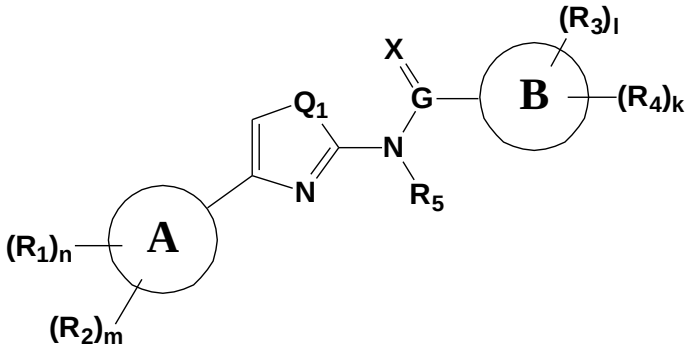
[0012] The compounds of this invention target activated fibroblasts and collagen over production and can therefore be used for treating fibrosis, including primary or secondary fibrosis, such as systemic sclerosis, graft-versus host disease (GVHD), pulmonary fibrosis and autoimmune disorders, lung fibrosis and idiopathic pulmonary fibrosis (IPF), as well as localized processes, as for example, pulmonary fibrosis and liver cirrhosis, or more generalized processes, like progressive systemic sclerosis. The compounds can be further useful in the treatment of different forms of dermal fibrosis, which in addition to scleroderma, include localized and generalized morphea, keloids, hypertrophic scars, familial cutaneous collagenoma and connective tissue nevi of the collagen type. The compounds can be further useful in the treatment of lung fibrosis and idiopathic pulmonary fibrosis (IPF), as well as hepatic fibrosis, resulting from hepatic scarring, caused by surgery or other forms of injury associated with mechanical biliary obstruction. Such fibrosis can lead to portal hypertension, in which scarring distorts blood flow through the liver, or cirrhosis as well as other hepato-fibrotic disorders including Non-alcoholic steatohepatitis (NASH), and alcoholic steatohepatitis (ASH), non-alcoholic fatty liver disease (NAFLD) and alcoholic fatty liver disease (AFLD), which can be similarly be treated by compounds of the invention.

SUMMARY

[0012a] In one aspect of the present disclosure, there is provided a compound represented by the structure of formula **I**:



I

wherein

A ring is a single or fused aromatic or heteroaromatic ring system (e.g., phenyl, thiophene, imidazole, pyrazole, pyrimidine, 2-, 3- or 4-pyridine, benzimidazole, indole, benzothiazole, benzooxazole, imidazopyridin, pyrazolopyridine, pyrrolopyridine, pyridazine, or pyrazine), or a single or fused C_3-C_{10} cycloalkyl (e.g. pyrrolidin-2-one) or a single or fused C_3-C_{10} heterocyclic ring (e.g., morpholine, piperidine, piperazine, tetrahydro-2H-pyran, azetidine, pyrrolidin-2-one);

B ring is a single or fused heteroaromatic ring system (e.g., pyrimidine, 2-, 3- or 4-pyridine, pyridazine or pyrazine, thiophene, thiazole, pyrrole, imidazole, indazole), or a single or fused C_3-C_{10} cycloalkyl (e.g. bicyclo[1.1.1]pentyl, cyclobutyl, cyclohexyl, cyclopentyl) or a single or fused C_3-C_{10} heterocyclic ring (e.g., morpholine, piperidine, piperazine, tetrahydro-2H-pyran, azetidine, pyrrolidin-2-one);

R_1 is F, Cl, Br, I, OH, SH, R_8-OH (e.g. CH_2OH), R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3, CH_2-O-CH_3), -O-R_8-O-R_{10} (e.g., O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, R_8-N(R_{10})(R_{11}) (e.g., CH_2-NH-CH_3, CH_2-NH-C(O)CH_3, CH_2-N(CH_3)$_2$), R_9-R_8-N(R_{10})(R_{11}), $B(OH)_2$, -OC(O)CF_3, -OCH_2Ph, NHC(O)-R (e.g., NHCO-Ph, NHCO-CH_3) , NHC(O)-R_{10} (e.g., NHCO-CH_3), NHCO-N(R_{10})(R_{11}), COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -C(O)NH_2, C(O)NHR (e.g., C(O)NH-Ph), C(O)N(R_{10})(R_{11}), SO_2R, SO_2N(R_{10})(R_{11}), $NHSO_2$(R_{10}) (e.g., $NHSO_2CH_3$), CH(CF_3)(NH-R_{10}), C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., azetidine, pyridine), substituted or unsubstituted aryl (e.g., phenyl) or substituted or unsubstituted benzyl;

R_2 is H, F, Cl, Br, I, OH, SH, R_8-OH (e.g. CH_2OH), R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3, CH_2-O-CH_3), -O-R_8-O-R_{10} (e.g., O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, R_8-N(R_{10})(R_{11}) (e.g., CH_2-NH-CH_3, CH_2-NH-C(O)CH_3, CH_2-N(CH_3)$_2$), R_9-R_8-N(R_{10})(R_{11}), $B(OH)_2$, -OC(O)CF_3, -OCH_2Ph, NHC(O)-R (e.g., NHCO-Ph, NHCO-CH_3) , NHC(O)-R_{10} (e.g., NHCO-CH_3), NHCO-N(R_{10})(R_{11}), COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -C(O)NH_2, C(O)NHR (e.g., C(O)NH-Ph), C(O)N(R_{10})(R_{11}), SO_2R, SO_2N(R_{10})(R_{11}), $NHSO_2$(R_{10}) (e.g., $NHSO_2CH_3$), CH(CF_3)(NH-R_{10}), C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., azetidine, pyridine), substituted or unsubstituted aryl (e.g., phenyl) or substituted or unsubstituted benzyl;

or **R_2** and **R_1** are joined together to form a 5 or 6 membered substituted or unsubstituted, aliphatic or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., 1,4-dioxane, 2,3-dihydro-1,4-dioxine, dioxol, dioxolpyridine) ring;

R_3 is F, Cl, Br, I, OH, SH, R_8-OH, R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, N(R_{10})(R_{11}) (e.g., morpholine, piperazine), R_8-N(R_{10})(R_{11}), R_9-R_8-N(R_{10})(R_{11}), $B(OH)_2$, -OC(O)CF_3, -OCH_2Ph, NHC(O)-R_{10}, NHCO-N(R_{10})(R_{11}), COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -C(O)NH_2, C(O)NHR (e.g., C(O)NH(CH_3)$_2$O-CH_3), C(O)N(R_{10})(R_{11}) (e.g., C(O)-piperidine, C(O)-pyrrolidine,

$C(O)N(CH_3)_2$, C(O)-piperazine), SO_2R, $SO_2N(R_{10})(R_{11})$, $CH(CF_3)(NH\text{-}R_{10})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy, 1-(methylsulfonyl)piperidin-4-oxy, 1-(methyl)piperidin-4-oxy, 1-(ethanone)piperidin-4-oxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted, single, spirocyclic, fused, or bridged C_3-C_{10} heterocyclic ring (e.g., piperazine, 1-(2-methoxyethyl)piperazine, 1-, or 4-methylpiperazine, 1- or 4-(methylsulfonyl)piperazine, 1- or 4-(methylsulfonyl)piperidine, 2-methoxy-1-(piperazin-1-yl)ethenone, , 1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)propanone, 2-hydroxy-1-(piperazin-1-yl)ethenone, *N*-methylpiperazine-1-carboxamide piperidin-4-ol, piperidin-3-ol, morpholine, 3-methylmorpholine, 3-hydroxypiperidine, tetrahydro-*2H*-pyrane, tetrahydro-2H-thiopyran 1,1-dioxide, pyrazole, thiazole, imidazole, pyrrolidine, pyrrolidinone, octahydropyrrolo[1,2-α]pyrazine, 6-methyl-2,6-diazaspiro[3.3]heptane, 2-oxa-7-azaspiro[3.5]nonane, 1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2-methoxy-1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2,8-diazaspiro[4.5]decan-1-one, 2-oxa-7-azaspiro[3.5]nonane), substituted or unsubstituted aryl (e.g., phenyl), substituted or unsubstituted benzyl;

R_4 is H, F, Cl, Br, I, OH, SH, R_8-OH, R_8-SH, $-R_8\text{-}O\text{-}R_{10}$ (e.g., $CH_2\text{-}CH_2\text{-}O\text{-}CH_3$, $CH_2\text{-}O\text{-}CH_2\text{-}CH_2\text{-}O\text{-}CH_3$), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, $-CH_2CN$, $-R_8CN$, NH_2, NHR, $N(R)_2$, $N(R_{10})(R_{11})$ (e.g., morpholine, piperazine), $R_8\text{-}N(R_{10})(R_{11})$, $R_9\text{-}R_8\text{-}N(R_{10})(R_{11})$, $B(OH)_2$, $-OC(O)CF_3$, $-OCH_2Ph$, $NHC(O)\text{-}R_{10}$, $NHCO\text{-}N(R_{10})(R_{11})$, COOH, -C(O)Ph, $C(O)O\text{-}R_{10}$, $R_8\text{-}C(O)\text{-}R_{10}$, C(O)H, $C(O)\text{-}R_{10}$, C_1-C_5 linear or branched C(O)-haloalkyl, $-C(O)NH_2$, C(O)NHR (e.g., $C(O)NH(CH_3)_2O\text{-}CH_3$), $C(O)N(R_{10})(R_{11})$ (e.g., C(O)-piperidine, C(O)-pyrrolidine, $C(O)N(CH_3)_2$, C(O)-piperazine), SO_2R, $SO_2N(R_{10})(R_{11})$, $CH(CF_3)(NH\text{-}R_{10})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy, 1-(methylsulfonyl)piperidin-4-oxy, 1-(methyl)piperidin-4-oxy, 1-(ethanone)piperidin-4-oxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted, single, spirocyclic, fused, or bridged C_3-C_{10} heterocyclic ring (e.g., piperazine, 1-(2-methoxyethyl)piperazine, 1-, or 4-methylpiperazine, 1- or 4-(methylsulfonyl)piperazine, 1- or 4-(methylsulfonyl)piperidine, 2-methoxy-1-(piperazin-1-yl)ethenone, , 1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)propanone, 2-hydroxy-1-(piperazin-1-yl)ethenone, *N*-methylpiperazine-1-carboxamide piperidin-4-ol, piperidin-3-ol, morpholine, 3-methylmorpholine, 3-hydroxypiperidine, tetrahydro-*2H*-pyrane, tetrahydro-2H-thiopyran 1,1-dioxide, pyrazole, thiazole,

imidazole, pyrrolidine, pyrrolidinone, octahydropyrrolo[1,2-α]pyrazine, 6-methyl-2,6-diazaspiro[3.3]heptane, 2-oxa-7-azaspiro[3.5]nonane, 1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2-methoxy-1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2,8-diazaspiro[4.5]decan-1-one, 2-oxa-7-azaspiro[3.5]nonane), substituted or unsubstituted aryl (e.g., phenyl), substituted or unsubstituted benzyl;

or **R_3** and **R_4** are joined together to form a 5 or 6 membered substituted or unsubstituted, aliphatic (e.g., cyclopentene) or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., thiophene, furane, pyrrol, pyrazole) ring;

R_5 is H, **R_{20}**, F, Cl, Br, I, CF_3, -C(O)Ph, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -$C(O)NH_2$, C(O)NHR, C(O)N(R_{10})(R_{11}), SO_2R, $SO_2N(R_{10})(R_{11})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted C_3-C_8 heterocyclic ring, substituted or unsubstituted aryl, or substituted or unsubstituted benzyl;

Q_1 is NH, S, or O;

G=X is C=O, C=S, S=O or SO_2;

R is H, OH, F, Cl, Br, I, CN, CF_3, NO_2, NH_2, NH(R_{10}) (e.g., NH(CH_3)), N(R_{10})(R_{11}), R_{20}, C_1-C_5 linear or branched, C_1-C_5 substituted or unsubstituted alkyl (e.g., methyl, ethyl, CH_2CH_2OH, $CH_2CH_2OCH_3$), R_8-R_{10} (e.g., CH_2-OH, CH_2CH_2-OH), C(O)-R_{10} (e.g., C(O)-methylpyrroldine, C(O)-methylpiperidine, C(O)-CH_3), C_1-C_5 substituted or unsubstituted C(O)-alkyl (e.g., C(O)-CH_2CH_2-OCH_3, C(O)-CH_3, C(O)-CH_2-N(CH_3)$_2$, C(O)-CH_2-CH_2-N(CH_3)$_2$, C(O)-CH_2-OH), C(O)-R_8-R_{10} (e.g., C(O)-CH_2CH_2-OH), C(O)-substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., C(O)-methylpyrroldine, C(O)-methylpiperidine), C_1-C_5 substituted or unsubstituted SO_2-alkyl (e.g., SO_2-CH_3), C_1-C_5 substituted or unsubstituted C(O)-NH-alkyl (e.g., C(O)-NH-CH_3), C_1-C_5 linear or branched C(O)-O-alkyl (e.g., C(O)-O-tBu), C_1-C_5 linear or branched alkoxy, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3), C_1-C_5 linear or branched haloalkyl (e.g., CF_3, CF_2CH_3, CH_2CF_3, $CF_2CH_2CH_3$, $CH_2CH_2CF_3$, $CF_2CH(CH_3)_2$,$CF(CH_3)$-$CH(CH_3)_2$), R_8-aryl (e.g., CH_2-Ph), substituted or unsubstituted aryl (e.g., phenyl), or substituted or unsubstituted heteroaryl (e.g., pyridine (2, 3, and 4-pyridine); or

two geminal **R** substitutions are joined together to form a 3 - 6 membered substituted or unsubstituted, aliphatic (e.g., cyclopropyl, cyclopentene) or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., thiophene, furane, pyrrol, pyrazole) ring;

R_8 is $[\mathbf{CH_2}]_p$

wherein **p** is between 1 and 10 (e.g., 2);

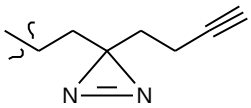
R_9 is $[CH]_q$, $[C]_q$

wherein **q** is between 2 and 10;

R_{10} and **R_{11}** are each independently H, OH, substituted or unsubstituted C_1-C_5 linear or branched alkyl (e.g., methyl, ethyl, CH_2-CH_2-O-CH_3), C_1-C_5 linear or branched alkoxy (e.g., O-CH_3), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., 1-(methylsulfonyl)piperidine, 1-(methylsulfonyl)piperazine, tetrahydro-*2H*-pyrane, morpholine, thiomorpholine 1,1-dioxide, methyl-pyrrolidine, methyl-piperidine), C(O)-alkyl, or S(O)$_2$-alkyl;

or $\mathbf{R_{10}}$ and $\mathbf{R_{11}}$ are joined to form a substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., morpholine, piperazine, piperidine, pyrrolidine, 1-methylpyrrolidin-2-one, oxetane, azetidine, 1-methylazetidine);

$\mathbf{R_{20}}$ is represented by the following structure:



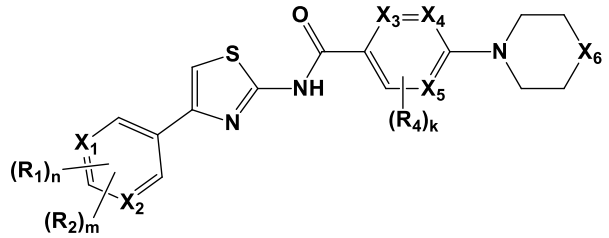
wherein substitutions include: F, Cl, Br, I, OH, SH, CF_3, CN, NO_2, substituted or unsubstituted C_1-C_5 linear or branched alkyl (e.g., methyl, methoxyethyl), substituted or unsubstituted C_1-C_5 linear or branched C(O)-alkyl (e.g., C(O)-CH_3, C(O)-CH_2-O-CH_3), SO_2-alkyl (e.g., SO_2-CH_3), C(O)-NH-alkyl, C_1-C_5 linear or branched alkyl-OH (e.g., $C(CH_3)_2CH_2$-OH, CH_2CH_2-OH), C_3-C_8 heterocyclic ring (e.g., piperidine), substituted or unsubstituted C_1-C_5 linear or branched alkoxy, $N(R)_2$, $N(R_{10})(R_{11})$, aryl, phenyl, heteroaryl, C_3-C_8 cycloalkyl, halophenyl, (benzyloxy)phenyl or any combination thereof;

n and **l** are each independently an integer between 1 and 3 (e.g., 1 or 2);

m and **k** are each independently an integer between 0 and 3 (e.g., 0);

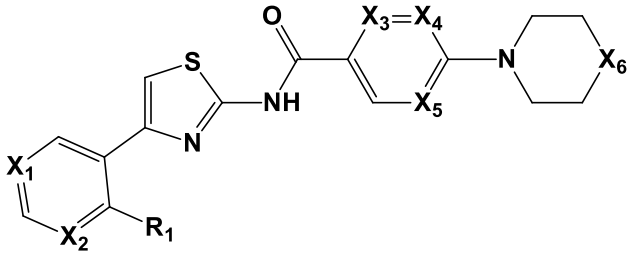
or its pharmaceutically acceptable salt, stereoisomer, tautomer, hydrate, *N*-oxide, prodrug, isotopic variant (e.g., deuterated analog), reverse amide, pharmaceutical product or any combination thereof.

[0012b] In another aspect of the present disclosure, there is provided a compound, represented by the structure of formula **VI**:



VI;

or by the structure of formula **VIII**:



VIII;

wherein

$\mathbf{R_1}$ and $\mathbf{R_2}$ are each independently H, F, Cl, Br, I, OH, SH, R_8-OH (e.g. CH_2OH), R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3, CH_2-O-CH_3), -O-R_8-O-R_{10} (e.g., O-CH_2-CH_2-

O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, R_8-$N(R_{10})(R_{11})$ (e.g., CH_2-NH-CH_3, CH_2-NH-C(O)CH_3, CH_2-$N(CH_3)_2$), R_9-R_8-$N(R_{10})(R_{11})$, $B(OH)_2$, -OC(O)CF_3, -OCH_2Ph, NHC(O)-R (e.g., NHCO-Ph, NHCO-CH_3) , NHC(O)-R_{10} (e.g., NHCO-CH_3), NHCO-$N(R_{10})(R_{11})$, COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -$C(O)NH_2$, C(O)NHR (e.g., C(O)NH-Ph), $C(O)N(R_{10})(R_{11})$, SO_2R, $SO_2N(R_{10})(R_{11})$, $NHSO_2(R_{10})$ (e.g., $NHSO_2CH_3$), $CH(CF_3)(NH\text{-}R_{10})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., azetidine, pyridine), substituted or unsubstituted aryl (e.g., phenyl), or substituted or unsubstituted benzyl;

or $\mathbf{R_2}$ and $\mathbf{R_1}$ are joined together to form a 5 or 6 membered substituted or unsubstituted, aliphatic or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., 1,4-dioxane, 2,3-dihydro-1,4-dioxine, dioxol, dioxolpyridine) ring;

$\mathbf{R_4}$ is H, F, Cl, Br, I, OH, SH, R_8-OH, R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, $N(R_{10})(R_{11})$ (e.g., morpholine, piperazine), R_8-$N(R_{10})(R_{11})$, R_9-R_8-$N(R_{10})(R_{11})$, $B(OH)_2$, -OC(O)CF_3, -OCH_2Ph, NHC(O)-R_{10}, NHCO-$N(R_{10})(R_{11})$, COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -$C(O)NH_2$, C(O)NHR (e.g., C(O)$NH(CH_3)_2$O-CH_3), $C(O)N(R_{10})(R_{11})$ (e.g., C(O)-piperidine, C(O)-pyrrolidine, $C(O)N(CH_3)_2$, C(O)-piperazine), SO_2R, $SO_2N(R_{10})(R_{11})$, $CH(CF_3)(NH\text{-}R_{10})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy, 1-(methylsulfonyl)piperidin-4-oxy, 1-(methyl)piperidin-4-oxy, 1-(ethanone)piperidin-4-oxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted, single, spirocyclic, fused, or bridged C_3-C_{10} heterocyclic ring (e.g., piperazine, 1-(2-methoxyethyl)piperazine, 1-, or 4-methylpiperazine, 1- or 4-(methylsulfonyl)piperazine, 1- or 4-(methylsulfonyl)piperidine, 2-methoxy-1-(piperazin-1-yl)ethenone, 1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)propanone, 2-hydroxy-1-(piperazin-1-yl)ethenone, *N*-methylpiperazine-1-carboxamide piperidin-4-ol, morpholine, 3-methylmorpholine, 3-hydroxypiperidine, tetrahydro-*2H*-pyrane, tetrahydro-2H-thiopyran 1,1-dioxide, pyrazole, thiazole, imidazole, pyrrolidine, pyrrolidinone, octahydropyrrolo[1,2-α]pyrazine, 6-methyl-2,6-diazaspiro[3.3]heptane, 2-oxa-7-azaspiro[3.5]nonane, 1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2-methoxy-1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2,8-diazaspiro[4.5]decan-1-one, 2-oxa-7-

azaspiro[3.5]nonane), substituted or unsubstituted aryl (e.g., phenyl), or substituted or unsubstituted benzyl;

X_1, X_2 X_3, X_4 and **X_5** are each independently C or N;

wherein at least one of **X_3**, **X_4** and **X_5 is N;**

X_6 is O, CH_2, CHR (e.g., CH(OH), $CH(NH_2)$, $CH(NH(CH_3))$), $C(R_{10})(R_{11})$ (e.g., $C(H)CH_2CH_2$-OH, $C(H)CH_2$-OH, 1-methylazetidine), NH, N-R (e.g., N-CH_3, N-SO_2-CH_3, N-R_{20}, N-CH_2CH_2-OCH_3,) or N-C(O)-R_{10} (e.g., N-C(O)O-tBu, N-C(O)-CH_2CH_2-OCH_3, N-C(O)-CH_3, N-C(O)-CH_2-$N(CH_3)_2$, N-C(O)-CH_2-CH_2-$N(CH_3)_2$, N-C(O)-CH_2-OH, N-C(O)-CH_2CH_2-OH, N-C(O)-NH-CH_3, N-C(O)-1-methyl-2-pyrrolidine, N-C(O)-1-methyl-3-pyrrolidine, N-C(O)-1-methyl-3-piperidine, N-C(O)-1-methyl-4-piperidine);

R is H, OH, F, Cl, Br, I, CN, CF_3, NO_2, NH_2, $NH(R_{10})$ (e.g., $NH(CH_3)$), $N(R_{10})(R_{11})$, R_{20}, C_1-C_5 linear or branched, C_1-C_5 substituted or unsubstituted alkyl (e.g., methyl, ethyl, CH_2CH_2OH, $CH_2CH_2OCH_3$), R_8-R_{10} (e.g., CH_2-OH, CH_2CH_2-OH), C(O)-R_{10} (e.g., C(O)-methylpyrroldine, C(O)-methylpiperidine, C(O)-CH_3), C_1-C_5 substituted or unsubstituted C(O)-alkyl (e.g., C(O)-CH_2CH_2-OCH_3 , C(O)-CH_3, C(O)-CH_2-$N(CH_3)_2$, C(O)-CH_2-CH_2-$N(CH_3)_2$, C(O)-CH_2-OH), C(O)-R_8-R_{10} (e.g., C(O)-CH_2CH_2-OH), C(O)-substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., C(O)-methylpyrroldine, C(O)-methylpiperidine), C_1-C_5 substituted or unsubstituted SO_2-alkyl (e.g., SO_2-CH_3), C_1-C_5 substituted or unsubstituted C(O)-NH-alkyl (e.g., C(O)-NH-CH_3), C_1-C_5 linear or branched C(O)-O-alkyl (e.g., C(O)-O-tBu), C_1-C_5 linear or branched alkoxy, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3), C_1-C_5 linear or branched haloalkyl (e.g., CF_3, CF_2CH_3, CH_2CF_3, $CF_2CH_2CH_3$, $CH_2CH_2CF_3$, $CF_2CH(CH_3)_2$,$CF(CH_3)$-$CH(CH_3)_2$), R_8-aryl (e.g., CH_2-Ph), substituted or unsubstituted aryl (e.g., phenyl), substituted or unsubstituted heteroaryl (e.g., pyridine (2, 3, and 4-pyridine); or

two geminal **R** substitutions are joined together to form a 3 - 6 membered substituted or unsubstituted, aliphatic (e.g., cyclopropyl, cyclopentene) or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., thiophene, furane, pyrrol, pyrazole) ring;

R_8 is $[\mathbf{CH_2}]_p$

wherein **p** is between 1 and 10 (e.g., 2);

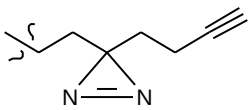
R_9 is $[CH]_q$, $[C]_q$

wherein **q** is between 2 and 10;

R_{10} and **R_{11}** are each independently H, OH, substituted or unsubstituted C_1-C_5 linear or branched alkyl (e.g., methyl, ethyl, CH_2-CH_2-O-CH_3), C_1-C_5 linear or branched alkoxy (e.g., O-CH_3), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., 1-(methylsulfonyl)piperidine, 1-(methylsulfonyl)piperazine, tetrahydro-*2H*-pyrane, morpholine, thiomorpholine 1,1-dioxide, methyl-pyrrolidine, methyl-piperidine), C(O)-alkyl, or $S(O)_2$-alkyl;

or **R_{10}** and **R_{11}** are joined to form a substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., morpholine, piperazine, piperidine, pyrrolidine, 1-methylpyrrolidin-2-one , oxetane, azetidine, 1-methylazetidine),

R_{20} is represented by the following structure:



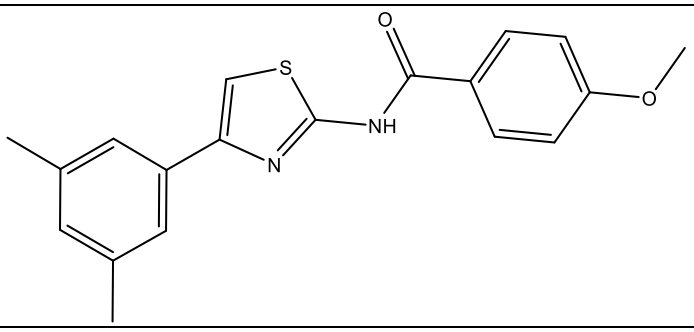
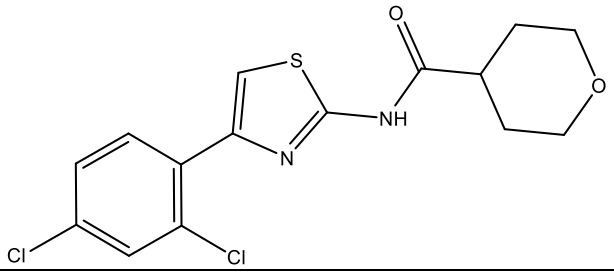
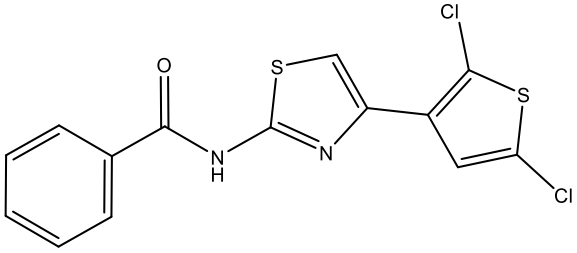
wherein substitutions include: F, Cl, Br, I, OH, SH, CF_3, CN, NO_2, substituted or unsubstituted C_1-C_5 linear or branched alkyl (e.g., methyl, methoxyethyl), substituted or unsubstituted C_1-C_5 linear or branched C(O)-alkyl (e.g., C(O)-CH_3, C(O)-CH_2-O-CH_3), SO_2-alkyl (e.g., SO_2-CH_3), C(O)-NH-alkyl, C_1-C_5 linear or branched alkyl-OH (e.g., $C(CH_3)_2CH_2$-OH, CH_2CH_2-OH), C_3-C_8 heterocyclic ring (e.g., piperidine), substituted or unsubstituted C_1-C_5 linear or branched alkoxy, $N(R)_2$, $N(R_{10})(R_{11})$, aryl, phenyl, heteroaryl, C_3-C_8 cycloalkyl, halophenyl, (benzyloxy)phenyl or any combination thereof;

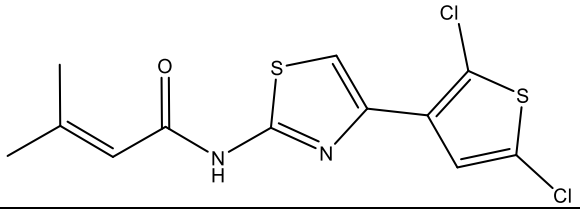
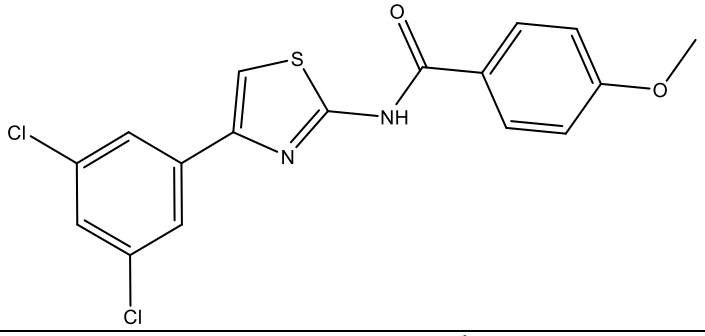
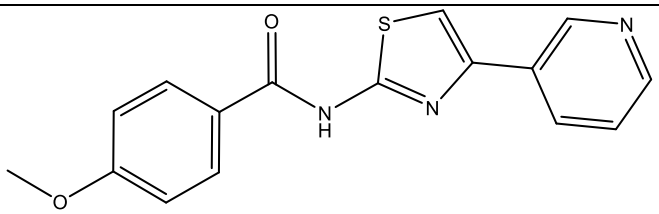
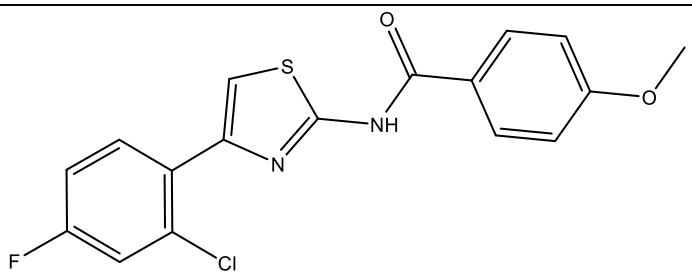
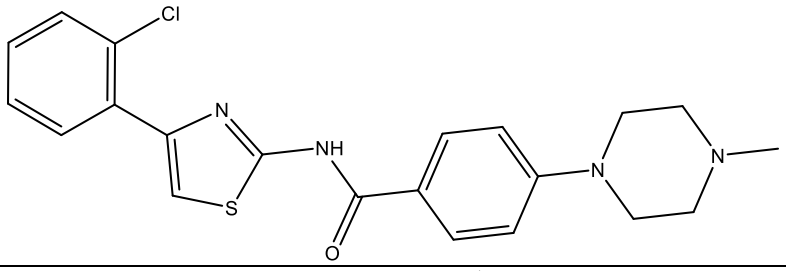
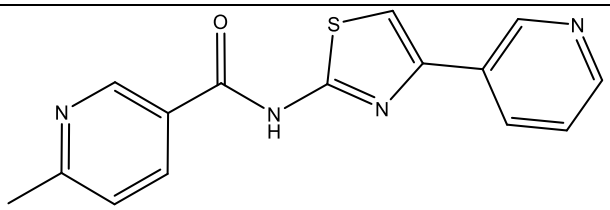
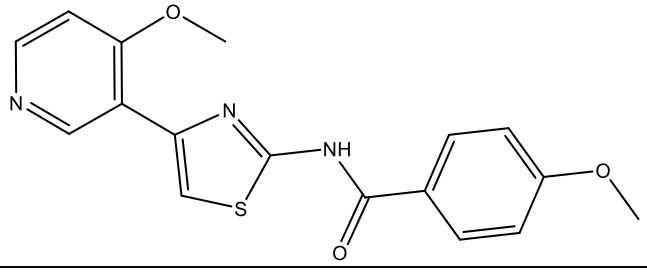
n is an integer between 1 and 3 (e.g., 1 or 2);

