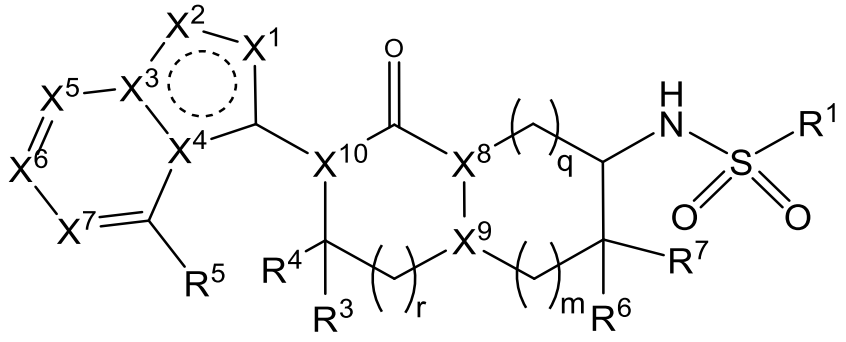
[Document] CLAIMS

[Claim 1]

A compound represented by the formula (I):



(I)

wherein

X^1 is NR^8, or CR^9;

X^2 is O, NR^{10}, or S;

X^3 and X^4 are both C, or one of X^3 and X^4 is N and the other is C;

X^5 is CR^{11} or N;

X^6 is CR^{12};

X^7 is CR^{13} or N;

X^8 is CR^{14} or N;

X^9 is CR^2 or N;

X^{10} is CR^{15} or N;

R^1 is an optionally substituted C_{1-6} alkyl group, an optionally substituted C_{3-10} cycloalkyl group, or an optionally substituted mono- or di-C_{1-6} alkylamino group;

R^2 and R^3 are each independently a hydrogen atom, or an optionally substituted C_{1-6} alkyl group, or

when r is 0, then R^2 and R^3 may be taken together each other to form a bond, or

when X^{10} is CR^{15}, then R^3 may be taken together with R^{15} to form a bond;

R^4 is a hydrogen atom, an optionally substituted C_{1-6} alkyl group, an optionally substituted C_{1-6} alkoxy group, or a hydroxy group;

R^5 is an optionally substituted 4-, 5-, or 6-membered monocyclic group;

R^6 and R^7 are each independently a hydrogen atom, a halogen atom, or an optionally substituted C_{1-6} alkyl group;
m is 0 or 1;
q is 1 or 2;
r is 0 or 1;
R^9, R^{11}, R^{12}, and R^{13} are each independently a hydrogen atom, an optionally substituted C_{1-6} alkyl group, a halogen atom, an optionally substituted C_{3-6} cycloalkyl group, an optionally substituted 3- to 7-membered nitrogen-containing heterocyclic group, an optionally substituted C_{1-6} alkoxy group, or a hydroxy group;
R^8 and R^{10} are each independently absent, or selected from a hydrogen atom and an optionally substituted C_{1-6} alkyl group; and
R^{14} is a hydrogen atom, a halogen atom, or an optionally substituted C_{1-6} alkyl group;
R^{15} is a hydrogen atom, a halogen atom, or an optionally substituted C_{1-6} alkyl group, or
R^{15} may be taken together with R^3 to form a bond;
or a salt thereof.

[Claim 2]
The compound according to claim 1, wherein m is 0; q is 1; and r is 0;
or a salt thereof.

[Claim 3]
The compound according to claim 1, wherein m is 1; q is 1; and r is 0;
or a salt thereof.

[Claim 4]
The compound according to claim 1, wherein m is 0; q is 1; and r is 1;
or a salt thereof.

[Claim 5]

The compound according to claim 1, wherein m is 0; q is 2; and r is 0;
or a salt thereof.

[Claim 6]

The compound according to claim 1, wherein
X^1 is NR^8 wherein R^8 is absent;
X^2 is O;
X^3 and X^4 are both C;
X^5 is CR^{11} or N, wherein R^{11} is a hydrogen atom;
X^6 is CR^{12} wherein R^{12} is a hydrogen atom, a C_{1-6} alkyl group, or a halogen atom; and
X^7 is CR^{13} wherein R^{13} is a hydrogen atom, or a halogen atom;
or a salt thereof.

