

〈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～」

皮膚表皮顆粒層の機能的細胞死コルネオトーシスを観る

松井 毅*

Imaging Analysis of Functional Keratinocyte Death, Corneoptosis

Takeshi MATSUI*

Abstract

The stratum corneum (SC) of the epidermis serves as a functional barrier against environmental factors such as pathogens, dehydration, and ultraviolet radiation. It is composed of multiple layers of dead corneocytes, which are terminally differentiated, enucleated keratinocytes. To elucidate the mechanism by which the uppermost stratum granulosum (SG1) cells undergo cell death to form the SC, we performed live imaging of intracellular Ca^{2+} and pH change in mice. Our findings revealed a prolonged increase in intracellular Ca^{2+} concentration (approximately 60 minutes) in SG1 cells, followed by intracellular acidification. To investigate the role of acidification, we developed a method to isolate SG1 cells from mice and conducted live imaging under various culture conditions. The results demonstrated that intracellular acidification is essential for the degradation of keratohyalin granules and nuclear DNA, hallmark features of cornification. Unlike apoptosis or necrosis, which often result in the removal of unnecessary cell debris, the SG1 cell death is unique in that the resulting dead cell bodies themselves form a functional biological barrier. Based on these findings, we propose the term “corneoptosis” to describe this distinct form of cell death in SG1 cells, where the dead cell remnants actively contribute to the formation of the stratum corneum. This study provides new insights into the molecular and cellular mechanisms underlying epidermal barrier formation and highlights the functional significance of corneoptosis in maintaining skin integrity.

Key words: skin, epidermis, stratum corneum, stratum granulosum, Ca^{2+} imaging, cell death, corneoptosis.