

Fig. S1. The pancreas is specified normally in *Hes1* mutants. Projections of E8.5 *Hes1*^{+/+} (A) and *Hes1*^{-/-} (F) embryos showing Pdx1 and Sox9 by whole-mount IF. (B–D) Close-ups of *Hes1*^{+/+} pancreatic anlage. (E) Optical section of embryo shown in (A) with the hatched line in (B) indicates the plane of the section. Insert shows ventral pancreas on a different optical section. (G–I) Close-ups of *Hes1*^{-/-} pancreatic anlage. Note that early endodermal Sox9 expression is restricted to the dorsal pancreas anlage. The hatched line in (G) indicates the plane of the section shown in (J). dp: dorsal pancreas, vp: ventral pancreas, nt: neural tube. Scale bar is 100 μ m.

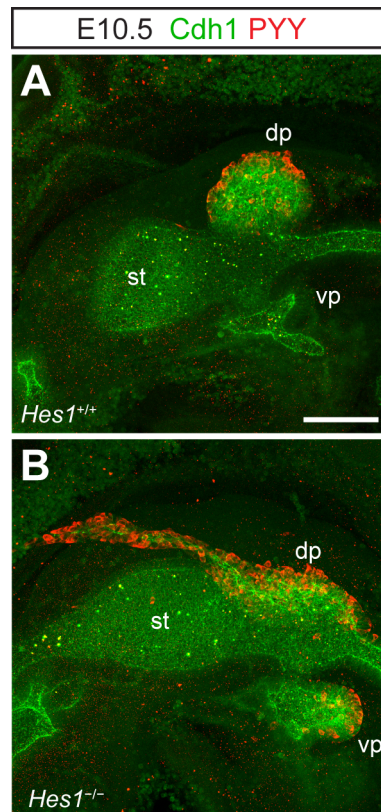


Fig. S2. PYY is expressed in the endocrine cells of *Hes1* mutants. E10.5 pancreatic primordia from *Hes1*^{+/+} (A) and *Hes1*^{-/-} (B) embryos showing Cdh1 and PYY by whole-mount IF. st: stomach, dp: dorsal pancreas, vp: ventral pancreas. Scale bar is 100 μ m.

