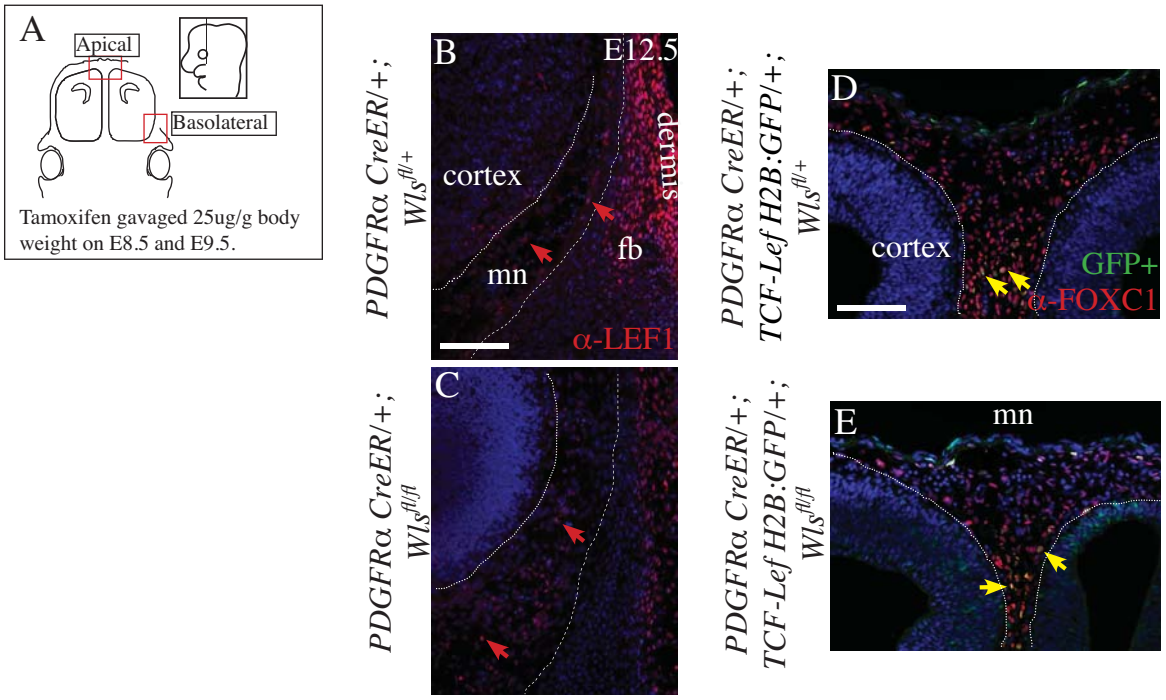
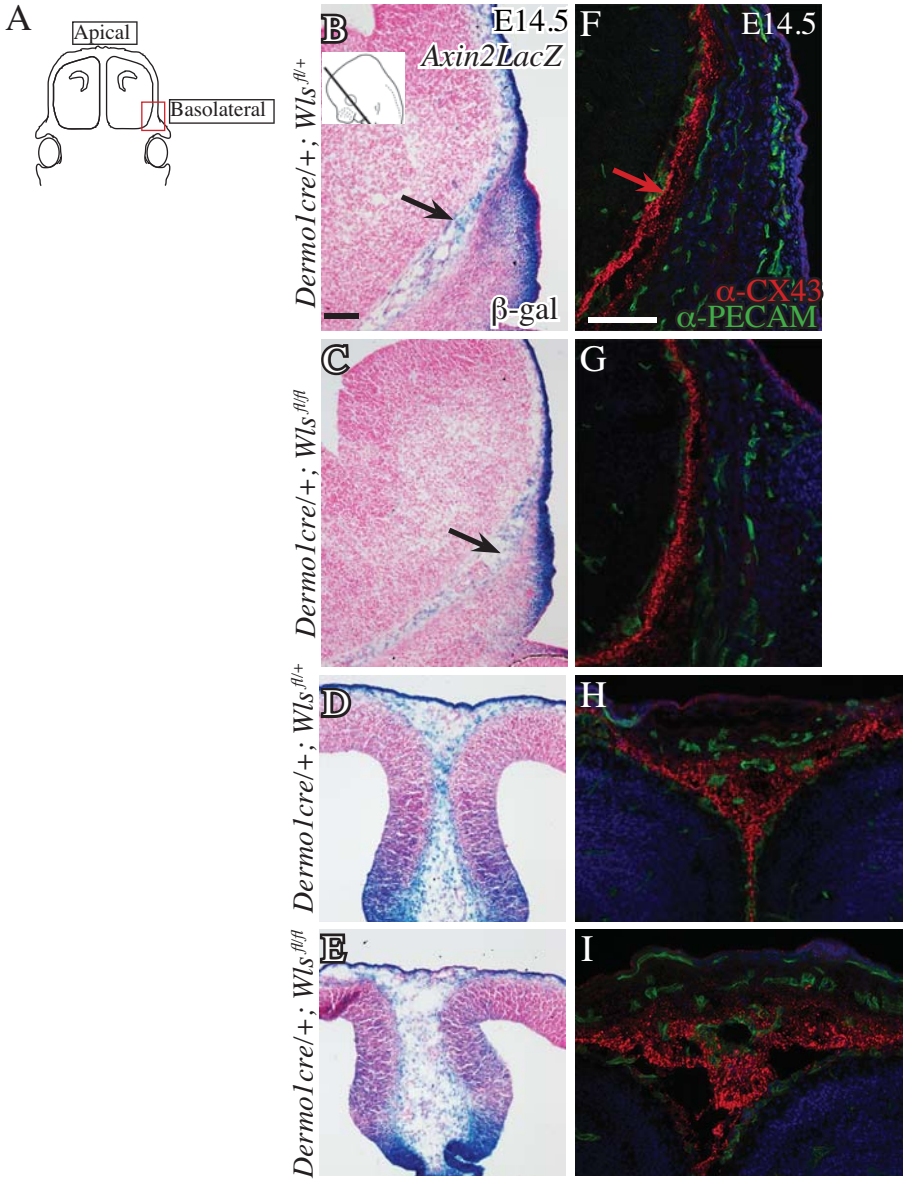


