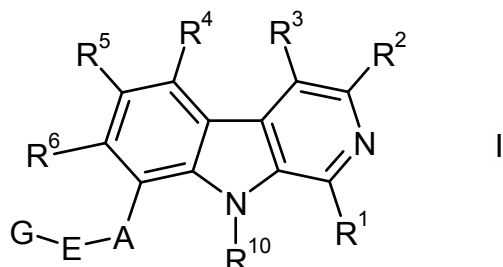


Claims

1. A compound of the formula I or a pharmaceutically acceptable salt thereof,



wherein

A is selected from the series consisting of phenyl and a monocyclic or bicyclic, 5-membered to 10-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰), O and S and is bonded via a ring carbon atom, wherein phenyl and the heterocyclic group are unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a direct bond or a chain consisting of 1 to 5 chain members of which 0, 1 or 2 chain members are identical or different hetero chain members selected from the series consisting of N(R²⁵), O and S(O)_m, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

G is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl, cyano and R³⁰;

R¹, R³, R⁴ and R⁶ are independently of each other selected from the series consisting of hydrogen, halogen and (C₁-C₄)-alkyl;

R² is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl and (C₁-C₄)-alkyl-O-C(O)-;

R^5 is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O-, cyano, R^7 -O-C(O)- and R^8 -N(R^9)-C(O)-;

R^7 , R^8 , R^9 , R^{20} , R^{22} , R^{25} , R^{31} , R^{33} , R^{34} and R^{40} are independently of each other selected from the series consisting of hydrogen and (C₁-C₄)-alkyl;

R^{10} is selected from the series consisting of hydrogen, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl and (C₃-C₇)-cycloalkyl, wherein alkyl is unsubstituted or substituted by 1 or 2 identical or different substituents selected from the series consisting of (C₃-C₇)-cycloalkyl, Het, cyano and (C₁-C₄)-alkyl-O-, wherein all cycloalkyl groups are unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₄)-alkyl;

R^{21} is selected from the series consisting of halogen, (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O- and cyano, and two groups R^{21} bonded to adjacent ring carbon atoms in the group A, together with the carbon atoms carrying them, can form a 5-membered to 7-membered mono-unsaturated ring, which comprises 0, 1 or 2 identical or different hetero ring members selected from the series consisting of N(R^{22}), O and S(O)_m and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₄)-alkyl;

R^{26} and R^{27} are independently of each other selected from the series consisting of hydrogen, fluorine, (C₁-C₄)-alkyl and hydroxy, and in one or two groups C(R^{26})(R^{27}) the groups R^{26} and R^{27} bonded to the same carbon atom together can be oxo;

R^{30} is a monocyclic or bicyclic, 3-membered to 10-membered ring, which is saturated or unsaturated and comprises 0, 1, 2 or 3 identical or different hetero ring members selected from the series consisting of N, N(R^{31}), O and S(O)_m, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{32} ;

R^{32} is selected from the series consisting of halogen, (C₁-C₄)-alkyl, hydroxy, oxo, (C₁-C₄)-alkyl-O-, cyano, R^{33} -N(R^{34})- and Het;

Het is a monocyclic, 4-membered to 7-membered, saturated heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R⁴⁰), O and S(O)_m, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₄)-alkyl;

m is selected from the series consisting of 0, 1 and 2, wherein all numbers m are independent of each other and can be identical or different;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents;

provided that the compound of the formula I is not 8-phenyl-9H-pyrido[3,4-b]indole.

2. A compound of the formula I according to claim 1 or a pharmaceutically acceptable salt thereof, wherein

A is selected from the series consisting of phenyl and a monocyclic, 5-membered or 6-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰), O and S and is bonded via a ring carbon atom, wherein phenyl and the heterocyclic group are unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a direct bond or a chain consisting of 1 to 4 chain members of which 0, 1 or 2 chain members are identical or different hetero chain members selected from the series consisting of N(R²⁵), O and S(O)_m, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

G is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl and R³⁰;

R¹, R³, R⁴ and R⁶ are independently of each other selected from the series consisting of hydrogen, halogen and (C₁-C₃)-alkyl;

R^2 is selected from the series consisting of hydrogen, halogen and (C₁-C₃)-alkyl;

R^5 is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O- and cyano;

R^{10} is selected from the series consisting of hydrogen, (C₁-C₆)-alkyl and (C₃-C₇)-cycloalkyl, wherein alkyl is unsubstituted or substituted by 1 substituent selected from the series consisting of (C₃-C₇)-cycloalkyl, Het, cyano and (C₁-C₄)-alkyl-O-, and wherein all cycloalkyl groups are unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₄)-alkyl;

