

Honoring the past, preparing for the future ...



Albert M. Kligman
Tribute Symposium
&
2005 World Congress
on Noninvasive Studies of the Skin

2nd Joint Meeting of
The International Society for Bioengineering and the Skin
The International Society of Skin Imaging
The International Society for Digital Imaging of Skin

September 28 to October 1, 2005
Brandywine Valley – Wilmington, DE USA

World Congress on Noninvasive Studies of the Skin
--

2nd Joint meeting of the ISBS, ISSI and ISDIS

**World Congress on
Noninvasive Studies of the Skin**
2nd Joint meeting of the ISBS, ISSI and ISDIS

Congress Sponsors

The following companies have generously donated to help support various aspects of this meeting:

AMA Laboratories, Inc.

BioNet/CuDerm

Canfield Scientific

Colgate-Palmolive

cyberDERM, inc.

Johnson & Johnson

KAO Brands

L'Oreal

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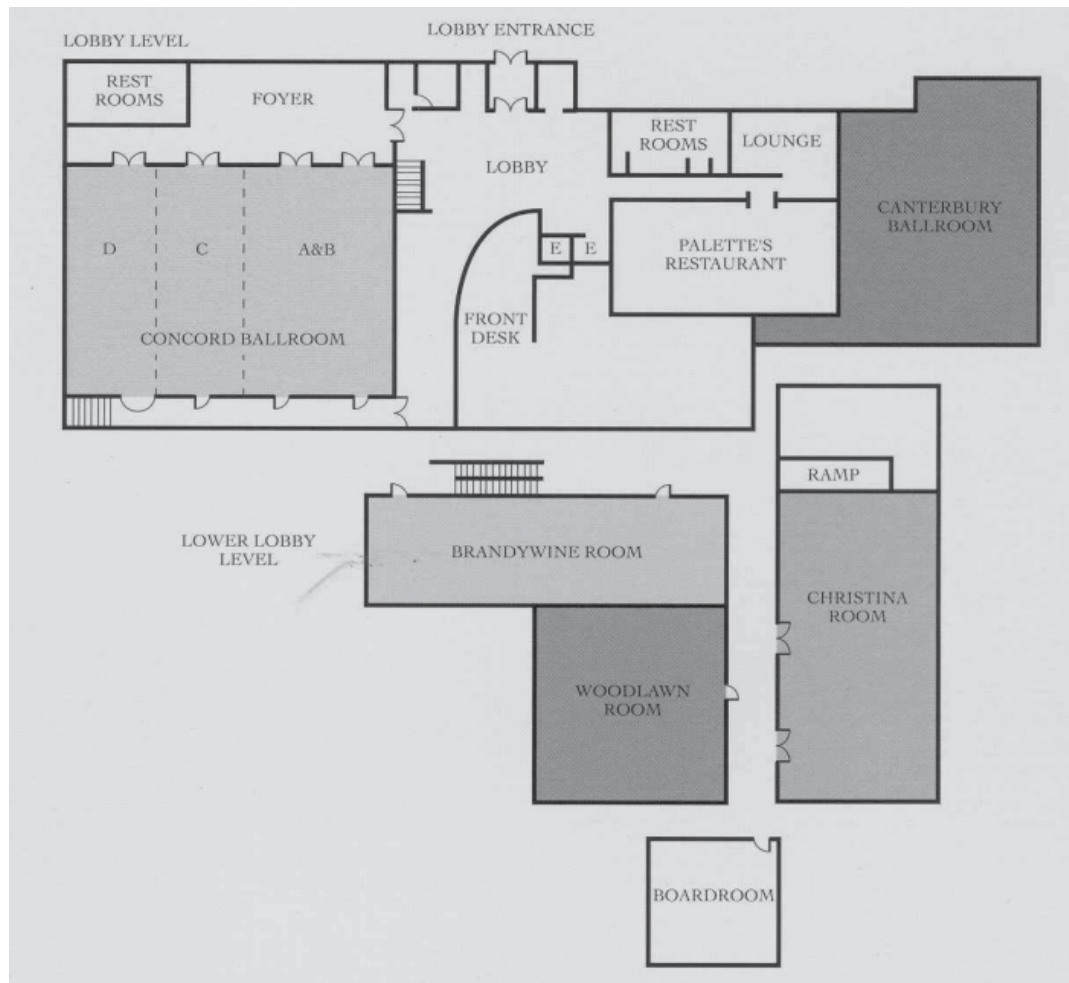
Unilever

Without their financial support and gifts in kind, this meeting would not have been possible.

World Congress on Noninvasive Studies of the Skin

2nd Joint meeting of the ISBS, ISSI and ISDIS

Brandywine DoubleTree Hotel Floor Plan



All lectures will be given in the Concord Ballrooms

The Technical Showcase will be in the Canterbury Ballroom

The Posters will be presented in the Brandywine Room

The Speaker's Prep Room will be in the Woodlawn Room

The Registration & Info Desk will be in the Foyer

All events held at Brandywine DoubleTree Hotel

World Congress on Noninvasive Studies of the Skin

2nd Joint meeting of the ISBS, ISSI and ISDIS

in Wilmington, DE unless otherwise indicated

Tuesday, Sept. 27, 2005

Pre-Registration & Mini-reception in Concord Ballroom Foyer

Wednesday, Sept 28, 2005

Continental Breakfast available from 7:00 AM to 8:30 AM

Registration Desk is open from 7:30 AM to 5:30 PM

Speaker Preview Room is open from 8:00 AM to 12:30 PM

Pre-Congress Workshops from 8:30 AM to 12:00 Noon

Digital Photography in Woodlawn Room

Electrical Properties of the Skin in Christina Room

Buffet Lunch served to Workshop Participants from 11:30 AM to 12:30 PM

Albert Kligman Tribute Symposium

in Concord Ballroom from 1:00 to 5:30 PM

Albert Kligman Reception

&

Congress Welcoming Party

Will be held at the

American Helicopter Museum

in West Chester. PA



Buses will begin to leave from the hotel

lobby starting at 6:00 PM

A limited number of helicopter rides will be available weather permitting.

Make sure you put your name in at the Registration Desk
for the lottery to see who gets one of these free rides

Buses will begin to return to hotel starting at 9:30 PM

Heavy hors d'oeuvres – Plenty to eat and drink

World Congress on Noninvasive Studies of the Skin

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Wednesday, September 28, 2005

Continental Breakfast is available to all workshop attendees starting at 7:30 AM

Electrical Properties of the Skin Workshop

Co-Chairs: Bernard Gabard & Andre Barel

Time	Workshop Talks will be given in Christina Room on lower level
8:30	Introductory Remarks & Overview of Skin Hydration Measurements Bernard Gabard, Switzerland
8:45	Basic underlying physical principles of electrical measurements on the skin, pitfalls in hydration measurements and validation of these methods. Andre Barel, Belgium
9:00	New methods for measuring skin moisturization Stacy Hawkins, USA
9:15	Skin conductance: validation of the Skicon 200EX vs. Skicon 100 Ken Ogoshi Japan / Denmark
	Technical Showcase Preview Presentations (10 min. each)
9:30	The Nova Meter by Michael Campbell
9:40	The Corneometer by Diane Khazaka
9:50	Delfin Moisture Meters by Jouni Nuutinen
10:00	Within and beyond the skin barrier by Peter Åberg
10:10	DermaLab Moisture Meter by Chuck Zerweck
10:20	Coffee Break & Informal Discussions
10:45	Hands-On Demos at Individual Work Stations set up by the vendors in Canterbury Ballroom <i>No set schedule, just pick & choose what you want to learn more about from among the following vendors</i> Cortex Technology ... Gunnar Svendsen Courage- Khazaka ... Diane Khazaka & Todd Maibach cyberDERM, inc ... Chuck Zerweck & Jonn Damia Delfin Technologies ... Jouni Nuutinen & Aki Immonen Nova Technology ... Mike Campbell, Sarah Campbell, James Mitkonis & John Sullivan SciBase AB ... Peter Åberg & Ingrid Nicander
12:00	

Buffet Lunch will be available to all workshop participants

starting at 11:30 AM in Concord Ballroom D

**All are invited to the Tribute to Albert Kligman
which will begin at 1:00 PM in Main Concord Ballroom**

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Wednesday, September 28, 2005

Continental Breakfast is available to all workshop attendees starting at 7:30 AM

Digital Photography Workshop **Co-Chairs: Doug Canfield & Dennis DaSilva**

Time	Workshop Talks will be given in Woodlawn Room on lower level
8:30	A Practical Guide to Digital Photography in the Clinic Doug Canfield
	Technical Showcase Preview Presentations (10 min. each)
9:30	Canfield Imaging Systems & DermaTrak Dennis DaSilva
9:40	Faraghan Medical Camera Systems Ken Faraghan
9:50	FotoFinder Systems, inc. Rich Engle
10:00	Coffee Break & Informal Discussions
10:30	Hands-On Demos at Individual Work Stations set up by the vendors in Canterbury Ballroom <i>No set schedule, just pick & choose what you want to learn more about from among the following vendors</i> Canfield Imaging Systems DermaTrak Faraghan Medical Camera Systems FotoFinder Systems, inc.
11:30	

**Buffet Lunch will be available to all workshop
participants
starting at 11:30 AM in Concord Ballroom D**

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which will begin at 1:00 PM in Main Concord Ballroom**

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Wednesday, September 28, 2005

Albert M. Kligman Tribute Symposium

- 1:00 PM **Opening Remarks / Housekeeping Items**
- 1:15 PM **Gary Grove**
 Introducing the man that needs no introduction
 ... Our pal AL
- 1:40 PM **Ronnie Marks**
 Dermatological blind sights
- 2:05 PM **Jean Luc Leveque**
 The AMK code
- 2:30 PM **Jorgen Serup**
 Visionary dermatology and dermatologist:
 Albert Kligman
- 3:00 PM **Coffee Break –**
 Technical Showcase Open for Preview Viewing
- 3:25 PM **David Miller**
 Musings of an almost industrial zombie
- 3:50 PM **Tony Simion**
 Invisible but real
- 4:15 PM **Tony Johnson**
 Reflections on skin care R&D collaborations
- 4:40 PM **Randy Wickett**
 Comparing African-American & Euro-American Skin
 Biophysical Properties & Response to irritants
- 5:05 PM **Closing Remarks / Housekeeping Items**

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Simon Greenberg Foundation Scholarship Recipients

The Simon Greenberg Foundation is devoted to advancing scientific studies of the skin by enhancing the educational experiences of biomedical researchers just entering the field. The unifying theme of the 2005 World Congress on Noninvasive Studies of the Skin is "Honoring the past, preparing for the future". Thus is quite fitting that the Simon Greenberg Foundation has created a scholarship fund in honor of Dr. Albert Kligman that has allowed the following 17 individuals who are new to the field of biophysical measurements and imaging of the skin to attend:

Thaschawee (Tash) Arkachaisri, M.D.

Division of Rheumatology, Children's Hospital of Pittsburgh, Pittsburgh, PA, USA

Marcio Bouer

Clinical Hospital of University of Sao Paulo Medical School, Sao Paulo, Brazil

Andrea Cheville, M.D.

Department of Rehabilitation Medicine, University of Pennsylvania Health System, Philadelphia, PA, USA

Louise Coutts

Institute of Cancer Research and Royal Marsden NHS Trust, Sutton, Surrey, UK

Aerlyn G. Dawn, M.D.

Department of Dermatology, Wake Forest University School of Medicine, NC, USA

Tejas Desai, D.O.

Harbor UCLA Medical Center, Torrance, CA, USA

Dr. Fatima Esposti

Argentinean Association of Cosmetic Chemists, Buenos Aires, Argentina

Lidija Goleva-Misheska

Department of Dermatology, Skopje, Macedonia

Daniel Hartman

University of Wisconsin, Madison, WI, USA

Laura Anne Kaplan

Temple University School of Medicine, Philadelphia, PA, USA

Marjo Karita Kiiskinen

Dept. of Electrical Engineering, Ragnar Granit Institute Tampere University of Technology, Finland

Doreen Kowatzki

Dept. of Dermatology, Skin Physiology Laboratory, University of Jena, Germany

Ajay P. Mody

Dept. of Biomedical Engineering, University of Texas at Austin, Houston, TX, USA

Kenichro Ogoshi

Department of Dermatology, Bispebjerg Hospital, Copenhagen, Denmark

Jennifer Smith

Skin Sciences Institute, University of Cincinnati, Cincinnati, OH, USA

Igor Sokolov, Ph.D.

Center for Advanced Materials Processing, Clarkson University, Potsdam, NY, USA

S. Son

Dept. of Dermatology & Research Institute for Skin Image
Korea University School of Medicine, Seoul, Korea

World Congress on Noninvasive Studies of the Skin

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Thursday, Sept. 29, 2005 AM Program Notes

Continental Breakfast available from 7:00 AM to 8:30 AM
Registration & Info Desks are open from 7:30 AM to 5:30 PM
Speaker Preview Room is open from 8:00 AM to 3:30 PM
All Scientific Sessions are being held in the Concord Ball Room

8:30 AM **Opening Remarks:** Gary Grove, Congress Convenor
Joachim Fluhr, Program Chairman

8:45 AM Invited Speaker: Klaus Hoffman
Image Analysis and Neuronal Networks

9:15 AM Session I: **Claims Support**
Chairs: Stacey Hawkins & Hassan Zahouani

(4 papers 12M + 3M Q&A each)

Abstract	1st Author	Title
1	DePaepe	CORNEOFIX F20® a new technology to define skin desquamation
2	Sokolov	Use of fluorescent silica particles to monitor location and adsorption of skin care products on skin
3	Van Neste	Refined scalp hair methods: hair shedding and hair loss
4	Tate	Wetness Protection of Skin by Personal Products as Measured by Dye Exclusion

10:15 AM **Coffee Break –**
Please visit Technical Showcase & Poster Exhibits

10:45 AM Session II: **Epidermal Barrier Function**
Chairs: Martha Tate & Joachim Fluhr

(5 papers 12M + 3M Q&A each)

Abstract	1st Author	Title
5	Imhof	Reconvolution analysis of occlusion recovery flux curves
6	Cui	Mathematical Modelling for Water Concentration Depth Profiles and Water Migration within the Stratum Corneum
7	Ferrag	Preliminary studies with an Erbium YAG laser for investigating epidermal barrier regeneration
8	Kiiskinen	Measurement depths of a skin-water analyzer (MOISTUREMETER-D)
9	Kowatzki	Regeneration Kinetic of Sweating, Stratum Corneum Hydration, Surface pH, Sebum Production and Mechanical Properties is not altered by Regular Sauna Bathing

12:00 NOON – 1:15 PM **Buffet Lunch**
Please visit Technical Showcase & Poster Exhibits

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Thursday, Sept. 29, 2005 PM Program Notes

1:30 PM Invited Speaker: **Julia Welzel**

Application of High Resolution OCT in Dermatology

2:00 PM Session III: **Clinical and Environment**

Chairs: **Randy Wickett & Chilhwan Oh**

(6 papers 12M + 3M Q&A each)

Abstract	1st Author	Title
10	Fluhr	Acute Experimentally induced barrier disruption by tape stripping is influenced by pressure, time and anatomical location: Integrity and Cohesion assessed by sequential tape stripping
11	Visscher	Stratum Corneum Integrity and Function in Health Care Workers Following Hand Hygiene Procedures
12	Bankova	Irritant potential of food additives: a bioengineering irritaion study
13	Bankova	Cutaneous blood flow in dermatomyositis and its association to disease severity
14	Son	Ex vivo image Basal Cell Epithelioma with unmonochromatized synchrotron hard x-ray microradiography
15	Gorodetsky	Mechanical properties of skin in health and disease evaluated by Visco-Elasticity Skin Analyzer (VESA)

3:30 PM **Coffee Break –**

Please visit Technical Showcase & Poster Exhibits

4:00 PM Session IV: **New Technology**

Chairs: **Bernard Gabbard & Ernest Braue**

(8 papers 10M + no Q&A each)

Abstract	1st Author	Title
16	Zhang	Near-infrared imaging: A better tool to measure and visualize skin hydration and to assess the performance of skin cleansing and care products
17	Berardesca	Capacitance imaging: new parameters for characterizing the skin surface texture, effect of hydration
18	Jiang	Measurement of Skin Translucency
19	Sokolov	Loss of elasticity of human epithelial cells during ageing and its treatment: AFM study in vitro
20	Coutts	Feasibility of skin elasticity imaging using surface topography
21	Cotton	Wide-field, geometry-invariant, chromophore imaging of human skin
22	Barel	In vitro calibration and validation of the reviscometer using silicone polymers as simple skin model systems
23	Eikje	Vibrational spectroscopy for clinical dermatology

5:30 PM **Closing Remarks & Housekeeping Items**

Thursday Evening is free. There are many fine restaurants in the immediate area. Some are within easy walking distance. Others are just a short shuttle ride away. The Info Desk will have sample menus and can help you decide what you may want to do.