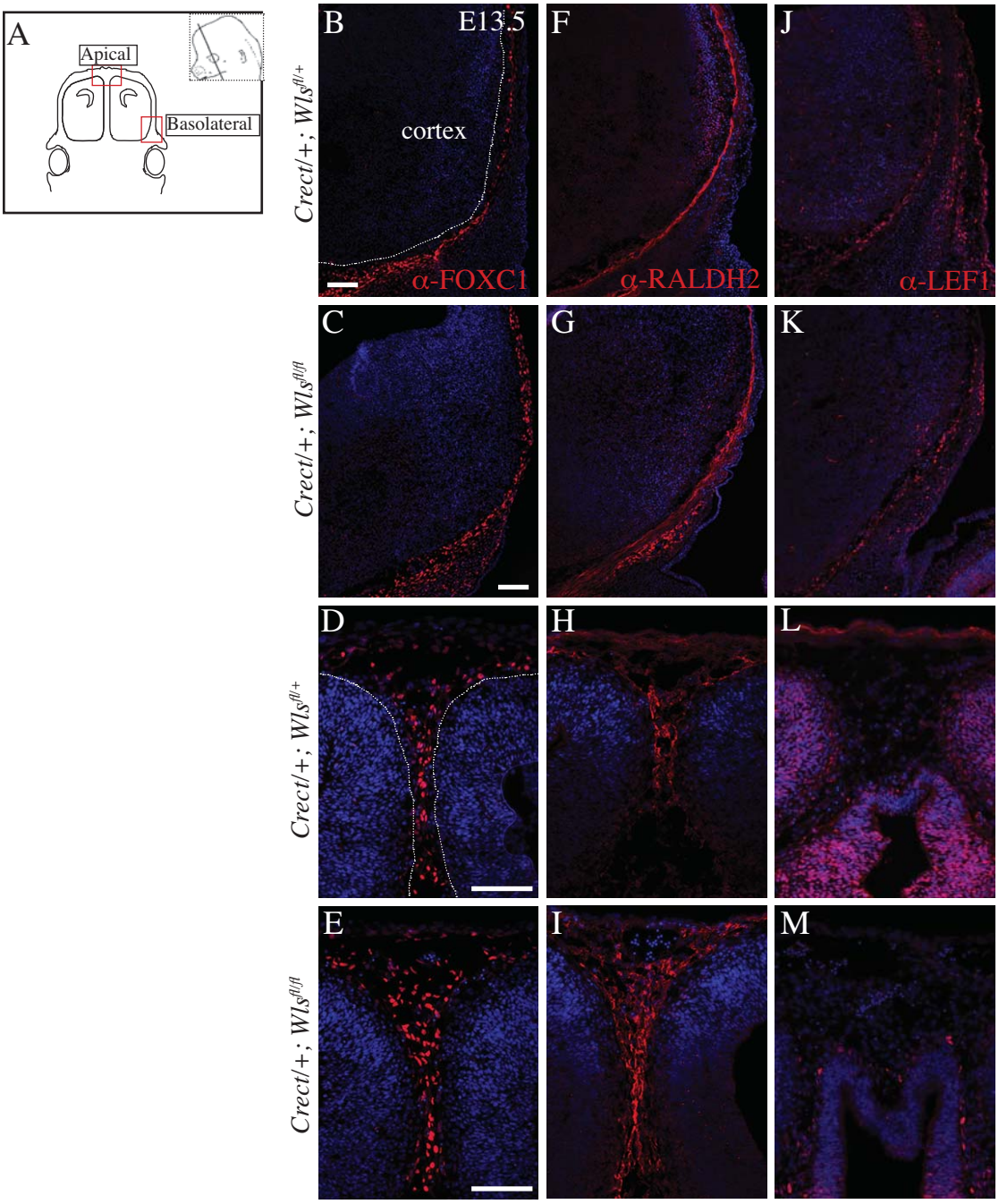
DiNuoscio and Atit, Figure S1

Figure S1: Wnt signaling transduction is present in meningeal progenitors in the absence of cranial mesenchyme Wnt ligand secretion. Schematic illustration of the coronal plane, tamoxifen induction regimen, and inset depicts the lateral view of the embryonic head in the region of interest (A). Indirect immunofluorescence for LEF1 in the basolateral region (B,C), FOXC1 (pan-meningeal progenitor at E12.5) and GFP in the apical region (D,E). Red arrows point to LEF1^{+} cells, and yellow arrows point to TCF-Lef H2B GFP and FOXC1^{+} cells. Scale bars represent 100μM. Meninges (mn), frontal bone (fb).



DiNuoscio and Atit,
Figure S2

Figure S2. Conditional deletion of *Wls* in cranial mesenchyme does not appear to affect meningeal histology. Schematic illustration of the coronal plane (A). β-galactosidase staining, basolateral (B,C), and apical (D,E) Indirect immunofluorescence for CONNEXIN43 (red) in gap junctions of the meninges and CD31/PECAM (green) in the endothelial cells of meningeal mesenchyme with DAPI-stained nuclei in the basolateral (F,G) and apical site (H,I). Scale bars represent 100μm.



