Opinion

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Novel Technology to Measure Skin Hydration

Karen Kalinyak*

Department of Dermatology, University of Cincinnati, Cincinnati, OH, USA

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***Corresponding author:** Karen Kalinyak

Department of Dermatology, University of Cincinnati, Cincinnati, OH, USA.

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Skin hydration is generally evaluated using devices that measure capacitance or conductance. A new technology (Bio display) was developed to provide accurate measurements of skin hydration at the contact site. This study aimed to test the reliability of the Bio display by comparing its performance results with those of similar devices currently used to objectively assess skin hydration. For each of the 30 participants, skin hydration was measured at each of the defined points on the forearm three times using the Biodisplay and a Hydration Probe (HP), an objective measurement device of skin hydration.

We also evaluated skin hydration of the arm using both tools after applying moisturizers to evaluate interferences from skin care products. The reliability and reproducibility of each device were analyzed by Intraclass Correlation Coefficients (ICC), and the correlation of the two devices was evaluated by Pearson's Correlation Coefficients (PCC). The skin hydration measurements made by the two devices were demonstrated to be significantly correlated, showing moderate correlations. The Bio display can provide reasonably reliable and accurate measurements for skin hydration with the strong points of portability and accessibility.

Measurement of skin surface hydration is carried out in routine in clinical and experimental settings. Several instruments were developed and are commercially available. Most instruments use the electrical properties of the upper most layers to estimate the water content. It is the aim of the present chapter to describe properties and features of the commercially available instruments and to describe some newer technologies. Although water content estimation is based on different principles, good correlations are found between the different instruments.

Skin hydration level is important both for everyday skin care, and for making selections among diferentcosmetics. Skin hydration level can also refect skin barrier function. It is disrupted in many dermatologic diseases, including atopic dermatitis and psoriasis, the degree of disruption may correlate with disease activity. Patients who can measure their skin hydration using an easily accessible device can take more interest in their skin condition, and manage their skin health more actively. In this study, skin hydration measurements by Bio display showed reliability, without the need for additional devices or sensors.

Since Bio display can measure skin hydration through a smartphone display panel, we suggest that Bio display is highly advantageous in terms of portability and accessibility. Therefore, it is expected that Bio display can be used for daily skin care in healthy individuals, and that it can also improve the adherence of patients with dermatologic disease by providing them with information about their skin barrier function. Furthermore, skin hydration information measured by Bio display can be utilized by other healthcare platforms for personalized medicine or health care.

Wireless electronics for monitoring of skin hydration in a quantitative fashion have broad relevance to our understanding of dermatological health and skin structure in both clinical and home settings. Here, we present a miniaturized, long-range automated system that adheres gently to the skin to yield quantitative recordings of skin water content for both epidermis and dermis. This system supports capabilities in characterizing skin barrier, assessing severity of skin diseases, and evaluating cosmetic and medication efficacy, with high levels of repeatability and insensitivity to ambient. Benchtop and pilot studies on patients with skin diseases highlight key features of these devices and their potential for broad utility in clinical research and in home settings to guide the management of disorders of the skin.

Skin cleansers have evolved from merely cleansing to providing mildness and moisturizing benefits as well. Alkyl carboxylate, commonly known as soap, is the prototypical surfactant used in skin-cleansing soap bars however, the superior mildness of syndetic bars over soap bars is well documented in the literature. Harsh surfactants in cleansers can cause damage to skin lipids and proteins, leading to after-wash tightness, dryness, barrier damage, irritation, and even itch. The structure of synthetic surfactants is often tailored to minimize damage to the stratum corneum. A significant breakthrough in cleansing came with the introduction of syndet bars containing sodium cocoyl isethionate as the cleanser and long-chain fatty acids asthe moisturizing agents. Current liquid cleansers use a combination of anionic

and amphoteric surfactants to reduce protein damage and skin irritation potential of anionic surfactants.

These combinations can still cause skin dryness, and this article indicates that this may be due to the interaction of surfactants with skin lipids. The combination of anionic and amphoteric surfactants can result in increased damage to lipids, even though their skin irritation potential is reduced considerably. Skin dryness is addressed in current moisturizing cleanser systems with the use of emollients, such as petrolatum and triglyceride oils. Typically, higher levels of petrolatum are used to increase moisturization by occlusion, with some moisturizer shaving a petrolatum content as high as 50% to 60% by weight. A novel approach to skin moisturization involves using a combination of lipids, natural oils, and humectants, supplemented with occlusives. In this article, we describe the efficacy of a new moisturizing body wash technology, with sodium cocoyl isethionate as the primary surfactant and fatty acids and triglyceride oils as the emollients.