~~What is Claimed~~CLAIMS

1. An isolated modified B cell, capable of expressing a chimeric receptor (CAR-B), wherein said chimeric receptor comprises

a) an extracellular domain, wherein the extracellular domain comprises an extracellular binding domain and a hinge domain;

b) a transmembrane domain; and

c) a cytoplasmic domain that comprises at least one signaling domain.

~~2. The isolated modified B cell of claim 1, wherein said extracellular binding domain(s), recognizes at least one antigen or protein expressed on the surface of a target cell.~~

~~3. The isolated modified B cell of claim 1, wherein the extracellular binding domain(s) recognizes at least one antigen that is a secreted protein.~~

~~4. The isolated modified B cell of claim 3, wherein the secreted protein accumulates in the extracellular matrix.~~

~~5. The isolated modified B cell of claim 2, wherein said target cell is selected from the group consisting of a tumor cell, a cardiac muscle cell, a skeletal muscle cell, a bone cell, a blood cell, a nerve cell, a fat cell, a skin cell, an endothelial cell, a hepatocyte, a pulmonary epithelial cell, and a fibroblast cell.~~

~~6. The isolated modified B cell of claim 1, wherein said B cell expresses more than one CAR-B receptor construct.~~

~~7. The isolated modified B cell of claim 1, wherein said CAR-B receptor comprises more than one extracellular binding domain.~~

~~8. The isolated modified B cell of claim 1, wherein said extracellular binding domain is a single chain variable fragment (scFv), or a full-length antibody or an antibody fragment, or the extracellular domain of a receptor or ligand.~~

9. The isolated modified B cell of claim 1, wherein said extracellular binding domain is capable of binding to an antigen or protein selected from the group consisting of: PSMA, GPC3, ASGR1, ASGR2, Sarcoglycan, Corin, FAP, MUC1, CEA153, JAM-1, LAF-1 and Her2.

10. The isolated modified B cell of claim 1, wherein said hinge domain is derived from the group consisting of an immunoglobulin (e.g., IgG, IgM), CD28 and CD8.

11. The isolated modified B cell of claim 1, wherein said cytoplasmic domain comprises at least one signaling domain native to B cells receptors.

12. The isolated modified B cell of claim 1, wherein said cytoplasmic domain comprises at least one signaling domain that is an immunoglobulin.

13. The isolated modified B cell of claim 1, wherein said cytoplasmic domain comprises a domain that is selected from the group consisting of: CD79a (Immunoglobulin α), CD40, CD19, CD137, Fcγr2a, MyD88, CD21, Syk, FYN, LYN, PI3K, BTK, PLCγ2, CD3ζ and BLNK.

14. The isolated modified B cell of claim 13, wherein said cytoplasmic domain comprises domain that is CD79a.

15. The isolated modified B cell of claim 13, wherein said cytoplasmic domain further comprises a costimulatory domain.

16. An isolated modified B cell, wherein said B cell is capable of expressing and secreting a payload, wherein the payload is not naturally expressed in a B cell or is expressed at higher levels than is naturally expressed in a B cell.

17. The isolated modified B cell of claim 16, wherein the payload is an antibody or fragment thereof.

18. The isolated modified B cell of claim 17, wherein the antibody is a secreted antibody or fragment thereof

19. The isolated modified B cell of claim 17, wherein the antibody is membrane bound.

20. The modified B cell of claim 16, wherein said payload is selected from a group of cytokines, chemokines, T cell costimulatory molecules, and checkpoint molecules, the group consisting of: IL-1, IL-7, IL-8, IL-10, IL-12, IL-13, IL-17, IL-18, IL-21, interferon α, interferon β,

~~interferon γ, TSLP, CCL21, FLT3L, XCL1, LIGHT(TNFSF14), OX40L, CD137L, CD40L, ICOSL, anti-CD3 antibody, CD47, TIM4-FC, CXCL13, CCL21, CD80, CD40L, IFNα A2, LIGHT, 4-1BBL, MDGF (C19orf10), FGF10, PDGF, agrin, TNF-α, GM-CSF, an anti-FAP antibody, an anti-TGF-β antibody; a TGF-β trap, decoy or other inhibitory molecule; an anti-BMP antibody; a BMP trap, decoy or other inhibitory molecule.~~

~~21. The modified B cell of claim 16, wherein said B cell is capable of expressing more than one payload.~~

~~22. The modified B cell of claim 16, wherein said B cell is capable of expressing more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12 payloads.~~

~~23. A method of treating a patient comprising administering the modified B cell of claim 14.~~

~~24. The method of claim 23, wherein the modified B cell is administered intra-tumorally, intravenously, subcutaneously, intradermally, or within an inflammatory lesion~~

~~25. The method of claim 23, further comprising administering one or more checkpoint inhibitors, with or without an additional chemotherapeutic agent.~~

~~26. The method of claim 25, wherein the checkpoint inhibitor is capable of inhibiting a checkpoint molecule selected from the group consisting of: PD-1, PD-L1, CTLA-4, LAG3, TIM-3 and NKG2A.~~

~~27. The method of claim 23, further comprising administering a T cell costimulatory molecule.~~

~~28. The method of claim 27, wherein the T cell costimulatory molecule is selected from the group consisting of: CD80, CD86, ICOSL, 4-1BBL, OX40L, CD27, and LIGHT.~~

~~29. An isolated modified B cell, capable of expressing a chimeric receptor, wherein said chimeric receptor comprises~~

~~30. an extracellular domain, wherein the extracellular domain comprises an extracellular binding domain and a hinge domain;~~

~~31. a transmembrane domain; and~~

~~32. a cytoplasmic domain that comprises at least one signaling domain~~

33. wherein said modified B cell is further capable of expressing a payload, wherein the payload is not naturally expressed in a B cell.

