahydro-pyrimido[4,5-d]azepin-7-yl)-pyrimidin-4-ol.

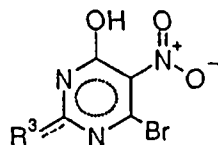
The term "lower alkyl" used in the present description denotes straight-chain or branched saturated hydrocarbon residues with 1-7 carbon atoms, preferably with 1-4 carbon atoms, such as methyl, ethyl, n-propyl, i-propyl and the like.

- 15        The term "lower alkenyl" used in the present description denotes straight-chain or branched unsaturated hydrocarbon residues with 2-7 carbon atoms, preferably with 2-4 carbon atoms.

The term "lower alkoxy" denotes a lower alkyl residue in the sense of the foregoing definition bonded via an oxygen atom.

- 20        In a second aspect of the present invention, the compounds of general formula I and their pharmaceutically acceptable salts can be manufactured according to a process which comprises

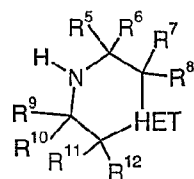
a) reacting a compound of the formula



III

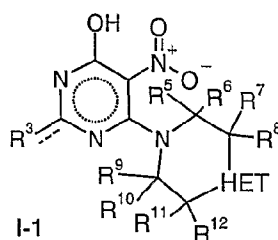
with a compound of formula

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IV

to a compound of formula

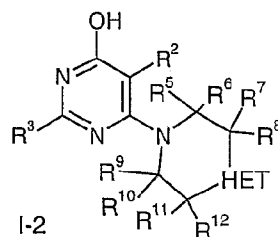


I-1

wherein  $R^3$  and  $R^5$  to  $R^{12}$  have the significance given above.

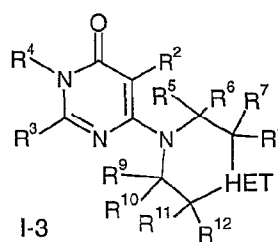
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b) reacting a compound of formula



I-2

to a compound of formula

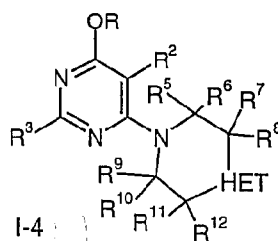


I-3

or to a compound of formula

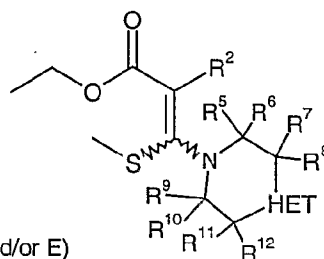


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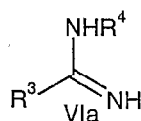
wherein  $R^2$ ,  $R^3$  and  $R^5$  to  $R^{12}$  have the significance given above and R signifies hydrogen or lower alkyl, or

c) reacting a compound of formula

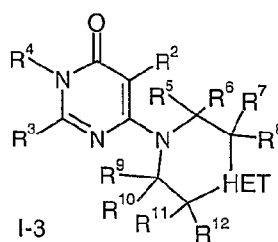


5

with a compound of formula



to a compound of formula



10

wherein the substituents have the significance given above,

and, if desired,

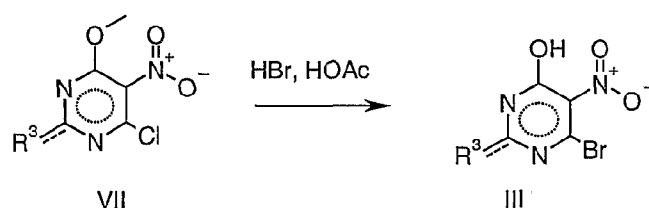
converting a functional group in a compound of formula I into another functional group and, if desired,

converting a compound of formula I into a pharmaceutically acceptable salt.

In the following schemes I to VII and in Examples 1 - 10 the reaction steps and reaction variants a) - c) are described in more detail.

Chloro-methoxy-nitro pyrimidines VII (Scheme I) are known [e.g. 6-chloro-4-methoxy-2-methyl-5-nitro-pyrimidine: Helv. (1958), 41, 1806]. Treatment of the 2-alkyl  
5 6-chloro-4-methoxy-5-nitro-pyrimidines VII with hydrobromic acid in acetic acid preferentially at temperatures between 0 °C and 60 °C gives the 2-alkyl-6-bromo-5-nitro-3H-pyrimidin-4-ones III (Scheme I).

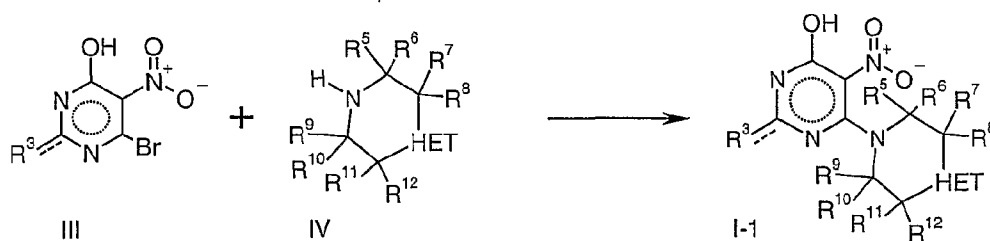
Scheme I



10 The 2-alkyl-6-bromo-5-nitro-3H-pyrimidin-4-ones III react with optionally substituted secondary amines IV in the presence of a base like triethylamine in solvents like N,N-dimethylformamide, dimethylsulfoxide, acetone, methyl-ethylketone or tetrahydrofuran at temperatures between 0 °C and 100 °C to the tertiary amines I-1 (Scheme II).

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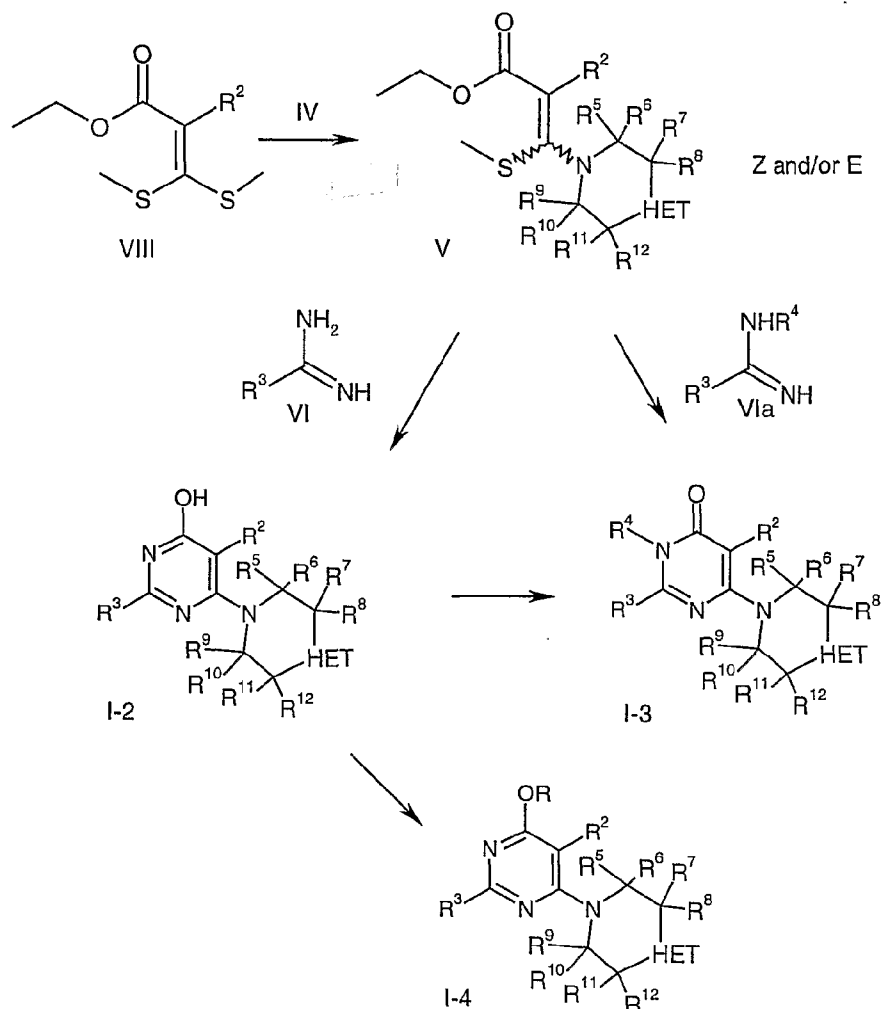
Scheme II



