Claims

1. A set of polypeptides comprising:

a first polypeptide P1 comprising

(i) a targeting moiety T1,

wherein said targeting moiety T1 specifically binds to an antigen A1, and

(ii) a fragment F1 of a functional domain F,

wherein neither said fragment F1 by itself nor said polypeptide P1 by itself is functional with respect to the function of said domain F,

and

a second polypeptide P2 comprising

(i) a targeting moiety T2,

wherein said targeting moiety T2 specifically binds to an antigen A2, and

(ii) a fragment F2 of said functional domain F,

wherein neither said fragment F2 by itself nor said polypeptide P2 by itself is functional with respect to the function of said domain F,

wherein said antigen A1 is different from said antigen A2,

wherein said polypeptide P1 and said polypeptide P2 are not associated with each other in the absence of a substrate that has both antigens A1 and A2 at its surface, and

wherein, upon dimerization of said fragment F1 of said polypeptide P1 with said fragment F2 of said polypeptide P2, the resulting dimer is functional with respect to the function of said domain F.

2. The set of polypeptides according to claim 1, wherein said polypeptide P1 and said polypeptide P2 are not associated with each other in the absence of a cell that carries both antigens A1 and A2 at its cell surface.

3. The set of polypeptides according to claim 1 or 2, wherein a cell carrying both antigens A1 and A2 at its cell surface induces dimerization of the fragment F1 of said polypeptide P1 with the fragment F2 of said polypeptide P2, whereas a cell which

does not carry both antigens A1 and A2 at its cell surface does not induce dimerization of the fragment F1 of said polypeptide P1 with the fragment F2 of said polypeptide P2.

4. The set of polypeptides according to any one of claims 1 to 3, wherein said polypeptides P1 and P2 have, in the absence of said substrate or cell, with each other a dissociation constant K_D in the range of 10^{-8} M to 10^{-2} M, in the range of 10^{-7} M to 10^{-3} M or in the range of 10^{-6} M to 10^{-3} M; and /or said polypeptides P1 and P2 have, in the presence of said substrate or cell, with each other a dissociation constant K_D below 10^{-6} M, below 10^{-7} M below 10^{-8} M or below 10^{-9} M.

5. The set of polypeptides according to any one of claims 1 to 4, wherein said antigen A1 and/or said antigen A2 is an antigen expressed on the surface of cells of a tumour or on the surface of progenitor/precursor cells of a tumour.

6. The set of polypeptides according to claim 5, wherein said antigen is expressed on the surface of cells of a haematologic tumour or on the surface of cells of a non-haematologic tumour.

7. The set of polypeptides according to any one of claims 1 to 6, wherein the combination of antigen A1 and antigen A2 is only found on cancerous cells, and not on cells that are not cancerous.

8. The set of polypeptides according to claim 7, wherein the combination of antigen A1 and antigen A2 is specific for cancerous cells of a certain type of cancer.

9. The set of polypeptides according to any one of claims 1 to 8, wherein said antigen A1 is an MHC antigen;
and/or said antigen A2 is an antigen that is specific for a certain cell type or cell lineage.

10. The set of polypeptides according to claim 9, wherein said MHC antigen is an allelic variant of any of HLA-A, HLA-B, HLA-C, HLA-DQ, HLA-DR, or HLA-DM.

11. The set of polypeptides according to claim 9 or 10, wherein said MHC antigen is an allelic variant of an MHC class I molecule.

12. The set of polypeptides according to any one of claims 9 to 11, wherein said MHC antigen is an allelic variant selected from the group consisting of HLA-A2, HLA-Cw6, HLA-A1, HLA-A3, HLA-A25, HLA-B7, HLA-B8, HLA-B35, HLA-B44, HLA-Cw3, HLA-Cw4, and HLA-Cw7.

