CLAIMS:

1. An adeno-associated virus (AAV) vector comprising a human distal-less homeobox 2 (hDlx2) sequence comprising the nucleic acid sequence of SEQ ID NO: 6, wherein the hDlx2 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: 3, 4, and 12;
    (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 selected from the group consisting of SEQ ID NOs: 5 and 19;
    (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 comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.

2. An adeno-associated virus (AAV) vector comprising a nucleic acid coding sequence encoding a human distal-less homeobox 2 (hDlx2) 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: 3, 4, and 12;
    (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 selected from the group consisting of SEQ ID NOs: 5 and 19;

(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 with a nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.

3. An adeno-associated virus (AAV) vector comprising a distal-less homeobox 2 (Dlx2) nucleic acid coding sequence encoding a Dlx2 protein, wherein said coding sequence is operably linked to regulatory elements comprising:

(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 sequence.

4. Use of a composition comprising an adeno-associated virus (AAV) vector in the preparation of medicine for converting glial cells to functional neurons in a human, wherein said AAV vector comprises a human distal-less homeobox 2 (hDlx2) sequence having a nucleic acid sequence of SEQ ID NO: 6, and wherein said sequence is operably linked to regulatory elements comprising:

(a) a human glial fibrillary acidic protein (GFAP) promoter comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 3, 4, and 12;

(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 selected from the group consisting of SEQ ID NOs: 5 and 19;

(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 comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.

5. Use of a composition comprising an adeno-associated-virus (AAV) vector in the preparation of medicine for converting glial cells to functional neurons in a human, wherein said AAV vector comprises a nucleic acid sequence encoding a distal-less homeobox 2 (hDlx2) protein comprising the amino acid coding sequence of SEQ ID NO: 10, and wherein said coding sequence is operably linked to regulatory elements comprising:

(a) a human glial fibrillary acidic protein (GFAP) promoter comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 3,4, and 12;

(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 selected from the group consisting of SEQ ID NOs: 5 and 19;

(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 signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.

6. Use of a composition comprising an adeno-associated virus (AAV) vector in the preparation of medicine for the treatment of a subject in need thereof, wherein said

AAV vector comprises a distal-less homeobox 2 (Dlx2) sequence operably linked to expression control elements comprising:

(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.

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.

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, seratonergic neurons, epinephrinergic neurons, motor neurons, and peptidergic neurons.

13. The use of claim 4 or 5, wherein said human has a neurological condition.

14. The AAV vector of claim 3, or the use of claim 6, wherein said Dlx2 is a human Dlx2 (hDlx2).

15. The AAV vector of claim 3, or the use of claim 6, wherein said Dlx2 is selected from the group consisting of a chimpanzee Dlx2, a bonobo Dlx2, an orangutan Dlx2, a gorilla Dlx2, a macaque Dlx2, a marmoset Dlx2, a capuchin Dlx2, a baboon Dlx2, a gibbon Dlx2, and a lemur Dlx2.

16. The AAV vector or use of claim 14, wherein said hDlx2 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 or use of claim 14, wherein said hDlx2 coding sequence comprises a nucleic acid 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 or use of claim 18, wherein said hGFAP promoter comprises a nucleic acid 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 NOs: 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 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.

24. The AAV vector or use of claim 23, wherein said EF1- α comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 2, or the complement thereof.

25. The AAV vector or use of claim 23, wherein said CMV enhancer comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 11, or the complement thereof.

26. 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 a nucleic acid selected from the group consisting of SEQ ID NOs: 5 and 19, or the complement thereof.

27. The AAV vector of claim 3, or the use of claim 6, wherein said WPRE comprises a nucleic acid sequence at least 80% identical to a nucleic acid selected from the group consisting of SEQ ID NOs: 7 and 18, or the complement thereof.

28. The AAV vector of claim 3, or the use of claim 6, wherein said polyadenylated signal is selected from the group consisting of SV40 polyadenylation signal a hGH polyadenylation signal, and a bGH polyadenylation signal.

29. The AAV vector or use of claim 28, wherein said SV40 polyadenylated signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 8, or the complement thereof.

30. The AAV vector or use of claim 28, wherein said hGH polyadenylated signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 13, or the complement thereof.

31. The AAV vector or use of claim 28, wherein said bGH polyadenylated signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 20, or the complement thereof.

32. The AAV vector of claim 3, or the use of claim 6, wherein said AAV vector further comprises a nucleic acid sequence encoding an AAV protein sequence.

33. 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).

34. 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).

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 9 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 at least one ITR nucleic acid sequence at least 80% identical to SEQ ID NO: 1.

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 at least one ITR nucleic acid sequence at least 80% identical to SEQ ID NO: 9.

