Patent Claims

1. An anti-IGF-1R antibody that specifically binds to human IGF-1R and that has abolished FcRn binding, wherein the antibody comprises a first Fc-region polypeptide and a second Fc-region polypeptide, wherein the first and the second Fc-region polypeptide further comprise the mutations I253A, H310A and H435A, and wherein the anti-IGF-1R antibody has

a) an antibody heavy chain comprising as HVRs the amino acid sequence of SEQ ID NO: 56 (HVR-H1), the amino acid sequence of SEQ ID NO: 57 (HVR-H2), and the amino acid sequence of SEQ ID NO: 58 (HVR-H3), and an antibody light chain comprising as HVRs the amino acid sequence of SEQ ID NO: 59 (HVR-L1), the amino acid sequence of SEQ ID NO: 60 (HVR-L2), and the amino acid sequence of SEQ ID NO: 61 (HVR-L3), or

b) an antibody heavy chain comprising as HVRs the amino acid sequence of SEQ ID NO: 64 (HVR-H1), the amino acid sequence of SEQ ID NO: 65 (HVR-H2), and the amino acid sequence of SEQ ID NO: 66 (HVR-H3), and an antibody light chain comprising as HVRs the amino acid sequence of SEQ ID NO: 67 (HVR-L1), the amino acid sequence of SEQ ID NO: 68 (HVR-L2), and the amino acid sequence of SEQ ID NO: 69 (HVR-L3), or

c) an antibody heavy chain comprising as HVRs the amino acid sequence of SEQ ID NO: 72 (HVR-H1), the amino acid sequence of SEQ ID NO: 73 (HVR-H2), and the amino acid sequence of SEQ ID NO: 74 (HVR-H3), and an antibody light chain comprising as HVRs the amino acid sequence of SEQ ID NO: 75 (HVR-L1), the amino acid sequence of SEQ ID NO: 76 (HVR-L2), and the amino acid sequence of SEQ ID NO: 77 (HVR-L3), or

d) an antibody heavy chain comprising as HVRs the amino acid sequence of SEQ ID NO: 80 (HVR-H1), the amino acid sequence of SEQ ID NO: 81 (HVR-H2), and the amino acid sequence of SEQ ID NO: 82 (HVR-H3), and an antibody light chain comprising as HVRs the amino acid sequence of SEQ ID NO: 83 (HVR-L1), the amino acid sequence of SEQ ID NO: 84 (HVR-L2), and the amino acid sequence of SEQ ID NO: 85 (HVR-L3), or

e) an antibody heavy chain comprising as HVRs the amino acid sequence of SEQ ID NO: 88 (HVR-H1), the amino acid sequence of SEQ ID NO: 89 (HVR-H2), and the amino acid sequence of SEQ ID NO: 90 (HVR-H3), and an antibody light chain comprising as HVRs the amino acid sequence of SEQ ID NO: 91 (HVR-L1), the amino acid sequence of SEQ ID NO: 92 (HVR-L2), and the amino acid sequence of SEQ ID NO: 93 (HVR-L3), or

f) an antibody heavy chain comprising as HVRs amino acid residues 31-35 (HVR-H1), amino acid residues 50-66 (HVR-H2) and amino acid residues 99-107 (HVR-H3) of SEQ ID NO: 02, and an antibody light chain comprising as HVRs amino acid residues 24-34 (HVR-L1), amino acid residues 50-56 (HVR-L2) and amino acid residues 89-98 (HVR-L3) of SEQ ID NO: 04, or

g) an antibody heavy chain comprising as HVRs amino acid residues 31-35 (HVR-H1), amino acid residues 50-66 (HVR-H2) and amino acid residues 99-107 (HVR-H3) of SEQ ID NO: 01 and an antibody light chain comprising as HVRs amino acid residues 24-34 (HVR-L1), amino acid residues 50-56 (HVR-L2) and amino acid residues 89-98 (HVR-L3) of SEQ ID NO: 03.