13. The set of polypeptides of any one of claims 9 to 12, wherein said antigen that is specific for a certain cell type or cell lineage is selected from the group consisting of: CD45; CD34; CD33; CD138; CD15; CD1a; CD2; CD3; CD4; CD5; CD8; CD20; CD23; CD31; CD43; CD56; CD57; CD68; CD79a; CD146; surfactant proteins; synaptophysin; CD56; CD57; nicotinic acetylcholine receptor; muscle-specific kinase MUSK; voltage-gated calcium channel (P/Q-type); voltage-gated potassium channel (VGKC); N-methyl-D-aspartate receptor (NMDA); TSH; amphiphysin; HepPar-1; ganglioside GQ1B, GD3 or GM1; and glycophorin-A.

14. The set of polypeptides according to any one of claims 1 to 13, wherein any of said antigens A1 and A2 is selected from the group consisting of:
HLA-A2; HLA-Cw6; EpCAM; CD45; Her2; EGFR; CD138; CEA; CD19; E-cadherin; Ca-125; Her-2/neu; gross cystic disease fluid protein; BCA-225; CA 19-9; CD117; CD30; Epithelial antigen BER-EP4, Epithelial membrane antigen and Epithelial Related Antigen MOC-31; Epidermal growth factor receptor HER1; Platelet derived growth factor receptor PDGFR alpha; Melanoma associated marker/Mart 1/Melan-A; CD133; TAG 72; and a clonotypic antibody on the surface of a B cell.

15. The set of polypeptides according to any one of claims 1 to 14, wherein
(i) one of said antigens A1 and A2 is EpCAM and the other one is EGFR, HER2/neu, CD10, VEGF-R or MDR;
(ii) one of said antigens A1 and A2 is MCSP and the other one is melanoferrin or EpCAM;
(iii) one of said antigens A1 and A2 is CA125 and the other one CD227
(iv) one of said antigens A1 and A2 is CD56 and the other one is CD140b or GD3 ganglioside;
(v) one of said antigens A1 and A2 is EGFR and the other one is HER2;
(vi) one of said antigens A1 and A2 is PSMA and the other one is HER2;

(vii) one of said antigens A1 and A2 is Sialyl Lewis and the other one is EGFR;

(viii) one of said antigens A1 and A2 is CD44 and the other one is ESA, CD24, CD133, MDR or CD117;

(ix) one of said antigens A1 and A2 is CD34 and the other one is CD19, CD79a, CD2, CD7, HLA-DR, CD13, CD117, CD33 or CD15;

(x) one of said antigens A1 and A2 is CD33 and the other one is CD19, CD79a, CD2, CD7, HLA-DR, CD13, CD117 or CD15;

(xi) one of said antigens A1 and A2 is MUC1 and the other one is CD10, CEA or CD57;

(xii) one of said antigens A1 and A2 is CD38 and the other one is CD138;

(xiii) one of said antigens A1 and A2 is CD 24 and the other one is CD29 or CD49f;

(xiv) one of said antigens A1 and A2 is carbonic anhydrase IX and the other one is aquaporin-2;

(xv) one of said antigens A1 and A2 is HLA-A2 and the other one is EpCAM;

(xvi) one of said antigens A1 and A2 is HLA-A2 and the other one is CD45;

(xvii) one of said antigens A1 and A2 is HLA-A2 and the other one is EGFR;

(xviii) one of said antigens A1 and A2 is HLA-A2 and the other one is Her2;

(xix) one of said antigens A1 and A2 is HLA-A2 and the other one is CEA;

(xx) one of said antigens A1 and A2 is EpCAM and the other one is CEA;

(xxi) one of said antigens A1 and A2 is CD45 and the other one is CD138;

(xxii) one of said antigens A1 and A2 is EGFR and the other one is CEA;

(xxiii) one of said antigens A1 and A2 is Her2 and the other one is CEA; or

(xxiv) one of said antigens A1 and A2 is CD19 and the other one is a clonotypic antibody on the surface of a B cell.

16. The set of polypeptides according to any one of claims 1 to 15, wherein said targeting moiety T1 and/or T2 comprises an immunoglobulin module; or
wherein said targeting moiety T1 and/or T2 comprises an aptamer or a natural ligand of said antigen A1 or antigen A2, respectively.

