We claim:

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

a) a heavy chain variable region (V_H) and a light chain variable region (V_L) comprising a heavy chain complementarity determining region (HCDR)1, a HCDR2, and a HCDR3, and a light chain complementarity determining region (LCDR)1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as SEQ ID NOs: 1 and 2, respectively;

b) a V_H and an V_L comprising a HCDR1, a HCDR2, and a HCDR3, and a LCDR1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as SEQ ID NOs: 11 and 12, respectively;

c) a V_H and a V_L comprising a HCDR1, a HCDR2, and a HCDR3, and a LCDR1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as SEQ ID NOs: 13 and 14, respectively; or

d) a V_H and a V_L comprising a HCDR1, a HCDR2, and a HCDR3, and a LCDR1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as SEQ ID NOs: 15 and 16, respectively,

wherein the monoclonal antibody specifically binds to epidermal growth factor receptor (EGFR) variant III (vIII).

2. The isolated monoclonal antibody or antigen binding fragment thereof of claim 1, comprising

a) a V_H and a V_L comprising a HCDR1, a HCDR2, and a HCDR3, and a LCDR1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as SEQ ID NOs: 17 and 12, respectively;

b) a V_H and a V_L comprising a HCDR1, a HCDR2, and a HCDR3, and a LCDR1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as SEQ ID NOs: 26 and 12, respectively;

c) a V_H and a V_L comprising a HCDR1, a HCDR2, and a HCDR3, and a LCDR1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as SEQ ID NOs: 29 and 30, respectively;

d) a V_H and an V_L comprising a HCDR1, a HCDR2, and a HCDR3, and a LCDR1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as set forth as SEQ ID NOs: 39 and 40, respectively;

e) a V_H and an V_L comprising a HCDR1, a HCDR2, and a HCDR3, and a LCDR1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as SEQ ID NOs: 43 and 44, respectively; or

f) a V_H and an V_L comprising a HCDR1, a HCDR2, and a HCDR3, and a LCDR1, a LCDR2, and a LCDR3 of the V_H and V_L set forth as SEQ ID NOs: 53 and 54, respectively.

3. The antibody or antigen binding fragment of claim 1 or claim 2, wherein

a) the HCDR1, the HCDR2, the HCDR3, the LCDR1, the LCDR2, and the LCDR3 comprise the amino acids sequences set forth as SEQ ID NOs: 5, 6, 7, 8, 9 and 10, respectively;

b) the HCDR1, the HCDR2, the HCDR3, the LCDR1, the LCDR2, and the LCDR3 comprise the amino acids sequences set forth as SEQ ID NOs: 20, 21, 22, 23, 24 and 25, respectively;

c) the HCDR1, the HCDR2, the HCDR3, the LCDR1, the LCDR2, and the LCDR3 comprise the amino acids sequences set forth as SEQ ID NOs: 20, 28, 22, 23, 24 and 25, respectively;

d) the HCDR1, the HCDR2, the HCDR3, the LCDR1, the LCDR2, and the LCDR3 comprise the amino acids sequences set forth as SEQ ID NOs: 33, 34, 35, 36, 37 and 38 respectively;

e) the HCDR1, the HCDR2, the HCDR3, the LCDR1, the LCDR2, and the LCDR3 comprise the amino acids sequences set forth as SEQ ID NOs: 47, 48, 49, 50, 51 and 52, respectively; or

f) the HCDR1, the HCDR2, the HCDR3, the LCDR1, the LCDR2, and the LCDR3 comprise the amino acids sequences set forth as SEQ ID NOs: 47, 57, 49, 58, 51 and 52, respectively.