38. The use of claim 6, wherein said subject in need thereof is a mammal.

39. The use of claim 38, wherein said mammal is a human.

40. The use of claim 38, wherein said mammal is a non-human primate.

41. The use of claim 6, wherein said subject in need thereof has a neurological condition.

42. The use of claim 13, wherein said neurological condition comprises an injury to the central nervous system (CNS) or peripheral nervous system.

43. The use of claim 13, wherein said wherein said neurological condition comprises an injury to the CNS.

44. 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.

45. The use of claim 13, wherein said neurological condition is Alzheimer's Disease.

46. The use of claim 13, wherein said neurological condition is Parkinson's Disease.

47. The use of claim 13, wherein said neurological condition is ALS.

48. The use of claim 13, wherein said neurological condition is Huntington's Disease.

49. The use of claim 13, wherein said neurological condition is a stroke.

50. The use of claim 49, wherein said stroke is an ischemic stroke.

51. The use of claim 49, wherein said stroke is a hemorrhagic stroke.

52. The use of claim 41, wherein said composition is capable of converting at least one glial cell to a neuron.

53. The use of claim 52, wherein said glial cells are selected from the group consisting of astrocytes and NG2 cells.

54. The use of claim 52, wherein said glial cells are astrocytes.

55. The use of claim 54, wherein said astrocytes are reactive astrocytes.

56. The use of claim 52, wherein said glial cells are GFAP positive.

57. The use of claim 52, wherein said neurons are functional neurons.

58. The use of claim 52, wherein said functional neurons are selected from the group consisting of glutamatergic neurons, GABAergic neurons. dopaminergic neurons, cholinergic neurons, seratonergic neurons, epinephrinergic neurons, motor neurons, and peptidergic neurons..

59. The use of claim 58, wherein said functional neurons are glutamatergic neurons.

60. The use of claim 6, wherein said composition is formulated to be delivered to a subject in need thereof.

61. The use of claim 60, wherein said composition is formulated for local delivery.

62. The use of claim 61, wherein said composition is formulated for systemic delivery.

63. The use of any one of claims 60-62, 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.

64. A composition for use in a method of 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 human distal-less homeobox 2 (hDlx2) sequence comprising the nucleic acid sequence of SEQ ID NO: 6, wherein said sequence is operably linked to regulatory 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: 3, 4, and 12;
    (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 selected from the group consisting of SEQ ID NOs: 5 and 19;
    (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 comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20;

    wherein the composition is to be injected into the living human.
65. A composition for use in a method of converting reactive astrocytes to functional neurons in a brain of a living brain, the composition comprising: an adeno-associated virus (AAV) comprising a DNA vector construct comprising a nucleic acid sequence encoding a human distal-less homeobox 2 (hDlx2) 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: 3, 4, and 12;

(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 selected from the group consisting of SEQ ID NOs: 5 and 19;

(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 comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20;

wherein the composition is to be injected into the living human.

66. A composition for use in a method of converting glial cells to neurons in a subject in need thereof, the composition comprising: an adeno-associated virus (AAV) comprising a DNA vector construct comprising a distal-less homeobox 2 (Dlx2) 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) and a polyadenylation signal sequence,

wherein said composition is to be delivered to said subject in need thereof; and wherein said vector is capable of converting at least one glial cell to a neuron in said subject in need thereof.

67. A composition for use in a method of treating a neurological condition in a subject in need thereof, the composition comprising: an adeno-associated virus (AAV) comprising a DNA vector construct comprising a distal-less homeobox 2 (Dlx2) 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 delivered to said subject in need thereof.

68. The composition of any one of claims 64-67, wherein said AAV is selected from the group consisting of AAV serotype 2, AAV serotype 5, and AAV serotype 9.

69. The composition of claim 68, wherein said AAV is AAV serotype 2.

70. The composition of claim 68, wherein said AAV is AAV serotype 5.

71. The composition of claim 68, wherein said AAV is AAV serotype 9.

72. The composition of claims 64 or 65, wherein said functional neurons are glutamatergic neurons, GABAergic neurons, dopaminergic neurons, cholinergic neurons, seratonergic neurons, epinephrinergic neurons, motor neurons, and peptidergic neurons.

73. The composition of claims 66 or 67, wherein said Dlx2 is human Dlx2 (hDlx2).

74. The composition of claims 66 or 67, wherein said Dlx2 is selected from the group consisting of a chimpanzee Dlx2, a bonobo Dlx2, an orangutan Dlx2, a gorilla Dlx2, a macaque Dlx2, a marmoset Dlx2, a capuchin Dlx2, a baboon Dlx2, a gibbon Dlx2, and a lemur Dlx2.

75. The composition of claim 73, wherein said hDlx2 comprises a amino acid sequence encoding an amino acid sequence at least 80% identical or similar to SEQ ID NO: 10.

