WHAT IS CLAIMED IS:

1. An antibody-like binding protein that specifically binds CA6, wherein the antibody-like binding protein comprises two polypeptides having structures represented by the formulas [I] and [II] below:

$$V_{L1}\text{-}L_1\text{-}V_{L2}\text{-}C_L \qquad [I]$$

$$V_{H1}\text{-}L_2\text{-}V_{H2}\text{-}C_{H1} \qquad [II]$$

wherein:

V_{L1} is a DS6-based immunoglobulin light chain variable domain;

V_{L2} is a DS6-based immunoglobulin light chain variable domain;

V_{H1} is a DS6-based immunoglobulin heavy chain variable domain;

V_{H2} is a DS6-based immunoglobulin heavy chain variable domain;

C_L is an immunoglobulin light chain constant domain, such as a human IGKC immunoglobulin light chain constant domain;

C_{H1} is an immunoglobulin C_{H1} heavy chain constant domain, such as a human immunoglobulin C_{H1} heavy chain constant domain;

L_1 and L_2 are amino acid linkers;

wherein the polypeptides of formula I and the polypeptides of formula II form a bivalent monospecific tandem immunoglobulin antibody-like binding protein; and

wherein the antibody-like protein further comprises a chelator.

2. The antibody-like binding protein of claim 1, wherein L_1 is GGGGS or GGGGSGGGGS (SEQ ID NO: 3).

3. The antibody-like binding protein of claim 1 or 2, wherein L_2 is GGGGS or GGGGSGGGGS (SEQ ID NO: 3).

4. The antibody-like binding protein of any one of claims 1 to 3, wherein L_1 and L_2 are identical.

5. The antibody-like binding protein of any one of claims 1 to 4, wherein V_{L1} and V_{L2} are identical.

6. The antibody-like binding protein of any one of claims 1 to 5, wherein V_{H1} and V_{H2} are identical.

7. The antibody-like binding protein of any one of claims 1 to 6, wherein the polypeptide of formula [I] comprises SEQ ID NO: 1.

8. The antibody- like binding protein of any one of claims 1 to 7, wherein the polypeptide of formula [II] comprises SEQ ID NO: 7.

9. The antibody- like binding protein of any one of claims 1 to 8, wherein the chelator is a hard acid cation chelator.

10. The antibody-like binding protein of claim 9, wherein the hard acid cation chelator is DOTA (1, 4, 7, 10-tetraazacyclododecane-l, 4, 7, 10-tetraacetic acid), NOTA (1, 4, 7-triaza-cyclononane-N,N',N''-triacetic acid), DTP A (1, 1, 4, 7, 7- Diethylenetriaminepentaacetic acid), or TETA (p-bromoacetamido-benzyl- tetraethy laminetetraacetic acid) .

11. The antibody- like binding protein of claim 10, wherein the hard acid cation chelator is DOTA.

12. The antibody- like protein of any one of claims 9 to 11, wherein the hard acid chelator is covalently attached.

13. The antibody- like protein of claim 12, wherein between 1 and 5 copies of the hard acid chelator are covalently attached.

14. The antibody- like binding protein of any one of claims 1 to 13, further comprising a tag.

15. The antibody-like binding protein of claim 14, wherein the tag is 6x-Histidine, biotin, MYC, V5, FLAG, MBP, or glutathione-S-transferase or HA.

16. The antibody-like binding protein of claim 15, wherein the tag is a 6x-Histidine tag.

17. The antibody-like binding protein of any one of claims 1 to 16, further comprising at least one radiolabel, imaging agent, therapeutic agent, or diagnostic agent.

18. The antibody-like binding protein of claim 17, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{110}In, ^{111}ln, ^{177}Lu, ^{18}F, ^{52}Fe, ^{62}Cu, ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{68}Ga, ^{86}Y, ^{90}Y, ^{89}Zr, ^{94}Tc, ^{94}Tc, ^{99m}Tc, ^{120}I, ^{123}I, ^{124}I, ^{125}I, ^{131}I, $^{154\text{-}158}$Gd, ^{32}P, ^{11}C, ^{13}N, ^{15}O, ^{186}Re, ^{188}Re, ^{51}Mn, ^{52m}Mn, ^{55}Co, ^{72}As, ^{75}Br, ^{76}Br, ^{82m}Rb, or ^{83}Sr.