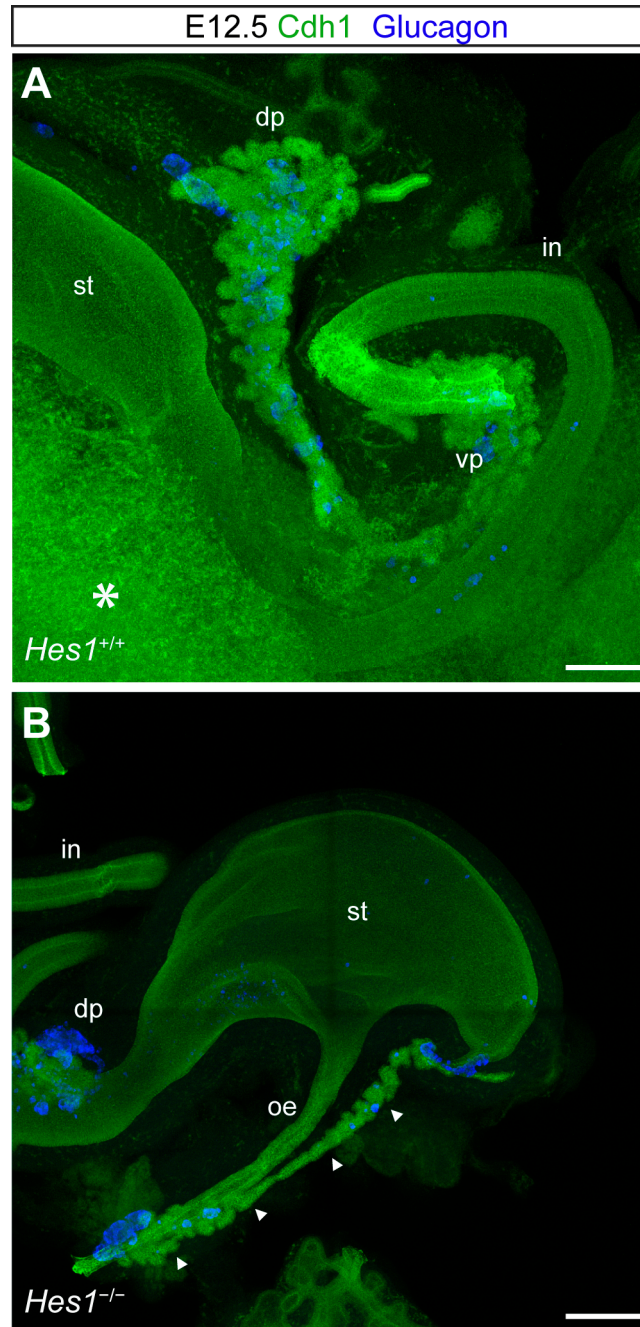


Fig. S3. Extreme anterior localization of ectopic pancreas. E12.5 *Hes1^{+/+}* (A) and *Hes1^{-/-}* (B) embryos showing Cdh1 and glucagon by whole-mount IF. (A) Asterisk indicates remaining liver. Scale bar is 100 μ m. (B) Composite image created by automatic tiling of four individual confocal image stacks. Arrowheads indicate ectopic pancreas. st: stomach, dp: dorsal pancreas, oe: oesophagus, in: intestine. Scale bar is 200 μ m.

