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Rudolf et al.

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(54) **MODIFIED AMINOACIDS, PHARMACEUTICALS CONTAINING THESE COMPOUNDS AND METHOD FOR THEIR PRODUCTION**

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(52) **U.S. Cl.** **514/211.05**; 514/252.17; 544/284; 540/500

(58) **Field of Search** 544/284; 514/252.17, 514/211.05; 540/500

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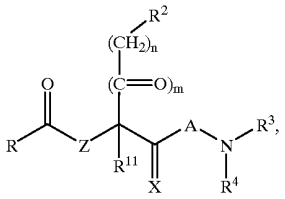
(57) **ABSTRACT**

The present invention relates to modified amino acids of general formula

(I)



wherein

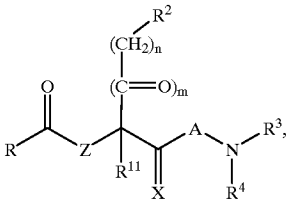
A, Z, X, n, m, R, R^2, R^3, R^4 and R^{11} are defined as in claims 1 to 5, their tautomers, their diastereomers, their enantiomers, the mixtures thereof and the salts thereof, particularly the physiologically acceptable salts thereof with inorganic or organic acids or bases, pharmaceutical compositions containing these compounds, the use thereof and processes for preparing them as well as their use for the production and purification of antibodies and as labelled compounds in RIA- and ELISA assays and as diagnostic or analytical aids in neurotransmitter research.

3 Claims, No Drawings

MODIFIED AMINOACIDS, PHARMACEUTICALS CONTAINING THESE COMPOUNDS AND METHOD FOR THEIR PRODUCTION

The present invention relates to modified amino acids of general formula

(I)



their tautomers, their diastereomers, their enantiomers, their mixtures and salts thereof, particularly physiologically acceptable salts thereof with inorganic or organic acids or bases, pharmaceutical compositions containing these compounds, the use thereof and processes for preparing them.

In the above general formula I

R denotes an unbranched C_{1-7}-alkyl group which may be substituted in the ω-position

by a C_{4-10}-cycloalkyl group,

by one or two phenyl groups, by a 1-naphthyl, 2-naphthyl or biphenylyl group,

by a 1,3-dihydro-2H-2-oxobenzimidazol-1-yl, 2,4(1H,3H)-dioxoquinazolin-1-yl, 2,4(1H,3H)-dioxoquinazolin-3-yl, 2,4(1H,3H)-dioxothieno[3,4-d]pyrimidin-3-yl, 3,4-dihydro-2(1H)-oxothieno[3,4-d]pyrimidin-3-yl, 3,4-dihydro-2(1H)-oxothieno[3,4-d]pyrimidin-1-yl, 3,4-dihydro-2(1H)-oxothieno[3,2-d]pyrimidin-3-yl, 3,4-dihydro- 2(1H)-oxothieno[3,2-d]pyrimidin-1-yl, 3,4-dihydro-2(1H)-oxoquinazolin-1-yl, 3,4-dihydro-2(1H)-oxoquinazolin-3-yl, 2(1H)-oxoquinolin-3-yl, 2(1H)-oxoquinoxalin-3-yl, 1,1-dioxido-3(4H)-oxo-1,2,4-benzothiadiazin-2-yl, 1,3-dihydro-2H-2-oxoimidazopyridinyl, 1,3-dihydro-2(2H)-oxoimidazo[4,5-c]quinolin-3-yl, 1,3-dihydro-2H-2-oxoimidazol-1-yl or 3,4-dihydro-2(1H)-oxopyrimidin-3-yl group, wherein the latter two groups may each be mono- or disubstituted in the 4- and/or 5-position or in the 5- and/or 6-position by lower straight chained or branched alkyl groups, by phenyl, biphenylyl, pyridinyl, diazinyl, furyl, thienyl, pyrrolyl, 1,3-oxazolyl, 1,3-thiazolyl, isoxazolyl, pyrazolyl-1-methylpyrazolyl, imidazolyl or 1-methylimidazolyl groups and the substituents may be identical or different,

by a 5-membered heteroaromatic ring linked via a carbon atom, which contains a nitrogen, oxygen or sulphur atom or, in addition to a nitrogen atom, contains an oxygen, sulphur or additional nitrogen atom, whilst a nitrogen atom of an imino group may be substituted by an alkyl group,