World Congress on Noninvasive Studies of the Skin

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Friday, Sept. 30, 2005 AM Program Notes

Continental Breakfast available from 7:00 AM to 8:30 AM
Registration & Info Desks are open from 7:30 AM to 5:30 PM
Speaker Preview Room is open from 8:00 AM to 3:30 PM
All Scientific Sessions are being held in the Concord Ball Room

8:30 AM **Opening Remarks:** Gary Grove, Congress Convenor

8:45 AM Invited Speaker: **Bernard Querleux**
**State of the Art of Magnetic
Resonance Imaging of the Skin**

9:15 AM Session V: **Ethnic Differences**
Chairs: **Frank Akin & Neelam Muizzuddin**

(4 papers 12M + 3M Q&A each)

Abstract	1st Author	Title
25	Querleux	Ethnic Skin studied by in vivo cross-sectional multi-modality imaging
26	Zahouani	Determination of Ageing Speed and the Index of Elasticity Loss of Caucasian and Japanese Women
27	Muizzuddin	Variations in Stratum Corneum properties of human subjects from different ethnic backgrounds
28	Diridollou	Skin Topography in Different Ethnic Populations and versus Age

10:15AM **Coffee Break –**
Please visit Technical Showcase & Poster Exhibits

10:45AM Session VI: **Skin Ageing**
Chairs: **Martha Tate & Joachim Fluhr**

(4 papers 12M+ 3M Q&A each)

Abstract	1st Author	Title
29	Delalleau	Characterization of human skin with the suction test – influence of the numerical models
30	Sadiq	Assessment of sun damage of the v-neck area of the chest by the skinchip device
31	Clarys	Investigation of intrinsic and photoaging of human skin using the reviscometer and the cutometer
33	Ruvolo	Aging the elastic parameters of human epidermis: the role of langer's line and skin anisotropy

11:45AM **Buffet Lunch –**
Please visit Technical Showcase & Poster Exhibits

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Friday, Sept. 30, 2005 PM Program Notes

1:00 PM Invited Speaker: **Jeff Bamber**

High-Resolution Sonography

1:30 PM Session VII: **Ultrasound & New Imaging**

Chairs: **Stephan El Gammal & Jorgen Serup**

(4 papers 12M + 3M Q&A each)

Abstract	1st Author	Title
34	Moussa	Value of high frequency ultrasound in the assessment of basal cell carcinoma (BCC) borders
35	Moussa	Non invasive diagnosis of atypical nevi with 100 MHz ultrasound and optical coherence tomography
36	Mac-Mary	Quantification of rosacea by videocapillaroscopy. Retrospective and comparative review of five studies
37	Josse	Cellulite and adipose tissue characterization by quantitative MRI analysis

2:30 PM **Coffee Break –**

Please visit Technical Showcase & Poster Exhibits

3:00 PM Session VIII: **Poster Discussions & proDerm Awards**

Chairs: **Marty Visscher & Klaus-Peter Wilhelm**

8 to 10 of the Posters will be selected
for mini-presentations of 5 minutes
followed by 3 minutes of discussion for each

proDERM Poster Awards

will be presented by Klaus-Peter Wilhelm

4:30 PM - **General Meeting of ISSI**

Room to be announced

5:00 PM - **Business Meeting of ISBS**

Room to be announced

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The Gala Banquet will be held on Friday Night at

*Longwood
Gardens*



**Our Keynote Speaker will be
Dr. Stephan Katz, Director NIAMS**

Buses will begin to leave from the hotel lobby starting at 6:30 PM

Buses will begin to return to hotel starting at 11:00 PM

Accompanying Persons Program

There will also be plenty for accompanying persons to do during the week as our congress hotel is conveniently located in the heartland of the Brandywine Valley with all of its major attractions such as Brandywine Battlefield, Brandywine River Museum, Chadd's Ford, Delaware Art Museum, Hagley Museum, Nemours Mansion, QVC, Winterthur, etc. Philadelphia and Wilmington with all their museums, art galleries, and shops are also just an easy drive away. Visit the World Congress Info Desk for more information.

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Saturday, Oct. 1, 2005

“Hot & Cold” breakfast available from 7:00 AM to 8:30 AM

Registration & Info Desks are open from 7:30 AM to 9:30 AM

Speaker Preview Room is open from 8:00 AM to 9:30 AM

Symposium: Clinical Applications of Non-Invasive Methods

will be held in Concord Ballroom from 8:30 AM to 12:30 PM

see separate page for detailed schedule

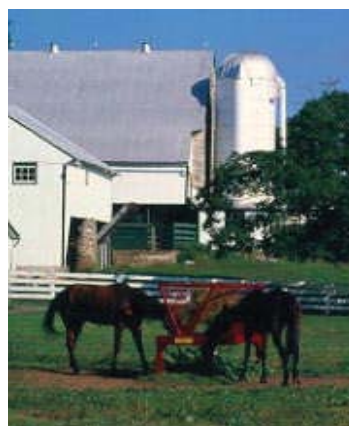
Closing Ceremonies will be held in Concord Ballroom at 12:30 PM

Post-Congress Tour (optional)

Box lunches will be provided to those going on the Post-Congress Tour

Bus will leave from hotel lobby promptly at 1:00 PM and travel through the heart of the Pennsylvania Dutch countryside.

Tour will include



Evening meal will be in a genuine Amish home

Bus will return to hotel by 9:00 PM

Post Congress party starts immediately thereafter.

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Special Saturday Session ... Oct. 1, 2005

Time	
8:30	Introductory Remarks Gary Grove, cyberDERM, inc.
8:40	Blindman Dermatology Update 2005 Albert Kligman, University of Pennsylvania
8:55	Total Body Photography Bill Witmer, DermaTrak
9:15	Non-invasive Optical Approaches to Diagnosis of Skin Diseases Rox Anderson, Harvard University
9:35	Bringing optical imaging to the bedside: Advances in Melanoma Diagnosis Allan Halpern, Sloan-Kettering
9:55	Human hair cycling: from images to figures! Dominique Van Neste, Skinterface, Belgium
10:15 - 10:35	Coffee Break
10:35	The Itch response... more than scratching the surface Gil Yosipovitch, Wake Forest University
10:55	Clinical Applications of Diagnostic Ultrasound Jorgen Serup, Ballerup Hospital, Copenhagen
11:15	Non-Invasive Monitoring of Neonates Marty Vischer, University of Cincinnati,
11:35	Biophysical Measurements Related to Atopic Dermatitis Joachim Fluhr, Friedrich Schiller Universität Jena, Germany
12:00	Session Wrap up and Future Prospects Nik Kollias, Johnson & Johnson
12:30	Closing Remarks Gary Grove, cyberDERM, inc.

Technical Showcase

We are pleased that all of the leading manufacturers will be showcasing their latest innovations in non-invasive instruments and imaging systems in concert with our meeting. This will be an unmatched opportunity to see the state of the art for the entire industry, all in one place.

Acaderm / Courage+Khazaka

Biox Systems Ltd.

Canfield Scientific Imaging Systems

Cortex Technology

CuDERM Corporation

cyberDERM, inc.

Delfin Technologies Ltd.

DermaTrak

Faraghan Medical Camera Systems

FotoFinder Systems, Inc.

Lucid

Moor Instruments

Neurotron, Inc.

NOVA Technology Corporation

Perimed

proDERM Institute for Applied Dermatological Research GmbH

River Diagnostics

SciBase AB

tpm-taberna pro medicum-GmbH

Detailed contact information can be found on the pages to follow:

World Congress on Noninvasive Studies of the Skin

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Technical Showcase Vendor Information



Biox Systems Ltd.

Southwark Campus
103 Borough Road
London SE1 0AA
UK

Phone: +44 (0)20 7815 7564 **Fax:** +44 (0)20 7815 7564

E-mail: info@biox.biz **Web Page:** <http://www.biox.biz/>

Meeting Attendees: Professor Bob Imhof



Courage + Khazaka electronic GmbH

Mathias-Bruggen-Str.91
50829 Köln
Germany

Phone: ++49-221/ 9564990 **Fax:** ++49-221/ 956 4991

Email: info@courage-khazaka.de
Web Page: www.courage-khazaka.de

Meeting Attendees: Georg Khazaka, Diana Khazaka



Canfield Imaging Systems

253 Passaic Avenue
Fairfield, NJ 07004-2524 USA

Phone: 973-276-0336 / 800-815-4330

Fax: 973-276-0339

E-mail: info@CanfieldSci.com
Web page: <http://www.canfieldsci.com>

Meeting Attendees: Douglas Canfield, Dennis DaSilva

CORTEX TECHNOLOGY

Smedevaenget 10
9560 Hadsund
Denmark

Phone: +45 9857 4100 **Fax:** +45 9857 2223
Email: cortex@cortex.dk **Web page:** www.cortex.dk

Meeting Attendees: Gunnar Svendsen



CuDerM Corporation

P.O. Box 797686
Dallas, TX 75379

Phone: 972.248.8095, 800.690.1933 **Fax:** 972.248.1094

Email: WorldCongress@cuiderm.com

Web page: <http://www.cuiderm.com>

Meeting Attendees: Dr. David Miller, John DeRudder, Sheila Dauth



cyberDERM, inc.

275 New Darlington Road
Media, PA 19063-5607

Phone: 610-558-4777 / 610-325-0112 **Fax:** 610-325-0881

Email: cyberDERM@comcast.net

Web page: <http://www.cyberderm-inc.com>

Meeting Attendees: Dr. Gary Grove, Mary Jo Grove, Jonn Damia, Dr. Charles Zerweck, Danielle Fendrick, Trish Alfano, Robert Moyer

cyberDERM, inc.

Clinical Studies Group
700 Parkway
Lawrence Park Industrial Center
Broomall, PA 19008

Delfin Technologies Ltd.



Microkatu 1, P.O. Box 1199
70211 Kuopio
Finland

Phone: +358 17 441 2348 **Fax:** +358 17 441 3051

Email: info@delfintech.com **web page:** www.delfintech.com

Meeting Attendees: Aki Immonen & Dr. Jouni Nuutinen



DermaTrak Skin Imaging Center

Suite 210
357 South Gulph Road
King of Prussia, PA 19406

Phone: 800-801-4240 MONDAY - FRIDAY
610-992-1770 SATURDAY

E-mail: BILL WITMER at B.Witmer@DermaTrak.com

Web page: <http://www.dermatrak.com>

Meeting Attendees: Bill Witmer

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Technical Showcase Vendor Information



Faraghan Medical Camera Systems

940 North Delaware Ave
Philadelphia PA 19123

Phone: 1-877-833-1583 / 215-928-0499 **FAX: 215-928-1866**

Email: Contact ken@uvcamera.com

Web page: uvcamera.com

Meeting Attendees: Ken Faraghan, George Faraghan



FotoFinder SYSTEMS, Inc.

FotoFinder Systems, Inc.

10015 Old Columbia Rd., Suite B215
Columbia, MD 21046

Phone: 410-312-7635

Fax: 410-312-7632

e-mail: info@fotofinder-systems.com

website: www.fotofinder-systems.com

Meeting Attendees: Richard Engle, Ferdinand Mayer



LUCID™

Lucid Inc.,

2320 Brighton Henrietta Townline Road
Rochester, NY 14623

Phone: 585-239-9800

Fax: 585-239-9806

Email: info@lucid-tech.com

Web page: www.lucid-tech.com

Meeting Attendees: Jay M. Eastman, Marcy K. Davis-McHugh

Moor Instruments

laser Doppler blood flow monitors and imagers



Moor Instruments, Inc.

501 Silverside Road
Suite #66
Wilmington, Delaware 19809 USA

Phone: 302-798-7470

FAX: 302-798-7299

Email: moorinc@interserv.com

Web page: <http://www.moor.co.uk>

Meeting Attendees: Brian Lock



NEUOTRON, INCORPORATED

INNOVATIVE MEDICAL TECHNOLOGY

Neurotron, Inc

1501 Sulgrave Avenue; Suite 203
Baltimore, MD 21209
USA

Phones: 410-664-0800 / 800-345-9040 **Fax:** 410-664-0831

Email: service@neurotron.com **Web page:** www.neurotron.com

Meeting Attendees: Jefferson J. Katims, M.D., Medical Director

NOVA

Technology Corporation

NOVA Technology Corporation
7 Pinecrest Terrace
Pease International Tradeport
Portsmouth, NH 03801-2880 USA

Phone: 603.422.9595

FAX: 603.422.7330

Email: mcampbell@novatechcorp.com

Web page: <http://novatechcorp.com>

Meeting Attendees: Sarah Campbell, James Mitkonis, John Sullivan



6785 Wallings Rd.
Suite 3A
North Royalton, OH 44133

Phone: 440-877-0537

Fax: 440-877-0534

Email: perimed@aol.com

Web page: www.perimed.se

Meeting attendees: Peter Delaney



proDERM Institute for Applied Dermatological Research GmbH

Kiebitzweg 2
22869 Schenefeld/ Hamburg
Germany

Phone: +49-40-83 93 58-0

Fax: +49-40-83 93 58-39

Email: info@proDERM.de

Web page: www.proDERM.de

Meeting attendees: Dr. Klaus Peter Wilhelm, Dr. Theresa Callaghan

World Congress on Noninvasive Studies of the Skin

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Technical Showcase Vendor Information



SCI.BASE
Dedicated to the pursuit of electronic biopsies.

SciBase AB
Novum Research Park
SE-14157 Huddinge
Sweden

Phone: +46 70 733 0646 **Fax:** +46 8 774 7737

Email: stig.ollmar@cob.ki.se **Web page:** www.scibase.se

Meeting Attendees: Peter Åberg, Ph.D. & Ingrid Nicander, Ph.D.



Post Box 25229
3001 HE
Rotterdam, NL

Phone: +31 (0)10 408-9267 **Fax:** +31 (0)10 408-9268

Email: info@riverd.com **Web page:** www.riverd.com

Meeting Attendees: William Riggs, Andre van der Pol, Peter Caspers



taberna pro medicum GmbH
Physik und Elektronik in der Medizintechnik

tpm - taberna pro medicum GmbH
Im Dorf 15a
D-21335 Lüneburg
Germany

Phone: +49-4131-401555 **Fax:** +49-4131- 401755

eMail: info@tpm-online.de **US:** gwbintl@adelphia.net

Web page: www.digitalultrasound.de

Meeting Attendees: Georg W. Bohsack, Ruediger Scharenberg



Office of Communications and Public Liaison
National Institute of Arthritis and Musculoskeletal and Skin Diseases
National Institutes of Health
Bldg. 31, Room 4C02
31 Center Dr. - MSC 2350
Bethesda, MD 20892-2350
Phone: (301) 496-8190
Fax: (301) 480-2814

Upcoming Meetings

ISBS Regional Meeting – Atlanta, GA USA

Local Hosts Frank Akin & Martha Tate

2006 at Stone Mountain, GA

3rd Joint ISBS & ISSI Meeting

Local Host Chilhwan Oh

2007 in Seoul, Korea

more info about both meetings will be posted on
ISBS web page <http://www.i-s-b-s.org/>

001

CORNEOFIX F20® a new technology to define skin desquamationK De Paepe and V Rogiers *Department of Toxicology, Dermato-Cosmetology and Pharmacognosy, Vrije Universiteit Brussel (VUB), Brussels, Belgium*

Objective: The aim of the present study was the evaluation of a newly marketed methodology for the characterization of the skin desquamation index (DI) being an important parameter for the evaluation of overall skin condition. In order to define the quality of the resulting data, the technology needed to be validated and checked for its applicability.

Methodology: Adhesive Corneofix F20® strips were used and analyzed by a light transmission technique (Skin Visiometer SV600®), both commercialized by Courage+Khazaka electronic GmbH, Köln, Germany. Measuring sites were the inner forearms of 15 healthy females (20 - 35 years old). After optimizing the specific settings of the apparatus, other potential parameters affecting the measurements were evaluated, including test site symmetry, the effect of in-depth stripping, and the correlation with skin capacitance measurements. Also the efficacy of a moisturizing lotion on skin scaliness was studied using the new technology.

Results and Conclusion: Light transmission results of the Corneofix strips gave precise DI values after standardization of the following parameters: shutter time, calculation area, and basic gray level. Squamometric measurements showed symmetry between corresponding test sites on both forearms and a negative correlation was detected in relation to skin hydration. In-depth stripping significantly decreased DI values with a concomitant increase in capacitance levels. Statistical evidence was also found for the differences detected – for both DI and skin hydration – between lotion treated and untreated control skin. It could be shown that the moisturizing product reduced skin scaliness. From these preliminary results, it could be concluded that the present technique seems to be a promising methodology for the evaluation of skin desquamation.

003

Refined scalp hair methods: hair shedding and hair lossD Van Neste *SkinInterface, Tournai (Belgium)*

The phenomenon of hair growth, shedding and re-growth can be monitored in great detail with contrast-enhanced phototrichogram (CE-PTG). In our hands this method can be applied in the hair clinic as a refined diagnostic method for patients complaining about hair loss and / or hair shedding. Hair density, anagen %, thickness and growth are gradually reduced from the less to the more severely affected patients while the proportion of thinner hair and exogen hair is increasing. Longitudinal studies may help understanding hair cycling and replacement during the natural progression of hair loss and document which hair follicles are responsible for the therapeutic response. Evidence generated from repeat surface viewing allows indeed dynamic studies about events that happen in the scalp of our patients either during the natural course of this disorder or during the therapeutic response with finasteride. Our CE-PTG technology alone or in combination with exogen hair collection may be applied in clinical situations for a quantified diagnosis of hair loss. Companies developing active compounds and using the CE-PTG method may be able to secure the inclusion of a volunteer in a trial, may sort out and define predictive parameters for the therapeutic response of an individual patient or use finding to support claims of drugs or cosmetic compositions.

005

Reconvolution analysis of occlusion recovery flux curvesRE Imhof^{1,2}, P Xiao^{1,2}, EP Berg² and MEP De Jesus³ *1 Photophysics Research Centre, London South Bank University, London SE1 0AA, UK; 2 Biox Systems Ltd, Southwark Campus, 103 Borough Road, London SE1 0AA, UK and 3 Departamento de Física, Universidade da Beira Interior, 6200 Covilhã, Portugal*

The aim of this study was to develop a method for analysing the decay kinetics of occlusion recovery flux curves at short-times, where instrumental response speed effects are important.

Volar forearm skin of a healthy volunteer was occluded for pre-set times with an 8x3cm Silgel® wound dressing. Occlusion recovery flux curves were measured with a condenser-chamber instrument, starting immediately after the removal of the dressing (<5 seconds) and continuing until the signals had settled to steady, final TEWL values.

