

Publications

EIS related to Skin Barrier and Other Tissue Alterations

Electrical impedance spectroscopy for the characterization of skin barrier in atopic dermatitis, Rinaldi, Korsfeldt, Ward, Burla, Dreher, Gautschi, Stolpe, Tan, Bersuch, Melin, Askary Lord, Grant, Svedenhag, Tsekova, Schmid-Grendelmeier, Möhrenschrager, Renner, Akdis, *European Journal of Allergy and Clinical Immunology*, April 2021, <https://doi.org/10.1111/all.14842>

Skin hydration dynamics investigated by electrical impedance techniques in vivo and in vitro Morin, Ruzgas, Svedenhag, Anderson, Ollmar, Engblom, Björklund, *Scientific reports* Oct 2020 10:17218, doi.org/10.1038/s41598-020-73684-y

Electrical impedance spectroscopy as a safe and efficient tool for the characterization of epidermal barrier in atopic dermatitis, Rinaldi, Dreher, Tsekova, Gautschi, Stolpe, Burla, Grant, Svedenhag, Renner, Möhrenschrager, Akdis, *European Academy of Allergy and Clinical Immunology Congress* June 2019, <http://dx.doi.org/10.1111/all.13958>

Direct Assessment of skin epithelial barrier by electrical impedance spectroscopy Rinaldi AO, Morita H, Wawrzyniak P, Dreher A, Grant S, Svedenhag P, Akdis CA, *Allergy* 2019 Apr 16, DOI: 10.1111/all.13824

Bioimpedance as a noninvasive method for measuring changes in skin Åberg P, Nicander I, Ollmar S. In: *Handbook of Non-Invasive Methods and the Skin*, 2nd ed - pp 345-350. Serup, Jemec, Grove. CRC Press 2006

Within and beyond the skin barrier Ollmar S, Nicander I. In: *Bioengineering of the skin - Water and the stratum corneum*, 2nd ed., pp 335-350. Fluhr, Elsner, Berardesca, Maibach (Eds.). CRC Press 2005

Effects of pretreatment with a urea-containing emollient on nickel allergic skin reactions Kuzmina N, Nyrén M, Lodén M, Edlund F, Emtestam L. *Acta Dermato-Venereologica* 2005; 85: 9-12

Effects of pre-treatment with a urea-containing emollient on nickel allergic skin reactions Kuzmina N, Nyrén M, Lodén M, Edlund F, Emtestam L, Nicander I, Ollmar S. *Proc XII Intern Conf on Electrical Bio-Impedance & V Electrical Impedance Tomography*, Gdansk (PL), June 20-24, 2004, 111-113. ISBN 83-917681-6-3

Skin bioimpedance Ollmar S, Nicander I, Åberg P. *Proc XII Intern Conf on Electrical Bio-Impedance*, Gdansk (PL), June 20-24, 2004, 343-346. ISBN 83-917681-6-3

Blood glucose modulates impedance level Birgersson U, Neiderud F, Åberg P, Ollmar S. *Proc XII Intern Conf on Electrical Bio-Impedance & V Electrical Impedance Tomography*, Gdansk (PL), June 20-24, 2004, 153-156. ISBN 83-917681-6-3

Biophysical aspects of contact dermatitis and its prevention Kuzmina N. Karolinska Institutet (thesis), Stockholm 2004

Clinically normal atopic skin versus non-atopic skin as seen through electrical impedance Nicander I, Ollmar S. *Skin Res Technol* 2004; 10: 178-183

Assessment of irritant skin reactions using electrical impedance - a comparison between 2 laboratories Kuzmina N, Duval C, Johnsson S, Boman A, Lindberg M, Emtestam L. *Contact dermatitis* 2003; 49(1): 26-31

Basal electrical impedance in relation to sodium lauryl sulphate-induced skin reactions - a comparison of patients with eczema and healthy controls Kuzmina N, Hagströmer L, Nyrén M, Emtestam L. *Skin Res Technol* 2003; 9: 357-362

Betaine in oral hygiene with special attention to dry and sensitive mucosa (thesis) Rantanen I. *Annales Universitatis Turkuensis* 559, Turku, Finland 2003

