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## STUDIES LIST REVISCOMETER®

*T. Hermanns-Le, F. Jonlet, A.Scheen, G.E.Pierard, Age- and Body Mass Index-Related Changes in Cutaneous Shear Wave Velocity.* Experimental Gerontology, 36, 363-372, 2001

*J.L. Nizet, C. Pierard-Franchimont, G.E.Pierard, Influence of Body Posture and Gravitational Forces on Shear Wave Propagation in the Skin.* Dermatology, 202, 177-180, 2001-05-14

*D.Khazaka, News in the Field of Elasticity Measurement.* Cosmetic Science Conference 2001

*Thomas Förster, Henkel KgaA, Cosmetic Lipids and the Skin Barrier,* 2001 by Marcel Dekker

There is no doubt that the application of cosmetic lipids has many positive effects on the structure and function of the skin. These effects are pleiotropic, caused either by direct interaction with the epidermis, particularly the stratum corneum, or indirectly, by influencing the physiologic, homeostatic condition of the skin.

*I. Uhoda, N. Faska, C. Robert, G. Cauwenbergh, G.E. Pierard, Split face study on the cutaneous tensile effect of 2-dimethylaminoethanol (deanol) gel,* Skin Research and Technology, Vol. 8, No. 3, August 2002

Large interindividual variations precluded any significant finding in the first study. The DMAE formulation showed, however, a significant effect characterized by increased shear wave velocity in the direction where the mechanical anisotropy of skin showed looseness. The DMAE formulation under investigation increased skin firmness.

*K. Sugata, T. Nishijima, T. Kitahara, Y. Takema, Etiology of the intrinsic and natural texture of human skin,* 22<sup>nd</sup> IFSCC Congress, Edinburgh, 25.09.2002

Skin texture, i.e. the surface of the skin consisting of furrows and ridges, is very tangible and important factor in the cosmetic field which makes skin beautiful. Although moisture and aging modify the texture, the mechanism(s) underlying the formation of intrinsic and natural skin texture remain obscure. In this study, to elucidate the etiology governing skin texture formation in vivo, we removed a portion of the epidermis by the suction blister method and investigated the recovery of the epidermal architecture of dermoepidermal junctions and viscoelasticity during the regeneration of the skin.

*A. Barel, R. Lambrecht, P. Clarys, Study of the mechanical properties of human skin using the shear wave propagation method,* Skin Research and Technology, Vol. 9, Nr. 2, May 2003, "Abstract Nr. 21".

In vivo determination of the elastic properties and anisotropy of human skin can be determined using the shear wave propagation method. The Reviscometer RVM-600 R (Courage-Khazaka, Cologne, Germany) measures the resonance running time (RRT) between two sensors which are placed on the skin surface.

*R. Estanislao, M. Suero, C. Galzote, Dr. A. Khaiat* **In-vivo Evaluation of Skin Viscoelasticity and Anisotropy Using Reviscometer® RVM 600**, Johnson & Johnson (Philippines) Inc.

A prototype of a new instrument, Reviscometer® RVM 600 from Courage + Khazaka (Cologne, Germany) was proven to measure in-vivo skin viscoelasticity and anisotropy. The measurement of the instrument based on the speed of acoustical shock wave propagation in the skin done in different directions allowed evaluation of skin firmness and directional variations in viscoelasticity.

*Hristo Dobrev*, **Comparative Study Of The Mechanical Properties In Erysipelas Of The Lower Legs Using Suction Method And Shear Wave Propagation Method**, EADV Plovdiv Bulgaria, 13<sup>th</sup> Congress “The Renaissance Of Dermatology”, Florence 2004.

Inflammatory dermal edema in erysipelas alters skin mechanics. The aim of this study was to compare the informativeness of two different methods for evaluation of skin mechanical properties.

*F. Périn, D. de Quéral, G. Georgesco*, **Age-related biomechanical properties of the normal human skin: comparison of clinical and instrumental evaluations**, Spincontrol Asia, Thailand, Laboratoire R&D LVMH, Frankreich, poster presentation, IFSCC Orlando USA, 2004.

Ageing and photoageing induce a degradation of the biomechanical properties of the skin. These biomechanical properties can be expressed in term in elasticity, tonicity, firmness, suppleness, stiffness and laxity through clinical evaluation. We conducted a study in order to identify correlations between these clinical terms and the parameters given by commercial devices dedicated to skin biomechanical measurements.

