Supplemental Figure 1. Co-localization of α-syn with lysosomal/autophagy markers in neuronal cells. B103 cells were infected with the LV-control or LV-α-syn, double immunolabeled and imaged with the laser scanning confocal microscope. (A-C) In control infected cells, colocalization between α-syn (red) and the lysosomal marker cathepsin-D (green). (D-F) In cells infected with LV-α-syn, co-localization between α-syn and the lysosomal marker cathepsin-D (green). (G-I) Control neuronal cells displaying baseline expression of α-syn (red) and LC3 (green). (J-L) In neuronal cells infected with LV-α-syn co-localization between α-syn (red) and LC3 (green). Arrows indicate areas of co-immunostaining. n – nucleus. Scale bar = 15µm.

Supplemental Figure 2. Double immunocytochemical analysis of beclin 1 and α-syn expression in co-infected neuronal cells. B103 cells were infected with the LV-control or LV-α-syn and with LV-Beclin 1, double immunolabeled with antibodies against α-syn (red) and beclin 1 (green) and imaged with the laser scanning confocal microscope. (A-C) Neuronal cells were infected with vector control (LV-control), (D-F) LV-Beclin 1, (G-I) LV-α-syn alone, or (J-L) Co-infected with LV-Beclin 1 and LV-α-syn. Scale bar= 15µm.

Supplemental Figure 3. Assays of neuronal cell death in neuronal cells expressing α-syn and beclin 1. B103 cells were infected with the LV-control or LV-α-syn, LV-Beclin 1 or co-infected with LV-α-syn and LV-Beclin 1. (A) LDH release assay; (B) TUNEL assay and (C) caspase 3 immunoreactivity were determined on cultures. No significant differences were observed among the groups.

Supplemental Figure 4. Co-localization of α-syn and markers of autophagy and the lysosome in LV-Beclin 1 infected neuronal cells. B103 neuronal cells were co-infected with LV-α-syn and LV-Beclin 1, double immunolabeled and imaged
with the laser scanning confocal microscope. (A-C) co-localization between α-syn (red) and LAMP2 (green); (D-F) co-localization between α-syn (red) and Atg5 (green); (G-I) co-localization between α-syn (red) and Atg7 (green) and (J-L) co-localization between α-syn (red) and cathepsin D (green). Scale bar= 10µm.

**Supplemental Figure 5.** LV-Beclin 1 ameliorates autophagy alterations in the α-syn tg mouse. Control and α-syn tg mice treated with LV-control or LV-Beclin 1 were analyzed by electron microscopy (A-F) or by double immunolabeling and confocal microscopy (G-I). All images are from the hippocampal CA1 region. (A-B) nontg mice treated with LV-control; (C-D) α-syn tg mice treated with the LV-control; (E-F) α-syn tg mice treated with LV-Beclin 1. (A-F) *indicates a normal lysosome and the arrow indicates a multivesicular body. n – nucleus, g – golgi, rer – rough endoplasmic reticulum, s – synapse, ap – autophagosome, mvb – multivesicular body. Scale bar = 2µm. (G-I) arrows indicate colocalization of α-syn (red) and LC3 (green).