34. The isolated modified B cell of claim 29, wherein said extracellular binding domain, recognizes an antigen or protein expressed on the surface of a target cell.

35. The isolated modified B cell of claim 29, wherein said extracellular binding domain, recognizes an antigen or protein that is secreted.

36. The isolated modified B cell of claim 29, wherein said target cell is selected from the group consisting of a tumor cell, a cardiac muscle cell, a skeletal muscle cell, a bone cell, a blood cell, a nerve cell, a fat cell, a skin cell, an endothelial cell, a hepatocyte, a pulmonary epithelial cell and a fibroblast.

37. The isolated modified B cell of claim 29, wherein said B cell expresses more than one CAR-B receptor construct.

38. The isolated modified B cell of claim 29, wherein said CAR-B receptor comprises more than one extracellular binding domain.

39. The isolated modified B cell of claim 29, wherein said extracellular binding domain is a single chain variable fragment (scFv), a full-length antibody, an antibody fragment or an extracellular domain of a receptor or ligand.

40. The isolated modified B cell of claim 29, wherein said extracellular binding domain is capable of binding to an antigen or protein selected from the group consisting of: PSMA, GP3, ASGR1, ASGR2, Sarcoglycan, Corin, and Her2, FAP, MUC1, CEA153, JAM-1, and LFA-1.

41. The isolated modified B cell of claim 29, wherein said hinge domain is derived from the group consisting of an immunoglobulin (for example, IgG or IgM), CD28 and CD8.

42. The isolated modified B cell of claim 29, wherein said cytoplasmic domain comprises at least one signaling domain native to B cells.

43. The isolated modified B cell of claim 29, wherein said cytoplasmic domain comprises at least one signaling domain that is an immunoglobulin.

44. The isolated modified B cell of claim 29, wherein said cytoplasmic domain comprises a domain selected from the group consisting of: CD79a (Immunoglobulin α), , CD40, CD19, CD137, Fcγr2a, MyD88, CD21, Syk, FYN, LYN, PI3K, BTK, PLCγ2, CD3ζ and BLNK.

45. The isolated modified B cell of claim 40, wherein the cytoplasmic domain comprises a domain that is CD79a (Immunoglobulin α).

46. The isolated modified B cell of claim 41, wherein said cytoplasmic domain further comprises a costimulatory domain.

47. The isolated modified B cell of claim 29, wherein the payload is a secreted or membrane bound antibody or fragment thereof.

48. The isolated modified B cell of claim 29, wherein said payload is selected from a group of cytokines, chemokines, T cell costimulatory molecules, and checkpoint molecules, the group consisting of: IL-1, IL-7, IL-8, IL-10, IL-12, IL-13, IL-17, IL-18, IL-21, interferon α, interferon β, interferon γ, TSLP, CCL21, FLT3L, XCL1, LIGHT(TNFSF14), OX40L, CD137L, CD40L, ICOSL, anti-CD3 antibody, CD47, TIM4-FC, CXCL13, CCL21, CD80, CD40L, IFNα A2, LIGHT , 4-1BBL, MDGF (C19orf10), FGF10, PDGF, agrin, TNF-α, GM-CSF, an anti-FAP antibody, an anti-TGF-β antibody; a TGF-β trap, decoy or other inhibitory molecule; an anti-BMP antibody; a BMP trap, decoy or other inhibitory molecule.

49. The isolated modified B cell of claim 29, wherein said B cell is capable of expressing more than one payload.

50. The isolated modified B cell of claim 29, wherein said B cell is capable of expressing more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12 payloads.

51. The isolated modified B cell of claim 29, wherein the modified B cell further encodes at least one protein selected from the group consisting of: the cytoplasmic domains of CD79a (Immunoglobulin α), CD79b (Immunoglobulin β), CD40, CD19, CD137, Fcγr2a, CD3ζ and MyD88.

52. A method of treating a patient comprising administering the modified B cell of claim 29.

53. The method of claim 48, further comprising administering a checkpoint inhibitor.

~~54. The method of claim 48, wherein the checkpoint inhibitor is capable of inhibiting a checkpoint molecule selected from the group consisting of: PD-1, PD-L1, CTLA-4, LAG3, TIM-3 and NKG2A.~~

~~55. The method of claim 50, wherein the checkpoint inhibitor is a monoclonal antibody.~~

~~56. An isolated modified B cell, capable of expressing a chimeric receptor, wherein said chimeric receptor comprises an extracellular domain, wherein said extracellular domain comprises a hinge domain and an extracellular binding domain, wherein said extracellular binding domain is not naturally expressed on a B cell; and wherein said extracellular binding domain is capable of recognizing a target of interest.~~

~~57. The isolated modified B cell of claim 52, wherein said binding domain is a single chain variable fragment (scFv), a full length antibody, an antibody fragment, an extracellular domain of a ligand or receptor.~~

~~58. The isolated modified B cell of claim 53, wherein said binding domain is an scFv.~~

~~59. The isolated modified B cell of claim 52, wherein herein said B cell is capable of expressing more than one chimeric receptor.~~

~~60. The isolated modified B cell of claim 52, wherein said B cell is further capable of expressing a payload.~~

~~61. A method of treating a patient comprising administering the modified B cell of claim 52.~~

~~62. A nucleic acid capable of expressing a chimeric B cell receptor, wherein said chimeric receptor comprises:~~

~~63. an extracellular domain, wherein said extracellular domain comprises an extracellular binding domain and a hinge domain;~~

~~64. a transmembrane domain; and~~

~~65. a cytoplasmic domain that comprises at least one signaling domain.~~

~~66. The nucleic acid of claim 58, wherein said extracellular binding domain, recognizes an antigen or protein expressed on the surface of a target cell.~~

67. The nucleic acid of claim 58, wherein said extracellular binding domain, recognizes an antigen or protein that is a secreted protein.