19. The antibody-like binding protein of claim 18, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{64}Cu.

20. The antibody-like binding protein of claim 17, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent comprises one or more agents for magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray or photoacoustic imaging.

21. A pharmaceutical composition comprising a pharmaceutically acceptable carrier and an amount of the antibody-like binding protein of any one of claims 1 to 20 effective to image a CA6 expressing tissue.

22. A method for making an antibody-like binding protein that specifically binds CA6, wherein the antibody-like binding protein further comprises a chelator, comprising:

(a) expressing in a cell one or more nucleic acid molecules encoding polypeptides having structures represented by the formulas [I] and [II] below:

$$V_{L1}\text{-}L_1\text{-}V_{L2}\text{-}C_L \qquad [I]$$

$$V_{H1}\text{-}L_2\text{-}V_{H2}\text{-}C_{H1} \qquad [II]$$

wherein:

V_{L1} is a DS6-based immunoglobulin light chain variable domain;

V_{L2} is a DS6-based immunoglobulin light chain variable domain;

V_{H1} is a DS6-based immunoglobulin heavy chain variable domain;
V_{H2} is a DS6-based immunoglobulin heavy chain variable domain;
C_L is an immunoglobulin light chain constant domain, such as a human IGKC immunoglobulin light chain constant domain;
C_{H1} is an immunoglobulin C_{H1} heavy chain constant domain, such as a human immunoglobulin C_{H1} heavy chain constant domain;
L_1 and L_2 are amino acid linkers;
wherein the polypeptides of formula I and the polypeptides of formula II form a bivalent monospecific tandem immunoglobulin antibody-like binding protein; and

(b) attaching the antibody-like binding protein to the chelator.

23. The method of claim 22, wherein L_1 is GGGGS or GGGGSGGGGS (SEQ ID NO: 3).

24. The method of claim 22 or 23, wherein L_2 is GGGGS or GGGGSGGGGS (SEQ ID NO: 3).

25. The method of any one of claims 22 to 24, wherein L_1 and L_2 are identical.

26. The method of any one of claims 22 to 25, wherein V_{L1} and V_{L2} are identical.

27. The method of any one of claims 22 to 26, wherein V_{H1} and V_{H2} are identical.

28. The method of any one of claims 22 to 27, wherein the polypeptide of formula [I] comprises SEQ ID NO: 1.

29. The method of any one of claims 22 to 28, wherein the polypeptide of formula [II] comprises SEQ ID NO: 7.

30. The method of any one of claims 22 to 29, wherein the chelator is a hard acid cation chelator.

31. The method of claim 30, wherein the hard acid cation chelator is DOTA (1 , 4, 7, 10-tetraazacyclododecane-l, 4, 7, 10-tetraacetic acid), NOTA (1, 4, 7-triaza- cyclononane-

N,N',N''-triacetic acid), DTPA (1, 1, 4, 7, 7-Diethylenetriaminepentaacetic acid) or TETA (p-bromoacetamido-benzyl-tetraethylaminetetraacetic acid).

32. The method of claim 31, wherein the hard acid cation chelator is DOTA.

33. The method of any one of claims 22 to 32, wherein the hard acid chelator is covalently attached.

34. The method of any one of claims 22 to 33, wherein between 1 and 5 copies of the hard acid chelator are covalently attached.

35. A method for treating diseased tissue expressing CA6 in a patient comprising:
(a) administering an antibody-like binding protein that specifically binds CA6 and further comprises a chelator and an imaging agent to the patient;
(b) identifying the diseased tissue expressing CA6 in the patient by positron emission tomography (PET) imaging; and
(c) determining that the patient is a candidate for treatment with huDS6-DM4 if the CA6 expression in the diseased tissue is greater than or equal to 10% of CA6 expression in a reference standard.

36. The method of claim 35, further comprising administering huDS6-DM4 if the patient is determined to be a candidate for treatment with huDS6-DM4.

