WHAT IS CLAIMED IS:

1. An isolated hypoimmunogenic~~hypoimmune~~ cardiac cell ~~differentiated from a hypoimmune induced pluripotent stem cell (HIP cell),~~comprising one or more genetic modifications, wherein the isolated hypoimmunogenic cardiac cell:

(i) has reduced expression of ~~wherein endogenous~~ β-2 ~~-~~microglobulin (B2M) ~~gene activity~~ and/or reduced expression of ~~endogenous~~ class II transactivator (CIITA) compared to a wild-type cell~~gene activity,~~

(ii) has increased expression of ~~have been eliminated and~~ CD47 compared to the ~~expression~~ wild-type cell ~~has~~

~~been increased,~~

(iii) comprises a safety switch,

(iv) is differentiated from an induced pluripotent stem cell (iPSC),

(v) is suitable for therapeutic administration to a recipient once every 28 days or longer, and

(vi) is suitable for administration into cardiac muscle of the recipient.

2. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of claim 1, wherein the iPSC ~~HIP cell~~ is a human iPSC, the B2M ~~gene~~ is a human B2M ~~gene~~, the CIITA ~~gene~~ is a human CIITA~~gene~~, and the increased expression of ~~increased~~ CD47 results from introducing at least one copy of a ~~expression~~ CD47 transgene ~~results from introducing into the iPSC at least one copy of a human CD47 gene~~ under the control of a promoter into the iPSC.

3. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of claim 1, wherein the ~~HIP~~ iPSC ~~cell~~ is a mouse iPSC, the B2M ~~gene~~ is a mouse B2M ~~gene~~, the CIITA ~~gene~~ is a mouse CIITA ~~gene~~, and the increased expression of CD47 ~~expression~~ results from introducing ~~into the iPSC~~ at least one copy of a mouse CD47 transgene under the control of a promoter.

4. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of any one of claims 1 to 3, wherein the ~~elimination of~~ reduced expression of B2M ~~gene activity~~ results from a Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)/Cas9 ~~reaction that~~mediated ~~disrupts~~ disruption of both alleles of the B2M gene.

5. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of any one of claims 1 to 4, wherein the ~~elimination of~~ reduced expression of CIITA ~~gene activity~~ results from a CRISPR/Cas9 ~~reaction that~~mediated ~~disrupts~~ disruption of both alleles of the CIITA gene.

6. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of any one of claims 1 to 5, ~~further comprising a~~wherein the safety switch is a suicide gene.

7. The isolated hypoimmunogenic cardiac cell of claim 6, wherein the suicide gene ~~that~~ is activated by a trigger agent that induces the isolated hypoimmunogenic cardiac ~~HIP~~ cell to die.

~~7~~8. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of claim ~~6~~7, wherein the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene and the trigger agent is ganciclovir.

~~8~~9. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of claim ~~7~~8, wherein the HSV-tk gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:4.

~~9. The isolated hypoimmune cardiac cell of claim 7, wherein the HSV-tk gene encodes a protein comprising the amino acid sequence of SEQ ID NO:4.~~

10. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of claim ~~6~~7, wherein the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene and the trigger agent is 5-fluorocytosine (5-FC).

11. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of claim 10, wherein the CD gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:5.

~~12. The isolated hypoimmune cardiac cell of claim 10, wherein the CD gene encodes a protein comprising the amino acid sequence of SEQ ID NO:5.~~

~~13~~12. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of claim ~~6~~7, wherein the suicide gene encodes an inducible caspase 9 protein and the trigger agent is a chemical inducer of dimerization (CID).

~~14~~13. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of claim ~~13~~12, wherein the inducible caspase 9 protein comprises at least 90% sequence identity to SEQ ID NO:6.

~~15. The isolated hypoimmune cardiac cell of claim 13, wherein the inducible caspase 9 protein comprises the amino acid sequence of SEQ ID NO:6.~~

~~16~~14. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of ~~any one of~~ claim~~s~~ ~~13 to 15~~12 or 13, wherein the CID is compound AP1903.

~~17~~15. The isolated hypoimmunogenic~~hypoimmune~~ cardiac cell of any one of claims 1 to 14~~13 to 16~~, wherein the isolated hypoimmunogenic~~hypoimmune~~ cardiac cell is selected from the group consisting of a cardiomyocyte, a nodal cardiomyocyte, a conducting cardiomyocyte, a working cardiomyocyte, a cardiomyocyte precursor, a cardiomyocyte progenitor cell, a cardiac stem cell, and a cardiac muscle cell.