68. The nucleic acid of claim 58, wherein the secreted protein accumulates in the extracellular matrix.

69. The nucleic acid of claim 58, wherein said extracellular binding domain is a single chain variable fragment (scFv), a full length antibody, an antibody fragment or an extracellular domain of a receptor or ligand.

70. The nucleic acid of claim 58, wherein said target cell is selected from the group consisting of a tumor cell, a cardiac muscle cell, a skeletal muscle cell, a bone cell, a blood cell, a nerve cell, a fat cell, a skin cell, an endothelial cell, a hepatocyte, a pulmonary epithelial cell or a fibroblast.

71. The nucleic acid of claim 58, wherein said vector expresses more than one CAR-B receptor.

72. The nucleic acid of claim 58, wherein said CAR-B receptor expresses more than one extracellular binding domain.

73. The nucleic acid of claim 58, wherein said extracellular binding domain is capable of binding to an antigen or protein selected from the group consisting of: PSMA, GP3, ASGR1, AGSR2, Sarcoglycan, Corin, Her2, PAF1, MUC1, CEA153, JAM-1, and LFA-1.

74. The nucleic acid of claim 58, wherein said hinge domain is derived from the group consisting of an immunoglobulin domain (for example, IgG or IgM), CD28 and CD8.

75. The nucleic acid of claim 58, wherein said cytoplasmic domain comprises at least one signaling domain native to B cell receptors.

76. The nucleic acid of claim 58, wherein said cytoplasmic domain comprises a domain selected from the group consisting of: CD79a (Immunoglobulin α), CD79b (Immunoglobulin β), CD40, CD19, CD137, Fcγr2a, MyD88, CD21, Syk, FYN, LYN, PI3K, BTK, PLCγ2, CD3ζ and BLNK.

77. The nucleic acid of claim 69, wherein said cytoplasmic domain comprises a domain that is CD79a (Immunoglobulin α).

78. The nucleic acid of claim 69, wherein said cytoplasmic domain further comprises a costimulatory domain.

79. A vector comprising a nucleic acid capable of expressing a chimeric B cell receptor, wherein said chimeric receptor comprises:

80. an extracellular domain, wherein said extracellular domain comprises an extracellular binding domain and a hinge domain;

81. a transmembrane domain; and

82. a cytoplasmic domain that comprises at least one signaling domain.

83. The vector of claim 72, wherein said extracellular binding domain recognizes an antigen or protein expressed on the surface of a target cell.

84. The vector of claim 72, wherein said extracellular binding domain, recognizes an antigen or protein that is a secreted protein.

85. The vector of claim 72, wherein the secreted protein accumulates in the extracellular matrix.

86. The vector of claim 72,wherein said target cell is selected from the group consisting of a tumor cell, a cardiac muscle cell, a skeletal muscle cell, a bone cell, a blood cell, a nerve cell, a fat cell, a skin cell , an endothelial cell, a hepatocyte, a pulmonary epithelial cell or a fibroblast.

87. The vector of claim 72, wherein said vector expresses more than one CAR-B receptor.

88. The vector of claim 72, wherein said CAR-B expresses more than one extracellular binding domain.

89. The vector of claim 72, wherein said extracellular binding domain is a single chain variable fragment (scFv), a full-length antibody, an antibody fragment, an extracellular domain of a receptor or ligand.

90. The vector of claim 72, wherein said extracellular binding domain is capable of binding to an antigen or protein selected from the group consisting of: PSMA, GPC3, ASGR1, AGSR2, Sarcoglycan, Corin, Her2, PAF1, MUC1, CEA153, JAM-1, and LFA-1.

91. The vector of claim 72, wherein said hinge domain is derived from the group consisting an immunoglobulin domain (for example, IgG or IgM), CD28 and CD8.

92. The vector of claim 72, wherein said cytoplasmic domain comprises at least one signaling domain native to B cells.

93. The vector of claim 72, wherein said cytoplasmic domain comprises a signaling domain selected from the group consisting of: CD79a (Immunoglobulin α), CD79b (Immunoglobulin β), CD40, CD19, CD137, Fcγr2a, MyD88, CD21, Syk, FYN, LYN, PI3K, BTK, PLCγ2, CD3ζ and BLNK.

94. The vector of claim 72, wherein said cytoplasmic domain further comprises a costimulatory domain.

95. An isolated modified B cell, capable of expressing an integrin, a homing antibody, protein, a receptor, or combinations thereof, wherein said integrin, homing antibody, protein, or receptor is not naturally expressed in a B cell or is expressed at higher levels than is naturally expressed in a B cell; and wherein said integrin, homing antibody, protein, receptor, or combinations thereof is attracted to a site or target of interest.

96. The isolated modified B cell of claim 85, wherein the integrin, homing antibody, protein, and receptor is selected from CLA (PSGL-1 glycoform), CLA (PSGL-1 glycoform), CCR10, CCR3, CCR4, CCR5, CCR6, CCR9, CD43E, CD44, c-Met, CXCR3, CXCR4, LFA-1, LFA-1 (αLβ2), selectin ligands, VLA-4, VLA-4 (α4β1), and α4β7, or combinations thereof.

