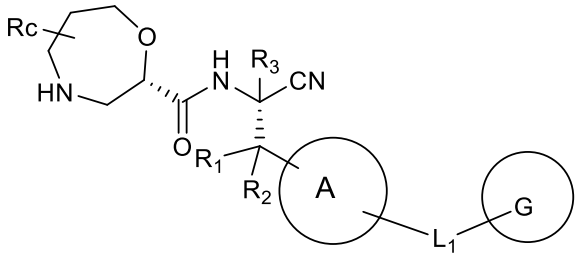
CLAIMS

WHAT IS CLAIMED IS:

1. A compound of formula (III), or a stereoisomer, a solvate or a pharmaceutically acceptable salt thereof:



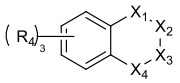
(III)

wherein Rc is H, =O, halogen, cyano, hydroxyl, NH_2, -COOH, C_{1-4} alkyl, halo C_{1-4} alkyl, hydroxy C_{1-4} alkyl, C_{1-4} alkoxy, C_{1-6} alkoxyalkyl, or halo C_{1-4} alkoxy;

R_1, R_2, and R_3 are each independently selected from H, deuterium, halogen, C_{1-4} alkyl, and C_{1-4} alkoxy, and the alkyl and alkoxy are optionally substituted with 1-3 groups selected from halogen, C_{1-4} alkyl, cyano, hydroxyl, NH_2, and COOH;

optionally, R_1 and R_2 together with the carbon atom to which they are attached form C_{3-6} cycloalkyl, and the cycloalkyl is optionally substituted with 1-3 groups selected from halogen, cyano, hydroxyl, NH_2, COOH, and C_{1-4} alkyl;

L_1 is a bond;



(I-2)

ring G is a benzene ring, optionally substituted with 1-3 R_G groups, or ring G is ,and L_1 is attached to the ring G by replacing any hydrogen atom on the ring atoms;

each R_4 is independently selected from H, halogen, C_{1-4} alkyl, C_{1-4} alkoxy, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-6} cycloalkyl, cyano, hydroxyl, and NH_2; the alkyl, alkenyl, alkynyl, and cycloalkyl in the case of R_4 are optionally substituted with 1-3 groups selected from deuterium, halogen;

each R_G is independently selected from deuterium, SF_5, =O, halogen, cyano, hydroxyl, NH_2, -COOH, C_{1-4} alkyl, halo C_{1-4} alkyl, C_{1-4} alkoxy, C_{3-6} cycloalkyloxy, C_{3-6} cycloalkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, -NHC_{1-4} alkyl, -$N(C_{1-4}$ alkyl$)_2$, -COC_{1-4} alkyl, -$COOC_{1-4}$ alkyl, -$CONH_2$, -$CONHC_{1-4}$ alkyl, -$CONHC_{3-6}$ cycloalkyl, -$CON(C_{1-4}$ alkyl$)_2$, -$NHCOC_{1-4}$ alkyl, -$NHCOC_{3-6}$ cycloalkyl, -$P(O)(C_{1-4}$ alkyl$)_2$, -$S(O)C_{1-4}$alkyl, -$S(O)_2C_{1-4}$ alkyl, -$S(O)_2C_{3-6}$ cycloalkyl, -$S(O)NH_2$, -$S(O)NHC_{1-4}$ alkyl, -$S(O)N(C_{1-4}$ alkyl$)_2$, -$S(O)_2NH_2$, and a 4-7-membered heterocycle containing 1-3 heteroatoms selected

from N, S and O, and the R_G is optionally further substituted with 1-3 groups selected from deuterium, halogen;

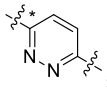
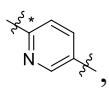
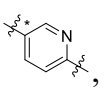
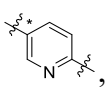
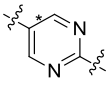
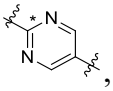
X_1, X_2, X_3, and X_4 are each independently selected from a bond, NR_5, O, CR_6R_7, S, S(O), and $S(O)_2$, and at most one of X_1, X_2, X_3, and X_4 is a bond;

each R_5 is independently selected from H, C_{1-4} alkyl, and C_{3-6} cycloalkyl, wherein the alkyl and cycloalkyl are optionally substituted with 1-3 groups selected from deuterium, halogen, cyano, hydroxyl, NH_2, and COOH;

R_6 and R_7 are each independently selected from H, deuterium, halogen, C_{1-4} alkyl, and C_{1-4} alkoxy, wherein the alkyl and alkoxy are optionally substituted with 1-3 groups selected from deuterium, halogen, cyano, hydroxyl, NH_2, and COOH;

