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Supplementary Information for

Developmental plasticity of epithelial stem cells in tooth and taste bud renewal

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Supplementary text
Figs. S1 to S5
Dataset captions

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S1. Labeling when pulsed at 20dpf and immediate sacrifice. (A) Cells labeled by IHC for BrdU after pulse and 0 DC with schema of signal (A'). Double label with Trp63 (B) cells reveals overlap at tip of tooth marking proliferating cells that are likely are undergoing transient amplification. Double label with β-cat (C) after pulse at 20dpf and no chase period reveals co-expression at the tip, cervical loops and papilla of the RT. Labial oriented to the bottom and oral to the left of the page. Paraffin sections in sagittal plane at 15 mm thickness, imaged at 40x magnification.

S2. Mouse tongues lacking Follistatin adopt transcriptome signatures similar to cichlid replacement teeth. Semantic similarity plots graphically display the concordance between GO biological process terms in cichlid replacement teeth and those genes upregulated from Fst-/- IE epithelium.

S3. Mouse tongues lacking Follistatin misexpress dental markers in the intermolar eminence. Dorsal view of whole mount ISH for tooth markers shows misexpression of these genes in Follistatin mutants (Fst -/-). Quantification of this effect follows dissection of intermolar eminence tissue.

S4. Histological sections of mouse tongues lacking Follistatin misexpress dental markers in the intermolar eminence. Lateral view of histological sections ISH for tooth markers shows misexpression of these genes in Follistatin mutants (Fst -/-).

Figure S5. An evo-devo 'web' describes the plasticity of regenerating epithelial appendages. From a similar epithelial placode, the development of a diversity of vertebrate epithelial appendages emerge. Previous and current studies describe inter-organ plasticity in a number of organisms. The shift between phenotypes can be achieved experimentally, with a proposed ground-state in the absence of key signaling factors. Oral (tongue) papilla can adopt tooth-specific expression patterns and epithelial remodeling in mammals (green; current study) following knock-out of BMP inhibitor Follistatin. Tooth territories in cichlid fishes can shift to more taste-dominant regions (blue) through inhibition of both Hh and BMP pathways, during early development (1) and during replacement stages (this study). Developing dermal scales in alligators can adopt a feather-like appearance through the manipulation of a set of separate markers (magenta) including the overexpression of Zic1 and Sox18 (2). The conditional deletion of Med1 in the mouse incisor can shift the product of dental epithelia toward the development of hair (red) via both a fate-shift in dental stem cells, and the reduction in Notch1 signaling forcing Sox2-expressing stem cells to remain multipotent in regions of differentiation (3). Genes in green text represent experimental activation/overexpression; red text refers to experimentally inhibited markers in that particular study. Arrows depict the direction of experimental inter-organ plasticity.

Dataset S1. Genes differentially expressed between cichlid RT and TB tissue types

Dataset S2. Genome paralogues expressed complementarily in cichlid RT and TB tissue types

Dataset S3. Enrichment analyses of RNA-seq experiments in cichlid and mouse.

Dataset S4. Genes differentially expressed between mouse WT and Fst-/- IE epithelium.

Dataset S5. List of real-time PCR primers, mouse.
Dataset S6. Plasmids used for Digoxigenin-labelled RNA probes, mouse.