17. The set of polypeptides according to claim 16, wherein said targeting moiety T1 comprises an immunoglobulin module I1 comprising a V_L domain linked to a V_H domain or comprising a variable domain V_HH of a llama antibody, camel antibody or shark antibody; and/or

said targeting moiety T2 comprises an immunoglobulin module I2 comprising a V_L domain linked to a V_H domain or comprising a variable domain V_HH of a llama antibody, camel antibody or shark antibody.

18. The set of polypeptides according to claim 17, wherein said immunoglobulin module I1 comprises a scFv (single-chain variant fragment), a Fab or a F(ab')$_2$ of an antibody or a complete antibody; and/or
said immunoglobulin module I2 comprises a scFv (single-chain variant fragment), a Fab or a F(ab')$_2$ of an antibody or a complete antibody.

19. The set of polypeptides according to any one of claims 16 to 18, wherein said immunoglobulin module comprises a V domain selected from the group consisting of:

(i) a V domain of an anti-HLA-A2 antibody comprising a V_L domain comprising SEQ ID NOS: 78 and 79 (CDRs 1 and 3) and DAS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 75-77 (CDRs 1-3);

(ii) a V domain of an anti-HLA-Cw6 antibody comprising a V_L domain comprising SEQ ID NOS: 83 and 84 (CDRs 1 and 3) and DDS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 80-82 (CDRs 1-3);

(iii) a V domain of an anti-EpCAM antibody comprising a V_L domain comprising SEQ ID NOS: 88 and 89 (CDRs 1 and 3) and WAS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 85-87 (CDRs 1-3);

(iv) a V domain of an anti-Her2 antibody comprising a V_L domain comprising SEQ ID NOS: 93 and 94 (CDRs 1 and 3) and SAS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 90-92 (CDRs 1-3);

(v) a V domain of an anti-EGFR1 antibody comprising a V_L domain comprising SEQ ID NOS: 98 and 99 (CDRs 1 and 3) and DAS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 95-97 (CDRs 1-3);

(vi) a V domain of an anti-CEA antibody comprising a V_L domain comprising SEQ ID NOS: 103 and 104 (CDRs 1 and 3) and SAS (CDR 2) and/or a V_H domain comprising SEQ ID NOS:100-102 (CDRs 1-3);

(vii) a V domain of an anti-CD45 antibody comprising a V_L domain comprising SEQ ID NOS: 107 and 108 (CDRs 1 and 3) and LAS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 105 and 106 (CDRs 1 and 2) and CDR3 or SEQ ID NOS:132-134 (CDRs 1-3);

(viii) a V domain of an anti-CD138 antibody comprising a V_L domain comprising SEQ ID NOS: 112 and 113 (CDRs and 1 and 3) and YTS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 109-111 (CDRs 1-3); and

(ix) a V domain of an anti-CD19 antibody comprising a V_L domain comprising SEQ ID NOS: 158 and 159 (CDRs 1 and 3) and DAS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 155-157 (CDRs 1-3).

20. The set of polypeptides according to any one of claims 16 to 19, wherein said immunoglobulin module comprises a V domain selected from the group consisting of:

(i) a V domain of an anti-HLA-A2 antibody comprising a V_L domain comprising SEQ ID NO: 52 and/or a V_H domain comprising SEQ ID NO: 51;

(ii) a V domain of an anti-HLA-Cw6 antibody comprising a V_L domain comprising SEQ ID NO: 54 and/or a V_H domain comprising SEQ ID NO: 53;

(iii) a V domain of an anti-EpCAM antibody comprising a V_L domain comprising SEQ ID NO: 56 and/or a V_H domain comprising SEQ ID NO: 55;

(iv) a V domain of an anti-Her2 antibody comprising a V_L domain comprising SEQ ID NO: 58 and/or a V_H domain comprising SEQ ID NO: 57;

(v) a V domain of an anti-EGFR1 antibody comprising a V_L domain comprising SEQ ID NO: 60 and/or a V_H domain comprising SEQ ID NO: 59;

(vi) a V domain of an anti-CEA antibody comprising a V_L domain comprising SEQ ID NO: 62 and/or a V_H domain comprising SEQ ID NO: 61;

(vii) a V domain of an anti-CD45 antibody comprising a V_L domain comprising SEQ ID NO: 64 and/or a V_H domain comprising SEQ ID NO: 63; and

(viii) a V domain of an anti-CD138 antibody comprising a V_L domain comprising SEQ ID NO: 66 and/or a V_H domain comprising SEQ ID NOS: 65;

(ix) a V domain of an anti-CD19 antibody comprising a V_L domain comprising SEQ ID NO: 153 and/or a V_H domain comprising SEQ ID NO: 152.