*Bertin, T. Oddos, A. Robert, H. Zunino*, **Anti-aging efficacy of the combination of dimethylaminoethanol (DMAE) and mineral salts**, Johnson and Johnson Consumer Europe, poster presentation, IFSCC Orlando USA, 2004.

DMAE is currently used in cosmetic products to obtain lifting and firming effects. In *in vitro* studies, DMAE was shown to enhance fibroblast proliferation. The objective of the *in vitro* studies performed was to demonstrate an increase of the efficacy of the product when DMAE was associated to mineral salts (mixture containing 5% of magnesium aspartate, 5% of zinc gluconate and 0,5% of copper acetate). A clinical study was then performed to assess the efficacy of the complete product (DMAE + mineral salts) in comparison with a placebo.

*E. Ruvolo, N. Kollias*, **Aging of human epidermis: the role of Langer’s line and skin anisotropy**. Poster presentation for Johnson & Johnson Consumer and Personal Products Worldwide, N.J. USA, SID 66<sup>th</sup> Annual Meeting St. Louis 2005, May 4-7. \*

One of the dominant characteristics of aging of the skin is its loss of elasticity, yet measurements of the mechanical properties of the skin yield relatively small changes in the percent values from youth (15 yrs) to advanced age (75 yrs). In this study we chose an instrument, the Reviscometer RVM 600®, that allows the determination of directional tension along the surface of the skin. The probe that comes in contact with the skin of the instrument in question is composed of two transducers placed 1.5-2 mm apart and mounted on two independent supports that generates a motion that probes the epidermis and the superficial dermis.

*D. Vanden Berghe1, A. Barel, A. Timchenko, K. De Paepe, N. Demeester, P. Clarys, V. Rogiers, M. Calomme*, **EFFECT OF ORAL INTAKE OF CHOLINE-STABILIZED ORTHOSILICIC ACID ON SKIN, NAILS AND HAIR IN WOMEN WITH PHOTODAMAGED FACIAL SKIN**, , Presentation on the IFSCC in Florence 2005. \*

Choline-stabilized orthosilicic acid (“ch-OSA”) is a bioavailable form of silicon. The effect of ch-OSA on skin, nails and hair was investigated in a double blind, placebo-controlled study. Fifty women with photodamaged facial skin were randomized to receive orally during 20 weeks 10 mg Si/day (ch-OSA pellets) or a placebo. Non-invasive methods were used to evaluate skin microrelief, hydration and mechanical anisotropy. Volunteers evaluated on a visual analogue scale (VAS) brittleness of hair and nails. In the ch-OSA group the serum Si concentration was significantly higher after 20 weeks compared

to the placebo. Skin roughness increased in the placebo group but decreased in the ch-OSA group. Skin anisotropy increased after 20 weeks in the placebo group but decreased in the ch-OSA group suggesting improvement of mechanical properties. VAS scores for nail and hair brittleness were significantly lower after 20 weeks in the ch-OSA group compared to baseline scores.

*A. O. Barel, K. Henau, P. Clarys, In vitro calibration and validation of the reviscometer using silicone polymers as simple skin model systems*, Presentation on the ISBS Meeting 2005 in Philadelphia, USA, abstract.

In vitro determination of the mechanical properties and isotropy of various polymers used as skin model systems can be determined using the shear wave propagation method. The Reviscometer (Courage-Khazaka, Cologn, Germany) measures the resonance running time (RTT) between 2 sensors which are placed with constant pressure on the surface of the material. The RTT times are expressed in arbitrary units related to time.

*P. Clarys, K. Henau, A.O. Barel, Investigation of intrinsic and photoaging of human skin using the reviscometer and the cutometer*, Presentation on the ISBS Meeting 2005 in Philadelphia, USA, abstract.

In vivo and mechanical isotropy/ anisotropy properties of the skin can be determined using the shear wave propagation method (Reviscometer, Courage-Khazaka). The wave travelling time from transmitter to receiver (Resonance Running Time, RTT), expressed in arbitrary time units, is inversely proportional to the stiffness of the skin.

*E. Ruvolo, N. Kollias, Aging the elastic parameters of human epidermis: the role of langer's line and skin anisotropy*, Presentation on the ISBS Meeting 2005 in Philadelphia, USA, abstract.

One of the dominant characteristics of aging of the skin is its loss of elasticity, yet measurements of the mechanical properties of the skin yield relatively small changes in the percent values from youth to advanced age using suction or torque based instruments.

