

CLAIMS:

1. An adeno-associated virus (AAV) vector comprising a human neurogenic differentiation 1 (hNeuroD1) sequence comprising the nucleic acid sequence of SEQ ID NO: 6, where the
5 hNeuroD1 sequence is operably linked to regulatory elements comprising:
 - (a) a glial fibrillary acidic protein (GFAP) promoter comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 4, 12, and 15;
 - (b) an enhancer from a human elongation factor-1 alpha (EF1- α) promoter comprising the nucleic acid sequence of SEQ ID NO: 2 or a cytomegalovirus (CMV) enhancer
10 comprising the nucleic acid sequence of SEQ ID NO: 11;
 - (c) a chimeric intron comprising the nucleic acid sequence of SEQ ID NO: 5 or 16;
 - (d) a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE) comprising the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 7 and 18; and
 - 15 (e) a SV40 polyadenylation signal sequence comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 14.
2. An adeno-associated virus (AAV) vector comprising a nucleic acid coding sequence
20 encoding a human neurogenic differentiation 1 (hNeuroD1) protein comprising the amino acid sequence of SEQ ID NO: 10, wherein said coding sequence is operably linked to regulatory elements comprising:
 - (a) a glial fibrillary acidic protein (GFAP) promoter comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 4, 12, and 15;
 - 25 (b) an enhancer from a human elongation factor-1 alpha (EF1- α) promoter comprising the nucleic acid sequence of SEQ ID NO: 2 or a cytomegalovirus (CMV) enhancer comprising the nucleic acid sequence of SEQ ID NO: 11;
 - (c) a chimeric intron comprising the nucleic acid sequence of SEQ ID NO: 5 or 16;

- (d) a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE) comprising the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 7 and 18; and
- (e) a SV40 polyadenylation signal sequence with a nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 14.
- 5
3. An adeno-associated virus (AAV) vector comprising a neurogenic differentiation 1 (NeuroD1) nucleic acid coding sequence encoding a NeuroD1 protein, wherein said coding sequence is operably linked to regulatory elements comprising:
- 10
- (a) a glial fibrillary acidic protein (GFAP) promoter;
- (b) an enhancer;
- (c) a chimeric intron;
- (d) a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE); and
- 15
- (e) a polyadenylation signal sequence.
4. Use of a composition comprising an adeno-associated virus (AAV) vector in the manufacture of a medicament for converting glial cells to functional neurons in a human, wherein said AAV vector comprises a human neurogenic differentiation 1 (hNeuroD1) sequence having a nucleic acid sequence of SEQ ID NO: 6, and wherein said sequence is operably linked to regulatory elements comprising:
- 20
- (a) a human glial fibrillary acidic protein (GFAP) promoter comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 4, 12, and 15;
- (b) an enhancer from the human elongation factor-1 alpha (EF-1 alpha) promoter comprising the nucleic acid sequence of SEQ ID NO: 2 or a cytomegalovirus (CMV) enhancer comprising the nucleic acid sequence of SEQ ID NO: 11;
- 25
- (c) a chimeric intron comprising the nucleic acid sequence of SEQ ID NO: 5 or 16;
- (d) a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE) comprising the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 7 and 18; and

- (e) a SV40 polyadenylation signal sequence comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 14.
- 5 5. Use of a composition comprising an adeno-associated-virus (AAV) vector in the manufacture of a medicament for converting glial cells to functional neurons in a human, wherein said AAV vector comprises a nucleic acid sequence encoding a human neurogenic differentiation 1 (hNeuroD1) protein comprising the amino acid coding sequence of SEQ ID NO: 10, and wherein said coding sequence is operably linked to regulatory elements comprising:
- 10 (a) a human glial fibrillary acidic protein (GFAP) promoter comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 4, 12, and 15;
- 15 (b) an enhancer from the human elongation factor-1 alpha (EF-1 alpha) promoter comprising the nucleic acid sequence of SEQ ID NO: 2 or a cytomegalovirus (CMV) enhancer comprising the nucleic acid sequence of SEQ ID NO: 11;
- 20 (c) a chimeric intron comprising the nucleic acid sequence of SEQ ID NO: 5 or 16;
- (d) a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE) comprising the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 7 and 18; and
- (e) a SV40 polyadenylation signal sequence comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 14.
- 25 6. Use of a composition comprising an adeno-associated virus (AAV) vector in the manufacture of a medicament for the treatment of a neurological condition in a subject in need thereof, wherein said AAV vector comprises a neurogenic differentiation 1 (NeuroD1) sequence operably linked to expression control elements comprising:
- 30 (a) a glial fibrillary acidic protein (GFAP) promoter;
- (b) an enhancer;
- (c) a chimeric intron;

(d) a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE); and
(e) a polyadenylation signal.

