Read Item - Skin Grafting In Mice As An Experimental Model Of Hair Growth

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Abstract:

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In vivo tests of gene function can be time consuming to develop and difficult to interpret. In gene knock out experiments, for example, it might be unclear whether observed hair growth abnormalities are direct or indirect effects of gene disruption1. An alternative approach is to restrict the genetic modification or treatment to a small region of the skin so that hair growth effects can be compared within the animal. We have developed a technique for the grafting of small patches of skin and determined hair growth parameters as the basis for hair growth bioassays.
Hair cycles in the skin of C57 BL/6 mice were monitored by observing skin pigment-ation changes and emergence of newly grown hairs. In another group of mice at 21 days of age, 4 mm2 patches of skin on the scapular region were removed and replaced in rotated orient-ation. Autografts were fixed in place using tissue adhesive and band-aged to restrict access during healing. Subsequent hair cycles in the graft, the contra-lateral site and surrounding skin were monitored by hair emergence. Skin was examined by histology during healing and after hair growth.
Normal murine hair replacement occurs in waves and, in this strain, the G2 moult began at the mid lateral site at 25.3 ± 0.3 days (males) or 29.3 ± 0.6 days (females), passing through the scapular region 0.2 to1.2 days later. Hair emer-g-ence in grafts occurred 4.0 ± 0.2 days later than in equival-ent sites ($P<0.01$), and the duration of hair growth phase is shorter by 5.9 ± 2.7 days ($P<0.01$). By rotating the auto-grafts, hairs originating from the grafted site were readily distinguishable (indicated by arrow in the figure). Loss of hair pigmentation was common.
We have shown that spontaneous hair cycles continue within graft sites, albeit with disturbed timing. This model provides a basis for determining local hair growth effects due to alterations in gene expression via targeted knock out or liposome transfection2.
1 Craven AJ, Ormandy CJ, Robertson FG, Wilkins RJ, Kelly PA, Nixon AJ and Pearson AJ. (2001). Prolactin signaling influences the timing mechanism of the hair follicle: analysis of hair growth cycles in prolactin receptor knockout mice. Endocrinology 142: 2533-2539.
2 Domashenko A, Gupta S, Cotsarelis G (2000). Efficient delivery of transgenes to human hair follicle progenitor cells using topical lipoplex. Nature Biotechnology 18: 420-423.