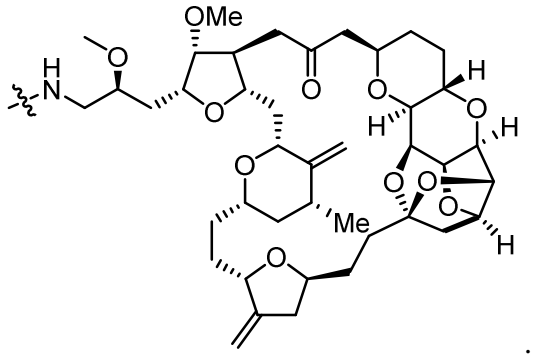
CLAIMS

1. An antibody-drug conjugate having a structure of formula (I):

$$Ab\text{-}(L\text{-}D)_k \qquad (I)$$

or a pharmaceutically acceptable salt or solvate thereof;
wherein Ab is an HER2 antibody or an antigen-binding fragment thereof binding to a domain II of HER2,
L is a linker covalently linking Ab to D, and k is 1 to 20;
-D is shown as the formula below:



.

2. The antibody-drug conjugate according to claim 1, wherein k is selected from the group consisting of 1 to 10 and can be an integer or a decimal.

3. The antibody-drug conjugate according to claim 1 or 2, wherein the linker comprises a cleavable peptide moiety.

4. The antibody-drug conjugate according to claim 3, wherein the cleavable peptide moiety is capable of being cleaved by an enzyme, preferably being cleaved by a cathepsin, and further, the cathepsin is preferably cathepsin B.

5. The antibody-drug conjugate according to claim 3 or 4, wherein the linker comprises an amino acid unit, and the amino acid unit preferably comprises a peptide residue consisting of 2 to 7 amino acids selected from the group consisting of phenylalanine, glycine, valine, lysine, citrulline, serine, glutamic acid, and aspartic acid, and more preferably valine-citrulline (Val-Cit), alanine-alanine-asparagine (Ala-Ala-Asn), glycine-glycine-lysine (Gly-Gly-lys), valine-lysine (Val-lys), valine-alanine (Val-Ala), valine-phenylalanine (Val-Phe), and glycine-glycine-phenylalanine-glycine (Gly-Gly-Phe-Gly) (SEQ ID NO: 7).

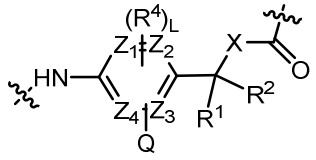
6. The antibody-drug conjugate according to claim 1 or 2, wherein the linker comprises a cleavable sulfonamide moiety.

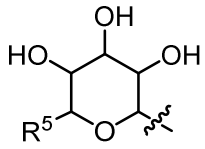
7. The antibody-drug conjugate according to any one of claims 1-3, wherein the linker comprises a cleavable disulfide moiety.

8. The antibody-drug conjugate according to claim 6 or 7, wherein the linker is capable of being cleaved under reduced conditions.

9. The antibody-drug conjugate according to any one of claims 1-8, wherein the linker comprises a spacer unit linking to D.

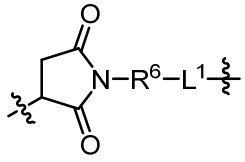
10. The antibody-drug conjugate according to claim 9, wherein the spacer unit comprises *p*-aminobenzyloxycarbonyl (pAB).

11. The antibody-drug conjugate according to claim 9, wherein the spacer unit comprises ,

wherein Z_1-Z_4 are optionally selected from the group consisting of a carbon atom and a nitrogen atom; R^4 is selected from the group consisting of alkyl, cycloalkyl, aryl, and heteroaryl, and the alkyl, cycloalkyl, aryl, and heteroaryl are each independently optionally substituted with one or more substituents selected from the group consisting of alkyl, alkoxy, halogen, amino, cyano, nitro, hydroxy, hydroxyalkyl, cycloalkyl, heterocycloalkyl, aryl, and heteroaryl; R^1 and R^2 are each independently selected from the group consisting of hydrogen, C_{1-6} alkyl, haloalkyl, and C_{3-6} cycloalkyl, preferably hydrogen; or R^1 and R^2, together with the carbon atom to which they are attached, form C_{3-6} cycloalkyl; X is selected from the group consisting of -O- and -NH-; L is selected from the group consisting of integers from 1 to 4;
Q is V-E, V-E provides a glycosidic bond cleavable by an intracellularly located glycosidase, and E is selected from the group consisting of -O-, -S- and -NR^3-, wherein R^3 is selected from the group consisting of hydrogen and methyl; further, V is selected from , wherein R^5 is selected from the group consisting of -COOH and CH_2OH.

