

include peptide, cell, vector or DNA-based vaccines, administration of monoclonal antibodies (mAb) or expression of a DNA-encoded mAb against PSMA (Muthumani, K. *et al.*, *Cancer Immunol. Immunother.* 2017, 66: 1577) and chimeric antigen receptor (CAR)-modified T cells (Junghans, RP *et al.*, *Prostate.* 2016, 76: 1257). Despite the reported expression of PSMA in normal tissues, anti-PSMA toxicities were not observed in the Phase I clinical study using anti-PSMA CAR T cells.

**[0007]** Accordingly, there remains a need in the art for agents (such as polypeptide constructs) that target PSMA for the diagnosis and/or treatment of cancer. The present application addresses these and other needs.

**[0008]** The disclosures of all publications, patents, patent applications and published patent applications referred to herein are hereby incorporated herein by reference in their entirety.

### **BRIEF SUMMARY OF THE INVENTION**

**[0009]** In some ~~embodimentexamples~~, provided is an anti-prostate specific membrane antigen (PSMA) construct comprising an antibody moiety specifically recognizing an extracellular domain of a cell surface-bound PSMA that comprises an amino acid sequence set forth in SEQ ID NO: 44. In some ~~embodimentexamples~~ according to (or as applied to) any of the ~~embodimentexamples~~ above, the PSMA is expressed on the surface of a cancer cell. In some ~~embodimentexample~~s according to (or as applied to) any of the ~~embodimentexamples~~ above, the cancer cell is a prostate cancer cell, a renal cell cancer cell, a uterine cancer cell, or a liver cancer cell. In some ~~embodimentexamples~~ according to (or as applied to) any of the ~~embodimentexamples~~ above, the cancer cell is a prostate cancer cell. In some ~~embodimentexamples~~ according to (or as applied to) any of the ~~embodimentexamples~~ above, the prostate cancer cell is a hormone refractory prostate cancer cell or a metastatic prostate cancer cell. In some ~~embodimentexamples~~ according to (or as applied to) any of the ~~embodimentexamples~~ above, the cancer cell is a renal cancer cell. In some ~~embodimentexamples~~ according to (or as applied to) any of the ~~embodimentexamples~~ above, the renal cancer cell is a clear cell renal cell carcinoma (CCRCC) cell. In some ~~embodimentexamples~~ according to (or as applied to) any of the ~~embodimentexamples~~ above, the PSMA is expressed on the surface of a cell selected from the group consisting of: LNCaP, MDA PCa 2b, VCaP, 22Rv1, Caki-1; HCC1482; and HuH-7.

**[0010]** In one aspect, the present disclosure refers to an anti-prostate specific membrane antigen (PSMA) construct comprising an anti-PSMA antibody moiety specifically recognizing an extracellular domain of a cell surface-bound PSMA that comprises an amino acid sequence set forth in SEQ ID NO: 44, wherein the anti-PSMA antibody moiety comprises: i) a heavy chain variable domain (V<sub>H</sub>) comprising a CDR-H1 comprising the amino acid sequence of any one of SEQ ID NOs: 1-2, or a variant thereof comprising up to about 5 amino acid substitutions, a CDR-H2 comprising the amino acid sequence of any one of SEQ ID NOs: 3-4, or a variant thereof comprising up to about 5 amino acid substitutions, and a CDR-H3 comprising the amino acid sequence of any one of SEQ ID NOs: 5-6, or a variant thereof comprising up to about 5 amino acid substitutions; and ii) a light chain variable domain (V<sub>L</sub>) comprising a CDR-L1 comprising the amino acid sequence of any one of SEQ ID NOs: 7-8, or a variant thereof comprising up to about 5 amino acid substitutions, a CDR-L2 comprising the amino acid sequence GNS or SSN, or a variant thereof comprising about 2 amino acid substitutions, and a CDR-L3 comprising the amino acid sequence of any one of SEQ ID NOs: 9-10, or a variant thereof comprising up to about 5 amino acid substitutions. In some ~~embodimentexamples~~ according to (or as applied to) any of the ~~embodimentexamples~~ above, the antibody moiety comprises: i) a heavy chain variable domain (V<sub>H</sub>) comprising a CDR-H1 comprising the amino acid sequence of any one of SEQ ID NOs: 1-2, or a variant thereof comprising up to about 5 amino acid substitutions, a CDR-H2 comprising the amino acid sequence of any one of SEQ ID NOs: 3-4, or a variant thereof comprising up to about 5 amino acid substitutions, and a CDR-H3 comprising the amino acid sequence of any one of SEQ ID NOs: 5-6, or a variant thereof comprising up to about 5 amino acid substitutions; and ii) a light chain variable domain (V<sub>L</sub>) comprising a CDR-L1 comprising the amino acid sequence of any one of SEQ ID NOs: 7-8, or a variant thereof

comprising up to about 5 amino acid substitutions, a CDR-L2 comprising the amino acid sequence GNS or SSN, or a variant thereof comprising about 2 amino acid substitutions, and a CDR-L3 comprising the amino acid sequence of any one of SEQ ID NOs: 9-10, or a variant thereof comprising up to about 5 amino acid substitutions. In some [embodiment examples](#) according to (or as applied to) any of the [embodiment examples](#) above, the antibody moiety comprises: i) a V<sub>H</sub> comprising a CDR-H1 comprising the amino acid sequence of any one of SEQ ID NOs: 1-2, a CDR-H2 comprising the amino acid sequence of any one of SEQ ID NOs: 3-4, and a CDR-H3 comprising the amino acid sequence of any one of SEQ ID NOs: 5-6; and ii) a V<sub>L</sub> comprising a CDR-L1 comprising the amino acid sequence of any one of SEQ ID NOs: 7-8, a CDR-L2 comprising the amino acid sequence of GNS or SSN, and a CDR-L3 comprising the amino acid sequence of any one of SEQ ID NOs: 9-10. In some [embodiment examples](#) according to (or as applied to) any of the [embodiment examples](#) above, the antibody moiety comprises i) a V<sub>H</sub> comprising a CDR-H1 comprising the amino acid sequence of SEQ ID NO: 1, a CDR-H2 comprising the amino acid sequence of SEQ ID NO: 3, and a CDR-H3 comprising the amino acid sequence of SEQ ID NO: 5; and ii) a light chain variable domain (V<sub>L</sub>) comprising a CDR-L1 comprising the amino acid sequence of SEQ ID NO: 7, a CDR-L2 comprising the amino acid sequence GNS, and a CDR-L3 comprising the amino acid sequence of SEQ ID NO: 9. In some [embodiment examples](#) according to (or as applied to) any of the [embodiment examples](#) above, the antibody moiety comprises i) a V<sub>H</sub> comprising a CDR-H1 comprising the amino acid sequence of SEQ ID NO: 2, a CDR-H2 comprising the amino acid sequence of SEQ ID NO: 4, and a CDR-H3 comprising the amino acid sequence of SEQ ID NO: 6; and ii) a V<sub>L</sub> comprising a CDR-L1 comprising the amino acid sequence of SEQ ID NO: 8, a CDR-L2 comprising the amino acid sequence SSN, and a CDR-L3 comprising the amino acid sequence of SEQ ID NO: 10.

