Claims:

1. An antibody molecule which binds PODXL and includes two monomers, each monomer including an Fv antibody fragment connected to a dimerizing portion, wherein the dimerizing portions interact to form the antibody molecule,

wherein each Fv antibody fragment has a VH region and a VL region,

and has one or more of CDR amino acid sequences (i) to (vi):

(i) VL CDR1: SASSSVNYMY (SEQ ID NO: 2);

(ii) VL CDR2: DTSNLAS (SEQ ID NO: 3);

(iii) VL CDR3: QQWSSYPYT (SEQ ID NO: 4);

(iv) VH CDR1: NYWMN (SEQ ID NO: 5);

(v) VH CDR2: EIRLKSNNYATHYAESVKG (SEQ ID NO: 6);

(vi) VH CDR3: ERA (SEQ ID NO: 7);

or has a variant of one or more of (i) to (vi).

2. The antibody molecule of claim 1 wherein the Fv antibody fragment is an scFv antibody fragment.

3. The antibody molecule of claims 1 or claim 2 which is a dimer.

4. The antibody molecule of any preceding claim wherein the dimerizing portion comprises a dimerization domain.

5. The antibody molecule of claim 4 wherein the antibody molecule comprises a linker which connects the Fv antibody fragment to the dimerization domain.

6. The antibody molecule of claim 5 wherein the linker is a flexible linker.

7. The antibody molecule of claim 5 or claim 6 wherein the linker is a linker peptide.

8. The antibody molecule of claim 6 or claim 7 wherein the linker peptide has 4 or more amino acids, 5 or more amino acids, 6 or more amino acids, 7 or more amino acids, 8 or more amino acids, 9 or more amino acids, 10 or more amino acids, 11 or more amino acids, 12 or more amino acids, 13 or more amino acids, 14 or more amino acids, 15 or more amino acids.

9. The antibody molecule of any one of claims 6 to 8 wherein the linker peptide has 30 or fewer amino acids, 25 or fewer amino acids, 20 or fewer amino acids, 15 or fewer amino acids.

10. The antibody molecule of any one of claims 6 to 9 wherein the linker peptide comprises the amino acid sequence of an immunoglobulin hinge region.

11. The antibody molecule of claim 10 wherein the linker peptide comprises an IgG hinge region.

12. The antibody molecule of claim 11 wherein the linker peptide has a sequence substantially as set out in SEQ ID NO: 10.

13. The antibody molecule of any one of claims 4 to 12 wherein the dimerization domain comprises a helix-turn-helix motif.

14. The antibody molecule of any preceding claim wherein the dimerizing portions interact through non-covalent interactions.

15. The antibody molecule of any preceding claim wherein the dimerizing portions interact through covalent interactions.

16. The antibody molecule of any preceding claim which is of less than 150 kDa.

17. The antibody molecule of claim 16 which is of about 65 kDa or less.

18. The antibody molecule of any preceding claim which is of 150 kDa or less, 140 kDa or less, 130 kDa or less, 120 kDa or less, 110 kDa or less, 100 kDa or less, 90 kDa or less, 80 kDa or less, 70 kDa or less, 60 kDa or less, or 50 kDa or less.

19. The antibody molecule of any preceding claim having a variant of (vi) in which one amino acid of (vi) (SEQ ID NO: 7) is replaced with another amino acid.

20. The antibody molecule of any preceding claim wherein the VH region of an Fv antibody fragment has the VH CDR3 amino acid sequence (vi) (SEQ ID NO: 7).

21. The antibody molecule of any preceding claim having a variant of one or more of (i) to (v), which variant is an amino acid sequence having at least about 70% sequence identity with the entire length of SEQ ID NO:2, SEQ ID NO:3, SEQ ID NO:4, SEQ ID NO:5, or SEQ ID NO:6.

22. The antibody molecule of any preceding claim having a variant of one or more of (i) to (v) in which one or two or three amino acids of one or more of (i) to (v) are replaced with another amino acid.

23. The antibody molecule of any preceding claim wherein the VH region of an Fv antibody fragment comprises:

(iv) VH CDR1: NYWMN (SEQ ID NO: 5);

(v) VH CDR2: EIRLKSNNYATHYAESVKG (SEQ ID NO: 6);

or a variant thereof in which one or two or three amino acids in one or more of the sequences (iv) to (v) are replaced with another amino acid.

