What is claimed is:

1. A conjugate comprising (i) a target binding moiety, (ii) at least one toxin, and (iii) optionally at least one linker connecting said target binding moiety with said at least one toxin, wherein said target binding moiety binds to CD37 and wherein said at least one toxin is an amatoxin,
wherein said target binding moiety is selected from the group consisting of
(i) an antibody, preferably a monoclonal antibody,
(ii) an antigen-binding fragment thereof, preferably a variable domain (Fv), a Fab fragment or an $F(ab)_2$ fragment,
(iii) an antigen-binding derivative thereof, preferably a single-chain Fv (scFv), and
(iv) an antibody-like protein,
each binding to CD37, and
wherein said antibody, or antigen-binding fragment thereof, or antigen-binding derivative thereof, respectively, comprises the following complementarity-determining regions (CDRs):
CDRH1 according to SEQ ID No. 1 (DYNMY),
CDRH2 according to SEQ ID No. 2 (YIDPYNGDTTYNQKFKG),
CDRH3 according to SEQ ID No. 3 (SPYGHYAMDY),
CDRL1 according to SEQ ID No. 4 (KASQDVSTAVD),
CDRL2 according to SEQ ID No. 5 (WASTRHT),
CDRL3 according to SEQ ID No. 6 (RQHYSTPFT), and
wherein said CDRs are comprised in a suitable protein framework so as to be capable of binding to human CD37.

2. Conjugate according to claim 1, wherein said antibody, or antigen-binding fragment thereof, or antigen-binding derivative thereof, respectively, comprises a heavy chain variable region having at least 90% sequence similarity to an amino acid sequence according to SEQ ID No. 7, and a light chain variable region having at least 90% sequence similarity to an amino acid sequence according to SEQ ID No. 8.

3. Conjugate according to claim 1 or claim 2, wherein said antibody comprises a heavy chain having at least 90% sequence similarity to an amino acid sequence according to

SEQ ID No. 9, and a light chain having at least 90% sequence similarity to an amino acid sequence according to SEQ ID No. 12.

4. Conjugate according to claim 1 or claim 2, wherein said antibody has been genetically engineered to comprise heavy chain 265Cys according to the EU numbering system, preferably a heavy chain 265Cys according to the EU numbering system, and wherein said linker, if present, or said amatoxin is connected to said antibody via said heavy chain 118Cys, or said heavy chain 239Cys, or heavy chain 265Cys residue, respectively.

5. Conjugate according to any one of claim 1, claim 2, and claim 4, wherein said antibody has been genetically engineered to comprise a heavy chain 234Ala and/or 235Ala according to the EU numbering system.

6. Conjugate according to claim 1 or claim 2, wherein said antibody has been genetically engineered to comprise a heavy chain 265Cys, 234Ala and 235Ala according to the EU numbering system, and wherein said linker, if present, or said amatoxin is connected to said antibody via said heavy chain 265Cys residue.

7. Conjugate according to claim 1 or claim 2, wherein said antibody comprises a heavy chain having at least 90% sequence similarity to an amino acid sequence according to SEQ ID No. 10 or 11, and a light chain having at least 90% sequence similarity to an amino acid sequence according to SEQ ID No. 12.

8. Conjugate according to claim 1 or claim 2, wherein said linker, if present, or said amatoxin is connected to said antibody via any of the naturally occurring Cys residues of said antibody, preferably via any of the naturally occurring Cys residues which form the interchain disulfide bonds of said antibody and/or via a disulfide linkage.

9. Conjugate according to any one of claims 1 – 8, wherein said linker is a non-cleavable or a cleavable linker.

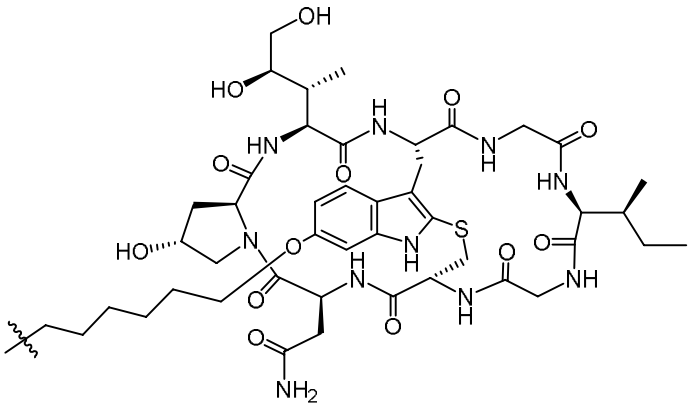
10. Conjugate according to claim 9, wherein said cleavable linker is selected from the group consisting of an enzymatically cleavable linker, preferably a protease-cleavable

linker, and a chemically cleavable linker, preferably a linker comprising a disulfide bridge.