21. The set of polypeptides according to any one of claims 16 to 20, wherein said immunoglobulin module comprises a V domain comprising any one of SEQ ID NOS: 67-74 and 154.

22. The set of polypeptides according to any one of claims 1 to 16, wherein any one of said targeting moiety T1 and T2 comprises an allergen or substrate which binds to a clonotypic antibody on the surface of a B cell.

23. The set of polypeptides according to any one of claims 1 to 22, wherein said functional domain F is or comprises an immunoglobulin module, or a fluorescent molecule, or a molecule capable of mediating bioluminescence.

24. The set of polypeptides according to claim 23, wherein said functional domain F is a Fv (variant fragment) or a scFv (single-chain variant fragment) of an antibody.

25. The set of polypeptides according to any one of claims 1 to 24, wherein said functional domain F is a domain that specifically binds to a carrier molecule or an affinity tag.

26. The set of polypeptides according to claim 25, wherein said carrier molecule is a peptide or a carbohydrate molecule.

27. The set of polypeptides according to claim 26, wherein said affinity tag is selected from the group consisting of a FLAG-tag, a myc-tag, a glutathione-S-transferase(GST)-tag, a hemagglutinin(HA)-tag, a polyhistidine(His)-tag, a digoxigenin (DIG)-tag and a maltose binding protein(MBP)-tag.

28. The set of polypeptides according to any one of claims 1 to 27, wherein said functional domain F is a domain that specifically binds to a radioactive compound, a domain that specifically binds to a toxin molecule that by itself is not capable of penetrating through the cell membrane of a human cell and that is internalized into a human cell upon association with the cell membrane of said cell, a domain that specifically binds to a fluorescent molecule, or a domain that specifically binds to a molecule capable of mediating bioluminescence.

29. The set of polypeptides according to any one of claims 1 to 28, wherein said fragment F1 comprises a V_L domain of an antibody and said fragment F2 comprises a V_H domain of the same antibody; or wherein said fragment F1 comprises a V_H domain of an antibody and said fragment F2 comprises a V_L domain of the same antibody.

30. The set of polypeptides according to any one of claims 1 to 29, wherein said fragment F1 comprises a V_L domain of an anti-CD3, anti-His or anti-DIG antibody and said fragment F2 comprises a V_H domain of the same antibody, or wherein said fragment F1 comprises a V_H domain of an anti-CD3 anti-His or anti-DIG antibody and said fragment F2 comprises a V_L domain of the same antibody.

31. The set of polypeptides according to any one of claims 23 to 30, wherein said immunoglobulin module comprises a V domain selected from the group consisting of:

(i) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NOS: 18-20 (CDRs 1-3) and/or a V_H domain comprising SEQ ID NOS: 15-17 (CDRs 1-3);

(ii) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NOS: 24-26 (CDRs 1-3) and/or a V_H domain comprising SEQ ID NOS: 21-23 (CDRs 1-3);

(iii) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NOS: 30-32 (CDRs 1-3) and/or a V_H domain comprising SEQ ID NOS: 27-29 (CDRs 1-3);

(iv) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NOS: 36 and 37 (CDRs 1 and 3) and DTS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 33-35 (CDRs 1-3);

(v) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NOS: 41 and 42 (CDRs 1 and 3) and YTN (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 38-40 (CDRs1-3); and

(vi) a V domain of an anti-His antibody comprising a V_L domain comprising SEQ ID NOS: 46 and 47 (CDRs 1 and 3) and KVS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 43-45 (CDRs 1-3);

(vii) a V domain of an anti-DIG antibody comprising a V_L domain comprising SEQ ID NOS: 50 and 131 (CDRs 1 and 3) and YSS (CDR 2) and/or a V_H domain comprising SEQ ID NOS: 48 and 49 (CDRs 1 and 2) and A (CDR 3).