~~18~~16. A ~~method of treating a patient suffering from a heart condition or disease, the method comprising administering a composition~~ composition comprising a therapeutically effective amount of a population of the isolated hypoimmunogenic~~hypoimmune~~ cardiac cells of any one of claims 1 to ~~17~~15, for use in a method of treating a heart condition or heart disease in the recipient.

~~19~~17. The ~~method~~ composition of claim ~~18~~16, wherein the composition further comprises a therapeutically effective carrier.

~~20~~18. The ~~method~~ composition of claim ~~18~~ 16 or ~~19~~17, wherein the composition is suitable for administration ~~comprises implantation into the patient's heart tissue,~~via intravenous injection,

intraarterial injection, intracoronary injection, intramuscular injection, intraperitoneal injection, intramyocardial injection, trans-endocardial injection, trans-epicardial injection, or infusion.

~~21~~19. The ~~method~~ composition of any one of claims ~~18~~ 16 to ~~20~~18, wherein the heart condition or heart disease is selected from the group consisting of pediatric cardiomyopathy, age-related cardiomyopathy, dilated cardiomyopathy, hypertrophic cardiomyopathy, restrictive cardiomyopathy, chronic ischemic cardiomyopathy, peripartum cardiomyopathy, inflammatory cardiomyopathy, other cardiomyopathy, myocarditis, myocardial ischemic reperfusion injury, ventricular dysfunction, heart failure, congestive heart failure, coronary artery disease, end stage heart disease, atherosclerosis, ischemia, hypertension, restenosis, angina pectoris, rheumatic heart, arterial inflammation, ~~or~~ and cardiovascular disease.

~~22~~20. A method of producing a population of isolated hypoimmunogenic~~hypoimmune~~ cardiac cells from a population of ~~hypoimmune~~ pluripotent cells ~~(HIP cells)~~ by *in vitro* differentiation, ~~wherein endogenous β-2 microglobulin (B2M) gene activity and endogenous class II transactivator (CIITA) gene activity have been eliminated and CD47 expression has been increased in the HIP cells,~~ the method comprising:

(a) culturing ~~a~~ the population of pluripotent ~~HIP~~ cells in a culture medium comprising a GSK inhibitor;

(b) after step (a), culturing the population of pluripotent ~~HIP~~ cells in a culture medium comprising a WNT antagonist to produce a population of pre-cardiac cells; and

(c) culturing the population of pre-cardiac cells in a culture medium comprising insulin to produce the~~a~~ population of isolated hypoimmunogenic cardiac cells,

wherein the population of isolated hypoimmunogenic cardiac cells:

(i) have reduced expression of β-2 microglobulin (B2M) and/or reduced expression of class II transactivator (CIITA) compared to a wild-type cell,

(ii) have increased expression of CD47 compared to the wild-type cell,

(iii) comprise a safety switch,

(iv) are suitable for therapeutic administration to a recipient once every 28 days or longer, and

(v) are suitable for administration into cardiac muscle of the recipient.

~~23~~21. The method of claim ~~22~~20, wherein the GSK inhibitor is CHIR-99021~~, a derivative thereof, or a variant thereof~~.

~~24~~22. The method of claim ~~22~~ 20 or ~~23~~21, wherein the GSK inhibitor is at a concentration ranging from ~~about~~ 2 μM to ~~about~~ 10 μM.

~~25~~23. The method of any one of claims ~~22~~ 20 to ~~24~~22, wherein the WNT antagonist is IWRl~~, a derivative thereof, or a variant thereof~~.

~~26~~24. The method of any one of claims ~~22~~ 20 to ~~25~~23, wherein the WNT antagonist is at a concentration ranging from ~~about~~ 2 μM to ~~about~~ 10 μM.

~~27~~25. The method of any one of claims ~~22~~ 20 to ~~26~~24, further comprising culturing the population of pre-cardiac cells of step (c) in a culture medium absent of glucose.

~~28~~26. The method of any one of claims ~~22~~ 20 to ~~27~~25, wherein the safety switch is a suicide gene and the method further ~~comprising~~ comprises culturing the population of pre-cardiac cells of step (~~c~~b) in a culture medium comprising a trigger agent that activates ~~if~~ the ~~HIP cells comprise a~~ suicide gene, and

wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.

