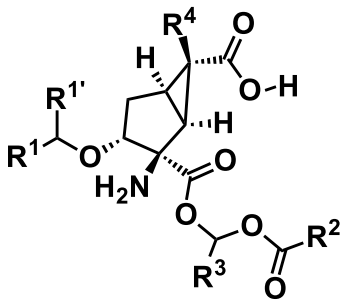
Claims

1. A compound represented by formula (I-A):

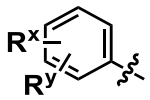


(I-A)

or pharmaceutically acceptable salt thereof,

wherein

R^1 represents a C_{1-6} alkyl group, a heteroaryl group optionally substituted by one halogen atom, or the following formula (IIIA):



(IIIA)

where R^x represents a hydrogen atom, a halogen atom, a C_{1-6} alkyl group, or a C_{1-6} alkoxy group, wherein the C_{1-6} alkyl group and the C_{1-6} alkoxy group are each optionally substituted by one to three halogen atoms, and

R^y represents a hydrogen atom, a fluorine atom, a C_{1-6} alkyl group, or a C_{1-6} alkoxy group, wherein the C_{1-6} alkyl group and the C_{1-6} alkoxy group are each optionally substituted by one to three halogen atoms,

$R^{1'}$ represents a hydrogen atom or a C_{1-6} alkyl group,

or R^1 and $R^{1'}$ optionally form a C_{3-8} cycloalkane together with the carbon atom adjacent thereto,

R^2 represents a C_{3-6} alkyl group, a C_{3-8} cycloalkyl group optionally substituted by one to three C_{1-6} alkyl groups, a C_{3-8} cycloalkoxy group optionally substituted by one to three C_{1-6} alkyl groups and optionally having a C_{1-5} alkylene group crosslinking two different carbon atoms in the ring, an adamantyl group optionally substituted by one to

three C_{1-6} alkyl groups, or a phenyl group,

R^3 represents a hydrogen atom or a C_{1-6} alkyl group, and

R^4 represents a hydrogen atom or a fluorine atom.

2. The compound or pharmaceutically acceptable salt thereof according to claim 1, wherein R^4 is a fluorine atom.

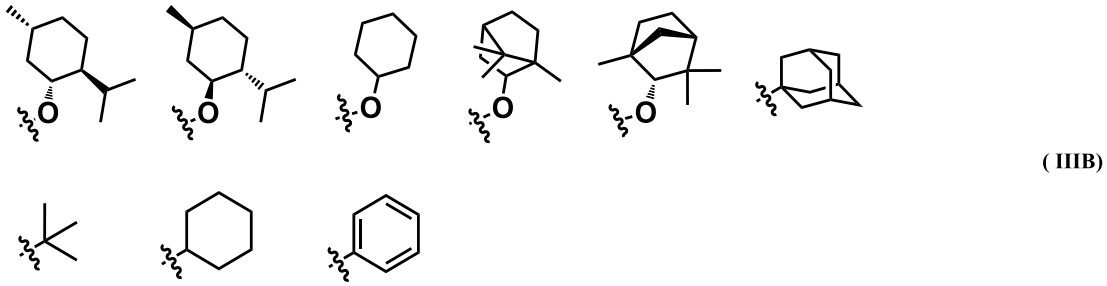
3. The compound or pharmaceutically acceptable salt thereof according to claim 2, wherein

R^1 is an ethyl group, a 4-fluorophenyl group, a 3,4-difluorophenyl group, a 4-fluoro-3-methoxyphenyl group, a 4-(trifluoromethyl)phenyl group, a 3-fluorophenyl group, a 4-methylphenyl group, a 6-chloropyridin-2-yl group, a 6-chloropyridin-3-yl group, a 5-chloropyridin-2-yl group, or a 2-methylpropyl group,

$R^{1'}$ represents a hydrogen atom or a methyl group,

or R^1 and $R^{1'}$ optionally form a cyclopentane together with the carbon atom adjacent thereto,

R^2 represents any structure of the following formula group (IIIB):



(IIIB)

and

R^3 is a hydrogen atom or a C_{1-6} alkyl group.

