We claim:

1. A modified peripheral blood mononuclear cell (PBMC) with reduced expression of *Slc16a11*, reduced activity of MCT11, or both, wherein the modified PBMC comprises:

1) an agent that reduces *Slc16a11* expression; or

2) a non-naturally occurring genetic modification that reduces an amount of functional MCT11.

2. The modified PBMC of claim 1, comprising the agent that reduces *Slc16a11* expression, wherein the agent comprises an inhibitory RNA (RNAi) specific for *Slc16a11* or a guide RNA (gRNA) specific for *Slc16a11*.

3. The modified PBMC of claim 2, wherein the RNAi is a short hairpin RNA (shRNA) molecule, short interfering RNA (siRNA) molecule, or antisense RNA molecule.

4. The modified PBMC of claim 2 or 3, wherein the agent comprises a heterologous nucleic acid molecule encoding:

a) the RNAi specific for *Slc16a11*, wherein the RNAi specific for *Slc16a11* comprises at least 90% sequence identity to a portion of the *Slc16a11* gene or transcript,

b) the gRNA specific for *Slc16a11*, wherein the gRNA specific for *Slc16a11* comprises at least 90% sequence identity to a portion of the *Slc16a11* gene or transcript, or

c) the gRNA specific for *Slc16a11*, wherein the gRNA specific for *Slc16a11*comprises at least 90% sequence identity to a portion of the *Slc16a11* gene or transcript, and the agent further comprises a *Cas* nuclease.

5. The modified PBMC of claim 4, comprising c) the gRNA specific for *Slc16a11* and the Cas nuclease, wherein the Cas nuclease comprises a Cas9, dCas9, Cas13d, or dCas13d nuclease.

6. The modified PBMC of claim 1, wherein the genetic modification is a point mutation, a partial deletion, full deletion, or insertion of *Slc16a11* that reduces expression of *Slc16a11* and/or reduces activity of MCT11.

7. The modified PBMC of any one of claims 1 to 6, wherein the modified PBMC is a T cell.

8. The modified PBMC of any one of claim 7, wherein the T cell is a tumor-infiltrating lymphocyte (TIL).

9. The modified PBMC of any one of claims 7 to 8, wherein the T cell comprises a chimeric antigen receptor (CAR) or engineered T cell receptor (TCR).

10. The modified PBMC of any one of claims 7 to 9, wherein the T cell is reactive to a tumor-specific antigen.

11. The modified PBMC of claim 10, wherein the tumor-specific antigen is one or more of CD19, CD20, BCMA, MUC1, PSA, CEA, HER1, HER2, TRP-2, EpCAM, GPC3, mesothelin 1(MSLN), or EGFR.

12. The modified PBMC of any one of claims 7 to 11, wherein the T cell is an exhausted T cell.

13. A method of generating the modified PBMC of any one of claims 1 to 12, comprising introducing the agent, or non-naturally occurring genetic modification into a PBMC, thereby generating the modified PBMC with reduced expression of *Slc16a11*, reduced activity of MCT11, or both.

14. The method of claim 13, wherein the PBMC is a T cell.

15. The method of claim 13 or claim 14, wherein the method further comprises incubating the modified PBMC with interleukin 2 (IL-2), interleukin 7 (IL-7), interleukin 15 (IL-15), or combinations thereof.

16. A pharmaceutical composition comprising:

the modified PBMC of any one of claims 1 to 12, or the modified PBMC generated by the method of any one of claims 13 to 15; and

a pharmaceutically acceptable carrier.

17. Use of the modified PBMC of any of one of claims 1 to 12, the modified PBMC generated by the method of any one of claims 13 to 15, or the pharmaceutical composition of claim 16, in the manufacture of a medicament for the therapeutic and/or prophylactic treatment of cancer or a tumor in a subject.

18. The method of claim 17, wherein the modified PBMC is autologous or allogeneic to the subject.

19. The method of any one of claims 17 to 18, wherein:

a therapeutically effective amount of IL-2, IL-7, and/or IL-15 is to be further administered to the subject; and/or

a therapeutically effective amount of a checkpoint inhibitor, a T cell agonist antibody, an oncolytic virus, or an adoptive cell transfer (ACT) immunotherapy is to be further administered to the subject; and/or

the subject is to be further treated with surgery, radiation, chemotherapy, biologic therapy, or immunotherapy.

20. The method of any one of claims 17 to 19, wherein non-modified lymphocytes are depleted in the subject prior to administering the modified PBMC.

21. The method of any one of claims 17 to 20, wherein the cancer or tumor is a leukemia, colorectal cancer, melanoma, cervical cancer, lung cancer, ovarian cancer, bladder cancer, breast cancer, pancreatic cancer, renal cell carcinoma, prostate cancer, or head and neck cancer.

22. The modified PBMC of any of one of claims 1 to 12, the modified PBMC generated by the method of any one of claims 13 to 15, or the pharmaceutical composition of claim 16, for use in the treatment of cancer or a tumor in a subject.