

WHAT IS CLAIMED IS:

1. An isolated T-cell population that comprises CD49f⁺ T-cells, wherein the CD49f⁺ T-cells constitute at least 1% (including at least 2% to 99% and all integer percentages therebetween) of the T-cells in the population.
2. The isolated population of claim 1, wherein the CD49f⁺ T-cells have one or more immune properties selected from an early memory phenotype, a stem-like phenotype, increased proliferative potential, increased survival and increased persistence in vivo, decreased differentiation, increased immune effector function, decreased immune effector dysfunction and increased responsiveness in immunotherapy.
3. The isolated population of claim 1 or claim 2, wherein the CD49f⁺ T-cells comprise memory T-cells (e.g., central memory T-cells) such as, but not limited to, CD49f⁺CD27⁺CD28⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD45RA⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CCR7⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD45RA⁺CCR7⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD95⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD45RA⁺CD95⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD95⁺CCR7⁺ memory T-cells and CD49f⁺CD27⁺CD28⁺CD45RA⁺CD95⁺CCR7⁺ memory T-cells, wherein the memory cells are optionally positive for CD127.
4. The isolated population of any one of claims 1 to 3, wherein the CD49f⁺ T-cells are positive for one or both of CD4 and CD8.
5. The isolated population of any one of claims 1 to 4, wherein the CD49f⁺ T-cells are positive for TCF-1 (e.g., TCF-1^{hi}) and/or LEF-1 (e.g., LEF-1^{hi}) and optionally positive for one or both of Oct4 and Sox2.
6. The isolated population of any one of claims 1 to 5, wherein the CD49f⁺ T-cells express a recombinant T-cell receptor (rTCR).
7. The isolated population of any one of claims 1 to 6, wherein the CD49f⁺ T-cells express a chimeric antigen receptor (CAR), wherein the CAR or CAR-expressing T-cell is suitably selected from a T-cell Redirected for Universal Cytokine Killing ("TRUCK"), Universal CAR, Self-driving CAR, Armored CAR, Self-destruct CAR, Conditional CAR, Marked CAR, TenCAR, Dual CAR, or safety CAR.
8. A process of manufacturing a T-cell population comprising T-cells with enhanced immune properties (e.g., selected from one or more of an early memory phenotype, a stem like phenotype, increased proliferative potential, increased survival and increased persistence in vivo, decreased differentiation, increased immune effector function, decreased immune effector dysfunction and increased responsiveness in immunotherapy), the process comprising or consisting essentially of: isolating or selecting from a sample containing T-cells a T-cell population comprising CD49f⁺ T-cells, wherein the CD49f⁺ T-cells constitute at least 1% (including at least 2% to at least 99% and all integer percentages therebetween) of the T-cells in the population, or enriching a sample containing T-cells for CD49f⁺ T-cells, thereby manufacturing a T-cell population comprising T-cells with enhanced immune properties.