Bis(methylthio)-acrylates VIII react with optionally substituted secondary amines IV in the presence of bases like potassium carbonate and/or triethylamine in solvents like ethanol, methanol, acetone or methyl-ethylketone at temperatures between room  
20 temperature and 100 °C to adducts V, which can be formed as Z-isomer, as mixture of E and Z isomers or as E isomer (Scheme III). Adducts V can be reacted with amidines, urea or thiourea derivatives VI either in the presence of 1,8-diazabicyclo[5.4.0]undec-7-ene in N,N-dimethylformamide or dimethylsulfoxide at temperatures between 70 °C and 140 °C or in the presence of sodium ethylate in ethanol preferentially at reflux thus yielding  
25 pyrimidineoles I-2 or pyrimidinones I-3.

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## Scheme III



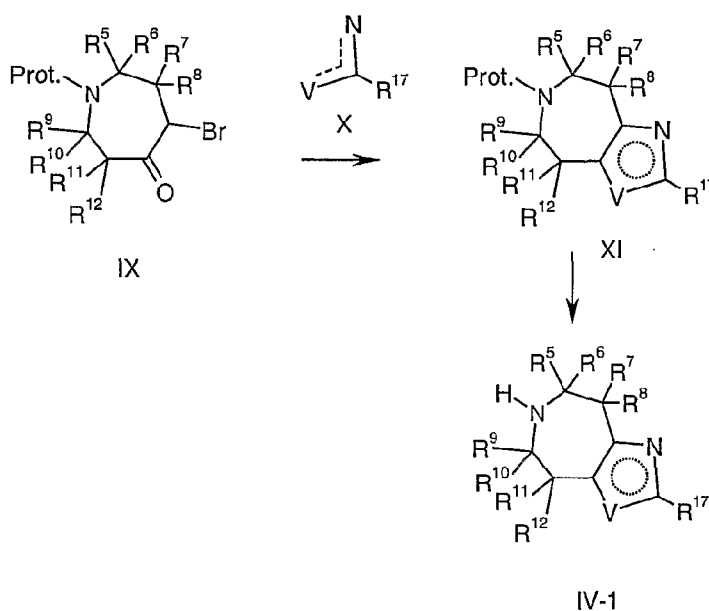
Alkylation of adducts I-2 with R<sup>2</sup> being a cyano or a nitro group (Scheme III) using optionally substituted alkyl halides, tosylates, mesylates or trifluoro-methanesulfonates in solvents like ethanol, methanol, dichloromethane, chloroform, N,N-dimethylformamide, dimethylsulfoxide, acetone, methyl-ethylketone or tetrahydrofuran in the presence of a base like alkali carbonates, e.g. sodium, potassium or cesium carbonate, tertiary amines like triethylamine or ethyl-diisopropylamine, alkali methyl hydrides, like sodium or potassium hydride, or phase transfer catalysts like benzyl-trimethylammonium chloride in the presence of solid or concentrated aqueous sodium hydroxide gives variable mixtures of N- and/ or O-alkylated products I-3 and I-4.

Azepines IV-1 condensed to a heteroaromatic 5-membered ring bearing two heteroatoms can be prepared from bromoazepinones IX (Scheme IV) as e.g. 4-bromo-5-

- 10 -

oxo-azepane-1-carboxylic acid tert.-butyl ester (prepared from 5-bromo-azepan-4-one hydrobromide (1:1) [Ger. Offen. (1989), DE 3820775] with di-tert.-butyldicarbonate in dioxane/aq. sodium hydrogen carbonate solution at room temperature) by reaction with an amide, a thioamide, an urea or a thiourea compound in a solvent like ethanol, dioxane or acetonitrile in the presence of a base like sodium ethylate or triethylamine at temperatures between room temperature and 120 °C followed by removal of the tert.-butoxy carbonyl function with acid, e.g. with hydrogen chloride (aqueous, 37%) in methanol at temperatures between room temperature and 80 °C.

Scheme IV



10

Azepines IV-2 condensed to a heteroaromatic 6-membered ring bearing two heteroatoms can be prepared from alkoxy-carbonyl-azepinones XII as e.g. 4-ethoxy-carbonyl-5-oxo-azepane-1-carboxylic acid tert.-butyl ester [Synthetic Communications 22 (1992), 1249-1258] (Scheme V) by condensation with an amidine XIII in a solvent like ethanol, dioxane or N,N-dimethylformamide in the presence of a base like sodium ethoxide or potassium tert.-butoxide at temperatures between 40 °C and 110 °C. The primarily formed compounds XIVa can be further modified by transformation of the hydroxy function into a leaving group, e.g. a trifluorosulfonyloxy function with trifluorosulfonic acid anhydride and a base like triethylamine in an inert solvent like dichloromethane at temperatures between -40 °C and 60 °C, thus giving compounds XIVb. The trifluorosulfonyloxy function in compounds XIVb can then be replaced by a hydrazine moiety by reacting it with hydrazine in a solvent like ethanol preferentially at reflux giving

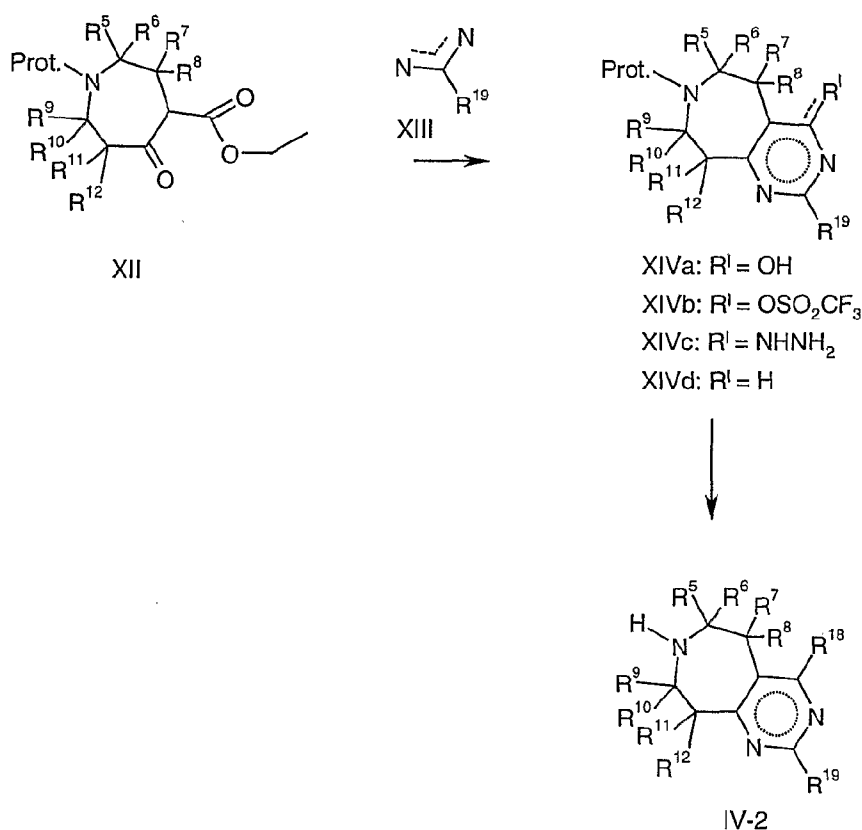
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compounds XIVc. Hydrazino-compounds XIVc can be transformed by silver oxide in ethanol at reflux into the compounds XIVd, a sequence as described in [Bull. Chem. Soc. Jap. (1971), 44(1), 153-8]. Removal of the tert.-butoxy carbonyl function in compounds XIVa or XIVd with acid, e.g. with hydrogen chloride (aqueous, 37%) in methanol at

5 temperatures between room temperature and 80 °C gives then the azepines IV-2.

