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The regulation of mitochondrial function in dermal papilla cells and the evaluation of hydrolyzed yeast extract

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Human dermal papilla cells (HDPCs) play essential roles in hair follicular morphogenesis and in postnatal hair growth cycles. Previous reports showed that platelet-derived growth factor-AA (PDGF-AA) enhanced the formation of dermal condensates in hair follicular development. Additionally, PDGF-AA induces/maintains the anagen phase of the hair cycle. It is likely that mitochondrial morphology and functions are tightly coupled with maintenance of these energy-demanding activities. However, little is known about the mitochondrial regulation in HDPCs.

We observed that primary HDPCs contained mitochondria with filamentous and/or rounded morphologies. Both types of mitochondria showed similar membrane potentials. Interestingly, in the presence of PDGF-AA, the balance between the two morphologies shifted toward the filamentous form. Concomitantly, both mitochondrial enzymatic activity and total cellular ATP level were augmented by PDGF-AA. These two parameters were closely correlated, suggesting the mitochondrial involvement in the PDGF-augmented ATP production. Notably, filamentous mitochondria dominated the migrating HDPCs.

One of our original ingredients, hydrolyzed yeast extract (HYE), induces the increase in filamentous mitochondria, activates the organelle, enhances ATP levels, as well as accelerates cell motility in migration.

Taken together, it seems that HDPCs maintain mitochondrial morphology and function, as required. PDGF-AA and HYE benefits HDPCs in high energy requirement stages, such as migration, by increasing the number of filamentous mitochondria.

In recent years, it has been found that mitochondrial dysfunction is associated with the progress of senescent alopecia and skin abnormalities. Hence, understanding of the mitochondrial regulation is believed to be helpful in health maintenance of hair and skin.

Biography

Chie Mifude obtained an administrative dietitian license from Nagasaki International University. At present, she is a principal investigator engaged in the development of cosmetics based on mitochondrial functions at Saravio Central Institute, Saravio Cosmetics Ltd. She is also a visiting researcher at Oita University.

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