97. The isolated modified B cell of claim 86, wherein the site of interest is a homing or target tissue, an inflammatory site in a specific location or tissue, or a tumor or tumor microenvironment, where delivery of payloads is desirable.

98. The isolated modified B cell of claim 87, wherein the homing or target tissue is selected from skin, gut (intestine, colon, mesenteric lymph nodes (mLN), Peyer's Patch (PP), small intestine), liver, lung, bone marrow, heart, peripheral lymph node (LN), CNS, thymus, and bone marrow.

99. The isolated modified B cell of claim 88, wherein the target of interest is selected from CXCL16, CCL17, CCL17(22), CCL20 (MIP-3α), CCL21, CCL25, CCL27, CCL28, CCL4, CCL5, CD62E, CD62P, CXCL10, CXCL12, CXCL13, CXCL16, CXCL9/CXCL10, CXCR3, E/P-selectin, E-selectin, GPR15L, HGF, Hyaluronate, ICAM-1, ligands for CCR1, 2, 5, MAdCAM, MAdCAM-1, PNAd, VAP-1, VCAM, and VCAM-1, or combinations thereof.

100. A method of treating a patient comprising administering the isolated modified B cell of claim 82.

101. The method of claim 90, further comprising administering a compound or a derivative thereof, wherein the compound or derivative thereof is capable of modulating the expression of the integrin, homing antibody, protein, and receptor, or combinations thereof.

102. The method of claim 91, wherein the compound or a derivative thereof is capable of altering trafficking of B cells to a site or target of interest in the patient.

103. The method of claim 92, wherein the compound is all-trans-retinoic acid (ATRA) or a derivative thereof.

104. An isolated modified B cell, capable of expressing an immune inhibitory molecule, wherein said immune inhibitory molecule is not naturally expressed in a B cell or is expressed at higher levels than is naturally expressed in a B cell.

105. The isolated modified B cell of claim 94, wherein said immune inhibitory molecule is selected from IL-10, TGF-β, PD-L1, PD-L2, LAG-3, and TIM-3, or combinations thereof.

106. The isolated modified B cell of claim 95, wherein said immune inhibitory molecule is capable of decreasing inflammation and autoimmune activity of B cells at a site or target of interest in a patient.

107. A method of treating a patient comprising administering the isolated modified B cell of claim 94.

108. The method of claim 97, wherein said immune inhibitory molecule is selected from IL-10, TGF-β, PD-L1, PD-L2, LAG-3, and TIM-3, or combinations thereof.

~~109. The method of claim 98, wherein said immune inhibitory molecule is capable of decreasing inflammation and autoimmune activity of B cells at a site or target of interest in the patient.~~

~~110. The method of claim 99, further comprising administering a compound or a derivative thereof capable of increasing the expression of an integrin, a homing antibody, a protein, a receptor, or combinations thereof in the B cell.~~

~~111. The method of claim 100, wherein said compound or derivative thereof is capable of altering trafficking of B cells to a site or target of interest in the patient.~~

~~112. The method of claim 101, wherein said compound is all-trans-retinoic acid (ATRA) or a derivative thereof.~~

~~113. An isolated modified B cell, wherein the isolated modified B cell is treated with a compound or a derivative thereof, wherein said compound or derivative thereof is capable of increasing the expression of an integrin, a homing antibody, a protein, a receptor, or combinations thereof in B cells.~~

~~114. The isolated modified B cell of claim 103, wherein said compound or derivative thereof is capable of altering trafficking of B cells to a site or target of interest in the patient.~~

~~115. The isolated modified B cell of claim 104, wherein said compound is all-trans-retinoic acid (ATRA) or a derivative thereof~~

~~116. A method of treating a patient comprising administering the isolated modified B cell of claim 100, wherein said compound or derivative thereof is capable of (i) modulating the expression of an integrin, a homing antibody, a protein, a receptor, or combinations thereof in B cells, and (ii) altering trafficking of B cells to a site or target of interest in the patient.~~

~~117. The method of claim 106, wherein said compound is all-trans-retinoic acid (ATRA) or a derivative thereof.~~

~~118. An isolated modified B cell, capable of expressing at least one or more of a constitutively active Toll-like receptor (TLR), wherein said TLR is not naturally expressed in a B cell or is expressed at higher levels than is naturally expressed in a B cell.~~

~~119. The isolated modified B cell of claim 108, wherein said TLR is selected from TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, TLR11, TLR12, and TLR13, or combinations thereof.~~

~~120. The isolated modified B cell of claim 109, wherein said TLR is capable of potentiating B cells for increasing immune responses in a patient.~~

~~121. The isolated modified B cell of claim 110, wherein said TLR is capable of producing potent effector B cells for increasing immune responses in a patient.~~

~~122. A method of treating a patient comprising administering the isolated modified B cell of claim 108, wherein said immune inhibitory molecule is capable of decreasing inflammation and autoimmune activity of B cells at a site or target of interest in a patient.~~

~~123. The method of claim 112, wherein said TLR is selected from TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, TLR11, TLR12, and TLR13, or combinations thereof.~~

~~124. The method of claim 113, wherein said TLR is capable of (i) potentiating B cells, and (ii) producing potent effector B cells, for increasing immune responses in a patient.~~

~~125. The method of claim 114, further comprising administering at least one or more of a TLR agonist to the patient.~~

~~126. An isolated modified B cell, wherein the isolated modified B cell is treated with at least one or more of a TLR agonist.~~

~~127. The isolated modified B cell of claim 116, wherein said TLR agonist is capable of (i) potentiating B cells, and (ii) producing potent effector B cells, for increasing immune responses in a patient.~~

