

ANTI-CLEC12A ANTIBODIES AND USES THEREOF

CROSS REFERENCED APPLICATIONS

[0001] This application claims priority to, and the benefit of, U.S. provisional application No. 63/179,755, filed on April 26, 2021, the contents of which is hereby incorporated by reference in its entirety.

SEQUENCE LISTING

[0002] The instant application contains a Sequence Listing which has been submitted electronically in ASCII format and is hereby incorporated by reference in its entirety. Said ASCII copy, created on April 19, 2022, is named MIL-017WO_SL.txt and is 44,670 bytes in size.

BACKGROUND

[0003] Anti-Clec12A antibodies bind Clec12A antigen, also known as MICL or C-type lectin domain family 12 member A. Clec12A antigen is an inhibitory C-type lectin-like receptor. Human MICL is expressed as a monomer primarily on myeloid cells, including granulocytes, monocytes, macrophages and dendritic cells. Murine MICL is expressed as dimer on granulocytes, monocytes but also on B lymphocytes and can be also found on NK cells surface in bone marrow.

[0004] The Clec12A gene encodes a member of the C-type lectin/C-type lectin-like domain (CTL/CTLD) superfamily, which shares a common protein fold and has diverse functions, such as cell adhesion, cell-cell signaling, glycoprotein turnover, and roles in inflammation and immune response. The protein encoded by this gene inhibits granulocyte and monocyte function.

SUMMARY

[0005] The present disclosure provides human anti-Clec12A antibodies and fragments thereof, for the treatment of autoimmune diseases and cancers, including leukemia, lymphoma, or myeloma, including, for example, relapsed and refractory acute myeloid leukemia. The antibodies and fragments thereof of the present disclosure can be used alone, in

fusion proteins or conjugated to at least one diagnostic and/or therapeutic agent or in combination with other treatment modalities. Binding of human Clec12A with the anti-Clec12A antibodies or fragments thereof described herein may demonstrate Antibody-dependent cellular cytotoxicity (ADCC) activity, including for example induction of apoptosis and inhibition of cancer cell proliferation.

[0006] In one aspect, an anti-Clec12A antibody or an antigen-binding fragment thereof is provided comprising:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least 80% identical to

QVQLQESGPGGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGSTK
YNPSLKSRTISVDTSKNLFSKLSSVTAADTAVYYCAREDDYGGSGSPFDYWGGQTL
VTVSS (SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVP
SRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGGGTKVEIK (SEQ ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDG
SDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYYFDYWGGQ
TLVTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRAT
GIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID
NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDG
SDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSRYYFDYWGGQ
TLVTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

EIFMTQSPATLSLSPGERATLSCRASQSVHSKYLSWYQQKPGQAPSLLIYGASTRATG
IPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO:
6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QLQLQESGPGLVKPSETLSLTCTVSGGSISSTYYWGWIRQPPRKGLEWIGSTHYRGS
TYYNPSLKSRLTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWGQGTL
VTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGV
PSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO:
8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYIYFSGSTN
YNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDDYGGSGSPFDYWGQGTL
VTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASSLQSGV
PSRFSGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGTKVEIK (SEQ ID NO:
10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGLVKPSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYFSGSTK
YNPSLKSRLTISVDTSKNQFSLKLSSVTAADTAVYYCAREDDYGGSGSPFDYWGQGTL
VTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASSLQSGV
PSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO:
12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWVTVISYDGS
DKYYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFDYWGGT
LVTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLLMYGASTRPT
GIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGKTKVEIK (SEQ ID
NO: 14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAVISYDG
SDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYFFDYWGQ
GTLVTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKPGQAPRLLIYGPSTRATGIP
ARFSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGKTKVEIK (SEQ ID NO:
16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFIWDYD
SIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFGIFYFDY
WGQGTLVTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

AIQLTQSPSSLSASVGDRVITTCRTSQGISSALAWYQQKPGKTPKLLIYDASSLESGVP
SRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGTKVEIK (SEQ ID NO:
18).

[0006a] In another aspect, the present disclosure provides a use of a composition comprising the anti-Clec12A antibody or antigen-binding fragment thereof of any one of the proceeding claims, in the manufacture of a medicament for treating a cancer in a subject.

[0007] In some examples, the anti-Clec12A antibody or antibody-binding fragment thereof comprises:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGSTK
YNPSLKSRTVISVDTSKNLFSKLSSVTAADTAVYYCAREDDYYGSGSPFDYWGGQTL
VTVSS (SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
IQMTQSPSSLSASVGDRVITTCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVP
SRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDG
SDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYDFDYWGQG
TLVTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRAT
GIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID
NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence

of QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYD

GSDKYSADSVKGRFNISRDNSKNTLYLQMNSLRAEDTAVYYCARDGSRYFDYWGQ
GTLVTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
EIFMTQSPATLSLSPGERATLSCRASQSVHISKYLSWYQQKPGQAPSLLIYGASTRATG

IPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTHYRGS
TYYNPSLKS RVTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWGQGTL
VTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGV
PSRFGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYIYFSGSTN
YNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFDYWGQGTL
VTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of
AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASSLQSGV
PSRFGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGTKVEIK (SEQ ID NO: 10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYFSGSTK
YNPSLKS RVTISVDTSKNQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFDYWGQGTL
VTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of
AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASSLQSGV
PSRFGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWVTVISYDGS
DKYYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFDYWGQGT
LVTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLLMYGASTRPT
GIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID
NO:14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAVISYDG
SDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYFFDYWGQ
GTLVTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKPGQAPRLLIYGPSTRATGIP
ARFSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK (SEQ ID NO:
16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFIWDYDG
SIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFGEFYFDY
WGQGTLVTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSLESGVP
SRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGGTKVEIK (SEQ ID NO:
18).

[0008] In some examples, the anti-Clec12A antibody or antibody-binding fragment thereof comprises:

(a) a heavy chain complementarity determining region (HCDR) 1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYYSGST (SEQ ID NO: 20), an HCDR3 comprising an amino acid sequence of AREDDYYGSGSPFDY (SEQ ID NO: 21); and

a light chain complementarity determining region (LCDR) 1 comprising an amino acid sequence of QGIRYD (SEQ ID NO: 22), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), and an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(b) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDKGYFFDY (SEQ ID NO: 26); and

an LCDR1 comprising an amino acid sequence of QSVGNRY (SEQ ID NO: 27), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO: 29);

(c) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), an HCDR3 comprising an amino acid sequence of ARDGSRYFDY (SEQ ID NO: 30); and

an LCDR1 comprising an amino acid sequence of QSVHSKY (SEQ ID NO: 31), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPIT (SEQ ID NO: 32); or

(d) an HCDR1 comprising an amino acid sequence of GGSISSSTYY (SEQ ID NO: 33), an HCDR2 comprising an amino acid sequence of THYRGST (SEQ ID NO: 34), an HCDR3 comprising an amino acid sequence of ARELTGEVFDY (SEQ ID NO: 35); and an LCDR1 comprising an amino acid sequence of QSISSY (SEQ ID NO: 36), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of QQSYSTPFT (SEQ ID NO: 37);

(e) an HCDR1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO: 38), and HCDR3 comprising an amino acid sequence of AREDDYYGSGSPFDY (SEQ ID NO: 21); and

an LCDR1 comprising an amino acid sequence of QGIRND (SEQ ID NO: 39), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNYPRT (SEQ ID NO:40);

(f) an HCDR1 comprising an amino acid sequence of GGSISTDY (SEQ ID NO:41), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO:38), and HCDR3 comprising an amino acid sequence of AREDY YGSGSPFDY (SEQ ID NO:21); and

an LCDR1 comprising an amino acid sequence of QDIRND (SEQ ID NO:42), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(g) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO:25), and HCDR3 comprising an amino acid sequence of ARDGQFYFDY (SEQ ID NO: 43); and

an LCDR1 comprising an amino acid sequence of QSVTSRY (SEQ ID NO:44), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO:28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO:29);

(h) an HCDR1 comprising an amino acid sequence of GFTFSNYG (SEQ ID NO: 45), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDSGRYFFDY (SEQ ID NO:46); and

an LCDR1 comprising an amino acid sequence of QSVSSRS (SEQ ID NO:47), an LCDR2 comprising an amino acid sequence of GPS (SEQ ID NO: 48), an LCDR3 comprising an amino acid sequence of HQDYNLPLT (SEQ ID NO:49); or

(i) an HCDR1 comprising an amino acid sequence of GFTFSKYG (SEQ ID NO: 50), an HCDR2 comprising an amino acid sequence of IWYDGSIK (SEQ ID NO: 51), and HCDR3 comprising an amino acid sequence of ARGSLWFGEFYFDY (SEQ ID NO: 52); and

an LCDR1 comprising an amino acid sequence of QGISSA (SEQ ID NO: 53), an LCDR2 comprising an amino acid sequence of DAS (SEQ ID NO: 54), an LCDR3 comprising an amino acid sequence of QQFNYPRT (SEQ ID NO: 55).

[0009] In some examples, the anti-Clec12A antibody or antigen-binding fragment thereof is selected from the group consisting of an IgA antibody, IgG antibody, IgE antibody, IgM antibody, bi- or multi- specific antibody, Fab fragment, Fab' fragment, F(ab')₂ fragment, Fd' fragment, Fd fragment, isolated CDRs or sets thereof; single-chain variable

fragment (scFv), polypeptide-Fc fusion, single domain antibody, cameloid antibody; masked antibody, Small Modular ImmunoPharmaceutical (“SMIPs™”), single chain, Tandem diabody, VHHs, Anticalin, Nanobody, minibodies, BiTE, ankyrin repeat protein, DARPIN, Avimer, DART, TCR-like antibody, Adnectin, Affilin, Trans-body; Affibody, TrimerX, MicroProtein, Fynomer, Centyrin; and KALBITOR.

[0010] In some examples, the anti-Clec12A antibody or antigen-binding fragment thereof is a monoclonal antibody or a single-chain variable fragment (scFv).

