LECTURE

Seeing through the Stratum Corneum

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(Received for publication on October 19, 1999)

Abstract. The stratum corneum (SC) provides a vital barrier membrane between the external environment and the vulnerable internal tissues of the skin. It impedes the flow of water, the penetration of xenobiotics, and invasion of pathogenic micro-organisms. It also has protective capacity against ultraviolet radiation and thermal injury. As routine histopathology provides a misleading picture of a disorganized and shadowy SC, we would recommend the skin surface biopsy technique. This painless technique is easy and reliable in obtaining information from the SC. It demonstrates the geometric patterns of the surface, the openings of the eccrine ducts and hair follicles. The skin surface biopsy technique is also ideal for the investigation of the *in situ* microbiology of skin. Staining with periodic acid Schiff reagent makes it possible to see ringworm fungi, pityriasis versicolor, candida species, or erythrasma micro-organisms. Scanning electron microscopy can be employed when the higher magnification is needed. Histochemical applications include silver staining for melanin particle, potassium ferricyanide staining for blood pigments and lipid staining with Sudan red, for sebum. The rate of movement of topically applied drugs into the skin can be measured using the skin surface biopsy technique. The concentration of radiolabelled drugs can be counted and compared. Comedogenicity and DNA analysis are other applications of this non-invasive technique. (Keio J Med 49 (2): 80–83, June 2000)

Key words: stratum corneum, cyanoacrylate, keratinocyte, skin surface biopsy

The stratum corneum (SC) provides a vital barrier membrane dividing the potentially injurious external environment from the vulnerable and metabolically constant internal tissues of the skin. It impedes the flow of water across the skin restricting the normal loss of water to 0.5 l/day—the so-called normal transepidermal water loss (TEWL). In psoriasis the barrier function is greatly compromised so that in psoriatic erythroderma the daily loss may be as much as 6 l/day—no wonder such patients feel thirsty! The SC barrier also protects against the penetration of xenobiotics and the invasion of pathogenic micro-organisms. It even has some protective capacity against UVR and thermal injury. It is surprising that despite its obvious importance to our continuing healthy existence, comparatively little attention has been devoted to its biology. Routinely prepared formalin fixed, paraffin embedded microtome sectioned human skin samples provide a reasonable view of the epidermal structure, but a misleading picture of a disorganised and shadowy SC.

For those reasons, we were delighted to stumble on the skin surface biopsy technique.[1] This technique relies on the use of one of the rapidly bonding cyanoacrylate adhesives to remove a thin layer of SC. We have used several of these adhesives including methyl, ethyl and octyl cyanoacrylate for this purpose. They rapidly polymerise with slight pressure and moisture and form a very strong optically transparent bond. In practice a drop of the adhesive is placed on a glass microscope slide which is then pressed against the skin site to be sampled. After some 20–30 seconds the slide is "rolled off" the skin taking an intact layer of SC some 2 or 3 cells thick with it (Fig. 1). The SC is undisturbed and is exactly the same on the microscope slide as it is *in vivo*.

The cyanoacrylate adhesive has the same optical properties as glass so that is it easy to inspect the SC specimen by routine light microscopy. Taking skin surface biopsies is painless—the worst discomfort arises from trapping hair in the specimen and removing these with the specimen. The adhesives appear non toxic and

Presented at the 1124th Meeting of The Keio Medical Society in Tokyo, April 13, 1999.
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