CLAIMS

1. An isolated antibody which:

a) binds to A3-B3 domain of human and *Macaca fascicularis* CEACAM5 proteins; and

b) does not significantly cross-react with human CEACAM1, human CEACAM6, human CEACAM7, human CEACAM8, *Macaca fascicularis* CEACAM1, *Macaca fascicularis* CEACAM6, and *Macaca fascicularis* CEACAM8.

2. An isolated antibody which competes for binding to A3-B3 domain of human and *Macaca fascicularis* CEACAM5 proteins with an antibody comprising the variable heavy and light chains of an antibody selected from the group consisting of

a) an antibody comprising a variable domain of heavy chain of sequence SEQ ID NO:31 and a variable domain of light chain of sequence of sequence SEQ ID NO:32;

b) an antibody comprising a variable domain of heavy chain of sequence SEQ ID NO:33 and a variable domain of light chain of sequence of sequence SEQ ID NO:34;

c) an antibody comprising a variable domain of heavy chain of sequence SEQ ID NO:33 and a variable domain of light chain of sequence of sequence SEQ ID NO:34 in which K at position 52 has been replaced by R;

e) an antibody comprising a variable domain of heavy chain of sequence SEQ ID NO:35 and a variable domain of light chain of sequence of sequence SEQ ID NO:36;

f) an antibody comprising a variable domain of heavy chain of sequence SEQ ID NO:37 and a variable domain of light chain of sequence of sequence SEQ ID NO:38; and

g) an antibody comprising a variable domain of heavy chain of sequence SEQ ID NO:39 and a variable domain of light chain of sequence of sequence SEQ ID NQ:40.

3. The antibody according to claim 2, wherein said antibody does not significantly cross-react with human CEACAM1, human CEACAM6, human CEACAM7, human CEACAM8, *Macaca fascicularis* CEACAM1, *Macaca fascicularis* CEACAM6 and *Macaca fascicularis* CEACAM8.

4. An antibody according to any one of claims 1 to 3, which binds to A3-B3 domain of human and *Macaca fascicularis* CEACAM5:

a) with a ratio of affinity for human CEACAM5 on to the affinity for *Macaca fascicularis* CEACAM5 which is ≤12; or

b) with an affinity for human CEACAM5 and/or *Macaca fascicularis* CEACAM5 which is ≤10nM, or

c) both a and b.

5. The antibody according to any one of claims 1 to 4, wherein said antibody binds to two regions of the A3-B3 domain of human CEACAM5 protein that comprise sequences SEQ ID NO:76 and SEQ ID NO:77, respectively.

6. An antibody according to any one of claims 1 to 5, which comprises:

a) a CDR1-H consisting of sequence $X_1X_2X_3X_4X_5X_6$YD (SEQ ID NO:83) wherein each of X_1, X_2, X_3, X_4, X_5 and X_6 is any amino acid; and

a CDR2-H consisting of a 6 to 10 amino acid-long sequence,; and

a CDR3-H consisting of sequence $X_1X_2HX_3FGX_4X_5GPX_6AX_7$ (SEQ ID NO:84) wherein each of X_1, X_4, X_5, X_6, and X_7 is any amino acid, X_2 is A or S, and X_3 is Y, F or W; or

b) a CDR1-L consisting of sequence $X_1X_2X_3X_4X_5$Y (SEQ ID NO:85) wherein each of X_1, X_2, X_3 and X_5 is any amino acid, and X_4 is Y, F or W; and

a CDR2-L consisting of sequence NX_1X_2 wherein each of X_1 and X_2 is any amino acid;

and a CDR3-L consisting of sequence $X_1X_2HX_3X_4X_5PX_6X_7$ (SEQ ID NO:86) wherein each of X_1, X_2, X_4, X_5, X_6 and X_7 is any amino acid, X_3 is Y, F or W, or

c) both a and b.

