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ADIPOSE TISSUE

SHH and dermal adipogenesis

In the dermis, adipose tissue expands in sync with the growth of hair follicles, but the mechanism that couples the growth of the two tissues is unclear. In new research, investigators have found that sonic hedgehog (SHH) secreted from hair follicle transit-amplifying cells (HF-TACs) is required for expansion of both dermal adipocytes and hair follicles.

"TACs are stem cell progeny responsible for generating a large amount of downstream cell types directly," explains Ya-Chieh Hsu who led the study. "TACs might be well-situated to couple downstream tissue production with changes in surrounding tissues, such as dermal adipogenesis."

The team found that, in mice, HF-TACs are crucial for dermal adipogenesis. SHH is secreted from HF-TACs; by knocking out this protein specifically in HF-TACs of mice, the dermal adipose layer failed to expand.

This effect was specific to SHH secreted from HF-TACs and not from hair follicles, as in mice with hair follicles lacking smoothened (Smo), a protein that mediates the downstream effect of SHH, dermal adipogenesis was unaffected but the follicles are shorter. Moreover, by deleting Smo in different skin cell types, Hsu and his colleagues showed that SHH acts on preadipocytes, but not on mature adipocytes, to regulate dermal adipogenesis. In skin lacking SHH or Smo, the key adipogenic gene *Pparg* was downregulated. Moreover, SHH overexpression increased skin thickness, which was also associated with increased *Pparg* expression.

Hsu and his colleagues hope that their findings will eventually help to mitigate the adverse effects of chemotherapy, such as thinning of the skin, hair loss and increased susceptibility to infections. "Some of these symptoms might be a consequence of a compromised ability of HF-TACs to direct changes in dermal adipocytes, which are important for skin thickening and innate immunity," concludes Hsu.

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ORIGINAL ARTICLE Zhang, B. *et al.* Hair follicles' transit-amplifying cells govern concurrent dermal adipocyte production through Sonic Hedgehog. *Genes Dev.* **30**, 2325–2338 (2016)