CLAIMS

What is claimed is:

1. A fusion molecule comprising a PD-L1 inhibitor fused to an IL-7 protein, through a peptide linker, wherein the IL-7 protein (a) comprises the amino acid sequence of SEQ ID NO:9 or an amino acid sequence having at least 90% sequence identity to SEQ ID NO: 9 and (b) has reduced binding affinity to the IL-7 receptor alpha as compared to the wild-type human IL-7 protein.

2. The fusion molecule of claim 1, wherein the IL-7 protein has an amino acid residue that is not W at position 142 according to SEQ ID NO:9.

3. The fusion molecule of claim 1, wherein the IL-7 protein has an amino acid residue selected from G, A, V, C, L, I, M, and F at position 142 according to SEQ ID NO:9.

4. The fusion molecule of claim 1, wherein the IL-7 protein comprises the amino acid sequence of SEQ ID NO: 9.

5. The fusion molecule of any one of claims 1-4, wherein the peptide linker has from 5 to 100 amino acid residues.

6. The fusion molecule of claim 5, wherein the peptide linker has from 10-75 amino acids.

7. The fusion molecule of any one of claims 1-6, wherein at least 20% of the amino acid residues of peptide linker are amino acid residues selected from the group consisting of alanine, glycine, cysteine, and serine.

8. The fusion molecule of any one of claims 1-7, wherein at least 40% of the amino acid residues of peptide linker are amino acid residues selected from the group consisting of alanine, glycine, cysteine, and serine.

9. The fusion molecule of claim 1, wherein the peptide linker comprises an amino acid sequence selected from the group consisting SEQ ID NO: 1-5.

10. The fusion molecule of any one of claims 1-9, wherein the PD-L1 inhibitor is a decoy PD-1 protein or an anti-PD-L1 antibody or antigen-binding fragment thereof.

11. The fusion molecule of claim 10, wherein the decoy PD-1 protein is an inactive PD-1 that binds PD-L1.

12. The fusion molecule of claim 10, wherein the antigen-binding fragment of the anti-PD-L1 antibody is a single-chain fragment, a Fab fragment, or a pair of Fab fragments.

13. The fusion molecule of claim 10, wherein the anti-PD-L1 antibody is a monospecific antibody or a bispecific antibody that further has a second specificity.

14. The fusion molecule of claim 13, wherein the anti-PD-L1 antibody is ADCC-enabled.

15. The fusion molecule of claim 10, wherein the anti-PD-L1 antibody or the antigen-binding fragment thereof comprises a heavy chain variable region comprising CDR1, CDR2, and CDR3 having the amino acid sequences of residues 31-35, residues 50-66, and residues 99-108 of SEQ ID NO:6 respectively, and a light chain variable region comprising CDR1, CDR2, and CDR3 having the amino acid sequences of residues 24-34, residues 50-56, and residues 89-97 of SEQ ID NO:7 respectively.

16. The fusion molecule of claim 10, wherein the anti-PD-L1 antibody or the antigen-binding fragment thereof comprises a heavy chain variable region comprising the amino acid sequence of SEQ ID NO: 6, and a light chain variable region comprising the amino acid sequence of SEQ ID NO: 7.

17. The fusion molecule of any one of claims 1-16, wherein peptide linker is fused to the C-terminal residue of the PD-L1 inhibitor, and fused to the N-terminal residue of the IL-7 protein.

18. The fusion molecule of any one of claims 1-16, wherein peptide linker is fused to the N-terminal residue of the PD-L1 inhibitor, and fused to the C-terminal residue of the IL-7 protein.

19. The fusion molecule of claim 18, wherein the peptide linker is fused to the N-terminal residue of a light chain of the anti-PD-L1 antibody or fragment thereof.

20. The fusion molecule of claim 18, wherein the peptide linker is fused to the N-terminal residue of a heavy chain of the anti-PD-L1 antibody or fragment thereof.

21. A composition comprising the molecule of any one of claims 1-20 and a pharmaceutically acceptable carrier.

22. An isolated cell comprising one or more polynucleotide encoding the molecule of any one of claims 1-20.

23. Use of a molecule of any one of claims 1-20 in the manufacture of a medicament for treating cancer in a patient in need thereof.