[0011] In some examples, the anti-Clec12A antibody is an antibody comprising an IgG constant region.

[0012] In some examples, the anti-Clec12A antigen-binding fragment thereof is a single-chain variable fragment (scFv).

[0013] In some examples, the scFv comprises a leader sequence, a heavy chain variable sequence, a GS-Linker, and a light chain variable sequence.

[0014] In some examples, the scFv comprises a sequence consisting of an amino acid sequence that is at least about 80% identity to:

(a)

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGSTK
YNPSLKSRTISVDTSKNLFSKLSSVTAADTAVYYCAREDDYGGSGSPFDYWGGQGLT
VTVSSASTGGGGSGGGGSGGGGSAIQMTQSPSSLSASVGDRVTITCRASQGIRYDLG
WYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDY
NFPRTFGQGTKVEIK (SEQ ID NO: 56);

(b)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAIVISYDGSD
KYYVDSVKGRFTISRDNKNTLYLHMNSLRAEDTAVYYCARDKGYFFDYWGQGLT
VSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQ
QKPGQAPRLLIYGASTRATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTF
GGGTKVEIK (SEQ ID NO: 57);

(c)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAIVISY
DGSDKYSADSVKGRFNISRDNKNTLYLQMNSLRAEDTAVYYCARDGSRYFDYWGGQ
GLTVTVSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLSPGERATLSCRASQSV

HSKYLSWYQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQ
QDYNLPITFGQGTRLEIK (SEQ ID NO: 58); or

(d)

QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTH
YRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWG
QGTLVTVSSASTGGGGSGGGGSGGGGSDIQTQSPSSLSASVGDRVITTCRASQSISS
YLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQ
QSYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

[0015] In some examples, the scFv comprises an amino acid sequence of:

(a)

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYY
SGSTKYNPSLKSRTISVDTSKNLFSKLSSVTAADTAVYYCAREDDYGGSGSPFDYW
GQGTLVTVSSASTGGGGSGGGGSGGGGSAIQTQSPSSLSASVGDRVITTCRASQGI
RYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYY
CLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 56);

(b)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAIV
ISYDGSDDKYYVDSVKGRFTISRDNKNTLYLHMNSLRAEDTAVYYCARDKGYYFDY
WGQGTLVTVSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERATLSCRASQS
VGNRYLSWYQQKPGQAPRLLIYGASTRATGIPARFSGSGSGTDFTLTISLQPEDFAV
YYCQQDYNLPLTFGGGKVEIK (SEQ ID NO: 57);

(c)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVI
SYDGSDDKYSADSVKGRFNISRDNKNTLYLQMNSLRAEDTAVYYCARDGSRYYFDY
WGQGTLVTVSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLSPGERATLSCRASQSV
HSKYLSWYQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLTISLQPEDFAVY
YCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 58); or

(d)

QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTH
YRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWG
QGTLVTVSSASTGGGGSGGGGSGGGGSDIQTQSPSSLSASVGDRVITTCRASQSISS

YLNWYQQKPGKAPKLLIYASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQ
SYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

[0016] In some examples, the anti-Clec12A antibody or antigen-binding fragment thereof binds to Clec12A with a dissociation constant (K_D) of less than about 10^{-8} M, less than about 10^{-9} M, less than about 10^{-10} M, less than about 10^{-11} M, less than about 10^{-12} M, or less than about 10^{-13} M.

[0017] In some examples, the K_D is 0.1 pM or below.

[0018] In some examples, the K_D is between 0.05 and 0.5 pM.

[0019] In some examples, the K_D is between about 0.1 nM and 5.0 nM.

[0020] In some examples, the K_D is between about 0.3 nM and 3.5 nM.

[0021] In some examples, the EC₅₀ is between about 1 and about 100 nM.

[0022] In some examples, a method of treating a cancer is provided, comprising administering the anti-Clec12A antibody or antigen-binding fragment thereof described herein.

[0023] In some examples, the cancer is selected from leukemia, lymphoma, and myeloma.

[0024] In another aspect, a pharmaceutical composition is provided comprising anti-Clec12A antibody or antigen-binding fragment thereof and a pharmaceutically acceptable carrier, wherein the anti-Clec12A antibody or antigen-binding fragment thereof comprises:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGSTKYN
PSLKSRVTISVDTSKNLFSCLKLSSVTAADTAVYYCAREDDYSGSPFDYWGQGTLVTVSS
(SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRF
SGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDG
SDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYYFDYWGQG
TLVTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRAT
GIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID
NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDG
SDKYSADSVKGRFNISRDN SKNTLYLQMNLSLRAEDTAVYYCARDGSR YFDYWGQG
TLVTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

EIFMTQSPATLSLSPGERATLSCRASQSVH SKYLSWYQQKPGQAPSLLIYGASTRATG
IPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO:
6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTHYRGS
TYYNPSLKS RVTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWGQGTL
VTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGV
PSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO:
8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYYFSGSTN
YNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFDYWGGTL
VTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASSLQSGV
PSRFGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGTKVEIK (SEQ ID NO:
10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGLVKPSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYYFSGSTK
YNPSLKSRLTISVDTSKNQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFDYWGGTL
VTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASSLQSGV
PSRFGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO:
12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWVTVISYDGS
DKYYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFDYWGGT
LTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLLMYGASTRPT
GIPARFGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID
NO: 14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAVISYDG
SDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYFFDYWGQ
GTLVTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence
that is at least about 80% identical to

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKPGQAPRLLIYGPSTRATGIP
ARFSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK (SEQ ID NO:
16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence that is at least about 80% identical to

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFIWYDG
SIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFGEFYFDY
WGQGTLVTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence
that is at least about 80% identical to

AIQLTQSPSSLSASVGDRVITITCRTSQGISSALAWYQQKPGKTPKLLIYDASSLESGVP
SRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGGTKVEIK (SEQ ID NO:
18).

[0025] In some examples, the pharmaceutical composition comprises an anti-Clec12a
antibody or antigen-binding fragment thereof that comprises:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence
of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGSTKYN
PSLKSRVTISVDTSKNLFSKLSSVTAADTAVYYCAREDYYGSGSPFDYWGQGTLVTVSS
(SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
IQMTQSPSSLSASVGDRVITITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRF
SGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGGTKVEIK (SEQ ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence
of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDG
SDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYYFDYWGQG
TLVTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRAT
GIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID
NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of 80% identical

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDGSDK
YSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSRYYFDYWGQGTLVTVS
S (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
EIFMTQSPATLSLSPGERATLSCRASQSVH SKYLSWYQQKPGQAPSLLIYGASTRATGIPA
RFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence
of

QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTHYRGSTY
YNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWGQGTLVTVSS
(SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSR
FSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence
of

QVQLQESGPGLVKPSETLSLTCTVSGGISSTYYWSWIRQPPGKGLEWLGYIYFSGSTNYN
PSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYWGQGTLVTVSS
(SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASSLQSGVPSR
FSGSGSGTYFTLTISSLQPEDSATYYCLQDYNYPRTFGQGTKVEIK (SEQ ID NO: 10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYFSGSTKYNP
SLKSRVTISVDTSKNQFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYWGQGTLVTVSS
(SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASSLQSGVPSR
FSGSGSGTDFTLTISSLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWTVVISYDGSDK
YYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFDYWGQGTLVTVS
S (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGESATLSRASQSVTSRYLSWYQQKPGQAPRLLMYGASTRPTGIP
ARFSGSGSGTDFTLTISSLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID NO:14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAVISYDGSD
KSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYFFDYWGQGTLVT
VSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIIMTQSPATLSLSPGERATLSRASQSVSSRSLSWYQHKGPGQAPRLLIYGPSTRATGIPAR
FSGSGSGTDFTLTISSLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK (SEQ ID NO: 16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFIWDG
SIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFGEFYFDYW
GQGTLLTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQLTQSPSSLSASVGDRVTITCRISQGISSALAWYQQKPGKTPKLLIYDASSLESVPSRF
SGSGSGTDFTLTISSLQPEDFATYYCQQFNYPRTFGQGTKVEIK (SEQ ID NO: 18).

[0026] In some examples, the pharmaceutical composition comprises an anti-Clec12a antibody or antigen-binding fragment thereof comprising:

(a) a heavy chain complementarity determining region (HCDR) 1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYYSGST (SEQ ID NO: 20), an HCDR3 comprising an amino acid sequence of AREDDYGGSGSPFDY (SEQ ID NO: 21); and

a light chain complementarity determining region (LCDR) 1 comprising an amino acid sequence of QGIRYD (SEQ ID NO: 22), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), and an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(b) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDKGYFDY (SEQ ID NO: 26); and

an LCDR1 comprising an amino acid sequence of QSVGNRY (SEQ ID NO: 27), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO: 29);

(c) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), an HCDR3 comprising an amino acid sequence of ARDGSRYFDY (SEQ ID NO: 30); and

an LCDR1 comprising an amino acid sequence of QSVHISKY (SEQ ID NO: 31), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPIT (SEQ ID NO: 32); or

(d) an HCDR1 comprising an amino acid sequence of GGSISSSTYY (SEQ ID NO: 33), an HCDR2 comprising an amino acid sequence of THYRGST (SEQ ID NO: 34), an HCDR3 comprising an amino acid sequence of ARELTGEVFDY (SEQ ID NO: 35); and an LCDR1 comprising an amino acid sequence of QSISSY (SEQ ID NO:36), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of QQSYSTPFT (SEQ ID NO: 37);

(e) an HCDR1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO: 38), and HCDR3 comprising an amino acid sequence of AREDDYGGSGSPFDY (SEQ ID NO:21); and

an LCDR1 comprising an amino acid sequence of QGIRND (SEQ ID NO: 39), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNYPRT (SEQ ID NO:40);

(f) an HCDR1 comprising an amino acid sequence of GGSISTDY (SEQ ID NO:41), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO:38), and HCDR3 comprising an amino acid sequence of AREDDYGGSGSPFDY (SEQ ID NO:21); and

an LCDR1 comprising an amino acid sequence of QDIRND (SEQ ID NO:42), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(g) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO:25), and HCDR3 comprising an amino acid sequence of ARDGQFYFDY (SEQ ID NO: 43); and

an LCDR1 comprising an amino acid sequence of QSVTSRY (SEQ ID NO:44), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO:28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO:29);

(h) an HCDR1 comprising an amino acid sequence of GFTFSNYG (SEQ ID NO: 45), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDSGRYFFDY (SEQ ID NO:46); and

an LCDR1 comprising an amino acid sequence of QSVSSRS (SEQ ID NO:47), an LCDR2 comprising an amino acid sequence of GPS (SEQ ID NO: 48), an LCDR3 comprising an amino acid sequence of HQDYNLPLT (SEQ ID NO:49); or

(i) an HCDR1 comprising an amino acid sequence of GFTFSKYG (SEQ ID NO: 50), an HCDR2 comprising an amino acid sequence of IWYDGSIK (SEQ ID NO: 51), and HCDR3 comprising an amino acid sequence of ARGSLWFGIFYFDY (SEQ ID NO: 52); and an LCDR1 comprising an amino acid sequence of QGISSA (SEQ ID NO: 53), an LCDR2 comprising an amino acid sequence of DAS (SEQ ID NO: 54), an LCDR3 comprising an amino acid sequence of QQFNYPRT (SEQ ID NO: 55).