**[0011]** In one aspect, the present disclosure refers to an anti-PSMA construct comprising an anti-PSMA antibody moiety specifically recognizing an extracellular domain of a cell surface-bound PSMA that comprises an amino acid sequence set forth in SEQ ID NO: 44, wherein the anti-PSMA antibody moiety comprises a CDR-H1, a CDR-H2, and a CDR-H3 of a V<sub>H</sub> set forth in SEQ ID NO: 16 or 17 and a CDR-L1, a CDR-L2, and a CDR-L3 of a V<sub>L</sub> set forth in SEQ ID NO: 18 or 19. In some [embodiment examples](#) according to (or as applied to) any of the [embodiment examples](#) above, the antibody moiety comprises a CDR-H1, a CDR-H2, and a CDR-H3 of a heavy chain variable domain (V<sub>H</sub>) set forth in SEQ ID NO: 16 or 17 and a CDR-L1, a CDR-L2, and a CDR-L3 of a light chain variable domain (V<sub>L</sub>) set forth in SEQ ID NO: 18 or 19. In some [embodiment examples](#) according to (or as applied to) any of the [embodiment examples](#) above, the antibody moiety comprises the CDR-H1, CDR-H2, and CDR-H3 of the V<sub>H</sub> set forth in SEQ ID NO: 16 and the CDR-L1, the CDR-L2, and the CDR-L3 of the V<sub>L</sub> set forth in SEQ ID NO: 18. In some [embodiment examples](#) according to (or as applied to) any of the [embodiment examples](#) above, the antibody moiety comprises the CDR-H1, CDR-H2, and CDR-H3 of the V<sub>H</sub> set forth in SEQ ID NO: 17 and the CDR-L1, the CDR-L2, and the CDR-L3 of the V<sub>L</sub> set forth in SEQ ID NO: 19. In some [embodiment examples](#) according to (or as applied to) any of the [embodiment examples](#) above, the antibody moiety comprises: i) a V<sub>H</sub> comprising an amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 16 or 17 and ii) a V<sub>L</sub> comprising an amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 18 or 19. In some [embodiment examples](#)

according to (or as applied to) any of the [embodimentexamples](#) above, the antibody moiety comprises: i) a V<sub>H</sub> comprising an amino acid sequence having at least about 90% sequence identity to SEQ ID NO: 16 or 17 and ii) a V<sub>L</sub> comprising an amino acid sequence having at least about 90% sequence identity to SEQ ID NO: 18 or 19. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the antibody moiety comprises: i) a V<sub>H</sub> comprising an amino acid sequence having at least about 95% sequence identity to SEQ ID NO: 16 or 17 and ii) a V<sub>L</sub> comprising an amino acid sequence having at least about 95% sequence identity to SEQ ID NO: 18 or 19. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the antibody moiety comprises: a V<sub>H</sub> comprising an amino acid sequence of SEQ ID NO: 16 and a V<sub>L</sub> comprising the amino acid sequence of SEQ ID NO: 18. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the antibody moiety comprises: a V<sub>H</sub> comprising an amino acid sequence of SEQ ID NO: 17; and a V<sub>L</sub> comprising the amino acid sequence of SEQ ID NO: 19. In one aspect, the present disclosure refers to an anti-PSMA construct comprising an anti-PSMA antibody moiety specifically recognizing an extracellular domain of a cell surface-bound PSMA that comprises an amino acid sequence set forth in SEQ ID NO: 44, wherein the anti-PSMA antibody moiety comprises: i) a V<sub>H</sub> comprising the amino acid sequences of SEQ ID NOs: 1, 3, and 5, and a V<sub>L</sub> comprising the amino acid sequences of SEQ ID NO: 7, GNS, and SEQ ID NO: 9; or ii) a V<sub>H</sub> comprising the amino acid sequences of SEQ ID NOs: 2, 4, and 6, and a V<sub>L</sub> comprising the amino acid sequences of SEQ ID NO: 8, SSN, and SEQ ID NO: 10. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the antibody moiety comprises: i) a heavy chain variable domain (V<sub>H</sub>) comprising the amino acid sequences of SEQ ID NOs: 1, 3, and 5, and a light chain variable domain (V<sub>L</sub>) comprising the amino acid sequence of SEQ ID NO: 7, GNS, and SEQ ID NO: 9; or ii) a V<sub>H</sub> comprising the amino acid sequences of SEQ ID NOs: 2, 4, and 6, and a V<sub>L</sub> comprising the amino acid sequence of SEQ ID NO: 8, SSN, and SEQ ID NO: 10.

**[0012]** In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the antibody moiety specifically recognizing PSMA is chimeric, human, partially humanized, fully humanized, or semi-synthetic. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the antibody moiety specifically recognizing PSMA is a full-length antibody, a Fab, a Fab', a F(ab')<sub>2</sub>, an Fv, or a single chain Fv (scFv). In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above antibody moiety specifically recognizing PSMA is an scFv. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the scFv comprises an amino acid sequence set forth in SEQ ID NO: 20. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the scFv comprises an amino acid sequence set forth in SEQ ID NO: 21. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the antibody moiety specifically recognizing PSMA is a Fab or Fab'. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the antibody moiety specifically recognizing PSMA is fused to an Fc fragment optionally via a linker. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the Fc fragment is a human IgG Fc fragment. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the human IgG is an IgG1, IgG2, IgG3, or IgG4. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA antibody moiety is a full-length antibody. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the full-length antibody

comprises a heavy chain comprising an amino acid sequence set forth in SEQ ID NO: 39 and a light chain comprising an amino acid sequence set forth in SEQ ID NO: 40. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the full-length antibody comprises a heavy chain comprising an amino acid sequence set forth in SEQ ID NO: 41 and a light chain comprising an amino acid sequence set forth in SEQ ID NO: 42. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct is monospecific. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above the anti-PSMA construct is multispecific. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above the anti-PSMA construct is bispecific. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above the anti-PSMA construct is a tandem scFv, a diabody (Db), a single chain diabody (scDb), a dual-affinity retargeting (DART) antibody, a F(ab')<sub>2</sub>, a dual variable domain (DVD) antibody, a knob-into-hole (KiH) antibody, a dock and lock (DNL) antibody, a chemically cross-linked antibody, a heteromultimeric antibody, or a heteroconjugate antibody.

**[0013]** In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above the anti-PSMA construct is a tandem scFv comprising two scFvs linked by a peptide linker. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above the anti-PSMA construct further comprises a second antibody moiety specifically recognizing a second antigen. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the second antigen is an antigen on the surface of a T cell. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the T cell is selected from the group consisting of a cytotoxic T cell, a helper T cell, and a natural killer T cell. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the second antigen is selected from the group consisting of CD3 $\gamma$ , CD3 $\delta$ , CD3 $\epsilon$ , CD3 $\zeta$ , CD28, OX40, GITR, CD137, CD27, CD40L, and HVEM. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the second antigen is CD3 $\epsilon$ . In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct is a tandem scFv comprising an N-terminal scFv specifically recognizing PSMA and a C-terminal scFv specifically recognizing CD3 $\epsilon$ . In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct comprises an amino acid sequence set forth in SEQ ID NO: 25 or 26. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct comprises an amino acid sequence set forth in SEQ ID NO: 27 or 28. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the expression of the anti-PSMA construct is induced by the activation of an engineered T cell. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the engineered T cell is a T cell comprising a chimeric antigen receptor (CAR). In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the CAR specifically binds to PSMA. In some [embodimentexamples](#)

according to (or as applied to) any of the [embodimentexamples](#) above, the CAR binds to an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the engineered T cell is a T cell comprising a chimeric antibody-T cell receptor (TCR) construct (caTCR). In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR specifically binds to PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR binds to an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the second antigen bound by the second antibody moiety of the anti-PSMA construct is an antigen on the surface of a B cell, a natural killer cell, a dendritic cell, a macrophage, a monocyte, or a neutrophil.

