CLAIMS

1. An AAV VP3 protein comprising:

a non-threonine amino acid residue at a position that corresponds to one or more of:

T251, T454, T455, T491, T503, T550, T659, T671, or T701,

of the wild-type AAV2 capsid protein of SEQ ID NO:2;

wherein the non-threonine amino acid residue is valine, and

wherein the AAV VP3 protein is not a wild-type AAV VP3 protein.

2. The AAV VP3 protein according to claim 1, comprising a non-threonine amino acid residue at a position that corresponds to one or more of:

T455, T491, T503, T659, or T671,

of the wild-type AAV2 capsid protein of SEQ ID NO:2.

3. The AAV VP3 protein according to claim 1 or claim 2, comprising a non-threonine amino acid residue at a position corresponding to T491 of the wild-type AAV2 capsid protein of SEQ ID NO:2, wherein the non-threonine amino acid residue at position corresponding to T491 of the wild-type AAV2 capsid protein of SEQ ID NO:2 is valine (V).

4. The AAV VP3 protein according to any one of claims 1-3, comprising non-threonine amino acid residues at positions corresponding to:

(a) T491 and T455;

(b) T491 and T550;

(c) T491 and T659;

(d) T491 and T671;

(e) T455, T491, and T550;

(f) T491, T550, and T659; or

(g) T455, T491, T550, and T659;

of the wild-type AAV2 capsid protein of SEQ ID NO:2.

5. The AAV VP3 protein according to claim 4, comprising non-threonine amino acid residues at positions corresponding to T491 and T455 of the wild-type AAV2 capsid protein of SEQ ID NO:2, wherein the non-threonine amino acid residues are valine (V).

6. The AAV VP3 protein according claim 4, comprising non-threonine amino acid residues at positions corresponding to T491 and T550 of the wild-type AAV2 capsid protein of SEQ ID NO:2, wherein the non-threonine amino acid residues are valine (V).

7. The AAV VP3 protein according to claim 4, comprising non-threonine amino acid residues at positions corresponding to T491 and T659 of the wild-type AAV2 capsid protein of SEQ ID NO:2, wherein the non-threonine amino acid residues are valine (V).

8. The AAV VP3 protein according to claim 4, comprising non-threonine amino acid residues at positions corresponding to T491 and T671 of the wild-type AAV2 capsid protein of SEQ ID NO:2, wherein the non-threonine amino acid residues are valine (V).

9. The AAV VP3 protein according to claim 4, comprising non-threonine amino acid residues at positions corresponding to T455, T491, and T550 of the wild-type AAV2 capsid protein of SEQ ID NO:2, wherein the non-threonine amino acid residues are valine (V).

10. The AAV VP3 protein according to claim 4, comprising non-threonine amino acid residues at positions corresponding to T491, T550, and T659 of the wild-type AAV2 capsid protein of SEQ ID NO:2, wherein the non-threonine amino acid residues are valine (V).

11. The AAV VP3 protein according to claim 4, comprising non-threonine amino acid residues at positions corresponding to T455, T491, T550, and T659 of the wild-type AAV2 capsid protein of SEQ ID NO:2, wherein the non-threonine amino acid residues are valine (V).

12. The AAV VP3 protein according to any one of the preceding claims, wherein the AAV VP3 protein further comprises one or more of:

(a) a non-lysine amino acid residue at a position that corresponds to one or more of K258, K321, K459, K490, K507, K527, K532, K544, K549, K556, K649, K665, or K706 of the wild-type AAV2 capsid protein of SEQ ID NO:2;

(b) a non-lysine amino acid residue at a position that corresponds to one or more of K530, K547, or K569 of the wild-type AAV8 capsid protein of SEQ ID NO:8;

(c) a non-serine amino acid residue at a position that corresponds to one or more of S261, S264, S267, S276, S384, S458, S468, S492, S498, S578, S658, S662, S668, S707, or S721 of the wild-type AAV2 capsid protein of SEQ ID NO:2; and/or

(d) a non-tyrosine amino acid residue at a position that corresponds to one or more of Y252, Y272, Y444, Y500, Y700, Y704, or Y730 of the wild-type AAV2 capsid protein of SEQ ID NO:2.

13. The AAV VP3 protein according to claim 12, wherein the non-lysine amino acid residue is glutamic acid (E) or arginine (R).

14. The AAV VP3 protein according to claim 12 or 13, wherein the non-tyrosine amino acid residue is a phenylalanine (F).

15. The AAV VP3 protein according to any one of claims 12-14, wherein the non-serine amino acid residue is valine (V), aspartic acid (D), or histidine (H).