[Claim 7]

The compound according to claim 1, wherein
X^8 is N;
X^9 is CR^2 wherein R^2 is a hydrogen atom, or when r is 0, then R^2 may be taken together with R^3 to form a bond; and
X^{10} is N;
or a salt thereof.

[Claim 8]

The compound according to claim 1, wherein
R^1 is
(1) a C_{1-6} alkyl group optionally substituted with 1 to 3 substituents independently selected from
(i) a halogen atom,
(ii) a C_{1-6} alkoxy group, and
(iii) a C_{3-6} cycloalkyl group,
(2) a C_{3-10} cycloalkyl group, or
(3) a mono- or di-C_{1-6} alkylamino group;

R^2 and R^3 are each independently a hydrogen atom, or a C_{1-6} alkyl group, or

when r is 0, then R^2 and R^3 may be taken together each other to form a bond, or

when X^{10} is CR^{15}, then R^3 is taken together with R^{15} to form a bond;

R^4 is a hydrogen atom, a C_{1-6} alkyl group, a C_{1-6} alkoxy group, or a hydroxy group;

R^5 is phenyl, pyrazolyl, furyl, thienyl, thiazolyl, pyridyl, piperidyl, or cyclobutyl, any of which is optionally substituted by one or more substituents independently selected from a C_{1-6} alkyl group, a halogen atom, a halo (C_{1-6}) alkyl group, and a C_{1-6} alkoxy group;

R^6 and R^7 are each independently a hydrogen atom, a halogen atom, or a C_{1-6} alkyl group;

X^1, X^2, X^3, X^4, X^5, X^6, and X^7 are selected to form a ring system that is one of:

(i) X^1 is NR^8 and R^8 is absent, X^2 is O; X^3 and X^4 are both C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13};

(ii) X^1 is NR^8 and R^8 is absent, X^2 is O, X^3 and X^4 are both C, X^5 is N, X^6 is CR^{12}, and X^7 is CR^{13};

(iii) X^1 is NR^8 and R^8 is absent, X^2 is O, X^3 and X^4 are both C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is N;

(iv) X^1 is NR^8 and R^8 is absent, X^2 is S, X^3 and X^4 are both C, X^5 is N, X^6 is CR^{12}, and X^7 is CR^{13};

(v) X^1 is NR^8 and R^8 is absent, X^2 is S; X^3 and X^4 are both C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13};

(vi) X^1 is NR^8 and X^2 is NR^{10}, and one of R^8 and R^{10} is absent and the other of R^8 and R^{10} is a C_{1-6} alkyl group, X^3 and X^4 are both C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13};

(vii) X^1 is CR^9, X^2 is NR^{10} and R^{10} is absent, X^3 is N, X^4 is C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13}; and

(viii) X^1 is CR^9, X^2 is NR^{10} and R^{10} is absent, X^3 is C, X^4 is N, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13};

X^8, X^9, X^{10}, m, q, and r are selected to form a ring system that is one of:

(i) X^8 is N, X^9 is CR^2, X^{10} is N, m is 0, q is 1, and r is 0;

(ii) X^8 is N, X^9 is CR^2, X^{10} is N, m is 1, q is 1, and r is 0;

(iii) X^8 is N, X^9 is CR^2, X^{10} is N, m is 0, q is 1, and r is 1;

(iv) X^8 is N, X^9 is N, X^{10} is CR^{15}, m is 0, q is 1, and r is 0;

(v) X^8 is CR^{14}, X^9 is CR^2, X^{10} is N, m is 0, q is 1, and r is 0; and

(vi) X^8 is N, X^9 is CR^2, X^{10} is N, m is 0, q is 2, and r is 0;