12. The antibody-drug conjugate according to any one of claims 1-11, wherein L-D is a chemical moiety represented by the formula below:
-Str- (Pep)-Sp-D, wherein Str is a stretcher unit covalently linking to Ab,
Sp is a spacer unit, and
Pep is selected from the group consisting of amino acid units.

13. The antibody-drug conjugate according to claim 12, wherein Str is selected from a chemical moiety represented by the formula below:



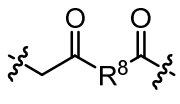
, wherein R^6 is selected from the group consisting of -W-C(O)-, -C(O)-W-C(O)-, $-(CH_2CH_2O)_{p1}C(O)-$, $-(CH_2CH_2O)_{p1}CH_2C(O)-$, and $-(CH_2CH_2O)_{p1}CH_2CH_2C(O)-$, wherein W is selected from the group consisting of C_{1-8} alkylene, C_{1-8} alkylene-cycloalkyl, and linear heteroalkylene with 1 to 8 atoms, and the heteroalkylene comprises 1 to 3 heteroatoms selected from the group consisting of N, O, and S, wherein the C_{1-8} alkylene, C_{1-8} alkylene-cycloalkyl, and linear heteroalkylene are each independently optionally further substituted with one or more substituents selected from the group consisting of halogen, hydroxy, cyano, amino, alkyl, chloroalkyl, alkoxy, and cycloalkyl;

L^1 is selected from the group consisting of $-NR^7(CH_2CH_2O)_{p1}CH_2CH_2C(O)-$, $-NR^7(CH_2CH_2O)_{p1}CH_2C(O)-$, $-S(CH_2)_{p1}C(O)-$, $-(CH_2)_{p1}C(O)-$, and a chemical bond, wherein p1 is an integer from 1 to 20, and L^1 is preferably a chemical bond; p1 is an integer from 1 to 20, and R^7 is selected from the group consisting of hydrogen, alkyl, haloalkyl, and hydroxyalkyl.

14. The antibody-drug conjugate according to claim 13, wherein R^6 is selected from the group consisting of C_{1-6} alkylene C(O)-, $-(CH_2-CH_2O)_2C(O)-$, $-(CH_2-CH_2O)_2CH_2C(O)-$, $-(CH_2-CH_2O)_2CH_2CH_2C(O)-$, $-(CH_2-CH_2O)_3C(O)-$, and $-(CH_2-CH_2O)_4C(O)-$.

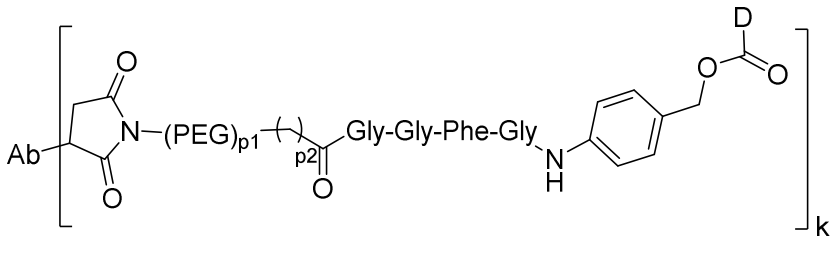
15. The antibody-drug conjugate according to claim 13 or 14, wherein the linker L comprises: maleimide-$(PEG)_2$-Val-Cit, maleimide-$(PEG)_6$-Val-Cit, maleimide-$(PEG)_8$-Val-Cit, maleimide-$(PEG)_4$-$CH_2CH_2C(O)$-Val-lys, maleimide-$(CH_2)_5$-Val-Cit, maleimide-$(CH_2)_5$-Val-lys, maleimide-$(CH_2)_5$-Gly-Gly-Phe-Gly, maleimide-$(PEG)_2$-Ala-Ala-Asn, maleimide-$(PEG)_6$-Ala-Ala-Asn, maleimide-$(PEG)_8$-Ala-Ala-Asn, maleimide-$(PEG)_4$-triazole-$(PEG)_3$-sulfonamide, maleimide-$(PEG)_2$-$CH_2CH_2C(O)$-Val-lys, maleimide-$(PEG)_4$-triazole-$(PEG)_3$-sulfonamide, or Mal-$(PEG)_4$-triazole-$(PEG)_3$-disulfide.

