



A new paradigm for organ regeneration: lessons from the hair follicle

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Skin is the largest regenerative organ in the body. The epidermis is constantly renewed and skin appendages, including the hair follicle and nail, regenerate under normal homeostatic conditions and in response to injury. Interactions between epithelial cells and underlying dermal cells primarily drive the regeneration of these tissues by partly recapitulating programs found during embryonic development. In addition, other cell types such as adipocytes and nerves play vital roles in promoting regeneration. In this seminar, I will introduce our studies that dissected cellular and molecular mechanisms underlying regeneration of skin and its appendages, especially focusing on how interactions between distinct cell types orchestrate regeneration in adult skin. In particular, I will focus on 1) molecular mechanisms of how epithelial stem cells and melanocyte stem cells in the hair follicle interact and cooperate to regenerate pigmented hair under normal homeostasis (Rabbani et al., Cell 2011; Takeo et al., Cell Report 2016); 2) mechanisms underlying skin regeneration following injury (Ito et al., Nat Med 2005, Nature 2007; Chou et al., Nat Med 2013). Additionally, we will discuss strategies of how these principles in mammalian tissue regeneration can be exploited to promote regeneration of non-regenerative organs such as the limb (Takeo et al., Nature 2013).