



Courage + Khazaka electronic GmbH
Mathias-Brüggen-Str.91 • D-50829 Köln
Phone +49 221 9564990 • Fax +49 221 956499-1
info@courage-khazaka.de • www.courage-khazaka.de

Literature List

3 S Biokit

R. Marks, R. Dawber, Skin Surface Biopsy: An Improved Technique for the Examination of the Horny Layer, Br. J. Derm. (1971) 84, p. 117-123

The cyanoacrylate adhesives have been used to examine the superficial horny layer in a horizontal plane. The adhesive strips a thin layer of horn from the skin and sticks it to glass slides. The preparations are superior to skin surface replicas because of the ease and speed of their production and because of their unflinching clarity. In addition, because actual horn is seen in its *in vivo* arrangement, the preparations can be stained histologically and histochemically. The results of examination of normal skin and its regional variation, and of viral and seborrhoeic warts, moles, pityriasis versicolor, psoriasis and ichthyosis are reported. The scanning electron microscope has been used to examine the horny squames removed with this technique from normal, ichthyotic and psoriatic skins. In psoriatic squames a particularly well developed series of folds and outpouchings of the plasma membrane were noted.

R. Marks, Histochemical Applications of Skin Surface Biopsy, Br, J Derm (1972) 86, p. 20-26

The method of skin surface biopsy in which cyanoacrylate adhesive is used to remove a coherent strip of stratum corneum, has been used to investigate aspects of epidermal function. The Sudan dyes were employed to demonstrate sebum in the hair follicle openings.

R. Marks, T. Saylan, The Surface Structure of the Stratum Corneum, Acta Dermatovener., 52 J, T 1972, p. 119-125

A method for the detailed examination of the intact stratum corneum is described, termed "skin surface biopsy". In this technique a cyanoacrylate adhesive is used to remove a sample of the horny layer that retains its *in vivo* structure. This manoeuvre does not disturb the underlying skin, and is simple and quick. Using the skin surface biopsy method the detailed structure of the surface of the horny layer of 14 subjects in 17 sites has been examined. It was also possible to examine the functional anatomy of the stratum corneum by demonstrating the presence of sebum, sweat and melanin in skin surface biopsies.

R. Marks, N. Ramnarain, B. Bhogal, T. Moore, The erythrasma microorganism in situ: studies using the skin surface biopsy technique, Journal of Clinical Pathology Volume 25, 1972, page 799-803

The skin surface biopsy technique has been used to investigate the erythrasma organism *in situ* in the stratum corneum in 11 patients. Staining by PAS and Gram stain showed the presence of a large number of organisms arranged haphazardly in some areas and in microcolonies in others. With the scanning electron microscope it was possible to see that smooth filamentous chains of microorganisms had penetrated horn cells and caused disturbance of the surface structure of these cells. Enzyme histochemical tests showed that the erythrasma microorganism possessed a strong reactivity for NAD diaphorase and other mitochondrial enzymes. The reactivity was focal confirming a complex subcellular organization of organelles. It is suggested that the erythrasma microorganism secretes a mucopolysaccharide sheath in some circumstances.

G. Piérard, C. Piérard-Franchimont, A. Dowlati, La biopsie de surface en dermatology clinique et expérimentale, Rev. Eur. Dermatol. MST 1992 4 455

La biopsie de surface consiste à prélever la partie superficielle de la couche cornée. Il en existe deux variantes. L'une est réalisée avec l'aide d'une colle de type cyanoacrylate et une lamelle de plastique transparent. L'autre repose sur l'utilisation de petits disques préencollés disponibles commercialement.

C. Piérard-Franchimont, G. Piérard, Cyanoacrylate Skin Surface Stripping for Visualizing Stratum Corneum Structures and Dynamics

Cyanoacrylate skin stripping (CSSS) came into existence when High-bond glues became available. The introduction of the polyethylene slide used to take the sample was a decisive new stage in the development of this technique. The necessary materials are presented in Table 7.1.

R. Dawber, Skin Surface Biopsy and the Follicular Cast, CRC Press 1995, chapter 5.5, p. 121-12

The technique of skin surface biopsy (SSB) was first described by Marks and Dawber. It is a simple, non-invasive method, removing only dead tissue, used to study the stratum corneum as a cohesive membrane, its constituent corneocytes and their relationship to each other, the many types of pathology within this compartment, and a vast array of microorganisms that may colonize or invade the layer.