37. The method of claim 35 or 36, further comprising monitoring the subject's response to huDS6-DM4 using the antibody-like binding protein of step (a).

38. The method of any one of claims 35 to 37, wherein said antibody-like binding protein is the antibody- like binding protein of any one of claims 1 to 20.

39. A method of treating CA6 positive cancer in a patient, comprising the steps of:
(a) acquiring information regarding expression level of CA6 in the patient; and
(b) administering huDS6-DM4 to the patient if the expression level of CA6 in the patient is greater than or equal to 10% of CA6 expression in a reference standard.

40. The method of claim 39 wherein the information regarding expression level of CA6 in the patient is acquired by administering an antibody-like protein that specifically binds CA6 and comprises a chelator and an imaging agent, and detecting the localization of the imaging agent in the patient using a bioimaging technique.

41. The method of claim 40, wherein said antibody- like binding protein is the antibody- like binding protein of any one of claims 1 to 20.

42. The method of any one of claims 39 to 41, wherein the CA6 positive cancer is serous ovarian carcinoma, endometriod ovaria carcinoma, neoplasm of the uterine cervix, neoplasm of the endometritis, neoplasm of the vulva, breast carcinoma, pancreatic turnor, and tumor of the urotheiium.

43. The method of any one of claims 39 to 42, wherein the information regarding expression level of CA6 in the patient is acquired by magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray, or photoacoustic imaging.

44. The method of any one of claims 40 to 42, wherein the chelator is a hard acid 5 cation chelator.

45. The method of claim 44, wherein the hard acid cation chelator is DOTA (1, 4, 7, 10-tetraazacyclododecane-l, 4, 7, 10-tetraacetic acid), NOTA (1, 4, 7-triaza- cyclononane-N,N',N''-triacetic acid), DTPA (1, 1, 4, 7, 7-Diethylenetriaminepentaacetic 10 acid), or TETA (p-bromoacetamido-benzyl-tetraethylaminetetraacetic acid).

46. The method of claim 45, wherein the hard acid cation chelator is DOTA.

47. The method of any one of claims 40 to 46, wherein the antibody-like binding 15 protein further comprises a tag.

48. The method of claim 47, wherein the tag is a 6x-Histidine tag.

49. The method of any one of claims 40 to 48, wherein the antibody-like binding 20 protein further comprises at least one radiolabel, imaging agent, therapeutic agent, or diagnostic agent.

50. The method of claim 49, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{110}In, ^{111}ln, ^{177}Lu, ^{18}F, ^{52}Fe, ^{62}Cu, ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{68}Ga, ^{86}Y, ^{90}Y, ^{89}Zr, ^{94}Tc, ^{94}Tc, ^{99m}Tc, ^{120}I, ^{123}I, ^{124}I, ^{125}I, ^{131}I, $^{154\text{-}158}$Gd, ^{32}P, ^{11}C, ^{13}N, ^{15}O, ^{186}Re, ^{188}Re, ^{51}Mn, ^{52m}Mn, ^{55}Co, ^{72}As, ^{75}Br, ^{76}Br, ^{82m}Rb, or ^{83}Sr.

51. The method of claim 50, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{64}Cu.

52. The method of any one of claims 49 to 51 , wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent comprises one or more agents for magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray, or photoacoustic imaging.

53. A method of determining whether a cancer patient is a candidate for treatment with huDS6-DM4, comprising the steps of:
(a) acquiring information regarding expression level of CA6 in the patient; and
(b) determining that the patient is a candidate for treatment with huDS6-DM4 if the expression level of CA6 in the patient is greater than or equal to 10% of CA6 expression in a reference standard.

54. The method of claim 53, wherein the information regarding expression level of CA6 in the patient is acquired by administering an antibody-like protein that specifically binds CA6 and comprises a chelator and an imaging agent, and detecting the localization of the imaging agent in the patient using a bioimaging technique.

55. The method of claim 54, wherein said antibody-like binding protein is the antibody- like binding protein of any one of claims 1 to 20.