76. The composition of claim 73, wherein said hDlx2 coding sequence comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 6, or the complement thereof.

77. The composition of claims 66 or 67, wherein said GFAP promoter is a human GFAP (hGFAP) promoter.

78. The composition of claims 66 or 67, 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.

79. The composition of claim 77, wherein said hGFAP promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 3, or the complement thereof.

80. The composition of claim 78, wherein said hGFAP promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NOs: 4, or the complement thereof.

81. The composition of claim 77, wherein said hGFAP promoter comprises a nucleic acid sequence at least 80% identical to SEQ ID NOs: 12, or the complement thereof.

82. The composition of claims 66 or 67, 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.

83. The composition of claim 82, wherein said EF1- α comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 2, or the complement thereof.

84. The composition of claim 82 wherein said CMV enhancer comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 11, or the complement thereof.

85. The composition of claims 66 or 67, wherein said chimeric intron comprises a nucleic acid sequence at least 80% identical to nucleic acid sequence selected from the group consisting of SEQ ID NOs: 5 and 19, or the complement thereof.

86. The composition of claims 66 or 67, 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.

87. The composition of claims 66 or 67, wherein said polyadenylation signal is selected from the group consisting of SV40 polyadenylation signal and a hGH polyadenylation signal.

88. The composition of claims 66 or 67, wherein said SV40 polyadenylation signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 8, or the complement thereof.

89. The composition of claims 66 or 67, wherein said hGH polyadenylation signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 13, or the complement thereof.

90. The composition of claims 66 or 67, wherein said bGH polyadenylated signal comprises a nucleic acid sequence at least 80% identical to SEQ ID NO: 20, or the complement thereof.

91. The composition of claims 66 or 67, wherein said vector further comprises a nucleic acid sequence encoding an AAV protein sequence.

92. The composition of any one of claims 64-67, wherein said vector comprises AAV serotype 2 inverted terminal repeats (ITRs).

93. The composition of any one of claims 64-67, wherein said vector comprises AAV serotype 5 inverted terminal repeats (ITRs).

94. The composition of any one of claims 64-67, wherein said vector comprises AAV serotype 9 inverted terminal repeats (ITRs).

95. The composition of any one of claims 64-67, wherein said vector comprises at least one ITR nucleic acid sequence at least 80% identical to SEQ ID NO: 1.

96. The composition of any one of claims 64-67, wherein said vector comprises at least one ITR nucleic acid sequence at least 80% identical to SEQ ID NO: 9.

97. The composition of claim 64, wherein said converting occurs in the central nervous system (CNS) or peripheral nervous system.

98. The composition of claim 66, wherein said converting occurs in the CNS.

99. The composition of claim 66 or 67, wherein said subject in need thereof is a mammal.

100. The composition of claim 99, wherein said mammal is a human.

101. The composition of claim 99, wherein said mammal is a non-human primate.

102. The composition of claim 66 or 67, wherein said delivering comprises a local administration.

103. The composition of claim 67 or 67, wherein said delivering comprises systemic administration.

104. The composition of claim 66 or 67, wherein said delivering comprises an administration selected from the group consisting of an intraperitoneal administration, intramuscular administration, intravenous administration, intrathecal administration, intracerebral administration, intracranial administration, intra lateral ventricle of the brain administration, intra cisterna magna administration, intra vitreous administration, intra-subretina administration, intraparenchymal administration, intranasal administration, and oral administration.

105. The composition of claim 64 or 65, wherein said injecting comprises an injection selected from the group consisting of an intraperitoneal injection, intramuscular injection, intravenous injection, intrathecal injection, intracerebral injection, intracranial injection, intra lateral ventricle of the brain injection, intra cisterna magna injection, intra vitreous injection, intra-subretina injection, intraparenchymal injection, intranasal injection, and oral injection.

106. The composition of claims 66 or 67, wherein said delivering comprises injecting.

107. The composition of any one of claims 64 or 65, wherein said injecting is performed at a concentration of between 10^{10} particles/mL and 10^{14} particles/mL.

108. The composition of claim 107, wherein said injecting further comprises a flow rate of between 0.1 µL/minute and 5.0 µL/minute.

109. The composition of claim 66, wherein said at least one glial cell is selected from the group consisting of at least one astrocyte and at least one NG2 cell.

110. The composition of claim 64, wherein said at least one glial cell is at least one astrocyte.

111. The composition of claim 109 or 110, wherein said at least one astrocyte is a reactive astrocyte.

112. The composition of claim 66, wherein said neuron is a functional neuron.

113. The composition of any one of claims 64 or 65, wherein said functional neurons are selected from the group consisting of glutamatergic neurons, GABAergic neurons, dopaminergic neurons, cholinergic neurons, seratonergic neurons, epinephrinergic neurons, motor neurons, and peptidergic neurons..