16. The AAV VP3 protein according to any one of claims 12-15, comprising non-native amino acid residues at positions corresponding to:

(a) T491 and Y730;

(b) T491 and S662;

(c) T491, Y444, and Y730;

(d) T491, Y704, and Y730;

(e) T491, Y730, and S662;

(f) T491, Y444, Y500, and Y730; or

(g) T491, Y444, Y500, Y730, and S662;

of the wild-type AAV2 capsid protein of SEQ ID NO:2.

17. The AAV VP3 protein according to claim 16, comprising a valine (V) at a position corresponding to T491 and a phenylalanine (F) at a position corresponding to Y730 of the wild-type AAV2 capsid protein of SEQ ID NO:2.

18. The AAV VP3 protein according to claim 16, comprising a valine (V) at a position corresponding to T491 and a valine (V) at a position corresponding to S662 of the wild-type AAV2 capsid protein of SEQ ID NO:2.

19. The AAV VP3 protein according to claim 16, comprising a valine (V) at a position corresponding to T491, a phenylalanine (F) at a position corresponding to Y444 of the wild-type AAV2, and phenylalanine (F) at a position corresponding to Y730 of wild-type AAV2 capsid protein of SEQ ID NO:2.

20. The AAV VP3 protein according to claim 16, comprising a valine (V) at a position corresponding to T491, a phenylalanine (F) at a position corresponding to Y704 of the wild-type AAV2, and phenylalanine (F) at a position corresponding to Y730 of wild-type AAV2 capsid protein of SEQ ID NO:2.

21. The AAV VP3 protein according to claim 16, comprising a valine (V) at a position corresponding to T491, phenylalanine (F) at a position corresponding to Y730, and a valine (V) at a position corresponding to S662 of wild-type AAV2 capsid protein of SEQ ID NO:2.

22. The AAV VP3 protein according to claim 16, comprising a valine (V) at a position corresponding to T491, a phenylalanine (F) at a position corresponding to Y444 of the wild-type AAV2, phenylalanine (F) at a position corresponding to Y500, and

phenylalanine (F) at a position corresponding to Y730 of wild-type AAV2 capsid protein of SEQ ID NO:2.

23. The AAV VP3 protein according to claim 16, comprising a valine (V) at a position corresponding to T491, a phenylalanine (F) at a position corresponding to Y444 of the wild-type AAV2, phenylalanine (F) at a position corresponding to Y500, a valine (V) at a position corresponding to S662, and phenylalanine (F) at a position corresponding to Y730 of wild-type AAV2 capsid protein of SEQ ID NO:2.

24. The AAV VP3 protein according to any one of the preceding claims, wherein the VP3 protein is of serotype AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, AAV9, or AAV10.

25. An isolated nucleic acid molecule that encodes an AAV VP3 protein of any one of the preceding claims.

26. An AAV particle that comprises the AAV VP3 protein of any one of claims 1 to 24.

27. The AAV particle of claim 26, further comprising a nucleic acid that encodes one or more therapeutic products or diagnostic agents.

28. A composition comprising (a) the AAV VP3 protein in accordance with any one of claims 1 to 24, the isolated nucleic acid molecule according to claim 25, or the AAV particle according to claim 26 or 27; and (b) a pharmaceutically-acceptable buffer, diluent, or vehicle.

29. The composition according to claim 28, comprised within a kit for diagnosing, preventing, treating or ameliorating one or more symptoms of a mammalian disease, injury, disorder, trauma or dysfunction.

30. The composition according to claim 28 or 29, for use in diagnosis or therapy, or for use in treating, preventing, or ameliorating one or more symptoms of cancer, diabetes, autoimmune disease, kidney disease, cardiovascular disease, pancreatic disease, intestinal disease, liver disease, neurological disease, neuromuscular disorder, neuromotor deficit, neuroskeletal impairment, neurological disability, neurosensory dysfunction, stroke, ischemia, eating disorder, α1-antitrypsin (AAT) deficiency, Batten's disease, Alzheimer's disease, Huntington's disease, Parkinson's disease, skeletal disease, trauma, or pulmonary disease in a mammal.

31. Use of a composition according to claim 28 or 29, in the manufacture of a medicament for diagnosing, treating, preventing or ameliorating one or more symptoms of a disease, a disorder, a dysfunction, an injury, an abnormal condition, a congenital defect, or trauma in a mammal.

32. The composition of claim 30, or the use of a composition according to claim 31, wherein the mammal is human.

33. An in vitro or ex-vivo method of transducing a population of mammalian cells, comprising introducing into one or more cells of the population, a composition that comprises an effective amount of an AAV particle in accordance with claim 26 or 27.

34. The method according to claim 33, wherein the one or more cells of the population is a endothelial, epithelial, vascular, liver, lung, heart, pancreas, intestinal, kidney, muscle, bone, dendritic, cardiac, neural, blood, brain, fibroblast, or cancer cell.

35. The method according to claim 34, where in the mammalian cells are human cells.