*P. Quatresooz, J. F. Hermanns, Ph. Paquet, G. E. Pierard, Mechanobiology and force transduction in scars developed in darker skin types*, Skin Research and Technology 2006, 12, pp. 279-282. \*

Skin of any part of the body is subjected to intrinsic mechanical tensions. These forces are oriented along specific directions named Langer's lines or relaxed skin tension lines according to the body posture (1, 2). Any scar is under similar physical solicitations, but it is also the site of other forces generated by the contractile properties of fibroblasts and myofibroblasts (3, 6).

*Alain Béguin, Comparative in vivo Reviscometer-RRTM and ultrasonography techniques to assess the anti-ageing efficacy of the Novel MF III of Switzerland Bluecell Extract Serum Gel*, Intercosmetica Neuchâtel, Switzerland

The anti-ageing properties of a new facial care treatment, MF III of Switzerland Bluecell Extract Serum Gel, were investigated using the shear wave propagation method (multi-angle measurements) and the high-frequency skin ultrasonography, A2-month cosmetic efficacy study was conducted with 29 healthy female volunteers, aged between 30 and 64 (mean 54 years).

*M. Paye, S. Mac-Mary, A. Elkhayat, C. Tarrit, P. Mermat, P.H. Humbert, Use of the Reviscometer for measuring cosmetics-induced skin surface effects*; Skin Research and Technology 2007; 13; pp. 343-349

Many different non-invasive instruments are available to evaluate the mechanical properties of the skin, characterized by different measuring approaches which include tensile, torsional, indentation or suction skin deformations. An indirect approach consists in studying the propagation mode of a shock or acoustic shear wave along the skin surface.

*E.C. Ruvolo Jr. , G.N. Stamatias, N. Kollias, Skin Viscoelasticity Displays Site- and Age-Dependent Angular Anisotropy; Skin Pharmacology and Physiology, June 2007-11-13, pp. 1-9*

One of the dominant characteristics of skin aging is loss of elasticity. Although the changes in the mechanical properties of the skin over several decades of life are substantial, objective measurements have failed to capture their magnitude thus far. Moreover, the mechanical properties of the skin are not uniform in all directions, and there is a need to understand this angular anisotropy.

#### **Stability and Clinical Efficacy of Cosmetic Formulations Containing Different Peptides;**

*Glasiela Lemos Anconi, Patrícia Maria Berardo Gonçalves Maia Campos; Ifsc Barcelona 2008*

Wrinkles, as a sign of skin aging, have an important social impact, especially because of longer lifetimes and more frequent social relationships; consequently, they are an important factor influencing our way of communication. Wrinkles represent the more evident outcome of cutaneous ageing. Their onset is linked to a variety of events, resulting from both chrono- and photoageing. Both *intrinsic* (hormones, racial and genetic factors, oxidative stress, systemic disease) and *extrinsic* (temperature, air pollution, smoke, alcohol) factors worsen skin condition. However, wrinkles deriving from skin texture, or micro-relief, modification afflict women more than all other wrinkles as signs of ageing in the common mind.

#### **Clinical efficacy of cosmetic formulations containing *Myrtus communis* extract; Patricia M. B. G.**

*Maia Campos; Flavio Bueno de Camargo Junior; Sabrina M. Bertucci; Emeline Esteves de Oliveira; Glasiela Lemos Anconi; Lorena Rigo Gaspa; Ifsc Barcelona 2008*

The Research & Development of cosmetic products that are able to act in skin ageing alterations has been a challenge in Cosmetic area. This way, a great number of botanical extracts have been proposed as active ingredients for anti-ageing cosmetic development. *Myrtus communis* is a plant rich in polysaccharides, essential oils, flavonoids, among other substances. Some studies showed that its different hydroalcoholic extracts have a potent antioxidant activity mainly due to the presence of polyphenols *Myrtus communis* leaves hydrolyzed extract has been proposed as cosmetic ingredient with anti-ageing properties because it is rich in galacturonic acid, ramosse, galactose, glucose, xylose and fructose.

