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9th World Congress for Hair Research

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A Comprehensive, International Hair Research Meeting for the Advancement of Knowledge In Hair Growth, Hair and Scalp Disease, and Clinical Care

Abstract Book

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How to read this book

- Abstracts are included for oral presentations in the plenary sessions and poster presentations.
- The abstracts are listed in this book in the order they are scheduled to present the plenaries. Posters are listed separately.
- The oral presentations are numbered in the order they are presenting starting with 001. The posters are numbered starting from P001.
- There is an author index and topic index at the end of the book. The indices reference the abstract numbers and poster numbers.
- Disclosures of conflict of interest are included in the introductory pages as well as next to each presenter's abstract throughout this book.
- The abstract format is as follows:

Abstract Number

001

Title of Presentation

KEYNOTE: Low level light therapy for hair loss: clinical use, mechanisms and important questions

Author Block
Bold name is presenting author.

R. Rox Anderson, MD.
Harvard Medical School; Wellman Center for Photomedicine; Massachusetts General Hospital, Boston, MA, USA

Biography of Presenting Author

Dr. Anderson's expertise in laser-tissue interactions, skin responses and dermatology are well suited to this project. He has studied and published extensively on the mechanisms of thermal, microthermal and photochemical changes produced by lasers. He conceived and developed many of the laser treatments used widely today for skin disorders, including selective photothermolysis and fractional laser technologies. He has studied skin optics and optical radiation transport through tissue, and is familiar with computational models for optical energy distribution and absorption, particularly in skin. Dr. Anderson conceived and developed many of the non-scarring laser treatments now widely used in medical care. These include treatments for birthmarks, microvascular and pigmented lesions, tattoo and permanent hair removal. He has also contributed to treatment for vocal cords, kidney stones, glaucoma, heart disease, photodynamic therapy for cancer and acne, and optical diagnostics. He is the co-inventor of fractional laser treatment; studying mechanisms of scar treatment. He is familiar with in-vivo skin microscopy, and is co-inventor of the leading confocal laser reflectance microscope used in animal and human studies.

Disclosure of Conflict of Interest Block

R.R. Anderson: None.

Learning Objectives

LEARNING OBJECTIVES:
Identify the role of low-level light therapy in treating hair loss disorders. Identify clinically and scientifically important gaps in our understanding of LLLT.

Abstract

ABSTRACT:
Also called photobiomodulation, low-level light therapy (LLLT) is widely used to stimulate hair growth in men and women with androgenetic alopecia, has been effective in small clinical trials for alopecia areata, but remains untested for many forms of hair loss. LLLT requires no medications and can be performed in minutes at home. In multiple clinical trials, efficacy for androgenetic alopecia is similar to that of topical minoxidil. The miniaturization of hair follicles is arrested, and some miniaturized hairs are also converted back into terminal hairs. In skin-wounded mice, LLLT increases the number of regenerated neo-follicles. Red and/or near-infrared light capable of penetrating at least 1 mm into human skin is used, at wavelengths corresponding to the absorption bands of mitochondrial cytochrome C oxidase complex. The mechanism(s) involved are clearly photochemical, but neither the action spectrum nor fluence (dose)-response have been established for hair stimulation. In general, LLLT exhibits hormesis, with high light fluences actively inhibiting the desired response. Hematopoetic stem cells are potently stimulated to migrate after LLLT of bone marrow, but the effect on follicular stem cells, if any, is unknown. Cytochrome C oxidase complex is the site of oxygen utilization, and includes heme and copper center chromophores liked to electron transport. LLLT rapidly restores mitochondrial membrane potential and ATP level in cells under ischemic, nutrient or oxidative stress, probably by photodissociation of NO from an inhibitory heme group and/or direct facilitation of electron transfer to the oxidative site. A host of downstream signaling pathways (e.g. via NFkb) then occur. It is unlikely that our present devices and treatment regimens for LLLT are optimal, and unknown how LLLT should best be used in combination with other treatments.

OFF-LABEL OR OTHER NON-FDA APPROVED, INVESTIGATIONAL USE

Listed below are those who indicated that their presentation will include discussion of an "off-label" or other non-FDA approved, investigational use of a medical device or pharmaceutical product:

Presentation Number	Presentation Title	First Name	Last Name	Off Label Disclosure
003	Moderator Introduction, "Hair Transplantation"	Paul	Rose	artas, robotic hair system
072	Session Co-Director, "Structure, Biology & Hair Curl, Color & Luster"	Amy	McMichael	I might mention minoxidil off label. This is no longer under patent in the generic form, but J & J
081	Treatment of Moderate to Severe Alopecia Areata with the Janus Kinase Inhibitor, Tofacitinib: The Cleveland Clinic Experience	Omer	Ibrahim	Xeljanz (tofactinib citrate), Pfizer
082	Two-Center Open-Label Trial of Oral Tofacitinib in Patients with Severe, Recalcitrant Alopecia Areata	Milene	Crispin	Oral Tofacitinib, Pfizer
088	α1-AR Agonist Induced Piloerection Protects Against the Development of Traction Alopecia	Andy	Goren	Phenylephrine HCl
091	Coffee with the Experts, Table Co-Leader on the Topic of, "Alopecia Areata"	Melissa	Piliang	There are no FDA-approved treatments for AA. All therapies discussed are off-label.
113	Coffee with the Experts, Table Co-Leader on the Topic of, "Robotic Hair Transplantation"	Paul	Rose	artas, robotic hair system
118	Coffee with the Experts, Table Co-Leader on the Topic of, "Genetic Testing"	angela	christiano	tofacitinib pfizer, ruxolitinib incyte
125	Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Loss in Women"	Paradi	Mirmirani	multiple treatments for hair loss are off-label
147	Female Pattern Hair Loss: Combination Therapy With Low Dose Oral Minoxidil and Spironolactone	Rodney	Sinclair	Minoxidil
P017	Clinical Effects of DPCP in Alopecia Areata, Retrospective Review of 50 Patients	Wilma	Bergfeld	DPCP
P035	Safety and Efficacy of Clobetasol Propionate 0.05% E Foam for the Treatment of Central Centrifugal Cicatricial Alopecia	Valerie	Callender	
P036	Trichotillomania Treated With N-acetyl Cysteine	María	Cappetta	N acetyl cysteine
P054	Two-Center Open-Label Trial of Oral Tofacitinib in Patients with Severe, Recalcitrant Alopecia Areata	Milene	Crispin	Oral Tofacitinib, Pfizer
P070	Safety and Efficacy of Combined Intralesional Hyaluronic acid and Triamcinolone Acetonide 10mg/cc for the Treatment of Alopecia Areata	Ronda	Farah	
P076	Low Level Laser Therapy in Scarring Alopecia	Shani	Francis	HairMax laser comb
P080	α1-AR Agonist Induced Piloerection Protects Against the Development of Traction Alopecia	Andy	Goren	Phenylephrine HCl
P086	Diagnosing and Managing the Painful, Burning Scalp.	Maria	Hordinsky	topical gabapentin, Fairview compounding pharmacy
P088	Treatment of Moderate to Severe Alopecia Areata with the Janus Kinase Inhibitor, Tofacitinib: The Cleveland Clinic Experience	Omer	Ibrahim	Xeljanz (tofactinib citrate), Pfizer
P089	Protection by Fullerene for Hair Shaft and Wig Fiber Damage by UV and Cosmetic Treatments	Shigeki	Inui	

Presentation Number	Presentation Title	First Name	Last Name	Off Label Disclosure
P102	Combination Topical Finasteride and Growth Factors Applied After Non-ablative Fractional Laser Treatment Leads to Improvement of Androgenetic Alopecia	Ana Carina	Junqueira Bertin	Finasteride 0,05%, BFGF +IGF +VEGF+ COPPER PEPTIDE 1%-BIOMETIL. FRAXEL Restore
P160	Current Treatment Modalities of Androgenetic Alopecia	Novia	Mozart	
P201	Side Effects of 5 alpha Reductase Inhibitors for Treatment of Hair Loss in Women: A Review	Lauren	Seale	Finasteride (Merck, several generic manufacturers), dutasteride (GlaxoSmithKline, Barr)
P210	Female Pattern Hair Loss: Combination Therapy With Low Dose Oral Minoxidil and Spironolactone	Rodney	Sinclair	Minoxidil
P216	Phototrichogram of Female Pattern Hair Loss in Asians	Poonkiat	Suchonwanit	Folliscope®, Leed M corporation, Seoul, South Korea
P227	Cosmetic Utility of Topical Minoxidil for Congenital Hypotrichosis	Masaki	Uchiyama	topical minoxidil

The views and techniques of the presenters are not necessarily those of the joint-sponsoring organizations, but are presented in this forum to advance scientific and medical education.

001

KEYNOTE: Low level light therapy for hair loss: clinical use, mechanisms and important questions

R. Rox Anderson, MD.
Harvard Medical School; Wellman Center for Photomedicine; Massachusetts General Hospital, Boston, MA, USA

Dr. Anderson's expertise in laser-tissue interactions, skin responses and dermatology are well suited to this project. He has studied and published extensively on the mechanisms of thermal, microthermal and photochemical changes produced by lasers. He conceived and developed many of the laser treatments used widely today for skin disorders, including selective photothermolysis and fractional laser technologies. He has studied skin optics and optical radiation transport through tissue, and is familiar with computational models for optical energy distribution and absorption, particularly in skin. Dr. Anderson conceived and developed many of the non-scarring laser treatments now widely used in medical care. These include treatments for birthmarks, microvascular and pigmented lesions, tattoo and permanent hair removal. He has also contributed to treatment for vocal cords, kidney stones, glaucoma, heart disease, photodynamic therapy for cancer and acne, and optical diagnostics. He is the co-inventor of fractional laser treatment; studying mechanisms of scar treatment. He is familiar with in-vivo skin microscopy, and is co-inventor of the leading confocal laser reflectance microscope used in animal and human studies.

R.R. Anderson: None.

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Also called photobiomodulation, low-level light therapy (LLLT) is widely used to stimulate hair growth in men and women with androgenetic alopecia, has been effective in small clinical trials for alopecia areata, but remains untested for many forms of hair loss. LLLT requires no medications and can be performed in minutes at home. In multiple clinical trials, efficacy for androgenetic alopecia is similar to that of topical minoxidil. The miniaturization of hair follicles is arrested, and some miniaturized hairs are also converted back into terminal hairs. In skin-wounded mice, LLLT increases the number of regenerated neo-follicles. Red and/or near-infrared light capable of penetrating at least 1 mm into human skin is used, at wavelengths corresponding to the absorption bands of mitochondrial cytochrome C oxidase complex. The mechanism(s) involved are clearly photochemical, but neither the action spectrum nor fluence (dose)-response have been established for hair stimulation. In general, LLLT exhibits hormesis, with high light fluences actively inhibiting the desired response. Hematopoetic stem cells are potently stimulated to migrate after LLLT of bone marrow, but the effect on follicular stem cells, if any, is unknown. Cytochrome C oxidase complex is the site of oxygen utilization, and includes heme and copper center chromophores liked to electron transport. LLLT rapidly restores mitochondrial membrane potential and ATP level in cells under ischemic, nutrient or oxidative stress, probably by photodissociation of NO from an inhibitory heme group and/or direct facilitation of electron transfer to the oxidative site. A host of downstream signaling pathways (e.g. via NFkb) then occur. It is unlikely that our present devices and treatment regimens for LLLT are optimal, and unknown how LLLT should best be used in combination with other treatments.

002

KEYNOTE: Hairs to hedgehogs: From in vitro modelling of the human hair follicle to basal cell carcinoma

Mike P. Philpott, BSc, D.Phil.
Professor of Cutaneous Biology, Centre for Cutaneous Research, Blizard Institute, Barts and The London School of Medicine and Dentistry, London, U.K.
M.P. Philpott: None.

LEARNING OBJECTIVES:
Describe the role in vitro models have played in our understanding of hair biology and how future models may further aid our studies

003

Session Director, "Hair Transplantation"

Paul T. Rose, MD, JD.
FL, USA.
P.T. Rose: Salary, Contractual Services; consultant to restoration robotics. Stock/Shareholder (self-managed); stock owner restoration robotics.

004

Robotic Hair Transplant Surgery

Chang hun HUH, PhD.
Seoul National University Bundang Hospital, SEONGNAM, Korea, Republic of.

Chang-Hun Huh is an Associate Professor of Department of Dermatology, Seoul National University. He got the PhD degree with the study about stem cells. He is not only active members and board of directors in many societies but many international societies. He is elected as the deputy secretary general of 36th international society for dermatologic surgery. He also serves the International Mentor of American Society for Dermatologic Surgery and the preceptor of International Society for Dermatologic Surgery. He has more than 100 peer reviewed articles, and presented more than 100 presentations internationally.

C. Huh: None.

LEARNING OBJECTIVES:
In this lecture, I would like to show the basic principles and key points of robotic surgery, that would be helpful for the doctors to understand it.

ABSTRACT:
Needs for Follicular unit extraction (FUE) have been increased in androgenetic alopecia patients, because it provides many advantages over strip method including absence of linear scar, much less pain, and short recovery time. However, stiff learning curve to become a good surgeon makes doctors hesitate to lush into hair restoration surgery with FUE. Also, FUE is a time-consuming, technically hard job for surgeons like beginners in hair restoration or strip surgeons.ARTAS^{TM} system (Restoration Robotics, Mountain View, CA, USA) is an interactive, computer-assisted, and physician-controlled robotic system used for the FUE harvest. Robot has been upgraded continuously since introduced 4 years ago, it compensate most of human errors and produced similar results in various surgeons and patients, if parameters are properly set. And any doctors who understand the basic principles of robot surgery could perform surgery successfully even if he or she is beginner in hair restoration surgery or FUE surgery.

005

Indications for Strip harvesting vs Follicular Unit Extraction in Hair Restoration Surgery

Nilofer Farjo, MBChB.
Farjo Hair Institute, Manchester, United Kingdom.

Nilofer Farjo exclusively practices hair restoration surgery. She is past president of the British Association of Hair Restoration Surgery, Fellow of the International Society of Hair Restoration Surgery, and current Treasurer of the European Hair Research Society. She has ongoing research collaborations and publications with Universities of Manchester, London, and Bradford as well as Unilever plc. She was a principal investigator with Intercytex plc during the first hair cell multiplication human trials. In 2012, Dr Farjo was awarded the Platinum Follicle Award by the ISHRS for outstanding achievement in basic science and/or scientific research as it relates to hair restoration.

N. Farjo: None.

LEARNING OBJECTIVES:
Explain the different methods of donor harvesting. Discuss the patients who are suitable candidates for surgery.

ABSTRACT:
Norman Orentreich wrote about the principle of donor dominance leading to the popularization of modern hair replacement surgery. Over the intervening 60 years, many changes in the surgical technique have occurred. The main indication is androgenetic alopecia but the refinement in technique means that we can now reconstruct beards, moustaches, eyebrows and eyelashes.
Today, strip harvesting is the predominant method of donor removal involving resection of a strip of skin and hair from the occipital and parietal areas. The strip is then dissected into follicular units under stereoscopic microscopes. The other method of harvesting which has become more popular in recent years involves use of a 1mm or smaller drill punch to take out individual grafts. This can be done manually, by motorised drills, and now using robot-assisted technology. Each of these extraction techniques has advantages and disadvantages depending on a number of factors: patients' age, hair type, hair colour, potential for future hair loss, preferred hair style and the surgeon's skill.
I will demonstrate current techniques, discuss assessing patient's suitability and look at indications for preference of one technique over the other.
Take Home Message: The main limitation in hair restoration surgery is the donor hair availability. It is essential that the best use of this limited resource is made utilising a technique that is appropriate for the patient.

006

Allogeneic Hair Transplantation with Enhanced Survival by Anti-ICAM-1 Antibody in Nonhuman Primate

Jin Yong Kim, PhD[1], Ji-Seon Yoon[2], Seong Hoe Park[3], Kyeong Cheon Jung[3], Wooseok Koh[4], Seong Jin Jo[1], Kyu Han Kim[1], Ohsang Kwon[1].
[1]Department of Dermatology, Seoul National University College of Medicine, Seoul, Korea, Republic of, [2]Laboratory of Cutaneous Aging and Hair Research, Biomedical Research Institute, Seoul National University Hospital, Institute of Human-Environment Interface Biology, Biomedical Research Center, Seoul National University, Seoul, Korea, Republic of, [3]Department of Pathology and Graduate School of Immunology, Seoul National University College of Medicine, Seoul, Korea, Republic of, [4]JMO Dermatology, Seoul, Korea, Republic of.

Jin Yong Kim is PhD student and research fellow in Department of Dermatology, Seoul National University College of Medicine.

J. Kim: None. **J. Yoon:** None. **S. Park:** None. **K. Jung:** None. **W. Koh:** None. **S. Jo:** None. **K. Kim:** None. **O. Kwon:** None.

LEARNING OBJECTIVES:
- Demonstrate therapeutic potential of anti-ICAM-1 antibody for antigen-specific T cell tolerance and hair allograft model in nonhuman primate.

ABSTRACT:
Alopecia patients with severe hair loss cannot benefit from autologous hair transplantation. However, it would be possible to utilize allogeneic hair follicles as the donor source with the induction of antigen-specific T cell tolerance. Recently, anti-ICAM-1 antibody (MD-3) was developed to induce dendritic cell arrest in a semi-mature stage and antigen-specific T cell tolerance in situ. In this study, we evaluated the tolerogenic potential of MD-3 under the skin immune system in hair allograft model of nonhuman primate. Following the preparation of recipient sites with a hair removing diode laser in the upper back skin of cynomolgus monkeys, hair follicles from monkey's thick eyebrow were transplanted in recipient sites under MD-3 pretreatment and short-term immunosuppressant. The number of visible hair allograft maintained in MD-3 group, whereas those of immunosuppressant and control group became rapidly decreased. In histological examination, outer root sheath of hair allograft was intact over several weeks in

MD-3 group while those of other groups were impaired. MD-3 significantly delayed and diminished perifollicular CD3+ T cell infiltration. Although long-term survival was not achieved, MD-3 markedly enhanced hair allograft survival regardless concomitant immunosuppressant. In conclusion, MD-3 pretreatment proved to have therapeutic potential for preventing allograft rejection, and hair allograft model in nonhuman primate, an effective model for transplantation research.

007

Genomics Comparison of Hair Follicles from FUT, FUE, and Plucks

Bradley R. Wolf, M.D.[1], Scott Youngquist[2], Ping Hu[2], Xingtoo Wei[2], Deborah Whittenbarger[2], Kenton Juhlin[2], Elizabeth Jewel-Motz[2], Thomas Dawson[2].
[1]Wolf Medical Enterprises, Cincinnati, OH, USA, [2]Procter and Gamble, Cincinnati, OH, USA.

Bradley Wolf M.D. has been treating hair loss patients, exclusively, since 1990. He has presented numerous lectures at meetings throughout the world and was director of workshops at the 2002 ISHRS meeting in Chicago. He is the author of "Anesthesia" in the 5th Edition of Hair Transplantation and a chapter on repair using FUE in the textbook, Hair Transplant 360. He is a current member of the ISHRS CME and FUE Research committees. He is Board Certified by the American Board of Hair Restoration Surgery (ABHRS) and was a member of the Board of Directors of the ABHRS from 2000-2005.

B.R. Wolf: Consultant; The Procter & Gamble Company. **S. Youngquist:** None. **P. Hu:** None. **X. Wei:** None. **D. Whittenbarger:** None. **K. Juhlin:** None. **E. Jewel-Motz:** None. **T. Dawson:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain genomic variations of FUE and FUT grafts.

ABSTRACT:
Traditional hair transplantation using grafts microscopically dissected from a strip of excised occipital scalp (FUT) has proven to be effective. The survivability of grafts obtained using the newer follicular unit extraction method (FUE) has been questioned.
To determine if there are biologic differences in follicles gathered by different techniques, we sought to compare follicles obtained by FUE, FUT, and plucks, by examining their genetic composition using gene chip analysis. Samples were collected from 30 pre-menopausal women aged 35-50. RNA was isolated with the Qiagen RNeasy Kit and gene chip analysis performed using the Illumina platform. Gene expression heat map representing 132 hair relevant keratin and keratin associated protein encoding transcript probes revealed that FUE and FUT follicles expressed similar genes, while plucks held a demonstrably different signature. Hair relevant keratin genes were detected in plucks, general markers such as bioenergetics and metabolism as well as stem cell markers were more highly expressed in FUT and FUE follicles. Stem cell markers K15 and CD200 showed no significant difference in FUE and FUT follicles.
This analysis indicates follicles obtained by FUE and FUT are very close in their genomic profile, are likely very close in their cellular profile, and both have components necessary to regenerate a new follicle.

008

Efficient Two Step Procedure For Scalp Scar Repair Combining Fat and Hair Grafting

Gorana Kuka, MD.
Colic hospital, Belgrade, Serbia.

Gorana Kuka, MD is formally trained as plastic and reconstructive surgeon at the Medical School at University of Belgrade, Serbia. Dr. Kuka is a chief resident at Colic hospital. She is highly interested in regenerative medicine and use of fat tissue. For more than 7 years she has been performing hair restoration with more than 600 cases done so far using the latest method- FUE (Follicular Unit Extraction).
Dr. Kuka is board certified by Serbian Medical Society. She is a member of ISHRS, ISPRES (International Society of Plastic and Regenerative Surgery) and AAFPRS (American Academy for Plastic and Reconstructive Surgery).

G. Kuka: None.

LEARNING OBJECTIVES:
Present an optional and efficient way to treat scalp scars combining fat and hair grafting.

ABSTRACT:
Efficient two step procedure for scalp scar repair combining fat and hair grafting. Scars are areas of fibrous tissue that replace normal skin after injury. Scalp scars are very common as a result of accidents, burns, disease or surgery. Usually they could be successfully reconstructed with hairs so the area is fully covered. However, due to very tense scalp tissue, scars could be very thin and grafts don't have enough subcutaneous tissue as a foundation to grow. Sometimes, when transplanting into very thin skin, it can result with buried grafts that leads to another excision therefore another scar. This problem can be resolved when patient's own fat is harvested from one body area (abdomen, outer or inner thighs, neck) and then injected into the area of thin skin in order to recreate that missing subcutaneous layer of skin. A couple of months later, successful hair transplant can be done.
This is to present an innovative two-step scalp scar repair method which provides a solution when single transplanting into scar tissue doesn't work.

009

Hair Transplant in Hypertrophic Scars Using PL-FUT

Kristel BJ van Herwijnen.
Hair Science Institute, Maastricht, Netherlands.

Kristel van Herwijnen(1977). After completing the study of medicine in 2003, my proffesional career started under guidance of Dr. Coen Gho. After learning how to perform a genaral hair transplant (mostly people suffering from AGA), the urge to copy Mother Nature as much as possible grew. Over the years we were capable to treat more difficult scars, younger patients and in the end more satisfying results. I make it my personal goal to spread this knowlegde and cooporate with other diciplines in order to get the best possible outcome for the client, and change their lives in a positive way.

K.B. van Herwijnen: Salary, Contractual Services; Hair Science Institute.

LEARNING OBJECTIVES:
It demontrates that by PL-FUT hair growth is possible in any type of scar while maitaining original donor area features.

ABSTRACT:
Introduction:
We use human follicular stem cells [1] to implant in cicatricial alopecia in order promote hair growth. We aim to reconstruct nature as closely as possible.
Method:
The donor site needs to be a non-scarring high density zone on the scalp. PL-FUT (Partial Longitudinal Follicular Unit Transplantation) [2] is preferred because of its minimum invasive character to harvest follicular units out of a donor site. Almost full regeneration in the donor site is expected. Recipient area is marked based on: number of grafts, clients goals for the result and aesthetic rules. The recipient area is prepared with a curved needle, grafts are immediately implanted.
Results:
After nine months, the final result is established. The recipient area seems more flexible and better perfused then before PL-FUT. Donor area shows no visible scars and is ready for a desirable next treatment.
Discussion:
Despite the fact that initially there is no hair growth on the scars, it is possible to initiate this through implantation of autologous follicular stem cells. In case of a limited donor area we noticed a limitation in possibilities. Collaboration with surgeons in a burn units is essential in order to get the best possible result in complex cases.

Conclusion:
We have shown that hair growth is possible in (hypertrophic) scars.

010

Eyelash Transplantation: Sequelae & Complication Management

Alan J. Bauman, MD.
Bauman Medical Group, Boca Raton, FL, USA.

Alan J. Bauman, M.D. is a full-time hair transplant surgeon who has performed over 7,000 hair transplant procedures since starting his hair loss practice, Bauman Medical Group, in 1997 located in Boca Raton, FL. He is one of approximately 100 physicians worldwide certified by the American Board of Hair Restoration Surgery. He is a Fellow of International Society of Hair Restoration Surgery and the only North American faculty member at the First ISHRS Live Surgery Workshop on Eyelash Transplantation in 2006. Dr. Bauman is an author of textbook chapters on hair transplantation, including eyelash transplant surgery.

A.J. Bauman: None.

LEARNING OBJECTIVES:
Learn the appropriate methods of preparation, execution and post-op care for the safe and aesthetic outcome of eyelash transplant sugery.

ABSTRACT:
Since eyelash transplantation was first described in the medical literature in 1914 (F. Krusius), there have been many methods used to surgically restore both form and function to the eyelid as well as recent FDA approval of bimatoprost 0.03% solution for eyelash growth. Based on a case-review of over 350 eyelash surgeries, the author will present a brief overview of preferred methods of patient selection, patient education, informed consent, in addition to instrumentation, technique, post-op care, and lash-maintenance; focusing on the critical steps to minimize complications, managing post-op sequelae, and maximizing patient satisfaction in both the cosmetic and reconstructive applications of eyelash transplant procedure. The author will also describe and demonstrate via animation and video his novel approach to the technique, ‘pairing’ and 'tripling' methods of implantation which allows larger numbers of hair follicles to be implanted into the lid per session, the ‘puppeteering method’ for aesthetic lash curl orientation, as well as several pearls for improved efficiency and a predictable aesthetic outcome.

011

Hair Transplantation for the Treatment of End-Stage Scarring Alopecia

Meena K. Singh, MD.
Kansas Medical Clinic, Shawnee, KS, USA.

Dr. Meena Singh is a board-certified dermatologist and hair transplant surgeon practicing in NYC and Kansas City. She attended Harvard Medical School, trained at the Mayo Clinic, and completed a fellowship with the International Society for Hair Restoration Surgery under Dr. Marc Avram. She has performed clinical trials in laser hair stimulation and hair transplantation for scarring hair loss. She has numerous publications in many journals, book chapters, and has been published in the New England Journal of Medicine and been featured on the cover of New York Times.

M.K. Singh: None.

LEARNING OBJECTIVES:
-Determine which patients are good hair transplant candidates.-Understand technical considerations.-Properly counsel patients about all treatment options.

ABSTRACT:
Patients with end-stage cicatricial alopecia should be offered hair restoration surgery as an option for treatment of

their cosmetically disfiguring condition. However, hair transplantation
into scarring alopecia can be more challenging as the patient not only needs a suitable donor area, but the inflammatory stage of the scarring alopecia must be inactive. In addition, scalp fibrosis and diminished vascularity may lead to decreased graft survival. Therefore, when a patient seeks consultation for hair restoration an accurate diagnosis should be obtained. It is highly recommended to perform a small, test area before undergoing a larger transplantation session. In 9-12 months, depending on the assessment of graft survival in the test area, a larger session can be performed. Smaller incisions and transplanting at lower densities of 10-25 follicular units per square centimeter is recommended. The patient is counseled that 2-4 sessions may need to be performed every 9-12 months minimum and that with each session higher densities can be achieved. It is important to set expectations for hair transplantation patients with scarring alopecia. Those who accept the limitations of the procedure are generally satisfied with any cosmetic improvement.This will be a case-based talk will discussing the above background and technical considerations.

012

Session Director, "Immunobiology, Alopecia Areata"

M. K. Hordinsky.
University of Minnesota, Minneapolis, MN, USA.

013

Targeting Immune Cells in Alopecia Areata

A. Christiano.
Columbia University, New York City, NY, USA.

014

NK and NK-like Cells in Alopecia Areata

Amos Gilhar, MD.
Ruth & Bruce Rappaport Faculty of Medicine Technion - Israel Institute of Technology, Haifa, Israel.

Professor of Dermatology Ruth & Bruce Rappaport Faculty of Medicine, Technion - Israel Institute of Technology, Haifa. **Public Professional Activities: 1996 - present:** Member, National Committee for Approval of Pharmaceutical Products, Ministry of Health, Jerusalem, Israel; **2005 - 2007:** Chairman, National Committee for Investigating Medical Aesthetics, Ministry of Health, Jerusalem, Israel; **2011 - present:** Editorial Board Member, Experimental Dermatology. 136 publications in peer reviewed journals; Organizer of 12 national and international meetings .

