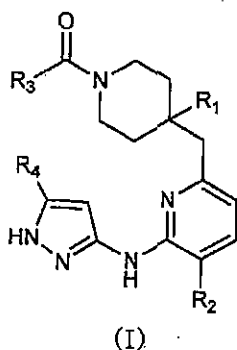


Claims

1. A piperidine compound represented by a general formula (I) or a salt thereof:



wherein, R_1 represents a carboxyl group, $-C(=O)NR_5R_6$, or an oxadiazolyl group optionally having a C_1 - C_6 alkyl group or a trifluoromethyl group as a substituent;

R_2 represents a halogen atom or a C_1 - C_6 alkoxy group;

R_3 represents a phenyl group optionally having 1 to 3 same or different group(s) selected from a halogen atom, a C_1 - C_6 alkyl group, a C_1 - C_6 alkoxy group, and a trifluoromethyl group as a substituent;

R_4 represents a hydrogen atom or a C_1 - C_6 alkyl group;

R_5 and R_6 are the same or different and each represent a hydrogen atom, a C_1 - C_6 alkyl group, or a C_3 - C_6 cycloalkyl group, or R_5 and R_6 optionally form a 3 to 6-membered nitrogen-containing saturated heterocyclic group together with a nitrogen atom to which R_5 and R_6 are bound.

2. The compound or a salt thereof according to claim 1, wherein, in the general formula (I), R_1 is a carboxyl group, $-C(=O)NR_5R_6$ (wherein, R_5 and R_6 are the same or different and each represent a hydrogen atom, a C_1 - C_6 alkyl group, or a C_3 - C_6 cycloalkyl group, or R_5 and R_6 optionally form an azetidiny group, a pyrrolidinyl group, or an isoxazolidinyl group

together with a nitrogen atom to which R_5 and R_6 are bound), or an oxadiazolyl group optionally having a C_1 - C_6 alkyl group or a trifluoromethyl group as a substituent.

3. The compound or a salt thereof according to claim 1 or 2, wherein, in the general formula (I), R_1 is a carboxyl group, $-C(=O)NR_5R_6$ (wherein, R_5 and R_6 are the same or different and each represent a hydrogen atom, a methyl group, a cyclopropyl group, or a cyclobutyl group, or R_5 and R_6 represent an azetidiny group, a pyrrolidinyl group, or an isoxazolidinyl group together with a nitrogen atom to which R_5 and R_6 are bound), or an oxadiazolyl group optionally having a methyl group or a trifluoromethyl group as a substituent.

4. The compound or a salt thereof according to any of claims 1 to 3, wherein, in the general formula (I), R_2 is a fluorine atom, a chlorine atom, or a C_1 - C_4 alkoxy group.

5. The compound or a salt thereof according to any of claims 1 to 4, wherein, in the general formula (I), R_2 is a fluorine atom, a chlorine atom, or a methoxy group.

6. The compound or a salt thereof according to any of claims 1 to 5, wherein, in the general formula (I), R_3 is a phenyl group optionally having 1 to 2 same or different group(s) selected from a halogen atom, a C_1 - C_4 alkyl group, a C_1 - C_4 alkoxy group, and a trifluoromethyl group as a substituent.

7. The compound or a salt thereof according to any of claims 1 to 6, wherein, in the general formula (I), R_3 is a phenyl group optionally having 1 to 2 same or different group(s) selected from a fluorine atom, a

chlorine atom, a methyl group, a methoxy group, and a trifluoromethyl group as a substituent.

8. The compound or a salt thereof according to any of claims 1 to 7, wherein, in the general formula (I), R_4 is a hydrogen atom or a C_1 - C_4 alkyl group.

9. The compound or a salt thereof according to claim 1, wherein, in the general formula (I), R_1 is a carboxyl group, $-C(=O)NR_5R_6$ (wherein, R_5 and R_6 are the same or different and each represent a hydrogen atom, a C_1 - C_4 alkyl group, or a C_3 - C_6 cycloalkyl group, or R_5 and R_6 optionally form an azetidiny group, a pyrrolidinyl group, or an isoxazolidinyl group together with a nitrogen atom to which R_5 and R_6 are bound), or an oxadiazolyl group optionally having a C_1 - C_4 alkyl group or a trifluoromethyl group as a substituent; R_2 is a fluorine atom, a chlorine atom, or a C_1 - C_4 alkoxy group; R_3 is a phenyl group optionally having 1 to 2 same or different group(s) selected from a halogen atom, a C_1 - C_4 alkyl group, a C_1 - C_4 alkoxy group, and a trifluoromethyl group as a substituent; and R_4 is a hydrogen atom or a C_1 - C_4 alkyl group.