Scheme V



5,6,7,8-Tetrahydro-4H-thieno[2,3-d]azepines IV-3 and IV-5 with or without a hydroxy function at the carbon attached to the thieno moiety are known [J. Heterocyclic

10 Chem. 22, 1011 (1985)]. Precursor acid chlorides XV bearing preferentially a tosyloxy protective function at the azepine secondary nitrogen function are cyclized in an inert solvent like 1,2-dichloroethane, dichloromethane or nitrobenzene in the presence of a Lewis acid catalyst like aluminium trichloride, tin tetrachloride or phosphorous pentachloride at temperatures between -40 °C and 80 °C to yield the protected ketones

15 XVI. Keto thieno[2,3-d]azepines IV-4 are then prepared by cleavage of N-tosyl function with hydrobromic acid in the presence of a scavenger reagent like phenol in a solvent like ethyl acetate at room temperature, whereas hydroxy thieno[2,3-d]azepines IV-3 can be

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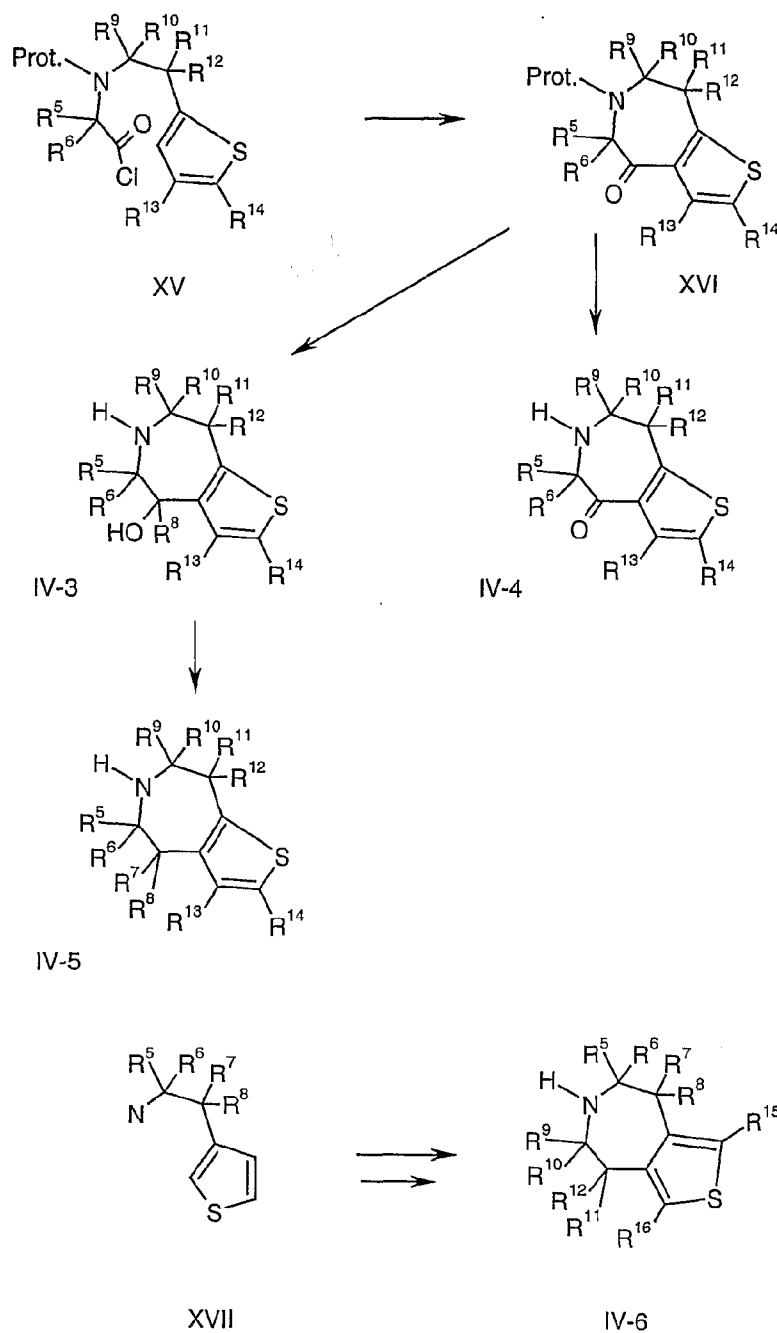
obtained by simultaneous reduction of the keton function and removal of the N-tosyl protective function by treatment with sodium bis(methoxyethoxy)aluminium-hydride in toluene at reflux. The hydroxy thieno[2,3-d]azepines IV-3 can be further reduced to 5,6,7,8-tetrahydro-4H-thieno[2,3-d]azepines IV-5 with stannous chloride in acetic acid in the presence of hydrochloric acid at temperatures between room temperature and 100 °C.

5,6,7,8-Tetrahydro-4H-thieno[3,4-d]azepines IV-6 isomeric to 5,6,7,8-tetrahydro-4H-thieno[2,3-d]azepines IV-5 can be prepared from 2-thiophen-3-yl-ethylamine derivatives XVII [Eur. Pat. Appl. (1988), EP 274324 A1] in an analogous sequence as described for the thieno[2,3-d]azepines outlined in detail in Scheme VI.

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Scheme VI

- 13 -

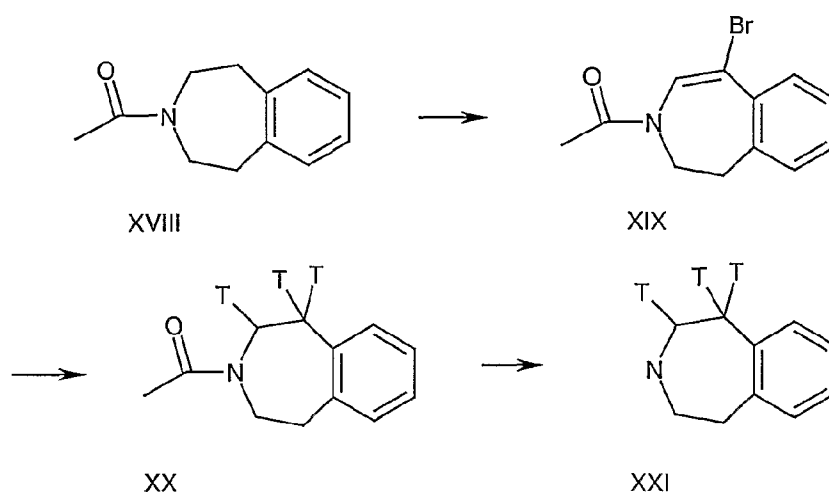


A labeled compound, for example 1-ethyl-2-methyl-6-oxo-4-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-1,6-dihydro-pyrimidine-5-carbonitrile, is needed for the binding assay for the characterization of mGluR 1 antagonistic properties and can be prepared according to synthesis schemes I – III starting from a labeled amine as the 1,1,2-tritritio-2,3,4,5-tetrahydro-1H-benzo[d]azepine XXI which can be prepared as outlined in

- 14 -

Scheme VII. The 1-(5-bromo-1,2-dihydro-benzo[d]azepin-3-yl)-ethanone XIX can be obtained by reaction of the 1-(1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-ethanone XVIII [J. Heterocycl. Chem. (1971), 8(5), 779-83] with N-bromosuccinimide in carbon tetrachloride in the presence of a radical initiator like dibenzoylperoxide or 1,1'-azobis-(cyclohexanecarbonitrile) preferentially at reflux. Hydrogenation of the 1-(5-bromo-1,2-dihydro-benzo[d]azepin-3-yl)-ethanone XIX with tritium gas using a palladium or platinum catalyst in solvents methanol, ethanol or an ether like tetrahydrofuran preferentially in the presence of a base like triethylamine gives the 1-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-ethanone XX which can be converted into the 1-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-ethanone XXI with conc. aq. hydrochloric acid in methanol.