**[0014]** In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct is a CAR comprising: (a) an extracellular domain comprising the anti-PSMA antibody moiety; (b) a transmembrane domain; and (c) an intracellular signaling domain. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the intracellular signaling domain comprises a primary immune cell signaling sequence derived from CD3 $\zeta$ , TCR $\zeta$ , FcR $\gamma$ , FcR $\beta$ , CD3 $\gamma$ , CD3 $\delta$ , CD3 $\epsilon$ , CD5, CD22, CD79a, CD79b, or CD66d. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the intracellular signaling domain further comprises a costimulatory signaling sequence derived from CD28, 4-1BB, ICOS, or OX40. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the intracellular signaling domain comprises a CD3 $\zeta$  intracellular signaling sequence and a CD28 intracellular signaling sequence. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct comprises an amino acid sequence set forth in SEQ ID NO: 29. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct comprises an amino acid sequence set forth in SEQ ID NO: 30.

**[0015]** In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct is a caTCR comprising: (a) an extracellular domain comprising the anti-PSMA antibody moiety; and (b) a T cell receptor module (TCRM) comprising a first TCR domain (TCRD) comprising a first TCR transmembrane domain (TCR-TM) and a second TCRD comprising a second TCR-TM, wherein the TCRM facilitates recruitment of at least one TCR-associated signaling molecule. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the first TCR-TM is derived from one of the transmembrane domains of a first naturally occurring TCR and the second TCR-TM is derived from the other transmembrane domain of the first naturally occurring TCR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the at least one of the TCR-TMs is non-naturally occurring. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the TCRM comprising the at least one non-naturally

occurring TCR-TM allows for enhanced recruitment of the at least one TCR-associated signaling molecule as compared to a TCRM comprising the first naturally occurring T cell receptor transmembrane domains. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the first and second TCR-TMs are naturally occurring. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the first naturally occurring TCR is a  $\gamma/\delta$  TCR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct comprises a first polypeptide chain comprising an amino acid sequence set forth in SEQ ID NO: 31 and a second polypeptide chain comprising an amino acid sequence set forth in SEQ ID NO: 32. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct comprises a first polypeptide chain comprising an amino acid sequence set forth in SEQ ID NO: 34 and a second polypeptide chain comprising an amino acid sequence set forth in SEQ ID NO: 35. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the first naturally occurring TCR is an  $\alpha/\beta$  TCR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the TCR-associated signaling molecule is selected from the group consisting of CD3 $\delta\epsilon$ , CD3 $\gamma\epsilon$ , and CD3 $\zeta\zeta$ . In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR lacks a functional primary immune cell signaling domain. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR lacks any primary immune cell signaling sequences.

**[0016]** In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct is a chimeric signaling receptor (CSR) comprising: i) a ligand-binding module that is capable of binding or interacting with PSMA; ii) a transmembrane module; and iii) a co-stimulatory immune cell signaling module that is capable of providing a co-stimulatory signal to the effector cell, wherein the ligand-binding module and the co-stimulatory immune cell signaling module are not derived from the same molecule, and wherein the CSR lacks a functional primary immune cell signaling domain. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the CSR lacks any primary immune cell signaling sequences. In some [embodimentexample](#) according to (or as applied to) any of the [embodimentexamples](#) above, the ligand-binding module comprises the anti-PSMA construct [as disclosed herein of any one of claims 1-23](#). In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the transmembrane module of the CSR comprises transmembrane domains derived from CD28, CD3 $\epsilon$ , CD3 $\zeta$ , CD45, CD4, CD5, CD8, CD9, CD16, CD22, CD33, CD37, CD64, CD80, CD86, CD134, CD137, or CD154. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the co-stimulatory immune cell signaling module is derived from the intracellular domain of a co-stimulatory receptor of a TCR. In some [embodimentexample](#) according to (or as applied to) any of the [embodimentexamples](#) above, the co-stimulatory receptor is selected from the group consisting of CD28, 4-1BB, OX40, ICOS, CD27, and CD40. In some [embodimentexamples](#) according to (or

as applied to) any of the [embodimentexamples](#) above, the expression of the CSR is inducible upon activation of an engineered T cell. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the engineered T cell is a T cell comprising a CAR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the CAR specifically binds to PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the CAR binds to an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the engineered T cell is a T cell comprising a caTCR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR specifically binds to PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR binds to an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct comprises an amino acid sequence set forth in SEQ ID NO 37. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct comprises an amino acid sequence set forth in SEQ ID NO 38.

**[0017]** In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the anti-PSMA construct is conjugated to an effector molecule. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the effector molecule is a therapeutic agent selected from the group consisting of: a drug, a toxin, a radioisotope, a protein, a peptide, and a nucleic acid. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the therapeutic agent is a drug or a toxin. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the effector molecule is a detectable label.

**[0018]** In another [aspectexample](#) of the current [inventiondisclosure](#), provided is an effector cell that has been genetically modified with one or more nucleic acids encoding the anti-PSMA CAR according to (or as applied to) any of the [embodimentexamples](#) above or the anti-PSMA caTCR according to (or as applied to) any of the [embodimentexamples](#) above. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the one or more nucleic acids encoding the anti-PSMA CAR or anti-PSMA caTCR also encode a CSR comprising a ligand binding module that binds a target antigen. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the effector cell has been genetically modified with one or more additional nucleic acids encoding a CSR comprising a ligand binding module that binds a target antigen. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the target antigen is PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the target antigen is an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the one or more nucleic acids encoding the anti-PSMA CAR or anti-PSMA caTCR also encode a tandem scFv that comprises a first scFv that binds a target antigen. In some [embodimentexamples](#) according to (or as applied to) any of

the [embodimentexamples](#) above, the effector cell has been genetically modified with one or more additional nucleic acids encoding a tandem scFv that comprises a first scFv that binds a target antigen. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the target antigen is PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the target is an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, provided is an effector cell that has been genetically modified with one or more nucleic acids encoding the anti-PSMA tandem scFv according to (or as applied to) any of the [embodimentexamples](#) above or the anti-PSMA CSR according to (or as applied to) any of the [embodimentexamples](#) above. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the one or more nucleic acids encoding the anti-PSMA tandem scFv or anti-PSMA CSR also encode a CAR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the effector cell has been genetically modified with one or more additional nucleic acids encoding a CAR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the CAR specifically binds PSMA. In some [embodimentexample](#)s according to (or as applied to) any of the [embodimentexamples](#) above, the CAR specifically binds an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the one or more nucleic acids encoding the anti-PSMA tandem scFv or anti-PSMA CSR also encode a caTCR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the effector cell has been genetically modified with one or more additional nucleic acids encoding a caTCR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR specifically binds PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR specifically binds an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the effector cell is an immune cell. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the immune cell is a T cell. In some [embodimentexample](#)s according to (or as applied to) any of the [embodimentexamples](#) above, the T cell is a cytotoxic T cell, a helper T cell, or a natural killer T cell.

