

CLAIMS

1. An anti-CSF1R antibody or an antigen-binding portion thereof, wherein the
 5 antibody comprises a heavy chain variable (VH) region and a light chain variable (VL)
 region, wherein
 - (a) the VH region amino acid sequence comprises HCDR1 of GYTFSSYYMI
 (SEQ ID NO: 31), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO: 32) and HCDR3
 of EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence
 10 comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASNRAT (SEQ
 ID NO:38) and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);
 - (b) the VH region amino acid sequence comprises HCDR1 of GYTFSSNYMI
 (SEQ ID NO:50), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO: 32), HCDR3 of
 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises
 15 LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASDRAT (SEQ ID NO:60)
 and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);
 - (c) the VH region amino acid sequence comprises HCDR1 of GYTFSSAYMI
 (SEQ ID NO:57), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32) and HCDR3 of
 EGPYFSNLYVMDY (HCDR3; SEQ ID NO: 33); and the VL region amino acid sequence
 20 comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO:37), LCDR2 of AASDRAT (SEQ
 ID NO:60) and LCDR3 of QLSNEDLLT (SEQ ID NO:39); or
 - (d) the VH region amino acid sequence comprises HCDR1 of GYTFTSYMYI
 (SEQ ID NO:41), HCDR2 of MGDINPYNGGTTAQKFQG (SEQ ID NO:42) and HCDR3 of
 EGPYFSNLYVMDY (SEQ ID NO:33); and the VL region amino acid sequence comprises
 25 LCDR1 of RASQSVSYEGENYLA (SEQ ID NO:40), LCDR2 of AASNLAT (SEQ ID NO:43)
 and LCDR3 of QLSNEDLLT (SEQ ID NO:39).
2. The antibody or antigen-binding portion of claim 1, wherein
 - (a) the VH region amino acid sequence comprises SEQ ID NO:352 and the VL
 30 region amino acid sequence comprises SEQ ID NO:351;
 - (b) the VH region amino acid sequence comprises SEQ ID NO:354 and the VL
 region amino acid sequence comprises SEQ ID NO:353;
 - (c) the VH region amino acid sequence comprises SEQ ID NO:356 and the VL
 region amino acid sequence comprises SEQ ID NO:355; or
 - 35 (d) the VH region amino acid sequence comprises SEQ ID NO:358 and the VL
 region amino acid sequence comprises SEQ ID NO:357.

3. An anti-CSF1R antibody or an antigen-binding portion thereof, wherein the antibody comprises a heavy chain variable (VH) region comprising HCDR1, HCDR2, and HCDR3 and a light chain variable (VL) region comprising LCDR1, LCDR2, and LCDR3, wherein
- 5 (a) the HCDR1 comprises the amino acid sequence G-X₁-T-F-X₂-X₃-X₄-X₅-X₆-X₇, wherein X₁ is Y or G, X₂ is T or S, X₃ is D or S, X₄ is N, A, S, H, or Y, X₅ is Y or A, X₆ is M or I, and X₇ is I or S (SEQ ID NO: 25);
- (b) the HCDR2 comprises the amino acid sequence X₁-G-X₂-I-X₃-P-X₄-X₅-G-X₆-X₇-X₈-X₉-X₁₀-Q-K-F-X₁₁-G, wherein X₁ is M or a conservative substitution of M, X₂ is D or G, 10 X₃ is N or I, X₄ is Y or I, X₅ is N or F, X₆ is G or T, X₇ is T or A, X₈ is T or N, X₉ is F or Y, X₁₀ is N or A, and X₁₁ is Q or K (SEQ ID NO: 26);
- (c) the HCDR3 comprises the amino acid sequence X₁-X₂-X₃-X₄-X₅-X₆-X₇-X₈-X₉-V-M-D-Y, wherein X₁ is E or a conservative substitution of E, X₂ is D, G, H, S, T, P, V, N, I, or Y, X₃ is P, T, N, E, L, A, D, or S, X₄ is Y, K, R, M, or P, X₅ is F, D, S, T, E, W, M, Y, L, Q, K, 15 G, A, or I, X₆ is S, E, G, or R, X₇ is N, E, Q, G, H, or M, X₈ is L, H, S, or Y, and X₉ is Y or W (SEQ ID NO: 27);
- (d) the LCDR1 comprises the amino acid sequence R-A-S-Q-S-V-X₁-Y-X₂-G-X₃-N-Y-L-X₄, wherein X₁ is S, D, or E, X₂ is D, E, or Q, X₃ is D or E, and X₄ is N or A (SEQ ID NO: 28);
- 20 (e) the LCDR2 comprises the amino acid sequence X₁-A-S-X₂-X₃-X₄-T, wherein X₁ is A or D, X₂ is D or N, X₃ is L or R, and X₄ is E or A (SEQ ID NO: 29); and
- (f) the LCDR3 comprises the amino acid sequence X₁-X₂-S-X₃-X₄-X₅-L-X₆-T, wherein X₁ is Q, H, or N, X₂ is L or Q, X₃ is N or S, X₄ is E, Q, or N, X₅ is D or W, and X₆ is L or S (SEQ ID NO: 30).
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4. An anti-CSF1R antibody or an antigen-binding portion thereof, wherein the antibody comprises a heavy chain variable (VH) region and a light chain variable (VL) region, wherein
- (a) the VH region amino acid sequence comprises HCDR1 of GYTFSSYYMI (SEQ 30 ID NO: 31), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYQGENYLA (SEQ ID NO: 34), LCDR2 of DASNRAT (SEQ ID NO: 35), and LCDR3 of QLSNQDLLT (SEQ ID NO: 36);
- (b) the VH region amino acid sequence comprises HCDR1 of GYTFSSYYMI (SEQ 35 ID NO: 31), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises

LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

(c) the VH region amino acid sequence comprises HCDR1 of GYTFSSYYMI (SEQ ID NO: 31), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 5 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLA (SEQ ID NO:40), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNQDLLT (SEQ ID NO: 36);

(d) the VH region amino acid sequence comprises HCDR1 of GYTFTSYMYI (SEQ ID NO:41), HCDR2 of MGDINPYNGGTTAQKFQG (SEQ ID NO: 42), and HCDR3 of
 10 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLA (SEQ ID NO:40), LCDR2 of AASNLAT (SEQ ID NO:43), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

(e) the VH region amino acid sequence comprises HCDR1 of GYTFTSYMYI (SEQ ID NO:41), HCDR2 of MGDINPYNGGANFAQKFQG (SEQ ID NO:44), and HCDR3 of
 15 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

(f) the VH region amino acid sequence comprises HCDR1 of GYTFTSYMYI (SEQ ID NO:41), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 20 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

(g) the VH region amino acid sequence comprises HCDR1 of GYTFSSYYMI (SEQ ID NO: 31), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 25 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVEYQGDNYLN (SEQ ID NO:45), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

(h) the VH region amino acid sequence comprises HCDR1 of GYTFTSYMYI (SEQ ID NO:46), HCDR2 of MGDINPYNGGATYAQKFQG (SEQ ID NO:47), and HCDR3 of
 30 EPPYFSNLYVMDY (SEQ ID NO:48); and the VL region amino acid sequence comprises LCDR1 of RASQSVEYEGDNYLN (SEQ ID NO:49), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNQDLLT (SEQ ID NO: 36);

(i) the VH region amino acid sequence comprises HCDR1 of GYTFSSNYMI (SEQ ID NO:50), HCDR2 of MGDINPYNGGATYNQKFQG (SEQ ID NO:51), and HCDR3 of
 35 EPPYFSNLYVMDY (SEQ ID NO:48); and the VL region amino acid sequence comprises

LCDR1 of RASQSVEYEGENYLN (SEQ ID NO:52), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNQDLLT (SEQ ID NO: 36);

(j) the VH region amino acid sequence comprises HCDR1 of GYTFSSYYMI (SEQ ID NO: 31), HCDR2 of MGDINPYNGGTTYAQKFQG (SEQ ID NO: 42), and HCDR3 of
 5 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVEYQGENYLN (SEQ ID NO:53), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNQDLLT (SEQ ID NO: 36);

