CLAIMS

1. A method of expanding and/or activating a population of immune effector cells, comprising:

providing a first CAR-expressing cell population, said first CAR-expressing cell population comprising a transiently expressed first CAR molecule, and said CAR molecule comprises an antigen binding domain of an antibody molecule; and

contacting said first CAR-expressing cell population with an anti-antigen idiotypic antibody molecule that binds to said CAR under conditions such that immune effector cell expansion and/or activation occurs, thereby producing an expanded and/or activated immune effector cell population;

wherein:

the first CAR molecule comprises a CD19 CAR and the anti-antigen idiotypic antibody molecule comprises an anti-idiotypic CD19 antibody molecule;

the first CAR molecule comprises a mesothelin CAR and the anti-antigen idiotypic antibody molecule comprises an anti-idiotypic mesothelin antibody molecule;

the first CAR molecule comprises a BCMA CAR and the anti-antigen idiotypic antibody molecule comprises an anti-idiotypic BCMA antibody molecule;

the first CAR molecule comprises a CD20 CAR and the anti-antigen idiotypic antibody molecule comprises an anti-idiotypic CD20 antibody molecule;

the first CAR molecule comprises a CD22 CAR and the anti-antigen idiotypic antibody molecule comprises an anti-idiotypic CD22 antibody molecule;

the first CAR molecule comprises an epidermal growth factor receptor variant III (EGFRvIII) CAR and the anti-antigen idiotypic antibody molecule comprises an anti-idiotypic EGFRvIII antibody molecule;

the first CAR molecule comprises a CD123 CAR and the anti-antigen idiotypic antibody molecule comprises an anti-idiotypic CD123 antibody molecule;

the first CAR molecule comprises a C-type lectin-like molecule-1 (CLL-1) CAR and the anti-antigen idiotypic antibody molecule comprises an anti-idiotypic CLL-1 antibody molecule; or

the first CAR molecule comprises a CD33 CAR and the anti-antigen idiotypic antibody molecule comprises an anti-idiotypic CD33 antibody molecule; and wherein:

(i) the expansion and/or activation of the population of immune effector cells is carried out *in vitro* or *ex vivo*; and/or

(ii) the population of immune effector cells is acquired, *e.g.*, obtained, from a blood sample from a subject (e.g., a cancer patient), e.g., by apheresis.

2. The method of claim 1, wherein providing the first CAR-expressing cell population comprises introducing a nucleic acid encoding a first CAR molecule into an immune effector cell population under conditions suitable for transient expression of the CAR molecule, thereby producing a first CAR-expressing cell population comprising a transiently expressed first CAR molecule.3. The method of any of claims 1 or 2, wherein the population of immune effector cells comprises T cells, B cells, natural killer (NK) cells, natural killer T (NKT) cells, mast cells, myeloid-derived phagocytes, or a combination thereof.

4. The method of claim 3, wherein the T cells comprise alpha/beta T cells and/or gamma/delta T cells.

5. The method of any of claims 1 or 2, wherein the population of immune effector cells comprises primary T cells or a subset of lymphocytes chosen from anergized T cells, naïve T cells, T-regulatory cells, Th-17 cells, stem T cells, or a combination thereof.

6. The method of any of claims 1 or 2, wherein the population of immune effector cells comprises peripheral blood mononucleated cells (PBMCs), cord blood cells, or a combination thereof.

7. The method of any of claims 1-6, wherein the population of immune effector cells comprises cells that do not have a functional T cell receptor and/or that express a mutated or truncated form of one or more of a subunit of a T cell receptor or that express a mutated or truncated form of one or more of a subunit of the TCR.
8. The method of any of claims 1-7, wherein the anti-antigen idiotypic antibody molecule is immobilized or attached to a non-naturally occurring substrate, *e.g.*, a substrate surface.

9. The method of claim 8, wherein the non-naturally occurring substrate is a solid support chosen from a plate, a membrane, a matrix, a chip or a bead (e.g., a magnetic bead).

10. The method of any of claims 1-9, wherein the nucleic acid encoding the first CAR molecule is an RNA molecule.

11. The method of claim 10, wherein the RNA molecule is an *in vitro* transcribed (IVT) RNA.

12. The method of any of claims 1-11, wherein the first CAR molecule is transiently expressed in the immune effector cell population for a finite period of time or number of cell replications, e.g., less than 50 days (e.g., less than 40, 30, 25, 20, 15, 10, 5 or fewer days).

13. The method of any one of claims 1-12, wherein the first CAR molecule is internalized post a stimulation by a single anti-antigen idiotypic antibody molecule.

14. The method of any one of claims 1-13, wherein the immune effector cell does not receive repeated anti-antigen idiotypic antibody molecule stimulation.

15. The method of any one of claims 1-14, wherein the strength of the immune effector cell stimulation is customized to a desired level by adjusting one or both of: the first CAR-surface density, or the affinity of the CAR antigen binding domain to the anti-antigen idiotypic antibody molecule.

16. The method of any one of claims 1-15, wherein the first CAR-expressing immune effector cells are cultured in the presence of the anti-antigen idiotypic antibody molecule of the CAR molecule for about 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 18, 21, 22, 23 or 24 hours, or about 1, 5, 10, 15, 20, 25, 30, 35, 40, 45 or 50 days.

17. The method of claim 16, wherein the first CAR-expressing cells are cultured for a period of 8 days or less, e.g., 7, 6 or 5 days.

18. The method of any of claims 1-17, wherein the CAR-expressing cells shows at least 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12 or higher population doublings (e.g., a total of 8-10, or about 9 population doublings).

19. The method of claim 18, wherein the first CAR-expressing immune effector cell population expands to a total of 400-600, or about 500 cells, wherein the cell expansion is

measured between 10 and 25 days after stimulation with the anti-antigen idiotypic antibody molecule.

20. The method of any of claims 1-19, wherein the expanded and/or activated immune effector cell population comprises immune effector cells having a less differentiated phenotype, e.g., a younger cell, e.g., a younger T cell.

21. The method of claim 20, wherein the younger T cell is chosen from a naïve T cell (T_N), a memory stem cell (T_{SCM}), a central memory T cell (T_{CM}), or a combination thereof.

22. An immune effector cell preparation or reaction mixture, comprising:

(a) a population of immune effector cells, wherein a plurality of the cells of the population comprise a nucleic acid encoding a first CAR molecule, wherein said nucleic acid encoding the first CAR molecule is not integrated into the cellular genome, wherein the nucleic acid encoding the first CAR molecule is an *in vitro* transcribed RNA or a synthetic RNA; and

(b) a ligand of the first CAR molecule that is an anti-antigen idiotypic antibody molecule.