## CLAIMS

1. A T lymphocyte cell or natural killer cell that expresses a peptide, wherein the peptide comprises:

   a) a single-chain variable fragment (scFv) domain that comprises:

      i) an immunoglobulin variable light ($V_L$) domain;

      ii) an immunoglobulin variable heavy ($V_H$) domain; and

      iii) a $(G_4S)_x$ linker domain joining the $V_L$ and $V_H$ domains,

      wherein x is an integer from 1 to 100;

   b) a hinge and constant heavy 2 ($C_H2$) and constant heavy 3 ($C_H3$) of IgG1 domain comprising SEQ ID NO: 10 that is C-terminal to the scFv domain; and

   c) a CD8α signal peptide that is N-terminal to the scFv domain; and

   d) a linker domain that is C-terminal to the constant heavy 3 ($C_H3$) of IgG1 domain and joins an IL-15 domain.

2. The T lymphocyte cell or natural killer cell of Claim 1, wherein the $(G_4S)_x$ linker domain is $(G_4S)_3$.

3. The T lymphocyte cell or natural killer cell of Claims 1 or 2, wherein the scFv domain binds CD19.

4. The T lymphocyte cell or natural killer cell of Claims 1 or 2, wherein the scFv domain binds CD20.

5. The T lymphocyte cell or natural killer cell of Claims 1 or 2, wherein the scFv domain binds CD22, CD38, CD7, CD2, CD3, epidermal growth factor receptor (EGFR), CD123, CD33, B-cell maturation antigen (BCMA), mesothelin, human epidermal growth factor receptor 2 (Her2), prostate-specific membrane antigen (PSMA), disialoganglioside (GD2), PD-L1 (CD274), CD80 or CD86.

6. The T lymphocyte cell or natural killer cell of Claims 1 or 2, wherein the peptide further comprises a self-cleaving peptide joining a chimeric receptor, wherein the chimeric

receptor comprises a receptor domain, a CD8α hinge and transmembrane domain comprising SEQ ID NO: 38, a co-stimulatory signaling domain, and a cytoplasmic signaling domain.

7. The T lymphocyte cell or natural killer cell of Claim 6, wherein the self-cleaving peptide is a 2A peptide.

8. The T lymphocyte cell or natural killer cell of Claim 6, wherein the receptor domain is a CD16 receptor domain.

9. The T lymphocyte cell or natural killer cell of Claim 6, wherein the co-stimulatory domain is 4-1BB co-stimulatory domain.

10. The T lymphocyte cell or natural killer cell of Claim 6, wherein the cytoplasmic signaling domain is a CD3ζ cytoplasmic signaling.

11. The T lymphocyte cell or natural killer cell of Claims 6, wherein the chimeric receptor is CD16V-4-1BB-CD3ζ.

12. The T lymphocyte cell or natural killer cell of Claims 1 or 2, wherein the peptide further comprises one or more of the following mutations: S239D; S267E; H268F; or I332E.

13. The T lymphocyte cell or natural killer cell of Claims 1 or 2, wherein the peptide further comprises one or more of the following mutations: E345K; E430G; or S440Y.

14. The T lymphocyte cell or natural killer cell of Claim 1 or 2, wherein the linker domain that is C-terminal to the constant heavy 3 ($C_H3$) of IgG1 domain is selected from the group consisting of SEQ ID NO: 52; $A(EAAK)_4ALEA(EAAAK)_4A$; $(EAAAK)_z$; $A(EAAAK)_zA$; and $(XP)_w$, wherein z is an integer from 1 to 100; X is any amino acid, and w is an integer from 1 to 100.

15. The T lymphocyte cell or natural killer cell of Claims 1 or 2, wherein the peptide further comprises a ligand that binds 4-1BB (CD37), CD28, or OX40 (CD134) joined by a linker.

16. The T lymphocyte cell or natural killer cell of Claim 15, wherein the linker is selected from the group consisting of SEQ ID NO: 52; $A(EAAK)_4ALEA(EAAAK)_4A$; $(EAAAK)_z$; $A(EAAAK)_zA$; and $(XP)_w$, wherein z is an integer from 1 to 100; X is any amino acid, and w is an integer from 1 to 100.