CLAIMS

1. A modified adeno-associated virus (AAV) capsid protein comprising an ocular cell targeting peptide, wherein the targeting peptide comprises a sequence from 3 to 10 amino acids in length that comprises GSTPPPM (SEQ ID NO: 1), in an amino to carboxy orientation or in a carboxy to amino orientation, and wherein the targeting peptide targets an AAV to an ocular cell.

2. The capsid protein of claim 1, wherein the targeting peptide is 3, 4, 5, 6 or 7 amino acids in length.

3. The capsid protein of claim 1, wherein the targeting peptide comprises a sequence up to 10 amino acids in length having therein amino acid sequence GSTPPPM (SEQ ID NO: 1) in an amino to carboxy orientation or in a carboxy to amino orientation.

4. The capsid protein of claim 1, wherein the targeting peptide consists of amino acid sequence GSTPPPM (SEQ ID NO: 1) in an amino to carboxy orientation or in a carboxy to amino orientation.

5. The capsid protein of claim 1, wherein the targeting peptide is inserted between the AAV2 capsid residues at positions P34-A35, T138-A139, A139-P140, G453-T454, N587-R588, and/or R588-Q589 of SEQ ID NO:8.

6. The capsid protein of claim 1, wherein the targeting peptide is inserted after the AAV9 capsid residues at positions D384, G385, I560, T561, N562, E563, E564, E565, N704, and/or Y705 of SEQ ID NO:11.

7. The capsid protein of claim 1, wherein the capsid protein comprises or consists of SEQ ID NO:9 or SEQ ID NO:10.

8. The capsid protein of claim 1 or 2, wherein the targeting peptide targets a diseased ocular cell.

9. The capsid protein of claim 8, wherein the target peptide targets an ocular cell in a subject that has retinitis pigmentosa, maculopathies, Leber's congenital amaurosis, early onset severe retinal dystrophy, achromatopsia, retinoschisis, ocular albinism, oculocutaneous albinism, glaucoma, Stargardt disease, choroideremia, age-related

macular degeneration, Spinocerebellar Ataxia type 7 (SCAT), color blindness, and lysosomal storage diseases that affect the cornea, such as Mucopolysaccharidosis (MPS) IV and MPS VII.

10. The capsid protein of any one of claims 1-9, wherein the AAV capsid is AAV1, AAV2, AAV3, AAV4, AAV5, AAV6, AAV7, AAV8, AAV9, AAV10, AAV-Rh74 (Rhesus macaque-derived AAV), AAVRh10, or modified capsids of these serotypes.

11. The capsid protein of claim 10, wherein the AAV capsid is AAV2 capsid.

12. A nucleic acid sequence encoding the modified capsid as described in any one of claims 1-11.

13. The nucleic acid sequence of claim 12, comprising the nucleic acid sequence GGGTCGACGCCGCCTCCTATG (SEQ ID NO:2).

14. An AAV virus containing the capsid protein of any one of claims 1-11.

15. A viral vector comprising the capsid protein of any one of claims 1-11.

16. The viral vector of claim 15, wherein the viral vector further comprises a nucleic acid sequence encoding a nucleic acid or protein of interest.

17. The viral vector of claim 16, wherein the nucleic acid or protein of interest is a therapeutic agent.

18. The viral vector of claim 17, wherein the therapeutic agent is an enzyme or an RNAi molecule.

19. The viral vector of claim 17, wherein the therapeutic agent is Ataxin 7 mirRNA, Retinal pigment epithelium-specific 65 kDa protein (RPE 65), vascular endothelial growth factor (VEGF) inhibitor or soluble VEGF receptor 1 (sFifl), (Rab escort protein-1) REP1, L-opsin, rhodopsin (Rho), phosphodiesterase 6(3 (PDE6I3), ATP-binding cassette, sub-family A, member 4 (ABCA4), lecithin retinol acyltransferase (LRAT), Retinal degeneration, slow/Peripherin (RDS/Peripherin), Tyrosine-protein kinase Mer (MERTK), Inosine-5 prime-monophosphate dehydrogenase, type I (IMPDHI), guanylate cyclase 2D (GUCY2D), aryl-hydrocarbon interacting protein-like 1 (AIPL 1), retinitis pigmentosa GTPase regulator interacting protein 1