Rinsing soap in ultra-pure soft water improves clinical skin conditions in patients with atopic dermatitis

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【The purpose of the study】To maintain skin barrier function is crucial for reduction in a susceptibility to irritants and for protecting skins from drying. On the other hand, dysfunction of the barrier function of skins has been reported to be closely related clinical severity of atopic dermatitis. Impaired barrier function may facilitate antigen penetration resulting in onset and/or exacerbation of allergic inflammation in skins. Therefore, appropriate skin care that improves dry skin conditions is necessary for strengthen the efficacy of treatment in atopic dermatitis. Although it is very important to keep skins clean and soap is a good cleaning agent, its effectiveness is reduced when used in hard water. Hardness in water is caused by the presence of mineral salts, mostly those of calcium (Ca^{++}) and magnesium (Mg^{++}). The mineral salts react with soap to form an insoluble precipitate known as soap scum or scum. Since soap scum remains tightly on skins and does not rinse away easily, it may become one of causes that exacerbate dermatitis. In this study, we used cation-exchange resin to prepare ultra-pure soft water (UPSW) excluding both Ca^{++} and Mg^{++}, and investigated effect of UPSW rinsing on dry skins in subjects with atopic dermatitis.

【Methods】Stratum corneum was collected from arms of healthy volunteers who rinsed soap in city water or UPSW, and the quantity of remained soap scum was determined with a gas chromatography. After 4 weeks of bathing in UPSW, the water content of the stratum corneum and transepidermal water loss (TEWL) of volunteers with mild atopic dermatitis were measured. By using NC/Nga mice, a model for atopic dermatitis, we attempted to confirm data obtained from atopic volunteers.

【A summary of results】On skins rinsed in UPSW, soap was washed away immediately and remained soap scum was significantly reduced when compared to that on skins rinsed in city water. In skins of atopic volunteers who rinsed soap away in UPSW, the water content in stratum corneum was increased and TEWL was decreased. Most volunteers stated that dryness and itch of skins were weakened. After washed with soap and rinsed in UPSW for 2 weeks, severe dermatitis of NC/Nga mice were slightly

reduced as well as TEWL. On the other hand, dermatitis in NC/Nga mice rinsed in city water became worse.

【Conclusion】UPSW protected skins from residue of soap scum. Dryness and itch in skins of atopic volunteers were weakened. Clinical skin severity scores and TEWL in skins of NC/Nga mice were decreased. The use of soap, which was previously not recommended, is now considered to be useful and beneficial for skin care of patients with atopic dermatitis when it is used in UPSW.