*Pascale Quatresooz, Jean-Francois Hermanns, Trinh Hermanns-LE, Gérald E. Pierard, Jean-Luc Nizet ; Laddering melanotic pattern of Langer's lines in skin of colour; European journal of dermatology 2008-Aug; vol 18 (issue 5)*

Mechanobiological stimulation of the skin influences the melanocyte activity. The clinical impact on melanocytes can be perceived by dermoscopy. Our aim was to assess the orientation of Langer's lines using the combination of ultrasound shear wave propagation and dermoscopy in 70 adults of darker skin complexion. On the back, 44/70 patients showed a honeycomb melanotic pattern without any main orientation. By contrast, a streaky parallel pattern of melanotic lines oriented in the direction of Langer's lines was found in 26/70 patients. Indeed, the maximum speed of ultrasound propagation was found parallel to the main orientation of the laddering melanotic pattern. The parallel melanotic pattern probably reflects the main orientation of the epidermal rete ridges aligned in the direction of Langer's lines. This aspect could be ascribed to the deepening of these structures and/or to mechanobiology affecting melanocytes. The aspect is reminiscent of that previously described in striae distensae and atrophic scars.

*M. Paye, S. Mac-Mary, A. Elkhyat, C. Tarrit, P. Mermet, P.H. Humbert; Use of the Reviscometer for measuring cosmetics-induced skin surface effects; Skin Research and Technology 2007; 13; pp. 343-349*

The Reviscometer RVM 600 that measures resonance running time (RRT) has been shown to be inversely related to the skin stiffness. However, very few publications describe the use of this instrument for testing the effect of cosmetic products. Slight xerotic skin condition was induced by using an alkaline soap for 1 week. Skin has then been rehydrated with a lotion or further dehydrated and dried with sodium lauryl sulfate.

*S. Davoudi, B. Sadr, A. Firooz, S. Keshavarz, M. Naghizadeh; FP0444 COMPARATIVE STUDY OF SKIN SEBUM AND ELASTICITY LEVEL IN PATIENTS WITH SULFUR MUSTARD-INDUCED DERMATITIS AND HEALTHY CONTROLS; Abstract; EADV Paris 09/2008*

Background: Sulfur mustard –a chemical agent- has numerous proven acute and chronic effects on skin. Xerosis which might be due to damage of hydrolipidic barrier of skin is the most common complaint of veterans. Objective: This study was designed to evaluate skin sebum and elasticity in veterans with a history of sulfur mustard contact.

*Farsinejad K, Firooz A, Davoudi S, Robati R, Hoseini M, Ehsani A, Sadr B.; Biophysical characteristics of skin in diabetes: a controlled study; Department of Dermatology, Razi Hospital, University of Tehran/Medical Sciences, Tehran, Iran.*

Background: Cutaneous complications are common in diabetes. Previous assays suggest that hyperglycemia and decreased insulin signal are involved in the impairment of skin function. The aim of this study was to evaluate the biophysical characteristics of skin in patients with diabetes mellitus and compares them with healthy non-diabetic controls.

Objective: To measure biophysical characteristic of skin including transepidermal water loss (TEWL), water content, sebum and skin elasticity in patients with diabetes mellitus and compare them with healthy non-diabetic controls.

*Permamed, Prof. Dr. med. P. Humbert, Besancon 2008; Klinische Anti-Aging-Studie;*

In einer monozentrischen klinischen Studie wurde die Anti-Aging-Wirkung von Lubex anti-age über drei Monate bei Frauen im Alter zwischen 45 und 60 Jahren mit mittelstark lichtgealterter Haut im Gesicht und Décolleté geprüft und belegt. Als Grundlage wurden hautphysiologische Messungen durchgeführt, das Hautbild wurde fotografisch dokumentiert und durch Dermatologen im Doppelblindverfahren bewertet.

*M. Lanctin, C. Bertin, F. Le Goff, P. Emilie, R. Roure ; A double-blind, placebo-controlled study to assess the efficacy of a body cream containing a combination of tetrahydropropyl ethylenediamine, caffeine, carnitine and retinal; JAAD, March 2009, San Francisco*

With aging, several changes occur in the skin. Skin firmness, hydration and uniformity are some of the parameters that are modified. Moreover, cellulite is a common condition of women's skin. Therefore, it is useful to design a formulation which can moisturize the skin and increase its firmness while reducing the brown spots and cellulite aspect.

*Motoko Murakami, Osamu Tanno, Hiroyuki Kurokawa; Evaluation of skin mechanical properties by determining of resonant frequency and loss resistance with tactile sensor; Skin Research and Technology No 1, Feb. 2009, pp. 125+126*

To clarify the characteristics of resonance frequency change and loss resistance by determining the mechanical properties of skin with a tactile sensor (Venustron Axiom Incl, Japan), which is a device used

to elucidate the mechanical characteristics of skin based on implementation of a resonance circuit and piezoelectric oscillator. Two different experiments were performed with 30 healthy Japanese males as subjects.