56. The method of any one of claims 53 to 55, wherein the information regarding expression level of CA6 in the patient is acquired by magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray or photoacoustic imaging.

57. The method of any one of claims 54 to 56, wherein the chelator is a hard acid cation chelator.

58. The method of claim 57, wherein the hard acid cation chelator is DOTA (1, 4, 7, 10-tetraazacyclododecane-l, 4, 7, 10-tetraacetic acid), NOTA (1, 4, 7-triaza- cyclononane-N,N',N''-triacetic acid), DTPA (1, 1, 4, 7, 7-Diethylenetriaminepentaacetic acid), or TETA (p-bromoacetamido-benzyl-tetraethylaminetetraacetic acid).

59. The method of claim 58, wherein the hard acid cation chelator is DOTA.

60. The method of claim 54, wherein the antibody-like binding protein further comprises tag.

61. The method of claim 60, wherein the tag is a 6x-Histidine tag.

62. The method of claim 54, wherein the antibody-like binding protein further comprises at least one radiolabel, imaging agent, therapeutic agent, or diagnostic agent.

63. The method of claim 62, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{110}In, ^{111}ln, ^{177}Lu, ^{18}F, ^{52}Fe, ^{62}Cu, ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{68}Ga, ^{86}Y, ^{90}Y, ^{89}Zr, ^{94}Tc, ^{94}Tc, ^{99m}Tc, ^{120}I, ^{123}I, ^{124}I, ^{125}I, ^{131}I, $^{154\text{-}158}$Gd, ^{32}P, ^{11}C, ^{13}N, ^{15}O, ^{186}Re, ^{188}Re, ^{51}Mn, ^{52m}Mn, ^{55}Co, ^{72}As, ^{75}Br, ^{76}Br, ^{82m}Rb, or ^{83}Sr.

64. The method of claim 63, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{64}Cu.

65. The method of any one of claims 62 to 64, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent comprises one or more agents for magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray or photoacoustic

imaging.

66. A method of monitoring a cancer patient's response to treatment with huDS6- DM4, comprising the steps of:

(a) acquiring information regarding expression level of CA6 in the patient following administration of the huDS6-DM4; and

(b) providing an indication that treatment should be continued if the level of CA6 expression in the patient has decreased as compared to the level of CA6 expression before treatment with the huDS6-DM4.

67. The method of claim 66, wherein the information regarding expression level of CA6 in the patient is acquired by:

treating the patient with huDS6-DM4 for a prescribed period of time;

administering an antibody-like protein that specifically binds CA6 and comprises a chelator and an imaging agent; and

detecting the localization of the imaging agent in the patient using a bioimaging technique.

68. The method of claim 67, wherein said antibody- like binding protein that specifically binds CA6 is the antibody- like binding protein of any one of claims 1 to 20.

69. The method of any one of claims 66 to 68, the information regarding expression level of CA6 in the patient is acquired by magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray or photoacoustic imaging.

70. The method of any one of claims 67 to 68, wherein the chelator is a hard acid cation chelator.

71. The method of claim 70, wherein the hard acid cation chelator is DOTA (1, 4, 7, 10-tetraazacyclododecane-l, 4, 7, 10-tetraacetic acid), NOTA (1, 4, 7-triaza- cyclononane-N,N',N''-triacetic acid), DTPA (1, 1, 4, 7, 7-Diethylenetriaminepentaacetic acid), or TETA (p-bromoacetamido-benzyl-tetraethylaminetetraacetic acid).

72. The method of claim 71, wherein the hard acid cation chelator is DOTA.

73. The method of any one of claims 67 to 72, wherein the antibody-like binding protein further comprises a tag.

74. The method of claim 73, wherein the tag is a 6x-Histidine tag.

75. The method of any one of claims 67 to 74, wherein the antibody-like binding protein further comprises at least one radiolabel, imaging agent, therapeutic agent, or diagnostic agent.