7. An antibody according to any one of claims 1 to 6, which comprises:

a) a CDR1-H consisting of sequence GFX_1FSSYD (SEQ ID NO:78) wherein X_1 is T, A or V; and

a CDR2-H consisting of sequence IX_1SX_2GGX_3T (SEQ ID NO:79) wherein X_1 is S or N, X_2 is Y or G, X_3 is R or I; and

a CDR3-H consisting of sequence X_1AHYFGX_2SGPFAY (SEQ ID NO:80) wherein X_1 is A or T, and X_2 is T or S; or

b) a CDR1-L consisting of sequence ENIFSY (SEQ ID NO:10) or ENIYSY (SEQ ID NO:22); and

a CDR2-L consisting of sequence NX_1X_2 wherein X_1 is A or T, and X_2 is K or R;

and

a CDR3-L consisting of sequence QHHYGTPFT (SEQ ID NO:12) or QHHYGIPFT (SEQ ID NO:24), or

c) both a and b.

8. An antibody according to any one of claims 1 to 4, which comprises:

a) a CDR1-H consisting of sequence $GFTFSX_1YX_2$ (SEQ ID NO:81) wherein X_1 is R or S, and X_2 is A or D; and

a CDR2-H consisting of sequence $ISSGGX_1X_2X_3$ (SEQ ID NO:82) wherein X_1 is absent, S or G, X_2 is D, Y or I, and X_3 is T or I; and

a CDR3-H consisting of sequence ARPAYYGNPAMDY (SEQ ID NO:3) or ARVNYYDSSFLDW (SEQ ID NO:15); or

b) a CDR1-L consisting of sequence QNVGTN (SEQ ID NO:4); and a CDR2-L consisting of sequence SAS; and

a CDR3-L consisting of sequence QQYNSYPLYT (SEQ ID NO:6) or QQYNNYPLYT (SEQ ID NO:18), or

c) both a and b.

9. An antibody according to any one of claims 1 to 4 which comprises:

a) a CDR1-H of sequence SEQ ID NO:1; CDR2-H of sequence SEQ ID NO:2 ; CDR3-H of sequence SEQ ID NO:3; CDR1-L of sequence SEQ ID NO:4; CDR2-L of sequence SAS and CDR3-L of sequence SEQ ID NO:6; or

b) a CDR1-H of sequence SEQ ID NO:7; CDR2-H of sequence SEQ ID NO:8; CDR3-H of sequence SEQ ID NO:9; CDR1-L of sequence SEQ ID N0:10; CDR2-L of sequence NTK or NTR and CDR3-L of sequence SEQ ID NO:12; or

c) a CDR1-H of sequence SEQ ID NO:13; CDR2-H of sequence SEQ ID NO:14; CDR3-H of sequence SEQ ID NO:15; CDR1-L of sequence SEQ ID NO:16; CDR2-L of sequence SAS and CDR3-L of sequence SEQ ID NO:18; or

d) a CDR1-H of sequence SEQ ID NO:19; CDR2-H of sequence SEQ ID NO:20; CDR3-H of sequence SEQ ID NO:21; CDR1-L of sequence SEQ ID NO:22; CDR2-L of sequence NAK and CDR3-L of sequence SEQ ID NO:24; or

e) a CDR1-H of sequence SEQ ID NO:25; CDR2-H of sequence SEQ ID NO:26; CDR3-H of sequence SEQ ID NO:27; CDR1-L of sequence SEQ ID NO:28; CDR2-L of sequence NAK and CDR3-L of sequence SEQ ID NO:30.