~~128. The isolated modified B cell of claim 117, wherein said TLR agonist binds to one or more TLRs selected from TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, TLR11, TLR12, and TLR13, or combinations thereof.~~

~~129. The isolated modified B cell of claim 118, wherein said TLR agonist is selected from CpG-rich oligonucleotides, double-stranded RNA mimic, polyinosinic acid:polycytidylic acid (poly-I:C).~~

~~130. The isolated modified B cell of claim 119, wherein said TLR agonist comprises CpG oligonucleotides.~~

~~131. A method of treating a patient comprising administering the isolated modified B cell of claim 116.~~

~~132. The method of claim 121, wherein said TLR agonist is capable of is capable of (i) potentiating B cells, and (ii) producing potent effector B cells, for increasing immune responses in the patient.~~

~~133. The method of claim 122, wherein said TLR agonist binds to one or more TLRs selected from TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, TLR11, TLR12, and TLR13, or combinations thereof.~~

~~134. The method of claim 123, wherein said TLR agonist is selected from CpG-rich oligonucleotides, double-stranded RNA mimic, polyinosinic acid:polycytidylic acid (poly-I:C).~~

~~135. The method of claim 124, wherein said TLR agonist comprises CpG oligonucleotides.~~

~~136. An isolated modified B cell, wherein said B cell is electroporated with an mRNA encoding at least one or more of an antigen fused to a targeting signal.~~

~~137. The isolated modified B cell of claim 126, wherein said antigen is (i) not naturally presented by a B cell, (ii) not presented by a B cell simultaneously in both HLA class I and class II molecules naturally, or (iii) not presented by a B cell with high efficiencies in both HLA class I and class II molecules naturally.~~

~~138. The isolated modified B cell of claim 127, wherein said targeting signal is targeting signal of a lysosomal protein.~~

~~139. The isolated modified B cell of claim 128, wherein said targeting signal is a targeting signal of lysosome-associated membrane protein-1 (LAMP1).~~

~~140. The isolated modified B cell of claim 129, wherein said antigen is capable of being targeted to the lysosomes and presented simultaneously and efficiently in both HLA class I and class II molecules.~~

141. The isolated modified B cell of claim 130, wherein said B cells is capable of increasing antigen-specific immune responses in a patient.

142. A method of treating a patient comprising administering the isolated modified B cell of claim 126.

143. The method of claim 132, wherein said antigen is (i) not naturally presented by a B cell, (ii) not presented by a B cell simultaneously by both HLA class I and class II molecules naturally, or (iii) not presented by a B cell with high efficiencies by both HLA class I and class II molecules naturally.

144. The method of claim 133, wherein said targeting signal is targeting signal of a lysosomal protein.

145. The method of claim 134, wherein said targeting signal is a targeting signal of lysosome-associated membrane protein-1 (LAMP1).

146. The method of claim 135, wherein said antigen is capable of being targeted to the lysosomes and presented simultaneously and efficiently in both HLA class I and class II molecules.

147. The method of claim 136, wherein said B cells is capable of increasing antigen-specific immune responses in the patient.

148. The method of any of the claims 132-137, wherein the patient is treated with more than one differently modified B cells.

149. The method of any one of the claims 132-137, wherein the patient is treated with more than two differently modified B cells.

140. An isolated modified B cell, capable of expressing a chimeric receptor (CAR-B), wherein said chimeric receptor comprises

a) an extracellular domain, wherein the extracellular domain comprises an extracellular binding domain and a hinge domain;

b) a transmembrane domain; and

c) a cytoplasmic domain.

~~141. The isolated modified B cell of claim 140, wherein the extracellular domain comprises an immunoglobulin domain.~~

~~142. The isolated modified B cell of claim 140, wherein the chimeric receptor is capable of forming a homologous dimer.~~

~~143. The isolated modified B cell of claim 140, wherein the extracellular binding domain, recognizes an antigen or protein expressed on the surface of a target cell.~~

~~144. The isolated modified B cell of claim 143, wherein said extracellular binding domain, recognizes an antigen or protein that is secreted.~~

~~145. The isolated modified B cell of claim 143, wherein said target cell is selected from the group consisting of a tumor cell, a cardiac muscle cell, a skeletal muscle cell, a bone cell, a blood cell, a nerve cell, a fat cell, a skin cell, an endothelial cell, a hepatocyte, a pulmonary epithelial cell and a fibroblast.~~

~~146. The isolated modified B cell of claim 143, wherein said extracellular binding domain is a single chain variable fragment (scFv), a full-length antibody, an antibody fragment or an extracellular domain of a receptor or ligand.~~

~~147. The isolated modified B cell of claim 143, wherein said extracellular binding domain is capable of binding to an antigen or protein selected from the group consisting of: PSMA, GP3, ASGR1, ASGR2, Sarcoglycan, Corin, and Her2, FAP, MUC1, CEA153, JAM-1, and LFA-1.~~

~~148. The isolated modified B cell of claim 14, wherein said hinge domain is derived from the group consisting of an immunoglobulin (for example, IgG or IgM), CD28 and CD8.~~

~~149. An isolated modified B cell, capable of expressing a chimeric receptor (CAR-B), wherein said chimeric receptor comprises the amino acid sequence SEQ ID NO: 146.~~

~~150. An isolated modified B cell, capable of expressing a chimeric receptor (CAR-B), wherein said chimeric receptor comprises the amino acid sequence SEQ ID NO: 142, SEQ ID NO: 144 or both.~~

2. An isolated modified B cell, wherein said B cell is capable of expressing and secreting a payload, wherein the payload is not naturally expressed in a B cell or is expressed at higher levels than is naturally expressed in a B cell.