DiNuoscio and Atit,
Figure S3

Figure S3. Conditional deletion of *Wls* in cranial surface ectoderm. Schematic illustration of the coronal plane (A). Indirect immunofluorescence for FOXC1 (basolateral B, C; apical D, E), RALDH2 (basolateral F, G; apical H, I), and LEF1 (basolateral J, K; apical L, M) with DAPI-stained (blue) nuclei on coronal mouse embryonic head sections. Dotted white line demarcates the cortex. Scale bars represent 100μM.

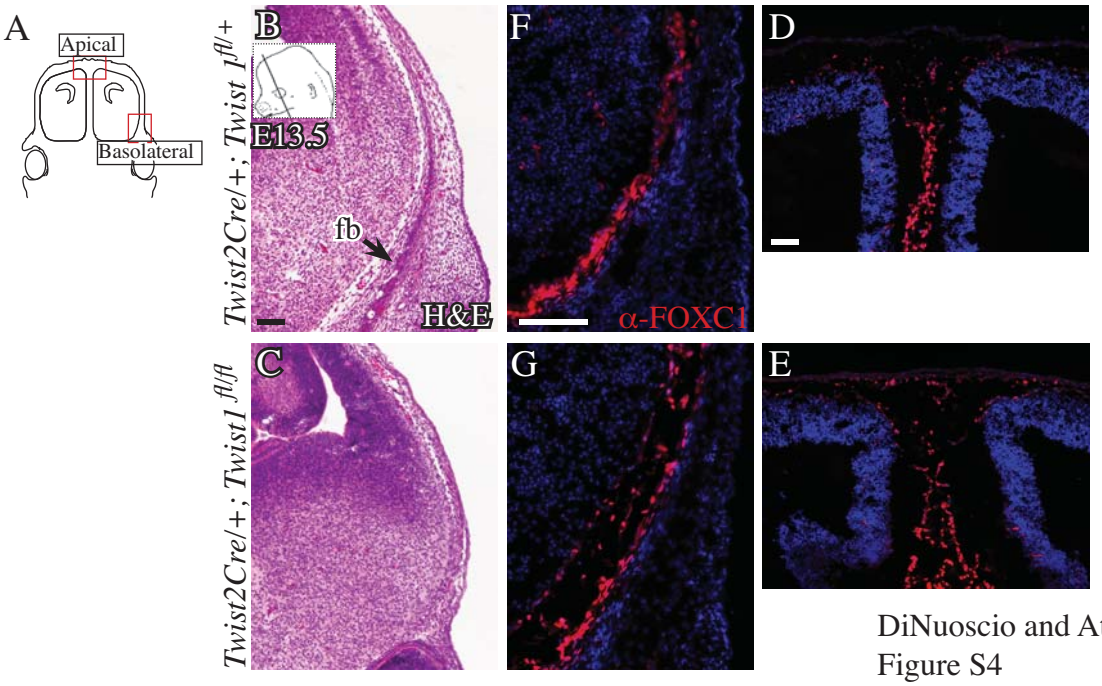
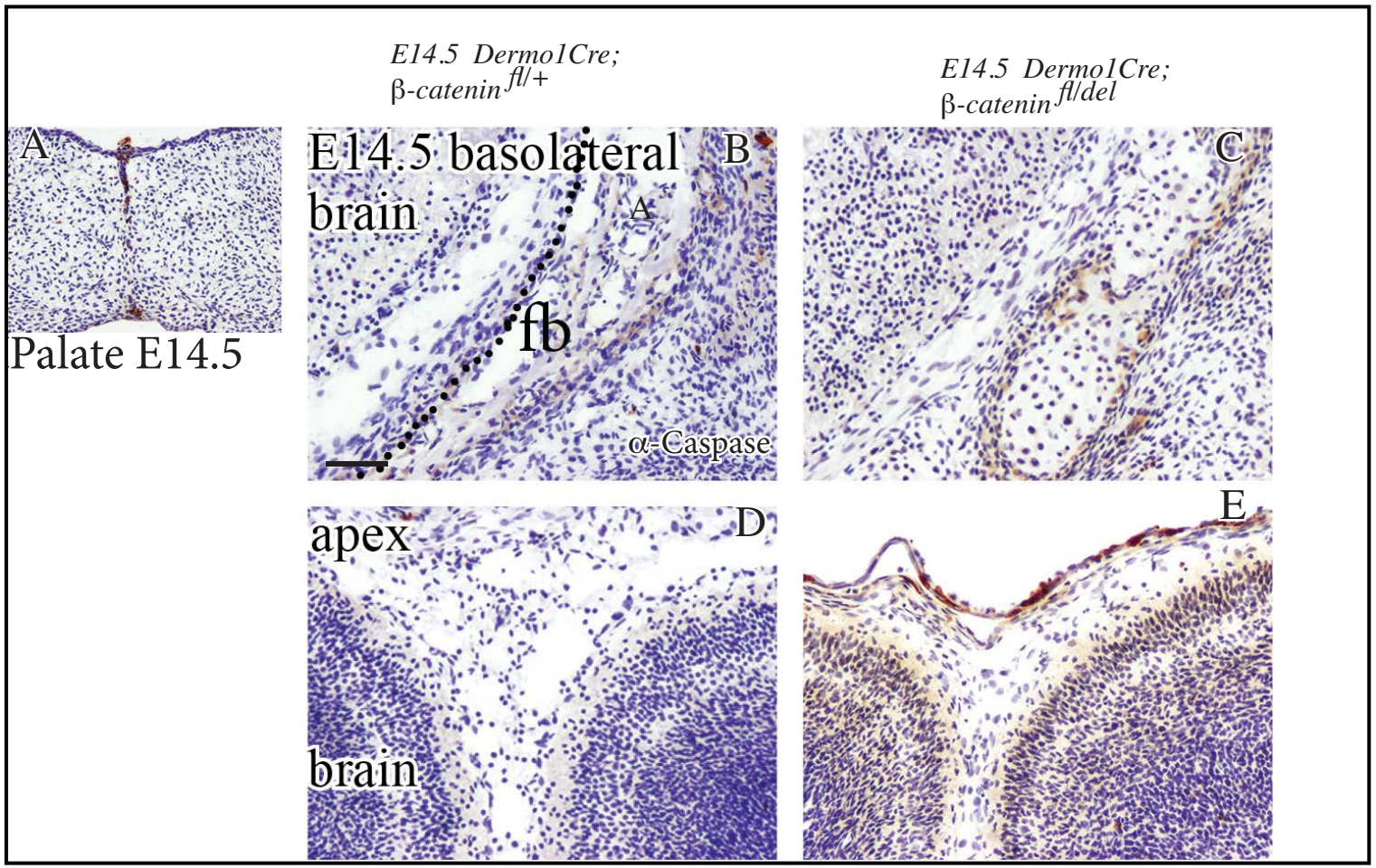
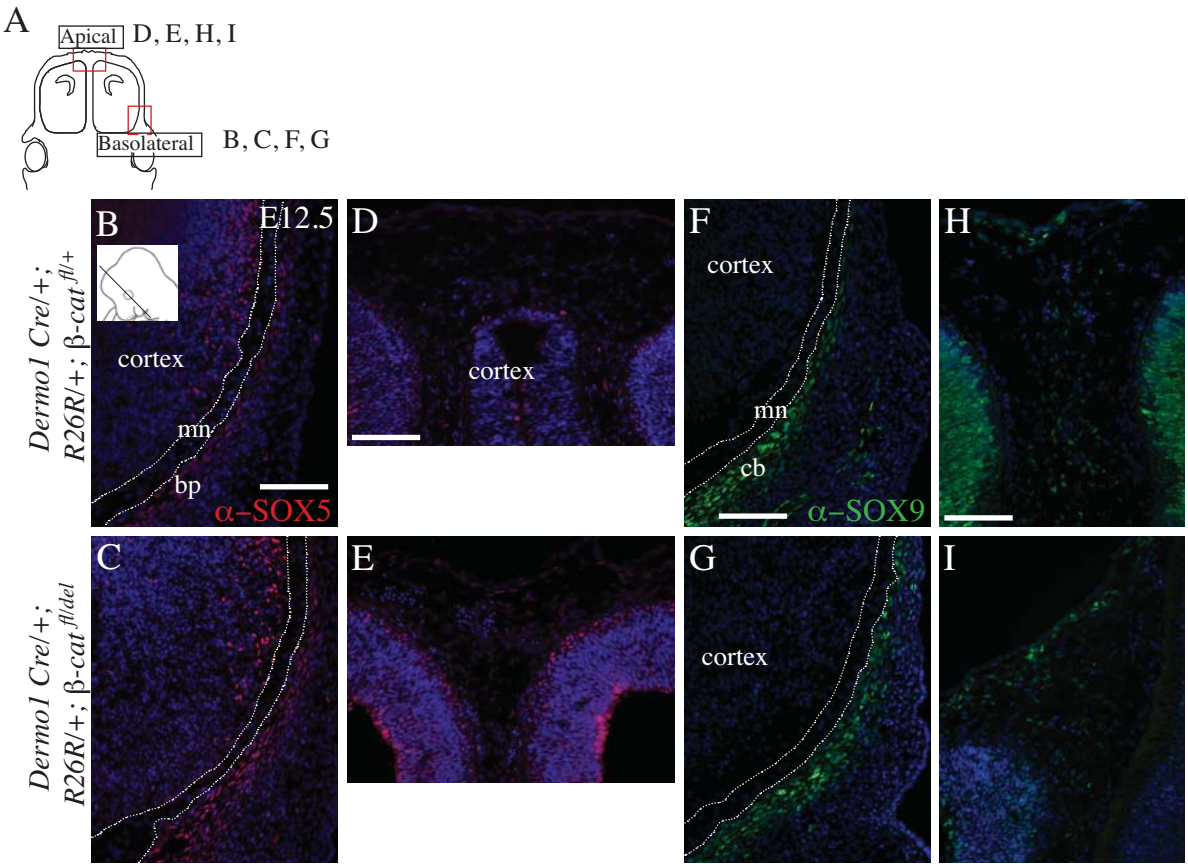