R^{20} , R^{22} , R^{25} , R^{31} and R^{40} are independently of each other selected from the series consisting of hydrogen and (C₁-C₄)-alkyl;

R^{21} is selected from the series consisting of halogen, (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O- and cyano, and two groups R^{21} bonded to adjacent ring carbon atoms in the group A, together with the carbon atoms carrying them, can form a 5-membered or 6-membered mono-unsaturated ring, which comprises 0, 1 or 2 identical or different hetero ring members selected from the series consisting of N(R^{22}), O and S(O)_m and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₄)-alkyl;

R^{26} and R^{27} are independently of each other selected from the series consisting of hydrogen, fluorine, (C₁-C₃)-alkyl and hydroxy, and in one group C(R^{26})(R^{27}) the groups R^{26} and R^{27} bonded to the same carbon atom together can be oxo;

R^{30} is a monocyclic or bicyclic, 3-membered to 10-membered ring, which is saturated or unsaturated and comprises 0, 1, 2 or 3 identical or different hetero ring members selected from the series consisting of N, N(R^{31}), O and S(O)_m, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{32} ;

R^{32} is selected from the series consisting of halogen, (C₁-C₄)-alkyl, hydroxy, oxo, (C₁-C₄)-alkyl-O- and cyano;

Het is a monocyclic, 4-membered to 6-membered, saturated heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R⁴⁰) and O, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₄)-alkyl;

m is selected from the series consisting of 0, 1 and 2, wherein all numbers m are independent of each other and can be identical or different;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents.

3. A compound of the formula I according to any of claims 1 and 2 or a pharmaceutically acceptable salt thereof, wherein

A is selected from the series consisting of phenyl and a monocyclic, 5-membered or 6-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰), O and S and is bonded via a ring carbon atom, wherein phenyl and the heterocyclic group are unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a direct bond or a chain consisting of 1 to 4 chain members of which 0, 1 or 2 chain members are identical or different hetero chain members selected from the series consisting of N(R²⁵) and O, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

G is selected from the series consisting of hydrogen, (C₁-C₄)-alkyl and R³⁰;

R^1 and R^4 are independently of each other selected from the series consisting of hydrogen, halogen and (C₁-C₃)-alkyl;

R^2 is selected from the series consisting of hydrogen, halogen and (C₁-C₃)-alkyl;

R^3 and R^6 are independently of each other selected from the series consisting of hydrogen, halogen and C₁-alkyl;

R^5 is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl and cyano;

R^{10} is selected from the series consisting of hydrogen, (C₁-C₆)-alkyl and (C₃-C₇)-cycloalkyl, wherein alkyl is unsubstituted or substituted by 1 substituent selected from the series consisting of (C₃-C₇)-cycloalkyl, Het, cyano and (C₁-C₄)-alkyl-O-, and wherein all cycloalkyl groups are unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₄)-alkyl;

R^{20} , R^{22} , R^{25} , R^{31} and R^{40} are independently of each other selected from the series consisting of hydrogen and (C₁-C₄)-alkyl;

R^{21} is selected from the series consisting of halogen, (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O- and cyano, and two groups R^{21} bonded to adjacent ring carbon atoms in the group A, together with the carbon atoms carrying them, can form a 5-membered or 6-membered mono-unsaturated ring, which comprises 0, 1 or 2 identical or different hetero ring members selected from the series consisting of N(R^{22}) and O, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents selected from the series consisting of fluorine and C₁-alkyl;

R^{26} and R^{27} are independently of each other selected from the series consisting of hydrogen, fluorine, (C₁-C₃)-alkyl and hydroxy, and in one group C(R^{26})(R^{27}) the groups R^{26} and R^{27} bonded to the same carbon atom together can be oxo;

R^{30} is a monocyclic or bicyclic, 3-membered to 10-membered ring, which is saturated or aromatic and comprises 0, 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R^{31}), O and S(O)_m, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{32} ;

R^{32} is selected from the series consisting of halogen, (C₁-C₄)-alkyl, hydroxy, oxo and (C₁-C₄)-alkyl-O-;

Het is a monocyclic, 4-membered to 6-membered, saturated heterocyclic group, which comprises 1 hetero ring member selected from the series consisting of N(R^{40}) and O, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₃)-alkyl;

m is selected from the series consisting of 0, 1 and 2, wherein all numbers m are independent of each other and can be identical or different;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents.