16. The antibody-drug conjugate according to claim 12, wherein Str is selected from a chemical moiety represented by the formula below:

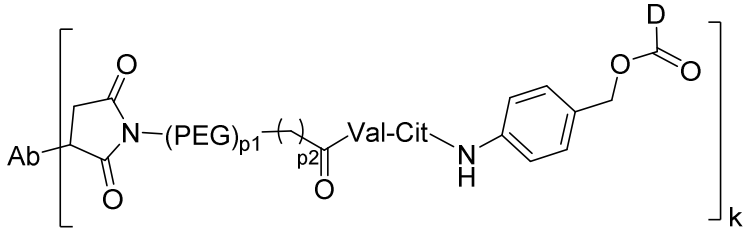


, wherein R^8 is selected from the group consisting of C_{1-10} alkylene, C_{2-10} alkenylene, (C_{1-10} alkylene)O-, $N(R^d)$-(C_{2-6} alkylene)-$N(R^d)$, and $N(R^d)$-(C_{2-6} alkylene); each R^d is independently H or C_{1-6} alkyl.

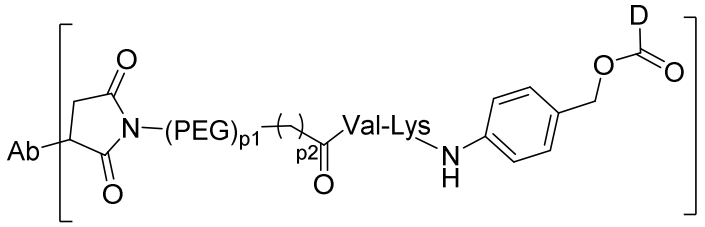
17. The antibody-drug conjugate according to any one of claims 1-15, wherein the antibody-drug conjugate is represented by the formulas below:



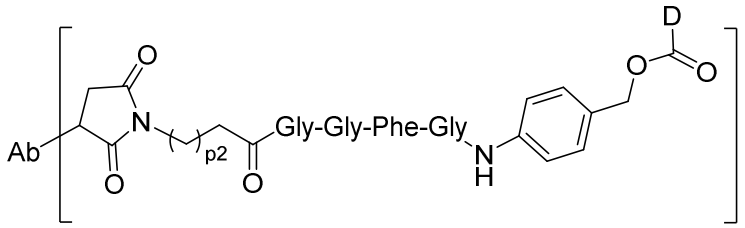
, wherein k is selected from the group consisting of 1 to 10 and can be an integer or a decimal; p1 is selected from the group consisting of 2, 4, 6, and 8; p2 is selected from the group consisting of 0, 1, and 2;



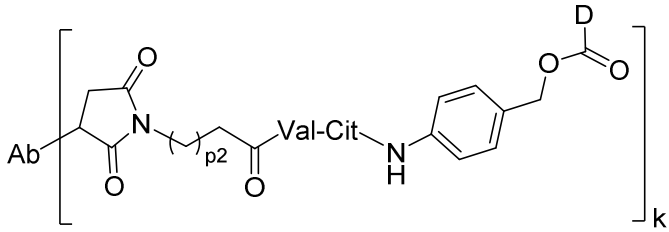
, wherein k is selected from the group consisting of 1 to 10 and can be an integer or a decimal; p1 is selected from the group consisting of 2, 4, 6, and 8; p2 is selected from the group consisting of 0, 1, and 2;



, wherein k is selected from the group consisting of 1 to 10 and can be an integer or a decimal; p1 is selected from the group consisting of 2, 4, 6, and 8; p2 is selected from the group consisting of 0, 1, and 2;

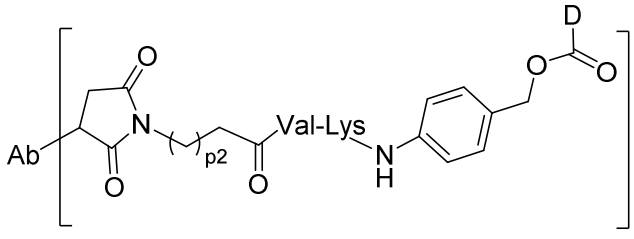


, wherein k is selected from the group consisting of 1 to 10 and can be an integer or a decimal; p2 is selected from the group consisting of integers from 1 to 6;



, wherein k is selected from the

group consisting of 1 to 10 and can be an integer or a decimal; p2 is selected from the group consisting of integers from 1 to 6;