[0027] In some examples, the pharmaceutical composition comprises an anti-Clec12A antibody or antigen-binding fragment thereof selected from the group consisting of an IgA antibody, IgG antibody, IgE antibody, IgM antibody, bi- or multi-specific antibody, Fab fragment, Fab' fragment, F(ab')₂ fragment, Fd' fragment, Fd fragment, isolated CDRs or sets thereof; single-chain variable fragment (scFv), polypeptide-Fc fusion, single domain antibody, cameloid antibody; masked antibody, Small Modular ImmunoPharmaceutical ("SMIPsTM"), single chain, Tandem diabody, VHHs, Anticalin, Nanobody, minibodies, BiTE, ankyrin repeat protein, DARPIN, Avimer, DART, TCR-like antibody, Adnectin, Affilin, Trans-body; Affibody, TrimerX, MicroProtein, Fynomer, Centyrin; and KALBITOR.

[0028] In some examples, the pharmaceutical composition comprises an anti-Clec12A antibody or antigen-binding fragment as a monoclonal antibody or a single-chain variable fragment (scFv).

[0029] In some examples, the anti-Clec12A antibody is an antibody comprising an IgG constant region.

[0030] In some examples, the anti-Clec12A antigen-binding fragment thereof is a single-chain variable fragment (scFv).

[0031] In some examples, the scFv comprises a leader sequence, a heavy chain variable sequence, a GS-Linker, and a light chain variable sequence.

[0032] In some examples, the pharmaceutical composition as described herein comprises an scFv comprising a sequence having an amino acid sequence that is at least about 80% identity to:

(a)

QVQLQESGPGGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGS
TKYNPSLKSRTISVDTSKNLFSCLKSSVTAADTAVYYCAREDDYGGSGSPFDYW

GQGTLVTVSSASTGGGGSGGGSGGGGSAIQMTQSPSSLSASVGDRVITITCRASQGIRYDLG
WYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTF
GQGTKVEIK (SEQ ID NO: 56);

(b)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAIVISYDG
SDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYFDYWGQGT
LVTVSSASTGGGGSGGGSGGGGSEIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPG
QAPRLLIYGA STRATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGG
TKVEIK (SEQ ID NO: 57);

(c)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAIVISYDGS
DKYSADSVKGRFNISRDNSKNTLYLQMNSLRAEDTAVYYCARDGSR YFDYWGQGT
LVTVSSASTGGGGSGGGSGGGGSEIFMTQSPATLSLSPGERATLSCRASQSVH SKYLSWYQQKPGQA
PSLLIYGA STRATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGT
RLEIK (SEQ ID NO: 58); or

(d)

QLQLQESGPGLVKPSETLSLTCTVSGGSISSTYYWGWIRQPPRKGLEWIGSTHYRGS
TYYNPSLKS RVTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWGQGT
LVTVSSASTGGGGSGGGSGGGGSDIQMTQSPSSLSASVGDRVITITCRASQSISSYLNWYQQKPGKAPK
LLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ
ID NO: 59).

[0033] In some examples, the pharmaceutical composition comprises an scFv comprising a sequence of:

(a)

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGSTK
YNPSLKS RVTISVDTSKNLFSKLSSVTAADTAVYYCAREDY YGSGSPFDYWGQGT
LVTVSSASTGGGGSGGGSGGGGSAIQMTQSPSSLSASVGDRVITITCRASQGIRYDLGWYQQKPGKAP
KLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK
(SEQ ID NO: 56);

(b)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAIVISY
DGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYFDY

WGQGTLLTVSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERATLSCRASQSVG
NRYLSWYQQKPGQAPRLLIYGASTRATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQ
QDYNLPLTFGGGTKVEIK (SEQ ID NO: 57);

(c)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVI
SYDGSDDKYSADSVKGRFNISRDNSKNTLYLQMNSLRAEDTAVYYCARDGSRFYDY
WGQGTLLTVSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLSPGERATLSCRASQSV
HSKYLSWYQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLTISLQPEDFAVY
YCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 58); or

(d)

QLQLQESGPGLVKPSETLSLTCTVSGGSISSTYYWGWIRQPPRKGLEWIGSTH
YRGSTYYNPSLKSRTISVDTSKNQFSLKVVSVTAADTAVYYCARELTGEVFDYWG
QGTLTVTVSSASTGGGGSGGGGSGGGGSDIQMTQSPSSLSASVGDRVTITCRASQSISS
YLNWYQQKPGKAPKLLIYASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQ
SYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

[0034] In another aspect, a nucleic acid sequence is provided encoding an amino acid sequence that is at least about 90% identical to any one of SEQ ID NO: 1-59.

[0035] In another aspect, a vector is provided comprising the nucleic acid encoding an amino acid sequence that is at least about 90% identical to any one of SEQ ID NO: 1-59.

[0036] In another aspect, a cell is provided comprising a vector as described herein.

[0037] In a further aspect, the present disclosure provides a use of a composition comprising an anti-Clec12A antibody or antigen-binding fragment thereof in the manufacture of a medicament for treating cancer in a subject in need thereof, wherein the anti-Clec12A antibody or antigen-binding fragment thereof comprises:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGSTK

YNPSLKSRTISVDTSKNLFSCLKSSVTAADTAVYYCAREDDYGGSGSPFDYWGQGTL
VTVSS (SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid
sequence of

IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVP
SRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino
acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVI
SYDGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGY
YFDYWGQGTLVTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid
sequence of

EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRAT
GIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID
NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino
acid sequence of 80% identical

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVI
SYDGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSR
YFDYWGQGTLVTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid
sequence of

EIVMTQSPATLSLSPGERATLSCRASQSVH SKYLSWYQQKPGQAPSLLIYGASTRATG
IPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO:
6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino
acid sequence

ofQLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGS
THYRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGE
VFDYWGQGTLVTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGV
PSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO:
8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYIYFSGSTN
YNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDDYSGSGSPFDYWGGTL
VTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASSLQSGV
PSRFSGSGSGTYFTLTISLQPEDSATYYCLQDYNPRTFGQGTKVEIK (SEQ ID NO:
10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYFSGSTK
YNPSLKSRLTISVDTSKNQFSLKLSSVTAADTAVYYCAREDDYSGSGSPFDYWGGTL
VTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASSLQSGVPSR
FSGSGSGTDFTLTISLQPEDFATYYCLQDYNPRTFGQGTKVEIK (SEQ ID NO: 12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWTVISYDGSDK
YYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFDYWGGTLVTVS
S (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGESATLSRASQSVTSRYLSWYQQKPGQAPRLLMYGASTRPTGIP
ARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID NO:14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAVISYDG
SDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYFFDYWGQ
GTLVTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKGPGQAPRLLIYGPSTRATGIP
ARFSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGKVEIK (SEQ ID NO:
16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFIWDYDG
SIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFGEFYFDY
WGQGTLVTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSLESGVP
SRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGKVEIK (SEQ ID NO:
18).

In some examples, a method of treating cancer is provided comprising administering an anti-Clec12A antibody or antigen-binding fragment thereof to a subject in need thereof, the anti-Clec12A antibody or antigen-binding fragment thereof comprising:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGSTKYN
PSLKSRVTISVDTSKNLFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYWGQGTLVTVSS
(SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYFYDYWGQGLTVTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSRFYDYWGQGLTVTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of EIFMTQSPATLSLSPGERATLSCRASQSVH SKYLSWYQQKPGQAPSLIYGASTRATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTHYRGSTYYNPSLKS RVTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWGQGLTVTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYYIFSGSTNYN
PSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYWGQGTLVTVSS
(SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASSLQSGVPSR
FSGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGTKVEIK (SEQ ID NO: 10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence
of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYYIFSGSTK
YNPSLKSRLTISVDTSKNQFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYWGQGTL
VTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASSLQSGVPSR
FSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence
of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWTVISYDGSDK
YYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFDYWGQGTLVTVS
S (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLLMYGASTRPTGIP
ARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID NO:14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence
of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAVISYDGSD
KSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYFFDYWGQGTLVT
VSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKPGQAPRLLIYGPSTRATGIPAR
FSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK (SEQ ID NO: 16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFIWDGSIK
NYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFGIFYFDYWGGGT
LVTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSLESGVPSRF
SGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGKVEIK (SEQ ID NO: 18).