4. The compound or pharmaceutically acceptable salt thereof according to claim 1, wherein R^4 is a hydrogen atom.

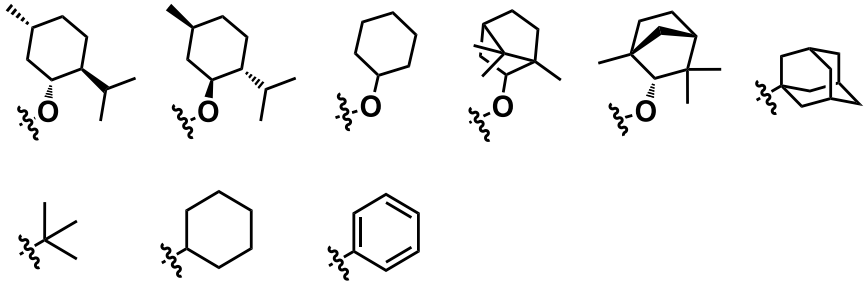
5. The compound or pharmaceutically acceptable salt thereof according to claim 4, wherein

R^1 is an ethyl group, a 4-fluorophenyl group, a 3,4-difluorophenyl group, a 4-fluoro-3-methoxyphenyl group, a 4-(trifluoromethyl)phenyl group, a 3-fluorophenyl group, a 4-methylphenyl group, a 6-chloropyridin-2-yl group, a 6-chloropyridin-3-yl group, a 5-chloropyridin-2-yl group or a 2-methylpropyl,

$R^{1'}$ represents a hydrogen atom or a methyl group,

or R^1 and $R^{1'}$ optionally form a cyclopentane together with the carbon atom adjacent thereto,

R^2 represents any structure of the following formula group (IIIB):



(IIIB)

and

R^3 is a hydrogen atom or a $C_{1\text{-}6}$ alkyl group.

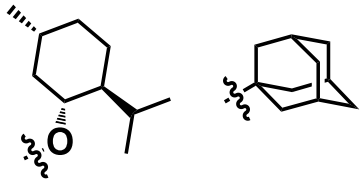
6. The compound or pharmaceutically acceptable salt thereof according to claim 4, wherein R^1 is a 4-fluorophenyl group or a 3,4-difluorophenyl group.

7. The compound or pharmaceutically acceptable salt thereof according to claim 4, wherein

R^1 is a 4-fluorophenyl group,

$R^{1'}$ is a hydrogen atom, and

R^2 represents any structure of the following formula group (IIIb):



(IIIb)

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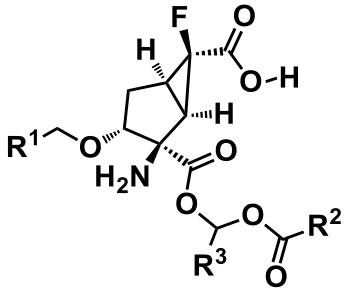
8. The compound or pharmaceutically acceptable salt thereof according to claim 4, wherein R^3 is a methyl group.

9. A compound or pharmaceutically acceptable salt thereof represented by formula (I):



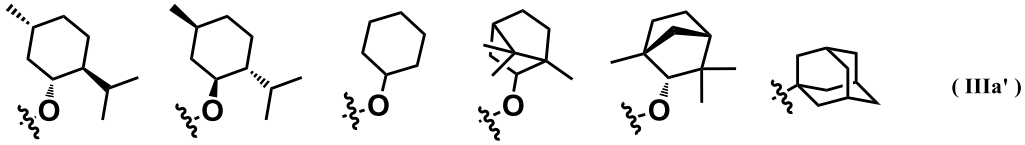
(I)

or pharmaceutically acceptable salt thereof,

wherein

R^1 represents an ethyl group, a 4-fluorophenyl group or a 3,4-difluorophenyl group,

R^2 represents any structure of the following formula group (IIIa'):

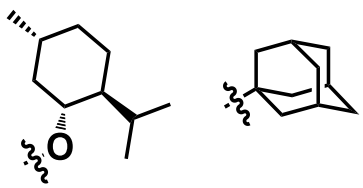


(IIIa')

and

R^3 represents a hydrogen atom or a C_{1-6} alkyl group.

