CLAIMS

What is claimed is:

1. An isolated or modified nucleic acid encoding aspartoacylase (ASPA) comprising the nucleic acid sequence of SEQ ID NO:2.

2. A vector genome comprising the modified nucleic acid of claim 1.

3. The vector genome of claim 2, wherein the vector genome is a recombinant adeno-associated virus (rAAV) vector genome, self-complementary, or both.

4. A recombinant adeno-associated virus (rAAV) vector comprising the vector genome of any one of claims 2 and 3, and a capsid selected from the group consisting of a capsid of Olig001, Olig002, Olig003, AAV1, AAV2, AAV3, AAV3A, AAV3B, AAV4, AAV5, AAV6, AAV7, AAV8, AAV9, AAV10, AAV11, AAV12, AAVrh10, AAVrh74, RHM4-1, RHM15-1, RHM15-2, RHM15-3/RHM15-5, RHM15-4, RHM15-6, AAVhu.26, AAV1.1, AAV2.5, AAV6.1, AAV6.3.1, AAV9.45, AAV2i8, AAV2G9, AAV2i8G9, AAV2-TT, AAV2-TT-S312N, AAV3B-S312N, AAV-DJ, AAV-DJ/8, AAV-DJ/9 and AAV-LK03.

5. The rAAV vector of claim 4, comprising one or more of the following features:

wherein the capsid is an Olig001, an Olig002 or an Olig003 capsid;

wherein the capsid is an Olig001 capsid comprising a viral protein 1(VP1) and wherein the VP1 comprises the amino acid sequence of SEQ ID NO:14;

wherein the vector genome is self- complementary;

wherein the vector genome further comprises at least one element selected from the group consisting of at least one AAV inverted terminal repeat (ITR) sequence, an enhancer, a promoter, an exon, an intron, and a poly-adenylation (polyA) signal sequence;

wherein the vector genome further comprises at least one element selected from the group consisting of at least one AAV2 ITR, a cytomegalovirus (CMV) enhancer, a hybrid form

of the CBA promoter (CBh promoter), a chicken B-actin (CBA) exon, a CBA intron, an minute virus of mice (MVM) intron and a bovine growth hormove (BGH) polyA; and

wherein the vector genome further comprises a least one element selected from the group consisting of at least one ITR comprising the nucleic acid sequence of SEQ ID NO:5, SEQ ID NO:12 or SEQ ID NO:19, an enhancer comprising the nucleic acid sequence of SEQ ID NO:6 or SEQ ID NO:17, a promoter comprising the nucleic acid sequence of SEQ ID NO:7, an exon comprising the nucleic acid sequence of SEQ ID NO:8 or SEQ ID NO:18, an intron comprising the nucleic acid sequence of SEQ ID NO:9, an intron comprising the nucleic acid sequence of SEQ ID NO:10 and a polyA comprising the nucleic acid sequence of SEQ ID NO:11.

6. An rAAV vector comprising a vector genome comprising from 5' to 3':

a) an AAV inverted terminal repeat (ITR) comprising the nucleic acid sequence of SEQ ID NO:5, SEQ ID NO:12 or SEQ ID NO:19;

b) an enhancer comprising the nucleic acid sequence of SEQ ID NO:6 or SEQ ID NO:17;

c) a promoter comprising the nucleic acid sequence of SEQ ID NO:7;

d) an exon comprising the nucleic acid sequence of SEQ ID NO:8 or SEQ ID NO:18;

e) an intron comprising the nucleic acid sequence of SEQ ID NO:9;

f) an intron comprising the nucleic acid sequence of SEQ ID NO:10;

g) a modified nucleic acid encoding aspartoacylase (ASPA) comprising the nucleic acid sequence of SEQ ID NO:2;

h) a polyA comprising the nucleic acid sequence of SEQ ID NO:11; and

i) an AAV ITR comprising the nucleic acid sequence of SEQ ID NO:5, SEQ ID NO:12 or SEQ ID NO:19.

7. The rAAV vector of claim 6, comprising one or more of the following features:

wherein the nucleic acid is self-complementary; and

wherein the vector comprises an Olig001 capsid comprising a viral protein 1 (VP1) and wherein the VP1 comprises the amino acid sequence of SEQ ID NO:14.

8. A pharmaceutical composition comprising the rAAV vector of any one of claims 4-7.

9. A host cell comprising the isolated nucleic acid or the modified nucleic acid of claim 1, the vector genome of any one of claims 2-3 or the rAAV vector of any one of claims 4-7.

10. The host cell of claim 9, comprising one or more of the following features:

wherein the cell is selected from the group consisting of VERO, WI38, MRC5, A549, HEK293, B-50 or any other HeLa cell, HepG2, Saos-2, HuH7, and HT1080;

wherein the cell is a HEK293 cell adapted to growth in suspension culture;

wherein the cell is a HEK293 cell having American Type Culture Collection (ATCC) No. PTA 13274; and

wherein the cell comprises at least one nucleic acid encoding at least one protein selected from the group consisting of an AAV rep protein, an AAV capsid (Cap) protein, an adenovirus (Ad) early region 1A (E1a) protein, an Ad E1b protein, an Ad E2a protein, an Ad E4 protein and a viral associated (VA) RNA.

11. A kit for the treatment of Canavan disease (CD), comprising a therapeutically effective amount of an isolated nucleic acid or a modified nucleic acid of claim 1, a vector genome of any one of claims 2-3, an rAAV vector of any one of claims 4-7, or a pharmaceutical composition of claim 8, and optionally,

wherein the kit further comprises a label or insert including instructions for using one or more of the kit components.

12. An isolated nucleic acid or a modified nucleic acid of claim 1, a vector of any one of claims 2-3, an rAAV vector of any one of claims 4-7 or a pharmaceutical composition of claim 8 for use in treating or preventing a disease, disorder or condition associated with deficiency or dysfunction of ASPA.

13. The isolated nucleic acid, modified nucleic acid, vector genome, rAAV vector, or pharmaceutical composition for use of claim 12, wherein the disease, disorder or condition is Canavan disease.

14. Use of an isolated nucleic acid or a modified nucleic acid of claim 1, a vector of any one of claims 2-3, or an rAAV vector of any one of claims 4-7 in the manufacture of a medicament for treating and/ or preventing a disease, disorder of condition associated with deficiency or dysfunction of ASPA.

15. The use of claim 14, wherein the disease, disorder or condition is Canavan disease.