A factor that maintains the resting phase of hair growth cycles

Suppression of the factor shortens resting phases, causing rapid succession of hair cycles.

Hair follicles repeatedly cycle through growth (anagen), regression (catagen), and resting (telogen) phases. Although the signaling molecules involved in the anagen and anagen–catagen transition have been studied extensively, the signaling that controls telogen has been only partly understood. Recently we showed that fibroblast growth factor 18 (FGF18) is expressed in a hair stem cell niche throughout telogen, and that it regulates the hair cycle through the non-growth phases. When the FGF18 gene is conditionally knocked out in keratin 5-positive epithelial cells in mice, telogen becomes very short, giving rise to a strikingly rapid succession of hair cycles. In wild-type mice, hair follicle growth during anagen is strongly suppressed by local delivery of FGF18 protein. Our results demonstrate that epithelial FGF18 signaling and its reduction in the milieu of hair stem cells are crucial for the maintenance of telogen and anagen phases, respectively.

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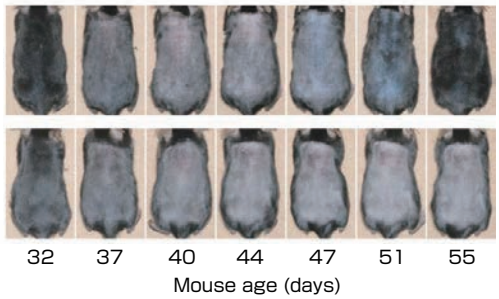

Telogen phase of the first physiological hair cycle was shorter in skin-specific FGF18-knockout mice (top) than in their littermates (bottom).

Finding the primary factor causing variability of scaled transistors

Contribution to yield improvement of integrated circuits such as SRAM

The primary factor causing on-state current variability in 14-nm-generation FinFETs (fin field-effect transistors) has been specified. The factors that cause variability of on-state currents in transistors are variability of threshold voltage, parasitic resistance, and trans-conductance. By analyzing the contribution of each of these factors in detail, it has been discovered that the primary factor causing variability of on-state current in the 14-nm-generation FinFETs is variability of trans-conductance. In addition, it was revealed that highly precise processing of fin channels, "nano-wet etching" developed in AIST, would reduce on-state current variability. The biggest problem in regard to the integrated circuits beyond the 14-nm generation, such as SRAM (static random access memory), has been the reduced yield of the circuits. Since on-state current of transistors varying from the design level causes malfunction of the circuit, larger variability of on-state current reduces the yield. However, it is anticipated that the introduction of the highly precise processing of the present research will help to solve this challenge.

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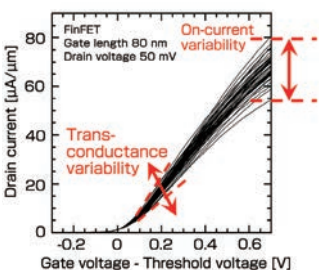
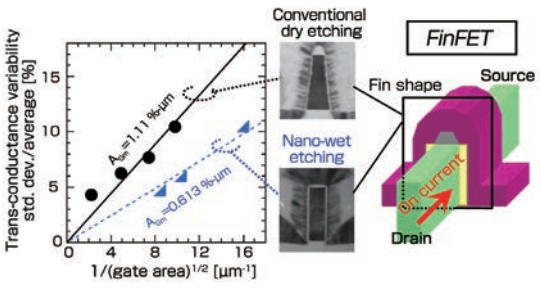


Variability of trans-conductance causing on-current fluctuation



Suppression of trans-conductance variability by nano-wet etching technology