A. Gilhar: None.

LEARNING OBJECTIVES:
Understanding the immunepathology of alopecia areata

ABSTRACT:
AA is now widely accepted as a CD8 T cell-dependent, antigen- and organ-specific autoimmune disease that selectively attacks growing hair follicles.However, recent literature implicates various
other potential players in the pathogenesis of autoimmune diseases including AA, among them non-conventional lymphocytes such as Invariant Natural Killer T (iNKT). The cells are a T cell subset expressing an invariant T Cell Receptor (TCR) that recognizes glycolipid antigens rather than peptides.The humanized SCID mouse model has been utilized to address a possible role of iNKT cells in AA. The study revealed the presence of iNKTs producing IL-10 in lesional skin of AA patient and in alopecic lesions of the humanized AA mouse model. Culture of PBMCs with α-galactosylceramide (αGalCer), which is a strong activator of iNKT cells, and IL-2 induced expansion of iNKTs producing IL-10. Injections of these cultured cells into in the humanized AA mice demonstrated regulatory

and therapeutic functions. Depletion of the iNKT cells or blocking their activity by neutralization antibodies prevented the tolerance effect. These data support the notion that non-conventional T-lymphocytes such as iNKTs producing IL-10 may play a role in the pathogenesis of AA and potentially related autoimmune diseases and point towards the therapeutic of potential glycolipid antigens in future AA management.

015

Putting things into perspective: How close have we really come to understanding the pathobiology of alopecia areata?

Ralf Paus, MD.
University of Manchester, United Kingdom.

016

Prevention and Treatment of Alopecia Areata with Mesenchymal Stem Cells in the C3H/HeJ Mouse Model

Gwang Seong Choi, MD, PhD, Ji Won Byun, Hyo Jin Kim, Hye Soo Ko, Jeonghyun Shin, Myeong Shin Jeon.
Inha University School of Medicine, Incheon, Korea, Republic of.

<Career>
1985- 1989 Graduated from Yonsei University College of Medicine
1997- 1999 Received the Ph.D. at Graduate School of Yonsei University
1999- present Clinical instructor, Assistant professor, Associate professor and Professor in the Department of Dermatology, Inha
University College Medicine
2005 - 2006 Visiting Investigator, Center for CutaneousResearch, Bart and London, London University
<Society>
Member of Korean Dermatological Association
Member of Korean Society for Investigative Dermatology
Director of Korean Hair Research Society
General Secretary of Korean Society for Dermatological Surgery
Director of Korean Academy of Vitiligo
Director of Korean Society for Chemical Peeling

G. Choi: None. **J. Byun:** None. **H. Kim:** None. **H. Ko:** None. **J. Shin:** None. **M. Jeon:** None.

LEARNING OBJECTIVES:
Mesenchymal stem cells provided promising therapeutic modality of AA in the C3H/HeJ model.

ABSTRACT:
Current therapeutic options for AA are limited, and there is no effective prevention for recurrent AA. Emerging evidence of the potent immunosuppressive activity of mesenchymal stem cells (MSCs) by modulation immune responses enables MSCs to be developed as a promising therapeutic modality for immune-related or inflammatory diseases.
In this study, we investigated the effects of MSCs on AA development and treatment in C3H/HeJ mice. We identified potentially important cytokines and chemokines in the treatment of AA by mcMSCs. Mice with skin graft induction of AA were injected with PBS, bone marrows from wild type C3H/HeJ mice and mcMSCs from wild type C3H/HeJ mice. Serum of C3H/HeJ mice was collected at 0, 7, 35 and 49 days after treatment and assessed for alterations in hematopoietic cytokine secretion using Luminex assays.In the result, Mice with AA development had increased secretion of IP-10 and MIG induced by IFN-γ in serum. mcMSCs injection resulted in a significant decrease in AA development, as compared with that with PBS and bone marrows injection. This result also correlated with significant decreases in IP-10, MIG after msMSCs injection.

In conclusion, our results demonstrated that mcMSCs provided effective prevention of onset of AA in the C3H/HeJ model, and warrant further studies to determine whether mcMSCs might be developed as a cell therapy for AA.

017

Chemokine Receptor CCR5 is the Novel Target for the Treatment of Alopecia Aerate

Taisuke Ito, MD, PhD, Takahiro Suzuki, Atsuko Funakoshi, Yoshhiki Tokura.
Hamamatsu University School of Medicine, Hamamatsu, Japan.

I have been studied hair biology, especially alopecia areata, and seen a lot of hair loss patients.

T. Ito: None. **T. Suzuki:** None. **A. Funakoshi:** None. **Y. Tokura:** None.

LEARNING OBJECTIVES:
Chemokine and its receptor is one of the strong candidate for the future target of alopecia aerate treatment.

ABSTRACT:
Alopecia areata (AA) is an organ-specific autoimmune disease with cell-mediated autoimmune reactions. T lymphocytes densely surround hair bulbs in the lesion of acute-phase AA, referred to as “swarm of bees”. The pathological mechanisms of “swarm of bees”, can be induced by the upregulation of Th1 chemokine expression from hair follicles that result in the resultant infiltration of CXCR3+ and CCR5+ Th1 or Tc1 cells into AA lesions. Here, C3H/HeJ mice with AA were treated with CCR5 inhibitor, Maraviroc, that is HIV drug by negative allosteric modulator of the CCR5 receptor. AA was induced by intracutaneous injection of activated LN cells derived from C3H/HeJ mice. Then, maraviroc is orally administerated. Interestingly, 4/5 maraviroc-treated C3H/HeJ mice with AA showed improvement of hair loss lesions after 2 weeks. Immunohistological assessments revealed decreased number of CD4+CCR5+ and CD8+CCR5+ T cells in the lesions after maraviroc treatment. Furthermore, FACS analysis also supports revealed the reduced frequency of CD4+CCR5+ T cells in skin-infiltrating cells. In addition, EZTaxiscan showed the significant inhibition of the chemotactic activity of CD4+ LN cells toward RANTES by maraviroc compared to PBS.
In conclusion, inhibition of chemokine receptors/chemokines can be the novel target for the treatment of AA.

018

Treatment with Simvastatin Decreases pStat1 Levels and Reverses AA in the C3H/HeH Mouse Model

Gina M. DelCanto, B.A., Vanessa A. Petit, B.S., Ailin Vila Granda, M.S., Oscar Alcazar, Ph.D., Carmen I. Perez, M.D., Ph.D., George W. Elgart, M.D., Lawrence A. Schachner, M.D., Joaquin J. Jimenez, M.D..
University of Miami, Miami, FL, USA.

Gina M. DelCanto is a graduate student working in the field of alopecia areata under the mentorship of Dr. Joaquin J. Jimenez, who has made significant contributions to the field of hair loss.

G.M. DelCanto: None. **V.A. Petit:** None. **A. Vila Granda:** None. **O. Alcazar:** None. **C.I. Perez:** None. **G.W. Elgart:** None. **L.A. Schachner:** None. **J.J. Jimenez:** None.

LEARNING OBJECTIVES:
At the end of the presentation, you will the effect of simvastatin treatment in alopecia areata.

ABSTRACT:
Alopecia areata (AA) is an autoimmune disorder characterized by T-cell infiltrate of the hair follicle. At present, there is no cure for AA, but JAK/STAT pathway inhibitors have recently shown considerable efficacy as treatment. We have shown previously that simvastatin, a lipid-lowering drug that has been suggested to modulate the JAK/STAT pathway in multiple cellular models, functions in combination with ezetimibe to reverse hair loss in a statistically significant number of AA patients. In this study, we examined the effects of topical simvastatin treatment on hair re-growth in the C3H/HeH mouse model. Mice with spontaneous alopecia areata received either a

topical simvastatin or vehicle treatment daily for 12 weeks. Skin samples were taken from a selection of mice after 8 weeks of treatment. Samples were fixed and stained to visualize pSTAT1 and inflammatory cell infiltrate. Of the mice treated with simvastatin, 8/11 responded with hair re-growth, five completely and three only partially. No new hair growth was observed in untreated mice. Staining of skin sections revealed a relative decrease in both inflammatory cell infiltrate and levels of activated STAT1 in the skin of mice treated with simvastatin. These findings serve to highlight simvastatin as a possible treatment option for AA whose effect on alopecia areata may be mediated, at least in part, by modulation of the JAK/STAT signaling pathway.

019

Session Director for "Morphogenesis, Neogenesis, and Tissue Engineering"

Sarah E. Millar, PhD.
University of Pennsylvania, Philadelphia, PA, USA.

020

Session Co-Director for "Morphogenesis, Neogenesis, and Tissue Engineering"

Vladmir Botchkarev, MD.
United Kingdom.

V. Botchkarev: None.

021

Session Co-Director for "Morphogenesis, Neogenesis, and Tissue Engineering"

Marja L. Mikkola, PhD.
Finland.

M.L. Mikkola: None.

022

ß-catenin signaling marks self-renewing stem cells in multiple epithelial tissues

Sarah E. Millar, PhD.
University of Pennsylvania, Philadelphia, PA, USA.

023

Regeneration of Skin Appendages: Physiological and Wound Induced Responses

Cheng Ming Chuong, MD.
University of Southern California, Los Angeles, CA, USA.

Dr. Cheng-Ming Chuong received his M.D. from Taiwan University in 1978. He then obtained his Ph.D. from The Rockefeller University in 1983. Later he moved to the University of Southern California in 1987 and work on the development and regeneration of feather, tooth, and hairs. He is currently a professor of pathology and also serves as the Chair of Graduate Committee in Department of Pathology.

C. Chuong: None.

LEARNING OBJECTIVES:

Appreciate the term “hair regeneration” involves many different modes of regenerative

behavior. It can be the reactivation of existing hair stem cells, or reprogramming to produce new hair stem cells. It can be physiological events or regeneration following different types of wounding.

ABSTRACT:
Skin appendages like hairs and feathers are unique in their ability to regenerate. Here we discuss different modes of skin appendage regeneration.
1) Cyclic regeneration of hair or feather follicles under physiological condition. Phenotypes can change under different age or hormone influence. Androgenetic alopecia belongs to this category and is the failure to activate hair stem cells.
2). Intra-follicular regeneration following the plucking of filament, or damage by chemical or irradiation.
3) Population regenerative behavior in which hair follicles in a population can influence the regeneration of other follicles via its status. This includes regenerative hair wave which involves interaction of hair follicles and intra-dermal adipose tissue, and quorum sensing behavior which involves interaction of hair follicles and immune system.
4) Changes of the cellular fate after wounding, as seen in the conversion of appendage progenitor into epidermis or nail.
5) Wound induced follicle neogenesis. This involves endogenous cellular reprogramming and the making of new hair primordia and follicles. We will discuss some of the molecular mechanisms that regulate these different regenerative behaviors.

024

Getting It Right: Coordinating Progenitors and Their Niche to Specify Hair Size and Structure.

Bruce Morgan, Ph.D..
Harvard Medical School, Charlestown, MA, USA.

I have worked to develop enabling techniques in a wide range of model organisms to study the process of pattern formation and organogenesis in vivo as graduate student, post-doc, and faculty member at Harvard Medical School. Since joining the Cutaneous Biology Research Center at HMS/MGH, I have employed cutaneous appendages for this purpose. Our hair research has focused on the dermal papilla to complement the community's work on epithelial stem cells in the follicle.

B. Morgan: None.

LEARNING OBJECTIVES:
Present current knowledge on the cellular and genetic mechanisms that maintain hair follicle size in model systems.

ABSTRACT:
The size and shape of the hair shaft is dependent on the number and activity of hair progenitor cells, which is in turn dependent on the number and activity of the dermal papilla cells that comprise their niche. Our work in the mouse has shown that a reduction in dermal papilla cell number can cause the follicular decline and telogen arrest observed in human hair thinning and loss. However, it has also revealed that dermal papilla number is actively regulated in the context of the regenerative phase of the hair cycle. Using genetically modified mice to manipulate gene expression in the dermal papilla of existing hair follicles, we have begun to dissect the mechanisms by which dermal papilla and progenitor numbers are set to ensure production of appropriately sized hairs.

025

Inducing Hair Follicle Organogenesis with Defined Protein Factors

Sabrina Mai-Yi Fan[1], Chia-Feng Tsai[2], Chien-Mei Yen[1], Su-Hua Pan[1], Yu-Ju Chen[2], **Sung-Jan Lin, MD, PhD**[1].
[1]National Taiwan University, Taipei, Taiwan, [2]Academia Sinica, Taipei, Taiwan.

Dr. Sung-Jan Lin, MD, PhD, is now an associate professor in Institute of Biomedical Engineering, National Taiwan University. He is also a dermatologist in National Taiwan University. His research interest includes tissue engineering, hair follicle regeneration, responses of hair follicles to various insults, pigment loss and biomedical optics.

S. Fan: None. **C. Tsai:** None. **C. Yen:** None. **S. Pan:** None. **Y. Chen:** None. **S. Lin:** None.

LEARNING OBJECTIVES:
To demonstrate a new method to induce hair follicle neogenesis with defined protein factors.

ABSTRACT:
Hair follicle neogenesis depends on the initiation and perpetuation of cross-talk between keratinocytes and dermal cells. When skin is injured, it is usually repaired with fibrosis except in embryos that exhibit scarless healing with formation of new hair follicles. We ask whether similar neogenesis of hair follicles can be reinitiated in postnatal life. We found that protein extract from embryonic skin of specific developmental stage was able to induce hair follicle neogenesis both in a full thickness wound and a modified patch assay in mice without the help of inductive mesenchymal cells. Hair follicle organogenesis here was mediated mainly through the effect on fibroblasts. When adult fibroblasts, but not keratinocytes, were cultured with the protein extract, they were conferred the ability to induce new hair follicles. In search for the molecular mechanisms involved through phosphoproteomic analysis, we found that insulin/IGF signaling was activated and required for the hair follicle inductivity in adult fibroblasts. Through proteomics analysis with mass spectometry, we identified 3 extracellular proteins enriched in embryonic skin that together were required and sufficient to induce hair follicle neogenesis in vivo. Therefore, hair follicle regeneration could be initiated by creating a pro-regeneration environment with defined extracellular factors enriched in the developmental stages. Identification of such environmental signals can be incorporated with other approaches to enhance hair follicle regeneration.

026

Session Director, “Cicatricial Alopecia”

Elise Olsen, MD.
Duke University, Durham, NC, USA.

E. Olsen: None.

027

Session Co-Director, "Cicatricial Alopecia"

Andrew G. Messenger, MD.
Sheffield, United Kingdom.

A.G. Messenger: None.

028

Frontal Fibrosing Alopecia: Preliminary Results of a Multicenter Study

Elise Olsen, MD.
Duke University, Durham, NC, USA.

Dr. Olsen is the founder and Director of the Duke University Hair Disorders Research and Treatment Center. She is one of the founders, past President and past Board member of the North American Hair Research Society (NAHRS). She is the author of the first and second editions of the textbook, "*Hair Disorders: Diagnosis and Treatment.”* She is on the

Scientific Advisory Board of CARF and the National Alopecia Areata Foundation and served as Chairman of the NAAF taskforce to develop investigative guidelines for alopecia areata.

E. Olsen: None.

LEARNING OBJECTIVES:

The focus in on identifying etiologic factors of FFA.

ABSTRACT:
Frontal fibrosing alopecia: preliminary results of a multicenter study . This presentation will review the results of an extensive online questionnaire filled out by patients with FFA. The focus in on identifying etiologic factors of FFA

029

Low-hanging fruit: Identifying Preventable Causes of Scarring Alopecia

Nonhlanhla P. Khumalo, MBChB, PhD.
University of Cape Town, South Africa

N. Khumalo: None.

030

Comparison of Four Regimens for the Treatment of Central Centrifugal Cicatricial Alopecia

Nikki Tang, MD[1], Marcy Coley, MD[2], Sejal Shah, MD[3], Yahya Argobi, MD[4], Cheryl M. Burgess, MD[5], Susan C. Taylor, MD[6], Andrew F. Alexis, MD, MPH[1].
[1]Mt. Sinai St. Luke's-Roosevelt Hospital, New York, NY, USA, [2]Summit Medical Group, Berkeley Heights, NJ, USA, [3]SmarterSkin Dermatology and Mt. Sinai Beth Israel Hospital, New York, NY, USA, [4]Tufts University, Boston, MA, USA, [5]Center for Dermatology and Dermatologic Surgery, Washington, DC, USA, [6]Society Hill Dermatology, Philadelphia, PA, USA.

Dr. Tang is originally from Los Angeles, California and graduated from Brown University with both her undergraduate degree and medical degree before entering residency at St. Luke’s-Roosevelt Hospital in New York City. She has a special interest in cutaneous oncology/Mohs micrographic surgery, skin of color, and medical education.

N. Tang: None. **M. Coley:** None. **S. Shah:** None. **Y. Argobi:** None. **C.M. Burgess:** None. **S.C. Taylor:** None. **A.F. Alexis:** Advisory Board or Panel; Aclaris, Amgen, Bayer, Galderma, Leo, Suneva, Valeant. Consultant; Allergan, Amgen, Anacor, Galderma, J&J, L'Oreal, Roche, Schick, Valeant. Grants/Research Support; Allergan, Novartis. Other Financial or Material Support (royalties, patents, etc.); Cipla (speaking fee).

LEARNING OBJECTIVES:
Understand the effectiveness of the four most common treatment options for central centrifugal cicatricial alopecia (CCCA).

ABSTRACT:
Evidence of effective treatment methods for central centrifugal cicatricial alopecia (CCCA) is lacking. Anti-inflammatory agents, oral antibiotics, topical steroids, and intralesional steroids are all commonly utilized but effectiveness has not been assessed. A limited scale, randomized trial was conducted to investigate the comparative efficacy of four anti-inflammatory treatment regimens. Thirteen patients, determined to have biopsy-verified CCCA, were randomized to four treatment arms: 1) Oral doxycycline, 100mg twice daily, 2) Clobetasol lotion, 2 week cycles, 3) Triamcinolone acetonide injections(TAC), 5mg/cc intralesionally every 4 weeks. 4) Oral rifampin 300mg and cephalexin 500mg, twice daily for 2 weeks, repeated up to 24 weeks. Patients underwent treatment for 6 months followed by Minoxidil 5%. Using last-observation-carried-forward (LOCF) analysis, the mean improvement of involved area was 32.8cm2/19.1% (doxycycline), 48.3cm2/34.5% (clobetasol), 70.3cm2/32.5% (TAC), and -12.3/-

8.9% (rifampin/cephalexin). Due to the small sample size, results approached but did not achieve statistical significance. Pooling all participants into a single group, mean change in involved area was 34.6cm2 (95% CI -5.9cm2, 75.1cm2, p = 0.09). Symptoms that improved during treatment included pruritus (10/13, 77%) and pain (6/13, 46%). This is the first clinical trial to investigate the effectiveness of treatment for CCCA and the first to compare steroidal and antibiotic therapy options. Further investigation of treatment options of CCCA are warranted.

031

Absence of Catagen/telogen Phase and Loss of Cytokeratin 15 Expression in Hair Follicles in Lichen Planopilaris

Arlette Habashi-Daniels, MD[1], Janet Roberts, MD[2], Nisha Desai, MD[2], **Curtis T. Thompson, MD**[3].
[1]Kansas University Medical Center, Kansas City, KS, USA, [2]Northwest Dermatology and Research Center, Portland, OR, USA, [3]Departments of Biomedical Engineering, Pathology and Dermatlogy, Oregon Health & Science University, Portland, OR, USA.

Dr. Thompson is a dermatopathologist with expertise in hair loss and nail diseases. Dr. Thompson also currently performing basic science research in melanocyte biology.

A. Habashi-Daniels: None. **J. Roberts:** None. **N. Desai:** None. **C.T. Thompson:** None.

LEARNING OBJECTIVES:
We present evidence of decreased catagen/telogen phase follicles in lichen planopilaris from the loss of CK15+ stem cells.

ABSTRACT:
Lichen planopilaris (LPP) is a lymphocyte-mediated cicatricial alopecia in which the focus of inflammation and scarring is centered around the bulge region of the follicle. The origin of LPP is unknown, and treatment may not prevent disease progression. As a useful tool for both histologic diagnosis and an explanation of for LPP disease progression, we demonstrate a decrease in the number of catagen-/telogen-phase follicles and confirm the loss of cytokeratin 15 (CK15+) expression in the stem cells of LPP-affected follicles.
In this study, 55 cases were stained immunohistochemically for the CK15 antigen, and 40 cases were sufficient for analysis. Catagen/telogen phase was significantly decreased or absent in all cases of LPP, a novel clue useful in histologic diagnostics. The loss of CK15+ stem cells in most affected follicles in LPP was also confirmed, with unaffected follicles retaining CK15+ stem cells. The finding explain why damaged follicles that have lost their CK15+ stem cells disappear when they enter catagen phase.
In conclusion, CK15+ stem cell loss explains LPP progresses despite immunosuppressive therapy. For dermopathologists, the absence of catagen/telogen hair follicles is a helpful diagnostic clue for LPP.

032

Frontal Fibrosing Alopecia: Epidemiologic Data From a Patient Registry

Varvara Kanti, MD[1], Eva Katharina Barbosa Pfannes[1], Johanna Meinhard[1], Annika Vogt[1], Pascal Reygagne[2], Ulrike Blume-Peytavi[1].
[1]Charité – Universitätsmedizin Berlin, Department of Dermatology and Allergy, Clinical Research Center for Hair and Skin Science, Berlin, Germany, [2]Centre de santé Sabouraud, Paris, France.

2003-2009 University of Crete, School of Medicine, Heraklion, Greece
2008-2009 ERASMUS, Charité-Universitätsmedizin Berlin, Germany
Okt. 2009 Exchange Student, Boston University, MA, USA
Aug. 2010 - Aug. 2012 Internal Medicine Resident, Bernau, Germany
Sep. 2012 Certification as Clinical Study Investigator according to AMG/GCP
Sep. 2012 - today Clinical Study Investigator, Development and execution of clinical studies according to GCP and AMG in the field of skin and hair physiology in children and adults, CRC, Department of Dermatology and Allergy, Charité-Universitätsmedizin Berlin, Germany

Jan. 2014 - today Dermatology Resident, Department of Dermatology and Allergy, Charité-Universitätsmedizin Berlin, Germany

V. Kanti: None. **E. Barbosa Pfannes:** None. **J. Meinhard:** None. **A. Vogt:** None. **P. Reygagne:** None. **U. Blume-Peytavi:** None.

LEARNING OBJECTIVES:
Assess the epidemiologic characteristics of frontal fibrosing alopecia, with prospective and retrospecive data from a patient registry.

ABSTRACT:
Frontal fibrosing alopecia (FFA), first described by Kossard in 1994, is a cicatricial alopecia of the frontotemporal hairline, regarded as a lichen planopilaris variant. Despite the increasing FFA incidence, few literature data exist on epidemiology, pathogenesis and influencing factors. A FFA patient registry was created, including retrospective patient data from France (n=135) and Germany (n=85). Since 2013 the German national registry is being carried on prospectively. Standardized questionnaires were developed to collect demographical data, dermatological assessment, laboratory test results, concomitant diseases, medication and cosmetic product use.314 patients were included: 96,5% female, 76% of which were postmenopausal. Age at diagnosis ranged from 26-86 years, averagely 3 years after first reported disease onset. 9% reported familial predisposition. Reduction or complete loss of eyebrows, axillary and pudental hair or hair of the extremities was found in 76%, 46% and 41% respectively. Beard involvement was found in 30% of the male patients. LPPAI score was rather low (2,3±1,8). 27% of the patients presented lipid metabolic disorders. Thyroid disorders, lichen planus, other autoimmune diseases or hepatitis were found in individual patients. Topical and intralesional corticosteroids were the mostly used treatments, followed by tetracyclines, hydroxychloroquine, finasteride, mycophenolate mofetil and methotrexate.The establishment of this FFA patient registry will help enhancing the current understanding of this increasingly common disease and developing diagnostic and therapeutic recommendations.

033

Session Director, “Auxiliary Cells”

Valerie Horsley, PhD.
Yale University, New Haven, CT, USA.

V.Horsley: None.

034

Links between macrophages and the activation of the skin stem cell niche

Donatello Castellana[1], Ralf Paus[2], **Mirna Perez-Moreno**[1].
[1]Spanish National Cancer Research Centre (CNIO), Madrid, Spain, [2]Institute of Inflammation and Repair, University of Manchester, Manchester, United Kingdom.

Mirna Perez-Moreno obtained her PhD from the Center for Research and Advanced Studies in Mexico City, and conducted a full post-doctoral training with Elaine Fuchs at The Rockefeller University in NY. Mirna Perez-Moreno is currently a Group Leader in the Cancer Cell Biology Program at the Spanish National Cancer Research Centre in Madrid (2008-present). Her research interests are directed to understand how the regenerative properties of skin progenitor cells are regulated by their intercellular connections, and by their interactions with immune cells within their niche to sustain skin homeostasis.

D. Castellana: None. **R. Paus:** None. **M. Perez-Moreno:** None.

LEARNING OBJECTIVES:
- Examine the recent advances in research on hair follicle regeneration and hair growth.

ABSTRACT:
The skin is home to diverse immune cell populations. However, the functional relationship of skin resident immunocytes in the activation of hair follicle progenitor cells and hair follicle growth in adult mammalian skin has not been widely studied. Using the murine hair cycle as a model system, we have explored whether such interactions are able to regulate hair follicle cycling, specifically the physiological entry of telogen hair follicles into anagen. Our results uncovered that perifollicular skin-resident macrophages are part of the skin stem cell niche, and that their numbers fluctuate before the onset of the activation of hair follicle progenitor cells. Transcriptional profiling revealed that this was accompanied by the expression of Wnt ligands in macrophages. Interestingly, the macrophage-specific pharmacological inhibition of Wnt processing is sufficient to delay hair follicle growth. Overall, our findings suggest a model where macrophage-derived Wnts contribute to the activation of hair follicle progenitor cells as a novel cue that regulates their regenerative activity.

035

Melanocyte stem cells in the hair follicle

Mayumi Ito, PhD.
New York University, New York, NY, USA.

M.Ito: None.

036

Regulation of dermal adipocytes

Valerie Horsley, PhD.
Yale University, New Haven, CT, USA.

V.Horsley: None.

037

Are Eccrine Glands Part Of The Pilosebaceous Unit?

Enrique Poblet[1], **Francisco Jimenez- Acosta**[2], Jonathan Hardman[3], Ralf Paus[4].
[1]Murcia University and Hospital General Universitario, Murcia University, Spain, [2]Mediteknia Clinic, Las Palmas de Gran Canaria, Suriname, [3]Dermatology Research Centre, Institute of Inflammation and Repair, University of Manchester, Manchester, United Kingdom, [4]Dermatology Research Centre, Institute of Inflammation and Repair. University of Manchester, and Department of Dermatology, University of Münster,, Manchester, United Kingdom.

Dr. Jimenez, Derm and Hair Transplant Surgeon from Spain. He did his Derm Residency in Madrid and his Doctoral Thesis in the University Autonoma of Madrid. Fellowship in Dermatopathology at the University of Miami, Mohs and Dermatologic Surgery at Duke Uni., and in Hair Transplant Surgery at Stough Clinic in Hot Springs. Works in his private Clinic Mediteknia, in Spain. Dr. Jimenez is Associate Researcher of the Medical Pathology Group from the School of Medicine, University of Las Palmas de Gran Canaria. Editor Emeritus of the Hair Transplant Forum International and Board Member of the ISHRS.

E. Poblet: None. **F. Jimenez- Acosta:** None. **J. Hardman:** None. **R. Paus:** None.

LEARNING OBJECTIVES:
Illustrate the relation that ecrine glands maintain with the pilosebaceous unit

ABSTRACT:
Background: The pilosebaceous unit and the eccrine sweat glands (EGs) are classically described as completely independent skin appendages. However, subtle, often overlooked morphological evidence, especially when the whole EG trajectory is examined, reveals that the distal eccrine duct and the secretory coils come very close to the hair follicle and surround the latter.
Material and Methods: For the present work we have made a complete follow up of the whole itinerary of the sweat glands through serial transversal sections of scalp skin stained with hematoxilin-eosin.

Results: Morphological association of the pilosebaceous unit with the eccrine glands is not obvious observing the classic histological perspectives of skin sections. However, an observation of the whole eccrine gland trajectory reveal that the distal eccrine duct and the secretory coils are associated to the hair follicle units. We propose the term “hair field unit (HFU)” for this association.
Relevance: If confirmed by systematic 3D modelling and functional studies, the inclusion of EGs into follicular unit hair is clinically important, while the hitherto separate fields EG and pilosebaceous research need to cross-fertilize each other.We speculate that EG activities, such as secretory activies of the EG epithelium and stromal progenitor cells, impact on the overall function of the hypothetical HFU in health and disease.

038

Session Director, “Great Cases from South America”

Ricardo Romiti, PhD.
University of São Paulo, São Paulo, Brazil.

Ricardo Romiti, MD, PhD, is responsible for the Hair Unit at the Department of Dermatology of the University of São Paulo, Brazil, and works as clinical Professor of Dermatology also at the University of São Paulo.
Having gained his medical degree from the Faculty of Medicine of the University of São Paulo, where he also completed his residency in the Department of Dermatology, Professor Romiti undertook a Fellowship at the “Ludwig-Maximilians-Universität”, Munich, Germany. Professor Romiti has authored or co-authored numerous papers published in national and international dermatology journals.