R^9, R^{11}, R^{12}, and R^{13} are each independently selected from a hydrogen atom, a C_{1-6} alkyl group, a halogen atom, a C_{3-6} cycloalkyl group, a C_{3-6} cycloalkyl (C_{1-6}) alkoxy group, a halo (C_{1-6}) alkyl group, a halo (C_{1-6}) alkoxy group, a C_{1-6} alkoxy (C_{1-6}) alkyl group, an azetidinyl group, a C_{1-6} alkoxy group, a hydroxy group, and a hydroxy (C_{1-6}) alkyl group; and

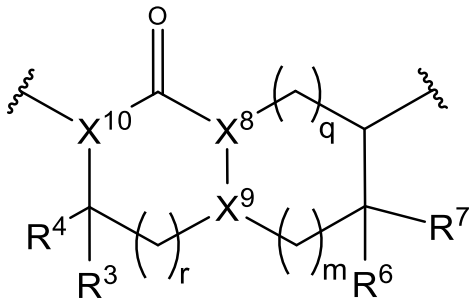
R^{14} is a hydrogen atom, a halogen atom, or a C_{1-6} alkyl group; and

R^{15} is taken together with R^3 to form a bond;

or a salt thereof.

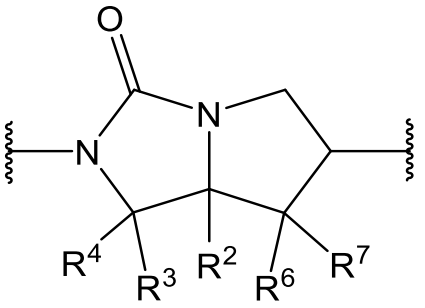
[Claim 9]

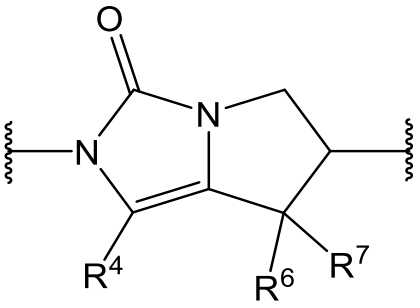
The compound according to claim 1, wherein the partial structure represented by the following formula:

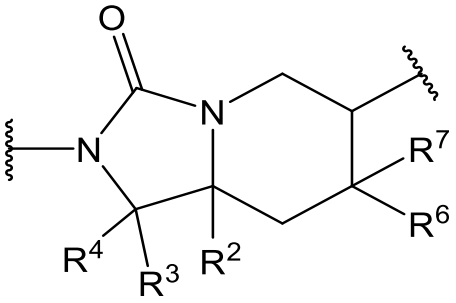


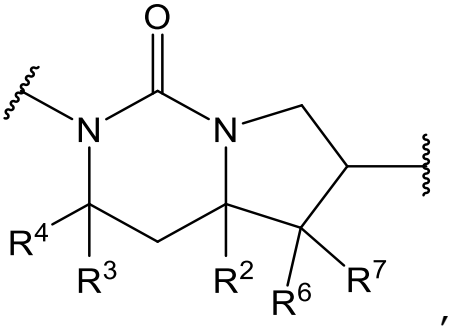
wherein each symbol is as defined in claim 1,

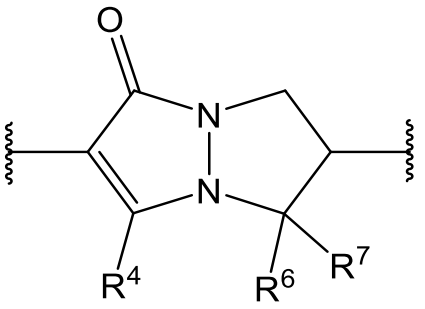
is one of partial structures represented by the following formulas:

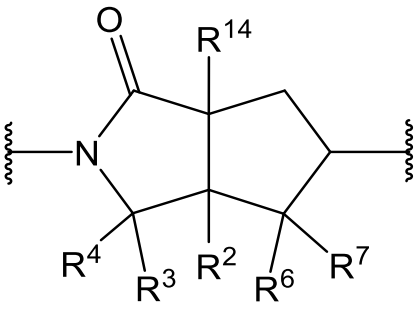


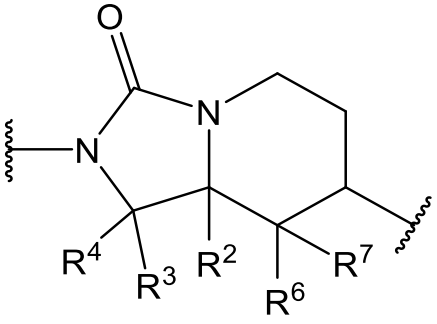
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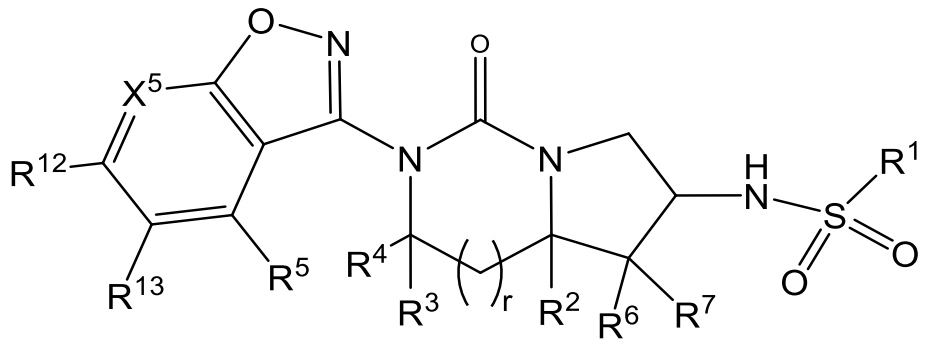
, and


,

wherein each symbol is as defined in claim 1.

[Claim 10]

The compound according to claim 1, wherein the compound is represented by the formula (Ia):



(Ia)

wherein

R^1 is a C_{1-6} alkyl group, a C_{3-10} cycloalkyl group, or a mono-C_{1-6} alkylamino group;

r is 0 or 1;

R^2 and R^3 are each independently a hydrogen atom, or

when r is 0, then R^2 and R^3 may be taken together each other to form a bond;

R^4 is a hydrogen atom;

R^5 is a phenyl group optionally substituted by 1 to 3 halogen atoms;

R^6 and R^7 are each independently a hydrogen atom, or a halogen atom;

X^5 is CH or N; and

R^{12} and R^{13} are each independently a hydrogen atom, a C_{1-6} alkyl group, or a halogen atom;

or a salt thereof.

[Claim 11]

The compound according to claim 10, wherein

R^1 is a C_{1-6} alkyl group;

r is 0 or 1;

R^2 and R^3 are each a hydrogen atom, or

when r is 0, then R^2 and R^3 may be taken together each other to form a bond;

R^4 is a hydrogen atom;

R^5 is a phenyl group substituted by 1 to 3 halogen atoms;

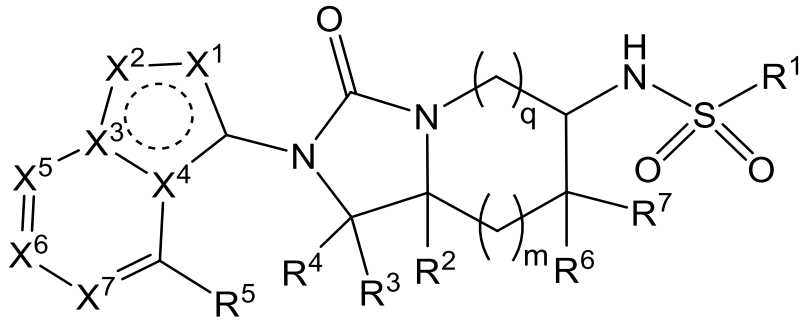
R^6 and R^7 are each a halogen atom;

X^5 is CH; and

R^{12} and R^{13} are each independently a hydrogen atom, or a halogen atom;
or a salt thereof.