Scheme VII



The pharmaceutically acceptable salts can be manufactured readily according to methods known per se and taking into consideration the nature of the compound to be converted into a salt. Inorganic or organic acids such as, for example, hydrochloric acid, hydrobromic acid, sulphuric acid, nitric acid, phosphoric acid or citric acid, formic acid, fumaric acid, maleic acid, acetic acid, succinic acid, tartaric acid, methanesulphonic acid, p-toluenesulphonic acid and the like are suitable for the formation of pharmaceutically acceptable salts of basic compounds of formula I. Compounds which contain the alkali metals or alkaline earth metals, for example sodium, potassium, calcium, magnesium or the like, basic amines or basic amino acids are suitable for the formation of pharmaceutically acceptable salts of acidic compounds of formula I.



The compounds of formula I and their pharmaceutically acceptable salts are, as already mentioned above, metabotropic glutamate receptor antagonists and can be used for the treatment or prevention of acute and/or chronic neurological disorders, such as epilepsy, stroke, chronic and acute pain, psychosis, schizophrenia, Alzheimer's disease, cognitive disorders, memory deficits and psychosis. Other treatable indications are restricted brain function caused by bypass operations or transplants, poor blood supply to the brain, spinal cord injuries, head injuries, hypoxia caused by pregnancy, cardiac arrest and hypoglycaemia. Further treatable indications are Huntington's chorea, ALS, dementia caused by AIDS, eye injuries, retinopathy, idiopathic parkinsonism or parkinsonism caused by medicaments as well as conditions which lead to glutamate-deficient functions, such as e.g. muscle spasms, convulsions, migraine, urinary incontinence, nicotine addiction, psychoses, opiate addiction, anxiety, vomiting, dyskinesia and depression.

The compounds of the present invention are group I mGluR antagonists and were tested using the following method:

Binding assay for the characterization of mGluR 1 antagonistic properties

Binding assay with tritiated 1-ethyl-2-methyl-6-oxo-4-(1,1,2-tritritio-1,2,4,5-tetrahydrobenzo[d]azepin-3-yl)-1,6-dihydro-pyrimidine-5-carbonitrile: HEK 293 cells were transiently transfected with the rat mGluR1a receptor. The cells were collected and washed 3 times with PBS. The cell pellets were frozen at  $-80^{\circ}\text{C}$ . Membranes were prepared from HEK 293 cells transfected with the rat mGluR1a receptor and used in the binding experiments at 10  $\mu\text{g}$  proteins per assay after resuspension in a HEPES NaOH 20mM, pH=7.4 binding buffer. 1-Ethyl-2-methyl-6-oxo-4-(1,1,2-tritritio-1,2,4,5-tetrahydrobenzo[d]azepin-3-yl)-1,6-dihydro-pyrimidine-5-carbonitrile (S.A 33.4Ci/mmol) was used at 3 nM final concentration. The incubation with variable concentrations of potential inhibitors was performed for 1 hour at room temperature, the incubate was then filtered onto GF/B glass fiber filter preincubated 1 hour in PEI 0,1% and washed 3 times with 1ml of cold binding buffer. The radioactivity retained on the unifilter 96 was counted using a Topcount  $\beta$  counter. After correction for non specific binding the data were normalized and the  $\text{IC}_{50}$  value calculated using a 4 parameters logistic equation which was fitted to the inhibition curve.

Preferred compounds have an  $\text{IC}_{50}$  range of 0,001 – 50,00  $\mu\text{M}$  ( $\text{B-IC}_{50}$ ).

In the table below are shown some specific activity data of preferred compounds:

	Example No.	B-IC <sub>50</sub> (μM)
2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one	1	30
6-(6-ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-2-methyl-5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine	2	4.2
3-ethyl-2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one	2	2.1
6-(2-amino-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-2-methyl-5-nitro-3H-pyrimidin-4-one	3	49
6-(2-amino-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3-ethyl-2-methyl-5-nitro-3H-pyrimidin-4-one	4	6
2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3H-pyrimidin-4-one	6	43
2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one	9	1.9
6-(6-ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-5,6,7,8-tetrahydro-4H-thieno[2,3-d]azepine	10	0.44
3-ethyl-2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one	10	0.069

The compounds of formula I and pharmaceutically acceptable salts thereof can be used as medicaments, e.g. in the form of pharmaceutical preparations. The pharmaceutical preparations can be administered orally, e.g. in the form of tablets, coated tablets, dragées, hard and soft gelatine capsules, solutions, emulsions or suspensions. However, the administration can also be effected rectally, e.g. in the form of suppositories, or parenterally, e.g. in the form of injection solutions.

The compounds of formula I and pharmaceutically acceptable salts thereof can be processed with pharmaceutically inert, inorganic or organic carriers for the production of pharmaceutical preparations. Lactose, corn starch or derivatives thereof, talc, stearic acid or its salts and the like can be used, for example, as such 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.

5 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.

10 In addition, the pharmaceutical preparations 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.

Accordingly, a third aspect of the present invention provides a medicament containing a compound of formula I or a pharmaceutically acceptable salt thereof in

15 accordance with the first aspect of the present invention described above and a therapeutically inert excipient. Disclosed herein is a process for the production of such medicaments which comprises bringing one or more compounds of formula I or pharmaceutically acceptable salts thereof and, if desired, one or more other therapeutically valuable substances into a galenical dosage form together with one or

20 more therapeutically inert carriers.

The dosage 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

25 adult human being weighing 70 kg accordingly lies between 0.7-1400 mg per day, preferably between 7 and 700 mg per day.

Finally, as mentioned earlier, a fourth aspect of the present invention provides the use of a compound of formula I and of pharmaceutically acceptable salts thereof for the manufacture of a medicament for the control or prevention of acute and/or chronic

30 neurological disorders including epilepsy, stroke, chronic and acute pain, psychosis, schizophrenia, Alzheimer's disease, cognitive disorders, memory deficits, restricted brain function caused by bypass operations or transplants, poor blood supply to the brain, spinal cord injuries, head injuries, hypoxia caused by pregnancy, cardiac arrest, hypoglycaemia, Huntington's chorea, ALS, dementia caused by AIDS, eye injuries, retinopathy,

35 idiopathic parkinsonism or parkinsonism caused by medicaments as well as conditions

which lead to glutamate-deficiency functions, including muscle spasms, convulsions, migraine, urinary incontinence, nicotine addiction, psychoses, opiate addiction, anxiety, vomiting, dyskinesia and depression.

A fifth aspect of the present invention provides a method of treating or  
5 preventing acute and/or chronic neurological disorders including epilepsy, stroke, chronic and acute pain, psychosis, schizophrenia, Alzheimer's disease, cognitive disorders, memory deficits, restricted brain function caused by bypass operations or transplants, poor blood supply to the brain, spinal cord injuries, head injuries, hypoxia caused by pregnancy, cardiac arrest, hypoglycaemia, Huntington's chorea, ALS, dementia caused by  
10 AIDS, eye injuries, retinopathy, idiopathic parkinsonism or parkinsonism caused by medicaments as well as conditions which lead to glutamate-deficiency functions, including muscle spasms, convulsions, migraine, urinary incontinence, nicotine addiction, psychoses, opiate addiction, anxiety, vomiting, dyskinesia and depression, comprising the administration of an effective amount of a compound as claimed in any one of claims 1 to  
15 9 or a pharmaceutically acceptable salt thereof or of a medicament as claimed in any one of claims 10 to 12, to a human in need thereof

Example 12-Methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-onea) 6-Bromo-2-methyl-5-nitro-3H-pyrimidin-4-one

- 5 56.6 ml (503 mmol) of hydrobromic acid solution (48% in water) were added dropwise to a solution of 20.5 g (101 mmol) of the 2-methyl-4-methoxy-5-nitro-6-chloro-pyrimidine [Helv. (1958), 41, 1806] in 450 ml of acetic acid and the reaction mixture was stirred at room temperature for 44 hours. It was then evaporated under reduced pressure and the residue formed poured into 500 ml of an ice/water mixture and extracted 3 times with 500  
10 ml of dichloromethane. The combined dichloromethane phases were washed with 100 ml of water and evaporated under reduced pressure. There were thus obtained 16.3 g (69.6 mmol, yield 69%) of the 6-bromo-2-methyl-5-nitro-3H-pyrimidin-4-one as light yellow solid, which was used without further purification.

b) 2-Methyl-5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine

- 15 The title compound was prepared by the following reaction sequence: i) treatment of the 5-bromo-azepan-4-one hydrobromide (1:1) [Ger. Offen. (1989), DE 3820775] with di-*t*-butyldicarbonate in dioxane/aq. sodium hydrogen carbonate solution to yield the 4-bromo-5-oxo-azepane-1-carboxylic acid *tert*-butyl ester; ii) treatment of the 4-bromo-5-oxo-azepane-1-carboxylic acid *tert*-butyl ester with thioacetamide in ethanol in the  
20 presence of triethylamine at reflux to give the 2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepine-6-carboxylic acid *tert*-butyl ester; iii) conversion of the 2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepine-6-carboxylic acid *tert*-butyl ester into the 2-methyl-5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine by removal of the *tert*-butyloxycarbonyl function with hydrogen chloride (aqueous, 37%) in methanol at room temperature.