4. A compound of the formula I according to any of claims 1 and 3 or a pharmaceutically acceptable salt thereof, wherein

A is selected from the series consisting of phenyl and a monocyclic, 5-membered or 6-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R^{20}) and S and is bonded via a ring carbon atom, wherein phenyl and the heterocyclic group are unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{21} ;

E is a direct bond or a chain consisting of 1 to 4 chain members of which 0 or 1 chain members are identical or different hetero chain members selected from the series

consisting of N(R²⁵) and O, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

G is selected from the series consisting of hydrogen and R³⁰;

R¹ and R⁴ are independently of each other selected from the series consisting of hydrogen, halogen and (C₁-C₂)-alkyl;

R² is selected from the series consisting of hydrogen, halogen and (C₁-C₂)-alkyl;

R³ and R⁶ are independently of each other selected from the series consisting of hydrogen, halogen and C₁-alkyl;

R⁵ is selected from the series consisting of hydrogen, halogen and (C₁-C₂)-alkyl;

R¹⁰ is selected from the series consisting of hydrogen, (C₁-C₄)-alkyl and (C₃-C₅)-cycloalkyl, wherein alkyl is unsubstituted or substituted by 1 substituent selected from the series consisting of (C₃-C₅)-cycloalkyl and Het, and wherein all cycloalkyl groups are unsubstituted or substituted by one or more identical or different substituents (C₁-C₂)-alkyl;

R²⁰, R²⁵ and R³¹ are independently of each other selected from the series consisting of hydrogen and (C₁-C₃)-alkyl;

R²¹ is selected from the series consisting of halogen, (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O- and cyano;

R²⁶ and R²⁷ are independently of each other selected from the series consisting of hydrogen, fluorine, C₁-alkyl and hydroxy, and in one group C(R²⁶)(R²⁷) the groups R²⁶ and R²⁷ bonded to the same carbon atom together can be oxo;

R³⁰ is a monocyclic 3-membered to 6-membered or bicyclic 9-membered to 10-membered ring, which is saturated or aromatic and comprises 0, 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R³¹) and O,

and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{32} ;

R^{32} is selected from the series consisting of halogen, (C₁-C₃)-alkyl, hydroxy and oxo;

Het is a monocyclic, 4-membered or 5-membered, saturated heterocyclic group, which comprises 1 hetero ring member which is O, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents (C₁-C₃)-alkyl;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents.

5. A compound of the formula I according to any of claims 1 and 4 or a pharmaceutically acceptable salt thereof, wherein

A is selected from the series consisting of phenyl and the aromatic heterocyclic groups pyrazolyl and pyridinyl, wherein phenyl and the heterocyclic groups are unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{21} ;

E is a direct bond or a chain consisting of 1 to 3 chain members of which 0 or 1 chain member is a hetero chain member which is O, and the other chain members are identical or different groups $C(R^{26})(R^{27})$;

G is selected from the series consisting of hydrogen and R^{30} ;

R^1 and R^4 are independently of each other selected from the series consisting of hydrogen, halogen and C₁-alkyl;

R^2 is selected from the series consisting of hydrogen, halogen and C₁-alkyl;

R^3 and R^6 are hydrogen;

R⁵ is selected from the series consisting of halogen and (C₁-C₂)-alkyl;

R¹⁰ is selected from the series consisting of hydrogen, (C₁-C₄)-alkyl and (C₃-C₅)-cycloalkyl, wherein alkyl is unsubstituted or substituted by 1 substituent selected from the series consisting of (C₃-C₅)-cycloalkyl and Het;

R²¹ is selected from the series consisting of halogen, (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O- and cyano;

R²⁶ and R²⁷ are independently of each other selected from the series consisting of hydrogen, fluorine and C₁-alkyl;

R³⁰ is a monocyclic, 3-membered to 6-membered ring, which is saturated or aromatic and comprises 0, 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R³¹) and O, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R³²;

R³¹ is selected from the series consisting of hydrogen and (C₁-C₃)-alkyl;

R³² is selected from the series consisting of halogen and (C₁-C₃)-alkyl;

Het is a monocyclic, 4-membered or 5-membered, saturated heterocyclic group, which comprises 1 hetero ring member which is O, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents (C₁-C₃)-alkyl;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents.

6. A compound of the formula I according to claim 1 or a pharmaceutically acceptable salt thereof, wherein

A is phenyl, which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a direct bond;

G is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl and cyano.

7. A compound of the formula I according to claim 1 or a pharmaceutically acceptable salt thereof, wherein

A is phenyl, which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a chain consisting of 1 to 5 chain members of which 0, 1 or 2 chain members are identical or different hetero chain members selected from the series consisting of N(R²⁵), O and S(O)_m, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

G is R³⁰.

