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(54) Title: COMPOSITIONS AND METHODS FOR THE MODULATION OF BETA CHAIN-MEDIATED IMMUNITY

(57) Abstract: Anti-Vβ17 antibodies or antigen binding fragments thereof are described. Also described are nucleic acids encoding the antibodies, compositions comprising the antibodies, methods of producing the antibodies, and methods of using the antibodies for treating or preventing diseases.

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COMPOSITIONS AND METHODS FOR THE MODULATION OF BETA CHAIN-MEDIATED IMMUNITY

CROSS REFERENCE TO RELATED APPLICATION

5 **[0001]** This application claims the benefit of U.S. Provisional Patent Application No. 63/274,430, filed November 1, 2021, U.S. Provisional Patent Application No. 63/274,446, filed November 1, 2021, and U.S. Provisional Patent Application No. 63/274,449, filed November 1, 2021, the disclosures of which are incorporated by reference herein in their entireties.

REFERENCE TO SEQUENCE LISTING SUBMITTED ELECTRONICALLY

10 **[0002]** This application contains a sequence listing, which is submitted electronically. The content of the electronic sequence listing (065768-135WO1_Sequence Listing.xml; size: 512,333 bytes; and date of creation: October 31, 2022) is herein incorporated by reference in its entirety.

FIELD

15 **[0003]** Provided herein, in certain aspects, are antibodies that bind to V β 17, as well as recombinant cells containing the vectors, and compositions comprising the antibodies. Methods of making and using the antibodies are also provided.

SUMMARY

20 **[0004]** In one aspect, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a heavy chain variable region (VH) comprising a VH complementarity determining region 1 (CDR1), a VH CDR2, and a VH CDR3 having the amino acid sequences of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:31; and a light chain variable region (VL) comprising a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:32.

25 **[0005]** In another aspect, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:65; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:66.

[0006] In one embodiment, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:99; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:100.

[0007] In another embodiment, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:133; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:134.

[0008] In one aspect, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:167; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:168.

[0009] In another aspect, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:201; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:202.

[0010] In one embodiment, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:235; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:236.

[0011] In another embodiment, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:269; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:270.

[0012] In one aspect, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:303; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:304.

[0013] In another aspect, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:337; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:338.

[0014] In one embodiment, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:371; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:372.

[0015] In another embodiment, the disclosure provides an antibody that binds V β 17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:405; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:406.

[0016] In one aspect, the disclosure provides an antibody that binds Vβ17 comprising a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:439; and a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:440.

[0017] The disclosure also provides an antibody, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Kabat numbering system.

[0018] The disclosure also provides an antibody, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Chothia numbering system.

[0019] The disclosure also provides an antibody, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the AbM numbering system.

[0020] The disclosure also provides an antibody, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Contact numbering system.

[0021] The disclosure also provides an antibody, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the IMGT numbering system.

[0022] The disclosure also provides an antibody, wherein the antibody is a humanized antibody.

[0023] The disclosure also provides an antibody, wherein the antibody is an IgG antibody.

The disclosure also provides an antibody, wherein the IgG antibody is an IgG1, IgG2, IgG3, or IgG4 antibody.

[0024] The disclosure also provides an antibody, wherein the antibody comprises a kappa light chain. The disclosure also provides an antibody, wherein the antibody comprises a lambda light chain.

[0025] The disclosure also provides an antibody, wherein the antibody is a monoclonal antibody.

[0026] The disclosure also provides an antibody, wherein the antibody binds a V β 17 antigen. The disclosure also provides an antibody, wherein antibody binds a V β 17 epitope.

[0027] The disclosure also provides an antibody, wherein the antibody specifically binds to V β 17.

5 [0028] The disclosure also provides an antibody, wherein the antibody is multivalent. The disclosure also provides an antibody, wherein the antibody is capable of binding at least three antigens. The disclosure also provides an antibody, wherein the antibody is capable of binding at least four antigens. The disclosure also provides an antibody, wherein the antibody is capable of binding at least five antigens.

10 [0029] The disclosure also provides an antibody, wherein the antibody is a multispecific antibody. The disclosure also provides an antibody, wherein the antibody is a bispecific antibody. The disclosure also provides an antibody, wherein the antibody is a trispecific antibody. The disclosure also provides an antibody, wherein the antibody is a quadraspecific antibody.

15 [0030] In one aspect, the disclosure provides a nucleic acid encoding the antibody disclosed herein.

[0031] In one aspect, the disclosure provides a vector comprising the nucleic acid disclosed herein.

20 [0032] In one aspect, the disclosure provides a host cell comprising the vector disclosed herein.

[0033] In one aspect, the disclosure provides a kit comprising the vector disclosed herein and instructions for using the vector. In one aspect, the disclosure provides a kit comprising the antibody disclosed herein and instructions for using the antibody.

25 [0034] In one aspect, the disclosure provides a pharmaceutical composition comprising the antibody disclosed herein, and a pharmaceutically acceptable carrier.

[0035] In one aspect, the disclosure provides a method of producing the pharmaceutical composition disclosed herein, comprising combining the antibody with a pharmaceutically acceptable carrier to obtain the pharmaceutical composition.

30 [0036] In one aspect, the disclosure provides a method of activating a T cell expressing V β 17, comprising contacting the antibody disclosed herein with the T cell expressing V β 17.

[0037] The disclosure also provides a method, wherein the contacting increases CD69, CD25, and/or Granzyme B expression, as compared to a T cell expressing V β 17 that is not contacted with the antibody disclosed herein.

[0038] In one aspect, the disclosure provides a process for making an antibody that binds to more than one target molecule, the process comprising: a step for performing a function of obtaining a first binding domain that binds to V β 17 present on a T cell; a step for performing a function of obtaining a second binding domain that binds to a second target on the surface of a target cell; and a step for performing a function of providing an antibody that binds to V β 17 present on a T cell and a second target on the surface of a target cell.

[0039] The disclosure also provides a process, wherein the step for performing a function of obtaining a second binding domain that binds to a second target on the surface of a target cell is repeated n times, and further comprising n steps for performing a function of providing a first binding domain that binds to V β 17 present on a T cell and n number of target molecules, wherein n is at least 2.

[0040] In one aspect, the disclosure provides a process for making the antibody disclosed herein, the process comprising growing the host cell disclosed herein under conditions to produce the antibody. In another aspect, the method further comprises isolating the antibody.

[0041] In one aspect, the disclosure provides a method of directing a T cell expressing V β 17 to a target cell, comprising contacting the antibody disclosed herein with the target cell, wherein a second target is present on the surface of the target cell, and wherein the contacting directs the T cell to the target cell.

[0042] In one aspect, the disclosure provides a method of inhibiting the growth or proliferation of a target cell, comprising contacting the antibody disclosed herein with the target cell having a second target present on the surface of the target cell, wherein the contacting is in the presence of a T cell expressing the V β 17, and wherein the contacting results in the inhibition of the growth or proliferation of the target cell.

[0043] In one aspect, the disclosure provides a method of eliminating a target cell in a subject, comprising contacting the antibody disclosed herein with the target cell having a second target present on the surface of the target cell, wherein the contacting is in the presence of a T cell expressing the V β 17, and wherein the contacting results in the elimination of the target cell.

[0044] In one aspect, the disclosure provides a method of treating a disease in a subject, comprising administering an effective amount of the antibody disclosed herein to the subject, wherein the disease is caused all or in part by a target cell having a second target present on the surface of the target cell. In another embodiment, the subject is a human. In one embodiment, the subject is a subject in need thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0045] The foregoing summary, as well as the following detailed description of specific embodiments of the present application, will be better understood when read in conjunction with the appended drawings. It should be understood, however, that the application is not limited to the precise embodiments shown in the drawings.

[0046] **FIG. 1** shows several monoclones with specific binding to V β 17 identified by flow-cytometry using different cell lines and primary cells.

[0047] **FIG. 2** shows 26 monoclones induce proliferation in V β 17+ cells.

[0048] **FIG. 3** shows differential proliferation kinetics observed for 26 purified antibodies.

[0049] **FIG. 4** shows differential CD71 upregulation kinetics observed for 26 purified antibodies.

[0050] **FIG. 5** shows the 10 best agonistic monoclones binding specifically to V β 17 using SKW3 cell line variants.

[0051] **FIG. 6** shows 10 purified V β 17 antibodies bind well to PBMCs.

[0052] **FIG. 7** shows 10 shortlisted monoclones differ in isotypes based on their hybrid parent.

[0053] **FIG. 8** shows an internalization assay used to screen the 10 shortlisted antibodies. Monoclones from 28B2 parent shows good internalization. Monoclones from 28C9, which had agonistic properties, shows poor internalization. Monoclones from parent 28D2 and 14H7 show no internalization.

[0054] **FIGS. 9A-9C** show an epitope binning matrix for the 10 shortlisted antibodies using Octet RED966. Purified monoclonal antibodies from 3 different parents bin to 3 different groups (**FIG. 9B**).

[0055] **FIGS. 10A-10C** show the 10 shortlisted antibodies bin differently compared to a commercial antibody (TCR V β 17-PE; Beckman coulter, catalogue no. IM2048) serving as a positive control.

[0056] FIG. 11 shows monoclones from the same parent have the same VH sequence. Heavy chain sequences of monoclones belonging to 3 different hybrids were diverse from each other.

[0057] FIG. 12 shows monoclones from the same parent have the same VK sequence. Light chain sequences of monoclones belonging to 3 different hybrids were diverse from each other.

5 [0058] FIG. 13 shows 12 new antibodies that had moderate agonistic properties and good PBMC binding.

[0059] FIGS. 14A-14C show monoclones from hybrid parent 23A9 bin similarly with positive control antibody TCRV β 17-PE.

[0060] FIGS. 15A-15C show monoclones from parent 23A9 and positive control TCRV β 17-PE bin differently to monoclones from other hybrid parents.

10 [0061] FIG. 16 shows that most monoclones do not compete with positive control TCRV β 17 to bind cells expressing V β 17.

DETAILED DESCRIPTION

[0062] Various publications, articles and patents are cited or described in the background and throughout the specification; each one of these references is herein incorporated by reference in its entirety. Discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is for the purpose of providing context for the invention. Such discussion is not an admission that any or all of these matters form part of the prior art with respect to any inventions disclosed or claimed.

20 [0063] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood to one of ordinary skill in the art to which this invention pertains. Otherwise, certain terms used herein have the meanings as set forth in the specification.

[0064] It must be noted that as used herein and in the appended claims, the singular forms “a,” “an,” and “the” include plural reference unless the context clearly dictates otherwise.

25 [0065] Unless otherwise stated, any numerical values, such as a concentration or a concentration range described herein, are to be understood as being modified in all instances by the term “about.” Thus, a numerical value typically includes $\pm 10\%$ of the recited value. For example, a concentration of 1 mg/mL typically includes 0.9 mg/mL to 1.1 mg/mL. Likewise, a concentration range of 1% to 10% (w/v) includes 0.9% (w/v) to 11% (w/v). As used herein, the use of a numerical range expressly includes all possible subranges, all individual numerical

values within that range, including integers within such ranges and fractions of the values unless the context clearly indicates otherwise.

[0066] Unless otherwise indicated, the term “at least” preceding a series of elements is to be understood to refer to every element in the series.

5 **[0067]** Those skilled in the art will recognize or be able to ascertain using no more than routine experimentation, many equivalents to the specific embodiments described herein. Such equivalents are intended to be encompassed by the invention.

[0068] As used herein, the terms “comprises,” “comprising,” “includes,” “including,” “has,” “having,” “contains” or “containing,” or any other variation thereof, will be understood to imply
10 the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers and are intended to be non-exclusive or open-ended. For example, a composition, a mixture, a process, a method, an article, or an apparatus that comprises a list of elements is not necessarily limited to only those elements but can include other elements not expressly listed or inherent to such composition, mixture, process, method, article, or apparatus.
15 Further, unless expressly stated to the contrary, “or” refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

[0069] As used herein, the conjunctive term “and/or” between multiple recited elements is
20 understood as encompassing both individual and combined options. For instance, where two elements are conjoined by “and/or,” a first option refers to the applicability of the first element without the second. A second option refers to the applicability of the second element without the first. A third option refers to the applicability of the first and second elements together. Any one of these options is understood to fall within the meaning, and therefore satisfy the
25 requirement of the term “and/or” as used herein. Concurrent applicability of more than one of the options is also understood to fall within the meaning, and therefore satisfy the requirement of the term “and/or.”

[0070] As used herein, the term “consists of,” or variations such as “consist of” or “consisting of,” as used throughout the specification and claims, indicate the inclusion of any
30 recited integer or group of integers, but that no additional integer or group of integers can be added to the specified method, structure, or composition.

[0071] As used herein, the term “consists essentially of,” or variations such as “consist essentially of” or “consisting essentially of,” as used throughout the specification and claims, indicate the inclusion of any recited integer or group of integers, and the optional inclusion of any recited integer or group of integers that do not materially change the basic or novel
5 properties of the specified method, structure or composition.

[0072] As used herein, “subject” means any animal, preferably a mammal, most preferably a human. The term “mammal” as used herein, encompasses any mammal. Examples of mammals include, but are not limited to, cows, horses, sheep, pigs, cats, dogs, mice, rats, rabbits, guinea pigs, monkeys, humans, *etc.*. In a specific embodiments, the subject is a human.

10 [0073] It should also be understood that the terms “about,” “approximately,” “generally,” “substantially,” and like terms, used herein when referring to a dimension or characteristic of a component of embodiments provided herein, indicate that the described dimension/characteristic is not a strict boundary or parameter and does not exclude minor variations therefrom that are functionally the same or similar, as would be understood by one
15 having ordinary skill in the art. At a minimum, such references that include a numerical parameter would include variations that, using mathematical and industrial principles accepted in the art (*e.g.*, rounding, measurement or other systematic errors, manufacturing tolerances, *etc.*), would not vary the least significant digit.

20 [0074] The terms “identical” or percent “identity,” in the context of two or more nucleic acids or polypeptide sequences (*e.g.*, V β 17 antibody and polynucleotides that encode them, V β 17 polynucleotides that encode them), refer to two or more sequences or subsequences that are the same or have a specified percentage of amino acid residues or nucleotides that are the same, when compared and aligned for maximum correspondence, as measured using one of the following sequence comparison algorithms or by visual inspection.

25 [0075] For sequence comparison, typically one sequence acts as a reference sequence, to which test sequences are compared. When using a sequence comparison algorithm, test and reference sequences are input into a computer, subsequence coordinates are designated, if necessary, and sequence algorithm program parameters are designated. The sequence comparison algorithm then calculates the percent sequence identity for the test sequence(s)
30 relative to the reference sequence, based on the designated program parameters.

[0076] Optimal alignment of sequences for comparison can be conducted, *e.g.*, by the local homology algorithm of Smith & Waterman, *Adv. Appl. Math.* 2:482 (1981), by the homology alignment algorithm of Needleman & Wunsch, *J. Mol. Biol.* 48:443 (1970), by the search for similarity method of Pearson & Lipman, *Proc. Nat'l. Acad. Sci. USA* 85:2444 (1988), by
5 computerized implementations of these algorithms (GAP, BESTFIT, FASTA, and TFASTA in the Wisconsin Genetics Software Package, Genetics Computer Group, 575 Science Dr., Madison, WI), or by visual inspection (see generally, *Current Protocols in Molecular Biology*, F.M. Ausubel *et al.*, eds., *Current Protocols*, a joint venture between Greene Publishing Associates, Inc. and John Wiley & Sons, Inc., (1995 Supplement) (Ausubel)).

[0077] Examples of algorithms that are suitable for determining percent sequence identity and sequence similarity are the BLAST and BLAST 2.0 algorithms, which are described in Altschul *et al.* (1990) *J. Mol. Biol.* 215: 403-410 and Altschul *et al.* (1997) *Nucleic Acids Res.* 25: 3389-3402, respectively. Software for performing BLAST analyses is publicly available through the National Center for Biotechnology Information. This algorithm involves first
15 identifying high scoring sequence pairs (HSPs) by identifying short words of length W in the query sequence, which either match or satisfy some positive-valued threshold score T when aligned with a word of the same length in a database sequence. T is referred to as the neighborhood word score threshold (Altschul *et al.*, *supra*). These initial neighborhood word hits act as seeds for initiating searches to find longer HSPs containing them. The word hits are
20 then extended in both directions along each sequence for as far as the cumulative alignment score can be increased.

[0078] Cumulative scores are calculated using, for nucleotide sequences, the parameters M (reward score for a pair of matching residues; always > 0) and N (penalty score for mismatching residues; always < 0). For amino acid sequences, a scoring matrix is used to calculate the
25 cumulative score. Extension of the word hits in each direction are halted when: the cumulative alignment score falls off by the quantity X from its maximum achieved value; the cumulative score goes to zero or below, due to the accumulation of one or more negative-scoring residue alignments; or the end of either sequence is reached. The BLAST algorithm parameters W, T, and X determine the sensitivity and speed of the alignment. The BLASTN program (for
30 nucleotide sequences) uses as defaults a word length (W) of 11, an expectation (E) of 10, M=5, N=-4, and a comparison of both strands. For amino acid sequences, the BLASTP program uses

as defaults a word length (W) of 3, an expectation (E) of 10, and the BLOSUM62 scoring matrix (see Henikoff & Henikoff, Proc. Natl. Acad. Sci. USA 89:10915 (1989)).

[0079] In addition to calculating percent sequence identity, the BLAST algorithm also performs a statistical analysis of the similarity between two sequences (see, *e.g.*, Karlin & Altschul, Proc. Nat'l. Acad. Sci. USA 90:5873-5787 (1993)). One measure of similarity provided by the BLAST algorithm is the smallest sum probability (P(N)), which provides an indication of the probability by which a match between two nucleotide or amino acid sequences would occur by chance. For example, a nucleic acid is considered similar to a reference sequence if the smallest sum probability in a comparison of the test nucleic acid to the reference nucleic acid is less than about 0.1, more preferably less than about 0.01, and most preferably less than about 0.001.

[0080] A further indication that two nucleic acid sequences or polypeptides are substantially identical is that the polypeptide encoded by the first nucleic acid is immunologically cross reactive with the polypeptide encoded by the second nucleic acid, as described below. Thus, a polypeptide is typically substantially identical to a second polypeptide, for example, where the two peptides differ only by conservative substitutions. Another indication that two nucleic acid sequences are substantially identical is that the two molecules hybridize to each other under stringent conditions.

[0081] As used herein, the term "polynucleotide," synonymously referred to as "nucleic acid molecule," "nucleotides" or "nucleic acids," refers to any polyribonucleotide or polydeoxyribonucleotide, which can be unmodified RNA or DNA or modified RNA or DNA. "Polynucleotides" include, without limitation single- and double-stranded DNA, DNA that is a mixture of single- and double-stranded regions, single- and double-stranded RNA, and RNA that is mixture of single- and double-stranded regions, hybrid molecules comprising DNA and RNA that can be single-stranded or, more typically, double-stranded or a mixture of single- and double-stranded regions. In addition, "polynucleotide" refers to triple-stranded regions comprising RNA or DNA or both RNA and DNA. The term polynucleotide also includes DNAs or RNAs containing one or more modified bases and DNAs or RNAs with backbones modified for stability or for other reasons. "Modified" bases include, for example, tritylated bases and unusual bases such as inosine. A variety of modifications can be made to DNA and RNA; thus, "polynucleotide" embraces chemically, enzymatically or metabolically modified

forms of polynucleotides as typically found in nature, as well as the chemical forms of DNA and RNA characteristic of viruses and cells. "Polynucleotide" also embraces relatively short nucleic acid chains, often referred to as oligonucleotides.

[0082] As used herein, the term "vector" is a replicon in which another nucleic acid segment can be operably inserted so as to bring about the replication or expression of the segment.

[0083] As used herein, the term "host cell" refers to a cell comprising a nucleic acid molecule provided herein. The "host cell" can be any type of cell, *e.g.*, a primary cell, a cell in culture, or a cell from a cell line. In one embodiment, a "host cell" is a cell transfected with a nucleic acid molecule provided herein. In another embodiment, a "host cell" is a progeny or potential progeny of such a transfected cell. A progeny of a cell may or may not be identical to the parent cell, *e.g.*, due to mutations or environmental influences that can occur in succeeding generations or integration of the nucleic acid molecule into the host cell genome.

[0084] The term "expression" as used herein, refers to the biosynthesis of a gene product. The term encompasses the transcription of a gene into RNA. The term also encompasses translation of RNA into one or more polypeptides, and further encompasses all naturally occurring post-transcriptional and post-translational modifications. The expressed antibody can be within the cytoplasm of a host cell, into the extracellular milieu such as the growth medium of a cell culture or anchored to the cell membrane.

[0085] As used herein, the terms "peptide," "polypeptide," or "protein" can refer to a molecule comprised of amino acids and can be recognized as a protein by those of skill in the art. The conventional one-letter or three-letter code for amino acid residues is used herein. The terms "peptide," "polypeptide," and "protein" can be used interchangeably herein to refer to polymers of amino acids of any length. The polymer can be linear or branched, it can comprise modified amino acids, and it can be interrupted by non-amino acids. The terms also encompass an amino acid polymer that has been modified naturally or by intervention; for example, disulfide bond formation, glycosylation, lipidation, acetylation, phosphorylation, or any other manipulation or modification, such as conjugation with a labeling component. Also included within the definition are, for example, polypeptides containing one or more analogs of an amino acid (including, for example, unnatural amino acids, *etc.*), as well as other modifications known in the art.

[0086] The peptide sequences described herein are written according to the usual convention whereby the N-terminal region of the peptide is on the left and the C-terminal region is on the right. Although isomeric forms of the amino acids are known, it is the L-form of the amino acid that is represented unless otherwise expressly indicated.

5 *Antibodies*

[0087] Provided herein are V β 17 antibodies or antigen-binding fragments thereof, nucleic acids and expression vectors encoding the antibodies, recombinant cells containing the vectors, and compositions comprising the antibodies. Methods of making the antibodies, and methods of using the antibodies to treat diseases are also provided. The antibodies disclosed herein possess one or more desirable functional properties, including but not limited to high-affinity binding to V β 17 or high specificity to V β 17. In certain embodiments, the antibodies disclosed herein possess the ability to treat or prevent a disease or disorder when administered to a subject alone or in combination with other therapies.

[0088] As used herein, the term “antibody” is used in a broad sense and includes immunoglobulin or antibody molecules including human, humanized, composite and chimeric antibodies and antibody fragments that are monoclonal or polyclonal. In general, antibodies are proteins or peptide chains that exhibit binding specificity to a specific antigen. Antibody structures are well known. Immunoglobulins can be assigned to five major classes (*i.e.*, IgA, IgD, IgE, IgG and IgM), depending on the heavy chain constant domain amino acid sequence. IgA and IgG are further sub-classified as the isotypes IgA1, IgA2, IgG1, IgG2, IgG3 and IgG4. Accordingly, the antibodies provided herein can be of any of the five major classes or corresponding sub-classes. In specific embodiments, the antibodies provided herein are IgG1, IgG2, IgG3 or IgG4. Antibody light chains of vertebrate species can be assigned to one of two clearly distinct types, namely kappa and lambda, based on the amino acid sequences of their constant domains. Accordingly, the antibodies provided herein can, in certain embodiments, contain a kappa light chain constant domain. The antibodies provided herein can, in certain embodiments, also contain a lambda light chain constant domain. According to particular embodiments, the antibodies provided herein include heavy and/or light chain constant regions from rat or human antibodies. In specific embodiments, the constant region is a human constant region.

[0089] In addition to the heavy and light constant domains, antibodies contain an antigen-binding region that is made up of a light chain variable region (VL) and a heavy chain variable region (VH), each of which contains three domains (*i.e.*, complementarity determining regions 1 (CDR1), CDR2 and CDR3. A “CDR” refers to one of three hypervariable regions (HCDR1, HCDR2 or HCDR3) within the non-framework region of the immunoglobulin (Ig or antibody) VH β -sheet framework, or one of three hypervariable regions (LCDR1, LCDR2 or LCDR3) within the non-framework region of the antibody VL β -sheet framework. Accordingly, CDRs are variable region sequences interspersed within the framework region sequences. CDR regions are well known to those skilled in the art and have been defined by, for example, Kabat as the regions of most hypervariability within the antibody variable (V) domains (Kabat *et al.*, *J. Biol. Chem.* 252:6609-6616 (1977); Kabat, *Adv. Prot. Chem.* 32:1-75 (1978)). CDR region sequences also have been defined structurally by Chothia as those residues that are not part of the conserved β -sheet framework, and thus are able to adapt different conformations (Chothia and Lesk, *J. Mol. Biol.* 196:901-917 (1987)). Both terminologies are well recognized in the art. CDR region sequences have also been defined by AbM, Contact and IMGT. Exemplary CDR region sequences are illustrated herein, for example, in the tables provided below. The positions of CDRs within a canonical antibody variable region have been determined by comparison of numerous structures (Al-Lazikani *et al.*, *J. Mol. Biol.* 273:927-948 (1997); Morea *et al.*, *Methods* 20:267-279 (2000)). Because the number of residues within a hypervariable region varies in different antibodies, additional residues relative to the canonical positions are conventionally numbered with a, b, c and so forth next to the residue number in the canonical variable region numbering scheme (Al-Lazikani *et al.*, *supra* (1997)). Such nomenclature is similarly well known to those skilled in the art.

