CLAIMS

1. A pharmaceutical composition comprising at least one neoantigenic peptide and a pharmaceutically acceptable carrier, each at least one neoantigenic peptide comprising a tumor-specific neoepitope capable of binding to an HLA protein in a subject, each tumor-specific neoepitope comprising a tumor-specific mutation present in a tumor, in which:

(a) the composition comprises at least one neoantigenic peptide comprising a tumor-specific mutation present in a tumor in at least 1% of subjects in a population of subjects suffering from cancer;

(b) the composition comprises at least one neoantigenic peptide comprising a tumor-specific neoepitope which binds to an HLA protein present in at least 5% of subjects in the population of subjects suffering from cancer; and

(c) the composition comprises at least one neoantigenic peptide capable of eliciting an immune response against a tumor present in at least 5% of the subjects in the population of subjects suffering from cancer.

2. A pharmaceutical composition according to Claim 1, in which the population of subjects is suffering from adrenocortical carcinoma (ACC), bladder urothelial carcinoma (BLCA), breast invasive carcinoma (BRCA), cervical squamous cell carcinoma and endocervical adenocarcinoma (CESC), colon adenocarcinoma (COAD), Chronic lymphocytic Leukaemia (CLL), colorectal cancer (CRC), Diffuse large B-cell lymphoma (DLBCL), glioblastoma multiforme (GBM), head and neck squamous cell carcinoma (HNSC), kidney chromophobe (KICH), kidney renal clear cell carcinoma (KIRC), kidney renal papillary cell carcinoma (KIRP), acute myeloid leukemia (LAML), liver hepatocellular carcinoma (LIHC), lung adenocarcinoma (LUAD), lung squamous cell carcinoma (LUSC), multiple myeloma (MM), ovarian serous cystadenocarcinoma (OV), pancreatic adenocarcinoma (PAAD), prostate adenocarcinoma (PRAD), rectum adenocarcinoma (READ), skin cutaneous melanoma (SKCM), stomach adenocarcinoma (STAD), testicular germ cell tumors (TGCT), thyroid adenocarcinoma (THCA), uterine corpus endometrioid carcinoma (UCEC), or uterine carcinosarcoma (UCS).

3. A pharmaceutical composition according to Claim 1 or 2, in which the population suffering from cancer was treated with, is being treated with, or is selected to be treated with a tyrosine kinase inhibitor, a RAF inhibitor, a MEK inhibitor, or antiestrogen therapy.

4. A pharmaceutical composition according to Claim 1, 2 or 3, in which the tumor-specific mutations comprise splice-variant mutations, point mutations, and/or frameshift mutations; or in which the tumor-specific mutations comprise drug resistance mutations.

5. A pharmaceutical composition according to any preceding claim, in which the at least one neoantigenic peptide comprises at least one neoantigenic peptide derived from a long peptide region flanking and including the tumor specific mutation, and in which all contiguous segments within the long peptide are included.

6. A pharmaceutical composition according to any preceding claim, in which the tumor-specific mutations are present in one or more genes encoding a protein selected from the group consisting of Programmed Death-Ligand 1 (PD-L1), androgen receptor (AR), Bruton's Tyrosine Kinase (BTK), Epidermal Growth Factor Receptor (EGFR), BCR-Abl, c-kit, PIK3CA, HER2, EML4-ALK, KRAS, ALK, ROS1, AKT1, BRAF, MEK1, MEK2, NRAS, RAC1, and ESR1.

7. A pharmaceutical composition according to any preceding claim, in which the at least one tumor-specific mutation has an incidence of at least 500 patients a year in the population of subjects suffering from cancer.

8. A pharmaceutical composition according to Claim 7, in which the at least one neoantigenic peptide comprises a sequence selcted from SEQ ID NOS 1-80, 3799-33502, or 33503-33732.

9. A pharmaceutical composition according to any preceding claim, in which the composition comprises at least 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 or 20 neoantigenic peptides.

10. A pharmaceutical composition according to Claim 9, in which the composition comprises at most 20 neoantigenic peptides.

11. A pharmaceutical composition according to any preceding claim, in which each neoantigenic peptide is from about 8 to about 50 amino acids in length.

12. A pharmaceutical composition according to any preceding claim, in which each tumor-specific neoepitope binds to a protein expressed by an HLA-A, -B or –C allele of a human subject suffering from the cancer with a K_D of less than 500 nM.

13. A pharmaceutical composition according to any preceding claim, which is an immunogenic or vaccine composition.

14. A pharmaceutical composition according to Claim 13, further comprising an immunomodulator or adjuvant.

15. A pharmaceutical composition according to Claim 14, in which the immunodulator or adjuvant is selected from the group consisting of poly-ICLC, 1018 ISS, aluminum salts, Amplivax, AS15, BCG, CP-870,893, CpG7909, CyaA, dSLIM, GM-CSF, IC30, IC31, Imiquimod, ImuFact IMP321, IS Patch, ISS, ISCOMATRIX, Juvlmmune, LipoVac, MF59, monophosphoryllipid A, Montanide IMS 1312, Montanide ISA 206, Montanide ISA 50V, Montanide ISA-51, OK-432, OM-174, OM-197-MP-EC, ONTAK, PepTel®, vector system, PLGA microparticles, resiquimod, SRL172, Virosomes and other Virus-like particles, YF-17D, VEGF trap, R848, beta-glucan, Pam3Cys, and Aquila's QS21 stimulon.

16. A pharmaceutical composition according to any preceding claim for use in a method of treating or preventing a tumor in a subject in need thereof.

17. A pharmaceutical composition for use according to Claim 16, in which the pharmaceutical composition is to be administered as a combination therapy with an additional cancer therapy.

18. A pharmaceutical composition for use according to Claim 17, in which the additional thereapy comprises a check point inhibitor; or in which the additional therapy is surgery, chemotherapy, a targeted therapy, or a combination thereof.

19. A pharmaceutical composition according to any preceding claim for use in a method of prophylactic cancer treatment, in which the at least one neoantigenic peptide is derived from drug resistant mutations associated with a cancer drug for a patient in need thereof and selected from the group consisting of: ibrutinib, erlotinib, imatinib, gefitinib, crizotinib, trastuzumab, vemurafenib, RAF/MEK inhibitors, and antiestrogen therapy.

20. An agent comprising an extracellular ligand-binding domain recognizing a tumor-specific neoepitope comprising a tumor-specific mutation having an incidence of at least 1% of subjects in the population for use in a method of treating or preventing a tumor in a population of subjects in need thereof.

21. An agent for use according to Claim 20, in which the agent comprises an antibody, antibody fragment, antibody drug conjugate, aptamer, CAR, or T cell receptor.

22. An agent for use according to Claim 21, in which the antibody or antibody fragment is humanized, fully humanized, or chimeric; or in which the antibody fragment comprises a nanobody, Fab, Fab', (Fab')2, Fv, ScFv, diabody, triabody, tetrabody, Bis-scFv, minibody, Fab2, or Fab3 fragment.