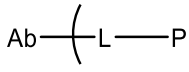
Claims

1. A ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a pharmaceutically acceptable salt or hydrate thereof, characterized in that the ligand-drug conjugate comprises the structure shown in formula (I):

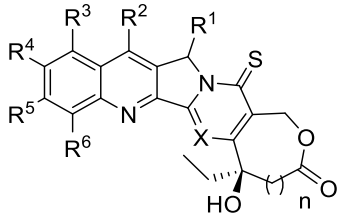


(I),

wherein, L is an optionally substituted linker that is connected to any O atom, S atom, or N atom in the P structure;

Ab is a ligand, "a" is a number greater than 0, and "a" is a decimal or integer; preferably, the "a" is 1-16 (such as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, or 16); more preferably, the "a" is 2-8;

P is a group formed by dehydrogenating the structure described in formula (II):



(II)

wherein, n is 0 or 1;

X is N or CR^0;

R^0 is selected from the group consisting of H, D, halogen, C_1-C_8 alkyl, C_1-C_8 alkoxy, OH, NH_2, N_3, and NO_2;

R^1 is selected from the group consisting of hydrogen atom, deuterium atom, halogen, C_1-C_8 alkyl, C_1-C_8 alkoxy, C_1-C_8 haloalkyl, C_1-C_8 haloalkoxy, N_3, NO_2, NH_2, NH-OH, -NR'R'', -COOR', -CONR'R'', and -NHR'''NR'R''; wherein, R', R'', and R''' are each independently selected from the group consisting of hydrogen, deuterium, alkyl, aryl, arylalkyl, acyl, alkoxycarbonyl, and aryloxycarbonyl;

R^2, R^3, R^4, R^5, and R^6 are each independently selected from the group consisting of hydrogen atom, deuterium atom, halogen, hydroxyl, cyano, NH_2, NO_2, substituted or unsubstituted C_1-C_8 alkyl, substituted or unsubstituted C_1-C_8 alkoxy, substituted or unsubstituted C_1-C_8 alkylthio, substituted or unsubstituted C_1-C_8 deuterated alkyl, -$(CH_2)_m$-tris-(C_1-C_4 alkyl)silyl, -$(CH_2)_m$(C_3-C_8 cycloalkyl), -$(CH_2)_m$(3-12 membered heterocyclic group), -$(CH_2)_mN(R^7)_2$, -$(CH_2)_mS(CH_2)_pR^7$, -$(CH_2)_mS(O)(CH_2)_pR^7$, -$(CH_2)_mS(O)_2(CH_2)_pR^7$, -$(CH_2)_mNH(CH_2)_pR^7$, -$(CH_2)_mNHC(O)(CH_2)_pR^7$, -$(CH_2)_mOC(O)(CH_2)_pR^7$, -$(CH_2)_mC(O)(CH_2)_pR^7$, and -CH=N(OtBu); wherein, m and p are each independently 0, 1, 2, 3, or 4;

or, R^2 and R^3 together with the carbon atoms to which they are attached form a structure selected from substituted or unsubstituted C_5-C_8 carbocycle or substituted or unsubstituted 5-12 membered heterocycle;

or, R^3 and R^4, or R^4 and R^5, together with the carbon atoms to which they are attached form a structure selected from the group consisting of a saturated or unsaturated 5-12 membered carbocycle which is unsubstituted or substituted with one or more R^e, and a saturated or unsaturated 5-12 membered heterocycle which is unsubstituted or substituted with one or more R^e; the R^e is a substituted or unsubstituted substituent selected from hydrogen atom, deuterium atom, halogen, cyano, nitro, hydroxyl, amino, C_1-C_6 alkyl-NH-, (C_1-C_6 alkyl)$_2$N-, C_1-C_6 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_1-C_6 alkoxy, allyl, benzyl, C_6-

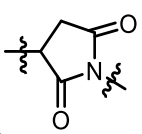
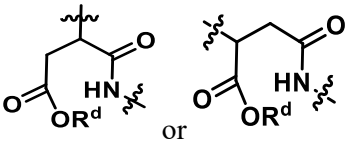
C_{12} aryl, C_1-C_6 alkoxy-C_1-C_6 alkyl, C_1-C_6 alkoxycarbonyl, phenoxycarbonyl, C_2-C_6 alkynylcarbonyl, C_2-C_6 alkenylcarbonyl, C_3-C_6 cycloalkylcarbonyl, C_1-C_6 alkylsulfonyl, phenyl, 5-7 membered heteroaryl, C_3-C_8 cycloalkyl, 3-12 membered heterocyclic group, -$(CH_2)_mN(R^7)_2$, -$(CH_2)_mS(CH_2)_pR^7$, -$(CH_2)_mS(O)(CH_2)_pR^7$, -$(CH_2)_mS(O)_2(CH_2)_pR^7$, -$(CH_2)_mNH(CH_2)_pR^7$, -$(CH_2)_mNHC(O)(CH_2)_pR^7$, -$(CH_2)_mOC(O)(CH_2)_pR^7$, and -$(CH_2)_mC(O)(CH_2)_pR^7$; wherein, m and p are each independently 0, 1, 2, 3 or 4, preferably 0, 1 or 2;

R^7 is selected from the group consisting of hydrogen atom, deuterium atom, halogen, substituted or unsubstituted C_1-C_8 alkyl, C_1-C_8 haloalkyl, C_1-C_8 deuterated alkyl, substituted or unsubstituted C_1-C_8 alkoxy, hydroxyl, amino, cyano, nitro, thiol, substituted or unsubstituted C_1-C_8 alkylene-OH, substituted or unsubstituted C_1-C_8 alkylene-NH_2, SO_2Me, -OC(O)(substituted or unsubstituted C_1-C_4 alkyl), -C(O)(substituted or unsubstituted C_1-C_4 alkyl), substituted or unsubstituted phenyl, substituted or unsubstituted 5-7 membered heteroaryl, substituted or unsubstituted C_3-C_8 cycloalkyl, and substituted or unsubstituted 3-12 membered heterocyclic group;

unless otherwise specified, each "substituted" refers to one or more hydrogen atoms on the group are substituted by substituents selected from the group consisting of hydrogen atom, deuterium atom, halogen, cyano, nitro, hydroxyl, amino, C_1-C_6 alkyl-NH-, (C_1-C_6 alkyl)$_2$N-, C_1-C_6 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_1-C_6 alkoxy, C_1-C_6 haloalkyl, C_2-C_6 haloalkenyl, C_2-C_6 haloalkynyl, C_1-C_6 haloalkoxy, allyl, benzyl, C_6-C_{12} aryl, C_1-C_6 alkoxy-C_1-C_6 alkyl, C_1-C_6 alkoxycarbonyl, phenoxycarbonyl, C_2-C_6 alkynylcarbonyl, C_2-C_6 alkenylcarbonyl, C_3-C_6 cycloalkylcarbonyl, C_1-C_6 alkylsulfonyl, phenyl, 5-7 membered heteroaryl, C_3-C_8 cycloalkyl, and 3-12 membered heterocyclic group.

2. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 1, characterized in that L has a structure as shown in the following formula:

L_1-L_2-L_3-L_4-L_5;

wherein, L_1 is optionally substituted  or , R^d is H, C_1-C_6 alkyl, C_1-C_6 deuterated alkyl, C_3-C_8 cycloalkyl, or C_3-C_8 deuterated cycloalkyl;

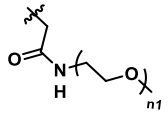
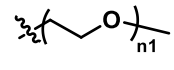
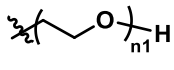
the L_2 group is selected from the group consisting of optionally substituted -$(CHR)_{m1}$-X_1-$(CH_2CH_2O)_{n3}$-$(CHR)_{m2}$-C(O)-, optionally substituted -$(CHR)_{m1}$-X_1-X_2-$(CH_2CH_2O)_{n3}$-$(CHR)_{m2}$-C(O)-, optionally substituted -X_1-$(CHROCHR)_{m2}$-C(O)-, optionally substituted -$(CHR)_{p1}$-C(O)-, optionally substituted -$(CHR)_{m1}$-X_1-$(CHR)_{m2}$-C(O)-, optionally substituted -$(CHR)_{m1}$-X_1-$(CHR)_{n3}$-X_2-$(CHR)_{m2}$-C(O)-, optionally substituted -X_1-$(CHR)_{m1}$-X_2-$(CHR)_{m2}$-C(O)-, and optionally substituted -$(CH_2CH_2O)_{n3}$-C(O)-;

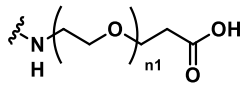
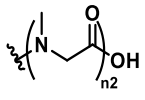
X_1 and X_2 are each independently selected from the group consisting of -O-, -C(O)-, -C(O)-NR-, optionally substituted C_6-C_{10} aryl, optionally substituted 5-9 membered heteroaryl, optionally substituted 3-8 membered heteroalicyclic group, and optionally substituted C_3-C_6 alicyclic group;

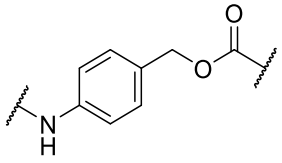
wherein, each R is independently selected from the group consisting of H, D, $(CH_2)_{n4}OH$, $(CH_2)_{n4}NH_2$, $(CH_2O)_{n4}(CH_2CH_2O)_{n5}H$, $(CH_2O)_{n4}(CH_2CH_2O)_{n5}CH_3$, $(CH_2)_{n4}OCH_3$, $(CH_2CH_2O)_{n5}CH_3$, $CH_2C(O)NH(CH_2O)_{n4}(CH_2CH_2O)_{n5}H$, and $CH_2C(O)NH(CH_2O)_{n4}(CH_2CH_2O)_{n5}CH_3$;

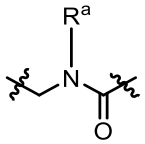
wherein, m1, m2, n3, n4, and n5 are each independently 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12; p1 is 0, 1, 2, 3, 4, 5, 6, 7 or 8;

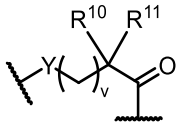
the L_3 is a peptide residue which can be optionally substituted by one or more substituents selected from the group consisting of




, and $CH_2C(O)R^c$; the R^c is selected from the group consisting of

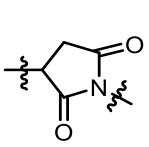
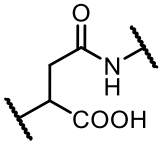
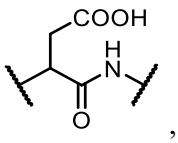
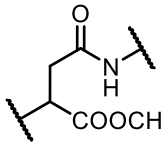
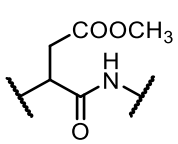
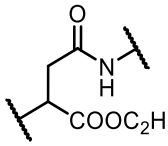
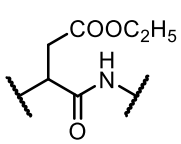

and

; wherein, n1 and n2 are each independently 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12;

the L_4 is an optionally substituted $-L_{4a}-(NR^b)_{n6}-R^{12}-L_{4b}-$, wherein L_{4a} is absent or L_{4a} is optionally substituted

; wherein n6 is 0 or 1; R^{12} is chemical bond, CH_2, or CD_2;

L_{4b} is absent, or L_{4b} is optionally substituted

, wherein R^a and R^b are each independently selected from the group consisting of hydrogen, optionally substituted C_1-C_4 alkyl, and optionally substituted C_1-C_4 deuterated alkyl;

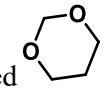
the L_5 is absent, or L_5 is optionally substituted

, wherein Y is selected from the group consisting of O, S, and NH; v is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10;

R^{10} and R^{11} are each independently selected from the group consisting of hydrogen, deuterium, optionally substituted C_3-C_6 cycloalkyl, and optionally substituted C_4-C_8 cycloalkylalkyl, halogen, optionally substituted C_1-C_8 alkyl, optionally substituted C_1-C_8 haloalkyl, and optionally substituted C_1-C_8 deuterated alkyl; or R^{10} and R^{11} together with the carbon atoms to which they are attached form an optionally substituted 3-6 membered cycloalkyl.

3. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 2, characterized in that L_1 is

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or

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4. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 2, characterized in that X_1 and X_2 are each independently selected from the group consisting of -O-, -C(O)-, -C(O)-NR-, optionally substituted phenyl, optionally substituted pyridyl, optionally substituted C_3-C_6 cycloalkyl, optionally substitute

, and optionally

substituted  ; and / or

L_2 is optionally substituted $-(CH_2)_{m1}-X_1-(CH_2CH_2O)_{n3}-(CH_2)_{m2}-C(O)-$; wherein, X_1 is -C(O)-NH-; preferably, m1 and m2 are each independently 1, 2, or 3; n3 is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12; and / or

L_2 is optionally substituted $-(CHR)_{m1}-X_1-X_2-(CH_2CH_2O)_{n3}-(CHR)_{m2}-C(O)-$; wherein, X_1 is optionally substituted  , or optionally substituted  ; X_2 is -C(O)-NR-; preferably, m1 and m2 are each independently 0, 1 or 2; n3 is 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12; and / or

L_2 is optionally substituted $-X_1-(CHROCHR)_{m2}-C(O)-$; wherein, X_1 is an optionally substituted aryl or an optionally substituted heteroaryl; preferably, m2 is 0, 1, 2 or 3; and / or

L_2 is optionally substituted $(CHR)_{p1}-C(O)-$; p1 is 0, 1 or 2; R is selected from: H, $(CH_2)_{n4}OH$, and $(CH_2O)_{n4}(CH_2CH_2O)_{n5}H$; preferably, n4 and n5 are each independently 0, 1, 2 or 3; and / or

L_2 is optionally substituted $-(CH_2)_{m1}-X_1-(CH_2CH_2O)_{n3}-(CHR)_{m2}-C(O)-$; wherein, X_1 is -C(O)-; preferably, m1 and m2 are each independently selected from 0, 1, 2, or 3; n3 is selected from 0, 1 or 2; and / or

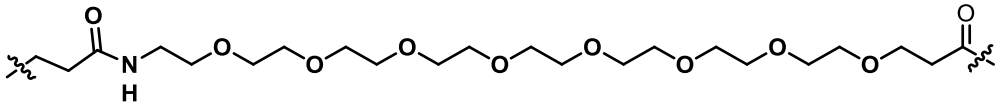
L_2 is optionally substituted $-X_1-(CH_2)_{m1}-X_2-(CHR)_{m2}-C(O)-$; wherein, X_1 is an optionally substituted aryl or an optionally substituted heteroaryl; X_2 is -C(O)-; preferably, m1 and m2 are each independently selected from 0, 1 or 2; and / or

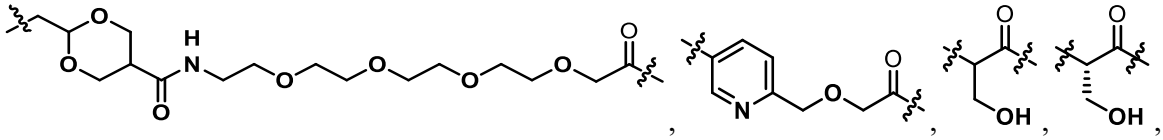
L_2 is $-(CHR)_{m1}-X_1-(CHR)_{m2}-C(O)-$; wherein, X_1 is optionally substituted 3-8 membered heteroalicyclic group or an optionally substituted C_3-C_6 alicyclic group; preferably, m1 is 0, 1 or 2, and m2 is 0; and / or

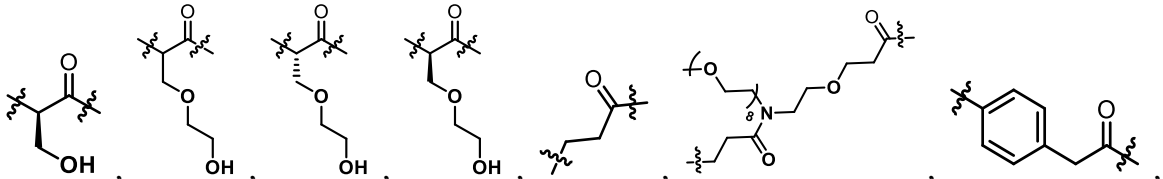
L_2 is optionally substituted $-(CHR)_{m1}-X_1-(CH_2CH_2O)_{n3}-(CHR)_{m2}-C(O)-$; wherein X_1 is O; preferably, m1, n3 and m2 are each independently 0, 1 or 2; and / or

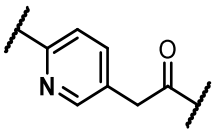
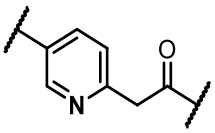
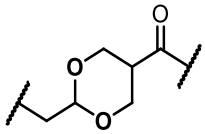
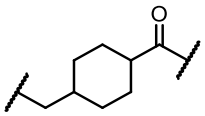
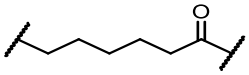
L_2 is optionally substituted $-(CHR)_{m1}-X_1-(CHR)_{n3}-X_2-(CHR)_{m2}-C(O)-$; wherein, X_1 is optionally substituted -C(O)-NR-, and X_2 is O; preferably, m1, n3 and m2 are each independently 1, 2 or 3; R is defined as claim 2.

5. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 2, wherein L_2 is an optionally substituted structure selected from the group consisting of

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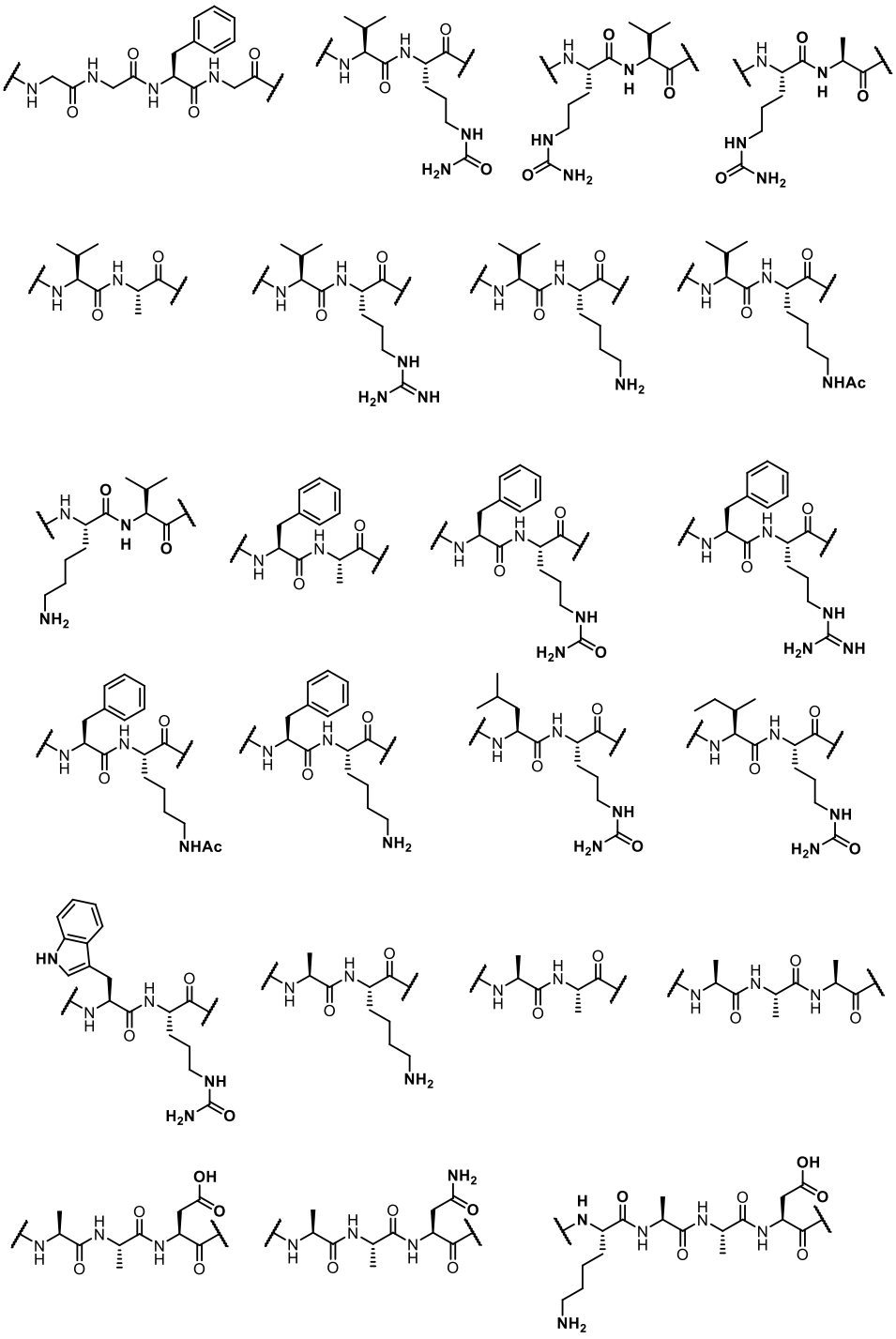

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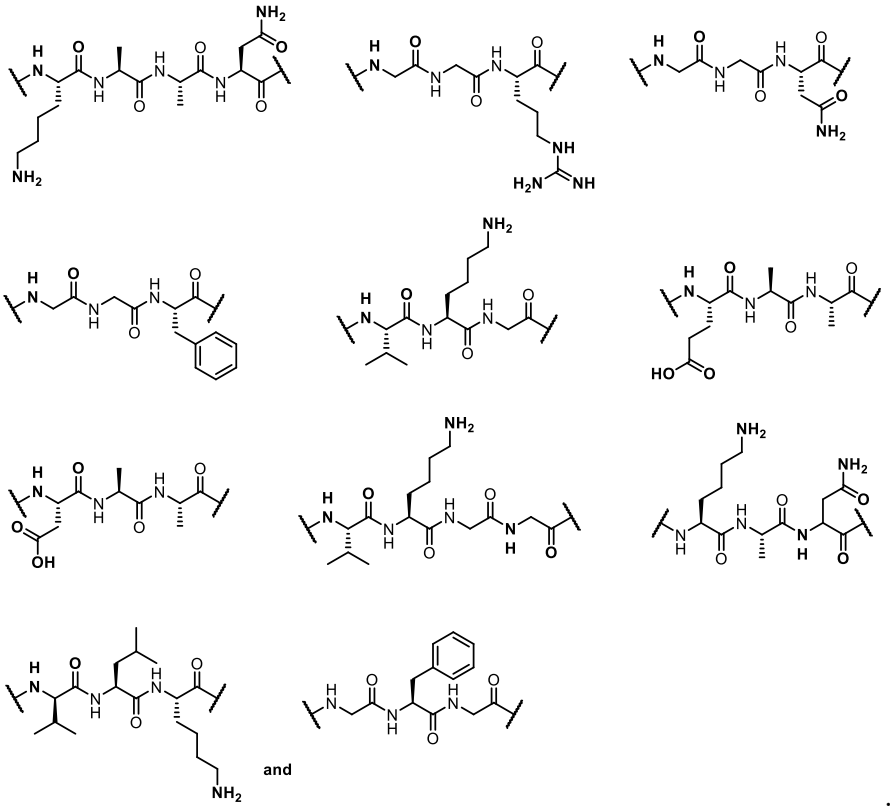
6. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 2, characterized in that L_3 is an unsubstituted or $CH_2C(O)R^c$-substituted peptide residue composed of amino acids selected from the group consisting of phenylalanine, isoleucine, leucine, tryptophan, valine, methionine, tyrosine, alanine, threonine, histidine, serine, glutamine, arginine, lysine, asparagine, glutamic acid, proline, citrulline, aspartic acid, and glycine; preferably,

L_3 is an unsubstituted or $CH_2C(O)R^c$-substituted peptide residue composed of amino acids selected from the group consisting of glycine, alanine, lysine, phenylalanine, valine, and citrulline; more preferably,

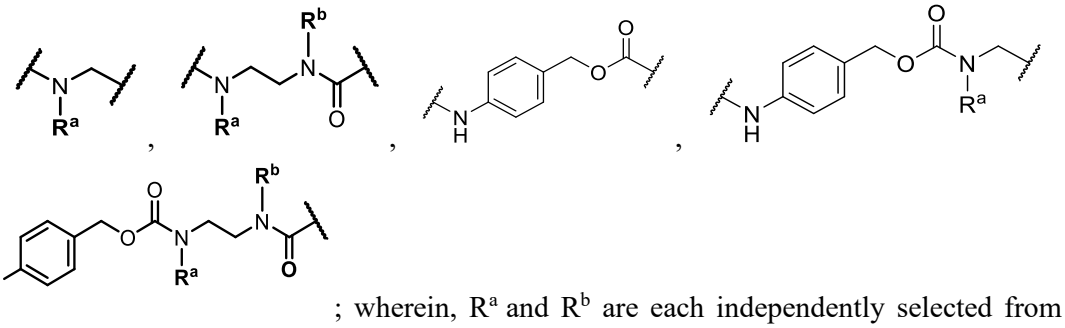
L_3 is an unsubstituted or $CH_2C(O)R^c$-substituted peptide residue selected from the group consisting of -Glycine-Phenylalanine-Glycine-(-Gly-Phe-Gly-), -Glycine-Glycine-Phenylalanine-Glycine-(-Gly-Gly-Phe-Gly-), -Valine-Citrulline-(-Val-Cit-), -Citrulline-Valine-(-Cit-Val-), -Citrulline-Alanine-(-Cit-Ala-), -Valine-Alanine-(-Val-Ala-), -Valine-Arginine-(-Val-Arg-), -Valine-Lysine-(-Val-Lys-), -Valine-Lysine (Ac)-(-Val-Lys(Ac)-), -Lysine-Valine-(-Lys-Val-), -Leucine-Citrulline-(-Leu-Cit-), -Isoleucine-Citrulline-(-Ile-Cit-), -Tryptophan-Citrulline-(-Trp-Cit-), -Phenylalanine-Lysine-(-Phe-Lys-), -Phenylalanine-Lysine(Ac)-(-Phe-Lys(Ac)-), -Phenylalanine-Citrulline-(-Phe-Cit), -Phenylalanine-Alanine-(-Phe-Ala-), -Phenylalanine-Arginine-(-Phe-Arg-), -Alanine-Lysine-(-Ala-Lys-), -Alanine-Alanine-(-Ala-Ala-), -Alanine-Alanine-Alanine-(-Ala-Ala-Ala-), -Alanine-Alanine-Asparagine-(-Ala-Ala-Asn-), -Alanine-Alanine-Aspartic Acid-(-Ala-Ala-Asp-), -Lysine-Alanine-Alanine-Asparagine-(-Lys-Ala-Ala-Asn-), -Lysine-Alanine-Alanine-Aspartic acid-(-Lys-Ala-Ala-Asp-), -(D)-Valine-Leucine-Lysine-(-(D)-Val-Leu-Lys-), -Glycine-Glycine-Arginine-(-Gly-Gly-Arg-), -Glycine-Glycine-Asparagine-(-Gly-Gly-Asn-), -Glycine-Glycine-Phenylalanine-(-Gly-Gly-Phe-), -Valine-Lysine-Glycine-(-Val-Lys-Gly-), -Glutamic Acid-Alanine-Alanine-(Glu-Ala-Ala-), -Aspartate-Alanine-Alanine-(Asp-Ala-Ala)-, -Valine-Lysine-Glycine-Glycine-(-Val-Lys-Gly-Gly-), and -Lysine-Alanine-Asparagine-(-Lys-Ala-Asn-); most preferably,

L_3 is an unsubstituted or $CH_2C(O)R^c$-substituted structure selected from the group consisting of



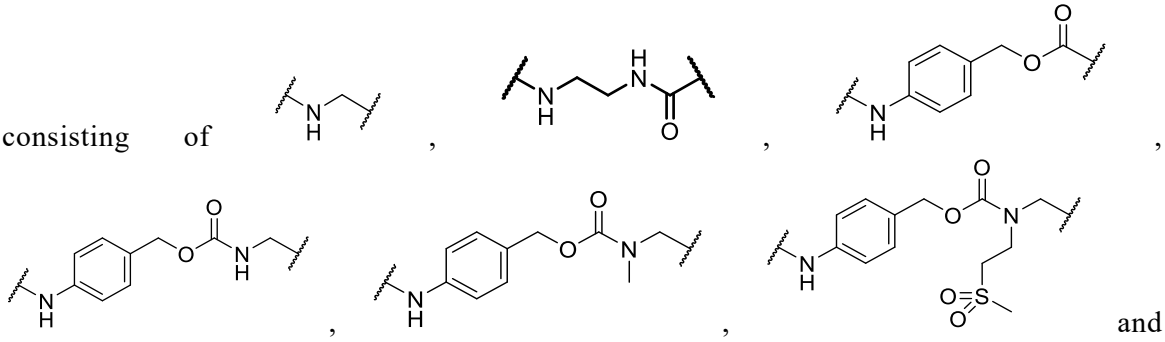


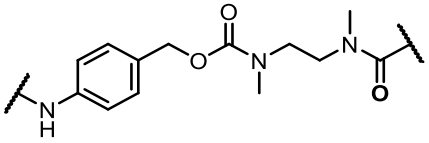
7. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 2, characterized in that L_4 is a chemical bond or an optionally substituted group selected from the group consisting of



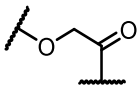
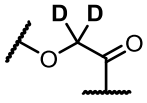
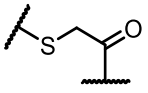
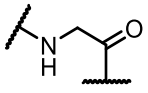
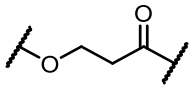
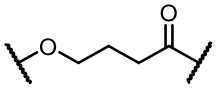
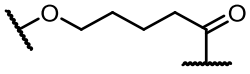
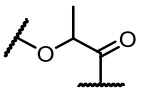
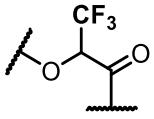
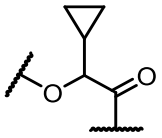
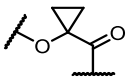
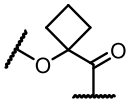
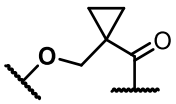
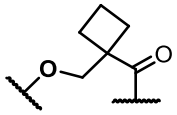
; wherein, R^a and R^b are each independently selected from the group consisting of hydrogen, optionally substituted C_1-C_4 alkyl, and optionally substituted C_1-C_4 deuterated alkyl, preferably,

L_4 is a chemical bond or an optionally substituted structure selected from the group consisting of

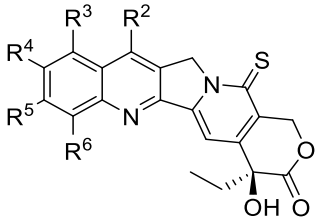




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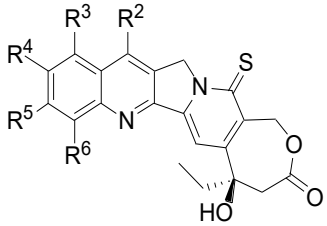
8. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 2, characterized in that L_5 is a chemical bond or a structure selected from the group consisting of optionally substituted , , optionally substituted , optionally substituted , optionally substituted , optionally substituted , optionally substituted , optionally substituted , optionally substituted , optionally substituted , optionally substituted , optionally substituted , optionally substituted , and optionally substituted .

9. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 1, characterized in that the compound of formula (II) is selected from the group consisting of



VI

and



VII;

preferably, R^4 is selected from the group consisting of hydrogen atom, deuterium atom, halogen, hydroxyl, cyano, NH_2, NO_2, substituted or unsubstituted C_1-C_8 alkyl, substituted or unsubstituted C_1-C_8 alkoxy, substituted or unsubstituted C_1-C_8 alkylthio, substituted or unsubstituted C_1-C_8 deuterated alkyl, $-(CH_2)_m(C_3$-C_8 cycloalkyl), $-(CH_2)_m$(3-12 membered heterocyclic group), $-(CH_2)_mN(R^7)_2$, $-(CH_2)_mS(O)(CH_2)_pR^7$, $-(CH_2)_mS(O)_2(CH_2)_pR^7$, and $-(CH_2)_mNH(CH_2)_pR^7$; wherein, m and p are each independently 0, 1, or 2; R^7 is defined as above;

R^5 is selected from the group consisting of hydrogen atom, deuterium atom, halogen, NH_2, OH, substituted or unsubstituted C_1-C_8 alkyl, substituted or unsubstituted C_1-C_8 alkoxy;

or R^4 and R^5 together with the carbon atoms to which they are attached form a structure selected from the group consisting of saturated or unsaturated 5-6 membered carbocycle that

is unsubstituted or substituted by one or more R^e, and saturated or unsaturated 5-6 membered heterocycle that is unsubstituted or substituted by one or more R^e; wherein, R^e is defined as above;

more preferably, R^2 and R^3 are each independently selected from the group consisting of hydrogen atom, deuterium atom, halogen, NH_2, substituted or unsubstituted C_1-C_8 alkyl, substituted or unsubstituted C_1-C_8 deuterated alkyl, -$(CH_2)_m$(C_3-C_6 cycloalkyl), -$(CH_2)_m$(3-6 membered heterocyclic group), -$(CH_2)_mN(R^7)_2$, and -$(CH_2)_mOC(O)R^7$; wherein, each m is independently 0, 1, 2, 3, or 4; R^7 is defined as above;

or R^2 and R^3 together with the carbon atoms to which they are attached form a structure selected from the group consisting of saturated or unsaturated 5-6 membered ring that is unsubstituted or substituted with one or more R^e, and saturated or unsaturated 5-6 membered heterocycle that is unsubstituted or substituted with one or more R^e; wherein, R^e is defined as above;

more preferably, R^4 and R^5 are each independently selected from the group consisting of hydrogen atom, deuterium atom, halogen, hydroxyl, NH_2, and substituted or unsubstituted C_1-C_4 alkyl;

or R^4 and R^5 together with the carbon atoms to which they are attached form a structure selected from the group consisting of unsubstituted or one or more R^e substituted 5-6 membered oxa-heterocycle; wherein, R^e is described as above;

most preferably, R^2 is selected from the group consisting of hydrogen atom, deuterium atom, halogen, NH_2, substituted or unsubstituted C_1-C_8 alkyl, substituted or unsubstituted C_1-C_8 deuterated alkyl, -$(CH_2)_m$(C_3-C_6 cycloalkyl), -$(CH_2)_m$(3-6 membered heterocyclic group), -$(CH_2)_mN(R^7)_2$, and -$(CH_2)_mOC(O)R^7$; wherein, each m is independently 0, 1, 2, 3, or 4;