2. The antibody according to claim 1, wherein the anti-IGF-1R antibody comprises

a) a heavy chain variable domain VH of SEQ ID NO: 62 and a light chain variable domain VL of SEQ ID NO: 63, or

b) a heavy chain variable domain VH of SEQ ID NO: 70 and a light chain variable domain VL of SEQ ID NO: 71, or

c) a heavy chain variable domain VH of SEQ ID NO: 78 and a light chain variable domain VL of SEQ ID NO: 79, or

d) a heavy chain variable domain VH of SEQ ID NO: 86 and a light chain variable domain VL of SEQ ID NO: 87, or

e) a heavy chain variable domain VH of SEQ ID NO: 94 and a light chain variable domain VL of SEQ ID NO: 95, or

f) a heavy chain variable domain VH of SEQ ID NO: 05 and a light chain variable domain VL of SEQ ID NO: 07, or

g) a heavy chain variable domain VH of SEQ ID NO: 06 and a light chain variable domain of SEQ ID NO: 08.

3. The antibody according to claim 1 or 2, wherein

i) the first Fc-region polypeptide is selected from the group comprising human IgG1 Fc-region polypeptide, human IgG2 Fc-region polypeptide, human IgG3 Fc-region polypeptide, human IgG4 Fc-region polypeptide, human IgG1 Fc-region polypeptide with the mutations L234A, L235A, human IgG1 Fc-region polypeptide with the mutations Y349C, T366S, L368A, Y407V, human IgG1 Fc-region polypeptide with the mutations L234A, L235A, Y349C, T366S, L368A, Y407V, human IgG1 Fc-region polypeptide with the mutations P329G, human IgG1 Fc-region polypeptide with the mutations L234A, L235A, P329G, human IgG1 Fc-region polypeptide with the mutations P329G, Y349C, T366S, L368A, Y407V, human IgG1 Fc-region polypeptide with the mutations L234A, L235A, P329G, Y349C, T366S, L368A, Y407V, human IgG4 Fc-region polypeptide with the mutations S228P, L235E, human IgG4 Fc-region polypeptide with the mutations S228P, L235E, P329G, human IgG4 Fc-region polypeptide with the mutations Y349C, T366S, L368A, Y407V, human IgG4 Fc-region polypeptide with the mutations S228P, L235E, Y349C, T366S, L368A, Y407V, human IgG4 Fc-region polypeptide with the mutations P329G, human IgG4 Fc-region polypeptide with the mutations P329G, Y349C, T366S, L368A, Y407V, and human IgG4 Fc-region polypeptide with the mutations S228P, L235E, P329G, Y349C, T366S, L368A, Y407V, and

ii) the second Fc-region polypeptide is selected from the group comprising human IgG1 Fc-region polypeptide, human IgG2 Fc-region polypeptide, human IgG3 Fc-region polypeptide, human IgG4 Fc-region polypeptide, human IgG1 Fc-region polypeptide with the mutations L234A, L235A, human IgG1 Fc-region polypeptide with the mutations S354C, T366W, human IgG1 Fc-region polypeptide with the mutations L234A, L235A, S354C, T366W, human IgG1 Fc-region polypeptide with the mutations P329G, human IgG1 Fc-region polypeptide with the mutations L234A, L235A, P329G, human IgG1 Fc-region polypeptide with the mutations P329G, S354C, T366W, human IgG1 Fc-region polypeptide with the mutations L234A, L235A, P329G, S354C, T366W, human IgG4 Fc-region polypeptide with the mutations S228P, L235E, human IgG4 Fc-region polypeptide with the mutations S228P, L235E, P329G, human IgG4 Fc-region polypeptide

with the mutations S354C, T366W, human IgG4 Fc-region polypeptide with the mutations S228P, L235E, S354C, T366W, human IgG4 Fc-region polypeptide with the mutations P329G, human IgG4 Fc-region polypeptide with the mutations P329G, S354C, T366W, and human IgG4 Fc-region polypeptide with the mutations S228P, L235E, P329G, S354C, T366W.

4. The antibody according to any one of claims 1 to 3, wherein

i) the first Fc-region polypeptide has an amino acid sequence selected from the group comprising SEQ ID NO: 14, 15, 16, 17, 18, 19, 21, 23, 24, 25, 27, 29, 30, 32, 34, 35, 36, and 38, and

ii) the second Fc-region polypeptide has an amino acid sequence selected from the group comprising SEQ ID NO: 14, 15, 16, 17, 18, 20, 22, 23, 24, 26, 28, 29, 30, 31, 33, 35, 37, and 39.

