We Claim:

1. A polypeptide for use in treating or preventing an anemia in a human patient in need thereof, wherein the polypeptide comprises an amino acid sequence selected from the group consisting of:

a) the amino acid sequence of SEQ ID NO:2 or an amino acid sequence at least 90% or 95% identical to SEQ ID NO:2;

b) the amino acid sequence of SEQ ID NO: 3 or an amino acid sequence at least 90% or 95% identical to SEQ ID NO:3;

c) a polypeptide comprising at least 50 consecutive amino acids selected from SEQ ID NO: 2;

d) the amino acid sequence of SEQ ID NO: 16 or an amino acid sequence at least 90% or 95% identical to SEQ ID NO: 16;

e) the amino acid sequence of SEQ ID NO: 17 or an amino acid sequence at least 90% or 95% identical to SEQ ID NO: 17; and

f) a polypeptide comprising at least 50 consecutive amino acids selected from SEQ ID NO: 16.

2. The polypeptide for use according to claim 1, wherein said polypeptide is a fusion protein including, in addition to said polypeptide, one or more polypeptide portions that enhance one or more of in vivo stability, in vivo half life, uptake/administration, tissue localization or distribution, formation of protein complexes, and/or purification.

3. The polypeptide for use according to claim 2, wherein said fusion protein includes a polypeptide portion selected from the group consisting of: an immunoglobulin Fc domain and a serum albumin.

4. The polypeptide for use according to any preceding claim, wherein said polypeptide includes one or more modified amino acid residues selected from: a glycosylated amino acid, a PEGylated amino acid, a farnesylated amino acid, an acetylated amino acid, a biotinylated amino

acid, an amino acid conjugated to a lipid moiety, and an amino acid conjugated to an organic derivatizing agent.

5. The polypeptide for use according to any preceding claim, wherein the anemia is anemia associated with multiple myeloma.

6. The polypeptide for use according to any one of claims 1 to 4, wherein the anemia is associated with chronic renal disease in the patient.

7. The polypeptide for use according to any one of claims 1 to 4, wherein the anemia is associated with chemotherapeutic treatment of the patient.

8. The polypeptide for use according to any one of claims 1 to 4, wherein the anemia is associated with myelodysplastic syndrome.

9. The polypeptide for use according to any one of claims 1 to 4, wherein the anemia is associated with a thalassemia.

10. A method of identifying an agent that increases red blood cell levels, the method comprising:

a) contacting an agent of interest with an isolated ActRII polypeptide which is ordinarily capable of binding to activin;

b) adding a composition containing activin;

c) quantifying the agent's efficacy at inhibiting complex formation between the ActRII polypeptide and activin; and

d) evaluating the effect of the agent on red blood cell levels in an animal.

11. An ActRII-Fc fusion protein for use in treating or preventing anemia in a human patient in need thereof, wherein the ActRII-Fc fusion protein is a polypeptide comprises an amino acid sequence selected from the group consisting of:

a) the amino acid sequence of SEQ ID NO:3 or a sequence that is at least 90% or 95% identical to SEQ ID NO:3;

b) the amino acid sequence of SEQ ID NO:2 or a sequence that is at least 90% or 95% identical to SEQ ID NO:2;

c) the amino acid sequence of SEQ ID NO:7 or a sequence that is at least 90% or 95% identical to SEQ ID NO:7;

d) the amino acid sequence of SEQ ID NO:12 or an amino acid sequence that is at least 90% or 95% identical to SEQ ID NO: 12;

e) the amino acid sequence of SEQ ID NO:17 or a sequence that is at least 90% or 95% identical to SEQ ID NO:12;

e) the amino acid sequence of SEQ ID NO:16 or a sequence that is at least 90% or 95% identical to SEQ ID NO:16;

f) the amino acid sequence of SEQ ID NO:20 or an amino acid sequence at least 90% or 95% identical to SEQ ID NO: 20; and

g) the amino acid sequence of SEQ ID NO:21 or an amino acid sequence at least 90% or 95% identical to SEQ ID NO: 21.

12. The protein for use according to claim 11, which causes less than 15% increase in the patient's skeletal muscle mass.

13. The protein for use according to claim 11 or claim 12, which is administered so as to reach a serum concentration in the patient of at least 100 ng/ml for a period of about 20 to 30 days.

14. The protein for use according to any one of claims 11-13, which is administered so as to reach a serum concentration in the patient in the range of 100 ng/ml to 1000 ng/ml.