Figure S4. Conditional mutant of *Twist1* lacks bone primordia and ectopic cartilage, but FOXC1 meningeal progenitor marker is present Schematic illustration of the regions of interest in the coronal plane (A). Hematoxylin and eosin staining of the basolateral region of E13.5 heads demonstrating lack of frontal bone in mutants (B, C). Indirect immunofluorescence for FOXC1 in the meningeal fibroblasts with DAPI-stained nuclei on coronal mouse embryonic mouse sections showing they are expressed comparably in control and *Twist1* mutant in the basolateral region (F, G) and apex (D, E). Scale bars represent 100μm. Frontal bone (fb).



DiNuoscio and Atit,
Figure S5

Figure S5. Cell survival is not compromised in *Dermo1Cre/+* β-*catenin* $^{fl/del}$ mutants.
Immunohistochemistry for activated CASPASE3 present in apoptotic cells in the palate (A), basolateral meninges (B, C), and apical site (D, E) counterstained with hematoxilin. Scale bars represent 100μM. Frontal bone (fb).



DiNuoscio and Atit,
Figure S6

Fig S6. Conditional β-catenin deletion does not result in ectopic expression of cartilage determinants in the meninges. Indirect immunofluorescence on mouse embryonic coronal sections at eye level for chondrocyte markers SOX5 (A-D) or SOX9 (E-H) with DAPI (blue) counterstained nuclei. Dotted lines outline the meninges. Abbreviations are cb (cartilage base), mn (meninges), bp (frontal bone primordia). Scale bars represent 100μm.