

bladder cancer patients, but it is not expressed in other normal important organs except the testis. Further, it is shown that cell proliferation in bladder cancer cell lines is suppressed as a result of down-regulation of the DEPDC1 expression by siRNAs (PTL1: WO2006/085684).

Recently, DEPDC1-derived HLA-A24-restricted CTL epitope peptides and HLA-A2-restricted CTL epitope peptides (PTL2: WO2008/047473) have been identified. These peptides are effective in cancer patients having the HLA-A24 type or HLA-A2 type, but cannot be expected to have effect on cancer patients who do not have these HLA types.

[Citation List]

10 [Patent Literature]

[PTL 1] WO2006/085684

[PTL 2] WO2008/047473

[Non Patent Literature]

[NPL 1] Boon T, Int J Cancer 1993 May 8, 54(2): 177-80

15 [NPL 2] Boon T & van der Bruggen P, J Exp Med 1996 Mar 1, 183(3): 725-9

[NPL 3] Harris CC, J Natl Cancer Inst 1996 Oct 16, 88(20): 1442-55

[NPL 4] Butterfield LH *et al.*, Cancer Res 1999 Jul 1, 59(13): 3134-42

[NPL 5] Vissers JL *et al.*, Cancer Res 1999 Nov 1, 59(21): 5554-9

[NPL 6] van der Burg SH *et al.*, J Immunol 1996 May 1, 156(9): 3308-14

20 [NPL 7] Tanaka F *et al.*, Cancer Res 1997 Oct 15, 57(20): 4465-8

[NPL 8] Fujie T *et al.*, Int J Cancer 1999 Jan 18, 80(2): 169-72

[NPL 9] Kikuchi M *et al.*, Int J Cancer 1999 May 5, 81(3): 459-66

[NPL 10] Oiso M *et al.*, Int J Cancer 1999 May 5, 81(3): 387-94

[NPL 11] Belli F *et al.*, J Clin Oncol 2002 Oct 15, 20(20): 4169-80

25 [NPL 12] Coulie PG *et al.*, Immunol Rev 2002 Oct, 188: 33-42

[NPL 13] Rosenberg SA *et al.*, Nat Med 2004 Sep, 10(9): 909-15

[NPL 14] Kanehira M *et al.*, Oncogene 2007,26(44):6448-55

Summary

30 The present disclosure relates to peptides that can induce CTLs specific to DEPDC1-expressing cells. When these peptides are presented on antigen-presenting cells (APCs) by the human leukocyte antigen (HLA), CTLs that show a specific cytotoxic activity against DEPDC1-expressing cells are induced. DEPDC1-derived peptides that have been identified so far to have CTL-inducing ability (CTL inducibility) are either HLA-A2-restricted or HLA-A24-restricted
35 peptides, and cannot induce CTLs against cells that do not express these HLAs. Therefore, conventional peptides are not suitable for performing immunotherapy in subjects that do not

have these HLAs. HLA-A11 is an allele commonly seen in Asians (Sette A, Sidney J., Immunogenetics 1999, 50: 201-12), and HLA-A01 is an allele commonly seen in Caucasians (Cao *et al.*, Hum Immunol 2001; 62(9): 1009-30). It is desirable to administer HLA-A11-restricted peptides to HLA-A11-positive subjects and HLA-A01-restricted peptides to HLA-A01-positive subjects. Hence, the present disclosure relates to DEPDC1-derived peptides with CTL-inducing ability that are restrictive to HLA-A11 or HLA-A01. Based on results disclosed herein, the peptides of the present disclosure have been proven to be epitope peptides that can induce a potent and specific immune response against cells expressing DEPDC1 and HLA-A11 or HLA-A01.