10. The compound or a salt thereof according to claim 9, wherein, in the general formula (I), R_1 is a carboxyl group, $-C(=O)NR_5R_6$ (wherein, R_5 and R_6 are the same or different and each represent a hydrogen atom, a methyl group, a cyclopropyl group, or a cyclobutyl group, or R_5 and R_6 represent an azetidiny group, a pyrrolidinyl group, or an isoxazolidinyl group together with a nitrogen atom to which R_5 and R_6 are bound), or an oxadiazolyl group optionally having a methyl group or a trifluoromethyl group as a substituent; R_2 is a fluorine atom, a chlorine atom, or a methoxy group; R_3 is a phenyl group optionally having 1 to 2 same or different group(s) selected from a fluorine atom, a chlorine atom, a

methyl group, a methoxy group, and a trifluoromethyl group as a substituent; and R₄ is a hydrogen atom or a methyl group.

11. The compound or a salt thereof according to claim 10, wherein, in the general formula (I), R₁ is a carboxyl group, -C(=O)NR₅R₆ (wherein, R₅ and R₆ are the same or different and each represent a hydrogen atom or a methyl group, or R₅ and R₆ represents an isoxazolidinyl group together with a nitrogen atom to which R₅ and R₆ are bound), or a 1,2,4-oxadiazolyl group or a 1,3,4-oxadiazolyl group optionally having a methyl group as a substituent; R₂ is a fluorine atom, a chlorine atom, or a methoxy group; R₃ is a phenyl group having 1 to 2 same or different group(s) selected from a fluorine atom, a chlorine atom, a methyl group, a methoxy group, and a trifluoromethyl group as a substituent; and R₄ is a hydrogen atom or a methyl group.

12. The compound or a salt thereof according to claim 11, wherein, in the general formula (I), R₁ is a carboxyl group or a 1,2,4-oxadiazolyl group optionally having a methyl group as a substituent; R₂ is a fluorine atom; R₃ is a phenyl group having 1 to 2 same or different group(s) selected from a fluorine atom and a chlorine atom as a substituent; and R₄ is a methyl group.

13. The compound or a salt thereof according to any of claims 1 to 8, wherein the compound is a compound selected from the following group of compounds:

1-(2,3-dichlorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;

1-(2-fluoro-3-trifluoromethylbenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;

1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;
 1-(3-chloro-2-fluorobenzoyl)-4-((5-methoxy-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;
 1-(3-chloro-2-fluorobenzoyl)-4-((5-chloro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;
 1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;
 1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-N-methylpiperidine-4-carboxamide;
 1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-N,N-dimethylpiperidine-4-carboxamide;
 azetidin-1-yl(1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidin-4-yl)methanone;
 (1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidin-4-yl)(isoxazolidin-2-yl)methanone;
 (3-chloro-2-fluorophenyl)(4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(5-methyl-1,2,4-oxadiazol-3-yl)piperidin-1-yl)methanone;
 (2,3-dichlorophenyl)(4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(5-methyl-1,2,4-oxadiazol-3-yl)piperidin-1-yl)methanone;
 (3-chloro-2-fluorophenyl)(4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(1,2,4-oxadiazol-3-yl)piperidin-1-yl)methanone;
 (3-chloro-2-fluorophenyl)(4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(5-methyl-1,3,4-oxadiazol-3-yl)piperidin-1-yl)methanone;

(3-chloro-2-fluorophenyl) (4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(3-methyl-1,2,4-oxadiazol-5-yl)piperidin-1-yl)methanone

14. An aurora A-selective inhibitor comprising the compound or a salt thereof according to any one of claims 1 to 13 as an active ingredient.

15. A pharmaceutical composition comprising the compound or a salt thereof according to any one of claims 1 to 13 and a pharmaceutical carrier.

16. An anti-tumor agent comprising the compound or a salt thereof according to any one of claims 1 to 13 as an active ingredient.

17. An agent for potentiation of anti-tumor effect of a microtubule agonist, comprising the compound or a salt thereof according to any one of claims 1 to 13 as an active ingredient.

18. Use of the compound or a salt thereof according to any one of claims 1 to 13 for the production of an anti-tumor agent.

19. Use of the compound or a salt thereof according to any one of claims 1 to 13 for the production of an agent for potentiation of anti-tumor effect of a microtubule agonist.

20. The compound or a salt thereof according to any one of claims 1 to 13 for treatment of cancer.

21. The compound or a salt thereof according to any one of claims 1 to 13 for potentiation of an anti-tumor effect of a microtubule agonist.

