WHAT IS CLAIMED IS:

1. A humanized antibody or antigen binding fragment thereof that specifically binds a human folate receptor 1, wherein the antibody comprises:

(a) a heavy chain CDR1 comprising GYFMN (SEQ ID NO:1); a heavy chain CDR2 comprising RIHPYDGDTFYNQXaa_1FXaa_2Xaa_3 (SEQ ID NO:56); and a heavy chain CDR3 comprising YDGSRAMDY (SEQ ID NO:3); and

(b) a light chain CDR1 comprising KASQSVSFAGTSLMH (SEQ ID NO:7); a light chain CDR2 comprising RASNLEA (SEQ ID NO:8); and a light chain CDR3 comprising QQSREYPYT (SEQ ID NO:9);

wherein Xaa_1 is selected from K, Q, H, and R; Xaa_2 is selected from Q, H, N, and R; and Xaa_3 is selected from G, E, T, S, A, and V.

2. The humanized antibody or antigen binding fragment thereof of claim 1, wherein the heavy chain CDR2 sequence comprises RIHPYDGDTFYNQKFQG (SEQ ID NO:2)

3. The humanized antibody or antigen binding fragment of claim 1, wherein said antibody or antigen binding fragment comprises a heavy chain variable domain of SEQ ID NO:4 and a light chain variable domain of SEQ ID NO:10 or SEQ ID NO:11.

4. The humanized antibody or antigen binding fragment of claim 1, wherein said antibody or antigen binding fragment comprises a heavy chain of SEQ ID NO:6 and a light chain of SEQ ID NO:12 or SEQ ID NO:13.

5. A humanized antibody or antigen binding fragment thereof encoded by the plasmid DNA deposited with the ATCC on April 7, 2010 and having ATCC deposit nos. PTA-10772, PTA-10773, or 10774.

6. The humanized antibody or antigen binding fragment thereof of claim 1 comprising a heavy chain variable domain at least about 90%, about 95%, about 99%, or 100%

identical to SEQ ID NO:4, and a light chain variable domain at least about 90%, about 95%, about 99%, or about 100% identical to SEQ ID NO:10 or SEQ ID NO:11.

7. An antibody or antigen binding fragment thereof that specifically binds a human folate receptor 1, wherein the antibody comprises:

(a) a heavy chain CDR1 comprising SSYGMS (SEQ ID NO:30); a heavy chain CDR2 comprising TISSGGSYTY (SEQ ID NO:31); and a heavy chain CDR3 comprising DGEGGLYAMDY (SEQ ID NO:32); and a light chain CDR1 comprising KASDHINNWLA (SEQ ID NO:27); a light chain CDR2 comprising GATSLET (SEQ ID NO:28); and a light chain CDR3 comprising QQYWSTPFT (SEQ ID NO:29);

(b) a heavy chain CDR1 comprising TNYWMQ (SEQ ID NO:60); a heavy chain CDR2 comprising AIYPGNGDSR (SEQ ID NO:61); and a heavy chain CDR3 comprising RDGNYAAY (SEQ ID NO:62); and a light chain CDR1 comprising RASENIYSNLA (SEQ ID NO:57); a light chain CDR2 comprising AATNLAD (SEQ ID NO:58); and a light chain CDR3 comprising QHFWASPYT (SEQ ID NO:59);

(c) a heavy chain CDR1 comprising TNYWMY (SEQ ID NO:66); a heavy chain CDR2 comprising AIYPGNSDTT (SEQ ID NO:67); and a heavy chain CDR3 comprising RHDYGAMDY (SEQ ID NO:68); and a light chain CDR1 comprising RASENIYTNLA (SEQ ID NO:63); a light chain CDR2 comprising TASNLAD (SEQ ID NO:64); and a light chain CDR3 comprising QHFWVSPYT (SEQ ID NO:65);

(d) a heavy chain CDR1 comprising SSFGMH (SEQ ID NO:72); a heavy chain CDR2 comprising YISSGSSTIS (SEQ ID NO:73); and a heavy chain CDR3 comprising EAYGSSMEY (SEQ ID NO:74); and a light chain CDR1 comprising RASQNINNNLH (SEQ ID NO:69); a light chain CDR2 comprising YVSQSVS (SEQ ID NO:70); and a light chain CDR3 comprising QQSNSWPHYT (SEQ ID NO:71); or