(k) the VH region amino acid sequence comprises HCDR1 of GYTFTSNYII (SEQ ID NO:54), HCDR2 of MGDINPYNGGTNYAQKFQG (SEQ ID NO:55), and HCDR3 of
 10 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVEYQGENYLN (SEQ ID NO:53), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSSEDLLT (SEQ ID NO:56);

(l) the VH region amino acid sequence comprises HCDR1 of GYTFSSNYMI (SEQ ID NO:50), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 15 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

(m) the VH region amino acid sequence comprises HCDR1 of GYTFSSAYMI (SEQ ID NO:57), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 20 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

(n) the VH region amino acid sequence comprises HCDR1 of GYTFSSSYMI (SEQ ID NO:58), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 25 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

(o) the VH region amino acid sequence comprises HCDR1 of GYTFSSHYMI (SEQ ID NO:59), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 30 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASNRAT (SEQ ID NO:38), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

(p) the VH region amino acid sequence comprises HCDR1 of GYTFSSNYMI (SEQ ID NO:50), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 35 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises

LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASDRAT (SEQ ID NO:60), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

- (q) the VH region amino acid sequence comprises HCDR1 of GYTFSSAYMI (SEQ ID NO:57), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 5 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASDRAT (SEQ ID NO:60), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39);

- (r) the VH region amino acid sequence comprises HCDR1 of GYTFSSSYMI (SEQ ID NO:58), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 10 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASDRAT (SEQ ID NO:60), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39); or

- (s) the VH region amino acid sequence comprises HCDR1 of GYTFSSHYMI (SEQ ID NO:59), HCDR2 of MGDINPYNGGANYAQKFQG (SEQ ID NO:32), and HCDR3 of
 15 EGPYFSNLYVMDY (SEQ ID NO: 33); and the VL region amino acid sequence comprises LCDR1 of RASQSVSYEGENYLN (SEQ ID NO: 37), LCDR2 of AASDRAT (SEQ ID NO:60), and LCDR3 of QLSNEDLLT (SEQ ID NO: 39).

5. An anti-CSF1R antibody or an antigen-binding portion thereof, wherein the
 20 antibody comprises a heavy chain variable (VH) region and a light chain variable (VL) region, wherein the VH region amino acid sequence comprises SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3; SEQ ID NO:4; SEQ ID NO:5; SEQ ID NO:6; SEQ ID NO:7; or SEQ ID NO:8; and the VL region amino acid sequence comprises SEQ ID NO:9; SEQ ID NO:10; SEQ ID NO:11 or SEQ ID NO:12.

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6. The antibody or antigen-binding portion of claim 5, wherein

(a) the VH region amino acid sequence comprises SEQ ID NO:1, and the VL region amino acid sequence comprises SEQ ID NO:9;

- (b) the VH region amino acid sequence comprises SEQ ID NO:1, and the VL region
 30 amino acid sequence comprises SEQ ID NO:10;

(c) the VH region amino acid sequence comprises SEQ ID NO:1, and the VL region amino acid sequence comprises SEQ ID NO:11;

(d) the VH region amino acid sequence comprises SEQ ID NO:1, and the VL region amino acid sequence comprises SEQ ID NO:12;

- (e) the VH region amino acid sequence comprises SEQ ID NO:2, and the VL region
 35 amino acid sequence comprises SEQ ID NO:9;