3. The isolated modified B cell of claim 2, wherein the payload is an antibody or fragment thereof.

4. An isolated modified B cell, capable of expressing a chimeric receptor, wherein said chimeric receptor comprises

a) an extracellular domain, wherein the extracellular domain comprises an extracellular binding domain and a hinge domain;

b) a transmembrane domain; and

c) a cytoplasmic domain that comprises at least one signaling domain

wherein said modified B cell is further capable of expressing a payload, wherein the payload is not naturally expressed in a B cell.

5. The isolated modified B cell of any one of claims 2-4, wherein said payload is selected from a group of cytokines, chemokines, T cell costimulatory molecules, and checkpoint molecules, the group consisting of: IL-1, IL-7, IL-8, IL-10, IL-12, IL-13, IL-17, IL-18, IL-21, interferon a, interferon b, interferon g, TSLP, CCL21, FLT3L, XCL1, LIGHT(TNFSF14), OX40L, CD137L, CD40L, ICOSL, anti-CD3 antibody, CD47, TIM4-FC, CXCL13, CCL21, CD80, CD40L, IFNa A2, LIGHT , 4-1BBL, MDGF (C19orfl0), FGF10, PDGF, agrin, TNF-a, GM-CSF, an anti-FAP antibody, an anti-TGF-b antibody; a TGF-b trap, decoy or other inhibitory molecule; an anti-BMP antibody; a BMP trap, decoy or other inhibitory molecule.

6. The isolated modified B cell of claim 5, wherein said B cell is capable of expressing more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12 payloads.

7. An isolated modified B cell, capable of expressing a chimeric receptor, wherein said chimeric receptor comprises an extracellular domain, wherein said extracellular domain comprises a hinge domain and an extracellular binding domain, wherein said extracellular binding domain is not naturally expressed on a B cell; and wherein said extracellular binding domain is capable of recognizing a target of interest.

8. An isolated modified B cell, capable of expressing an integrin, a homing antibody, protein, a receptor, or combinations thereof, wherein said integrin, homing antibody, protein, or receptor is not naturally expressed in a B cell or is expressed at higher levels than is naturally expressed in a B cell; and wherein said integrin, homing antibody, protein, receptor, or combinations thereof is attracted to a site or target of interest, and wherein the integrin, homing antibody, protein, and receptor is selected from CLA (PSGL-1 gly coform), CLA (PSGL-1 gly coform), CCR10, CCR3, CCR4, CCR5, CCR6, CCR9, CD43E, CD44, c-Met, CXCR3, CXCR4, LFA-1, LFA-1 (aEb2), selectin ligands, VLA-4, VLA-4 (a4b1), and a4b7, or combinations thereof.

9. The isolated modified B cell of claim 8, wherein the site of interest is a homing or target tissue, an inflammatory site in a specific location or tissue, or a tumor or tumor microenvironment, where delivery of payloads is desirable.

10. The isolated modified B cell of claim 9, wherein the homing or target tissue is selected from skin, gut (intestine, colon, mesenteric lymph nodes (mLN), Peyer's Patch (PP), small intestine), liver, lung, bone marrow, heart, peripheral lymph node (LN), CNS, thymus, and bone marrow.

11. The isolated modified B cell of claim 10, wherein the target of interest is selected from CXCL16, CCL17, CCL17(22), CCL20 (MIP-3a), CCL21, CCL25, CCL27, CCL28, CCL4, CCL5, CD62E, CD62P, CXCL10, CXCL12, CXCL13, CXCL16, CXCL9/CXCL10, CXCR3,

E/P- selectin, E-selectin, GPR15L, HGF, Hyaluronate, ICAM-1, ligands for CCR1, 2, 5, MAdCAM, MAdCAM-1, PNAd, VAP-1, VC AM, and VCAM-1, or combinations thereof.

12. An isolated modified B cell, capable of expressing an immune inhibitory molecule, wherein said immune inhibitory molecule is not naturally expressed in a B cell or is expressed at higher levels than is naturally expressed in a B cell.

13. The isolated modified B cell of claim 12, wherein said immune inhibitory molecule is selected from IL-10, TGF-b, PD-L1, PD-L2, LAG-3, and TIM-3, or combinations thereof.

14. The isolated modified B cell of claim 13, wherein said immune inhibitory molecule is capable of decreasing inflammation and autoimmune activity of B cells at a site or target of interest in a patient.

15. An isolated modified B cell, wherein the isolated modified B cell is treated with a compound or a derivative thereof, wherein said compound or derivative thereof is capable of increasing the expression of an integrin, a homing antibody, a protein, a receptor, or combinations thereof in B cells.

16. The isolated modified B cell of claim 15, wherein said compound or derivative thereof is capable of altering trafficking of B cells to a site or target of interest in the patient.

17. The isolated modified B cell of claim 16, wherein said compound is all-trans-retinoic acid (ATRA) or a derivative thereof.

18. An isolated modified B cell, capable of expressing at least one or more of a constitutively active Toll-like receptor (TLR), wherein said TLR is not naturally expressed in a B cell or is expressed at higher levels than is naturally expressed in a B cell.

19. The isolated modified B cell of claim 18, wherein said TLR is selected from TLR1, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TLR10, TLR11, TLR12, and TLR13, or combinations thereof.

20. The isolated modified B cell of claim 19, wherein said TLR is capable of potentiating B cells for increasing immune responses in a patient.