76. The method of claim 75, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{110}In, ^{111}ln, ^{177}Lu, ^{18}F, ^{52}Fe, ^{62}Cu, ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{68}Ga, ^{86}Y, ^{90}Y, ^{89}Zr, ^{94}Tc, ^{94}Tc, ^{99m}Tc, ^{120}I, ^{123}I, ^{124}I, ^{125}I, ^{131}I, $^{154\text{-}158}$Gd, ^{32}P, ^{11}C, ^{13}N, ^{15}O, ^{186}Re, ^{188}Re, ^{51}Mn, ^{52m}Mn, ^{55}Co, ^{72}As, ^{75}Br, ^{76}Br, ^{82m}Rb, or ^{83}Sr.

77. The method of claim 76, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{64}Cu.

78. The method of any one of claims 75 to 77, wherein the wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent comprises one or more agents for magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray, or photoacoustic imaging.

WHAT IS CLAIMED IS:

1. An antibody-like binding protein that specifically binds the tumor-associated MUC1 sialoglycotype CA6, characterized in that the antibody-like binding protein comprises two polypeptides having structures represented by the formulas [I] and [II] below:

$$V_{L1}\text{-}L_1\text{-}V_{L2}\text{-}C_L \qquad [I]$$

$$V_{H1}\text{-}L_2\text{-}V_{H2}\text{-}C_{H1} \qquad [II]$$

wherein:

V_{L1} is an immunoglobulin light chain variable domain derived from the DS6 antibody;

V_{L2} is an immunoglobulin light chain variable domain derived from the DS6 antibody;

V_{H1} is an immunoglobulin heavy chain variable domain derived from the DS6 antibody;

V_{H2} is an immunoglobulin heavy chain variable domain derived from the DS6 antibody;

C_L is an immunoglobulin light chain constant domain, such as a human IGKC immunoglobulin light chain constant domain;

C_{H1} is an immunoglobulin C_{H1} heavy chain constant domain, such as a human immunoglobulin C_{H1} heavy chain constant domain;

L_1 and L_2 are amino acid linkers;

wherein the polypeptides of formula I and the polypeptides of formula II form a bivalent monospecific tandem immunoglobulin antibody-like binding protein; and

wherein the antibody-like protein further comprises a chelator.

2. The antibody-like binding protein of claim 1, wherein L_1 is GGGGS or GGGGSGGGGS (SEQ ID NO: 3).

3. The antibody-like binding protein of claim 1 or 2, wherein L_2 is GGGGS or GGGGSGGGGS (SEQ ID NO: 3).

4. The antibody-like binding protein of any one of claims 1 to 3, wherein L_1 and L_2 are identical.

5. The antibody-like binding protein of any one of claims 1 to 4, wherein V_{L1} and V_{L2} are identical.

6. The antibody-like binding protein of any one of claims 1 to 5, wherein V_{H1} and V_{H2} are identical.

7. The antibody-like binding protein of any one of claims 1 to 6, wherein the polypeptide of formula [I] comprises SEQ ID NO: 1.

8. The antibody-like binding protein of any one of claims 1 to 7, wherein the polypeptide of formula [II] comprises SEQ ID NO: 7.

9. The antibody-like binding protein of any one of claims 1 to 8, wherein the chelator is a hard acid cation chelator.

10. The antibody-like binding protein of claim 9, wherein the hard acid cation chelator is DOTA (1, 4, 7, 10-tetraazacyclododecane-1, 4, 7, 10-tetraacetic acid), NOTA (1, 4, 7-triaza-cyclononane-N,N',N''-triacetic acid), DTPA (1, 1, 4, 7, 7-Diethylenetriaminepentaacetic acid), or TETA (p-bromoacetamido-benzyl-tetraethylaminetetraacetic acid).

11. The antibody-like binding protein of claim 10, wherein the hard acid cation chelator is DOTA.

12. The antibody-like protein of any one of claims 9 to 11, wherein the hard acid chelator is covalently attached.

13. The antibody-like protein of claim 12, wherein between 1 and 5 copies of the hard acid chelator are covalently attached.

14. The antibody-like binding protein of any one of claims 1 to 13, further comprising a tag.

15. The antibody-like binding protein of claim 14, wherein the tag is 6x-Histidine, biotin, MYC, V5, FLAG, MBP, or glutathione-S-transferase or HA.