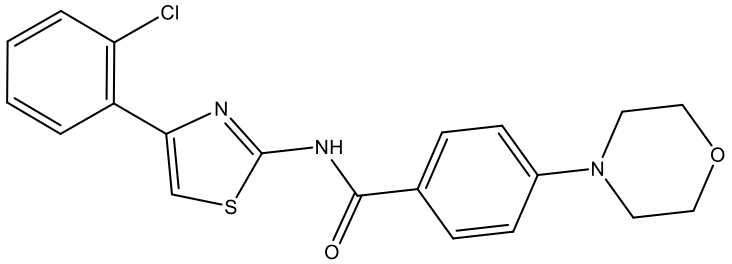
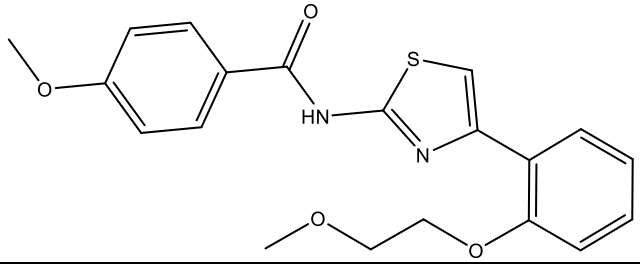
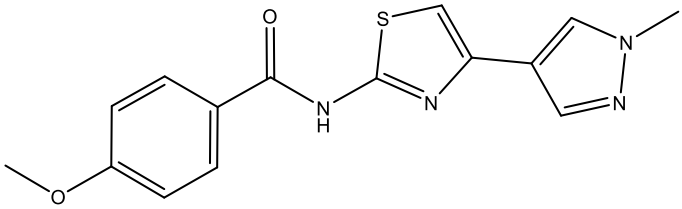
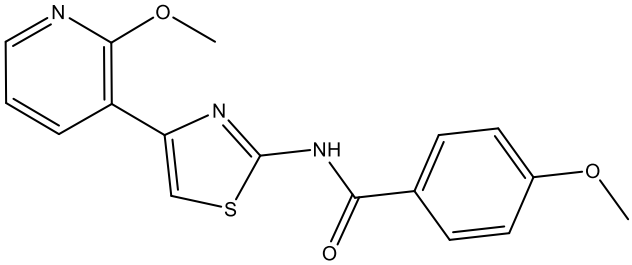
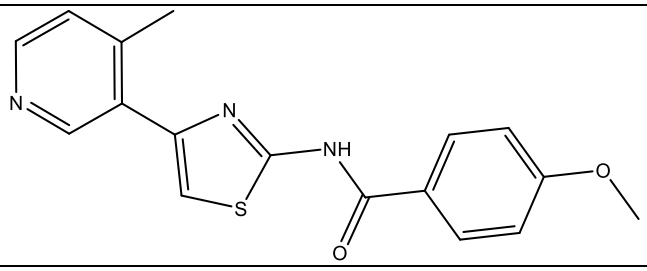
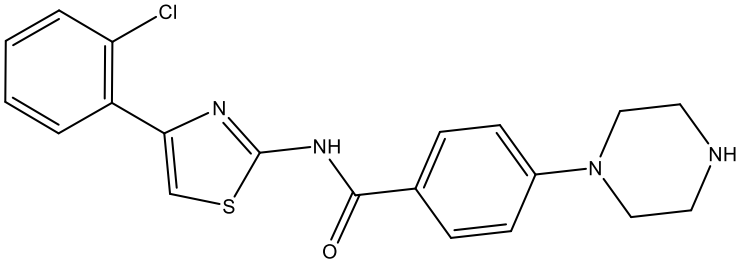
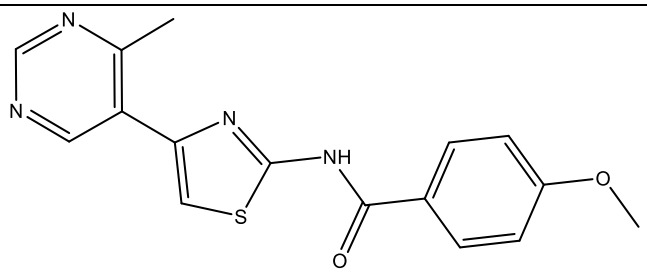
m and **k** are each independently an integer between 0 and 2 (e.g., 0);

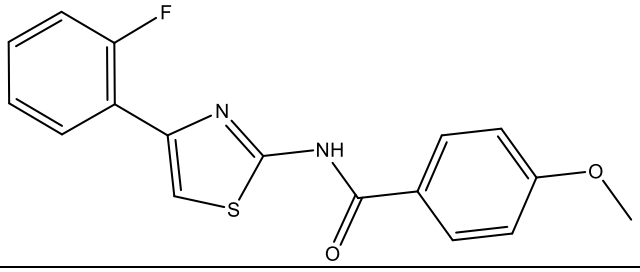
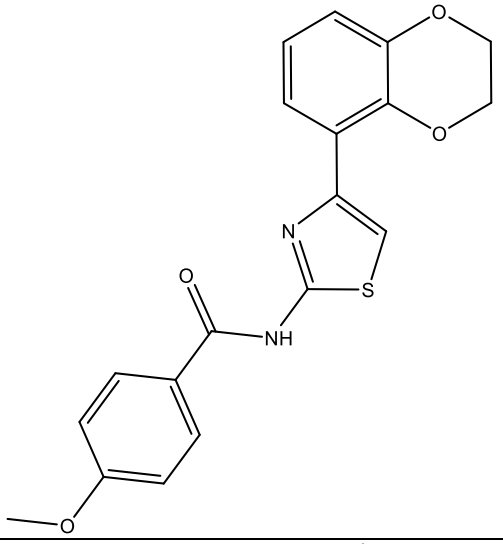
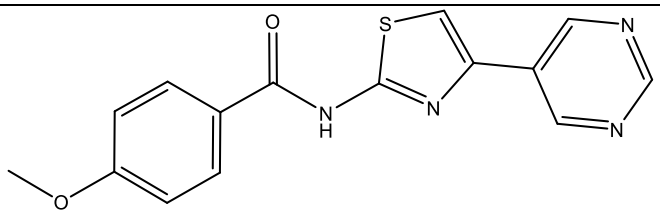
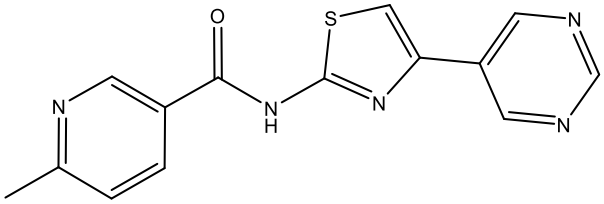
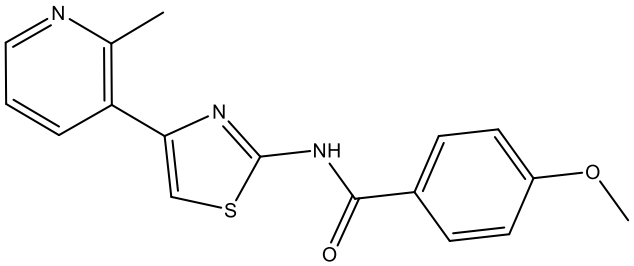
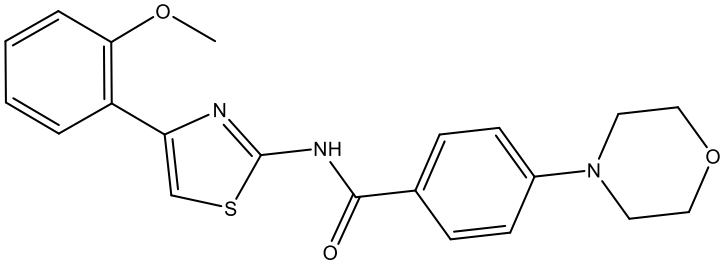
or its pharmaceutically acceptable salt, stereoisomer, tautomer, hydrate, *N*-oxide, prodrug, isotopic variant (e.g., deuterated analog), reverse amide, pharmaceutical product or any combination thereof**.**

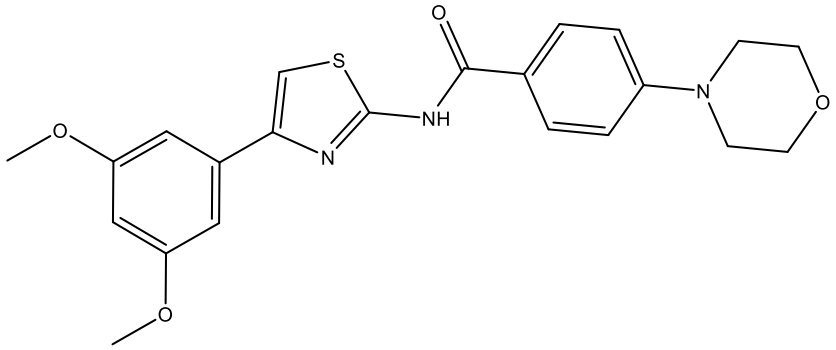
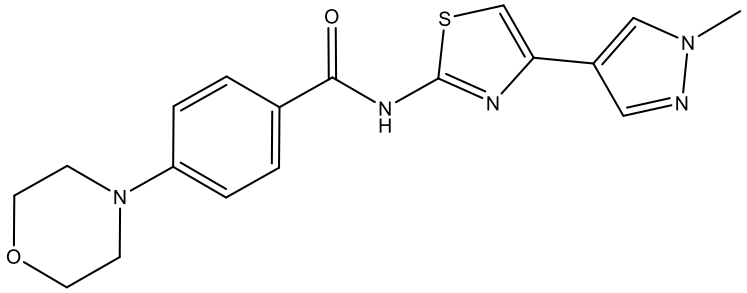
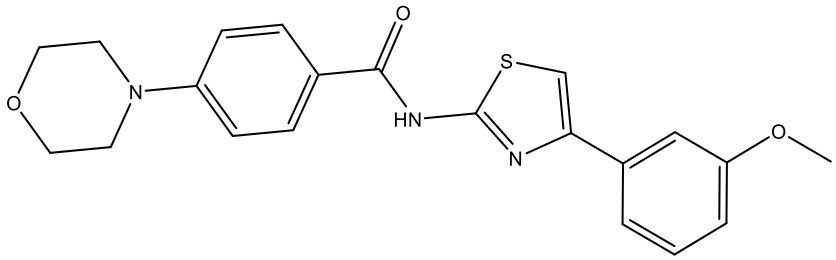
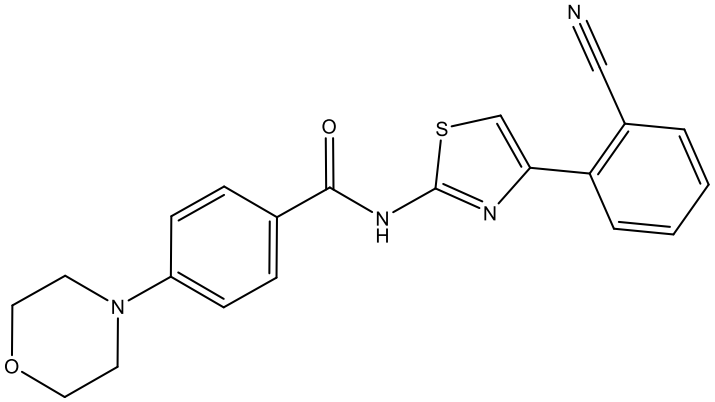
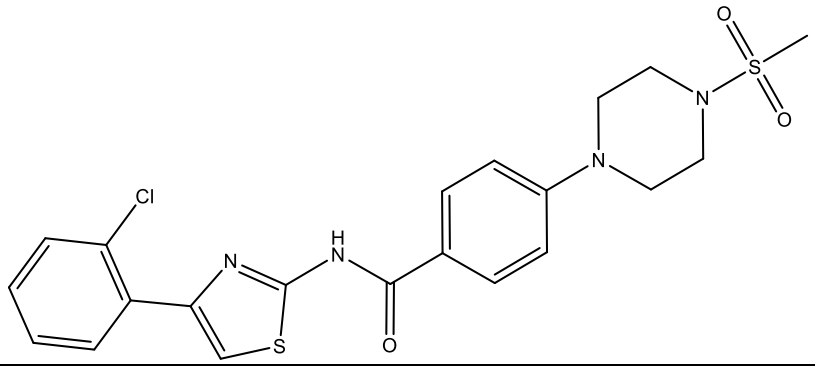
[0012c] In a further aspect of the present disclosure, there is provided a compound, selected from the following:

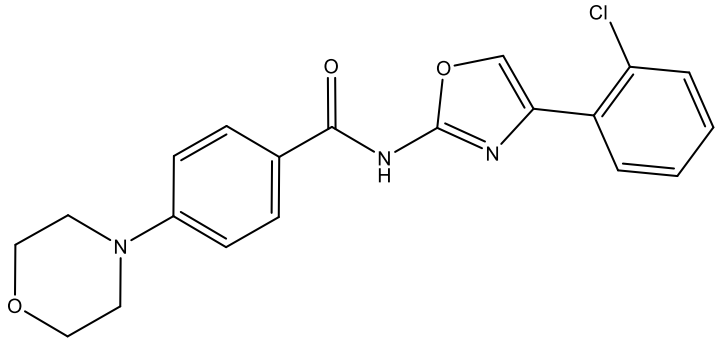
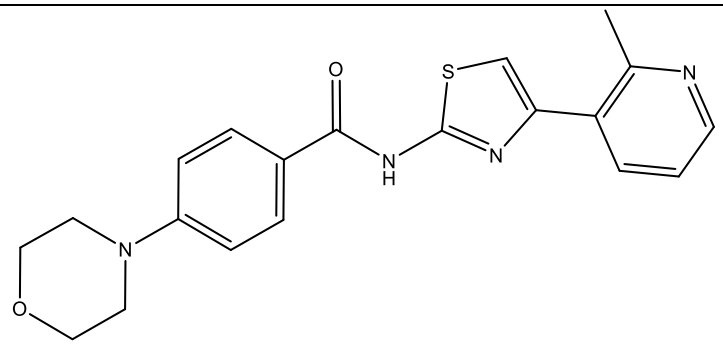
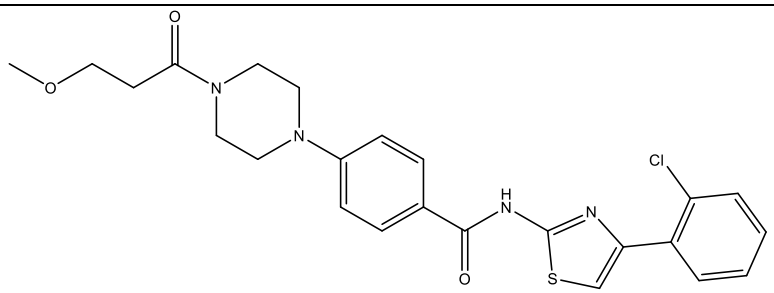
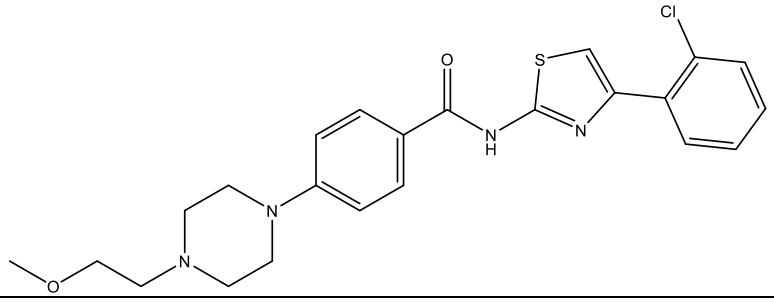
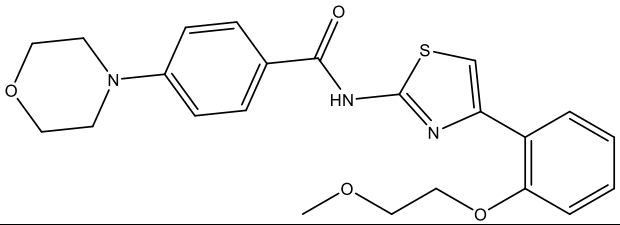
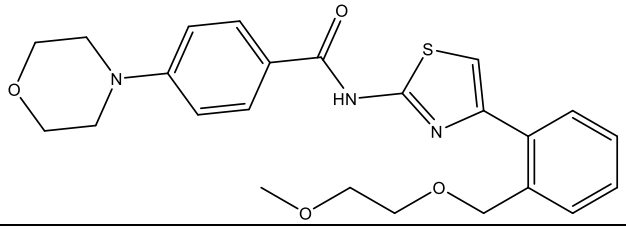
Compound Number	**Compound Structure**
305	
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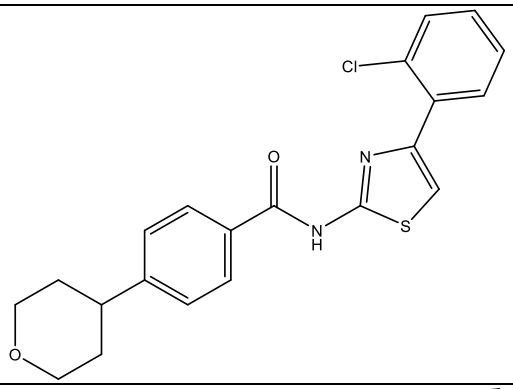
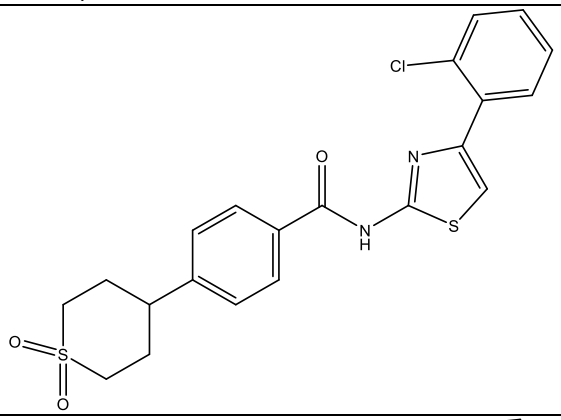
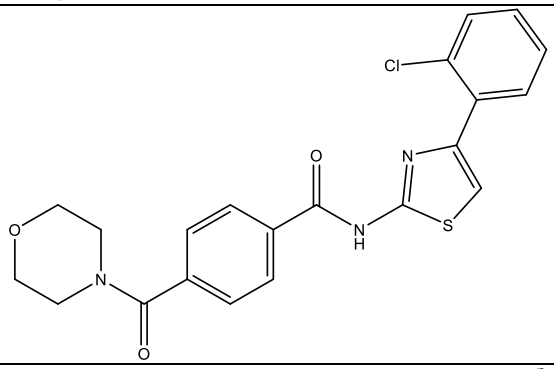
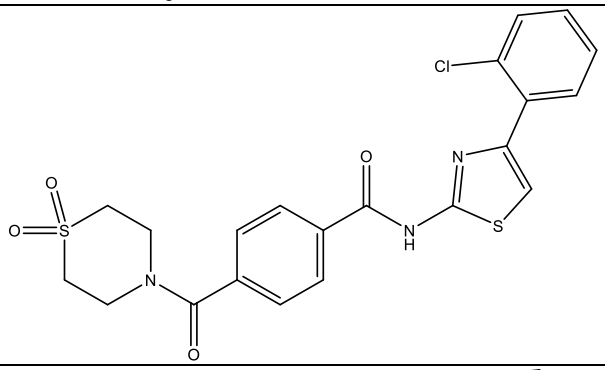
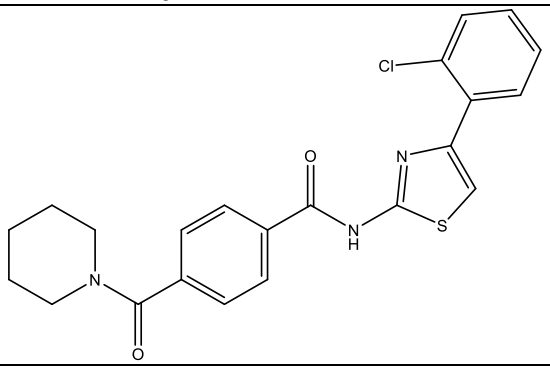
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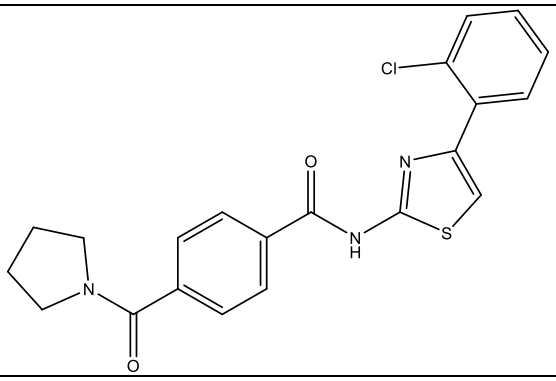
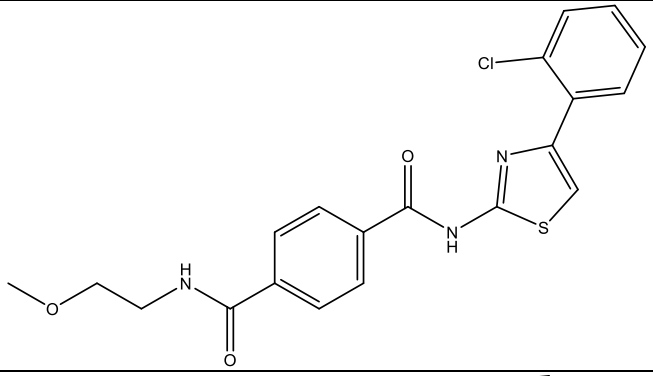
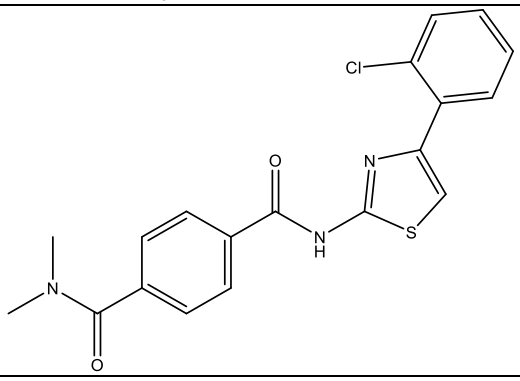
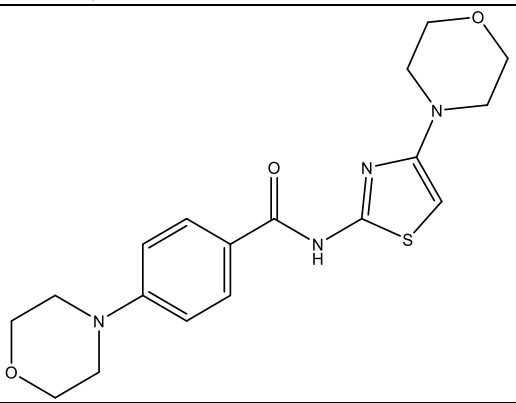
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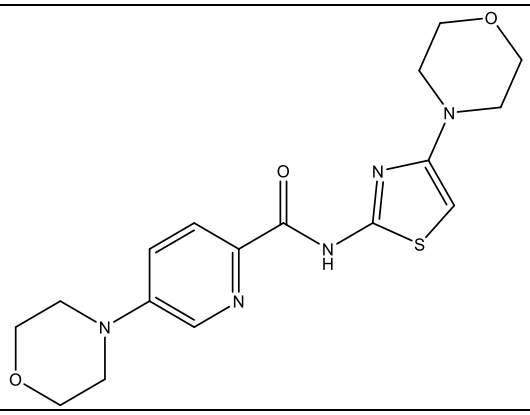
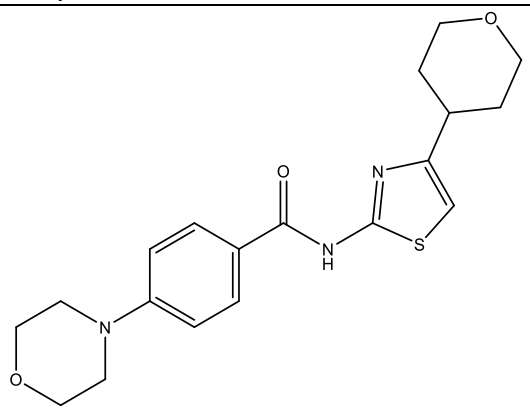
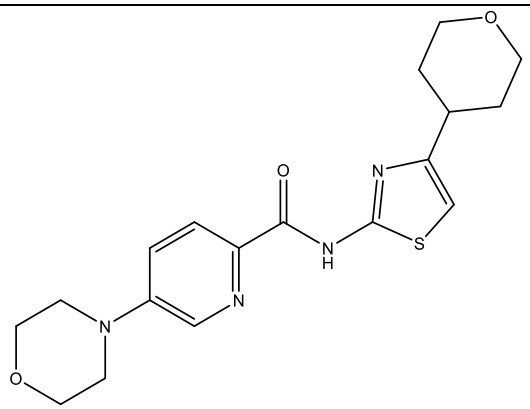
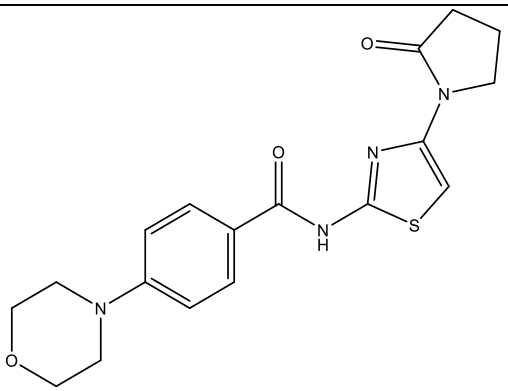
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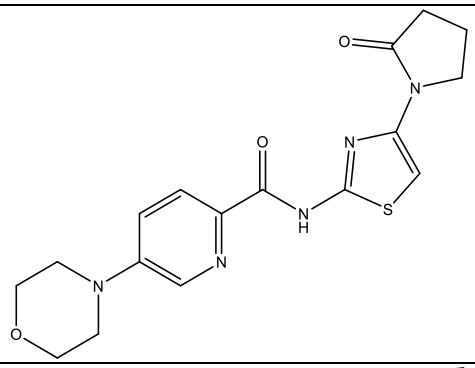
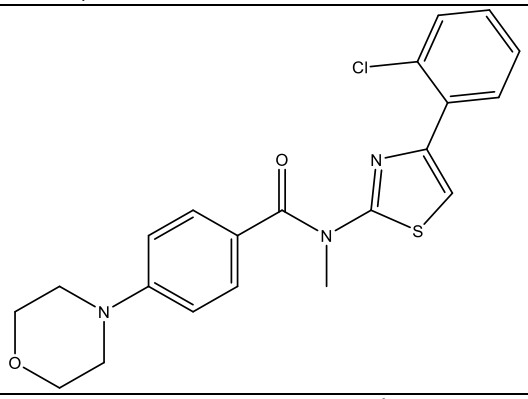
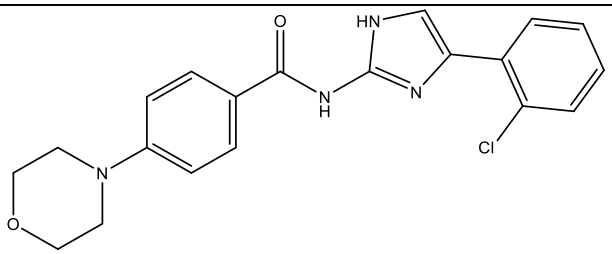
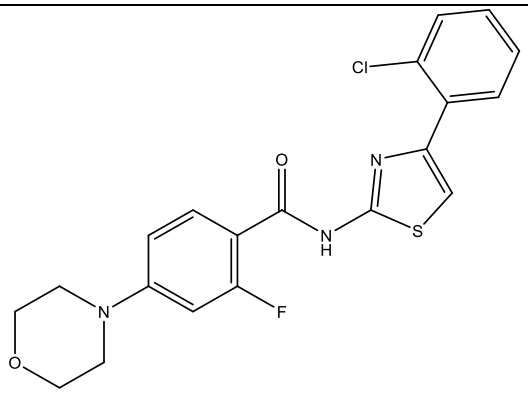
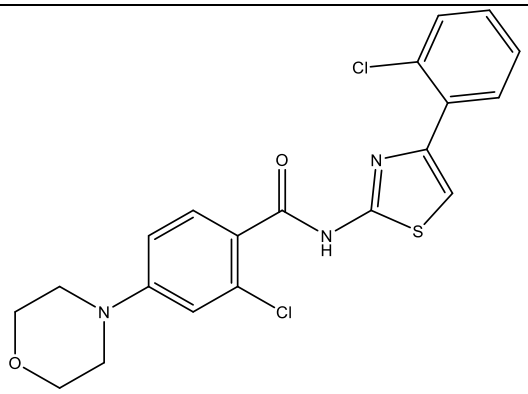
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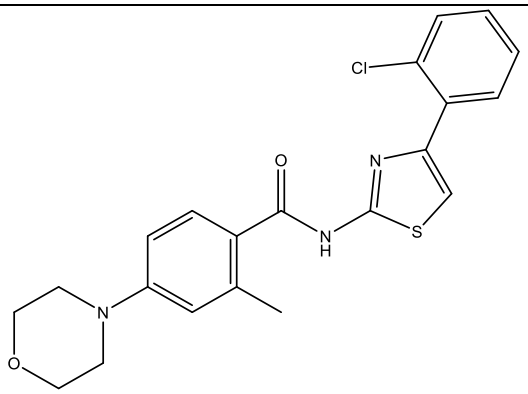
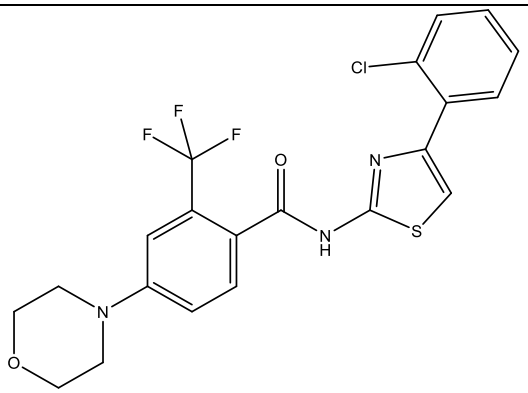
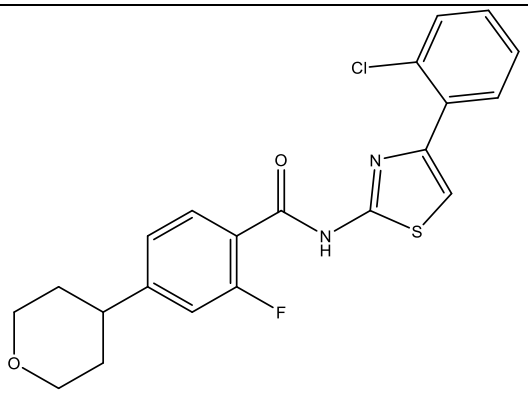
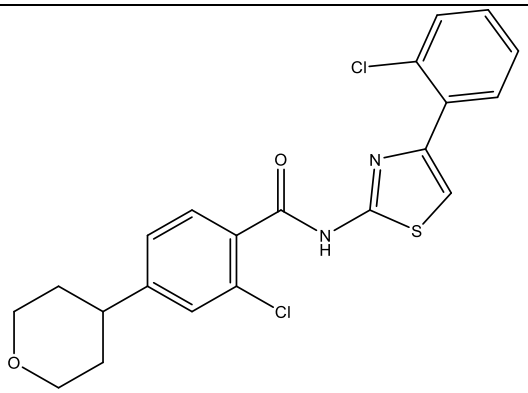
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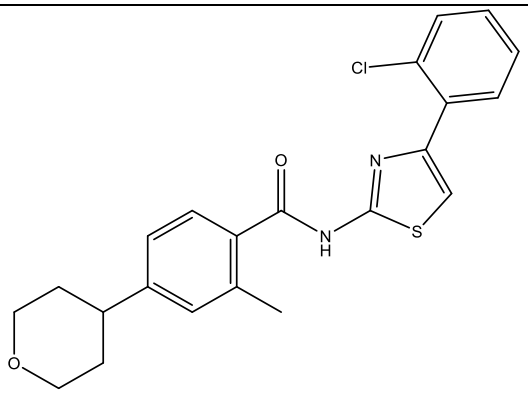
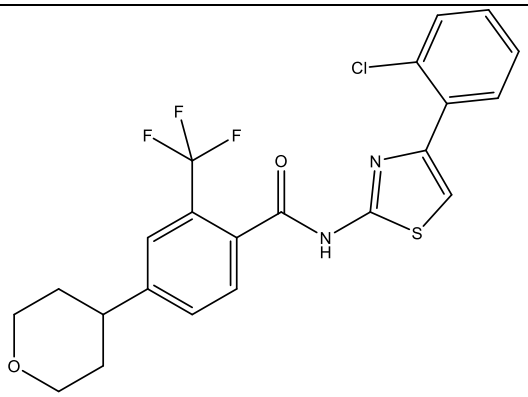
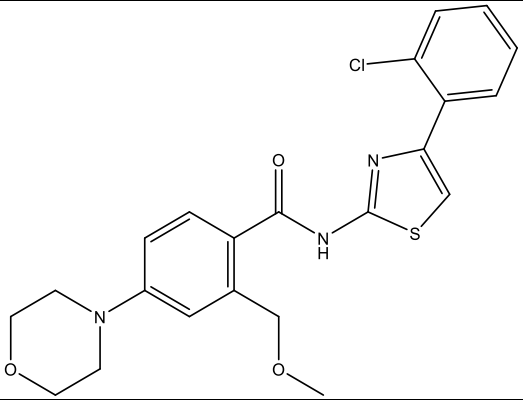
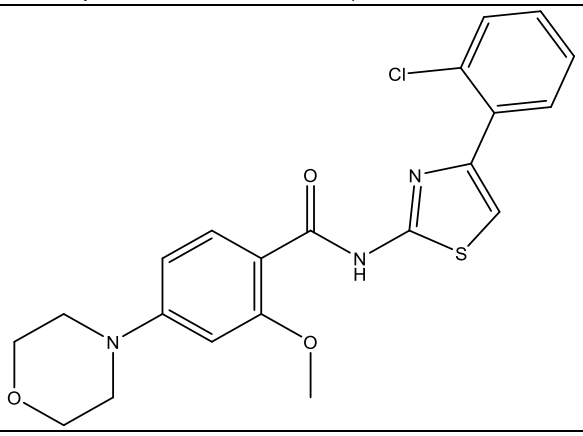
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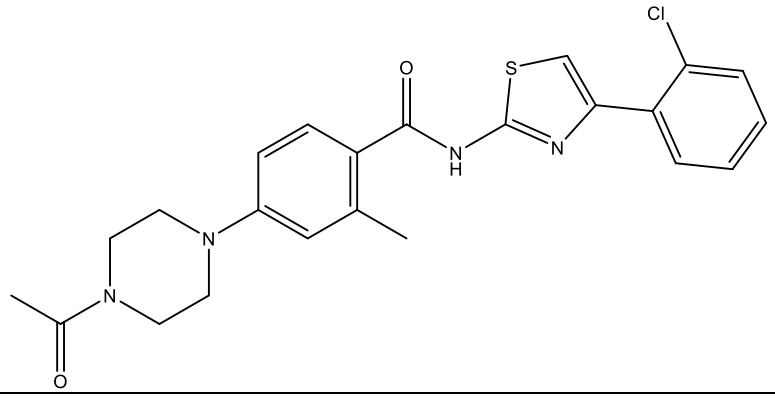
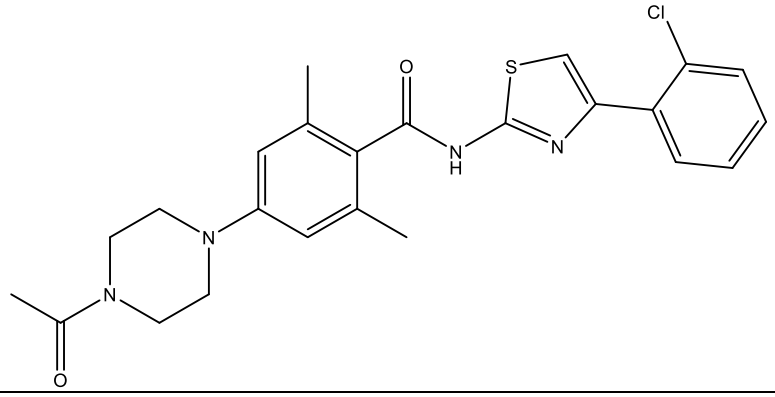
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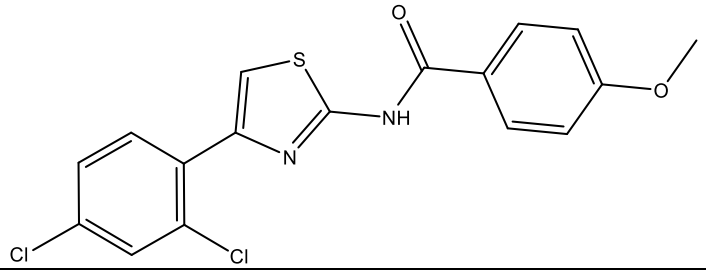
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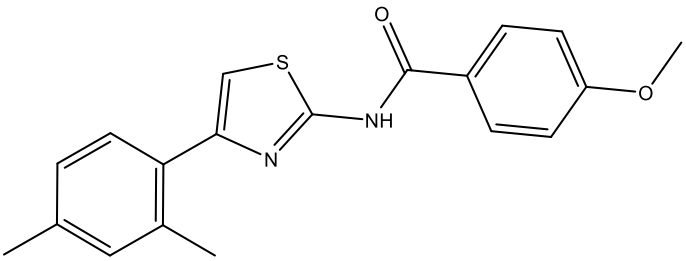
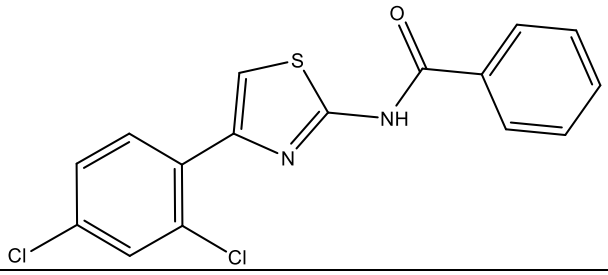
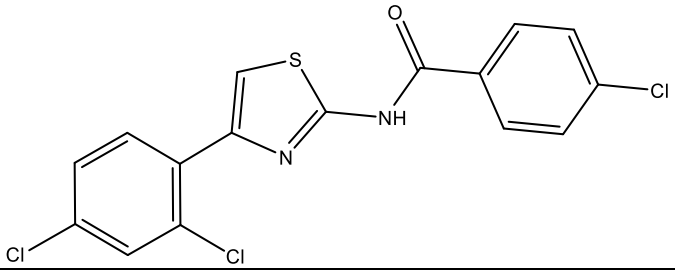
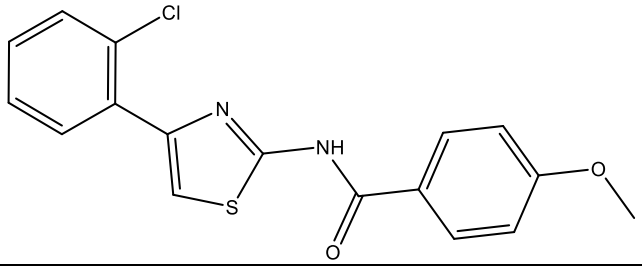
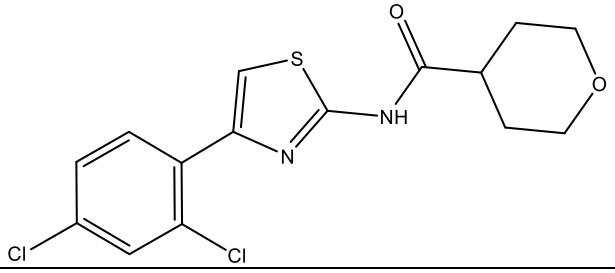
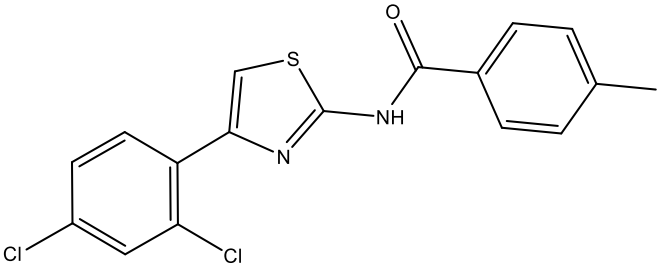
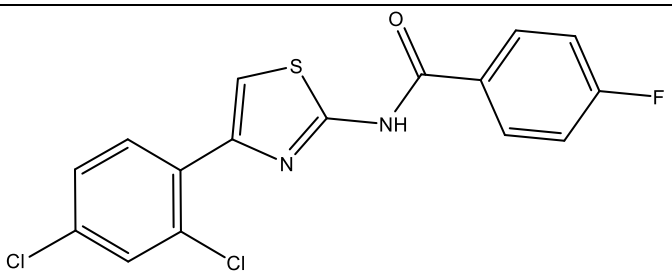
[0012d] In another aspect of the present disclosure, there is provided a pharmaceutical composition comprising a compound disclosed herein and a pharmaceutically acceptable carrier.

