

〈一般論文〉

Na⁺/H⁺ Exchanger 1 (NHE1) の機能低下は 皮膚の保湿およびバリア機能に影響する

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Decreased Level of Na⁺/H⁺ Exchanger 1 (NHE1) Affects Skin Moisturizing and Barrier Function

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Abstract

Recently, it has become clear that Na⁺/H⁺ exchanger 1 (NHE1) plays an important role in the acidification of skin surface. NHE1 exists on the cell membrane of keratinocytes and regulates intracellular pH by effectively extruding H⁺ ions from intracellular compartments in exchange for external sodium ions, which also controls the acidification of extracellular microdomains and, consequently, was suggested to contribute to skin surface pH. Our previous study using human skin suggested that NHE1 protein amount, skin surface pH, and the onset of rough skin are related to each other. In this study, we investigated how NHE1 participated in skin surface pH, and the water holding capacity and the barrier function of the stratum corneum in human keratinocytes. A NHE1 activator significantly increased the mRNA expression of filaggrin (FLG) and serine palmitoyl transferase (SPT), a ceramide synthesis enzyme, while a NHE1 inhibitor significantly decreased the mRNA expression of both. Environmental and mental stress factors decreased the NHE1 mRNA expression in human keratinocytes. Moreover, a mild acidic environment significantly decreased the FLG and SPT mRNA expression in human keratinocytes. On the basis of these results, NHE1 was suggested to play an important role in not only controlling skin surface pH but also maintaining water holding capacity and barrier function of stratum corneum. Furthermore, decreased level of NHE1 due to environmental and mental stress was assumed to decrease water holding capacity and barrier function of stratum corneum, followed by the onset of rough skin. Therefore, to improve rough skin, preventing the depression of NHE1 function was considered to be more important than mere acidification of skin surface.

Key words: Na⁺/H⁺ exchanger 1 (NHE1), pH, filaggrin, serine palmitoyl transferase (SPT), keratinocyte.