

CLAIMS

1. A pharmaceutical composition comprising (i) an acute myeloid leukemia (AML) tumor specific antigen (TSA) of 20 amino acids or less that binds to an HLA-A*02:01 molecule, wherein the AML TSA is encoded by a sequence located in a non-protein coding region of the genome and comprises the amino acid sequence KLQDKEIGL (SEQ ID NO:108), TLNQGINVYI (SEQ ID NO:119), ALPVALPSL (SEQ ID NO:123), ALDPLLLRI (SEQ ID NO:130), KILDVNLRI (SEQ ID NO:132), SLLSGLLRA (SEQ ID NO:146), SLDLLPLSI (SEQ ID NO:150), ILLEEQSLI (SEQ ID NO:167), LTSISIRPV (SEQ ID NO:168), TISECPLLI (SEQ ID NO:169), ILLSNFSSL (SEQ ID NO:171), RMVAYLQQL (SEQ ID NO:183), or KLNQAFLVL (SEQ ID NO:188), and (ii) a pharmaceutically acceptable carrier.
2. The pharmaceutical composition of claim 1, wherein the AML TSA consists of the amino acid sequence KLQDKEIGL (SEQ ID NO:108), TLNQGINVYI (SEQ ID NO:119), ALPVALPSL (SEQ ID NO:123), ALDPLLLRI (SEQ ID NO:130), KILDVNLRI (SEQ ID NO:132), SLLSGLLRA (SEQ ID NO:146), SLDLLPLSI (SEQ ID NO:150), ILLEEQSLI (SEQ ID NO:167), LTSISIRPV (SEQ ID NO:168), TISECPLLI (SEQ ID NO:169), ILLSNFSSL (SEQ ID NO:171), RMVAYLQQL (SEQ ID NO:183), or KLNQAFLVL (SEQ ID NO:188)
3. The pharmaceutical composition of claim 1, wherein the AML TSA comprises the amino acid sequence KLQDKEIGL (SEQ ID NO:108), TLNQGINVYI (SEQ ID NO:119), ALPVALPSL (SEQ ID NO:123), ALDPLLLRI (SEQ ID NO:130), KILDVNLRI (SEQ ID NO:132), SLLSGLLRA (SEQ ID NO:146) or SLDLLPLSI (SEQ ID NO:150).
4. The pharmaceutical composition of claim 3, wherein the AML TSA consists of the amino acid sequence KLQDKEIGL (SEQ ID NO:108), TLNQGINVYI (SEQ ID NO:119), ALPVALPSL (SEQ ID NO:123), ALDPLLLRI (SEQ ID NO:130), KILDVNLRI (SEQ ID NO:132), SLLSGLLRA (SEQ ID NO:146) or SLDLLPLSI (SEQ ID NO:150).
5. The pharmaceutical composition of claim 1, wherein the non-protein coding region of the genome is an intron, and wherein the AML TSA comprises one of the amino acid sequences set forth in SEQ ID NOs: 123, 130, 132, 146, 150, 183 or 188.

6. The pharmaceutical composition of claim 1, wherein the non-protein coding region of the genome is an intergenic region, and wherein the AML TSA comprises one of the amino acid sequences set forth in SEQ ID NO: 108.
7. The pharmaceutical composition of claim 1, wherein the non-protein coding region of the genome is an endogenous retroviral element, and wherein the AML TSA comprises one of the amino acid sequences set forth in SEQ ID NOs: 167, 168, or 171.
8. The pharmaceutical composition of any one of claims 1-7, comprising at least two of the AML TSAs defined in any one of claims 1-7.
9. A pharmaceutical composition comprising (i) a nucleic acid encoding one or more of the AML TSAs of any one of claims 1-7, and a pharmaceutically acceptable excipient.
10. The pharmaceutical composition of claim 9, wherein the nucleic acid is an mRNA.
11. The pharmaceutical composition of any one of claims 1-10, wherein the AML TSA or nucleic acid is comprised within a vehicle.
12. The pharmaceutical composition of claim 11, wherein the vehicle is a liposome.
13. The pharmaceutical composition of any one of claims 1-12, further comprising an adjuvant.
14. A pharmaceutical composition comprising an isolated cell expressing at its surface major histocompatibility complex (MHC) class I molecules comprising the AML TSA defined in any one of claims 1-8 in their peptide binding groove.
15. A pharmaceutical composition comprising a T-cell receptor (TCR) that specifically recognizes MHC class I molecules expressed at the surface of the cell defined in claim 14.
16. The pharmaceutical composition of claim 15, wherein the TCR comprises a TCRbeta (TCR β) chain comprising a complementary determining region 3 (CDR3)

comprising one of the amino acid sequences set forth in SEQ ID NO: 191-219.

17. A pharmaceutical composition comprising an isolated cell expressing at its cell surface the TCR defined in claim 15 or claim 16.

18. A pharmaceutical composition comprising a cell population comprising at least 0.5% of the isolated cell as defined in claim 17.

19. Use of the pharmaceutical composition of any one of claims 1-18 in the manufacture of a medicament for treating acute myeloid leukemia (AML) or myelodysplastic syndromes (MDS) in a subject.

20. The use of claim 19, wherein the medicament is for use in combination with at least one additional antitumor agent or therapy.

21. The use of claim 20, wherein the at least one additional antitumor agent or therapy is a chemotherapeutic agent, immunotherapy, an immune checkpoint inhibitor, radiotherapy or surgery.