16. The antibody-like binding protein of claim 15, wherein the tag is a 6x-Histidine tag.

17. The antibody-like binding protein of any one of claims 1 to 16, further comprising at least one radiolabel, imaging agent, therapeutic agent, or diagnostic agent.

18. The antibody-like binding protein of claim 17, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{110}In, ^{111}In, ^{177}Lu, ^{18}F, ^{52}Fe, ^{62}Cu, ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{68}Ga, ^{86}Y, ^{90}Y, ^{89}Zr, ^{94}Tc, ^{94}Tc, ^{99m}Tc, ^{120}I, ^{123}I, ^{124}I, ^{125}I, ^{131}I, $^{154\text{-}158}Gd$, ^{32}P, ^{11}C, ^{13}N, ^{15}O, ^{186}Re, ^{188}Re, ^{51}Mn, ^{52m}Mn, ^{55}Co, ^{72}As, ^{75}Br, ^{76}Br, ^{82m}Rb, or ^{83}Sr.

19. The antibody-like binding protein of claim 18, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{64}Cu.

20. The antibody-like binding protein of claim 17, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent comprises one or more agents for magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray or photoacoustic imaging.

21. A pharmaceutical composition comprising a pharmaceutically acceptable carrier and an amount of the antibody-like binding protein of any one of claims 1 to 20 effective to image a CA6 expressing tissue.

22. A method for making an antibody-like binding protein that specifically binds the tumor-associated MUC1 sialoglycotype CA6, characterized in that the antibody-like binding protein further comprises a chelator, comprising:

(a) expressing in a cell one or more nucleic acid molecules encoding polypeptides having structures represented by the formulas [I] and [II] below:

$$V_{L1}\text{-}L_1\text{-}V_{L2}\text{-}C_L \qquad [I]$$

$$V_{H1}\text{-}L_2\text{-}V_{H2}\text{-}C_{H1} \qquad [II]$$

wherein:

V_{L1} is an immunoglobulin light chain variable domain derived from the DS6 antibody;

V_{L2} is an immunoglobulin light chain variable domain derived from the DS6 antibody;

V_{H1} is an immunoglobulin heavy chain variable domain derived from the DS6 antibody;

V_{H2} is an immunoglobulin heavy chain variable domain derived from the DS6 antibody;

C_L is an immunoglobulin light chain constant domain, such as a human IGKC immunoglobulin light chain constant domain;

C_{H1} is an immunoglobulin C_{H1} heavy chain constant domain, such as a human immunoglobulin C_{H1} heavy chain constant domain;

L_1 and L_2 are amino acid linkers; and

wherein the polypeptides of formula I and the polypeptides of formula II form a bivalent monospecific tandem immunoglobulin antibody-like binding protein; and

(b) attaching the antibody-like binding protein to the chelator.

23. The method of claim 22, wherein L_1 is GGGGS or GGGGSGGGGS (SEQ ID NO: 3).

24. The method of claim 22 or 23, wherein L_2 is GGGGS or GGGGSGGGGS (SEQ ID NO: 3).

25. The method of any one of claims 22 to 24, wherein L_1 and L_2 are identical.

26. The method of any one of claims 22 to 25, wherein V_{L1} and V_{L2} are identical.

27. The method of any one of claims 22 to 26, wherein V_{H1} and V_{H2} are identical.

28. The method of any one of claims 22 to 27, wherein the polypeptide of formula [I] comprises SEQ ID NO: 1.

29. The method of any one of claims 22 to 28, wherein the polypeptide of formula [II] comprises SEQ ID NO: 7.

30. The method of any one of claims 22 to 29, wherein the chelator is a hard acid cation chelator.

31. The method of claim 30, wherein the hard acid cation chelator is DOTA (1, 4, 7, 10-tetraazacyclododecane-1, 4, 7, 10-tetraacetic acid), NOTA (1, 4, 7-triaza-cyclononane-N,N',N''-triacetic acid), DTPA (1, 1, 4, 7, 7-Diethylenetriaminepentaacetic acid) or TETA (p-bromoacetamido-benzyl-tetraethylaminetetraacetic acid).