21. The isolated modified B cell of claim 19 or claim 20, wherein said TLR is capable of producing potent effector B cells for increasing immune responses in a patient.

22. An isolated modified B cell, wherein the isolated modified B cell is treated with at least one or more of a TLR agonist.

23. The isolated modified B cell of claim 22, wherein said TLR agonist is selected from CpG-rich oligonucleotides, double-stranded RNA mimic, polyinosinic acid:polycytidylic acid (poly-I:C).

24. An isolated modified B cell, wherein said B cell is electroporated with an mRNA encoding at least one or more of an antigen fused to a targeting signal.

25. The isolated modified B cell of claim 24, wherein said antigen is (i) not naturally presented by a B cell, (ii) not presented by a B cell simultaneously in both HLA class I and class II molecules naturally, or (iii) not presented by a B cell with high efficiencies in both HLA class I and class II molecules naturally.

26. The isolated modified B cell of claim 24 or claim 25, wherein said targeting signal is targeting signal of a lysosomal protein.

27. The isolated modified B cell of claim 26, wherein said targeting signal is a targeting signal of lysosome-associated membrane protein- 1 (LAMP1).

28. The isolated modified B cell of any one of claims 24-27, wherein said antigen is capable of being targeted to the lysosomes and presented simultaneously and efficiently in both HLA class I and class II molecules.

29. The isolated modified B cell of any one of claims 24-28, wherein said B cells is capable of increasing antigen-specific immune responses in a patient.

30. The isolated modified B cell of any one of claims 24-29, wherein the extracellular domain comprises an immunoglobulin domain.

31. The isolated modified B cell of any one of claims 24-30, wherein the chimeric receptor is capable of forming a homologous dimer.

32. An isolated modified B cell, capable of expressing a chimeric receptor (CAR-B), wherein said chimeric receptor comprises

a) an extracellular domain, wherein the extracellular domain comprises an extracellular binding domain and a hinge domain;

b) a transmembrane domain; and

c) a cytoplasmic domain.

33. An isolated modified B cell, capable of expressing a chimeric receptor (CAR-B), wherein said chimeric receptor comprises the amino acid sequence of one or more of SEQ ID NO: 142, SEQ ID NO: 144, or SEQ ID NO: 146.

34. The isolated modified B cell of any one of claims 1-33, wherein said extracellular binding domain, recognizes an antigen or protein that is secreted.

35. The isolated modified B cell of any one of claims 1-34, wherein said extracellular binding domain, recognizes an antigen or protein expressed on the surface of a target cell.

36. The isolated modified B cell of claim 35, wherein said target cell is selected from the group consisting of a tumor cell, a cardiac muscle cell, a skeletal muscle cell, a bone cell, a blood cell, a nerve cell, a fat cell, a skin cell, an endothelial cell, a hepatocyte, a pulmonary epithelial cell and a fibroblast.

37. The isolated modified B cell of any one of claims 1-36, wherein said B cell expresses more than one CAR-B receptor construct.

38. The isolated modified B cell of any one of claims 1-37, wherein said CAR-B receptor comprises more than one extracellular binding domain.

39. The isolated modified B cell of any one of claims 1-38, wherein said extracellular binding domain is a single chain variable fragment (scFv), a full-length antibody, an antibody fragment or an extracellular domain of a receptor or ligand.

40. The isolated modified B cell of any one of claims 1-39, wherein said extracellular binding domain is capable of binding to an antigen or protein selected from the group consisting of: PSMA, GP3, ASGR1, ASGR2, Sarcoglycan, Corin, and Her2, FAP, MUC1, CEA153, JAM-1, and LFA-1.

41. The isolated modified B cell of any one of claims 1-40, wherein said hinge domain is derived from the group consisting of an immunoglobulin (for example, IgG or IgM), CD28 and CD8.

42. The isolated modified B cell of any one of claims 1-41, wherein said cytoplasmic domain comprises at least one signaling domain native to B cells.

43. The isolated modified B cell of any one of claims 1-42, wherein said cytoplasmic domain comprises at least one signaling domain that is an immunoglobulin.

44. The isolated modified B cell of any one of claims 1-43, wherein said cytoplasmic domain comprises a domain selected from the group consisting of: CD79a (Immunoglobulin a), CD79b (Immunoglobulin b), CD40, CD 19, CD 137, Fcyr2a, MyD88, CD21, Syk, FYN, LYN, PI3K, BTK, PLCy2, CD3 and BLNK.

45. The isolated modified B cell of any one of claims 1-44, wherein said cytoplasmic domain further comprises a costimulatory domain.

46. The isolated modified B cell of any one of claims 1-45, wherein the modified B cell further encodes at least one protein selected from the group consisting of: the cytoplasmic domains of CD79a (Immunoglobulin a), CD79b (Immunoglobulin b), CD40, CD19, CD137, Fcyr2a, €O3z and MyD88.

47. The isolated modified B cell of any one of claims 1-46, wherein herein said B cell is capable of expressing more than one chimeric receptor.

48. The isolated modified B cell of any one of claims 1-47, wherein said B cell is further capable of expressing a payload.

49. The isolated modified B cell of claim 48, wherein said payload is selected from a group of cytokines, chemokines, T cell costimulatory molecules, and checkpoint molecules, the group consisting of: IL-1, IL-7, IL-8, IL-10, IL-12, IL-13, IL-17, IL-18, IL-21, interferon a, interferon b, interferon g, TSLP, CCL21, FLT3L, XCL1, LIGHT(TNFSF14), OX40L, CD137L, CD40L, ICOSL, anti-CD3 antibody, CD47, TIM4-FC, CXCL13, CCL21, CD80, CD40L, IFNa A2, LIGHT , 4-1BBL, MDGF (C19orfl0), FGF10, PDGF, agrin, TNF-a, GM-CSF, an anti-FAP antibody, an anti-TGF-b antibody; a TGF-b trap, decoy or other inhibitory molecule; an anti-BMP antibody; a BMP trap, decoy or other inhibitory molecule.