or by a 6-membered heteroaromatic ring linked via a carbon atom, which contains one, two or three nitrogen atoms,

whilst a 1,4-butadienylene group may be attached both to the above-mentioned 5-membered heteroaromatic monocyclic rings and to the 6-membered heteroaromatic monocyclic rings, in each case via two adjacent carbon atoms, and the bicyclic heteroaromatic rings thus formed may also be bound via a carbon atom of the 1,4-butadienylene group,

an unbranched C_{1-6}-alkylamino group optionally substituted at the nitrogen atom by a C_{1-6}-alkyl group or by a phenylmethyl group, which may be substituted in the ω-position

by a C_{4-10}-cycloalkyl group,

by one or two phenyl groups, by a 1-naphthyl, 2-naphthyl or biphenylyl group,

by a 1H-indol-3-yl, 1,3-dihydro-2H-2-oxobenzimidazol-1-yl, 2,4(1H,3H)-dioxoquinazolin-1-yl, 2,4(1H,3H)-dioxoquinazolin-3-yl, 2,4(1H,3H)-dioxothieno[3,4-d]pyrimidin-3-yl, 3,4-dihydro-2(1H)-oxothieno[3,4-d]pyrimidin-3-yl, 3,4-dihydro-2(1H)-oxothieno[3,4-d]pyrimidin-1-yl, 3,4-dihydro-2(1H)-oxothieno[3,2-d]pyrimidin-3-yl, 3,4-dihydro-2(1H)-oxothieno[3,2-d]pyrimidin-1-yl, 3,4-dihydro-2(1H)-oxoquinazolin-1-yl, 3,4-dihydro-2(1H)-oxoquinazolin-3-yl, 2(1H)-oxoquinolin-3-yl, 2(1H)-oxoquinoxalin-3-yl, 1,1-dioxido-3(4H)-oxo-1,2,4-benzothiadiazin-2-yl, 1,3-dihydro-4-(3-thienyl)-2H-2-oxoimidazol-1-yl, 1,3-dihydro-4-phenyl-2H-2-oxoimidazol-1-yl, 1,3-dihydro-5-phenyl-2H-2-oxoimidazol-1-yl, 1,3-dihydro-2(2H)-oxoimidazo[4,5-c]quinolin-3-yl, 3,4-dihydro-5-phenyl-2(1H)-oxopyrimidin-3-yl, 3,4-dihydro-6-phenyl-2(1H)-oxopyrimidin-3-yl- or 1,3-dihydro-2H-2-oxoimidazo[4,5-b]pyridin-3-yl-group,

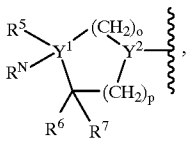
by a 5-membered heteroaromatic ring linked via a carbon atom, which contains a nitrogen, oxygen or sulphur atom or, in addition to a nitrogen atom, contains an oxygen, sulphur or an additional nitrogen atom, whilst a nitrogen atom of an imino group may be substituted by an alkyl group, or

by a 6-membered heteroaromatic ring linked via a carbon atom, containing 1, 2 or 3 nitrogen atoms, whilst a 1,4-butadienylene group may be attached both to the 5-membered and to the 6-membered heteroaromatic monocyclic rings, in each case via two adjacent carbon atoms, and the bicyclic heteroaromatic rings thus formed may also be bound via a carbon atom of the 1,4-butadienylene group,

whilst the phenyl, naphthyl and biphenylyl groups mentioned above for the substitution of the alkyl and alkylamino groups in the ω-position and optionally also partially hydrogenated mono- and bicyclic heteroaromatic rings in the carbon skeleton may additionally be mono-, di- or trisubstituted by fluorine, chlorine or bromine atoms or by alkyl groups, C_{3-8}-cycloalkyl groups, nitro, alkoxy, phenyl, phenylalkoxy, trifluoromethyl, alkoxycarbonyl, alkoxycarbonylalkyl, carboxy, carboxyalkyl, dialkylaminoalkyl, hydroxy, amino, acetylamino, propionylamino, benzoyl, benzoylamino, benzoylmethylamino, aminocarbonyl, alkylaminocarbonyl, dialkylaminocarbonyl, (1-pyrrolidinyl)carbonyl, (1-piperidinyl)carbonyl, (hexahydro-1H-azepin-1-yl)carbonyl, (4-methyl-1-piperazinyl)carbonyl, (4-morpholinyl)carbonyl, alkanoyl, cyano, trifluoromethoxy, trifluoromethylthio, trifluoromethylsulphinyl or trifluoromethylsulphonyl groups, wherein the substituents may be identical or different and the above-mentioned benzoyl, benzoylamino and benzoylmethylamino groups may in turn additionally be substituted in the phenyl moiety by a fluorine, chlorine or bromine atom or by an alkyl,