R. Romiti: None.

039

Session Co-Director, "Great Cases from South America"

Maria E. Cappetta, MD.
CEMIC, Department of Dermatology, Buenos Aires, Argentina.

María E. Cappetta, MD.
Medical Doctor Specialist in Dermatology. Hair Clinic at CEMIC (Centro de Educación Médica e Investigaciones Clínicas- Fundación Norberto Quirno) and Buenos Aires Skin. Buenos Aires, Argentina.

M.E. Cappetta: None.

040

Session Co-Director, "Great Cases from South America"

Isabella Doche, MD.
University of Sao Paulo, Sao Paulo, Brazil.

Dermatologist and PhD student at the University of Sao Paulo (Brazil) and Research fellow at the University of Minnesota (USA).

I. Doche: None.

041

The Pseudo-'Fringe Sign" in Frontal Fibrosing Alopecia

Rodrigo Pirmez, MD.
Santa Casa de Misericórdia do Rio de Janeiro, Rio de Janeiro, Brazil.

Dermatologist, Hair and Scalp Disorders Clinic, Department of Dermatology, Santa Casa de Misericórdia do Rio de Janeiro, Rio de Janeiro, Brazil

R. Pirmez: None.

LEARNING OBJECTIVES:
Demonstrate a new clinical presentation of frontal fibrosing alopecia, in which an unusual retention of the hairline produces a misleading pseudo-“Fringe Sign”.

ABSTRACT:
Frontal fibrosing alopecia (FFA) is a clinically distinct variant of lichen planopilaris mainly characterized by a progressive band of alopecia of the frontotemporal hairline. Traction alopecia (TA) is one of the main differential diagnoses especially in black patients. The ‘fringe sign’, the presence of retained hairs along the frontotemporal rim, is a useful clinical marker of TA, helping in the differential diagnosis between both entities. We describe a series of FFA patients in which an unusual retention of the hairline produced a misleading pseudo-‘fringe sign’. Currently, FFA is considered an epidemic by several authors and dermatologists will certainly come across an increasing number of exceptions and new presentations of the disease. Awareness of this newly described clinical presentation may prevent incorrect diagnoses, thus allowing early treatment and halting of disease progression.

042

Breast cancer metastasis mimicking cicatricial alopecia

Mariana S. Martin, MD, Ana Vulcano, M.D, Ana C. Torre, M.D, Cecilia Navarro Tuculet, M.D, Ricardo L. Galimberti, M.D Ph.D.
Italian Hospital of Buenos Aires, BUENOS AIRES, Argentina.

Received my medical degree from Buenos Aires University with greatest honours (2008). Residence in Dermatology at the Italian Hospital of Buenos Aires (HIBA). Trained with one of the lider trichologist,Prof. Francisco Camacho-Martinez in Spain and trained on FUE technique with Dr Alejandro Chueco in Buenos Aires. National and International presentations on dermatologic and hair congresses. Member of the Argentinian Dermatology Society (SAD) and Hair Recovery Argentinian Association. Professor at the SAD Hair course. Author of chapters of the Argentinian book “ 50 diagnósticos dermatológicos”. Coordinator of medical athenaeums and fellow at the Capilar Center at the the HIBA dermatology service.

M.S. Martin: None. **A. Vulcano:** None. **A.C. Torre:** None. **C. Navarro Tuculet:** None. **R.L. Galimberti:** None.

LEARNING OBJECTIVES:
Considerer metastases in the differential diagnosis of cicatricial alopecia.

ABSTRACT:
A well known, but infrequent, presentation of scalp metastasis is alopecia neoplastica. It usually presents as single or multiple, erythematous, infiltrated, plaques mimicking scarring alopecia; but it may also resemble non cicatricial alopecia as alopecia areata. Therefore, histological evaluation of scalp lesions is essential for diagnosis.
A 48 year-old-woman was referred due to a two-month history of hair loss. She had no past medical history and was taking no medication. Physical examination revealed multiple asymptomatic, slightly erythematous, alopecic patches throughout the scalp. Multiple punch biopsies were performed for histological examination. It showed bundles of fibrotic collagen with round cells, with large and elongated nuclei and minimal cytoplasm, in a single and clustered infiltrative pattern, located in the deep dermis. Immunohistochemical staining for CK7, estrogen receptor and GCDFP15 were positive, and CK20 was negative. Clinical evaluation revealed a left breast mass and solid lymphadenopathies in left axilla. Infiltrating ductal breast adenocarcinoma was diagnosed. A CT scan showed multiple metastases affecting bone, lung and liver. Treatment was initiated with paclitaxel and doxorubicin but the patient died 8 months after the diagnosis.
Cutaneous metastases can mimic benign dermatosis and therefore delay a correct diagnosis. Frequently, they appear late during the course of the systemic malignancy but as in our case, they could be the first manifestation of the disease.

043

Vitiligo-like patches: a further hallmark of frontal fibrosing alopecia?

Alessandra Anzai, MD.
University of São Paulo Medical School, São Paulo, Brazil.

Alessandra Anzai, MD, was graduated in medicine from School of Medicine - University of Sao Paulo (FMUSP) in 2010, and completed her residency in Dermatology at the Department of Dermatology-FMUSP in 2014. In 2014 she received the North American Hair Research Society Mentorship Grant and was a mentee of Dr. Antonella Tosti, MD, at Miller School of Medicine - University of Miami. She completed in 2015 a fellowship in stomatology and hair and nails diseases and she is currently a research fellow at the Department of Dermatology, FMUSP.

A. Anzai: None.

LEARNING OBJECTIVES:
Illustrate achromic vitligo-like lesions as a cutaneous hallmark of the interface dermatitis associated to frontal fibrosing alopecia.

ABSTRACT:
Frontal Fibrosing Alopecia (FFA) is a primary lymphocytic cicatricial alopecia that presents with recession of frontal and temporal hairlines. Pigmentary disorders were associated with FFA in 2012, when the association between FFA and Lichen Planus (LP) pigmentosus was described. I will present a case report of a Caucasian FFA female patient with vitiligo-like patches over the front and neck whose biopsy showed epidermal interface changes. This case corroborates previous findings of cutaneous interface changes in FFA. True vitiligo, as well as subacute lupus erythematosus, are differential diagnoses that must be excluded.

044

Folliculitis decalvans following hair transplant in surgical scar site

Néstor Carreño.
Pontificia Universidad Católica de Chile, Santiago, Chile.

Dermatologist, Pontificia Universidad Católica de Chile

N. Carreño: None.

LEARNING OBJECTIVES:
In those post-transplant patients that have poor hair growth, we should suspect the initial development of a scar alopecia.

ABSTRACT:
A healthy 40 year-old man with frontal androgenetic alopecia and occipital scar secondary to trauma. He consulted for hair transplant. Hair grafting was performed using FUE technique, getting 1500 grafts for both sites.
The anterior evolved favorably but the scar area showed signs of local inflammation. Skin biopsy showed superficial suppurative folliculitis and underlying fibrosis. Neutrophilic and lymphoplasmocytic infiltrates and fibrosis. Follicle destruction and suppurative inflammation. Which it was consistent with the diagnosis of folliculitis decalvans (FD) on surgical scar.
The patient was treated with Cefadroxil and topical fusidic acid. Oral isotretinoin was used and suspended for gastric intolerance. It was decided to use oral Dapsone. Two months after its use, marked improvement was observed, with some normal grown hairs. The frontal area and the occipital site, never showed signs of inflammation. This case suggest that a traumatic skin injury for a recipient site could create a foreign body reaction that may be relevant to the pathogenesis. It is likely that early treatment prevented triggering of the same kind of process in the frontal area, and poorly final hair density.
In those post-transplant patients that have poor hair growth, we should suspect the initial development of a scar alopecia, in order to make an early diagnosis and a better hair growth in receiving area.

045

Histologic examination of "normal-appearing" scalp in lichen planopilaris and frontal fibrosing alopecia

Isabella Doche, MD.
University of Sao Paulo, Sao Paulo, Brazil.

Dermatologist and PhD student at the University of Sao Paulo (Brazil) and Research fellow at the University of Minnesota (USA).

I. Doche: None.

LEARNING OBJECTIVES:
Learning objectives:
- To identify the scarring alopecias and why some patients may experience burning and itching sensations in areas not "clinically affected".
- To evaluate and apply recent information on histopathologic studies to choose the best option treatment in the clinical practice.

ABSTRACT:
Both frontal fibrosing alopecia (FFA) and lichen planopilaris (LPP) are lymphocyte-mediated scarring alopecias. While LPP typically affects the vertex area, FFA presents with perifollicular erythema and scale in the frontotemporal area and is usually associated with eyebrow alopecia and facial papules. We describe a series of cases of FFA and LPP biopsies and the histopathologic findings on both affected and "clinically normal" scalp areas. Based on the finding that “normal-appearing” scalp can be histologically affected even before clinical lesions are apparent, we suggest global scalp therapy and earlier use of systemic medications, such as doxycycline and hydroxychloroquine to prevent disease progression and arrest inflammation.

046

Fibrosing Alopecia in a Pattern Distribution: an unreported diagnosis in chilean patients

Felipe A. Mardones.
University of Chile Clinical Hospital, Santiago, Chile.

Dermatologist
Assistant Professor of Dermatology
University of Chile Clinical Hospital.
Director of hair clinic.
Fields of interest: hair follicle cycle, alopecia areata, cicatricial alopecia

F.A. Mardones: None.

LEARNING OBJECTIVES:
-Describe epidemiologic and clinical profiles of Fibrosing Alopecia in a pattern distribution (FAPD) in a South American (Chilean) study group.
-Analyze and compare treatment regimen and outcomes of FAPD in Chilean patients with previous reports.

ABSTRACT:
Fibrosing Alopecia in a pattern distribution (FAPD) is a recently described form of primary cicatricial alopecia. It shares clinical and histopathologic features of lichen planopilaris and androgenetic alopecia. Diagnosis is not usually straightforward as other inflammatory conditions of hair loss are primarily suspected. Unlike other scarring alopecias, there a no treatment guidelines for FAPD, although minoxidil, steroids and systemic antiandrogens seem to be beneficial. Few cases of FAPD have been reported so far and most come from Europe and North America. In this presentation, 13 Chilean patients (9 females and 4 males) with FAPD are described. Epidemiologic data, clinical profile and treatment regimen and outcomes are analyzed.

047

Trichoscopy Pitfalls

Aline Donati, MD, Daniela Sano, Neusa S. Valente, Ricardo Romiti.
University of Sao Paulo, Sao Paulo, Brazil.

EDUCATION
Ongoing Post-graduate student at USP
Fellowship in dermatology at “Hospital das Clínicas” - USP
Medical School at University of São Paulo - USP
MOST RELEVANT PUBLICATIONS
Hordinsky M,Donati A. Alopecia areata: an evidence-based treatment update. Am J Clin Dermatol. 2014 Jul;15(3):231-46.
Donati A, Molina L, Doche I, Valente NS, Romiti R. Facial papules in Frontal Fibrosing Alopecia. Evidence of vellus follicle involvement. Arch Dermatol 2011;147(12):1424-7.
Donati A, Assouly P, Matard B, Jouanique C, Reygagne P. Clinical and photographic assessment of lichen planopilaris treatment efficacy. J Am Acad Dermatol. 2011 Mar;64(3):597-8; author reply 598-9.

A. Donati: None. **D. Sano:** None. **N.S. Valente:** None. **R. Romiti:** None.

LEARNING OBJECTIVES:
Recognize alert signs indicating areata-like lesions. Discuss main differential diagnosis of areata-like lesions.

ABSTRACT:
Trichoscopy is a very useful tool for the diagnosis of alopecia areata. Dystrophic hairs, broken hairs and black dots are related to ongoing or recent hair bulb inflammation, while yellow dots and vellus hairs are seen in more chronic lesions. Trichoscopy features in areata result from hair follicle changes due to the aggresion of anagen hair bulbs by a cytotoxic auto-immune inflammatory infiltrate. Other diseases, inflammatory or not, that attack the anagen bulb may look like areata clinically and on trichoscopy. Alert signs to areata-like lesions include diffuse erythema, any epidermal change and absence of typical exclamation mark hairs in clinically active lesions.

048

Alopecia areata in solid organ transplant patients, case series

Cecilia Navarro Tuculet, MD, Dermatologist, Mariana Martin, MD, Dermatologist, Paula Enz, MD, Dermatologist, Gaston Galimberti, MD, Dermatologist, Ricardo Galimberti.
Hospital Italiano de Buenos Aires, Buenos Aires, Argentina.

MD Dermatologist graduated from the University of Buenos Aires in 2004, Coordinator of Hospital Italiano Trichology Area

C. Navarro Tuculet: None. **M. Martin:** None. **P. Enz:** None. **G. Galimberti:** None. **R. Galimberti:** None.

LEARNING OBJECTIVES:
Present the unexpected emergence of AA based on a series of cases of solid organ transplanted patients.

ABSTRACT:
There is general agreement that alopecia areata (AA) is an organ-specific autoinmune disease that leads to nonscarring hair loss. Several treatments have been tried including ciclosporine A and cortocisteroids. As these drugs are habitually used in the therapy of solid organ transplanted patients, it is rare to find AA in these patients. We present 13 transplanted patients that developed AA, between day 3 and 6 months after been transplanted. All patients were under inmunosuppressive therapy. It is disfficult to explain why AA may develop during treatment with cyclosporine A and corticosteroid, in fact most patients with transplanted organs taking ciclopsporina A for inmunosuppressive properties who developed AA had lower regimes (4-6 mg/kg/day) than patients in studies presenting a favorable regrowth of hair (6mg/kg/day)

049

TrichoQuiz

Ricardo Romiti, PhD.
University of São Paulo, São Paulo, Brazil.

Ricardo Romiti, MD, PhD, is responsible for the Hair Unit at the Department of Dermatology of the University of São Paulo, Brazil, and works as clinical Professor of Dermatology also at the University of São Paulo.
Having gained his medical degree from the Faculty of Medicine of the University of São Paulo, where he also completed his residency in the Department of Dermatology, Professor Romiti undertook a Fellowship at the "Ludwig-Maximilians-Universität", Munich, Germany. Professor Romiti has authored or co-authored numerous papers published in national and international dermatology journals.

R. Romiti: None.

LEARNING OBJECTIVES:
During this interactive session, the audience will be presented different topics which will be discussed in detail so as to enhance knowledge of unique aspects in the field of hair disorders.

ABSTRACT:
During this interactive activity, which will represent the final block of this session, different topics concerning hair disorders will be discussed in a dynamic "Question&Answer" format.

050

Session Director, "Hormones, Hair Growth and Pattern Hair Loss"

Wilma F. Bergfeld, MD.
Cleveland, OH, USA.

W.F. Bergfeld: None.

051

Session Co-Director, "Hormones, Hair Growth and Pattern Hair Loss"

Rodney D. Sinclair, MBBS, MD, FACD.
University of Melbourne, Melbourne, Australia.

R.D. Sinclair: Other Financial or Material Support (royalties, patents, etc.); Patent.

052

Translational approach to androgenetic alopecia – clinical and molecular read-outs

Ulrike Blume-Peytavi, MD.
Charité-Universitätsmedizin Berlin, Germany.

U. Blume-Peytavi: None.

053

Regulation of human hair growth: androgens and prostanoids

Valerie A. Randall, PhD, FIBMS, FRSB.
University of Bradford, Bradford, United Kingdom.

Professor Valerie Randall is Professor of Biomedical Sciences at the University of Bradford, UK. She teaches at undergraduate and post-graduate levels and leads a well-established, internationally-recognised team investigating the biology of hair growth, particularly the mechanisms of androgen action and drugs which stimulate human hair growth. Professor Randall also contributes extensively to the scientific community. Highlights include: Secretary and President of the European Hair Research Society, Editorial Board, Journal of Endocrinology, Editor, The Endocrinologist, Council/Executive Committee Member: Institute of Biology, Society for Endocrinology, Heads of University Centres of Biomedical Sciences and Chair/Member, Organising Committee for 15 national & international conferences.

V.A. Randall: Grants/Research Support; Received unrestricted research grants to support my hair research from Allergan Inc., Irvine, California, USA.

LEARNING OBJECTIVES:
Improved understanding of the complex regulation of hair growth

ABSTRACT:
The main role of most human hair is social and sexual communication; axillary and pubic hair development signals adulthood and beard etc. masculinity. Therefore, hair loss or excessive hair
growth (hirsutism) causes psychological distress and decreased quality of life. Unfortunately, hair disorders are generally poorly controlled because the mechanisms regulating hair follicles are not fully understood. Androgens are the main regulator of human hair growth, stimulating pubertal hair changes but also promoting gradual, patterned scalp hair loss (androgenetic alopecia). All androgen responses require androgen receptors within follicle cells, particularly the dermal papilla. However, whether the follicle is stimulated (many areas), inhibited (scalp) or unaffected (eyelashes) varies depending on their body site; this corresponds to differences in gene expression within individual follicles.Recently, prostanoids, prostaglandins (PGs) and closely-related prostamides, attracted attention because prostanoid glaucoma drugs promoted eyelash growth side-effects. We found that one, bimatoprost, a prostamide $F_{2\alpha}$ analogue, also stimulated mouse pelage growth *in vivo* and scalp follicle growth in organ culture. We identified PGs within isolated scalp follicles using lipidomics and showed bimatoprost upregulated prostamide synthesizing enzymes in cultured scalp follicles and dermal papilla cells, while simultaneously downregulating PG pathways and altering prostanoid receptor levels. This indicates that prostanoid paracrine mediators have natural signalling roles in human
follicles. Further investigations of androgens and prostanoids should facilitate novel therapeutic approaches.

054

The Role of Inflammation and Immunity in the Pathogenesisof Female-Pattern Hair Loss

Neil Sadick, MD.
Sadick Dermatology, New York, NY, USA.

Dr. Sadick holds four board certifications in internal medicine, dermatology, cosmetic surgery, hair restoration surgery and is a Diplomat of the American Board of Phlebology. Dr. Sadick is one of the world's most respected dermatologists and the medical director and owner of Sadick Dermatology. Dr. Sadick is also the director of Sadick Research Group, which runs multiple FDA clinical trials each year.

N. Sadick: None.

LEARNING OBJECTIVES:
Learning about novel theories regarding female patter hair loss.

ABSTRACT:
Background:
Female-pattern hair loss (FPHL) affects a significant percentage of women with increased prevalence with aging. While follicular pathology and pathophysiology of male androgenetic alopecia are widely considered to be resolved, FPHL is still under investigation; particularly as no androgen excess is found in more than 50% of the affected women.

Objective:
The objective of this study was to determine the role of immunity and inflammation in FPHL as immunoglobulin deposition within the epidermal basement membrane zone was a finding in androgenetic alopecia. A second objective was to evaluate a modulated therapy according to inflammatory and immunoreactant profiles in a clinical study.
Conclusion:
A lymphocytic microfolliculitis targeting the bulge epithelium along with deposits of epithelial basement membrane zone immunoreactants are frequent findings in female pattern hair loss and point toward an immunologically driven trigger. Cases showing a positive immunoreactant profile respond well to combined modality therapy compared to those with a negative result.

055

CRTH2/ PTGDR2 Antagonists Reverse the Hair Growth Inhibition Caused by Elevated PGD2 Level

Ying Zheng, PhD[1], Jen-Chih Hsieh[1], Arben Nace[1], Mikhail Geyfman[2], Serge Lichtsteiner[2], Ken Washenik[3], David W. Collins[1], George Cotsarelis[1].
[1]University of Pennsylvania, Philadelphia, PA, USA, [2]Kythera Biopharmaceuticals, Inc, Los Angeles, CA, USA, [3]Bosley, Inc, Los Angeles, CA, USA.

Dr. Ying Zheng is a Senior Research Investigator in the Department of Dermatology, University of Pennsylvania. Dr. Zheng received her Ph.D. degree from University of Delaware, and her postdoctoral training at the Skin Biology Research Center at Johnson & Johnson. Her current research is focused on skin stem cells, wound healing and hair follicle regeneration.

Y. Zheng: None. **J. Hsieh:** None. **A. Nace:** None. **M. Geyfman:** Salary, Contractual Services; Mikhail Geyfman is an employee of Kythera Inc which sponsored this research. **S. Lichtsteiner:** Salary, Contractual Services; Serge Lichtsteiner is an employee of Kythera Inc which sponsored this research. **K. Washenik:** Advisory Board or Panel; Ken Washenik is on the Scientific Advisory Board of Kythera, Inc.. **D.W. Collins:** None. **G. Cotsarelis:** Advisory Board or Panel; GC is on the Advisory Board of Kythera Inc.. Grants/Research Support; This study was funded by sponsored research agreements between UPenn and Kythera Biopharmaceuticals, Inc.. Kythera has licensed IP from Penn and GC is an inventor on the licensed IP..

LEARNING OBJECTIVES:
Demonstrate pharmacological intervention of PTGDR2 may be an effective approach in preventing and/or treating alopecia in patients sensitive to PGD2.

ABSTRACT:
Prostaglandin D2 (PGD2) and its synthesizing enzyme, PGD2 synthase, are present at higher levels in balding versus non-balding scalp in men with androgenetic alopecia. Our previous observations in a mouse model that PGD2 inhibits hair growth via CRTH2/ PTGDR2, led us to hypothesize that PTGDR2 is the key receptor mediating the hair growth inhibitory activity of PGD2 in human follicles. In this study we tested several pharmacological PTGDR2 antagonists for their anti-PGD2 activity on human hair growth. We found that PTGDR2 antagonists reversed the growth inhibition mediated by PGD2 in a dose-dependent manner by reducing PGD2-triggered apoptosis and maintaining proliferation of keratinocytes. Topical administration of a PTGDR2 antagonist to mice extended anagen, resulting in longer hair. We also found that hair follicles from 2/5 of the alopecia patients exhibited little susceptibility to PGD2's effect in our culture assay. By sequencing the entire PTGDR2 gene, including the flanking regions, we identified SNPs in the human PTGDR2 gene that are associated with sensitivity of hair growth to PGD2. Our findings here further underscore the key role of PTGDR2 in regulating hair growth and suggest that pharmacological intervention of PTGDR2 may be an effective approach in preventing and/or treating alopecia in patients sensitive to PGD2. Furthermore, the SNPs identified here may serve as markers for identifying patients with high risk to PGD2's effect.

056

To Be Announced

057

Session Director, "Stem Cells and Stem Cell Niches"

George Cotsarelis, MD.
University of Pennsylvania, Philadelphia, PA, USA

G. Cotsarelis: None.

058

Session Co-Director, "Stem Cells and Stem Cell Niches"

Colin Jahoda, PhD.
Durham University, United Kingdom.

C. Jahoda: None.

059

Session Co-Director, "Stem Cells and Stem Cell Niches"

Manabu Ohyama, MD, PhD.
Kyorin University School of Medicine, Tokyo, Japan.

Manabu Ohyama, M.D., Ph.D. is currently a Professor at the Department of Dermatology, Kyorin University School of Medicine. His clinical interest is in hair loss disorders, especially quantitative histopathological dissection of their pathophysiology and his research topics include, hair follicle stem cell biology, development of new treatments for alopecia and regenerative medicine of the skin. He received M.D. and Ph.D. degrees from Keio University Tokyo, Japan, in 1993 and 2002 respectively.

M. Ohyama: Consultant; LION corporation.

060

Molecular Control of Hair Follicle Stem and Progenitor Cells

Tudorita Tumbar, PhD.
Cornell University, Ithaca, NY, USA.

T. Tumbar: None.

061

Mechanisms of hair follicle stem cell fate by live imaging

Panteleimon Rompolas, BSc, MBA, PhD.
University of Pennsylvania, Philadelphia, PA, USA.

Dr. Rompolas earned a B.Sc. in Biology from the University of Athens, Greece. He then worked as a Laboratory Technologist at Ikonisys Inc, in New Haven CT. In 2009 he graduated with an M.B.A. in Management and a Ph.D. in Biomedical Science from the University of Connecticut Health Center. Dr. Rompolas then joined Dr. Valentina Greco's laboratory at Yale University School of Medicine where he established a system to visualize live stem cells in their native environment in mammalian skin. Dr. Rompolas is currently an Assistant Professor of Dermatology at the University of Pennsylvania Perelman School of Medicine.

P. Rompolas: None.

LEARNING OBJECTIVES:
Explain the behavior and role of stem cells in hair regeneration, based on live imaging approaches.

ABSTRACT:
Hair follicles are self-contained mini-organs with a resident stem cell pool that is sufficient to periodically and stereotypically regenerate new hair appendages throughout life. One of the major hurdles in uncovering the cellular mechanisms of hair regeneration is the accessibility of stem cells in their native environment in the skin. For this, we recently established the ability to visualize and modulate stem cell behavior in the intact skin of live mice by multiphoton microscopy. To fully delineate the fate and role of individual stem cells in hair growth we also pioneered the ability to follow the same genetically marked stem cells from their initial location in the Telogen hair follicle and re-visit them over a period of several days and until the end of the regeneration cycle. These studies established that the precise position of individual cells and therefore the cellular organization of the hair follicle determined their fate and specific contribution to hair growth. Thus, we have proposed a model for the compartmentalization of the hair follicle, which describes a hierarchical process for hair follicle stem cells towards terminal differentiation. We also provide evidence for extrinsic regulation of hair follicle stem cell behavior by elements of the niche microenvironment.

062

Human Long Term Deregulated Circadian Rhythm in Vvo Alters the Clonogenic Properties of Outer Root Sheath Cells

Nathalie Deshayes, MSc, Gaïanne Genty, Ariane Dimitrov, Maryline Paris.
L'Oreal R&I, Aulnay-sous-Bois, France.

Nathalie Deshayes obtained her Master degree in 2004 at Pierre and Marie Curie University of Sciences in Paris-France in the fields of bio-engineering and microbiology. She joined L'Oreal Company in the International Department of reconstructed skin to achieve her last year of training in the field of hair and skin stem cells. Since then she has been a research scientist at L'Oreal Research and Innovation in the Stem Cell lab currently leaded by Maryline Paris PhD Biological and Clinical Research Department) where her work focuses on deciphering hair and skin stem cells involvement during human aging process.

N. Deshayes: None. **G. Genty:** None. **A. Dimitrov:** None. **M. Paris:** None.

LEARNING OBJECTIVES:
To demonstrate the latest developments in research on hair follicle epidermal stem cell function and regulation by circadian oscillations.

ABSTRACT:
Humans epidermal stem cell function in vitro is regulated by circadian oscillations, the deregulation of which may contribute to skin aging. Circadian arrhythmia of hair follicle precursor cells (keratinocytes located in the outer root sheath, ORS) contributes to age-related hair cycling defect, in mice. Despite the well-described impact of circadian oscillation, involving a CLOCK gene pathway feedback loop, on keratinocyte function, little is known about changes in the clonogenic potential of human Hair Follicle keratinocytes (hHFK) after long-term alteration of the circadian rhythm in vivo. This study assessed the properties of hHFK through a CLOCK pathway alteration due to long-term regulated circadian rhythm. The physiological relevance of the study was validated. Using a 3D Spinning disk imaging approach on micro-dissected hHF, we demonstrated the expression of Per1 and Bmal1 (two CLOCK pathway proteins) in the upper and lower ORS. Comparing the CLOCK pathway protein expression and hHFK properties in two groups of women: shift and diurnal workers. Cell culture characterization, measurement of colony area and immunostaining were performed. We demonstrated that long-term circadian rhythm deregulation affected CLOCK pathway protein expression and was correlated with alteration in hHFK clone-forming efficiency. This

study, for the first time in humans, provides evidence that in vivo alterations of the CLOCK gene pathway affect the clonogenic properties of hHFK and circadian protein expression.

063

An Integrated Transcriptome Atlas of Embryonic Hair Follicle Progenitors, their Niche and the Developing Skin

Michael Rendl, MD.
Icahn School of Medicine at Mount Sinai, NEW YORK, NY, USA.

Michael Rendl is an Associate Professor of Developmental and Regenerative Biology and Dermatology, and a member of the Black Family Stem Cell Institute at Icahn School of Medicine at Mount Sinai in New York City. Michael received his M.D. from the Medical University of Vienna in Austria. He then performed postdoctoral training in the laboratory of Dr. Elaine Fuchs at The Rockefeller University. In 2008 he joined the faculty at Mount Sinai where he established his own laboratory.

M. Rendl: None.

LEARNING OBJECTIVES:
Learn about gene expression signatures of embryonic hair follicle placode and dermal condensate cells.

ABSTRACT:
Defining the unique molecular features of progenitors and their niche requires a genome-wide, whole-tissue approach with cellular resolution. Here we co-isolate embryonic hair follicle (HF) placode and dermal condensate cells, precursors of adult HF stem cells and the dermal papilla/sheath niche, along with lineage-related keratinocytes and fibroblasts, Schwann cells, melanocytes, and a population inclusive of all remaining skin cells. With next-generation RNA-sequencing we define gene expression patterns in the context of the entire embryonic skin, and through transcriptome cross-comparisons we uncover hundreds of enriched genes in cell type-specific signatures. Axon guidance signaling and many other pathway genes are enriched in multiple signatures, implicating these factors in driving the large-scale cellular rearrangements necessary for HF formation. Finally, we share all data in an interactive, searchable companion website. Our study provides an overarching view of signaling within the entire embryonic skin and captures a molecular snapshot of HF progenitors and their niche.