The main experimental results are a family of flux curves for occlusion times in the range 0-15 minutes. The final, steady TEWL values were found to be consistent, with a mean of $9.3 \text{ g m}^{-2} \text{ h}^{-1}$ and a CV<2%. The quantity of trapped water was found to increase linearly with occlusion time, with a mean accumulation rate of $1.6 \text{ g m}^{-2} \text{ h}^{-1}$ and a CV<11%. Peak flux densities were found to be in the range $14\text{--}30 \text{ g m}^{-2} \text{ h}^{-1}$, low compared with the $\sim 180 \text{ g m}^{-2} \text{ h}^{-1}$ expected from free surface evaporation. The reason is thought to be instrumental response speed: the estimated evaporation times of the small quantities of accumulated surface water are ~ 7 seconds and less, whereas the $1/e$ response time of the instrument is ~ 15 seconds. Other instrumental response time effects include a finite rise-time, a rounding of the peak and a distortion of the decay kinetics at short times. These effects can be corrected to some extent by least-squares convolution methods such as those developed for fluorescence decay analysis. The results of our analysis of these data by this approach will be presented.

Accurate steady-state parameters can be extracted straightforwardly from occlusion recovery curves, since they are not affected by instrumental response speed effects. However, peak flux density and decay kinetics at short times require correction, for which we have adapted a least-squares convolution method.

002

Use of fluorescent silica particles to monitor location and adsorption of skin care products on skinI Sokolov and S Iyer *Clarkson University, USA*

Goal of the study: Introduce a novel technique to trace the presence of skin care products on the skin using fluorescent silica particles.

Methodology: We used self-assembled micron-size nanoporous silica particles with encapsulated fluorescent dyes. The particles, being silica outside, are safe and bio-inert. We used the particles as tracers of skin-care products. Specifically, we "tagged" Vaseline and glycerin with the particles, and studied imaging of its position and adsorption by skin after application on arm.

Results: Using a regular photo/microscopy imaging in UV light, we can visualize location of applied skin care product. We assembled a simple fluorescent device fibre-optically coupled to a miniaturized spectrometer to characterize the amount of skin care product on the skin surface. The fluorescence data were compared with a direct weighting method, scraping the products out from the skin with a piece of thick aluminum foil.

Conclusions: We believe that the use of these nanostructured particles can provide a novel route to quantify action of skin care products. Our method is non-contact, and can be used even when the other methods are not effective.

004

Wetness Protection of Skin by Personal Products as Measured by Dye ExclusionM Tate¹, G Grove², J Laabs¹, K Menard¹, B Nelson¹, K Shepard¹, R Zepp¹ and R Zuleger¹ *1 Kimberly-Clark Corporation, Roswell, GA, and Neenah, WI, USA and 2 CyberDERM, Inc., Media, PA., USA*

Background/purpose: Excessive skin hydration from wearing wet undergarments, such as infant diapers and adult incontinence products, has been historically problematic. Damage to the stratum corneum occurs as a result of wetness (urine) and limited product breathability, which reduces evaporation. Protection from wetness may be imparted by barrier materials, such as lotions and ointments on the skin. Barrier materials have traditionally been applied from bulk (bottle or tube) by hand. In recent years, diapers contain barrier ointments, and in this case, the personal product applies the barrier material during wear. The purpose of this research was to develop a reliable in vivo method of evaluating skin for wetness protection when wearing personal products.

Methods: The means for evaluating wetness protection is dye exclusion evaluation in vivo, on human skin. Dye exclusion involves application of the barrier material, then a dye is applied and skin staining is evaluated by instrumental color measurement. The dye exclusion method may be conducted on adult arms with direct application of the barrier material, or infant or adult torsos after wearing a diaper or incontinence product (or other personal product) that contains the barrier material.

Conclusions: Dye exclusion demonstrated skin protection on adult arms and on infant buttocks. Ointments in diapers were successful in protecting the skin from the dye, when diapers were worn 6 hours to 3 days (with appropriate changes of product). Dye exclusion on infants used cosmetic dyes (safe for use in the eye area).

006

Mathematical modelling for water concentration depth profiles and water migration within the Stratum CorneumY Cui^{1,2}, P Xiao¹ and RE Imhof¹ *1 Photophysics Research Centre, London South Bank University, 103 Borough Road, London SE1 0AA, UK and 2 Sunrise Systems Limited, Flint Bridge Business Centre, Ely Road, Waterbeach, Cambridge CB5 9QZ*

Water in human stratum corneum plays a key role in its functionalities and cosmetic properties. Therefore, to understand the water content, especially water concentration depth profile and the migration of free water within the stratum corneum is very important for skin research. In this paper, we will present a theoretical study on water concentration depth profiles and water flux profiles within human stratum corneum under various initial and boundary conditions. We will present results for steady skin water concentration depth profiles at certain ambient conditions, water migration dynamics under sudden changes of external environment, water migration dynamics with a surface water reservoir, and the drying dynamics of fully hydrated skin. We will also compare theoretical results with in-vivo measurements using opto-thermal radiometry and AquaFlux.

007

Preliminary studies with an Erbium YAG laser for investigating epidermal barrier regeneration

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Goal of the study : The rapid and controlled skin ablation obtained using Erbium:YAG lasers, shows potential for this technology in studying skin tissue regeneration at different levels : stratum corneum (SC), epidermis and dermis. We present preliminary data characterizing laser energy and ablation depth, and its application in vivo for investigating epidermal and SC regeneration. Methodology : An Er:YAG laser (2940nm), pulse duration 250µs, was used on 1) human skin ex vivo and 2) on the skin of hairless rats in vivo. In the first study fluences of 10, 50 & 200 J/cm² were used with a 1.6mm beam diameter, with skin ablation analysed volumetrically with non-invasive 3D imaging (fringe projection principle) and histologically. In the second study, a fluence of 20 J/cm² and beam diameter of 5mm was used, for inducing a series of epidermal wounds every 2 days for 10 days on each of 5 hairless rats. Wounds were assessed using the same techniques as the first study in addition to measurements of transepidermal water loss and macrophotography. Results : The first study showed stratum corneum (SC) fragmentation at 10J/cm², epidermal ablation with dermal papillae flattening at 50J/cm², and deeper dermal damage with 200 J/cm². These ranked similarly with 3D images of wound depth and volume. In the second study, complete re-epithelialisation was seen histologically within 2-4 days, with transepidermal water loss measurements decreasing to baseline values during the same time, indicating normal skin barrier function. Conclusions : The Er:YAG laser allows rapid, controllable wound induction suitable for the study of skin wound healing. Evaluation of wound depth and tissue functionality has been performed non-invasively and using conventional histology. Preliminary data suggest that re-epithelialisation and normal barrier function of wounds with entirely ablated epidermis occurs between 2-4 days in the hairless rat model.

009

Regeneration kinetic of sweating, Stratum Corneum hydration, Surface pH, Sebum production and mechanical properties is not altered by regular sauna bathing

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Background and Aim: Wellness and especially sauna bathing are of growing interest in modern health care. The positive effect of sauna for general health is well documented. However, to our knowledge no controlled studies have been published on the effect of sauna on skin physiology.

Methodology: Two groups, of 20 healthy volunteers (age 18-50 yrs. males and females): regular sauna users (RSU) vs. non-sauna (NS) users were tested after 2 sequential sauna baths of 15 min at 85°C in a dry Finnish sauna (0-5% rel. humidity). The parameters were transepidermal water loss (sweating) (Tewameter TM 300), stratum corneum hydration (Cormeter CM 825), sebum production (Sebumeter), mechanical properties (Cutometer 475) and surface pH (pH-Meter).

Result: We could demonstrate that transepidermal water loss from sweating returns relatively quickly to normal (within 60 min after the second sauna bath). The second sauna bath induced in both group a stronger sweating response. Stratum corneum hydration remained elevated until 180 min after the second sauna bath and was slightly higher in the RSU group. Delipidization (reduced Sebumeter values) normalized within 3 hours after the second sauna bath but significantly faster in the RSU group. Mechanical properties did not vary significantly. Finally the pH of the RSU was lower throughout the entire study and also the increase after both sauna baths was less pronounced in the RSU group.

Conclusions: To our knowledge, this is the first study on skin physiology of sauna bathing. We could show, that sauna induces a specific response kinetic to heat exposure. Regular sauna bathing has no harmful effects on skin physiology and might be beneficial for some parameters (sebum content; surface pH) as a kind of "hardening-training" for the skin.

011

Stratum Corneum integrity and function in health care workers following hand hygiene procedures

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Compliance with the Centers for Disease Control's hand hygiene guideline is low and health care workers (HCWs) cite skin irritation as highest reason for failure to comply. We hypothesized that low irritancy cleansers, alcohol sanitizers with emollients, and protective lotions would minimize the damaging effects of repetitive hand sanitization.

We investigated two product regimens, current (CP) and test (TP), on stratum corneum (SC) integrity and function among groups of HCWs from a neonatal unit in two seasons: spring of 2004 (parallel groups, n=55 total) and the winter of 2004-5 (crossover, n=60). Most HCWs took part in both trials. We measured skin condition at the start and end of the work cycle (2-3 consecutive 12-hour shifts) with high resolution digital photography, visual scoring of dryness, erythema, and fissuring, hydration, barrier function (TEWL), and subject self-assessment. We used image analysis for the objective quantitation of erythema and a visual perception system for comparison of images and assessment of spring versus winter skin condition.

Significant regional differences in dryness and erythema were observed at baseline in both seasons, indicating that HCWs returned to work (after 2-4 days off) with SC damage. In the spring, the skin condition worsened and hydration decreased over the cycle for the CP and improved (hydration increased) for the TP and differences were significant among the two subject groups. The skin condition was significantly poorer in winter for dryness, but erythema scores were elevated in both seasons. The imaging techniques improved the discrimination of erythema by normalization to inherent skin coloration. Product differences were also found during the winter. For some cycles, the skin worsened for the CP and remained unchanged for the TP. For others, the skin remained unchanged for CP and improved for the TP. The results have important implications for HCWs and for infection control.

008

Measurement depths of a skin-water analyzer (moisturemeter-D)

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Goal: A high-frequency dielectric analyzer (MoistureMeter-D, Delfin Technologies Ltd, Kuopio, Finland) was recently introduced for noninvasive monitoring of localized tissue water in skin and subcutis. Since a variety of probes is available the effective measurement depths of probes with various dimensions should be known.

Methodology: A two-layer dielectrical model for skin and subcutis was created and effective measurement depths for probes with different dimensions were calculated. To compare of the predictions of the dielectrical model with measurements a water-filled phantom with a movable acrylic piston was constructed. Water in the phantom simulated well-conducting skin structures and the piston subcutaneous fat with low water content. The probes were in contact with water. A sample of 4 probes (sensor contact diameter 10, 20, 23 and 55 mm) allowing assessment of tissue water from superficial dermis until 5 mm in subcutaneous fat was selected.

Result: According to the experiments the effective measurement depths of the tested dielectrical probes were appr. 0.5, 1.5, 2.5 and 5.0 mm. The depth was directly proportional to the dimensions of the probe. Theoretical calculations agreed well with the empirical findings.

Conclusions: The present results help to determine the correct probe size to monitor tissue water at any depth until 5 mm.

010

Acute experimentally induced barrier disruption by tape stripping is influenced by pressure, time and anatomical location: Integrity and Cohesion assessed by sequential tape stripping

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Background and Aim: Tape stripping is a well-known procedure in stratum corneum physiology research. Adhesive films are pressed to the surface of SC and then removed. The superficial layers of SC adhere on the film and are accessible for further investigations. Although this method is widely used, only few information about standardization are known. Various protocols are utilized and the results of similar studies might be difficult to compare. Different factors are known to have an influence on barrier damage by tape stripping. The aim of the study was to investigate the effects of such factors and to give some general indications for the performance of these method.

Methodology: 12 healthy volunteers (age 20-31 years) were studied in a controlled, randomised study with sequential tape stripping at the forearm, upper arm, cheek and back. Different methods and times of applied pressure, different degrees of pressure and different tapes were investigated and the impact on barrier function was assessed by TEWL measurements and measurements of stratum corneum hydration, skin colour and skin surface pH. Spectroscopic measurements and protein assay to determine the mass of removed stratum corneum were carried out. Result: Degree of barrier disruption, irritation and SC cohesion is influenced by character of adhesive tapes, kind of pressure and time of applied pressure (2N, 7N, 2 s, 10 s), kind of method for pressure application (roller, stamp, thumb, stretched skin), anatomical site and condition before stripping (occlusion vs. non-occlusion). Conclusions: In summary the present study shows that there were significant differences between different factors on barrier damage. Our data indicate that it is important to well define these factors when a study is initiated and when results of different studies should be compared.

012

Irritant potential of food additives: a bioengineering Irritation study

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Goal of the study: To assess the skin irritant effects of food additives and the potential relevance for the development of irritant contact dermatitis

Methodology: The irritants (ascorbic acid, acetic acid and sodium hydroxide at different pH values) were applied to the skin of the mid-back of 19 volunteers twice daily for four days using an occlusive epicutaneous patch test system and in combinations with sodium lauryl sulfate (SLS). Erythema was measured using skin colorimetry (Chromameter CR-300®, Minolta, Osaka, Japan), the epidermal barrier integrity was evaluated by means of transepidermal water loss measurement (Tewameter TM 210®, Courage&Khazaka, Germany).

Results: Ascorbic and acetic acid elicited a slight irritation when applied to the skin and this irritation was markedly higher when they were applied in combination with SLS as measured both by means of colorimetry and transepidermal water loss. Sodium hydroxide induced severe irritation when applied alone. Unexpectedly, the combined application of SLS and sodium hydroxide caused milder irritation than what was observed with sodium hydroxide only.

Conclusions: SLS – a known skin irritant that is an ingredient in many skin cleansing solutions was shown to enhance the skin irritation caused by food additives such as ascorbic and acetic acid. The application of SLS might prevent the irritation caused by sodium hydroxide. Our data underline the importance of various mild irritants and their especially their combinations for the development of irritant contact dermatitis.

013

Cutaneous blood flow in dermatomyositis and its association to disease severity
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Goal of the Study: To determine cutaneous blood flow in diseased and healthy skin surfaces of patients with dermatomyositis and to assess possible correlation with clinical measures of disease severity. **Methodology:** Using a Laser Doppler Imager, cutaneous blood flow was measured at targeted sites of involved and uninvolved skin of 13 dermatomyositis patients and the corresponding uninvolved sites of 13 healthy controls. Overall disease severity of dermatomyositis patients was determined by physician's global assessment (PGA), creatinine phosphatase kinase (CPK) levels, medical research council (MRC) scores, and the dermatomyositis skin severity index (DSSI).

Results: Comparison of blood flow in involved versus uninvolved skin of dermatomyositis patients revealed significant differences at all anatomical sites measured: periungual nail ($p=0.001$), knuckle ($p=0.001$), elbow ($p=0.013$), periorbital ($p=0.015$), chest ($p=0.028$), and back ($p=0.001$). Blood flow was higher in uninvolved skin of dermatomyositis patients versus healthy controls at all anatomical sites, although statistical significance was not achieved. DSSI significantly correlated with blood flow in involved skin of the chest ($p=0.003$), back ($p=0.002$), and knuckle ($p=0.026$). In several patients, no erythema was noted in involved sites but blood flow was significantly higher versus uninvolved skin. **Conclusions:** Dermatomyositis is associated with significantly increased cutaneous blood flow, even in cases where no erythema is evident. This suggests significant involvement of the skin vasculature in this disease process. Furthermore, blood flow in involved skin correlates with the dermatomyositis skin severity index.

015

Mechanical properties of skin in health and disease evaluated by viscoelasticity skin analyzer (VESA)

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Goals and Background: Monitoring alteration in the mechanical properties of the skin may help to diagnose systemic diseases, as well as local skin lesions. The mechanical properties of the skin are also known to be age, sex and race dependent and reflect different physiological skin conditions as well as skin disorder. Reliable quantitative methods for the in-situ examination of skin viscoelasticity are scarce. **Methodology:** We developed a dedicated viscoelasticity skin analyzer (VESA) that may be hooked into a sophisticated computerized system for mapping skin viscoelasticity. The portable pocket size user-friendly device allows a fast and non-invasive measurement of the speed of shear wave propagation (SWP) in viscoelastic materials with highly reproducible results. The SWP was found to correlate inversely with Young's modulus of elasticity. The directional nature of the measurement allows also the evaluation of skin anisotropy. **Results:** The VESA device was able to show significant variations in skin stiffness and anisotropy in different areas tested with high reproducibility. This could be applied to monitor variations associated with area tested and skin treatments. In a multinational study the VESA was used to evaluate late radiation effects on the skin of breast cancer patients treated with different protocols of high dose radiation therapy. The protocol used was based on surgical removal of the tumor followed by adequate radiation therapy for the preservation of the affected breast. Complications associated with late radiation damages to the skin, leading to late fibrosis, dermal atrophy, retraction, and susceptibility to necrosis were monitored. Late effects of radiotherapy were monitored in a multinational study detecting late changes in skin viscoelasticity associated with altered dose fractionation. For instance, we found that the increase in dose of radiation per fraction had more impact on the development of late skin effects than elevation in the total dose given. **Conclusions:** Our studies suggest that the VESA may have major applications in experimental and clinical practice for quantitative evaluation of skin condition, with special reference to dermatology and plastic surgery. It may also have major application in other fields, especially in areas related to cosmetology.