trifluoromethyl, amino or acetylamino group, or the group of formula

(II)



wherein

p denotes the number 1 or 2,

o denotes the number 2 or 3 or, if Y^1 and Y^2 are not simultaneously nitrogen atoms, o may also denote 1.

Y^1 denotes the nitrogen atom if R^5 is a free pair of electrons, or the carbon atom,

Y^2 is the nitrogen atom or the group >CH—,

R^5 is a free pair of electrons if Y^1 denotes the nitrogen atom or, if Y^1 denotes the carbon atom, R^5 denotes a hydrogen atom, a C_{1-3}-alkyl group, a hydroxy, cyano, aminocarbonyl, carboxy, alkoxycarbonyl, aminocarbonylamino, phenylmethyl or phenyl group,

R^6 denotes the hydrogen atom or, provided that Y^1 is not a nitrogen atom, R^6 together with R^5 may denote an additional bond,

R^7 denotes the hydrogen atom or, provided that Y^1 is not a nitrogen atom and R^5 and R^6 together constitute an additional bond, R^7 together with R^N may also denote a 1,4-butadienylene group,

R^N denotes a hydrogen atom or a C_{1-6}-alkyl group which may be mono- or disubstituted in the ω-position

by a C_{5-7}-cycloalkyl group, by a 1-naphthyl, 2-naphthyl, hydroxy, alkoxy, amino, alkylamino, dialkylamino, piperidinyl, morpholinyl, pyrrolidinyl, hexahydro-1H-1-azepinyl, aminocarbonyl, alkylaminocarbonyl, acetylamino, cyano, aminocarbonylamino or alkylaminocarbonylamino group or by phenyl, pyridinyl or diazinyl groups, whilst these substituents may be identical or different,

a C_{5-7}-cycloalkyl group, a phenyl, pyridinyl, cyano, amino, benzoylamino, aminocarbonyl, alkylaminocarbonyl, alkoxycarbonyl, phenylalkoxycarbonyl, aminocarbonylamino, alkylaminocarbonylamino, dialkylaminocarbonylamino, N-(aminocarbonyl)-N-alkylamino, N-(alkylaminocarbonyl)-N-alkylamino, N-(alkylaminocarbonyl)-N-phenylamino, phenylaminocarbonylamino, [phenyl(alkylamino)] carbonylamino, N-(phenylaminocarbonyl)-N-alkylamino, N-(phenylaminocarbonyl)-N-phenylamino, benzoylaminocarbonylamino, phenylalkylaminocarbonylamino, pyridinylaminocarbonylamino, N-(aminocarbonyl)-N-phenylamino, N-(alkylaminocarbonyl)-N-phenylamino, N-(aminocarbonylaminocarbonyl)-N-phenylamino, N-(pyridinyl)-N-(aminocarbonyl) amino, N-(pyridinyl)-N-(alkylaminocarbonyl) amino, phenylamino, pyridinylamino, 4-[3,4-dihydro-2(1H)-oxoquinazolin-3-yl]-1-piperidinyl or diazinylamino group,

a saturated, mono- or di-unsaturated 5- to 7-membered aza, diaza, triaza, oxaza, thiaza, thiadiaza- or S,S-dioxido-thiadiaza-heterocycle.