10. An isolated antibody which binds to A3-B3 domain of human and *Macaca fascicularis* CEACAM5 proteins and which comprises:

a) a CDR1-H consisting of sequence X1X2X3X4X5X6YD (SEQ ID NO:83) wherein
each of X_1, X_2, X_3, X_4, X_5 and X_6 is any amino acid; and
a CDR2-H consisting of a 6 to 10 amino acid-long sequence; and
a CDR3-H consisting of sequence $_{X1X2HX3FGX4X5GPX6AX7}$ (SEQ ID NO:84) wherein each of X1, X4, X5, X6, and X7 is any amino acid, X2 is A or S, and X3 is Y, F or W; or
b) a CDR1-L consisting of sequence X1X2X3X4X5Y (SEQ ID NO:85) wherein each
of X_1, X_2, X_3 and X_5 is any amino acid, and X_4 is Y, F or W; and
a CDR2-L consisting of sequence NX_1X_2 wherein each of X_1 and X_2 is any amino acid; and
a CDR3-L consisting of sequence X1X2HX3X4X5PX6X7 (SEQ ID NO:86)
wherein each of X_1, X_2, X_4, X_5, X_6 and X_7 is any amino acid, X_3 is Y, F or W, or
c) both a and b.

11. An isolated antibody which binds to A3-B3 domain of human and *Macaca fascicularis* CEACAM5 proteins and which comprises:

a) a CDR1-H of sequence SEQ ID NO:1; CDR2-H of sequence SEQ ID NO:2; CDR3-H of sequence SEQ ID NO:3; CDR1-L of sequence SEQ ID NO:4; CDR2-L of sequence SAS and CDR3-L of sequence SEQ ID NO:6; or

b) a CDR1-H of sequence SEQ ID NO:7; CDR2-H of sequence SEQ ID NO:8; CDR3-H of sequence SEQ ID NO:9; CDR1-L of sequence SEQ ID N0:10; CDR2-L of sequence NTK or NTR and CDR3-L of sequence SEQ ID NO:12; or

c) a CDR1-H of sequence SEQ ID NO: 13; CDR2-H of a sequence ID NO: 14 ; CDR3-H of sequence SEQ ID NO:15; CDR1-L of sequence SEQ ID NO:16; CDR2-L of sequence SAS and CDR3-L of sequence SEQ ID NO:18; or

d) a CDR1-H of sequence SEQ ID NO:19; CDR2-H of sequence SEQ ID N0:20; CDR3-H of sequence SEQ ID NO:21; CDR1-L of sequence SEQ ID NO:22; CDR2-L of sequence NAK and CDR3-L of sequence SEQ ID NO:24; or

e) a CDR1-H of sequence SEQ ID NO:25; CDR2-H of sequence SEQ ID NO:26; CDR3-H of sequence SEQ ID NO:27; CDR1-L of sequence SEQ ID NO:28; CDR2-L of sequence NAK and CDR3-L of sequence SEQ ID NO:30.

12. The antibody according to any one of claims 1 to 11, which comprises:

a) a variable domain of heavy chain of sequence SEQ ID NO:31 or a CDR1-H of sequence SEQ ID NO:1; CDR2-H of sequence SEQ ID NO: 2; and CDR3-H of sequence SEQ ID NO: 3 and/or a variable domain of light chain of sequence SEQ ID NO:32 or a CDR1-L of sequence SEQ ID NO:4; CDR2-L of sequence SAS; and CDR3-L of sequence SEQ ID NO:6; or

b) a variable domain of heavy chain of sequence SEQ ID NO:33 or a CDR1-H of sequence SEQ ID NO:7; CDR2-H of sequence SEQ ID NO:8; and CDR3-H of sequence SEQ ID NO:9, and/or a variable domain of light chain of sequence of sequence SEQ ID NO:34 or a CDR1-L of sequence SEQ ID NO:10; CDR2-L of sequence NTK; and CDR3-L of sequence SEQ ID NO:12; or

c) a variable domain of heavy chain of sequence SEQ ID NO:35 or a CDR1-H of sequence SEQ ID NO:13; CDR2-H of sequence SEQ ID NO:14; and CDR3-H of sequence SEQ ID NO:15, and/or a variable domain of light chain of sequence of sequence SEQ ID NO:36 or a CDR1-L of sequence SEQ ID NO:16; CDR2-L of sequence SAS; and CDR3-L of sequence SEQ ID NO:18; or

