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Primary cilia-mediated mesenchymal-epidermal interaction

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Dermal papilla cells (DPCs) play essential roles in hair follicle formation and hair growth. A great deal of attention has been paid to the primary cilium, which is an antenna-like organelle, as a signaling center in mammalian cells. The organelle coordinates intercellular signaling pathways. However, the fundamental mechanism of the primary cilia of DPCs has not been unveiled. Here, we show that the primary cilia of DPCs are involved in intercellular communication between DPCs and other cells.

In order to investigate the role of the organelle in intercellular signaling, mesenchymal stromal cells were grown in DPCconditioned media and the cellular viability of the acceptor cells was analyzed. In the presence of lithium chloride, the ciliary length of DPCs became longer and the mesenchymal stromal cells became more viable. In contrast, shortening of the primary cilia by KIF3A knockdown reduced the viability of the mesenchymal stromal cells. Interestingly, compared to monolayered cultures, spheroidal DPCs that mimic the physiological structure of dermal papillae showed 70% longer primary cilia. In addition, the conditioned media of spheroidal DPCs showed higher proliferation efficiency of the mesenchymal stromal cells than those of monolayered DPCs. Based on these findings, we propose that the primary cilia of DPCs are involved in mesenchymal–epidermal communication in hair follicular homeostasis.

In search of exogenous regulators of DPC primary cilia, we have found that a hydrolyzed yeast extract elongated the primary cilia by 60%. The gene expression of a fibroblast growth factor, FGF-10, was 3-fold elevated by the cosmetic ingredient. 249

Biography

Kazuyuki Matsushima received his PhD from the Kyushu Institute of Technology in 2005. At present, he is a senior principal investigator at the Saravio Central Institute of Saravio Cosmetics Ltd. He has been engaged in the research and development of hair care ingredients, based on fundamental functions of hair follicle cells.

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