~~29~~27. The method of any one of claims ~~22~~ 20 to ~~28~~26, wherein the safety switch is a suicide gene and the method further ~~comprising~~ comprises culturing the population of isolated hypoimmunogenic cardiac cells of step (~~d~~c) in a culture medium comprising a trigger agent ~~if~~ that activates the ~~HIP cells comprise a~~ suicide gene, and

wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene

is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.

~~30~~28. The method of any one of claims ~~22~~ 20 to ~~29~~27, wherein step (c) further ~~comprising~~ comprises isolating ~~the population of~~ hypoimmunogenic~~hypoimmune~~ cardiac cells from non-cardiac cells to obtain the population of isolated hypoimmunogenic cardiac cells.

~~31~~29. The method of any one of claims ~~30~~20-28, wherein the method further ~~comprising~~ comprises cryopreserving the ~~isolated~~ population of isolated hypoimmunogenic~~hypoimmune~~ cardiac cells.

~~32. An isolated hypoimmune endothelial cell differentiated from a hypoimmune pluripotent stem cell (HIP cell),~~

~~wherein endogenous β-2 microglobulin (B2M) gene activity and endogenous class II transactivator (CIITA) gene activity have been eliminated and CD47 expression has been increased.~~

~~33. The isolated hypoimmune endothelial cell of claim 32, wherein the HIP cell is a human iPSC, the B2M gene is human B2M gene, the CIITA gene is human B2M gene, and the increased CD47 expression results from introducing into the iPSC at least one copy of a human CD47 gene under the control of a promoter.~~

~~34. The isolated hypoimmune endothelial cell of claim 32, wherein the iPS HIP cell C is a mouse iPSC, the B2M gene is mouse B2M gene, the CIITA gene is mouse B2M gene, and the increased CD47 expression results from introducing into the iPSC at least one copy of a mouse CD47 gene under the control of a promoter.~~

~~35. The isolated hypoimmune endothelial cell of any one of claims 32 to 34, wherein the elimination of B2M gene activity results from a Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)/Cas9 reaction that disrupts both alleles of the B2M gene.~~

36. The isolated hypoimmune endothelial cell of any one of claims 32 to 35, wherein the elimination of CIITA gene activity results from a CRISPR/Cas9 reaction that disrupts both alleles of the CIITA gene.

37. The isolated hypoimmune endothelial cell of any one of claims 32 to 36, further comprising a suicide gene that is activated by a trigger agent that induces the HIP cell to die.

38. The isolated hypoimmune endothelial cell of claim 37, wherein the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene and the trigger agent is ganciclovir.

39. The isolated hypoimmune endothelial cell of claim 38, wherein the HSV-tk gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:4.

40. The isolated hypoimmune endothelial cell of claim 38, wherein the HSV-tk gene encodes a protein comprising the amino acid sequence of SEQ ID NO:4.

41. The isolated hypoimmune endothelial cell of claim 37, wherein the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene and the trigger agent is 5-fluorocytosine (5-FC).

42. The isolated hypoimmune endothelial cell of claim 41, wherein the CD gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:5.

43. The isolated hypoimmune endothelial cell of claim 41, wherein the CD gene encodes a protein comprising the amino acid sequence of SEQ ID NO:5.

44. The isolated hypoimmune endothelial cell of claim 41, wherein the suicide gene encodes an inducible caspase 9 protein and the trigger agent is a chemical inducer of dimerization (CID).

45. The isolated hypoimmune endothelial cell of claim 44, wherein the inducible caspase 9 protein comprises at least 90% sequence identity to SEQ ID NO:6.

46. The isolated hypoimmune endothelial cell of claim 44, wherein the inducible caspase 9 protein comprises the amino acid sequence of SEQ ID NO:6.

47. The isolated hypoimmune endothelial cell of any one of claims 44 to 46, wherein the CID is compound AP 1903.

48. The isolated hypoimmune endothelial cell of any one of claims 44 to 46, wherein the isolated hypoimmune endothelial cell is selected from the group consisting of a capillary endothelial cell, vascular endothelial cell, aortic endothelial cell, brain endothelial cell, and renal endothelial cell.

49. A method of treating a patient suffering from a vascular condition or disease, the method comprising administering a composition comprising a therapeutically effective amount of a population of isolated hypoimmune endothelial cells of any one of claims 32 to 48.

50. The method of claim 49, wherein the composition further comprises a therapeutically effective carrier.

51. The method of claim 49 or 50, wherein the administration comprises implantation into the patient's tissue, intravenous injection, intraarterial injection, intracoronary injection, intramuscular injection, intraperitoneal injection, intramyocardial injection, trans-endocardial injection, trans-epicardial injection, or infusion.