wherein the above-mentioned heterocycles may be linked via a carbon or nitrogen atom and

may contain one or two carbonyl groups adjacent to a nitrogen atom,

may be substituted at one of the nitrogen atoms by an alkyl, alkanoyl, aroyl, hydroxycarbonylalkyl, alkoxycarbonylalkyl, phenylalkoxycarbonylalkyl, phenylmethyl or phenyl group,

may be substituted at one or two carbon atoms by a branched or unbranched alkyl group or by a phenyl, phenylmethyl, naphthyl, biphenylyl, pyridinyl, diazinyl, furyl, thienyl, pyrrolyl, 1,3-oxazolyl, 1,3-thiazolyl, isoxazolyl, pyrazolyl, 1-methylpyrazolyl, imidazolyl or 1-methylimidazolyl group, wherein the substituents may be the same or different,

and wherein a C_{3-6}-alkylene group may additionally be attached to the above-mentioned heterocycles via two adjacent carbon atoms or an olefinic double bond of one of the above-mentioned unsaturated heterocycles may be fused with a benzene, pyridine, diazine, 1,3-oxazole, thiophene, furan, thiazole, pyrrole, N-methyl-pyrrole, quinoline, imidazole or N-methylimidazole ring,

or if Y^1 is not a nitrogen atom and R^5 and R^6 together denote an additional bond, R^N together with R^7 may also denote the 1,4-butadienylene group,

or, if Y^1 is a carbon atom, R^N together with R^5, including Y^1, also denotes a carbonyl group or a saturated or mono-unsaturated 5- or 6-membered 1,3-diaza-heterocycle which may optionally contain one or two carbonyl groups in the ring and, if it is unsaturated, may be benzofused at the double bond and may be substituted at one of the nitrogen atoms by a methyl, aminocarbonyl, hydroxycarbonylalkyl, alkoxycarbonylalkyl, phenylalkoxycarbonylalkyl, phenylmethyl or phenyl group,

whilst the phenyl, pyridinyl, diazinyl, furyl, thienyl, pyrrolyl, 1,3-oxazolyl, 1,3-thiazolyl, isoxazolyl, pyrazolyl, 1-methylpyrazolyl, imidazolyl- or 1-methylimidazolyl groups contained in the residues mentioned under R^5, R^7 and R^N, as well as benzo, thieno, pyrido- and diazino-fused heterocycles in the carbon skeleton may additionally be mono-, di- or trisubstituted by fluorine, chlorine or bromine atoms, by alkyl groups, C_{3-8}-cycloalkyl groups, nitro, alkoxy, alkylthio, alkylsulphinyl, alkylsulphonyl, alkylsulphonylamino, phenyl, phenylalkoxy, trifluoromethyl, alkoxycarbonyl, alkoxycarbonylalkyl, carboxy, carboxyalkyl, dialkylaminoalkyl, hydroxy, amino, acetylamino, propionylamino, benzoyl, benzoylamino, benzoylmethylamino, aminocarbonyl, alkylaminocarbonyl, dialkylaminocarbonyl, hydroxyalkylaminocarbonyl, (4-morpholinyl) carbonyl, (1-pyrrolidinyl)carbonyl, (1-piperidinyl) carbonyl, (hexahydro-1-azepinyl)carbonyl, (4-methyl-1-piperazinyl)carbonyl, methylenedioxy, aminocarbonylamino, aminocarbonylaminoalkyl, alkylaminocarbonylamino, alkanoyl, cyano, trifluoromethoxy, trifluormethylthio, trifluoromethylsulphinyl- or trifluoromethylsulphonyl groups, wherein the substituents may be identical or different and the above-mentioned benzoyl, benzoylamino, benzoylaminocarbonylamino and benzoylmethylamino groups may in turn additionally be substituted in the phenyl moiety by a fluorine, chlorine or bromine atom or by an alkyl, trifluoromethyl, amino- or acetylamino group

and unless otherwise specified the alkyl groups contained in the above-mentioned radicals may contain 1 to 5 carbon atoms,

