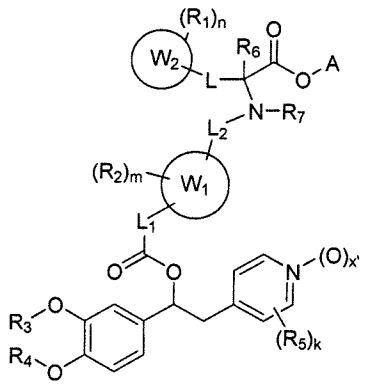
CLAIMS

1. A compound of general formula (I):



(I)

wherein

each R_1 is the same or different and is independently

hydrogen,

halogen,

$(C_1\text{-}C_4)$ alkyl optionally substituted by one or more groups selected from the group consisting of $(C_3\text{-}C_7)$ cycloalkyl, hydroxyl, and $-NR^IR^{II}$,

$(C_1\text{-}C_4)$ alkoxy optionally substituted by one or more halogen atoms or $(C_3\text{-}C_7)$ cycloalkyl groups,

$(C_1\text{-}C_4)$ haloalkyl,

hydroxy,

$-SO_2NR^IR^{II}$,

-CN,

$-NR^ISO_2R^{III}$,

$-NR^IR^{II}$,

$-(CO)NR^IR^{II}$, or

$-NR^I(CO)R^{III}$, wherein:

R^I is hydrogen or $(C_1\text{-}C_6)$ alkyl;

R^{II} is hydrogen or $(C_1\text{-}C_6)$ alkyl;

R^{III} is hydrogen or $(C_1\text{-}C_6)$ alkyl;

n is an integer ranging from 1 to 3;

each R_2 is the same or different and is independently hydrogen,

halogen,

(C_1-C_4) alkyl optionally substituted by one or more groups selected from the group consisting of (C_3-C_7) cycloalkyl, hydroxyl, and -NR^IR^{II},

(C_1-C_4) alkoxy optionally substituted by one or more halogen atoms or (C_3-C_7) cycloalkyl groups,

(C_1-C_4)haloalkyl,

hydroxy,

-$SO_2NR^IR^{II}$,

-CN,

-$NR^ISO_2R^{III}$,

-NR^IR^{II},

-(CO)NR^IR^{II}, or

-NR^I(CO)R^{III}, wherein:

R^I, R^{II}, and R^{III} are as defined above;

m is an integer ranging from 1 to 3;

each R_3 and each R_4 are the same or different and is independently H,

(C_3-C_7) cycloalkylcarbonyl,

(C_1-C_6) alkyl optionally substituted by one or more substituents selected from the group consisting of (C_3-C_7) cycloalkyl and (C_5-C_7) cycloalkenyl,

(C_1-C_6) haloalkyl,

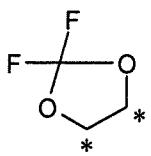
(C_3-C_7) cycloalkyl,

(C_5-C_7) cycloalkenyl,

(C_2-C_6) alkenyl, or

(C_2-C_6) alkynyl;

or R_3 and R_4, together with the interconnecting atoms, form a 2,2-difluoro-1,3-dioxolane ring of formula (r) fused to the phenyl moiety which bears groups -OR_3 and -OR_4, wherein asterisks indicate carbon atoms shared with such phenyl ring:



(r)

each R_5 is the same or different and is independently CN, NO_2, CF_3, or halogen;

k is 0 or an integer ranging from 1 to 3;

x' is 0 or 1;

L_1 is a bond or $-(CH_2)_p-$ wherein p is an integer ranging from 1 to 4;

W_1 is a divalent heteroarylene group;

L_2 is a bond, $-(CH_2)_q-$ wherein q is 1 or 2, [1]-(CO)-[X]-$(CH_2)_t$-[2], or [1]-(SO_2)-[X]-$(CH_2)_t$-[2], wherein [1] and [2] represent, respectively the point of attachment of group L_2 to the ring W_1 and to the chain nitrogen atom, and wherein

[X] is a bond or a substituted or unsubstituted arylene group;

t is an integer ranging from 1 to 4;

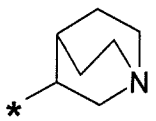
W_2 is phenyl group;

L is a bond or a $-(CH_2)-$ group;

R_6 is ethyl, hydroxymethyl, 1-hydroxyethyl, 2-hydroxyethyl, methoxymethyl, trifluoromethyl, or difluoromethyl;

R_7 is hydrogen or (C_1-C_4) alkyl optionally substituted by hydroxy or $-NR_{11}R_{12}$, wherein R_{11} and R_{12} are independently hydrogen or (C_1-C_4) alkyl, or, together with the nitrogen atom to which they are linked, R_{11} and R_{12} form a saturated heterocycloalkyl group having an additional heteroatom selected from the group consisting of O, S, and NH; and

A is a group of formula (i):

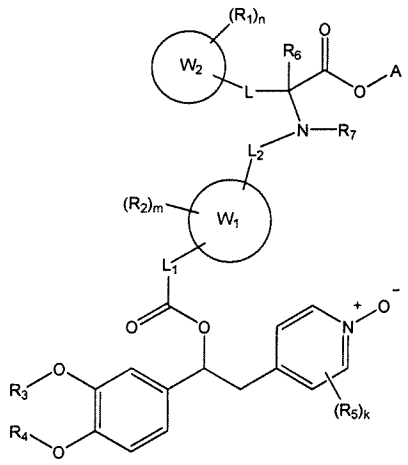


(i)

wherein the asterisk (*) represents the point of attachment to the oxygen atom of formula (I);

or a deuterated derivative or pharmaceutically acceptable salt thereof.

