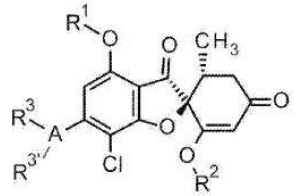
That is, the present disclosure is as described below.

[0013] [1]

In one example, the present disclosure provides for compound of the general formula (1) or a pharmacologically acceptable salt thereof.

[0014] [Chemical formula 1]



(1)

[0015] The symbols in the formula are defined as follows.

R^1:

A C1-C6 alkyl group optionally substituted with the same or different one to two substituents selected from a substituent group X,

a C3-C6 cycloalkyl group optionally substituted with the same or different one to two substituents selected from the substituent group X, or

a 4-7 membered saturated heterocyclic group optionally substituted with the same or different one to two substituents selected from the substituent group X

R^2:

A C1-C6 alkyl group optionally substituted with the same or different one to two substituents selected from the substituent group X,

a C3-C6 cycloalkyl group optionally substituted with the same or different one to two substituents selected from the substituent group X, or

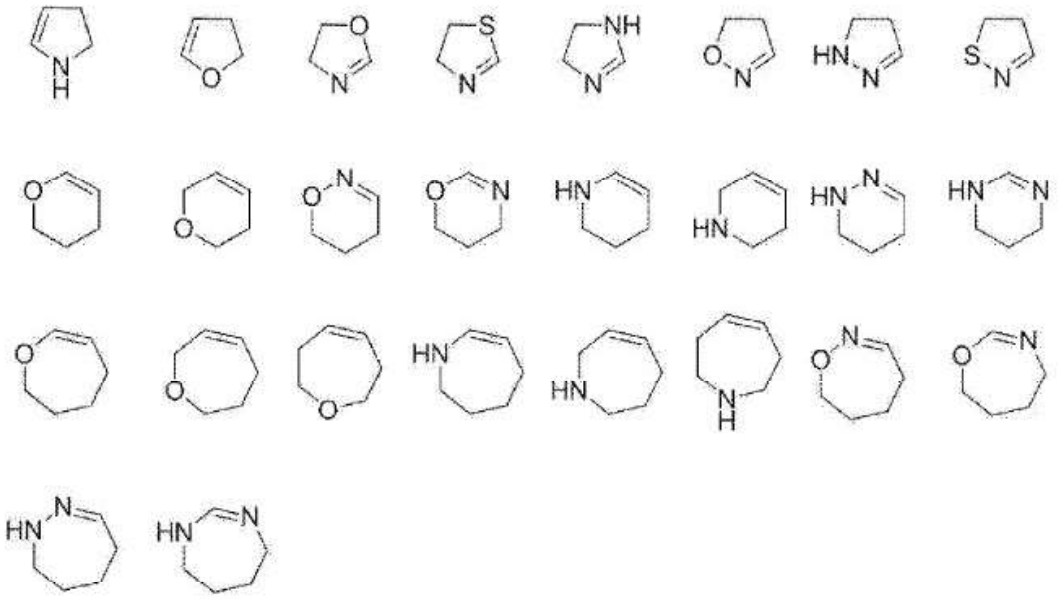
a 4-7 membered saturated heterocyclic group optionally substituted with the same or different one to two substituents selected from the substituent group X

A:

A 5-membered aromatic heterocyclic ring,

a 6-membered aromatic heterocyclic ring,

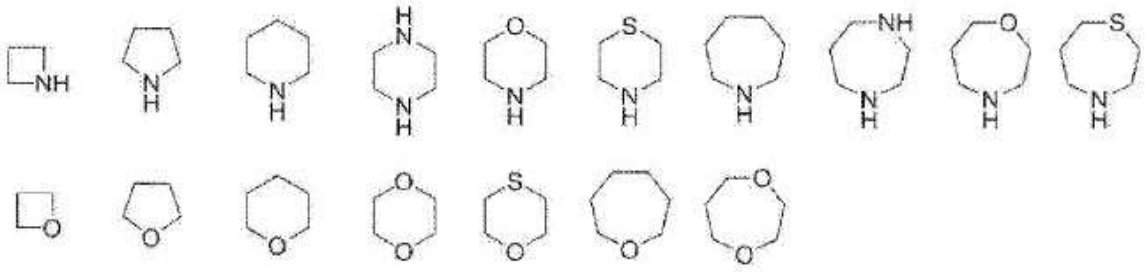
[0025] [Chemical formula 6]