15. The protein for use according to any one of claims 11-14, which has a serum half-life of between 15 and 30 days.

16. The protein for use according to any one of claims 11-15, which is for administration to the patient no more frequently than once per week.

17. The protein for use according to-claim 16, which is for administration to the patient no more frequently than once per month.

18. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises an amino acid sequence at least 95% identical to SEQ ID NO:3.

19. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:3.

20. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises an amino acid sequence at least 95% identical to SEQ ID NO:2.

21. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:2.

23. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises an amino acid sequence at least 95% identical to SEQ ID NO:7.

24. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:7.

25. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises an amino acid sequence at least 95% identical to SEQ ID NO:12.

26. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:12.

27. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises an amino acid sequence at least 95% identical to SEQ ID NO:16.

28. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:16.

29. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises an amino acid sequence at least 95% identical to SEQ ID NO:17.

30. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:17.

31. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises an amino acid sequence at least 95% identical to SEQ ID NO:20.

32. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:20.

33. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises an amino acid sequence at least 95% identical to SEQ ID NO:21.

34. The polypeptide for use according to any one of claims 1-9 or protein for use according to any one of claims 11-17, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:21.

CLAIMS:

1. A polypeptide for use in treating or preventing an anemia in a human patient in need thereof, wherein the polypeptide comprises an amino acid sequence selected from the group consisting of:
a) the amino acid sequence of SEQ ID NO:2 or an amino acid sequence that is at least 90% or 95% identical to SEQ ID NO:2;
b) the amino acid sequence of SEQ ID NO: 3 or an amino acid sequence that is at least 90% or 95% identical to SEQ ID NO:3;
c) a polypeptide comprising at least 50 consecutive amino acids selected from SEQ ID NO:2;
d) the amino acid sequence of SEQ ID NO: 16 or an amino acid sequence that is at least 90% or 95% identical to SEQ ID NO: 16;
e) the amino acid sequence of SEQ ID NO: 17 or an amino acid sequence that is at least 90% or 95% identical to SEQ ID NO: 17; and
f) a polypeptide comprising at least 50 consecutive amino acids selected from SEQ ID NO:16.

2. The polypeptide for use according to claim 1, wherein said polypeptide is a fusion protein comprising, in addition to said polypeptide, one or more polypeptide portions that enhance one or more of *in vivo* stability, *in vivo* half-life, uptake/administration, tissue localization or distribution, formation of protein complexes, and/or purification.

3. The polypeptide for use according to claim 2, wherein said fusion protein comprises a polypeptide portion selected from the group consisting of: an immunoglobulin Fc domain and a serum albumin.

4. The polypeptide for use according to any preceding claim, wherein said polypeptide comprises one or more modified amino acid residues selected from: a glycosylated amino acid, a PEGylated amino acid, a farnesylated amino acid, an acetylated amino acid, a biotinylated amino acid, an amino acid conjugated to a lipid moiety, and an amino acid conjugated to an organic derivatizing agent.

5. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:3.

6. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:3.

7. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:2.

8. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:2.

9. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:7.

10. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:7.

11. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:12.

12. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:12.

13. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:16.

14. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:16.

15. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:17.

16. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:17.

17. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:20.

18. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:20.

19. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:21.

20. The polypeptide for use according to any one of claims 1 to 4, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:21.

21. The polypeptide for use according to any one of claims 1 to 20, wherein the polypeptide binds to activin A.

22. The polypeptide for use according to any one of claims 1 to 20, wherein the polypeptide binds to GDF11.

23. The polypeptide for use according to any one of claims 1 to 22, wherein the anemia is anemia associated with multiple myeloma.

24. The polypeptide for use according to any one of claims 1 to 22, wherein the anemia is associated with chronic renal disease in the patient.

25. The polypeptide for use according to any one of claims 1 to 22, wherein the anemia is associated with acute renal disease in the patient.

26. The polypeptide for use according to any one of claims 1 to 22, wherein the anemia is associated with end-stage renal disease.

27. The polypeptide for use according to any one of claims 1 to 22, wherein the anemia is associated with chemotherapeutic treatment of the patient.

28. The polypeptide for use according to any one of claims 1 to 22, wherein the anemia is associated with a myelodysplastic syndrome.