R^3 is selected from the group consisting of hydrogen atom, deuterium atom, halogen, substituted or unsubstituted C_1-C_8 alkyl, substituted or unsubstituted C_1-C_8 deuterated alkyl, -$(CH_2)_m$(C_3-C_6 cycloalkyl), -$(CH_2)_m$(3-6 membered heterocyclic group), -$(CH_2)_mN(R^7)_2$, and -$(CH_2)_mOC(O)R^7$; wherein, each m is independently 0, 1, 2, 3, or 4;

or R^2 and R^3 together with the carbon atoms to which they are attached form a structure selected from the group consisting of saturated or unsaturated 5-6 membered ring that is unsubstituted or substituted with one or more R^e, and saturated or unsaturated 5-6 membered heterocycle that is unsubstituted or substituted with one or more R^e; wherein, R^e is defined as above;

R^4 is selected from the group consisting of hydrogen atom, deuterium atom, halogen, hydroxyl, CN, NH_2, NO_2, substituted or unsubstituted C_1-C_8 alkyl, and substituted or unsubstituted C_1-C_8 alkoxy;

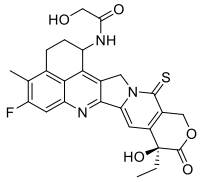
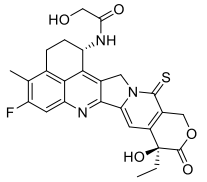
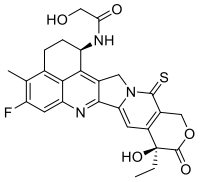
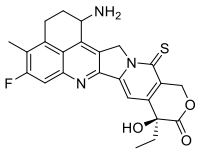
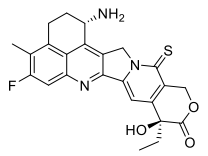
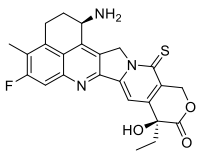
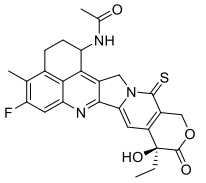
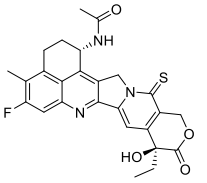
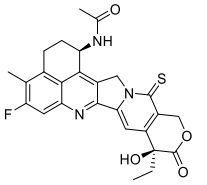
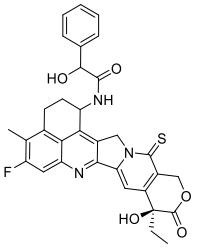
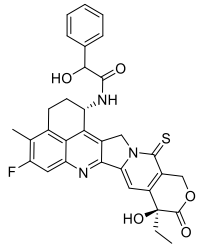
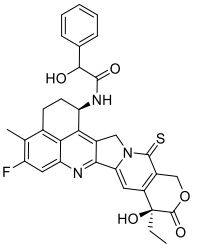
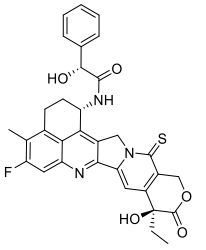
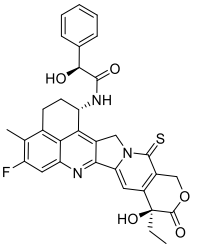
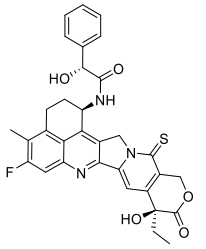
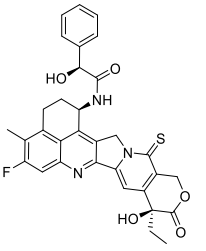
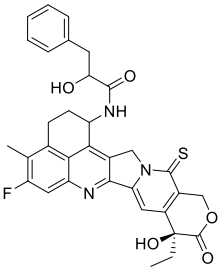
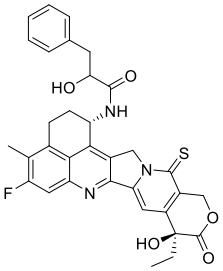
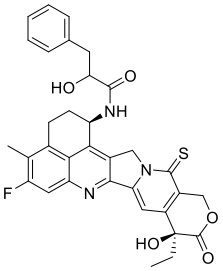
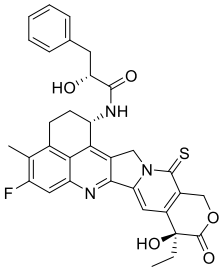
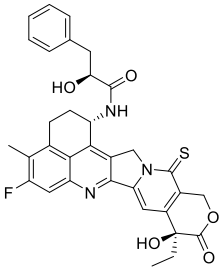
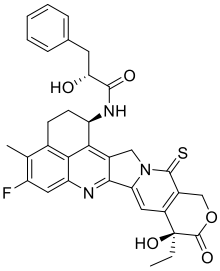
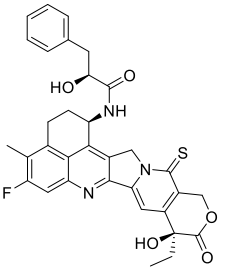
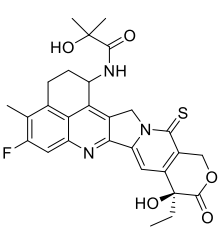
R^5 is selected from the group consisting of hydrogen atom, deuterium atom, halogen, substituted or unsubstituted C_1-C_8 alkyl;

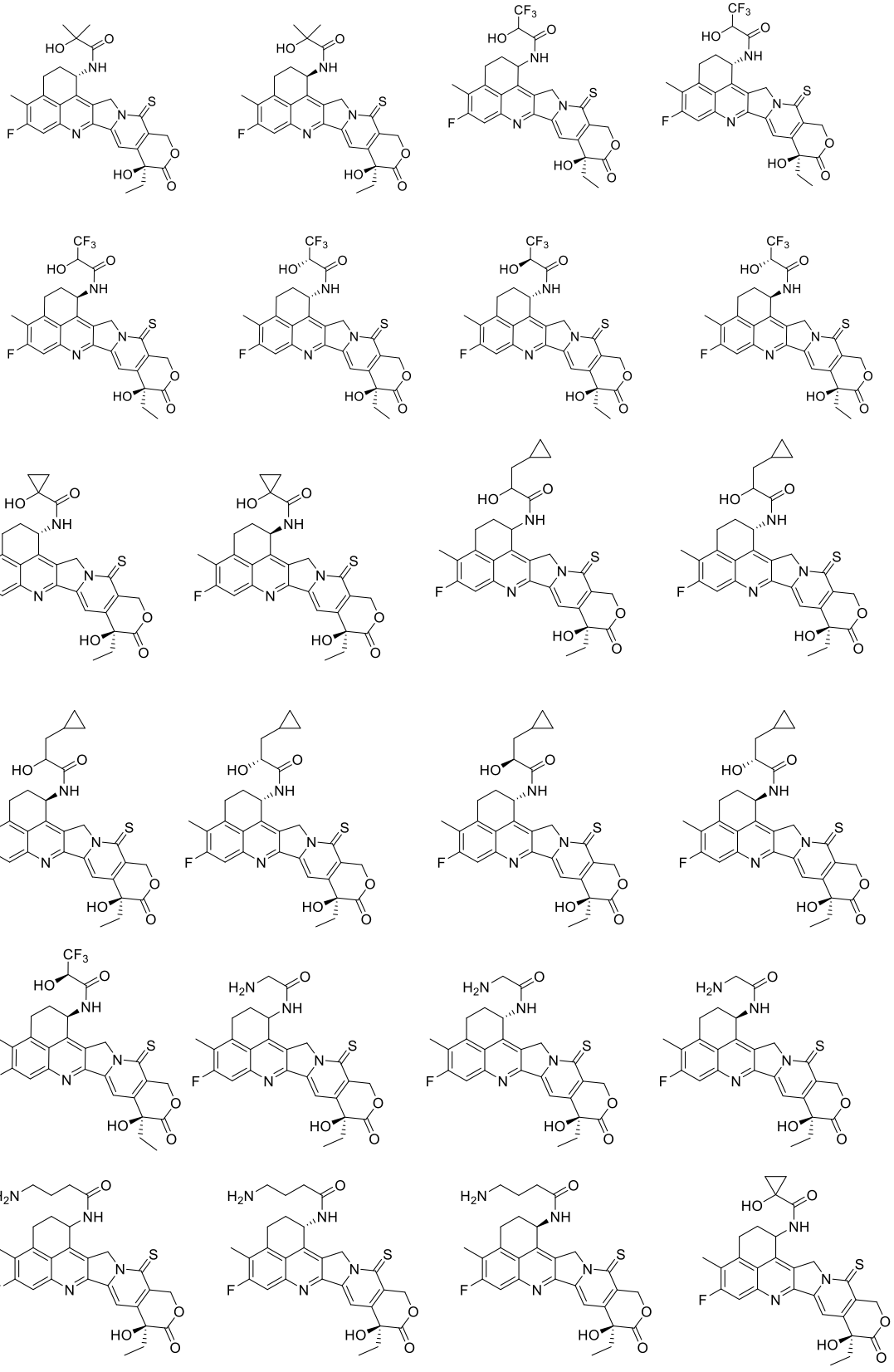
or R^4 and R^5 together with the carbon atoms to which they are attached form an unsubstituted or one or more R^e substituted structure selected from the group consisting of -OCH_2O- and -$O(CH_2)_2O$-;

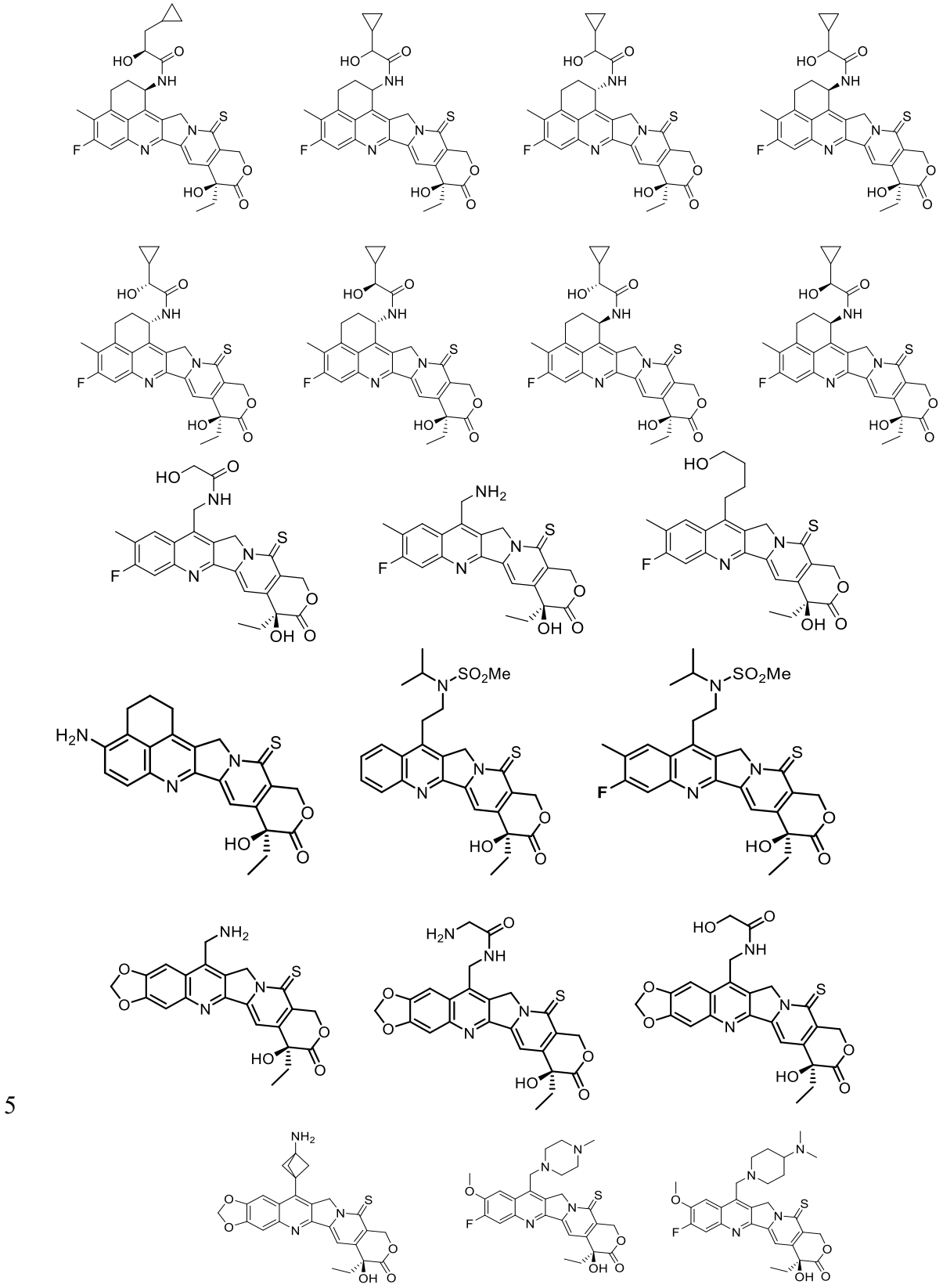
R^7 is selected from the group consisting of hydrogen atom, deuterium atom, halogen, substituted or unsubstituted C_1-C_8 alkyl, hydroxyl, amino, cyano, nitro, and thiol;

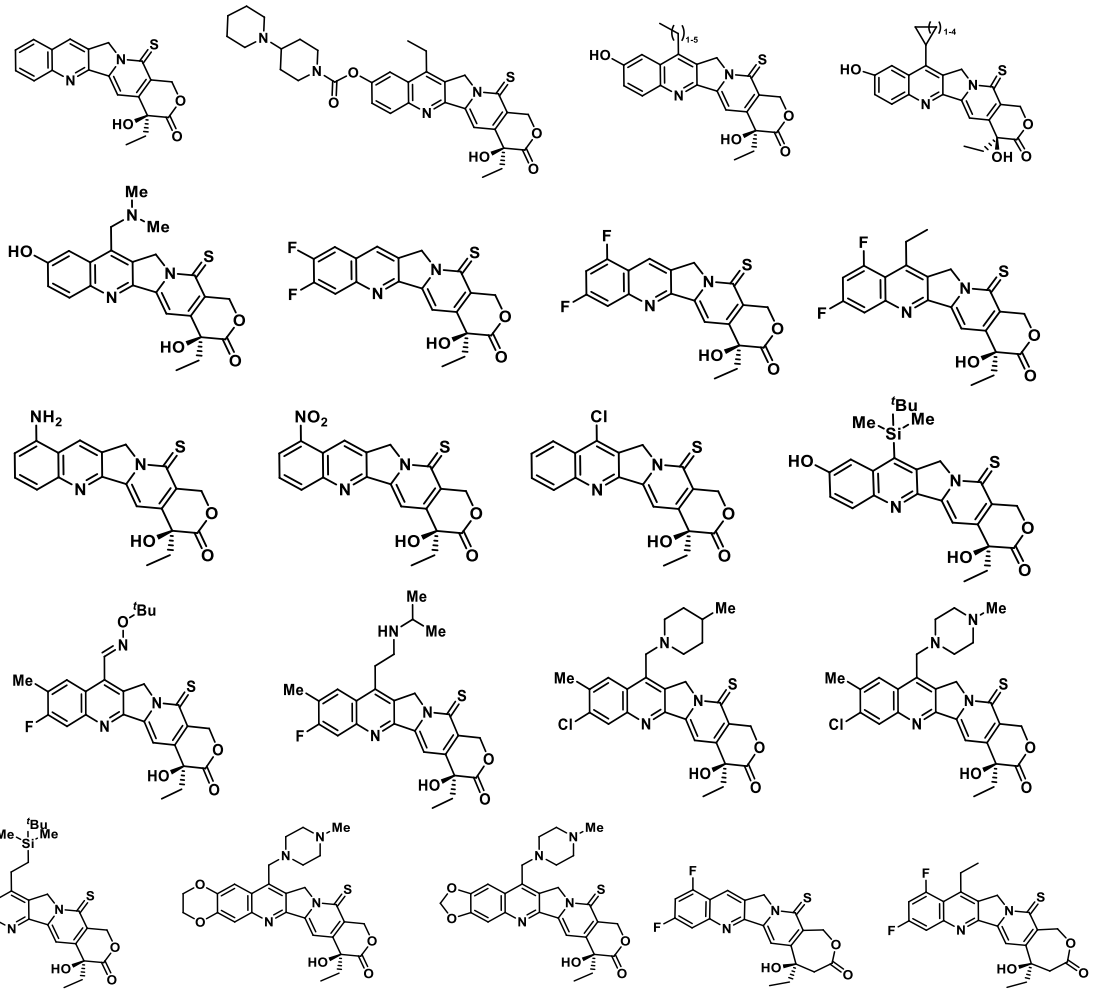
wherein, R^e is defined as above.

