Claims

1. A composition comprising: an engineered polypeptide that has an amino acid sequence comprising an immunoglobulin heavy chain variable region that contains no more than 16 substitutions as compared with the heavy chain variable region of SEQ ID NO: 1.

2. The composition of claim 1, further comprising a second polypeptide that has an amino acid sequence comprising an immunoglobulin light chain variable region.

3. The composition of claim 1, wherein the substitutions compared with the heavy chain variable region of SEQ ID NO: 1 include one or more of T30S, , S100T, S100D, S100G, E101N, E101K, E101Q, S104T, Q113S, Y115L, Y115F, F116L, N117D, P118Y or combinations thereof.

4. The composition of claim 1, wherein the heavy chain variable region contains no more than 10 substitutions as compared with the heavy chain variable region of SEQ ID NO: 1.

5. The composition of claim 1, wherein the heavy chain variable region contains no more than 6 substitutions as compared with the heavy chain variable region of SEQ ID NO: 1.

6. The composition of claim 1, wherein the heavy chain variable region shows more than 90% identity with the heavy chain variable region of SEQ ID NO: 1.

7. The composition of claim 6, having heavy chain CDRs that show more than 80% identity with the CDRs of SEQ ID NO: 1.

8. The composition of claim 6, having heavy chain CDRs that show more than 90% identity with the CDRs of SEQ ID NO: 1.

9. The composition of claim 1, having heavy chain CDRs that show more than 80% identity with the CDRs of SEQ ID NO: 1.

10. The composition of claim 1, having heavy chain CDRs that show more than 90% identity with the CDRs of SEQ ID NO: 1.

11. The composition of claim 1, having heavy chain CDRs that have fewer than 2 amino acid substitutions as compared with the CDRs of SEQ ID NO: 1.

12. The composition of claim 1, wherein the polypeptide binds to HA polypeptides of subtype H1, H3, H5, H7, H9.

13. The composition of claim 1, wherein the immunoglobulin heavy chain variable region comprises a heavy chain complementarity determining region (CDR) 1 that has fewer than two amino acid substitutions as compared to the CDR1 region from the heavy chain variable region of SEQ ID NO: 1.

14. The composition of claim 1, wherein the immunoglobulin heavy chain variable region comprises a heavy chain complementarity determining region (CDR) 1 that has an amino acid sequence that is identical to that of the CDR1 region of the heavy chain variable region of SEQ ID NO: 1.

15. The composition of claim 1, wherein the immunoglobulin heavy chain variable region comprises a heavy chain complementarity determining region (CDR) 2 that has fewer than two amino acid substitutions as compared to the CDR2 region of the heavy chain variable region of SEQ ID NO: 1.

16. The composition of claim 1, wherein the immunoglobulin heavy chain variable region comprises a heavy chain complementarity determining region (CDR) 3 that has fewer than two amino acid substitutions as compared to the CDR3 region of the heavy chain variable region of SEQ ID NO: 1.

17. The composition of claim 2, wherein the light chain variable region shows more than 70% identity with a light chain variable region of Table 3 SEQ ID NOs: 33-43.

18. The composition of claim 2, wherein the light chain variable region shows more than 75% identity with a light chain variable region of Table 3 SEQ ID NOs: 33-43.

19. The composition of claim 2, wherein the light chain variable region shows more than 80% identity with a light chain variable region of Table 3 SEQ ID NOs: 33-43.

20. The composition of claim 2, wherein the light chain variable region shows more than 85% identity with a light chain variable region of Table 3 SEQ ID NOs: 33-43.

21. The composition of claim 2, wherein the light chain variable region shows more than 90% identity with a light chain variable region of Table 3 SEQ ID NOs: 33-43.

22. The composition of claim 2, wherein the light chain variable region shows more than 95% identity with a light chain variable region of Table 3 SEQ ID NOs: 33-43.

23. The composition of claim 2, wherein the light chain variable region shows more than 70% identity with the light chain variable region of SEQ ID NO: 33.

24. The composition of claim 2, wherein the light chain variable region shows more than 75% identity with the light chain variable region of SEQ ID NO: 33.

25. The composition of claim 2, wherein the immunoglobulin heavy chain variable region comprises VH-1 (SEQ ID NO: 1) and the immunoglobulin light chain variable region comprises VL-1 (SEQ ID NO: 33).

26. The composition of claim 2, wherein the composition shows binding to influenza HA selected from the group consisting of group 1 subtype, group 2 subtype, and combinations thereof.

27. The composition of claim 2, wherein the composition shows neutralization IC_{50} (ug/ml) of influenza HA selected from the group of group 1 subtype, group 2 subtype, and combinations thereof.

28. The composition of claim 2, wherein the composition binds to at least two of HA polypeptides of subtype selected from the group of H1, H3, H5, H7, H9, and combinations thereof.

29. The composition of claim 2, wherein the engineered polypeptide and the second polypeptide together constitute an IgG.

30. The composition of claim 2, wherein the engineered polypeptide and the second polypeptide together constitute a monoclonal antibody.

31. The composition of claim 2, wherein the engineered polypeptide and the second polypeptide together constitute an antibody and the composition further comprises a pharmaceutically acceptable excipient.

