

THAT WHICH IS CLAIMED

1. A fusion protein comprising:
 - (a) a first polypeptide comprising Interleukin-2 (IL-2) or a functional variant or fragment thereof; and
 - (b) a second polypeptide, fused in frame to said first polypeptide, said second polypeptide comprises an extracellular domain of Interleukin-2 Receptor alpha (IL-2Ra) or a functional variant or fragment thereof, wherein said fusion protein has IL-2 activity.
2. The fusion protein of claim 1, wherein said fusion protein has an increased IL-2 potency when compared to native or recombinant IL-2.
3. The fusion protein of any one of claims 1 or 2, wherein said fusion protein has an increased persistent IL-2 stimulation of IL-2R bearing lymphocytes *in vivo* when compared to native or recombinant IL-2.
4. The fusion protein of any one of claims 1-3, wherein
 - (a) said first polypeptide comprising IL-2 shares at least 70% sequence identity to SEQ ID NO: 2; and/or,
 - (b) said second polypeptide comprising the extracellular domain of IL-2Ra shares at least 70% sequence identity to SEQ ID NO: 7.
5. The fusion protein of claim 4, wherein
 - (a) said first polypeptide comprising IL-2 shares at least 85%, 90%, 95%, or 99% sequence identity to SEQ ID NO: 2; and/or,
 - (b) said second polypeptide comprising the extracellular domain of IL-2Ra shares at least 85%, 90%, 95% or 99% sequence identity to SEQ ID NO: 7.
6. The fusion protein of any one of claims 1-5, further comprising a linker sequence fused in frame between said first polypeptide and said second polypeptide.
7. The fusion protein of claim 6, wherein the linker sequence comprises:
 - (a) a glycine/serine linker;
 - (b) the sequence set forth in SEQ ID NO:11, 12, 13, 14, 15, 40, 41, 50, 51, or 52; or,

(c) a sequence having least 90% or 95% sequence identity to any one of SEQ ID NO:11, 12, 13, 14, 15, 40, 41, 50, 51, or 52.

8. The fusion protein of claim 7, wherein the fusion protein comprises

(a) the amino acid sequence of any one of SEQ ID NO: 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 36, 37, 38, 39, 43, 44, 45, 46, 54, 55, 56, 57, 58, 59, 60, or 61; or,

(b) a sequence having at least 80%, 85%, 90%, or 95% to any one of SEQ ID NO: 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 36, 37, 38, 39, 43, 44, 45, 46, 54, 55, 56, 57, 58, 59, 60, or 61.

9. The fusion protein of claim 7, wherein the fusion protein comprises at least one mutation in the extracellular domain of IL-2Ra.

10. The fusion protein of claim 9, wherein the fusion protein comprises:

(a) the amino acid sequence of any one of SEQ ID NO: 62 or 64; or

(b) a sequence having at least 80%, 85%, 90%, or 95% to any one of SEQ ID NO: 62 or 64.

11. A polynucleotide comprising a nucleotide sequence encoding the fusion protein of any one of claims 1-10.

12. A host cell comprising the polynucleotide of claim 11.

13. The host cell of claim 12, wherein the host cell comprises a CHO cell or a COS cell.

14. A method for making a fusion protein of any one of claims 1-10, said method comprising introducing into a host cell a polynucleotide encoding the fusion protein of any one of claims 1-8 and expressing the fusion protein in the host cell.

15. The method of claim 14, wherein the polynucleotide encoding the fusion protein is operably linked to a promoter active in the host cell.

16. Use of a therapeutically effective amount of the fusion protein of any one of claims 1-10 in the manufacture of a medicament for the treatment of an autoimmune disease by decreasing the immune response of a subject in need thereof.

17. The use of claim 16, wherein said autoimmune disease comprises type 1 diabetes, multiple sclerosis, rheumatoid arthritis, celiac disease, systemic lupus erythematosus, juvenile idiopathic arthritis, Crohn's disease, ulcerative colitis or systemic sclerosis, graft versus host disease, psoriasis, alopecia areata, or HCV-induced vasculitis.

18. The use of any one of claims 16-17, wherein the therapeutically effective amount of the fusion protein comprises 10^3 to 10^6 IU of IL-2 activity per adult or $10^4 \pm 100$ fold of IL-2 activity per adult to decrease an immune response.

19. Use of a therapeutically effective amount of the fusion protein of any one of claims 1-10 in the manufacture of a medicament for the treatment of a medical condition associated with decreased immunity by increasing the immune response of a subject in need thereof.

20. Use of a therapeutically effective amount of the fusion protein of any one of claims 1-10 in the manufacture of a medicament for the treatment of a medical condition that is treated by a vaccine by enhancing the immunogenicity of said vaccine in a subject, wherein said medicament and said vaccine are to be administered to the subject, wherein said fusion protein enhances the immunogenicity of the vaccine.

21. Use of a therapeutically effective amount of the fusion protein of any one of claims 1-10 in the manufacture of a medicament for the treatment of a medical condition that is treated by a vaccine by overcoming a suppressed immune response to said vaccine in a subject, wherein said medicament and said vaccine are to be administered to said subject, wherein said fusion protein overcomes said suppressed immune response to said vaccine.

22. The use of any one of claims 20 or 21, wherein said medicament and said vaccine are to be administered sequentially, in any order.

23. The use of any one of claims 20 or 21, wherein said medicament and said vaccine are to be administered simultaneously.

24. The use of any one of claims 20-23, wherein said vaccine is a cancer vaccine.

25. The use of any one of claims 19-24, wherein the therapeutically effective amount of the fusion protein comprises at least 104 to 107 IU of IL-2 activity per adult or at least 105+100 of IL-2 activity per adult to increase an immune response.

26. The use of any one of claims 16-25, wherein said subject is a human.

27. The use of any one of claims 16-25, wherein said subject is a domesticated mammal or an agricultural mammal.