[0038] In some examples, the method of treating cancer comprises administering to a subject in need thereof an anti-Clec12A antibody or antigen-binding fragment thereof comprising:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGSTKYN
PSLKSRVTISVDTSKNLFSKLSSVTAADTAVYYCAREDYYGSGSPFDYWGGGTLVTVSS
(SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRF
SGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGKVEIK (SEQ ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISYDGSDK
YYVDSVKGRFTISRDNKNTLYLHMNSLRAEDTAVYYCARDKGYFDYWGGGTLVTV
SS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRAT

GIPARFSGSGSGTDFTLTISSLQPEDFAVYYCQQDYNLPLTFGGGKVEIK (SEQ ID NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTSSYGMHWVRQAPGKGLEWVAVISYDGSDK
YSADSVKGRFNISRDNSKNTLYLQMNSLRAEDTAVYYCARDGSRFYFDYWGQGTLVTVS
S (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
EIFMTQSPATLSLSPGERATLSCRASQSVHISKYLSWYQQKPGQAPSLLIYGASTRATG
IPARFSGSGSGTDFTLTISSLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO:
6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QLQLQESGPGLVKPSETLSLTCTVSGGSISSTYYWGWIRQPPRKGLEWIGSTHYRGS
TYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWGQGTL
VTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGV
PSRFSGSGSGTDFTLTISSLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO:
8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYIYFSGSTNYN
PSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDYGSGSPFDYWGQGTLVTVSS
(SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASSLQSGVPSR
FSGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGTKVEIK (SEQ ID NO: 10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLQESGPGLVKPSSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYFSGSTK
YNPSLKSRTISVDTSKNQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFDYWGGQTL
VTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASSLQSGV
PSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO:
12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWVTVISYDGS
DKYYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFDYWGGGT
LVTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLIMYGASTRPT
GIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID
NO:14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAVISYDGSD
KSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYFFDYWGQGLVT
VSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKGPGQAPRLIYGPSTRATGIPAR
FSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK (SEQ ID NO: 16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence
of

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFIWDYDG
SIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFGEFYFDY
WGQGLVTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of
AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSLESGVP
SRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGGTKVEIK (SEQ ID NO:
18).

[0039] In some examples, the method of treating cancer comprises administering to a subject in need thereof an anti-Clec12A antibody or fragment thereof comprising:

(a) a heavy chain complementarity determining region (HCDR) 1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYYSGST (SEQ ID NO: 20), an HCDR3 comprising an amino acid sequence of AREDDYYGSGSPFDY (SEQ ID NO: 21); and

a light chain complementarity determining region (LCDR) 1 comprising an amino acid sequence of QGIRYD (SEQ ID NO: 22), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), and an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(b) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDKGYFFDY (SEQ ID NO: 26); and

an LCDR1 comprising an amino acid sequence of QSVGNRY (SEQ ID NO: 27), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO: 29);

(c) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), an HCDR3 comprising an amino acid sequence of ARDGSRYFDY (SEQ ID NO: 30); and

an LCDR1 comprising an amino acid sequence of QSVHISKY (SEQ ID NO: 31), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPIT (SEQ ID NO: 32); or

(d) an HCDR1 comprising an amino acid sequence of GGSISSSTYY (SEQ ID NO: 33), an HCDR2 comprising an amino acid sequence of THYRGST (SEQ ID NO: 34), an HCDR3 comprising an amino acid sequence of ARELTGEVFDY (SEQ ID NO: 35); and an LCDR1 comprising an amino acid sequence of QSISSY (SEQ ID NO: 36), an LCDR2 comprising an

amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of QQSYSTPFT (SEQ ID NO: 37);

(e) an HCDR1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO: 38), and HCDR3 comprising an amino acid sequence of AREDDYGGSGSPFDY (SEQ ID NO:21); and an LCDR1 comprising an amino acid sequence of QGIRND (SEQ ID NO: 39), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNYPRT (SEQ ID NO:40);

(f) an HCDR1 comprising an amino acid sequence of GGSISTDY (SEQ ID NO:41), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO:38), and HCDR3 comprising an amino acid sequence of AREDDYGGSGSPFDY (SEQ ID NO:21); and an LCDR1 comprising an amino acid sequence of QDIRND (SEQ ID NO:42), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(g) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO:25), and HCDR3 comprising an amino acid sequence of ARDGQFYFDY (SEQ ID NO: 43); and an LCDR1 comprising an amino acid sequence of QSVTSRY (SEQ ID NO:44), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO:28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO:29);

(h) an HCDR1 comprising an amino acid sequence of GFTFSNYG (SEQ ID NO: 45), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDSGRYFFDY (SEQ ID NO:46); and an LCDR1 comprising an amino acid sequence of QSVSSRS (SEQ ID NO:47), an LCDR2 comprising an amino acid sequence of GPS (SEQ ID NO: 48), an LCDR3 comprising an amino acid sequence of HQDYNLPLT (SEQ ID NO:49); or

(i) an HCDR1 comprising an amino acid sequence of GFTFSKYG (SEQ ID NO: 50), an HCDR2 comprising an amino acid sequence of IWYDGSIK (SEQ ID NO: 51), and HCDR3 comprising an amino acid sequence of ARGSLWFGFYFDY (SEQ ID NO: 52); and

an LCDR1 comprising an amino acid sequence of QGISSA (SEQ ID NO: 53), an LCDR2 comprising an amino acid sequence of DAS (SEQ ID NO: 54), an LCDR3 comprising an amino acid sequence of QQFNYPRT (SEQ ID NO: 55).

[0040] In some examples, the anti-Clec12A antibody or antigen-binding fragment thereof is a monoclonal antibody or a single-chain variable fragment (scFv).

[0041] In some examples, the anti-Clec12A antibody is an antibody comprising an IgG constant region.

[0042] In some examples, the antigen-binding fragment thereof is a single-chain variable fragment (scFv).

[0043] In some examples, the scFv comprises a leader sequence, a heavy chain variable sequence, a GS-Linker, and a light chain variable sequence.

[0044] In some examples, the method of treating cancer comprises administering to a subject in need thereof an scFv comprising a sequence having at least about 80% identity to:

(a)

QVQLQESGPGLVKPSSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYY
SGSTKYNPSLKS RVTISVDTSKNL FSLKLSSVTAADTAVYYCAREDDYYGSGSPFDYW
GQGTLVTVSSASTGGGGSGGGGSGGGGSAIQMTQSPSSLSASVGDRVTITCRASQGI
RYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYY
CLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 56) ;

(b)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAIV
ISYDGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYYFDY
WGQGT LVT VSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERATLSCRASQS
VGNRYLSWYQQKPGQAPRLLIYGA STRATGIPARFSGSGSGTDFTLTISSLQPEDFAV
YYCQQDYNLPLTFGGGTKVEIK (SEQ ID NO: 57);

(c)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVI
SYDGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSRYYFDY
WGQGT LVT VSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLSPGERATLSCRASQSV

HSKYLSWYQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLTISSLQPEDFAVY
YCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 58); or

(d)

QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTH
YRGSTYYNPSLKSRVTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWG
QGTLVTVSSASTGGGGSGGGGSGGGGSDIQMTQSPSSLSASVGDRVTITCRASQSISS
YLNWYQQKPGKAPKLLIYASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQ
SYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

[0045] In some examples, the method of treating cancer comprises administering to a subject in need thereof an scFv comprising a sequence of:

(a)

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGS
TKYNPSLKSRVTISVDTSKNLFSKLSSVTAADTAVYYCAREDYYGSGSPFDYWGQGT
LVTVSSASTGGGGSGGGGSGGGGSAIQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWY
QQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCLQDYNFPRT
FGQGTKVEIK (SEQ ID NO: 56);

(b)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAIVISY
DGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYYFDYWGQG
TLVTVSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERATLSCRASQSVGNRYLS
WYQQKPGQAPRLLIYGASTRATGIPARFSGSGSGTDFTLTISSLQPEDFAVYYCQQDYNL
PLTFGGGGTKVEIK (SEQ ID NO: 57);

(c)

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAIVISY
DGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSR YFDYWGQG
TLVTVSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLPGERATLSCRASQSVH SKYLSW
YQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLTISSLQPEDFAVYYCQQDYNLPIT
FGQGTRLEIK (SEQ ID NO: 58); or

(d)

QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTHYR
GSTYYNPSLKSRVTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYWGQGT
LVTVSSASTGGGGSGGGGSGGGGSDIQMTQSPSSLSASVGDRVTITCRASQSISS

YLNWYQQKPGKAPKLLIYASSLQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYS
TPFTFGPGTKVDIK (SEQ ID NO: 59).

[0046] In some examples, the cancer is selected from leukemia, lymphoma, and myeloma.

[0047] In some examples, the treatment comprises administration of one or more additional agents.

[0048] In some examples, the one or more additional agents is selected from an antibody, a chemotherapeutic, and radiation therapy.

DEFINITIONS

[0049] *A or An:* The articles “a” and “an” are used herein to refer to one or to more than one (*i.e.*, to at least one) of the grammatical object of the article. By way of example, “an element” means one element or more than one element.

[0050] *Affinity:* As used herein, the term “affinity” refers to the characteristics of a binding interaction between a binding moiety (e.g., an antigen binding moiety (e.g., variable domain described herein) and/or Fc receptor binding moiety (e.g., FcRn binding moiety described herein)) and a target (e.g., an antigen (e.g., Clec12A) and/or FcR (e.g., FcRn)) and that indicates the strength of the binding interaction. In some embodiments, the measure of affinity is expressed as a dissociation constant (K_D). In some embodiments, a binding moiety has a high affinity for a target (e.g., a K_D of less than about 10^{-7} M, less than about 10^{-8} M, or less than about 10^{-9} M). In some embodiments, a binding moiety has a low affinity for a target (e.g., a K_D of higher than about 10^{-7} M, higher than about 10^{-6} M, higher than about 10^{-5} M, or higher than about 10^{-4} M). In some embodiments, a binding moiety has high affinity for a target at a first pH, has low affinity for the target at a second pH, and has an intermediate affinity for the target at a pH level between the first pH and the second pH.