8. A compound of the formula I according to claim 1 or a pharmaceutically acceptable salt thereof, wherein

A is a monocyclic or bicyclic, 5-membered to 10-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰), O and S and is bonded via a ring carbon atom, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a direct bond;

G is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl and cyano.

9. A compound of the formula I according to claim 1 or a pharmaceutically acceptable salt thereof, wherein

A is a monocyclic or bicyclic, 5-membered to 10-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰), O and S and is bonded via a ring carbon atom, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a chain consisting of 1 to 5 chain members of which 0, 1 or 2 chain members are identical or different hetero chain members selected from the series consisting of

$N(R^{25})$, O and $S(O)_m$, and the other chain members are identical or different groups $C(R^{26})(R^{27})$;
G is R^{30} .

10. A compound of the formula I according to any of claims 1 to 3, which is selected from the series consisting of:

6-Bromo-9-ethyl-1-methyl-8-(1-pyridin-3-ylmethyl-1H-pyrazol-4-yl)-9H-pyrido[3,4-b]indole,

6-Chloro-1,5-dimethyl-8-[4-(3-methyl-oxetan-3-ylmethoxy)-phenyl]-9H-pyrido[3,4-b]indole,

2-(4-[6-Chloro-9-(2,2,2-trifluoroethyl)-9H-pyrido[3,4-b]indol-8-yl]pyrazol-1-yl)ethanol,

6-Chloro-1-methyl-8-[4-(2-pyrazol-1-ylethoxy)-phenyl]-9H-pyrido[3,4-b]indole,

6-Bromo-9-ethyl-1,3-dimethyl-8-(1-methyl-1H-pyrazol-4-yl)-9H-pyrido[3,4-b]indole,

6-Chloro-8-(4-methoxy-phenyl)-1,9-dimethyl-9H-pyrido[3,4-b]indole,

6-Chloro-8-(4-methoxy-phenyl)-1,5-dimethyl-9H-pyrido[3,4-b]indole,

8-(4-Methoxy-phenyl)-1-methyl-9H-pyrido[3,4-b]indole-6-carbonitrile,

6-Chloro-1-methyl-8-[4-(1-methyl-1H-imidazol-2-ylmethoxy)-phenyl]-9H-pyrido[3,4-b]indole,

6-Chloro-1,5-dimethyl-8-[4-(2-pyrazol-1-yl-ethoxy)-phenyl]-9H-pyrido[3,4-b]pyridine,

6-Chloro-9-cyclopropylmethyl-8-(2,6-dichloro-pyridin-3-yl)-9H-pyrido[3,4-b]indole, 6-Chloro-8-(2,6-dichloro-pyridin-3-yl)-9-ethyl-9H-pyrido[3,4-b]indole,

8-(2,6-Dichloro-pyridin-3-yl)-1,6-dimethyl-9H-pyrido[3,4-b]indole,

6-Chloro-9-ethyl-1-methyl-8-(1-pyridin-3-ylmethyl-1H-pyrazol-4-yl)-9H-pyrido[3,4-b]indole,

6-Chloro-8-(4-chloro-phenyl)-9-ethyl-1-methyl-9H-pyrido[3,4-b]indole,

6-Chloro-8-(4-methoxy-phenyl)-1-methyl-9H-pyrido[3,4-b]indole,

6-Chloro-8-chroman-6-yl-1-methyl-9H-pyrido[3,4-b]indole,

6-Chloro-8-[4-(2-imidazol-1-yl-ethoxy)-phenyl]-1-methyl-9H-pyrido[3,4-b]indole,

6-Bromo-9-ethyl-1-methyl-8-(1-methyl-1H-pyrazol-4-yl)-9H-pyrido[3,4-b]indole,

4-(6-Chloro-1-methyl-9H-pyrido[3,4-b]indol-8-yl)-pyridin-2-ylamine,

6-Chloro-1-methyl-8-[4-(1-methyl-pyrrolidin-3-ylmethoxy)-phenyl]-9H-pyrido[3,4-b]indole,