(e) a heavy chain CDR1 comprising TSYTMH (SEQ ID NO:78); a heavy chain CDR2 comprising YINPISGYTN (SEQ ID NO:79); and a heavy chain CDR3 comprising

GGAYGRKPMDY (SEQ ID NO:80); and a light chain CDR1 comprising KASQNVGPNVA (SEQ ID NO:75); a light chain CDR2 comprising SASYRYS (SEQ ID NO:76); and a light chain CDR3 comprising QQYNSYPYT (SEQ ID NO:77).

8. The antibody of any one of claims 1-7 which is a full length antibody.

9. The antibody of any one of claims 1, 2, or 4-7 which is an antigen binding fragment.

10. The antibody of claim 9, wherein said antibody or antigen binding fragment comprises a Fab, a Fab', a F(ab')2, a Fd, a single chain Fv or scFv, a disulfide linked Fv, a V NAR domain, a IgNar, an intrabody, an IgG-CH2, a minibody, a F(ab')3, a tetrabody, a triabody, a diabody, a single-domain antibody, DVD-Ig, Fcab, mAb2, a (scFv)2, or a scFv-Fc.

11. The antibody or antigen binding fragment thereof of any one of claims 1-10, which binds to a human folate receptor 1 with a Kd of about 1.0 nM or better or between about 1.0 to about 10 nM.

12. A method of making the antibody of any one of claims 1-11 comprising (a) culturing a cell expressing said antibody; and (b) isolating the antibody from said cultured cell.

13. An immunoconjugate having the formula (A) - (L) - (C), wherein:

(A) is an antibody or antigen binding fragment of any one of claims 1-11;

(L) is a linker; and

(C) is a cytotoxic agent.

wherein said linker (L) links (A) to (C).

14. The immunoconjugate of claim 13, wherein said linker is selected from the group consisting of a cleavable linker, a non-cleavable linker, a hydrophilic linker, and a dicarboxylic acid based linker.

15. The immunoconjugate of claim 14, wherein said linker is selected from the group consisting: *N*-succinimidyl 4-(2-pyridyldithio)pentanoate (SPP) or *N*-succinimidyl 4-(2-pyridyldithio)-2-sulfopentanoate (sulfo-SPP); *N*-succinimidyl 4-(2-pyridyldithio)butanoate (SPDB) or *N*-succinimidyl 4-(2-pyridyldithio)-2-sulfobutanoate (sulfo-SPDB); *N*-succinimidyl 4-(maleimidomethyl) cyclohexanecarboxylate (SMCC); *N*-sulfosuccinimidyl 4-(maleimidomethyl) cyclohexanecarboxylate (sulfoSMCC); *N*-succinimidyl-4-(iodoacetyl)-aminobenzoate (SIAB); and *N*-succinimidyl-[(N-maleimidopropionamido)-tetraethyleneglycol] ester (NHS-PEG4-maleimide).

16. The immunoconjugate of claim 15, wherein said linker is *N*-succinimidyl 4-(2-pyridyldithio)butanoate (SPDB) or *N*-succinimidyl 4-(2-pyridyldithio)-2-sulfobutanoate (sulfo-SPDB).

17. The immunoconjugate of any one of claims 13-16, wherein said cytotoxic agent is selected from the group consisting of a maytansinoid, maytansinoid analog, benzodiazepine, taxoid, CC-1065, CC-1065 analog, duocarmycin, duocarmycin analog, calicheamicin, dolastatin, dolastatin analog, auristatin, tomaymycin derivative, and leptomycin derivative or a prodrug of the agent.

18. The immunoconjugate of claim 17, wherein said cytotoxic agent is a maytansinoid.

19. The immunoconjugate of claim 18, wherein said cytotoxic agent is N(2')-deacetyl-N(2')-(3-mercapto-1-oxopropyl)-maytansine or N(2')-deacetyl-N2-(4-mercapto-4-methyl-1-oxopentyl)-maytansine.