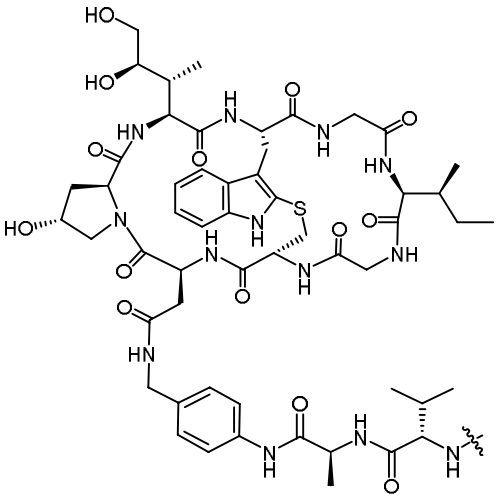
11. Conjugate according to any one of claims 1 – 10, wherein said linker, if present, or said target binding moiety is connected to said amatoxin via (i) the γ C-atom of amatoxin amino acid 1, or (ii) the δ C-atom of amatoxin amino acid 3, or (iii) the 6'-C-atom of amatoxin amino acid 4.

12. Conjugate according to any one of claims 1 – 11, wherein said amatoxin comprises (i) an amino acid 4 with a 6'-deoxy position and (ii) an amino acid 8 with an S-deoxy position.

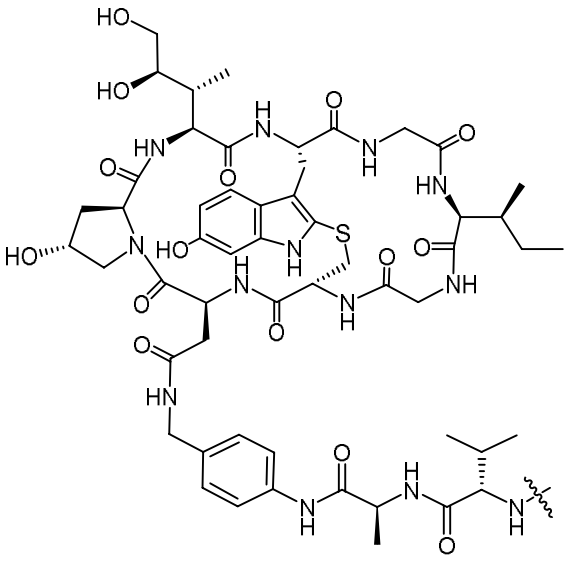
13. Conjugate according to any one of claims 1 – 8, wherein said conjugate comprises any of the following compounds of formulas (I) to (XI), respectively, as linker-amatoxin moieties:



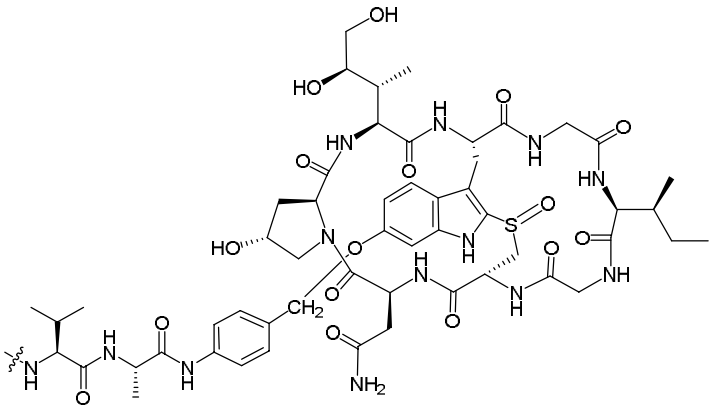
(I)