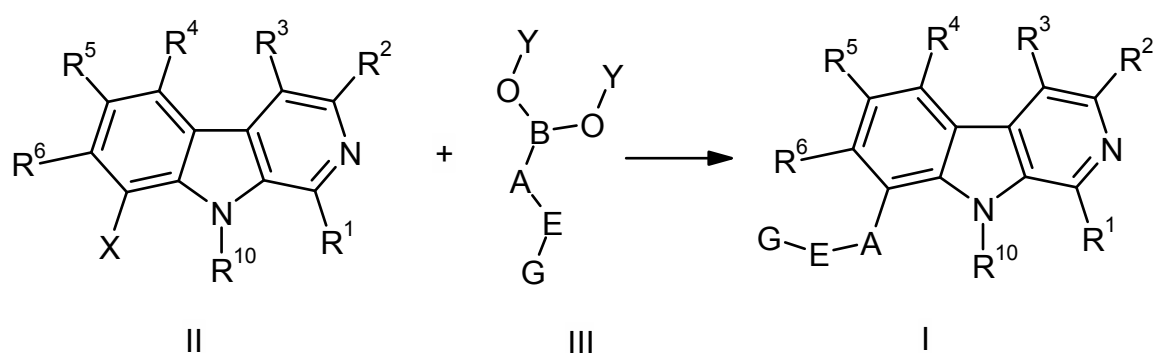
6-Chloro-9-ethyl-1-methyl-8-[4-(3-methyl-oxetan-3-ylmethoxy)-phenyl]-9H-pyrido[3,4-b]indole,

6-Bromo-9-ethyl-1-methyl-8-[4-(3-methyl-oxetan-3-ylmethoxy)-phenyl]-9H-pyrido[3,4-b]indole, and

6-Chloro-9-cyclopropylmethyl-8-(1-pyridin-3-ylmethyl-1H-pyrazol-4-yl)-9H-pyrido[3,4-b]indole,

or a pharmaceutically acceptable salt thereof.

11. A process for the preparation of a compound of the formula I according to any of claims 1 to 10,



which comprises reacting a compound of the formula II with a compound of the formula III, wherein the groups A, E, G, R¹ to R⁶ and R¹⁰ in the compounds of the formulae II and III are defined as in the compound of the formula I, or functional groups are present in protected form or in the form of a precursor group, the group X in the compound of the formula II is leaving group, and the groups Y in the compounds of the formula III are hydrogen or (C₁-C₄)-alkyl or the two groups Y, together with the -O-B-O- moiety to which they are bonded, form a saturated 5-membered or 6-membered ring, which comprises 2 or 3 carbon atoms as ring atoms in addition to the -O-B-O- moiety and is unsubstituted or substituted by one or more (C₁-C₄)-alkyl substituents.

12. A pharmaceutical composition, comprising a compound of the formula I or a pharmaceutically acceptable salt thereof according to any of claims 1 to 10 and a pharmaceutically acceptable carrier.

13. A compound of the formula I or a pharmaceutically acceptable salt thereof according to any of claims 1 to 10, for use as a pharmaceutical.

14. A compound of the formula I or a pharmaceutically acceptable salt thereof, according to any of claims 1 to 10, for use as a stimulator of chondrogenesis or cartilage formation or as an inducer of SOX transcription factors or for the treatment of degenerative joint disorders, degenerative cartilage changes, fibrosis, inflammatory processes or pain.

15. Use of a compound of the formula I or a pharmaceutically acceptable salt thereof according to any of claims 1 to 10, for the manufacture of a medicament for stimulating chondrogenesis or cartilage formation or for the treatment of degenerative joint disorders, degenerative cartilage changes, fibrosis, inflammatory processes or pain.

wherein

A is selected from the series consisting of phenyl and a monocyclic or bicyclic, 5-membered to 10-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰), O and S and is bonded via a ring carbon atom, wherein phenyl and the heterocyclic group are unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

10 E is a direct bond or a chain consisting of 1 to 5 chain members of which 0, 1 or 2 chain members are identical or different hetero chain members selected from the series consisting of N(R²⁵), O and S(O)_m, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

15 G is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl, cyano and R³⁰;

R¹, R³, R⁴ and R⁶ are independently of each other selected from the series consisting of hydrogen, halogen and (C₁-C₄)-alkyl;

20 R² is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl and (C₁-C₄)-alkyl-O-C(O)-;

25 R⁵ is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O-, cyano, R⁷-O-C(O)- and R⁸-N(R⁹)-C(O)-;

R⁷, R⁸, R⁹, R²⁰, R²², R²⁵, R³¹, R³³, R³⁴ and R⁴⁰ are independently of each other selected from the series consisting of hydrogen and (C₁-C₄)-alkyl;

30 R¹⁰ is selected from the series consisting of hydrogen, (C₁-C₆)-alkyl, (C₂-C₆)-alkenyl, (C₂-C₆)-alkynyl and (C₃-C₇)-cycloalkyl, wherein alkyl is unsubstituted or substituted by 1 or 2 identical or different substituents selected from the series consisting of (C₃-C₇)-

in another embodiment they are N, and in another embodiment they are S. In the case of the group A, the hetero ring member N denotes a ring nitrogen atom which is bonded to the adjacent ring atoms in A via a single bond and a double bond and via which the ring A cannot be bonded to another moiety in the molecule, as well as a

