

〈教育セミナー〉

皮膚機能の新展開

表皮タイトジャンクションの生理的機能とその応用

黒田昇平

Epidermal Tight Junctions Function and Its Application

Shohei KURODA

Abstract

Tight junctions (TJs) among adjacent epithelial cells control paracellular permeability of solutes, and function in maintaining cell polarity by fencing lipid bilayer components into demarcated apical and basolateral domains. In present study, we investigated the role of epidermal TJs on two skin physiological events, “the epidermal calcium ion (Ca^{2+}) gradient” and “the polarized lamellar body (LB) secretion.” Both events are very important in maintaining healthy skin. We hypothesized that TJs might form the extracellular Ca^{2+} gradient in epidermis by sealing the cell-cell contact at the stratum granulosum and allow LBs to be normally secreted toward the stratum corneum (SC) by giving granular cells polarity. In our experiments, we demonstrated that TJs control not only the intercellular calcium permeability but also the polarized LB secretion in the skin equivalent. Highly concentrated extracellular Ca^{2+} is well known as an essential element to induce differentiation of epidermal cells, while differentiation of epidermal cells is closely related to LB maturation. Also, the lipid secretion from LB is essential for intercellular lipid formation to provide SC barrier function. Therefore, TJs should be responsible for linking a series of processes from epidermal differentiation to SC barrier formation. Moreover, a recent study shows that TJs should also be involved in epidermal barrier function in the skin. Thus, our findings suggest that TJ should have a crucial role, not only in epidermal barrier function, but also in both the epidermal differentiation and SC formation. Based on this study, we propose a novel theory for skin care. The conventional approach for skin care has been mainly to apply externally the ingredients which are similar to intercellular lipids and natural moisturizing factors. According to our research, however, taking care of TJs could promote a positive internal reaction from both epidermis and SC, which should greatly help maintain healthy skin.

Key words: tight junction, skin barrier, calcium gradient, lamellar body.