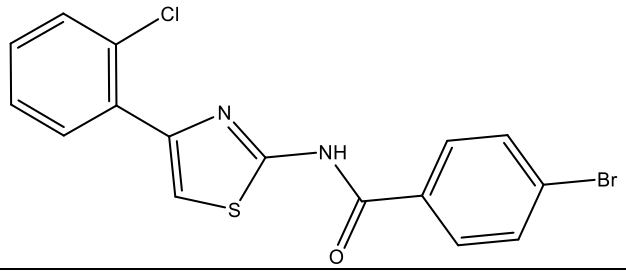
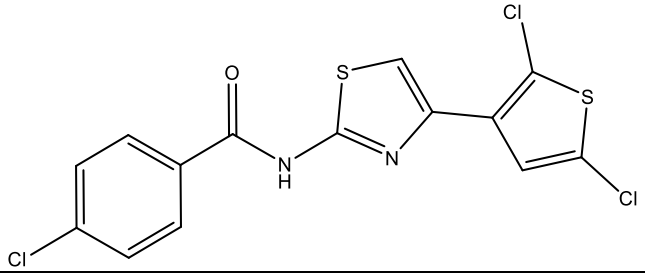
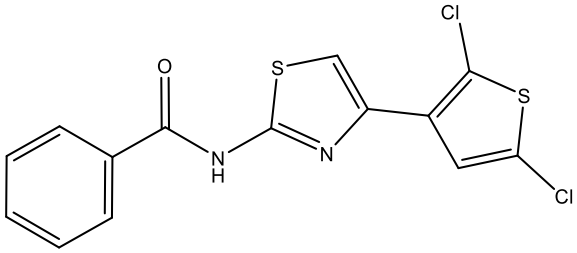
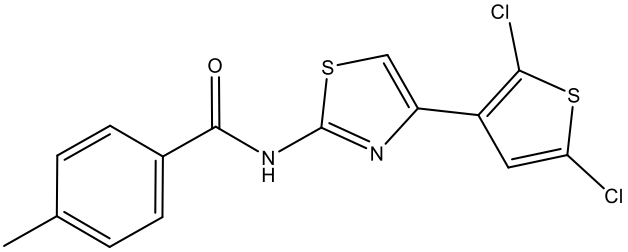
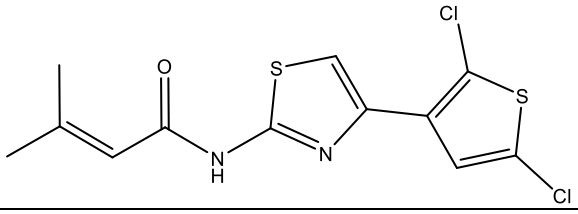
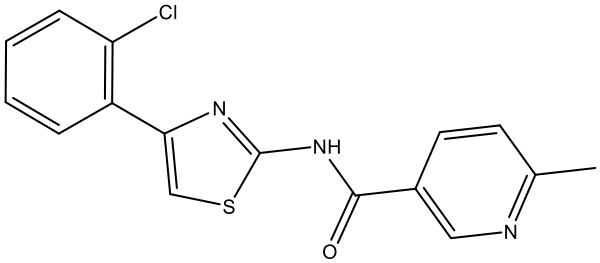
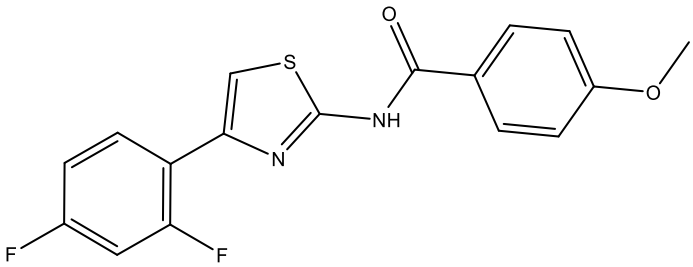
[0012e] In a further aspect of the present disclosure, there is provided a use of a compound disclosed herein, in the manufacture of a medicament for treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting fibrosis in a subject.

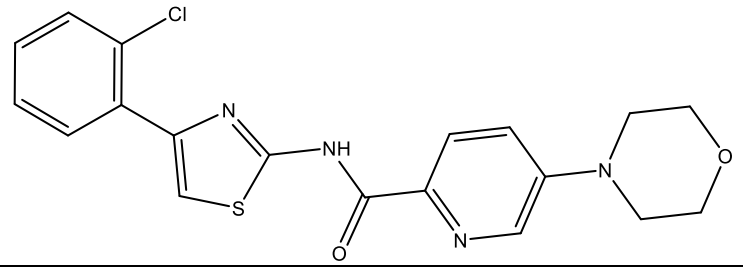
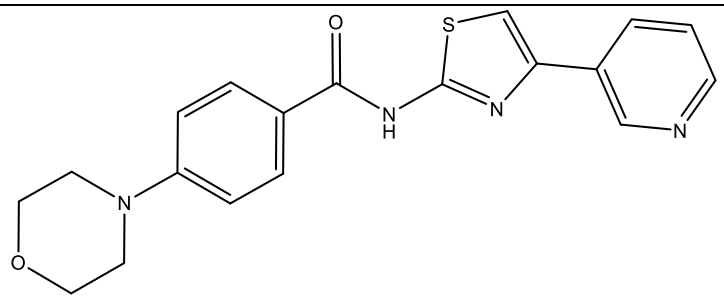
[0012f] In another aspect of the present disclosure, there is provided a use of a compound disclosed herein, in the manufacture of a medicament for treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting lung fibrosis, idiopathic pulmonary fibrosis (IPF), hepato-fibrotic disorder, cirrhosis, alcoholic steatohepatitis (ASH), non-alcoholic steatohepatitis (NASH), alcoholic fatty liver disease (AFLD), non alcoholic fatty liver disease (NAFLD), or an autoimmune disease in a subject.

[0012g]In a further aspect of the present disclosure, there is provided a use of a compound represented by any one of the following structures:

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in the manufacture of a medicament for treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting: fibrosis, lung fibrosis, idiopathic pulmonary fibrosis (IPF), hepato-fibrotic disorder, cirrhosis, alcoholic steatohepatitis (ASH) , non-alcoholic steatohepatitis (NASH), alcoholic fatty liver disease (AFLD), non alcoholic fatty liver disease (NAFLD), or an autoimmune disease, in a subject.

[0012h] In another aspect of the present disclosure, there is provided a compound disclosed herein for use in therapy.

[0013] This disclosure provides a compound or its pharmaceutically acceptable salt, stereoisomer, tautomer, hydrate, *N*-oxide, reverse amide analog, prodrug, isotopic variants (e.g., deuterated analog), PROTAC, pharmaceutical product or any combination thereof, represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below. In various examples, the compound is a Collagen I translation inhibitor.

[0014] This disclosure further provides a pharmaceutical composition comprising a compound or its pharmaceutically acceptable salt, stereoisomer, tautomer, hydrate, *N*-oxide, prodrug, isotopic variants (e.g., deuterated analog), PROTAC, pharmaceutical product or any combination thereof, represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, and a pharmaceutically acceptable carrier.

[0015] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting fibrosis in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from fibrosis under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit fibrosis in said subject. In some examples, the fibrosis is a systemic fibrotic disease. In some examples, the systemic fibrotic disease is systemic sclerosis, multifocal fibrosclerosis (IgG4-associated fibrosis), nephrogenic systemic fibrosis, sclerodermatous graft vs. host disease, or any combination thereof. In some examples, the fibrosis is an organ-specific fibrotic disease. In some examples, the organ-specific fibrotic disease is lung fibrosis, cardiac fibrosis, kidney fibrosis, pulmonary fibrosis, liver and portal vein fibrosis, radiation-induced fibrosis, bladder fibrosis, intestinal fibrosis, peritoneal sclerosis, diffuse fasciitis, wound

healing, scaring, or any combination thereof. In some examples, the lung fibrosis is idiopathic pulmonary fibrosis (IPF). In some examples, the cardiac fibrosis is hypertension-associated cardiac fibrosis, Post-myocardial infarction, Chagas disease-induced myocardial fibrosis or any combination thereof. In some examples, the kidney fibrosis is diabetic and hypertensive nephropathy, urinary tract obstruction-induced kidney fibrosis, inflammatory/autoimmune-induced kidney fibrosis, aristolochic acid nephropathy, polycystic kidney disease, or any combination thereof. In some examples, the pulmonary fibrosis is idiopathic pulmonary fibrosis, silica-induced pneumoconiosis (silicosis), asbestos-induced pulmonary fibrosis (asbestosis), chemotherapeutic agent-induced pulmonary fibrosis, or any combination thereof. In some examples, the liver and portal vein fibrosis is alcoholic and nonalcoholic liver fibrosis, hepatitis C-induced liver fibrosis, primary biliary cirrhosis, parasite-induced liver fibrosis (schistosomiasis), or any combination thereof. In some examples, the diffuse fasciitis is localized scleroderma, keloids, dupuytren's disease, peyronie's disease, myelofibrosis, oral submucous fibrosis, or any combination thereof. In some examples, the fibrosis is primary or secondary fibrosis. In some examples, the fibrosis is a result of systemic sclerosis, graft-versus host disease (GVHD), pulmonary fibrosis, autoimmune disorder, tissue injury, inflammation, oxidative stress or any combination thereof. In some examples, the fibrosis is hepatic fibrosis, lung fibrosis or dermal fibrosis. In some examples, the subject has a liver cirrhosis. In some examples, the dermal fibrosis is scleroderma. In some examples, the dermal fibrosis is a result of a localized or generalized morphea, keloids, hypertrophic scars, familial cutaneous collagenoma, connective tissue nevi of the collagen type, or any combination thereof. In some examples, the hepatic fibrosis is a result of hepatic scarring or chronic liver injury. In some examples, the chronic liver injury results from alcoholism, malnutrition, hemochromatosis, exposure to poisons, toxins or drugs.

[0016] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting lung fibrosis in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from lung fibrosis under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit lung fibrosis in said subject. In some examples, the lung fibrosis is idiopathic pulmonary fibrosis (IPF).

[0017] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting idiopathic pulmonary fibrosis (IPF) in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from idiopathic pulmonary fibrosis (IPF) under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit idiopathic pulmonary fibrosis (IPF) in said subject.

[0018] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting hepato-fibrotic disorder in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed

in Table 1, as defined herein below, to a subject suffering from hepato-fibrotic disorder under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit hepato-fibrotic disorder in said subject. In some examples, the hepato-fibrotic disorder is a portal hypertension, cirrhosis, congenital hepatic fibrosis or any combination thereof.

[0019] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting cirrhosis in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from cirrhosis under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit cirrhosis in said subject. In some examples, the cirrhosis is a result of hepatitis or alcoholism.

[0020] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting alcoholic steatohepatitis (ASH) in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from alcoholic steatohepatitis (ASH) under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit the alcoholic steatohepatitis (ASH) in said subject.

[0021] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting a non-alcoholic steatohepatitis (NASH) in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from non-alcoholic steatohepatitis (NASH) under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit the non-alcoholic steatohepatitis (NASH) in said subject.

[0022] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting an alcoholic fatty liver disease (AFLD) in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from alcoholic fatty liver disease (AFLD) under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit the alcoholic fatty liver disease (AFLD) in said subject.

[0023] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting a non alcoholic fatty liver disease (NAFLD) in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from non alcoholic fatty liver disease (NAFLD) under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit the non alcoholic fatty liver disease (NAFLD) in said subject.

[0024] This disclosure further provides a method of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting an autoimmune disease or disorder in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from an autoimmune disease or disorder under

conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit the autoimmune disease or disorder in said subject.

[0025] This disclosure further provides amethod of treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting an autoimmune disease or disorder in a subject, comprising administering a compound represented by the structure of formula **I-VIII**, and by the structures listed in Table 1, as defined herein below, to a subject suffering from an autoimmune disease or disorder under conditions effective to treat, suppress, reduce the severity, reduce the risk of developing, or inhibit the autoimmune disease or disorder in said subject.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The patent of application file contains at least one drawing executed in color. Copies of this patent or patent application publication with color drawing(s) will be provided by the office upon request and payment of the necessary fee.

[0027] **Figure 1** demonstrates how Protein synthesis monitoring (PSM) specifically monitors collagen 1 synthesis. The assay system comprises human lung fibroblast cell line, WI-38 cells, which are activated to produce higher levels of collagen. Two tRNAs (di-tRNA) which decode one specific glycine codon and one specific proline codon were transfected with control RNAi or an RNAi directed to Collagen 1. The FRET signal specifically monitors collagen 1 translation, as the FRET signal in collagen 1-targeted siRNA treated cells is inhibited by 90%. In gray, cell nuclei stained with DAPI; In white, FRET signals from tRNA pair which decodes glycine-proline di-codons.

[0028] **Figure 2** depicts that hits selectively regulate collagen translation. In the upper panel, the Y-axis depicts normalized values of metabolic labeling in control cells. Only compounds which showed minimal effects on global protein synthesis (±20% of control) and minimal effects on collagen 1 protein accumulation in WI38 cells by di-tRNA Collagen FRET and by Collagen 1 specific immunofluorescence were selected as compounds which selectively regulate collagen synthesis; In the lower panel, Y axis shows the FRET score for the collagen specific di-tRNA (PSM score) and the X-axis shows the normalized immunofluorescence values (relative to control). Compounds that show high PSM score are marked by dot size.

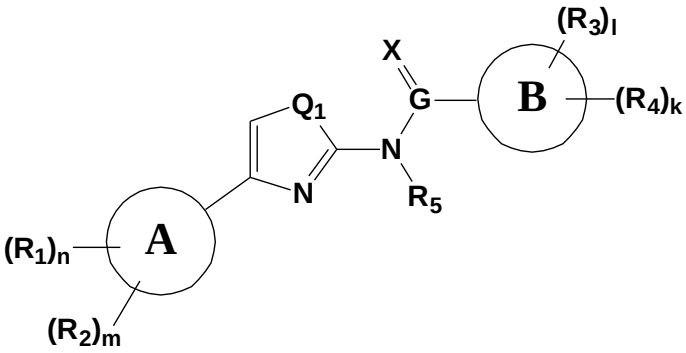
[0029] **Figure 3** demonstrate that Collagen translation modulator compound **327** is tissue selective

[0030] **Figure 4** demonstrate that compound **327** act at the level of translation. **Figure 4A**: WI-38 Human Lung Fibroblasts, 96 hours incubation with compounds. White: Collagen type-I; Gray: DAPI. Immunofluorescence. **Figure 4B**: WI-38 Human Lung Fibroblasts, 24 hours incubation with compounds. FISH analysis. White: Col-I mRNA; Gray: DAPI.

[0031] **Figures 5A** and **5B** demonstrate the efficacy and toxicity of compounds **367**, **365**, **339** and **366**. **Figure 5A** depicts the pEC_{50} of efficacy plotted against pEC_{50} of toxicity. Dashed lines represent x10 or x100 window between efficacy and toxicity. **Figure 5B** depicts representative images from compound **365**. Images were taken with x20 objective in Operetta machine (Perkin-Elmer). White: Collagen type-I; Grey: DAPI.

WHAT IS CLAIMED:

1. A compound represented by the structure of formula **I**:



I

wherein

A ring is a single or fused aromatic or heteroaromatic ring system (e.g., phenyl, thiophene, imidazole, pyrazole, pyrimidine, 2-, 3- or 4-pyridine, benzimidazole, indole, benzothiazole, benzooxazole, imidazopyridin, pyrazolopyridine, pyrrolopyridine, pyridazine, or pyrazine), or a single or fused C_3-C_{10} cycloalkyl (e.g. pyrrolidin-2-one) or a single or fused C_3-C_{10} heterocyclic ring (e.g., morpholine, piperidine, piperazine, tetrahydro-2H-pyran, azetidine, pyrrolidin-2-one);

B ring is a single or fused heteroaromatic ring system (e.g., pyrimidine, 2-, 3- or 4-pyridine, pyridazine or pyrazine, thiophene, thiazole, pyrrole, imidazole, indazole), or a single or fused C_3-C_{10} cycloalkyl (e.g. bicyclo[1.1.1]pentyl, cyclobutyl, cyclohexyl, cyclopentyl) or a single or fused C_3-C_{10} heterocyclic ring (e.g., morpholine, piperidine, piperazine, tetrahydro-2H-pyran, azetidine, pyrrolidin-2-one);

R_1 is F, Cl, Br, I, OH, SH, R_8-OH (e.g. CH_2OH), R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3, CH_2-O-CH_3), -O-R_8-O-R_{10} (e.g., O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, R_8-$N(R_{10})(R_{11})$ (e.g., CH_2-NH-CH_3, CH_2-NH-C(O)CH_3, CH_2-$N(CH_3)_2$), R_9-R_8-$N(R_{10})(R_{11})$, $B(OH)_2$, -OC(O)CF_3, -OCH_2Ph, NHC(O)-R (e.g., NHCO-Ph, NHCO-CH_3) , NHC(O)-R_{10} (e.g., NHCO-CH_3), NHCO-$N(R_{10})(R_{11})$, COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -$C(O)NH_2$, C(O)NHR (e.g., C(O)NH-Ph), $C(O)N(R_{10})(R_{11})$, SO_2R, $SO_2N(R_{10})(R_{11})$, $NHSO_2(R_{10})$ (e.g., $NHSO_2CH_3$), $CH(CF_3)(NH\text{-}R_{10})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., azetidine, pyridine), substituted or unsubstituted aryl (e.g., phenyl) or substituted or unsubstituted benzyl;

R_2 is H, F, Cl, Br, I, OH, SH, R_8-OH (e.g. CH_2OH), R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3, CH_2-O-CH_3), -O-R_8-O-R_{10} (e.g., O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8

cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, R_8-$N(R_{10})(R_{11})$ (e.g., CH_2-NH-CH_3, CH_2-NH-C(O)CH_3, CH_2-$N(CH_3)_2$), R_9-R_8-$N(R_{10})(R_{11})$, $B(OH)_2$, -$OC(O)CF_3$, -OCH_2Ph, NHC(O)-R (e.g., NHCO-Ph, NHCO-CH_3) , NHC(O)-R_{10} (e.g., NHCO-CH_3), NHCO-$N(R_{10})(R_{11})$, COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -$C(O)NH_2$, C(O)NHR (e.g., C(O)NH-Ph), $C(O)N(R_{10})(R_{11})$, SO_2R, $SO_2N(R_{10})(R_{11})$, $NHSO_2(R_{10})$ (e.g., $NHSO_2CH_3$), $CH(CF_3)(NH\text{-}R_{10})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., azetidine, pyridine), substituted or unsubstituted aryl (e.g., phenyl) or substituted or unsubstituted benzyl;

or $\mathbf{R_2}$ and $\mathbf{R_1}$ are joined together to form a 5 or 6 membered substituted or unsubstituted, aliphatic or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., 1,4-dioxane, 2,3-dihydro-1,4-dioxine, dioxol, dioxolpyridine) ring;

$\mathbf{R_3}$ is F, Cl, Br, I, OH, SH, R_8-OH, R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, $N(R_{10})(R_{11})$ (e.g., morpholine, piperazine), R_8-$N(R_{10})(R_{11})$, R_9-R_8-$N(R_{10})(R_{11})$, $B(OH)_2$, -$OC(O)CF_3$, -OCH_2Ph, NHC(O)-R_{10}, NHCO-$N(R_{10})(R_{11})$, COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -$C(O)NH_2$, C(O)NHR (e.g., C(O)NH(CH_3)$_2$O-CH_3), $C(O)N(R_{10})(R_{11})$ (e.g., C(O)-piperidine, C(O)-pyrrolidine, $C(O)N(CH_3)_2$, C(O)-piperazine), SO_2R, $SO_2N(R_{10})(R_{11})$, $CH(CF_3)(NH\text{-}R_{10})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy, 1-(methylsulfonyl)piperidin-4-oxy, 1-(methyl)piperidin-4-oxy, 1-(ethanone)piperidin-4-oxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted, single, spirocyclic, fused, or bridged C_3-C_{10} heterocyclic ring (e.g., piperazine, 1-(2-methoxyethyl)piperazine, 1-, or 4-methylpiperazine, 1- or 4-(methylsulfonyl)piperazine, 1- or 4-(methylsulfonyl)piperidine, 2-methoxy-1-(piperazin-1-yl)ethenone, , 1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)propanone, 2-hydroxy-1-(piperazin-1-yl)ethenone, *N*-methylpiperazine-1-carboxamide piperidin-4-ol, piperidin-3-ol, morpholine, 3-methylmorpholine, 3-hydroxypiperidine, tetrahydro-*2H*-pyrane, tetrahydro-2H-thiopyran 1,1-dioxide, pyrazole, thiazole, imidazole, pyrrolidine, pyrrolidinone, octahydropyrrolo[1,2-α]pyrazine, 6-methyl-2,6-diazaspiro[3.3]heptane, 2-oxa-7-azaspiro[3.5]nonane, 1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2-methoxy-1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2,8-diazaspiro[4.5]decan-1-one, 2-oxa-7-

azaspiro[3.5]nonane), substituted or unsubstituted aryl (e.g., phenyl), substituted or unsubstituted benzyl;

