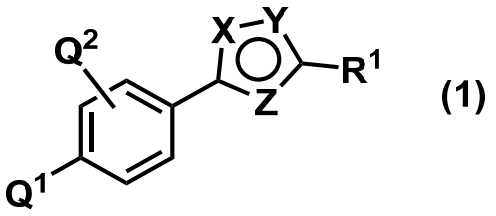
CLAIMS

1. A compound of formula (1):



(1)

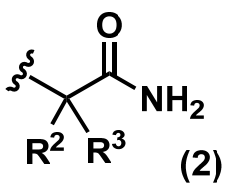
or a pharmaceutically acceptable salt thereof, wherein

Q^1 is halogen,

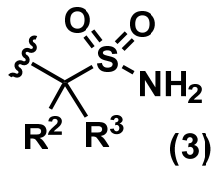
Q^2 is hydrogen, halogen, cyano, C_{1-3} alkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{3-6} cycloalkyl, and C_{1-3} alkoxy), or C_{1-3} alkoxy (which may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{3-6} cycloalkyl, and C_{1-3} alkoxy),

X, Y, and Z are the same or different and are nitrogen atom or oxygen atom, provided that the ring containing X, Y, and Z is a heteroaryl wherein any two of X, Y, and Z are nitrogen atom and the other is oxygen atom,

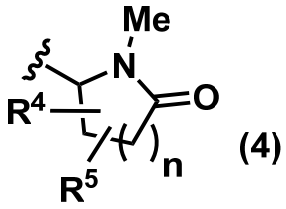
R^1 is any one of the following formulae (2) to (4):



(2)



(3)



(4)

R^2 and R^3 are the same or different and are C_{1-6} alkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{3-6} cycloalkyl, and C_{1-3} alkoxy) or C_{3-6} cycloalkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy); or R^2 and R^3 may be taken together with the carbon atom to which they are attached to form C_{3-6} cycloalkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy), or C_{4-6} saturated hetero ring containing one or two heteroatoms selected independently from nitrogen atom and oxygen atom (said saturated hetero ring may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy),

R^4 and R^5 are the same or different and are hydrogen, halogen, hydroxy, C_{1-6} alkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{3-6} cycloalkyl, and C_{1-3} alkoxy), or C_{3-6} cycloalkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy); or when R^4 and R^5 are attached to the same carbon atom or

to two adjacent carbon atoms respectively, R^4 and R^5 may be taken together with the carbon atom(s) to which they are attached to form C_{3-6} cycloalkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy), or C_{4-6} saturated hetero ring containing one or two heteroatoms selected independently from nitrogen atom and oxygen atom (said saturated hetero ring may be substituted with 1 to 3 substituents selected independently from the group consisting of halogen, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy), and

n is an integer of 0 to 2,

provided that the following compounds are excluded from the compound of formula (1)

2-[3-(3,4-dichlorophenyl)-1,2,4-oxadiazol-5-yl]-2-methylpropanamide,

2-[3-(2,4-dichlorophenyl)-1,2,4-oxadiazol-5-yl]-2-methylpropanamide,

1-[3-(3,4-difluorophenyl)-1,2,4-oxadiazol-5-yl]cyclobutane-1-carboxamide,

1-[3-(4-bromophenyl)-1,2,4-oxadiazol-5-yl]cyclobutane-1-carboxamide,

6-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpiperidin-2-one,

6-[3-(3,4-difluorophenyl)-1,2,4-oxadiazol-5-yl]-1-

methylpiperidin-2-one, and

2-[3-(2-bromo-4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-2-methylpropanamide.

2. The compound of claim 1 or a pharmaceutically acceptable salt thereof, wherein

R^2 and R^3 are the same or different and are C_{1-3} alkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of fluorine, hydroxy, and C_{1-3} alkoxy); or R^2 and R^3 may be taken together with the carbon atom to which they are attached to form C_{3-6} cycloalkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of fluorine, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy), or C_{4-6} saturated hetero ring containing one or two heteroatoms selected independently from nitrogen atom and oxygen atom (said saturated hetero ring may be substituted with 1 to 3 substituents selected independently from the group consisting of fluorine, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy).