**[0019]** In another [aspectexample](#) of the current ~~invention~~[disclosure](#), provided is a method of producing an effector cell, comprising genetically modifying a cell with one or more nucleic acids encoding the anti-PSMA CAR according to (or as applied to) any of the [embodimentexamples](#) above, or the anti-PSMA caTCR according to (or as applied to) any of the [embodimentexamples](#) above. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the one or more nucleic acids encoding the anti-PSMA CAR or anti-PSMA caTCR also encode a CSR comprising a ligand binding module that binds a target antigen. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the method comprises further genetically modifying the cell with one or more additional nucleic acids encoding a CSR comprising a ligand binding module that binds a target antigen. In some

embodimentexamples according to (or as applied to) any of the embodimentexamples above, the target antigen is PSMA. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the target antigen is an antigen other than PSMA. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the one or more nucleic acids encoding the anti-PSMA CAR or anti-PSMA caTCR also encode a tandem scFv that comprises a first scFv that binds a target antigen. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the method comprises further genetically modifying the cell with one or more additional nucleic acids encoding a tandem scFv that comprises a first scFv that binds a target antigen. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the target antigen is PSMA. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the target is an antigen other than PSMA. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, provided is a method of producing an effector cell, comprising genetically modifying a cell with one or more nucleic acids encoding the anti-PSMA tandem scFv according to (or as applied to) any of the embodimentexamples above, or the anti-PSMA CSR according to (or as applied to) any of the embodimentexamples above. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the one or more nucleic acids encoding the anti-PSMA tandem scFv or anti-PSMA CSR also encode a CAR. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the method comprises further genetically modifying the cell with one or more additional nucleic acids encoding a CAR. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the CAR specifically binds PSMA. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the CAR specifically binds an antigen other than PSMA. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the one or more nucleic acids encoding the anti-PSMA CAR or anti-PSMA caTCR also encode a caTCR. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the method comprises further genetically modifying the cell with one or more additional nucleic acids encoding a caTCR. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the caTCR specifically binds PSMA. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the caTCR specifically binds an antigen other than PSMA. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the effector cell is an immune cell. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the immune cell is a T cell. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the T cell is a cytotoxic T cell, a helper T cell, or a natural killer T cell.

**[0020]** In another aspectexample of the current inventiondisclosure, provided is nucleic acid encoding the polypeptide portion(s) of the anti-PSMA construct according to (or as applied to) any of the embodimentexamples above. Also provided is a vector comprising the nucleic acid according to (or as applied

to) any of the [embodimentexamples](#) above. Also provided is a host cell comprising the nucleic acid or the vector according to (or as applied to) any of the [embodimentexamples](#) above.

**[0021]** Also provided is a method of producing the anti-PSMA construct according to (or as applied to) any of the [embodimentexamples](#) above, comprising culturing the host cell according to (or as applied to) any of the [embodimentexamples](#) above under conditions where the anti-PSMA construct is expressed, and recovering the anti-PSMA construct produced by the host cell.

**[0022]** In another [aspectexample](#) of the current [inventiondisclosure](#), provided is a pharmaceutical composition comprising the anti-PSMA construct according to (or as applied to) any of the [embodimentexamples](#) above, the effector cell according to (or as applied to) any of the [embodimentexamples](#) above, the nucleic acid according to (or as applied to) any of the [embodimentexamples](#) above, or the vector according to (or as applied to) any of the [embodimentexamples](#) above, and a pharmaceutical acceptable carrier.

**[0023]** In another [aspectexample](#) of the current [inventiondisclosure](#), provided is a kit comprising the anti-PSMA construct of according to (or as applied to) any of the [embodimentexamples](#) above, the effector cell according to (or as applied to) any of the [embodimentexamples](#) above, the nucleic acid according to (or as applied to) any of the [embodimentexamples](#) above, the vector according to (or as applied to) any of the [embodimentexamples](#) above and/or the host cell of according to (or as applied to) any of the [embodimentexamples](#) above.

**[0024]** Another [aspectexample](#) of the current [inventiondisclosure](#) provides a method of detecting PSMA in a sample, comprising contacting the sample with the anti-PSMA construct according to (or as applied to) any of the [embodimentexamples](#) above conjugated to a detectable label, and detecting the presence of the label. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, provided the sample comprises cells expressing PSMA.

**[0025]** Another [aspectexample](#) of the current [inventiondisclosure](#) provides a method of treating an individual having a PSMA-associated disease or disorder, comprising administering to the individual an effective amount of the pharmaceutical composition according to (or as applied to) any of the [embodimentexamples](#) above. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, provided is a method of treating an individual having a PSMA-associated disease or disorder, comprising administering to the individual an effector cell that has been genetically modified with one or more nucleic acids that encode the anti-PSMA CAR according to (or as applied to) any of the [embodimentexamples](#) above, or the anti-PSMA caTCR according to (or as applied to) any of the [embodimentexamples](#) above. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the method comprises genetically modifying the effector cell with the one or more nucleic acids prior to administration. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexample](#) above, the one or more nucleic acids that encode the anti-PSMA CAR or the anti-PSMA caTCR also encode a CSR or a tandem scFv. In some [embodimentexamples](#) according to (or as applied to) any of the

[embodimentexamples](#) above, the method comprises further genetically modifying the effector cell with one or more additional nucleic acids encoding a CSR or a tandem scFv. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the tandem scFv specifically binds PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the tandem scFv specifically binds an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the CSR specifically binds PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the CSR specifically binds an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, provided is a method of treating an individual having a PSMA-associated disease or disorder, comprising administering to the individual an effector cell that has been genetically modified with one or more nucleic acids that encode the anti-PSMA tandem scFv according to (or as applied to) any of the [embodimentexamples](#) above, or anti-PSMA CSR according to (or as applied to) any of the [embodimentexamples](#) above. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the method comprises genetically modifying the effector cell with the one or more nucleic acids prior to administration. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the one or more nucleic acids that encode the anti-PSMA CSR or anti-PSMA tandem scFv also encode a CAR or a caTCR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the method comprises further genetically modifying the effector cell with one or more additional nucleic acids encoding a CAR or a caTCR. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the CAR specifically binds PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the CAR specifically binds an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR specifically binds PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the caTCR specifically binds an antigen other than PSMA. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the effector cell is an immune cell. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the immune cell is a T cell. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the T cell is a cytotoxic T cell, a helper T cell, or a natural killer T cell. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the method further comprises obtaining an effector cell from an individual prior to genetically modifying and administering the effector cell. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the individual from whom the effector cell is obtained is the individual to whom the genetically modified effector cell is administered. In some [embodimentexamples](#) according to (or as applied to) any of the [embodimentexamples](#) above, the individual from whom the effector cell is obtained is not the individual to whom the genetically modified effector cell is administered. In some

embodimentexamples according to (or as applied to) any of the embodimentexamples above, the genetically modified effector cell is allogenic with respect to the individual to whom the genetically modified effector cell is administered. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the genetically modified effector cell is syngeneic with respect to the individual to whom the genetically modified effector cell is administered. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the genetically modified effector cell is xenogeneic respect to the individual to whom the genetically modified effector cell is administered. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the method of treating the individual having the PSMA-associated disease or disorder comprises administering an additional therapy to the individual. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the PSMA-associated disease or disorder is cancer. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the cancer is selected from the group consisting of: prostate cancer, renal cancer cell, uterine cancer, and liver cancer. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the cancer is prostate cancer. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the prostate cancer is hormone-refractory prostate cancer or metastatic prostate cancer. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the cancer is renal cancer. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the renal cancer is clear cell renal cell cancer (CCRCC). In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the individual having the PSMA-associated disease or disorder is a mammal. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the mammal is a human.