[0090] The light chain variable region CDR1 domain is interchangeably referred to herein as LCDR1 or VL CDR1. The light chain variable region CDR2 domain is interchangeably referred to herein as LCDR2 or VL CDR2. The light chain variable region CDR3 domain is interchangeably referred to herein as LCDR3 or VL CDR3. The heavy chain variable region CDR1 domain is interchangeably referred to herein as HCDR1 or VH CDR1. The heavy chain variable region CDR2 domain is interchangeably referred to herein as HCDR2 or VH CDR2. The heavy chain variable region CDR3 domain is interchangeably referred to herein as HCDR3 or VH CDR3.

[0091] The term “hypervariable region”, such as a VH or VL, when used herein refers to the regions of an antibody variable region that are hypervariable in sequence and/or form structurally defined loops. Generally, antibodies comprise six hypervariable regions; three in the VH (HCDR1, HCDR2, HCDR3), and three in the VL (LCDR1, LCDR2, LCDR3). A number of hypervariable region delineations are in use and are encompassed herein. The “Kabat” CDRs are based on sequence variability and are the most commonly used (see, *e.g.*, Kabat *et al.*, Sequences of Proteins of Immunological Interest, 5th Ed. Public Health Service, National Institutes of Health, Bethesda, MD. (1991)). “Chothia” refers instead to the location of the structural loops (see, *e.g.*, Chothia and Lesk, *J. Mol. Biol.* 196:901-917 (1987)). The end of the Chothia CDR-HCDR1 loop when numbered using the Kabat numbering convention varies between H32 and H34 depending on the length of the loop (this is because the Kabat numbering scheme places the insertions at H35A and H35B; if neither 35A nor 35B is present, the loop ends at 32; if only 35A is present, the loop ends at 33; if both 35A and 35B are present, the loop ends at 34). The “AbM” hypervariable regions represent a compromise between the Kabat CDRs and Chothia structural loops, and are used by Oxford Molecular’s AbM antibody modeling software (see, *e.g.*, Martin, in Antibody Engineering, Vol. 2, Chapter 3, Springer Verlag). “Contact” hypervariable regions are based on an analysis of the available complex crystal structures.

[0092] Recently, a universal numbering system has been developed and widely adopted, ImMunoGeneTics (IMGT) Information System[®] (Lafranc *et al.*, *Dev. Comp. Immunol.* 27(1):55-77 (2003)). IMGT is an integrated information system specializing in immunoglobulins (IG), T cell receptors (TR) and major histocompatibility complex (MHC) of human and other vertebrates. Herein, the CDRs are referred to in terms of both the amino acid sequence and the location within the light or heavy chain. As the “location” of the CDRs within the structure of the immunoglobulin variable domain is conserved between species and present in structures called loops, by using numbering systems that align variable domain sequences according to structural features, CDR and framework residues and are readily identified. This information can be used in grafting and replacement of CDR residues from immunoglobulins of one species into an acceptor framework from, typically, a human antibody. An additional numbering system (AHon) has been developed by Honegger and Plückthun, *J. Mol. Biol.* 309: 657-670 (2001). Correspondence between the numbering system, including, for example, the

Kabat numbering and the IMGT unique numbering system, is well known to one skilled in the art (see, *e.g.*, Kabat, *supra*; Chothia and Lesk, *supra*; Martin, *supra*; Lefranc *et al.*, *supra*). An Exemplary system, shown herein, combines Kabat and Chothia.

	Exemplary	IMGT	Kabat	AbM	Chothia	Contact
V _H CDR1	26-35	27-38	31-35	26-35	26-32	30-35
V _H CDR2	50-65	56-65	50-65	50-58	53-55	47-58
V _H CDR3	95-102	105-117	95-102	95-102	96-101	93-101
V _L CDR1	24-34	27-38	24-34	24-34	26-32	30-36
V _L CDR2	50-56	56-65	50-56	50-56	50-52	46-55
V _L CDR3	89-97	105-117	89-97	89-97	91-96	89-96

[0093] Hypervariable regions may comprise “extended hypervariable regions” as follows: 24-36 or 24-34 (LCDR1), 46-56 or 50-56 (LCDR2) and 89-97 or 89-96 (LCDR3) in the VL and 26-35 or 26-35A (HCDR1), 50-65 or 49-65 (HCDR2) and 93-102, 94-102, or 95-102 (HCDR3) in the VH. CDR sequences, reflecting each of the above numbering schemes, are provided herein, including in Tables 1-6.

[0094] The term “constant region” or “constant domain” refers to a carboxy terminal portion of the light and heavy chain which is not directly involved in binding of the antibody to antigen but exhibits various effector function, such as interaction with the Fc receptor. The terms refer to the portion of an immunoglobulin molecule having a more conserved amino acid sequence relative to the other portion of the immunoglobulin, the variable region, which contains the antigen binding site. The constant region may contain the CH1, CH2 and CH3 regions of the heavy chain and the CL region of the light chain.

[0095] The term “framework” or “FR” residues are those variable region residues flanking the CDRs. FR residues are present, for example, in chimeric, humanized, human, domain antibodies, diabodies, linear antibodies, and bispecific antibodies. FR residues are those variable domain residues other than the hypervariable region residues or CDR residues.

[0096] As used herein, the term an “isolated antibody” refers to an antibody which is substantially free of other antibodies having different antigenic specificities (*e.g.*, an isolated antibody that specifically binds to Vβ17 is substantially free of antibodies that do not bind to

Vβ17). In addition, an isolated antibody is substantially free of other cellular material and/or chemicals.

[0097] As used herein, the term “monoclonal antibody” refers to an antibody obtained from a population of substantially homogeneous antibodies, *i.e.*, the individual antibodies comprising the population are identical except for possible naturally occurring mutations that can be present in minor amounts. Monoclonal antibodies provided herein can be made by the hybridoma method, phage display technology, single lymphocyte gene cloning technology, or by recombinant DNA methods. For example, the monoclonal antibodies can be produced by a hybridoma which includes a B cell obtained from a transgenic nonhuman animal, such as a transgenic mouse or rat, having a genome comprising a human heavy chain transgene and a light chain transgene.

[0098] As used herein, the term “antigen-binding fragment” refers to an antibody fragment such as, for example, a diabody, a Fab, a Fab', a F(ab')₂, an Fv fragment, a disulfide stabilized Fv fragment (dsFv), a (dsFv)₂, a bispecific dsFv (dsFv-dsFv'), a disulfide stabilized diabody (ds diabody), a single-chain antibody molecule (scFv), a single domain antibody (sdAb) an scFv dimer (bivalent diabody), a multispecific antibody formed from a portion of an antibody comprising one or more CDRs, a camelized single domain antibody, a nanobody, a domain antibody, a bivalent domain antibody, or any other antibody fragment that binds to an antigen but does not comprise a complete antibody structure. An antigen-binding fragment is capable of binding to the same antigen to which the parent antibody or a parent antibody fragment binds. According to particular embodiments, the antigen-binding fragment comprises a light chain variable region, a light chain constant region, and an Fd segment of the heavy chain. According to other particular embodiments, the antigen-binding fragment comprises Fab and F(ab').

[0099] As used herein, the term “single-chain antibody” refers to a conventional single-chain antibody in the field, which comprises a heavy chain variable region and a light chain variable region connected by a short peptide of about 15 to about 20 amino acids. As used herein, the term “single domain antibody” refers to a conventional single domain antibody in the field, which comprises a heavy chain variable region and a heavy chain constant region or which comprises only a heavy chain variable region.

[00100] As used herein, the term “human antibody” refers to an antibody produced by a human or an antibody having an amino acid sequence corresponding to an antibody produced by a human made using any technique known in the art. This definition of a human antibody includes intact or full-length antibodies, fragments thereof, and/or antibodies comprising at least one human heavy and/or light chain polypeptide.

[00101] As used herein, the term “humanized antibody” refers to a non-human antibody that is modified to increase the sequence homology to that of a human antibody, such that the antigen-binding properties of the antibody are retained, but its antigenicity in the human body is reduced.

[00102] As used herein, the term “chimeric antibody” refers to an antibody wherein the amino acid sequence of the immunoglobulin molecule is derived from two or more species. The variable region of both the light and heavy chains often corresponds to the variable region of an antibody derived from one species of mammal (*e.g.*, mouse, rat, rabbit, *etc.*) having the desired specificity, affinity, and capability, while the constant regions correspond to the sequences of an antibody derived from another species of mammal (*e.g.*, human) to avoid eliciting an immune response in that species.

[00103] As used herein, the term “multispecific antibody” refers to an antibody that comprises a plurality of immunoglobulin variable domain 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 do not overlap or do not substantially 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 comprises a third, fourth, or fifth immunoglobulin variable domain. In an embodiment, a multispecific antibody is a bispecific antibody molecule, a trispecific antibody molecule, or a tetraspecific antibody molecule.

[00104] As used herein, the term “bispecific antibody” refers to a multispecific antibody that binds no more than two epitopes or two antigens, *e.g.*, two epitopes or antigens that are different genetic targets (*e.g.*, V β 17, CD69, or CD25). A bispecific antibody is characterized by a first immunoglobulin variable domain sequence which has binding specificity for a first epitope (*e.g.*, an epitope on a V β 17 antigen) 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 different antigens, *e.g.*, the different proteins (or different subunits of a multimeric protein). In an embodiment, a bispecific antibody 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 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 comprises a scFv, or fragment thereof, having binding specificity for a first epitope, and a scFv, or fragment thereof, having binding specificity for a second epitope.

[00105] As used herein, the term “Vβ17” refers to a T cell receptor, which is expressed in response to an immune response on a cytotoxic T cell. Vβ17-expressing CD8+ T cells are commonly produced in response to influenza A virus exposure in a subject. Vβ17-expressing CD8+ T cells provide great recall in response to influenza exposure in the subject. The term “Vβ17” includes any Vβ17 variant, isoform, and species homolog, which is naturally expressed by cells (including T cells) or can be expressed on cells transfected with genes or cDNA encoding the polypeptide. Unless noted, preferably the Vβ17 is a human Vβ17. An exemplary human Vβ17 amino acid sequence is provided by GenBank Accession Number AAB49730.1.

[00106] As used herein, an antibody that “specifically binds to Vβ17” refers to an antibody that binds to a Vβ17, preferably a human Vβ17, with a KD of 1×10^{-7} M or less, such as 1×10^{-8} M or less, 5×10^{-9} M or less, 1×10^{-9} M or less, 5×10^{-10} M or less, or 1×10^{-10} M or less.

[00107] The term “KD” refers to the dissociation constant, which is obtained from the ratio of Kd to Ka (*i.e.*, Kd/Ka) and is expressed as a molar concentration (M). KD values for antibodies can be determined using methods in the art in view of the present disclosure. For example, the KD of an antibody can be determined by using surface plasmon resonance, such as by using a biosensor system, *e.g.*, a Biacore® system, or by using bio-layer interferometry technology, such as an Octet RED96 system. The smaller the value of the KD of an antibody, the higher affinity that the antibody binds to a target antigen.

[00108] In one aspect, provided herein is an antibody that binds to Vβ17. In some embodiments, the antibody comprises a heavy chain variable region and a light chain variable

region. In some embodiments, the V β 17 antibody is not a single domain antibody or nanobody. In some embodiments, the V β 17 antibody is a humanized antibody.

[00109] In certain embodiments, provided herein is a V β 17 antibody comprising a VH region, VL region, VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and/or VL CDR3 of any one of the antibodies described herein. In some embodiments, provided herein is a V β 17 antibody comprising a VH region of any one of the antibodies described herein. In some embodiments, provided herein is a V β 17 antibody comprising a VL region of any one of the antibodies described herein. In some embodiments, provided herein is a V β 17 antibody comprising a VH region of any one of the antibodies described herein, and a VL region of any one of the antibodies described herein. In some embodiments, provided herein is a V β 17 antibody comprising a VH CDR1, VH CDR2, and VH CDR3 of any one of the antibodies described herein. In some embodiments, provided herein is a V β 17 antibody comprising a VL CDR1, VL CDR2, and VL CDR3 of any one of the antibodies described herein. In some embodiments, provided herein is a V β 17 antibody comprising a VH CDR1, VH CDR2, and VH CDR3 of any one of the antibodies described herein; and a VL CDR1, VL CDR2, and VL CDR3 of any one of the antibodies described herein. Representative VH and VL amino acid sequences, including VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2 and VL CDR3 amino acid sequences, of V β 17 antibodies provided herein are provided in Tables 1-6.

[00110] In some embodiments, the antibody specifically binds V β 17. In other embodiments, the V β 17 is present on the surface of a T cell.

[00111] In some embodiments, the antibody is a humanized antibody. In certain embodiments, the antibody is an IgG antibody. In other embodiments, the IgG antibody is an IgG1, IgG2, IgG3, or IgG4 antibody. In some embodiments, the antibody is a bispecific antibody. In certain embodiments, the antibody is multivalent. In other embodiments, the antibody is capable of binding at least three antigens. In some embodiments, the antibody is capable of binding at least five antigens.

[00112] In certain embodiments, provided is a V β 17 antibody that is an intact antibody. In other embodiments, provided is a V β 17 antibody is an antigen binding fragment of the V β 17 antibody. In some embodiments, the antigen binding fragment of the V β 17 antibody is a functional fragment.

[00113] In some embodiments, the antigen binding fragment is a diabody. In some embodiments, the antigen binding fragment is a Fab. In some embodiments, the antigen binding fragment is a Fab'. In some embodiments, the antigen binding fragment is a F(ab')₂. In some embodiments, the antigen binding fragment is a Fv fragment. In some embodiments, the antigen binding fragment is a disulfide stabilized Fv fragment (dsFv). In some embodiments, the antigen binding fragment is a (dsFv)₂. In some embodiments, the antigen binding fragment is a bispecific dsFv (dsFv-dsFv'). In some embodiments, the antigen binding fragment is a disulfide stabilized diabody (ds diabody). In some embodiments, the antigen binding fragment is a single-chain antibody molecule (scFv). In some embodiments, the antigen binding fragment is a single domain antibody (sdAb). In some embodiments, the antigen binding fragment is an scFv dimer (bivalent diabody). In some embodiments, the antigen binding fragment is a multispecific antibody formed from a portion of an antibody comprising one or more CDRs. In some embodiments, the antigen binding fragment is a camelized single domain antibody. In some embodiments, the antigen binding fragment is a nanobody. In some embodiments, the antigen binding fragment is a domain antibody. In some embodiments, the antigen binding fragment is a bivalent domain antibody. In some embodiments, the antigen binding fragment is an antibody fragment that binds to an antigen but does not comprise a complete antibody structure.

[00114] In specific embodiments, the Vβ17 antibody comprises a VH region and a VL region. In some embodiments, the Vβ17 antibody is a single chain antibody. In some embodiments, the Vβ17 antibody is a single domain antibody. In some embodiments, the Vβ17 antibody is a nanobody. In certain embodiments, the Vβ17 antibody is a VHH antibody. In certain embodiments, the Vβ17 antibody is a llama antibody. In some embodiments, the Vβ17 antibody is not a single chain antibody. In some embodiments, the Vβ17 antibody is not a single domain antibody. In some embodiments, the Vβ17 antibody is not a nanobody. In certain embodiments, the Vβ17 antibody is not a VHH antibody. In certain embodiments, the Vβ17 antibody is not a llama antibody. In some embodiments, the Vβ17 antibody is a multispecific antibody. In other embodiments, the Vβ17 is a bispecific antibody. In certain embodiments, the multispecific antibody comprises an antigen binding fragment of a Vβ17 antibody provided herein. In other embodiments, the bispecific antibody comprises an antigen binding fragment of a Vβ17 antibody provided herein. In some embodiments, the Vβ17 antibody is an agonistic antibody. In certain embodiments, the Vβ17 antibody activates T cells. In other embodiments, the Vβ17

antibody is an antagonistic antibody. In certain embodiments, the V β 17 antibody inactivates T cells. In some embodiments, the V β 17 antibody blocks activation of T cells. In some embodiments, the V β 17 antibody modulates the activity of T cells. In some embodiments, the V β 17 antibody neither activates or inactivates the activity of T cells. In specific embodiments, the T cells are human T cells.

[00115] In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 sequences are according to the Kabat numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 sequences are according to the Chothia numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 sequences are according to the Exemplary numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 sequences are according to the Contact numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 sequences are according to the IMGT numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 sequences are according to the AbM numbering system. Exemplary sets of 6 CDRs (VH CDR1-3 and VL CDR1-3) of certain antibody embodiments are provided herein. Other sets of CDRs are contemplated and within the scope of the antibody embodiments provided herein.

Table 1. V β 17 Antibody VH and VL Amino Acid Sequences

#	Protein Name	VH AA sequence	VL AA sequence
1	20A9A9	EVQLQESGPGLVQPSQSLSTCTVSGFSLTSYGVHW VRQSPGKGLEWLGIIWSAGGTDYNAAFISRLSISKD NSKSQIFFKLNSLHADDTAIYFCARGSFYDYGRLLDY WGQGTTLTVSS	DIVMTQSHRFMSTSVGDRVSTICKASQDVSTAV AWYQQKPGQSPKLLIYSSSYRYTGVPDRFTGSGS GTDFTFITISSVQAEDLAVYYCQQHYGTPYTFGG GTKLEIQ
2	20C12A3	EVQLQESGAELVRPGTSVKMSCKASGYTFTHYWID WTKQRPGHGLEWIGNIYPGGYTYNENFKGKATL TADKSSSTVFMQFSSLTSDDSAIYYCTRKGYYYGSD WYFDVWGTGTTTVSS	STSVGDRVSTICKASQDVSTAVAWYHQKPGQSP KLLIYSASYRYTGVPDRFTGSGSGTDFTFITISSVQ AEDLAVYYCQQHYTTPYTFGGGKLEMK
3	21G11A8	EVQLQESGPDLLKPKGETVKISCKASGYTFTTYGMN WVKQAPGKGLKWMGYLNTYSGVSTYADDFKGRF AFSLETSAANTAYLQINNLNRDDTATYFCARWGNYG AMDYWGQGTSTVTVSS	DIKMTQSPSLPVS LGDQASISCRSSQSIVRSNGFT YLEWYLQKPGQSPPELLIYKVSNRFSGVPPDRFSGS GSGTDFTLKISRVEAEDLGVYYCFQSSSHVPRTFG GGTKLEIK
4	21G11D5	EVQLQESGPDLLKPKGETVKISCKASGYTFTTYGMN WVKQAPGKGLKWMGYLNTYSGVSTYADDFKGRF AFSLETSAANTAYLQINNLNRDDTATYFCARWGNYG AMDYWGQGTSTVTVSS	DIVMTQSPSLPVS LGDQASISCRSSQSIVRSNGFT YLEWYLQKPGQSPPELLIYKVSNRFSGVPPDRFSGS GSGTDFTLKISRVEAEDLGVYYCFQSSSHVPRTFG GGTKLEIK
5	23A9B10	EVQLQESGPGLVKPSQSLSLTCSVTGYSTSGYYWN WIRQFLGNKLEWMGYITYDGSNNYNPSLKDRISITR DTSKNQFFLNLNSVTDDTATYYCARGGGYVPVW GTGTTTVTVSS	IQMTQSPAFLSVSPGERVSFSCRASQNIGTSHWY QQR TN GSPRL LIKYASESISGIPSRFSGSGTDF LSINSVESEDFADYYCHQSHNWPTTFGAGTKLEL K
6	23A9C10	EVQLQESGPGLVKPSQSLSLTCSVTGYSTSGYYWN WIRQFLGNKLEWMGYITYDGSNNYNPSLKDRISITR DTSKNQFFLNLNSVTDDTATYYCARGGGYVPVW GTGTTTVTVSS	DIQMTQSPAFLSVSPGERVSFSCRASQNIGTSHW YQRTNGSPRL LIKYASESISGIPSRFSGSGTDF TLSINSVESEDFADYYCHQSHNWPTTFGAGTKLE LK
7	23A9F7	EVQLQESGPGLVKPSQSLSLTCSVTGYSTSGYYWN WIRQFLGNKLEWMGYITYDGSNNYNPSLKDRISITR DTSKNQFFLNLNSVTDDTATYYCARGGGYVPVW GTGTTTVTVSS	DVQMTQSPAFLSVSPGERVSFSCRASQNIGTSHI WYQQR TN GSPRL LIKYASESISGIPSRFSGSGGT DFTLINSVESEDFADYYCHQSHNWPTTFGAGTK LELK
		235	236

8	28B2A2	EVQLQESGPELVKPGASVKMSCKASGYTFTDDNMHWVKQSHGKSLIEWIGYINPNNNHTNYNQKFKGKATLTVNKSSSTAYMELRSLTSEDSAVYFCARSTVVPFYAMDYWGQGTSTVTVSS	269	DIVMTQSPASLSMAIGKEVTIRCITITDIDDDMMNWYQKPGPEPKLLFSEGNLTPGVPSPRFSSSGYGSDFAFTIENMLSEDAVYYCLQSDNPLPLTFGAGTKLELK	270
9	28B2A4	EVQLQESGPELVKPGASVKMSCKASGYTFTDDNMHWVKQSHGKSLIEWIGYINPNNNHTNYNQKFKGKATLTVNKSSSTAYMELRSLTSEDSAVYFCARSTVVPFYAMDYWGQGTSTVTVSS	303	DIQMTQSPASLSMAIGKEVTIRCITITDIDDDMMNWYQKPGPEPKLLFSEGNLTPGVPSPRFSSSGYGSDFAFTIENMLSEDAVYYCLQSDNPLPLTFGAGTKLELK	304
10	28B2F5	EVQLQESGPELVKPGASVKMSCKASGYTFTDDNMHWVKQSHGKSLIEWIGYINPNNNHTNYNQKFKGKATLTVNKSSSTAYMELRSLTSEDSAVYFCARSTVVPFYAMDYWGQGTSTVTVSS	337	DIKMTQSPASLSMAIGKEVTIRCITITDIDDDMMNWYQKPGPEPKLLFSEGNLTPGVPSPRFSSSGYGSDFAFTIENMLSEDAVYYCLQSDNPLPLTFGAGTKLELK	338
11	28C9A5	EVQLQESGAELVRPGTSVKMSCKASGYTFTTHYWIDWTKQRPGHGLEWIGNIYPGGGYTNYNENFKGKATLTADKSSSTVFMQFSSLTSDDSAIIYYCTRKGYYYGSDWYFDVWGTGTTVTVSS	371	QIVLSQSPAIMSAPGKEKVTMTCSASSSVSYMHWYQKSGTSPKRWIYDTSKLASGVPARFSGSGSGTSYSLTISSEAEADAATYYCQQWSSNPYTFGGGKTLEIK	372
12	28D2E6	EVQLQESGPGLVKPSQSLSLTCSVTGYFISSGYWKKWIRQFPGNKLEWMGYISYDGSNNYNPSLKNRISITRDTSKNQFFLKLNSVTAEDTATYYCARGGGYVPVWGTGTTVTVSS	405	DIQMTQSPSLPVS LGDQASISCRSSQSIVRSNGNTYLEWY LKPGQSPKLLIYKVSNRFSGV PDRFSGSGGTDFTLKISRVEAEDLGVYYCFQSSSHVPRTFGGGTKLEIK	406
13	28D2E8	EVQLQESGPGLVKPSQSLSLTCSVTGYFISSGYWKKWIRQFPGNKLEWMGYISYDGSNNYNPSLKNRISITRDTSKNQFFLKLNSVTAEDTATYYCARGGGYVPVWGTGTTVTVSS	439	DIKMTQSPSLPVS LGDQASISCRSSQSIVRSNGNTYLEWY LKPGQSPKLLIYKVSNRFSGV PDRFSGSGGTDFTLKISRVEAEDLGVYYCFQSSSHVPRTFGGGTKLEIK	440