4. The antibody or antigen binding fragment of any one of the prior claims, wherein

a) the V_H and the V_L comprise the amino acid sequences at least 90% identical to the amino acid sequences set forth as SEQ ID NOs: 1 and 2, respectively;

b) the V_H and the V_L comprise the amino acid sequences at least 90% identical to the amino acid sequences set forth as SEQ ID NOs: 17 and 12, respectively;

c) the V_H and the V_L comprise the amino acid sequences at least 90% identical to the amino acid sequences set forth as SEQ ID NOs: 26 and 12, respectively;

d) the V_H and the V_L comprise the amino acid sequences at least 90% identical to the amino acid sequences set forth as SEQ ID NOs: 29 and 30, respectively;

e) the V_H and the V_L comprise the amino acid sequences at least 90% identical to the amino acid sequences set forth as SEQ ID NOs: 39 and 40, respectively;

f) the V_H and the V_L comprise the amino acid sequences at least 90% identical to the amino acid sequences set forth as SEQ ID NOs: 43 and 44, respectively; or

g) the V_H and the V_L comprise the amino acid sequences at least 90% identical to the amino acid sequences set forth as SEQ ID NOs: 53 and 54, respectively.

5. The antibody or antigen binding fragment of any one of the prior claims, comprising a human framework region.

6. The antibody or antigen binding fragment of any one of claims 1-4, wherein:

a) the V_H and the V_L comprise the amino acid sequences set forth as SEQ ID NOs: 1 and 2, respectively;

b) the V_H and the V_L comprise the amino acid sequences set forth as SEQ ID NOs: 17 and 12, respectively;

c) the V_H and the V_L comprise the amino acid sequences set forth as SEQ ID NOs: 26 and 12, respectively;

d) the V_H and the V_L comprise the amino acid sequences set forth as SEQ ID NOs: 29 and 30, respectively;

e) the V_H and the V_L comprise the amino acid sequences set forth as SEQ ID NOs: 39 and 40, respectively;

f) the V_H and the V_L comprise the amino acid sequences set forth as SEQ ID NOs: 43 and 44, respectively; or

g) the V_H and the V_L comprise the amino acid sequences set forth as SEQ ID NOs: 53 and 54, respectively.

7. The antibody of any one of the prior claims, wherein the antibody comprises a human constant domain.

8. The antibody of any one of the prior claims, wherein the antibody is an IgG.

9. The antibody of any one of the prior claims, comprising a recombinant constant domain comprising a modification that increases the half-life of the antibody.

10. The antibody or antigen binding fragment of any one of the prior claims, conjugated to a toxin or a chemotherapeutic agent.

11. The antibody or antigen binding fragment of claim 10, wherein the toxin is a Pseudomonas exotoxin (PE), ricin, abrin, diphtheria toxin, ribotoxin, ribonuclease, saporin, calicheamicin, or a botulinum toxin.

12. The antibody of antigen binding fragment of claim 11, wherein the toxin is the PE, and wherein the PE is PE25, PE38 or PE40.

13. The antibody of antigen binding fragment of claim 10, wherein the chemotherapeutic agent is Monomethyl Auristatin E or a maytansinoid.

14. The antigen binding fragment of any one of claims 1-6 or 10-13.

15. The antigen binding fragment of claim 14, wherein the antigen binding fragment is a Fv, dsFV, ds-scvFV, Fab, $F(ab')_2$, scFV or a $scFV_2$ fragment.

16. The antibody or antigen binding fragment of any one of the prior claims, conjugated to a detectable marker.

17. A chimeric antigen T cell receptor comprising the antigen binding fragment of any one of the prior claims.

18. A bispecific antibody comprising the antibody or antigen binding fragment of any one of claims 1-16.

19. An isolated nucleic acid molecule encoding the antibody or antigen binding fragment of any one of claims 1-16, or a V_H or V_L of the antibody or antigen binding fragment, or the chimeric antigen T cell receptor of claim 17.

20. The nucleic acid molecule of claim 19, comprising

a) the V_H and/or the V_L nucleotide sequences set forth as SEQ ID NOs: 3 and 4, respectively;

b) the V_H and/or the V_L nucleotide sequences set forth as SEQ ID NOs: 18 and 19, respectively;

c) the V_H and/or the V_L nucleotide sequences set forth as SEQ ID NOs: 27 and 19, respectively;

d) the V_H and/or the V_L nucleotide sequences set forth as SEQ ID NOs: 31 and 32, respectively;

e) the V_H and/or the V_L nucleotide sequences set forth as SEQ ID NOs: 41 and 42, respectively;

f) the V_H and/or the V_L nucleotide sequences set forth as SEQ ID NOs: 45 and 46, respectively; or

g) the V_H and/or the V_L nucleotide sequences set forth as SEQ ID NOs: 55 and 56, respectively.

