Claims

[1] An isolated peptide having cytotoxic T cell inducibility, wherein said peptide derived from amino acid sequence of SEQ ID NO: 2, 4, or 6.

[2] An isolated peptide of less than about 15 amino acids selected from the group consisting of peptides comprising the amino acid sequences of SEQ ID NO: 7, 8 and 12, or a peptide having cytotoxic T cell inducibility, wherein said peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 7, 8 and 12, wherein 1, 2, or several amino acids are substituted, deleted, or added.

[3] The peptide having cytotoxic T cell inducibility of claim 2, wherein the second amino acid from the N-terminus is phenylalanine, tyrosine, methionine, or tryptophan.

[4] The peptide having cytotoxic T cell inducibility of claim 2, wherein the C-terminal amino acid is phenylalanine, leucine, isoleucine, tryptophan, or methionine.

[5] An isolated peptide of less than about 15 amino acids selected from the group consisting of peptides comprising the amino acid sequences of SEQ ID NO: 9, 10, 11, 192, 195, 197, 209, 225, 226, 228, 230, 240, 241, 243, 244, 253, 254 and 255, or a peptide having cytotoxic T cell inducibility, wherein said peptide comprises an amino acid sequence selected from the group consisting of SEQ ID NO: 9, 10, 11, 192, 195, 197, 209, 225, 226, 228, 230, 240, 241, 243, 244, 253, 254 and 255, wherein 1, 2, or several amino acids are substituted, deleted, or added.

[6] The peptide having cytotoxic T cell inducibility of claim 5, wherein the second amino acid from the N-terminus is leucine or methionine.

[7] The peptide having cytotoxic T cell inducibility of claim 5, wherein the C-terminal amino acid is valine or leucine.

[8] A vector in which the DNA encodes peptides of any one of claims 1 to 7.

[9] A pharmaceutical composition for treating or preventing a disease associated with over-expression of the genes of SEQ ID NO: 1, 3 and/or 5, said composition comprising one or more peptides of claim 2 or 5.

[10] The pharmaceutical composition of claim 9, wherein the disease is cancer.

[11] The pharmaceutical composition of claim 10, wherein the cancer is selected from the group consisting of bladder cancer, breast cancer, cervical cancer, cholangiocellular carcinoma, CML, colorectal cancer, gastric cancer, NSCLC, lymphoma, osteosarcoma, prostate cancer, renal carcinoma, SCLC and soft tissue tumor.

[12] An exosome that presents on its surface a complex comprising a peptide of claim

2 or 5 and an HLA antigen.

[13] The exosome of claim 12, wherein the HLA antigen is HLA-A24.

[14] The exosome of claim 13, wherein the HLA antigen is HLA-A2402.

[15] The exosome of claim 12, wherein the HLA antigen is HLA-A2.

[16] The exosome of claim 13, wherein the HLA antigen is HLA-A0201.

[17] A method of inducing antigen-presenting cells having a high cytotoxic T cell inducibility comprising the step of contacting an antigen-presenting cell with a peptide of claim 2 or 5.

[18] A method of inducing cytotoxic T cells by contacting a T cell with a peptide of claim 2 or 5.

[19] A method of inducing antigen-presenting cells having high cytotoxic T cell inducibility, said method comprising the step of transferring a gene comprising a polynucleotide encoding a peptide of claim 2 or 5 to an antigen-presenting cell.

[20] An isolated cytotoxic T cell, which is induced by contacting a T cell with a peptide of any one of claims 1 to 8 or which is transduced with the nucleic acids encoding the TCR subunits polypeptides binding with a peptide of any one claims 1 to 8 in the context of HLA-A24 or HLA-A2.

[21] An antigen-presenting cell, which comprises a complex formed between an HLA antigen and a peptide of claim 2 or 5.

[22] The antigen-presenting cell of claim 21, induced by the method of claim 17.

[23] A vaccine for inhibiting proliferation of cells expressing genes of SEQ ID NO: 1, 3 and/or 5, wherein the vaccine comprises a peptide of claim 2 or 5 as the active ingredient.

[24] The vaccine of claim 23, wherein the cell is a cancer cell.

[25] The vaccine of claim 24, wherein the cancer is selected from the group consisting of bladder cancer, breast cancer, cervical cancer, cholangincellular carcinoma, CML, colorectal cancer, gastric cancer, NSCLC, lymphoma, osteosarcoma, prostate cancer, renal carcinoma, SCLC and soft tissue tumor.

[26] The vaccine of claim 23, formulated for administration to a subject whose HLA antigen is HLA-A24 or HLA-A2.

[27] A method of treating or preventing a disease associated with the over-expression of the genes of SEQ ID NO: 1, 3 and/or 5 in a subject comprising administering to said subject a vaccine comprising one or more peptide of claim 2 or 5, an immunologically active fragment thereof, or a polynucleotide encoding said peptide or immunologically active fragment.

