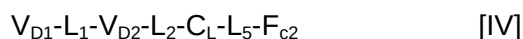
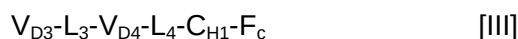


CLAIMS

1. An antibody-like binding protein that binds specifically to human CD3 ϵ and human CD123 comprising two polypeptide chains that form two antigen-binding sites, wherein one polypeptide chain has a structure represented by the formula [IV]:



and one polypeptide chain has a structure represented by the formula [III]:



wherein:

- a) said polypeptide of formula [IV] consists of:
 - (i) the amino acid sequence SEQ ID NO: 71 which comprises
 V_{D1} of sequence SEQ ID NO: 54,
 L_1 of sequence SEQ ID NO: 56,
 V_{D2} of sequence SEQ ID NO: 10,
 L_2 of sequence SEQ ID NO: 56,
 C_L of sequence SEQ ID NO: 18,
 L_5 consists of no amino acid residues, and
 F_{c2} consists of sequence SEQ ID NO: 70
 - or
 - (ii) a sequence at least 85% identical to SEQ ID NO: 71 in which
 the 3 CDRs of sequences SEQ ID NO: 48, 'WAS' and SEQ ID NO: 49 of
 V_{D1} of sequence SEQ ID NO: 54 are unaltered, and
 the 3 CDRs of sequences SEQ ID NO: 11, 'KVS' and SEQ ID NO: 8 of
 V_{D2} of sequence SEQ ID NO: 10 are unaltered;
- b) said polypeptide of formula [III] consists of:
 - (i) the amino acid sequence SEQ ID NO: 67 which comprises
 V_{D3} of sequence SEQ ID NO: 9,
 L_3 which consists of 0 amino acids,
 V_{D4} of sequence SEQ ID NO: 52,
 L_4 which consists of 0 amino acid,
 C_{H1} of sequence SEQ ID NO: 19, and
 F_c consists of sequence SEQ ID NO: 68;
 - or
 - (ii) a sequence at least 85% identical to SEQ ID NO: 67 in which

the 3 CDRs of sequences SEQ ID NO: 50, SEQ ID NO: 53, and SEQ ID NO: 51 of V_{D4} of sequence SEQ ID NO: 52 are unaltered, and the 3 CDRs of sequences SEQ ID NO: 5, SEQ ID NO: 6, SEQ ID NO: 7 of V_{D3} of sequence SEQ ID NO: 9 are unaltered;

and wherein the polypeptide formula [IV] and the polypeptide of formula [III] form a cross-over light chain-heavy chain pair.

2. The antibody-like binding protein according to claim 1, wherein the polypeptide of formula [III] comprises the F_c of sequence SEQ ID NO: 68 wherein

X_1 is Y, X_2 is S, X_3 is T, X_4 is L, X_5 is Y, or

X_1 is C, X_2 is S, X_3 is S, X_4 is A, X_5 is V, and

X_6 is H and X_7 is Y, or

X_6 is R and X_7 is F.

3. The antibody-like binding protein according to claim 1 or 2, wherein

a) the polypeptide of formula [IV] comprises the F_c domain (F_{c2}) of SEQ ID NO: 81 or a sequence at least 85% identical to SEQ ID NO: 81, and the polypeptide of formula [III] comprises the F_c domain of SEQ ID NO: 60 or a sequence at least 85% identical to SEQ ID NO: 60, or

b) the polypeptide of formula [IV] comprises the F_c domain (F_{c2}) of SEQ ID NO: 73 or a sequence at least 85% identical to SEQ ID NO: 73, and the polypeptide of formula [III] comprises the F_c domain of SEQ ID NO: 75 or a sequence at least 85% identical to SEQ ID NO: 75, or

c) the polypeptide of formula [IV] comprises the F_c domain (F_{c2}) of SEQ ID NO: 77 or a sequence at least 85% identical to SEQ ID NO: 77, and the polypeptide of formula [III] comprises the F_c domain of SEQ ID NO: 75 or a sequence at least 85% identical to SEQ ID NO: 75, or

d) the polypeptide of formula [IV] comprises the F_c domain (F_{c2}) of SEQ ID NO: 77 or a sequence at least 85% identical to SEQ ID NO: 77, and the polypeptide of formula [III] comprises the F_c domain of SEQ ID NO: 79 or a sequence at least 85% identical to SEQ ID NO: 79.