Therefore, one of the objectives of the present disclosure is to provide DEPDC1-derived peptides that can induce CTLs in an HLA-A11- or HLA-A01-restrictive manner. These peptides can be used to induce CTLs *in vitro*, *ex vivo* or *in vivo*, or can be used to administer to subjects for the purpose of inducing an immune response against DEPDC1-expressing cancer cells. Preferable peptides are peptides comprising the amino acid sequence selected from among SEQ ID NOs: 1, 81, 82, 21, 83, 84, 85, 86, 87, 88, 89, 90, 91, 58, 92, 96, 99, 101, 102, 103, 104, 106, 107, and 108; more preferable peptides are nonapeptides, decapeptides, or undecapeptides; and even more preferable peptides are peptides consisting of the amino acid sequence selected from among SEQ ID NOs: 1, 81, 82, 21, 83, 84, 85, 86, 87, 88, 89, 90, 91, 58, 92, 96, 99, 101, 102, 103, 104, 106, 107, and 108.

In one aspect, the present disclosure refers to an isolated peptide of less than 15 amino acids having cytotoxic T cell (CTL)-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced: (a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine; (b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine; (c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and (d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine.

In another aspect, the present disclosure refers to a composition comprising a pharmaceutically acceptable carrier and one or more types of peptides selected from the group consisting of (i) to (ii) below: (i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and (ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of

SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced: (a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine; (b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine; (c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and (d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine; in combination with an adjuvant in an amount to enhance an immune response.

In yet another aspect, the present disclosure refers to a method of inducing an APC(s) having CTL-inducing ability, which comprises contacting an APC(s) with a peptide *in vitro*, or *ex vivo*, wherein the peptide is selected from the group consisting of (i) to (ii) below: (i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and (ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced: (a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine; (b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine; (c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and (d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine.

In yet another aspect, the present disclosure refers to an *in vitro* or *ex vivo* method of inducing a CTL(s), which comprises co-culturing a CD8-positive T cell(s) with an APC(s) that presents on its surface a complex of an HLA antigen and a peptide, wherein the peptide is selected from the group consisting of (i) to (ii) below: (i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and (ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced: (a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the

group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine; (b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine; (c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and (d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine.

In yet another aspect, the present disclosure refers to the use of the composition as described herein in the manufacture of medicament for treating cancer.

In yet another aspect, the present disclosure refers to an emulsion comprising one or more types of peptides selected from the group consisting of (i) to (ii) below: (i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and (ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced: (a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine; (b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine; (c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and (d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine; a water-soluble carrier; and an oil adjuvant in an amount to enhance an immune response.

In yet another aspect, the present disclosure refers to a kit comprising a container that houses a composition comprising a pharmaceutically acceptable carrier and one or more types of peptides selected from the group consisting of (i) to (ii) below: (i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and (ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced: (a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine; (b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine,

phenylalanine, tyrosine, isoleucine, and alanine; (c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and (d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine;

5 and a container that houses an adjuvant in an amount effective to enhance an immune response.

The peptides of the present disclosure encompass peptides in which one, two or more amino acid(s) is/are substituted, deleted, inserted and/or added, as long as the resultant modified peptides retain the CTL-inducing ability of the original peptide.

10 The present disclosure further provides isolated polynucleotides encoding any one of the peptides of the present disclosure. Similar to the peptides of the present disclosure, these polynucleotides can be used for inducing APCs with CTL-inducing ability, and can be administered to subjects for inducing an immune response against DEPDC1-expressing cancer cells.

15 The present disclosure also provides compositions comprising one or more types of peptides of the present disclosure, one or more types of polynucleotides encoding one or more types of peptides of the present disclosure, APCs of the present disclosure, exosomes presenting peptides of the present disclosure, and/or CTLs of the present disclosure. The compositions of the present disclosure are preferably pharmaceutical compositions. The pharmaceutical compositions of the present disclosure can be used for treating and/or preventing cancer, as well

20 as preventing postoperative recurrence thereof. They can also be used for inducing an immune response against cancer. When administered to a subject, a peptide of the present disclosure is presented on the surface of an APC, and as a result CTLs targeting the peptide are induced. Therefore, another objective of the present disclosure is to provide compositions that induce CTLs, wherein the compositions comprise one or more types of peptides of the present

25 disclosure, one or more types of polynucleotides encoding one or more types of peptides of the present disclosure, APCs of the present disclosure, and/or exosomes presenting peptides of the present disclosure.

A further objective of the present disclosure is to provide methods of inducing APCs having CTL-inducing ability, wherein the methods comprise a step of contacting one or more

30 types of peptides of the present disclosure with an APC, or a step of introducing a polynucleotide encoding any one peptide of the present disclosure into an APC.