24. The antibody molecule of any preceding claim wherein the VL region of an Fv antibody fragment comprises:

(i) VL CDR1: SASSSVNYMY (SEQ ID NO: 2);

(ii) VL CDR2: DTSNLAS (SEQ ID NO: 3);

(iii) VL CDR3: QQWSSYPYT (SEQ ID NO: 4);

or a variant thereof in which one or two or three amino acids in one or more of the sequences (i) to (iii) are replaced with another amino acid.

25. The antibody molecule of any preceding claim wherein an Fv antibody fragment comprises:

(i) VL CDR1: SASSSVNYMY (SEQ ID NO: 2);

(ii) VL CDR2: DTSNLAS (SEQ ID NO: 3);

(iii) VL CDR3: QQWSSYPYT (SEQ ID NO: 4);

(iv) VH CDR1: NYWMN (SEQ ID NO: 5);

(v) VH CDR2: EIRLKSNNYATHYAESVKG (SEQ ID NO: 6);

(vi) VH CDR3: ERA (SEQ ID NO: 7).

26. The antibody molecule of any preceding claim which is capable of destroying an undifferentiated pluripotent stem cell.

27. The antibody molecule of any preceding claim which is cytotoxic to an undifferentiated pluripotent stem cell.

28. A monomeric antibody molecule which includes an Fv antibody fragment connected to a dimerizing portion,

wherein the Fv antibody fragment has a VH region and a VL region,

and has one or more of CDR amino acid sequences (i) to (vi):

(i) VL CDR1: SASSSVNYMY (SEQ ID NO: 2);

(ii) VL CDR2: DTSNLAS (SEQ ID NO: 3);

(iii) VL CDR3: QQWSSYPYT (SEQ ID NO: 4);

(iv) VH CDR1: NYWMN (SEQ ID NO: 5);

(v) VH CDR2: EIRLKSNNYATHYAESVKG (SEQ ID NO: 6);

(vi) VH CDR3: ERA (SEQ ID NO:7);

or has a variant of one or more of (i) to (vi).

29. The monomeric antibody molecule of claim 28 wherein the Fv antibody fragment is an scFv antibody fragment.

30. The monomeric antibody molecule of claims 28 or claim 29 which is a dimer.

31. The monomeric antibody molecule of any one of claims 28 to 30 wherein the dimerizing portion comprises a dimerization domain.

32. The monomeric antibody molecule of claim 31 wherein the antibody molecule comprises a linker peptide which connects the Fv fragment to the dimerization domain.

33. The monomeric antibody molecule of claim 32 wherein the linker peptide is a flexible linker peptide.

34. The monomeric antibody molecule of any one of claims 31 to 33 wherein the dimerization domain comprises a helix-turn-helix motif.

35. The monomeric antibody molecule of any one of claims 28 to 34 which is capable of dimerizing with a second monomeric antibody molecule to form an antibody molecule according to any one of claims 1 to 27.

36. The monomeric antibody molecule of any one of claims 28 to 35 wherein the VH region of the Fv antibody fragment has the VH CDR3 amino acid sequence (vi) (SEQ ID NO: 7).

37. An isolated nucleic acid which comprises a nucleotide sequence encoding the monomeric antibody molecule of any one of claims 28 to 36.

38. An expression vector for expression of an antibody molecule, the expression vector comprising the nucleic acid of claim 37 operably linked to a promoter.

39. A host cell carrying the nucleic acid of claim 37 or the expression vector of claim 38.

40. A method of producing an antibody molecule, the method comprising culturing host cells according to claim 39 under conditions for production of the antibody molecule.

41. A method of producing an antibody molecule, the method comprising providing a plurality of antibody molecules according to any one of claims 28 to 36 under conditions permitting dimerization of said antibody molecules.

42. A method according to claim 41 wherein the antibody molecules are produced by the method of claim 40.

43. A method of binding an undifferentiated pluripotent stem cell or cells in a sample containing one or a plurality of undifferentiated pluripotent stem cells, the method comprising:

providing an antibody molecule according to any one of claims 1 to 27; and

contacting the sample with the antibody molecule under conditions permitting binding of the antibody molecule to an undifferentiated pluripotent stem cell.