52. The method of any one of claims 49 to 51, wherein the vascular condition or disease is selected from the group consisting of, vascular injury, cardiovascular disease, vascular disease, ischemic disease, myocardial infarction, congestive heart failure, hypertension, ischemic tissue injury, limb ischemia, stroke, neuropathy, and cerebrovascular disease.

53. A method of producing a population of hypoimmune endothelial cells from a population of hypoimmune pluripotent stem cells (HIP cells) by in vitro differentiation, wherein endogenous

β-2 microglobulin (B2M) gene activity and endogenous class II transactivator (CIITA) gene activity have been eliminated and CD47 expression has been increased in the HIP cells,

the method comprising:

(a) culturing a population of HIP cells in a first culture medium comprising a GSK inhibitor;

(b) culturing the population of HIP cells in a second culture medium comprising VEGF and bFGF to produce a population of pre-endothelial cells; and

(c) culturing the population of pre-endothelial cells in a third culture medium comprising a ROCK inhibitor and an ALK inhibitor to produce a population ofhypoimmune endothelial cells.

54. The method of claim 53, wherein the GSK inhibitor is CHIR-99021, a derivative thereof, or a variant thereof.

55. The method of claim 53 or 54, wherein the GSK inhibitor is at a concentration ranging from about 1 μM to about 10 μM.

56. The method of any one of claims 53 to 55, wherein the ROCK inhibitor is Y-27632, a derivative thereof, or a variant thereof.

57. The method of any one of claims 53 to 56, wherein the ROCK inhibitor is at a concentration ranging from about 1 μM to about 20 μM.

58. The method of any one of claims 53 to 55, wherein the ALK inhibitor is SB-431542, a derivative thereof, or a variant thereof.

59. The method of any one of claims 53 to 56, wherein the ALK inhibitor is at a concentration ranging from about 0.5 μM to about 10 μM.

60. The method of any one of claims 53 to 59, wherein the first culture medium comprises from 2 μM to about 10 μM of CHIR-99021.

~~61. The method of any one of claims 53 to 60, wherein the second culture medium comprises 50 ng/ml VEGF and 10 ng/ml bFGF.~~

~~62. The method of claim 61, wherein the second culture medium further comprises Y-27632 and SB-431542.~~

~~63. The method of any one of claims 53 to 62, wherein the third culture medium comprises 10 μM Y-27632 and 1 μM SB-431542.~~

~~64. The method of claim 63, wherein the third culture medium further comprises VEGF and bFGF.~~

~~65. The method of any one of claims 53 to 64, wherein the first culture medium and/or the second medium is absent of insulin.~~

~~66. The method of any one of claims 53 to 65, wherein the second culture medium further comprises a trigger agent if the HIP cells comprise a suicide gene, wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.~~

~~67. The method of any one of claims 53 to 66, wherein the third culture medium further comprises a trigger agent if the HIP cells comprise a suicide gene, wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.~~

68. The method of any one of claims 53 to 67, further comprising isolating the population of hypoimmune endothelial cells from non-endothelial cells.

69. The method of claim 68, further comprising cryopreserving the isolated population of hypoimmune endothelial cells.

70. An isolated hypoimmune dopaminergic neuron (DN) differentiated from a hypoimmune pluripotent stem cell (HIP cell),

wherein endogenous β-2 microglobulin (B2M) gene activity and endogenous class II transactivator (CIITA) gene activity have been eliminated and CD47 expression has been increased.

71. The isolated hypoimmune dopaminergic neuron of claim 70, wherein the HIP cell is a human iPSC, the B2M gene is human B2M gene, the CIITA gene is human B2M gene, and the increased CD47 expression results from introducing into the iPSC at least one copy of a human CD47 gene under the control of a promoter.

72. The isolated hypoimmune dopaminergic neuron of claim 70, wherein the HIP cell is a mouse iPSC, the B2M gene is mouse B2M gene, the CIITA gene is mouse B2M gene, and the increased CD47 expression results from introducing into the iPSC at least one copy of a mouse CD47 gene under the control of a promoter.

73. The isolated hypoimmune dopaminergic neuron of any one of claims 70 to 72, wherein the elimination of B2M gene activity results from a Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)/Cas9 reaction that disrupts both alleles of the B2M gene.