[0026] [6]

The compound or the pharmacologically acceptable salt thereof according to any one of [1] to [5] wherein the 4-7 membered saturated heterocyclic ring or the 4-7 membered saturated heterocyclic group in A, R^1, R^2, or R^3 is any one selected from the group shown below.

[0027] [Chemical formula 7]



[0028] [7]

In one aspect, the present disclosure provides for a compound or the pharmacologically acceptable salt, wherein the compound is any compound selected from the following group:

(2S,5'R)-7-chloro-6-(5-ethyl-1,3,4-oxadiazol-2-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

(2S,5'R)-7-chloro-6-(1,8-dioxa-2-azaspiro [4.5] dec-2-en-3-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(8-methyl-1-oxa-2,8-diazaspiro [4.5] dec-2-en-3-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

(2S,5'R)-7-chloro-3',4-dimethoxy-6-(2-methoxypyrimidin-5-yl)-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

(2S,5'R)-7-chloro-3',4-dimethoxy-6-(6-methoxy-3-pyridyl)-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione or

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(3-pyridyl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione.

[0029] [8]

In another aspect, the present disclosure provides for a pharmaceutical composition containing the compound or the pharmacologically acceptable salt thereof according to [7], as an active ingredient.

[0030] [9]

The pharmaceutical composition according to [8], which is for the prevention and/or treatment of a central inflammatory disease. In yet another aspect, the present disclosure provides for use of the pharmaceutical composition according to [8]in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease.

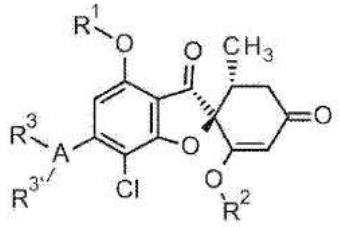
[0031] [10]

A pharmaceutical composition for the prevention and/or treatment of a central inflammatory disease, the pharmaceutical composition containing a compound of a general formula (1') or a pharmacologically acceptable salt thereof:

[0032]

a 6-membered aromatic heterocyclic oxy group optionally substituted with the same or different one to two substituents selected from the substituent group Y,
a 4-7 membered saturated heterocyclic oxy group optionally substituted with the same or different one to two substituents selected from the substituent group Y,
a C1-C6 alkoxycarbonyl group, a C3-C6 cycloalkoxycarbonyl group, a carboxy group, a C1-C6 alkylcarbonyl group, a C3-C6 cycloalkylcarbonyl group,
a phenylcarbonyl group optionally substituted with the same or different one to two substituents selected from the substituent group Y,
a carbamoyl group, a mono (C1-C6 alkyl) aminocarbonyl group, a di (C1-C6 alkyl) aminocarbonyl group, a mono (C1-C6 alkyl) aminosulfonyl group, a di (C1-C6 alkyl) aminosulfonyl group, an amino group, a mono (C1-C6 alkyl) amino group, a di (C1-C6 alkyl) amino group, a C1-C6 alkoxycarbonylamino group, a mono (C1-C6 alkyl) aminocarbonylamino group, a di (C1-C6 alkyl) aminocarbonylamino group, a C1-C6 alkylcarbonylamino group,
a phenylcarbonylamino group optionally substituted with the same or different one to two substituents selected from the substituent group Y,
a 5-membered aromatic heterocyclic carbonylamino group optionally substituted with the same or different one to two substituents selected from the substituent group Y,
a 6-membered aromatic heterocyclic carbonylamino group optionally substituted with the same or different one to two substituents selected from the substituent group Y, or
a C1-C6 alkylsulfonylamino group
Substituent group Y:
A C1-C6 alkyl group, a C1-C6 alkoxy group, a halogen atom, or a hydroxy group]