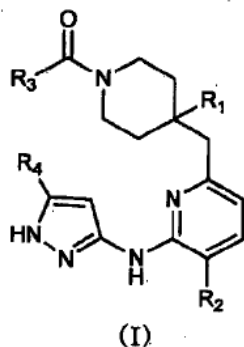
22. A method for treating cancer, comprising administering an effective dose of the compound or a salt thereof according to any one of claims 1 to 13.

23. A method for potentiating an anti-tumor effect of a microtubule agonist, comprising administering an effective dose of the compound or a salt thereof according to any one of claims 1 to 13.

24. A method for treating cancer, comprising combining an effective dose of the compound or a salt thereof according to any one of claims 1 to 13 and an effective dose of a microtubule agonist.

Claims

1. A piperidine compound represented by a general formula (I) or a salt thereof:



wherein, R_1 represents a carboxyl group, $-C(=O)NR_5R_6$, or an oxadiazolyl group optionally having a C_1 - C_6 alkyl group or a trifluoromethyl group as a substituent;

R_2 represents a halogen atom or a C_1 - C_6 alkoxy group;

R_3 represents a phenyl group optionally having 1 to 3 same or different group(s) selected from a halogen atom, a C_1 - C_6 alkyl group, a C_1 - C_6 alkoxy group, and a trifluoromethyl group as a substituent;

R_4 represents a hydrogen atom or a C_1 - C_6 alkyl group;

R_5 and R_6 are the same or different and each represent a hydrogen atom, a C_1 - C_6 alkyl group, or a C_3 - C_6 cycloalkyl group, or R_5 and R_6 optionally form a 3 to 6-membered nitrogen-containing saturated heterocyclic group together with a nitrogen atom to which R_5 and R_6 are bound.

2. The compound or a salt thereof according to claim 1, wherein, in the general formula (I), R_1 is a carboxyl group, $-C(=O)NR_5R_6$ (wherein, R_5 and R_6 are the same or different and each represent a hydrogen atom, a C_1 - C_6 alkyl group, or a C_3 - C_6 cycloalkyl group, or R_5 and R_6 optionally form an azetidiny group, a pyrrolidinyl group, or an isoxazolidinyl group together with a nitrogen atom to which R_5 and R_6 are bound),

or an oxadiazolyl group optionally having a C₁-C₆ alkyl group or a trifluoromethyl group as a substituent.

3. The compound or a salt thereof according to claim 1 or 2, wherein, in the general formula (I), R₁ is a carboxyl group, -C(=O)NR₅R₆ (wherein, R₅ and R₆ are the same or different and each represent a hydrogen atom, a methyl group, a cyclopropyl group, or a cyclobutyl group, or R₅ and R₆ represent an azetidiny group, a pyrrolidinyl group, or an isoxazolidinyl group together with a nitrogen atom to which R₅ and R₆ are bound), or an oxadiazolyl group optionally having a methyl group or a trifluoromethyl group as a substituent.

4. The compound or a salt thereof according to any of claims 1 to 3, wherein, in the general formula (I), R₂ is a fluorine atom, a chlorine atom, or a C₁-C₄ alkoxy group, preferably R₂ is a fluorine atom, a chlorine atom, or a methoxy group.

5. The compound or a salt thereof according to any of claims 1 to 4, wherein, in the general formula (I), R₃ is a phenyl group optionally having 1 to 2 same or different group(s) selected from a halogen atom, a C₁-C₄ alkyl group, a C₁-C₄ alkoxy group, and a trifluoromethyl group as a substituent.

6. The compound or a salt thereof according to any of claims 1 to 5, wherein, in the general formula (I), R₃ is a phenyl group optionally having 1 to 2 same or different group(s) selected from a fluorine atom, a chlorine atom, a methyl group, a methoxy group, and a trifluoromethyl group as a substituent.

7. The compound or a salt thereof according to any of claims 1 to 6, wherein, in the general formula (I), R₄ is a hydrogen atom or a C₁-C₄ alkyl group.

8. The compound or a salt thereof according to claim 1, wherein, in the general formula (I), R_1 is a carboxyl group, $-C(=O)NR_5R_6$ (wherein, R_5 and R_6 are the same or different and each represent a hydrogen atom, a C_1 - C_4 alkyl group, or a C_3 - C_6 cycloalkyl group, or R_5 and R_6 optionally form an azetidinyll group, a pyrrolidinyl group, or an isoxazolidinyl group together with a nitrogen atom to which R_5 and R_6 are bound), or an oxadiazolyl group optionally having a C_1 - C_4 alkyl group or a trifluoromethyl group as a substituent; R_2 is a fluorine atom, a chlorine atom, or a C_1 - C_4 alkoxy group; R_3 is a phenyl group optionally having 1 to 2 same or different group(s) selected from a halogen atom, a C_1 - C_4 alkyl group, a C_1 - C_4 alkoxy group, and a trifluoromethyl group as a substituent; and R_4 is a hydrogen atom or a C_1 - C_4 alkyl group.