74. The isolated hypoimmune dopaminergic neuron of any one of claims 70 to 73, wherein the elimination of CIIT A gene activity results from a CRISPR/Cas9 reaction that disrupts both alleles of the CIITA gene.

75. The isolated hypoimmune dopaminergic neuron of any one of claims 70 to 74, further comprising a suicide gene that is activated by a trigger agent that induces the HIP cell to die.

76. The isolated hypoimmune dopaminergic neuron of claim 75, wherein the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene and the trigger agent is ganciclovir.

77. The isolated hypoimmune dopaminergic neuron of claim 76, wherein the HSV-tk gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:4.

78. The isolated hypoimmune dopaminergic neuron of claim 76, wherein the HSV-tk gene encodes a protein comprising the amino acid sequence of SEQ ID NO:4.

79. The isolated hypoimmune dopaminergic neuron of claim 75, wherein the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene and the trigger agent is 5-fluorocytosine (5-FC).

80. The isolated hypoimmune dopaminergic neuron of claim 79, wherein the CD gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:5.

81. The isolated hypoimmune dopaminergic neuron of claim 79, wherein the CD gene encodes a protein comprising the amino acid sequence of SEQ ID NO:5.

82. The isolated hypoimmune dopaminergic neuron of claim 75, wherein the suicide gene encodes an inducible caspase 9 protein and the trigger agent is a chemical inducer of dimerization (CID).

83. The isolated hypoimmune dopaminergic neuron of claim 82, wherein the inducible caspase 9 protein comprises at least 90% sequence identity to SEQ ID NO:6.

84. The isolated hypoimmune dopaminergic neuron of claim 82, wherein the inducible caspase 9 protein comprises the amino acid sequence of SEQ ID NO:6.

85. The isolated hypoimmune dopaminergic neuron of any one of claims 82 to 84, wherein the CID is compound AP1903.

86. The isolated hypoimmune dopaminergic neuron of any one of claims 82 to 85, wherein the isolated hypoimmune dopaminergic neuron is selected from the group consisting of a neuronal stem cell, neuronal progenitor cell, immature dopaminergic neuron, and mature dopaminergic neuron.

87. A method of treating a patient suffering from a neurodegenerative disease or condition, the method comprising administering a composition comprising a therapeutically effective amount of a population of the isolated hypoimmune dopaminergic neurons of any one of claims 70 to 86.

88. The method of claim 87, wherein the composition further comprises a therapeutically effective carrier.

89. The method of claim 87 or 88, wherein the population of the isolated hypoimmune dopaminergic neurons is on a biodegradable scaffold.

90. The method of any one of claims 87 to 89, wherein the administration comprises transplantation or injection.

91. The method of any one of claims 87 to 90, wherein the neurodegenerative disease or condition is selected from the group consisting of Parkinson's disease, Huntington disease, and multiple sclerosis.

92. A method of producing a population of hypoimmune dopaminergic neurons from a population of hypoimmune pluripotent cells (HIP cells) by *in vitro* differentiation, wherein endogenous β-2 microglobulin (B2M) gene activity and endogenous class II transactivator

(CIITA) gene activity have been eliminated and CD47 expression has been increased in the HIP cells,

the method comprising:

(a) culturing the population of HIP cells in a first culture medium comprising one or more factors selected from the group consisting of sonic hedgehog (SHH), brain-derived neurotrophic factor (BDNF), epidermal growth factor (EGF), basic fibroblast growth factor (bFGF), fibroblast growth factor 8 (FGF8), WNTl, retinoic acid, a GSK3β inhibitor, an ALK inhibitor, and a ROCK inhibitor to produce a population of immature dopaminergic neurons; and

(b) culturing the population of immature dopaminergic neurons in a second culture medium that is different than the first culture medium to produce a population of hypoimmune dopaminergic neurons.

93. The method of claim 92, wherein the GSK3P inhibitor is CHIR-99021, a derivative thereof, or a variant thereof.

94. The method of claim 92 or 93, wherein the GSK3β inhibitor is at a concentration ranging from about 2 μM to about 10 μM.

95. The method of any one of claims 92 to 94, wherein the ALK inhibitor is SB-431542, a derivative thereof, or a variant thereof.

96. The method of any one of claims 92 to 95, wherein the ALK inhibitor is at a concentration ranging from about 1 μM to about 10 μM.

97. The method of any one of claims 92 to 96, wherein the first culture medium and/or second culture medium are absent of animal serum.