X denotes an oxygen atom or 2 hydrogen atoms,

Z denotes a methylene group or the group —NR^1, wherein

R^1 denotes a hydrogen atom or an alkyl or phenylalkyl group,

R^{11} denotes a hydrogen atom, a C_{1-3}-alkyl group, an alkoxycarbonyl group having a total of 2 to 4 carbon atoms or a phenylmethyl group,

n denotes the number 1 or 2 or, if m is 1, n may also be 0,

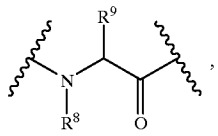
m denotes the number 0 or 1,

R^2 denotes a phenyl, 1-naphthyl, 2-naphthyl, 1,2,3,4-tetrahydro-1-naphthyl, 1H-indol-3-yl, 1-methyl-1H-indol-3-yl, 1-formyl-1H-indol-3-yl, 1-(1,1-dimethylethoxycarbonyl)-1H-indol-3-yl, 4-imidazolyl, 1-methyl-4-imidazolyl, 2-thienyl, 3-thienyl, thiazolyl, 1H-indazol-3-yl, 1-methyl-1H-indazol-3-yl, benzo[b]fur-3-yl, benzo[b]thien-3-yl, pyridinyl, qui-nolinyl or isoquinolinyl group,

whilst the above-mentioned aromatic and heteroaromatic groups in the carbon skeleton may additionally be mono-, di- or trisubstituted by fluorine, chlorine or bromine atoms or by branched or unbranched alkyl groups, C_{3-8}-cycloalkyl groups, phenylalkyl groups, alkenyl, alkoxy, phenyl, phenylalkoxy, trifluoromethyl, alkoxycarbonylalkyl, carboxyalkyl, alkoxycarbonyl, carboxy, dialkylaminoalkyl, dialkylaminoalkoxy, hydroxy, nitro, amino, acetylamino, propionylamino, benzoyl, benzoylamino, benzoylmethylamino, methylsulphonyloxy, aminocarbonyl, alkylaminocarbonyl, dialkylaminocarbonyl, alkanoyl, cyano, tetrazolyl, phenyl, pyridinyl, thiazolyl, furyl, trifluoromethoxy, trifluoromethylthio, trifluoromethylsulphinyl- or trifluoromethylsulphonyl groups, and the substituents may be identical or different and the above-mentioned benzoyl, benzoylamino- and benzoylmethylamino groups may in turn additionally be substituted in the phenyl moiety by a fluorine, chlorine or bromine atom, or by an alkyl, trifluoromethyl, amino or acetylamino group,

A denotes a bond or the divalent group of formula

(III)



(which is linked to the NR^3R^4 group via the —CX group)

wherein

R^8 and R^9 together denote an n-propylene group or

R^8 denotes a hydrogen atom or an alkyl- or phenylalkyl group and

R^9 denotes a hydrogen atom or a branched or unbranched C_{1-5}-alkyl group which, if it is unbranched, may be substituted in the ω-position by a hydroxy, mercapto, amino, alkylamino, dialkylamino, 1-azetidinyl, 1-pyrrolidinyl, 1-piperidinyl, hexahydro-1-azepinyl, methylthio, hydroxycarbonyl, aminocarbonyl, aminoiminomethylamino, aminocarbonylamino, phenyl, 1H-indol-3-yl, 1-methyl-1H-indol-3-yl, 1-formyl-1H-indol-3-yl, 4-imidazolyl, 1-methyl-4-imidazolyl, 1-naphthyl, 2-naphthyl- or pyridinyl group, whilst the above-mentioned heterocycles, phenyl and naphthyl groups may in turn be mono-, di- or trisubstituted in the carbon skeleton by fluorine, chlorine or bromine atoms or by methyl, alkoxy, trifluoromethyl, hydroxy, amino, acetylamino, aminocarbonyl, cyano, trifluoromethoxy, methylsulphonyloxy, trifluoromethylthio, trifluoromethylsulphinyl or trifluoromethylsulphonyl groups, wherein the substituents may be identical or different, and wherein the hydroxy, mercapto, amino, guanidino, indolyl and imidazolyl groups contained in the groups mentioned for R^9 may be substituted with the protecting groups commonly used in peptide chemistry, preferably with the acetyl, benzyloxycarbonyl or tert.butyloxycarbonyl group,

R^3 denotes a hydrogen atom,

a C_{1-7}-alkyl group which may be substituted in the ω-position by a cyclohexyl, phenyl, pyridinyl, diazinyl, hydroxy, amino, alkylamino, dialkylamino, carboxy, aminocarbonyl, aminocarbonylamino, acetylamino, 1-pyrrolidinyl, 1-piperidinyl, 4-(1-piperidinyl)-1-piperidinyl, 4-morpholinyl, hexahydro-1H-1-azepinyl, [bis-(2-hydroxyethyl)]amino, 4-alkyl-1-piperazinyl or 4-(ω-hydroxyalkyl)-1-piperazinyl group,