064

Two Distinct Spontaneous Regenerative Activities to Repair Ionizing Radiation-induced Dystrophy in Anagen Follicles

Wen-Yen Huang, Hsien-Yi Chiu, **Sung-Jan Lin, MD, PhD**.
National Taiwan University, Taipei, Taiwan.

Dr. Sung-Jan Lin, MD, PhD, is now an associate professor in Institute of Biomedical Engineering, National Taiwan University. He is also a dermatologist in National Taiwan University. His research interest includes tissue engineering, hair follicle regeneration, responses of hair follicles to various insults, pigment loss and biomedical optics.

W. Huang: None. **H. Chiu:** None. **S. Lin:** None.

LEARNING OBJECTIVES:
There are two distinct repair activities to restore the anagen hair follicle structure following radiation injury.

ABSTRACT:
Whether and how anagen hair follicles attempt to repair themselves in response to ionizing radiation (IR) have not been characterized. We found, depending on doses of IR, anagen hair follicles undergo dystrophic anagen or dystrophic catagen. For dystrophic anagen response, there was a dose-dependent effect of IR on the severity of dystrophy. According the severity of dystrophy, anagen hair follicles were able to initiate two spatially and

temporally distinct early and late repair activities to restore their structure. At low dose of IR, lineage tracing showed that K5+ hair bulb cells, but not bulge stem cells, compensatorily proliferated at 12 to 48hr to restore hair bulb structure. At higher dose of ionizing radiation, Lgr5+ cells in the more dystrophic hair follicle proliferated at 72 to 120hr to restore anagen hair follicle structure and this was later followed by activation of bulge stem cells to repair upper outer root sheath. RNA sequencing showed that the apoptosis-driven dystrophy was p53-dependent and the severity of dystrophy was associated with the duration of Wnt signaling inhibition by IR. Restoration of Wnt signaling preceded the repair attempts. We demonstrated that boosting Wnt signaling was able to prevent hair loss by enhancing self-repair at an earlier stage. Thus, radiation-induced alopecia can be prevented by modulating Wnt signaling to enhance spontaneous anagen repair.

065

Session Director, "Emerging Technologies and Therapies"

Ken Washenik, MD, PhD.
BOSLEY MEDICAL GROUP AND NEW YORK UNIVERSITY SCHOOL OF MEDICINE, BEVERLY HILLS, CA, USA.

Ken Washenik, M.D., Ph.D., is the CEO of the Bosley Medical Groups and the former CEO of the Aderans Research Institute.
Dr. Washenik serves as Vice President of the Board of Governors of the International Society of Hair Restoration Surgery and is on the Board of the North American Hair Research Society, Cicatricial Alopecia Research Foundation and the Hair Foundation.
Dr. Washenik is a faculty member in the NYU Department of Dermatology and the 2014 recipient of the Platinum Follicle Award from the ISHRS.

K. Washenik: Advisory Board or Panel; Kythera. Consultant; Allergan, Cosmo, Follica, Johson and Johnson, Kerastem, Kythera, Rapunzel Bioscience, Theradome. Grants/Research Support; Kerastem.

066

Hair Regeneration as a Future Organ Replacement Regenerative Therapy

Takashi Tsuji, PhD.
RIKEN Center for Developmental Biology, Kobe, Japan.

PhD Course, Graduate School of Science, Kyushu University, Japan (1989-1992), Researchers, Research Laboratories, Yamanouchi Pharmaceutical Co Ltd. (1986-1989), Senior Researcher, Pharmaceutical Frontier Research Laboratory, JT Inc. (1993-2000), Associate Professor, Faculty of Industrial Science and Technology, Tokyo University of Science (2000-2007), Professor, Graduate School of Industrial Science and Technology, Tokyo University of Science (2007-2014), Professor, Research Institute of Science and Technology, Tokyo University of Science (2009-2014), Visiting Professor, Louis Pasteur University, France (2008), Visiting Professor, Tokyo Dental College, Japan (2009-Present), Team leader, Laboratory for Organ Regeneration, RIKEN Center for Developmental Biology (2014-Present). Councilor of the Japanese Society for Regenerative Medicine (2002-Present).

T. Tsuji: Other Financial or Material Support (royalties, patents, etc.); Author is a Director at Organ Technologies Inc..

LEARNING OBJECTIVES:
Development of basic technologies and clinical application of hair follicle organ replacement regenerative therapy.

ABSTRACT:
Organ replacement regenerative therapy is purported to enable the replacement of organs damaged by disease, injury and aging in the foreseeable future. Hair follicle regeneration, which is one of the next-generation of regenerative medicine, is expected to develop a novel therapeutic system for alopecia patients. Previously, we developed a novel method, designated as Organ Germ Method to reconstitute a bioengineered organ germ comprising organ-inductive

potential epithelial and mesenchymal stem cells in vitro (Nature Methods 4, 227-230, 2007). We successfully developed bioengineered tooth (PNAS 106, 13475-13480, 2009), hair follicle (Nature Commun. 3, 784, 2012) and secretory organs including salivary gland (Nature Commun. 4, 2498, 2013) and lachrymal glands (Nature Commun. 4, 2497, 2013), which have correct physiologically functions in vivo. The bioengineered hair follicle develops correct structure and form proper connections surrounding host tissues including the epidermis, arector pilli muscle and nerve fibers. The bioengineered hair follicle could restored hair cycle, hair color, and piloerection through the rearrangement of stem cells and their niches. Our studies reveals the potential application of adult tissue-derived follicular stem cells as a future hair follicle regenerative therapy for alopecia patiets.
In this presentation, I'd like to talk and discuss about the strategies and recent progress of the research and development for the establishment of hair follicle regenerative therapies as a future organ replacement regenerative therapy.

067

Differences between affected and non-affected scalp in male individuals with male-pattern androgenetic alopecia: Linking of clinical and molecular biological findings

Annika Vogt, Eva KB Pfannes, Sabine Fimmel, Sabrina Hadam, Annette Andruck, Jan Kottner, Ulrike Blume-Peytavi.
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PD Dr. Annika Vogt is senior physician in the Hair Competence Center and the Pediatric Dermatology Unit and Scientific Director of Experimental and Translational Research at the Clinical Research Center for Hair and Skin Science, Department of Dermatology, Charité-Universitätsmedizin Berlin. Since 2013 she holds a research professorship at the Université Pierre et Marie Curie, Paris, France.
Targeted delivery of molecules into the hair follicle and innovative topical treatment strategies are main areas of research with special focus on experimental and early-phase clinical trials. She is project leader in national and European projects on nanocarrier-based dermatotherapy and transcutaneous immune cell targeting.

A. Vogt: Grants/Research Support; Parts of the presented work were funded by an investigator-initiated research grant by the Hair and Skin Research Institute GmbH and Johnson &Johnson Consumer & Personal Products Worldwide. **E.K. Pfannes:** None. **S. Fimmel:** None. **S. Hadam:** None. **A. Andruck:** None. **J. Kottner:** None. **U. Blume-Peytavi:** None.

LEARNING OBJECTIVES:
- have gained insights into non-invasive strategies which could improve our understanding of hair growth disorders and could become a valuable addition to conventional clinical read-outs in hair research.

ABSTRACT:
Non-invasive tools are needed to better link clinical with molecular findings in patients during the course of disease and under therapy. Here, we present the data obtained by clinical scalp skin assessment and comparison of gene expression in hair follicles from fronto-temporal and vertex skin of male individuals affected by androgenetic alopecia (AGA), Norwood-Hamilton IIIv-IV. The RNA expression profile from 30 plucked hair follicles per investigational site reflected the clinical manifestation and key events known to be involved in AGA.
Confirmation of such RNA results in humans is a challenge when material is limited and non-invasive procedures are a goal to increase volunteers' interest in participating in clinical trials. Thus, we will further discuss a newly developed standard operating procedure for non-invasive collection of protein material from scalp surface and hair follicle openings using of cyanoacrylate skin surface stripping on shaved scalp skin areas of 1,8 cm2. 18 samples were successfully collected from frontal, vertex and occipital skin and enabled profile array panels for a total of 101 cytokines, chemokines and proteases and quantitative ELISA for IL-1α, IL-1RA.
Detailed results will also be discussed in separate presentations. However, this combinational approach of non-invasive sampling and clinical assessment was found to be safe, well tolerated by volunteers and could become a valuable addition to conventional clinical read-outs in hair research.

068

Various Wavelengths of Light-emitting Diode Light Regulate the Proliferation of Human Dermal Papilla Cells and Growth of Hair Follicles viaWnt/β-catenin and the ERK Pathways

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2011. She took clinical elective course at the Mount Sinai School of Medicine in New York and was a member of Asian Medical Students' Association in medical school. She completed an internship at Seoul St. Mary's Hospital of the Catholic University of Korea in 2012. She is currently in the third year of dermatology residency and serves as the chief resident at St. Paul's Hospital of the Catholic University of Korea.

H. Kang: None. **K. Jeong:** None. **U. Yeo:** None. **J. Kim:** None. **H. Joo:** None.

LEARNING OBJECTIVES:
LED inhibits IFN-γ-induced catagen-like changes on hDPCs.

ABSTRACT:
Light emitting diode (LED) has been demonstrated to promote hair growth in clinical trials. However, the underlying mechanisms are not fully understood. IFN-γ involved in the regulation of hair follicle (HF) cycling and recent studies suggested that IFN-γ is a potent catagen inducer in normal human scalp HFs. The aim of this study was to determine the effect of LED irradiation on IFN-γ-treated human dermal papilla cells (hDPCs). The effect of the LED irradiation on cell proliferative effect of DPCs was examined by MTT assay. hDPCs were irradiated using four ranges of LED wavelengths from 415nm to 830nm. The proliferation of hDPCs was significantly increased by LED irradiation at 660 nm with 1, 5 and 10 J/cm^2 compared to non-irradiated cells. LED irradiation at 660 nm significantly counteracted the inhibitory effect of IFN-γ on hDPCs proliferation. The effect of LED irradiation on the expression of IFN-γ-regulated genes including IFN-γ receptor, IL-1β, IL-18, ICAM-1, MICA, and JAK/STAT-1 pathway in IFNγ-treated hDPCs, was examined by real-time PCR and Western blot assay. LED irradiation at 660 nm significantly decreased mRNA expression of IL-1β, IL-18, IFN-γ receptor, and cleaved caspase-3 and also inhibited the phosphorylation of Stat1 in IFN-γ-treated hDPCs. Therefore we suggest that LED inhibits IFN-γ-induced catagen-like changes on hDPCs.

069

Minoxidil Response Testing in Females with Androgenetic Alopecia: A 24 Week Multi-Center Prospective Study

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Prof. Andy Goren has over 15 years of experience in research, development and launch of breakthrough medical technologies. Among the list of many firsts in dermatology, Prof. Goren was the first to develop a clinical genetic test for predicting androgenetic alopecia and the first to discover epigenetic markers predicting anti-androgen therapy response in female androgenetic alopecia. Prof. Goren currently serves as a Professor of Dermatology at the University of Rome "G.Marconi", Italy. He is a member of several dermatology societies, a scientific reviewer for Dermatologic Therapy, and a lecturer in several international dermatology societies.

A. Goren: Salary, Contractual Services; Salary. **J. McCoy:** Salary, Contractual Services; Salary. **J. Roberts:** None. **N. Desai:** None. **S. Keene:** None.

LEARNING OBJECTIVES:
Relate the clinical response to minoxidil to sulfotransferase enzyme activity in the hair follicle.

ABSTRACT:
Topical minoxidil is the only US FDA approved drug used for the treatment of female androgenetic alopecia (AGA). Recently the US FDA approved 5% minoxidil foam for women. While the 5% topical foam addresses some of the shortcomings of the 2% solution, the efficacy of the new 5% minoxidil foam remains low i.e., 30-40% of patients re-grow hair.
Minoxidil is a prodrug converted in the scalp to its active form, minoxidil sulfate, by the sulfotransferase enzyme SULT1A1. The enzyme expression is variable among individuals. In several retrospective pilot studies, we have demonstrated the ability of the SULT1A1 enzymatic assay to accurately identify non-responders to topical minoxidil based on global photographic assessment.
Here we report the results of a 24 week multi-center prospective study of 5% minoxidil foam using target area hair count (TAHC) as the primary clinical endpoint. This is the first prospective study demonstrating that the SULT1A1 enzymatic test predicts with high confidence patients that are likely not to benefit from 5% topical minoxidil therapy based on mean change in TAHC from baseline. Further, the study demonstrated a high concordance between mean change in hair counts and global photographic assessment in patients deemed non-responders by the test.

070

The Microfollicle: In Vitro Modelling the Hair Follicle for High-throughput Screening

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Dr. Atac studied in Istanbul Technical University on Molecular Biology and had her Master's degree in the same field. She completed the PhD program of Berlin-Brandenburg School for Regenerative Therapies and graduated from Technical University of Berlin with her thesis on developing in vitro static and dynamic model of human hair follicle in 2014. She is working on advancement of the in vitro hair follicle model and integrating it into skin models since then.

T. Grix: None. **I. Rütschle:** None. **T. DiColandrea:** None. **S. Giselbrecht:** None. **G. Lindner:** None. **R. Lauster:** None. **U. Marx:** None. **B. Atac:** None.

LEARNING OBJECTIVES:
Static and dynamic high-throughput Microfollicle cultures enable tracing the individual organoids during development with acute and chronic substance testing possibility.

ABSTRACT:
The Microfollicle (MF) is a 3D in vitro model system of the human hair follicle. This culture system is based on a spatio-temporal defined co-culture of primary dermal cells, i.e outer root sheath keratinocytes, dermal papilla fibroblasts and melanocytes, in providing a 3D differentiation platform for the cells via epidermal-mesenchymal-neuroectodermal cross-talk.
The Multi-Organ-Chip (MOC) is a micro-bioreactor platform for long term dynamic cultivation and differentiation of ex vivo and in vitro engineered tissues. Polycarbonate micro-cavity system is used to form and culture the MFs in 3D in the MOC.
In this study, we adapted the MF cultures to a high-throughput (HTP) format in static and dynamic conditions up to 21 days and characterized with spatial markers extensively. The MFs start to show hair specific keratin markers in early stages, while differentiation markers of keratins appear/increase in later stages.
The use of HTP-MF cultures enables tracking of such hair organoids during its development and studying hair follicle biology. Moreover, as an in vitro model of the hair follicle, HTP-MF cultures enable studying acute and chronic effects of substances on hair follicles.

071

Session Director, "Structure, Biology & Hair Curl, Color & Luster"

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T.L. Dawson: None.

072

Session Co-Director, "Structure, Biology & Hair Curl, Color & Luster"

Amy McMichael, MD, PhD.
NC, USA.

A. McMichael: Advisory Board or Panel; CARF. Consultant; Samumed, Pantene, Merz, Johnson and Johnson, Gillette, Galderma, Kythera, Allergan. Grants/Research Support; Allergan, Pantene, Galderma, Kythera, Casseopia, Regeneron, Amgen. Other Financial or Material Support (royalties, patents, etc.); Up to Date, Taylor and Francis.

073

Fibre Structure & Performance: Mapping of the Crosslink Network

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Jolon Dyer
Dr Jolon Dyer is Science Group Leader, Food & Bio-Based Products in AgResearch, New Zealand. Dr Dyer specialises in the application of protein chemistry and proteomics to protein-based foods and materials. He has significant expertise in the development of redox proteomics approaches to understanding and controlling protein modification and damage within these substrates. Dr Dyer has achieved significant national and international recognition, including the AWI Award for Scientific Achievement and AWI-DWI Excellence in Wool Science Personal Award (2005), NZIAHS Significant Science Achievement Award (2008) and American Society of Photobiology New Investigator Award (2010).

J.M. Dyer: None.

LEARNING OBJECTIVES:
Understand how proteomic approaches can be utilized to explore the protein-protein crosslink networks in human hair and skin.

ABSTRACT:
Fibre Structure & Performance: Mapping of the Crosslink Network
The physico-mechanical properties and therefore quality and performance of human hair and other mammalian fibres is underpinned by a complex network of protein-protein crosslinks. Notably, the position and relative accessibility of disulphide crosslinks within the fibre play a key role in the strength and shape of the fibre and how it responds to treatments. However, this crosslink network is difficult to fully understand and map. We here present the results of a proteomics-based approach to mapping the disulphide crosslink network in fibres, including a novel approach to evaluating and tracking the relative accessibility of specific disulphide bonds, with relevance to locating crosslinks that are particularly vulnerable to modification by treatment, and therefore affect structure and mechanical performance.

074

Compartmentation of Mitochondrial and Oxidative Metabolism in Hair Follicles: A Ring of Fire

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Professor and GlaxoSmithKline Distinguished Endowed Chair and Director, Center for Cell Death, Injury and Regeneration

J.J. Lemasters: Consultant; Proctor & Gamble, NovoNordisk. Grants/Research Support; Proctor & Gamble. **V.K. Ramshesh:** None. **G.L. Lovelace:** None. **J. Lim:** None. **G.D. Wright:** None. **T.L. Dawson:** Salary, Contractual Services; Proctor & Gamble.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be introduced to new concepts regarding mitochondrial metabolism in hair follicles.

ABSTRACT:
Little is known about the bioenergetics of hair. Accordingly, mitochondrial and oxidative metabolism was visualized by multiphoton and other imaging techniques in bovine hair follicles and plucked non-pigmented human hairs cultured in Eagle's medium. Mitochondrial membrane potential ($\Delta\Psi$), cell viability, reactive oxygen species (ROS) and secretory granules were assessed with parameter-indicating fluorophores. In anagen (growing) follicles, cell viability was high for germative epidermal cells within the follicular bulb, and $\Delta\Psi$-indicating fluorophores revealed highly polarized mitochondria. Abrupt loss of $\Delta\Psi$ occurred moving up from the base and lateral sides of the bulb. Approaching the transition, mitochondrial polarization increased and secretory granules disappeared, consistent with degranulation and release of keratins. Viable non-growing (catagen) follicles had far fewer epidermal cells with polarized mitochondria. Most germative epidermal cells showed ROS generation proportional to $\Delta\Psi$. ROS was very strong in a paraxial ring of epidermal cells at sites of putative cuticular hair formation. Highly polarized epidermal mitochondria were also located here. Plucked hairs showed a similar abrupt transition of degranulation and depolarization as well as this "ring of fire" of ROS-generating cells with hyperpolarized mitochondria. Dermal papillae contained fibroblasts with polarized mitochondria that produced virtually no detectable ROS. Overall, hair follicles have robust mitochondrial metabolism. The results also suggest that cuticular hair formation, in particular, occurs in a highly oxidative environment.

075

Relating the Biomechanical Properties of the Human Hair Follicle to its Microstructure

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L'Oréal, Aulnay-sous-Bois, France.

Dr. Lucien Bildstein holds a PhD in physical chemistry and Drug delivery from Paris-Sud University. He currently works at the Physics Department of L'Oreal Advanced Research. His research interests include the nanoscale characterization and biophysical properties of human hair and the hair follicle.

L. Bildstein: None.

LEARNING OBJECTIVES:
Grasp the relationship between the ultrastructure and mechanical properties of the human hair follicle

ABSTRACT:
The mechanical properties of biological materials such as hair, skin or bone are determined by their underlying fibrous bionetworks. However, the influence of the local network architecture of the cytoskeleton on cell mechanics has not been thoroughly investigated at the tissue level. Here we report for the first time how microscopic changes in the underlying keratin network of the hair follicle correlate with the macroscopic mechanical properties of the tissue. Using atomic force microscopy, the soft matrix of proliferating cells present at the bulb of the follicle was found hardening within the first millimeter of the follicle from 30 kPa up to 11 MPa, corresponding to a multiplying factor

of 366. This mechanical hardening correlates with an increase in diameter of macrofibrils from 137 to 333 nm, together with a continuous compaction, an increasing parallel orientation of the fibers and a progressive expression of keratins K35, K33 and K36, markers of hair fiber differentiation. While the concentration of keratin fibers increases linearly along the follicle axis, the hardening of the network follows a power law behavior, as previously described for in vitro model systems such as chemically controllable actin gels. This first thorough measurement of the mechanical properties of the hair follicle opens up opportunities for a more in-depth characterization of the physiology of the human hair follicle.

076

Optical Properties of the Medulla and the Cortex of Human Beard and Scalp Hair

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Philips Research, Eindhoven, Netherlands.

Dr. Babu Varghese is a Senior Scientist and a project leader in the Biomedical Systems division at Philips Research. He has 13 years of Industrial and Academic Research experience in Biophotonics. He holds PhD degree from Biomedical Photonics Imaging group, University of Twente, Netherlands and Master of Technology degree in Photonics from International School of Photonics, Cochin University, India. His research interests include novel Biophotonic solutions for non-invasive optical imaging of hair and skin and light-based (energy-based) skin treatment. Co-authored 41 scientific publications, 35 Patent filings and 85 Invention disclosures.

B. Varghese: None. **J. Alexandra Holz:** None. **R. Verhagen:** None. **N. Uzunbajakava:** None.

LEARNING OBJECTIVES:
Demonstrate quantitative results on hair properties, follicle depth at different locations and novel methods for hair imaging.

ABSTRACT:
Non- and minimally invasive methods for hair diagnostics and treatment, including cosmetic procedures for hair care, photoepilation, hair re-growth create a need for knowing the optical properties of hair and its depth in the skin. Here we report the total attenuation coefficient of the cortex of scalp and beard hairs measured using the principle of collimated transmittance measurements in a confocal setup from 409 to 1064 nm. Our quantitative results show a very large scattering coefficient of the medulla of lightly pigmented hair compared to Asian black hair. This is consistent with what is known from hair biology, where light-pigmented and grey hair develop large medulla. Also, we demonstrate the dependence of the total attenuation coefficient of the cortex and the medulla on the polarization of incident light, resulting from birefringent properties of the hair cortex formed by highly aligned keratin fibers. In-vivo and ex-vivo measurements shows that the average follicle depth of male beard hair is significantly deeper compared to female leg hair and male chest and leg hair. Also chin seems to have the highest follicle depth of all beard areas with a range of 2.4-3.7mm, followed by the cheek with 1.7-3.5mm, the upper lip 2.7mm, the submax 1.8-2.8mm and the front neck has the lowest follicle depth with a range of 1.3-2.4mm.

077

Monitoring Changes in Hair Structure During Childhood

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M.L. Bovcon: None. **M. Cisterna:** None.

LEARNING OBJECTIVES:
Discover the visual changes of a boy virgin-hair since birth through 8 years old, using high resolution imaging technologies.

ABSTRACT:
Human hair changes through lifetime are highly described in bibliography. The aim of this case report is to share the visual morphological changes in the hair of a child from birth to 8 years old. For this observational study we analyze Macro, OM - Optical Microscopy, and SEM - Scanning Electron Microscopy photographies.

078

Session Director, "New Topics Selected from Abstracts: Part I"

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V. H. Barbosa: None.

079

Session Co-Director, "New Topics Selected from Abstracts: Part I"

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W. Sim: None.

080

Session Co-Director, "New Topics Selected from Abstracts: Part I"

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University of Bradford, Bradford, United Kingdom.

Gill has a PhD in hair biology and over 30 years' experience in R&D in the personal care sector. Following a career in Unilever and establishing her own consultancy, Gill joined the University of Bradford, Centre for Skin Sciences in 2009 and has since developed academic-led projects with numerous large and small companies in this sector. Gill is Chairman of the International Board of Hair Research Societies and is immediate past President of the European Hair Research Society

G.E. Westgate: Consultant; Westgate Consultancy Ltd.

081

Treatment of Moderate to Severe Alopecia Areata with the Janus Kinase Inhibitor, Tofacitinib: The Cleveland Clinic Experience

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O. Ibrahim: None. **C. Bayart:** None. **M. Piliang:** None. **W.F. Bergfeld:** None.

LEARNING OBJECTIVES:
Propose that JAK-inhibition is a possible novel treatment of alopecia areata.

ABSTRACT:
The treatment of alopecia areata (AA) can be difficult and many of the available options yield marginal results.

Novel therapies are constantly under study. Herein we describe 8 AA patients treated with the oral janus kinase (JAK) inhibitor, tofacitinib. Review of the medical records at Cleveland Clinic revealed 8 patients with AA treated with tofacitinib. Seven of the 8 patients were female. Disease duration ranged from 3 to 34 years. AA severity ranged from 50-60% scalp involvement to alopecia universalis. One patient ended her treatment after 1 week of therapy due to the development of a rash on her trunk and severe peripheral edema in her hands and feet. Two patients prematurely ended treatment after 3 months due to loss of insurance. Remaining 5 patients currently continue on treatment, with cumulative duration of therapy ranging from 1 to 4 months. Early preliminary results demonstrate up to 50% regrowth in 1 patient after 4 months of treatment, and 0-25% regrowth in the remaining patients after 1 week to 2 months total treatment. Adverse effects included mild increase in creatinine from 0.91 to 1.5 mg/dL (1 patient), rash (1 patient), peripheral edema (1 patient), and upper respiratory infection (2 patients). We present these patients and their updated data to discuss the potential role of JAK-inhibition in the treatment of AA.

082

Two-Center Open-Label Trial of Oral Tofacitinib in Patients with Severe, Recalcitrant Alopecia Areata

Milene Crispin, M.D.[1], Brittany G. Craiglow, M.D.[2], Justin Ko, M.D., M.B.A.[1], Anthony E. Oro, M.D., Ph.D.[2], Brett King, M.D., Ph.D.[2].
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Milène Crispin is a second year resident in Dermatology at the Stanford University School of Medicine. She received her Bachelor of Arts from Dartmouth College and her Doctorate of Medicine from Weill Cornell Medical College. Her clinical and research interests include the immunobiology of autoimmune and inflammatory diseases, as well as procedural dermatology.

M. Crispin: None. **B.G. Craiglow:** None. **J. Ko:** None. **A.E. Oro:** None. **B. King:** None.

LEARNING OBJECTIVES:
Understand the interim results of a study investigating the safety and efficacy of oral tofacitinib in patients with alopecia areata.

ABSTRACT:
Alopecia areata (AA) is a common autoimmune disease, with a lifetime risk around 2%. Recent therapeutic insights derive from the discovery that blockade of common signaling pathways downstream of cytokine receptors inhibit established AA. While treatment of a patient with the JAK3 inhibitor tofacitinib or three patients with the JAK1/2 inhibitor ruxolitinib induced inflammatory remission and hair regrowth, confirmation of efficacy and safety in larger scale studies is required. We present interim results of a two-center, open-label trial of the oral JAK3 inhibitor tofacitinib. We enrolled 70 patients to undergo treatment with oral tofacitinib 5 mg twice daily for three months. The participants had AA including patch stage with >50% scalp involvement in 16 (22.8%), totalis in 5 (7.1%), and universalis in 49 (70%). Median age was 37 years and median current episode was 9.6 years. At the time of abstract submission, 45% of patients completed the trial, with significant hair growth over three months in 75% of these patients. Responders included those with pre-treatment biopsies that included inflammatory infiltrates as well as those with no detectable infiltrates. Non-responders were more likely to have had alopecia universalis for twenty years or longer. Tofacitinib was well-tolerated without significant clinical or laboratory adverse events. Our interim results suggest Tofacitinib is a safe and efficacious therapy for the treatment of severe AA.

083

Sequential Cyclic Change of Hair Roots of Dystrophic Anagen Followed by Catagen and Telogen in The Mechanism of Alopecia Areata Incognita Revealed by Dermoscopy

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9/1985-7/1988: Master
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12/1982-9/1985: Residency

X. Zhang: None. **Y. Ye:** None. **Y. Yang:** None. **H. Cao:** None. **Z. Zhu:** None. **L. Yunxia:** None. **K.J. McElwee:** None.

LEARNING OBJECTIVES:
Presentation ofdermoscopy of hair roots to reveal the cycle status of hair follicles at the time of hair loss.

ABSTRACT:
Material and methods: Hair roots were collected by pull test or combing from 23 patients with alopecia areata incognita (AAI), throughout their hair loss duration,and examined by dermoscopy. Scalpel dermoscopy and histopathology was also carried out. Result:Sequential cyclic changes of hair roots werefound, i.e., dystrophic anagen effluvium followed by catagen and telogen effluvium, with prominent depigmentation was also found in hair roots and proximal hair shafts in the later course. The morphology of the hair roots waswell correlated to dermoscopy of the hair shafts on the scalp, i.e., dystrophic anagen with black dots, catagen/telogen hair roots with broken hairs, and discolored hair shafts. Histology features of AAI at early stages of hair loss with dystrophic anagen effluvium revealed prominent acute inflammation and early stages of hair follicle regression;anagen follicles couldbe seen in the close vicinity of catagen follicles. At the later stage with telogen/exogen hair effluvium, less inflammatory infiltration and increased hair follicle regression were found. Conclusion: The sequential cyclic staging of shed hairs in patients with AAI indicates the insult maybe hair cycle specific and a “one-hit” event, leading to dystrophic anagen release for some follicles, disturbance of pigment production, and subsequent catagen or telogen release for the other follicles, according to the hair cycle stages they are in. Anti-inflammatory management should be instigatedearly in the disease duration cycle.