R_4 is H, F, Cl, Br, I, OH, SH, R_8-OH, R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, $N(R_{10})(R_{11})$ (e.g., morpholine, piperazine), R_8-$N(R_{10})(R_{11})$, R_9-R_8-$N(R_{10})(R_{11})$, $B(OH)_2$, -$OC(O)CF_3$, -OCH_2Ph, $NHC(O)$-R_{10}, $NHCO$-$N(R_{10})(R_{11})$, COOH, -C(O)Ph, $C(O)O$-R_{10}, R_8-$C(O)$-R_{10}, C(O)H, $C(O)$-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -$C(O)NH_2$, C(O)NHR (e.g., $C(O)NH(CH_3)_2O$-CH_3), $C(O)N(R_{10})(R_{11})$ (e.g., C(O)-piperidine, C(O)-pyrrolidine, $C(O)N(CH_3)_2$, C(O)-piperazine), SO_2R, $SO_2N(R_{10})(R_{11})$, $CH(CF_3)(NH$-$R_{10})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy, 1-(methylsulfonyl)piperidin-4-oxy, 1-(methyl)piperidin-4-oxy, 1-(ethanone)piperidin-4-oxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted, single, spirocyclic, fused, or bridged C_3-C_{10} heterocyclic ring (e.g., piperazine, 1-(2-methoxyethyl)piperazine, 1-, or 4-methylpiperazine, 1- or 4-(methylsulfonyl)piperazine, 1- or 4-(methylsulfonyl)piperidine, 2-methoxy-1-(piperazin-1-yl)ethenone, , 1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)propanone, 2-hydroxy-1-(piperazin-1-yl)ethenone, *N*-methylpiperazine-1-carboxamide piperidin-4-ol, piperidin-3-ol, morpholine, 3-methylmorpholine, 3-hydroxypiperidine, tetrahydro-*2H*-pyrane, tetrahydro-2H-thiopyran 1,1-dioxide, pyrazole, thiazole, imidazole, pyrrolidine, pyrrolidinone, octahydropyrrolo[1,2-α]pyrazine, 6-methyl-2,6-diazaspiro[3.3]heptane, 2-oxa-7-azaspiro[3.5]nonane, 1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2-methoxy-1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2,8-diazaspiro[4.5]decan-1-one, 2-oxa-7-azaspiro[3.5]nonane), substituted or unsubstituted aryl (e.g., phenyl), substituted or unsubstituted benzyl;

or **R_3** and **R_4** are joined together to form a 5 or 6 membered substituted or unsubstituted, aliphatic (e.g., cyclopentene) or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., thiophene, furane, pyrrol, pyrazole) ring;

R_5 is H, **R_{20}**, F, Cl, Br, I, CF_3, -C(O)Ph, $C(O)$-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -$C(O)NH_2$, C(O)NHR, $C(O)N(R_{10})(R_{11})$, SO_2R, $SO_2N(R_{10})(R_{11})$, C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted C_3-C_8 heterocyclic ring, substituted or unsubstituted aryl, or substituted or unsubstituted benzyl;

Q_1 is NH, S, or O;

G=X is C=O, C=S, S=O or SO_2;

R is H, OH, F, Cl, Br, I, CN, CF_3, NO_2, NH_2, $NH(R_{10})$ (e.g., $NH(CH_3)$), $N(R_{10})(R_{11})$, R_{20}, C_1-C_5 linear or branched, C_1-C_5 substituted or unsubstituted alkyl (e.g., methyl, ethyl, CH_2CH_2OH,

$CH_2CH_2OCH_3$), R_8-R_{10} (e.g., CH_2-OH, CH_2CH_2-OH), C(O)-R_{10} (e.g., C(O)-methylpyrroldine, C(O)-methylpiperidine, C(O)-CH_3), C_1-C_5 substituted or unsubstituted C(O)-alkyl (e.g., C(O)-CH_2CH_2-OCH_3, C(O)-CH_3, C(O)-CH_2-$N(CH_3)_2$, C(O)-CH_2-CH_2-$N(CH_3)_2$, C(O)-CH_2-OH), C(O)-R_8-R_{10} (e.g., C(O)-CH_2CH_2-OH), C(O)-substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., C(O)-methylpyrroldine, C(O)-methylpiperidine), C_1-C_5 substituted or unsubstituted SO_2-alkyl (e.g., SO_2-CH_3), C_1-C_5 substituted or unsubstituted C(O)-NH-alkyl (e.g., C(O)-NH-CH_3), C_1-C_5 linear or branched C(O)-O-alkyl (e.g., C(O)-O-tBu), C_1-C_5 linear or branched alkoxy, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3), C_1-C_5 linear or branched haloalkyl (e.g., CF_3, CF_2CH_3, CH_2CF_3, $CF_2CH_2CH_3$, $CH_2CH_2CF_3$, $CF_2CH(CH_3)_2$,$CF(CH_3)$-$CH(CH_3)_2$), R_8-aryl (e.g., CH_2-Ph), substituted or unsubstituted aryl (e.g., phenyl), or substituted or unsubstituted heteroaryl (e.g., pyridine (2, 3, and 4-pyridine); or

two geminal **R** substitutions are joined together to form a 3 - 6 membered substituted or unsubstituted, aliphatic (e.g., cyclopropyl, cyclopentene) or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., thiophene, furane, pyrrol, pyrazole) ring;

R_8 is $[\mathbf{CH_2}]_p$

wherein **p** is between 1 and 10 (e.g., 2);

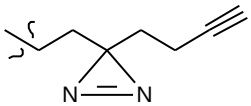
R_9 is $[CH]_q$, $[C]_q$

wherein **q** is between 2 and 10;

R_{10} and **R_{11}** are each independently H, OH, substituted or unsubstituted C_1-C_5 linear or branched alkyl (e.g., methyl, ethyl, CH_2-CH_2-O-CH_3), C_1-C_5 linear or branched alkoxy (e.g., O-CH_3), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., 1-(methylsulfonyl)piperidine, 1-(methylsulfonyl)piperazine, tetrahydro-*2H*-pyrane, morpholine, thiomorpholine 1,1-dioxide, methyl-pyrrolidine, methyl-piperidine), C(O)-alkyl, or $S(O)_2$-alkyl;

or **R_{10}** and **R_{11}** are joined to form a substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., morpholine, piperazine, piperidine, pyrrolidine, 1-methylpyrrolidin-2-one, oxetane, azetidine, 1-methylazetidine);

R_{20} is represented by the following structure:



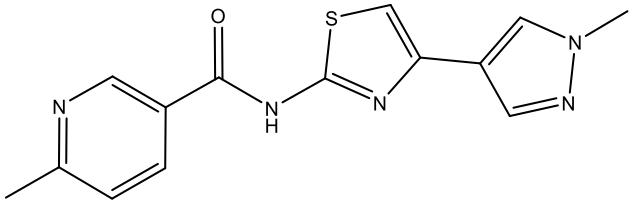
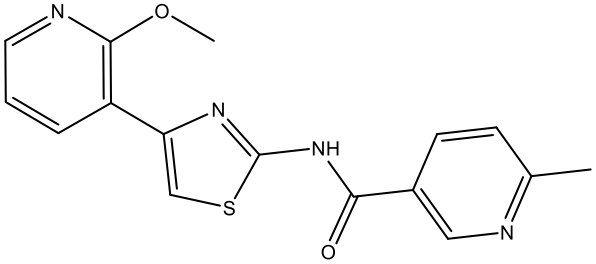
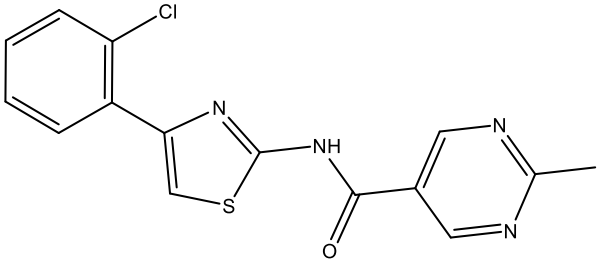
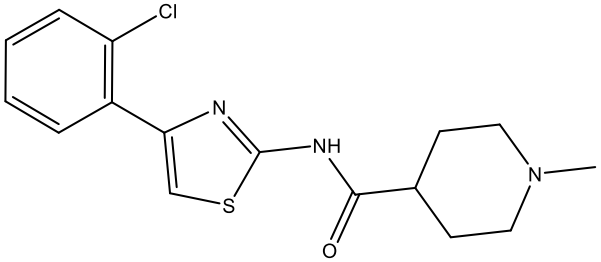
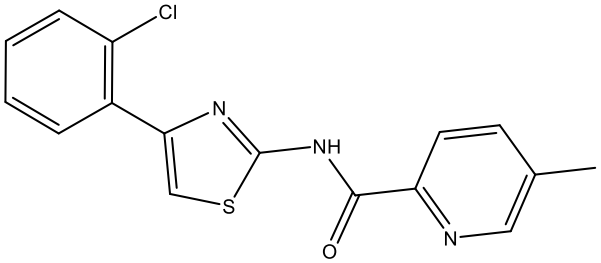
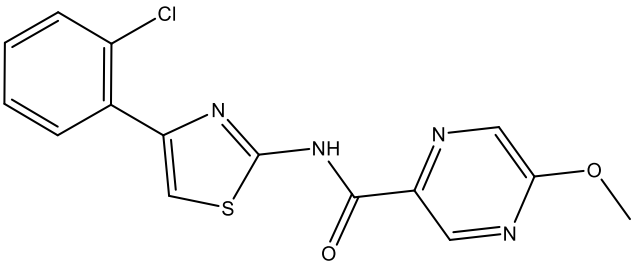
wherein substitutions include: F, Cl, Br, I, OH, SH, CF_3, CN, NO_2, substituted or unsubstituted C_1-C_5 linear or branched alkyl (e.g., methyl, methoxyethyl), substituted or unsubstituted C_1-C_5 linear or branched C(O)-alkyl (e.g., C(O)-CH_3, C(O)-CH_2-O-CH_3), SO_2-alkyl (e.g., SO_2-CH_3), C(O)-NH-alkyl, C_1-C_5 linear or branched alkyl-OH (e.g., $C(CH_3)_2CH_2$-OH, CH_2CH_2-OH), C_3-C_8 heterocyclic ring (e.g., piperidine), substituted or unsubstituted C_1-C_5 linear or branched alkoxy, $N(R)_2$, $N(R_{10})(R_{11})$, aryl, phenyl, heteroaryl, C_3-C_8 cycloalkyl, halophenyl, (benzyloxy)phenyl or any combination thereof;

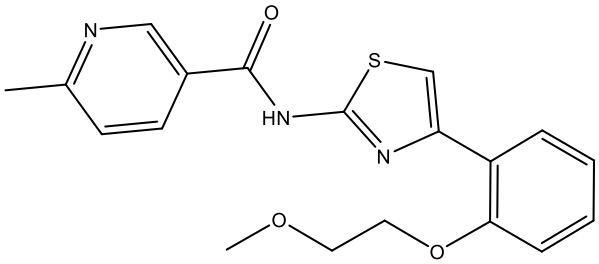
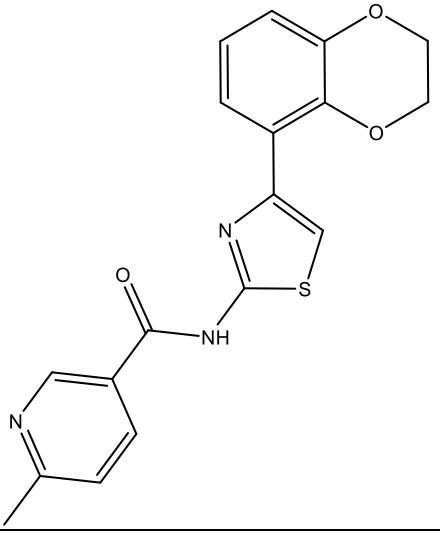
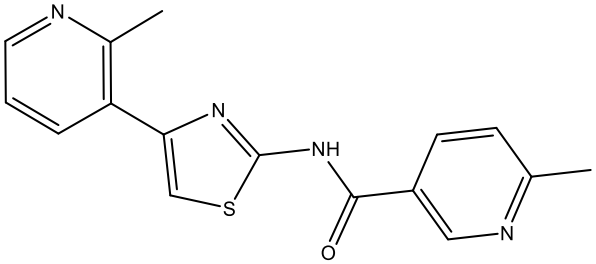
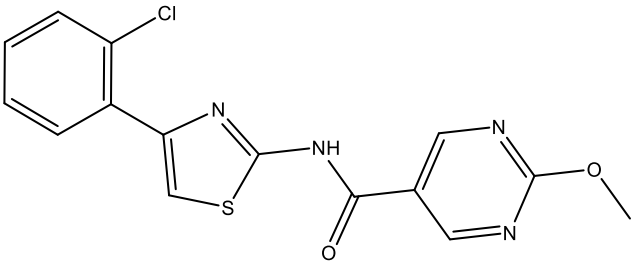
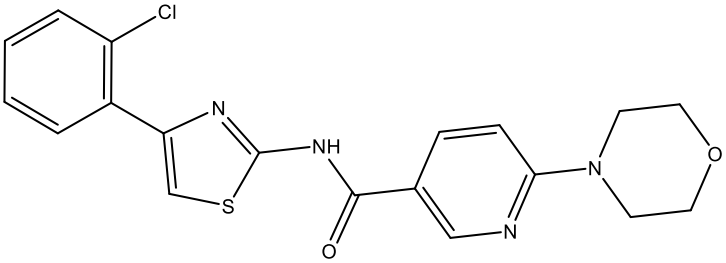
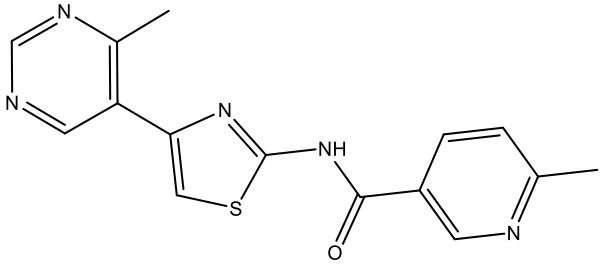
n and **l** are each independently an integer between 1 and 3 (e.g., 1 or 2);

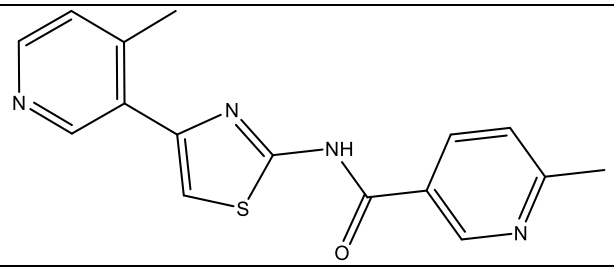
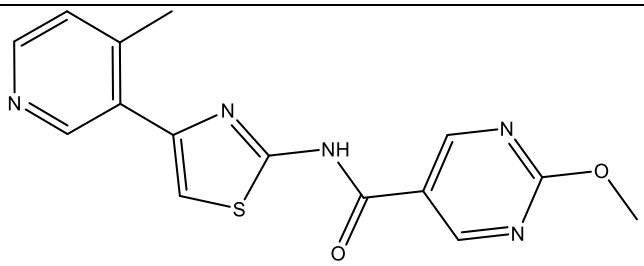
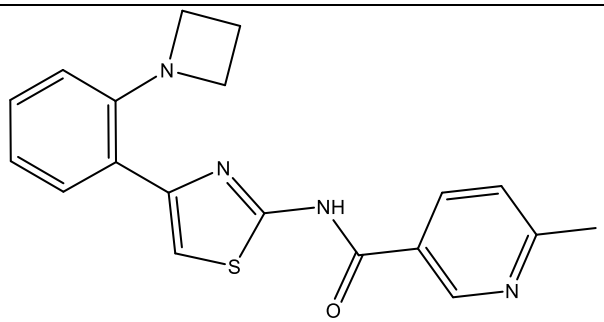
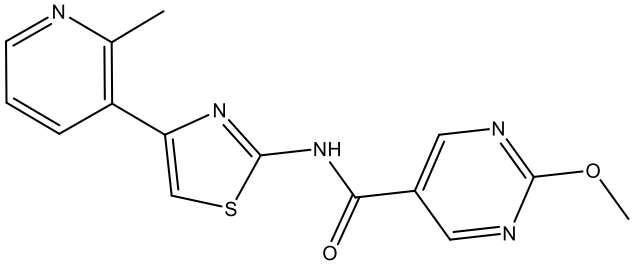
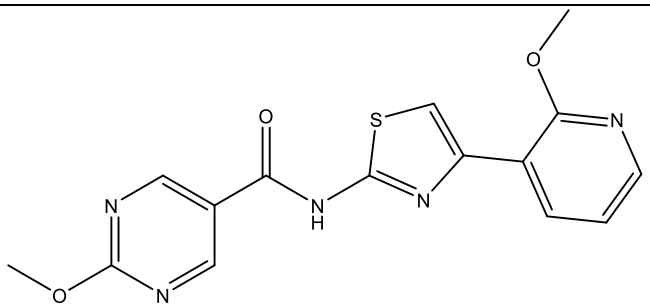
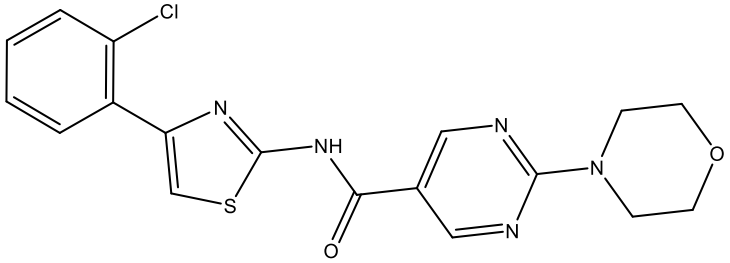
m and **k** are each independently an integer between 0 and 3 (e.g., 0);

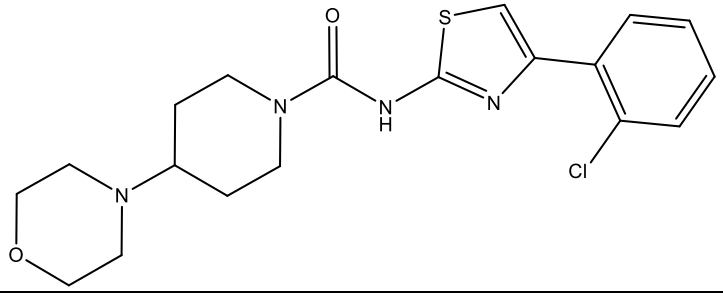
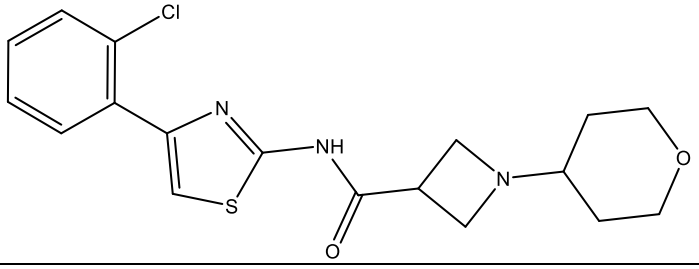
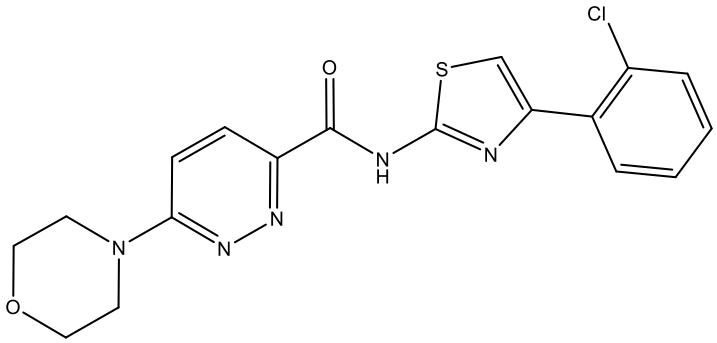
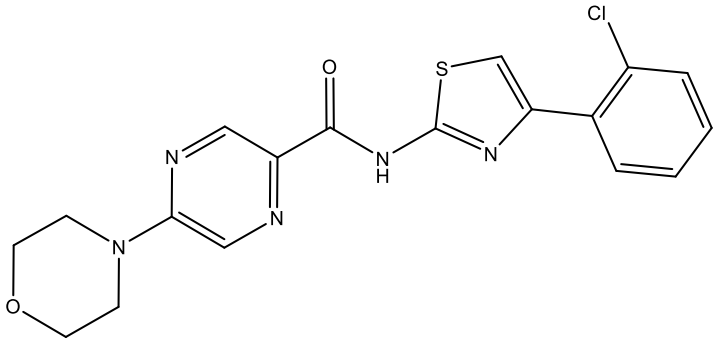
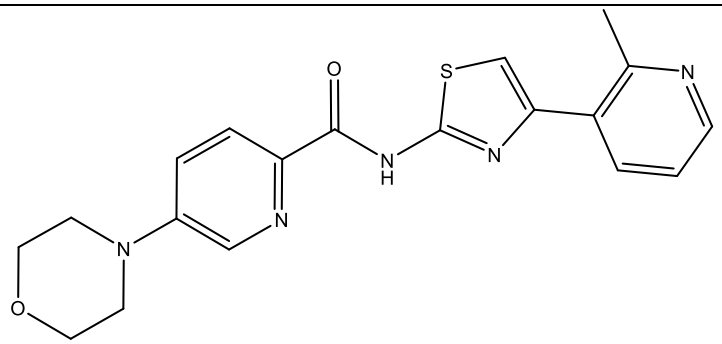
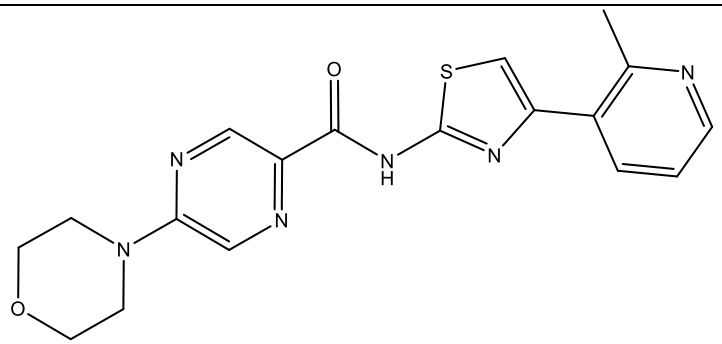
or its pharmaceutically acceptable salt, stereoisomer, tautomer, hydrate, *N*-oxide, prodrug, isotopic variant (e.g., deuterated analog), reverse amide, pharmaceutical product or any combination thereof.

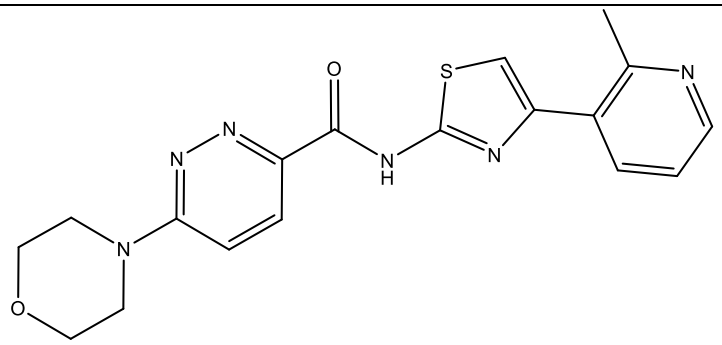
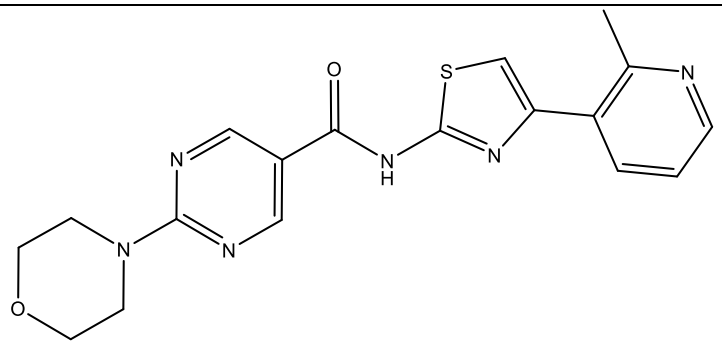
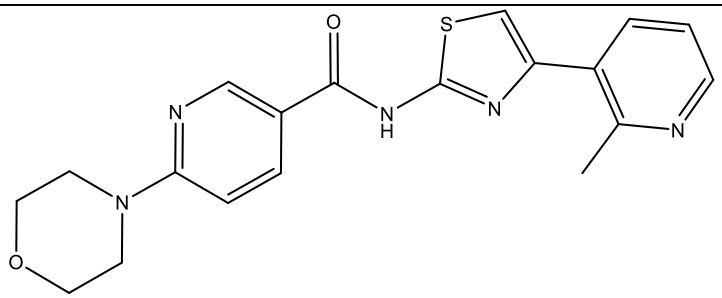
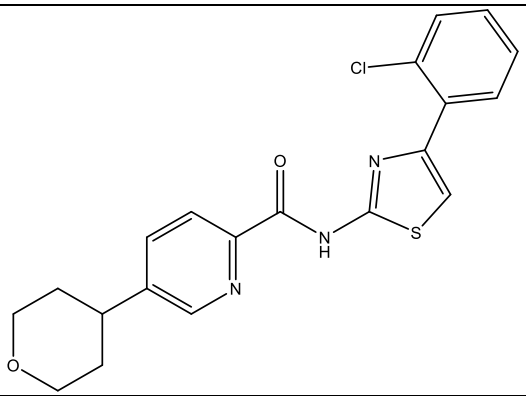
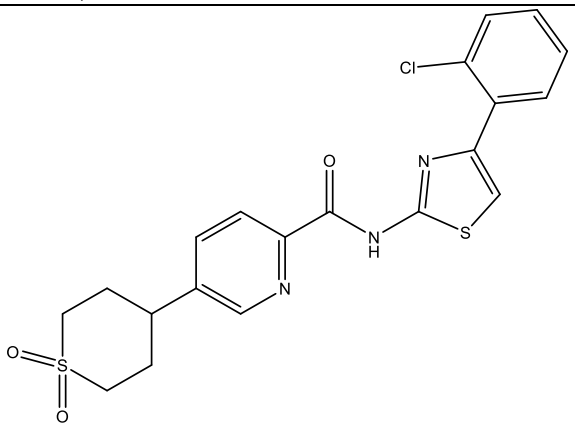
2. The compound of claim 1, represented by the following structures:

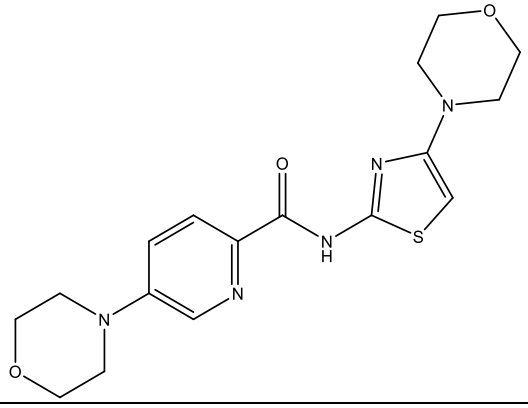
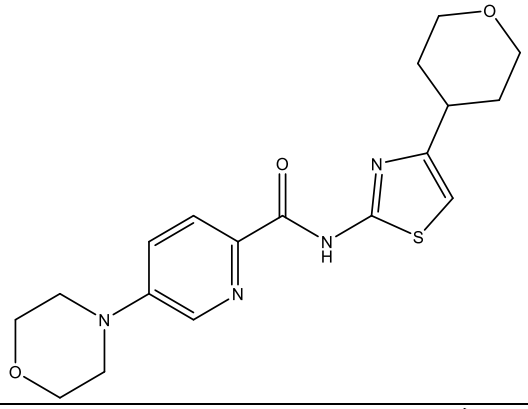
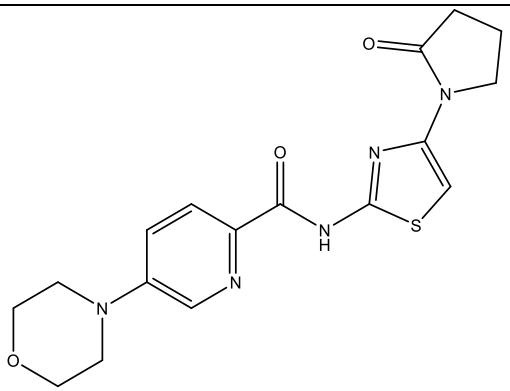
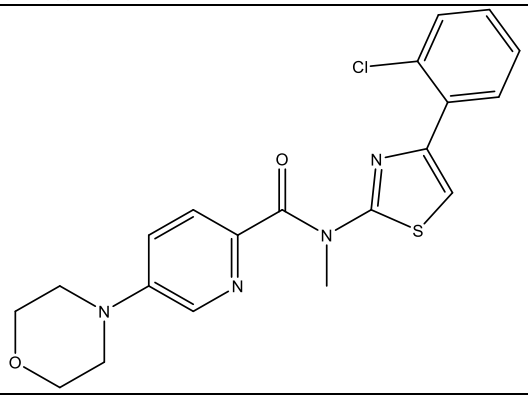
Compound Number	Compound Structure
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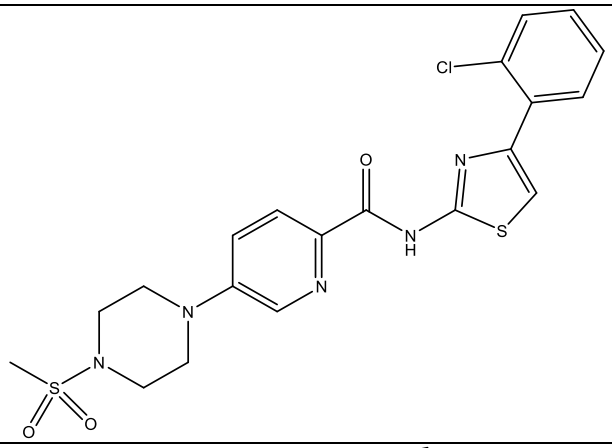
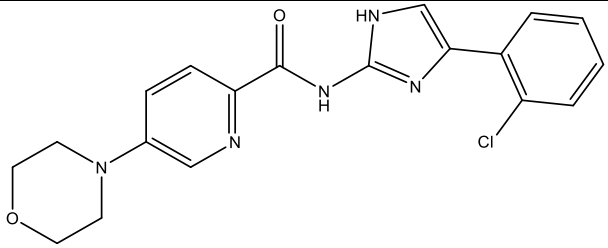
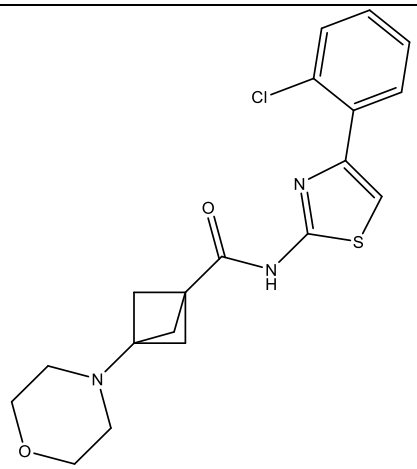
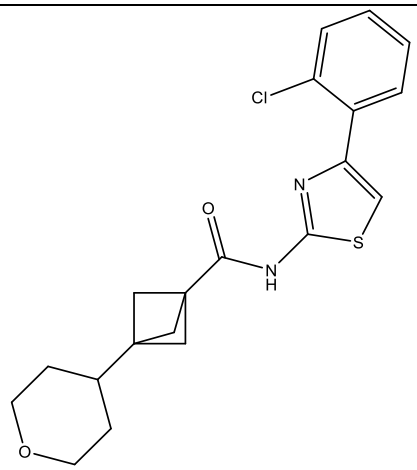
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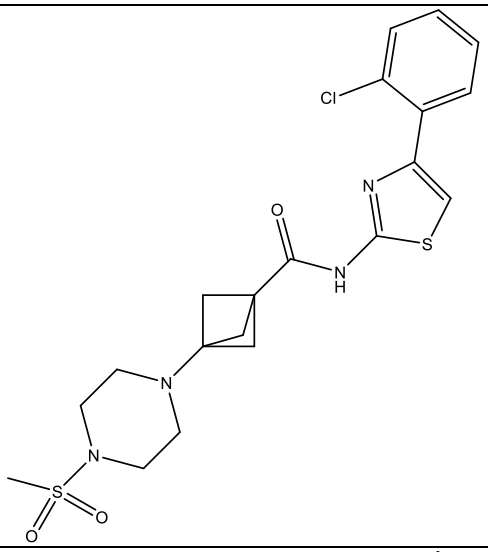
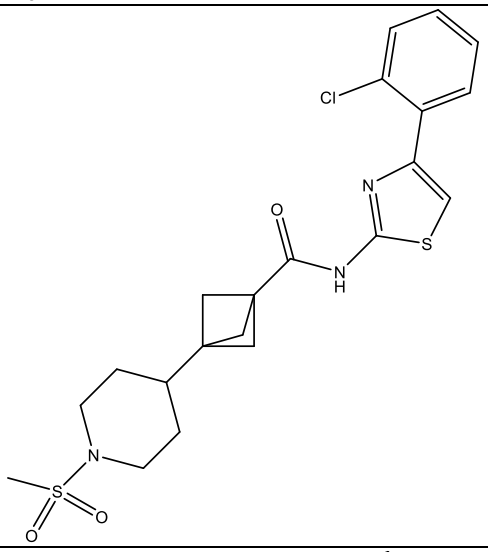
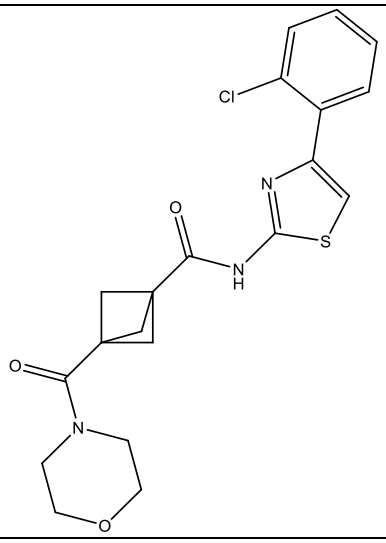
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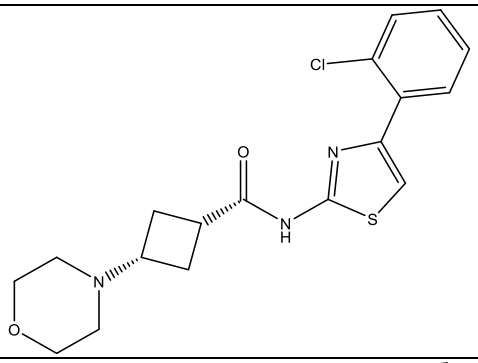
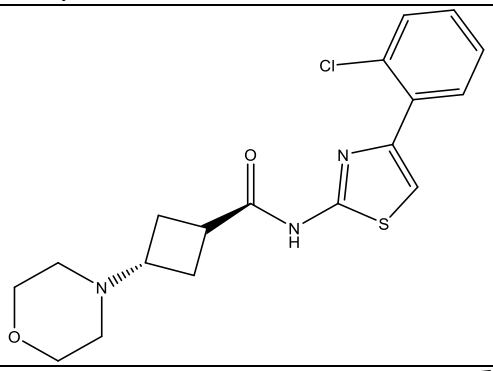
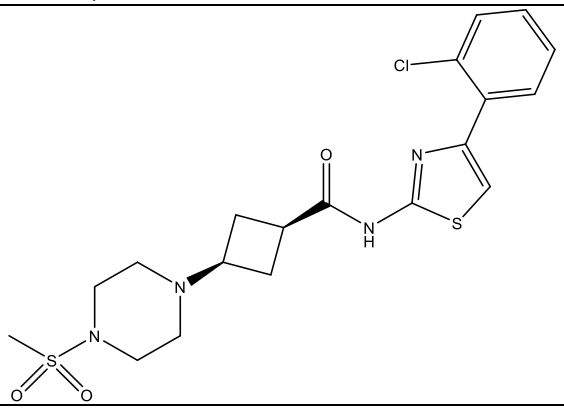
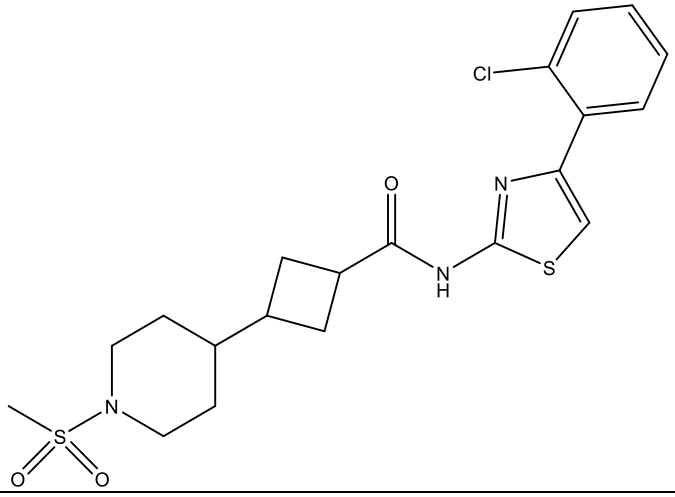
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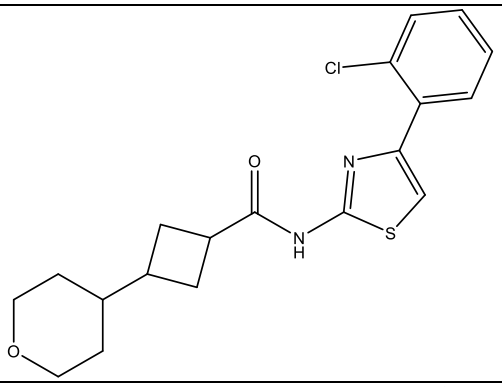
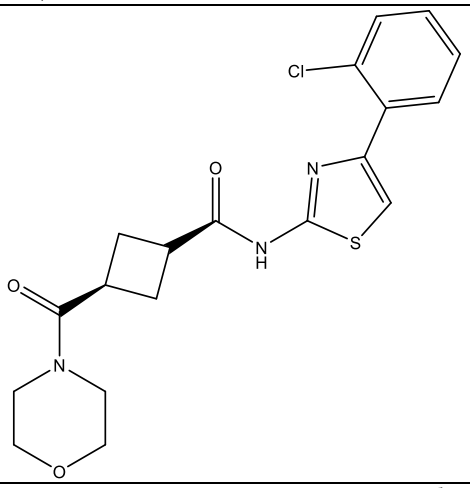
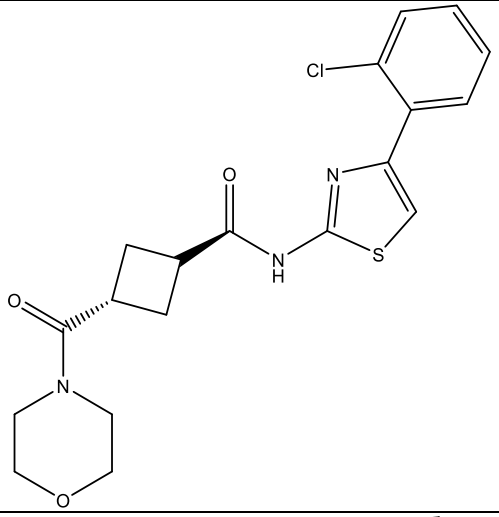
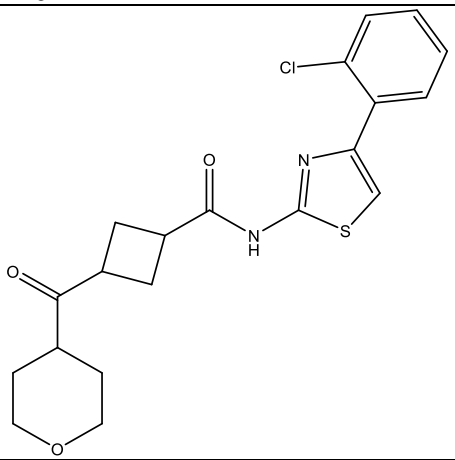
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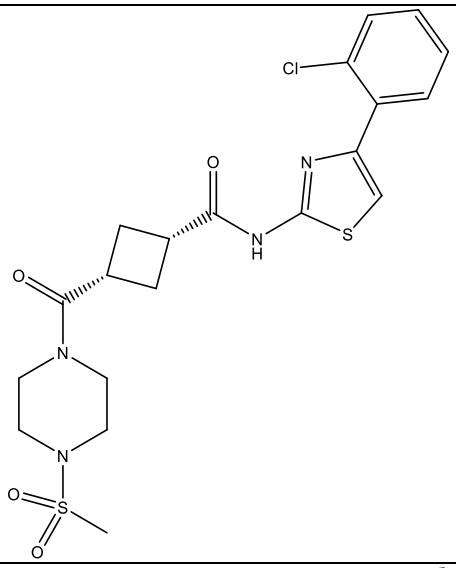
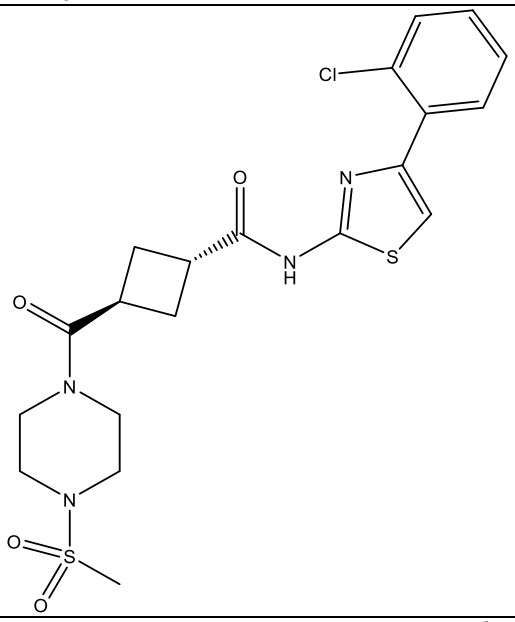
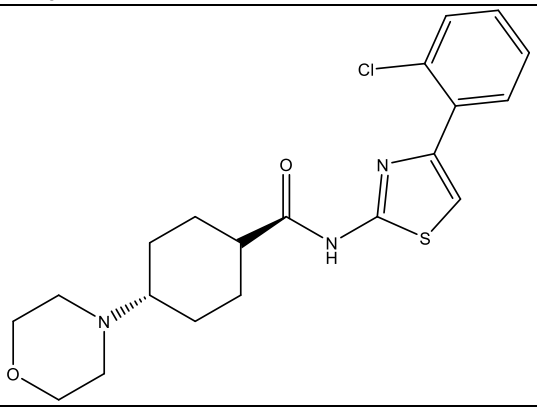
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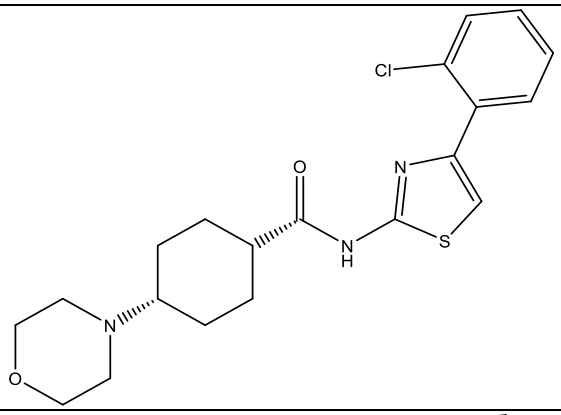
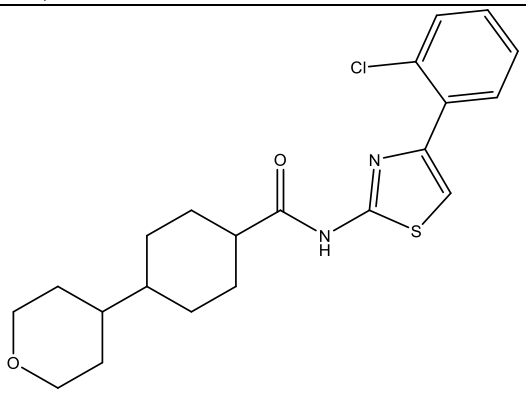
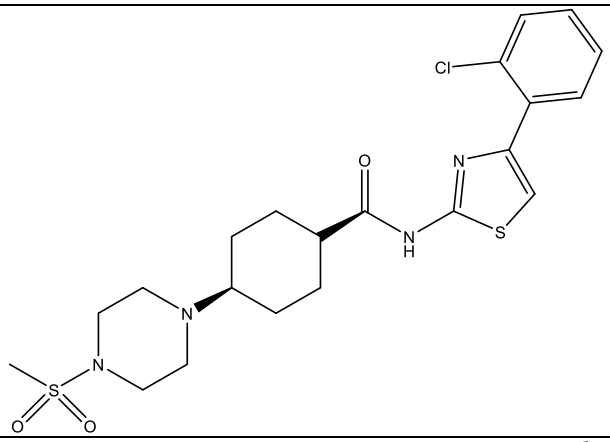
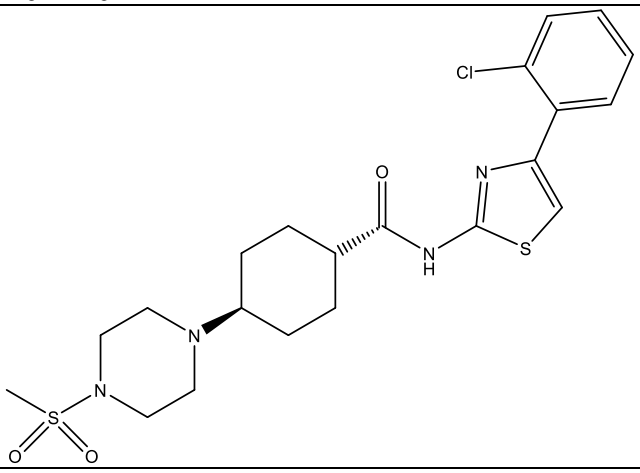
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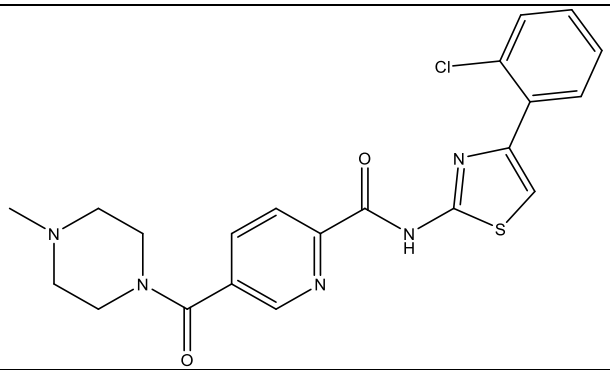
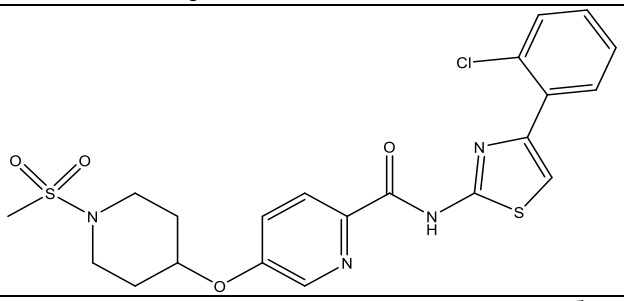
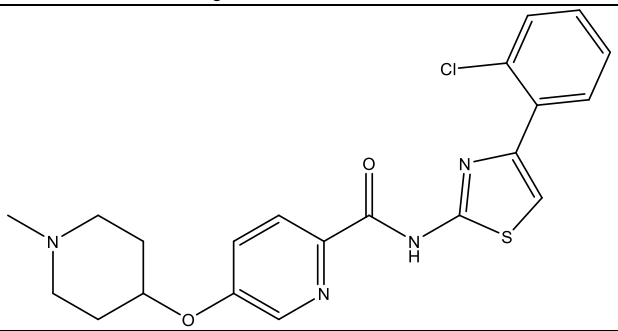
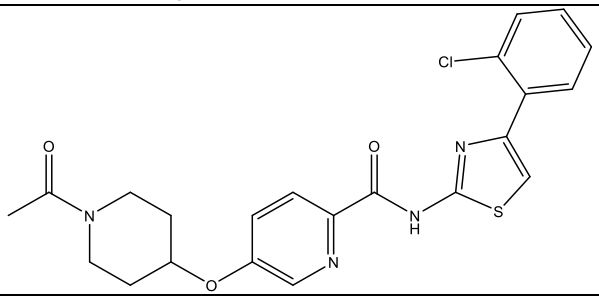
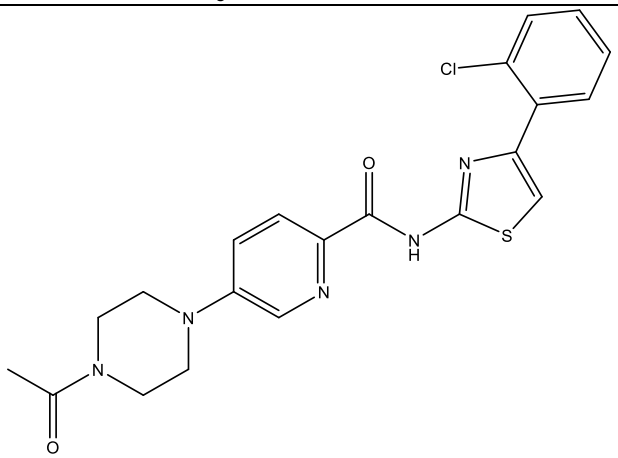
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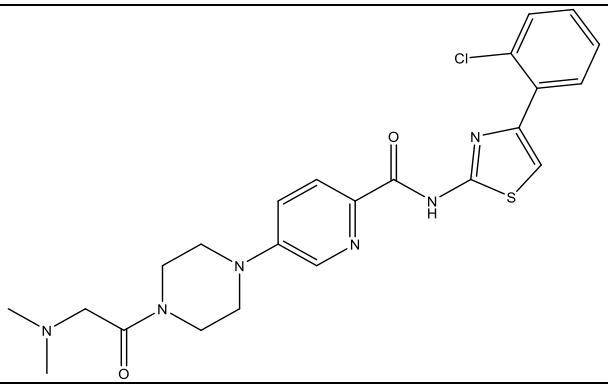
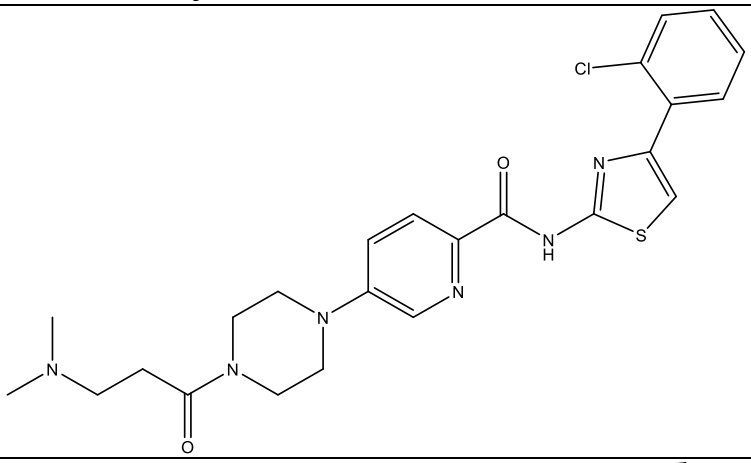
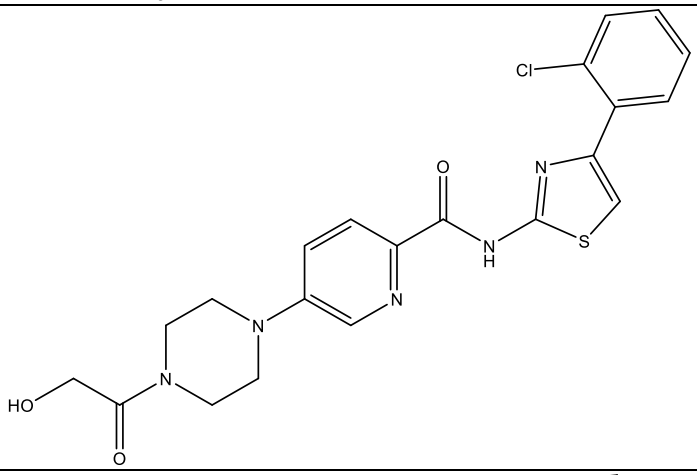
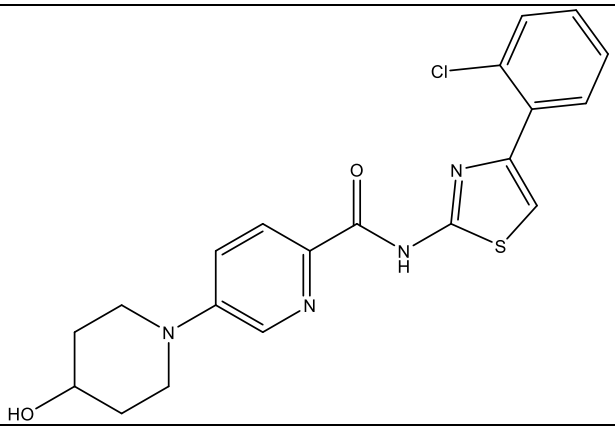
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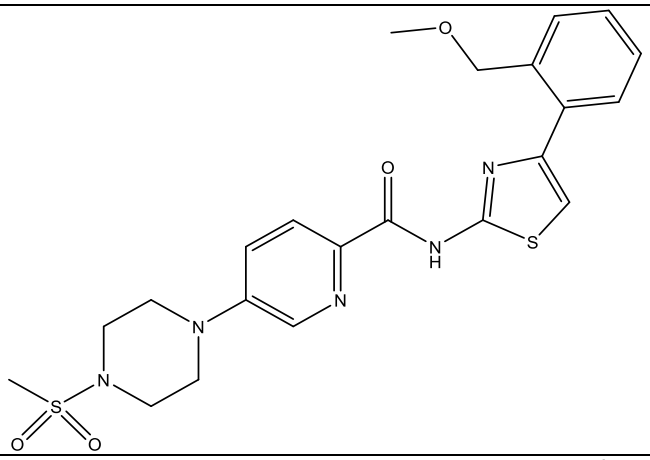
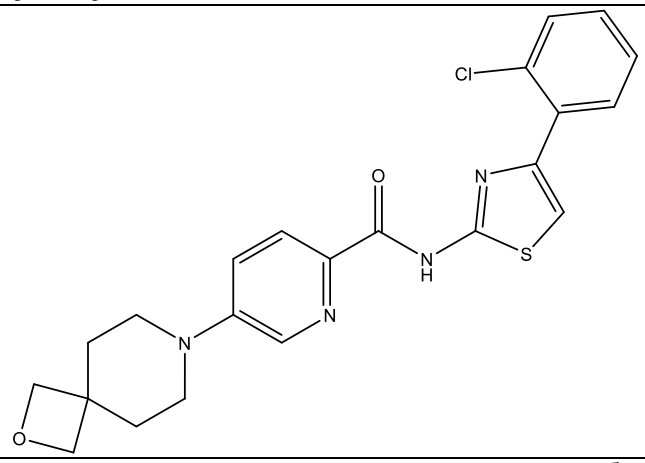
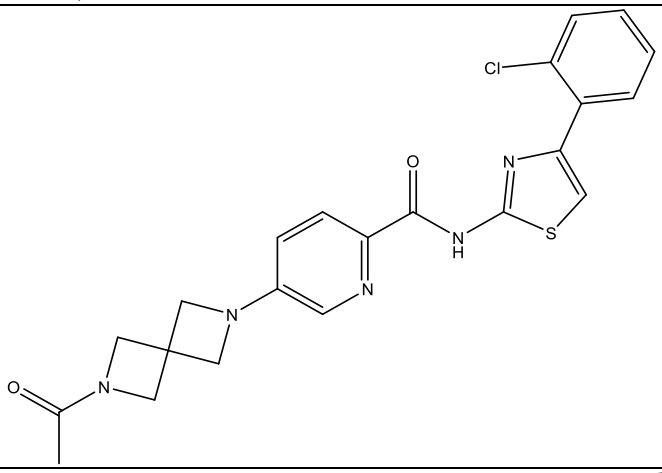
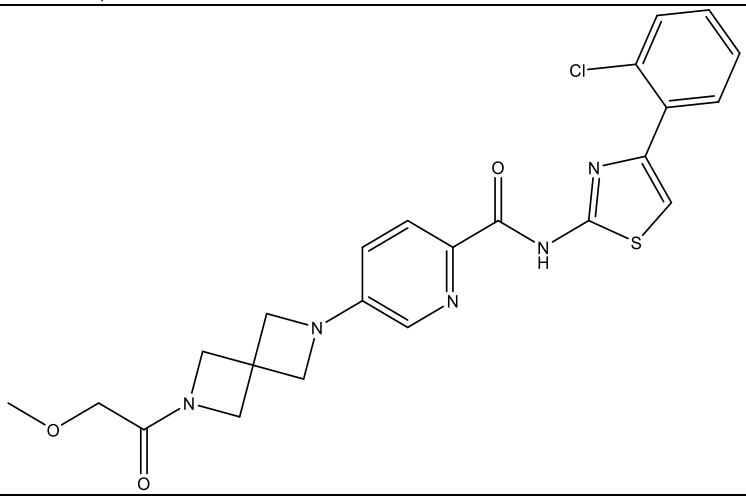
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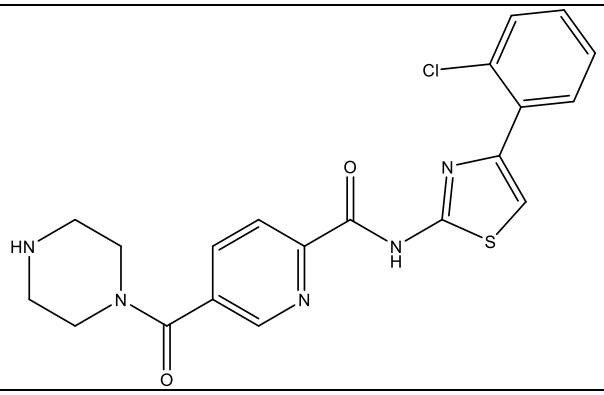
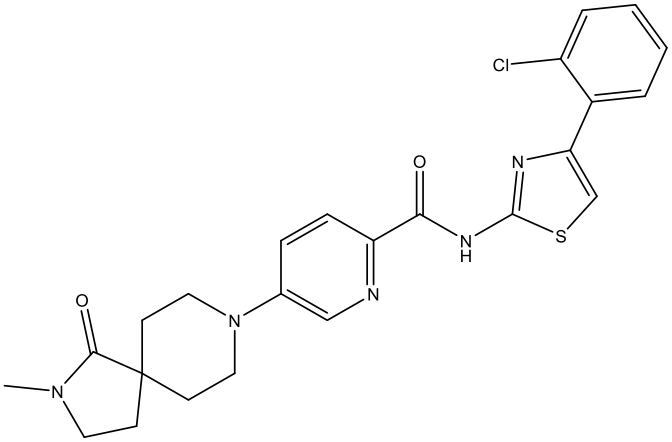
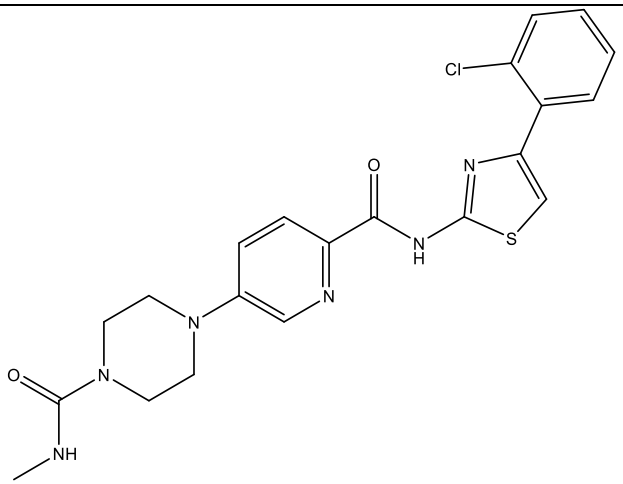
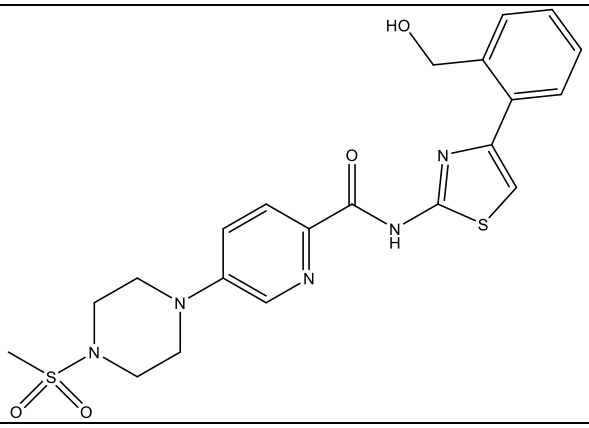
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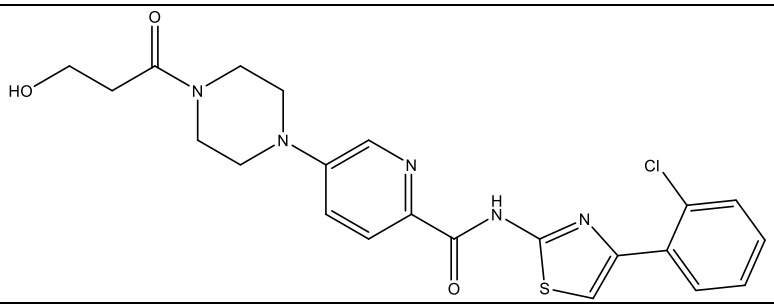
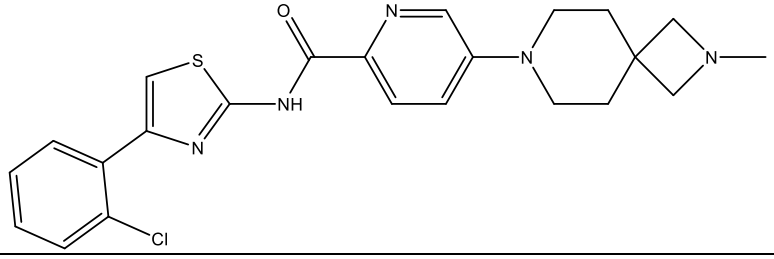
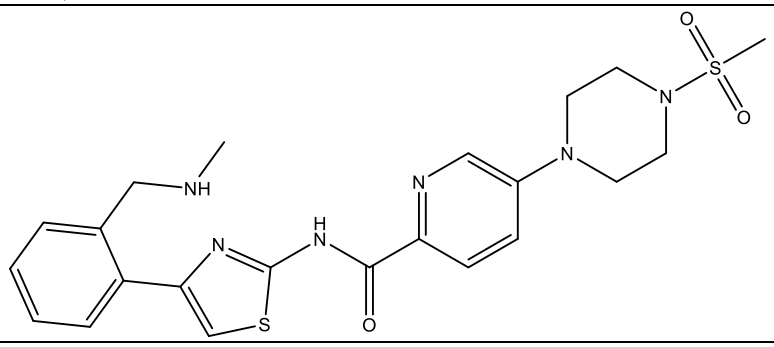
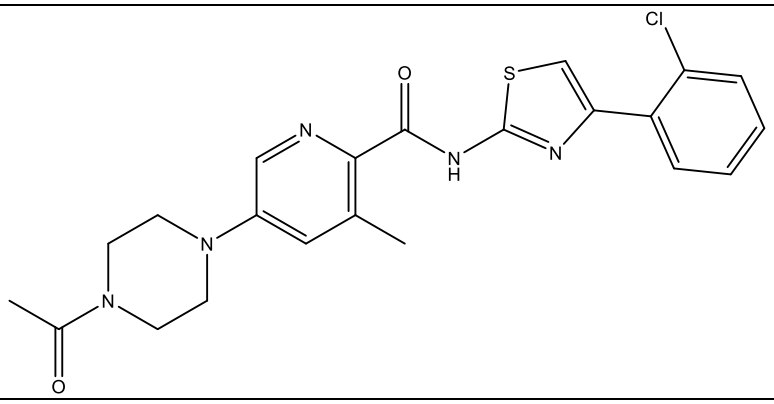
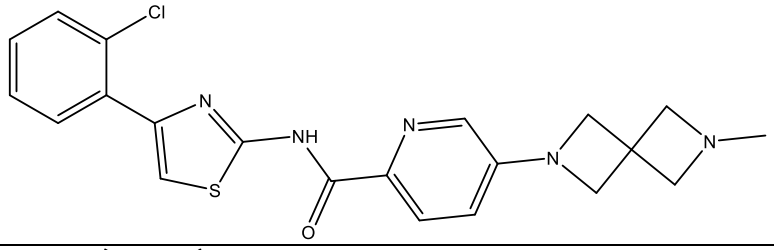
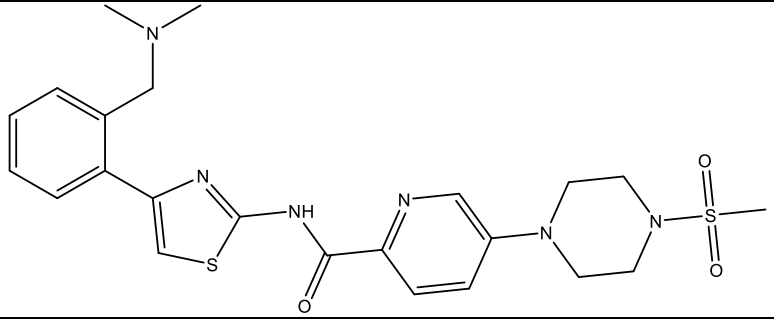
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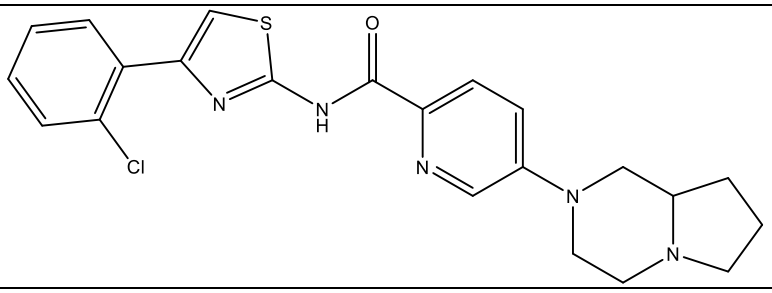
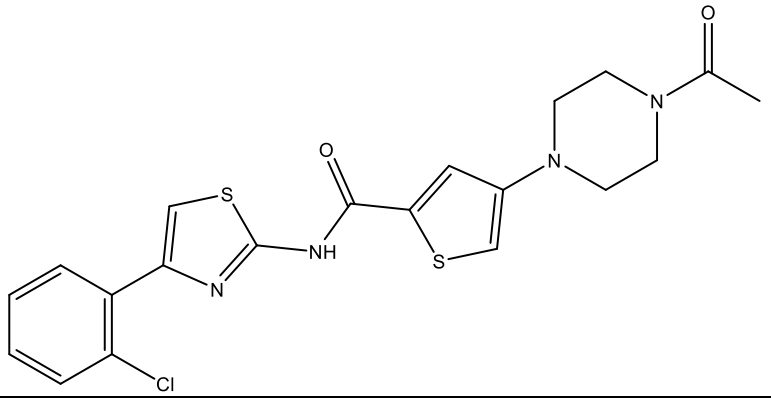
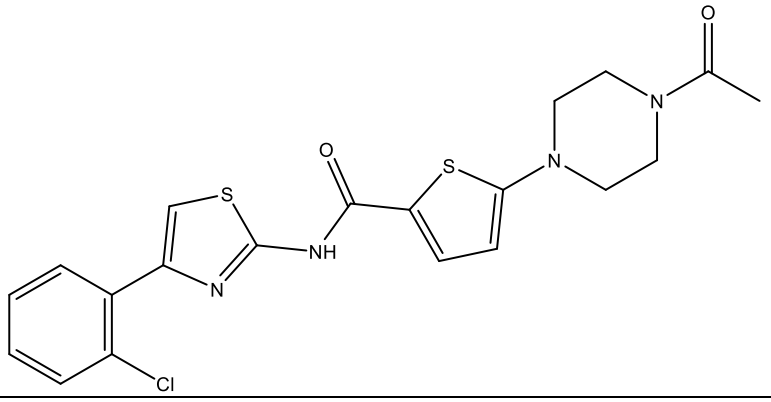
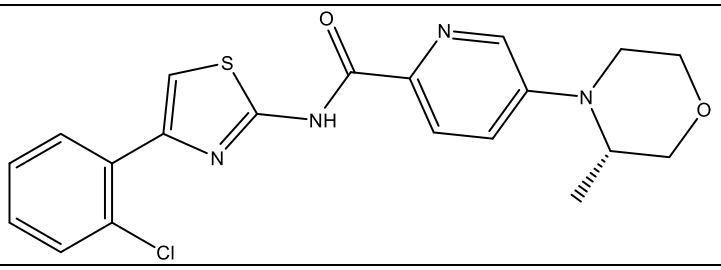
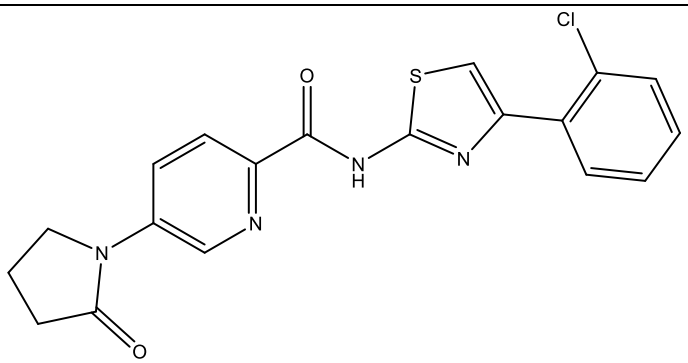
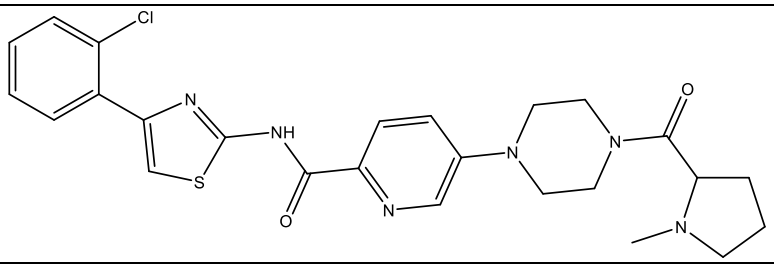
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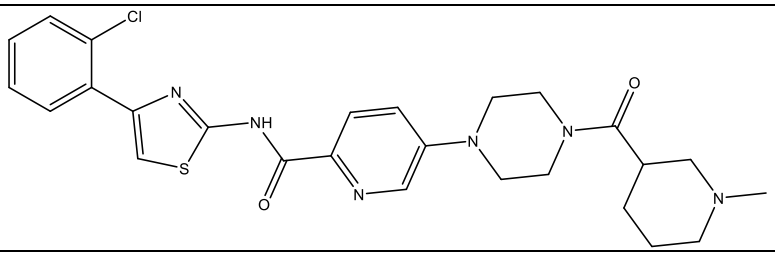
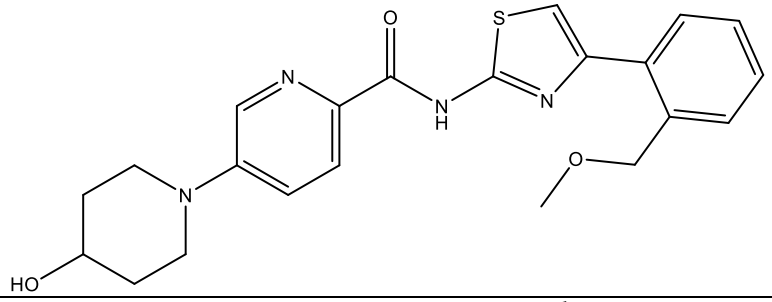
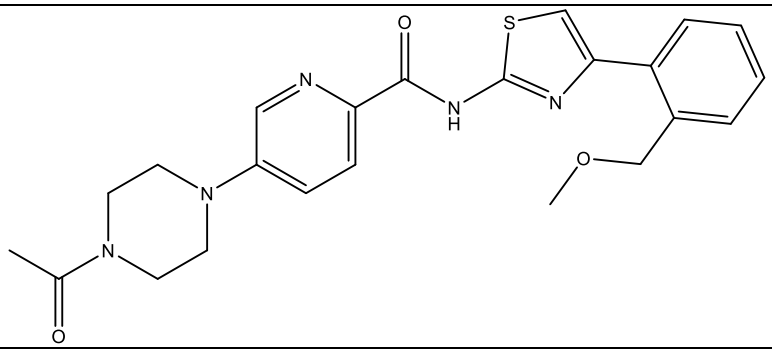
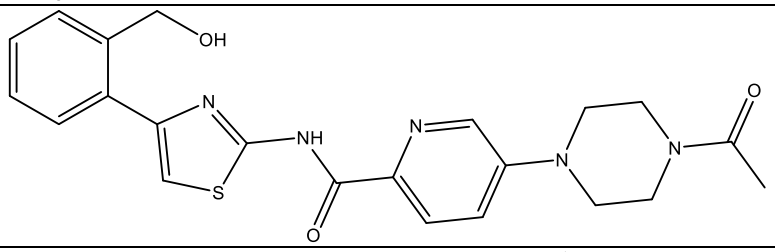
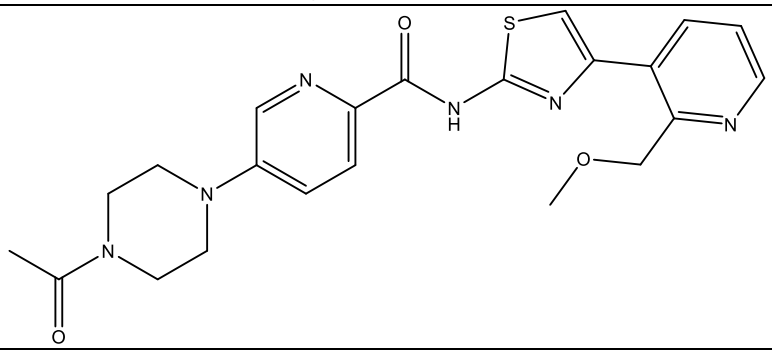
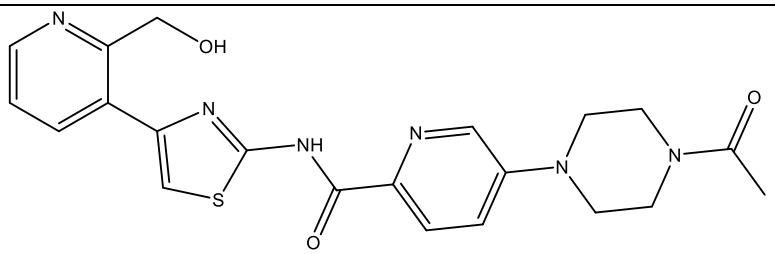
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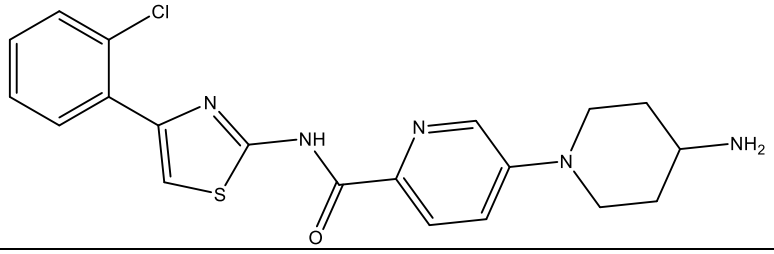
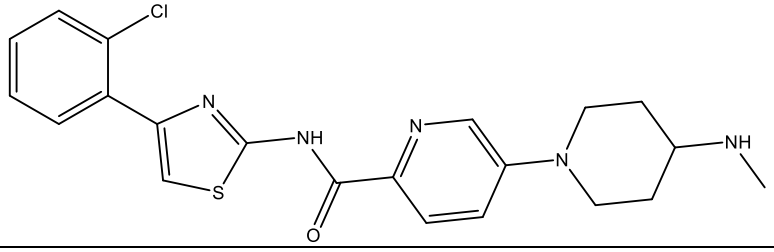
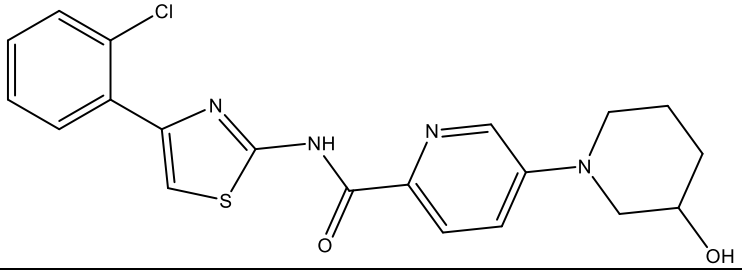
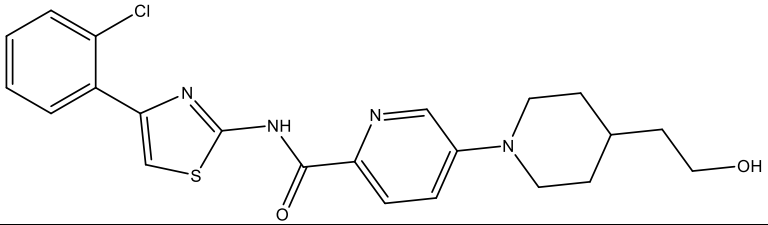
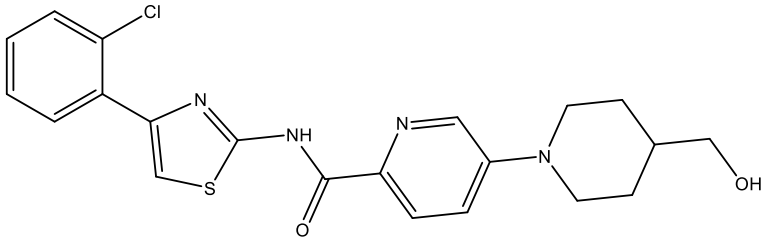
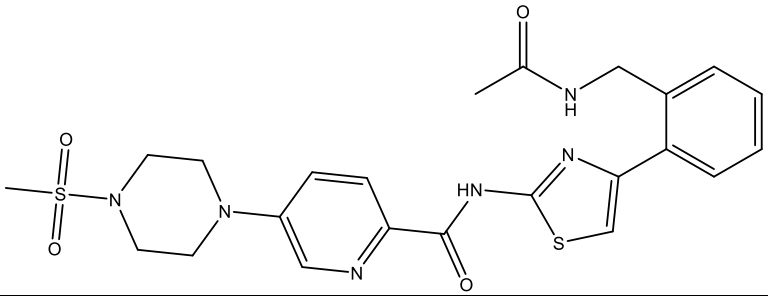
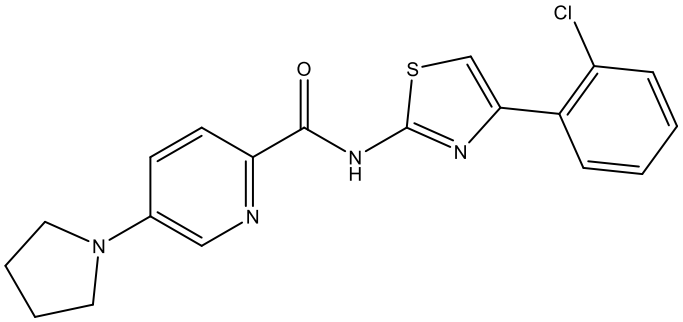
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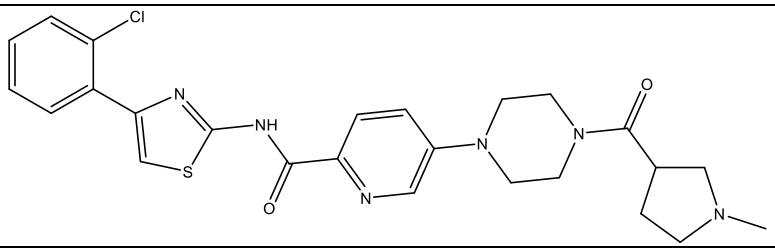
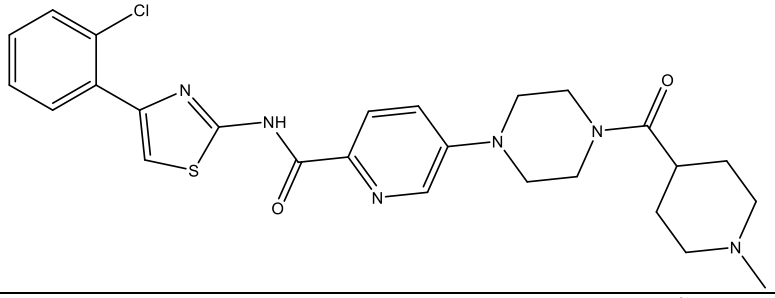
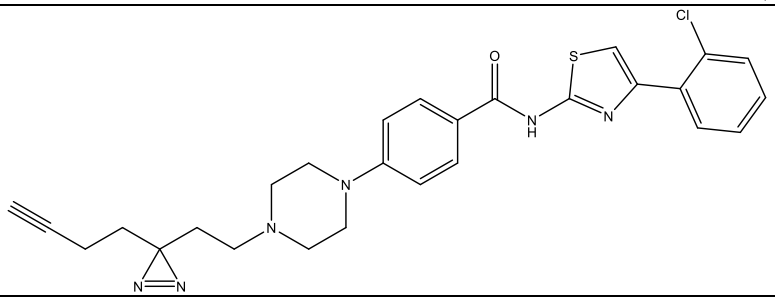
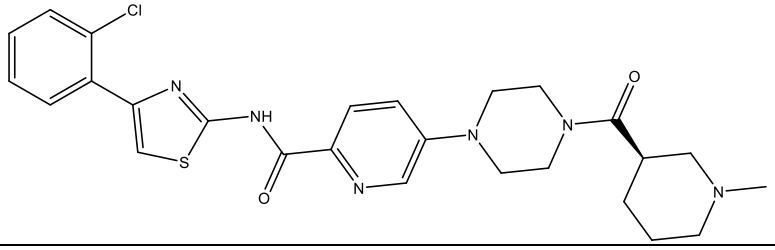
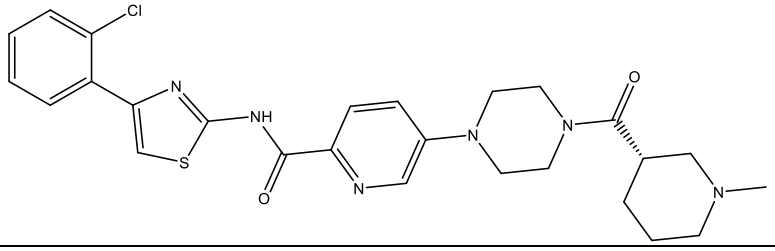
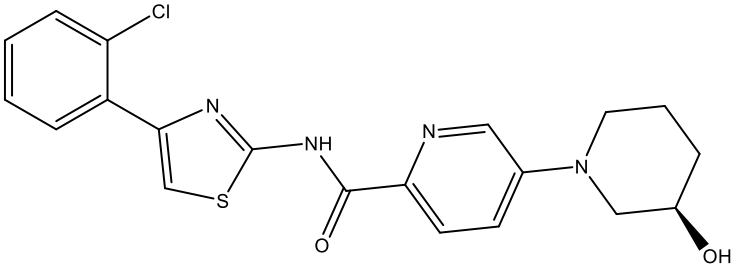
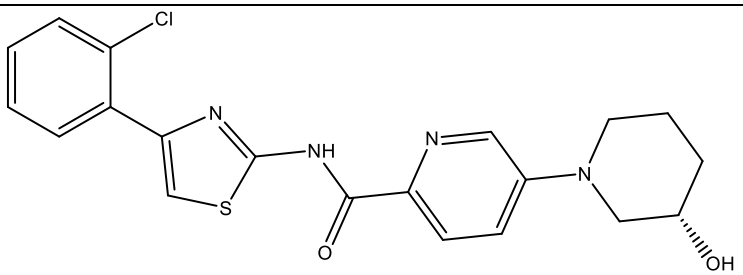
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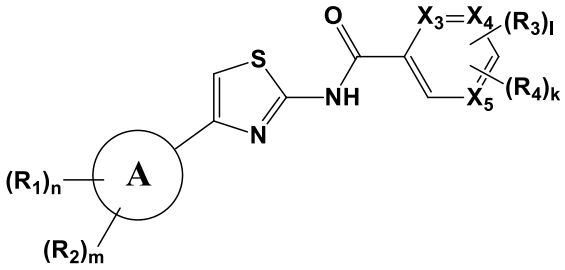
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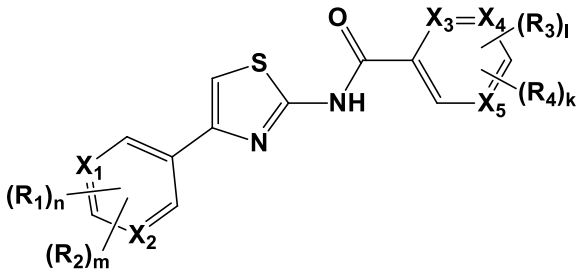
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3. The compound of claim 1, represented by the structure of formula **II**:



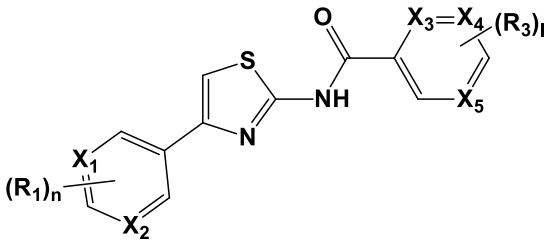
II;

by the structure of formula **III**:



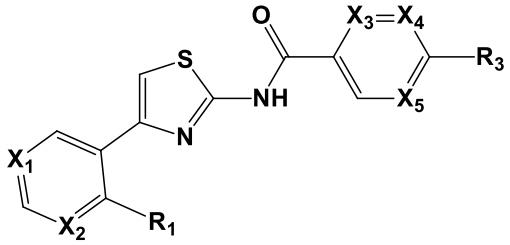
III;

by the structure of formula **IV**:



IV;

or by the structure of formula **V**:



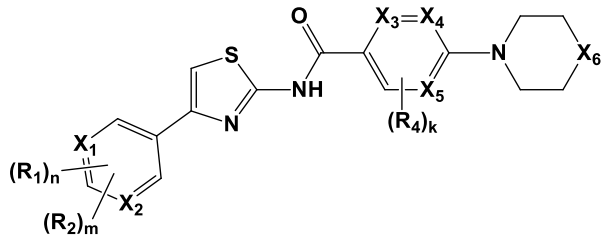
V

wherein

$\mathbf{X_1}$, $\mathbf{X_2}$ $\mathbf{X_3}$, $\mathbf{X_4}$ and $\mathbf{X_5}$ are each independently C or N; and

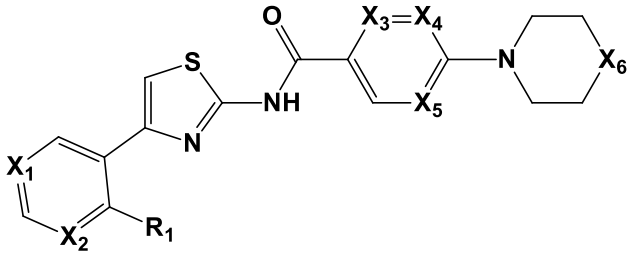
wherein at least one of $\mathbf{X_3}$, $\mathbf{X_4}$ and $\mathbf{X_5}$ is N.

4. A compound, represented by the structure of formula **VI**:



VI;

or by the structure of formula **VIII**:



VIII;

wherein

R_1 and **R_2** are each independently H, F, Cl, Br, I, OH, SH, R_8-OH (e.g. CH_2OH), R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3, CH_2-O-CH_3), -O-R_8-O-R_{10} (e.g., O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, R_8-N(R_{10})(R_{11}) (e.g., CH_2-NH-CH_3, CH_2-NH-C(O)CH_3, CH_2-N(CH_3)$_2$), R_9-R_8-N(R_{10})(R_{11}), $B(OH)_2$, -OC(O)CF_3, -OCH_2Ph, NHC(O)-R (e.g., NHCO-Ph, NHCO-CH_3) , NHC(O)-R_{10} (e.g., NHCO-CH_3), NHCO-N(R_{10})(R_{11}), COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -C(O)NH_2, C(O)NHR (e.g., C(O)NH-Ph), C(O)N(R_{10})(R_{11}), SO_2R, SO_2N(R_{10})(R_{11}), $NHSO_2$(R_{10}) (e.g., $NHSO_2CH_3$), CH(CF_3)(NH-R_{10}), C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., azetidine, pyridine), substituted or unsubstituted aryl (e.g., phenyl), or substituted or unsubstituted benzyl;

or **R_2** and **R_1** are joined together to form a 5 or 6 membered substituted or unsubstituted, aliphatic or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., 1,4-dioxane, 2,3-dihydro-1,4-dioxine, dioxol, dioxolpyridine) ring;

R_4 is H, F, Cl, Br, I, OH, SH, R_8-OH, R_8-SH, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3, CH_2-O-CH_2-CH_2-O-CH_3), R_8-(C_3-C_8 cycloalkyl), R_8-(C_3-C_8 heterocyclic ring), CF_3, CD_3, OCD_3, CN, NO_2, -CH_2CN, -R_8CN, NH_2, NHR, $N(R)_2$, N(R_{10})(R_{11}) (e.g., morpholine, piperazine), R_8-N(R_{10})(R_{11}), R_9-R_8-N(R_{10})(R_{11}), $B(OH)_2$, -OC(O)CF_3, -OCH_2Ph, NHC(O)-R_{10}, NHCO-N(R_{10})(R_{11}), COOH, -C(O)Ph, C(O)O-R_{10}, R_8-C(O)-R_{10}, C(O)H, C(O)-R_{10}, C_1-C_5 linear or branched C(O)-haloalkyl, -C(O)NH_2,

C(O)NHR (e.g., C(O)NH(CH_3)$_2$O-CH_3), C(O)N(R_{10})(R_{11}) (e.g., C(O)-piperidine, C(O)-pyrrolidine, C(O)N(CH_3)$_2$, C(O)-piperazine), SO_2R, SO_2N(R_{10})(R_{11}), CH(CF_3)(NH-R_{10}), C_1-C_5 linear or branched, substituted or unsubstituted alkyl (e.g., methyl, ethyl), C_1-C_5 linear or branched, substituted or unsubstituted alkenyl, C_1-C_5 linear, branched or cyclic haloalkyl (e.g., CHF_2), C_1-C_5 linear, branched or cyclic alkoxy (e.g. methoxy, 1-(methylsulfonyl)piperidin-4-oxy, 1-(methyl)piperidin-4-oxy, 1-(ethanone)piperidin-4-oxy), optionally wherein at least one methylene group (CH_2) in the alkoxy is replaced with an oxygen atom, C_1-C_5 linear or branched thioalkoxy, C_1-C_5 linear or branched haloalkoxy, C_1-C_5 linear or branched alkoxyalkyl, substituted or unsubstituted C_3-C_8 cycloalkyl (e.g., cyclopropyl), substituted or unsubstituted, single, spirocyclic, fused, or bridged C_3-C_{10} heterocyclic ring (e.g., piperazine, 1-(2-methoxyethyl)piperazine, 1-, or 4-methylpiperazine, 1- or 4-(methylsulfonyl)piperazine, 1- or 4-(methylsulfonyl)piperidine, 2-methoxy-1-(piperazin-1-yl)ethenone, 1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)propanone, 2-hydroxy-1-(piperazin-1-yl)ethenone, *N*-methylpiperazine-1-carboxamide piperidin-4-ol, morpholine, 3-methylmorpholine, 3-hydroxypiperidine, tetrahydro-*2H*-pyrane, tetrahydro-2H-thiopyran 1,1-dioxide, pyrazole, thiazole, imidazole, pyrrolidine, pyrrolidinone, octahydropyrrolo[1,2-α]pyrazine, 6-methyl-2,6-diazaspiro[3.3]heptane, 2-oxa-7-azaspiro[3.5]nonane, 1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2-methoxy-1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2,8-diazaspiro[4.5]decan-1-one, 2-oxa-7-azaspiro[3.5]nonane), substituted or unsubstituted aryl (e.g., phenyl), or substituted or unsubstituted benzyl;

X_1, **X_2 X_3**, **X_4** and **X_5** are each independently C or N;

wherein at least one of **X_3**, **X_4** and **X_5 is N;**

X_6 is O, CH_2, CHR (e.g., CH(OH), CH(NH_2), CH(NH(CH_3))), C(R_{10})(R_{11}) (e.g., C(H)CH_2CH_2-OH, C(H)CH_2-OH, 1-methylazetidine), NH, N-R (e.g., N-CH_3, N-SO_2-CH_3, N-R_{20}, N-CH_2CH_2-OCH_3,) or N-C(O)-R_{10} (e.g., N-C(O)O-tBu, N-C(O)-CH_2CH_2-OCH_3, N-C(O)-CH_3, N-C(O)-CH_2-N(CH_3)$_2$, N-C(O)-CH_2-CH_2-N(CH_3)$_2$, N-C(O)-CH_2-OH, N-C(O)-CH_2CH_2-OH, N-C(O)-NH-CH_3, N-C(O)-1-methyl-2-pyrrolidine, N-C(O)-1-methyl-3-pyrrolidine, N-C(O)-1-methyl-3-piperidine, N-C(O)-1-methyl-4-piperidine);

R is H, OH, F, Cl, Br, I, CN, CF_3, NO_2, NH_2, NH(R_{10}) (e.g., NH(CH_3)), N(R_{10})(R_{11}), R_{20}, C_1-C_5 linear or branched, C_1-C_5 substituted or unsubstituted alkyl (e.g., methyl, ethyl, CH_2CH_2OH, $CH_2CH_2OCH_3$), R_8-R_{10} (e.g., CH_2-OH, CH_2CH_2-OH), C(O)-R_{10} (e.g., C(O)-methylpyrroldine, C(O)-methylpiperidine, C(O)-CH_3), C_1-C_5 substituted or unsubstituted C(O)-alkyl (e.g., C(O)-CH_2CH_2-OCH_3 , C(O)-CH_3, C(O)-CH_2-N(CH_3)$_2$, C(O)-CH_2-CH_2-N(CH_3)$_2$, C(O)-CH_2-OH), C(O)-R_8-R_{10} (e.g., C(O)-CH_2CH_2-OH), C(O)-substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., C(O)-methylpyrroldine, C(O)-methylpiperidine), C_1-C_5 substituted or unsubstituted SO_2-alkyl (e.g., SO_2-CH_3), C_1-C_5 substituted or unsubstituted C(O)-NH-alkyl (e.g., C(O)-NH-CH_3), C_1-C_5 linear or branched C(O)-O-alkyl (e.g., C(O)-O-tBu), C_1-C_5 linear or branched alkoxy, -R_8-O-R_{10} (e.g., CH_2-CH_2-O-CH_3), C_1-C_5 linear or branched haloalkyl (e.g., CF_3, CF_2CH_3, CH_2CF_3, $CF_2CH_2CH_3$,

$CH_2CH_2CF_3$, $CF_2CH(CH_3)_2$,$CF(CH_3)$-$CH(CH_3)_2$), R_8-aryl (e.g., CH_2-Ph), substituted or unsubstituted aryl (e.g., phenyl), substituted or unsubstituted heteroaryl (e.g., pyridine (2, 3, and 4-pyridine); or

two geminal **R** substitutions are joined together to form a 3 - 6 membered substituted or unsubstituted, aliphatic (e.g., cyclopropyl, cyclopentene) or aromatic, carbocyclic (e.g., benzene) or heterocyclic (e.g., thiophene, furane, pyrrol, pyrazole) ring;

R_8 is $[\mathbf{CH_2}]_p$

wherein **p** is between 1 and 10 (e.g., 2);

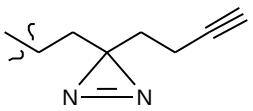
R_9 is $[CH]_q$, $[C]_q$

wherein **q** is between 2 and 10;