4. The antibody-like binding protein according to any one of claims 1 to 3, wherein

a) one polypeptide of formula [IV] consists of the amino acid sequence SEQ ID NO: 80,
or

a sequence at least 85% identical to SEQ ID NO: 80 in which the 3 CDRs of sequences SEQ ID NO: 48, 'WAS' and SEQ ID NO: 49 of V_{D1} of sequence SEQ ID NO: 54, and the 3 CDRs of sequences SEQ ID NO: 11, 'KVS' and SEQ ID NO: 8 of V_{D2} of sequence SEQ ID NO: 10 and the amino acid positions 481, 486, 498, 500, 539, 567, 568 of SEQ ID NO: 80 are unaltered; and

one polypeptide of formula [III] consists of the amino acid sequence SEQ ID NO: 59, or
a sequence at least 85% identical to SEQ ID NO: 59 in which the 3 CDRs of sequences SEQ ID NO: 50, SEQ ID NO: 53, and SEQ ID NO: 51 of V_{D4} of sequence SEQ ID NO: 52, and the 3 CDRs of sequences SEQ ID NO: 5, SEQ ID NO: 6, SEQ ID NO: 7 of V_{D3} of sequence SEQ ID NO: 9 and the amino acid positions 473, 492, 531, 559, 560, 478, 490 of SEQ ID NO: 59 are unaltered; or

b) one polypeptide of formula [IV] consists of the amino acid sequence SEQ ID NO: 72,
or

a sequence at least 85% identical to SEQ ID NO: 72 in which the 3 CDRs of sequences SEQ ID NO: 48, 'WAS' and SEQ ID NO: 49 of V_{D1} of sequence SEQ ID NO: 54, and the 3 CDRs of sequences SEQ ID NO: 11, 'KVS' and SEQ ID NO: 8 of V_{D2} of sequence SEQ ID NO: 10 and the amino acid positions 481, 486, 498, 500, 539, 567, 568 of SEQ ID NO: 72 are unaltered; and

one polypeptide of formula [III] consists of the amino acid sequence SEQ ID NO: 74, or
a sequence at least 85% identical to SEQ ID NO: 74 in which the 3 CDRs of sequences SEQ ID NO: 50, SEQ ID NO: 53, and SEQ ID NO: 51 of V_{D4} of sequence SEQ ID NO: 52, and the 3 CDRs of sequences SEQ ID NO: 5, SEQ ID NO: 6, SEQ ID NO: 7 of V_{D3} of sequence SEQ ID NO: 9 and the amino acid positions 473, 492, 531, 559, 560, 478, 490 of SEQ ID NO: 74 are unaltered; or

c) one polypeptide of formula [IV] consists of the amino acid sequence SEQ ID NO: 76,
or

a sequence at least 85% identical to SEQ ID NO: 76 in which the 3 CDRs of sequences SEQ ID NO: 48, 'WAS' and SEQ ID NO: 49 of V_{D1} of sequence SEQ ID NO: 54, and the 3 CDRs of sequences SEQ ID NO: 11, 'KVS' and SEQ ID NO: 8 of V_{D2} of sequence SEQ ID NO: 10 and the amino acid positions 481, 486, 498, 500, 539, 567, 568 in SEQ ID NO: 76 are unaltered; and

one polypeptide of formula [III] consists of the amino acid sequence SEQ ID NO: 74, or

a sequence at least 85% identical to SEQ ID NO: 74 in which the 3 CDRs of sequences SEQ ID NO: 50, SEQ ID NO: 53, and SEQ ID NO: 51 of V_{D4} of sequence SEQ ID NO: 52, and the 3 CDRs of sequences SEQ ID NO: 5, SEQ ID NO: 6, SEQ ID NO: 7 of V_{D3} of sequence SEQ ID NO: 9 and the amino acid positions 473, 492, 531, 559, 560, 478, 490 of SEQ ID NO: 74 are unaltered; or

d) one polypeptide of formula [IV] consists of the amino acid sequence SEQ ID NO: 76, or

a sequence at least 85% identical to SEQ ID NO: 76 in which the 3 CDRs of sequences SEQ ID NO: 48, 'WAS' and SEQ ID NO: 49 of V_{D1} of sequence SEQ ID NO: 54, and the 3 CDRs of sequences SEQ ID NO: 11, 'KVS' and SEQ ID NO: 8 of V_{D2} of sequence SEQ ID NO: 10 and the amino acid positions 481, 486, 498, 500, 539, 567, 568 in SEQ ID NO: 76 are unaltered; and

one polypeptide of formula [III] consists of the amino acid sequence SEQ ID NO: 78, or

a sequence at least 85% identical to SEQ ID NO: 78 in which the 3 CDRs of sequences SEQ ID NO: 50, SEQ ID NO: 53, and SEQ ID NO: 51 of V_{D4} of sequence SEQ ID NO: 52, and the 3 CDRs of sequences SEQ ID NO: 5, SEQ ID NO: 6, SEQ ID NO: 7 of V_{D3} of sequence SEQ ID NO: 9 and the amino acid positions 473, 492, 531, 559, 560, 478, 490 of SEQ ID NO: 78 are unaltered.