5 ring nitrogen atom which is bonded to the adjacent ring atoms in A via two single bonds and which has a free valence via which the ring A can be bonded to the moiety G-E-. Examples of heterocycles, from which an aromatic heterocyclic group representing A can be derived and from any one or more of which an aromatic heterocyclic group representing A is selected in one embodiment of the invention, are

10 furan, thiophene, pyrrole, isoxazole, oxazole, isothiazole, thiazole, pyrazole, imidazole, pyridine, pyridazine, pyrimidine, pyrazine, benzofuran, benzothiophene, 1H-indole, benzoxazole, benzthiazole, 1H-benzimidazole, 1H-indazole, 1H-pyrrolo[2,3-b]pyridine, pyrazolo[1,5-a]pyridine, quinoline, isoquinoline, cinnoline, quinazoline, quinoxaline, which can all be unsubstituted or substituted on ring carbon

15 atoms by one or more identical or different substituents R^{21} . In another embodiment, an aromatic heterocyclic group representing A is derived from an aromatic heterocyclic group selected from the series consisting of thiophene, thiazole, pyrazole, imidazole, pyridine and pyrimidine, in another embodiment from the series consisting of thiophene, thiazole, pyrazole and pyridine, in another embodiment from

20 the series consisting of thiophene, thiazole and pyridine, in another embodiment from the series consisting of thiophene, thiazole and pyrazole, in another embodiment from the series consisting of thiophene and pyridine, in another embodiment from the series consisting of thiazole and pyridine, in another embodiment from the series consisting of pyrazole and pyridine, in another from the series consisting of thiazole

25 and pyrazole, in another embodiment an aromatic heterocyclic group representing A is derived from thiophene, in another embodiment from thiazole, in another embodiment from pyrazole, in another embodiment from pyridine, in another embodiment from pyrimidine, which can all be unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{21} . In one

30 embodiment A is an aromatic heterocyclic group, which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{21} , in another embodiment A is phenyl, which is unsubstituted or substituted by one

or more identical or different substituents R^{21} . Also a group A that is unsubstituted, i.e. that does not carry any substituents R^{21} , of course carries the group G-E- depicted in formula I, in which G and E can have all their meanings. As specified in the general definition of the group A, the divalent group A is bonded to the 9H-

pyrido[3,4-b]indole ring depicted in formula I via a ring carbon atom. The group E, and the group G in case the group E is a direct bond, can be bonded to a ring carbon atom in the group A or to a ring nitrogen atom, i.e. to a hetero ring member N, in the group A.

If the divalent group E is a direct bond, the group G is linked to the group A via a single bond. If the group E is a chain, it consists of 1, 2, 3, 4 or 5 chain members which are defined as specified in the definition of E, to the terminal chain members of which, or to the sole chain member of which in case the chain consists of 1 chain member only, the groups G and A are bonded. In one embodiment of the invention the divalent group E is a direct bond. In another embodiment, the divalent group E is a chain consisting of 1, 2, 3, 4 or 5 chain members which are defined as specified in the definition of E. In one embodiment, the number of chain members in a chain E is 1, 2, 3 or 4, in another embodiment 2, 3, 4 or 5, in another embodiment 1, 2 or 3, in another embodiment 2, 3 or 4, in another embodiment 2 or 3, in another embodiment 1, in another embodiment 2, in another embodiment 3, in another embodiment 4. In one embodiment, 0 (zero) or 1 chain members in a chain E are identical or different hetero chain members selected from the series consisting of $N(R^{25})$, O and $S(O)_m$, in another embodiment 1 or 2 chain members are such hetero chain members, in another embodiment 0 chain member is such a hetero chain member, in another embodiment 1 chain member is such a hetero chain member, and in another embodiment 2 chain members are such heterochain members. If 2 hetero chain members are present in a chain E, in one embodiment they are not present in adjacent positions of the chain, i. e., in this embodiment they are separated by at least 1 chain member $C(R^{26})(R^{27})$, in another embodiment they are not present in adjacent positions of the chain unless one of them is the group $S(O)_m$ in which m is 1 or 2, and in another embodiment they are separated by 2 or 3, in another embodiment by 2, in another embodiment by 3, chain members $C(R^{26})(R^{27})$. In one

embodiment it is 1, 2 or 3, in another embodiment it is 1 or 2, in another embodiment it is 1. In one embodiment Het is unsubstituted. In one embodiment, substituents on ring carbon atoms in Het are (C₁-C₄)-alkyl group, in another embodiment (C₁-C₃)-alkyl groups, in another embodiment (C₁-C₂)-alkyl groups, in another embodiment C₁-alkyl groups.

