Synopsis of Original Research Paper

Establishment of novel animal models for age-related hair graying that are useful to develop preventive therapies

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Hair graying is a symbol for senescence in humans and one of great cosmetic problems especially for women. Therefore, development of preventive therapy for hair graying is very important in the field of cosmetology. However, available preventive therapies for hair graying are very limited at present. Experiments using humans are difficult to develop drugs for hair graying. Therefore, model mice that mimic the mechanism of hair graying in humans could be strong tools for development of the preventive therapy. Up to now, more than 10 kinds of model mice for hair graying have been reported. However, most of the mice are models for premature hair graying with limited life span. In this study, we developed a novel model mouse for hair graying with long life span. Our macroscopic analysis showed that our model mice progressively develop hair graying with senescence. Previous microscopic studies showed that loss of follicular melanocyte stem cells is a fundamental cause for hair graying in humans. Therefore, we histologically evaluated follicular melanocyte stem cells in our model mice. Our melanocyte-targeted reporter transgene analysis showed depletions of follicular melanocyte stem cell as well as the descendant melanocytes in gray hairs of our model mice. Previous study showed that melanocyte stem cells divide and produce their descendant melanocytes in every hair cycles to regenerate pigmented hairs. Previous study also showed that promotion of hair cycles accelerates hair graying. We in this study examined effect of increased hair cycle on hair graying in our model mice. Hair graying was accelerated by depilation, which is a well-established method to artificially promote hair cycles, in our model mice. These results suggest that melanocyte stem cells and descendant melanocytes are associated with hair graying in our model mice. Our findings suggested that hair graying in our model mice are partially resembles hair graying in humans, whereas further analysis to characterize hair graying in our model mice will be needed. Thus, in this study, we developed a novel model mouse line for hair graying, partially clarified mechanism of hair graying in the mice with considering the similarity of hair graying in humans and suggest that the mice could be a potential tool to develop preventive therapy for hair graying.