017

Capacitance Imaging: new parameters for characterizing the skin surface texture, effect of hydration

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Most of the knowledge we have about the skin surface texture comes from studies carried out by means of skin surface replicas characterized by profilometry or image analysis. These methods are good and precise and supply parameters relative to the 3D dimensions of the skin surface. The complete process for analyzing one zone on the skin is however very time consuming. The aim of the present study was to examine if capacitance images of the skin surface, given by the SkinChip technique, would allow the determination of new parameters for a fast and precise characterization of the skin surface texture. Skin capacitance images are coded in 255 gray levels (the darker pixels representing high capacitance, the clearer, the low one). With this technology, primary lines of the microrelief appear as clear lines because their bottoms are not in contact with the measuring window. It is therefore possible, by using image analysis thresholding techniques, to calculate the number of "crossings" of the lines. This parameter, called "Corner Density" (CD), is directly related to the density of the primary lines which is considered as a good parameter for describing skin ageing.

This new parameter was first compared with the usual parameters (SPmx and SPmy) supplied by classical image analysis package (Toposurf). It was also compared to other parameters ("Mean Pattern Area" or MPA), extracted from the images by using the "watershed" technique. These parameters were extracted from images obtained from two cohorts of volunteers of different mean ages and compared. Results show that all the parameters illustrate changes occurring at the skin surface during ageing, but with different relative amplitudes. A second study shows that skin treatment by an efficient moisturizer induces some recovery in the lines density. Causes of such a phenomenon will be discussed.

014

Ex vivo image Basal Cell Epithelioma with unmonochromatized synchrotron hard x-ray microradiography

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Goal of the study: To investigate the potential of refractive index radiology using unmonochromatized synchrotron beam for the imaging of basal cell epithelioma (BCCs). **Methodology:** Paraffin and formalin fixed BCC blocks were cut with 3mm thickness for refractive index radiographic imaging and from adjacent area 4mm thickness sections were obtained and prepared for hematoxylin-eosin staining. Images of dissected BCCs were produced using hard x-ray from the 7B2 beamline of the Pohang Light Source (PLS). The technique used for the study was phase-contrast (Fresnel diffraction) imaging which didn't use monochromator. The resultant phase-contrast images were compared with low magnification optical microscopic images of corresponding histological slides.

Results: By using unmonochromatized beamline which was also eliminated with other hard x-ray optical components except windows we could get images with clear edge enhancement in relatively large field of view (approximately up to 6 x 6 cm). Images taken with this technique showed clear anatomic details of organelles in normal skin such as epidermis, dermis and skin appendages. Most of cancerous lesions were clearly differentiated from adjacent normal tissues and the images showed fair similarity with those of low-magnification optical microscopy.

Conclusions: For the first time in this study we successfully demonstrated that synchrotron hard x-ray can be used for radiological imaging of relatively thick tumor samples of BCC with great anatomic details.

016

Near-Infrared imaging: A better tool to measure and visualize skin hydration and to assess the performance of skin cleansing and care products

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The state of skin hydration has been typically assessed through instrumental methods that depend on the correlation of skin hydration with the electrical conductance and capacitance responses of the skin. They have been used in differentiating products with large differences in hydration effect. These electrical methods are both indirect and contact methods and the relationship between the electrical response and the skin hydration level is not straightforward. Their reliability may be an issue, as well, particularly if ingredients deposited on the skin from skin care products have a significant contribution (positive or negative) to the electrical property measured. Near infrared (NIR) spectroscopy measures water content of living tissue by its effect on tissue reflectance in the NIR region of the spectrum. The method has been used in the literature to assess tissue water content. The imaging technique using NIR digital camera and filters, developed in the recent years, has also been demonstrated in clinical studies to be useful for measuring skin hydration upon application of different products ranging from various skin cleansers to moisturizers. The imaging method has additional advantages of being non-contact and providing visualization of the changes in skin hydration. In this presentation, the NIR imaging technique will be reviewed, along with its key elements that provide the advantages over other methods for evaluating skin hydration levels. Some recently reported applications in discriminating between marketed products will be reviewed and new applications in examining prototype products will be discussed in the context of supporting new technology development and providing insight into skin-product interaction. The results from our studies have provided evidence that the NIR imaging technique is more sensitive in discriminating changes in skin hydration induced by different moisturizing cleansers than are typically measured between products with large differences in hydration effect (e.g. soap vs. syndet cleansers). The imaging result is more strongly correlated to visual appearance of dryness than those of the electrical properties-based techniques.

018

Measurement of skin translucency

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Goal: Skin translucency has long been identified as an important attribute of healthy and youthful looking skin. However, there is currently no universally accepted definition for this important parameter let alone a measurement method. In this study, we propose a definition and a noninvasive and quantitative measurement for skin translucency. **Methodology:** Skin translucency is about light migration beneath or along the surface of skin. It is related to the absorption and scattering properties of the skin. Skin translucency is defined as the ratio of the total of light intensity of the light spread outside to that inside of the light injection point. The technique is based on the measurement of the spread of light from a small light injection point on the skin surface. Light diffuses from the injection point as a result of scattering beneath the skin surface. During the process, light may also be absorbed. The extent and intensity of the light diffusion are measured with cross polarization point spread imaging.

Results: In vitro measurement with clays and milk has shown good correlation between the optical scattering and absorption properties of the materials with their respective visual perception of translucency. In vivo measurement of skin translucency with subjects of various ethnic groups has also shown good correlation with melanin concentration variation. **Conclusions:** This new technology will allow us to measure quantitatively the perception concept of skin translucency and link it with optical properties of skin

Loss of elasticity of human epithelial cells during ageing and its treatment: AFM Study *in vitro*

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Goal of the study: Study mechanics of ageing epithelial cells and its possible biochemical alteration. Methodology: We used atomic force microscopy (AFM) with a probe modified by 5- micron sphere. Such a modification was done to minimize a possible harm to cell during the measurements, and to be able to measure rather soft areas of the cell, which were not measured before. Results: We found that the epithelial cells have three distinctive regions of different rigidity: the nucleus, cytoplasm, and edge areas. We measured rigidity of young cells (10 to 20 population doublings) and old cells (over 40-60 doublings) that were near senescence. We found that the Young's modulus of viable cells was consistently increased 2- to 10-fold in older versus younger cells. We also found that the increased rigidity of ageing cells was due to a higher density of cytoskeletal fibres, mostly microfilaments, F-actin, as we showed by using immunofluorescence. Using drugs that inhibit polymerization of F-actin, we managed to recover the rigidities of old viable cells back to the young level in all three areas of rigidity simultaneously. Conclusions: These results may contribute to a treatment of the age-related loss of elasticity in epithelial tissues.

021

Wide-field, geometry-invariant, chromophore imaging of human skin

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Background and Aim: The major scattering and absorbing components within human skin have relatively slow-moving spectral functions within the visible and near infrared region. These properties lend themselves to examination with broad-band spectroscopy; typical implementations of this approach require knowledge of the scene geometry to allow calibration for lighting variations. We show the development of a robust system capable of operating with no prior knowledge of scene geometry that can be implemented with a

calibrated digital camera. Methodology: Within such a device P_n , the measured value for a particular spectral primary n at a point in a scene, is $P_n = I_n S_n G_n$ where I_n is the illuminating light, S_n the remitted light from the skin and G_n a term reflecting light loss due to scene geometry. To remove the dependence on scene geometry we utilised ratios of P_n where $R_{12} = \frac{P_1}{P_2} = \frac{I_1 S_1 G_1}{I_2 S_2 G_2}$. S_n , however, is a complex function depending on the quantities and position of melanin, haemoglobin and collagen

within the skin along with other chromophores. G_n is similarly complex, dependent on the angle of illumination with the skin and wavelength of illuminating light. However, by analysing the exact variations of G_n with wavelength compared with the major absorbers elanin and haemoglobin it becomes apparent, that to a first approximation, G_n can be considered a constant. Similarly the effects of collagen can be shown to be constant across visible wavelengths to a level that impacts the measurement of melanin

and haemoglobin to a non-significant order. Considering G_n to be a constant the term R_{12} therefore depends on $\frac{I_1}{I_2}$, which is known, and $\frac{S_1}{S_2}$ which depends largely on haemoglobin and melanin. Results and conclusions: The result of this analysis is a system for non-invasively mapping the chromophores melanin and haemoglobin across an area of skin, invariant of scene geometry. Practical uses include chromophore maps of human facial skin as utilised in P&G clinical imaging systems and Astron Clinica's Dermetrics™ system providing useful information in the fields of skin aging and dermatology. A particularly useful aspect is the portable and practical nature of the technique.

023

Vibrational spectroscopy for clinical dermatology

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Few recent applications of vibrational spectroscopy, either infrared (IR) or Raman, in clinical dermatology have showed new approaches to qualitative and quantitative assessment of skin lesions *in vitro* and *in vivo*. Tissue IR microscopy has been probed in dermatopathological assessment of common benign (nevi), premalignant (Bowen's disease, solar keratosis) and malignant (BCC, SCC, MM) skin lesions. Fiber optic NIR Raman spectroscopy (RS) has been used for *in vivo* assessment of dermal oedema by estimating relative water content values in various intensities positive patch test (PT) reactions directly on the back of the patients with suspected allergic contact dermatitis. IR spectral data processing and principal component analysis showed modified and enhanced with progression to malignancy nucleic acid and protein spectral contributions. Raman spectra obtained from positive PT sites displayed distinct spectral features mainly attributed to variations in the concentration of water and proteins in the skin, and showed a possibility to quantify cutaneous oedema at positive PT sites with continuous data grading of reaction intensity suitable for clinical studies *in vivo*. Both techniques are non-destructive, sensitive and highly informative at the molecular level. At the same time, due to physics involved and accessories used, each having their own advantages and disadvantages for clinical applications in dermatology. So, IR spectroscopy was evaluated as a possible complementary technique for detection and monitoring of benign, premalignant and malignant states in skin cancer lesions *in vitro*; and fiber optic NIR RS was demonstrated as an alternative method for *in vivo* noninvasive quantification of cutaneous oedema by measuring tissues of living patients online and in real time. Although these approaches are still in their introductory and developmental stages, requiring further technological developments, optimization and data processing, IR and RS can show potentials towards their fully acceptance as rapid and specific screening tools in clinical dermatology.

020

Feasibility of skin elasticity imaging using surface topography

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The measurement of skin elasticity has potential to aid clinical diagnosis of localized skin conditions such as skin cancer. A method for imaging skin elasticity with high resolution would be desirable, since established measurement methods do not enable regional variations in stiffness to be assessed on a scale less than 1cm. Although ultrasound elasticity imaging of skin is under investigation, an optical method would be useful when skin contact is undesirable, and would also be low in cost. We have hypothesized that the microscopic skin surface topography should represent a reliable signal for displacement tracking and strain estimation. Such a signal can easily be measured by various optical methods. This study therefore assesses the feasibility of tracking skin surface topography to allow strain images to be generated. In cases where force can be measured, an elasticity image can also be produced from the strain data. Part of the aim was to provide an understanding of the optimum parameters for strain image construction. Unlike ultrasound elasticity imaging, where optimum tracking parameters are determined by speckle, in this application they are determined by the skin line pattern. For this study, silicon rubber skin replicas, taken from various skin sites and age groups, were used as phantoms. When using a slow profilometry system this allowed stress relaxation effects in skin to be avoided. Extensive strains of up to 10% were applied. The variation in skin line pattern between samples was found to be large enough to make it worthwhile estimating the optimal tracking parameters for each different sample. A procedure was therefore developed which calculates the signal to noise ratio of the strain image over a range of tracking parameters and strains, allowing optimal parameters to be chosen for each skin sample being analyzed. In general, spatial resolutions of 1mm may be achieved. Strain imaging by skin surface profile tracking is feasible. Using the method described, in combination with a force measurement, diseased skin can now be investigated to establish the value of using skin elasticity images for diagnosis.

022

In vitro calibration and validation of the reviscometer using silicone polymers as simple skin model systems

AO Bareil, K Henau and P Clarys

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, Cologne, 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.

The aims of this study were to investigate the possibility to calibrate and validate the method using various isotropic elastic silicone polymers as simple model systems for human skin. Two series of isotropic silicone polymers were used as models: first 6 Silastic rubber sheets of 2 mm thickness (Dow Corning, Seneffe, Belgium) and secondly 8 silicone polymers of 13 mm thickness (Courage-Khazaka, Cologne, Germany). In both series of silicone polymers the sheets ranged from very hard (high stiffness) to very soft materials. The silicone rubber sheets were investigated using the Reviscometer (RTT times) and the Cutometer (determination of the Modulus of Young in the Stress – Strain curves). All silicone polymers were isotropic resulting in identical RTT data when measuring at perpendicular angles (0° versus 90°).

For both series of polymers the RTT times decreased linearly from soft to hard materials. Significant negative correlations were observed between RTT times and the Modulus of Young.

In conclusion, in these isotropic silicone polymers which can be considered as very simple skin models, the RTT data decreased with the stiffness / hardness character of the sheets and support the use of these silicone polymers for calibration of the Reviscometer and the validation of this method in order to evaluate the stiffness and isotropy of a biopolymer such as human skin.

025

Ethnic skin studied by *in vivo* cross-sectional multi-modality imaging

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Goal of the study: The aim of this study was to investigate 4 ethnic populations of women (African American, Mexican, Caucasian and Chinese) at the same time and in the same location using non-invasive biophysical methods and sensorial methods. We report results obtained with *in vivo* skin imaging modalities: ultrasound operating at 25 MHz and 150 MHz, and Optical Coherence Tomography (OCT). Methodology: 360 women participated in this study after informed consent was obtained. Each ethnic population was divided in 6 age groups ([18-30]; [31-40]; [41-50]; [51-60]; [61-70]; >71]). Skin was analyzed on the dorsal and ventral forearm (sun-exposed & sun-protected areas), and on the cheek. Ultrasound imaging at 25 MHz was used for the measurement of the skin thickness, and the quantification of the dermal echo-structure based on the grey-level statistics. Ultrasound imaging at 150 MHz offers an in-depth resolution of about 15 µm allowing us to characterize the outermost layers of the skin: living epidermis and/or papillary dermis. A fiber-based non-contact OCT prototype, offering an in-depth resolution of about 10 µm, was finally used for the first time in such a large international study in order to obtain a direct comparison between acoustical images and optical images. Results: Morphological data and parameters of the dermal texture allow us to differentiate ethnic populations. Largest mean differences were obtained between African Americans and Caucasians. Mexican and Chinese mean data were between these extremes. Age-related effects were reported but with little ethnic specificity. All these results will be discussed according to the skin area. Conclusion: Non-invasive imaging modalities appear as very informative methods to further our knowledge of the morphological and physiological properties of ethnic skin and aging effects.

Determination of ageing speed and the index of elasticity loss of Caucasian and Japanese women

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In this study we attempted to elucidate parts of ageing mechanism by quantifying morphological changes induced in the micro network of the volar forearm. The replicas of volar forearm of respectively 365 caucasian and 120 Japanese healthy women, aged from 20 to 80 years, were measured by the Wyko interferometer and characterized by a new mathematical morphology approach, based on the watersheds lines and catchment basins algorithm.

To quantify the morphological signature during ageing, we study the lines network as a family of 3D patterns with a distribution density of depth, orientation and the area limited by the line network: the area of the plateaux. The family of lines are more connected to the ageing process, and permit the quantification the anisotropy of the local tensions. The loss of the elasticity can be identified simultaneously by the decrease of the secondary lines and the increase of the area of the plateaux. The algorithm developed to identify the local morphology of skin lines and plateaux area distribution is based on mathematical morphology: watersheds line and catchment basins.

The growth of the plateaux area during ageing encouraged us to use this criterion of surface to measure an index of elasticity loss and ageing speed related to the capacity of expansion of the skin plateaux area. Our results showed that in both populations important changes in ageing speed and the elasticity loss determined from the morphology signature. However these changes were found to be more pronounced in Caucasians and appear at a younger age.

028

Skin topography in different ethnic populations and versus age

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The skin micro-relief of African American, Caucasian, Chinese and Mexican women was investigated during the summer of 2004 in Chicago.

Results obtained on skin micro-relief, in terms of line density and line orientation according to the age and ethnicity of the women studied will be presented.

Materials and Methods: 310 females participated in this study and each ethnic population was divided into 5 age groups: [18-30]; [31-40]; [41-50]; [51-60]; and [61-]. The dorsal and ventral forearm skin sites were analyzed to represent sun-exposed and sun-protected areas, respectively. The skin micro-relief was investigated using a new device called SkinChip® that is based on an active capacitive pixel-sensing technology. The sensor is composed of an array of more 92,000 micro-sensors located on a 18mm x 12.8mm surface. This apparatus can map out the topography of skin in real-time. Dedicated image analysis software was used to quantify the skin micro-relief, the angles of the main orientations and the density of the micro-relief lines.

Results: It was observed that the two main directions of the micro-relief became closer together and the density of the intersection of the micro-relief decreased as the age of the skin increased. Skin differences in terms of ethnicity, sun-exposed and sun-protected areas will also be reported.

Conclusion: The SkinChip® is a non-invasive real-time imaging apparatus and its analysis of the skin appears to be a convenient way to investigate a large number of subjects to improve our knowledge of skin as a function of ethnicity and age.

