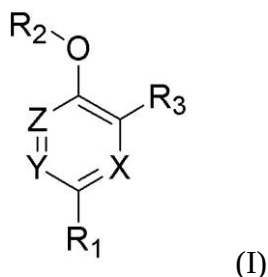


【CLAIMS】

【Claim 1】

A compound of formula (I) or pharmaceutically acceptable salt thereof:



wherein,

X is nitrogen, Y and Z are carbon;

R₁ is phenyl, pyridine, or pyrimidine substituted or unsubstituted with one or more substituents selected from the group consisting of hydroxy, amino and halogen;

R₂ is hydrogen; and

R₃ is pyrimidine substituted or unsubstituted with one or more substituents selected from the group consisting of C₁-C₆ alkyl, tetrahydropyranyl, piperidinyll substituted or unsubstituted with C₁-C₆ alkyl, morpholino, piperazinyl substituted or unsubstituted with C₁-C₆ alkyl, amino, C₁-C₆ alkylamino and halogen.

【Claim 2】

The compound according to claim 1 or pharmaceutically acceptable salt thereof selected from the group consisting of the following compounds:

2,6-bis(2-aminopyrimidin-4-yl)pyridin-3-ol;

2'-amino-6-(2-aminopyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2-(2-aminopyrimidin-4-yl)-6-(4-hydroxyphenyl)pyridin-3-ol;

2'-amino-6-(2-aminopyrimidin-4-yl)-[2,4'-bipyridin]-5-ol;

6-(2-aminopyrimidin-4-yl)-[2,3'-bipyridin]-5-ol;

6-(2-aminopyrimidin-4-yl)-[2,4'-bipyridin]-5-ol;

2-(2-aminopyrimidin-4-yl)-6-(3-hydroxyphenyl)pyridin-3-ol;

6-(2-aminopyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

6-(4-amino-2-fluorophenyl)-2-(2-aminopyrimidin-4-yl)pyridin-3-ol;

6-(3-aminophenyl)-2-(2-aminopyrimidin-4-yl)pyridin-3-ol;
 2-(2-aminopyrimidin-4-yl)-6-(2-fluoro-4-hydroxyphenyl)pyridin-3-ol;
 6-(3-amino-2-fluorophenyl)-2-(2-aminopyrimidin-4-yl)pyridin-3-ol;
 2-(2-aminopyrimidin-4-yl)-6-(3-fluoro-4-hydroxyphenyl)pyridin-3-ol;
 2-(2-aminopyrimidin-4-yl)-6-(2,3-difluoro-4-hydroxyphenyl)pyridin-3-ol;
 2'-amino-6-(2-aminopyrimidin-4-yl)-[2,4'-bipyridin]-3',5-diol;
 2'-amino-6-(2-amino-6-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;
 6-(2-amino-6-methylpyrimidin-4-yl)-[2,4'-bipyridin]-5-ol;
 6-(2-amino-6-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;
 2-(2-amino-6-methylpyrimidin-4-yl)-6-(4-hydroxyphenyl)pyridin-3-ol;
 2-(2-amino-6-methylpyrimidin-4-yl)-6-(2,3-difluoro-4-hydroxyphenyl)pyridin-3-ol;
 2-(2-amino-6-methylpyrimidin-4-yl)-6-(2-fluoro-4-hydroxyphenyl)pyridin-3-ol;
 2-(2-amino-6-methylpyrimidin-4-yl)-6-(3-aminophenyl)pyridin-3-ol;
 2'-amino-6-(2-amino-6-isopropylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;
 2'-amino-6-(2-amino-6-(tetrahydro-2H-pyran-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol;
 2'-amino-6-(2-amino-6-(piperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;
 2'-amino-6-(2-amino-6-(1-methylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol;
 2'-amino-6-(2-amino-6-(1-ethylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-
 5-ol;
 2'-amino-6-(2-amino-6-(1-propylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol;
 2'-amino-6-(2-amino-6-(1-isopropylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol;
 2'-amino-6-(2-amino-6-(1-methylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol;
 2'-amino-6-(2-amino-6-(1-ethylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-
 5-ol;
 2'-amino-6-(2-amino-6-(1-propylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol;
 2'-amino-6-(2-amino-6-(1-isopropylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-

bipyridin]-5-ol;

