The effects of Two Terpenoids, UA and ONA on Skin Barrier and Its Application

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Ursolic acid (UA) and Oleanolic acid (ONA), known as urson, micromerol, prunol and malol, are pentacyclic triterpenoid compounds which naturally occur in a large number of vegetarian foods, medicinal herbs, and plants. They may occur in their free acid form or as aglycones for triterpenoid saponins, which are comprised of a triterpenoid aglycone, linked to one or more sugar moieties. Therefore UA and ONA are similar in pharmacological activity. Lately scientific research, which led to the identification of UA and ONA, revealed that several pharmacological effects, such as antitumor, hepatoprotective, anti-inflammatory, antimicrobial, and anti-hyperlipidemic could be attributed to UA and ONA. Here, we introduced the effects of UA and ONA on acute barrier disruption and normal epidermal permeability barrier function. To clarify the effects of UA and ONA on skin barrier recovery, both flank skin of 8-12 weeks hairless mice were topically treated with samples (2mg/ml) after tape stripping, then measured recovery rate using TEWL on hairless mice. The recovery rate increased in UA and ONA treated groups at 6h more than 20% compared to vehicle treated group ($p < 0.05$). For verifying the effects of UA and ONA on normal epidermal barrier, hydration and TEWL were measured for 1 and 3 weeks after UA and ONA applications (2mg/ml per day). We also investigated the features of epidermis and dermis using electron microscopy (EM) and light microscopy (LM). Both samples increased hydration compared to Vehicle group from 1 week without TEWL alteration ($p<0.005$). EM examination using RuO4 and OsO4 fixation revealed that secretion and numbers of lamellar bodies and complete formation of lipid bilayers were most prominent (ONA≥UA>Vehicle). LM finding showed that stratum corneum was slightly increased and especially epidermal thickening and flattening was observed (UA>ONA>Vehicle). Using Masson-trichrome and elastic fiber staining, we observed collagen thickening and elastic fiber increasing by UA and ONA treatments. *In vitro* results of collagen and elastin synthesis and elastase inhibitory experiments were also confirmed *in vivo* findings. This result suggested that the effects of UA and ONA related to not only skin barrier but also collagen and elastic fibers. Taken together, UA and ONA can be relevant candidates to improve barrier function and pertinent agents for cosmetic applications.