98. The method of any one of claims 92 to 95, further comprising culturing the population of immature dopaminergic neurons of step (a) in a culture medium comprising a trigger agent if the HIP cells comprise a suicide gene,

wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex

virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.

99. The method of any one of claims 92 to 98, further comprising culturing the population of dopaminergic neurons of step (b) in a culture medium comprising a trigger agent if the HIP cells comprise a suicide gene,

wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.

100. The method of any one of claims 92 to 99, further comprising isolating the population of hypoimmune dopaminergic neurons from non-dopaminergic neurons.

101. The method of claim 100, further comprising cryopreserving the isolated population of hypoimmune dopaminergic neurons.

102. An isolated hypoimmune pancreatic islet cell differentiated from a hypoimmune induced pluripotent stem cell (HIP cell), wherein endogenous β-2 microglobulin (B2M) gene activity and endogenous class II transactivator (CIITA) gene activity have been eliminated and CD47 expression has been increased.

103. The isolated hypoimmune pancreatic islet cell of claim 102, wherein the HIP cell is a human iPSC, the B2M gene is human B2M gene, the CIIT A gene is human B2M gene, and the increased CD47 expression results from introducing into the iPSC at least one copy of a human CD47 gene under the control of a promoter.

~~104. The isolated hypoimmune pancreatic islet cell of claim 102, wherein the HIP cell is a mouse iPSC, the B2M gene is mouse B2M gene, the CIIT-A gene is mouse B2M gene, and the increased CD47 expression results from introducing into the iPSC at least one copy of a mouse CD4 7 gene under the control of a promoter.~~

~~105. The isolated hypo immune pancreatic islet cell of any one of claims 102 to 104, wherein the elimination of B2M gene activity results from a Clustered Regularly Interspaced Short Palindromic Repeats (CR1SPR)/Cas9 reaction that disrupts both alleles of the B2M gene.~~

~~106. The isolated hypoimmune pancreatic islet cell of any one of claims 102 to 105, wherein the elimination of CIITA gene activity results from a CR1SPR/Cas9 reaction that disrupts both alleles of the CIITA gene.~~

~~107. The isolated hypoimmune pancreatic islet cell of any one of claims 102 to 106, further comprising a suicide gene that is activated by a trigger agent that induces the HIP cell to die.~~

~~108. The isolated hypoimmune pancreatic islet cell of claim 107, wherein the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene and the trigger agent is ganciclovir.~~

~~109. The isolated hypoimmune pancreatic islet cell of claim 108, wherein the HSV-tk gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:4.~~

~~110. The isolated hypoimmune pancreatic islet cell of claim 108, wherein the HSV-tk gene encodes a protein comprising the amino acid sequence of SEQ ID NO:4.~~

~~111. The isolated hypo immune pancreatic islet cell of claim 107, wherein the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene and the trigger agent is 5-fluorocytosine (5-FC).~~

~~112. The isolated hypoimmune pancreatic islet cell of claim 111, wherein the CD gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:5.~~

~~113. The isolated hypoimmune pancreatic islet cell of claim 111, wherein the CD gene encodes a protein comprising the amino acid sequence of SEQ ID NO:5.~~

~~114. The isolated hypoimmune pancreatic islet cell of claim 107, wherein the suicide gene encodes an inducible caspase 9 protein and the trigger agent is a chemical inducer of dimerization (CID).~~

~~115. The isolated hypoimmune pancreatic islet cell of claim 114, wherein the inducible caspase 9 protein comprises at least 90% sequence identity to SEQ ID NO:6.~~

~~116. The isolated hypoimmune pancreatic islet cell of claim 114, wherein the inducible caspase 9 protein comprises the amino acid sequence of SEQ ID NO:6.~~

~~117. The isolated hypoimmune pancreatic islet cell of any one of claims 114 to 116, wherein the CID is compound AP1903.~~

~~118. The isolated hypoimmune pancreatic islet cell of any one of claims 114 to 117, wherein the isolated hypoimmune pancreatic islet cell is selected from the group consisting of a pancreatic islet progenitor cell, immature pancreatic islet cell, and mature pancreatic islet cell.~~

~~119. A method of treating a patient suffering from diabetes, the method comprising administering a composition comprising a therapeutically effective amount of a population of the isolated hypoimmune pancreatic islet cells of any one of claims 102 to 118~~

~~120. The method of claim 119, wherein the composition further comprises a therapeutically effective carrier.~~

~~121. The method of claim 119 or 120, wherein the population of the isolated hypoimmune pancreatic islet cells is on a biodegradable scaffold.~~