32. The set of polypeptides according to any one of claims 23 to 31, wherein said immunoglobulin module comprises a V domain selected from the group consisting of:

(i) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 2 and/or a V_H domain comprising SEQ ID NO: 1;

(ii) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 4 and/or a V_H domain comprising SEQ ID NO: 3;

(iii) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 6 and/or a V_H domain comprising SEQ ID NO: 5;

(iv) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 8 and/or a V_H domain comprising SEQ ID NO: 7;

(v) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 10 and/or a V_H domain comprising SEQ ID NO: 9; and

(vi) a V domain of an anti-His antibody comprising a V_L domain comprising SEQ ID NO: 12 and/or a V_H domain comprising SEQ ID NO: 11;

(vii) a V domain of an anti-DIG antibody comprising a V_L domain comprising SEQ ID NO: 14 and/or a V_H domain comprising SEQ ID NO: 30.

33. The set of polypeptides according to any one of claims 1 to 32, wherein any of the polypeptides P1 and P2 is or comprises an amino acid sequence selected from the group consisting of SEQ ID NOS: 114-129 and 197.

34. The set of polypeptides according to any one of claims 1 to 33 for use in the treatment of a patient who is suffering from cancer and/or a tumour or for diagnostic use in a patient who is suffering from cancer and/or a tumour.

35. The set of polypeptides according to claim 34, for use in the treatment of a patient who is suffering from cancer and/or a tumour and undergoing allogeneic tissue or cell transplantation or meant to undergo such transplantation or for diagnostic use in a patient who is suffering from cancer and/or a tumour and undergoing or meant to undergo allogeneic tissue or cell transplantation.

36. The set of polypeptides according to claim 34 or 35, wherein said set of polypeptides is to be administered to said patient.

37. The set of polypeptides according to any one of claims 1 to 33, for use in treating or preventing a disorder selected from the group consisting of

(i) an autoimmune disorder; and

(ii) a hypersensitivity disorder.

38. The set of polypeptides according to claim 37, wherein said autoimmune disorder is selected from the group consisting of

(i) an allergic disorder
(ii) Multiple Sclerosis;
(iii) Psoriasis;
(iv) Systemic Lupus Erythematosus;
(v) Sjögren's syndrome;
(vi) Rheumatoid Arthritis;
(vii) Idiopathic Thrombocytopenic Purpura;
(viii) Diabetes;
(xi) Vasculitis;
(x) Crohn's disease; and
(xi) Amyloidosis.

39. The set of polypeptides according to claim 37, wherein said hypersensitivity disorder is an allergy (type I hypersensitivity reaction according to Coombs and Gell classification), an antibody dependent cytotoxic reaction (type II hypersensitivity reaction), a immune complex disease (type III hypersensitivity reaction), delayed type hypersensitivity (type IV hypersensitivity reaction) or a receptor mediated autoimmune disease (type V hypersensitivity reaction).

40. The set of polypeptides according to claim 39, wherein said autoimmune or hypersensitivity disorder comes along with or is triggered by allogenic stem cell transplantation.

41. The set of polypeptides according to any one of claims 1 to 33, for use in treating or preventing an infectious disease.

42. A nucleic acid molecule or a set of nucleic acid molecules encoding the set of polypeptides or one of the polypeptides of the set of polypeptides according to any one of claims 1 to 33.

43. The nucleic acid molecule or set of nucleic acid molecules according to claim 42 comprising a nucleotide sequence as depicted in any one of SEQ ID NOS: 135-150 and 196.

44. A vector comprising the nucleotide sequence of the nucleic acid molecule according to claim 42 or 43 or the sequence of one of the nucleic acid molecules of the set of nucleic acid molecules according to claim 42 or 43.