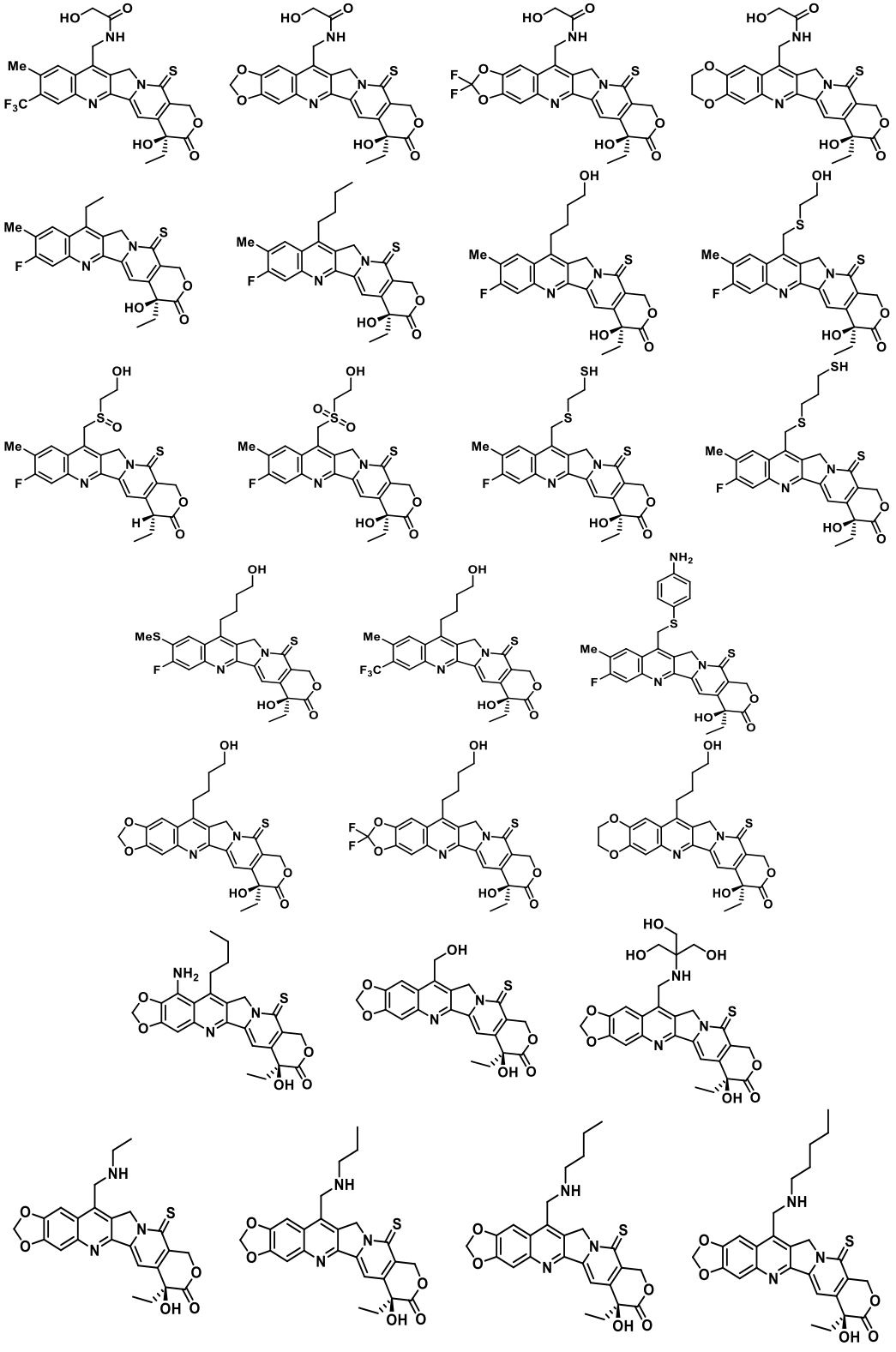
10. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 9, characterized in that the compound of formula (II) is selected from the group consisting of

