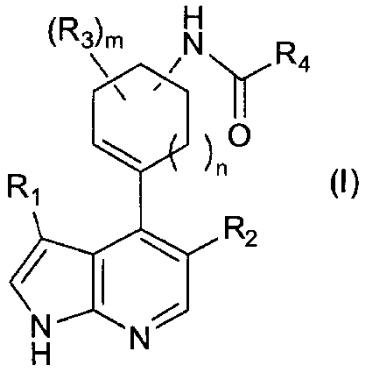
Claims

[Claim 1]

A compound of the following formula (I), or a salt thereof:



(I)

wherein

R_1 represents an optionally substituted C_4-C_{10} cycloalkyl group, an optionally substituted C_4-C_{10} cycloalkenyl group, an optionally substituted C_4-C_{10} cycloalkynyl group, an optionally substituted C_6-C_{14} aromatic hydrocarbon group, or an optionally substituted 4- to 10-membered saturated or unsaturated heterocyclic group;

R_2 represents a hydrogen atom, a halogen atom, a hydroxy group, a cyano group, a nitro group, $-C(=O)R_x$, $-C(=O)OR_x$, $-C(=O)N(R_x)(R_y)$, $-N(R_x)(R_y)$, $-NR_xC(=O)R_y$, $-NR_xS(=O)_2R_y$, $-NR_xC(=O)OR_y$, $-NR_xC(=O)N(R_y)(R_z)$, $-NR_xS(=O)_2N(R_y)(R_z)$, $-OC(=O)R_x$, $-OC(=O)OR_x$, $-OC(=O)N(R_x)(R_y)$, $-SR_x$, $-S(=O)_2R_x$, $-S(=O)_2OR_x$, an optionally R_b-substituted C_1-C_6 alkyl group, an optionally R_b-substituted C_2-C_6 alkenyl group, an optionally R_b-substituted C_2-C_6 alkynyl group, an optionally R_b-substituted C_1-C_6 alkoxy group, an optionally R_c-substituted C_3-C_{10} cycloalkyl group, an optionally R_c-substituted C_6-C_{14} aromatic hydrocarbon group, or an optionally R_c-substituted 4- to 10-membered saturated or unsaturated heterocyclic group;

R_3 represents a halogen atom, an amino group, a hydroxy group, a cyano group, a nitro group, a C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, or a C_1-C_6 alkoxy group;

R_4 represents an optionally R_b-substituted C_2-C_6 alkenyl group or an optionally R_b-substituted C_2-C_6 alkynyl group;

R_b represents a halogen atom, an amino group, a hydroxy group, a cyano group, a nitro group, a C_1-C_6 alkoxy group, a di- or mono-(C_1-C_6 alkyl)amino group, or a 4- to 10-membered saturated or unsaturated heterocyclic group;

R_c represents a halogen atom, an amino group, a hydroxy group, a cyano group, a nitro group, an oxo group, an imino group, an N-oxide group, a C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a C_1-C_6 alkoxy group, or a di- or mono-(C_1-C_6 alkyl)amino group;

R_x, R_y and R_z, which are the same or different, each represent a hydrogen atom, a C_1-C_6 alkyl group, a C_1-C_6 haloalkyl group, a C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a C_3-C_{10} cycloalkyl group, a C_6-C_{14} aromatic hydrocarbon group, or a 4- to 10-membered saturated or unsaturated heterocyclic group;

m represents an integer of 0 to 3; and

n represents an integer of 0 to 2.

[Claim 2]