122. The method of any one of claims 119 to 121, wherein the administration comprises transplantation or injection.

123. A method of producing a population of hypoimmune pancreatic islet cells from a population of hypoimmunogenic pluripotent cells (HIP cells) by *in vitro* differentiation, wherein endogenous β-2 microglobulin (B2M) gene activity and endogenous class II transactivator (CIITA) gene activity have been eliminated and CD47 expression has been increased in the hypoimmunogenic iPSCs,

the method comprising:

(a) culturing the population of HIP cells in a first culture medium comprising one or more factors selected from the group consisting insulin-like growth factor (IGF), transforming growth factor (TGF), fibroblast growth factor (EGF), epidermal growth factor (EGF), hepatocyte growth factor (HGF), sonic hedgehog (SHH), and vascular endothelial growth factor (VEGF), transforming growth factor-β (TGFβ) superfamily, bone morphogenic protein-2 (BMP2), bone morphogenic protein-7 (BMP7), a GSK3β inhibitor, an ALK inhibitor, a BMP type 1 receptor inhibitor, and retinoic acid to produce a population of immature pancreatic islet cells; and

(b) culturing the population of immature pancreatic islet cells in a second culture medium that is different than the first culture medium to produce a population of pancreatic islet cells.

124. The method of claim 123, wherein the GSK3β inhibitor is CHIR-99021, a derivative thereof, or a variant thereof.

125. The method of claim 123 or 124, wherein the GSK3β inhibitor is at a concentration ranging from about 2 μM to about 10 μM.

126. The method of any one of claims 123 to 125, wherein the ALK inhibitor is SB-431542, a derivative thereof, or a variant thereof.

127. The method of any one of claims 123 to 126, wherein the ALK inhibitor is at a concentration ranging from about 1 μM to about 10 μM.

128. The method of any one of claims 123 to 127, wherein the first culture medium and/or second culture medium are absent of animal serum.

129. The method of any one of claims 123 to 128, further comprising culturing the population of immature pancreatic islet cells of step (a) in a culture medium comprising a trigger agent if the HIP cells comprise a suicide gene,

wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.

130. The method of any one of claims 123 to 129, further comprising culturing the population of pancreatic islet cells of step (b) in a culture medium comprising a trigger agent if the HIP cells comprise a suicide gene,

wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.

131. The method of any one of claims 123 to 130, further comprising isolating the population of hypoimmune pancreatic islet cells from non-pancreatic islet cells.

132. The method of claim 131, further comprising cryopreserving the isolated population of hypoimmune pancreatic islet cells.

133. An isolated hypoimmune retinal pigmented epithelium (RPE) cell differentiated from a hypoimmune induced pluripotent stem cell (HIP cell),

wherein endogenous β-2 microglobulin (B2M) gene activity and endogenous

class II transactivator (CIITA) gene activity have been eliminated and CD47 expression has been increased.

134. The isolated hypoimmune RPE cell of claim 133, wherein the HIP cell is a human iPSC, the B2M gene is human B2M gene, the CIITA gene is human B2M gene, and the increased CD4 7 expression results from introducing into the iPSC at least one copy of a human CD47 gene under the control of a promoter.

135. The isolated hypoimmune RPE cell of claim 133, wherein the HIP cell is a mouse iPSC, the B2M gene is mouse B2M gene, the CIITA gene is mouse B2M gene, and the increased CD47 expression results from introducing into the iPSC at least one copy of a mouse CD47 gene under the control of a promoter.

136. The isolated hypoimmune RPE cell of any one of claims 133 to 135, wherein the elimination of B2M gene activity results from a Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)/Cas9 reaction that disrupts both alleles of the B2M gene.

137. The isolated hypoimmune RPE cell of any one of claims 133 to 136, wherein the elimination of CIITA gene activity results from a CRISPR/Cas9 reaction that disrupts both alleles of the CIITA gene.

138. The isolated engineered RPE cell of any one of claims 133 to 137, further comprising a suicide gene that is activated by a trigger agent that induces the HIP cell to die.

139. The isolated hypoimmune RPE cell of claim 138, wherein the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene and the trigger agent is ganciclovir.

140. The isolated hypoimmune RPE cell of claim 139, wherein the HSV-tk gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:4.

141. The isolated hypoimmune RPE cell of claim 139, wherein the HSV-tk gene encodes a protein comprising the amino acid sequence of SEQ ID NO:4.

