METHODS OF DETECTING TRBC1 OR TRBC2

RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 63/070,793 filed on August 26, 2020, the entire contents of which are hereby incorporated by reference.

BACKGROUND

[0002] Lymphomas are cancers that arise from lymphocytes. T cell lymphoma (TCL) is a lymphoma that arises from T cells; these account for approximately 7% of all non-Hodgkin's lymphomas in the United States. Common subtypes of TCL include: Peripheral T Cell Lymphoma, Not Otherwise Specified (PTCLNOS), Anaplastic Large Cell Lymphoma (ALCL), Angioimmunoblastic T Cell Lymphoma (AITL), and Cutaneous T Cell Lymphoma (CTCL). Each type of TCL has its own pathology and symptoms. Given the ongoing need for improved treatment of lymphomas such as TCLs, new compositions and treatments targeting lymphomas, e.g., TCLs, are highly desirable.

SUMMARY OF THE INVENTION

[0003] Provided herein, inter alia, in an aspect, is a method of identifying a subject in need of treatment for cancer, e.g., a lymphoma or leukemia, e.g., a T cell lymphoma or leukemia, using a composition comprising a polypeptide molecule comprising: (i) a first antigen binding domain that binds to T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2), and (ii) a second antigen binding domain that binds to NKp30, comprising determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC2, wherein: responsive to a determination that the subject has cancer cells that express a T cell receptor comprising TRBC2, identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, and optionally not as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1.

[0004] In some embodiments, the polypeptide molecule is a multifunctional polypeptide molecule.

[0005] In some embodiments, the polypeptide molecule is a multispecific polypeptide molecule.

[0006] In some embodiments, the first antigen binding domain binds to T cell receptor beta chain constant domain 2 (TRBC2), and the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto

[0007] In some embodiments, the first antigen binding domain binds to T cell receptor beta chain constant domain 2 (TRBC2), and the first antigen binding domain comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a

VLCDR3, wherein: the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7441, 201, and 7442, respectively; or the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7443, 224, and 225, respectively.

[0008] In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7422, 201, and 7403, respectively; SEQ ID NOs: 7401, 201, and 7403, respectively; SEQ ID NOs: 7394, 201, and 7396, respectively; SEQ ID NOs: 7346, 201, and 7398, respectively; SEQ ID NOs: 7346, 201, and 7400, respectively; SEQ ID NOs: 7405, 201, and 7403, respectively; SEQ ID NOs: 7407, 201, and 7403, respectively; SEQ ID NOs: 7427, 201, and 7403, respectively; or SEQ ID NOs: 7430, 201, and 7403, respectively.

[0009] In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7410, 224, and 225, respectively; or SEQ ID NOs: 7409, 224, and 225, respectively.

[0010] In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7422, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7401, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7394, 201, 7396, 7410, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 7398, 7410, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 7400, 7410, 224, and 225, respectively; SEQ ID NOs: 7405, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7407, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7427, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7430, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7422, 201, 7403, 7409, 224, and 225, respectively; SEQ ID NOs: 7401, 201, 7403, 7409, 224, and 225, respectively; SEQ ID NOs: 7394, 201, 7396, 7409, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 7398, 7409, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 7400, 7409, 224, and 225, respectively; SEQ ID NOs: 7405, 201, 7403, 7409, 224, and 225, respectively; SEQ ID NOs: 7407, 201, 7403, 7409, 224, and 225, respectively; SEQ ID NOs: 7427, 201, 7403, 7409, 224, and 225, respectively; or SEQ ID NOs: 7430, 201, 7403, 7409, 224, and 225, respectively.

[0011] In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7420, 7423, 7411, 7412, 7413, 7414, 7415, 7416, 7417, 7425, 7428, and 7431 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7419 and 7418 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[0012] In some embodiments, the VH and VL comprise the amino acid sequences of: SEQ ID NOs: 7420 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7423 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7411 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7412 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7413 and 7419, respectively (or a

sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7414 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7415 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7416 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7417 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7425 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7428 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7431 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7420 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7423 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7411 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7412 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7413 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7414 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7415 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7416 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7417 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7425 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7428 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or SEQ ID NOs: 7431 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[0013] In some embodiments, the first antigen binding domain binds to T cell receptor beta chain constant domain 2 (TRBC2), and wherein: (i) the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor not comprising TRBC2, optionally wherein the KD for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the KD for the binding between the first antigen binding domain and a T cell receptor not comprising TRBC2; (ii) the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor comprising TRBC1, optionally wherein the KD for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the KD for the binding between the first antigen binding domain and a T cell receptor comprising TRBC1; or (iii) binding of the first antigen binding domain to TRBC2 on a lymphoma cell or lymphocyte, e.g., T cell, does not appreciably activate the lymphoma cell or lymphocyte, e.g., T cell, e.g., as measured by T cell proliferation, expression of a T cell activation marker (e.g., CD69 or CD25), and/or expression of a cytokine (e.g., TNFα and IFNγ).

[0014] In some embodiments, the first antigen binding domain binds to T cell receptor beta chain constant domain 2 (TRBC2), and the polypeptide molecule binds to TRBC2 monovalently.

[0015] In some embodiments, the polypeptide molecule comprises a configuration shown in any of FIGs. 30A-30D, optionally wherein: (i) the polypeptide molecule comprises an anti-TRBC2 Fab and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 30A; (ii) the polypeptide molecule comprises an anti-TRBC2 Fab and an anti-NKp30 Fab, e.g., comprises a configuration shown in FIG. 30B; (iii) the polypeptide molecule comprises an anti-NKp30 Fab and an anti-TRBC2 scFv, e.g., comprises a configuration shown in FIG. 30C; or (iv) the polypeptide molecule comprises an anti-TRBC2 scFv and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 30D.

[0016] In some embodiments, the polypeptide molecule further comprises a dimerization module comprising one or more immunoglobulin chain constant regions (e.g., Fc regions) comprising one or more of: a paired cavity-protuberance ("knob-in-a hole"), an electrostatic interaction, or a strand-exchange.

[0017] In some embodiments, the polypeptide molecule comprises an anti-TRBC2 amino acid sequence disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto, and/or an anti-NKp30 amino acid sequence disclosed in any one of Tables 7, 8, 8A, 8B, 9, 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[0018] In some embodiments, the polypeptide molecule comprises: (i) an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); (ii) an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or (iii) SEQ ID NOs: 7438, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[0019] In some embodiments, the polypeptide molecule comprises: (i) an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); (ii) an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or (iii) SEQ ID NOs: 7440, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[0020] In some embodiments, the first antigen binding domain binds to T cell receptor beta chain constant domain 1 (TRBC1), and wherein the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 3A-3B or 4 (e.g., any of SEQ ID NOs: B001-B095), or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[0021] In some embodiments, the first antigen binding domain binds to T cell receptor beta chain constant domain 1 (TRBC1), and wherein the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any one of Tables 8A-8B, 9, and 10 (e.g., any of SEQ ID NOs C001-C128): , or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[0022] In some embodiments, the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any one of Tables 7, 8, 8A, 8B, 9, 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[0023] In some embodiments, the second antigen binding domain comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3, wherein the VHCDR1, VHCDR2, and VHCDR3 of the second antigen binding domain comprise the amino acid sequences of: SEQ ID NOs: 7313, 6001, and 7315, respectively; SEQ ID NOs: 7313, 6001, and 6002, respectively; SEQ ID NOs: 7313, 6008, and 6009, respectively; SEQ ID NOs: 7313, 7385, and 7315, respectively; SEQ ID NOs: 7313, 7318, and 6009, respectively; SEQ ID NOs: C019, C021, and C023, respectively; SEQ ID NOs: C033, C035, and C037, respectively; SEQ ID NOs: C047, C049, and C051, respectively; SEQ ID NOs: C061, C063, and C065, respectively; SEQ ID NOs: C075, C077, and C079, respectively; SEQ ID NOs: C089, C091, and C093, respectively; SEQ ID NOs: C103, C105, and C107, respectively; or SEQ ID NOs: C116, C118, and C120, respectively.

[0024] In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 of the second antigen binding domain comprise the amino acid sequences of: SEQ ID NOs: 7326, 7327, and 7329, respectively; SEQ ID NOs: 6063, 6064, and 7293, respectively; SEQ ID NOs: 6070, 6071, and 6072, respectively; SEQ ID NOs: 6070, 6064, and 7321, respectively; SEQ ID NOs: C026, C028, and C030, respectively; SEQ ID NOs: C040, C042, and C044, respectively; SEQ ID NOs: C054, C056, and C058, respectively; SEQ ID NOs: C068, C070, and C072, respectively; SEQ ID NOs: C082, C084, and C086, respectively; SEQ ID NOs: C096, C098, and C100, respectively; SEQ ID NOs: C110, C112, and C113, respectively; or SEQ ID NOs: C123, C125, and C127, respectively.

[0025] In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 of the second antigen binding domain comprise the amino acid sequences of: SEQ ID NOs: 7313, 6001, 7315, 7326, 7327, and 7329, respectively; SEQ ID NOs: 7313, 6001, 6002, 6063, 6064, and 7293, respectively; SEQ ID NOs: 7313, 6008, 6009, 6070, 6071, and 6072, respectively; SEQ ID

NOs: 7313, 7385, 7315, 6070, 6064, and 7321, respectively; SEQ ID NOs: 7313, 7318, 6009, 6070, 6064, and 7321, respectively; SEQ ID NOs: C019, C021, C023, C026, C028, and C030, respectively; SEQ ID NOs: C033, C035, C037, C040, C042, and C044, respectively; SEQ ID NOs: C047, C049, C051, C054, C056, and C058, respectively; SEQ ID NOs: C061, C063, C065, C068, C070, and C072, respectively; SEQ ID NOs: C075, C077, C079, C082, C084, and C086, respectively; SEQ ID NOs: C089, C091, C093, C096, C098, and C100, respectively; SEQ ID NOs: C103, C105, C107, C110, C112, and C113, respectively; or SEQ ID NOs: C116, C118, C120, C123, C125, and C127, respectively.

[0026] In some embodiments, (i) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7302, 7298, 7300, 7301, 7303, and 7304 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7309, 7305, 7299, and 7306-7308 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); (ii) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6121 and 6123-6128 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7294 or 6137-6141 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or (iii) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6122 and 6129-6134 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6136 or 6142-6147 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or (iv) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: C001-C008 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: C009-C016 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[0027] In some embodiments, the VH and VL of the second antigen binding domain comprise the amino acid sequences of: SEQ ID NOs: 7302 and 7309, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or SEQ ID NOs: 7302 and 7305, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[0028] In some embodiments, the second antigen binding domain comprise the amino acid sequences of: SEQ ID NO: 7311 or 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NO: 6187 or 6188 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NO: 6189 or 6190 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or any of SEQ ID NOs: C017-C024.

[0029] In some embodiments, the method as described herein further comprises: responsive to identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, treating the subject with (e.g., administering to the subject) a multifunctional molecule as described herein.

[0030] In some embodiments, the cancer is leukemia or lymphoma.

[0031] In some embodiments, the cancer is selected from Acquired immune deficiency syndrome (AIDS)-associated lymphoma, Angioimmunoblastic T-cell lymphoma, Adult T-cell leukemia/lymphoma, Burkitt lymphoma, Central nervous system (CNS) lymphoma, Diffuse large B-cell lymphoma (DLBCL), Lymphoblastic lymphoma, Mantle cell lymphoma (MCL), Peripheral T-cell lymphoma (PTCL) (e.g., Hepatosplenic T-cell lymphoma (HSGDTCL), Subcutaneous paniculitis-like T-cell lymphoma, or Enteropathy-associated T-cell lymphoma), Transformed follicular and transformed mucosa-associated lymphoid tissue (MALT) lymphomas, Cutaneous T-cell lymphoma (mycosis fungoides and Sézary syndrome), Follicular lymphoma, Lymphoplasmacytic lymphoma/Waldenström macroglobulinemia, Marginal zone B-cell lymphoma, Gastric mucosa-associated lymphoid tissue (MALT) lymphoma, Chronic lymphocytic leukemia/small-cell lymphocytic lymphoma (CLL/SLL), Extranodal T-/NK-cell lymphoma (nasal type), and Anaplastic large-cell lymphoma (e.g., primary cutaneous anaplastic large-cell lymphoma or systemic anaplastic large-cell lymphoma).

[0032] In some embodiments, the cancer is Peripheral T-cell lymphoma (PTCL).

[0033] In another aspect, provides herein is a method of detecting TRBC1 or TRBC2 in a sample or subject, comprising: contacting the sample or subject with an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein; and detecting formation of a complex between the antibody molecule and the sample or subject, thereby detecting TRBC1 or TRBC2.

[0034] In some embodiments, TRBC1 or TRBC2 is detected in vitro or in vivo.

[0035] In some embodiments, the method as described herein further comprises contacting a reference sample or subject with the antibody molecule; and detecting formation of a complex between the antibody molecule and the reference sample or subject, wherein a change, e.g., a statistically significant change, in the formation of the complex in the sample or subject, relative to the reference sample or subject is indicative of the presence of TRBC1 or TRBC2 in the sample or subject.

[0036] In some embodiments, the method as described herein further comprises obtaining a sample from a subject.

[0037] In some embodiments, the sample comprises one or more of plasma, tissue (e.g., cancerous tissue), biopsy, blood (e.g., whole blood), PBMCs, bone marrow, and/or lymphatic tissue, e.g., lymph node. comprises one or more of plasma, tissue (e.g., cancerous tissue), biopsy, blood (e.g., whole blood), PBMCs, bone marrow, and/or lymphatic the sample has not been frozen and/or fixed.

comprises one or more of plasma, tissue (e.g., cancerous tissue), biopsy, blood (e.g., whole blood), PBMCs, bone marrow, and/or lymphatic the sample has been frozen (e.g., snap frozen) and/or fixed (e.g., formalin-fixed paraffin-embedded (FFPE)). comprises one or more of plasma, tissue (e.g., cancerous tissue), biopsy, blood (e.g., whole blood), PBMCs, bone marrow, and/or lymphatic the subject has, or is at risk of having, a disease or disorder described herein (e.g., cancer, e.g., a lymphoma, e.g., a T cell lymphoma).

[0038] In some embodiments, the method as described herein further comprises performing a flow analysis, e.g., using a multi-panel method.

[0039] In some embodiments, the method as described herein further comprises assessing T-cell clonality, e.g., to determine the presence and/or level of T cell malignancy.

[0040] In some embodiments, the method as described herein further comprises measuring the level of TRBC1+ or TRBC2+ cells from the biological sample (e.g., determining if TRBC1+ or TRBC2+ cells are depleted, e.g., relative to a reference sample or subject).

[0041] In some embodiments, the method as described herein further comprises measuring the intracellular level of TRBC1 or TRBC2.

[0042] In some embodiments, the method as described herein further comprises measuring the membrane level of TRBC1 or TRBC2.

[0043] In some embodiments, the method as described herein further comprises evaluating the subject for a change in prognosis, severity, or presence or absence of a disease or disorder (e.g., cancer), e.g., after treatment (e.g., with an antibody molecule described herein).

[0044] In some embodiments, the antibody molecule is detectably labeled.

[0045] In another aspect, provides herein is a method of evaluating a subject, comprising: contacting a sample (e.g., a sample described herein) from the subject with an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein; and detecting formation of a complex between the antibody molecule and the sample, thereby evaluating the subject.

[0046] In some embodiments, the subject has, or is at risk of having, a disease or disorder described herein (e.g., cancer, e.g., a lymphoma, e.g., a T cell lymphoma).

[0047] In some embodiments, the subject has not been treated with an antibody molecule described herein.

[0048] In some embodiments, the subject has been treated with an antibody molecule described herein.

[0049] In another aspect, provides herein is a kit comprising an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody.

[0050] In another aspect, provides herein is a method of identifying a subject in need of treatment for cancer comprising determining that a peripheral blood mononuclear cell (PBMC)-derived T cell population obtained from the subject has a monotypia and specificity for TRBC1 or TRBC2, wherein

the monotypia and specificity for TRBC1 or TRBC2 in the PBMC-derived T cell population indicates that the subject has a T cell malignancy, thereby identifying the subject as a candidate for treatment for the cancer.

[0051] Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, suitable methods and materials are described below. All publications, patent applications, patents, and other references mentioned herein are incorporated by reference in their entirety. In the case of conflict, the present specification, including definitions, will control. In addition, the materials, methods, and examples are illustrative only and are not intended to be limiting.

[0052] Other features and advantages of the invention will be apparent from the following detailed description and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0053] **FIGs. 1A-1D** are schematic representations of exemplary formats and configurations of multispecific antibodies (e.g., bispecific antibodies) that bind to TRBC1 and NKp30. FIG. 1A depicts an anti-TRBC1 antibody fused to an anti-NKp30 scFv. The anti-TRBC1 antibody comprises two heavy chains and two light chains. The anti-NKp30 scFv is fused to the N-terminus of one heavy chain of the anti-TRBC1 antibody. FIG. 1B depicts an antibody molecule comprising an anti-TRBC1 Fab, an anti-NKp30 scFv, and an Fc dimer. The Fc dimer comprises two Fc chains. The C-terminus of the heavy chain of the anti-TRBC1 Fab is fused to the N-terminus of one Fc chain. The anti-NKp30 scFv is fused to the N-terminus of the other Fc chain. FIGs. 1C and 1D depict an anti-TRBC1 antibody fused to two anti-NKp30 scFvs. The anti-TRBC1 antibody comprises two heavy chains and two light chains. In FIG. 1C, the two anti-NKp30 scFvs are fused to the C-terminus of the two light chains of the anti-TRBC1 antibody, respectively. In FIG. 1D, the two anti-NKp30 scFvs are fused to the N-terminus of the two heavy chains of the anti-TRBC1 antibody, respectively.

[0054] **FIGs. 2A-2F** are schematic representations of exemplary formats and configurations of antibody molecules that comprises a moiety that binds to TRBC1 and a TRAIL molecule (e.g., a trimeric, dimeric, or monomeric TRAIL molecule). FIGs. 2A and 2D depict an antibody molecule comprising an anti-TRBC1 Fab, a trimeric TRAIL molecule, and an Fc dimer. FIGs. 2B and 2E depict an antibody molecule comprising an anti-TRBC1 Fab, a dimeric TRAIL molecule, and an Fc dimer. FIGs. 2C and 2F depict an antibody molecule comprising an anti-TRBC1 Fab, a monomeric TRAIL molecule, and an Fc dimer. The Fc dimer comprises two Fc chains. The C-terminus of the heavy chain of the anti-TRBC1 Fab is fused to the N-terminus of one Fc chain. The trimeric, dimeric, or monomeric TRAIL molecule is fused to the N-terminus of the other Fc chain. In some embodiments, the antibody molecule depicted in FIG. 2A comprises the amino acid sequences of SEQ ID NOs:

6169, 6167, and 6159. In some embodiments, the antibody molecule depicted in FIG. 2B comprises the amino acid sequences of SEQ ID NOs: 6169, 6167, and 6158. In some embodiments, the antibody molecule depicted in FIG. 2C comprises the amino acid sequences of SEQ ID NOs: 6169, 6167, and 6157. In some embodiments, then antibody molecule depicted in FIG. 2D comprises the amino acid sequences of SEQ ID NOs: 6169, 6167, and 6162. In some embodiments, then antibody molecule depicted in FIG. 2E comprises the amino acid sequences of SEQ ID NOs: 6169, 6167, and 6161. In some embodiments, then antibody molecule depicted in FIG. 2F comprises the amino acid sequences of SEQ ID NOs: 6169, 6167, and 6160.

[0055] **FIGs. 3A and 3B** are schematic representations of exemplary formats and configurations of multispecific antibodies (e.g., bispecific antibodies) that bind to TRBC1 and DR5. FIG. 3A depicts a multispecific antibody (e.g., a bispecific antibody) comprising an anti-TRBC1 Fab, an anti-DR5 scFv, and an Fc dimer. The Fc dimer comprises two Fc chains. The C-terminus of the heavy chain of the anti-TRBC1 Fab is fused to the N-terminus of one Fc chain. The anti-DR5 scFv is fused to the N-terminus of the other Fc chain. FIG. 3B depicts an anti-TRBC1 antibody fused to two anti-DR5 scFvs. The anti-TRBC1 antibody comprises two heavy chains and two light chains. The two anti-DR5 scFvs are fused to the C-terminus of the two light chains of the anti-TRBC1 antibody, respectively. In some embodiments, the multispecific antibody depicted in FIG. 3A comprises the amino acid sequences of SEQ ID NOs: 6169, 6167, and 6163. In some embodiments, the multispecific antibody depicted in FIG. 3B comprises the amino acid sequences of SEQ ID NOs: 6170 and 6168.

[0056] **FIGs. 4A-4B** shows the alignment of the H131 source mouse VH and VL framework 1, CDR 1, framework 2, CDR 2, framework 3, CDR3, and framework 4 regions with their respective humanized sequences. Kabat CDRs are shown in bold, Chothia CDRs are shown in italics, and combined CDRs are shown in boxes. The framework positions that were back mutated are double underlined. **FIG. 4A** shows VH sequences for murine H131 (SEQ ID NO: 1) and humanized H131 (SEQ ID NO: 9). **FIG. 4B** shows VL sequences for murine H131 (SEQ ID NO: 2) and humanized H131 (SEQ ID NO: 10 and SEQ ID NO: 11).

[0057] **FIGs. 5A-5B** shows the alignment of the 16G8 source mouse VH and VL framework 1, CDR 1, framework 2, CDR 2, framework 3, CDR3, and framework 4 regions with their respective humanized sequences. Kabat CDRs are shown in bold, Chothia CDRs are shown in italics, and combined CDRs are shown in boxes. The framework positions that were back mutated are double underlined. **FIG. 5A** shows VH sequences for murine 16G8 (SEQ ID NO: 15) and humanized 16G8 (SEQ ID NOs: 23-25). **FIG. 5B** shows VL sequences for murine 16G8 (SEQ ID NO: 16) and humanized 16G8 (SEQ ID NOs: 26-30).

[0058] **FIG. 6** depicts the phylogenetic tree of TCRBV gene family and subfamilies with corresponding antibodies mapped. Subfamily identities are as follows: Subfamily A: TCRβ V6; Subfamily B: TCRβ V10; Subfamily C: TCRβ V12; Subfamily D: TCRβ V5; Subfamily E: TCRβ

V7; Subfamily F: TCRβ V11; Subfamily G: TCRβ V14; Subfamily H: TCRβ V16; Subfamily I:TCRβ V18; Subfamily J:TCRβ V9; Subfamily K: TCRβ V13; Subfamily L: TCRβ V4; Subfamily M:TCRβ V3; Subfamily N:TCRβ V2; Subfamily O:TCRβ V15; Subfamily P: TCRβ V30; Subfamily Q: TCRβ V19; Subfamily R:TCRβ V27; Subfamily S:TCRβ V28; Subfamily T: TCRβ V24; Subfamily U: TCRβ V20; Subfamily V: TCRβ V25; and Subfamily W:TCRβ V29 subfamily. Subfamily members are described in detail herein in the Section titled "TCR beta V (TCRβV)".

[0059] **FIG. 7** is a graph showing binding of JOVI.1 and humanized JOVI.1 to human TRBC1.

[0060] **FIG. 8** is a set of graphs showing binding of JOVI.1 Fab (left) and humanized JOVI.1 Fab to human TRBC1 (right).

[0061] **FIG. 9** is a graph showing binding of NKp30 antibodies to NK92 cells. Data was calculated as the percent-AF747 positive population.

[0062] **FIG. 10** is a graph showing activation of NK92 cells by NKp30 antibodies. Data were generated using hamster anti-NKp30 mAbs.

[0063] **FIGs. 11A-11E** are schematic representations of anti-TRBC1/NKp30 antibodies and control molecules.

[0064] **FIGs. 12A-12B** are graphs showing binding of antibodies to Fcγ receptor-expressing THP1 cells.

[0065] **FIGs. 13A-13D** are graphs showing T cell activation after incubation with the indicated antibodies. FIG. 13A is a graph showing % CD4+ divided. FIG. 13B is a graph showing % CD8+ divided. FIG. 13C is a graph showing % CD69-CD25+ of CD4+. FIG. 13D is a graph showing % CD69-CD25+ of CD8+.

[0066] **FIGs. 14A-14D** are schematic representations of anti-TRBC1/NKp30 antibodies. In FIGs. 14B and 14D, "460" indicates a Fab based on BIM0460; "578" indicates a Fab based on BJM0578; "407" indicates a scFv (FIG. 18B) or a Fab (FIG. 14D) based on BJM0407; "411" indicates a scFv (FIG. 18B) or a Fab (FIG. 14D) based on BJM0411; and "N297A" indicates that the antibody comprises an N297A mutation in the Fc region.

[0067] **FIGs. 15A-15D** are graphs showing binding of the indicated antibodies to NK cell line KHYG-1 (FIG. 15A) and TRBC1+ Jurkat cells (FIG. 15B). FIG. 15C is a table providing information on the antibodies tested. FIG. 15D is a table providing EC50 for binding to KHYG-1 cells or TRBC1+ Jurkat cells.

[0068] **FIGs. 16A-16C** are graphs showing killing of TRBC1+ target cells in the presence of NK-92 effector cells. The target cells are TRBC1+ Jurkat cells (FIG. 16A) or H9 cells (FIG. 16B). TRBC2+ HPB-ALL cells were used as a control (FIG. 16C).

[0069] **FIGs. 17A-17C** are graphs showing killing of TRBC1+ target cells in the presence of primary NK cells. The target cells are TRBC1+ Jurkat cells (FIG. 17A) or H9 cells (FIG. 17B). TRBC2+ HPB-ALL cells were used as a control (FIG. 17C).

[0070] **FIGs. 18A-18C** are graphs showing activation of NK cells after co-culture with TRBC1+ Jurkat cells in the presence of anti-TRBC1/NKp30 antibodies. FIG. 18A shows % CD69+CD107a+ NK cells. FIG. 18B shows the level of IFNγ. FIG. 18C shows the level of TNFα.

[0071] **FIGs. 19A-19B** are graphs showing cytokine levels produced by NK cells in the presence or absence of TRBC1+ Jurkat cells. FIG. 19A shows the level of IFNγ. FIG. 19B shows the level of TNFα.

[0072] **FIG. 20** is a graph showing % NK cell death induced by the indicated antibodies in the presence of TRBC1+ Jurkat cells.

[0073] **FIGs. 21A and 21B** are schematic representations of a single arm anti-TRBC1 antibody and a bispecific anti-TRBC1/NKp30 antibody, respectively.

[0074] **FIGs. 22A-22D** are graphs showing NK cell-mediated killing of TRBC1+ PDX in the presence of the indicated antibodies.

[0075] **FIG. 23** is a panel of figures showing killing of TRBC1+ Jurkat cells in the presence of the indicated antibodies. The NK cells tested were isolated from healthy donors (upper panel) or from PTCL patients (lower panel).

[0076] **FIG. 24** is a panel of figures showing activation of NK cells during the killing assay shown in FIG. 23. The NK cells tested were isolated from healthy donors (upper panel) or from PTCL patients (lower panel).

[0077] **FIGs. 25A and 25B** are a panel of figures showing IFNγ (FIG. 25A) or TNFα (FIG. 25B) secretion levels of NK cells when co-cultured with Jurkat cells in the presence of the indicated antibodies. The NK cells tested were isolated from healthy donors (upper panel) or from PTCL patients (lower panel).

[0078] **FIGs. 26A-26C** are graphs measuring binding to NKp30 in ELISA. FIG. 26A shows binding of B7-H6 to NKp30. FIG. 26B shows binding of BJM1042 to NKp30. FIG. 26C shows binding of B7-H6 to NKp30 in the presence of varying concentrations of the indicated antibodies.

[0079] **FIGs. 27A-27C** are graphs from an in vivo TRBC1+ tumor study. FIG. 27A shows the study design. FIG. 27B shows tumor volume under the indicated treatments. FIG. 27C is a water plot showing % change in tumor volume on Day 3 post treatment. The following treatment groups are shown in FIG. 27C from left to right: No NK, PBS; No NK, TRBC1 x NKp30; NK, PBS; NK, TRBC1; NK, NKp30; and NK + 1mpk BJM1042.

[0080] **FIGs. 28A-28B** are graphs from an in vivo TRBC2+ tumor study. FIG. 28A shows the study design. FIG. 28B shows tumor volume under the indicated treatments.

[0081] **FIGs. 29A-29D** are schematic representations of anti-TRBC1/NKp30 antibodies.

[0082] **FIGs. 30A-30D** are schematic representations of anti-TRBC2/NKp30 antibodies.

[0083] **FIGs. 31A-31B** are schematic representations of antibody designs. FIGs. 31A is a schematic representation of a bispecific antibody comprising anti-TRBC2 Fab and anti-NKp30 ScFv

arms. FIG. 31B shows a design similar to that of FIG. 31A, lacking the NK-p30 binding chain.

[0084] **FIGs. 32A-32C** are representative data showing selective binding of the anti-TRBC2 antibody to cells expressing either human TRBC2, human TRBC1 or human NK-p30. FIG. 32A shows binding to TRBC2+ HPB-ALL cells; FIG. 32B shows binding to NKp30+ KHYG-1 cells; FIG. 32C shows binding to TRBC1+ Jurkat cells.

[0085] **FIGs. 33A-33D** are representative data showing selective killing of TRBC2 expressing cell lines (TRBC2+) and not TRBC1 (TRBC1+) expressing cell lines. FIG. 33A, data showing TRBC2x NKp30 bispecifics selectively kill TRBC2+ HPB-ALL cells with KHYG-1 NK cells as effectors in vitro. FIG. 33B, data showing TRBC2x NKp30 bispecifics do not kill TRBC1+ Jurkat cells in vitro. FIG. 33C, data showing TRBC2x NKp30 bispecifics selectively kill TRBC2+ HPB-ALL cells with primary NK cells as effectors in vitro. FIG. 33D, data showing TRBC2x NKp30 bispecifics do not kill TRBC1+ Jurkat cells with primary NK cells in vitro.

[0086] **FIGs. 34A-34B** are representative data showing TRBC2xNKp30 bispecifics activate primary NK cells cocultured with TRBC2+ cells in vitro. FIG. 34A, data showing primary NK cell activation in cocultures with TRBC2+ HPB-ALL cells. FIG. 34B, data showing lack of primary NK cell activation in cocultures with TRBC1+ Jurkat cells.

[0087] **FIGs. 35A-35D** are representative data showing TRBC2xNKp30 bispecific antibodies induce secretion of NK activation state relevant cytokines in cocultures of TRBC1+ cells and primary NK cells. FIG. 35A shows increased IFNγ secretion in cocultures of HPB-ALL cells and primary NK cells in vitro. FIG. 35B shows lack IFNγ secretion in cocultures of Jurkat cells and primary NK cells in vitro. FIG. 35C shows increased TNFα secretion in cocultures of HPB-ALL cells and primary NK cells in vitro. FIG. 35D shows lack TNFα secretion in cocultures of Jurkat cells and primary NK cells in vitro.

[0088] **FIGs. 36A-36C** are representative data showing targeted killing of patient derived xenograft cells by TRBC2xNKp30 bispecific antibodies. FIG. 36A, data showing TRBC2x NKp30 bispecifics selectively kill TRBC2+ cells derived from a patient with Adult T-cell Leukemia/Lymphoma (ATLL) (PDX2) with KHYG-1 cells as effectors. FIG. 36B, data showing TRBC2x NKp30 bispecifics selectively kill TRBC2+ cells derived from a patient with Hepatosplenic T-cell Lymphoma (HTCL) (PDX5) with KHYG-1 cells as effectors in vitro. FIG. 35C, data showing TRBC2x NKp30 bispecifics does not kill TRBC1+ cells derived from a patient with Adult T-cell Leukemia/Lymphoma (ATLL) (PDX3) with KHYG-1 cells as effectors in vitro.

[0089] **FIG. 37** is representative data showing specific deletion of TRBC1+ vs TRBC2+ T cells from human PBMCs using target specific bispecific antibodies as indicated in the figure. Data was collected at 4 days after treatment.

[0090] **FIG. 38** is representative data showing specific depletion TRBC1 + vs TRBC2 + T cells from human PBMCs using either TRBC1xNKp30 or TRBC2xNKp30 bispecific antibodies in vivo. Mice were administered human PBMCs at day 0, and treated with either TRBC1x NKp30 or TRBC2x

NKp30 antibodies, and whole blood was harvested on day 7.

[0091] **FIG. 39** is representative data showing significant antitumor activity in TRBC2+ HPB-ALL derived xenograft mouse model engrafted with human NK cells.

[0092] **FIG. 40** is representative flow analysis data confirming consistent profiles of TRBC1 and TRBC2 noted in healthy donor PBMCs (T-lymphocytes : CD4: Light grey. CD8: Grey).

[0093] **FIG. 41** is representative flow analysis data confirming monotypia for TRBC1 T cell Lymphoma sample #1.

T-lymphocytes : CD4: Light grey. CD8: Grey.

Aberrant CD3 dim CD4+ T lymphocytes. Dark grey, TCRB1+

[0094] **FIG. 42** is representative flow analysis data confirming monotypia for TRBC1 T cell Lymphoma sample #2.

Normal T-lymphocytes: CD4+CD8+: Dark grey

Aberrant CD4+T lymphocytes: Grey. TCRB1+

Other Lymphocytes (NK + B): Light grey

[0095] **FIG. 43** is representative flow analysis data confirming monotypia for TRBC2 T cell Lymphoma sample.

Normal T-lymphocytes: CD4+CD8+: Dark grey

Aberrant CD8+ Tlymphocytes: Grey. TCRB2+

Other Lymphocytes (NK + B): Light grey

[0096] **FIG. 44** is representative flow analysis data confirming monotypia for TRBC2 T cell Lymphoma sample.

Normal T-lymphocytes: CD4+CD8+: Dark grey

Aberrant TCD4+ lymphocytes: Grey. TCRB2+

Other Lymphocytes (NK + B): Light grey

DETAILED DESCRIPTION OF THE INVENTION

[0097] Disclosed herein are multifunctional molecules (also referred to herein as "multispecific molecules") that include a plurality of (e.g., two or more) functionalities (or binding specificities), comprising (i) an antigen binding domain that preferentially binds to TRBC1 or a TRBC2, and (ii) one, two, or all of: (a) an immune cell engager chosen from a T cell engager, an NK cell engager (e.g., a molecule that binds to NKp30, NKp46, NKG2D, or CD16), a B cell engager, a dendritic cell engager, or a macrophage cell engager; (b) a cytokine molecule; and (c) a stromal modifying moiety. Also disclosed herein are antibody molecules comprising an antigen binding domain that preferentially binds to TRBC1 or TRBC2. In some embodiments, the antigen binding domain that binds to TRBC1 comprises a sequence or part of a sequence found in Tables 2, 3, 3A, 3B, 4, 5, 6. In some embodiments, the antigen binding domain that binds to TRBC2 comprises a sequence or part of

a sequence found in Tables 21-24. In some embodiments, the immune cell engager comprises an NK cell engager comprising a sequence or part of a sequence found in Tables 7, 8, 8A, 8B, 9, 10 and 18. In some embodiments, the antigen binding domain comprises a sequence or part of a sequence found in Tables 2, 3, 3A, 3B, 4, 5, 6 and the immune cell engager comprises an NK cell engager comprising a sequence or part of a sequence found in Tables 7, 8, 8A, 8B, 9, 10 and 18. In some embodiments, the antigen binding domain comprises a sequence or part of a sequence found in Tables 21-24 and the immune cell engager comprises an NK cell engager comprising a sequence or part of a sequence found in Tables 7, 8, 8A, 8B, 9,10 and 18.

[0098] In an embodiment, the multispecific or multifunctional molecule is a bispecific (or bifunctional) molecule, a trispecific (or trifunctional) molecule, or a tetraspecific (or tetrafunctional) molecule.

[0099] In some embodiments, the multifunctional molecule comprises an antigen binding domain that binds a tumor antigen on the surface of a T cell receptor comprising TRBC1 targets immune cells (e.g., via the immune cell engager) to lymphoma cells (e.g., T cells) that exhibit T cell receptors comprising TRBC1. In some embodiments, the multifunctional molecule comprises an antigen binding domain that binds a tumor antigen on the surface of a T cell receptor comprising TRBC2 targets immune cells (e.g., via the immune cell engager) to lymphoma cells (e.g., T cells) that exhibit T cell receptors comprising TRBC2.

[00100] Without being bound by theory, the multispecific or multifunctional molecules disclosed herein are expected to localize (e.g., bridge) and/or activate an immune cell (e.g., an immune effector cell chosen from a T cell, an NK cell, a B cell, a dendritic cell or a macrophage), in the presence of a cell (e.g., a cancer cell, e.g., lymphoma cell, e.g., T cell) expressing a T cell receptor comprising TRBC1 or TRBC2, e.g., on the surface. Increasing the proximity and/or activity of the immune cell, in the presence of the cell (e.g., cancer cell, e.g., lymphoma cell, e.g., T cell) expressing a T cell receptor comprising TRBC1 or TRBC2, using the multispecific or multifunctional molecules described herein is expected to enhance an immune response against the target cell, thereby providing a more effective therapy.

[00101] Without being bound by theory, it is thought that T cells do not typically express T cell receptors comprising TRBC1 and T cell receptors comprising TRBC2. By utilizing, in some embodiments, a multispecific or multifunctional molecule specific for a T cell receptor comprising TRBC1 or a T cell receptor comprising TRBC2, but not with specificity for both types of T cell receptors, it is expected that the deleterious effects of increasing the proximity or activity of immune cells toward T cells generally may be mitigated. In this way, it is thought that use of the multispecific or multifunctional molecules disclosed herein may increase the proximity or activity of immune cells toward cancer cells (e.g., lymphoma cells, e.g., T cells) without necessarily increasing proximity or activity of immune cells toward T cells generally.

[00102] Novel multifunctional, e.g., multispecific, molecules that include (i) a stromal modifying

moiety and (ii) an antigen binding domain that preferentially binds to tumor antigen on a lymphoma cell (e.g., T cell), e.g., a T cell receptor comprising TRBC1 or a T cell receptor comprising TRBC2 are disclosed. Without being bound by theory, the multifunctional molecules disclosed herein are believed to inter alia target (e.g., localize to) a cancer site, and alter the tumor stroma, e.g., alter the tumor microenvironment near the cancer site. The multifunctional molecules can further include one or both of: an immune cell engager (e.g., chosen from one, two, three, or all of a T cell engager, NK cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager); and/or a cytokine molecule. Accordingly, provided herein are, inter alia, multifunctional, e.g., multispecific molecules, that include the aforesaid moieties, nucleic acids encoding the same, methods of producing the aforesaid molecules, and methods of treating a cancer using the aforesaid molecules.

[00103] Accordingly, provided herein are, *inter alia*, multispecific or multifunctional molecules (e.g., multispecific or multifunctional antibody molecules) that include the aforesaid moieties, nucleic acids encoding the same, methods of producing the aforesaid molecules, and methods of treating a disease or disorder, e.g., cancer, using the aforesaid molecules.

Definitions

[00104] In some embodiments, the multifunctional molecule includes an immune cell engager. "An immune cell engager" refers to one or more binding specificities that bind and/or activate an immune cell, e.g., a cell involved in an immune response. In embodiments, the immune cell is chosen from a T cell, an NK cell, a B cell, a dendritic cell, and/or the macrophage cell. The immune cell engager can be an antibody molecule, a receptor molecule (e.g., a full length receptor, receptor fragment, or fusion thereof (e.g., a receptor-Fc fusion)), or a ligand molecule (e.g., a full length ligand, ligand fragment, or fusion thereof (e.g., a ligand-Fc fusion)) that binds to the immune cell antigen (e.g., the T cell, the NK cell antigen, the B cell antigen, the dendritic cell antigen, and/or the macrophage cell antigen). In embodiments, the immune cell engager specifically binds to the target immune cell, e.g., binds preferentially to the target immune cell. For example, when the immune cell engager is an antibody molecule, it binds to an immune cell antigen (e.g., a T cell antigen, an NK cell antigen, a B cell antigen, a dendritic cell antigen, and/or a macrophage cell antigen) with a dissociation constant of less than about 10 nM.

[00105] In some embodiments, the multifunctional molecule includes a cytokine molecule. As used herein, a "cytokine molecule" refers to full length, a fragment or a variant of a cytokine; a cytokine further comprising a receptor domain, e.g., a cytokine receptor dimerizing domain; or an agonist of a cytokine receptor, e.g., an antibody molecule (e.g., an agonistic antibody) to a cytokine receptor, that elicits at least one activity of a naturally-occurring cytokine. In some embodiments the cytokine molecule is chosen from interleukin-2 (IL-2), interleukin-7 (IL-7), interleukin-12 (IL-12), interleukin-15 (IL-15), interleukin-18 (IL-18), interleukin-21 (IL-21), or interferon gamma, or a fragment or variant thereof, or a combination of any of the aforesaid cytokines. The cytokine molecule can be a

monomer or a dimer. In embodiments, the cytokine molecule can further include a cytokine receptor dimerizing domain. In other embodiments, the cytokine molecule is an agonist of a cytokine receptor, e.g., an antibody molecule (e.g., an agonistic antibody) to a cytokine receptor chosen from an IL-15Ra or IL-21R.

[00106] As used herein, the term "molecule" as used in, e.g., antibody molecule, cytokine molecule, receptor molecule, includes full-length, naturally-occurring molecules, as well as variants, e.g., functional variants (e.g., truncations, fragments, mutated (e.g., substantially similar sequences) or derivatized form thereof), so long as at least one function and/or activity of the unmodified (e.g., naturally-occurring) molecule remains.

[00107] In some embodiments, the multifunctional molecule includes a stromal modifying moiety. A "stromal modifying moiety," as used herein refers to an agent, e.g., a protein (e.g., an enzyme), that is capable of altering, e.g., degrading a component of, the stroma. In embodiments, the component of the stroma is chosen from, e.g., an ECM component, e.g., a glycosaminoglycan, e.g., hyaluronan (also known as hyaluronic acid or HA), chondroitin sulfate, chondroitin, dermatan sulfate, heparin sulfate, heparin, entactin, tenascin, aggrecan and keratin sulfate; or an extracellular protein, e.g., collagen, laminin, elastin, fibrinogen, fibronectin, and vitronectin.

[00108] Certain terms are defined below.

[00109] As used herein, the articles "a" and "an" refer to one or more than one, *e.g.*, to at least one, of the grammatical object of the article. The use of the words "a" or "an" when used in conjunction with the term "comprising" herein may mean "one," but it is also consistent with the meaning of "one or more," "at least one," and "one or more than one."

[00110] As used herein, "about" and "approximately" generally mean an acceptable degree of error for the quantity measured given the nature or precision of the measurements. Exemplary degrees of error are within 20 percent (%), typically, within 10%, and more typically, within 5% of a given range of values.

[00111] "Antibody molecule" as used herein refers to a protein, e.g., an immunoglobulin chain or fragment thereof, comprising at least one immunoglobulin variable domain sequence. An antibody molecule encompasses antibodies (e.g., full-length antibodies) and antibody fragments. In an embodiment, an antibody molecule comprises an antigen binding or functional fragment of a full length antibody, or a full length immunoglobulin chain. For example, a full-length antibody is an immunoglobulin (Ig) molecule (e.g., an IgG antibody) that is naturally occurring or formed by normal immunoglobulin gene fragment recombinatorial processes). In embodiments, an antibody molecule refers to an immunologically active, antigen-binding portion of an immunoglobulin molecule, such as an antibody fragment. An antibody fragment, e.g., functional fragment, is a portion of an antibody, e.g., Fab, Fab′, $F(ab')_2$, $F(ab)_2$, variable fragment (Fv), domain antibody (dAb), or single chain variable fragment (scFv). A functional antibody fragment binds to the same antigen as that recognized

by the intact (e.g., full-length) antibody. The terms "antibody fragment" or "functional fragment" also include isolated fragments consisting of the variable regions, such as the "Fv" fragments consisting of the variable regions of the heavy and light chains or recombinant single chain polypeptide molecules in which light and heavy variable regions are connected by a peptide linker ("scFv proteins"). In some embodiments, an antibody fragment does not include portions of antibodies without antigen binding activity, such as Fc fragments or single amino acid residues. Exemplary antibody molecules include full length antibodies and antibody fragments, e.g., dAb (domain antibody), single chain, Fab, Fab', and $F(ab')_2$ fragments, and single chain variable fragments (scFvs).

[00112] As used herein, an "immunoglobulin variable domain sequence" refers to an amino acid sequence which can form the structure of an immunoglobulin variable domain. For example, the sequence may include all or part of the amino acid sequence of a naturally occurring variable domain. For example, the sequence may or may not include one, two, or more N- or C-terminal amino acids, or may include other alterations that are compatible with formation of the protein structure.

[00113] In embodiments, an antibody molecule is monospecific, e.g., it comprises binding specificity for a single epitope. In some embodiments, an antibody molecule is multispecific, e.g., it comprises a plurality of immunoglobulin variable domain sequences, where a first immunoglobulin variable domain sequence has binding specificity for a first epitope and a second immunoglobulin variable domain sequence has binding specificity for a second epitope. In some embodiments, an antibody molecule is a bispecific antibody molecule. "Bispecific antibody molecule" as used herein refers to an antibody molecule that has specificity for more than one (e.g., two, three, four, or more) epitope and/or antigen.

[00114] "Antigen" (Ag) as used herein refers to a molecule that can provoke an immune response, e.g., involving activation of certain immune cells and/or antibody generation. Any macromolecule, including almost all proteins or peptides, can be an antigen. Antigens can also be derived from genomic recombinant or DNA. For example, any DNA comprising a nucleotide sequence or a partial nucleotide sequence that encodes a protein capable of eliciting an immune response encodes an "antigen." In embodiments, an antigen does not need to be encoded solely by a full length nucleotide sequence of a gene, nor does an antigen need to be encoded by a gene at all. In embodiments, an antigen can be synthesized or can be derived from a biological sample, e.g., a tissue sample, a tumor sample, a cell, or a fluid with other biological components. As used, herein a "tumor antigen" or interchangeably, a "cancer antigen" includes any molecule present on, or associated with, a cancer, e.g., a cancer cell or a tumor microenvironment that can provoke an immune response. As used, herein an "immune cell antigen" includes any molecule present on, or associated with, an immune cell that can provoke an immune response.

[00115] The "antigen-binding site," or "binding portion" of an antibody molecule refers to the part of an antibody molecule, e.g., an immunoglobulin (Ig) molecule, that participates in antigen binding. In embodiments, the antigen binding site is formed by amino acid residues of the variable (V) regions

of the heavy (H) and light (L) chains. Three highly divergent stretches within the variable regions of the heavy and light chains, referred to as hypervariable regions, are disposed between more conserved flanking stretches called "framework regions," (FRs). FRs are amino acid sequences that are naturally found between, and adjacent to, hypervariable regions in immunoglobulins. In embodiments, in an antibody molecule, the three hypervariable regions of a light chain and the three hypervariable regions of a heavy chain are disposed relative to each other in three dimensional space to form an antigen-binding surface, which is complementary to the three-dimensional surface of a bound antigen. The three hypervariable regions of each of the heavy and light chains are referred to as "complementarity-determining regions," or "CDRs." The framework region and CDRs have been defined and described, e.g., in Kabat, E.A., et al. (1991) Sequences of Proteins of Immunological Interest, Fifth Edition, U.S. Department of Health and Human Services, NIH Publication No. 91-3242, and Chothia, C. et al. (1987) J. Mol. Biol. 196:901-917. Each variable chain (e.g., variable heavy chain and variable light chain) is typically made up of three CDRs and four FRs, arranged from amino-terminus to carboxy-terminus in the amino acid order: FR1, CDR1, FR2, CDR2, FR3, CDR3, and FR4.

[00116] "Cancer" as used herein can encompass all types of oncogenic processes and/or cancerous growths. In embodiments, cancer includes primary tumors as well as metastatic tissues or malignantly transformed cells, tissues, or organs. In embodiments, cancer encompasses all histopathologies and stages, e.g., stages of invasiveness/severity, of a cancer. In embodiments, cancer includes relapsed and/or resistant cancer. The terms "cancer" and "tumor" can be used interchangeably. For example, both terms encompass solid and liquid tumors. As used herein, the term "cancer" or "tumor" includes premalignant, as well as malignant cancers and tumors.

[00117] As used herein, an "immune cell" refers to any of various cells that function in the immune system, e.g., to protect against agents of infection and foreign matter. In embodiments, this term includes leukocytes, e.g., neutrophils, eosinophils, basophils, lymphocytes, and monocytes. Innate leukocytes include phagocytes (e.g., macrophages, neutrophils, and dendritic cells), mast cells, eosinophils, basophils, and natural killer cells. Innate leukocytes identify and eliminate pathogens, either by attacking larger pathogens through contact or by engulfing and then killing microorganisms, and are mediators in the activation of an adaptive immune response. The cells of the adaptive immune system are special types of leukocytes, called lymphocytes. B cells and T cells are important types of lymphocytes and are derived from hematopoietic stem cells in the bone marrow. B cells are involved in the humoral immune response, whereas T cells are involved in cell-mediated immune response. The term "immune cell" includes immune effector cells.

[00118] "Immune effector cell," as that term is used herein, refers to a cell that is involved in an immune response, e.g., in the promotion of an immune effector response. Examples of immune effector cells include, but are not limited to, T cells, e.g., alpha/beta T cells and gamma/delta T cells, B cells, natural killer (NK) cells, natural killer T (NK T) cells, and mast cells.

[00119] The term "effector function" or "effector response" refers to a specialized function of a cell.

Effector function of a T cell, for example, may be cytolytic activity or helper activity including the secretion of cytokines.

[00120] The compositions and methods of the present invention encompass polypeptides and nucleic acids having the sequences specified, or sequences substantially identical or similar thereto, *e.g.*, sequences at least 80%, 85%, 90%, 95% identical or higher to the sequence specified. In the context of an amino acid sequence, the term "substantially identical" is used herein to refer to a first amino acid that contains a sufficient or minimum number of amino acid residues that are i) identical to, or ii) conservative substitutions of aligned amino acid residues in a second amino acid sequence such that the first and second amino acid sequences can have a common structural domain and/or common functional activity. For example, amino acid sequences that contain a common structural domain having at least about 80%, 85%, 90%. 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identity to a reference sequence, *e.g.*, a sequence provided herein.

[00121] In the context of nucleotide sequence, the term "substantially identical" is used herein to refer to a first nucleic acid sequence that contains a sufficient or minimum number of nucleotides that are identical to aligned nucleotides in a second nucleic acid sequence such that the first and second nucleotide sequences encode a polypeptide having common functional activity, or encode a common structural polypeptide domain or a common functional polypeptide activity. For example, nucleotide sequences having at least about 80%, 85%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98% or 99% identity to a reference sequence, *e.g.*, a sequence provided herein.

[00122] The term "variant" refers to a polypeptide that has a substantially identical amino acid sequence to a reference amino acid sequence, or is encoded by a substantially identical nucleotide sequence. In some embodiments, the variant is a functional variant.

[00123] The term "functional variant" refers to a polypeptide that has a substantially identical amino acid sequence to a reference amino acid sequence, or is encoded by a substantially identical nucleotide sequence, and is capable of having one or more activities of the reference amino acid sequence.

[00124] Calculations of homology or sequence identity between sequences (the terms are used interchangeably herein) are performed as follows.

[00125] To determine the percent identity of two amino acid sequences, or of two nucleic acid sequences, the sequences are aligned for optimal comparison purposes (*e.g.*, gaps can be introduced in one or both of a first and a second amino acid or nucleic acid sequence for optimal alignment and non-homologous sequences can be disregarded for comparison purposes). In a preferred embodiment, the length of a reference sequence aligned for comparison purposes is at least 30%, preferably at least 40%, more preferably at least 50%, 60%, and even more preferably at least 70%, 80%, 90%, 100% of the length of the reference sequence. The amino acid residues or nucleotides at corresponding amino acid positions or nucleotide positions are then compared. When a position in the first sequence is occupied by the same amino acid residue or nucleotide as the corresponding position in the second

sequence, then the molecules are identical at that position (as used herein amino acid or nucleic acid "identity" is equivalent to amino acid or nucleic acid "homology").

[00126] The percent identity between the two sequences is a function of the number of identical positions shared by the sequences, taking into account the number of gaps, and the length of each gap, which need to be introduced for optimal alignment of the two sequences.

[00127] The comparison of sequences and determination of percent identity between two sequences can be accomplished using a mathematical algorithm. In a preferred embodiment, the percent identity between two amino acid sequences is determined using the Needleman and Wunsch ((1970) *J. Mol. Biol.* 48:444-453) algorithm which has been incorporated into the GAP program in the GCG software package (available at gcg.com), using either a Blossum 62 matrix or a PAM250 matrix, and a gap weight of 16, 14, 12, 10, 8, 6, or 4 and a length weight of 1, 2, 3, 4, 5, or 6. In yet another preferred embodiment, the percent identity between two nucleotide sequences is determined using the GAP program in the GCG software package (available at gcg.com), using a NWSgapdna.CMP matrix and a gap weight of 40, 50, 60, 70, or 80 and a length weight of 1, 2, 3, 4, 5, or 6. A particularly preferred set of parameters (and the one that should be used unless otherwise specified) are a Blossum 62 scoring matrix with a gap penalty of 12, a gap extend penalty of 4, and a frameshift gap penalty of 5.

[00128] The percent identity between two amino acid or nucleotide sequences can be determined using the algorithm of E. Meyers and W. Miller ((1989) *CABIOS*, 4:11-17) which has been incorporated into the ALIGN program (version 2.0), using a PAM120 weight residue table, a gap length penalty of 12 and a gap penalty of 4.

[00129] The nucleic acid and protein sequences described herein can be used as a "query sequence" to perform a search against public databases to, for example, identify other family members or related sequences. Such searches can be performed using the NBLAST and XBLAST programs (version 2.0) of Altschul, *et al.* (1990) *J. Mol. Biol.* 215:403-10. BLAST nucleotide searches can be performed with the NBLAST program, score = 100, wordlength = 12 to obtain nucleotide sequences homologous to a nucleic acid molecule of the invention. BLAST protein searches can be performed with the XBLAST program, score = 50, wordlength = 3 to obtain amino acid sequences homologous to protein molecules of the invention. To obtain gapped alignments for comparison purposes, Gapped BLAST can be utilized as described in Altschul *et al.*, (1997) *Nucleic Acids Res.* 25:3389-3402. When utilizing BLAST and Gapped BLAST programs, the default parameters of the respective programs (*e.g.*, XBLAST and NBLAST) can be used. See ncbi.nlm.nih.gov.

[00130] It is understood that the molecules of the present invention may have additional conservative or non-essential amino acid substitutions, which do not have a substantial effect on their functions.

[00131] The term "amino acid" is intended to embrace all molecules, whether natural or synthetic, which include both an amino functionality and an acid functionality and capable of being included in a polymer of naturally occurring amino acids. Exemplary amino acids include naturally occurring

amino acids; analogs, derivatives and congeners thereof; amino acid analogs having variant side chains; and all stereoisomers of any of any of the foregoing. As used herein the term "amino acid" includes both the D- or L- optical isomers and peptidomimetics.

[00132] A "conservative amino acid substitution" is one in which the amino acid residue is replaced with an amino acid residue having a similar side chain. Families of amino acid residues having similar side chains have been defined in the art. These families include amino acids with basic side chains (*e.g.*, lysine, arginine, histidine), acidic side chains (*e.g.*, aspartic acid, glutamic acid), uncharged polar side chains (*e.g.*, glycine, asparagine, glutamine, serine, threonine, tyrosine, cysteine), nonpolar side chains (*e.g.*, alanine, valine, leucine, isoleucine, proline, phenylalanine, methionine, tryptophan), beta-branched side chains (*e.g.*, threonine, valine, isoleucine) and aromatic side chains (*e.g.*, tyrosine, phenylalanine, tryptophan, histidine).

[00133] The terms "polypeptide", "peptide" and "protein" (if single chain) are used interchangeably herein to refer to polymers of amino acids of any length. The polymer may be linear or branched, it may comprise modified amino acids, and it may be interrupted by non-amino acids. The terms also encompass an amino acid polymer that has been modified; for example, disulfide bond formation, glycosylation, lipidation, acetylation, phosphorylation, or any other manipulation, such as conjugation with a labeling component. The polypeptide can be isolated from natural sources, can be a produced by recombinant techniques from a eukaryotic or prokaryotic host, or can be a product of synthetic procedures.

[00134] The terms "nucleic acid," "nucleic acid sequence," "nucleotide sequence," or "polynucleotide sequence," and "polynucleotide" are used interchangeably. They refer to a polymeric form of nucleotides of any length, either deoxyribonucleotides or ribonucleotides, or analogs thereof. The polynucleotide may be either single-stranded or double-stranded, and if single-stranded may be the coding strand or non-coding (antisense) strand. A polynucleotide may comprise modified nucleotides, such as methylated nucleotides and nucleotide analogs. The sequence of nucleotides may be interrupted by non-nucleotide components. A polynucleotide may be further modified after polymerization, such as by conjugation with a labeling component. The nucleic acid may be a recombinant polynucleotide, or a polynucleotide of genomic, cDNA, semisynthetic, or synthetic origin which either does not occur in nature or is linked to another polynucleotide in a non-natural arrangement.

[00135] The term "isolated," as used herein, refers to material that is removed from its original or native environment (*e.g.*, the natural environment if it is naturally occurring). For example, a naturally occurring polynucleotide or polypeptide present in a living animal is not isolated, but the same polynucleotide or polypeptide, separated by human intervention from some or all of the co-existing materials in the natural system, is isolated. Such polynucleotides could be part of a vector and/or such polynucleotides or polypeptides could be part of a composition, and still be isolated in that such vector or composition is not part of the environment in which it is found in nature.

[00136] Various aspects of the invention are described in further detail below. Additional definitions are set out throughout the specification.

Antibody Molecules

[00137] In one embodiment, the antibody molecule binds to a cancer antigen, e.g., a tumor antigen or a stromal antigen. In some embodiments, the cancer antigen is, *e.g.*, a mammalian, e.g., a human, cancer antigen. In other embodiments, the antibody molecule binds to an immune cell antigen, *e.g.*, a mammalian, e.g., a human, immune cell antigen. For example, the antibody molecule binds specifically to an epitope, *e.g.*, linear or conformational epitope, on the cancer antigen or the immune cell antigen.

[00138] In an embodiment, an antibody molecule is a monospecific antibody molecule and binds a single epitope. *E.g.*, a monospecific antibody molecule having a plurality of immunoglobulin variable domain sequences, each of which binds the same epitope.

[00139] In an embodiment an antibody molecule is a multispecific or multifunctional antibody molecule, *e.g.*, it comprises a plurality of immunoglobulin variable domains sequences, wherein a first immunoglobulin variable domain sequence of the plurality has binding specificity for a first epitope and a second immunoglobulin variable domain sequence of the plurality has binding specificity for a second epitope. In an embodiment the first and second epitopes are on the same antigen, *e.g.*, the same protein (or subunit of a multimeric protein). In an embodiment the first and second epitopes overlap. In an embodiment the first and second epitopes do not overlap. In an embodiment the first and second epitopes are on different antigens, *e.g.*, the different proteins (or different subunits of a multimeric protein). In an embodiment a multispecific antibody molecule comprises a third, fourth or fifth immunoglobulin variable domain. In an embodiment, a multispecific antibody molecule is a bispecific antibody molecule, a trispecific antibody molecule, or a tetraspecific antibody molecule.

[00140] In an embodiment a multispecific antibody molecule is a bispecific antibody molecule. A bispecific antibody has specificity for no more than two antigens. A bispecific antibody molecule is characterized by a first immunoglobulin variable domain sequence which has binding specificity for a first epitope and a second immunoglobulin variable domain sequence that has binding specificity for a second epitope. In an embodiment the first and second epitopes are on the same antigen, *e.g.*, the same protein (or subunit of a multimeric protein). In an embodiment the first and second epitopes overlap. In an embodiment the first and second epitopes do not overlap. In an embodiment the first and second epitopes are on different antigens, *e.g.*, the different proteins (or different subunits of a multimeric protein). In an embodiment a bispecific antibody molecule comprises a heavy chain variable domain sequence and a light chain variable domain sequence which have binding specificity for a first epitope and a heavy chain variable domain sequence and a light chain variable domain sequence which have binding specificity for a second epitope. In an embodiment a bispecific antibody molecule comprises a half antibody having binding specificity for a first epitope and a half antibody

having binding specificity for a second epitope. In an embodiment a bispecific antibody molecule comprises a half antibody, or fragment thereof, having binding specificity for a first epitope and a half antibody, or fragment thereof, having binding specificity for a second epitope. In an embodiment a bispecific antibody molecule comprises a scFv or a Fab, or fragment thereof, have binding specificity for a first epitope and a scFv or a Fab, or fragment thereof, have binding specificity for a second epitope.

[00141] In an embodiment, an antibody molecule comprises a diabody, and a single-chain molecule, as well as an antigen-binding fragment of an antibody (*e.g.*, Fab, F(ab')$_2$, and Fv). For example, an antibody molecule can include a heavy (H) chain variable domain sequence (abbreviated herein as VH), and a light (L) chain variable domain sequence (abbreviated herein as VL). In an embodiment an antibody molecule comprises or consists of a heavy chain and a light chain (referred to herein as a half antibody. In another example, an antibody molecule includes two heavy (H) chain variable domain sequences and two light (L) chain variable domain sequence, thereby forming two antigen binding sites, such as Fab, Fab', F(ab')$_2$, Fc, Fd, Fd', Fv, single chain antibodies (scFv for example), single variable domain antibodies, diabodies (Dab) (bivalent and bispecific), and chimeric (*e.g.*, humanized) antibodies, which may be produced by the modification of whole antibodies or those synthesized de novo using recombinant DNA technologies. These functional antibody fragments retain the ability to selectively bind with their respective antigen or receptor. Antibodies and antibody fragments can be from any class of antibodies including, but not limited to, IgG, IgA, IgM, IgD, and IgE, and from any subclass (*e.g.*, IgG1, IgG2, IgG3, and IgG4) of antibodies. A preparation of antibody molecules can be monoclonal or polyclonal. An antibody molecule can also be a human, humanized, CDR-grafted, or *in vitro* generated antibody. The antibody can have a heavy chain constant region chosen from, *e.g.*, IgG1, IgG2, IgG3, or IgG4. The antibody can also have a light chain chosen from, *e.g.*, kappa or lambda. The term "immunoglobulin" (Ig) is used interchangeably with the term "antibody" herein.

[00142] Examples of antigen-binding fragments of an antibody molecule include: (i) a Fab fragment, a monovalent fragment consisting of the VL, VH, CL and CH1 domains; (ii) a F(ab')2 fragment, a bivalent fragment comprising two Fab fragments linked by a disulfide bridge at the hinge region; (iii) a Fd fragment consisting of the VH and CH1 domains; (iv) a Fv fragment consisting of the VL and VH domains of a single arm of an antibody, (v) a diabody (dAb) fragment, which consists of a VH domain; (vi) a camelid or camelized variable domain; (vii) a single chain Fv (scFv), *see e.g.*, Bird *et al.* (1988) *Science* 242:423-426; and Huston *et al.* (1988) *Proc. Natl. Acad. Sci. USA* 85:5879-5883); (viii) a single domain antibody. These antibody fragments are obtained using conventional techniques known to those with skill in the art, and the fragments are screened for utility in the same manner as are intact antibodies.

[00143] Antibody molecules include intact molecules as well as functional fragments thereof. Constant regions of the antibody molecules can be altered, *e.g.*, mutated, to modify the properties of

the antibody (*e.g.*, to increase or decrease one or more of: Fc receptor binding, antibody glycosylation, the number of cysteine residues, effector cell function, or complement function).

[00144] Antibody molecules can also be single domain antibodies. Single domain antibodies can include antibodies whose complementary determining regions are part of a single domain polypeptide. Examples include, but are not limited to, heavy chain antibodies, antibodies naturally devoid of light chains, single domain antibodies derived from conventional 4-chain antibodies, engineered antibodies and single domain scaffolds other than those derived from antibodies. Single domain antibodies may be any of the art, or any future single domain antibodies. Single domain antibodies may be derived from any species including, but not limited to mouse, human, camel, llama, fish, shark, goat, rabbit, and bovine. According to another aspect of the invention, a single domain antibody is a naturally occurring single domain antibody known as heavy chain antibody devoid of light chains. Such single domain antibodies are disclosed in WO 9404678, for example. For clarity reasons, this variable domain derived from a heavy chain antibody naturally devoid of light chain is known herein as a VHH or nanobody to distinguish it from the conventional VH of four chain immunoglobulins. Such a VHH molecule can be derived from antibodies raised in *Camelidae* species, for example in camel, llama, dromedary, alpaca and guanaco. Other species besides *Camelidae* may produce heavy chain antibodies naturally devoid of light chain; such VHHs are within the scope of the invention.

[00145] The VH and VL regions can be subdivided into regions of hypervariability, termed "complementarity determining regions" (CDR), interspersed with regions that are more conserved, termed "framework regions" (FR or FW).

[00146] The extent of the framework region and CDRs has been precisely defined by a number of methods (*see*, Kabat, E. A., *et al.* (1991) Sequences of Proteins of Immunological Interest, Fifth Edition, U.S. Department of Health and Human Services, NIH Publication No. 91-3242; Chothia, C. *et al.* (1987) *J. Mol. Biol.* 196:901-917; and the AbM definition used by Oxford Molecular's AbM antibody modeling software. *See*, generally, *e.g.*, *Protein Sequence and Structure Analysis of Antibody Variable Domains.* In: Antibody Engineering Lab Manual (Ed.: Duebel, S. and Kontermann, R., Springer-Verlag, Heidelberg).

[00147] The terms "complementarity determining region," and "CDR," as used herein refer to the sequences of amino acids within antibody variable regions which confer antigen specificity and binding affinity. In general, there are three CDRs in each heavy chain variable region (HCDR1, HCDR2, HCDR3) and three CDRs in each light chain variable region (LCDR1, LCDR2, LCDR3).

[00148] The precise amino acid sequence boundaries of a given CDR can be determined using any of a number of known schemes, including those described by Kabat *et al.* (1991), "Sequences of Proteins of Immunological Interest," 5th Ed. Public Health Service, National Institutes of Health, Bethesda, MD ("Kabat" numbering scheme), Al-Lazikani *et al.*, (1997) *JMB* 273,927-948 ("Chothia" numbering scheme). As used herein, the CDRs defined according the "Chothia" number scheme are also sometimes referred to as "hypervariable loops."

[00149] For example, under Kabat, the CDR amino acid residues in the heavy chain variable domain (VH) are numbered 31-35 (HCDR1), 50-65 (HCDR2), and 95-102 (HCDR3); and the CDR amino acid residues in the light chain variable domain (VL) are numbered 24-34 (LCDR1), 50-56 (LCDR2), and 89-97 (LCDR3). Under Chothia, the CDR amino acids in the VH are numbered 26-32 (HCDR1), 52-56 (HCDR2), and 95-102 (HCDR3); and the amino acid residues in VL are numbered 26-32 (LCDR1), 50-52 (LCDR2), and 91-96 (LCDR3).

[00150] Each VH and VL typically includes three CDRs and four FRs, arranged from amino-terminus to carboxy-terminus in the following order: FR1, CDR1, FR2, CDR2, FR3, CDR3, FR4.

[00151] The antibody molecule can be a polyclonal or a monoclonal antibody.

[00152] The terms "monoclonal antibody" or "monoclonal antibody composition" as used herein refer to a preparation of antibody molecules of single molecular composition. A monoclonal antibody composition displays a single binding specificity and affinity for a particular epitope. A monoclonal antibody can be made by hybridoma technology or by methods that do not use hybridoma technology (*e.g.*, recombinant methods).

[00153] The antibody can be recombinantly produced, *e.g.,* produced by phage display or by combinatorial methods.

[00154] Phage display and combinatorial methods for generating antibodies are known in the art (as described in, *e.g.,* Ladner *et al.* U.S. Patent No. 5,223,409; Kang *et al.* International Publication No. WO 92/18619; Dower *et al.* International Publication No. WO 91/17271; Winter *et al.* International Publication WO 92/20791; Markland *et al.* International Publication No. WO 92/15679; Breitling *et al.* International Publication WO 93/01288; McCafferty *et al.* International Publication No. WO 92/01047; Garrard *et al.* International Publication No. WO 92/09690; Ladner *et al.* International Publication No. WO 90/02809; Fuchs *et al.* (1991) *Bio/Technology* 9:1370-1372; Hay *et al.* (1992) *Hum Antibod Hybridomas* 3:81-85; Huse *et al.* (1989) *Science* 246:1275-1281; Griffths *et al.* (1993) *EMBO J* 12:725-734; Hawkins *et al.* (1992) *J Mol Biol* 226:889-896; Clackson *et al.* (1991) *Nature* 352:624-628; Gram *et al.* (1992) *PNAS* 89:3576-3580; Garrad *et al.* (1991) *Bio/Technology* 9:1373-1377; Hoogenboom *et al.* (1991) *Nuc Acid Res* 19:4133-4137; and Barbas *et al.* (1991) *PNAS* 88:7978-7982, the contents of all of which are incorporated by reference herein).

[00155] In one embodiment, the antibody is a fully human antibody (*e.g.*, an antibody made in a mouse which has been genetically engineered to produce an antibody from a human immunoglobulin sequence), or a non-human antibody, *e.g.,* a rodent (mouse or rat), goat, primate (*e.g.*, monkey), camel antibody. Preferably, the non-human antibody is a rodent (mouse or rat antibody). Methods of producing rodent antibodies are known in the art.

[00156] Human monoclonal antibodies can be generated using transgenic mice carrying the human immunoglobulin genes rather than the mouse system. Splenocytes from these transgenic mice immunized with the antigen of interest are used to produce hybridomas that secrete human mAbs with specific affinities for epitopes from a human protein (see, *e.g.*, Wood *et al.* International Application

WO 91/00906, Kucherlapati *et al.* PCT publication WO 91/10741; Lonberg *et al.* International Application WO 92/03918; Kay *et al.* International Application 92/03917; Lonberg, N. *et al.* 1994 *Nature* 368:856-859; Green, L.L. *et al.* 1994 *Nature Genet.* 7:13-21; Morrison, S.L. *et al.* 1994 *Proc. Natl. Acad. Sci. USA* 81:6851-6855; Bruggeman *et al.* 1993 *Year Immunol* 7:33-40; Tuaillon *et al.* 1993 *PNAS* 90:3720-3724; Bruggeman *et al.* 1991 *Eur J Immunol* 21:1323-1326).

[00157] An antibody molecule can be one in which the variable region, or a portion thereof, *e.g.*, the CDRs, are generated in a non-human organism, *e.g.*, a rat or mouse. Chimeric, CDR-grafted, and humanized antibodies are within the invention. Antibody molecules generated in a non-human organism, *e.g.*, a rat or mouse, and then modified, *e.g.*, in the variable framework or constant region, to decrease antigenicity in a human are within the invention.

[00158] An "effectively human" protein is a protein that does substantially not evoke a neutralizing antibody response, *e.g.*, the human anti-murine antibody (HAMA) response. HAMA can be problematic in a number of circumstances, *e.g.*, if the antibody molecule is administered repeatedly, *e.g.*, in treatment of a chronic or recurrent disease condition. A HAMA response can make repeated antibody administration potentially ineffective because of an increased antibody clearance from the serum (*see, e.g.,* Saleh *et al.*, *Cancer Immunol. Immunother.*, 32:180-190 (1990)) and also because of potential allergic reactions (*see, e.g.,* LoBuglio *et al., Hybridoma*, 5:5117-5123 (1986)).

[00159] Chimeric antibodies can be produced by recombinant DNA techniques known in the art (see Robinson *et al.*, International Patent Publication PCT/US86/02269; Akira, *et al.,* European Patent Application 184,187; Taniguchi, M., European Patent Application 171,496; Morrison *et al.,* European Patent Application 173,494; Neuberger *et al.*, International Application WO 86/01533; Cabilly *et al.* U.S. Patent No. 4,816,567; Cabilly *et al.*, European Patent Application 125,023; Better *et al.* (1988 *Science* 240:1041-1043); Liu *et al.* (1987) *PNAS* 84:3439-3443; Liu *et al.*, 1987, *J. Immunol.* 139:3521-3526; Sun *et al.* (1987) *PNAS* 84:214-218; Nishimura *et al.*, 1987, *Canc. Res.* 47:999-1005; Wood *et al.* (1985) *Nature* 314:446-449; and Shaw *et al.*, 1988, *J. Natl Cancer Inst.* 80:1553-1559).

[00160] A humanized or CDR-grafted antibody will have at least one or two but generally all three recipient CDRs (of heavy and or light immuoglobulin chains) replaced with a donor CDR. The antibody may be replaced with at least a portion of a non-human CDR or only some of the CDRs may be replaced with non-human CDRs. It is only necessary to replace the number of CDRs required for binding to the antigen. Preferably, the donor will be a rodent antibody, *e.g.,* a rat or mouse antibody, and the recipient will be a human framework or a human consensus framework. Typically, the immunoglobulin providing the CDRs is called the "donor" and the immunoglobulin providing the framework is called the "acceptor." In one embodiment, the donor immunoglobulin is a non-human (*e.g.,* rodent). The acceptor framework is a naturally occurring (*e.g.,* a human) framework or a consensus framework, or a sequence about 85% or higher, preferably 90%, 95%, 99% or higher identical thereto.

[00161] As used herein, the term "consensus sequence" refers to the sequence formed from the most

frequently occurring amino acids (or nucleotides) in a family of related sequences (See *e.g.*, Winnaker, From Genes to Clones (Verlagsgesellschaft, Weinheim, Germany 1987). In a family of proteins, each position in the consensus sequence is occupied by the amino acid occurring most frequently at that position in the family. If two amino acids occur equally frequently, either can be included in the consensus sequence. A "consensus framework" refers to the framework region in the consensus immunoglobulin sequence.

[00162] An antibody molecule can be humanized by methods known in the art (*see e.g.,* Morrison, S. L., 1985, *Science* 229:1202-1207, by Oi *et al.,* 1986, *BioTechniques* 4:214, and by Queen *et al.* US 5,585,089, US 5,693,761 and US 5,693,762, the contents of all of which are hereby incorporated by reference).

[00163] Humanized or CDR-grafted antibody molecules can be produced by CDR-grafting or CDR substitution, wherein one, two, or all CDRs of an immunoglobulin chain can be replaced. *See e.g.*, U.S. Patent 5,225,539; Jones *et al.* 1986 *Nature* 321:552-525; Verhoeyan *et al.* 1988 *Science* 239:1534; Beidler *et al.* 1988 *J. Immunol.* 141:4053-4060; Winter US 5,225,539, the contents of all of which are hereby expressly incorporated by reference. Winter describes a CDR-grafting method which may be used to prepare the humanized antibodies of the present invention (UK Patent Application GB 2188638A, filed on March 26, 1987; Winter US 5,225,539), the contents of which is expressly incorporated by reference.

[00164] Also within the scope of the invention are humanized antibody molecules in which specific amino acids have been substituted, deleted or added. Criteria for selecting amino acids from the donor are described in US 5,585,089, *e.g.*, columns 12-16 of US 5,585,089, *e.g.,* columns 12-16 of US 5,585,089, the contents of which are hereby incorporated by reference. Other techniques for humanizing antibodies are described in Padlan *et al.* EP 519596 A1, published on December 23, 1992.

[00165] The antibody molecule can be a single chain antibody. A single-chain antibody (scFv) may be engineered (see, for example, Colcher, D. *et al.* (1999) *Ann N Y Acad Sci* 880:263-80; and Reiter, Y. (1996) *Clin Cancer Res* 2:245-52). The single chain antibody can be dimerized or multimerized to generate multivalent antibodies having specificities for different epitopes of the same target protein.

[00166] In yet other embodiments, the antibody molecule has a heavy chain constant region chosen from, *e.g.*, the heavy chain constant regions of IgG1, IgG2, IgG3, IgG4, IgM, IgA1, IgA2, IgD, and IgE; particularly, chosen from, *e.g.*, the (*e.g.*, human) heavy chain constant regions of IgG1, IgG2, IgG3, and IgG4. In another embodiment, the antibody molecule has a light chain constant region chosen from, *e.*g., the (*e.g.*, human) light chain constant regions of kappa or lambda. The constant region can be altered, *e.g.*, mutated, to modify the properties of the antibody (*e.g.*, to increase or decrease one or more of: Fc receptor binding, antibody glycosylation, the number of cysteine residues, effector cell function, and/or complement function). In one embodiment the antibody has: effector function; and can fix complement. In other embodiments the antibody does not; recruit effector cells; or fix complement. In another embodiment, the antibody has reduced or no ability to bind an Fc

receptor. For example, it is a isotype or subtype, fragment or other mutant, which does not support binding to an Fc receptor, *e.g.*, it has a mutagenized or deleted Fc receptor binding region.

[00167] Methods for altering an antibody constant region are known in the art. Antibodies with altered function, *e.g.* altered affinity for an effector ligand, such as FcR on a cell, or the C1 component of complement can be produced by replacing at least one amino acid residue in the constant portion of the antibody with a different residue (*see e.g.,* EP 388,151 A1, U.S. Pat. No. 5,624,821 and U.S. Pat. No. 5,648,260, the contents of all of which are hereby incorporated by reference). Similar type of alterations could be described which if applied to the murine, or other species immunoglobulin would reduce or eliminate these functions.

[00168] An antibody molecule can be derivatized or linked to another functional molecule (*e.g.*, another peptide or protein). As used herein, a "derivatized" antibody molecule is one that has been modified. Methods of derivatization include but are not limited to the addition of a fluorescent moiety, a radionucleotide, a toxin, an enzyme or an affinity ligand such as biotin. Accordingly, the antibody molecules of the invention are intended to include derivatized and otherwise modified forms of the antibodies described herein, including immunoadhesion molecules. For example, an antibody molecule can be functionally linked (by chemical coupling, genetic fusion, noncovalent association or otherwise) to one or more other molecular entities, such as another antibody (*e.g.*, a bispecific antibody or a diabody), a detectable agent, a cytotoxic agent, a pharmaceutical agent, and/or a protein or peptide that can mediate association of the antibody or antibody portion with another molecule (such as a streptavidin core region or a polyhistidine tag).

[00169] One type of derivatized antibody molecule is produced by crosslinking two or more antibodies (of the same type or of different types, *e.g.,* to create bispecific antibodies). Suitable crosslinkers include those that are heterobifunctional, having two distinctly reactive groups separated by an appropriate spacer (*e.g.*, m-maleimidobenzoyl-N-hydroxysuccinimide ester) or homobifunctional (*e.g.*, disuccinimidyl suberate). Such linkers are available from Pierce Chemical Company, Rockford, Ill.

Multispecific or multifunctional antibody molecules

[00170] Exemplary structures of multispecific and multifunctional molecules defined herein are described throughout. Exemplary structures are further described in: Weidle U et al. (2013) The Intriguing Options of Multispecific Antibody Formats for Treatment of Cancer. *Cancer Genomics & Proteomics* 10: 1-18 (2013); and Spiess C et al. (2015) Alternative molecular formats and therapeutic applications for bispecific antibodies. *Molecular Immunology* 67: 95-106; the full contents of each of which is incorporated by reference herein).

[00171] In embodiments, multispecific antibody molecules can comprise more than one antigen-binding site, where different sites are specific for different antigens. In embodiments, multispecific antibody molecules can bind more than one (e.g., two or more) epitopes on the same antigen. In

embodiments, multispecific antibody molecules comprise an antigen-binding site specific for a target cell (e.g., cancer cell) and a different antigen-binding site specific for an immune effector cell. In one embodiment, the multispecific antibody molecule is a bispecific antibody molecule. Bispecific antibody molecules can be classified into five different structural groups: (i) bispecific immunoglobulin G (BsIgG); (ii) IgG appended with an additional antigen-binding moiety; (iii) bispecific antibody fragments; (iv) bispecific fusion proteins; and (v) bispecific antibody conjugates.

[00172] BsIgG is a format that is monovalent for each antigen. Exemplary BsIgG formats include but are not limited to crossMab, DAF (two-in-one), DAF (four-in-one), DutaMab, DT-IgG, knobs-in-holes common LC, knobs-in-holes assembly, charge pair, Fab-arm exchange, SEEDbody, triomab, LUZ-Y, Fcab, κλ-body, orthogonal Fab. *See* Spiess et al. Mol. Immunol. 67(2015):95-106. Exemplary BsIgGs include catumaxomab (Fresenius Biotech, Trion Pharma, Neopharm), which contains an anti-CD3 arm and an anti-EpCAM arm; and ertumaxomab (Neovii Biotech, Fresenius Biotech), which targets CD3 and HER2. In some embodiments, BsIgG comprises heavy chains that are engineered for heterodimerization. For example, heavy chains can be engineered for heterodimerization using a "knobs-into-holes" strategy, a SEED platform, a common heavy chain (e.g., in κλ-bodies), and use of heterodimeric Fc regions. *See* Spiess et al. Mol. Immunol. 67(2015):95-106. Strategies that have been used to avoid heavy chain pairing of homodimers in BsIgG include knobs-in-holes, duobody, azymetric, charge pair, HA-TF, SEEDbody, and differential protein A affinity. *See Id.* BsIgG can be produced by separate expression of the component antibodies in different host cells and subsequent purification/assembly into a BsIgG. BsIgG can also be produced by expression of the component antibodies in a single host cell. BsIgG can be purified using affinity chromatography, e.g., using protein A and sequential pH elution.

[00173] IgG appended with an additional antigen-binding moiety is another format of bispecific antibody molecules. For example, monospecific IgG can be engineered to have bispecificity by appending an additional antigen-binding unit onto the monospecific IgG, e.g., at the N- or C- terminus of either the heavy or light chain. Exemplary additional antigen-binding units include single domain antibodies (e.g., variable heavy chain or variable light chain), engineered protein scaffolds, and paired antibody variable domains (e.g., single chain variable fragments or variable fragments). *See Id.* Examples of appended IgG formats include dual variable domain IgG (DVD-Ig), IgG(H)-scFv, scFv-(H)IgG, IgG(L)-scFv, scFv-(L)IgG, IgG(L,H)-Fv, IgG(H)-V, V(H)-IgG, IgG(L)-V, V(L)-IgG, KIH IgG-scFab, 2scFv-IgG, IgG-2scFv, scFv4-Ig, zybody, and DVI-IgG (four-in-one). *See* Spiess et al. Mol. Immunol. 67(2015):95-106. An example of an IgG-scFv is MM-141 (Merrimack Pharmaceuticals), which binds IGF-1R and HER3. Examples of DVD-Ig include ABT-981 (AbbVie), which binds IL-1α and IL-1β; and ABT-122 (AbbVie), which binds TNF and IL-17A.

[00174] Bispecific antibody fragments (BsAb) are a format of bispecific antibody molecules that lack some or all of the antibody constant domains. For example, some BsAb lack an Fc region. In

embodiments, bispecific antibody fragments include heavy and light chain regions that are connected by a peptide linker that permits efficient expression of the BsAb in a single host cell. Exemplary bispecific antibody fragments include but are not limited to nanobody, nanobody-HAS, BiTE, Diabody, DART, TandAb, scDiabody, scDiabody-CH3, Diabody-CH3, triple body, miniantibody, minibody, TriBi minibody, scFv-CH3 KIH, Fab-scFv, scFv-CH-CL-scFv, F(ab′)2, F(ab′)2-scFv2, scFv-KIH, Fab-scFv-Fc, tetravalent HCAb, scDiabody-Fc, Diabody-Fc, tandem scFv-Fc, and intrabody. *See Id.* For example, the BiTE format comprises tandem scFvs, where the component scFvs bind to CD3 on T cells and a surface antigen on cancer cells

[00175] Bispecific fusion proteins include antibody fragments linked to other proteins, e.g., to add additional specificity and/or functionality. An example of a bispecific fusion protein is an immTAC, which comprises an anti-CD3 scFv linked to an affinity-matured T-cell receptor that recognizes HLA-presented peptides. In embodiments, the dock-and-lock (DNL) method can be used to generate bispecific antibody molecules with higher valency. Also, fusions to albumin binding proteins or human serum albumin can be extend the serum half-life of antibody fragments. *See Id.*

[00176] In embodiments, chemical conjugation, e.g., chemical conjugation of antibodies and/or antibody fragments, can be used to create BsAb molecules. *See Id.* An exemplary bispecific antibody conjugate includes the CovX-body format, in which a low molecular weight drug is conjugated site-specifically to a single reactive lysine in each Fab arm or an antibody or fragment thereof. In embodiments, the conjugation improves the serum half-life of the low molecular weight drug. An exemplary CovX-body is CVX-241 (NCT01004822), which comprises an antibody conjugated to two short peptides inhibiting either VEGF or Ang2. *See Id.*

[00177] The antibody molecules can be produced by recombinant expression, e.g., of at least one or more component, in a host system. Exemplary host systems include eukaryotic cells (e.g., mammalian cells, e.g., CHO cells, or insect cells, e.g., SF9 or S2 cells) and prokaryotic cells (e.g., *E. coli*). Bispecific antibody molecules can be produced by separate expression of the components in different host cells and subsequent purification/assembly. Alternatively, the antibody molecules can be produced by expression of the components in a single host cell. Purification of bispecific antibody molecules can be performed by various methods such as affinity chromatography, e.g., using protein A and sequential pH elution. In other embodiments, affinity tags can be used for purification, e.g., histidine-containing tag, myc tag, or streptavidin tag.

CDR-grafted scaffolds

[00178] In embodiments, the antibody molecule is a CDR-grafted scaffold domain. In embodiments, the scaffold domain is based on a fibronectin domain, e.g., fibronectin type III domain. The overall fold of the fibronectin type III (Fn3) domain is closely related to that of the smallest functional antibody fragment, the variable domain of the antibody heavy chain. There are three loops at the end of Fn3; the positions of BC, DE and FG loops approximately correspond to those of CDR1, 2 and 3 of

the VH domain of an antibody. Fn3 does not have disulfide bonds; and therefore Fn3 is stable under reducing conditions, unlike antibodies and their fragments (see, e.g., WO 98/56915; WO 01/64942; WO 00/34784). An Fn3 domain can be modified (e.g., using CDRs or hypervariable loops described herein) or varied, e.g., to select domains that bind to an antigen/marker/cell described herein.

[00179] In embodiments, a scaffold domain, e.g., a folded domain, is based on an antibody, e.g., a "minibody" scaffold created by deleting three beta strands from a heavy chain variable domain of a monoclonal antibody (see, e.g., Tramontano et al., 1994, J Mol. Recognit. 7:9; and Martin et al., 1994, EMBO J. 13:5303-5309). The "minibody" can be used to present two hypervariable loops. In embodiments, the scaffold domain is a V-like domain (see, e.g., Coia et al. WO 99/45110) or a domain derived from tendamistatin, which is a 74 residue, six-strand beta sheet sandwich held together by two disulfide bonds (see, e.g., McConnell and Hoess, 1995, J Mol. Biol. 250:460). For example, the loops of tendamistatin can be modified (e.g., using CDRs or hypervariable loops) or varied, e.g., to select domains that bind to a marker/antigen/cell described herein. Another exemplary scaffold domain is a beta-sandwich structure derived from the extracellular domain of CTLA-4 (see, e.g., WO 00/60070).

[00180] Other exemplary scaffold domains include but are not limited to T-cell receptors; MHC proteins; extracellular domains (e.g., fibronectin Type III repeats, EGF repeats); protease inhibitors (e.g., Kunitz domains, ecotin, BPTI, and so forth); TPR repeats; trifoil structures; zinc finger domains; DNA-binding proteins; particularly monomeric DNA binding proteins; RNA binding proteins; enzymes, e.g., proteases (particularly inactivated proteases), RNase; chaperones, e.g., thioredoxin, and heat shock proteins; and intracellular signaling domains (such as SH2 and SH3 domains). See, e.g., US 20040009530 and US 7,501,121, incorporated herein by reference.

[00181] In embodiments, a scaffold domain is evaluated and chosen, e.g., by one or more of the following criteria: (1) amino acid sequence, (2) sequences of several homologous domains, (3) 3-dimensional structure, and/or (4) stability data over a range of pH, temperature, salinity, organic solvent, oxidant concentration. In embodiments, the scaffold domain is a small, stable protein domain, e.g., a protein of less than 100, 70, 50, 40 or 30 amino acids. The domain may include one or more disulfide bonds or may chelate a metal, e.g., zinc.

Antibody-Based Fusions

[00182] A variety of formats can be generated which contain additional binding entities attached to the N or C terminus of antibodies. These fusions with single chain or disulfide stabilized Fvs or Fabs result in the generation of tetravalent molecules with bivalent binding specificity for each antigen. Combinations of scFvs and scFabs with IgGs enable the production of molecules which can recognize three or more different antigens.

Antibody-Fab Fusion

[00183] Antibody-Fab fusions are bispecific antibodies comprising a traditional antibody to a first target and a Fab to a second target fused to the C terminus of the antibody heavy chain. Commonly the antibody and the Fab will have a common light chain. Antibody fusions can be produced by *(1)* engineering the DNA sequence of the target fusion, and *(2)* transfecting the target DNA into a suitable host cell to express the fusion protein. It seems like the antibody-scFv fusion may be linked by a (Gly)-Ser linker between the C-terminus of the CH3 domain and the N-terminus of the scFv, as described by Coloma, J. *et al*. (1997) *Nature Biotech* 15:159.

Antibody-scFv Fusion

[00184] Antibody-scFv Fusions are bispecific antibodies comprising a traditional antibody and a scFv of unique specificity fused to the C terminus of the antibody heavy chain. The scFv can be fused to the C terminus through the Heavy Chain of the scFv either directly or through a linker peptide. Antibody fusions can be produced by *(1)* engineering the DNA sequence of the target fusion, and *(2)* transfecting the target DNA into a suitable host cell to express the fusion protein. It seems like the antibody-scFv fusion may be linked by a (Gly)-Ser linker between the C-terminus of the CH3 domain and the N-terminus of the scFv, as described by Coloma, J. *et al*. (1997) *Nature Biotech* 15:159.

Variable Domain Immunoglobulin DVD

[00185] A related format is the dual variable domain immunoglobulin (DVD), which are composed of VH and VL domains of a second specificity place upon the N termini of the V domains by shorter linker sequences.

[00186] Other exemplary multispecific antibody formats include, e.g., those described in the following US20160114057A1, US20130243775A1, US20140051833, US20130022601, US20150017187A1, US20120201746A1, US20150133638A1, US20130266568A1, US20160145340A1, WO2015127158A1, US20150203591A1, US20140322221A1, US20130303396A1, US20110293613, US20130017200A1, US20160102135A1, WO2015197598A2, WO2015197582A1, US9359437, US20150018529, WO2016115274A1, WO2016087416A1, US20080069820A1, US9145588B, US7919257, and US20150232560A1. Exemplary multispecific molecules utilizing a full antibody-Fab/scFab format include those described in the following, US9382323B2, US20140072581A1, US20140308285A1, US20130165638A1, US20130267686A1, US20140377269A1, US7741446B2, and WO1995009917A1. Exemplary multispecific molecules utilizing a domain exchange format include those described in the following, US20150315296A1, WO2016087650A1, US20160075785A1, WO2016016299A1, US20160130347A1, US20150166670, US8703132B2, US20100316645, US8227577B2, US20130078249.

Fc-containing entities (mini-antibodies)

[00187] Fc-containing entities, also known as mini-antibodies, can be generated by fusing scFv to the C-termini of constant heavy region domain 3 (CH3-scFv) and/or to the hinge region (scFv-hinge-Fc) of an antibody with a different specificity. Trivalent entities can also be made which have disulfide stabilized variable domains (without peptide linker) fused to the C-terminus of CH3 domains of IgGs.

Fc-containing multispecific molecules

[00188] In some embodiments, the multispecific molecules disclosed herein includes an immunoglobulin constant region (e.g., an Fc region). Exemplary Fc regions can be chosen from the heavy chain constant regions of IgG1, IgG2, IgG3 or IgG4; more particularly, the heavy chain constant region of human IgG1, IgG2, IgG3, or IgG4.

[00189] In some embodiments, the immunoglobulin chain constant region (e.g., the Fc region) is altered, e.g., mutated, to increase or decrease one or more of: Fc receptor binding, antibody glycosylation, the number of cysteine residues, effector cell function, or complement function.

[00190] In other embodiments, an interface of a first and second immunoglobulin chain constant regions (e.g., a first and a second Fc region) is altered, e.g., mutated, to increase or decrease dimerization, e.g., relative to a non-engineered interface, e.g., a naturally occurring interface. For example, dimerization of the immunoglobulin chain constant region (e.g., the Fc region) can be enhanced by providing an Fc interface of a first and a second Fc region with one or more of: a paired protuberance-cavity ("knob-in-a hole"), an electrostatic interaction, or a strand-exchange, such that a greater ratio of heteromultimer to homomultimer forms, e.g., relative to a non-engineered interface.

