日本香粧品学会誌　Vol. 48, No. 4, pp. 233–234（2024）

〈シンポジウム〉

第49回日本香粧品学会（2024）・シンポジウムII「最新技術で皮膚を観る～明日の肌のサイエンス～」

1細胞レベルで観るヒト皮膚線維芽細胞の不均一性と加齢変化

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Heterogeneity and Age-related Changes of Human Dermal Fibroblasts Observed at the Single Cell Level

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Abstract

Aging leads to tissue dysfunction through phenotypic changes in cells. The human dermal fibroblast is one of the targets of studies that have explored the relationship between cellular status and skin condition. Dermal fibroblasts are crucial in maintaining homeostasis of the dermal environment by producing extracellular matrix. Age-related changes in dermal fibroblasts cause various structural alterations in the dermis, such as loss of dermal papilla, fragmentation and disorganization of collagen fibrils, and replacement with abnormal elastic fibers. These changes are involved in impaired wound healing and a decrease in skin strength and elasticity. The skin is affected by a variety of exogenous and endogenous factors, such as UV exposure, smoking, pollutants, habitual facial expressions, race, and hormonal changes. These factors vary widely between individuals, making it challenging to capture cellular alterations that are purely due to aging. However, given the important findings that removing senescent cells from the body can extend lifespan and alleviate symptoms associated with aging, it will become more important to understand the mechanisms behind cellular senescence and accumulation of senescent cells *in vivo*. Technological progress has enabled the identification of spatially and functionally distinct fibroblast subpopulations in various skin samples. In particular, single-cell RNA sequencing is a powerful tool in aging research. For example, it has shown that human dermal fibroblasts from the sun-protected inguinal region consist of four major subpopulations, whose differences were found to be obscure in the elderly. We investigated transcriptional and phenotypic changes in a unique fibroblast cell line obtained from an adult male donor over 35 years at a single-cell level and identified a possible model of cellular aging and a novel gene related to suppression of cellular senescence. These findings may provide us with clues for developing new cosmetic approaches to prevent skin aging.

Key words: dermal fibroblast, aging, senescent cell, single-cell RNA sequencing.