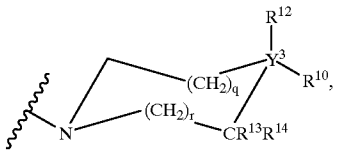
a phenyl or pyridinyl group,

wherein the above-mentioned heterocyclic groups and phenyl groups may additionally be mono-, di- or trisubstituted in the carbon skeleton by fluorine, chlorine or bromine atoms or by methyl, alkoxy, trifluoromethyl, hydroxy, amino, acetylamino, aminocarbonyl, cyano, methylsulphonyloxy, trifluoromethoxy, trifluoromethylthio, trifluoromethylsulphinyl or trifluoromethylsulphonyl groups and the substituents may be identical or different,

R^4 denotes a hydrogen atom or a C_{1-3}-alkyl group optionally substituted by a phenyl or pyridinyl group or

R^3 and R^4 together with the enclosed nitrogen atom denote a group of general formula

(IV)



wherein

Y^3 denotes a carbon atom or, if R^{12} denotes a free pair of electrons, Y^3 may also be the nitrogen atom,

r denotes the number 0, 1 or 2,

q denotes the number 0, 1 or 2,

R^{10} denotes a hydrogen atom or an amino, alkylamino, dialkylamino, alkyl, cycloalkyl, aminoalkyl, alkylaminoalkyl, dialkylaminoalkyl, aminoiminomethyl, aminocarbonylamino, alkylaminocarbonylamino, cycloalkylaminocarbonylamino, phenylaminocarbonylamino, aminocarbonylalkyl, aminocarbonylaminoalkyl, alkoxycarbonyl, alkoxycarbonylalkyl, carboxyalkyl or carboxy group,

a phenyl, pyridinyl, diazinyl, 1-naphthyl, 2-naphthyl, pyridinylcarbonyl- or phenylcarbonyl-group which may be mono-, di- or trisubstituted in the carbon skeleton by fluorine, chlorine or bromine atoms, or by alkyl, alkoxy, methylsulphonyloxy, trifluoromethyl, hydroxy, amino, acetylamino, aminocarbonyl, aminocarbonylamino, aminocarbonylaminomethyl, cyano, carboxy, carbalkoxy, carboxyalkyl, carbalkoxyalkyl, alkanoyl, ω-(dialkylamino)alkanoyl, ω-(dialkylamino)alkyl, ω-(dialkylamino) hydroxyalkyl, ω-(carboxy)alkanoyl, trifluoromethoxy, trifluoromethylthio, trifluoromethylsulphinyl or trifluoromethylsulphonyl groups, whilst the substituents may be identical or different,

a 1,3-dihydro-2-oxo-2H-imidazolyl, 2,4(1H,3H)-dioxopyrimidinyl or 3,4-dihydro-2(1H)-oxopyrimidinyl group bound via a nitrogen atom, which may be substituted by a phenyl group or fused at the double bond to a benzene, pyridine or diazine ring,

a 1,1-dioxido-3(4H)-oxo-1,2,4-benzothiadiazin-2-yl group,

a 4- to 10-membered azacycloalkyl group, a 5- to 10-membered oxaza, thiaza- or diazacycloalkyl group or a 6- to 10-membered azabicycloalkyl group,

wherein the above-mentioned mono- and bicyclic heterocycles may be bound via a nitrogen or carbon atom and

may be substituted by a C_{1-7}-alkyl group, by an alkanoyl, dialkylamino, phenylcarbonyl, pyridinylcarbonyl, carboxyalkanoyl, carboxyalkyl, alkoxycarbonylalkyl, alkoxycarbonyl, aminocarbonyl, alkylaminocarbonyl, alkylsulphonyl, cycloalkyl- or cycloalkylalkyl group, by a cycloalkylcarbonyl, azacycloalkylcarbonyl, diazacycloalkylcarbonyl or oxazacycloalkylcarbonyl group optionally substituted in the ring,

whilst the alicyclic parts contained in these substituents may comprise 3 to 10 ring members and the heteroalicyclic parts may comprise 4 to 10 ring members and

the above-mentioned phenyl and pyridinyl groups may in turn be mono- , di- or trisubstituted by fluorine, chlorine or bromine atoms, by alkyl, alkoxy, methylsulphonyloxy, trifluoromethyl, hydroxy, amino, acetylamino, aminocarbonyl, aminocarbonylamino, aminocarbonylaminomethyl, cyano, carboxy, carbalkoxy, carboxyalkyl, carbalkoxyalkyl, alkanoyl, ω-(dialkylamino)alkanoyl, ω-(carboxy) alkanoyl, trifluoromethoxy, trifluoromethylthio, trifluoromethylsulphinyl or trifluoromethylsulphonyl groups, whilst the substituents may be identical or different, or