[00191] In some embodiments, the multispecific molecules include a paired amino acid substitution at a position chosen from one or more of 347, 349, 350, 351, 366, 368, 370, 392, 394, 395, 397, 398, 399, 405, 407, or 409, e.g., of the Fc region of human IgG1 For example, the immunoglobulin chain constant region (e.g., Fc region) can include a paired an amino acid substitution chosen from: T366S, L368A, or Y407V (e.g., corresponding to a cavity or hole), and T366W (e.g., corresponding to a protuberance or knob).

[00192] In other embodiments, the multifunctional molecule includes a half-life extender, e.g., a human serum albumin or an antibody molecule to human serum albumin.

Heterodimerized Antibody Molecules & Methods of Making

[00193] Various methods of producing multispecific antibodies have been disclosed to address the problem of incorrect heavy chain pairing. Exemplary methods are described below. Exemplary multispecific antibody formats and methods of making said multispecific antibodies are also disclosed in e.g., Speiss et al. Molecular Immunology 67 (2015) 95−106; and Klein et al mAbs 4:6, 653−663; November/December 2012; the entire contents of each of which are incorporated by reference herein.

[00194] Heterodimerized bispecific antibodies are based on the natural IgG structure, wherein the two binding arms recognize different antigens. IgG derived formats that enable defined monovalent (and simultaneous) antigen binding are generated by forced heavy chain heterodimerization, combined with technologies that minimize light chain mispairing (e.g., common light chain). Forced heavy chain heterodimerization can be obtained using, e.g., knob-in-hole OR strand exchange engineered domains (SEED).

[00195] *Knob-in-Hole*

[00196] Knob-in-Hole as described in US 5,731,116, US 7,476,724 and Ridgway, J. et al. (1996) Prot. Engineering 9(7): 617-621, broadly involves: (1) mutating the CH3 domain of one or both antibodies to promote heterodimerization; and (2) combining the mutated antibodies under conditions that promote heterodimerization. "Knobs" or "protuberances" are typically created by replacing a small amino acid in a parental antibody with a larger amino acid (e.g., T366Y or T366W); "Holes" or "cavities" are created by replacing a larger residue in a parental antibody with a smaller amino acid (e.g., Y407T, T366S, L368A and/or Y407V).

[00197] For bispecific antibodies including an Fc domain, introduction of specific mutations into the constant region of the heavy chains to promote the correct heterodimerization of the Fc portion can be utilized. Several such techniques are reviewed in Klein et al. (mAbs (2012) 4:6, 1-11), the contents of which are incorporated herein by reference in their entirety. These techniques include the "knobs-into-holes" (KiH) approach which involves the introduction of a bulky residue into one of the CH3 domains of one of the antibody heavy chains. This bulky residue fits into a complementary "hole" in the other CH3 domain of the paired heavy chain so as to promote correct pairing of heavy chains (see e.g., US7642228).

[00198] Exemplary KiH mutations include S354C, T366W in the "knob" heavy chain and Y349C, T366S, L368A, Y407V in the "hole" heavy chain. Other exemplary KiH mutations are provided in Table 1, with additional optional stabilizing Fc cysteine mutations.

Table 1. Exemplary Fc KiH mutations and optional Cysteine mutations

Position	**Knob Mutation**	**Hole Mutation**
T366	T366W	T366S
L368	-	L368A
Y407	-	Y407V
Additional Cysteine Mutations to form a stabilizing disulfide bridge		
Position	**Knob CH3**	**Hole CH3**
S354	S354C	-
Y349	-	Y349C

[00199] Other Fc mutations are provided by Igawa and Tsunoda who identified 3 negatively charged residues in the CH3 domain of one chain that pair with three positively charged residues in

the CH3 domain of the other chain. These specific charged residue pairs are: E356-K439, E357-K370, D399-K409 and vice versa. By introducing at least two of the following three mutations in chain A: E356K, E357K and D399K, as well as K370E, K409D, K439E in chain B, alone or in combination with newly identified disulfide bridges, they were able to favor very efficient heterodimerization while suppressing homodimerization at the same time (Martens T et al. A novel one-armed antic- Met antibody inhibits glioblastoma growth in vivo. Clin Cancer Res 2006; 12:6144-52; PMID:17062691). Xencor defined 41 variant pairs based on combining structural calculations and sequence information that were subsequently screened for maximal heterodimerization, defining the combination of S364H, F405A (HA) on chain A and Y349T, T394F on chain B (TF) (Moore GL et al. A novel bispecific antibody format enables simultaneous bivalent and monovalent co-engagement of distinct target antigens. MAbs 2011; 3:546-57; PMID: 22123055).

[00200] Other exemplary Fc mutations to promote heterodimerization of multispecific antibodies include those described in the following references, the contents of each of which is incorporated by reference herein, WO2016071377A1, US20140079689A1, US20160194389A1, US20160257763, WO2016071376A2, WO2015107026A1, WO2015107025A1, WO2015107015A1, US20150353636A1, US20140199294A1, US7750128B2, US20160229915A1, US20150344570A1, US8003774A1, US20150337049A1, US20150175707A1, US20140242075A1, US20130195849A1, US20120149876A1, US20140200331A1, US9309311B2, US8586713, US20140037621A1, US20130178605A1, US20140363426A1, US20140051835A1 and US20110054151A1.

[00201] Stabilizing cysteine mutations have also been used in combination with KiH and other Fc heterodimerization promoting variants, see e.g., US7183076. Other exemplary cysteine modifications include, e.g., those disclosed in US20140348839A1, US7855275B2, and US9000130B2.

[00202] *Strand Exchange Engineered Domains (SEED)*

[00203] Heterodimeric Fc platform that support the design of bispecific and asymmetric fusion proteins by devising strand-exchange engineered domain (SEED) C(H)3 heterodimers are known. These derivatives of human IgG and IgA C(H)3 domains create complementary human SEED C(H)3 heterodimers that are composed of alternating segments of human IgA and IgG C(H)3 sequences. The resulting pair of SEED C(H)3 domains preferentially associates to form heterodimers when expressed in mammalian cells. SEEDbody (Sb) fusion proteins consist of [IgG1 hinge]-C(H)2-[SEED C(H)3], that may be genetically linked to one or more fusion partners (see e.g., Davis JH et al. SEEDbodies: fusion proteins based on strand exchange engineered domain (SEED) CH3 heterodimers in an Fc analogue platform for asymmetric binders or immunofusions and bispecific antibodies. Protein Eng Des Sel 2010; 23:195-202; PMID:20299542 and US8871912. The contents of each of which are incorporated by reference herein).

[00204] *Duobody*

[00205] "Duobody" technology to produce bispecific antibodies with correct heavy chain pairing are known. The DuoBody technology involves three basic steps to generate stable bispecific human IgG1antibodies in a post-production exchange reaction. In a first step, two IgG1s, each containing single matched mutations in the third constant (CH3) domain, are produced separately using standard mammalian recombinant cell lines. Subsequently, these IgG1 antibodies are purified according to standard processes for recovery and purification. After production and purification (post-production), the two antibodies are recombined under tailored laboratory conditions resulting in a bispecific antibody product with a very high yield (typically >95%) (see e.g., Labrijn et al, PNAS 2013;110(13):5145-5150 and Labrijn et al. Nature Protocols 2014;9(10):2450-63, the contents of each of which are incorporated by reference herein).

[00206] *Electrostatic Interactions*

[00207] Methods of making multispecific antibodies using CH3 amino acid changes with charged amino acids such that homodimer formation is electrostatically unfavorable are disclosed. EP1870459 and WO 2009089004 describe other strategies for favoring heterodimer formation upon co-expression of different antibody domains in a host cell. In these methods, one or more residues that make up the heavy chain constant domain 3 (CH3), CH3-CH3 interfaces in both CH3 domains are replaced with a charged amino acid such that homodimer formation is electrostatically unfavorable and heterodimerization is electrostatically favorable. Additional methods of making multispecific molecules using electrostatic interactions are described in the following references, the contents of each of which is incorporated by reference herein, include US20100015133, US8592562B2, US9200060B2, US20140154254A1, and US9358286A1.

[00208] *Common Light Chain*

[00209] Light chain mispairing needs to be avoided to generate homogenous preparations of bispecific IgGs. One way to achieve this is through the use of the common light chain principle, i.e. combining two binders that share one light chain but still have separate specificities. An exemplary method of enhancing the formation of a desired bispecific antibody from a mixture of monomers is by providing a common variable light chain to interact with each of the heteromeric variable heavy chain regions of the bispecific antibody. Compositions and methods of producing bispecific antibodies with a common light chain as disclosed in, e.g., US7183076B2, US20110177073A1, EP2847231A1, WO2016079081A1, and EP3055329A1, the contents of each of which is incorporated by reference herein.

[00210] *CrossMab*

[00211] Another option to reduce light chain mispairing is the CrossMab technology which avoids non-specific L chain mispairing by exchanging CH1 and CL domains in the Fab of one half of the

bispecific antibody. Such crossover variants retain binding specificity and affinity, but make the two arms so different that L chain mispairing is prevented. The CrossMab technology (as reviewed in Klein et al. Supra) involves domain swapping between heavy and light chains so as to promote the formation of the correct pairings. Briefly, to construct a bispecific IgG-like CrossMab antibody that could bind to two antigens by using two distinct light chain−heavy chain pairs, a two-step modification process is applied. First, a dimerization interface is engineered into the C-terminus of each heavy chain using a heterodimerization approach, e.g., Knob-into-hole (KiH) technology, to ensure that only a heterodimer of two distinct heavy chains from one antibody (e.g., Antibody A) and a second antibody (e.g., Antibody B) is efficiently formed. Next, the constant heavy 1 (CH1) and constant light (CL) domains of one antibody are exchanged (Antibody A), keeping the variable heavy (VH) and variable light (VL) domains consistent. The exchange of the CH1 and CL domains ensured that the modified antibody (Antibody A) light chain would only efficiently dimerize with the modified antibody (antibody A) heavy chain, while the unmodified antibody (Antibody B) light chain would only efficiently dimerize with the unmodified antibody (Antibody B) heavy chain; and thus only the desired bispecific CrossMab would be efficiently formed (see e.g., Cain, C. SciBX 4(28); doi:10.1038/scibx.2011.783, the contents of which are incorporated by reference herein).

[00212] *Common Heavy Chain*

[00213] An exemplary method of enhancing the formation of a desired bispecific antibody from a mixture of monomers is by providing a common variable heavy chain to interact with each of the heteromeric variable light chain regions of the bispecific antibody. Compositions and methods of producing bispecific antibodies with a common heavy chain are disclosed in, e.g., US20120184716, US20130317200, and US20160264685A1, the contents of each of which is incorporated by reference herein.

[00214] *Amino Acid Modifications*

[00215] Alternative compositions and methods of producing multispecific antibodies with correct light chain pairing include various amino acid modifications. For example, Zymeworks describes heterodimers with one or more amino acid modifications in the CH1 and/or CL domains, one or more amino acid modifications in the VH and/or VL domains, or a combination thereof, which are part of the interface between the light chain and heavy chain and create preferential pairing between each heavy chain and a desired light chain such that when the two heavy chains and two light chains of the heterodimer pair are co-expressed in a cell, the heavy chain of the first heterodimer preferentially pairs with one of the light chains rather than the other (see e.g., WO2015181805). Other exemplary methods are described in WO2016026943 (Argen-X), US20150211001, US20140072581A1, US20160039947A1, and US20150368352.

[00216] *Lambda/Kappa Formats*

[00217] Multispecific molecules (e.g., multispecific antibody molecules) that include the lambda light chain polypeptide and a kappa light chain polypeptide, can be used to allow for heterodimerization. Methods for generating bispecific antibody molecules comprising the lambda light chain polypeptide and a kappa light chain polypeptide are disclosed in PCT/US17/53053 filed on September 22, 2017, incorporated herein by reference in its entirety.

[00218] In embodiments, the multispecific molecules includes a multispecific antibody molecule, e.g., an antibody molecule comprising two binding specificities, e.g., a bispecific antibody molecule. The multispecific antibody molecule includes:

a lambda light chain polypeptide 1 (LLCP1) specific for a first epitope;

a heavy chain polypeptide 1 (HCP1) specific for the first epitope;

a kappa light chain polypeptide 2 (KLCP2) specific for a second epitope; and

a heavy chain polypeptide 2 (HCP2) specific for the second epitope.

[00219] "Lambda light chain polypeptide 1 (LLCP1)", as that term is used herein, refers to a polypeptide comprising sufficient light chain (LC) sequence, such that when combined with a cognate heavy chain variable region, can mediate specific binding to its epitope and complex with an HCP1. In an embodiment it comprises all or a fragment of a CH1 region. In an embodiment, an LLCP1 comprises LC-CDR1, LC-CDR2, LC-CDR3, FR1, FR2, FR3, FR4, and CH1, or sufficient sequence therefrom to mediate specific binding of its epitope and complex with an HCP1. LLCP1, together with its HCP1, provide specificity for a first epitope (while KLCP2, together with its HCP2, provide specificity for a second epitope). As described elsewhere herein, LLCP1 has a higher affinity for HCP1 than for HCP2.

[00220] "Kappa light chain polypeptide 2 (KLCP2)", as that term is used herein, refers to a polypeptide comprising sufficient light chain (LC) sequence, such that when combined with a cognate heavy chain variable region, can mediate specific binding to its epitope and complex with an HCP2. In an embodiment, it comprises all or a fragment of a CH1 region. In an embodiment, a KLCP2 comprises LC-CDR1, LC-CDR2, LC-CDR3, FR1, FR2, FR3, FR4, and CH1, or sufficient sequence therefrom to mediate specific binding of its epitope and complex with an HCP2. KLCP2, together with its HCP2, provide specificity for a second epitope (while LLCP1, together with its HCP1, provide specificity for a first epitope).

[00221] "Heavy chain polypeptide 1 (HCP1)", as that term is used herein, refers to a polypeptide comprising sufficient heavy chain (HC) sequence, e.g., HC variable region sequence, such that when combined with a cognate LLCP1, can mediate specific binding to its epitope and complex with an HCP1. In an embodiment, it comprises all or a fragment of a CH1region. In an embodiment, it comprises all or a fragment of a CH2 and/or CH3 region. In an embodiment an HCP1 comprises HC-CDR1, HC-CDR2, HC-CDR3, FR1, FR2, FR3, FR4, CH1, CH2, and CH3, or sufficient sequence therefrom to: (i) mediate specific binding of its epitope and complex with an LLCP1, (ii) to complex

preferentially, as described herein to LLCP1 as opposed to KLCP2; and (iii) to complex preferentially, as described herein, to an HCP2, as opposed to another molecule of HCP1. HCP1, together with its LLCP1, provide specificity for a first epitope (while KLCP2, together with its HCP2, provide specificity for a second epitope).

[00222] "Heavy chain polypeptide 2 (HCP2)", as that term is used herein, refers to a polypeptide comprising sufficient heavy chain (HC) sequence, e.g., HC variable region sequence, such that when combined with a cognate LLCP1, can mediate specific binding to its epitope and complex with an HCP1. In an embodiment, it comprises all or a fragment of a CH1region. In an embodiment, it comprises all or a fragment of a CH2 and/or CH3 region. In an embodiment an HCP1 comprises HC-CDR1, HC-CDR2, HC-CDR3, FR1, FR2, FR3, FR4, CH1, CH2, and CH3, or sufficient sequence therefrom to: (i) mediate specific binding of its epitope and complex with an KLCP2, (ii) to complex preferentially, as described herein to KLCP2 as opposed to LLCP1; and (iii) to complex preferentially, as described herein, to an HCP1, as opposed to another molecule of HCP2. HCP2, together with its KLCP2, provide specificity for a second epitope (while LLCP1, together with its HCP1, provide specificity for a first epitope).

[00223] In some embodiments of the multispecific antibody molecule disclosed herein:

LLCP1 has a higher affinity for HCP1 than for HCP2; and/or

KLCP2 has a higher affinity for HCP2 than for HCP1.

[00224] In embodiments, the affinity of LLCP1 for HCP1 is sufficiently greater than its affinity for HCP2, such that under preselected conditions, e.g., in aqueous buffer, e.g., at pH 7, in saline, e.g., at pH 7, or under physiological conditions, at least 75, 80, 90, 95, 98, 99, 99.5, or 99.9 % of the multispecific antibody molecule molecules have a LLCP1complexed, or interfaced with, a HCP1.

[00225] In some embodiments of the multispecific antibody molecule disclosed herein:

the HCP1 has a greater affinity for HCP2, than for a second molecule of HCP1; and/or

the HCP2 has a greater affinity for HCP1, than for a second molecule of HCP2.

In embodiments, the affinity of HCP1 for HCP2 is sufficiently greater than its affinity for a second molecule of HCP1, such that under preselected conditions, e.g., in aqueous buffer, e.g., at pH 7, in saline, e.g., at pH 7, or under physiological conditions, at least 75%, 80, 90, 95, 98, 99 99.5 or 99.9 % of the multispecific antibody molecule molecules have a HCP1complexed, or interfaced with, a HCP2.

[00226] In another aspect, disclosed herein is a method for making, or producing, a multispecific antibody molecule. The method includes:

(i) providing a first heavy chain polypeptide (e.g., a heavy chain polypeptide comprising one, two, three or all of a first heavy chain variable region (first VH), a first CH1, a first heavy chain constant region (e.g., a first CH2, a first CH3, or both));

(ii) providing a second heavy chain polypeptide (e.g., a heavy chain polypeptide comprising one, two, three or all of a second heavy chain variable region (second VH), a second CH1, a second heavy chain

constant region (e.g., a second CH2, a second CH3, or both));

(iii) providing a lambda chain polypeptide (e.g., a lambda light variable region (VLλ), a lambda light constant chain (VLλ), or both) that preferentially associates with the first heavy chain polypeptide (e.g., the first VH); and

(iv) providing a kappa chain polypeptide (e.g., a lambda light variable region (VLκ), a lambda light constant chain (VLκ), or both) that preferentially associates with the second heavy chain polypeptide (e.g., the second VH),

under conditions where (i)-(iv) associate.

[00227] In embodiments, the first and second heavy chain polypeptides form an Fc interface that enhances heterodimerization.

[00228] In embodiments, (i)-(iv) (e.g., nucleic acid encoding (i)-(iv)) are introduced in a single cell, e.g., a single mammalian cell, e.g., a CHO cell. In embodiments, (i)-(iv) are expressed in the cell.

[00229] In embodiments, (i)-(iv) (e.g., nucleic acid encoding (i)-(iv)) are introduced in different cells, e.g., different mammalian cells, e.g., two or more CHO cell. In embodiments, (i)-(iv) are expressed in the cells.

[00230] In one embodiment, the method further comprises purifying a cell-expressed antibody molecule, e.g., using a lambda- and/or- kappa-specific purification, e.g., affinity chromatography.

[00231] In embodiments, the method further comprises evaluating the cell-expressed multispecific antibody molecule. For example, the purified cell-expressed multispecific antibody molecule can be analyzed by techniques known in the art, include mass spectrometry. In one embodiment, the purified cell-expressed antibody molecule is cleaved, e.g., digested with papain to yield the Fab moieties and evaluated using mass spectrometry.

[00232] In embodiments, the method produces correctly paired kappa/lambda multispecific, e.g., bispecific, antibody molecules in a high yield, e.g., at least 75%, 80, 90, 95, 98, 99 99.5 or 99.9 %.

[00233] In other embodiments, the multispecific, e.g., a bispecific, antibody molecule that includes:

(i) a first heavy chain polypeptide (HCP1) (e.g., a heavy chain polypeptide comprising one, two, three or all of a first heavy chain variable region (first VH), a first CH1, a first heavy chain constant region (e.g., a first CH2, a first CH3, or both)), e.g., wherein the HCP1 binds to a first epitope;

(ii) a second heavy chain polypeptide (HCP2) (e.g., a heavy chain polypeptide comprising one, two, three or all of a second heavy chain variable region (second VH), a second CH1, a second heavy chain constant region (e.g., a second CH2, a second CH3, or both)), e.g., wherein the HCP2 binds to a second epitope;

(iii) a lambda light chain polypeptide (LLCP1) (e.g., a lambda light variable region (VLl), a lambda light constant chain (VLl), or both) that preferentially associates with the first heavy chain polypeptide (e.g., the first VH), e.g., wherein the LLCP1 binds to a first epitope; and

(iv) a kappa light chain polypeptide (KLCP2) (e.g., a lambda light variable region (VLk), a lambda

light constant chain (VLk), or both) that preferentially associates with the second heavy chain polypeptide (e.g., the second VH), e.g., wherein the KLCP2 binds to a second epitope.

[00234] In embodiments, the first and second heavy chain polypeptides form an Fc interface that enhances heterodimerization. In embodiments, the multispecific antibody molecule has a first binding specificity that includes a hybrid VLl-CLl heterodimerized to a first heavy chain variable region connected to the Fc constant, CH2-CH3 domain (having a knob modification) and a second binding specificity that includes a hybrid VLk-CLk heterodimerized to a second heavy chain variable region connected to the Fc constant, CH2-CH3 domain (having a hole modification).

TRBC1 and TRBC2 Antigen Binding Domains

[00235] The present disclosure provides, *inter alia*, antibody molecules, e.g., multispecific (e.g., bi-, tri-, tetra- specific) or multifunctional molecules, that include, e.g., are engineered to contain, one or more antigen binding domains that bind to a tumor antigen on a lymphoma cell (e.g., T cell). In some embodiments, the tumor antigen comprises a T cell receptor comprising TRBC1 or TRBC2. In some embodiments, the antigen binding domain preferentially binds to a T cell receptor comprising TRBC1 (e.g., relative to a T cell receptor comprising TRBC2). In some embodiments, the antigen binding domain preferentially binds to a T cell receptor comprising TRBC2 (e.g., relative to a T cell receptor comprising TRBC1). In some embodiments, the multifunctional molecules include, e.g., are engineered to contain, one or more antigen binding domains that selectively target lymphocytes expressing TRBC1 or TRBC2. In some embodiments, the antigen binding domain selectively targets lymphocytes expressing a T cell receptor comprising TRBC1 or a T cell receptor comprising TRBC2.

[00236] T cell receptors (TCRs) are receptors found on the surface of lymphocytes, specifically on T lymphocytes (T cells). TCRs are responsible for recognizing antigen fragments presented by major histocompatibility complex (MHC) molecules on other immune cells (e.g., B cells) by signaling through associated CD3 and activating the T cell. The vast majority of TCRs in humans are heterodimers comprising an alpha chain and a beta chain. Both alpha and beta chains of TCR comprise variable and constant regions. The variable regions of the alpha and beta chain are encoded by distinct DNA elements (V, D, and J elements for beta chain; V and J elements for the alpha chain). Recombination between these elements produces in large part the variation in antigen binding specificity of TCRs. The TCR beta chain constant region is selected from two different domains, beta constant domain 1 and beta constant domain 2. Without wishing to be bound by theory, it is thought that the majority of TCRs comprising a beta chain comprise a beta chain comprising beta constant domain 1 or beta constant domain 2, but not both constant domain 1 and constant domain 2.

[00237] In some embodiments, the multifunctional or multispecific molecules or antibody molecules of the present application comprise an antigen binding domain that binds to a tumor antigen on a lymphoma cell (e.g., a T cell), e.g., a T cell receptor comprising TRBC1, TRBC1, a T cell receptor comprising TRBC2, or TRBC2. In some embodiments, the multifunctional or multispecific

molecules or antibody molecules of the present application comprise an antigen binding domain that selectively targets lymphocytes expressing a T cell receptor comprising TRBC1, TRBC1, a T cell receptor comprising TRBC2, or TRBC2. While it is most typical for a lymphocyte or lymphoma cell presenting a T cell receptor comprising TRBC1 or TRBC2 to be a T cell, cancer causes many disruptions in non-disease expression patterns. Thus, in some embodiments, the lymphoma cell or lymphocyte may not be a T cell. In some embodiments, the lymphoma cell or lymphocyte is a B cell. In some embodiments, the lymphoma cell or lymphocyte is a natural killer cell.

[00238] In some embodiments, the antigen binding domain (e.g., first antigen binding domain) comprises any CDR amino acid sequence, framework region (FWR) amino acid sequence, or variable region amino acid sequence of an anti-TRBC1 antibody known in the art. In some embodiments, CDR amino acid sequence, framework region (FWR) amino acid sequence, or variable region amino acid sequence are selected from JOVI.1.

TRBC1 Antigen Binding Domains

[00239] In some embodiments, the antigen binding domain that binds to TRBC1 comprises one or more CDRs (e.g., VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and/or VLCDR3) disclosed in Table 2, Table 6, or Table 3, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to TRBC1 comprises one or more framework regions (e.g., VHFWR1, VHFWR2, VHFWR3, VHFWR4, VLFWR1, VLFWR2, VLFWR3, and/or VLFWR4) disclosed in Table 2, Table 6, or Table 3, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to TRBC1 comprises a VH and/or a VL disclosed in Table 4, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to TRBC1 comprises an amino acid sequence disclosed in Table 5, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00240] In some embodiments, the antigen binding domain that binds to TRBC1 comprises one or more CDRs (e.g., VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and/or VLCDR3) disclosed in Table 3A and/or 3B, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to TRBC1 comprises one or more framework regions (e.g., VHFWR1, VHFWR2, VHFWR3, VHFWR4, VLFWR1, VLFWR2, VLFWR3, and/or VLFWR4) disclosed in Table 3A and/or 3B, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to TRBC1 comprises a VH and/or a VL disclosed in Table 4, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00241] In some embodiments, the antigen binding domain that binds to TRBC1 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a

VLCDR2, and a VLCDR3.

[00242] In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 7355, and 202, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 201, and 202, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7354, 201, and 202, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7354, 7355, and 202, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00243] In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00244] In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 7355, 202, 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 201, 202, 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7346, 7355, 202, 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 7355, 202, 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 7355, 202, 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 7355, 202, 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 202, 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs:

7346, 201, 202, 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 202, 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 202, 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 201, 202, 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 201, 202, 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 201, 202, 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 201, 202, 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 201, 202, 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 7355, 202, 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 7355, 202, 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 7355, 202, 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 7355, 202, 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or SEQ ID NOs: 7354, 7355, 202, 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00245] In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7351, 253, 250-252, 254, 7343, 7344, 7350, and 7352 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 258, 255-257, 259, 260, and 7357-7360 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7351 and 258, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 253 and 258, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00246] In some embodiments, the antigen binding domain (e.g., first antigen binding domain) that binds to a tumor antigen on a lymphoma cell (e.g., a T cell), e.g., a T cell receptor comprising TRBC1, TRBC1, a T cell receptor comprising TRBC2, or TRBC2 comprises any CDR amino acid sequence, framework region (FWR) amino acid sequence, or variable region amino acid sequence Tables 2, 3, 3A, 3B, 4, 5, or 6. In some embodiments, the antigen binding domain (e.g., first antigen binding domain) that binds to a tumor antigen on a lymphoma cell (e.g., a T cell), e.g., a T cell receptor comprising TRBC1, TRBC1, a T cell receptor comprising TRBC2, or TRBC2 comprises heavy and/or light chain amino acid sequences of Table 5. In some embodiments, the antigen binding domain (e.g., first antigen binding domain) that selectively targets lymphocytes expressing a T cell receptor comprising TRBC1, TRBC1, a T cell receptor comprising TRBC2, or TRBC2 comprises any

CDR amino acid sequence, framework region (FWR) amino acid sequence, or variable region amino acid sequence disclosed in Tables 2, 3, 3A, 3B, 4, 5, or 6. In some embodiments, the antigen binding domain (e.g., first antigen binding domain) that selectively targets lymphocytes expressing a T cell receptor comprising TRBC1, TRBC1, a T cell receptor comprising TRBC2, or TRBC2 comprises heavy and/or light chain amino acid sequences of Table 5. An antigen binding domain that binds to a tumor antigen comprising TRBC1 or selectively targets lymphocytes expressing TRBC1 may be said to target TRBC1 (i.e., a TRBC1-targeting antigen binding domain). An antigen binding domain that binds to a tumor antigen comprising TRBC2 or selectively targets lymphocytes expressing TRBC2 may be said to target TRBC2 (i.e., a TRBC2-targeting antigen binding domain).

[00247] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1) amino acid sequence of SEQ ID NO: 200 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VHCDR2 amino acid sequence of SEQ ID NO: 201 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VHCDR3 amino acid sequence of SEQ ID NO: 202 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions). In some embodiments, the TRBC1 antigen binding domain comprises a VH comprising a VHCDR1 amino acid sequence of SEQ ID NO: 200, a VHCDR2 amino acid sequence of SEQ ID NO: 201, and/or a VHCDR3 amino acid sequence of SEQ ID NO: 202.

[00248] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a light chain complementarity determining region 1 (VLCDR1) amino acid sequence of SEQ ID NO: 223 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VLCDR2 amino acid sequence of SEQ ID NO: 224 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VLCDR3 amino acid sequence of SEQ ID NO: 225 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions). In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a VLCDR1 amino acid sequence of SEQ ID NO: 223, a VLCDR2 amino acid sequence of SEQ ID NO: 224, and a VLCDR3 amino acid sequence of SEQ ID NO: 225.

[00249] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 203, a VHFWR2 amino acid sequence of SEQ ID NO: 204, a VHFWR3 amino acid sequence of SEQ ID NO: 205, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 206.

[00250] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 226, a VLFWR2 amino acid sequence of SEQ ID NO: 227, a VLFWR3 amino acid sequence of SEQ ID NO: 228, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 229.

[00251] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH

comprising a VHFWR1 amino acid sequence of SEQ ID NO: 203 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 204 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 205 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 206.

[00252] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 226 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 227 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 228 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 229.

[00253] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 207, a VHFWR2 amino acid sequence of SEQ ID NO: 208, a VHFWR3 amino acid sequence of SEQ ID NO: 209, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 210.

[00254] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 207 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 208 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 209 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 210.

[00255] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 211, a VHFWR2 amino acid sequence of SEQ ID NO: 212, a VHFWR3 amino acid sequence of SEQ ID NO: 213, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 214.

[00256] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 211 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 212 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 213 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 214.

[00257] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 215, a VHFWR2 amino acid sequence of SEQ ID NO: 216, a VHFWR3 amino acid sequence of SEQ ID

NO: 217, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 218.

[00258] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 215 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 216 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 217 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 218.

[00259] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 219, a VHFWR2 amino acid sequence of SEQ ID NO: 220, a VHFWR3 amino acid sequence of SEQ ID NO: 221, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 222.

[00260] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 219 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 220 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 221 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 222.

[00261] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 230, a VLFWR2 amino acid sequence of SEQ ID NO: 231, a VLFWR3 amino acid sequence of SEQ ID NO: 232, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 233.

[00262] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 230 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 231 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 232 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 233.

[00263] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 234, a VLFWR2 amino acid sequence of SEQ ID NO: 235, a VLFWR3 amino acid sequence of SEQ ID NO: 236, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 237.

[00264] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 234 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 235 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a

VLFWR3 amino acid sequence of SEQ ID NO: 236 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 237.

[00265] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 238, a VLFWR2 amino acid sequence of SEQ ID NO: 239, a VLFWR3 amino acid sequence of SEQ ID NO: 240, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 241.

[00266] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 238 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 239 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 240 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 241.

[00267] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 242, a VLFWR2 amino acid sequence of SEQ ID NO: 243, a VLFWR3 amino acid sequence of SEQ ID NO: 244, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 245.

[00268] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 242 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 243 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 244 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 245.

[00269] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 246, a VLFWR2 amino acid sequence of SEQ ID NO: 247, a VLFWR3 amino acid sequence of SEQ ID NO: 248, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 249.

[00270] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 246 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 247 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 248 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 249.

[00271] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 250 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 250). In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 255 (or an amino acid sequence having at least about 93%, 95%, or

99% sequence identity to SEQ ID NO: 255). In some embodiments, antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 250. In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 255.

[00272] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 250, and a VL comprising the amino acid sequence of SEQ ID NO: 255.

[00273] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 251 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 251). In some embodiments, antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 251.

[00274] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 252 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 252). In some embodiments, antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 252.

[00275] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 253 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 253). In some embodiments, antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 253.

[00276] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 254 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 254). In some embodiments, antigen binding domain that targets TRBC1 comprises a VH comprising the amino acid sequence of SEQ ID NO: 254.

[00277] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 256 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 256). In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 256.

[00278] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 257 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 257). In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 257.

[00279] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 258 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 258). In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 258.

[00280] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 259 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 259). In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 259.

[00281] In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 260 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 260). In some embodiments, the antigen binding domain that targets TRBC1 comprises a VL comprising the amino acid sequence of SEQ ID NO: 260.

[00282] In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6154 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6154). In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6154.

[00283] In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6155 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6155). In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6155.

[00284] In some embodiments, the antigen binding domain that targets TRBC1 comprises a light chain comprising the amino acid sequence of SEQ ID NO: 6156 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6156). In some embodiments, the antigen binding domain that targets TRBC1 comprises a light chain comprising the amino acid sequence of SEQ ID NO: 6156.

[00285] In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6167 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6167). In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6167.

[00286] In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6168 (or an amino acid sequence having at

least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6168). In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6168.

[00287] In some embodiments, the antigen binding domain that targets TRBC1 comprises a light chain comprising the amino acid sequence of SEQ ID NO: 6169 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6169). In some embodiments, the antigen binding domain that targets TRBC1 comprises a light chain comprising the amino acid sequence of SEQ ID NO: 6169.

[00288] In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6154 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6154) and a light chain comprising the amino acid sequence of SEQ ID NO: 6156 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6156). In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6154 and a light chain comprising the amino acid sequence of SEQ ID NO: 6156.

[00289] In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6155 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6155) and a light chain comprising the amino acid sequence of SEQ ID NO: 6156 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6156). In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6155 and a light chain comprising the amino acid sequence of SEQ ID NO: 6156.

[00290] In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6167 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6167) and a light chain comprising the amino acid sequence of SEQ ID NO: 6169 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6169). In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6167 and a light chain comprising the amino acid sequence of SEQ ID NO: 6169.

[00291] In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6168 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6168) and a light chain comprising the amino acid sequence of SEQ ID NO: 6169 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6169). In some embodiments, the antigen binding domain that targets TRBC1 comprises a heavy chain comprising the amino acid sequence of SEQ ID NO: 6168 and a light chain comprising the amino acid sequence of SEQ ID NO: 6169.

Table 2. Exemplary heavy chain CDRs and FWRs of TRBC1-targeting antigen binding domains derived from JOVI.1

Ab ID	VHFWR1	VHCDR1	VHFWR2	VHCDR2	VHFWR3	VHCDR3	VHFWR4
mJOVI.1-H	EVRLQQSGPDLIKPGASVKMSCKASGYT (SEQ ID NO: 203)	FTGYVMH (SEQ ID NO: 200)	WVKQRPGQGLEWIG (SEQ ID NO: 204)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	KATLTSDKSSTTAYMELSSLTSEDSAVYYCAR (SEQ ID NO: 205)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTTLTVSS (SEQ ID NO: 206)
h1JOVI.1-H	QVQLVQSGAEVKKPGASVKVSCKASGYT (SEQ ID NO: 207)	FTGYVMH (SEQ ID NO: 200)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 209)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 210)
h2JOVI.1-H	QVQLVQSGAEVKKPGASVKVSCKASGYT (SEQ ID NO: 211)	FTGYVMH (SEQ ID NO: 200)	WVRQAPGQGLEWMG (SEQ ID NO: 212)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	WVTMTSDKSITTAYMELSRLRSDDTAVYYCAR (SEQ ID NO: 213)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 214)
h3JOVI.1-H	QVQLVQSGAEVKKPGSSVKVSCKASGYT (SEQ ID NO: 215)	FTGYVMH (SEQ ID NO: 200)	WVRQAPGQGLEWMG (SEQ ID NO: 216)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 217)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 218)
h4JOVI.1-H	QVQLVQSGAEVKKPGASVKVSCKASGYT (SEQ ID NO: 219)	FTGYVMH (SEQ ID NO: 200)	WVRQAPGQRLEWMG (SEQ ID NO: 220)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTITSDKSATTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 221)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 222)

Table 6. Exemplary heavy chain CDRs and FWRs of TRBC1-targeting antigen binding domains derived from JOVI.1 (according to the Kabat numbering scheme)

Ab ID	VHFWR1	VHCDR1	VHFWR2	VHCDR2	VHFWR3	VHCDR3	VHFWR4
mJOVI.1-H	EVRLQQSGPDLIKPGASVKMSCKASGYTFT	GYVMH (SEQ ID NO: 7346)	WVKQRPGQGLEWIG (SEQ ID NO: 204)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	KATLTSDKSSTTAYMELSSLTSEDSAVYYCA	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTTLTVSS (SEQ ID NO: 206)

	(SEQ ID NO: 7370)				R (SEQ ID NO: 205)		
h1JOVI.1-H	QVQLVQSGAEVKKPGASVKVSCKASGYTFT (SEQ ID NO: 7348)	GYVMH (SEQ ID NO: 7346)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 209)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 210)
h2JOVI.1-H	QVQLVQSGAEVKKPGASVKVSCKASGYTFT (SEQ ID NO: 7348)	GYVMH (SEQ ID NO: 7346)	WVRQAPGQGLEWMG (SEQ ID NO: 212)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	WVTMTSDKSITTAYMELSRLRSDDTAVYYCAR (SEQ ID NO: 213)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 214)
h3JOVI.1-H	QVQLVQSGAEVKKPGSSVKVSCKASGYTFT (SEQ ID NO: 7345)	GYVMH (SEQ ID NO: 7346)	WVRQAPGQGLEWMG (SEQ ID NO: 216)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 217)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 218)
h4JOVI.1-H	QVQLVQSGAEVKKPGASVKVSCKASGYTFT (SEQ ID NO: 7348)	GYVMH (SEQ ID NO: 7346)	WVRQAPGQRLEWMG (SEQ ID NO: 220)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTITSDKSATTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 221)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 222)
h5JOVI.1-H	QVQLVQSGAEVKKPGSSVKVSCKASGYTFT (SEQ ID NO: 7345)	GYVMH (SEQ ID NO: 7346)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 217)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTTVTVSS (SEQ ID NO: 7347)
h6JOVI.1-H	QVQLVQSGAEVKKPGASVKVSCKASGYTFT (SEQ ID NO: 7348)	GYVMH (SEQ ID NO: 7346)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSITTAYMELSRLRSDDTAVYYCAR (SEQ ID NO: 7349)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTTVTVSS (SEQ ID NO: 7347)
H1 germli	QVQLVQSGAEVKKPGSSV	GYAIS (SEQ ID NO: 7354)	WVRQAPGQGLEWMG (SEQ	FINPYNDDIQSNERFRG	RVTITSDKSTTTAYMELSS	GAGYNFDGAYRFFDF (SEQ	WGQGTLVTVSS

ned-VH	KVSCKASGYTFS (SEQ ID NO: 7353)		ID NO: 208)	(SEQ ID NO: 201)	LRSEDTAVYYCAR (SEQ ID NO: 217)	ID NO: 202)	(SEQ ID NO: 210)
H2 germlined-VH	QVQLVQSGAEVKKPGSSVKVSCKASGYTFT (SEQ ID NO: 7345)	GYVMH (SEQ ID NO: 7346)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FIIPIFGTANYAQKFQG (SEQ ID NO: 7355)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 217)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 210)
H1/H2 germlined-VH	QVQLVQSGAEVKKPGSSVKVSCKASGYTFS (SEQ ID NO: 7353)	GYAIS (SEQ ID NO: 7354)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FIIPIFGTANYAQKFQG (SEQ ID NO: 7355)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 217)	GAGYNFDGAYRFFDF (SEQ ID NO: 202)	WGQGTLVTVSS (SEQ ID NO: 210)

Table 3. Exemplary light chain CDRs and FWRs of TRBC1-targeting antigen binding domains derived from JOVI.1

Ab ID	VLFWR1	VLCDR1	VLFWR2	VLCDR2	VLFWR3	VLCDR3	VLFWR4
mJOVI.1-L	DVVMTQSPLSLPVSLGDQASISC (SEQ ID NO: 226)	RSSQRLVHSNGNTYLH (SEQ ID NO: 223)	WYLQKPGQSPKLLIY (SEQ ID NO: 227)	RVSNRFP (SEQ ID NO: 224)	GVPDRFSGSGSGTDFTLKISRVEAEDLGIYFC (SEQ ID NO: 228)	SQSTHVPYT (SEQ ID NO: 225)	FGGGTKLEIK (SEQ ID NO: 229)
h1JOVI.1-L	DVVMTQSPLSLPVTPGEPASISC (SEQ ID NO: 230)	RSSQRLVHSNGNTYLH (SEQ ID NO: 223)	WYLQKPGQSPQLLIY (SEQ ID NO: 231)	RVSNRFP (SEQ ID NO: 224)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: 232)	SQSTHVPYT (SEQ ID NO: 225)	FGGGTKVEIK (SEQ ID NO: 233)
h2JOVI.1-L	EVVMTQSPGTLSLSPGERATLSC (SEQ ID NO: 234)	RSSQRLVHSNGNTYLH (SEQ ID NO: 223)	WYQQKPGQAPRLLIY (SEQ ID NO: 235)	RVSNRFP (SEQ ID NO: 224)	GIPDRFSGSGSGTDFTLTISRLEPEDFAVYFC (SEQ ID NO: 236)	SQSTHVPYT (SEQ ID NO: 225)	FGGGTKVEIK (SEQ ID NO: 237)
h3JOVI.1-L	DVVMTQSPLSLPVTLGQPASISC	RSSQRLVHSNGNTYLH (SEQ ID NO: 223)	WYQQRPGQSPRLLIY (SEQ ID NO: 239)	RVSNRFP (SEQ ID NO: 224)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYF	SQSTHVPYT (SEQ ID NO: 225)	FGGGTKVEIK (SEQ ID NO: 241)

	(SEQ ID NO: 238)				C (SEQ ID NO: 240)		
h4JOVI.1-L	DVVMTQTPLSLPVTPGEPASISC (SEQ ID NO: 242)	RSSQRLVHSNGNTYLH (SEQ ID NO: 223)	WYLQKPGQSPQLLIY (SEQ ID NO: 243)	RVSNRFP (SEQ ID NO: 224)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: 244)	SQSTHVPYT (SEQ ID NO: 225)	FGGGTKVEIK (SEQ ID NO: 245)
h5JOVI.1-L	DVVMTQTPLSLSVTPGQPASISC (SEQ ID NO: 246)	RSSQRLVHSNGNTYLH (SEQ ID NO: 223)	WYLQKPGQSPQLLIY (SEQ ID NO: 247)	RVSNRFP (SEQ ID NO: 224)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: 248)	SQSTHVPYT (SEQ ID NO: 225)	FGGGTKVEIK (SEQ ID NO: 249)
L1 germlined-VL	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: 238)	RSSQSLVYSDGNTYH (SEQ ID NO: 7367)	WYQQRPGQSPRLLIY (SEQ ID NO: 239)	RVSNRFP (SEQ ID NO: 224)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: 232)	SQSTHVPYT (SEQ ID NO: 225)	FGGGTKVEIK (SEQ ID NO: 233)
L2 germlined-VL	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: 238)	RSSQRLVHSNGNTYLH (SEQ ID NO: 223)	WYQQRPGQSPRLLIY (SEQ ID NO: 239)	KVSNRDS (SEQ ID NO: 7368)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: 232)	SQSTHVPYT (SEQ ID NO: 225)	FGGGTKVEIK (SEQ ID NO: 233)
L3 germlined-VL	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: 238)	RSSQRLVHSNGNTYLH (SEQ ID NO: 223)	WYQQRPGQSPRLLIY (SEQ ID NO: 239)	RVSNRFP (SEQ ID NO: 224)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: 232)	MQSTHWPYT (SEQ ID NO: 7369)	FGGGTKVEIK (SEQ ID NO: 233)
L1/L2/L3 germlined-VL	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: 238)	RSSQSLVYSDGNTYH (SEQ ID NO: 7367)	WYQQRPGQSPRLLIY (SEQ ID NO: 239)	KVSNRDS (SEQ ID NO: 7368)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: 232)	MQSTHWPYT (SEQ ID NO: 7369)	FGGGTKVEIK (SEQ ID NO: 233)

Table 3A. Exemplary heavy chain CDRs and FWRs of TRBC1-targeting antigen binding domains

Ab ID	VHFWR1	VHCDR1	VHFWR2	VHCDR2	VHFWR3	VHCDR3	VHFWR4
BKM0191	QVQLVQSGAEVKKPGSSVKVSCKASGYT (SEQ ID NO: B019)	FTGYVMH (SEQ ID NO: B020)	WVRQAPGQGLEWMG (SEQ ID NO: B021)	FIIPIFGTANYAQKFQG (SEQ ID NO: B022)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: B023)	GAGYNFDGAYRFFDF (SEQ ID NO: B024)	WGQGTLVTVSS (SEQ ID NO: B025)
BKM0192	QVQLVQSGAEVKKPGSSVKVSCKASGYT (SEQ ID NO: B033)	FTGYVMH (SEQ ID NO: B034)	WVRQAPGQGLEWMG (SEQ ID NO: B035)	FIIPIFGTANYAQKFQG (SEQ ID NO: B036)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: B037)	GAGYNFDGAYRFFDF (SEQ ID NO: B038)	WGQGTLVTVSS (SEQ ID NO: B039)
BKM0193	QVQLVQSGAEVKKPGSSVKVSCKASGYT (SEQ ID NO: B047)	FTGYVMH (SEQ ID NO: B048)	WVRQAPGQGLEWMG (SEQ ID NO: B049)	FIIPIFGTANYAQKFQG (SEQ ID NO: B050)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: B051)	GAGYNFDGAYRFFDF (SEQ ID NO: B052)	WGQGTLVTVSS (SEQ ID NO: B053)
BKM0194	QVQLVQSGAEVKKPGSSVKVSCKASGYT (SEQ ID NO: B061)	FTGYVMH (SEQ ID NO: B062)	WVRQAPGQGLEWMG (SEQ ID NO: B063)	FIIPIFGTANYAQKFQG (SEQ ID NO: B064)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: B065)	GAGYNFDGAYRFFDF (SEQ ID NO: B066)	WGQGTLVTVSS (SEQ ID NO: B067)
BKM0195	QVQLVQSGAEVKKPGSSVKVSCKASGYT (SEQ ID NO: B075)	FTGYVMH (SEQ ID NO: B076)	WVRQAPGQGLEWMG (SEQ ID NO: B077)	FIIPIFGTANYAQKFQG (SEQ ID NO: B078)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: B079)	GAGYNFDGAYRFFDF (SEQ ID NO: B080)	WGQGTLVTVSS (SEQ ID NO: B081)
BKM0196	QVQLVQSGAEVKKPGSSVKVSCKASGYT (SEQ ID NO: B089)	FTGYVMH (SEQ ID NO: B090)	WVRQAPGQGLEWMG (SEQ ID NO: B091)	FIIPIFGTANYAQKFQG (SEQ ID NO: B092)	RVTITSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: B093)	GAGYNFDGAYRFFDF (SEQ ID NO: B094)	WGQGTLVTVSS (SEQ ID NO: B095)

Table 3B. Exemplary light chain CDRs and FWRs of TRBC1-targeting antigen binding domains

Ab ID	VLFWR1	VLCDR1	VLFWR2	VLCDR2	VLFWR3	VLCDR3	VLFWR4
BKM0191	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: B013)	RSSQRLVHSNANTYLH (SEQ ID NO: B014)	WYQQRPGQSPRLLIY (SEQ ID NO: B015)	RVSNRFP (SEQ ID NO: B016)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: B016)	SQSTHVPYTF (SEQ ID NO: B017)	GGGTKVEIK (SEQ ID NO: B018)
BKM0192	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: B026)	RSSQRLVHSNGNAYLH (SEQ ID NO: B027)	WYQQRPGQSPRLLIY (SEQ ID NO: B028)	RVSNRFP (SEQ ID NO: B029)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: B030)	SQSTHVPYTF (SEQ ID NO: B031)	GGGTKVEIK (SEQ ID NO: B032)
BKM0193	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: B040)	RSSQRLVHSNANAYLH (SEQ ID NO: B041)	WYQQRPGQSPRLLIY (SEQ ID NO: B042)	RVSNRFP (SEQ ID NO: B043)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: B044)	SQSTHVPYT (SEQ ID NO: B045)	FGGGTKVEIK (SEQ ID NO: B046)
BKM0194	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: B054)	RSSQRLVHSGGNTYLH (SEQ ID NO: B055)	WYQQRPGQSPRLLIY (SEQ ID NO: B056)	RVSNRFP (SEQ ID NO: B057)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: B058)	SQSTHVPYT (SEQ ID NO: B059)	FGGGTKVEIK (SEQ ID NO: B060)
BKM0195	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: B068)	RSSQRLVHSNGSTYLH (SEQ ID NO: B069)	WYQQRPGQSPRLLIY (SEQ ID NO: B070)	RVSNRFP (SEQ ID NO: B071)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: B072)	SQSTHVPYT (SEQ ID NO: B073)	FGGGTKVEIK (SEQ ID NO: B074)
BKM0196	DVVMTQSPLSLPVTLGQPASISC (SEQ ID NO: B082)	RSSQRLVHSGGSTYLH (SEQ ID NO: B083)	WYQQRPGQSPRLLIY (SEQ ID NO: B084)	RVSNRFP (SEQ ID NO: B085)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: B086)	SQSTHVPYT (SEQ ID NO: B087)	FGGGTKVEIK (SEQ ID NO: B088)

Table 4. Exemplary variable regions of TRBC1-targeting antigen binding domains

SEQ ID NO	Ab ID	Description	Sequence
SEQ ID NO: 250	mJOVI.1-H	JOVI.1 heavy chain variable region	EVRLQQSGPDLIKPGASVKMSCKASGYTFTGY VMHWVKQRPGQGLEWIGFINPYNDDIQSNERF RGKATLTSDKSSTTAYMELSSLTSEDSAVYYCA RGAGYNFDGAYRFFDFWGQGTTLTVSS
SEQ ID NO: 251	h1JOVI.1-H	JOVI.1 heavy chain variable region humanized variant 1	QVQLVQSGAEVKKPGASVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFINPYNDDIQSNER FRGRVTMTSDKSTTTAYMELSSLRSEDTAVYY CARGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 252	h2JOVI.1-H	JOVI.1 heavy chain variable region humanized variant 2	QVQLVQSGAEVKKPGASVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFINPYNDDIQSNER FRGWVTMTSDKSITTAYMELSRLRSDDTAVYY CARGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 253	h3JOVI.1-H	JOVI.1 heavy chain variable region humanized variant 3	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFINPYNDDIQSNER FRGRVTITSDKSTTTAYMELSSLRSEDTAVYYC ARGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 254	h4JOVI.1-H	JOVI.1 heavy chain variable region humanized variant 4	QVQLVQSGAEVKKPGASVKVSCKASGYTFTGY VMHWVRQAPGQRLEWMGFINPYNDDIQSNER FRGRVTITSDKSATTAYMELSSLRSEDTAVYYC ARGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7343	h5JOVI.1-H	JOVI.1 heavy chain variable region humanized variant 5	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFINPYNDDIQSNER FRGRVTITSDKSTTTAYMELSSLRSEDTAVYYC ARGAGYNFDGAYRFFDFWGQGTTVTVSS
SEQ ID NO: 7344	h6JOVI.1-H	JOVI.1 heavy chain variable region humanized variant 6	QVQLVQSGAEVKKPGASVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFINPYNDDIQSNER FRGRVTMTSDKSITTAYMELSRLRSDDTAVYY CARGAGYNFDGAYRFFDFWGQGTTVTVSS
SEQ ID NO: 7350	H1 germlined-VH	JOVI.1 heavy chain variable region humanized H1	QVQLVQSGAEVKKPGSSVKVSCKASGYTFSGY AISWVRQAPGQGLEWMGFINPYNDDIQSNERF RGRVTITSDKSTTTAYMELSSLRSEDTAVYYCA RGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7351	H2 germlined-VH	JOVI.1 heavy chain variable region humanized H2	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFIIPIFGTANYAQKF QGRVTITSDKSTTTAYMELSSLRSEDTAVYYCA RGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7352	H1/H2 germlined-VH	JOVI.1 heavy chain variable region humanized H1/H2	QVQLVQSGAEVKKPGSSVKVSCKASGYTFSGY AISWVRQAPGQGLEWMGFIIPIFGTANYAQKFQ GRVTITSDKSTTTAYMELSSLRSEDTAVYYCAR GAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: B001	BKM0191 VH	BKM0191 G29A heavy chain variable region	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFIIPIFGTANYAQKF QGRVTITSDKSTTTAYMELSSLRSEDTAVYYCA RGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: B002	BKM0192 VH	BKM0192 T31A heavy chain variable region	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFIIPIFGTANYAQKF QGRVTITSDKSTTTAYMELSSLRSEDTAVYYCA RGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: B003	BKM0193 VH	BKM0193 G29a T31A heavy chain variable region	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFIIPIFGTANYAQKF

			QGRVTITSDKSTTTAYMELSSLRSEDTAVYYCA RGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: B004	BKM0194 VH	BKM0194 N28G heavy chain variable region	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFIIPIFGTANYAQKF QGRVTITSDKSTTTAYMELSSLRSEDTAVYYCA RGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: B005	BKM0195 VH	BKM0195 N30S heavy chain variable region	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFIIPIFGTANYAQKF QGRVTITSDKSTTTAYMELSSLRSEDTAVYYCA RGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: B006	BKM0196 VH	BKM0196 N28G N30S heavy chain variable region	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGY VMHWVRQAPGQGLEWMGFIIPIFGTANYAQKF QGRVTITSDKSTTTAYMELSSLRSEDTAVYYCA RGAGYNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 255	mJOVI.1-L	JOVI.1 light chain variable region	DVVMTQSPLSLPVSLGDQASISCRSSQRLVHSN GNTYLHWYLQKPGQSPKLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDLGIYFCSQSTHV PYTFGGGTKLEIK
SEQ ID NO: 256	h1JOVI.1-L	JOVI.1 light chain variable region humanized variant 1	DVVMTQSPLSLPVTPGEPASISCRSSQRLVHSN GNTYLHWYLQKPGQSPQLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: 257	h2JOVI.1-L	JOVI.1 light chain variable region humanized variant 2	EVVMTQSPGTLSLSPGERATLSCRSSQRLVHSN GNTYLHWYQQKPGQAPRLLIYRVSNRFPGIPDR FSGSGSGTDFTLTISRLEPEDFAVYFCSQSTHVP YTFGGGTKVEIK
SEQ ID NO: 258	h3JOVI.1-L	JOVI.1 light chain variable region humanized variant 3	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSN GNTYLHWYQQRPGQSPRLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: 259	h4JOVI.1-L	JOVI.1 light chain variable region humanized variant 4	DVVMTQTPLSLPVTPGEPASISCRSSQRLVHSN GNTYLHWYLQKPGQSPQLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: 260	h5JOVI.1-L	JOVI.1 light chain variable region humanized variant 5	DVVMTQTPLSLSVTPGQPASISCRSSQRLVHSN GNTYLHWYLQKPGQSPQLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: 7357	L1 germlined-VL	JOVI.1 light chain variable region humanized L1	DVVMTQSPLSLPVTLGQPASISCRSSQSLVYSD GNTYHWYQQRPGQSPRLLIYRVSNRFPGVPDR FSGSGSGTDFTLKISRVEAEDVGVYFCSQSTHV PYTFGGGTKVEIK
SEQ ID NO: 7358	L2 germlined-VL	JOVI.1 light chain variable region humanized L2	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSN GNTYLHWYQQRPGQSPRLLIYKVSNRDSGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: 7359	L3 germlined-VL	JOVI.1 light chain variable region humanized L3	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSN GNTYLHWYQQRPGQSPRLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCMQSTH WPYTFGGGTKVEIK
SEQ ID NO: 7360	L1/L2/L3 germlined-VL	JOVI.1 light chain variable region humanized L1/L2/L3	DVVMTQSPLSLPVTLGQPASISCRSSQSLVYSD GNTYHWYQQRPGQSPRLLIYKVSNRDSGVPDR FSGSGSGTDFTLKISRVEAEDVGVYFCMQSTH WPYTFGGGTKVEIK

SEQ ID NO: B007	BKM0191 VL	BKM0191 G29A light chain variable region	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSN ANTYLHWYQQRPGQSPRLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: B008	BKM0192 VL	BKM0192 T31A light chain variable region	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSN GNAYLHWYQQRPGQSPRLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: B009	BKM0193 VL	BKM0193 G29a T31A light chain variable region	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSN ANAYLHWYQQRPGQSPRLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: B010	BKM0194 VL	BKM0194 N28G light chain variable region	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSG GNTYLHWYQQRPGQSPRLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: B011	BKM0195 VL	BKM0195 N30S light chain variable region	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSN GSTYLHWYQQRPGQSPRLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK
SEQ ID NO: B012	BKM0196 VL	BKM0196 N28G N30S light chain variable region	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSG GSTYLHWYQQRPGQSPRLLIYRVSNRFPGVPD RFSGSGSGTDFTLKISRVEAEDVGVYFCSQSTH VPYTFGGGTKVEIK

Table 5. Exemplary TRBC1-targeting antigen binding domains/antibody molecules

SEQ ID NO	Ab ID	Description	Sequence
SEQ ID NO: 6154	Ch(anti-TRBC1) HC N297A	Anti-TRBC1 heavy chain	EVRLQQSGPDLIKPGASVKMSCKASGYTFTGYV MHWVKQRPGQGLEWIGFINPYNDDIQSNERFRG KATLTSDKSSTTAYMELSSLTSEDSAVYYCARG AGYNFDGAYRFFDFWGQGTTLTVSSASTKGPSV FPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSW NSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSS LGTQTYICNVNHKPSNTKVDKRVEPKSCDKTHT CPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVT CVVVDVSHEDPEVKFNWYVDGVEVHNAKTKP REEQYASTYRVVSVLTVLHQDWLNGKEYKCKV SNKALPAPIEKTISKAKGQPREPQVYTLPPCREE MTKNQVSLWCLVKGFYPSDIAVEWESNGQPEN NYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNV FSCSVMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 6155	Ch(anti-TRBC1) HC	Anti-TRBC1 heavy chain	EVRLQQSGPDLIKPGASVKMSCKASGYTFTGYV MHWVKQRPGQGLEWIGFINPYNDDIQSNERFRG KATLTSDKSSTTAYMELSSLTSEDSAVYYCARG AGYNFDGAYRFFDFWGQGTTLTVSSASTKGPSV FPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSW NSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSS LGTQTYICNVNHKPSNTKVDKRVEPKSCDKTHT CPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVT CVVVDVSHEDPEVKFNWYVDGVEVHNAKTKP REEQYNSTYRVVSVLTVLHQDWLNGKEYKCKV SNKALPAPIEKTISKAKGQPREPQVYTLPPCREE

			MTKNQVSLWCLVKGFYPSDIAVEWESNGQPEN NYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNV FSCSVMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 6156	Ch(anti-TRBC1) LC	Anti-TRBC1 light chain, e.g., a LC Fab	DVVMTQSPLSLPVSLGDQASISCRSSQRLVHSNG NTYLHWYLQKPGQSPKLLIYRVSNRFPGVPDRF SGSGSGTDFTLKISRVEAEDLGIYFCSQSTHVPYT FGGGTKLEIKRTVAAPSVFIFPPSDEQLKSGTASV VCLLNNFYPREAKVQWKVDNALQSGNSQESVT EQDSKDSTYSLSSTLTLSKADYEKHKVYACEVT HQGLSSPVTKSFNRGEC
SEQ ID NO: 6191	Ch(anti-TRBC1) HC	Anti-TRBC1 heavy chain, e.g., a HC Fab	EVRLQQSGPDLIKPGASVKMSCKASGYTFTGYV MHWVKQRPGQGLEWIGFINPYNDDIQSNERFRG KATLTSDKSSTTAYMELSSLTSEDSAVYYCARG AGYNFDGAYRFFDFWGQGTTLTVSSASTKGPSV FPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSW NSGALTSGVHTFPAVLQSSGLYSLSSVVTVPSSS LGTQTYICNVNHKPSNTKVDKRVEPKSC
SEQ ID NO: 6167	a_hTRBC1_Jovi1_Hum5_VH-hCHIg_Hole_Cys-Blank	Anti-TRBC1 heavy chain	METDTLLLWVLLLWVPGSTGQVQLVQSGAEVK KPGSSVKVSCKASGYTFTGYVMHWVRQAPGQG LEWMGFINPYNDDIQSNERFRGRVTITSDKSTTT AYMELSSLRSEDTAVYYCARGAGYNFDGAYRF FDFWGQGTLVTVSSASTKGPSVFPLAPSSKSTSG GTAALGCLVKDYFPEPVTVSWNSGALTSGVHTF PAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNH KPSNTKVDKRVEPKSCDKTHTCPPCPAPELLGG PSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDP EVKFNWYVDGVEVHNAKTKPREEQYNSTYRV VSVLTVLHQDWLNGKEYKCKVSNKALPAPIEK TISKAKGQPREPQVCTLPPSREEMTKNQVSLSCA VKGFYPSDIAVEWESNGQPENNYKTTPPVLDSD GSFFLVSKLTVDKSRWQQGNVFSCSVMHEALH NHYTQKSLSLSPGK
SEQ ID NO: 6168	a_hTRBC1_Jovi1_Hum5_VH-hCHIg-Blank	Anti-TRBC1 heavy chain	METDTLLLWVLLLWVPGSTGQVQLVQSGAEVK KPGSSVKVSCKASGYTFTGYVMHWVRQAPGQG LEWMGFINPYNDDIQSNERFRGRVTITSDKSTTT AYMELSSLRSEDTAVYYCARGAGYNFDGAYRF FDFWGQGTLVTVSSASTKGPSVFPLAPSSKSTSG GTAALGCLVKDYFPEPVTVSWNSGALTSGVHTF PAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNH KPSNTKVDKRVEPKSCDKTHTCPPCPAPELLGG PSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDP EVKFNWYVDGVEVHNAKTKPREEQYNSTYRV VSVLTVLHQDWLNGKEYKCKVSNKALPAPIEK TISKAKGQPREPQVYTLPPSREEMTKNQVSLTCL VKGFYPSDIAVEWESNGQPENNYKTTPPVLDSD GSFFLYSKLTVDKSRWQQGNVFSCSVMHEALH NHYTQKSLSLSPGK
SEQ ID NO: 6169	a_hTRBC1_Jovi1_Hum3_VL-hCLIg_vk-Blank	Anti-TRBC1 light chain	METDTLLLWVLLLWVPGSTGDVVMTQSPLSLP VTLGQPASISCRSSQRLVHSNGNTYLHWYQQRP GQSPRLLIYRVSNRFPGVPDRFSGSGSGTDFTLKI SRVEAEDVGVYFCSQSTHVPYTFGGGTKVEIKR TVAAPSVFIFPPSDEQLKSGTASVVCLLNNFYPR EAKVQWKVDNALQSGNSQESVTEQDSKDSTYS

			LSSTLTLSKADYEKHKVYACEVTHQGLSSPVTK SFNRGEC

TRBC2 Antigen Binding Domains

[00292] In some embodiments, the antigen binding domain that binds to TRBC2 comprises one or more CDRs (e.g., VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and/or VLCDR3) disclosed in Table 21 or Table 22, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to TRBC2 comprises one or more framework regions (e.g., VHFWR1, VHFWR2, VHFWR3, VHFWR4, VLFWR1, VLFWR2, VLFWR3, and/or VLFWR4) disclosed in Table 21 or Table 22, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to TRBC2 comprises a VH and/or a VL disclosed in Table 23, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to TRBC2 comprises an amino acid sequence disclosed in Table 24, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00293] In some embodiments, the antigen binding domain that binds to TRBC2 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3.

[00294] In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7441, 201, and 7442, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7422, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7401, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7394, 201, and 7396, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 201, and 7398, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 201, and 7400, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7405, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7407, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99%

identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7427, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7430, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00295] In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7443, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00296] In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7441, 201, 7442, 7443, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7422, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7401, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7394, 201, 7396, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 7398, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 7400, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7405, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7407, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7427, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7430, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7422, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7401, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7394, 201, 7396, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 7398, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ

ID NOs: 7346, 201, 7400, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7405, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7407, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7427, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or SEQ ID NOs: 7430, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00297] In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7420, 7423, 7411, 7412, 7413, 7414, 7415, 7416, 7417, 7425, 7428, and 7431 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7419 and 7418 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7420 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7423 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7411 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7412 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7413 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7414 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7415 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7416 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7417 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7425 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7428 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7431 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7420 and 7418, respectively (or a sequence

having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7423 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7411 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7412 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7413 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7414 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7415 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7416 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7417 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7425 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7428 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7431 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00298] In some embodiments, the antigen binding domain that binds to TRBC2 comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7433, 7434, 7435, 7436, and 7437 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

Table 21. Exemplary heavy chain CDRs and FWRs of TRBC2-targeting antigen binding domains

Ab ID	VHFWR1	VHCDR1	VHFWR2	VHCDR2	VHFWR3	VHCDR3	VHFWR4
JVD3-VH	QVQLVQSGAEVKKPGASVKVSCKASGYTFP (SEQ ID NO: 7393)	GFVMH (SEQ ID NO: 7394)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 209)	GNGMWFDGAYRFFDF (SEQ ID NO: 7396)	WGQGTLVTVSS (SEQ ID NO: 210)

JVD4-VH	QVQLVQSGAEVKKPGASVKVSCKASGYPFH (SEQ ID NO: 7397)	GYVMH (SEQ ID NO: 7346)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 209)	GNGKNFDGAYRFFDF (SEQ ID NO: 7398)	WGQGTLVTVSS (SEQ ID NO: 210)
JVD5-VH	QVQLVQSGAEVKKPGASVKVSCKASGYTYP (SEQ ID NO: 7399)	GYVMH (SEQ ID NO: 7346)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 209)	GNGKWFDGAYRFFDF (SEQ ID NO: 7400)	WGQGTLVTVSS (SEQ ID NO: 210)
JVD6-VH	QVQLVQSGAEVKKPGASVKVSCKASNQNFH (SEQ ID NO: 7401)	GYHMH (SEQ ID NO: 7401)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 209)	GNGKWGDGAYRFFDF (SEQ ID NO: 7403)	WGQGTLVTVSS (SEQ ID NO: 210)
JVD7-VH	QVQLVQSGAEVKKPGASVKVSCKASSQNFH (SEQ ID NO: 7404)	GFYMH (SEQ ID NO: 7405)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 209)	GNGKWGDGAYRFFDF (SEQ ID NO: 7403)	WGQGTLVTVSS (SEQ ID NO: 210)
JVD8-VH	QVQLVQSGAEVKKPGASVKVSCKASYQDFH (SEQ ID NO: 7406)	GYKMH (SEQ ID NO: 7407)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 209)	GNGKWGDGAYRFFDF (SEQ ID NO: 7403)	WGQGTLVTVSS (SEQ ID NO: 210)
JVD9-VH	QVQLVQSGAEVKKPGASVKVSCKASGYNFH (SEQ ID NO: 7408)	GFYMH (SEQ ID NO: 7405)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ ID NO: 209)	GNGKWGDGAYRFFDF (SEQ ID NO: 7403)	WGQGTLVTVSS (SEQ ID NO: 210)
BKM0097 anti-TRBC2 VH; BJM1	QVQLVQSGAEVKKPGASVKVSCKASTSGFH	GYPMH (SEQ ID NO: 7422)	WVRQAPGQGLEWMG (SEQ ID NO: 208)	FINPYNDDIQSNERFRG (SEQ ID NO: 201)	RVTMTSDKSTTTAYMELSSLRSEDTAVYYCAR (SEQ	GNGKWGDGAYRFFDF (SEQ ID NO: 7403)	WGQGTLVTVSS (SEQ ID NO: 210)

184 VH	(SEQ ID NO: 7421)				ID NO: 209)		
BKM 0098 anti-TRBC 2 VH; BJM1 185 VH	QVQLVQ SGAEVK KPGASV KVSCKA SPRGFH (SEQ ID NO: 7424)	GYHMH (SEQ ID NO: 7401)	WVRQAP GQGLEW MG (SEQ ID NO: 208)	FINPYND DIQSNER FRG (SEQ ID NO: 201)	RVTMTS DKSTTT AYMELS SLRSEDT AVYYCA R (SEQ ID NO: 209)	GNGKW GDGAYR FFDF (SEQ ID NO: 7403)	WGQGTL VTVSS (SEQ ID NO: 210)
BJM1 186 VH	QVQLVQ SGAEVK KPGASV KVSCKA SFQDFH (SEQ ID NO: 7426)	GYAMH (SEQ ID NO: 7427)	WVRQAP GQGLEW MG (SEQ ID NO: 208)	FINPYND DIQSNER FRG (SEQ ID NO: 201)	RVTMTS DKSTTT AYMELS SLRSEDT AVYYCA R (SEQ ID NO: 209)	GNGKW GDGAYR FFDF (SEQ ID NO: 7403)	WGQGTL VTVSS (SEQ ID NO: 210)
BJM1 187 VH	QVQLVQ SGAEVK KPGASV KVSCKA SSKDFH (SEQ ID NO: 7429)	GFAMH (SEQ ID NO: 7430)	WVRQAP GQGLEW MG (SEQ ID NO: 208)	FINPYND DIQSNER FRG (SEQ ID NO: 201)	RVTMTS DKSTTT AYMELS SLRSEDT AVYYCA R (SEQ ID NO: 209)	GNGKW GDGAYR FFDF (SEQ ID NO: 7403)	WGQGTL VTVSS (SEQ ID NO: 210)
BC2_ YR3_ B11-scFv VH	QVQLVQ SGAEVK KPGASV KVSCKA SPKGFH (SEQ ID NO: 7432)	GYHMH (SEQ ID NO: 7401)	WVRQAP GQGLEW MG (SEQ ID NO: 208)	FINPYND DIQSNER FRG (SEQ ID NO: 201)	RVTMTS DKSTTT AYMELS SLRSEDT AVYYCA R (SEQ ID NO: 209)	GNGKW GDGAYR FFDF (SEQ ID NO: 7403)	WGQGTL VTVSS (SEQ ID NO: 210)
Consensus VHCDR		GX1X2MH, wherein X1 is Y or F, and X2 is P, H, V, Y, K, or A (SEQ ID NO: 7441)		FINPYND DIQSNER FRG (SEQ ID NO: 201)		GNGX1X 2X3DGA YRFFDF, wherein X1 is K or M, X2 is W or N, and X3 is G or F (SEQ ID NO: 7442)	

Table 22. Exemplary light chain CDRs and FWRs of TRBC2-targeting antigen binding domains

Ab ID	VLFWR1	VLCDR1	VLFWR2	VLCDR2	VLFWR3	VLCDR3	VLFWR4
JVD2-VL	DVVMT QSPLSLP VTPGEP ASISC	RSSQNL VHSNGR TYLH (SEQ ID NO: 7409)	WYLQKP GQSPQL LIY (SEQ ID NO: 231)	RVSNRF P (SEQ ID NO: 224)	GVPDRF SGSGSG TDFTLKI SRVEAE DVGVYF	SQSTHV PYT (SEQ ID NO: 225)	FGGGTK VEIK (SEQ ID NO: 233)

	(SEQ ID NO: 230)				C (SEQ ID NO: 232)		
JVD34-VL	DVVMTQSPLSLPVTPGEPASISC (SEQ ID NO: 230)	RSSQNLVHSNGRTYLQ (SEQ ID NO: 7410)	WYLQKPGQSPQLLIY (SEQ ID NO: 231)	RVSNRFP (SEQ ID NO: 224)	GVPDRFSGSGSGTDFTLKISRVEAEDVGVYFC (SEQ ID NO: 232)	SQSTHVPYT (SEQ ID NO: 225)	FGGGTKVEIK (SEQ ID NO: 233)
Consensus LHCDR		RSSQNLVHSNGRTYLX, wherein X is Q or H (SEQ ID NO: 7443)		RVSNRFP (SEQ ID NO: 224)		SQSTHVPYT (SEQ ID NO: 225)	

Table 23. Exemplary variable regions of TRBC2-targeting antigen binding domains

SEQ ID NO	Description	Sequence
SEQ ID NO: 7411	JVD3-VH	QVQLVQSGAEVKKPGASVKVSCKASGYTFPGFVMHWVRQAPGQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRSEDTAVYYCARGNGMWFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7412	JVD4-VH	QVQLVQSGAEVKKPGASVKVSCKASGYPFHGYVMHWVRQAPGQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRSEDTAVYYCARGNGKNFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7413	JVD5-VH	QVQLVQSGAEVKKPGASVKVSCKASGYTYPGYVMHWVRQAPGQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRSEDTAVYYCARGNGKWFDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7414	JVD6-VH	QVQLVQSGAEVKKPGASVKVSCKASNQNFHGYHMHWVRQAPGQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7415	JVD7-VH	QVQLVQSGAEVKKPGASVKVSCKASSQNFHGFYMHWVRQAPGQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7416	JVD8-VH	QVQLVQSGAEVKKPGASVKVSCKASYQDFHGYKMHWVRQAPGQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7417	JVD9-VH	QVQLVQSGAEVKKPGASVKVSCKASGYNFHGFYMHWVRQAPGQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7420	BKM0097 anti-TRBC2 VH; BJM1184 VH	QVQLVQSGAEVKKPGASVKVSCKASTSGFHGYPMHWVRQAPGQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7423	BKM0098 anti-TRBC2 VH; BJM1185 VH	QVQLVQSGAEVKKPGASVKVSCKASPRGFHGYHMHWVRQAPGQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSS

SEQ ID NO: 7425	BJM1186 VH	QVQLVQSGAEVKKPGASVKVSCKASFQDFHGYAMHWVRQAP GQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELS SLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7428	BJM1187 VH	QVQLVQSGAEVKKPGASVKVSCKASSKDFHGFAMHWVRQAP GQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELS SLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7431	BC2_YR3_B11-scFv VH	QVQLVQSGAEVKKPGASVKVSCKASPKGFHGYHMHWVRQAP GQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELS SLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSS
SEQ ID NO: 7418	JVD2-VL	DVVMTQSPLSLPVTPGEPASISCRSSQNLVHSNGRTYLHWYLQ KPGQSPQLLIYRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDV GVYFCSQSTHVPYTFGGGTKVEIK
SEQ ID NO: 7419	JVD34-VL	DVVMTQSPLSLPVTPGEPASISCRSSQNLVHSNGRTYLQWYLQ KPGQSPQLLIYRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDV GVYFCSQSTHVPYTFGGGTKVEIK

Table 24. Exemplary TRBC2-targeting antigen binding domains/antibody molecules

SEQ ID NO	Description	Sequence
SEQ ID NO: 7433	BC2_YR3-A12-scFv (BJM1184)	QVQLVQSGAEVKKPGASVKVSCKASTSGFHGYPMHWVRQAPGQ GLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRS EDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSSGGGGSGG GGSGGGGSGGGGSDVVMTQSPLSLPVTPGEPASISCRSSQNLVHS NGRTYLQWYLQKPGQSPQLLIYRVSNRFPGVPDRFSGSGSGTDFT LKISRVEAEDVGVYFCSQSTHVPYTFGGGTKVEIK
SEQ ID NO: 7434	BC2_YR3-A5-scFv (BJM1185)	QVQLVQSGAEVKKPGASVKVSCKASPRGFHGYHMHWVRQAPGQ GLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRS EDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSSGGGGSGG GGSGGGGSGGGGSDVVMTQSPLSLPVTPGEPASISCRSSQNLVHS NGRTYLQWYLQKPGQSPQLLIYRVSNRFPGVPDRFSGSGSGTDFT LKISRVEAEDVGVYFCSQSTHVPYTFGGGTKVEIK
SEQ ID NO: 7435	BC2_YR3-B3-scFv (BJM1186)	QVQLVQSGAEVKKPGASVKVSCKASFQDFHGYAMHWVRQAPGQ GLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRS EDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSSGGGGSGG GGSGGGGSGGGGSDVVMTQSPLSLPVTPGEPASISCRSSQNLVHS NGRTYLQWYLQKPGQSPQLLIYRVSNRFPGVPDRFSGSGSGTDFT LKISRVEAEDVGVYFCSQSTHVPYTFGGGTKVEIK
SEQ ID NO: 7436	BC2_YR3_B4-scFv (BJM1187)	QVQLVQSGAEVKKPGASVKVSCKASSKDFHGFAMHWVRQAPGQ GLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRS EDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSSGGGGSGG GGSGGGGSGGGGSDVVMTQSPLSLPVTPGEPASISCRSSQNLVHS NGRTYLQWYLQKPGQSPQLLIYRVSNRFPGVPDRFSGSGSGTDFT LKISRVEAEDVGVYFCSQSTHVPYTFGGGTKVEIK
SEQ ID NO: 7437	BC2_YR3_B11-scFv	QVQLVQSGAEVKKPGASVKVSCKASPKGFHGYHMHWVRQAPGQ GLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELSSLRS EDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSSGGGGSGG GGSGGGGSGGGGSDVVMTQSPLSLPVTPGEPASISCRSSQNLVHS NGRTYLQWYLQKPGQSPQLLIYRVSNRFPGVPDRFSGSGSGTDFT LKISRVEAEDVGVYFCSQSTHVPYTFGGGTKVEIK

Antibody molecules that bind to TRBC1/TRBC2 and NKp30

[00299] In some embodiments, the disclosure features a multifunctional antibody molecule that

binds to TRBC1 and NKp30. In some embodiments, the multifunctional antibody molecule comprises a configuration shown in any of FIGs. 29A-29D. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 Fab. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 scFv. In some embodiments, the multifunctional antibody molecule comprises an anti-NKp30 Fab. In some embodiments, the multifunctional antibody molecule comprises an anti-NKp30 scFv. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 Fab and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 29A. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 Fab and an anti-NKp30 Fab, e.g., comprises a configuration shown in FIG. 29B. In some embodiments, the multifunctional antibody molecule comprises an anti-NKp30 Fab and an anti-TRBC1 scFv, e.g., comprises a configuration shown in FIG. 29C. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 scFv and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 29D. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 antigen binding domain disclosed herein, e.g., an anti-TRBC1 antigen binding domain disclosed in Tables 2, 3, 3A, 3B, 4, 5, or 6. In some embodiments, the multifunctional antibody molecule comprises an anti-NKp30 antigen binding domain disclosed herein, e.g., an anti-NKp30 antigen binding domain disclosed in Tables 7, 8, 8A, 8B, 9, 10 and 18.

[00300] In some embodiments, exemplary multifunctional antibody molecules that bind to TRBC1 and NKp30 are disclosed in Table 19.

[00301] In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 VH of SEQ ID NO: 7351 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC1/NKp30 antibody molecule comprises an anti-TRBC1 VH of SEQ ID NO: 7351 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC1/NKp30 antibody molecule comprises SEQ ID NOs: 7382, 7380, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00302] In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 VH of SEQ ID NO: 253 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC1/NKp30 antibody

molecule comprises an anti-TRBC1 VH of SEQ ID NO: 253 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC1/NKp30 antibody molecule comprises SEQ ID NOs: 7379, 7380, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00303] In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 VH of SEQ ID NO: 7351 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7305 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC1/NKp30 antibody molecule comprises an anti-TRBC1 VH of SEQ ID NO: 7351 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC1/NKp30 antibody molecule comprises SEQ ID NOs: 7382, 7380, and 7384 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00304] In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC1 VH of SEQ ID NO: 253 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7305 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC1/NKp30 antibody molecule comprises an anti-TRBC1 VH of SEQ ID NO: 253 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC1/NKp30 antibody molecule comprises SEQ ID NOs: 7379, 7380, and 7384 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

Table 19. Exemplary antibody molecules that bind to TRBC1 and NKp30

SEQ ID NO	Description	Sequence
BJM0772		
SEQ ID NO: 7379	anti-TRBC1 HC	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGYVMHWVRQAPG QGLEWMGFINPYNDDIQSNERFRGRVTITSDKSTTTAYMELSSL RSEDTAVYYCARGAGYNFDGAYRFFDFWGQGTLVTVSSASTK GPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTS

		GVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTK VDKRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISR TPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYA STYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK GQPREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSDIAVEWES NGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCS VMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 7380	anti-TRBC1 LC	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSNGNTYLHWYQQ RPGQSPRLLIYRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDV GVYFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKSG TASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDS TYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC
SEQ ID NO: 7381	anti-NKp30 15E1 scFv-Fc	QIQLQESGPGLVKPSQSLSLSCSVTGFSITTTGYHWNWIRQFPGK KLEWMGYIYSSGSTSYNPSLKSRFSITRDTSKNQFFLQLNSVTTE DTATYYCARGDWHYFDYWGPGTMVTVSSGGGGSGGGGSGGG GSGGGGSSFTLTQPPLVSVAVGQVATITCSGEKLSDKYVHWYQ QKPGRAPVMVIYENDRRPSGIPDQFSGSNSGNIASLTISKAQAGD EADYFCQFWDSTNSAVFGGGTQLTVLDKTHTCPPCPAPELLGGP SVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGV EVHNAKTKPREEQYASTYRVVSVLTVLHQDWLNGKEYKCKVS NKALPAPIEKTISKAKGQPREPQVCTLPPSREEMTKNQVSLSCAV KGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLVSKLTVD KSRWQQGNVFSCSVMHEALHNRFTQKSLSLSPGK
BJM1042		
SEQ ID NO: 7382	anti-TRBC1 HC	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGYVMHWVRQAPG QGLEWMGFIIPIFGTANYAQKFQGRVTITSDKSTTTAYMELSSLR SEDTAVYYCARGAGYNFDGAYRFFDFWGQGTLVTVSSASTKGP SVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGV HTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVD KRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTP EVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYAST YRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQ PREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSDIAVEWESNG QPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVM HEALHNHYTQKSLSLSPGK
SEQ ID NO: 7380	anti-TRBC1 LC	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSNGNTYLHWYQQ RPGQSPRLLIYRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDV GVYFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKSG TASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDS TYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC
SEQ ID NO: 7383	anti-NKp30 humanized 15E1 scFv-Fc	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGYHWNWVRQAPG KGLEWVGYIYSSGSTSYNPSLKSRFTISRDTSKNTFYLQMNSLRA EDTAVYYCARGDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSDSVTTQSPLSLPVTLGQPASISCSGEKLSDKYVHWY QQRPGQSPRMLIYENDRRPSGVPDRFSGSNSGNDATLKISRVEA EDVGVYFCQFWDSTNSAVFGGGTKVEIKDKTHTCPPCPAPELLG GPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVD GVEVHNAKTKPREEQYASTYRVVSVLTVLHQDWLNGKEYKCK VSNKALPAPIEKTISKAKGQPREPQVCTLPPSREEMTKNQVSLSC AVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLVSKLT VDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
BJM1052		

SEQ ID NO: 7379	anti-TRBC1 HC	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGYVMHWVRQAPG QGLEWMGFINPYNDDIQSNERFRGRVTITSDKSTTTAYMELSSL RSEDTAVYYCARGAGYNFDGAYRFFDFWGQGTLVTVSSASTK GPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTS GVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTK VDKRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISR TPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYA STYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK GQPREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSDIAVEWES NGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCS VMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 7380	anti-TRBC1 LC	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSNGNTYLHWYQQ RPGQSPRLLIYRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDV GVYFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKSG TASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDS TYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC
SEQ ID NO: 7383	anti-NKp30 humanized 15E1 scFv-Fc	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGYHWNWVRQAPG KGLEWVGYIYSSGSTSYNPSLKSRFTISRDTSKNTFYLQMNSLRA EDTAVYYCARGDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSDSVTTQSPLSLPVTLGQPASISCSGEKLSDKYVHWY QQRPGQSPRMLIYENDRRPSGVPDRFSGSNSGNDATLKISRVEA EDVGVYFCQFWDSTNSAVFGGGTKVEIKDKTHTCPPCPAPELLG GPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVD GVEVHNAKTKPREEQYASTYRVVSVLTVLHQDWLNGKEYKCK VSNKALPAPIEKTISKAKGQPREPQVCTLPPSREEMTKNQVSLSC AVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLVSKLT VDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
BJM1038		
SEQ ID NO: 7382	anti-TRBC1 HC	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGYVMHWVRQAPG QGLEWMGFIIPIFGTANYAQKFQGRVTITSDKSTTTAYMELSSLR SEDTAVYYCARGAGYNFDGAYRFFDFWGQGTLVTVSSASTKGP SVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTSGV HTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTKVD KRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTP EVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYAST YRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQ PREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSDIAVEWESNG QPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVM HEALHNHYTQKSLSLSPGK
SEQ ID NO: 7380	anti-TRBC1 LC	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSNGNTYLHWYQQ RPGQSPRLLIYRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDV GVYFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKSG TASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDS TYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC
SEQ ID NO: 7384	anti-NKp30 humanized 15E1 scFv-Fc	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGYHWNWVRQAPG KGLEWVGYIYSSGSTSYNPSLKSRFTISRDTSKNTFYLQMNSLRA EDTAVYYCARGDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSSSETTQPPSVSVSPGQTASITCSGEKLSDKYVHWYQ QKPGQSPVMVIYENDRRPSGIPERFSGSNSGNTATLTISGTQAMD EADYFCQFWDSTNSAVFGGGTQLTVLDKTHTCPPCPAPELLGGP SVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGV EVHNAKTKPREEQYASTYRVVSVLTVLHQDWLNGKEYKCKVS NKALPAPIEKTISKAKGQPREPQVCTLPPSREEMTKNQVSLSCAV

		KGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLVSKLTVD KSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
BJM1048		
SEQ ID NO: 7379	anti-TRBC1 HC	QVQLVQSGAEVKKPGSSVKVSCKASGYTFTGYVMHWVRQAPG QGLEWMGFINPYNDDIQSNERFRGRVTITSDKSTTTAYMELSSL RSEDTAVYYCARGAGYNFDGAYRFFDFWGQGTLVTVSSASTK GPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGALTS GVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSNTK VDKRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISR TPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYA STYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK GQPREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSDIAVEWES NGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCS VMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 7380	anti-TRBC1 LC	DVVMTQSPLSLPVTLGQPASISCRSSQRLVHSNGNTYLHWYQQ RPGQSPRLLIYRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDV GVYFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKSG TASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDS TYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC
SEQ ID NO: 7384	anti-NKp30 humanized 15E1 scFv-Fc	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGYHWNWVRQAPG KGLEWVGYIYSSGSTSYNPSLKSRFTISRDTSKNTFYLQMNSLRA EDTAVYYCARGDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSSSETTQPPSVSVSPGQTASITCSGEKLSDKYVHWYQ QKPGQSPVMVIYENDRRPSGIPERFSGSNSGNTATLTISGTQAMD EADYFCQFWDSTNSAVFGGGTQLTVLDKTHTCPPCPAPELLGGP SVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGV EVHNAKTKPREEQYASTYRVVSVLTVLHQDWLNGKEYKCKVS NKALPAPIEKTISKAKGQPREPQVCTLPPSREEMTKNQVSLSCAV KGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLVSKLTVD KSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK

[00305] In some embodiments, the disclosure features a multifunctional antibody molecule that binds to TRBC2 and NKp30. In some embodiments, the multifunctional antibody molecule comprises a configuration shown in any of FIGs. 30A-30D. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 Fab. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 scFv. In some embodiments, the multifunctional antibody molecule comprises an anti-NKp30 Fab. In some embodiments, the multifunctional antibody molecule comprises an anti-NKp30 scFv. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 Fab and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 30A. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 Fab and an anti-NKp30 Fab, e.g., comprises a configuration shown in FIG. 30B. In some embodiments, the multifunctional antibody molecule comprises an anti-NKp30 Fab and an anti-TRBC2 scFv, e.g., comprises a configuration shown in FIG. 30C. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 scFv and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 30D. In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 antigen binding domain disclosed herein, e.g., an anti-TRBC2

antigen binding domain disclosed in Tables 21-24. In some embodiments, the multifunctional antibody molecule comprises an anti-NKp30 antigen binding domain disclosed herein, e.g., an anti-NKp30 antigen binding domain disclosed in Tables 7, 8, 8A, 8B, 9, 10 and 18.

[00306] In some embodiments, exemplary multifunctional antibody molecules that bind to TRBC2 and NKp30 are disclosed in Table 25.

[00307] In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC2/NKp30 antibody molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC2/NKp30 antibody molecule comprises SEQ ID NOs: 7438, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00308] In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC2/NKp30 antibody molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC2/NKp30 antibody molecule comprises SEQ ID NOs: 7440, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00309] In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7305 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC2/NKp30 antibody molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having

at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC2/NKp30 antibody molecule comprises SEQ ID NOs: 7438, 7439, and 7384 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00310] In some embodiments, the multifunctional antibody molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7305 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC2/NKp30 antibody molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the anti-TRBC2/NKp30 antibody molecule comprises SEQ ID NOs: 7440, 7439, and 7384 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

Table 25. Exemplary antibody molecules that bind to TRBC2 and NKp30

SEQ ID NO	Description	Sequence
BKM0097		
SEQ ID NO: 7438	Anti-TRBC2 HC	QVQLVQSGAEVKKPGASVKVSCKASTSGFHGYPMHWVRQAP GQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELS SLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSSAS TKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGA LTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKP SNTKVDKRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDT LMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPR EEQYASTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEK TISKAKGQPREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSDI AVEWESNGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQ GNVFSCSVMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 7439	Anti-TRBC2 LC	DVVMTQSPLSLPVTPGEPASISCRSSQNLVHSNGRTYLQWYLQ KPGQSPQLLIYRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDV GVYFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKS GTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSK DSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRG EC
SEQ ID NO: 7383	anti-NKp30 humanized 15E1 scFv-Fc	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGYHWNWVRQAP GKGLEWVGYIYSSGSTSYNPSLKSRFTISRDTSKNTFYLQMNSL RAEDTAVYYCARGDWHYFDYWGQGTMVTVSSGGGGSGGGG SGGGGSGGGGSDSVTTQSPLSLPVTLGQPASISCSGEKLSDKYV HWYQQRPGQSPRMLIYENDRRPSGVPDRFSGSNSGNDATLKIS RVEAEDVGVYFCQFWDSTNSAVFGGGTKVEIKDKTHTCPPCPA PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKF

		NWYVDGVEVHNAKTKPREEQYASTYRVVSVLTVLHQDWLNG KEYKCKVSNKALPAPIEKTISKAKGQPREPQVCTLPPSREEMTK NQVSLSCAVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGS FFLVSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSP GK
BKM0098		
SEQ ID NO: 7440	Anti-TRBC2 HC	QVQLVQSGAEVKKPGASVKVSCKASPRGFHGYHMHWVRQAP GQGLEWMGFINPYNDDIQSNERFRGRVTMTSDKSTTTAYMELS SLRSEDTAVYYCARGNGKWGDGAYRFFDFWGQGTLVTVSSAS TKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGA LTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKP SNTKVDKRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDT LMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPR EEQYASTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEK TISKAKGQPREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSDI AVEWESNGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQ GNVFSCSVMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 7439	Anti-TRBC2 LC	DVVMTQSPLSLPVTPGEPASISCRSSQNLVHSNGRTYLQWYLQ KPGQSPQLLIYRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDV GVYFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDEQLKS GTASVVCLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSK DSTYSLSSTLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRG EC
SEQ ID NO: 7383	anti-NKp30 humanized 15E1 scFv-Fc	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGYHWNWVRQAP GKGLEWVGYIYSSGSTSYNPSLKSRFTISRDTSKNTFYLQMNSL RAEDTAVYYCARGDWHYFDYWGQGTMVTVSSGGGGSGGGG SGGGGSGGGGSDSVTTQSPLSLPVTLGQPASISCSGEKLSDKYV HWYQQRPGQSPRMLIYENDRRPSGVPDRFSGSNSGNDATLKIS RVEAEDVGVYFCQFWDSTNSAVFGGGTKVEIKDKTHTCPPCPA PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKF NWYVDGVEVHNAKTKPREEQYASTYRVVSVLTVLHQDWLNG KEYKCKVSNKALPAPIEKTISKAKGQPREPQVCTLPPSREEMTK NQVSLSCAVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGS FFLVSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSP GK

Multifunctional antibody effector function and Fc variants

[00311] In some embodiments, the multifunctional molecule (e.g., an anti-TRBC1/NKp30 antibody molecule or an anti-TRBC2/NKp30 antibody molecule) disclosed herein comprises an Fc region, e.g., as described herein. In some embodiments, the Fc region is a wildtype Fc region, e.g., a wildtype human Fc region. In some embodiments, the Fc region comprises a variant, e.g., an Fc region comprising an addition, substitution, or deletion of at least one amino acid residue in the Fc region which results in, e.g., reduced or ablated affinity for at least one Fc receptor.