- 5 7. The AAV vector of any one of claims 1-3, or the use of any one of claims 4-6, wherein
 said AAV vector is selected from the group consisting of AAV serotype 2, AAV serotype
 5, and AAV serotype 9.
8. The AAV vector or use of claim 7, wherein said AAV vector is AAV serotype 2.
9. The AAV vector or use of claim 7, wherein said AAV vector is AAV serotype 5.
10. The AAV vector or use of claim 7, wherein said AAV vector is AAV serotype 9.
11. The use of claim 4 or 5, wherein said glial cells are reactive astrocytes.
- 10 12. The use of claim 4 or 5, wherein said functional neurons are selected from the group
 consisting of glutamatergic neurons, GABAergic neurons, dopaminergic neurons,
 cholinergic neurons, serotonergic neurons, epinephrinergic neurons, motor neurons, and
 peptidergic neurons.
13. The use of claim 4 or 5, wherein said human has a neurological condition.
- 15 14. The AAV vector of claim 3, or the use of claim 6, wherein said NeuroD1 is a human
 NeuroD1 (hNeuroD1).
15. The AAV vector of claim 3, or the use of claim 6, wherein said NeuroD1 is selected from
 the group consisting of a chimpanzee NeuroD1, a bonobo NeuroD1, an orangutan
 NeuroD1, a gorilla NeuroD1, a macaque NeuroD1, a marmoset NeuroD1, a capuchin
20 NeuroD1, a baboon NeuroD1, a gibbon NeuroD1, and a lemur NeuroD1.
16. The AAV vector of claim 14, wherein said hNeuroD1 comprises a nucleic acid coding
 sequence encoding an amino acid sequence at least 80% identical or similar to SEQ ID
 NO: 10.
17. The AAV vector of claim 14, wherein said hNeuroD1 sequence comprises a nucleic acid
25 sequence at least 80% identical to SEQ ID NO: 6, or the complement thereof.

18. The AAV vector of claim 3, or the use of claim 6, wherein said GFAP promoter is a human GFAP (hGFAP) promoter.
19. The AAV vector of claim 3, or the use of claim 6, wherein said GFAP promoter is selected from the group consisting of a chimpanzee GFAP promoter, a bonobo GFAP promoter, an orangutan GFAP promoter, a gorilla GFAP promoter, a macaque GFAP promoter, a marmoset GFAP promoter, a capuchin GFAP promoter, a baboon GFAP promoter, a gibbon GFAP promoter, and a lemur GFAP promoter.
20. The AAV vector of any one of claims 1–3 or the use of any one of claims 4–6, wherein the AAV vector further comprises a 2A self-cleavage peptide sequence at least 80% identical to SEQ ID NO: 3 or the complement thereof.
21. The AAV vector or use of claim 18, wherein said hGFAP promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 4 or the complement thereof.
22. The AAV vector or use of claim 18, wherein said hGFAP promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NOs: 12 or the complement thereof.
23. The AAV vector or use of claim 18, wherein said hGFAP promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NOs: 15 or the complement thereof.
24. The AAV vector of claim 3, or the use of claim 6, wherein said enhancer is selected from the group consisting of an enhancer from human elongation factor-1 alpha (EF1- α) promoter and cytomegalovirus (CMV) enhancer.
25. The AAV vector or use of claim 24, wherein said EF1- α comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 2, or the complement thereof.
26. The AAV vector or use of claim 24, wherein said CMV enhancer comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 11, or the complement thereof.
27. The AAV vector of claim 3, or the use of claim 6, wherein said chimeric intron comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 5 or the complement thereof.