44. The method of claim 43 further comprising:

identifying the undifferentiated pluripotent stem cell or cells by virtue of being bound to the antibody molecule.

45. The method of claim 43 or claim 44 further comprising:

isolating the undifferentiated pluripotent stem cell or cells from the sample by separating cells bound to the antibody molecule from cells not bound to the antibody molecule.

46. The method of any one of claims 43 to 45 wherein the sample contains pluripotent stem cells which are differentiated, or are undergoing differentiation, the method further comprising:

separating the undifferentiated pluripotent stem cell or cells from the pluripotent stem cells which are differentiated, or are undergoing differentiation by separating cells bound to the antibody molecule from cells not bound to the antibody molecule.

47. An isolated undifferentiated pluripotent stem cell or cells obtained by the method of claim 45.

48. An isolated differentiated pluripotent stem cell or cells obtained by the method of claim 46.

49. A method of enriching pluripotent stem cells that have undergone or are undergoing differentiation from a sample comprising undifferentiated pluripotent stem cells and pluripotent stem cells that have undergone or are undergoing differentiation, the method comprising:

(i) contacting the sample with an antibody molecule according to any one of claims 1 to 27 under conditions permitting the binding of the antibody molecule to undifferentiated pluripotent stem cells; and

(ii) separating cells not bound to the antibody molecule from cells bound to the antibody molecule so as to generate a sample that is enriched in pluripotent stem cells that have undergone or are undergoing differentiation.

50. A method of preparing a composition containing cells differentiated from undifferentiated pluripotent stem cells which contains substantially no undifferentiated pluripotent stem cells, the method comprising:

(i) providing a population of cells comprising undifferentiated pluripotent stem cells and cells differentiated from undifferentiated pluripotent stem cells;

(ii) contacting the population with an antibody molecule according to any one of claims 1 to 27 under conditions permitting the binding of the antibody molecule to undifferentiated pluripotent stem cells; and

(iii) separating cells not bound to the antibody molecule from cells bound to the moiety.

51. A method according to claims 49 or claim 50 wherein the cells bound to the antibody molecule are destroyed by virtue of being bound to the antibody molecule.

52. A composition containing cells differentiated from undifferentiated pluripotent stem cells which composition contains substantially no undifferentiated pluripotent stem cells which composition is obtained by the method of claim 50 or 51.

53. A method of destroying an undifferentiated pluripotent stem cells or cells in a sample containing such cells, the method comprising:

(i) contacting the sample with an antibody molecule according to any one of claims 1 to 27 under conditions permitting the binding of the antibody molecule to undifferentiated pluripotent stem cells; and

(ii) allowing the antibody molecule to destroy the said cell.

Claims:

1. An cytotoxic antibody molecule which binds PODXL and includes two monomers, each monomer including an Fv antibody fragment connected to a dimerizing portion, wherein the dimerizing portions interact to form the antibody molecule,

wherein each Fv antibody fragment has a VH region and a VL region, and has CDR amino acid sequences (i) to (vi):

(i) VL CDR1: SASSSVNYMY (SEQ ID NO: 2);

(ii) VL CDR2: DTSNLAS (SEQ ID NO: 3);

(iii) VL CDR3: QQWSSYPYT (SEQ ID NO: 4);

(iv) VH CDR1: NYWMN (SEQ ID NO: 5);

(v) VH CDR2: EIRLKSNNYATHYAESVKG (SEQ ID NO: 6);

(vi) VH CDR3: ERA (SEQ ID NO: 7); and

wherein the antibody molecule does not include a whole antibody Fc region or a part of an antibody Fc region and wherein the dimerizing portion comprises a dimerization domain, the dimerization domain being selected from a helix-turn-helix (HTH) motif, a coiled- coil motif, a leucine zipper motif or an EF hand motif.

2. The cytotoxic antibody molecule of claim 1 which is a dimer.

3. The cytotoxic antibody molecule of any preceding claim wherein the antibody molecule comprises a linker which connects the Fv antibody fragment to the dimerization domain.

