**Supplementary Figure S1:** Evaluation of AAV-S163 treated eyes at 9 months post-injection by immunohistochemistry and Oil red O lipid staining.  

**A.** Detection of AAV-S163R (green) by immunofluorescence on the basal RPE side. Apical RPE microvilli are labeled with an anti-MFRP antibody (red).  

**B.** In the negative control the anti-HA antibody was omitted, and the image was purposefully overexposed to visualize any background autofluorescence (scale bar, 25 µm).  

**C,D.** Oil red O staining for neutral lipid detection.  

**C:** Retinal cross-section from an AAV-S163R treated eye showing no detectable Oil red O staining.  

**D:** Positive control sample showing lipid accumulation (red) in a frozen liver section from a mouse exposed to carbon tetrachloride (CCl4) to induce hepatic injury and chronic liver fibrosis. Nuclei are shown in blue (hematoxylin stain).