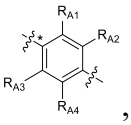
optionally, R_6 and R_7 form =O;

optionally, two R_5 on adjacent ring atoms, two R_6 on adjacent ring atoms, or R_5 and R_6 on adjacent ring atoms in X_1, X_2, X_3, and X_4 together with the atoms to which they are attached form a double bond;

A is , , , ,  or , and ring A is substituted with 1-3 R_8 groups;

each R_8 is independently selected from halogen, =O, cyano, hydroxyl, NH_2, -COOH, C_{1-4} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, and C_{3-6} cycloalkyl;

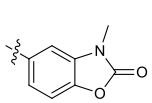
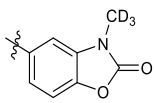
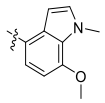
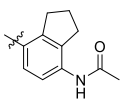
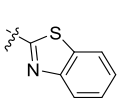
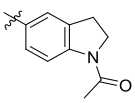
* indicates the end connected to the alkyl carbon atom; or

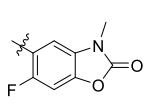
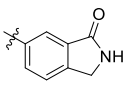
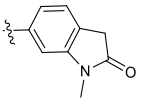
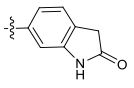
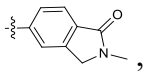
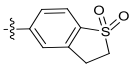
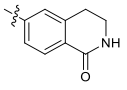
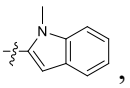
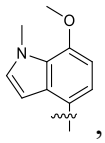
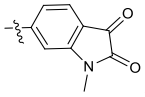
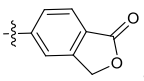
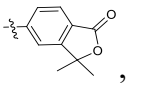
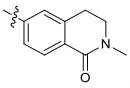
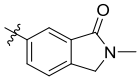
A is , wherein * indicates the end connected to the alkyl carbon atom;

R_{A1}, R_{A2}, R_{A3}, and R_{A4} are each independently R_8, and R_{A1}, R_{A2}, R_{A3}, and R_{A4} are not H at the same time;

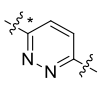
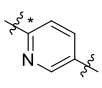
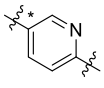
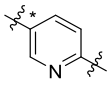
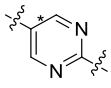
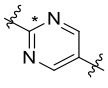
and each R_8 is independently selected from H, deuterium, halogen, C_{1-4} alkyl, C_{1-4} alkoxy, cyano, hydroxyl, NH_2, and COOH, wherein the alkyl and alkoxy are optionally substituted with 1-3 groups selected from deuterium, halogen, cyano, hydroxyl, NH_2, and COOH.

2. The compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof according to claim 1, wherein

ring G is a benzene ring, optionally substituted with 1-3 R_G groups, or ring G is selected from one of the following structures: , , , , , ,

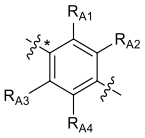
, , , , , , , , , , , , , and ;

each R_G is independently selected from deuterium, SF_5, halogen, cyano, C_{1-4} alkyl, C_{1-4} alkoxy, C_{3-6} cycloalkyl, -NHC_{1-4} alkyl, -$N(C_{1-4}$ alkyl$)_2$, -COC_{1-4} alkyl, -$CONHC_{1-4}$ alkyl, -$CON(C_{1-4}$ alkyl$)_2$, -$NHCOC_{1-4}$ alkyl, and a 4-7-membered heterocycle containing 1-3 heteroatoms selected from N, S and O;

A is , , , , , or , and ring A is substituted with 1-3 R_8 groups;

each R_8 is independently selected from halogen, cyano, hydroxyl, NH_2, C_{1-4} alkyl, and C_{1-4} alkoxy;

* indicates the end connected to the alkyl carbon atom; or

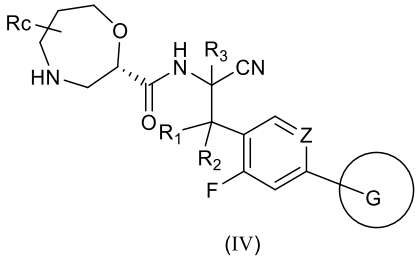
A is , wherein * indicates the end connected to the alkyl carbon atom;

R_{A1}, R_{A2}, R_{A3}, and R_{A4} are each independently R_8, and R_{A1}, R_{A2}, R_{A3}, and R_{A4} are not H at the same time;

and each R_8 is independently selected from H, deuterium, halogen, C_{1-4} alkyl, C_{1-4} alkoxy, cyano, hydroxyl, NH_2, and COOH, wherein the alkyl and alkoxy are optionally substituted with 1-3 groups selected from deuterium, halogen, cyano, hydroxyl, NH_2, and COOH;

R_1, R_2, and R_3 are each independently selected from H, deuterium.