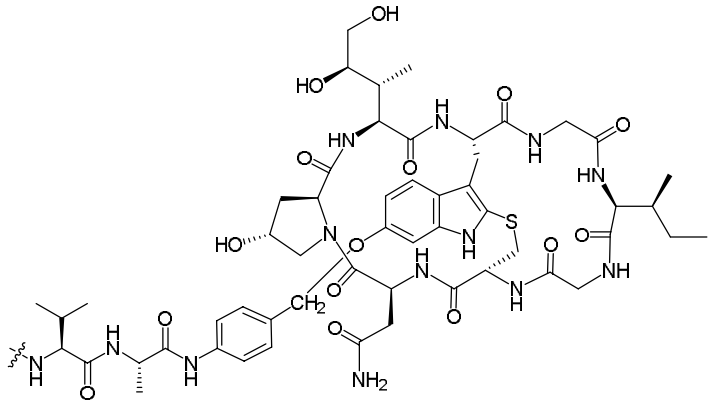
(II)



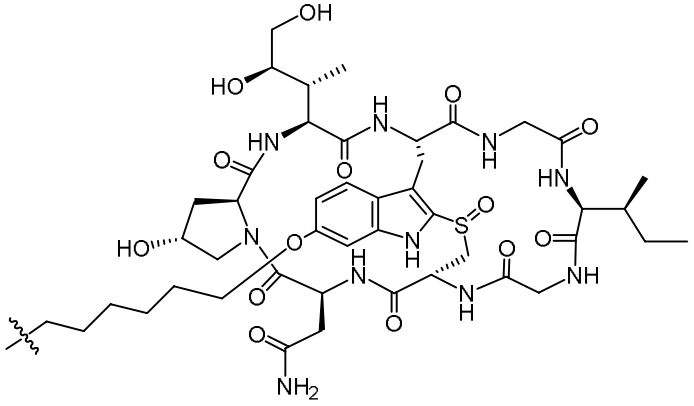
(III),



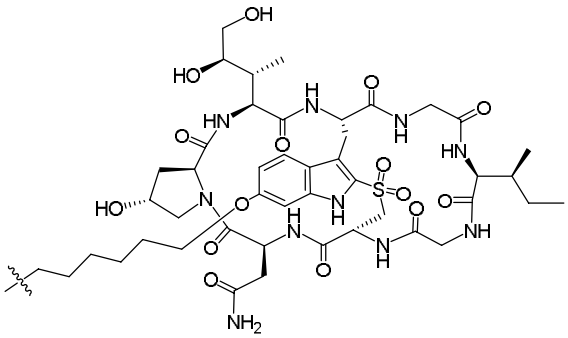
(IV),



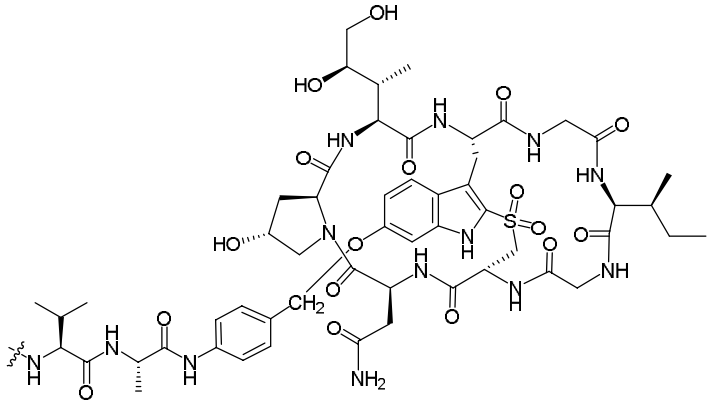
(V),



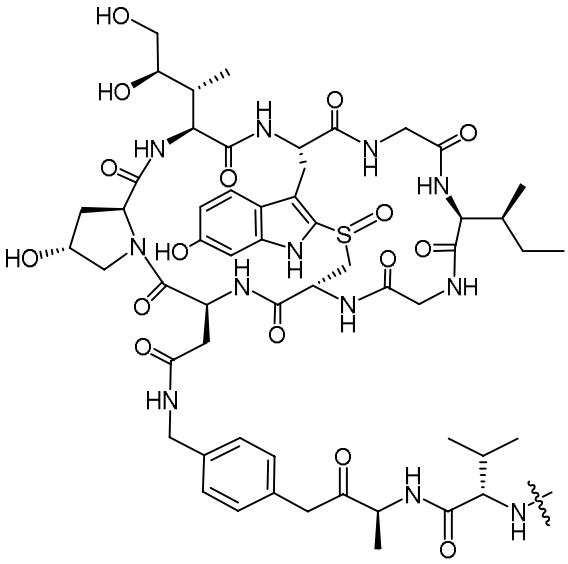
