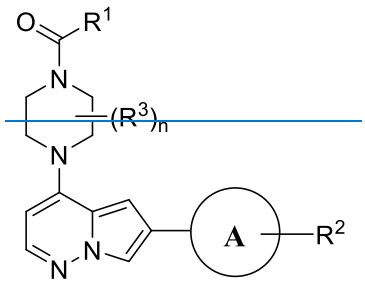
Claims:

1. A compound of formula (I):



(I), or a pharmaceutically acceptable salt thereof, wherein:

ring A is phenyl or heteroaryl, wherein ring A is substituted with 0, 1, 2, or 3 independently selected substituents in addition to R^2;

R^1 is selected from $NH(C_1\text{-}C_6\text{ alkyl})$, $N(C_1\text{-}C_6\text{ alkyl})_2$, $C_1\text{-}C_6$ alkyl, $\text{-}O\text{-}C_1\text{-}C_6$ alkyl, $\text{-}C(O)\text{-}C_1\text{-}C_4$ alkyl, carbocyclyl, heterocyclyl, $\text{-}O\text{-}(C_0\text{-}C_4\text{ alkylene})$ carbocyclyl, $\text{-}O\text{-}(C_0\text{-}C_4$ alkylene) heterocyclyl, $\text{-NH-}(C_0\text{-}C_4\text{ alkylene})$ carbocyclyl, -NH-aryl, $\text{-NH-O-}(C_1\text{-}C_4\text{ alkyl})$, -S-heterocyclyl, and $\text{-NH-}(C_0\text{-}C_4\text{ alkylene})$-heterocyclyl, wherein each alkyl, alkylene, carbocyclyl, and heterocyclyl portion of R^1 is unsubstituted, or is independently substituted with 1, 2, 3, or 4 independently selected substituents; or

R^1 is taken together with one R^3 to form a saturated ring fused to the piperazine ring in formula (I), and wherein the ring formed by R^1 and R^3 is unsubstituted, or is substituted with 1, 2, or 3 independently selected substituents;

R^2 is selected from halo, $C_1\text{-}C_6$ alkyl, heterocyclyl, cycloalkyl, $\text{-NH-}(C_0\text{-}C_4$ alkylene)-heterocyclyl, $\text{-}(C_1\text{-}C_4\text{ alkylene})$-heterocyclyl, $\text{-}(C_1\text{-}C_4\text{ alkylene})$-NH-heterocyclyl, and $\text{-O-}(C_0\text{-}C_4\text{ alkylene})$-heterocyclyl, wherein any heterocyclyl, cycloalkyl, alkyl or alkylene portion of R^2 is unsubstituted, or is substituted with 1, 2, 3, or 4 independently selected substituents; or

R^2 is taken together with any ring atom in ring A to form a cycloalkyl or saturated heterocyclyl ring that is fused, spirofused, or bridged to ring A, and wherein the ring formed by R^2 and the ring atom in ring A is unsubstituted, or is substituted with 1, 2, or 3 independently

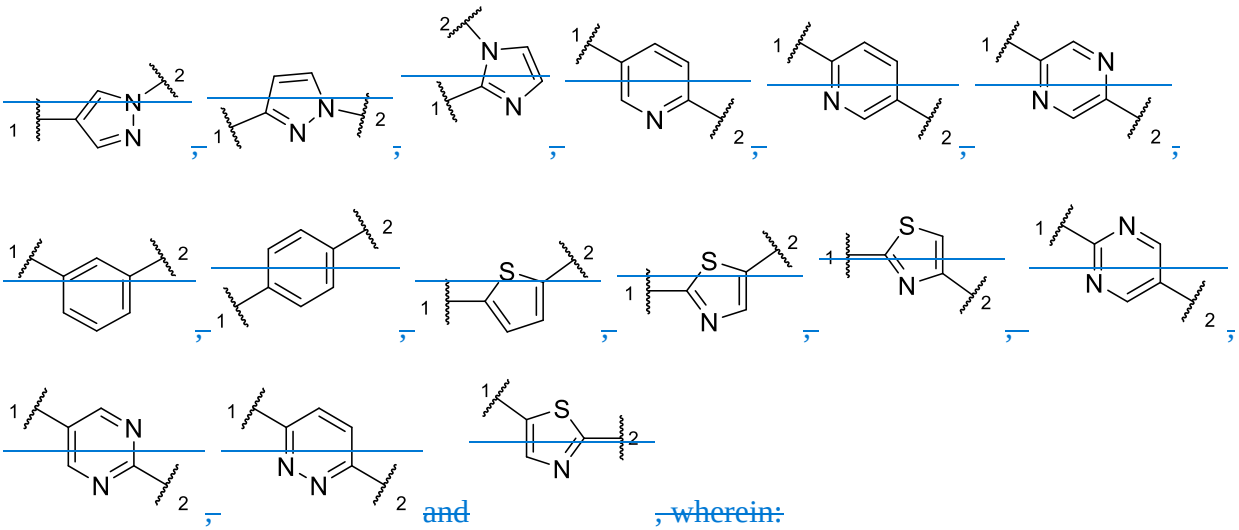
~~selected substituents;~~

~~each R^3, if present, is independently selected from C_1-C_4 alkyl and C_1-C_4 haloalkyl; and~~