The effects of two sodium lauryl sulphate-containing toothpastes with and without betaine on human oral mucosa in vivo Rantanen I, Jutila K, Nicander I, Tenovuo J, Söderling E. *Swed Dent J* 2003; 27: 31-34

Electrical impedance as a potential tool to distinguish between allergic and irritant contact dermatitis Nyren M, Kuzmina N, Emtestam L. *J Am Acad Dermatol* 2003;48: 394-400

The use of different concentrations of betaine as a reducing irritation agent in soaps monitored visually and non-invasively Nicander I, Åberg P, Ollmar S. *Skin Res Technol* 2003; 9: 43-49

The ability of betaine to reduce the irritating effects of detergents assessed visually, histologically and by bioengineering methods Nicander I, Rantanen I, Lundh Rozell B, Söderling E, Ollmar S. *Skin Res Technol* 2003; 9: 50-58

Non-invasive detection of sub-clinical skin reactions Ollmar S. *Proc of the 2nd International Workshop on Biological Effects of Electromagnetic Fields, Rhodes (GR), 7-11 Oct 2002, vol I: 46-53. ISBN 960-86733-3-X*

Betaine reduces the irritating effect of sodium lauryl sulphate on human oral mucosa in vivo Rantanen I, Nicander I, Jutila K, Ollmar S, Tenovuo J, Soderling E. *Acta Odontol Scand* 2002 Oct; 60(5): 306-10

Variation of skin properties within human forearms demonstrated by non-invasive detection and multi-way analysis Åberg P, Geladi P, Nicander I, Ollmar S. *Skin Res Technol* 2002; 8: 194-201

Urea and sodium chloride in moisturisers for skin of the elderly - a comparative, double-blind, randomised study Kuzmina N, Hagstromer L, Emtestam L. *Skin Pharmacol Appl Skin Physiol* 2002; 15: 166-174

Skin Sensitivity Testing - A Biophysical Approach (thesis) Nyrén M. Karolinska Institutet, Stockholm 2002

Do urea and sodium chloride together increase the efficacy of moisturizers for atopic dermatitis skin? Hagströmer L, Nyren M, Emtestam L. *Skin Pharmacol Appl Skin Physiol* 2001; 14: 27-33

Instrumental measurement of the Mantoux test: Differential effects of tuberculin and sodium lauryl sulphate on impedance response patterns in human skin Nyrén M, Hagströmer L, Emtestam L. *Dermatology* 2000; 201: 212-217

Electrical impedance measurements at different skin sites related to seasonal variations Nicander I, Ollmar S. *Skin Res Technol* 2000; 6: 81-86

Making electronic biopsies into a viable future for non-invasive diagnostics with electrical impedance Ollmar S. *Med Biol Eng Comp* 1999; 37, Suppl 2: 116-117

Electrical impedance related to structural differences in the skin and in the oral mucosa Nicander I, Ollmar S. *Med Biol Eng Comp* 1999; 37, Suppl 1: 161-162

Electrical Bio-Impedance related to structural differences and reactions in skin and oral mucosa Nicander I, Ollmar S. *Annals of the New York Academy of Sciences* 1999; 873: 221-226

Inter- and intra-individual differences in human stratum corneum lipid content related to physical parameters of skin barrier function in vivo Norlen L, Nicander I, Lundh Rozell B, Ollmar S, Forslind B. *J Invest Dermatol*. 1999 Jan;112(1):72-7

Electrical impedance related to experimentally induced changes of human skin and oral mucosa (thesis) Nicander I. Karolinska Institutet, Stockholm, 1998

Multivariate analysis of skin impedance data in long-term type 1 diabetic patients Lindholm-Sethson B, Han S, Ollmar S, Nicander I, Jonsson G, Lithner F, Bertheim U, Geladi P. *Chemometrics and Intelligent Laboratory Systems* 1998; 44: 381-394

Electrical impedance and other physical parameters as related to lipid content of human stratum corneum Nicander I, Norlén L, Brockstedt U, Lundh Rozell B, Forslind B, Ollmar S. *Skin Res Technol* 1998; 4: 213-221