[Claim 12]

The compound according to claim 1, wherein the compound is represented by the formula (Ib):



(Ib)

wherein
R^1 is an optionally substituted C_{1-6} alkyl group, an optionally substituted C_{3-10} cycloalkyl group, or an optionally substituted mono- or di-C_{1-6} alkylamino group;
R^2 and R^3 are each independently a hydrogen atom, or an optionally substituted C_{1-6} alkyl group, or
R^2 and R^3 are taken together each other to form a bond;
R^4 is a hydrogen atom, an optionally substituted C_{1-6} alkyl group, an optionally substituted C_{1-6} alkoxy group, or a hydroxy group;
R^5 is an optionally substituted 5- or 6-membered monocyclic group;
R^6 and R^7 are each independently a hydrogen atom, a halogen atom, or an optionally substituted C_{1-6} alkyl group;
m is 0 or 1;
q is 1 or 2;
X^1 is NR^8, or CR^9;
X^2 is O, NR^{10}, or S;
X^3 and X^4 are both C, or one of X^3 and X^4 is N and the other is C;
X^5 is CR^{11} or N;
X^6 is CR^{12};
X^7 is CR^{13} or N;

R^9, R^{11}, R^{12}, and R^{13} are each independently a hydrogen atom, an optionally substituted C_{1-6} alkyl group, a halogen atom, an optionally substituted C_{3-6} cycloalkyl group, an optionally substituted 3- to 7-membered nitrogen-containing heterocyclic group, an optionally substituted C_{1-6} alkoxy group, or a hydroxy group; and

R^8 and R^{10} are each independently absent, or selected from a hydrogen atom and an optionally substituted C_{1-6} alkyl group; or a salt thereof.

[Claim 13]

The compound according to claim 12, wherein

R^1 is

(1) a C_{1-6} alkyl group optionally substituted with 1 to 3 substituents independently selected from

(i) a halogen atom,

(ii) a C_{1-6} alkoxy group, and

(iii) a C_{3-6} cycloalkyl group,

(2) a C_{3-10} cycloalkyl group, or

(3) a mono- or di-C_{1-6} alkylamino group;

R^2 and R^3 are each independently a hydrogen atom, or a C_{1-6} alkyl group, or R^2 and R^3 are taken together each other to form a bond;

R^4 is a hydrogen atom, a C_{1-6} alkyl group, a C_{1-6} alkoxy group, or a hydroxy group;

R^5 is phenyl, pyrazolyl, furyl, thienyl or thiazolyl, any of which is optionally substituted by one or more substituents independently selected from a C_{1-6} alkyl group, a halogen atom, a halo (C_{1-6}) alkyl group, and a C_{1-6} alkoxy group;

m is 0 or 1;

q is 1 or 2;

R^6 and R^7 are each independently a hydrogen atom, a halogen atom, or a C_{1-6} alkyl group;

X^1, X^2, X^3, X^4, X^5, X^6, and X^7 are selected to form a ring system that is one of:

(i) X^1 is NR^8 and R^8 is absent, X^2 is O; X^3 and X^4 are both C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13};

(ii) X^1 is NR^8 and R^8 is absent, X^2 is O, X^3 and X^4 are both C, X^5 is N, X^6 is CR^{12}, and X^7 is CR^{13};

(iii) X^1 is NR^8 and R^8 is absent, X^2 is O, X^3 and X^4 are both C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is N;

(iv) X^1 is NR^8 and R^8 is absent, X^2 is S, X^3 and X^4 are both C, X^5 is N, X^6 is CR^{12}, and X^7 is CR^{13};

(v) X^1 is NR^8 and R^8 is absent, X^2 is S; X^3 and X^4 are both C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13};

(vi) X^1 is NR^8 and X^2 is NR^{10}, and one of R^8 and R^{10} is absent and the other of R^8 and R^{10} is a C_{1-6} alkyl group, X^3 and X^4 are both C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13};

(vii) X^1 is CR^9, X^2 is NR^{10} and R^{10} is absent, X^3 is N, X^4 is C, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13}; and