3. The compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof according to claim 1, wherein the compound has a structure of formula (IV):



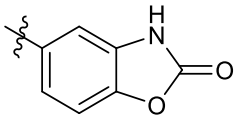
(IV)

wherein

Rc is H, halogen, C_{1-2} alkyl or C_{1-2} alkoxy;

R_1, R_2, and R_3 are each independently selected from H, deuterium, F, Cl, Br, methyl, ethyl, methoxy or ethoxy, and the methyl, ethyl, methoxy or ethoxy is optionally substituted with 1-3 groups selected from F, Cl, Br, cyano, hydroxyl, and NH_2;

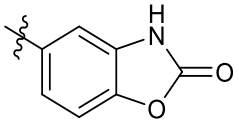
Z is CH or N;

ring G is  or a benzene ring, optionally substituted with 1-2 R_G groups; and

each R_G is independently selected from F, Cl, Br, I, methyl, ethyl, propyl, SF_5 and CN, wherein the methyl, ethyl or propyl is optionally further substituted with 1-3 groups selected from deuterium, F, Cl, Br, and I.

4. The compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof according to claim 3, wherein Z is CH.

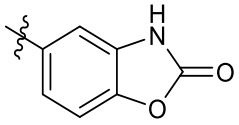
5. The compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof according to claim 3 wherein

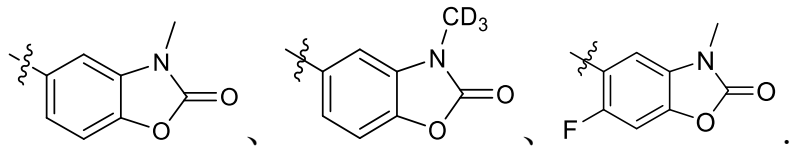
ring G is  optionally substituted with 1-2 R_G groups.

6. The compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof according to claim 3 or 5, wherein

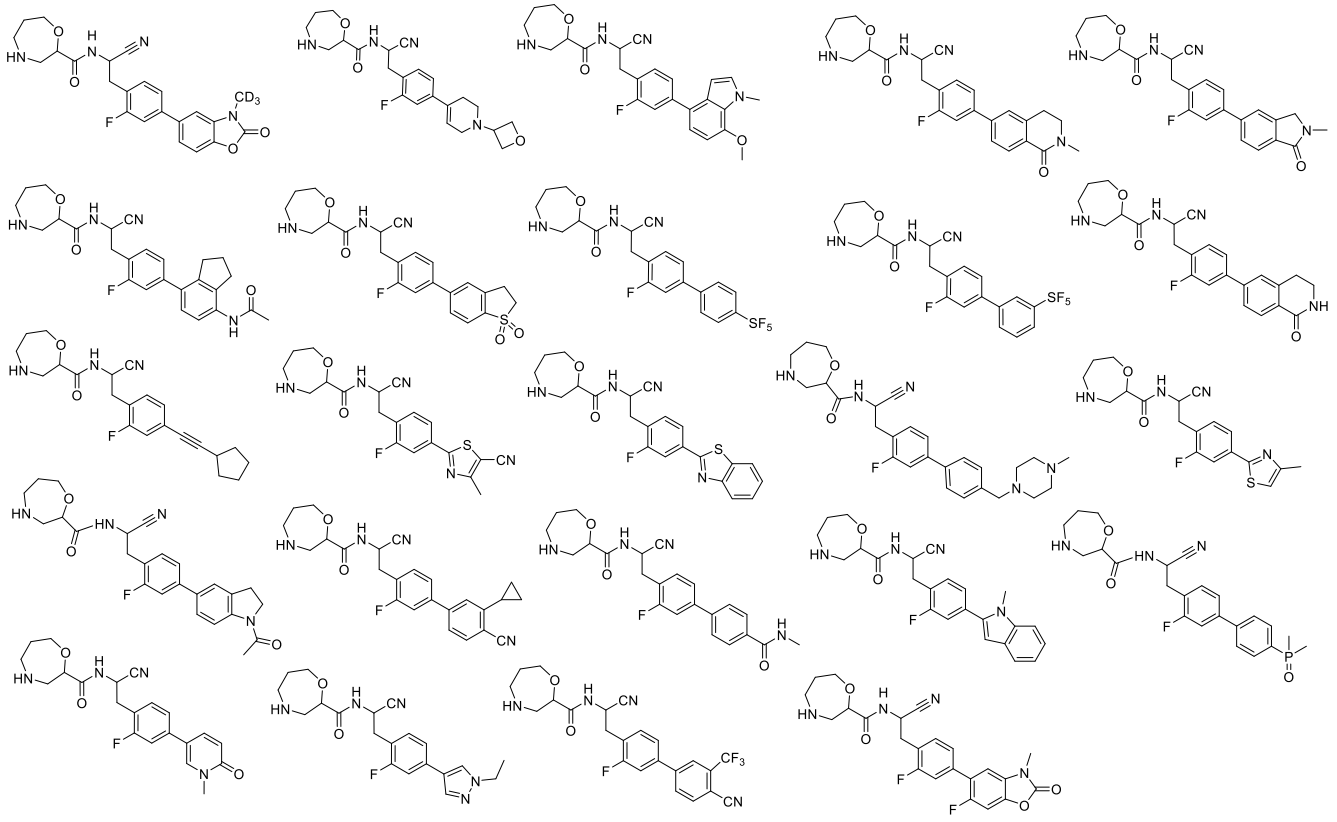
each R_G is independently selected from methyl, ethyl, or propyl, wherein the methyl, ethyl, or propyl is optionally further substituted with 1-3 groups selected from deuterium, F, Cl, Br, and I.