030

Assessment of sun damage of the V-Neck area of the chest by the skinchip device

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A new instrument called SkinChip has been developed to characterize skin micro-relief and measure skin surface hydration. A digital sensor consisting of a large number of capacitor elements, arranged in a rectangular grid, was used. Each of these capacitor elements can assess the hydration level of a specific point on a variably hydrated surface. When this sensor is in contact with skin it produces a capacitance map of the skin. The areas of skin which are moist and in contact with the sensor glass plate, appear dark and the areas which are dry or moist but away from the glass plate, appear bright. This produces an image of the skin micro-relief showing the skin surface features along with hairs, pores etc. The hydration level at a specific point on the skin is proportional to the darkness level of that point in the SkinChip image i.e. Inverse of the gray value of that pixel. Analysis of this capacitance image can be used to assess structural changes in skin due to life-long exposure to sun. Exposure of human skin to decades of sunlight results in the gradual structural degradation and the appearance of an assortment of unwelcome signs of photodamage, viz. dyspigmentation, wrinkles, roughness and leathery appearance. We have studied the v-neck area of the chest of female volunteers showing varying degrees of sun-damage. SkinChip measurements showed decreasing corner density (of the microrelief) with increasing photodamage. The hydration measured by the SkinChip device correlated well with the hydration assessed by the traditional devices like skicon or corneometer. An interesting feature we observed was that the hyper-pigmented lesions had hypo-hydration i.e. they appeared brighter in the SkinChip image. This may be due to hyper-keratinization within the pigmented area. In this preliminary study, we have illustrated how SkinChip device may be utilized, non-invasively, to measure many structural alterations evident in photodamaged skin.

027

Variations in Stratum Corneum properties of human subjects from different ethnic backgrounds

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Understanding the similarities and differences in skin characteristics as a function of race and geographical sites could aid in the development of skin care products that better meet consumer care needs around the world. A clinical study was conducted to observe variations in skin of African Americans, Caucasian in Asian immigrants in New York. Skin barrier strength was observed by measurement of trans epidermal water loss and the number of tape strippings required to disrupt barrier. Barrier repair was measured as the number of hours required to induce 50% repair. Skin sensitivity was measured in terms of response to lactic acid sting response and skin microflora was quantitated 3 hours after washing with a mild soap. In addition biochemical composition (proteins, ceramides and low molecular weight components) extracted from D-squame® tape strippings collected on the forearm was determined. Generally skin barrier was strongest in African Americans > Caucasian > Asians. Skin barrier repair was similar for Caucasians and Asians but slower for the African Americans. Caucasians and Asians appeared to be slightly more reactive to lactic acid than the African Americans. Skin microflora was highest in African Americans. Asians had the lowest quantity of bacterial population on skin. Compared to Caucasian subjects, African Americans had a decreased ratio of ceramides/proteins, while the Asians had a similar level suggesting a more compact stratum corneum for the African Americans.

029

Characterization of human skin with the suction test – influence of the numerical models

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The assessment of the mechanical properties of human skin is a key point to better understand skin aging and skin mechanisms. It is a complex multi-layered medium which exhibits a non linear anisotropic viscoelastic behavior. Moreover as it is a living medium it must be studied in vivo. Several mechanical tests have been specially developed to measure skin response to a kind of stress. We propose to study here the suction test performed in vivo on a individual's forearm. This test is modeled with finite elements method in order to compare the experimental and numerical variations of the suction bubble as a function of the pressure applied. Then an inverse method is used to assess the required parameters. This process is based on Kalman's filters and was previously developed to deal with the indentation (compressive) test. In this study skin is simply modeled as a single-layered medium. As results hardly depend on models, we propose to compare three different elastic behaviors: linear elasticity (Hooke's law), hyperelasticity (Mooney Rivlin's law) and non linear elasticity (Young's modulus is defined as a function of the equivalent strain). Geometry is an other key point to deal with. Three thicknesses of the skin are thus considered: 0.5 mm, 1 mm and 1.5 mm. Results are then compared with those of literature. We finally conclude on this study by proposing the different works we currently focus on to get closer to more realistic behaviors.

031

Investigation of intrinsic and photoaging of human skin using the reviscometer and the cutometer

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In vivo 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. RTT measurements can be carried out at arbitrary orientations at the skin surface (0, 45, 90 and 135 °) in order to evaluate mechanical anisotropy of the skin. The classical elastic and visco-elastic properties (UR/UE, UR/UF, Modulus of Young and UV/UE) of the skin can be evaluated with the suction method (Cutometer).

The aims of this study were to investigate the aging of the skin at the volar part of both forearms (intrinsic aging) and at the front of the face (intrinsic + photoaging) in two groups of volunteers (respectively young 23 years and old 66 years) using the Reviscometer and Cutometer.

For the forearms, an anisotropy in the mechanical properties was observed in the young and elderly groups (different RTT data at different angles). When comparing the 2 groups significant decreases in RTT data were observed in the older volunteers suggesting an increase in the stiffness of the skin. As expected, comparison between young and older volunteers using the Cutometer data revealed a significant decrease in UR/UE and UR/UF and increase of the UV/UE. A trend towards an increase of the Modulus of Young suggests also more stiffness in the skin. Similar to the in vitro data with silicone sheets, a negative correlation was observed between RTT data and the Modulus of Young. The results concerning the RTT data for the front of the face (intrinsic and photoaging) are more complex for interpretation. A trend towards a decrease of the RTT data when examining the older volunteers was noticed but no significant variations in the elastic and visco-elastic skin parameters were measured using the Cutometer. In conclusion the shear wave propagation method can be considered as an useful method in order to evaluate the isotropy/anisotropy in the mechanical properties of the forearm skin in young and elderly volunteers.

State of the art of magnetic resonance imaging of the skin

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Introduction: Amongst in vivo skin imaging methods, magnetic resonance (MR) imaging and spectroscopy is of high interest not only for its ability to distinguish structures at a submillimeter scale but also for its ability to describe the physiology of the different skin layers through the measurement of intrinsic MR parameters.

Methodology: Until recently clinical whole-body MR scanners offered not enough spatial resolution for skin imaging requiring to develop dedicated gradients and specific surface RF coils in specific research centers. In this short review, we'll briefly compare image characteristics produced with these scanners to recent prospective images which can be obtained with new up-to-date commercially-available scanners.

Results: In a first part, we'll present potentialities of MR skin imaging to visualize anatomic details of the skin structure. In a second part, we'll focus on the more functional aspects offered by this technique such as the characterization of water state in the different skin layers, and biochemical information available with proton and phosphorus spectroscopy.

Conclusion: Even if MR imaging is of little interest for dermatological diagnosis, preliminary studies have shown interesting results for preoperative staging, postoperative follow-up, and assessment of the efficacy of new dermatological products. For healthy skin, MR imaging and spectroscopy is a very promising method for the study of chronological and photoaging effects.

034

Value of high frequency ultrasound in the assessment of basal cell carcinoma (bcc) borders

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Goal: Basal cell carcinoma (BCC) is the most common malignancy in humans. BCC is usually slowly growing and rarely metastasizes, but it can cause significant local destruction. For some BCC subtypes, the correct border assessment prior to surgical excision can be difficult, even for experienced surgeons. In the study, which is presented here, the potential of sonography utilizing High Frequency Ultrasound (HFUS) in the 20 MHz and 100 MHz range for the preoperative assessment of BCC depth and size has been investigated. We have screened 37 patients with different types of BCC prior to their surgical excision. **Methods:** 37 Caucasian patients, aged over 18 years (20 male, 17 female, mean age: 47.8 years) were included into the study. After visual inspection by a physician, the BCC were photographed and scanned with 100 MHz and 20 MHz HFUS (taberna pro medicum GmbH, Lüneburg, Germany) in two perpendicular cross sections located around the assumed center of each BCC. The tumors were surgically removed after HFUS imaging. **Results:** Maximum depth and maximum diameter of each tumor were independently measured by two dermatopathologists analyzing the acquired HFUS images and histological specimens. High correlations between the maximum depths, which have been measured with 100 MHz and 20 MHz HFUS, and the maximum depth given in the histological cuts (100 MHz HFUS / histology: $r=0.93$; 20 MHz HFUS / histology: $r=0.79$) and between the maximum diameters (100 MHz HFUS / histology: $r=0.87$; 20 MHz HFUS / histology: $r=0.78$) was found. **Conclusion:** A high correlation between the dimensions of BCC, measured with 20 MHz and 100 MHz HFUS with the histological cuts was found. Because of higher spatial resolution 100 MHz correlated more with the histological results than 20 MHz. The next clinical approach should be a tumor border marking prior to surgical excision with High Frequency Ultrasound.

036

Quantification of rosacea by videocapillaroscopy.

Retrospective and comparative review of five studies

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Digital videocapillaroscopy is a valuable tool to measure rosacea and understand the associated vascular phenomena. This technique provides images which are useful for the study and follow-up of the evolution of rosacea in patients tested in the fields of dermatology or cosmetology. We have developed a new example-based filtration method which provides the automated detection of affected areas, their number and surface. The neural filtration classifies rosacea according to saturation and redness and its originality lies in its use of a computer learning approach set up from representative and characteristic images.

We applied the same learning method, thus the same colorimetric expertise, in 5 active-versus-placebo studies. All the tests were carried out in Besancon (France) between 2000 and 2005 on patients with light rosacea. The results were completed by chromametry and digital imaging.

The aim of this retrospective review is to compare the results obtained by this detection method. The statistical analysis compares the effects of different actives, while showing the possible influence of season and age as well.

033

Aging the elastic parameters of human epidermis: the role of langer's line and skin anisotropy

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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. On this set of studies we have found an instrument, skin sites and a means of calibration that provides a sensitive means of assessing changes in the skin elastic properties and how the shear wave propagation distribution along and across the Langer's Line can be used to evaluate skin as a function of age. The instrument chosen - the Reviscometer RVM 600- determines the directional dependence of the speed of sound in the skin, the skin site chosen was the upper inner arm and a set of elastomers were chosen to provide an objective calibration of the instrument. Using this instrument we developed a new measurement procedure that we will call Angular Reviscometry. Based on the Angular Reviscometry we determined two parameters that provide a sensitive assessment of the changes of the elastic properties of the skin with age and a means of assessment of the number of years of age reversal that is generated by skin firming/lifting products. A comprehensive study shows that the Reviscometer[®] readings can measure the distribution of the tension directions in skin as well the Anisotropy and a Angular Dispersion of the Acoustical Signal (ADOTAS) which provide a new mechanical parameter to access the age of skin. Defined new mechanical parameters can differentiate age groups from babies to 65 years old ($p<0.001$).

035

Non invasive diagnosis of atypical nevi with 100 MHz ultrasound and optical coherence tomography

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Goal: Melanocytic nevi are initially benign neoplasms or hamartomas, which are mostly composed of melanocytes. These nevi are normally visually classified by the ABCD-rule (asymmetry, border irregularity, color and diameter). Even for experienced dermatologists it is not always possible to distinguish between normal and atypical nevi. Modern High Frequency Ultrasound (HFUS) and Optical Coherence Tomography (OCT) allow to image suspicious nevi non invasively over depth. In a study, which is presented here, we have screened 16 patients for atypical nevi with HFUS and OCT in a multi modal imaging approach. **Methods:** 16 healthy, not randomized Caucasian patients, aged over 18 years (10 male, 6 female, mean age: 44.6 years) were included into the study. After visual inspection by a physician, all suspicious nevi were marked, photographed and scanned with 100 MHz and 20 MHz ultrasound (taberna pro medicum GmbH, Lüneburg, Germany) in two perpendicular cross sections. Afterwards, OCT images were acquired with a SkinDex 300 OCT system (Isis optronics GmbH, Mannheim, Germany). Cross sectional images were acquired at the center of the nevus and in healthy skin. **Results:** Size and structure of each nevus were quantified analyzing HFUS and OCT images. Based on these data, in 4 cases additional surgical excision of suspicious nevi were performed. In all 4 cases the histological results confirmed dysplastic nevi. The comparison of the histological probes with HFUS and OCT results showed a high correlation in maximum depth ($r=0.96$) and diameter ($r=0.82$). **Conclusions:** For borderline nevi, predictions based on the visual ABCD-approach are unreliable, but the proposed multi modal imaging approach with HFUS and OCT delivers valuable additional information to the physician. However, we are still not able to provide a clear cut differential diagnosis.

037

Cellulite and adipose tissue characterization by quantitative MRI analysis

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Goal of the study: Although this area is a major esthetical concern for women and therefore a leader market area for cosmetic companies, the cellulite characterization is principally based on visual classification and very few research tend to really characterize the adipose tissue. The aim of this study is to evaluate the potential of quantitative MRI for differentiate tissues and especially stage of cellulite evolution. **Methodology:** A set of 15 women partitioned in 3 groups of different cellulite stages, from low to infiltrate were scored by a physician. 10 men were also selected, 5 normal and 5 presenting obesity. Patients were scanned on a 1T MRI with a multi spin echo scan without injecting any contrast media. Not only a view of the thigh was performed but also of the abdomen. Women were scanned twice at 15 days to evaluate an eventual effect of menstrual cycle. **Mathematical analysis of the relaxation of the magnetic signal enabled transverse relaxation time (T₂) images to be computed, which are quantitative since they relate to the tissue and not to the acquisition method. Results:** First it is shown how the procedure can be efficiently implemented for characterizing adipose tissue. A bi-exponential relaxation is measured. Increasing grade of cellulite is associated with an increase of the long relaxation time (T₂). This is associated with metabolic differences and changes in chemical contents of a dipocytes. **Conclusions:** This pilot study shows how quantitative MRI leads to more information than simple hypodermal thickness measurements and that it enables to distinguish different grade of cellulites. It could lead to a universal grade scale which does not yet exist. A high potential exists not only for product efficiency testing but also in very common medical concerns such as obesity.

Session VIII: Poster Discussions

Chairs: Marty Visscher and Klaus Wilhelm

P039

Capacitance imaging of the hand skin: Effect of age and cosmetics

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Goal of the study: To investigate by means of the new "Capacitance Imaging Technique" (CIT) the effect of age and of cosmetics on the hand skin characteristics.

Methodology: Two experiments were carried out in vivo on the top of hands of volunteer women. In the first study, 57 women of different ages were enrolled. Skin images were obtained on hands open, closed and re-open. In the second study, 29 women treated one of their hands with a cosmetic cream for three weeks. Skin images on the treated and controlled hands were recorded. From each image some parameters were extracted: Mean Gray Level (MGL), Mean Gray Level of the thresholded histogram (MTH20) and Corner Density (CD). Skin smoothness was also clinically assessed. Results: There is a significant decrease in the primary lines density given by CD versus age, but no change in the skin surface hydration. All the parameters are changed according to the hand positions. Treating the skin increases skin hydration but also the lines density, some lines are indeed reappearing. Skin smoothness is more related to micro relief density than to age. Skin pigmented spots appear as dehydrated zones. Conclusion: Results in general illustrate the great importance of the way of life on both the subjective and objective skin parameters. Chronically applied, an efficient cosmetic cream may counterbalance some detrimental effects of environment and age. In a very routine way, CIT allows both to characterize skin micro relief and to see and measure hydration with a great 2D resolution.

P041

Automated measurement of epidermal thickness from OCT images

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Optical coherence tomography (OCT) provides a non-invasive method for in-vivo imaging of subsurface skin tissue. OCT of skin is performed using near-infrared (NIR) illumination and typical images have a resolution of ~5 µm and a penetration depth of several hundred micrometers. Many skin features such as sweat ducts and blisters are clearly visible in OCT images. Despite many promising reports, OCT of skin still faces difficult hurdles to widespread adaptation by the dermatological community. Among the chief obstacles is the lack of availability of image processing routines that can identify features in OCT images and perform measurements based on such image segmentation.

Epidermal thickness and the local shape of the dermal-epidermal junction (DEJ) are important factors for evaluating skin health, aging, and photodamage, and should be monitored accordingly. Despite this fact, few studies have addressed the measurement of epidermal thickness from OCT images. To date, the most common approach for measuring epidermal thickness with OCT is to perform an A-scan, but this method does not account for curvature of either the skin surface of the DEJ. Furthermore, more comprehensive analysis of skin structure for dermatological diagnosis will require some sort of automated feature recognition. Shapelet analysis is an image processing tool that is used to segment an image or data set by matching features in the image to a defined target "basis-image", or shapelet, that correspond in size and shape across multiple length-scales and orientations. The use of shapelets has the advantage that the form of the basis function is not restricted mathematically and so can be chosen from a wider array of functions to optimally match the desired features in the image. We will report our progress in using shapelet-based image processing techniques to identify the DEJ and measure epidermal thickness from skin OCT images in an automated fashion, and demonstrate that this analysis provides superior results compared to manual feature identification and A-scan.

P038

Novel facial prototyping techniques for characterizing improvement to skin appearance in clinical study panels

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Background: Improvement to skin appearance with healthy or anti-aging treatment regimens typically involves improvement along multi-dimensional appearance scales. Facial averaging, or morphing has evolved as a powerful tool for characterizing healthy and photoaged skin, and understanding key drivers of attractive appearance.

Goal: The objective of this research was to characterize facial skin groups on multidimensional scales, and to track average panel improvement using subject- and expert-perceivable 2D averaging techniques.

Methodology: Calibrated digital images of female subjects (ages 20-68) were captured. Facial averages were computed for subjects in different decade groups: 20s, 30s, 40s, 50s, and 60s, with 8-12 subjects in each age group. The difference in age groups represented a composite of both intrinsic and extrinsic aging factors. In a separate regimen study, digital photographs were taken of the subjects at baseline and after 1 and 2 weeks of product application, following a twice-daily regimen of mild cleansing and moisturization. Facial averages of the panel were computed at baseline, and after each week of the product application regimen.

Results: Resulting facial average/prototypes were assessed by experts and considered to accurately represent features within the correct age group. Additionally, improvement observed to facial averages post-application were confirmed by dermatologic assessment and subject self-perception.

Conclusions: The advantages of the proposed facial averaging techniques over other image processing algorithms is that there are no a priori assumptions on areas or features that improve, and only the important features/sources of variation that are representative of the whole panel will appear in a facial average. Facial prototyping and modeling can therefore drive the development of more relevant objective measures in 2D and 3D.