084

P-3074, a New HPCH Topical Formulation for the Treatment of Androgenetic Alopecia in Male Subjects

Antonella Tosti, MD[1], Matilde Iorizzo[2], Renata Palmieri[3], **Francesco Scarci**[3], Maurizio Caserini[3].
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Francesco Scarci is Clinical Project Manager at Polichem SA

A. Tosti: Consultant; Polichem SA, Kythera. **M. Iorizzo:** Consultant; Polichem SA. **R. Palmieri:** None. **F. Scarci:** None. **M. Caserini:** None.

LEARNING OBJECTIVES:
Illustrate the development of a new topical solution, candidate for the treatment of androgenetic alopecia in men

ABSTRACT:
AGA is an androgen-dependent disorder, which leads to progressive miniaturization of hair follicles. It depends on an increased rate of conversion of testosterone into dihydrotestosterone (DHT) in scalp, through the action of 5α-reductase enzyme. Oral finasteride is an effective treatment for AGA, potentially associated with sexual side effects. A new topical formulation of finasteride (P-3074), vehicled in Hydroxypropyl Chitosan (HPCH) Technology, able to control the release of finasteride in hair and scalp, minimizing the systemic exposure, has been developed. A pharmacokinetic phase I study, tested P-3074 b.i.d. vs oral finasteride 1 mg o.d., revealing a finasteride systemic exposure 15 times lower in the topical formulation. A pharmacodynamic study compared P-3074 b.i.d. and o.d. vs oral finasteride 1 mg o.d. in DHT inhibition in scalp (vertex) and in serum. The results showed comparable serum/scalp DHT inhibitions across formulations, suggesting that the achievement of comparable levels of DHT inhibition vs the oral form could be attained by a lower dose of P-3074. A following dose-response study evaluated whether P-3074 lower doses could achieve consistent inhibitory effects on scalp DHT, minimizing the systemic effect. At doses up to 200 mcL, topically applied P-3074, allowed to significantly and consistently decrease DHT in scalp (comparable to oral finasteride)and only marginally in serum, potentially minimizing the untoward side effects linked to a systemic DHT reduction.

085

A Novel Ingredient for Improved Hair Surface

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Eric Spengler, B Pharm, MAS.
Eric is currently Sr. V.P R&D at Living Proof. Eric has a Bachelor's in Pharmacy and Masters in Business and has focused his career on developing technology based consumer care products. He was among the first employee's at Living Proof. Since joining in 2007, his primary research has focused on Octafluoropentyl Methacrylate's effect on hair. Prior to joining Living Proof, Eric was also in R&D at Procter & Gamble, Clairol & Matrix.
Other contributors include:
Soo-Young Kang, Ph.D. Living Proof; David Puerta, Ph.D. Living Proof, Roger York, Ph. D. M.I.T., David Scurr, Ph.D. Univ Nottingham.

E. Spengler: Salary, Contractual Services; Employee of Living Proof. **S. Kang:** Salary, Contractual Services; Employee of Living Proof. **D. Puerta:** Consultant; Consulting for Living Proof. **R. York:** Consultant; Consultant to Living Proof. **D. Scurr:** None.

LEARNING OBJECTIVES:
Illustrate and examine recent advances in hair cosmesis which can be an adjuvant therapy for improving hair quality.

ABSTRACT:
The integrity of hair decreases with weathering. This includes repeated grooming, shampooing, UV exposure and chemical treatments. Weathering causes gradual damage and ultimate removal of the protective cuticle, exposing the weaker cortex - leading to breakage and loss. The most controllable way to minimize cuticle damage is to protect it and decrease the frequency of shampooing.
Octafluoropentyl methacrylate (OFPMA) is a novel material that possesses lipophobic, hydrophobic and very low surface energy properties. OFPMA imparts surface protective properties to hair, reducing weathering and extending the interval between shampooing.
We conducted a series of experiments to assess OFPMA's interaction with the surface of human hair and its

consumer benefits. Tof-SIMS and AFM were used to assess deposition of OFPMA. OFPMA preferentially deposited at the edge of cuticles, significantly reducing friction. Dynamic Vapor Sorption experiments on hair treated with OFPMA showed a significant decrease in hysteresis isotherms indicating a decrease in moisture vapor flux. A cornstarch particulate experiment demonstrated OFPMA resists accumulation of particulates; helping keep hair cleaner longer. Finally a consumer use study showed shampooing frequency decreased while impressions of hair quality improved when using an OFPMA product.
Results demonstrate novel and beneficial effects from OFPMA, not available via current treatments.

086

A Novel Treatment Principle in Anti-hirsutism Management: An Osteopontin-derived Peptide Potently Inhibits Human Hair Growth in Vitro and in Vivo

Marta Bertolini, MD, PhD[1], Majid Alam[1], Aviad Keren[2], Jennifer Gherardini[1], Jennifer E. Klöpper[3], Amos Gilhar[2], Ralf Paus[4].
[1]Dept. of Dermatology, University of Münster, Münster, Germany, [2]Laboratory for Skin Research, Rappaport Faculty of Medicine, Technion-Israel Institute of Technology, Haifa, Israel, [3]Dept. of Dermatology, University of Lübeck, Lübeck, Germany, [4]Centre for Dermatology Research, Institute of Inflammation and Repair, University of Manchester, Manchester, United Kingdom.

Dr. Bertolini is originally from Verona, Italy. She joined Prof. Paus´ lab at the University of Lübeck, Germany, in 2009 for her Master's thesis project, graduating in Pharmaceutical Biotechnology from the University of Padua, Italy that year and continued to a PhD in "Modulation of autoimmunity" from the University of Lübeck, Germany (awarded Nov 2014, thesis title: Abnormal interactions between perifollicular mast cells and CD8+ T-cells may contribute to the pathogenesis of alopecia areata). She currently is the Lab Chief of the Paus Lab at the University of Münster, Germany.

M. Bertolini: None. **M. Alam:** None. **A. Keren:** None. **J. Gherardini:** None. **J.E. Klöpper:** None. **A. Gilhar:** Grants/Research Support; Basic research grants from Follicum AB, Sweden. **R. Paus:** Grants/Research Support; Basic research grants from Follicum AB, Sweden.

LEARNING OBJECTIVES:
Osteopontin-derived peptide is a potent, novel inhibitor of human hair growth in vitro and in vivo.

ABSTRACT:
Undesired hair growth (hirsutism, hypertrichosis) can cause major psychological distress. Since only few, and then often unsatisfactory therapeutic options are currently available, new treatment strategies need to be developed. Since the multifunctional, immunomodulatory glycoprotein, osteopontin, reportedly is expressed by rat hair follicles (HFs) only during catagen, we hypothesized that osteopontin-derived fragments may inhibit human hair growth. Here, we have tested this hypothesis, using a newly generated, short modified osteopontin-derived peptide (FOL-005). In microdissected, organ-cultured human scalp HFs, FOL-005 highly reproducibly induced premature HF regression (catagen). This was confirmed in organ-cultured, full-thickness human scalp skin from 6-9 subjects, where FOL-005 (15nM, 150nM) significantly promoted catagen development, along with increased hair matrix keratinocyte apoptosis. When human male scalp skin was transplanted onto SCID/beige mice (three 3 mm2 grafts per mouse) and FOL-005 was injected intracutaneously, this significantly decreased the number of hairs growing per graft compared to vehicle-treated control transplants. Moreover, FOL-005 administration potently counteracted the hair growth-promoting effects of minoxidil, one of the strongest hypertrichosis-inducing agents. There was no morphological evidence of FOL-005-induced HF-toxicity, and a standard battery of toxicological tests revealed no overall FOL-005 toxicity. These data identify this osteopontin-derived peptide as a potent, novel inhibitor of human hair growth in vitro and in vivo, which deserves clinical testing as a new treatment principle for excessive hair growth (hirsutism, hypertrichosis).

087

Alopecia Areata Bulbs Show Significant Transcriptional Abnormalities Before, During and After Active Hair Loss

Jane Li, MBBS[1], Catherine van Vliet[2], Nicholas W. Rufaut[3], Leslie Jones[3], Rodney Sinclair[3], Francis R. Carbone[2].
[1]Department of Microbiology and Immunology, The University of Melbourne at The Peter Doherty Institute for Infection and Immunity & Department of Medicine (St Vincent's Hospital), The University of Melbourne & Department of Dermatology, Epworth Hospital, Melbourne, Australia, [2]Department of Microbiology and Immunology, The University of Melbourne at The Peter Doherty Institute for Infection and Immunity, Melbourne, Australia, [3]Department of Medicine (St Vincent's Hospital), The University of Melbourne & Department of Dermatology, Epworth Hospital, Melbourne, Australia.

Dr Jane Li is a PhD student and dermatology trainee from The University of Melbourne. Currently, she is based at the Peter Doherty Institute for Infection and Immunity. Jane obtained her MBBS (Hons) from the University of Melbourne in 2010, and commenced her PhD in 2013, studying gene expression of hair follicles in alopecia areata.

J. Li: None. **C. van Vliet:** None. **N.W. Rufaut:** None. **L. Jones:** None. **R. Sinclair:** None. **F.R. Carbone:** None.

LEARNING OBJECTIVES:
Describe the transcriptional abnormalities present in alopecia areata hair bulbs during different stages of the disease.

ABSTRACT:
Anagen bulbs are the primary targets of autoimmune attack in alopecia areata (AA). In this study, we investigated the transcriptional profile of AA bulbs during different disease stages.
Biopsies were collected from AA and healthy volunteers, with AA biopsies obtained from areas of active hair loss, regrown areas, and previously unaffected areas. We used laser capture microdissection to isolate mRNA specifically from anagen bulbs, then performed PCR with primers targeting immune- and hair-related genes, including all known chemokines. We found that multiple chemokines were significantly upregulated in active AA compared to normal controls. Furthermore, we observed strong correlations in the expression of several chemokine-receptor pairs, suggesting that these chemokines were recruiting immune cells bearing the corresponding receptors. Although the transcription pattern in regrown AA was attenuated compared to active AA, it remained significantly abnormal. This finding implies that permanent changes may persist in regrown AA despite clinical remission, potentially predisposing to future relapse. Unaffected AA bulbs also showed transcriptional abnormalities compared to normal controls, including a relative decrease in CST6 expression. Interestingly, CST6 deficiency is known to cause scarring alopecia in mice. Finally, we identified 5 genes that were significantly overexpressed in all AA categories: CCL5, CXCL9, CCL19, HLA-C and CD4. This "core signature" supports the existence of an underlying abnormality in AA that is present before overt hair loss.

088

α1-AR Agonist Induced Piloerection Protects Against the Development of Traction Alopecia

John McCoy, PhD, **Andy Goren, MD**, Maja Kovacevic, MD, Jerry Shapiro, MD.
Applied Biology, Inc., Irvine, CA, USA.

Prof. Goren has over 15 years of experience in research, development and launch of breakthrough medical technologies.
Among the list of many firsts in dermatology, Prof. Goren was the first to develop a clinical genetic test for predicting androgenetic alopecia, the first to discover epigenetic markers predicting anti-androgen therapy response in female androgenetic alopecia, the first to develop a clinical acne vulgaris antibiotic response test based on P. Acnes bacterial genomics, and the first to develop a rapid test for predicting minoxidil response in androgenetic alopecia.

J. McCoy: None. **A. Goren:** None. **M. Kovacevic:** None. **J. Shapiro:** None.

LEARNING OBJECTIVES:
Illustrate and examine the recent advances and research outcomes of a novel treatment for traction alopecia.

ABSTRACT:
Traction alopecia affects a large number of women undergoing cosmetic hair procedures, such as, blow drying, flat ironing, braiding, ponytails, hair extensions, and repeated brushing. Traction alopecia develops from the force applied to hair follicles during mechanical procedures. Each hair follicle in the human scalp contains an arrector pili muscle that, when contracted, erects the hair. The smooth muscle in the arrector pili expresses α1 adrenergic receptors (α1-AR). As such, we hypothesized that contraction of the arrector pili muscle via an α1-AR agonist would increase the threshold of force required to pluck hair during cosmetic procedures. Female subjects, ages 18-40, were recruited to study the effect of topically applied phenylephrine, a selective α1-AR agonist, on epilation force and hair loss during cosmetic procedures. In our blinded study, 80% of subjects demonstrated reduced hair loss on days using phenylephrine compared to days using a placebo solution. The average reduction in hair loss was approximately 44%. In addition, the force threshold required for epilation increased by approximately 172% following topical phenylephrine application. To our knowledge this is the first study demonstrating the utility of α1-AR agonists in the treatment of traction alopecia and excessive hair loss resulting from cosmetic procedures.

089

Pharmacologic Inhibition of JAK-STAT signaling Promotes Hair Growth

Etienne Wang, MBBS, MA[1], Sivan Harel, PhD[1], Claire Higgins, PhD[2], Jane Cerise, PhD[1], Zhenpeng Dai, PhD[1], James Chen, PhD[1], Raphael Clynes, MD, PhD[1], Angela M. Christiano, PhD[1].
[1]Columbia University Medical Centre, New York, NY, USA, [2]King's College, London, United Kingdom.

Etienne Wang is a dermatologist from the National Skin Centre in Singapore. He is currently a graduate student in the laboratory of Angela Christiano in Columbia University.

E. Wang: None. **S. Harel:** None. **C. Higgins:** None. **J. Cerise:** None. **Z. Dai:** None. **J. Chen:** None. **R. Clynes:** None. **A.M. Christiano:** None.

LEARNING OBJECTIVES:
This presentation provides data that JAK-STAT signaling plays an important in the hair cycle, and therapeutic targeting may be justifiable in hair diseases.

ABSTRACT:
The JAK-STAT pathway has been implicated in regulation of the immune system, but has not been examined in the non-inflammatory context in the skin. Our recent studies showed that JAK inhibition can both prevent and reverse disease in murine AA. Unexpectedly, topical treatment with JAK inhibitors resulted in more hair regrowth compared to systemic treatment, suggesting a localized effect of JAK-STAT inhibition on initiation of the hair cycle. We confirmed that topical JAK-STAT inhibitors in normal mice in telogen resulted anagen onset within 10 days of treatment. This effect was not T-cell dependent. To define the state of JAK-STAT signaling in the hair follicle (HF), we found that activation of signaling components Stat3 and Stat5 in stem cell compartments such as the bulge, hair germ and dermal papilla. Functional studies suggest that JAK-STAT inhibition promotes HF stem cell activity, as well as enhances the inductive capacity of dermal papillae in patch assays. To establish relevance in human HFs, we treated grafted human scalp skin with JAK-STAT inhibitors, and showed that inhibition of JAK-STAT signaling is sufficient to stimulate human hair growth. JAK-STAT inhibition also resulted in the elongation of the hair shaft in human organ culture assays. Our findings suggest that blockade of the JAK-STAT pathway represents a new therapeutic target for the promotion of hair growth.

090

Coffee with the Experts, Table Co-Leader on the Topic of, "Alopecia Areata"

Maria K. Hordinsky, MD.
University of Minnesota, Minneapolis, MN, USA.

091

Coffee with the Experts, Table Co-Leader on the Topic of, "Alopecia Areata"

Melissa Piliang.
Cleveland Clinic, Cleveland, OH, USA.

Dr. Melissa Piliang joined the staff at the Cleveland Clinic after dermatology residency and dermatopathology fellowship at the Cleveland Clinic. She is a graduate of Indiana University School of Medicine and holds a Bachelor's degree from Purdue University. Her areas of interest are general alopecias, androgen disorders, and dermatopathology. She has authored numerous scientific papers and textbook chapters. At Cleveland Clinic, she is Vice Chair of Education in the Dermatology and Plastic Surgery Institute and serves as associate program director for the dermatology residency and dermatopathology fellowship. Dr. Piliang is active in NAHRS, AAD and ASDP.

M. Piliang: Grants/Research Support; Kythera - Investigator, Samumed - Investigator.

LEARNING OBJECTIVES:
- Understand treatment protocols and approach to patients with various patterns of alopecia areata

092

Coffee with the Experts, Table Co-Leader on the Topic of, "Cicatricial Alopecia"

Leonard Sperling, MD.
Uniformed Services University of the Health Sciences, Bethesda, MD, USA.

Dr. Sperling is a graduate of Yale College and received his M.D. from the University of Pennsylvania. He completed dermatology residency training at Walter Reed Army Medical Center and a dermatopathology fellowship at the Armed Forces Institute of Pathology. Dr. Sperling is currently Sulzberger Professor of Dermatology and Pathology at the Uniformed Services University in Bethesda, MD, where he served from 1996-2014 as chairman of the Dept. of Dermatology. He is the author of over 120 publications, including a popular textbook, and is regarded as an international authority on the subject of hair disease.

L. Sperling: None.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Cicatricial Alopecia"

Ralf Paus, MD.
University of Manchester, United Kingdom.

094

Coffee with the Experts, Table Co-Leader on the Topic of, "Central Centrifugal Cicatricial Alopecia"

Valerie D. Callender, MD.
Howard University College of Medicine, Washington, DC, USA.

095

Coffee with the Experts, Table Co-Leader on the Topic of, "Central Centrifugal Cicatricial Alopecia"

Nonhlanhla Khumalo, PhD.
University of Cape Town, Cape Town, South Africa.

Dr Khumalo is a wife and mother who worked half-time for 10 years to raise her daughters. She is a clinician scientist trained in Dermatology at Groote Schuur Hospital and the Oxford Churchill Hospital. She recently established the Hair and Skin Research Laboratory (HSR lab) a state-of-the-art national facility. From researching alopecia, preparing hair for various tests (drugs, toxins, hormones) to identifying illegal ingredients; a combined focus on comprehensive hair testing and safety in cosmetic formulations makes the HSR Lab unique internationally. In 2015 Dr Khumalo was awarded the National Research Foundation South African Research Chair for Dermatology and Toxicology.

N. Khumalo: None.

LEARNING OBJECTIVES:
Scarring alopecia is best prevented than treated. This will be an open discussion exploring potential (from current knowledge) clues that could help identify preventable causes of CCCA

096

Coffee with the Experts, Table Co-Leader on the Topic of, "Frontal Fibrosing Alopecia"

Elise Olsen.
Duke University, Durham, NC, USA.

Dr. Olsen is the founder and Director of the Duke University Hair Disorders Research and Treatment Center. She is one of the founders, past President and past Board member of the North American Hair Research Society (NAHRS). She is the author of the first and second editions of the textbook, "*Hair Disorders: Diagnosis and Treatment.*" She is on the
Scientific Advisory Board of CARF and the National Alopecia Areata Foundation
and served as Chairman of the NAAF taskforce to develop investigative
guidelines for alopecia areata.

E. Olsen: None.

LEARNING OBJECTIVES:
The focus in on identifying etiologic factors of FFA

097

Coffee with the Experts, Table Co-Leader on the Topic of, "Frontal Fibrosing Alopecia"

Janet L. Roberts, MD[1], Elise A. Olsen, MD[2].
[1]Northwest Dermatology and Research Center, LLC, Portland, OR, USA, [2]Duke University, Center for Hair Research, Durham, NC, USA.

Janet L. Roberts, MD specializes in the the diagnosis and treatment of hair disorders as well as lecturing, authoring manuscripts, teaching and research. Clinical professor of Dermatology at Oregon Health and Science University.

J.L. Roberts: None. **E.A. Olsen:** None.

LEARNING OBJECTIVES:
Familiarize the attendees with the diverse clinical presentation, histopathology and treatment options for frontal fibrosing alopecia.

098

Coffee with the Experts, Table Co-Leader on the Topic of, "Medical Therapy for Andrdogenetic Alopecia"

Ulrike Blume-Peytavi.
Charité-Universitätsmedizin Berlin, Berlin, Germany.

Ulrike Blume-Peytavi is Professor and Executive Medical Director of the Department of Dermatology and Allergy and Director of the Clinical Research Center for Hair and Skin Science (CRC) at the Charité-Universitätsmedizin in Berlin, Germany, specialized in dermatology, venerology, allergology and became University-Professor in 2001. She is editor of the Textbook on Hair Growth and Disorders.

U. Blume-Peytavi: None.

099

Coffee with the Experts, Table Co-Leader on the Topic of, "Medical Therapy for Andrdogenetic Alopecia"

Ken Washenik, MD, PhD.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Low Level Laser Therapy"

R. Rox Anderson, MD.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Low Level Laser Therapy"

Joaquin J. Jimenez, MD.
University of Miami, Miami, FL, USA.

Dr. Joaquin J. Jimenez M.D. is a Research Professor of Dermatology and Cutaneous Surgery and Biochemistry and Molecular Biology at the University of Miami Miller School of Medicine. Dr. Jimenez scientific interest is transitional research. Several of his research projects on hair have been taken from the bench to the bedside.

J.J. Jimenez: None.

LEARNING OBJECTIVES:
Discuss the LLLT emerging technology and possible applications.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Camouflaging Techniques"

Nilofer Farjo.
Farjo Hair Institute, Manchester, United Kingdom.

Nilofer Farjo graduated in 1988 from the Royal College of Surgeons in Ireland. In 1993, she co-founded clinics in the UK exclusively practicing hair restoration surgery. She is a founding member and past president of the British Association of Hair Restoration Surgery, Fellow and Board member of the International Society of Hair Restoration Surgery (ISHRS), Editor Emeritus of the Hair Transplant Forum International journal, past Chair and current member of the Fellowship Training Committee of the ISHRS, Diplomate of the American Board of Hair Restoration Surgery, Fellow of the Institute of Trichologists, and Treasurer of the European Hair Research Society.

N. Farjo: None.

LEARNING OBJECTIVES:
Demonstrate the different techniques that are available to use as camouflage in hair loss patients

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Coffee with the Experts, Table Co-Leader on the Topic of, "Camouflaging Techniques"

Alex Ginzburg, MD.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Nutraceuticals"

Wilma F. Bergfeld.
Dermatology, Cleveland Clinic, Cleveland, OH, USA.

Wilma Fowler Bergfeld, MD, FACP is Co-Director of Dermatopathology, Departments of Dermatology and Pathology and Senior Staff Dermatologist and Past Head of the Section of Dermatological Research in the Department of Dermatology, Cleveland Clinic. She also is the Director of the Cleveland Clinic's Dermatopathology Fellowship and Professor of Dermatology and Pathology.
She is currently President of North American Hair Research Society (2011-2015) and Co Director WCHRS2015 and was the President of the American Society of Dermatopathology,and President of The American Academy of Dermatology.Dr Bergfeld is the author of over 600 publications, 4 books and 80 book chapters. .

W.F. Bergfeld: None.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Nutraceuticals"

Natasha Mesinkovska, MD PhD.
Cleveland Clinic, Laguna Niguel, CA, USA.

Educated at the Mayo Clinic, Dr. Natasha Mesinkovska developed her interest in hair research with Dr. Wilma Bergfeld at the Cleveland Clinic. She currently serves as a Chief Scientific Officer for the National Alopecia Areata Foundation.

N. Mesinkovska: None.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Pathology"

Lynne Goldberg.
Boston University School of Medicine, Boston, MA, USA.

Dr. Goldberg is triple boarded in internal medicine, dermatology and dermatopathology, and divides her time evenly between the practices of dermatology and dermatopathology at the Boston University School of Medicine. In addition to signing out cases at the Skin Pathology Laboratory at Boston University, she directs the Hair Clinic at Boston Medical Center. Her clinical practice is limited to patients with hair disorders. She is an avid teacher and lecturer and is the recipient of several teaching awards.

L. Goldberg: None.

LEARNING OBJECTIVES:
1) Enhance communication with conference participants
2) Increase knowledge on the role of dermatopathology in the diagnosis of alopecia

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Coffee with the Experts, Table Co-Leader on the Topic of, "Trichoscopy"

Fernanda Torres, MD.

108

Coffee with the Experts, Table Co-Leader on the Topic of, "Trichograms"

D. Hugh Rushton, PhD DSc.
University of Portsmouth, London, United Kingdom.

I have a DSc from the University of Cardiff and a PhD entitled from The Welsh School of Pharmacy, University of Wales. I have published over 55 research papers in peer-reviewed
journals and written or co-authored book chapters concerning scalp hair loss, treatment modalities, hair care and associated matters.

D. Rushton: None.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Instruments You Need"

Bernard Cohen, MD.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Transplantation"

Bessam Farjo, MB ChB FISHRS.
Farjo Hair Institute, Manchester, United Kingdom.

Co-founder Farjo Hair Institute in Manchester and London exclusively practicing hair restoration surgery since 1993. Fellow, Ambassador & Past President of International Society of Hair Restoration Surgery (ISHRS) (2007-08), Past President and co-founder of the British Association of Hair Restoration Surgery, Diplomate and Past Board Director of the American Board of Hair Restoration Surgery, Fellow, Board Governor & Medical Director of the Institute of Trichologists, Fellow of the International College of Surgeons and Board Trustee of The Hair Foundation.
Joint recipient of the 2012 ISHRS Platinum Follicle Award for 'outstanding contribution to hair research'.

B. Farjo: Consultant; Restoration Robotics.

LEARNING OBJECTIVES:
Tips and pearls on any issue connected with the practice of hair transplant surgery.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Transplantation"

Sharon A. Keene, MD.
PHI, Tucson, AZ, USA.

Dr. Sharon Keene completed training in surgery at the University of AZ in Tucson, eventually specializing in hair restoration surgery. She is actively involved in scientific teaching with the ISHRS, and recently served as president. In addition to developing surgical tools to improve quality/ efficiency of surgery, she engaged in research studying genetics/ epigenetics of hair loss as factors that influence rates of hair loss and response to medical therapy. Most

recently she worked with Applied Biology evaluating follicle sulfotransferase levels and response to Minoxidil. She has also performed a critical review of LLLT device studies & efficacy.

S.A. Keene: Salary, Contractual Services; Contracted by Applied Biology to perform data gathering for Minoxidil Study.

LEARNING OBJECTIVES:
1) Discuss ways to properly select hair transplantation candidates, especially those with a complex history of hair loss i.e. history of inflammatory alopecia
2) Review adjunctive therapies to treat androgenetic hair loss, and possible emerging therapies
3) Review possible epigenetic or contributing environmental factors that may impact rates of hairloss
4) Review the use of LLLT devices and limitations of current studies to predict clinical response

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Coffee with the Experts, Table Co-Leader on the Topic of, "Robotic Hair Transplantation"

Chang hun HUH.
Dermatology, Seoul National University Bundang Hospital, SEONGNAM, Korea, Republic of.

Chang-Hun Huh is an Associate Professor of Department of Dermatology, Seoul National University. He got the PhD degree with the study about stem cells. He is not only active members and board of directors in many societies but many international societies. He is elected as the deputy secretary general of 36th international society for dermatologic surgery. He also serves the International Mentor of American Society for Dermatologic Surgery and the preceptor of International Society for Dermatologic Surgery. He has more than 100 peer reviewed articles, and presented more than 100 presentations internationally.

C. Huh: None.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Robotic Hair Transplantation"

Paul T. Rose, MD, FAAD.FISHRS, JD.
hair institute miami, Coral gables, FL, USA.

Dr. Rose is a board certified dermatologist. He has served as President of the ISHRS and has served in other roles in the society. He has published numerous articles related to hair restoration procedures and hair loss biology.

P.T. Rose: Salary, Contractual Services; consultant to restoration robotics. Stock/Shareholder
(self‐m anaged) stock owner restoration robotics.

LEARNING OBJECTIVES:
The objectives for this session include providing an opportunity for attendees to ask questions regarding the use of the robotic hair restoration device.
We will cover the capabilities and advantages and disadvantages of the system.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Stem Cells"

George Cotsarelis, M.D..
University of Pennsylvania, Philadelphia, PA, USA.

Dr. Cotsarelis received his B.A. and his M.D. from the University of Pennsylvania, and did his dermatology residency at Penn. He joined the faculty at Penn as an Assistant Professor of Dermatology in 1996. He became the first member in the history of the Dermatology Department to enter and then be promoted on the tenure track. He was awarded tenure and the Albert M. Kligman Associate Professorship of Dermatology in 2005. He was promoted

to full professor in 2009, and achieved his current position as Milton B Hartzell Professor of Dermatology and Chairman of the Department in 2010.

G. Cotsarelis: Grants/Research Support; Kythera.

LEARNING OBJECTIVES:
Have a better understanding of Stem Cells.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Stem Cells"

Valerie A. Randall, PhD, FIBMS, FRSB.
University of Bradford, Bradford, United Kingdom.