R_{10} and **R_{11}** are each independently H, OH, substituted or unsubstituted C_1-C_5 linear or branched alkyl (e.g., methyl, ethyl, CH_2-CH_2-O-CH_3), C_1-C_5 linear or branched alkoxy (e.g., O-CH_3), substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., 1-(methylsulfonyl)piperidine, 1-(methylsulfonyl)piperazine, tetrahydro-*2H*-pyrane, morpholine, thiomorpholine 1,1-dioxide, methyl-pyrrolidine, methyl-piperidine), C(O)-alkyl, or $S(O)_2$-alkyl;

or **R_{10}** and **R_{11}** are joined to form a substituted or unsubstituted C_3-C_8 heterocyclic ring (e.g., morpholine, piperazine, piperidine, pyrrolidine, 1-methylpyrrolidin-2-one , oxetane, azetidine, 1-methylazetidine),

R_{20} is represented by the following structure:



wherein substitutions include: F, Cl, Br, I, OH, SH, CF_3, CN, NO_2, substituted or unsubstituted C_1-C_5 linear or branched alkyl (e.g., methyl, methoxyethyl), substituted or unsubstituted C_1-C_5 linear or branched C(O)-alkyl (e.g., C(O)-CH_3, C(O)-CH_2-O-CH_3), SO_2-alkyl (e.g., SO_2-CH_3), C(O)-NH-alkyl, C_1-C_5 linear or branched alkyl-OH (e.g., $C(CH_3)_2CH_2$-OH, CH_2CH_2-OH), C_3-C_8 heterocyclic ring (e.g., piperidine), substituted or unsubstituted C_1-C_5 linear or branched alkoxy, $N(R)_2$, $N(R_{10})(R_{11})$, aryl, phenyl, heteroaryl, C_3-C_8 cycloalkyl, halophenyl, (benzyloxy)phenyl or any combination thereof;

n is an integer between 1 and 3 (e.g., 1 or 2);

m and **k** are each independently an integer between 0 and 2 (e.g., 0);

or its pharmaceutically acceptable salt, stereoisomer, tautomer, hydrate, *N*-oxide, prodrug, isotopic variant (e.g., deuterated analog), reverse amide, pharmaceutical product or any combination thereof**.**

5. The compound of any one of the preceding claims,

wherein R_1 is not H;

wherein **R_1** is in the *ortho* position,

wherein **R_1** is Cl, -R_8-O-R_{10}, or CH_2-O-CH_3;

wherein **R_3** is in the *para* position,

wherein **R_3** is $N(R_{10})(R_{11})$ (e.g., morpholine, piperazine), substituted or unsubstituted, single, spirocyclic, fused, or bridged C_3-C_{10} heterocyclic ring (e.g., piperazine, 1-(2-methoxyethyl)piperazine,

1-, or 4-methylpiperazine, 1- or 4-(methylsulfonyl)piperazine, 1- or 4-(methylsulfonyl)piperidine, 2-methoxy-1-(piperazin-1-yl)ethenone, , 1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)ethanone, 2-(dimethylamino)-1-(piperazin-1-yl)propanone, 2-hydroxy-1-(piperazin-1-yl)ethenone, *N*-methylpiperazine-1-carboxamide piperidin-4-ol, piperidin-3-ol, morpholine, 3-methylmorpholine, 3-hydroxypiperidine, tetrahydro-*2H*-pyrane, tetrahydro-2H-thiopyran 1,1-dioxide, pyrazole, thiazole, imidazole, pyrrolidine, pyrrolidinone, octahydropyrrolo[1,2-α]pyrazine, 6-methyl-2,6-diazaspiro[3.3]heptane, 2-oxa-7-azaspiro[3.5]nonane, 1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2-methoxy-1-(2,6-diazaspiro[3.3]heptan-2-yl)ethenone, 2,8-diazaspiro[4.5]decan-1-one, 2-oxa-7-azaspiro[3.5]nonane), or any combination thereof;

wherein $\mathbf{X_6}$ is CHR, CH(OH), $C(R_{10})(R_{11})$, 1-methylazetidine, N-R, $N\text{-}SO_2\text{-}CH_3$, $N\text{-}C(O)\text{-}R_{10}$, $N\text{-}C(O)\text{-}CH_3$, $N\text{-}C(O)\text{-}NH\text{-}CH_3$, or N-C(O)-1-methyl-3-piperidine;

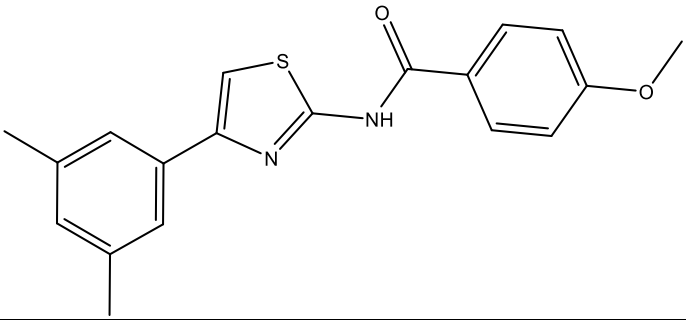
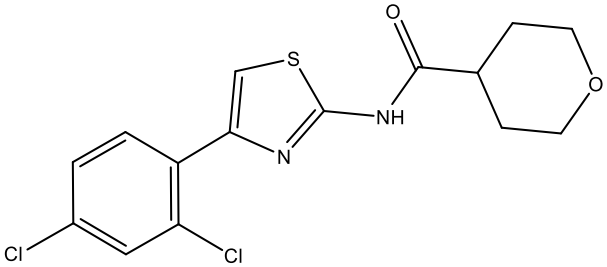
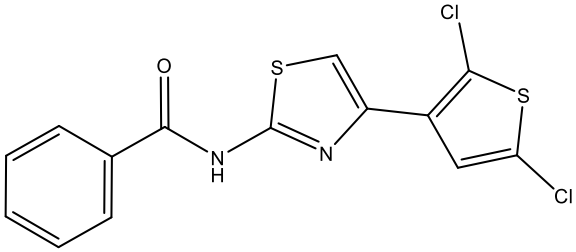
wherein **R** is H or OH;

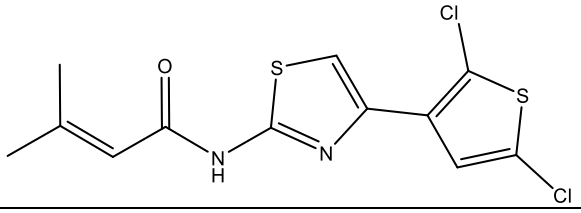
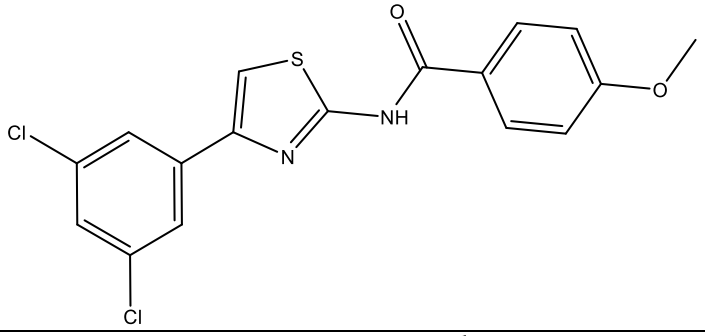
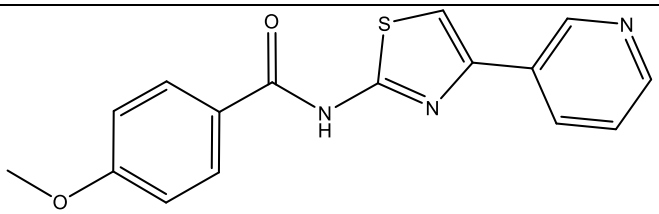
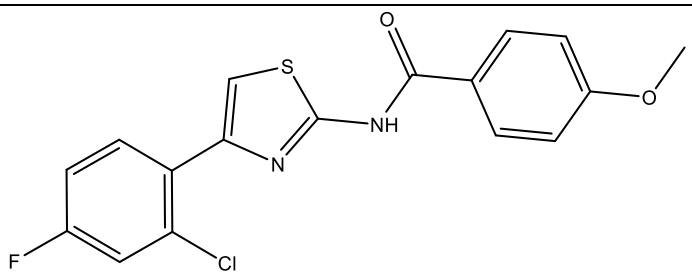
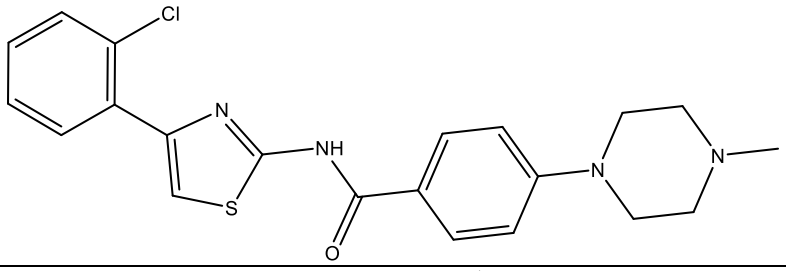
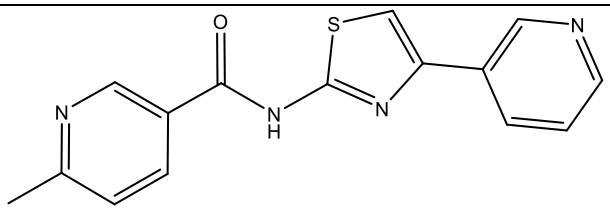
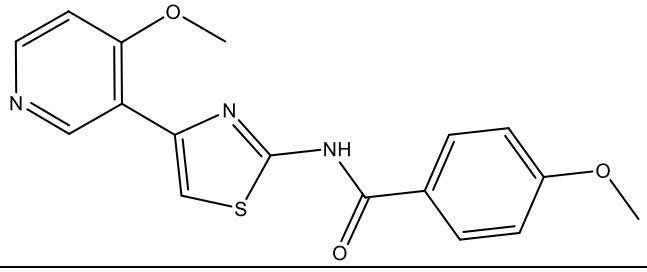
wherein $\mathbf{R_{10}}$ is substituted or unsubstituted C_3-C_8 heterocyclic ring, methyl-piperidine, or wherein $\mathbf{R_{10}}$ and $\mathbf{R_{11}}$ are joined to form a substituted or unsubstituted C_3-C_8 heterocyclic ring or 1-methylazetidine;

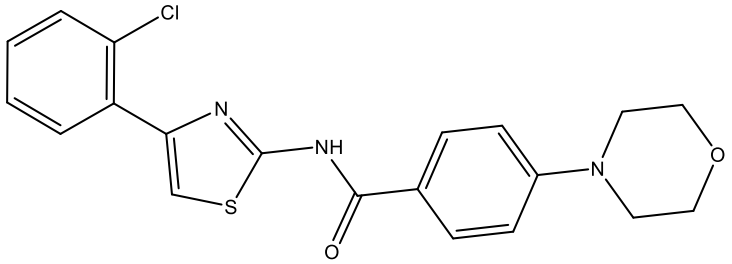
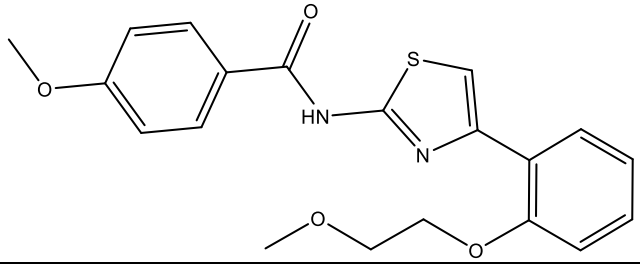
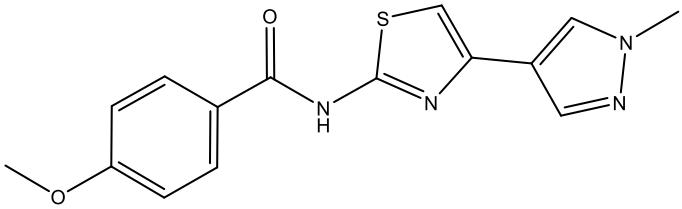
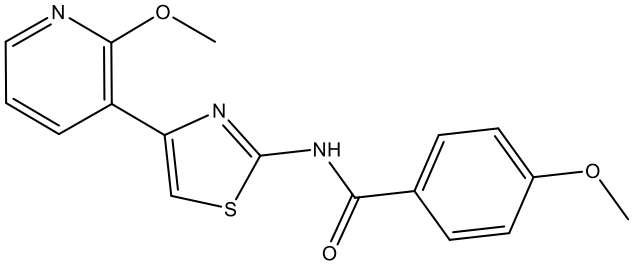
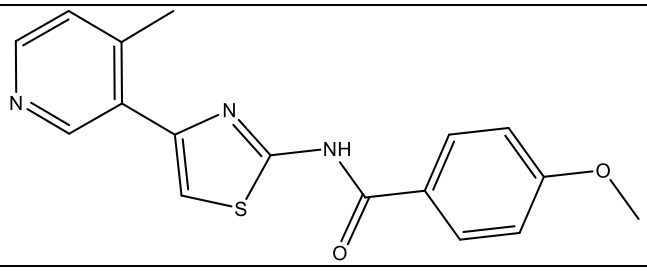
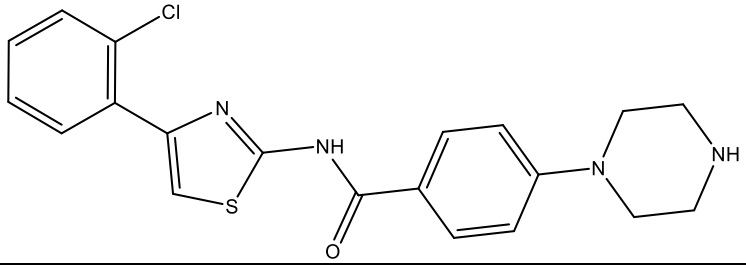
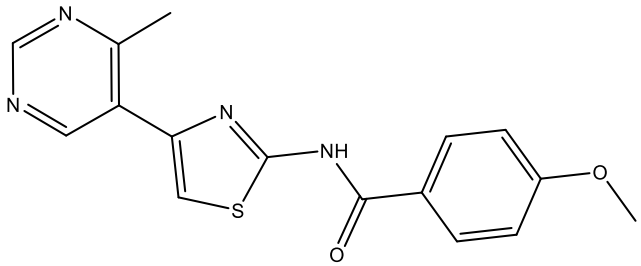
or any combination thereof.

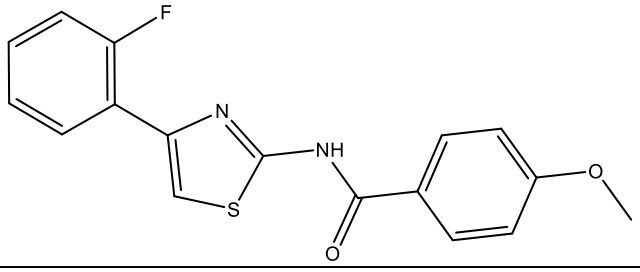
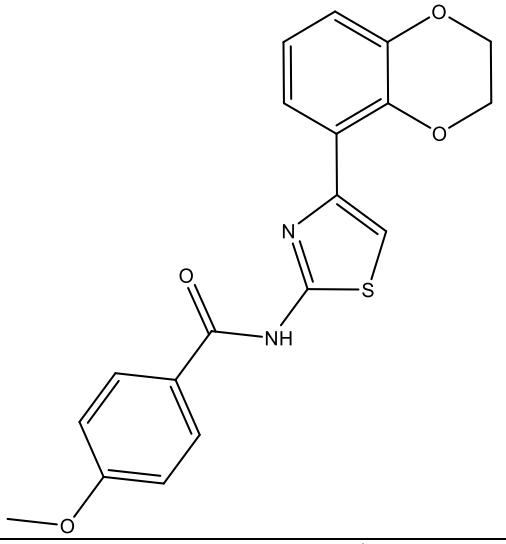
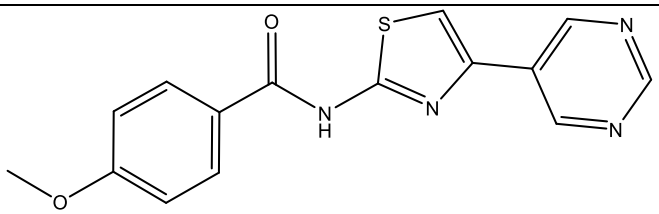
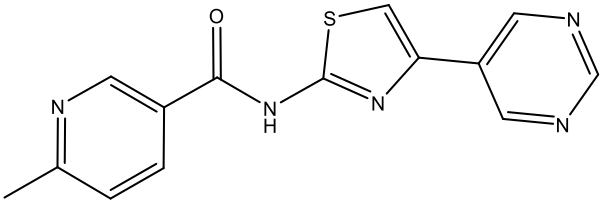
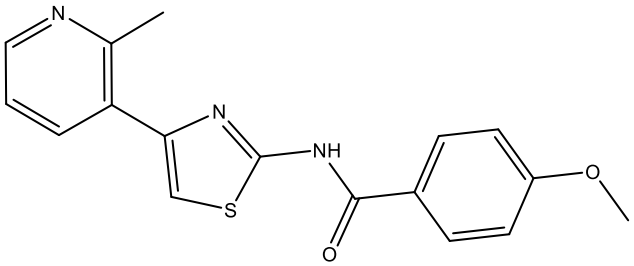
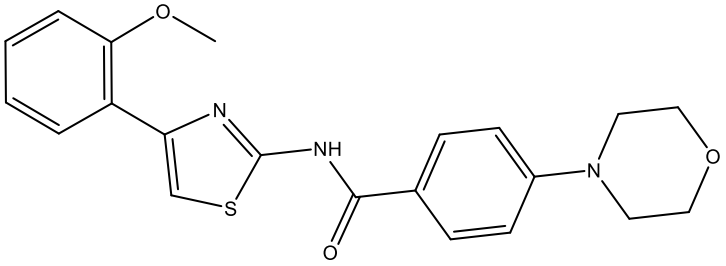
6. The compound of any one of the preceding claims, wherein at least two of $\mathbf{X_3}$, $\mathbf{X_4}$ and $\mathbf{X_5}$ are N.