[00312] The Fc region of an antibody interacts with a number of receptors or ligands including Fc Receptors (e.g., FcγRI, FcγRIIA, FcγRIIIA), the complement protein CIq, and other molecules such as proteins A and G. These interactions are essential for a variety of effector functions and downstream signaling events including: antibody dependent cell-mediated cytotoxicity (ADCC), Antibody-dependent cellular phagocytosis (ADCP) and complement dependent cytotoxicity (CDC).

[00313] In some embodiments, the multifunctional molecule (e.g., an anti-TRBC1/NKp30 antibody molecule or an anti-TRBC2/NKp30 antibody molecule) comprising a variant Fc region has reduced, e.g., ablated, affinity for an Fc receptor, e.g., an Fc receptor described herein. In some embodiments, the reduced affinity is compared to an otherwise similar antibody with a wildtype Fc region.

[00314] In some embodiments, the multifunctional molecule (e.g., an anti-TRBC1/NKp30 antibody molecule or an anti-TRBC2/NKp30 antibody molecule) comprising a variant Fc region has one or more of the following properties: (1) reduced effector function (e.g., reduced ADCC, ADCP and/or CDC); (2) reduced binding to one or more Fc receptors; and/or (3) reduced binding to C1q complement. In some embodiments, the reduction in any one, or all of properties (1)-(3) is compared to an otherwise similar antibody with a wildtype Fc region.

[00315] In some embodiments, the multifunctional molecule (e.g., an anti-TRBC1/NKp30 antibody molecule or an anti-TRBC2/NKp30 antibody molecule) comprising a variant Fc region has reduced affinity to a human Fc receptor, e.g., FcγR I, FcγR II and/or FcγR III. In some embodiments, the multifunctional molecule (e.g., an anti-TRBC1/NKp30 antibody molecule or an anti-TRBC2/NKp30 antibody molecule) comprising a variant Fc region comprises a human IgG1 region or a human IgG4 region.

[00316] Exemplary Fc region variants are provided in **Table 20** and also disclosed in Saunders O, (2019) *Frontiers in Immunology;* vol 10, article1296, the entire contents of which is hereby incorporated by reference.

[00317] In some embodiments, the multifunctional molecule (e.g., an anti-TRBC1/NKp30 antibody molecule or an anti-TRBC2/NKp30 antibody molecule) comprises any one or all, or any combination of Fc region variants, e.g., mutations, disclosed in **Table 20**. In some embodiments, the multifunctional molecule (e.g., an anti-TRBC1/NKp30 antibody molecule or an anti-TRBC2/NKp30 antibody molecule) comprises an Asn297Ala (N297A) mutation. In some embodiments, the multifunctional molecule (e.g., an anti-TRBC1/NKp30 antibody molecule or an anti-TRBC2/NKp30 antibody molecule) comprises a Leu234Ala/Leu235Ala (LALA) mutation.

Table 20: Exemplary Fc modifications

Modification or mutation	**Altered effector function**
Leu235Glu	ADCC;
Leu234Ala/Leu235Ala (LALA)	ADCC; ADCP; CDC
Ser228Pro/Leu235Glu	
Leu234Ala/Leu235Ala/Pro329Gly	ADCP
Pro331Ser/Leu234Glu/Leu235Phe	CDC
Asp265Ala	ADCC, ADCP
Gly237Ala	ADCP
Glu318Ala	ADCP
Glu233Pro	
Gly236Arg/Leu328Arg	ADCC
His268Gln/Val309Leu/Ala330Ser/Pro331Ser	ADCC; ADCP; CDC

Val234Ala/Gly237Ala/Pro238Ser/ His268Ala/Val309Leu/Ala330Ser/Pro331Ser	ADCC; ADCP; CDC
Leu234Ala/L235Ala/Gly237Ala/P238Ser/ His268Ala/Ala330Ser/Pro331Ser	ADCC; CDC
Ala330Leu	CDC
Asp270Ala	CDC
Lys322Ala	CDC
Pro329Ala	CDC
Pro331Ala	CDC
Val264Ala	CDC
High mannose glycosylation	CDC
Phe241Ala	CDC
Asn297Ala or Gly or Gln	ADCC; ADCP; CDC
S228P/Phe234Ala/Leu235Ala	ADCC; CDC

Antibody Molecules Targeting TRBC1

[00318] In another aspect, the present disclosure features an antibody molecule, e.g., a monoclonal antibody molecule, or fragment thereof that binds TRBC1.

[00319] In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC1 comprises one or more CDRs (e.g., VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and/or VLCDR3) disclosed in Table 2, Table 6, or Table 3, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC1 comprises one or more framework regions (e.g., VHFWR1, VHFWR2, VHFWR3, VHFWR4, VLFWR1, VLFWR2, VLFWR3, and/or VLFWR4) disclosed in Table 2, Table 6, or Table 3, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC1 comprises a VH and/or a VL disclosed in Table 4, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC1 comprises an amino acid sequence disclosed in Table 5, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00320] In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC1 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3.

[00321] In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 7355, and 202, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 201, and 202, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7354, 201, and 202, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some

embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7354, 7355, and 202, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00322] In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00323] In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 7355, 202, 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 201, 202, 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7346, 7355, 202, 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 7355, 202, 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 7355, 202, 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 7355, 202, 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 202, 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 202, 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 202, 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 202, 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 201, 202, 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 201, 202, 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 201, 202, 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity

thereto); SEQ ID NOs: 7354, 201, 202, 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 201, 202, 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 7355, 202, 223, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 7355, 202, 7367, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 7355, 202, 223, 7368, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7354, 7355, 202, 223, 224, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or SEQ ID NOs: 7354, 7355, 202, 7367, 7368, and 7369, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00324] In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7351, 253, 250-252, 254, 7343, 7344, 7350, and 7352 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 258, 255-257, 259, 260, and 7357-7360 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7351 and 258, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 253 and 258, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00325] In some embodiments, the antibody molecule or fragment thereof comprises:

a heavy chain variable region (VH) comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 215 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 216 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 217 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 218 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), and

a light chain variable region (VL) comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 238 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VLFWR2 amino acid sequence of SEQ ID NO: 239 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VLFWR3 amino acid sequence of SEQ ID NO: 240 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 241 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom).

[00326] In some embodiments, the antibody molecule or fragment thereof comprises a VH

comprising a VHCDR1 amino acid sequence of SEQ ID NO: 200, a VHCDR2 amino acid sequence of SEQ ID NO: 201, and/or a VHCDR3 amino acid sequence of SEQ ID NO: 202.

[00327] In some embodiments, the antibody molecule or fragment thereof comprises a VL comprising a VLCDR1 amino acid sequence of SEQ ID NO: 223, a VLCDR2 amino acid sequence of SEQ ID NO: 224, and a VLCDR3 amino acid sequence of SEQ ID NO: 225.

[00328] In some embodiments, the antibody molecule or fragment thereof comprises a VH comprising the amino acid sequence of SEQ ID NO: 253 (or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto), and/or a VL comprising the amino acid sequence of SEQ ID NO: 258 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity thereto). In some embodiments, the antibody molecule or fragment thereof comprises a VH and/or VL substantially homologous to SEQ ID NOs: 253 and/or 258.

Antibody Molecules Targeting TRBC2

[00329] In another aspect, the present disclosure features an antibody molecule, e.g., a monoclonal antibody molecule, or fragment thereof that binds TRBC2.

[00330] In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC2 comprises one or more CDRs (e.g., VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and/or VLCDR3) disclosed in Table 21 or Table 22, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC2 comprises one or more framework regions (e.g., VHFWR1, VHFWR2, VHFWR3, VHFWR4, VLFWR1, VLFWR2, VLFWR3, and/or VLFWR4) disclosed in Table 21 or Table 22, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC2 comprises a VH and/or a VL disclosed in Table 23, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC2 comprises an amino acid sequence disclosed in Table 24, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00331] In some embodiments, the antibody molecule, or fragment thereof, that binds to TRBC2 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3.

[00332] In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7441, 201, and 7442, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7422, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7401, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some

embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7394, 201, and 7396, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 201, and 7398, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7346, 201, and 7400, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7405, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7407, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7427, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7430, 201, and 7403, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00333] In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7443, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00334] In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7441, 201, 7442, 7443, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7422, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7401, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7394, 201, 7396, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 7398, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 7400, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ

ID NOs: 7405, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7407, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7427, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7430, 201, 7403, 7410, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7422, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7401, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7394, 201, 7396, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 7398, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7346, 201, 7400, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7405, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7407, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7427, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or SEQ ID NOs: 7430, 201, 7403, 7409, 224, and 225, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00335] In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7420, 7423, 7411, 7412, 7413, 7414, 7415, 7416, 7417, 7425, 7428, and 7431 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7419 and 7418 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7420 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7423 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7411 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7412 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7413 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7414 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7415 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL

comprise the amino acid sequences of SEQ ID NOs: 7416 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7417 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7425 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7428 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7431 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7420 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7423 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7411 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7412 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7413 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7414 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7415 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7416 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7417 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7425 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7428 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7431 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00336] In another aspect, the disclosure features an antibody molecule, e.g., an IgM antibody molecule comprising: (i) a first antigen binding domain that selectively binds to T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2), and (ii) a

complement activating domain that activates the complement pathway, e.g., by binding C1q. In some embodiments, an antibody molecule, e.g., IgM antibody molecule, comprises an antigen binding domain that targets TRBC1. In some embodiments, the antibody molecule is an IgM antibody molecule, e.g., that multimerizes into tetramers, pentamers, and/or hexamers and is capable of activating complement pathway(s). In some embodiments, the IgM antibody molecule comprises an antigen binding domain that targets TRBC1 comprising a heavy chain comprising the amino acid sequence of SEQ ID NO: 6173 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6173).

METDTLLLWVLLLWVPGSTGQVQLVQSGAEVKKPGSSVKVSCKASGYTFTGYVMHWVRQ
APGQGLEWMGFINPYNDDIQSNERFRGRVTITSDKSTTTAYMELSSLRSEDTAVYYCARGAG
YNFDGAYRFFDFWGQGTLVTVSSGSASAPTLFPLVSCENSPSDTSSVAVGCLAQDFLPDSITFS
WKYKNNSDISSTRGFPSVLRGGKYAATSQVLLPSKDVMQGTDEHVVCKVQHPNGNKEKNV
PLPVIAELPPKVSVFVPPRDGFFGNPRKSKLICQATGFSPRQIQVSWLREGKQVGSGVTTDQV
QAEAKESGPTTYKVTSTLTIKESDWLGQSMFTCRVDHRGLTFQQNASSMCVPDQDTAIRVFA
IPPSFASIFLTKSTKLTCLVTDLTTYDSVTISWTRQNGEAVKTHTNISESHPNATFSAVGEASIC
EDDWNSGERFTCTVTHTDLPSPLKQTISRPKGVALHRPDVYLLPPAREQLNLRESATITCLVT
GFSPADVFVQWMQRGQPLSPEKYVTSAPMPEPQAPGRYFAHSILTVSEEEWNTGETYTCVV
AHEALPNRVTERTVDKSTGKPTLYNVSLVMSDTAGTCY (SEQ ID NO: 6173).

[00337] In some embodiments, the IgM antibody molecule comprises an antigen binding domain that targets TRBC1 comprising a light chain comprising the amino acid sequence of SEQ ID NO: 6174 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6174).

[00338] MKNHLLFWGVLAVFIKAVHVKAQEDERIVLVDNKCKCARITSRIIRSSEDPNEDIVE
RNIRIIVPLNNRENISDPTSPLRTRFVYHLSDLCKKCDPTEVELDNQIVTATQSNICDEDSATET
CYTYDRNKCYTAVVPLVYGGETKMVETALTPDACYPD (SEQ ID NO: 6174).

[00339] In some embodiments, the IgM antibody molecule comprises an antigen binding domain that targets TRBC1 comprising amino acid sequences of SEQ ID NO: 6173 and 6174 (or amino acid sequences having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6173 and 6174) and an amino acid sequence of a light chain sequence provided herein, e.g., in Tables 3 or 4.

[00340] In some embodiments, the complement activating domain comprises a portion of an antibody molecule capable of binding or being bound by C1q, e.g., a portion of a IgG1, IgG2, IgG3, IgG4, IgM, IgA1, IgA2, IgD, or IgE. In some embodiments, a complement activating domain comprises a Ch2, Ch3, or Ch4 domain.

[00341] Without wishing to be bound by theory, it is thought that complement activation in proximity to a target cell (e.g., a TRBC1 or TRBC2 expressing cell, e.g., a lymphocyte expressing TRBC1 or TRBC2, e.g., a lymphoma cell expressing TRBC1 or TRBC2) may induce the death of the target cell. In some embodiments, use of an antibody molecule, e.g., IgM antibody molecule, or a

multifunctional molecule in the methods described herein induces complement mediated cell death of the target cell.

[00342] In another aspect, the disclosure features a multispecific antibody molecule (e.g., a bispecific antibody molecule) that binds to TRBC1 and NKp30. In some embodiments, the multispecific antibody molecule comprises one or more moieties that bind to TRBC1, e.g., one or more Fabs that bind to TRBC1, e.g., one or two Fabs that bind to TRBC1. In some embodiments, the multispecific antibody molecule comprises one or more moieties that bind to NKp30, e.g., one or more scFvs that bind to NKp30, e.g., one or two scFvs that bind to NKp30. In some embodiments, the moiety that binds to TRBC1 comprises an anti-TRBC1 sequence disclosed herein, e.g., comprises a CDR, VH, VL, heavy chain, or light chain sequence disclosed in Tables 2-5, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the moiety that binds to NKp30 comprises an anti-NKp30 sequence disclosed herein, e.g., comprises a CDR, VH, VL, heavy chain, or light chain sequence disclosed in Tables 7, 8, 8A, 8B, 9, 10, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto.

[00343] In some embodiments, the multispecific antibody molecule comprises a configuration shown in FIG. 1A. In some embodiments, the multispecific antibody molecule comprises an anti-TRBC1 antibody molecule and an anti-NKp30 antibody molecule, e.g., an anti-TRBC1 antibody molecule comprising two heavy chains and two light chains, and an anti-NKp30 scFv that is fused to the N-terminus of one of the heavy chains of the anti-TRBC1 antibody. In some embodiments, the two heavy chains of the anti-TRBC1 antibody form a heterodimer, e.g., via knob-and-hole mutations. In some embodiments, the two heavy chains of the anti-TRBC1 antibody comprise the N297A mutation. In some embodiments, the two heavy chains of the anti-TRBC1 antibody do not comprise the N297A mutation. In some embodiments, the multispecific antibody molecule comprises a first chain, a second chain, a third chain, and a fourth chain, wherein the first chain comprises an anti-TRBC1 light chain variable region (VL) and a light chain constant region (CL); the second chain comprises an anti-NKp30 scFv, an anti-TRBC1 heavy chain variable region (VH), a CH1, a CH2, and a CH3; the third chain comprises an anti-TRBC1 VH, a CH1, a CH2, and a CH3; and the fourth chain comprises an anti-TRBC1 VL and a CL.

[00344] In some embodiments, the multispecific antibody molecule comprises a configuration shown in FIG. 1B. In some embodiments, the multispecific antibody molecule comprises an anti-TRBC1 antibody molecule and an anti-NKp30 antibody molecule. In some embodiments, the multispecific antibody molecule comprises an anti-TRBC1 Fab, an anti-NKp30 scFv, and an Fc dimer comprising two Fc chains. In some embodiments, the C-terminus of the heavy chain of the anti-TRBC1 Fab is fused to the N-terminus of one Fc chain, and the anti-NKp30 scFv is fused to the N-terminus of the other Fc chain. In some embodiments, the two Fc chains form a heterodimer, e.g., via knob-and-hole mutations. In some embodiments, the two Fc chains comprise the N297A mutation. In some embodiments, the two Fc chains do not comprise the N297A mutation. In some embodiments,

the multispecific antibody molecule comprises a first chain, a second chain, and a third chain, wherein the first chain comprises an anti-TRBC1 VL and a CL; the second chain comprises an anti-TRBC1 VH, a CH1, a CH2, and a CH3; and the third chain comprises an anti-NKp30 scFv, a CH2, and a CH3.

[00345] In some embodiments, the multispecific antibody molecule comprises a configuration shown in FIG. 1C. In some embodiments, the multispecific antibody molecule comprises an anti-TRBC1 antibody molecule and an anti-NKp30 antibody molecule, e.g., an anti-TRBC1 antibody molecule comprising two heavy chains and two light chains, and two anti-NKp30 scFvs that are fused to the C-terminus of the two light chains of the anti-TRBC1 antibody molecule, respectively. In some embodiments, the two heavy chains of the anti-TRBC1 antibody form a homodimer. In some embodiments, the two heavy chains of the anti-TRBC1 antibody comprise the N297A mutation. In some embodiments, the two heavy chains of the anti-TRBC1 antibody do not comprise the N297A mutation. In some embodiments, the multispecific antibody molecule comprises a first chain, a second chain, a third chain, and a fourth chain, wherein the first chain comprises an anti-TRBC1 VL, a CL, and an anti-NKp30 scFv; the second chain comprises an anti-TRBC1 VH, a CH1, a CH2, and a CH3; the third chain comprises an anti-TRBC1 VH, a CH1, a CH2, and a CH3; and the fourth chain comprises an anti-TRBC1 VL, a CL, and an anti-NKp30 scFv.

[00346] In some embodiments, the multispecific antibody molecule comprises a configuration shown in FIG. 1D. In some embodiments, the multispecific antibody molecule comprises an anti-TRBC1 antibody molecule and an anti-NKp30 antibody molecule, e.g., an anti-TRBC1 antibody molecule comprising two heavy chains and two light chains, and two anti-NKp30 scFvs that are fused to the N-terminus of the two heavy chains of the anti-TRBC1 antibody molecule, respectively. In some embodiments, the two heavy chains of the anti-TRBC1 antibody form a homodimer. In some embodiments, the two heavy chains of the anti-TRBC1 antibody comprise the N297A mutation. In some embodiments, the two heavy chains of the anti-TRBC1 antibody do not comprise the N297A mutation. In some embodiments, the multispecific antibody molecule comprises a first chain, a second chain, a third chain, and a fourth chain, wherein the first chain comprises an anti-TRBC1 VL and a CL; the second chain comprises an anti-NKp30 scFv, an anti-TRBC1 VH, a CH1, a CH2, and a CH3; the third chain comprises an anti-NKp30 scFv, an anti-TRBC1 VH, a CH1, a CH2, and a CH3; and the fourth chain comprises an anti-TRBC1 VL and a CL.

[00347] In another aspect, the disclosure features an antibody molecule that comprises a moiety that binds to TRBC1 and a TRAIL molecule (e.g., a trimeric, dimeric, or monomeric TRAIL molecule). In some embodiments, the antibody molecule comprises one or more moieties that bind to TRBC1, e.g., one or more Fabs that bind to TRBC1, e.g., one Fab that binds to TRBC1. In some embodiments, the moiety that binds to TRBC1 comprises an anti-TRBC1 sequence disclosed herein, e.g., comprises a CDR, VH, VL, heavy chain, or light chain sequence disclosed in Tables 2-5, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the antibody molecule comprises

a TRAIL molecule (e.g., a trimeric, dimeric, or monomeric TRAIL molecule). In some embodiments, each monomer of TRAIL comprises amino acid residues 122-281 of human TRAIL, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, each monomer of TRAIL comprises amino acid residues 95-281 of human TRAIL, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto.

[00348] In some embodiments, the antibody molecule comprises a configuration shown in FIGs. 2A-2F. In some embodiments, the antibody molecule comprises a moiety that binds to TRBC1 and a trimeric, dimeric, or monomeric TRAIL molecule, e.g., comprises an anti-TRBC1 Fab, a trimeric, dimeric, or monomeric TRAIL molecule, and an Fc dimer comprising two Fc chains. In some embodiments, the two Fc chains form a heterodimer, e.g., via knob-and-hold mutations. In some embodiments, the two Fc chains comprise the N297A mutation. In some embodiments, the two Fc chains do not comprise the N297A mutation. In some embodiments, the C-terminus of the heavy chain of the anti-TRBC1 Fab is fused to the N-terminus of one Fc chain. In some embodiments, the trimeric, dimeric, or monomeric TRAIL molecule is fused to the N-terminus of the other Fc chain. In some embodiments, the antibody molecule comprises a first chain, a second chain, and a third chain. In some embodiments, the first chain comprises an anti-TRBC1 VL and a CL, e.g., comprises the amino acid sequence of SEQ ID NO: 6169, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the second chain comprises an anti-TRBC1 VH, a CH1, a CH2, and a CH3, e.g., comprises the amino acid sequence of SEQ ID NO: 6167, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the third chain comprises a trimeric TRAIL molecule, a CH2, and a CH3, e.g., comprises the amino acid sequence of SEQ ID NO: 6159 or 6162, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the third chain comprises a dimeric TRAIL molecule, a CH2, and a CH3, e.g., comprises the amino acid sequence of SEQ ID NO: 6158 or 6161, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the third chain comprises a monomeric TRAIL molecule, a CH2, and a CH3, e.g., comprises the amino acid sequence of SEQ ID NO: 6157 or 6160, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto.

[00349] In another aspect, the disclosure features a multispecific antibody molecule (e.g., a bispecific antibody molecule) that binds to TRBC1 and DR5. In some embodiments, the multispecific antibody molecule comprises one or more moieties that bind to TRBC1, e.g., one or more Fabs that bind to TRBC1, e.g., one Fab that binds to TRBC1. In some embodiments, the multispecific antibody molecule comprises one or more moieties that bind to DR5, e.g., one or more scFvs that bind to DR5, e.g., one or two scFvs that bind to DR5. In some embodiments, the moiety that binds to TRBC1 comprises an anti-TRBC1 sequence disclosed herein, e.g., comprises a CDR, VH, VL, heavy chain, or light chain sequence disclosed in Tables 2-5, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the moiety that binds to DR5 comprises an anti-DR5 sequence disclosed herein, e.g., comprises a CDR, VH, VL, heavy chain, or light chain sequence disclosed in

Table 11, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto.

[00350] In some embodiments, the multispecific antibody molecule comprises a configuration shown in FIG. 3A. In some embodiments, the multispecific antibody molecule comprises an anti-TRBC1 Fab, an anti-DR5 scFv, and an Fc dimer comprising two Fc chains. In some embodiments, the two Fc chains form a heterodimer, e.g., via knob-and-hold mutations. In some embodiments, the two Fc chains comprise the N297A mutation. In some embodiments, the two Fc chains do not comprise the N297A mutation. In some embodiments, the C-terminus of the heavy chain of the anti-TRBC1 Fab is fused to the N-terminus of one Fc chain. In some embodiments, the anti-DR5 scFv is fused to the N-terminus of the other Fc chain. In some embodiments, the multispecific antibody molecule comprises a first chain, a second chain, and a third chain. In some embodiments, the first chain comprises an anti-TRBC1 VL and a CL, e.g., comprises the amino acid sequence of SEQ ID NO: 6169, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the second chain comprises an anti-TRBC1 VH, a CH1, a CH2, and a CH3, e.g., comprises the amino acid sequence of SEQ ID NO: 6167, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the third chain comprises an anti-DR5 scFv, a CH2, and a CH3, e.g., comprises the amino acid sequence of SEQ ID NO: 6163, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto.

[00351] In some embodiments, the multispecific antibody molecule comprises a configuration shown in FIG. 3B. In some embodiments, the multispecific antibody molecule comprises an anti-TRBC1 antibody molecule and an anti-DR5 antibody molecule, e.g., an anti-TRBC1 antibody molecule comprising two heavy chains and two light chains, and two anti-DR5 scFvs that are fused to the C-terminus of the two light chains of the anti-TRBC1 antibody, respectively. In some embodiments, the two heavy chains of the anti-TRBC1 antibody comprise the N297A mutation. In some embodiments, the two heavy chains of the anti-TRBC1 antibody do not comprise the N297A mutation. In some embodiments, the multispecific antibody molecule comprises a first chain, a second chain, a third chain, and a fourth chain. In some embodiments, the first chain comprises an anti-TRBC1 VL, a CL, and an anti-DR5 scFv, e.g., comprises the amino acid sequence of SEQ ID NO: 6170, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the second chain comprises an anti-TRBC1 VH, a CH1, a CH2, and a CH3, e.g., comprises the amino acid sequence of SEQ ID NO: 6168, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the fourth chain comprises an anti-TRBC1 VH, a CH1, a CH2, and a CH3, e.g., comprises the amino acid sequence of SEQ ID NO: 6168, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto. In some embodiments, the first chain comprises an anti-TRBC1 VL, a CL, and an anti-DR5 scFv, e.g., comprises the amino acid sequence of SEQ ID NO: 6170, or a sequence having at least 70, 80, 90, 95, or 99% identity thereto.

[00352] Uses of the antibody molecules disclosed herein include but are not limited to methods of treating cancer (e.g., a cancer expressing TRBC1) disclosed herein; methods of identifying,

evaluating, or selecting a subject in need of treatment (e.g., determining whether a subject has cancer cells that express TRBC1) disclosed herein; and methods of laboratory or diagnostic analysis (e.g., immunological assays comprising detecting the presence and/or level of TRBC1 or TRBC1 expressing cells).

Cytokine Molecules and Cytokine Inhibitor Molecules

[00353] Cytokines are generally polypeptides that influence cellular activity, for example, through signal transduction pathways. Accordingly, a cytokine of the multispecific or multifunctional polypeptide is useful and can be associated with receptor-mediated signaling that transmits a signal from outside the cell membrane to modulate a response within the cell. Cytokines are proteinaceous signaling compounds that are mediators of the immune response. They control many different cellular functions including proliferation, differentiation and cell survival/apoptosis; cytokines are also involved in several pathophysiological processes including viral infections and autoimmune diseases. Cytokines are synthesized under various stimuli by a variety of cells of both the innate (monocytes, macrophages, dendritic cells) and adaptive (T- and B-cells) immune systems. Cytokines can be classified into two groups: pro- and anti-inflammatory. Pro-inflammatory cytokines, including IFNγ, IL-1, IL-6 and TNF-alpha, are predominantly derived from the innate immune cells and Th1 cells. Anti-inflammatory cytokines, including IL-10, IL-4, IL-13 and IL-5, are synthesized from Th2 immune cells.

[00354] The present disclosure provides, *inter alia*, multispecific (e.g., bi-, tri-, quad- specific) or multifunctional molecules, that include, e.g., are engineered to contain, one or more cytokine molecules, e.g., immunomodulatory (e.g., proinflammatory) cytokines and variants, e.g., functional variants, thereof. Accordingly, in some embodiments, the cytokine molecule is an interleukin or a variant, e.g., a functional variant thereof. In some embodiments the interleukin is a proinflammatory interleukin. In some embodiments the interleukin is chosen from interleukin-2 (IL-2), interleukin-12 (IL-12), interleukin-15 (IL-15), interleukin-18 (IL-18), interleukin-21 (IL-21), interleukin-7 (IL-7), or interferon gamma. In some embodiments, the cytokine molecule is a proinflammatory cytokine.

[00355] In certain embodiments, the cytokine is a single chain cytokine. In certain embodiments, the cytokine is a multichain cytokine (e.g., the cytokine comprises 2 or more (e.g., 2) polypeptide chains. An exemplary multichain cytokine is IL-12.

[00356] Examples of useful cytokines include, but are not limited to, GM-CSF, IL-1α, IL-1β, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-10, IL-12, IL-21, IFN-α, IFN-β, IFN-γ, MIP-1α, MIP-1β, TGF-β, TNF-α, and TNFβ. In one embodiment the cytokine of the multispecific or multifunctional polypeptide is a cytokine selected from the group of GM-CSF, IL-2, IL-7, IL-8, IL-10, IL-12, IL-15, IL-21, IFN-α, IFN-γ, MIP-1α, MIP-1β and TGF-β. In one embodiment the cytokine of the i the multispecific or multifunctional polypeptide is a cytokine selected from the group of IL-2, IL-7, IL-

10, IL-12, IL-15, IFN-α, and IFN-γ. In certain embodiments the cytokine is mutated to remove N- and/or O-glycosylation sites. Elimination of glycosylation increases homogeneity of the product obtainable in recombinant production.

[00357] In one embodiment, the cytokine of the multispecific or multifunctional polypeptide is IL-2. In a specific embodiment, the IL-2 cytokine can elicit one or more of the cellular responses selected from the group consisting of: proliferation in an activated T lymphocyte cell, differentiation in an activated T lymphocyte cell, cytotoxic T cell (CTL) activity, proliferation in an activated B cell, differentiation in an activated B cell, proliferation in a natural killer (NK) cell, differentiation in a NK cell, cytokine secretion by an activated T cell or an NK cell, and NK/lymphocyte activated killer (LAK) antitumor cytotoxicity. In another particular embodiment the IL-2 cytokine is a mutant IL-2 cytokine having reduced binding affinity to the .alpha.-subunit of the IL-2 receptor. Together with the .beta.- and .gamma.-subunits (also known as CD122 and CD132, respectively), the .alpha.-subunit (also known as CD25) forms the heterotrimeric high-affinity IL-2 receptor, while the dimeric receptor consisting only of the β- and γ-subunits is termed the intermediate-affinity IL-2 receptor. As described in PCT patent application number PCT/EP2012/051991, which is incorporated herein by reference in its entirety, a mutant IL-2 polypeptide with reduced binding to the .alpha.-subunit of the IL-2 receptor has a reduced ability to induce IL-2 signaling in regulatory T cells, induces less activation-induced cell death (AICD) in T cells, and has a reduced toxicity profile in vivo, compared to a wild-type IL-2 polypeptide. The use of such a cytokine with reduced toxicity is particularly advantageous in a multispecific or multifunctional polypeptide according to the invention, having a long serum half-life due to the presence of an Fc domain. In one embodiment, the mutant IL-2 cytokine of the multispecific or multifunctional polypeptide according to the invention comprises at least one amino acid mutation that reduces or abolishes the affinity of the mutant IL-2 cytokine to the .alpha.-subunit of the IL-2 receptor (CD25) but preserves the affinity of the mutant IL-2 cytokine to the intermediate-affinity IL-2 receptor (consisting of the β and γ subunits of the IL-2 receptor), compared to the non-mutated IL-2 cytokine. In one embodiment the one or more amino acid mutations are amino acid substitutions. In a specific embodiment, the mutant IL-2 cytokine comprises one, two or three amino acid substitutions at one, two or three position(s) selected from the positions corresponding to residue 42, 45, and 72 of human IL-2. In a more specific embodiment, the mutant IL-2 cytokine comprises three amino acid substitutions at the positions corresponding to residue 42, 45 and 72 of human IL-2. In an even more specific embodiment, the mutant IL-2 cytokine is human IL-2 comprising the amino acid substitutions F42A, Y45A and L72G. In one embodiment the mutant IL-2 cytokine additionally comprises an amino acid mutation at a position corresponding to position 3 of human IL-2, which eliminates the O-glycosylation site of IL-2. Particularly, said additional amino acid mutation is an amino acid substitution replacing a threonine residue by an alanine residue. A particular mutant IL-2 cytokine useful in the invention comprises four amino acid substitutions at

positions corresponding to residues 3, 42, 45 and 72 of human IL-2. Specific amino acid substitutions are T3A, F42A, Y45A and L72G. As demonstrated in PCT patent application number PCT/EP2012/051991 and in the appended Examples, said quadruple mutant IL-2 polypeptide (IL-2 qm) exhibits no detectable binding to CD25, reduced ability to induce apoptosis in T cells, reduced ability to induce IL-2 signaling in T.sub.reg cells, and a reduced toxicity profile in vivo. However, it retains ability to activate IL-2 signaling in effector cells, to induce proliferation of effector cells, and to generate IFN-γ as a secondary cytokine by NK cells.

[00358] The IL-2 or mutant IL-2 cytokine according to any of the above embodiments may comprise additional mutations that provide further advantages such as increased expression or stability. For example, the cysteine at position 125 may be replaced with a neutral amino acid such as alanine, to avoid the formation of disulfide-bridged IL-2 dimers. Thus, in certain embodiments the IL-2 or mutant IL-2 cytokine of the multispecific or multifunctional polypeptide according to the invention comprises an additional amino acid mutation at a position corresponding to residue 125 of human IL-2. In one embodiment said additional amino acid mutation is the amino acid substitution C125A.

[00359] In a specific embodiment the IL-2 cytokine of the multispecific or multifunctional polypeptide comprises the polypeptide sequence of SEQ ID NO: 7227 [APTSSSTKKTQLQLEHLLLDLQMILNGINNYKNPKLTRMLTFKFYMPKKATELKHLQCLEEE LKPLEEVLNLAQSKNFHLRPRDLISNINVIVLELKGSETTFMCEYADETATIVEFLNRWITFAQ SIISTLT]. In another specific embodiment the IL-2 cytokine of the multispecific or multifunctional polypeptide comprises the polypeptide sequence of SEQ ID NO: 7228 [APASSSTKKT QLQLEHLLLD LQMILNGINN YKNPKLTRMLTAKFAMPKKATELKHLQCLE EELKPLEEVLNGAQSKNFHL RPRDLISNIN VIVLELKGSETTFMCEYADETATIVEFLNRWITFAQSIISTLT].

[00360] In another embodiment the cytokine of the multispecific or multifunctional polypeptide is IL-12. In a specific embodiment said IL-12 cytokine is a single chain IL-12 cytokine. In an even more specific embodiment the single chain IL-12 cytokine comprises the polypeptide sequence of SEQ ID NO: 7229 [IWELKKDVYVVELDWYPDAPGEMVVLTCDTPEEDGITWTLDQSSEVLGSGKTLTIQVKEFG DAGQYTCHKGGEVLSHSLLLLHKKEDGIWSTDILKDQKEPKNKTFLRCEAKNYSGRFTCWW LTTISTDLTFSVKSSRGSSDPQGVTCGAATLSAERVRGDNKEYEYSVECQEDSACPAAEESLPI EVMVDAVHKLKYENYTSSFFIRDIIKPDPPKNLQLKPLKNSRQVEVSWEYPDTWSTPHSYFSL TFCVQVQGKSKREKKDRVFTDKTSATVICRKNASISVRAQDRYYSSSWSEWASVPCSGGGGS GGGGSGGGGSRNLPVATPDPGMFPCLHHSQNLLRAVSNMLQKARQTLEFYPCTSEEIDHEDI TKDKTSTVEACLPLELTKNESCLNSRETSFITNGSCLASRKTSFMMALCLSSIYEDLKMYQVE FKTMNAKLLMDPKRQIFLDQNMLAVIDELMQALNFNSETVPQKSSLEEPDFYKTKIKLCILLH AFRIRAVTIDRVMSYLNAS]. In one embodiment, the IL-12 cytokine can elicit one or more of the

cellular responses selected from the group consisting of: proliferation in a NK cell, differentiation in a NK cell, proliferation in a T cell, and differentiation in a T cell.

[00361] In another embodiment the cytokine of the multispecific or multifunctional polypeptide is IL-10. In a specific embodiment said IL-10 cytokine is a single chain IL-10 cytokine. In an even more specific embodiment the single chain IL-10 cytokine comprises the polypeptide sequence of SEQ ID NO: 7230 [SPGQGTQSENSCTHFPGNLPNMLRDLRDAFSRVKTFFQMKDQLDNLLLKESLLEDFKGYLG CQALSEMIQFYLEEVMPQAENQDPDIKAHVNSLGENLKTLRLRLRRCHRFLPCENKSKAVEQ VKNAFNKLQEKGIYKAMSEFDIFINYIEAYMTMKIRNGGGGSGGGGSGGGGSGGGGSSPGQ GTQSENSCTHFPGNLPNMLRDLRDAFSRVKTFFQMKDQLDNLLLKESLLEDFKGYLGCQALS EMIQFYLEEVMPQAENQDPDIKAHVNSLGENLKTLRLRLRRCHRFLPCENKSKAVEQVKNAF NKLQEKGIYKAMSEFDIFINYIEAYMTMKIRN]. In another specific embodiment the IL-10 cytokine is a monomeric IL-10 cytokine. In a more specific embodiment the monomeric IL-10 cytokine comprises the polypeptide sequence of SEQ ID NO: 7231 [SPGQGTQSENSCTHFPGNLPNMLRDLRDAFSRVKTFFQMKDQLDNLLLKESLLEDFKGYLG CQALSEMIQFYLEEVMPQAENQDPDIKAHVNSLGENLKTLRLRLRRCHRFLPCENGGGSGGK SKAVEQVKNAFNKLQEKGIYKAMSEFDIFINYIEAYMTMKIRN]. In one embodiment, the IL-10 cytokine can elicit one or more of the cellular responses selected from the group consisting of: inhibition of cytokine secretion, inhibition of antigen presentation by antigen presenting cells, reduction of oxygen radical release, and inhibition of T cell proliferation. A multispecific or multifunctional polypeptide according to the invention wherein the cytokine is IL-10 is particularly useful for downregulation of inflammation, e.g. in the treatment of an inflammatory disorder.

[00362] In another embodiment, the cytokine of the multispecific or multifunctional polypeptide is IL-15. In a specific embodiment said IL-15 cytokine is a mutant IL-15 cytokine having reduced binding affinity to the α-subunit of the IL-15 receptor. Without wishing to be bound by theory, a mutant IL-15 polypeptide with reduced binding to the .alpha.-subunit of the IL-15 receptor has a reduced ability to bind to fibroblasts throughout the body, resulting in improved pharmacokinetics and toxicity profile, compared to a wild-type IL-15 polypeptide. The use of a cytokine with reduced toxicity, such as the described mutant IL-2 and mutant IL-15 effector moieties, is particularly advantageous in a multispecific or multifunctional polypeptide according to the invention, having a long serum half-life due to the presence of an Fc domain. In one embodiment the mutant IL-15 cytokine of the multispecific or multifunctional polypeptide according to the invention comprises at least one amino acid mutation that reduces or abolishes the affinity of the mutant IL-15 cytokine to the .alpha.-subunit of the IL-15 receptor but preserves the affinity of the mutant IL-15 cytokine to the intermediate-affinity IL-15/IL-2 receptor (consisting of the .beta.- and .gamma.-subunits of the IL-15/IL-2 receptor), compared to the non-mutated IL-15 cytokine. In one embodiment the amino acid mutation is an amino acid substitution. In a specific embodiment, the mutant IL-15 cytokine

comprises an amino acid substitution at the position corresponding to residue 53 of human IL-15. In a more specific embodiment, the mutant IL-15 cytokine is human IL-15 comprising the amino acid substitution E53A. In one embodiment the mutant IL-15 cytokine additionally comprises an amino acid mutation at a position corresponding to position 79 of human IL-15, which eliminates the N-glycosylation site of IL-15. Particularly, said additional amino acid mutation is an amino acid substitution replacing an asparagine residue by an alanine residue. In an even more specific embodiment the IL-15 cytokine comprises the polypeptide sequence of SEQ ID NO: 7232 [NWVNVISDLKKIEDLIQSMHIDATLYTESDVHPSCKVTAMKCFLLELQVISLASGDASIHDTV ENLIILANNSLSSNGAVTESGCKECEELEEKNIKEFLQSFVHIVQMFINTS]. In one embodiment, the IL-15 cytokine can elicit one or more of the cellular responses selected from the group consisting of: proliferation in an activated T lymphocyte cell, differentiation in an activated T lymphocyte cell, cytotoxic T cell (CTL) activity, proliferation in an activated B cell, differentiation in an activated B cell, proliferation in a natural killer (NK) cell, differentiation in a NK cell, cytokine secretion by an activated T cell or an NK cell, and NK/lymphocyte activated killer (LAK) antitumor cytotoxicity.

[00363] Mutant cytokine molecules useful as effector moieties in the multispecific or multifunctional polypeptide can be prepared by deletion, substitution, insertion or modification using genetic or chemical methods well known in the art. Genetic methods may include site-specific mutagenesis of the encoding DNA sequence, PCR, gene synthesis, and the like. The correct nucleotide changes can be verified for example by sequencing. Substitution or insertion may involve natural as well as non-natural amino acid residues. Amino acid modification includes well known methods of chemical modification such as the addition or removal of glycosylation sites or carbohydrate attachments, and the like.

[00364] In one embodiment, the cytokine, particularly a single-chain cytokine, of the multispecific or multifunctional polypeptide is GM-CSF. In a specific embodiment, the GM-CSF cytokine can elicit proliferation and/or differentiation in a granulocyte, a monocyte or a dendritic cell. In one embodiment, the cytokine, particularly a single-chain cytokine, of the multispecific or multifunctional polypeptide is IFN-α. In a specific embodiment, the IFN-α cytokine can elicit one or more of the cellular responses selected from the group consisting of: inhibiting viral replication in a virus-infected cell, and upregulating the expression of major histocompatibility complex I (MHC I). In another specific embodiment, the IFN-α cytokine can inhibit proliferation in a tumor cell. In one embodiment the cytokine, particularly a single-chain cytokine, of the multispecific or multifunctional polypeptide is IFNγ. In a specific embodiment, the IFN-γ cytokine can elicit one or more of the cellular responses selected from the group of: increased macrophage activity, increased expression of MHC molecules, and increased NK cell activity. In one embodiment the cytokine, particularly a single-chain cytokine, of the multispecific or multifunctional polypeptide is IL-7. In a specific embodiment, the IL-7 cytokine can elicit proliferation of T and/or B lymphocytes. In one embodiment, the cytokine,

particularly a single-chain cytokine, of the multispecific or multifunctional polypeptide is IL-8. In a specific embodiment, the IL-8 cytokine can elicit chemotaxis in neutrophils. In one embodiment, the cytokine, particularly a single-chain cytokine, of the multispecific or multifunctional polypeptide, is MIP-1α. In a specific embodiment, the MIP-1α cytokine can elicit chemotaxis in monocytes and T lymphocyte cells. In one embodiment, the cytokine, particularly a single-chain cytokine, of the multispecific or multifunctional polypeptide is MIP-1β. In a specific embodiment, the MIP-1β cytokine can elicit chemotaxis in monocytes and T lymphocyte cells. In one embodiment, the cytokine, particularly a single-chain cytokine, of the multispecific or multifunctional polypeptide is TGF-β. In a specific embodiment, the TGF-β cytokine can elicit one or more of the cellular responses selected from the group consisting of: chemotaxis in monocytes, chemotaxis in macrophages, upregulation of IL-1 expression in activated macrophages, and upregulation of IgA expression in activated B cells.

[00365] In one embodiment, the multispecific or multifunctional polypeptide of the invention binds to an cytokine receptor with a dissociation constant (K_D) that is at least about 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5 or 10 times greater than that for a control cytokine. In another embodiment, the multispecific or multifunctional polypeptide binds to an cytokine receptor with a K_D that is at least 2, 3, 4, 5, 6, 7, 8, 9, or 10 times greater than that for a corresponding multispecific or multifunctional polypeptide comprising two or more effector moieties. In another embodiment, the multispecific or multifunctional polypeptide binds to an cytokine receptor with a dissociation constant K_D that is about 10 times greater than that for a corresponding the multispecific or multifunctional polypeptide comprising two or more cytokines.

[00366] In some embodiments, the multispecific molecules disclosed herein include a cytokine molecule. In embodiments, the cytokine molecule includes a full length, a fragment or a variant of a cytokine; a cytokine receptor domain, e.g., a cytokine receptor dimerizing domain; or an agonist of a cytokine receptor, e.g., an antibody molecule (e.g., an agonistic antibody) to a cytokine receptor.

[00367] In some embodiments the cytokine molecule is chosen from IL-2, IL-12, IL-15, IL-18, IL-7, IL-21, or interferon gamma, or a fragment or variant thereof, or a combination of any of the aforesaid cytokines. The cytokine molecule can be a monomer or a dimer. In embodiments, the cytokine molecule can further include a cytokine receptor dimerizing domain.

[00368] In other embodiments, the cytokine molecule is an agonist of a cytokine receptor, e.g., an antibody molecule (e.g., an agonistic antibody) to a cytokine receptor chosen from an IL-15Ra or IL-21R.

[00369] In one embodiment, the cytokine molecule is IL-15, e.g., human IL-15 (e.g., comprising the amino acid sequence:
NWVNVISDLKKIEDLIQSMHIDATLYTESDVHPSCKVTAMKCFLLELQVISLESGDASIHDTV
ENLIILANNSLSSNGNVTESGCKECEELEEKNIKEFLQSFVHIVQMFINTS (SEQ ID NO: 7017),

a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7017.

[00370] In some embodiments, the cytokine molecule comprises a receptor dimerizing domain, e.g., an IL15Ralpha dimerizing domain. In one embodiment, the IL15Ralpha dimerizing domain comprises the amino acid sequence:
MAPRRARGCRTLGLPALLLLLLRPPATRGITCPPPMSVEHADIWVKSYSLYSRERYICNSGF KRKAGTSSLTECVL (SEQ ID NO: 7018), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (e.g., substitutions, deletions, or insertions, e.g., conservative substitutions) to the amino acid sequence of SEQ ID NO: 7018. In some embodiments, the cytokine molecule (e.g., IL-15) and the receptor dimerizing domain (e.g., an IL15Ralpha dimerizing domain) of the multispecific molecule are covalently linked, e.g., via a linker (e.g., a Gly-Ser linker, e.g., a linker comprising the amino acid sequence SGGSGGGGSGGGSGGGGSLQ (SEQ ID NO: 7019). In other embodiments, the cytokine molecule (e.g., IL-15) and the receptor dimerizing domain (e.g., an IL15Ralpha dimerizing domain) of the multispecific molecule are not covalently linked, e.g., are non-covalently associated.

[00371] In other embodiments, the cytokine molecule is IL-2, e.g., human IL-2 (e.g., comprising the amino acid sequence:
APTSSSTKKTQLQLEHLLLDLQMILNGINNYKNPKLTRMLTFKFYMPKKATELKHLQCLEEE LKPLEEVLNLAQSKNFHLRPRDLISNINVIVLELKGSETTFMCEYADETATIVEFLNRWITFCQ SIISTLT (SEQ ID NO: 7020), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7020).

[00372] In other embodiments, the cytokine molecule is IL-18, e.g., human IL-18 (e.g., comprising the amino acid sequence:
YFGKLESKLSVIRNLNDQVLFIDQGNRPLFEDMTDSDCRDNAPRTIFIISMYKDSQPRGMAVTI SVKCEKISTLSCENKIISFKEMNPPDNIKDTKSDIIFFQRSVPGHDNKMQFESSSYEGYFLACEK ERDLFKLILKKEDELGDRSIMFTVQNED (SEQ ID NO: 7021), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7021).

[00373] In other embodiments, the cytokine molecule is IL-21, e.g., human IL-21 (e.g., comprising the amino acid sequence:

QGQDRHMIRMRQLIDIVDQLKNYVNDLVPEFLPAPEDVETNCEWSAFSCFQKAQLKSANTG NNERIINVSIKKLKRKPPSTNAGRRQKHRLTCPSCDSYEKKPPKEFLERFKSLLQKMIHQHLSS RTHGSEDS (SEQ ID NO: 7022), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7022).

[00374] In yet other embodiments, the cytokine molecule is interferon gamma, e.g., human interferon gamma (e.g., comprising the amino acid sequence: QDPYVKEAENLKKYFNAGHSDVADNGTLFLGILKNWKEESDRKIMQSQIVSFYFKLFKNFKD DQSIQKSVETIKEDMNVKFFNSNKKKRDDFEKLTNYSVTDLNVQRKAIHELIQVMAELSPAA KTGKRKRSQMLFRG (SEQ ID NO: 7023), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7023).

TGF-beta Inhibitors

[00375] The present disclosure further provides, *inter alia*, multispecific (e.g., bi-, tri-, quad-specific) or multifunctional molecules, that include, e.g., are engineered to contain, one or more cytokine inhibitor molecules, e.g., inhibitors of immunomodulatory (e.g., proinflammatory) cytokines and variants, e.g., functional variants, thereof. Accordingly, in some embodiments, the cytokine inhibitor molecule is a TGF-beta inhibitor. In some embodiments, the TGF-beta inhibitor binds to and inhibits TGF-beta, e.g., reduces the activity of TGF-beta. In some embodiments, the TGF-beta inhibitor inhibits (e.g., reduces the activity of) TGF-beta 1. In some embodiments, the TGF-beta inhibitor inhibits (e.g., reduces the activity of) TGF-beta 2. In some embodiments, the TGF-beta inhibitor inhibits (e.g., reduces the activity of) TGF-beta 3. In some embodiments, the TGF-beta inhibitor inhibits (e.g., reduces the activity of) TGF-beta 1 and TGF-beta 3. In some embodiments, the TGF-beta inhibitor inhibits (e.g., reduces the activity of) TGF-beta 1, TGF-beta 2, and TGF-beta 3.

[00376] In some embodiments, the TGF-beta inhibitor comprises a portion of a TGF-beta receptor (e.g., an extracellular domain of a TGF-beta receptor) that is capable of inhibiting (e.g., reducing the activity of) TGF-beta, or functional fragment or variant thereof. In some embodiments, the TGF-beta inhibitor comprises a TGFBR1 polypeptide (e.g., an extracellular domain of TGFBR1 or functional variant thereof). In some embodiments, the TGF-beta inhibitor comprises a TGFBR2 polypeptide (e.g., an extracellular domain of TGFBR2 or functional variant thereof). In some embodiments, the TGF-beta inhibitor comprises a TGFBR3 polypeptide (e.g., an extracellular domain of TGFBR3 or functional variant thereof). In some embodiments, the TGF-beta inhibitor comprises a TGFBR1 polypeptide (e.g., an extracellular domain of TGFBR1 or functional variant thereof) and a TGFBR2 polypeptide (e.g., an extracellular domain of TGFBR2 or functional variant thereof). In some

embodiments, the TGF-beta inhibitor comprises a TGFBR1 polypeptide (e.g., an extracellular domain of TGFBR1 or functional variant thereof) and a TGFBR3 polypeptide (e.g., an extracellular domain of TGFBR3 or functional variant thereof). In some embodiments, the TGF-beta inhibitor comprises a TGFBR2 polypeptide (e.g., an extracellular domain of TGFBR2 or functional variant thereof) and a TGFBR3 polypeptide (e.g., an extracellular domain of TGFBR3 or functional variant thereof).

[00377] Exemplary TGF-beta receptor polypeptides that can be used as TGF-beta inhibitors have been disclosed in US8993524, US9676863, US8658135, US20150056199, US20070184052, and WO2017037634, all of which are herein incorporated by reference in their entirety.

[00378] In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of TGFBR1 or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of SEQ ID NO: 95, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of SEQ ID NO: 96, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of SEQ ID NO: 97, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises the amino acid sequence of SEQ ID NO: 104, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises the amino acid sequence of SEQ ID NO: 105, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto).

[00379] In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of TGFBR2 or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of SEQ ID NO: 98, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of SEQ ID NO: 99, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises the amino acid sequence of SEQ ID NO: 100, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises the amino acid sequence of SEQ ID NO: 101, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises the amino acid sequence of SEQ ID NO: 102, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises the amino acid sequence of SEQ ID NO: 103, or a sequence substantially

identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto).

[00380] In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of TGFBR3 or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of SEQ ID NO: 106, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises an extracellular domain of SEQ ID NO: 107, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto). In some embodiments, the TGF-beta inhibitor comprises the amino acid sequence of SEQ ID NO: 108, or a sequence substantially identical thereto (e.g., a sequence that is at least 80%, 85%, 90%, or 95% identical thereto).

[00381] In some embodiments, the TGF-beta inhibitor comprises no more than one TGF-beta receptor extracellular domain. In some embodiments, the TGF-beta inhibitor comprises two or more (e.g., two, three, four, five, or more) TGF-beta receptor extracellular domains, linked together, e.g., via a linker.

Table 16. Exemplary amino acid sequences of TGF-beta polypeptides or TGF-beta receptor polypeptides

SEQ ID NO	Description	Amino acid sequence
SEQ ID NO: 92	Immature human TGF-beta 1 (P01137-1)	MPPSGLRLLLLLLPLLWLLVLTPGRPAAGLSTCKTIDMELVKRK RIEAIRGQILSKLRLASPPSQGEVPPGPLPEAVLALYNSTRDRVA GESAEPEPEPEADYYAKEVTRVLMVETHNEIYDKFKQSTHSIYM FFNTSELREAVPEPVLLSRAELRLLRLKLKVEQHVELYQKYSNN SWRYLSNRLLAPSDSPEWLSFDVTGVVRQWLSRGGEIEGFRLSA HCSCDSRDNTLQVDINGFTTGRRGDLATIHGMNRPFLLLMATPL ERAQHLQSSRHRRALDTNYCFSSTEKNCCVRQLYIDFRKDLGW KWIHEPKGYHANFCLGPCPYIWSLDTQYSKVLALYNQHNPGAS AAPCCVPQALEPLPIVYYVGRKPKVEQLSNMIVRSCKCS
SEQ ID NO: 117	Human TGF-beta 1 (P01137-1)	LSTCKTIDMELVKRKRIEAIRGQILSKLRLASPPSQGEVPPGPLPE AVLALYNSTRDRVAGESAEPEPEPEADYYAKEVTRVLMVETHN EIYDKFKQSTHSIYMFFNTSELREAVPEPVLLSRAELRLLRLKLK VEQHVELYQKYSNNSWRYLSNRLLAPSDSPEWLSFDVTGVVRQ WLSRGGEIEGFRLSAHCSCDSRDNTLQVDINGFTTGRRGDLATI HGMNRPFLLLMATPLERAQHLQSSRHRRALDTNYCFSSTEKNC CVRQLYIDFRKDLGWKWIHEPKGYHANFCLGPCPYIWSLDTQY SKVLALYNQHNPGASAAPCCVPQALEPLPIVYYVGRKPKVEQLS NMIVRSCKCS
SEQ ID NO: 93	Immature human TGF-beta 2 (P61812-1)	MHYCVLSAFLILHLVTVALSLSTCSTLDMDQFMRKRIEAIRGQIL SKLKLTSPPEDYPEPEEVPPEVISIYNSTRDLLQEKASRRAAACER ERSDEEYYAKEVYKIDMPPFFPSENAIPPTFYRPYFRIVRFDVSA MEKNASNLVKAEFRVFRLQNPKARVPEQRIELYQILKSKDLTSP TQRYIDSKVVKTRAEGEWLSFDVTDAVHEWLHHKDRNLGFKIS LHCPCCTFVPSNNYIIPNKSEELEARFAGIDGTSTYTSGDQKTIKS TRKKNSGKTPHLLLMLLPSYRLESQQTNRRKKRALDAAYCFRN

		VQDNCCLRPLYIDFKRDLGWKWIHEPKGYNANFCAGACPYLW SSDTQHSRVLSLYNTINPEASASPCCVSQDLEPLTILYYIGKTPKI EQLSNMIVKSCKCS
SEQ ID NO: 118	Human TGF-beta 2 (P61812-1)	LSTCSTLDMDQFMRKRIEAIRGQILSKLKLTSPPEDYPEPEEVPPE VISIYNSTRDLLQEKASRRAAACERERSDEEYYAKEVYKIDMPP FFPSENAIPPTFYRPYFRIVRFDVSAMEKNASNLVKAEFRVFRLQ NPKARVPEQRIELYQILKSKDLTSPTQRYIDSKVVKTRAEGEWLS FDVTDAVHEWLHHKDRNLGFKISLHCPCCTFVPSNNYIIPNKSEE LEARFAGIDGTSTYTSGDQKTIKSTRKKNSGKTPHLLLMLLPSYR LESQQTNRRKKRALDAAYCFRNVQDNCCLRPLYIDFKRDLGWK WIHEPKGYNANFCAGACPYLWSSDTQHSRVLSLYNTINPEASAS PCCVSQDLEPLTILYYIGKTPKIEQLSNMIVKSCKCS
SEQ ID NO: 94	Immature human TGF-beta 3 (P10600-1)	MKMHLQRALVVLALLNFATVSLSLSTCTTLDFGHIKKKRVEAIR GQILSKLRLTSPPEPTVMTHVPYQVLALYNSTRELLEEMHGERE EGCTQENTESEYYAKEIHKFDMIQGLAEHNELAVCPKGITSKVF RFNVSSVEKNRTNLFRAEFRVLRVPNPSSKRNEQRIELFQILRPD EHIAKQRYIGGKNLPTRGTAEWLSFDVTDTVREWLLRRESNLGL EISIHCPCHTFQPNGDILENIHEVMEIKFKGVDNEDDHGRGDLGR LKKQKDHHNPHLILMMIPPHRLDNPGQGGQRKKRALDTNYCFR NLEENCCVRPLYIDFRQDLGWKWVHEPKGYYANFCSGPCPYLR SADTTHSTVLGLYNTLNPEASASPCCVPQDLEPLTILYYVGRTPK VEQLSNMVVKSCKCS
SEQ ID NO: 119	Human TGF-beta 3 (P10600-1)	LSTCTTLDFGHIKKKRVEAIRGQILSKLRLTSPPEPTVMTHVPYQ VLALYNSTRELLEEMHGEREEGCTQENTESEYYAKEIHKFDMIQ GLAEHNELAVCPKGITSKVFRFNVSSVEKNRTNLFRAEFRVLRV PNPSSKRNEQRIELFQILRPDEHIAKQRYIGGKNLPTRGTAEWLS FDVTDTVREWLLRRESNLGLEISIHCPCHTFQPNGDILENIHEVM EIKFKGVDNEDDHGRGDLGRLKKQKDHHNPHLILMMIPPHRLD NPGQGGQRKKRALDTNYCFRNLEENCCVRPLYIDFRQDLGWK WVHEPKGYYANFCSGPCPYLRSADTTHSTVLGLYNTLNPEASA SPCCVPQDLEPLTILYYVGRTPKVEQLSNMVVKSCKCS
SEQ ID NO: 95	Immature human TGFBR1 isoform 1 (P36897-1)	MEAAVAAPRPRLLLLVLAAAAAAAAALLPGATALQCFCHLCTK DNFTCVTDGLCFVSVTETTDKVIHNSMCIAEIDLIPRDRPFVCAP SSKTGSVTTTYCCNQDHCNKIELPTTVKSSPGLGPVELAAVIAGP VCFVCISLMLMVYICHNRTVIHHRVPNEEDPSLDRPFISEGTTLK DLIYDMTTSGSGSGLPLLVQRTIARTIVLQESIGKGRFGEVWRGK WRGEEVAVKIFSSREERSWFREAEIYQTVMLRHENILGFIAADN KDNGTWTQLWLVSDYHEHGSLFDYLNRYTVTVEGMIKLALST ASGLAHLHMEIVGTQGKPAIAHRDLKSKNILVKKNGTCCIADLG LAVRHDSATDTIDIAPNHRVGTKRYMAPEVLDDSINMKHFESFK RADIYAMGLVFWEIARRCSIGGIHEDYQLPYYDLVPSDPSVEEM RKVVCEQKLRPNIPNRWQSCEALRVMAKIMRECWYANGAARL TALRIKKTLSQLSQQEGIKM
SEQ ID NO: 120	Human TGFBR1 isoform 1 (P36897-1)	LQCFCHLCTKDNFTCVTDGLCFVSVTETTDKVIHNSMCIAEIDLI PRDRPFVCAPSSKTGSVTTTYCCNQDHCNKIELPTTVKSSPGLGP VELAAVIAGPVCFVCISLMLMVYICHNRTVIHHRVPNEEDPSLD RPFISEGTTLKDLIYDMTTSGSGSGLPLLVQRTIARTIVLQESIGK GRFGEVWRGKWRGEEVAVKIFSSREERSWFREAEIYQTVMLRH ENILGFIAADNKDNGTWTQLWLVSDYHEHGSLFDYLNRYTVTV EGMIKLALSTASGLAHLHMEIVGTQGKPAIAHRDLKSKNILVKK NGTCCIADLGLAVRHDSATDTIDIAPNHRVGTKRYMAPEVLDDS INMKHFESFKRADIYAMGLVFWEIARRCSIGGIHEDYQLPYYDL VPSDPSVEEMRKVVCEQKLRPNIPNRWQSCEALRVMAKIMREC WYANGAARLTALRIKKTLSQLSQQEGIKM

SEQ ID NO: 96	Immature human TGFBR1 isoform 2 (P36897-2)	MEAAVAAPRPRLLLLVLAAAAAAAAALLPGATALQCFCHLCTK DNFTCVTDGLCFVSVTETTDKVIHNSMCIAEIDLIPRDRPFVCAP SSKTGSVTTTYCCNQDHCNKIELPTTGPFSVKSSPGLGPVELAAV IAGPVCFVCISLMLMVYICHNRTVIHHRVPNEEDPSLDRPFISEGT TLKDLIYDMTTSGSGSGLPLLVQRTIARTIVLQESIGKGRFGEVW RGKWRGEEVAVKIFSSREERSWFREAEIYQTVMLRHENILGFIA ADNKDNGTWTQLWLVSDYHEHGSLFDYLNRYTVTVEGMIKLA LSTASGLAHLHMEIVGTQGKPAIAHRDLKSKNILVKKNGTCCIA DLGLAVRHDSATDTIDIAPNHRVGTKRYMAPEVLDDSINMKHF ESFKRADIYAMGLVFWEIARRCSIGGIHEDYQLPYYDLVPSDPSV EEMRKVVCEQKLRPNIPNRWQSCEALRVMAKIMRECWYANGA ARLTALRIKKTLSQLSQQEGIKM
SEQ ID NO: 121	Human TGFBR1 isoform 2 (P36897-2)	LQCFCHLCTKDNFTCVTDGLCFVSVTETTDKVIHNSMCIAEIDLI PRDRPFVCAPSSKTGSVTTTYCCNQDHCNKIELPTTGPFSVKSSP GLGPVELAAVIAGPVCFVCISLMLMVYICHNRTVIHHRVPNEED PSLDRPFISEGTTLKDLIYDMTTSGSGSGLPLLVQRTIARTIVLQE SIGKGRFGEVWRGKWRGEEVAVKIFSSREERSWFREAEIYQTV MLRHENILGFIAADNKDNGTWTQLWLVSDYHEHGSLFDYLNR YTVTVEGMIKLALSTASGLAHLHMEIVGTQGKPAIAHRDLKSK NILVKKNGTCCIADLGLAVRHDSATDTIDIAPNHRVGTKRYMAP EVLDDSINMKHFESFKRADIYAMGLVFWEIARRCSIGGIHEDYQ LPYYDLVPSDPSVEEMRKVVCEQKLRPNIPNRWQSCEALRVMA KIMRECWYANGAARLTALRIKKTLSQLSQQEGIKM
SEQ ID NO: 97	Immature human TGFBR1 isoform 3 (P36897-3)	MEAAVAAPRPRLLLLVLAAAAAAAAALLPGATALQCFCHLCTK DNFTCVTDGLCFVSVTETTDKVIHNSMCIAEIDLIPRDRPFVCAP SSKTGSVTTTYCCNQDHCNKIELPTTGLPLLVQRTIARTIVLQESI GKGRFGEVWRGKWRGEEVAVKIFSSREERSWFREAEIYQTVML RHENILGFIAADNKDNGTWTQLWLVSDYHEHGSLFDYLNRYTV TVEGMIKLALSTASGLAHLHMEIVGTQGKPAIAHRDLKSKNILV KKNGTCCIADLGLAVRHDSATDTIDIAPNHRVGTKRYMAPEVL DDSINMKHFESFKRADIYAMGLVFWEIARRCSIGGIHEDYQLPY YDLVPSDPSVEEMRKVVCEQKLRPNIPNRWQSCEALRVMAKIM RECWYANGAARLTALRIKKTLSQLSQQEGIKM
SEQ ID NO: 122	Human TGFBR1 isoform 3 (P36897-3)	LQCFCHLCTKDNFTCVTDGLCFVSVTETTDKVIHNSMCIAEIDLI PRDRPFVCAPSSKTGSVTTTYCCNQDHCNKIELPTTGLPLLVQRT IARTIVLQESIGKGRFGEVWRGKWRGEEVAVKIFSSREERSWFR EAEIYQTVMLRHENILGFIAADNKDNGTWTQLWLVSDYHEHGS LFDYLNRYTVTVEGMIKLALSTASGLAHLHMEIVGTQGKPAIAH RDLKSKNILVKKNGTCCIADLGLAVRHDSATDTIDIAPNHRVGT KRYMAPEVLDDSINMKHFESFKRADIYAMGLVFWEIARRCSIGG IHEDYQLPYYDLVPSDPSVEEMRKVVCEQKLRPNIPNRWQSCEA LRVMAKIMRECWYANGAARLTALRIKKTLSQLSQQEGIKM
SEQ ID NO: 104	Human TGFBR1 fragment 1	LQCFCHLCTKDNFTCVTDGLCFVSVTETTDKVIHNSMCIAEIDLI PRDRPFVCAPSSKTGSVTTTYCCNQDHCNKIELPTTVKSSPGLGP VEL
SEQ ID NO: 105	Human TGFBR1 fragment 2	ALQCFCHLCTKDNFTCVTDGLCFVSVTETTDKVIHNSMCIAEID LIPRDRPFVCAPSSKTGSVTTTYCCNQDHCNKIEL
SEQ ID NO: 98	Immature human TGFBR2 isoform B (short	MGRGLLRGLWPLHIVLWTRIASTIPPHVQKSVNNDMIVTDNNG AVKFPQLCKFCDVRFSTCDNQKSCMSNCSITSICEKPQEVCVAV WRKNDENITLETVCHDPKLPYHDFILEDAASPKCIMKEKKKPGE TFFMCSCSSDECNDNIIFSEEYNTSNPDLLLVIFQVTGISLLPPLGV AISVIIIFYCYRVNRQQKLSSTWETGKTRKLMEFSEHCAIILEDDR SDISSTCANNINHNTELLPIELDTLVGKGRFAEVYKAKLKQNTSE

	isoform) (P37173-1)	QFETVAVKIFPYEEYASWKTEKDIFSDINLKHENILQFLTAEERK TELGKQYWLITAFHAKGNLQEYLTRHVISWEDLRKLGSSLARGI AHLHSDHTPCGRPKMPIVHRDLKSSNILVKNDLTCCLCDFGLSL RLDPTLSVDDLANSGQVGTARYMAPEVLESRMNLENVESFKQT DVYSMALVLWEMTSRCNAVGEVKDYEPPFGSKVREHPCVESM KDNVLRDRGRPEIPSFWLNHQGIQMVCETLTECWDHDPEARLT AQCVAERFSELEHLDRLSGRSCSEEKIPEDGSLNTTK
SEQ ID NO: 123	Human TGFBR2 isoform B (short isoform) (P37173-1)	TIPPHVQKSVNNDMIVTDNNGAVKFPQLCKFCDVRFSTCDNQK SCMSNCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLPYH DFILEDAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEEYNT SNPDLLLVIFQVTGISLLPPLGVAISVIIIFYCYRVNRQQKLSSTWE TGKTRKLMEFSEHCAIILEDDRSDISSTCANNINHNTELLPIELDT LVGKGRFAEVYKAKLKQNTSEQFETVAVKIFPYEEYASWKTEK DIFSDINLKHENILQFLTAEERKTELGKQYWLITAFHAKGNLQEY LTRHVISWEDLRKLGSSLARGIAHLHSDHTPCGRPKMPIVHRDL KSSNILVKNDLTCCLCDFGLSLRLDPTLSVDDLANSGQVGTARY MAPEVLESRMNLENVESFKQTDVYSMALVLWEMTSRCNAVGE VKDYEPPFGSKVREHPCVESMKDNVLRDRGRPEIPSFWLNHQGI QMVCETLTECWDHDPEARLTAQCVAERFSELEHLDRLSGRSCS EEKIPEDGSLNTTK
SEQ ID NO: 99	Immature human TGFBR2 isoform A (long isoform) (P37173-2)	MGRGLLRGLWPLHIVLWTRIASTIPPHVQKSDVEMEAQKDEIIC PSCNRTAHPLRHINNDMIVTDNNGAVKFPQLCKFCDVRFSTCDN QKSCMSNCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLP YHDFILEDAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEE YNTSNPDLLLVIFQVTGISLLPPLGVAISVIIIFYCYRVNRQQKLSS TWETGKTRKLMEFSEHCAIILEDDRSDISSTCANNINHNTELLPIE LDTLVGKGRFAEVYKAKLKQNTSEQFETVAVKIFPYEEYASWK TEKDIFSDINLKHENILQFLTAEERKTELGKQYWLITAFHAKGNL QEYLTRHVISWEDLRKLGSSLARGIAHLHSDHTPCGRPKMPIVH RDLKSSNILVKNDLTCCLCDFGLSLRLDPTLSVDDLANSGQVGT ARYMAPEVLESRMNLENVESFKQTDVYSMALVLWEMTSRCNA VGEVKDYEPPFGSKVREHPCVESMKDNVLRDRGRPEIPSFWLN HQGIQMVCETLTECWDHDPEARLTAQCVAERFSELEHLDRLSG RSCSEEKIPEDGSLNTTK
SEQ ID NO: 124	Human TGFBR2 isoform A (long isoform) (P37173-2)	TIPPHVQKSDVEMEAQKDEIICPSCNRTAHPLRHINNDMIVTDNN GAVKFPQLCKFCDVRFSTCDNQKSCMSNCSITSICEKPQEVCVA VWRKNDENITLETVCHDPKLPYHDFILEDAASPKCIMKEKKKPG ETFFMCSCSSDECNDNIIFSEEYNTSNPDLLLVIFQVTGISLLPPLG VAISVIIIFYCYRVNRQQKLSSTWETGKTRKLMEFSEHCAIILEDD RSDISSTCANNINHNTELLPIELDTLVGKGRFAEVYKAKLKQNTS EQFETVAVKIFPYEEYASWKTEKDIFSDINLKHENILQFLTAEER KTELGKQYWLITAFHAKGNLQEYLTRHVISWEDLRKLGSSLAR GIAHLHSDHTPCGRPKMPIVHRDLKSSNILVKNDLTCCLCDFGLS LRLDPTLSVDDLANSGQVGTARYMAPEVLESRMNLENVESFKQ TDVYSMALVLWEMTSRCNAVGEVKDYEPPFGSKVREHPCVES MKDNVLRDRGRPEIPSFWLNHQGIQMVCETLTECWDHDPEARL TAQCVAERFSELEHLDRLSGRSCSEEKIPEDGSLNTTK
SEQ ID NO: 100	Human TGFBR2 fragment 1 (ECD of human TGFBR2 isoform B)	TIPPHVQKSVNNDMIVTDNNGAVKFPQLCKFCDVRFSTCDNQK SCMSNCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLPYH DFILEDAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEEYNT SNPD

SEQ ID NO: 101	Human TGFBR2 fragment 2	IPPHVQKSVNNDMIVTDNNGAVKFPQLCKFCDVRFSTCDNQKS CMSNCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLPYHD FILEDAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEEYNTS NPD
SEQ ID NO: 102	Human TGFBR2 fragment 3 (ECD of human TGFBR2 isoform A)	TIPPHVQKSDVEMEAQKDEIICPSCNRTAHPLRHINNDMIVTDNN GAVKFPQLCKFCDVRFSTCDNQKSCMSNCSITSICEKPQEVCVA VWRKNDENITLETVCHDPKLPYHDFILEDAASPKCIMKEKKKPG ETFFMCSCSSDECNDNIIFSEEYNTSNPD
SEQ ID NO: 103	Human TGFBR2 fragment 4	QLCKFCDVRFSTCDNQKSCMSNCSITSICEKPQEVCVAVWRKN DENITLETVCHDPKLPYHDFILEDAASPKCIMKEKKKPGETFFMC SCSSDECNDNIIF
SEQ ID NO: 106	Immature human TGFBR3 isoform 1 (Q03167-1)	MTSHYVIAIFALMSSCLATAGPEPGALCELSPVSASHPVQALME SFTVLSGCASRGTTGLPQEVHVLNLRTAGQGPGQLQREVTLHL NPISSVHIHHKSVVFLLNSPHPLVWHLKTERLATGVSRLFLVSEG SVVQFSSANFSLTAETEERNFPHGNEHLLNWARKEYGAVTSFTE LKIARNIYIKVGEDQVFPPKCNIGKNFLSLNYLAEYLQPKAAEGC VMSSQPQNEEVHIIELITPNSNPYSAFQVDITIDIRPSQEDLEVVK NLILILKCKKSVNWVIKSFDVKGSLKIIAPNSIGFGKESERSMTMT KSIRDDIPSTQGNLVKWALDNGYSPITSYTMAPVANRFHLRLEN NAEEMGDEEVHTIPPELRILLDPGALPALQNPPIRGGEGQNGGLP FPFPDISRRVWNEEGEDGLPRPKDPVIPSIQLFPGLREPEEVQGSV DIALSVKCDNEKMIVAVEKDSFQASGYSGMDVTLLDPTCKAKM NGTHFVLESPLNGCGTRPRWSALDGVVYYNSIVIQVPALGDSSG WPDGYEDLESGDNGFPGDMDEGDASLFTRPEIVVFNCSLQQVR NPSSFQEQPHGNITFNMELYNTDLFLVPSQGVFSVPENGHVYVE VSVTKAEQELGFAIQTCFISPYSNPDRMSHYTIIENICPKDESVKF YSPKRVHFPIPQADMDKKRFSFVFKPVFNTSLLFLQCELTLCTK MEKHPQKLPKCVPPDEACTSLDASIIWAMMQNKKTFTKPLAVI HHEAESKEKGPSMKEPNPISPPIFHGLDTLTVMGIAFAAFVIGAL LTGALWYIYSHTGETAGRQQVPTSPPASENSSAAHSIGSTQSTPC SSSSTA
SEQ ID NO: 125	Human TGFBR3 isoform 1 (Q03167-1)	GPEPGALCELSPVSASHPVQALMESFTVLSGCASRGTTGLPQEV HVLNLRTAGQGPGQLQREVTLHLNPISSVHIHHKSVVFLLNSPH PLVWHLKTERLATGVSRLFLVSEGSVVQFSSANFSLTAETEERN FPHGNEHLLNWARKEYGAVTSFTELKIARNIYIKVGEDQVFPPK CNIGKNFLSLNYLAEYLQPKAAEGCVMSSQPQNEEVHIIELITPN SNPYSAFQVDITIDIRPSQEDLEVVKNLILILKCKKSVNWVIKSFD VKGSLKIIAPNSIGFGKESERSMTMTKSIRDDIPSTQGNLVKWAL DNGYSPITSYTMAPVANRFHLRLENNAEEMGDEEVHTIPPELRIL LDPGALPALQNPPIRGGEGQNGGLPFPFPDISRRVWNEEGEDGLP RPKDPVIPSIQLFPGLREPEEVQGSVDIALSVKCDNEKMIVAVEK DSFQASGYSGMDVTLLDPTCKAKMNGTHFVLESPLNGCGTRPR WSALDGVVYYNSIVIQVPALGDSSGWPDGYEDLESGDNGFPGD MDEGDASLFTRPEIVVFNCSLQQVRNPSSFQEQPHGNITFNMEL YNTDLFLVPSQGVFSVPENGHVYVEVSVTKAEQELGFAIQTCFIS PYSNPDRMSHYTIIENICPKDESVKFYSPKRVHFPIPQADMDKKR FSFVFKPVFNTSLLFLQCELTLCTKMEKHPQKLPKCVPPDEACTS LDASIIWAMMQNKKTFTKPLAVIHHEAESKEKGPSMKEPNPISPP IFHGLDTLTVMGIAFAAFVIGALLTGALWYIYSHTGETAGRQQV PTSPPASENSSAAHSIGSTQSTPCSSSSTA

SEQ ID NO: 107	Immature human TGFBR3 isoform 2 (Q03167-2)	MTSHYVIAIFALMSSCLATAGPEPGALCELSPVSASHPVQALME SFTVLSGCASRGTTGLPQEVHVLNLRTAGQGPGQLQREVTLHL NPISSVHIHHKSVVFLLNSPHPLVWHLKTERLATGVSRLFLVSEG SVVQFSSANFSLTAETEERNFPHGNEHLLNWARKEYGAVTSFTE LKIARNIYIKVGEDQVFPPKCNIGKNFLSLNYLAEYLQPKAAEGC VMSSQPQNEEVHIIELITPNSNPYSAFQVDITIDIRPSQEDLEVVK NLILILKCKKSVNWVIKSFDVKGSLKIIAPNSIGFGKESERSMTMT KSIRDDIPSTQGNLVKWALDNGYSPITSYTMAPVANRFHLRLEN NEEMGDEEVHTIPPELRILLDPGALPALQNPPIRGGEGQNGGLPF PFPDISRRVWNEEGEDGLPRPKDPVIPSIQLFPGLREPEEVQGSVD IALSVKCDNEKMIVAVEKDSFQASGYSGMDVTLLDPTCKAKMN GTHFVLESPLNGCGTRPRWSALDGVVYYNSIVIQVPALGDSSG WPDGYEDLESGDNGFPGDMDEGDASLFTRPEIVVFNCSLQQVR NPSSFQEQPHGNITFNMELYNTDLFLVPSQGVFSVPENGHVYVE VSVTKAEQELGFAIQTCFISPYSNPDRMSHYTIIENICPKDESVKF YSPKRVHFPIPQADMDKKRFSFVFKPVFNTSLLFLQCELTLCTK MEKHPQKLPKCVPPDEACTSLDASIIWAMMQNKKTFTKPLAVI HHEAESKEKGPSMKEPNPISPPIFHGLDTLTVMGIAFAAFVIGAL LTGALWYIYSHTGETAGRQQVPTSPPASENSSAAHSIGSTQSTPC SSSSTA
SEQ ID NO: 126	Human TGFBR3 isoform 2 (Q03167-2)	GPEPGALCELSPVSASHPVQALMESFTVLSGCASRGTTGLPQEV HVLNLRTAGQGPGQLQREVTLHLNPISSVHIHHKSVVFLLNSPH PLVWHLKTERLATGVSRLFLVSEGSVVQFSSANFSLTAETEERN FPHGNEHLLNWARKEYGAVTSFTELKIARNIYIKVGEDQVFPPK CNIGKNFLSLNYLAEYLQPKAAEGCVMSSQPQNEEVHIIELITPN SNPYSAFQVDITIDIRPSQEDLEVVKNLILILKCKKSVNWVIKSFD VKGSLKIIAPNSIGFGKESERSMTMTKSIRDDIPSTQGNLVKWAL DNGYSPITSYTMAPVANRFHLRLENNEEMGDEEVHTIPPELRILL DPGALPALQNPPIRGGEGQNGGLPFPFPDISRRVWNEEGEDGLP RPKDPVIPSIQLFPGLREPEEVQGSVDIALSVKCDNEKMIVAVEK DSFQASGYSGMDVTLLDPTCKAKMNGTHFVLESPLNGCGTRPR WSALDGVVYYNSIVIQVPALGDSSGWPDGYEDLESGDNGFPGD MDEGDASLFTRPEIVVFNCSLQQVRNPSSFQEQPHGNITFNMEL YNTDLFLVPSQGVFSVPENGHVYVEVSVTKAEQELGFAIQTCFIS PYSNPDRMSHYTIIENICPKDESVKFYSPKRVHFPIPQADMDKKR FSFVFKPVFNTSLLFLQCELTLCTKMEKHPQKLPKCVPPDEACTS LDASIIWAMMQNKKTFTKPLAVIHHEAESKEKGPSMKEPNPISPP IFHGLDTLTVMGIAFAAFVIGALLTGALWYIYSHTGETAGRQQV PTSPPASENSSAAHSIGSTQSTPCSSSSTA
SEQ ID NO: 108	Human TGFBR3 fragment 1	GPEPGALCELSPVSASHPVQALMESFTVLSGCASRGTTGLPQEV HVLNLRTAGQGPGQLQREVTLHLNPISSVHIHHKSVVFLLNSPH PLVWHLKTERLATGVSRLFLVSEGSVVQFSSANFSLTAETEERN FPHGNEHLLNWARKEYGAVTSFTELKIARNIYIKVGEDQVFPPK CNIGKNFLSLNYLAEYLQPKAAEGCVMSSQPQNEEVHIIELITPN SNPYSAFQVDITIDIRPSQEDLEVVKNLILILKCKKSVNWVIKSFD VKGSLKIIAPNSIGFGKESERSMTMTKSIRDDIPSTQGNLVKWAL DNGYSPITSYTMAPVANRFHLRLENNAEEMGDEEVHTIPPELRIL LDPGALPALQNPPIRGGEGQNGGLPFPFPDISRRVWNEEGEDGLP RPKDPVIPSIQLFPGLREPEEVQGSVDIALSVKCDNEKMIVAVEK DSFQASGYSGMDVTLLDPTCKAKMNGTHFVLESPLNGCGTRPR WSALDGVVYYNSIVIQVPALGDSSGWPDGYEDLESGDNGFPGD MDEGDASLFTRPEIVVFNCSLQQVRNPSSFQEQPHGNITFNMEL YNTDLFLVPSQGVFSVPENGHVYVEVSVTKAEQELGFAIQTCFIS PYSNPDRMSHYTIIENICPKDESVKFYSPKRVHFPIPQADMDKKR FSFVFKPVFNTSLLFLQCELTLCTKMEKHPQKLPKCVPPDEACTS

		LDASIIWAMMQNKKTFTKPLAVIHHEAESKEKGPSMKEPNPISPP IFHGLDTLTV
SEQ ID NO: 192	hCH1-hFc_Hole-3x4GS-TGFbR2	ASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSG ALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKP SNTKVDKRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTL MISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREE QYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTIS KAKGQPREPQVCTLPPSREEMTKNQVSLSCAVKGFYPSDIAVE WESNGQPENNYKTTPPVLDSDGSFFLVSKLTVDKSRWQQGNVF SCSVMHEALHNHYTQKSLSLSPGXGGGGSGGGGSGGGGSIPPH VQKSVNNDMIVTDNNGAVKFPQLCKFCDVRFSTCDNQKSCMS NCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLPYHDFILE DAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEEYNTSNPD, wherein X is K or absent
SEQ ID NO: 193	hCH1-hFc_Knob-3x4GS-TGFbR2	ASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSG ALTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKP SNTKVDKRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTL MISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREE QYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTIS KAKGQPREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSDIAVE WESNGQPENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVF SCSVMHEALHNHYTQKSLSLSPGXGGGGSGGGGSGGGGSIPPH VQKSVNNDMIVTDNNGAVKFPQLCKFCDVRFSTCDNQKSCMS NCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLPYHDFILE DAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEEYNTSNPD, wherein X is K or absent
SEQ ID NO: 194	hFc_Hole-3x4GS-TGFbR2	DKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVD VSHEDPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVSVLT VLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVCT LPPSREEMTKNQVSLSCAVKGFYPSDIAVEWESNGQPENNYKTT PPVLDSDGSFFLVSKLTVDKSRWQQGNVFSCSVMHEALHNHYT QKSLSLSPGXGGGGSGGGGSGGGGSIPPHVQKSVNNDMIVTDN NGAVKFPQLCKFCDVRFSTCDNQKSCMSNCSITSICEKPQEVCV AVWRKNDENITLETVCHDPKLPYHDFILEDAASPKCIMKEKKKP GETFFMCSCSSDECNDNIIFSEEYNTSNPD, wherein X is K or absent
SEQ ID NO: 195	hFc_Knob-3x4GS-TGFbR2	DKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVD VSHEDPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVSVLT VLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVYT LPPCREEMTKNQVSLWCLVKGFYPSDIAVEWESNGQPENNYKT TPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHY TQKSLSLSPGXGGGGSGGGGSGGGGSIPPHVQKSVNNDMIVTD NNGAVKFPQLCKFCDVRFSTCDNQKSCMSNCSITSICEKPQEVC VAVWRKNDENITLETVCHDPKLPYHDFILEDAASPKCIMKEKK KPGETFFMCSCSSDECNDNIIFSEEYNTSNPD, wherein X is K or absent
SEQ ID NO: 196	TGFbR2-3x4GS-hCH1-hFc_Hole	IPPHVQKSVNNDMIVTDNNGAVKFPQLCKFCDVRFSTCDNQKS CMSNCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLPYHD FILEDAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEEYNTS NPDGGGGSGGGGSGGGGSASTKGPSVFPLAPSSKSTSGGTAALG CLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVT VPSSSLGTQTYICNVNHKPSNTKVDKRVEPKSCDKTHTCPPCPA PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFN WYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGK

		EYKCKVSNKALPAPIEKTISKAKGQPREPQVCTLPPSREEMTKN QVSLSCAVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFF LVSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGX, wherein X is K or absent
SEQ ID NO: 197	TGFbR2-3x4GS-hCH1-hFc_Knob	IPPHVQKSVNNDMIVTDNNGAVKFPQLCKFCDVRFSTCDNQKS CMSNCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLPYHD FILEDAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEEYNTS NPDGGGGSGGGGSGGGGSASTKGPSVFPLAPSSKSTSGGTAALG CLVKDYFPEPVTVSWNSGALTSGVHTFPAVLQSSGLYSLSSVVT VPSSSLGTQTYICNVNHKPSNTKVDKRVEPKSCDKTHTCPPCPA PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFN WYVDGVEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGK EYKCKVSNKALPAPIEKTISKAKGQPREPQVYTLPPCREEMTKN QVSLWCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFF LYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGX, wherein X is K or absent
SEQ ID NO: 198	TGFbR2-3x4GS-hCLIg_vl	IPPHVQKSVNNDMIVTDNNGAVKFPQLCKFCDVRFSTCDNQKS CMSNCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLPYHD FILEDAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEEYNTS NPDGGGGSGGGGSGGGGSGQPKANPTVTLFPPSSEELQANKAT LVCLISDFYPGAVTVAWKADGSPVKAGVETTKPSKQSNNKYAA SSYLSLTPEQWKSHRSYSCQVTHEGSTVEKTVAPTECS
SEQ ID NO: 199	TGFβR2-3x4GS-hCLIg_vk	IPPHVQKSVNNDMIVTDNNGAVKFPQLCKFCDVRFSTCDNQKS CMSNCSITSICEKPQEVCVAVWRKNDENITLETVCHDPKLPYHD FILEDAASPKCIMKEKKKPGETFFMCSCSSDECNDNIIFSEEYNTS NPDGGGGSGGGGSGGGGSRTVAAPSVFIFPPSDEQLKSGTASVV CLLNNFYPREAKVQWKVDNALQSGNSQESVTEQDSKDSTYSLS STLTLSKADYEKHKVYACEVTHQGLSSPVTKSFNRGEC

Immune Cell Engagers

[00382] The immune cell engagers of the multispecific or multifunctional molecules disclosed herein can mediate binding to, and/or activation of, an immune cell, e.g., an immune effector cell. In some embodiments, the immune cell is chosen from a T cell, an NK cell, a B cell, a dendritic cell, or a macrophage cell engager, or a combination thereof. In some embodiments, the immune cell engager is chosen from one, two, three, or all of a T cell engager, NK cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager, or a combination thereof. The immune cell engager can be an agonist of the immune system. In some embodiments, the immune cell engager can be an antibody molecule, a ligand molecule (e.g., a ligand that further comprises an immunoglobulin constant region, e.g., an Fc region), a small molecule, a nucleotide molecule.

Natural Killer Cell Engagers

[00383] Natural Killer (NK) cells recognize and destroy tumors and virus-infected cells in an antibody-independent manner. The regulation of NK cells is mediated by activating and inhibiting receptors on the NK cell surface. One family of activating receptors is the natural cytotoxicity receptors (NCRs) which include NKp30, NKp44 and NKp46. The NCRs initiate tumor targeting by recognition of heparan sulfate on cancer cells. NKG2D is a receptor that provides both stimulatory

and costimulatory innate immune responses on activated killer (NK) cells, leading to cytotoxic activity. DNAM1 is a receptor involved in intercellular adhesion, lymphocyte signaling, cytotoxicity and lymphokine secretion mediated by cytotoxic T-lymphocyte (CTL) and NK cell. DAP10 (also known as HCST) is a transmembrane adapter protein which associates with KLRK1 to form an activation receptor KLRK1-HCST in lymphoid and myeloid cells; this receptor plays a major role in triggering cytotoxicity against target cells expressing cell surface ligands such as MHC class I chain-related MICA and MICB, and U(optionally L1)6-binding proteins (ULBPs); it KLRK1-HCST receptor plays a role in immune surveillance against tumors and is required for cytolysis of tumors cells; indeed, melanoma cells that do not express KLRK1 ligands escape from immune surveillance mediated by NK cells. CD16 is a receptor for the Fc region of IgG, which binds complexed or aggregated IgG and also monomeric IgG and thereby mediates antibody-dependent cellular cytotoxicity (ADCC) and other antibody-dependent responses, such as phagocytosis.

[00384] The present disclosure provides, *inter alia*, multispecific (e.g., bi-, tri-, quad- specific) or multifunctional molecules, that are engineered to contain one or more NK cell engagers that mediate binding to and/or activation of an NK cell. Accordingly, in some embodiments, the NK cell engager is selected from an antigen binding domain or ligand that binds to (e.g., activates): NKp30, NKp40, NKp44, NKp46, NKG2D, DNAM1, DAP10, CD16 (e.g., CD16a, CD16b, or both), CRTAM, CD27, PSGL1, CD96, CD100 (SEMA4D), NKp80, CD244 (also known as SLAMF4 or 2B4), SLAMF6, SLAMF7, KIR2DS2, KIR2DS4, KIR3DS1, KIR2DS3, KIR2DS5, KIR2DS1, CD94, NKG2C, NKG2E, or CD160.

[00385] In some embodiments, the NK cell engager is an antigen binding domain that binds to NKp30 (e.g., NKp30 present, e.g., expressed or displayed, on the surface of an NK cell) and comprises any CDR amino acid sequence, framework region (FWR) amino acid sequence, or variable region amino acid sequence disclosed in Tables 7, 8, 8A, 8B, 9, or 10. In some embodiments, the NK cell engager is an antigen binding domain that binds to NKp30 (e.g., NKp30 present, e.g., expressed or displayed, on the surface of an NK cell) and comprises any CDR amino acid sequence, framework region (FWR) amino acid sequence, or variable region amino acid sequence disclosed in U.S. Patent No. 6,979,546, U.S. Patent No. 9,447,185, PCT Application No. WO2015121383A1, PCT Application No. WO2016110468A1, PCT Application No. WO2004056392A1, or U.S. Application Publication No. US20070231322A1, the sequences of which are hereby incorporated by reference. In some embodiments, binding of the NK cell engager, e.g., antigen binding domain that binds to NKp30, to the NK cell activates the NK cell. An antigen binding domain that binds to NKp30 (e.g., NKp30 present, e.g., expressed or displayed, on the surface of an NK cell) may be said to target NKp30, the NK cell, or both.

[00386] In some embodiments, the antigen binding domain that binds to NKp30 comprises one or more CDRs (e.g., VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and/or VLCDR3) disclosed in Table 7, Table 18, or Table 8, or a sequence having at least 85%, 90%, 95%, or 99% identity

thereto. In some embodiments, the antigen binding domain that binds to NKp30 comprises one or more framework regions (e.g., VHFWR1, VHFWR2, VHFWR3, VHFWR4, VLFWR1, VLFWR2, VLFWR3, and/or VLFWR4) disclosed in Table 7, Table 18, or Table 8, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to NKp30 comprises a VH and/or a VL disclosed in Table 9, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to NKp30 comprises an amino acid sequence disclosed in Table 10, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00387] In some embodiments, the antigen binding domain that binds to NKP30 comprises one or more CDRs (e.g., VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and/or VLCDR3) disclosed in Table 8A and/or 8B, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to NKP30 comprises one or more framework regions (e.g., VHFWR1, VHFWR2, VHFWR3, VHFWR4, VLFWR1, VLFWR2, VLFWR3, and/or VLFWR4) disclosed in Table 8A and/or 8B, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antigen binding domain that binds to NKP30 comprises a VH and/or a VL disclosed in Table 9, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00388] In some embodiments, the antigen binding domain that binds to NKp30 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3.

