

WHAT IS CLAIMED IS

1. An antibody that binds to B-Cell Maturation Antigen (BCMA), or a BCMA-binding fragment thereof, comprising:

(A) heavy chain CDR1, CDR2 or CDR3 sequences of:

- a. SEQ ID NO:7, SEQ ID NO:8, and SEQ ID NO:9, respectively;
- b. SEQ ID NO:10, SEQ ID NO:11 and SEQ ID NO:12, respectively;
- c. SEQ ID NO:13, SEQ ID NO:14 and SEQ ID NO:15, respectively;
- d. SEQ ID NO:18, SEQ ID NO:19 and SEQ ID NO:20, respectively;
- e. SEQ ID NO:21, SEQ ID NO:22 and SEQ ID NO:23, respectively;
- f. SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:26, respectively;
- g. SEQ ID NO:29, SEQ ID NO:30 and SEQ ID NO:31, respectively;
- h. SEQ ID NO:32, SEQ ID NO:33 and SEQ ID NO:34, respectively;
- i. SEQ ID NO:35, SEQ ID NO:36 and SEQ ID NO:37, respectively;
- j. SEQ ID NO:40, SEQ ID NO:41 and SEQ ID NO:42, respectively;
- k. SEQ ID NO:43, SEQ ID NO:44 and SEQ ID NO:45, respectively;
- l. SEQ ID NO:46, SEQ ID NO:47 and SEQ ID NO:48, respectively;
- m. SEQ ID NO:51, SEQ ID NO:52 and SEQ ID NO:53, respectively;
- n. SEQ ID NO:54, SEQ ID NO:55 and SEQ ID NO:56, respectively; or
- o. SEQ ID NO:57, SEQ ID NO:58 and SEQ ID NO:59, respectively; and

(B) light chain CDR1, CDR2 or CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 or SEQ ID NO:4, respectively.

2. The antibody or BCMA-binding fragment thereof, of claim 1, wherein said antibody comprises light chain CDR1, CDR2 and CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4, respectively.

3. An antibody that binds to BCMA, or a BCMA-binding fragment thereof according to claim 1, comprising a light chain comprising CDR1, CDR2 or CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4, respectively, and heavy chain CDR1, CDR2 and CDR3 sequences of:

- a. SEQ ID NO:7, SEQ ID NO:8, and SEQ ID NO:9, respectively;
- b. SEQ ID NO:10, SEQ ID NO:11, and SEQ ID NO:12, respectively; or
- c. SEQ ID NO:13, SEQ ID NO:14 and SEQ ID NO:15, respectively.

4. An antibody that binds to BCMA, or a BCMA-binding fragment thereof according to claim 1, comprising a light chain comprising CDR1, CDR2 or CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4, respectively, and heavy chain CDR1, CDR2 and CDR3 sequences of:

- a. SEQ ID NO:18, SEQ ID NO:19 and SEQ ID NO:20, respectively;
- b. SEQ ID NO:21, SEQ ID NO:22 and SEQ ID NO:23, respectively; or
- c. SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:26, respectively.

5. An antibody that binds to BCMA, or a BCMA-binding fragment thereof according to claim 1, comprising a light chain comprising CDR1, CDR2 or CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4, respectively, and heavy chain CDR1, CDR2 and CDR3 sequences of:

- a. SEQ ID NO:29, SEQ ID NO:30 and SEQ ID NO:31, respectively;
- b. SEQ ID NO:32, SEQ ID NO:33 and SEQ ID NO:34, respectively;
- or
- c. SEQ ID NO:35, SEQ ID NO:36 and SEQ ID NO:37, respectively.

6. An antibody that binds to BCMA, or a BCMA-binding fragment thereof according to claim 1, comprising a light chain comprising CDR1, CDR2 or CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4, respectively, and heavy chain CDR1, CDR2 and CDR3 sequences of:

- a. SEQ ID NO:40, SEQ ID NO:41 and SEQ ID NO:42, respectively;
- b. SEQ ID NO:43, SEQ ID NO:44 and SEQ ID NO:45, respectively; or
- c. SEQ ID NO:46, SEQ ID NO:47 and SEQ ID NO:48, respectively.

7. An antibody that binds to BCMA, or a BCMA-binding fragment thereof according to claim 1, comprising a light chain comprising CDR1, CDR2 or CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4, respectively, and heavy chain CDR1, CDR2 and CDR3 sequences of:

- a. SEQ ID NO:51, SEQ ID NO:52 and SEQ ID NO:53, respectively;

- b. SEQ ID NO:54, SEQ ID NO:55 and SEQ ID NO:56, respectively; or
- c. SEQ ID NO:57, SEQ ID NO:58 and SEQ ID NO:59, respectively.

8. The antibody or binding fragment thereof of any of claims 1-5, which comprises the light chain variable sequence of SEQ ID NO:1.

9. The antibody or binding fragment thereof of any of claims 1-5, which comprises the heavy chain variable sequence of SEQ ID NO:6, SEQ ID NO:17, SEQ ID NO:28, SEQ ID NO:39, or SEQ ID NO:50.

10. The antibody of any of claims 1-7, wherein said antibody is a monoclonal antibody, a chimeric antibody, a diabody, a bispecific antibody, a bispecific Fab₂, a bispecific (mab)₂, a humanized antibody, an artificially-generated human antibody, bispecific T-cell engager, bispecific NK cell engager, or a single chain antibody.