~~n is 0, 1, 2, or 3.~~

~~2. The compound of claim 1, wherein n is 0 or 1; and R^3, if present, is selected from methyl, ethyl, and -CHF_2.~~

~~3. The compound of any one of claims 1-2, wherein ring A is selected from:~~

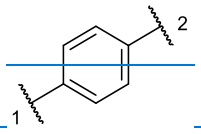


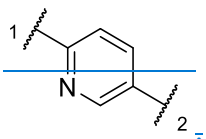
~~and , wherein:~~

~~"1" represents a portion of ring A bound to a pyrrolo[1,2-b]pyridazine moiety;~~

~~"2" represents a portion of ring A bound to R^2; and~~

~~ring A is substituted with 0, 1, 2, or 3 independently selected substituents in addition to R^2.~~

~~4. The compound of claim 3, wherein ring A is selected from~~  ~~and~~



5. The compound of any one of claims 1-4, wherein ring A is substituted with 0, 1, or 2 substituents in addition to R^2, wherein each of the substituents is independently selected from -CN, halo, methyl, and -$OCHF_2$.

6. The compound of any one of claims 1-5, wherein R^1 is selected from -C(O)-(C_1-C_3 alkyl), C_1-C_3 alkyl, -O-(C_1-C_5 alkyl), -NH(C_1-C_5 alkyl), -N(C_1-C_4 alkyl)$_2$, -NH-(C_3-C_6 cycloalkyl), C_3-C_6 cycloalkyl, -O-(C_3-C_6 cycloalkyl), -O-(C_1-C_3 alkyl)-(C_3-C_6 cycloalkyl), -(C_1-C_3 alkylene)-(C_3-C_6 cycloalkyl), -O-(C_0-C_3 alkylene)-(O-containing heterocyclyl), -NH-(C_0-C_3 alkylene)-(O-containing heterocyclyl), an O-containing heterocyclyl, an N-containing heterocyclyl, -O-(C_0-C_3 alkylene)-(N-containing heterocyclyl), -S-(C_0-C_3 alkylene)-(O-containing heterocyclyl), -NH-O-(C_1-C_3 alkyl), and -NH-phenyl, wherein any alkyl, cycloalkyl, phenyl, or heterocyclyl portion of R^1 is unsubstituted, or is substituted with 1, 2, or 3 substituents independently selected from deuterium , halo, cyano, acetyl, C_1-C_4 alkyl, C_1-C_4 haloalkyl, -O-C_1-C_4 alkyl, -C_1-C_4 alkylene-O-C_1-C_4 alkyl, optionally substituted heteroaryl, optionally substituted phenyl, optionally substituted cycloalkyl, -COOH, and -OH; or R^1 is taken together with any ring atom in the piperazine moiety of formula (I) to form a carbocyclyl or heterocyclyl ring fused to the piperazine moiety.

7. The compound of any one of claims 1-6, wherein R^1 is selected from 1-(3-chlorophenyl)cyclopropyl, 1-(3-fluorophenyl)cyclopropyl, 1-acetylcyclopropyl, 1-cyclopropylcyclopropyl, 1-difluoromethylcyclopropyl, 1-fluorocyclopropyl, 1-methylpropylamino1-pyridin-3-ylcyclopropyl, 1-thiazol-2-ylcyclopropyl, 1-thien-2-ylcyclopropyl, 1-trifluoromethylcyclopropyl, 2-(4-chlorophenyl)cyclopropyl, 2,2,2-trifluoroethoxy, 2,2-difluorocyclopropyl, 2,2-dimethylcyclopropyl, 2-cyanocyclopropyl, 2-cyanoethyl, 2-cyanoethylamino2-cyclobutylcyclopropyl, 2-fluorocyclopropyl, 2-fluoroethoxy, 2-hydroxyethylamino, 2-methoxyethoxy, 2-methylcyclopropyl, 2-oxa-6-azaspiro[3.3]heptan-6-yl, 3,3-difluorocyclobutyl, 3-cyanoazetidin-1-yl, 3-cyanocyclobutyl, 3-fluorocyclobutyl, 3-hydroxy-3-methylcyclobutyl, 3-hydroxy-3-trifluoromethylcyclobutyl, 3-hydroxyazetidin-1-yl, 3-hydroxycyclobutyl, 3-methoxyazetidin-1-yl, 3-methoxymethylazetidin-1-yl, 3-phenyl-3-hydroxycyclobutyl, 4-cyanocyclohexyl, 4-cyanoypiperidin-1-yl, 4-hydroxy-4-methylcyclohexyl,