9. The process of claim 8, wherein T-cell-containing sample is enriched for T-cells of interest, for example CD8⁺ T-cells, CD4⁺ T-cells, naive T-cells, memory T-cells, previously activated T-cells and/or tumor infiltrating lymphocytes.
10. The process of claim 8 or claim 9, wherein the CD49f⁺ T-cells include CD49f⁺ memory T-cells including CD49f⁺ central memory T-cells (e.g., CD49f⁺CD27⁺CD28⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD45RA⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CCR7⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD45RA⁺CCR7⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD95⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD45RA⁺CD95⁺ memory T-cells, CD49f⁺CD27⁺CD28⁺CD95⁺CCR7⁺ memory T-cells or CD49f⁺CD27⁺CD28⁺CD45RA⁺CD95⁺CCR7⁺ memory T-cells), wherein the memory T-cells are optionally positive for CD127.
11. The process of any one of claims 8 to 10, wherein the CD49f⁺ T-cells have an early memory phenotype and/or a stem-like phenotype (e.g., CD49f⁺ T-cells are positive for TCF-1 (e.g., TCF-1^{hi}) and/or LEF-1 (e.g., LEF-1^{hi}) and optionally positive for one or both of Oct4 and Sox2).
12. The process of any one of claims 8 to 11 wherein the enhanced immune properties are relative to a control (e.g., a T-cell population that is not enriched for CD49f⁺ T-cells as defined above and elsewhere herein, or an isolated or CD49f⁺ T-cell enriched T-cell population as defined above and elsewhere herein).
13. The process of any one of claims 8 to 12, wherein the isolation or enriching steps comprises contacting the sample T-cell population with an antigen-binding molecule that binds to CD49f and isolating cells that bind to the antigen-binding molecule, optionally wherein the anti-CD49f antigen-binding molecule is directly or indirectly connected to a magnetic or paramagnetic particle.
14. The process of any one of claims 8 to 13, wherein the enriching comprises positive selection for CD49f⁺ cells using affinity based selection.
15. The process of any one of claims 8 to 14, further comprising activating the T-cells of the isolated or CD49f⁺ T-cell enriched T-cell population, and/or further comprising stimulating the T-cells of the isolated or CD49f⁺ T-cell enriched T-cell population to proliferate, preferably wherein the activation and stimulation of the T-cells comprises contacting the T-cells with
 - (1) an anti-CD3 antigen-binding molecule and (2) an anti-CD28 antigen-binding molecule;
 - B7-1 or B7-2;
 - an anti-CD49f antigen-binding molecule; or
 - contacting the T-cells with an antigen to produce antigen-specific T-cells.
16. The process of any one of claims 8 to 15, further comprising transducing the T-cells of the isolated or CD49f⁺ T-cell enriched T-cell population with a nucleic acid (e.g., a vector such as a viral vector including a retroviral vector such as a lentiviral vector) from which a rTCR or CAR is expressible, optionally in combination with a cytokine (e.g., an immune-stimulatory

cytokine), optionally wherein the T-cells are transduced with the nucleic acid after T-cell proliferation..

17. The process of claim 16, wherein the CAR comprises a) an extracellular domain that binds to an antigen or portion thereof, wherein the antigen is selected from the group consisting of: a cancer or tumor-associated antigen, an infectious disease-associated antigen, an autoimmune disease-associated antigen, a transplantation antigen and an allergen; b) a transmembrane domain derived from a polypeptide selected from the group consisting of: CD8a, CD4, CD28, CD45, PD-1, and CD152; c) one or more intracellular costimulatory signaling domains selected from the group consisting of: CD28, CD54 (ICAM), CD134 (OX40), CD137 (4-1BB), CD152 (CTLA4), CD273 (PD-L2), CD274 (PD-L1), and CD278 (ICOS); and d) a CD3- ζ signaling domain.
18. The process of claim 17, wherein the extracellular domain comprises an antigen binding molecule (e.g., scFv) that binds the antigen and/or wherein the CAR further comprises
 - a hinge region polypeptide (e.g., a hinge region of IgG1 or CD8a; and/or
 - a signal peptide (e.g., an IgG1 heavy chain signal polypeptide or a CD8a signal polypeptide).
19. A method of determining a likelihood that a T-cell population is competent for immunotherapy (e.g., adoptive cell therapy), the method comprising or consisting essentially of: determining a level or concentration of CD49f⁺ T-cells in a sample of the T-cell population; and determining a likelihood that the T-cell population is competent for immunotherapy based on the level or concentration of CD49f⁺ T-cells in the sample.
20. A pharmaceutical composition comprising an isolated or CD49f⁺ T-cell enriched T-cell population as defined in any one of claims 1 to 7 or obtained from the process of any one of claims 8 to 18.
21. Use of the isolated T cell population of claims 1 to 7, as obtained from the process of any one of claims 8 to 18 in the manufacture of a medicament for treating or inhibiting the development of a condition (for example cancer, infectious disease, autoimmune disease, inflammatory disease, and immunodeficiency) in a patient, wherein the patient has or is at risk of developing an immune dysfunction and/or is in need or desirous of augmented immune effector function.