G. Piérard, EEMCO guidance for the assessment of dry skin (xerosis) and ichthyosis: evaluation by stratum corneum strippings, Skin Research and Technology 1996; 2; 3-11

Evaluation of scaliness in xerotic and ichthyotic conditions is conveniently addressed by stratum corneum strippings. The assessment of scaling conditions by stratum corneum stripping methods may be validly used in the laboratory. Interpretations, however, must be cautious. Direct extrapolations with respect to the water content in the stratum corneum should be avoided.

R. Marks, A Deeper Look Into The Superficial Layers Of The Skin, Retinoids Today and Tomorrow 1996, Issue 43

The boundary of self from non-self is defined by the outermost part of the skin. It provides the chemical barrier that grudgingly permits the egress of water and impedes the penetration of microbes, xenobiotics and other antigens.

A. Pagnoni, A. M. Kligman, T. Stoudemayer, Image Analysis of Cyanoacrylate Follicular Biopsies, CRC Press, chapter 9, p. 113-119, 1997

The cyanoacrylate follicular biopsy (CFB) is the most reliable tool to sample the follicular contents of facial skin. In 1971, Marks and Dawber introduced the cyanoacrylate "skin surface biopsy" to study the stratum corneum. This polymer removes the outermost horny layer as a sheet. They showed how this quick and convenient method could be used to examine the glyphic pattern, to search for fungi, or to study diseases in which the stratum corneum is prominently involved.

E. Röpke, W. Augustin, H. Gollnick, Lipidbestimmung der Hautoberfläche mittels Cyanoacrylattechnik und modifizierter Dünnschicht-Chromatographie, Kosmetische Medizin Vol. 18, 2; 1997, p. 130-134

Epidermale und Sebumlipide sind ein permanentes Untersuchungsgebiet in Studien über Akne und die Barrierefunktion der Haut. Unser Ziel war es, eine Methode zur Anwendung zu bringen, die einerseits eine nichtinvasive Probengewinnung beinhaltet, das heißt, die den Patienten möglichst wenig belastet und andererseits schnell und unkompliziert auszuführen ist.

C. Piérard-Franchimont, V. Goffin, J.E. Arrese, G. E. Piérard, **Biometry applied to cyanoacrylate skin surface strippings. A review of the Liège experience**, Dermatologia Clinica No. 3/ 1999, p. 93-97

The cyanoacrylate skin surface stripping (CSSS) is a time-honoured method to harvest in a single procedure a sheet of the superficial stratum corneum and follicular casts as well. Such sampling is currently used to assess non-invasively various physiological and pathological aspects of the skin.

C. Piérard-Franchimont, G. Piérard, **Skin Surface Stripping in Diagnosing and Monitoring inflammatory Xerotic, and Neoplastic Diseases**, Pediatric Dermatology Vol. 2 No. 3 180-184, 2000

Skin surface stripping is a useful and simple diagnostic tool for the diagnosis of a number of diseases that affect the skin during childhood and adolescence. The procedure has proved to be especially valuable in inflammatory, xerotic, and neoplastic conditions as it provides information regarding pathologic changes as well as diagnosis.

C. Piérard-Franchimont, G.E. Piérard, **Biopsie de la Surface pour la Visualisation des Structures de la Surface Cutanée**, in P. Agache and H. I. Maibach (Editors), Physiologie De La Peau Et Explorations Fonctionnelles Cutanées, Editions Médicales Internationales, Cachan cedex, August 2002

La biopsie de surface a vu le jour lorsque des colles au cyanoacrylate sont devenues disponibles [1, 2]. L'utilisation d'une lamelle en polyéthylène comme support du prélèvement fut une nouvelle étape décisive au développement de cette technique [3].

J.E. Arrese, P. Quatresooz, P. Pierard- Franchimont, et. al., **Indications diagnostiques de la biopsie de surface au cyanoacrylate**, Dermatologie Aktualité, No. 83, June-July 2004

La biopsie de surface au cyanoacrylate consiste à prélever la partie superficielle de la couche cornée. La méthode est non invasive et habituellement indolore. Elle peut être répétitive au même site. Dans le domaine de la dermatologie clinique, les indications de ce type de prélèvement sont multiples. Elles concernent principalement le diagnostic des dermatites inflammatoires squameuses, des infections et parasitoses superficielles, ainsi que des tumeurs pigmentaires.

R. Marks, **Seeing Through the Stratum Corneum**, study on the new biopsy method Biokit, Courage + Khazaka electronic GmbH, Cologne, Germany

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 0.5l/day – the so called normal transepidermal water loss (TEWL).

