

CLAIMS

1. ~~An isolated anti-GM-CSFR α antibody that specifically binds to an epitope on human GM-CSFR α , wherein the epitope comprises amino acid residues Val50, Glu59, Lys194, Lys195, Arg283, and Ile284 of human GM-CSFR α .~~
2. ~~The isolated anti-GM-CSFR α antibody of claim 1, wherein the epitope further comprises amino acid residues:~~
 - (i) ~~Val51, Thr63, and Ile196; or~~
 - (ii) ~~Leu191 and Ile196; or~~
 - (iii) ~~Arg49, Val51, Asn57, and Ser61.~~
3. ~~The isolated anti-GM-CSFR α antibody of claims 1 or 2, wherein the anti-GM-CSFR α antibody has a T_m of at least about 69°C.~~
4. ~~The isolated anti-GM-CSFR α antibody of any one of claims 1-3, wherein the anti-GM-CSFR α antibody binds to the human GM-CSFR α with a K_d from about 0.1 pM to about 1 nM.~~
5. ~~An isolated anti-GM-CSFR α antibody, wherein the anti-GM-CSFR α antibody comprises:~~
 - ~~a heavy chain variable domain (V_H) comprising a heavy chain complementarity determining region (HC-CDR) 1 comprising X₁LX₂X₃H (SEQ ID NO: 76), wherein X₁ is E, N, G, D, M, S, P, F, Y, A, V, K, W, R or C, X₂ is S, C or P, and X₃ is I or M;~~
 - ~~an HC-CDR2 comprising GFDX₁X₂X₃X₄EX₅X₆YAQKX₇QG (SEQ ID NO: 77), wherein X₁ is P, G, T, S, or V, X₂ is E, D, G, or A, X₃ is D, G, I, W, S, or V, X₄ is G, E, D, or H, X₅ is T or A, X₆ is N or I, and X₇ is S or F; and~~
 - ~~an HC-CDR3 comprising GRYX₁X₂X₃X₄X₅X₆YGFDY (SEQ ID NO: 78), wherein X₁ is C, T, S, I, A, or V, X₂ is S, G, E, F, W, H, I, V, N, Y, T, or R, X₃ is T, H, L, F, P, I, S, Y, K, A, D, V, N, or G, X₄ is D, A, M, Y, F, S, T, G, or W, X₅ is T, S, F, Q, A, N, L, E, I, G, or M, and X₆ is C, T, N, S, or A;~~
 - ~~and a light chain variable domain (V_L) comprising a light chain complementarity determining region (LC-CDR) 1 comprising RAX₁X₂X₃VX₄X₅X₆LA (SEQ ID NO: 293), wherein X₁ is S, L, N, A, K, R, I, Q, G, T, H, M, or C, X₂ is Q, Y, P, A, I, F, T, R, V, L,~~

E, S, or C, X₃ is S, H, W, L, R, K, T, P, I, F, V, E, A, or Q, X₄ is S, L, W, M, A, Y, K, R, G, T, E, V, N, F, or C, X₅ is S, T, R, A, H, Q, P, M, L, or G, and X₆ is Y, L, or F;
~~a LC-CDR2 comprising X₁X₂X₃SRAT (SEQ ID NO: 294), wherein X₁ is G or T, X₂ is A, G, R, H, K, S, T, M, or F, and X₃ is S, A, W, R, L, T, Q, F, Y, H, or N; and~~
~~a LC-CDR3 comprising QQYX₁X₂X₃PX₄T (SEQ ID NO: 79), wherein X₁ is N, D, S, R, A, T, L, Y, Q, W or G, X₂ is N, D, E, T, Y, G, A, M, F, S, I or L, X₃ is W, S, P, V, G, or R, and X₄ is P, Y, H, S, F, N, D, V, or G.~~

6. ~~The isolated anti GM-CSFR α antibody of claim 5, wherein the anti GM-CSFR α antibody comprises:~~