In one embodiment of the invention the number m, which is an integer, is in any of its occurrences, independently of any other occurrence, selected from the numbers 0 and 2, in another embodiment 1 and 2, in another embodiment it is 0, in another embodiment it is 1 and in another embodiment it is 2.

A subject of the invention are all compounds of the formula I wherein any one or more structural elements such as groups, residues, substituents and numbers are defined as in any of the specified embodiments or definitions of the elements, or have one or more of the specific meanings which are mentioned herein as examples of elements, wherein all combinations of one or more definitions of compounds or elements and/or specified embodiments and/or specific meanings of elements are a subject of the present invention. Also with respect to all such compounds of the formula I, all their stereoisomeric forms and mixtures of stereoisomeric forms in any ratio, and their pharmaceutically acceptable salts are a subject of the present invention.

As an example of compounds of the invention, which with respect to any structural elements are defined as in specified embodiments of the invention or definitions of such elements, compounds of the formula I may be mentioned, wherein

A is phenyl, which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a direct bond;

G is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl and cyano;

and all other groups and numbers are defined as in the general definition of the compounds of the formula I or in any specified embodiments of the invention or definitions of structural elements, and the pharmaceutically acceptable salts thereof.

- 5 As another such example compounds of the formula I may be mentioned, wherein
 A is phenyl, which is unsubstituted or substituted on ring carbon atoms by one or
 more identical or different substituents R^{21} ;
 E is a direct bond;
 G is R^{30} ;
 10 and all other groups and numbers are defined as in the general definition of the
 compounds of the formula I or in any specified embodiments of the invention or
 definitions of structural elements, and the pharmaceutically acceptable salts thereof.

- As another such example compounds of the formula I may be mentioned, wherein
 15 A is phenyl, which is unsubstituted or substituted on ring carbon atoms by one or
 more identical or different substituents R^{21} ;
 E is a chain consisting of 1 to 5 chain members of which 0, 1 or 2 chain members are
 identical or different hetero chain members selected from the series consisting of
 $N(R^{25})$, O and $S(O)_m$, and the other chain members are identical or different groups
 20 $C(R^{26})(R^{27})$;
 G is selected from the series consisting of hydrogen, halogen, (C_1-C_4) -alkyl and
 cyano;
 and all other groups and numbers are defined as in the general definition of the
 compounds of the formula I or in any specified embodiments of the invention or
 25 definitions of structural elements, and the pharmaceutically acceptable salts thereof.

- As another such example compounds of the formula I may be mentioned, wherein;
 A is phenyl, which is unsubstituted or substituted on ring carbon atoms by one or
 more identical or different substituents R^{21} ;
 30 E is a chain consisting of 1 to 5 chain members of which 0, 1 or 2 chain members are
 identical or different hetero chain members selected from the series consisting of

$N(R^{25})$, O and $S(O)_m$, and the other chain members are identical or different groups $C(R^{26})(R^{27})$;

G is R^{30} ;

and all other groups and numbers are defined as in the general definition of the

- 5 compounds of the formula I or in any specified embodiments of the invention or definitions of structural elements, and the pharmaceutically acceptable salts thereof.

As another such example compounds of the formula I may be mentioned, wherein

- 10 A is a monocyclic or bicyclic, 5-membered to 10-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, $N(R^{20})$, O and S and is bonded via a ring carbon atom, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{21} ;

E is a direct bond;

- 15 G is selected from the series consisting of hydrogen, halogen, (C_1-C_4) -alkyl and cyano;

and all other groups and numbers are defined as in the general definition of the compounds of the formula I or in any specified embodiments of the invention or definitions of structural elements, and the pharmaceutically acceptable salts thereof.

20

As another such example compounds of the formula I may be mentioned, wherein

- A is a monocyclic or bicyclic, 5-membered to 10-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, $N(R^{20})$, O and S and is bonded via a ring carbon atom, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R^{21} ;

E is a direct bond;

G is R^{30} ;

and all other groups and numbers are defined as in the general definition of the

- 30 compounds of the formula I or in any specified embodiments of the invention or definitions of structural elements, and the pharmaceutically acceptable salts thereof.

As another such example compounds of the formula I may be mentioned, wherein A is a monocyclic or bicyclic, 5-membered to 10-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰), O and S and is bonded via a ring carbon atom, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a chain consisting of 1 to 5 chain members of which 0, 1 or 2 chain members are identical or different hetero chain members selected from the series consisting of N(R²⁵), O and S(O)_m, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

G is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl and cyano;

and all other groups and numbers are defined as in the general definition of the compounds of the formula I or in any specified embodiments of the invention or

definitions of structural elements, and the pharmaceutically acceptable salts thereof.