Table 2. V β 17 Antibody Kabat CDR Amino Acid Sequences

#	Protein Name	HC KABAT CDR1	HC KABAT CDR2	HC KABAT CDR3	LC KABAT CDR1	LC KABAT CDR2	LC KABAT CDR3
1	20A9A9	SYGVH	IIWSAGGTDYNAAFIS	GSFYDYGRLDY	KASQDVSTAVA	SSSYRYT	QQHYGTPYT
		1	2	3	4	5	6
2	20C12A3	HYWID	NIYPGGGYTNYNENFKG	KGYYYGSDWYFDV	KASQDVSTAVA	SASYRYT	QQHYTTPYT
		35	36	37	38	39	40
3	21G11A8	TYGMN	YLNTYSGVSTYADDFKG	WGNYGAMDY	RSSQSIVRNNGFTYLE	KVSNRFS	FQSSHVPRT
		69	70	71	72	73	74
4	21G11D5	TYGMN	YLNTYSGVSTYADDFKG	WGNYGAMDY	RSSQSIVRNNGFTYLE	KVSNRFS	FQSSHVPRT
		103	104	105	106	107	108
5	23A9B10	SGYYWN	YITYDGSNNYNPSLKD	GGGYVPV	RASQNIIGTSIH	YASESIS	HQSHNWPTT
		137	138	139	140	141	142
6	23A9C10	SGYYWN	YITYDGSNNYNPSLKD	GGGYVPV	RASQNIIGTSIH	YASESIS	HQSHNWPTT
		171	172	173	174	175	176
7	23A9F7	SGYYWN	YITYDGSNNYNPSLKD	GGGYVPV	RASQNIIGTSIH	YASESIS	HQSHNWPTT
		205	206	207	208	209	210
8	28B2A2	DDNMH	YINPNNHHTNYNQKFKG	STVVPFYAMDY	ITITDIDDDMN	EGNTLRP	LQSDNLPIT
		239	240	241	242	243	244
9	28B2A4	DDNMH	YINPNNHHTNYNQKFKG	STVVPFYAMDY	ITITDIDDDMN	EGNTLRP	LQSDNLPIT
		273	274	275	276	277	278
10	28B2F5	DDNMH	YINPNNHHTNYNQKFKG	STVVPFYAMDY	ITITDIDDDMN	EGNTLRP	LQSDNLPIT
		307	308	309	310	311	312
11	28C9A5	HYWID	NIYPGGGYTNYNENFKG	KGYYYGSDWYFDV	SASSSVSYMH	DTSKLAS	QQWSSNPYT
		341	342	343	344	345	346
12	28D2E6	SGYYWK	YISYDGSNNYNPSLKN	GGGYVPV	RSSQSIVRNNGNTYLE	KVSNRFS	FQSSHVPRT
		375	376	377	378	379	380
13	28D2E8	SGYYWK	YISYDGSNNYNPSLKN	GGGYVPV	RSSQSIVRNNGNTYLE	KVSNRFS	FQSSHVPRT
		409	410	411	412	413	414

Table 3. V β 17 Antibody Chothia CDR Amino Acid Sequences

#	Protein Name	HC CHOTHIA CDR1	HC CHOTHIA CDR2	HC CHOTHIA CDR3	LC CHOTHIA CDR1	LC CHOTHIA CDR2	LC CHOTHIA CDR3						
1	20A9A9	GFSLTSY	7	WSAGG	8	GSFYDYGRLDY	9	KASQDVSTAVA	10	SSSYRYT	11	QQHYGTPYT	12
2	20C12A3	GYTFTHY	41	YPGGGY	42	KGYYYGSDWYFDV	43	KASQDVSTAVA	44	SASYRYT	45	QQHYTTPYT	46
3	21G11A8	GYTFTTY	75	NTYSGV	76	WGNYGAMDY	77	RSSQSIVRSNGFTYLE	78	KVSNRFS	79	FQSSHVPRT	80
4	21G11D5	GYTFTTY	109	NTYSGV	110	WGNYGAMDY	111	RSSQSIVRSNGFTYLE	112	KVSNRFS	113	FQSSHVPRT	114
5	23A9B10	GYSITSGY	143	TYDGS	144	GGGYVPV	145	RASQNIIGTSIH	146	YASESIS	147	HQSHNWPTT	147
6	23A9C10	GYSITSGY	177	TYDGS	178	GGGYVPV	179	RASQNIIGTSIH	180	YASESIS	181	HQSHNWPTT	182
7	23A9F7	GYSITSGY	211	TYDGS	212	GGGYVPV	213	RASQNIIGTSIH	214	YASESIS	215	HQSHNWPTT	216
8	28B2A2	GYTFDD	245	NPNNH	246	STVVPFYAMDY	247	ITITDIDDDMN	248	EGNTLRP	249	LQSDNPLPT	250
9	28B2A4	GYTFDD	279	NPNNH	280	STVVPFYAMDY	281	ITITDIDDDMN	282	EGNTLRP	283	LQSDNPLPT	284
10	28B2F5	GYTFDD	313	NPNNH	314	STVVPFYAMDY	315	ITITDIDDDMN	316	EGNTLRP	317	LQSDNPLPT	318
11	28C9A5	GYTFTHY	347	YPGGGY	348	KGYYYGSDWYFDV	349	SASSSVSYMH	350	DTSKLAS	351	QQWSSNPYT	352
12	28D2E6	GYFISSGY	381	SYDGS	382	GGGYVPV	383	RSSQSIVRSNGNTYLE	384	KVSNRFS	385	FQSSHVPRT	386
13	28D2E8	GYFISSGY	415	SYDGS	416	GGGYVPV	417	RSSQSIVRSNGNTYLE	418	KVSNRFS	419	FQSSHVPRT	420

Table 4. Vβ17 Antibody AbM CDR Amino Acid Sequences

#	Protein Name	HC AbM CDR1	HC AbM CDR2	HC AbM CDR3	LC AbM CDR1	LC AbM CDR2	LC AbM CDR3
1	20A9A9	GFSLTSGVH 13	LIWSAGGTD 14	GSFYDYGRLDY 15	KASQDVSTAVA 16	SSSYRYT 17	QQHYGTPYT 18
2	20C12A3	GYTFTHYWID 47	NIYPGGGYTN 48	KGYYYGSDWYFDV 49	KASQDVSTAVA 50	SASYRYT 51	QQHYTTPYT 52
3	21G11A8	GYTFTTYGMN 81	YLNTYSGVST 82	WGNYGAMDY 83	RSSQSIVRNNGFTYLE 84	KVSNRFS 85	FQSSHVPRT 86
4	21G11D5	GYTFTTYGMN 115	YLNTYSGVST 116	WGNYGAMDY 117	RSSQSIVRNNGFTYLE 118	KVSNRFS 119	FQSSHVPRT 120
5	23A9B10	GYSITSGYWN 149	YITYDGSNN 150	GGGYVPV 151	RASQNIGTSH 152	YASESIS 153	HQSHNWPTT 154
6	23A9C10	GYSITSGYWN 183	YITYDGSNN 184	GGGYVPV 185	RASQNIGTSH 186	YASESIS 187	HQSHNWPTT 188
7	23A9F7	GYSITSGYWN 217	YITYDGSNN 218	GGGYVPV 219	RASQNIGTSH 220	YASESIS 221	HQSHNWPTT 222
8	28B2A2	GYTFDDNMH 251	YINPNNHTN 252	STVVPFYAMDY 253	ITITDIDDDMN 254	EGNTLRP 255	LQSDNLPLT 256
9	28B2A4	GYTFDDNMH 285	YINPNNHTN 286	STVVPFYAMDY 287	ITITDIDDDMN 288	EGNTLRP 289	LQSDNLPLT 290
10	28B2F5	GYTFDDNMH 319	YINPNNHTN 320	STVVPFYAMDY 321	ITITDIDDDMN 322	EGNTLRP 323	LQSDNLPLT 324
11	28C9A5	GYTFTHYWID 353	NIYPGGGYTN 354	KGYYYGSDWYFDV 355	SASSSVSYMH 356	DTSKLAS 356	QQWSSNPYT 358
12	28D2E6	GYFISSGYWK 387	YISYDGSNN 388	GGGYVPV 389	RSSQSIVRNNGNTYLE 390	KVSNRFS 391	FQSSHVPRT 392
13	28D2E8	GYFISSGYWK 421	YISYDGSNN 422	GGGYVPV 423	RSSQSIVRNNGNTYLE 424	KVSNRFS 425	FQSSHVPRT 426

Table 5. Vβ17 Antibody Contact CDR Amino Acid Sequences

#	Protein Name	HC CONTACT CDR1	HC CONTACT CDR2	HC CONTACT CDR3	LC CONTACT CDR1	LC CONTACT CDR2	LC CONTACT CDR3
1	20A9A9	TSYGVH	WLGLIWSAGGTD	ARGSFYDYGRLD	STAVAWY	LLIYSSSYRY	QQHYGTPY
		19	20	21	22	23	24
2	20C12A3	THYWID	WIGNIYPGGGYTN	TRKGYYYGSDWYFD	STAVAWY	LLIYSASYRY	QQHYTTTPY
		53	54	55	56	57	58
3	21G11A8	TTYGMN	WMGYLNTYSGVST	ARWGNYGAMD	VRNNGFTYLEWY	LLIYKVSNRF	FQSSHVPR
		87	88	89	90	91	92
4	21G11D5	TTYGMN	WMGYLNTYSGVST	ARWGNYGAMD	VRNNGFTYLEWY	LLIYKVSNRF	FQSSHVPR
		121	122	123	124	125	126
5	23A9B10	TSGYYWN	WMGYITYDGSNN	ARGGGYVP	GTSIHWY	LLIKYASESI	HQSHNWPT
		155	156	157	158	159	160
6	23A9C10	TSGYYWN	WMGYITYDGSNN	ARGGGYVP	GTSIHWY	LLIKYASESI	HQSHNWPT
		189	190	191	192	193	194
7	23A9F7	TSGYYWN	WMGYITYDGSNN	ARGGGYVP	GTSIHWY	LLIKYASESI	HQSHNWPT
		223	224	225	226	227	228
8	28B2A2	TDDNMH	WIGYINPNNNHTN	ARSTVVPFYAMD	DDDMNWX	LLFSEGNTLR	LQSDNLP
		257	258	259	260	261	262
9	28B2A4	TDDNMH	WIGYINPNNNHTN	ARSTVVPFYAMD	DDDMNWX	LLFSEGNTLR	LQSDNLP
		291	292	293	294	295	296
10	28B2F5	TDDNMH	WIGYINPNNNHTN	ARSTVVPFYAMD	DDDMNWX	LLFSEGNTLR	LQSDNLP
		325	326	327	328	329	330
11	28C9A5	THYWID	WIGNIYPGGGYTN	TRKGYYYGSDWYFD	SYMHXY	RWIYDTSKLA	QQWSSNPY
		359	360	361	362	363	364
12	28D2E6	SSGYWK	WMGYISYDGSNN	ARGGGYVP	VRNNGNTYLEWY	LLIYKVSNRF	FQSSHVPR
		393	394	395	396	397	398
13	28D2E8	SSGYWK	WMGYISYDGSNN	ARGGGYVP	VRNNGNTYLEWY	LLIYKVSNRF	FQSSHVPR
		427	428	429	430	431	432

Table 6. V β 17 Antibody IMGT CDR Amino Acid Sequences

#	Protein Name	HC IMGT CDR1	HC IMGT CDR2	HC IMGT CDR3	LC IMGT CDR1	LC IMGT CDR2	LC IMGT CDR3
1	20A9A9	GFSLTSYG	IWSAGGT	ARGSFYDYGRLDY	QDVSTA	SSS	QQHYGTPYT
		25	26	27	28	29	30
2	20C12A3	GYTFTHYW	IYPGGGYT	TRKGYYYGSDWYFDV	QDVSTA	SAS	QQHYTTPYT
		59	60	61	62	63	64
3	21G11A8	GYTFPTYG	LNITYSGVS	ARWGNYGAMDY	QSIVRNSNGFTY	KVS	FQSSHVPRT
		93	94	95	96	97	98
4	21G11D5	GYTFPTYG	LNITYSGVS	ARWGNYGAMDY	QSIVRNSNGFTY	KVS	FQSSHVPRT
		127	128	129	130	131	132
5	23A9B10	GYSITSGYY	ITYDGSN	ARGGGYVPV	QNIGTS	YAS	HQSHNWPTT
		161	162	163	164	164	166
6	23A9C10	GYSITSGYY	ITYDGSN	ARGGGYVPV	QNIGTS	YAS	HQSHNWPTT
		195	196	197	198	199	200
7	23A9F7	GYSITSGYY	ITYDGSN	ARGGGYVPV	QNIGTS	YAS	HQSHNWPTT
		229	230	231	232	233	234
8	28B2A2	GYTFDDN	INPNNNHT	ARSTVVPFYAMDY	TDIDDD	EGN	LQSDNLPLT
		263	264	265	266	267	268
9	28B2A4	GYTFDDN	INPNNNHT	ARSTVVPFYAMDY	TDIDDD	EGN	LQSDNLPLT
		297	298	299	300	301	302
10	28B2F5	GYTFDDN	INPNNNHT	ARSTVVPFYAMDY	TDIDDD	EGN	LQSDNLPLT
		331	332	333	334	335	336
11	28C9A5	GYTFTHYW	IYPGGGYT	TRKGYYYGSDWYFDV	SSVSY	DTS	QQWSSNPYT
		365	366	367	368	369	370
12	28D2E6	GYFISSGY	ISYDGSN	ARGGGYVPV	QSIVRNSNGNTY	KVS	FQSSHVPRT
		399	400	401	402	403	404
13	28D2E8	GYFISSGY	ISYDGSN	ARGGGYVPV	QSIVRNSNGNTY	KVS	FQSSHVPRT
		433	434	435	436	437	438

[00119] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:1, 2, and 3, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:4, 5, and 6, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:7, 8, and 9, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:10, 11, and 12, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:13, 14, and 15, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:16, 17, and 18, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:19, 20, and 21, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:22, 23, and 24, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:25, 26, and 27, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:28, 29, and 30, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:31; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:32. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:31. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:32. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:31, and a VL having an amino acid sequence of SEQ ID NO:32. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity

to an amino acid sequence of SEQ ID NO:31. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:32. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:31, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:32.

[00120] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:35, 36, and 37, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:38, 39, and 40, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:41, 42, and 43, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:44, 45, and 46, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:47, 48, and 49, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:50, 51, and 52, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:53, 54, and 55, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:56, 57, and 58, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:59, 60, and 61, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:62, 63, and 64, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:65; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:66. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid

sequence of SEQ ID NO:65. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:66. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:65, and a VL having an amino acid sequence of SEQ ID NO:66. In one aspect, provided
5 herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:65. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:66. In one aspect, provided
10 herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:65, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:66.

[00121] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:69, 70, and 71, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL
15 CDR3 having an amino acid sequence of SEQ ID NOs:72, 73, and 74, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:75, 76, and 77, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:78, 79, and 80, respectively. In one aspect, provided
20 herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:81, 82, and 83, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:84, 85, and 86, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a
25 VH CDR3 having an amino acid sequence of SEQ ID NOs:87, 88, and 89, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:90, 91, and 92, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:93, 94, and 95, respectively, and (ii) a VL
30 comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:96, 97, and 98, respectively. In one aspect, provided herein is an antibody that binds V β 17,

comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:99; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:100. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:99. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:100. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:99, and a VL having an amino acid sequence of SEQ ID NO:100. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:99. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:100. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:99, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:100.

[00122] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:103, 104, and 105, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:106, 107, and 108, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:109, 110, and 111, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:112, 113, and 114, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:115, 116, and 117, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:118, 119, and 120, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:121, 122, and 123, respectively, and

(ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:124, 125, and 126, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:127, 128, and 129, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:130, 131, and 132, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:133; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:134. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:133. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:134. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:133, and a VL having an amino acid sequence of SEQ ID NO:134. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:133. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:134. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:133, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:134.

[00123] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:137, 138, and 139, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:140, 141, and 142, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:143, 144, and 145, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:146, 147, and 148, respectively. In one aspect,

provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:149, 150, and 151, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:152, 153, and 154, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:155, 156, and 157, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:158, 159, and 160, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:161, 162, and 163, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:164, 165, and 166, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:167; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:168. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:167. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:168. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:167, and a VL having an amino acid sequence of SEQ ID NO:168. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:167. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:168. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:167, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:168.

[00124] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ

ID NOs:171, 172, and 173, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:174, 175, and 176, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:177, 178, and 179, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:180, 181, and 182, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:183, 184, and 185, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:186, 187, and 188, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:189, 190, and 191, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:192, 193, and 194, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:195, 196, and 197, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:198, 199, and 200, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:201; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:202. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:201. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:202. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:201, and a VL having an amino acid sequence of SEQ ID NO:202. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:201. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:202. In

one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:201, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:202.

5 **[00125]** In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:205, 206, and 207, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:208, 209, and 210, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a
10 VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:211, 212, and 213, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:214, 215, and 216, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:217, 218, and 219,
15 respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:220, 221, and 222, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:223, 224, and 225, respectively, and
20 (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:226, 227, and 228, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:229, 230, and 231, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:232, 233, and 234, respectively. In one aspect, provided herein is an antibody that binds
25 V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:235; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:236. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an
30 amino acid sequence of SEQ ID NO:235. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:236. In one

aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:235, and a VL having an amino acid sequence of SEQ ID NO:236. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:235. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:236. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:235, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:236.

[00126] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:239, 240, and 241, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:242, 243, and 244, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:245, 246, and 247, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:248, 249, and 250, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:251, 252, and 253, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:254, 255, and 256, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:257, 258, and 259, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:260, 261, and 262, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:263, 264, and 265, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:266, 267, and 268, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an

amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:269; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:270. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:269. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:270. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:269, and a VL having an amino acid sequence of SEQ ID NO:270. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:269. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:270. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:269, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:270.

[00127] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:273, 274, and 275, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:276, 277, and 278, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:279, 280, and 281, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:282, 283, and 284, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:285, 286, and 287, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:288, 289, and 290, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:291, 292, and 293, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of

SEQ ID NOs:294, 295, and 296, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:297, 298, and 299, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:300, 301, and 302, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:303; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:304.

In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:303. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:304. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:303, and a VL having an amino acid sequence of SEQ ID NO:304. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:303. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:304. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:303, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:304.

[00128] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:307, 308, and 309, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:310, 311, and 312, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:313, 314, and 315, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:316, 317, and 318, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a

VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:319, 320, and 321, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:322, 323, and 324, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:325, 326, and 327, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:328, 329, and 330, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:331, 332, and 333, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:334, 335, and 336, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:337; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:338. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:337. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:338. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:337, and a VL having an amino acid sequence of SEQ ID NO:338. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:337. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:338. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:337, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:338.

[00129] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:341, 342, and 343, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and

VL CDR3 having an amino acid sequence of SEQ ID NOs:344, 345, and 346, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:347, 348, and 349, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3

5 having an amino acid sequence of SEQ ID NOs:350, 351, and 352, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:353, 354, and 355, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:356, 357, and 358, respectively. In one aspect, provided herein is

10 an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:359, 360, and 361, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:362, 363, and 364, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3

15 having an amino acid sequence of SEQ ID NOs:365, 366, and 367, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:368, 369, and 370, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID

20 NO:371; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:372. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:371. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:372. In one

25 aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:371, and a VL having an amino acid sequence of SEQ ID NO:372. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:371. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:372. In

30 one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino

acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:371, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:372.

[00130] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:375, 376, and 377, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:378, 379, and 380, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:381, 382, and 383, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:384, 385, and 386, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:387, 388, and 389, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:390, 391, and 392, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:393, 394, and 395, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:396, 397, and 398, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:399, 400, and 401, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:402, 403, and 404, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID NO:405; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:406. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:405. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:406. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid

sequence of SEQ ID NO:405, and a VL having an amino acid sequence of SEQ ID NO:406. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:405. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:406. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:405, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:406.

[00131] In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:409, 410, and 411, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:412, 413, and 414, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:415, 416, and 417, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:418, 419, and 420, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:421, 422, and 423, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:424, 425, and 426, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:427, 428, and 429, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:430, 431, and 432, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of SEQ ID NOs:433, 434, and 435, respectively, and (ii) a VL comprising a VL CDR1, VL CDR2, and VL CDR3 having an amino acid sequence of SEQ ID NOs:436, 437, and 438, respectively. In one aspect, provided herein is an antibody that binds V β 17, comprising: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of SEQ ID

NO:439; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of SEQ ID NO:440. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:439. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence of SEQ ID NO:440. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence of SEQ ID NO:439, and a VL having an amino acid sequence of SEQ ID NO:440. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:439. In one aspect, provided herein is an antibody that binds V β 17, comprising a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:440. In one aspect, provided herein is an antibody that binds V β 17, comprising a VH having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:439, and a VL having an amino acid sequence having at least 95% identity to an amino acid sequence of SEQ ID NO:440.

[00132] In another aspect, provided herein is an antibody that competes for binding to V β 17 with any of the V β 17 antibodies described herein. In another aspect, provided herein is an antibody that binds to the same epitope as any of the V β 17 antibodies described herein. In another aspect, provided is a V β 17 antibody that binds an epitope on V β 17 that overlaps with the epitope on V β 17 bound by a V β 17 antibody described herein.

[00133] In one aspect, provided is an antibody that competes for binding to V β 17 with a V β 17 reference antibody. In another aspect, provided is a V β 17 antibody that binds to the same V β 17 epitope as a V β 17 reference antibody. In another aspect, provided is a V β 17 antibody that binds an epitope on V β 17 that overlaps with the epitope on V β 17 bound by a V β 17 reference antibody.

[00134] In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:31; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:32. In one embodiment, the V β 17 reference antibody

comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:65; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:66. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:99; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:100. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:133; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:134. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:167; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:168. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:201; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:202. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:235; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL

having an amino acid sequence of SEQ ID NO:236. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:269; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:270. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:303; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:304. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:337; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:338. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:371; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:372. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:405; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:406. In one embodiment, the V β 17 reference antibody comprises: (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:439; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having

an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:440.

[00135] In some embodiments, a multispecific antibody provided herein is a diabody, a cross-body, or a multispecific antibody obtained via a controlled Fab arm exchange as those described herein.

[00136] In some embodiments, the multispecific antibodies include IgG-like molecules with complementary CH3 domains that promote heterodimerization; recombinant IgG-like dual targeting molecules, wherein the two sides of the molecule each contain the Fab fragment or part of the Fab fragment of at least two different antibodies; IgG fusion molecules, wherein full length IgG antibodies are fused to an extra Fab fragment or parts of Fab fragment; Fc fusion molecules, wherein single chain Fv molecules or stabilized diabodies are fused to heavy-chain constant-domains, Fc-regions or parts thereof; Fab fusion molecules, wherein different Fab-fragments are fused together; ScFv- and diabody-based and heavy chain antibodies (*e.g.*, domain antibodies, nanobodies) wherein different single chain Fv molecules or different diabodies or different heavy-chain antibodies (*e.g.* domain antibodies, nanobodies) are fused to each other or to another protein or carrier molecule.

[00137] In some embodiments, IgG-like molecules with complementary CH3 domains molecules include the Triomab/Quadroma (Trion Pharma/Fresenius Biotech), the Knobs-into-Holes (Genentech), CrossMAbs (Roche) and the electrostatically-matched (Amgen), the LUZ-Y (Genentech), the Strand Exchange Engineered Domain body (SEEDbody) (EMD Serono), the Biclonic (Merus) and the DuoBody (Genmab A/S).

[00138] In some embodiments, recombinant IgG-like dual targeting molecules include Dual Targeting (DT)-Ig (GSK/Domantis), Two-in-one Antibody (Genentech), Cross-linked Mabs (Karmanos Cancer Center), mAb2 (F-Star) and CovX-body (CovX/Pfizer).

[00139] In some embodiments, IgG fusion molecules include Dual Variable Domain (DVD)-Ig (Abbott), IgG-like Bispecific (ImClone/Eli Lilly), Ts2Ab (MedImmune/AZ) and BsAb (Zymogenetics), HERCULES (Biogen Idec) and TvAb (Roche).

[00140] In some embodiments, Fc fusion molecules can include ScFv/Fc Fusions (Academic Institution), SCORPION (Emergent BioSolutions/Trubion, Zymogenetics/BMS), Dual Affinity Retargeting Technology (Fc-DART) (MacroGenics) and Dual(ScFv)₂-Fab (National Research Center for Antibody Medicine--China).

[00141] In some embodiments, Fab fusion bispecific antibodies include F(ab)₂ (Medarex/AMGEN), Dual-Action or Bis-Fab (Genentech), Dock-and-Lock (DNL) (ImmunoMedics), Bivalent Bispecific (Biotechnol) and Fab-Fv (UCB-Celltech). ScFv-, diabody-based, and domain antibodies, include but are not limited to, Bispecific T Cell Engager (BiTE) (Micromet), Tandem Diabody (Tandab) (Affimed), Dual Affinity Retargeting Technology (DART) (MacroGenics), Single-chain Diabody (Academic), TCR-like Antibodies (AIT, ReceptorLogics), Human Serum Albumin ScFv Fusion (Merrimack) and COMBODY (Epigen Biotech), dual targeting nanobodies (Ablynx), dual targeting heavy chain only domain antibodies.

