**Suppl. File. 1 AAV peroxidase constructs**

AAV constructs Cre dependence Peroxidase cDNA

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AAV-CAG-DIO-APX Cre-dependent APX (Pea ascorbate peroxidase, dimeric)

AAV-CAG-DIO-APEX2NES Cre-dependent APEX2NES (Soybean ascorbate peroxidase, monomeric, NES)

AAV-CAG-DIO-erHRP Cre-dependent erHRP (Horseradish peroxidase, ER)

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All of plant peroxidase cDNAs are codon-optimized for expression in mammalian cells. NES, nuclear export signal. APEX2 is more robust monomeric ascorbate peroxidase than APX. erHRP has a signal sequence from human immunoglobulin kappa light chain and N175S mutation to its activity in addition to the KDEL enhance endoplasmic reticulum retention signal (ER).