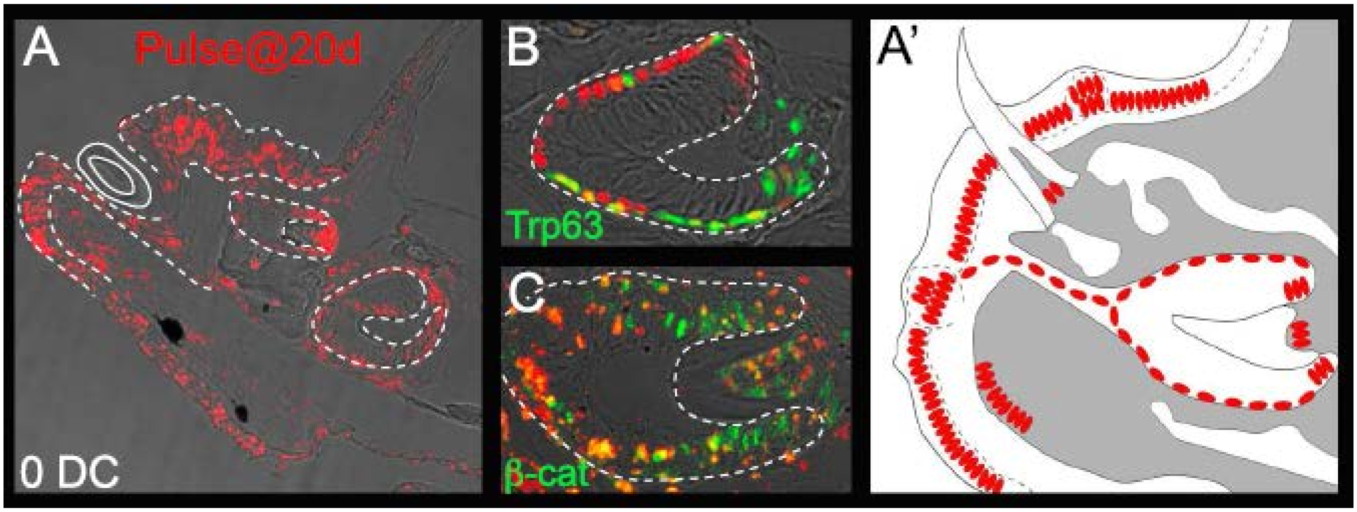

Fig. S1. Labeling when pulsed at 20dpf and immediate sacrifice.

