CLAIMS:

1. A tumor antigen peptide (TAP) comprising or consisting of one of the amino acid sequences set forth in SEQ ID NOs:120, 1-119 and 121-505.

2. The TAP of claim 1, wherein the TAP binds to (a) an HLA-A*02:01 molecule and comprises or consists of the sequence of SEQ ID NO: 1, 2, 4, 19, 22, 25, 40, 50, 52, 54, 60, 65, 67, 76, 81, 89, 91, 103, 107, 120, 124, 128, 135, 157, 175, 179, 186, 188, 201, 208, 218, 219, 228, 232, 233, 240, 250, 257, 261, 263, 265, 266, 282, 286, 298, 311, 315, 317, 325, 333, 337, 349, 367, 373, 387, 388, 393, 399, 404, 412, 414, 415, 422, 434, 437, 455, 480, 489, or 494; (b) an HLA-A*01:01 molecule and comprises or consists of the sequence of SEQ ID NO: 11, 14, 20, 27, 29, 37, 86, 87, 121, 150, 165, 173, 279, 288, 299, 308, 312, 316, 319, 331, 340, 352, 362, 363, 384, 395, 398, 411, 419, 429, 458, 474, 476, 487, 492, 500, or 501; (c) an HLA-A*02:09 molecule and comprises or consists of the sequence of SEQ ID NO: 22, 40, 50, 62, 83, 89, 232, 265, 282, 311, 315, 317, 337, 349, 367, 399, 407, 412, or 494; (d) an HLA-A*03:01 molecule and comprises or consists of the sequence of SEQ ID NO: 209, 247, 272, 347, or 505; (e) an HLA-A*23:01 molecule and comprises or consists of the sequence of SEQ ID NO: 48, 84, 129, 151, 152, 171, 174, 182, 223, 237, 245, 290, 358, 397, 426, 446, 481, 482, or 486; (f) an HLA-A*24:02 molecule and comprises or consists of the sequence of SEQ ID NO: 31, 244 or 481; (g) an HLA-A*25:01 molecule and comprises or consists of the sequence of SEQ ID NO: 11, 31, 249, 289, 403, 425, 464, or 490; (h) an HLA-A*26:01 molecule and comprises or consists of the sequence of SEQ ID NO: 11, 20, 27, 39, 41, 42, 45, 114, 116, 122, 168, 181, 268, 284, 329, 364, 398, 417, 430, 440, 447, 452, 457, 460, 462, 475, 490, or 497; (i) an HLA-A*30:01 molecule and comprises or consists of the sequence of SEQ ID NO: 26, 304 or 376; (j) an HLA-A*30:02 molecule and comprises or consists of the sequence of SEQ ID NO: 117, 185, 190, 193, 197, 256, 294, 323, 471, or 485; (k) an HLA-A*33:01 molecule and comprises or consists of the sequence of SEQ ID NO: 248; (l) an HLA-A*68:01 molecule and comprises or consists of the sequence of SEQ ID NO: 6-8, 12, 15, 23, 28, 41, 42, 47, 51, 53, 56, 59, 64, 66, 68, 70, 73-75, 77, 79, 80, 82, 85, 88, 92, 93, 96-99, 101, 102, 108-112, 118, 119, 123, 130, 131, 134, 137, 138, 141, 142, 144-147, 149, 153, 154, 156, 158, 160, 161, 166, 169, 172, 176, 184, 198, 202, 203, 212, 214, 216, 217, 220, 224, 226, 229, 234, 236, 239, 248, 254, 269, 270, 275, 280, 283, 287, 293, 300, 301, 303, 306, 310, 314, 320, 328, 332, 348, 354, 355, 359, 360, 366, 369, 370, 372, 381, 382, 386, 389, 390, 392, 394, 402, 405, 406, 409, 413, 418, 424, 428, 436, 441-445, 449, 456, 459, 465-468, 473, 479, 483, 488, 493, 499, or 502; (m) an HLA-B*07:02 molecule and comprises or consists of the sequence of SEQ ID NO: 35, 36, 43, 104, 125, 127, 139, 140, 187, 191, 196, 206, 231, 243, 246, 251, 252, 260, 281, 291, 292, 321, 330, 361, 408, 432, 435, 439, 451, 461, 491, or 503; (n) an HLA-B*08:01 molecule