4-hydroxycyclohexyl, 4-hydroxypiperidin-1-yl, 4-methylcyclohexyl, acetyl, azetidin-1-yl, cyclobutoxy, cyclobutyl, cyclobutylamino, cyclopentylamino, cyclopropyl, cyclopropylmethyl, diethylamino, ethoxy, ethyl, ethylamino, isobutoxy, isopropoxy, isopropyl, isopropylamino, methoxymethyl, N-ethyl-N-methylamino, pentylamino, piperidin-1-yl, propylamino, propyloxypyrrolidin-1-yl, and t-butylamino, t-butoxy, 2,2-dimethylpropoxy, 2,2-difluoroethoxy, N-(2,2-dimethylpropyl)amino, N-(1,2-dimethylpropyl)amino, 2,2,2-trifluoroethylamino, N-(methoxymethyl)amino, oxetan-3-yloxy, oxetan-3-yl, oxetan-3-ylamino, oxetan-3-ylmethoxy, N-(oxetan-3-ylmethyl)amino, tetrahydrofuran-3-yloxy, tetrahydropyran-4-yloxy, 3-cyanocyclobutoxy, 1,3-dihydroxypropan-2-yloxy, 1-acetylazetidin-3-yloxy, 1-hydroxy-2-hydroxycarbonylethan-2-yloxy, 1-methyl-2-fluoroethoxy, 2,2-difluoroethylamino, 2-cyanoethan-1-yloxy, 2-fluoroethylamino, 2-fluorophenylamino, 2-fluoropropoxy, 2-methyloxetan-3-yloxy, 3-cyano-oxetan-3-yloxy, 3-deutero-oxetan-3-yloxy, 6-oxa-1-azaspiro[3.3]heptan-1-yl, cyclopropoxy, ethoxyamino, oxetan-3-ylthio, perdeuteroethoxy, phenylamino, tetrahydrofuran-2-yloxy, and tetrahydrofuran-3-yl, or

R^1 is taken together with a ring atom in the piperazine moiety to form a 6-oxohexahydropyrrolo[1,2-a]pyrazin-2-yl or 2-ethyl-3-oxohexahydroimidazo[1,5-a]pyrazin-7-yl.

8. The compound of any one of claims 1-7, wherein R^2 is selected from halo, cycloalkyl, heterocyclyl, -O-(C_0-C_4 alkylene)-(heterocyclyl), -(C_1-C_3 alkylene)-heterocyclyl, -(C_1-C_3 alkylene)-NH-(C_1-C_3 alkyl), -(hydroxy-substituted C_1-C_3 alkylene)-NH-(C_1-C_3 alkyl), C_1-C_4 alkyl substituted with both hydroxy and one or more of amino, C_1-C_4 alkylamino or di-C_1-C_4 alkylamino cyano-substituted C_1-C_4 alkyl, -OH, -$S(O)_2$-C_1-C_4 alkyl, and -(amino substituted C_1-C_3 alkylene)-heterocyclyl, or R^2 is taken together with a ring atom in ring A to form a heterocyclyl or a carbocyclyl that is fused to ring A, wherein any heterocyclyl, cycloalkyl, or carbocyclyl is optionally substituted with up to 3 substituents independently selected from halo, cyano, -OH, -NH_2, -NH(C_1-C_4 alkyl), -NH-C(O)-O-(C_1-C_4 alkyl), =O, -OH, -C(O)-C_1-C_4 alkyl, -C_1-C_4 alkyl, deuterated C_1-C_4 alkyl, -C_1-C_4 haloalkyl, hydroxy-substituted -C_1-C_4 alkyl, -O-C_1-C_4 alkyl, -O-C_1-C_4 haloalkyl, -(C_1-C_4 alkylene)-O-(C_1-C_4 alkyl), -(amino substituted C_1-C_4 alkylene)-O-(C_1-C_4 alkyl), -(C_1-C_4 alkylene)-O-(C_1-C_4 haloalkyl), -C(O)-O-C_1-C_4 alkyl, -COOH, C_3-C_6 cycloalkyl, an optionally substituted second heterocyclyl,

and -NH-(optionally substituted second heterocyclyl).