P040

Localisation of intradermal hyaluronic acid injection using high resolution quantitative MRI

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Goal of the study: In the last few years, increasing use of injectable resorbable fillings has been reported for facial wrinkle treatment. However, the physiological processes involved such as the localisation and subsequent diffusion of the injected product in skin tissues are poorly documented. This may be achieved using a quantitative MRI technique which is duly presented as a pilot study.

The aim was to demonstrate how intradermal injections of hyaluronic acid (HA) may be monitored through quantitative magnetic resonance imaging (MRI), a non-invasive technique performed without the use of any contrast media. Methodology: HA was injected intradermally in the forearm of a young male volunteer. High resolution MRI scans using a surface antenna were performed just after injection, and after 1, 3 and 9 months. High resolution MRI is required due to the thickness of the dermis being approximately 1mm. Mathematical analysis of the relaxation of the magnetic signal enabled transverse relaxation time (T_2) images to be computed, which are quantitative since they relate to the tissue and not to the acquisition method. Results:

Using classical MRI the HA injection is barely visible, but with quantitative MRI the zone of injection is clearly seen as a bright zone. This is due to HA having a distinctly different relaxation time compared to dermal and hypodermal tissues. By monitoring this parameter over time, changes in its absolute value and tissue distribution were observed up to 9 months from injection, indicating HA diffusion into surrounding tissue. Conclusions: High resolution quantitative MRI as opposed to classical MRI is an appropriate technique for visualising intradermal injection of hyaluronic acid.

P042

High-frequency elastography for the in-vivo study of the mechanical behavior of skin

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Goal of the study: Skin diseases often involve a reorganization of cutaneous tissue, which may result in mechanical modifications to the skin. Thus the measurement of the skin's mechanical properties may provide functional information on those processes. But its analysis through usual mechanical tests remains a hard task because in addition it is performed without taking into account the particular geometry of the tissues. Thus we present a high frequency ultrasound technique called elastography for imaging the deformation of skin structures when an external stress is applied. Methodology: The method consists of tracking the modification of the echographic signal due to local tissue displacement. First, all computing algorithms were developed and tested by simulations methods. Then, experiments were conducted with a 20MHz real time ultrasound scanner in combination with an Extensometer device, developed by our group. Mechanical behavior was described according to the axial strain and lateral displacements induced in the tissue. Results: The experimental setup and the deformation mechanism were checked on inert material. When the material is stretched, displacement along the stretching direction is well observed but also shrinkage on the lateral sides and in depth. After these controls it is shown by being tested on many patients that the method is well efficient in-vivo. Classical displacements behaviors are found for the stretching direction and sides ones. These are quantified. But also a very surprising observation is made, the dermis had a quasi-homogeneous axial thickening while it is extended. Further studies are performed to lead to a better insight of this phenomenon. Conclusion: As it presents a precise image of local deformations the potential of elastography is shown for healthy and diseased skin characterization. Moreover an unusual deformation mechanism of the dermis when extended has been proved.

Session VIII: Poster Discussions

Chairs: Marty Visscher and Klaus Wilhelm

P043

Assessment of spray application of Saint-Gervais® water Effects on dry skin. Comparison with three other thermal spring waters

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Goal of the study: To quantify the influence of spray application of thermal spring waters (TSW): Saint-Gervais® water and three other waters with low, medium and high mineral contents respectively on the hydrophobic tendency of dry skin and to compare the spreading of these TSW on the skin through contact angle (θ) measurement. **b) Methodology:** 20 healthy volunteers having a lipid rate below $100\mu\text{g}/\text{cm}^2$ ($24, 4 \pm 3, 7$ years of age) were included in the study. Several measurements such as the hydration index (HI), cutaneous temperature ($^{\circ}\text{C}$) and pH, and the measurement of θ between the skin and waters were recorded before and immediately after and 30 minutes after the application of thermal spring waters. **c) Results:** Skin hydration significantly increased immediately after and 30 minutes after the application of two TSW: Saint Gervais® water and TSW with medium mineral content. Concerning $^{\circ}\text{C}$, all TSW had a refreshing effect with a very significant effect ($p < 0.001$) with Saint Gervais® water and TSW with high mineral content. $^{\circ}\text{C}$ returned to basal values 30 minutes after TSW application. The pH of the skin was increased immediately after the application of all TSW but it returned to basal value 30 minutes only after the application of Saint-Gervais® water. The skin's affinity for TSW was higher than that of bi-distilled water and it was illustrated by a significant lower θ than that measured between the skin and bidistilled water. The skin's affinity for water was very significantly improved ($p < 0.001$) immediately after the application of Saint-Gervais® water and significantly increased ($p < 0.05$) immediately after the application of TSW with high mineral content. **d) Conclusion:** In this study, Saint Gervais® TSW came in the first place amongst the four TSW tested for criteria such as HI, $^{\circ}\text{C}$, pH and θ .

P045

Rapid measurement of TEWL with a condenser chamber instrument

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The aim of this study was to develop a protocol for the rapid measurement of TEWL for a condenser-chamber instrument.

There are two main components to rapid TEWL measurement: (i) the measurement time itself and (ii) the recovery time before the next measurement can be started. The established TEWL guidelines for open-chamber instruments recommend taking a recovery time into consideration before starting the next measurement. With unventilated-chamber instruments, speed is determined more by time spent clearing the chamber of accumulated vapour than by time spent measuring flux. Condenser-chamber instruments are different, because the active microclimate control maintains consistent measurement conditions, permitting measurement protocols without recovery time to be developed. Volar forearm skin of a healthy volunteer was divided into 7 regions and the TEWL measured in sequence by means of a condenser-chamber instrument (AquaFlux Model AF102, Biox Systems Ltd, UK) for a total of 12 repeats. These 84 measurements were performed in 89 minutes by moving the probe rapidly from site to site, without any recovery delays. TEWL values were found to increase from $11.9 \text{ g m}^{-2} \text{ h}^{-1}$ (elbow) to $16.3 \text{ g m}^{-2} \text{ h}^{-1}$ (wrist), with coefficients of variation ranging from 2.6% to 4.4%. Measurement time can be further reduced by adjusting the measurement termination criteria in the software. Results to underpin this measurement protocol will be presented.

The main finding is that the accuracy of condenser-chamber TEWL measurements can be maintained in a rapid site-hopping measurement protocol.

P047

A global test of skin color measurement devices

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Goal: Color measurement of human skin is often done with commercially available instruments that may be quite costly. When studies are conducted in multiple locations around the world, it may be necessary to use different instruments. This study was conducted to estimate the variability within and between the instruments to assess their potential for use in such global studies.

Methodology: In the period April 2004 – May 2004 a color print with 15 different patches of realistic skin color was measured in seven different cities in 6 countries, using seventeen chromameters. All instruments provided CIE Lab values (L^* , a^* and b^*). **Results:** Between instrument variability is very large compared to the within- and between subject variation. Expensive spectrophotometers showed the largest variation. A low cost tristimulus chromameter showed highly consistent results.

Conclusions: Care should be taken with colorimetry using different devices. The proposed test can be used to make decisions on which instrument to use.

P044

Acute Barrier Disruption: Glycerol-based emollient enhances barrier homeostasis, stratum corneum hydration and in vivo comeocyte morphology (in vivo confocal microscopy)

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Background and Aim: Glycerol is known to exert barrier repairing and moisturizing properties. The underlying mechanism for the barrier repair after an acute insult is still under discussion. Furthermore, most of the studies on glycerol-based emollients are not placebo controlled. The aim of the study was to test effect of a glycerol-based emollient vs. placebo on barrier homeostasis and SC hydration after acute disruption of the skin barrier. Furthermore, we investigated the effect of glycerol on comeocyte morphology assessed by *in vivo* confocal microscopy.

Methodology: 24 healthy volunteers (age: 20-30 yrs.) were studied in a controlled, randomised, double-blinded study, on the volar forearm after sequential tape stripping with 2 application per day over 3 days of a glycerol-based emollient vs. non-glycerol containing placebo. The endpoints were: Barrier homeostasis, SC hydration and *in vivo* comeocyte morphology assessed by *in vivo* confocal microscopy.

Result: Barrier recovery after acute disruption was faster on glycerol treated sites vs. placebo. Furthermore the SC hydration was significantly higher during the entire study on the glycerol treated areas compared to placebo. Faster comeocyte morphology normalization after tape stripping could be detected on the glycerol-treated sites compared to placebo.

Conclusions: In summary the present study shows a clear benefit of glycerol vs. placebo on barrier homeostasis, SC hydration and comeocyte morphology in a model with acute barrier disruption. Our data is indicative that glycerol as an active ingredient in the tested formulation does not only add moisture to the SC but also normalizes comeocyte morphology and thus enhances barrier repair.

P046

Closed chamber and open chamber TEWL Measurement: A comparison of DERMALAB® and AQUAFLEX AF102 instruments

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Introduction: Transepidermal water loss (TEWL) is a measure of the amount of water vapour passing through the skin by passive diffusion. Conventional technologies for conducting TEWL measurements use an open chamber head, which is affected by environmental conditions and requires the reading to be taken with the head in a horizontal position. Recently closed chamber TEWL devices have become available. These devices have the advantage of being used with the probe at different angles and are less affected by air turbulence. **Goal:** The objective of the current study was to investigate how the open chamber Dermalab® TEWL instrument (Cortex Technology, Hadsund, Denmark) compares with the closed chamber Aquaflux AF102 TEWL (Biox, London, UK) at selected body sites (scalp, calf, upper and lower inner forearm).

Methodology: Female volunteers ($n=16$, age 21-52) underwent a 3 week run-in phase where they used controlled personal care products on the body sites to be measured prior to the measurement session. All TEWL measurements were taken in a temperature and humidity controlled room (temp. $20 \pm 1^{\circ}\text{C}$ & RH $55 \pm 5\%$). Three readings were taken at each body site with both TEWL instruments. Results were analysed using correlation analysis. **Results:** A correlation was observed between readings from the Dermalab® and Aquaflux AF102 TEWL instruments ($r=0.5088$ overall, $p < 0.0001$). Both instruments were able to differentiate between body sites with forearm giving the lowest TEWL scores and scalp the highest ($p < 0.05$). There was a significant difference between readings with the Aquaflux AF102 giving higher TEWL values than the Dermalab® ($p < 0.0001$). For Aquaflux the coefficient of variance was lower for the scalp readings than the Dermalab (0.06 & 0.11 respectively). **Conclusions:** The Aquaflux AF102 and Dermalab® are both reliable tools for measuring TEWL. The Aquaflux may be more suitable for use on scalp.

P048

Measurement of skin shine

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Shine has been known to be an important attribute of skin. Skin shine can go from being acceptable in the low to moderate ranges to oily, greasy and unacceptable at high levels. There are currently multiple methods of analyzing skin shine and this presentation detail a method for acquisition and image analysis of skin images to quantify shine.

A novel, non-contact, non-invasive and quantitative measure of skin shine has been developed. The method helps us to better understand skin shine and product effects to control the same. The technique is based on parallel-polarized microscopy followed by image analysis of the acquired images. A Chamview® Microscope was used with a 30X magnification lens under parallel polarized condition. MGI PhotoSuite III was used to capture images in Bitmap format. A program in IDL was developed to process the captured images and list results in a text file. Shine intensity was defined as the cumulative intensity if the top 10% of pixels in the captured image. 4 naïve consumers were used to visually grade skin shine using a grading scale. Shine grades before and after product application were compared and documented and compared to the shine intensity calculated from the images. The instrumental method provides similar results as the visual assessment for different products at different dosages.

Session VIII: Poster Discussions

Chairs: Marty Visscher and Klaus Wilhelm

P049

A novel method to evaluate barrier protection potential of commercial lotions

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By nature, occlusive patch testing generally results in exaggerated irritation and barrier damage. The intensity of the reaction is based on several different factors including the volume, concentration, mode of application, and exposure time. Another important factor is skin condition since a compromised stratum corneum will react more severely than undamaged skin.

Historically, most occlusive patch testing techniques within the cosmetics industry seek to measure the irritation potential of products for safety purposes. Perhaps the most common method for quantifying irritation is by using transepidermal water loss (TEWL) as a measure of barrier quality and function.

While patch testing is generally associated with irritation and sensitization testing, it can also be a useful tool for assessing the effect of products to improve skin quality and/or resist the damaging effects of a skin irritant. For example, post-irritation application of cream has been tested to investigate whether this improves barrier function recovery time. Repeated application of the test cream showed an improvement in recovery time versus an untreated control. Another test showed that pre-treating skin with various alpha hydroxyacids (in a base cream) before applying the occlusive patch with irritant helped prevent barrier damage.

To further explore the effects of topical skin-care products in the prevention and recovery of barrier damage, we have developed a novel approach of patch testing designed to evaluate the barrier protection potential of commercially available lotions. Sites are pre-treated with lotions and then patched with a known irritant. When patches are removed and sites have recovered from the effects of occlusion, an assessment of barrier damage is performed using TEWL and visual grading. Where untreated sites exhibit an increase in TEWL and visual dryness grading, suppression of this damage in treated sites is an indication of barrier protection of the lotion. Using this approach, the relative protective quality of commercial moisturizing lotions was evaluated.

P051

The study of dermoscopic findings for seborrheic keratoses

- A morphological study

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Goal of the study: In the past 2 decades, there has been a rising incidence of malignant melanoma. Seborrheic keratosis is the one of the most common benign condition in Korean people, and it should be distinguished from melanocytic pigmented skin lesions such as malignant melanoma, at the first level of dermoscopic examination.

To describe morphological features of seborrheic keratosis as seen by dermoscopy and to investigate their prevalence.

Methodology: We performed a retrospective study using clinical charts, pathologic slides, and dermoscopic photographs for the documentation of seborrheic keratoses. A total of 32 facial pigmented lesions (from 30 patients), which were diagnosed pathologically as seborrheic keratoses, were collected. We described dermoscopic findings of them, such as milium-like cysts, comedo-like openings, cerebriform appearances, pigment networks.

Results: Nine morphological dermoscopic criteria were identified. Standard criteria such as milium-like cysts and comedo-like openings were found in many cases (22 and 21, respectively). Most of the lesions had sharply demarcated border (31), and some of them had moth-eaten appearance on the margins (14). We found pigment networks, which is known to be a characteristic finding of melanocytic skin lesions, to be present in 8 lesions (25.0%). Using standard diagnostic criteria for seborrheic keratosis, 8 lesions would not have been diagnosed as such.

Conclusions: The classic dermoscopic criteria for seborrheic keratosis (milium-like cysts and comedo-like openings) have a high prevalence, but the use of additional dermoscopic criteria such as cerebriform appearances, fingerprinting appearance, sharp demarcation, and moth-eaten borders may improve the diagnostic accuracy.

P053

Tissue water in arms of women with Postmastectomy Lymphedema

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Goal: To determine the differences in dielectric constant between normal (N) and edematous (E) arms of patients with unilateral lymphedema as an index of relative skin tissue water content. Because the relative dielectric constant is sensitive to tissue water content, we hypothesized that patients who had experienced arm lymphedema secondary to breast cancer treatment would show significantly elevated values. Methodology: Relative arm skin tissue water (RTW) was determined based on the measured dielectric constant (0-80) at 300 MHz in N and E forearms of women using the Delfin MoistureMeter-D. Measurements were made before the start of treatment at a standardized site on the volar forearm seven cm distal to the antecubital crease. Different skin depths were assessed in triplicate using four probe sizes that targeted depths of about 0.5, 1.5, 2.5 and 5 mm. Volumes (VOL) and edema of a four cm segment encompassing the RTW measurement site were determined by arm girth measures and calculations based on an elliptical frustum model. Edema percentage was calculated as $100(VOL_E - VOL_N)/VOL_N$. Results: Segmental volume measurements showed that VOL_E was significantly greater than VOL_N (251 ± 48 vs. 184 ± 40.6 ml, $p=0.003$) with an associated edema of $37.9 \pm 19.8\%$. Corresponding RTW values were also all significantly greater in E for all depths (Table)

	Target Depth (mm)			
ARM	0.5	1.5	2.5	5.0
Lymphedema	44.6±9.0	38.1±6.0	37.3±8.6	28.7±5.5
Control	30.7±3.4	27.7±2.7	24.5±3.3	19.1±2.6
p-value	0.003	0.002	0.010	0.007

Regression of the mean values obtained for each probe shows a parallel decrease in measured RTW with increasing depth for both E ($R^2=0.920$) and NE arms ($R^2=0.977$). Conclusions: These initial findings suggest that this method may serve as a rapid quantitative assessment procedure for documenting lymphedema and possibly for early detection of incipient lymphedema that is not yet clinically observable.

P050

Examination of cellulite using in vivo confocal microscopy

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There is little coherency or consistency within the scientific literature as to the manifestation of the cellulite condition which is not a skin disorder, disease, nor a tissue dystrophy, but an inevitable reality of the genetic makeup of the female human species interlinked with steroid hormones and external influences. There are a number of clinical methods available to evaluate the cellulite condition though the limitations of each method alone are such that more than one method is required in order to correlate clinical findings with any laboratory findings. In vivo confocal microscopy (CFM) using a Vivascope 1500, was employed in a recent study in an attempt to identify specific characteristics of subcutaneous cellulite based on published histopathological findings. The main objective was to determine the impact of cellulite adipose protrusion at the papillary dermis, using in vivo confocal microscopy in the subcutaneous adipose in healthy non-diabetic, females was compared to that of healthy non-diabetic, males. Initial results found that 'striae' were seen penetrating into papillary dermis, which were not seen in male skin. Surrounding these 'epidermal' striae, - which were located and observed within the epidermis at the basal-spinous cell layers - were strands of sclerotic collagen fibers. Clear differences were observed between females with average BMI and females with greater than average BMI. With regard to the observed collagen patterns, in all males, these were random and sparse at all sites. In females with average BMI, collagen patterns on the front thigh were also random and sparse, however at the side and back of the thigh the collagen was stretched (resembling striae). Furthermore at the back of the thigh in females, dark fluid filled spaces were observed. Resolution in average BMI women was still permissible with resolution of blood flow and individual collagen fibers. In females with greater than average BMI at all sites collagen was stretched (resembling striae) and many dark fluid filled spaces were observed at all sites compared to females with average BMI. Resolution in greater than average BMI women was not permissible with loss of resolution of blood flow and individual collagen fibers. The observed dark fluid filled spaces index matched to water. Another observation particular to female skin was the presence of so-called 'puncture' zones surrounded by blood flow. The collagen appeared very dense and 'stretched' in one direction and the epidermis very thin with little resolution of the basal cell layer. Although the observations appeared as actual 'holes', they are not considered at this stage of investigation to be actual adipose tissue puncturing the dermis but tightly packed dermal papillae. However neither is it ruled out that they are where adipose had protruded through, since this is common place under pressure. The limitations of this technique as with other image analysis systems is obtaining clear resolution beyond the upper portion of the dermal papillae.

