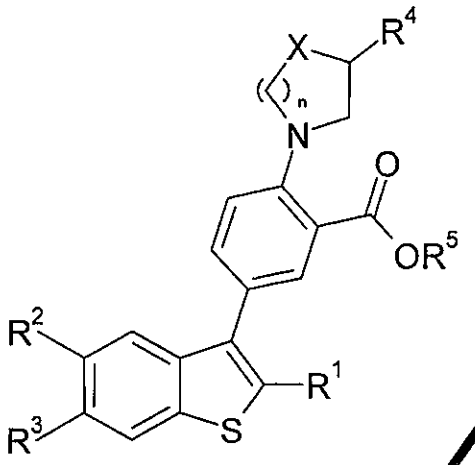
Claims

[Claim 1] A compound of the following formula (I) or a salt thereof.

[Chem. 1]



(I)

(In the formula,
X is -O-, -CH_2-, -NH-, or -N(lower alkyl)-,
n is an integer of 1 to 3,
R^1 is -H, halogen, or lower alkyl,
R^2 and R^3 are each the same as or different from each other, and are -H, halogen, lower alkyl, or halo-lower alkyl,
R^4 is -H or -Lk-NH-R^0,
Lk is lower alkylene or a bond,
R^0 is lower alkyl, -lower alkylene-OH, or cycloalkyl,
provided that in a case where R^4 is -H, X is -N(lower alkyl)-, and
R^5 is -H or lower alkyl.)

[Claim 2] The compound or a salt thereof according to claim 1, wherein R^4 is -Lk-NH-R^0.

[Claim 3] The compound or a salt thereof according to claim 2, wherein X is -O- or -CH_2-.

[Claim 4] The compound or a salt thereof according to claim 3, wherein n is 2.

[Claim 5] The compound or a salt thereof according to claim 4, wherein Lk is $-CH_2-$.

[Claim 6] The compound or a salt thereof according to claim 5, wherein R^5 is -H.

[Claim 7] The compound or a salt thereof according to claim 6, wherein R^0 is C_4 alkyl, $-C_4$ alkylene-OH, or C_{3-8} cycloalkyl.

[Claim 8] The compound or a salt thereof according to claim 1, wherein R^1 is lower alkyl, R^2 is -H, R^3 is halogen, R^4 is -Lk-NH-R^0, Lk is $-CH_2-$, R^0 is C_{3-8} cycloalkyl, R^5 is -H, X is -O-, and n is 2.

[Claim 9] The compound or a salt thereof according to claim 1, wherein R^1 is lower alkyl, R^2 is halogen, R^3 is halogen, R^4 is -Lk-NH-R^0, Lk is $-CH_2-$, R^0 is C_{3-8} cycloalkyl, R^5 is -H, X is -O-, and n is 2.

[Claim 10] The compound or a salt thereof according to claim 7, which is selected from the following group consisting of:

5-(6-chloro-2-methyl-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid,

5-(6-chloro-2-fluoro-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid,

2-{(3R)-3-[(tert-butylamino)methyl]piperidin-1-yl}-5-[6-(trifluoromethyl)-1-benzothiophen-3-yl]benzoic acid,

5-[5-chloro-6-(trifluoromethyl)-1-benzothiophen-3-yl]-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid, and

5-(6-chloro-5-fluoro-2-methyl-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid.

[Claim 11] The compound or a salt thereof according to claim 10, which is 5-(6-chloro-2-methyl-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid or a salt thereof.

[Claim 12] The compound or a salt thereof according to claim 10, which is 5-(6-chloro-5-fluoro-2-methyl-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid or a salt thereof.

[Claim 13] A pharmaceutical composition comprising the compound or a salt thereof according to claim 1 and a pharmaceutically acceptable excipient.

[Claim 14] The pharmaceutical composition according to claim 13, which is an intermediate conductance calcium-activated potassium channel activator.

[Claim 15] The pharmaceutical composition according to claim 13, which is a pharmaceutical composition for preventing or treating a disease selected from the group consisting of visceral pain, inflammatory pain, osteoarthritis pain, neuropathic pain, and fibromyalgia.

[Claim 16] Use of the compound or a salt thereof according to claim 1 for the manufacture of a pharmaceutical composition for preventing or treating a disease selected from the group consisting of visceral pain, inflammatory pain, osteoarthritis pain, neuropathic pain, and fibromyalgia.

[Claim 17] Use of the compound or a salt thereof according to claim 1 for preventing or treating a disease selected from the group consisting of visceral pain, inflammatory pain, osteoarthritis pain, neuropathic pain, and fibromyalgia.

[Claim 18] The compound or a salt thereof according to claim 1 for preventing or treating a disease selected from the group consisting of visceral pain, inflammatory pain, osteoarthritis pain, neuropathic pain, and fibromyalgia.

