

# Hair stem cell regulation and regeneration

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## Abstract

**Key words: hair stem cells, quorum sensing, hair regeneration, hair loss, mechanical force**

Stem cells are fascinating because of their potential in regenerative medicine. The homeostasis of stem cells has been thought to be mainly regulated by signals from their adjacent micro-environment named the “stem cell niche”. However, more and more studies reveal that there can be multiple layers of environmental controls which allowing stem cells to adapt to a larger changing environment and physiological needs. Other than physiological response, injury can also activate stem cells to elicit a regeneration process. Recently, we accidentally discovered that regeneration could occur through a collective decision making process. By delivering a properly arranged minor injury, up to 5 times more neighboring, uninjured resting hairs were activated to regenerate. This work demonstrated that stem cells activation can be induced simultaneously when surrounding stimulating factors are accumulated and reach the threshold. This type of regeneration is a threshold dependent all-or-none process, which provides an organ-level example of quorum sensing. We believe that the quorum sensing behavior principle is likely to be present in the regeneration of tissue and organs beyond the skin. Utilizing such efficient regenerative strategies opens a new window in treating alopecia as well as other degenerative disorders.