[00389] In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 6001, and 7315, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 6001, and 6002, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 6008, and 6009, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 7385, and 7315, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 7318, and 6009, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: C019, C021, and C023, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: C033, C035, and C037, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: C047, C049, and C051, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: C061, C063, and C065, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: C075, C077, and C079, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: C089, C091, and C093, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: C103, C105, and C107, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: C116, C118, and C120, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00390] In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7326, 7327, and 7329, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 6063, 6064, and 7293, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 6070, 6071, and 6072, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 6070, 6064, and 7321, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C026, C028, and C030, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C040, C042, and C044, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C054, C056, and C058, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C068, C070, and C072, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C082, C084, and C086, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C096, C098, and C100, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the

VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C110, C112, and C113, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C123, C125, and C127, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00391] In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 6001, 7315, 7326, 7327, and 7329, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 6001, 6002, 6063, 6064, and 7293, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 6008, 6009, 6070, 6071, and 6072, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 7385, 7315, 6070, 6064, and 7321, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7313, 7318, 6009, 6070, 6064, and 7321, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C019, C021, C023, C026, C028, and C030, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto)In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C033, C035, C037, C040, C042, and C044, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto)In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C047, C049, C051, C054, C056, and C058, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto)In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C061, C063, C065, C068, C070, and C072, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto)In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C075, C077, C079, C082, C084, and C086, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto)In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C089, C091, C093, C096, C098, and C100, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto)In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and

VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C103, C105, C107, C110, C112, and C113, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto)In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: C116, C118, C120, C123, C125, and C127, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00392] In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7298 or 7300-7304 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7299 or 7305-7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7302 and 7305, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7302 and 7309, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00393] In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6121 or 6123-6128 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7294 or 6137-6141 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6122 or 6129-6134 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6136 or 6142-6147 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7295 and 7296, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 7297 and 7296, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of SEQ ID NOs: 6122 and 6136, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00394] In some embodiments, the antigen binding domain that binds to NKp30 comprises the amino acid sequence of SEQ ID NO: 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the antigen binding domain that binds to NKp30 comprises the amino acid sequence of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the antigen binding domain that binds to NKp30 comprises the amino acid sequence of SEQ ID NO: 6187, 6188, 6189 or 6190 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00395] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1) amino acid sequence of

SEQ ID NO: 6000 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VHCDR2 amino acid sequence of SEQ ID NO: 6001 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VHCDR3 amino acid sequence of SEQ ID NO: 6002 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions). In some embodiments, the NKp30 antigen binding domain comprises a VH comprising a VHCDR1 amino acid sequence of SEQ ID NO: 6000, a VHCDR2 amino acid sequence of SEQ ID NO: 6001, and/or a VHCDR3 amino acid sequence of SEQ ID NO: 6002.

[00396] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain complementarity determining region 1 (VLCDR1) amino acid sequence of SEQ ID NO: 6063 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VLCDR2 amino acid sequence of SEQ ID NO: 6064 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VLCDR3 amino acid sequence of SEQ ID NO: 7293 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions). In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLCDR1 amino acid sequence of SEQ ID NO: 6063, a VLCDR2 amino acid sequence of SEQ ID NO: 6064, and a VLCDR3 amino acid sequence of SEQ ID NO: 7293.

[00397] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1) amino acid sequence of SEQ ID NO: 6000 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VHCDR2 amino acid sequence of SEQ ID NO: 6001 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VHCDR3 amino acid sequence of SEQ ID NO: 6002 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and a VL comprising a light chain complementarity determining region 1 (VLCDR1) amino acid sequence of SEQ ID NO: 6063 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VLCDR2 amino acid sequence of SEQ ID NO: 6064 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VLCDR3 amino acid sequence of SEQ ID NO: 7293 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions). In some embodiments, the NKp30 antigen binding domain comprises a VH comprising a VHCDR1 amino acid sequence of SEQ ID NO: 6000, a VHCDR2 amino acid sequence of SEQ ID NO: 6001, and/or a VHCDR3 amino acid sequence of SEQ ID NO: 6002, and a VL comprising a VLCDR1 amino acid sequence of SEQ ID NO: 6063, a VLCDR2 amino acid sequence of SEQ ID NO: 6064, and a VLCDR3 amino acid sequence of SEQ ID NO: 7293.

[00398] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1) amino acid sequence of

SEQ ID NO: 6007 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VHCDR2 amino acid sequence of SEQ ID NO: 6008 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VHCDR3 amino acid sequence of SEQ ID NO: 6009 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions). In some embodiments, the NKp30 antigen binding domain comprises a VH comprising a VHCDR1 amino acid sequence of SEQ ID NO: 6007, a VHCDR2 amino acid sequence of SEQ ID NO: 6008, and/or a VHCDR3 amino acid sequence of SEQ ID NO: 6009.

[00399] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain complementarity determining region 1 (VLCDR1) amino acid sequence of SEQ ID NO: 6070 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VLCDR2 amino acid sequence of SEQ ID NO: 6071 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VLCDR3 amino acid sequence of SEQ ID NO: 6072 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions). In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLCDR1 amino acid sequence of SEQ ID NO: 6070, a VLCDR2 amino acid sequence of SEQ ID NO: 6071, and a VLCDR3 amino acid sequence of SEQ ID NO: 6072.

[00400] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1) amino acid sequence of SEQ ID NO: 6007 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VHCDR2 amino acid sequence of SEQ ID NO: 6008 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VHCDR3 amino acid sequence of SEQ ID NO: 6009 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and a VL comprising a light chain complementarity determining region 1 (VLCDR1) amino acid sequence of SEQ ID NO: 6070 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), a VLCDR2 amino acid sequence of SEQ ID NO: 6071 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions), and/or a VLCDR3 amino acid sequence of SEQ ID NO: 6072 (or a sequence with no more than 1, 2, 3, or 4 mutations, e.g., substitutions, additions, or deletions). In some embodiments, the NKp30 antigen binding domain comprises a VH comprising a VHCDR1 amino acid sequence of SEQ ID NO: 6007, a VHCDR2 amino acid sequence of SEQ ID NO: 6008, and/or a VHCDR3 amino acid sequence of SEQ ID NO: 6009, and a VL comprising a VLCDR1 amino acid sequence of SEQ ID NO: 6070, a VLCDR2 amino acid sequence of SEQ ID NO: 6071, and a VLCDR3 amino acid sequence of SEQ ID NO: 6072.

[00401] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO:

6003, a VHFWR2 amino acid sequence of SEQ ID NO: 6004, a VHFWR3 amino acid sequence of SEQ ID NO: 6005, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6006.

[00402] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6066, a VLFWR2 amino acid sequence of SEQ ID NO: 6067, a VLFWR3 amino acid sequence of SEQ ID NO: 7292, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6069.

[00403] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6003, a VHFWR2 amino acid sequence of SEQ ID NO: 6004, a VHFWR3 amino acid sequence of SEQ ID NO: 6005, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6006, and a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6066, a VLFWR2 amino acid sequence of SEQ ID NO: 6067, a VLFWR3 amino acid sequence of SEQ ID NO: 7292, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6069.

[00404] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6003 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6004 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6005 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6006.

[00405] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6066 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6067 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 7292 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6069.

[00406] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6003 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6004 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6005 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6006, and a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6066 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6067 (or a sequence with no more than 1 mutation, e.g., substitution,

addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 7292 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6069.

[00407] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6010, a VHFWR2 amino acid sequence of SEQ ID NO: 6011, a VHFWR3 amino acid sequence of SEQ ID NO: 6012, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6013.

[00408] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6073, a VLFWR2 amino acid sequence of SEQ ID NO: 6074, a VLFWR3 amino acid sequence of SEQ ID NO: 6075, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6076.

[00409] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6010, a VHFWR2 amino acid sequence of SEQ ID NO: 6011, a VHFWR3 amino acid sequence of SEQ ID NO: 6012, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6013, and a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6073, a VLFWR2 amino acid sequence of SEQ ID NO: 6074, a VLFWR3 amino acid sequence of SEQ ID NO: 6075, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6076.

[00410] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6010 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6011 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6012 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6013.

[00411] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6073 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6074 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6075 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6076.

[00412] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6010 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6011 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID

NO: 6012 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6013, and a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6073 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6074 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6075 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6076.

[00413] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6014, a VHFWR2 amino acid sequence of SEQ ID NO: 6015, a VHFWR3 amino acid sequence of SEQ ID NO: 6016, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6017.

[00414] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6014 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6015 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6016 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6017.

[00415] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6077, a VLFWR2 amino acid sequence of SEQ ID NO: 6078, a VLFWR3 amino acid sequence of SEQ ID NO: 6079, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6080.

[00416] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6077 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6078 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6079 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6080.

[00417] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6018, a VHFWR2 amino acid sequence of SEQ ID NO: 6019, a VHFWR3 amino acid sequence of SEQ ID NO: 6020, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6021.

[00418] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6018 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino

acid sequence of SEQ ID NO: 6019 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6020 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6021.

[00419] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6081, a VLFWR2 amino acid sequence of SEQ ID NO: 6082, a VLFWR3 amino acid sequence of SEQ ID NO: 6083, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6084.

[00420] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6081 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6082 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6083 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6084.

[00421] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6022, a VHFWR2 amino acid sequence of SEQ ID NO: 6023, a VHFWR3 amino acid sequence of SEQ ID NO: 6024, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6025.

[00422] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6022 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6023 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6024 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6025.

[00423] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6085, a VLFWR2 amino acid sequence of SEQ ID NO: 6086, a VLFWR3 amino acid sequence of SEQ ID NO: 6087, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6088.

[00424] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6085 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6086 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6087 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6088.

[00425] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6026, a VHFWR2 amino acid sequence of SEQ ID NO: 6027, a VHFWR3 amino acid sequence of SEQ ID NO: 6028, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6029.

[00426] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6026 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6027 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6028 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6029.

[00427] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6089, a VLFWR2 amino acid sequence of SEQ ID NO: 6090, a VLFWR3 amino acid sequence of SEQ ID NO: 6091, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6092.

[00428] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6089 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6090 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6091 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6092.

[00429] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6030, a VHFWR2 amino acid sequence of SEQ ID NO: 6032, a VHFWR3 amino acid sequence of SEQ ID NO: 6033, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6034.

[00430] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6030 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6032 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6033 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6034.

[00431] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6093, a VLFWR2 amino acid sequence of SEQ ID NO: 6094, a VLFWR3 amino acid sequence of SEQ ID NO: 6095, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6096.

[00432] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6093 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6094 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6095 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6096.

[00433] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6035, a VHFWR2 amino acid sequence of SEQ ID NO: 6036, a VHFWR3 amino acid sequence of SEQ ID NO: 6037, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6038.

[00434] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6035 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6036 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6037 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6038.

[00435] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6039, a VHFWR2 amino acid sequence of SEQ ID NO: 6040, a VHFWR3 amino acid sequence of SEQ ID NO: 6041, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6042.

[00436] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6039 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6040 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6041 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6042.

[00437] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6097, a VLFWR2 amino acid sequence of SEQ ID NO: 6098, a VLFWR3 amino acid sequence of SEQ ID NO: 6099, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6100.

[00438] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6097 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6098 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or

deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6099 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6100.

[00439] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6043, a VHFWR2 amino acid sequence of SEQ ID NO: 6044, a VHFWR3 amino acid sequence of SEQ ID NO: 6045, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6046.

[00440] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6043 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6044 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6045 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6046.

[00441] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6101, a VLFWR2 amino acid sequence of SEQ ID NO: 6102, a VLFWR3 amino acid sequence of SEQ ID NO: 6103, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6104.

[00442] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6101 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6102 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6103 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6104.

[00443] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6047, a VHFWR2 amino acid sequence of SEQ ID NO: 6048, a VHFWR3 amino acid sequence of SEQ ID NO: 6049, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6050.

[00444] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6047 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6048 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6049 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6050.

[00445] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL

comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6105, a VLFWR2 amino acid sequence of SEQ ID NO: 6106, a VLFWR3 amino acid sequence of SEQ ID NO: 6107, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6108.

[00446] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6105 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6106 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6107 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6108.

[00447] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6051, a VHFWR2 amino acid sequence of SEQ ID NO: 6052, a VHFWR3 amino acid sequence of SEQ ID NO: 6053, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6054.

[00448] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6051 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6052 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6053 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6054.

[00449] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6109, a VLFWR2 amino acid sequence of SEQ ID NO: 6110, a VLFWR3 amino acid sequence of SEQ ID NO: 6111, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6112.

[00450] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6109 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6110 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6111 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6112.

[00451] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6055, a VHFWR2 amino acid sequence of SEQ ID NO: 6056, a VHFWR3 amino acid sequence of SEQ ID NO: 6057, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6058.

[00452] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH

comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6055 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6056 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6057 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6058.

[00453] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6113, a VLFWR2 amino acid sequence of SEQ ID NO: 6114, a VLFWR3 amino acid sequence of SEQ ID NO: 6115, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6116.

[00454] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6113 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6114 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6115 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6116.

[00455] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 6059, a VHFWR2 amino acid sequence of SEQ ID NO: 6060, a VHFWR3 amino acid sequence of SEQ ID NO: 6061, and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6062.

[00456] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising a VHFWR1 amino acid sequence of SEQ ID NO: 6059 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 6060 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 6061 (or a sequence with no more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 mutations, e.g., substitutions, additions, or deletions), and/or a VHFWR4 amino acid sequence of SEQ ID NO: 6062.

[00457] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 6117, a VLFWR2 amino acid sequence of SEQ ID NO: 6118, a VLFWR3 amino acid sequence of SEQ ID NO: 6119, and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6120.

[00458] In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising a VLFWR1 amino acid sequence of SEQ ID NO: 6117 (or a sequence with no more than 1, 2, or 3 mutations, e.g., substitutions, additions, or deletions), a VLFWR2 amino acid sequence of SEQ ID NO: 6118 (or a sequence with no more than 1 mutation, e.g., substitution, addition, or deletion), a VLFWR3 amino acid sequence of SEQ ID NO: 6119 (or a sequence with no more than 1

mutation, e.g., substitution, addition, or deletion), and/or a VLFWR4 amino acid sequence of SEQ ID NO: 6120.

[00459] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6148 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6148). In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6149 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6149). In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising the amino acid sequence of SEQ ID NO: 6150 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6150). In some embodiments, antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6148. In some embodiments, antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6149. In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising the amino acid sequence of SEQ ID NO: 6150.

[00460] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6148, and a VL comprising the amino acid sequence of SEQ ID NO: 6150. In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6149, and a VL comprising the amino acid sequence of SEQ ID NO: 6150.

[00461]

[00462] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6151 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6151). In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6152 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6152). In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising the amino acid sequence of SEQ ID NO: 6153 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6153). In some embodiments, antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6151. In some embodiments, antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6152. In some embodiments, the antigen binding domain that targets NKp30 comprises a VL comprising the amino acid sequence of SEQ ID NO: 6153.

[00463] In some embodiments, the antigen binding domain that targets NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6151, and a VL comprising the amino acid sequence of SEQ ID NO: 6153. In some embodiments, the antigen binding domain that targets

NKp30 comprises a VH comprising the amino acid sequence of SEQ ID NO: 6152, and a VL comprising the amino acid sequence of SEQ ID NO: 6153.

[00464] In some embodiments, the antigen binding domain that targets NKp30 comprises an scFv. In some embodiments, the scFv comprises an amino acid sequence selected from SEQ ID NOs: 6187-6190, or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity thereto.

Table 7. Exemplary heavy chain CDRs and FWRs of NKp30-targeting antigen binding domains

Ab ID	VHFWR1	VHCDR1	VHFWR2	VHCDR2	VHFWR3	VHCDR3	VHFWR4
9G1-HC	QIQLQESGPGLVKPSQSLSLTCSVTGFSIN (SEQ ID NO: 6003)	TGGYHWN (SEQ ID NO: 6000)	WIRQFPGKKLEWMG (SEQ ID NO: 6004)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RISITRDTSKNQFFLQLNSVTTEDTATYYCAR (SEQ ID NO: 6005)	GNWHYFDF (SEQ ID NO: 6002)	WGQGTMVTVSS (SEQ ID NO: 6006)
15H6-HC	QIQLQESGPGLVKPSQSLSLTCSVTGFSIN (SEQ ID NO: 6010)	TGGYHWN (SEQ ID NO: 6007)	WIRQFPGKKLEWMG (SEQ ID NO: 6011)	YIYSSGTTRYNPSLKS (SEQ ID NO: 6008)	RISITRDTSKNQFFLQLNSVTPEDTATYYCTR (SEQ ID NO: 6012)	GNWHYFDY (SEQ ID NO: 6009)	WGQGTLVAVSS (SEQ ID NO: 6013)
9G1-HC_1	QIQLQESGPGLVKPSETLSLTCTVSGFSIN (SEQ ID NO: 6014)	TGGYHWN (SEQ ID NO: 6000)	WIRQPAGKGLEWIG (SEQ ID NO: 6015)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RVTMSRDTSKNQFSLKLSSVTAADTAVYYCAR (SEQ ID NO: 6016)	GNWHYFDF (SEQ ID NO: 6002)	WGQGTMVTVSS (SEQ ID NO: 6017)
9G1-HC_2	QIQLQESGPGLVKPSQTLSLTCTVSGFSIN (SEQ ID NO: 6018)	TGGYHWN (SEQ ID NO: 6000)	WIRQHPGKGLEWIG (SEQ ID NO: 6019)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	LVTISRDTSKNQFSLKLSSVTAADTAVYYCAR (SEQ ID NO: 6020)	GNWHYFDF (SEQ ID NO: 6002)	WGQGTMVTVSS (SEQ ID NO: 6021)
9G1-HC_3	EIQLLESGGGLVQPGGSLRLSCAVSGFSIN (SEQ ID NO: 6022)	TGGYHWN (SEQ ID NO: 6000)	WVRQAPGKGLEWVG (SEQ ID NO: 6023)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: 6024)	GNWHYFDF (SEQ ID NO: 6002)	WGQGTMVTVSS (SEQ ID NO: 6025)
9G1-HC_4	QIQLVQSGAEVKKPGSSVKVSCKV	TGGYHWN (SEQ ID NO: 6000)	WVRQAPGQGLEWMG (SEQ	YIYSSGSTSYNPSLKS (SEQ	RVTITRDTSTNTFYMELSSLRSEDT	GNWHYFDF (SEQ ID NO: 6002)	WGQGTMVTVSS (SEQ ID NO: 6029)

	SGFSIN (SEQ ID NO: 6026)		ID NO: 6027)	ID NO: 6001)	AVYYCA R (SEQ ID NO: 6028)		
9G1-HC_5	EIQLVES GGGLVQ PGGSLR LSCAVS GFSIN (SEQ ID NO: 6030)	TGGYH WN (SEQ ID NO: 6000)	WVRQAP GKGLEW VG (SEQ ID NOL 6032)	YIYSSGS TSYNPSL KS (SEQ ID NO: 6001)	RFTISRD TAKNSF YLQMNS LRAEDT AVYYCA R (SEQ ID NO: 6033)	GNWHY FDF (SEQ ID NO: 6002)	WGQGT MVTVSS (SEQ ID NO: 6034)
9G1-HC_6	QIQLVQ SGAEVK KPGASV KVSCKV SGFSIN (SEQ ID NO: 6035)	TGGYH WN (SEQ ID NO: 6000)	WVRQAP GQGLEW MG (SEQ ID NO: 6036)	YIYSSGS TSYNPSL KS (SEQ ID NO: 6001)	RVTMTR DTSTNT FYMELS SLRSEDT AVYYCA R (SEQ ID NO: 6037)	GNWHY FDF (SEQ ID NO: 6002)	WGQGT MVTVSS (SEQ ID NO: 6038)
15H6-HC_1	QIQLQES GPGLVK PSQTLSL TCTVSG FSIN (SEQ ID NO: 6039)	TGGYH WN (SEQ ID NO: 6007)	WIRQHP GKGLEW IG (SEQ ID NO: 6040)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	LVTISRD TSKNQF SLKLSSV TAADTA VYYCAR (SEQ ID NO: 6041)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6042)
15H6-HC_2	QIQLQES GPGLVK PSETLSL TCTVSG FSIN (SEQ ID NO: 6043)	TGGYH WN (SEQ ID NO: 6007)	WIRQPA GKGLEW IG (SEQ ID NO: 6044)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	RVTMSR DTSKNQ FSLKLSS VTAADT AVYYCA R (SEQ ID NO: 6045)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6046)
15H6-HC_3	EIQLLES GGGLVQ PGGSLR LSCAVS GFSIN (SEQ ID NO: 6047)	TGGYH WN (SEQ ID NO: 6007)	WVRQAP GKGLEW VG (SEQ ID NO: 6048)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	RFTISRD TSKNTF YLQMNS LRAEDT AVYYCA R (SEQ ID NO: 6049)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6050)
15H6-HC_4	QIQLVES GGGLVK PGGSLR LSCAVS GFSIN (SEQ ID NO: 6051)	TGGYH WN (SEQ ID NO: 6007)	WIRQAP GKGLEW VG (SEQ ID NO: 6052)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	RFTISRD TAKNSF YLQMNS LRAEDT AVYYCA R (SEQ ID NO: 6053)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6054)
15H6-HC_5	QIQLVQ SGAEVK KPGASV	TGGYH WN (SEQ	WVRQAP GQGLEW MG (SEQ	YIYSSGT TRYNPS LKS	RVTMTR DTSTNT FYMELS	GNWHY FDY	WGQGTL VTVSS

	KVSCKVSGFSIN (SEQ ID NO: 6055)	ID NO: 6007)	ID NO: 6056)	(SEQ ID NO: 6008)	SLRSEDTAVYYCAR (SEQ ID NO: 6057)	(SEQ ID NO: 6009)	(SEQ ID NO: 6058)
15H6-HC_6	EIQLVQSGAEVKKPGATVKISCKVSGFSIN (SEQ ID NO: 6059)	TGGYHWN (SEQ ID NO: 6007)	WVQQAPGKGLEWMG (SEQ ID NO: 6060)	YIYSSGTTRYNPSLKS (SEQ ID NO: 6008)	RVTITRDTSTNTFYMELSSLRSEDTAVYYCAR (SEQ ID NO: 6061)	GNWHYFDY (SEQ ID NO: 6009)	WGQGTLVTVSS (SEQ ID NO: 6062)

Table 18. Exemplary heavy chain CDRs and FWRs of NKp30-targeting antigen binding domains (according to the Kabat numbering scheme)

Ab ID	VHFWR1	VHCDR1	VHFWR2	VHCDR2	VHFWR3	VHCDR3	VHFWR4
9G1-HC	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTG (SEQ ID NO: 7317)	GYHWN (SEQ ID NO: 7313)	WIRQFPGKKLEWMG (SEQ ID NO: 6004)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RISITRDTSKNQFFLQLNSVTTEDTATYYCAR (SEQ ID NO: 6005)	GNWHYFDF (SEQ ID NO: 6002)	WGQGTMVTVSS (SEQ ID NO: 6006)
15H6-HC	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTG (SEQ ID NO: 7317)	GYHWN (SEQ ID NO: 7313)	WIRQFPGKKLEWMG (SEQ ID NO: 6011)	YIYSSGTTRYNPSLKS (SEQ ID NO: 6008)	RISITRDTSKNQFFLQLNSVTPEDTATYYCTR (SEQ ID NO: 6012)	GNWHYFDY (SEQ ID NO: 6009)	WGQGTLVAVSS (SEQ ID NO: 6013)
9G1-HC_1	QIQLQESGPGLVKPSETLSLTCTVSGFSINTG (SEQ ID NO: 7371)	GYHWN (SEQ ID NO: 7313)	WIRQPAGKGLEWIG (SEQ ID NO: 6015)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RVTMSRDTSKNQFSLKLSSVTAADTAVYYCAR (SEQ ID NO: 6016)	GNWHYFDF (SEQ ID NO: 6002)	WGQGTMVTVSS (SEQ ID NO: 6017)
9G1-HC_2	QIQLQESGPGLVKPSQTLSLTCTVSGFSINTG (SEQ ID NO: 7372)	GYHWN (SEQ ID NO: 7313)	WIRQHPGKGLEWIG (SEQ ID NO: 6019)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	LVTISRDTSKNQFSLKLSSVTAADTAVYYCAR (SEQ ID NO: 6020)	GNWHYFDF (SEQ ID NO: 6002)	WGQGTMVTVSS (SEQ ID NO: 6021)
9G1-HC_3	EIQLLESGGGLVQPGGSLRLSCAVSGFSINTG	GYHWN (SEQ ID NO: 7313)	WVRQAPGKGLEWVG (SEQ ID NO: 6023)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RFTISRDTSKNTFYLQMNSLRAEDTAVYYCA	GNWHYFDF (SEQ ID NO: 6002)	WGQGTMVTVSS (SEQ ID NO: 6025)

	(SEQ ID NO: 7373)				R (SEQ ID NO: 6024)		
9G1-HC_4	QIQLVQ SGAEVK KPGSSV KVSCKV SGFSINT G (SEQ ID NO: 7374)	GYHWN (SEQ ID NO: 7313)	WVRQAP GQGLEW MG (SEQ ID NO: 6027)	YIYSSGS TSYNPSL KS (SEQ ID NO: 6001)	RVTITRD TSTNTF YMELSS LRSEDT AVYYCA R (SEQ ID NO: 6028)	GNWHY FDF (SEQ ID NO: 6002)	WGQGT MVTVSS (SEQ ID NO: 6029)
9G1-HC_5	EIQLVES GGGLVQ PGGSLR LSCAVS GFSINTG (SEQ ID NO: 7375)	GYHWN (SEQ ID NO: 7313)	WVRQAP GKGLEW VG (SEQ ID NOL 6032)	YIYSSGS TSYNPSL KS (SEQ ID NO: 6001)	RFTISRD TAKNSF YLQMNS LRAEDT AVYYCA R (SEQ ID NO: 6033)	GNWHY FDF (SEQ ID NO: 6002)	WGQGT MVTVSS (SEQ ID NO: 6034)
9G1-HC_6	QIQLVQ SGAEVK KPGASV KVSCKV SGFSINT G (SEQ ID NO: 7376)	GYHWN (SEQ ID NO: 7313)	WVRQAP GQGLEW MG (SEQ ID NO: 6036)	YIYSSGS TSYNPSL KS (SEQ ID NO: 6001)	RVTMTR DTSTNT FYMELS SLRSEDT AVYYCA R (SEQ ID NO: 6037)	GNWHY FDF (SEQ ID NO: 6002)	WGQGT MVTVSS (SEQ ID NO: 6038)
15H6-HC_1	QIQLQES GPGLVK PSQTLSL TCTVSG FSINTG (SEQ ID NO: 7372)	GYHWN (SEQ ID NO: 7313)	WIRQHP GKGLEW IG (SEQ ID NO: 6040)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	LVTISRD TSKNQF SLKLSSV TAADTA VYYCAR (SEQ ID NO: 6041)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6042)
15H6-HC_2	QIQLQES GPGLVK PSETLSL TCTVSG FSINTG (SEQ ID NO: 7371)	GYHWN (SEQ ID NO: 7313)	WIRQPA GKGLEW IG (SEQ ID NO: 6044)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	RVTMSR DTSKNQ FSLKLSS VTAADT AVYYCA R (SEQ ID NO: 6045)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6046)
15H6-HC_3	EIQLLES GGGLVQ PGGSLR LSCAVS GFSINTG (SEQ ID NO: 7373)	GYHWN (SEQ ID NO: 7313)	WVRQAP GKGLEW VG (SEQ ID NO: 6048)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	RFTISRD TSKNTF YLQMNS LRAEDT AVYYCA R (SEQ ID NO: 6049)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6050)
15H6-HC_4	QIQLVES GGGLVK PGGSLR LSCAVS	GYHWN (SEQ ID NO: 7313)	WIRQAP GKGLEW VG (SEQ	YIYSSGT TRYNPS LKS	RFTISRD TAKNSF YLQMNS LRAEDT	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6054)

	GFSINTG (SEQ ID NO: 7377)		ID NO: 6052)	(SEQ ID NO: 6008)	AVYYCA R (SEQ ID NO: 6053)		
15H6-HC_5	QIQLVQ SGAEVK KPGASV KVSCKV SGFSINT G (SEQ ID NO: 7376)	GYHWN (SEQ ID NO: 7313)	WVRQAP GQGLEW MG (SEQ ID NO: 6056)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	RVTMTR DTSTNT FYMELS SLRSEDT AVYYCA R (SEQ ID NO: 6057)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6058)
15H6-HC_6	EIQLVQS GAEVKK PGATVK ISCKVSG FSINTG (SEQ ID NO: 7378)	GYHWN (SEQ ID NO: 7313)	WVQQA PGKGLE WMG (SEQ ID NO: 6060)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	RVTITRD TSTNTF YMELSS LRSEDT AVYYCA R (SEQ ID NO: 6061)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VTVSS (SEQ ID NO: 6062)
9D9-HC	QIQLQES GPGLVK PSQSLSL SCSVTG FSINTG (SEQ ID NO: 7312)	GYHWN (SEQ ID NO: 7313)	WIRQFP GKKVE WMG (SEQ ID NO: 7314)	YIYSSGT TKYNPS LKS (SEQ ID NO: 7385)	RISITRD TSKNQF FLQLNS VTTEDT ATYYCA R (SEQ ID NO: 6005)	GDWHY FDY (SEQ ID NO: 7315)	WGQGT MVAVSS (SEQ ID NO: 7316)
3A12-HC	QIQLQES GPGLVK PSQSLSL TCSVTG FSINTG (SEQ ID NO: 7317)	GYHWN (SEQ ID NO: 7313)	WIRQFP GKKLEW MG (SEQ ID NO: 6004)	YIYSSGS TRYNPS LKS (SEQ ID NO: 7318)	RFSITRD TSKNQF FLQLNS VTTEDT ATYYCT R (SEQ ID NO: 7319)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VAVSS (SEQ ID NO: 6013)
12D10-HC	QIQLQES GPGLVK PSQSLSL TCSVTG FSINTG (SEQ ID NO: 7317)	GYHWN (SEQ ID NO: 7313)	WIRQFP GKKLEW MG (SEQ ID NO: 6004)	YIYSSGT TRYNPS LKS (SEQ ID NO: 6008)	RISITRD TSKNQF FLQLNS VTPEDT ATYYCT R (SEQ ID NO: 6012)	GNWHY FDY (SEQ ID NO: 6009)	WGQGTL VAVSS (SEQ ID NO: 6013)
15E1-HC	QIQLQES GPGLVK PSQSLSL SCSVTG FSITTT (SEQ ID NO: 7322)	GYHWN (SEQ ID NO: 7313)	WIRQFP GKKLEW MG (SEQ ID NO: 6004)	YIYSSGS TSYNPSL KS (SEQ ID NO: 6001)	RFSITRD TSKNQF FLQLNS VTTEDT ATYYCA R (SEQ ID NO: 7323)	GDWHY FDY (SEQ ID NO: 7315)	WGPGT MVTVSS (SEQ ID NO: 7324)

15E1_Humanized variant_VH 1	QIQLQESGPGLVKPSQTLSLTCTVSGFSITTT (SEQ ID NO: 7330)	GYHWN (SEQ ID NO: 7313)	WIRQHPGKGLEWIG (SEQ ID NO: 6019)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	LVTISRDTSKNQFSLKLSSVTAADTAVYYCAR (SEQ ID NO: 6020)	GDWHYFDY (SEQ ID NO: 7315)	WGQGTMVTVSS (SEQ ID NO: 6006)
15E1_Humanized variant_VH 2	QIQLVESGGGLVKPGGSLRLSCAVSGFSITTT (SEQ ID NO: 7331)	GYHWN (SEQ ID NO: 7313)	WIRQAPGKGLEWVG (SEQ ID NO: 6052)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RFTISRDTAKNSFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: 6033)	GDWHYFDY (SEQ ID NO: 7315)	WGQGTMVTVSS (SEQ ID NO: 6006)
15E1_Humanized variant_VH 3	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTT (SEQ ID NO: 7332)	GYHWN (SEQ ID NO: 7313)	WVRQAPGKGLEWVG (SEQ ID NO: 6023)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: 6024)	GDWHYFDY (SEQ ID NO: 7315)	WGQGTMVTVSS (SEQ ID NO: 6006)
15E1_Humanized variant_VH 4	EIQLVESGGGLVQPGGSLRLSCAVSGFSITTT (SEQ ID NO: 7333)	GYHWN (SEQ ID NO: 7313)	WVRQAPGKGLEWVG (SEQ ID NO: 6023)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RFTISRDTAKNSFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: 6033)	GDWHYFDY (SEQ ID NO: 7315)	WGQGTMVTVSS (SEQ ID NO: 6006)
15E1_Humanized variant_VH 5	QIQLVQSGAEVKKPGASVKVSCKVSGFSITTT (SEQ ID NO: 7334)	GYHWN (SEQ ID NO: 7313)	WVRQAPGQGLEWMG (SEQ ID NO: 6027)	YIYSSGSTSYNPSLKS (SEQ ID NO: 6001)	RVTMTRDTSTNTFYMELSSLRSEDTAVYYCAR (SEQ ID NO: 6037)	GDWHYFDY (SEQ ID NO: 7315)	WGQGTMVTVSS (SEQ ID NO: 6006)

Table 8. Exemplary light chain CDRs and FWRs of NKp30-targeting antigen binding domains

Ab ID	VLFWR1	VLCDR1	VLFWR2	VLCDR2	VLFWR3	VLCDR3	VLFWR4
9G1-LC	SYTLTQPPLLSVALGHKATITC (SEQ ID NO: 6066)	SGERLSDKYVH (SEQ ID NO: 6063)	WYQQKPGRAPVMVIY (SEQ ID NO: 6067)	ENDKRPS (SEQ ID NO: 6064)	GIPDQFSGSNSGNIATLTISKAQAGYEADYYC (SEQ ID NO: 7292)	QSWDSTNSAV (SEQ ID NO: 7293)	FGSGTQLTVL (SEQ ID NO: 6069)
15H6-LC	SYTLTQPPSLSVAPGQKATIIC (SEQ	SGENLSDKYVH (SEQ ID NO: 6070)	WYQQKPGRAPVMVIY	ENEKRPS (SEQ ID NO: 6071)	GIPDQFSGSNSGNIATLTISKAQPGSE	HYWESINSVV (SEQ ID NO: 6072)	FGSGTHLTVL (SEQ ID NO: 6076)

	ID NO: 6073)		(SEQ ID NO: 6074)		ADYYC (SEQ ID NO: 6075)		
9G1-LC_1	QSVTTQPPSVSGAPGQRVTISC (SEQ ID NO: 6077)	SGERLSDKYVH (SEQ ID NO: 6063)	WYQQLPGTAPKMLIY (SEQ ID NO: 6078)	ENDKRPS (SEQ ID NO: 6064)	GVPDRFSGSNSGNSASLAITGLQAEDEADYYC (SEQ ID NO: 6079)	QSWDSTNSAV (SEQ ID NO: 7293)	FGGGTQLTVL (SEQ ID NO: 6080)
9G1-LC_2	QSVTTQPPSASGTPGQRVTISC (SEQ ID NO: 6081)	SGERLSDKYVH (SEQ ID NO: 6063)	WYQQLPGTAPKMLIY (SEQ ID NO: 6082)	ENDKRPS (SEQ ID NO: 6064)	GVPDRFSGSNSGNSASLAISGLQSEDEADYYC (SEQ ID NO: 6083)	QSWDSTNSAV (SEQ ID NO: 7293)	FGGGTQLTVL (SEQ ID NO: 6084)
9G1-LC_3	QSVTTQPPSASGTPGQRVTISC (SEQ ID NO: 6085)	SGERLSDKYVH (SEQ ID NO: 6063)	WYQQLPGTAPKMLIY (SEQ ID NO: 6086)	ENDKRPS (SEQ ID NO: 6064)	GVPDRFSGSNSGNSASLAISGLRSEDEADYYC (SEQ ID NO: 6087)	QSWDSTNSAV (SEQ ID NO: 7293)	FGGGTQLTVL (SEQ ID NO: 6088)
9G1-LC_4	SSETTQPHSVSVATAQMARITC (SEQ ID NO: 6089)	SGERLSDKYVH (SEQ ID NO: 6063)	WYQQKPGQDPVMVIY (SEQ ID NO: 6090)	ENDKRPS (SEQ ID NO: 6064)	GIPERFSGSNPGNTATLTISRIEAGDEADYYC (SEQ ID NO: 6091)	QSWDSTNSAV (SEQ ID NO: 7293)	FGGGTQLTVL (SEQ ID NO: 6092)
9G1-LC_5	DIQMTQSPSTLSASVGDRVTITC (SEQ ID NO: 6093)	SGERLSDKYVH (SEQ ID NO: 6063)	WYQQKPGKAPKMLIY (SEQ ID NO: 6094)	ENDKRPS (SEQ ID NO: 6064)	GVPSRFSGSNSGNEATLTISSLQPDDFATYYC (SEQ ID NO: 6095)	QSWDSTNSAV (SEQ ID NO: 7293)	FGQGTKVEIK (SEQ ID NO: 6096)
15H6-LC_1	QYVLTQPPSASGTPGQRVTISC (SEQ ID NO: 6097)	SGENLSDKYVH (SEQ ID NO: 6070)	WYQQLPGTAPKMLIY (SEQ ID NO: 6098)	ENEKRPS (SEQ ID NO: 6071)	GVPDRFSGSNSGNSASLAISGLQSEDEADYYC (SEQ ID NO: 6099)	HYWESINSVV (SEQ ID NO: 6072)	FGEGTELTVL (SEQ ID NO: 6100)
15H6-LC_2	QYVLTQPPSASGTPGQRVTISC (SEQ	SGENLSDKYVH (SEQ ID NO: 6070)	WYQQLPGTAPKMLIY (SEQ ID NO: 6102)	ENEKRPS (SEQ ID NO: 6071)	GVPDRFSGSNSGNSASLAISGLRSEDEADYY	HYWESINSVV (SEQ ID NO: 6072)	FGEGTELTVL (SEQ ID NO: 6104)

	ID NO: 6101)				C (SEQ ID NO: 6103)		
15H6-LC_3	SYELTQ PPSVSVS PGQTASI TC (SEQ ID NO: 6105)	SGENLS DKYVH (SEQ ID NO: 6070)	WYQQK PGQSPV MVIY (SEQ ID NO: 6106)	ENEKRP S (SEQ ID NO: 6071)	GIPERFS GSNSGN TATLTIS GTQAM DEADYY C (SEQ ID NO: 6107)	HYWESI NSVV (SEQ ID NO: 6072)	FGEGTE LTVL (SEQ ID NO: 6108)
15H6-LC_4	DYVLTQ SPLSLPV TPGEPAS ISC (SEQ ID NO: 6109)	SGENLS DKYVH (SEQ ID NO: 6070)	WYLQKP GQSPQM LIY (SEQ ID NO: 6110)	ENEKRP S (SEQ ID NO: 6071)	GVPDRF SGSNSG NDATLK ISRVEAE DVGVYY C (SEQ ID NO: 6111)	HYWESI NSVV (SEQ ID NO: 6072)	FGQGTK VEIK (SEQ ID NO: 6112)
15H6-LC_5	AYQLTQ SPSSLSA SVGDRV TITC (SEQ ID NO: 6113)	SGENLS DKYVH (SEQ ID NO: 6070)	WYQQK PGKAPK MLIY (SEQ ID NO: 6114)	ENEKRP S (SEQ ID NO: 6071)	GVPSRFS GSNSGN DATLTIS SLQPEDF ATYYC (SEQ ID NO: 6115)	HYWESI NSVV (SEQ ID NO: 6072)	FGQGTK VEIK (SEQ ID NO: 6116)
15H6-LC_6	EYVLTQ SPATLSV SPGERA TLSC (SEQ ID NO: 6117)	SGENLS DKYVH (SEQ ID NO: 6070)	WYQQK PGQAPR MLIY (SEQ ID NO: 6118)	ENEKRP S (SEQ ID NO: 6071)	GIPARFS GSNSGN EATLTIS SLQSEDF AVYYC (SEQ ID NO: 6119)	HYWESI NSVV (SEQ ID NO: 6072)	FGQGTK VEIK (SEQ ID NO: 6120)
9D9-LC	SYTLTQ PPLVSV ALGQKA TIIC (SEQ ID NO: 7320)	SGENLS DKYVH (SEQ ID NO: 6070)	WYQQK PGRAPV MVIY (SEQ ID NO: 6067)	ENDKRP S (SEQ ID NO: 6064)	GIPDQFS GSNSGNI ATLTISK AQAGYE ADYYC (SEQ ID NO: 7292)	HCWDST NSAV (SEQ ID NO: 7321)	FGSGTH LTVL (SEQ ID NO: 6076)
3A12-LC	SYTLTQ PPLVSV ALGQKA TIIC (SEQ ID NO: 7320)	SGENLS DKYVH (SEQ ID NO: 6070)	WYQQK PGRAPV MVIY (SEQ ID NO: 6067)	ENDKRP S (SEQ ID NO: 6064)	GIPDQFS GSNSGNI ATLTISK AQAGYE ADYYC (SEQ ID NO: 7292)	HCWDST NSAV (SEQ ID NO: 7321)	FGSGTH LTVL (SEQ ID NO: 6076)
12D10-LC	SYTLTQ PPSLSVA PGQKAT IIC (SEQ ID NO: 6073)	SGENLS DKYVH (SEQ ID NO: 6070)	WYQQK PGRAPV MVIY (SEQ ID NO: 6074)	ENEKRP S (SEQ ID NO: 6071)	GIPDQFS GSNSGNI ATLTISK AQPGSE ADYYC (SEQ ID NO: 6075)	HYWESI NSVV (SEQ ID NO: 6072)	FGSGTH LTVL (SEQ ID NO: 6076)

15E1-LC	SFTLTQPPLVSVAVGQVATITC (SEQ ID NO: 7325)	SGEKLSDKYVH (SEQ ID NO: 7326)	WYQQKPGRAPVMVIY (SEQ ID NO: 6067)	ENDRRPS (SEQ ID NO: 7327)	GIPDQFSGSNSGNIASLTISKAQAGDEADYFC (SEQ ID NO: 7328)	QFWDSTNSAV (SEQ ID NO: 7329)	FGGGTQLTVL (SEQ ID NO: 6080)
15E1_Humanized variant_VL1	SSETTQPPSVSVSPGQTASITC (SEQ ID NO: 7335)	SGEKLSDKYVH (SEQ ID NO: 7326)	WYQQKPGQSPVMVIY (SEQ ID NO: 6106)	ENDRRPS (SEQ ID NO: 7327)	GIPERFSGSNSGNTATLTISGTQAMDEADYFC (SEQ ID NO: 7336)	QFWDSTNSAV (SEQ ID NO: 7329)	FGGGTQLTVL (SEQ ID NO: 6080)
15E1_Humanized variant_VL2	SSETTQPHSVSVATAQMARITC (SEQ ID NO: 6089)	SGEKLSDKYVH (SEQ ID NO: 7326)	WYQQKPGQDPVMVIY (SEQ ID NO: 6090)	ENDRRPS (SEQ ID NO: 7327)	GIPERFSGSNPGNTATLTISRIEAGDEADYFC (SEQ ID NO: 7337)	QFWDSTNSAV (SEQ ID NO: 7329)	FGGGTQLTVL (SEQ ID NO: 6080)
15E1_Humanized variant_VL3	QSVTTQPPSASGTPGQRVTISC (SEQ ID NO: 6081)	SGEKLSDKYVH (SEQ ID NO: 7326)	WYQQLPGTAPKMLIY (SEQ ID NO: 6078)	ENDRRPS (SEQ ID NO: 7327)	GVPDRFSGSNSGNSASLAISGLRSEDEADYFC (SEQ ID NO: 7338)	QFWDSTNSAV (SEQ ID NO: 7329)	FGGGTQLTVL (SEQ ID NO: 6080)
15E1_Humanized variant_VL4	QSVTTQPPSVSGAPGQRVTISC (SEQ ID NO: 6077)	SGEKLSDKYVH (SEQ ID NO: 7326)	WYQQLPGTAPKMLIY (SEQ ID NO: 6078)	ENDRRPS (SEQ ID NO: 7327)	GVPDRFSGSNSGNSASLAITGLQAEDEADYFC (SEQ ID NO: 7339)	QFWDSTNSAV (SEQ ID NO: 7329)	FGGGTQLTVL (SEQ ID NO: 6080)
15E1_Humanized variant_VL5	DSVTTQSPLSLPVTLGQPASISC (SEQ ID NO: 7340)	SGEKLSDKYVH (SEQ ID NO: 7326)	WYQQRPGQSPRMLIY (SEQ ID NO: 7341)	ENDRRPS (SEQ ID NO: 7327)	GVPDRFSGSNSGNDATLKISRVEAEDVGVYFC (SEQ ID NO: 7342)	QFWDSTNSAV (SEQ ID NO: 7329)	FGGGTKVEIK (SEQ ID NO: 233)

Table 8A. Exemplary heavy chain CDRs and FWRs of NKp30-targeting antigen binding domains

Ab ID	VHFWR1	VHCDR1	VHFWR2	VHCDR2	VHFWR3	VHCDR3	VHFWR4
BKM0138	EIQLLESGGGLVQPGGSLRLSCAVS	ITTTGYHWN (SEQ ID NO: C019)	WVRQAPGKGLEWVG (SEQ	YIYSSGSTSYNPSLKS (SEQ	RFTISRDTSKNTFYLQMNSLRAEDT	GDWHYFDY (SEQ ID	WGQGTMVTVSS (SEQ ID

	GFS (SEQ ID NO: C018)		ID NO: C020)	ID NO: C021)	AVYYCAR (SEQ ID NO: C022)	NO: C023)	NO: C024)
BKM 0139	EIQLLESGGGLVQPGGSLRLSCAVSGFS (SEQ ID NO: C032)	ITTTGYHWN (SEQ ID NO: C033)	WVRQAPGKGLEWVG (SEQ ID NO: C034)	YIYSSGSTSYNPSLKS (SEQ ID NO: C035)	RFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: C036)	GDWHYFDY (SEQ ID NO: C037)	WGQGTMVTVSS (SEQ ID NO: C038)
BKM 0140	EIQLLESGGGLVQPGGSLRLSCAVSGFS (SEQ ID NO: C046)	ITTTGYHWN (SEQ ID NO: C047)	WVRQAPGKGLEWVG (SEQ ID NO: C048)	YIYSSGSTSYNPSLKS (SEQ ID NO: C049)	RFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: C050)	GDWHYFDY (SEQ ID NO: C051)	WGQGTMVTVSS (SEQ ID NO: C052)
BKM 0141	EIQLLESGGGLVQPGGSLRLSCAVSGFS (SEQ ID NO: C060)	ITTTGYHWN (SEQ ID NO: C061)	WVRQAPGKGLEWVG (SEQ ID NO: C062)	YIYSSGSTSYNPSLKS (SEQ ID NO: C063)	RFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: C064)	GDWHYFDY (SEQ ID NO: C065)	WGQGTMVTVSS (SEQ ID NO: C066)
BKM 0142	EIQLLESGGGLVQPGGSLRLSCAVSGFS (SEQ ID NO: C074)	ITTTGYHWN (SEQ ID NO: C075)	WVRQAPGKGLEWVG (SEQ ID NO: C076)	YIYSSGSTSYAPSLKS (SEQ ID NO: C077)	RFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: C078)	GDWHYFDY (SEQ ID NO: C079)	WGQGTMVTVSS (SEQ ID NO: C080)
BKM 0143	EIQLLESGGGLVQPGGSLRLSCAVSGFS (SEQ ID NO: C088)	ITTTGYHWN (SEQ ID NO: C089)	WVRQAPGKGLEWVG (SEQ ID NO: C090)	YIYSSGSTSYAPSLKS (SEQ ID NO: C091)	RFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: C092)	GDWHYFDY (SEQ ID NO: C093)	WGQGTMVTVSS (SEQ ID NO: C094)
BKM 0144	EIQLLESGGGLVQPGGSLRLSCAVSGFS (SEQ ID NO: C102)	ITTTGYHWN (SEQ ID NO: C103)	WVRQAPGKGLEWVG (SEQ ID NO: C104)	YIYSSGSTSYAPSLKS (SEQ ID NO: C105)	RFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR (SEQ ID NO: C106)	GDWHYFDY (SEQ ID NO: C107)	WGQGTMVTVSS (SEQ ID NO: C108)
BKM 0145	EIQLLESGGGLVQ	ITTTGYHWN (SEQ	WVRQAPGKGLEW	YIYSSGSTSYAPSL	RFTISRDTSKNTF	GDWHYFDY	WGQGTMVTVSS

	PGGSLR LSCAVS GFS (SEQ ID NO: C115)	ID NO: C116)	VG (SEQ ID NO: C117)	KS (SEQ ID NO: C118)	YLQMNS LRAEDT AVYYCA R (SEQ ID NO: C119)	(SEQ ID NO: C120)	(SEQ ID NO: C121)

Table 8B. Exemplary light chain CDRs and FWRs of NKp30-targeting antigen binding domains

Ab ID	VLFWR1	VLCDR1	VLFWR2	VLCDR2	VLFWR3	VLCDR3	VLFWR4
BKM0 138	DSVTTQ SPLSLPV TLGQPA SISC (SEQ ID NO: C025)	SGEKLS DKYVH (SEQ ID NO: C026)	WYQQRP GQSPRM LIY (SEQ ID NO: C027)	ENDRRP S (SEQ ID NO: C028)	GVPDRF SGSNSG NDATLKI SRVEAE DVGVYF C (SEQ ID NO: C029)	QFWDST ASAV (SEQ ID NO: C030)	FGGGTK VEIK (SEQ ID NO: C031)
BKM0 139	DSVTTQ SPLSLPV TLGQPA SISC (SEQ ID NO: C039)	SGEKLS DKYVH (SEQ ID NO: C040)	WYQQRP GQSPRM LIY (SEQ ID NO: C041)	ENDRRP S (SEQ ID NO: C042)	GVPDRF SGSNSG NDATLKI SRVEAE DVGVYF C (SEQ ID NO: C043)	QFWAST NSAV (SEQ ID NO: C044)	FGGGTK VEIK (SEQ ID NO: C045)
BKM0 140	SSETTQP PSVSVSP GQTASIT C (SEQ ID NO: C053)	SGEKLS DKYVH (SEQ ID NO: C054)	WYQQKP GQSPVM VIY (SEQ ID NO: C055)	ENDRRP S (SEQ ID NO: C056)	GIPERFS GSNSGN TATLTIS GTQAMD EADYFC (SEQ ID NO: C057)	QFWAST NSAV (SEQ ID NO: C058)	FGGGTQ LTVL (SEQ ID NO: C059)
BKM0 141	SSETTQP PSVSVSP GQTASIT C (SEQ ID NO: C067)	SGEKLS DKYVH (SEQ ID NO: C068)	WYQQKP GQSPVM VIY (SEQ ID NO: C069)	ENDRRP S (SEQ ID NO: C070)	GIPERFS GSNSGN TATLTIS GTQAMD EADYFC (SEQ ID NO: C071)	QFWDST ASAV (SEQ ID NO: C072)	FGGGTQ LTVL (SEQ ID NO: C073)
BKM0 142	DSVTTQ SPLSLPV TLGQPA SISC (SEQ ID NO: C081)	SGEKLS DKYVH (SEQ ID NO: C082)	WYQQRP GQSPRM LIY (SEQ ID NO: C083)	ENDRRP S (SEQ ID NO: C084)	GVPDRF SGSNSG NDATLKI SRVEAE DVGVYF C (SEQ ID NO: C085)	QFWDST NSAV (SEQ ID NO: C086)	FGGGTK VEIK (SEQ ID NO: C087)
BKM0 143	SSETTQP PSVSVSP GQTASIT C (SEQ ID NO: C095)	SGEKLS DKYVH (SEQ ID NO: C096)	WYQQKP GQSPVM VIY (SEQ ID NO: C097)	ENDRRP S (SEQ ID NO: C098)	GIPERFS GSNSGN TATLTIS GTQAMD EADYFC (SEQ ID NO: C099)	QFWDST NSAV (SEQ ID NO: C100)	FGGGTQ LTVL (SEQ ID NO: C101)

BKM0144	DSVTTQSPLSLPVTLGQPASISC (SEQ ID NO: C109)	SGEKLSDKYVH (SEQ ID NO: C110)	WYQQRPGQSPRMLIY (SEQ ID NO: C111)	ENDRRPS (SEQ ID NO: C112)	GVPDRFSGSNSGNDATLKISRVEAEDVGVYFC (SEQ ID NO: C085)	QFWASTASAV (SEQ ID NO: C113)	FGGGTKVEIK (SEQ ID NO: C114)
BKM0145	SSETTQPPSVSVSPGQTASITC (SEQ ID NO: C122)	SGEKLSDKYVH (SEQ ID NO: C123)	WYQQKPGQSPVMVIY (SEQ ID NO: C124)	ENDRRPS (SEQ ID NO: C125)	GIPERFSGSNSGNTATLTISGTQAMDEADYFC (SEQ ID NO: C126)	QFWASTASAV (SEQ ID NO: C127)	FGGGTQLTVL (SEQ ID NO: C128)

Table 9. Exemplary variable regions of NKp30-targeting antigen binding domains

SEQ ID NO	Ab ID	Description	Sequence
SEQ ID NO: 6121	9G1-HC	9G1 heavy chain variable region	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGYHWNWIRQFPGKKLEWMGYIYSSGSTSYNPSLKSRISITRDTSKNQFFLQLNSVTTEDTATYYCARGNWHYFDFWGQGTMVTVSS
SEQ ID NO: 6122	15H6-HC	15H6 heavy chain variable region	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGYHWNWIRQFPGKKLEWMGYIYSSGTTRYNPSLKSRISITRDTSKNQFFLQLNSVTPEDTATYYCTRGNWHYFDYWGQGTLVAVSS
SEQ ID NO: 6123	9G1-HC_1	9G1 heavy chain variable region humanized variant 1	QIQLQESGPGLVKPSETLSLTCTVSGFSINTGGYHWNWIRQPAGKGLEWIGYIYSSGSTSYNPSLKSRVTMSRDTSKNQFSLKLSSVTAADTAVYYCARGNWHYFDFWGQGTMVTVSS
SEQ ID NO: 6124	9G1-HC_2	9G1 heavy chain variable region humanized variant 2	QIQLQESGPGLVKPSQTLSLTCTVSGFSINTGGYHWNWIRQHPGKGLEWIGYIYSSGSTSYNPSLKSLVTISRDTSKNQFSLKLSSVTAADTAVYYCARGNWHYFDFWGQGTMVTVSS
SEQ ID NO: 6125	9G1-HC_3	9G1 heavy chain variable region humanized variant 3	EIQLLESGGGLVQPGGSLRLSCAVSGFSINTGGYHWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLKSRFTISRDTSKNTFYLQMNSLRAEDTAVYYCARGNWHYFDFWGQGTMVTVSS
SEQ ID NO: 6126	9G1-HC_4	9G1 heavy chain variable region humanized variant 4	QIQLVQSGAEVKKPGSSVKVSCKVSGFSINTGGYHWNWVRQAPGQGLEWMGYIYSSGSTSYNPSLKSRVTITRDTSTNTFYMELSSLRSEDTAVYYCARGNWHYFDFWGQGTMVTVSS
SEQ ID NO: 6127	9G1-HC_5	9G1 heavy chain variable region humanized variant 5	EIQLVESGGGLVQPGGSLRLSCAVSGFSINTGGYHWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLKSRFTISRDTAKNSFYLQMNSLRAEDTAVYYCARGNWHYFDFWGQGTMVTVSS
SEQ ID NO: 6128	9G1-HC_6	9G1 heavy chain variable region humanized variant 6	QIQLVQSGAEVKKPGASVKVSCKVSGFSINTGGYHWNWVRQAPGQGLEWMGYIYSSGSTSYNPSLKSRVTMTRDTSTNTFYMELSSLRSEDTAVYYCARGNWHYFDFWGQGTMVTVSS
SEQ ID NO: 6129	15H6-HC_1	15H6 heavy chain variable	QIQLQESGPGLVKPSQTLSLTCTVSGFSINTGGYHWNWIRQHPGKGLEWIGYIYSSGTTRYNPSLKS

		region humanized variant 1	LVTISRDTSKNQFSLKLSSVTAADTAVYYCARG NWHYFDYWGQGTLVTVSS
SEQ ID NO: 6130	15H6-HC_2	15H6 heavy chain variable region humanized variant 2	QIQLQESGPGLVKPSETLSLTCTVSGFSINTGGYH WNWIRQPAGKGLEWIGYIYSSGTTRYNPSLKSR VTMSRDTSKNQFSLKLSSVTAADTAVYYCARG NWHYFDYWGQGTLVTVSS
SEQ ID NO: 6131	15H6-HC_3	15H6 heavy chain variable region humanized variant 3	EIQLLESGGGLVQPGGSLRLSCAVSGFSINTGGY HWNWVRQAPGKGLEWVGYIYSSGTTRYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GNWHYFDYWGQGTLVTVSS
SEQ ID NO: 6132	15H6-HC_4	15H6 heavy chain variable region humanized variant 4	QIQLVESGGGLVKPGGSLRLSCAVSGFSINTGGY HWNWIRQAPGKGLEWVGYIYSSGTTRYNPSLK SRFTISRDTAKNSFYLQMNSLRAEDTAVYYCAR GNWHYFDYWGQGTLVTVSS
SEQ ID NO: 6133	15H6-HC_5	15H6 heavy chain variable region humanized variant 5	QIQLVQSGAEVKKPGASVKVSCKVSGFSINTGG YHWNWVRQAPGQGLEWMGYIYSSGTTRYNPS LKSRVTMTRDTSTNTFYMELSSLRSEDTAVYYC ARGNWHYFDYWGQGTLVTVSS
SEQ ID NO: 6134	15H6-HC_6	15H6 heavy chain variable region humanized variant 6	EIQLVQSGAEVKKPGATVKISCKVSGFSINTGGY HWNWVQQAPGKGLEWMGYIYSSGTTRYNPSL KSRVTITRDTSTNTFYMELSSLRSEDTAVYYCAR GNWHYFDYWGQGTLVTVSS
SEQ ID NO: 7294	9G1-LC	9G1 light chain variable region	SYTLTQPPLLSVALGHKATITCSGERLSDKYVH WYQQKPGRAPVMVIYENDKRPSGIPDQFSGSNS GNIATLTISKAQAGYEADYYCQSWDSTNSAVFG SGTQLTVL
SEQ ID NO: 6136	15H6-LC	15H6 light chain variable region	SYTLTQPPSLSVAPGQKATIICSGENLSDKYVHW YQQKPGRAPVMVIYENEKRPSGIPDQFSGSNSG NIATLTISKAQPGSEADYYCHYWESINSVVFGSG THLTVL
SEQ ID NO: 6137	9G1-LC_1	9G1 light chain variable region humanized variant 1	QSVTTQPPSVSGAPGQRVTISCSGERLSDKYVH WYQQLPGTAPKMLIYENDKRPSGVPDRFSGSNS GNSASLAITGLQAEDEADYYCQSWDSTNSAVFG GGTQLTVL
SEQ ID NO: 6138	9G1-LC_2	9G1 light chain variable region humanized variant 2	QSVTTQPPSASGTPGQRVTISCSGERLSDKYVH WYQQLPGTAPKMLIYENDKRPSGVPDRFSGSNS GNSASLAISGLQSEDEADYYCQSWDSTNSAVFG GGTQLTVL
SEQ ID NO: 6139	9G1-LC_3	9G1 light chain variable region humanized variant 3	QSVTTQPPSASGTPGQRVTISCSGERLSDKYVH WYQQLPGTAPKMLIYENDKRPSGVPDRFSGSNS GNSASLAISGLRSEDEADYYCQSWDSTNSAVFG GGTQLTVL
SEQ ID NO: 6140	9G1-LC_4	9G1 light chain variable region humanized variant 4	SSETTQPHSVSVATAQMARITCSGERLSDKYVH WYQQKPGQDPVMVIYENDKRPSGIPERFSGSNP GNTATLTISRIEAGDEADYYCQSWDSTNSAVFG GGTQLTVL
SEQ ID NO: 6141	9G1-LC_5	9G1 light chain variable region humanized variant 5	DIQMTQSPSTLSASVGDRVTITCSGERLSDKYVH WYQQKPGKAPKMLIYENDKRPSGVPSRFSGSNS GNEATLTISSLQPDDFATYYCQSWDSTNSAVFG QGTKVEIK
SEQ ID NO: 6142	15H6-LC_1	15H6 light chain variable region humanized variant 1	QYVLTQPPSASGTPGQRVTISCSGENLSDKYVH WYQQLPGTAPKMLIYENEKRPSGVPDRFSGSNS GNSASLAISGLQSEDEADYYCHYWESINSVVFG EGTELTVL

SEQ ID NO: 6143	15H6-LC_2	15H6 light chain variable region humanized variant 2	QYVLTQPPSASGTPGQRVTISCSGENLSDKYVH WYQQLPGTAPKMLIYENEKRPSGVPDRFSGSNS GNSASLAISGLRSEDEADYYCHYWESINSVVFG EGTELTVL
SEQ ID NO: 6144	15H6-LC_3	15H6 light chain variable region humanized variant 3	SYELTQPPSVSVSPGQTASITCSGENLSDKYVHW YQQKPGQSPVMVIYENEKRPSGIPERFSGSNSGN TATLTISGTQAMDEADYYCHYWESINSVVFGEG TELTVL
SEQ ID NO: 6145	15H6-LC_4	15H6 light chain variable region humanized variant 4	DYVLTQSPLSLPVTPGEPASISCSGENLSDKYVH WYLQKPGQSPQMLIYENEKRPSGVPDRFSGSNS GNDATLKISRVEAEDVGVYYCHYWESINSVVFG QGTKVEIK
SEQ ID NO: 6146	15H6-LC_5	15H6 light chain variable region humanized variant 5	AYQLTQSPSSLSASVGDRVTITCSGENLSDKYVH WYQQKPGKAPKMLIYENEKRPSGVPSRFSGSNS GNDATLTISSLQPEDFATYYCHYWESINSVVFGQ GTKVEIK
SEQ ID NO: 6147	15H6-LC_6	15H6 light chain variable region humanized variant 6	EYVLTQSPATLSVSPGERATLSCSGENLSDKYVH WYQQKPGQAPRMLIYENEKRPSGIPARFSGSNS GNEATLTISSLQSEDFAVYYCHYWESINSVVFGQ GTKVEIK
SEQ ID NO: 7295	9D9-HC	9D9 heavy chain variable region	QIQLQESGPGLVKPSQSLSLSCSVTGFSINTGGYH WNWIRQFPGKKVEWMGYIYSSGTTKYNPSLKS RISITRDTSKNQFFLQLNSVTTEDTATYYCARGD WHYFDYWGQGTMVAVSS
SEQ ID NO: 7296	9D9-LC	9D9 light chain variable region	SYTLTQPPLVSVALGQKATIICSGENLSDKYVH WYQQKPGRAPVMVIYENDKRPSGIPDQFSGSNS GNIATLTISKAQAGYEADYYCHCWDSTNSAVFG SGTHLTVL
SEQ ID NO: 7297	3A12-HC	3A12 heavy chain variable region	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGY HWNWIRQFPGKKLEWMGYIYSSGSTRYNPSLKS RFSITRDTSKNQFFLQLNSVTTEDTATYYCTRGN WHYFDYWGQGTLVAVSS
SEQ ID NO: 7296	3A12-LC	3A12 light chain variable region	SYTLTQPPLVSVALGQKATIICSGENLSDKYVH WYQQKPGRAPVMVIYENDKRPSGIPDQFSGSNS GNIATLTISKAQAGYEADYYCHCWDSTNSAVFG SGTHLTVL
SEQ ID NO: 6122	12D10-HC	12D10 heavy chain variable region	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGY HWNWIRQFPGKKLEWMGYIYSSGTTRYNPSLK SRISITRDTSKNQFFLQLNSVTPEDTATYYCTRG NWHYFDYWGQGTLVAVSS
SEQ ID NO: 6136	12D10-LC	12D10 light chain variable region	SYTLTQPPSLSVAPGQKATIICSGENLSDKYVHW YQQKPGRAPVMVIYENEKRPSGIPDQFSGSNSG NIATLTISKAQPGSEADYYCHYWESINSVVFGSG THLTVL
SEQ ID NO: 7298	15E1-HC	15E1 heavy chain variable region	QIQLQESGPGLVKPSQSLSLSCSVTGFSITTTGYH WNWIRQFPGKKLEWMGYIYSSGSTSYNPSLKSR FSITRDTSKNQFFLQLNSVTTEDTATYYCARGD WHYFDYWGPGTMVTVSS
SEQ ID NO: 7299	15E1-LC	15E1 light chain variable region	SFTLTQPPLVSVAVGQVATITCSGEKLSDKYVH WYQQKPGRAPVMVIYENDRRPSGIPDQFSGSNS GNIASLTISKAQAGDEADYFCQFWDSTNSAVFG GGTQLTVL

SEQ ID NO: 7300	15E1_ Humanized variant_VH 1	15E1 heavy chain variable region humanized variant 1	QIQLQESGPGLVKPSQTLSLTCTVSGFSITTTGYH WNWIRQHPGKGLEWIGYIYSSGSTSYNPSLKSL VTISRDTSKNQFSLKLSSVTAADTAVYYCARGD WHYFDYWGQGTMVTVSS
SEQ ID NO: 7301	15E1_ Humanized variant_VH 2	15E1 heavy chain variable region humanized variant 2	QIQLVESGGGLVKPGGSLRLSCAVSGFSITTTGY HWNWIRQAPGKGLEWVGYIYSSGSTSYNPSLKS RFTISRDTAKNSFYLQMNSLRAEDTAVYYCARG DWHYFDYWGQGTMVTVSS
SEQ ID NO: 7302	15E1_ Humanized variant_VH 3 (BJM0407 VH and BJM0411 VH)	15E1 heavy chain variable region humanized variant 3	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: 7303	15E1_ Humanized variant_VH 4	15E1 heavy chain variable region humanized variant 4	EIQLVESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTAKNSFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: 7304	15E1_ Humanized variant_VH 5	15E1 heavy chain variable region humanized variant 5	QIQLVQSGAEVKKPGASVKVSCKVSGFSITTTGY HWNWVRQAPGQGLEWMGYIYSSGSTSYNPSLK SRVTMTRDTSTNTFYMELSSLRSEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: 7305	15E1_ Humanized variant_VL 1 (BJM0407 VL)	15E1 light chain variable region humanized variant 1	SSETTQPPSVSVSPGQTASITCSGEKLSDKYVHW YQQKPGQSPVMVIYENDRRPSGIPERFSGSNSGN TATLTISGTQAMDEADYFCQFWDSTNSAVFGGG TQLTVL
SEQ ID NO: 7306	15E1_ Humanized variant_VL 2	15E1 light chain variable region humanized variant 2	SSETTQPHSVSVATAQMARITCSGEKLSDKYVH WYQQKPGQDPVMVIYENDRRPSGIPERFSGSNP GNTATLTISRIEAGDEADYFCQFWDSTNSAVFG GGTQLTVL
SEQ ID NO: 7307	15E1_ Humanized variant_VL 3	15E1 light chain variable region humanized variant 3	QSVTTQPPSASGTPGQRVTISCSGEKLSDKYVH WYQQLPGTAPKMLIYENDRRPSGVPDRFSGSNS GNSASLAISGLRSEDEADYFCQFWDSTNSAVFG GGTQLTVL
SEQ ID NO: 7308	15E1_ Humanized variant_VL 4	15E1 light chain variable region humanized variant 4	QSVTTQPPSVSGAPGQRVTISCSGEKLSDKYVH WYQQLPGTAPKMLIYENDRRPSGVPDRFSGSNS GNSASLAITGLQAEDEADYFCQFWDSTNSAVFG GGTQLTVL
SEQ ID NO: 7309	15E1_ Humanized variant_VL 5 (BJM0411 VL)	15E1 light chain variable region humanized variant 5	DSVTTQSPLSLPVTLGQPASISCSGEKLSDKYVH WYQQRPGQSPRMLIYENDRRPSGVPDRFSGSNS GNDATLKISRVEAEDVGVYFCQFWDSTNSAVFG GGTKVEIK
SEQ ID NO: C001	BKM0138 VH	BKM0138 heavy chain variable region	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS

SEQ ID NO: C002	BKM0139 VH	BKM0139 heavy chain variable region	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: C003	BKM0140 VH	BKM0140 heavy chain variable region	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: C004	BKM0141 VH	BKM0141 heavy chain variable region	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: C005	BKM0142 VH	BKM0142 heavy chain variable region	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYAPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: C006	BKM0143 VH	BKM0143 heavy chain variable region	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYAPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: C007	BKM0144 VH	BKM0144 heavy chain variable region	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYAPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: C008	BKM0145 VH	BKM0145 heavy chain variable region	EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYAPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSS
SEQ ID NO: C009	BKM0138 VL	BKM0138 light chain variable region	DSVTTQSPLSLPVTLGQPASISCSGEKLSDKYVH WYQQRPGQSPRMLIYENDRRPSGVPDRFSGSNS GNDATLKISRVEAEDVGVYFCQFWDSTASAVFG GGTKVEIK
SEQ ID NO: C010	BKM0139 VL	BKM0139 light chain variable region	DSVTTQSPLSLPVTLGQPASISCSGEKLSDKYVH WYQQRPGQSPRMLIYENDRRPSGVPDRFSGSNS GNDATLKISRVEAEDVGVYFCQFWASTNSAVFG GGTKVEIK
SEQ ID NO: C011	BKM0140 VL	BKM0140 light chain variable region	SSETTQPPSVSVSPGQTASITCSGEKLSDKYVHW YQQKPGQSPVMVIYENDRRPSGIPERFSGSNSGN TATLTISGTQAMDEADYFCQFWASTNSAVFGGG TQLTVL
SEQ ID NO: C012	BKM0141 VL	BKM0141 light chain variable region	SSETTQPPSVSVSPGQTASITCSGEKLSDKYVHW YQQKPGQSPVMVIYENDRRPSGIPERFSGSNSGN TATLTISGTQAMDEADYFCQFWDSTASAVFGGG TQLTVL
SEQ ID NO: C013	BKM0142 VL	BKM0142 light chain variable region	DSVTTQSPLSLPVTLGQPASISCSGEKLSDKYVH WYQQRPGQSPRMLIYENDRRPSGVPDRFSGSNS GNDATLKISRVEAEDVGVYFCQFWDSTNSAVFG GGTKVEIK
SEQ ID NO: C014	BKM0143 VL	BKM0143 light chain variable region	SSETTQPPSVSVSPGQTASITCSGEKLSDKYVHW YQQKPGQSPVMVIYENDRRPSGIPERFSGSNSGN TATLTISGTQAMDEADYFCQFWDSTNSAVFGGG TQLTVL

SEQ ID NO: C015	BKM0144 VL	BKM0144 light chain variable region	DSVTTQSPLSLPVTLGQPASISCSGEKLSDKYVH WYQQRPGQSPRMLIYENDRRPSGVPDRFSGSNS GNDATLKISRVEAEDVGVYFCQFWASTASAVFG GGTKVEIK
SEQ ID NO: C016	BKM0145 VL	BKM0145 light chain variable region	SSETTQPPSVSVSPGQTASITCSGEKLSDKYVHW YQQKPGQSPVMVIYENDRRPSGIPERFSGSNSGN TATLTISGTQAMDEADYFCQFWASTASAVFGGG TQLTVL

Table 10. Exemplary NKp30-targeting antigen binding domains/antibody molecules

SEQ ID NO	Ab ID	Description	Sequence
SEQ ID NO: 6148	Ch(anti-NKp30 9G1)HC N297A	9G1 heavy chain	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGY HWNWIRQFPGKKLEWMGYIYSSGSTSYNPSLKS RISITRDTSKNQFFLQLNSVTTEDTATYYCARGN WHYFDFWGQGTMVTVSSASTKGPSVFPLAPSSK STSGGTAALGCLVKDYFPEPVTVSWNSGALTSG VHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYIC NVNHKPSNTKVDKRVEPKSCDKTHTCPPCPAPE LLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVS HEDPEVKFNWYVDGVEVHNAKTKPREEQYAST YRVVSVLTVLHQDWLNGKEYKCKVSNKALPAP IEKTISKAKGQPREPQVCTLPPSREEMTKNQVSL SCAVKGFYPSDIAVEWESNGQPENNYKTTPPVL DSDGSFFLVSKLTVDKSRWQQGNVFSCSVMHE ALHNHYTQKSLSLSPGK
SEQ ID NO: 6149	Ch(anti-NKp30 9G1)HC	9G1 heavy chain	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGY HWNWIRQFPGKKLEWMGYIYSSGSTSYNPSLKS RISITRDTSKNQFFLQLNSVTTEDTATYYCARGN WHYFDFWGQGTMVTVSSASTKGPSVFPLAPSSK STSGGTAALGCLVKDYFPEPVTVSWNSGALTSG VHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYIC NVNHKPSNTKVDKRVEPKSCDKTHTCPPCPAPE LLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVS HEDPEVKFNWYVDGVEVHNAKTKPREEQYNST YRVVSVLTVLHQDWLNGKEYKCKVSNKALPAP IEKTISKAKGQPREPQVCTLPPSREEMTKNQVSL SCAVKGFYPSDIAVEWESNGQPENNYKTTPPVL DSDGSFFLVSKLTVDKSRWQQGNVFSCSVMHE ALHNHYTQKSLSLSPGK
SEQ ID NO: 6150	Ch(anti-NKp30 9G1)LC	9G1 light chain	SYTLTQPPLLSVALGHKATITCSGERLSDKYVH WYQQKPGRAPVMVIYENDKRPSGIPDQFSGSNS GNIATLTISKAQAGYEADYYCQSWDSTNSAVFG SGTQLTVLGQPKANPTVTLFPPSSEELQANKATL VCLISDFYPGAVTVAWKADGSPVKAGVETTKPS KQSNNKYAASSYLSLTPEQWKSHRSYSCQVTHE GSTVEKTVAPTECS
SEQ ID NO: 6151	Ch(anti-NKp30 15H6)HC N297A	15H6 heavy chain	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGY HWNWIRQFPGKKLEWMGYIYSSGTTRYNPSLK SRISITRDTSKNQFFLQLNSVTPEDTATYYCTRG NWHYFDYWGQGTLVAVSSASTKGPSVFPLAPSS KSTSGGTAALGCLVKDYFPEPVTVSWNSGALTS GVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYI

			CNVNHKPSNTKVDKRVEPKSCDKTHTCPPCPAP ELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDV SHEDPEVKFNWYVDGVEVHNAKTKPREEQYAS TYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA PIEKTISKAKGQPREPQVCTLPPSREEMTKNQVS LSCAVKGFYPSDIAVEWESNGQPENNYKTTPPV LDSDGSFFLVSKLTVDKSRWQQGNVFSCSVMH EALHNHYTQKSLSLSPGK
SEQ ID NO: 6152	Ch(anti-NKp30 15H6)HC (hole)	15H6 heavy chain	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGY HWNWIRQFPGKKLEWMGYIYSSGTTRYNPSLK SRISITRDTSKNQFFLQLNSVTPEDTATYYCTRG NWHYFDYWGQGTLVAVSSASTKGPSVFPLAPSS KSTSGGTAALGCLVKDYFPEPVTVSWNSGALTS GVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYI CNVNHKPSNTKVDKRVEPKSCDKTHTCPPCPAP ELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDV SHEDPEVKFNWYVDGVEVHNAKTKPREEQYNS TYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA PIEKTISKAKGQPREPQVCTLPPSREEMTKNQVS LSCAVKGFYPSDIAVEWESNGQPENNYKTTPPV LDSDGSFFLVSKLTVDKSRWQQGNVFSCSVMH EALHNHYTQKSLSLSPGK
SEQ ID NO: 6153	Ch(anti-NKp30 15H6)LC	15H6 light chain	SYTLTQPPSLSVAPGQKATIICSGENLSDKYVHW YQQKPGRAPVMVIYENEKRPSGIPDQFSGSNSG NIATLTISKAQPGSEADYYCHYWESINSVVFGSG THLTVLGQPKANPTVTLFPPSSEELQANKATLVC LISDFYPGAVTVAWKADGSPVKAGVETTKPSKQ SNNKYAASSYLSLTPEQWKSHRSYSCQVTHEGS TVEKTVAPTECS
SEQ ID NO: 6187	anti-NKp30 9G1 scFv (VH-VL)	Hamster anti-NKp30 scFv of 9G1 in VH to VL orientation	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGY HWNWIRQFPGKKLEWMGYIYSSGSTSYNPSLKS RISITRDTSKNQFFLQLNSVTTEDTATYYCARGN WHYFDFWGQGTMVTVSSGGGGSGGGGSGGGG SGGGGSSYTLTQPPLLSVALGHKATITCSGERLS DKYVHWYQQKPGRAPVMVIYENDKRPSGIPDQ FSGSNSGNIATLTISKAQAGYEADYYCQSWDST NSAVFGSGTQLTVL
SEQ ID NO: 6188	anti-NKp30 9G1 scFv (VL-VH)	Hamster anti-NKp30 scFv of 9G1 in VL to VH orientation	SYTLTQPPLLSVALGHKATITCSGERLSDKYVH WYQQKPGRAPVMVIYENDKRPSGIPDQFSGSNS GNIATLTISKAQAGYEADYYCQSWDSTNSAVFG SGTQLTVLGGGGSGGGGSGGGGSGGGGSQIQL QESGPGLVKPSQSLSLTCSVTGFSINTGGYHWN WIRQFPGKKLEWMGYIYSSGSTSYNPSLKSRISIT RDTSKNQFFLQLNSVTTEDTATYYCARGNWHY FDFWGQGTMVTVSS
SEQ ID NO: 6189	anti-NKp30 15H6 scFv (VH-VL)	Hamster anti-NKp30 scFv of 15H6 in VH to VL orientation	QIQLQESGPGLVKPSQSLSLTCSVTGFSINTGGY HWNWIRQFPGKKLEWMGYIYSSGTTRYNPSLK SRISITRDTSKNQFFLQLNSVTPEDTATYYCTRG NWHYFDYWGQGTLVAVSSGGGGSGGGGSGGG GSGGGGSSYTLTQPPSLSVAPGQKATIICSGENLS DKYVHWYQQKPGRAPVMVIYENEKRPSGIPDQ FSGSNSGNIATLTISKAQPGSEADYYCHYWESIN SVVFGSGTHLTVL

SEQ ID NO: 6190	anti-NKp30 15H6 scFv (VL-VH)	Hamster anti-NKp30 scFv of 15H6 in VL to VH orientation	SYTLTQPPSLSVAPGQKATIICSGENLSDKYVHW YQQKPGRAPVMVIYENEKRPSGIPDQFSGSNSG NIATLTISKAQPGSEADYYCHYWESINSVVFGSG THLTVLGGGGSGGGGSGGGGSGGGGSQIQLQES GPGLVKPSQSLSLTCSVTGFSINTGGYHWNWIR QFPGKKLEWMGYIYSSGTTRYNPSLKSRISITRD TSKNQFFLQLNSVTPEDTATYYCTRGNWHYFD YWGQGTLVAVSS
SEQ ID NO: 7310	BJM0859 lambda scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSSSETTQPPSVSVSPGQTASITCSGEK LSDKYVHWYQQKPGQSPVMVIYENDRRPSGIPE RFSGSNSGNTATLTISGTQAMDEADYFCQFWDS TNSAVFGGGTQLTVL
SEQ ID NO: 7311	BJM0860 kappa scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSDSVTTQSPLSLPVTLGQPASISCSGE KLSDKYVHWYQQRPGQSPRMLIYENDRRPSGV PDRFSGSNSGNDATLKISRVEAEDVGVYFCQFW DSTNSAVFGGGTKVEIK
SEQ ID NO: C017	BKM0138 scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSDSVTTQSPLSLPVTLGQPASISCSGE KLSDKYVHWYQQRPGQSPRMLIYENDRRPSGV PDRFSGSNSGNDATLKISRVEAEDVGVYFCQFW DSTASAVFGGGTKVEIK
SEQ ID NO: C018	BKM0139 scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSDSVTTQSPLSLPVTLGQPASISCSGE KLSDKYVHWYQQRPGQSPRMLIYENDRRPSGV PDRFSGSNSGNDATLKISRVEAEDVGVYFCQFW ASTNSAVFGGGTKVEIK
SEQ ID NO: C019	BKM0140 scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSSSETTQPPSVSVSPGQTASITCSGEK LSDKYVHWYQQKPGQSPVMVIYENDRRPSGIPE RFSGSNSGNTATLTISGTQAMDEADYFCQFWAS TNSAVFGGGTQLTVL
SEQ ID NO: C020	BKM0141 scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYNPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSSSETTQPPSVSVSPGQTASITCSGEK LSDKYVHWYQQKPGQSPVMVIYENDRRPSGIPE

			RFSGSNSGNTATLTISGTQAMDEADYFCQFWDS TASAVFGGGTQLTVL
SEQ ID NO: C021	BKM0142 scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYAPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSDSVTTQSPLSLPVTLGQPASISCSGE KLSDKYVHWYQQRPGQSPRMLIYENDRRPSGV PDRFSGSNSGNDATLKISRVEAEDVGVYFCQFW DSTNSAVFGGGTKVEIK
SEQ ID NO: C022	BKM0143 scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYAPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSSSETTQPPSVSVSPGQTASITCSGEK LSDKYVHWYQQKPGQSPVMVIYENDRRPSGIPE RFSGSNSGNTATLTISGTQAMDEADYFCQFWDS TNSAVFGGGTQLTVL
SEQ ID NO: C023	BKM0144 scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYAPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSDSVTTQSPLSLPVTLGQPASISCSGE KLSDKYVHWYQQRPGQSPRMLIYENDRRPSGV PDRFSGSNSGNDATLKISRVEAEDVGVYFCQFW ASTASAVFGGGTKVEIK
SEQ ID NO: C024	BKM0145 scFv		EIQLLESGGGLVQPGGSLRLSCAVSGFSITTTGY HWNWVRQAPGKGLEWVGYIYSSGSTSYAPSLK SRFTISRDTSKNTFYLQMNSLRAEDTAVYYCAR GDWHYFDYWGQGTMVTVSSGGGGSGGGGSGG GGSGGGGSSSETTQPPSVSVSPGQTASITCSGEK LSDKYVHWYQQKPGQSPVMVIYENDRRPSGIPE RFSGSNSGNTATLTISGTQAMDEADYFCQFWAS TASAVFGGGTQLTVL

[00465] In some embodiments, the NK cell engager is an antigen binding domain that binds to NKp46 (e.g., NKp46 present, e.g., expressed or displayed, on the surface of an NK cell) and comprises any CDR amino acid sequence, framework region (FWR) amino acid sequence, or variable region amino acid sequence disclosed in Table 15. In some embodiments, binding of the NK cell engager, e.g., antigen binding domain that binds to NKp46, to the NK cell activates the NK cell. An antigen binding domain that binds to NKp46 (e.g., NKp46 present, e.g., expressed or displayed, on the surface of an NK cell) may be said to target NKp46, the NK cell, or both.

[00466] In some embodiments, the NK cell engager is an antigen binding domain that binds to NKG2D (e.g., NKG2D present, e.g., expressed or displayed, on the surface of an NK cell) and comprises any CDR amino acid sequence, framework region (FWR) amino acid sequence, or variable region amino acid sequence disclosed in Table 15. In some embodiments, binding of the NK cell engager, e.g., antigen binding domain that binds to NKG2D, to the NK cell activates the NK cell. An antigen binding domain that binds to NKG2D (e.g., NKG2D present, e.g., expressed or displayed, on

the surface of an NK cell) may be said to target NKG2D, the NK cell, or both.

[00467] In some embodiments, the NK cell engager is an antigen binding domain that binds to CD16 (e.g., CD16 present, e.g., expressed or displayed, on the surface of an NK cell) and comprises any CDR amino acid sequence, framework region (FWR) amino acid sequence, or variable region amino acid sequence disclosed in Table 15. In some embodiments, binding of the NK cell engager, e.g., antigen binding domain that binds to CD16, to the NK cell activates the NK cell. An antigen binding domain that binds to CD16 (e.g., CD16 present, e.g., expressed or displayed, on the surface of an NK cell) may be said to target CD16, the NK cell, or both.

Table 15. Exemplary variable regions of NKp46, NKG2D, or CD16-targeting antigen binding domains

SEQ ID NO	Ab ID	Description	Sequence
SEQ ID NO: 6175	NKG2D_1scFv	scFv that binds NKG2D	QVHLQESGPGLVKPSETLSLTCTVSDDSISSYYWSWIRQ PPGKGLEWIGHISYSGSANYNPSLKSRVTISVDTSKNQF SLKLSSVTAADTAVYYCANWDDAFNIWGQGTMVTVSS GGGGSGGGGSGGGGSGGGGSEIVLTQSPGTLSLSPGER ATLSCRASQSVSSSYLAWYQQKPGQAPRLLIYGASSRA TGIPDRFSGSGSGTDFTLTISRLEPEDFAVYYCQQYGSSP WTFGQGTKVEIK
SEQ ID NO: 6176	NKG2D_1VH	VH that binds NKG2D	QVHLQESGPGLVKPSETLSLTCTVSDDSISSYYWSWIRQ PPGKGLEWIGHISYSGSANYNPSLKSRVTISVDTSKNQF SLKLSSVTAADTAVYYCANWDDAFNIWGQGTMVTVSS
SEQ ID NO: 6177	NKG2D_1VL	VL that binds NKG2D	EIVLTQSPGTLSLSPGERATLSCRASQSVSSSYLAWYQQ KPGQAPRLLIYGASSRATGIPDRFSGSGSGTDFTLTISRL EPEDFAVYYCQQYGSSPWTFGQGTKVEIK
SEQ ID NO: 6178	NKG2D_2scFv	scFv that binds NKG2D	EVQLVQSGAEVKEPGESLKISCKNSGYSFTNYWVGWV RQMPGKGLEWMGIIYPGDSDTRYSPSFQGQVTISADKSI NTAYLQWSSLKASDTAMYYCGRLTMFRGIIIGYFDYW GQGTLVTVSSGGGGSGGGGSGGGGSGGGGSEIVLTQSP ATLSLSPGERATLSCRASQSVSSYLAWYQQKPGQAPRL LIYDASNRATGIPARFSGSGSGTDFTLTISSLEPEDFAVY YCQQRSNWPWTFGQGTKVEIK
SEQ ID NO: 6179	NKG2D_2VH	VH that binds NKG2D	EVQLVQSGAEVKEPGESLKISCKNSGYSFTNYWVGWV RQMPGKGLEWMGIIYPGDSDTRYSPSFQGQVTISADKSI NTAYLQWSSLKASDTAMYYCGRLTMFRGIIIGYFDYW GQGTLVTVSS
SEQ ID NO: 6180	NKG2D_2VL	VL that binds NKG2D	EIVLTQSPATLSLSPGERATLSCRASQSVSSYLAWYQQK PGQAPRLLIYDASNRATGIPARFSGSGSGTDFTLTISSLEP EDFAVYYCQQRSNWPWTFGQGTKVEIK
SEQ ID NO: 6181	NKp46scFv	scFv that binds NKp46	QVQLQQSGPELVKPGASVKMSCKASGYTFTDYVINWG KQRSGQGLEWIGEIYPGSGTNYYNEKFKAKATLTADKS SNIAYMQLSSLTSEDSAVYFCARRGRYGLYAMDYWGQ GTSVTVSSGGGGSGGGGSGGGGSGGGGSDIQMTQTTSS LSASLGDRVTISCRASQDISNYLNWYQQKPDGTVKLLIY YTSRLHSGVPSRFSGSGSGTDYSLTINNLEQEDIATYFCQ QGNTRPWTFGGGTKLEIK

SEQ ID NO: 6182	NKp46VH	VH that binds NKp46	QVQLQQSGPELVKPGASVKMSCKASGYTFTDYVINWG KQRSGQGLEWIGEIYPGSGTNYYNEKFKAKATLTADKS SNIAYMQLSSLTSEDSAVYFCARRGRYGLYAMDYWGQ GTSVTVSS
SEQ ID NO: 6183	NKp46VL	VL that binds NKp46	DIQMTQTTSSLSASLGDRVTISCRASQDISNYLNWYQQK PDGTVKLLIYYTSRLHSGVPSRFSGSGSGTDYSLTINNLE QEDIATYFCQQGNTRPWTFGGGTKLEIK
SEQ ID NO: 6184	CD16scFv	scFv that binds CD16	EVQLVESGG GVVRPGGSLR LSCAASGFTF DDYGMSWVRQ APGKGLEWVS GINWNGGSTG YADSVKGRFT ISRDNAKNSL YLQMNSLRAE DTAVYYCARG RSLLFDYWGQ GTLVTVSRGG GGSGGGGSGG GGSSELTQDP AVSVALGQTV RITCQGDSLR SYYASWYQQK PGQAPVLVIY GKNNRPSGIP DRFSGSSSGN TASLTITGAQ AEDEADYYCN SRDSSGNHVV FGGGTKLTVL
SEQ ID NO: 6185	CD16VH	VH that binds CD16	EVQLVESGG GVVRPGGSLR LSCAASGFTF DDYGMSWVRQ APGKGLEWVS GINWNGGSTG YADSVKGRFT ISRDNAKNSL YLQMNSLRAE DTAVYYCARG RSLLFDYWGQ GTLVTVSR
SEQ ID NO: 6186	CD16VL	VL that binds CD16	SSELTQDP AVSVALGQTVRITCQGDSLR SYYASWYQQK PGQAPVLVIY GKNNRPSGIP DRFSGSSSGNTASLTITGAQ AEDEADYYCN SRDSSGNHVV FGGGTKLTVL

[00468] In one embodiment, the NK cell engager is a ligand of NKp30, e.g., is a B7-6, e.g., comprises the amino acid sequence of: DLKVEMMAGGTQITPLNDNVTIFCNIFYSQPLNITSMGITWFWKSLTFDKEVKVFEFFGDHQE AFRPGAIVSPWRLKSGDASLRLPGIQLEEAGEYRCEVVVTPLKAQGTVQLEVVASPASRLLLD QVGMKENEDKYMCESSGFYPEAINITWEKQTQKFPHPIEISEDVITGPTIKNMDGTFNVTSCL KLNSSQEDPGTVYQCVVRHASLHTPLRSNFTLTAARHSLSETEKTDNFS (SEQ ID NO: 7233), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7233.

[00469] In other embodiments, the NK cell engager is a ligand of NKp44 or NKp46, which is a viral HA. Viral hemagglutinins (HA) are glyco proteins which are on the surface of viruses. HA proteins allow viruses to bind to the membrane of cells via sialic acid sugar moieties which contributes to the fusion of viral membranes with the cell membranes (see e.g., Eur J Immunol. 2001 Sep;31(9):2680-9 "Recognition of viral hemagglutinins by NKp44 but not by NKp30"; and Nature. 2001 Feb 22;409(6823):1055-60 "Recognition of haemagglutinins on virus-infected cells by NKp46 activates lysis by human NK cells" the contents of each of which are incorporated by reference herein).

[00470] In other embodiments, the NK cell engager is a ligand of NKG2D chosen from MICA,

MICB, or ULBP1, e.g., wherein:

(i) MICA comprises the amino acid sequence:
EPHSLRYNLTVLSWDGSVQSGFLTEVHLDGQPFLRCDRQKCRAKPQGQWAEDVLGNKTWD
RETRDLTGNGKDLRMTLAHIKDQKEGLHSLQEIRVCEIHEDNSTRSSQHFYYDGELFLSQNLE
TKEWTMPQSSRAQTLAMNVRNFLKEDAMKTKTHYHAMHADCLQELRRYLKSGVVLRRTV
PPMVNVTRSEASEGNITVTCRASGFYPWNITLSWRQDGVSLSHDTQQWGDVLPDGNGTYQT
WVATRICQGEEQRFTCYMEHSGNHSTHPVPSGKVLVLQSHW (SEQ ID NO: 7234), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7234;

(ii) MICB comprises the amino acid sequence:
AEPHSLRYNLMVLSQDESVQSGFLAEGHLDGQPFLRYDRQKRRAKPQGQWAEDVLGAKTW
DTETEDLTENGQDLRRTLTHIKDQKGGLHSLQEIRVCEIHEDSSTRGSRHFYYDGELFLSQNL
ETQESTVPQSSRAQTLAMNVTNFWKEDAMKTKTHYRAMQADCLQKLQRYLKSGVAIRRTV
PPMVNVTCSEVSEGNITVTCRASSFYPRNITLTWRQDGVSLSHNTQQWGDVLPDGNGTYQT
WVATRIRQGEEQRFTCYMEHSGNHGTHPVPSGKVLVLQSQRTD (SEQ ID NO: 7235), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7235; or

(iii) ULBP1 comprises the amino acid sequence:
GWVDTHCLCYDFIITPKSRPEPQWCEVQGLVDERPFLHYDCVNHKAKAFASLGKKVNVTKT
WEEQTETLRDVVDFLKGQLLDIQVENLIPIEPLTLQARMSCEHEAHGHGRGSWQFLFNGQKF
LLFDSNNRKWTALHPGAKKMTEKWEKNRDVTMFFQKISLGDCKMWLEEFLMYWEQMLDP
TKPPSLAPG (SEQ ID NO: 7236), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7236.