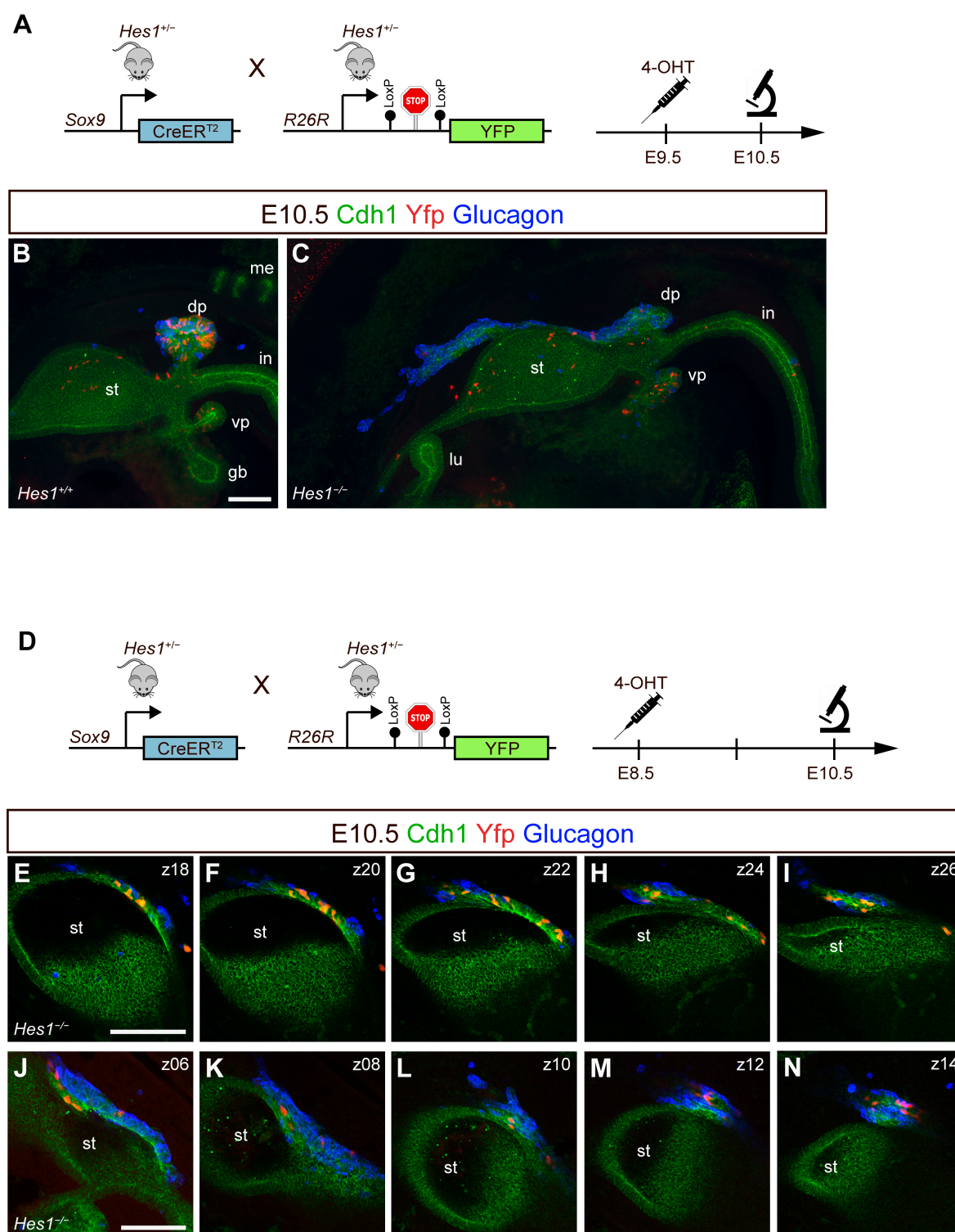


Fig. S4. Sox9-CreERT2 lineage tracing at E9.5 and E8.5. (A) Schematic of experimental setup with 4-OHT administration at E9.5. (B,C) Projections of E10.5 pancreatic primordia from *Sox9-CreERT2R26R^{Yfp/+}Hes1^{+/+}* (B) and *Sox9-CreERT2R26R^{Yfp/+}Hes1^{-/-}* (C) embryos from dams treated with 4-OHT at E9.5 and showing Cdh1, Yfp, and glucagon by whole-mount IF. Note that a significant number of the labeled cells reside outside the dorsal (ectopic) pancreas area. (D) Schematic of experimental setup with 4-OHT administration at E8.5. (E-N) Individual optical sections of two different *Sox9-CreERT2R26R^{Yfp/+}Hes1^{-/-}* embryos. The optical section (z) is indicated for each embryo (E-I and J-N, respectively). st: stomach, dp: dorsal pancreas, vp: ventral pancreas, in: intestine, lu: lung, gb: gall bladder, me: mesonephros. Scale bars are 100 μ m.