In yet another aspect, the present disclosure provides for use of a pharmaceutical composition, the pharmaceutical composition containing a compound of a general formula (1') or a pharmacologically acceptable salt thereof:
[Chemical formula 8]

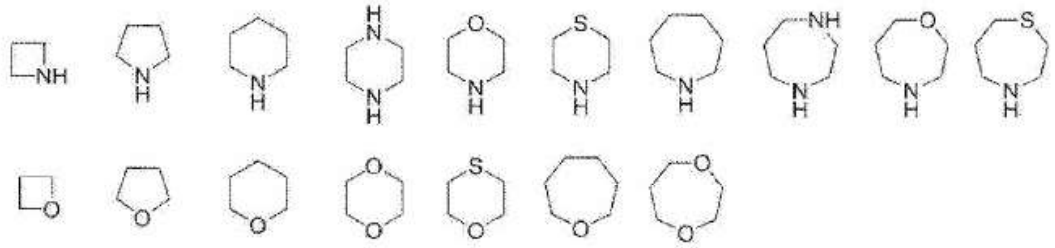


(1')

wherein
R^1 is a methyl group, an ethyl group, or a hydroxyethyl group,

R^2 is a methyl group,
A is any ring selected from the following group, and in the case of two binding groups, $R^{3'}$ is not present:
[Chemical formula 13]

wherein * indicates a binding group,
R^3 is a methyl group, an ethyl group, a hydroxy C1-C3 alkyl group, a methoxy C1-C3 alkyl group, or any one selected from the group shown below:
[Chemical formula 12]



, and

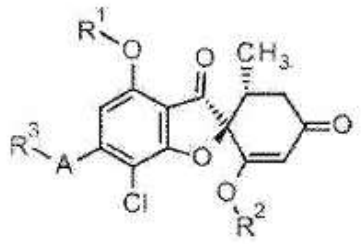
R^3 is a hydrogen atom,

in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is anyone selected from a group consisting of: Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[0034] [11]

The pharmaceutical composition according to [10], wherein R^1 is a methyl group, an ethyl group, or a hydroxyethyl group.

[0035] [12]



(1")

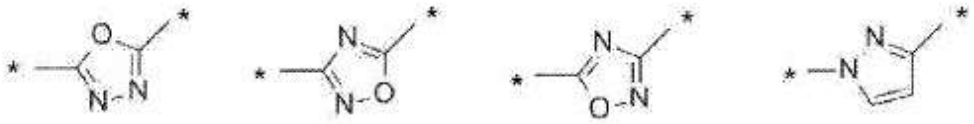
The symbols in the formula are defined as follows.

R^1: A methyl group or an ethyl group

R^2: A methyl group

A: Any ring selected from the following group

[Chemical formula 15]



[* indicates a binding group.]

R^3: A methyl group or an ethyl group]

in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of: Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[0053] [20]

The pharmaceutical composition according to [10], wherein the compound of the general formula (1') is any compound selected from the following group.

(2S,5'R)-7-chloro-3',4-dimethoxy-6-(6-methoxy-3-pyridyl)-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(3-pyridyl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

(2S,5'R)-7-chloro-3',4,6-trimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

[0054] [21]

A pharmaceutical composition for the prevention and/or treatment of a central inflammatory disease, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof.

(2S,5'R)-7-chloro-6-(1-ethylpyrazol-3-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

In yet another aspect, the present disclosure provides for use of a pharmaceutical composition, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof:

(2S,5'R)-7-chloro-6-(1-ethylpyrazol-3-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione; or

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of: Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[0055] [22]

A pharmaceutical composition for the prevention and/or treatment of a central inflammatory disease, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof.

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

[0056] [23]

A pharmaceutical composition for the prevention and/or treatment of a central inflammatory disease, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof.

(2S,5'R)-7-chloro-6-(5-ethyl-1,3,4-oxadiazol-2-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

In yet another aspect, the present disclosure provides for use of a pharmaceutical composition, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof

(2S,5'R)-7-chloro-6-(5-ethyl-1,3,4-oxadiazol-2-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione
in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of
Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.
[0057] [24]

A pharmaceutical composition for the prevention and/or treatment of a central inflammatory disease, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof.