142. The isolated hypoimmune RPE cell of claim 138, wherein the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene and the trigger agent is 5-fluorocytosine (5-FC).

143. The isolated hypoimmune RPE cell of claim 142, wherein the CD gene encodes a protein comprising at least 90% sequence identity to SEQ ID NO:5.

144. The isolated hypoimmune RPE cell of claim 142, wherein the CD gene encodes a protein comprising the amino acid sequence of SEQ ID NO:5.

145. The isolated hypoimmune RPE cell of claim 138, wherein the suicide gene encodes an inducible caspase 9 protein and the trigger agent is a chemical inducer of dimerization (CID).

146. The isolated hypoimmune RPE cell of claim 145, wherein the inducible caspase 9 protein comprises at least 90% sequence identity to SEQ ID NO:6.

147. The isolated hypoimmune RPE cell of claim 145, wherein the inducible caspase 9 protein comprises the amino acid sequence of SEQ ID NO:6.

148. The isolated hypoimmune RPE cell of any one of claims 145 to 147, wherein the CID is compound AP1903.

149. The isolated hypoimmune RPE cell of any one of claims 145 to 148, wherein the isolated hypoimmune RPE cell is selected from the group consisting of a RPE progenitor cell, immature RPE cell, mature RPE cell, and functional RPE cell.

150. A method of treating a patient suffering from an ocular condition, the method comprising administering a composition comprising a therapeutically effective amount of a population of the isolated hypoimmune RPE cells of any one of claims 133 to 149.

151. The method of claim 150, wherein the composition further comprises a therapeutically effective carrier.

152. The method of claim 150 or 151, wherein the population of the isolated hypoimmune RPE cells is on a biodegradable scaffold.

153. The method of any one of claims 150 to 152, wherein the administration comprises transplantation or injection to the patient's retina.

154. The method of any one of claims 150 to 153, wherein the ocular condition is selected from the group consisting of wet macular degeneration, dry macular degeneration, juvenile macular degeneration, Leber's Congenital Ameurosis, retinitis pigmentosa, and retinal detachment.

155. A method of producing a population of hypoimmune retinal pigmented epithelium (RPE) cells from a population of hypoimmune pluripotent cells (HIP cells) by *in vitro* differentiation, wherein endogenous β-2 microglobulin (B2M) gene activity and endogenous class II transactivator (CIITA) gene activity have been eliminated and CD47 expression has been increased in the HIP cells,

the method comprising:

(a) culturing the population of HIP cells in a first culture medium comprising any one of the factors selected from the group consisting of activin A, bFGF, BMP4/7, DKKl, IGFl, noggin, a BMP inhibitor, an ALK inhibitor, a ROCK inhibitor, and a VEGFR inhibitor to produce a population of pre-RPE cells; and

(b) culturing the population of pre-RPE cells in a second culture medium that is different than the first culture medium to produce a population of hypoimmune RPE cells.

156. The method of claim 155, wherein the ALK inhibitor is SB-431542, a derivative thereof, or a variant thereof.

157. The method of claim 155 or 156, wherein the ALK inhibitor is at a concentration ranging from about 2 μM to about 10 μM.

158. The method of any one of claims 155 to 157, wherein the ROCK inhibitor is Y-27632, a derivative thereof, or a variant thereof.

159. The method of any one of claims 155 to 158, wherein the ROCK inhibitor is at a concentration ranging from about 1 μM to about 10 μM.

160. The method of any one of claims 155 to 159, wherein the first culture medium and/or second culture medium are absent of animal serum.

161. The method of any one of claims 155 to 160, further comprising culturing the population of pre-RPE cells of step (a) in a culture medium comprising a trigger agent if the HIP cells comprise a suicide gene,

wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.

162. The method of any one of claims 155 to 161, further comprising culturing the population of RPE cells of step (b) in a culture medium comprising a trigger agent if the HIP cells comprise a suicide gene,

wherein the trigger agent is ganciclovir if the suicide gene is a herpes simplex virus thymidine kinase (HSV-tk) gene, the trigger agent is 5-fluorocytosine (5-FC) if the suicide gene is an *Escherichia coli* cytosine deaminase (CD) gene, or the trigger agent is a chemical inducer of dimerization (CID) if the suicide gene encodes an inducible caspase 9 protein.

163. The method of any one of claims 155 to 162, further comprising isolating the population of hypoimmune RPE cells from non-RPE cells.

~~164. The method of claim 163, further comprising cryopreserving the isolated population of hypoimmune RPE cells.~~