Methods of information extraction from impedance spectra of biological tissue, in particular skin and oral mucosa - a critical review and suggestions for the future Ollmar S. *Bioelectrochemistry & Bioenergetics* 1998; 45: 157-160

Lipid content and electrical impedance Nicander I, Norlén L, Forslind B, Ollmar S. *Curr Probl Dermatol. Basel, Karger, 1998, vol 26, pp 165-176*

Electrical impedance for quantification and classification of experimental skin reactions Emtestam L, Nyrén M. Am J Contact Dermatitis 1997; 8 (4): 202-206

Electrical impedance. A method to evaluate subtle changes of the human oral mucosa abstract Nicander I, Lundh Rozell B, Rundquist L, Ollmar S. Eur J Oral Sci 1997; 105: 576-582

Mild and below threshold skin responses to sodium lauryl sulphate assessed by depth controlled electrical impedance Nicander I, Ollmar S. Skin Res Technol 1997; 3: 259-263

Baseline electrical impedance measurements at various skin sites, related to age and sex Nicander I, Nyrén M, Emtestam L, Ollmar S. Skin Res Technol 1997; 3: 252-258

Information in full and reduced data sets of electrical impedance spectra from various skin conditions compared by using a holographic neural network Ollmar S, Nicander I, Ollmar J, Emtestam L. Med Biol Eng Comput 1997; 35: 415-419

Allergic contact reactions in the skin assessed by electrical impedance - a pilot study Nicander I, Ollmar S, Lundh Rozell B, Emtestam L. Skin Res Technol 1997; 3: 121-125

Electric impedance measurements at six different anatomic locations of macroscopically normal human oral mucosa Nicander I, Rundquist L, Ollmar S. Acta Odontol Scand 1997; 55: 88-93

Instrumental evaluation of skin irritation Rizwi PY, Morrison BM, Grove MJ, Grove GL. Cosmetics & Toiletries mag 1996; 111, Sept: 39-42

An electrical impedance technique for assessment of wheals Nyrén M, Ollmar S, Nicander I, Emtestam L. Allergy 1996; 51: 923-926

Interpretation of impedance data of stripped skin supported by histological findings Nicander I, Lundh Rozell B, Emtestam L, Ollmar S. Med Biol Eng Comput 1996; 34, Supplement 1, Part 2: 147-148

Quantification of skin and mucosal reactions by electrical impedance Ollmar S. Med Biol Eng Comput 1996; 34, Supplement 1, Part 2: 145-146

Correlation of impedance response patterns to histological findings in irritant skin reactions induced by various surfactants Nicander I, Ollmar S, Eek A, Lundh Rozell B, Emtestam L. Br J Dermatology 1996; 134: 221-228

Information in multi frequency measurement of intact skin Ollmar S, Nicander I. Innov Tech Biol Med 1995; 16: 745-751

Electrical impedance measured to five skin depths in mild irritant dermatitis induced by sodium lauryl sulphate Nicander I, Ollmar S, Lundh-Rozell B, Eek A, Emtestam L. British J Dermatology 1995; 132: 718-724

Electrical impedance for estimation of irritation in oral mucosa and skin Ollmar S, Eek A, Sundström F, Emtestam L. Med Progr Techn 1995; 21: 29-37

EIS related to Skin Cancer

Diagnostic Efficacy of Electrical Impedance Spectroscopy versus Dermoscopy for Pigmented Skin Lesions: A pilot study, S Owji, J Han, H He, I Lopera, M Tassavor, N Brownstone, N Gulati, B Ungar, J Ungar, SKIN May 2022, Vol 6, Issue 3

Electrical Impedance Spectroscopy improves skin cancer detection and reduces the number of biopsies, C. Liebich, J. Bartsch, I. Schubert, M-L. v. Bruehl, C. Sander, Dermato, 2022, 2, 21-29. DOI.org/10.3390/dermato2020004

Impact of Electrical Impedance Spectroscopy on Clinician Confidence and Diagnostic Accuracy in Evaluating Melanocytic Skin Lesions Suspicious for Melanoma: A Pilot Study, A. Kolla, L. Fried, P. Shah, T. Liebman, J. Stein, D. Polsky, SKIN January 2022 Vol6, Issue 1