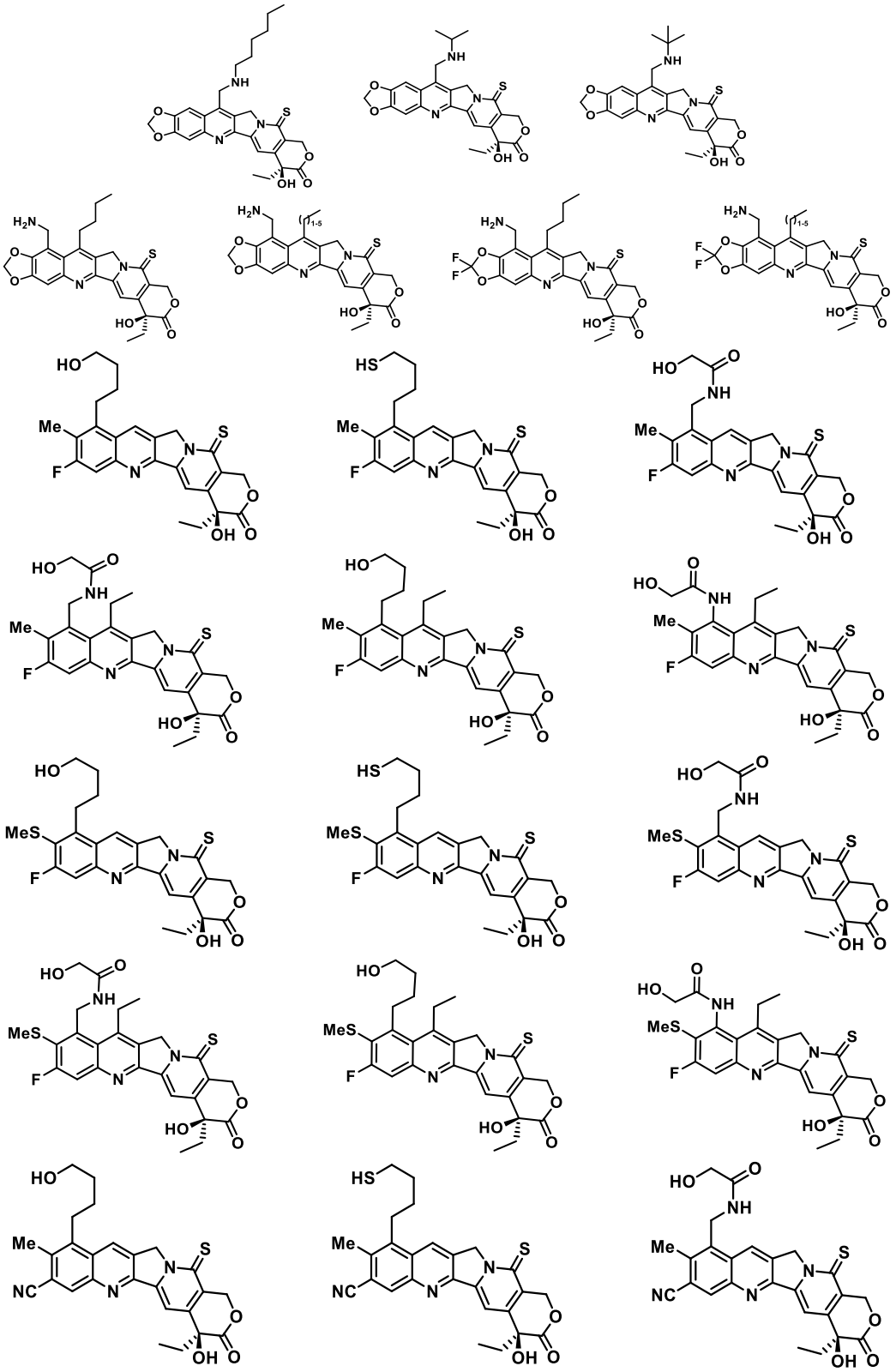

























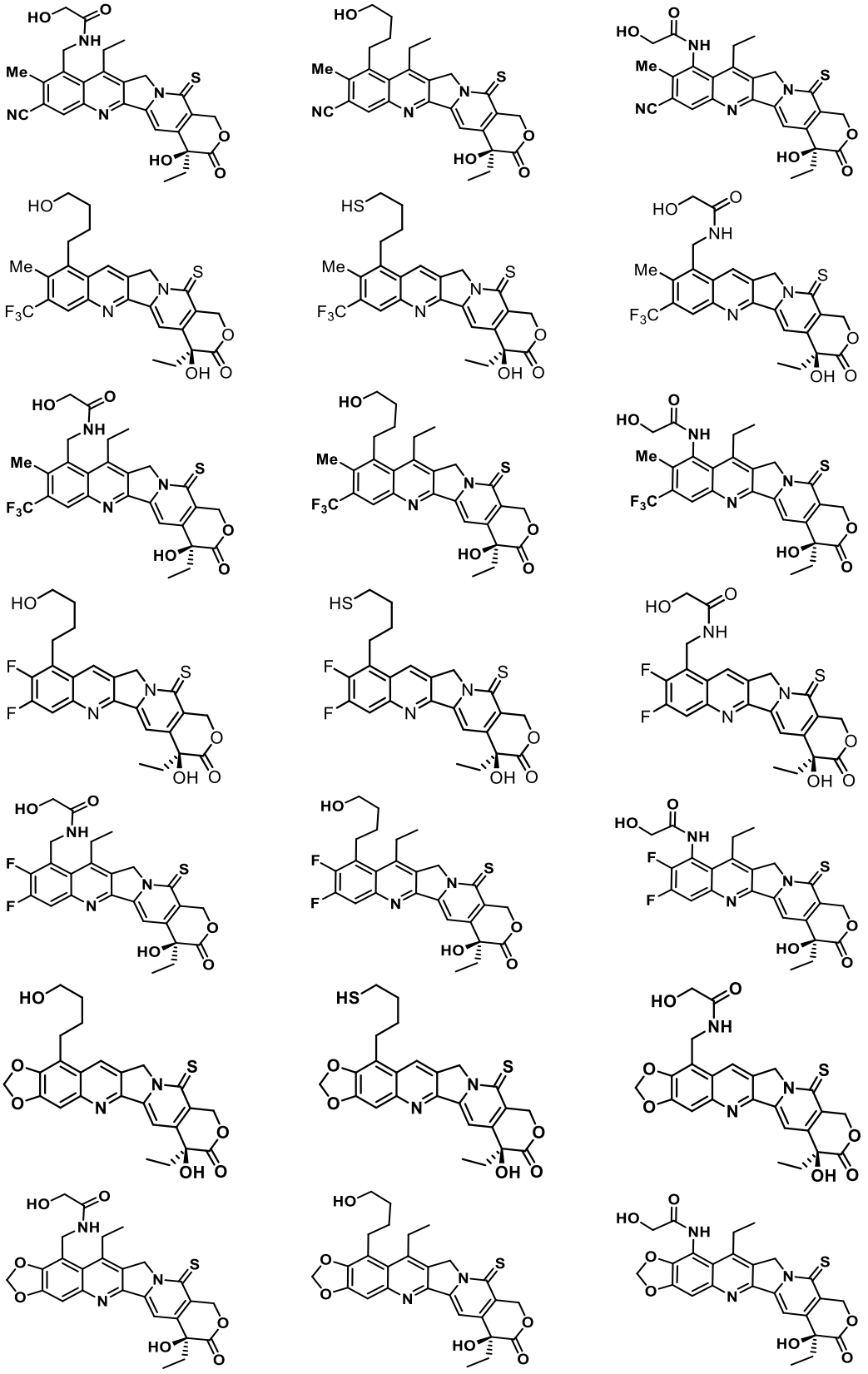


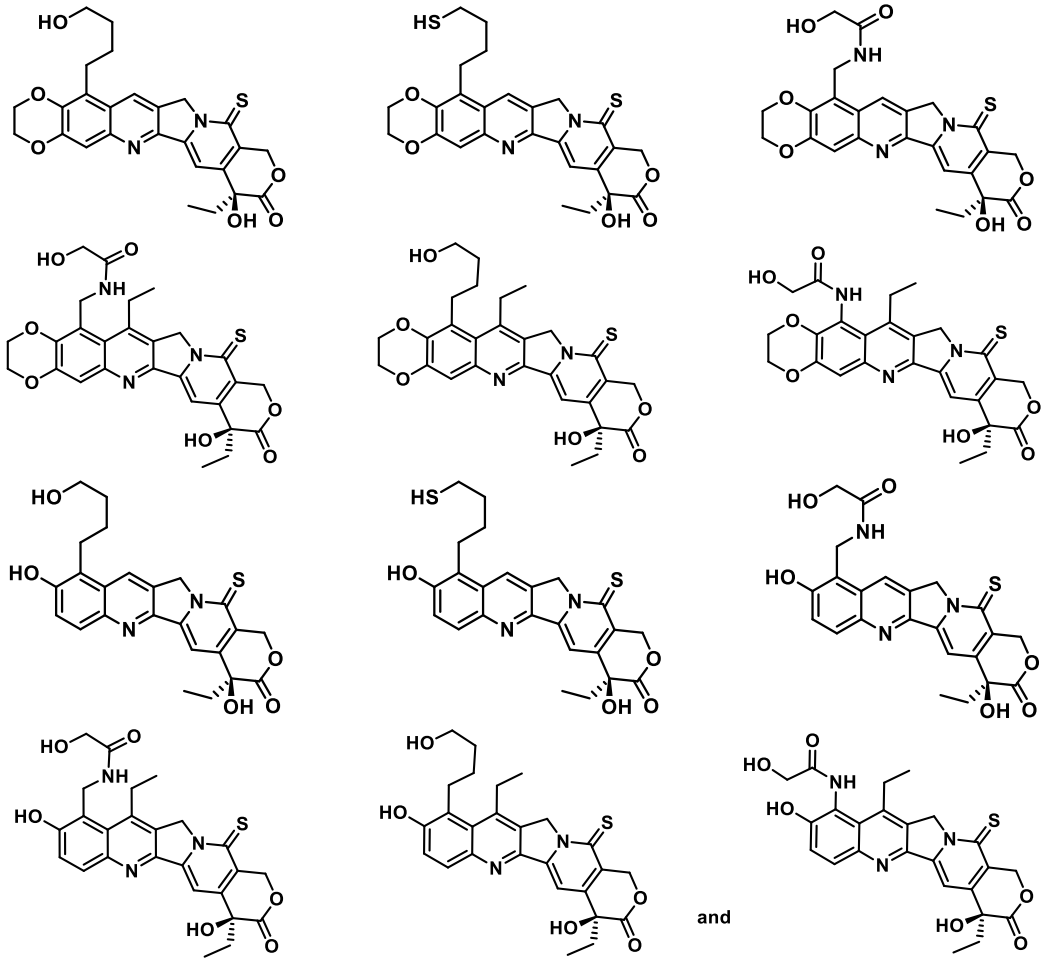












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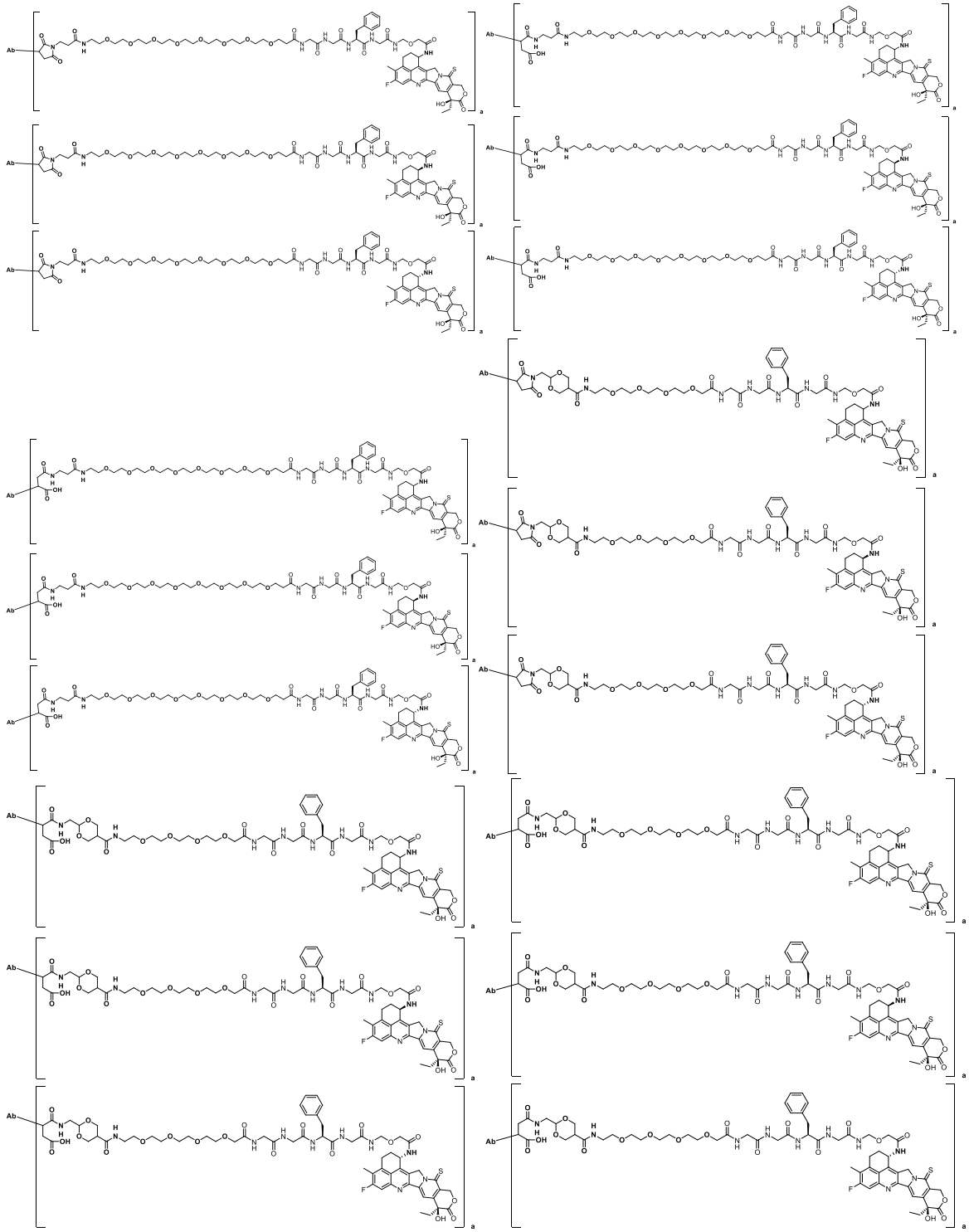
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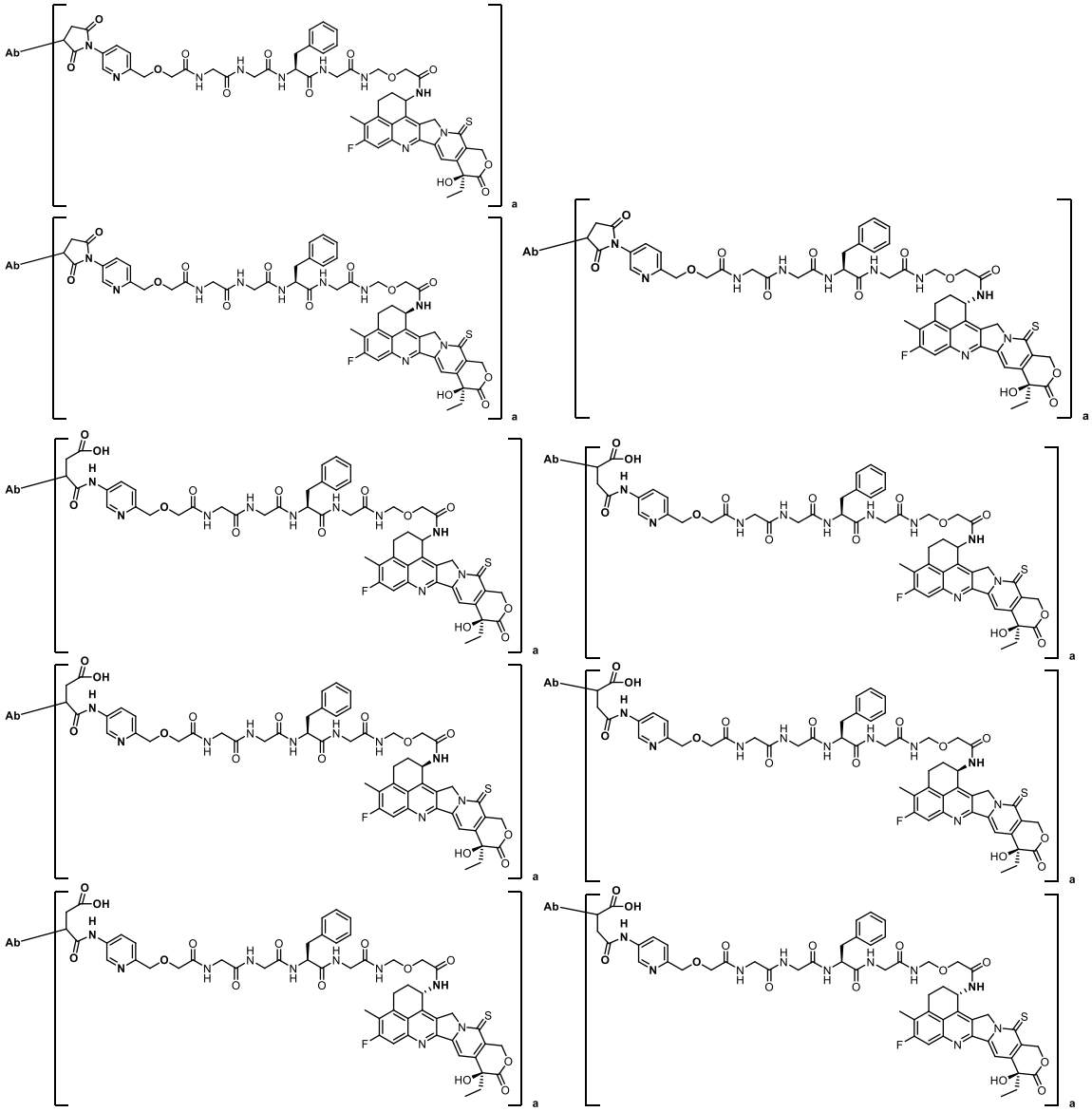
11. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 1, wherein the Ab is an antibody or antigen binding fragment thereof; preferably, the antibody is selected from the group consisting of murine antibody, chimeric antibody, humanized antibody, and fully human antibody；

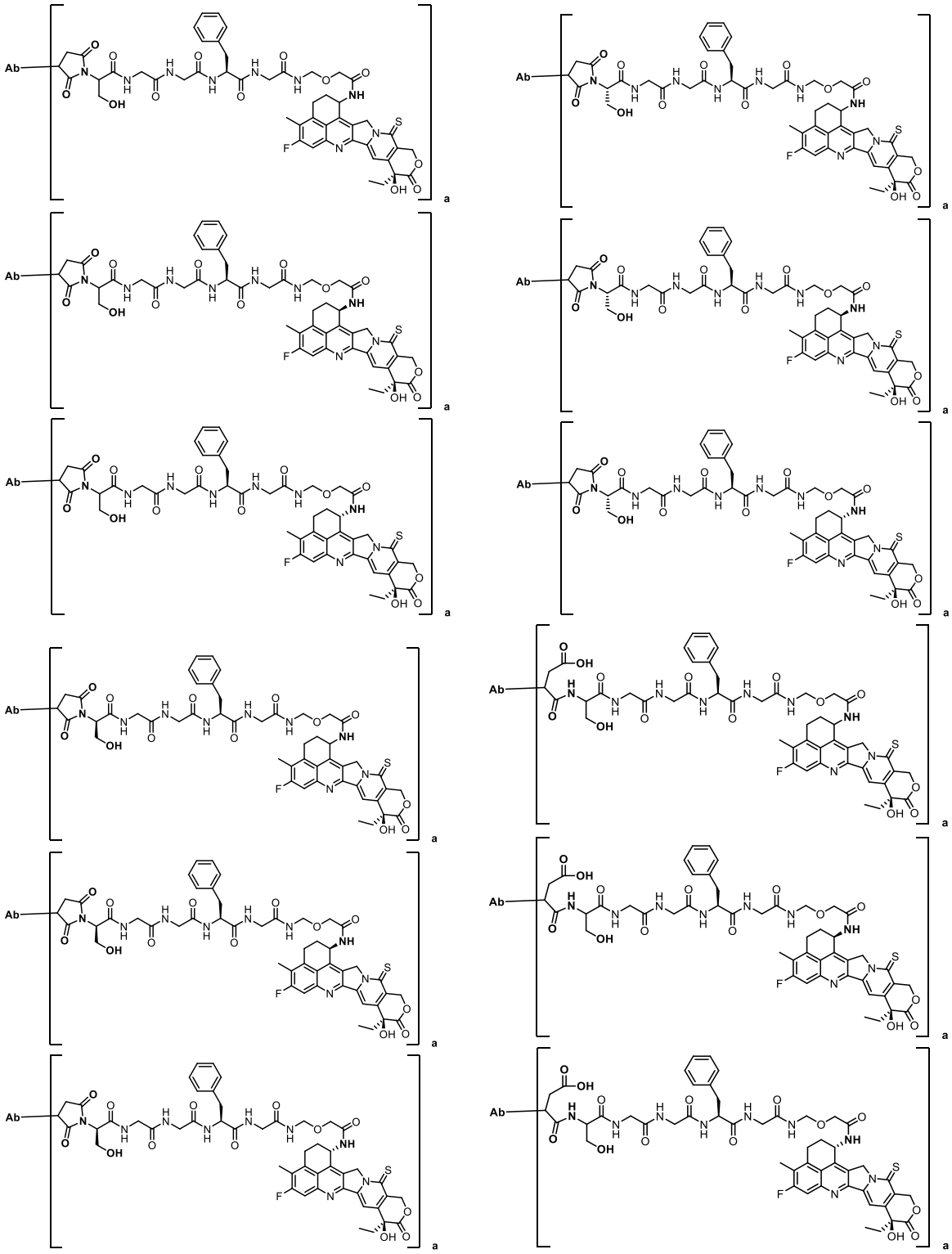
more preferably, wherein the antibody is a monoclonal antibody, bispecific antibody, or polypeptide；

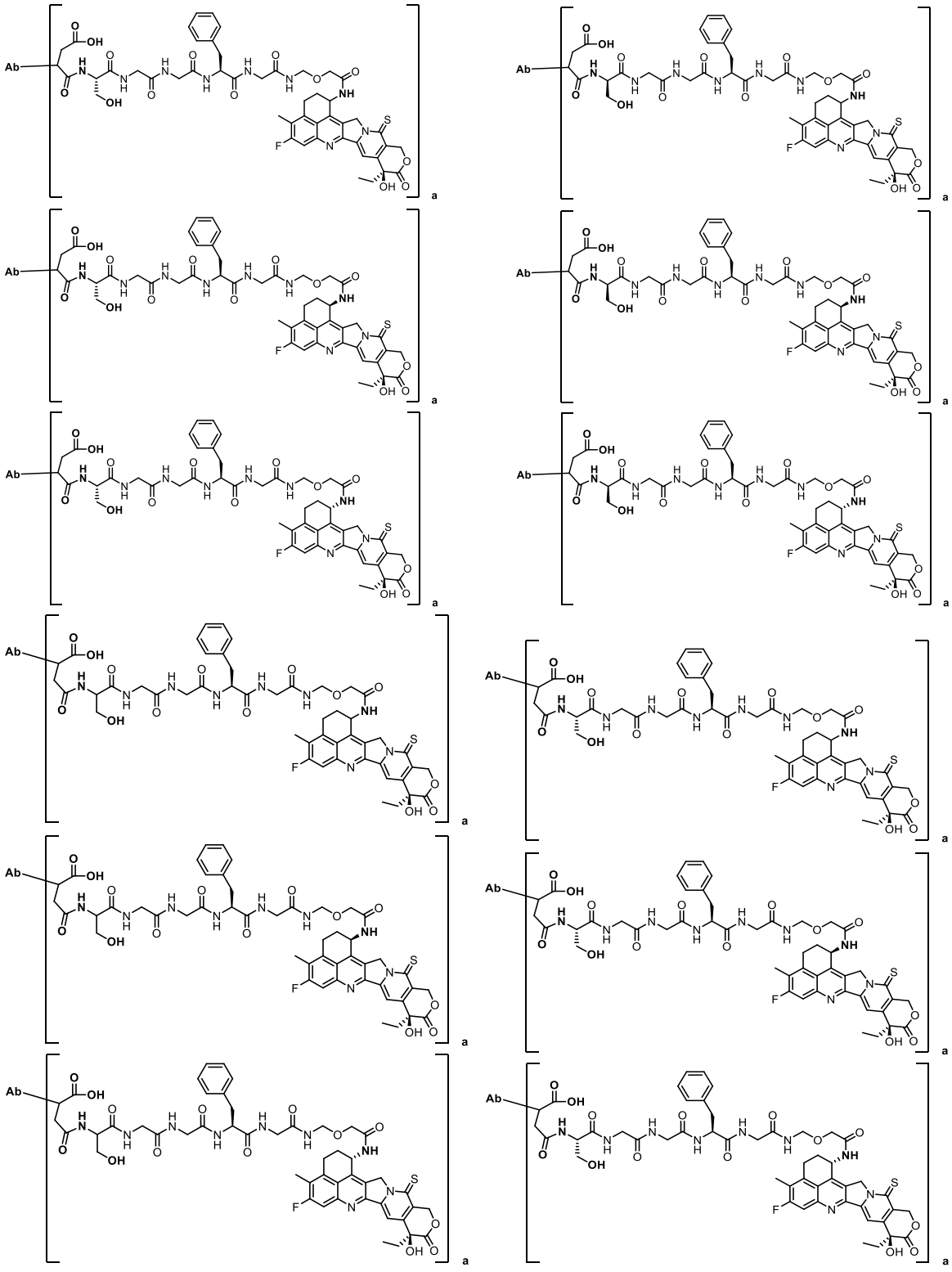
most preferably, the antigen binding fragment is selected from the group consisting of Fab, Fab', Fv fragment, F $(ab')_2$, F $(ab)_2$, scFv, di-scFv, VHH, and dAb.

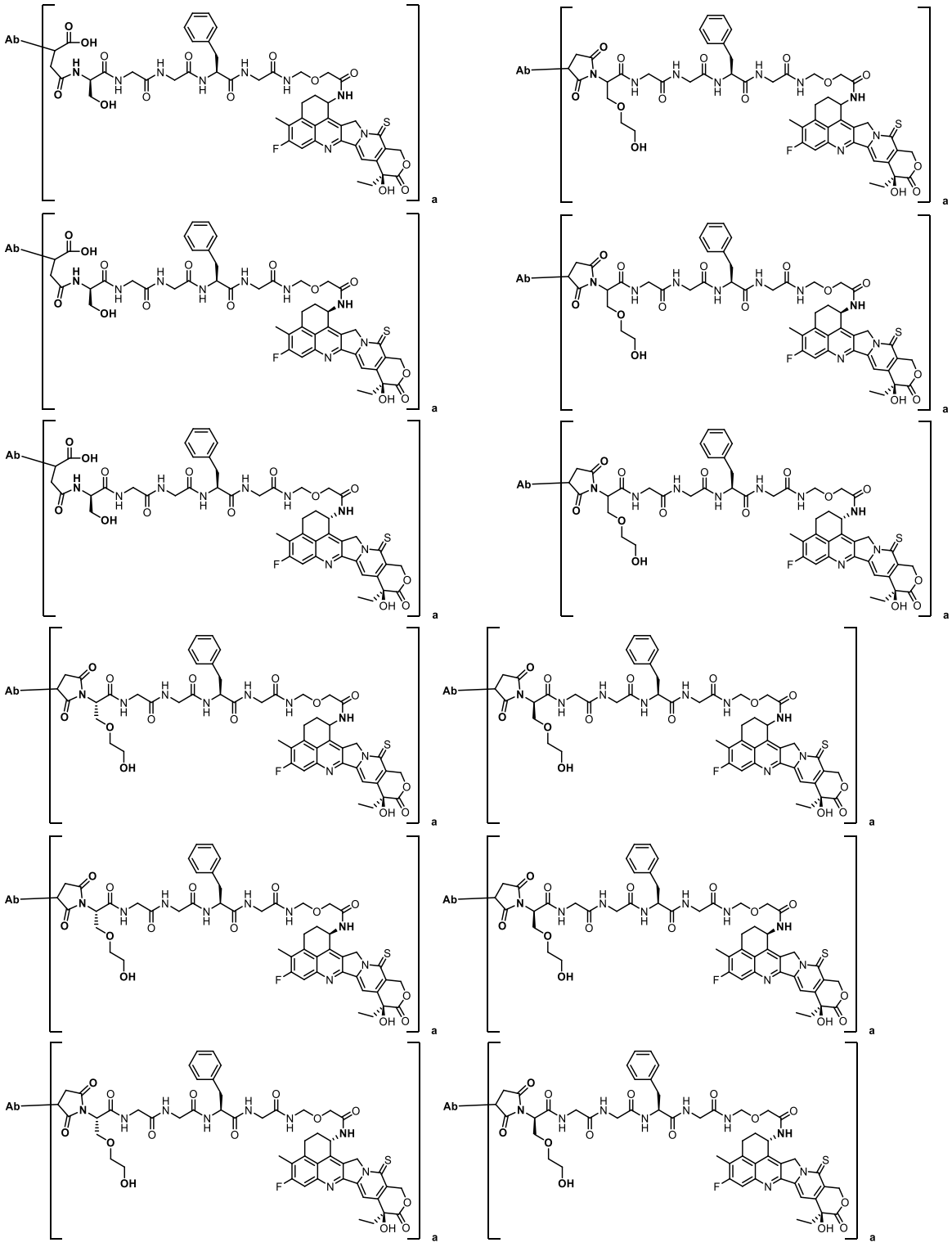
12. The ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 1, characterized in that the ligand-drug conjugate is selected from the group consisting of