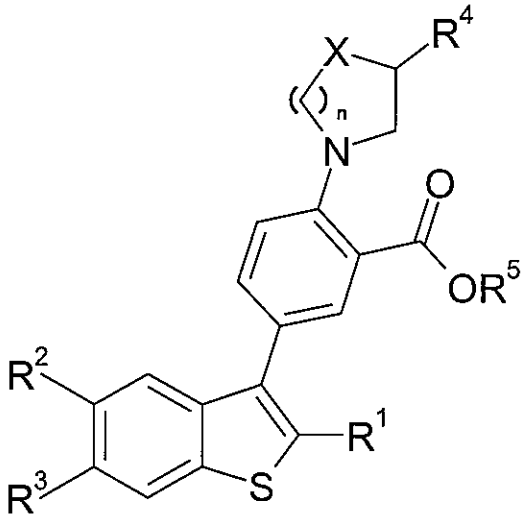
[Claim 19] A method for preventing or treating a disease selected from the group consisting of visceral pain, inflammatory pain, osteoarthritis pain, neuropathic pain, and fibromyalgia, comprising administering an effective amount of the compound or a salt thereof according to claim 1 to a subject.

[Claim 20] An agent for preventing or treating inflammatory pain, osteoarthritis pain, neuropathic pain, or fibromyalgia, comprising an intermediate conductance calcium-activated potassium channel activator as an active ingredient.

Claims

[Claim 1] A compound of the following formula (I) or a salt thereof.

[Chem. 1]



(I)

(In the formula,
X is -O-, -CH_2-, -NH-, or -N(lower alkyl)-,
n is an integer of 1 to 3,
R^1 is -H, halogen, or lower alkyl,
R^2 and R^3 are each the same as or different from each other, and are -H, halogen, lower alkyl, or halo-lower alkyl,
R^4 is -H or -Lk-NH-R^0,
Lk is lower alkylene or a bond,
R^0 is lower alkyl, -lower alkylene-OH, or cycloalkyl,
provided that in a case where R^4 is -H, X is -N(lower alkyl)-, and
R^5 is -H or lower alkyl.)

[Claim 2] The compound or a salt thereof according to claim 1, wherein R^4 is -Lk-NH-R^0.

[Claim 3] The compound or a salt thereof according to claim 2, wherein X is -O- or -CH_2-.

[Claim 4] The compound or a salt thereof according to claim 3, wherein n is 2.

[Claim 5] The compound or a salt thereof according to claim 4, wherein Lk is $-CH_2-$.

[Claim 6] The compound or a salt thereof according to claim 5, wherein R^5 is -H.

[Claim 7] The compound or a salt thereof according to claim 6, wherein R^0 is C_4 alkyl, $-C_4$ alkylene-OH, or C_{3-8} cycloalkyl.

[Claim 8] The compound or a salt thereof according to claim 1, wherein R^1 is lower alkyl, R^2 is -H, R^3 is halogen, R^4 is -Lk-NH-R^0, Lk is $-CH_2-$, R^0 is C_{3-8} cycloalkyl, R^5 is -H, X is -O-, and n is 2.

[Claim 9] The compound or a salt thereof according to claim 1, wherein R^1 is lower alkyl, R^2 is halogen, R^3 is halogen, R^4 is -Lk-NH-R^0, Lk is $-CH_2-$, R^0 is C_{3-8} cycloalkyl, R^5 is -H, X is -O-, and n is 2.

[Claim 10] The compound or a salt thereof according to claim 7, which is selected from the following group consisting of:

5-(6-chloro-2-methyl-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid,

5-(6-chloro-2-fluoro-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid,

2-{(3R)-3-[(tert-butylamino)methyl)piperidin-1-yl}-5-[6-(trifluoromethyl)-1-benzothiophen-3-yl]benzoic acid,

5-[5-chloro-6-(trifluoromethyl)-1-benzothiophen-3-yl]-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid, and

5-(6-chloro-5-(fluoro-2-methyl-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid.

[Claim 11] The compound or a salt thereof according to claim 10, which is 5-(6-chloro-2-methyl-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid or a salt thereof.

[Claim 12] The compound or a salt thereof according to claim 10, which is 5-(6-chloro-5-fluoro-2-methyl-1-benzothiophen-3-yl)-2-{(2R)-2-[(cyclobutylamino)methyl]morpholin-4-yl}benzoic acid or a salt thereof.

[Claim 13] A pharmaceutical composition comprising the compound or a salt thereof according to claim 1 and a pharmaceutically acceptable excipient.

[Claim 14] The pharmaceutical composition according to claim 13, which is an intermediate conductance calcium-activated potassium channel activator.

[Claim 15] The pharmaceutical composition according to claim 13, which is a pharmaceutical composition for use in preventing or treating a disease selected from the group consisting of visceral pain, inflammatory pain, osteoarthritis pain, neuropathic pain, and fibromyalgia.

[Claim 16] Use of the compound or a salt thereof according to claim 1 for the manufacture of a pharmaceutical composition for preventing or treating a disease selected from the group consisting of visceral pain, inflammatory pain, osteoarthritis pain, neuropathic pain, and fibromyalgia.

[Claim 17] The compound or a salt thereof according to claim 1 for use in preventing or treating a disease selected from the group consisting of visceral pain, inflammatory pain, osteoarthritis pain, neuropathic pain, and fibromyalgia.