WHAT IS CLAIMED IS:

1. A polynucleotide encoding a chimeric receptor complex comprising (a) a CD3 zeta cytoplasmic domain, (b) a Natural Killer Group 2 member D (NKG2D) receptor, and (c) a DNAX-activating protein 10 (DAP10) polypeptide.

2. The polynucleotide of claim 1, wherein the CD3 zeta cytoplasmic domain comprises the amino acid sequence of SEQ ID NO: 10.

3. The polynucleotide of claim 2, wherein the CD3 zeta cytoplasmic domain is encoded by the nucleic acid sequence of SEQ ID NO: 9.

4. The polynucleotide of claim 1, wherein the NKG2D receptor comprises the amino acid sequence of SEQ ID NO: 12.

5. The polynucleotide of claim 4, wherein the NKG2D receptor is encoded by the nucleic acid sequence of SEQ ID NO: 11.

6. The polynucleotide of claim 1, wherein the DAP10 polypeptide comprises the amino acid sequence of SEQ ID NO: 14.

7. The polynucleotide of claim 6, wherein the DAP10 polypeptide is encoded by the nucleic acid sequence of SEQ ID NO: 13.

8. The polynucleotide of claim 1, wherein the CD3 zeta cytoplasmic domain comprises the amino acid sequence of SEQ ID NO: 10, the NKG2D receptor comprises the amino acid sequence of SEQ ID NO: 12, and the DAP10 polypeptide comprises the amino acid sequence of SEQ ID NO: 14.

9. The polynucleotide of claim 1, wherein the CD3 zeta cytoplasmic domain is encoded by the nucleic acid sequence of SEQ ID NO: 9, the NKG2D receptor is encoded by the nucleic acid sequence of SEQ ID NO: 11, and the DAP10 polypeptide is encoded by the nucleic acid sequence of SEQ ID NO: 13.

~~10. The polynucleotide of claim 1 which is an mRNA.~~

11. A vector comprising the polynucleotide of claim 1, wherein the polynucleotide is operably linked to at least one regulatory element for expression of the chimeric receptor complex.

12. The vector of claim 11, wherein the CD3 zeta cytoplasmic domain and the NKG2D receptor are expressed as a single chimeric receptor protein.

13. The vector of claim 11, wherein the DAP10 polypeptide is expressed as a separate molecule from the CD3 zeta cytoplasmic domain and the NKG2D receptor.

14. The vector of claim 13, wherein the nucleotide sequence encoding the DAP10 polypeptide is operably linked to a nucleotide sequence comprising an internal ribosome entry site (IRES).

15. An isolated genetically engineered cell comprising the polynucleotide of claim 1.

16. The genetically engineered cell of claim 15, which is a natural killer (NK) cell.

17. Use of a therapeutic effective amount of natural killer (NK) cells expressing a chimeric receptor complex comprising (a) a CD3 zeta cytoplasmic domain, (b) a Natural Killer Group 2 member D (NKG2D) receptor, and (c) a DNAX-activating protein 10 (DAP10) polypeptide for the manufacture of a medicament for enhancing natural killer (NK) cells cytotoxicity, or for treating or preventing cancer or an infectious disease.

18. The use of claim 17, wherein the medicament is prepared to be administered to mammal NK cells to enhance the natural killer (NK) cells ~~cytotoxicity.~~

~~19. The use of claim 17, wherein said NK cells are autologous NK cells.~~

20. The use of claim 17, wherein the CD3 zeta cytoplasmic domain comprises the amino acid sequence of SEQ ID NO: 10, the NKG2D receptor comprises the amino acid sequence of SEQ ID NO: 12, and the DAP10 polypeptide comprises the amino acid sequence of SEQ ID NO: 14.

~~21. A polynucleotide of claim 1 for use in medicine.~~

WHAT IS CLAIMED IS:

1. A polynucleotide encoding a chimeric receptor complex comprising (a) a CD3 zeta cytoplasmic domain, (b) a Natural Killer Group 2 member D (NKG2D) receptor, and (c) a DNAX-activating protein 10 (DAP10) polypeptide, wherein the CD3 zeta cytoplasmic domain comprises the amino acid sequence of SEQ ID NO: 10.

2. The polynucleotide of claim 1, wherein the CD3 zeta cytoplasmic domain is encoded by the nucleic acid sequence of SEQ ID NO: 9.

3. The polynucleotide of claim 1 or 2, wherein the NKG2D receptor comprises the amino acid sequence of SEQ ID NO: 12.

4. The polynucleotide of claim 3, wherein the NKG2D receptor is encoded by the nucleic acid sequence of SEQ ID NO: 11.

5. The polynucleotide of any one of claims 1-4, wherein the DAP10 polypeptide comprises the amino acid sequence of SEQ ID NO: 14.

6. The polynucleotide of claim 5, wherein the DAP10 polypeptide is encoded by the nucleic acid sequence of SEQ ID NO: 13.

7. The polynucleotide of claim 1, wherein the CD3 zeta cytoplasmic domain comprises the amino acid sequence of SEQ ID NO: 10, the NKG2D receptor comprises the amino acid sequence of SEQ ID NO: 12, and the DAP10 polypeptide comprises the amino acid sequence of SEQ ID NO: 14.

8. The polynucleotide of claim 7, wherein the CD3 zeta cytoplasmic domain is encoded by the nucleic acid sequence of SEQ ID NO: 9, the NKG2D receptor is encoded by the nucleic acid sequence of SEQ ID NO: 11, and the DAP10 polypeptide is encoded by the nucleic acid sequence of SEQ ID NO: 13.

9. The polynucleotide of any one of claims 1-8 which is an mRNA.

10. A vector comprising the polynucleotide of any one of claims 1-8, wherein the polynucleotide is operably linked to at least one regulatory element for expression of the chimeric receptor complex.

11. The vector of claim 10, wherein the CD3 zeta cytoplasmic domain and the NKG2D receptor are expressed as a single chimeric receptor protein.

12. The vector of claim 10 or 11, wherein the DAP10 polypeptide is expressed as a separate molecule from the CD3 zeta cytoplasmic domain and the NKG2D receptor.

13. The vector of claim 12, wherein the nucleotide sequence encoding the DAP10 polypeptide is operably linked to a nucleotide sequence comprising an internal ribosome entry site (IRES).

14. An isolated genetically engineered cell comprising the polynucleotide of any one of claims 1-9 or the vector of any one of claims 10-13.

15. The genetically engineered cell of claim 14, which is a natural killer (NK) cell.

16. Use of a therapeutic effective amount of natural killer (NK) cells expressing a chimeric receptor complex encoded by the polynucleotide of any one of claims 1-9 for the manufacture of a medicament for treating or preventing cancer or an infectious disease.

17. The use of claim 16, wherein the medicament is prepared to be administered to mammal NK cells to enhance the natural killer (NK) cells cytotoxicity.

18. The use of claim 16 or 17, wherein said NK cells are autologous NK cells.

19. The use of any one of claims 16-18-, wherein the CD3 zeta cytoplasmic domain comprises the amino acid sequence of SEQ ID NO: 10, the NKG2D receptor comprises the amino acid sequence of SEQ ID NO: 12, and the DAP10 polypeptide comprises the amino acid sequence of SEQ ID NO: 14.

20. A polynucleotide of any one of claims 1-9 for use in medicine.