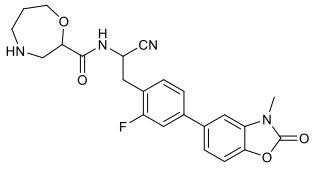
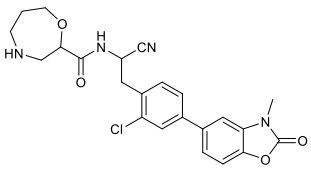
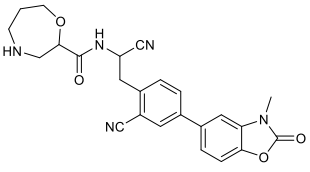
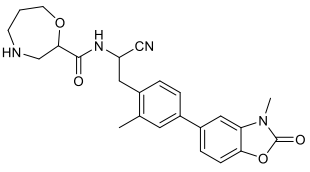
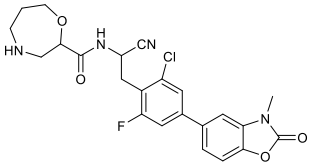
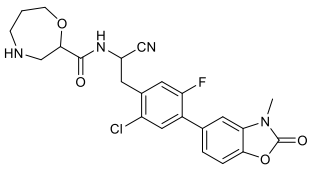
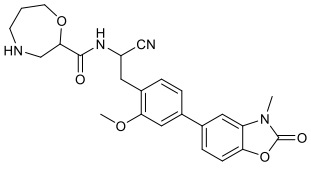
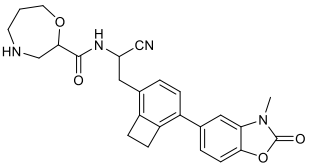
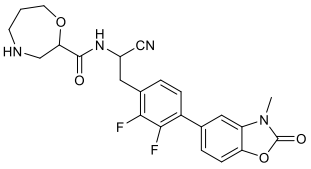
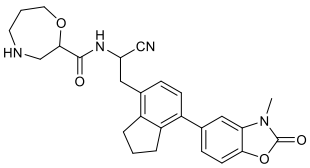
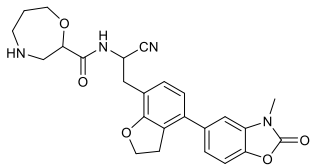
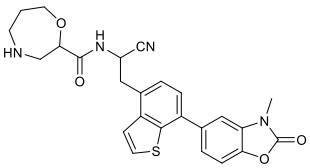
7. The compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof according to claim 6, wherein each R_G is independently selected from methyl, ethyl, or propyl.

