CLAIMS:

1. An AAV VP3 protein comprising:

a non-serine amino acid residue at a position that corresponds to 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, wherein the non-serine amino acid residue is selected from valine (V), aspartic acid (D), or histidine (H).

2. The AAV VP3 protein according to claim 1, comprising:

(a) a non-lysine amino acid residue at a position that corresponds to K258, K321, K459, K490, K507, K527, K572, K532, K544, K549, K556, K649, K655, 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 K530, K547, or K569 of the wild-type AAV8 capsid protein of SEQ ID NO:8;

(c) a non-threonine amino acid residue at a position that corresponds to T251, T329, T330, T454, T455, T503, T550, T592, T581, T597, T491, T671, T659, T660, T701, T713, or T716 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 Y252, Y272, Y444, Y500, Y700, Y704, or Y730 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-lysine amino acid residue at a position that corresponds to K459, K490, K532, K544, or K556 of the wild-type AAV2 capsid protein of SEQ ID NO:2.

4. The AAV VP3 protein according to any one of claims 1 to 3, comprising a non-lysine amino acid residue at a position that corresponds to K530, K547, or K569 of the wild-type AAV8 capsid protein of SEQ ID NO:8.

5. The AAV VP3 protein according to any one of claims 1 to 4, comprising non-lysine amino acid residues at positions correspond to K544 and K566 of the wild-type AAV2 capsid protein of SEQ ID NO:2.

6. The AAV VP3 protein according to any preceding claim, wherein the non-lysine amino acid residue is selected from glutamic acid (E), arginine (R), serine (S), or isoleucine (I).

7. The AAV VP3 protein according to any preceding claim, comprising a glutamic acid (E) amino acid residue at a position that corresponds to K258, K321, K459, K490, K507, K527, K572, K532, K544, K549, K556, K649, K655, or K706 of the wild-type AAV2 capsid protein of SEQ ID NO:2.

8. The AAV VP3 protein according to any preceding claim, comprising glutamic acid (E) amino acid residues at positions correspond to K544 and K566 of the wild-type AAV2 capsid protein of SEQ ID NO:2.

9. The AAV VP3 protein according to any preceding claim, comprising a glutamic acid (E) amino acid residue at a position that corresponds to K530, K547, or K569 of the wild-type AAV8 capsid protein of SEQ ID NO:8.

10. The AAV VP3 protein according to any preceding claim, comprising a non-serine amino acid residue at a position that corresponds to S662 of the wild-type AAV2 capsid protein of SEQ ID NO:2.

11. The AAV VP3 protein according to any preceding claim, comprising a valine residue at a position that corresponds to S662 of the wild-type AAV2 capsid protein of SEQ ID NO:2.

12. An isolated nucleic acid molecule that encodes an AAV VP3 protein in accordance with any preceding claim.

13. An AAV vector that encodes the protein of any one of claims 1 to 11, or that comprises the isolated nucleic acid molecule of claim 12.

14. The AAV VP3 protein in accordance with any one of claims 1 to 11, comprised within an adeno-associated viral particle or infectious rAAV virion.

15. The adeno-associated viral particle or infectious rAAV virion according to claim 14, wherein the transduction efficiency of the adeno-associated viral particle or infectious rAAV virion is at least five fold higher when compared to that of a corresponding, unmodified viral particle or virion that does not comprise an AAV VP3 protein in accordance with any of claims 1 to 11.

16. A composition comprising (a) the AAV VP3 protein in accordance with any one of claims 1 to 11, the isolated nucleic acid molecule according to claim 12, the AAV vector according to claim 13, or the adeno-associated viral particle or infectious rAAV virion of any one of claims 14 to 15; and (b) a pharmaceutically-acceptable buffer, diluent, or vehicle.

17. A composition comprising an adeno-associated viral particle or infectious rAAV virion comprising (a) the AAV VP3 protein in accordance with any one of claims 1 to 11; and (b) a recombinant nucleic acid encoding a diagnostic or therapeutic agent.

18. The composition according to claim 16 or 17, comprised within a kit for diagnosing, preventing, treating or ameliorating one or more symptoms of a mammalian disease, injury, disorder, trauma or dysfunction.

19. The composition according to any one of claims 16 to 18, 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, α_1-antitrypsin (AAT) deficiency, Batten's disease, Alzheimer's disease, Huntington's disease, Parkinson's disease, skeletal disease, trauma, or pulmonary disease in a mammal.

20. Use of a composition according to any one of claims 16 to 19, in the manufacture of a medicament for diagnosing, treating, preventing or ameliorating liver cancer.

21. A composition comprising an effective amount of an AAV vector in accordance with claim 13, or an adeno-associated viral particle or infectious rAAV virion of any one of claims 14, 15, or 17 for use in a method of transducing a population of mammalian cells, wherein the method comprises introducing the composition into one or more cells of the population.

22. A method of transducing a population of in vitro mammalian cells, comprising introducing into one or more cells of the population, a composition that comprises an effective amount of an AAV vector in accordance with claim 13, or an adeno-associated viral particle or infectious rAAV virion of any one of claims 14, 15, or 17.

23. The method according to claim 22, wherein the AAV vector comprises a VP3 protein comprising a non-lysine amino acid residue at a position that corresponds to K459, K490, K532, K544, or K556 of the wild-type AAV2 VP3 protein of SEQ ID NO:2 or K530, K547, or K569 of the wild-type AAV8 capsid protein of SEQ ID NO:8.

24. The method according to claim22 or 23, wherein the non-lysine amino acid residue is glutamic acid (E), arginine (R), serine (S), or isoleucine (I).

25. The method according to any one of claims 22 to 24, wherein the non-lysine amino acid residue is glutamic acid (E).

26. The method according to any one of claims 22 to 25, wherein the host cell is a mammalian cell.

27. The method according to any one of claims 22 to 26, wherein the host cell is a endothelial, epithelial, vascular, liver, lung, heart, pancreas, intestinal, kidney, muscle, bone, dendritic, cardiac, neural, blood, brain, fibroblast, or cancer cell.