45. A pharmaceutical composition comprising either the set of polypeptides according to any of claims 1 to 33 or the nucleic acid molecule/set of nucleic acid molecules according to claim 42 or 43 or the vector according to claim 44, wherein, preferably, said pharmaceutical composition further comprises a pharmaceutically acceptable carrier.

46. A kit comprising the set of polypeptides according to any of claims 1-33, the nucleic acid molecule or the set of nucleic acid molecules according to claim 42 or 43 or the vector according to claim 44.

Claims

1. A set of polypeptides comprising:

a first polypeptide P1 comprising

(i) a targeting moiety T1,

wherein said targeting moiety T1 specifically binds to an antigen A1, and

(ii) a fragment F1 of a functional domain F,

wherein neither said fragment F1 by itself nor said polypeptide P1 by itself is functional with respect to the function of said domain F,

and

a second polypeptide P2 comprising

(i) a targeting moiety T2,

wherein said targeting moiety T2 specifically binds to an antigen A2, and

(ii) a fragment F2 of said functional domain F,

wherein neither said fragment F2 by itself nor said polypeptide P2 by itself is functional with respect to the function of said domain F,

wherein said antigen A1 is different from said antigen A2,

wherein said polypeptide P1 and said polypeptide P2 are not associated with each other in the absence of a substrate that has both antigens A1 and A2 at its surface, and

wherein, upon dimerization of said fragment F1 of said polypeptide P1 with said fragment F2 of said polypeptide P2, the resulting dimer is functional with respect to the function of said domain F.

2. The set of polypeptides according to claim 1, wherein said polypeptide P1 and said polypeptide P2 are not associated with each other in the absence of a cell that carries both antigens A1 and A2 at its cell surface.

3. The set of polypeptides according to claim 1 or 2, wherein a cell carrying both antigens A1 and A2 at its cell surface induces dimerization of the fragment F1 of said polypeptide P1 with the fragment F2 of said polypeptide P2, whereas a cell which does not carry both antigens A1 and A2 at its cell surface does not induce dimerization of the fragment F1 of said polypeptide P1 with the fragment F2 of said polypeptide P2.

4. The set of polypeptides according to any one of claims 1 to 3, wherein said polypeptides P1 and P2 have, in the absence of said substrate or cell, with each other a

dissociation constant K_D in the range of 10^{-8} M to 10^{-2} M, in the range of 10^{-7} M to 10^{-3} M or in the range of 10^{-6} M to 10^{-3} M; and /or said polypeptides P1 and P2 have, in the presence of said substrate or cell, with each other a dissociation constant K_D below 10^{-6} M, below 10^{-7} M below 10^{-8} M or below 10^{-9} M.

5. The set of polypeptides according to any one of claims 1 to 4, wherein said antigen A1 and/or said antigen A2 is an antigen expressed on the surface of cells of a tumour or on the surface of progenitor/precursor cells of a tumour.

6. The set of polypeptides according to any one of claims 1 to 5, wherein the combination of antigen A1 and antigen A2 is only found on cancerous cells, and not on cells that are not cancerous.

7. The set of polypeptides according to claim 6, wherein the combination of antigen A1 and antigen A2 is specific for cancerous cells of a certain type of cancer.

8. The set of polypeptides according to any one of claims 1 to 7, wherein said antigen A1 is an MHC antigen being an allelic variant selected from the group consisting of:
HLA-A2, HLA-Cw6, HLA-A1, HLA-A3, HLA-A25, HLA-B7, HLA-B8, HLA-B35, HLA-B44, HLA-Cw3, HLA-Cw4, and HLA-Cw7; and/or

said antigen A2 is an antigen that is specific for a certain cell type or cell lineage selected from the group consisting of:
CD45; CD34; CD33; CD138; CD15; CD1a; CD2; CD3; CD4; CD5; CD8; CD20; CD23; CD31; CD43; CD56; CD57; CD68; CD79a; CD146; surfactant proteins; synaptophysin; CD56; CD57; nicotinic acetylcholine receptor; muscle-specific kinase MUSK; voltage-gated calcium channel (P/Q-type); voltage-gated potassium channel (VGKC); N-methyl-D-aspartate receptor (NMDA); TSH; amphiphysin; HepPar-1; ganglioside GQ1B, GD3 or GM1; and glycophorin-A.