R^{10} together with R^{12} and Y^3 denotes a 4- to 7-membered cycloaliphatic ring in which a methylene group may be replaced by an —NH— or —N(alkyl)— group,

whilst a hydrogen atom bound to a nitrogen atom within the group R^{10} may be replaced by a protecting group,

R^{12} denotes a hydrogen atom,

a C_{1-4}-alkyl group, wherein an unbranched alkyl group may be substituted in the co-position by a phenyl, pyridinyl, diazinyl, amino, alkylamino, dialkylamino, 1-pyrrolidinyl, 1-piperidinyl, 4-methyl-1-piperazinyl, 4-morpholinyl- or hexahydro-1H-1-azepinyl group,

an alkoxycarbonyl, cyano or aminocarbonyl group or a free pair of electrons, if Y^3 denotes a nitrogen atom, and

R^{13} and R^{14} in each case denote a hydrogen atom or,

if Y^3 is a carbon atom, R^{12} together with R^{14} also denotes another carbon-carbon bond, wherein R^{10} is as hereinbefore defined and R^{13} denotes a hydrogen atom or

if Y^3 is a carbon atom, R^{12} together with R^{14} also denotes another carbon-carbon bond and R^{10} together with R^{13} and the enclosed double bond denotes a partially hydrogenated or aromatic 5- to 7-membered mono- or bicyclic carbocycle or heterocycle,

whilst all the above-mentioned alkyl and alkoxy groups and the alkyl groups present within the other groups mentioned may contain 1 to 7 carbon atoms, unless otherwise specified,

all the above-mentioned cycloalkyl groups and the cycloalkyl groups present within the other groups named may contain 5 to 10 carbon atoms, unless otherwise specified, and

the term “aroyl group” used above denotes, for example, the benzoyl or naphthoyl group.

The protecting groups mentioned in the foregoing definitions and hereinafter are the protecting groups which are commonly known from peptide chemistry, particularly

a phenylalkoxycarbonyl group having 1 to 3 carbon atoms in the alkoxy moiety, optionally substituted in the phenyl nucleus by a halogen atom, by a nitro or phenyl group or by one or two methoxy groups,

for example the benzyloxycarbonyl, 2-nitro-benzyloxycarbonyl, 4-nitro-benzyloxycarbonyl, 4-methoxy-benzyloxycarbonyl, 2-chloro-benzyloxycarbonyl, 3-chloro-benzyloxycarbonyl, 4-chloro-benzyloxycarbonyl, 4-Biphenylyl-α,α-dimethyl-benzyloxycarbonyl or 3,5-dimethoxy-α,α-dimethyl-benzyloxycarbonyl group,

an alkoxycarbonyl group having a total of 1 to 5 carbon atoms in the alkyl moiety,

for example the methoxycarbonyl, ethoxycarbonyl, n-propoxycarbonyl, isopropoxycarbonyl, n-butoxycarbonyl, 1-methylpropoxycarbonyl, 2-methylpropoxycarbonyl or tert.butyloxycarbonyl group,

the allyloxycarbonyl, 2,2,2-trichloro-(1,1-dimethylethoxy)carbonyl or 9-fluorenylmethoxycarbonyl group or

the formyl, acetyl or trifluoroacetyl group.

The present invention relates to racemates, where the compounds of general formula I have only one chiral element. However, the application also covers the individual diastereomeric pairs of antipodes or mixtures thereof which occur when there is more than one chiral element in the compounds of general formula (I).

Particularly preferred are compounds of general formula I wherein Z denotes NR^1 and m assumes the value 0 and which are in the D- or (R)-configuration with regard to the partial amino acid structure of the formula

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