2'-amino-6-(2-amino-5-methyl-6-(1-methylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-6-(1-ethylpiperidin-4-yl)-5-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-5-methyl-6-(1-propylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-6-(1-isopropylpiperidin-4-yl)-5-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-5-methyl-6-(1-methylpiperidin-3-yl)pyrimidin-3-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-5-methyl-6-(1-propylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-6-(1-isopropylpiperidin-3-yl)-5-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-5-ethyl-6-(1-isopropylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-6-(1-isopropylpiperidin-4-yl)-5-propylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-6-morpholinopyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-6-(dimethylamino)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-6-(4-methylpiperazin-1-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

6-(2-amino-6-chloropyrimidin-4-yl)-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-5-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-5-ethylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-5-propylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-5-isopropylpyrimidin-5-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2'-amino-3'-fluoro-6-(2-(methylamino)-6-(1-methylpiperidin-4-yl)pyrimidin-4-yl)-[2,4'-bipyridin]-5-ol;

2'-amino-6-(2-amino-5,6-dimethylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol;

2,6-bis(2-aminopyrimidin-4-yl)pyridin-3-ol 3hydrochloride;

2,6-bis(2-aminopyrimidin-4-yl)pyridin-3-ol oxalate;
 2,6-bis(2-aminopyrimidin-4-yl)pyridin-3-ol malonate;
 2,6-bis(2-aminopyrimidin-4-yl)pyridin-3-ol sulfate;
 2'-amino-4-(2-aminopyrimidin-4-yl)-[2,4'-bipyridin]-5-ol oxalate;
 2'-amino-6-(2-aminopyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 3hydrochloride;
 2'-amino-6-(2-aminopyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol acetate;
 2'-amino-6-(2-aminopyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol oxalate;
 2'-amino-6-(2-aminopyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 2malonate;
 2-(2-aminopyrimidin-4-yl)-6-(2-fluoro-4-hydroxyphenyl)pyridin-3-ol 2hydrochloride;
 2'-amino-6-(2-amino-6-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol
 3hydrochloride;
 2'-amino-6-(2-amino-6-morpholinopyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol
 4hydrochloride;
 2'-amino-6-(2-amino-6-morpholinopyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol acetate;
 2'-amino-6-(2-amino-6-(dimethylamino)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol
 4hydrochloride;
 2'-amino-6-(2-amino-6-(4-methylpiperazin-1-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol 5hydrochloride;
 2'-amino-6-(2-amino-6-(4-methylpiperazin-1-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol acetate;
 2'-amino-6-(2-amino-6-(1-methylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol 4hydrochloride;
 2'-amino-6-(2-amino-6-(1-methylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol 2acetate;
 2'-amino-6-(2-amino-6-(1-methylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol oxalate;
 2'-amino-6-(2-amino-6-(1-methylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-
 bipyridin]-5-ol malonate;
 2'-amino-6-(2-amino-6-isopropylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol
 3hydrochloride;
 2'-amino-6-(2-amino-6-isopropylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 2acetate;
 2'-amino-6-(2-amino-6-(piperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol

4hydrochloride;

2'-amino-6-(2-amino-6-(piperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol acetate;

2'-amino-6-(2-amino-6-(tetrahydro-2H-pyran-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 3hydrochloride;

2'-amino-6-(2-amino-6-(1-ethylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-6-(1-propylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-6-(1-isopropylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-6-(1-methylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-6-(1-ethylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-6-(1-propylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-6-(1-isopropylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-5-methyl-6-(1-methylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-6-(1-ethylpiperidin-4-yl)-5-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-5-methyl-6-(1-propylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-6-(1-isopropylpiperidin-4-yl)-5-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-5-methyl-6-(1-methylpiperidin-3-yl)pyrimidin-3-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-5-methyl-6-(1-propylpiperidin-3-yl)pyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-6-(1-isopropylpiperidin-3-yl)-5-methylpyrimidin-4-yl)-3'-fluoro-

[2,4'-bipyridin]-5-ol 4hydrochloride;

2'-amino-6-(2-amino-5-methylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol
3hydrochloride;

2'-amino-6-(2-amino-5,6-dimethylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol
3hydrochloride;

2'-amino-6-(2-amino-5-ethylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol
3hydrochloride;