3. The compound of claim 2 or a pharmaceutically acceptable salt thereof, wherein

R^2 and R^3 are the same or different and are C_{1-3} alkyl which may be substituted with fluorine; or R^2 and R^3 may be

taken together with the carbon atom to which they are attached to form C_{3-6} cycloalkyl (which may be substituted with fluorine), or C_{4-6} saturated hetero ring containing one or two heteroatoms selected independently from nitrogen atom and oxygen atom (said saturated hetero ring may be substituted with fluorine).

4. The compound of any one of claims 1 to 3 or a pharmaceutically acceptable salt thereof, wherein

R^4 and R^5 are the same or different and are hydrogen, fluorine, hydroxy, C_{1-3} alkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of fluorine, hydroxy, and C_{1-3} alkoxy), or C_{3-6} cycloalkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of fluorine, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy); or when R^4 and R^5 are attached to the same carbon atom or to two adjacent carbon atoms respectively, R^4 and R^5 may be taken together with the carbon atom(s) to which they are attached to form C_{3-6} cycloalkyl (which may be substituted with 1 to 3 substituents selected independently from the group consisting of fluorine, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy), or C_{4-6} saturated hetero ring containing one or two heteroatoms selected independently from nitrogen atom and oxygen atom (said saturated hetero ring may be

substituted with 1 to 3 substituents selected independently from the group consisting of fluorine, hydroxy, C_{1-3} alkyl, and C_{1-3} alkoxy).

5. The compound of claim 4 or a pharmaceutically acceptable salt thereof, wherein

R^4 and R^5 are the same or different and are hydrogen, fluorine, hydroxy, C_{1-3} alkyl (which may be substituted with fluorine), or C_{3-6} cycloalkyl (which may be substituted with fluorine); or when R^4 and R^5 are attached to the same carbon atom or to two adjacent carbon atoms respectively, R^4 and R^5 may be taken together with the carbon atom(s) to which they are attached to form C_{3-6} cycloalkyl which may be substituted with 1 to 3 substituents selected independently from the group consisting of fluorine and C_{1-3} alkyl.

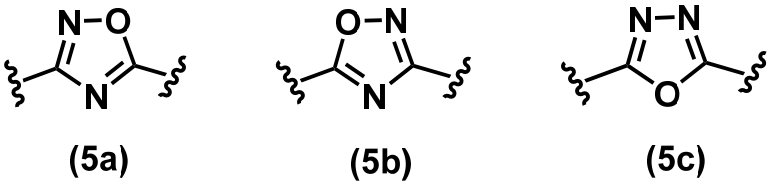
6. The compound of any one of claims 1 to 5 or a pharmaceutically acceptable salt thereof, wherein

Q^1 is fluorine, chlorine, or bromine, and

Q^2 is hydrogen, fluorine, chlorine, bromine, cyano, C_{1-3} alkyl (which may be substituted with fluorine), or C_{1-3} alkoxy (which may be substituted with fluorine).

7. The compound of any one of claims 1 to 6 or a pharmaceutically acceptable salt thereof, wherein

the ring containing X, Y, and Z is the following (5a), (5b), or (5c).



(5a) (5b) (5c)

8. The compound of claim 7 or a pharmaceutically acceptable salt thereof, wherein

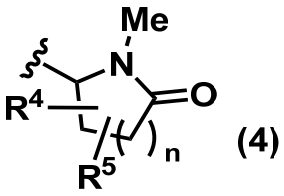
the ring containing X, Y, and Z is the following (5a) or (5b).



(5a) (5b)

9. The compound of any one of claims 1 and 4 to 8 or a pharmaceutically acceptable salt thereof, wherein

R^1 is the following (4).



(4)

10. The compound of claim 1 or a pharmaceutically acceptable salt thereof, which is selected from the following compounds:

2-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-2-

methylpropanamide,

2-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]-2-methylpropanamide,

2-[3-(4-bromophenyl)-1,2,4-oxadiazol-5-yl]-2-methylpropanamide,

1-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]cyclopropane-1-carboxamide,

1-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]cyclopropane-1-carboxamide,

1-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]-3-fluorocyclobutane-1-carboxamide,

1-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]-3,3-difluorocyclobutane-1-carboxamide,

1-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]cyclobutane-1-carboxamide,

1-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]cyclopentane-1-carboxamide,

4-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]tetrahydro-2H-pyran-4-carboxamide,