20. An immunoconjugate comprising:

(A) a humanized antibody comprising the heavy chain variable domain of SEQ ID NO:97, 99, 101, or 103, and the light chain variable domain of SEQ ID NO:96, 98, 100, or 102;

(L) *N*-succinimidyl 4-(maleimidomethyl) cyclohexanecarboxylate (SMCC); and

(C) N(2')-deacetyl-N(2')-(3-mercapto-1-oxopropyl)-maytansine;

wherein (L) links (A) to (C).

21. An immunoconjugate comprising:

(A) a humanized antibody comprising the heavy chain variable domain of SEQ ID NO:4, and the light chain variable domain of SEQ ID NO:10 or SEQ ID NO:11;

(L) *N*-succinimidyl-[(N-maleimidopropionamido)-tetraethyleneglycol] ester (NHS-PEG4-maleimide); *N*-succinimidyl 4-(2-pyridyldithio)butanoate (SPDB); or *N*-succinimidyl 4-(2-pyridyldithio)-2-sulfobutanoate (sulfo-SPDB); and

(C) N(2')-deacetyl-N2-(4-mercapto-4-methyl-1-oxopentyl)-maytansine;

wherein (L) links (A) to (C).

22. An immunoconjugate comprising:

(A) a humanized antibody comprising the heavy chain variable domain of SEQ ID NO:4, and the light chain variable domain of SEQ ID NO:10 or SEQ ID NO:11;

(L) N-succinimidyl 4-(2-pyridyldithio)-2-sulfobutanoate (sulfo-SPDB); and

(C) N(2')-deacetyl-N2-(4-mercapto-4-methyl-1-oxopentyl)-maytansine;

wherein (L) links (A) to (C).

23. An immunoconjugate comprising:

(A) a humanized antibody comprising the heavy chain variable domain of SEQ ID NO:4, and the light chain variable domain of SEQ ID NO:10 or SEQ ID NO:11;

(L) *N*-succinimidyl 4-(2-pyridyldithio)-2-sulfopentanoate (sulfo-SPP) or *N*-succinimidyl 4-(2-pyridyldithio)pentanoate (SPP); and

(C) N(2')-deacetyl-N(2')-(3-mercapto-1-oxopropyl)-maytansine;

wherein (L) links (A) to (C).

24. The immunoconjugate of any one of claims 21-23, wherein said humanized antibody comprises the heavy chain variable domain of SEQ ID NO:4, and the light chain variable domain of SEQ ID NO:11.

25. The immunoconjugate of any one of claims 13-24, wherein (A) comprises an antibody or antigen binding fragment that competes with chMov19 for specific binding to human folate receptor 1.

26. The immunoconjugate of any one of claims 13-25, wherein the antibody or antigen binding fragment, (A), binds to a human folate receptor 1 with a Kd of 10nM or less.

27. The immunoconjugate of any one of claims 13-26, further comprising 2-6 (C).

28. A pharmaceutical composition comprising the antibody or immunoconjugate of any one of claims 1-11 or 13-27 and a pharmaceutically acceptable carrier.

29. A pharmaceutical composition comprising the antibody or immunoconjugate of any one of claims 1-11 or 13-27, further comprising a second anti-cancer agent.

30. The pharmaceutical composition of claim 28 or claim 29, wherein the immunoconjugates have an average of about 3 to about 4 (C) per (A).

31. A diagnostic reagent comprising the antibody or antigen binding fragment of any one of claims 1-11, wherein said antibody is labeled.

32. The diagnostic reagent of claim 31, wherein said label is selected from the group consisting of a radiolabel, a fluorophore, a chromophore, an imaging agent and a metal ion.

33. A kit comprising the antibody, antigen binding fragment, polypeptide, or immunoconjugate of any one of claims 1-11 or 13-27.

34. The antibody, antigen binding fragment, immunoconjugate, or pharmaceutical composition of any one of claims 1-11 or 13-30 for use in inhibiting tumor growth.

35. Use of the antibody, antigen binding fragment, immunoconjugate, or pharmaceutical composition of any one of claims 1-11 or 13-30 in the manufacture of a medicament for inhibiting tumor growth.

