We Claim:

1. A pharmaceutical composition comprising APOE2 rAAV viral vectors; wherein the rAAV viral vector comprises an AAVrh10 capsid protein and an APOE2 rAAV vector; wherein the pharmaceutical composition comprises at least about 1.0×10^{11} genome copies (gc)/mL to about 1.0×10^{14} gc/mL and wherein the pharmaceutical composition comprises less than about 40% empty rAAV capsids.

2. The pharmaceutical composition of claim 1, wherein the pharmaceutical composition comprises less than about 40%, about 35%, about 30%, about 25%, about 20%, about 15%, about 10%, or about 5% empty rAAV capsids.

3. The pharmaceutical composition of claim 1, wherein the pharmaceutical composition comprises at least about 1.5×10^{13} gc/mL.

4. The pharmaceutical composition of any one of the preceding claims, wherein the APOE2 rAAV viral vector is formulated in about 1 mM potassium phosphate monobasic, 3 mM sodium phosphate dibasic, and about 155 mM sodium chloride (NaCl) at a pH of about 7.4.

5. The pharmaceutical composition of any one of the preceding claims, wherein the rAAV vector comprises in the 5' to 3' direction:

a first AAV ITR sequence;

an enhancer sequence;

a promoter sequence;

a chimeric intron;

a nucleic acid sequence encoding an apolipoprotein 2 (APOE2) polypeptide;

a polyA sequence; and

a second ITR sequence.

6. The pharmaceutical composition of claim 5, wherein the nucleic acid sequence encoding an APOE2 polypeptide comprises SEQ ID NO: 5.

7. The pharmaceutical composition of claim 5 or 6, wherein the first ITR sequence comprises the nucleic acid sequence set forth in SEQ ID NO: 1.

8. The pharmaceutical composition of any one of claims 5-7, wherein the second ITR sequence comprises the nucleic acid sequence set forth in SEQ ID NO: 7, SEQ ID NO: 10, or SEQ ID NO: 12.

9. The pharmaceutical composition of any one of claims 5-8, wherein the enhancer sequence comprises the nucleic acid sequence set forth in SEQ ID NO: 2.

10. The pharmaceutical composition of any one of claims 5-9, wherein the promoter sequence comprises the nucleic acid sequence set forth in SEQ ID NO: 3.

11. The pharmaceutical composition of any one of claims 5-10, wherein the polyA sequence comprises the nucleic acid sequence set forth in SEQ ID NO: 6.

12. The pharmaceutical composition of any one of the preceding claims, wherein the rAAV vector comprises the nucleic acid sequence set forth in SEQ ID NO: 8 or SEQ ID NO: 11.

13. A pharmaceutical composition comprising APOE2 rAAV viral vectors; wherein the rAAV viral vector comprises an AAVrh10 capsid protein and an APOE2 rAAV vector; wherein the APOE2 rAAV vector comprises the nucleic acid sequence set forth in SEQ ID NO: 8 or SEQ ID NO: 11.

14. Use of a pharmaceutical composition according to any one of claims 1 - 13 in the manufacture of a medicament for treating Alzheimer's disease.

15. The use of claim 14, wherein following administration the subject experiences an at least about 5% increase in APOE2 expression relative to a pre-administration baseline.

16. The use of claim 14 or 15, wherein the patient is an APOE4 homozygote.

17. The use of any one of claims 14-16, wherein the pharmaceutical composition is to be administered via C1-C2 administration or intracisterna magna (ICM) administration.

18. The use of any one of claims 14-17, wherein the pharmaceutical composition is to be administered at a dose of about 5.0 x 10^9 gc/mL CSF to about 5.0 x 10^{12} gc/mL CSF.

19. The use of any one of claims 14-18, wherein the pharmaceutical composition is to be administered at a dose of about:

i) 1.4 x 10^{10} gc/mL CSF,

ii) 4.4 x 10^{10} gc/mL CSF,

iii) 5.0 x 10^{10} gc/mL CSF,

iv) 1.4 x 10^{11} gc/mL CSF,

v) 1.6 x 10^{11} gc/mL CSF, or

vi) 5.0 x 10^{11} gc/mL CSF.

20. The use of any one of claims 14-19, wherein the pharmaceutical composition is to be administered in a total volume of about 5 mL, about 10 mL, about 15 mL, or about 20 mL.

21. A method of producing a cellular lysate comprising rAAV viral vectors, the method comprising:

(i) transfecting a cell culture comprising HEK293T cells in a transfection medium with a first plasmid encoding an APOE2 AAV vector and a second plasmid encoding AAV Rep proteins and AAV Cap proteins, wherein the ratio of second plasmid to first plasmid is 2:1;

(ii) culturing the transfected HEK293T cells in the culture medium under conditions in which the transfected HEK293T cells produce recombinant adeno-associated virus (rAAV) viral vectors encoding APOE2;

(iii) harvesting the transfected HEK293T cells; and

(iv) lysing the transfected HEK293T cells to produce a cellular lysate comprising the rAAV viral vectors.

22. A method for producing an APOE2 rAAV pharmaceutical composition, the method comprising:

(i) obtaining a cellular lysate comprising rAAV viral vectors encoding APOE2;

(ii) contacting a density gradient with the cellular lysate comprising rAAV viral vectors encoding APOE2 and subjecting the density gradient to centrifugation;

(iii) contacting an anion exchange column with the cellular lysate comprising rAAV viral vectors encoding APOE2;

(iv) eluting the rAAV viral vectors from the column; and

(v) concentrating the eluted rAAV viral vectors via ultrafiltration into a formulation buffer thereby producing an APOE2 rAAV pharmaceutical composition.

23. A cellular lysate comprising rAAV viral vectors produced by the method of claim 21.

24. An rAAV vector comprising the nucleic acid sequence set forth in SEQ ID NO: 8 or SEQ ID NO: 11.

25. An rAAV vector comprising in the 5’ to 3’ direction:

a first AAV ITR sequence;

an enhancer sequence;

a promoter sequence;

a chimeric intron;

a nucleic acid sequence encoding an apolipoprotein 2 (APOE2) polypeptide;

a polyA sequence; and

a second ITR sequence.