Impact of Electrical Impedance Spectroscopy on Dermatologists' Number-Needed-to-Biopsy Metric and Biopsy Decisions for Pigmented Skin Lesions, G. Litchman, R Teplitz, J. Marson, D Rigel, JAAD October 2021, doi.org/10.1016/j.jaad.2020.09.011

Retrospective evaluation of the performance of the electrical impedance spectroscopy system Nevisense in detecting keratinocyte cancers, C. Liebich, M-L Bruehl, I Schubert, R Oberhoffer, C Sander, Skin Research and Technology, 2021;00:1-7; DOI:10.1111/srt.13007

Diagnostic Accuracy of Electrical Impedance Spectroscopy in Non-melanoma Skin Cancer, E Sarac, A Meiweis, T Eigentler, S Forchhammer, L Kofler, H-M Häfner, C Garbe., DOI: 10.2340/00015555-3689, Acta Derm Venereol 2020; 100: adv00328

Electrical Impedance Spectroscopy: Augmented Intelligence Technology for the Early Detection of Melanoma, G Goldenberg, Practical Dermatology April 2020, p44-45.

Integrating Electrical Impedance Spectroscopy into Clinical Decisions for Pigmented Skin Lesions Improves Diagnostic Accuracy: A Multitiered Study, G Litchman, D Rigel et al, SKIN July 2020 Volume 4, Issue 4

Electrical impedance spectroscopy of 79 melanocytic lesions in a National Health Service skin cancer clinic, Haddadeen C.; Maguire C.; Henderson C. 99th Annual Meeting of the British Association of Dermatologists, conference abstract, British Journal of Dermatology 181 Supplement 1 (62-63). 2019, http://dx.doi.org/10.1111/bjd.17893

Integrating Electrical Impedance Score into Decision to Biopsy Increases Biopsy Efficiency, G Prado, D Rigel, ePoster 10062, AAD 2019, www.aad.org/eposters/Submissions/getFile.aspx?id=10062&type=sub

Electrical Impedance Spectroscopy Improves Diagnostic Accuracy of Pigmented Lesions, G Prado, D Rigel et al, ePoster 10229, AAD 2019, www.aad.org/eposters/Submissions/getFile.aspx?id=10229&type=sub

EIS: Atypien von Hautveränderungen präzise messen, J Welzel, U Reinhold, Der Deutsche Dermatologe 2018 Nov, pages 847-851, DOI: 10.1007/s15011-018-2189-3

Assessment of Clinician Accuracy for Diagnosing Melanoma Based on Electrical Impedance Spectroscopy Score Plus Morphology Versus Lesion Morphology Alone, R Svoboda, Giselle Prado, R Mirsky, D Rigel, JAAD 2018. DOI: 10.1016/j.jaad.2018.08.048

Electrical Impedance Spectroscopy Versus Clinical Inspection Approaches: Melanoma Efficacy Detection Comparison, R Svoboda, A Franco, D Rigel, SKIN 2018, DOI: 10.25251/skin.2.3.2

Noninvasive diagnosis in dermatology, J Welzel, S Schuh, JDDG 2017 999-1016, DOI: 10.1111/ddg.13347

Electrical Impedance Spectroscopy in Skin Cancer Diagnosis, R Braun, J Mangana, S Goldinger, Lars French, R Dummer, A Marghoob, Dermatological Clinic 35 (2017) 489-493, http://dx.doi.org/10.1016/j.det.2017.06.009

Utilisation of an Electrical Impedance Spectroscopy System in an NHS setting in a pigmented lesion clinic as an adjuvant to dermoscopy and clinical history, Catriona Henderson, Birgit Pees, Poster the 97th Annual Meeting of the British Association of Dermatologists in Liverpool July 4-6 2017

Analysis of an electrical impedance spectroscopy system in short-term digital dermoscopy imaging of melanocytic lesions, Rocha, S.W. Menzies, S. Lo, M. Avramidis, R. Khoury, L. Jackett, P.Guitera. British Journal of Dermatology. 19 April 2017. DOI: 10.1111/bjd.15595