P052

Evaluating efficacy of novel in-shower moisturizers using

Near infrared imaging

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In-shower moisturizers are a novel class of products in the market place today that hydrate skin by helping to retain the moisture it absorbs in the shower. Moisturization efficacy of these products can be evaluated by measuring changes in skin hydration levels over time after use of the product and by expert visual evaluations of skin dryness. In this poster we discuss the application of a new method - near infrared imaging - that directly measures skin hydration, in evaluating moisturization efficacy of this novel class of products. Comparison of hydration measurements in a short term test (single application, 4 hrs) vs long term (repeat use, 5 days) suggest that short term hydration improvements are indicative of longer term skin condition improvement. Correlations between the electrical methods for measuring skin hydration and the NIR method as well as changes in visual appearance of skin are discussed.

P054

Image analysis techniques for objective quantification of the efficacy of different depilation methods

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In the field of consumer use cosmetics for hair removal and hair growth reduction there is a need for improved quantitative methods to enable credible claim support. Optimized endpoints are currently lacking that compare the efficacy of standard methods such as shaving or plucking with new methods and products.

Non invasive image analysis to assess hair growth was investigated for this purpose. We describe an in vivo test using image analysis with the parameter time of re-growth as an endpoint. This endpoint is found to be appropriate to assess the efficacy of hair removal methods the same as hair growth reduction treatments. Setting the new endpoint in relation to ordinary shaving, a relevant and easy understood efficacy parameter can be obtained.

Compared to shaving, for plucking of female leg hairs the re-growth speed was found to be reduced by approximately 10 days.

Closeness of hair removal and visible signs of skin irritation can be assessed as additional quantitative parameters from the same images. Discomfort and pain rating by the volunteers complete the set of parameters, which are required to benchmark a new hair removal or hair growth reduction treatment.

Session VIII: Poster Discussions

Chairs: Marty Visscher and Klaus Wilhelm

P056

Skin texture improvements with mild cleansing

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Skin texture (surface topography) can be described at various length scales, is closely linked to skin appearance and can be influenced by hydration, exfoliation and cellular regenerative mechanisms in the stratum corneum and epidermis. Several methods including visual assessment, photographic analysis and instrumental techniques are used to evaluate changes in skin texture induced through use of skin care products. In addition subjective self-assessment is also often used to estimate product effects. We have recently investigated the skin texture improvement benefits of mild cleansing using a group of mild-moderate photo-damaged women. In a 4 week, double blinded, 1/2 face clinical trial it was found that daily cleansing with a mild syndet bar leads to significant improvements in skin texture compared to daily cleansing with regular soap. Skin texture changes were evaluated using a variety of methodologies such as expert dermatologist assessment, subject self-assessment, analysis of photographs and direct in-vivo texture determinations using the PRIMOS, 3D in-vivo texture analyzer. Improvements in texture are seen to translate into consumer perceived improvements in skin appearance.

P057

A method to determine the efficacy of moisturizers with sunless tanning ingredients

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Dihydroxyacetone (DHA) has long been known for its properties as a skin colorant. Products that contain DHA are promoted as self-tanners. In the past, most self-tanners resulted in an uneven and orange-looking coloring of the skin. Recently, several daily use moisturizers that contain low levels of DHA have been marketed. These products aim to subtly darken the skin with each use for a natural looking summer glow.

We have developed a method to evaluate the color development of these products. A measured amount of product is applied once daily for five days on the forearms. Chromameter readings are taken before any product usage and at Day 3 and Day 5. Panelists fill out a questionnaire regarding the evenness and appropriateness of the color. Also, using an evenness scale that we developed, a clinician grades the evenness of color on different sites. This protocol allows us to examine the development of color over time and to measure the evenness of color.

P058

What is shoulder stiffness?

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Goal of the study: Many Japanese complain of shoulder stiffness as a physical ailment. Shoulder stiffness was the third most common condition for men with physical ailments and the most common condition among women in the 2001 National Health Survey conducted by the Ministry of Health, Labor and Welfare of Japan. Shoulder stiffness is uncomfortable and can cause esthetic problems such as pale facial color. Although most Japanese can relate to shoulder stiffness, few studies have been conducted and no clear definition has been established. To improve shoulder stiffness, objective evaluation of the condition is necessary. The present study aimed to gather objective data associated with shoulder stiffness. Methodology: According to dictionaries and references, abnormally tense and hard muscles around the shoulder represent a common feature of shoulder stiffness. In addition, persistent muscular tension hinders blood flow. The following investigations were therefore performed in 41 Japanese women: 1) subjective assessment of the severity of shoulder stiffness using a 4-point grading scale; 2) measurement of shoulder muscle hardness using a muscular rigidity analyzer; and 3) measurement of total hemoglobin and oxyhemoglobin levels in shoulder muscles using near-infrared spectroscopy. Correlations among these parameters were examined, with $p < 0.05$ considered statistically significant. Results: Shoulder stiffness score correlated significantly with muscle rigidity and both total hemoglobin and oxyhemoglobin levels. In addition, muscle rigidity correlated significantly with total hemoglobin and oxyhemoglobin levels. Conclusions: People who are aware of shoulder stiffness have hardened shoulder muscles and reduced blood flow. Reducing shoulder muscle rigidity or increasing blood flow would appear to be effective for improving shoulder stiffness. However, shoulder muscle rigidity correlates with levels of total and oxygenated hemoglobin. Blood flow to the shoulder muscles can thus be improved by relieving abnormal shoulder muscle tension and relaxing the muscles.

P059

An innovative method to measure skin pigmentation

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Goal of the study: It is crucial to establish an accurate method for measuring skin pigmentation in cosmetic science and clinical dermatology. To evaluate the degree of pigmentation of the skin, this study establish a non-invasive method for measuring melanin content in the skin precisely.

Methodology: (1) The reflection spectrum of the skin was measured with a spectrophotometer. An absorption spectrum of the skin was calculated from the reflection spectrum. The concentration of melanin and hemoglobin were determined from the skin absorption spectrum by multiple regression analysis (SR Method), assuming that the absorption spectra of the skin is expressed as a linear summation of the absorption of melanin and hemoglobin according to Lambert-Beer's law. (2) The skin change in volar forearm which had been irradiated by UV was observed daily by two different methods including a Mexameter MX-16 and SR method.

Result: (1) Multiple regression analysis with an absorption spectrum of 500 - 700 nm was performed, because an absorption spectrum less than 500 nm is affected by the light diffusion effect of the dermis. The multiple correlation coefficient was 0.993, resulting in a satisfactory precise estimate of the quantity of melanin and hemoglobin. (2) The quantity of hemoglobin measured by SR method increased within 1 to 2 days after UV irradiation and then decreased gradually to the initial value for 9 days. This phenomenon was confirmed by erythema index by Mexameter. The quantity of melanin monitored by SR method increased until 8 days after UV irradiation and decreased gradually afterwards. On the contrary, the melanin index of Mexameter decreased for 3 days after UV irradiation, then increased until 8 days, and gradually decreased.

Conclusions: SR method can evaluate the changes of epidermal melanin induced by UV irradiation. The estimated melanin content by SR method is a good correspondence with naked-eye observation. The method can allow us to measure pigmentation with high accuracy, and eventually helps us to develop whitening and suncreening cosmetics.

P060

Critical study of hair growth analysis with computer assisted methods

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Computer assisted image analysis has been proposed for human hair growth studies. The performances of Trichoscan, a commercially available automated system combining epiluminiscence microscopy with digital image analysis, developed for office-based hair growth measurements, have been evaluated comparatively on the same skin sites using standardized photographic equipment and calibrated processing for contrast-enhanced phototrichogram (CE-PTG) analysis. This reference method has been validated with scalp biopsies and histological examination of serial sectioning.

Besides edge effects, hair fibres escaped the Trichoscan analysis for various reasons including, but not limited to, thickness, pigmentation, closeness, and hair fibre crossing. Most of these problems have been identified in the late 80ies and remain largely unsolved by the processing software that was evaluated in 2004. Therefore claims promoting the Trichoscan method for accurate hair measurements in clinical trials on scalp and body hair are not supported by the present investigation. The speed at which the analysis is performed is outweighed by the errors in signal detection. Therefore we suggest that improvements must be clearly documented before Trichoscan is established for quantified diagnostic purposes and detailed hair cycle monitoring during hair trials

Session VIII: Poster Discussions

Chairs: Marty Visscher and Klaus Wilhelm

P061

Mathematical modelling for TEWL calibration using the droplet method

P Xiao^{1,2}, RE Imhof^{1,2}, M E P de Jesus³, Y Cui^{1,4} and the TEWL Calibration Consortium⁵
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The droplet method (Figure 1) for TEWL calibration is a new technique [1,2], which has the advantages of gravimetric based calibration, good repeatability, and traceability. It can be used for calibrating any TEWL instruments that is capable of recording a time series of water vapour flux density readings. In this paper, we will present a mathematical modeling for calibrating both open-chamber and closed chamber TEWL instruments. We will study the effect of sensor position, sensor mis-calibration, chamber length, droplet position, and instrument response speed. We will present the theoretical results compared with measurement results.

P065

Facial sagging: morphological changes characterised by 3D reconstruction

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As people age, face is subject to morphological changes. Loss of cutaneous elasticity and modification of the adipose tissue repartition lead to skin sagging, a morphological characteristic more visible in the upright position. On the face, sagging skin is predominantly located near the eyes and the mouth and in the lower part of the cheeks, causing an alteration of jaw line sharpness. The interferometry by fringe projection is a non-contact optical technique which usually allows fast *in vivo* measurement of the topometry of the skin. The aim of this work was firstly to quantify the facial sagging, in particular the gravitational load effect which creates jowls, by comparing 3D acquisition on volunteers in the sitting and horizontal position. Secondly, the modelling effect of a cosmetic product applied twice daily, on the face and neck for a period of 28 days, was quantified.

This fast optical technique allows us to obtain 3D acquisition on the face in the sitting and horizontal position. The analysis involved matching (automatic alignment) the 3D acquisitions between both positions in order to calculate the relative volume of the lower area of the jaw line (jowls) and the distance separating each acquired surface. This analysis has been performed before after the cosmetic treatment. The results show less important relative volume values in the horizontal position for all 30 subjects. The mean relative volume between both positions is 2013 (± 816) mm³. This difference characterises the effect of the gravitational load on the cheek when the subjects are in the sitting position. Regarding the effect of the remodelling face care, the results show a significant decrease in the relative volume between the two positions following 28 days of treatment (1171 (± 713) mm³). This new use of 3D reconstruction with fringe projection technique permitted us to quantify the intensity of the morphological modification of the lower part of the face due to gravity. This new application was shown to be also interesting to evaluate the effect of cosmetic products on sagging skin.

P067

Induction of a hardening phenomenon by repeated application of SLS and subsequent analysis of the changes in the lipid composition of the stratum corneum

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Background and Aim: The hardening phenomenon results from the adaptation of the skin to repeated influence of exogenous irritative noxes. This study focuses on the lipid composition in the stratum corneum before and after induction of a hardening phenomenon. Methodology: A cumulative irritant contact dermatitis was induced in 23 non-atopic volunteers by occlusive application of 0.5% sodium lauryl sulfate for 3, 6 and 9 weeks, respectively. Thereafter, the reactivity to SLS was compared between pre-irritated and normal skin. The lipid composition (ceramides 1–7, cholesterol and free fatty acids) of the stratum corneum was assessed before irritation and 3, 6 and 9 weeks after irritation. During the first two weeks of irritation the transepidermal water loss (TEWL) increased continuously and seemed to decrease during the third week as an effect of adaptation. Result: After SLS administration, the increase of TEWL was lower on pre-irritated sites ($p < 0.05$, 6 weeks after irritation), thereby representing a hardening phenomenon. The amount of total ceramides and cholesterol ($p < 0.001$) relative to other stratum corneum lipids was increased, whereas the amount of free fatty acids was decreased ($p < 0.05$) 9 weeks after irritation. 3 weeks after irritation there was a significant increase of ceramide 1 ($p < 0.001$). Only 1 volunteer showed no hardening phenomenon at all and no increase of ceramide 1. Conclusions: In summary, our data indicate that upregulation of ceramide 1 plays a key role as a protection mechanism to repeated influence of irritative noxes.

P062

Analysis of the skin hydration states using high resolution magnetic resonance microscope

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Goal of the study: Magnetic Resonance (MR) technique have been rapidly developed, and Magnetic Resonance Image (MRI) is now the most versatile non-invasive diagnostic tool with a much higher resolution than other imaging modalities such as conventional X-ray, or Computed Tomography (CT). Moreover, MR is a particularly useful tool in investigation of the brain, but there are some limitations in some aspects due to relative low resolution for the microstructural level, for example, the stratum corneum. The skin hydration efficacies are investigated using a high resolution MR microscope developed 'in-house' in this study. Methodology: Because the technique which analyses stratum corneum plays a highly important role in determining skin hydration effects, new methodology was developed for measuring the skin hydration effects directly and objectively using 3T high resolution MR microscope. Modifications of high sensitivity RF coil and gradient coil in the high resolution MR microscope are necessary to evaluate skin hydration states. A planar RF and a gradient coil system were modified to acquire high resolution MR images.

In this study, a high resolution MR microscope was used to evaluate quantitatively the efficacy of moisturizers with rapid test in 'before and after' moisturization. It has been compared between the results of high resolution MR and conventional bioengineering devices such as Corneometer[®], pH-meter[®], Evaporimeter[®], and Desquame[®]. SOT statistically. Results: In this comparison, microstructural images have clearly correlated with high resolution MR microscope and histology, such as stratum corneum, epidermis, and dermis. The line scanning method, one of the method for MR image analysis, demonstrated significant differences between 'before and after' moisturization in the stratum corneum and epidermis. Otherwise the changing of hydration states in dermis was not found. In the analysis using an area based method, water contents are significantly increased in stratum corneum and epidermis except in dermis. Hydration effect, measured by Corneometer[®], was increased significantly after applying a moisturizer. On the other hand, DI (Desquamation Index) and SI (Scaling Index) of D-square[®] were decreased significantly after moisturization. Evaporimeter[®] and pH-meter[®] has not shown any significant difference between before and after moisturization. In addition, four SOT parameters (Sz, SA, SL, SV) showed that skin roughness was reduced, the result confirms the skin hydration effect.

Conclusions: The results by the classical bioengineering methods were similar to those obtained by MR imaging analysis and confirmed the reliability and validity of high resolution MR spectroscopy.

P066

Evaluation of dark circles of lower eyelid by image processing and concern of dermal thickness with its appearance

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Background: A beauty problem "dark circles of lower eyelid (DCLE)" has been regarded as the reflection of the hyperpigmentation and congestion of the eyelid. However, the cause is still unclear in detail. Our previous *in vitro* study suggested that the thickness and density of the dermis might influence the appearance of DCLE. Aim: The aims of this study were to establish a simple method for quantitative evaluation of DCLE and to examine whether the thickness and the density of the eyelid dermis concern the appearance of DCLE. Methods: Because of the difficulties in measuring skin color at lower eyelid with bulky reflectance instruments, we employed an image processing method by freeware *Image J* for quantitative measurement of skin pigments. After splitting a brightness-adjusted, original color image into RGB channel images, we defined the log R – log G as the Erythema Index (EI) image and the inverse log R as the Melanin index (MI) image. These index images were examined both *in vivo* and *in vitro* on their accuracy for quantifying the amounts of melanin and hemoglobin. Using this method, we measured EI and MI of lower eyelids in 14 subjects with DCLE and 28 subjects without DCLE. Furthermore, we recorded 30MHz ultrasound echo images of their lower eyelids and measured the thickness and echogenicity of the dermis. Results: Both EI and MI images of variously diluted hemoglobin and melanin solutions appeared specific and the index values were proportional to their respective concentrations. When UVB-induced erythema and pigmentation were evaluated, excellent linear correlations were found between the index values by image analysis and those measured with a reflectance spectrometer. Mean values of EI and MI in DCLE group were significantly higher than those in non-DCLE group ($p < 0.01$). Mean dermal thickness of lower eyelids was 1.19mm in DCLE group, while 1.31mm in non-DCLE group ($p < 0.05$). There was no significant difference in dermal echo density. Conclusion: *Image J*-assisted EI and MI measurement seems to be useful for quantitative evaluation of DCLE. Not only the amounts of skin pigments but also dermal thickness of lower eyelids may also concern the appearance and severity of DCLE.