29. The polypeptide for use according to any one of claims 1 to 22, wherein the anemia is associated with a thalassemia.

30. A method of identifying an agent that increases red blood cell levels, the method comprising: a) contacting an agent of interest with an isolated ActRII polypeptide which is ordinarily capable of binding to activin, wherein the ActRII polypeptide comprises an amino acid sequence that is at least 90% identical to any one of SEQ ID NOs: 2, 3, 7, 12, 16, 17, 20, and 21;

b) adding a composition containing activin;
c) quantifying the agent's efficacy at inhibiting complex formation between the ActRII polypeptide and activin; and
d) evaluating the effect of the agent on red blood cell levels in an animal.

31. An ActRII-Fc fusion protein for use in treating or preventing anemia in a human patient in need thereof, wherein the ActRII-Fc fusion protein comprises a polypeptide that comprises an amino acid sequence selected from the group consisting of:

a) the amino acid sequence of SEQ ID NO:3 or a sequence that is at least 90% or 95% identical to SEQ ID NO:3;
b) the amino acid sequence of SEQ ID NO:2 or a sequence that is at least 90% or 95% identical to SEQ ID NO:2;
c) the amino acid sequence of SEQ ID NO:7 or a sequence that is at least 90% or 95% identical to SEQ ID NO:7;
d) the amino acid sequence of SEQ ID NO:12 or an amino acid sequence that is at least 90% or 95% identical to SEQ ID NO: 12;
e) the amino acid sequence of SEQ ID NO:17 or a sequence that is at least 90% or 95% identical to SEQ ID NO:12;
f) the amino acid sequence of SEQ ID NO:16 or a sequence that is at least 90% or 95% identical to SEQ ID NO:16;
g) the amino acid sequence of SEQ ID NO:20 or an amino acid sequence at least 90% or 95% identical to SEQ ID NO: 20; and
h) the amino acid sequence of SEQ ID NO:21 or an amino acid sequence at least 90% or 95% identical to SEQ ID NO: 21.

32. The protein for use according to claim 31, which causes less than a 15% increase in the patient's skeletal muscle mass.

33. The protein for use according to claim 31 or claim 32, which is for administration so as to reach a serum concentration of the fusion protein in the patient of at least 100 ng/ml for a period of about 20 to 30 days.

34. The protein for use according to any one of claims 31 to 33, which is for administration so as to reach a serum concentration of the fusion protein in the patient in the range of 100 ng/ml to 1000 ng/ml.

35. The protein for use according to any one of claims 31 to 34, which has a serum half-life of between 15 and 30 days.

36. The protein for use according to any one of claims 31 to 35, which is for administration to the patient no more frequently than once per week.

37. The protein for use according to claim 36, which is for administration to the patient no more frequently than once per month.

38. The protein for use according to any one of claims 31 to 37, wherein said polypeptide comprises one or more modified amino acid residues selected from: a glycosylated amino acid, a PEGylated amino acid, a farnesylated amino acid, an acetylated amino acid, a biotinylated amino

acid, an amino acid conjugated to a lipid moiety, and an amino acid conjugated to an organic derivatizing agent.

39. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:3.

40. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:3.

41. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:2.

42. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:2.

43. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:7.

44. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:7.

45. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:12.

46. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:12.

47. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:16.

48. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:16.

49. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:17.

50. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:17.

51. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:20.

52. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:20.

53. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises an amino acid sequence that is at least 95% identical to SEQ ID NO:21.

54. The protein for use according to any one of claims 31 to 38, wherein the polypeptide comprises the amino acid sequence of SEQ ID NO:21.

55. The polypeptide for use according to any one of claims 31 to 54, wherein the polypeptide binds to activin A.

56. The polypeptide for use according to any one of claims 31 to 54, wherein the polypeptide binds to GDF11.

57. The polypeptide for use according to any one of claims 31 to 54, wherein the anemia is anemia associated with multiple myeloma.

58. The polypeptide for use according to any one of claims 31 to 54, wherein the anemia is associated with chronic renal disease in the patient.

59. The polypeptide for use according to any one of claims 31 to 54, wherein the anemia is associated with acute renal disease in the patient.

60. The polypeptide for use according to any one of claims 31 to 54, wherein the anemia is associated with end-stage renal disease.

61. The polypeptide for use according to any one of claims 31 to 54, wherein the anemia is associated with chemotherapeutic treatment of the patient.

62. The polypeptide for use according to any one of claims 31 to 54, wherein the anemia is associated with a myelodysplastic syndrome.

63. The polypeptide for use according to any one of claims 31 to 54, wherein the anemia is associated with a thalassemia.