[00142] Full length bispecific antibodies provided herein can be generated for example using Fab arm exchange (or half molecule exchange) between two mono specific bivalent antibodies by introducing substitutions at the heavy chain CH3 interface in each half molecule to favor heterodimer formation of two antibody half molecules having distinct specificity either *in vitro* in cell-free environment or using co-expression. The Fab arm exchange reaction is the result of a disulfide-bond isomerization reaction and dissociation-association of CH3 domains. The heavy-chain disulfide bonds in the hinge regions of the parent mono specific antibodies are reduced. The resulting free cysteines of one of the parent monospecific antibodies form an inter heavy-chain disulfide bond with cysteine residues of a second parent mono specific antibody molecule and simultaneously CH3 domains of the parent antibodies release and reform by dissociation-association. The CH3 domains of the Fab arms can be engineered to favor heterodimerization over homodimerization. The resulting product is a bispecific antibody having two Fab arms or half molecules which each binding a distinct epitope, *e.g.*, an epitope on a first target and an epitope on a second target. Other methods of making multispecific antibodies are known and contemplated.

[00143] “Homodimerization” as used herein refers to an interaction of two heavy chains having identical CH3 amino acid sequences. “Homodimer” as used herein refers to an antibody having two heavy chains with identical CH3 amino acid sequences.

[00144] “Heterodimerization” as used herein refers to an interaction of two heavy chains having non-identical CH3 amino acid sequences. “Heterodimer” as used herein refers to an antibody having two heavy chains with non-identical CH3 amino acid sequences.

[00145] The “knob-in-hole” strategy (see, *e.g.*, PCT Publ. No. WO2006/028936) can be used to generate full length bispecific antibodies. Briefly, selected amino acids forming the interface of the CH3 domains in human IgG can be mutated at positions affecting CH3 domain interactions to promote heterodimer formation. An amino acid with a small side chain (hole) is introduced into a heavy chain of an antibody specifically binding a first antigen and an amino acid with a large side chain (knob) is introduced into a heavy chain of an antibody specifically binding a second antigen. After co-expression of the two antibodies, a heterodimer is formed as a result of the preferential interaction of the heavy chain with a “hole” with the heavy chain with a “knob.” Exemplary CH3 substitution pairs forming a knob and a hole are (expressed as modified position in the first CH3 domain of the first heavy chain/modified position in the second CH3 domain of the second heavy chain): T366Y/F405A, T366W/F405W, F405W/Y407A, T394W/Y407T, T394S/Y407A, T366W/T394S, F405W/T394S and T366W/T366S_L368A_Y407V.

[00146] Other strategies such as promoting heavy chain heterodimerization using electrostatic interactions by substituting positively charged residues at one CH3 surface and negatively charged residues at a second CH3 surface can be used, as described in US Pat. Publ. No. US2010/0015133; US Pat. Publ. No. US2009/0182127; US Pat. Publ. No. US2010/028637; or US Pat. Publ. No. US2011/0123532. In other strategies, heterodimerization can be promoted by the following substitutions (expressed as modified position in the first CH3 domain of the first heavy chain/modified position in the second CH3 domain of the second heavy chain): L351Y_F405A_Y407V/T394W, T366I_K392M_T394W/F405A_Y407V, T366L_K392M_T394W/F405A_Y407V, L351Y_Y407A/T366A_K409F, L351Y_Y407A/T366V_K409F_Y407A/T366A_K409F, or T350V_L351Y_F405A_Y407V/T350V_T366L_K392L_T394W as described in U.S. Pat. Publ. No. US2012/0149876 or U.S. Pat. Publ. No. US2013/0195849.

[00147] In addition to methods described above, bispecific antibodies provided herein can be generated *in vitro* in a cell-free environment by introducing asymmetrical mutations in the CH3 regions of two mono specific homodimeric antibodies and forming the bispecific heterodimeric antibody from two parent monospecific homodimeric antibodies in reducing conditions to allow disulfide bond isomerization according to methods described in PCT Pat. Publ. No. WO2011/131746. In the methods, the first monospecific bivalent antibody and the second

monospecific bivalent antibody are engineered to have certain substitutions at the CH3 domain that promotes heterodimer stability; the antibodies are incubated together under reducing conditions sufficient to allow the cysteines in the hinge region to undergo disulfide bond isomerization; thereby generating the bispecific antibody by Fab arm exchange. The incubation conditions can optionally be restored to non-reducing conditions. Exemplary reducing agents that can be used are 2-mercaptoethylamine (2-MEA), dithiothreitol (DTT), dithioerythritol (DTE), glutathione, tris (2-carboxyethyl) phosphine (TCEP), L-cysteine and beta-mercaptoethanol, preferably a reducing agent selected from the group consisting of: 2-mercaptoethylamine, dithiothreitol and tris (2-carboxyethyl) phosphine. For example, incubation for at least 90 min at a temperature of at least 20°C in the presence of at least 25 mM 2-MEA or in the presence of at least 0.5 mM dithiothreitol at a pH from 5-8, for example at pH of 7.0 or at pH of 7.4 can be used.

[00148] In some embodiments, the V β 17 antibody comprises a single chain antibody. In some embodiments, the V β 17 antibody comprises a single domain antibody. In certain embodiments, the V β 17 antibody comprises a nanobody. In certain embodiments, the V β 17 antibody comprises a VHH antibody. In certain embodiments, the V β 17 antibody comprises a llama antibody. In some embodiments, the V β 17 antibody does not comprise a single chain antibody. In some embodiments, the V β 17 antibody does not comprise a single domain antibody. In certain embodiments, the V β 17 antibody does not comprise a nanobody. In certain embodiments, the V β 17 antibody does not comprise a VHH antibody. In certain embodiments, the V β 17 antibody does not comprise a llama antibody.

[00149] According to another particular aspect, provided herein is a V β 17 antibody or antigen-binding fragment thereof that induces antibody-dependent cell-mediated cytotoxicity (ADCC). The antibody or antigen-binding fragment thereof can, for example, induce ADCC *in vitro*.

[00150] In certain embodiments, the TRGV9 antibody induces T cell dependent cytotoxicity of a second cell *in vitro* with an EC₅₀ of less than about 160 pM, when assessed *in vitro* at an effector to target cell ratio of 1:1.

[00151] In some embodiments, V β 17 is present on the surface of a T cell. In some embodiments, the V β 17 is present on the surface of a T cell, and the second target antigen is on the surface of a second cell. In some embodiments, the second cell is killed when the

multispecific antibody binds to the V β 17 on the surface of the T cell and the second target antigen on the surface of the second cell.

[00152] In some embodiments, the multispecific antibody induces T cell dependent cytotoxicity of the second cell *in vitro* with an EC₅₀ of less than about 500 pM. In some
5 embodiments, the multispecific antibody induces T cell dependent cytotoxicity of the second cell *in vitro* with an EC₅₀ of less than about 300 pM. In some embodiments, the multispecific antibody induces $\gamma\delta$ T cell dependent cytotoxicity of the second cell *in vitro* with an EC₅₀ of less than about 160 pM. In some embodiments, the EC₅₀ is assessed with a mixture of $\gamma\delta$ T effector cells and target cells expressing the second target antigen. In some embodiments, the effector
10 cell to target cell ratio is about 0.01 to 1 to about 5 to 1. In some embodiments, the effector cell to target cell ratio is about 0.1 to 1 to about 2 to 1. In some embodiments, the effector cell to target cell ratio is about 1:1.

[00153] In certain embodiments, the EC₅₀ is less than about 1000 pM, less than about 900 pM, less than about 800 pM, less than about 700 pM, less than about 600 pM, less than about
15 500 pM, less than about 400 pM, less than about 300 pM, less than about 200 pM, less than about 190 pM, less than about 180 pM, less than about 170 pM, less than about 160 pM, less than about 150 pM, less than about 140 pM, less than about 130 pM, less than about 120 pM, less than about 110 pM, less than about 100 pM, less than about 90 pM, less than about 80 pM, less than about 70 pM, less than about 60 pM, less than about 50 pM, less than about 40 pM,
20 less than about 30 pM, less than about 20 pM, or less than about 10 pM.

[00154] In certain embodiments, the effector to target cell ratio can, for example, be 0.01:1, 0.02:1, 0.03:1, 0.04:1, 0.05:1, 0.06:1, 0.07:1, 0.08:1, 0.09:1, 1:1, 2:1, 3:1, 4:1, 5:1, 6:1, 7:1, 8:1, 9:1, or 10:1. In certain embodiments, the concentration of the multispecific antibody is about
25 0.000005 ng/mL, about 0.00005 ng/mL, about 0.0005, about 0.005 ng/mL, about 0.01 ng/mL, about 0.02 ng/mL, about 0.03 ng/mL, about 0.04 ng/mL, about 0.05 ng/mL, about 0.06 ng/mL, about 0.07 ng/mL, about 0.08 ng/mL, about 0.09 ng/mL, about 0.1 ng/mL, about 0.5 ng/mL, about 1.0 ng/mL, about 10 ng/mL, about 20 ng/mL about, about 30 ng/mL about 40 ng/mL, about 50 ng/mL, about 60 ng/mL, about 70 ng/mL, about 80 ng/mL, about 90 ng/mL, about 100 ng/mL, or about 1000 ng/mL.

[00155] In another aspect, provided herein is an antibody that competes for binding to V β 17
30 with any of the V β 17 antibodies described herein. In another aspect, provided herein is an

antibody that binds to the same epitope as any of the V β 17 antibodies described herein. In another aspect, provided is a V β 17 antibody that binds an epitope on V β 17 that overlaps with the epitope on V β 17 bound by a V β 17 antibody described herein. In some embodiments, the V β 17 antibody comprises a VH CDR1, VH CDR2, and VH CDR3 of a V β 17 antibody provided herein. In some embodiments, the V β 17 antibody comprises a VL CDR1, VL CDR2, and VL CDR3 of a V β 17 antibody provided herein. In some embodiments, the V β 17 antibody comprises a VH CDR1, VH CDR2, VH CDR3, a VL CDR1, VL CDR2, and VL CDR3 of a V β 17 antibody provided herein. In some embodiments, the V β 17 antibody comprises a VH of a V β 17 antibody provided herein. In some embodiments, the V β 17 antibody comprises a VL of a V β 17 antibody provided herein. In some embodiments, the V β 17 antibody comprises a VH and a VL of a V β 17 antibody provided herein. In some embodiments, the V β 17 antibody comprises a VH CDR1, VH CDR2, VH CDR3, a VL CDR1, VL CDR2, and VL CDR3 of a V β 17 antibody provided herein. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 antibody are according to the Kabat numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 antibody are according to the Chothia numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 antibody are according to the AbM numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 antibody are according to the Contact numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 antibody are according to the IMGT numbering system. In certain embodiments, the V β 17 antibody is a multispecific antibody. In some embodiments, the V β 17 antibody is a bispecific antibody.

[00156] In another aspect, provided is an antibody that competes for binding to V β 17 with a V β 17 reference antibody. In another aspect, provided is a V β 17 antibody that binds to the same V β 17 epitope as a V β 17 reference antibody. In another aspect, provided is a V β 17 antibody that binds an epitope on V β 17 that overlaps with the epitope on V β 17 bound by a V β 17 reference antibody. In some embodiments, the V β 17 reference antibody comprises a VH CDR1, VH CDR2, and VH CDR3 of a V β 17 reference antibody provided herein. In some embodiments, the V β 17 reference antibody comprises a VL CDR1, VL CDR2, and VL CDR3 of a V β 17 reference

antibody provided herein. In some embodiments, the V β 17 reference antibody comprises a VH CDR1, VH CDR2, VH CDR3, a VL CDR1, VL CDR2, and VL CDR3 of a V β 17 reference antibody provided herein. In some embodiments, the V β 17 reference antibody comprises a VH of a V β 17 reference antibody provided herein. In some embodiments, the V β 17 reference antibody comprises a VL of a V β 17 reference antibody provided herein. In some embodiments, the V β 17 reference antibody comprises a VH and a VL of a V β 17 reference antibody provided herein. In some embodiments, the V β 17 reference antibody comprises a VH CDR1, VH CDR2, VH CDR3, a VL CDR1, VL CDR2, and VL CDR3 of a V β 17 reference antibody provided herein. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 reference antibody are according to the Kabat numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 reference antibody are according to the Chothia numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 reference antibody are according to the AbM numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 reference antibody are according to the Contact numbering system. In some embodiments, the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences of the V β 17 reference antibody are according to the IMGT numbering system. In certain embodiments, the antibody is a multispecific antibody. In some embodiments, the antibody is a bispecific antibody. In certain embodiments, the V β 17 reference antibody is a multispecific antibody. In some embodiments, the V β 17 reference antibody is a bispecific antibody.

[00157] In some embodiments described herein, immune effector properties of the antibodies provided herein can be enhanced or silenced through Fc modifications by techniques known to those skilled in the art. For example, Fc effector functions such as C1q binding, complement dependent cytotoxicity (CDC), antibody-dependent cell-mediated cytotoxicity (ADCC), antibody-dependent cell-mediated phagocytosis (ADCP), down regulation of cell surface receptors (*e.g.*, B cell receptor; BCR), *etc.* can be provided and/or controlled by modifying residues in the Fc responsible for these activities.

[00158] “Antibody-dependent cell-mediated cytotoxicity” or “ADCC” refers to a cell-mediated reaction in which non-specific cytotoxic cells that express Fc receptors (FcRs) (*e.g.*

Natural Killer (NK) cells, neutrophils, and macrophages) recognize bound antibody on a target cell and subsequently cause lysis of the target cell.

[00159] The ability of antibodies to induce ADCC can be enhanced by engineering their oligosaccharide component. Human IgG1 or IgG3 are N-glycosylated at Asn297 with the majority of the glycans in the well-known biantennary G0, G0F, G1, G1F, G2 or G2F forms. Antibodies produced by non-engineered CHO cells typically have a glycan fucose content of about at least 85%. The removal of the core fucose from the biantennary complex-type oligosaccharides attached to the Fc regions enhances the ADCC of antibodies via improved FcγRIIIa binding without altering antigen binding or CDC activity. Such Abs can be achieved using different methods reported to lead to the successful expression of relatively high defucosylated antibodies bearing the biantennary complex-type of Fc oligosaccharides such as control of culture osmolality (Konno *et al.*, Cytotechnology 64:249-65, 2012), application of a variant CHO line Lec13 as the host cell line (Shields *et al.*, J Biol Chem 277:26733-26740, 2002), application of a variant CHO line EB66 as the host cell line (Olivier *et al.*, MAbs; 2(4), 2010; Epub ahead of print; PMID:20562582), application of a rat hybridoma cell line YB2/0 as the host cell line (Shinkawa *et al.*, J Biol Chem 278:3466-3473, 2003), introduction of small interfering RNA specifically against the α -1,6-fucosyltransferase (FUT8) gene (Mori *et al.*, Biotechnol Bioeng 88:901-908, 2004), or coexpression of β -1,4-N-acetylglucosaminyltransferase III and golgi α -mannosidase II or a potent alpha-mannosidase I inhibitor, kifunensine (Ferrara *et al.*, J Biol Chem 281:5032-5036, 2006, Ferrara *et al.*, Biotechnol Bioeng 93:851-861, 2006; Xhou *et al.*, Biotechnol Bioeng 99:652-65, 2008).

[00160] In some embodiments described herein, ADCC elicited by the antibodies provided herein can also be enhanced by certain substitutions in the antibody Fc. Exemplary substitutions are for example substitutions at amino acid positions 256, 290, 298, 312, 356, 330, 333, 334, 360, 378 or 430 (residue numbering according to the EU index) as described in U.S. Pat. No. 6,737,056.

[00161] In some embodiments, a V β 17 antibody provided herein is chimeric. In some embodiments, a V β 17 antibody provided herein is human. In some embodiments, a V β 17 antibody provided herein is humanized. In certain embodiments, a V β 17 antibody provided herein is an isolated V β 17 antibody. In some embodiments, a V β 17 antigen binding fragment provided herein is chimeric. In some embodiments, a V β 17 antigen binding fragment provided

herein is human. In some embodiments, a V β 17 antigen binding fragment provided herein is humanized. In certain embodiments, a V β 17 antigen binding fragment provided herein is an isolated V β 17 antigen binding fragment. In some embodiments, a V β 17 antibody provided herein is an IgG antibody. In some embodiments, the IgG antibody is an IgG1 antibody. In some embodiments, the IgG antibody is an IgG2 antibody. In some embodiments, the IgG antibody is an IgG3 antibody. In some embodiments, the IgG antibody is an IgG4 antibody. In some embodiments, a V β 17 antibody provided herein is multivalent. In some embodiments, the V β 17 antibody is capable of binding at least three antigens. In some embodiments, the V β 17 antibody is capable of binding at least four antigens. In some embodiments, the V β 17 antibody is capable of binding at least five antigens.

[00162] Also provided is a nucleic acid encoding an antibody provided herein. In another general aspect, provide is a vector comprising an isolated nucleic acid encoding an antibody provided herein. In another general aspect, provided is a vector comprising an isolated nucleic acid encoding an antibody provided herein. Also provided is a vector comprising a nucleic acid encoding an antibody provided herein. Also provided is a host cell comprising a vector comprising a nucleic acid encoding an antibody provided herein. Also provided is a kit comprising the vector comprising a nucleic acid encoding an antibody provided herein, and packaging for the same. In another general aspect, provided herein is an isolated nucleic acid encoding a monoclonal antibody or antigen-binding fragment thereof provided herein. In certain embodiments, the antibody is a V β 17 antibody.

[00163] It will be appreciated by those skilled in the art that the coding sequence of a protein can be changed (*e.g.*, replaced, deleted, inserted, *etc.*) without changing the amino acid sequence of the protein. Accordingly, it will be understood by those skilled in the art that nucleic acid sequences encoding antibodies provided herein can be altered without changing the amino acid sequences of the proteins.

[00164] Any vector known to those skilled in the art in view of the present disclosure can be used, such as a plasmid, a cosmid, a phage vector or a viral vector. In some embodiments, the vector is a recombinant expression vector such as a plasmid. The vector can include any element to establish a conventional function of an expression vector, for example, a promoter, ribosome binding element, terminator, enhancer, selection marker, and origin of replication. The promoter can be a constitutive, inducible or repressible promoter. A number of expression

vectors capable of delivering nucleic acids to a cell are known in the art and can be used herein for production of an antibody or antigen-binding fragment thereof in the cell. Conventional cloning techniques or artificial gene synthesis can be used to generate a recombinant expression vector according to certain embodiments. Such techniques are well known to those skilled in the art in view of the present disclosure.

[00165] Also provided is a host cell comprising an isolated nucleic acid encoding an antibody provided herein. Also provided is a host cell comprising an isolated nucleic acid encoding an antigen binding fragment provided herein. Any host cell known to those skilled in the art in view of the present disclosure can be used for recombinant expression of antibodies or antigen-binding fragments thereof provided herein. In some embodiments, the host cells are E. coli TG1 or BL21 cells (for expression of, e.g., an scFv or Fab antibody), CHO-DG44 or CHO-K1 cells or HEK293 cells (for expression of, e.g., a full-length IgG antibody). According to particular embodiments, the recombinant expression vector is transformed into host cells by conventional methods such as chemical transfection, heat shock, or electroporation, where it is stably integrated into the host cell genome such that the recombinant nucleic acid is effectively expressed.

[00166] Also provided are methods of producing an antibody disclosed herein. The methods comprise culturing a cell comprising a nucleic acid encoding the antibody under conditions to produce an antibody and recovering the antibody from the cell or cell culture (e.g., from the supernatant). Expressed antibodies can be harvested from the cells and purified according to conventional techniques known in the art and as described herein.

Pharmaceutical Compositions

[00167] In another general aspect, provided is a pharmaceutical composition comprising a V β 17 antibody provided herein and a pharmaceutically acceptable carrier. In certain embodiments, the antibody is isolated. Also provided is a method of producing the pharmaceutical composition, comprising combining the antibody with a pharmaceutically acceptable carrier to obtain the pharmaceutical composition.

[00168] In another general aspect, provided is a pharmaceutical composition comprising a V β 17 multispecific antibody provided herein and a pharmaceutically acceptable carrier. In certain embodiments, the multispecific antibody is isolated. Also provided is a method of producing the pharmaceutical composition, comprising combining the multispecific antibody

with a pharmaceutically acceptable carrier to obtain the pharmaceutical composition. Any of the antibodies provided herein are contemplated in the pharmaceutical compositions.

[00169] The term “pharmaceutical composition” as used herein means a product comprising an antibody provided herein together with a pharmaceutically acceptable carrier. Antibodies of provided herein and compositions comprising them are also useful in the manufacture of a medicament for therapeutic applications.

[00170] As used herein, the term “carrier” refers to any excipient, diluent, filler, salt, buffer, stabilizer, solubilizer, oil, lipid, lipid containing vesicle, microsphere, liposomal encapsulation, or other material well known in the art for use in pharmaceutical formulations. It will be understood that the characteristics of the carrier, excipient or diluent will depend on the route of administration for a particular application. As used herein, the term “pharmaceutically acceptable carrier” refers to a non-toxic material that does not interfere with the effectiveness of a composition provided herein the biological activity of a composition provided herein.

According to particular embodiments, in view of the present disclosure, any pharmaceutically acceptable carrier suitable for use in an antibody pharmaceutical composition can be used herein.

[00171] The formulation of pharmaceutically active ingredients with pharmaceutically acceptable carriers is known in the art, *e.g.*, Remington: The Science and Practice of Pharmacy (*e.g.* 21st edition (2005), and any later editions). Non-limiting examples of additional ingredients include: buffers, diluents, solvents, tonicity regulating agents, preservatives, stabilizers, and chelating agents. One or more pharmaceutically acceptable carriers can be used in formulating the pharmaceutical compositions provided herein.

[00172] In one embodiment, the pharmaceutical composition is a liquid formulation. A preferred example of a liquid formulation is an aqueous formulation, *i.e.*, a formulation comprising water. The liquid formulation can comprise a solution, a suspension, an emulsion, a microemulsion, a gel, and the like. An aqueous formulation typically comprises at least 50% w/w water, or at least 60%, 70%, 75%, 80%, 85%, 90%, or at least 95% w/w of water.

[00173] In one embodiment, the pharmaceutical composition can be formulated as an injectable which can be injected, for example, via an injection device (*e.g.*, a syringe or an infusion pump). The injection can be delivered subcutaneously, intramuscularly, intraperitoneally, intravitreally, or intravenously, for example.

[00174] In another embodiment, the pharmaceutical composition is a solid formulation, *e.g.*, a freeze-dried or spray-dried composition, which can be used as is, or where to the physician or the patient adds solvents, and/or diluents prior to use. Solid dosage forms can include tablets, such as compressed tablets, and/or coated tablets, and capsules (*e.g.*, hard or soft gelatin capsules). The pharmaceutical composition can also be in the form of sachets, dragees, powders, granules, lozenges, or powders for reconstitution, for example.

[00175] The dosage forms can be immediate release, in which case they can comprise a water-soluble or dispersible carrier, or they can be delayed release, sustained release, or modified release, in which case they can comprise water-insoluble polymers that regulate the rate of dissolution of the dosage form in the gastrointestinal tract or under the skin.

[00176] In other embodiments, the pharmaceutical composition can be delivered intranasally, intrabuccally, or sublingually.

[00177] The pH in an aqueous formulation can be between pH 3 and pH 10. In one embodiment, the pH of the formulation is from about 7.0 to about 9.5. In another embodiment, the pH of the formulation is from about 3.0 to about 7.0.

[00178] In another embodiment, the pharmaceutical composition comprises a buffer. Non-limiting examples of buffers include: arginine, aspartic acid, bicine, citrate, disodium hydrogen phosphate, fumaric acid, glycine, glycyglycine, histidine, lysine, maleic acid, malic acid, sodium acetate, sodium carbonate, sodium dihydrogen phosphate, sodium phosphate, succinate, tartaric acid, tricine, and tris(hydroxymethyl)-aminomethane, and mixtures thereof. The buffer can be present individually or in the aggregate, in a concentration from about 0.01 mg/ml to about 50 mg/ml, for example from about 0.1 mg/ml to about 20 mg/ml. Pharmaceutical compositions comprising each one of these specific buffers constitute alternative embodiments.