(VI),



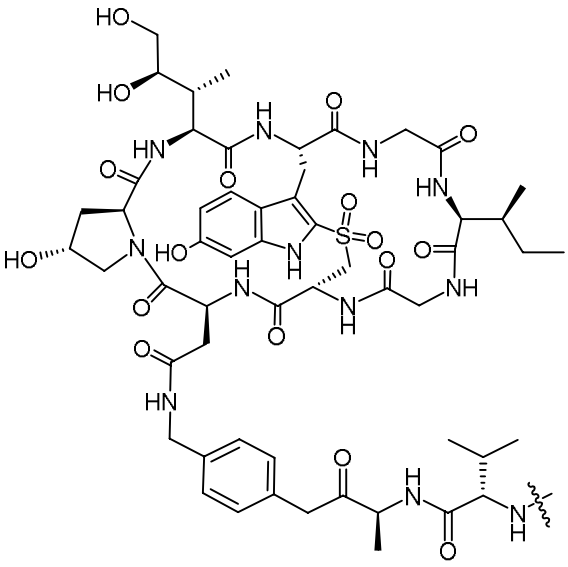
(VII),



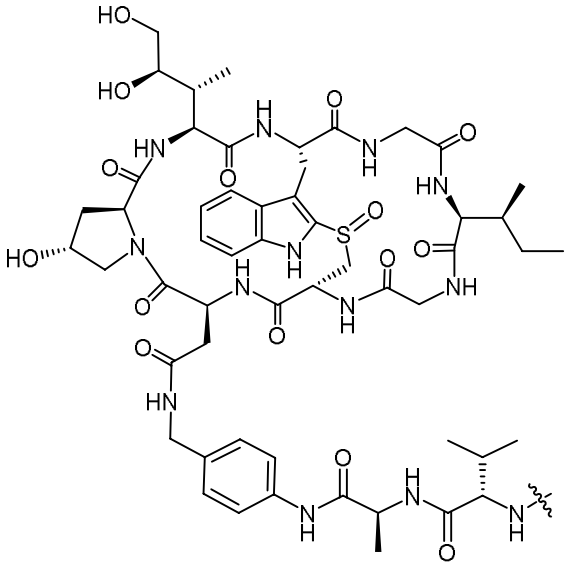
(VIII),



(IX),

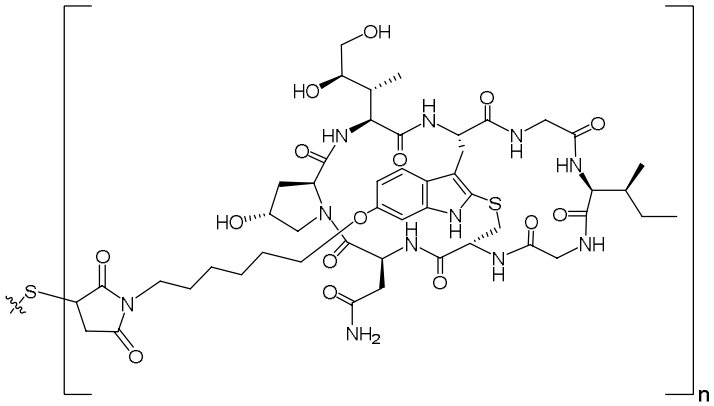


(X),

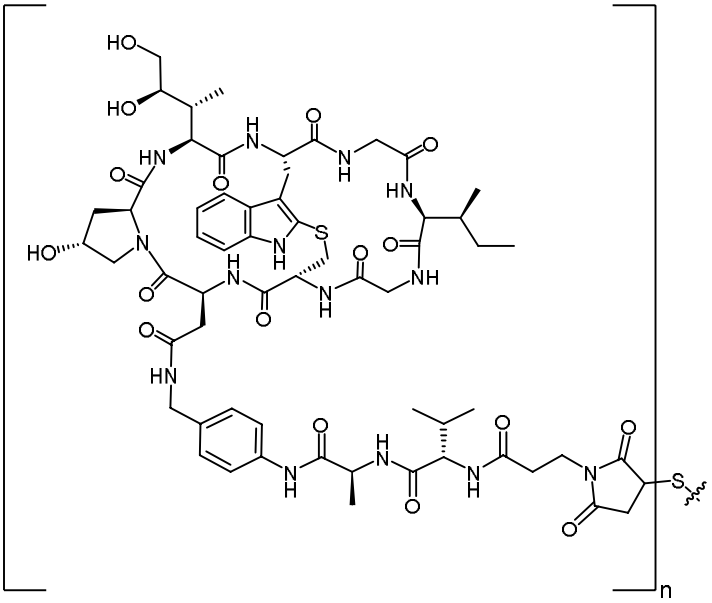


(XI).

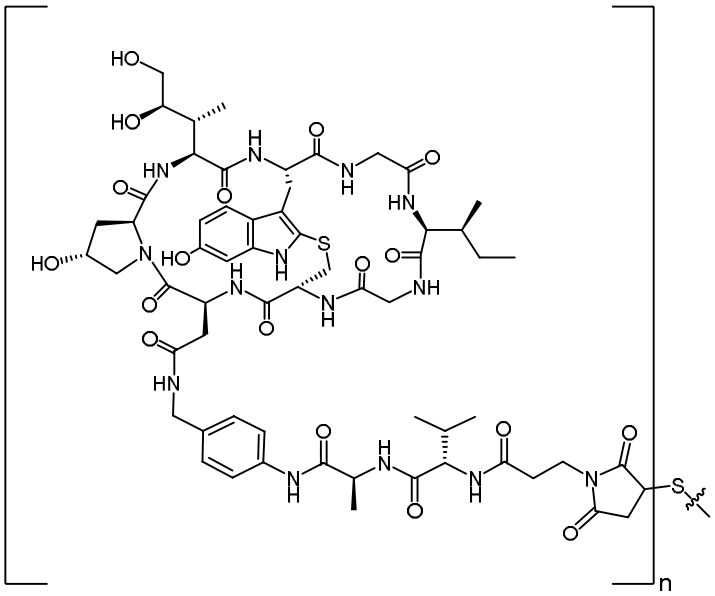
14. Conjugate according to any one of claims 1 – 8, wherein said conjugate comprises an antibody as target binding moiety conjugated to amatoxin linker moieties via a thioether linkage according to any one of formula XII to XXII:



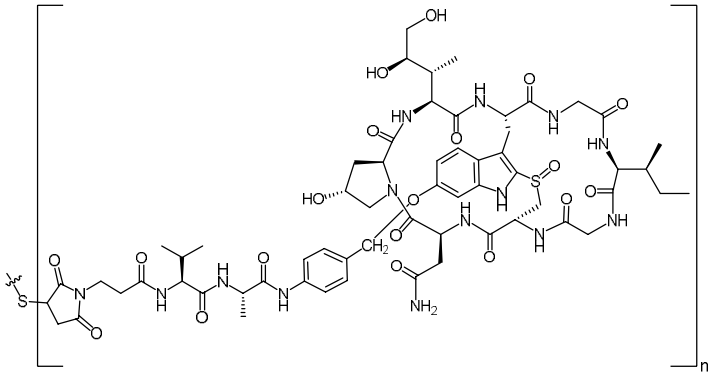
(XII),



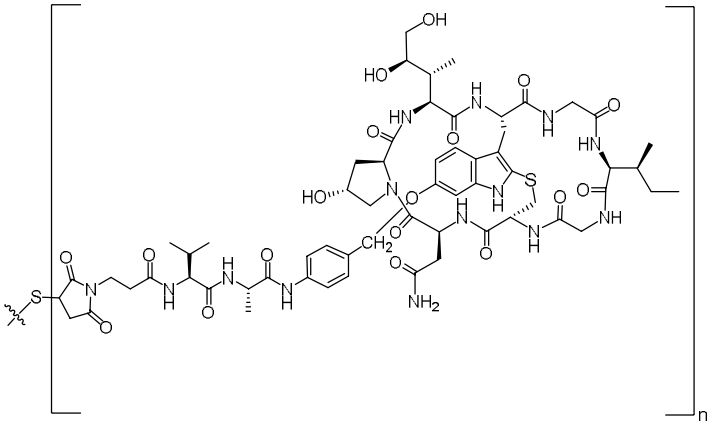
(XIII),



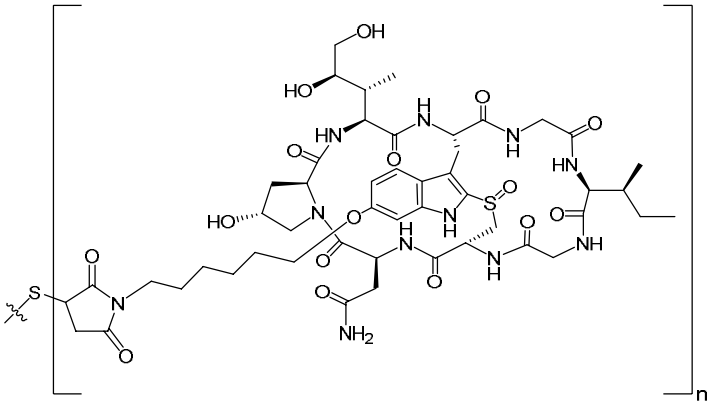
(XIV),



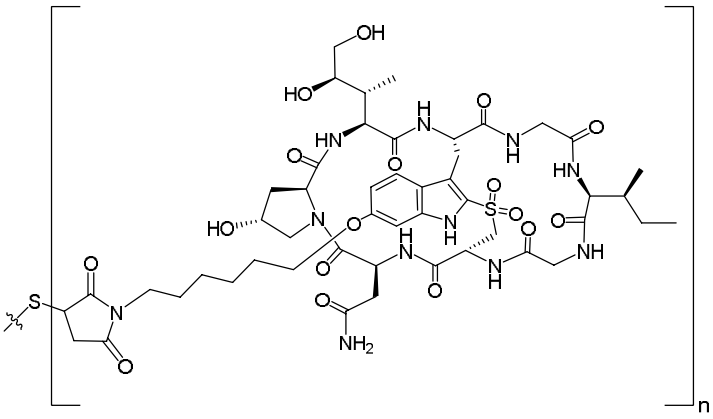
(XV),



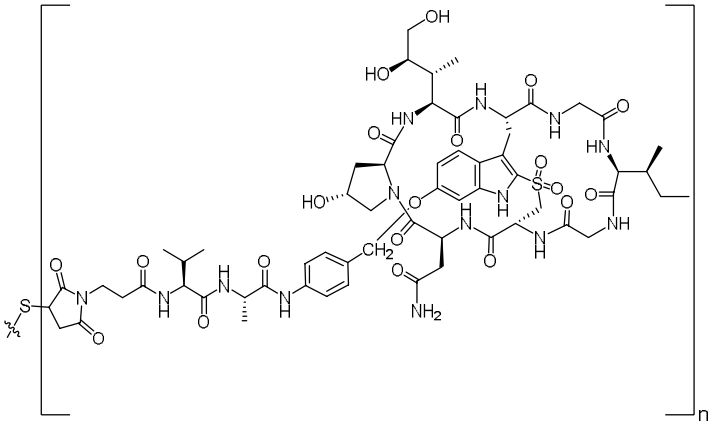
(XVI),



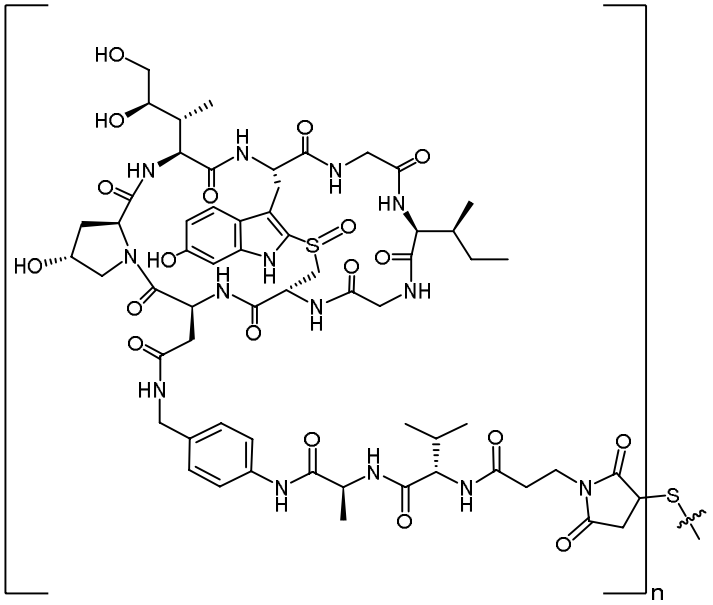
(XVII),



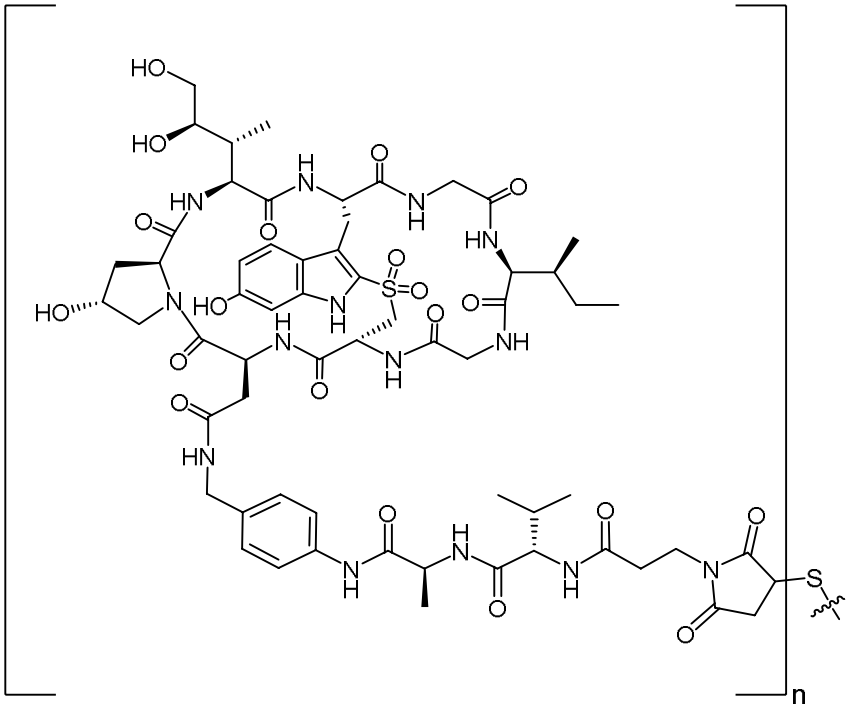
(XVIII),



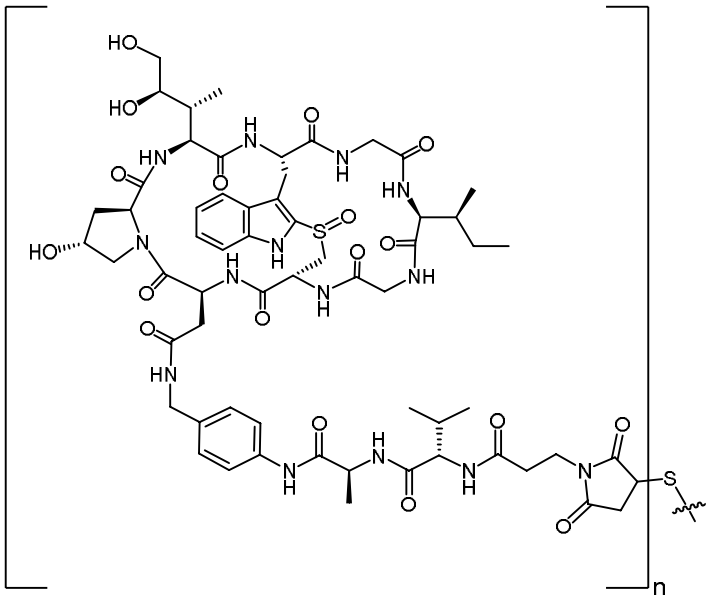
(XIX),



(XX),



(XXI),



(XXII),

wherein said amatoxin linker moieties are coupled to the thiol groups of cysteine residues of the antibody, and wherein n is preferably from 1 to 7.

15. Conjugate according to claim 14, wherein said amatoxin linker moieties are coupled to the thiol groups of cysteine residues of the antibody, and wherein n is 1, or 2.

16. Conjugate according to claim 1, wherein said conjugate is selected from the group consisting of

(i) a conjugate (XXIII) consisting of an antibody consisting of two heavy chains, each heavy chain consisting of or comprising an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain consisting or comprising an amino acid sequence according to SEQ ID No. 12, as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XII) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(ii) a conjugate (XXIV) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XIII) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(iii) a conjugate (XXV) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XIV) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(iv) a conjugate (XXVI) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XV) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(v) a