32. The method of claim 31, wherein the hard acid cation chelator is DOTA.

33. The method of any one of claims 22 to 32, wherein the hard acid chelator is covalently attached.

34. The method of any one of claims 22 to 33, wherein between 1 and 5 copies of the hard acid chelator are covalently attached.

35. Use of an antibody-like binding protein that specifically binds CA6 in the manufacture of a medicament for treating diseased tissue expressing CA6 in a patient, wherein the antibody-like binding protein further comprises a chelator and an imaging agent, wherein the diseased tissue expressing CA6 is identified by positron emission tomography (PET) imaging, and wherein the patient is a candidate for treatment with huDS6-DM4 if the CA6 expression in the diseased tissue is greater than or equal to 10% of CA6 expression in a reference standard.

36. The use of claim 35, wherein said antibody-like binding protein is the antibody-like binding protein of any one of claims 1 to 20.

37. Use of an antibody-like protein that specifically binds CA6 in the manufacture of a medicament for treating CA6 positive cancer in a patient, wherein the antibody-like protein further comprises a chelator and an imaging agent, wherein the localization of the imaging

agent in the patient is detected using a bioimaging technique, wherein information regarding expression level of CA6 in the patient is acquired, and wherein a huDS6-DM4 is to be administered if the expression level of CA6 in the patient is greater than or equal to 10% of CA6 expression in a reference standard.

38. The use of claim 37, wherein said antibody-like binding protein is the antibody-like binding protein of any one of claims 1 to 20.

39. The use of any one of claims 37 to 38, wherein the CA6 positive cancer is serous ovarian carcinoma, endometriod ovarian carcinoma, neoplasm of the uterine cervix, neoplasm of the endometrius, neoplasm of the vulva, breast carcinoma, pancreatic tumor, and tumor of the urothelium.

40. The use of any one of claims 37 to 39, wherein the information regarding expression level of CA6 in the patient is acquired by magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray, or photoacoustic imaging.

41. The use of any one of claims 37 to 40, wherein the chelator is a hard acid cation chelator.

42. The use of claim 41, wherein the hard acid cation chelator is DOTA (1, 4, 7, 10-tetraazacyclododecane-1, 4, 7, 10-tetraacetic acid), NOTA (1, 4, 7-triaza-cyclononane-N,N',N''-triacetic acid), DTPA (1, 1, 4, 7, 7-Diethylenetriaminepentaacetic acid), or TETA (p-bromoacetamido-benzyl-tetraethylaminetetraacetic acid).

43. The use of claim 42, wherein the hard acid cation chelator is DOTA.

44. The use of any one of claims 37 to 43, wherein the antibody-like binding protein further comprises a tag.

45. The use of claim ~~47~~44, wherein the tag is a 6x-Histidine tag.

46. The use of any one of claims 37 to 45, wherein the antibody-like binding protein further comprises at least one radiolabel, imaging agent, therapeutic agent, or diagnostic agent.

47. The use of claim 46, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{110}In, ^{111}In, ^{177}Lu, ^{18}F, ^{52}Fe, ^{62}Cu, ^{64}Cu, ^{67}Cu, ^{67}Ga, ^{68}Ga, ^{86}Y, ^{90}Y, ^{89}Zr, ^{94}Tc, ^{94}Tc, ^{99m}Tc, ^{120}I, ^{123}I, ^{124}I, ^{125}I, ^{131}I, $^{154\text{-}158}$Gd, ^{32}P, ^{11}C, ^{13}N, ^{15}O, ^{186}Re, ^{188}Re, ^{51}Mn, ^{52m}Mn, ^{55}Co, ^{72}As, ^{75}Br, ^{76}Br, ^{82m}Rb, or ^{83}Sr.

48. The use of claim 47, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent is ^{64}Cu.

49. The use of any one of claims 46 to 48, wherein the radiolabel, imaging agent, therapeutic agent, or diagnostic agent comprises one or more agents for magnetic resonance imaging (MRI); positron emission tomography (PET); single photon emission tomography (SPECT); optical imaging, computed tomography (CT); ultrasound, X-ray, or photoacoustic imaging.