(2S,5'R)-7-chloro-6-[3-(1-hydroxy-1-methyl-ethyl)-1,2,4-oxadiazol-5-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

In yet another aspect, the present disclosure provides for use of a pharmaceutical composition, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof

(2S,5'R)-7-chloro-6-[3-(1-hydroxy-1-methyl-ethyl)-1,2,4-oxadiazol-5-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione
in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of:
Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[0058] [25]

A pharmaceutical composition for the prevention and/or treatment of a central inflammatory disease, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof.

(2S,5'R)-7-chloro-4-ethoxy-3'-methoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

In yet another aspect, the present disclosure provides for use of a pharmaceutical composition, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof

(2S,5'R)-7-chloro-4-ethoxy-3'-methoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of

Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome..

[0059] [26]

The pharmaceutical composition according to any one of [9] to [25], wherein the central inflammatory disease is any one selected from a group consisting of

Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, multiple sclerosis, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[0060] [27]

The pharmaceutical composition according to any one of [9] to [25], wherein the central inflammatory disease is any one selected from a group consisting of

Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, multiple sclerosis, Creutzfeldt-Jakob disease, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome

[0061] [28]

The pharmaceutical composition according to any one of [9] to [25], wherein the central inflammatory disease is any one selected from a group consisting of

schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, and obsessive compulsive disorders.

[29]

In yet another example, the present disclosure provides for a crystal of (2S,5'R)-7-chloro-6-(1-ethylpyrazol-3-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione (example 4) having peaks at about 9.5, 10.7, 14.1, 16.4, 17.9, 23.3, 23.6, 23.9, 24.4, and 27.2 as diffraction angles (2θ (°)) in powder X-ray diffraction.

[30]

In yet another example, the present disclosure provides for a crystal of (2S,5'R)-7-chloro-6-(1-ethylpyrazol-3-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione (example 4) having the X-ray diffraction pattern shown in FIG. 1.

[31]

In yet another example, the present disclosure provides for a crystal of (2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione (example 5) having peaks at about 10.0, 12.3, 15.6, 18.3, 19.1, 20.7, 22.3, 22.9, 24.2, and 29.3 as diffraction angles (2θ (°)) in powder X-ray diffraction.

[32]

In yet another example, the present disclosure provides for a crystal of (2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione (example 5) having the X-ray diffraction pattern shown in FIG. 2.

[33]

In yet another example, the present disclosure provides for a crystal of (2S,5'R)-7-chloro-6-(5-ethyl-1,3,4-oxadiazol-2-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione (example 17) having peaks at about 6.4, 11.2, 11.6, 12.7, 14.7, 17.0, 19.6, 22.4, 24.1, and 26.0 as diffraction angles (2θ (°)) in powder X-ray diffraction.

[34]

In yet another example, the present disclosure provides for a crystal of (2S,5'R)-7-chloro-6-(5-ethyl-1,3,4-oxadiazol-2-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione (example 17) having the X-ray diffraction pattern shown in FIG. 3.

[35]

In yet another example, the present disclosure provides for a crystal of (2S,5'R)-7-chloro-6-[3-(1-hydroxy-1-methyl-ethyl)-1,2,4-oxadiazol-5-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione (example 25) having peaks at about 8.1, 11.5, 13.2, 13.5, 14.0, 14.4, 20.8, 21.4, 22.3, and 25.3 as diffraction angles (2θ (°)) in powder X-ray diffraction.

[36]

In yet another example, the present disclosure provides for a crystal of (2S,5'R)-7-chloro-6-[3-(1-hydroxy-1-methyl-ethyl)-1,2,4-oxadiazol-5-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione (example 25) having the X-ray diffraction pattern shown in FIG. 4.