Professor Valerie Randall is Professor of Biomedical Sciences at the University of Bradford, UK. She teaches at undergraduate and post-graduate levels and leads a well-established, internationally-recognised team investigating the biology of hair growth, particularly the mechanisms of androgen action and drugs which stimulate human hair growth. Professor Randall also contributes extensively to the scientific community. Highlights include: Secretary and President of the European Hair Research Society, Editorial Board, Journal of Endocrinology, Editor, The Endocrinologist, Council/Executive Committee Member: Institute of Biology, Society for Endocrinology, Heads of University Centres of Biomedical Sciences and Chair/Member, Organising Committee for 15 national & international conferences.

V.A. Randall: None.

LEARNING OBJECTIVES:
To understand more about stem cells in hair follicles

116

Coffee with the Experts, Table Co-Leader on the Topic of, "Follicular Neogenesis"

Colin Jahoda, PhD.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Follicular Neogenesis"

Jerry Shapiro.
New York University School of Medicine, New York, NY, USA.

J. Shapiro: Consultant; Merck, J and J, Applied Biology. Stock/Shareholder
(self-managed; Replicel Life Sciences Inc..

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Coffee with the Experts, Table Co-Leader on the Topic of, "Genetic Testing"

angela christiano.
columbia, ny, NY, USA.

Dr. Angela Christiano is the Richard and Mildred Rhodebeck Professor of Dermatology and Genetics & Development at Columbia University . The major focus of her research is the study of inherited skin and hair disorders using classical genetics starting with human patients, leading to functional studies in mice and humans. A long-range goal of the research is to develop rationally designed therapies for skin and hair diseases through understanding the underlying pathogenetic mechanisms. Her lab's recent work focuses on the genetics and immunology of alopecia areata as well as iPSC and stem cell technologies for skin and hair disorders.

A. christiano: None.

LEARNING OBJECTIVES:
Learning objective is to familiarize participants with the work going on in our lab, using genetic studies to approach hair disorders, and then to extend such studies into mouse models and into clinical trials. Translational approaches and precision medicine.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Diversity"

John Gray, MD.
Procter & Gamble, Gillitts, South Africa.

John Gray trained in medicine at St Georges Medical School, London and entered family practice where he developed his interest in dermatology and particularly hair disorders including opening a Hair Treatment Clinic. In addition he is the Medical Advisor to Procter & Gamble and has thirty years experience in their hair and skin care division.He has acted as Chair of many Premier Science Panel round table discussions with external experts relating to hair and skin care initiatives and from 1997 to 2005 he was a Director of the Oxford Hair Foundation.

J. Gray: Advisory Board or Panel; Medical Advisor Procter & Gamble.

LEARNING OBJECTIVES:
To discuss the anatomy , genetic derivation and aesthetic consequences
of the differences in ethnic hair diversity

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Diversity"

Gillian E. Westgate, PhD.
University of Bradford, Bradford, United Kingdom.

Gill has a PhD in hair biology and over 30 years' experience in R&D in the personal care sector. Following a career in Unilever and establishing her own consultancy, Gill joined the University of Bradford, Centre for Skin Sciences in 2009 and has since developed academic-led projects with numerous large and small companies in this sector. Gill is Chairman of the International Board of Hair Research Societies and is immediate past President of the European Hair Research Society.

G.E. Westgate: Consultant; Westgate Consultancy Ltd.

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Coffee with the Experts, Table Co-Leader on the Topic of, "African American Hair"

Yolanda M. Lenzy.
Univ of Connecticut Health Sciences, Chicopee, MA, USA.

Dr. Yolanda Lenzy, M.D. is a board-certified dermatologist in Chicopee, MA. Dr Lenzy is a Clinical Associate at University of Connecticut Health Science Center. Her research and clinical practice focuses on hair and scalp disorders. Prior to college, Dr. Lenzy trained in cosmetology and has been a licensed cosmetologist for over 20 years. Her background as a hair stylist fueled her passion to focus her career on optimizing care for the hair and scalp from a medical perspective. Dr. Lenzy's research includes including partnering with local hair salons to educate stylists on ways to help prevent styling induced hair loss.

Y.M. Lenzy: Grants/Research Support; Sun Dial Brands.

LEARNING OBJECTIVES:
Ask questions related to African American Hair including hair grooming practices as well as management of common scalp conditions commonly seen in this group.

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Coffee with the Experts, Table Co-Leader on the Topic of, "African American Hair"

Amy J. McMichael.
Dermatology, Wake Forest Baptist Health, Winston-Salem, NC, USA.

Dr. Amy McMichael is Professor and Chair of Dermatology at the Wake Forest Baptist Health Med Ctr. She received her MD at the University of Pennsylvania School of Medicine and dermatology training at the University of Michigan. Dr. McMichael is a diplomat of the American Board of Dermatology. Her research focuses on hair and scalp disorders. Her publications include many peer-reviewed articles, chapters, and invited articles. She is the also the co-editor of the text *Hair and Scalp Diseases. She* is on the Editorial Board of Cosmetic Dermatology and JAMA Dermatology.

A.J. McMichael: Advisory Board or Panel; CARF. Consultant; Samumed, Pantene, Merz, Johnson and Johnson, Gillette, Galderma, Kythera, Allergan. Grants/Research Support; Allergan, Pantene, Galderma, Kythera, Casseopia, Regeneron, Amgen. Other Financial or Material Support (royalties, patents, etc.); Up to Date, Taylor and Francis.

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Coffee with the Experts, Table Co-Leader on the Topic of, "New Drugs and Hair"

Gabriella Fabbrocini, Associate Professor.
University of Naples Federico II, Naples, Italy.

Author of 236 publications, 158 published on impacted/indexed national and international journals, with a total impact factor of 232.957. Author and or co-author of 17 international and national text book. She has participated as invited speaker at 360 International and National Meetings. She is well experienced in field of acne, hydrosadenite, dermoscopy, melanoma, photodermatology and alopecia; from 5 years she created an outpatient for dermocosmetological care of chemotherapy skin reaction.

G. Fabbrocini: None.

LEARNING OBJECTIVES:
To recognize specific pattern of chemotherapy-induced alopecia and to distinguish it from other type of hair loss.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Loss in Women"

Paul Farrant.
Brighton & Sussex University Hospitals Trust, Brighton, United Kingdom.

Dr Farrant is a UK trained consultant dermatologist at Brighton & Sussex University Hospital trust where he is currently clinical lead for the dermatology service. His main subspeciality interest is hair loss and scalp disorders and he runs the regional hair disorders clinic in Brighton. In 2011 Dr Farrant set up the British Hair and Nail Society, an affiliated organisation of the British Association of dermatologists. He is also a member of the European Hair Research Society.

P. Farrant: None.

LEARNING OBJECTIVES:
-differentiate common hair loss conditions in women

-decide on appropriate investigations
-initiate therapy when appropriate

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Loss in Women"

Paradi Mirmirani, PhD.
The Permanente Medical Group, Vallejo, CA, USA.

Dr. Paradi Mirmirani completed residencies in Internal Medicine and Dermatology and a clinical hair research fellowship at the University of California San Francisco(UCSF). Dr. Mirmirani practices at the Kaiser Permanente Medical Center in Vallejo, California where she serves as the Northern California regional hair disorders referral center. She has faculty appointments at Case Western Reserve University and at UCSF. Dr. Mirmirani co-authored “Cicatricial Alopecia: An Approach to Diagnosis and Management”. She is on the scientific advisory board of the Cicatricial Alopecia Research Foundation and is a past member of the Board of Directors for the North American Hair Research Society.

P. Mirmirani: Other Financial or Material Support (royalties, patents, etc.); Springer- royalties/ Uptodate- royalites.

LEARNING OBJECTIVES:
Discuss various issues that are pertinent to hair loss in women: causes, management and treatment, psychosocial impact, and identification of important areas for future research.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Care"

Maria Fernanda R. Gavazzoni Dias, BM, MS, Phd.
Universidade Federal Fluminense, Niterói, Brazil.

Professor of Dermatology at Universidade Federal Fluminense, bachelor's at Medicine from Universidade Federal do Rio de Janeiro, master's at Dermatology from Universidade Federal do Rio de Janeiro and doctorate at Dermatology from Universidade Federal do Rio de Janeiro.

M.R. Gavazzoni Dias: Consultant; Procter and Gamble company.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to:
1)Understand and precribe the different hair care cosmetics ingredients envolved in the formulations of shampoos and conditioners.
2)Understand the hair straightening chemical treatments, as well as the formaldehyde hair treatment and their colateral effects.
3)Understand the medical and cosmetic importance of hair dyes and bleaching products.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Dyes"

Jennifer M. Marsh, PhD.
The Procter & Gamble Company, Mason, OH, USA.

Jennifer Marsh is a Research Fellow at The Procter & Gamble Company. Her expertise is in hair colorant technology, hair structure understand and oxidation chemistry. She has worked in this field for 18 years and has published multiple patents and publications

J.M. Marsh: None.

LEARNING OBJECTIVES:
Leaning opportunity is questions related to hair color.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Pigmentation"

Bruno A. BERNARD.
L'OREAL, Asnières-sur-Seine, France.

Dr. Bruno A.Bernard joined L'Oréal in 1992, where he founded the Hair Biology Research Group, at the Department of Life Sciences. He was appointed L'Oréal Fellow in 2011. During his >20 years in human hair research, he made significant contributions in different aspects of hair biology, including control of hair growth, androgen and prostaglandin metabolism, alopecia and inflammation, origin of hair shape, pigmentation and hair whitening, and last but not least, stem cells. Dr. Bruno A.Bernard is a member of the Society for Investigative Dermatology and the European Hair Research Society.

B.A. Bernard: Salary, Contractual Services; I'm an employee of L'Oréal company.

LEARNING OBJECTIVES:
At the conclusion of the discussion, you will be able to explain the mechanisms of hair pigmentation and the origin of hair whitening.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Pigmentation"

Desmond J. Tobin, PhD.
University of Bradford, Bradford, United Kingdom.

Desmond J. Tobin is Professor of Cell Biology & Director of the Centre for Skin Sciences at University of Bradford. He has a BSc from National University of Ireland-Maynooth, a PhD from University of London (St. John's Institute of Dermatology) and post-doctoral training from NYU Medical Centre Dept. of Dermatology. He researches basic and applied skin/hair sciences, with a focus on human pigmentation and immune-mediated hair growth disorders. Des Tobin is a Fellow of; Royal College of Pathologists, Royal Society of Biology, and of Institute of Trichologists. He has published >140 publications (incl. 3 books). His H-Index is currently 49.

D.J. Tobin: None.

LEARNING OBJECTIVES:
To provide laboratory research insights into the regulation of human hair follicle pigmentation, in an interactive setting.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Shaft Disorders"

David A. Whiting, M.D., F.A.C.P., F.R.C.P. (Ed).
The Hair and Skin Research and Treatment Center, Dallas, TX, USA.

Dr. David Whiting is the Medical Director of The Hair and Skin Research and Treatment Center. He graduated medicine at University of Witwatersrand, Johannesburg, South Africa 1953. He was Chairman of Dermatology at the Johannesburg General Hospital prior to his appointment as Chief Dermatologist at the Veterans Administration Medical Center in Dallas in 1977. He has practiced and taught dermatology and dermatopathology at Baylor University Medical Center from 1979 until the present. He is boarded in Dermatology and Dermatopathology in the U.S.A. and in Internal Medicine in Great Britain. He is a Fellow of the ACP and of the RCPE.

D.A. Whiting: None.

LEARNING OBJECTIVES:
How to Diagnose Hair Loss Disorders.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Hair Diseases in Children"

Andrew G. Messenger, MD.

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Coffee with the Experts, Table Co-Leader on the Topic of, "Infections/Infestations"

Daniel Asz-Sigall.
Centro Medico ABC, Mexico City, Mexico.

Dermatologist and trichologist, ABC Hospital and Dermalomas Clinic, Mexico City

D. Asz-Sigall: None.

LEARNING OBJECTIVES:
At the conclusion of the discussion, you will be able to diagnose and treat hair infections and infestations.

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Session Director, “Genetics, Genomics, and Personalized Medicine/Biomarkers”

Angela Christiano, PhD.

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Session Co-Director, “Genetics, Genomics, and Personalized Medicine/Biomarkers”

Regina C. Betz, MD.
Institute of Human Genetics, University of Bonn, Bonn, Germany.

Regina C. Betz is Professor of Dermatogenetics at the Institute of Human Genetics at the University of Bonn, Germany. After studying medicine, she worked as postdoctoral fellow at the universities of Stockholm, Freiburg, Bonn and Antwerp before she started her Emmy Noether young investigator research group in 2004. In 2010, she was appointed as Heisenberg Professor for Dermatogenetics in Bonn. Her particular research focus is dermatogenetics, with a main interest in diverse forms of monogenic and genetically complex alopecias. The work of Prof. Betz was rewarded by a number of prizes and awards and is documented in approximately 100 publications.

R.C. Betz: None.

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Session Co-Director, “Genetics, Genomics, and Personalized Medicine/Biomarkers”

Abraham Zlotogorski, MD.
Hadassah - Hebrew University Medical Center, Jerusalem, Israel.

President - European Hair Research Society; Head, Department of Dermatology and Director of the Center for Genetic Diseases of the Skin & Hair, Hadassah - Hebrew University Medical Center, Jerusalem, Israel.

A. Zlotogorski: None.

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Latest findings in the field of monogenic hair disorders

Regina C. Betz, MD.
Institute of Human Genetics, University of Bonn, Bonn, Germany.

Regina C. Betz is Professor of Dermatogenetics at the Institute of Human Genetics at the University of Bonn, Germany. After studying medicine, she worked as postdoctoral fellow at the universities of Stockholm, Freiburg, Bonn and Antwerp before she started her Emmy Noether young investigator research group in 2004. In 2010, she was appointed as Heisenberg Professor for Dermatogenetics in Bonn. Her particular research focus is dermatogenetics, with a main interest in diverse forms of monogenic and genetically complex alopecias. The work of Prof. Betz was rewarded by a number of prizes and awards and is documented in approximately 100 publications.

R.C. Betz: None.

LEARNING OBJECTIVES:
Tell 2 of the most common genes for AR hypotrichosis. Explain novel technologies for gene identification in monogenic hair disorders.

ABSTRACT:
Inherited hair disorders comprise a large group of clinically and genetically heterogeneous forms, such as alopecia, hirsutism, or diverse hair shaft disorders. Most of these abnormalities can occur isolated or in combination with other ectodermal or extracutaneous symptoms resulting in diverse syndroms. Clinical classification of isolated hair disorders is based on the onset of the disorder, the regions affected, and the structure of the hair shaft. Both sexes are usually equally affected, and the inheritance pattern is mostly autosomal dominant or recessive. A powerful approach to advancing our understanding of the pathophysiology of human hair disorders is the identification of genes for these rare phenotypes. Within the last two decades, molecular genetic research has progressed enormously and many of rare hair disorders could be clarified. Especially a number of genes for monogenic hair loss disorders have been elucidated, among them keratin genes, the hairless gene and others. Molecular genetic and pathophysiological studies of these hair development disorders contribute significantly to our understanding of the pathomechanisms of hair loss as well as the basic physiological mechanisms of hair growth.In times of next-generation-sequencing and the possibility to examine the patients' exome within a few weeks, the number of novel disease genes should have been dramatically increased, however the literature does not seem to reflect this opportunity in monogenic hair research.

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Mapping of hair disorders - Not everything is gold

Abraham Zlotogorski, MD.
Hadassah - Hebrew University Medical Center, Jerusalem, Israel.

President - European Hair Research Society; Head, Department of Dermatology and Director of the Center for Genetic Diseases of the Skin & Hair, Hadassah - Hebrew University Medical Center, Jerusalem, Israel.

A. Zlotogorski: None.

LEARNING OBJECTIVES:
Illustrate the difficulties associated with mapping of genotrichoses, and the approach to overcome these projects with hard work and humor.

ABSTRACT:
Genetic mapping of hereditary hair disorders is an exciting field, which involves fun, pleasure and satisfaction. In recent years, there has been a remarkable progress in molecular technology, and the advent of next-generation sequencing has provided dermatologists with promising new instruments for diagnosing genotrichoses. However, the ease of genetic mapping is oftentimes counterbalanced by numerous unexpected obstacles in the process. In this

talk I will review some examples of such difficulties that arose during the genetic mapping of androgenetic alopecia, alopecia areata, monilethrix, congenital atrichia with papular lesions, and other disorders. These examples emphasize that not everything is gold in current genetic testing of genotrichoses, and that sometimes over simplicity can lead to as much confusion as over complexity.

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Keratoderma and Woolly Hair Caused by Mutation in KANK2, a Novel Player in the Regulation of Hair Structure

Yuval Ramot, MD, MSc[1], Vered Molho-Pessach[1], Tomer Meir[1], Ruslana Alper-Pinus[1], Ihab Siam[1], Spiro Tams[2], Sofia Babay[1], Abraham Zlotogorski[1].
[1]Hadassah - Hebrew University Medical Center, Jerusalem, Israel, [2]The Palestinian Al Quds University, Abu Dis, Israel.

Dr. Yuval Ramot holds an MD and an MSc degree in Biochemistry from the Hebrew University of Jerusalem, and is currently a senior dermatologist in the Department of Dermatology and a researcher in the Center for Genetic Diseases of the Skin and Hair in Hadassah Medical Center. He is the recipient of the Minerva Post-doctoral Fellowship and the Young Dermatologist International Achievement Award. He has co-authored 4 chapters in books and more than 90 articles in peer-reviewed journals. His main fields of interest are genodermatoses and genotrichoses, and endocrine regulation of keratin expression in the hair and skin.

Y. Ramot: None. **V. Molho-Pessach:** None. **T. Meir:** None. **R. Alper-Pinus:** None. **I. Siam:** None. **S. Tams:** None. **S. Babay:** None. **A. Zlotogorski:** None.

LEARNING OBJECTIVES:
Describe the importance of the sequestration of steroid receptor coactivators to normal hair and skin functions

ABSTRACT:
Keratoderma and woolly hair are the characteristic manifestations of Naxos and Carvajal syndromes, and should alert the physician to the presence of cardiomyopathy. They are caused by mutations in the genes JUP, DSP and DSC2, which encode components of the desmosome. We identified two large consanguineous families, with autosomal-recessive palmoplantar keratoderma and woolly hair. The patients also had leukonychia and pseudoainhum of the fifth toes. None of the patients had evidence of cardiomyopathy or mutations in known culprit genes. Using whole-exome and direct sequencing, a homozygous missense c.2009C>T mutation in KANK2 in the patients was identified. KANK2 encodes the steroid receptor coactivator (SRC)-interacting protein (SIP), which sequesters SRCs in the cytoplasm via its ankyrin repeats, thus controlling the activation of several nuclear receptors, including the vitamin D receptor. Since the mutation is located in the ankyrin repeat domain of the protein, it is predicted to affect the sequestering capabilities of SIP, and indeed, SRC2 and SRC3 were localized to the nucleus of the patients, in contrast to the cytosplasmic distribution in the carrier, and vitamin D-induced transactivation was increased in patient's keratinocytes. This finding unveils the sequestration of SRCs as a new mechanism for regulation of hair structure and growth. It is also the first report of keratoderma and woolly hair caused by mutations in a non-desmosomal gene.

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The Development of a Genetic Approach to Suppress an Inheritable Structure Defect of the Hair

Ying Liu[1], Elizabeth R. Snedecor[2], Xu Zhang[1], Lian-Feng Zhang[1], Richard A. Clark[2], Dennis R. Roop[3], Chuan Qin[1], **Jiang Chen**[2].
[1]Institute of Laboratory Animal Science, Chinese Academy of Medical Science, Beijing, China, [2]Stony Brook University, Stony Brook, NY, USA, [3]University of Colorado Anschutz Medical Campus, Aurora, CO, USA.

Dr. Chen is an Associate Professor in the Departments of Pathology and Dermatology of Stony Brook University School of Medicine. Dr. Chen’s laboratory is interested in understanding molecular signaling pathways involved in

hair follicle morphogenesis and testing keratinocyte stem cells-based therapeutic strategies for genetic skin disorders caused by keratin mutations.

Y. Liu: None. **E.R. Snedecor:** None. **X. Zhang:** None. **L. Zhang:** None. **R.A. Clark:** None. **D.R. Roop:** None. **C. Qin:** None. **J. Chen:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain inheritable hair disorders and potential therapeutic strategies.

ABSTRACT:
Genetic mutations are responsible for a number of inheritable hair disorders characterized by structural defects in the hair. It is unknown whether correcting genetic mutations is sufficient to suppress related hair phonotypes in vivo. In this study, we examined whether it is feasible to suppress a hair shaft blebbing phenotype associated with the expression of a dominant mutant form of Krt75. First, allele-specific siRNAs that are capable of silencing the mutant, but not wild-type, Krt75 were developed. Subsequently, mutant Krt75-specific shRNA was expressed in epidermal keratinocyte progenitor cells isolated from mutant Krt75 mice. These genetically modified mutant cells were then used to regenerate new hair follicles in vivo. Hair formed with these genetically modified mutant keratinocyte progenitor cells developed significantly reduced number of defective hair shafts in comparison to controls. Moreover, phenotypic improvement was associated with suppressed expression of mutant Krt75 in reconstituted skin grafts. Data obtained from this study provided proof-of-concept that inheritable hair structural defects may be suppressed through genetic manipulation.

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Global MicroRNA Profiling Suggests Their Role in the Control of Human Hair Follicle Ageing

Serena Buscone, PhD[1], Mohammed Ahmed[2], Krzysztof Poterlowicz[1], Dragos Ilas[1], Ankit Patel[1], Nilofer Farjo[3], **Natalia Botchkareva**[1].
[1]University of Bradford, Bradford, United Kingdom, [2]University of Oxford, Oxford, United Kingdom, [3]Farjo Hair Institute, Manchester, United Kingdom.

Natalia Botchkareva is a Reader in Cutaneous Biology, Centre for Skin Sciences, University of Bradford. Research in Dr Botchkareva's laboratory focuses on delineating the roles for microRNAs in controlling gene expression programmes in the skin during development, hair cycle-associated tissue remodelling, postnatal regeneration and aging.

S. Buscone: None. **M. Ahmed:** None. **K. Poterlowicz:** None. **D. Ilas:** None. **A. Patel:** None. **N. Farjo:** None. **N. Botchkareva:** None.

LEARNING OBJECTIVES:
Delineate the involvement of small non-coding RNA and their target genes in the development of hair follicle aging.

ABSTRACT:
Hair aging is manifested by the reduced rate of hair growth, hair thinning, and changes in the hair fibre structure and colour. To investigate the potential role of miRNAs in hair follicle (HF) aging, RNA was obtained from anagen HF of the occipital area of healthy male patients of different age groups (30-35 year-old versus 60+ year-old) and processed for miRNA microarray analysis. Global profiling revealed decreased expression of 80 miRNAs and increased expression of 94 miRNAs in the HF of older versus young individuals. Specifically, downregulation of the members of the miR-17-92, miR-106a-363, and miR-106b-25 clusters was detected in 60+ year-old subjects. qPCR validation confirmed the decrease in expression of miR-17, miR-20a, miR-27a, miR-106a and miR-371b in the aged HF. miR-17 mimic protected anagen HF entry into catagen phase in in vitro "aging" model induced by oxidative stress. HF transfection with miR-17 mimic resulted in the decreased expression of the putative miR-17 targets BMP2, Oxr1 and Map3k8, whose expression was increased in the HF of older subjects. In addition, miR-17 mimic treatment resulted in down-regulation of anti-proliferative genes E2F1 and p21 in the hair follicles. This study

suggests that miRNA mediated control of gene expression program could contribute to the aging-associated changes in the HF. Specifically, downregulation of miR-17 could promote the development of the pre-mature HF ageing.

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Session Director, "Clinical Trials"

Jerry Shapiro, MD.
New York School of Medicine, New York City, NY, USA.

Jerry Shapiro is Professor of Dermatology at the Ronald O. Perelman Department of Dermatology, New York University School of Medicine. He has written over 150 peer reviewed articles, two books and 50 book chapters. He has trained 27 hair fellows from four continents and has restricted his practice to disorders of scalp and hair. He was the President of the World Congress of Hair in 2007 and the World Congress of Dermatology in 2015 both in Vancouver, Canada. He continues as an adjunct professor at the University of British Columbia.

J. Shapiro: Advisory Board or Panel; Merck, J and J, Applied Biology. Consultant; Merck, J and J, Kythera, Applied Biology. Other Financial or Material Support (royalties, patents, etc.); Replicel Life Sciences Inc. Stock/Shareholder (self-managed); Replicel Life Sciences.

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Session Co-Director, "Clinical Trials"

Valerie D. Callender, MD.
Howard University College of Medicine, Washington, DC, USA.

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Treating Alopecia and Beyond: How the hair follicle may be an ideal resource for cell-based therapeutics

Rolf Hoffmann, MD.
Professor, Replicel Life Sciences Inc., Vancouver, BC, Canada.

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Alopecia Areata: Clinicotherapeutic Trials and Updates

Won-Soo Lee, MD, PhD.
Yonsei Wonju University, Wonju, Korea, Republic of.

Won-Soo Lee is a Professor and Chairman of Dermatology at the Yonsei Wonju University in Wonju, Korea. He has received 16 national and international academic awards and honors. He has published more than 200 scientific articles in peer-reviewed journals. He, a well known national and international lecturer, has presented more than 230 invited lectures. He was a congress president of the 8th World Congress for Hair Research on Jeju Island, Korea. He is a past secretary general of the Korean Hair Research Society and the Korean Society of Cosmetic Dermatology.

W. Lee: None.

LEARNING OBJECTIVES:
To summarize the recent updates of evidence-based treatments and various therapeutic trials for alopecia areata

ABSTRACT:
Alopecia areata (AA) may cause serious psycho-emotional stress but there is no universally proven therapy that induces and sustains remission although many therapies are available. This presentation will review classification systems of AA for better strategic approach on this disease in clinical practice. In this presentation, the recent

updates of main evidence-based treatments for AA such as contact immunotherapy and corticosteroids will be reviewed. Other more
recent and controversial treatments and various therapeutic trials including the use of pulsed corticosteroids, immunosuppressive agents and JAK inhibitors will be also discussed.

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Safety and Efficacy of a Topical Treatment (SM04554) for Androgenetic Alopecia (AGA): Results from a Phase 1 Trial

Yusuf Yazici, MD[1], Stacy R. Smith, MD[2], Christopher J. Swearingen, PhD[1], Ismail Simsek, MD[1], Anita DiFrancesco[1], John D. Hood, PhD[1].
[1]Samumed LLC, San Diego, CA, USA, [2]California Dermatology & Clinical Research Institute, Encinitas, CA, USA.

Dr. Yazici is the Chief Medical Officer of Samumed, LLC. Additionally, Dr. Yazici is an Assistant Professor at New York University School of Medicine Department of Rheumatology, where he serves as Director of the Seligman Center for Advanced Therapeutics and Director of the Behcet's Syndrome Center, the largest US center for Behcet's Disease. Recognized nationally and internationally, Dr. Yazici has more than 250 publications. After receiving his medical degree from Istanbul University, his Rheumatology Fellowship was completed at the Weill Medical College Hospital for Special Surgery of Cornell University and his Internal Medicine Residency at Creighton University in Nebraska.

Y. Yazici: Salary, Contractual Services; Samumed, LLC. **S.R. Smith:** Consultant; Samumed, LLC. **C.J. Swearingen:** Salary, Contractual Services; Samumed, LLC. **I. Simsek:** Salary, Contractual Services; Samumed, LLC. **A. DiFrancesco:** Salary, Contractual Services; Samumed, LLC. **J.D. Hood:** Salary, Contractual Services; Samumed, LLC.

LEARNING OBJECTIVES:
To evaulate the safety and efficacy of a topical treatment for androgenetic alopecia (AGA) in a phase 1 clinical trial

ABSTRACT:
AGA is a common form of hair loss with only two approved drugs in the US. A randomized, double-blind, placebo-controlled, single-center trial for AGA assessing safety and efficacy of SM04554, a novel small molecule modulating the Wnt pathway, was conducted. The trial treated male subjects topically once daily for 14 days with either 0.05%, 0.15% or 0.45% SM04554 or vehicle; subjects returned 14 days post-treatment for final evaluation. Safety data, including pharmacokinetics (PK), electrocardiogram (ECG), laboratory parameters, application site assessments and vital signs, were collected throughout treatment, with subject-reported efficacy outcomes collected at end of study. 29 subjects (7-0.05%, 8-0.15%, 8-0.25%, 6-vehicle, average age 44.6) were enrolled; 13 (45%) were Norwood-Hamilton score 5 (range 4-7). 15 treatment-emergent adverse events (TEAEs) were reported by 11 (38%) subjects. The most frequently reported TEAE was eye irritation / hyperaemia (N=2 [7%]). ECGs, labs and vital signs were unremarkable. One vehicle subject presented with minimal scalp erythema; no other subject reported application site irritation. Systemic exposure was dose-dependent. In the 0.15% group, 6 (75%) subjects reported slowing of hair loss and 3 (37%) reported increased hair growth compared to zero (P=0.01) and 1 (17%, P=0.58) of vehicle subjects, respectively, at end of study. SM04554 appears to be safe, well-tolerated, and potentially efficacious. These results will help guide future AGA trials using this treatment.