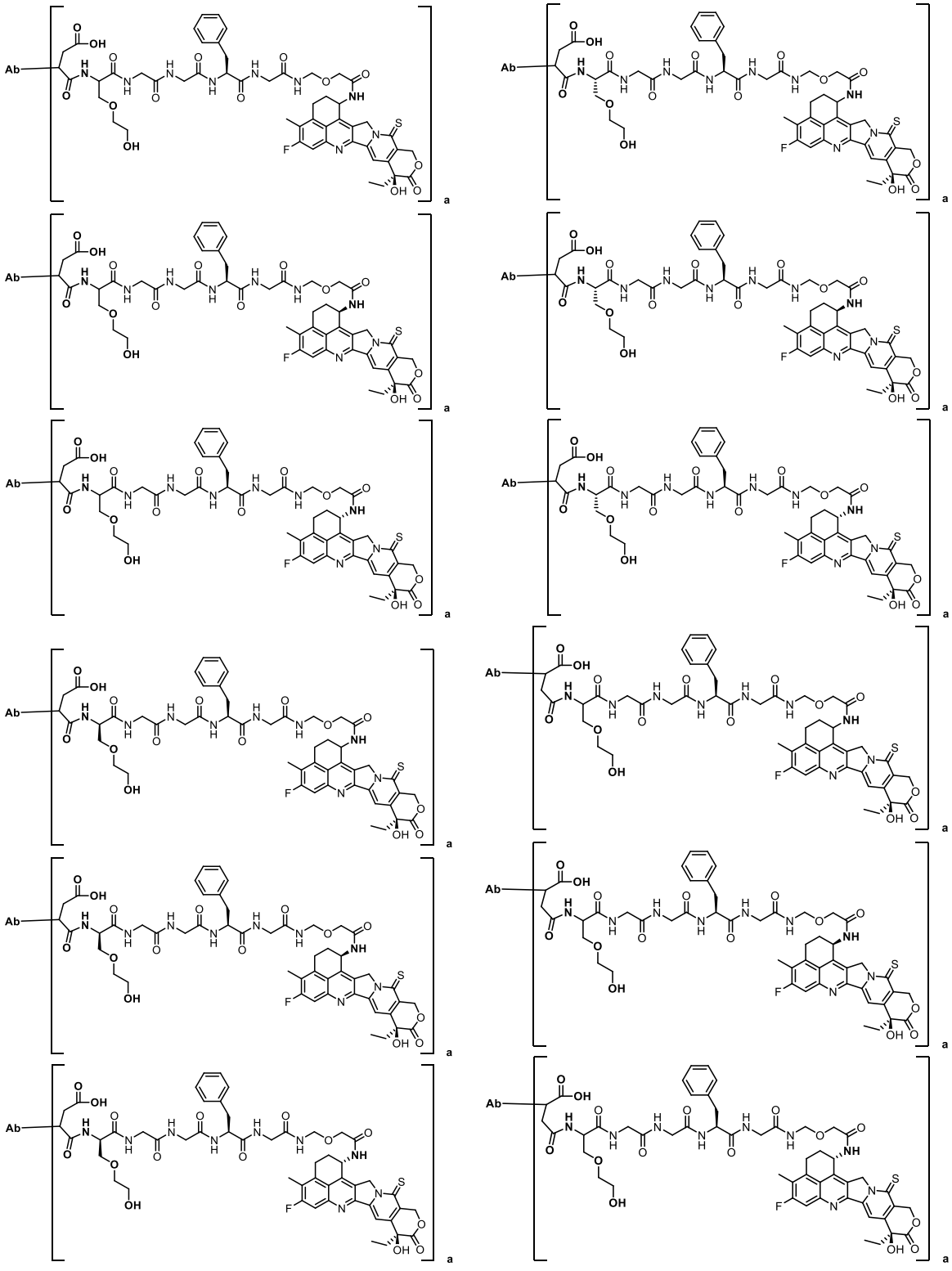


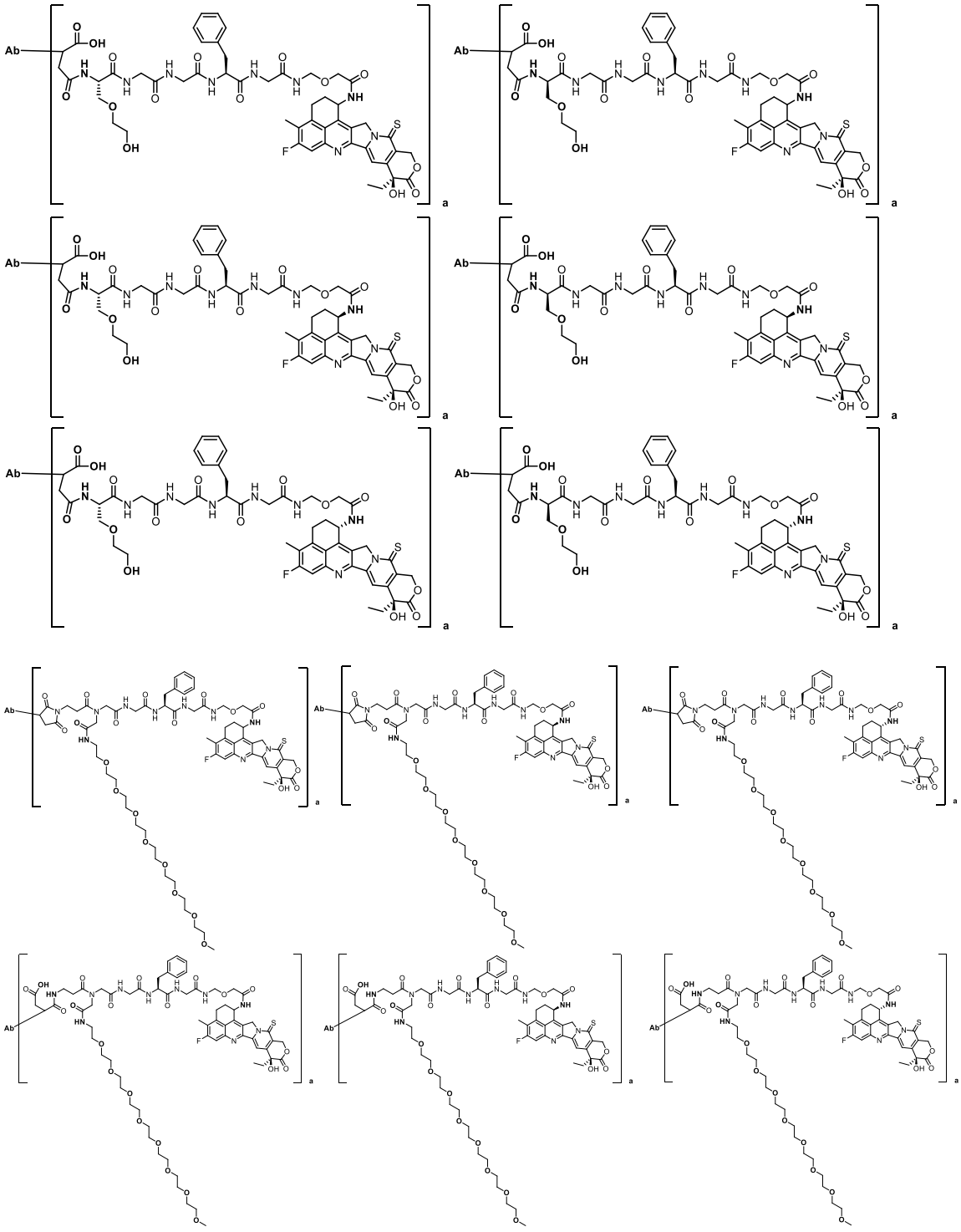


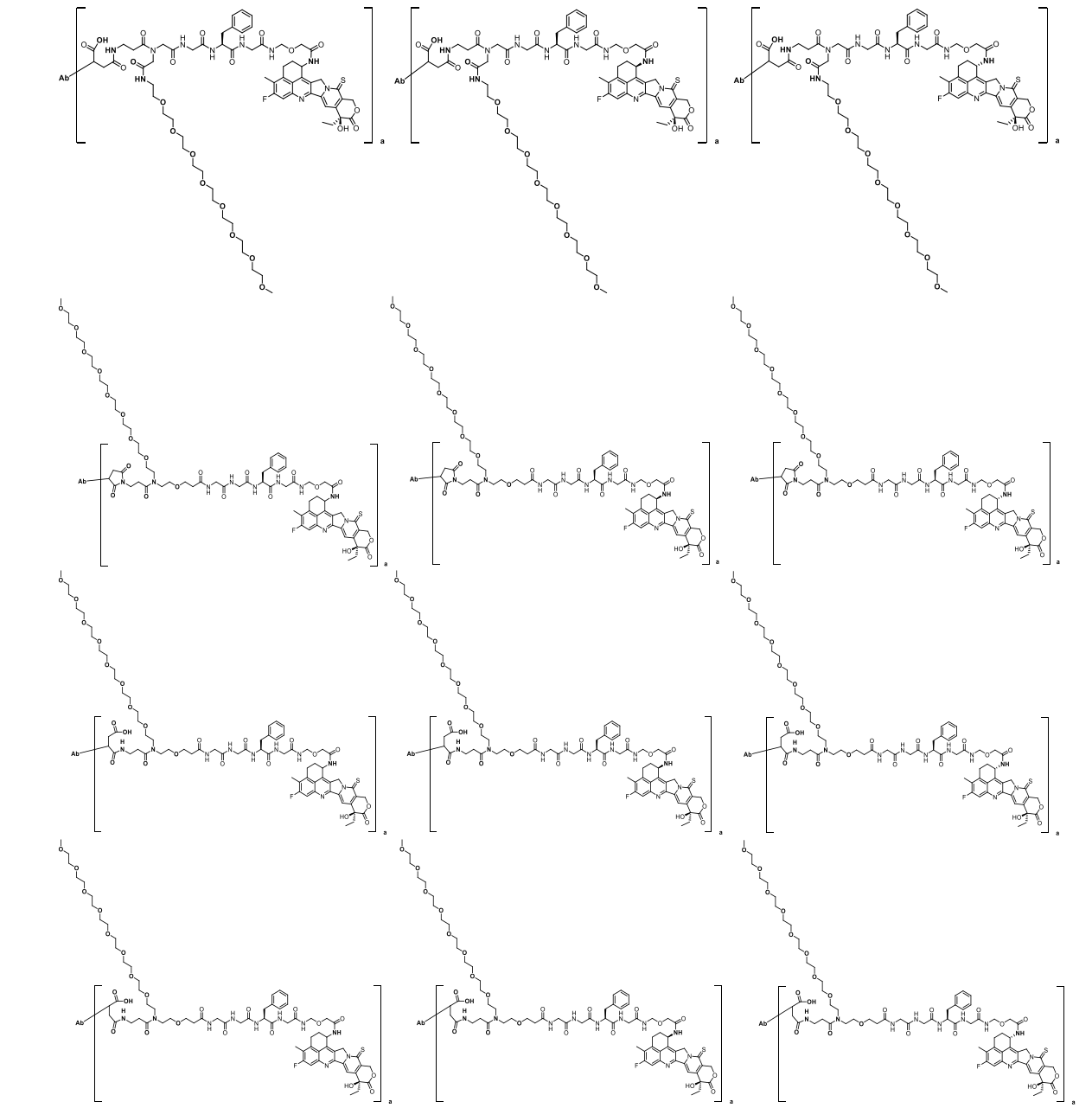




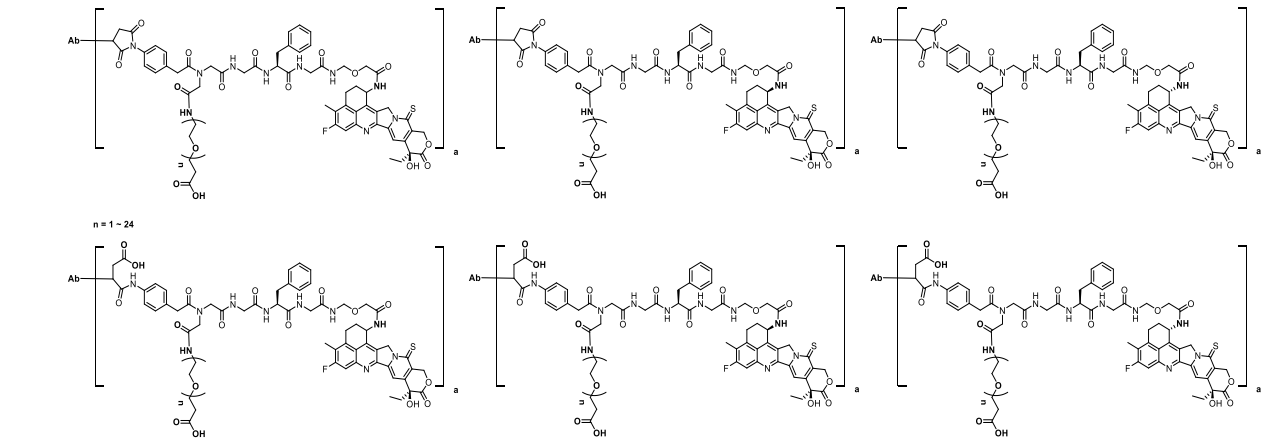






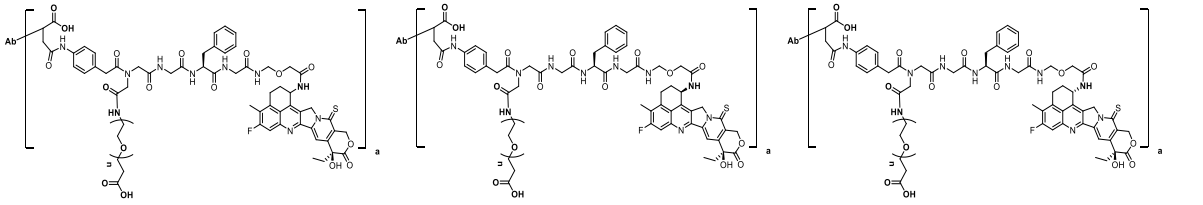


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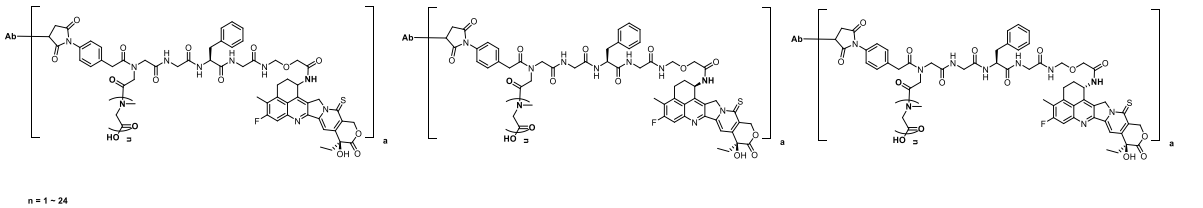