~~a V_H comprising a HC-CDR1 comprising ELX₁X₂H (SEQ ID NO: 295), wherein X₁ is S, C or P, and X₂ is I or M; an HC-CDR2 comprising~~
~~GFDX₁X₂X₃X₄EX₅X₆YAQKX₇QG (SEQ ID NO: 77), wherein X₁ is P, G, T, S, or V, X₂ is E, D, G, or A, X₃ is D, G, I, W, S, or V, X₄ is G, E, D, or H, X₅ is T or A, X₆ is N or I, and X₇ is S or F; and an HC-CDR3 comprising GRYX₁X₂X₃X₄X₅X₆YGFY (SEQ ID NO: 78), wherein X₁ is C, T, S, I, A, or V, X₂ is S, G, E, F, W, H, I, V, N, Y, T, or R, X₃ is T, H, L, F, P, I, S, Y, K, A, D, V, N, or G, X₄ is D, A, M, Y, F, S, T, G, or W, X₅ is T, S, F, Q, A, N, L, E, I, G, or M, and X₆ is C, T, N, S, or A;~~
~~and a V_L comprising a LC-CDR1 comprising RASQSVSSYLA (SEQ ID NO: 51); a LC-CDR2 comprising GASSRAT (SEQ ID NO: 52); and a LC-CDR3 comprising~~
~~QQYX₁X₂X₃PX₄T (SEQ ID NO: 79), wherein X₁ is N, D, S, R, A, T, L, Y, Q, W or G, X₂ is N, D, E, T, Y, G, A, M, F, S, I or L, X₃ is W, S, P, V, G, or R, and X₄ is P, Y, H, S, F, N, D, V, or G.~~

7. ~~An isolated anti GM-CSFR α antibody, comprising:~~

~~a V_H comprising an HC-CDR1 comprising the amino acid sequence of any one of SEQ ID NOs: 1-4, or a variant thereof comprising up to about 3 amino acid substitutions; an HC-CDR2 comprising the amino acid sequence of any one of SEQ ID NOs: 5-16, or a variant thereof comprising up to about 3 amino acid substitutions; and an HC-CDR3 comprising the amino acid sequence of any one of SEQ ID NOs: 17-50, or a variant thereof comprising up to about 3 amino acid substitutions; and~~

a ~~V_L~~ comprising a LC CDR1 comprising the amino acid sequence of SEQ ID NO: 51, or a variant thereof comprising up to about 3 amino acid substitutions; a LC CDR2 comprising the amino acid sequence of SEQ ID NO: 52, or a variant thereof comprising up to about 3 amino acid substitutions; and a LC CDR3 comprising the amino acid sequence of any one of SEQ ID NOs: 53-75, or a variant thereof comprising up to about 3 amino acid substitutions.

8. ~~An isolated anti-GM-CSFR α antibody, comprising a V_H comprising an HC CDR1, an HC CDR2, and an HC CDR3 of a V_H comprising the amino acid sequence of any one of SEQ ID NOs: 80-121; and a V_L comprising a LC CDR1, a LC CDR2, and a LC CDR3 of a V_L comprising the amino acid sequence of any one of SEQ ID NOs: 122-144.~~

9.1. ~~The~~ An isolated anti-GM-CSFR α antibody of any one of claims 1-8, comprising:

(i) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 5, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 17; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 53;

~~(+)(ii)~~ a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 5, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 17; or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 54, or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs;

(iii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 2, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 18; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51,

- a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 53;
- (iv) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 19; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 53;
- (v) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 20; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 53;
- (vi) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 21; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 55;
- (ii)(vii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 8, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 22; or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 56; or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs;
- (iii)(viii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO:

23, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs~~; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 57, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs~~;

- (ix) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 24; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 53;
- (x) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 25; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 58;
- (xi) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 17; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 58;
- (xii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 26; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 59;
- (iv)(xiii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID

NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 27, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs~~; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 57, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs~~;

- (xiv) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 2, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 28; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 60;
- (xv) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 29; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 58;
- (xvi) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 30; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 61;
- (xvii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 2, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 31; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 62;