9. The set of polypeptides according to any one of claims 1 to 8, wherein any of said antigens A1 and A2 is selected from the group consisting of:
HLA-A2; HLA-Cw6; EpCAM; CD20; CD33; CD38; CD45; Her2; EGFR; CD138; CEA; CD19; PSMA; E-cadherin; Ca-125; Her-2/neu; gross cystic disease fluid protein; BCA-225; CA 19-9; CD117; CD30; Epithelial antigen BER-EP4, Epithelial membrane antigen and Epithelial Related Antigen MOC-31; Epidermal growth factor

receptor HER1; Platelet derived growth factor receptor PDGFR alpha; Melanoma associated marker/Mart 1/Melan-A; CD133; TAG 72; aquaporin-2 and a clonotypic antibody on the surface of a B cell.

10. The set of polypeptides according to any one of claims 1 to 9, wherein

(i) one of said antigens A1 and A2 is EpCAM and the other one is EGFR, HER2/neu, CD10, VEGF-R or MDR;

(ii) one of said antigens A1 and A2 is MCSP and the other one is melanoferrin or EpCAM;

(iii) one of said antigens A1 and A2 is CA125 and the other one CD227

(iv) one of said antigens A1 and A2 is CD56 and the other one is CD140b or GD3 ganglioside;

(v) one of said antigens A1 and A2 is EGFR and the other one is HER2;

(vi) one of said antigens A1 and A2 is PSMA and the other one is HER2;

(vii) one of said antigens A1 and A2 is Sialyl Lewis and the other one is EGFR;

(viii) one of said antigens A1 and A2 is CD44 and the other one is ESA, CD24, CD133, MDR or CD117;

(ix) one of said antigens A1 and A2 is CD34 and the other one is CD19, CD79a, CD2, CD7, HLA-DR, CD13, CD117, CD33 or CD15;

(x) one of said antigens A1 and A2 is CD33 and the other one is CD19, CD79a, CD2, CD7, HLA-DR, CD13, CD117 or CD15;

(xi) one of said antigens A1 and A2 is MUC1 and the other one is CD10, CEA or CD57;

(xii) one of said antigens A1 and A2 is CD38 and the other one is CD138;

(xiii) one of said antigens A1 and A2 is CD 24 and the other one is CD29 or CD49f;

(xiv) one of said antigens A1 and A2 is carbonic anhydrase IX and the other one is aquaporin-2;

(xv) one of said antigens A1 and A2 is HLA-A2 and the other one is EpCAM;

(xvi) one of said antigens A1 and A2 is HLA-A2 and the other one is CD45;

(xvii) one of said antigens A1 and A2 is HLA-A2 and the other one is EGFR;

(xviii) one of said antigens A1 and A2 is HLA-A2 and the other one is Her2;

(xix) one of said antigens A1 and A2 is HLA-A2 and the other one is CEA;

(xx) one of said antigens A1 and A2 is EpCAM and the other one is CEA;

(xxi) one of said antigens A1 and A2 is CD45 and the other one is CD138;

(xxii) one of said antigens A1 and A2 is EGFR and the other one is CEA;

(xxiii) one of said antigens A1 and A2 is Her2 and the other one is CEA; or

(xxiv) one of said antigens A1 and A2 is CD19 and the other one is a clonotypic antibody on the surface of a B cell.

11. The set of polypeptides according to any one of claims 1 to 10, wherein said targeting moiety T1 and/or T2 comprises an immunoglobulin module; or
wherein said targeting moiety T1 and/or T2 comprises an aptamer or a natural ligand of said antigen A1 or antigen A2, respectively.