The compound or a salt thereof according to claim 1, wherein R_1 is optionally substituted with R_a, and the R_a represents a halogen atom, a hydroxy group, a cyano group, a nitro group, an oxo group, an N-oxide group, $-C(=O)R_x$, $-C(=O)OR_x$, $-C(=O)N(R_x)(R_y)$, $-C(=O)SR_x$, $-C(=S)OR_x$, $-C(=O)ON(R_x)(R_y)$, $-N(R_x)(R_y)$, $-NR_xC(=O)R_y$, $-NR_xS(=O)_2R_y$, $-NR_xC(=O)OR_y$, $-NR_xC(=O)N(R_y)(R_z)$, $-NR_xS(=O)_2N(R_y)(R_z)$, $-N(R_x)$-OR_y, $=NR_x$, $=N$-OR_x, $-OC(=O)R_x$, $-OC(=S)R_x$, $-OC(=O)OR_x$, $-OC(=O)N(R_x)(R_y)$, $-OC(=S)OR_x$, $-SR_x$, $-S(=O)_2R_x$, $-S(=O)_2OR_x$, $-S(=O)_2N(R_x)(R_y)$, an optionally R_b-substituted C_1-C_6 alkyl group, an optionally R_b-substituted C_2-C_6 alkenyl group, an optionally R_b-substituted C_2-C_6 alkynyl group, an optionally R_b-substituted C_1-C_6 alkoxy group, an optionally R_c-substituted C_3-C_{10} cycloalkyl group, an optionally R_c-substituted C_6-C_{14} aromatic hydrocarbon group, or an optionally R_c-substituted 4- to 10-membered saturated or unsaturated heterocyclic group.

[Claim 3]

The compound or a salt thereof according to claim 1 or 2, wherein R_1 represents an optionally R_a-substituted C_5-C_7 cycloalkenyl group, an optionally R_a-substituted C_6-C_{10} aromatic hydrocarbon group, or an optionally R_a-substituted monocyclic 4- to 7-membered unsaturated heterocyclic group having 1 to 3 heteroatoms selected from the group consisting of N, S and O.

[Claim 4]

The compound or a salt thereof according to any one of claims 1 to 3, wherein R_1 represents an optionally R_a-substituted cyclopentenyl group, cyclohexenyl group, phenyl group, furanyl group, 1H-pyrazolyl group, thiazolyl group, oxazolyl group, isoxazolyl group, 1,3,4-thiadiazolyl group, 1,2,4-oxadiazolyl group, 1,3,4-oxadiazolyl group, pyridyl group, dihydropyranyl group, dihydrofuranyl group, or 4,5-dihydro-1,3,4-oxadiazolyl group.

[Claim 5]

The compound or a salt thereof according to any one of claims 1 to 4, wherein R_1 represents a cyclopentenyl group, a cyclohexenyl group, a phenyl group, a furanyl group, a 1H-pyrazolyl group, a thiazolyl group, an oxazolyl group, an isoxazolyl group, a 1,3,4-thiadiazolyl group, a 1,2,4-oxadiazolyl group, a 1,3,4-oxadiazolyl group, a pyridyl group, a dihydropyranyl group, a dihydrofuranyl group, or a 4,5-dihydro-1,3,4-oxadiazolyl group, which is optionally substituted with a group selected from the group consisting of a halogen atom, an amino group, a hydroxy group, an oxo group, an N-oxide group, a formyl group, a C_1-C_6 alkyl group which is optionally substituted with a group selected from the group consisting of a hydroxy group and a di- or mono-(C_1-C_6 alkyl)amino group, a C_1-C_6 alkoxy group which is optionally

substituted with a halogen atom, and a 4- to 10-membered saturated heterocyclic group.

[Claim 6]

The compound or a salt thereof according to any one of claims 1 to 5, wherein R_1 represents a cyclopentenyl group; a cyclohexenyl group; a phenyl group; a furanyl group, which is optionally substituted with a group selected from the group consisting of a formyl group and a C_1-C_6 alkyl group which is optionally substituted with a group selected from the group consisting of a hydroxy group and a di- or mono-(C_1-C_6 alkyl)amino group; a 1H-pyrazolyl group, which is optionally substituted with a group selected from the group consisting of a C_1-C_6 alkyl group and a 4- to 10-membered saturated heterocyclic group; a thiazolyl group; an oxazolyl group; an isoxazolyl group; a 1,3,4-thiadiazolyl group; a 1,2,4-oxadiazolyl group; a 1,3,4-oxadiazolyl group, which is optionally substituted with a C_1-C_6 alkyl group; a pyridyl group, which is optionally substituted with a group selected from the group consisting of a halogen atom, an amino group, a hydroxy group, an N-oxide group, a C_1-C_6 alkyl group which is optionally substituted with a hydroxy group, and a C_1-C_6 alkoxy group which is optionally substituted with a halogen atom; a dihydropyranyl group; a dihydrofuranyl group; or a 4,5-dihydro-1,3,4-oxadiazolyl group, which is optionally substituted with a group selected from the group consisting of an oxo group and a C_1-C_6 alkyl group.