**[0026]** Another aspectexample of the current inventiondisclosure provides a method of diagnosing an individual suspected of having a PSMA-associated disease or disorder, comprising: a) administering an effective amount of the anti-PSMA construct according to (or as applied to) any of the embodimentexamples above conjugated to a detectable label to the individual; and b) determining the level of the label in the individual, wherein a level of the label above a threshold level indicates that the individual has the PSMA-associated disease or disorder. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, provided is a method of diagnosing an individual suspected of having a PSMA-associated disease or disorder, comprising: a) contacting a sample derived from the individual with the anti-PSMA construct according to (or as applied to) any of the embodimentexamples above conjugated to a detectable label; and b) determining the number of cells bound with the anti-PSMA construct in the sample, wherein a value for the number of cells bound with the anti-PSMA construct above a threshold level indicates that the individual has the PSMA-associated disease or disorder. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the PSMA-associated disease or disorder is cancer. In some embodimentexamples according to (or as applied to) any of the

embodimentexamples above, the cancer is selected from the group consisting of: prostate cancer, renal cancer cell, uterine cancer, and liver cancer. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the cancer is prostate cancer. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the prostate cancer is hormone-refractory prostate cancer or metastatic prostate cancer. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the cancer is renal cancer. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the renal cancer is clear cell renal cell cancer (CCRCC). In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the individual suspected of having a disease or disorder associated with expression, aberrant expression, and/or aberrant activity of PSMA is a mammal. In some embodimentexamples according to (or as applied to) any of the embodimentexamples above, the mammal is a human.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0027]** FIG. 1 shows the results of flow cytometry experiments that were performed to assess the binding phase clones A and B to PSMA-positive and PSMA-negative cells.

**[0028]** FIG. 2 shows the results experiments that were performed to assess specific killing of target cells by T cells expressing a CAR comprising an scFv moiety derived from Clone A or Clone B.

**[0029]** FIG. 3 shows the results experiments that were performed to assess specific IFN gamma release by T cells expressing a CAR comprising an scFv moiety derived from Clone A or Clone B.

**[0030]** FIG. 4 provides a schematic depiction of an exemplary caTCR. The Fab fragment is derived from Clone A or Clone B.

**[0031]** FIG. 5 shows the results of flow cytometry experiments confirming that Clone A and Clone B can be used in multiple receptor configurations (e.g., CAR or caTCR + CSR) to stimulate T-cell proliferation in response to antigen.

**[0032]** FIG. 6 shows the results of experiments performed to assess the specific killing of three PSMA<sup>+</sup> target cell lines by T cells expressing Clone A and/or Clone B in different anti-PSMA construct configurations and construct combinations.

**[0033]** FIG. 7 shows the results of additional experiments performed to assess the specific killing of three PSMA<sup>+</sup> target cell lines by T cells expressing Clone A and/or Clone B in different anti-PSMA construct configurations and construct combinations.

## CLAIMS

1. An anti-prostate specific membrane antigen (PSMA) construct comprising an anti-PSMA antibody moiety specifically recognizing an extracellular domain of a cell surface-bound PSMA that comprises an amino acid sequence set forth in SEQ ID NO: 44, wherein the anti-PSMA antibody moiety comprises:

i) a heavy chain variable domain (V<sub>H</sub>) comprising a CDR-H1 comprising the amino acid sequence of any one of SEQ ID NOs: 1-2, or a variant thereof comprising up to about 5 amino acid substitutions, a CDR-H2 comprising the amino acid sequence of any one of SEQ ID NOs: 3-4, or a variant thereof comprising up to about 5 amino acid substitutions, and a CDR-H3 comprising the amino acid sequence of any one of SEQ ID NOs: 5-6, or a variant thereof comprising up to about 5 amino acid substitutions; and

ii) a light chain variable domain (V<sub>L</sub>) comprising a CDR-L1 comprising the amino acid sequence of any one of SEQ ID NOs: 7-8, or a variant thereof comprising up to about 5 amino acid substitutions, a CDR-L2 comprising the amino acid sequence GNS or SSN, or a variant thereof comprising about 2 amino acid substitutions, and a CDR-L3 comprising the amino acid sequence of any one of SEQ ID NOs: 9-10, or a variant thereof comprising up to about 5 amino acid substitutions.

2. The anti-PSMA construct of claim 1, wherein the anti-PSMA antibody moiety comprises:  
i) a V<sub>H</sub> comprising a CDR-H1 comprising the amino acid sequence of any one of SEQ ID NOs: 1-2, a CDR-H2 comprising the amino acid sequence of any one of SEQ ID NOs: 3-4, and a CDR-H3 comprising the amino acid sequence of any one of SEQ ID NOs: 5-6; and ii) a V<sub>L</sub> comprising a CDR-L1 comprising the amino acid sequence of any one of SEQ ID NOs: 7-8, a CDR-L2 comprising the amino acid sequence of GNS or SNN, and a CDR-L3 comprising the amino acid sequence of any one of SEQ ID NOs: 9-10.

3. An anti-PSMA construct comprising an anti-PSMA antibody moiety specifically recognizing an extracellular domain of a cell surface-bound PSMA that comprises an amino acid sequence set forth in SEQ ID NO: 44, wherein the anti-PSMA antibody moiety comprises a CDR-H1, a CDR-H2, and a CDR-H3 of a V<sub>H</sub> set forth in SEQ ID NO: 16 or 17 and a CDR-L1, a CDR-L2, and a CDR-L3 of a V<sub>L</sub> set forth in SEQ ID NO: 18 or 19.

4. The anti-PSMA construct of claim 3, wherein the anti-PSMA antibody moiety comprises:  
(a) the CDR-H1, CDR-H2, and CDR-H3 of the V<sub>H</sub> set forth in SEQ ID NO: 16 and the CDR-L1, the CDR-L2, and the CDR-L3 of the V<sub>L</sub> set forth in SEQ ID NO: 18; or

(b) the CDR-H1, CDR-H2, and CDR-H3 of the V<sub>H</sub> set forth in SEQ ID NO: 17 and the CDR-L1, the CDR-L2, and the CDR-L3 of the V<sub>L</sub> set forth in SEQ ID NO: 19.

5. An anti-PSMA construct comprising an anti-PSMA antibody moiety specifically recognizing an extracellular domain of a cell surface-bound PSMA that comprises an amino acid sequence set forth in SEQ ID NO: 44, wherein the anti-PSMA antibody moiety comprises:

i) a V<sub>H</sub> comprising the amino acid sequences of SEQ ID NOs: 1, 3, and 5, and a V<sub>L</sub> comprising the amino acid sequences of SEQ ID NO: 7, GNS, and SEQ ID NO: 9; or

ii) a V<sub>H</sub> comprising the amino acid sequences of SEQ ID NOs: 2, 4, and 6, and a V<sub>L</sub> comprising the amino acid sequences of SEQ ID NO: 8, SSN, and SEQ ID NO: 10.

2. ~~The anti-PSMA construct of claim 1, wherein the antibody moiety comprises:~~

~~i) a heavy chain variable domain (V<sub>H</sub>) comprising a CDR-H1 comprising the amino acid sequence of any one of SEQ ID NOs: 1-2, or a variant thereof comprising up to about 5 amino acid substitutions, a CDR-H2 comprising the amino acid sequence of any one of SEQ ID NOs: 3-4, or a variant thereof comprising up to about 5 amino acid substitutions, and a CDR-H3 comprising the amino acid sequence of any one of SEQ ID NOs: 5-6, or a variant thereof comprising up to about 5 amino acid substitutions; and~~

~~ii) a light chain variable domain (V<sub>L</sub>) comprising a CDR-L1 comprising the amino acid sequence of any one of SEQ ID NOs: 7-8, or a variant thereof comprising up to about 5 amino acid substitutions, a CDR-L2 comprising the amino acid sequence GNS or SSN, or a variant thereof comprising about 2 amino acid substitutions, and a CDR-L3 comprising the amino acid sequence of any one of SEQ ID NOs: 9-10, or a variant thereof comprising up to about 5 amino acid substitutions.~~