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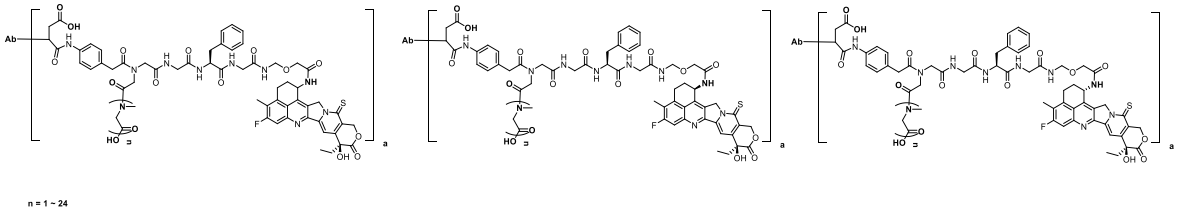
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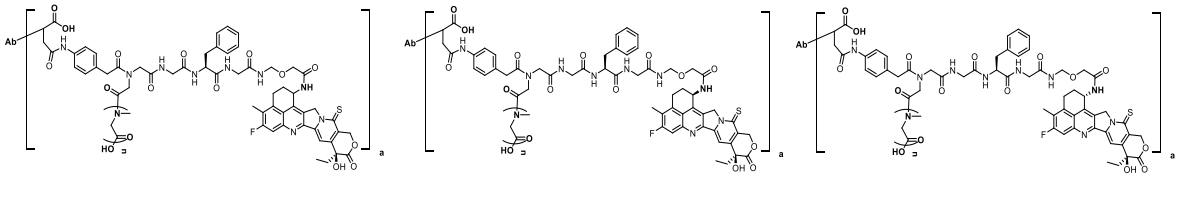
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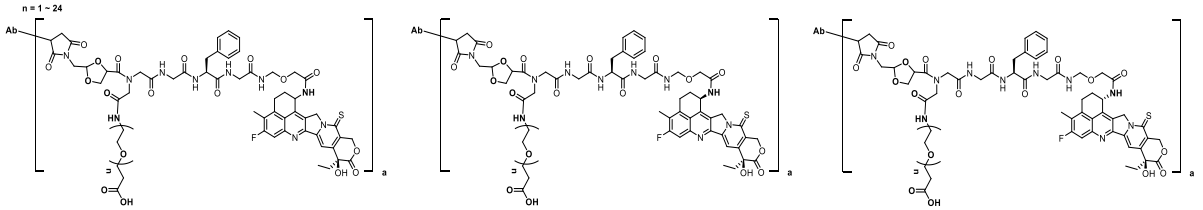
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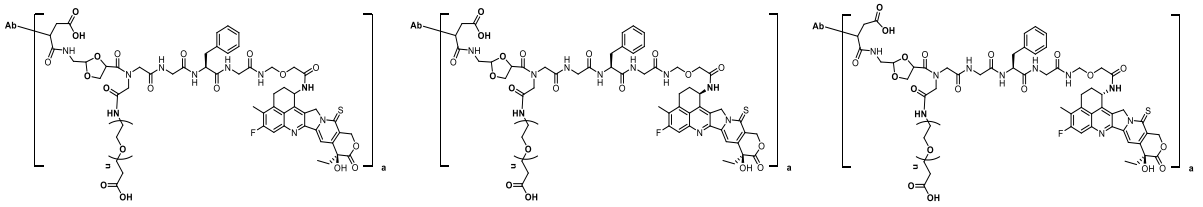
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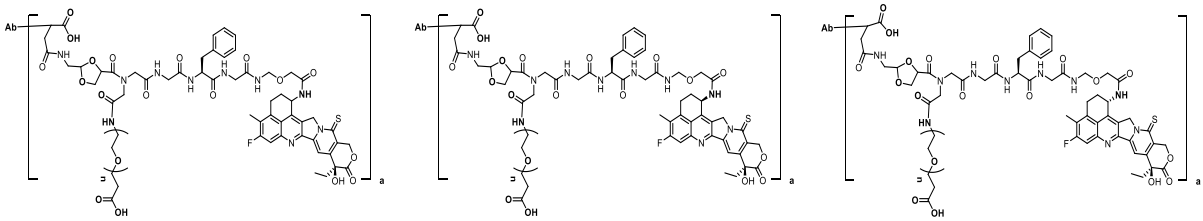
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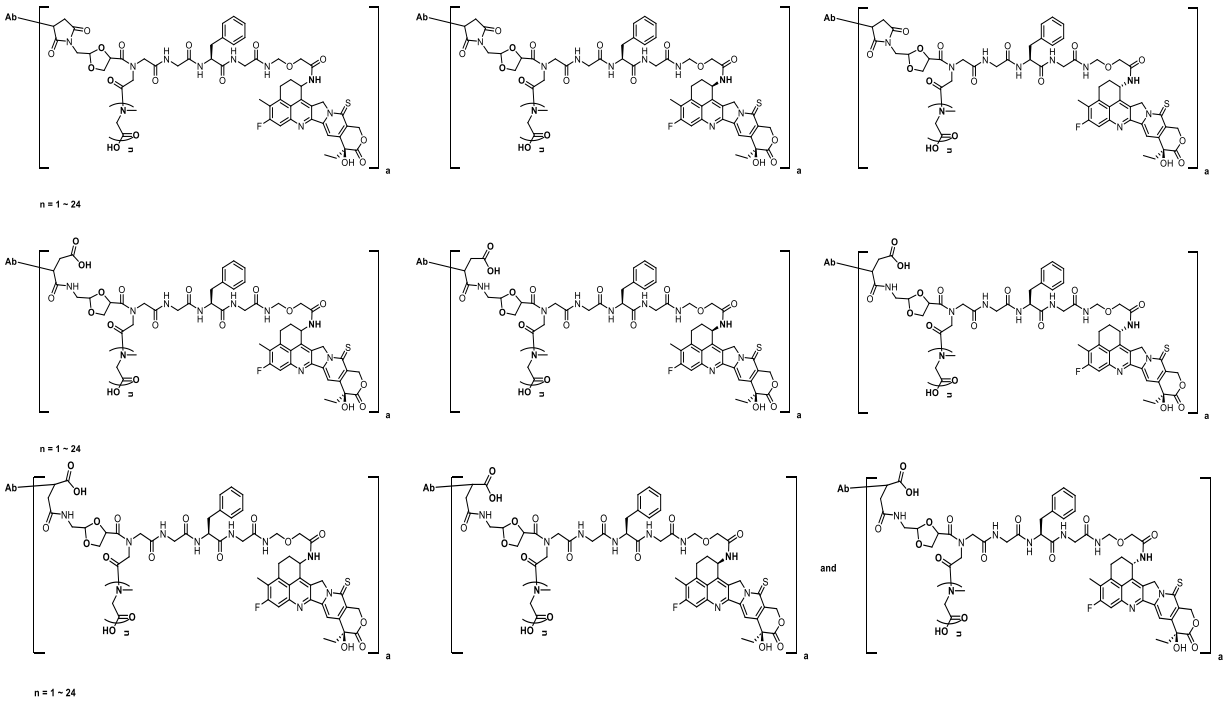
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n = 1 ~ 24

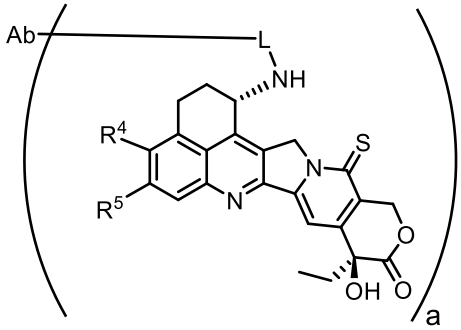


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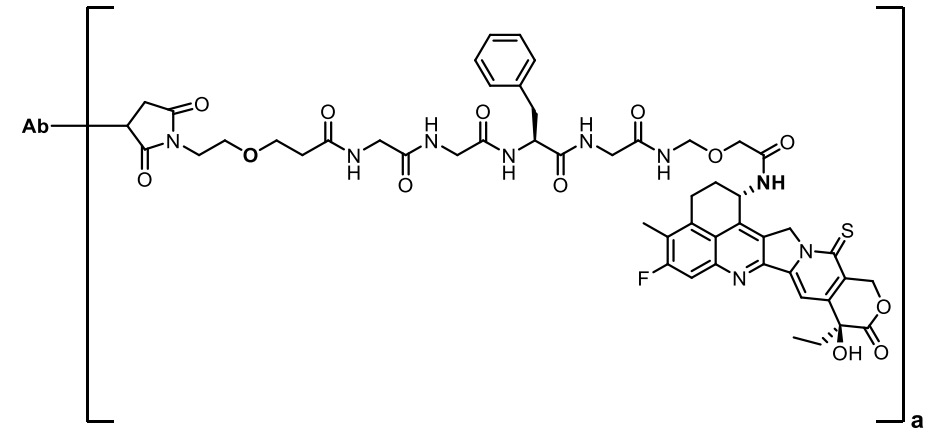
13. A ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt or hydrate thereof according to claim 1, wherein the ligand-drug conjugate has the structure shown in formula (I-a):

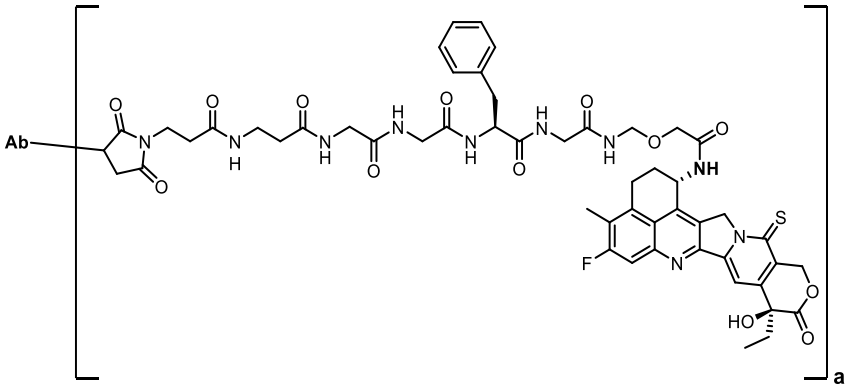


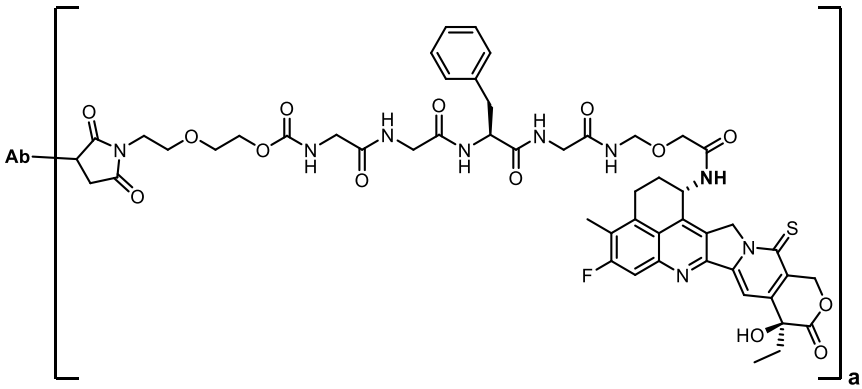
(I-a),

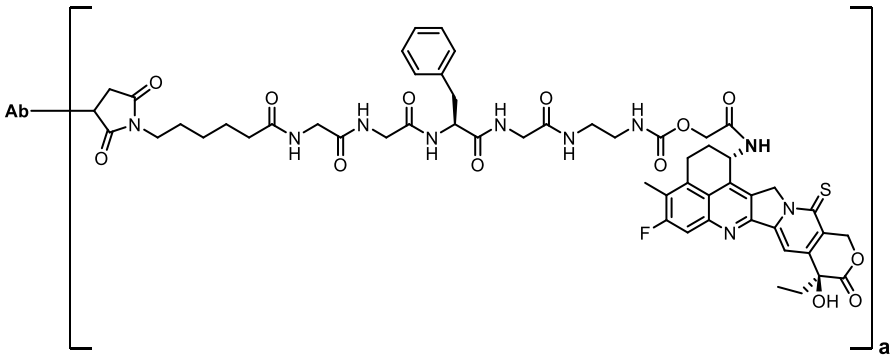
wherein, R^4, R^5 and L are defined as in claim 1, where "a" is a number greater than 0 and "a" is a decimal or integer;

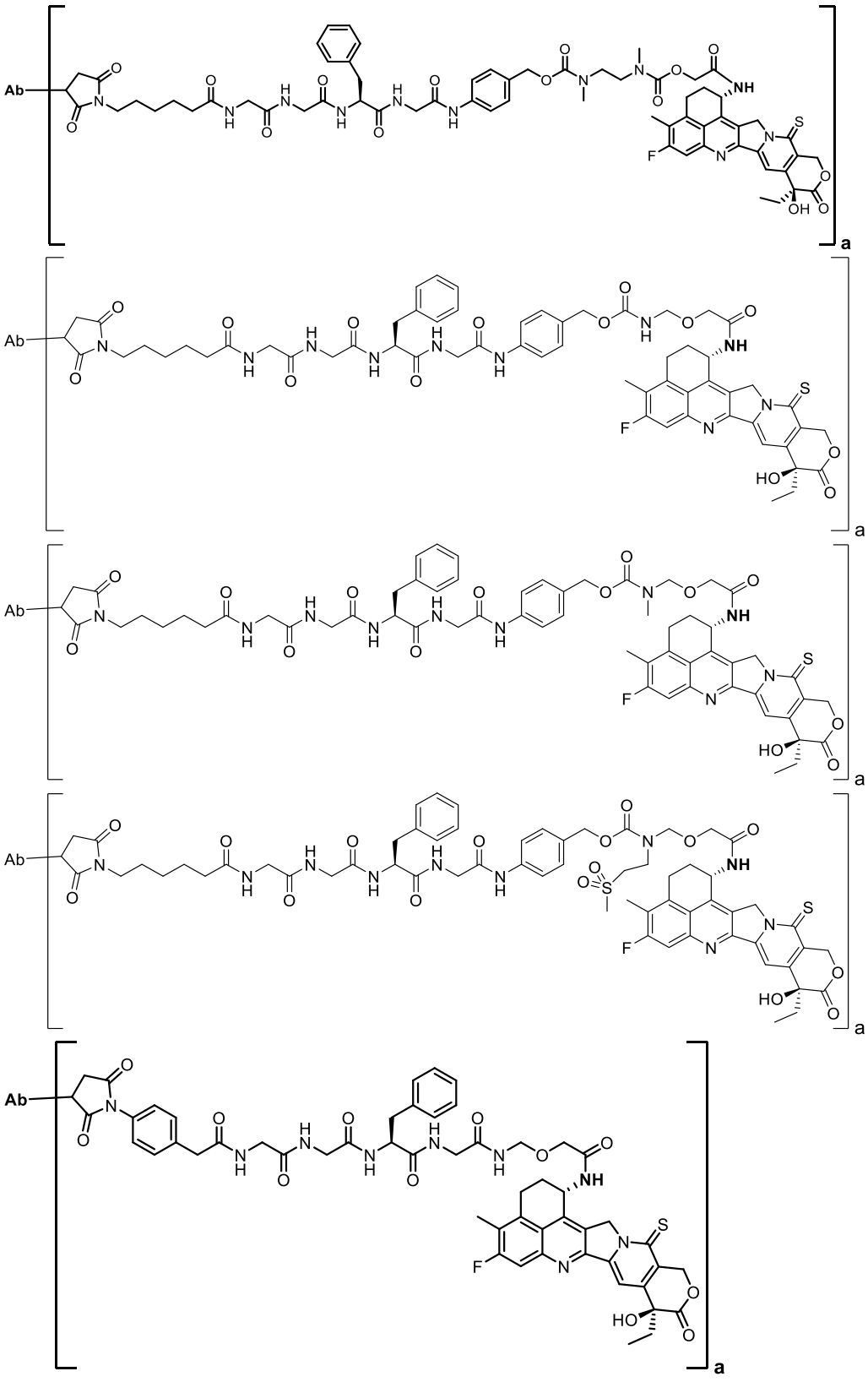
preferably, the ligand-drug conjugate is a structure selected from the group consisting of

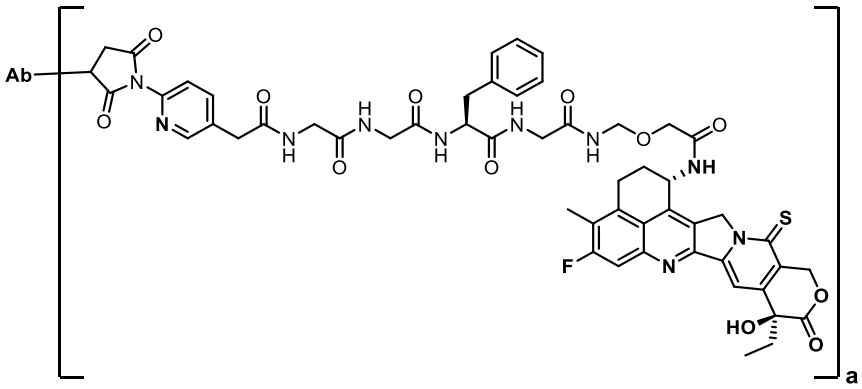


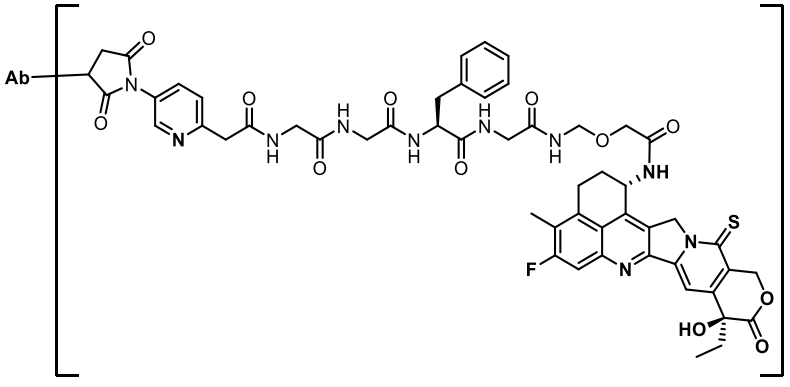


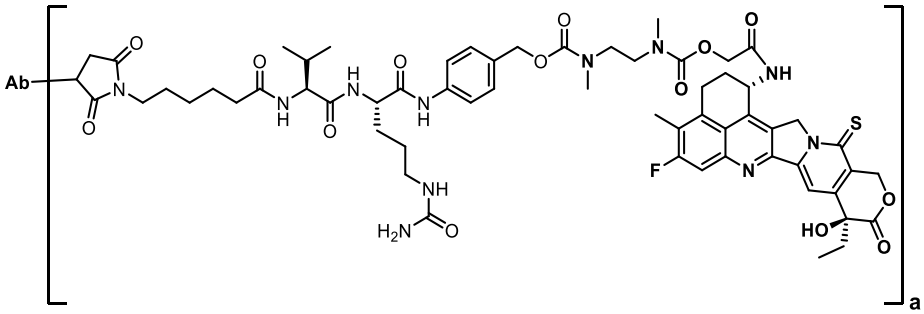


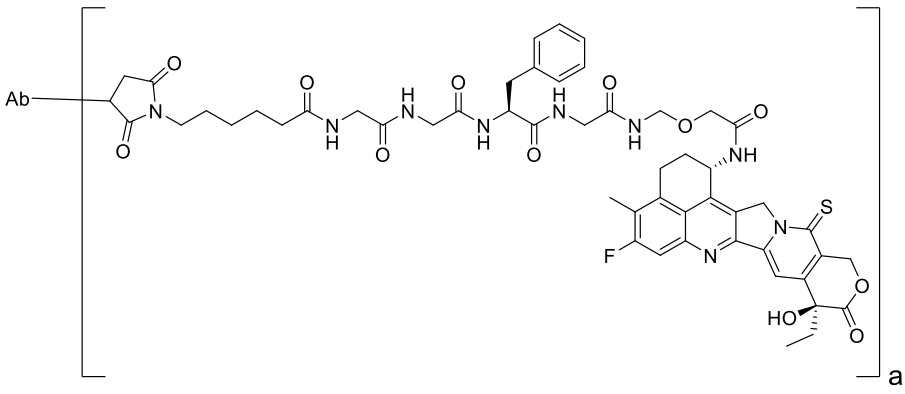




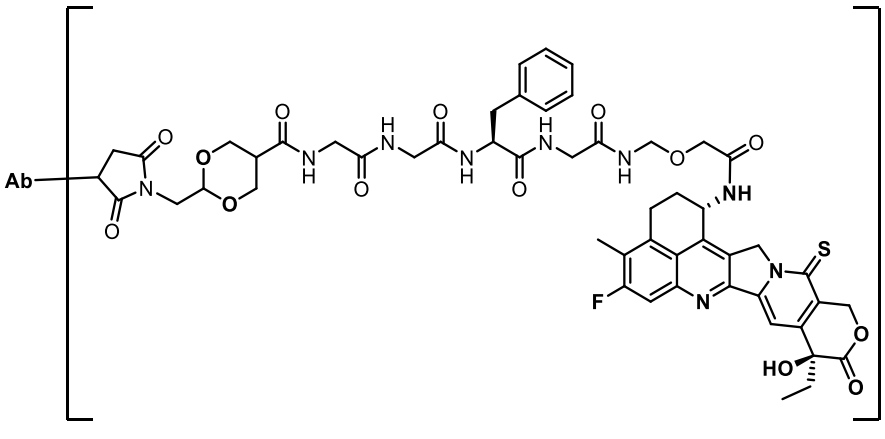








and



wherein "a" is a number greater than 0, and "a" is a decimal or integer;

more preferably, the antibody is an IGF-1R specific antibody;

more preferably, the antibody comprises HCDR3, which comprises the amino acid sequence shown in SEQ ID NO: 3: NPRRATPDLTQYAY; and / or

the antibody comprises HCDR2, which comprises the amino acid sequence shown in SEQ ID NO: 2: AISGSGSRARYADSVKG; and / or

the antibody comprises HCDR1, which comprises the amino acid sequence shown in SEQ ID NO: 1: SFVMA;

even more preferably, the antibody comprises a heavy chain variable region VH, wherein the VH comprises the HCDR1, HCDR2, and HCDR3, and the HCDR3 comprises the amino acid sequence shown in SEQ ID NO: 3; The HCDR2 comprises the amino acid sequence shown in SEQ ID NO: 2; and the HCDR1 comprises the amino acid sequence shown in SEQ ID NO: 1;

even more preferably, the antibody comprises a heavy chain variable region VH comprising the amino acid sequence shown in SEQ ID NO: 4:

