

## SUPPLEMENT FIGURE LEGENDS

**Fig. S1.** Protocol of lentivirus-mediated shRNA expression. Lentivirus was added to the media on day 1 and 2 followed by 2  $\mu\text{g/ml}$  puromycin selections on day 4, 5 and 7. Media including autophagy inhibitor (Drug) were changed on day 3, 4, 5 and 7. Only attached cells were subjected to the experiments. For nutrient-starvation, media was changed to nutrient-starved media on day 6.

**Fig. S2.** Comparison of *Pdx1*<sup>+/-</sup> and *Pdx1*<sup>+/-</sup>*Becn1*<sup>+/-</sup> mice after 7 wks on a high fat diet. (A) Blood glucose concentrations during IPGTT after 7 wks on a high fat diet in 10 wks old *Pdx1*<sup>+/-</sup> (n = 4) and *Pdx1*<sup>+/-</sup>*Becn1*<sup>+/-</sup> mice (n = 4) (upper panel) and *Becn1*<sup>+/-</sup> (n = 4) and wild type (WT) mice (n = 4) in the lower panel. (B) Total areas under the glucose curves (AUC) from Figure S2A. The AUC was increased in *Pdx1*<sup>+/-</sup>*Becn1*<sup>+/-</sup> and *Pdx1*<sup>+/-</sup> mice compared to *Becn1*<sup>+/-</sup> and WT mice. (C) Fasting and 30 min serum insulin levels in *Pdx1*<sup>+/-</sup>*Becn1*<sup>+/-</sup> mice (n = 4) measured during IPGTT were decreased similar to the levels obtained in *Pdx1*<sup>+/-</sup> mice (n = 4). While fasting and 30 min serum insulin levels in *Becn1*<sup>+/-</sup> mice (n = 4) measured during IPGTT were similar to the levels obtained in WT mice (n = 4).

**Fig. S3.** Beta cell autophagy, apoptosis, proliferation and mass in pancreatic islets from mice after 7 wks on a high fat diet. These analyses were conducted in the mouse groups depicted in Figure S2. (A) The number of cells staining positive for cleaved caspase-3 was similarly increased in *Pdx1*<sup>+/-</sup>*Becn1*<sup>+/-</sup> and *Pdx1*<sup>+/-</sup> mice compared to *Becn1*<sup>+/-</sup> and WT mice (n = 3). (B) Beta cell area at 7 wks after high fat diet was estimated using insulin immunoreactivity and normalized to the total pancreas area. Six sections were analyzed from each animal (n = 3). *Pdx1*<sup>+/-</sup>*Becn1*<sup>+/-</sup> and *Pdx1*<sup>+/-</sup> beta cell area per pancreas area were similarly decreased to  $0.57 \pm 0.09\%$  and  $0.46 \pm 0.09\%$  compared to WT ( $0.88 \pm 0.05\%$ ) and *Becn1*<sup>+/-</sup> mice ( $0.85 \pm 0.16\%$ ), respectively. (C) Ki-67 positive beta cell was increased in *Pdx1*<sup>+/-</sup>*Becn1*<sup>+/-</sup> mice compared to *Pdx1*<sup>+/-</sup> mice (\*,  $P < 0.01$ ; *Pdx1*<sup>+/-</sup>*Becn1*<sup>+/-</sup> versus *Pdx1*<sup>+/-</sup>). Ki-67 positive beta cell in *Becn1*<sup>+/-</sup> mice was comparable to WT mice (n = 3). (D) The number of LC3 punctae of beta cell was repressed from  $12.14 \pm 3.58$  punctae in *Pdx1*<sup>+/-</sup> beta cell to  $4.39 \pm 2.47$  punctae in *Pdx1*<sup>+/-</sup>*Becn1*<sup>+/-</sup> beta cell (\*,  $P < 0.001$ ). While the number of LC3 punctae in WT and *Becn1*<sup>+/-</sup> beta cells were  $3.02 \pm 0.34$  punctae and  $2.60 \pm 0.25$  punctae, respectively.

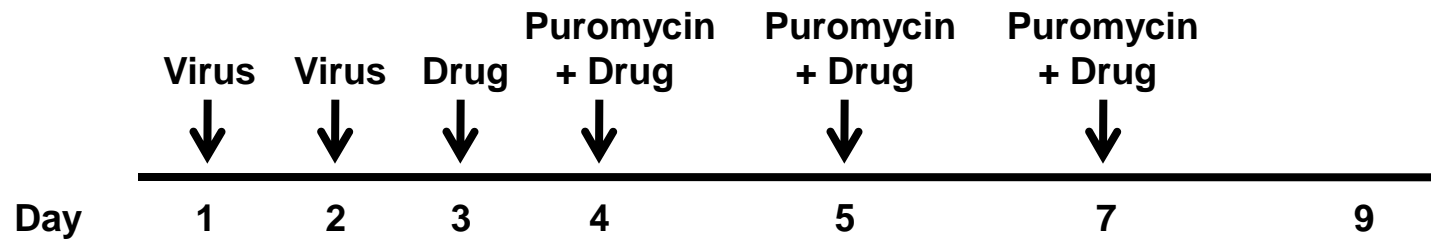


Figure S1.