5. The antibody according to any one of claims 1 to 3, wherein

i) the Fc-region polypeptide is a human IgG1 Fc-region polypeptide and the second Fc-region polypeptide is a human IgG1 Fc-region polypeptide, or

ii) the first Fc-region polypeptide is a human IgG1 Fc-region polypeptide with the mutations L234A, L235A and the second Fc-region polypeptide is a human IgG1 Fc-region polypeptide with the mutations L234A, L235A, or

iii) the first Fc-region polypeptide is a human IgG1 Fc-region polypeptide with the mutations L234A, L235A, P329G and the second Fc-region polypeptide is a human IgG1 Fc-region polypeptide with the mutations L234A, L235A, P329G, or

iv) the first Fc-region polypeptide is a human IgG1 Fc-region polypeptide with the mutations L234A, L235A, S354C, T366W and the second Fc-region polypeptide is a human IgG1 Fc-region polypeptide with the mutations L234A, L235A, Y349C, T366S, L368A, Y407V, or

v) the first Fc-region polypeptide is a human IgG1 Fc-region polypeptide with the mutations L234A, L235A, P329G, S354C, T366W and the second Fc-region polypeptide is a human IgG1 Fc-region polypeptide

with the mutations L234A, L235A, P329G, Y349C, T366S, L368A, Y407V, or

vi) the first Fc-region polypeptide is a human IgG4 Fc-region polypeptide and the second Fc-region polypeptide is a human IgG4 Fc-region polypeptide, or

vii) the first Fc-region polypeptide is a human IgG4 Fc-region polypeptide with the mutations S228P, L235E and the second Fc-region polypeptide is a human IgG4 Fc-region polypeptide with the mutations S228P, L235E, or

viii) the first Fc-region polypeptide is a human IgG4 Fc-region polypeptide with the mutations S228P, L235E, P329G and the second Fc-region polypeptide is a human IgG4 Fc-region polypeptide with the mutations S228P, L235E, P329G, or

ix) the first Fc-region polypeptide is a human IgG4 Fc-region polypeptide with the mutations S228P, L235E, S354C, T366W and the second Fc-region polypeptide is a human IgG4 Fc-region polypeptide with the mutations S228P, L235E, Y349C, T366S, L368A, Y407V, or

x) the first Fc-region polypeptide is a human IgG4 Fc-region polypeptide with the mutations S228P, L235E, P329G, S354C, T366W and the second Fc-region polypeptide is a human IgG4 Fc-region polypeptide with the mutations S228P, L235E, P329G, Y349C, T366S, L368A, Y407V.

6. The antibody according to any one of claims 1 to 5, wherein

i) the first Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 14 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 14, or

ii) the first Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 18 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 18, or

iii) the first Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 24 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 24, or

iv) the first Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 22 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 21, or

v) the first Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 28 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 27, or

vi) the first Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 17 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 17, or

vii) the first Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 29 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 29, or

viii) the first Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 30 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 30, or

ix) the first Fc-region polypeptide is has the amino acid sequence of SEQ ID NO: 33 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 34, or

x) the first Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 39 and the second Fc-region polypeptide has the amino acid sequence of SEQ ID NO: 38.

7. An anti-IGF-1R antibody according to any one of claims 1 to 6 for use in inhibiting IGF-1R in the eye.

8. An anti-IGF-1R antibody according to any one of claims 1 to 6 for use in intravitreal application.

9. An anti-IGF-1R antibody according to any one of claims 1 to 6 for use in the treatment of vascular eye diseases.

10. A pharmaceutical formulation comprising an anti-IGF-1R antibody according to any one of claims 1 to 6 and optionally a pharmaceutically acceptable carrier.

11. An anti-IGF-1R antibody according to any one of claims 1 to 6 for use as a medicament.

12. An anti-IGF-1R antibody according to any one of claims 1 to 6 for use in treating vascular eye diseases.

13. An anti-IGF-1R antibody according to any one of claims 1 to 6 for use in treatment.

14. The antibody for use according to claim 12, further comprising at least one additional therapeutic agent.

15. An anti-IGF-1R antibody according to any one of claims 1 to 6 for use in inhibiting angiogenesis in an individual.

16. Use of an anti-IGF-1R antibody according to any one of claims 1 to 6 in the manufacture of a medicament for the treatment of a vascular eye disease or for inhibiting angiogenesis.

17. The use according to claim 16, further comprising at least one additional therapeutic agent.

18. A pharmaceutical formulations comprising an anti-IGF-1R antibody according to any one of claims 1 to 6.