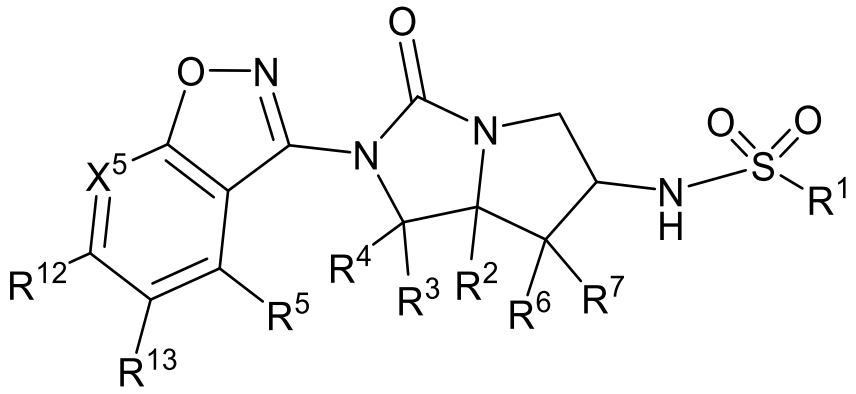
(viii) X^1 is CR^9, X^2 is NR^{10} and R^{10} is absent, X^3 is C, X^4 is N, X^5 is CR^{11}, X^6 is CR^{12}, and X^7 is CR^{13}; and

R^9, R^{11}, R^{12}, and R^{13} are each independently selected from a hydrogen atom, a C_{1-6} alkyl group, a halogen atom, a C_{3-6} cycloalkyl group, a C_{3-6} cycloalkyl (C_{1-6}) alkoxy group, a halo (C_{1-6}) alkyl group, a halo (C_{1-6}) alkoxy group, a C_{1-6} alkoxy (C_{1-6}) alkyl group, an azetidinyl group, a C_{1-6} alkoxy group, a hydroxy group, and a hydroxy (C_{1-6}) alkyl group;

or a salt thereof.

[Claim 14]

The compound according to claim 1, wherein the compound is represented by the formula (Ic):



(Ic)

wherein

R^1 is a C_{1-6} alkyl group, or a mono-C_{1-6} alkylamino group;

R^2 and R^3 are each a hydrogen atom, or R^2 and R^3 are taken together each other to form a bond;

R^4 is a hydrogen atom;

R^5 is a phenyl group optionally substituted by 1 to 3 halogen atoms;

R^6 and R^7 are each independently a hydrogen atom, or a halogen atom;

X^5 is CH or N; and

R^{12} and R^{13} are each independently a hydrogen atom, a C_{1-6} alkyl group, or a halogen atom;

or a salt thereof.

[Claim 15]

The compound according to claim 14, wherein

R^1 is a C_{1-6} alkyl group;

R^2 and R^3 are each a hydrogen atom, or R^2 and R^3 are taken together each other to form a bond;

R^4 is a hydrogen atom;

R^5 is a phenyl group substituted by 1 to 3 halogen atoms;

R^6 and R^7 are each a halogen atom;

X^5 is CH; and

R^{12} and R^{13} are each independently a hydrogen atom, or a halogen atom;

or a salt thereof.

[Claim 16]

The compound according to claim 1, wherein the compound is selected from the group consisting of:

N-{(6S,7aS)-2-[4-(2,6-difluorophenyl)-1,2-benzoxazol-3-yl]-3-oxohexahydro-1H-pyrrolo[1,2-c]imidazol-6-yl}ethanesulfonamide;

N-{(6R)-7,7-difluoro-3-oxo-2-[4-(2,4,6-trifluorophenyl)-1,2-benzoxazol-3-yl]-2,5,6,7-tetrahydro-3H-pyrrolo[1,2-c]imidazol-6-yl}methanesulfonamide;

N-{(6R,7aR)-7,7-difluoro-3-oxo-2-[4-(2,4,6-trifluorophenyl)-1,2-benzoxazol-3-yl]hexahydro-1H-pyrrolo[1,2-c]imidazol-6-yl}ethanesulfonamide;

N-{(6S,7aS)-2-[6-chloro-4-(2,6-difluorophenyl)-1,2-benzoxazol-3-yl]-3-oxohexahydro-1H-pyrrolo[1,2-c]imidazol-6-yl}ethanesulfonamide;