- (f) the VH region amino acid sequence comprises SEQ ID NO:2, and the VL region amino acid sequence comprises SEQ ID NO:10;
- (g) the VH region amino acid sequence comprises SEQ ID NO:2, and the VL region amino acid sequence comprises SEQ ID NO:11;
- 5 (h) the VH region amino acid sequence comprises SEQ ID NO:2, and the VL region amino acid sequence comprises SEQ ID NO:12;
- (i) the VH region amino acid sequence comprises SEQ ID NO:3, and the VL region amino acid sequence comprises SEQ ID NO:9;
- (j) the VH region amino acid sequence comprises SEQ ID NO:3, and the VL region amino acid sequence comprises SEQ ID NO:10;
- 10 (k) the VH region amino acid sequence comprises SEQ ID NO:3, and the VL region amino acid sequence comprises SEQ ID NO:11;
- (l) the VH region amino acid sequence comprises SEQ ID NO:3, and the VL region amino acid sequence comprises SEQ ID NO:12;
- 15 (m) the VH region amino acid sequence comprises SEQ ID NO:4, and the VL region amino acid sequence comprises SEQ ID NO:9;
- (n) the VH region amino acid sequence comprises SEQ ID NO:4, and the VL region amino acid sequence comprises SEQ ID NO:10;
- (o) the VH region amino acid sequence comprises SEQ ID NO:4, and the VL region amino acid sequence comprises SEQ ID NO:11;
- 20 (p) the VH region amino acid sequence comprises SEQ ID NO:4, and the VL region amino acid sequence comprises SEQ ID NO:12;
- (q) the VH region amino acid sequence comprises SEQ ID NO:5, and the VL region amino acid sequence comprises SEQ ID NO:9;
- 25 (r) the VH region amino acid sequence comprises SEQ ID NO:5, and the VL region amino acid sequence comprises SEQ ID NO:10;
- (s) the VH region amino acid sequence comprises SEQ ID NO:5, and the VL region amino acid sequence comprises SEQ ID NO:11;
- (t) the VH region amino acid sequence comprises SEQ ID NO:5, and the VL region amino acid sequence comprises SEQ ID NO:12;
- 30 (u) the VH region amino acid sequence comprises SEQ ID NO:6, and the VL region amino acid sequence comprises SEQ ID NO:9;
- (v) the VH region amino acid sequence comprises SEQ ID NO:6, and the VL region amino acid sequence comprises SEQ ID NO:10;
- 35 (w) the VH region amino acid sequence comprises SEQ ID NO:6, and the VL region amino acid sequence comprises SEQ ID NO:11;

- (x) the VH region amino acid sequence comprises SEQ ID NO:6, and the VL region amino acid sequence comprises SEQ ID NO:12;
- (y) the VH region amino acid sequence comprises SEQ ID NO:7, and the VL region amino acid sequence comprises SEQ ID NO:9;
- 5 (z) the VH region amino acid sequence comprises SEQ ID NO:7, and the VL region amino acid sequence comprises SEQ ID NO:10;
- (aa) the VH region amino acid sequence comprises SEQ ID NO:7, and the VL region amino acid sequence comprises SEQ ID NO:11;
- (bb) the VH region amino acid sequence comprises SEQ ID NO:7, and the VL
- 10 region amino acid sequence comprises SEQ ID NO:12;
- (cc) the VH region amino acid sequence comprises SEQ ID NO:8, and the VL region amino acid sequence comprises SEQ ID NO:9;
- (dd) the VH region amino acid sequence comprises SEQ ID NO:8, and the VL region amino acid sequence comprises SEQ ID NO:10;
- 15 (ee) the VH region amino acid sequence comprises SEQ ID NO:8, and the VL region amino acid sequence comprises SEQ ID NO:11; or
- (ff) the VH region amino acid sequence comprises SEQ ID NO:8, and the VL region amino acid sequence comprises SEQ ID NO:12.
- 20 7. An anti-CSF1R antibody or an antigen-binding portion thereof, wherein the antibody or antigen-binding portion cross-competes for binding to CSF1R with the antibody or antigen-binding portion of any one of claims 1-6; and
- (a) comprises fully germline human framework amino acid sequences;
- (b) comprises the IGHV1-69*01 allele germline framework regions in the VH
- 25 domain;
- (c) does not contain an isomerisation risk motif in the LCDR1 sequence;
- (d) binds specifically to human CSF1R, cynomolgus CSF1R, and rhesus CSF1R; and/or
- (e) binds to human CSF1R with a KD that is within 3-fold of said antibody's or
- 30 antigen-binding portion's KD for binding to cynomolgus CSF1R;
- (f) does not comprise a human T cell epitope sequence in the Framework 3/LCDR3 region of the VL domain; and/or
- (g) does not comprise a human T cell epitope sequence in the HCDR-2/Framework 3 region of the VH domain; and/or
- 35 (h) does not comprise a human T cell epitope sequence in the HCDR1/Framework 2 region of the VH domain; and/or