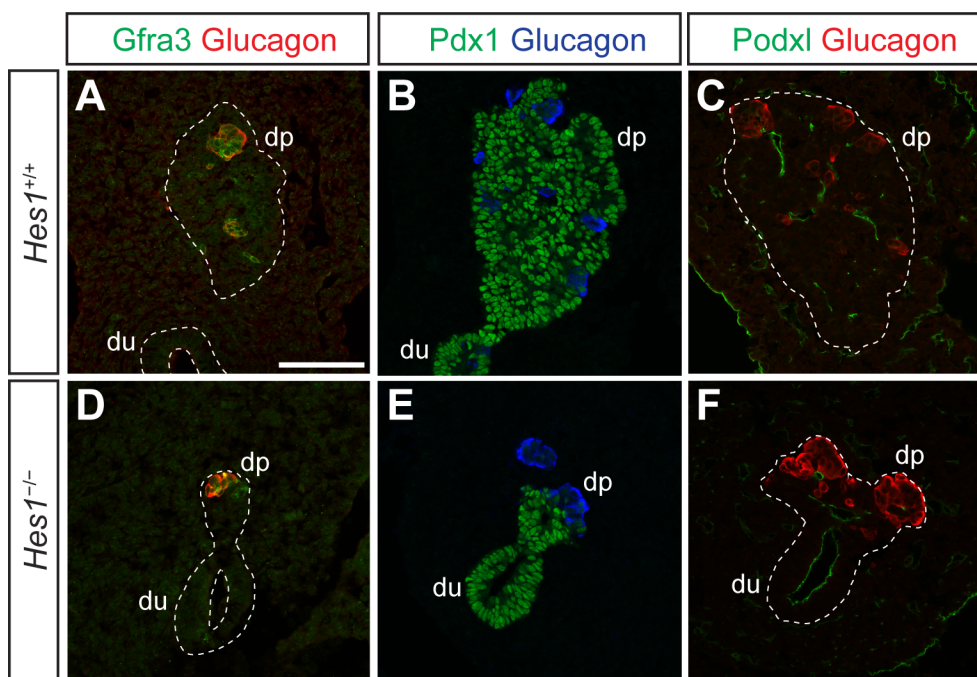
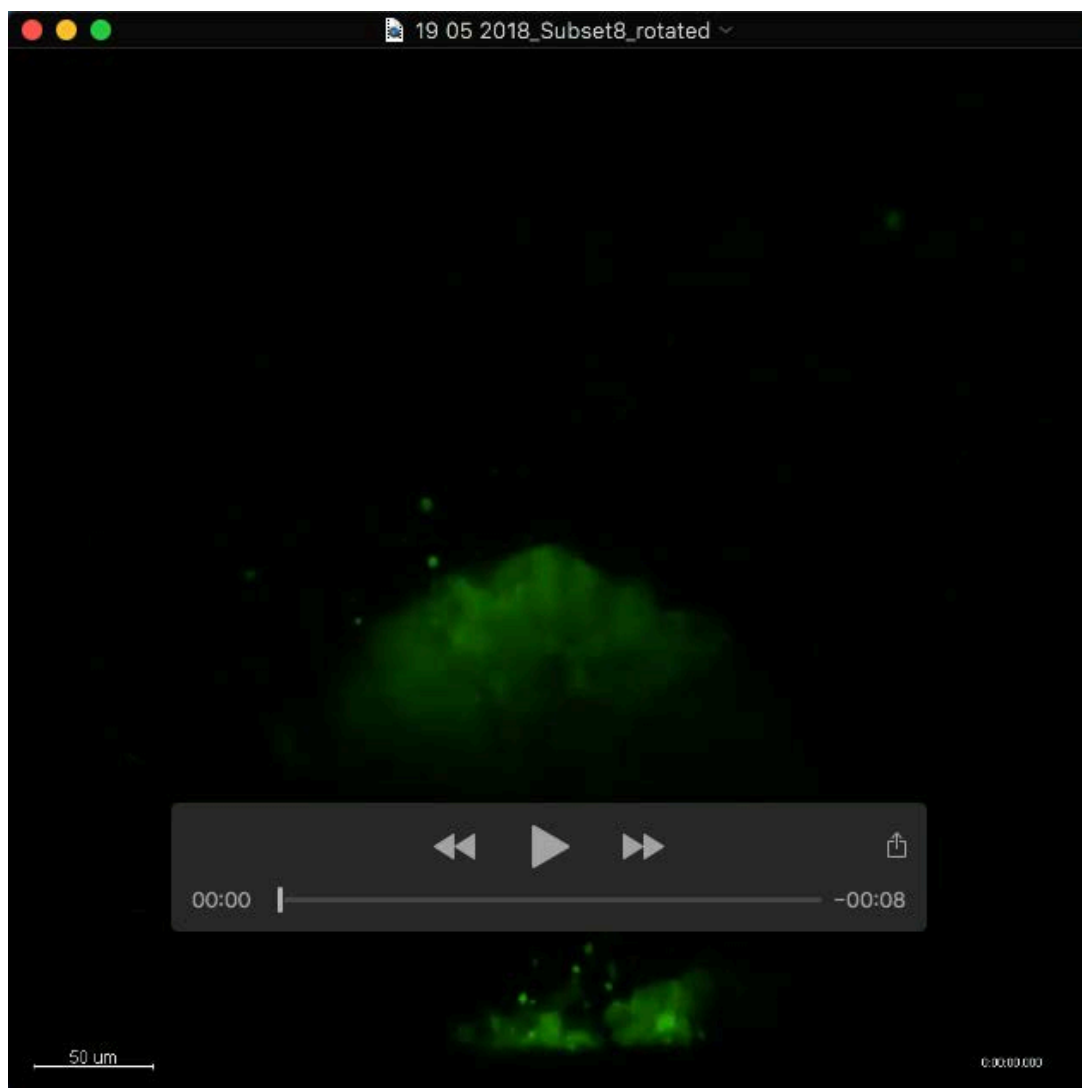