21. The nucleic acid molecule of claim 19 or claim 20, wherein the nucleic acid molecule is a cDNA sequence.

22. The nucleic acid molecule of any of claims 19-21, operably linked to a promoter.

23. A vector comprising the nucleic acid molecule of any of claims 19-22.

24. An isolated host cell comprising the nucleic acid molecule or vector of any one of claims 19-23.

25. An isolated T cell expressing the chimeric antigen T cell receptor of claim 17.

26. A pharmaceutical composition for use in treating a cancer that expresses EGFRvIII, comprising an effective amount of the antibody, antigen binding fragment, nucleic acid molecule, or vector, of any one of the prior claims; and a pharmaceutically acceptable carrier.

27. A method of producing an antibody or antigen binding fragment that specifically binds to EGFRvIII, or a bispecific antibody comprising the monoclonal antibody or antigen binding fragment, the method comprising:

expressing one or more nucleic acid molecules encoding the antibody, antigen binding fragment, or bispecific antibody of any one of claims 1-16 in a host cell; and

purifying the antibody, antigen binding fragment, or the bispecific antibody.

28. A method of detecting the presence of EGFRvIII in a biological sample from a human subject, comprising:

contacting the biological sample with an effective amount of the antibody or antigen binding fragment of any one of claims 1-16 under conditions sufficient to form an immune complex; and

detecting the presence of the immune complex in the biological sample, wherein the presence of the immune complex in the biological sample indicates the presence of EGFRvIII in the sample.

29. The method of claim 28, wherein the subject has a glioma, a head and neck cancer, a breast cancer or a bladder cancer.

30. The method of claim 29, wherein the biological sample is a biopsy from the glioma, the head and neck cancer, the breast cancer or the bladder cancer, respectively.

31. The antibody, antigen binding fragment, nucleic acid molecule, vector, T cell or pharmaceutical composition of any one of claims 1-26 for use in therapy.

32. Use of an effective amount of the antibody, antigen binding fragment, nucleic acid molecule, vector, T cell or pharmaceutical composition of any one of claims 1-26 in the manufacture of a medicament for inhibiting a tumor expressing EGFRvIII in a subject, wherein the effective amount of the antibody, antigen binding fragment, nucleic acid molecule, vector, T cell or pharmaceutical composition is to be administered to the subject, and wherein the subject has a tumor expressing EGFRvIII.

33. The use of claim 32, wherein the tumor is a glioma, a head and neck cancer, a breast cancer or a bladder cancer.

34. The use of claim 32 or 33, wherein the subject is human.

35. The use of any one of claims 32-34, wherein inhibiting the tumor comprises reducing the growth, size, or metastasis of the tumor.

36. Use of an effective amount of the antibody, antigen binding fragment, nucleic acid molecule, vector, T cell or pharmaceutical composition of any one of claims 1-26 in the manufacture of a medicament for inhibiting a tumor over-expressing EGFR in a subject, wherein the effective amount of the antibody, antigen binding fragment, nucleic acid molecule, vector, T cell or pharmaceutical composition is to be administered to the subject, the subject having the tumor overexpressing EGFR, and wherein

the antibody or antign binding fragment comprises the V_H comprising the HCDR1, the HCDR2, and the HCDR3 of SEQ ID NO: 1, and the V_H comprising the LCDR1, the LCDR2, and the LCDR3 of SEQ ID NO: 2, thereby inhibiting the tumor in the subject.

37. The use of claim 36, wherein the tumor is a glioma, a head and neck cancer, a breast cancer or a bladder cancer.

38. The use of claim 36 or 37, wherein the subject is human.

39. The use of any one of claims 36-38, wherein inhibiting the tumor comprises reducing the growth, size, or metastasis of the tumor.

40. Use of the antibody, antigen binding fragment, nucleic acid molecule, vector, chimeric antigen receptor, T cells expressing the chimeric antigen receptor or pharmaceutical composition of any one of claims 1-26 in the manufacture of a medicament to inhibit a tumor expressing EGFRvIII in a subject or to detect the presence of EGFRvIII in a biological sample.