EVQLVESGGGLVQPGGSLRLSCAASGRTFSSFVMAWFRQAPGKGLEFVSAISGSGSR ARYADSVKGRFTISRDNSKNTLYLQMNSLRAEDTAVYYCAANPRRATPDLTQYAYWGQ GTLVTVSS;

most preferably, the antibody has a full-length sequence as shown in SEQ ID No. 5:

EVQLVESGGGLVQPGGSLRLSCAASGRTFSSFVMAWFRQAPGKGLEFVSAISGSGSR ARYADSVKGRFTISRDNSKNTLYLQMNSLRAEDTAVYYCAANPRRATPDLTQYAYWGQ GTLVTVSSEPKSSDKTHTCPPCPAPEAAGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSH EDPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSN KALPAPIEKTISKAKGQPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNG QPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLS PGK.

14. A pharmaceutical composition comprising a ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture, or a pharmaceutically acceptable salt, prodrug, or solvate according to any one of claims 1-13.

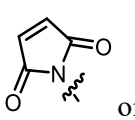
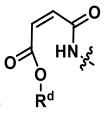
15. The use of a ligand-drug conjugate, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a mixture thereof, or a pharmaceutically acceptable salt, prodrug, or solvate thereof according to any one of claims 1-13 and/or a pharmaceutical composition according to claim 14 in the preparation of a drug for the treatment and/or prevention of diseases or disorders associated with expression and/or abnormal expression of the target of the ligand; preferably,

the disease or disorder related to the target expression and/or abnormal expression of the ligand is selected from the group consisting of tumor, cancer, autoimmune diseases or infectious diseases; more preferably, the tumor/cancer is a tumor/cancer with high, medium, or low expression of the target of the ligand.

16. The ligand-drug conjugate precursor, or a tautomer, a mesomer, a racemate, an enantiomer, a diastereomer, or a pharmaceutically acceptable salt, or hydrate thereof, wherein the ligand-drug

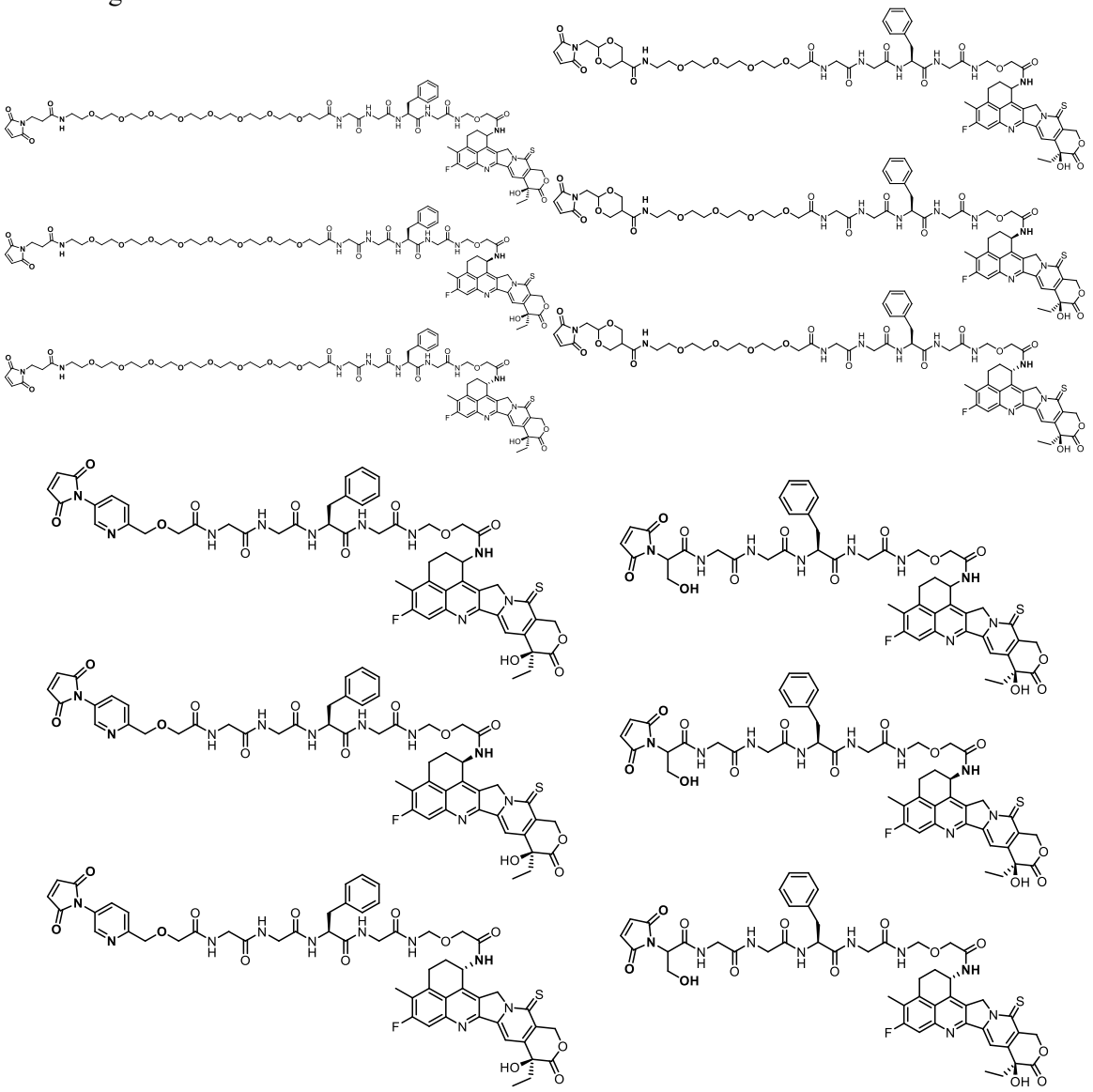
conjugate precursor comprises a structure represented by formula (IA):

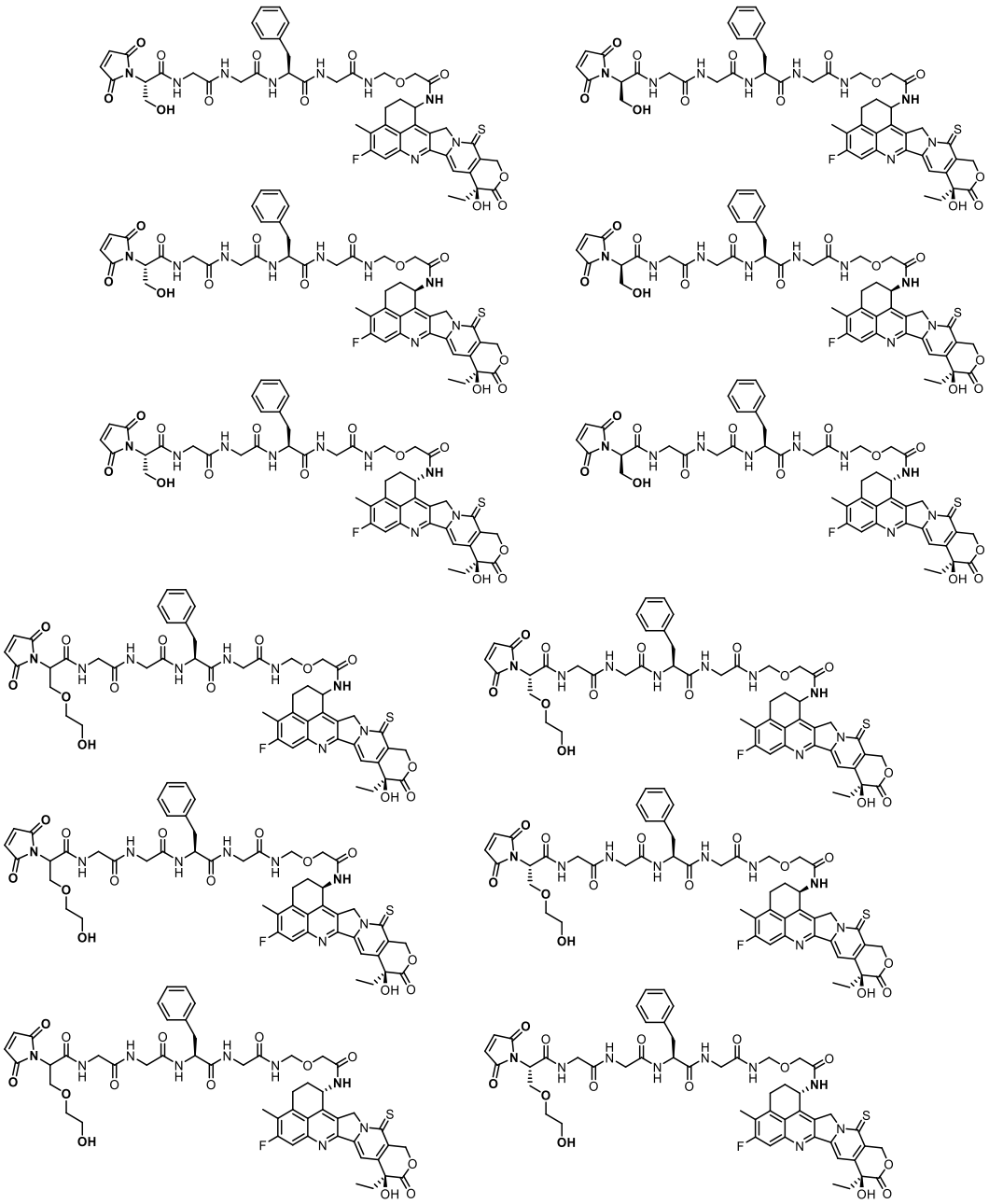
L_A-P (IA),

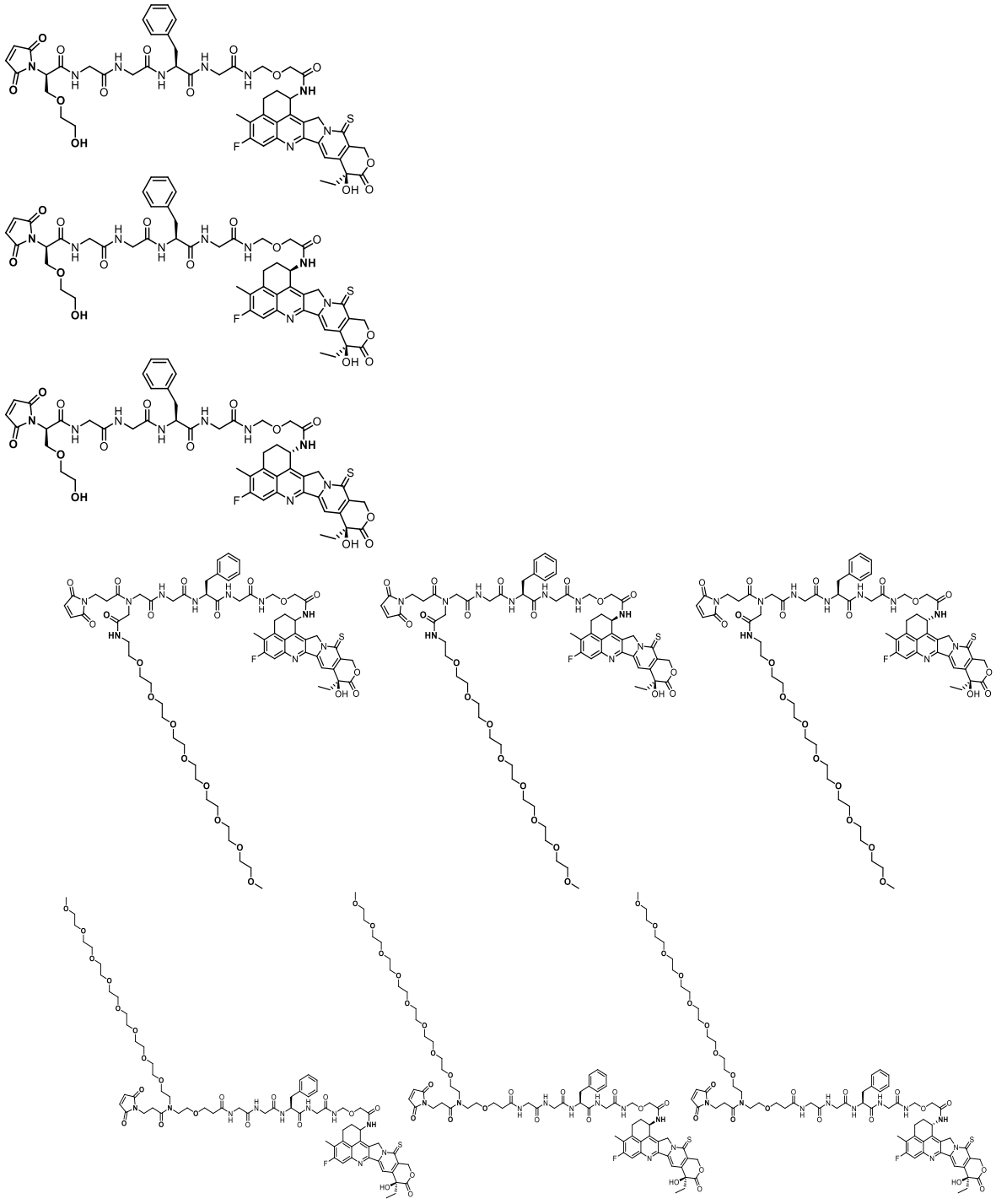
wherein, L_A is L_{1A}-L_2-L_3-L_4-L_5; among them, L_{1A} is  or ;

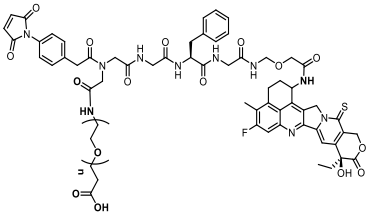
R^d, L_2, L_3, L_4, L_5, and P are defined as in any one of claims 1-13;

more preferably, the ligand-drug conjugate precursor is selected from the group consisting of

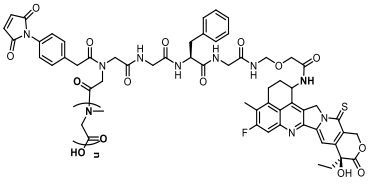




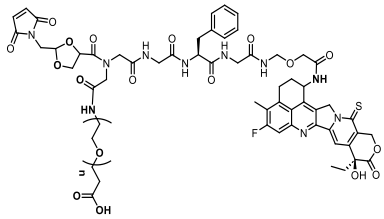




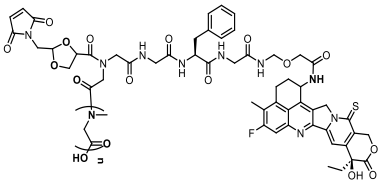
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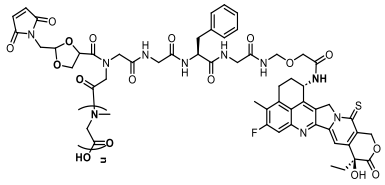
n = 1 ~ 24



n = 1 ~ 24



and



n = 1 ~ 24

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