28. The AAV vector of claim 3, or the use of claim 6, wherein said chimeric intron comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 16 or the complement thereof.
29. The AAV vector of claim 3, or the use of claim 6, wherein said WPRE comprises a
5 nucleic acid sequence at least 80% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 7 and 18, or the complement thereof.
30. The AAV vector of claim 3, or the use of claim 6, wherein said polyadenylation signal is selected from the group consisting of SV40 polyadenylation signal and a hGH polyadenylation signal.
- 10 31. The AAV vector or use of claim 30, wherein said SV40 polyadenylation signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 8, or the complement thereof.
32. The AAV vector or use of claim 30, wherein said hGH polyadenylation signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 13, or the complement
15 thereof.
33. The AAV vector or use of claim 30, wherein said bGH polyadenylation signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 14, or the complement thereof.
34. The AAV vector of claim 3, or the use of claim 6, wherein said AAV vector further
20 comprises a nucleic acid sequence encoding an AAV protein sequence.
35. The AAV vector of any one of claims 1-3, or the use of any one of claims 4-6, wherein said AAV vector comprises AAV serotype 2 inverted terminal repeats (ITRs).
36. The AAV vector of any one of claims 1-3, or the use of any one of claims 4-6, wherein said AAV vector comprises AAV serotype 5 inverted terminal repeats (ITRs).
- 25 37. The AAV vector of any one of claims 1-3, or the use of any one of claims 4-6, wherein said AAV vector comprises AAV serotype 9 inverted terminal repeats (ITRs).

38. The AAV vector of any one of claims 1-3, or the use of any one of claims 4-6, wherein said AAV vector comprises at least one ITR nucleic acid sequence at least 80% identical to SEQ ID NO: 1.
39. The AAV vector of any one of claims 1-3, or the use of any one of claims 4-6, wherein said AAV vector comprises at least one ITR nucleic acid sequence at least 80% identical to SEQ ID NO: 9.
40. The use of claim 6, wherein said subject in need thereof is a mammal.
41. The use of claim 40, wherein said mammal is a human.
42. The use of claim 40, wherein said mammal is a non-human primate.
43. The use of claim 6, wherein said subject in need thereof has a neurological condition.
44. The use of claim 13, wherein said neurological condition comprises an injury to the central nervous system (CNS) or peripheral nervous system.
45. The use of claim 13, wherein said wherein said neurological condition comprises an injury to the CNS.
46. The use of claim 13, wherein said neurological condition is selected from the group consisting of Alzheimer's Disease, Parkinson's Disease, amyotrophic lateral sclerosis (ALS), Huntington's Disease, epilepsy, physical injury, stroke, cerebral aneurysm, traumatic brain injury, concussion, a tumor, inflammation, infection, ataxia, brain atrophy, spinal cord atrophy, multiple sclerosis, traumatic spinal cord injury, ischemic or hemorrhagic myelopathy (myelopathy), global ischemia, hypoxic ischemic encephalopathy, embolism, fibrocartilage embolism myelopathy, thrombosis, nephropathy, chronic inflammatory disease, meningitis, and cerebral venous sinus thrombosis.
47. The use of claim 13, wherein said neurological condition is Alzheimer's Disease.
48. The use of claim 13, wherein said neurological condition is Parkinson's Disease.

49. The use of claim 13, wherein said neurological condition is ALS.
50. The use of claim 13, wherein said neurological condition is Huntington's Disease.
51. The use of claim 13, wherein said neurological condition is a stroke.
52. The use of claim 51, wherein said stroke is an ischemic stroke.
- 5 53. The use of claim 51, wherein said stroke is a hemorrhagic stroke.
54. The use of claim 43, wherein said composition is capable of converting at least one glial cell to a neuron.
55. The use of claim 54, wherein said glial cells are selected from the group consisting of astrocytes and NG2 cells.
- 10 56. The use of claim 54, wherein said glial cells are astrocytes.
57. The use of claim 56, wherein said astrocytes are reactive astrocytes.
58. The use of claim 54, wherein said glial cells are GFAP positive.
59. The use of claim 54, wherein said neurons are functional neurons.
- 15 60. The use of claim 54, wherein said functional neurons are selected from the group consisting of glutamatergic neurons, GABAergic neurons, dopaminergic neurons, cholinergic neurons, serotonergic neurons, epinephrinergic neurons, motor neurons, and peptidergic neurons..
61. The use of claim 60, wherein said functional neurons are glutamatergic neurons.
- 20 62. The use of claim 6, wherein said composition is formulated to be delivered to a subject in need thereof.
63. The use of claim 62, wherein said composition is formulated for local delivery.
64. The use of claim 62, wherein said composition is formulated for systemic delivery.