d) a variable domain of heavy chain of sequence SEQ ID NO:37 or a CDR1-H of sequence SEQ ID NO:19; CDR2-H of sequence SEQ ID NO:20; and CDR3-H of sequence SEQ ID NO:21, and/or a variable domain of light chain of sequence of sequence SEQ ID NO:38 or a CDR1-L of sequence SEQ ID NO:22; CDR2-L of sequence NAK; and CDR3-L of sequence SEQ ID NO:24; or

e) a variable domain of heavy chain of sequence SEQ ID NO:39 or a CDR1-H of sequence SEQ ID NO:25; CDR2-H of sequence SEQ ID NO:26; and CDR3-H of sequence SEQ ID NO:27, and/or a variable domain of light chain of sequence of sequence SEQ ID N0:40 or a CDR1-L of sequence SEQ ID NO:28; CDR2-L of sequence NAK; and CDR3-L of sequence SEQ ID NO:30.

13. The antibody according to any one of claims 1 to 12, which is a chimeric or a humanised antibody.

14. The antibody according to any one of claims 1 to 13, which is an antibody comprising:

a) a heavy chain of sequence SEQ ID NO:41 and/or a light chain of sequence of sequence SEQ ID NO:42; or

b) a heavy chain of sequence SEQ ID NO:43 and/or a light chain of sequence of sequence SEQ ID NO:44; or

c) a heavy chain of sequence SEQ ID NO:45 and/or a light chain of sequence of sequence SEQ ID NO:46; or

d) a heavy chain of sequence SEQ ID NO:47 and/or a light chain of sequence of sequence SEQ ID NO:48; or

e) a heavy chain of sequence SEQ ID NO:49 and/or a light chain of sequence of sequence SEQ ID N0:50.

15. The antibody according to any one of claims 1 to 13, which comprises:

a) a variable domain of a heavy chain of sequence SEQ ID NO:51, SEQ ID NO:5, or SEQ ID NO: 74;

and/or

b) a variable domain of a light chain of sequence SEQ ID NO:17, SEQ ID NO:23, SEQ ID NO:29, SEQ ID NO:55, or SEQ ID NO: 75.

16. The antibody according to any one of claims 1 to 15, which comprises:

a) a variable domain of a heavy chain of sequence SEQ ID NO:51 and a light chain of sequence SEQ ID NO:17, or

b) a variable domain of a heavy chain of sequence SEQ ID NO:5 and a light chain of sequence SEQ ID NO:23, or

c) a variable domain of a heavy chain of sequence SEQ ID NO:5 and a light chain of sequence SEQ ID NO:29, or

d) a variable domain of a heavy chain of sequence SEQ ID NO:51 and a light chain of sequence SEQ ID NO:55, or

e) a variable domain of a heavy chain of sequence SEQ ID NO:74 and a light chain of sequence SEQ ID NO:75.

17. An isolated antibody which binds to A3-B3 domain of human and *Macaca fascicularis* CEACAM5 proteins and which comprises

a) a heavy chain consisting of sequence SEQ ID NO:87; and/or

b) a light chain consisting of sequence SEQ ID NO:88

18. The antibody according to any one of claims 1 to 17, which is an antibody fragment.

19. The antibody according to any one of claims 1 to 18, which is a variable heavy 10 chain of a single domain antibody (VHH).

20. The antibody according to any one of claims 1 to 19, which is a bispecific or a multispecific antibody.

21. The antibody according to any one of claims 1 to 20, which is a fragment selected from the group consisting of Fv, Fab, F(ab')2, Fab', dsFv, (dsFv)2, scFv, sc(Fv)2, and diabodies.

22. An isolated nucleic acid comprising a sequence encoding an antibody according to any one of claims 1 to 21.

23. A host cell which has been transformed by a nucleic acid according to claim 22.

24. An immunoconjugate comprising an antibody according to any one of claims to 1 to 21 conjugated or linked to at least one growth inhibitory agent.