As another such example compounds of the formula I may be mentioned, wherein;

A is a monocyclic or bicyclic, 5-membered to 10-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰), O and S and is bonded via a ring carbon atom, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a chain consisting of 1 to 5 chain members of which 0, 1 or 2 chain members are identical or different hetero chain members selected from the series consisting of N(R²⁵), O and S(O)_m, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

G is R³⁰;

and all other groups and numbers are defined as in the general definition of the compounds of the formula I or in any specified embodiments of the invention or

definitions of structural elements, and the pharmaceutically acceptable salts thereof.

As another such example, compounds of the formula I may be mentioned, wherein

A is selected from the series consisting of phenyl and a monocyclic, 5-membered or 6-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰), O and S and is bonded via a ring carbon atom, wherein phenyl and the heterocyclic group are unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a direct bond or a chain consisting of 1 to 4 chain members of which 0, 1 or 2 chain members are identical or different hetero chain members selected from the series consisting of N(R²⁵), O and S(O)_m, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

G is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl and R³⁰;

R¹, R³, R⁴ and R⁶ are independently of each other selected from the series consisting of hydrogen, halogen and (C₁-C₃)-alkyl;

R² is selected from the series consisting of hydrogen, halogen and (C₁-C₃)-alkyl;

R⁵ is selected from the series consisting of hydrogen, halogen, (C₁-C₄)-alkyl, (C₁-C₄)-alkyl-O- and cyano;

R¹⁰ is selected from the series consisting of hydrogen, (C₁-C₆)-alkyl and (C₃-C₇)-cycloalkyl, wherein alkyl is unsubstituted or substituted by 1 substituent selected from the series consisting of (C₃-C₇)-cycloalkyl, Het, cyano and (C₁-C₄)-alkyl-O-, and wherein all cycloalkyl groups are unsubstituted or substituted by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₄)-alkyl;

R²⁰, R²², R²⁵, R³¹ and R⁴⁰ are independently of each other selected from the series consisting of hydrogen and (C₁-C₄)-alkyl;

Het is a monocyclic, 4-membered to 6-membered, saturated heterocyclic group, which comprises 1 hetero ring member selected from the series consisting of N(R⁴⁰) and O, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents selected from the series consisting of fluorine and (C₁-C₃)-alkyl;

m is selected from the series consisting of 0, 1 and 2, wherein all numbers m are independent of each other and can be identical or different;

wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents;

and the pharmaceutically acceptable salts thereof.

As another such example, compounds of the formula I may be mentioned, wherein

A is selected from the series consisting of phenyl and a monocyclic, 5-membered or 6-membered, aromatic heterocyclic group, which comprises 1 or 2 identical or different hetero ring members selected from the series consisting of N, N(R²⁰) and S and is bonded via a ring carbon atom, wherein phenyl and the heterocyclic group are unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

E is a direct bond or a chain consisting of 1 to 4 chain members of which 0 or 1 chain members are identical or different hetero chain members selected from the series consisting of N(R²⁵) and O, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

G is selected from the series consisting of hydrogen and R³⁰;

R¹ and R⁴ are independently of each other selected from the series consisting of hydrogen, halogen and (C₁-C₂)-alkyl;

Het is a monocyclic, 4-membered or 5-membered, saturated heterocyclic group, which comprises 1 hetero ring member which is O, and which is unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents (C₁-C₃)-alkyl;

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wherein all alkyl groups, independently of any other substituents which can be present on an alkyl group, can be substituted by one or more fluorine substituents;

and the pharmaceutically acceptable salts thereof.

10

As another such example, compounds of the formula I may be mentioned, wherein

A is selected from the series consisting of phenyl and the aromatic heterocyclic groups pyrazolyl and pyridinyl, wherein phenyl and the heterocyclic groups are unsubstituted or substituted on ring carbon atoms by one or more identical or different substituents R²¹;

15

E is a direct bond or a chain consisting of 1 to 3 chain members of which 0 or 1 chain member is a hetero chain member which is O, and the other chain members are identical or different groups C(R²⁶)(R²⁷);

20

G is selected from the series consisting of hydrogen and R³⁰;

R¹ and R⁴ are independently of each other selected from the series consisting of hydrogen, halogen and C₁-alkyl;

25

R² is selected from the series consisting of hydrogen, halogen and C₁-alkyl;

R³ and R⁶ are hydrogen;

30

R⁵ is selected from the series consisting of halogen and (C₁-C₂)-alkyl;