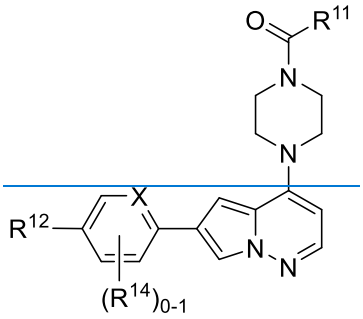
9. The compound of any one of the claims 1-8, wherein R^2 is selected from 1-(1-hydroxypropan-2-yl)-4-methoxypiperidin-4-yl, 1-(3-difluoromethoxy)propan-2-yl-4-methoxypiperidin-4-yl, 1-(3-methoxy)propan-2-yl-4-methoxypiperidin-4-yl, 1-(oxetan-3-yl)-4-methoxypiperidin-4-yl, 1-(oxetan-3-yl)piperidin-4-yl, 1-(propan-2-yl)piperidin-3-yl, 1-(propan-2-yl)piperidin-4-yl, 1-(pyrrolidin-1-yl)ethan-1-yl, 1,2,3,6-tetrahydropyridin-4-yl, 1,4-diazabicyclo[4.2.0]octan-4-yl, 1-acetylpiperdin-4-yl, 1-cyclobutylpiperidin-3-yl, 1-ethyl-3,3-difluoropiperidin-4-yl, 1-ethyl-3-fluoropiperidin-4-yl, 1-ethyl-3-hydroxyazetidin-3-yl, 1-ethyl-4-fluoropyrrolidin-3-yl, 1-ethylazetidin-3-yl, 1-ethylazetidin-3-yloxy, 1-ethylpiperidin-3-yl, 1-ethylpiperidin-3-yloxy, 1-ethylpiperidin-4-yl, 1-ethylpiperidin-4-yloxy, 1-ethylpyrrolidin-3-yl, 1-ethylpyrrolidin-3-ylmethoxy, 1-ethylpyrrolidin-3-yloxy, 1H-pyrrolidin-2-yl, 1-hydroxy-2-aminoprop-2-yl, 1-isopropyl-1,2,3,6-tetrahydropyridin-4-yl, 1-isopropyl-2-methylpyrrolidin-2-yl, 1-isopropyl-3,4-dimethylpiperazin-3-yl, 1-isopropyl-3-ethoxypiperidin-3-yl, 1-isopropyl-3-fluoropiperidin-3-yl, 1-isopropyl-3-hydroxyazetidin-3-yl, 1-isopropyl-3-hydroxypiperidin-3-yl, 1-isopropyl-3-hydroxypyrrolidin-3-yl, 1-isopropyl-3-methoxyazetidin-3-yl, 1-isopropyl-3-methoxypiperidin-3-yl, 1-isopropyl-3-methoxypyrrolidin-3-yl, 1-isopropyl-3-methylpiperazin-3-yl, 1-isopropyl-4-cyanopiperidin-4-yl, 1-isopropyl-4-ethoxypiperidin-4-yl, 1-isopropyl-4-fluoropiperidin-4-yl, 1-isopropyl-4-fluoropyrrolidin-3-yl, 1-isopropyl-4-hydroxypiperidin-3-yl, 1-isopropyl-4-hydroxypiperidin-4-yl, 1-isopropyl-4-methoxypiperidin-4-yl, 1-isopropyl-4-methylpiperazin-3-yl, 1-isopropyl-4-methylpiperidin-4-yl, 1-isopropyl-4-trifluoromethylpiperidin-4-yl, 1-isopropyl-5-methylpyrrolidin-3-yl, 1-isopropylazetidin-2-ylmethoxy, 1-isopropylazetidin-3-yl, 1-isopropylazetidin-3-ylmethoxy, 1-isopropylazetidin-3-yloxy, 1-isopropylpiperazin-3-yl, 1-isopropylpiperazin-4-yl, 1-isopropylpiperidin-2-yl, 1-isopropylpiperidin-3-yl, 1-isopropylpiperidin-4-yl, 1-isopropylpyrrolidin-2-yl, 1-isopropylpyrrolidin-3-yl, 1-methyl-1-cyanoethyl, 1-sec-butylpiperidin-4-yl, 1-t-butoxycarbonyl-4-aminopiperidin-4-yl, 2-(isopropylamino)-3-hydroxypropan-2-yl, 2-(isopropylamino)-propan-2-yl, 2,3,5,6-tetrahydroimidazo[2,1-b]thiazol-6-yl, 2,6-diazaspiro[3.3]heptan-2-yl, 2,6-diazaspiro[3.4]octan-2-yl, 2,6-diazaspiro[3.4]octan-6-yl, 2,7-diazaspiro[4.4]nonan-2-yl, 2-difluoromethylpiperazin-1-yl, 2-isopropyl-2,6-diazaspiro[3.3]heptan-6-yl, 2-methyl-1H-