3. ~~The anti-PSMA construct of claim 2, wherein the antibody moiety comprises: i) a V<sub>H</sub> comprising a CDR-H1 comprising the amino acid sequence of any one of SEQ ID NOs: 1-2, a CDR-H2 comprising the amino acid sequence of any one of SEQ ID NOs: 3-4, and a CDR-H3 comprising the amino acid sequence of any one of SEQ ID NOs: 5-6; and ii) a V<sub>L</sub> comprising a CDR-L1 comprising the amino acid sequence of any one of SEQ ID NOs: 7-8, a CDR-L2 comprising the amino acid sequence of GNS or SSN, and a CDR-L3 comprising the amino acid sequence of any one of SEQ ID NOs: 9-10.~~

46. The anti-PSMA construct of any one of claims 1-5~~claim 2 or 3~~, wherein the anti-PSMA antibody moiety comprises

a) a V<sub>H</sub> comprising a CDR-H1 comprising the amino acid sequence of SEQ ID NO: 1, a CDR-H2 comprising the amino acid sequence of SEQ ID NO: 3, and a CDR-H3 comprising the amino acid sequence of SEQ ID NO: 5; and a ~~light chain variable domain (V<sub>L</sub>)~~ comprising a CDR-L1 comprising the amino acid sequence of SEQ ID NO: 7, a CDR-L2 comprising the amino acid sequence GNS, and a CDR-L3 comprising the amino acid sequence of SEQ ID NO: 9; or

b) a V<sub>H</sub> comprising a CDR-H1 comprising the amino acid sequence of SEQ ID NO: 2, a CDR-H2 comprising the amino acid sequence of SEQ ID NO: 4, and a CDR-H3 comprising the amino acid sequence of SEQ ID NO: 6; and a V<sub>L</sub> comprising a CDR-L1 comprising the amino acid sequence of SEQ ID NO: 8, a CDR-L2 comprising the amino acid sequence SNN, and a CDR-L3 comprising the amino acid sequence of SEQ ID NO: 10.

~~5. The anti-PSMA construct of claim 1, wherein the antibody moiety comprises a CDR-H1, a CDR-H2, and a CDR-H3 of a heavy chain variable domain (V<sub>H</sub>) set forth in SEQ ID NO: 16 or 17 and a CDR-L1, a CDR-L2, and a CDR-L3 of a light chain variable domain (V<sub>L</sub>) set forth in SEQ ID NO: 18 or 19.~~

~~6. The anti-PSMA construct of claim 5, wherein the antibody moiety comprises:  
—— (a) the CDR-H1, CDR-H2, and CDR-H3 of the V<sub>H</sub> set forth in SEQ ID NO: 16 and the CDR-L1, the CDR-L2, and the CDR-L3 of the V<sub>L</sub> set forth in SEQ ID NO: 18; or  
—— (b) the CDR-H1, CDR-H2, and CDR-H3 of the V<sub>H</sub> set forth in SEQ ID NO: 17 and the CDR-L1, the CDR-L2, and the CDR-L3 of the V<sub>L</sub> set forth in SEQ ID NO: 19.~~

7. The anti-PSMA construct of any one of claims 1-6, wherein the anti-PSMA antibody moiety comprises:

i) a V<sub>H</sub> comprising the amino acid sequence of SEQ ID NO: 16 ~~or, SEQ ID NO: 17~~, or an amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 16 or 17; and a V<sub>L</sub> comprising the amino acid sequence of SEQ ID NO: 18 ~~or, SEQ ID NO: 19~~, or an amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 18 or 19;

ii) a V<sub>H</sub> comprising the amino acid sequence of SEQ ID NO: 16, or an amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 16, and a V<sub>L</sub> comprising the amino acid sequence of SEQ ID NO: 18, or an amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 18;

iii) a V<sub>H</sub> comprising the amino acid sequence of SEQ ID NO: 17 or an amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 17, and a V<sub>L</sub> comprising the amino acid sequence of SEQ ID NO: 19, or an amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 19;

iv) a V<sub>H</sub> comprising ~~the~~ amino acid sequence of SEQ ID NO: 16 and a V<sub>L</sub> comprising the amino acid sequence of SEQ ID NO: 18; or

v) a V<sub>H</sub> comprising ~~the~~ amino acid sequence of SEQ ID NO: 17 and a V<sub>L</sub> comprising the amino acid sequence of SEQ ID NO: 19.

~~8. The anti-PSMA construct of claim 1, wherein the antibody moiety comprises:~~

~~——— i) a heavy chain variable domain (V<sub>H</sub>) comprising the amino acid sequences of SEQ ID NOs: 1, 3, and 5, and a light chain variable domain (V<sub>L</sub>) comprising the amino acid sequence of SEQ ID NO: 7, GNS, and SEQ ID NO: 9; or~~

~~——— ii) a V<sub>H</sub> comprising the amino acid sequences of SEQ ID NOs: 2, 4, and 6, and a V<sub>L</sub> comprising the amino acid sequence of SEQ ID NO: 8, SSN, and SEQ ID NO: 10.~~

98. The anti-PSMA construct of any one of claims 1-8, wherein the anti-PSMA antibody moiety ~~specifically recognizing PSMA~~ is chimeric, human, partially humanized, fully humanized, or semi-synthetic.

109. The anti-PSMA construct of any one of claims 1-89, wherein the anti-PSMA antibody moiety ~~specifically recognizing PSMA~~ is a full-length antibody, a Fab, a Fab', a F(ab')<sub>2</sub>, an Fv, or a single chain Fv (scFv).

110. The anti-PSMA construct of claim 910, wherein the anti-PSMA antibody moiety ~~specifically recognizing PSMA~~ is an scFv.

121. The anti-PSMA construct of claim 110, wherein the scFv comprises:

i) the amino acid sequence set forth in SEQ ID NO: 20<sub>1</sub> or an amino acid sequence ~~having that has~~ at least about 85%<sub>1</sub> sequence identity to SEQ ID NO: 20; or

ii) the amino acid sequence set forth in SEQ ID NO: 21<sub>1</sub> or an amino acid sequence ~~having that has~~ at least about 85%, ~~90%, or 95%~~ sequence identity to SEQ ID NO: 21.

1312. The anti-PSMA construct of claim 910, wherein the anti-PSMA construct is a full-length antibody<sub>1</sub>.

13. ~~The anti-PSMA construct of claim 12, and~~ wherein the full-length antibody comprises:

i) a ~~V<sub>H</sub> heavy chain~~ comprising the amino acid sequence of SEQ ID NO: 39<sub>1</sub> or an amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 39<sub>1</sub> and a ~~V<sub>L</sub> light chain~~ comprising the amino acid sequence of SEQ ID NO: 40<sub>1</sub> or amino acid sequence having at least about 85% sequence identity to SEQ ID NO: 40; or

ii) a ~~V<sub>H</sub> heavy chain~~ comprising the amino acid sequence of ~~SEQ~~ ID NO: 41<sub>1</sub> or an amino acid sequence having at least about 85% sequence identity to -SEQ ID NO: 41<sub>1</sub> and a ~~V<sub>L</sub> light chain~~ comprising the amino acid sequence of SEQ ID NO: 42<sub>1</sub> or an amino acid sequence having at least about 85% sequence identity to -SEQ ID NO: 42.

14. The anti-PSMA construct of any one of claims 1-13, wherein the anti-PSMA construct is monospecific.

15. The anti-PSMA construct of any one of claims 1-13, wherein the anti-PSMA construct is multispecific.

16. The anti-PSMA construct of claim 15, wherein the anti-PSMA construct is bispecific.

17. The anti-PSMA construct of claim 15 or 16, wherein the anti-PSMA construct is a tandem scFv, a diabody (Db), a single chain diabody (scDb), a dual-affinity retargeting (DART) antibody, a F(ab')<sub>2</sub>, a dual variable domain (DVD) antibody, a knob-into-hole (KiH) antibody, a dock and lock (DNL) antibody, a chemically cross-linked antibody, a heteromultimeric antibody, or a heteroconjugate antibody.