9. The compound or a salt thereof according to claim 8, wherein, in the general formula (I), R_1 is a carboxyl group, $-C(=O)NR_5R_6$ (wherein, R_5 and R_6 are the same or different and each represent a hydrogen atom, a methyl group, a cyclopropyl group, or a cyclobutyl group, or R_5 and R_6 represent an azetidinyll group, a pyrrolidinyl group, or an isoxazolidinyl group together with a nitrogen atom to which R_5 and R_6 are bound), or an oxadiazolyl group optionally having a methyl group or a trifluoromethyl group as a substituent; R_2 is a fluorine atom, a chlorine atom, or a methoxy group; R_3 is a phenyl group optionally having 1 to 2 same or different group(s) selected from a fluorine atom, a chlorine atom, a methyl group, a methoxy group, and a trifluoromethyl group as a substituent; and R_4 is a hydrogen atom or a methyl group.

10. The compound or a salt thereof according to claim 9, wherein, in the general formula (I), R_1 is a carboxyl group, $-C(=O)NR_5R_6$ (wherein, R_5 and R_6 are the same or different and each represent a hydrogen atom or a methyl group, or R_5 and R_6 represents an isoxazolidinyl group together with a nitrogen atom to which R_5 and R_6 are bound), or a 1,2,4-oxadiazolyl

group or a 1,3,4-oxadiazolyl group optionally having a methyl group as a substituent; R₂ is a fluorine atom, a chlorine atom, or a methoxy group; R₃ is a phenyl group having 1 to 2 same or different group(s) selected from a fluorine atom, a chlorine atom, a methyl group, a methoxy group, and a trifluoromethyl group as a substituent; and R₄ is a hydrogen atom or a methyl group.

11. The compound or a salt thereof according to claim 10, wherein, in the general formula (I), R₁ is a carboxyl group or a 1,2,4-oxadiazolyl group optionally having a methyl group as a substituent; R₂ is a fluorine atom; R₃ is a phenyl group having 1 to 2 same or different group(s) selected from a fluorine atom and a chlorine atom as a substituent; and R₄ is a methyl group.

12. The compound or a salt thereof according to any of claims 1 to 7, wherein the compound is a compound selected from the following group of compounds:

1-(2,3-dichlorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;

1-(2-fluoro-3-trifluoromethylbenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;

1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;

1-(3-chloro-2-fluorobenzoyl)-4-((5-methoxy-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;

1-(3-chloro-2-fluorobenzoyl)-4-((5-chloro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;

1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidine-4-carboxylic acid;

1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-N-methylpiperidine-4-carboxamide;

1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-N,N-dimethylpiperidine-4-carboxamide;

azetidin-1-yl(1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidin-4-yl)methanone;

(1-(3-chloro-2-fluorobenzoyl)-4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)piperidin-4-yl)(isoxazolidin-2-yl)methanone;

(3-chloro-2-fluorophenyl)(4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(5-methyl-1,2,4-oxadiazol-3-yl)piperidin-1-yl)methanone;

(2,3-dichlorophenyl)(4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(5-methyl-1,2,4-oxadiazol-3-yl)piperidin-1-yl)methanone;

(3-chloro-2-fluorophenyl)(4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(1,2,4-oxadiazol-3-yl)piperidin-1-yl)methanone;

(3-chloro-2-fluorophenyl)(4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(5-methyl-1,3,4-oxadiazol-2-yl)piperidin-1-yl)methanone; and

(3-chloro-2-fluorophenyl)(4-((5-fluoro-6-(5-methyl-1H-pyrazol-3-ylamino)pyridin-2-yl)methyl)-4-(3-methyl-1,2,4-oxadiazol-5-yl)piperidin-1-yl)methanone.

13. A pharmaceutical composition comprising the compound or a salt thereof according to any one of claims 1 to 12 and a pharmaceutical carrier.

14. The pharmaceutical composition according to claim 13, which is an oral pharmaceutical composition.

15. An anti-tumor agent or an agent for potentiation of anti-tumor effect of a microtubule agonist, said agents comprising the compound or a salt thereof according to any one of claims 1 to 12 as an active ingredient.