[Scope of Patent Claims]

[Claim 1]

A compound or the pharmacologically acceptable salt thereof, wherein the compound is any compound selected from the following group:

(2S,5'R)-7-chloro-6-(5-ethyl-1,3,4-oxadiazol-2-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(5-tetrahydropyran-4-yl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-[5-(1-methyl-4-piperidyl)-1,3,4-oxadiazol-2-yl] spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-6-[5-(4-fluoro-1-methyl-4-piperidyl)-1,3,4-oxadiazol-2-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-3',4-dimethoxy-6-[5-[(1S)-1-methoxyethyl]-1,3,4-oxadiazol-2-yl]-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-4-ethoxy-3'-methoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-4-(difluoromethoxy)-3'-methoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-3',4-dimethoxy-6-[3-(1-methoxyethyl)-1,2,4-oxadiazol-5-yl]-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-6-[3-(1-hydroxy-1-methyl-ethyl)-1,2,4-oxadiazol-5-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(1H-pyrazol-5-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-3',4-dimethoxy-6-[1-(2-methoxyethyl) pyrazol-3-yl]-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-6-(1,8-dioxa-2-azaspiro [4.5] dec-2-en-3-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(8-methyl-1-oxa-2,8-diazaspiro [4.5] dec-2-en-3-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-3',4-dimethoxy-6-(2-methoxypyrimidin-5-yl)-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione;

(2S,5'R)-7-chloro-3',4-dimethoxy-6-(6-methoxy-3-pyridyl)-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione; or

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(3-pyridyl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione.

[Claim 2]

A pharmaceutical composition containing the compound or the pharmacologically acceptable salt thereof, according to claim 1, as an active ingredient.

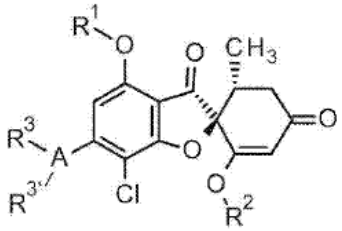
[Claim 3]

Use of the pharmaceutical composition according to claim 2 in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease.

[Claim 4]

Use of a pharmaceutical composition, the pharmaceutical composition containing a compound of a general formula (1') or a pharmacologically acceptable salt thereof:

[Chemical formula 8]



(1')

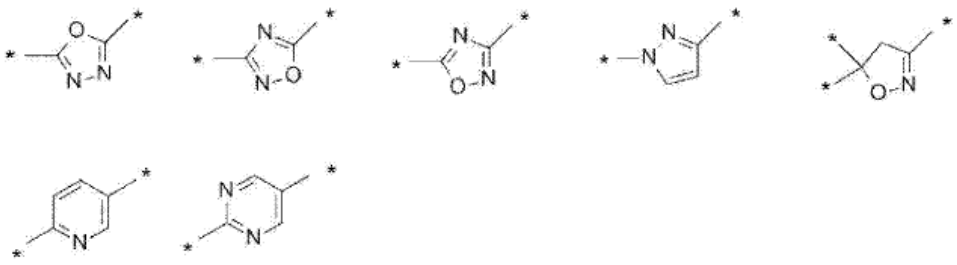
wherein:

R^1 is a methyl group, an ethyl group, or a hydroxyethyl group,

R^2 is a methyl group,

A is any ring selected from the following group, and in the case of two binding groups, $R^{3'}$ is not present:

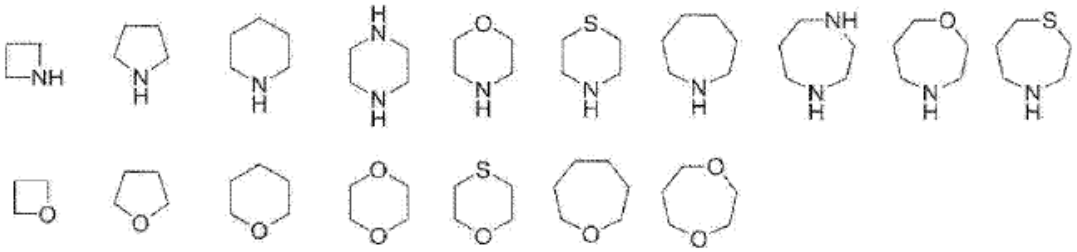
[Chemical formula 13]



wherein * indicates a binding group,

R^3 is a methyl group, an ethyl group, a hydroxy C1-C3 alkyl group, a methoxy C1-C3 alkyl group, or any one selected from the group shown below:

[Chemical formula 12]



, and

$R^{3'}$ is a hydrogen atom,

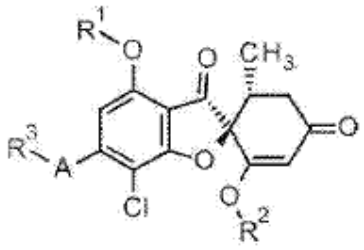
in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is anyone selected from a group consisting of:

Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[Claim 5]

Use of a pharmaceutical composition, the pharmaceutical composition containing a compound of a general formula (1'') or a pharmacologically acceptable salt thereof:

[Chemical formula 14]



(1")

wherein:
R^1 is a methyl group or an ethyl group,
R^2 is a methyl group
A is any ring selected from the following group:

[Chemical formula 15]



wherein * indicates a binding group, and
R^3 is a methyl group or an ethyl group
in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease,
wherein the central inflammatory disease is any one selected from a group consisting of:
Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[Claim 6]

The use according to claim 4, wherein the compound of the general formula (1') is any compound selected from the following group:

(2S,5'R)-7-chloro-6-(2-hydroxyethoxy)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-3',4-dimethoxy-6-(2-methoxyethoxy)-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(1-methylpyrazol-3-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-6-(1-ethylpyrazol-3-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(3-methyl-1,2,4-oxadiazol-5-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(5-methyl)-1,2,4-oxadiazol-3-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione (2S,5'R)-7-chloro-6-[5-(1-hydroxy-1-methyl-ethyl)-1,3,4-oxadiazol-2-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-6-[5-[(1S)-1-hydroxyethyl]-1,3,4-oxadiazol-2-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-6-[5-[(1R)-1-hydroxyethyl]-1,3,4-oxadiazol-2-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-4-ethoxy-6-[5-(1-hydroxy-1-methyl-ethyl)-1,3,4-oxadiazol-2-yl]-3'-methoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-4-ethoxy-6-[5-[(1S)-1-hydroxyethyl]-1,3,4-oxadiazol-2-yl]-3'-methoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-6-[3-(1-hydroxyethyl)-1,2,4-oxadiazol-5-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-4-(2-hydroxyethoxy)-3'-methoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-4-(2-hydroxyethoxy)-3'-methoxy-5'-methyl-6-(3-methyl-1,2,4-oxadiazol-5-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-4-(2-hydroxyethoxy)-3'-methoxy-5'-methyl-6-(5-methyl-1,2,4-oxadiazol-3-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-6-(5-ethyl-1,3,4-oxadiazol-2-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5'R)-7-chloro-3',4-dimethoxy-5'-methyl-6-(5-tetrahydropyran-4-yl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione,

(2S,5’R)-7-chloro-3’,4-dimethoxy-5’-methyl-6-[5-(1-methyl-4-piperidyl)-1,3,4-oxadiazol-2-yl] spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-6-[5-(4-fluoro-1-methyl-4-piperidyl)-1,3,4-oxadiazol-2-yl]-3’,4-dimethoxy-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-3’,4-dimethoxy-6-[5-[(1S)-1-methoxyethyl]-1,3,4-oxadiazol-2-yl]-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-4-ethoxy-3’-methoxy-5’-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-4-(difluoromethoxy)-3’-methoxy-5’-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-3’,4-dimethoxy-6-[3-(1-methoxyethyl)-1,2,4-oxadiazol-5-yl]-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-6-[3-(1-hydroxy-1-methyl-ethyl)-1,2,4-oxadiazol-5-yl]-3’,4-dimethoxy-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-3’,4-dimethoxy-5’-methyl-6-(1H-pyrazol-5-yl) spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-3’,4-dimethoxy-6-[1-(2-methoxyethyl) pyrazol-3-yl]-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-6-(1,8-dioxa-2-azaspiro [4.5] dec-2-en-3-yl)-3’,4-dimethoxy-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-3’,4-dimethoxy-5’-methyl-6-(8-methyl-1-oxa-2,8-diazaspiro [4.5] dec-2-en-3-yl) spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-3’,4-dimethoxy-6-(2-methoxypyrimidin-5-yl)-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-3’,4-dimethoxy-6-(6-methoxy-3-pyridyl)-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione,

(2S,5’R)-7-chloro-3’,4-dimethoxy-5’-methyl-6-(3-pyridyl) spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione, or

(2S,5’R)-7-chloro-3’,4,6-trimethoxy-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione.