18. The anti-PSMA construct of any one of claims 15-17, wherein the anti-PSMA construct further comprises a second antibody moiety specifically recognizing a second antigen.

19. The anti-PSMA construct of claim 18, wherein the second antigen is an antigen on the surface of a B cell, a natural killer cell, a dendritic cell, a macrophage, a monocyte, a neutrophil, or a T cell.

~~20.~~ The anti-PSMA construct of claim 19, ~~optionally~~ wherein the antigen on the surface of the T cell is selected from the group consisting of CD3γ, CD3δ, CD3ε, CD3ζ, CD28, OX40, GITR, CD137, CD27, CD40L, and HVEM.

~~2021.~~ The anti-PSMA construct of any one of claims 1-1~~12~~, wherein the anti-PSMA construct is a CAR comprising:

- (a) an extracellular domain comprising the anti-PSMA antibody moiety;
- (b) a transmembrane domain; and
- (c) an intracellular signaling domain.

~~2122.~~ The anti-PSMA construct of claim ~~210~~, wherein the intracellular signaling domain comprises a primary immune cell signaling sequence derived from CD3ζ, TCRζ, FcRγ, FcRβ, CD3γ, CD3δ, CD3ε, CD5, CD22, CD79a, CD79b, or CD66d.

~~2223.~~ The anti-PSMA construct of claim ~~2122~~, wherein the intracellular signaling domain further comprise a costimulatory signaling sequence derived from CD28, 4-1BB, ICOS, or OX40.

~~2324.~~ The anti-PSMA construct of any one of claims ~~2021-2223~~, wherein the intracellular signaling domain comprises a primary immune cell signaling sequence derived from CD3ζ and a costimulatory signaling sequence derived from CD28.

~~2425.~~ The anti-PSMA construct of any one of claims ~~2021-2324~~, comprising:

- i) the amino acid sequence of SEQ ID NO: 29, or an amino acid sequence ~~having that has~~ at least about 85% sequence identity to SEQ ID NO: 29; or

ii) ~~the amino acid sequence of~~ SEQ ID NO: 30<sub>1</sub> or an amino acid sequence ~~having that~~ ~~has~~ at least about 85% sequence identity to SEQ ID NO: 30.

2526. The anti-PSMA construct of any one of claims 1-~~89~~, wherein the anti-PSMA construct is a caTCR comprising:

(a) an extracellular domain comprising the anti-PSMA antibody moiety; and

(b) a T cell receptor module (TCRM) comprising a first TCR domain (TCRD) comprising a first TCR transmembrane domain (TCR-TM) and a second TCRD comprising a second TCR-TM, wherein the TCRM facilitates recruitment of at least one TCR-associated signaling molecule.

2627. The anti-PSMA construct of claim 2526, wherein the first TCR-TM and the second TCR-TM are derived from a  $\gamma/\delta$  TCR<sub>1</sub>.

28. The anti-PSMA construct of claim 27, wherein:

~~optionally wherein~~ the first TCR-TM is derived from a TCR  $\gamma$  chain and the second TCR-TM is derived from a TCR  $\delta$  chain<sub>1</sub>; or

~~ii) optionally wherein~~ the first TCR-TM is derived from a TCR  $\delta$  chain and the second TCR-TM is derived from a TCR  $\gamma$  chain.

2729. The anti-PSMA construct of any one of claims 26-28~~claim 27~~, wherein the anti-PSMA construct comprises:

i) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 31<sub>1</sub> or an amino acid sequence ~~having that has~~ at least about 85% sequence identity to SEQ ID NO: 31<sub>1</sub> and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 32<sub>1</sub> or ~~an amino acid sequence~~ ~~having that has~~ at least about 85% sequence identity to SEQ ID NO: 32;

ii) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 34<sub>1</sub> or an amino acid sequence ~~having that has~~ at least about 85% sequence identity to SEQ ID NO: 34<sub>1</sub> and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 35<sub>1</sub> or an amino acid sequence ~~having that has~~ at least about 85% sequence identity to SEQ ID NO: 35;

iii) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 165<sub>1</sub> or an amino acid sequence ~~having that has~~ at least about 85% sequence identity to SEQ ID NO: 165<sub>1</sub> and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 166<sub>1</sub> or an amino acid sequence ~~having that has~~ at least about 85% sequence identity to SEQ ID NO: 166;

iv) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 167<sub>1</sub> or an amino acid sequence ~~having that has~~ at least about 85% sequence identity to SEQ ID NO: 167<sub>1</sub> and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 168<sub>1</sub> or an amino acid sequence ~~having that has~~ at least about 85% sequence identity to SEQ ID NO: 168;

v) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 169, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 169, and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 170, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 170;

vi) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 171, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 171, and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 172, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 172;

vii) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 173, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 173, and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 174 or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 174;

viii) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 175, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 175, and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 176, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 176;

ix) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 177, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 177, and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 178, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 178; or

x) a first polypeptide chain comprising the amino acid sequence of SEQ ID NO: 179, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 179, and a second polypeptide chain comprising the amino acid sequence of SEQ ID NO: 180, or an amino acid sequence havingthat has at least about 85% sequence identity to SEQ ID NO: 180.

2830. The anti-PSMA construct of any one of claims 26-29~~25-27~~, wherein the TCR-associated signaling molecule is selected from the group consisting of CD3 $\delta$  $\epsilon$ , CD3 $\gamma$  $\epsilon$ , and CD3 $\zeta$  $\zeta$ .

2931. The anti-PSMA construct of any one of claims 26-30~~25-28~~, wherein the caTCR lacks a functional primary immune cell signaling domain.

3032. The anti-PSMA construct of any one of claims 1-89, wherein the anti-PSMA construct is a chimeric signaling receptor (CSR) comprising:

- i) a ligand-binding module that is capable of binding or interacting with PSMA;
- ii) a transmembrane module; and
- iii) a co-stimulatory immune cell signaling module ~~that is capable of providing a co-stimulatory signal to the effector cell,~~

wherein the ligand-binding module and the co-stimulatory immune cell signaling module are not derived from the same molecule, and wherein the CSR lacks a functional primary immune cell signaling domain.

~~31~~33. The anti-PSMA construct of claim ~~30~~32, wherein the CSR lacks any primary immune cell signaling sequences.

~~32~~34. The anti-PSMA construct of claim ~~32~~30 or ~~33~~31, wherein the ligand-binding module comprises the anti-PSMA construct of any one of claims 1-~~24~~25.

~~33~~35. The anti-PSMA construct of any one of claims ~~32-34~~30 to 32, wherein the transmembrane module of the CSR and the co-stimulatory immune cell signaling module of the CSR are from the same molecule.

~~36~~. The anti-PSMA construct of claim ~~25~~, ~~optionally~~ wherein the molecule is selected from the group consisting of CD28, 4-1BB (CD137), OX40, CD30, CD27, CD40, PD-1, ICOS, lymphocyte function-associated antigen-1 (LFA-1), CD2, CD7, LIGHT, NKG2C, B7-H3, and a ligand that specifically binds with CD83.

~~34~~37. The anti-PSMA construct of any one of claims ~~32-36~~30-33, wherein the transmembrane module of the CSR and the co-stimulatory immune cell signaling module of the CSR are from different molecules.