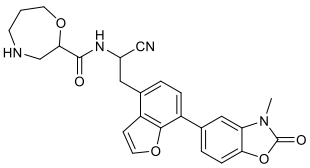
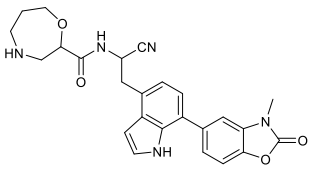
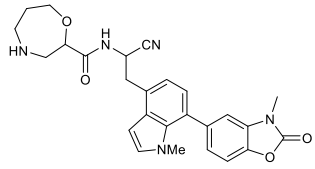
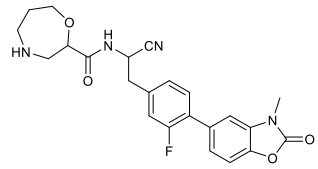
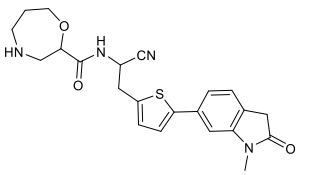
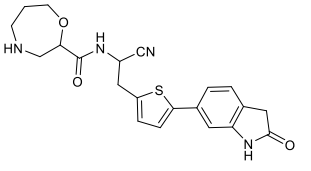
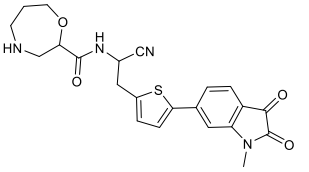
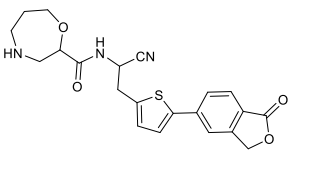
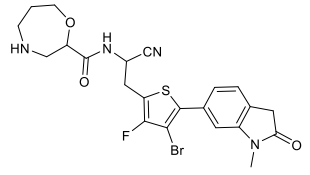
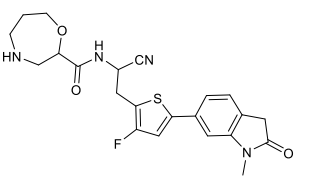
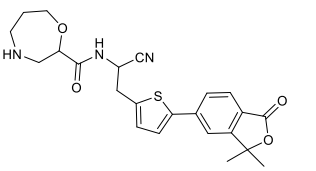
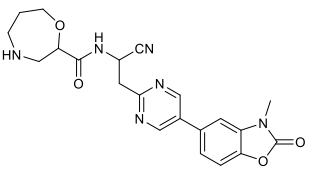
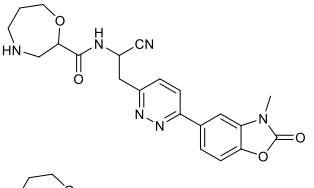
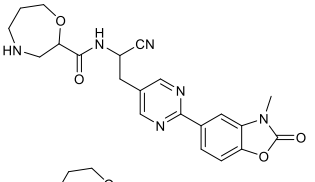
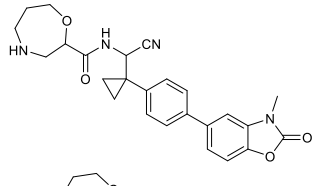
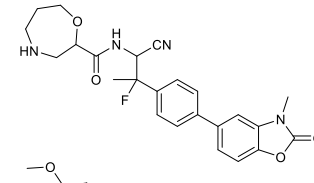
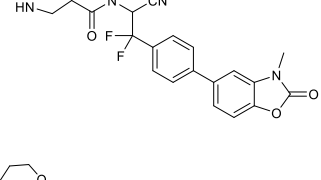
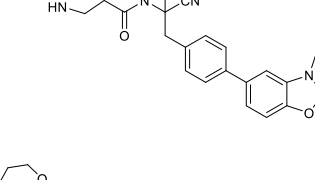
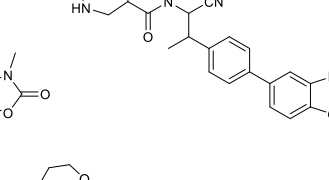
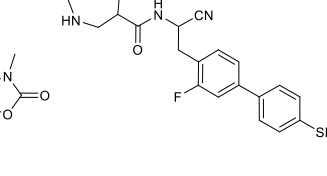
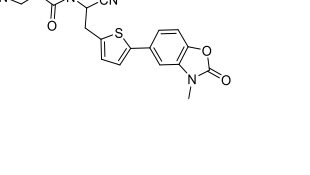
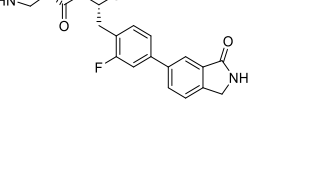
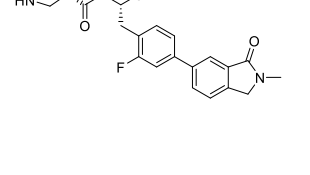
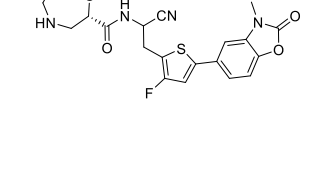
8. The compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof according to claim 1 or 3, wherein the  optionally substituted with 1-2 R_G groups is selected from the following structures:

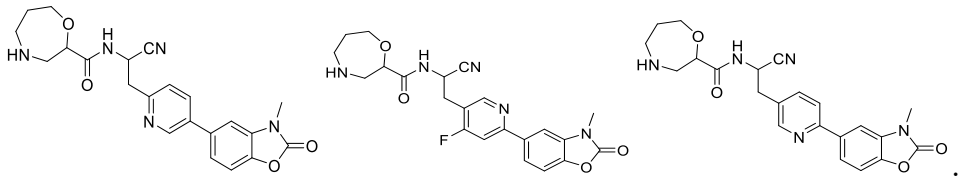


9. A compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof, wherein the compound is selected from one of the following structures:

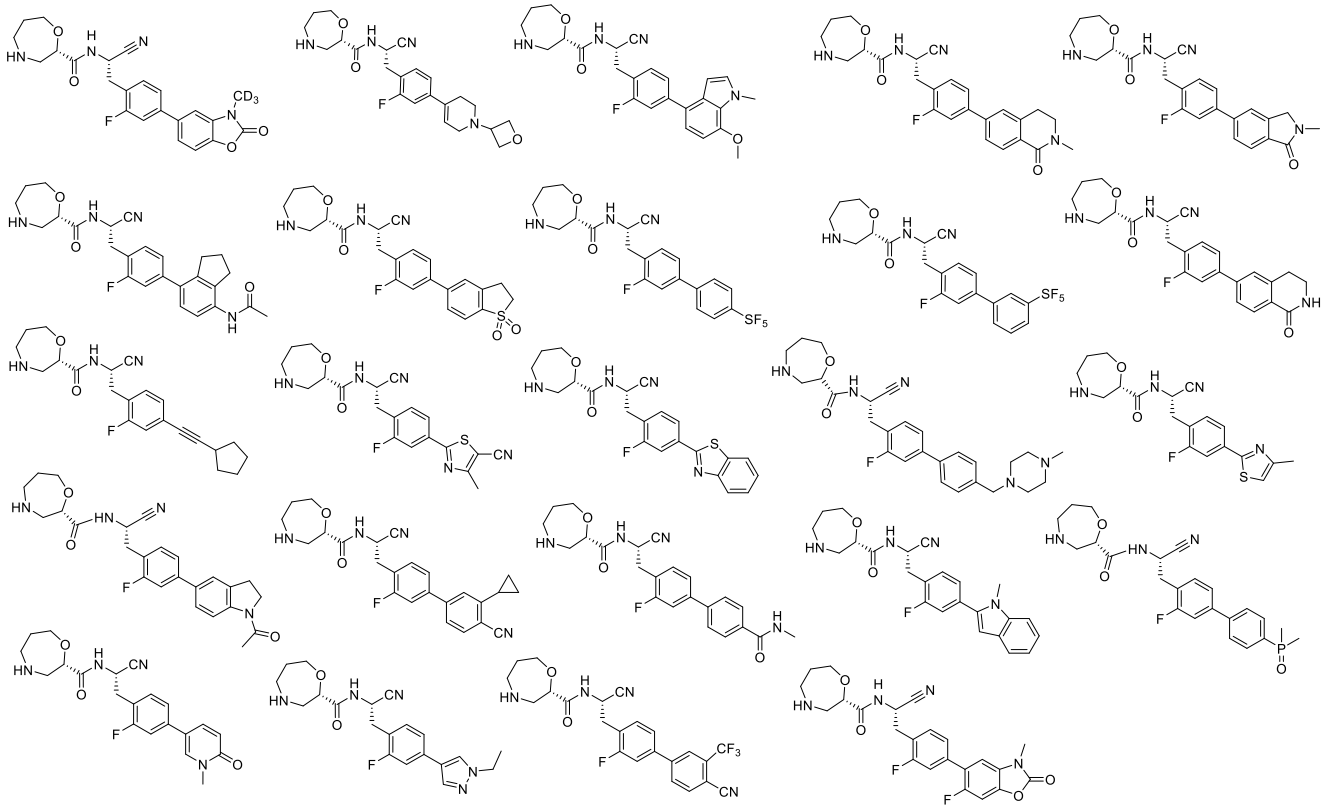


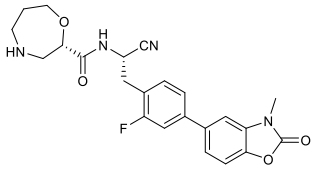
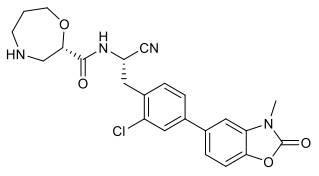
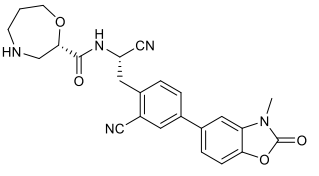
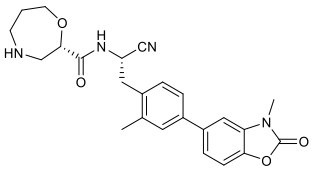
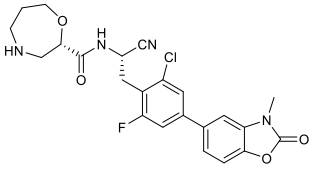
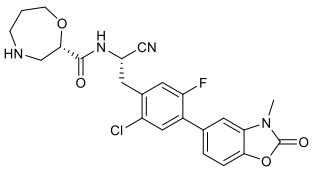
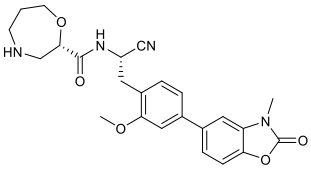
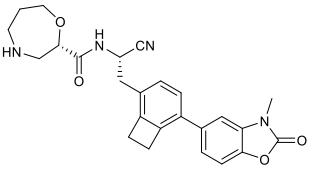
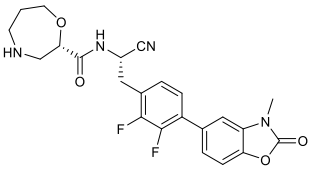
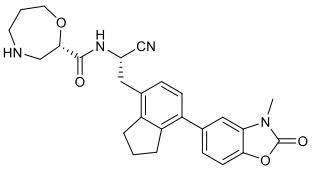
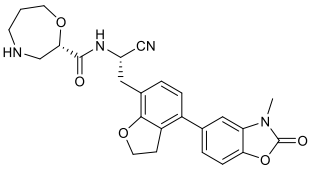
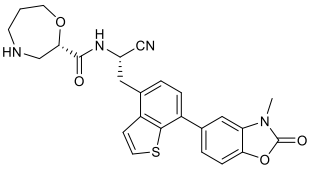
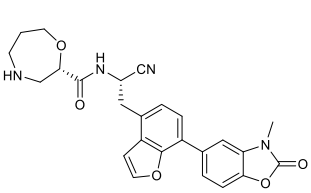
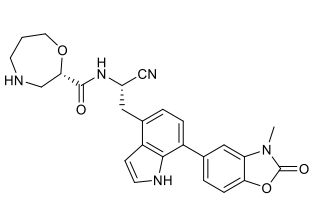
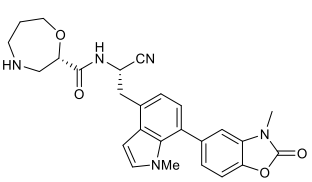