36. The antibody, antigen binding fragment, immunoconjugate, or pharmaceutical composition of any one of claims 1-11 or 13-30 for use in treatment of cancer.

37. Use of the antibody, antigen binding fragment, immunoconjugate, or pharmaceutical composition of any one of claims 1-11 or 13-30 in the manufacture of a medicament for the treatment of cancer.

38. The use of claim 35 or claim 37, wherein said antibody is the huFR-1-21 antibody deposited with ATCC on April 7, 2010 and having ATCC deposit nos. PTA-10775 and PTA-10776.

39. The antibody of claim 34 or claim 36, wherein said antibody is the huFR-1-21 antibody deposited with ATCC on April 7, 2010 and having ATCC deposit nos. PTA-10775 and PTA-10776.

40. The antibody, antigen binding fragment, immunoconjugate, or pharmaceutical composition of any one of claims 34, 36, or 39, wherein the tumor or cancer is selected from the group consisting of: ovarian, brain, breast, uterine, endometrial, pancreatic, renal, and lung.

41. The antibody, antigen binding fragment, immunoconjugate, or pharmaceutical composition of claim 40, wherein the tumor is an ovarian or lung tumor.

42. The antibody, antigen binding fragment, immunoconjugate, or pharmaceutical composition of claim 36 or claim 39, wherein tumor growth is inhibited in the treatment of cancer.

43. The use of any one of claims 35, 37, or 38, wherein the tumor or cancer is selected from the group consisting of: ovarian, brain, breast, uterine, endometrial, pancreatic, renal, and lung.

44. The use of claim 43, wherein the tumor is an ovarian or lung tumor.

45. The use of claim 37 or claim 38, wherein tumor growth is inhibited in the treatment of cancer.

46. The use of any one of claims 35, 37, or 38 further comprising a second anti-cancer agent to the subject.

47. The use of claim 46, wherein said second anti-cancer agent is a chemotherapeutic agent.

48. An isolated cell producing the antibody or antigen binding fragment of any one of claims 1-11.

49. An isolated polynucleotide comprising a sequence at least 90%, at least 95%, or at least 99% identical to a sequence selected from the group consisting of SEQ ID NOs: 5, 14, 15, 37, 38, 43, 44, 47, 48, and 120-127.

50. A vector comprising the polynucleotide of claim 49.

WHAT IS CLAIMED IS:

1. A humanized antibody or antigen binding fragment thereof that specifically binds a human folate receptor 1, wherein the antibody comprises:

(a) a heavy chain CDR1 comprising GYFMN (SEQ ID NO:1); a heavy chain CDR2 comprising RIHPYDGDTFYNQKFQG (SEQ ID NO:2); and a heavy chain CDR3 comprising YDGSRAMDY (SEQ ID NO:3); and

(b) a light chain CDR1 comprising KASQSVSFAGTSLMH (SEQ ID NO:7); a light chain CDR2 comprising RASNLEA (SEQ ID NO:8); and a light chain CDR3 comprising QQSREYPYT (SEQ ID NO:9).

2. The humanized antibody or antigen binding fragment of claim 1, wherein said antibody or antigen binding fragment comprises a heavy chain variable domain of SEQ ID NO:4 and a light chain variable domain of SEQ ID NO:10 or SEQ ID NO:11.

3. The humanized antibody or antigen binding fragment of claim 1, wherein said antibody comprises a heavy chain of SEQ ID NO:6 and a light chain of SEQ ID NO:12 or SEQ ID NO:13.

4. The humanized antibody or antigen binding fragment thereof of claim 1, wherein said antibody comprises a heavy chain encoded by the plasmid DNA deposited with the ATCC on April 7, 2010 and having ATCC deposit no. PTA-10772 and a light chain encoded by the plasmid DNA deposited with the ATCC on April 7, 2010 and having ATCC deposit no. PTA-10773 or PTA-10774.

5. The humanized antibody or antigen binding fragment thereof of claim 1, wherein said antibody or antigen binding fragment comprises a heavy chain variable domain at least about 90%, about 95%, or about 99% identical to SEQ ID NO:4, and a light chain variable domain at least about 90%, about 95%, or about 99% identical to SEQ ID NO:10 or SEQ ID NO:11.