R. Marks, G. Khazaka, **Diagnostik an der Grenzfläche: Hinweise zur Hautoberflächenbiopsie**, 16. DGK-Symposium 2004, Köln, Poster Presentation

Das Stratum Corneum (SC) blieb bis heute von den Dermatologen und Hautbiologen nahezu unbeachtet. Diese mangelnde Aufmerksamkeit besteht weiter, obwohl mittlerweile erkannt wurde, dass die Struktur eine lebenswichtige Rolle in der Aufrechterhaltung einer konstanten, inneren physiologischen Umgebung spielt.

R. Marks, **Diagnostic Clues at the Interface**, Poster Presentation, DGK Symposium Leipzig, 02.-04.03.2005

The stratum corneum (SC) has been comparatively ignored by dermatologists and skin biologists. This lack of attention still persists despite the recognition that the structure plays a vital role in maintaining the constancy of the internal physiological environment. It is its barrier properties that give the SC its central role in skin physiology. In health we lose about 0.5l of H₂O per day across the SC (excluding sweat) – the so called transepidermal water loss (TEWL). When seriously damaged such as in burns or from psoriasis we can lose up to 10 times as much – 5l, per day rapidly producing life threatening dehydration.

C. Piérard-Franchimont, V. Goffin, G.E. Piérard, Indaguer la couche corneé. Biométrie par la biopsie de surface au cyanoacrylate, *Dermatologie Actualité*, 87, pp. 23-26, 2005

La biopsie de surface au cyanoacrylate est un outil diagnostique précieux (1-3). Elle trouve aussi son utilité en dermatologie expérimentale, lorsque la couche cornée exprime certaines propriétés quantifiables (4). Nous rapportons ici un bref synopsis des méthodes qui ont vu le jour ces 20 dernières années.

G. E. Piérard, Cyanoacrylate biopsy for cytologic evaluation of the epidermis, Department of Dermatopathology, University Hospital Sart Tilman, Liège, Belgium

Cyanoacrylate skin surface stripping (CSSS) is a time-honoured method. After its clever discovery, it was soon applied for diagnostic purposes. Sampling on polyethylene slide was a decisive improvement in the development of this method.

G.-W. Nam, S.-H. Kim, E.-J. Kim, J.-H. Kim, B.-G. Chae, H.-K. Lee, S.-J. Moon, H.-H. Kang, I.-S. Chang, How Skincare Ingredient Concentrations Can Modulate the Effect of Polyols and Oils on Skin Moisturization and Skin Surface Roughness, *IFSCC Magazine*, Vol. 9, No. 1 2006

The aim of this study was to evaluate the influence of different skincare ingredient concentrations on the effect of polyols and oils on human skin moisturization and skin surface roughness. Polyols and oils are essential ingredients in a skin care formulation, but it is still not understood how their concentrations affect their efficacy and sensory properties on human skin.

A. Sparavigna, Di Pietro, M. Setaro, Sensitive skin: correlation with skin surface microrelief appearance, *Skin Research and Technology* 2006: 12, p. 7-10

Sensitive skin has been defined as a condition associated with reduced cutaneous tolerance to environmental factors, such as cold, heat and wind, and/or frequent or prolonged applications of some topical products, such as cosmetics.

A. Rougier, G. Piérard, Nudging acne by topical beta-lipohydroxy acid (LHA), a new comedolytic agent, *AB15 J. Am. Acad. Dermatol.*

Beta-lipohydroxy acid (LHA) is a lipophilic derivative of salicylic acid. It exhibits a potent keratolytic effect caused by the dissociation of the comedodesmosomes in the outmost layers of the stratum corneum. In addition, topical applications of a 2% LHA formulation increased the thickness of the epidermal germinative layers, stratum malpighi, and filaggrin layer.

P. Quatresooz, E. Xhaufaire-Uhoda, C. Piérard-Franchimont, G.E. Piérard, Regional variability in stratum corneum reactivity to antiseptic formulations, *Contact Dermatitis* 2007; 56; p. 271-273

Skin does not react in an identical way to the action of chemicals over all anatomic sites. Accordingly, distinct regional differences have been described in relation to irritancy. The present study assesses the regional variations of stratum corneum (SC) reactivity to 3 proprietary antiseptic solutions.

J.E. Arrese, P. Quatresooz, C. Piérard-Franchimont, G.E. Piérard, Indications diagnostiques de la biopsie de surface au cyanoacrylate. L'avènement du 3S-Biokit, *Service de Dermatopathologie, CHU du Sart Tilman, Liège*

Résumé La biopsie de surface au cyanoacrylate consiste à prélever la partie superficielle de la couche cornée. La méthode est non invasive et habituellement indolore. Elle peut être répétitive au même site. Dans le domaine de la dermatologie clinique, les indications de ce type de prélèvement sont multiples. Elles concernent principalement le diagnostic des dermatites inflammatoires squameuses, des infections et parasitoses superficielles, ainsi que destumeurs pigmentaires.