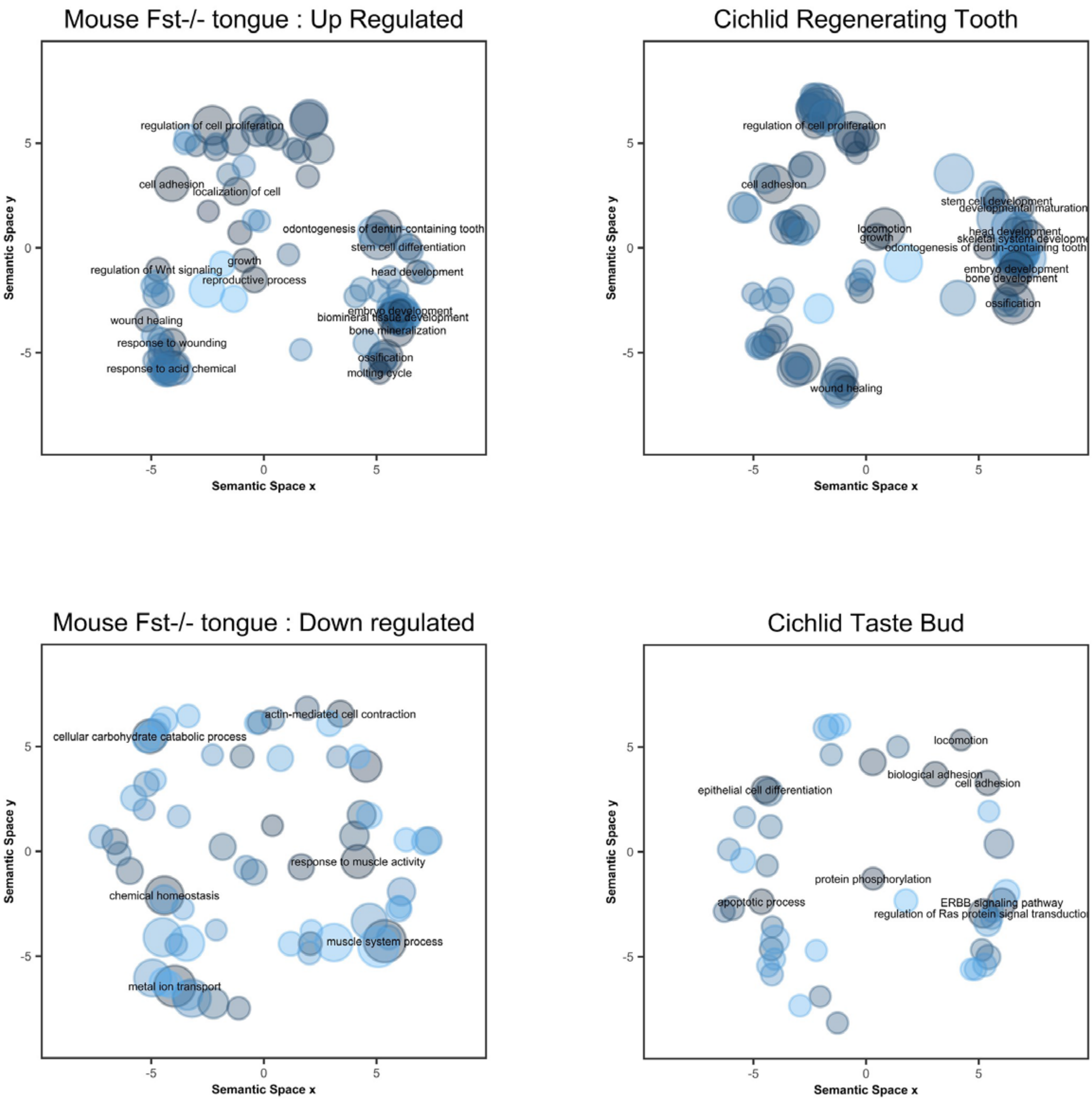

Fig. S2. Mouse tongues lacking Follistatin adopt transcriptome signatures similar to cichlid replacement teeth**.**