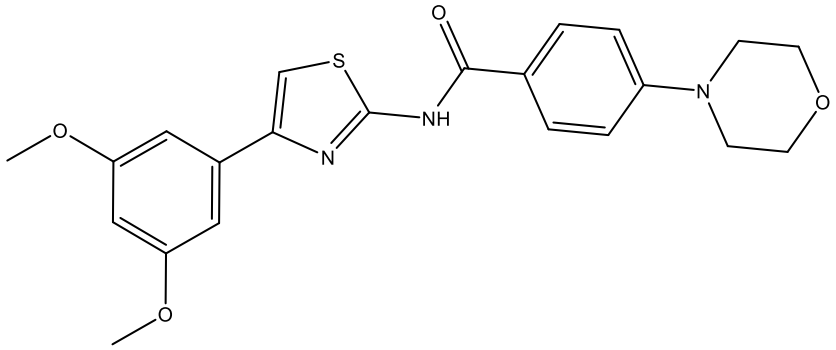
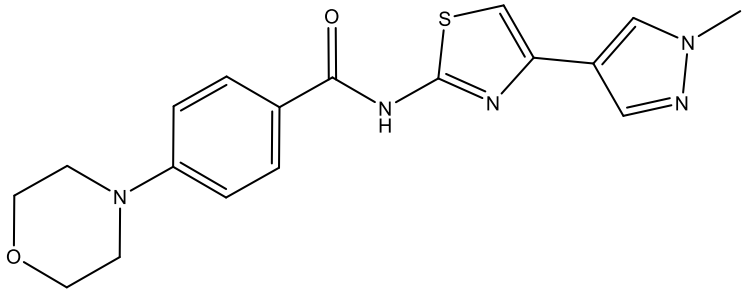
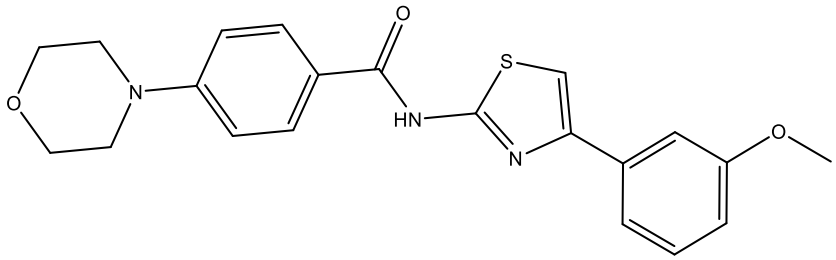
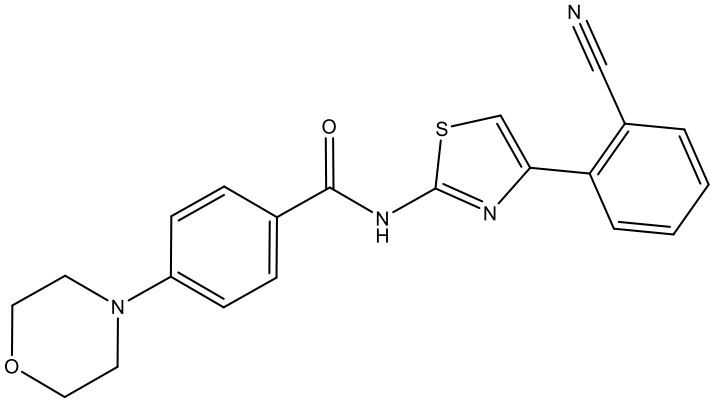
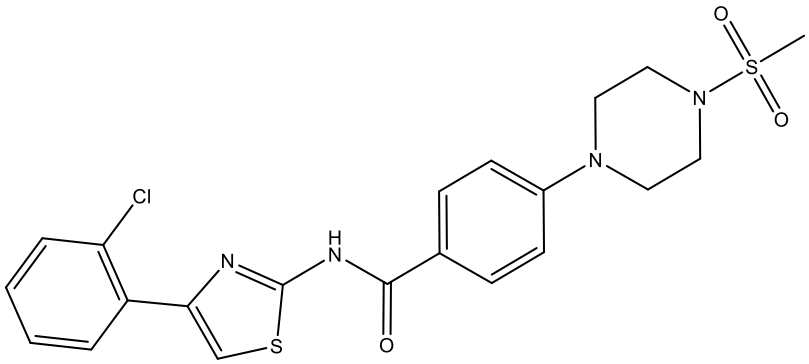
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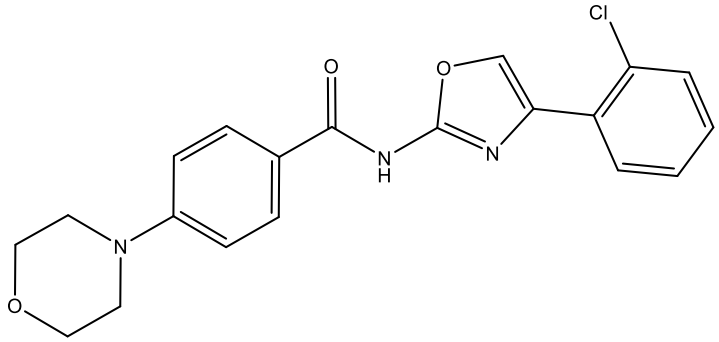
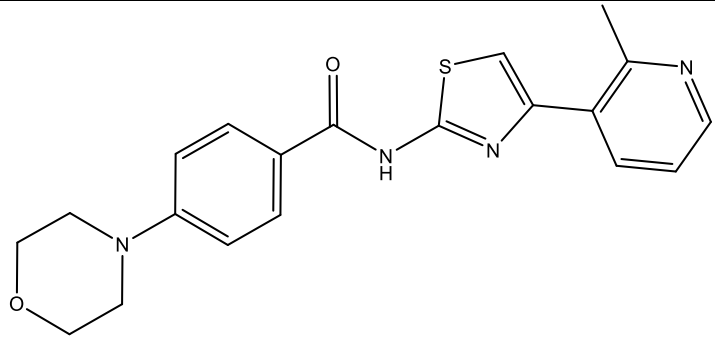
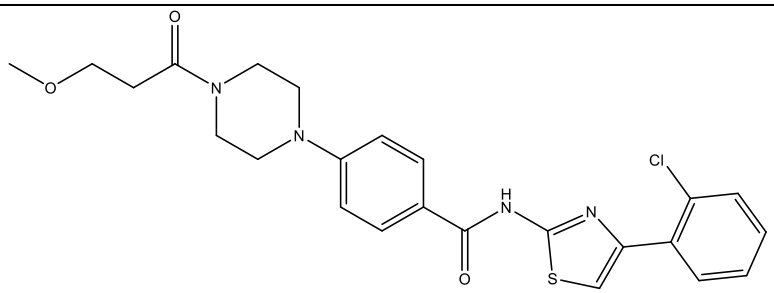
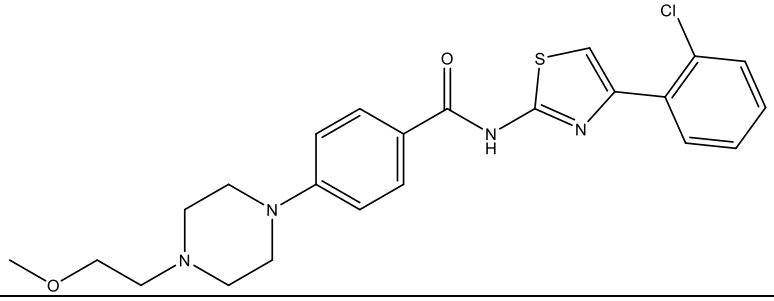
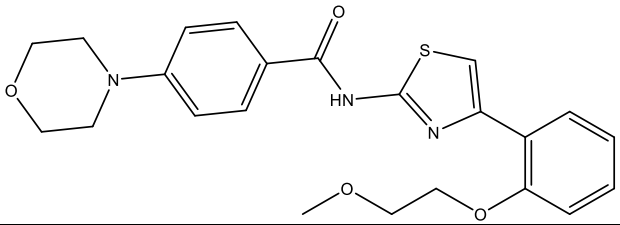
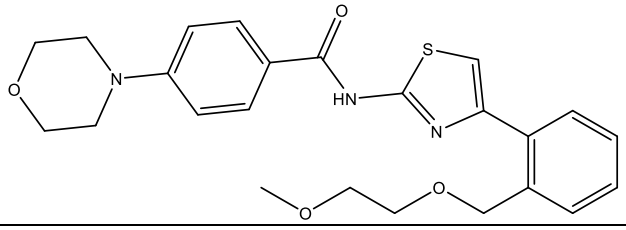
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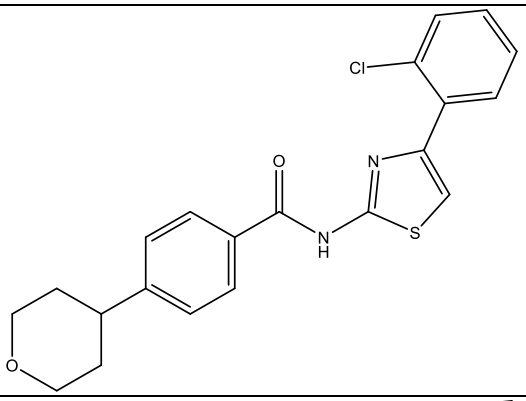
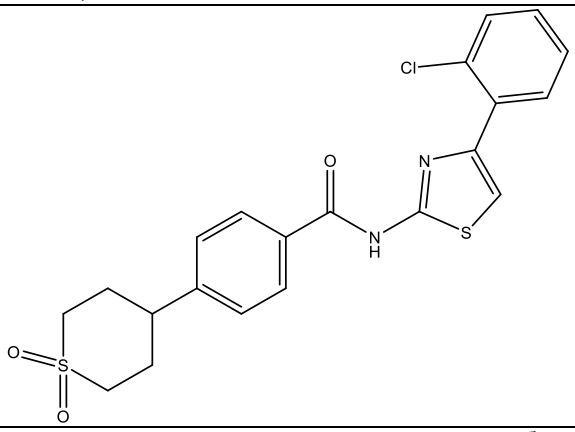
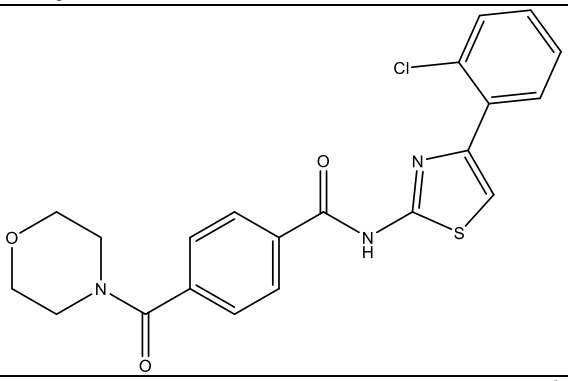
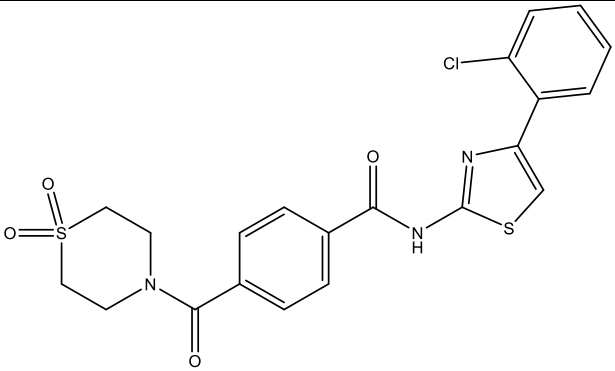
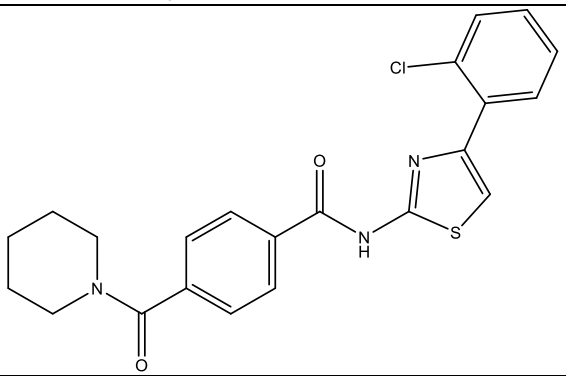
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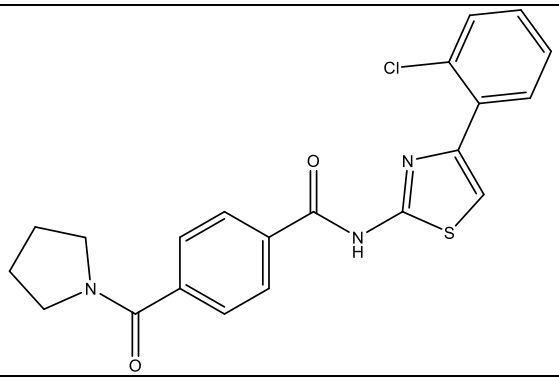
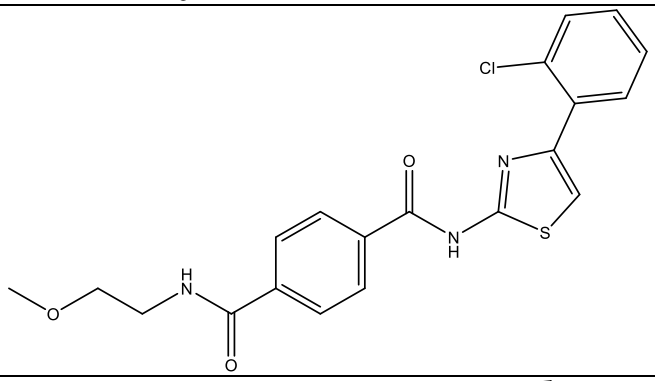
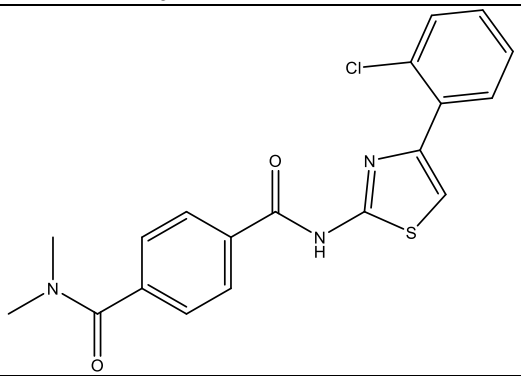
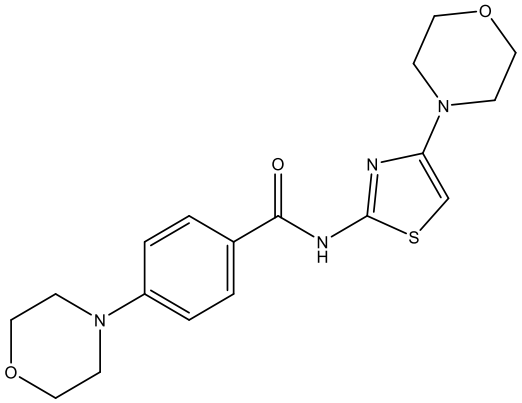
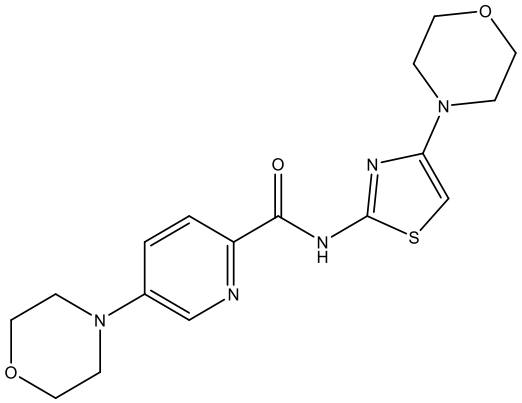
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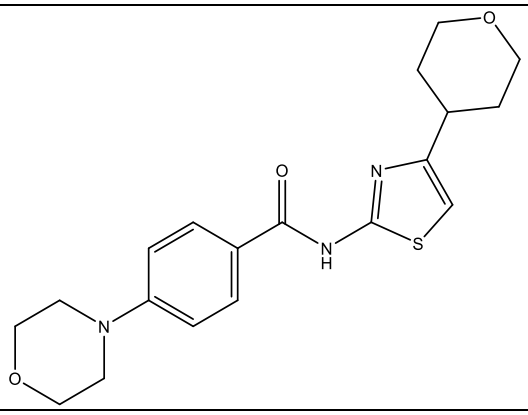
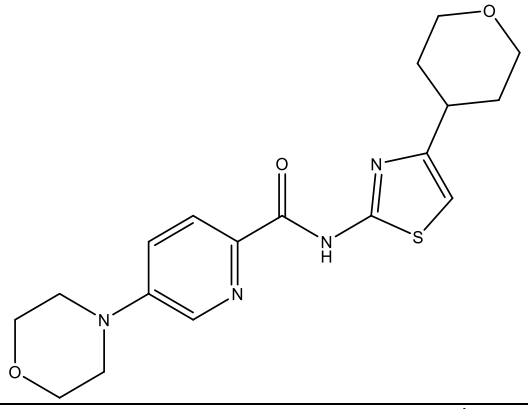
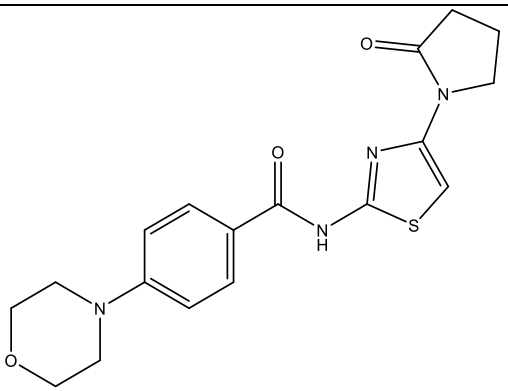
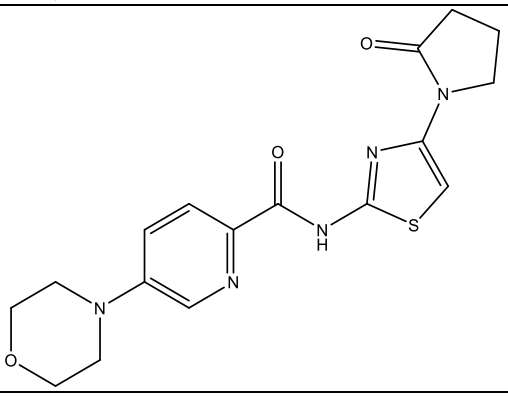
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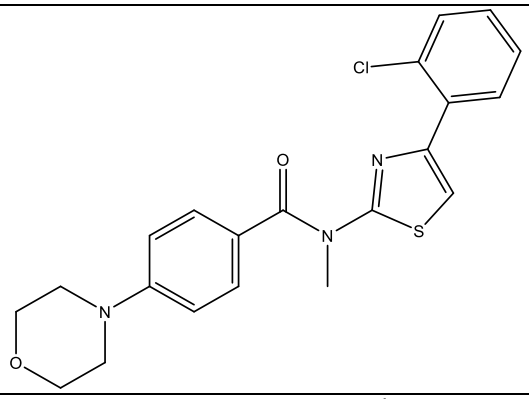
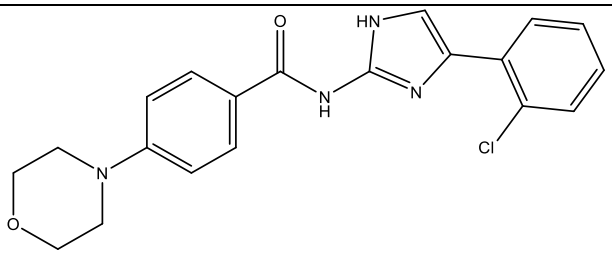
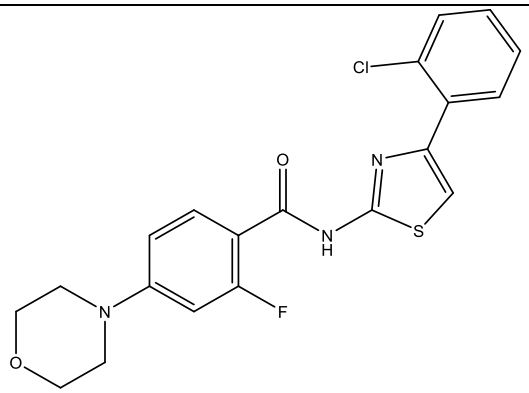
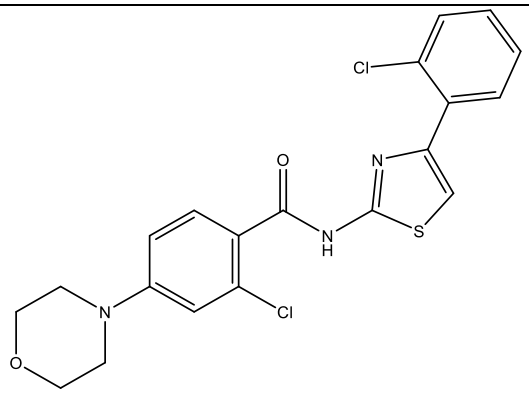
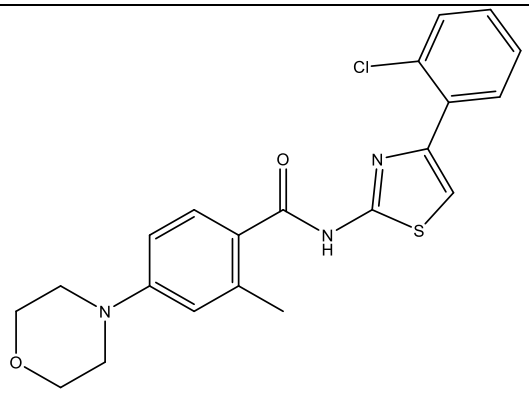
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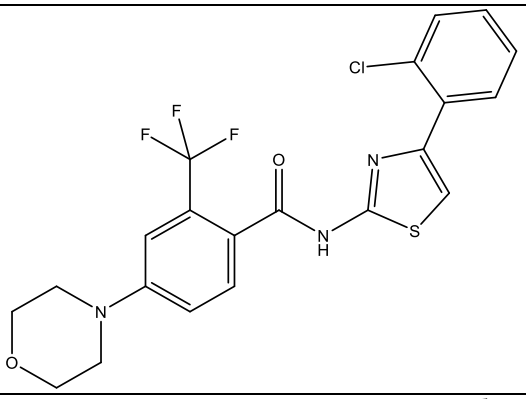
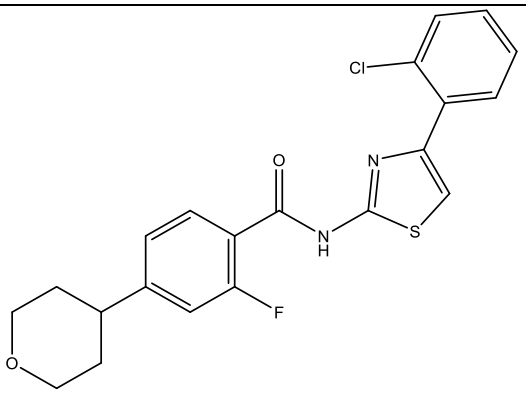
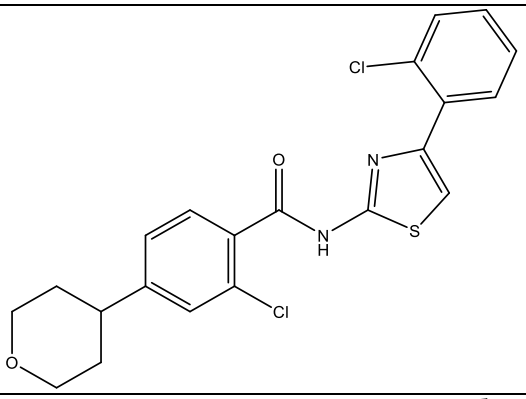
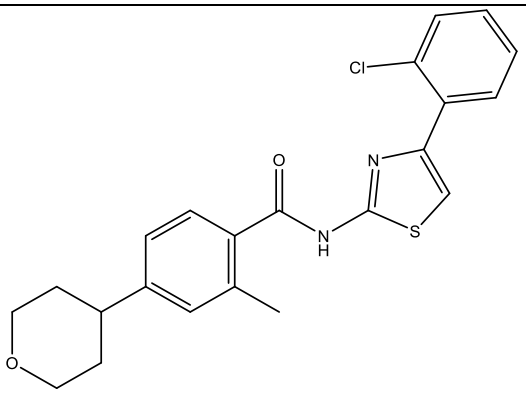
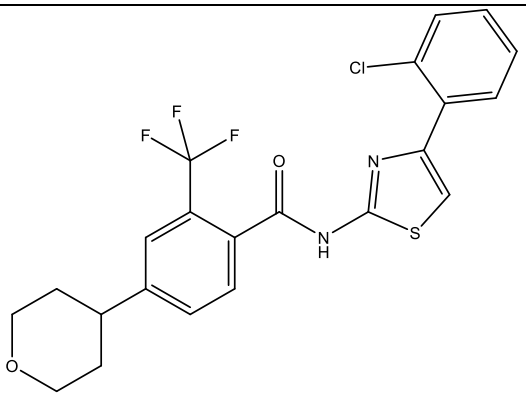
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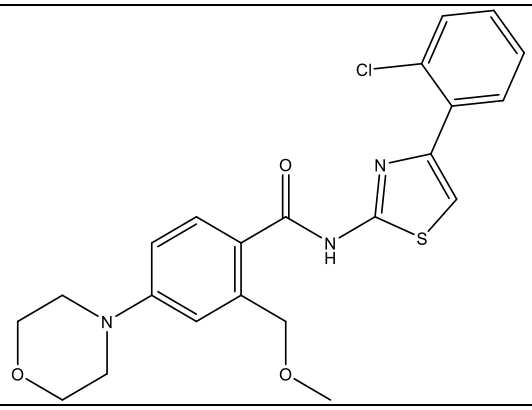
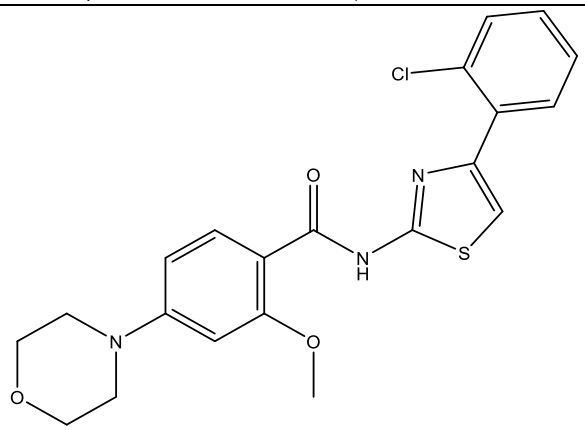
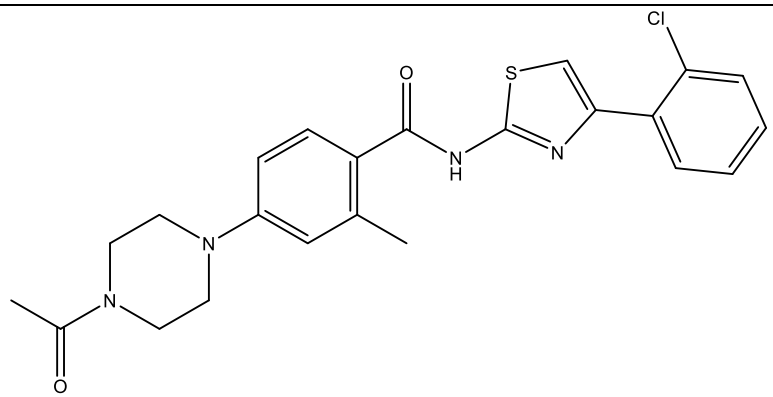
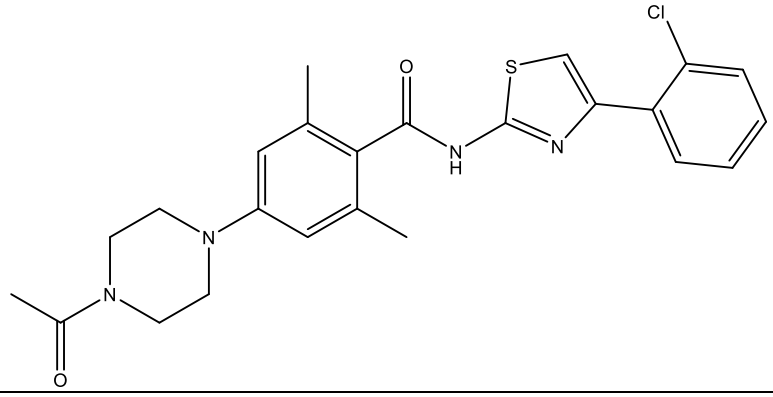
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8. The compound according to any one of claims 1-7, wherein the compound is a collagen translation inhibitor.

9. A pharmaceutical composition comprising a compound according to any one of claims 1 to 8 and a pharmaceutically acceptable carrier.

10. Use of a compound according to any one of claims 1 to 8, in the manufacture of a medicament for treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting fibrosis in a subject.

11. The use of claim 10,

wherein said fibrosis is a systemic fibrotic disease;

wherein said fibrosis is an organ-specific fibrotic disease;

wherein said fibrosis is primary or secondary fibrosis;

wherein said fibrosis is a result of systemic sclerosis, graft-versus host disease (GVHD), pulmonary fibrosis, autoimmune disorder, tissue injury, inflammation, oxidative stress or any combination thereof;

wherein the fibrosis is hepatic fibrosis, lung fibrosis or dermal fibrosis;

wherein said subject has a liver cirrhosis;

or any combination thereof.

12. The use of claim 11,

wherein said systemic fibrotic disease is systemic sclerosis, multifocal fibrosclerosis (IgG4-associated fibrosis), nephrogenic systemic fibrosis, sclerodermatous graft vs. host disease, or any combination thereof;

wherein said organ-specific fibrotic disease is lung fibrosis, cardiac fibrosis, kidney fibrosis, pulmonary fibrosis, liver and portal vein fibrosis, radiation-induced fibrosis, bladder fibrosis, intestinal fibrosis, peritoneal sclerosis, diffuse fasciitis, wound healing, scaring, or any combination thereof;

wherein the dermal fibrosis is scleroderma;

wherein the dermal fibrosis is a result of a localized or generalized morphea, keloids, hypertrophic scars, familial cutaneous collagenoma, connective tissue nevi of the collagen type, or any combination thereof;

wherein the hepatic fibrosis is a result of hepatic scarring or chronic liver injury;

or any combination thereof.

13. The use of claim 12,

wherein said lung fibrosis is idiopathic pulmonary fibrosis (IPF);

wherein said cardiac fibrosis is hypertension-associated cardiac fibrosis, Post-myocardial infarction, Chagas disease-induced myocardial fibrosis or any combination thereof;

wherein said kidney fibrosis is diabetic and hypertensive nephropathy, urinary tract obstruction-induced kidney fibrosis, inflammatory/autoimmune-induced kidney fibrosis, aristolochic acid nephropathy, polycystic kidney disease, or any combination thereof;

wherein said pulmonary fibrosis is idiopathic pulmonary fibrosis, silica-induced pneumoconiosis (silicosis), asbestos-induced pulmonary fibrosis (asbestosis), chemotherapeutic agent-induced pulmonary fibrosis, or any combination thereof;

wherein said liver and portal vein fibrosis is alcoholic and nonalcoholic liver fibrosis, hepatitis C-induced liver fibrosis, primary biliary cirrhosis, parasite-induced liver fibrosis (schistosomiasis), or any combination thereof;

wherein said diffuse fasciitis is localized scleroderma, keloids, dupuytren's disease, peyronie's disease, myelofibrosis, oral submucous fibrosis, or any combination thereof;

wherein the chronic liver injury results from alcoholism, malnutrition, hemochromatosis, exposure to poisons, toxins or drugs;

or any combination thereof.

14. Use of a compound according to any one of claims 1 to 8, in the manufacture of a medicament for treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting lung fibrosis, idiopathic pulmonary fibrosis (IPF), hepato-fibrotic disorder, cirrhosis, alcoholic steatohepatitis (ASH), non-alcoholic steatohepatitis (NASH), alcoholic fatty liver disease (AFLD), non alcoholic fatty liver disease (NAFLD), or an autoimmune disease in a subject.

15. The use of claim 14,

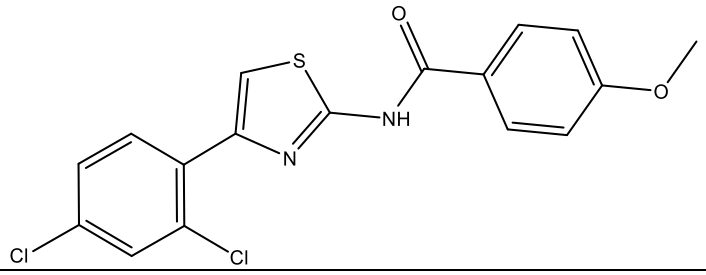
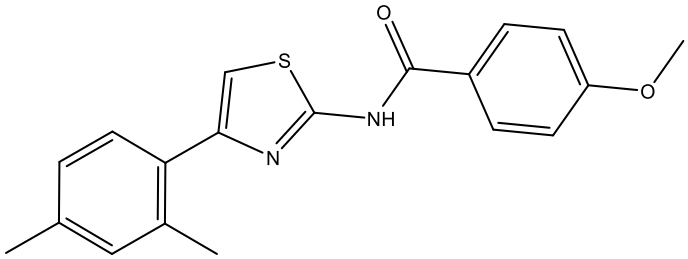
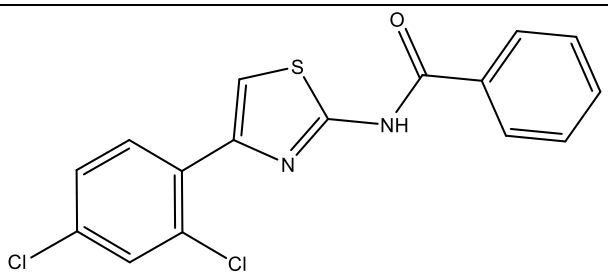
wherein the lung fibrosis is idiopathic pulmonary fibrosis (IPF),

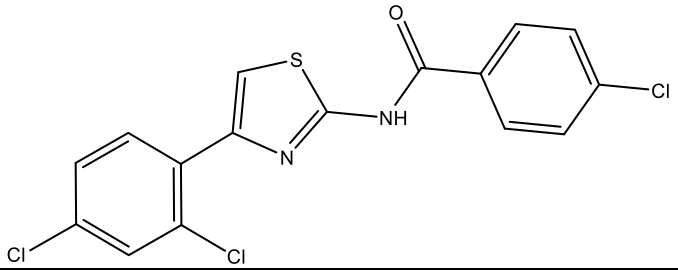
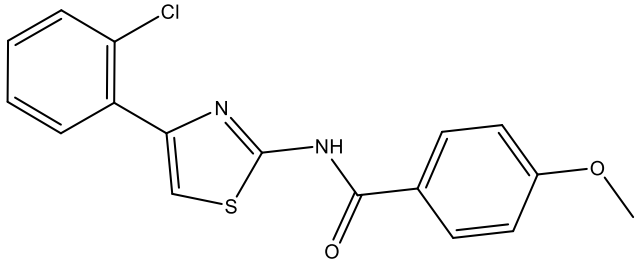
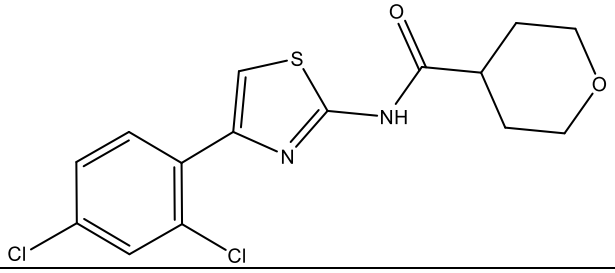
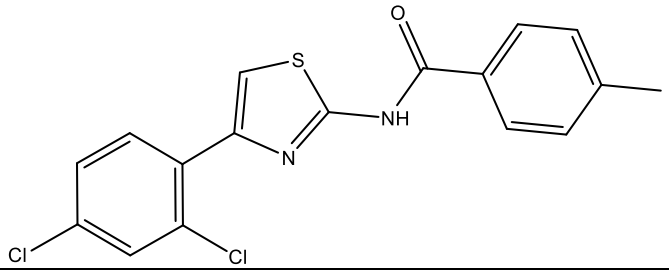
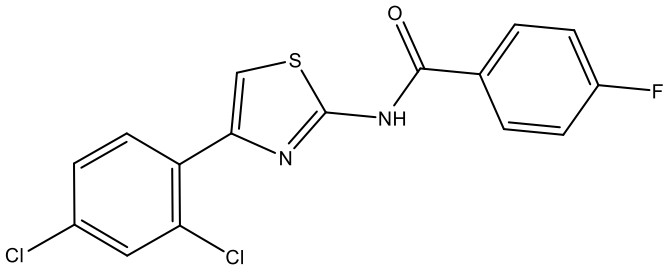
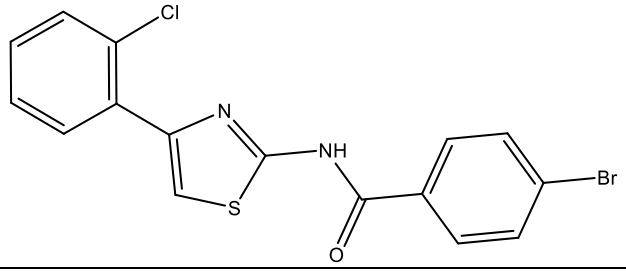
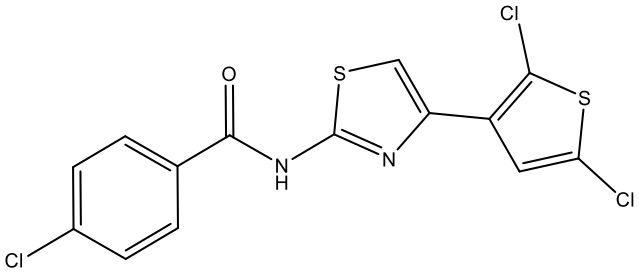
wherein the hepato-fibrotic disorder is a portal hypertension, cirrhosis, congenital hepatic fibrosis or any combination thereof;

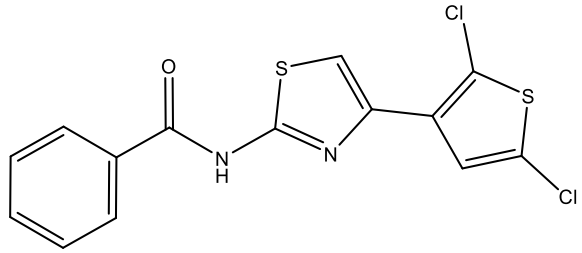
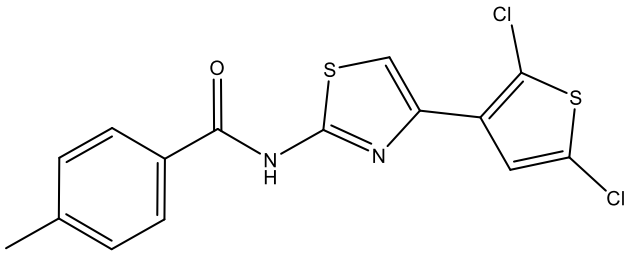
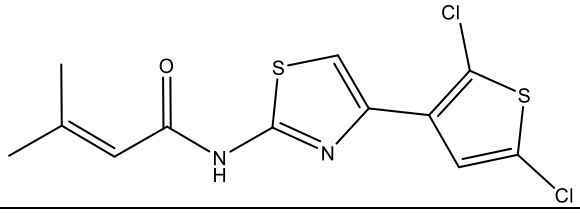
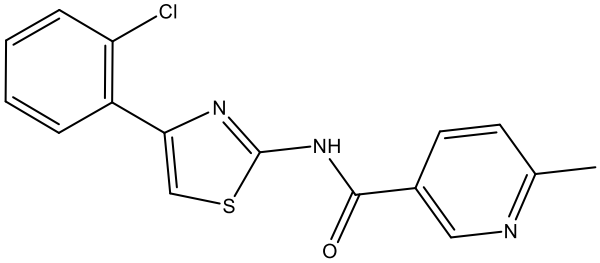
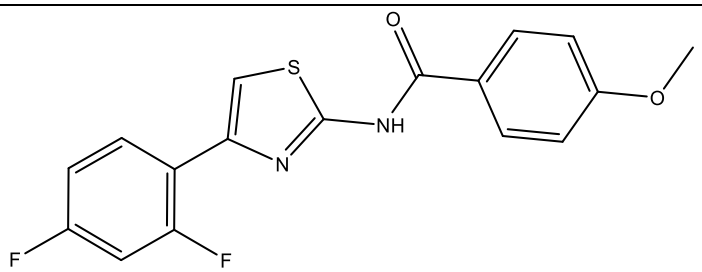
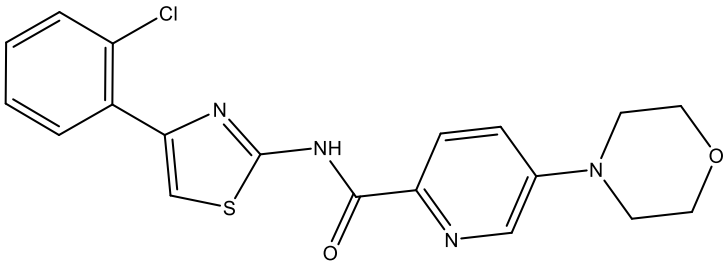
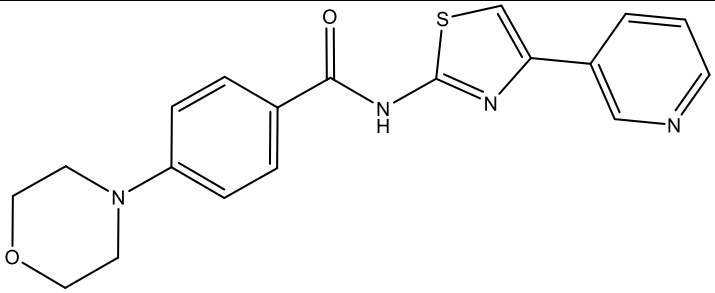
wherein the cirrhosis is a result of hepatitis or alcoholism; or combination thereof;

or any combination thereof.

16. Use of a compound represented by any one of the following structures:

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in the manufacture of a medicament for treating, suppressing, reducing the severity, reducing the risk of developing or inhibiting: fibrosis, lung fibrosis, idiopathic pulmonary fibrosis (IPF), hepato-fibrotic

disorder, cirrhosis, alcoholic steatohepatitis (ASH) , non-alcoholic steatohepatitis (NASH), alcoholic fatty liver disease (AFLD), non alcoholic fatty liver disease (NAFLD), or an autoimmune disease, in a subject.

17. The use of claim 16,

wherein said fibrosis is a systemic fibrotic disease;

wherein said fibrosis is an organ-specific fibrotic disease;

wherein said fibrosis is primary or secondary fibrosis;

wherein said fibrosis is a result of systemic sclerosis, graft-versus host disease (GVHD), pulmonary fibrosis, autoimmune disorder, tissue injury, inflammation, oxidative stress or any combination thereof;

wherein said subject has a liver cirrhosis;

wherein the fibrosis is hepatic fibrosis, lung fibrosis or dermal fibrosis;

wherein the lung fibrosis is idiopathic pulmonary fibrosis (IPF);

wherein the hepato-fibrotic disorder is a portal hypertension, cirrhosis, congenital hepatic fibrosis or any combination thereof;

wherein the cirrhosis is a result of hepatitis or alcoholism;

or any combination thereof.

18. The use of claim 17,

wherein said systemic fibrotic disease is systemic sclerosis, multifocal fibrosclerosis (IgG4-associated fibrosis), nephrogenic systemic fibrosis, sclerodermatous graft vs. host disease, or any combination thereof;

wherein said organ-specific fibrotic disease is lung fibrosis, cardiac fibrosis, kidney fibrosis, pulmonary fibrosis, liver and portal vein fibrosis, radiation-induced fibrosis, bladder fibrosis, intestinal fibrosis, peritoneal sclerosis, diffuse fasciitis, wound healing, scaring, or any combination thereof;

wherein the dermal fibrosis is scleroderma;

wherein the dermal fibrosis is a result of a localized or generalized morphea, keloids, hypertrophic scars, familial cutaneous collagenoma, connective tissue nevi of the collagen type, or any combination thereof;

wherein the hepatic fibrosis is a result of hepatic scarring or chronic liver injury;

or any combination thereof.

19. The use of claim 18,

wherein said lung fibrosis is idiopathic pulmonary fibrosis (IPF);

wherein said cardiac fibrosis is hypertension-associated cardiac fibrosis, Post-myocardial infarction, Chagas disease-induced myocardial fibrosis or any combination thereof;

wherein said kidney fibrosis is diabetic and hypertensive nephropathy, urinary tract obstruction-induced kidney fibrosis, inflammatory/autoimmune-induced kidney fibrosis, aristolochic acid nephropathy, polycystic kidney disease, or any combination thereof;

wherein said pulmonary fibrosis is idiopathic pulmonary fibrosis, silica-induced pneumoconiosis (silicosis), asbestos-induced pulmonary fibrosis (asbestosis), chemotherapeutic agent-induced pulmonary fibrosis, or any combination thereof;

wherein said liver and portal vein fibrosis is alcoholic and nonalcoholic liver fibrosis, hepatitis C-induced liver fibrosis, primary biliary cirrhosis, parasite-induced liver fibrosis (schistosomiasis), or any combination thereof;

wherein said diffuse fasciitis is localized scleroderma, keloids, dupuytren's disease, peyronie's disease, myelofibrosis, oral submucous fibrosis, or any combination thereof;

wherein the chronic liver injury results from alcoholism, malnutrition, hemochromatosis, exposure to poisons, toxins or drugs;

or any combination thereof.

20. The compound according to any one of claims 1 to 8 for use in therapy.