and comprises or consists of the sequence of SEQ ID NO: 21, 162, 189, 286, 307, 309, 317, 339, 343, 349, or 414; (o) an HLA-B*13:02 molecule and comprises or consists of the sequence of SEQ ID NO: 207, 311, 393, 400, or 455; (p) an HLA-B*14:01 molecule and comprises or consists of the sequence of SEQ ID NO: 396; (q) an HLA-B*15:01 molecule and comprises or consists of the sequence of SEQ ID NO: 11, 26, 30, 63, 113, 132, 148, 192, 195, 200, 207, 210, 222, 235, 238, 258, 262, 267, 276, 295, 297, 305, 309, 318, 326, 336, 342, 374, 377, 383, 401, 421, 427, 433, 438, 450, 463, 470, or 477; (r) an HLA-B*18:01 molecule and comprises or consists of the sequence of SEQ ID NO: 3, 10, 33, 225 or 396; (s) an HLA-B*37:01 molecule and comprises or consists of the sequence of SEQ ID NO: 302; (t) an HLA-B*38:01 molecule and comprises or consists of the sequence of SEQ ID NO: 26, 180, 338, 341, 378, 380, 416, 448, 454, 496, or 498; (u) an HLA-B*40:01 molecule and comprises or consists of the sequence of SEQ ID NO: 215 or 322; (v) an HLA-B*40:02 molecule and comprises or consists of the sequence of SEQ ID NO: 213, 215, 339, or 351; (w) an HLA-B*44:02 molecule and comprises or consists of the sequence of SEQ ID NO: 346, 353, 356, or 453; (x) an HLA-B*49:01 molecule and comprises or consists of the sequence of SEQ ID NO: 9, 57, 78, 115, 136, 167, 255, 273, 274, 278, 313, 339, 480, 484, or 495; (y) an HLA-B*51:01 molecule and comprises or consists of the sequence of SEQ ID NO: 227 or 259; (z) an HLA-C*03:03 molecule and comprises or consists of the sequence of SEQ ID NO: 24, 69, 204 or 388; (aa) an HLA-C*03:04 molecule and comprises or consists of the sequence of SEQ ID NO: 24, 49, 69, 159, 241, 242 or 334; (bb) an HLA-C*06:02 molecule and comprises or consists of the sequence of SEQ ID NO: 13, 34 or 72; (cc) an HLA-C*07:01 molecule and comprises or consists of the sequence of SEQ ID NO: 13, 75, 133, 163, 183, 199, 205, 285, 334, 391 or 472; (dd) an HLA-C*07:02 molecule and comprises or consists of the sequence of SEQ ID NO: 13, 32, 36, 105, 177, 339, 371 or 478; (ee) an HLA-C*08:02 molecule and comprises or consists of the sequence of SEQ ID NO: 18, 54 or 379; (ff) an HLA-C*12:03 molecule and comprises or consists of the sequence of SEQ ID NO: 24, 49, 58, 71, 94, 162, 178, 242, 289, 344, 345, 357, 367, 368, 375, 423 or 431; or (gg) an HLA-C*14:02 molecule and comprises or consists of the sequence of SEQ ID NO: 105, 271, 350, 365, 385, 410, 423, or 504.

3. The TAP of claim 1 or 2, which is encoded by a sequence located a non-protein coding region of the genome or by a long non-coding RNA, wherein said non-protein coding region of the genome is an intergenic region or an intron.

4. A combination comprising at least two of the TAPs defined in any one of claims 1-3.

5. A synthetic long peptide (SLP) comprising at least one of the amino acid sequences defined in claim 1.

6. A nucleic acid encoding one or more of the TAPs of claims 1 to 3, the combination of claim 4, or the SLP of claim 5.

7. The nucleic acid of claim 6, wherein the nucleic acid is an mRNA, and wherein the mRNA optionally comprises one or more 5'-end modifications, 3'-end modifications, and/or modified nucleosides to increase stability, improve translation and/or reduce immunogenicity of the mRNA.

8. A vesicle or particle comprising the TAP of any one of claims 1-3, the combination of claim 4, the SLP of claim 5, or the nucleic acid of claim 6 or 7.

9. The vesicle or particle of claim 8, wherein the vesicle is a lipid nanoparticle (LNP).

10. The vesicle or particle of claim 8 or 9, which comprises a cationic lipid.

11. A composition comprising the TAP of any one of claims 1-3, the combination of claim 4, the SLP of claim 5, the nucleic acid of claim 6 or 7, or the vesicle or particle of any one of claim 8-10, and a pharmaceutically acceptable carrier.

12. A vaccine comprising the TAP of any one of claims 1-3, the combination of claim 4, the SLP of claim 5, the nucleic acid of claim 6 or 7, the vesicle or particle of any one of claims 8-10, or the composition of claim 11, and an adjuvant.

13. An isolated cell expressing at its surface major histocompatibility complex (MHC) class I molecules comprising the TAP or combination of any one of claims 1-3 or the combination of claim 4 in their peptide binding groove.

14. A T-cell receptor (TCR) that specifically recognizes MHC class I molecules expressed at the surface of the cell of claim 13.