10. The compound or pharmaceutically acceptable salt thereof according to claim 9, wherein R^2 represents any structure of the following formula group (IIIb):



(IIIb)

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11. The compound or pharmaceutically acceptable salt thereof according to claim 9, wherein R^3 is a methyl group.

12. The compound or pharmaceutically acceptable salt thereof according to claim 1, wherein the compound or pharmaceutically acceptable salt thereof is any of the following compounds:
(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(4-fluorophenyl)methoxy]-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(4-fluorophenyl)methoxy]-2-({[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]methoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-3-[(3,4-difluorophenyl)methoxy]-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-3-[(3,4-difluorophenyl)methoxy]-6-fluoro-2-({[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]methoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-6-fluoro-2-({(1R)-1-[({[(1R,2S,5R)-5-methyl-2-(propan-2-yl)cyclohexyl]oxy}carbonyl)oxy]ethoxy}carbonyl)-3-propoxybicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-6-fluoro-2-({1-[({[(1S,2R,5S)-5-methyl-2-(propan-2-yl)cyclohexyl]oxy}carbonyl)oxy]ethoxy}carbonyl)-3-propoxybicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(4-fluorophenyl)methoxy]-2-({1-[({[(1S,2R,4S)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-yl]oxy}carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-propoxy-2-({1-[({[(1S,2R,4S)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-yl]oxy}carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(4-fluorophenyl)methoxy]-2-({1-[({[(1R,2S,4R)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-yl]oxy}carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)-3-{[4-(trifluoromethyl)phenyl]methoxy}bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(3-fluorophenyl)methoxy]-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-3-[(6-chloropyridin-2-yl)methoxy]-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(1R)-1-(4-fluoro-3-methoxyphenyl)ethoxy]-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-3-[(5-chloropyridin-2-yl)methoxy]-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-3-[(6-chloropyridin-3-yl)methoxy]-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(4-methylphenyl)methoxy]-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-(3-methylbutoxy)-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-3-(cyclopentyloxy)-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(3-fluorophenyl)methoxy]-2-({(1R)-1-[({[(1R,2S,5R)-5-methyl-2-(propan-2-yl)cyclohexyl]oxy}carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-3-[(6-chloropyridin-2-yl)methoxy]-6-fluoro-2-({(1R)-1-[({[(1R,2S,5R)-5-methyl-2-(propan-2-yl)cyclohexyl]oxy}carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-2-({[(2,2-dimethylpropanoyl)oxy]methoxy}carbonyl)-6-fluoro-3-[(4-fluorophenyl)methoxy]bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-2-{[(benzoyloxy)methoxy]carbonyl}-6-fluoro-3-[(4-fluorophenyl)methoxy]bicyclo[3.1.0]hexane-6-carboxylic acid,
(1R,2R,3R,5R,6R)-2-amino-2-({[(cyclohexanecarbonyl)oxy]methoxy}carbonyl)-6-fluoro-3-[(4-fluorophenyl)methoxy]bicyclo[3.1.0]hexane-6-carboxylic acid, and
(1S,2R,3R,5R,6S)-2-amino-3-[(4-fluorophenyl)methoxy]-2-({(1S)-1-[(tricycle[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,
or a pharmaceutically acceptable salt thereof.

13. The compound or pharmaceutically acceptable salt thereof according to claim 1, wherein the compound or pharmaceutically acceptable salt thereof is any of the following compounds:
(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(4-fluorophenyl)methoxy]-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(4-fluorophenyl)methoxy]-2-({[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]methoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-3-[(3,4-difluorophenyl)methoxy]-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-3-[(3,4-difluorophenyl)methoxy]-6-fluoro-2-({[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]methoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-2-({(1R)-1-[({[(1R,2S,5R)-5-methyl-2-(propan-2-yl)cyclohexyl]oxy}carbonyl)oxy]ethoxy}carbonyl)-3-propoxybicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)-3-{[4-(trifluoromethyl)phenyl]methoxy}bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(3-fluorophenyl)methoxy]-2-({(1S)-1-[(tricycle[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-3-[(6-chloropyridin-2-yl)methoxy]-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(1R)-1-(4-fluoro-3-methoxyphenyl)ethoxy]-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-3-[(5-chloropyridin-2-yl)methoxy]-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-3-[(6-chloropyridin-3-yl)methoxy]-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(4-methylphenyl)methoxy]-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-(3-methylbutoxy)-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