conjugate (XXVII) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XVI) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(vi) a conjugate (XXVIII) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XVII) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(vii) a conjugate (XXIX) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XVIII) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(viii) a conjugate (XXX) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XIX) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(ix) a conjugate (XXXI) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of

formula (XX) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(x) a conjugate (XXXII) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XXI) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

(xi) a conjugate (XXXIII) consisting of an antibody consisting of two heavy chains, each heavy chain having an amino acid sequence according to SEQ ID No. 11, and two light chains, each light chain having an amino acid sequence according to SEQ ID No. 12 as target binding moiety, conjugated to at least one amatoxin-linker moiety of formula (XXII) via thioether linkage of the linker with the sulfhydryl group of heavy chain 265Cys residue according to the EU numbering system of said antibody,

wherein n is 1 to 2.

17. A pharmaceutical composition comprising the conjugate of any one of claims 1 – 16.

18. Use of the conjugate of any one of claims 1 – 12 or the pharmaceutical composition of claim 17 in the manufacture of a medicament for the treatment of B lymphocyte-associated malignancies or B cell-mediated autoimmune diseases, in particular for use in the manufacture of a medicament for the treatment of non-Hodgkin's lymphoma (NHL), follicular lymphoma, diffuse large B cell non-Hodgkin's lymphoma (DBNHL), subtypes of non-Hodgkin's lymphoma including mantle cell lymphoma (MCL), chronic lymphocytic leukaemia (CLL), Richter syndrome, primary cutaneous marginal zone lymphoma (PCMZL), hairy cell leukemia, acute myeloid leukemia (AML), rheumatoid arthritis, granulomatosis with polyangiitis and microscopic polyangiitis and pemphigus vulgaris.

19. The use of the conjugate or the pharmaceutical composition according to claim 18 in combination with a checkpoint inhibitor.

20. The use of the conjugate, or the pharmaceutical composition according to claim 18 or claim 19, wherein the B lymphocyte-associated malignancies or B cell-mediated autoimmune diseases are characterized by a hemizygous loss of TP53, POLR2A, or del(17p13).

21. Use of the conjugate of any one of claims 13 – 16 in the manufacture of a medicament for the treatment of B lymphocyte-associated malignancies or B cell-mediated autoimmune diseases, in particular for use in the manufacture of a medicament for the treatment of non-Hodgkin's lymphoma (NHL), follicular lymphoma, diffuse large B cell non-Hodgkin's lymphoma (DBNHL), subtypes of non-Hodgkin's lymphoma including mantle cell lymphoma (MCL), chronic lymphocytic leukaemia (CLL), Richter syndrome, primary cutaneous marginal zone lymphoma (PCMZL), hairy cell leukemia, acute myeloid leukemia (AML), rheumatoid arthritis, granulomatosis with polyangiitis and microscopic polyangiitis and pemphigus vulgaris.