[0051] *Approximately or about:* As used herein, the term “approximately” or “about,” as applied to one or more values of interest, refers to a value that is similar to a stated reference value. In certain embodiments, the term “approximately” or “about” refers to a range of values that fall within 25%, 20%, 19%, 18%, 17%, 16%, 15%, 14%, 13%, 12%, 11%, 10%, 9%, 8%, 7%, 6%, 5%, 4%, 3%, 2%, 1%, or less in either direction (greater than or

CLAIMS

1. An anti-Clec12A antibody or antigen-binding fragment thereof comprising:

(a) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGS
TKYNPSLKSRTISVDTSKNLFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYW
GQGTLVTVSS (SEQ ID NO: 1), and

an immunoglobulin light chain variable (V_L) region comprising an amino acid sequence that is at least about 80% identical to

IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ
ID NO: 2);

(b) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISY
DGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYYFDY
WGQGTLLVTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (V_L) region comprising an amino acid sequence that is at least about 80% identical to

EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 4);

(c) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISY
DGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSRFYFDY
WGQGTLLVTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (V_L) region comprising an amino acid sequence that is at least about 80% identical to
EIFMTQSPATLSLSPGERATLSCRASQSVHSKYLSWYQQKPGQAPSLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ
ID NO: 6); or

(d) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence that is at least about 80% identical to
QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTHY
RGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYW
GQGTLVTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (V_L) region comprising an amino acid sequence that is at least about 80% identical to
DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID
NO: 8);

(e) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYIYF
SGSTNYPNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFD
YWGQGTLLVTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence that is at least about 80% identical to

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFSGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGTKVEIK
(SEQ ID NO: 10);

(f) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGLVKPSSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYF
SGSTKYNPSLKSRTISVDTSKNQFSLKLSSVTAADTAVYYCAREDYYGSGSPFD
YWGQGTLVTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence
that is at least about 80% identical to

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK
(SEQ ID NO: 12);

(g) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid
sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWVTVI
SYDGSDKYYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFD
YWGQGTLVTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence
that is at least about 80% identical to

EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLLMYGA
STRPTGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 14);

(h) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid
sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAV
ISYDGSDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYF
FDYWGQGTLVTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence
that is at least about 80% identical to

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKPGQAPRLLIYGPST
RATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 16); or

(i) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence that is at least about 80% identical to

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFI
WYDGSIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFG
EFYFDYWGGTLVTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence that is at least about 80% identical to

AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSL
ESGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGGQTKVEIK
(SEQ ID NO: 18).

2. The anti-Clec12A antibody or antigen-binding fragment thereof of claim 1, comprising:

(a) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGS
TKYNPSLKSRVTISVDTSKNLFSKLSSVTAADTAVYYCAREDYYGSGSPFDYW
GGTLVTVSS (SEQ ID NO: 1), and

an immunoglobulin light chain variable (V_L) region comprising an amino acid sequence of

IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGGQTKVEIK (SEQ
ID NO: 2);

(b) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSYGMHWVRQAPGKGLEWVAVISY
DGSDKYYVDSVKGRFTISRDNKNTLYLHMNSLRAEDTAVYYCARDKGYFDY
WGQTLVTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (V_L) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTR

ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 4);

(c) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence of QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVIS YDGSDKYSADSVKGRFNISRDNSKNTLYLQMNSLRAEDTAVYYCARDGSRYFD YWGQGTLLTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (V_L) region comprising an amino acid sequence of EIFMTQSPATLSLSPGERATLSCRASQSVHSKYLSWYQQKPGQAPSLLIYGASTR ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 6); or

(d) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence of QLQLQESGPGLVKPSETLSLTCTVSGGSISSTYYWGWIRQPPRKGLEWIGSTHY RGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYW GQGTLTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (V_L) region comprising an amino acid sequence of DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQS GVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 8);

(e) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence of QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYIYFSG STNYPNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYW GQGTLTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFSGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGTKVEIK
(SEQ ID NO: 10);

- (f) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYF
SGSTKYNPSLKSRTISVDTSKNQFSLKLSSVTAADTAVYYCAREDYYGSGSP
FDYWGQGTLVTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK
(SEQ ID NO: 12);

- (g) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWVTVI
SYDGSDKYYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQF
YFDYWGQGTLVTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGESATLSRASQSVTSRYLSWYQQKPGQAPRLLMYGA
STRPTGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQDYNLPLTFGGGTKVE
IK (SEQ ID NO: 14);

- (h) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAV
ISYDGSDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSG
RYFFDYWGQGTLVTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence of

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKPGQAPRLLIYGPST
RATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 16); or

- (i) an immunoglobulin heavy chain variable (V_H) region comprising an amino acid sequence of

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFI
WYDGSIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSL
WFGEFYFDYWGGTGLTVVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (V_L) region comprising an amino acid sequence of

AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSL
ESGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGTKVEIK
(SEQ ID NO: 18).

3. The anti-Clec12A antibody or antigen-binding fragment thereof of claim 1 or 2 comprising:

(a) a heavy chain complementarity determining region (HCDR) 1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYYSGST (SEQ ID NO: 20), an HCDR3 comprising an amino acid sequence of AREDY YGSGSPFDY (SEQ ID NO: 21); and

a light chain complementarity determining region (LCDR) 1 comprising an amino acid sequence of QGIRYD (SEQ ID NO: 22), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), and an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(b) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDKGY YFDY (SEQ ID NO: 26); and

an LCDR1 comprising an amino acid sequence of QSVGNRY (SEQ ID NO: 27), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO:29);

(c) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), an HCDR3 comprising an amino acid sequence of ARDGSRYFDY (SEQ ID NO: 30); and

an LCDR1 comprising an amino acid sequence of QSVHSKY (SEQ ID NO: 31), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPIT (SEQ ID NO: 32); or

(d) an HCDR1 comprising an amino acid sequence of GGSISSSTYY (SEQ ID NO: 33), an HCDR2 comprising an amino acid sequence of THYRGST (SEQ ID NO: 34), an HCDR3 comprising an amino acid sequence of ARELTGEVFDY (SEQ ID NO: 35); and an LCDR1 comprising an amino acid sequence of QSISSY (SEQ ID NO:36), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of QQSYSTPFT (SEQ ID NO: 37);

(e) an HCDR1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO: 38), and HCDR3 comprising an amino acid sequence of AREDYYGSGSPFDY (SEQ ID NO:21); and

an LCDR1 comprising an amino acid sequence of QGIRND (SEQ ID NO: 39), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNYPRT (SEQ ID NO:40);

(f) an HCDR1 comprising an amino acid sequence of GGSISTDY (SEQ ID NO:41), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO:38), and HCDR3 comprising an amino acid sequence of AREDYYGSGSPFDY (SEQ ID NO:21); and

an LCDR1 comprising an amino acid sequence of QDIRND (SEQ ID NO:42), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(g) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO:25), and HCDR3 comprising an amino acid sequence of ARDGQFYFDY (SEQ ID NO: 43); and

an LCDR1 comprising an amino acid sequence of QSVTSRY (SEQ ID NO:44), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO:28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO:29);

(h) an HCDR1 comprising an amino acid sequence of GFTFSNYG (SEQ ID NO: 45), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDSGRYFFDY (SEQ ID NO:46); and

an LCDR1 comprising an amino acid sequence of QSVSSRS (SEQ ID NO:47), an LCDR2 comprising an amino acid sequence of GPS (SEQ ID NO: 48), an LCDR3 comprising an amino acid sequence of HQDYNLPLT (SEQ ID NO:49); or

(i) an HCDR1 comprising an amino acid sequence of GFTFSKYG (SEQ ID NO: 50), an HCDR2 comprising an amino acid sequence of IWYDGSIK (SEQ ID NO: 51), and HCDR3 comprising an amino acid sequence of ARGSLWFGEFYFDY (SEQ ID NO: 52); and

an LCDR1 comprising an amino acid sequence of QGISSA (SEQ ID NO: 53), an LCDR2 comprising an amino acid sequence of DAS (SEQ ID NO: 54), an LCDR3 comprising an amino acid sequence of QQFNYPRT (SEQ ID NO: 55).

4. The anti-Clec12A antibody or antigen-binding fragment thereof of any one of the preceding claims, wherein the anti-Clec12A antibody or fragment thereof is selected from the group consisting of an IgA antibody, IgG antibody, IgE antibody, IgM antibody, bi- or multi- specific antibody, Fab fragment, Fab' fragment, F(ab')₂ fragment, Fd' fragment, Fd fragment, isolated CDRs or sets thereof; single-chain variable fragment (scFv), polypeptide-Fc fusion, single domain antibody, cameloid antibody; masked antibody, Small Modular ImmunoPharmaceutical ("SMIPsTM"), single chain, Tandem diabody, VHHs, Anticalin, Nanobody, minibodies, BiTE, ankyrin repeat protein,

DARPIN, Avimer, DART, TCR-like antibody, Adnectin, Affilin, Trans-body; Affibody, TrimerX, MicroProtein, Fynomer, Centyrin; and KALBITOR.