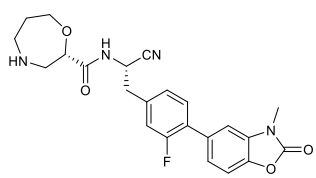
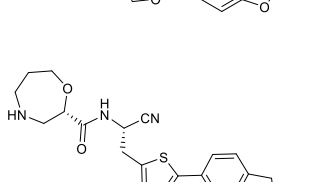
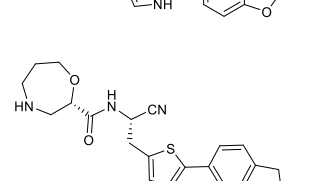
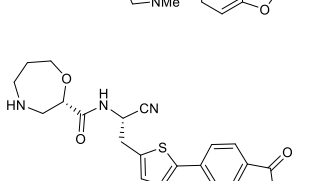
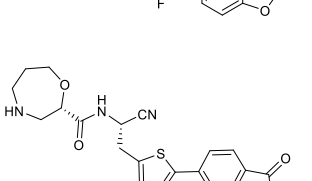
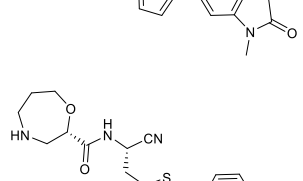
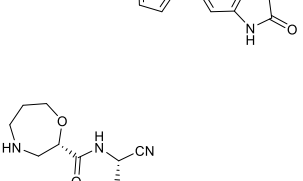
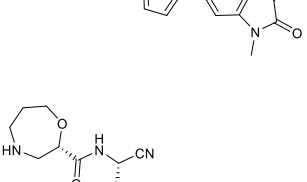
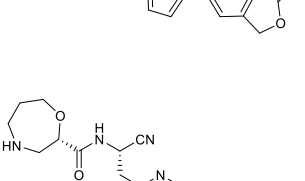
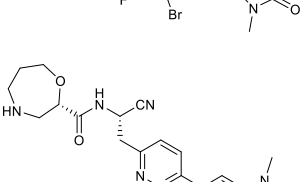
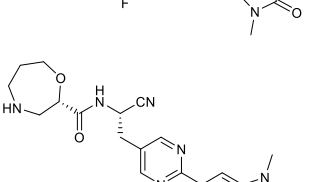
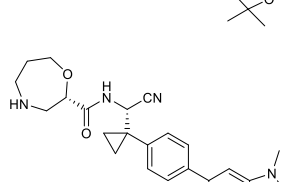
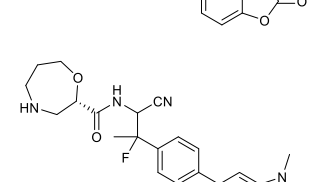
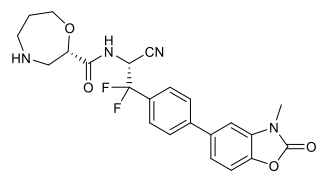
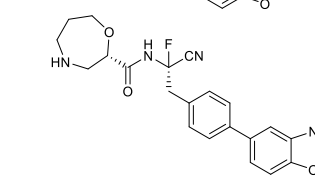
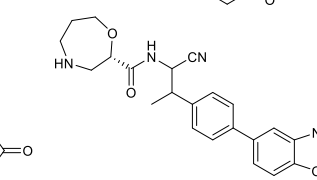
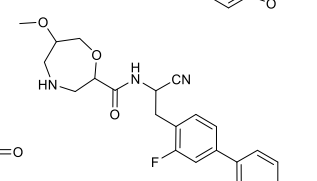
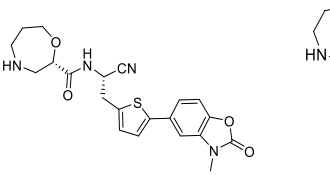
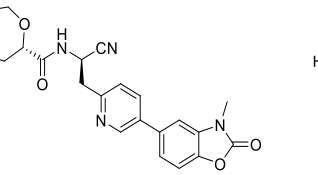
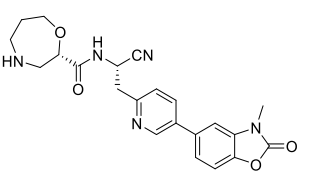
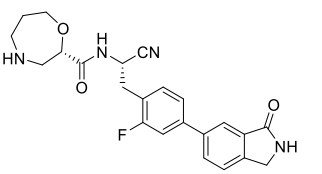