P068

Take a bath... The chemistry of bathing assessed by *in vivo* confocal raman spectroscopy

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Everyday experience tell us that hot bathing has an effect on the skin, often described in terms of softness, color, touch, texture etcetera. These effects can last for an hour or more. It is commonly believed that hot bathing temporarily increases the water content of the skin and it is thought that the Natural Moisturizing Factor (NMF), being mainly composed free amino acids, easily washes out. Currently, no real-time, *in vivo* technique exists to objectively study the effects of hot bathing on the biochemical composition of the skin. Raman micro-spectroscopy can obtain spatially resolved chemical compositional information of the skin in seconds and could therefore be excellently suited for bathing studies.

Hot bathing was simulated by soaking of the right forearm of three healthy volunteers in a bath for 20 minutes. The left arm served as a control site. The Model 3510 Skin Composition Analyzer (River Diagnostics BV) was used to measure the relative concentrations of the main potentially washable components of the stratum corneum before and directly after bathing. The study also intends to follow recovery by repeated measurements in the days and weeks after the hot bathing. These results were not yet available at the time of submission of this abstract, but will be presented at the 16th International Congress.

Noninvasive *in vivo* methods are becoming more and more important for applied and fundamental skin research. *In vivo* confocal Raman spectroscopy is currently the only fully noninvasive technique that enables detailed analysis of skin molecular composition with high spatial resolution. This study demonstrates that Raman spectroscopy is able to answer simple questions, such as the effects of bathing on skin biochemistry, which are difficult to answer using conventional measurement techniques. This is an example of the wide range of applications in skin research that can benefit from use of this noninvasive *in vivo* analytical tool.

Session VIII: Poster Discussions

Chairs: Marty Visscher and Klaus Wilhelm

P069

Evaluation of the effects of facial microdermabrasion treatments compared to exfoliating skin cleansing products

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Microdermabrasion is a procedure that is used to improve the appearance of photodamaged skin. The procedure involves spraying a fine stream of aluminum oxide crystals onto the surface of the skin, in a closed loop system. As the crystals are sprayed across the surface of the skin a pressure controlled vacuum immediately suctions off the crystals and the top epidermal layer. Microdermabrasion results in a deep exfoliation of the skin surface.

Microdermabrasion treatments are known to enhance the skin condition by improving enlarged pores, granularity of the skin, as well as fine lines and wrinkles. The combination of skin exfoliation and suction stimulates production of new, living cells at the base level of the skin, which can cause more rapid cell turnover and improved blood flow. The result is healthier, smoother, more radiant skin with enhanced elasticity and skin texture. While there are measurable benefits of Microdermabrasion treatments, mild discomfort and irritation to the skin are known side effects.

In this poster we outline the clinical testing of Microdermabrasion treatments compared to regular use of an exfoliating cleansing product. Results show that the regular use of an exfoliating skin cleansing product yields the same clinical benefits as a Microdermabrasion treatment, but in a gentler manner. The Complexion Mapping technique developed by Unilever was used in these studies to evaluate facial skin attributes such as enlarged pores, wrinkles, fine lines, luminosity, rough texture, radiance, and pigment. Clinical benefits of an exfoliation product regimen compared to Microdermabrasion were evaluated on normal skin for a period of four weeks.

P071

Differences in epidermal thickness, hydration, transepidermal water loss and appearance of skin of four body sites in younger and older women

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Skin thickness, hydration, transepidermal water loss (TEWL) and visual appearance vary depending on the body site and the age of an individual. A study was conducted to compare the average epidermal thickness, skin hydration and TEWL of four body sites (cheek, volar forearm, upper chest and outer leg) of women in two age groups (25-35 and 55-70 years old). Two techniques were used to measure epidermal thickness, Optical Coherence Tomography (OCT) and Confocal microscopy, while skin hydration was assessed by conductance, capacitance and near infra-red imaging (NIR). TEWL values were determined with the Dermalab and Biox AquaFlux. Facial skin was visually assessed for photodamage while dryness and erythema grades were determined for the arm and leg skin. Significant age and body site differences were observed, and strong agreement between instrumental assessments was noted. Older skin tended to be thinner, less hydrated and more photodamaged than younger skin. For both age groups, the ordering of body sites in terms of epidermal thickness, hydration and TEWL was similar. In this study, age and body site had a significant impact on the hydration, TEWL, epidermal thickness and visual appearance of the skin, and instrumental and visual assessments were in agreement in showing these effects.

P073

Basocellular carcinoma of the skin: Ultrasonographic and color DOPPLER ASPECTS

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a) Goal of the study: The aim of this study was to investigate ultrasonographic characteristics of the basocellular carcinoma in B-mode and color Doppler using high-frequency probe.

b) Methodology: 65 patients with clinical and histopathological diagnosis of basocellular carcinoma had their lesions analysed with an equipment GE LOGIQ 700 using a 13-MHz linear probe in B-mode and color Doppler.

c) Results: All the lesions were hypoechoic, some with regular and others lobulated borders, several with vascularization at color Doppler. All the lesions were located in the dermis, some with extension to subcutaneous and few with deep extension.

d) Conclusions: The 13 MHz ultrasound may be useful as a non-invasive method to show the localization, extension and vascularization of the basocellular carcinoma lesions.

P070

In Vivo biomechanics of aged human skin by sono elastography

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Goal of the study: The purpose was to characterize biomechanical properties of aged skin with a new, noninvasive method allowing local and intrinsic Young's modulus quantification in dermis and hypodermis.

Methodology: The sonoelastographic system combines a 50 MHz ultrasound system which detects displacements induced by a low frequency (300 Hz) shear wave generated from the surface by a vibrator exciting a ring set around the ultrasound transducer. Localized elastic modulus is then estimated from the shear wave velocity measurement.

Two groups of healthy women: 14 young women (22 ± 3 years) and 14 elderly women (61 ± 4 years) were examined on the arm.

Results: A significant increase of the shear wave velocity was observed in aged dermis (85 ± 27 m/s) compared to young dermis (65 ± 24 m/s), whereas no difference was recorded in the hypodermis.

Conclusions: Sonoelastography is a very convenient method for mapping intrinsic measurements of biomechanical properties in dermis and hypodermis.

These results confirmed that age-related effects are mainly induced within the dermis, whereas hypodermis is quite stable, in accordance with its main function of energy reserve.

P072

A new high frequency ultrasound (20 to 100 Mhz range) skin imaging system: imaging properties and clinical results

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Goal: High frequency ultrasound (HFUS) in the 20 MHz range is already widely utilized for non invasive skin imaging. The goal of the presented work was to develop a commercial HFUS skin imaging system with larger center frequency and larger bandwidth than the already available technique in order to improve the spatial resolution.

Methods: A new HFUS imaging system with two different applicators, covering the 20 to 100 MHz frequency range, was developed. During the imaging session, one of the two applicators can easily be selected by a switch. Mechanical scans are performed with spherically focused single element transducers. The developed system was tested in the imaging lab of the Dermatological University Hospital, Ruhr-University Bochum, Germany. The imaging properties of the new system and its potential in clinical applications have been evaluated. Results: The new clinical HFUS scanner has successfully been implemented. Utilizing ultrasound in the 100 MHz range, high resolution imaging of the epidermis and the upper dermis is enabled with a minimum axial and lateral resolution of 9.9 µm and 84 µm, respectively. The conventional 20 MHz range applicator can be utilized for imaging of the whole skin with a minimum axial and lateral resolution of 39 µm and 210 µm. Scans are performed along a lateral distance of 12.8 mm with both applicators. The maximum imaging depths are 1.6 mm and 8.2 mm for the 100 MHz and 20 MHz range applicators. Conclusions: Results from our clinical evaluation show that the extended capabilities of the new HFUS scanner are of particular benefit for imaging the epidermis and the upper dermis. Compared to the conventional standard 20 MHz technique, a significantly better spatial resolution is obtained.

P074

Clinical and ultrasonographic correlation in cutaneous localized scleroderma

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a) Goal of the study: The aim of this study was to describe the ultrasonographic findings in localized scleroderma and correlation with the clinical aspect.

b) Methodology: 23 patients presenting localized scleroderma lesions with clinical and anatomic-pathological diagnostic were submitted to ultrasonographic examinations with an equipment GE LOGIQ 700 using a 13-MHz linear probe. Three measures of the skin thickness were made in each analysed area, from the echogenic line between the epidermis and the gel layer until the echogenic line between the dermis and the subcutaneous tissue.

c) Results: The echographic findings can be divided in two groups: increase in thickness and decrease in echogenicity of the dermis; decrease in thickness and increase in echogenicity of the dermis. In all cases the alteration of dermis echogenicity was diffuse with loss of the differentiation between the papillar and the reticular layers.

d) Conclusions: The echographic findings permit us to associate the increase of skin thickness and decrease of dermis echogenicity with the edematous phase of the disease where there is a predominance of edema and inflammatory process and associate the decrease of skin thickness and increase of dermis echogenicity with the atrophic phase of the disease where there is a loss of skin elasticity and compaction of dermis cells.

Session VIII: Poster Discussions

Chairs: Marty Visscher and Klaus Wilhelm

P075

Comparison of three TEWL instruments for in vitro and in vivo measurements

W Tian *Unilever Research and Development, USA*

Skin barrier function is a very important attribute of healthy skin. Many instruments are available to measure the skin barrier function, TEWL. They can be based on different principles and techniques. Measurement results from groups using different instruments are sometimes confusing and hard to compare.

We tested 3 TEWL instruments (Dermalab, Tewameter and AquaFlux) both in vitro and in vivo to compare their performance (accuracy and the repeatability). For in vitro measurement, we selected several materials under various external conditions (temperature and relative humidity). For in vivo measurement, we selected two body sites: palm and forearm.

We have reviewed the difference between instruments and will report our findings in this paper.

P077

A Practical Guide to Computerized Evaporimetry

G. Grove, J. Damia & C. Zerweck

cyberDERM, Inc., Media, PA

Our group has nearly 30 years of experience with a variety of devices that allows one to measure evaporative water loss from human skin non-invasively. These include both closed-chamber and open chamber devices that were either laboratory constructed prototypes or commercially available instruments such as the ServoMed Evaporimeter and the Dermalab TEWL Probe. Many of our studies have monitored the response of the stratum corneum barrier to a variety of mechanical, physical and chemical insults by measuring TEWL rates under steady-state conditions at appropriate times after the insult has been delivered and the test products administered either prophylactically or therapeutically. Other studies such as the Post Occlusive Stress Test and evaluating the absorbance of diapers have required these assessments to be made under dynamic conditions. As a result of our considerable experience, we have a good appreciation of the various problems and pitfalls that one can encounter in these types of investigation. In this poster we will discuss different design considerations, various calibration procedures, performance tests and other quality assurance concerns related to evaporative water loss rate measurements.

P079

Anti-aging and Anti-inflammatory Properties of Skin Care Products Containing Fructosamine-3-Kinase Pathway Inhibitors

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Dynamis has discovered that fructosamine-3-kinase (F3K) and 3-deoxyglucosone (3DG) are present in skin. F3K is a novel and unique enzyme responsible for the in vivo formation of 3DG, a highly reactive toxic molecule that causes inflammation, oxidative stress, free radicals and forms crosslinks in collagen and elastin. Research based upon these findings in skin has led to development of topical skin care products that when tested in human volunteers have resulted in statistically significant results in blinded human trials.

The use of topical preparations that contain an F3K inhibitor and a 3DG inactivator result in the reversal of the appearance of skin aging in clinical trials. In a study with 18 volunteers showing photo-damaged skin on the upper arm, a base cream supplemented with Dynamis' actives showed statistically significant improvements in an expert grader's assessments of visual dryness and skin texture (loss of crepiness) over a base cream alone after 4 weeks. In a wound healing trial, preparations of a base cream and a base cream containing Dynamis' actives were tested by an independent research group in a single-blind study with 15 female volunteers. Six sites on the volar forearms (3 on each arm) were exposed on Day 0 to an irritant solution (0.5% sodium lauryl sulfate) under occlusion for 18-24 hr. On Day 1, the four arm sites with the most similar degree of damage for 12 of the volunteers who experienced significant irritation were selected for the treatment phase. Patches were removed and panelists then had the test creams applied to the four selected sites twice daily for 7 days. The other forearm sites were not treated so they could be used as controls. Extent of irritation and healing rates were based on clinical observations of an Expert Grader and machine measurements for TEWL and redness on day 0 (prior to SLS exposure), and on days 1, 2, 3, 4, 7, and 8. Skin patches treated with Dynamis' creams showed decreased redness, and increased healing with the greatest benefit seen between 3-8 days. In addition, preliminary results from a trial with 9 volunteers with psoriasis indicate beneficial effects of Dynamis' cream compared to a base cream to decrease dryness, induration and pruritis.

P076

Efficient and Simple Quantification of Stratum Corneum Proteins on Tape Strippings

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Goal: Tape stripping is established as a common technique in dermatological research and is used in a broad range of applications. However, a concurrent colorimetric determination of protein content and enzyme activity on the same tape is circumstantial. Cutting the adhesive tapes in halves and measuring either value on each half is time consuming and prone to error. This is also the case by weighing the tapes for protein determination. A promising indirect method is measuring the protein content by optical transmission. A spectrophotometer with a broad slit is needed for levelling the inhomogeneity of protein distribution on the tape strippings. The instruments available today are rather expensive and the handling of the sticky tapes in the measuring zone is tricky. Therefore a compact infrared densitometer was developed allowing a fast, user friendly and reliable protein determination on tape strippings.

Methods: 12 healthy Caucasian subjects (6 female, 6 male, skin type II - III, age 27 - 50) participated in the study. Before the sequential tape stripping (20 times) on the ventral forearm, skin hydration and pH were measured.

The transmission of the tape strippings was determined with a novel infrared densitometer especially designed for the application of D-Squame[®] disks. This instrument is equipped with a diode emitting light with a wavelength of 850 nm which prevents the thermal denaturation of biomolecules. The diameter of the circular slit is 13 mm corresponding to 1.3 cm², covering 35% of the area of a standard 22 mm D-Squame[®] disk. The disks can be placed easily, adhesive side up, onto a well accessible, round, horizontal measuring area of the densitometer.

The protein content of each disk was determined in 96-well microplates. A calibration curve demonstrating optical transmission vs. protein content was established.

Results: The overall correlation between transmission and protein content is 0.851 and the overall regression is 1.459x - 2.567. The individual correlation averages 0.910 ± 0.029.

Conclusion: The novel infrared densitometer is a suitable tool for the convenient measure of optical transmission of stratum corneum strippings which was shown to be linearly proportional to their protein content. Thus the corresponding calibration curve can be used for a fast indirect protein evaluation of tape strippings by transmission measurement. Moreover the tapes can subsequently be utilized for determination of enzyme activities or any other bioassay.

P078

A metabolic Approach to increased Epidermal Lipid Production and Improved Skin Barrier Function in Humans

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P.W. Wertz, University of Iowa

The objective of this study was to evaluate the effect of a novel formulation on the production of the skin's own lipids and on the skin barrier function in humans. In developing this formulation, we have chosen a metabolic approach and a "pro-lipid" strategy. We have utilized branched-chain amino acids (leucine, isoleucine, and valine) as "pro-lipid" molecules and have exploited skin's own biochemical machinery to enhance the production of skin lipids.

P080

Validation and Use of OCT (Optical Coherence Tomography) for Epidermal and Stratum Corneum Thickness Measurements

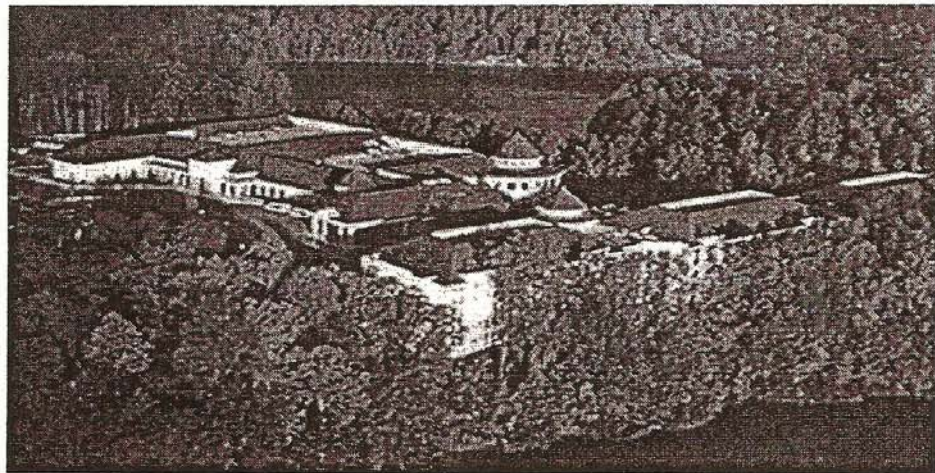
K. Miyamoto, J. F. Joa, M. J. Marmor, V. Gartstein, R. M. Osborne, J. R. Kaczvinsky, A. T. Schroer, K. M. Lammers, *The Procter & Gamble Company, Cincinnati, OH USA*

Albert Kligman M.D., *S.K.I.N., Inc., Philadelphia, PA USA*

Optical Coherence Tomography is a non-invasive imaging technique that is being increasingly used for skin assessments. Measurements of epidermal thicknesses with our OCT system were found to be consistent with those obtained from histological assessments of biopsies. Stratum corneum (SC) thickness measured with OCT was consistent with the observed number of corneocyte layers but histological preparation artifacts limited other correlations. OCT can be used to non-invasively measure changes in skin thickness induced by various treatments.

International Society for Bioengineering and the Skin

**USA Technical Symposium
October 12-14, 2006**



**Evergreen Conference Center
Stone Mountain
Atlanta, GA**

Theme: Skin Health Through the Life Stages

Proposed Agenda

Thursday:	Workshop 1:30-6:00
Friday:	Seminar 8:30-3:00
	3:00-6:00 Stone Mountain Park
	7:00-10:00 Riverboat dinner cruise
Saturday:	Seminar 8:30-3:00