(xviii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 2, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 32; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 63;

(xix) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 33; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 60;

(xx) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 34; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 55;

(+)(xxi) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 35, or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 53, or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs;

(xxii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 2, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 36; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51,

a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 64;

~~(vi)~~(xxiii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 37, or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 57, or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs;

(xxiv) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 2, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 38; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 53;

~~(vii)~~(xxv) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 3, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 39, or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 54, or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs;

(xxvi) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 9, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 40; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 65;

- (xxvii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 10, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 27; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 66;
- (xxviii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 40; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 67;
- (xxix) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 2, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 43; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 55;
- (xxx) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 2, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 45; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 53;
- (xxxii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 2, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 48; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 55;
- (xxxiii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 14,

and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 49; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 73;

~~(viii)~~(xxxiii) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 35, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs;~~ and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 57, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs;~~

(xxxiv) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 7, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 50, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs;~~ and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 57;
or

~~(ix)~~(xxxv) a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 27; and a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 61, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs.~~

10.2. The isolated anti-GM-CSFR α antibody of ~~any one of~~ claims 1-9, comprising a V_H comprising an HC-CDR1 comprising the amino acid sequence of SEQ ID NO: 1, an

HC-CDR2 comprising the amino acid sequence of SEQ ID NO: 6, and an HC-CDR3 comprising the amino acid sequence of SEQ ID NO: 27, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the HC-CDRs~~; a V_L comprising a LC-CDR1 comprising the amino acid sequence of SEQ ID NO: 51, a LC-CDR2 comprising the amino acid sequence of SEQ ID NO: 52, and a LC-CDR3 comprising the amino acid sequence of SEQ ID NO: 57, ~~or a variant thereof comprising up to about 5 amino acid substitutions in the LC-CDRs~~.

~~14-3.~~ The isolated anti-GM-CSFR α antibody of any one of claims ~~51-102~~, comprising amino acid residues:

- (i) E, H, N, G, D, M, S, P, F, Y, A, V, K, W, R, or C at position 31 of the V_H; and/or
 - (ii) S, L, N, A, K, R, I, Q, G, T, H, M, or C at position 26 of the V_L; and/or
 - (iii) Q, Y, P, A, I, F, T, R, V, L, E, S, or C at position 27 of the V_L; and/or
 - (iv) S, H, W, L, R, K, T, P, I, F, V, E, A, or Q at position 28 of the V_L; and/or
 - (v) S, L, W, M, A, Y, K, R, G, T, E, V, N, F, or C at position 30 of the V_L; and/or
 - (vi) S, T, R, A, H, Q, P, M, L, or G at position 31 of the V_L; and/or
 - (vii) Y, L or F at position 32 of the V_L; and/or
 - (viii) G, or T at position 50 of the V_L; and/or
 - (ix) A, G, R, H, K, S, T, M, F, N, or V at position 51 of the V_L; and/or
 - (x) S, A, W, R, L, T, Q, F, Y, H, or N at position 52 of the V_L; and/or
 - (xi) D, A, Q, or W at position 92 of the V_L; and/or
 - (xii) N, D, E, T, Y, G, A, M, F, S, I, or L at position 93 of the V_L; and/or
 - (xiii) amino acid residues selected from T, H, V, E, P, L, M, S, W, C, A, G, N, or K at position 28 of the V_H; and/or
 - (xiv) amino acid residues selected from T, P, D, E, Y, W, V, M, N, L, Q, G, S, A, K, or R at position 30 of the V_H,
- wherein the numbering is according to the EU index of Kabat.