R. Marks, Hinweise zur Schnittstellendiagnostik

Das Stratum corneum (SC) blieb bis heute von den Dermatologen und Hautbiologen nahezu unbeachtet. Diese mangelnde Aufmerksamkeit besteht weiter, obwohl mittlerweile erkannt wurde, dass die Struktur eine lebenswichtige Rolle in der Aufrechterhaltung einer konstanten, inneren physiologischen Umgebung spielt. Es ist die Barriere-Eigenschaft, die dem SC eine zentrale Rolle in der

Hautphysiologie verleiht. Gesunde verlieren ca. 0.5l Wasser pro Tag über das SC (Schweiß ist dabei nicht eingerechnet) – der sogenannte transepidermale Wasserverlust (TEWL). Bei gravierenden Schäden wie bei Verbrennungen oder Psoriasis können bis zur zehnfachen Menge, d.h. bis 5 l Wasser pro Tag verloren gehen, was zu lebensbedrohlicher Dehydrierung führen kann. Das SC erschwert ebenfalls den Eintritt von Xenobiotika in den Körper und schützt so vor Problemen durch Kontakt mit toxischen Substanzen. Zusätzlich verhindert das SC auch das Eindringen pathogener Mikroorganismen in den Körper und schützt uns teilweise gegen die Sonnenbestrahlung, thermische Schäden und geringe mechanische Traumata.

C. Piérard-Franchimont, V. Goffin, G. E. Piérard, Indaguer la couche cornée. Biométrie par la biopsie de surface au cyanoacrylate, Service de Dermatopathologie, CHU du Sart Tilman, Liège

La biopsie de surface au cyanoacrylate est un outil diagnostique précieux (1-3). Elle trouve aussi son utilité en dermatologie expérimentale, lorsque la couche cornée exprime certaines propriétés quantifiables (4). Nous rapportons ici un bref synopsis des méthodes qui ont vu le jour ces 20 dernières années.

G. Piérard, P. Quatresooz, Corneoxenometry: a stratum corneum toxicity model, ISBS Besancon 2009

Predicting the damaging effects of peeling agents on human stratum corneum is hazardous in conditions close to the in vivo situation. Comparisons between the effects of different compounds or different concentrations of a given compound may prove to be difficult to perform. By contrast, the in vitro corneoxenometry bioassay is safe, quite easy to handle and serve to predict some specific effects occurring in clinical practice. The effects of different concentrations of glycolic acid (GA) and those of problematic commercially available phenol formulations were tested using the corneoxenometry bioassay

H.-U. Jabs, Wet-Peeling mit dem Korneo-Rubber – ein neues Behandlungskonzept bei Barriere- und Verhornungsstörungen, Ästhetische Dermatologie 2 / 2010

Ein gemeinsames Kennzeichen von Hautalterung und von fast allen Hauterkrankungen sind Barriere- und Verhornungsstörungen. Die äußere Schicht der Haut – die Epidermis – besteht hauptsächlich aus Keratinozyten, wenigen Melanozyten und einigen immunkompetenten Zellen (Langerhans Zellen). Die Epidermis ist ein dynamisches System, deren Struktur und Metabolismus zwei Hauptaufgaben haben: Die Haut vor äußeren, schädlichen Einflüssen zu schützen und das Flüssigkeitsgleichgewicht (Hydratation) von inneren Geweben und Organen zu gewährleisten.

C. Piérard-Franchimont, J. Arrese-Estrada, P. Quatresooz, G. E. Piérard, 39 Cyanoacrylate Skin Surface Strippings; Textbook of Ageing Skin, Springer-Verlag Berlin Heidelberg 2010

In its most widely appreciated context, the stratum corneum (SC) exerts a major barrier function extending to protection from ultraviolet light, microorganisms, oxidants, and other toxic xenobiotics. In addition, it protects from loss of water and electrolytes from the body. Despite limited metabolic activity, the SC is viewed as a highly specialized structure showing continuous renewal keeping ideally a steady state in its structure and thickness.

