CLAIMS

1. A method for preparing an antigen-specific T-cell population from naïve T cells, comprising:

providing a sample comprising naïve T-cells from a patient or a suitable donor;

contacting said sample with a population of particles which are paramagnetic and comprise on their surfaces an MHC-peptide antigen-presenting complex and a lymphocyte co-stimulating ligand, wherein the particles are from about 10 to about 500 nm in diameter;

placing a magnetic field in proximity to the paramagnetic particles;

separating cells associated with the paramagnetic particles from cells not associated with the paramagnetic particles;

recovering the cells associated with the paramagnetic particles; and

expanding the recovered cells in culture for 1 to 3 weeks to prepare the antigen-specific T-cell population, the antigen-specific T cell population having at least a 1000-fold expansion of antigen-specific T cells.

2. The method of claim 1, wherein the antigen-specific T cells are cytotoxic T lymphocytes, helper T cells, or regulatory T cells.

3. The method of claim 1, wherein the antigen-specific T cells are CD8+ cytotoxic T lymphocytes.

4. The method of claim 3, wherein the T-cells are from a patient, or a donor, and the patient is a cancer patient, wherein optionally:

(a) the cancer is a solid tumor;

(b) the cancer is melanoma, colon cancer, duodenal cancer, prostate cancer, breast cancer, ovarian cancer, ductal cancer, hepatic cancer, pancreatic cancer, renal cancer, endometrial cancer, testicular cancer, stomach cancer, dysplastic oral mucosa, polyposis, head and neck cancer, invasive oral cancer, non-small-cell lung carcinoma, small-cell lung cancer, mesothelioma, transitional and squamous cell urinary carcinoma, brain cancer, neuroblastoma, or glioma;

(c) the cancer is a hematological malignancy;

(d) the antigen-presenting complex presents a tumor associated antigen;

(e) the antigen-presenting complex presents a neoantigen predicted from genetic analysis of the patient's tumor, wherein the neoantigen is formed by a mutation

selected from the group consisting of a passenger mutation, a driver mutation, an oncogene forming mutation, and a tumor suppressor destroying mutation; or

(f) the antigen-presenting complex presents an antigen predicted from genetic analysis of the patient's tumor.

5. The method of claim 1, wherein: the antigen-specific T cells are CD8+ cytotoxic T lymphocytes and/or CD4+ helper T cells, wherein optionally the T cells are from a patient and the patient has an infectious disease; or the antigen-specific T cells are regulatory T cells, wherein optionally the T cells are from a patient and the patient has an autoimmune disease.

6. The method of any one of claims 1 to 5, wherein the sample comprising T cells is from a suitable donor who is HLA-matched to an adoptive transfer recipient, wherein the antigen-specific T-cell population is for adoptive transfer to the recipient.

7. The method of claim 6, wherein the antigen presenting complex is dimeric, and wherein the complex comprises a fusion of MHC with immunoglobulin heavy chain sequences associated by disulfide bonds, wherein optionally:

(a) the immunoglobulin sequences are IgG sequences;

(b) the MHC is an HLA-A2; or

(c) the immunoglobulin sequences are humanized monoclonal antibody sequences.

8. The method of claim 6, wherein the lymphocyte costimulatory ligand is one or more selected from: an antibody or antigen-binding fragment thereof that specifically binds to CD28, CD80 (B7-1), CD86 (B7-2), B7-H3, 4-1BBL, 4-1BB, CD27, CD30, CD134 (OX-40L), B7h (B7RP-1), CD40, LIGHT, an antibody or antigen-binding fragment thereof that specifically binds to HVEM, an antibody or antigen-binding fragment thereof that specifically binds to CD40L, an antibody or antigen binding fragment thereof that specifically binds to OX40, and an antibody or antigen-binding fragment thereof that specifically binds to 4-1BB.

9. The method of claim 7 or 8, wherein the co-stimulatory ligand is a humanized murine monoclonal antibody or fully human antibody against CD28, wherein optionally the co-stimulatory ligand is a humanized monoclonal antibody 9.3 or antigen-binding fragment thereof.

10. The method of any one of claims 1 to 9, wherein:

(1) from about 3 to about 10 different antigens are presented by the antigen presenting complexes in the population of paramagnetic particles;

(2) the recovered cells are enriched for antigen- specific, naïve T cells; and/or

(3) wherein at least about 10^6, or at least about 10^7 antigen specific T cells are obtained, and wherein optionally said at least about 10^6, or at least about 10^7 antigen-specific T cells are for administration to a patient recipient as adoptive immunotherapy, wherein preferably the sample comprises T cells from a suitable donor who is HLA-mismatched to an adoptive transfer recipient.

11. The antigen-specific T-cell population obtained by the method of claim 1 for use in therapy by injection.

12. The method of claim 1, wherein the sample comprising T cells is a peripheral blood mononuclear cell (PBMC) sample.

13. The method of claim 1, wherein the sample is isolated by leukapheresis or apheresis.

14. The method of any one of the preceding claims, wherein the sample is enriched for CD8+ cells.

15. Use of the antigen-specific T-cell population prepared by the method of any one of the preceding claims in the manufacture of a medicament for the treatment of a cancer patient.

16. The use of claim 15, wherein the cancer is a hematological malignancy.

17. The use of claim 15 or 16, wherein the T cells are obtained from a donor that is HLA-matched to an adoptive transfer recipient.

18. The use of any one of claims 15-17, wherein the MHC-peptide antigen- presenting complex is loaded with one or more tumor-associated antigens.