[00471] In other embodiments, the NK cell engager is a ligand of DNAM1 chosen from NECTIN2 or NECL5, e.g., wherein:

(i) NECTIN2 comprises the amino acid sequence:
QDVRVQVLPEVRGQLGGTVELPCHLLPPVPGLYISLVTWQRPDAPANHQNVAAFHPKMGPS
FPSPKPGSERLSFVSAKQSTGQDTEAELQDATLALHGLTVEDEGNYTCEFATFPKGSVRGMT
WLRVIAKPKNQAEAQKVTFSQDPTTVALCISKEGRPPARISWLSSLDWEAKETQVSGTLAGT
VTVTSRFTLVPSGRADGVTVTCKVEHESFEEPALIPVTLSVRYPPEVSISGYDDNWYLGRTDA
TLSCDVRSNPEPTGYDWSTTSGTFPTSAVAQGSQLVIHAVDSLFNTTFVCTVTNAVGMGRAE

QVIFVRETPNTAGAGATGG (SEQ ID NO: 7237), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7237; or

(ii) NECL5 comprises the amino acid sequence:

WPPPGTGDVVVQAPTQVPGFLGDSVTLPCYLQVPNMEVTHVSQLTWARHGESGSMAVFHQ TQGPSYSESKRLEFVAARLGAELRNASLRMFGLRVEDEGNYTCLFVTFPQGSRSVDIWLRVL AKPQNTAEVQKVQLTGEPVPMARCVSTGGRPPAQITWHSDLGGMPNTSQVPGFLSGTVTVT SLWILVPSSQVDGKNVTCKVEHESFEKPQLLTVNLTVYYPPEVSISGYDNNWYLGQNEATLT CDARSNPEPTGYNWSTTMGPLPPFAVAQGAQLLIRPVDKPINTTLICNVTNALGARQAELTV QVKEGPPSEHSGISRN (SEQ ID NO: 7238), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7238.

[00472] In yet other embodiments, the NK cell engager is a ligand of DAP10, which is an adapter for NKG2D (see e.g., Proc Natl Acad Sci U S A. 2005 May 24; 102(21): 7641–7646; and Blood, 15 September 2011 Volume 118, Number 11, the full contents of each of which is incorporated by reference herein).

[00473] In other embodiments, the NK cell engager is a ligand of CD16, which is a CD16a/b ligand, e.g., a CD16a/b ligand further comprising an antibody Fc region (see e.g., Front Immunol. 2013; 4: 76 discusses how antibodies use the Fc to trigger NK cells through CD16, the full contents of which are incorporated herein).

[00474] In other embodiments, the NK cell engager is a ligand of CRTAM, which is NECL2, e.g., wherein NECL2 comprises the amino acid sequence:

QNLFTKDVTVIEGEVATISCQVNKSDDSVIQLLNPNRQTIYFRDFRPLKDSRFQLLNFSSSELK VSLTNVSISDEGRYFCQLYTDPPQESYTTITVLVPPRNLMIDIQKDTAVEGEEIEVNCTAMASK PATTIRWFKGNTELKGKSEVEEWSDMYTVTSQLMLKVHKEDDGVPVICQVEHPAVTGNLQT QRYLEVQYKPQVHIQMTYPLQGLTREGDALELTCEAIGKPQPVMVTWVRVDDEMPQHAVL SGPNLFINNLNKTDNGTYRCEASNIVGKAHSDYMLYVYDPPTTIPPPTTTTTTTTTTTTILTII TDSRAGEEGSIRAVDH (SEQ ID NO: 7239), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7239.

[00475] In other embodiments, the NK cell engager is a ligand of CD27, which is CD70, e.g., wherein CD70 comprises the amino acid sequence:

QRFAQAQQQLPLESLGWDVAELQLNHTGPQQDPRLYWQGGPALGRSFLHGPELDKGQLRIH RDGIYMVHIQVTLAICSSTTASRHHPTTLAVGICSPASRSISLLRLSFHQGCTIASQRLTPLARG

DTLCTNLTGTLLPSRNTDETFFGVQWVRP (SEQ ID NO: 7240), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7240.

[00476] In other embodiments, the NK cell engager is a ligand of PSGL1, which is L-selectin (CD62L), e.g., wherein L-selectin comprises the amino acid sequence: WTYHYSEKPMNWQRARRFCRDNYTDLVAIQNKAEIEYLEKTLPFSRSYYWIGIRKIGGIWTW VGTNKSLTEEAENWGDGEPNNKKNKEDCVEIYIKRNKDAGKWNDDACHKLKAALCYTASC QPWSCSGHGECVEIINNYTCNCDVGYYGPQCQFVIQCEPLEAPELGTMDCTHPLGNFSFSSQC AFSCSEGTNLTGIEETTCGPFGNWSSPEPTCQVIQCEPLSAPDLGIMNCSHPLASFSFTSACTFIC SEGTELIGKKKTICESSGIWSNPSPICQKLDKSFSMIKEGDYN (SEQ ID NO: 7241), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7241.

[00477] In other embodiments, the NK cell engager is a ligand of CD96, which is NECL5, e.g., wherein NECL5 comprises the amino acid sequence: WPPPGTGDVVVQAPTQVPGFLGDSVTLPCYLQVPNMEVTHVSQLTWARHGESGSMAVFHQ TQGPSYSESKRLEFVAARLGAELRNASLRMFGLRVEDEGNYTCLFVTFPQGSRSVDIWLRVL AKPQNTAEVQKVQLTGEPVPMARCVSTGGRPPAQITWHSDLGGMPNTSQVPGFLSGTVTVT SLWILVPSSQVDGKNVTCKVEHESFEKPQLLTVNLTVYYPPEVSISGYDNNWYLGQNEATLT CDARSNPEPTGYNWSTTMGPLPPFAVAQGAQLLIRPVDKPINTTLICNVTNALGARQAELTV QVKEGPPSEHSGISRN (SEQ ID NO: 7238), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7238.

[00478] In other embodiments, the NK cell engager is a ligand of CD100 (SEMA4D), which is CD72, e.g., wherein CD72 comprises the amino acid sequence: RYLQVSQQLQQTNRVLEVTNSSLRQQLRLKITQLGQSAEDLQGSRRELAQSQEALQVEQRAH QAAEGQLQACQADRQKTKETLQSEEQQRRALEQKLSNMENRLKPFFTCGSADTCCPSGWIM HQKSCFYISLTSKNWQESQKQCETLSSKLATFSEIYPQSHSYYFLNSLLPNGGSGNSYWTGLS SNKDWKLTDDTQRTRTYAQSSKCNKVHKTWSWWTLESESCRSSLPYICEMTAFRFPD (SEQ ID NO: 7242), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7242.

[00479] In other embodiments, the NK cell engager is a ligand of NKp80, which is CLEC2B (AICL), e.g., wherein CLEC2B (AICL) comprises the amino acid sequence: KLTRDSQSLCPYDWIGFQNKCYYFSKEEGDWNSSKYNCSTQHADLTIIDNIEEMNFLRRYKC SSDHWIGLKMAKNRTGQWVDGATFTKSFGMRGSEGCAYLSDDGAATARCYTERKWICRKR IH (SEQ ID NO: 7243), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7243.

[00480] In other embodiments, the NK cell engager is a ligand of CD244, which is CD48, e.g., wherein CD48 comprises the amino acid sequence: QGHLVHMTVVSGSNVTLNISESLPENYKQLTWFYTFDQKIVEWDSRKSKYFESKFKGRVRLD PQSGALYISKVQKEDNSTYIMRVLKKTGNEQEWKIKLQVLDPVPKPVIKIEKIEDMDDNCYL KLSCVIPGESVNYTWYGDKRPFPKELQNSVLETTLMPHNYSRCYTCQVSNSVSSKNGTVCLS PPCTLARS (SEQ ID NO: 7244), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7244.

[00481] In some embodiments, the NK cell engager is a viral hemagglutinin (HA), HA is a glycoprotein found on the surface of influenza viruses. It is responsible for binding the virus to cells with sialic acid on the membranes, such as cells in the upper respiratory tract or erythrocytes. HA has at least 18 different antigens. These subtypes are named H1 through H18. NCRs can recognize viral proteins. NKp46 has been shown to be able to interact with the HA of influenza and the HA-NA of Paramyxovirus, including Sendai virus and Newcastle disease virus. Besides NKp46, NKp44 can also functionally interact with HA of different influenza subtypes.

Death Receptor Signal Engagers

[00482] Death receptors, e.g., death receptors 4 and 5 (DR4 and DR5, also known as TRAIL-R1 and TRAIL-R2 respectively), are trimeric type I transmembrane proteins widely expressed in normal human tissues. Activation of death receptors causes intracellular signaling that induces cell death. TNF-related apoptosis-inducing ligand (TRAIL) (also known as Apo2L) is a trimeric protein that binds to Death receptors, activating their cell death-inducing signaling (Amarante-Mendes and Griffith. Pharmacol Ther. 2015 Nov;155:117-31).

[00483] The present disclosure provides, *inter alia*, multispecific (e.g., bi-, tri-, quad- specific) or multifunctional molecules, that are engineered to contain one or more death receptor signal engagers that mediate binding to death receptors and/or activation of death receptor signaling on a target cell (e.g., a tumor antigen presenting cell (e.g., cancer cell, e.g., a lymphoma cell), or a lymphocyte expressing TRBC1 or TRBC2). Accordingly, in some embodiments, the death receptor signal engager

comprises one or more TRAIL polypeptides or a fragment thereof (TRAIL molecule), one or more death receptors or a fragment thereof (death receptor molecule), or one or more antigen binding domains that specifically binds to a death receptor (e.g., and activates death receptor signaling). Without wishing to be bound by theory, it is thought that a death receptor signal engager that can activate death receptor signaling on a target cell can induce the death of the target cell, e.g., a target disease cell, e.g., a target cancer cell.

[00484] Death receptor signal engagers may comprise TRAIL molecules and/or death receptor molecules from or derived from versions of TRAIL and death receptors known to those skilled in the art. In some embodiments, the death receptor signal engager comprises a human TRAIL molecule or death receptor molecule. In some embodiments, the death receptor signal engager comprises a mouse TRAIL molecule or death receptor molecule. In some embodiments, the death receptor signal engager comprises a mammalian TRAIL molecule or death receptor molecule. In some embodiments, the death receptor signal engager comprises a truncated TRAIL molecule or death receptor molecule (e.g., relative to a wild-type TRAIL molecule or death receptor molecule).

[00485] In some embodiments, the death receptor signal engager comprises a truncated TRAIL molecule comprising at least residues corresponding to amino acids 95-281 of human TRAIL, e.g., a truncated TRAIL molecule comprising residues corresponding to amino acids 95-281 of human TRAIL. In some embodiments, the death receptor signal engager comprises a truncated TRAIL molecule comprising residues of 95-281 of human TRAIL.

[00486] In some embodiments, the death receptor signal engager comprises a truncated TRAIL molecule comprising at least residues corresponding to amino acids 122-281 of human TRAIL, e.g., a truncated TRAIL molecule comprising residues corresponding to amino acids 122-281 of human TRAIL. In some embodiments, the death receptor signal engager comprises a truncated TRAIL molecule comprising residues of 122-281 of human TRAIL.

[00487] In some embodiments, the death receptor signal engager comprises one, two, or three TRAIL molecules (e.g., the death receptor signal engager is a monomeric, dimeric, or trimeric TRAIL molecule, respectively). In some embodiments, the death receptor signal engager comprises one, two, or three death receptor molecules (e.g., the death receptor signal engager is a monomeric, dimeric, or trimeric death receptor molecule, respectively). In some embodiments, the death receptor signal engager comprises one, two, or three antigen binding domains that specifically bind to a death receptor (e.g., to one or more death receptors, e.g., the same or different death receptors)

[00488] In some embodiments, the death receptor signal engager comprises an amino acid sequence selected from Table 11 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to a sequence selected from Table 11).

[00489] In some embodiments, the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6157 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6157).

[00490] In some embodiments, the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6158 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6158).

[00491] In some embodiments, the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6159 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6159).

[00492] In some embodiments, the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6160 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6160).

[00493] In some embodiments, the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6161 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6161).

[00494] In some embodiments, the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6162 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6162).

[00495] In some embodiments, the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6163 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6163).

[00496] In some embodiments, the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6164 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6164).

[00497] In some embodiments, the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6165 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6165).

[00498] In some embodiments, the death receptor signal engager is comprised on the same polypeptide chain as another component of a multifunctional molecule of the present disclosure, e.g., the death receptor signal engager is comprised on the same polypeptide chain as a heavy and/or light chain of a first antigen binding domain that preferentially binds to a tumor antigen on a lymphoma cell (e.g., T cell), wherein the tumor antigen is T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2), a heavy and/or light chain of a first antigen binding domain that selectively targets lymphocytes expressing T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2), an immune cell engager, a cytokine molecule, or a stromal modified moiety, e.g., as a fusion protein. In some embodiments, the multifunctional molecule comprises a fusion protein comprising a death receptor signal engager and light chain of a first antigen binding domain that preferentially binds to a tumor antigen on a lymphoma cell (e.g., T cell), wherein the tumor antigen is T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2). In some

embodiments, the multifunctional molecule comprises a fusion protein comprising a death receptor signal engager and a light chain of a first antigen binding domain that selectively targets lymphocytes expressing T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2).

[00499] In some embodiments, the fusion protein comprising a death receptor signal engager and a light chain of a first antigen binding domain targeting TRBC1 comprises an amino acid sequence of SEQ ID NO: 6170 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6170).

[00500] In some embodiments, the fusion protein comprising a death receptor signal engager and a light chain of a first antigen binding domain targeting TRBC1 comprises an amino acid sequence of SEQ ID NO: 6171 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6171).

[00501] In some embodiments, the fusion protein comprising a death receptor signal engager and a light chain of a first antigen binding domain targeting TRBC1 comprises an amino acid sequence of SEQ ID NO: 6172 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6172).

[00502] In some embodiments, the multifunctional molecule comprises a fusion protein comprising a death receptor signal engager and a light chain of a first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6170 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6170), and a heavy chain of the first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6167 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6167). In some embodiments, the multifunctional molecule comprises a fusion protein comprising a death receptor signal engager and a light chain of a first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6170 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6170), and a heavy chain of the first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6168 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6168).

[00503] In some embodiments, the multifunctional molecule comprises a fusion protein comprising a death receptor signal engager and a light chain of a first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6171 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6171), and a heavy chain of the first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6167 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6167). In some embodiments, the multifunctional molecule comprises a fusion protein comprising a death receptor signal engager and a light chain of a first

antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6171 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6171), and a heavy chain of the first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6168 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6168).

[00504] In some embodiments, the multifunctional molecule comprises a fusion protein comprising a death receptor signal engager and a light chain of a first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6172 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6172), and a heavy chain of the first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6167 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6167). In some embodiments, the multifunctional molecule comprises a fusion protein comprising a death receptor signal engager and a light chain of a first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6172 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6172), and a heavy chain of the first antigen binding domain targeting TRBC1 comprising an amino acid sequence of SEQ ID NO: 6168 (or an amino acid sequence having at least about 77%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6168).

Table 11. Exemplary death receptor signal engagers

SEQ ID NO	ID Ref.	Description	Sequence
SEQ ID NO: 6157	monomeric_hTRAIL_aa122_281-hFc_Knob_Cys-Blank	Monomeric human TRAIL comprising residues 122-281	METDTLLLWVLLLWVPGSTGDYKDDDDKGGGGSG TGGAAAHITGTRGRSNTLSSPNSKNEKALGRKINSW ESSRSGHSFLSNLHLRNGELVIHEKGFYYIYSQTYFRF QEEIKENTKNDKQMVQYIYKYTSYPDPILLMKSARN SCWSKDAEYGLYSIYQGGIFELKENDRIFVSVTNEHL IDMDHEASFFGAFAVSGSGNGTSNGTSGSSGGDKTH TCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCV VVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQY NSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAP IEKTISKAKGQPREPQVYTLPPCREEMTKNQVSLWCL VKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFF LYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKS LSLSPGK
SEQ ID NO: 6158	dimeric_hTRAIL_aa122_281-hFc_Knob_Cys-Blank	Dimeric human TRAIL comprising residues 122-281	METDTLLLWVLLLWVPGSTGDYKDDDDKGGGGSG TGGAAAHITGTRGRSNTLSSPNSKNEKALGRKINSW ESSRSGHSFLSNLHLRNGELVIHEKGFYYIYSQTYFRF QEEIKENTKNDKQMVQYIYKYTSYPDPILLMKSARN SCWSKDAEYGLYSIYQGGIFELKENDRIFVSVTNEHL IDMDHEASFFGAFAVSGAAAHITGTRGRSNTLSSPNS KNEKALGRKINSWESSRSGHSFLSNLHLRNGELVIHE KGFYYIYSQTYFRFQEEIKENTKNDKQMVQYIYKYT SYPDPILLMKSARNSCWSKDAEYGLYSIYQGGIFELK ENDRIFVSVTNEHLIDMDHEASFFGAFAVSGSGNGTS

			NGTSGSSGGDKTHTCPPCPAPELLGGPSVFLFPPKPK DTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVE VHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNGKE YKCKVSNKALPAPIEKTISKAKGQPREPQVYTLPPCR EEMTKNQVSLWCLVKGFYPSDIAVEWESNGQPENN YKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCS VMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 6159	trimeric_hTRAIL_aa122_281-hFc_Knob_Cys-Blank	Trimeric human TRAIL comprising residues 122-281	METDTLLLWVLLLWVPGSTGDYKDDDDKGGGGSG TGGAAAHITGTRGRSNTLSSPNSKNEKALGRKINSW ESSRSGHSFLSNLHLRNGELVIHEKGFYYIYSQTYFRF QEEIKENTKNDKQMVQYIYKYTSYPDPILLMKSARN SCWSKDAEYGLYSIYQGGIFELKENDRIFVSVTNEHL IDMDHEASFFGAFAVSGAAAHITGTRGRSNTLSSPNS KNEKALGRKINSWESSRSGHSFLSNLHLRNGELVIHE KGFYYIYSQTYFRFQEEIKENTKNDKQMVQYIYKYT SYPDPILLMKSARNSCWSKDAEYGLYSIYQGGIFELK ENDRIFVSVTNEHLIDMDHEASFFGAFAVSGAAAHIT GTRGRSNTLSSPNSKNEKALGRKINSWESSRSGHSFL SNLHLRNGELVIHEKGFYYIYSQTYFRFQEEIKENTK NDKQMVQYIYKYTSYPDPILLMKSARNSCWSKDAE YGLYSIYQGGIFELKENDRIFVSVTNEHLIDMDHEAS FFGAFAVSGSGNGTSNGTSGSSGGDKTHTCPPCPAPE LLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHED PEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVSV LTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKG QPREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSDI AVEWESNGQPENNYKTTPPVLDSDGSFFLYSKLTVD KSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 6160	monomeric_hTRAIL_95-281-hFc_Knob_Cys-Blank	Monomeric human TRAIL comprising residues 95-281	METDTLLLWVLLLWVPGSTGTSEETISTVQEKQQNIS PLVRERGPQRVAAHITGTRGRSNTLSSPNSKNEKALG RKINSWESSRSGHSFLSNLHLRNGELVIHEKGFYYIYS QTYFRFQEEIKENTKNDKQMVQYIYKYTSYPDPILL MKSARNSCWSKDAEYGLYSIYQGGIFELKENDRIFVS VTNEHLIDMDHEASFFGAFLVGGGGGSGGGGSDKT HTCPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTC VVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQ YNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPA PIEKTISKAKGQPREPQVYTLPPCREEMTKNQVSLWC LVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGS FFLYSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQ KSLSLSPGK
SEQ ID NO: 6161	dimeric_hTRAIL_95-281-hFc_Knob_Cys-Blank	Dimeric human TRAIL comprising residues 95-281	METDTLLLWVLLLWVPGSTGTSEETISTVQEKQQNIS PLVRERGPQRVAAHITGTRGRSNTLSSPNSKNEKALG RKINSWESSRSGHSFLSNLHLRNGELVIHEKGFYYIYS QTYFRFQEEIKENTKNDKQMVQYIYKYTSYPDPILL MKSARNSCWSKDAEYGLYSIYQGGIFELKENDRIFVS VTNEHLIDMDHEASFFGAFLVGGGGGSGGGGSGTSE ETISTVQEKQQNISPLVRERGPQRVAAHITGTRGRSN TLSSPNSKNEKALGRKINSWESSRSGHSFLSNLHLRN GELVIHEKGFYYIYSQTYFRFQEEIKENTKNDKQMV QYIYKYTSYPDPILLMKSARNSCWSKDAEYGLYSIY QGGIFELKENDRIFVSVTNEHLIDMDHEASFFGAFLV GGGGGSGGGGSDKTHTCPPCPAPELLGGPSVFLFPPK PKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDG

			VEVHNAKTKPREEQYNSTYRVVSVLTVLHQDWLNG KEYKCKVSNKALPAPIEKTISKAKGQPREPQVYTLPP CREEMTKNQVSLWCLVKGFYPSDIAVEWESNGQPE NNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFS CSVMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 6162	trimeric_hTRAIL_95-281-hFc_Knob_Cys-Blank	Trimeric human TRAIL comprising residues 95-281	METDTLLLWVLLLWVPGSTGTSEETISTVQEKQQNIS PLVRERGPQRVAAHITGTRGRSNTLSSPNSKNEKALG RKINSWESSRSGHSFLSNLHLRNGELVIHEKGFYYIYS QTYFRFQEEIKENTKNDKQMVQYIYKYTSYPDPILL MKSARNSCWSKDAEYGLYSIYQGGIFELKENDRIFVS VTNEHLIDMDHEASFFGAFLVGGGGGSGGGGSGTSE ETISTVQEKQQNISPLVRERGPQRVAAHITGTRGRSN TLSSPNSKNEKALGRKINSWESSRSGHSFLSNLHLRN GELVIHEKGFYYIYSQTYFRFQEEIKENTKNDKQMV QYIYKYTSYPDPILLMKSARNSCWSKDAEYGLYSIY QGGIFELKENDRIFVSVTNEHLIDMDHEASFFGAFLV GGGGGSGGGGSGTSEETISTVQEKQQNISPLVRERGP QRVAAHITGTRGRSNTLSSPNSKNEKALGRKINSWES SRSGHSFLSNLHLRNGELVIHEKGFYYIYSQTYFRFQ EEIKENTKNDKQMVQYIYKYTSYPDPILLMKSARNS CWSKDAEYGLYSIYQGGIFELKENDRIFVSVTNEHLI DMDHEASFFGAFLVGGGGGSGGGGSDKTHTCPPCP APELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVS HEDPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRV VSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISK AKGQPREPQVYTLPPCREEMTKNQVSLWCLVKGFY PSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSKL TVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSP GK
SEQ ID NO: 6163	a_hDR5_Tigatuzumab_scFv_VH_VL-hFc_Knob_Cys-Blank	Antigen binding domain specific to DR5, a.k.a. tigatuzumab	METDTLLLWVLLLWVPGSTGEVQLVESGGGLVQPG GSLRLSCAASGFTFSSYVMSWVRQAPGKGLEWVATI SSGGSYTYYPDSVKGRFTISRDNAKNTLYLQMNSLR AEDTAVYYCARRGDSMITTDYWGQGTLVTVSSGGG GSGGGGSGGGGSGGGGSDIQMTQSPSSLSASVGDRV TITCKASQDVGTAVAWYQQKPGKAPKLLIYWASTR HTGVPSRFSGSGSGTDFTLTISSLQPEDFATYYCQQYS SYRTFGQGTKVEIKGGGGSGGGGSDKTHTCPPCPAP ELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHE DPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVVS VLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAK GQPREPQVYTLPPCREEMTKNQVSLWCLVKGFYPSD IAVEWESNGQPENNYKTTPPVLDSDGSFFLYSKLTVD KSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 6164	a_hDR5_Drozitumab_scFv_VH_VL-hFc_Knob_Cys	Antigen binding domain specific to DR5, a.k.a. drozitumab	METDTLLLWVLLLWVPGSTGEVQLVQSGGGVERPG GSLRLSCAASGFTFDDYAMSWVRQAPGKGLEWVSG INWQGGSTGYADSVKGRVTISRDNAKNSLYLQMNS LRAEDTAVYYCAKILGAGRGWYFDYWGKGTTVTVS SGGGGSGGGGSGGGGSGGGGSSELTQDPAVSVALG QTVRITCSGDSLRSYYASWYQQKPGQAPVLVIYGAN NRPSGIPDRFSGSSSGNTASLTITGAQAEDEADYYCN SADSSGNHVVFGGGTKLTVLGGGGSGGGGSDKTHT CPPCPAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVV VDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYNS TYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIE

			KTISKAKGQPREPQVYTLPPCREEMTKNQVSLWCLV KGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFL YSKLTVDKSRWQQGNVFSCSVMHEALHNHYTQKSL SLSPGK
SEQ ID NO: 6165	a_hDR5_Conatumumab_scFv_VH_VL-hFc_Knob_Cys	Antigen binding domain specific to DR5, a.k.a. conatumumab	METDTLLLWVLLLWVPGSTGQVQLQESGPGLVKPS QTLSLTCTVSGGSISSGDYFWSWIRQLPGKGLEWIGH IHNSGTTYYNPSLKSRVTISVDTSKKQFSLRLSSVTAA DTAVYYCARDRGGDYYYGMDVWGQGTTVTVSSGG GGSGGGGSGGGGSGGGGSEIVLTQSPGTLSLSPGERA TLSCRASQGISRSYLAWYQQKPGQAPSLLIYGASSRA TGIPDRFSGSGSGTDFTLTISRLEPEDFAVYYCQQFGS SPWTFGQGTKVEIKRGGGGSGGGGSDKTHTCPPCPA PELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSH EDPEVKFNWYVDGVEVHNAKTKPREEQYNSTYRVV SVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKA KGQPREPQVYTLPPCREEMTKNQVSLWCLVKGFYPS DIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSKLTV DKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
SEQ ID NO: 6170	a_hTRBC1_Jovi1_Hum1_VL-hCLIg_vk-a_hDR5_Tigatuzumab_scFv_VH_VL	Antigen binding domain specific to DR5, a.k.a. tigatuzumab, with anti-TRBC1 light chain	METDTLLLWVLLLWVPGSTGDVVMTQSPLSLPVTPG EPASISCRSSQRLVHSNGNTYLHWYLQKPGQSPQLLI YRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDVGV YFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDE QLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGN SQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYAC EVTHQGLSSPVTKSFNRGECGGGGSGGGGSGGGGSE VQLVESGGGLVQPGGSLRLSCAASGFTFSSYVMSWV RQAPGKGLEWVATISSGGSYTYYPDSVKGRFTISRD NAKNTLYLQMNSLRAEDTAVYYCARRGDSMITTDY WGQGTLVTVSSGGGGSGGGGSGGGGSGGGGSDIQM TQSPSSLSASVGDRVTITCKASQDVGTAVAWYQQKP GKAPKLLIYWASTRHTGVPSRFSGSGSGTDFTLTISSL QPEDFATYYCQQYSSYRTFGQGTKVEIK
SEQ ID NO: 6171	a_hTRBC1_Jovi1_Hum1_VL-hCLIg_vk-a_hDR5_Conatumumab_scFv_VH_VL	Antigen binding domain specific to DR5, a.k.a. drozitumab, with anti-TRBC1 light chain	METDTLLLWVLLLWVPGSTGDVVMTQSPLSLPVTPG EPASISCRSSQRLVHSNGNTYLHWYLQKPGQSPQLLI YRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDVGV YFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDE QLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGN SQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYAC EVTHQGLSSPVTKSFNRGECGGGGSGGGGSGGGGSQ VQLQESGPGLVKPSQTLSLTCTVSGGSISSGDYFWSW IRQLPGKGLEWIGHIHNSGTTYYNPSLKSRVTISVDTS KKQFSLRLSSVTAADTAVYYCARDRGGDYYYGMD VWGQGTTVTVSSGGGGSGGGGSGGGGSGGGGSEIV LTQSPGTLSLSPGERATLSCRASQGISRSYLAWYQQK PGQAPSLLIYGASSRATGIPDRFSGSGSGTDFTLTISRL EPEDFAVYYCQQFGSSPWTFGQGTKVEIKR
SEQ ID NO: 6172	a_hTRBC1_Jovi1_Hum1_VL-hCLIg_vk-a_hDR5_Drozitumab_scFv_VH_VL	Antigen binding domain specific to DR5, a.k.a. conatumumab, with anti-	METDTLLLWVLLLWVPGSTGDVVMTQSPLSLPVTPG EPASISCRSSQRLVHSNGNTYLHWYLQKPGQSPQLLI YRVSNRFPGVPDRFSGSGSGTDFTLKISRVEAEDVGV YFCSQSTHVPYTFGGGTKVEIKRTVAAPSVFIFPPSDE QLKSGTASVVCLLNNFYPREAKVQWKVDNALQSGN SQESVTEQDSKDSTYSLSSTLTLSKADYEKHKVYAC EVTHQGLSSPVTKSFNRGECGGGGSGGGGSGGGGSE VQLVQSGGGVERPGGSLRLSCAASGFTFDDYAMSW

		TRBC1 light chain	VRQAPGKGLEWVSGINWQGGSTGYADSVKGRVTIS RDNAKNSLYLQMNSLRAEDTAVYYCAKILGAGRGW YFDYWGKGTTVTVSSGGGGSGGGGSGGGGSGGGGS SELTQDPAVSVALGQTVRITCSGDSLRSYYASWYQQ KPGQAPVLVIYGANNRPSGIPDRFSGSSSGNTASLTIT GAQAEDEADYYCNSADSSGNHVVFGGGTKLTVL

T Cell Engagers

[00505] The present disclosure provides, *inter alia*, multispecific (e.g., bi-, tri-, quad- specific) or multifunctional molecules, that are engineered to contain one or more T cell engager that mediate binding to and/or activation of a T cell. Accordingly, in some embodiments, the T cell engager is selected from an antigen binding domain or ligand that binds to (e.g., and in some embodiments activates) one or more of CD3, TCRα, TCRβ, TCRγ, TCRζ, ICOS, CD28, CD27, HVEM, LIGHT, CD40, 4-4BB, OX40, DR3, GITR, CD30, TIM1, SLAM, CD2, or CD226. In other embodiments, the T cell engager is selected from an antigen binding domain or ligand that binds to and does not activate one or more of CD3, TCRα, TCRβ, TCRγ, TCRζ, ICOS, CD28, CD27, HVEM, LIGHT, CD40, 4-4BB, OX40, DR3, GITR, CD30, TIM1, SLAM, CD2, or CD226.

TCR beta V Antigen Binding Domains

[00506] In some embodiments, the T cell engager is an antigen binding domain (e.g., an antibody molecule or fragment thereof) that binds to (e.g., and in some embodiments activates) TCRβ. This disclosure provides, inter alia, antibody molecules and fragments thereof, that bind, *e.g.*, specifically bind, to a human TCR beta V chain (TCRβV), *e.g.*, a TCRβV gene family, *e.g.*, a TCRβV subfamily, *e.g.*, as described herein. TCR beta V families and subfamilies are known in the art, *e.g.*, as described in Yassai et al., (2009) *Immunogenetics* 61(7)pp:493-502; Wei S. and Concannon P. (1994) *Human Immunology* 41(3) pp: 201-206. The antibodies described herein can be recombinant antibodies, *e.g.*, recombinant non-murine antibodies, *e.g.*, recombinant human or humanized antibodies. Throughout this disclosure, TCRβV and TCRBV are used interchangeably.

[00507] In some embodiments, the disclosure provides T cell engagers comprising an anti-TCRβV antibody molecule that binds to human TCRβV, *e.g.*, a TCRβV family, *e.g.*, gene family. In some embodiments a TCRBV gene family comprises one or more subfamilies, *e.g.*, as described herein, *e.g.*, in FIG. 6. In some embodiments, the TCRβV gene family comprises subfamilies comprising: a TCRβ V6 subfamily, a TCRβ V10 subfamily, a TCRβ V12 subfamily, a TCRβ V5 subfamily, a TCRβ V7 subfamily, a TCRβ V11 subfamily, a TCRβ V14 subfamily, a TCRβ V16 subfamily, a TCRβ V18 subfamily, a TCRβ V9 subfamily, a TCRβ V13 subfamily, a TCRβ V4 subfamily, a TCRβ V3 subfamily, a TCRβ V2 subfamily, a TCRβ V15 subfamily, a TCRβ V30 subfamily, a TCRβ V19 subfamily, a TCRβ V27 subfamily, a TCRβ V28 subfamily, a TCRβ V24 subfamily, a TCRβ V20 subfamily, TCRβ V25 subfamily, or a TCRβ V29 subfamily.

[00508] In some embodiments, TCRβ V6 subfamily is also known as TCRβ V13.1. In some embodiments, the TCRβ V6 subfamily comprises: TCRβ V6-4*01, TCRβ V6-4*02, TCRβ V6-9*01, TCRβ V6-8*01, TCRβ V6-5*01, TCRβ V6-6*02, TCRβ V6-6*01, TCRβ V6-2*01, TCRβ V6-3*01 or TCRβ V6-1*01. In some embodiments, TCRβ V6 comprises TCRβ V6-5*01. In some embodiments, TCRβ V6, *e.g.*, TCRβ V6-5*01, is recognized, *e.g.*, bound, by SEQ ID NO: 1 and/or SEQ ID NO: 2. In some embodiments, TCRβ V6, *e.g.*, TCRβ V6-5*01, is recognized, *e.g.*, bound, by SEQ ID NO: 9 and/or SEQ ID NO: 10. In some embodiments, TCRβ V6 is recognized, *e.g.*, bound, by SEQ ID NO: 9 and/or SEQ ID NO: 11.

[00509] In some embodiments, TCRβ V10 subfamily is also known as TCRβ V12. In some embodiments, the TCRβ V10 subfamily comprises: TCRβ V10-1*01, TCRβ V10-1*02, TCRβ V10-3*01 or TCRβ V10-2*01.

[00510] In some embodiments, TCRβ V12 subfamily is also known as TCRβ V8.1. In some embodiments, the TCRβ V12 subfamily comprises: TCRβ V12-4*01, TCRβ V12-3*01, or TCRβ V12-5*01. In some embodiments, TCRβ V12 is recognized, *e.g.*, bound, by SEQ ID NO: 15 and/or SEQ ID NO: 16. In some embodiments, TCRβ V12 is recognized, *e.g.*, bound, by any one of SEQ ID NOs 23-25, and/or any one of SEQ ID NO: 26-30:

[00511] In some embodiments, the TCRβ V5 subfamily is chosen from: TCRβ V5-5*01, TCRβ V5-6*01, TCRβ V5-4*01, TCRβ V5-8*01, TCRβ V5-1*01.

[00512] In some embodiments, the TCRβ V7 subfamily comprises TCRβ V7-7*01, TCRβ V7-6*01, TCRβ V7 -8*02, TCRβ V7 -4*01, TCRβ V7-2*02, TCRβ V7-2*03, TCRβ V7-2*01, TCRβ V7-3*01, TCRβ V7-9*03, or TCRβ V7-9*01.

[00513] In some embodiments, the TCRβ V11 subfamily comprises: TCRβ V11-1*01, TCRβ V11-2*01 or TCRβ V11-3*01.

[00514] In some embodiments, the TCRβ V14 subfamily comprises TCRβ V14*01.

[00515] In some embodiments, the TCRβ V16 subfamily comprises TCRβ V16*01.

[00516] In some embodiments, the TCRβ V18 subfamily comprises TCRβ V18*01.

[00517] In some embodiments, the TCRβ V9 subfamily comprises TCRβ V9*01 or TCRβ V9*02.

[00518] In some embodiments, the TCRβ V13 subfamily comprises TCRβ V13*01.

[00519] In some embodiments, the TCRβ V4 subfamily comprises TCRβ V4-2*01, TCRβ V4-3*01, or TCRβ V4-1*01.

[00520] In some embodiments, the TCRβ V3 subfamily comprises TCRβ V3-1*01.

[00521] In some embodiments, the TCRβ V2 subfamily comprises TCRβ V2*01.

[00522] In some embodiments, the TCRβ V15 subfamily comprises TCRβ V15*01.

[00523] In some embodiments, the TCRβ V30 subfamily comprises TCRβ V30*01, or TCRβ V30*02.

[00524] In some embodiments, the TCRβ V19 subfamily comprises TCRβ V19*01, or TCRβ V19*02.

[00525] In some embodiments, the TCRβ V27 subfamily comprises TCRβ V27*01.

[00526] In some embodiments, the TCRβ V28 subfamily comprises TCRβ V28*01.

[00527] In some embodiments, the TCRβ V24 subfamily comprises TCRβ V24-1*01.

[00528] In some embodiments, the TCRβ V20 subfamily comprises TCRβ V20-1*01, or TCRβ V20-1*02.

[00529] In some embodiments, the TCRβ V25 subfamily comprises TCRβ V25-1*01.

[00530] In some embodiments, the TCRβ V29 subfamily comprises TCRβ V29-1*01.

Table 12: List of TCRβV subfamilies and subfamily members

Reference in Fig. 6	**Subfamily**	**Subfamily members**
A	TCRβ V6 *Also referred to as: TCR VB 13.1*	TCRβ V6-4*01, TCRβ V6-4*02, TCRβ V6-9*01, TCRβ V6-8*01, TCRβ V6-5*01, TCRβ V6-6*02, TCRβ V6-6*01, TCRβ V6-2*01, TCRβ V6-3*01 or TCRβ V6-1*01.
B	TCRβ V10 *Also referred to as: TCRβ V12*	TCRβ V10-1*01, TCRβ V10-1*02, TCRβ V10-3*01 or TCRβ V10-2*01
C	TCRβ V12 *Also referred to as: TCRβ V8.1*	TCRβ V12-4*01, TCRβ V12-3*01, or TCRβ V12-5*01
D	TCRβ V5	TCRβ V5-5*01, TCRβ V5-6*01, TCRβ V5-4*01, TCRβ V5-8*01, TCRβ V5-1*01
E	TCRβ V7	TCRβ V7-7*01, TCRβ V7-6*01, TCRβ V7 -8*02, TCRβ V7 -4*01, TCRβ V7-2*02, TCRβ V7-2*03, TCRβ V7-2*01, TCRβ V7-3*01, TCRβ V7-9*03, or TCRβ V7-9*01
F	TCRβ V11	TCRβ V11-1*01, TCRβ V11-2*01 or TCRβ V11-3*01
G	TCRβ V14	TCRβ V14*01
H	TCRβ V16	TCRβ V16*01
I	TCRβ V18	TCRβ V18*01
J	TCRβ V9	TCRβ V9*01 or TCRβ V9*02
K	TCRβ V13	TCRβ V13*01
L	TCRβ V4	TCRβ V4-2*01, TCRβ V4-3*01, or TCRβ V4-1*01
M	TCRβ V3	TCRβ V3-1*01
N	TCRβ V2	TCRβ V2*01
O	TCRβ V15	TCRβ V15*01
P	TCRβ V30	TCRβ V30*01, or TCRβ V30*02
Q	TCRβ V19	TCRβ V19*01, or TCRβ V19*02
R	TCRβ V27	TCRβ V27*01.
S	TCRβ V28	TCRβ V28*01.
T	TCRβ V24	TCRβ V24-1*01
U	TCRβ V20	TCRβ V20-1*01, or TCRβ V20-1*02

V	TCRβ V25	TCRβ V25-1*01
W	TCRβ V29	TCRβ V29-1*01

Anti-TCRβV antibodies

[00531] In an aspect, the disclosure provides an anti-TCRβV antibody molecule that binds to human TCRβV, *e.g.*, a TCRβV gene family, *e.g.*, one or more of a TCRβV subfamily, *e.g.*, as described herein, *e.g.*, in FIG. 6. In some embodiments, the anti-TCRβV antibody molecule binds to one or more TCRβV subfamilies chosen from: a TCRβ V6 subfamily, a TCRβ V10 subfamily, a TCRβ V12 subfamily, a TCRβ V5 subfamily, a TCRβ V7 subfamily, a TCRβ V11 subfamily, a TCRβ V14 subfamily, a TCRβ V16 subfamily, a TCRβ V18 subfamily, a TCRβ V9 subfamily, a TCRβ V13 subfamily, a TCRβ V4 subfamily, a TCRβ V3 subfamily, a TCRβ V2 subfamily, a TCRβ V15 subfamily, a TCRβ V30 subfamily, a TCRβ V19 subfamily, a TCRβ V27 subfamily, a TCRβ V28 subfamily, a TCRβ V24 subfamily, a TCRβ V20 subfamily, TCRβ V25 subfamily, or a TCRβ V29 subfamily. In some embodiments, the anti-TCRβV antibody molecule binds to a TCRβ V6 subfamily comprising: TCRβ V6-4*01, TCRβ V6-4*02, TCRβ V6-9*01, TCRβ V6-8*01, TCRβ V6-5*01, TCRβ V6-6*02, TCRβ V6-6*01, TCRβ V6-2*01, TCRβ V6-3*01 or TCRβ V6-1*01. In some embodiments the TCRβ V6 subfamily comprises TCRβ V6-5*01. In some embodiments, the anti-TCRβV antibody molecule binds to a TCRβ V10 subfamily comprising: TCRβ V10-1*01, TCRβ V10-1*02, TCRβ V10-3*01 or TCRβ V10-2*01. In some embodiments, the anti-TCRβV antibody molecule binds to a TCRβ V12 subfamily comprising: TCRβ V12-4*01, TCRβ V12-3*01 or TCRβ V12-5*01. In some embodiments, the anti-TCRβV antibody molecule binds to a TCRβ V5 subfamily comprising: TCRβ V5-5*01, TCRβ V5-6*01, TCRβ V5-4*01, TCRβ V5-8*01, TCRβ V5-1*01.

[00532] In some embodiments, the anti-TCRβV antibody molecule does not bind to TCRβ V12, or binds to TCRβ V12 with an affinity and/or binding specificity that is less than (e.g., less than about 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or about 2-, 5-, or 10- fold) the affinity and/or binding specificity of the 16G8 murine antibody or a humanized version thereof as described in US Patent 5,861,155.

[00533] In some embodiments, the anti-TCRβV antibody molecule binds to TCRβ V12 with an affinity and/or binding specificity that is greater than (e.g., greater than about 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or about 2-, 5-, or 10- fold) the affinity and/or binding specificity of the 16G8 murine antibody or a humanized version thereof as described in US Patent 5,861,155.

[00534] In some embodiments, the anti-TCRβV antibody molecule binds to a TCRβV region other than TCRβ V12 (e.g., TCRβV region as described herein, e.g., TCRβ V6 subfamily (e.g., TCRβ V6-5*01) with an affinity and/or binding specificity that is greater than (e.g., greater than about 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or about 2-, 5-, or 10- fold) the affinity and/or binding specificity of the 16G8 murine antibody or a humanized version thereof as described in US Patent

5,861,155.

[00535] In some embodiments, the anti-TCRβV antibody molecule does not bind to TCRβ V5-5*01 or TCRβ V5-1*01, or binds to TCRβ V5-5*01 or TCRβ V5-1*01 with an affinity and/or binding specificity that is less than (e.g., less than about 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or about 2-, 5-, or 10- fold) the affinity and/or binding specificity of the TM23 murine antibody or a humanized version thereof as described in US Patent 5,861,155.

[00536] In some embodiments, the anti-TCRβV antibody molecule binds to TCRβ V5-5*01 or TCRβ V5-1*01with an affinity and/or binding specificity that is greater than (e.g., greater than about 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or about 2-, 5-, or 10- fold) the affinity and/or binding specificity of the TM23 murine antibody or a humanized version thereof as described in US Patent 5,861,155.

[00537] In some embodiments, the anti-TCRβV antibody molecule binds to a TCRβV region other than TCRβ V5-5*01 or TCRβ V5-1*01 (e.g., TCRβV region as described herein, e.g., TCRβ V6 subfamily (e.g., TCRβ V6-5*01) with an affinity and/or binding specificity that is greater than (e.g., greater than about 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% or about 2-, 5-, or 10- fold) the affinity and/or binding specificity of the TM23 murine antibody or a humanized version thereof as described in US Patent 5,861,155.

Anti-TCRβ V6 antibodies

[00538] Accordingly, in one aspect, the disclosure provides an anti-TCRβV antibody molecule that binds to human TCRβ V6, *e.g.*, a TCRβ V6 subfamily comprising: TCRβ V6-4*01, TCRβ V6-4*02, TCRβ V6-9*01, TCRβ V6-8*01, TCRβ V6-5*01, TCRβ V6-6*02, TCRβ V6-6*01, TCRβ V6-2*01, TCRβ V6-3*01 or TCRβ V6-1*01. In some embodiments the TCRβ V6 subfamily comprises TCRβ V6-5*01.

[00539] In some embodiments, TCRβ V6-5*01 is encoded by the nucleic acid sequence of SEQ ID NO: 43, or a sequence having 85%, 90%, 95%, 99% or more identity thereof.

[00540] SEQ ID NO: 43

[00541] ATGAGCATCGGCCTCCTGTGCTGTGCAGCCTTGTCTCTCCTGTGGGCAGGTCCA GTGAATGCTGGTGTCACTCAGACCCCAAAATTCCAGGTCCTGAAGACAGGACAGAGCAT GACACTGCAGTGTGCCCAGGATATGAACCATGAATACATGTCCTGGTATCGACAAGACC CAGGCATGGGGCTGAGGCTGATTCATTACTCAGTTGGTGCTGGTATCACTGACCAAGGAG AAGTCCCCAATGGCTACAATGTCTCCAGATCAACCACAGAGGATTTCCCGCTCAGGCTGC TGTCGGCTGCTCCCTCCCAGACATCTGTGTACTTCTGTGCCAGCAGTTACTC

[00542] In some embodiments, TCRβ V6-5*01 comprises the amino acid sequence of SEQ ID NO: 44, or an amino acid sequence having 85%, 90%, 95%, 99% or more identity thereof.

[00543] SEQ ID NO: 44

[00544] MSIGLLCCAALSLLWAGPVNAGVTQTPKFQVLKTGQSMTLQCAQDMNHEYMSW YRQDPGMGLRLIHYSVGAGITDQGEVPNGYNVSRSTTEDFPLRLLSAAPSQTSVYFCASSY

[00545] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, is a non-murine antibody molecule, *e.g.*, a human or humanized antibody molecule. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule is a human antibody molecule. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule is a humanized antibody molecule.

[00546] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, is isolated or recombinant.

[00547] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises at least one antigen-binding region, *e.g.*, a variable region or an antigen-binding fragment thereof, from an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in **Table 13**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00548] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises at least one, two, three or four variable regions from an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in Table 13, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00549] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises at least one or two heavy chain variable regions from an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in Table 13, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00550] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises at least one or two light chain variable regions from an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in Table 13, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00551] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a heavy chain constant region for an IgG4, *e.g.*, a

human IgG4. In still another embodiment, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule includes a heavy chain constant region for an IgG1, *e.g.*, a human IgG1. In one embodiment, the heavy chain constant region comprises an amino sequence set forth in **Table 17**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) thereto.

[00552] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes a kappa light chain constant region, *e.g.*, a human kappa light chain constant region. In one embodiment, the light chain constant region comprises an amino sequence set forth in **Table 17**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) thereto.

[00553] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes at least one, two, or three complementarity determining regions (CDRs) from a heavy chain variable region of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in Table 13, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00554] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes at least one, two, or three CDRs (or collectively all of the CDRs) from a heavy chain variable region comprising an amino acid sequence shown in **Table 13**, or encoded by a nucleotide sequence shown in **Table 13**. In one embodiment, one or more of the CDRs (or collectively all of the CDRs) have one, two, three, four, five, six or more changes, *e.g.*, amino acid substitutions or deletions, relative to the amino acid sequence shown in **Table 13**, or encoded by a nucleotide sequence shown in **Table 13**.

[00555] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes at least one, two, or three complementarity determining regions (CDRs) from a light chain variable region of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in Table 13, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00556] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes at least one, two, or three CDRs (or collectively all of the CDRs) from a light chain variable region comprising an amino acid sequence shown in **Table 13**, or encoded by a nucleotide sequence shown in **Table 13**. In one embodiment, one or more of the CDRs (or collectively all of the CDRs) have one, two, three, four, five, six or more changes, *e.g.*, amino acid substitutions or deletions, relative to the amino acid sequence shown in **Table 13**, or encoded by a nucleotide sequence shown in **Table 13**.

[00557] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes at least one, two, three, four, five or six CDRs (or collectively all of the CDRs) from a heavy and light chain variable region comprising an amino acid sequence shown in **Table 13**, or encoded by a nucleotide sequence shown in **Table 13**. In one embodiment, one or more of the CDRs (or collectively all of the CDRs) have one, two, three, four, five, six or more changes, *e.g.*, amino acid substitutions or deletions, relative to the amino acid sequence shown in **Table 13**, or encoded by a nucleotide sequence shown in **Table 13**.

[00558] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, molecule includes all six CDRs from an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in Table 13, or closely related CDRs, *e.g.*, CDRs which are identical or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions). In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, may include any CDR described herein.

[00559] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule includes at least one, two, or three CDRs according to Kabat *et al.* (*e.g.*, at least one, two, or three CDRs according to the Kabat definition as set out in **Table 13**) from a heavy chain variable region of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, or three CDRs according to Kabat et al. shown in **Table 13**.

[00560] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule includes at least one, two, or three CDRs according to Kabat *et al.* (*e.g.*, at least one, two, or three CDRs according to the Kabat definition as set out in **Table 13**) from a light chain variable region of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, or three CDRs according to Kabat et al. shown in **Table 13**.

[00561] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes at least one, two, three, four, five, or six CDRs according to Kabat *et al.* (*e.g.*, at least one, two, three, four, five, or six CDRs according to the Kabat

definition as set out in **Table 13**) from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in **Table 13**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, three, four, five, or six CDRs according to Kabat et al. shown in **Table 13**.

[00562] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes all six CDRs according to Kabat *et al.* (*e.g.,* all six CDRs according to the Kabat definition as set out in Table 13) from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in **Table 13**; or encoded by the nucleotide sequence in **Table 13**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to all six CDRs according to Kabat et al. shown in **Table 13**. In one embodiment, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, may include any CDR described herein.

[00563] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes at least one, two, or three hypervariable loops that have the same canonical structures as the corresponding hypervariable loop of an antibody described herein, *e.g.*, an antibody chosen from chosen from BHM1709 or BHM1710 *e.g.*, the same canonical structures as at least loop 1 and/or loop 2 of the heavy and/or light chain variable domains of an antibody described herein. See, *e.g.*, Chothia et al., (1992) J. Mol. Biol. 227:799-817; Tomlinson et al., (1992) J. Mol. Biol. 227:776-798 for descriptions of hypervariable loop canonical structures. These structures can be determined by inspection of the tables described in these references.

[00564] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule includes at least one, two, or three CDRs according to Chothia et al. (*e.g.*, at least one, two, or three CDRs according to the Chothia definition as set out in Table 13) from a heavy chain variable region of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in Table 13, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, or three CDRs according to Chothia et al. shown in Table 13.

[00565] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-

TCRβ V6-5*01) antibody molecule includes at least one, two, or three CDRs according to Chothia *et al.* (*e.g.,* at least one, two, or three CDRs according to the Chothia definition as set out in **Table 13)** from a light chain variable region of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, or three CDRs according to Chothia et al. shown in **Table 13**.

[00566] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes at least one, two, three, four, five, or six CDRs according to Chothia *et al.* (*e.g.,* at least one, two, three, four, five, or six CDRs according to the Chothia definition as set out in **Table 13)** from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in **Table 13**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, three, four, five, or six CDRs according to Chothia et al. shown in **Table 13**.

[00567] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes all six CDRs according to Chothia *et al.* (*e.g.,* all six CDRs according to the Chothia definition as set out in Table 13) from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in **Table 13**; or encoded by the nucleotide sequence in **Table 13**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to all six CDRs according to Chothia et al. shown in **Table 13**. In one embodiment, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, may include any CDR described herein.

[00568] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, molecule includes a combination of CDRs or hypervariable loops defined according to Kabat et al., Chothia et al., or as described in Table 13.

[00569] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, can contain any combination of CDRs or hypervariable loops according to the Kabat and Chothia definitions.

[00570] In some embodiments, a combined CDR as set out in Table 13 is a CDR that comprises a Kabat CDR and a Chothia CDR.

[00571] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, molecule includes a combination of CDRs or hypervariable loops identified as combined CDRs in Table 13. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, can contain any combination of CDRs or hypervariable loops according the "combined" CDRs are described in Table 13.

[00572] In an embodiment, *e.g.*, an embodiment comprising a variable region, a CDR (*e.g.,* a combined CDR, Chothia CDR or Kabat CDR), or other sequence referred to herein, *e.g.,* in **Table 13**, the antibody molecule is a monospecific antibody molecule, a bispecific antibody molecule, a bivalent antibody molecule, a biparatopic antibody molecule, or an antibody molecule that comprises an antigen binding fragment of an antibody, *e.g.,* a half antibody or antigen binding fragment of a half antibody. In certain embodiments the antibody molecule comprise a multispecific molecule, *e.g.*, a bispecific molecule, *e.g.*, as described herein.

[00573] In an embodiment, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule includes:

[00574] (i) one, two or all of a light chain complementarity determining region 1 (LC CDR1), a light chain complementarity determining region 2 (LC CDR2),and a light chain complementarity determining region 3 (LC CDR3) of SEQ ID NO: 2, SEQ ID NO: 10 or SEQ ID NO: 11, and/or

[00575] (ii) one, two or all of a heavy chain complementarity determining region 1 (HC CDR1), heavy chain complementarity determining region 2 (HC CDR2), and a heavy chain complementarity determining region 3 (HC CDR3) of SEQ ID NO: 1 or SEQ ID NO: 9.

[00576] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule comprises a LC CDR1, LC CDR2, and LC CDR3 of SEQ ID NO: 2, and a HC CDR1, HC CDR2, and HC CDR3 of SEQ ID NO: 1.

[00577] In some embodiments the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule comprises a LC CDR1, LC CDR2, and LC CDR3 of SEQ ID NO: 10, and a HC CDR1, HC CDR2, and HC CDR3 of SEQ ID NO: 9.

[00578] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule comprises a LC CDR1, LC CDR2, and LC CDR3 of SEQ ID NO: 11, and a HC CDR1, HC CDR2, and HC CDR3 of SEQ ID NO: 9.

[00579] In an embodiment, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule comprises:

[00580] (i) a LC CDR1 amino acid sequence of SEQ ID NO: 6, a LC CDR2 amino acid sequence of SEQ ID NO: 7, or a LC CDR3 amino acid sequence of SEQ ID NO: 8; and/or

[00581] (ii) a HC CDR1 amino acid sequence of SEQ ID NO: 3, a HC CDR2 amino acid sequence of SEQ ID NO: 4, or a HC CDR3 amino acid sequence of SEQ ID NO: 5.

[00582] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule comprises:

[00583] (i) a light chain variable region (VL) comprising a LC CDR1 amino acid sequence of SEQ ID NO: 6, a LC CDR2 amino acid sequence of SEQ ID NO: 7, or a LC CDR3 amino acid sequence of SEQ ID NO: 8; and/or

[00584] (ii) a heavy chain variable region (VH) comprising a HC CDR1 amino acid sequence of SEQ ID NO: 3, a HC CDR2 amino acid sequence of SEQ ID NO: 4, or a HC CDR3 amino acid sequence of SEQ ID NO: 5.

[00585] In an embodiment, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule comprises:

[00586] (i) a LC CDR1 amino acid sequence of SEQ ID NO: 51, a LC CDR2 amino acid sequence of SEQ ID NO: 52, or a LC CDR3 amino acid sequence of SEQ ID NO: 53; and/or

[00587] (ii) a HC CDR1 amino acid sequence of SEQ ID NO: 45, a HC CDR2 amino acid sequence of SEQ ID NO: 46, or a HC CDR3 amino acid sequence of SEQ ID NO: 47.

[00588] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule comprises:

[00589] (i) a light chain variable region (VL) comprising a LC CDR1 amino acid sequence of SEQ ID NO: 51, a LC CDR2 amino acid sequence of SEQ ID NO: 52, or a LC CDR3 amino acid sequence of SEQ ID NO: 53; and/or

[00590] (ii) a heavy chain variable region (VH) comprising a HC CDR1 amino acid sequence of SEQ ID NO: 45, a HC CDR2 amino acid sequence of SEQ ID NO: 46, or a HC CDR3 amino acid sequence of SEQ ID NO: 47.

[00591] In an embodiment, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule comprises:

[00592] (i) a LC CDR1 amino acid sequence of SEQ ID NO: 54, a LC CDR2 amino acid sequence of SEQ ID NO: 55, or a LC CDR3 amino acid sequence of SEQ ID NO: 56; and/or

[00593] (ii) a HC CDR1 amino acid sequence of SEQ ID NO: 48, a HC CDR2 amino acid sequence of SEQ ID NO: 49, or a HC CDR3 amino acid sequence of SEQ ID NO: 50.

[00594] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule comprises:

[00595] (i) a light chain variable region (VL) comprising a LC CDR1 amino acid sequence of SEQ ID NO: 54, a LC CDR2 amino acid sequence of SEQ ID NO: 55, or a LC CDR3 amino acid sequence of SEQ ID NO: 56; and/or

[00596] (ii) a heavy chain variable region (VH) comprising a HC CDR1 amino acid sequence of

SEQ ID NO: 48, a HC CDR2 amino acid sequence of SEQ ID NO: 49, or a HC CDR3 amino acid sequence of SEQ ID NO: 50.

[00597] In one embodiment, the light or the heavy chain variable framework (*e.g.*, the region encompassing at least FR1, FR2, FR3, and optionally FR4) of the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule can be chosen from: (a) a light or heavy chain variable framework including at least 80%, 85%, 87% 90%, 92%, 93%, 95%, 97%, 98%, or 100% of the amino acid residues from a human light or heavy chain variable framework, *e.g.*, a light or heavy chain variable framework residue from a human mature antibody, a human germline sequence, or a human consensus sequence; (b) a light or heavy chain variable framework including from 20% to 80%, 40% to 60%, 60% to 90%, or 70% to 95% of the amino acid residues from a human light or heavy chain variable framework, *e.g.*, a light or heavy chain variable framework residue from a human mature antibody, a human germline sequence, or a human consensus sequence; (c) a non-human framework (*e.g.*, a rodent framework); or (d) a non-human framework that has been modified, *e.g.*, to remove antigenic or cytotoxic determinants, *e.g.*, deimmunized, or partially humanized. In one embodiment, the light or heavy chain variable framework region (particularly FR1, FR2 and/or FR3) includes a light or heavy chain variable framework sequence at least 70, 75, 80, 85, 87, 88, 90, 92, 94, 95, 96, 97, 98, 99% identical or identical to the frameworks of a VL or VH segment of a human germline gene.

[00598] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a heavy chain variable domain having at least one, two, three, four, five, six, seven, ten, fifteen, twenty or more changes, *e.g.*, amino acid substitutions or deletions, from an amino acid sequence of BHM1709 or BHM1710 .*g.*, the amino acid sequence of the FR region in the entire variable region, *e.g.*, shown in **FIG. 4A**, or in SEQ ID NO: 9.

[00599] Alternatively, or in combination with the heavy chain substitutions described herein, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a light chain variable domain having at least one, two, three, four, five, six, seven, ten, fifteen, twenty or more amino acid changes, *e.g.*, amino acid substitutions or deletions, from an amino acid sequence of BHM1709 or BHM1710 .*e.g.*, the amino acid sequence of the FR region in the entire variable region, *e.g.*, shown in **FIG. 4B,** or in SEQ ID NO: 10 or SEQ ID NO: 11.

[00600] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes one, two, three, or four heavy chain framework regions shown in **FIG. 4A,** or a sequence substantially identical thereto.

[00601] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, includes one, two, three, or four light chain framework regions shown in **FIG. 4B,** or a sequence substantially identical thereto.

[00602] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-

TCRβ V6-5*01) antibody molecule, comprises the light chain framework region 1 of BHM1709 or BHM1710, *e.g.*, as shown in **FIG. 4B.**

[00603] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the light chain framework region 2 of BHM1709 or BHM1710, *e.g.*, as shown in **FIG. 4B.**

[00604] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the light chain framework region 3 of BHM1709 or BHM1710, *e.g.*, as shown in **FIG. 4B.**

[00605] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the light chain framework region 4 of BHM1709 or BHM1710, *e.g.*, as shown in **FIG. 4B.**

[00606] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a light chain variable domain comprising a framework region, *e.g.*, framework region 1 (FR1), comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at position 10 according to Kabat numbering. In some embodiments, the FR1 comprises a Phenylalanine at position 10, *e.g.*, a Serine to Phenyalanine substitution. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00607] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a light chain variable domain comprising a framework region, *e.g.*, framework region 2 (FR2), comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at a position disclosed herein according to Kabat numbering. In some embodiments, FR2 comprises a Histidine at position 36, *e.g.*, a substitution at position 36 according to Kabat numbering, *e.g.*, a Tyrosine to Histidine substitution. In some embodiments, FR2 comprises an Alanine at position 46, *e.g.*, a substitution at position 46 according to Kabat numbering, *e.g.*, a Arginine to Alanine substitution. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00608] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a light chain variable domain comprising a framework region, *e.g.*, framework region 3 (FR3), comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at a position disclosed herein according to Kabat numbering. In some embodiments, FR3 comprises a Phenyalanine at position 87, *e.g.*, a substitution at position 87 according to Kabat numbering, *e.g.*, a Tyrosine to Phenyalanine substitution. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00609] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a light chain variable domain comprising: (a) a framework region 1 (FR1) comprising a Phenylalanine at position 10, *e.g.*, a substitution at position

10 according to Kabat numbering, *e.g.*, a Serine to Phenyalanine substitution; (b) a framework region 2 (FR2) comprising a Histidine at position 36, *e.g.*, a substitution at position 36 according to Kabat numbering, *e.g.*, a Tyrosine to Histidine substitution, and a Alanine at position 46, *e.g.*, a substitution at position 46 according to Kabat numbering, *e.g.*, a Arginine to Alanine substitution; and (c) a framework region 3 (FR3) comprising a Phenylalanine at position 87, *e.g.*, a substitution at position 87 according to Kabat numbering, *e.g.*, a Tyrosine to Phenyalanine substitution, *e.g.*, as shown in the amino acid sequence of SEQ ID NO: 10. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00610] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a light chain variable domain comprising: (a) a framework region 2 (FR2) comprising a Histidine at position 36, *e.g.*, a substitution at position 36 according to Kabat numbering, *e.g.*, a Tyrosine to Histidine substitution, and a Alanine at position 46, *e.g.*, a substitution at position 46 according to Kabat numbering, *e.g.*, a Arginine to Alanine substitution; and (b) a framework region 3 (FR3) comprising a Phenylalanine at position 87, *e.g.*, a substitution at position 87 according to Kabat numbering, *e.g.*, a Tyrosine to Phenyalanine substitution, *e.g.*, as shown in the amino acid sequence of SEQ ID NO: 11. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00611] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a light chain variable domain comprising: (a) a framework region 1 (FR1) comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at one or more (*e.g.*, all) positions disclosed herein according to Kabat numbering, ; (b) a framework region 2 (FR2) comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at one or more (*e.g.*, all) position disclosed herein according to Kabat numbering and (c) a framework region 3 (FR3) comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at one or more (*e.g.*, all) position disclosed herein according to Kabat numbering. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00612] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the heavy chain framework region 1 of BHM1709 or BHM1710, *e.g.*, as shown in **FIG. 4A.**

[00613] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the heavy chain framework region 2 of BHM1709 or BHM1710, *e.g.*, as shown in **FIG. 4A**

[00614] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the heavy chain framework region 3 of BHM1709 or BHM1710, *e.g.*, as shown in **FIG. 4A**.

[00615] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-

TCRβ V6-5*01) antibody molecule, comprises the heavy chain framework region 4 of BHM1709 or BHM1710, *e.g.*, as shown in **FIG. 4A.**

[00616] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a heavy chain variable domain comprising a framework region, *e.g.*, framework region 3 (FR3), comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at a position disclosed herein according to Kabat numbering. In some embodiments, FR3 comprises a Threonine at position 73, *e.g.*, a substitution at position 73 according to Kabat numbering, *e.g.*, a Glutamic Acid to Threonine substitution. In some embodiments, FR3 comprises a Glycine at position 94, *e.g.*, a substitution at position 94 according to Kabat numbering, *e.g.*, a Arginine to Glycine substitution. In some embodiments, the substitution is relative to a human germline heavy chain framework region sequence.

[00617] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises a heavy chain variable domain comprising a framework region 3 (FR3) comprising a Threonine at position 73, *e.g.*, a substitution at position 73 according to Kabat numbering, *e.g.*, a Glutamic Acid to Threonine substitution, and a Glycine at position 94, *e.g.*, a substitution at position 94 according to Kabat numbering, *e.g.*, a Arginine to Glycine substitution, *e.g.*, as shown in the amino acid sequence of SEQ ID NO: 10.

[00618] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the heavy chain framework regions 1-4 of BHM1709 or BHM1710, *e.g.*, SEQ ID NO: 9, or as shown in **FIGs. 4A** and **4B.**

[00619] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the light chain framework regions 1-4 of BHM1709, *e.g.*, SEQ ID NO: 10, or as shown in **FIGs. 4A** and **4B.**

[00620] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the light chain framework regions 1-4 of BHM1710, *e.g.*, SEQ ID NO: 11, or as shown in **FIGs. 4A** and **4B**.

[00621] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the heavy chain framework regions 1-4 of BHM1709, *e.g.*, SEQ ID NO: 9; and the light chain framework regions 1-4 of BHM1709, *e.g.*, SEQ ID NO: 10, or as shown in **FIGs. 4A** and **4B.**

[00622] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises the heavy chain framework regions 1-4 of BHM1710, *e.g.*, SEQ ID NO: 9; and the light chain framework regions 1-4 of BHM1710, *e.g.*, SEQ ID NO: 11, or as shown in **FIGs. 4A** and **4B.**

[00623] In some embodiments, the heavy or light chain variable domain, or both, of the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule,

includes an amino acid sequence, which is substantially identical to an amino acid disclosed herein, *e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical to a variable region of an antibody described herein, *e.g.*, an antibody chosen from BHM1709 or BHM1710, or as described in **Table 13**, or encoded by the nucleotide sequence in **Table 13**; or which differs at least 1 or 5 residues, but less than 40, 30, 20, or 10 residues, from a variable region of an antibody described herein.

[00624] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises at least one, two, three, or four antigen-binding regions, *e.g.*, variable regions, having an amino acid sequence as set forth in **Table 13**, or a sequence substantially identical thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, or which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the sequences shown in **Table 13**. In another embodiment, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule includes a VH and/or VL domain encoded by a nucleic acid having a nucleotide sequence as set forth in **Table 13**, or a sequence substantially identical thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, or which differs by no more than 3, 6, 15, 30, or 45 nucleotides from the sequences shown in **Table 13**.

[00625] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises:

[00626] a VH domain comprising the amino acid sequence of SEQ ID NO: 9, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence of SEQ ID NO: 9, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 9; and/or

[00627] a VL domain comprising the amino acid sequence of SEQ ID NO: 10, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence of SEQ ID NO: 10, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 10.

[00628] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, comprises:

[00629] a VH domain comprising the amino acid sequence of SEQ ID NO: 9, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence of SEQ ID NO: 9, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 9; and/or

[00630] a VL domain comprising the amino acid sequence of SEQ ID NO: 11, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence of SEQ ID NO: 11, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 11.

[00631] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-

TCRβ V6-5*01) antibody molecule is a full antibody or fragment thereof (*e.g.*, a Fab, $F(ab')_2$, Fv, or a single chain Fv fragment (scFv)). In embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule is a monoclonal antibody or an antibody with single specificity. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, can also be a humanized, chimeric, camelid, shark, or an *in vitro*-generated antibody molecule. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, is a humanized antibody molecule. The heavy and light chains of the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, can be full-length (*e.g.*, an antibody can include at least one, and preferably two, complete heavy chains, and at least one, and preferably two, complete light chains) or can include an antigen-binding fragment (*e.g.*, a Fab, F(ab')2, Fv, a single chain Fv fragment, a single domain antibody, a diabody (dAb), a bivalent antibody, or bispecific antibody or fragment thereof, a single domain variant thereof, or a camelid antibody).

[00632] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, is in the form of a multispecific molecule, *e.g.*, a bispecific molecule, *e.g.*, as described herein.

[00633] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, has a heavy chain constant region (Fc) chosen from, *e.g.*, the heavy chain constant regions of IgG1, IgG2, IgG3, IgG4, IgM, IgA1, IgA2, IgD, and IgE. In some embodiments, the Fc region is chosen from the heavy chain constant regions of IgG1, IgG2, IgG3, and IgG4. In some embodiments, the Fc region is chosen from the heavy chain constant region of IgG1 or IgG2 (*e.g.*, human IgG1, or IgG2). In some embodiments, the heavy chain constant region is human IgG1.

[00634] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule, has a light chain constant region chosen from, *e.g.*, the light chain constant regions of kappa or lambda, preferably kappa (*e.g.*, human kappa). In one embodiment, the constant region is altered, *e.g.,* mutated, to modify the properties of the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule (*e.g.*, to increase or decrease one or more of: Fc receptor binding, antibody glycosylation, the number of cysteine residues, effector cell function, or complement function). For example, the constant region is mutated at positions 296 (M to Y), 298 (S to T), 300 (T to E), 477 (H to K) and 478 (N to F) to alter Fc receptor binding (*e.g.*, the mutated positions correspond to positions 132 (M to Y), 134 (S to T), 136 (T to E), 313 (H to K) and 314 (N to F) of SEQ ID NOs: 212 or 214; or positions 135 (M to Y), 137 (S to T), 139 (T to E), 316 (H to K) and 317 (N to F) of SEQ ID NOs: 215, 216, 217 or 218), *e.g.*, relative to human IgG1.

Table 13: Amino acid and nucleotide sequences for murine, chimeric and humanized antibody molecules. The antibody molecules include murine mAb H131, and humanized mAb H131 Clones BHM1709 and BHM1710. The amino acid the heavy and light chain CDRs, and the amino acid and nucleotide sequences of the heavy and light chain variable regions, and the heavy and light chains are shown.

H131 (murine)		
SEQ ID NO: 3	HC CDR1 (Combined)	GYSFTTYYIH
SEQ ID NO: 4	HC CDR2 (Combined)	WFFPGSGNIKYNEKFKG
SEQ ID NO: 5	HC CDR3 (Combined)	SYYSYDVLDY
SEQ ID NO: 45	HC CDR1 (Kabat)	TYYIH
SEQ ID NO: 46	HC CDR2 (Kabat)	WFFPGSGNIKYNEKFKG
SEQ ID NO: 47	HC CDR3 (Kabat)	SYYSYDVLDY
SEQ ID NO:48	HC CDR1 (Chothia)	GYSFTTY
SEQ ID NO: 49	HC CDR2 (Chothia)	FPGSGN
SEQ ID NO: 50	HC CDR3 (Chothia)	SYYSYDVLDY
SEQ ID NO: 1	VH	QVQLQQSGPELVKPGTSVKISCKASGYSFTTYY IHWVKQRPGQGLEWIGWFFPGSGNIKYNEKFK GKATLTADTSSSTAYMQLSSLTSEESAVYFCAG SYYSYDVLDYWGHGTTLTVSS
SEQ ID NO: 6	LC CDR1 (Combined)	KASQNVGINVV
SEQ ID NO: 7	LC CDR2 (Combined))	SSSHRYS
SEQ ID NO: 8	LC CDR3 (Combined)	QQFKSYPLT
SEQ ID NO: 51	LC CDR1 (Kabat)	KASQNVGINVV
SEQ ID NO: 52	LC CDR2 (Kabat)	SSSHRYS
SEQ ID NO: 53	LC CDR3 (Kabat)	QQFKSYPLT
SEQ ID NO: 54	LC CDR1 (Chothia)	KASQNVGINVV
SEQ ID NO: 55	LC CDR2 (chothia)	SSSHRYS
SEQ ID NO: 56	LC CDR3 (chothia)	QQFKSYPLT
SEQ ID NO: 2	VL	DILMTQSQKFMSTSLGDRVSVSCKASQNVGIN VVWHQQKPGQSPKALIYSSSHRYSGVPDRFTG SGSGTDFTLTINNVQSEDLAEYFCQQFKSYPLTF GAGTKLELK
BHM1709 (humanized)		
SEQ ID NO: 3	HC CDR1 (Combined)	GYSFTTYYIH
SEQ ID NO: 4	HC CDR2 (Combined)	WFFPGSGNIKYNEKFKG
SEQ ID NO: 5	HC CDR3 (Combined)	SYYSYDVLDY
SEQ ID NO: 9	VH	QVQLVQSGAEVKKPGSSVKVSCKASGYSFTTY YIHWVRQAPGQGLEWMGWFFPGSGNIKYNEK FKGRVTITADTSTSTAYMELSSLRSEDTAVYYC AGSYYSYDVLDYWGQGTTVTVSS
SEQ ID NO: 12	DNA VH	CAGGTGCAGCTGGTTCAGTCTGGCGCCGAAG TGAAGAAACCTGGCTCCTCCGTGAAGGTGTC CTGCAAGGCTTCCGGCTACTCCTTCACCACCT ACTACATCCACTGGGTCCGACAGGCCCCTGG ACAAGGATTGGAATGGATGGGCTGGTTCTTC CCCGGCTCCGGCAACATCAAGTACAACGAGA AGTTCAAGGGCCGCGTGACCATCACCGCCGA CACCTCTACCTCTACCGCCTACATGGAACTGT CCAGCCTGAGATCTGAGGACACCGCCGTGTA CTACTGCGCCGGCTCCTACTACTCTTACGACG

		TGCTGGATTACTGGGGCCAGGGCACCACAGT GACAGTGTCCTCT
SEQ ID NO: 6	LC CDR1 (Combined)	KASQNVGINVV
SEQ ID NO: 7	LC CDR2 (Combined))	SSSHRYS
SEQ ID NO: 8	LC CDR3 (Combined)	QQFKSYPLT
SEQ ID NO: 10	VL	DIQMTQSPSFLSASVGDRVTITCKASQNVGINV VWHQQKPGKAPKALIYSSSHRYSGVPSRFSGS GSGTEFTLTISSLQPEDFATYFCQQFKSYPLTFG QGTKLEIK
SEQ ID NO: 13	DNA VL	GACATCCAGATGACCCAGTCTCCATCCTTCCT GTCCGCCTCTGTGGGCGACAGAGTGACCATC ACATGCAAGGCCTCTCAGAACGTGGGCATCA ACGTCGTGTGGCACCAGCAGAAGCCTGGCAA GGCTCCTAAGGCTCTGATCTACTCCTCCAGCC ACCGGTACTCTGGCGTGCCCTCTAGATTTTCC GGCTCTGGCTCTGGCACCGAGTTTACCCTGAC AATCTCCAGCCTGCAGCCTGAGGACTTCGCC ACCTACTTTTGCCAGCAGTTCAAGAGCTACCC TCTGACCTTTGGCCAGGGCACCAAGCTGGAA ATCAAG
BHM1710 (humanized)		
SEQ ID NO: 3	HC CDR1 (Combined)	GYSFTTYYIH
SEQ ID NO: 4	HC CDR2 (Combined)	WFFPGSGNIKYNEKFKG
SEQ ID NO: 5	HC CDR3 (Combined)	SYYSYDVLDY
SEQ ID NO: 9	VH	QVQLVQSGAEVKKPGSSVKVSCKASGYSFTTY YIHWVRQAPGQGLEWMGWFFPGSGNIKYNEK FKGRVTITADTSTSTAYMELSSLRSEDTAVYYC AGSYYSYDVLDYWGQGTTVTVSS
SEQ ID NO: 12	DNA VH	CAGGTGCAGCTGGTTCAGTCTGGCGCCGAAG TGAAGAAACCTGGCTCCTCCGTGAAGGTGTC CTGCAAGGCTTCCGGCTACTCCTTCACCACCT ACTACATCCACTGGGTCCGACAGGCCCCTGG ACAAGGATTGGAATGGATGGGCTGGTTCTTC CCCGGCTCCGGCAACATCAAGTACAACGAGA AGTTCAAGGGCCGCGTGACCATCACCGCCGA CACCTCTACCTCTACCGCCTACATGGAACTGT CCAGCCTGAGATCTGAGGACACCGCCGTGTA CTACTGCGCCGGCTCCTACTACTCTTACGACG TGCTGGATTACTGGGGCCAGGGCACCACAGT GACAGTGTCCTCT
SEQ ID NO: 6	LC CDR1 (Combined)	KASQNVGINVV
SEQ ID NO: 7	LC CDR2 (Combined))	SSSHRYS
SEQ ID NO: 8	LC CDR3 (Combined)	QQFKSYPLT
SEQ ID NO: 11	VL	DIQMTQSPSSLSASVGDRVTITCKASQNVGINV VWHQQKPGKVPKALIYSSSHRYSGVPSRFSGS GSGTDFTLTISSLQPEDVATYFCQQFKSYPLTFG QGTKLEIK
SEQ ID NO: 14	DNA VL	GACATCCAGATGACCCAGTCTCCATCCTCTCT GTCCGCCTCTGTGGGCGACAGAGTGACCATC ACATGCAAGGCCTCTCAGAACGTGGGCATCA ACGTCGTGTGGCACCAGCAGAAACCTGGCAA GGTGCCCAAGGCTCTGATCTACTCCTCCAGCC ACAGATACTCCGGCGTGCCCTCTAGATTCTCC GGCTCTGGCTCTGGCACCGACTTTACCCTGAC

		AATCTCCAGCCTGCAGCCTGAGGACGTGGCC ACCTACTTTTGCCAGCAGTTCAAGAGCTACCC TCTGACCTTTGGCCAGGGCACCAAGCTGGAA ATCAAG

Anti-TCRβ V12 antibodies

[00635] Accordingly, in one aspect, the disclosure provides an anti-TCRβV antibody molecule that binds to human TCRβ V12, *e.g.*, a TCRβ V12 subfamily comprising: TCRβ V12-4*01, TCRβ V12-3*01 or TCRβ V12-5*01. In some embodiments the TCRβ V12 subfamily comprises TCRβ V12-4*01. In some embodiments the TCRβ V12 subfamily comprises TCRβ V12-3*01.

[00636] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, is a non-murine antibody molecule, *e.g.*, a human or humanized antibody molecule. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule is a human antibody molecule. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule is a humanized antibody molecule.

[00637] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, is isolated or recombinant.

[00638] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, comprises at least one antigen-binding region, *e.g.*, a variable region or an antigen-binding fragment thereof, from an antibody described herein, *e.g.*, an antibody described in **Table 14**, or encoded by the nucleotide sequence in **Table 14**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00639] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, comprises at least one, two, three or four variable regions from an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in Table 14, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00640] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, comprises at least one or two heavy chain variable regions from an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in Table 14, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00641] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, comprises at least one or two light chain variable regions from an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in Table 14, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00642] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, comprises a heavy chain constant region for an IgG4, *e.g.*, a human IgG4. In still another embodiment, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, includes a heavy chain constant region for an IgG1, *e.g.*, a human IgG1. In one embodiment, the heavy chain constant region comprises an amino sequence set forth in **Table 17**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) thereto.

[00643] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, includes a kappa light chain constant region, *e.g.*, a human kappa light chain constant region. In one embodiment, the light chain constant region comprises an amino sequence set forth in **Table 17**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) thereto.

[00644] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, includes at least one, two, or three complementarity determining regions (CDRs) from a heavy chain variable region of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in **Table 14,** or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00645] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, includes at least one, two, or three CDRs (or collectively all of the CDRs) from a heavy chain variable region comprising an amino acid sequence shown in **Table 14**, or encoded by a nucleotide sequence shown in **Table 14**. In one embodiment, one or more of the CDRs (or collectively all of the CDRs) have one, two, three, four, five, six or more changes, *e.g.*, amino acid substitutions or deletions, relative to the amino acid sequence shown in **Table 14**, or encoded by a nucleotide sequence shown in **Table 14**.

[00646] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, includes at least one, two, or three complementarity determining regions (CDRs) from a light chain variable region of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in **Table 14**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences.

[00647] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, includes at least one, two, or three CDRs (or collectively all of the CDRs) from a light chain variable region comprising an amino acid sequence shown in **Table 14**, or encoded by a nucleotide sequence shown in **Table 14**. In one embodiment, one or more of the CDRs (or collectively all of the CDRs) have one, two, three, four, five, six or more changes, *e.g.*, amino acid substitutions or deletions, relative to the amino acid sequence shown in **Table 14**, or encoded by a nucleotide sequence shown in **Table 14**.

[00648] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, includes at least one, two, three, four, five or six CDRs (or collectively all of the CDRs) from a heavy and light chain variable region comprising an amino acid sequence shown in **Table 14**, or encoded by a nucleotide sequence shown in **Table 14**. In one embodiment, one or more of the CDRs (or collectively all of the CDRs) have one, two, three, four, five, six or more changes, *e.g.*, amino acid substitutions or deletions, relative to the amino acid sequence shown in **Table 14**, or encoded by a nucleotide sequence shown in **Table 14**.

[00649] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, molecule includes all six CDRs from an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in Table 14, or closely related CDRs, *e.g.*, CDRs which are identical or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions). In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, may include any CDR described herein.

[00650] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, or three CDRs according to Kabat *et al.* (*e.g.,* at least one, two, or three CDRs according to the Kabat definition as set out in **Table 14)** from a heavy chain variable region of an antibody described herein, *e.g.*, an antibody chosen as described in **Table 14**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, or three CDRs according to Kabat et al. shown in **Table 14**.

[00651] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, or three CDRs according to Kabat *et al.* (*e.g.,* at least one, two, or three CDRs according to the Kabat definition as set out in **Table 14)** from a light chain variable region of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, or three CDRs according to Kabat et al. shown in **Table 14**.

[00652] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, three, four, five, or six CDRs according to Kabat *et al.* (*e.g.,* at least one, two, three, four, five, or six CDRs according to the Kabat definition as set out in **Table 14)** from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in **Table 14**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the

aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, three, four, five, or six CDRs according to Kabat et al. shown in **Table 14**.

[00653] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes all six CDRs according to Kabat *et al.* (*e.g.,* all six CDRs according to the Kabat definition as set out in Table 14) from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in **Table 14**; or encoded by the nucleotide sequence in **Table 14**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to all six CDRs according to Kabat et al. shown in **Table 14**. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule may include any CDR described herein.

[00654] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, or three hypervariable loops that have the same canonical structures as the corresponding hypervariable loop of an antibody described herein, *e.g.*, an antibody described in Table 14, *e.g.*, the same canonical structures as at least loop 1 and/or loop 2 of the heavy and/or light chain variable domains of an antibody described herein. See, *e.g.*, Chothia et al., (1992) J. Mol. Biol. 227:799-817; Tomlinson et al., (1992) J. Mol. Biol. 227:776-798 for descriptions of hypervariable loop canonical structures. These structures can be determined by inspection of the tables described in these references.

[00655] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, or three CDRs according to Chothia *et al.* (*e.g.,* at least one, two, or three CDRs according to the Chothia definition as set out in **Table 14**) from a heavy chain variable region of an antibody described herein, *e.g.*, an antibody chosen as described in **Table 14**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, or three CDRs according to Chothia et al. shown in **Table 14**.

[00656] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, or three CDRs according to Chothia *et al.* (*e.g.,* at least one, two, or three CDRs according to the Chothia definition as set out in **Table 14**) from a light chain variable region of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative

substitutions) relative to one, two, or three CDRs according to Chothia et al. shown in **Table 14**.

[00657] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, three, four, five, or six CDRs according to Chothia *et al.* (*e.g.,* at least one, two, three, four, five, or six CDRs according to the Chothia definition as set out in **Table 14**) from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in **Table 14**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, three, four, five, or six CDRs according to Chothia et al. shown in **Table 14**.

[00658] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes all six CDRs according to Chothia *et al.* (*e.g.,* all six CDRs according to the Chothia definition as set out in Table 14) from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in **Table 14**; or encoded by the nucleotide sequence in **Table 14**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to all six CDRs according to Chothia et al. shown in **Table 14**. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule may include any CDR described herein.

[00659] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, or three CDRs according to a combined CDR (*e.g.,* at least one, two, or three CDRs according to the combined CDR definition as set out in **Table 14**) from a heavy chain variable region of an antibody described herein, *e.g.*, an antibody chosen as described in **Table 14**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, or three CDRs according to combined CDR shown in **Table 14**.

[00660] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, or three CDRs according to a combined CDR (*e.g.,* at least one, two, or three CDRs according to the combined CDR definition as set out in **Table 14**) from a light chain variable region of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not

more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, or three CDRs according to a combined CDR shown in **Table 14**.

[00661] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes at least one, two, three, four, five, or six CDRs according to a combined CDR. (*e.g.*, at least one, two, three, four, five, or six CDRs according to the combined CDR definition as set out in **Table 14**) from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in **Table 14**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to one, two, three, four, five, or six CDRs according to a combined CDR shown in **Table 14**.

[00662] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes all six CDRs according to a combined CDR (*e.g.*, all six CDRs according to the combined CDR definition as set out in Table 14) from the heavy and light chain variable regions of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in **Table 14**; or encoded by the nucleotide sequence in **Table 14**; or a sequence substantially identical (*e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical) to any of the aforesaid sequences; or which have at least one amino acid alteration, but not more than two, three or four alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) relative to all six CDRs according to a combined CDR shown in **Table 14**. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule may include any CDR described herein.

[00663] In some embodiments, a combined CDR as set out in Table 13 is a CDR that comprises a Kabat CDR and a Chothia CDR.

[00664] In some embodiments, the anti-TCRβV antibody molecule, e *e.g.*, anti-TCRβ V12 antibody molecule, molecule includes a combination of CDRs or hypervariable loops identified as combined CDRs in Table 13. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, can contain any combination of CDRs or hypervariable loops according the "combined" CDRs are described in Table 13.

[00665] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes a combination of CDRs or hypervariable loops defined according to the Kabat et al. and Chothia et al., or as described in Table 13

[00666] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule can contain any combination of CDRs or hypervariable loops according to the Kabat and Chothia definitions.

[00667] In an embodiment, *e.g.*, an embodiment comprising a variable region, a CDR (*e.g.,* a combined CDR, Chothia CDR or Kabat CDR), or other sequence referred to herein, *e.g.,* in **Table 14**, the antibody molecule is a monospecific antibody molecule, a bispecific antibody molecule, a bivalent antibody molecule, a biparatopic antibody molecule, or an antibody molecule that comprises an antigen binding fragment of an antibody, *e.g.,* a half antibody or antigen binding fragment of a half antibody. In certain embodiments the antibody molecule comprise a multispecific molecule, *e.g.*, a bispecific molecule, *e.g.*, as described herein.

[00668] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes:

[00669] (i) one, two or all of a light chain complementarity determining region 1 (LC CDR1), a light chain complementarity determining region 2 (LC CDR2), and a light chain complementarity determining region 3 (LC CDR3) of SEQ ID NO: 16, SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 28, SEQ ID NO: 29 or SEQ ID NO: 30, and/or

[00670] (ii) one, two or all of a heavy chain complementarity determining region 1 (HC CDR1), heavy chain complementarity determining region 2 (HC CDR2), and a heavy chain complementarity determining region 3 (HC CDR3) of SEQ ID NO: 15, SEQ ID NO: 23, SEQ ID NO: 24 or SEQ ID NO: 25.

[00671] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00672] (i) a LC CDR1 amino acid sequence of SEQ ID NO: 20, a LC CDR2 amino acid sequence of SEQ ID NO: 21, or a LC CDR3 amino acid sequence of SEQ ID NO: 22; and/or

[00673] (ii) a HC CDR1 amino acid sequence of SEQ ID NO: 17, a HC CDR2 amino acid sequence of SEQ ID NO: 18, or a HC CDR3 amino acid sequence of SEQ ID NO: 19.

[00674] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00675] (i) a light chain variable region (VL) comprising a LC CDR1 amino acid sequence of SEQ ID NO: 20, a LC CDR2 amino acid sequence of SEQ ID NO: 21, and a LC CDR3 amino acid sequence of SEQ ID NO: 2; and/or

[00676] (ii) a heavy chain variable region (VH) comprising a HC CDR1 amino acid sequence of SEQ ID NO: 17, a HC CDR2 amino acid sequence of SEQ ID NO: 18, and a HC CDR3 amino acid sequence of SEQ ID NO: 19.

[00677] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00678] (i) a LC CDR1 amino acid sequence of SEQ ID NO: 63, a LC CDR2 amino acid sequence of SEQ ID NO: 64, or a LC CDR3 amino acid sequence of SEQ ID NO: 65; and/or

[00679] (ii) a HC CDR1 amino acid sequence of SEQ ID NO: 57, a HC CDR2 amino acid sequence

of SEQ ID NO: 58, or a HC CDR3 amino acid sequence of SEQ ID NO: 59.

[00680] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00681] (i) a light chain variable region (VL) comprising a LC CDR1 amino acid sequence of SEQ ID NO: 63, a LC CDR2 amino acid sequence of SEQ ID NO: 64, or a LC CDR3 amino acid sequence of SEQ ID NO: 65; and/or

[00682] (ii) a heavy chain variable region (VH) comprising a HC CDR1 amino acid sequence of SEQ ID NO: 57, a HC CDR2 amino acid sequence of SEQ ID NO: 58, or a HC CDR3 amino acid sequence of SEQ ID NO: 59.

[00683] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00684] (i) a LC CDR1 amino acid sequence of SEQ ID NO: 66, a LC CDR2 amino acid sequence of SEQ ID NO: 67, or a LC CDR3 amino acid sequence of SEQ ID NO: 68; and/or

[00685] (ii) a HC CDR1 amino acid sequence of SEQ ID NO: 60, a HC CDR2 amino acid sequence of SEQ ID NO: 61, or a HC CDR3 amino acid sequence of SEQ ID NO: 62.

[00686] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00687] (i) a light chain variable region (VL) comprising a LC CDR1 amino acid sequence of SEQ ID NO: 63, a LC CDR2 amino acid sequence of SEQ ID NO: 64, or a LC CDR3 amino acid sequence of SEQ ID NO: 65; and/or

[00688] (ii) a heavy chain variable region (VH) comprising a HC CDR1 amino acid sequence of SEQ ID NO: 57, a HC CDR2 amino acid sequence of SEQ ID NO: 58, or a HC CDR3 amino acid sequence of SEQ ID NO: 59.

[00689] In one embodiment, the light or the heavy chain variable framework (*e.g.*, the region encompassing at least FR1, FR2, FR3, and optionally FR4) of the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule can be chosen from: (a) a light or heavy chain variable framework including at least 80%, 85%, 87% 90%, 92%, 93%, 95%, 97%, 98%, or 100% of the amino acid residues from a human light or heavy chain variable framework, *e.g.*, a light or heavy chain variable framework residue from a human mature antibody, a human germline sequence, or a human consensus sequence; (b) a light or heavy chain variable framework including from 20% to 80%, 40% to 60%, 60% to 90%, or 70% to 95% of the amino acid residues from a human light or heavy chain variable framework, *e.g.*, a light or heavy chain variable framework residue from a human mature antibody, a human germline sequence, or a human consensus sequence; (c) a non-human framework (*e.g.*, a rodent framework); or (d) a non-human framework that has been modified, *e.g.*, to remove antigenic or cytotoxic determinants, *e.g.*, deimmunized, or partially humanized. In one embodiment, the light or heavy chain variable framework region (particularly FR1, FR2 and/or FR3)

includes a light or heavy chain variable framework sequence at least 70, 75, 80, 85, 87, 88, 90, 92, 94, 95, 96, 97, 98, 99% identical or identical to the frameworks of a VL or VH segment of a human germline gene.

[00690] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, comprises a heavy chain variable domain having at least one, two, three, four, five, six, seven, ten, fifteen, twenty or more changes, *e.g.*, amino acid substitutions or deletions, from an amino acid sequence described in Table 14 .*e.g.*, the amino acid sequence of the FR region in the entire variable region, *e.g.*, shown in **FIGs. 5A** and **5B**, or in SEQ ID NOs: 23-25.

[00691] Alternatively, or in combination with the heavy chain substitutions described herein the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain variable domain having at least one, two, three, four, five, six, seven, ten, fifteen, twenty or more amino acid changes, *e.g.*, amino acid substitutions or deletions, from an amino acid sequence of an antibody described herein .*e.g.*, the amino acid sequence of the FR region in the entire variable region, *e.g.*, shown in **FIGs. 5A** and **5B,** or in SEQ ID NOs: 26-30.

[00692] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes one, two, three, or four heavy chain framework regions shown in **FIG. 5A,** or a sequence substantially identical thereto.