2. A compound according to claim 1, wherein x' is 1, represented by formula (IA):

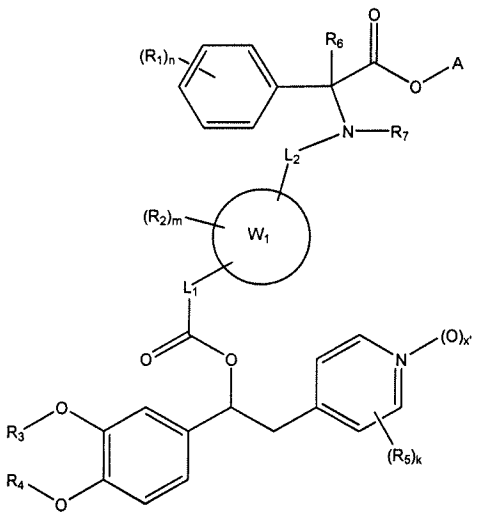


(IA)

or a deuterated derivative or pharmaceutically acceptable salt thereof.

3. A compound according to claim 1, wherein L_1 is a bond, W_1 is thiophene-2,5-diyl or thiophene-2,4-diyl, L_2 is $-(CH_2)-$, and R_7 is H, or a deuterated derivative or pharmaceutically acceptable salt thereof.

4. A compound, according to claim 1, wherein W_2 is a phenyl ring and L is a bond represented by formula (IC):

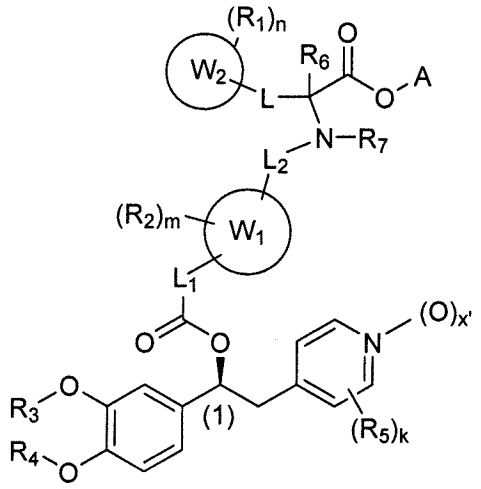


(IC)

wherein R_6 is ethyl, hydroxymethyl, 1-hydroxyethyl, 2-hydroxyethyl, methoxymethyl, trifluoromethyl, or difluoromethyl, or a deuterated derivative or pharmaceutically acceptable salt thereof.

5. A compound, according to claim 4, wherein L_1 is a bond, W_1 is thiophene-2,5-diyl or thiophene-2,4-diyl, L_2 is $-(CH_2)-$, R_7 is H or methyl, and R_6 is ethyl, hydroxymethyl, 1-hydroxyethyl, 2-hydroxyethyl, methoxymethyl, trifluoromethyl, or difluoromethyl, or a deuterated derivative or pharmaceutically acceptable salt thereof.

6. A compound according claim 1, represented by formula (I)' which has the absolute configuration of carbon (1) which is shown below:



(I)'

or a deuterated derivative or pharmaceutically acceptable salt thereof.

7. A pharmaceutical composition, comprising a compound, deuterated derivative, or pharmaceutically acceptable salt according to claim 1 in admixture with one or more pharmaceutically acceptable carriers.

8. A pharmaceutical composition according to claim 7, further comprising another active ingredient.

9. A compound, deuterated derivative, or pharmaceutically acceptable salt thereof according to claim 1 for use in the treatment of a disease of the respiratory tract selected from the group consisting of asthma or COPD.

10. The compound, deuterated derivative, or pharmaceutically acceptable salt thereof for use according to claim 9, wherein said disease of the respiratory tract is

asthma.

11. An inhalation device, which contains a pharmaceutical composition according to claim 7.

12. An inhalation device, which contains a pharmaceutical composition according to claim 8.

13. A kit, comprising a pharmaceutical composition according to claim 7 and a device which is a single- or multi-dose dry powder inhaler, a metered dose inhaler or a nebulizer.

14. A kit, comprising a pharmaceutical composition according to claim 8 and a device which is a single- or multi-dose dry powder inhaler, a metered dose inhaler or a nebulizer.

15. The compound, deuterated derivative, or pharmaceutically acceptable salt thereof for use according to claim 9, wherein said disease of the respiratory tract is COPD.

16. A compound according to claim 1, which is a compound selected from the group consisting of:

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)-ethyl]-5-[[[1-phenyl-1-[(3R)-quinuclidin-3-yl]oxycarbonyl-propyl]amino]methyl]thiophene-2-carboxylate;

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)-ethyl]-5-[[[1-(hydroxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]-methyl-amino]methyl]thiophene-2-carboxylate;

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)-ethyl]-5-[[[1-(hydroxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]-methyl]thiophene-2-carboxylate;

[(1S)-2-(3,5-dichloro-1-oxido-pyridin-1-ium-4-yl)-1-(3,4-dimethoxyphenyl)-

ethyl] 5-[[[1-(methoxymethyl)-2-oxo-1-phenyl-2-[(3R)-quinuclidin-3-yl]oxy-ethyl]amino]methyl]thiophene-2-carboxylate;

or a deuterated derivative or pharmaceutically acceptable salt thereof.

17. A compound, deuterated derivative, or pharmaceutically acceptable salt thereof according to claim 1, for use as a medicament.

18. Use of a compound, deuterated derivative, or pharmaceutically acceptable salt thereof according to claim 1 in the manufacture of a medicament for the treatment of a disease of the respiratory tract selected from the group consisting of asthma or COPD.

19. The use according to claim 18, wherein said disease of the respiratory tract is asthma.

20. The use according to claim 18, wherein said disease of the respiratory tract is COPD.