50. The isolated modified B cell of claim 48 or 49, wherein said B cell is capable of expressing more than 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12 payloads.

51. A nucleic acid capable of expressing a chimeric B cell receptor, wherein said chimeric receptor comprises:

a) an extracellular domain, wherein said extracellular domain comprises an extracellular binding domain and a hinge domain;

b) a transmembrane domain; and

c) a cytoplasmic domain that comprises at least one signaling domain.

52. A vector comprising a nucleic acid capable of expressing a chimeric B cell receptor, wherein said chimeric receptor comprises:

a) an extracellular domain, wherein said extracellular domain comprises an extracellular binding domain and a hinge domain;

b) a transmembrane domain; and

c) a cytoplasmic domain that comprises at least one signaling domain.

53. The nucleic acid of claim 51 or the vector of claim 52, wherein the secreted protein accumulates in the extracellular matrix.

54. The nucleic acid of claim 51 or the vector of claim 52, wherein said extracellular binding domain recognizes an antigen or protein expressed on the surface of a target cell.

55. The nucleic acid of claim 51 or the vector of claim 52, wherein said extracellular binding domain, recognizes an antigen or protein that is a secreted protein.

56. The nucleic acid of claim 51 or the vector of claim 52, wherein the secreted protein accumulates in the extracellular matrix.

57. The nucleic acid of claim 51 or the vector of claim 52, wherein said target cell is selected from the group consisting of a tumor cell, a cardiac muscle cell, a skeletal muscle cell, a bone cell, a blood cell, a nerve cell, a fat cell, a skin cell, an endothelial cell, a hepatocyte, a pulmonary epithelial cell or a fibroblast.

58. The nucleic acid of claim 51 or the vector of claim 52, wherein said vector expresses more than one CAR-B receptor.

59. The nucleic acid of claim 51 or the vector of claim 52, wherein said CAR-B expresses more than one extracellular binding domain.

60. The nucleic acid of claim 51 or the vector of claim 52, wherein said extracellular binding domain is a single chain variable fragment (scFv), a full-length antibody, an antibody fragment, an extracellular domain of a receptor or ligand.

61. The nucleic acid of claim 51 or the vector of claim 52, wherein said extracellular binding domain is capable of binding to an antigen or protein selected from the group consisting of: PSMA, GPC3, ASGR1, AGSR2, Sarcoglycan, Corin, Her2, PAF1, MUC1, CEA153, JAM-1, and LFA-1.

62. The nucleic acid of claim 51 or the vector of claim 52, wherein said hinge domain is derived from the group consisting of an immunoglobulin domain (for example, IgG or IgM), CD28 and CD8.

63. The nucleic acid of claim 51 or the vector of claim 52, wherein said cytoplasmic domain comprises at least one signaling domain native to B cells.

64. The nucleic acid of claim 51 or the vector of claim 52, wherein said cytoplasmic domain comprises a signaling domain selected from the group consisting of: CD79a (Immunoglobulin a), CD79b (Immunoglobulin b), CD40, CD19, CD137, Fcyr2a, MyD88, CD21, Syk, FYN, LYN, PI3K, BTK, PLCy2, CD3t and BLNK.

65. The nucleic acid of claim 51 or the vector of claim 52, wherein said cytoplasmic domain further comprises a costimulatory domain.

66. A method of treating a patient comprising administering the isolated modified B cell of any one of claims 1-50.

67. The method of claim 66, further comprising administering a checkpoint inhibitor capable of inhibiting a checkpoint molecule selected from the group consisting of: PD-1, PD-L1, CTLA-4, LAG3, TIM-3 and NKG2A.

68. The method of claim 66 or claim 67, further comprising administering a compound or a derivative thereof, wherein the compound or derivative thereof is capable of modulating the expression of the integrin, homing antibody, protein, and receptor, or combinations thereof.

69. The method of claim 68, wherein the compound or a derivative thereof is capable of altering trafficking of B cells to a site or target of interest in the patient.

70. The method of claim 69, wherein the compound is all-trans-retinoic acid (ATRA) or a derivative thereof.

71. A method of treating a patient comprising administering the isolated modified B cell of claims 24-31, wherein said antigen is (i) not naturally presented by a B cell, (ii) not presented by a B cell simultaneously by both HLA class I and class II molecules naturally, or (iii) not presented by a B cell with high efficiencies by both HLA class I and class II molecules naturally.

72. The method of claim 71, wherein said targeting signal is targeting signal of a lysosomal protein.

73. The method of claim 72, wherein said targeting signal is a targeting signal of lysosome-associated membrane protein-1 (LAMP1).

74. The method of claim 73, wherein said antigen is capable of being targeted to the lysosomes and presented simultaneously and efficiently in both HLA class I and class II molecules.

75. The method of claim 74, wherein said B cells is capable of increasing antigen-specific immune responses in the patient.

76. The method of any one of claims 66-75, wherein the patient is treated with more than one differently modified B cells.

77. The method of any one of claims 65-76, further comprising administering at least one or more of a TLR agonist to the patient, wherein said at least one or more TLR agonists is capable of (i) potentiating B cells, and (ii) producing potent effector B cells, for increasing immune responses in a patient.