[00179] In another embodiment, the pharmaceutical composition comprises a preservative. Non-limiting examples of preservatives include: benzethonium chloride, benzoic acid, benzyl alcohol, bronopol, butyl 4-hydroxybenzoate, chlorobutanol, chlorocresol, chlorohexidine, chlorphenesin, o-cresol, m-cresol, p-cresol, ethyl 4-hydroxybenzoate, imidurea, methyl 4-hydroxybenzoate, phenol, 2-phenoxyethanol, 2-phenylethanol, propyl 4-hydroxybenzoate, sodium dehydroacetate, thiomerosal, and mixtures thereof. The preservative can be present individually or in the aggregate, in a concentration from about 0.01 mg/ml to about 50 mg/ml,

for example from about 0.1 mg/ml to about 20 mg/ml. Pharmaceutical compositions comprising each one of these specific preservatives constitute alternative embodiments.

[00180] In another embodiment, the pharmaceutical composition comprises an isotonic agent.

Non-limiting examples of isotonic agents include a salt (such as sodium chloride), an amino acid (such as glycine, histidine, arginine, lysine, isoleucine, aspartic acid, tryptophan, and threonine), an alditol (such as glycerol, 1,2-propanediol propyleneglycol), 1,3-propanediol, and 1,3-butanediol), polyethyleneglycol (*e.g.* PEG400), and mixtures thereof. Another example of an isotonic agent includes a sugar. Non-limiting examples of sugars can include mono-, di-, or polysaccharides, or water-soluble glycans, including for example fructose, glucose, mannose, sorbose, xylose, maltose, lactose, sucrose, trehalose, dextran, pullulan, dextrin, cyclodextrin, alpha and beta- HPCD, soluble starch, hydroxyethyl starch, and sodium carboxymethyl-cellulose. Another example of an isotonic agent is a sugar alcohol, wherein the term “sugar alcohol” is defined as a C(4-8) hydrocarbon having at least one -OH group. Non-limiting examples of sugar alcohols include mannitol, sorbitol, inositol, galactitol, dulcitol, xylitol, and arabitol. The isotonic agent can be present individually or in the aggregate, in a concentration from about 0.01 mg/ml to about 50 mg/ml, for example from about 0.1 mg/ml to about 20 mg/ml. Pharmaceutical compositions comprising each one of these specific isotonic agents constitute alternative embodiments.

[00181] In another embodiment, the pharmaceutical composition comprises a chelating agent.

Non-limiting examples of chelating agents include citric acid, aspartic acid, salts of ethylenediaminetetraacetic acid (EDTA), and mixtures thereof. The chelating agent can be present individually or in the aggregate, in a concentration from about 0.01 mg/ml to about 50 mg/ml, for example from about 0.1 mg/ml to about 20 mg/ml. Pharmaceutical compositions comprising each one of these specific chelating agents constitute alternative embodiments.

[00182] In another embodiment, the pharmaceutical composition comprises a stabilizer. Non-limiting examples of stabilizers include one or more aggregation inhibitors, one or more oxidation inhibitors, one or more surfactants, and/or one or more protease inhibitors.

[00183] In another embodiment, the pharmaceutical composition comprises a stabilizer, wherein said stabilizer is carboxy-/hydroxycellulose and derivatives thereof (such as HPC, HPC-SL, HPC-L and HPMC), cyclodextrins, 2-methylthioethanol, polyethylene glycol (such as PEG 3350), polyvinyl alcohol (PVA), polyvinyl pyrrolidone, salts (such as sodium chloride),

5 sulphur-containing substances such as monothioglycerol), or thioglycolic acid. The stabilizer can be present individually or in the aggregate, in a concentration from about 0.01 mg/ml to about 50 mg/ml, for example from about 0.1 mg/ml to about 20 mg/ml. Pharmaceutical compositions comprising each one of these specific stabilizers constitute alternative
embodiments.

[00184] In further embodiments, the pharmaceutical composition comprises one or more surfactants, preferably a surfactant, at least one surfactant, or two different surfactants. The term “surfactant” refers to any molecules or ions that are comprised of a water-soluble (hydrophilic) part, and a fat-soluble (lipophilic) part. The surfactant can, for example, be selected from the
10 group consisting of anionic surfactants, cationic surfactants, nonionic surfactants, and/or zwitterionic surfactants. The surfactant can be present individually or in the aggregate, in a concentration from about 0.1 mg/ml to about 20 mg/ml. Pharmaceutical compositions comprising each one of these specific surfactants constitute alternative embodiments.

[00185] In a further embodiment, the pharmaceutical composition comprises one or more
15 protease inhibitors, such as, *e.g.*, EDTA, and/or benzamidine hydrochloric acid (HCl). The protease inhibitor can be present individually or in the aggregate, in a concentration from about 0.1 mg/ml to about 20 mg/ml. Pharmaceutical compositions comprising each one of these specific protease inhibitors constitute alternative embodiments.

[00186] In another general aspect, provided herein is a method of producing a pharmaceutical
20 composition comprising an antibody or antigen-binding fragment thereof provided herein, comprising combining an antibody or antigen-binding fragment thereof with a pharmaceutically acceptable carrier to obtain the pharmaceutical composition.

Methods of use

[00187] The functional activity of antibodies provided herein can be characterized by methods
25 known in the art and as described herein. Methods for characterizing antibodies and antigen-binding fragments thereof include, but are not limited to, affinity and specificity assays including Biacore, ELISA, and OctetRed analysis; binding assays to detect the binding of antibodies to target cells by FACS; binding assays to detect the binding of antibodies to the target antigen on cells. According to particular embodiments, the methods for characterizing
30 antibodies and antigen-binding fragments thereof include those described below. In certain embodiments, the antibody is a V β 17 antibody.

[00188] Also provided is a method of activating a T cell expressing V β 17, comprising contacting the T cell with a V β 17 antibody provided herein. In some embodiments, the contacting results in an increase in CD69, CD25, and/or Granzyme B expression, as compared to a control T cell expressing V β 17.

5 **[00189]** In another general aspect, provided is a method of inactivating a T cell expressing V β 17, comprising contacting the T cell with an antibody that binds to a V β 17 provided herein. In another general aspect, provided is a method of blocking activation of a T cell expressing V β 17, comprising contacting the T cell with an antibody that binds to a V β 17 provided herein. In another general aspect, provided is a method of modulating the activation of a T cell
10 expressing V β 17, comprising contacting the T cell with an antibody that binds to a V β 17 provided herein.

[00190] Also provided herein is a method of treating a disease or disorder in a subject, comprising administering to the subject a V β 17 antibody provided herein. Also provided herein is a method of treating a disease or disorder in a subject, comprising administering to the subject
15 a V β 17 antigen binding fragment provided herein. Also provided herein is a method of treating a disease or disorder in a subject, comprising administering to the subject a pharmaceutical composition comprising a V β 17 antibody provided herein. Also provided herein is a method of treating a disease or disorder in a subject, comprising administering to the subject a pharmaceutical composition comprising a V β 17 antigen binding fragment provided herein.

20 **[00191]** Also provided herein is a V β 17 antibody for use in the treatment of a disease, wherein the V β 17 antibody is provided herein. In some embodiments, the disease is caused all or in part by a target cell having the second target present on the surface of the target cell. In some embodiments, the subject is human. In some embodiments, the subject is a subject in need thereof.

25 **[00192]** Also provided herein is use of a V β 17 antibody in the manufacture of a medicament for the treatment of a disease, wherein the V β 17 antibody is provided herein. In some embodiments, the disease is caused all or in part by a target cell having the second target present on the surface of the target cell. In some embodiments, the subject is human. In some embodiments, the subject is a subject in need thereof.

[00193] In some embodiments, the subject is a subject in need thereof. In some embodiments, the subject is a human. In specific embodiments, the subject is administered an effective amount.

[00194] As used herein, the term “effective amount” refers to an amount of an active ingredient or component that elicits the desired biological or medicinal response in a subject.

[00195] According to particular embodiments, an effective amount refers to the amount of therapy which is sufficient to achieve one, two, three, four, or more of the following effects: (i) reduce or ameliorate the severity of the disease, disorder or condition to be treated or a symptom associated therewith; (ii) reduce the duration of the disease, disorder or condition to be treated, or a symptom associated therewith; (iii) prevent the progression of the disease, disorder or condition to be treated, or a symptom associated therewith; (iv) cause regression of the disease, disorder or condition to be treated, or a symptom associated therewith; (v) prevent the development or onset of the disease, disorder or condition to be treated, or a symptom associated therewith; (vi) prevent the recurrence of the disease, disorder or condition to be treated, or a symptom associated therewith; (vii) reduce hospitalization of a subject having the disease, disorder or condition to be treated, or a symptom associated therewith; (viii) reduce hospitalization length of a subject having the disease, disorder or condition to be treated, or a symptom associated therewith; (ix) increase the survival of a subject with the disease, disorder or condition to be treated, or a symptom associated therewith; (xi) inhibit or reduce the disease, disorder or condition to be treated, or a symptom associated therewith in a subject; and/or (xii) enhance or improve the prophylactic or therapeutic effect(s) of another therapy.

[00196] The effective amount or dosage can vary according to various factors, such as the disease, disorder or condition to be treated, the means of administration, the target site, the physiological state of the subject (including, *e.g.*, age, body weight, health), whether the subject is a human or an animal, other medications administered, and whether the treatment is prophylactic or therapeutic. Treatment dosages are optimally titrated to optimize safety and efficacy.

[00197] According to particular embodiments, the compositions described herein are formulated to be suitable for the intended route of administration to a subject. For example, the compositions described herein can be formulated to be suitable for intravenous, subcutaneous, or intramuscular administration.

[00198] As used herein, the terms “treat,” “treating,” and “treatment” are all intended to refer to an amelioration or reversal of at least one measurable physical parameter related to a cancer, which is not necessarily discernible in the subject, but can be discernible in the subject. The terms “treat,” “treating,” and “treatment,” can also refer to causing regression, preventing the progression, or at least slowing down the progression of the disease, disorder, or condition. In a particular embodiment, “treat,” “treating,” and “treatment” refer to an alleviation, prevention of the development or onset, or reduction in the duration of one or more symptoms associated with the disease, disorder, or condition, such as a tumor or more preferably a cancer. In a particular embodiment, “treat,” “treating,” and “treatment” refer to prevention of the recurrence of the disease, disorder, or condition. In a particular embodiment, “treat,” “treating,” and “treatment” refer to an increase in the survival of a subject having the disease, disorder, or condition. In a particular embodiment, “treat,” “treating,” and “treatment” refer to elimination of the disease, disorder, or condition in the subject.

[00199] In some embodiments, a V β 17 antibody provided herein is used in combination with a supplemental therapy.

[00200] As used herein, the term “in combination,” in the context of the administration of two or more therapies to a subject, refers to the use of more than one therapy. The use of the term “in combination” does not restrict the order in which therapies are administered to a subject. For example, a first therapy (*e.g.*, a composition described herein) can be administered prior to (*e.g.*, 5 minutes, 15 minutes, 30 minutes, 45 minutes, 1 hour, 2 hours, 4 hours, 6 hours, 12 hours, 16 hours, 24 hours, 48 hours, 72 hours, 96 hours, 1 week, 2 weeks, 3 weeks, 4 weeks, 5 weeks, 6 weeks, 8 weeks, or 12 weeks before), concomitantly with, or subsequent to (*e.g.*, 5 minutes, 15 minutes, 30 minutes, 45 minutes, 1 hour, 2 hours, 4 hours, 6 hours, 12 hours, 16 hours, 24 hours, 48 hours, 72 hours, 96 hours, 1 week, 2 weeks, 3 weeks, 4 weeks, 5 weeks, 6 weeks, 8 weeks, or 12 weeks after) the administration of a second therapy to a subject.

[00201] V β 17 antibodies provided herein may also be used as agents to detect V β 17-expressing cells. Thus, in another methods, provided is a method of detecting a cell expressing V β 17, comprising contacting a cell with a V β 17 antibody provided herein. In certain embodiments, the detecting is by ELISA. In some embodiments, the detecting is by FACS analysis. Also provided are kits comprising a V β 17 antibody provided herein, and instructions for use.

Enrichment and detection methods

[00202] In one aspect, the V β 17 antibodies provided herein are used as agents to detect V β 17-expressing cells. Thus, in other methods, provided is a method of detecting a cell expressing V β 17, comprising contacting a cell with a V β 17 antibody provided herein. In certain
5 embodiments, the detecting is by ELISA. In some embodiments, the detecting is by FACS analysis. Also provided are kits comprising a V β 17 antibody provided herein, and instructions for use.

[00203] Enrichment, isolation, separation, purification, sorting, selecting, capturing or detecting, or any combination thereof can be done using known technologies such as bead,
10 microfluidics, solid support, columns, and the like. For example, V β 17 cells may be separated or visualized using known methods when bound to the V β 17 antibodies provided herein.

[00204] The V β 17 antibodies or multispecific V β 17 antibodies provided herein can be used to selectively enrich, isolate, separate, purify, sort, select, capture or detect V β 17-expressing cells. The V β 17 antibodies or multispecific V β 17 antibodies provided herein may be utilized in a
15 bispecific format, *e.g.* containing a first antigen binding domain that specifically binds V β 17 and a second antigen binding domain that specifically binds a second target. In other embodiments, the multispecific V β 17 antibodies provided herein may be utilized in a format that further incorporates a third antigen binding domain that specifically binds a third antigen (*e.g.*, at a trispecific antibody). In other embodiments, the multispecific V β 17 antibodies
20 provided herein may be utilized in a format that further incorporates a fourth antigen binding domain that specifically binds a fourth antigen. (*e.g.*, as a quadraspecific antibody).

[00205] In one aspect, provided herein is a method of enriching a V β 17-expressing cell comprising: providing a sample comprising the V β 17-expressing cell; contacting the sample with a V β 17 antibody provided herein; and enriching the V β 17-expressing cell bound to the
25 V β 17 antibody. In one aspect, provided herein is a method of isolating a V β 17-expressing cell comprising: providing a sample comprising the V β 17-expressing cell; contacting the sample with a V β 17 antibody provided herein; and isolating the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of separating a V β 17-expressing cell comprising: providing a sample comprising the V β 17-expressing cell; contacting the sample
30 with a V β 17 antibody provided herein; and separating the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of purifying a V β 17-expressing cell

comprising: providing a sample comprising the V β 17-expressing cell; contacting the sample with a V β 17 antibody provided herein; and purifying the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of sorting a V β 17-expressing cell comprising: providing a sample comprising the V β 17-expressing cell; contacting the sample with a V β 17 antibody provided herein; and sorting the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of selecting a V β 17-expressing cell comprising: providing a sample comprising the V β 17-expressing cell; contacting the sample with a V β 17 antibody provided herein; and selecting the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of capturing a V β 17-expressing cell comprising: providing a sample comprising the V β 17-expressing cell; contacting the sample with a V β 17 antibody provided herein; and capturing the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of detecting a V β 17-expressing cell comprising: providing a sample comprising the V β 17-expressing cell; contacting the sample with a V β 17 antibody provided herein; and detecting the V β 17-expressing cell bound to the V β 17 antibody.

[00206] In one aspect, provided herein is a method of enriching a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and enriching the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of isolating a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and isolating the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of separating a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and separating the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of purifying a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and purifying the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of sorting a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and sorting the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of selecting a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and selecting the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of capturing a V β 17-expressing cell

comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and capturing the V β 17-expressing cell bound to the V β 17 antibody. In one aspect, provided herein is a method of detecting a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and detecting the V β 17-expressing cell bound to the V β 17 antibody.

[00207] In one aspect, provided herein is a method of enriching a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and enriching the V β 17-expressing cell based on binding of the V β 17-expressing cell to the V β 17 antibody. In one aspect, provided herein is a method of isolating a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and isolating the V β 17-expressing cell based on binding of the V β 17-expressing cell to the V β 17 antibody. In one aspect, provided herein is a method of separating a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and separating the V β 17-expressing cell based on binding of the V β 17-expressing cell to the V β 17 antibody. In one aspect, provided herein is a method of purifying a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and purifying the V β 17-expressing cell based on binding of the V β 17-expressing cell to the V β 17 antibody. In one aspect, provided herein is a method of sorting a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and sorting the V β 17-expressing cell based on binding of the V β 17-expressing cell to the V β 17 antibody. In one aspect, provided herein is a method of selecting a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and selecting the V β 17-expressing cell based on binding of the V β 17-expressing cell to the V β 17 antibody. In one aspect, provided herein is a method of capturing a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and capturing the V β 17-expressing cell based on binding of the V β 17-expressing cell to the V β 17 antibody. In one aspect, provided herein is a method of detecting a V β 17-expressing cell comprising: contacting a V β 17-expressing cell with a V β 17 antibody provided herein; and detecting the V β 17-expressing cell based on binding of the V β 17-expressing cell to the V β 17 antibody.

[00208] In certain embodiments of the methods, the V β 17-expressing cell is a T cell. In some embodiments of the methods, the V β 17-expressing cell is in a population of cells. In some embodiments of the methods, the V β 17-expressing cell is in a population of lymphocytes. In some embodiments of the methods, the V β 17-expressing cell is in a population of T cells. In some embodiments of the methods, the V β 17-expressing cell is provided as a population of cells. In some embodiments of the methods, the V β 17-expressing cell is provided as a population of lymphocytes. In some embodiments of the methods, the V β 17-expressing cell is provided as a population of T cells. In some embodiments of the methods, the V β 17-expressing cell is provided as a sample comprising a population of cells. In some embodiments of the methods, the V β 17-expressing cell is provided as a sample comprising a population of lymphocytes. In some embodiments of the methods, the V β 17-expressing cell is provided as a sample comprising a population of T cells. In some embodiments of the methods, the sample is a blood sample. In some embodiments of the methods, the sample is a tissue sample. In some embodiments of the methods, the sample is a tissue culture sample.

[00209] In some embodiments of the methods, the V β 17 antibody is a multispecific V β 17 antibody provided herein. In some embodiments of the methods, the V β 17 antibody is a bispecific V β 17 antibody provided herein. In some embodiments of the methods, the V β 17 antibody is a trispecific V β 17 antibody provided herein. In some embodiments of the methods, the V β 17 antibody is a quadraspecific V β 17 antibody provided herein. In certain embodiments, the V β 17 antibody specifically binds to V β 17. In one embodiment, the multispecific V β 17 antibody comprises: (a) a first binding domain that binds V β 17, and (b) a second binding domain that binds to a second target (*e.g.*, a target that is not V β 17). In one embodiment, the multispecific V β 17 antibody comprises: (a) a first binding domain that binds V β 17, and (b) a second binding domain that binds to a second target (*e.g.*, a target that is not V β 17), and (c) a third binding domain that binds to a third target (*e.g.*, a target that is not V β 17). In one embodiment, the multispecific V β 17 antibody comprises: (a) a first binding domain that binds V β 17, and (b) a second binding domain that binds to a second target (*e.g.*, a target that is not V β 17), (c) a third binding domain that binds to a third target (*e.g.*, a target that is not V β 17), and (d) a fourth binding domain that binds to a fourth target (*e.g.*, a target that is not V β 17). In one embodiment, the multispecific V β 17 antibody comprises: (a) a first binding domain that specifically binds V β 17, and (b) a second binding domain that specifically binds to a second

target (*e.g.*, a target that is not V β 17). In one embodiment, the multispecific V β 17 antibody comprises: (a) a first binding domain that specifically binds V β 17, and (b) a second binding domain that specifically binds to a second target (*e.g.*, a target that is not V β 17), and (c) a third binding domain that specifically binds to a third target (*e.g.*, a target that is not V β 17). In one
5 embodiment, the multispecific V β 17 antibody comprises: (a) a first binding domain that specifically binds V β 17, and (b) a second binding domain that specifically binds to a second target (*e.g.*, a target that is not V β 17), (c) a third binding domain that specifically binds to a third target (*e.g.*, a target that is not V β 17), and (d) a fourth binding domain that specifically binds to a fourth target (*e.g.*, a target that is not V β 17).

10 **[00210]** In specific embodiments of the methods provided herein, the method uses multi-marker detection. In some embodiments, the multi-marker detection uses a multispecific V β 17 antibody provided herein. In some embodiments, the multi-marker detection uses a bispecific V β 17 antibody provided herein. In some embodiments, the multi-marker detection uses a trispecific V β 17 antibody provided herein. In some embodiments, the multi-marker detection
15 uses a quadraspecific V β 17 antibody provided herein.

[00211] In certain embodiments of the methods provided herein, the methods are included as steps in a T cell manufacturing process. In certain embodiments, the cells are CAR-T cells. In certain embodiments of the methods provided herein, the methods are included as steps in a T cell modification process.

20 **[00212]** In certain embodiments of the methods provided herein, the methods are included as steps in a diagnostic method. In certain embodiments of the methods provided herein, the methods are included as steps in a method to quantify the V β 17-expressing T cells.

[00213] In certain embodiments of the methods provided herein, the method further comprises expanding the enriched, isolated, separated, purified, sorted, selected, captured or
25 detected V β 17-expressing cells. In certain embodiments, the expanding is *in vitro*. In certain embodiments, the expanding is *in vivo*. In certain embodiments of the methods provided herein, the method further comprises growing the enriched, isolated, separated, purified, sorted, selected, captured or detected V β 17-expressing cells. In certain embodiments, the growing is *in vitro*. In certain embodiments, the growing is *in vivo*. In certain embodiments of the methods
30 provided herein, the method further comprises quantifying the enriched, isolated, separated, purified, sorted, selected, captured or detected V β 17-expressing cells.

EMBODIMENTS

[00214] This invention provides the following non-limiting embodiments.

[00215] In one set of embodiments, provided are:

A1. An antibody that binds V β 17 comprising:

- 5 (1) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:31; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:32;
- 10 (2) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:65; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:66;
- 15 (3) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:99; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:100;
- 20 (4) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:133; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:134;
- 25 (5) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:167; and (ii) a VL comprising
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a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:168;

(6) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:201; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:202;

(7) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:235; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:236;

(8) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:269; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:270;

(9) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:303; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:304;

(10) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:337; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a

VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:338;

(11) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:371; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:372;

(12) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:405; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:406; or

(13) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:439; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:440.

A2. The antibody of embodiment A1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Kabat numbering system.

A3. The antibody of embodiment A1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Chothia numbering system.

A4. The antibody of embodiment A1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the AbM numbering system.

- A5. The antibody of embodiment A1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Contact numbering system.
- A6. The antibody of embodiment A1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the IMGT numbering system.
- A7. The antibody of any one of embodiments A1 to A6, wherein the antibody is a humanized antibody.
- A8. The antibody of any one of embodiments A1 to A7, wherein the antibody is an IgG antibody.
- A9. The antibody of embodiment A8, wherein the IgG antibody is an IgG1, IgG2, IgG3, or IgG4 antibody.
- A10. The antibody of any one of embodiments A1 to A9, wherein the antibody comprises a kappa light chain.
- A11. The antibody of any one of embodiments A1 to A9, wherein the antibody comprises a lambda light chain.
- A12. The antibody of any one of embodiments A1 to A11, wherein the antibody is a monoclonal antibody.
- A13. The antibody of any one of embodiments A1 to A12, wherein the antibody binds a V β 17 antigen.
- A14. The antibody of any one of embodiments A1 to A12, wherein antibody binds a V β 17 epitope.
- A15. The antibody of any one of embodiments A1 to A14, wherein the antibody specifically binds to V β 17.
- A16. The antibody of any one of embodiments A1 to A15, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2 and VL CDR3 form a binding site for an antigen of the V β 17.
- A17. The antibody of any one of embodiments A1 to A15, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2 and VL CDR3 form a binding site for an epitope of the V β 17.
- A18. The antibody of any one of embodiments A1 to A17, wherein the V β 17 is present on the surface of a T cell.
- A19. The antibody of any one of embodiments A1 to A18, wherein the antibody is multivalent.

- A20. The antibody of embodiment A19, wherein the antibody is capable of binding at least three antigens.
- A21. The antibody of embodiment A19, wherein the antibody is capable of binding at least four antigens.
- 5 A22. The antibody of embodiment A19, wherein the antibody is capable of binding at least five antigens.
- A23. The antibody of any one of embodiments A1 to A22, wherein the antibody is a multispecific antibody.
- A24. The antibody of embodiment A23, wherein the antibody is a bispecific antibody.
- 10 A25. The antibody of embodiment A23, wherein the antibody is a trispecific antibody.
- A26. The antibody of embodiment A23, wherein the antibody is a quadraspecific antibody.
- A27. A nucleic acid encoding the antibody of any one of embodiments A1 to A26.
- A28. A vector comprising the nucleic acid of embodiment A27.
- A29. A host cell comprising the vector of embodiment A28.
- 15 A30. A kit comprising the vector of embodiment A28 and packaging for the same.
- A31. A kit comprising the antibody of any one of embodiments A1 to A26 and packaging for the same.
- A32. A method of directing a T cell expressing V β 17 to a target cell, comprising contacting the V β 17 antibody of any one of embodiments A1 to A26 with the target cell, wherein the second
- 20 target is present on the surface of the target cell, and wherein the contacting directs the T cell to the target cell.
- A33. A method of inhibiting the growth or proliferation of a target cell, comprising contacting the V β 17 antibody of any one of embodiments A1 to A26 with the target cell having the second
- 25 target present on the surface of the target cell, wherein the contacting is in the presence of a T cell expressing the V β 17, and wherein the contacting results in the inhibition of the growth or proliferation of the target cell.
- A34. A method of eliminating a target cell in a subject, comprising contacting the V β 17 antibody of any one of embodiments A1 to A26 with the target cell having the second target
- 30 present on the surface of the target cell, wherein the contacting is in the presence of a T cell expressing the V β 17, and wherein the contacting results in the elimination of the target cell.

