CLAIMS

1. A peptide consisting of an amino acid sequence of SEQ ID No. 1 or SEQ ID No. 3; or a pharmaceutical acceptable salt thereof, wherein the peptide is non-naturally occurring.

2. An antibody, in particular a soluble or membrane-bound antibody, that specifically recognizes an amino acid sequence of SEQ ID No. 1 or SEQ ID No. 3, when bound to an MHC molecule.

3. A T-cell receptor, optionally soluble or membrane-bound, that is reactive with an HLA ligand, wherein said ligand is the peptide according to claim 1, optionally the peptide according claim 1 when bound to an MHC molecule.

4. The T-cell receptor according to 3, wherein said T-cell receptor is provided as a soluble molecule and optionally carries a further effector function such as an immune stimulating domain or toxin.

5. An aptamer that specifically recognizes an amino acid of SEQ ID No. 1 or SEQ ID No. 3, that is bound to an MHC molecule.

6. A nucleic acid, encoding for the peptide according to claim 1, the antibody according to claim 2, the TCR according to claim 3 or 4, or an aptamer according to claim 5, wherein said nucleic acid is optionally linked to a heterologous promoter sequence, or an expression vector expressing said nucleic acid.

7. A recombinant host cell comprising the peptide according to claim 1 or the nucleic acid or the expression vector according to claim 6, wherein said host cell preferably is an antigen presenting cell such as a dendritic cell, or a T cell or NK cell.

8. A method for producing the peptide according to claim 1, the antibody according to claim 2 or the TCR according to claim 3 or 4 said method comprising culturing the host cell according to claim 7 expressing the nucleic acid or the expression

vector according to claim 6, and isolating the peptide, the antibody or the TCR from the host cell or its culture medium.

9. An *in vitro* method for producing activated T lymphocytes, the method comprising contacting *in vitro* T cells with antigen loaded human class I MHC molecules expressed on the surface of a suitable antigen-presenting cell or an artificial construct mimicking an antigen-presenting cell for a period of time sufficient to activate said T cells in an antigen specific manner, wherein said antigen is a peptide according to claim 1.

10. An activated T lymphocyte, produced by the method according to claim 9, that selectively recognizes a cell presenting an amino acid sequence of SEQ ID No. 1 or SEQ ID No. 3.

11. A pharmaceutical composition comprising at least one active ingredient selected from the group consisting of
    a) the peptide or salt thereof according to claim 1;
    b) the T-cell receptor according to claim 3;
    c) the nucleic acid) or the expression vector according to claim 6,
    d) the host cell according to claim 7,
    e) the activated T-lymphocyte according to claim 10;
    f) the antibody according to claim 2,
    g) the aptamer according to claim 5,
    and a pharmaceutically acceptable carrier, and optionally, pharmaceutically acceptable excipients and/or stabilizers.

12. The pharmaceutical composition according to claim 11, wherein (i) the pharmaceutical composition further comprises an adjuvant, and/or (ii) wherein the pharmaceutical composition is a vaccine or a cellular therapeutic agent.

13. The pharmaceutical composition according to claim 12, wherein the adjuvant is an interleukin, including IL-2, IL-15 or a combination thereof.

14. An effective number of activated T lymphocytes as defined in claim 10 for use in the manufacture of a medicament for killing target cancer cells in a patient, wherein the target cancer cells present a peptide of an amino acid sequence of SEQ ID No. 1 or SEQ ID No. 3.

15. The peptide or salt thereof according to claim 1, the antibody according to claim 2, the TCR according to claim 3 or 4, the aptamer according to claim 5, the activated T lymphocyte according to claim 10, the nucleic acid or the expression vector according to claim 6, or the host cell according to claim 7, for use in diagnosis and/or treatment of cancer, or for use in the manufacture of a medicament for the treatment of cancer, wherein said cancer shows an overpresentation of a peptide of SEQ ID No. 1 or SEQ ID No. 3.