[00693] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes one, two, three, or four light chain framework regions shown in **FIG. 5B,** or a sequence substantially identical thereto.

[00694] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the light chain framework region 1 *e.g.*, as shown in **FIG. 5B.**

[00695] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the light chain framework region 2 *e.g.*, as shown in **FIG. 5B.**

[00696] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the light chain framework region 3, *e.g.*, as shown in **FIG. 5B.**

[00697] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the light chain framework region 4, *e.g.*, as shown in **FIG. 5B.**

[00698] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 1 (FR1), comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at one or more, *e.g.*, all, position disclosed herein according to Kabat numbering. In some embodiments, FR1 comprises an Aspartic Acid at position 1, *e.g.*, a substitution at position 1 according to Kabat numbering, *e.g.*, an Alanine to Aspartic Acid substitution. In some embodiments, FR1 comprises an Asparagine at position 2, *e.g.*, a substitution at position 2 according to Kabat numbering, *e.g.*, an Isoleucine to Asparagine substitution, Serine to Asparagine substitution or Tyrosine to Asparagine substitution. In

some embodiments, FR1 comprises a Leucine at position 4, *e.g.*, a substitution at position 4 according to Kabat numbering, *e.g.*, a Methionine to Leucine substitution.

[00699] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 1 (FR1), comprising a substitution at position 1 according to Kabat numbering, *e.g.*, an Alanine to Aspartic Acid substitution, a substitution at position 2 according to Kabat numbering, *e.g.*, an Isoleucine to Asparagine substitution, Serine to Asparagine substitution or Tyrosine to Asparagine substitution, and a substitution at position 4 according to Kabat numbering, *e.g.*, a Methionine to Leucine substitution. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 1 (FR1), comprising a substitution at position 1 according to Kabat numbering, *e.g.*, an Alanine to Aspartic Acid substitution, and a substitution at position 2 according to Kabat numbering, *e.g.*, an Isoleucine to Asparagine substitution, Serine to Asparagine substitution or Tyrosine to Asparagine substitution. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 1 (FR1), comprising a substitution at position 1 according to Kabat numbering, *e.g.*, an Alanine to Aspartic Acid substitution, and a substitution at position 4 according to Kabat numbering, *e.g.*, a Methionine to Leucine substitution. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 1 (FR1), comprising a substitution at position 2 according to Kabat numbering, *e.g.*, an Isoleucine to Asparagine substitution, Serine to Asparagine substitution or Tyrosine to Asparagine substitution, and a substitution at position 4 according to Kabat numbering, *e.g.*, a Methionine to Leucine substitution. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00700] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 3 (FR3), comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at one or more, *e.g.*, all, position disclosed herein according to Kabat numbering. In some embodiments, FR3 comprises a Glycine at position 66, *e.g.*, a substitution at position 66 according to Kabat numbering, *e.g.*, a Lysine to Glycine substitution, or a Serine to Glycine substitution. In some embodiments, FR3 comprises an Asparagine at position 69, *e.g.*, a substitution at position 69 according to Kabat numbering, *e.g.*, a Tyrosine to Asparagine substitution. In some embodiments, FR3 comprises a Tyrosine at position 71, *e.g.*, a substitution at position 71 according to Kabat numbering, *e.g.*, a Phenylalanine to Tyrosine substitution, or an Alanine to Tyrosine substitution.

[00701] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 3 (FR3),

comprising a substitution at position 66 according to Kabat numbering, *e.g.*, a Lysine to Glycine substitution, or a Serine to Glycine substitution, and a substitution at position 69 according to Kabat numbering, *e.g.*, a Tyrosine to Asparagine substitution. . In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 3 (FR3), comprising a substitution at position 66 according to Kabat numbering, *e.g.*, Lysine to Glycine substitution, or a Serine to Glycine substitution, and a substitution at position 71 according to Kabat numbering, *e.g.*, a Phenylalanine to Tyrosine substitution, or an Alanine to Tyrosine substitution. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 3 (FR3), comprising a substitution at position 69 according to Kabat numbering, *e.g.*, a Tyrosine to Asparagine substitution and a substitution at position 71 according to Kabat numbering, *e.g.*, a Phenylalanine to Tyrosine substitution, or an Alanine to Tyrosine substitution. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising a framework region, *e.g.*, framework region 3 (FR3), comprising a substitution at position 66 according to Kabat numbering, *e.g.*, a Lysine to Glycine substitution, or a Serine to Glycine substitution, a substitution at position 69 according to Kabat numbering, *e.g.*, a Tyrosine to Asparagine substitution and a substitution at position 71 according to Kabat numbering, *e.g.*, a Phenylalanine to Tyrosine substitution, or an Alanine to Tyrosine substitution. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00702] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising: a framework region 1 (FR1) comprising a substitution at position 2 according to Kabat numbering, *e.g.*, a Isoleucine to Asparagine substitution; and a framework region 3 (FR3), comprising a substitution at position 69 according to Kabat numbering, *e.g.*, a Threonine to Asparagine substitution and a substitution at position 71 according to Kabat numbering, *e.g.*, a Phenylalanine to Tyrosine substitution, *e.g.*, as shown in the amino acid sequence of SEQ ID NO: 26. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00703] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising: (a) a framework region 1 (FR1) comprising a substitution at position 1 according to Kabat numbering, *e.g.*, a Alanine to Aspartic Acid substitution, and a substitution at position 2 according to Kabat numbering, *e.g.*, a Isoleucine to Asparagine substitution; and (b) a framework region 3 (FR3), comprising a substitution at position 69 according to Kabat numbering, *e.g.*, a Threonine to Asparagine substitution and a substitution at position 71 according to Kabat numbering, *e.g.*, a Phenylalanine to Tyrosine substitution, *e.g.*, as shown in the amino acid sequence of SEQ ID NO: 27 In some embodiments, the substitution is relative to a human

germline light chain framework region sequence.

[00704] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising: (a) a framework region 1 (FR1) comprising a substitution at position 2 according to Kabat numbering, *e.g.*, a Serine to Asparagine substitution; and a substitution at position 4 according to Kabat numbering, *e.g.*, a Methionine to Leucine substitution; and (b) a framework region 3 (FR3), comprising a substitution at position 69 according to Kabat numbering, *e.g.*, a Threonine to Asparagine substitution and a substitution at position 71 according to Kabat numbering, *e.g.*, a Phenylalanine to Tyrosine substitution, *e.g.*, as shown in the amino acid sequence of SEQ ID NO: 28 In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00705] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising: (a) a framework region 1 (FR1) comprising a substitution at position 2 according to Kabat numbering, *e.g.*, a Serine to Asparagine substitution; and (b) a framework region 3 (FR3) comprising a substitution at position 66 according to Kabat numbering, *e.g.*, a Lysine to Glycine substitution; a substitution at position 69 according to Kabat numbering, *e.g.*, a Threonine to Asparagine substitution; and a substitution at position 71 according to Kabat numbering, *e.g.*, a Alanine to Tyrosine substitution, *e.g.*, as shown in the amino acid sequence of SEQ ID NO: 29. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00706] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain comprising: (a) a framework region 1 (FR1) comprising a substitution at position 2 according to Kabat numbering, *e.g.*, a Tyrosine to Asparagine substitution; and (b) a framework region 3 (FR3) comprising a substitution at position 66 according to Kabat numbering, *e.g.*, a Serine to Glycine substitution; a substitution at position 69 according to Kabat numbering, *e.g.*, a Threonine to Asparagine substitution; and a substitution at position 71 according to Kabat numbering, *e.g.*, a Alanine to Tyrosine substitution, *e.g.*, as shown in the amino acid sequence of SEQ ID NO: 29. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00707] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises a light chain variable domain comprising: (a) a framework region 1 (FR1) comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at one or more (*e.g.*, all) positions disclosed herein according to Kabat numbering, and (b) a framework region 3 (FR3) comprising a change, *e.g.*, a substitution (*e.g.*, a conservative substitution) at one or more (*e.g.*, all) position disclosed herein according to Kabat numbering. In some embodiments, the substitution is relative to a human germline light chain framework region sequence.

[00708] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody

molecule comprises the heavy chain framework region 1, *e.g.*, as shown in **FIG. 5A.**

[00709] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the heavy chain framework region 2, *e.g.*, as shown in **FIG. 5A.**

[00710] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the heavy chain framework region 3, *e.g.*, as shown in **FIG. 5A**.

[00711] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the heavy chain framework region 4, *e.g.*, as shown in **FIG. 5A.**

[00712] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the heavy chain framework regions 1-4, *e.g.*, SEQ ID NOS: 20-23, or as shown in **FIG. 5A.**

[00713] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the light chain framework regions 1-4, *e.g.*, SEQ ID NOs: 26-30, or as shown in **FIG. 5B.**

[00714] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises the heavy chain framework regions 1-4, *e.g.*, SEQ ID NOs: 23-25; and the light chain framework regions 1-4, *e.g.*, SEQ ID NOs: 26-30, or as shown in **FIGs. 5A** and **5B.**

[00715] In some embodiments, the heavy or light chain variable domain, or both, of , the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes an amino acid sequence, which is substantially identical to an amino acid disclosed herein, *e.g.*, at least 80%, 85%, 90%, 92%, 95%, 97%, 98%, 99% or higher identical to a variable region of an antibody described herein, *e.g.*, an antibody as described in **Table 14**, or encoded by the nucleotide sequence in **Table 14**; or which differs at least 1 or 5 residues, but less than 40, 30, 20, or 10 residues, from a variable region of an antibody described herein.

[00716] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises at least one, two, three, or four antigen-binding regions, *e.g.*, variable regions, having an amino acid sequence as set forth in **Table 14**, or a sequence substantially identical thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, or which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the sequences shown in **Table 14**. In another embodiment, , the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule includes a VH and/or VL domain encoded by a nucleic acid having a nucleotide sequence as set forth in **Table 14**, or a sequence substantially identical thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, or which differs by no more than 3, 6, 15, 30, or 45 nucleotides from the sequences shown in **Table 14**.

[00717] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00718] a VH domain comprising an amino acid sequence chosen from the amino acid sequence of

SEQ ID NO: 23, SEQ ID NO:24 or SEQ ID NO:25, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 23, SEQ ID NO:24 or SEQ ID NO:25, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 23, SEQ ID NO:24 or SEQ ID NO:25; and/or

[00719] a VL domain comprising an amino acid sequence chosen from the amino acid sequence of SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 28, SEQ ID NO: 29 or SEQ ID NO: 30, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence of SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 28, SEQ ID NO: 29 or SEQ ID NO: 30, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 26, SEQ ID NO: 27, SEQ ID NO: 28, SEQ ID NO: 29 or SEQ ID NO: 30.

[00720] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00721] a VH domain comprising the amino acid sequence of SEQ ID NO: 23, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 23, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 23; and

[00722] a VL domain comprising the amino acid sequence of SEQ ID NO: 26, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 26, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 26.

[00723] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00724] a VH domain comprising the amino acid sequence of SEQ ID NO: 23, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 23, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 23; and

[00725] a VL domain comprising the amino acid sequence of SEQ ID NO: 27, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 27, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 27.

[00726] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00727] a VH domain comprising the amino acid sequence of SEQ ID NO: 23, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 23, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 23; and

[00728] a VL domain comprising the amino acid sequence of SEQ ID NO: 28, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 28, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 28.

[00729] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00730] a VH domain comprising the amino acid sequence of SEQ ID NO: 23, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 23, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 23; and

[00731] a VL domain comprising the amino acid sequence of SEQ ID NO: 29, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 29, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 29.

[00732] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00733] a VH domain comprising the amino acid sequence of SEQ ID NO: 23, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 23, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 23; and

[00734] a VL domain comprising the amino acid sequence of SEQ ID NO: 30, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 30, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 30.

[00735] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00736] a VH domain comprising the amino acid sequence of SEQ ID NO: 24, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 24, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 24; and

[00737] a VL domain comprising the amino acid sequence of SEQ ID NO: 26, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 26, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 26.

[00738] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00739] a VH domain comprising the amino acid sequence of SEQ ID NO: 24, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 24, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 24; and

[00740] a VL domain comprising the amino acid sequence of SEQ ID NO: 27, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 27, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 27.

[00741] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00742] a VH domain comprising the amino acid sequence of SEQ ID NO: 24, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 24, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 24; and

[00743] a VL domain comprising the amino acid sequence of SEQ ID NO: 28, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 28, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 28.

[00744] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00745] a VH domain comprising the amino acid sequence of SEQ ID NO: 24, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 24, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 24; and

[00746] a VL domain comprising the amino acid sequence of SEQ ID NO: 29, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 29, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 29.

[00747] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00748] a VH domain comprising the amino acid sequence of SEQ ID NO: 24, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 24, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 24; and

[00749] a VL domain comprising the amino acid sequence of SEQ ID NO: 30, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID

NO: 30, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 30.

[00750] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00751] a VH domain comprising the amino acid sequence of SEQ ID NO: 25, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 25, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 25; and

[00752] a VL domain comprising the amino acid sequence of SEQ ID NO: 26, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 26, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 26.

[00753] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00754] a VH domain comprising the amino acid sequence of SEQ ID NO: 25, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 25, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 25; and

[00755] a VL domain comprising the amino acid sequence of SEQ ID NO: 27, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 27, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 27.

[00756] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00757] a VH domain comprising the amino acid sequence of SEQ ID NO: 25, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 25, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 25; and

[00758] a VL domain comprising the amino acid sequence of SEQ ID NO: 28, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 28, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 28.

[00759] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00760] a VH domain comprising the amino acid sequence of SEQ ID NO: 25, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID

NO: 25, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 25; and

[00761] a VL domain comprising the amino acid sequence of SEQ ID NO: 29, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 29, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 29.

[00762] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule comprises:

[00763] a VH domain comprising the amino acid sequence of SEQ ID NO: 25, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 25, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 25; and

[00764] a VL domain comprising the amino acid sequence of SEQ ID NO: 30, an amino acid sequence at least about 85%, 90%, 95%, 99% or more identical to the amino acid sequence SEQ ID NO: 30, or an amino acid sequence which differs by no more than 1, 2, 5, 10, or 15 amino acid residues from the amino acid sequence of SEQ ID NO: 30.

[00765] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule is a full antibody or fragment thereof (*e.g.*, a Fab, $F(ab')_2$, Fv, or a single chain Fv fragment (scFv)). In embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V6 (*e.g.*, anti-TCRβ V6-5*01) antibody molecule is a monoclonal antibody or an antibody with single specificity. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule, can also be a humanized, chimeric, camelid, shark, or an *in vitro*-generated antibody molecule. In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule is a humanized antibody molecule. The heavy and light chains of the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule can be full-length (*e.g.*, an antibody can include at least one, and preferably two, complete heavy chains, and at least one, and preferably two, complete light chains) or can include an antigen-binding fragment (*e.g.*, a Fab, F(ab')2, Fv, a single chain Fv fragment, a single domain antibody, a diabody (dAb), a bivalent antibody, or bispecific antibody or fragment thereof, a single domain variant thereof, or a camelid antibody).

[00766] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule is in the form of a multispecific molecule, *e.g.*, a bispecific molecule, *e.g.*, as described herein.

[00767] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule has a heavy chain constant region (Fc) chosen from, *e.g.*, the heavy chain constant regions of IgG1, IgG2, IgG3, IgG4, IgM, IgA1, IgA2, IgD, and IgE. In some embodiments, the Fc region is chosen from the heavy chain constant regions of IgG1, IgG2, IgG3, and IgG4. In some embodiments,

the Fc region is chosen from the heavy chain constant region of IgG1 or IgG2 (*e.g.*, human IgG1, or IgG2). In some embodiments, the heavy chain constant region is human IgG1.

[00768] In some embodiments, the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule has a light chain constant region chosen from, *e.g.*, the light chain constant regions of kappa or lambda, preferably kappa (*e.g.*, human kappa). In one embodiment, the constant region is altered, *e.g.,* mutated, to modify the properties of the anti-TCRβV antibody molecule, *e.g.*, anti-TCRβ V12 antibody molecule (*e.g.*, to increase or decrease one or more of: Fc receptor binding, antibody glycosylation, the number of cysteine residues, effector cell function, or complement function). For example, the constant region is mutated at positions 296 (M to Y), 298 (S to T), 300 (T to E), 477 (H to K) and 478 (N to F) to alter Fc receptor binding (*e.g.*, the mutated positions correspond to positions 132 (M to Y), 134 (S to T), 136 (T to E), 313 (H to K) and 314 (N to F) of SEQ ID NOs: 212 or 214; or positions 135 (M to Y), 137 (S to T), 139 (T to E), 316 (H to K) and 317 (N to F) of SEQ ID NOs: 215, 216, 217 or 218).

Table 14: Amino acid and nucleotide sequences for murine and humanized antibody molecules. The antibody molecules include murine mAb 16G8 and humanized mAb 16G8. The amino acid the heavy and light chain CDRs, and the amino acid and nucleotide sequences of the heavy and light chain variable regions, and the heavy and light chains are shown.

16G8 (murine)		
SEQ ID NO: 17	HC CDR1 (Combined)	GFTFSNFGMH
SEQ ID NO: 18	HC CDR2 (Combined)	YISSGSSTIYYADTLKG
SEQ ID NO: 19	HC CDR3 (Combined)	RGEGAMDY
SEQ ID NO: 57	HC CDR1 (Kabat)	NFGMH
SEQ ID NO: 58	HC CDR2 (Kabat)	YISSGSSTIYYADTLKG
SEQ ID NO: 59	HC CDR3 (Kabat)	RGEGAMDY
SEQ ID NO: 60	HC CDR1 (Chothia)	GFTFSNF
SEQ ID NO: 61	HC CDR2 (Chothia)	SSGSST
SEQ ID NO: 62	HC CDR3 (Chothia)	RGEGAMDY
SEQ ID NO: 15	VH	DVQLVESGGGLVQPGGSRKLSCAASGFTFSNF GMHWVRQAPDKGLEWVAYISSGSSTIYYADT LKGRFTISRDNPKNTLFLQMTSLRSEDTAMYY CARRGEGAMDYWGQGTSVTVSS
SEQ ID NO: 20	LC CDR1 (Combined)	RASSSVNYIY
SEQ ID NO: 21	LC CDR2 (Combined))	YTSNLAP
SEQ ID NO: 22	LC CDR3(Combined)	QQFTSSPFT
SEQ ID NO: 63	LC CDR1 (Kabat)	RASSSVNYIY
SEQ ID NO: 64	LC CDR2 (Kabat)	YTSNLAP
SEQ ID NO: 65	LC CDR3 (Kabat)	QQFTSSPFT
SEQ ID NO: 66	LC CDR1 (Chothia)	RASSSVNYIY
SEQ ID NO: 67	LC CDR2 (Chothia)	YTSNLAP
SEQ ID NO: 68	LC CDR3 (Chothia)	QQFTSSPFT
SEQ ID NO: 16	VL	ENVLTQSPAIMSASLGEKVTMSCRASSSVNYI YWYQQKSDASPKLWIYYTSNLAPGVPTRFSGS GSGNSYSLTISSMEGEDAATYYCQQFTSSPFTF GSGTKLEIK

16G8 humanized HC-1		
SEQ ID NO: 17	HC CDR1 (Combined)	GFTFSNFGMH
SEQ ID NO: 18	HC CDR2 (Combined)	YISSGSSTIYYADTLKG
SEQ ID NO: 19	HC CDR3 (Combined)	RGEGAMDY
SEQ ID NO: 23	VH	EVQLVESGGGLVQPGGSLRLSCAASGFTFSNF GMHWVRQAPGKGLEWVSYISSGSSTIYYADT LKGRFTISRDNAKNSLYLQMNSLRAEDTAVY YCARRGEGAMDYWGQGTTVTVSS
SEQ ID NO: 31	DNA VH	GAGGTGCAGCTGGTTGAATCTGGCGGAGGA TTGGTTCAGCCTGGCGGCTCTCTGAGACTGT CTTGTGCCGCTTCTGGCTTCACCTTCTCCAAC TTCGGCATGCACTGGGTCCGACAGGCCCCTG GAAAAGGACTGGAATGGGTGTCCTACATCT CCTCCGGCTCCTCCACCATCTACTACGCTGA CACCCTGAAGGGCAGATTCACCATCTCTCGG GACAACGCCAAGAACTCCCTGTACCTGCAG ATGAACAGCCTGAGAGCCGAGGACACCGCC GTGTACTACTGTGCTAGAAGAGGCGAGGGC GCCATGGATTATTGGGGCCAGGGAACCACA GTGACCGTGTCTAGC
16G8 humanized HC-2		
SEQ ID NO: 17	HC CDR1 (Combined)	GFTFSNFGMH
SEQ ID NO: 18	HC CDR2 (Combined)	YISSGSSTIYYADTLKG
SEQ ID NO: 19	HC CDR3 (Combined)	RGEGAMDY
SEQ ID NO: 24	VH	EVQLVESGGGLVQPGGSLRLSCAASGFTFSNF GMHWVRQAPGKGLEWVSYISSGSSTIYYADT LKGRFTISRDNSKNTLYLQMNSLRAEDTAVYY CARRGEGAMDYWGQGTTVTVSS
SEQ ID NO: 32	DNA VH	GAGGTGCAGCTGGTTGAATCTGGCGGAGGA TTGGTTCAGCCTGGCGGCTCTCTGAGACTGT CTTGTGCCGCTTCTGGCTTCACCTTCTCCAAC TTCGGCATGCACTGGGTCCGACAGGCCCCTG GAAAAGGACTGGAATGGGTGTCCTACATCT CCTCCGGCTCCTCCACCATCTACTACGCTGA CACCCTGAAGGGCAGATTCACCATCAGCCG GGACAACTCCAAGAACACCCTGTACCTGCA GATGAACTCCCTGAGAGCCGAGGACACCGC CGTGTACTACTGTGCTAGAAGAGGCGAGGG CGCCATGGATTATTGGGGCCAGGGAACCAC AGTGACCGTGTCTAGC
16G8 humanized HC-3		
SEQ ID NO: 17	HC CDR1 (Combined)	GFTFSNFGMH
SEQ ID NO: 18	HC CDR2 (Combined)	YISSGSSTIYYADTLKG
SEQ ID NO: 19	HC CDR3 (Combined)	RGEGAMDY
SEQ ID NO: 25	VH	QVQLVESGGGVVQPGRSLRLSCAASGFTFSNF GMHWVRQAPGKGLEWVAYISSGSSTIYYADT LKGRFTISRDNSKNTLYLQMNSLRAEDTAVYY CARRGEGAMDYWGQGTTVTVSS
SEQ ID NO: 33	DNA VH	CAGGTGCAGCTGGTGGAATCTGGTGGCGGA GTTGTGCAGCCTGGCAGATCCCTGAGACTGT CTTGTGCCGCCTCTGGCTTCACCTTCTCCAA CTTCGGCATGCACTGGGTCCGACAGGCCCCT GGAAAAGGATTGGAGTGGGTCGCCTACATC TCCTCCGGCTCCTCCACCATCTACTACGCTG

		ACACCCTGAAGGGCAGATTCACCATCAGCC GGGACAACTCCAAGAACACCCTGTACCTGC AGATGAACTCCCTGAGAGCCGAGGACACCG CCGTGTACTACTGTGCTAGAAGAGGCGAGG GCGCCATGGATTATTGGGGCCAGGGAACCA CAGTGACCGTGTCTAGC
16G8 humanized LC-1		
SEQ ID NO: 20	LC CDR1 (Combined)	RASSSVNYIY
SEQ ID NO: 21	LC CDR2 (Combined))	YTSNLAP
SEQ ID NO: 22	LC CDR3(Combined)	QQFTSSPFT
SEQ ID NO: 26	VL	DNQLTQSPSFLSASVGDRVTITCRASSSVNYIY WYQQKPGKAPKLLIYYTSNLAPGVPSRFSGSG SGNEYTLTISSLQPEDFATYYCQQFTSSPFTFG QGTKLEIK
SEQ ID NO: 34	DNA VL	GATAACCAGCTGACCCAGTCTCCTAGCTTCC TGTCTGCCTCTGTGGGCGACAGAGTGACAAT TACCTGCCGGGCCTCCTCCTCCGTGAACTAC ATCTACTGGTATCAGCAGAAGCCCGGCAAG GCCCCTAAGCTGCTGATCTACTACACCTCCA ATCTGGCCCCTGGCGTGCCCTCTAGATTTTC CGGATCTGGCTCCGGCAACGAGTATACCCTG ACAATCTCCAGCCTGCAGCCTGAGGACTTCG CCACCTACTACTGCCAGCAGTTCACCTCCTC TCCATTCACCTTTGGCCAGGGCACCAAGCTG GAAATCAAA
16G8 humanized LC-2		
SEQ ID NO: 20	LC CDR1 (Combined)	RASSSVNYIY
SEQ ID NO: 21	LC CDR2 (Combined))	YTSNLAP
SEQ ID NO: 22	LC CDR3(Combined)	QQFTSSPFT
SEQ ID NO: 27	VL	DNQLTQSPSSLSASVGDRVTITCRASSSVNYIY WYQQKPGKAPKLLIYYTSNLAPGVPSRFSGSG SGNDYTLTISSLQPEDFATYYCQQFTSSPFTFG QGTKLEIK
SEQ ID NO: 35	DNA VL	ATAACCAGCTGACCCAGTCTCCTTCCAGCCT GTCTGCTTCTGTGGGCGACAGAGTGACAATT ACCTGCCGGGCCTCCTCCTCCGTGAACTACA TCTACTGGTATCAGCAGAAGCCCGGCAAGG CCCCTAAGCTGCTGATCTACTACACCTCCAA TCTGGCCCCTGGCGTGCCCTCTAGATTTTCC GGATCTGGCTCCGGCAACGACTATACCCTGA CAATCTCCAGCCTGCAGCCTGAGGACTTCGC CACCTACTACTGCCAGCAGTTCACCTCCTCT CCATTCACCTTTGGCCAGGGCACCAAGCTGG AAATCAAA
16G8 humanized LC-3		
SEQ ID NO: 20	LC CDR1 (Combined)	RASSSVNYIY
SEQ ID NO: 21	LC CDR2 (Combined))	YTSNLAP
SEQ ID NO: 22	LC CDR3(Combined)	QQFTSSPFT
SEQ ID NO: 28	VL	ENVLTQSPATLSVSPGERATLSCRASSSVNYIY WYQQKPGQAPRLLIYYTSNLAPGIPARFSGSG SGNEYTLTISSLQSEDFAVYYCQQFTSSPFTFG QGTKLEIK
SEQ ID NO: 36	DNA VL	GAGAATGTGCTGACCCAGTCTCCTGCCACAC TGTCTGTTAGCCCTGGCGAGAGAGCTACCCT

		GAGCTGCAGAGCCTCTTCCTCCGTGAACTAC ATCTACTGGTATCAGCAGAAGCCCGGCCAG GCTCCTAGACTGCTGATCTACTACACCTCCA ATCTGGCCCCTGGCATCCCTGCCAGATTTTC CGGATCTGGCTCCGGCAACGAGTATACCCTG ACCATCTCCAGCCTGCAGTCCGAGGACTTTG CTGTGTACTATTGCCAGCAGTTCACAAGCAG CCCTTTCACCTTTGGCCAGGGCACCAAGCTG GAAATCAAA
16G8 humanized LC-4		
SEQ ID NO: 20	LC CDR1 (Combined)	RASSSVNYIY
SEQ ID NO: 21	LC CDR2 (Combined))	YTSNLAP
SEQ ID NO: 22	LC CDR3(Combined)	QQFTSSPFT
SEQ ID NO: 29	VL	QNVLTQPPSASGTPGQRVTISCRASSSVNYIYW YQQLPGTAPKLLIYYTSNLAPGVPDRFSGSGS GNSYSLAISGLRSEDEADYYCQQFTSSPFTFGT GTKVTVL
SEQ ID NO: 37	DNA VL	CAGAATGTGCTGACCCAACCTCCTTCCGCCT CTGGCACACCTGGACAGAGAGTGACAATCT CCTGCCGGGCCTCCTCCTCCGTGAACTACAT CTACTGGTATCAGCAGCTGCCCGGCACCGCT CCTAAACTGCTGATCTACTACACCTCCAATC TGGCCCCTGGCGTGCCCGATAGATTTTCCGG ATCTGGCTCCGGCAACTCCTACAGCCTGGCT ATCTCTGGCCTGAGATCTGAGGACGAGGCC GACTACTACTGCCAGCAGTTCACCTCCTCTC CATTCACCTTTGGCACCGGCACCAAAGTGAC AGTTCTT
16G8 humanized LC-5		
SEQ ID NO: 20	LC CDR1 (Combined)	RASSSVNYIY
SEQ ID NO: 21	LC CDR2 (Combined))	YTSNLAP
SEQ ID NO: 22	LC CDR3(Combined)	QQFTSSPFT
SEQ ID NO: 30	VL	SNELTQPPSVSVSPGQTARITCRASSSVNYIYW YQQKSGQAPVLVIYYTSNLAPGIPERFSGSGSG NMYTLTISGAQVEDEADYYCQQFTSSPFTFGT GTKVTVL
SEQ ID NO: 38	DNA VL	TCTAATGAGCTGACCCAGCCTCCTTCCGTGT CCGTGTCTCCTGGACAGACCGCCAGAATTAC CTGCCGGGCCTCCTCCTCCGTGAACTACATC TACTGGTATCAGCAGAAGTCCGGCCAGGCT CCTGTGCTCGTGATCTACTACACCTCCAATC TGGCCCCTGGCATCCCTGAGAGATTCTCCGG ATCTGGCTCCGGCAACATGTACACCCTGACC ATCTCTGGCGCCCAGGTGGAAGATGAGGCC GACTACTACTGCCAGCAGTTCACCTCCTCTC CATTCACCTTTGGCACCGGCACCAAAGTGAC AGTTCTT

Table 17. Constant region amino acid sequences of human IgG heavy chains and human kappa light chain

Human kappa constant region SEQ ID NO: 39	LC	RTVAAPSVFI FPPSDEQLKS GTASVVCLLN NFYPREAKVQ WKVDNALQSG NSQESVTEQD SKDSTYSLSS TLTLSKADYE KHKVYACEVT HQGLSSPVTK SFNRGEC

IgG4 (S228P) mutant constant region (EU Numbering) SEQ ID NO: 40	HC	ASTKGPSVFPLAPCSRSTSESTAALGCLVKDYFPEPVTVSWNSGAL TSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTKTYTCNVDHKPSNT KVDKRVESKYGPPCPPCPAPEFLGGPSVFLFPPKPKDTLMISRTPEV TCVVVDVSQEDPEVQFNWYVDGVEVHNAKTKPREEQFNSTYRV VSVLTVLHQDWLNGKEYKCKVSNKGLPSSIEKTISKAKGQPREPQ VYTLPPSQEEMTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYK TTPPVLDSDGSFFLYSRLTVDKSRWQEGNVFSCSVMHEALHNHYT QKSLSLSLG
IgG1 wild type SEQ ID NO: 41	HC	ASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGA LTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSN TKVDKRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMIS RTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYN STYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKG QPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQ PENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHE ALHNHYTQKSLSLSPGK
IgG1 (N297A) mutant constant region (EU Numbering) SEQ ID NO: 42	HC	ASTKGPSVFPLAPSSKSTSGGTAALGCLVKDYFPEPVTVSWNSGA LTSGVHTFPAVLQSSGLYSLSSVVTVPSSSLGTQTYICNVNHKPSN TKVDKRVEPKSCDKTHTCPPCPAPELLGGPSVFLFPPKPKDTLMIS RTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKTKPREEQYA STYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKG QPREPQVYTLPPSREEMTKNQVSLTCLVKGFYPSDIAVEWESNGQ PENNYKTTPPVLDSDGSFFLYSKLTVDKSRWQQGNVFSCSVMHE ALHNHYTQKSLSLSPGK

B Cell, Macrophage & Dendritic Cell Engagers

[00769] Broadly, B cells, also known as B lymphocytes, are a type of white blood cell of the lymphocyte subtype. They function in the humoral immunity component of the adaptive immune system by secreting antibodies. Additionally, B cells present antigen (they are also classified as professional antigen-presenting cells (APCs)) and secrete cytokines. Macrophages are a type of white blood cell that engulfs and digests cellular debris, foreign substances, microbes, cancer cells via phagocytosis. Besides phagocytosis, they play important roles in nonspecific defense (innate immunity) and also help initiate specific defense mechanisms (adaptive immunity) by recruiting other immune cells such as lymphocytes. For example, they are important as antigen presenters to T cells. Beyond increasing inflammation and stimulating the immune system, macrophages also play an important anti-inflammatory role and can decrease immune reactions through the release of cytokines. Dendritic cells (DCs) are antigen-presenting cells that function in processing antigen material and present it on the cell surface to the T cells of the immune system.

[00770] The present disclosure provides, *inter alia*, multispecific (e.g., bi-, tri-, quad- specific) or multifunctional molecules, that include, e.g., are engineered to contain, one or more B cell, macrophage, and/or dendritic cell engager that mediate binding to and/ or activation of a B cell, macrophage, and/or dendritic cell.

[00771] Accordingly, in some embodiments, the immune cell engager comprises a B cell, macrophage, and/or dendritic cell engager chosen from one or more of CD40 ligand (CD40L) or a

CD70 ligand; an antibody molecule that binds to CD40 or CD70; an antibody molecule to OX40; an OX40 ligand (OX40L); an agonist of a Toll-like receptor (e.g., as described herein, e.g., a TLR4, e.g., a constitutively active TLR4 (caTLR4), or a TLR9 agonists); a 41BB; a CD2; a CD47; or a STING agonist, or a combination thereof.

[00772] In some embodiments, the B cell engager is a CD40L, an OX40L, or a CD70 ligand, or an antibody molecule that binds to OX40, CD40 or CD70.

[00773] In some embodiments, the macrophage engager is a CD2 agonist. In some embodiments, the macrophage engager is an antigen binding domain that binds to: CD40L or antigen binding domain or ligand that binds CD40, a Toll like receptor (TLR) agonist (e.g., as described herein), e.g., a TLR9 or TLR4 (e.g., caTLR4 (constitutively active TLR4), CD47, or a STING agonist. In some embodiments, the STING agonist is a cyclic dinucleotide, e.g., cyclic di-GMP (cdGMP) or cyclic di-AMP (cdAMP). In some embodiments, the STING agonist is biotinylated.

[00774] In some embodiments, the dendritic cell engager is a CD2 agonist. In some embodiments, the dendritic cell engager is a ligand, a receptor agonist, or an antibody molecule that binds to one or more of: OX40L, 41BB, a TLR agonist (e.g., as described herein) (e.g., TLR9 agonist, TLR4 (e.g., caTLR4 (constitutively active TLR4)), CD47, or and a STING agonist. In some embodiments, the STING agonist is a cyclic dinucleotide, e.g., cyclic di-GMP (cdGMP) or cyclic di-AMP (cdAMP). In some embodiments, the STING agonist is biotinylated.

[00775] In other embodiments, the immune cell engager mediates binding to, or activation of, one or more of a B cell, a macrophage, and/or a dendritic cell. Exemplary B cell, macrophage, and/or dendritic cell engagers can be chosen from one or more of CD40 ligand (CD40L) or a CD70 ligand; an antibody molecule that binds to CD40 or CD70; an antibody molecule to OX40; an OX40 ligand (OX40L); a Toll-like receptor agonist (e.g., a TLR4, e.g., a constitutively active TLR4 (caTLR4) or a TLR9 agonist); a 41BB agonist; a CD2; a CD47; or a STING agonist, or a combination thereof.

[00776] In some embodiments, the B cell engager is chosen from one or more of a CD40L, an OX40L, or a CD70 ligand, or an antibody molecule that binds to OX40, CD40 or CD70.

[00777] In other embodiments, the macrophage cell engager is chosen from one or more of a CD2 agonist; a CD40L; an OX40L; an antibody molecule that binds to OX40, CD40 or CD70; a Toll-like receptor agonist or a fragment thereof (e.g., a TLR4, e.g., a constitutively active TLR4 (caTLR4)); a CD47 agonist; or a STING agonist.

[00778] In other embodiments, the dendritic cell engager is chosen from one or more of a CD2 agonist, an OX40 antibody, an OX40L, 41BB agonist, a Toll-like receptor agonist or a fragment thereof (e.g., a TLR4, e.g., a constitutively active TLR4 (caTLR4)), CD47 agonist, or a STING agonist.

[00779] In one embodiment, the OX40L comprises the amino acid sequence:
QVSHRYPRIQSIKVQFTEYKKEKGFILTSQKEDEIMKVQNNSVIINCDGFYLISLKGYFSQEVNI
SLHYQKDEEPLFQLKKVRSVNSLMVASLTYKDKVYLNVTTDNTSLDDFHVNGGELILIHQNP

GEFCVL (SEQ ID NO: 7245), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7245.

[00780] In another embodiment, the CD40L comprises the amino acid sequence: MQKGDQNPQIAAHVISEASSKTTSVLQWAEKGYYTMSNNLVTLENGKQLTVKRQGLYYIYA QVTFCSNREASSQAPFIASLCLKSPGRFERILLRAANTHSSAKPCGQQSIHLGGVFELQPGASV FVNVTDPSQVSHGTGFTSFGLLKL (SEQ ID NO: 7246), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7246.

[00781] In yet other embodiments, the STING agonist comprises a cyclic dinucleotide, e.g., a cyclic di-GMP (cdGMP), a cyclic di-AMP (cdAMP), or a combination thereof, optionally with 2′,5′ or 3′,5′ phosphate linkages.

[00782] In one embodiment, the immune cell engager includes 41BB ligand, e.g., comprising the amino acid sequence: ACPWAVSGARASPGSAASPRLREGPELSPDDPAGLLDLRQGMFAQLVAQNVLLIDGPLSWYS DPGLAGVSLTGGLSYKEDTKELVVAKAGVYYVFFQLELRRVVAGEGSGSVSLALHLQPLRS AAGAAALALTVDLPPASSEARNSAFGFQGRLLHLSAGQRLGVHLHTEARARHAWQLTQGAT VLGLFRVTPEIPAGLPSPRSE (SEQ ID NO: 7247), a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7247.

Toll-Like Receptors

[00783] Toll-Like Receptors (TLRs) are evolutionarily conserved receptors are homologues of the Drosophila Toll protein, and recognize highly conserved structural motifs known as pathogen-associated microbial patterns (PAMPs), which are exclusively expressed by microbial pathogens, or danger-associated molecular patterns (DAMPs) that are endogenous molecules released from necrotic or dying cells. PAMPs include various bacterial cell wall components such as lipopolysaccharide (LPS), peptidoglycan (PGN) and lipopeptides, as well as flagellin, bacterial DNA and viral double-stranded RNA. DAMPs include intracellular proteins such as heat shock proteins as well as protein fragments from the extracellular matrix. Stimulation of TLRs by the corresponding PAMPs or DAMPs initiates signaling cascades leading to the activation of transcription factors, such as AP-1, NF-κB and interferon regulatory factors (IRFs). Signaling by TLRs results in a variety of cellular responses, including the production of interferons (IFNs), pro-inflammatory cytokines and effector

cytokines that direct the adaptive immune response. TLRs are implicated in a number of inflammatory and immune disorders and play a role in cancer (Rakoff-Nahoum S. & Medzhitov R., 2009. Toll-like receptors and cancer. Nat Revs Cancer 9:57- 63.)

[00784] TLRs are type I transmembrane proteins characterized by an extracellular domain containing leucine-rich repeats (LRRs) and a cytoplasmic tail that contains a conserved region called the Toll/IL-1 receptor (TIR) domain. Ten human and twelve murine TLRs have been characterized, TLR1 to TLR10 in humans, and TLR1 to TLR9, TLR11, TLR12 and TLR13 in mice, the homolog of TLR10 being a pseudogene. TLR2 is essential for the recognition of a variety of PAMPs from Gram-positive bacteria, including bacterial lipoproteins, lipomannans and lipoteichoic acids. TLR3 is implicated in virus-derived double-stranded RNA. TLR4 is predominantly activated by lipopolysaccharide. TLR5 detects bacterial flagellin and TLR9 is required for response to unmethylated CpG DNA. Finally, TLR7 and TLR8 recognize small synthetic antiviral molecules, and single-stranded RNA was reported to be their natural ligand. TLR11 has been reported to recognize uropathogenic E.coli and a profilin-like protein from Toxoplasma gondii. The repertoire of specificities of the TLRs is apparently extended by the ability of TLRs to heterodimerize with one another. For example, dimers of TLR2 and TLR6 are required for responses to diacylated lipoproteins while TLR2 and TLR1 interact to recognize triacylated lipoproteins. Specificities of the TLRs are also influenced by various adapter and accessory molecules, such as MD-2 and CD14 that form a complex with TLR4 in response to LPS.

[00785] TLR signaling consists of at least two distinct pathways: a MyD88-dependent pathway that leads to the production of inflammatory cytokines, and a MyD88-independent pathway associated with the stimulation of IFN-β and the maturation of dendritic cells. The MyD88-dependent pathway is common to all TLRs, except TLR3 (Adachi O. et al., 1998. Targeted disruption of the MyD88 gene results in loss of IL-1- and IL-18-mediated function. Immunity. 9(1):143-50). Upon activation by PAMPs or DAMPs, TLRs hetero- or homodimerize inducing the recruitment of adaptor proteins via the cytoplasmic TIR domain. Individual TLRs induce different signaling responses by usage of the different adaptor molecules. TLR4 and TLR2 signaling requires the adaptor TIRAP/Mal, which is involved in the MyD88-dependent pathway. TLR3 triggers the production of IFN-β in response to double-stranded RNA, in a MyD88-independent manner, through the adaptor TRIF/TICAM-1. TRAM/TICAM-2 is another adaptor molecule involved in the MyD88-independent pathway which function is restricted to the TLR4 pathway.

[00786] TLR3, TLR7, TLR8 and TLR9 recognize viral nucleic acids and induce type I IFNs. The signaling mechanisms leading to the induction of type I IFNs differ depending on the TLR activated. They involve the interferon regulatory factors, IRFs, a family of transcription factors known to play a critical role in antiviral defense, cell growth and immune regulation. Three IRFs (IRF3, IRF5 and IRF7) function as direct transducers of virus-mediated TLR signaling. TLR3 and TLR4 activate IRF3 and IRF7, while TLR7 and TLR8 activate IRF5 and IRF7 (Doyle S. et al., 2002. IRF3 mediates a

TLR3/TLR4-specific antiviral gene program. Immunity. 17(3):251-63). Furthermore, type I IFN production stimulated by TLR9 ligand CpG-A has been shown to be mediated by PI(3)K and mTOR (Costa-Mattioli M. & Sonenberg N. 2008. RAPping production of type I interferon in pDCs through mTOR. Nature Immunol. 9: 1097-1099).

[00787] *TLR-9*

[00788] TLR9 recognizes unmethylated CpG sequences in DNA molecules. CpG sites are relatively rare (~1%) on vertebrate genomes in comparison to bacterial genomes or viral DNA. TLR9 is expressed by numerous cells of the immune system such as B lymphocytes, monocytes, natural killer (NK) cells, and plasmacytoid dendritic cells. TLR9 is expressed intracellularly, within the endosomal compartments and functions to alert the immune system of viral and bacterial infections by binding to DNA rich in CpG motifs. TLR9 signals leads to activation of the cells initiating pro-inflammatory reactions that result in the production of cytokines such as type-I interferon and IL-12.

[00789] *TLR Agonists*

[00790] A TLR agonist can agonize one or more TLR, e.g., one or more of human TLR- 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10. In some embodiments, an adjunctive agent described herein is a TLR agonist. In some embodiments, the TLR agonist specifically agonizes human TLR-9. In some embodiments, the TLR-9 agonist is a CpG moiety. As used herein, a CpG moiety, is a linear dinucleotide having the sequence: 5'—C—phosphate—G—3', that is, cytosine and guanine separated by only one phosphate.

[00791] In some embodiments, the CpG moiety comprises at least 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, or more CpG dinucleotides. In some embodiments, the CpG moiety consists of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, or 30 CpG dinucleotides. In some embodiments, the CpG moiety has 1-5, 1-10, 1-20, 1-30, 1-40, 1-50, 5-10, 5-20, 5-30, 10-20, 10-30, 10-40, or 10-50 CpG dinucleotides.

[00792] In some embodiments, the TLR-9 agonist is a synthetic ODN (oligodeoxynucleotides). CpG ODNs are short synthetic single-stranded DNA molecules containing unmethylated CpG dinucleotides in particular sequence contexts (CpG motifs). CpG ODNs possess a partially or completely phosphorothioated (PS) backbone, as opposed to the natural phosphodiester (PO) backbone found in genomic bacterial DNA. There are three major classes of CpG ODNs: classes A, B and C, which differ in their immunostimulatory activities. CpG-A ODNs are characterized by a PO central CpG-containing palindromic motif and a PS-modified 3′ poly-G string. They induce high IFN-α production from pDCs but are weak stimulators of TLR9-dependent NF-κB signaling and pro-inflammatory cytokine (e.g. IL-6) production. CpG-B ODNs contain a full PS backbone with one or more CpG dinucleotides. They strongly activate B cells and TLR9-dependent NF-κB signaling but

weakly stimulate IFN-α secretion. CpG-C ODNs combine features of both classes A and B. They contain a complete PS backbone and a CpG-containing palindromic motif. C-Class CpG ODNs induce strong IFN-α production from pDC as well as B cell stimulation.

Stromal Modifying Moieties

[00793] Solid tumors have a distinct structure that mimics that of normal tissues and comprises two distinct but interdependent compartments: the parenchyma (neoplastic cells) and the stroma that the neoplastic cells induce and in which they are dispersed. All tumors have stroma and require stroma for nutritional support and for the removal of waste products. In the case of tumors which grow as cell suspensions (e.g., leukemias, ascites tumors), the blood plasma serves as stroma (Connolly JL et al. Tumor Structure and Tumor Stroma Generation. In: Kufe DW et al., editors. Holland-Frei *Cancer Medicine*. 6th edition. Hamilton: BC Decker; 2003). The stroma includes a variety of cell types, including fibroblasts/myofibroblasts, glial, epithelial, fat, vascular, smooth muscle, and immune cells along with extracellular matrix (ECM) and extracellular molecules (Li Hanchen et al. Tumor Microenvironment: The Role of the Tumor Stroma in Cancer. *J of Cellular Biochemistry* 101: 805-815 (2007)).

[00794] Stromal modifying moieties described herein include moieties (e.g., proteins, e.g., enzymes) capable of degrading a component of the stroma, e.g., an ECM component, e.g., a glycosaminoglycan, e.g., hyaluronan (also known as hyaluronic acid or HA), chondroitin sulfate, chondroitin, dermatan sulfate, heparin sulfate, heparin, entactin, tenascin, aggrecan and keratin sulfate; or an extracellular protein, e.g., collagen, laminin, elastin, fibrinogen, fibronectin, and vitronectin.

Stromal Modifying Enzymes

[00795] In some embodiments, the stromal modifying moiety is an enzyme. For example, the stromal modifying moiety can include, but is not limited to a hyaluronidase, a collagenase, a chondroitinase, a matrix metalloproteinase (e.g., macrophage metalloelastase).

[00796] *Hyaluronidases*

[00797] Hyaluronidases are a group of neutral- and acid-active enzymes found throughout the animal kingdom. Hyaluronidases vary with respect to substrate specificity, and mechanism of action. There are three general classes of hyaluronidases: (1) Mammalian-type hyaluronidases, (EC 3.2.1.35) which are endo-beta-N-acetylhexosaminidases with tetrasaccharides and hexasaccharides as the major end products. They have both hydrolytic and transglycosidase activities, and can degrade hyaluronan and chondroitin sulfates; (2) Bacterial hyaluronidases (EC 4.2.99.1) degrade hyaluronan and, and to various extents, chondroitin sulfate and dermatan sulfate. They are endo-beta-N-acetylhexosaminidases that operate by a beta elimination reaction that yields primarily disaccharide

end products; (3) Hyaluronidases (EC 3.2.1.36) from leeches, other parasites, and crustaceans are endo-beta-glucuronidases that generate tetrasaccharide and hexasaccharide end products through hydrolysis of the beta 1-3 linkage.

[00798] Mammalian hyaluronidases can be further divided into two groups: (1) neutral active and (2) acid active enzymes. There are six hyaluronidase-like genes in the human genome, HYAL1, HYAL2, HYAL3 HYAL4 HYALP1 and PH20/SPAM1. HYALP1 is a pseudogene, and HYAL3 has not been shown to possess enzyme activity toward any known substrates. HYAL4 is a chondroitinase and lacks activity towards hyaluronan. HYAL1 is the prototypical acid-active enzyme and PH20 is the prototypical neutral-active enzyme. Acid active hyaluronidases, such as HYAL1 and HYAL2 lack catalytic activity at neutral pH. For example, HYAL1 has no catalytic activity in vitro over pH 4.5 (Frost and Stern, "A Microtiter-Based Assay for Hyaluronidase Activity Not Requiring Specialized Reagents", Analytical Biochemistry, vol. 251, pp. 263-269 (1997). HYAL2 is an acid active enzyme with a very low specific activity in vitro.

[00799] In some embodiments the hyaluronidase is a mammalian hyaluronidase. In some embodiments the hyaluronidase is a recombinant human hyaluronidase. In some embodiments, the hyaluronidase is a neutral active hyaluronidase. In some embodiments, the hyaluronidase is a neutral active soluble hyaluronidase. In some embodiments, the hyaluronidase is a recombinant PH20 neutral-active enzyme. In some embodiments, the hyaluronidase is a recombinant PH20 neutral-active soluble enzyme. In some embodiments the hyaluronidase is glycosylated. In some embodiments, the hyaluronidase possesses at least one N-linked glycan. A recombinant hyaluronidase can be produced using conventional methods known to those of skill in the art, e.g., US7767429, the entire contents of which are incorporated by reference herein.

[00800] In some embodiments the hyaluronidase is rHuPH20 (also referred to as Hylenex®; presently manufactured by Halozyme; approved by the FDA in 2005 (see e.g., Scodeller P (2014) Hyaluronidase and other Extracellular Matrix Degrading Enzymes for Cancer Therapy: New Uses and Nano- Formulations. J Carcinog Mutage 5:178; US7767429; US8202517; US7431380; US8450470; US8772246; US8580252, the entire contents of each of which is incorporated by reference herein). rHuPH20 is produced by genetically engineered CHO cells containing a DNA plasmid encoding for a soluble fragment of human hyaluronidase PH20. In some embodiments the hyaluronidase is glycosylated. In some embodiments, the hyaluronidase possesses at least one N-linked glycan. A recombinant hyaluronidase can be produced using conventional methods known to those of skill in the art, e.g., US7767429, the entire contents of which are incorporated by reference herein. In some embodiments, rHuPH20 has a sequence at least 95% (e.g., at least 96%, 97%, 98%, 99%, 100%) identical to the amino acid sequence of

LNFRAPPVIPNVPFLWAWNAPSEFCLGKFDEPLDMSLFSFIGSPRINATGQGVTIFYVDRLGYY
PYIDSITGVTVNGGIPQKISLQDHLDKAKKDITFYMPVDNLGMAVIDWEEWRPTWARNWKP

KDVYKNRSIELVQQQNVQLSLTEATEKAKQEFEKAGKDFLVETIKLGKLLRPNHLWGYYLFP
DCYNHHYKKPGYNGSCFNVEIKRNDDLSWLWNESTALYPSIYLNTQQSPVAATLYVRNRVR
EAIRVSKIPDAKSPLPVFAYTRIVFTDQVLKFLSQDELVYTFGETVALGASGIVIWGTLSIMRS
MKSCLLLDNYMETILNPYIINVTLAAKMCSQVLCQEQGVCIRKNWNSSDYLHLNPDNFAIQL
EKGGKFTVRGKPTLEDLEQFSEKFYCSCYSTLSCKEKADVKDTDAVDVCIADGVCIDAFLKP
PMETEEPQIFYNASPSTLS (SEQ ID NO: 7248).

[00801] In any of the methods provided herein, the anti-hyaluronan agent can be an agent that degrades hyaluronan or can be an agent that inhibits the synthesis of hyaluronan. For example, the anti-hyaluronan agent can be a hyaluronan degrading enzyme. In another example, the anti-hyaluronan agent or is an agent that inhibits hyaluronan synthesis. For example, the anti-hyaluronan agent is an agent that inhibits hyaluronan synthesis such as a sense or antisense nucleic acid molecule against an HA synthase or is a small molecule drug. For example, an anti-hyaluronan agent is 4-methylumbelliferone (MU) or a derivative thereof, or leflunomide or a derivative thereof. Such derivatives include, for example, a derivative of 4-methylumbelliferone (MU) that is 6,7-dihydroxy-4-methyl coumarin or 5,7-dihydroxy-4-methyl coumarin.

[00802] In further examples of the methods provided herein, the hyaluronan degrading enzyme is a hyaluronidase. In some examples, the hyaluronan-degrading enzyme is a PH20 hyaluronidase or truncated form thereof to lacking a C-terminal glycosylphosphatidylinositol (GPI) attachment site or a portion of the GPI attachment site. In specific examples, the hyaluronidase is a PH20 selected from a human, monkey, bovine, ovine, rat, mouse or guinea pig PH20. For example, the hyaluronan-degrading enzyme is a human PH20 hyaluronidase that is neutral active and N- glycosylated and is selected from among (a) a hyaluronidase polypeptide that is a full- length PH20 or is a C-terminal truncated form of the PH20, wherein the truncated form includes at least amino acid residues 36-464 of SEQ ID NO: 7248, such as 36-481 , 36-482, 36-483, where the full-length PH20 has the sequence of amino acids set forth in SEQ ID NO: 7248; or (b) a hyaluronidase polypeptide comprising a sequence of amino acids having at least 85 %, 86 %, 87 %, 88 %, 89 %, 90 %, 91 %, 92 %, 93 %, 94 %, 95 %, 96 %, 97 %, 98 %, 99 % or more sequence identity with the polypeptide or truncated form of sequence of amino acids set forth in SEQ ID NO: 7248; or (c) a hyaluronidase polypeptide of (a) or (b) comprising amino acid substitutions, whereby the hyaluronidase polypeptide has a sequence of amino acids having at least 85 %, 86 %, 87 %, 88 %, 89 %, 90 %, 91 %, 92 %, 93 %, 94 %, 95 %, 96 %, 97 %, 98 %, 99 % or more sequence identity with the polypeptide set forth in SEQ ID NO: 7248 or the with the corresponding truncated forms thereof. In exemplary examples, the hyaluronan-degrading enzyme is a PH20 that comprises a composition designated rHuPH20.

[00803] In other examples, the anti-hyaluronan agent is a hyaluronan degrading enzyme that is modified by conjugation to a polymer. The polymer can be a PEG and the anti-hyaluronan agent a PEGylated hyaluronan degrading enzyme. Hence, in some examples of the methods provided herein the hyaluronan-degrading enzyme is modified by conjugation to a polymer. For example, the

hyaluronan-degrading enzyme is conjugated to a PEG, thus the hyaluronan degrading enzyme is PEGylated. In an exemplary example, the hyaluronan-degrading enzyme is a PEGylated PH20 enzyme (PEGPH20). In the methods provided herein, the corticosteroid can be a glucocorticoid that is selected from among cortisones, dexamethasones, hydrocortisones, methylprednisolones, prednisolones and prednisones.

[00804] *Chondroitinases*

[00805] Chondroitinases are enzymes found throughout the animal kingdom which degrade glycosaminoglycans, specifically chondroitins and chondroitin sulfates, through an endoglycosidase reaction. In some embodiments the chondroitinase is a mammalian chondroitinase. In some embodiments the chondroitinase is a recombinant human chondroitinase. In some embodiments the chondroitinase is HYAL4. Other exemplary chondroitinases include chondroitinase ABC (derived from Proteus vulgaris; Japanese Patent Application Laid-open No 6-153947, T. Yamagata et al. J. Biol. Chem., 243, 1523 (1968), S. Suzuki et al, J. Biol. Chem., 243, 1543 (1968)), chondroitinase AC (derived from Flavobacterium heparinum; T. Yamagata et al., J. Biol. Chem., 243, 1523 (1968)), chondroitinase AC II (derived from Arthrobacter aurescens; K. Hiyama, and S. Okada, J. Biol. Chem., 250, 1824 (1975), K. Hiyama and S. Okada, J. Biochem. (Tokyo), 80, 1201 (1976)), Hyaluronidase ACIII (derived from Flavobacterium sp. Hp102; Hirofumi Miyazono et al., Seikagaku, 61, 1023 (1989)), chondroitinase B (derived from Flavobacterium heparinum; Y. M. Michelacci and C. P. Dietrich, Biochem. Biophys. Res. Commun., 56, 973 (1974), Y. M. Michelacci and C. P. Dietrich, Biochem. J., 151, 121 (1975), Kenichi Maeyama et al, Seikagaku, 57, 1189 (1985)), chondroitinase C (derived from Flavobacterium sp. Hp102; Hirofumi Miyazono et al, Seikagaku, 61, 1023 (1939)), and the like.

[00806] *Matrix Metalloproteinases*

[00807] Matrix metalloproteases (MMPs) are zinc-dependent endopeptidases that are the major proteases involved in extracellular matrix (ECM) degradation. MMPs are capable of degrading a wide range of extracellular molecules and a number of bioactive molecules. Twenty-four MMP genes have been identified in humans, which can be organized into six groups based on domain organization and substrate preference: Collagenases (MMP-1, -8 and -13), Gelatinases (MMP-2 and MMP-9), Stromelysins (MMP-3, -10 and -11), Matrilysin (MMP-7 and MMP-26), Membrane-type (MT)-MMPs (MMP-14, -15, -16, -17, -24 and -25) and others (MMP-12, -19, -20, -21, -23, -27 and -28). In some embodiments, the stromal modifying moiety is a human recombinant MMP (e.g., MMP -1, -2, -3, -4, -5, -6, -7, -8, -9, 10, -11, -12, -13, -14, 15, -15, -17, -18, -19, 20, -21, -22, -23, or -24).

[00808] *Collagenases*

[00809] The three mammalian collagenases (MMP-1, -8, and -13) are the principal secreted

endopeptidases capable of cleaving collagenous extracellular matrix. In addition to fibrillar collagens, collagenases can cleave several other matrix and non-matrix proteins including growth factors. Collagenases are synthesized as inactive pro-forms, and once activated, their activity is inhibited by specific tissue inhibitors of metalloproteinases, TIMPs, as well as by non-specific proteinase inhibitors (Ala-aho R et al. Biochimie. Collagenases in cancer. 2005 Mar-Apr;87(3-4):273-86). In some embodiments, the stromal modifying moiety is a collagenase. In some embodiments, the collagenase is a human recombinant collagenase. In some embodiments, the collagenase is MMP-1. In some embodiments, the collagenase is MMP-8. In some embodiments, the collagenase is MMP-13.

[00810] *Macrophage metalloelastase*

[00811] Macrophage metalloelastase (MME), also known as MMP-12, is a member of the stromelysin subgroup of MMPs and catalyzes the hydrolysis of soluble and insoluble elastin and a broad selection of matrix and nonmatrix substrates including type IV collagen, fibronectin, laminin, vitronectin, entactin, heparan, and chondroitin sulfates (Erja Kerkelä et al. Journal of Investigative Dermatology (2000) 114, 1113−1119; doi:10.1046/j.1523-1747.2000.00993). In some embodiments, the stromal modifying moiety is a MME. In some embodiments, the MME is a human recombinant MME. In some embodiments, the MME is MMP-12.

Additional stromal modifying moieties

[00812] In some embodiments, the stromal modifying moiety causes one or more of: decreases the level or production of a stromal or extracellular matrix (ECM) component; decreases tumor fibrosis; increases interstitial tumor transport; improves tumor perfusion; expands the tumor microvasculature; decreases interstitial fluid pressure (IFP) in a tumor; or decreases or enhances penetration or diffusion of an agent, e.g., a cancer therapeutic or a cellular therapy, into a tumor or tumor vasculature.

[00813] In some embodiments, the stromal or ECM component decreased is chosen from a glycosaminoglycan or an extracellular protein, or a combination thereof. In some embodiments, the glycosaminoglycan is chosen from hyaluronan (also known as hyaluronic acid or HA), chondroitin sulfate, chondroitin, dermatan sulfate, heparin, heparin sulfate, entactin, tenascin, aggrecan and keratin sulfate. In some embodiments, the extracellular protein is chosen from collagen, laminin, elastin, fibrinogen, fibronectin, or vitronectin. In some embodiments, the stromal modifying moiety includes an enzyme molecule that degrades a tumor stroma or extracellular matrix (ECM). In some embodiments, the enzyme molecule is chosen from a hyaluronidase molecule, a collagenase molecule, a chondroitinase molecule, a matrix metalloproteinase molecule (e.g., macrophage metalloelastase), or a variant (e.g., a fragment) of any of the aforesaid. The term "enzyme molecule" includes a full length, a fragment or a variant of the enzyme, e.g., an enzyme variant that retains at least one functional property of the naturally occurring enzyme.

[00814] In some embodiments, the stromal modifying moiety decreases the level or production of hyaluronic acid. In other embodiments, the stromal modifying moiety comprises a hyaluronan degrading enzyme, an agent that inhibits hyaluronan synthesis, or an antibody molecule against hyaluronic acid.

[00815] In some embodiments, the hyaluronan degrading enzyme is a hyaluronidase molecule, e.g., a full length or a variant (e.g., fragment thereof) thereof. In some embodiments, the hyaluronan degrading enzyme is active in neutral or acidic pH, e.g., pH of about 4-5. In some embodiments, the hyaluronidase molecule is a mammalian hyaluronidase molecule, e.g., a recombinant human hyaluronidase molecule, e.g., a full length or a variant (e.g., fragment thereof, e.g., a truncated form) thereof. In some embodiments, the hyaluronidase molecule is chosen from HYAL1, HYAL2, or PH-20/SPAM1, or a variant thereof (e.g., a truncated form thereof). In some embodiments, the truncated form lacks a C-terminal glycosylphosphatidylinositol (GPI) attachment site or a portion of the GPI attachment site. In some embodiments, the hyaluronidase molecule is glycosylated, e.g., comprises at least one N-linked glycan.

[00816] In some embodiments, the hyaluronidase molecule comprises the amino acid sequence: LNFRAPPVIPNVPFLWAWNAPSEFCLGKFDEPLDMSLFSFIGSPRINATGQGVTIFYVDRLGYY PYIDSITGVTVNGGIPQKISLQDHLDKAKKDITFYMPVDNLGMAVIDWEEWRPTWARNWKP KDVYKNRSIELVQQQNVQLSLTEATEKAKQEFEKAGKDFLVETIKLGKLLRPNHLWGYYLFP DCYNHHYKKPGYNGSCFNVEIKRNDDLSWLWNESTALYPSIYLNTQQSPVAATLYVRNRVR EAIRVSKIPDAKSPLPVFAYTRIVFTDQVLKFLSQDELVYTFGETVALGASGIVIWGTLSIMRS MKSCLLLDNYMETILNPYIINVTLAAKMCSQVLCQEQGVCIRKNWNSSDYLHLNPDNFAIQL EKGGKFTVRGKPTLEDLEQFSEKFYCSCYSTLSCKEKADVKDTDAVDVCIADGVCIDAFLKP PMETEEPQIFYNASPSTLS (SEQ ID NO: 7256), or a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7256.

[00817] In some embodiments, the hyaluronidase molecule comprises:

(i) the amino acid sequence of 36-464 of SEQ ID NO: 7256;

(ii) the amino acid sequence of 36-481, 36-482, or 36-483 of PH20, wherein PH20 has the sequence of amino acids set forth in SEQ ID NO: 7256; or

(iii) an amino acid sequence having at least 95% to 100 % sequence identity to the polypeptide or truncated form of sequence of amino acids set forth in SEQ ID NO: 7256; or

(iv) an amino acid sequence having 30, 20, 10, 5 or fewer amino acid substitutions to the amino acid sequence set forth in SEQ ID NO: 7256. In some embodiments, the hyaluronidase molecule comprises an amino acid sequence at least 95% (e.g., at least 95%, 96%, 97%, 98%, 99%, 100%) identical to the amino acid sequence of SEQ ID NO: 7256. In some embodiments, the hyaluronidase molecule is encoded by a nucleotide sequence at least 95% (e.g., at least 96%, 97%, 98%, 99%,

100%) identical to the nucleotide sequence of SEQ ID NO: 7256.

[00818] In some embodiments, the hyaluronidase molecule is PH20, e.g., rHuPH20. In some embodiments, the hyaluronidase molecule is HYAL1 and comprises the amino acid sequence: FRGPLLPNRPFTTVWNANTQWCLERHGVDVDVSVFDVVANPGQTFRGPDMTIFYSSQGTYP YYTPTGEPVFGGLPQNASLIAHLARTFQDILAAIPAPDFSGLAVIDWEAWRPRWAFNWDTKD IYRQRSRALVQAQHPDWPAPQVEAVAQDQFQGAARAWMAGTLQLGRALRPRGLWGFYGF PDCYNYDFLSPNYTGQCPSGIRAQNDQLGWLWGQSRALYPSIYMPAVLEGTGKSQMYVQH RVAEAFRVAVAAGDPNLPVLPYVQIFYDTTNHFLPLDELEHSLGESAAQGAAGVVLWVSWE NTRTKESCQAIKEYMDTTLGPFILNVTSGALLCSQALCSGHGRCVRRTSHPKALLLLNPASFSI QLTPGGGPLSLRGALSLEDQAQMAVEFKCRCYPGWQAPWCERKSMW (SEQ ID NO: 7253), or a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7253.

[00819] In some embodiments, the hyaluronan degrading enzyme, e.g., the hyaluronidase molecule, further comprises a polymer, e.g., is conjugated to a polymer, e.g., PEG. In some embodiments, the hyaluronan-degrading enzyme is a PEGylated PH20 enzyme (PEGPH20). In some embodiments, the hyaluronan degrading enzyme, e.g., the hyaluronidase molecule, further comprises an immunoglobulin chain constant region (e.g., Fc region) chosen from, *e.g.*, the heavy chain constant regions of IgG1, IgG2, IgG3, and IgG4, more particularly, the heavy chain constant region of human IgG1, IgG2, IgG3, or IgG4. In some embodiments, the immunoglobulin constant region (e.g., the Fc region) is linked, e.g., covalently linked to, the hyaluronan degrading enzyme, e.g., the hyaluronidase molecule. In some embodiments, the immunoglobulin chain constant region (e.g., Fc region) is altered, e.g., mutated, to increase or decrease one or more of: Fc receptor binding, antibody glycosylation, the number of cysteine residues, effector cell function, or complement function. In some embodiments, the hyaluronan degrading enzyme, e.g., the hyaluronidase molecule forms a dimer.

[00820] In some embodiments, the stromal modifying moiety comprises an inhibitor of the synthesis of hyaluronan, e.g., an HA synthase. In some embodiments, the inhibitor comprises a sense or an antisense nucleic acid molecule against an HA synthase or is a small molecule drug. In some embodiments, the inhibitor is 4- methylumbelliferone (MU) or a derivative thereof (e.g., 6,7-dihydroxy-4-methyl coumarin or 5,7-dihydroxy-4-methyl coumarin), or leflunomide or a derivative thereof.

[00821] In some embodiments, the stromal modifying moiety comprises antibody molecule against hyaluronic acid.

[00822] In some embodiments, the stromal modifying moiety comprises a collagenase molecule, e.g., a mammalian collagenase molecule, or a variant (e.g., fragment) thereof. In some embodiments,

the collagenase molecule is collagenase molecule IV, e.g., comprising the amino acid sequence of: YNFFPRKPKWDKNQITYRIIGYTPDLDPETVDDAFARAFQVWSDVTPLRFSRIHDGEADIMIN FGRWEHGDGYPFDGKDGLLAHAFAPGTGVGGDSHFDDDELWTLGEGQVVRVKYGNADGE YCKFPFLFNGKEYNSCTDTGRSDGFLWCSTTYNFEKDGKYGFCPHEALFTMGGNAEGQPCK FPFRFQGTSYDSCTTEGRTDGYRWCGTTEDYDRDKKYGFCPETAMSTVGGNSEGAPCVFPFT FLGNKYESCTSAGRSDGKMWCATTANYDDDRKWGFCPDQGYSLFLVAAHEFGHAMGLEH SQDPGALMAPIYTYTKNFRLSQDDIKGIQELYGASPDIDLGTGPTPTLGPVTPEICKQDIVFDGI AQIRGEIFFFKDRFIWRTVTPRDKPMGPLLVATFWPELPEKIDAVYEAPQEEKAVFFAGNEYW IYSASTLERGYPKPLTSLGLPPDVQRVDAAFNWSKNKKTYIFAGDKFWRYNEVKKKMDPGF PKLIADAWNAIPDNLDAVVDLQGGGHSYFFKGAYYLKLENQSLKSVKFGSIKSDWLGC (SEQ ID NO: 7254), or a fragment thereof, or an amino acid sequence substantially identical thereto (e.g., 95% to 99.9% identical thereto, or having at least one amino acid alteration, but not more than five, ten or fifteen alterations (*e.g.*, substitutions, deletions, or insertions, *e.g.*, conservative substitutions) to the amino acid sequence of SEQ ID NO: 7254.

Linkers

[00823] The multispecific or multifunctional molecule disclosed herein can further include a linker, e.g., a linker between one or more of: the antigen binding domain and the cytokine molecule, the antigen binding domain and the immune cell engager, the antigen binding domain and the stromal modifying moiety, the cytokine molecule and the immune cell engager, the cytokine molecule and the stromal modifying moiety, the immune cell engager and the stromal modifying moiety, the antigen binding domain and the immunoglobulin chain constant region, the cytokine molecule and the immunoglobulin chain constant region, the immune cell engager and the immunoglobulin chain constant region, or the stromal modifying moiety and the immunoglobulin chain constant region. In embodiments, the linker is chosen from: a cleavable linker, a non-cleavable linker, a peptide linker, a flexible linker, a rigid linker, a helical linker, or a non-helical linker, or a combination thereof.

[00824] In one embodiment, the multispecific molecule can include one, two, three or four linkers, e.g., a peptide linker. In one embodiment, the peptide linker includes Gly and Ser. In some embodiments, the peptide linker is selected from GGGGS (SEQ ID NO: 7249); GGGGSGGGGS (SEQ ID NO: 7250); GGGGSGGGGSGGGGS (SEQ ID NO: 7251); and DVPSGPGGGGGSGGGGS (SEQ ID NO: 7252). In some embodiments, the peptide linker is a A(EAAAK)nA (SEQ ID NO: 7255) family of linkers (e.g., as described in Protein Eng. (2001) 14 (8): 529-532). These are stiff helical linkers with n ranging from 2 – 5. In some embodiments, the peptide linker is selected from AEAAAKEAAAKAAA (SEQ ID NO: 75); AEAAAKEAAAKEAAAKAAA (SEQ ID NO: 76); AEAAAKEAAAKEAAAKEAAAKAAA (SEQ ID NO: 77); and AEAAAKEAAAKEAAAKEAAAKEAAAKAAA(SEQ ID NO: 78).

Nucleic Acids

[00825] Nucleic acids encoding the aforementioned multispecific or multifunctional molecules are also disclosed.

[00826] In certain embodiments, the invention features nucleic acids comprising nucleotide sequences that encode heavy and light chain variable regions and CDRs or hypervariable loops of the antibody molecules, as described herein. For example, the invention features a first and second nucleic acid encoding heavy and light chain variable regions, respectively, of an antibody molecule chosen from one or more of the antibody molecules disclosed herein. The nucleic acid can comprise a nucleotide sequence as set forth in the tables herein, or a sequence substantially identical thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, or which differs by no more than 3, 6, 15, 30, or 45 nucleotides from the sequences shown in the tables herein.

[00827] In certain embodiments, the nucleic acid can comprise a nucleotide sequence encoding at least one, two, or three CDRs or hypervariable loops from a heavy chain variable region having an amino acid sequence as set forth in the tables herein, or a sequence substantially homologous thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, and/or having one or more substitutions, *e.g.*, conserved substitutions). In other embodiments, the nucleic acid can comprise a nucleotide sequence encoding at least one, two, or three CDRs or hypervariable loops from a light chain variable region having an amino acid sequence as set forth in the tables herein, or a sequence substantially homologous thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, and/or having one or more substitutions, *e.g.*, conserved substitutions). In yet another embodiment, the nucleic acid can comprise a nucleotide sequence encoding at least one, two, three, four, five, or six CDRs or hypervariable loops from heavy and light chain variable regions having an amino acid sequence as set forth in the tables herein, or a sequence substantially homologous thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, and/or having one or more substitutions, *e.g.*, conserved substitutions).

[00828] In certain embodiments, the nucleic acid can comprise a nucleotide sequence encoding at least one, two, or three CDRs or hypervariable loops from a heavy chain variable region having the nucleotide sequence as set forth in the tables herein, a sequence substantially homologous thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, and/or capable of hybridizing under the stringency conditions described herein). In another embodiment, the nucleic acid can comprise a nucleotide sequence encoding at least one, two, or three CDRs or hypervariable loops from a light chain variable region having the nucleotide sequence as set forth in the tables herein, or a sequence substantially homologous thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, and/or capable of hybridizing under the stringency conditions described herein). In yet another embodiment, the nucleic acid can comprise a nucleotide sequence encoding at least one, two, three, four, five, or six CDRs or hypervariable loops from heavy and light chain variable regions having the nucleotide sequence as set forth in the tables herein, or a sequence

substantially homologous thereto (*e.g.*, a sequence at least about 85%, 90%, 95%, 99% or more identical thereto, and/or capable of hybridizing under the stringency conditions described herein).

[00829] In certain embodiments, the nucleic acid can comprise a nucleotide sequence encoding a cytokine molecule, an immune cell engager, or a stromal modifying moiety disclosed herein.

[00830] In another aspect, the application features host cells and vectors containing the nucleic acids described herein. The nucleic acids may be present in a single vector or separate vectors present in the same host cell or separate host cell, as described in more detail hereinbelow.

Vectors

[00831] Further provided herein are vectors comprising the nucleotide sequences encoding a multispecific or multifunctional molecule described herein. In one embodiment, the vectors comprise nucleotides encoding a multispecific or multifunctional molecule described herein. In one embodiment, the vectors comprise the nucleotide sequences described herein. The vectors include, but are not limited to, a virus, plasmid, cosmid, lambda phage or a yeast artificial chromosome (YAC).

[00832] Numerous vector systems can be employed. For example, one class of vectors utilizes DNA elements which are derived from animal viruses such as, for example, bovine papilloma virus, polyoma virus, adenovirus, vaccinia virus, baculovirus, retroviruses (Rous Sarcoma Virus, MMTV or MOMLV) or SV40 virus. Another class of vectors utilizes RNA elements derived from RNA viruses such as Semliki Forest virus, Eastern Equine Encephalitis virus and Flaviviruses.

[00833] Additionally, cells which have stably integrated the DNA into their chromosomes may be selected by introducing one or more markers which allow for the selection of transfected host cells. The marker may provide, for example, prototropy to an auxotrophic host, biocide resistance (e.g., antibiotics), or resistance to heavy metals such as copper, or the like. The selectable marker gene can be either directly linked to the DNA sequences to be expressed, or introduced into the same cell by cotransformation. Additional elements may also be needed for optimal synthesis of mRNA. These elements may include splice signals, as well as transcriptional promoters, enhancers, and termination signals.

[00834] Once the expression vector or DNA sequence containing the constructs has been prepared for expression, the expression vectors may be transfected or introduced into an appropriate host cell. Various techniques may be employed to achieve this, such as, for example, protoplast fusion, calcium phosphate precipitation, electroporation, retroviral transduction, viral transfection, gene gun, lipid based transfection or other conventional techniques. In the case of protoplast fusion, the cells are grown in media and screened for the appropriate activity.Methods and conditions for culturing the resulting transfected cells and for recovering the antibody molecule produced are known to those skilled in the art, and may be varied or optimized depending upon the specific expression vector and mammalian host cell employed, based upon the present description.

Cells

[00835] In another aspect, the application features host cells and vectors containing the nucleic acids described herein. The nucleic acids may be present in a single vector or separate vectors present in the same host cell or separate host cell. The host cell can be a eukaryotic cell, *e.g.*, a mammalian cell, an insect cell, a yeast cell, or a prokaryotic cell, *e.g.*, *E. coli*. For example, the mammalian cell can be a cultured cell or a cell line. Exemplary mammalian cells include lymphocytic cell lines (*e.g.*, NSO), Chinese hamster ovary cells (CHO), COS cells, oocyte cells, and cells from a transgenic animal, *e.g.*, mammary epithelial cell.

[00836] The invention also provides host cells comprising a nucleic acid encoding an antibody molecule as described herein.

[00837] In one embodiment, the host cells are genetically engineered to comprise nucleic acids encoding the antibody molecule.

[00838] In one embodiment, the host cells are genetically engineered by using an expression cassette. The phrase "expression cassette," refers to nucleotide sequences, which are capable of affecting expression of a gene in hosts compatible with such sequences. Such cassettes may include a promoter, an open reading frame with or without introns, and a termination signal. Additional factors necessary or helpful in effecting expression may also be used, such as, for example, an inducible promoter.

[00839] The invention also provides host cells comprising the vectors described herein.

[00840] The cell can be, but is not limited to, a eukaryotic cell, a bacterial cell, an insect cell, or a human cell. Suitable eukaryotic cells include, but are not limited to, Vero cells, HeLa cells, COS cells, CHO cells, HEK293 cells, BHK cells and MDCKII cells. Suitable insect cells include, but are not limited to, Sf9 cells.

Uses and Combination Therapies

[00841] Methods described herein include treating a cancer in a subject by using a multispecific molecule described herein, e.g., using a pharmaceutical composition described herein. Also provided are methods for reducing or ameliorating a symptom of a cancer in a subject, as well as methods for inhibiting the growth of a cancer and/or killing one or more cancer cells. In embodiments, the methods described herein decrease the size of a tumor and/or decrease the number of cancer cells in a subject administered with a described herein or a pharmaceutical composition described herein.

[00842] In embodiments, the cancer is a hematological cancer. In embodiments, the hematological cancer is a leukemia or a lymphoma. As used herein, a "hematologic cancer" refers to a tumor of the hematopoietic or lymphoid tissues, *e.g.*, a tumor that affects blood, bone marrow, or lymph nodes. Exemplary hematologic malignancies include, but are not limited to, leukemia (*e.g.*, acute lymphoblastic leukemia (ALL), acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL), chronic myelogenous leukemia (CML), hairy cell leukemia, acute monocytic leukemia

(AMoL), chronic myelomonocytic leukemia (CMML), juvenile myelomonocytic leukemia (JMML), or large granular lymphocytic leukemia), lymphoma (*e.g.,* AIDS-related lymphoma, cutaneous T-cell lymphoma, Hodgkin lymphoma (*e.g.,* classical Hodgkin lymphoma or nodular lymphocyte-predominant Hodgkin lymphoma), mycosis fungoides, non-Hodgkin lymphoma (*e.g.,* B-cell non-Hodgkin lymphoma (*e.g.,* Burkitt lymphoma, small lymphocytic lymphoma (CLL/SLL), diffuse large B-cell lymphoma, follicular lymphoma, immunoblastic large cell lymphoma, precursor B-lymphoblastic lymphoma, or mantle cell lymphoma) or T-cell non-Hodgkin lymphoma (mycosis fungoides, anaplastic large cell lymphoma, or precursor T-lymphoblastic lymphoma)), primary central nervous system lymphoma, Sézary syndrome, Waldenström macroglobulinemia), chronic myeloproliferative neoplasm, Langerhans cell histiocytosis, multiple myeloma/plasma cell neoplasm, myelodysplastic syndrome, or myelodysplastic/myeloproliferative neoplasm.

[00843] In embodiments, the cancer is a solid cancer. Exemplary solid cancers include, but are not limited to, ovarian cancer, rectal cancer, stomach cancer, testicular cancer, cancer of the anal region, uterine cancer, colon cancer, rectal cancer, renal-cell carcinoma, liver cancer, non-small cell carcinoma of the lung, cancer of the small intestine, cancer of the esophagus, melanoma, Kaposi's sarcoma, cancer of the endocrine system, cancer of the thyroid gland, cancer of the parathyroid gland, cancer of the adrenal gland, bone cancer, pancreatic cancer, skin cancer, cancer of the head or neck, cutaneous or intraocular malignant melanoma, uterine cancer, brain stem glioma, pituitary adenoma, epidermoid cancer, carcinoma of the cervix squamous cell cancer, carcinoma of the fallopian tubes, carcinoma of the endometrium, carcinoma of the vagina, sarcoma of soft tissue, cancer of the urethra, carcinoma of the vulva, cancer of the penis, cancer of the bladder, cancer of the kidney or ureter, carcinoma of the renal pelvis, spinal axis tumor, neoplasm of the central nervous system (CNS), primary CNS lymphoma, tumor angiogenesis, metastatic lesions of said cancers, or combinations thereof.

[00844] In certain embodiments, the cancer is an epithelial, mesenchymal or hematologic malignancy. In certain embodiments, the cancer treated is a solid tumor (e.g., carcinoid, carcinoma or sarcoma), a soft tissue tumor (e.g., a heme malignancy), and a metastatic lesion, e.g., a metastatic lesion of any of the cancers disclosed herein. In one embodiment, the cancer treated is a fibrotic or desmoplastic solid tumor, e.g., a tumor having one or more of: limited tumor perfusion, compressed blood vessels, fibrotic tumor interstitium, or increased interstitial fluid pressure. In one embodiment, the solid tumor is chosen from one or more of pancreatic (e.g., pancreatic adenocarcinoma or pancreatic ductal adenocarcinoma), breast, colon, colorectal, lung (e.g., small cell lung cancer (SCLC) or non-small cell lung cancer (NSCLC)), skin, ovarian, liver cancer, esophageal cancer, endometrial cancer, gastric cancer, head and neck cancer, kidney, or prostate cancer.

[00845] Examples of cancer include, but are not limited to, carcinoma, lymphoma, blastoma, sarcoma, and leukemia or lymphoid malignancies. More particular examples of such cancers are noted below and include: squamous cell cancer (e.g. epithelial squamous cell cancer), lung cancer including

small-cell lung cancer, non-small cell lung cancer, adenocarcinoma of the lung and squamous carcinoma of the lung, cancer of the peritoneum, hepatocellular cancer, gastric or stomach cancer including gastrointestinal cancer, pancreatic cancer, glioblastoma, cervical cancer, ovarian cancer, liver cancer, bladder cancer, hepatoma, breast cancer, colon cancer, rectal cancer, colorectal cancer, endometrial cancer or uterine carcinoma, salivary gland carcinoma, kidney or renal cancer, prostate cancer, vulval cancer, thyroid cancer, hepatic carcinoma, anal carcinoma, penile carcinoma, as well as head and neck cancer. The term "cancer" includes primary malignant cells or tumors (e.g., those whose cells have not migrated to sites in the subject's body other than the site of the original malignancy or tumor) and secondary malignant cells or tumors (e.g., those arising from metastasis, the migration of malignant cells or tumor cells to secondary sites that are different from the site of the original tumor).

[00846] Other examples of cancers or malignancies include, but are not limited to: Acute Childhood Lymphoblastic Leukemia, Acute Lymphoblastic Leukemia, Acute Lymphocytic Leukemia, Acute Myeloid Leukemia, Adrenocortical Carcinoma, Adult (Primary) Hepatocellular Cancer, Adult (Primary) Liver Cancer, Adult Acute Lymphocytic Leukemia, Adult Acute Myeloid Leukemia, Adult Hodgkin's Disease, Adult Hodgkin's Lymphoma, Adult Lymphocytic Leukemia, Adult Non-Hodgkin's Lymphoma, Adult Primary Liver Cancer, Adult Soft Tissue Sarcoma, AIDS-Related Lymphoma, AIDS-Related Malignancies, Anal Cancer, Astrocytoma, Bile Duct Cancer, Bladder Cancer, Bone Cancer, Brain Stem Glioma, Brain Tumors, Breast Cancer, Cancer of the Renal Pelvis and Ureter, Central Nervous System (Primary) Lymphoma, Central Nervous System Lymphoma, Cerebellar Astrocytoma, Cerebral Astrocytoma, Cervical Cancer, Childhood (Primary) Hepatocellular Cancer, Childhood (Primary) Liver Cancer, Childhood Acute Lymphoblastic Leukemia, Childhood Acute Myeloid Leukemia, Childhood Brain Stem Glioma, Childhood Cerebellar Astrocytoma, Childhood Cerebral Astrocytoma, Childhood Extracranial Germ Cell Tumors, Childhood Hodgkin's Disease, Childhood Hodgkin's Lymphoma, Childhood Hypothalamic and Visual Pathway Glioma, Childhood Lymphoblastic Leukemia, Childhood Medulloblastoma, Childhood Non-Hodgkin's Lymphoma, Childhood Pineal and Supratentorial Primitive Neuroectodermal Tumors, Childhood Primary Liver Cancer, Childhood Rhabdomyosarcoma, Childhood Soft Tissue Sarcoma, Childhood Visual Pathway and Hypothalamic Glioma, Chronic Lymphocytic Leukemia, Chronic Myelogenous Leukemia, Colon Cancer, Cutaneous T-Cell Lymphoma, Endocrine Pancreas Islet Cell Carcinoma, Endometrial Cancer, Ependymoma, Epithelial Cancer, Esophageal Cancer, Ewing's Sarcoma and Related Tumors, Exocrine Pancreatic Cancer, Extracranial Germ Cell Tumor, Extragonadal Germ Cell Tumor, Extrahepatic Bile Duct Cancer, Eye Cancer, Female Breast Cancer, Gaucher's Disease, Gallbladder Cancer, Gastric Cancer, Gastrointestinal Carcinoid Tumor, Gastrointestinal Tumors, Germ Cell Tumors, Gestational Trophoblastic Tumor, Hairy Cell Leukemia, Head and Neck Cancer, Hepatocellular Cancer, Hodgkin's Disease, Hodgkin's Lymphoma, Hypergammaglobulinemia, Hypopharyngeal Cancer, Intestinal Cancers, Intraocular Melanoma, Islet Cell Carcinoma, Islet Cell

Pancreatic Cancer, Kaposi's Sarcoma, Kidney Cancer, Laryngeal Cancer, Lip and Oral Cavity Cancer, Liver Cancer, Lung Cancer, Lymphoproliferative Disorders, Macroglobulinemia, Male Breast Cancer, Malignant Mesothelioma, Malignant Thymoma, Medulloblastoma, Melanoma, Mesothelioma, Metastatic Occult Primary Squamous Neck Cancer, Metastatic Primary Squamous Neck Cancer, Metastatic Squamous Neck Cancer, Multiple Myeloma, Multiple Myeloma/Plasma Cell Neoplasm, Myelodysplastic Syndrome, Myelogenous Leukemia, Myeloid Leukemia, Myeloproliferative Disorders, Nasal Cavity and Paranasal Sinus Cancer, Nasopharyngeal Cancer, Neuroblastoma, Non-Hodgkin's Lymphoma During Pregnancy, Nonmelanoma Skin Cancer, Non-Small Cell Lung Cancer, Occult Primary Metastatic Squamous Neck Cancer, Oropharyngeal Cancer, Osteo-/Malignant Fibrous Sarcoma, Osteosarcoma/Malignant Fibrous Histiocytoma, Osteosarcoma/Malignant Fibrous Histiocytoma of Bone, Ovarian Epithelial Cancer, Ovarian Germ Cell Tumor, Ovarian Low Malignant Potential Tumor, Pancreatic Cancer, Paraproteinemias, Purpura, Parathyroid Cancer, Penile Cancer, Pheochromocytoma, Pituitary Tumor, Plasma Cell Neoplasm/Multiple Myeloma, Primary Central Nervous System Lymphoma, Primary Liver Cancer, Prostate Cancer, Rectal Cancer, Renal Cell Cancer, Renal Pelvis and Ureter Cancer, Retinoblastoma, Rhabdomyosarcoma, Salivary Gland Cancer, Sarcoidosis Sarcomas, Sezary Syndrome, Skin Cancer, Small Cell Lung Cancer, Small Intestine Cancer, Soft Tissue Sarcoma, Squamous Neck Cancer, Stomach Cancer, Supratentorial Primitive Neuroectodermal and Pineal Tumors, T-Cell Lymphoma, Testicular Cancer, Thymoma, Thyroid Cancer, Transitional Cell Cancer of the Renal Pelvis and Ureter, Transitional Renal Pelvis and Ureter Cancer, Trophoblastic Tumors, Ureter and Renal Pelvis Cell Cancer, Urethral Cancer, Uterine Cancer, Uterine Sarcoma, Vaginal Cancer, Visual Pathway and Hypothalamic Glioma, Vulvar Cancer, Waldenstrom's Macroglobulinemia, Wilms' Tumor, and any other hyperproliferative disease, besides neoplasia, located in an organ system listed above.

[00847] In other embodiments, the multispecific molecule, as described above and herein, is used to treat a hyperproliferative disorder, e.g., a hyperproliferative connective tissue disorder (e.g., a hyperproliferative fibrotic disease). In one embodiment, the hyperproliferative fibrotic disease is multisystemic or organ-specific. Exemplary hyperproliferative fibrotic diseases include, but are not limited to, multisystemic (e.g., systemic sclerosis, multifocal fibrosclerosis, sclerodermatous graft-versus-host disease in bone marrow transplant recipients, nephrogenic systemic fibrosis, scleroderma), and organ-specific disorders (e.g., fibrosis of the eye, lung, liver, heart, kidney, pancreas, skin and other organs). In other embodiments, the disorder is chosen from liver cirrhosis or tuberculosis. In other embodiments, the disorder is leprosy.

[00848] In embodiments, the multispecific molecules (or pharmaceutical composition) are administered in a manner appropriate to the disease to be treated or prevented. The quantity and frequency of administration will be determined by such factors as the condition of the patient, and the type and severity of the patient's disease. Appropriate dosages may be determined by clinical trials. For example, when "an effective amount" or "a therapeutic amount" is indicated, the precise amount

of the pharmaceutical composition (or multispecific molecules) to be administered can be determined by a physician with consideration of individual differences in tumor size, extent of infection or metastasis, age, weight, and condition of the subject. In embodiments, the pharmaceutical composition described herein can be administered at a dosage of 10^4 to 10^9 cells/kg body weight, e.g., 10^5 to 10^6 cells/kg body weight, including all integer values within those ranges. In embodiments, the pharmaceutical composition described herein can be administered multiple times at these dosages. In embodiments, the pharmaceutical composition described herein can be administered using infusion techniques described in immunotherapy (see, *e.g.*, Rosenberg et al., New Eng. J. of Med. 319:1676, 1988).

[00849] In embodiments, the cancer is a myeloproliferative neoplasm, e.g., primary or idiopathic myelofibrosis (MF), essential thrombocytosis (ET), polycythemia vera (PV), or chronic myelogenous leukemia (CML). In embodiments, the cancer is myelofibrosis. In embodiments, the subject has myelofibrosis. In embodiments, the subject has a calreticulin mutation, e.g., a calreticulin mutation disclosed herein. In embodiments, the subject does not have the JAK2-V617F mutation. In embodiments, the subject has the JAK2-V617F mutation. In embodiments, the subject has a MPL mutation. In embodiments, the subject does not have a MPL mutation.

[00850] In embodiments, the cancer is a solid cancer. Exemplary solid cancers include, but are not limited to, ovarian cancer, rectal cancer, stomach cancer, testicular cancer, cancer of the anal region, uterine cancer, colon cancer, rectal cancer, renal-cell carcinoma, liver cancer, non-small cell carcinoma of the lung, cancer of the small intestine, cancer of the esophagus, melanoma, Kaposi's sarcoma, cancer of the endocrine system, cancer of the thyroid gland, cancer of the parathyroid gland, cancer of the adrenal gland, bone cancer, pancreatic cancer, skin cancer, cancer of the head or neck, cutaneous or intraocular malignant melanoma, uterine cancer, brain stem glioma, pituitary adenoma, epidermoid cancer, carcinoma of the cervix squamous cell cancer, carcinoma of the fallopian tubes, carcinoma of the endometrium, carcinoma of the vagina, sarcoma of soft tissue, cancer of the urethra, carcinoma of the vulva, cancer of the penis, cancer of the bladder, cancer of the kidney or ureter, carcinoma of the renal pelvis, spinal axis tumor, neoplasm of the central nervous system (CNS), primary CNS lymphoma, tumor angiogenesis, metastatic lesions of said cancers, or combinations thereof.