pyrrolidin-2-yl, 2-oxa-5,8-diazaspiro[3.5]nonan-8-yl, 2-oxo-4-ethylpiperazin-1-yl, 2-oxopiperazin-1-yl, 2-trifluoromethylpiperazin-1-yl, 3,3-difluoropiperidin-4-yl, 3,3-dimethyl-4-ethylpiperazin-1-yl, 3-aminopyrrolidin-1-yl, 3-fluoropiperidin-3-yl, 3-fluoropiperidin-4-yl, 3-hydroxyazetidin-3-yl, 3-hydroxyquinuclidin-3-yl, 3-methyl-4-ethylpiperazin-1-yl, 3-methylpiperazin-1-yl, 3-trifluoromethylpiperazin-1-yl, 4-(1,1,2,2,2-pentadeuteroethyl)piperazin-1-yl, 4-(2,2-difluoroethyl)piperazin-1-yl, 4-(2-hydroxyethyl)piperazin-1-yl, 4-(2-methoxyethyl)piperazin-1-yl, 4-(methoxycarbonylamino)piperidin-4-yl, 4-(oxetan-3-yl)piperazin-1-yl, 4,5-dihydro-1H-imidazol-2-yl, 4,5-dihydro-1H-imidazol-2-ylamino, 4-aminopiperidin-1-yl, 4-cyanopiperidin-4-yl, 4-ethoxypiperidin-4-yl, 4-ethylmorpholin-2-yl, 4-ethylpiperazin-1-yl, 4-ethylpiperazin-1-ylethoxy, 4-fluoropiperidin-4-yl, 4-fluoropyrrolidin-3-yl, 4-hydroxy-tetrahydro-2H-pyran-4-yl, 4-isopropylmorpholin-3-yl, 4-isopropylpiperazin-1-yl, 4-methoxypiperidin-4-yl, 4-methylpiperazin-1-yl, 4-methylpiperidin-4-yl, 5,5-difluoropiperidin-3-yl, 5-ethyl-2,5-diazabicyclo[2.2.1]heptan-2-yl, 6-ethyl-2,6-diazaspiro[3.3]heptan-2-yl, 6-isopropyl-2,6-diazaspiro[3.3]heptan-2-yl, 6-methylmorpholin-2-yl, azetidin-2-ylmethoxy, azetidin-3-yl, bromo, cyclopentyl, hexahydropyrazino[2,1-c][1,4]oxazin-8(1H)-yl, hexahydropyrrolo[1,2-a]pyrazin-2(1H)-yl, morpholin-2-yl, morpholin-3-yl, octahydro-2H-pyrido[1,2-a]pyrazin-2-yl, piperazin-1-yl, piperazin-1-ylethoxy, piperdin-4-yl, piperidin-2-yl, piperidin-3-yl, piperidin-3-yloxy, piperidin-4-yloxy, pyrrolidin-2-yl, pyrrolidin-3-yl, pyrrolidin-3-ylmethoxy, pyrrolidin-3-yloxy, quinuclidin-4-yl, tetrahydro-2H-pyran-4-yl, 1-(1-fluoropropan-2-yl)-4-ethoxypiperidin-4-yl, 1-(1-fluoropropan-2-yl)-4-methoxypiperidin-4-yl, 1-(2-fluoropropyl)-4-ethoxypiperidin-4-yl, 1-(2-fluoropropyl)-4-ethoxypiperidin-4-yl, 1-(3-(difluoromethoxy)propan-2-yl)-4-methoxypiperidin-4-yl, 1-(oxetan-3-yl)-4-ethoxypiperidin-4-yl, 1-(tetrahydrofuran-2-yl)-1-aminomethyl, 1-amino-2-hydroxy-2-methylpropyl, 1-amino-2-methoxyethyl, 1-azabicyclo[2.2.1]heptan-4-yl, 1-cyclopropyl-4-ethoxypiperidin-4-yl, 1-diethylamino-2-hydroxyethyl, 1-ethylamino-2-hydroxyethyl, 1-isopropyl-4-difluoromethoxypiperidin-3-yl, 1-isopropyl-4-difluoromethoxypiperidin-4-yl, 1-isopropyl-4-hydroxymethylpiperidin-4-yl, 1-isopropyl-4-methoxycarbonylpiperidin-4-yl, 1-isopropyl-4-(methoxymethyl)piperidin-4-yl, 1-isopropyl-4-methoxypiperidin-4-yl, 1-methyl-1-isopropylamino-2-hydroxyethyl, 2,2,5,5-tetramethyl-4-hydroxypiperidin-4-yl, 2,2-dimethyl-4-methoxypiperidin-4-yl, 2-amino-1-hydroxyethyl, 2-amino-3-hydroxypropyl, 2-

azaspiro[3.3]heptan-6-yl, 2-hydroxy-1-aminoethyl, 2-hydroxy-1-isopropylaminoethyl, 2-hydroxyethylaminomethyl, 3-amino-oxetan-3-yl, 3-ethoxypiperidin-3-yl, 3-methoxypiperidin-3-yl, 4-amino-tetrahydropyran-4-yl, 4-ethoxytetrahydropyran-4-yl, 4-hydroxycarbonylpiperidin-4-yl, 4-hydroxymethylpiperidin-4-yl, 4-methoxycarbonylpiperidin-4-yl, 4-methoxytetrahydropyran-4-yl, 4-trifluoromethylpiperidin-4-yl, ethylsulfonyl, and oxetan-3-ylaminomethyl, or

R^2 is taken together with ring A to form 3'H-spiro[azetidine-3,1'-isobenzofuran]-5'-yl, 6-isopropyl-4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl, 4,5,6,7-tetrahydrothiazolo[4,5-c]pyridin-2-yl, 4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl, 5,6,7,8-tetrahydroimidazo[1,5-a]pyrazin-3-yl, 7-methyl-5,6,7,8-tetrahydroimidazo[1,5-a]pyrazin-3-yl, 4,5,6,7-tetrahydrothieno[2,3-c]pyridin-2-yl, 5-isopropyl-4,5,6,7-tetrahydrothiazolo[5,4-c]pyridin-2-yl,1-amino-2,3-dihydro-1H-inden-5-yl, or 1-(isopropylamino)-2,3-dihydro-1H-inden-5-yl.