[Claim 7]

Use of a pharmaceutical composition, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof:

(2S,5’R)-7-chloro-6-(1-ethylpyrazol-3-yl)-3’,4-dimethoxy-5’-methyl-spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione

in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of:

Alzheimer’s disease, Parkinson’s disease, Lewy body dementia, multiple system atrophy, Pick’s disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington’s disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke’s encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett’s syndrome.

[Claim 8]

Use of a pharmaceutical composition, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof:

(2S,5’R)-7-chloro-3’,4-dimethoxy-5’-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4’-cyclohex-2-ene]-1’,3-dione

in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of:

Alzheimer’s disease, Parkinson’s disease, Lewy body dementia, multiple system atrophy, Pick’s disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington’s disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke’s encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett’s syndrome.

[Claim 9]

Use of a pharmaceutical composition, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof:

(2S,5'R)-7-chloro-6-(5-ethyl-1,3,4-oxadiazol-2-yl)-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[Claim 10]

Use of a pharmaceutical composition, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof:

(2S,5'R)-7-chloro-6-[3-(1-hydroxy-1-methyl-ethyl)-1,2,4-oxadiazol-5-yl]-3',4-dimethoxy-5'-methyl-spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of:

Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain

injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[Claim 11]

Use of a pharmaceutical composition, the pharmaceutical composition containing a compound described below or a pharmacologically acceptable salt thereof:

(2S,5'R)-7-chloro-4-ethoxy-3'-methoxy-5'-methyl-6-(5-methyl-1,3,4-oxadiazol-2-yl) spiro [benzofuran-2,4'-cyclohex-2-ene]-1',3-dione

in the manufacture of a medicament for the prevention and/or treatment of a central inflammatory disease, wherein the central inflammatory disease is any one selected from a group consisting of

Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, fatal familial insomnia, Gerstmann-Straussler-Scheinker syndrome, Down syndrome, Niemann-Pick disease, cerebral amyloid angiopathy, HIV encephalopathy, influenza encephalopathy, hepatic encephalopathy, progressive multifocal leukoencephalopathy, anti-NMDA receptor antibody encephalitis, cerebrovascular disorders, traumatic brain injuries, spinal cord injuries, hypoxic encephalopathy, epilepsy, optic neuritis, congenital metabolic brain diseases, Wernicke's encephalopathy, autism spectrum disorders, attention deficit/hyperactivity disorders, tic disorders, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[Claim 12]

The use according to any one of claims 3 to 11, wherein the central inflammatory disease is any one selected from a group consisting of:

Alzheimer's disease, Parkinson's disease, Lewy body dementia, multiple system atrophy, Pick's disease, progressive supranuclear palsy, cerebral cortex basement degeneration, frontotemporal lobe degeneration, Huntington's disease, amyotrophic lateral sclerosis, spinal and bulbar muscular atrophy, spinal muscular

atrophy, spinocerebellar degeneration, Creutzfeldt-Jakob disease, schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, obsessive compulsive disorders, emotional trauma and stress related disorders, eating disorders, circadian rhythm sleep/wake disorders, narcolepsy, substance related disorders (alcohol addiction and drug addiction), impulse control disorders, delirium, personality disorders, and Rett's syndrome.

[Claim 13]

The use according to any one of claims 3 to 11, wherein the central inflammatory disease is any one selected from a group consisting of:
schizophrenia, bipolar disorders, major depressive disorders (treatment resistant depression and postpartum depression), persistent depressive disorders (dysthymic disorder), premenstrual dysthymic disorders, anxiety disorders, focal phobia, panic disorders, and obsessive compulsive disorders.