[Claim 7]

The compound or a salt thereof according to any one of claims 1 to 6, wherein R_2 represents a hydrogen atom, a cyano group, -C(=O)OR_x, -C(=O)N(R_x)(R_y), an optionally R_b-substituted C_1-C_6 alkyl group, an optionally R_b-substituted C_1-C_6 alkoxy group, or an optionally R_c-substituted monocyclic 4- to 7-membered unsaturated heterocyclic group having 1 to 3 heteroatoms selected from the group consisting of N, S and O.

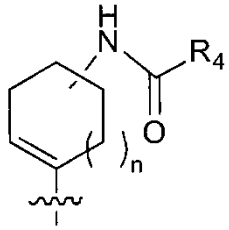
[Claim 8]

The compound or a salt thereof according to any one of claims 1 to 7, wherein R_2 represents a hydrogen atom; a cyano group; a (C_1-C_6 alkoxy)carbonyl group; a carbamoyl group; a di- or mono-(C_1-C_6 alkyl)carbamoyl group; a C_1-C_6 alkyl group, which is optionally substituted with a group selected from the group consisting of a hydroxy group, a C_1-C_6 alkoxy group, a di- or mono-(C_1-C_6 alkyl)amino group, and a 4- to 10-membered saturated heterocyclic group; a C_1-C_6 alkoxy group; or a monocyclic 5- or 6-membered completely unsaturated heterocyclic group having 1 to 3 N atoms, which is optionally substituted with a C_1-C_6 alkyl group.

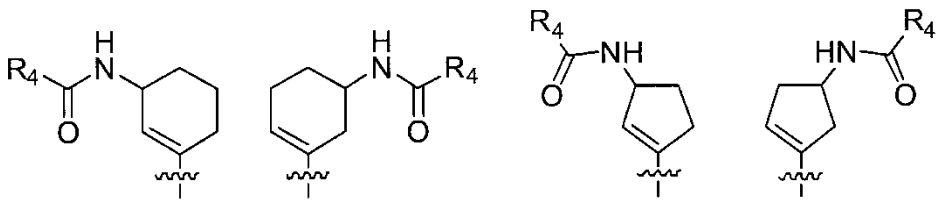
[Claim 9]

The compound or a salt thereof according to any one of claims 1 to 8, wherein m represents 0, n represents 0 or 1, R_4 represents a C_2-C_6 alkenyl group, and

in the formula (I), the following structure:



is any one of the following structures:



[Claim 10]

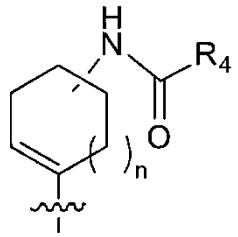
The compound according to any one of claims 1 to 9, or a salt thereof, wherein

R_1 represents a cyclopentenyl group; a cyclohexenyl group; a phenyl group; a furanyl group, which is optionally substituted with a group selected from the group consisting of a formyl group and a C_1-C_6 alkyl group which is optionally substituted with a group selected from the group consisting of a hydroxy group and a di- or mono-(C_1-C_6 alkyl)amino group; a 1H-pyrazolyl group, which is optionally substituted with a group selected from the group consisting of a C_1-C_6 alkyl group and a 4- to 10-membered saturated heterocyclic group; a thiazolyl group; an oxazolyl group; an isoxazolyl group; a 1,3,4-thiadiazolyl group; a 1,2,4-oxadiazolyl group; a 1,3,4-oxadiazolyl group, which is optionally substituted with a C_1-C_6 alkyl group; a pyridyl group, which is optionally substituted with a group selected from the group consisting of a halogen atom, an amino group, a hydroxy group, an N-oxide group, a C_1-C_6 alkyl group which is optionally substituted with a hydroxy group, and a C_1-C_6 alkoxy group which is optionally substituted with a halogen atom; a dihydropyranyl group; a dihydrofuranyl group; or a 4,5-dihydro-1,3,4-oxadiazolyl group, which is optionally substituted with a group selected from the group consisting of an oxo group and a C_1-C_6 alkyl group,