10. A compound of formula (II):



– (II), or a pharmaceutically acceptable salt thereof, wherein:

X is $C(R^{13})$ or N;

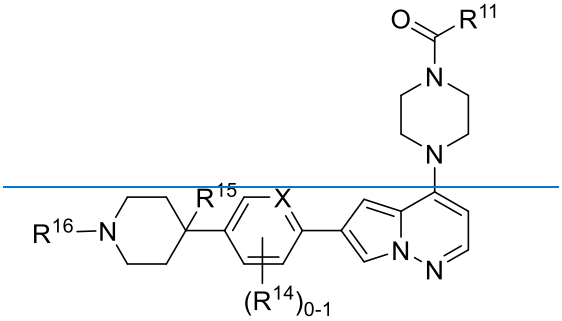
R^{11} is selected from -NH-(C_3-C_4 cycloalkyl); -NH-C_1-C_3 alkyl; -O-C_3-C_4 cycloalkyl; -O-C_1-C_3 alkyl optionally substituted with one or more substituents selected from fluoro, hydroxy, -CN, and deuterium; and -O-(O-containing heterocycle);

R^{12} is selected from piperidin-3-yl optionally 3-substituted with C_1-C_3 alkoxy, fluoro, C_1-C_3 alkyl, or -CN; and piperidin-4-yl optionally 4-substituted with C_1-C_3 alkoxy, fluoro, C_1-C_3 alkyl, -CN, wherein R^{12} is additionally optionally 1-substituted with C_1-C_5 alkyl optionally substituted with one or more -OH and/or one or more -NH_2;

R^{13} is selected from hydrogen, -CN and fluoro; and

~~R^{14}, if present, is fluoro.~~

~~11. The compound of claim 10, wherein the compound is a compound of formula IIa:~~



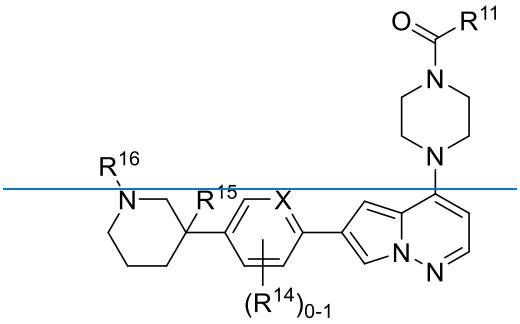
~~(IIa) , or a pharmaceutically acceptable salt thereof, wherein:~~

~~X, R^{11}, R^{14}, and subvariables thereof are as defined in claim 10;~~

~~R^{15} is selected from hydrogen, C_1-C_3 alkoxy, fluoro, C_1-C_3 alkyl, and -CN; and~~

~~R^{16} is hydrogen or C_1-C_5 alkyl optionally substituted with one or more -OH and/or one or more -NH_2.~~

~~12. The compound of claim 10, wherein the compound is a compound of formula IIb:~~



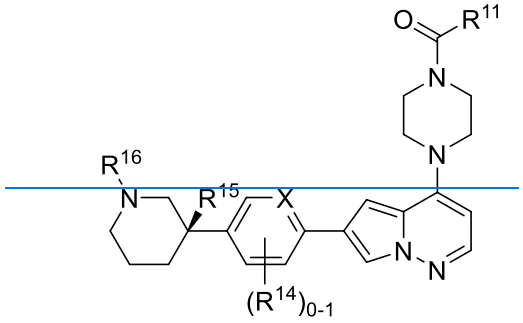
~~(IIb), or a pharmaceutically acceptable salt thereof, wherein:~~

~~X, R^{11}, R^{14}, and subvariables thereof are as defined in claim 10;~~

~~R^{15} is selected from hydrogen, C_1-C_3 alkoxy, fluoro, C_1-C_3 alkyl, and -CN; and~~

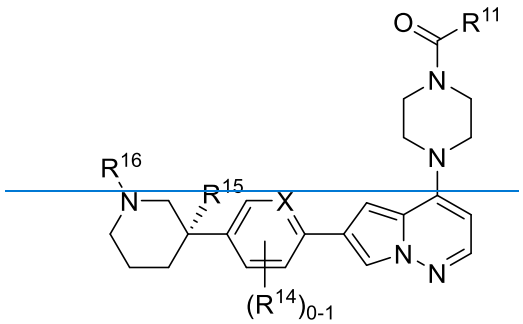
R^{16} is hydrogen or C_1-C_5 alkyl optionally substituted with one or more -OH and/or one or more -NH_2.