K. Myer, H. Maibach, Stratum corneum evaluation methods: overview, Skin Research and Technology 2013; 19; 213-219

Background/purpose: The stratum corneum serves as a main barrier for the skin, minimizing water loss and regulating absorption of substances. Because of its surface location, it is readily available for analysis. Consequently, many techniques are amenable to investigating its content and function. Here, we review the methods employed to evaluate the stratum corneum and its function. Methods: We reviewed Pubmed and Embase search results for 'stratum corneum', 'method', 'methods', 'technique', 'and 'evaluation' and extracted pertinent articles that discussed ways to examine the stratum corneum and its constituents. Results: Traditional and novel methods vary by accuracy, ease of use, time requirements, cost, invasiveness, and equipment requirements.

G.E. Piérard, C. Franchimont, P. Delvenne, **The thousand and one facets of actinic keratosis**, Dermatology Laboratory and Clinical Research, Nova Biomedical; ISBN: 978-1-62808-106-0

Introduction: Actinic (or solar) keratosis (AK) is a common photoinduced neoplasm. It is a biologically benign condition. However, it represents the initial clinical step of a disease continuum observed on chronically photodamaged skin leading to a peculiar type of invasive squamous cell carcinoma (SCC). This cancer has limited metastatic potential [1], and is tentatively more specifically named “actinic carcinoma” (AC). When considering AK, the older terms “senile keratosis” and “senile keratoma” have been abandoned as clinical designations because the age of the individual is not an essential feature.

G.E. Piérard, C. Piérard-Franchimont, P. Delvenne, P. Quatresooz, **Cyanoacrylate Skin Surface/Follicular Stripping**, Non Invasive Diagnostic Techniques in Clinical Dermatology; Springer Berlin Heidelberg 2014; ISBN 978-3-642-32108-5

Introduction: The stratum corneum (SC) is a dead structure. However, it exerts a unique barrier function partly protecting the living tissues from a series of environmental threats including ultraviolet light, microorganisms and irritant/toxic xenobiotics. In addition, the SC controls any excessive loss in water, electrolytes and macromolecules from the skin. In addition, the SC acts as a unique sophisticated biosensor that signals the underlying epidermis to respond to various external stimuli. Despite minimal metabolic activity, the SC corresponds to a highly specialised structure resulting from the continuous corneocyte renewal ideally keeping a steady state in the SC structure and thickness. However, corneocytes are structurally and biochemically heterogeneous.

G.E. Piérard, C. Piérard-Franchimont, P. Paquet, T. Hermanns-Lê, J. Radermacher, P. Delvenne, **Cyanoacrylate Skin Surface Stripping and the 3S-Biokit Advent in Tropical Dermatology: A Look from Liège**, Hindawi Publishing Corporation, The Scientific World Journal Volume 2014, Article ID 462634

1. Background of Laboratory Aids in Tropical Dermatology Most tropical dermatoses contracted by native residents, travelers, immigrants, and refugees are not life-threatening precluding basic diagnostic work-up. A series of simple laboratory tests are conveniently performed using minimum equipment for establishing a clinical diagnosis, clarifying a differential diagnosis or ruling out some specific alternatives. Practical advice on the diagnosis of tropical dermatoses is thus available in simple straightforward ways. In most medical institutions diagnostic microbiology laboratories provide advice about adequate conditions for collecting, storing, and sending skin samples for establishing possible tropical bacterial, parasitic, or viral infections. During the early acute phase of infection, serum samples are possibly collected and stored in a freezer where available. Other distinct sampling procedures are available and have proven usefulness to practitioners facing a series of tropical dermatoses.

G.E. Piérard, J. Courtois, C. Ritacco, P. Humbert, F. Fanian, C. Piérard-Franchimont, **From observational to analytical morphology of the stratum corneum: progress avoiding hazardous animal and human testings**; Clinical, Cosmetic and Investigational Dermatology 2015:8 113–125

Background: In cosmetic science, noninvasive sampling of the upper part of the stratum corneum is conveniently performed using strippings with adhesive-coated discs (SACD) and cyanoacrylate skin surface strippings (CSSSs). Methods: Under controlled conditions, it is possible to scrutinize SACD and CSSS with objectivity using appropriate methods of analytical morphology. These procedures apply to a series of clinical conditions including xerosis grading, comedometry, corneodynamics, corneomelametry, corneosurfametry, corneoxenometry, and dandruff assessment. Results: With any of the analytical evaluations, SACD and CSSS provide specific salient information that is useful in the field of cosmetology. In particular, both methods appear valuable and complementary in assessing the human skin compatibility of personal skincare products. Conclusion: A set of quantitative analytical methods applicable to the minimally invasive and low-cost SACD and CSSS procedures allow for a sound assessment of cosmetic effects on the stratum corneum. Under regular conditions, both methods are painless and do not induce adverse events. Globally, CSSS appears more precise and informative than the regular SACD stripping.