[00216] In one set of embodiments, provided are:

B1. A pharmaceutical composition comprising an antibody that binds V β 17, and a pharmaceutically acceptable carrier.

B2. The pharmaceutical composition of embodiment B1, wherein the antibody that binds V β 17 comprises

- (1) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:31; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:32;
- (2) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:65; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:66;
- (3) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:99; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:100;
- (4) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:133; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:134;
- (5) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a

VH having an amino acid sequence of SEQ ID NO:167; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:168;

(6) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:201; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:202;

(7) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:235; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:236;

(8) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:269; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:270;

(9) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:303; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:304;

(10) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:337; and (ii) a VL comprising

a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:338;

(11) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:371; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:372;

(12) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:405; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:406; or

(13) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:439; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:440.

B3. The pharmaceutical composition of embodiment B2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Kabat numbering system.

B4. The pharmaceutical composition of embodiment B2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Chothia numbering system.

B5. The pharmaceutical composition of embodiment B2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the AbM numbering system.

B6. The pharmaceutical composition of embodiment B2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Contact numbering system.

B7. The pharmaceutical composition of embodiment B2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the IMGT numbering system.

B8. The pharmaceutical composition of any one of embodiments B1 to B7, wherein the antibody is a humanized antibody.

B9. The pharmaceutical composition of any one of embodiments B1 to B8, wherein the antibody is an IgG antibody.

B10. The pharmaceutical composition of embodiment B9, wherein the IgG antibody is an IgG1, IgG2, IgG3, or IgG4 antibody.

B11. The pharmaceutical composition of any one of embodiments B1 to B10, wherein the antibody comprises a kappa light chain.

B12. The pharmaceutical composition of any one of embodiments B1 to B11, wherein the antibody comprises a lambda light chain.

B13. The pharmaceutical composition of any one of embodiments B1 to B12, wherein the antibody is a monoclonal antibody.

B14. The pharmaceutical composition of any one of embodiments B1 to B13, wherein the antibody binds a V β 17 antigen.

B15. The pharmaceutical composition of any one of embodiments B1 to B13, wherein antibody binds a V β 17 epitope.

B16. The pharmaceutical composition of any one of embodiments B1 to B15, wherein the antibody specifically binds to V β 17.

B17. The pharmaceutical composition of any one of embodiments B1 to B16, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2 and VL CDR3 form a binding site for an antigen of the V β 17.

B18. The pharmaceutical composition of any one of embodiments B1 to B16, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2 and VL CDR3 form a binding site for an epitope of the V β 17.

B19. The pharmaceutical composition of any one of embodiments B1 to B18, wherein the V β 17 is present on the surface of a T cell.

B20. The pharmaceutical composition of any one of embodiments B1 to B19, wherein the antibody is multivalent.

5 B21. The pharmaceutical composition of embodiment B20, wherein the antibody is capable of binding at least three antigens.

B22. The pharmaceutical composition of embodiment B20, wherein the antibody is capable of binding at least four antigens.

10 B23. The pharmaceutical composition of embodiment B20, wherein the antibody is capable of binding at least five antigens.

B24. The pharmaceutical composition of any one of embodiments B1 to B23, wherein the antibody is a multispecific antibody.

B25. The pharmaceutical composition of embodiment B24, wherein the antibody is a bispecific antibody.

15 B26. The pharmaceutical composition of embodiment B24, wherein the antibody is a trispecific antibody.

B27. The pharmaceutical composition of embodiment B24, wherein the antibody is a quadraspecific antibody.

20 B28. A method of producing the pharmaceutical composition of any one of embodiments B1 to B27, comprising combining the antibody with a pharmaceutically acceptable carrier to obtain the pharmaceutical composition.

[00217] In one set of embodiments, provided are:

25 C1. A method of treating a disease in a subject, comprising administering an effective amount an antibody that binds V β 17 to the subject, wherein the disease is caused all or in part by a target cell having the second target present on the surface of the target cell.

C2. The method of embodiment C1, wherein the antibody that binds V β 17 comprises:

- (1) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:31; and (ii)
- 30 a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino

acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:32;

- (2) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:65; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:66;

- (3) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:99; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:100;

- (4) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:133; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:134;

- (5) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:167; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:168;

- (6) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:201; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a

VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:202;

- (7) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:235; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:236;

- (8) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:269; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:270;

- (9) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:303; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:304;

- (10) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:337; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:338;

- (11) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:371; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a

VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:372;

- (12) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:405; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:406; or

- (13) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having an amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having an amino acid sequence of SEQ ID NO:439; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having an amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having an amino acid sequence of SEQ ID NO:440.

C3. The method of embodiment C2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Kabat numbering system.

C4. The method of embodiment C2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Chothia numbering system.

C5. The method of embodiment C2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the AbM numbering system.

C6. The method of embodiment C2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Contact numbering system.

C7. The method of embodiment C2, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the IMGT numbering system.

C8. The method of any one of embodiments C1 to C7, wherein the antibody is a humanized antibody.

- C9. The method of any one of embodiments C1 to C8, wherein the antibody is an IgG antibody.
- C10. The method of embodiment C9, wherein the IgG antibody is an IgG1, IgG2, IgG3, or IgG4 antibody.
- 5 C11. The method of any one of embodiments C1 to C10, wherein the antibody comprises a kappa light chain.
- C12. The method of any one of embodiments C1 to C10, wherein the antibody comprises a lambda light chain.
- C13. The method of any one of embodiments C1 to C12, wherein the antibody is a monoclonal
10 antibody.
- C14. The method of any one of embodiments C1 to C13, wherein the antibody binds a V β 17 antigen.
- C15. The method of any one of embodiments C1 to C13, wherein antibody binds a V β 17 epitope.
- 15 C16. The method of any one of embodiments C1 to C15, wherein the antibody specifically binds to V β 17.
- C17. The method of any one of embodiments C1 to C16, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2 and VL CDR3 form a binding site for an antigen of the V β 17.
- C18. The method of any one of embodiments C1 to C16, wherein the VH CDR1, VH CDR2,
20 VH CDR3, VL CDR1, VL CDR2 and VL CDR3 form a binding site for an epitope of the V β 17.
- C19. The method of any one of embodiments C1 to C18, wherein the V β 17 is present on the surface of a T cell.
- C20. The method of any one of embodiments C1 to C19, wherein the antibody is multivalent.
- C21. The method of embodiment C20, wherein the antibody is capable of binding at least three
25 antigens.
- C22. The method of embodiment C20, wherein the antibody is capable of binding at least four antigens.
- C23. The method of embodiment C20, wherein the antibody is capable of binding at least five antigens.
- 30 C24. The method of any one of embodiments C1 to C23, wherein the antibody is a multispecific antibody.

C25. The method of embodiment C24, wherein the antibody is a bispecific antibody.

C26. The method of embodiment C24, wherein the antibody is a trispecific antibody.

C27. The method of embodiment C24, wherein the antibody is a quadraspecific antibody.

C28. The method of any one of embodiments C1 to C27, wherein the subject is a human.

5 C29. The method of any one of embodiments C1 to C27, wherein the subject is a subject in need thereof.

C30. A method of activating a T cell expressing V β 17, comprising contacting the T cell with the antibody of any one of embodiments C1 to C29.

10 C31. The method of embodiment C30, wherein the contacting results in an increase in CD69, CD25, and/or Granzyme B expression, as compared to a control T cell expressing V β 17.

C32. A process for making an antibody that binds to more than one target molecule, the process comprising: a step for performing a function of obtaining a first binding domain that binds to V β 17 present on a T cell; a step for performing a function of obtaining a second binding domain that binds to a second target on the surface of a target cell; and a step for performing a
15 function of providing an antibody that binds to V β 17 present on a T cell and a second target on the surface of a target cell.

C33. The process of embodiment C32, wherein the step for performing a function of obtaining a second binding domain that binds to a second target on the surface of a target cell is repeated n times, and further comprising n steps for performing a function of providing a first binding
20 domain that binds to V β 17 present on a T cell and n number of target molecules, wherein n is at least 2.

[00218] Provided in the Examples herein are exemplary antibodies that bind to V β 17.

[00219] Exemplary binding agents that bind to V β 17 are provided herein, for example in the Examples, as well as Tables 1-6.

25 **[00220]** Particular embodiments of this invention are described herein. Upon reading the foregoing description, variations of the disclosed embodiments may become apparent to individuals working in the art, and it is expected that those skilled artisans may employ such variations as appropriate. Accordingly, it is intended that the invention be practiced otherwise than as specifically described herein, and that the invention includes all modifications and
30 equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible

variations thereof is encompassed by the invention unless otherwise indicated herein or otherwise clearly contradicted by context. A number of embodiments of the invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. Accordingly, the descriptions in the Examples section are intended to illustrate but not limit the scope of invention described in the claims.

EXAMPLES

EXAMPLE 1: ANTIBODIES THAT BIND V β 17

1.1: Identification of V β 17 monoclones

[00221] A cell based approach was used to identify V β 17 specific monoclones.

[00222] Mice were tolerized with NS0-WT cells in neonatal stage and then immunized with TCRV α 10.2*V β 17.2 expressing NS0 cell line weekly for 3 boosters.

[00223] High titer was assessed by checking specificity towards V β 17.2 using 3 variants of SKW3 cell line [SKW3-1 (V α 10*V β 17), SKW3-2 (V α 12*V β 17), SKW3-3 (V α 10*V β 7/9)].

[00224] Several monoclones binding to V β 17 were identified by flow cytometry using different cell lines and primary cells as shown in **FIG. 1**. Anti TCR V β 17-PE Ab, Beckman Coulter, Cat: IM2048 was used as a positive control. Goat anti mouse IgG PE, Southern Biotech, Cat:1030-09, E2518-RJ69Y was used as a negative control.

EXAMPLE 2: EVALUATION OF V β 17 ANTIBODY PROPERTIES

2.1: Proliferation and activation

[00225] To test proliferation of V β 17+ cells, 96 well ELISA plate was coated with V β 17 antibodies or Control Antibody (B17B21) at 10ug/ml and incubated for 24 hour. PBMC were thawed and labeled with Cell trace violet to track the proliferation. 0.5M PBMC cells/well/200 ul of 10% RPMI media (without IL-2) were incubated for 24 hour in a CO₂ incubator. Cells were transferred from 96 well to 48 well culture plate with 200ul of 10% RPMI media (no IL-2). The CTV dilution was checked for proliferation and activation status using markers: CD25, CD69 and CD71.

[00226] Monoclones from 7 parents showed good agonistic properties as shown in **FIG. 2**.

Selected 26 monoclones with good agonistic properties were taken for purification.

[00227] Differential proliferation kinetics were observed for the 26 purified antibodies. As shown in **FIG. 3**, monoclones from parents 28B2, 28C9 and 28D2 showed good proliferation and were taken for further assays.

[00228] Differential CD71 upregulation were observed for the 26 purified antibodies. As shown in **FIG. 4**, monoclones from parents 28B2, 28C9 and 28D2 showed good CD71 upregulation and were taken for further assays.

2.2: V β 17 binding

[00229] The 10 best agonistic monoclones binding to V β 17 was assessed using SKW3 cell line variants. As shown in **FIG. 5**, the 10 purified antibodies belonging to 3 different parents bound well to SKW3-1 and 2 cell lines and not to SKW3-3 cells, which does not express V β 17. Purified antibodies of 14H7 parent did not bind well on SKW3-2 cell line and was included as a negative control.

[00230] The 10 selected purified monoclones binding to PBMCs was assessed. As shown in **FIG. 6**, the 10 purified antibodies belonging to 3 different parents bound well to T cells on PBMCs.

[00231] These 10 shortlisted monoclones differ in isotypes based on their hybrid parent as shown in **FIG. 7**. The purified monoclonal antibodies from 3 different parent have different isotypes: 28D2 has IgG1, 28B2 has IgG2a and 28C9 has IgG2b.

2.3: V β 17 antibody internalization

[00232] Internalization Assay used to screen the 10 shortlisted antibodies. MMAF and antibodies was added to 5000 cells/well/50 μ l each at 50nM concentration, with Ab control, MMAF control and at 3-fold dilution till 7th points. MMAF antibody was incubated with cells for 20 mins and assay was run in duplicates. The plate was incubated for 96 hr at 37 °C following which Cell Titre Glo was added to the plates. Luminescence was read in TECAN SPARK and % viability was calculated using the formula MMAF+Ab/MMAF X 100. Data was plotted in GraphPad Prism.

[00233] As shown in **FIG. 8**, monoclones from 28B2 parent show good internalization. Monoclones from parent 28C9 which had very good agonistic property, show poor internalization. Monoclones from parent 28D2 and 14H7 show no internalization.

EXAMPLE 3: EPIOTOPE BINNING OF V β 17 MONOCLONES

[00234] Epitope binning helped segregate the final monoclonal antibodies into separate epitope recognition groups and the antibodies recognizing different epitopes from that of the commercial antibody. The distinction in epitope recognition was supported by diversity in V-gene sequences.

[00235] Epitope binning matrix for 10 shortlisted antibodies using Octet RED96 showed 3 separate specificities as shown in **FIGS. 9A-9C**. The Antibody 1 were loaded onto anti-mouse IgG Fc capture (AMC) sensors and then made to bind to the antigen (TCRV α 10.2*V β 17 huFc), before running them on Antibody 2 panel. Purified monoclonal antibodies from 3 different parents binned into 3 different groups.

[00236] Furthermore, the 10 shortlisted antibodies bin differently compared to the commercial positive control antibody as was assessed using Octet RED96. As shown in **FIGS. 10A-10C**, positive control antibody TCRV β 17-PE (Beckman coulter, Catalogue No: IM2048) bin differently from the 10 shortlisted antibodies.

[00237] As shown in **FIG. 11**, monoclonal antibodies from the same parent have the same VH sequence. Heavy chain sequences of monoclonal antibodies belonging to 3 different hybrids were diverse from each other.

[00238] As shown in **FIG. 12**, monoclonal antibodies from the same parent have the same VK sequence. Light chain sequences of monoclonal antibodies belonging to 3 different hybrids were diverse from each other.

EXAMPLE 4: FURTHER CHARACTERIZATION OF OTHER V β 17 ANTIBODIES

[00239] As shown in **FIG. 13**, 12 other antibodies were tested for their proliferation and activation profiles. These 12 additional antibodies had moderate agonistic properties and good PBMC binding and were taken forward for Epitope binning and Cell based competition assays.

[00240] As shown in **FIGS. 14A-14C**, monoclonal antibodies from one hybrid parent 23A9 binned similarly with positive control antibody (TCRV β 17-PE).

[00241] As shown in **FIGS. 15A-15C**, Monoclonal antibodies from 23A9 and commercial antibody bin similarly to each other, but differently to monoclonal antibodies from other hybrid parents.

EXAMPLE 5: CELL BASED COMPETITION ASSAY OF V β 17 ANTIBODIES

[00242] Cells were treated with Live/dead dye for 15 min at 4°C followed by seeding of cells in 96 well plate. Cells were treated with different concentrations of humanized V β 17 antibody

(B17B633.001) and incubated for 40 min at 4°C. Cells were washed and incubated with 20ug/ml of purified mouse Vb17 antibodies for 40 min at 4°C. Cells were stained with secondary antibody, washed and read on Novocyte. As shown in **FIG. 16**, most monoclones did not compete with the commercial antibody to bind to cells expressing Vβ17.

Table 7. Antibody Binding to TCR Vβ17

SEQ ID NO.	Clone Name	PBMC binding (%)	HuTCR Vb17 x Va10.2 (SKW3_1) MFI	HuTCR Vb17 x Va12 (SKW3_2) MFI	HuTCR Vb7/9 x Va10.2 (SKW3_3) MFI	Cell Internalization (EC50)	Proliferation (EC50, ug/ml)	CD71 Activation (EC50)	Selection
	Positive control Ab (commercial Vb17PE (Beckman coulter, IM-2048))	3.40%	11337	10250	610	<0.07nM	1.2	1.04	positive control antibody here the B17B21 humanized
	Secondary Ab control (Goat anti-mouse IgG PE)	0.13%	486	472	426				
1	20A9A9	2.70%	39502	43146	448	0.29nM	>5	>5	No
2	20C12A3	2.12%	59136	85598	455	0.06nM	>5	>5	No
3	21G11A8	2.96%	48723	38927	532	poor internalization	>5	>5	YES
4	21G11D5	3.06%	47493	56261	427	poor internalization	2.0	>5	YES
5	23A9B10	2.74%	10062	6595	507	15.4nM	no proliferation	no upregulation	No
6	23A9C10	3.20%	7655	3210	458	poor internalization	no proliferation	no upregulation	No
7	23A9F7	2.32%	8596	3403	466	poor internalization	no proliferation	no upregulation	No
8	28B2A2	3.13%	77448	36541	434	<0.07nM	poor proliferation	>5	No
9	28B2A4	2.97%	45741	53757	472	<0.07nM	>5	>5	YES
10	28B2F5	3.20%	81791	36648	438	<0.07nM	0.7	0.8	YES
11	28C9A5	3.27%	55206	56857	438	poor internalization	0.9	0.9	YES
12	28D2E6	3.27%	38042	53763	441	no internalization	0.3	0.3	YES
13	28D2E8	3.30%	43575	49957	452	no internalization	poor proliferation	>5	No

* * * * *

[00243] It will be appreciated by those skilled in the art that changes could be made to the embodiments described above without departing from the broad inventive concept thereof. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but it is intended to cover modifications within the spirit and scope of the present invention as
5 defined by the present description.

CLAIMS

What is claimed is:

1. An antibody that binds V β 17 comprising:

- 5 (1) (i) a heavy chain variable region (VH) comprising a VH complementarity determining region 1 (CDR1), a VH CDR2, and a VH CDR3 having the amino acid sequences of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:31; and (ii) a light chain variable region (VL) comprising a VL CDR1, a VL CDR2, and a VL CDR3
10 having the amino acid sequences of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:32;
- (2) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively,
15 of a VH having the amino acid sequence of SEQ ID NO:65; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:66;
- (3) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively,
20 of a VH having the amino acid sequence of SEQ ID NO:99; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:100;
- (4) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively,
25 of a VH having the amino acid sequence of SEQ ID NO:133; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:134;
- 30 (5) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:167; and (ii) a VL

comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:168;

(6) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:201; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:202;

(7) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:235; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:236;

(8) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:269; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:270;

(9) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:303; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:304;

(10) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:337; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid

sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:338;

(11) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:371; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:372;

(12) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:405; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:406; or

(13) (i) a VH comprising a VH CDR1, a VH CDR2, and a VH CDR3 having the amino acid sequence of a VH CDR1, a VH CDR2, and a VH CDR3, respectively, of a VH having the amino acid sequence of SEQ ID NO:439; and (ii) a VL comprising a VL CDR1, a VL CDR2, and a VL CDR3 having the amino acid sequence of a VL CDR1, a VL CDR2, and a VL CDR3, respectively, of a VL having the amino acid sequence of SEQ ID NO:440.

2. The antibody of claim 1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Kabat numbering system.

3. The antibody of claim 1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Chothia numbering system.

4. The antibody of claim 1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the AbM numbering system.

5. The antibody of claim 1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the Contact numbering system.
6. The antibody of claim 1, wherein the VH CDR1, VH CDR2, VH CDR3, VL CDR1, VL CDR2, and VL CDR3 amino acid sequences are according to the IMGT numbering system.
7. The antibody of any one of claims 1 to 6, wherein the antibody is a humanized antibody.
8. The antibody of any one of claims 1 to 7, wherein the antibody is an IgG antibody.
9. The antibody of claim 8, wherein the IgG antibody is an IgG1, IgG2, IgG3, or IgG4 antibody.
10. The antibody of any one of claims 1 to 9, wherein the antibody comprises a kappa light chain.
11. The antibody of any one of claims 1 to 9, wherein the antibody comprises a lambda light chain.
12. The antibody of any one of claims 1 to 11, wherein the antibody is a monoclonal antibody.
13. The antibody of any one of claims 1 to 12, wherein the antibody binds a V β 17 antigen.
14. The antibody of any one of claims 1 to 12, wherein antibody binds a V β 17 epitope.
15. The antibody of any one of claims 1 to 14, wherein the antibody specifically binds to V β 17.
16. The antibody of any one of claims 1 to 15, wherein the antibody is multivalent.
17. The antibody of claim 16, wherein the antibody is capable of binding at least three antigens.
18. The antibody of claim 16, wherein the antibody is capable of binding at least four antigens.
19. The antibody of claim 16, wherein the antibody is capable of binding at least five antigens.
20. The antibody of any one of claims 1 to 19, wherein the antibody is a multispecific antibody.
21. The antibody of claim 20, wherein the antibody is a bispecific antibody.
22. The antibody of claim 20, wherein the antibody is a trispecific antibody.

23. The antibody of claim 20, wherein the antibody is a quadraspecific antibody.
24. A nucleic acid encoding the antibody of any one of claims 1 to 23.
25. A vector comprising the nucleic acid of claim 24.
26. A host cell comprising the vector of claim 25.
- 5 27. A kit comprising the vector of claim 25 and instructions for using the vector.
28. A kit comprising the antibody of any one of claims 1 to 23 and instructions for using the antibody.
29. A pharmaceutical composition comprising the antibody of any one of claims 1 to 23 and a pharmaceutically acceptable carrier.
- 10 30. A method of producing the pharmaceutical composition of claim 29, comprising combining the antibody with a pharmaceutically acceptable carrier to obtain the pharmaceutical composition.
31. A method of activating a T cell expressing V β 17, comprising contacting the antibody of any one of claims 1 to 23 with the T cell expressing V β 17.
- 15 32. The method of claim 31, wherein the contacting increases CD69, CD25, and/or Granzyme B expression, as compared to a T cell expressing V β 17 that is not contacted with the antibody of any one of claims 1 to 23.
33. A process for making an antibody that binds to more than one target molecule, the process comprising: a step for performing a function of obtaining a first binding domain
20 that binds to V β 17 present on a T cell; a step for performing a function of obtaining a second binding domain that binds to a second target on the surface of a target cell; and a step for performing a function of providing an antibody that binds to V β 17 present on a T cell and a second target on the surface of a target cell.
34. The process of claim 33, wherein the step for performing a function of obtaining a second
25 binding domain that binds to a second target on the surface of a target cell is repeated n times, and further comprising n steps for performing a function of providing a first binding domain that binds to V β 17 present on a T cell and n number of target molecules, wherein n is at least 2.
35. A process for making the antibody of any one of claims 1 to 23, comprising growing the
30 host cell of claim 26 under conditions to produce the antibody.

36. The process for making of claim 35, wherein the process further comprises isolating the antibody.
37. A method of directing a T cell expressing V β 17 to a target cell, comprising contacting the antibody of any one of claims 1 to 23 with the target cell, wherein a second target is present on the surface of the target cell, and wherein the contacting directs the T cell to the target cell.
38. A method of inhibiting the growth or proliferation of a target cell, comprising contacting the antibody of any one of claims 1 to 23 with the target cell having a second target present on the surface of the target cell, wherein the contacting is in the presence of a T cell expressing the V β 17, and wherein the contacting results in inhibition of the growth or proliferation of the target cell.
39. A method of eliminating a target cell in a subject, comprising contacting the antibody of any one of claims 1 to 23 with the target cell having a second target present on the surface of the target cell, wherein the contacting is in the presence of a T cell expressing the V β 17, and wherein the contacting results in the elimination of the target cell.
40. A method of treating a disease in a subject, comprising administering an effective amount the antibody of any one of claims 1 to 23 to the subject, wherein the disease is caused all or in part by a target cell having a second target present on the surface of the target cell.
41. The method of claim 40, wherein the subject is a human.
42. The method of claim 40 or 41, wherein the subject is a subject in need thereof.

