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Melanocyte precocious differentiation and ectopic localization in Notch conditional loss-of-function mice

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Notch signalling is essential to maintain a number of stem cell populations, including melanocyte stem cells (MSC). Here, we re-investigate the phenotype of *Tyr-Cre; RBPJ^{fl/fl}* conditional loss-of-function (*cRBP-J* KO) mice. We compared X-gal positive (X-gal +) cells distribution in skin from *Tg(Dct-lacZ); cRBP-J* KO and *Tg(Dct-lacZ)* control littermates from E12.5 onwards. Absence of Notch signalling did not impair melanocyte lineage development until E16.5. From E16.5 onwards, there was a slight reduction in the number of X-gal + melanoblasts in *Tg(Dct-lacZ); cRBP-J* KO skin. We investigated melanocyte lineage distribution in postnatal hair follicles (HF). For this purpose, we counted X-gal + cells in the upper permanent portion (UPP), the lower permanent portion (LPP), and the upper transitory portion (UTP) of *Tg(Dct-lacZ); cRBP-J* KO and control anagen HF at P8 and P30. In *Tg(Dct-lacZ); cRBP-J* KO P8 and P30 HF, the average number of X-gal + cells per hair follicle was reduced and the distribution of X-gal + cells was impaired compared to control HF. Whereas the number of X-gal + cells remained constant between P8 and P30 in controls, it was drastically reduced in *Tg(Dct-lacZ); cRBP-J* KO LPP and UTP at P30 compared to P8. Furthermore, in *Tg(Dct-lacZ); cRBP-J* KO HF, there were numerous pigmented X-gal + cells, mostly in LPP, but also in UPP and UTP; some were found in ectopic localizations: outside the outer root sheath, around the hair shaft, within the dermal papilla. A majority of *Tg(Dct-lacZ); cRBP-J* KO hair bulbs contained X-gal + cells that were not pigmented; the corresponding hairs were mostly grey or black at P8, and white at P30.

We conclude from these observations that in the LPP, Notch deficient MCS and/or transit amplifying melanoblasts undergo precocious differentiation leading to MCS pool depletion and reduced melanoblast number in the UTP; at the opposite, in the hair bulb, Notch deficient melanoblasts fail to differentiate into mature melanocytes.