65. The use of any one of claims 62-64, wherein said composition is formulated for delivery via intraperitoneal, intramuscular, intravenous, intrathecal, intracerebral, intracranial, intra lateral ventricle of the brain, intra cisterna magna, intra vitreous, intra-subretina, intraparenchymal, intranasal, or oral administration.

5 66. The use of claim 4 or 5, wherein the converting glial cells to functional neurons in a human occurs in a brain of a living human.

67. Use of a composition in the manufacture of a medicament for converting reactive astrocytes to functional neurons in a brain of a living human, the composition comprising an adeno-associated virus (AAV) comprising a DNA vector construct comprising a
10 nucleic acid sequence encoding a human neurogenic differentiation 1 (hNeuroD1) protein comprising the amino acid coding sequence of SEQ ID NO: 10, wherein said coding sequence is operably linked to expression control elements comprising:

- (a) a human glial fibrillary acid protein (GFAP) promoter comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 4, 12, and 15;
- 15 (b) an enhancer from the human elongation factor-1 alpha (EF-1 alpha) promoter comprising the nucleic acid sequence of SEQ ID NO: 2 or a cytomegalovirus (CMV) enhancer comprising the nucleic acid sequence of SEQ ID NO: 11;
- (c) a chimeric intron comprising the nucleic acid sequence of SEQ ID NO: 5 or 16;
- (d) a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE)
20 comprising the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 7 and 18; and
- (e) a SV40 polyadenylation signal sequence comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation sequence comprising the
25 nucleic acid sequence of SEQ ID NO: 14,
wherein the composition is to be injected into said brain of a living human.

68. A composition comprising an adeno-associated virus (AAV) comprising a DNA vector construct comprising a neurogenic differentiation 1 (NeuroD1) sequence operably linked to expression control elements comprising:
- (a) a glial fibrillary acid protein (GFAP) promoter;
 - (b) an enhancer;
 - (c) a chimeric intron;
 - (d) a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE); and
 - (e) a polyadenylation signal,
- wherein said composition is to be delivered to said subject in need thereof.
69. The use of claim 67 or the composition of claim 68, wherein said AAV is selected from the group consisting of AAV serotype 2, AAV serotype 5, and AAV serotype 9.
70. The use or composition of claim 69, wherein said AAV is AAV serotype 2.
71. The use or composition of claim 69, wherein said AAV is AAV serotype 5.
72. The use or composition of claim 69, wherein said AAV is AAV serotype 9.
73. The use of claim 67 , wherein said functional neurons are glutamatergic neurons, GABAergic neurons, dopaminergic neurons, cholinergic neurons, serotonergic neurons, epinephrinergic neurons, motor neurons, and peptidergic neurons.
74. The composition of claim 68, wherein said NeuroD1 is human NeuroD1 (hNeuroD1).
75. The composition of claim 68, wherein said NeuroD1 is selected from the group consisting of a chimpanzee NeuroD1, a bonobo NeuroD1, an orangutan NeuroD1, a gorilla NeuroD1, a macaque NeuroD1, a marmoset NeuroD1, a capuchin NeuroD1, a baboon NeuroD1, a gibbon NeuroD1, and a lemur NeuroD1.
76. The composition of claim 74, wherein said hNeuroD1 comprises a amino acid sequence encoding an amino acid coding sequence at least 80% identical or similar to SEQ ID NO: 10.