15. The TCR of claim 14, which is a soluble TCR.

16. An antibody or an antigen-binding fragment thereof that specifically binds to MHC class I molecules expressed at the surface of the cell of claim 13.

17. The TCR of claim 14 or 15, or the antibody or antigen-binding fragment thereof according to claim 16, which is a bispecific TCR or a bispecific antibody or antigen-binding fragment thereof.

18. The TCR, antibody or antigen-binding fragment thereof according to claim 17, wherein the bispecific antibody or antigen-binding fragment thereof is a single-chain diabody (scDb).

19. The TCR, antibody or antigen-binding fragment thereof according to claim 17 or 18, wherein the bispecific TCR, antibody or antigen-binding fragment thereof also specifically binds to a T cell signaling molecule.

20. The TCR, antibody or antigen-binding fragment thereof according to claim 19, wherein the T cell signaling molecule is a CD3 chain.

21. A chimeric antigen receptor (CAR) comprising the antibody or an antigen-binding fragment thereof of claim 16, or a nucleic acid encoding said CAR.

22. An isolated cell expressing at its cell surface the TCR of claim 14 or the CAR of claim 21.

23. The isolated cell of claim 22, which is a $CD8^+$ T lymphocyte.

24. A cell population comprising at least 0.5% of the isolated cell as defined in claim 22 or 23.

25. Use of:

(a) a TAP comprising or consisting of any one of the sequences set forth in SEQ ID NOs: 120, 1-119 and 121-505 or any combination thereof, or a synthetic long peptide (SLP) comprising at least one of the sequences set forth in SEQ ID NOs: 120, 1-119 and 121-505;

(b) at least one nucleic acid encoding the TAP, combination thereof or SLP defined in (a);

(c) a vesicle or particle comprising the TAP, combination thereof or SLP defined in (a) or the at least one nucleic acid defined in (b);

(d) a composition comprising the TAP, combination thereof or SLP defined in (a), the at least one nucleic acid defined in (b), or the vesicle or particle defined in (c), and a pharmaceutically acceptable carrier;

(e) a vaccine comprising the TAP, combination thereof or SLP defined in (a), the at least one nucleic acid defined in (b), the vesicle or particle defined in (c), or the composition defined in (d), and an adjuvant;

(f) a cell expressing at its surface major histocompatibility complex (MHC) class I molecules comprising the TAP or combination thereof defined in (a) in their peptide binding groove;

(g) a cell expressing at its cell surface a T-cell receptor (TCR) or a chimeric antigen receptor (CAR) that specifically recognizes MHC class I molecules expressed at the surface of the cell defined in (f); or

(h) a soluble TCR, an antibody or an antigen-binding fragment thereof, or a CAR, that specifically binds to the MHC class I molecules expressed at the surface of the cell defined in (f), or a nucleic acid encoding said soluble TCR, antibody, antigen-binding fragment thereof, or CAR;

for the manufacture of a medicament for treating cancer in a subject.

26. The use of claim 25, wherein said cancer is melanoma.

27. The use of claim 25 or 26, further comprising the use at least one additional antitumor agent or therapy to the subject.

28. The use of claim 27, wherein said at least one additional antitumor agent or therapy is a chemotherapeutic agent, immunotherapy, an immune checkpoint inhibitor, radiotherapy or surgery.

29. An agent for use in treating cancer in a subject, wherein the agent is:

(a) a TAP comprising or consisting of any one of the sequences set forth in SEQ ID NOs: 1-505 or any combination thereof, or a synthetic long peptide (SLP) comprising at least one of the sequences set forth in SEQ ID NOs: 1-505;

(b) at least one nucleic acid encoding the TAP, combination thereof or SLP defined in (a);

(c) a vesicle or particle comprising the TAP, combination thereof or SLP defined in (a) or the at least one nucleic acid defined in (b);

(d) a composition comprising the TAP, combination thereof or SLP defined in (a), the at least one nucleic acid defined in (b), or the vesicle or particle defined in (c), and a pharmaceutically acceptable carrier;

(e) a vaccine comprising the TAP, combination thereof or SLP defined in (a), the at least

one nucleic acid defined in (b), the vesicle or particle defined in (c), or the composition defined in (d), and an adjuvant;

(f) a cell expressing at its surface major histocompatibility complex (MHC) class I molecules comprising the TAP or combination thereof defined in (a) in their peptide binding groove;

(g) a cell expressing at its cell surface a T-cell receptor (TCR) or a chimeric antigen receptor (CAR) that specifically recognizes MHC class I molecules expressed at the surface of the cell defined in (f); or

(h) a soluble TCR, an antibody or an antigen-binding fragment thereof, or a CAR, that specifically binds to the MHC class I molecules expressed at the surface of the cell defined in (f), or a nucleic acid encoding said soluble TCR, antibody, antigen-binding fragment thereof, or CAR.