6. The humanized antibody or antigen binding fragment thereof of any one of claims 1-5 which is a full length antibody.

7. The humanized antibody or antigen binding fragment thereof of any one of claims 1, 2, and 5 which is an antigen binding fragment.

8. The humanized antibody or antigen binding fragment thereof of claim 7, wherein said antigen binding fragment comprises a Fab, a Fab', a F(ab')2, a Fd, a single chain Fv or scFv, a disulfide linked Fv, a vNAR domain, a IgNar, an intrabody, an IgG-CH2, a minibody, a F(ab')3, a tetrabody, a triabody, a diabody, a single-domain antibody, DVD-Ig, Fcab, mAb2, a (scFv)2, or a scFv-Fc.

9. The humanized antibody or antigen binding fragment thereof of any one of claims 1-8, which binds to a human folate receptor 1 with a Kd of about 1.0 nM or better.

10. The humanized antibody or antigen binding fragment thereof of any one of claims 1-8, which binds to a human folate receptor 1 with a Kd of about 1.0 to about 10 nM.

11. A method of making the humanized antibody of any one of claims 1-6 comprising (a) culturing a cell expressing said humanized antibody; and (b) isolating the humanized antibody from said cultured cell.

12. An immunoconjugate having the formula (A) - (L) - (C), wherein:

(A) is a humanized antibody or antigen binding fragment thereof of any one of claims 1-10;

(L) is a linker; and

(C) is a cytotoxic agent; and

wherein said linker (L) links (A) to (C).

13. The immunoconjugate of claim 12, wherein said linker is selected from the group consisting of a cleavable linker, a non-cleavable linker, a hydrophilic linker, and a dicarboxylic acid based linker.

14. The immunoconjugate of claim 13, wherein said linker is selected from the group consisting of: *N*-succinimidyl 4-(2-pyridyldithio)pentanoate (SPP); *N*-succinimidyl 4-(2-pyridyldithio)-2-sulfopentanoate (sulfo-SPP); *N*-succinimidyl 4-(2-pyridyldithio)butanoate

(SPDB); *N*-succinimidyl 4-(2-pyridyldithio)-2-sulfobutanoate (sulfo-SPDB); *N*-succinimidyl 4-(maleimidomethyl) cyclohexanecarboxylate (SMCC); *N*-sulfosuccinimidyl 4-(maleimidomethyl) cyclohexanecarboxylate (sulfoSMCC); *N*-succinimidyl-4-(iodoacetyl)-aminobenzoate (SIAB); and *N*-succinimidyl-[(N-maleimidopropionamido)-tetraethyleneglycol] ester (NHS-PEG4-maleimide).

15. The immunoconjugate of claim 14, wherein said linker is *N*-succinimidyl 4-(2-pyridyldithio)butanoate (SPDB) or *N*-succinimidyl 4-(2-pyridyldithio)-2-sulfobutanoate (sulfo-SPDB).

16. The immunoconjugate of any one of claims 12-15, wherein said cytotoxic agent is selected from the group consisting of a maytansinoid, maytansinoid analog, benzodiazepine, taxoid, CC-1065, CC-1065 analog, duocarmycin, duocarmycin analog, calicheamicin, dolastatin, dolastatin analog, auristatin, tomaymycin derivative, and leptomycin derivative or a prodrug of the agent.

17. The immunoconjugate of claim 16, wherein said cytotoxic agent is a maytansinoid.

18. The immunoconjugate of claim 17, wherein said cytotoxic agent is N(2')-deacetyl-N(2')-(3-mercapto-1-oxopropyl)-maytansine or N(2')-deacetyl-N(2')-(4-mercapto-4-methyl-1-oxopentyl)-maytansine.

19. The immunoconjugate of any one of claims 12-18, wherein (A) comprises the heavy chain variable domain of SEQ ID NO:4 and the light chain variable domain of SEQ ID NO:10 or SEQ ID NO:11.