~~38~~. The anti-PSMA construct of any one of claims ~~32-37~~, ~~optionally~~ wherein the transmembrane module of the CSR comprises a transmembrane domain derived from CD28, CD3 $\epsilon$ , CD3 $\zeta$ , CD45, CD4, CD5, CD8, CD9, CD16, CD22, CD27, CD30, CD33, CD37, CD64, CD80, CD86, CD134, CD137, CD154, 4-1BB, OX40, the  $\alpha$ ,  $\beta$ ,  $\delta$ ,  $\gamma$ , or  $\zeta$  chain of the T-cell receptor, a sequence comprising the amino acid sequence of any one of SEQ ID NOs 94-99, or an amino acid sequence ~~having that has~~ at least about 85% sequence identity to any one of SEQ ID NOS: 94-99.

~~39~~. The anti-PSMA construct of any one of claims ~~32-38~~, ~~optionally~~ wherein the co-stimulatory immune cell signaling module is derived from the intracellular domain of a co-stimulatory receptor of a TCR.

~~40~~. The anti-PSMA construct of claim ~~39~~, ~~optionally~~ wherein the co-stimulatory receptor is selected from the group consisting of 4-1BB, CD27, CD28, CD30, OX40, ICOS, CD40, a sequence comprising the amino acid sequence of any one of SEQ ID NOs: 100-103 and 183, or an amino acid sequence having that has at least about 85% sequence identity to any one of SEQ ID NOs: 100-103 and 183.

~~35~~41. The anti-PSMA construct of any one of claims ~~33-40~~31-34, comprising the amino acid sequence of any one of SEQ ID NOS: 37-38, 55-84, 93, and 184-186, or an amino acid sequence

~~having that has~~ at least about 85% sequence identity to any one of -SEQ ID NOS: 37-38, 55-84, 93, and 184-186;

~~42. The anti-PSMA construct of any one of claims 32-41, optionally~~ wherein the anti-PSMA construct further comprising a signal peptide;

~~43. The anti-PSMA construct of claim 42, optionally~~ wherein the signal peptide comprises the amino acid sequence of ~~METDTLLLWVLLLWVPGSTG~~ SEQ ID NO: 128.

~~3644.~~ The anti-PSMA construct of any one of claims 1-~~2019~~, wherein the anti-PSMA construct is conjugated to an effector molecule, wherein the effector molecule is a detectable label or a therapeutic agent selected from the group consisting of: a drug, a toxin, a radioisotope, a protein, a peptide, and a nucleic acid.

~~37. An effector cell that has been genetically modified with one or more nucleic acids encoding the anti-PSMA CAR of any one of claims 20-24 or the anti-PSMA caTCR of any one of claims 25-29,~~

~~wherein the one or more nucleic acids encoding the anti-PSMA CAR or anti-PSMA caTCR also encode a CSR comprising a ligand binding module that binds a target antigen or a tandem scFv that comprises a first scFv that binds a target antigen; or~~

~~wherein the effector cell has been genetically modified with one or more additional nucleic acids encoding a CSR comprising a ligand binding module that binds a target antigen or a tandem scFv that comprises a first scFv that binds a target antigen;~~

~~optionally wherein the effector cell is an immune cell,~~

~~optionally, wherein the immune cell is a T cell,~~

~~optionally wherein the T cell is a cytotoxic T cell, a helper T cell, or a natural killer T cell.~~

~~38. An effector cell that has been genetically modified with one or more nucleic acids encoding the anti-PSMA tandem scFv of any one of claims 17-19 or the anti-PSMA CSR of any one of claims 30-35,~~

~~optionally wherein the effector cell is an immune cell,~~

~~optionally, wherein the immune cell is a T cell,~~

~~optionally wherein the T cell is a cytotoxic T cell, a helper T cell, or a natural killer T cell.~~

~~39. A method of producing an effector cell, comprising genetically modifying a cell with one or more nucleic acids encoding the anti-PSMA CAR of any one of claims 20-24 or the anti-PSMA caTCR of any one of claims 25-29~~

~~optionally wherein the one or more nucleic acids encoding the anti-PSMA CAR or anti-PSMA caTCR also encode a CSR comprising a ligand binding module that binds a target antigen, or a tandem scFv that comprises a first scFv that binds a target antigen; or~~

~~optionally wherein the method further comprises further genetically modifying the cell with one or more additional nucleic acids encoding a CSR comprising a ligand binding module that binds a target antigen or a tandem scFv that comprises a first scFv that binds a target antigen;~~

~~optionally wherein the effector cell is an immune cell,~~

~~optionally, wherein the immune cell is a T cell,~~

~~optionally wherein the T cell is a cytotoxic T cell, a helper T cell, or a natural killer T cell.~~

~~40. A method of producing an effector cell, comprising genetically modifying a cell with one or more nucleic acids encoding the anti-PSMA tandem scFv of any one of claims 17-19 or the anti-PSMA CSR of any one of claims 30-35;~~

~~optionally wherein the effector cell is an immune cell,~~

~~optionally, wherein the immune cell is a T cell,~~

~~optionally wherein the T cell is a cytotoxic T cell, a helper T cell, or a natural killer T cell.~~

~~41. A nucleic acid encoding the polypeptide portion(s) of the anti-PSMA construct of any one of claims 1-35.~~

~~42. A vector comprising the nucleic acid of claim 41.~~

~~43. A host cell comprising the nucleic acid of claim 41, or the vector of 42.~~

~~44. A method of producing the anti-PSMA construct of any one of claims 1-19, comprising culturing the host cell of claim 43 under conditions where the anti-PSMA construct is expressed, and recovering the anti-PSMA construct produced by the host cell.~~

~~45. A pharmaceutical composition comprising the anti-PSMA construct of any one of claims 1-19 and 36, the effector cell of claim 37 or 38, the nucleic acid of claim 41, and/or the vector of claim 42 and a pharmaceutical acceptable carrier.~~

~~46. A kit comprising the anti-PSMA construct of any one of claims 1-19 and 36, the effector cell of claim 37 or 38, the nucleic acid of claim 41, the vector of claim 42, and/or the host cell of claim 43.~~

~~47. A method of detecting PSMA in a sample, comprising contacting the sample with the anti-PSMA construct of claim 36, wherein the effector molecule is a detectable label, and detecting the presence of the label.~~

~~48. A method of treating an individual having a PSMA-associated disease or disorder, comprising:~~

~~—— i) administering to the individual an effective amount of the pharmaceutical composition of claim 45; or~~

~~—— ii) administering to the individual an effector cell of 37 or 38;~~

~~—— optionally wherein the method further comprises administering an additional therapy to the individual;~~

~~—— optionally wherein the PSMA-associated disease or disorder is cancer;~~

~~—— optionally wherein the mammal is a human.~~

~~49. A method of diagnosing an individual suspected of having a PSMA-associated disease or disorder, comprising:~~

~~—— a) administering an effective amount of the anti-PSMA construct of claim 36, wherein the effector molecule is a detectable label, to the individual; and~~

~~—— b) determining the level of the label in the individual, wherein a level of the label above a threshold level indicates that the individual has the PSMA-associated disease or disorder;~~

~~—— optionally wherein PSMA-associated disease or disorder is cancer;~~

~~—— optionally wherein the mammal is a human.~~

~~50. A method of diagnosing an individual suspected of having a PSMA-associated disease or disorder, comprising:~~

~~—— a) contacting a sample comprising cells derived from the individual with the anti-PSMA construct of claim 114; and~~

~~—— b) determining the number of cells in the sample bound to the anti-PSMA construct, wherein a value for the number of cells bound to the anti-PSMA construct above a threshold level indicates that the individual has the PSMA-associated disease or disorder;~~

~~—— optionally wherein PSMA-associated disease or disorder is cancer;~~

~~—— optionally wherein the mammal is a human~~