25. The immunoconjugate according to claim 24, wherein said growth inhibitory agent is a cytotoxic agent or a radioactive isotope.

26. The immunoconjugate according to claim 24 or 25, wherein said growth inhibitory agent is selected from the group consisting of chemotherapeutic agents, enzymes, antibiotics, and toxins such as small molecule toxins or enzymatically active toxins, taxoids, vincas, taxanes, maytansinoid or maytansinoid analogs, tomaymycin or pyrrolobenzodiazepine derivatives, cryptophycin derivatives, leptomycin derivatives, auristatin or dolastatin analogs, prodrugs, topoisomerase II inhibitors, DNA alkylating agenst, anti-tubulin agents, and CC-1065 or CC-1065 analogs.

27. The immunoconjugate according to claim 25 or 26, wherein said growth inhibitory agent is ($N^{2'}$-deacetyl-$N^{2'}$-(3-mercapto-1-oxopropyl)-maytansine) DM1 or $N^{2'}$-deacetyl-$N^{2'}$(4-methyl-4-mercapto-1 -oxopentyl)-maytansine (DM4).

28. The immunoconjugate according to any one of claims 24 to 27, wherein the antibody is covalently attached via a cleavable or non-cleavable linker to the at least one growth inhibitory agent.

29. The immunoconjugate according to claim 28, wherein said linker is selected from the group consisting of N-succinimidyl pyridyldithiobutyrate (SPDB), 4-(Pyridin-2-yldisulfanyl)-2- sulfo-butyric acid (sulfo-SPDB), and succinimidyl (N-maleimidomethyl) 15 cyclohexane-1- carboxylate (SMCC).

30. The immunoconjugate according to any one of claims 24 to 29, wherein the antibody comprises a variable domain of a heavy chain of sequence SEQ ID NO:5 and a variable domain of a light chain of sequence SEQ ID NO:29.

31. The immunoconjugate according to any one of claims 23 to 30, wherein the immunoconjugate is characterised by a drug-to-antibody ratio (DAR) ranging from 1 to 10.

32. A pharmaceutical composition comprising an antibody according to any one of claims 1 to 21, or an immunoconjugate according to any one of claims 24 to 31, and a pharmaceutically acceptable carrier.

33. Use of an antibody according to any one of claims 1 to 21, or an immunoconjugate according to any one of claims 24 to 31, or a pharmaceutical composition according to claim 32, in the manufacture of a medicament for the treatment of cancer.

34. The use of an antibody, immunoconjugate or pharmaceutical composition according to claim 33, wherein the cancer is CEACAM5 expressing cancer.

35. The use of an antibody, immunoconjugate or pharmaceutical composition according to claim 33 or 34, wherein the cancer is colorectal, stomach, lung, uterus cervix, pancreas, oesophagus, ovary, thyroid, bladder, endometrium, breast, liver, prostate, or skin cancer.

36. An antibody according to any one of claims 1 to 21 for use for *ex vivo* detecting CEACAM5 expression in biological sample of a subject.

37. An antibody for the use according to claim 36, wherein said antibody is labelled with a detectable molecule or substance.

38. An antibody for the use according to claim 36 or 37, wherein said use is for diagnosing the presence of a cancer in a subject, determining susceptibility of a patient having cancer to a therapeutic agent targeting CEACAM5, or monitoring effectiveness of

anti-CEACAM5 cancer therapy or detecting cancer relapse after anti-CEACAM5 cancer therapy.

39. An immunoconjugate comprising an antibody which comprises a heavy chain consisting of sequence SEQ ID NO:87 and a light chain consisting of sequence SEQ ID NO:88 wherein the antibody is covalently linked via N-succinimidyl pyridyldithiobutyrate (SPDB) to N $^{2'}$-deacetyl-N-$^{2'}$(4-methyl-4-mercapto-1-oxopentyl)-maytansine (DM4).