11. The antibody of any of claims 1-7, wherein said antibody is a triomab, knob-in-hole (kih) IgG with common light chain, crossmab, ortho-Fab IgG, DVD-Ig, 2 in 1-IgG, IgG-scFv, sdFv₂-Fc, bi-nanobody, tandAb, DART, DART-Fc, scFv-HAS-scFv, or DNL-Fab3.

12. The antibody of any of claims 1-9, wherein said antibody is an antibody-drug conjugate.

13. The binding fragment of any of claims 1-7, which is a single-chain variable fragment (scFv), Fab fragment, or F(ab')₂ fragment.

14. A polypeptide that comprises:

(A) the heavy chain CDR1, CDR2 or CDR3 sequences of:

- a. SEQ ID NO:7, SEQ ID NO:8, and SEQ ID NO:9, respectively;
- b. SEQ ID NO:10, SEQ ID NO:11 and SEQ ID NO:12, respectively;
- c. SEQ ID NO:13, SEQ ID NO:14 and SEQ ID NO:15, respectively;
- d. SEQ ID NO:18, SEQ ID NO:19 and SEQ ID NO:20, respectively;
- e. SEQ ID NO:21, SEQ ID NO:22 and SEQ ID NO:23, respectively;
- f. SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:26, respectively;
- g. SEQ ID NO:29, SEQ ID NO:30 and SEQ ID NO:31, respectively;
- h. SEQ ID NO:32, SEQ ID NO:33 and SEQ ID NO:34, respectively;
- i. SEQ ID NO:35, SEQ ID NO:36 and SEQ ID NO:37, respectively;

- j. SEQ ID NO:40, SEQ ID NO:41 and SEQ ID NO:42, respectively;
 - k. SEQ ID NO:43, SEQ ID NO:44 and SEQ ID NO:45, respectively;
 - l. SEQ ID NO:46, SEQ ID NO:47 and SEQ ID NO:48, respectively;
 - m. SEQ ID NO:51, SEQ ID NO:52 and SEQ ID NO:53, respectively;
 - n. SEQ ID NO:54, SEQ ID NO:55 and SEQ ID NO:56, respectively; or
 - o. SEQ ID NO:57, SEQ ID NO:58 and SEQ ID NO:59, respectively; and
- (B) light chain CDR1, CDR2 or CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 or SEQ ID NO:4, respectively.

15. The polypeptide of claim 14, wherein said polypeptide comprises light chain CDR1, CDR2 and CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4, respectively.

16. A polypeptide according to claim 15 that comprises the light chain variable sequence of SEQ ID NO:1.

17. A polypeptide according to claim 14 that comprises the heavy chain variable sequence of SEQ ID NO:6, SEQ ID NO:17, SEQ ID NO:28, SEQ ID NO:39, or SEQ ID NO:50.

18. A polynucleotide encoding a polypeptide comprising:

(A) heavy chain CDR1, CDR2 or CDR3 sequences of:

- a. SEQ ID NO:7, SEQ ID NO:8, and SEQ ID NO:9, respectively;
- b. SEQ ID NO:10, SEQ ID NO:11 and SEQ ID NO:12, respectively;
- c. SEQ ID NO:13, SEQ ID NO:14 and SEQ ID NO:15, respectively;
- d. SEQ ID NO:18, SEQ ID NO:19 and SEQ ID NO:20, respectively;
- e. SEQ ID NO:21, SEQ ID NO:22 and SEQ ID NO:23, respectively;
- f. SEQ ID NO:24, SEQ ID NO:25 and SEQ ID NO:26, respectively;
- g. SEQ ID NO:29, SEQ ID NO:30 and SEQ ID NO:31, respectively;
- h. SEQ ID NO:32, SEQ ID NO:33 and SEQ ID NO:34, respectively;
- i. SEQ ID NO:35, SEQ ID NO:36 and SEQ ID NO:37, respectively;
- j. SEQ ID NO:40, SEQ ID NO:41 and SEQ ID NO:42, respectively;
- k. SEQ ID NO:43, SEQ ID NO:44 and SEQ ID NO:45, respectively;
- l. SEQ ID NO:46, SEQ ID NO:47 and SEQ ID NO:48, respectively;
- m. SEQ ID NO:51, SEQ ID NO:52 and SEQ ID NO:53, respectively;
- n. SEQ ID NO:54, SEQ ID NO:55 and SEQ ID NO:56, respectively; or
- o. SEQ ID NO:57, SEQ ID NO:58 and SEQ ID NO:59, respectively; and

(B) light chain CDR1, CDR2 or CDR3 sequences of SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4, respectively.

19. The polynucleotide of claim 18, wherein said polynucleotide comprises the nucleotide sequence of SEQ ID NO:5, SEQ ID NO:16, SEQ ID NO:27, SEQ ID NO:38, SEQ ID NO:49 or SEQ ID NO:60.

20. A polynucleotide according to claim 18 that encodes a polypeptide that comprises the light chain variable sequence of SEQ ID NO:1.

21. A polynucleotide according to claim 18 that encodes a polypeptide that comprises the heavy chain variable sequence of SEQ ID NO:6, SEQ ID NO:17, SEQ ID NO:28, SEQ ID NO:39, or SEQ ID NO:50.

22. A polynucleotide vector comprising the polynucleotide of any of claims 18-21.

23. A cell comprising the vector of claim 22.

24. An antibody, or BCMA binding fragment thereof, of claim 1 for use in a method of depleting BCMA-expressing cells in a patient in need thereof.