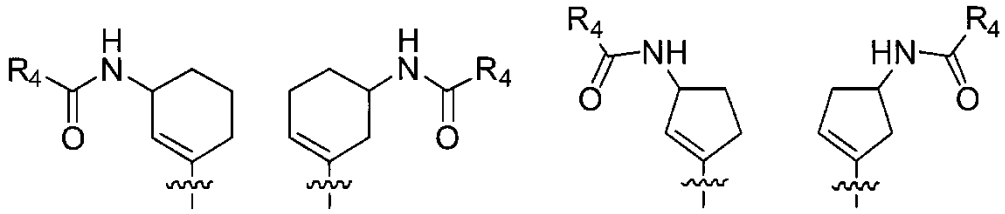
R_2 represents a hydrogen atom; a cyano group; a (C_1-C_6 alkoxy)carbonyl group; a carbamoyl group; a di- or mono-(C_1-C_6 alkyl)carbamoyl group; a C_1-C_6 alkyl group, which is optionally substituted with a group selected from the group consisting of a hydroxy group, a C_1-C_6 alkoxy group, a di- or mono-(C_1-C_6 alkyl)amino group, and a 4- to 10-membered saturated heterocyclic group; a C_1-C_6 alkoxy group; or a monocyclic 5- or 6-membered completely unsaturated heterocyclic group having 1 to 3 N atoms, which is optionally substituted with a C_1-C_6 alkyl group,

m represents 0, n represents 0 or 1, R_4 represents a C_2-C_6 alkenyl group, and

in the formula (I), the following structure:



is any one of the following structures:



[Claim 11]

The compound or a salt thereof according to any one of claims 1 to 10, wherein the compound is any of compounds represented by the following (1) to (11):

(1)

N-(3-(3-phenyl-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide,

(2)

N-(3-(3-(1H-pyrazol-4-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide,

(3)

N-(3-(3-(2-methoxypyridin-3-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide,

(4)

N-(3-(3-(furan-2-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide,

(5)

N-(3-(3-(4-(hydroxymethyl)furan-2-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide,

(6)

N-(3-(3-(2,5-dihydrofuran-3-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide,

(7)
N-(3-(3-(oxazol-5-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide,
(8)
N-(3-(3-(1,3,4-oxadiazol-2-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide,
(9)
(S)-N-(3-(3-(1,3,4-oxadiazol-2-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide,
(10)
N-(3-(3-(1,3,4-oxadiazol-2-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclopent-3-en-1-yl)acrylamide, and
(11)
(S)-N-(3-(3-(isoxazol-5-yl)-1H-pyrrolo[2,3-b]pyridin-4-yl)cyclohex-3-en-1-yl)acrylamide.

[Claim 12]
A JAK3 inhibitor comprising, as an active ingredient, the compound or a salt thereof according to any one of claims 1 to 11.

[Claim 13]
A pharmaceutical composition comprising the compound or a salt thereof according to any one of claims 1 to 11.

[Claim 14]

The pharmaceutical composition according to claim 13, wherein the pharmaceutical composition is a pharmaceutical composition for treating a disease involving JAK3, wherein the disease is auto autoimmune disease, allergic disease, nervous system disease, inflammatory bowel disease, psoriasis, contact dermatitis, diabetes, celiac disease, viral infectious disease, acute respiratory distress syndrome, graft-versus-host disease, transplant rejection or hematologic malignancy.

[Claim 15]

The compound or a salt thereof according to any one of claims 1 to 11 for use in the prevention and/or treatment of rheumatoid arthritis or multiple sclerosis.

[Claim 16]

The use of the compound or a salt thereof according to any one of claims 1 to 11 in the manufacture of a medicament for the treatment of a disease involving JAK3, wherein the disease is auto autoimmune disease, allergic disease, nervous system disease, inflammatory bowel disease, psoriasis, contact dermatitis, diabetes, celiac disease, viral infectious disease, acute respiratory distress syndrome, graft-versus-host disease, transplant rejection or hematologic malignancy.

[Claim 17]

The use of the compound or a salt thereof according to any one of claims 1 to 11 in the manufacture of a medicament for the prevention and/or treatment of rheumatoid arthritis or multiple sclerosis.