5. The anti-Clec12A antibody or antigen-binding fragment thereof of any one of the preceding claims, wherein the anti-Clec12A antibody or fragment thereof is a monoclonal antibody or a single-chain variable fragment (scFv).
6. The anti-Clec12A antibody or antigen-binding fragment thereof of any one of the preceding claims, wherein the anti-Clec12A antibody is an antibody comprising an IgG constant region.
7. The anti-Clec12A antibody or antibody-binding fragment thereof of any one of the preceding claims, wherein the anti-Clec12A antigen-binding fragment thereof is a single-chain variable fragment (scFv).
8. The anti-Clec12A antibody or antibody-binding fragment thereof of claim 7, wherein the scFv comprises a leader sequence, a heavy chain variable sequence, a GS-Linker, and a light chain variable sequence.
9. The anti-Clec12A antibody or antigen-binding fragment of claim 8, wherein the scFv comprises a sequence having at least about 80% identity to:

(a) QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYI
YYSGSTKYNPSLKSRVTISVDTSKNLFSCLKSSVTAADTAVYYCAREDYYGSGSP
FDYWGGQGT LVTVSSASTGGGGSGGGGSGGGGSAIQMTQSPSSLSASVGDRVTIT
CRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISL
QPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 56);

(b) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AIVISYDGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKG
YYFDYWGGQGT LVTVSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERAT
LSCRASQSVGNRYLSWYQQKPGQAPRLLIYGA STRATGIPARFSGSGSGTDFTLT
SSLQPEDFAVYYCQDYNLPLTFGGGTKVEIK (SEQ ID NO: 57);

(c) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AIVISYDGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSR
YFDYWGGQGT LVTVSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLPGERATLS

CRASQSVHSKYLSWYQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLTSS
LQPEDFAVYYCQQDYNLPITFGQGRLEIK (SEQ ID NO: 58); or

(d) QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIG
STHYRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVF
DYWGQGTLVTVSSASTGGGGSGGGGSGGGGSDIQMTQSPSSLSASVGDRVITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTSSLPQ
EDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

10. The anti-Clec12A antibody or antibody-binding fragment thereof of claim 9, wherein the scFv comprises a sequence of:

(a) QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYI
YYSGSTKYNPSLKSRTISVDTSKNLFSLKLSSVTAADTAVYYCAREDDYGGSGSP
FDYWGQGTLVTVSSASTGGGGSGGGGSGGGGSAIQMTQSPSSLSASVGDRVITC
CRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTSSLP
QPEDFATYYCLQDYNFPRTFGQGKVEIK (SEQ ID NO: 56);

(b) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AIVISYDGSDKYYVDSVKGRFTISRDNKNTLYLHMNSLRAEDTAVYYCARDKG
YYFDYWGQGTLVTVSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERAT
LSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRATGIPARFSGSGSGTDFTLT
SSLQPEDFAVYYCQQDYNLPITFGGGTKVEIK (SEQ ID NO: 57);

(c) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AVISYDGSDKYSADSVKGRFNISRDNKNTLYLQMNSLRAEDTAVYYCARDGSR
YFDYWGQGTLVTVSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLSPGERATLS
CRASQSVHSKYLSWYQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLTSS
LQPEDFAVYYCQQDYNLPITFGQGRLEIK (SEQ ID NO: 58); or

(d) QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIG
STHYRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVF
DYWGQGTLVTVSSASTGGGGSGGGGSGGGGSDIQMTQSPSSLSASVGDRVITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTSSLPQ
EDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

11. The anti-Clec12A antibody of any one of the preceding claims, wherein the anti-Clec12A antibody or fragment thereof binds to Clec12A with a disassociation constant (K_D) of less than about 10^{-8} M, less than about 10^{-9} M, less than about 10^{-10} M, less than about 10^{-11} M, less than about 10^{-12} M, or less than about 10^{-13} M.
12. The anti-Clec12A antibody of claim 11, wherein the K_D is about 0.1 pM or below.
13. The anti-Clec12A antibody of claim 11, wherein the K_D is between about 0.05 and about 0.5 pM.
14. The anti-Clec12A antibody of claim 11, wherein the K_D is between about 0.1 nM and about 5.0 nM.
15. The anti-Clec12A antibody of claim 14, wherein the K_D is between about 0.3 nM and about 3.5 nM.
16. The anti-Clec12A antibody of any one of the preceding claims, wherein the EC₅₀ is between about 1 and about 100 nM.
17. Use of a composition comprising the anti-Clec12A antibody or antigen-binding fragment thereof of any one of the preceding claims, in the manufacture of a medicament for treating a cancer in a subject.
18. The use according to claim 17, wherein the cancer is selected from leukemia, lymphoma, and myeloma.
19. A pharmaceutical composition comprising an anti-Clec12A antibody or an antigen-binding fragment thereof and a pharmaceutically acceptable carrier, wherein the anti-Clec12a antibody or antigen-binding fragment thereof comprises:
 - (a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to
 QVQLQESGPGLVKPSSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGS
 TKYNPSLKSRTISVDTSKNLFSLKLSSVTAADTAVYYCAREDDYYGSGSPFDYW
 GQGTLVTVSS (SEQ ID NO: 1), and
 - an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

IQMTQSPSSLSASVGDRVITITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ
ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence that is at least about 80% identical to
QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISY
DGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYFDY
WGQGTLLTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid
sequence that is at least about 80% identical to
EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence that is at least about 80% identical to
QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISY
DGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSRFYFDY
WGQGTLLTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid
sequence that is at least about 80% identical to
EIFMTQSPATLSLSPGERATLSCRASQSVH SKYLSWYQQKPGQAPSLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ
ID NO: 6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence that is at least about 80% identical to
QLQLQESGPGLVKPSSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTHY
RGSTYYNP SLKSRVTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDYW
GQGTLLTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence that is at least about 80% identical to
DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQS
GVPSRFRSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYIYF
SGSTNYNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFD
YWGQGTLLTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFRSGSGSGTYFTLTISLQPEDSATYYCLQDYNPRTFGQGKVEIK
(SEQ ID NO: 10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLQESGPGLVKPSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYF
SGSTKYNPSLKSRLTISVDTSKNQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFD
YWGQGTLLTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence that is at least about 80% identical to

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFRSGSGSGTDFTLTISLQPEDFATYYCLQDYNPRTFGQGKVEIK
(SEQ ID NO: 12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTSSYGMHWVRQAPGEGLEWVTVI
SYDGSDDKYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFD
YWGQGTLLTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence
that is at least about 80% identical to

EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLLMYGA
STRPTGIPARFSGSGGTDFLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence that is at least about 80% identical to

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAV
ISYDGSDDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYF
FDYWGQGTLLTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence
that is at least about 80% identical to

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKGPGQAPRLLIYGPST
RATGIPARFSGSGGTDFLTISLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence that is at least about 80% identical to

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFI
WYDGSIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFG
EFYFDYWGQGTLLTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence
that is at least about 80% identical to

AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSL
ESGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGTKVEIK
(SEQ ID NO: 18).

20. A pharmaceutical composition comprising an anti-Clec12A antibody or antigen-binding fragment thereof and a pharmaceutically acceptable carrier of claim 19, wherein the anti-Clec12a antibody or antigen-binding fragment thereof comprises:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of
QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGS
TKYNPSLKSRVTISVDTSKNLFSKLSSVTAADTAVYYCAREDYYGSGSPFDYW
GQGTLVTVSS (SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ
ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of
QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISY
DGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYYFDY
WGQGTLLVTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of
EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of 80% identical
QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISY

DGSDKYSADSVKGRFNISRDNSKNTLYLQMNSLRAEDTAVYYCARDGSRFYFDY
WGQGTLVTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid
sequence of

EIFMTQSPATLSLSPGERATLSCRASQSVHSKYLSWYQQKPGQAPSLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ
ID NO: 6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence

ofQLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTH
YRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDY
WGQGTLVTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid
sequence of

DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID
NO: 8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKLEWLGYIYF
SGSTNYNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFD
YWGQGTLVTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFSGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGTKVEIK
(SEQ ID NO: 10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLQESGPGLVKPSSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYF
SGSTKYNPSLKSRTISVDTSKNQFSLKLSSVTAADTAVYYCAREDYYGSGSPFD
YWGQGTLVTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK
(SEQ ID NO: 12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWVTVI
SYDGSDKYYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFD
YWGQGTLVTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLLMYGA
STRPTGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGGTKVEIK
(SEQ ID NO:14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAV
ISYDGSDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYF
FDYWGQGTLVTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKPGQAPRLLIYGPST
RATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGGTKVEIK
(SEQ ID NO: 16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFI
WYDGSIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFG
EFYFDYWGGQGLTVTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSL
ESGVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGTKVEIK
(SEQ ID NO: 18).

21. The pharmaceutical composition of claim 19 or 20, wherein the anti-Clec12a antibody or antigen-binding fragment thereof comprises:

(a) a heavy chain complementarity determining region (HCDR) 1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYYSGST (SEQ ID NO: 20), an HCDR3 comprising an amino acid sequence of AREDYYGSGSPFDY (SEQ ID NO: 21); and

a light chain complementarity determining region (LCDR) 1 comprising an amino acid sequence of QGIRYD (SEQ ID NO: 22), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), and an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(b) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDKGYFFDY (SEQ ID NO: 26); and

an LCDR1 comprising an amino acid sequence of QSVGNRY (SEQ ID NO: 27), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO: 29);

(c) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), an HCDR3 comprising an amino acid sequence of ARDGSRYFDY (SEQ ID NO: 30); and

an LCDR1 comprising an amino acid sequence of QSVHSKY (SEQ ID NO: 31), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPIT (SEQ ID NO: 32); or

(d) an HCDR1 comprising an amino acid sequence of GGSISSSTYY (SEQ ID NO: 33), an HCDR2 comprising an amino acid sequence of THYRGST (SEQ ID NO: 34), an HCDR3 comprising an amino acid sequence of ARELTGEVFDY (SEQ ID NO: 35); and an LCDR1 comprising an amino acid sequence of QSISSY (SEQ ID NO:36), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of QQSYSTPFT (SEQ ID NO: 37);

(e) an HCDR1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO: 38), and HCDR3 comprising an amino acid sequence of AREDYYGSGSPFDY (SEQ ID NO:21); and

an LCDR1 comprising an amino acid sequence of QGIRND (SEQ ID NO: 39), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNYPRT (SEQ ID NO:40);

(f) an HCDR1 comprising an amino acid sequence of GGSISTDY (SEQ ID NO:41), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO:38), and HCDR3 comprising an amino acid sequence of AREDYYGSGSPFDY (SEQ ID NO:21); and

an LCDR1 comprising an amino acid sequence of QDIRND (SEQ ID NO:42), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(g) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO:25), and HCDR3 comprising an amino acid sequence of ARDGQFYFDY (SEQ ID NO: 43); and

an LCDR1 comprising an amino acid sequence of QSVTSRY (SEQ ID NO:44), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO:28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO:29);

(h) an HCDR1 comprising an amino acid sequence of GFTFSNYG (SEQ ID NO: 45), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDSGRYFFDY (SEQ ID NO:46); and

an LCDR1 comprising an amino acid sequence of QSVSSRS (SEQ ID NO:47), an LCDR2 comprising an amino acid sequence of GPS (SEQ ID NO: 48), an LCDR3 comprising an amino acid sequence of HQDYNLPLT (SEQ ID NO:49); or

(i) an HCDR1 comprising an amino acid sequence of GFTFSKYG (SEQ ID NO: 50), an HCDR2 comprising an amino acid sequence of IWYDGSIK (SEQ ID NO: 51), and HCDR3 comprising an amino acid sequence of ARGSLWFGGEFYFDY (SEQ ID NO: 52); and

an LCDR1 comprising an amino acid sequence of QGISSA (SEQ ID NO: 53), an LCDR2 comprising an amino acid sequence of DAS (SEQ ID NO: 54), an LCDR3 comprising an amino acid sequence of QQFNYPRT (SEQ ID NO: 55).