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Induction of Hair Growth in Subjects with Male Pattern Baldness by Hypoxia Induced Multipotent Stem Cell-Secreted Proteins

Gail Naughton, PhD, Mark Hubka, Christina Ring, Michael Zimber, Ph.D..
Histogen, Inc., San Diego, CA, USA.

Dr. Gail Naughton founded Histogen, Inc, a regenerative medicine company, in 2007, and serves as its CEO and Chairman of the Board. She was the founder of Advanced Tissue Sciences and has spent more than 30 years

extensively researching the tissue engineering process, holds more than 100 U.S. and foreign patents, and has been extensively published in the field. In 2000, Dr. Naughton received the National Inventor of the Year award by the Intellectual Property Owners Association in honor of her pioneering work in tissue engineering.

G. Naughton: Salary, Contractual Services; Employee, Histogen, Inc. **M. Hubka:** Consultant; Histogen, Inc.. **C. Ring:** None. **M. Zimber:** Salary, Contractual Services; Employee, Histogen, Inc..

LEARNING OBJECTIVES:
Show the role of growth factors on the stimulation of bulge cells and interfollicular stem cells to induce hair growth.

ABSTRACT:
Stimulation of telogen to anagen and subsequent hair growth involves Follistatin, FGF-7, VEGF, and other growth factors. We studied the effects of a human cell-derived formulation, termed Hair Stimulating Complex (HSC), in two double-blind, placebo-controlled trials in male pattern baldness. 26 subjects received four 0.1cc intradermal injections at baseline in our proof-of concept (POC) study. Trichoscan analysis of HSC-treated sites at 12 and 52 weeks showed improvements in hair growth over the placebo. At the 12-week evaluation period, HSC-treated sites demonstrated an increase in hair shaft thickness (6.3%±2.5% vs. -0.63%±2.1%; p=0.046), thickness density (12.8%±4.5% vs. -0.2%±2.9%; p=0.028), and terminal hair density (20.6±4.9% vs. 4.4±4.9%; p=0.029). At one year, an increase in total hair count (p=0.032) continued to be seen. Doubling the number and frequency of injections in a Phase I/II 56 subject study resulted in a 46.5% increase in total hair at week 12 as compared to the POC trial (p=0.0013). The primary efficacy endpoint of increased terminal hair at 12 weeks was met, with a 49.5% increase over the same endpoint in our proof-of-concept trial. At the 48 week time point there continued to be an increase in total hairs over baseline (p=0.028). Additional dose ranging clinicals utilizing the isolated growth factors are being conducted to evaluate the safety and efficacy of this formulation in subjects with androgenetic alopecia.

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Female Pattern Hair Loss: Combination Therapy With Low Dose Oral Minoxidil and Spironolactone

Rodney D. Sinclair, MBBS, MD, FACD.
University of Melbourne, Melbourne, Australia.

Rodney Sinclair is Professor of Dermatology at the University of Melbourne and Director of Epworth Dermatology. He is Past-President of the Australasian Society for Dermatology Research and the Australasian Hair and Wool Research Society. He is the co-author of the section on Dermatology in the Oxford Textbook of Medicine, the Hair Chapters in Rook and Bologna, 13 textbooks of dermatology and 400 research publications. Prof Sinclair convened the World Congress of Cosmetic Dermatology in 2006 and the World Congress of Hair Research in Cairns in 2010 and the Annual Meeting of the Australasian Society for Dermatology Research from 1999-2012.

R.D. Sinclair: Other Financial or Material Support (royalties, patents, etc.); patent.

LEARNING OBJECTIVES:
Oral minoxidil is an anti-hypertensive that causes hypertrichosis and may have a role in the treatment of Female Pattern Hairloss.

ABSTRACT:
Oral minoxidil stimulates hair growth, but its use in female pattern hair loss (FPHL) is limited by potential adverse events including postural hypotension, fluid retention and hypertrichosis. Spironolactone, another oral antihypertensive with antiandrogen activity, may arrest hair loss in FPHL.
To investigate the use oral minoxidil and spironolactone in FPHL, 100 women with a Sinclair stage 2-5 FPHL were enrolled in a pilot study and followed for 12 months. Hair shedding was scored using a 6 point visual analogue scale.
Mean age was 48.44 years (range 18-80). Mean hair loss severity at baseline was Sinclair 2.79 (range 1-5). Mean hair shedding score at baseline was 4.82. Mean duration of diagnosis was 6.5 years (range 0.5 -30). Mean reduction

in hair loss severity score was 0.85 at 6 months and 1.3 at 12 months. Mean reduction in hair shedding score was 2.3 at 6 months and 2.6 at 12 months. Mean change in blood pressure was -4.52mmHg systolic and -6.48mmHg diastolic.
Side effects were seen in 8 of women but were generally mild. Six continued treatment while 2 women who developed urticarial discontinued treatment.
In this prospective uncontrolled open label observational pilot study, once daily minoxidil 0.25mg and spironolactone 25 mg appears to be safe and effective in the treatment of FPHL. Placebo controlled studies to investigate this further are warranted.

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Session Director, "New Topics Selected from Abstracts: Part II"

Lloyd E. King, MD, PhD.
Vanderbilt University Medical Center, Nashville, TN, USA.

Brief Biosketchlek101315
Lloyd E. King, Jr., M.D., Ph.D. is a board certified Dermatologist and Dermatopathologist at Vanderbilt University Medical Center. His primary interest is in using mouse models of human skin and hair diseases to study their pathogenesis to develop new safe and effective therapies for alopecia areata and scarring alopecias.

L.E. King: Advisory Board or Panel; National Alopecia Areata Foundation, Cicatricial Alopecia Research Foundation.

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Session Co-Director, "New Topics Selected from Abstracts: Part"

Sundaram Murugusundram, MD.
Founder & Medical Director, Chennai Skin Foundation & Yesudian Research Institute, Chennai, India

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Session Co-Director, "New Topics Selected from Abstracts: Part II"

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2002-present Professor
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R. Tsuboi: None.

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A Stable Polyamine Analogue, N1-methylspermidine, Prolongs Anagen and Regulates Human Hair Follicle Stem Cells via Anti-oxidative, Anti-inflammatory and Peripheral Clock-related Mechanisms

Yuval Ramot, MD, MSc[1], Barbara Marzani[2], Daniela Pinto[2], Jennifer E. Kloepper[3], Ralf Paus[4].
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Dr. Yuval Ramot holds an MD and an MSc degree in Biochemistry from the Hebrew University of Jerusalem, and is currently a senior dermatologist in the Department of Dermatology and a researcher in the Center for Genetic Diseases of the Skin and Hair in Hadassah Medical Center. He is the recipient of the Minerva Post-doctoral Fellowship and the Young Dermatologist International Achievement Award. He has co-authored 4 chapters in books and more tha 90 articles in peer-reviewed journals. His main fields of interest are genodermatoses and genotrichoses, and endocrine regulation of keratin expression in the hair and skin.

Y. Ramot: Grants/Research Support; Travel support from Giuliani S.p.A. **B. Marzani:** Salary, Contractual Services; Employed by Giuliani S.p.A. **D. Pinto:** Salary, Contractual Services; Employed by Giuliani S.p.A.. **J.E. Kloepper:** None. **R. Paus:** Consultant; Served in a consultancy function for Giuliani S.p.A., Milan. Grants/Research Support; received basic research grants from Giuliani S.p.A., Milan.

LEARNING OBJECTIVES:
Demonstrate the benefits of polyamines to hair growth and stem cells, and the potential underlying mechanisms

ABSTRACT:
Polyamines are instrumental for hair follicle (HF) growth and function. However, they are readily interconvertible and physiologically unstable because they can be quickly metabolized. Therefore, we used a metabolically-stable polyamine, the spermidine analogue N1-methylspermidine (N1-MeSpd), to assess its functional effects on HFs, using microdissected, organ-cultured human scalp HFs as a clinically relevant assay system. Potential effects were further dissected in a human keratinocyte cell line (NCTC-2544). First, we confirmed that N1-MeSpd is a stable compound, with a half-life of 90 hours. 0.5µM N1-MeSpd had a strong anagen-prolonging effect on HFs after 6 days in culture, accompanied with increased expression of the epithelial stem cell-associated keratin, K15. Furthermore, N1-MeSpd decreased lactate dehydrogenase activity in the culture supernatant, a parameter of cell death and cell lysis. We showed that N1-MeSpd decreased the mRNA and protein expression of PER1 and mRNA expression of CLOCK, two peripheral clock core genes that are associated with catagen induction. Gene and protein expression of MTCO1, a subunit of respiratory chain complex IV, were decreased after N1-MeSpd application, in addition to reduced intracellular reactive oxygen species production in cultured keratinocytes. N1-MeSpd also reduced TNF-α gene and protein expression after lipopolysaccharide stimulation. Taken together, these results suggest that the anagen-promoting effects of N1-MeSpd on HFs are mediated by a combined effect of anti-oxidative, anti-inflammatory and peripheral clock-related mechanisms.

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A Multi-scale Model for Hair Follicle Reveals Phase Separation Mechanism Drives Rapid Hair Growth Patterning

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University of California Irvine, Irvine, CA, USA.

JI WON OH had his MD from Kyungpook National University School of Medicine. And he got his PhD at the same University. He is currently working as postdoctorate researcher at Maksim Plikus' lab investigating the regenerative potential of skin and the role of adult stem cells under physiological and pathological environment. He is working to learn how activities of adult stem cells are regulated and how they can be directed to undergo embryonic-like regeneration events as hair biologist and physician.

J. Oh: None. **Q. Wang:** None. **Q. Nie:** None. **M. Plikus:** None.

LEARNING OBJECTIVES:
Demonstrate a systems biological approach to reveal previously unrecognized hair cycle dynamics contributing to rapid evolution of mouse skin pattern.

ABSTRACT:
Biological dynamics can refer to the behavior of a group that results from the interactions of its individual components. Recognized for its dynamics including periodicity and patterning, the hair follicle (HF) is becoming a preferred biological system for the mathematical modeling of biological dynamics. Cyclic growth of each individual HF is regulated both by signaling interactions of different cells within the HF (micro-environmental networking) and by long-range signals between neighboring HFs and other skin cells (macro-environmental networking), leading to biological complexity. We performed a detailed hair growth pattern analysis during the first two hair cycles. Indeed, we found a previously unrecognized spatio-temporal complexity of hair morphogenesis. Furthermore, we identified previously unknown interactions between anatomically distinct HF populations at the onset of the second anagen biologically. A 3D mathematical model based on the coupling of activator and inhibitor signals and captures critical features of HF growth including cyclic HF growth and communication among a population of HFs was used to analyze the dynamical properties of each HF domain, and more importantly, the interactions among different HF domains based on their geometric vicinity. We try to apply a systems biological approach to reveal previously unrecognized hair cycle dynamics that contribute to rapid evolution of the hair growth pattern complexity in mouse skin.

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Hair Follicle Mesenchyme Cells Exhibit Immune Privilege and Can Improve Islet Allograft Survival

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University of British Columbia, Vancouver, BC, Canada.

Dr. McElwee is an Associate Professor in the Department of Dermatology and Skin Health at the University of British Columbia, Canada, and Director of the Hair Research Laboratory in the Vancouver Coastal Health Research Institute at Vancouver General Hospital. He is Chief Scientific Officer for Replicel Life Sciences Inc.

K. McElwee: Consultant; Replicel Life Sciences Inc.. Grants/Research Support; Replicel Life Sciences Inc.. Stock/Shareholder (self managed); Replicel Life Sciences Inc.. **X. Wang:** None. **J. Hao:** None. **G. Leung:** None. **E. Wang:** None. **N. Akhoundsadegh:** None. **G. Warnock:** None. **J. Shapiro:** Stock/Shareholder (self - managed); Replicel Life Sciences Inc..

LEARNING OBJECTIVES:
Understand hair follicle mesenchyme immune privilege and its potential exploitation in inflammation modulation.

ABSTRACT:
We investigated the immune privilege (IP) of hair follicle mesenchymal cells. Cultured dermal papilla (DP), dermal sheath cup cells (DSCC), and non-bulbar dermal sheath (DS) cells were evaluated for IP related gene and protein expression against non-follicular fibroblasts (FB). DP and DSCC exhibited significantly reduced H2d (MHC II) expression by mRNA, and DP, DSCC, and DS expressed Inhibin A (Inhba) mRNA and protein. DSCC also expressed higher Fgf2. DP, DSCC, and DS expressed BMP6 notionally supportive of islet survival. In vitro assays using allogeneic C57BL/6J derived spleen cells mixed with cultured BALB/cJ DSCC or FB cells demonstrated a significantly reduced activation response, as measured by IFN gamma, to DSCC from both CD4+ and CD8+ cells. BALB/cJ mouse islets were co-transplanted with syngeneic hair follicle DSCC (group 1) or FB (group 2) under the kidney capsule of immune-competent, streptozotocin induced, diabetic C57BL/6J recipients. Group 1 allografts survived significantly longer than group 2 (32.2 +/- 12.2 vs. 14.1 +/- 3.3 days, $p<0.001$). Analysis of transplants revealed increased blood vessel formation and lower inflammatory cell infiltration in group 1 post-transplantation.

Analysis of cells from the renal lymph nodes of transplanted mice revealed higher frequencies of CD4+Foxp3+, and CD25+Foxp3+ cells, and lower CD8+CD69+ effector cell percentages in Group 1. This novel finding demonstrates the functional IP of cultured hair follicle derived mesenchymal cells.

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DNA Methylation Profile of Monozygotic and Dizygotic Twins Discordant for Alopecia Areata

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Columbia University, New York, NY, USA.

Dr.Eddy Wang obtained his PhD in 2014 under the supervision of Dr.Kevin McElwee and Dr.Jerry Shapiro at the University of British Columbia. He studied the autoantigen epitopes that could trigger T-cell activation in alopecia areata (AA) patients and linked the disease with heart tissue damage. He also developed a simplified method to generate AA mice via injection of cultured cells instead of performing skin graft. Right now, he is working as a post-doctoral research scientist under the mentorship of Dr.Angela Christiano at Columbia University where he continues his research on AA and explores the roles of epigenetics on disease progression.

E. Wang: None. **L.M. Petukhova:** None. **J. Cerise:** None. **A.M. Christiano:** None.

LEARNING OBJECTIVES:
Demonstrate the differences in the DNA methylation profile of twins discordant for AA and how it may affect gene expression.

ABSTRACT:
Alopecia areata (AA) is a disfiguring autoimmune hair-loss disease with strong genetic predisposition. However, previous epidemiological and genetic studies revealed only a 55% concordance rate among monozygotic twins, suggesting that epigenetic factors may contribute to the manifestation of AA. We performed an Illumina Infinium 450k methylation assay on 6 pairs of monozygotic (MZ) and 4 pairs of dizygotic (DZ) twins that were discordant for AA. We have found a scarcity of overlap between the sites that were differentially methylated in MZ compared to DZ. Also, the DNA of AA siblings was mostly hyper-methylated in MZ, but instead was hypo-methylated in DZ. The distributions of hyper-methylated sites in MZ AA were also over-represented in the promoter regions of nearest genes, consistent with a transcriptionally repressive state. Gene ontology analysis revealed dysregulation of biological processes such as limb morphogenesis and antigen presentation in MZ (neural/sensory process in DZ). Interrogation of gene expression profiles of an independent AA cohort with the genes we found to be differentially methylated in MZ twins revealed an increase of HLA-DRB1 expression consistent with decrease of methylation. HLA-DRB1 dysregulation is associated with autoimmune diseases like rheumatoid arthritis and multiple sclerosis affecting antigen presentation. Our results indicate that differential DNA methylation status and epigenetic factors may influence the expression of susceptibility genes in AA and contribute to disease pathogenesis.

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Shh Signaling Regulates the Damage Response of Murine and Human Hair Follicles in Chemotherapy-induced Alopecia

Iain Haslam, PhD[1], Guojiang Xie[2], Zhigang Xue[3], Hao Han[4], Yongjian Zhou[5], Yi Eve Sun[3], Ralf Paus[1], Zhicao Yue[2].
[1]University of Manchester, Manchester, United Kingdom, [2]Fuzhou University, Fuzhou, China, [3]Tongji University, Shanghai, China, [4]Agency for Science, Technology and Research, Singapore, Singapore, [5]Union Hospital of Fujian Medical University, Fuzhou, China.

Dr Iain Haslam has worked with Professor Ralf Paus in the Centre for Dermatology Research at the University of Manchester since 2011. Since joining the Paus lab, he has worked on defining the role of Nrf2 in the hair follicle, investigating how this transcription factor can modulate inflammatory and oxidative stress. He has also introduced a new field of research into the lab, specifically the role of ABC transporter proteins in hair follicle biology. The focus

of this research is centred around protection against chemotherapy-induced alopecia, a psychologically traumatic side-effect of cancer therapy.

I. Haslam: None. **G. Xie:** None. **Z. Xue:** None. **H. Han:** None. **Y. Zhou:** None. **Y. Sun:** None. **R. Paus:** None. **Z. Yue:** None.

LEARNING OBJECTIVES:
Demonstrate the impact of chemotherapy on Shh signaling in the hair follicle.

ABSTRACT:
Traditionally, chemotherapy-induced alopecia (CIA) is considered to be a consequence of the pan-antimitotic toxicity of chemotherapeutic agents. Previous work emphasized the critical role of p53-mediated apoptosis in the pathogenesis of CIA. Recent work shows that, in the feather follicle, a sonic hedgehog (Shh)-dependent mechanism also contributes to chemotherapy-induced tissue damage. Therefore, we have investigated the role of the Shh pathway in CIA in mice and humans. Through whole genome expression profiling analysis, we show that, in the best-studied murine CIA model (C57BL/6 mice), Shh signaling is significantly down-regulated during the early response, within 24 hours of treatment. Disruption of Shh signaling by cyclopamine recapitulated key features of CIA, while supplementation with exogenous Shh protein partially prevented chemotherapy-induced hair loss. Using organ cultured human hair follicles, we show that chemotherapeutic agents (4-hydroxycyclophosphamide and doxorubicin) also down-regulated genes in the Shh pathway. In addition, qRT-PCR analysis of plucked hair follicles from patients under demonstrated consistent downregulation of SHH gene expression in response to several chemotherapy regimens. We propose that down-regulation of Shh signaling plays a significant role in the pathogenesis of CIA, and provides an important novel target for future management of the disease. This raises the question of whether downregulation of Shh signaling is a common pathomechanism of chemotherapy-induced adverse effects such as hemocystitis, infertility, memory loss and GI syndromes.

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Evidence for Alopecia Areata and Celiac Disease Cross-reactive Epitopes Expressed by Anagen Hair Follicle Inner Root Sheath - Implications for Alopecia Areata Autoantigen(s) Discovery

Desmond J. Tobin, PhD[1], Sonia Manaf[1], Haleema Sajid[1], Asram Munir[1], Stephen K. Sikkink[1], Rachael Sedman-Sutherland[1], Reem Hashem Ahmed[1], David A. Fenton[2].
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Dr Desmond J. Tobin is Professor of Cell Biology and Director of the Centre for Skin Sciences at University of Bradford. He holds a BSc from NUIM, Ireland, a PhD from University of London and post-doctoral training from NYU Medical School. He has researched in basic and applied skin/hair sciences, with focus on biology of human melanocytes/ pigmentation and immune-mediated hair growth disorders (esp. alopecia areata). He was first to identify specific immune response to hair follicle-specific antigens in AA, and first to establish human hair follicle melanocytes in long-term culture. He has published over 140 publications, incl. 3 books.

D.J. Tobin: None. **S. Manaf:** None. **H. Sajid:** None. **A. Munir:** None. **S.K. Sikkink:** None. **R. Sedman-Sutherland:** None. **R. Hashem Ahmed:** None. **D.A. Fenton:** None.

LEARNING OBJECTIVES:
Appreciate how different immune-mediated disorders can affect the skin and other organs via their sharing of cross-reactive antigenic epitopes.

ABSTRACT:
Alopecia areata (AA) and celiac disease (CD) are disorders of the immune system with skin-associated impact (e.g., hair loss in AA and dermatitis herpetiformis in CD). Evidence from the literature suggests that some AA patients with CD have poorer outcomes, but benefit from treatment for their CD. A recent GWAS also identified AA-

associated risk loci in common with CD and the striking epithelial relatedness between skin and gut prompted us to explore whether AA and CD may target similar epitopes on hair follicle (HF) and gut epithelium (GE) respectively. Using a combined immunohistochemistry and immuno-blotting approach, we observed that antibody to an immunogenic target epitope in CD reacted specifically with the inner root sheath (IRS) in human scalp anagen HF, and in a pattern that co-localized with the IRS-associated structural protein trichohyalin (THH). Moreover, anti-gliadin antibody raised to the deamidated gliadin peptide reacted with urea-extracted human anagen HF protein by immuno-blotting. Finally, the majority of AA sera tested reacted to an α-gliadin peptide by western blotting. Together with our previous identification of THH (or a component cross-reacting epitope) as a potential immuno-dominant antigen in AA using a proteomics approach, the current findings further support the view that the anagen-specific formation of the IRS may indeed be both a target-site and target-time for the immune response to hair follicles in AA.

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Variations and Similarities of Hair Follicles and Papillae from Vertex and Occipital Regions in Subjects with Androgenetic Alopecia and Healthy Controls

PAUL L. BIGLIARDI, A/Prof[1], Siu-Yin Bryan Ho[2], Srinivas Ramasami[1], Candida Vaz[3], Guo Yan Elaine Chew[4], Huma Jaffar, MD[5], Vivek Tanavde[3], Mei Bigliardi-Qi[1].
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Position
Senior Consultant adult Allergology clinic / Director of Academic Dermatology/Allergology, NUH, Singapore
A/Professor YLL School of Medicine, NUS
Director of Clinical Research Unit for Skin, Allergy and Regeneration / Senior PI Experimental Dermatology group, IMB/A*STAR
Grants (last 3 years)
2013Co-PI: Skin-on-a-chip for High-throughput Skin Absorption and Irritation Evaluation
2012Lead PI for “Clinical Research Unit for Skin, Allergy and Regeneration“
2012PI: Effects of different light qualities on skin and their use in photodynamic therapy”
Research interests
Neurodermatology (opioid receptors, interactions nerves-keratinocytes; peripheral pain/itch); clinical trials in Dermatology and hair research, Allergology and wound healing

P.L. Bigliardi: None. **S.B. Ho:** None. **S. Ramasami:** None. **C. Vaz:** None. **G.E. Chew:** None. **H. Jaffar:** None. **V. Tanavde:** None. **M. Bigliardi-Qi:** None.

LEARNING OBJECTIVES:
Explain the close collaboration between scientists and clinicians in this study and the importance for statistical analysis of RNAseq data.

ABSTRACT:
Androgenetic alopecia (AGA) is common in Singapore and better understanding of the pathophysiology behind is necessary. Therefore, we designed a study with 20 male subjects with AGA and 10 controls without AGA. The vertex and occipital region of each subject was precisely photodocumented, then follicular unit extractions (FUEs) were taken and the extracted FUEs were photodocumented and dissected into papillar region, intermediate region with sebaceous glands and infundibulum/ostium area.
The main objectives of the study are following:
1)compare the morphological differences of follicular units in AGA and normal controls in macro- and microphotographs taken from the vertex and occipital regions.
2)perform full RNA sequencing of the papillae of FUEs
3)carry out extensive bioinformatics analysis by Cuffdiff of RNAseq results and correlate them to clinical and

morphological parameters
The RNAseqr results revealed very interesting and statistically significant differences and also similarities with clustering of genes in the miniaturized hair from vertex regions from patients and normal hair follicles from the vertex region from healthy volunteers. The genes expression from hair papilla from the occipital region from healthy volunteers and AGA patients was not significant different.
The results obtained by this close collaboration between scientists and clinicians will be presented and prove how such a translational approach with integration of clinico-morphological informations will revealed new, interesting pathophysiological pathways.

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BMP Signalling and Sox2 in the Dermal Papilla Regulates the Hair Follicle Stem Cell Niche

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A*Star Institute of Medical Biology, Singapore, Singapore.

Carlos Clavel received his BS and MS in Biological Sciences from Saint Louis University in the US. He finished his PhD training in a Cell Therapy lab at the University of Navarra, Spain. He did his postdoctoral work in the lab of Dr. Catherine Verfaillie, Belgium. He subsequently joined Dr. Michael Rendl's laboratory at Mount Sinai School of Medicine in New York. Carlos has recently joined A*Star IMB in Singapore where he is starting up his own research group focusing on the regulation of the hair follicle stem cell niche and novel therapies for skin pigmentation disorders.

D. Quek: None. **J. Lim:** None. **C. Clavel:** None.

LEARNING OBJECTIVES:
To show how the dermal papilla regulates not only hair growth but also pigmentation. To show the importance of BMP signalling in the regulation of the melanocyte stem cell niche of the hair follicle.

ABSTRACT:
The Hair follicle melanocyte stem cell (SC) niche is the main melanocyte reservoir in the skin and a better understanding of the mechanisms regulating pigmentation is critical for designing novel therapy strategies for pigmentation disorders, which affect 1 in 3 people worldwide. How dermal papilla (DP) regulates the hair follicle (HF) stem cell niches remains unclear. Using novel genetic tools to study DP cells in the HF SC niche, we have recently shown how in the DP compartment the gene Sox2 is a key regulator of hair growth by controlling the BMP-mediated mesenchymal-epithelial crosstalk between the DP niche cells and the SC progeny. Now, we have identified a pigment switch in the pelage of DP-specific Sox2 knock down mice and observed abnormal BMP cell signaling within the melanocyte compartment of the HF. This phenotype, suggests that Sox2 is also a master regulator of the melanocyte SC niche. In addition, new preliminary data in human skin biopsies indicates the presence of active BMP signaling at the Melanocyte SC compartment within the hair follicle. Finally, our novel in vitro data shows BMP regulation of melanogenesis, melanin transfer and migration in human melanocytes and keratinocyte co-cultures.

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Using Signaling Pathway Activation Analysis to Identify Prospective Drugs that May Be Used for Treatment of Androgenetic Alopecia

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Evgeniya is a scientist working for Insilico Medicine, Inc - a bioinformatics company focused on drug discovery for aging and age-related diseases located at the Johns Hopkins Eastern Campus.

E. Schastnaya: None. **P. Mamoshina:** None. **A. Aliper:** None. **A. Artemov:** None. **A. Buzdin:** None. **A. Moskalev:** None. **A. Zhavoronkov:** None.

LEARNING OBJECTIVES:
Present new candidate drugs for treatment of androgenetic alopecia, that were identified by analysing activation of signaling pathways.

ABSTRACT:
Androgenetic alopecia or male pattern baldness is the most common form of hair loss in men. It is suspected that to some extent, this type of baldness is mediated by both androgen and non-androgen signals, however the underlying mechanisms remain largely unexplored.
To explore signaling and metabolic pathway regulation during balding we used the GeroScope platform, based on the OncoFinder algorithm used in personalized medicine in oncology. We used samples of dermal papilla cells from balding and non-balding regions of the scalp of men to analyze pathway dysregulation during the development of androgenetic alopecia. We evaluated the activity of over 40,000 compounds for their ability to mimic signaling pathway activation profiles characteristics of non-baling regions of the scalp to shortlist potential candidates. We cross-reference the candidate molecules with the recently launched Geroprotectors.org database. We applied the PharmAtlas tools to estimate the possible adverse effects of compounds with reports odds ratio (ROR) and predicted adverse effects for compounds that did not have reports of adverse effects using signaling pathway activation similarity.

P001 – TBA

P002

Child Ludwig Pattern Hair Loss

Ornella Accaputo, **Jean-Jacques Stene**.
Dermatology department, Unité George Achten, CHU Saint-Pierre, ULB, Bruxelles, Belgium.

Jean-Jacques Stene, MD, Dermatologist, CHU St-Pierre, Université Libre de Bruxelles; Chief of the Georges Achten Unity : Hair diseases, endocrinology, hair surgery and cosmetology. Lecturer in Biomedical Sciences (dermopharmacy and cosmetology).

O. Accaputo: None. **J. Stene:** None.

LEARNING OBJECTIVES:
To approach the androgenetic alopecia differently knowning that different physiopathogenic mechanisms probably exist.

ABSTRACT:
We report 6 cases of mid and frontal area alopecia in children with preservation of the frontal hairline. This topography characterizes the Ludwig pattern which is usually observed in androgenetic alopecia in women. The average age of these children is 8 years old. They show no clinical signs of early puberty and normal hormonal status. There was a strong family history of androgenetic alopecia in all cases. Trichoscopy, pull test and trichogram allow us to rule out other causes of alopecia in children which can sometimes present the same pattern (trichotillomania, loose anagen syndrome, short anagen syndrome etc.). We propose to call this alopecia « Child Ludwig pattern hair loss » because of the pattern and the age of onset. Pathogenesis of androgenetic alopecia in men is well known to follow the classic androgenic pathway. However, mechanisms in female androgenetic alopecia are still not completely defined. Antiandrogen therapy does not indeed control female androgenic alopecia in all cases. The "Child Ludwig pattern hair loss" could be an additional argument to consider other pathways than the DHT driven mechanism in the pathogenesis of androgenetic alopecia.