- 25 c) 2-Methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one

- A suspension of 0.234 g (1.00 mmol) of the 6-bromo-2-methyl-5-nitro-3H-pyrimidin-4-one, 0.205 g (1.00 mmol) of the 2-methyl-5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine hydrochloride and 0.304 g (2.20 mmol) of potassium carbonate in 2.0 ml of *N,N*-  
30 dimethylformamide was stirred at room temperature for 60 hours. The reaction mixture was then poured into 50 ml of an ice/water mixture and the crystals formed collected by

filtration. Thus, a first crop of the 2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one was obtained. The mother liquor was then evaporated and the residue chromatographed on silica gel using a 9:1 v/v mixture of dichloromethane and methanol as eluent giving a second crop of the 2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one, in total 0.252 g (0.785 mmol, yield 78.5%) as light yellow solid; m.p. >200 °C; MS:  $[M+H]^+ = 322$ .

### Example 2

6-(6-Ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-2-methyl-5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine  
and  
3-Ethyl-2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one

A suspension of 0.120 g (0.373 mmol) of 2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one (example 1), of 0.070 g (0.45 mmol) of the ethyl iodide and of 0.077 g (0.56 mmol) of potassium carbonate in 1.0 ml of N,N-dimethylformamide was stirred at room temperature for 4 hours. The reaction mixture was then poured into 50 ml of an ice/water mixture and extracted 3 times with 50 ml of ethylacetate. The combined ethylacetate phases were dried over magnesium sulfate and evaporated under reduced pressure. The residue formed was then chromatographed on silica gel using a 95:5 v/v mixture of dichloromethane and methanol as eluent giving in a first fraction 0.025 g (0.072 mmol, yield 19%) of the 6-(6-ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-2-methyl-5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine as yellow amorphous solid; MS:  $[M+H]^+ = 350$ .

The second fraction provided 0.081 g (0.23 mmol, yield 62%) of the 3-ethyl-2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one as yellow solid after crystallization from ether; m.p. 164.2-166.8 °C; MS:  $[M+H]^+ = 350$ .

### Example 3

6-(2-Amino-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-2-methyl-5-nitro-3H-pyrimidin-4-one

- In analogy to the procedure described in example 1c 6-bromo-2-methyl-5-nitro-3H-pyrimidin-4-one as prepared in example 1a was treated with 2-amino-5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine [Ger. Offen. (1989), DE 3820775] in N,N-dimethylformamide in the presence of potassium carbonate at 110 °C to yield the title compound as yellow solid; m.p. >200 °C; MS:  $[M+H]^+ = 323$ .

#### Example 4

##### 6-(2-Amino-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3-ethyl-2-methyl-5-nitro-3H-pyrimidin-4-one

- In analogy to the procedure described in example 2 the 6-(2-amino-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-2-methyl-5-nitro-3H-pyrimidin-4-one (example 3) was treated with the ethyl iodide in N,N-dimethylformamide in the presence of potassium carbonate at room temperature to yield the title compound as yellow solid; m.p. >200 °C; MS:  $[M+H]^+ = 351$ .

#### Example 5

- 15 7-(6-Hydroxy-2-methyl-5-nitro-pyrimidin-4-yl)-2-methyl-6,7,8,9-tetrahydro-5H-pyrimido[4,5-d]azepin-4-ol

- In analogy to the procedure described in example 1c 6-bromo-2-methyl-5-nitro-3H-pyrimidin-4-one (example 1a) was treated with the 2-methyl-6,7,8,9-tetrahydro-5H-pyrimido[4,5-d]azepin-4-ol (prepared from the corresponding N-benzyl derivative [Bull. Chem. Soc. Jap. (1971), 44(1), 153-8] by catalytic hydrogenation with palladium on charcoal) in N,N-dimethylformamide in the presence of triethylamine at room temperature to yield the title compound as yellow solid; m.p. >200 °C; MS:  $[M+H]^+ = 333$ .

#### Example 6

##### 2-Methyl-5-nitro-6-(4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3H-pyrimidin-4-one

- 25 a) 5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine

The title compound was prepared by the following reaction sequence: i) treatment of 4-bromo-5-oxo-azepane-1-carboxylic acid tert-butyl ester (example 1 b) with phosphorous pentasulfide, formamide and triethylamine in dioxane at reflux to yield 4,5,7,8-tetrahydro-thiazolo[4,5-d]azepine-6-carboxylic acid tert-butyl ester; ii) conversion of 4,5,7,8-

tetrahydro-thiazolo[4,5-d]azepine-6-carboxylic acid tert-butyl ester into 5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine by removal of the tert-butyloxycarbonyl function with hydrogen chloride (aqueous, 37%) in methanol at room temperature.

5 b) 2-Methyl-5-nitro-6-(4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3H-pyrimidin-4-one

In analogy to the procedure described in example 1c 6-bromo-2-methyl-5-nitro-3H-pyrimidin-4-one (example 1a) was treated with the 5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine in N,N-dimethylformamide in the presence of potassium carbonate at room temperature to yield the 2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3H-pyrimidin-4-one as yellow amorphous solid; MS:  $[M-H]^- = 306$ .

Example 7

2-Methyl-5-nitro-6-(5,6,8,9-tetrahydro-pyrimido[4,5-d]azepin-7-yl)-pyrimidin-4-ol

In analogy to the procedure described in example 1c 6-bromo-2-methyl-5-nitro-3H-pyrimidin-4-one (example 1a) was treated with 6,7,8,9-tetrahydro-5H-pyrimido[4,5-d]azepine trihydrochloride [Bull. Chem. Soc. Jap. (1971), 44(1), 153-8] in N,N-dimethylformamide in the presence of N-ethyl-di-isopropylamine at room temperature to yield the title compound as yellow solid; m.p.  $>200^\circ\text{C}$ ; MS:  $[M-H]^- = 301$ .

Example 8

20 [rac]-6-(4-Hydroxy-4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-2-methyl-5-nitro-3H-pyrimidin-4-one

In analogy to the procedure described in example 1c 6-bromo-2-methyl-5-nitro-3H-pyrimidin-4-one (example 1a) was treated with the [rac]-5,6,7,8-tetrahydro-4H-thieno[2,3-d]azepin-4-ol [J. Heterocycl. Chem. (1985), 22(4), 1011-16] in N,N-dimethylformamide in the presence of N-ethyl-di-isopropylamine at room temperature to yield the title compound as light yellow oil; MS:  $[M-H]^- = 321$ .

Example 9

2-Methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one



According to the method described in example 1c 6-bromo-2-methyl-5-nitro-3H-pyrimidin-4-one (example 1a) was treated with 5,6,7,8-tetrahydro-4H-thieno-[2,3-d]azepine [J. Heterocycl. Chem. (1985), 22(4), 1011-16] in N,N-dimethylformamide in the presence of N-ethyl-di-isopropylamine at room temperature to yield the title compound as  
5 yellow solid; m.p. >200 °C; MS:  $[M-H]^- = 305$ .

