

CLAIMS

1. A binding molecule that binds to chemokine receptor 9 (CCR9) and comprises a heavy chain variable (VH) region having a set of CDRs HCDR1, HCDR2 and HCDR3 and a light chain variable (VL) region having a set of CDRs LCDR1, LCDR2 and LCDR3,

wherein the VH region amino acid sequence comprises HCDR1 of SEQ ID NO: 1, HCDR2 of SEQ ID NO: 2 and HCDR3 of SEQ ID NO: 3, and

wherein the VL region amino acid sequence comprises LCDR2 of SEQ ID NO: 5 and LCDR3 of SEQ ID NO: 6 and LCDR1 having an amino acid sequence selected from SEQ ID NO: 21 or SEQ ID NO: 20.
2. The binding molecule of claim 1, wherein:
 - (i) the VH region amino acid sequence comprises SEQ ID NO: 51, or a sequence having at least 80%, 85%, 90%, 95%, 98% or 99% sequence identity thereto and; the VL region amino acid sequence comprises SEQ ID NO: 52, or a sequence having at least 80%, 85%, 90%, 95%, 98% or 99% sequence identity thereto;
 - (ii) the VH region amino acid sequence comprises SEQ ID NO: 51, or a sequence having at least 80%, 85%, 90%, 95%, 98% or 99% sequence identity thereto and; the VL region amino acid sequence comprises SEQ ID NO: 53, or a sequence having at least 80%, 85%, 90%, 95%, 98% or 99% sequence identity thereto; or
 - (iii) the VH region amino acid sequence comprises SEQ ID NO: 56, or a sequence having at least 80%, 85%, 90%, 95%, 98% or 99% sequence identity thereto and; the VL region amino acid sequence comprises SEQ ID NO: 57, or a sequence having at least 80%, 85%, 90%, 95%, 98% or 99% sequence identity thereto.
3. The binding molecule of claim 1 or 2, wherein the binding molecule inhibits binding of CCL25 to CCR9.
4. The binding molecule of any of claims 1-3, wherein the binding molecule is an anti-CCR9 antibody, or an antigen-binding fragment thereof.
5. The binding molecule of claim 4, wherein the anti-CCR9 antibody, or antigen-binding fragment thereof is humanised, chimeric, or fully human.
6. The binding molecule of claim 4 or 5, which is:
 - (a) an IgG immunoglobulin or a fragment thereof; or
 - (b) an IgG1 immunoglobulin or a fragment thereof.

7. The binding molecule of any of claims 1-6, wherein said binding molecule comprises an immunoglobulin Fc domain, or a fragment thereof that retains the ability to bind to one or more Fc receptors.
8. The binding molecule of claim 7, wherein the immunoglobulin Fc domain or fragment:
 - (a) is an IgG Fc domain or fragment thereof;
 - (b) is a human IgG Fc domain or fragment thereof;
 - (c) is a human IgG1 Fc domain or fragment thereof;
 - (d) is modified compared to the corresponding wild-type Fc domain, wherein said modification leads to an increased affinity for one or more Fcγ receptors;
 - (e) is modified compared to the corresponding wild-type Fc domain, wherein said modification leads to an enhanced antibody dependent cell-mediated cytotoxicity response; and/or
 - (f) comprises an afucosylated N-linked glycan at amino acid position 297.
9. The binding molecule of any of claims 1-8, wherein the binding molecule is:
 - (a) afucosylated;
 - (b) afucosylated at amino acid position 297; or
 - (c) present in a composition comprising multiple copies of said binding molecule, wherein at least 50%, 75%, 80%, 90%, 95%, 98%, 99% or 100% of the copies of the binding molecule in the composition are afucosylated.
10. The binding molecule of any of claims 1-9, wherein the binding molecule:
 - (a) binds to human CCR9;
 - (b) binds to human CCR9A and human CCR9B;
 - (c) binds to cynomolgus CCR9; and/or
 - (e) does not bind to CCR5, CCR8, CXCR1 or CXCR2.
11. The binding molecule of any of claims 1-10 wherein the binding molecule:
 - (a) is capable of mediating antibody dependent cell-mediated cytotoxicity against a CCR9-expressing cell to which it binds;
 - (b) is capable of mediating antibody dependent cell-mediated cytotoxicity against a CCR9-expressing lymphocyte to which it binds;
 - (c) can be bound by an FcγR;
 - (d) can be bound by FcγRIIIa;

- (e) is capable of cross-linking an immune effector cell to a CCR9-expressing cell;
 - (f) is capable of cross-linking an immune effector cell to a CCR9-expressing cell and activating antibody dependent cell-mediated cytotoxicity by the effector cell;
 - (g) is capable of inhibiting CCL25 induced CCR9 receptor internalisation;
 - (h) is capable of inhibiting CCL25 mediated migration of CCR9 expressing T cells to the gut,
 - (i) is capable of cross-linking an immune effector cell to a CCR9-expressing cell and activating antibody dependent cell-mediated cytotoxicity by the effector cell, thereby causing lysis of the CCR9-expressing cell; and/or
 - (j) is capable of depleting CCR9-expressing cells in a population of cells comprising CCR9-expressing cells and immune effector cells.
12. The binding molecule of any preceding claims, wherein the binding molecule is capable of binding to human CCR9 with an affinity (K_D) of about 0.1 nM, optionally 0.09 nM.
 13. A pharmaceutical composition comprising the binding molecule of any of claims 1-12, and a pharmaceutically acceptable carrier or diluent.
 14. A pharmaceutical composition for use in a method of treating a disease or condition in a subject, wherein the pharmaceutical composition comprises the binding molecule of any of claims 1-12, wherein an effective amount of the pharmaceutical composition is to be administered to the subject.
 15. The pharmaceutical composition for use of claim 14, wherein the disease is an inflammatory bowel disease, optionally wherein the disease is selected from the group consisting of Crohn's disease, ileal/ileocolonic Crohn's disease, and ulcerative colitis.