32. A polypeptide whose amino acid sequence includes sequences corresponding to each of CDR1, CDR2, and CDR3 found in SEQ ID NO:33, which sequences are either identical to SEQ ID NO: 44, SEQ ID NO: 55 and SEQ ID NO: 59 or:

with respect to CDR1, differ from the CDR1 in SEQ ID NO: 33 due to a substitution compared with SEQ ID NO: 33 that includes Y31F; and

with respect to CDR3, differ from the CDR3 of SEQ ID NO: 33 due to a substitution compared with SEQ ID NO: 33 that includes Y95H.

33. An HA polypeptide binding agent comprising: an engineered polypeptide that has an amino acid sequence comprising: an immunoglobulin heavy chain variable region that contains no more than 16 substitutions as compared with the heavy chain variable region of SEQ ID NO: 1.

34. An engineered polypeptide whose heavy chain variable region amino acid sequence comprises CDR1 (SEQ ID NO: 17), CDR2 (SEQ ID NO: 19), and CDR3 (SEQ ID NO: 21).

35. The engineered polypeptide of claim 34, having heavy chain CDRs that contains no more than 2 amino acid substitutions as compared with the CDRs of SEQ ID NO: 1.

36. A binding agent that is or comprises a full-length antibody or fragment thereof, which binding agent comprises the polypeptide of claim 34, and binds to an HA antigen.

37. A heavy chain variable region that contains no more than 16 substitutions as compared with the heavy chain variable region of SEQ ID NO: 1.

38. The heavy chain variable region of claim 37, wherein the heavy chain variable region contains no more than 10 substitutions as compared with the heavy chain variable region of SEQ ID NO: 1.

39. The heavy chain variable region of claim 37, wherein the heavy chain variable region contains no more than 6 substitutions as compared with the heavy chain variable region of SEQ ID NO: 1.

40. The heavy chain variable region of claim 37, wherein the heavy chain variable region shows more than 90% identity with the heavy chain variable region of SEQ ID NO: 1.

41. The heavy chain variable region of claim 37, having heavy chain CDRs that show more than 80% identity with the CDRs of SEQ ID NO: 1.

42. The heavy chain variable region of claim 37, having heavy chain CDRs that show more than 90% identity with the CDRs of SEQ ID NO: 1.

43. The heavy chain variable region of claim 37, having heavy chain CDRs that have fewer than 2 substitutions as compared with the CDRs of SEQ ID NO: 1.

44. The heavy chain variable region of claim 40, having heavy chain CDRs that show more than 80% identity with the CDRs of SEQ ID NO: 1.

45. The heavy chain variable region of claim 40, having heavy chain CDRs that show more than 90% identity with the CDRs of SEQ ID NO: 1.

46. The heavy chain variable region of claim 40, having heavy chain CDRs that have fewer than 2 substitutions as compared with the CDRs of SEQ ID NO: 1.

47. A cell line expressing the engineered polypeptide of claim 1.

48. The cell line of claim 47, wherein the cell line is a mammalian cell line.

49. The cell line of claim 47, wherein the cell line is a hybridoma.

50. A kit comprising:

at least one composition of claim 2;

a syringe, needle, or applicator for administration of the at least one antibody to subject;

and

instructions for use.

CLAIMS

1. A composition comprising: an engineered antibody that binds to an epitope in the membrane proximal epitope region (MPER) of hemagglutinin (HA), which antibody comprises a heavy chain having an amino acid sequence that is at least 95% identical to SEQ ID NO:1 and a light chain having an amino acid sequence that is at least 95% identical to one of SEQ ID NO:33-43.

2. The composition of claim 1, wherein the light chain includes at least CDR1 found in one of SEQ ID NO:33-43.

3. The composition of claim 1, wherein the light chain includes at least CDR2 found in one of SEQ ID NO:33-43.

4. The composition of claim 1, wherein the light chain includes at least CDR3 found in one of SEQ ID NO:33-43.

5. The composition of claim 1, wherein the light chain includes each of CDR1, CDR2, and CDR3 found in one of SEQ ID NO:33-43.

6. The composition of claim 1, wherein the light chain has the sequence set forth in one of SEQ ID NO:33-43.

7. The composition of claim 1, wherein the light chain has a sequence that is at least 99% identical with one of SEQ ID NO:33-43.

8. The composition of claim 1, wherein the heavy chain has an amino acid sequence that includes at least one CDR that is identical to a CDR found in SEQ ID NO:1.

9. The composition of claim 1, wherein the composition binds to at least two of HA polypeptides of subtype selected from the group of H1, H3, H5, H7, H9, and combinations thereof.

10. The composition of claim 1, wherein the engineered antibody is an IgG.

11. The composition of claim 1, wherein the engineered antibody is a monoclonal.

12. A cell line expressing the engineered antibody of claim 1.

13. The cell line of claim 12, wherein the cell line is a mammalian cell line.

14. The cell line of claim 12, wherein the cell line is a hybridoma.

15. The composition of claim 1, wherein the engineered antibody further comprises a pharmaceutically acceptable excipient.

16. A kit comprising:

the composition of claim 1;

a syringe, needle, or applicator for administration of the antibody to subject; and instructions for use.