2-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]-2-ethylbutanamide,

2-[5-(4-fluorophenyl)-1,2,4-oxadiazol-3-yl]-2-methylpropanamide,

2-[5-(4-chlorophenyl)-1,2,4-oxadiazol-3-yl]-2-methylpropanamide,

2-[5-(4-bromophenyl)-1,2,4-oxadiazol-3-yl]-2-methylpropanamide,

2-[5-(4-chlorophenyl)-1,3,4-oxadiazol-2-yl]-2-methylpropanamide,

2-[5-(4-bromophenyl)-1,3,4-oxadiazol-2-yl]-2-methylpropanamide,

2-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]propane-2-sulfonamide,

2-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]propane-2-sulfonamide,

2-[3-(4-bromophenyl)-1,2,4-oxadiazol-5-yl]propane-2-sulfonamide,

2-[5-(4-chlorophenyl)-1,2,4-oxadiazol-3-yl]propane-2-sulfonamide,

2-[5-(4-bromophenyl)-1,2,4-oxadiazol-3-yl]propane-2-sulfonamide,

2-[5-(4-fluorophenyl)-1,3,4-oxadiazol-2-yl]propane-2-sulfonamide,

2-[5-(4-chlorophenyl)-1,3,4-oxadiazol-2-yl]propane-2-sulfonamide,

2-[5-(4-bromophenyl)-1,3,4-oxadiazol-2-yl]propane-2-sulfonamide,

5-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one,

5-[3-(2,4-difluorophenyl)-1,2,4-oxadiazol-5-yl]-1-

methylpyrrolidin-2-one,

5-[3-(3,4-difluorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one,

5-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-1,5-dimethylpyrrolidin-2-one,

5-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one,

5-[3-(4-bromophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one,

(S)-5-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one, and

(R)-5-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one.

11. The compound of claim 1 or a pharmaceutically acceptable salt thereof, which is selected from the following compounds:

2-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]-2-methylpropanamide,

2-[3-(4-bromophenyl)-1,2,4-oxadiazol-5-yl]-2-methylpropanamide,

2-[5-(4-chlorophenyl)-1,2,4-oxadiazol-3-yl]-2-methylpropanamide,

2-[5-(4-chlorophenyl)-1,2,4-oxadiazol-3-yl]propane-2-sulfonamide,

5-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one,

5-[3-(4-chlorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one,

(S)-5-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one, and

(R)-5-[3-(4-fluorophenyl)-1,2,4-oxadiazol-5-yl]-1-methylpyrrolidin-2-one.

12. A pharmaceutical composition comprising the compound of any one of claims 1 to 11 or a pharmaceutically acceptable salt thereof.

13. A medicament for treating and/or preventing diseases associated with hypofunction of GABAergic system, comprising the compound of any one of claims 1 to 11 or a pharmaceutically acceptable salt thereof as an active ingredient.

14. The medicament of claim 13, wherein the diseases associated with hypofunction of GABAergic system are neurological disease or psychiatric disease.

15. The medicament of claim 14, wherein the neurological disease or psychiatric disease is epilepsy, neuropathic

pain, neurodevelopmental disorders, bipolar disorder and its related disorders, schizophrenia spectrum disorder, Alzheimer's disease and the other neurocognitive disorders, amyotrophic lateral sclerosis, Parkinson's disease, depressive syndrome, anxiety disorders, obsessive-compulsive disorder, trauma- and stressor-related disorders, sleep-wake disorders, and/or REM sleep behavior disorder associated with Parkinson's disease/dementia with Lewy bodies.

16. Use of the compound of any one of claims 1 to 11 or a pharmaceutically acceptable salt thereof, in the manufacture of a medicament for treating and/or preventing neurological disease or psychiatric disease.

17. The compound of any one of claims 1 to 11 or a pharmaceutically acceptable salt thereof for use in treating and/or preventing neurological disease or psychiatric disease.

18. A pharmaceutical combination comprising the compound of any one of claims 1 to 11 or a pharmaceutically acceptable salt thereof, and at least one drug selected from drugs classified into antiepileptic drug, antidepressant drug, or antipsychotic drug.

19. A medicament for treating diseases associated with hypofunction of GABAergic system, comprising the compound of any one of claims 1 to 11, or a pharmaceutically acceptable salt thereof, to be used in combination with at least one drug selected from drugs classified into antiepileptic drug, antidepressant drug, or antipsychotic drug.