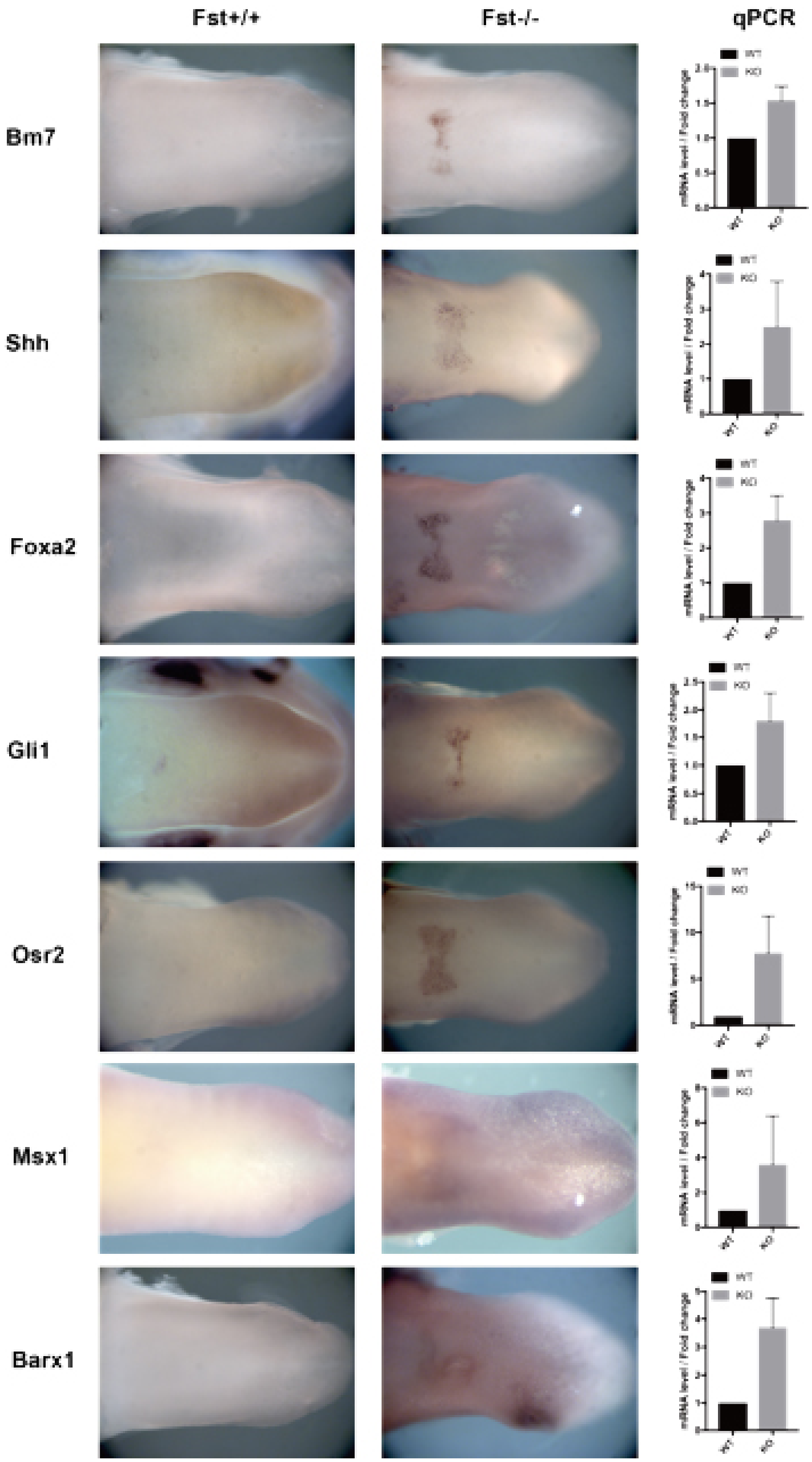

Fig. S3. Mouse tongues lacking Follistatin misexpress dental markers in the intermolar eminence.

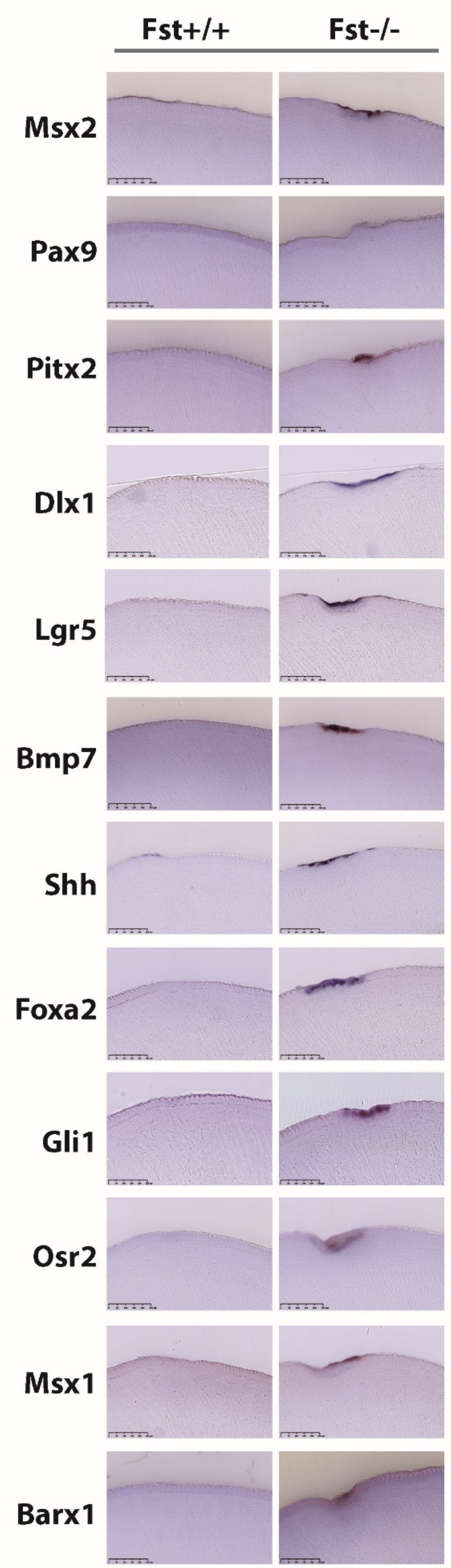

Fig. S4. RNA expression in WT versus Fst null mouse tongues in section at Intermolar Eminence.

