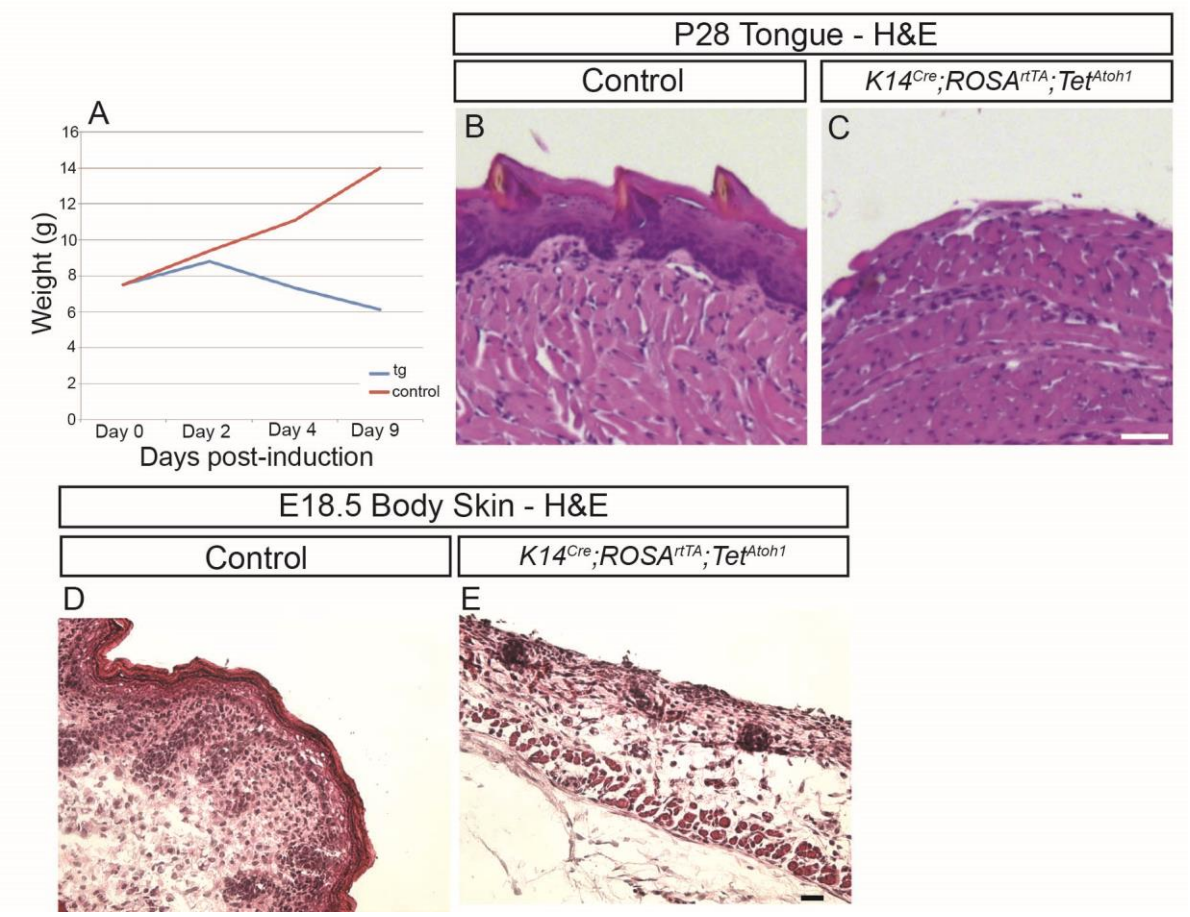
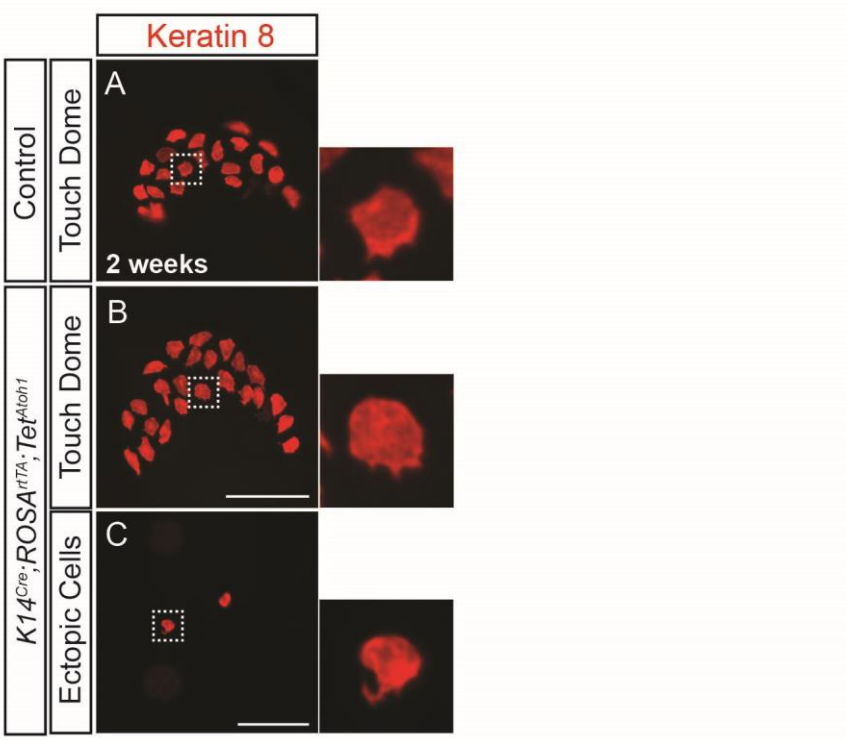
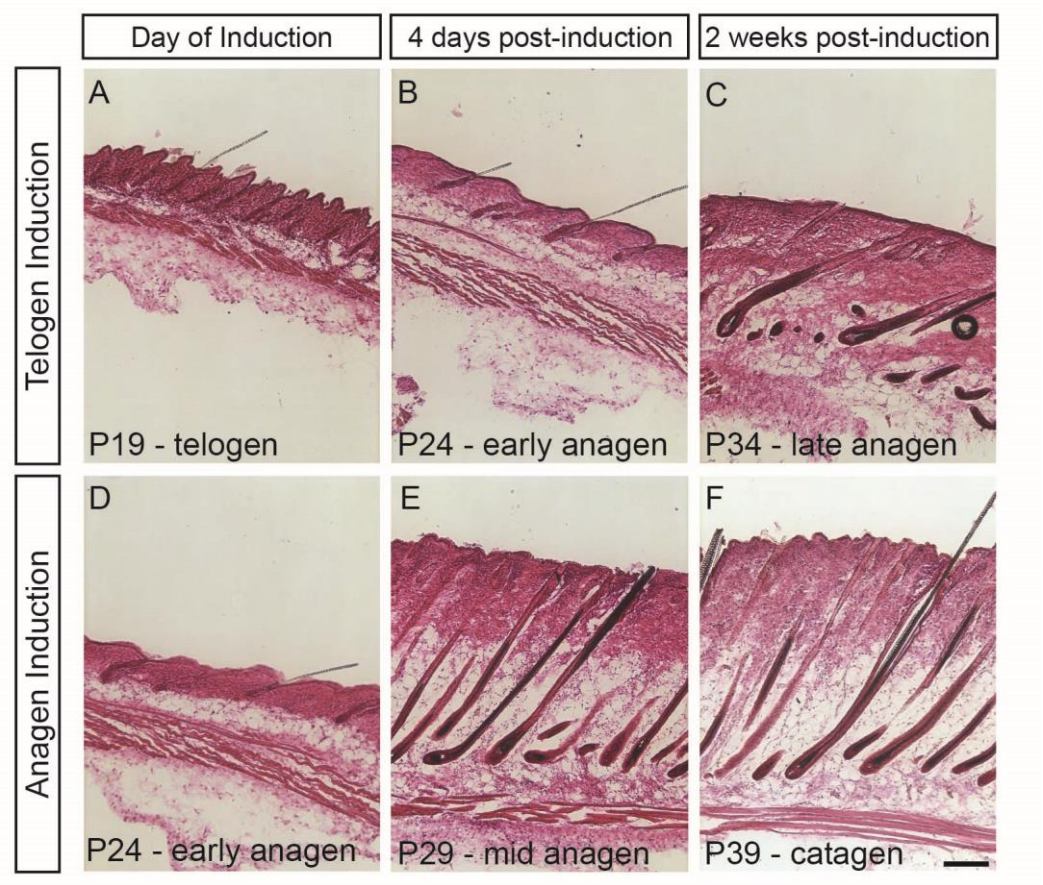



**Supplemental Figure 1**. **Excessive ectopic *Atoh1* over-expression damages the skin.** (A) Weight of P24-P28 *K14*$^{Cre}$; *ROSA*$^{rtTA}$; *Tet*$^{Atoh1}$ (n=7) and control (n=7) mice treated for 2 or 4 days with doxycycline. *K14*$^{Cre}$; *ROSA*$^{rtTA}$; *Tet*$^{Atoh1}$ (n=2) mice but not littermate controls (n=2) allowed to age past day 4 required euthanasia on day 9 due to emaciation. (B, C) Hematoxylin and eosin (H&E)-stained tongue tissue sections from P28 control littermate (B) and *K14*$^{Cre}$; *ROSA*$^{rtTA}$; *Tet*$^{Atoh1}$ mice (C) that received doxycycline for 4 days reveals acantholysis and epidermal loss in