*Shunpeng Song, Peter M. Elias, Qinian Hou, Chengzhi Lv, Yuejun Shi, Kenneth R. Feingol, Mao-Qiang Man, **Decreased Cutaneous Resonance running time in Cured Leprosy Subjects***; Dalian Skin Disease hospital, Liaoning, China

Leprosy involves both the skin and peripheral neural tissue. In addition to neuropathy, cutaneous abnormalities, such as decreased stratum corneum (SC) hydration, elevated skin surface pH, hyperpigmentation and ulcerations, remain significant problems in “cured” leprosy. Moreover, alternations in dermis have been reported in leprosy. Cutaneous Resonance running time (CRRT) is a non-invasive approach to measure CRRT property, which is mainly influenced by collagen fibers in dermis.

*S. Song, PM Elias, Q Hou, C Lv, Y Shi, KR Feingol, M. Man; **Decreased cutaneous resonance running time in cured leprosy subjects***; Journal of Investigative Dermatology (2009), Volume 129

Leprosy involves both the skin and peripheral neural tissue. In addition to neuropathy, cutaneous abnormalities, such as decreased stratum corneum (SC) Hydration, elevated skin surface pH, hyperpigmentation, and ulcerations, remain significant problems in “cured” leprosy. Moreover, alternations in dermis have been reported in leprosy.

*Diana Khazaka, Christiane Uhl; **More than 2 decades of bioengineering for efficacy testing and product recommendation***; Household and Personal Care TODAY, n1/2009,

Due to high competition in the cosmetic and growing customer expectations, in the past two decades there has been a continuous development of new cosmetic products with more efficient ingredients covering new effects on the skin. Simultaneously to this, there was an increasing demand for new measuring techniques to substantiate the new product claims. The field of skin bioengineering has consequently been immensely enriched in the last years by inventing new physical and optical measurement methods for all kind of skin parameters.

*Martin Johannes Koehler, Anja Preller, Nadja Kindler, Peter Elsner, Karsten König, Rainer Bückle, Martin Kaatz; **Intrinsic, solar and sunbed-induced skin aging measured in vivo by multiphoton laser tomography and biophysical methods***; Skin Research and Technology 2009; 15; 357-363;

In aging skin, the decreasing dermal collagen content due to diminished collagen synthesis is responsible for some of the clinically most evident signs of intrinsic aging skin such as thinning, loss of elasticity and fine wrinkling. Extrinsic skin aging is mainly a consequence of cumulative ultraviolet (UV) exposure of the skin, but can be accelerated by nicotine abuse and environmental hazardous compounds

*H. Seirafi, K. Farsinejad, A. Firooz, SM Davoudi, RM Robati, MS Hoseini, AH Ehsani, B Sadr; **Biophysical characteristics of skin in diabetes: a controlled study***; JEADV 2009, 23, 146-149;

Cutaneous complications are common in diabetes, with approximately 30% of patients experiencing some skin involvement during the course of their illness; these may also be the first presenting sign of diabetes or even herald the diagnosis by many years. The skin involvement in diabetes encompasses various

clinical entities such as acanthosis nigricans, necrobiosis lipoidica, diabetic dermopathy and neuropathy, sclerodema and granuloma annulare.

*Pauline D.H.M. Verhaegen, Evelien M. Res, Arna van Engelen, Esther Middelkoop, Pau van Zuijlen; **The Reviscometer: a reliable, non-invasive measurement tool for anisotropy in normal skin and scar tissue**; VU Medical Centre, Amsterdam, The Netherlands*

There is an increasing need to perform non-invasive objective measurements of tissue anisotropy (directional variations in viscoelasticity). Currently, no reliable measurement tool is available for measurements of the anisotropy of the skin. A new measurement tool that may provide objective data on tissue anisotropy is the Reviscometer,

*K.A. Tadini; **Acetyl hexapeptide-3 in a cosmetic formulation acts on skin anisotropy – clinical study**; ISBS Besancon, 2009*

Acetyl hexapeptide-3 has been used in anti-aging topical formulations since it has demonstrated effects in improving the skin appearance. However, there are few scientific studies about its effects on epidermis and dermis, when vehiculated in topical formulations, mainly using objective measurements, which are an important tool in clinical efficacy studies. Thus the aim of this study was to determine the clinical efficacy of the acetyl hexapeptide-3 using biophysical techniques. Formulations with and without acetyl hexapeptide-3 were applied to the ventral forearm and the face area of human volunteers. Skin conditions were evaluated after 2 and 4 week period daily applications, by analyzing the stratum corneum water content