16. The peptide, the antibody, the T-cell receptor, the aptamer, the nucleic acid, the expression vector, the host cell or the activated T lymphocyte for use according to claim 15, wherein said cancer is selected from the group of head and neck squamous cell carcinoma, acute myelogenous leukemia, breast cancer, bile duct cancer, brain cancer, chronic lymphocytic leukemia, colorectal carcinoma, esophageal cancer, gallbladder cancer, gastric cancer, hepatocellular cancer, melanoma, non-Hodgkin lymphoma, non-small cell lung cancer, ovarian cancer, pancreatic cancer, prostate cancer, renal cell cancer, small cell lung cancer, urinary bladder cancer, uterine cancer.

17. A kit comprising:

a) a container comprising a pharmaceutical composition comprising a peptide or salt thereof according to claim 1, the antibody according to claim 2, the TCR according to claim 3 or 4, the activated T lymphocyte according to claim 10, the nucleic acid or the expression vector according to claim 6, or the host cell according to claim 7, in solution or in lyophilized form;

b) optionally, a second container containing a diluent or reconstituting solution for the lyophilized formulation;

c) optionally, at least one more peptide selected from the group consisting of SEQ ID No. 1 to SEQ ID No. 156, preferably SEQ ID No. 1 to SEQ ID No. 91, and

d) optionally, instructions for (i) use of the solution or (ii) reconstitution and/or use of the lyophilized formulation, and optionally

one or more of (iii) a buffer, (iv) a diluent, (v) a filter, (vi) a needle, (vii) a syringe, or (viii) an adjuvant.

18. A method for producing a personalized anti-cancer vaccine or a compound-based and/or cellular therapy for an individual patient, said method comprising:

a) identifying tumor-associated peptides (TUMAPs) presented by a tumor sample from said individual patient;

b) comparing the peptides as identified in a) with a warehouse of peptides that have been pre-screened for immunogenicity and/or over-presentation in tumors as compared to normal tissues;

c) selecting at least one peptide from the warehouse that matches a TUMAP identified in the patient; and

d) manufacturing and/or formulating the personalized vaccine or compound-based or cellular therapy based on the selected peptide of step c),

wherein the selected warehouse peptide of step c) consists of SEQ ID No. 1 or SEQ ID No. 3.

19. The method according to claim 18, wherein said TUMAPs are identified comprising:

a1) comparing expression data from the tumor sample to expression data from a sample of normal tissue corresponding to the tissue type of the tumor sample to identify proteins that are over-expressed or aberrantly expressed in the tumor sample; and

a2) correlating the expression data with sequences of MHC ligands bound to MHC class I and/or class II molecules in the tumor sample to identify MHC ligands derived from proteins over-expressed or aberrantly expressed by the tumor.

20. The method according to claim 18 or 19, wherein the peptides included in the warehouse are identified based on the following steps:

aa. Performing genome-wide messenger ribonucleic acid (mRNA) expression analysis by highly parallel methods, such as microarrays or sequencing-based expression profiling, comprising identify genes that over-expressed in a malignant tissue, compared with a normal tissue or tissues;

ab. Selecting peptides encoded by selectively expressed or over-expressed genes as detected in step aa, and

ac. Determining an induction of in vivo T-cell responses by the peptides as selected comprising *in vitro* immunogenicity assays using human T cells from healthy donors or said patient; or

ba. Identifying HLA ligands from said tumor sample using mass spectrometry;

bb. Performing genome-wide messenger ribonucleic acid (mRNA) expression analysis by highly parallel methods, such as microarrays or sequencing-based expression profiling, comprising identify genes that over-expressed in a malignant tissue, compared with a normal tissue or tissues;

bc. Comparing the identified HLA ligands to said gene expression data;

bd. Selecting peptides encoded by selectively expressed or over-expressed genes as detected in step bc;

be. Re-detecting of selected TUMAPs from step bd on tumor tissue and lack of or infrequent detection on healthy tissues and confirming the relevance of over-expression at the mRNA level; and

bf. Determining an induction of *in vivo* T-cell responses by the peptides as selected comprising *in vitro* immunogenicity assays using human T cells from healthy donors or said patient.

21. The method according to any of claims 18 to 20, further comprising identifying at least one mutation that is unique to the tumor sample relative to normal corresponding tissue from the individual patient, and selecting a peptide that correlates with the mutation for inclusion in the vaccine or for the generation of cellular therapies.