Nevisense: Improving the accuracy of diagnosing melanoma, Ollmar S.; Grant S, Melanoma Management (2016) 3:2 (93-96). http://dx.doi.org/10.2217/mmt-2015-0004

Practical application of new technologies for melanoma diagnosis: Part I. Noninvasive approaches March, Hand, Grossman, Journal of the American Academy of Dermatology (2015) 72:6 (929-941). DOI:/10.1016/j.jaad.2015.02.1138

Clinical performance of the Nevisense system in cutaneous melanoma detection: an international, multi-centre, prospective and blinded clinical trial on efficacy and safety, Malveyh J, Hauschild A, Curiel-Lewandrowski C, Mohr P,

Hofmann-Wellenhof R, Motley R, Berking C, Grossman D, Paoli J, Loquai C, Olah J, Reinhold U, Wenger H, Dirschka T, Davis S, Henderson C, Rabinovitz H, Welzel J, Schadendorf D, Birgersson U. *British Journal of Dermatology*. 2014 May 19. DOI: 10.1111/bjd.13121.

Electrical impedance of human skin and tissue alterations: Mathematical modeling and measurements Birgersson U, Karolinska Institutet (thesis) Stockholm 2013

Electrical Impedance Spectroscopy as a potential adjunct diagnostic tool for cutaneous melanoma Mohr P, Birgersson U, Berking C, Henderson C, Trefzer U, Kemeny L, Sunderkötter C, Dirschka T, Motley R, Frohm-Nilsson M, Reinhold U, Loquai C, Braun R, Nyberg F, Paoli J. *Skin Research and Technology*, 2013; 19: 75–83

Electrical impedance and the diagnostic accuracy for malignant melanoma Åberg P, Birgersson U, Elsner P, Mohr P, Ollmar S. *Experimental Dermatology*, 2011 Mar 3; 648-652

Non-invasive and microinvasive electrical impedance spectra of skin cancer - a comparison between two techniques Åberg P, Geladi P, Nicander I, Hansson J, Holmgren U, Ollmar S. *Skin Res Technol*. 2005 Nov;11(4):281-6

Skin cancer as seen by electrical impedance Åberg P. Karolinska Institutet (thesis), Stockholm 2004

Bioimpedance of different skin tumours - clinical tricks and treats Nicander I, Holmgren U, Åberg P, Ollmar S. *Proc XII Intern Conf on Electrical Bio-Impedance & V Electrical Impedance Tomography, Gdansk (PL)*, June 20-24, 2004, 99-102. ISBN 83-917681-6-3

Skin bioimpedance - electronic views of malignancies Åberg P, Nicander I, Hansson J, Holmgren U, Ollmar S. *Proc XII Intern Conf on Electrical Bio-Impedance & V Electrical Impedance Tomography, Gdansk (PL)*, June 20-24, 2004, 79-82. ISBN 83-917681-6-3

Skin cancer identification using multi-frequency electrical impedance - a potential screening tool Åberg P, Nicander I, Hansson J, Geladi P, Holmgren U, Ollmar S. *IEEE Trans Biomed Eng* 2004; 51(12): 2097-2102

Detection of basal cell carcinoma using electrical impedance and neural networks Dua R, Beetner DG, Stoecker WV, Wunsch DC. *IEEE Trans Biomed Eng* 2004; 51(1): 66-71

Minimally invasive electrical impedance spectroscopy of skin exemplified by skin cancer assessments Åberg P, Nicander I, Ollmar S. In: *Proc IEEE EMBS, Cancun (MX)*, 17-21 Sept 2003, 3211-3214, ISBN 0-7803-7790-7

Differentiation among basal cell carcinoma, benign lesions, and normal skin using electric impedance Beetner DG, Kapoor S, Manjunath S, Zhou X, Stoecker WV. *IEEE Trans Biomed Eng* 2003; 50(8): 1020-1025

Assessment of skin lesions and skin cancer using simple electrical impedance indices Åberg P, Nicander I, Holmgren U, Geladi P, Ollmar S. *Skin Res Technol* 2003; 9: 257-261

Electrical impedance of nodular basal cell carcinoma: a pilot study Emtestam L, Nicander I, Stenström M, Ollmar S. *Dermatology* 1998; 197: 313-316