[28] The method of claim 27, wherein the disease is cancer.

[29] The method of claim 28, wherein the cancer is selected from the group consisting of bladder cancer, breast cancer, cervical cancer, cholangincellular carcinoma,

CML, colorectal cancer, gastric cancer, NSCLC, lymphoma, osteosarcoma, prostate cancer, renal carcinoma, SCLC and soft tissue tumor.

CLAIMS:

1. An isolated peptide having cytotoxic T cell inducibility, wherein said peptide derived from the amino acid sequence of SEQ ID NO: 2, wherein the peptide is less than 15 amino acids, wherein the peptide comprises the amino acid sequence selected from the group consisting of SEQ ID NO: 7, 8 and 9 to 11.

2. An isolated peptide of less than 15 amino acids, wherein the peptide comprises the amino acid sequence selected from the group consisting of:

(a) SEQ ID NO:7;

(b) SEQ ID NO:8;

(c) SEQ ID NO: 7 in which 1 or 2 amino acids are substituted, deleted or added; and

(d) SEQ ID NO: 8 in which 1 or 2 amino acids are substituted, deleted or added; wherein the peptide has cytotoxic T cell inducibility.

3. The peptide of Claim 2, wherein the second amino acid from the N-terminus is phenylalanine, tyrosine, methionine or tryptophan.

4. The peptide of Claim 2 or 3, wherein the C-terminal amino acid is phenylalanine, leucine, isoleucine, tryptophan or methionine.

5. An isolated peptide of less than 15 amino acids, wherein the peptide comprises the amino acid sequence selected from the group consisting of:

(a) SEQ ID NO:9;

(b) SEQ ID NO:10;

(c) SEQ ID NO:11;

(d) SEQ ID NO:9 in which 1 or 2 amino acids are substituted, deleted or added;

(e) SEQ ID NO:10 in which 1 or 2 amino acids are substituted, deleted or added; and

(f) SEQ ID NO:11 in which 1 or 2 amino acids are substituted, deleted or added; wherein the peptide has cytotoxic T cell inducibility.

6. The peptide of Claim 5, wherein the second amino acid from the N-terminus is leucine or methionine.

7. The peptide of Claim 5 or 6, wherein the C-terminal amino acid is valine or leucine.

8. An isolated peptide consisting of the amino acid sequence selected from the group consisting of SEQ ID NO: 7, 8 and 9 to 11.

9. A vector comprising DNA which encodes the peptide of any one of Claims 1 to 8.

10. An exosome that presents on its surface a complex comprising a peptide of any one of Claims 1 to 8 and an HLA antigen.

11. The exosome of Claim 10, wherein the HLA antigen is HLA-A24 or HLA-A2.

12. The exosome of Claim 11, wherein the HLA antigen is HLA-A2402 or HLA-A0201.

13. An *in vitro* method of inducing antigen-presenting cells having a high cytotoxic T cell inducibility, said method comprising the step of contacting an antigen-presenting cell with a peptide of any one of Claims 1 to 8.

14. An *in vitro* method of inducing cytotoxic T cells, said method comprising the step of contacting $CD8^+$ T cells with the antigen-presenting cells induced by the method of Claim 13.

15. An *in vitro* method of inducing antigen-presenting cells having high cytotoxic T cell

inducibility, said method comprising the step of transferring a gene comprising a polynucleotide encoding a peptide of any one of Claims 1 to 8 to an antigen-presenting cell.

16. An isolated cytotoxic T cell, which is induced by the method of Claim 14 or which is transduced with the nucleic acids encoding the TCR subunits polypeptides binding with a peptide of any one Claims 1 to 8 in the context of HLA-A24 or HLA-A2.

17. An antigen-presenting cell, which comprises a complex formed between an HLA antigen and a peptide of any one of claims 1 to 8.

18. The antigen-presenting cell of Claim 17, induced by the method of Claim 13.

19. A vaccine for inhibiting proliferation of cells expressing the gene of SEQ ID NO:1, wherein the vaccine comprises a peptide of any one of Claims 1 to 8 as an active ingredient.

20. The vaccine of Claim 19, wherein the cell is a cancer cell.

21. The vaccine of Claim 20, wherein the cancer is selected from the group consisting of bladder cancer, breast cancer, cervical cancer, cholangiocellular carcinoma, CML, colorectal cancer, gastric cancer, NSCLC, lymphoma, osteosarcoma, prostate cancer, renal carcinoma, SCLC and soft tissue tumor.

22. The vaccine of Claim 19, formulated for administration to a subject whose HLA antigen is HLA-A24 or HLA-A2.