- (i) does not comprise a human T cell epitope sequence in the HCDR3/Framework 4 region of the VH domain; and/or
- (j) does not comprise a human T cell epitope sequence in the Framework 2/LCDR2 region of the VL domain; and/or
- 5 (k) exhibits minimal or no binding to insulin and/or double-stranded DNA; and/or
- (l) exhibits reduced susceptibility to oxidative damage compared to antibody hu0301, when in IgG4(S228P) antibody format; and/or
- (m) exhibits improved thermal stability in the Fab domain compared to antibody hu0301, when in IgG4(S228P) antibody format; and/or
- 10 (n) exhibits reduced hydrophobic species heterogeneity compared to antibody hu0301, when in IgG4(S228P) antibody format.
8. The antibody or antigen-binding portion of any one of claims 1-6, wherein the antibody is human, humanized or chimeric.
- 15 9. The antibody or antigen-binding portion of any one of claims 1-8, wherein the VH region, the VL region, or both the VH and the VL region comprise one or more human framework region amino acid sequences.
- 20 10. The antibody or antigen-binding portion of any one of claims 1-9, wherein the VH region, the VL region, or both the VH and the VL region comprise a human variable region framework scaffold amino acid sequence into which the CDRs have been inserted.
- 25 11. The antibody or antigen-binding portion of any one of claims 1, 3, 4 and 7 wherein the VH region comprises an IGHV1-69*01 human germline scaffold amino acid sequence into which the HCDR1, HCDR2 and HCDR3 amino acid sequences have been inserted.
- 30 12. The antibody or antigen-binding portion of any one of claims 1, 3, 4, 7 and 11, wherein the VL region comprises an IGKV3-11 human germline scaffold amino acid sequence into which the LCDR1, LCDR2 and LCDR3 amino acid sequences have been inserted.
- 35 13. The antibody or antigen-binding portion of any one of claims 1-12, wherein the antibody comprises an immunoglobulin constant region.

14. The antibody or antigen-binding portion of claim 13, wherein the immunoglobulin constant region is IgG, IgE, IgM, IgD, IgA or IgY.
15. The antibody or antigen-binding portion of claim 14, wherein the immunoglobulin constant region is IgG1, IgG2, IgG3, IgG4, IgA1 or IgA2.
16. The antibody or antigen-binding portion of claim 13, wherein the immunoglobulin constant region is immunologically inert.
17. The antibody or antigen-binding portion of claim 13, wherein the immunoglobulin constant region is a wild-type human IgG4 constant region, a human IgG4 constant region comprising the amino acid substitution S228P, a wild-type human IgG1 constant region or a human IgG1 constant region comprising the amino acid substitutions L234A, L235A and G237A.
18. The antibody or antigen-binding portion of claim 13, wherein the immunoglobulin constant region comprises any one of SEQ ID NOS:359-364.
19. The antigen-binding portion of any one of claims 1-18, wherein the antibody or antigen-binding portion is an Fab, an Fab', an F(ab')₂, an Fd, an Fv, an scFv, a single domain antibody (dAb), a maxibody, a minibody, an intrabody, a diabody, a triabody, a tetrabody, a v-NAR or a bis-scFv,
20. The antibody or antigen-binding portion of any one of claims 1-19, wherein the antibody is monoclonal.
21. The antibody or antigen-binding portion of any one of claims 1-20, wherein the antibody is a tetrameric antibody, a tetravalent antibody or a multispecific antibody.
22. The antibody or antigen-binding portion of any one of claims 1-21, wherein the antibody is a bispecific antibody that binds specifically to a first antigen and a second antigen, wherein the first antigen is CSF1R and the second antigen is not CSF1R.
23. The antibody or antigen-binding portion of any one of claims 1-22, wherein the antibody or antigen-binding portion binds specifically to (a) human CSF1R, (b) human

CSF1R and cynomolgus CSF1R, or (c) human CSF1R, cynomolgus CSF1R, and rhesus CSF1R.

24. An immunoconjugate comprising the antibody or antigen-binding portion of any one
5 of claims 1-23 linked to a therapeutic agent.