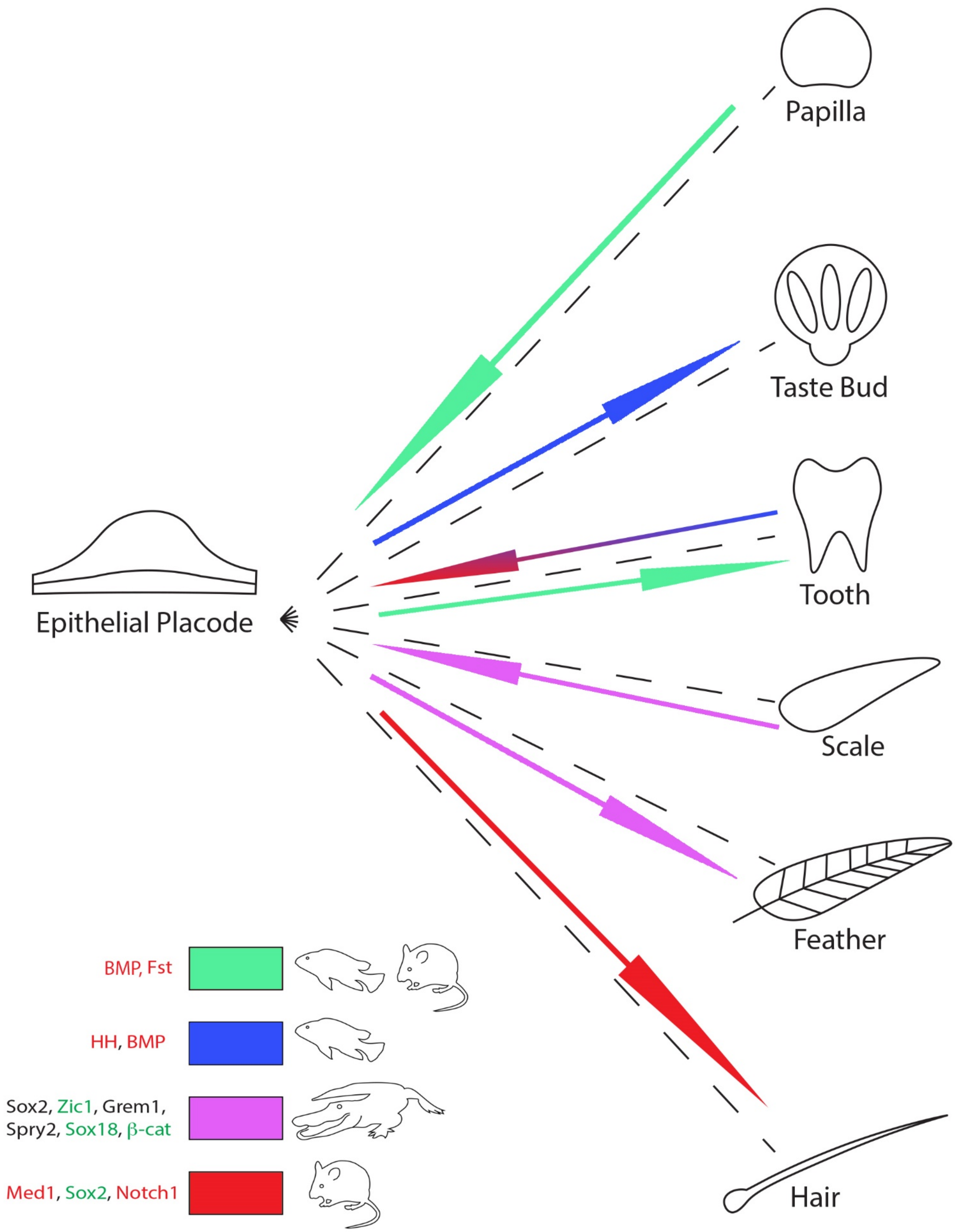

Figure S5. An evo-devo web for inter-organ placode ground-state of regenerating epithelial appendages.

References

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(2) Wu P, *et al.* (2018) Multiple Regulatory Modules Are Required for Scale-to-Feather Conversion. *Molecular biology and evolution* 35(2):417-430.

(3) Yoshizaki K, *et al.* (2014) Ablation of Coactivator Med1 Switches the Cell Fate of Dental Epithelia to That Generating Hair. *PloS one* 9(6):e99991.