[00851] In embodiments, the multispecific molecules or pharmaceutical composition is administered to the subject parenterally. In embodiments, the cells are administered to the subject intravenously, subcutaneously, intratumorally, intranodally, intramuscularly, intradermally, or intraperitoneally. In embodiments, the cells are administered, e.g., injected, directly into a tumor or lymph node. In embodiments, the cells are administered as an infusion (e.g., as described in Rosenberg et al., New Eng. J. of Med. 319:1676, 1988) or an intravenous push. In embodiments, the cells are administered as an injectable depot formulation.

[00852] In embodiments, the subject is a mammal. In embodiments, the subject is a human,

monkey, pig, dog, cat, cow, sheep, goat, rabbit, rat, or mouse. In embodiments, the subject is a human. In embodiments, the subject is a pediatric subject, *e.g.*, less than 18 years of age, e.g., less than 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 or less years of age. In embodiments, the subject is an adult, *e.g.*, at least 18 years of age, e.g., at least 19, 20, 21, 22, 23, 24, 25, 25-30, 30-35, 35-40, 40-50, 50-60, 60-70, 70-80, or 80-90 years of age.

Combination Therapies

[00853] The multispecific or multifunctional molecules disclosed herein can be used in combination with a second therapeutic agent or procedure.

[00854] In embodiments, the multispecific or multifunctional molecule and the second therapeutic agent or procedure are administered/performed after a subject has been diagnosed with a cancer, e.g., before the cancer has been eliminated from the subject. In embodiments, the multispecific or multifunctional molecule and the second therapeutic agent or procedure are administered/performed simultaneously or concurrently. For example, the delivery of one treatment is still occurring when the delivery of the second commences, e.g., there is an overlap in administration of the treatments. In other embodiments, the multispecific or multifunctional molecule and the second therapeutic agent or procedure are administered/performed sequentially. For example, the delivery of one treatment ceases before the delivery of the other treatment begins.

[00855] In embodiments, combination therapy can lead to more effective treatment than monotherapy with either agent alone. In embodiments, the combination of the first and second treatment is more effective (e.g., leads to a greater reduction in symptoms and/or cancer cells) than the first or second treatment alone. In embodiments, the combination therapy permits use of a lower dose of the first or the second treatment compared to the dose of the first or second treatment normally required to achieve similar effects when administered as a monotherapy. In embodiments, the combination therapy has a partially additive effect, wholly additive effect, or greater than additive effect.

[00856] In one embodiment, the multispecific or multifunctional molecule is administered in combination with a therapy, *e.g.*, a cancer therapy (*e.g.*, one or more of anti-cancer agents, immunotherapy, photodynamic therapy (PDT), surgery and/or radiation). The terms "chemotherapeutic," "chemotherapeutic agent," and "anti-cancer agent" are used interchangeably herein. The administration of the multispecific or multifunctional molecule and the therapy, *e.g.*, the cancer therapy, can be sequential (with or without overlap) or simultaneous. Administration of the multispecific or multifunctional molecule can be continuous or intermittent during the course of therapy (*e.g.*, cancer therapy). Certain therapies described herein can be used to treat cancers and non-cancerous diseases. For example, PDT efficacy can be enhanced in cancerous and non-cancerous conditions (*e.g.*, tuberculosis) using the methods and compositions described herein (reviewed in, *e.g.*, Agostinis, P. *et al.* (2011) *CA Cancer J. Clin.* 61:250-281).

Anti-cancer therapies

[00857] In other embodiments, the multispecific or multifunctional molecule is administered in combination with a low or small molecular weight chemotherapeutic agent. Exemplary low or small molecular weight chemotherapeutic agents include, but not limited to, 13-cis-retinoic acid (isotretinoin, ACCUTANE®), 2-CdA (2-chlorodeoxyadenosine, cladribine, LEUSTATIN™), 5-azacitidine (azacitidine, VIDAZA®), 5-fluorouracil (5-FU, fluorouracil, ADRUCIL®), 6-mercaptopurine (6-MP, mercaptopurine, PURINETHOL®), 6-TG (6-thioguanine, thioguanine, THIOGUANINE TABLOID®), abraxane (paclitaxel protein-bound), actinomycin-D (dactinomycin, COSMEGEN®), alitretinoin (PANRETIN®), all-transretinoic acid (ATRA, tretinoin, VESANOID®), altretamine (hexamethylmelamine, HMM, HEXALEN®), amethopterin (methotrexate, methotrexate sodium, MTX, TREXALL™, RHEUMATREX®), amifostine (ETHYOL®), arabinosylcytosine (Ara-C, cytarabine, CYTOSAR-U®), arsenic trioxide (TRISENOX®), asparaginase (Erwinia L-asparaginase, L-asparaginase, ELSPAR®, KIDROLASE®), BCNU (carmustine, BiCNU®), bendamustine (TREANDA®), bexarotene (TARGRETIN®), bleomycin (BLENOXANE®), busulfan (BUSULFEX®, MYLERAN®), calcium leucovorin (Citrovorum Factor, folinic acid, leucovorin), camptothecin-11 (CPT-11, irinotecan, CAMPTOSAR®), capecitabine (XELODA®), carboplatin (PARAPLATIN®), carmustine wafer (prolifeprospan 20 with carmustine implant, GLIADEL® wafer), CCI-779 (temsirolimus, TORISEL®), CCNU (lomustine, CeeNU), CDDP (cisplatin, PLATINOL®, PLATINOL-AQ®), chlorambucil (leukeran), cyclophosphamide (CYTOXAN®, NEOSAR®), dacarbazine (DIC, DTIC, imidazole carboxamide, DTIC-DOME®), daunomycin (daunorubicin, daunorubicin hydrochloride, rubidomycin hydrochloride, CERUBIDINE®), decitabine (DACOGEN®), dexrazoxane (ZINECARD®), DHAD (mitoxantrone, NOVANTRONE®), docetaxel (TAXOTERE®), doxorubicin (ADRIAMYCIN®, RUBEX®), epirubicin (ELLENCE™), estramustine (EMCYT®), etoposide (VP-16, etoposide phosphate, TOPOSAR®, VEPESID®, ETOPOPHOS®), floxuridine (FUDR®), fludarabine (FLUDARA®), fluorouracil (cream) (CARAC™, EFUDEX®, FLUOROPLEX®), gemcitabine (GEMZAR®), hydroxyurea (HYDREA®, DROXIA™, MYLOCEL™), idarubicin (IDAMYCIN®), ifosfamide (IFEX®), ixabepilone (IXEMPRA™), LCR (leurocristine, vincristine, VCR, ONCOVIN®, VINCASAR PFS®), L-PAM (L-sarcolysin, melphalan, phenylalanine mustard, ALKERAN®), mechlorethamine (mechlorethamine hydrochloride, mustine, nitrogen mustard, MUSTARGEN®), mesna (MESNEX™), mitomycin (mitomycin-C, MTC, MUTAMYCIN®), nelarabine (ARRANON®), oxaliplatin (ELOXATIN™), paclitaxel (TAXOL®, ONXAL™), pegaspargase (PEG-L-asparaginase, ONCOSPAR®), PEMETREXED (ALIMTA®), pentostatin (NIPENT®), procarbazine (MATULANE®), streptozocin (ZANOSAR®), temozolomide (TEMODAR®), teniposide (VM-26, VUMON®), TESPA (thiophosphoamide, thiotepa, TSPA,

THIOPLEX®), topotecan (HYCAMTIN®), vinblastine (vinblastine sulfate, vincaleukoblastine, VLB, ALKABAN-AQ®, VELBAN®), vinorelbine (vinorelbine tartrate, NAVELBINE®), and vorinostat (ZOLINZA®).

[00858] In another embodiment, the multispecific or multifunctional molecule is administered in conjunction with a biologic. Biologics useful in the treatment of cancers are known in the art and a binding molecule of the invention may be administered, for example, in conjunction with such known biologics. For example, the FDA has approved the following biologics for the treatment of breast cancer: HERCEPTIN® (trastuzumab, Genentech Inc., South San Francisco, Calif.; a humanized monoclonal antibody that has anti-tumor activity in HER2-positive breast cancer); FASLODEX® (fulvestrant, AstraZeneca Pharmaceuticals, LP, Wilmington, Del.; an estrogen-receptor antagonist used to treat breast cancer); ARIMIDEX® (anastrozole, AstraZeneca Pharmaceuticals, LP; a nonsteroidal aromatase inhibitor which blocks aromatase, an enzyme needed to make estrogen); Aromasin® (exemestane, Pfizer Inc., New York, N.Y.; an irreversible, steroidal aromatase inactivator used in the treatment of breast cancer); FEMARA® (letrozole, Novartis Pharmaceuticals, East Hanover, N.J.; a nonsteroidal aromatase inhibitor approved by the FDA to treat breast cancer); and NOLVADEX® (tamoxifen, AstraZeneca Pharmaceuticals, LP; a nonsteroidal antiestrogen approved by the FDA to treat breast cancer). Other biologics with which the binding molecules of the invention may be combined include: AVASTIN® (bevacizumab, Genentech Inc.; the first FDA-approved therapy designed to inhibit angiogenesis); and ZEVALIN® (ibritumomab tiuxetan, Biogen Idec, Cambridge, Mass.; a radiolabeled monoclonal antibody currently approved for the treatment of B-cell lymphomas).

[00859] In addition, the FDA has approved the following biologics for the treatment of colorectal cancer: AVASTIN®; ERBITUX® (cetuximab, ImClone Systems Inc., New York, N.Y., and Bristol-Myers Squibb, New York, N.Y.; is a monoclonal antibody directed against the epidermal growth factor receptor (EGFR)); GLEEVEC® (imatinib mesylate; a protein kinase inhibitor); and ERGAMISOL® (levamisole hydrochloride, Janssen Pharmaceutica Products, LP, Titusville, N.J.; an immunomodulator approved by the FDA in 1990 as an adjuvant treatment in combination with 5-fluorouracil after surgical resection in patients with Dukes' Stage C colon cancer).

[00860] For the treatment of lung cancer, exemplary biologics include TARCEVA® (erlotinib HCL, OSI Pharmaceuticals Inc., Melville, N.Y.; a small molecule designed to target the human epidermal growth factor receptor 1 (HER1) pathway).

[00861] For the treatment of multiple myeloma, exemplary biologics include VELCADE® Velcade (bortezomib, Millennium Pharmaceuticals, Cambridge Mass.; a proteasome inhibitor). Additional biologics include THALIDOMID® (thalidomide, Clegene Corporation, Warren, N.J.; an immunomodulatory agent and appears to have multiple actions, including the ability to inhibit the growth and survival of myeloma cells and anti-angiogenesis).

[00862] Additional exemplary cancer therapeutic antibodies include, but are not limited to, 3F8, abagovomab, adecatumumab, afutuzumab, alacizumab pegol, alemtuzumab (CAMPATH®, MABCAMPATH®), altumomab pentetate (HYBRI-CEAKER®), anatumomab mafenatox, anrukinzumab (IMA-638), apolizumab, arcitumomab (CEA-SCAN®), bavituximab, bectumomab (LYMPHOSCAN®), belimumab (BENLYSTA®, LYMPHOSTAT-B®), besilesomab (SCINTIMUN®), bevacizumab (AVASTIN®), bivatuzumab mertansine, blinatumomab, brentuximab vedotin, cantuzumab mertansine, capromab pendetide (PROSTASCINT®), catumaxomab (REMOVAB®), CC49, cetuximab (C225, ERBITUX®), citatuzumab bogatox, cixutumumab, clivatuzumab tetraxetan, conatumumab, dacetuzumab, denosumab (PROLIA®), detumomab, ecromeximab, edrecolomab (PANOREX®), elotuzumab, epitumomab cituxetan, epratuzumab, ertumaxomab (REXOMUN®), etaracizumab, farletuzumab, figitumumab, fresolimumab, galiximab, gemtuzumab ozogamicin (MYLOTARG®), girentuximab, glembatumumab vedotin, ibritumomab (ibritumomab tiuxetan, ZEVALIN®), igovomab (INDIMACIS-125®), intetumumab, inotuzumab ozogamicin, ipilimumab, iratumumab, labetuzumab (CEA-CIDE®), lexatumumab, lintuzumab, lucatumumab, lumiliximab, mapatumumab, matuzumab, milatuzumab, minretumomab, mitumomab, nacolomab tafenatox, naptumomab estafenatox, necitumumab, nimotuzumab (THERACIM®, THERALOC®), nofetumomab merpentan (VERLUMA®), ofatumumab (ARZERRA®), olaratumab, oportuzumab monatox, oregovomab (OVAREX®), panitumumab (VECTIBIX®), pemtumomab (THERAGYN®), pertuzumab (OMNITARG®), pintumomab, pritumumab, ramucirumab, ranibizumab (LUCENTIS®), rilotumumab, rituximab (MABTHERA®, RITUXAN®), robatumumab, satumomab pendetide, sibrotuzumab, siltuximab, sontuzumab, tacatuzumab tetraxetan (AFP-CIDE®), taplitumomab paptox, tenatumomab, TGN1412, ticilimumab (tremelimumab), tigatuzumab, TNX-650, tositumomab (BEXXAR®), trastuzumab (HERCEPTIN®), tremelimumab, tucotuzumab celmoleukin, veltuzumab, volociximab, votumumab (HUMASPECT®), zalutumumab (HUMAX-EGFR®), and zanolimumab (HUMAX-CD4®).

[00863] In other embodiments, the multispecific or multifunctional molecule is administered in combination with a viral cancer therapeutic agent. Exemplary viral cancer therapeutic agents include, but not limited to, vaccinia virus (vvDD-CDSR), carcinoembryonic antigen-expressing measles virus, recombinant vaccinia virus (TK-deletion plus GM-CSF), Seneca Valley virus-001, Newcastle virus, coxsackie virus A21, GL-ONC1, EBNA1 C-terminal/LMP2 chimeric protein-expressing recombinant modified vaccinia Ankara vaccine, carcinoembryonic antigen-expressing measles virus, G207 oncolytic virus, modified vaccinia virus Ankara vaccine expressing p53, OncoVEX GM-CSF modified herpes-simplex 1 virus, fowlpox virus vaccine vector, recombinant vaccinia prostate-specific antigen vaccine, human papillomavirus 16/18 L1 virus-like particle/AS04 vaccine, MVA-EBNA1/LMP2 Inj. vaccine, quadrivalent HPV vaccine, quadrivalent human papillomavirus (types 6,

11, 16, 18) recombinant vaccine (GARDASIL®), recombinant fowlpox-CEA(6D)/TRICOM vaccine; recombinant vaccinia-CEA(6D)-TRICOM vaccine, recombinant modified vaccinia Ankara-5T4 vaccine, recombinant fowlpox-TRICOM vaccine, oncolytic herpes virus NV1020, HPV L1 VLP vaccine V504, human papillomavirus bivalent (types 16 and 18) vaccine (CERVARIX®), herpes simplex virus HF10, Ad5CMV-p53 gene, recombinant vaccinia DF3/MUC1 vaccine, recombinant vaccinia-MUC-1 vaccine, recombinant vaccinia-TRICOM vaccine, ALVAC MART-1 vaccine, replication-defective herpes simplex virus type I (HSV-1) vector expressing human Preproenkephalin (NP2), wild-type reovirus, reovirus type 3 Dearing (REOLYSIN®), oncolytic virus HSV1716, recombinant modified vaccinia Ankara (MVA)-based vaccine encoding Epstein-Barr virus target antigens, recombinant fowlpox-prostate specific antigen vaccine, recombinant vaccinia prostate-specific antigen vaccine, recombinant vaccinia-B7.1 vaccine, rAd-p53 gene, Ad5-delta24RGD, HPV vaccine 580299, JX-594 (thymidine kinase-deleted vaccinia virus plus GM-CSF), HPV-16/18 L1/AS04, fowlpox virus vaccine vector, vaccinia-tyrosinase vaccine, MEDI-517 HPV-16/18 VLP AS04 vaccine, adenoviral vector containing the thymidine kinase of herpes simplex virus TK99UN, HspE7, FP253/Fludarabine, ALVAC(2) melanoma multi-antigen therapeutic vaccine, ALVAC-hB7.1, canarypox-hIL-12 melanoma vaccine, Ad-REIC/Dkk-3, rAd-IFN SCH 721015, TIL-Ad-INFg, Ad-ISF35, and coxsackievirus A21 (CVA21, CAVATAK®).

[00864] In other embodiments, the multispecific or multifunctional molecule is administered in combination with a nanopharmaceutical. Exemplary cancer nanopharmaceuticals include, but not limited to, ABRAXANE® (paclitaxel bound albumin nanoparticles), CRLX101 (CPT conjugated to a linear cyclodextrin-based polymer), CRLX288 (conjugating docetaxel to the biodegradable polymer poly (lactic-co-glycolic acid)), cytarabine liposomal (liposomal Ara-C, DEPOCYT™), daunorubicin liposomal (DAUNOXOME®), doxorubicin liposomal (DOXIL®, CAELYX®), encapsulated-daunorubicin citrate liposome (DAUNOXOME®), and PEG anti-VEGF aptamer (MACUGEN®).

[00865] In some embodiments, the multispecific or multifunctional molecule is administered in combination with paclitaxel or a paclitaxel formulation, e.g., TAXOL®, protein-bound paclitaxel (e.g., ABRAXANE®). Exemplary paclitaxel formulations include, but are not limited to, nanoparticle albumin-bound paclitaxel (ABRAXANE®, marketed by Abraxis Bioscience), docosahexaenoic acid bound-paclitaxel (DHA-paclitaxel, Taxoprexin, marketed by Protarga), polyglutamate bound-paclitaxel (PG-paclitaxel, paclitaxel poliglumex, CT-2103, XYOTAX, marketed by Cell Therapeutic), the tumor-activated prodrug (TAP), ANG105 (Angiopep-2 bound to three molecules of paclitaxel, marketed by ImmunoGen), paclitaxel-EC-1 (paclitaxel bound to the erbB2-recognizing peptide EC-1; see Li *et al., Biopolymers* (2007) 87:225-230), and glucose-conjugated paclitaxel (*e.g.,* 2'-paclitaxel methyl 2-glucopyranosyl succinate, see Liu *et al., Bioorganic & Medicinal Chemistry Letters* (2007) 17:617-620).

[00866] Exemplary RNAi and antisense RNA agents for treating cancer include, but not limited to,

CALAA-01, siG12D LODER (Local Drug EluteR), and ALN-VSP02.

[00867] Other cancer therapeutic agents include, but not limited to, cytokines (e.g., aldesleukin (IL-2, Interleukin-2, PROLEUKIN®), alpha Interferon (IFN-alpha, Interferon alfa, INTRON® A (Interferon alfa-2b), ROFERON-A® (Interferon alfa-2a)), Epoetin alfa (PROCRIT®), filgrastim (G-CSF, Granulocyte - Colony Stimulating Factor, NEUPOGEN®), GM-CSF (Granulocyte Macrophage Colony Stimulating Factor, sargramostim, LEUKINE™), IL-11 (Interleukin-11, oprelvekin, NEUMEGA®), Interferon alfa-2b (PEG conjugate) (PEG interferon, PEG-INTRON™), and pegfilgrastim (NEULASTA™)), hormone therapy agents (e.g., aminoglutethimide (CYTADREN®), anastrozole (ARIMIDEX®), bicalutamide (CASODEX®), exemestane (AROMASIN®), fluoxymesterone (HALOTESTIN®), flutamide (EULEXIN®), fulvestrant (FASLODEX®), goserelin (ZOLADEX®), letrozole (FEMARA®), leuprolide (ELIGARD™, LUPRON®, LUPRON DEPOT®, VIADUR™), megestrol (megestrol acetate, MEGACE®), nilutamide (ANANDRON®, NILANDRON®), octreotide (octreotide acetate, SANDOSTATIN®, SANDOSTATIN LAR®), raloxifene (EVISTA®), romiplostim (NPLATE®), tamoxifen (NOVALDEX®), and toremifene (FARESTON®)), phospholipase A2 inhibitors (e.g., anagrelide (AGRYLIN®)), biologic response modifiers (e.g., BCG (THERACYS®, TICE®), and Darbepoetin alfa (ARANESP®)), target therapy agents (e.g., bortezomib (VELCADE®), dasatinib (SPRYCEL™), denileukin diftitox (ONTAK®), erlotinib (TARCEVA®), everolimus (AFINITOR®), gefitinib (IRESSA®), imatinib mesylate (STI-571, GLEEVEC™), lapatinib (TYKERB®), sorafenib (NEXAVAR®), and SU11248 (sunitinib, SUTENT®)), immunomodulatory and antiangiogenic agents (e.g., CC-5013 (lenalidomide, REVLIMID®), and thalidomide (THALOMID®)), glucocorticosteroids (e.g., cortisone (hydrocortisone, hydrocortisone sodium phosphate, hydrocortisone sodium succinate, ALA-CORT®, HYDROCORT ACETATE®, hydrocortone phosphate LANACORT®, SOLU-CORTEF®), decadron (dexamethasone, dexamethasone acetate, dexamethasone sodium phosphate, DEXASONE®, DIODEX®, HEXADROL®, MAXIDEX®), methylprednisolone (6-methylprednisolone, methylprednisolone acetate, methylprednisolone sodium succinate, DURALONE®, MEDRALONE®, MEDROL®, M-PREDNISOL®, SOLU-MEDROL®), prednisolone (DELTA-CORTEF®, ORAPRED®, PEDIAPRED®, PRELONE®), and prednisone (DELTASONE®, LIQUID PRED®, METICORTEN®, ORASONE®)), and bisphosphonates (e.g., pamidronate (AREDIA®), and zoledronic acid (ZOMETA®))

[00868] In some embodiments, the multispecific or multifunctional molecule is used in combination with a tyrosine kinase inhibitor (*e.g.*, a receptor tyrosine kinase (RTK) inhibitor). Exemplary tyrosine kinase inhibitor include, but are not limited to, an epidermal growth factor (EGF) pathway inhibitor (*e.g.*, an epidermal growth factor receptor (EGFR) inhibitor), a vascular endothelial growth factor (VEGF) pathway inhibitor (*e.g.*, an antibody against VEGF, a VEGF trap, a vascular endothelial

growth factor receptor (VEGFR) inhibitor (*e.g.*, a VEGFR-1 inhibitor, a VEGFR-2 inhibitor, a VEGFR-3 inhibitor)), a platelet derived growth factor (PDGF) pathway inhibitor (*e.g.*, a platelet derived growth factor receptor (PDGFR) inhibitor (*e.g.*, a PDGFR-ß inhibitor)), a RAF-1 inhibitor, a KIT inhibitor and a RET inhibitor. In some embodiments, the anti-cancer agent used in combination with the AHCM agent is selected from the group consisting of: axitinib (AG013736), bosutinib (SKI-606), cediranib (RECENTIN™, AZD2171), dasatinib (SPRYCEL®, BMS-354825), erlotinib (TARCEVA®), gefitinib (IRESSA®), imatinib (Gleevec®, CGP57148B, STI-571), lapatinib (TYKERB®, TYVERB®), lestaurtinib (CEP-701), neratinib (HKI-272), nilotinib (TASIGNA®), semaxanib (semaxinib, SU5416), sunitinib (SUTENT®, SU11248), toceranib (PALLADIA®), vandetanib (ZACTIMA®, ZD6474), vatalanib (PTK787, PTK/ZK), trastuzumab (HERCEPTIN®), bevacizumab (AVASTIN®), rituximab (RITUXAN®), cetuximab (ERBITUX®), panitumumab (VECTIBIX®), ranibizumab (Lucentis®), nilotinib (TASIGNA®), sorafenib (NEXAVAR®), alemtuzumab (CAMPATH®), gemtuzumab ozogamicin (MYLOTARG®), ENMD-2076, PCI-32765, AC220, dovitinib lactate (TKI258, CHIR-258), BIBW 2992 (TOVOK™), SGX523, PF-04217903, PF-02341066, PF-299804, BMS-777607, ABT-869, MP470, BIBF 1120 (VARGATEF®), AP24534, JNJ-26483327, MGCD265, DCC-2036, BMS-690154, CEP-11981, tivozanib (AV-951), OSI-930, MM-121, XL-184, XL-647, XL228, AEE788, AG-490, AST-6, BMS-599626, CUDC-101, PD153035, pelitinib (EKB-569), vandetanib (zactima), WZ3146, WZ4002, WZ8040, ABT-869 (linifanib), AEE788, AP24534 (ponatinib), AV-951(tivozanib), axitinib, BAY 73-4506 (regorafenib), brivanib alaninate (BMS-582664), brivanib (BMS-540215), cediranib (AZD2171), CHIR-258 (dovitinib), CP 673451, CYC116, E7080, Ki8751, masitinib (AB1010), MGCD-265, motesanib diphosphate (AMG-706), MP-470, OSI-930, Pazopanib Hydrochloride, PD173074, Sorafenib Tosylate (Bay 43-9006), SU 5402, TSU-68(SU6668), vatalanib, XL880 (GSK1363089, EXEL-2880). Selected tyrosine kinase inhibitors are chosen from sunitinib, erlotinib, gefitinib, or sorafenib. In one embodiment, the tyrosine kinase inhibitor is sunitinib.

[00869] In one embodiment, the multispecific or multifunctional molecule is administered in combination with one of more of: an anti-angiogenic agent, or a vascular targeting agent or a vascular disrupting agent. Exemplary anti-angiogenic agents include, but are not limited to, VEGF inhibitors (*e.g.*, anti-VEGF antibodies (*e.g.*, bevacizumab); VEGF receptor inhibitors (*e.g.*, itraconazole); inhibitors of cell proliferatin and/or migration of endothelial cells (*e.g.*, carboxyamidotriazole, TNP-470); inhibitors of angiogenesis stimulators (*e.g.*, suramin), among others. A vascular-targeting agent (VTA) or vascular disrupting agent (VDA) is designed to damage the vasculature (blood vessels) of cancer tumors causing central necrosis (reviewed in, *e.g.*, Thorpe, P.E. (2004) *Clin. Cancer Res*. Vol. 10:415-427). VTAs can be small-molecule. Exemplary small-molecule VTAs include, but are not limited to, microtubule destabilizing drugs (e.g., combretastatin A-4 disodium phosphate (CA4P), ZD6126, AVE8062, Oxi 4503); and vadimezan (ASA404).

Immune checkpoint inhibitors

[00870] In other embodiments, methods described herein comprise use of an immune checkpoint inhibitor in combination with the multispecific or multifunctional molecule. The methods can be used in a therapeutic protocol *in vivo*.

[00871] In embodiments, an immune checkpoint inhibitor inhibits a checkpoint molecule. Exemplary checkpoint molecules include but are not limited to CTLA4, PD1, PD-L1, PD-L2, TIM3, LAG3, CD160, 2B4, CD80, CD86, B7-H3 (CD276), B7-H4 (VTCN1), HVEM (TNFRSF14 or CD270), BTLA, KIR, MHC class I, MHC class II, GAL9, VISTA, BTLA, TIGIT, LAIR1, and A2aR. See, e.g., Pardoll. Nat. Rev. Cancer 12.4(2012):252-64, incorporated herein by reference.

[00872] In embodiments, the immune checkpoint inhibitor is a PD-1 inhibitor, e.g., an anti-PD-1 antibody such as Nivolumab, Pembrolizumab or Pidilizumab. Nivolumab (also called MDX- 1106, MDX-1106-04, ONO-4538, or BMS-936558) is a fully human IgG4 monoclonal antibody that specifically inhibits PD1. See, e.g., US 8,008,449 and WO2006/121168. Pembrolizumab (also called Lambrolizumab, MK-3475, MK03475, SCH-900475 or KEYTRUDA®; Merck) is a humanized IgG4 monoclonal antibody that binds to PD-1. See, e.g., Hamid, O. *et al*. (2013) *New England Journal of Medicine* 369 (2): 134−44, US 8,354,509 and WO2009/114335. Pidilizumab (also called CT-011 or Cure Tech) is a humanized IgG1k monoclonal antibody that binds to PD1. See, e.g., WO2009/101611. In one embodiment, the inhibitor of PD-1 is an antibody molecule having a sequence substantially identical or similar thereto, *e.g.*, a sequence at least 85%, 90%, 95% identical or higher to the sequence of Nivolumab, Pembrolizumab or Pidilizumab. Additional anti-PD1 antibodies, e.g., AMP 514 (Amplimmune), are described, e.g., in US 8,609,089, US 2010028330, and/or US 20120114649.

[00873] In some embodiments, the PD-1 inhibitor is an immunoadhesin, e.g., an immunoadhesin comprising an extracellular/PD-1 binding portion of a PD-1 ligand (e.g., PD-L1 or PD-L2) that is fused to a constant region (*e.g.*, an Fc region of an immunoglobulin). In embodiments, the PD-1 inhibitor is AMP-224 (B7-DCIg, *e.g.*, described in WO2011/066342and WO2010/027827), a PD-L2 Fc fusion soluble receptor that blocks the interaction between B7-H1 and PD-1.

[00874] In embodiments, the immune checkpoint inhibitor is a PD-L1 inhibitor, e.g., an antibody molecule. In some embodiments, the PD-L1 inhibitor is YW243.55.S70, MPDL3280A, MEDI-4736, MSB-0010718C, or MDX-1105. In some embodiments, the anti-PD-L1 antibody is MSB0010718C (also called A09-246-2; Merck Serono), which is a monoclonal antibody that binds to PD-L1. Exemplary humanized anti-PD-L1 antibodies are described, e.g., in WO2013/079174. In one embodiment, the PD-L1 inhibitor is an anti-PD-L1 antibody, e.g., YW243.55.S70. The YW243.55.S70 antibody is described, e.g., in WO 2010/077634. In one embodiment, the PD-L1 inhibitor is MDX-1105 (also called BMS-936559), which is described, e.g., in WO2007/005874. In one embodiment, the PD-L1 inhibitor is MDPL3280A (Genentech / Roche), which is a human Fc-

optimized IgG1 monoclonal antibody against PD-L1. See, e.g., U.S. Patent No.: 7,943,743 and U.S Publication No.: 20120039906. In one embodiment, the inhibitor of PD-L1 is an antibody molecule having a sequence substantially identical or similar thereto, *e.g.*, a sequence at least 85%, 90%, 95% identical or higher to the sequence of YW243.55.S70, MPDL3280A, MEDI-4736, MSB-0010718C, or MDX-1105.

[00875] In embodiments, the immune checkpoint inhibitor is a PD-L2 inhibitor, e.g., AMP-224 (which is a PD-L2 Fc fusion soluble receptor that blocks the interaction between PD1 and B7-H1. See, e.g., WO2010/027827 and WO2011/066342.

[00876] In one embodiment, the immune checkpoint inhibitor is a LAG-3 inhibitor, e.g., an anti LAG-3 antibody molecule. In embodiments, the anti-LAG-3 antibody is BMS-986016 (also called BMS986016; Bristol-Myers Squibb). BMS-986016 and other humanized anti-LAG-3 antibodies are described, e.g., in US 2011/0150892, WO2010/019570, and WO2014/008218.

[00877] In embodiments, the immune checkpoint inhibitor is a TIM-3 inhibitor, e.g., anti-TIM3 antibody molecule, e.g., described in U.S. Patent No.: 8,552,156, WO 2011/155607, EP 2581113 and U.S Publication No.: 2014/044728.

[00878] In embodiments, the immune checkpoint inhibitor is a CTLA-4 inhibitor, e.g., anti-CTLA-4 antibody molecule. Exemplary anti-CTLA4 antibodies include Tremelimumab (IgG2 monoclonal antibody from Pfizer, formerly known as ticilimumab, CP-675,206); and Ipilimumab (also called MDX-010, CAS No. 477202-00-9). Other exemplary anti-CTLA-4 antibodies are described, *e.g.,* in U.S. Pat. No. 5,811,097.

Diagnostic Uses

[00879] The antibody molecules described herein can be used, in some embodiments, in diagnostic methods, e.g., for determining if a subject has, or is at risk of having, a disease or disorder (e.g., cancer, e.g., a lymphoma, e.g., a T cell lymphoma, e.g., a T cell malignancy) as described herein. In some embodiments, the antibody molecule is used in a companion diagnostic, for example, to determine if a subject shows a change in prognosis, severity, or presence or absence of a disease or disorder (e.g., cancer), e.g., after treatment (e.g., with an antibody molecule described herein).

[00880] Generally, the diagnostic method comprises contacting an antibody molecule described herein with a biological sample (e.g., comprising a tissue or cell, or a portion or constituent thereof). In some embodiments, the method comprises flow analysis, e.g., using a multi-panel method. In some embodiments, the method comprises immunohistochemistry (e.g., chromogenic or fluorescent methods). In some embodiments, the method comprises immunohistochemistry (e.g., of fixed tissue, e.g., FFPE tissue). In some embodiments, the method comprises assessing T-cell clonality, e.g., to determine the presence and/or level of T cell malignancy. In some embodiments, the method comprises measuring the level of TRBC1+ cells from the biological sample (e.g., determining if TRBC1+ cells are depleted, e.g., relative to a reference sample, e.g., from a healthy subject or a

subject who has not been treated an antibody molecule described herein). In some embodiments, the method comprises measuring the level of TRBC2+ cells from the biological sample (e.g., determining if TRBC2+ cells are depleted, e.g., relative to a reference sample, e.g., from a subject or a subject who has not been treated an antibody molecule described herein). In some embodiments, the method comprises measuring intracellular levels (e.g., intracellular expression) of TRBC1. In some embodiments, the method comprises measuring membrane levels (e.g., membrane expression) of TRBC1. In some embodiments, the method comprises measuring intracellular levels (e.g., intracellular expression) of TRBC2. In some embodiments, the method comprises measuring membrane levels (e.g., membrane expression) of TRBC2.

[00881] In one aspect, the present disclosure provides a diagnostic method for detecting the presence of a TRBC1 or TRBC2 protein *in vitro* (e.g., in a biological sample, such as a tissue biopsy (e.g., from a cancerous tissue) or a blood sample, e.g., from a subject) or *in vivo* (e.g., *in vivo* imaging in a subject). The method includes: (i) contacting the sample with an antibody molecule described herein , or administering to the subject an antibody molecule described herein; (optionally) (ii) contacting a reference sample (e.g., a control sample), e.g., from a healthy subject or a subject who has not been treated with an antibody molecule described herein, or a reference subject (e.g., a control subject), e.g., a healthy subject or a subject who has not been treated with an antibody molecule described herein); and (iii) detecting formation of a complex between the antibody molecule and the sample or subject, and (optionally) the reference sample or subject. In some embodiments, a change, e.g., a statistically significant change, in the formation of the complex in the sample or subject, relative to the reference sample or subject is indicative of the presence of TRBC1 or TRBC2 in the sample or subject.

[00882] In some embodiments, the biological sample comprises one or more of plasma, tissue (e.g., cancerous tissue), biopsy, blood (e.g., whole blood), PBMCs, bone marrow, and/or lymphatic tissue, e.g., lymph node. In some embodiments, the biological sample is freshly obtained from the subject (e.g., has not been frozen and/or fixed). In some embodiments, the biological sample has been frozen (e.g., snap frozen). In some embodiments, the biological sample has been fixed (e.g., a formalin-fixed paraffin-embedded (FFPE) sample).

[00883] The antibody molecule can be directly or indirectly labeled with a detectable substance to facilitate detection of the bound or unbound antibody. Suitable detectable substances include, for example, various enzymes, prosthetic groups, fluorescent materials, luminescent materials and radioactive materials, e.g., as described above and described in more detail below.

[00884] The term "sample," as it refers to samples used for detecting polypeptides includes, but is not limited to, cells, cell lysates, proteins or membrane extracts of cells, body fluids, or tissue samples.

[00885] Complex formation between the antibody molecule and either TRBC1 or TRBC2 can be detected by measuring or visualizing either the binding molecule bound to the TRBC1 or TRBC2

antigen or unbound binding molecule. Conventional detection assays can be used, e.g., tissue immunohistochemistry, flow analysis, immune-cyto-chemical analysis, fluorescence microscopy, an enzyme-linked immunosorbent assay (ELISA), and/or a radioimmunoassay (RIA). Alternative to labeling the antibody molecule, the presence of TRBC1 or TRBC2 can be assayed in a sample by a competition immunoassay utilizing standards labeled with a detectable substance and an unlabeled antibody molecule. In this assay, the biological sample, the labeled standards and the antibody molecule are combined, and the amount of labeled standard bound to the unlabeled binding molecule is determined. The amount of TRBC1 or TRBC2 in the sample is inversely proportional to the amount of labeled standard bound to the antibody molecule.

EXAMPLES

Example 1: Immunization of Armenian hamster to generate anti-NKp30 antibodies

[00886] Briefly, armenian hamster were immunized with the extracellular domain of human NKp30 protein in complete Freund′s adjuvant and boosted twice on day 14 and day 28 with NKp30 in incomplete Freund′s adjuvant (IFA). On day 56 one more boost in IFA was given and the animals harvested three days later. Spleens were collected and fused with P3X63Ag8.653 murine myeloma cell line. 0.9 x 10^5 cells/well in 125 ul were seated in 96 well plate and feed with 125 μl of I-20 + 2ME + HAT (IMDM (4g/L glucose) supplemented with 20% fetal bovine serum, 4 mM L-glutamine, 1 mM sodium pyruvate, 50 U penicillin, 50 μg streptomycin and 50 μM 2-ME in the absence or presence of HAT or HT for selection, and Hybridoma Cloning Factor (1% final) on days 7, 11 and thereafter as needed. At approximately 2 weeks after fusion (cells are about 50% confluent) supernatant was collected and assayed for binding.

Example 2: Hybridoma screen for NKp30 mAbs

[00887] Expi293 cells were transfected with BG160 (hNKp30 cell antigen) 18 hours prior to screening. The day of screening, transfected cells were diluted to 0.05 x$10^{\wedge 6}$/mL and anti-Armenian hamster Fc Alexa Fluor 488 added to a final concentration of 0.4 ug/mL. 50 uL (2,500 cells) of this mixture was added to each well of a 384 well plate. The same density of untransfected 293 cells with secondary were used as a negative control. 5 uL of hybridoma supernatant was added to the cell mixture and the plate incubated for 1 hour at 37° C. The plates were then imaged on Mirrorball. Positive clones were identified and subcloned by serial dilution to obtain clonal selected hybridoma. After reconfirmation using the same protocols the hybridoma cells were harvested and the corresponding heavy and light chain sequences recovered. The DNA was subcloned into pcDNA3.4 for subsequent expression of the corresponding antibodies and further validation.

Example 3: Binding of NKp30 antibodies to NK92 cells

[00888] NK-92 cells were washed with PBS containing 0.5% BSA and 0.1% sodium azide (staining

buffer) and added to 96-well V-bottom plates with 200,000 cells/well. Hamster NKp30 antibodies were added to the cells in 2.0-fold serial dilutions and incubated for 1 hour at room temperature. The plates were washed twice with staining buffer. The secondary antibody against hamster Fc conjugated to AF647 (Jackson, 127-605-160) was added at 1:100 dilution (1.4mg/ml stock) and incubated with the cells for 30 minutes at 4°C followed by washing with staining buffer. Cells were subsequently were fixed for 10 minutes with 4% paraformaldehyde at room temperature. The plates were read on CytoFLEX LS (Beckman Coulter). Data was calculated as the percent-AF747 positive population (FIG. 9).

Example 4: Bioassay to measure activity of NKp30 antibodies using NK92 cell line

[00889] NKp30 antibodies were three-fold serially diluted in PBS and incubated at 2-8 C° overnight in flat bottom 96 well plates. Plates were washed twice in PBS and 40,000 NK-92 cells were added in growth medium containing IL-2. Plates were incubated at 37 C°, 5% CO2, humidified incubator for 16-24 hours before supernatants were collected. IFNγ levels in supernatants was measured following MSD assay instructions (FIG. 10). Supernatant collected from cells incubated with hamster isotype IgG was used as negative control and supernatants from cells incubated with NKp30 monoclonal antibody (R&D, clone 210847) was utilized as a positive control. Data were generated using hamster anti-NKp30 mABs.

Example 5: ELISA to measure binding of humanized JOVI.1 variant to human TRBC1

[00890] An ELISA assay was performed to assay binding of a humanized JOVI.1 variant to human TRBC1. Microplates were coated with 1 ug/mL of each JOVI.1 variant separately in 100 uL and blocked with 2% BSA. Serial dilutions of hTRBC1, BIM0444 (7 points, 5-fold dilutions, 100 nM to 6.4 pM) were transferred to the coated and blocked plates at 100 uL/well and incubated for 1 hr at room temperature. Plates were washed three times and incubated for 30 mins with anti-his tag Fc horseradish peroxidase conjugate followed by addition of TMB, a substrate of HRP. The plates were developed for 5 mins, stopped with 1M HCL and read at a wavelength of 450 nm. The ELISA data show direct binding of anti-TRBC1 mAbs (bivalent) to human TRBC1 (FIG. 7).

Example 6: Assay to measure binding of humanized JOVI.1 variant to human TRBC1

[00891] An Octet assay was performed to check binding of JOVI.1 humanized variants. Protein A biosensors were equilibrated in PBS at 25°C. The sensors were loaded with hTRBC1, BIM0444 at 20 ug/mL in PBS to a response of 1.5 nM followed by serial dilutions of JOVI1.1 fabs, BIM0446 and BIM0460 (7 points, 2-fold dilutions, 50 nM to 0.78 nM).

[00892] Further Octet parameters include:

Baseline: 30 sec in PBS

Load: 20 sec to a response of 1.5 nm

Baseline: 60 sec

Association: 60 sec

Dissociation: 60 sec in PBS

[00893] Octet data showed binding of anti-TRBC1 Fabs to hTRBC1 (FIG. 8). hTRBC1 was captured on the sensor tip and dipped in solution containing different concentrations of monovalent Fabs.

Example 7: Generation and characterization of humanized anti-NKp30 antibodies

[00894] A series of hamster anti-NKp30 antibodies were selected. These antibodies were shown to bind to human NKp30 and cynomolgus NKp30 and induce IFNγ production from NK-90 cells (data not shown). The VH and VL sequences of exemplary hamster anti-NKp30 antibodies 15E1, 9G1, 15H6, 9D9, 3A12, and 12D10 are disclosed in Table 9. The VH and VL sequences of exemplary humanized anti-NKp30 antibodies based on 15E1, 9G1, and 15H6 are also disclosed in Table 9. The Kabat CDRs of these antibodies are disclosed in Table 18 and Table 8.

[00895] Two humanized constructs based on 15E1 were selected. The first construct BJM0407 is a Fab comprising a heavy chain variable region comprising the amino acid sequence of SEQ ID NO: 7302 and a lambda light chain variable region comprising the amino acid sequence of SEQ ID NO: 7305. Its corresponding scFv construct BJM0859 comprises the amino acid sequence of SEQ ID NO: 7310. The second construct BJM0411 is a Fab comprising a heavy chain variable region comprising the amino acid sequence of SEQ ID NO: 7302 and a kappa light chain variable region comprising the amino acid sequence of SEQ ID NO: 7309. Its corresponding scFv construct BJM0860 comprises the amino acid sequence of SEQ ID NO: 7311. BJM0407 and BJM0411 showed comparable biophysical characteristics, e.g., binding affinity to NKp30 and thermal stability. The scFv constructs BJM0859 and BJM0860 also showed comparable biophysical properties.

Example 8: Generation and characterization of humanized anti-TRBC1 antibodies

[00896] The murine anti-TRBC1 antibody JOVI.1 was humanized, leading to a number of humanized variants. The VH and VL sequences of exemplary humanized variants are disclosed in Table 4. One humanized variant BIM0460 was selected, which comprises a VH comprising the amino acid sequence of SEQ ID NO: 253 and a VL comprising the amino acid sequence of SEQ ID NO: 258. BIM0460 was further modified by germlining, leading to a number of germlined variants. The VH and VL sequences of exemplary germlined variants are also disclosed in Table 4. One germlined variant BJM0578 was selected, which comprises a VH comprising the amino acid sequence of SEQ ID NO: 7351 and a VL comprising the amino acid sequence of SEQ ID NO: 258. The Kabat CDRs of these humanized and germlined variants are disclosed in Table 6 and Table 3. BIM0460 was shown to bind to human TRBC1 with an affinity of 17 nM. BJM0578 was shown to bind to human TRBC1

with an affinity of 110 nM.

Example 9: Cytokine secretion and T cell activation profiling.

[00897] This example explores whether ADCC-disabled formats would be preferable for antibodies that bind to TRBC1 and NKp30. JOVI.1 engagement upon plate coating or in solution upon Fc engagement induced T cell proliferation and activation (data not shown). This could be a liability for treating patients with T cell lymphoma, e.g., patients with peripheral T-cell lymphoma (PTCL).

[00898] Five constructs were generated as shown in FIGs. 11A-11E. BJM1052 is a bispecific antibody comprising an anti-TRBC1 Fab (based on BIM0460) and an anti-NKp30 scFv (based on BJM0407) (FIG. 11A). BJM1052 comprises the amino acid sequences of SEQ ID NO: 7379 (anti-TRBC1 HC), SEQ ID NO: 7380 (anti-TRBC1 LC), and SEQ ID NO: 7383 (anti-NKp30 scFv-Fc). BJM1052 comprises an N297A mutation in its Fc region. BJM1042 is a bispecific antibody comprising an anti-TRBC1 Fab (based on BJM0578) and an anti-NKp30 scFv (based on BJM0407) (FIG. 11B). BJM1042 comprises the amino acid sequences of SEQ ID NO: 7382 (anti-TRBC1 HC), SEQ ID NO: 7380 (anti-TRBC1 LC), and SEQ ID NO: 7383 (anti-NKp30 scFv-Fc). BJM1042 comprises an N297A mutation in its Fc region. BJM0889 is a single arm antibody comprising an anti-TRBC1 Fab (based on BIM0460) (FIG. 11C). BJM1083 is a single arm antibody comprising an anti-TRBC1 Fab (based on BJM0578) (FIG. 11D). Both BJM0889 and BJM1083 comprise an N297A mutation in the Fc region. BJM1053 is similar to BJM1052, except that BJM1053 has an ADCC enabled Fc region.

[00899] As shown in FIGs. 12A and 12B, Fc enabled antibodies BJM1053 and hIgG1 bound to THP1 cells which express Fcγ receptors, whereas N297A mutated antibodies (BJM1052, BJM1042, and BJM0889) did not show significant binding.

[00900] To test if antibodies with N297A mutation (Fc disabled) are safer, anti-TRBC1/NKp30 antibodies and control molecules were added to PBMCs in solution at 100, 10 or 1nM and T cell proliferation was measured on Days 1 and Day 5. Fc disabled antibodies BJM1052 and BJM1042 showed less lymphocyte clustering than the Fc enabled antibody BJM1053 (data not shown). T cell activation was significantly reduced in PBMCs treated with BJM1052 and BJM1042 on Day 5, as demonstrated by the percentage of proliferating T cells (FIGs. 13A and 13B) as well as the percentage of CD69-CD25+ T cells (FIGs. 13C and 13D).

Example 10: In vitro binding to TRBC1 and NKp30

[00901] Various constructs were generated as shown in FIGs. 14A-14D. Shown in FIG. 14A is a bispecific antibody comprising an anti-TRBC1 Fab (based on BIM0460 or BJM0578) and an anti-NKp30 scFv (based on BJM0407 or BJM0411). The bispecific antibodies may or may not have an N297A mutation in their Fc regions. The molecules listed in FIG. 14B have the configuration shown in FIG. 14A.

[00902] FIG. 14C shows a bispecific antibody comprising an anti-TRBC1 Fab (based on BIM0460 or BJM0578) and an anti-NKp30 Fab (based on BJM0407 or BJM0411). The bispecific antibodies may or may not have an N297A mutation in their Fc regions. The molecules listed in FIG. 14D have the configuration shown in FIG. 14C.

[00903] All the anti-TRBC1/NKp30 antibodies tested exhibited binding to NK cell line KHYG-1 (FIGs. 15A and 15D) as well as TRBC1+ Jurkat cells (FIGs. 15B and 15D).

Example 11: In vitro cytolysis of TRBC1+ cell lines

[00904] In this example, anti-TRBC1/NKp30 antibodies were tested for their ability to induce killing of TRBC1-expressing cells in the presence of NK cells. The antibodies tested in this Example are shown in FIGs. 11A-11E.

[00905] In a first study, NK-92 effector cells were cultured in 5:1 ratio with CFSE labeled target cells for 4h. Target cell lysis was measured using flow cytometry and gating on dead target cells. Anti-TRBC1/NKp30 bispecific antibodies BJM1052 and BJM1042 induced killing of TRBC1+ Jurkat cells (FIG. 16A) and H9 cells (FIG. 16B), but not TRBC2+ HPB-ALL cells (FIG. 16C), in the presence of NK-92 effector cells.

[00906] In a second study, primary NK cells were cultured in 5:1 ratio with CFSE labeled target cells for 4h. For H9 cells, 10:1 E:T ratio was used. Target cell lysis was measured using flow cytometry. Anti-TRBC1/NKp30 bispecific antibodies BJM1052 and BJM1042 induced killing of TRBC1+ Jurkat cells (FIG. 17A) and H9 cells (FIG. 17B), but not TRBC2+ HPB-ALL cells (FIG. 17C), in the presence of primary NK cells.

[00907] In a third study, NK cells and target cells were co-cultured for 4 hours in the presence of anti-TRBC1/NKp30 antibodies BJM1052 and BJM1042, supernatants were collected, and cytokine levels were measured using MSD. Target cell lysis correlated with NK cell activation, as demonstrated by the percentage of CD69+CD107a+ NK cells (FIG. 18A), IFNγ secretion (FIG. 18B), and TNFα secretion (FIG. 18C).

[00908] The next study examines whether anti-TRBC1/NKp30 antibodies BJM1052 and BJM1042 activates NK cells in the absence of target cells. Primary NK cells were incubated with 50nM of antibodies for 4h in the absence of target cells, and then supernatants were collected to measure IFNγ and TNFα levels. As shown in FIGs. 19A and 19B, NK cell activation mediated by anti-TRBC1/NKp30 antibodies required the presence of both NK cells and target cells.

[00909] Finally, anti-TRBC1/NKp30 antibodies BJM1052 and BJM1042 did not induce NK cell death in the presence of target cells (FIG. 20).

Example 12: Selective in vitro cytolysis of patient-derived TRBC1+ or TRBC2+ PDX

[00910] Common subtypes of T-cell lymphoma include: Peripheral T-Cell Lymphoma, Not

Otherwise Specified (PTCL - NOS); Anaplastic Large Cell Lymphoma (ALCL); Angioimmunoblastic T-Cell Lymphoma (AITL); and Cutaneous T-Cell Lymphoma (CTCL). Uncommon subtypes of T-cell lymphoma include: Adult T-Cell Leukemia/Lymphoma (ATLL); T-Cell Lymphoblastic Lymphoma; Hepatosplenic Gamma-Delta T-Cell Lymphoma; Enteropathy-Type T-Cell Lymphoma; Nasal NK/T-Cell Lymphomas; Treatment-Related T-Cell Lymphomas. Similar frequency and expression of TRBC1 was observed in PBMCs isolated from healthy donors and PBMCs isolated from PTCL patients (data not shown).

[00911] Two Patient-Derived Xenograft (PDX) samples were tested to be TRBC1 positive: PDX3 was derived from a patient with Acute Lymphoblastic Leukemia (T-ALL), and PDX6 was derived from a patient with Primary cutaneous CD30+ T-Cell Lymphoproliferative Disorder (CTCL).

[00912] The antibodies shown in FIGs. 21A and 21B were used in a functional killing assay. BJM0145 is a single arm anti-TRBC1 antibody. BJM0773 is a bispecific antibody comprising an anti-TRBC1 Fab and an anti-NKp30 scFv. PDX samples were labeled with CFSE, cultured with primary NK cells or KHYG1 cells at 5:1 ratio of E:T for 5 hours in the presence of BJM0145 or BJM0773 (0.01 - 10nM). Specific killing was measured using the following calculation:

$$\frac{\%\ \text{dead treated (PDX+NK)} - \%\ \text{dead PDX}}{100\%\ (\text{Max killing}) - \%\ \text{dead PDX}}$$

[00913] As shown in FIGs. 22A-22D, anti-TRBC1/NKp30 antibody BJM0773 efficiently killed TRBC1 positive PDX3 and PDX6. The single arm anti-TRBC1 antibody BJM0145 exhibited weak killing in the presence of primary NK cells due to ADCC (FIGs. 22A and 22C), but not in the presence of KHYG1 cells, which are CD16 deficient NK cells (FIGs. 22B and 22D). The single arm anti-TRBC1 antibody or the bispecific anti-TRBC1/NKp30 antibody did not kill TRBC1 negative PDX (data not shown).

Example 13: In vitro cytolysis of TRBC1+ Jurkat cells using NK cells from PTCL patients

[00914] This example examines whether anti-TRBC1/NKp30 antibodies can mediate killing of TRBC1+ target cells in the presence of NK cells isolated from PTCL patients.

[00915] NK cells and NKp30+ NK cells are present in normal proportions in PTCL patient PBMCs (data not shown). NK cells were enriched from PTCL patients and healthy donor PBMCs by negative selection and then incubated overnight with 200U/ml IL-2. On the following day, NK cells were co-cultured with Jurkat cells for 4h in the presence of 10nM antibodies.

[00916] As shown in FIG. 23, PTCL patient derived NK cells killed TRBC1+ Jurkat cells in the presence of the anti-TRBC1/NKp30 antibody BJM1042. NK cells were activated during the killing assay, as demonstrated by the percentage of CD69+CD107+ NK cells (FIG. 24). The bispecific anti-TRBC1/NKp30 antibodies BJM1052 and BJM1042 induced higher levels of IFNγ (FIG. 25A) and TNFα (FIG. 25B) than the single arm anti-TRBC1 antibody FJM0889 did.

Example 14: Competition with B7-H6, a natural ligand for NKp30

[00917] The natural ligands of NKp30 includes B7-H6, pp65, BAT3, and BAG6. B7-H6 is found on many cancer cell lines and primary cancer cells (e.g., T- and B-cell lymphoma, leukemia, and melanoma). Membrane-bound B7-H6 can mediate activation of primary human NK cells and killing of target cells. Soluble B7-H6, on the other hand, is found in serum or tumor microenvironment and can inhibit binding of anti-NKp30 mAbs, down-modulate NKp30 expression, and dampen NKp30-mediate activation and target cell killing.

[00918] This example examines whether the bispecific anti-TRBC1/NKp30 antibodies compete with B7-H6 for binding to NKp30.

[00919] As shown in FIGs. 26A and 26B, the bispecific anti-TRBC1/NKp30 antibody BJM1042 bound more strongly to NKp30 than B7-H6. In a competition assay, B7H6 (4μg/ml, ~143nM) and varying concentration of antibodies (BJM1042, anti-NKp30 or anti-NKp46) were added simultaneously to NKp30 coated ELISA plate. As shown in FIG. 26C, B7H6 binding signal was diminished with increasing concentrations of competing antibodies. BJM1042 competed with B7-H6 for binding with NKp30, to a similar level as a positive control anti-NKp30 antibody (FIG. 26C). A negative control anti-NKp46 antibody did not interfere with B7-H6 binding to NKp30, suggesting that the interference observed in this ELISA was specific (FIG. 26C).

Example 15: In-vivo killing of TRBC1 cell line derived model

[00920] This example examines the anti-tumor activity of the anti-TRBC1/NKp30 antibody BJM1042 in an in vivo model.

[00921] On day 0, NOG-IL-15 mice were implanted subcutaneously with H9 tumor cells. 16 days post tumor implant, mice were engrafted with in vitro expanded primary NK cells. Two weeks following NK implant (31 days post tumor implant), mice were randomized by tumor volume and dosed with 1mg/kg BJM1042 or associated controls. Tumor volume and body weight was measured daily following exposure to test articles.

[00922] The anti-TRBC1/NKp30 antibody BJM1042 induced regression of subcutaneous H9 tumors in NOG IL-15 mice engrafted with primary NK cells (FIGs. 27B and 27C). BJM1042 also inhibited tumor growth in the absence of NK cells, but to a lesser extent compared to treatment in the presence of NK cells (FIGs. 27B and 27C). Similar results were observed with the anti-TRBC1 control antibody BJM1083 (FIGs. 27B and 27C).

Example 16: In-vivo specificity for TRBC1

[00923] In this example, the specificity of BJM1042 was evaluated using TRBC2-expressing HPB-ALL xenografts in primary NK cell engrafted NOG-IL-15 mice.

[00924] On day 0, NOG-IL-15 mice were implanted subcutaneously with 5e6 TRBC2+ HPB-ALL cells. 12 days post tumor implant, mice were engrafted with 2e6 in vitro expanded primary NK cells.

2 days following NK implant (14 days post tumor implant), mice were randomized by tumor volume and dosed with 0.5mg/kg BJM1042 or associated controls. Mice were treated with therapeutics twice a week. Tumor volume was quantified by calipers twice a week. Body weight was measured twice a week.

[00925] The anti-TRBC1/NKp30 antibody BJM1042, which induced regression of TRBC1-expressing H9 and Jurkat tumors, did not affect the growth of TRBC2-expressing HPB-ALL tumors (FIG. 28B). The molecules were well tolerated at the doses used and did not result in body weight loss or any other obvious adverse effects (data not shown).

Example 17: Biophysical analysis of anti-TRBC1/NKp30 antibodies

[00926] The anti-TRBC1/NKp 30 antibodies BJM1042 and BJM1052 were analyzed for biophysical properties. BJM1042 and BJM1052 exhibited high stability and low aggregation propensity. BJM1042 and BJM1052 showed retained binding to FcRn and reduced or negligible binding to Fcγ receptors.

Example 18: Biacore analysis of exemplary anti-TRBC1 antibody molecules

[00927] In this example, a series of exemplary anti-TRBC1 antibody molecules were analyzed for their binding affinity for TRBC1. Briefly, surface plasmon resonance (SPR) measurements were performed by using the BIAcore T200. Each of the exemplary anti-TRBC1 antibody constructs was immobilized on a CM5 chip via anti-human Fc antibody to a response of 50 RU. Human TRBC1 (BIM0443) was injected at concentrations of 15.6, 31.2, 62.5, 125, 250, and 500 nM, at a flow rate of 20 μl/min, over the surface on which each antibody construct was immobilized. The data was fit using a 1:1 binding model.

[00928] As shown in Table 26, the exemplary antibodies showed preserved affinity to human TRCB1 compared to the parental antibody.

Table 26: Biacore results

Construct	Description	BIM0443 (hTRBC1)	BIM0445 (hTRBC2)
BIM0460 (bivalent)	Parental	10 nM	No binding
BJM0578 (bivalent)	Parental	75 nM	No binding
BKM0191 (single arm)	G29A	75 nM	No binding
BKM0192 (single arm)	T31A	138 nM	No binding
BKM0193 (single arm)	G29A_T31A	360 nM	No binding
BKM0194 (single arm)	N28G	180 nM	No binding
BKM0195 (single arm)	N30S	317 nM	No binding
BKM0196 (single arm)	N28G_N30S	690 nM	No binding

Example 19: Biacore analysis of exemplary anti-NKp30 antibody molecules

[00929] In this example, a series of exemplary anti-NKp30 antibody molecules were analyzed for

their binding affinity for NKp30. Briefly, surface plasmon resonance (SPR) measurements were performed by using the BIAcore T200. Human NKp30 (BKM0179) was immobilized on a CM5 chip via anti-mouse Fc antibody to a response of 50 RU. Each exemplary antibody construct were injected at concentrations of 3.9, 7.8, 15.6, 31.2, 62.5, and 125 nM, and at a flow rate of 20 μl/min, over the surface on which the human NKp30 was immobilized. The data was fit using a 1:1 binding model.

[00930] As shown in Table 27, most of the exemplary antibodies showed preserved affinity to human NKp30 compared to the parental antibody.

Table 27: Biacore results

Construct	Description	Human Nkp30 (BKM0179)
BJM1078	BJM0407 Parental	1.48 nM
BJM1079	BJM0411 Parental	1.26 nM
BKM0138	BJM0411 VL-N95A	3.2 nM
BKM0139	BJM0411 VL-D92A	3.2 nM
BKM0140	BJM0407 VL-D92A	3.3 nM
BKM0141	BJM0407 VL-N95A	3.0 nM
BKM0142	BJM0411 VH-N60A	1.28 nM
BKM0143	BJM0407 VH-N60A	1.45 nM
BKM0144	BJM0411 VH-N60A-VL-D92A-N95A	6.4 nM
BKM0145	BJM0407 VH-N60A-VL-D92A-N95A	4.2 nM

Example 20. Generation of exemplary anti-TRBC2 antibodies

[00931] Anti-TRBC1 antibodies were engineered to introduce specificity to TRBC2 using display-based approaches. Through multiple cycles of molecular evolution, anti-TRBC1 antibody was mutated to achieve TRBC2 binding and lose TRBC1 binding. For this purpose, scFv libraries were built using random mutagenesis (1) or a modified version of Kunkel mutagenesis (2). Library selections vs human TRBC2 were performed using standard phage display (3) and yeast display techniques (4). During selections, varying concentrations of competitor unlabeled TRBC1 were added to enrich for mutants that do not bind TRBC1. Selections were followed by standard screening methods such as ELISA and flow cytometry to identify individual clones that bind TRBC2 specifically. Following hit sequencing and analysis of mutation-activity correlation, second-generation libraries were constructed using the same methods above in order to improve specific TRBC2 binding, remove a potential CDR-deamidation site, and humanize the CDRs based on the closest-germline alignment. Library selections and individual clone screening were repeated as above with the modification that more stringent conditions were applied to select for clones with enhanced, but specific TRBC2 affinity. Following hit sequencing, scFv genes were reformatted into the biologically relevant antibody format for expression, purification, and triaging.

Example 21. TRBC1 and TRBC2 antibodies utilized in the Flow based assay for the diagnosis of TRBC1 vs TRBC2 monotypia in T- cell malignancies

[00932] Healthy human donor PBMCs derived T cell populations contain both TRBC1+ and TRBC2+ compartments, whereas T cell malignancies are predominantly monotypic. Flow method has been applied to test for monotypia and specificity for TRBC1 vs TRBC2 in one healthy donor PBMC and four PBMC samples from pre-diagnosed to be T malignancies. Heparinized whole blood from patients was lysed with ACK lysis buffer followed by 20 min Fc Block. Blood from patients was stained with Jovi.1 (TRBC1 antibody) or BKM0213 (TRBC2 antibody). Cells were washed in PBS followed by staining with antibody cocktail containing CD56-PE (NK Marker), CD3-AF700 (T-Cell Marker), CD4-BV421 (T-Cell Marker), CD8-Percp cy5.5 (T-Cell Marker) and Live/Dead staining. The cells were then fixed, and flow assessments were acquired on CytoFLEX LX.

INCORPORATION BY REFERENCE

[00933] All publications and patents mentioned herein are hereby incorporated by reference in their entirety as if each individual publication or patent was specifically and individually indicated to be incorporated by reference.

EQUIVALENTS

[00934] Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments of the invention described herein. Such equivalents are intended to be encompassed by the following claims.

EXEMPLARY EMBODIMENTS

[00935] Additional features of any of the aforesaid multifunctional molecules, nucleic acids, vectors, host cells, or methods include one or more of the following exemplary embodiments.

[00936] Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments of the invention described herein. Such equivalents are intended to be encompassed by the following exemplary embodiments.

Exemplary Embodiment 1

[00937] The disclosure relates, *inter alia,* to novel multispecific or multifunctional molecules that include (i) an antigen binding domain that binds to a tumor antigen on a lymphoma cell (e.g., a T cell), e.g., a T cell receptor comprising T cell receptor beta chain constant domain 1 (TRBC1) or a T cell receptor comprising T cell receptor beta chain constant domain 2 (TRBC2); and one, two or all of: (ii) an immune cell engager (e.g., chosen from an NK cell engager, a T cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager); (iii) a cytokine molecule; and/or (iv) a stromal modifying moiety. The terms “multispecific” or “multifunctional” are used interchangeably herein.

[00938] Without wishing to be bound by theory, the multispecific or multifunctional molecules

disclosed herein are expected to target (e.g., localize, bridge and/or activate) an immune cell (e.g., an immune effector cell chosen from an NK cell, a T cell, a B cell, a dendritic cell or a macrophage), at a target cell, e.g., a cancer cell (e.g., a lymphoma cell), expressing a T cell receptor comprising TRBC1 or TRBC2, and/or alter the tumor stroma, e.g., alter the tumor microenvironment near the cancer site. Increasing the proximity and/or activity of the immune cell using the multispecific molecules described herein is expected to enhance an immune response against the target cell (e.g., the cancer cell, e.g., lymphoma cell), thereby providing a more effective therapy (e.g., a more effective cancer therapy). Without being bound by theory, a targeted, localized immune response against the target cell (e.g., the cancer cell) is believed to reduce the effects of systemic toxicity of the multispecific molecules described herein. Furthermore, in the case where the target cancer cell is a T cell (e.g., a T cell expressing a T cell receptor comprising TRBC1 or TRBC2), a targeted immune response against the cancerous T cell population that targets non-cancerous T cells to a lesser degree (e.g., does not target non-cancerous T cells) is believed to have fewer deleterious effects than systemic ablation of all T cells.

[00939] Without wishing to be bound by theory, clonally derived T cell lymphomas are positive for either TRBC1 or TRBC2, but not both. In the case of TRBC1+ T cell malignancies, an anti-TRBC1 molecule disclosed herein (e.g., a multifunctional molecule that binds to TRBC1 and NKp30) may deplete TRBC1+ cells while sparing TRBC2+ non-malignant T cells. Similarly, in the case of TRBC2+ T cell malignancies, an anti-TRBC2 molecule disclosed herein (e.g., a multifunctional molecule that binds to TRBC2 and NKp30) may deplete TRBC2+ cells while sparing TRBC1+ non-malignant T cells.

[00940] Without wishing to be bound by theory, in some embodiments, a multifunctional molecule disclosed herein (e.g., anti-TRBC1/NKp30 antibody) only activates NK cells in the presence of a TRBC1-expressing cell. Without wising to be bound by theory, in some embodiments, a multifunctional molecule disclosed herein (e.g., anti-TRBC2/NKp30 antibody) only activates NK cells in the presence of a TRBC2-expressing cell.

[00941] Accordingly, provided herein are, *inter alia*, multispecific molecules (e.g., multispecific or multifunctional antibody molecules) that include the aforesaid moieties, nucleic acids encoding the same, methods of producing the aforesaid molecules, and methods of treating a cancer using the aforesaid molecules.

[00942] In an aspect, the disclosure features a method of detecting TRBC1 or TRBC2 in a sample or subject, comprising: contacting the sample or subject with an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein; and detecting formation of a complex between the antibody molecule and the sample or subject, thereby detecting TRBC1 or TRBC2.

[00943] In some embodiments, TRBC1 or TRBC2 is detected *in vitro* or *in vivo*.

[00944] In some embodiments, the method further comprises contacting a reference sample or

subject with the antibody molecule; and detecting formation of a complex between the antibody molecule and the reference sample or subject, wherein a change, e.g., a statistically significant change, in the formation of the complex in the sample or subject, relative to the reference sample or subject is indicative of the presence of TRBC1 or TRBC2 in the sample or subject.

[00945] In some embodiments, the method further comprises obtaining a sample from a subject.

[00946] In some embodiments, the sample comprises one or more of plasma, tissue (e.g., cancerous tissue), biopsy, blood (e.g., whole blood), PBMCs, bone marrow, and/or lymphatic tissue, e.g., lymph node. In some embodiments, the sample has not been frozen and/or fixed. In some embodiments, the sample has been formalin-fixed (e.g., formalin-fixed, paraffin-embedded (FFPE). In some embodiments, the sample has been stained (e.g., for analysis by immunohistochemistry). In some embodiments, the sample has been frozen and/or fixed.

[00947] In some embodiments, the subject has, or is at risk of having, a disease or disorder described herein (e.g., cancer, e.g., a lymphoma, e.g., a T cell lymphoma).

[00948] In some embodiments, the method further comprises performing a flow cytometry analysis, e.g., using a multi-panel method. In some embodiments, the method further comprises performing an immunohistochemical (IHC) analysis, e.g. monochrome or in a multiplexed format. In some embodiments, the IHC method comprises brightfield chromogenic IHC. In embodiments, the brightfield chromogenic IHC method comprises direct detection of antigens by primary antibodies, e.g., which are directly labeled with different chromogens. In some embodiments, the IHC method comprises fluorescent IHC. In embodiments, the fluorescent IHC method comprises direct detection of antigens by primary antibodies, e.g., which are directly labeled with different fluorophores. In some embodiments, the method further comprises performing immunohistochemistry on a sample, e.g., a fixed sample, e.g., an FFPE sample. In some embodiments, the method further comprises assessing T-cell clonality, e.g., to determine the presence and/or level of T cell malignancy. In some embodiments, the method further comprises measuring the level of TRBC1+ or TRBC2+ cells from the biological sample (e.g., determining if TRBC1+ or TRBC2+ cells are depleted, e.g., relative to a reference sample or subject. In some embodiments, the method further comprises measuring the intracellular level of TRBC1 or TRBC2. In some embodiments, the method further comprises measuring the membrane level of TRBC1 or TRBC2.

[00949] In some embodiments, the method comprises combining two or more of the detection methods described herein. In embodiments, the method comprises a nucleic acid-based method and an antibody-based method.

[00950] In some embodiments, the method further comprises evaluating the subject for a change in prognosis, severity, or presence or absence of a disease or disorder (e.g., cancer), e.g., after treatment (e.g., with an antibody molecule described herein).

[00951] In some embodiments, the antibody molecule is detectably labeled. In some embodiments, the antibody molecule is an anti-TRBC1 antibody molecule. In some embodiments, the antibody

molecule is an anti-TRBC2 antibody molecule.

[00952] In an aspect, the disclosure features a method of evaluating (e.g., identifying) a subject, comprising: contacting a sample (e.g., a sample described herein) from the subject with an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein; and

[00953] detecting formation of a complex between the antibody molecule and the sample, thereby evaluating the subject.

[00954] In some embodiments, the subject has, or is at risk of having, a disease or disorder described herein (e.g., cancer, e.g., a lymphoma, e.g., a T cell lymphoma). In some embodiments, the subject has not been treated with an antibody molecule described herein. In some embodiments, the subject has been treated with an antibody molecule described herein.

[00955] In an aspect, the disclosure features a kit comprising an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein and instructions for use in a method of detecting TRBC1 or TRBC2 in a sample or subject, e.g., in accordance with a method described herein.

Exemplary Embodiment 2

[00956] In one aspect, provided herein is a multifunctional molecule comprising (i) a first antigen binding domain that binds to T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2), and (ii) a second antigen binding domain that binds to NKp30.

[00957] In some embodiments, the first antigen binding domain binds to TRBC2. In some embodiments, the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the first antigen binding domain comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3. In some embodiments, the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7441, 201, and 7442, respectively. In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7443, 224, and 225, respectively. In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7441, 201, 7442, 7443, 224, and 225, respectively. In some embodiments, VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7422, 201, and 7403, respectively; SEQ ID NOs: 7401, 201, and 7403, respectively; SEQ ID NOs: 7394, 201, and 7396, respectively; SEQ ID NOs: 7346, 201, and 7398, respectively; SEQ ID NOs: 7346, 201, and 7400, respectively; SEQ ID NOs: 7405, 201, and 7403, respectively; SEQ ID NOs: 7407, 201, and 7403, respectively;

SEQ ID NOs: 7427, 201, and 7403, respectively; or SEQ ID NOs: 7430, 201, and 7403, respectively. In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7410, 224, and 225, respectively; or SEQ ID NOs: 7409, 224, and 225, respectively. In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7422, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7401, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7394, 201, 7396, 7410, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 7398, 7410, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 7400, 7410, 224, and 225, respectively; SEQ ID NOs: 7405, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7407, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7427, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7430, 201, 7403, 7410, 224, and 225, respectively; SEQ ID NOs: 7422, 201, 7403, 7409, 224, and 225, respectively; SEQ ID NOs: 7401, 201, 7403, 7409, 224, and 225, respectively; SEQ ID NOs: 7394, 201, 7396, 7409, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 7398, 7409, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 7400, 7409, 224, and 225, respectively; SEQ ID NOs: 7405, 201, 7403, 7409, 224, and 225, respectively; SEQ ID NOs: 7407, 201, 7403, 7409, 224, and 225, respectively; SEQ ID NOs: 7427, 201, 7403, 7409, 224, and 225, respectively; or SEQ ID NOs: 7430, 201, 7403, 7409, 224, and 225, respectively. In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7420, 7423, 7411, 7412, 7413, 7414, 7415, 7416, 7417, 7425, 7428, and 7431 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7419 and 7418 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of: SEQ ID NOs: 7420 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7423 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7411 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7412 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7413 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7414 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7415 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7416 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7417 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7425 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7428 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7431 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7420 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99%

identity thereto); SEQ ID NOs: 7423 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7411 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7412 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7413 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7414 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7415 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7416 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7417 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7425 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7428 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NOs: 7431 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00958] In some embodiments, the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor not comprising TRBC2, optionally wherein the KD for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the KD for the binding between the first antigen binding domain and a T cell receptor not comprising TRBC2. In some embodiments, the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor comprising TRBC1, optionally wherein the K_D for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the K_D for the binding between the first antigen binding domain and a T cell receptor comprising TRBC1. In some embodiments, binding of the first antigen binding domain to TRBC2 on a lymphoma cell or lymphocyte, e.g., T cell, does not appreciably activate the lymphoma cell or lymphocyte, e.g., T cell, e.g., as measured by T cell proliferation, expression of a T cell activation marker (e.g., CD69 or CD25), and/or expression of a cytokine (e.g., TNFα and IFNγ). In some embodiments, the multifunctional molecule does not activate NK cells or does not substantially activate NK cells in the absence of a TRBC2-expressing cell.

[00959] In some embodiments, the first antigen binding domain binds to TRBC1. In some embodiments, the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 2, 3, 3A, 3B, 4, 5, 6 and 19, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the first antigen binding domain comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3, wherein the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7346, 7355, and 202, respectively; SEQ ID NOs: 7346, 201, and 202, respectively; SEQ ID NOs: 7354, 201,

and 202, respectively; or SEQ ID NOs: 7354, 7355, and 202, respectively. In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 223, 224, and 225, respectively; SEQ ID NOs: 7367, 224, and 225, respectively; SEQ ID NOs: 223, 7368, and 225, respectively; SEQ ID NOs: 223, 224, and 7369, respectively; or SEQ ID NOs: 7367, 7368, and 7369, respectively. In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of: SEQ ID NOs: 7346, 7355, 202, 223, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 202, 223, 224, and 225, respectively; SEQ ID NOs: 7346, 7355, 202, 7367, 224, and 225, respectively; SEQ ID NOs: 7346, 7355, 202, 223, 7368, and 225, respectively; SEQ ID NOs: 7346, 7355, 202, 223, 224, and 7369, respectively; SEQ ID NOs: 7346, 7355, 202, 7367, 7368, and 7369, respectively; SEQ ID NOs: 7346, 201, 202, 7367, 224, and 225, respectively; SEQ ID NOs: 7346, 201, 202, 223, 7368, and 225, respectively; SEQ ID NOs: 7346, 201, 202, 223, 224, and 7369, respectively; SEQ ID NOs: 7346, 201, 202, 7367, 7368, and 7369, respectively; SEQ ID NOs: 7354, 201, 202, 223, 224, and 225, respectively; SEQ ID NOs: 7354, 201, 202, 7367, 224, and 225, respectively; SEQ ID NOs: 7354, 201, 202, 223, 7368, and 225, respectively; SEQ ID NOs: 7354, 201, 202, 223, 224, and 7369, respectively; SEQ ID NOs: 7354, 201, 202, 7367, 7368, and 7369, respectively; SEQ ID NOs: 7354, 7355, 202, 223, 224, and 225, respectively; SEQ ID NOs: 7354, 7355, 202, 7367, 224, and 225, respectively; SEQ ID NOs: 7354, 7355, 202, 223, 7368, and 225, respectively; SEQ ID NOs: 7354, 7355, 202, 223, 224, and 7369, respectively; or SEQ ID NOs: 7354, 7355, 202, 7367, 7368, and 7369, respectively. In some embodiments, the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7351, 253, 250-252, 254, 7343, 7344, 7350, and 7352 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 258, 255-257, 259, 260, and 7357-7360 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL comprise the amino acid sequences of: SEQ ID NOs: 7351 and 258, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or SEQ ID NOs: 253 and 258, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00960] In some embodiments, the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC1 than for T cell receptors not comprising TRBC1, optionally wherein the KD for the binding between the first antigen binding domain and TRBC1 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the KD for the binding between the first antigen binding domain and a T cell receptor not comprising TRBC1. In some embodiments, the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC1 than for T cell receptors comprising TRBC2, optionally wherein the K_D for the binding between the first antigen binding domain and TRBC1 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the K_D for the binding between the first antigen binding domain and a T cell receptor comprising TRBC2. In some embodiments, binding of the first antigen binding domain to TRBC1 on a lymphoma cell or lymphocyte, e.g., T cell,

does not appreciably activate the lymphoma cell or lymphocyte, e.g., T cell, (e.g., as measured by T cell proliferation, expression of a T cell activation marker (e.g., CD69 or CD25), and/or expression of a cytokine (e.g., TNFα and IFNγ). In some embodiments, the multifunctional molecule does not activate NK cells or does not substantially activate NK cells in the absence of a TRBC1-expressing cell.

[00961] In some embodiments, the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 7, 8, 8A, 8B, 9, 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the second antigen binding domain comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3, wherein the VHCDR1, VHCDR2, and VHCDR3 of the second antigen binding domain comprise the amino acid sequences of: SEQ ID NOs: 7313, 6001, and 7315, respectively; SEQ ID NOs: 7313, 6001, and 6002, respectively; SEQ ID NOs: 7313, 6008, and 6009, respectively; SEQ ID NOs: 7313, 7385, and 7315, respectively; SEQ ID NOs: 7313, 7318, and 6009, respectively; SEQ ID NOs: C019, C021, and C023, respectively; SEQ ID NOs: C033, C035, and C037, respectively; SEQ ID NOs: C047, C049, and C051, respectively; SEQ ID NOs: C061, C063, and C065, respectively; SEQ ID NOs: C075, C077, and C079, respectively; SEQ ID NOs: C089, C091, and C093, respectively; SEQ ID NOs: C103, C105, and C107, respectively; or SEQ ID NOs: C116, C118, and C120, respectively. In some embodiments, the VLCDR1, VLCDR2, and VLCDR3 of the second antigen binding domain comprise the amino acid sequences of: SEQ ID NOs: 7326, 7327, and 7329, respectively; SEQ ID NOs: 6063, 6064, and 7293, respectively; SEQ ID NOs: 6070, 6071, and 6072, respectively; SEQ ID NOs: 6070, 6064, and 7321, respectively; SEQ ID NOs: C026, C028, and C030, respectively; SEQ ID NOs: C040, C042, and C044, respectively; SEQ ID NOs: C054, C056, and C058, respectively; SEQ ID NOs: C068, C070, and C072, respectively; SEQ ID NOs: C082, C084, and C086, respectively; SEQ ID NOs: C096, C098, and C100, respectively; SEQ ID NOs: C110, C112, and C113, respectively; SEQ ID NOs: C123, C125, and C127, respectively.

[00962] In some embodiments, the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 of the second antigen binding domain comprise the amino acid sequences of: SEQ ID NOs: 7313, 6001, 7315, 7326, 7327, and 7329, respectively; SEQ ID NOs: 7313, 6001, 6002, 6063, 6064, and 7293, respectively; SEQ ID NOs: 7313, 6008, 6009, 6070, 6071, and 6072, respectively; SEQ ID NOs: 7313, 7385, 7315, 6070, 6064, and 7321, respectively; SEQ ID NOs: 7313, 7318, 6009, 6070, 6064, and 7321, respectively; SEQ ID NOs: C019, C021, C023, C026, C028, and C030, respectively; SEQ ID NOs: C033, C035, C037, C040, C042, and C044, respectively; SEQ ID NOs: C047, C049, C051, C054, C056, and C058, respectively; SEQ ID NOs: C061, C063, C065, C068, C070, and C072, respectively; SEQ ID NOs: C075, C077, C079, C082, C084, and C086, respectively; SEQ ID NOs: C089, C091, C093, C096, C098, and C100, respectively; SEQ ID NOs: C103, C105, C107, C110,

C112, and C113, respectively; or SEQ ID NOs: C116, C118, C120, C123, C125, and C127, respectively.

[00963] In some embodiments, the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7302, 7298, 7300, 7301, 7303, and 7304 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7309, 7305, 7299, 7306-7308 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6121 or 6123-6128 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7294 or 6137-6141 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6122 or 6129-6134 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6136 or 6142-6147 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: C001-C008 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: C009-C016 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the VH and VL of the second antigen binding domain comprise the amino acid sequences of: SEQ ID NOs: 7302 and 7309, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or SEQ ID NOs: 7302 and 7305, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the second antigen binding domain comprise the amino acid sequences of: SEQ ID NO: 7311 or 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NO: 6187 or 6188 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); SEQ ID NO: 6189 or 6190 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); any of SEQ ID NOs: C017-C024.

[00964] In some embodiments, the multifunctional molecule binds to TRBC2 monovalently. In some embodiments, the multifunctional molecule comprises a configuration shown in any of FIGs. 30A-30D, optionally wherein: (i) the multifunctional antibody molecule comprises an anti-TRBC2 Fab and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 30A; (ii) the multifunctional antibody molecule comprises an anti-TRBC2 Fab and an anti-NKp30 Fab, e.g., comprises a configuration shown in FIG. 30B; (iii) the multifunctional antibody molecule comprises an anti-NKp30 Fab and an anti-TRBC2 scFv, e.g., comprises a configuration shown in FIG. 30C; or

(iv) the multifunctional antibody molecule comprises an anti-TRBC2 scFv and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 30D.

[00965] In some embodiments, the multifunctional molecule binds to TRBC1 monovalently. In some embodiments, the multifunctional molecule comprises a configuration shown in any of FIGs. 29A-29D, optionally wherein: (i) the multifunctional antibody molecule comprises an anti-TRBC1 Fab and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 29A; (ii) the multifunctional antibody molecule comprises an anti-TRBC1 Fab and an anti-NKp30 Fab, e.g., comprises a configuration shown in FIG. 29B; (iii) the multifunctional antibody molecule comprises an anti-NKp30 Fab and an anti-TRBC1 scFv, e.g., comprises a configuration shown in FIG. 29C; or (iv) the multifunctional antibody molecule comprises an anti-TRBC1 scFv and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 29D.

[00966] In some embodiments, a multifunctional molecule disclosed herein further comprises a dimerization module comprising one or more immunoglobulin chain constant regions (e.g., Fc regions) comprising one or more of: a paired cavity-protuberance ("knob-in-a hole"), an electrostatic interaction, or a strand-exchange.

[00967] In some embodiments, the multifunctional molecule comprises an anti-TRBC2 amino acid sequence disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto, and/or an anti-NKp30 amino acid sequence disclosed in any of Tables 7, 8, 8A, 8B, 9, 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the multifunctional molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the multifunctional molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the multifunctional molecule comprises SEQ ID NOs: 7438, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the multifunctional molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the multifunctional molecule comprises an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2

VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the multifunctional molecule comprises SEQ ID NOs: 7440, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00968] In some embodiments, the multifunctional molecule comprises an anti-TRBC1 amino acid sequence disclosed in any of Tables 2, 3, 3A, 3B, 4, 5, 6 and 19, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto, and/or an anti-NKp30 amino acid sequence disclosed in any of Tables 7, 8, 8A, 8B, 9, 10, 18, and 19, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the multifunctional molecule comprises: (i) an anti-TRBC1 VH of SEQ ID NO: 7351 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); (ii) an anti-TRBC1 VH of SEQ ID NO: 7351 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or (iii) SEQ ID NOs: 7382, 7380, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the multifunctional molecule comprises: (i) an anti-TRBC1 VH of SEQ ID NO: 253 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); (ii) an anti-TRBC1 VH of SEQ ID NO: 253 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or (iii) SEQ ID NOs: 7379, 7380, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the multifunctional molecule comprises: (i) an anti-TRBC1 VH of SEQ ID NO: 7351 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7305 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); (ii) an anti-TRBC1 VH of SEQ ID NO: 7351 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or (iii) SEQ ID NOs:

7382, 7380, and 7384 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto). In some embodiments, the multifunctional molecule comprises: (i) an anti-TRBC1 VH of SEQ ID NO: 253 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7305 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); (ii) an anti-TRBC1 VH of SEQ ID NO: 253 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC1 VL of SEQ ID NO: 258 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or (iii) SEQ ID NOs: 7379, 7380, and 7384 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[00969] In some embodiments, the multifunctional molecule comprises: a heavy chain constant region variant, e.g., an Fc region variant, that comprises one or more mutations that result in reduced or ablated affinity for at least one Fc receptor, optionally wherein the one or more mutations result in reduced or ablated antibody dependent cell-mediated cytotoxicity (ADCC), Antibody-dependent cellular phagocytosis (ADCP), or complement dependent cytotoxicity (CDC). In some embodiments, the Fc region variant comprises one or more mutations disclosed in Table 20, optionally wherein the Fc region variant comprises an N297A mutation.

Exemplary Embodiment 3

[00970] In an aspect, the disclosure features a multifunctional molecule, comprising:

(i) a first antigen binding domain that binds to T cell receptor beta chain constant domain 1 (TRBC1), and

(ii) a second antigen binding domain that binds to NKp30,

wherein the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 3A-3B or 4 (e.g., any of SEQ ID NOs: B001-B095), or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00971] In some embodiments, the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed herein.

[00972] In another aspect, the disclosure features a multifunctional molecule, comprising:

(i) a first antigen binding domain that binds to T cell receptor beta chain constant domain 1 (TRBC1), and

(ii) a second antigen binding domain that binds to NKp30,

wherein the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 8A-8B, 9, or 10 (e.g., any of SEQ ID NOs C001-C128): , or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00973] In some embodiments, the first antigen binding domain comprises one or more CDRs,

framework regions, variable regions, or antigen binding domains disclosed herein.

[00974] In an aspect, the disclosure features a multifunctional molecule, comprising:

(i) a first antigen binding domain that binds to T cell receptor beta chain constant domain 1 (TRBC1), and

(ii) a second antigen binding domain that binds to NKp30,

wherein the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 3A-3B or 4 (e.g., any of SEQ ID NOs: B001-B095), or a sequence having at least 85%, 90%, 95%, or 99% identity thereto; and

wherein the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 8A-8B, 9, or 10 (e.g., any of SEQ ID NOs C001-C128): , or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

Exemplary Embodiment 4

[00975] In one aspect, provided herein is an antibody molecule that binds to TRBC2, comprising one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule that binds to TRBC2 comprises one or more CDRs (e.g., VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and/or VLCDR3) disclosed in Table 21 or Table 22, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule that binds to TRBC2 comprises one or more framework regions (e.g., VHFWR1, VHFWR2, VHFWR3, VHFWR4, VLFWR1, VLFWR2, VLFWR3, and/or VLFWR4) disclosed in Table 21 or Table 22, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule that binds to TRBC2 comprises a VH and/or a VL disclosed in Table 23, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto. In some embodiments, the antibody molecule that binds to TRBC2 comprises an amino acid sequence disclosed in Table 24, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00976] In one aspect, provided herein is an antibody molecule that binds to NKp30, comprising one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 7, 8, 8A, 8B, 9, 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00977] In one aspect, provided herein is an antibody molecule that binds to TRBC1, comprising one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 2, 3, 3A, 3B, 4, 5, 6 and 19, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[00978] In some embodiments, the antibody molecule comprises a heavy chain constant region variant, e.g., an Fc region variant, that comprises one or more mutations that result in reduced or

ablated affinity for at least one Fc receptor, optionally wherein the one or more mutations result in reduced or ablated antibody dependent cell-mediated cytotoxicity (ADCC), Antibody-dependent cellular phagocytosis (ADCP), or complement dependent cytotoxicity (CDC). In some embodiments, the Fc region variant comprises one or more mutations disclosed in Table 20, optionally wherein the Fc region variant comprises an N297A mutation.

[00979] In some embodiments, an amino acid sequence disclosed herein comprises a signal peptide of METDTLLLWVLLLWVPGSTG (SEQ ID NO: SEQ ID NO: 7444). In some embodiments, an amino acid sequence disclosed herein does not comprise a signal peptide of METDTLLLWVLLLWVPGSTG (SEQ ID NO: SEQ ID NO: 7444)

[00980] In one aspect, provide herein is a nucleic acid molecule encoding a multifunctional molecule disclosed herein or an antibody molecule disclosed herein. In one aspect, provide herein is a vector, e.g., an expression vector, comprising a nucleic acid molecule disclosed herein. In one aspect, provide herein is a cell comprising a nucleic acid molecule disclosed herein or a vector disclosed herein. In one aspect, provide herein is a pharmaceutical composition comprising a multifunctional molecule disclosed herein or an antibody molecule disclosed herein and a pharmaceutically acceptable carrier, excipient, or stabilizer.

[00981] In one aspect, provide herein is a method of making, e.g., producing, a multifunctional molecule disclosed herein or an antibody molecule disclosed herein, comprising culturing a cell disclosed herein, under suitable conditions, e.g., conditions suitable for gene expression and/or homo- or heterodimerization.

[00982] In one aspect, provide herein is a method of treating a cancer, comprising administering to a subject in need thereof a multifunctional molecule disclosed herein or an antibody molecule disclosed herein, wherein the multifunctional molecule or antibody molecule is administered in an amount effective to treat the cancer. In some embodiments, the method further comprises identifying, evaluating, or selecting a subject in need of treatment, wherein identifying, evaluating, or selecting comprises determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC1 or TRBC2. In some embodiments, the method further comprises: responsive to a determination that a subject has cancer cells that express a T cell receptor comprising TRBC2: optionally, selecting the subject for treatment with a multifunctional molecule comprising an antigen binding domain that binds to a T cell receptor comprising TRBC2, and administering a multifunctional molecule disclosed herein comprising an antigen binding domain that binds to a T cell receptor comprising TRBC2. In some embodiments, the method further comprises: responsive to a determination that a subject has cancer cells that express a T cell receptor comprising TRBC1: optionally, selecting the subject for treatment with a multifunctional molecule comprising an antigen binding domain that binds to a T cell receptor comprising TRBC1, and administering a multifunctional molecule disclosed herein comprising an antigen binding domain that binds to a T cell

receptor comprising TRBC1.

[00983] In one aspect, provide herein is a method of treating a cancer, e.g., a lymphoma or leukemia, e.g., a T cell lymphoma or leukemia, comprising: responsive to a determination that a subject has cancer cells that express a T cell receptor comprising TRBC2, administering to the subject a multifunctional molecule disclosed herein, wherein the first antigen binding domain of the multifunctional molecule binds to TRBC2, wherein the multifunctional molecule is administered in an amount effective to treat the cancer. In one aspect, provide herein is a method of treating a cancer, e.g., a lymphoma or leukemia, e.g., a T cell lymphoma or leukemia, comprising: responsive to a determination that a subject has cancer cells that express a T cell receptor comprising TRBC1, administering to the subject a multifunctional molecule disclosed herein, wherein the first antigen binding domain of the multifunctional molecule binds to TRBC1, wherein the multifunctional molecule is administered in an amount effective to treat the cancer.

[00984] In one aspect, provide herein is a method of identifying a subject in need of treatment for cancer, e.g., a lymphoma or leukemia, e.g., a T cell lymphoma or leukemia, using a multifunctional molecule disclosed herein, comprising determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC1 or TRBC2, wherein:

responsive to a determination that the subject has cancer cells that express a T cell receptor comprising TRBC1, identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1, and optionally not as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, or

responsive to a determination that the subject has cancer cells that express a T cell receptor comprising TRBC2, identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, and optionally not as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1.

[00985] In some embodiments, the method further comprises:

responsive to identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1, treating the subject with (e.g., administering to the subject) a multifunctional molecule comprising an antigen binding domain that binds to TRBC1, or

responsive to identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, treating the subject with (e.g., administering to the subject) a multifunctional molecule comprising an antigen binding domain that binds to TRBC2.

[00986] In some embodiments of the aforementioned methods, the cancer is leukemia or lymphoma.