~~12. The isolated anti-GM-CSFR α antibody of any one of claims 1-11, comprising:~~
~~a V_H comprising the amino acid sequence of any one of SEQ ID NOs: 80-121, and 246-287, or a variant thereof having at least about 90% sequence identity to the amino acid sequence of any one of SEQ ID NOs: 80-121, and 246-287; and~~

~~a V_L comprising the amino acid sequence of any one of SEQ ID NOs: 122-144, 150-245, and 288-289, or a variant thereof having at least about 90% sequence identity to the amino acid sequence of any one of SEQ ID NOs: 122-144, 150-245, and 288-289.~~

~~13.4.~~ The isolated anti-GM-CSFR α antibody of any one of claims 12-3, comprising:

- (i) a V_H comprising the amino acid sequence of SEQ ID NO: 80, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 80; and a V_L comprising the amino acid sequence of SEQ ID NO: 122, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 122;
- ~~(ii)~~ (ii) a V_H comprising the amino acid sequence of SEQ ID NO: 80, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 80; and a V_L comprising the amino acid sequence of SEQ ID NO: 123, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 123;
- (iii) a V_H comprising the amino acid sequence of SEQ ID NO: 81, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 81; and a V_L comprising the amino acid sequence of SEQ ID NO: 122, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 122;
- (iv) a V_H comprising the amino acid sequence of SEQ ID NO: 82, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 82; and a V_L comprising the amino acid sequence of SEQ ID NO: 122, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 122;
- (v) a V_H comprising the amino acid sequence of SEQ ID NO: 83, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 83; and a V_L comprising the amino acid sequence of SEQ ID NO: 122, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 122;
- (vi) a V_H comprising the amino acid sequence of SEQ ID NO: 84, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID

- NOs: 84; and a V_L comprising the amino acid sequence of SEQ ID NO: 124, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 124;
- ~~(ii)~~(vii) a V_H comprising the amino acid sequence of SEQ ID NO: 85, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 85; and a V_L comprising the amino acid sequence of SEQ ID NO: 125, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 125;
- ~~(iii)~~(viii) a V_H comprising the amino acid sequence of SEQ ID NO: 86, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 86; and a V_L comprising the amino acid sequence of SEQ ID NO: 126, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 126;
- (ix) a V_H comprising the amino acid sequence of SEQ ID NO: 87, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 87; and a V_L comprising the amino acid sequence of SEQ ID NO: 122, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 122;
- (x) a V_H comprising the amino acid sequence of SEQ ID NO: 88, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 88; and a V_L comprising the amino acid sequence of SEQ ID NO: 127, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 127;
- (xi) a V_H comprising the amino acid sequence of SEQ ID NO: 89, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 89; and a V_L comprising the amino acid sequence of SEQ ID NO: 127, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 127;
- (xii) a V_H comprising the amino acid sequence of SEQ ID NO: 90, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 90; and a V_L comprising the amino acid sequence of SEQ ID NO: 128, or a

variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 128;

- ~~(iv)~~(xiii) a V_H comprising the amino acid sequence of SEQ ID NO: 91, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 91; and a V_L comprising the amino acid sequence of SEQ ID NO: 126, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 126;
- (xiv) a V_H comprising the amino acid sequence of SEQ ID NO: 92, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 92; and a V_L comprising the amino acid sequence of SEQ ID NO: 129, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 129;
- (xv) a V_H comprising the amino acid sequence of SEQ ID NO: 93, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 93; and a V_L comprising the amino acid sequence of SEQ ID NO: 127, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 127;
- (xvi) a V_H comprising the amino acid sequence of SEQ ID NO: 94, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 94; and a V_L comprising the amino acid sequence of SEQ ID NO: 130, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 130;
- (xvii) a V_H comprising the amino acid sequence of SEQ ID NO: 95, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 95; and a V_L comprising the amino acid sequence of SEQ ID NO: 131, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 131;
- (xviii) a V_H comprising the amino acid sequence of SEQ ID NO: 96, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 96; and a V_L comprising the amino acid sequence of SEQ ID NO: 132, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 132;