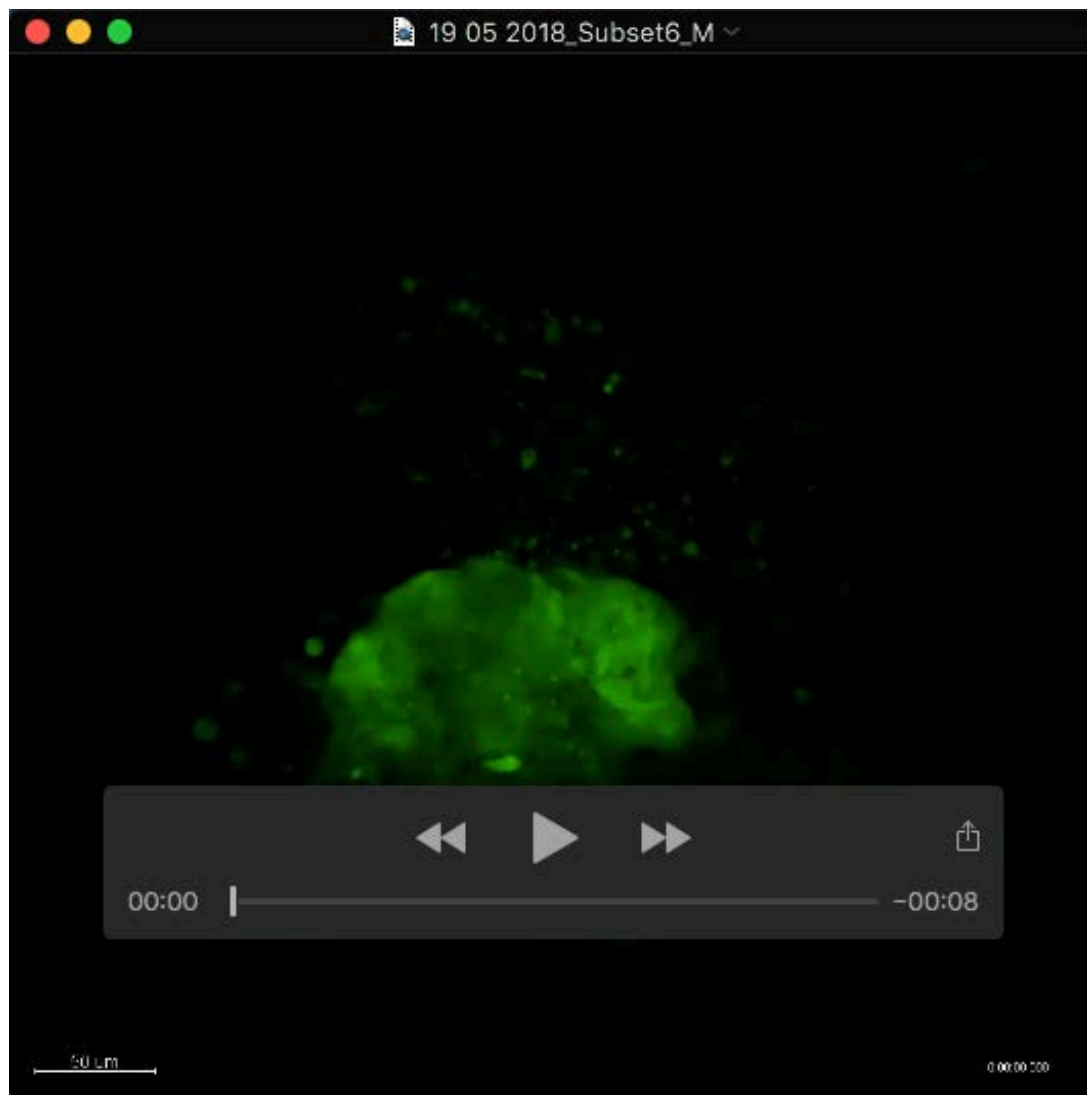