(1R,2R,3R,5R,6R)-2-amino-3-(cyclopentyloxy)-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

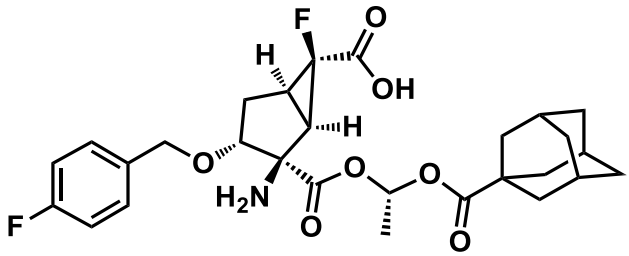
and

(1S,2R,3R,5R,6S)-2-amino-3-[(4-fluorophenyl)methoxy]-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid,

or a pharmaceutically acceptable salt thereof.

14. The compound or pharmaceutically acceptable salt thereof according to claim 1, wherein the compound is the following compound:

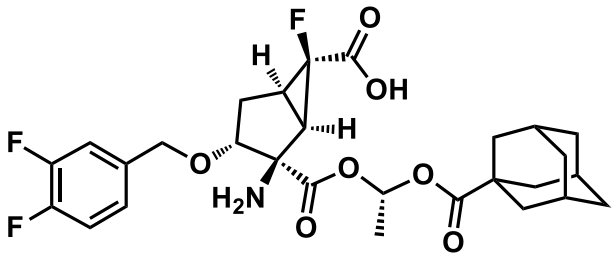
(1R,2R,3R,5R,6R)-2-amino-6-fluoro-3-[(4-fluorophenyl)methoxy]-2-({(1S)-1-[(tricycle[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid



,

or a pharmaceutically acceptable salt thereof.

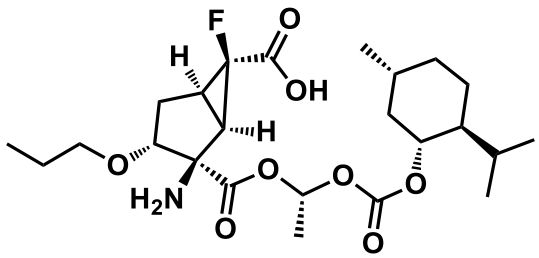
15. The compound or pharmaceutically acceptable salt thereof according to claim 1, wherein the compound or pharmaceutically acceptable salt thereof is the following compound:
(1R,2R,3R,5R,6R)-2-amino-3-[(3,4-difluorophenyl)methoxy]-6-fluoro-2-({(1S)-1-[(tricyclo[3.3.1.1^{3,7}]decane-1-carbonyl)oxy]ethoxy}carbonyl)bicyclo[3.1.0]hexane-6-carboxylic acid



,

or a pharmaceutically acceptable salt thereof.

16. The compound or pharmaceutically acceptable salt thereof according to claim 1, wherein the compound or pharmaceutically acceptable salt thereof is the following compound:
(1R,2R,3R,5R,6R)-2-amino-6-fluoro-2-({(1R)-1-[({[(1R,2S,5R)-5-methyl-2-(propan-2-yl)cyclohexyl]oxy}carbonyl)oxy]ethoxy}carbonyl)-3-propoxybicyclo[3.1.0]hexane-6-carboxylic acid



,

or a pharmaceutically acceptable salt thereof.

17 A pharmaceutical composition comprising the compound or pharmaceutically acceptable salt thereof according to claim 1 and a pharmaceutically acceptable carrier, excipient, or diluent.

18. A pharmaceutical composition comprising the compound or pharmaceutically acceptable salt thereof according to claim 9 and a pharmaceutically acceptable carrier, excipient, or diluent.