In some embodiments, the cancer is selected from Acquired immune deficiency syndrome (AIDS)-associated lymphoma, Angioimmunoblastic T-cell lymphoma, Adult T-cell leukemia/lymphoma, Burkitt lymphoma, Central nervous system (CNS) lymphoma, Diffuse large B-cell lymphoma (DLBCL), Lymphoblastic lymphoma, Mantle cell lymphoma (MCL), Peripheral T-cell lymphoma (PTCL) (e.g., Hepatosplenic T-cell lymphoma (HSGDTCL), Subcutaneous paniculitis-like T-cell lymphoma, or Enteropathy-associated T-cell lymphoma), Transformed follicular and transformed mucosa-associated lymphoid tissue (MALT) lymphomas, Cutaneous T-cell lymphoma (mycosis fungoides and Sézary syndrome), Follicular lymphoma, Lymphoplasmacytic lymphoma/Waldenström macroglobulinemia, Marginal zone B-cell lymphoma, Gastric mucosa-associated lymphoid tissue (MALT) lymphoma, Chronic lymphocytic leukemia/small-cell lymphocytic lymphoma (CLL/SLL), Extranodal T-/NK-cell lymphoma (nasal type), and Anaplastic large-cell lymphoma (e.g., primary cutaneous anaplastic large-cell lymphoma or systemic anaplastic large-cell lymphoma). In some embodiments, the cancer is Peripheral T-cell lymphoma (PTCL).

[00987] In one aspect, this invention provides a composition comprising a multifunctional molecule or an antibody molecule disclosed herein for use in a method of treating a subject having cancer.

[00988] Accordingly, in one aspect, the disclosure features multifunctional molecule, comprising:

(i) a first antigen binding domain that selectively binds to T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2),

[00989] and

(ii) one, two, or all of:

(a) an immune cell engager chosen from an NK cell engager (e.g., a molecule that binds to NKp30, NKp46, NKG2D, or CD16), T cell engager (e.g., that binds to a T cell antigen other than CD3), a B cell engager, a dendritic cell engager, or a macrophage cell engager;

(b) a cytokine molecule or cytokine inhibitor molecule;

(c) a death receptor signal engager; and

(d) a stromal modifying moiety.

[00990] In another aspect, the disclosure features a multifunctional molecule, comprising:

(i) a first antigen binding domain that selectively targets lymphocytes expressing (e.g., on their surface, e.g., displaying) a T cell receptor comprising T cell receptor beta chain constant domain 1 (TRBC1), TRBC1, a T cell receptor comprising T cell receptor beta chain constant domain 2 (TRBC2), or TRBC2, and

(ii) one, two, or all of:

(a) an immune cell engager chosen from an NK cell engager (e.g., a molecule that binds to NKp30, NKp46, NKG2D, or CD16), a T cell engager (e.g., that binds to a T cell antigen other than CD3), a B cell engager, a dendritic cell engager, or a macrophage cell engager;

(b) a cytokine molecule or cytokine inhibitor molecule;

(c) a death receptor signal engager; and

(c) a stromal modifying moiety.

[00991] In another aspect, the disclosure features a multifunctional molecule, comprising:

(i) a first antigen binding domain that preferentially binds to a tumor antigen on a lymphoma cell (e.g., T cell), e.g., a T cell receptor comprising T cell receptor beta chain constant domain 1 (TRBC1), TRBC1, a T cell receptor comprising T cell receptor beta chain constant domain 2 (TRBC2), or TRBC2, and

(ii) one, two, or all of:

(a) an immune cell engager chosen from an NK cell engager (e.g., a molecule that binds to NKp30, NKp46, NKG2D, or CD16), a T cell engager (e.g., that binds to a T cell antigen other than CD3), a B cell engager, a dendritic cell engager, or a macrophage cell engager;

(b) a cytokine molecule or cytokine inhibitor molecule;

(c) a death receptor signal engager; and

(d) a stromal modifying moiety.

[00992] In another aspect, the disclosure features an antibody molecule, e.g., an IgM antibody molecule, comprising:

(i) a first antigen binding domain that selectively binds to T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2), and

(ii) a complement activating domain that activates the complement pathway, e.g., by binding C1q.

[00993] In another aspect, the disclosure features a nucleic acid molecule encoding a multifunctional molecule disclosed herein.

[00994] In another aspect, the disclosure features a vector, e.g., an expression vector, comprising the nucleic acid molecules disclosed herein.

[00995] In another aspect, the disclosure features a host cell comprising a nucleic acid molecule or vector disclosed herein.

[00996] In another aspect, the disclosure features a method of making, e.g., producing, a multifunctional molecule disclosed herein, comprising culturing a host cell disclosed herein under suitable conditions, e.g., conditions suitable for gene expression and/or homo- or heterodimerization.

[00997] In another aspect, the disclosure features a pharmaceutical composition comprising a multifunctional molecule disclosed herein.

[00998] In another aspect, the disclosure features a method of treating a cancer, comprising administering to a subject in need thereof a multifunctional molecule disclosed herein, wherein the multifunctional molecule is administered in an amount effective to treat the cancer. In some embodiments, the cancer is a T cell malignancy, e.g., a T cell lymphoma or a T cell leukemia. In some embodiments, the cancer is chosen from: T cell prolymphocytic leukemia, T cell large granular lymphocytic leukemia, Systemic EBV positive T cell lymphoproliferative disease of childhood, Hydroa vaccineform-like lymphoma, PTCL, PTCL-NOS (Not Otherwise Specified), Angioimmunoblastic T-cell lymphoma (AITL), Anaplastic Large cell Lymphoma (ALCT) ALK

positive and ALK negative, Primary cutaneous anaplastic large cell lymphoma, Primary cutaneous gd Tcell lymphoma, Primary cutaneous CD8 poasitive aggressive epidermotropic cytotoxic T cell lymphoma, Primary cutaneous CD4 positive small/medium T cell lymphoma, Extranodal T cell lymphoma,Enteropathy-associated T cell Lymphoma (EATL), Hepatoslenic T cell lymphoma, Cutaneous T cell Lymphoma (CTCL) including CD 30 positive T cell lymphoproliferative disorders, Subcutanoeus panniculitis-like T cell lymphoma, Mycosis fugoides, Sezary Syndrome, lymphomatoid papulosis, T-cell Acute Lymphoblastic Leukemia (T-ALL), Adult T cell lymphoma, Monoclonal T cell proliferation of unknown significance, anaplastic large cell lymphoma (ALCL); angioimmunoblastic T cell lymphoma; peripheral T cell lymphoma (PTCL), not otherwise specified (NOS); cutaneous T-cell lymphoma (CTCL); NKT cell lymphoma; Sézary syndrome; T acute lymphoblastic leukemia or lymphoma; adult T cell leukemia or lymphoma; T prolymphocytic leukemia; and T large granular leukemia. In some embodiments, the cancer is PTCL. In some embodiments, TRBC subtype expression is analyzed by flow cytometry analysis of, e.g., fresh tumor tissue, or by immunohistochemistry (IHC) on fixed tissue (e.g., FFPE tissue). In some embodiments, the multifunctional molecule is used in combination with a second agent. In some embodiments, the second agent is a histone deacetylases (HDAC) inhibitor, e.g., romidepsin or belinostat. In some embodiments, the second agent is a kinase or enzyme inhibitor. In some embodiments, the second agent is a PI3K inhibitor, e.g., duvelisib. In some embodiments, the second agent is a farnesyltransferase inhibitor, e.g., tipifarnib. In some embodiments, the second agent is a SYK/JAK inhibitor, e.g., cerdulatinib. In some embodiments, the second agent is a chemotherapy. In some embodiments, the second agent is an anti-CD30 antibody. In some embodiments, the second agent is an IMiD.

[00999] In another aspect, the disclosure features a method of identifying a subject in need of treatment for cancer using a multifunctional molecule disclosed herein, comprising determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC1 or TRBC2, wherein:

responsive to determining that the subject has cancer cells that express a T cell receptor comprising TRBC1, identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1, and optionally not as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, and

responsive to determining that the subject has cancer cells that express a T cell receptor comprising TRBC2, identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, and optionally not as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1.

[001000] In another aspect, the disclosure features a method of evaluating a subject in need of

treatment for cancer, e.g., a lymphoma, comprising determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC1 or TRBC2.

Exemplary Embodiment 5

[001001] 1. A multifunctional molecule, comprising:

(i) a first antigen binding domain that preferentially binds to a tumor antigen on a lymphoma cell (e.g., T cell), wherein the tumor antigen is T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2),

and

(ii) one, two, or all of:

(a) an immune cell engager chosen from an NK cell engager (e.g., a molecule that binds to NKp30, NKp46, NKG2D, or CD16), a T cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager;

(b) a cytokine molecule or cytokine inhibitor molecule;

(c) a death receptor signal engager; and

(d) a stromal modifying moiety.

[001002] 1A. A multifunctional molecule, comprising:

(i) a first antigen binding domain that selectively binds to T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2),

and

(ii) one, two, or all of:

(a) an immune cell engager chosen from an NK cell engager (e.g., a molecule that binds to NKp30, NKp46, NKG2D, or CD16), a T cell engager that binds to a T cell antigen other than CD3, a B cell engager, a dendritic cell engager, or a macrophage cell engager;

(b) a cytokine molecule or cytokine inhibitor molecule;

(c) a death receptor signal engager; and

(d) a stromal modifying moiety.

[001003] 2. A multifunctional molecule, comprising:

(i) a first antigen binding domain that selectively targets lymphocytes expressing T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2),

and

(ii) one, two, or all of:

(a) an immune cell engager chosen from an NK cell engager (e.g., a molecule that binds to NKp30, NKp46, NKG2D, or CD16), a T cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager;

(b) a cytokine molecule or cytokine inhibitor molecule;

(c) a death receptor signal engager; and

(d) a stromal modifying moiety.

[001004] 3. The multifunctional molecule of embodiment 1 or 2, wherein the multifunctional molecule:

(i) binds specifically to an epitope of TRBC1 or TRBC2, *e.g.*, the same or similar epitope as the epitope recognized by an anti-TRBC1 or anti-TRBC2 antibody molecule as described herein;

(ii) shows the same or similar binding affinity or specificity, or both, as an anti-TRBC1 or anti-TRBC2 antibody molecule as described herein;

(iii) inhibits, *e.g.*, competitively inhibits, the binding of an anti-TRBC1 or anti-TRBC2 antibody molecule as described herein;

(iv) binds the same or an overlapping epitope with an anti-TRBC1 or anti-TRBC2 antibody molecule as described herein; or

(v) competes for binding, and/or binds the same epitope, with an anti-TRBC1 or anti-TRBC2 antibody molecule as described herein.

[001005] 4. The multifunctional molecule of embodiment 3, wherein the anti-TRBC1 or anti-TRBC2 antibody molecule comprises one or more CDRs, framework regions, variable domains, heavy or light chains, or an antigen binding domain chosen from Tables 2-5, or a sequence substantially identical thereto.

[001006] 5. The multifunctional molecule of any of embodiments 1-4, wherein the antigen or tumor antigen is TRBC1.

[001007] 6. The multifunctional molecule of any of embodiments 1-4, wherein the antigen or tumor antigen is TRBC2.

[001008] 7. The multifunctional molecule of any of embodiments 1-4 or 6, wherein the first antigen binding domain comprises an anti-TRBC2 antigen binding domain disclosed herein, e.g., comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[001009] 8. The multifunctional molecule of any one of embodiments 1-4, 6, or 7, wherein the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor not comprising TRBC2, optionally wherein the K_D for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the K_D for the binding between the first antigen binding domain and a T cell receptor not comprising TRBC2.

[001010] 9. The multifunctional molecule of any one of embodiments 1-4 or 6-8, wherein the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor comprising TRBC1, optionally wherein the K_D for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the K_D for the binding between the first antigen binding domain and a T cell receptor comprising TRBC1.

[001011] 10. The multifunctional molecule of any preceding embodiment, wherein binding of the

first antigen binding domain to TRBC1 or TRBC2 on a lymphoma cell or lymphocyte (e.g., T cell) or the tumor antigen on the lymphoma cell (e.g., T cell) does not activate the lymphoma cell or lymphocyte, e.g., T cell.

[001012] 11. The multifunctional molecule of any preceding embodiment, wherein binding of the first antigen binding domain to TRBC1 or TRBC2 on a lymphoma cell or lymphocyte (e.g., T cell) or the tumor antigen on the lymphoma cell e.g., T cell) does not appreciably activate the lymphoma cell or lymphocyte, e.g., T cell, (e.g., as measured by T cell proliferation, expression of a T cell activation marker (e.g., CD69 or CD25), and/or expression of a cytokine (e.g., TNFα and IFNγ).

[001013] 12. The multifunctional molecule of any one of embodiments 1 or 2-11, wherein the multifunctional molecule preferentially binds to a lymphoma cell over a non-lymphoma cell, optionally wherein the binding between the multifunctional molecule and the lymphoma cell is more than 10, 20, 30, 40, or 50-fold greater than the binding between the multifunctional molecule and a non-lymphoma cell.

[001014] 13. The multifunctional molecule of any one of embodiments 2-9, wherein:

(i) the binding between the multifunctional molecule and the lymphocyte expressing TRBC1 is more than 10, 20, 30, 40, or 50-fold greater than the binding between the multifunctional molecule and a lymphocyte that does not express TRBC1, or

(ii) the binding between the multifunctional molecule and the lymphocyte expressing TRBC2 is more than 10, 20, 30, 40, or 50-fold greater than the binding between the multifunctional molecule and a lymphocyte that does not express TRBC2.

[001015] 14. The multifunctional molecule of any one of embodiments 1-13, wherein the multifunctional molecule comprises an immune cell engager chosen from an NK cell engager, a T cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager.

[001016] 15. The multifunctional molecule of embodiment 14, wherein the immune cell engager binds to and activates an immune cell, e.g., an effector cell.

[001017] 16. The multifunctional molecule of embodiment 15, wherein the immune cell engager binds to, but does not activate, an immune cell, e.g., an effector cell.

[001018] 17. The multifunctional molecule of any one of embodiments 14-16, wherein the immune cell engager is a T cell engager, e.g., a T cell engager that mediates binding to and activation of a T cell, or a T cell engager that mediates binding to but not activation of a T cell.

[001019] 18. The multifunctional molecule of embodiment 17, wherein the T cell engager binds to TCRα, TCRβ, TCRγ, TCRζ, ICOS, CD28, CD27, HVEM, LIGHT, CD40, 4-1BB, OX40, DR3, GITR, CD30, TIM1, SLAM, CD2, or CD226, e.g., the T cell engager is an anti-TCRβ antibody molecule.

[001020] 19. The multifunctional molecule of any one of embodiments 14-16, wherein the immune cell engager is an NK cell engager, e.g., an NK cell engager that mediates binding to and activation of

an NK cell, or an NK cell engager that mediates binding to but not activation of an NK cell.

[001021] 20. The multifunctional molecule of embodiment 19, wherein the NK cell engager is chosen from an antibody molecule, e.g., an antigen binding domain, or ligand that binds to (e.g., activates): NKp30, NKp40, NKp44, NKp46, NKG2D, DNAM1, DAP10, CD16 (e.g., CD16a, CD16b, or both), CRTAM, CD27, PSGL1, CD96, CD100 (SEMA4D), NKp80, CD244 (also known as SLAMF4 or 2B4), SLAMF6, SLAMF7, KIR2DS2, KIR2DS4, KIR3DS1, KIR2DS3, KIR2DS5, KIR2DS1, CD94, NKG2C, NKG2E, or CD160, e.g., the NK cell engager is an antibody molecule or ligand that binds to (e.g., activates) NKp30.

[001022] 21. The multifunctional molecule of embodiment 19, wherein the NK cell engager is an antibody molecule, e.g., an antigen binding domain.

[001023] 22. The multifunctional molecule of either of embodiments 20 or 21, wherein the NK cell engager is capable of engaging an NK cell.

[001024] 23. The multifunctional molecule of any one of embodiments 19-22, wherein the NK cell engager is an antibody molecule, e.g., an antigen binding domain, that binds to NKp30, NKp46, NKG2D, or CD16.

[001025] 24. The multifunctional molecule of any preceding embodiment, wherein the multifunctional molecule:

(i) binds specifically to an epitope of NKp30, NKp46, NKG2D, or CD16, *e.g.*, the same or similar epitope as the epitope recognized by an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule as described herein;

(ii) shows the same or similar binding affinity or specificity, or both, as an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule as described herein;

(iii) inhibits, *e.g.*, competitively inhibits, the binding of an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule as described herein;

(iv) binds the same or an overlapping epitope with an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule as described herein; or

(v) competes for binding, and/or binds the same epitope, with an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 molecule as described herein.

[001026] 25. The multifunctional molecule of any of embodiments 19-24, wherein the anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule comprises one or more CDRs, framework regions, variable domains, heavy or light chains, or an antigen binding domain chosen from Tables 7, 8, 8A, 8B, 9, 10 or 15, or a sequence substantially identical thereto.

[001027] 26. The multifunctional molecule of any of embodiments 19-25, wherein the NK cell engager is an antibody molecule, e.g., an antigen binding domain, that binds to NKp30.

[001028] 27. The multifunctional molecule of any of embodiments 19-26, wherein lysis of the lymphoma cell or lymphocyte is mediated by NKp30.

[001029] 28. The multifunctional molecule of any of embodiments 19-27, wherein the

multifunctional molecule does not activate the NK cell when incubated with the NK cell in the absence of the tumor antigen on the lymphoma cell or TRBC1 or TRBC2 on the lymphocyte.

[001030] 29. The multifunctional molecule of any of embodiments 19-28, wherein the multifunctional molecule activates the NK cell when the NK cell is a NKp30 expressing NK cell and either: (1) the tumor antigen on the lymphoma cell is also present or (2) TRBC1 or TRBC2 on the lymphocyte is also present.

[001031] 30. The multifunctional molecule of any of embodiments 19-29, wherein the multifunctional molecule does not activate the NK cell when the NK cell is not a NKp30 expressing NK cell and either: (1) the tumor antigen on the lymphoma cell is also present or (2) TRBC1 or TRBC2 on the lymphocyte is also present.

[001032] 31. The multifunctional molecule of any of embodiments 19-30, wherein the NK cell engager comprises an anti-NKp30 antigen binding domain disclosed herein, e.g., comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 7, 8, 8A, 8B, 9, 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[001033] 32. The multifunctional molecule of any of embodiments 19-25, wherein the NK cell engager is an antibody molecule, e.g., an antigen binding domain, that binds to NKp46.

[001034] 33. The multifunctional molecule of embodiment 32, wherein lysis of the lymphoma cell is mediated by NKp46.

[001035] 34. The multifunctional molecule of either of embodiments 32 or 33, wherein the multifunctional molecule does not activate the NK cell when incubated with the NK cell in the absence of the tumor antigen on the lymphoma cell.

[001036] 35. The multifunctional molecule of any one of embodiments 32-34, wherein the multifunctional molecule activates the NK cell when the NK cell is a NKp46 expressing NK cell and the tumor antigen on the lymphoma cell is also present.

[001037] 36. The multifunctional molecule of any one of embodiments 32-35, wherein the multifunctional molecule does not activate the NK cell when the NK cell is not a NKp46 expressing NK cell and the tumor antigen on the lymphoma cell is also present.

[001038] 37. The multifunctional molecule of any one of embodiments 32-36, wherein the NK cell engager comprises a VH comprising the amino acid sequence of SEQ ID NO: 6182 (or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6182).

[001039] 38. The multifunctional molecule of any one of embodiments 32-37, wherein the NK cell engager comprises a VL comprising the amino acid sequence of SEQ ID NO: 6183 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6183).

[001040] 39. The multifunctional molecule of 32-38, wherein the NK cell engager comprises an scFv comprising the amino acid sequence of SEQ ID NO: 6181 (or an amino acid sequence having at least

about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6181).

[001041] 40. The multifunctional molecule of any of embodiments 19-25, wherein the NK cell engager is an antibody molecule, e.g., an antigen binding domain, that binds to NKG2D.

[001042] 41. The multifunctional molecule of embodiment 40, wherein lysis of the lymphoma cell is mediated by NKG2D.

[001043] 42. The multifunctional molecule of either of embodiments 40 or 41, wherein the multifunctional molecule does not activate the NK cell when incubated with the NK cell in the absence of the tumor antigen on the lymphoma cell.

[001044] 43. The multifunctional molecule of any one of embodiments 40-42, wherein the multifunctional molecule activates the NK cell when the NK cell is a NKG2D expressing NK cell and the tumor antigen on the lymphoma cell is also present.

[001045] 44. The multifunctional molecule of any one of embodiments 40-43, wherein the multifunctional molecule does not activate the NK cell when the NK cell is not a NKG2D expressing NK cell and the tumor antigen on the lymphoma cell is also present.

[001046] 45. The multifunctional molecule of any one of embodiments 40-44, wherein the NK cell engager comprises a VH comprising the amino acid sequence of SEQ ID NO: 6176 (or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6176).

[001047] 46. The multifunctional molecule of any one of embodiments 40-45, wherein the NK cell engager comprises a VL comprising the amino acid sequence of SEQ ID NO: 6177 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6177).

[001048] 47. The multifunctional molecule of any of embodiments 40-46, wherein the NK cell engager comprises an scFv comprising the amino acid sequence of SEQ ID NO: 6175(or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6175).

[001049] 48. The multifunctional molecule of any one of embodiments 40-44, wherein the NK cell engager comprises a VH comprising the amino acid sequence of SEQ ID NO: 6179 (or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6179).

[001050] 49. The multifunctional molecule of any one of embodiments 40-44 or 48, wherein the NK cell engager comprises a VL comprising the amino acid sequence of SEQ ID NO: 6180 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6180).

[001051] 50. The multifunctional molecule of any of embodiments 40-44, 48, or 49, wherein the NK cell engager comprises an scFv comprising the amino acid sequence of SEQ ID NO: 6178 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6178).

[001052] 51. The multifunctional molecule of any of embodiments 19-25, wherein the NK cell engager is an antibody molecule, e.g., an antigen binding domain, that binds to CD16.

[001053] 52. The multifunctional molecule of embodiment 51, wherein lysis of the lymphoma cell is mediated by CD16.

[001054] 53. The multifunctional molecule of either of embodiments 51 or 52, wherein the multifunctional molecule does not activate the NK cell when incubated with the NK cell in the absence of the tumor antigen on the lymphoma cell.

[001055] 54. The multifunctional molecule of any one of embodiments 51-53, wherein the multifunctional molecule activates the NK cell when the NK cell is a CD16 expressing NK cell and the tumor antigen on the lymphoma cell is also present.

[001056] 55. The multifunctional molecule of any one of embodiments 51-54, wherein the multifunctional molecule does not activate the NK cell when the NK cell is not a CD16 expressing NK cell and the tumor antigen on the lymphoma cell is also present.

[001057] 56. The multifunctional molecule of any one of embodiments 51-55, wherein the NK cell engager comprises a VH comprising the amino acid sequence of SEQ ID NO: 6185 (or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 6185).

[001058] 57. The multifunctional molecule of any one of embodiments 51-56, wherein the NK cell engager comprises a VL comprising the amino acid sequence of SEQ ID NO: 6186 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6186).

[001059] 58. The multifunctional molecule of any of embodiments 51-57, wherein the NK cell engager comprises an scFv comprising the amino acid sequence of SEQ ID NO: 6184(or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity to SEQ ID NO: 6184).

[001060] 59. The multifunctional molecule of embodiment 19, wherein the NK cell engager is a ligand, optionally, the ligand further comprises an immunoglobulin constant region, e.g., an Fc region.

[001061] 60. The multifunctional molecule of embodiment 59, wherein the NK cell engager is a ligand of NKp44 or NKp46, e.g., a viral HA.

[001062] 61. The multifunctional molecule of embodiment 59, wherein the NK cell engager is a ligand of DAP10, e.g., a coreceptor for NKG2D.

[001063] 62. The multifunctional molecule of embodiment 59, wherein the NK cell engager is a ligand of CD16, e.g., a CD16a/b ligand, e.g., a CD16a/b ligand further comprising an antibody Fc region.

[001064] 63. The multifunctional molecule of any one of embodiments 14-16, wherein the immune cell engager mediates binding to, or activation of, or both of, one or more of a B cell, a macrophage, and/or a dendritic cell.

[001065] 64. The multifunctional molecule of embodiment 63, wherein the immune cell engager comprises a B cell, macrophage, and/or dendritic cell engager chosen from one or more of CD40 ligand (CD40L) or a CD70 ligand; an antibody molecule that binds to CD40 or CD70; an antibody molecule to OX40; an OX40 ligand (OX40L); an agonist of a Toll-like receptor (e.g., a TLR4, e.g., a

constitutively active TLR4 (caTLR4) or a TLR9 agonist); a 41BB; a CD2 agonist; a CD47; or a STING agonist, or a combination thereof.

[001066] 65. The multifunctional molecule of any one of embodiments 14-16, wherein the immune cell engager is a B cell engager, e.g., a CD40L, an OX40L, or a CD70 ligand, or an antibody molecule that binds to OX40, CD40 or CD70.

[001067] 66. The multifunctional molecule of any one of embodiments 14-16, wherein the immune cell engager is a macrophage cell engager, e.g., a CD2 agonist; a CD40L; an OX40L; an antibody molecule that binds to OX40, CD40 or CD70; an agonist of a Toll-like receptor (TLR) (e.g., a TLR4, e.g., a constitutively active TLR4 (caTLR4) or a TLR9 agonist); CD47; or a STING agonist.

[001068] 67. The multifunctional molecule of any one of embodiments 14-16, wherein the immune cell engager is a dendritic cell engager, e.g., a CD2 agonist, an OX40 antibody, an OX40L, 41BB agonist, a Toll-like receptor agonist or a fragment thereof (e.g., a TLR4, e.g., a constitutively active TLR4 (caTLR4)), CD47 agonist, or a STING agonist.

[001069] 68. The multifunctional molecule of embodiment 66 or 67, wherein the STING agonist comprises a cyclic dinucleotide, e.g., a cyclic di-GMP (cdGMP), a cyclic di-AMP (cdAMP), or a combination thereof, optionally with 2′,5′ or 3′,5′ phosphate linkages, e.g., wherein the STING agonist is covalently coupled to the multifunctional molecule.

[001070] 69. The multifunctional molecule of any one of embodiments 1-13, wherein the multifunctional molecule comprises a cytokine molecule.

[001071] 70. The multifunctional molecule of embodiment 69, wherein the cytokine molecule is chosen from interleukin-2 (IL-2), interleukin-7 (IL-7), interleukin-12 (IL-12), interleukin-15 (IL-15), interleukin-18 (IL-18), interleukin-21 (IL-21), or interferon gamma, or a fragment or variant thereof, or a combination of any of the aforesaid cytokines.

[001072] 71. The multifunctional molecule of embodiment 70, wherein the cytokine molecule is interleukin-2 (IL-2).

[001073] 72. The multifunctional molecule of any of embodiments 69-71, wherein the cytokine molecule is a monomer or a dimer.

[001074] 73. The multifunctional molecule of any one of embodiments 69-72, wherein the cytokine molecule further comprises a receptor dimerizing domain, e.g., an IL15Ralpha dimerizing domain.

[001075] 74. The multifunctional molecule of embodiment 73, wherein the cytokine molecule (e.g., IL-15) and the receptor dimerizing domain (e.g., an IL15Ralpha dimerizing domain) are not covalently linked, e.g., are non-covalently associated.

[001076] 75. The multifunctional molecule of any of embodiments 1-13, wherein the multifunctional molecule comprises a cytokine inhibitor molecule.

[001077] 76. The multifunctional molecule of embodiment 75, wherein the cytokine inhibitor molecule is a TGF-beta inhibitor.

[001078] 77. The multifunctional molecule of either of embodiments 75 or 76, wherein the TGF-beta

inhibitor inhibits (e.g., reduces the activity of): (i) TGF-beta 1; (ii) TGF-beta 2; (iii) TGF-beta 3; (iv) (i) and (ii); (v) (i) and (iii); (vi) (ii) and (iii); or (vii) (i), (ii), and (iii).

[001079] 78. The multifunctional molecule of any of embodiments 75-77, wherein the TGF-beta inhibitor comprises a portion of a TGF-beta receptor (e.g., an extracellular domain of a TGF-beta receptor) that is capable of inhibiting (e.g., reducing the activity of) TGF-beta, or functional fragment or variant thereof.

[001080] 79. The multifunctional molecule of embodiment 78, wherein the TGF-beta inhibitor comprises a portion of (i) TGFBR1; (ii) TGFBR2; (iii) TGFBR3; (iv) (i) and (ii); (v) (i) and (iii); (vi) (ii) and (iii); or (vii) (i), (ii), and (iii).

[001081] 80. The multifunctional molecule of any of embodiments 75-79, wherein the TGF-beta inhibitor comprises an amino acid sequence selected from Table 16, or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity thereto.

[001082] 81. The multifunctional molecule of any of embodiments 1-13, wherein the multifunctional molecule comprises a death receptor signal engager chosen from a TNF-related apoptosis-inducing ligand (TRAIL) molecule, a death receptor molecule, or an antigen binding domain that specifically binds to a death receptor.

[001083] 82. The multifunctional molecule of embodiment 81, wherein the death receptor signal engager activates death receptor signaling in the lymphoma cell (e.g., T cell) or lymphocyte expressing TRBC1 or TRBC2, e.g., and induces apoptosis or cell death in said cell.

[001084] 83. The multifunctional molecule of either of embodiments 81 or 82, wherein the death receptor signal engager does not activate death receptor signaling on non-lymphoma cells and lymphocytes not expressing TRBC1 or not expressing TRBC2.

[001085] 84. The multifunctional molecule of any of embodiments 81-83, wherein the death receptor signal engager comprises a TRAIL molecule, e.g., one or more TRAIL polypeptides or a fragment thereof.

[001086] 85. The multifunctional molecule of embodiment 84, wherein the TRAIL molecule specifically binds to Death Receptor 4 (DR4) or Death Receptor 5 (DR5).

[001087] 86. The multifunctional molecule of either of embodiments 84 or 85, wherein the TRAIL molecule comprises a truncated TRAIL polypeptide, e.g., relative to a wild-type TRAIL polypeptide.

[001088] 87. The multifunctional molecule of embodiment 86, wherein the TRAIL molecule comprises at least residues corresponding to amino acids 95-281 of human TRAIL, e.g., a truncated TRAIL molecule comprising residues corresponding to amino acids 95-281 of human TRAIL.

[001089] 88. The multifunctional molecule of embodiment 87, wherein the TRAIL molecule comprises a truncated TRAIL polypeptide comprising amino acids 95-281 of human TRAIL, e.g., and not amino acids 1-94 of human TRAIL.

[001090] 89. The multifunctional molecule of embodiment 86, wherein the TRAIL molecule comprises at least residues corresponding to amino acids 122-281 of human TRAIL, e.g., a truncated

TRAIL molecule comprising residues corresponding to amino acids 122-281 of human TRAIL.

[001091] 90. The multifunctional molecule of embodiment 89, wherein the TRAIL molecule comprises a truncated TRAIL polypeptide comprising amino acids 122-281 of human TRAIL, e.g., and not amino acids 1-121 of human TRAIL.

[001092] 91. The multifunctional molecule of any of embodiments 84-90, wherein the death receptor signal engager comprises one, two, or three TRAIL molecules.

[001093] 92. The multifunctional molecule of any of embodiments 81-83, wherein the death receptor signal engager comprises an antigen binding domain that specifically binds to a death receptor, e.g., Death Receptor 4 (DR4) or Death Receptor 5 (DR5).

[001094] 93. The multifunctional molecule of embodiment 92, wherein the death receptor signal engager comprises one, two, or three antigen binding domains that specifically binds to a death receptor.

[001095] 94. The multifunctional molecule of either of embodiments 92 or 93, wherein the antigen binding domain that specifically binds to a death receptor binds to DR5.

[001096] 95. The multifunctional molecule of any of embodiments 92-94, wherein the antigen binding domain that specifically binds to a death receptor comprises tigatuzumab, drozitumab, or conatumumab.

[001097] 96. The multifunctional molecule of any of embodiments 81-95, wherein the death receptor signal engager comprises an amino acid sequence selected from Table 11, or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001098] 97. The multifunctional molecule of any of embodiments 81-96, wherein the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6157, or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001099] 98. The multifunctional molecule of any of embodiments 81-96, wherein the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6158, or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001100] 99. The multifunctional molecule of any of embodiments 81-96, wherein the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6159, or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001101] 100. The multifunctional molecule of any of embodiments 81-96, wherein the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6160, or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001102] 101. The multifunctional molecule of any of embodiments 81-96, wherein the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6161, or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001103] 102. The multifunctional molecule of any of embodiments 81-96, wherein the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6162, or an amino acid

sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001104] 103. The multifunctional molecule of any of embodiments 81-96, wherein the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6163, or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001105] 104. The multifunctional molecule of any of embodiments 81-96, wherein the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6164, or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001106] 105. The multifunctional molecule of any of embodiments 81-96, wherein the death receptor signal engager comprises an amino acid sequence of SEQ ID NO: 6165, or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto.

[001107] 106. The multifunctional molecule of embodiment 18, wherein the T cell engager binds to TCRβ, e.g., to TCR beta V chain (TCRBV).

[001108] 107. The multifunctional molecule of embodiment 106, wherein the T cell engager comprises an antigen binding domain (e.g., an antibody molecule or fragment thereof) that binds to (e.g., and in some embodiments activates) TCRβ.

[001109] 108. The multifunctional molecule of either of embodiments 106 or 107, wherein the T cell engager comprises an anti-TCRβV antibody molecule, e.g., that specifically binds to a human TCR beta V chain (TCRβV).

[001110] 109. The multifunctional molecule of any of embodiments 106-108, wherein the T cell engager does not bind to the lymphoma cell or the lymphocyte expressing TRBC1 or TRBC2.

[001111] 110. The multifunctional molecule of any of embodiments 106-108, wherein the T cell engager is capable of binding to or binds to the lymphoma cell or the lymphocyte expressing TRBC1 or TRBC2.

[001112] 111. The multifunctional molecule of any of embodiments 106-110, wherein the T cell engager does not activate the lymphoma cell or the lymphocyte expressing TRBC1 or TRBC2.

[001113] 112. The multifunctional molecule of any of embodiments 106-111, wherein the T cell engager comprises an anti-TCRβV antibody molecule that specifically binds to a TCRβV subfamily or subfamily member of Table 12.

[001114] 113. The multifunctional molecule of embodiment 112, wherein the anti-TCRβV antibody molecule specifically binds to TCRβ V6, *e.g.*, a TCRβ V6 subfamily comprising: TCRβ V6-4*01, TCRβ V6-4*02, TCRβ V6-9*01, TCRβ V6-8*01, TCRβ V6-5*01, TCRβ V6-6*02, TCRβ V6-6*01, TCRβ V6-2*01, TCRβ V6-3*01 or TCRβ V6-1*01.

[001115] 114. The multifunctional molecule of embodiment 113, wherein the anti-TCRβV antibody molecule comprises one or more CDRs, framework regions, or variable heavy and/or light chain regions provided in Table 13 or having at least about 93%, 95%, or 99% sequence identity thereto.

[001116] 115. The multifunctional molecule of embodiment 112, wherein the anti-TCRβV antibody

molecule specifically binds to TCRβ V12, *e.g.*, a TCRβ V12 subfamily comprising: TCRβ V12-4*01, TCRβ V12-3*01 or TCRβ V12-5*01.

[001117] 116. The multifunctional molecule of embodiment 115, wherein the anti-TCRβV antibody molecule comprises one or more CDRs, framework regions, or variable heavy and/or light chain regions provided in Table 14 or having at least about 93%, 95%, or 99% sequence identity thereto.

[001118] 117. The multifunctional molecule of any one of embodiments 1-13, wherein the multifunctional molecule comprises a stromal modifying moiety.

[001119] 118. The multifunctional molecule of embodiment 117, wherein the stromal modifying moiety causes one or more of: decreases the level or production of a stromal or extracellular matrix (ECM) component; decreases tumor fibrosis; increases interstitial tumor transport; improves tumor perfusion; expands the tumor microvasculature; decreases interstitial fluid pressure (IFP) in a tumor; or decreases or enhances penetration or diffusion of an agent, e.g., a cancer therapeutic or a cellular therapy, into a tumor or tumor vasculature.

[001120] 119. The multifunctional molecule of embodiment 118, wherein the stromal or ECM component decreased is chosen from a glycosaminoglycan or an extracellular protein, or a combination thereof.

[001121] 120. The multifunctional molecule of any one of embodiments 1-119, wherein the multifunctional molecule comprises:

(i) an immune cell engager (e.g., a T cell engager, an NK cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager) and a cytokine molecule,

(ii) an immune cell engager (e.g., a T cell engager, an NK cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager) and a cytokine inhibitor molecule,

(iii) an immune cell engager (e.g., a T cell engager, an NK cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager) and a death receptor signal engager,

(iv) an immune cell engager (e.g., a T cell engager, an NK cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager) and a stromal modifying moiety,

(v) a cytokine molecule and a stromal modifying moiety,

(vi) a cytokine molecule and a death receptor signal engager,

(vii) a cytokine inhibitor molecule and a stromal modifying moiety,

(viii) a cytokine inhibitor molecule and a death receptor signal engager,

(ix) an immune cell engager (e.g., a T cell engager, an NK cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager), a cytokine molecule, a death receptor signal engager, and a stromal modifying moiety, or

(x) an immune cell engager (e.g., a T cell engager, an NK cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager), a cytokine inhibitor molecule, a death receptor signal engager, and a stromal modifying moiety.

[001122] 121. The multifunctional molecule of any one of embodiments 1-120, wherein the multifunctional molecule comprises the following configuration:

A, B-[dimerization module]-C, -D, wherein:

(a) the dimerization module comprises an immunoglobulin constant domain, *e.g.*, a heavy chain constant domain (*e.g.*, a homodimeric or heterodimeric heavy chain constant region, *e.g.*, an Fc region), or a constant domain of an immunoglobulin variable region (*e.g.*, a Fab region); and

(b) A, B, C, and D are independently absent; (i) an antigen binding domain that preferentially binds to TRBC1 or TRBC2; (ii) an immune cell engager chosen from a T cell engager, an NK cell engager, a B cell engager, a dendritic cell engager, or a macrophage cell engager; (iii) a cytokine molecule or cytokine inhibitor molecule; (iv) a death receptor signal engager; or (v) a stromal modifying moiety, provided that:

at least one, two, or three of A, B, C, and D comprises an antigen binding domain that preferentially binds to TRBC1 or TRBC2, and

any of the remaining A, B, C, and D is absent or comprises one of an immune cell engager, a cytokine molecule, a cytokine inhibitor molecule, a death receptor signal engager, or a stromal modifying moiety.

[001123] 122. The multifunctional molecule of embodiment 121, wherein:

(1) A comprises an antigen binding domain that preferentially binds to a T cell receptor comprising TRBC1 or TRBC2, and B, C, or D comprises an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule;

(2) A comprises an antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30 or anti-NKp46 antibody molecule;

(3) A comprises an antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises a cytokine molecule;

(4) A comprises an antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises a cytokine inhibitor molecule;

(5) A comprises an antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises a death receptor signal engager;

(6) A comprises an antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises a stromal modifying moiety;

(7) A comprises a first antigen binding domain that binds to a TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule;

(8) A comprises a first antigen binding domain that binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or

anti-CD16 antibody molecule;

(9) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises a cytokine molecule;

(10) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises a cytokine inhibitor molecule;

(11) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises a death receptor signal engager;

(12) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises a stromal modifying moiety;

(13) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule;

(14) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule;

(15) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises a cytokine molecule;

(16) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises a cytokine inhibitor molecule;

(17) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises a death receptor signal engager;

(18) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises a stromal modifying moiety;

(19) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a cytokine molecule;

(20) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-

NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a cytokine inhibitor molecule;

(21) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a death receptor signal engager;

(22) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a stromal modifying moiety;

(23) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a cytokine molecule;

(24) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a cytokine inhibitor molecule;

(25) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a death receptor signal engager;

(26) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a stromal modifying moiety;

(27) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) a cytokine molecule and (b) a stromal modifying moiety;

(28) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) a cytokine molecule and (b) a death receptor signal engager;

(29) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) a cytokine inhibitor molecule and (b) a stromal modifying moiety;

(30) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) a cytokine inhibitor molecule and (b) a death receptor signal engager;

(31) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B, C, or D comprises (a) a death receptor signal engager and (b) a stromal modifying moiety;

(32) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a cytokine molecule;

(33) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46,

anti-NKG2D, or anti-CD16 antibody molecule, and (b) a cytokine inhibitor molecule;

(34) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a death receptor signal engager;

(35) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a stromal modifying moiety;

(36) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a cytokine molecule;

(37) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a cytokine inhibitor molecule;

(38) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a death receptor signal engager;

(39) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a stromal modifying moiety;

(40) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) a cytokine molecule and (b) a stromal modifying moiety;

(41) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) a cytokine molecule and (b) a death receptor signal engager;

(42) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) a cytokine inhibitor molecule and (b) a stromal modifying moiety;

(43) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or

D comprises (a) a cytokine inhibitor molecule and (b) a death receptor signal engager;

(44) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, B comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and C or D comprises (a) a stromal modifying moiety and (b) a death receptor signal engager;

(45) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a cytokine molecule;

(46) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a cytokine inhibitor molecule;

(47) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a death receptor signal engager;

(48) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) an immune cell engager, e.g., an NK cell engager, e.g., an anti-NKp30, anti-NKp46, anti-NKG2D, or anti-CD16 antibody molecule, and (b) a stromal modifying moiety;

(49) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a cytokine molecule;

(50) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a cytokine inhibitor molecule;

(51) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a death receptor signal engager;

(52) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) an immune cell engager, e.g., a T cell engager, e.g., an anti-TCRβV antibody molecule, and (b) a stromal modifying moiety;

(53) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) a cytokine molecule and (b) a stromal modifying moiety;

(54) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) a cytokine molecule and (b) a death receptor signal engager;

(55) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) a cytokine inhibitor molecule and (b) a stromal modifying moiety;

(56) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) a cytokine inhibitor molecule and (b) a death receptor signal engager; or

(57) A comprises a first antigen binding domain that preferentially binds to TRBC1 or TRBC2, C comprises a second antigen binding domain that preferentially binds to TRBC1 or TRBC2, and B or D comprises (a) a stromal modifying moiety and (b) a death receptor signal engager.

[001124] 123. The multifunctional molecule of embodiment 121 or 122, wherein the dimerization module comprises one or more immunoglobulin chain constant regions (e.g., Fc regions) comprising one or more of: a paired cavity-protuberance ("knob-in-a hole"), an electrostatic interaction, or a strand-exchange.

[001125] 124. The multifunctional molecule of embodiment 123, wherein the one or more immunoglobulin chain constant regions (e.g., Fc regions) comprise an amino acid substitution at a position chosen from one or more of 347, 349, 350, 351, 366, 368, 370, 392, 394, 395, 397, 398, 399, 405, 407, or 409, e.g., of the Fc region of human IgG1, optionally wherein the one or more immunoglobulin chain constant regions (e.g., Fc regions) comprise an amino acid substitution chosen from: T366S, L368A, or Y407V (e.g., corresponding to a cavity or hole), or T366W (e.g., corresponding to a protuberance or knob), or a combination thereof.

[001126] 125. The multifunctional molecule of any one of embodiments 1-124, further comprising a linker, e.g., a linker between one or more of: the antigen binding domain and the immune cell engager, the antigen binding domain and the cytokine molecule, the antigen binding domain and the stromal modifying moiety, the immune cell engager and the cytokine molecule, the immune cell engager and the stromal modifying moiety, the cytokine molecule and the stromal modifying moiety, the antigen binding domain and the dimerization module, the immune cell engager and the dimerization module, the cytokine molecule and the dimerization module, or the stromal modifying moiety and the dimerization module.

[001127] 126. The multifunctional molecule of embodiment 125, wherein the linker is chosen from: a cleavable linker, a non-cleavable linker, a peptide linker, a flexible linker, a rigid linker, a helical linker, or a non-helical linker.

[001128] 127. The multifunctional molecule of embodiment 125 or 126, wherein the linker is a peptide linker.

[001129] 128. The multifunctional molecule of embodiment 127, wherein the peptide linker comprises Gly and Ser.

[001130] 129. The multifunctional molecule of embodiment 128, wherein the peptide linker comprises an amino acid sequence chosen from SEQ ID NOs: 7249-7252 or 75-78.

[001131] 130. A multifunctional molecule, comprising:

(i) a first antigen binding domain that preferentially binds to TRBC1, and

(ii) an NK cell engager, e.g., an anti-NKp30 antibody molecule, anti-NKp46 antibody molecule, an anti-NKG2D antibody molecule, or an anti-CD16 antibody molecule.

[001132] 131. The multifunctional molecule of embodiment 130, wherein the NK cell engager comprises an anti-NKp30 antibody molecule.

[001133] 132. The multifunctional molecule of embodiment 130, wherein the NK cell engager comprises an anti-NKp46 antibody molecule.

[001134] 133. The multifunctional molecule of embodiment 130, wherein the NK cell engager comprises an anti-NKG2D antibody molecule.

[001135] 134. The multifunctional molecule of embodiment 130, wherein the NK cell engager comprises an anti-CD16 antibody molecule.

[001136] 135. A multifunctional molecule, comprising:

(i) a first antigen binding domain that preferentially binds to TRBC1, and

(ii) a death receptor signal engager.

[001137] 136. A multifunctional molecule, comprising:

(i) a first antigen binding domain that preferentially binds to TRBC1, and

(ii) a T cell engager, e.g., an antigen binding domain that binds to TCR beta V chain (TCRBV).

[001138] 137. A multifunctional molecule, comprising:

(i) a first antigen binding domain that preferentially binds to TRBC1, and

(ii) a cytokine inhibitor molecule, e.g., TGF-beta inhibitor.

[001139] 138. The multifunctional molecule of any of embodiments 1 or 3-137, wherein the multifunctional molecule binds to TRBC1, TRBC2, or the tumor antigen monovalently.

[001140] 139. The multifunctional molecule of any one of embodiments 1 or 3-137, wherein the multifunctional molecule binds to TRBC1, TRBC2, or the tumor antigen multivalently, e.g., di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, or deca-valently.

[001141] 140. The multifunctional molecule of any of embodiments 2-137, wherein the multifunctional molecule binds to TRBC1, TRBC2, or the lymphocyte expressing TRBC1 or TRBC2 monovalently.

[001142] 141. The multifunctional molecule of any one of embodiments 2-137, wherein the multifunctional molecule binds to the lymphocyte expressing TRBC1 or TRBC2 multivalently, e.g.,

di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, or deca-valently.

[001143] 142. The multifunctional molecule of any preceding embodiment, wherein the multifunctional molecule binds, e.g., via the immune cell engager, to the immune cell monovalently.

[001144] 143. The multifunctional molecule of any one of embodiments 1-141, wherein the multifunctional molecule binds, e.g., via the immune cell engager, to the immune cell multivalently, e.g., di-, tri-, tetra-, penta-, hexa-, hepta-, octa-, nona-, or deca-valently.

[001145] 144. The multifunctional molecule of any preceding embodiment, further comprising a heavy chain constant region, e.g., an Fc region, that mediates antibody dependent cellular cytotoxicity (ADCC).

[001146] 145. The multifunctional molecule of any preceding embodiment, further comprising a heavy chain constant region, e.g., an Fc region, that mediates antibody dependent cellular phagocytosis (ADCP).

[001147] 146. The multifunctional molecule of embodiment 145, wherein the first antigen binding domain that binds TRBC1 or TRBC2 comprises an IgG2 heavy chain constant region or the immune cell engager, cytokine inhibitor molecule, or death receptor signal engager comprise an IgG2 heavy chain constant region.

[001148] 147. The multifunctional molecule of any preceding embodiment, further comprising a heavy chain constant region, e.g., an Fc region, that mediates complement dependent cytotoxicity (e.g., via C1q).

[001149] 148. An antibody molecule that binds TRBC1, comprising one or more CDRs, framework regions, variable domains, heavy or light chains, or an antigen binding domain chosen from Tables 2-5, or a sequence substantially identical thereto.

[001150] 149. The antibody molecule of embodiment 148, comprising a heavy chain variable region (VH) comprising a heavy chain framework region 1 (VHFWR1) amino acid sequence of SEQ ID NO: 215 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR2 amino acid sequence of SEQ ID NO: 216 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VHFWR3 amino acid sequence of SEQ ID NO: 217 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), or a VHFWR4 amino acid sequence of SEQ ID NO: 218 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom).

[001151] 150. The antibody molecule of either of embodiments 148 or 149, comprising a light chain variable region (VL) comprising a light chain framework region 1 (VLFWR1) amino acid sequence of SEQ ID NO: 238 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VLFWR2 amino acid sequence of SEQ ID NO: 239 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), a VLFWR3 amino acid sequence of SEQ ID NO: 240 (or a sequence with no more than 1,

2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom), or a VLFWR4 amino acid sequence of SEQ ID NO: 241 (or a sequence with no more than 1, 2, 3, 4, 5, or 6 mutations, e.g., substitutions, additions, or deletions, therefrom).

[001152] 151. The antibody molecule of any of embodiments 148-150, wherein the antibody molecule comprises a VH comprising the amino acid sequence of SEQ ID NO: 253 (or an amino acid sequence having at least about 75%, 80%, 85%, 90%, 95%, or 99% sequence identity thereto).

[001153] 152. The antibody molecule of any of embodiments 148-151, wherein the antibody molecule comprises a VL comprising the amino acid sequence of SEQ ID NO: 258 (or an amino acid sequence having at least about 93%, 95%, or 99% sequence identity thereto).

[001154] 153. A nucleic acid molecule encoding the multifunctional molecule or antibody molecule of any one of embodiments 1-152.

[001155] 154. A vector, e.g., an expression vector, comprising the nucleic acid molecules of embodiment 153.

[001156] 155. A host cell comprising the nucleic acid molecule of embodiment 153 or the vector of embodiment 154.

[001157] 156. A method of making, e.g., producing, the multifunctional molecule or antibody molecule of any one of embodiments 1-152, comprising culturing the host cell of embodiment 155, under suitable conditions, e.g., conditions suitable for gene expression and/or homo- or heterodimerization.

[001158] 157. A pharmaceutical composition comprising the multifunctional molecule of any one of embodiments 1-152 and a pharmaceutically acceptable carrier, excipient, or stabilizer.

[001159] 158. A method of treating a cancer, comprising administering to a subject in need thereof the multifunctional molecule of any one of embodiments 1-152, wherein the multifunctional molecule is administered in an amount effective to treat the cancer.

[001160] 159. The method of embodiment 158, further comprising identifying, evaluating, or selecting a subject in need of treatment, wherein identifying, evaluating, or selecting comprises determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC1 or TRBC2.

[001161] 160. The method of embodiment 159, further comprising, responsive to determining that a subject has cancer cells that express a T cell receptor comprising TRBC1:

optionally, selecting the subject for treatment with a multifunctional molecule comprising an antigen binding domain that binds to a T cell receptor comprising TRBC1, and

administering a multifunctional molecule comprising an antigen binding domain that binds to a T cell receptor comprising TRBC1.

[001162] 161. The method of embodiment 160, further comprising not administering a multifunctional molecule comprising an antigen binding domain that binds to a T cell receptor

comprising TRBC2.

[001163] 162. A method of treating a cancer, e.g., a lymphoma or leukemia, comprising:

[001164] responsive to determining that a subject has cancer cells that express a T cell receptor comprising TRBC1, administering to a subject in need thereof the multifunctional molecule of any one of embodiments 1-152, wherein the multifunctional molecule is administered in an amount effective to treat the cancer.

[001165] 163. The method of embodiment 162, further comprising, responsive to determining that a subject has cancer cells that express a T cell receptor comprising TRBC2:

optionally, selecting the subject for treatment with a multifunctional molecule comprising an antigen binding domain that binds to a T cell receptor comprising TRBC2, and

administering a multifunctional molecule comprising an antigen binding domain that binds to a T cell receptor comprising TRBC2.

[001166] 164. The method of embodiment 163, further comprising not administering a multifunctional molecule comprising an antigen binding domain that binds to a T cell receptor comprising TRBC1.

[001167] 165. The method of any of embodiments 158-162, wherein the subject has cancer cells that express a T cell receptor comprising TRBC1.

[001168] 166. The method of any of embodiments 158, 159, 163, or 164, wherein the subject has cancer cells that express a T cell receptor comprising TRBC2.

[001169] 167. A method of identifying a subject in need of treatment for cancer using a multifunctional molecule or antibody molecule of any of embodiments 1-152, comprising determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC1 or TRBC2, wherein:

responsive to determining that the subject has cancer cells that express a T cell receptor comprising TRBC1, identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1, and optionally not as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, and

responsive to determining that the subject has cancer cells that express a T cell receptor comprising TRBC2, identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, and optionally not as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1.

[001170] 168. The method of embodiment 167, further comprising:

responsive to identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1, treating the subject with (e.g., administering to the subject) a multifunctional molecule comprising an antigen binding domain that

binds to TRBC1, or

responsive to identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, treating the subject with (e.g., administering to the subject) a multifunctional molecule comprising an antigen binding domain that binds to TRBC2.

[001171] 169. A method of evaluating a subject in need of treatment for cancer, e.g., a lymphoma, comprising determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC1 or TRBC2.

[001172] 170. The method of embodiment 169, further comprising responsive to the evaluation, treating the subject with (e.g., administering to the subject) a multifunctional molecule comprising an antigen binding domain that binds to TRBC1 or a multifunctional molecule comprising an antigen binding domain that binds to TRBC2.

[001173] 171. The method of any one of embodiments 158-170, wherein the cancer is a hematological cancer.

[001174] 172. The method of embodiment 171, wherein the hematological cancer is leukemia or lymphoma.

[001175] 173. The method of embodiment 172, wherein the hematological cancer is selected from leukemia (*e.g.,* acute lymphoblastic leukemia (ALL), acute myeloid leukemia (AML), chronic lymphocytic leukemia (CLL), chronic myelogenous leukemia (CML), hairy cell leukemia, acute monocytic leukemia (AMoL), chronic myelomonocytic leukemia (CMML), juvenile myelomonocytic leukemia (JMML), or large granular lymphocytic leukemia), lymphoma (*e.g.,* AIDS-related lymphoma, cutaneous T-cell lymphoma, Hodgkin lymphoma (*e.g.,* classical Hodgkin lymphoma or nodular lymphocyte-predominant Hodgkin lymphoma), mycosis fungoides, non-Hodgkin lymphoma (*e.g.,* B-cell non-Hodgkin lymphoma (*e.g.,* Burkitt lymphoma, small lymphocytic lymphoma (CLL/SLL), diffuse large B-cell lymphoma, follicular lymphoma, immunoblastic large cell lymphoma, precursor B-lymphoblastic lymphoma, or mantle cell lymphoma) or T-cell non-Hodgkin lymphoma (mycosis fungoides, anaplastic large cell lymphoma, or precursor T-lymphoblastic lymphoma)), primary central nervous system lymphoma, Sézary syndrome, Waldenström macroglobulinemia), chronic myeloproliferative neoplasm, Langerhans cell histiocytosis, multiple myeloma/plasma cell neoplasm, myelodysplastic syndrome, or myelodysplastic/myeloproliferative neoplasm.

[001176] 174. The method of embodiment 172, wherein the lymphoma is selected from Acquired immune deficiency syndrome (AIDS)-associated lymphoma, Angioimmunoblastic T-cell lymphoma, Adult T-cell leukemia/lymphoma, Burkitt lymphoma, Central nervous system (CNS) lymphoma, Diffuse large B-cell lymphoma (DLBCL), Lymphoblastic lymphoma, Mantle cell lymphoma (MCL), Peripheral T-cell lymphoma (PTCL) (e.g., Hepatosplenic T-cell lymphoma (HSGDTCL),

Subcutaneous paniculitis-like T-cell lymphoma, or Enteropathy-associated T-cell lymphoma), Transformed follicular and transformed mucosa-associated lymphoid tissue (MALT) lymphomas, Cutaneous T-cell lymphoma (mycosis fungoides and Sézary syndrome), Follicular lymphoma, Lymphoplasmacytic lymphoma/Waldenström macroglobulinemia, Marginal zone B-cell lymphoma, Gastric mucosa-associated lymphoid tissue (MALT) lymphoma, Chronic lymphocytic leukemia/small-cell lymphocytic lymphoma (CLL/SLL), Extranodal T-/NK-cell lymphoma (nasal type), or Anaplastic large-cell lymphoma (e.g., primary cutaneous anaplastic large-cell lymphoma or systemic anaplastic large-cell lymphoma).

[001177] 175. The method of any one of embodiments 158-170, the cancer is a solid tumor cancer.

[001178] 176. The method of any of embodiments 158-175, further comprising administering a second therapeutic treatment.

[001179] 177. The method of embodiment 176, wherein the second therapeutic treatment comprises a therapeutic agent (e.g., a chemotherapeutic agent, a biologic agent, hormonal therapy), radiation, or surgery.

[001180] 178. The method of embodiment 177, wherein the therapeutic agent is selected from: a chemotherapeutic agent, or a biologic agent.

Exemplary Embodiment 6

[001181] A1. A multifunctional molecule, comprising:

(i) a first antigen binding domain that binds to T cell receptor beta chain constant domain 2 (TRBC2), and

(ii) a second antigen binding domain that binds to NKp30,

wherein the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[001182] A2. The multifunctional molecule of embodiment A1, wherein the first antigen binding domain comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3, wherein:

the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7441, 201, and 7442, respectively; or

the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7443, 224, and 225, respectively.

[001183] A3. The multifunctional molecule of embodiment A2, wherein the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of:

SEQ ID NOs: 7422, 201, and 7403, respectively;

SEQ ID NOs: 7401, 201, and 7403, respectively;

SEQ ID NOs: 7394, 201, and 7396, respectively;

SEQ ID NOs: 7346, 201, and 7398, respectively;

SEQ ID NOs: 7346, 201, and 7400, respectively;

SEQ ID NOs: 7405, 201, and 7403, respectively;

SEQ ID NOs: 7407, 201, and 7403, respectively;

SEQ ID NOs: 7427, 201, and 7403, respectively; or

SEQ ID NOs: 7430, 201, and 7403, respectively.

[001184] A4. The multifunctional molecule of embodiment A2 or A3, wherein the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of:

SEQ ID NOs: 7410, 224, and 225, respectively; or

SEQ ID NOs: 7409, 224, and 225, respectively.

[001185] A5. The multifunctional molecule of any of embodiments A2-A4, wherein the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of:

SEQ ID NOs: 7422, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7401, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7394, 201, 7396, 7410, 224, and 225, respectively;

SEQ ID NOs: 7346, 201, 7398, 7410, 224, and 225, respectively;

SEQ ID NOs: 7346, 201, 7400, 7410, 224, and 225, respectively;

SEQ ID NOs: 7405, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7407, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7427, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7430, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7422, 201, 7403, 7409, 224, and 225, respectively;

SEQ ID NOs: 7401, 201, 7403, 7409, 224, and 225, respectively;

SEQ ID NOs: 7394, 201, 7396, 7409, 224, and 225, respectively;

SEQ ID NOs: 7346, 201, 7398, 7409, 224, and 225, respectively;

SEQ ID NOs: 7346, 201, 7400, 7409, 224, and 225, respectively;

SEQ ID NOs: 7405, 201, 7403, 7409, 224, and 225, respectively;

SEQ ID NOs: 7407, 201, 7403, 7409, 224, and 225, respectively;

SEQ ID NOs: 7427, 201, 7403, 7409, 224, and 225, respectively; or

SEQ ID NOs: 7430, 201, 7403, 7409, 224, and 225, respectively.

[001186] A6. The multifunctional molecule of any of embodiments A2-A5, wherein the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7420, 7423, 7411, 7412, 7413, 7414, 7415, 7416, 7417, 7425, 7428, and 7431 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7419 and 7418 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[001187] A7. The multifunctional molecule of any of embodiments A2-A6, wherein the VH and VL comprise the amino acid sequences of:

SEQ ID NOs: 7420 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7423 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7411 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7412 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7413 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7414 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7415 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7416 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7417 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7425 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7428 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7431 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7420 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7423 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7411 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7412 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7413 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7414 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99%

identity thereto);

SEQ ID NOs: 7415 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7416 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7417 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7425 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7428 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7431 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[001188] A8. The multifunctional molecule of any of embodiments A1-A7, wherein:

(i) the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor not comprising TRBC2, optionally wherein the KD for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the KD for the binding between the first antigen binding domain and a T cell receptor not comprising TRBC2;

(ii) the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor comprising TRBC1, optionally wherein the K_D for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the K_D for the binding between the first antigen binding domain and a T cell receptor comprising TRBC1; or

(iii) binding of the first antigen binding domain to TRBC2 on a lymphoma cell or lymphocyte, e.g., T cell, does not appreciably activate the lymphoma cell or lymphocyte, e.g., T cell, e.g., as measured by T cell proliferation, expression of a T cell activation marker (e.g., CD69 or CD25), and/or expression of a cytokine (e.g., TNFα and IFNγ).

[001189] A9. The multifunctional molecule of any of embodiments A1-A8, wherein the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 7, 8, 8A, 8B, 9,- 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[001190] A10. The multifunctional molecule of any of embodiments A1-A9, wherein the second antigen binding domain comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3, wherein the VHCDR1, VHCDR2, and VHCDR3 of the second antigen binding domain comprise the amino acid

sequences of:

SEQ ID NOs: 7313, 6001, and 7315, respectively;

SEQ ID NOs: 7313, 6001, and 6002, respectively;

SEQ ID NOs: 7313, 6008, and 6009, respectively;

SEQ ID NOs: 7313, 7385, and 7315, respectively; or

SEQ ID NOs: 7313, 7318, and 6009, respectively;

SEQ ID NOs: C019, C021, and C023, respectively;

SEQ ID NOs: C033, C035, and C037, respectively;

SEQ ID NOs: C047, C049, and C051, respectively;

SEQ ID NOs: C061, C063, and C065, respectively;

SEQ ID NOs: C075, C077, and C079, respectively;

SEQ ID NOs: C089, C091, and C093, respectively;

SEQ ID NOs: C103, C105, and C107, respectively; or

SEQ ID NOs: C116, C118, and C120, respectively.

[001191] A11. The multifunctional molecule of embodiment A10, wherein the VLCDR1, VLCDR2, and VLCDR3 of the second antigen binding domain comprise the amino acid sequences of:

SEQ ID NOs: 7326, 7327, and 7329, respectively;

SEQ ID NOs: 6063, 6064, and 7293, respectively;

SEQ ID NOs: 6070, 6071, and 6072, respectively; or

SEQ ID NOs: 6070, 6064, and 7321, respectively;

SEQ ID NOs: C026, C028, and C030, respectively;

SEQ ID NOs: C040, C042, and C044, respectively;

SEQ ID NOs: C054, C056, and C058, respectively;

SEQ ID NOs: C068, C070, and C072, respectively;

SEQ ID NOs: C082, C084, and C086, respectively;

SEQ ID NOs: C096, C098, and C100, respectively;

SEQ ID NOs: C110, C112, and C113, respectively;

SEQ ID NOs: C123, C125, and C127, respectively.

[001192] A12. The multifunctional molecule of embodiment A10 or A11, wherein the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 of the second antigen binding domain comprise the amino acid sequences of:

SEQ ID NOs: 7313, 6001, 7315, 7326, 7327, and 7329, respectively;

SEQ ID NOs: 7313, 6001, 6002, 6063, 6064, and 7293, respectively;

SEQ ID NOs: 7313, 6008, 6009, 6070, 6071, and 6072, respectively;

SEQ ID NOs: 7313, 7385, 7315, 6070, 6064, and 7321, respectively; or

SEQ ID NOs: 7313, 7318, 6009, 6070, 6064, and 7321, respectively;

SEQ ID NOs: C019, C021, C023, C026, C028, and C030, respectively;

SEQ ID NOs: C033, C035, C037, C040, C042, and C044, respectively;
SEQ ID NOs: C047, C049, C051, C054, C056, and C058, respectively;
SEQ ID NOs: C061, C063, C065, C068, C070, and C072, respectively;
SEQ ID NOs: C075, C077, C079, C082, C084, and C086, respectively;
SEQ ID NOs: C089, C091, C093, C096, C098, and C100, respectively;
SEQ ID NOs: C103, C105, C107, C110, C112, and C113, respectively; or
SEQ ID NOs: C116, C118, C120, C123, C125, and C127, respectively.

[001193] A13. The multifunctional molecule of any of embodiments A10-A12, wherein:
(i) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7302, 7298, 7300, 7301, 7303, and 7304 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7309, 7305, 7299, and 7306-7308 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);
(ii) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6121 or 6123-6128 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7294 or 6137-6141 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or
(iii) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6122 or 6129-6134 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6136 or 6142-6147 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or
(iv) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: C001-C008 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: C009-C016 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[001194] A14. The multifunctional molecule of any of embodiments A10-A13, wherein the VH and VL of the second antigen binding domain comprise the amino acid sequences of:
SEQ ID NOs: 7302 and 7309, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or
SEQ ID NOs: 7302 and 7305, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[001195] A15. The multifunctional molecule of any of embodiments A10-A14, wherein the second antigen binding domain comprise the amino acid sequences of:
SEQ ID NO: 7311 or 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NO: 6187 or 6188 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or SEQ ID NO: 6189 or 6190 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or any of SEQ ID NOs: C017-C024.

[001196] A16. The multifunctional molecule of any of embodiments A1-A15, wherein the multifunctional molecule binds to TRBC2 monovalently.

[001197] A17. The multifunctional molecule of any of embodiments A1-A16, wherein the multifunctional molecule comprises a configuration shown in any of FIGs. 30A-30D, optionally wherein:

(i) the multifunctional antibody molecule comprises an anti-TRBC2 Fab and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 30A;

(ii) the multifunctional antibody molecule comprises an anti-TRBC2 Fab and an anti-NKp30 Fab, e.g., comprises a configuration shown in FIG. 30B;

(iii) the multifunctional antibody molecule comprises an anti-NKp30 Fab and an anti-TRBC2 scFv, e.g., comprises a configuration shown in FIG. 30C; or

(iv) the multifunctional antibody molecule comprises an anti-TRBC2 scFv and an anti-NKp30 scFv, e.g., comprises a configuration shown in FIG. 30D.

[001198] A18. The multifunctional molecule of any of embodiments A1-A17, further comprising a dimerization module comprising one or more immunoglobulin chain constant regions (e.g., Fc regions) comprising one or more of: a paired cavity-protuberance ("knob-in-a hole"), an electrostatic interaction, or a strand-exchange.

[001199] A19. The multifunctional molecule of any of embodiments A1-A18, comprising an anti-TRBC2 amino acid sequence disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto, and/or an anti-NKp30 amino acid sequence disclosed in any of Tables 7, 8, 8A, 8B, 9,- 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[001200] A20. The multifunctional molecule of any of embodiments A1-A19, comprising:

(i) an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

(ii) an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or

(iii) SEQ ID NOs: 7438, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[001201] A21. The multifunctional molecule of any of embodiments A1-A19, comprising:
(i) an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);
(ii) an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or
(iii) SEQ ID NOs: 7440, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

[001202] A22. A multifunctional molecule, comprising:
(i) a first antigen binding domain that binds to T cell receptor beta chain constant domain 1 (TRBC1), and
(ii) a second antigen binding domain that binds to NKp30,
wherein the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 3A-3B or 4 (e.g., any of SEQ ID NOs: B001-B095), or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[001203] A23. The multifunctional molecule of embodiment A22, wherein the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed herein.

[001204] A24. A multifunctional molecule, comprising:
(i) a first antigen binding domain that binds to T cell receptor beta chain constant domain 1 (TRBC1), and
(ii) a second antigen binding domain that binds to NKp30,
wherein the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 8A-8B, 9, or 10 (e.g., any of SEQ ID NOs C001-C128): , or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[001205] A25. The multifunctional molecule of embodiment A24, wherein the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed herein.

[001206] A26. An antibody molecule that binds to TRBC2, comprising one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[001207] A27. An antibody molecule that binds to TRBC1, comprising one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 3A-3B or

4 (e.g., any of SEQ ID NOs: B001-B095), or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

[001208] A28. The multifunctional molecule of any of embodiments A1-A25 or the antibody molecule of embodiment A26 or A27, further comprising a heavy chain constant region variant, e.g., an Fc region variant, that comprises one or more mutations that result in reduced or ablated affinity for at least one Fc receptor, optionally wherein the one or more mutations result in reduced or ablated antibody dependent cell-mediated cytotoxicity (ADCC), Antibody-dependent cellular phagocytosis (ADCP), or complement dependent cytotoxicity (CDC).

[001209] A29. The multifunctional molecule of any of embodiments A1-A25 and A28, or the antibody molecule of any of embodiments A26-A28, wherein the Fc region variant comprises one or more mutations disclosed in Table 20, optionally wherein the Fc region variant comprises an N297A mutation.

[001210] A30. A nucleic acid molecule encoding the multifunctional molecule of any of embodiments multifunctional molecule of any of embodiments A1-A25, A28, and A29, or the antibody molecule of any of embodiments A26-A29.

[001211] A31. A vector, e.g., an expression vector, comprising the nucleic acid molecule of embodiment A30.

[001212] A32. A cell comprising the nucleic acid molecule of embodiment A30 or the vector of embodiment A31.

[001213] A33. A method of making, e.g., producing, the multifunctional molecule of any of embodiments A1-A25, A28, and A29 or the antibody molecule of any of embodiments A26-A29, comprising culturing the cell of embodiment A32, under suitable conditions, e.g., conditions suitable for gene expression and/or homo- or heterodimerization.

[001214] A34. A pharmaceutical composition comprising the multifunctional molecule of any of embodiments A1-A25, A28, and A29 or the antibody molecule of any of embodiments A26-A29 and a pharmaceutically acceptable carrier, excipient, or stabilizer.

[001215] A35. A method of treating a cancer, comprising administering to a subject in need thereof the multifunctional molecule of any of embodiments A1-A25, A28, and A29, wherein the multifunctional molecule is administered in an amount effective to treat the cancer.

[001216] A36. The method of embodiment A35, further comprising identifying, evaluating, or selecting a subject in need of treatment, wherein identifying, evaluating, or selecting comprises determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC1 or TRBC2.

[001217] A37. The method of embodiment A35, further comprising, responsive to determining that a subject has cancer cells that express a T cell receptor comprising TRBC1 or TRBC2:
optionally, selecting the subject for treatment with a multifunctional molecule comprising an antigen

binding domain that binds to a T cell receptor comprising TRBC1 or TRBC2, and administering a multifunctional molecule comprising an antigen binding domain that binds to a T cell receptor comprising TRBC1 or TRBC2.

[001218] A38. A method of treating a cancer, e.g., a lymphoma or leukemia, e.g., a T cell lymphoma or leukemia, comprising:

responsive to a determination that a subject has cancer cells that express a T cell receptor comprising TRBC2, administering to the subject the multifunctional molecule of any of embodiments A1-A25, A28, and A29, wherein the multifunctional molecule is administered in an amount effective to treat the cancer.

Exemplary Embodiment 7

[001219] 1. A method of identifying a subject in need of treatment for cancer, e.g., a lymphoma or leukemia, e.g., a T cell lymphoma or leukemia, using the multifunctional molecule of any of embodiments 1-21D, 23, or 24, comprising determining (e.g., directly determining or indirectly determining, e.g., obtaining information regarding) whether a subject has cancer cells that express a T cell receptor comprising TRBC2, wherein:

responsive to a determination that the subject has cancer cells that express a T cell receptor comprising TRBC2, identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, and optionally not as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1.

[001220] 2. The method of embodiment 1, further comprising:

responsive to identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, treating the subject with (e.g., administering to the subject) a multifunctional molecule as described herein.

[001221] 3. The method of embodiment 1 or 2, wherein the cancer is leukemia or lymphoma.

[001222] 4. The method of any of embodiments 1-3, wherein the cancer is selected from Acquired immune deficiency syndrome (AIDS)-associated lymphoma, Angioimmunoblastic T-cell lymphoma, Adult T-cell leukemia/lymphoma, Burkitt lymphoma, Central nervous system (CNS) lymphoma, Diffuse large B-cell lymphoma (DLBCL), Lymphoblastic lymphoma, Mantle cell lymphoma (MCL), Peripheral T-cell lymphoma (PTCL) (e.g., Hepatosplenic T-cell lymphoma (HSGDTCL), Subcutaneous paniculitis-like T-cell lymphoma, or Enteropathy-associated T-cell lymphoma), Transformed follicular and transformed mucosa-associated lymphoid tissue (MALT) lymphomas, Cutaneous T-cell lymphoma (mycosis fungoides and Sézary syndrome), Follicular lymphoma, Lymphoplasmacytic lymphoma/Waldenström macroglobulinemia, Marginal zone B-cell lymphoma, Gastric mucosa-associated lymphoid tissue (MALT) lymphoma, Chronic lymphocytic leukemia/small-cell lymphocytic lymphoma (CLL/SLL), Extranodal T-/NK-cell lymphoma (nasal

type), and Anaplastic large-cell lymphoma (e.g., primary cutaneous anaplastic large-cell lymphoma or systemic anaplastic large-cell lymphoma).

[001223] 5. The method of any of embodiments 1-4, wherein the cancer is Peripheral T-cell lymphoma (PTCL).

[001224] 6. A method of detecting TRBC1 or TRBC2 in a sample or subject, comprising:
contacting the sample or subject with an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein; and
detecting formation of a complex between the antibody molecule and the sample or subject,
thereby detecting TRBC1 or TRBC2.

[001225] 7. The method of embodiment 6, wherein TRBC1 or TRBC2 is detected *in vitro* or *in vivo*.

[001226] 8. The method of embodiment 6 or 7, further comprising contacting a reference sample or subject with the antibody molecule; and detecting formation of a complex between the antibody molecule and the reference sample or subject, wherein a change, e.g., a statistically significant change, in the formation of the complex in the sample or subject, relative to the reference sample or subject is indicative of the presence of TRBC1 or TRBC2 in the sample or subject.

[001227] 9. The method of any of embodiments 6-8, further comprising obtaining a sample from a subject.

[001228] 10. The method of any of embodiment 6-9, wherein sample comprises one or more of plasma, tissue (e.g., cancerous tissue), biopsy, blood (e.g., whole blood), PBMCs, bone marrow, and/or lymphatic tissue, e.g., lymph node.

[001229] 11. The method of any of embodiments 6-10, wherein the sample has not been frozen and/or fixed.

[001230] 12. The method of any of embodiments 6-10, wherein the sample has been frozen (e.g., snap frozen) and/or fixed (e.g., formalin-fixed paraffin-embedded (FFPE)).

[001231] 13. The method of any of embodiments 6-12, wherein the subject has, or is at risk of having, a disease or disorder described herein (e.g., cancer, e.g., a lymphoma, e.g., a T cell lymphoma).

[001232] 14. The method of any of embodiments 6-13, further comprising performing a flow analysis, e.g., using a multi-panel method.

[001233] 15. The method of any of embodiments 6-14, further comprising assessing T-cell clonality, e.g., to determine the presence and/or level of T cell malignancy.

[001234] 16. The method of any of embodiments 6-15, further comprising measuring the level of TRBC1+ or TRBC2+ cells from the biological sample (e.g., determining if TRBC1+ or TRBC2+ cells are depleted, e.g., relative to a reference sample or subject).

[001235] 17. The method of any of embodiments 6-16, further comprising measuring the intracellular level of TRBC1 or TRBC2.

[001236] 18. The method of any of embodiments 6-17, further comprising measuring the membrane

level of TRBC1 or TRBC2.

[001237] 19. The method of any of embodiments 6-18, further comprising evaluating the subject for a change in prognosis, severity, or presence or absence of a disease or disorder (e.g., cancer), e.g., after treatment (e.g., with an antibody molecule described herein).

[001238] 20. The method of any of embodiments 6-19, wherein the antibody molecule is detectably labeled.

[001239] 21. A method of evaluating a subject, comprising:

contacting a sample (e.g., a sample described herein) from the subject with an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein; and

detecting formation of a complex between the antibody molecule and the sample,

thereby evaluating the subject.

[001240] 22. The method of embodiment 21, wherein the subject has, or is at risk of having, a disease or disorder described herein (e.g., cancer, e.g., a lymphoma, e.g., a T cell lymphoma).

[001241] 23. The method of embodiment 21 or 22, wherein the subject has not been treated with an antibody molecule described herein.

[001242] 24. The method of embodiment 21 or 22, wherein the subject has been treated with an antibody molecule described herein.

[001243] 25. A kit comprising an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein and instructions for use in a method of detecting TRBC1 or TRBC2 in a sample or subject.

CLAIMS

WHAT IS CLAIMED IS:

1. A method of identifying a subject in need of treatment for cancer using a composition comprising a polypeptide molecule comprising:

(i) a first antigen binding domain that binds to T cell receptor beta chain constant domain 1 (TRBC1) or T cell receptor beta chain constant domain 2 (TRBC2), and

(ii) a second antigen binding domain that binds to NKp30,

comprising determining whether a subject has cancer cells that express a T cell receptor comprising TRBC2, wherein:

a determination that the subject has cancer cells that express a T cell receptor comprising TRBC2 identifies the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, and optionally identifies the subject as not being as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC1.

2. The method of claim 1, wherein the polypeptide molecule is a multifunctional polypeptide molecule.

3. The method of claim 1 or 2, wherein the polypeptide molecule is a multispecific polypeptide molecule.

4. The method of any one of claims 1-3, wherein the first antigen binding domain binds to T cell receptor beta chain constant domain 2 (TRBC2), and the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto

5. The method of any one of claims 1-4, wherein the first antigen binding domain binds to T cell receptor beta chain constant domain 2 (TRBC2), and the first antigen binding domain comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3, wherein:

the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of SEQ ID NOs: 7441, 201, and 7442, respectively; or

the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of SEQ ID NOs: 7443, 224, and 225, respectively.

6. The method of claim 5, wherein the VHCDR1, VHCDR2, and VHCDR3 comprise the amino acid sequences of:

SEQ ID NOs: 7422, 201, and 7403, respectively;

SEQ ID NOs: 7401, 201, and 7403, respectively;

SEQ ID NOs: 7394, 201, and 7396, respectively;

SEQ ID NOs: 7346, 201, and 7398, respectively;

SEQ ID NOs: 7346, 201, and 7400, respectively;

SEQ ID NOs: 7405, 201, and 7403, respectively;

SEQ ID NOs: 7407, 201, and 7403, respectively;

SEQ ID NOs: 7427, 201, and 7403, respectively; or

SEQ ID NOs: 7430, 201, and 7403, respectively.

7. The method of claim 5 or 6, wherein the VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of:

SEQ ID NOs: 7410, 224, and 225, respectively; or

SEQ ID NOs: 7409, 224, and 225, respectively.

8. The method of any one of claims 5-7, wherein the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 comprise the amino acid sequences of:

SEQ ID NOs: 7422, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7401, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7394, 201, 7396, 7410, 224, and 225, respectively;

SEQ ID NOs: 7346, 201, 7398, 7410, 224, and 225, respectively;

SEQ ID NOs: 7346, 201, 7400, 7410, 224, and 225, respectively;

SEQ ID NOs: 7405, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7407, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7427, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7430, 201, 7403, 7410, 224, and 225, respectively;

SEQ ID NOs: 7422, 201, 7403, 7409, 224, and 225, respectively;

SEQ ID NOs: 7401, 201, 7403, 7409, 224, and 225, respectively;

SEQ ID NOs: 7394, 201, 7396, 7409, 224, and 225, respectively;

SEQ ID NOs: 7346, 201, 7398, 7409, 224, and 225, respectively;

SEQ ID NOs: 7346, 201, 7400, 7409, 224, and 225, respectively;

SEQ ID NOs: 7405, 201, 7403, 7409, 224, and 225, respectively;

SEQ ID NOs: 7407, 201, 7403, 7409, 224, and 225, respectively;

SEQ ID NOs: 7427, 201, 7403, 7409, 224, and 225, respectively; or

SEQ ID NOs: 7430, 201, 7403, 7409, 224, and 225, respectively.

9. The method of any one of claims 5-8, wherein the VH comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7420, 7423, 7411, 7412, 7413, 7414, 7415, 7416, 7417, 7425, 7428, and 7431 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7419 and 7418 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

10. The method of any one of claims 5-9, wherein the VH and VL comprise the amino acid sequences of:

SEQ ID NOs: 7420 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7423 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7411 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7412 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7413 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7414 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7415 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7416 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7417 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7425 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7428 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7431 and 7419, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7420 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7423 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7411 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7412 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7413 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7414 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7415 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7416 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7417 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7425 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or

SEQ ID NOs: 7428 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NOs: 7431 and 7418, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

11. The method of any one of claims 1-10, wherein the first antigen binding domain binds to T cell receptor beta chain constant domain 2 (TRBC2), and wherein:

(i) the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor not comprising TRBC2, optionally wherein the KD for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the KD for the binding between the first antigen binding domain and a T cell receptor not comprising TRBC2;

(ii) the first antigen binding domain has a higher affinity for a T cell receptor comprising TRBC2 than for a T cell receptor comprising TRBC1, optionally wherein the K_D for the binding between the first antigen binding domain and TRBC2 is no more than 40%, 30%, 20%, 10%, 1%, 0.1%, or 0.01% of the K_D for the binding between the first antigen binding domain and a T cell receptor comprising TRBC1; or

(iii) binding of the first antigen binding domain to TRBC2 on a lymphoma cell or lymphocyte, does not appreciably activate the lymphoma cell or lymphocyte expression of a T cell activation marker, and/or expression of a cytokine.

12. The method of any one of claims 1-11, wherein the first antigen binding domain binds to T cell receptor beta chain constant domain 2 (TRBC2), and the polypeptide molecule binds to TRBC2 monovalently.

13. The method of any one of claims 1-12, wherein the polypeptide molecule comprises a configuration shown in any of FIGs. 30A-30D, optionally wherein:

(i) the polypeptide molecule comprises an anti-TRBC2 Fab and an anti-NKp30 scFv;

(ii) the polypeptide molecule comprises an anti-TRBC2 Fab and an anti-NKp30 Fab;

(iii) the polypeptide molecule comprises an anti-NKp30 Fab and an anti-TRBC2 scFv; or

(iv) the polypeptide molecule comprises an anti-TRBC2 scFv and an anti-NKp30 scFv.

14. The method of any one of claims 1-13, wherein the polypeptide molecule further comprises a dimerization module comprising one or more immunoglobulin chain constant regions comprising one or more of: a paired cavity-protuberance ("knob-in-a hole"), an electrostatic interaction, or a strand-exchange.

15. The method of any one of claims 1-14, wherein the polypeptide molecule comprises an anti-TRBC2 amino acid sequence disclosed in any of Tables 21-25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto, and/or an anti-NKp30 amino acid sequence disclosed in any one of Tables 7, 8, 8A, 8B, 9, 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

16. The method of any one of claims 1-15, wherein the polypeptide molecule comprises:

(i) an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

(ii) an anti-TRBC2 VH of SEQ ID NO: 7420 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or

(iii) SEQ ID NOs: 7438, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

17. The method of any one of claims 1-15, wherein the polypeptide molecule comprises:

(i) an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-NKp30 VH of SEQ ID NO: 7302 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 VL of SEQ ID NO: 7309 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

(ii) an anti-TRBC2 VH of SEQ ID NO: 7423 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), an anti-TRBC2 VL of SEQ ID NO: 7419 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto), and an anti-NKp30 scFv of SEQ ID NO: 7311 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or

(iii) SEQ ID NOs: 7440, 7439, and 7383 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

18. The method of any one of claims 1-3, wherein the first antigen binding domain binds to T cell receptor beta chain constant domain 1 (TRBC1), and wherein the first antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any of Tables 3A-3B or 4, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

19. The method of any one of claims 1-3, wherein the first antigen binding domain binds to T cell receptor beta chain constant domain 1 (TRBC1), and wherein the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any one of Tables 8A-8B, 9, and 10, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

20. The method of any one of claims 1-19, wherein the second antigen binding domain comprises one or more CDRs, framework regions, variable regions, or antigen binding domains disclosed in any one of Tables 7, 8, 8A, 8B, 9, 10, 18, and 25, or a sequence having at least 85%, 90%, 95%, or 99% identity thereto.

21. The method of any one of claims 1-20, wherein the second antigen binding domain comprises a VH comprising a heavy chain complementarity determining region 1 (VHCDR1), a VHCDR2, and a VHCDR3, and a VL comprising a light chain complementarity determining region 1 (VLCDR1), a VLCDR2, and a VLCDR3, wherein the VHCDR1, VHCDR2, and VHCDR3 of the second antigen binding domain comprise the amino acid sequences of:

SEQ ID NOs: 7313, 6001, and 7315, respectively;
SEQ ID NOs: 7313, 6001, and 6002, respectively;
SEQ ID NOs: 7313, 6008, and 6009, respectively;
SEQ ID NOs: 7313, 7385, and 7315, respectively;
SEQ ID NOs: 7313, 7318, and 6009, respectively;
SEQ ID NOs: C019, C021, and C023, respectively;
SEQ ID NOs: C033, C035, and C037, respectively;
SEQ ID NOs: C047, C049, and C051, respectively;
SEQ ID NOs: C061, C063, and C065, respectively;
SEQ ID NOs: C075, C077, and C079, respectively;
SEQ ID NOs: C089, C091, and C093, respectively;
SEQ ID NOs: C103, C105, and C107, respectively; or
SEQ ID NOs: C116, C118, and C120, respectively.

22. The method of claim 21, wherein the VLCDR1, VLCDR2, and VLCDR3 of the second antigen binding domain comprise the amino acid sequences of:

SEQ ID NOs: 7326, 7327, and 7329, respectively;

SEQ ID NOs: 6063, 6064, and 7293, respectively;

SEQ ID NOs: 6070, 6071, and 6072, respectively;

SEQ ID NOs: 6070, 6064, and 7321, respectively;

SEQ ID NOs: C026, C028, and C030, respectively;

SEQ ID NOs: C040, C042, and C044, respectively;

SEQ ID NOs: C054, C056, and C058, respectively;

SEQ ID NOs: C068, C070, and C072, respectively;

SEQ ID NOs: C082, C084, and C086, respectively;

SEQ ID NOs: C096, C098, and C100, respectively;

SEQ ID NOs: C110, C112, and C113, respectively; or

SEQ ID NOs: C123, C125, and C127, respectively.

23. The method of claim 21 or 22, wherein the VHCDR1, VHCDR2, VHCDR3, VLCDR1, VLCDR2, and VLCDR3 of the second antigen binding domain comprise the amino acid sequences of:

SEQ ID NOs: 7313, 6001, 7315, 7326, 7327, and 7329, respectively;

SEQ ID NOs: 7313, 6001, 6002, 6063, 6064, and 7293, respectively;

SEQ ID NOs: 7313, 6008, 6009, 6070, 6071, and 6072, respectively;

SEQ ID NOs: 7313, 7385, 7315, 6070, 6064, and 7321, respectively;

SEQ ID NOs: 7313, 7318, 6009, 6070, 6064, and 7321, respectively;

SEQ ID NOs: C019, C021, C023, C026, C028, and C030, respectively;

SEQ ID NOs: C033, C035, C037, C040, C042, and C044, respectively;

SEQ ID NOs: C047, C049, C051, C054, C056, and C058, respectively;

SEQ ID NOs: C061, C063, C065, C068, C070, and C072, respectively;

SEQ ID NOs: C075, C077, C079, C082, C084, and C086, respectively;

SEQ ID NOs: C089, C091, C093, C096, C098, and C100, respectively;

SEQ ID NOs: C103, C105, C107, C110, C112, and C113, respectively; or

SEQ ID NOs: C116, C118, C120, C123, C125, and C127, respectively.

24. The method of any one of claims 21-23, wherein:

(i) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7302, 7298, 7300, 7301, 7303, and 7304 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 7309, 7305, 7299, and 7306-7308 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

(ii) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6121 and 6123-6128 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an

amino acid sequence selected from the group consisting of SEQ ID NOs: 7294 or 6137-6141 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or

(iii) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6122 and 6129-6134 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: 6136 or 6142-6147 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or

(iv) the VH of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: C001-C008 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto) and/or the VL of the second antigen binding domain comprises an amino acid sequence selected from the group consisting of SEQ ID NOs: C009-C016 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

25. The method of any one of claims 21-24, wherein the VH and VL of the second antigen binding domain comprise the amino acid sequences of:

SEQ ID NOs: 7302 and 7309, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or

SEQ ID NOs: 7302 and 7305, respectively (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto).

26. The method of any one of claims 21-25, wherein the second antigen binding domain comprise the amino acid sequences of:

SEQ ID NO: 7311 or 7310 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NO: 6187 or 6188 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto);

SEQ ID NO: 6189 or 6190 (or a sequence having at least 85%, 90%, 95%, or 99% identity thereto); or

any of SEQ ID NOs: C017-C024.

27. The method of any one of claims 1-26, further comprising:

responsive to identifying the subject as a candidate for treatment using a multifunctional molecule comprising an antigen binding domain that binds to TRBC2, treating the subject with a multifunctional molecule as described herein.

28. The method of any one of claims 1-27, wherein the cancer is leukemia or lymphoma.

29. The method of any one of claims 1-28, wherein the cancer is selected from Acquired immune deficiency syndrome (AIDS)-associated lymphoma, Angioimmunoblastic T-cell lymphoma, Adult T-cell leukemia/lymphoma, Burkitt lymphoma, Central nervous system (CNS) lymphoma, Diffuse large

B-cell lymphoma (DLBCL), Lymphoblastic lymphoma, Mantle cell lymphoma (MCL), Peripheral T-cell lymphoma (PTCL), Transformed follicular and transformed mucosa-associated lymphoid tissue (MALT) lymphomas, Cutaneous T-cell lymphoma (mycosis fungoides and Sézary syndrome), Follicular lymphoma, Lymphoplasmacytic lymphoma/Waldenström macroglobulinemia, Marginal zone B-cell lymphoma, Gastric mucosa-associated lymphoid tissue (MALT) lymphoma, Chronic lymphocytic leukemia/small-cell lymphocytic lymphoma (CLL/SLL), Extranodal T-/NK-cell lymphoma (nasal type), and Anaplastic large-cell lymphoma.

30. The method of any one of claims 1-29, wherein the cancer is Peripheral T-cell lymphoma (PTCL).

31. A method of detecting TRBC1 or TRBC2 in a sample or subject, comprising:

contacting the sample or subject with an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein; and

detecting formation of a complex between the antibody molecule and the sample or subject, thereby detecting TRBC1 or TRBC2.

32. The method of claim 31, wherein TRBC1 or TRBC2 is detected *in vitro* or *in vivo*.

33. The method of claim 31 or 32, further comprising contacting a reference sample or subject with the antibody molecule; and detecting formation of a complex between the antibody molecule and the reference sample or subject, wherein a change in the formation of the complex in the sample or subject, relative to the reference sample or subject is indicative of the presence of TRBC1 or TRBC2 in the sample or subject.

34. The method of any one of claims 31-33, further comprising obtaining a sample from a subject.

35. The method of any one of claims 31-34, wherein the sample comprises one or more of plasma, tissue, biopsy, blood, PBMCs, bone marrow, and/or lymphatic tissue.

36. The method of any one of claims 31-35, wherein the sample has not been frozen and/or fixed.

37. The method of any one of claims 31-35, wherein the sample has been frozen and/or fixed.

38. The method of any one of claims 31-37, wherein the subject has, or is at risk of having, a disease or disorder described herein .

39. The method of any one of claims 31-38, further comprising performing a flow analysis.

40. The method of any one of claims 31-39, further comprising assessing T-cell clonality.

41. The method of any one of claims 31-40, further comprising measuring the level of TRBC1+ or TRBC2+ cells from the biological sample.

42. The method of any one of claims 31-41, further comprising measuring the intracellular level of TRBC1 or TRBC2.

43. The method of any one of claims 31-42, further comprising measuring the membrane level of TRBC1 or TRBC2.

44. The method of any one of claims 31-43, further comprising evaluating the subject for a change in prognosis, severity, or presence or absence of a disease or disorder.

45. The method of any one of claims 31-44, wherein the antibody molecule is detectably labeled.

46. A method of evaluating a subject, comprising:

contacting a sample from the subject with an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein; and

detecting formation of a complex between the antibody molecule and the sample,

thereby evaluating the subject.

47. The method of claim 46, wherein the subject has, or is at risk of having, a disease or disorder described herein.

48. The method of claim 46 or 47, wherein the subject has not been treated with an antibody molecule described herein.

49. The method of claim 46 or 47, wherein the subject has been treated with an antibody molecule described herein.

50. A kit comprising an anti-TRBC1 antibody molecule described herein or an anti-TRBC2 antibody molecule described herein and instructions for use in a method of detecting TRBC1 or TRBC2 in a sample or subject.

51. A method of identifying a subject in need of treatment for cancer comprising determining that a peripheral blood mononuclear cell (PBMC)-derived T cell population obtained from the subject has a monotypia and specificity for TRBC1 or TRBC2,

wherein the monotypia and specificity for TRBC1 or TRBC2 in the PBMC-derived T cell population indicates that the subject has a T cell malignancy, thereby identifying the subject as a candidate for treatment for the cancer.