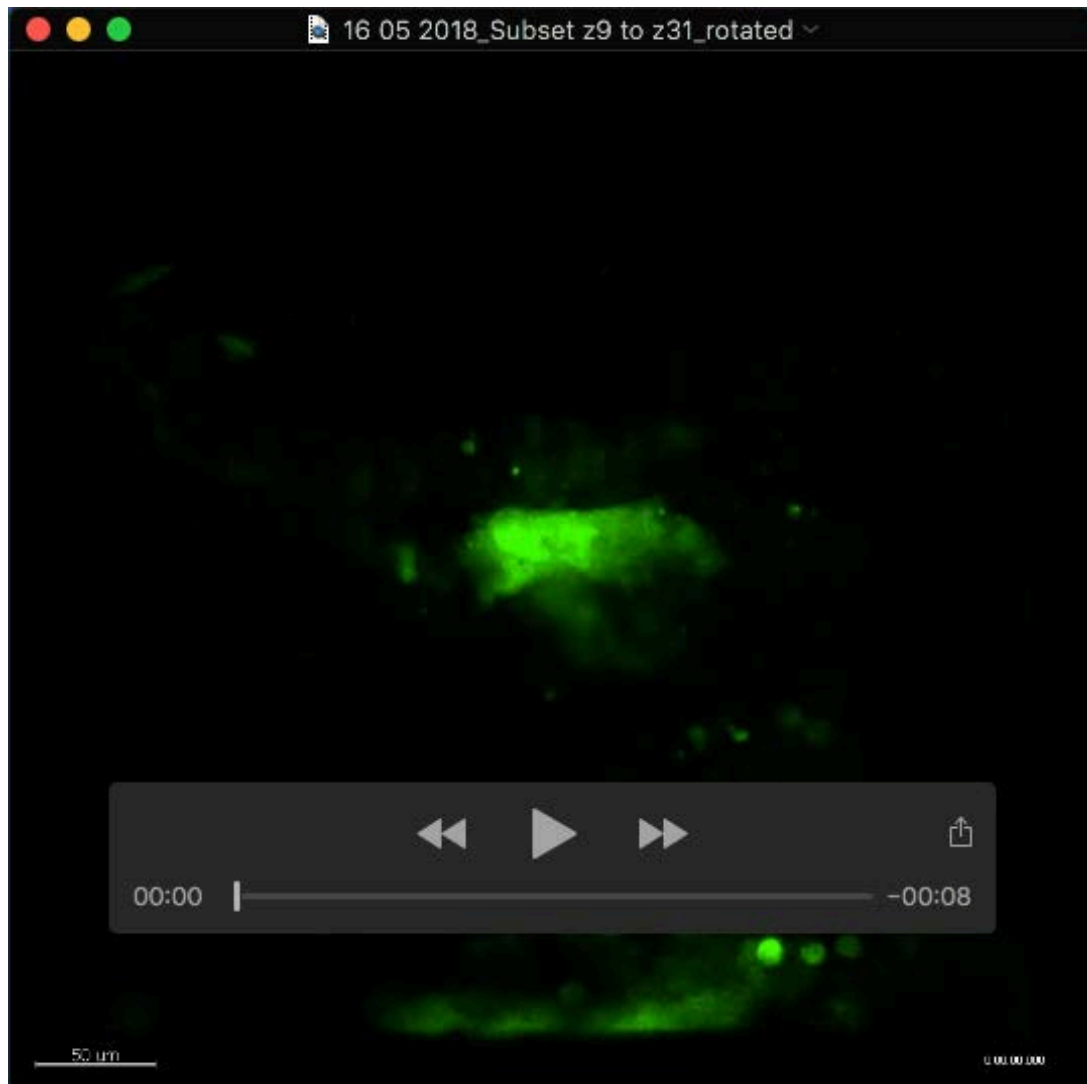
Fig. S5. Expression of *Gfra3* and *Podxl* appear similar in *Hes1* mutants and controls. IF analysis of pancreas cross sections from E10.5 *Hes1*^{+/+} (A-C) and *Hes1*^{-/-} (D-F) showing *Gfra3* and glucagon (A,D), *Pdx1* and glucagon (B,E), or *Podxl* and glucagon (C,F). Dorsal is up. Near adjacent sections are shown. dp: dorsal pancreas, du: duodenum. Scale bar is 100 μ m.



Movie S1. Growth of dorsal pancreas anlage in a *Hes1*^{+/+} midgut explant. Live-imaging of the GFP expressing dorsal pancreatic cells during culture of the explanted midgut from an E9.5 *Hes1*^{+/+}*Pdx1*-GFP embryo. Anterior is to the left and dorsal is up.



Movie S2. Growth of dorsal pancreas anlage in a *Hes1*^{+/-} midgut explant. Live-imaging of the GFP expressing dorsal pancreatic cells during culture of the explanted midgut from an E9.5 *Hes1*^{+/-}*Pdx1*-GFP embryo. Anterior is to the left and dorsal is up.



Movie 3. Rostral extension of the dorsal pancreas anlage in a *Hes1*^{-/-} midgut explant. Live-imaging of the GFP expressing dorsal pancreatic cells during culture of the explanted midgut from an E9.5 *Hes1*^{-/-} *Pdx1*-GFP embryo. Note the lack of dorsal expansion and a rostral extension of the GFP⁺ cells. Anterior is to the left and dorsal is up.