The present disclosure further provides a method of inducing CTLs, comprising a step of co-culturing a CD8-positive T cell with an APC that presents on its surface a complex of an HLA antigen and a peptide of the present disclosure, a step of co-culturing a CD8-positive T cell

35 with an exosome that presents on its surface a complex of an HLA antigen and a peptide of the present disclosure, or a step of introducing into a CD8-positive T cell a vector comprising a

polynucleotide encoding each subunit of a T cell receptor (TCR) capable of binding to a peptide of the present disclosure presented by an HLA antigen on a cell surface. The preferred HLA antigen in the present disclosure is HLA-A11 or HLA-A01.

5 A further objective of the present disclosure is to provide isolated APCs that present on their surface a complex of an HLA antigen and a peptide of the present disclosure. The present disclosure further provides isolated CTLs targeting a peptide of the present disclosure. These APCs and CTLs can be used in immunotherapy for DEPDC1-expressing cancers. In the present disclosure, the cancer to be subjected to immunotherapy is, for example, a cancer present in patients who have a homozygote or heterozygote of HLA-A11 or HLA-A01. Thus, the APCs
10 are also cells having a homozygote or heterozygote of HLA-A11 or HLA-A01. That is, the present disclosure provides immunotherapy for cancers expressing DEPDC1 and an HLA antigen selected from HLA-A11 and HLA-A01.

Another objective of the present disclosure is to provide methods of inducing an immune response against cancer in a subject, wherein the methods comprise a step of
15 administering to the subject a peptide(s) of the present disclosure, a polynucleotide(s) encoding the peptide(s), an APC(s) of the present disclosure, an exosome(s) presenting a peptide(s) of the present disclosure, and/or a CTL(s) of the present disclosure. Another objective of the present disclosure is to provide methods of treating and/or preventing cancer, as well as preventing postoperative recurrence thereof in a subject, wherein the methods comprise a step of
20 administering to the subject a peptide(s) of the present disclosure, a polynucleotide(s) encoding the peptide(s), an APC(s) of the present disclosure, an exosome(s) presenting a peptide(s) of the present disclosure, and/or a CTL(s) of the present disclosure.

In addition to the above, other objects and features of the present disclosure will become more fully apparent when the following detailed description is read in conjunction with the
25 accompanying figures and examples. However, it is to be understood that both the foregoing summary of the present disclosure and the following detailed description are of exemplified examples, and not restrictive of the present disclosure or other alternate examples of the present disclosure. In particular, while the present disclosure is described herein with reference to a number of specific examples, it will be appreciated that the description is illustrative of the
30 present disclosure and is not constructed as limiting of the present disclosure. Various modifications and applications may occur to those who are skilled in the art, without departing from the spirit and the scope of the present disclosure, as described by the appended claims. Likewise, other objects, features, benefits and advantages of the present disclosure will be apparent from this summary and certain examples described below, and will be readily apparent
35 to those skilled in the art. Such objects, features, benefits and advantages will be apparent from the above in conjunction with the accompanying examples, data, figures and all reasonable

inferences to be drawn therefrom, alone or with consideration of the references incorporated herein.

Brief Description of the Drawings

5 Fig. 1 consists of photos (a) to (b) showing results of an interferon (IFN)-gamma enzyme-linked immunospot (ELISPOT) assay in CTLs induced using peptides derived from DEPDC1. In comparison with the control, CTLs in Well #4 with DEPDC1-A11-9-627 (SEQ ID NO: 1) (a) showed potent IFN-gamma production. In these photos, the square on the wells show that cells from the respective wells were propagated for the establishment of CTL lines. In
10 contrast, DEPDC1-A11-9-558 (SEQ ID NO: 2) (b) is shown as an example of typical negative data where there was no specific IFN-gamma production. In the figure, “+” shows IFN-gamma production against target cells pulsed with an appropriate peptide; and “-” shows IFN-gamma production against target cells that have not been pulsed with any peptides.