13. The compound of claim 12, wherein the compound is a compound of formula IIb-1:



- (IIb-1), or a pharmaceutically acceptable salt thereof.

14. The compound of claim 12, wherein the compound is a compound of formula IIb-2:



- (IIb-2), or a pharmaceutically acceptable salt thereof.

15. The compound of any one of claims 10-14, wherein R^{14} is absent.

16. The compound of any one of claims 10-14, wherein R^{13} is hydrogen.

17. The compound of any one of claims 10-14, wherein R^{11} is selected from -NH-C_1-C_3 alkyl; -O-C_1-C_3 alkyl optionally substituted with one or more substituents selected from fluoro,

hydroxy, -CN, and deuterium; oxetan-3-yloxy and tetrahydrofuran-3-yl.

18. The compound of claim 17, wherein R^{11} is selected from $-OCH_2CH_3$, $-NHCH(CH_3)_2$, oxetan-3-yloxy and tetrahydrofuran-3-yl.

19. A compound selected from any one of the compounds of 100-899 in Table 1.

20. A pharmaceutical composition, comprising at least one compound of any one of claims 1 to 19, and at least one pharmaceutically acceptable excipient.

21. A method of treating or ameliorating fibrodysplasia ossificans progressiva in a subject, comprising administering to the subject in need thereof a pharmaceutically effective amount of at least one compound of any one of claims 1 to 19 or a pharmaceutical composition of claim 20.

22. The method of claim 21, wherein the subject has a mutation in an ALK2 gene that results in the expression of an ALK2 enzyme having an amino acid modification selected from one or more of L196P, PF197-8L, R202I, R206H, Q207E, R258S, R258G, G328A, G328W, G328E, G328R, G356D, and R375P.

23. The method of claim 21 or 22, wherein the ALK2 enzyme has the amino acid modification R206H.

24. A method of treating or ameliorating diffuse intrinsic pontine glioma in a subject, comprising administering to the subject in need thereof a pharmaceutically effective amount of at least one compound of any one of claims 1 to 19 or a pharmaceutical composition of claim 20.

25. The method of claim 24, wherein the subject has a mutation in an ALK2 gene that results in the expression of an ALK2 enzyme having an amino acid modification selected from one or more of R206H, G328V, G328W, G328E, and G356D.

~~26. The method of claim 25, wherein the ALK2 enzyme has the amino acid modification R206H.~~

~~27. A method of inhibiting aberrant ALK2 activity in a subject comprising the step of administering to the subject in need thereof a pharmaceutically effective amount of at least one compound of any one of claims 1 to 19 or a pharmaceutical composition of claim 20.~~

~~28. The method of claim 27, wherein the aberrant ALK2 activity is caused by a mutation in an ALK2 gene that results in the expression of an ALK2 enzyme having an amino acid modification selected from one or more of L196P, PF197-8L, R202I, R206H, Q207E, R258S, R258G, G328A, G328V, G328W, G328E, G328R, G356D, and R375P.~~

~~29. The method of claim 28, wherein the ALK2 enzyme has the amino acid modification R206H.~~

~~30. The method of any one of claims 27-29, wherein the subject is suffering from fibrodysplasia ossificans progressiva or diffuse intrinsic pontine glioma.~~

~~31. A compound that is 6-halo-pyrrolo[1,2-b]pyridazin-4-ol, wherein halo is selected from Cl, I, and Br, particularly 6-bromopyrrolo[1,2-b]pyridazin-4-ol.~~

~~32. The compound of claim 31, having a purity of greater than 90%.~~

~~33. A method of synthesizing a compound of claim 31.~~

~~34. A compound for use in a method of treating or ameliorating fibrodysplasia ossificans progressiva in a subject comprising the step of administering to the subject in need thereof a pharmaceutically effective amount of at least one compound of any one of claims 1 to 19 or a pharmaceutical composition of claim 20.~~

~~35. The compound for use of claim 34, wherein the subject has a mutation in an ALK2 gene that results in the expression of an ALK2 enzyme having an amino acid modification selected from one or more of L196P, PF197-8L, R202I, R206H, Q207E, R258S, R258G, G328A, G328W, G328E, G328R, G356D, and R375P.~~

~~36. The compound for use of claim 34 or 35, wherein the ALK2 enzyme has the amino acid modification R206H.~~

~~37. A compound for use in a method of treating or ameliorating diffuse intrinsic pontine glioma in a subject comprising the step of administering to the subject in need thereof a pharmaceutically effective amount of at least one compound of any one of claims 1 to 19 or a pharmaceutical composition of claim 20.~~