the latter. (D, E) H&E staining of skin from E18.5 control littermate (D) and *K14*$^{Cre}$; *ROSA*$^{rtTA}$; *Tet*$^{Atoh1}$ (E) embryos given doxycycline from E14.5-E18.5 demonstrates acantholysis and epidermal loss in the latter. Scale bars: 50μm.




| Time post-induction | Control | $K14^{Cre}$;$ROSA^{rtTA}$;$Tet^{Atoh1}$ | T-test |
|---|---|---|---|
| 4 days | 19.2 ±0.4 | 22.8 ±4.9 | 0.60 |
| 2 weeks | 18.2 ±1.4 | 20.4 ±2.5 | 0.50 |
| 3 months | 14.8 ±0.1 | 14.6 ±0.1 | 0.89 |

**Supplemental Figure 2. *Atoh1* induction does not affect Merkel cell morphology or number in touch domes, and ectopic K8+ cells have typical Merkel cell morphology.** K8 immunostaining in wholemount back skin 2 weeks post-doxycycline shows touch dome (A, B) and ectopic (C) K8+ cells in adult littermate control (A) and $K14^{Cre}$; $ROSA^{rtTA}$; $Tet^{Atoh1}$ (B, C) mice. Boxed regions are shown at higher magnification to the right of each panel. Table shows average number of Merkel cells per touch dome ±SEM at different time points post-doxycycline (n=2-3 mice/genotype). Scale bars: 50μm.




**Supplemental Figure 3. *K14$^{Cre}$*; *ROSA$^{rtTA}$*; *Tet$^{Atoh1}$* mouse hair cycle stages following induction during telogen I and anagen I.** H&E staining of sectioned back skin from *K14$^{Cre}$*; *ROSA$^{rtTA}$*; *Tet$^{Atoh1}$* mice at the time of (A, D), four days post- (B, E) and two weeks post- (C, F) doxycycline administration. Age at time of tissue harvest and hair cycle stage are indicated in each panel. Scale bar: 100μm.