

CLAIMS

1. An isolated antibody or antigen-binding fragment thereof, comprising:

(a) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 1 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 5; or

(b) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 1 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 6; or

(c) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 1 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 7; or

(d) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 1 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 8; or

(e) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 2 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 5; or

(f) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 2 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 6; or

(g) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 2 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 7; or

(h) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 2 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 8; or

(i) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 3 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 5; or

j) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 3 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 6; or

(k) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 3 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 7; or

(l) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 3 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 8; or

(m) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 4 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 5; or

(n) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 4 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 6; or

(o) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 4 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 7; or

(p) a heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 4 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 8.

2. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 1 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 5.

3. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 1 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 6.

4. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 1 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 7.

5. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 1 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 8.

6. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 2 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 5.

7. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 2 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 6.

8. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 2 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 7.

9. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 2 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 8.

10. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 3 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 5.

11. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 3 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 6.

12. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 3 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 7.

13. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 3 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 8.

14. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 4 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 5.

15. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 4 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 6.

16. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 4 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 7.

17. The isolated antibody or antigen-binding fragment thereof, comprising the heavy chain variable region (VH) having the amino acid sequence as set forth in SEQ ID NO: 4 and the light chain variable region (VL) having the amino acid sequence as set forth in SEQ ID NO: 8.

18. The isolated antibody or antigen binding fragment thereof, according to any one of claims 1 to 17, wherein the antibody is of the IgG1 isotype, and wherein the heavy chain constant region comprises the amino acid sequence as set forth in SEQ ID NO: 21, SEQ ID NO: 22, SEQ ID NO: 23, or SEQ ID NO: 24.

19. The isolated antibody according to claim 18, wherein the antibody further comprises a light chain constant region wherein the light chain constant region comprises the amino acid sequence set forth in SEQ ID NO: 25.

20. The isolated antibody according to claim 1, wherein the antibody comprises:

(a) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 42 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 38; or

(b) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 42 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 39; or

(c) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 42 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 40; or

(d) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 42 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 41; or

(e) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 43 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 38; or

(f) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 43 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 39; or

(g) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 43 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 40; or

(h) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 43 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 41; or

(i) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 44 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 38; or

j) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 44 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 39; or

(k) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 44 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 40; or

(l) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 44 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 41; or

(m) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 45 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 38; or

(n) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 45 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 39; or

(o) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 45 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 40; or

(p) a heavy chain having the amino acid sequence as set forth in SEQ ID NO: 45 and the light chain having the amino acid sequence as set forth in SEQ ID NO: 41.