20. The immunoconjugate of claim 12, wherein:

(A) comprises the heavy chain variable domain of SEQ ID NO:4 and the light chain variable domain of SEQ ID NO:10 or SEQ ID NO:11;

(L) comprises *N*-succinimidyl 4-(2-pyridyldithio)butanoate (SPDB); and

(C) comprises N(2')-deacetyl-N(2')-(4-mercapto-4-methyl-1-oxopentyl)-maytansine.

21. The immunoconjugate of claim 12, wherein:

(A) comprises the heavy chain variable domain of SEQ ID NO:4 and the light chain variable domain of SEQ ID NO:10 or SEQ ID NO:11;

(L) comprises N-succinimidyl 4-(2-pyridyldithio)-2-sulfobutanoate (sulfo-SPDB); and

(C) comprises N(2')-deacetyl-N(2')-(4-mercapto-4-methyl-1-oxopentyl)-maytansine.

22. The immunoconjugate of any one of claims 19-21, wherein (A) comprises the heavy chain variable domain of SEQ ID NO:4 and the light chain variable domain of SEQ ID NO:11.

23. The immunoconjugate of any one of claims 12-22, further comprising 2-6 (C).

24. A pharmaceutical composition comprising the antibody, antigen binding fragment thereof, or immunoconjugate of any one of claims 1-10 and 12-23 and a pharmaceutically acceptable carrier.

25. A pharmaceutical composition comprising the antibody, antigen binding fragment thereof, or immunoconjugate of any one of claims 1-10 and 12-23, further comprising a second anti-cancer agent.

26. The pharmaceutical composition of claim 24 or claim 25, wherein the immunoconjugates have an average of about 3 to about 4 (C) per (A).

27. A diagnostic reagent comprising the antibody or antigen binding fragment of any one of claims 1-10.

28. The diagnostic reagent of claim 27 further comprising a label.

29. The diagnostic reagent of claim 28, wherein said label is selected from the group consisting of a radiolabel, a fluorophore, a chromophore, an imaging agent and a metal ion.

30. A kit comprising the antibody, antigen binding fragment thereof, or immunoconjugate of any one of claims 1-10 and 12-23.

31. Use of the antibody, antigen binding fragment thereof, immunoconjugate, or pharmaceutical composition of any one of claims 1-10 and 12-26 in the preparation of a medicament for inhibiting tumor growth in a subject, wherein the inhibiting tumor growth in a subject comprises administering a therapeutically effective amount of the antibody, antigen binding fragment thereof, immunoconjugate, or pharmaceutical composition of any one of claims 1-10 and 12-26 to the subject.

32. Use of the humanized antibody, antigen binding fragment thereof, immunoconjugate, or pharmaceutical composition of any one of claims 1-10 and 12-26 in the preparation of a medicament for treating cancer in a subject, wherein the treating cancer in a subject comprises administering a therapeutically effective amount of the antibody, antigen binding fragment thereof, immunoconjugate, or pharmaceutical composition of any one of claims 1-10 and 12-26 to the subject.

33. The use of claim 31, wherein the tumor is selected from the group consisting of: ovarian tumor, brain tumor, breast tumor, uterine tumor, endometrial tumor, pancreatic tumor, renal tumor, and lung tumor.

34. The use of claim 33, wherein the tumor is an ovarian tumor.

35. The use of claim 33, wherein the tumor is a lung tumor.

36. The use of claim 33, wherein the tumor is an endometrial tumor.

37. The use of claim 32, wherein the cancer is selected from the group consisting of: ovarian cancer, brain cancer, breast cancer, uterine cancer, endometrial cancer, pancreatic cancer, renal cancer, and lung cancer.

38. The use of claim 37, wherein the cancer is ovarian cancer.

39. The use of claim 37, wherein the cancer is lung cancer.

40. The use of claim 37, wherein the cancer is endometrial cancer.

41. The use of claim 31, wherein the inhibiting tumor growth in a subject further comprises administering a second anti-cancer agent to the subject.

42. The use of claim 41, wherein said second anti-cancer agent is a chemotherapeutic agent.

43. The use of claim 32, wherein the treating cancer in a subject further comprises administering a second anti-cancer agent to the subject.

44. The use of claim 43, wherein said second anti-cancer agent is a chemotherapeutic agent.

45. An isolated cell producing the antibody of any one of claims 1-6.