- (xix) a V_H comprising the amino acid sequence of SEQ ID NO: 97, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 97; and a V_L comprising the amino acid sequence of SEQ ID NO: 129, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 129;
- (xx) a V_H comprising the amino acid sequence of SEQ ID NO: 98, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 98; and a V_L comprising the amino acid sequence of SEQ ID NO: 124, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 124;
- ~~(vi)~~(xxi) a V_H comprising the amino acid sequence of SEQ ID NO: 99, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 99; and a V_L comprising the amino acid sequence of SEQ ID NO: 122, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 122;
- (xxii) a V_H comprising the amino acid sequence of SEQ ID NO: 100, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 100; and a V_L comprising the amino acid sequence of SEQ ID NO: 133, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 133;
- ~~(vi)~~(xxiii) a V_H comprising the amino acid sequence of SEQ ID NO: 101, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 101; and a V_L comprising the amino acid sequence of SEQ ID NO: 126, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 126;
- (xxiv) a V_H comprising the amino acid sequence of SEQ ID NO: 102, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 102; and a V_L comprising the amino acid sequence of SEQ ID NO: 122, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 122;
- ~~(vii)~~(xxv) a V_H comprising the amino acid sequence of SEQ ID NO: 103, or a variant thereof having at least 90% sequence identity to the amino acid sequence

- of SEQ ID NOs: 103; and a V_L comprising the amino acid sequence of SEQ ID NO: 123, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 123;
- (xxvi) a V_H comprising the amino acid sequence of SEQ ID NO: 104, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 104; and a V_L comprising the amino acid sequence of SEQ ID NO: 134, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 134;
- (xxvii) a V_H comprising the amino acid sequence of SEQ ID NO: 105, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 105; and a V_L comprising the amino acid sequence of SEQ ID NO: 135, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 135;
- (xxviii) a V_H comprising the amino acid sequence of SEQ ID NO: 106, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 106; and a V_L comprising the amino acid sequence of SEQ ID NO: 136, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 136;
- (xxix) a V_H comprising the amino acid sequence of SEQ ID NO: 109, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 109; and a V_L comprising the amino acid sequence of SEQ ID NO: 124, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 124;
- (xxx) a V_H comprising the amino acid sequence of SEQ ID NO: 111, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 111; and a V_L comprising the amino acid sequence of SEQ ID NO: 122, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 122;
- (xxxi) a V_H comprising the amino acid sequence of SEQ ID NO: 114, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 114; and a V_L comprising the amino acid sequence of SEQ ID NO: 124,

- or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 124;
- (xxxii) a V_H comprising the amino acid sequence of SEQ ID NO: 118, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 118; and a V_L comprising the amino acid sequence of SEQ ID NO: 142, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 142;
- ~~(viii)~~(xxxiii) a V_H comprising the amino acid sequence of SEQ ID NO: 99, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 99; and a V_L comprising the amino acid sequence of SEQ ID NO: 126, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 126; or
- (xxxiv) a V_H comprising the amino acid sequence of SEQ ID NO: 121, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 121; and a V_L comprising the amino acid sequence of SEQ ID NO: 126, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 126;-
- ~~(ix)~~(xxxv) a V_H comprising the amino acid sequence of SEQ ID NO: 91, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 91; and a V_L comprising the amino acid sequence of SEQ ID NO: 130, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 130;
- ~~(x)~~(xxxvi) a V_H comprising the amino acid sequence of SEQ ID NO: 250, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 250; and a V_L comprising the amino acid sequence of SEQ ID NO: 241, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 241;
- ~~(xi)~~(xxxvii) a V_H comprising the amino acid sequence of SEQ ID NO: 250, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 250; and a V_L comprising the amino acid sequence of SEQ ID NO: 193, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 193;

