

CLAIMS

WHAT IS CLAIMED IS:

1. An AAV capsid comprising a polypeptide sequence of:

- (a) L-A-L-G-X3-X1-X1-X4 (SEQ ID NO: 94);
- (b) L-K-L-G-X3-X1-X1-X4 (SEQ ID NO: 95); or
- (c) V-K-L-G-X3-X1-X1-X4 (SEQ ID NO: 96),

wherein:

X1 is Alanine (A), Asparagine (N), Glutamine (Q), Serine (S), Threonine (T), Glutamic Acid (E), Aspartic Acid (D), Lysine (K), Arginine (R), or Histidine (H);

X3 is E, S, or Q; and

X4 is K, R, E, or A, and

wherein the polypeptide sequence is in a VP domain of the AAV capsid.

2. The AAV capsid of claim 1, wherein the polypeptide sequence is (a), and wherein (a) is:

- (i) L-A-L-G-X3-X1-T-X4 (SEQ ID NO: 99); or
- (ii) L-A-L-G-X3-X1-S-X4 (SEQ ID NO: 100).

3. The AAV capsid of claim 2 wherein the polypeptide sequence is (i), and wherein (i) is:

- (A) L-A-L-G-X3-X1-T-R (SEQ ID NO: 101);
- (B) L-A-L-G-X3-X1-T-K (SEQ ID NO: 102);
- (C) L-A-L-G-X3-X1-T-E (SEQ ID NO: 103); or
- (D) L-A-L-G-X3-X1-T-A (SEQ ID NO: 104).

4. The AAV capsid of claim 2, wherein the polypeptide sequence is (ii), and wherein (ii) is: L-A-L-G-X3-X1-S-K (SEQ ID NO: 105).

5. The AAV capsid of claim 1, wherein the polypeptide sequence is (b), and wherein (b) is

- (i) L-K-L-G-X3-X1-T-X4 (SEQ ID NO: 106).

6. The AAV capsid of claim 5, wherein (i) is L-K-L-G-X3-X1-T-K (SEQ ID NO: 107).

7. The AAV capsid of claim 1, wherein the polypeptide sequence is (c), and wherein (c) is:

- (i) V-K-L-G-X3-X1-T-X4 (SEQ ID NO: 97); or
- (ii) V-K-L-G-X3-X1-X1-K (SEQ ID NO: 98).

8. The AAV capsid of any one of claims 1-7, wherein the serotype of the AAV capsid is selected from the group consisting of: AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, AAV9, AAV10, AAV11, AAV12, and AAV13.

9. The AAV capsid of any one of claims 1-7, wherein the AAV capsid is a chimeric AAV capsid comprising an amino acid sequence from two or more serotypes selected from the group

consisting of: AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, AAV9, AAV10, AAV11, AAV12, and AAV13.

10. The AAV capsid of any one of claims 1-9, wherein the AAV capsid is of serotype AAV2 or is a chimeric AAV capsid comprising an amino acid sequence from serotype AAV2.

11. The AAV capsid of any one of claims 1-10, wherein the AAV capsid comprises an amino acid sequence having at least about 60% sequence identity to the amino acid sequence of any one of SEQ ID NOS: 28-47.

12. The AAV capsid of any one of claims 1-11, wherein the polypeptide sequence is in the GH loop or loop IV of the AAV capsid.

13. The AAV capsid of any one of claims 1-12, wherein the polypeptide sequence is an insertion within:

- (i) amino acid positions 570-611 relative to AAV2 capsid;
- (ii) amino acid positions 571-612 relative to AAV1 capsid;
- (iii) amino acid positions 560-601 relative to AAV5 capsid;
- (iv) amino acid positions 571-612 relative to AAV6 capsid;
- (v) amino acid positions 572 to 613 relative to AAV7 capsid;
- (vi) amino acid positions 573 to 614 relative to AAV8 capsid;
- (vii) amino acid positions 571 to 612 relative to AAV9 capsid; or
- (viii) amino acid positions 573 to 614 relative to AAV10 capsid.

14. The AAV capsid of any one of claims 1-13, wherein the polypeptide sequence is an insertion at position 452, 453, 466, 467, 468, 471, 585, 586, 587, and/or 588 relative to SEQ ID NO: 1.

15. The AAV capsid of any one of claims 1-14, wherein the AAV capsid further comprises at least one amino acid mutation relative to a wild-type AAV capsid.

16. The AAV capsid of claim 15, wherein the at least one amino acid mutation is at amino acid position 452, 453, 466, 467, 468, 471, 585, 586, 587, and/or 588 relative to SEQ ID NO: 1.

17. The AAV capsid of claim 16, wherein the at least one amino acid mutation is R to A at amino acid position 585 or 588 relative to SEQ ID NO: 1.

18. A vector comprising a polynucleotide sequence encoding the AAV capsid of any one of claims 1-17.

19. The vector of claim 18, wherein the AAV capsid is of serotype AAV2 or is a chimeric AAV capsid comprising an amino acid sequence from serotype AAV2.

20. The vector of claim 18 or 19, wherein the vector comprises a polynucleotide sequence encoding a transgene.