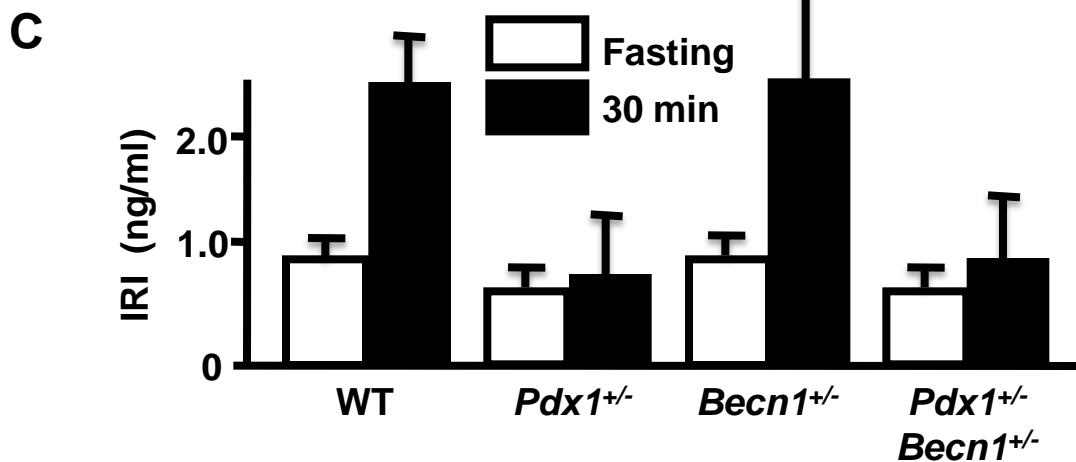
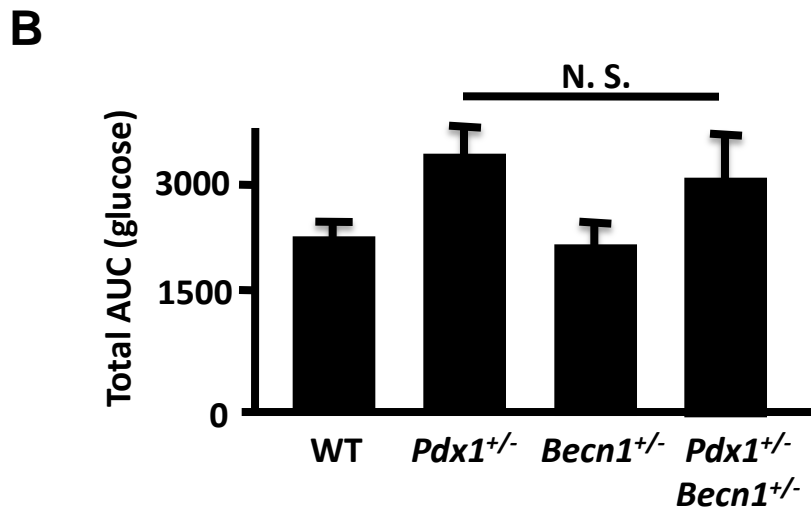
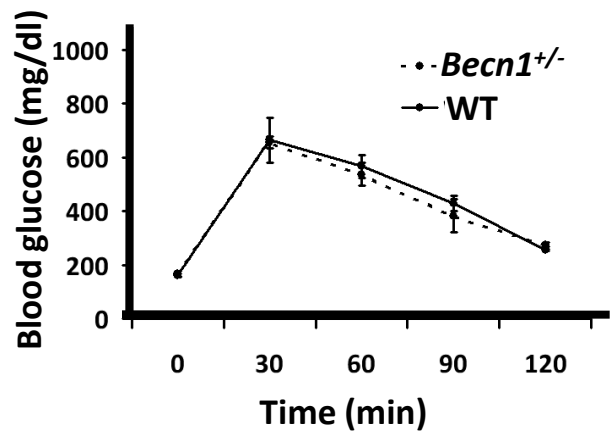
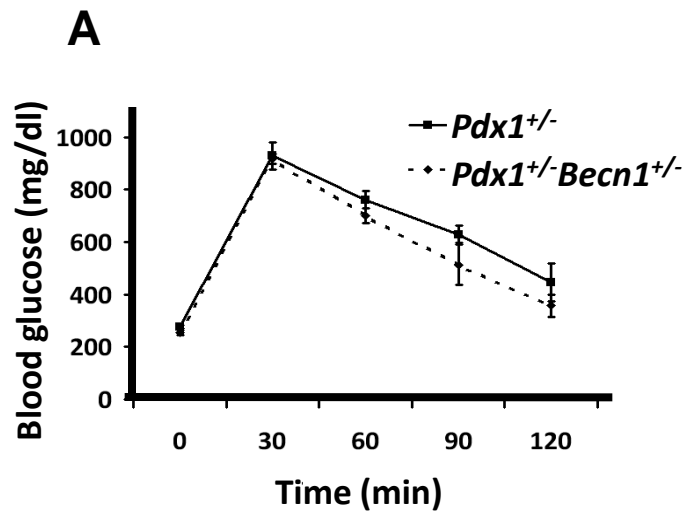
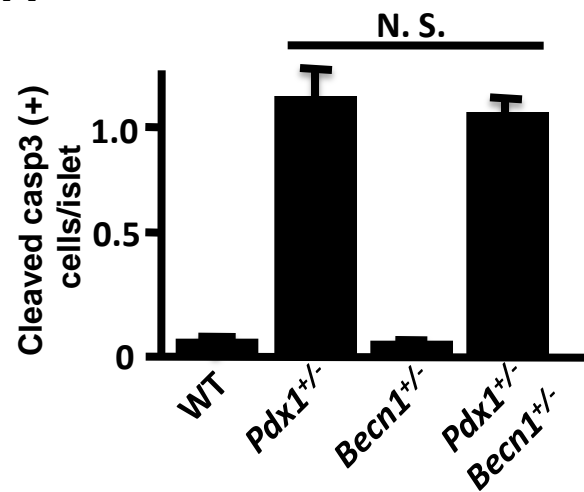