22. The pharmaceutical composition of any one of claims 19-21, wherein the anti-Clec12A antibody or antigen-binding fragment thereof is selected from the group consisting of an IgA antibody, IgG antibody, IgE antibody, IgM antibody, bi- or multi- specific antibody, Fab fragment, Fab' fragment, F(ab')₂ fragment, Fd' fragment, Fd fragment, isolated CDRs or sets thereof; single-chain variable fragment (scFv), polypeptide-Fc fusion, single domain antibody, cameloid antibody; masked antibody, Small Modular ImmunoPharmaceutical ("SMIPsTM"), single chain, Tandem diabody, VHHs, Anticalin, Nanobody, minibodies, BiTE, ankyrin repeat protein, DARPIN, Avimer, DART, TCR-like antibody, Adnectin, Affilin, Trans-body; Affibody, TrimerX, MicroProtein, Fynomer, Centyrin, and KALBITOR.
23. The pharmaceutical composition of any one of claims 19-22, wherein the anti-Clec12A antibody or antigen-binding fragment thereof of any one of the preceding claims, wherein the anti-Clec12A antibody or antigen-binding fragment thereof is a monoclonal antibody or a single-chain variable fragment (scFv).
24. The pharmaceutical composition of claim 23, wherein the anti-Clec12A antibody is an antibody comprising an IgG constant region.

25. The pharmaceutical composition of any one of claims 19-24, wherein the anti-Clec12A antigen-binding fragment thereof is a single-chain variable fragment (scFv).
26. The pharmaceutical composition of claim 25, wherein the scFv comprises a leader sequence, a heavy chain variable sequence, a GS-Linker, and a light chain variable sequence.
27. The pharmaceutical composition of claim 26, wherein the scFv comprises a sequence having at least about 80% identity to:

(a) QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYI
YYSGSTKYNPSLKSRTISVDTSKNLFSCLKSSVTAADTAVYYCAREDDYYGSGSP
FDYWGQGTLVTVSSASTGGGGSGGGGSGGGGSAIQMTQSPSSLSASVGDRVTIT
CRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISL
QPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 56);

(b) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AIVISYDGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKG
YYFDYWGQGTLVTVSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERAT
LSCRASQSVGNRYLSWYQQKPGQAPRLLIYGA STRATGIPARFSGSGSGTDFTLT
SSLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ ID NO: 57);

(c) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AIVISYDGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSR
YFDYWGQGTLVTVSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLPGERATLS
CRASQSVH SKYLSWYQQKPGQAPSLLIYGA STRATGIPARFSGSGSGTDFTLT
LQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 58); or

(d) QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWG WIRQPPRKGLEWIG
STHYRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVF
DYWGQGTLVTVSSASTGGGGSGGGGSGGGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQ
P
EDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

28. The pharmaceutical composition of claim 26, wherein the scFv comprises a sequence of:

(a) QVQLQESGPGLVKPSSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYI
YYSGSTKYNPSLKSRTISVDTSKNLFSKLSSVTAADTAVYYCAREDDYYGSGSP
FDYWGQGTLVTVSSASTGGGGSGGGSGGGGSAIQMTQSPSSLSASVGDRVTIT
CRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISL
QPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 56);

(b) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AIVSYDGSDKYYVDSVKGRFTISRDNKNTLYLHMNSLRAEDTAVYYCARDKG
YYFDYWGQGTLVTVSSASTGGGGSGGGSGGGGSEIVMTQSPATLSLSPGERAT
LSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRATGIPARFSGSGSGTDFTLT
SSLQPEDFAVYYCQQDYNLPLTFGGGKTKVEIK (SEQ ID NO: 57);

(c) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AVISYDGSDKYSADSVKGRFNISRDNKNTLYLQMNSLRAEDTAVYYCARDGSR
YFDYWGQGTLVTVSSASTGGGGSGGGSGGGGSEIFMTQSPATLSLSPGERATLS
CRASQSVHISKYLSWYQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLT
LQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 58); or

(d) QLQLQESGPGLVKPSSETLSLTCTVSGGSISSTYYWGWIRQPPRKGLEWIG
STHYRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVF
DYWGQGTLVTVSSASTGGGGSGGGSGGGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQ
EDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

29. A nucleic acid sequence encoding an amino acid sequence at least about 90% identical to any one of the amino acid sequences in claims 1-28.
30. A vector comprising the nucleic acid sequence of claim 29.
31. A cell comprising the vector of claim 30.
32. Use of a composition comprising an anti-Clec12A antibody or antigen-binding fragment thereof in the manufacture of a medicament for treating cancer in a subject in need thereof, wherein the anti-Clec12A antibody or antigen-binding fragment thereof comprises:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGS
TKYNPSLKSRTISVDTSKNLFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYW
GQGTLVTVSS (SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ
ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISY
DGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYFDY
WGQGTLLTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of 80% identical

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISY
DGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSRFYDY
WGQGTLLTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

EIFMTQSPATLSLSPGERATLSCRASQSVH SKYLSWYQQKPGQAPSLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ
ID NO: 6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence

of QLQLQESGPGLVKPSETLSLTCTVSGGSISSTYYWGWIRQPPRKGLEWIGSTH
YRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDY
WGQGLTVTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID
NO: 8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYIYFSG
STNYPNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYW
GQGLTVTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFSGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGKTKVEIK
(SEQ ID NO: 10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYFSGS
TKYNPSLKSRTISVDTSKNQFSLKLSSVTAADTAVYYCAREDYYGSGSPFDYW
GQGLTVTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASSLQ
SGVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGKTKVEIK (SEQ
ID NO: 12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWTVISY
DGSDKYYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFDY
WGQGTLVTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of
EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLLMYGASTR
PTGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK (SEQ
ID NO:14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAV
ISYDGSDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYF
FDYWGQGTLVTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of
EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKPGQAPRLLIYGPSTRAT
GIPARFSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK (SEQ
ID NO: 16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFIW
YDGSIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFGE
FYFDYWGQGTLVTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of
AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSLES
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQFNYPRTFGQGGTKVEIK (SEQ
ID NO: 18).

33. The use according to claim 32, wherein the anti-Clec12A antibody or antigen-binding fragment thereof comprises:

(a) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLQESGPGLVKPSSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYIYYSGS
TKYNPSLKSRTISVDTSKNLFSKLSSVTAADTAVYYCAREDYYGSGSPFDYW
GQGTLVTVSS (SEQ ID NO: 1), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

IQMTQSPSSLSASVGDRVTITCRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ
ID NO: 2);

(b) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVISY
DGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKGYYFDY
WGQGT LTVSS (SEQ ID NO: 3), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

EIVMTQSPATLSLSPGERATLSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 4);

(c) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence

of QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWVAVIS
YDGSDKYSADSVKGRFNISRDN SKNTLYLQMNSLRAEDTAVYYCARDGSR YFD
YWGQGT LTVSS (SEQ ID NO: 5), and

an immunoglobulin light chain variable (VL) region comprising an amino acid sequence of

EIFMTQSPATLSLSPGERATLSCRASQSVHSKYLSWYQQKPGQAPSLLIYGASTR
ATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPTFGQGTRLEIK (SEQ
ID NO: 6); or

(d) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence

ofQLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIGSTH
YRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVFDY
WGQGTLVTVSS (SEQ ID NO: 7), and

an immunoglobulin light chain variable (VL) region comprising an amino acid
sequence of

DIQMTQSPSSLSASVGDRVTITCRASQSISSYLNWYQQKPGKAPKLLIYAASSLQS
GVPSRFSGSGSGTDFTLTISLQPEDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID
NO: 8);

(e) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWLGYIYF
SGSTNYPNPSLKSRLTISVAASKSQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFD
YWGQGTLVTVSS (SEQ ID NO: 9), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQGIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFSGSGSGTYFTLTISLQPEDSATYYCLQDYNYPRTFGQGTKVEIK
(SEQ ID NO: 10);

(f) an immunoglobulin heavy chain variable (VH) region comprising an amino acid
sequence of

QVQLQESGPGLVKPSETLSLTCTVSGGSISTDYWSWIRQPPGKGLEWIGYIYF
SGSTKYNPSLKSRTISVDTSKNQFSLKLSSVTAADTAVYYCAREDDYYGSGSPFD
YWGQGTLVTVSS (SEQ ID NO: 11), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

AIQMTQSPSSLSASVGDRVTITCRASQDIRNDLGWFQQKPGKAPKLLIYAASS
LQSGVPSRFSGSGSGTDFTLTISLQPEDFATYYCLQDYNFPRTFGQGTKVEIK
(SEQ ID NO: 12);

(g) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGEGLEWVTVI
SYDGSDKYYADSVKGRFTISRDNKSTLFLQMNSLRAEDTAVYYCARDGQFYFD
YWGQGTLLTVSS (SEQ ID NO: 13), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence
of

EIVMTQSPATLSLSPGESATLSCRASQSVTSRYLSWYQQKPGQAPRLLMYGA
STRPTGIPARFSGSGSGTDFTLTISLQPEDFAVYYCQQDYNLPLTFGGGTKVEIK
(SEQ ID NO:14);

(h) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVQLVESGGGVVQPGRSLRLSCAASGFTFSNYGMHWVRQAPGKGLEWVAV
ISYDGSDKSYKDSVKGRFTIARDNSKNTLYLQMNSLRAEDTAVYYCARDSGRYF
FDYWGQGTLLTVSS (SEQ ID NO: 15), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence of

EIIMTQSPATLSLSPGERATLSCRASQSVSSRSLSWYQHKPGQAPRLLIYGPST
RATGIPARFSGSGSGTDFTLTISLQPEDFAVYYCHQDYNLPLTFGGGTKVEIK
(SEQ ID NO: 16); or

(i) an immunoglobulin heavy chain variable (VH) region comprising an amino acid sequence of

QVKLVESGGGVVQPGRSLRLSCAASGFTFSKYGMHWVRQAPGKGLEWVAFI
WYDGSIKNYADSVKGRFTTSRDNSKNTLYLQMNSLRAEDTAVYYCARGSLWFG
EFYFDYWGQGTLLTVSS (SEQ ID NO: 17), and

an immunoglobulin light variable (VL) region comprising an amino acid sequence

of

AIQLTQSPSSLSASVGDRVTITCRTSQGISSALAWYQQKPGKTPKLLIYDASSL
ESGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQFNYPRTFGQGTKVEIK
(SEQ ID NO: 18).