N-{(6R,7aR)-7,7-difluoro-3-oxo-2-[4-(2,4,6-trifluorophenyl)-1,2-benzoxazol-3-yl]hexahydro-1H-pyrrolo[1,2-c]imidazol-6-yl}methanesulfonamide;

N-{(6R)-7,7-difluoro-2-[5-fluoro-4-(2,4,6-trifluorophenyl)-1,2-benzoxazol-3-yl]-3-oxo-2,5,6,7-tetrahydro-3H-pyrrolo[1,2-c]imidazol-6-yl}methanesulfonamide;

N-{(6R,7aR)-7,7-difluoro-2-[6-fluoro-4-(2,4,6-trifluorophenyl)-1,2-benzoxazol-3-yl]-3-oxohexahydro-1H-pyrrolo[1,2-c]imidazol-6-yl}methanesulfonamide;

N-{(4aR,6R)-5,5-difluoro-1-oxo-2-[4-(2,4,6-trifluorophenyl)-1,2-benzoxazol-3-yl]octahydropyrrolo[1,2-c]pyrimidin-6-yl}methanesulfonamide;

N-{(4aR,6R)-2-[5,6-difluoro-4-(2,4,6-trifluorophenyl)-1,2-benzoxazol-3-yl]-5,5-difluoro-1-oxooctahydropyrrolo[1,2-c]pyrimidin-6-yl}methanesulfonamide;

N-{(4aR,6R)-2-[4-(2,6-difluorophenyl)-5-fluoro-1,2-benzoxazol-3-yl]-5,5-difluoro-1-oxooctahydropyrrolo[1,2-c]pyrimidin-6-yl}methanesulfonamide; and

N-{(6R)-2-[4-(2,6-difluorophenyl)-6-fluoro-1,2-benzoxazol-3-yl]-7,7-difluoro-3-oxo-2,5,6,7-tetrahydro-3H-pyrrolo[1,2-c]imidazol-6-yl}ethanesulfonamide;

or a salt thereof.

[Claim 17]

A medicament comprising the compound as defined in any one of claims 1 to 16 or a salt thereof.

[Claim 18]

The compound as defined in any one of claims 1 to 16 or a salt thereof, for use in therapy.

[Claim 19]

The compound or salt according to claim 18, wherein the therapy comprises treatment of a disease or disorder associated with an orexin type 2 receptor.

[Claim 20]

The compound or salt according to claim 19, wherein the disease or disorder is selected from the group consisting of narcolepsy, idiopathic hypersomnia, hypersomnia, sleep apnea syndrome, narcolepsy syndrome accompanied by narcolepsy-like symptoms, hypersomnia syndrome accompanied by daytime hypersomnia, Alzheimer's disease, obesity, insulin resistance syndrome, cardiac failure, diseases related to bone loss, sepsis, disturbance of consciousness, and side effects and complications due to anesthesia.

[Claim 21]

The compound or salt according to claim 19, wherein the disease or disorder is selected from the group consisting of narcolepsy, idiopathic hypersomnia, hypersomnia, and sleep apnea syndrome.

[Claim 22]

The compound or salt according to claim 19, wherein the disease or disorder is narcolepsy.

[Claim 23]

Use of the compound as defined in any one of claims 1 to 16 or a salt thereof, in the manufacture of a medicament for the prophylaxis or treatment of a disease or disorder associated with an orexin type 2 receptor.

[Claim 24]

The use according to claim 23, wherein the disease or disorder is selected from the group consisting of narcolepsy, idiopathic hypersomnia, hypersomnia, sleep apnea syndrome, narcolepsy syndrome accompanied by narcolepsy-like symptoms, hypersomnia syndrome accompanied by daytime hypersomnia, Alzheimer's disease, obesity, insulin resistance syndrome, cardiac failure, diseases related to bone loss, sepsis, disturbance of consciousness, and side effects and complications due to anesthesia.

[Claim 25]

The use according to claim 23, wherein the disease or disorder is selected from the group consisting of narcolepsy, idiopathic hypersomnia, hypersomnia, and sleep apnea syndrome.

[Claim 26]

The use according to claim 23, wherein the disease or disorder is narcolepsy.