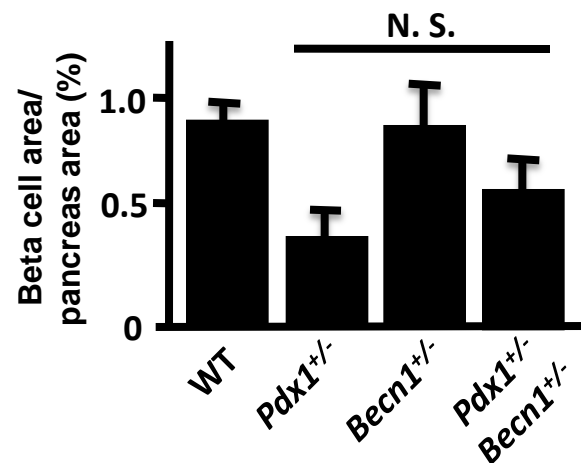
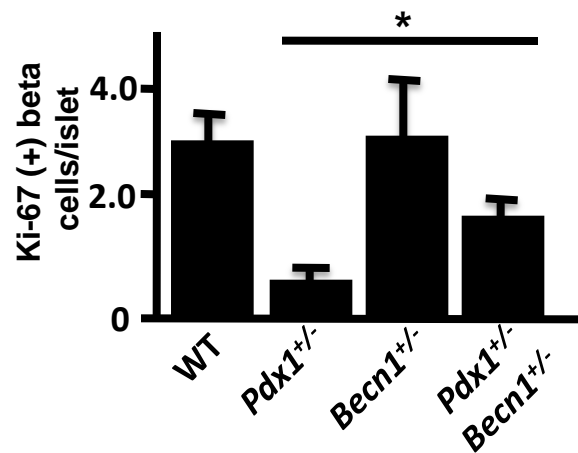
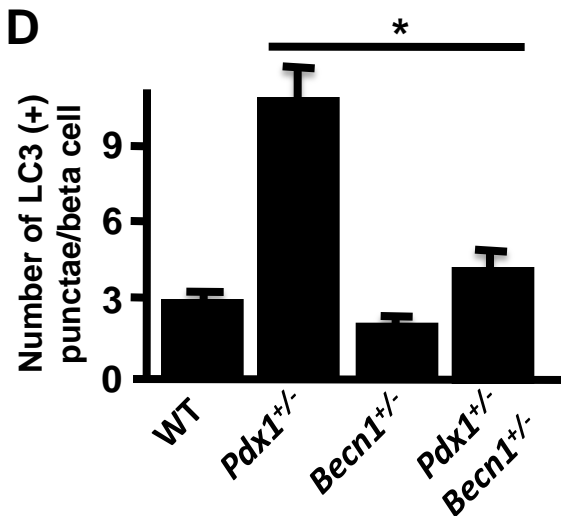


Figure S2.

**A****B****C****D****Figure S3.**