~~38. The compound for use of claim 37, wherein the subject has a mutation in an ALK2 gene that results in the expression of an ALK2 enzyme having an amino acid modification selected from one or more of R206H, G328V, G328W, G328E, and G356D.~~

~~39. The compound for use of claim 38, wherein the ALK2 enzyme has the amino acid modification R206H.~~

~~40. A compound for use in a method of inhibiting aberrant ALK2 activity in a subject comprising the step of administering to the subject in need thereof a pharmaceutically effective amount of at least one compound of any one of claims 1 to 19 or a pharmaceutical composition of claim 20.~~

~~41. The compound for use of claim 40, wherein the aberrant ALK2 activity is caused by a mutation in an ALK2 gene that results in the expression of an ALK2 enzyme having an amino acid modification selected from one or more of L196P, PF197-8L, R202I, R206H, Q207E, R258S, R258G, G328A, G328V, G328W, G328E, G328R, G356D, and R375P.~~

~~42. The compound for use of claim 41, wherein the ALK2 enzyme has the amino acid modification R206H.~~

~~43. The compound for use of claim 40, wherein the subject is suffering from fibrodysplasia ossificans progressiva or diffuse intrinsic pontine glioma.~~

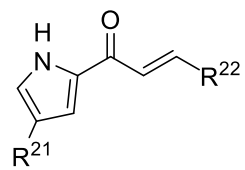
1. A compound that is 6-halo-pyrrolo[1,2-b]pyridazin-4-ol, wherein halo is selected from Cl, I, and Br, or a pharmaceutically acceptable salt thereof.

2. A compound, wherein the compound is 6-bromopyrrolo[1,2-b]pyridazin-4-ol, or a pharmaceutically acceptable salt thereof.

3. The compound of claim 1 or 2, having a purity of greater than 90%.

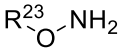
4. A method of synthesizing a compound of any one of claims 1-3 comprising the step of:

combining a compound of Formula C-1:



(C-1),

with a compound of Formula D-1:

 (D-1),

wherein:

R^{21} is selected from chloro, bromo, and iodo;

R^{22} is a leaving group; and

R^{23} is an electron withdrawing group.

5. The method of claim 4, wherein R^{21} is bromo.

6. The method of claim 4 or 5, wherein R^{22} is selected from $-N(R^{24})(R^{25})$ and $-OR^{24}$, wherein each of R^{24} and R^{25} is independently C_1-C_4 alkyl.

7. The method of claim 6, wherein R^{22} is $–N(CH_3)_2$.

8. The method of any one of claims 4-7, wherein R^{23} is selected from methylcarbonyl, t-butylcarbonyl, 4-nitrophenylcarbonyl, 4-cyanophenylcarbonyl, 4-trifluoromethylphenylcarbonyl, 4-fluorophenylcarbonyl, 4-trifluoromethylcarbonylphenylcarbonyl, 4-ethoxycarbonylphenylcarbonyl, 4-trifluoromethylsulfonylphenylcarbonyl, 2,4,6-trimethylphenylcarbonyl, 2,4,6-trimethyl-3,5-dinitrophenylcarbonyl, 2-trifluoromethyl-4-nitrophenyl, and 2,4-dinitrophenyl, and diphenylphosphinyl.

9. The method of claim 8, wherein R^{23} is 4-nitrophenylcarbonyl.

10. The method of any one of claims 4-9, wherein the compound of Formula C-1 and the compound of Formula D-1 are dissolved in a polar solvent.

11. The method of claim 10, wherein the polar solvent is selected from N-methyl-2-pyrrolidine (“NMP”), N,N-dimethylacetamide (“DMAC”), dimethylformamide

("DMF"), tetrahydrofuran ("THF"), methyl-tetrahydrofuran ("MeTHF"), dimethyl sulfoxide ("DMSO"), and cyclopentylmethyl ether ("CPME").

12. The method of claim 10, wherein the polar solvent is NMP or DMAC.

13. The method of any one of claims 4-12, wherein the compound of Formula C-1 is treated with a base.

14. The method of claim 13, wherein the base is selected from $KOC(CH_3)_3$, $NaOC(CH_3)_3$, $LiOC(CH_3)_3$, $LiC(CH_3)_3$, $Li(CH_2)_3CH_3$, $LiN(C_3H_7)_2$, $NaOCH_3$, $NaOCH_2CH_3$, $KOCH_3$, $LiOCH_3$, $LiOCH_2CH_3$, and $KOCH_2CH_3$.

15. The method of claim 13, wherein the base is $KOC(CH_3)_3$.

16. The method of claim any one of claims 4-15, wherein the method further comprises adding a protonating agent.

17. The method of claim 16, wherein the protonating agent is selected from NH_4Cl, $NaHCO_3$, $KHCO_3$, $LiHCO_3$, acetic acid, HCl, HBr, and H_2SO_4.

18. The method of claim 16, wherein the protonating agent is NH_4Cl.