4. The cytotoxic antibody molecule of claim 3 wherein the linker is

(a) a flexible linker, or

(b) a linker peptide, or

(c) a linker peptide which comprises the amino acid sequence of an immunoglobulin hinge region, or

(d) a linker peptide which comprises an IgG hinge region, or

(e) a linker peptide which has a sequence substantially as set out in SEQ ID NO: 10.

5. The cytotoxic antibody molecule of claim 4 wherein the linker peptide has

(a) 4 or more amino acids, 5 or more amino acids, 6 or more amino acids, 7 or more amino acids, 8 or more amino acids, 9 or more amino acids, 10 or more

amino acids, 11 or more amino acids, 12 or more amino acids, 13 or more amino acids, 14 or more amino acids, 15 or more amino acids, and/or

(b) 30 or fewer amino acids, 25 or fewer amino acids, 20 or fewer amino acids, 15 or fewer amino acids.

6. A monomeric antibody molecule which includes an Fv antibody fragment connected to a dimerizing portion, the dimerizing portion comprising a dimerization domain, the dimerization domain being selected from a helix-turn-helix (HTH) motif, a coiled-coil motif, a leucine zipper motif or an EF hand motif, the monomeric antibody molecule being capable of forming a dimeric or multimeric cytotoxic antibody molecule which binds PODXL, and which does not include a whole antibody Fc region or a part of an antibody Fc region;

wherein the Fv antibody fragment has a VH region and a VL region, and has the CDR amino acid sequences (i) to (vi):

(i) VL CDR1: SASSSVNYMY (SEQ ID NO: 2);

(ii) VL CDR2: DTSNLAS (SEQ ID NO: 3);

(iii) VL CDR3: QQWSSYPYT (SEQ ID NO: 4);

(iv) VH CDR1: NYWMN (SEQ ID NO: 5);

(v) VH CDR2: EIRLKSNNYATHYAESVKG (SEQ ID NO: 6);

(vi) VH CDR3: ERA (SEQ ID NO:7);

7. The monomeric antibody molecule of claim 6 wherein the antibody molecule comprises a linker peptide which connects the Fv fragment to the dimerization domain.

8. An isolated nucleic acid which comprises a nucleotide sequence encoding the monomeric antibody molecule of any one of claim 6 or claim 7.

9. An expression vector for expression of an antibody molecule, the expression vector comprising the nucleic acid of claim 8 operably linked to a promoter.

10. A host cell carrying the nucleic acid of claim 8 or the expression vector of claim 9.

11. A method of producing an antibody molecule, the method comprising culturing host cells according to claim 10 under conditions for production of the antibody molecule.

12. A method of binding an undifferentiated pluripotent stem cell or cells in a sample containing one or a plurality of undifferentiated pluripotent stem cells, the method comprising:

providing an antibody molecule according to any one of claims 1 to 5; and

contacting the sample with the antibody molecule under conditions permitting binding of the antibody molecule to an undifferentiated pluripotent stem cell.

13. The method of claim 12 further comprising:

identifying the undifferentiated pluripotent stem cell or cells by virtue of being bound to the antibody molecule, and/or

isolating the undifferentiated pluripotent stem cell or cells from the sample by separating cells bound to the antibody molecule from cells not bound to the antibody molecule.

14. A method of preparing a composition containing cells differentiated from undifferentiated pluripotent stem cells which contains substantially no undifferentiated pluripotent stem cells, the method comprising:

(i) providing a population of cells comprising undifferentiated pluripotent stem cells and cells differentiated from undifferentiated pluripotent stem cells;

(ii) contacting the population with an antibody molecule according to any one of claims 1 to 5 under conditions permitting the binding of the antibody molecule to undifferentiated pluripotent stem cells; and

(iii) separating cells not bound to the antibody molecule from cells bound to the moiety.

15. A method of destroying an undifferentiated pluripotent stem cells or cells in a sample containing such cells, the method comprising:

(i) contacting the sample with an antibody molecule according to any one of claims 1 to 5 under conditions permitting the binding of the antibody molecule to undifferentiated pluripotent stem cells; and

(ii) allowing the antibody molecule to destroy the said cell.