 Fig. 2 is a line graph showing results of an IFN-gamma enzyme-linked immunosorbent
15 assay (ELISA), confirming IFN-gamma production in a CTL line stimulated with DEPDC1-A11-9-627 (SEQ ID NO: 1). This result proves that the CTL line established by stimulation with DEPDC1-A11-9-627 (SEQ ID NO: 1) showed potent IFN-gamma production in comparison with the control. In the figure, “+” shows IFN-gamma production against target cells pulsed with DEPDC1-A11-9-627 (SEQ ID NO: 1); and “-” shows IFN-gamma production against target
20 cells that have not been pulsed with any peptide. The R/S ratio indicates the ratio of the cell number of CTL line (Responder cells) and the cell number of target cells (Stimulator cells).

CLAIMS

1. An isolated peptide of less than 15 amino acids having cytotoxic T cell (CTL)-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced:

(a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine;

(b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine;

(c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and

(d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine.

2. A composition comprising a pharmaceutically acceptable carrier and one or more types of peptides selected from the group consisting of (i) to (ii) below:

(i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and

(ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced:

(a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine;

(b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine;

(c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and

(d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine;

in combination with an adjuvant in an amount to enhance an immune response.

3. The composition of claim 2, which is for inducing a CTL(s).
4. The composition of claim 2, which is a pharmaceutical composition.
5. The composition of claim 4 for use in the treatment of cancer.
6. The composition of claim 5, wherein the cancer is selected from the group consisting of bladder cancer, breast cancer, cervical cancer, cholangiocellular cancer, chronic myeloid leukemia (CML), colon cancer, gastric cancer, non-small-cell lung cancer (NSCLC), lymphoma, osteosarcoma, prostate cancer, small-cell lung cancer (SCLC), and soft tissue tumor.
7. The composition of claim 2, which is formulated to be administered to a subject positive for HLA-A11.
8. A method of inducing an APC(s) having CTL-inducing ability, which comprises contacting an APC(s) with a peptide *in vitro*, or *ex vivo*, wherein the peptide is selected from the group consisting of (i) to (ii) below:
 - (i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and
 - (ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced:
 - (a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine;
 - (b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine;
 - (c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and
 - (d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine.
9. An *in vitro* or *ex vivo* method of inducing a CTL(s), which comprises co-culturing a CD8-positive T cell(s) with an APC(s) that presents on its surface a complex of an HLA

antigen and a peptide, wherein the peptide is selected from the group consisting of (i) to (ii) below:

(i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and

5 (ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced:

10 (a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine;

(b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine;

15 (c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and

(d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine.

20 10. Use of the composition of claim 2 in the manufacture of a medicament for treating cancer.

11. An emulsion comprising one or more types of peptides selected from the group consisting of (i) to (ii) below:

25 (i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and

(ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced:

30 (a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine;

(b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine;

(c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and

(d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine;

a water-soluble carrier; and

an oil adjuvant in an amount to enhance an immune response.

12. A kit comprising a container that houses a composition comprising a pharmaceutically acceptable carrier and one or more types of peptides selected from the group consisting of (i) to (ii) below:

(i) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1; and

(ii) a peptide of less than 15 amino acids having CTL-inducing ability, which comprises the amino acid sequence of SEQ ID NO: 1 into which one or two substitution(s) selected from the group consisting of (a) to (d) below is introduced:

(a) the second amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of threonine, valine, isoleucine, leucine, phenylalanine, and tyrosine;

(b) the third amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, phenylalanine, tyrosine, isoleucine, and alanine;

(c) the seventh amino acid from the N terminus in the amino acid sequence of SEQ ID NO: 1 is substituted with an amino acid selected from the group consisting of leucine, isoleucine, tyrosine, valine, and phenylalanine; and

(d) the C-terminal amino acid in the amino acid sequence of SEQ ID NO: 1 is substituted with arginine;

and a container that houses an adjuvant in an amount effective to enhance an immune response.

13. The composition of claim 2, wherein the peptide consists of the amino acid sequence of SEQ ID NO: 1.

14. The emulsion of claim 11, wherein the peptide consists of the amino acid sequence of SEQ ID NO: 1.

15. The kit of claim 12, wherein the peptide consists of the amino acid sequence of SEQ ID NO: 1.