5. The antibody-like binding protein according to any one of claims 1 to 4, comprising

a) one polypeptide of formula [IV] consisting of the amino acid sequence SEQ ID NO: 80; and

one polypeptide of formula [III] consisting of the amino acid sequence SEQ ID NO: 59, b)

one polypeptide of formula [IV] consisting of the amino acid sequence SEQ ID NO: 72, and

one polypeptide of formula [III] consisting of the amino acid sequence SEQ ID NO: 74, c)

one polypeptide of formula [IV] consisting of the amino acid sequence SEQ ID NO: 76; and

one polypeptide of formula [III] consisting of the amino acid sequence SEQ ID NO: 74, or

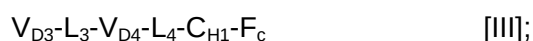
d) one polypeptide of formula [IV] consisting of the amino acid sequence SEQ ID NO: 76; and

one polypeptide of formula [III] consisting of the amino acid sequence SEQ ID NO: 78.

6. An antibody-like binding protein that binds specifically to human CD3 ϵ and human CD123 comprising three polypeptide chains that form two antigen-binding sites, wherein a first polypeptide has a structure represented by the formula [I]:



and a second polypeptide chain has a structure represented by the formula [III]:



and a third polypeptide F_{c3} which is the immunoglobulin hinge region and C_{H2} , C_{H3} immunoglobulin heavy chain constant domains of an immunoglobulin;

wherein

- a) said polypeptide of formula [I] consists of:
 - (i) the amino acid sequence SEQ ID NO: 55 which comprises
 V_{D1} of sequence SEQ ID NO: 54,
 L_1 of sequence SEQ ID NO: 56,
 V_{D2} of sequence SEQ ID NO: 10,
 L_2 of sequence SEQ ID NO: 56,
 C_L of sequence SEQ ID NO: 18,
 - or
 - (ii) a sequence at least 85% identical to SEQ ID NO: 55 in which
 the 3 CDRs of sequences SEQ ID NO: 48, 'WAS' and SEQ ID NO: 49 of
 V_{D1} of sequence SEQ ID NO: 54, are unaltered and
 the 3 CDRs of sequences SEQ ID NO: 11, 'KVS' and SEQ ID NO: 8 of
 V_{D2} of sequence SEQ ID NO: 10 are unaltered;
- b) said polypeptide of formula [III] consists of:
 - (i) the amino acid sequence SEQ ID NO: 67 which comprises:
 V_{D3} of sequence SEQ ID NO: 9,
 L_3 which consists of 0 amino acid,
 V_{D4} of sequence SEQ ID NO: 52,
 L_4 which consists of 0 amino acid,
 $CH1$ of sequence SEQ ID NO: 19, and
 F_c of sequence SEQ ID NO: 68 wherein X_1 is Y, X_2 is C, X_3 is W, X_4 is L,
 X_5 is Y, and X_6 is H and X_7 is Y, or X_6 is R and X_7 is F,
 - or
 - (ii) a sequence at least 85% identical to SEQ ID NO: 67 in which

the 3 CDRs of sequences SEQ ID NO: 50, SEQ ID NO:53, and SEQ ID NO: 51 of V_{D4} of sequence SEQ ID NO: 52, are unaltered and the 3 CDRs of sequences SEQ ID NO: 5, SEQ ID NO: 6, SEQ ID NO: 7 of V_{D3} of sequence SEQ ID NO: 9 are unaltered, and the amino acids X₁, X₂, X₃, X₄, X₅, X₆ and X₇ are as defined above in b)(i),

and wherein:

- the polypeptide formula [I] and the polypeptide of formula [III] form a cross-over light chain-heavy chain pair,
 - the polypeptide of formula [III] heterodimerizes with the third polypeptide through its Fc domain
 - said third polypeptide F_{c3} consists of SEQ ID NO: 69 or a sequence at least 85% identical to SEQ ID NO: 69, wherein the amino acid positions 129, 146, 148, 187, 215, 216 of SEQ ID NO: 69 are unaltered.
7. The antibody-like binding protein according to claim 6, comprising
- one polypeptide of formula [I] consisting of SEQ ID NO: 55,
 - one polypeptide of formula [III] consisting of SEQ ID NO: 65, and
 - F_{c3} consisting of SEQ ID NO: 69.
8. A pharmaceutical composition comprising an antibody-like binding protein according to any one of claims 1 to 7 and a pharmaceutically acceptable carrier.
9. An antibody-like binding protein according to any one of claims 1 to 7 or a pharmaceutical composition according to claim 8 for use as a medicament.
10. An antibody-like binding protein according to any one of claims 1 to 7 or a pharmaceutical composition according to claim 8 for use for the treatment of cancer.
11. An antibody-like binding protein or pharmaceutical composition for use according to claim 10, wherein the cancer is a haematological cancer.
12. An isolated nucleic acid comprising a sequence encoding an antibody-like binding protein according to any one of claims 1 to 7.

13. A host cell which has been transformed by a nucleic acid according to claim 12.
14. A kit comprising
 - a) at least one antibody-like binding protein as defined according to any one of claims 1 to 7,
 - b) packaging material, and
 - c) a label or packaging insert contained within said packaging material indicating that said antibody-like binding protein is for effective for treating cancer or for use for the treatment of cancer.