34. The use according to claim 32 or 33, wherein the anti-Clec12A antibody or antigen-binding fragment thereof comprises:

(a) a heavy chain complementarity determining region (HCDR) 1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYYSGST (SEQ ID NO: 20), an HCDR3 comprising an amino acid sequence of AREDDYYGSGSPFDY (SEQ ID NO: 21); and

a light chain complementarity determining region (LCDR) 1 comprising an amino acid sequence of QGIRYD (SEQ ID NO: 22), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), and an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(b) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDKGYFFDY (SEQ ID NO: 26); and

an LCDR1 comprising an amino acid sequence of QSVGNRY (SEQ ID NO: 27), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO: 29);

(c) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), an HCDR3 comprising an amino acid sequence of ARDGSRYFDY (SEQ ID NO: 30); and

an LCDR1 comprising an amino acid sequence of QSVHSKY (SEQ ID NO: 31), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO: 28), an LCDR3 comprising an amino acid sequence of QQDYNLPIT (SEQ ID NO: 32); or

(d) an HCDR1 comprising an amino acid sequence of GGSISSSTYY (SEQ ID NO: 33), an HCDR2 comprising an amino acid sequence of THYRGST (SEQ ID NO: 34), an HCDR3 comprising an amino acid sequence of ARELTGEVFDY (SEQ ID NO: 35); and

an LCDR1 comprising an amino acid sequence of QSISSY (SEQ ID NO:36), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of QQSYSTPFT (SEQ ID NO: 37);

(e) an HCDR1 comprising an amino acid sequence of GGSISTYY (SEQ ID NO: 19), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO: 38), and HCDR3 comprising an amino acid sequence of AREDYYGSGSPFDY (SEQ ID NO:21); and

an LCDR1 comprising an amino acid sequence of QGIRND (SEQ ID NO: 39), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNYPRT (SEQ ID NO:40);

(f) an HCDR1 comprising an amino acid sequence of GGSISTDY (SEQ ID NO:41), an HCDR2 comprising an amino acid sequence of IYFSGST (SEQ ID NO:38), and HCDR3 comprising an amino acid sequence of AREDYYGSGSPFDY (SEQ ID NO:21); and

an LCDR1 comprising an amino acid sequence of QDIRND (SEQ ID NO:42), an LCDR2 comprising an amino acid sequence of AAS (SEQ ID NO: 23), an LCDR3 comprising an amino acid sequence of LQDYNFPRT (SEQ ID NO: 24);

(g) an HCDR1 comprising an amino acid sequence of GFTFSSYG (SEQ ID NO: 73), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO:25), and HCDR3 comprising an amino acid sequence of ARDGQFYFDY (SEQ ID NO: 43); and

an LCDR1 comprising an amino acid sequence of QSVTSRY (SEQ ID NO:44), an LCDR2 comprising an amino acid sequence of GAS (SEQ ID NO:28), an LCDR3 comprising an amino acid sequence of QQDYNLPLT (SEQ ID NO:29);

(h) an HCDR1 comprising an amino acid sequence of GFTFSNYG (SEQ ID NO: 45), an HCDR2 comprising an amino acid sequence of ISYDGSDK (SEQ ID NO: 25), and HCDR3 comprising an amino acid sequence of ARDSGRYFFDY (SEQ ID NO:46); and

an LCDR1 comprising an amino acid sequence of QSVSSRS (SEQ ID NO:47), an LCDR2 comprising an amino acid sequence of GPS (SEQ ID NO: 48), an LCDR3 comprising an amino acid sequence of HQDYNLPLT (SEQ ID NO:49); or

(i) an HCDR1 comprising an amino acid sequence of GFTFSKYG (SEQ ID NO: 50), an HCDR2 comprising an amino acid sequence of IWYDGSIK (SEQ ID NO: 51), and HCDR3 comprising an amino acid sequence of ARGSLWFGEFYFDY (SEQ ID NO: 52); and

an LCDR1 comprising an amino acid sequence of QGISSA (SEQ ID NO: 53), an LCDR2 comprising an amino acid sequence of DAS (SEQ ID NO: 54), an LCDR3 comprising an amino acid sequence of QQFNYPRT (SEQ ID NO: 55).

35. The use according to any one of claims 32-34, wherein the anti-Clec12A antibody or antigen-binding fragment thereof is a monoclonal antibody or a single-chain variable fragment (scFv).

36. The use according to any one of claims 32-35, wherein the anti-Clec12A antibody is an antibody comprising an IgG constant region.

37. The use according to any one of claims 32-36, wherein the anti-Clec12A antigen-binding fragment thereof is a single-chain variable fragment (scFv).

38. The use according to claim 37, wherein the scFv comprises a leader sequence, a heavy chain variable sequence, a GS-Linker, and a light chain variable sequence.

39. The use according to claim 38, wherein the scFv comprises a sequence having at least about 80% identity to:

(a) QVQLQESGPGLVKPSSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYI
YYSGSTKYNPSLKSRTISVDTSKNLFSCLKSSVTAADTAVYYCAREDDYYGSGSP
FDYWGGQGLTVTVSSASTGGGGSGGGGSGGGGSAIQMTQSPSSLSASVGDRVTIT
CRASQGIRYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISSL
QPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 56) ;

(b) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AIVISYDGSDKYYVDSVKGRFTISRDN SKNTLYLHMNSLRAEDTAVYYCARDKG
YYFDYWGGQGLTVTVSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERAT

LSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRATGIPARFSGSGSGTDFTLTIT
SSLQPEDFAVYYCQQDYNLPLTFGGGKTKVEIK (SEQ ID NO: 57);

(c) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AVISYDGSDKYSADSVKGRFNISRDNSKNTLYLQMNSLRAEDTAVYYCARDGSR
YFDYWGGQGLVTVSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLPGERATLS
CRASQSVHISKYLSWYQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLTITSS
LQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 58); or

(d) QLQLQESGPGLVKPSETLSLTCTVSGGSISSTYYWGWIRQPPRKGLEWIG
STHYRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVF
DYWGQGLVTVSSASTGGGGSGGGGSGGGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTITSSLQP
EDFATYYCQSYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

40. The use according to claim 39, wherein the scFv comprises a sequence of:

(a) QVQLQESGPGLVKPSETLSLTCTVSGGSISTYYWSWIRQPPGKGLEWIGYI
YYSGSTKYNPSLKSRTISVDTSKNLFSKLSSVTAADTAVYYCAREDDYYGSGSP
FDYWGGQGLVTVSSASTGGGGSGGGGSGGGGSAIQMTQSPSSLSASVGDRVTIT
CRASQGIQYDLGWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTITSS
LPEDFATYYCLQDYNFPRTFGQGTKVEIK (SEQ ID NO: 56);

(b) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AIVISYDGSDKYYVDSVKGRFTISRDNSKNTLYLHMNSLRAEDTAVYYCARDKG
YYFDYWGGQGLVTVSSASTGGGGSGGGGSGGGGSEIVMTQSPATLSLSPGERAT
LSCRASQSVGNRYLSWYQQKPGQAPRLLIYGASTRATGIPARFSGSGSGTDFTLTIT
SSLQPEDFAVYYCQQDYNLPLTFGGGKTKVEIK (SEQ ID NO: 57);

(c) QVQLVESGGGVVQPGRSLRLSCAASGFTFSSYGMHWVRQAPGKGLEWV
AVISYDGSDKYSADSVKGRFNISRDNSKNTLYLQMNSLRAEDTAVYYCARDGSR
YFDYWGGQGLVTVSSASTGGGGSGGGGSGGGGSEIFMTQSPATLSLPGERATLS
CRASQSVHISKYLSWYQQKPGQAPSLLIYGASTRATGIPARFSGSGSGTDFTLTITSS
LQPEDFAVYYCQQDYNLPITFGQGTRLEIK (SEQ ID NO: 58); or

(d) QLQLQESGPGLVKPSETLSLTCTVSGGSISSSTYYWGWIRQPPRKGLEWIG
STHYRGSTYYNPSLKSRTISVDTSKNQFSLKVSSVTAADTAVYYCARELTGEVF
DYWGQGTLVTVSSASTGGGGSGGGGSGGGGSDIQMTQSPSSLSASVGDRVTITC
RASQSISSYLNWYQQKPGKAPKLLIYAASSLQSGVPSRFSGSGSGTDFTLTISLQP
EDFATYYCQQSYSTPFTFGPGTKVDIK (SEQ ID NO: 59).

41. The use according to any one of claims 32-40, wherein the cancer is selected from leukemia, lymphoma, and myeloma.
42. The use according to any one of claims 32-41, further comprising that one or more additional agents is to be administered.
43. The use according to claim 42, wherein the one or more additional agents is selected from an antibody, a chemotherapeutic, and radiation therapy.