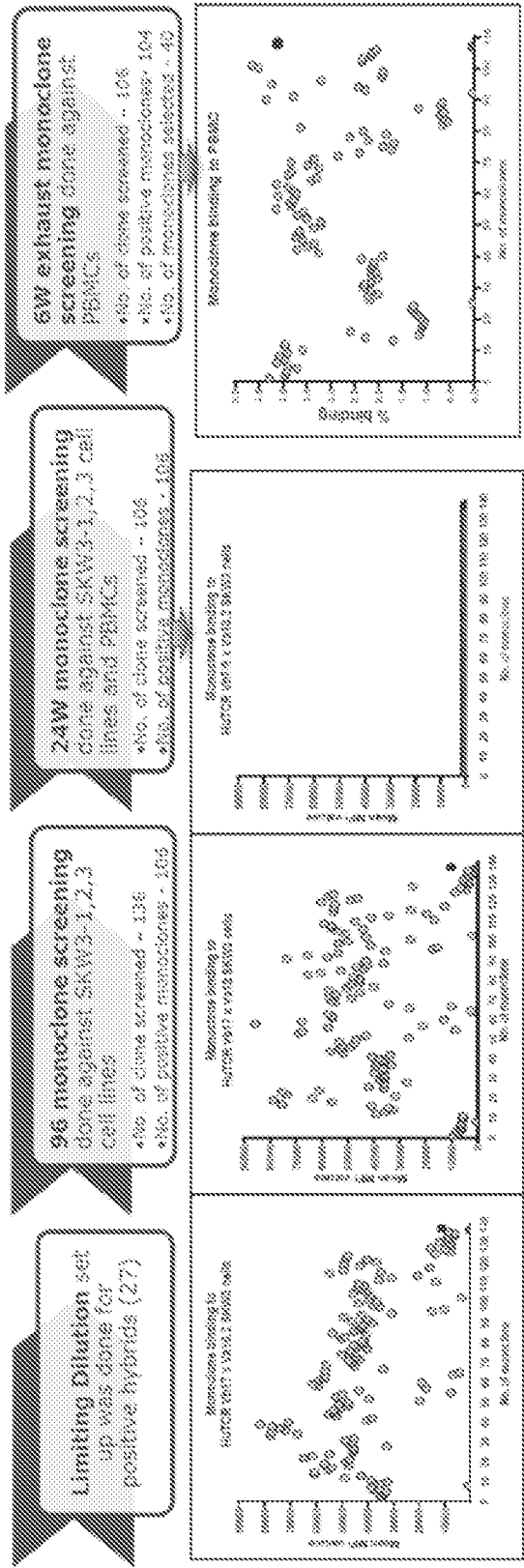


FIG. 1

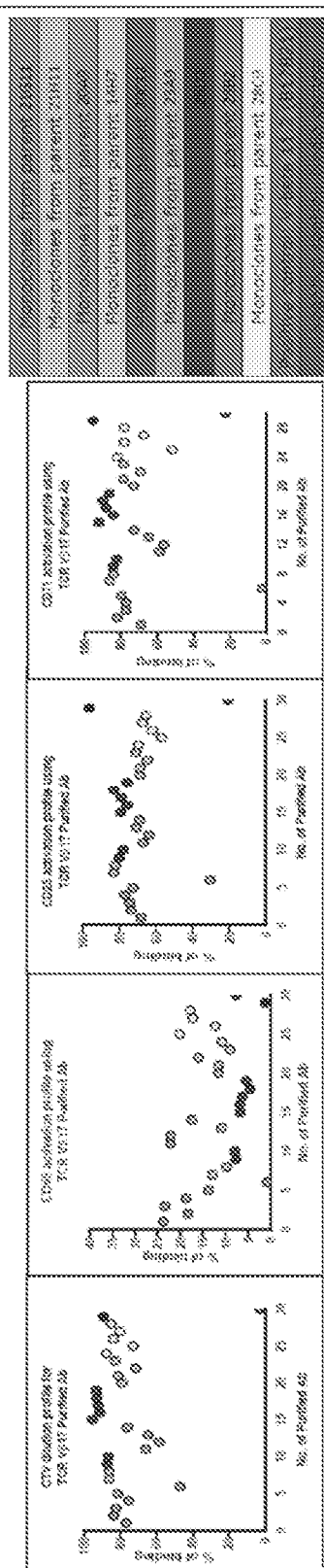


FIG. 2

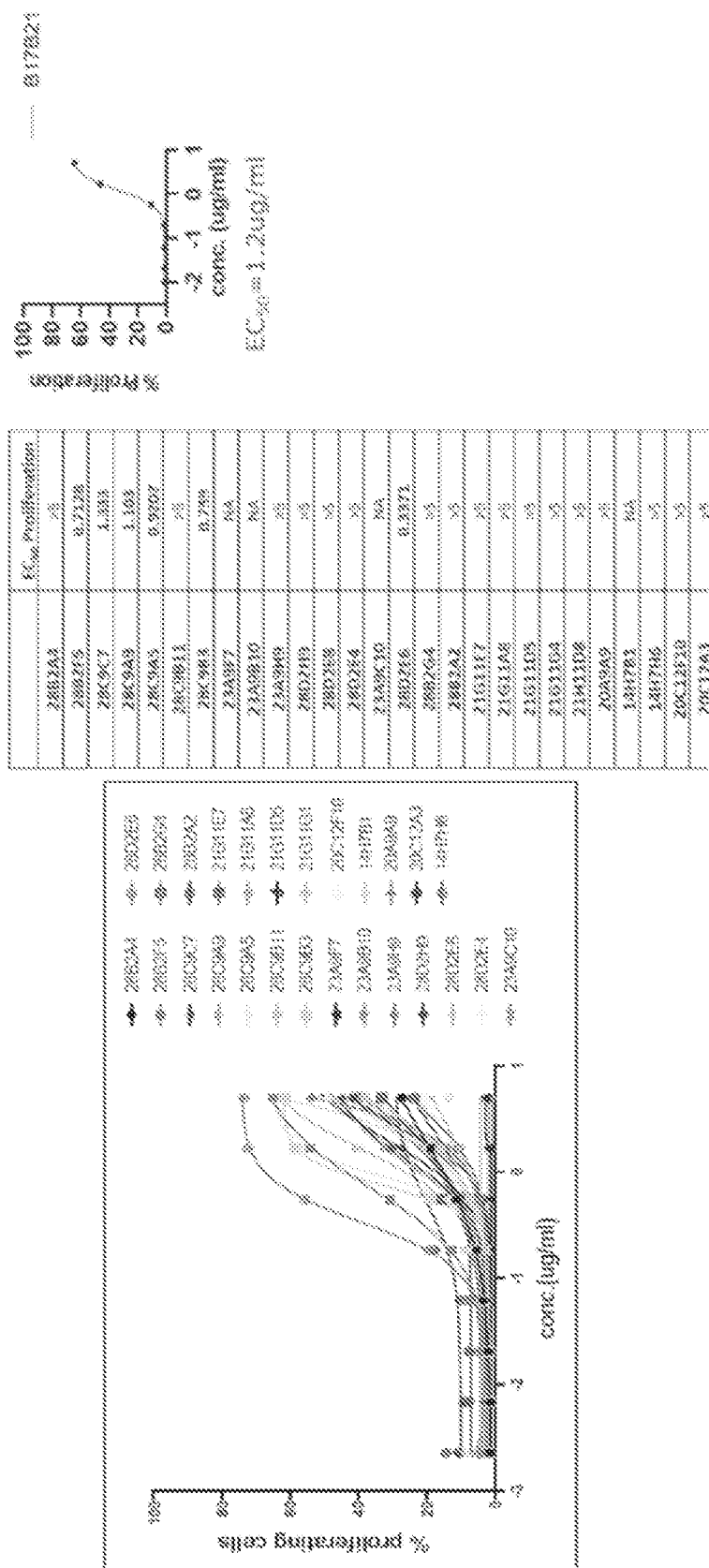


FIG. 3

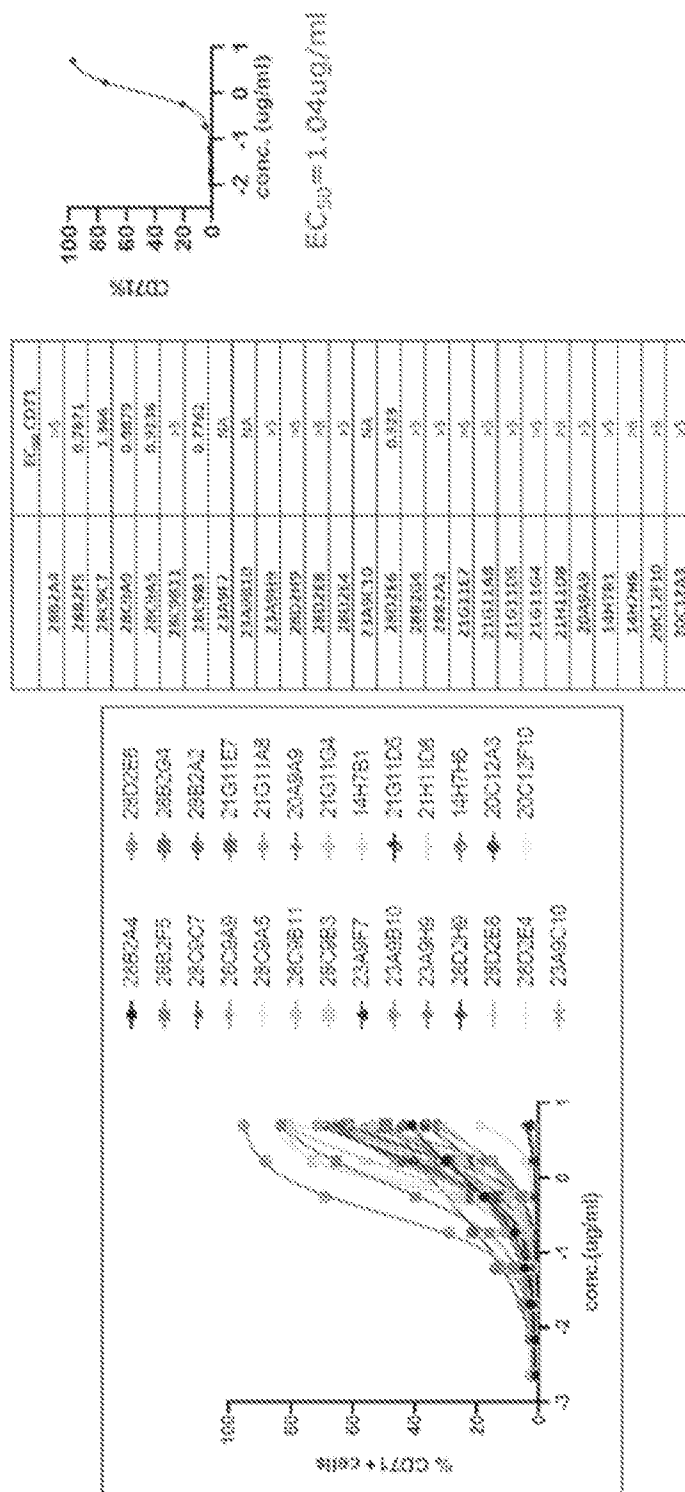
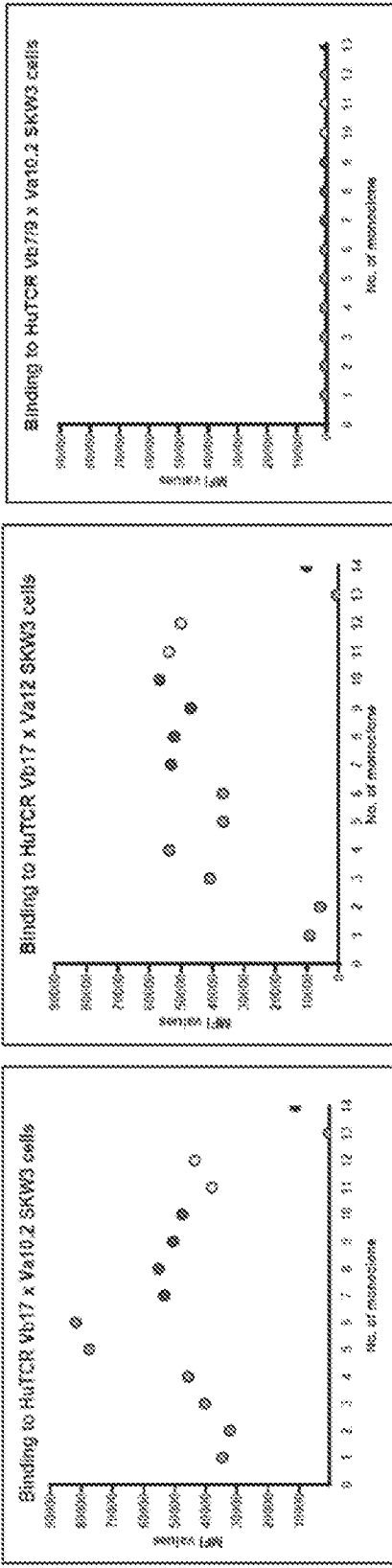


FIG. 4



Monoclones from parent 28B2
Monoclones from parent 14B17
Monoclones from parent 28C9
Monoclones from parent 28D2
Positive control: anti TCR Vβ17-02 Ab, Beckman Coulter, Cat: 1M048
Negative control: Secondary control Ab: Goat anti mouse IgG PE, Southern Biotech, Cat: 1030-09, E2518-RJ69Y

FIG. 5

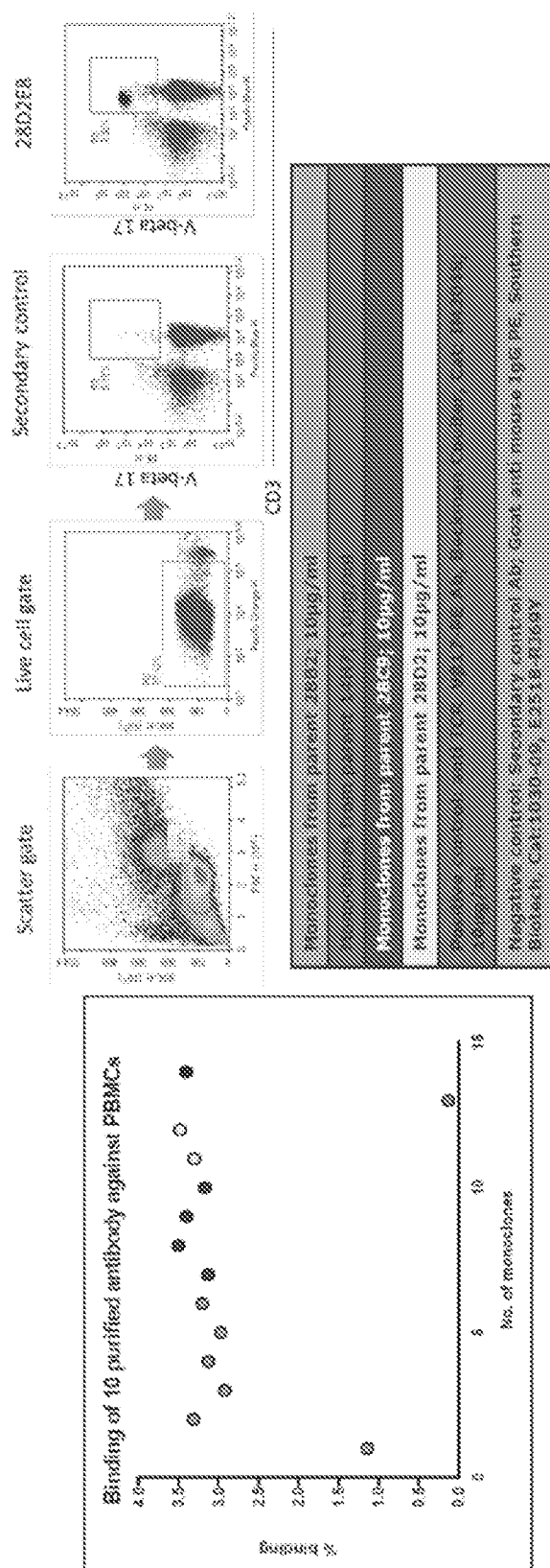


FIG. 6

Clone name	28B2G4	28B2A2	28B2A4	28B2F5	28C9A9	28C9C7	28C9B11	28C9A5	28D2E6	28D2E8
IgG1	0.051758	0.049998	0.053624	0.049439	0.050504	0.053449	0.051079	0.049217	1.6882	1.3951
IgG2a	1.8297	1.7856	1.8676	1.6765	0.11447	0.11215	0.14032	0.1065	0.096423	0.10172
IgG2b	0.058839	0.060283	0.063725	0.056974	1.7748	1.6087	1.9507	1.5914	0.05028	0.058756
IgG3	0.2565	0.2489	0.18801	0.12533	0.11294	0.11176	0.12831	0.11173	0.078632	0.020931
IgGA	0.16956	0.15107	0.13463	0.075337	0.072926	0.076697	0.09056	0.072193	0.060901	0.065098
HGM	0.24777	0.23017	0.1746	0.10144	0.089953	0.098229	0.11981	0.087297	0.065143	0.066005
Kappa	0.98279	1.0919	1.0778	1.1918	1.4392	1.4561	1.5024	1.1246	0.76103	0.60052
Lambda	0.22951	0.21774	0.055624	0.030403	0.082247	0.093142	0.10739	0.075841	0.05399	0.071635
Rapid ELISA mouse isotyping kit										
Pierce										37503

FIG. 7

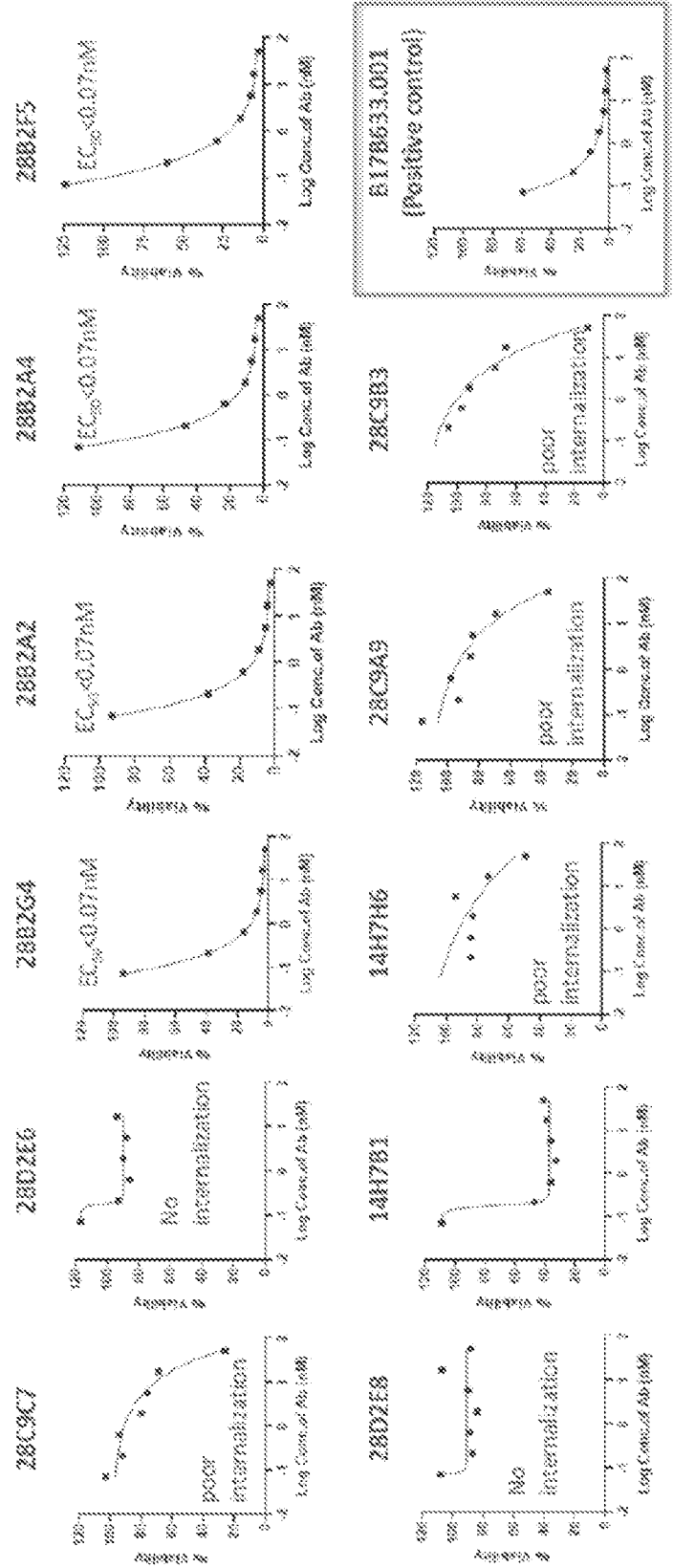


FIG. 8

Step Details	Sample Details	Sensor Location	Concentration (if any)	Time (sec)
Baseline 1	DPBS	Nil	Nil	120
Loading	Antibody1: TCRVb17 purified mAb	A-H	50ug/ml	900
Baseline 2	DPBS	Nil	Nil	300
Association1	Antigen	A-H	10ug/ml	600
Association2	2882A4	A	30ug/ml	600
	2882G4	B	30ug/ml	
	2882F5	C	30ug/ml	
	2882A2	D	30ug/ml	
	2882A5	E	30ug/ml	
	2882B3	F	30ug/ml	
	2882F8	G	30ug/ml	
	2882F8	H	30ug/ml	

FIG. 9A

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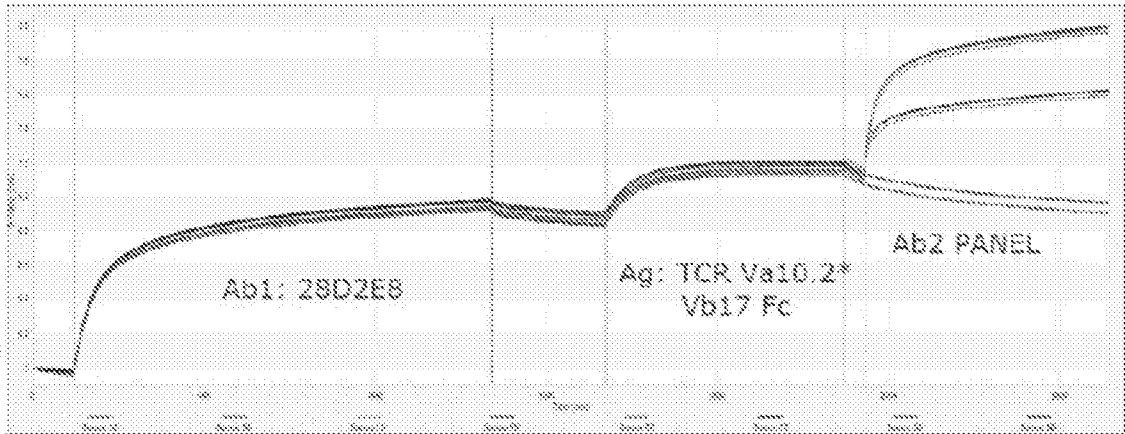


FIG. 9B

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Purified antibodies:	mAbs as Antibody 2 panel							
mAb as antibody1	28B2A4	28B2G4	28B2F5	28B2A2	28C9A9	28C9B3	28D2E6	28D2E8
28B2A4	0.1883	0.194	0.2026	0.2153	0.5315	0.523	0.339	0.2388
28B2G4	0.3769	0.3944	0.4189	0.4186	0.8148	0.8084	0.7733	0.7508
28B2F5	0.3605	0.3238	0.4376	0.3695	0.7306	0.7221	0.6878	0.7797
28B2A2	0.3799	0.3434	0.3933	0.39	0.7617	0.7445	0.7055	0.7029
28C9B3	0.5214	0.5089	0.522	0.5171	0.3868	0.3794	0.5504	0.5148
28C9A9	0.4219	0.4233	0.4332	0.4327	0.4039	0.3005	0.4632	0.4491
28C9C7	0.1064	0.0772	0.0248	0.0706	-0.0829	-0.0899	0.088	0.0924
28C9A5	0.216	0.158	0.1624	0.1722	-0.0666	-0.0707	0.186	0.1797
28D2E8	0.8791	0.7945	0.8838	0.8723	0.4458	0.4306	0.177	-0.1752
28D2E6	0.4871	0.4812	0.4991	0.5019	0.2731	0.2788	0.099	0.0318

FIG. 9C

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Step Details	Sample Details	Sensor Location	Concentration (if any)	Time (sec)
Baseline 1	DPBS	Nil	Nil	120
Loading	Antibody1: TCRVb17 purified mAb	A-H	50ug/ml	900
Baseline 2	DPBS	Nil	Nil	300
Association1	Antigen	A-H	10ug/ml	600
Association2	TCRVb17PE Ab	A	30ug/ml	600
	288264	B	30ug/ml	
	288264	C	30ug/ml	
	288265	D	30ug/ml	
	288262	E	30ug/ml	
		F	30ug/ml	
	288261	G	30ug/ml	
	288263	H	30ug/ml	