#### Example 10

6-(6-Ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-5,6,7,8-tetrahydro-4H-thieno[2,3-d]azepine

and

10 3-Ethyl-2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one

In analogy to the procedure described in example 2 2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one (example 9) was treated with ethyl bromide in N,N-dimethylformamide in the presence of potassium carbonate at room  
15 temperature to yield 6-(6-ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-5,6,7,8-tetrahydro-4H-thieno[2,3-d]azepine as light yellow amorphous solid; MS:  $[M+H]^+ = 335$ ; and 3-ethyl-2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one as yellow foam; MS:  $[M+H]^+ = 335$ .

#### Preparation of the labeled compound needed for the binding assay

20 1-Ethyl-2-methyl-6-oxo-4-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-1,6-dihydro-pyrimidine-5-carbonitrile

a) 1,1,2-Tritritio-2,3,4,5-tetrahydro-1H-benzo[d]azepine

The 1,1,2-tritritio-2,3,4,5-tetrahydro-1H-benzo[d]azepine was obtained by the following sequence:

25 i) reaction of the 1-(1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-ethanone [J. Heterocycl. Chem. (1971), 8(5), 779-83] with dibenzoylperoxide and N-bromosuccinimide in carbon tetrachloride at reflux yielded the 1-(5-bromo-1,2-dihydro-benzo[d]azepin-3-yl)-ethanone;

ii) hydrogenation of the 1-(5-bromo-1,2-dihydro-benzo[d]azepin-3-yl)-ethanone with tritium using Pd/C in methanol in the presence of triethylamine yielded the 1-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-ethanone;

iii) treatment of the 1-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-ethanone with conc. aq. hydrochloric acid in methanol gave the 1,1,2-tritritio-2,3,4,5-tetrahydro-1H-benzo[d]azepine.

b) E- and/or Z-2-cyano-3-methylsulfanyl-3-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-acrylic acid ethyl ester

A solution of 35 mg (0.16 mmol) of ethyl 2-cyano-3,3-bis(methylthio)acrylate, of 4.4 mg (0.024 mmol) of 1,1,2-tritritio-2,3,4,5-tetrahydro-1H-benzo[d]azepine hydrochloride, and of 10 mg (0.1 mmol) of triethylamine in 0.37 ml of ethanol was heated at reflux for 6.5 h. The reaction mixture was then evaporated and the residue chromatographed on 6 g Lichroprep silica gel Si-60 (25-40 $\mu$ m) using a 5:1 v/v mixture of toluene and ethyl acetate as eluent. Thus, 4.5 mg (0.014 mmol, yield 60%) of the E- and/or Z- 2-cyano-3-methylsulfanyl-3-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-acrylic acid ethyl ester was obtained.

c) 2-methyl-6-oxo-4-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-1,6-dihydro-pyrimidine-5-carbonitrile

A solution of 4.4 mg (0.014 mmol) of Z- and/or E-2-cyano-3-methylsulfanyl-3-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-acrylic acid ethyl ester, of 3 mg (0.032 mmol) of acetamidine hydrochloride and of 6.6 mg (0.044 mmol) of 1,8-diazabicyclo[5.4.0]undec-7-ene in 1.0 ml of N,N-dimethylformamide was stirred at 100 °C for 2 hours. The reaction mixture was then partitioned between a 50:1 v/v mixture of dichloromethane and methanol and ice water acidified with about 2 ml 0.2 N hydrogen chloride. The organic phase was dried over anhydrous sodium sulfate. The crude product was chromatographed on 5 g Lichroprep silica gel Si-60 (25-40 $\mu$ m) using a 6:1 v/v mixture of toluene and methanol as eluent. There was thus obtained 2.2 mg (0.008 mmol, yield 57 %) of 2-methyl-6-oxo-4-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-1,6-dihydro-pyrimidine-5-carbonitrile.

d) 1-Ethyl-2-methyl-6-oxo-4-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-1,6-dihydro-pyrimidine-5-carbonitrile

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A suspension of 2.2 mg (0.008 mmol) of 2-methyl-6-oxo-4-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-1,6-dihydro-pyrimidine-5-carbonitrile, of 16 mg (0.10 mmol) of ethyl iodide and of 4.3 mg (0.031 mmol) of potassium carbonate in 0.21 ml of N,N-dimethylformamide was stirred at room temperature for 3 h. The reaction mixture  
5 was then partitioned between ethyl acetate and ice water acidified with about 1 ml 0.2 N hydrochloric acid. The organic phase was dried over anhydrous sodium sulfate. The thus obtained crude product was purified by chromatography on 5 g Lichroprep silica gel Si-60 (15-25 $\mu$ m) using a 50:1 v/v mixture of dichloromethane and methanol as eluent to yield  
10 1.8 mg (0.0058 mmol, yield 73 %) of the 1-ethyl-2-methyl-6-oxo-4-(1,1,2-tritritio-1,2,4,5-tetrahydro-benzo[d]azepin-3-yl)-1,6-dihydro-pyrimidine-5-carbonitrile as colorless solid, MS:  $[M(^3H_0)+H]^+ = 309$  (27%), MS:  $[M(^3H_1)+H]^+ = 311$  (38%), MS:  $[M(^3H_2)+H]^+ = 313$  (27%), MS:  $[M(^3H_3)+H]^+ = 315$  (8%).

- 25 -

Example A

Tablets of the following composition are produced in a conventional manner:

	mg/Tablet
Active ingredient	100
5 Powdered lactose	95
White corn starch	35
Polyvinylpyrrolidone	8
Na carboxymethylstarch	10
Magnesium stearate	2
10	Tablet weight 250

Example B

Tablets of the following composition are produced in a conventional manner:

	mg/Tablet
Active ingredient	200
15 Powdered lactose	100
White corn starch	64
Polyvinylpyrrolidone	12
Na carboxymethylstarch	20
Magnesium stearate	4
20	Tablet weight 400

- 26 -

Example C

Capsules of the following composition are produced:

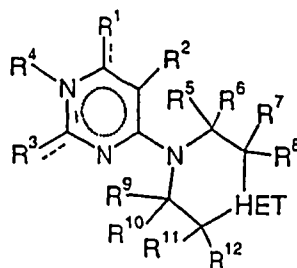
	mg/Capsule
Active ingredient	50
5 Crystalline lactose	60
Microcrystalline cellulose	34
Talc	5
Magnesium stearate	1

Capsule fill weight 150

- 10 The active ingredient having a suitable particle size, the crystalline lactose and the microcrystalline cellulose are homogeneously mixed with one another, sieved and thereafter talc and magnesium stearate are admixed. The final mixture is filled into hard gelatine capsules of suitable size.

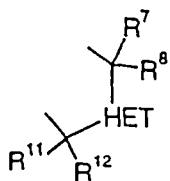
The claims defining the invention are as follows:

1. A compound of the general formula

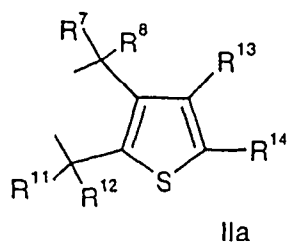


wherein

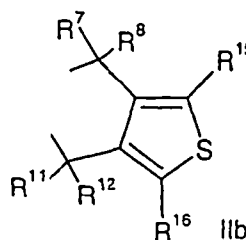
- 5  $R^1$  signifies oxygen, hydroxy, lower alkoxy or 2,2,2-trifluoroethoxy;
- $R^2$  signifies nitro or cyano;
- $R^3$  signifies hydrogen, lower alkyl, oxygen, lower alkoxy, amino, lower alkyl-amino or hydroxy-lower alkyl-amino;
- $R^4$  signifies hydrogen, lower alkyl, lower alkenyl,  
 10 or is absent, if the adjacent nitrogen atom already is the origin of three bonds as  $-N=$  or  $=N-$ ;
- $R^5$ ,  $R^6$ ,  $R^9$  and  $R^{10}$  signify, independently from each other, hydrogen or lower alkyl;

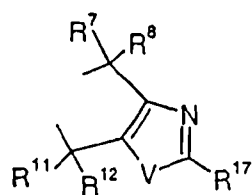


signifies



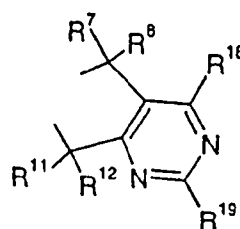
or





or

IIc



or

IIId

$R^7, R^8, R^{11}$  or  $R^{12}$  signify, independently from each other, hydrogen, lower alkyl, or hydroxy;

$R^{13}$  and  $R^{14}$  signify, independently from each other, hydrogen or lower alkyl;

$R^{15}$  and  $R^{16}$  signify, independently from each other, hydrogen or lower alkyl;

5  $R^{17}$  signifies hydrogen, lower alkyl, lower alkoxy, hydroxy or amino;

$R^{18}$  signifies hydrogen or hydroxy;

$R^{19}$  signifies hydrogen, lower alkyl, lower alkoxy, hydroxy or amino;

V signifies NH, S or O; and

the dotted line may be a bond,

10 as well as pharmaceutically acceptable salts thereof.