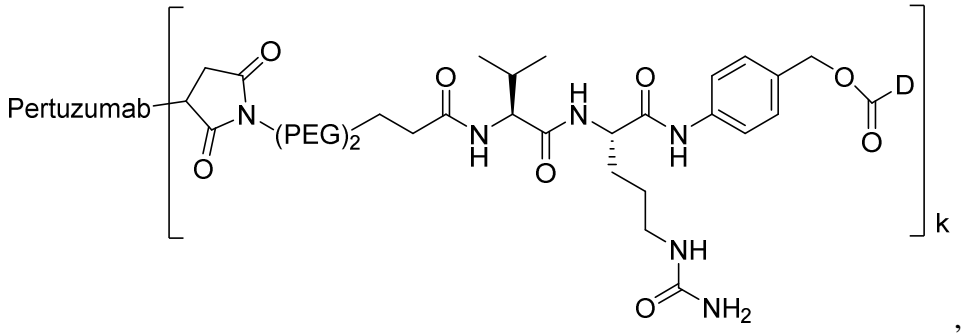


, wherein k is selected from the group consisting of 1 to 10 and can be an integer or a decimal; p2 is selected from the group consisting of integers from 1 to 6;

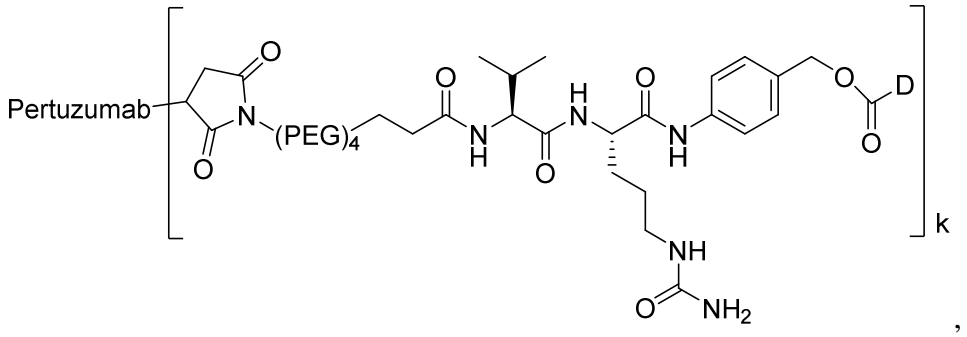
Ab and D are as defined in claim 1.

18. The antibody-drug conjugate according to any one of claims 1-17, wherein the HER2 antibody comprises a light chain variable region and a heavy chain variable region having amino acid sequences set forth in SEQ ID NOs: 1 and 2, respectively, and preferably, the HER2 antibody comprises a light chain and a heavy chain having amino acid sequences set forth in SEQ ID NOs: 3 and 4, respectively.

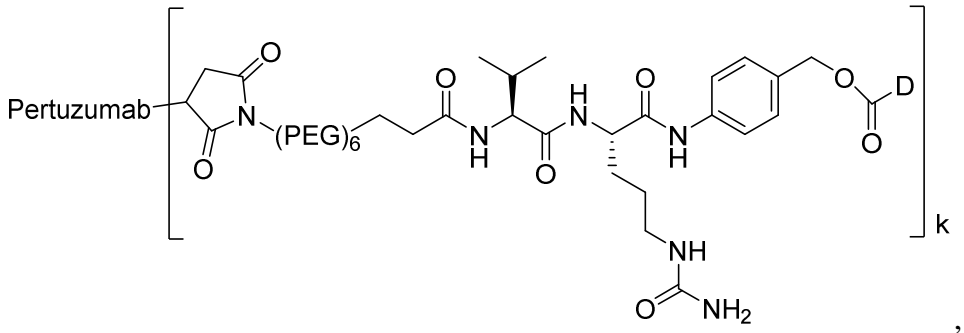
19. The antibody-drug conjugate according to any one of claims 1-18, wherein the antibody-drug conjugate is represented by the formulas below:



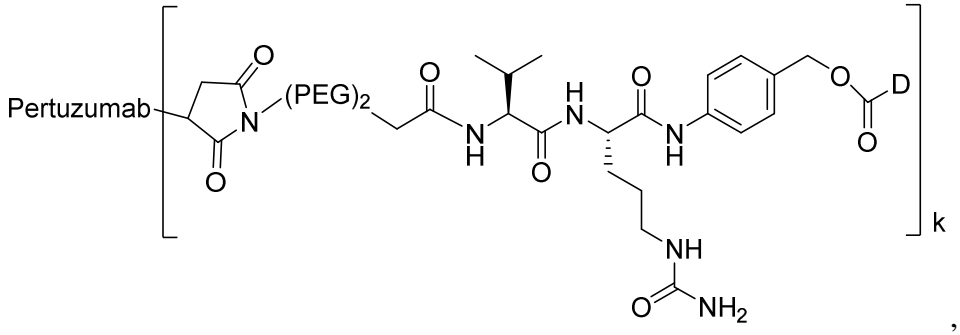
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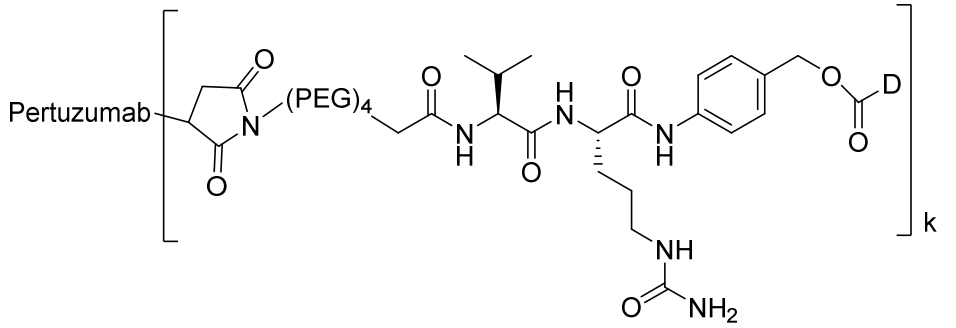
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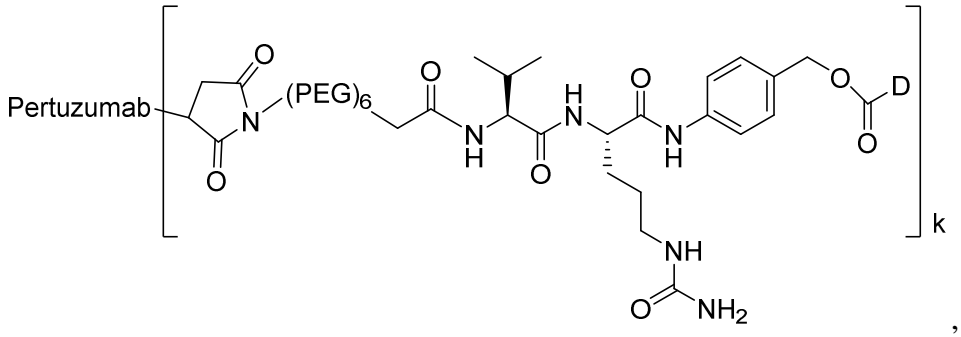
,



,



, and



, wherein k is selected from the group consisting of 1 to 10 and can be an integer or a decimal.

20. The antibody-drug conjugate according to any one of claims 1-19, wherein k is selected from the group consisting of 2.0 to 2.5, 2.5 to 3.5, and 3.5 to 5.0.

21. An isotopically substituted form of the antibody-drug conjugate according to any one of claims 1-20, wherein preferably, the isotopic substitution is a substitution with a deuterium atom.

22. A pharmaceutical composition, comprising:
a therapeutically effective amount of the antibody-drug conjugate according to any one of claims 1-20 or the isotopically substituted form according to claim 21, and
a pharmaceutically acceptable carrier, diluent, or excipient.

23. Use of the antibody-drug conjugate according to any one of claims 1-20, or the isotopically substituted form according to claim 21, or the pharmaceutical composition according to claim 22 in the manufacture of a medicament for treating or preventing a tumor, wherein the tumor is a cancer associated with expression of a domain II of HER2.

24. The use according to claim 23, wherein the cancer is selected from any one of breast cancer, ovarian cancer, cervical cancer, uterine cancer, prostate cancer, kidney cancer, urinary tract cancer, bladder cancer, liver cancer, gastric cancer, endometrial cancer, salivary gland carcinoma, esophageal cancer, melanoma, neuroglioma, neuroblastoma, sarcoma, lung cancer, colon cancer, rectal cancer, colorectal cancer, leukemia, bone cancer, skin cancer, thyroid cancer, pancreatic cancer, and lymphoma.

25. The antibody-drug conjugate according to any one of claims 1-20, or the isotopically substituted form according to claim 21, or the pharmaceutical composition according to claim 22 for use as a medicament.