12. The set of polypeptides according to claim 11, wherein said targeting moiety T1 comprises an immunoglobulin module I1 comprising a V_L domain linked to a V_H domain or comprising a variable domain V_HH of a llama antibody, camel antibody or shark antibody; and/or
said targeting moiety T2 comprises an immunoglobulin module I2 comprising a V_L domain linked to a V_H domain or comprising a variable domain V_HH of a llama antibody, camel antibody or shark antibody.

13. The set of polypeptides according to claim 12, wherein said immunoglobulin module I1 comprises a scFv (single-chain variant fragment), a Fab or a $F(ab')_2$ of an antibody or a complete antibody; and/or
said immunoglobulin module I2 comprises a scFv (single-chain variant fragment), a Fab or a $F(ab')_2$ of an antibody or a complete antibody.

14. The set of polypeptides according to any one of claims 1 to 4 and 7 to 13, wherein any one of said targeting moiety T1 and T2 comprises an allergen or substrate which binds to a clonotypic antibody on the surface of a B cell.

15. The set of polypeptides according to any one of claims 1 to 14, wherein said functional domain F is or comprises an immunoglobulin module, or a fluorescent molecule, or a molecule capable of mediating bioluminescence.

16. The set of polypeptides according to claim 15, wherein said functional domain F is a Fv (variant fragment) or a scFv (single-chain variant fragment) of an antibody.

17. The set of polypeptides according to any one of claims 1 to 16, wherein said fragment F1 comprises a V_L domain of an antibody and said fragment F2 comprises a V_H domain of the same antibody; or wherein said fragment F1 comprises a V_H domain of an antibody and said fragment F2 comprises a V_L domain of the same antibody.

18. The set of polypeptides according to any one of claims 1 to 17, wherein said fragment F1 comprises a V_L domain of an anti-CD3, anti-His or anti-DIG antibody and said fragment F2 comprises a V_H domain of the same antibody, or wherein said fragment F1 comprises a V_H domain of an anti-CD3 anti-His or anti-DIG antibody and said fragment F2 comprises a V_L domain of the same antibody.

19. The set of polypeptides according to any one of claims 15 to 18, wherein said immunoglobulin module comprises a V domain selected from the group consisting of:

(i) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 2 and/or a V_H domain comprising SEQ ID NO: 1;

(ii) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 4 and/or a V_H domain comprising SEQ ID NO: 3;

(iii) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 6 and/or a V_H domain comprising SEQ ID NO: 5;

(iv) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 8 and/or a V_H domain comprising SEQ ID NO: 7;

(v) a V domain of an anti-CD3 antibody comprising a V_L domain comprising SEQ ID NO: 10 and/or a V_H domain comprising SEQ ID NO: 9; and

(vi) a V domain of an anti-His antibody comprising a V_L domain comprising SEQ ID NO: 12 and/or a V_H domain comprising SEQ ID NO: 11;

(vii) a V domain of an anti-DIG antibody comprising a V_L domain comprising SEQ ID NO: 14 and/or a V_H domain comprising SEQ ID NO: 30.

20. The set of polypeptides according to any one of claims 1 to 19, wherein any of the polypeptides P1 and P2 is or comprises an amino acid sequence selected from the group consisting of SEQ ID NOS: 114-129 and 197.

21. The set of polypeptides according to any one of claims 1 to 20 for use in the treatment of a patient who is suffering from cancer and/or a tumour or for use in diagnosis in a patient who is suffering from cancer and/or a tumour.

22. A nucleic acid molecule or a set of nucleic acid molecules encoding the set of polypeptides or one of the polypeptides of the set of polypeptides according to any one of claims 1 to 20.

23. The nucleic acid molecule or set of nucleic acid molecules according to claim 22 comprising a nucleotide sequence as depicted in any one of SEQ ID NOS: 135-150 and 196.

24. A pharmaceutical composition comprising either the set of polypeptides according to any of claims 1 to 20 or the nucleic acid molecule/set of nucleic acid molecules according to claim 22 or 23, said pharmaceutical composition further comprises a pharmaceutically acceptable carrier.

25. A kit comprising the set of polypeptides according to any of claims 1-20 or the nucleic acid molecule or the set of nucleic acid molecules according to claim 22 or 23.