114. The composition of claim 66, wherein said subject exhibits an improvement of at least one neurological condition symptom as compared to said subject prior to said delivering.

115. The composition of claim 114, wherein said improvement is measured within 1 year of said delivering.

116. The composition of any one of claims 64 or 65, wherein said method comprises directly injecting said AAV vector into the brain of said subject.

117. The composition of any one of claims 64 or 65 wherein said converting is in the cerebral cortex of said brain.

118. The composition of any one of claims 64 or 65, wherein said method comprises directly injecting said AAV vector into the spinal cord of said subject.

119. The composition of claim 67, wherein said neurological condition comprises an injury to the central nervous system (CNS) or peripheral nervous system.

120. The composition of claim 67, 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.

121. The composition of claim 67, wherein said neurological condition is Alzheimer's Disease.

122. The composition of claim 67, wherein said neurological condition is Parkinson’s Disease.

123. The composition of claim 67, wherein said neurological condition is ALS.

124. The composition of claim 67, wherein said neurological condition is Huntington’s Disease.

125. The composition of claim 67, wherein said neurological condition is a stroke.

126. The composition of claim 125, wherein said stroke is an ischemic stroke.

127. The composition of claim 1235, wherein said stroke is a hemorrhagic stroke.

128. The composition of claim 67, wherein said method is capable of converting at least one glial cell into a neuron.

129. The composition of claim 128, wherein said glial cells are selected from the group consisting of astrocytes and NG2 cells.

130. The composition of claim 129, wherein said glial cells are astrocytes.

131. The composition of claim 130, wherein said astrocytes are reactive astrocytes.

132. The composition of claim 129, wherein said glial cells are GFAP positive.

133. The composition of claim 129, wherein said neurons are functional neurons.

134. The composition of claim 133, wherein said functional neurons are selected from the group consisting of glutamatergic neurons, GABAergic neurons, dopaminergic neurons, cholinergic neurons, seratonergic neurons, epinephrinergic neurons, motor neurons, and peptidergic neurons..

135. The composition of claims 64 or 54, wherein a therapeutically effective dose of said AAV is injected into said subject.

136. The composition of claims 66 or 67, wherein a therapeutically effective dose of said AAV is delivered to said subject.

137. The composition of claim 135, wherein said therapeutically effective dose is administered with a pharmaceutically acceptable carrier.

138. An adeno-associated virus (AAV) vector comprising a human distal-less homeobox 2 (hDlx2) sequence comprising the nucleic acid sequence of SEQ ID NO: 6, wherein the hDlx2 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: 3, 4, and 12;

(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; and

(c) a SV40 polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.

139. An adeno-associated virus (AAV) vector comprising a nucleic acid coding sequence encoding a human distal-less homeobox 2 (hDlx2) 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: 3, 4, and 12;

(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; and

(c) a SV40 polyadenylation signal with a nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.

140. A composition comprising an adeno-associated virus (AAV) vector for converting glial cells to functional neurons in a human, wherein said AAV vector comprises a human distal-less homeobox 2 (hDlx2) sequence having a nucleic acid

sequence of SEQ ID NO: 6, and wherein said sequence is operably linked to regulatory elements comprising:

(a) a human glial fibrillary acidic protein (GFAP) promoter comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 3, 4, and 12;

(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; and

(c) a SV40 polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.

141. A composition comprising an adeno-associated-virus (AAV) vector for converting glial cells to functional neurons in a human, wherein said AAV vector comprises a nucleic acid sequence encoding a distal-less homeobox 2 (hDlx2) protein comprising the amino acid coding sequence of SEQ ID NO: 10, and wherein said coding sequence is operably linked to regulatory elements comprising:

(a) a human glial fibrillary acidic protein (GFAP) promoter comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 3,4, and 12;

(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; and

(c) a SV40 polyadenylation signal sequence comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.

142. A method of converting reactive astrocytes to functional neurons in a brain of a living human comprising: injecting an adeno-associated virus (AAV) into a subject in need thereof, wherein said AAV comprises a DNA vector construct comprising a human distal-less homeobox 2 (hDlx2) sequence comprising the nucleic acid

sequence of SEQ ID NO: 6, wherein said sequence is operably linked to regulatory 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: 3, 4, and 12;

(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; and

(c) a SV40 polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.

143. A method of converting reactive astrocytes to functional neurons in a brain of a living brain comprising: injecting an adeno-associated virus (AAV) into a subject in need thereof, wherein said AAV comprises a DNA vector construct comprising a nucleic acid sequence encoding a human distal-less homeobox 2 (hDlx2) 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: 3, 4, and 12;

(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; and

(c) a SV40 polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 8, a hGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 13, or a bGH polyadenylation signal comprising the nucleic acid sequence of SEQ ID NO: 20.