2. A compound of formula I in accordance with claim 1, wherein  $R^2$  is  $\text{NO}_2$ , and pharmaceutically acceptable salts thereof.

3. A compound of formula I in accordance with claim 1 or 2, wherein  $R^1$  is = O or lower alkoxy and HET represents a thiophene group, and pharmaceutically acceptable  
15 salts thereof.

4. A compound of formula I in accordance with claim 3, which is selected from [rac]-6-(4-hydroxy-4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-2-methyl-5-nitro-3H-pyrimidin-4-one,

2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one,

6-(6-ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-5,6,7,8-tetrahydro-4H-thieno[2,3-d]azepine, or

5 3-ethyl-2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thieno[2,3-d]azepin-6-yl)-3H-pyrimidin-4-one.

5. A compound of formula I in accordance with claim 1 or 2, wherein R<sup>1</sup> is = O or lower alkoxy and HET represents a thiazole group, and pharmaceutically acceptable salts thereof.

10 6. A compound of formula I in accordance with claim 5, which is selected from

2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one,

6-(6-ethoxy-2-methyl-5-nitro-pyrimidin-4-yl)-2-methyl-5,6,7,8-tetrahydro-4H-thiazolo[4,5-d]azepine,

15 3-ethyl-2-methyl-6-(2-methyl-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-5-nitro-3H-pyrimidin-4-one,

6-(2-amino-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-2-methyl-5-nitro-3H-pyrimidin-4-one,

20 6-(2-amino-4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3-ethyl-2-methyl-5-nitro-3H-pyrimidin-4-one, or

2-methyl-5-nitro-6-(4,5,7,8-tetrahydro-thiazolo[4,5-d]azepin-6-yl)-3H-pyrimidin-4-one.

7. A compound of formula I in accordance with claim 1 or 2, wherein R<sup>1</sup> is hydroxy and HET represents a pyrimidine group, and pharmaceutically acceptable salts thereof.

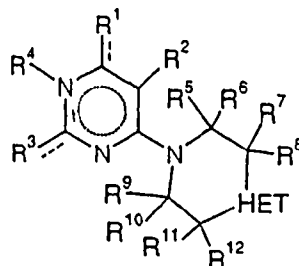
25 8. A compound of formula I in accordance with claim 7, which is

7-(6-hydroxy-2-methyl-5-nitro-pyrimidin-4-yl)-2-methyl-6,7,8,9-tetrahydro-5H-pyrimido[4,5-d]azepin-4-ol, or



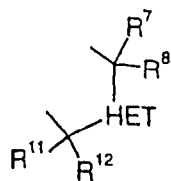
2-methyl-5-nitro-6-(5,6,8,9-tetrahydro-pyrimido[4,5-d]azepin-7-yl)-pyrimidin-4-ol.

9. A compound of formula I

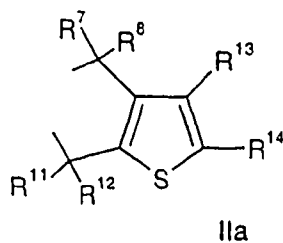


wherein

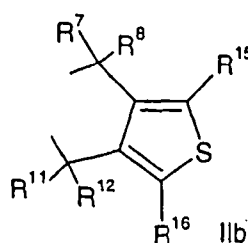
- $R^1$  signifies oxygen, hydroxy, lower alkoxy or 2,2,2-trifluoroethoxy;
- $R^2$  signifies nitro or cyano;
- $R^3$  signifies hydrogen, lower alkyl, oxygen, lower alkoxy, amino, lower alkyl-amino or hydroxy-lower alkyl-amino;
- $R^4$  signifies hydrogen, lower alkyl, lower alkenyl,  
or is absent, if the adjacent nitrogen atom already is the origin of three  
bonds as  $-N=$  or  $=N-$ ;
- $R^5$ ,  $R^6$ ,  $R^9$  and  $R^{10}$  signify, independently from each other, hydrogen or lower alkyl;

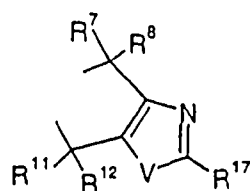


signifies



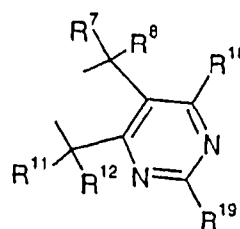
or





or

IIc



or

IIId

$R^7, R^8, R^{11}$  or  $R^{12}$  signify, independently from each other, hydrogen, lower alkyl, or hydroxy;

$R^{13}$  and  $R^{14}$  signify, independently from each other, hydrogen or lower alkyl;

$R^{15}$  and  $R^{16}$  signify, independently from each other, hydrogen or lower alkyl;

$R^{17}$  signifies hydrogen, lower alkyl, lower alkoxy, hydroxy or amino;

$R^{18}$  signifies hydrogen or hydroxy;

$R^{19}$  signifies hydrogen, lower alkyl, lower alkoxy, hydroxy or amino;

20 V signifies NH, S or O; and

the dotted line may be a bond,

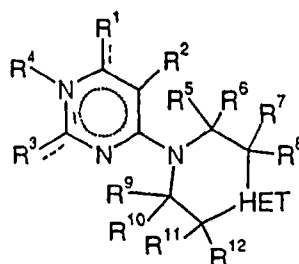
as well as pharmaceutically acceptable salts thereof

as defined in claim 1, substantially as hereinbefore described with reference to any one of  
25 Examples 1 to 10.

10. A medicament comprising a compound of formula I according to any one of claims 1 to 9 or a pharmaceutically acceptable salt thereof and one or more pharmaceutically acceptable excipients.

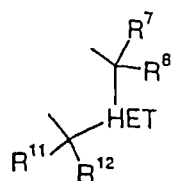
11. A medicament comprising a compound of formula I

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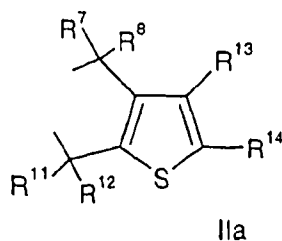


wherein

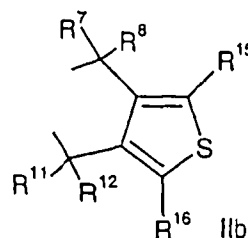
- $R^1$  signifies oxygen, hydroxy, lower alkoxy or 2,2,2-trifluoroethoxy;
- $R^2$  signifies nitro or cyano;
- $R^3$  signifies hydrogen, lower alkyl, oxygen, lower alkoxy, amino, lower alkyl-amino or hydroxy-lower alkyl-amino;
- $R^4$  signifies hydrogen, lower alkyl, lower alkenyl,  
or is absent, if the adjacent nitrogen atom already is the origin of three  
bonds as  $-N=$  or  $=N-$ ;
- $R^5, R^6, R^9$  and  $R^{10}$  signify, independently from each other, hydrogen or lower alkyl;