77. The composition of claim 74, wherein said hNeuroD1 sequence comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 6, or the complement thereof.
78. The composition of claim 68, wherein said GFAP promoter is a human GFAP (hGFAP) promoter.
- 5 79. The composition of claim 68, wherein said GFAP promoter is selected from the group consisting of a chimpanzee GFAP promoter, a bonobo GFAP promoter, an orangutan GFAP promoter, a gorilla GFAP promoter, a macaque GFAP promoter, a marmoset GFAP promoter, a capuchin GFAP promoter, a baboon GFAP promoter, a gibbon GFAP promoter, and a lemur GFAP promoter.
- 10 80. The use of any one of claims 67 or 69 to 73, or the composition of any one of claims 68 to 72 or 75 to 79, wherein the DNA vector construct further comprises a 2A self-cleavage peptide sequence at least 80% identical to SEQ ID NO: 3 or the complement thereof.
81. The composition of claim 78, wherein said hGFAP promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 4, or the complement thereof.
- 15 82. The composition of claim 78, wherein said hGFAP promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 12, or the complement thereof.
83. The composition of claim 78, wherein said hGFAP promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 15, or the complement thereof.
- 20 84. The composition of claim 68, wherein said enhancer is selected from the group consisting of an enhancer from human elongation factor-1 alpha (EF1- α) promoter and cytomegalovirus (CMV) enhancer.
85. The composition of claim 84, wherein said EF1- α comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 2, or the complement thereof.
- 25 86. The composition of claim 84 wherein said CMV enhancer comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 11, or the complement thereof.

87. The composition of claim 68, wherein said chimeric intron comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 5, or the complement thereof.
88. The composition of claim 68, wherein said chimeric intron comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 16, or the complement thereof.
- 5 89. The composition of claim 68, wherein said WPRE comprises a nucleic acid sequence at least 80% identical to a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 7 and 18, or the complement thereof.
90. The composition of claim 68, wherein said polyadenylation signal is selected from the group consisting of SV40 polyadenylation signal, a hGH polyadenylation signal, and a
10 bGH polyadenylation signal.
91. The composition of claim 68, wherein said SV40 polyadenylation signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 8, or the complement thereof.
92. The composition of claim 68, wherein said hGH polyadenylation signal comprises a
15 nucleic acid sequence at least 80% identical to SEQ ID NO: 13, or the complement thereof.
93. The composition of claim 68, wherein said bGH polyadenylation signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 14, or the complement thereof.
- 20 94. The composition of claim 68, wherein said vector further comprises a nucleic acid sequence encoding an AAV protein sequence.
95. The use of claim 67 or the composition of claim 68, wherein said vector comprises AAV serotype 2 inverted terminal repeats (ITRs).
- 25 96. The use of claim 67 or the composition of claim 68, wherein said vector comprises AAV serotype 5 inverted terminal repeats (ITRs).

97. The use of claim 67 or the composition of claim 68, wherein said vector comprises AAV serotype 9 inverted terminal repeats (ITRs).
98. The use of claim 67 or the composition of claim 68, wherein said vector comprises at least one ITR nucleic acid sequence at least 80% identical to SEQ ID NO: 1.
- 5 99. The use of claim 67 or the composition of claim 68, wherein said vector comprises at least one ITR nucleic acid sequence at least 80% identical to SEQ ID NO: 9.
100. The composition of claim 68, wherein said subject in need thereof is a mammal.
101. The composition of claim 100, wherein said mammal is a human.
102. The composition of claim 100, wherein said mammal is a non-human primate.
- 10 103. The composition of claim 68, wherein said delivering comprises a local administration.
104. The composition of claim 68, wherein said delivering comprises systemic administration.
105. The composition of claim 68, wherein said delivering comprises an administration selected from the group consisting of an intraperitoneal administration, intramuscular
15 administration, intravenous administration, intrathecal administration, intracerebral administration, intracranial, intra lateral ventricle of the brain, intra cisterna magna, intra vitreous, intra-subretina, intraparenchymal administration, intranasal administration, and oral administration.
106. The use of claim 67, wherein said injecting comprises an injection selected from the
20 group consisting of an intraperitoneal injection, intramuscular injection, intravenous injection, intrathecal injection, intracerebral injection, intracranial, intra lateral ventricle of the brain, intra cisterna magna, intra vitreous, intra-subretina, intraparenchymal injection, intranasal injection, and oral injection.
107. The composition of claim 68, wherein said delivering comprises injecting.

108. The use of claim 67, wherein said injecting is performed at a concentration of between 10^{10} particles/mL and 10^{14} particles/mL.

109. The composition of claim 108, wherein said injecting further comprises a flow rate of between 0.1 μ L/minute and 5.0 μ L/minute.

5 110. The use of claim 67, or the composition of claim 107, wherein said AAV is to be directly injected into the brain of said subject.