25. The immunoconjugate of claim 24, wherein the therapeutic agent is a cytotoxin, a
radioisotope, a chemotherapeutic agent, an immunomodulatory agent, an anti-angiogenic
agent, an antiproliferative agent, a pro-apoptotic agent, a cytostatic enzyme, a cytolytic
10 enzymes, a therapeutic nucleic acid, an anti-angiogenic agent, an anti-proliferative agent,
or a pro-apoptotic agent.

26. A pharmaceutical composition comprising the antibody or antigen-binding portion of
any one of claims 1-23 or the immunoconjugate of claim 24 or 25, and a pharmaceutically
15 acceptable carrier, diluent or excipient.

27. A nucleic acid molecule encoding
(a) the VH region amino acid sequence;
(b) the VL region amino acid sequence; or
20 (c) both the VH and the VL region amino acid sequences
of the antibody or antigen-binding portion of any one of claims 1-23.

28. An expression vector comprising the nucleic acid molecule of claim 27.

25 29. A recombinant host cell comprising the nucleic acid molecule of claim 27 or the
expression vector of claim 28.

30. A method of producing an anti-CSF1R antibody or an antigen-binding portion
thereof, the method comprising:
30 culturing a recombinant host cell comprising the expression vector of claim 28
under conditions whereby the nucleic acid molecule is expressed, thereby producing the
antibody or antigen-binding portion; and
isolating the antibody or antigen-binding portion from the host cell or culture.

35 31. A method for enhancing an immune response in a subject, comprising
administering to the subject a therapeutically effective amount of the antibody or antigen-

binding portion of any one of claims 1-23, the immunoconjugate of claim 24 or 25 or the pharmaceutical composition of claim 26.

32. A method of treating or preventing cancer, an infectious disease, or an immune
5 disease in a subject, comprising administering to the subject a therapeutically effective amount of the antibody or antigen-binding portion of any one of claims 1-23, the immunoconjugate of claim 24 or 25 or the pharmaceutical composition of claim 26.

33. The method of claim 32, wherein the cancer is pancreatic cancer, melanoma,
10 breast cancer, lung cancer, bronchial cancer, colorectal cancer, prostate cancer, stomach cancer, ovarian cancer, urinary bladder cancer, brain or central nervous system cancer, peripheral nervous system cancer, esophageal cancer, cervical cancer, uterine or endometrial cancer, cancer of the oral cavity or pharynx, liver cancer, kidney cancer, testicular cancer, biliary tract cancer, small bowel or appendix cancer, salivary gland
15 cancer, thyroid gland cancer, adrenal gland cancer, osteosarcoma, chondrosarcoma, or cancer of hematological tissues.

34. The method of claim 32, wherein the infectious disease is viral, bacterial, fungal, or
20 parasitic.

35. The method of claim 32, wherein the immune disease is pigmented villonodular synovitis.

36. The antibody or antigen-binding portion of any one of claims 1-23, the
25 immunoconjugate of claim 24 or 25 or the pharmaceutical composition of claim 26 for use in the treatment of cancer, an infectious disease, or an immune disease.

37. The antibody or antigen-binding portion, the immunoconjugate or the
30 pharmaceutical composition for use according to claim 36, wherein the cancer is pancreatic cancer, melanoma, breast cancer, lung cancer, bronchial cancer, colorectal cancer, prostate cancer, stomach cancer, ovarian cancer, urinary bladder cancer, brain or central nervous system cancer, peripheral nervous system cancer, esophageal cancer, cervical cancer, uterine or endometrial cancer, cancer of the oral cavity or pharynx, liver cancer, kidney cancer, testicular cancer, biliary tract cancer, small bowel or appendix cancer,
35 salivary gland cancer, thyroid gland cancer, adrenal gland cancer, osteosarcoma, chondrosarcoma, or cancer of hematological tissues.

38. The antibody or antigen-binding portion, the immunoconjugate or the pharmaceutical composition for use according to claim 36, wherein the infectious disease is viral, bacterial, fungal, or parasitic.
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39. The antibody or antigen-binding portion, the immunoconjugate or the pharmaceutical composition for use according to claim 36, wherein the immune disease is pigmented villonodular synovitis.
- 10
40. The antibody or antigen-binding portion of any one of claims 1-23, the immunoconjugate of claim 24 or 25 or the pharmaceutical composition of claim 26, for use as a medicament.