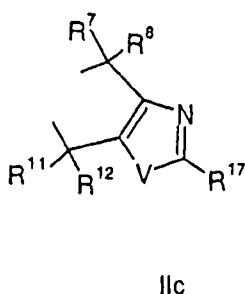
signifies



or

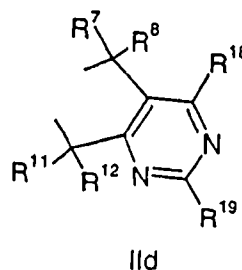


25



or

or



30

	$R^7, R^8, R^{11}$ or $R^{12}$	signify, independently from each other, hydrogen, lower alkyl, or hydroxy;
	$R^{13}$ and $R^{14}$	signify, independently from each other, hydrogen or lower alkyl;
	$R^{15}$ and $R^{16}$	signify, independently from each other, hydrogen or lower alkyl;
5	$R^{17}$	signifies hydrogen, lower alkyl, lower alkoxy, hydroxy or amino;
	$R^{18}$	signifies hydrogen or hydroxy;
	$R^{19}$	signifies hydrogen, lower alkyl, lower alkoxy, hydroxy or amino;
	V	signifies NH, S or O; and

the dotted line may be a bond,

15 or a pharmaceutically acceptable salt thereof, and one or more pharmaceutically acceptable excipients, substantially as herein before described with reference to any one of Examples A to C.

12. A medicament in accordance with claim 10 or claim 11 for the control or prevention of acute and/or chronic neurological disorders including epilepsy, stroke,  
 20 chronic and acute pain, psychosis, schizophrenia, Alzheimer's disease, cognitive disorders, memory deficits, restricted brain function caused by bypass operations or transplants, poor blood supply to the brain, spinal cord injuries, head injuries, hypoxia caused by pregnancy, cardiac arrest, hypoglycaemia, Huntington's chorea, ALS, dementia caused by AIDS, eye injuries, retinopathy, idiopathic parkinsonism or parkinsonism  
 25 caused by medicaments as well as conditions which lead to glutamate-deficiency functions, including muscle spasms, convulsions, migraine, urinary incontinence, nicotine addiction, psychoses, opiate addiction, anxiety, vomiting, dyskinesia and depression.

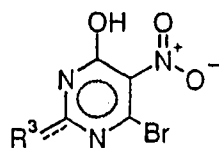
13. The use of a compound of formula I in accordance with any one of claims 1 to 9 as well as pharmaceutically acceptable salts thereof for the manufacture of a  
 30 medicament for the control or prevention of acute and/or chronic neurological disorders including epilepsy, stroke, chronic and acute pain, psychosis, schizophrenia, Alzheimer's disease, cognitive disorders, memory deficits, restricted brain function caused by bypass operations or transplants, poor blood supply to the brain, spinal cord injuries, head

injuries, hypoxia caused by pregnancy, cardiac arrest, hypoglycaemia, Huntington's chorea, ALS, dementia caused by AIDS, eye injuries, retinopathy, idiopathic parkinsonism or parkinsonism caused by medicaments as well as conditions which lead to glutamate-deficiency functions, including muscle spasms, convulsions, migraine, urinary incontinence, nicotine addiction, psychoses, opiate addiction, anxiety, vomiting, dyskinesia and depression.

14. A method of treating or preventing acute and/or chronic neurological disorders including epilepsy, stroke, chronic and acute pain, psychosis, schizophrenia, Alzheimer's disease, cognitive disorders, memory deficits, restricted brain function caused by bypass operations or transplants, poor blood supply to the brain, spinal cord injuries, head injuries, hypoxia caused by pregnancy, cardiac arrest, hypoglycaemia, Huntington's chorea, ALS, dementia caused by AIDS, eye injuries, retinopathy, idiopathic parkinsonism or parkinsonism caused by medicaments as well as conditions which lead to glutamate-deficiency functions, including muscle spasms, convulsions, migraine, urinary incontinence, nicotine addiction, psychoses, opiate addiction, anxiety, vomiting, dyskinesia and depression, comprising the administration of an effective amount of a compound as claimed in any one of claims 1 to 9 or a pharmaceutically acceptable salt thereof, or of a medicament as claimed in any one of claims 10 to 12, to a human in need thereof.

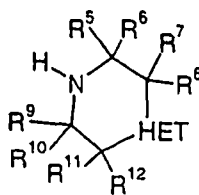
15. A process for the manufacture of a compound according to any one of claims 1 to 9 as well as of a pharmaceutically acceptable salt thereof, which process comprises

a) reacting a compound of the formula



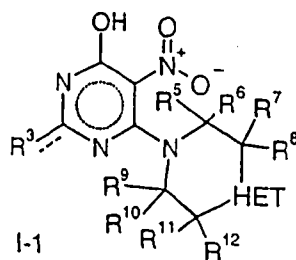
III

with a compound of formula



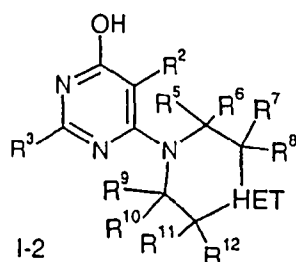
IV

to a compound of formula

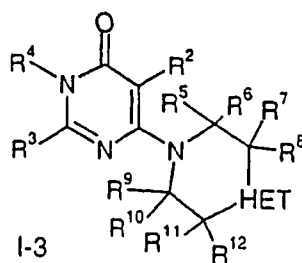


wherein R<sup>3</sup> and R<sup>5</sup> to R<sup>12</sup> have the significance given above.

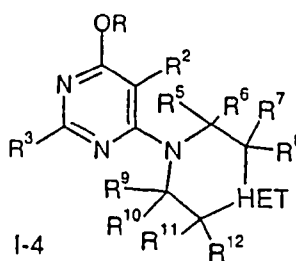
b) reacting a compound of formula



to a compound of formula

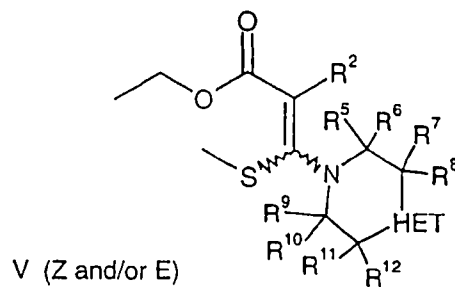


or to a compound of formula

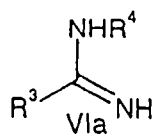


wherein R<sup>2</sup>, R<sup>3</sup> and R<sup>5</sup> to R<sup>12</sup> have the significance given above and R signifies hydroxy or lower alkyl, or

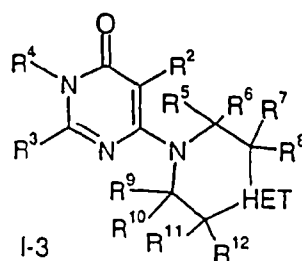
c) reacting a compound of formula



with a compound of formula



to a compound of formula



wherein the substituents have the significance given above,

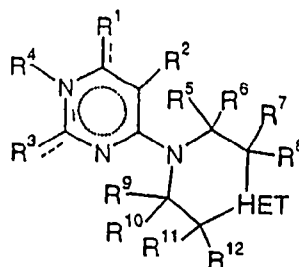
and, if desired,

converting a functional group in a compound of formula I into another functional group  
and,

if desired,

converting a compound of formula I into a pharmaceutically acceptable salt.

16. A process for the manufacture of a compound of formula I



as defined in claim 1 or a pharmaceutically acceptable salt thereof, which process  
10 comprises step a), step b) or step c) as defined in claim 15,  
and, if desired,  
converting a functional group in a compound of formula I into another functional group  
and, if desired,  
converting a compound of formula I into a pharmaceutically acceptable salt; substantially  
15 as hereinbefore described with reference to any one of Examples 1 to 10.

17. A compound of formula I in accordance with any one of claims 1 to 9, when  
manufactured by a process in accordance with claim 14 or claim 15.

20

**Dated 21 July, 2006**  
**F.Hoffman-La Roche AG**

25

**Patent Attorneys for the Applicant/Nominated Person**  
**SPRUSON & FERGUSON**