111. The use of claim 67, wherein said converting is in the cerebral cortex of said brain.

112. The use of claim 67, or the composition of claim 107, wherein said AAV is to be directly injected into the spinal cord of said subject.

10 113. The composition of claim 68, wherein said neurological condition comprises an injury to the central nervous system (CNS) or peripheral nervous system.

114. The composition of claim 68, wherein said neurological condition is selected from the group consisting of Alzheimer's Disease, Parkinson's Disease, amyotrophic lateral sclerosis (ALS), Huntington's Disease, epilepsy, physical injury, stroke, cerebral aneurysm, traumatic
15 brain injury, concussion, a tumor, inflammation, infection, ataxia, brain atrophy, spinal cord atrophy, multiple sclerosis, traumatic spinal cord injury, ischemic or hemorrhagic myelopathy (myelopathy), global ischemia, hypoxic ischemic encephalopathy, embolism, fibrocartilage embolism myelopathy, thrombosis, nephropathy, chronic inflammatory disease, meningitis, and cerebral venous sinus thrombosis.

20 115. The composition of claim 68, wherein said neurological condition is Alzheimer's Disease.

116. The composition of claim 68, wherein said neurological condition is Parkinson's Disease.

117. The composition of claim 68, wherein said neurological condition is ALS.

118. The composition of claim 68, wherein said neurological condition is Huntington's Disease.
119. The composition of claim 68, wherein said neurological condition is a stroke.
120. The composition of claim 119, wherein said stroke is an ischemic stroke.
- 5 121. The composition of claim 119, wherein said stroke is a hemorrhagic stroke.
122. The composition of claim 68, wherein said composition is capable of converting at least one glial cell into a neuron.
123. The composition of claim 122, wherein said glial cells are selected from the group consisting of astrocytes and NG2 cells.
- 10 124. The composition of claim 122, wherein said glial cells are astrocytes.
125. The composition of claim 124, wherein said astrocytes are reactive astrocytes.
126. The composition of claim 122, wherein said glial cells are GFAP positive.
127. The composition of claim 122, wherein said neurons are functional neurons.
- 15 128. The composition of claim 127, wherein said functional neurons are selected from the group consisting of glutamatergic neurons, GABAergic neurons, dopaminergic neurons, cholinergic neurons, serotonergic neurons, epinephrinergic neurons, motor neurons, and peptidergic neurons.
129. The use of claim 67, wherein a therapeutically effective dose of said AAV vector is to be injected into said subject.
- 20 130. The composition of claim 68, wherein a therapeutically effective dose of said AAV vector is to be delivered to said subject.
131. The use of claim 129, wherein said therapeutically effective dose is to be administered with a pharmaceutically acceptable carrier.

132. The composition of claim 130, wherein said therapeutically effective dose is to be administered with a pharmaceutically acceptable carrier.

133. An adeno-associated virus (AAV) vector comprising a human neurogenic differentiation 1 (hNeuroD1) sequence comprising the nucleic acid sequence of SEQ ID NO: 6, where the hNeuroD1 sequence is operably linked to regulatory elements comprising:

a glial fibrillary acidic protein (GFAP) promoter comprising the nucleic acid sequence of SEQ ID NO: 15;

an enhancer from a human elongation factor-1 alpha (EF1- α) promoter comprising the nucleic acid sequence of SEQ ID NO: 2;

a chimeric intron comprising the nucleic acid sequence of SEQ ID NO: 16;

a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE) comprising the nucleic acid sequence of SEQ ID NO: 18; and

a bGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO: 14.

134. An adeno-associated virus (AAV) vector comprising a human neurogenic differentiation 1 (hNeuroD1) sequence comprising the nucleic acid sequence of SEQ ID NO: 6, where the hNeuroD1 sequence is operably linked to regulatory elements comprising:

a glial fibrillary acidic protein (GFAP) promoter comprising the nucleic acid sequence of SEQ ID NO: 15;

a cytomegalovirus (CMV) enhancer comprising the nucleic acid sequence of SEQ ID NO: 11;

a chimeric intron comprising the nucleic acid sequence of SEQ ID NO: 16;

a woodchuck hepatitis virus posttranscriptional regulatory element (WPRE) comprising the nucleic acid sequence of SEQ ID NO: 18; and

a bGH polyadenylation sequence comprising the nucleic acid sequence of SEQ ID NO:
14.