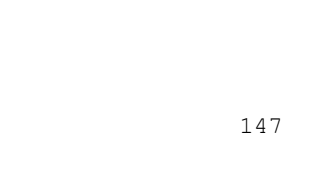

























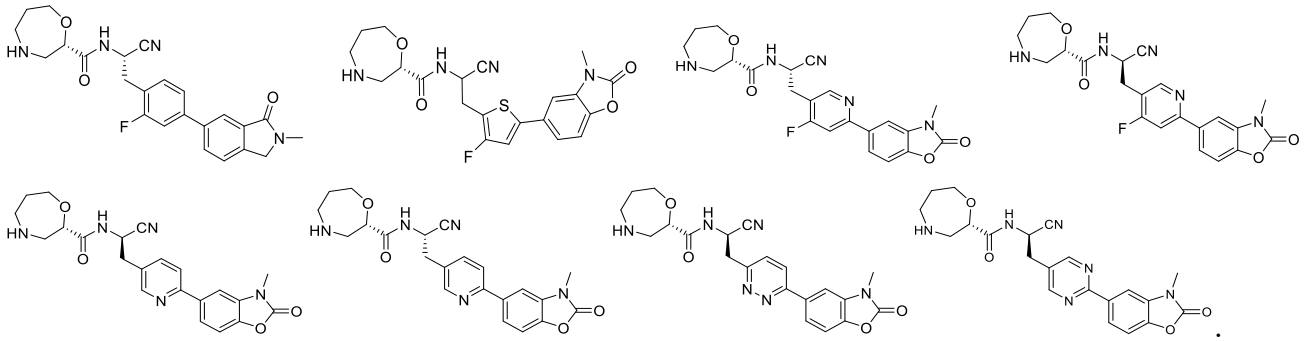


10. A compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof, wherein the compound is selected from one of the following structures:







11. A pharmaceutical composition, comprising the compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof according to any one of claims 1-10, and a pharmaceutically acceptable carrier and/or excipient.

12. Use of the compound, or the stereoisomer, solvate or pharmaceutically acceptable salt thereof according to any one of claims 1-10, or the composition according to claim 11 in the preparation of a drug for treating a disease mediated by dipeptidyl peptidase 1, wherein the disease is selected from obstructive airway diseases, bronchiectasis, cystic fibrosis, asthma, emphysema, and chronic obstructive pulmonary diseases.