FIG. 10A

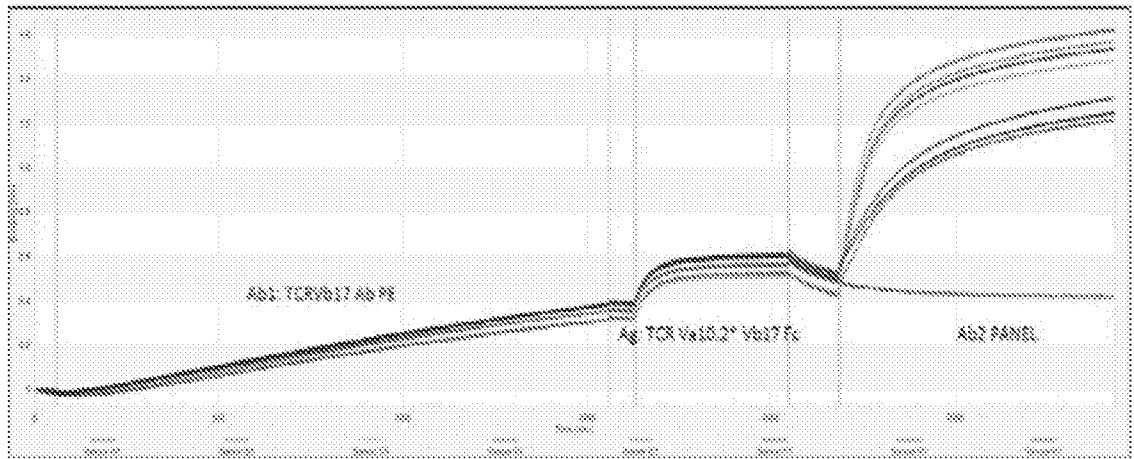


FIG. 10B

	mAbs as Antibody 2 panel										
Commercial	TCRVb17										
TCRVb17PE as	PE Ab	Z882A4	Z882G4	Z882F5	Z882A2	Z8C9A9	Z8C9B3	Z8C9A5	Z8C9C7	Z8D3F5	Z8D2E4
Ab1											
TCRVb17PE											

FIG. 10C

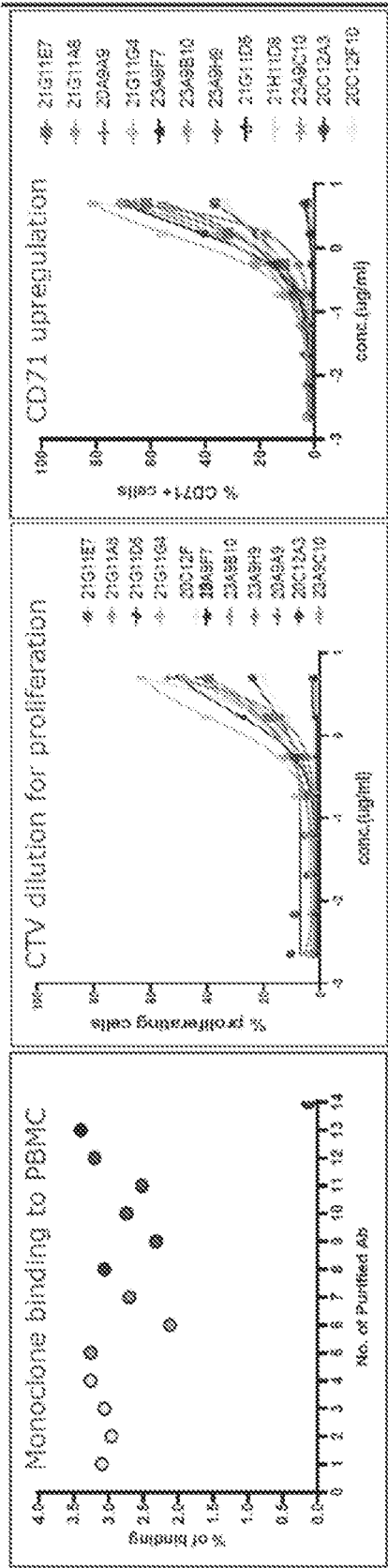
Sequence	Clone name	Sequence ID	V-DOMAIN	VBase2	V-D-J-RE4	V-J-REGION	V-REGION	FR1-IMG1	CDR1-IMG	FR2-IMG	CDR2-IMG	FR3-IMG	CDR3-IMG
1	28B2F5	VH1_FP_1	productive	Y F	EVQLQESGP	ELVKRP	EVQLQES	GYTFETDD	MIHWVK	INPNNN	NYNOKF	ARSTVVP	
2	28B2A4	VH2_FP_1	productive	Y F	EVQLQESGP	ELVKRP	EVQLQES	GYTFETDD	MIHWVK	INPNNN	NYNOKF	ARSTVVP	
3	28B2A2	VH3_FP_1	productive	Y F	EVQLQESGP	ELVKRP	EVQLQES	GYTFETDD	MIHWVK	INPNNN	NYNOKF	ARSTVVP	
4	28B2G4	VH7_FP_1	productive	Y F	EVQLQESGP	ELVKRP	EVQLQES	GYTFETDD	MIHWVK	INPNNN	NYNOKF	ARSTVVP	
5	28C9C7	VH6_FP_1	productive	Y F	EVQLQESGAEL	VRP	EVQLQES	GYTFETHY	IDWTKQ	INPGGGY	NYNENF	TRKGYYY	
6	28C9B3	VH8_FP_2	productive	Y F	EVQLQESGAEL	VRP	EVQLQES	GYTFETHY	IDWTKQ	INPGGGY	NYNENF	TRKGYYY	
7	28C9A9	VH9_FP_2	productive	Y F	EVQLQESGAEL	VRP	EVQLQES	GYTFETHY	IDWTKQ	INPGGGY	NYNENF	TRKGYYY	
8	28D2E9	VH4_FP_1	productive	Y F	EVQLQESGP	LVLP	EVQLQES	GYRFSSGY	WKWIRQ	ISYDGSN	NYNPSL	ARGGGY	
9	28D2E6	VH5_FP_1	productive	Y F	EVQLQESGP	LVLP	EVQLQES	GYRFSSGY	WKWIRQ	ISYDGSN	NYNPSL	ARGGGY	

FIG. 11

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Sequence	Clone name	Sequence ID	V- DOMAIN F	----CDR1---->	<---CDR2-->	<---CD	V-J- REGION	V- REGION	FR1-IMGT	CDR1-IMGT	FR2-IMGT	CDR2-IMGT
1	288275	VK1_FP_2	productive	DDDD.....E	DIKMTOS	DIKMTOS	DIKMTOSP	DIKMTQSPA	TDIDDD	MNWWYQOKPGE	EGN	TLRPGVP
2	288344	VK2_FP_1	productive	DDDD.....E	DIQMTOS	DIQMTOS	DIQMTOSP	DIQMTQSPA	TDIDDD	MNWWYQOKPGE	EGN	TLRPGVP
3	2882A2	VK3_FP_2	productive	DDDD.....E	DIVMTOS	DIVMTOS	DIVMTOSP	DIVMTQSPA	TDIDDD	MNWWYQOKPGE	EGN	TLRPGVP
4	2882G4	VK7_FP_1	productive	DDDD.....E	DIKMTOS	DIKMTOS	DIKMTOSP	DIKMTQSPA	TDIDDD	MNWWYQOKPGE	EGN	TLRPGVP
5	288307	VK6_FP_4	productive	DDVVY.....D	QIVLSQS	QIVLSQS	QIVLSQSPA	QIVLSQSPA	SSVS	MHWYQOKSGT	DT5	KLASGVP
6	288380	VK8_FP_3	productive	DDVVY.....D	QIVLSQS	QIVLSQS	QIVLSQSPA	QIVLSQSPA	SSVS	MHWYQOKSGT	DT5	KLASGVP
7	2883A9	VK9_FP_1	productive	DDVVY.....D	QIVLSQS	QIVLSQS	QIVLSQSPA	QIVLSQSPA	SSVS	MHWYQOKSGT	DT5	KLASGVP
8	288388	VK4_FP_3	productive	DDVF.....Y	DIQMTOS	DIQMTOS	DIQMTOSP	DIQMTQSPA	QSVRSN	LEWYLOKPGQS	KVS	NRFSGVP
9	288216	VK5_FP_3	productive	DDVF.....Y	DIKMTOS	DIKMTOS	DIKMTOSP	DIKMTQSPA	QSVRSN	LEWYLOKPGQS	KVS	NRFSGVP

FIG. 12



Monoclonones from parent 21G11; 10µg/ml
Monoclonones from parent 20C12; 10µg/ml
Monoclonones from parent 20A9; 10µg/ml
Monoclonones from parent 21H11; 10µg/ml
Monoclonones from parent 23A9; 10µg/ml
Positive control: 15S V107; 10µg/ml
Secondary control Ab: Anti-mouse IgG PC, Southern Biotech, Cat:1030-09

FIG. 13

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Step Details	Sample Details	Sensor Location	Concentration (if any)	Time (sec)
Baseline 1	DPBS	N1	N1	120
Loading	Antibody1: TCXVb17 commercial antibody	A-H	50ug/ml	900
Baseline 2	DPBS	N1	N1	120
Association1	Antigen	A-H	10ug/ml	600
Association2	21G12A3	A	30ug/ml	600
	21G12F10	B	30ug/ml	
	21G12A8	C	30ug/ml	
	21G12A9	D	30ug/ml	
	21G11C7	E	30ug/ml	
	21G11A8	F	30ug/ml	
	21G11G4	G	30ug/ml	
	DPBS	H	30ug/ml	

Step Details	Sample Details	Sensor Location	Concentration (if any)	Time (sec)
Baseline 1	DPBS	N1	N1	120
Loading	Antibody1: TCXVb17 commercial antibody	A-H	50ug/ml	900
Baseline 2	DPBS	N1	N1	120
Association1	Antigen	A-H	10ug/ml	600
Association2	21G12A3	A	30ug/ml	600
	21G12A8	B	30ug/ml	
	21G12F10	C	30ug/ml	
	21G12A9	D	30ug/ml	
	DPBS	E	NA	
	DPBS	F	NA	
	DPBS	G	NA	
	DPBS	H	NA	

FIG. 14A

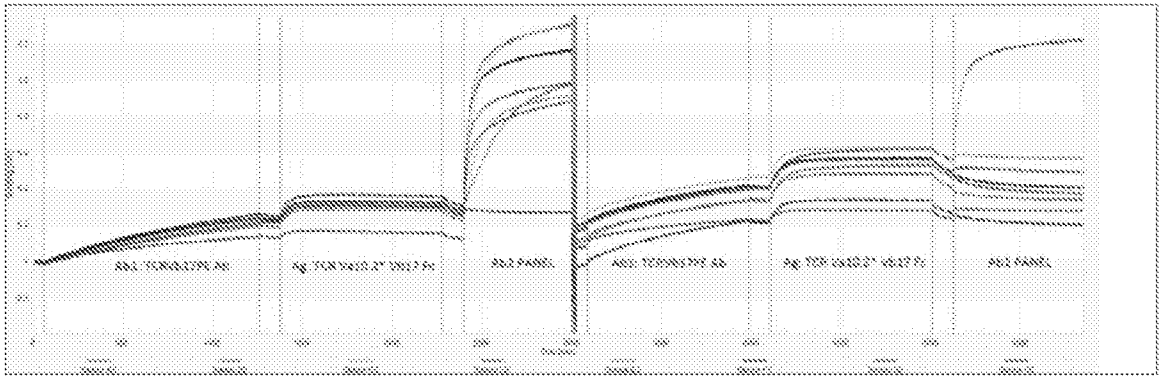


FIG. 14B

Commercial	TCRVb17PE	20C12A3	20C12F10	20A9A9	21H11D8	21G11E7	21G11A9	21G11G4	21G11D5	23A9B10	23A9H9	23A9C10
TCRVb17PE ssAb1												
TCRVb17PE	-0.1245	4.2456	2.8306	4.1674	5.1402	3.3593	3.4097	3.3875	2.7525	-0.07	-0.0057	-0.0422

FIG. 14C

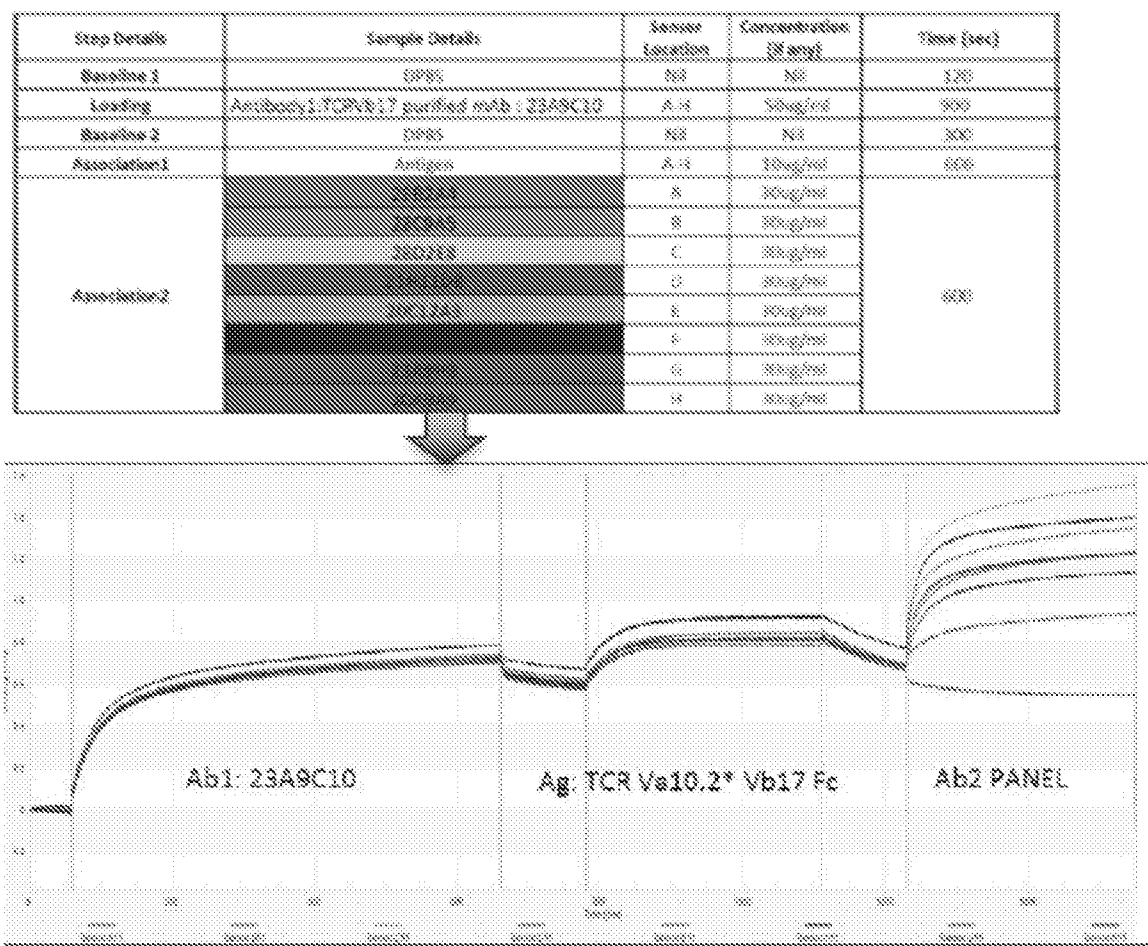


FIG. 15A

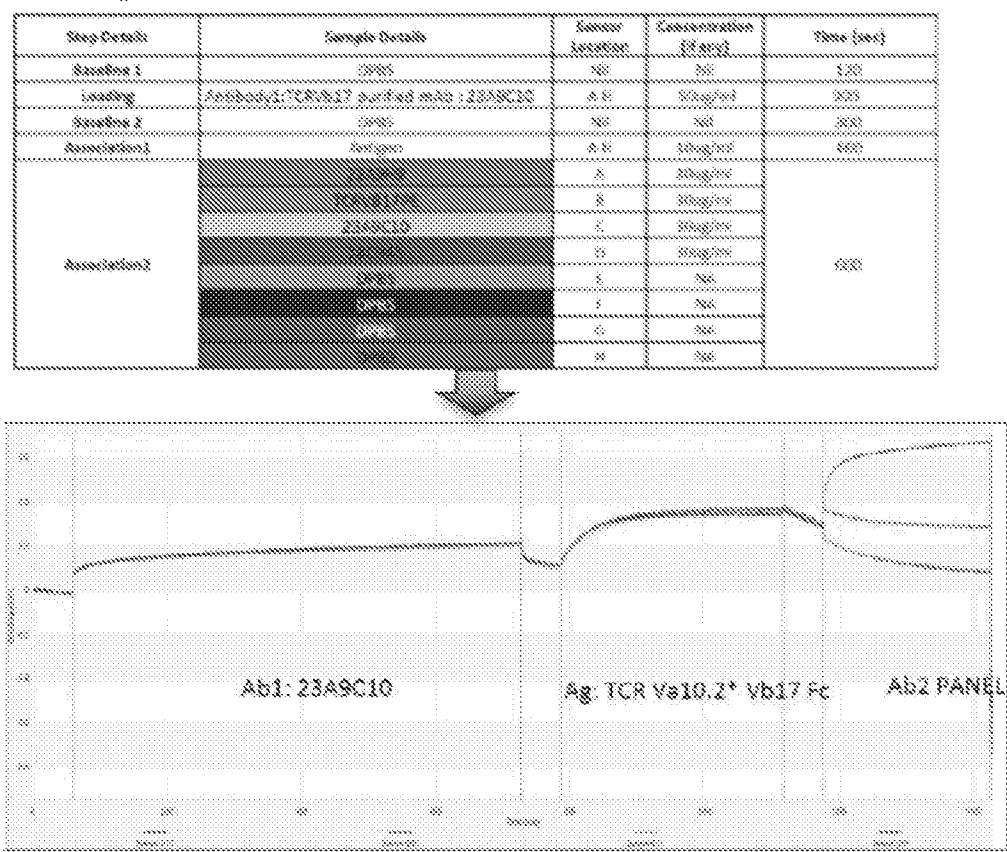


FIG. 15B

AB1	2882A4	28C9A5	28D2E8	21H11D9	20C12A3	21G11D5	23A9H9	20A9A9	TCRVR17PE	23A9C10
23A9C10	0.228	0.937	0.7489	0.4822	0.5769	0.5824	-0.0675	0.4028	0.8828	-1.1286
23A9H9	1.1561	0.7621	1.9255	1.1878	2.4507	1.5278	-0.1029	1.1405	0.1834	-0.4331

FIG. 15C

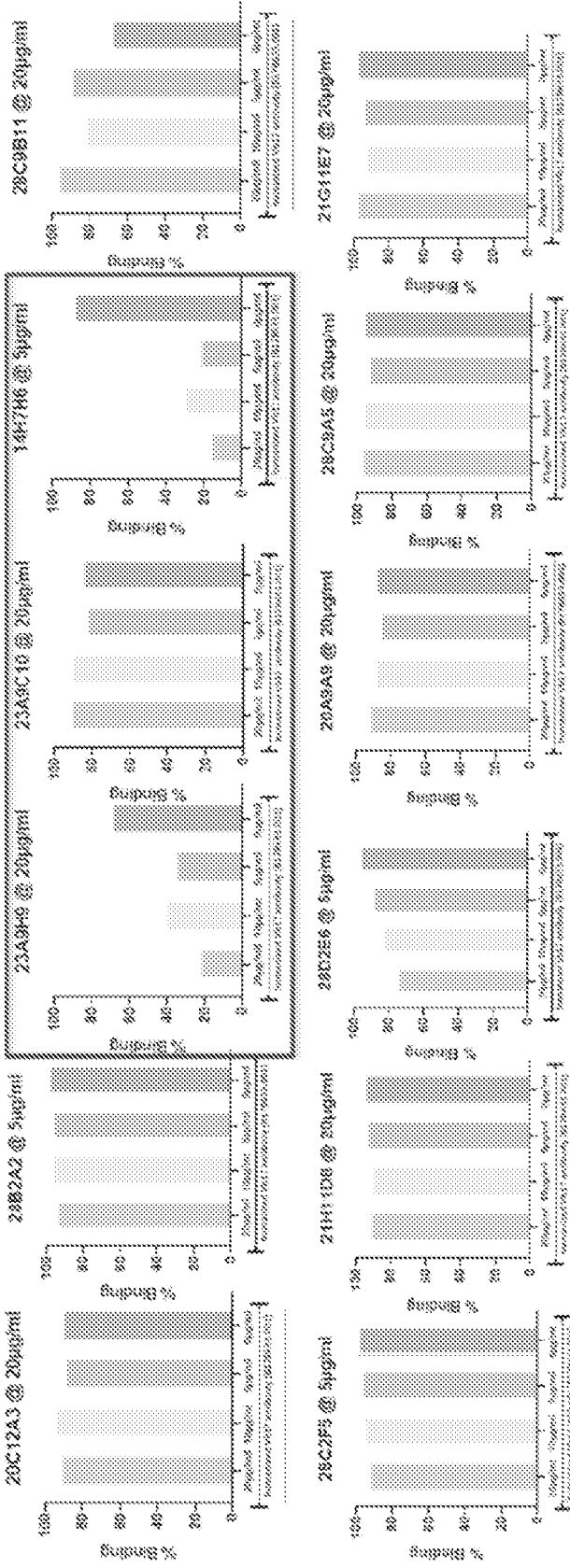


FIG 16

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2022/079051

A. CLASSIFICATION OF SUBJECT MATTER

INV. C07K16/28

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C07K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, BIOSIS, EMBASE, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2020/183245 A2 (JANSSEN PHARMACEUTICA NV [BE]) 17 September 2020 (2020-09-17) paragraphs [0004], [0032]; figures 9A, 9B -----	1-32, 35-42
A	Anonymous: "Conjugated Antibody Anti-TCR V[beta]17-PE", / 1 September 2019 (2019-09-01), XP093019823, Retrieved from the Internet: URL:https://bec-techdocs-prod.s3.us-west-2.amazonaws.com/techdoc/files/pi/B60043AB.pdf?AWSAccessKeyId=ASIA2KJI7HMZZAPUARRJ&Expires=1675258767&Signature=jxQqCxivziM9xsyihQUp87cOXmjM%3D&x-amz-security-token=IQoJb3JpZ2luX2VjEUEuACVzLXdlc3QtMiJHMEUCIFGA8bG%2FcDHLhAAp44ifPf%2BJxcd0P0Z3V%2FGIZY%2Bx93%2FjAiEA0c -----	1-32, 35-42



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

2 February 2023

Date of mailing of the international search report

04/04/2023

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2

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Authorized officer

Marinoni J-C

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2022/079051

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of a sequence listing:
 - a. ☒ forming part of the international application as filed.
 - b. ☐ furnished subsequent to the international filing date for the purposes of international search (Rule 13~~ter~~.1(a)).
☐ accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.
2. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this report has been established to the extent that a meaningful search could be carried out without a WIPO Standard ST.26 compliant sequence listing.
3. Additional comments:

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2022/079051

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims;; it is covered by claims Nos.:
1-32, 35-42 (all partially)

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-32, 35-42(all partially)

Anti-Vbeta17 antibody 20A9A9 as defined in item (1) of claim 1, and related subject-matter.

2. claims: 1-32, 35-42(all partially)

Anti-Vbeta17 antibody 20C12A3 as defined in item (2) of claim 1, and related subject-matter.

3. claims: 1-32, 35-42(all partially)

Anti-Vbeta17 antibodies 21G11A8 and 21G11D5 as defined in item (3) and item (4) of claim 1, and related subject-matter.

4. claims: 1-32, 35-42(all partially)

Anti-Vbeta17 antibodies 23A9B10, 23A9C10 and 23A9F7 as defined in item (5), item (6) and item (7) of claim 1, and related subject-matter.

5. claims: 1-32, 35-42(all partially)

Anti-Vbeta17 antibodies 28B2A2, 28B2A4 and 28B2F5 as defined in item (8), item (9) and item (10) of claim 1, and related subject-matter.

6. claims: 1-32, 35-42(all partially)

Anti-Vbeta17 antibody 2C9A5 as defined in item (11) of claim 1, and related subject-matter.

7. claims: 1-32, 35-42(all partially)

Anti-Vbeta17 antibodies 28D2E6 and 28D2E8 as defined in item (12) and item (13) of claim 1, and related subject-matter.

8. claims: 33, 34

A method for making an antibody that binds to more than one target molecule as defined in claim 33.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2022/079051

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		BR 112021017801 A2	18-01-2022
		CA 3132916 A1	17-09-2020
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