CLAIMS

1. A recombinant transforming growth factor (TGF)-β2 monomer, comprising:

a cysteine to serine substitution, or a cysteine to arginine substitution, at an amino acid residue corresponding to residue 77 of SEQ ID NO: 1;

a deletion of the α3 helix corresponding to amino acid residues 52-71 of SEQ ID NO: 1;

a lysine to arginine substitution at an amino acid residue corresponding to residue 25 of SEQ ID NO: 1;

a leucine to arginine substitution at an amino acid residue corresponding to residue 51 of SEQ ID NO: 1;

an alanine to lysine substitution at an amino acid residue corresponding to residue 74 of SEQ ID NO: 1;

a lysine to arginine substitution at an amino acid residue corresponding to residue 94 of SEQ ID NO: 1; and

(i) an arginine to lysine substitution at an amino acid residue corresponding to residue 26 of SEQ ID NO: 1; a valine to arginine substitution at an amino acid residue corresponding to residue 79 of SEQ ID NO: 1; a leucine to valine substitution at an amino acid residue corresponding to residue 89 of SEQ ID NO: 1; an isoleucine to valine substitution at an amino acid residue corresponding to residue 92 of SEQ ID NO: 1; a threonine to lysine substitution at an amino acid residue corresponding to residue 95 of SEQ ID NO: 1; and an isoleucine to valine substitution at an amino acid residue corresponding to residue 98 of SEQ ID NO: 1;

(ii) a cysteine to valine substitution at an amino acid residue corresponding to residue 7 of SEQ ID NO: 1; and a cysteine to alanine substitution at an amino acid residue corresponding to residue 16 of SEQ ID NO: 1; or

(iii) a cysteine to valine substitution at an amino acid residue corresponding to residue 7 of SEQ ID NO: 1; a cysteine to alanine substitution at an amino acid residue corresponding to residue 16 of SEQ ID NO: 1; an arginine to lysine substitution at an amino acid residue corresponding to residue 26 of SEQ ID NO: 1; a valine to arginine substitution at an amino acid residue corresponding to residue 79 of SEQ ID NO: 1; a leucine to valine substitution at an amino acid residue corresponding to residue 89 of SEQ ID NO: 1; an isoleucine to valine substitution at an amino acid residue corresponding to residue 92 of SEQ ID NO: 1; a threonine to lysine substitution at an amino acid residue corresponding to residue 95 of SEQ ID NO: 1; and an isoleucine to valine substitution at an amino acid residue corresponding to residue 98 of SEQ ID NO: 1.

2. The recombinant TGF-β2 monomer of claim 1, comprising a cysteine to arginine substitution at an amino acid residue corresponding to residue 77 of SEQ ID NO: 1.

3. The recombinant TGF-β2 monomer of claim 2, wherein the amino acid sequence of the TGF-β2 monomer comprises or consists of SEQ ID NO: 4.

4. The recombinant TGF-β2 monomer of claim 2, wherein the amino acid sequence of the TGF-β2 monomer comprises or consists of SEQ ID NO: 6.

5. The recombinant TGF-β2 monomer of claim 1, comprising a cysteine to serine substitution at an amino acid residue corresponding to residue 77 of SEQ ID NO: 1.

6. The recombinant TGF-β2 monomer of claim 5, wherein the amino acid sequence of the TGF-β2 monomer comprises or consists of SEQ ID NO: 5.

7. A recombinant transforming growth factor (TGF)-β2 monomer, wherein the amino acid sequence of the TGF-β2 monomer comprises or consists of SEQ ID NO: 7.

8. The recombinant TGF-β2 monomer of claim 1, which is PEGylated.

9. The recombinant TGF-β2 monomer of claim 1, which is glycosylated or hyper-glycosylated.

10. The recombinant TGF-β2 monomer of claim 1, further comprising a radiotherapy agent, a cytotoxic agent for chemotherapy, a drug, an imaging agent, a fluorescent dye, or a fluorescent protein tag.

11. A fusion protein comprising the recombinant TGF-β2 monomer of claim 1 and a heterologous protein.

12. The fusion protein of claim 11, wherein the heterologous protein comprises a protein tag, an Fc domain, albumin, an albumin-binding polypeptide, an antibody, an antigen-binding fragment of an antibody or a targeting moiety.

13. The fusion protein of claim 11, wherein the fusion protein is a single-chain polypeptide.

14. The fusion protein of claim 11, wherein the fusion protein forms a dimeric polypeptide.

15. The fusion protein of claim 11, wherein the fusion protein is heterodimeric.

16. The fusion protein of claim 11, wherein the fusion protein is multimeric.

17. An isolated nucleic acid molecule encoding the recombinant TGF-β2 monomer of claim 1.

18. The nucleic acid molecule of claim 17 operably linked to a promoter.

19. A vector comprising the nucleic acid molecule of claim 18.

20. An isolated cell comprising the vector of claim 19.

21. The isolated cell of claim 20, wherein the cell is a T lymphocyte.

22. A composition comprising:
the recombinant TGF-β2 monomer of claim 1; and
a pharmaceutically acceptable carrier, diluent, or excipient.

23. A method of inhibiting TGF-β signaling in a cell, comprising contacting the cell with an effective amount of the recombinant TGF-β2 monomer of claim 1.

24. The recombinant TGF-β2 monomer of claim 1 for use in therapy.

25. Use of the recombinant TGF-β2 monomer of claim 1 in the manufacture of a medicament for the treatment of a disease or disorder associated with aberrant TGF-β signaling.

26. The use of claim 25, wherein the disease or disorder associated with aberrant TGF-β signaling is a fibrotic disorder.

27. The use of claim 25, wherein the disease or disorder associated with aberrant TGF-β signaling is breast cancer, brain cancer, pancreatic cancer, prostate cancer, skin cancer, bladder cancer, liver cancer, ovarian cancer, renal cancer, endometrial cancer, colorectal cancer, gastric cancer, skin cancer or thyroid cancer.

28. The use of claim 25, wherein the disease or disorder associated with aberrant TGF-β signaling is an ocular disease.

29. The use of claim 25, wherein the disease or disorder associated with aberrant TGF-β signaling is a genetic disorder of connective tissue.