- ~~(xii)~~(xxxviii) a V_H comprising the amino acid sequence of SEQ ID NO: 248, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 248; and a V_L comprising the amino acid sequence of SEQ ID NO: 188, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 188;
- ~~(xiii)~~(xxxix) a V_H comprising the amino acid sequence of SEQ ID NO: 248, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 248; and a V_L comprising the amino acid sequence of SEQ ID NO: 193, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 193;
- ~~(xiv)~~(xl) a V_H comprising the amino acid sequence of SEQ ID NO: 250, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 250; and a V_L comprising the amino acid sequence of SEQ ID NO: 288, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 288;
- ~~(xv)~~(xli) a V_H comprising the amino acid sequence of SEQ ID NO: 250, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 250; and a V_L comprising the amino acid sequence of SEQ ID NO: 188, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 188;
- ~~(xvi)~~(xlii) a V_H comprising the amino acid sequence of SEQ ID NO: 250, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 250; and a V_L comprising the amino acid sequence of SEQ ID NO: 236, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 236; or
- ~~(xvii)~~(xliii) a V_H comprising the amino acid sequence of SEQ ID NO: 91, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 91; and a V_L comprising the amino acid sequence of SEQ ID NO: 288, or a variant thereof having at least 90% sequence identity to the amino acid sequence of SEQ ID NOs: 288.

- ~~14.~~ An isolated anti-GM-CSFR α antibody that specifically binds to GM-CSFR α competitively with the isolated anti-GM-CSFR α antibody of any one of claims 1-13, or specifically binds to the same epitope as the isolated anti-GM-CSFR α antibody of any one of claims 1-13.
- ~~15.~~5. The isolated anti-GM-CSFR α antibody according to any one of claims 1-14, wherein the anti-GM-CSFR α antibody comprises an Fc fragment.
- ~~16.~~6. The isolated anti-GM-CSFR α antibody of claim 15, wherein the anti-GM-CSFR α antibody is a full-length IgG antibody.
- ~~17.~~7. The isolated anti-GM-CSFR α antibody of claim 16, wherein the anti-GM-CSFR α antibody is a full-length IgG1 or IgG4 antibody.
- ~~18.~~8. The isolated anti-GM-CSFR α antibody of any one of claims 1-17, wherein the anti-GM-CSFR α antibody is chimeric, human, or humanized.
- ~~19.~~9. The isolated anti-GM-CSFR α antibody according to any one of claims 1-14, wherein the anti-GM-CSFR α antibody is an antigen binding fragment selected from the group consisting of a Fab, a Fab', a F(ab')₂, a Fab'-SH, a single-chain Fv (scFv), an Fv fragment, a dAb, a Fd, a nanobody, a diabody, and a linear antibody.
- ~~20.~~10. An isolated nucleic acid molecule that encodes the anti-GM-CSFR α antibody according to any one of claims 1-19.
- ~~21.~~11. A vector comprising the nucleic acid molecule of claim ~~20~~10.
- ~~22.~~12. An isolated host cell comprising the anti-GM-CSFR α antibody of any one of claims 1-~~18~~9, the nucleic acid of claim ~~21~~10, or the vector of claim ~~21~~11.
- ~~23.~~13. A method of producing an anti-GM-CSFR α antibody, comprising:

- a) culturing the host cell of claim ~~2~~12 under conditions effective to express the anti-GM-CSFR α antibody; and
- b) obtaining the expressed anti-GM-CSFR α antibody from the host cell.

~~24~~14. ____ A pharmaceutical composition comprising the anti-GM-CSFR α antibody according to any one of claims 1-~~4~~9, the nucleic acid of claim ~~2~~10, the vector of claim ~~2~~11, or the isolated host cell of claim ~~2~~12, and a pharmaceutically acceptable carrier.

~~25~~15. ____ Use of the pharmaceutical composition of claim ~~14~~A ~~method of~~ in the manufacture of a medicament for treating a disease or condition in an individual in need thereof, ~~comprising administering to the individual an effective amount of the pharmaceutical composition of claim 24.~~

~~26~~16. ____ The ~~method~~use of claim ~~12~~5, wherein the disease or condition is an inflammatory, respiratory or autoimmune disease or condition.

~~27~~17. ____ The ~~use~~method of claim ~~2~~16, wherein the disease or condition is selected from the group consisting of rheumatoid arthritis, asthma, chronic obstructive pulmonary disease, allergic response, multiple sclerosis, myeloid leukemia, atherosclerosis.