2'-amino-6-(2-amino-5-propylpyrimidin-4-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol
3hydrochloride;

2'-amino-6-(2-amino-5-isopropylpyrimidin-5-yl)-3'-fluoro-[2,4'-bipyridin]-5-ol
3hydrochloride;

2'-amino-6-(2-amino-5-ethyl-6-(1-isopropylpiperidin-4-yl)pyrimidin-4-yl)-3'-fluoro-
[2,4'-bipyridin]-5-ol 4hydrochloride; and

2'-amino-6-(2-amino-6-(1-isopropylpiperidin-4-yl)-5-propylpyrimidin-4-yl)-3'-fluoro-
[2,4'-bipyridin]-5-ol 4hydrochloride.

【Claim 3】

A pharmaceutical composition comprising the compound according to any one of claims 1 and 2 or pharmaceutically acceptable salt thereof together with a pharmaceutically acceptable carrier for use in the treatment or prevention of cancer.

【Claim 4】

The pharmaceutical composition according to claim 3 for use in the treatment or prevention of acute lymphoblastic leukemia (ALL), chronic lymphoblastic leukemia (CLL), acute myeloid leukemia (AML), chronic myeloid leukemia (CML), multiple myeloma (MM), Hodgkin's lymphoma, non-Hodgkin's lymphoma, non-small cell lung cancer, small cell lung cancer, gastric cancer, pancreas cancer, glioma, colon cancer, breast cancer, head and neck squamous cell cancer, liver cancer, melanoma, uterine cancer, prostate cancer, ovarian cancer, thyroid cancer, biliary tract cancer, gallbladder cancer, bladder cancer, kidney cancer, or esophageal cancer.

【Claim 5】

A pharmaceutical composition comprising the compound according to any one of claims 1 and 2 or pharmaceutically acceptable salt thereof together with a pharmaceutically acceptable carrier for use in the treatment or prevention of a degenerative brain disease.

【Claim 6】

The pharmaceutical composition according to claim 5 for use in the treatment or prevention of Alzheimer's disease, Huntington's chorea or Parkinson's disease.

【Claim 7】

The pharmaceutical composition according to claim 3 for use in the treatment or prevention of cancer, wherein the compound of formula (I) or pharmaceutically acceptable salt thereof is administered in combination with one or more anticancer agents selected from the group consisting of capecitabine, 5-fluorouracil, thioguanine, chlorambucil, oxaliplatin, cisplatin, carboplatin, paclitaxel, docetaxel, irinotecan, doxorubicin, vinorelbin, gemcitabine, pemetrexed, etoposide, vincristine, citarabine, cyclophosphamide, iphosphamide, tamoxifen, anastrozole, retrozole, exemestane, fulvestrant, temozolomide, camustine, lomustine, epirubicine, eribulin, toremifene, goserelin, megestrol, vinblastine, bendamustine, thiotepa, bleomycin, topotecan, leucovorin, trifluridine, tipiracil, mitomycin C, aldesleukin, temsirolimus, everolimus, mitoxantrone, mecloretamine, methotrexate, trastuzumab, bevacizumab, cetuximab, aflibercept, pertuzumab, ramucirumab, panitumumab, nivolumab, necitumumab, pembrolizumab, obinutuzumab, ofatumumab, erlotinib, gefitinib, sorafenib, lapatinib, palbociclib, regorafenib, imatinib, sunitinib, axitinib, pazopanib, apatinib, ceritinib, crizotinib, osimertinib, bosutinib, dasatinib, nilotinib, ponatinib, hydroxyurea, and procarbazine.

【Claim 8】

The pharmaceutical composition according to claim 5 for use in the treatment or prevention of a degenerative brain disease, wherein the compound of formula (I) or pharmaceutically acceptable salt thereof is administered in combination with one or more drugs for treating a degenerative brain disease selected from the group consisting of levodopa, bromocriptine, ropinirole, pramipexole, rotigotine, trihexyphenidyl, benzotropine, procyclidine,

entacapone, selegiline, rasagiline, amantadine, tetrabenazine, donepezil, rivastigmine, galantamine and memantine.

【Claim 9】

The pharmaceutical composition according to claim 3 for use in the treatment or prevention of cancer, wherein the compound of formula (I) or pharmaceutically acceptable salt thereof is administered in combination with temozolomide.