P003

Hair Follicle Neogenesis and Regenerative Cutaneous Wound Healing with Tocotrienol

Noha S. Ahmed, MD[1], Savita Khanna[1], Sashwati Roy[1], Mohamed Amer, MD[2], Chandan K. Sen[1].
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Noha Ahmed, MD is a staff member in Dermatology Department, Faculty of medicine, Zagazig University, Egypt. She graduated 2005 and ranked in the top three of her class. She completed masters of dermatology with honors (A+). She has 6 years of clinical dermatology experience. She was chosen by her country to receive a competitive international Scholarship to perform research in the USA in her field. She is interested in the hair follicle regeneration & wound healing field and she is currently doing research in that field since 2014 in Dr.Chandan Sen's lab at Wexner Medical Center,The Ohio State University.

N.S. Ahmed: None. **S. Khanna:** None. **S. Roy:** None. **M. Amer:** None. **C.K. Sen:** None.

LEARNING OBJECTIVES:
Demonstrate the ability of tocotrienol to induce hair follicle neogenesis and its effect on regenerative cutaneous wound healing.

ABSTRACT:
The objective of this work was to develop a strategy to induce hair follicle neogenesis and test its effect on

cutaneous wound healing. Studies screening natural products identified tocotrienol (natural vitamin E form) as a potent inducer of hair follicle neogenesis. Eight week old C57BL/6 mice were subjected to hair depilation followed by topical tocotrienol (TCT; 5mg/cm2 skin) thrice per week. After week 4, two 6mm stented excisional wounds were made on the dorsal skin. H&E staining from the dorsal skin collected at time of wounding revealed significant increase in number of hair follicles in the TCT treated group ($p<0.01$, n=4) compared to a placebo (PBO) group. TCT upregulated β-catenin expression ($p\leq0.05$, n=4). Mice were sacrificed at day 10 and wound tissue was harvested. Adult skin is known to heal without regeneration of hair follicles. However, TCT treatment caused hair follicle neogenesis in the repaired skin ($p<0.01$, n=4). Furthermore, TCT upregulated K15, marker of follicular bulge stem cells ($p<0.05$, n=4). TCT enhanced wound angiogenesis as marked by higher CD31 ($p\leq0.05$, n=4) and laser speckle perfusion data. Finally, TCT upregulated regenerative wound healing markers: collagen III, matrix metalloproteinase 2, hyaluronic acid synthase and chondroitin sulfate. In summary, we present first evidence demonstrating that topical application of tocotrienol-rich natural vitamin E potently induces hair follicle neogenesis and regenerative cutaneous wound healing.

P004

From Hair to Heart: Nestin-Expressing Hair Follicle Associated Pluripotent (HAP) Stem Cells Differentiate to Beating Cardiac Muscle Cells

Yasuyuki Amoh, PhD[1], Masateru Yashiro[1], Sumiyuki Mii[1], Ryoichi Aki[1], Yuko Hamada[1], Nobuko Arakawa[1], Katsumasa Kawahara[2], Robert M. Hoffman[3].
[1]Kitasato University School of Medicine, Department of Dermatology, Sagamihara, Japan, [2]Kitasato University School of Medicine, Department of Physiology, Sagamihara, Japan, [3]AntiCancer, Inc., San Diego, CA, USA.

Yasuyuki Amoh received his MD from Kitasato University School of Medicine, Sagamihara, Japan in 1996. He researched the angiogenesis in cutaneous carcinoma, and received his PhD from the Kitasato University School of Medicine in 2002. He received his post-doc training at the Department of Dermatology, Kitasato University School of Medicine and Department of Surgery, University of California San Diego (Prof. Robert M. Hoffman). Amoh is currently working as a Professor of Dermatology at Kitasato University School of Medicine.

Y. Amoh: None. **M. Yashiro:** None. **S. Mii:** None. **R. Aki:** None. **Y. Hamada:** None. **N. Arakawa:** None. **K. Kawahara:** None. **R.M. Hoffman:** None.

LEARNING OBJECTIVES:
You will be able to understand that hair follicle associated pluripotent (HAP) cells can differentiate to beating cardiac muscle cells.

ABSTRACT:
We have previously demonstrated that nestin-expressing hair follicle associated (HAP) stem cells from the upper part of the hair follicle can differentiate to neurons and other cell types. In the present study, we demonstrate that HAP stem cells differentiate to beating cardiac muscle cells. We separated the mouse vibrissa hair follicle into three parts (upper, middle, and lower), and suspended each part separately in DMEM containing 10% FBS. HAP stem cells from all three separated parts of the hair follicle differentiated to cardiac muscle cells, as well as neurons, glial cells, keratinocytes, and smooth muscle cells. The differentiation potential to cardiac muscle is greatest in the upper part of the follicle. Nestin-expressing hair spheres, formed from HAP stem cells from the upper part of vibrissa hair follicle, also differentiated to beating cardiac muscle cells. Nestin-expressing HAP stem cells have clinical potential for heart regeneration as well as nerve and spinal cord repair and have many advantages over iPS and ES cells.

P005

Lichen Planus Pigmentosus in Frontal Fibrosing Alopecia: Limitations for the Use of Antimalarials?

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Alessandra Anzai, MD, was graduated in medicine from School of Medicine - University of Sao Paulo (FMUSP) in 2010, and completed her residency in Dermatology at the Department of Dermatology-FMUSP in 2014. In 2014 she received the North American Hair Research Society Mentorship Grant and was a mentee of Dr. Antonella Tosti, MD, at Miller School of Medicine - University of Miami. She completed in 2015 a fellowship in stomatology and hair and nails diseases and she is currently a research fellow at the Department of Dermatology, FMUSP.

A. Anzai: None. **A. Donati:** None. **N.Y. Valente:** None. **R. Romiti:** None.

LEARNING OBJECTIVES:
Recognize that use of hydroxychloroquine in patients with FFA and LPPigm can significantly worsen skin hyperpigmention.

ABSTRACT:
The association of lichen planus pigmentosus (LPPigm) with frontal fibrosing alopecia (FFA) has been recently described and shown to be frequent in patients with high skin phototype. LPPigm is an uncommon macular variant of lichen planus, characterized as grey to brownish-black macules on sun-exposed areas, especially the face, and in flexures. Histologically, there is melanin incontinence of a pigmented epidermis with previous or ongoing interface changes.
Nowadays, antimalarials are one of the best treatment options for FFA due to their anti-inflammatory and immune-modulating properties with good long-term safety profile. However, up to 25% of patients receiving antimalarials, especially chloroquine diphosphate may develop cutaneous hyperpigmentation. The pathophysiology is unclear but antimalarials can bind to melanin and there are melanin deposits in dermis. We present four female FFA patients that presented severe darkening of LPPigm after oral hydroxychloroquine 400mg/day within the first 3 months of use. Treatment was kept from 5 to 26 months and, despite hair loss stabilization, all patients discontinued medication due to severe cosmetic impairment.
There are few reports of cutaneous hyperpigmentation due to hydroxychloroquine, but the presence of an epidermal involvement in FFA-LPPigm patients might increase this frequency. We want to remind physicians that use of hydroxychloroquine in these patients can significantly worsen skin hyperpigmention, limiting the therapeutic options for FFA and causing loss of quality of life.

P006

Male Frontal Fibrosing Alopecia with Cutaneous Lichen Planus: A Case Report

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[1]University of São Paulo Medical School, São Paulo, Brazil, [2]private practice, São Paulo, Brazil.

Alessandra Anzai, MD, was graduated in medicine from School of Medicine - University of Sao Paulo (FMUSP) in 2010, and completed her residency in Dermatology at the Department of Dermatology-FMUSP in 2014. In 2014 she received the North American Hair Research Society Mentorship Grant and was a mentee of Dr. Antonella Tosti, MD, at Miller School of Medicine - University of Miami. She completed in 2015 a fellowship in stomatology and hair and nails diseases and she is currently a research fellow at the Department of Dermatology, FMUSP.

A. Anzai: None. **L.D. Bloch:** None.

LEARNING OBJECTIVES:
To recognize frontal fibrosing alopecia in males and the association with other variants of lichen planus.

ABSTRACT:
A 65-year-old Caucasian male reported the onset of an alopecic plaque in the left occipital region about 12 years ago. He had a biopsy with diagnosis of discoid lupus erythematosus (DLE) and was successfully treated with intralesional triamcinolone, remaining with a cicatricial atrophic area. He also was diagnosed with androgenetic alopecia but decided not to treat. Four years later, he developed shiny, reddish purple papules on temporal and retroauricular areas and biopsy was consistent with cutaneous lichen planus (LP). Simultaneously he noticed worsening of hair loss in frontoparietal area. Clinical examination showed frontoparietal recession with loss of

follicular openings, absence of vellus hais and discrete perifollicular erythema and scaling. He also had symmetrical distal loss of the eyebrows but sideburns were unaffected. He denied symptoms. Biopsy of the frontal area confirmed frontal fibrosing alopecia (FFA) and a new biopsy of the cicatricial plaque in occiput was consistent with lichen planopilaris (LPP). FFA is a scarring alopecia, considered a subset variant of LPP. Its occurrence in males is rare and the association with cutaneous LP appears to be less common than with others forms of LP. This case illustrates the coexistence of variants of LP and the misdiagnosis of LPP as DLE.

P007

Regulatory T-cells in the C3H/HeJ Mouse Model of Alopecia Areata

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Annika Åstrand defended her thesis in renal development in 1999 and has since 2000 worked within the pharma industry, studying mainly cardiovascular diseases and safety pharmacology aspects of drug development. Since 2011 she joined the Respiratory, Inflammation and Autoimmunity unit and has worked on COPD, Cystic Fibrosis and more recently Autoimmunity, especially with regards to alopecia areata. Annika has Alopecia universalis since 2013 and believes the disease is a good model system for a dysfunctional immune system leading to autoimmunity as members of her family have Ankylosing spondylitis, Grave's disease, RA, vitiligo, IBS and sarcoidosis.

A.B. Åstrand: None. **K. Björhall:** None. **C. Wingren:** None. **A. Borde:** None. **L. Yrlid:** None. **L. Rousk:** None. **S. Jackson:** None. **N. Krutrök:** None. **N. Krutrök:** None.

LEARNING OBJECTIVES:
Understanding the role of regulatory T-cells locally in the skin and in peripheral tissues in autoimmune alopecia areata

ABSTRACT:
Alopecia areata (AA) is a common autoimmune disease where the pathobiology is not fully understood, and there are no FDA-approved therapies available[1]. Results from genome-wide association studies indicate common-cause hypothesis of autoimmune diseases and certain risk loci that link AA to rheumatoid arthritis, type I diabetes, coeliac disease, systemic lupus erythematosus, multiple sclerosis and psoriasis: especially in genes critical for Treg Maintenance, which may allow cytotoxic cell attack of the anagen hair follicles[2].We have investigated the Treg number, location and function in the C3H/HeJ mouse, both before onset and at different stages of AA. Compared to control mouse strains, healthy C3H/HeJ have lower absolute numbers of immune cells and also fewer Tregs, despite higher frequencies of T helper cells, in peripheral lymphatic tissues. However, in skin, the Treg frequencies and numbers are increased (2-fold), indicating the importance of immune regulation, dysfunctional Tregs, or Tregs not homing into the effector area (hair follicles)[3]. Preliminary data additionally showed a dramatic drop of Treg skin frequencies in early stages of the disease. Moreover, we see elevated suppressive Treg function *in vitro* in C3H/HeJ vs C3H/HeN mice (from draining lymph nodes), which could be due to an already activated state. Whether the Tregs are homing
to the hair follicles or not working properly in the *in vivo* milieu is under investigation.

P008

Trichoscopy in Diferencial Diagnosis of Female Pattern Hair Loss

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Member of ABC Hospital staff, Mexico City

D. Asz-Sigall: None.

LEARNING OBJECTIVES:
To learn how clinical diagnosis sometimes fail and how trichoscopy is a useful method in trichology differential diagnosis

ABSTRACT:
Female pattern hair loss (FPHL) is the most common hair loss disorder in women. Initial signs may develop during teenage years leading to a progressive hair loss with a characteristic pattern distribution over the frontal and vertex regions by miniaturized follicles. This leads progressively to a visible reduction in hair density. Diagnosis is mostly clinical depending on patient history and clinical evaluation. Trichoscopy may be very useful in diferencial diagnosis of FPHL. We present two cases that clincally present as FPHL; but by trichoscopy, diffuse alopecia areata and lichen plano pilaris diagnosis were done respectively; histophatology confirmed the diagnosis. Hair dermoscopy is a not invasive and easy method for diferencial diagnosis in trichology.

P009

The Microfollicle: In Vitro Modelling the Hair Follicle for High-throughput Screening

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Dr. Atac studied in Istanbul Technical University on Molecular Biology and had her Master's degree in the same field. She completed the PhD program of Berlin-Brandenburg School for Regenerative Therapies and graduated from Technical University of Berlin with her thesis on developing in vitro static and dynamic model of human hair follicle in 2014. She is working on advancement of the in vitro hair follicle model and integrating it into skin models since then.

T. Grix: None. **I. Rütschle:** None. **T. DiColandrea:** None. **S. Giselbrecht:** None. **G. Lindner:** None. **R. Lauster:** None. **U. Marx:** None. **B. Atac:** None.

LEARNING OBJECTIVES:
Static and dynamic high-throughput Microfollicle cultures enable tracing the individual organoids during development with acute and chronic substance testing possibility.

ABSTRACT:
The Microfollicle (MF) is a 3D in vitro model system of the human hair follicle. This culture system is based on a spatio-temporal defined co-culture of primary dermal cells, i.e outer root sheath keratinocytes, dermal papilla fibroblasts and melanocytes, in providing a 3D differentiation platform for the cells via epidermal-mesenchymal-neuroectodermal cross-talk.
The Multi-Organ-Chip (MOC) is a micro-bioreactor platform for long term dynamic cultivation and differentiation of ex vivo and in vitro engineered tissues. Polycarbonate micro-cavity system is used to form and culture the MFs in 3D in the MOC.
In this study, we adapted the MF cultures to a high-throughput (HTP) format in static and dynamic conditions up to 21 days and characterized with spatial markers extensively. The MFs start to show hair specific keratin markers in early stages, while differentiation markers of keratins appear/increase in later stages.
The use of HTP-MF cultures enables tracking of such hair organoids during its development and studying hair follicle biology. Moreover, as an in vitro model of the hair follicle, HTP-MF cultures enable studying acute and chronic effects of substances on hair follicles.

P010

Repairing Effect on Damaged Hair of the Shampoo With a High Content of Botanical Oil

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J. Ahn: None. **W. Bae:** None. **B. Kang:** None. **D. Kim:** None. **W. Kim:** None.

LEARNING OBJECTIVES:
Investigate repairing effect on damaged hair of the shampoo with a high content of botanical oil.

ABSTRACT:
Shampoo removes sebum and pollutants on the hair and scalp and makes it easy to arrange hair providing flexibility for it. As the hair damage is intensified due to the frequent chemical treatment such as permanent wave, bleaching and dyeing, the conditioning effect of shampoo is becoming more important. Various cationic polymers and silicones are included in shampoo for conditioning effect to improve wet/dry combability and offer antistatic effect and good manageability after drying hair. However botanical oil originating in nature has been included in shampoo with limited amount because of its instability in shampoo system.
In this study, we stabilized a high content of botanical oil in shampoo system by forming lamellar structure and investigated restoring effect resulted from botanical oil for damaged hair. With a high content of botanical oil, coacervate lays botanical oil down on hair fiber and botanical oil is coated finely on hair surface by hydrophobic interaction during shampooing and washing out. As a result, hydrophobicity of damaged hair treated with oil contained shampoo is almost closed to the level of virgin hair. In addition, shine value and water content ability of hair treated with oil contained shampoo is more increased rather than treated with general shampoo. Surprisingly oil contained shampoo keeps color of dyed hair lasting longer than general shampoo.

P011

A Retrospective Review of Treatment Results for Patients With Central Centrifugal Cicatrical Alopecia

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E.H. Dothard: None. **C.W. Bagayoko:** None. **A.S. Daniel:** None. **A.J. McMichael:** Consultant; Procter and Gamble, Johnson and Johnson, Galderma, Allergan, Up to Date, Gunthy-Renker, Merz, Abbvie. Grants/Research Support; Allergen, Intendis/Bayer, Proctor and Gamble, Galderma, Samumed.

LEARNING OBJECTIVES:
Compare the effectiveness of different treatment regimens for central centrifugal cicatricial alopecia based on results of before and after photos.

ABSTRACT:
Central centrifugal cicatricial alopecia (CCCA) is a form of scarring alopecia primarily affecting women of African descent on the crown of the scalp. Limited data exists regarding evidence-based treatment for CCCA. Our objective was to examine photos of subjects with CCCA before and after treatment in order to evaluate results of treatment

and compare results of different treatment regimens. Photographs of 15 subjects with CCCA before and after treatment were evaluated by two blinded investigators who assigned disease severity scores to photographs based on the published scale: Central Scalp Alopecia Photographic Scale in African American Women. The median change in severity score (post-treatment severity score - pre-treatment severity score) was 0.5 (P = 0.58) for all 15 subjects receiving a series of 7 to 8 intralesional steroid injections along with topical steroids (Class I/II) +/- minoxidil and +/- anti-dandruff shampoo, indicating worsening of disease after treatment. Subjects receiving minoxidil versus those who did not (0.25 vs. 0.5, P = 0.38) and subjects receiving anti-dandruff shampoo versus those who did not (0.0 vs. 0.5, P = 0.42) demonstrated no statistically significant difference in pre- and post-treatment severity scores. Although no statistically significant difference was found in pre- versus post-treatment disease severity, this may indicate intralesional steroid injections and topical steroids +/- minoxidil and +/- anti-dandruff shampoo halt disease progression.

P012

Prostaglandin D2 and Its Metabolite 15-dPGJ2 Promote Catagen Progression in Mice

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I have received my PhD degree from Busan National University, Korea in 2009. During 2010-2013, I was a postdoctoral fellow at Marine Bioprocess Research Center, Pukyong National University, Korea. Since 2014, I have been working as a research fellow of Professor Young Kwan Sung's laboratory at the department of Immunology, Kyungpook National University School of Medicine, Korea. I'm currently studying on the role of prostaglandins in hair cycling.

S. Bak: None. **M. Kim:** None. **J. Kim:** None. **Y. Sung:** None.

LEARNING OBJECTIVES:
Demonstrate PGD2 and its metabolite promote catagen progression.

ABSTRACT:
Recent study showed showed that the levels of prostaglandin D2 synthase (PTGDS) and its catalytic product, prostaglandin D2 (PGD2), were elevated in balding scalp compared with the non-balding scalp of patients with androgenetic alopecia. During hair cycling in mice, PTGDS and PGD2 levels peaked at late anagen and in catagen, suggesting an inhibitory effect on hair growth. In fact, PGD2 and its nonenzymatic metabolite, 15-dPGJ2, inhibited in vitro growth of explanted human hair follicles and inhibited hair growth in mouse through the GPR44 receptor. However, no evidence of changes in hair cycling was reported. In this study, we examined the roles of PGD2 and 15-dPGJ2 on hair cycling. PGD2 or 15-dPGJ2 was applied topically to dorsal back skin of 4-week-old female C57BL/6 mice for 8 days and hair follicle length was measured from the bottom of hair bulbs to the pore in the epidermis. We found that hair length was significantly decreased in PGD2-treated mice compare to vehicle-treated mice. Histological analysis in combination with hair cycle scoring showed that the hair follicles of the PGD2-treated skin entered premature catagen. Similar results were observed in 15-dPGJ2-treated mice. Our data demonstrate PGD2 and its metabolite promote catagen progression.

P013

In Vitro Reconstructed Scalp Model to Study Early Steps of Hair Follicle Neo Morphogenesis

Khalid Bakkar, Theebah Sellathurai, Frederic Amaral, Paulo Marinho Nobrega, Julien Demaude.
L'Oreal, Aulnay Sous Bois, France.

Mr Khalid Bakkar has started his carrier in 1989 within the L'Oreal group in R&D, focused on the biology of hair. He has developed an expertise on hair dissection, tissue reconstruction and deep knowledge on how to manipulate

cells from hair. Using his knowledge and tissue reconstruction, he was able to reconstruct a vitro scalp model and to patent different tissue model with the use of cells isolated from hair (Patent N°20140199721 and Patent N°20080097607). He also published book chapters and is currently involved in trainings for hair and scalp aesthetic surgeons at Pierre & Marie Curie University in Paris

K. Bakkar: None. **T. Sellathurai:** None. **F. Amaral:** None. **P. Marinho Nobrega:** None. **J. Demaude:** None.

LEARNING OBJECTIVES:
Highlight how new technologies allow tissue engineers to customize and structure vitro reconstructed scalp.

ABSTRACT:
The availability of a 3D in vitro reconstructed scalp (RS) model is still a big challenge for cosmetic and dermatological companies. This type of model could indeed open the possibility to address specific scalp disorders such as dandruff and hair follicle morphogenesis. Based upon our long term established in vitro skin reconstruction models and hair follicle cell culture, we set up a reconstructed full-thickness scalp model including isolated human scalp keratinocytes and scalp dermal fibroblasts. Histological assessments reveal a good multilayer tissue organization with a normal stratification. After immunohistological characterization of various epidermal differentiation markers, the overall RS structure looked closer to in vivo scalp compared to reconstructed skin models made from breast/mammary keratinocytes, particularly with respect to the late filaggrin and involucrin expression.
This model was further modified to possibly study hair follicle morphogenesis, since dermal papilla (DP) cell's interaction with epidermis is key for hair follicle development. Microspheres of hair follicle DP fibroblasts were prepared (8 reconstructed microspheres with 3000 DP fibroblasts each) and inserted at the dermal/epidermal junction. As a first step, we observed that DP microspheres remained well organized and in intimate contact with epidermis and retained alkaline phosphatase activity. Further work will be undertake for i) determining the different cell types that could participate in microsphere formation and ii) optimizing the growth medium

P014

Eyelash Transplantation: Sequelae & Complication Management

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Alan J. Bauman, M.D. is a full-time hair transplant surgeon who has performed over 7,000 hair transplant procedures since starting his hair loss practice, Bauman Medical Group, in 1997 located in Boca Raton, FL. He is one of approximately 100 physicians worldwide certified by the American Board of Hair Restoration Surgery. He is a Fellow of International Society of Hair Restoration Surgery and the only North American faculty member at the First ISHRS Live Surgery Workshop on Eyelash Transplantation in 2006. Dr. Bauman is an author of textbook chapters on hair transplantation, including eyelash transplant surgery.

A.J. Bauman: None.

LEARNING OBJECTIVES:
Learn the appropriate methods of preparation, execution and post-op care for the safe and aesthetic outcome of eyelash transplant sugery.

ABSTRACT:
Since eyelash transplantation was first described in the medical literature in 1914 (F. Krusius), there have been many methods used to surgically restore both form and function to the eyelid as well as recent FDA approval of bimatoprost 0.03% solution for eyelash growth. Based on a case-review of over 350 eyelash surgeries, the author will present a brief overview of preferred methods of patient selection, patient education, informed consent, in addition to instrumentation, technique, post-op care, and lash-maintenance; focusing on the critical steps to minimize complications, managing post-op sequelae, and maximizing patient satisfaction in both the cosmetic and reconstructive applications of eyelash transplant procedure. The author will also describe and demonstrate via

animation and video his novel approach to the technique, ‘pairing’ and 'tripling' methods of implantation which allows larger numbers of hair follicles to be implanted into the lid per session, the ‘puppeteering method’ for aesthetic lash curl orientation, as well as several pearls for improved efficiency and a predictable aesthetic outcome.

P015

Effects of Hair Products and Actives on Hair Water Content

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Unilever R&D Port Sunlight, Wirral, United Kingdom.

I am the Product Performance & Appraisal Manager for the Hair Global Design Centre of Unilever Research & Development Port Sunlight. I lead a team responsible for the generation of claims substantiation data to support all market communications for brands including Dove, Sunsilk, Tresemme, Nexxus, Lux, TIGI and Toni & Guy.
I’ve more than 12 years experience in hair care and before working in area of claims my primary focus was on building an in depth knowledge of the chemical and structural characteristics of hair and developing technologies that influence hair's look and feel through their modification.

P.A. Cornwell: None. **L. Henry:** None. **F.I. Bell:** None.

LEARNING OBJECTIVES:
Understand the ability of a number of hair product formats and active ingredients to influence the water content of hair.

ABSTRACT:
Water is a fundamental component of human hair and its moisture content strongly affects its physical and sensory properties. Moisturising hair products are designed to meet the consumer need for softer, smoother hair and to deal with problems associated with consumer perceived dry hair. A wide variety of humectants have been purported to moisturise hair, however, to date, the effects these materials, silicones and other conditioning ingredients have on water content not been widely reported. In the present study hair water content was investigated using Dynamic Vapour Sorption (DVS), Thermogravimetric Analysis (TGA) and Differential Scanning Calorimetry (DSC) exploring the effects of humidity, hair damage and active ingredients on hair moisture content. Each of the methods were able to show that oxidative damage increased the equilibrium water content of the hair over a range of humidities. Furthermore, a good correlation was seen between hair water contents measured by TGA and DSC. The results of this study suggest that the occlusive films produced by lamellar-phase conditioner products are able increase equilibrium hair water content whereas the shampoo formulations tested here do not. The results have also confirmed that a common humectant, glycerine, can significantly impact the water content of hair.

P016

Progressive Modification of Hair Keratin Protein Through Repeated Use of Penetrating Actives Delivered by Shampoo and Conditioner Systems

Jennifer Yates, **Fraser I. Bell, Expert in hair fibre structure and modifications**, Geraldine Griffiths, Toufik Yamane.
Unilever R&D Port Sunlight, Wirral, United Kingdom.

I am the Product Performance & Appraisal Manager for the Hair Global Design Centre of Unilever Research & Development Port Sunlight. I lead a team of measurement technicians responsible for the generation of claims substantiation data to support all market communications for brands including Dove, Sunsilk, Tresemme, Nexxus, Lux, TIGI and Toni & Guy.
I’ve more than 12 year’s experience in hair care and my primary career focus has been building an in depth knowledge of the chemical and structural characteristics of hair and developing technologies that influence hair's look and feel through their modification.

J. Yates: None. **F.I. Bell:** None. **G. Griffiths:** None. **T. Yamane:** None.

LEARNING OBJECTIVES:
Show how novel active materials delivered from hair care products can penetrate fibres & influence properties at several length

ABSTRACT:
Consumers regularly subject their hair to intensive styling routines to achieve their desired look. The actions performed introduce modifications to hair keratin protein chemistry and, in turn, structure and fibre physical properties and are perceived by the consumer as damage.
Here we explore how the thermal and mechanical properties of damaged hair are modified through application of our 'Keratin Repair Active' materials: a unique blend of small molecules, specifically a sugar, salt and organic acid, that penetrate deep into the hair fibre cortex and electrostatic forces and bonds.
The thermal stability of oxidatively damaged hair treated with 'Keratin Repair Actives' has been measured using Differential Scanning Calorimetry (DSC) and compared to undamaged hair. The mechanical properties of treated hair has been evaluated using a micro tensile tester (MTT).
We observe a progressive increase in the α-helical denaturation temperature with increasing product applications to a value greater than that of undamaged hair. This observation is indicative of the 'Keratin Repair Actives' modifying the internal electrostatic forces of the fibre cortex and increasing the strength of interactions between cortical matrix proteins.
The changes in denaturation temperature are reflected as increases in the Young's modulus of up to 4.69% from repeated use of 'Keratin Repair Active' containing formulations, providing support for the reinforcement of the fibre cortical microstructure from the active species.

P017

Clinical Effects of DPCP in Alopecia Areata, Retrospective Review of 50 Patients

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Wilma Fowler Bergfeld, MD, FACP is Co-Director of Dermatopathology, Departments of Dermatology and Pathology and Senior Staff Dermatologist and Past Head of the Section of Dermatological Research in the Department of Dermatology, Cleveland Clinic. She also is the Director of the Cleveland Clinic's Dermatopathology Fellowship and Professor of Dermatology and Pathology.
She is currently President of North American Hair Research Society (2011-2015) and Co Director WCHRS2015 and was the President of the American Society of Dermatopathology,and President of The American Academy of Dermatology.Dr Bergfeld is the author of over 600 publications, 4 books and 80 book chapters. .

W.F. Bergfeld: None.

LEARNING OBJECTIVES:
- demonstrate the effectiveness of DPCP therapy
- outcome review of 50 AA patients
-Demonstrate the prevalance of thyroid disease

ABSTRACT:
Abstract
Diphenylcyclopropenone (DPCP) is widely considered the most effective topical immunotherapy for refractory or extensive alopecia areata (AA), but the question of how long to try DPCP therapy before terminating, and what factors are prognostic of therapeutic success still remains. In this retrospective study of 50 AA patients, we evaluated DPCP efficacy, and identified patient factors predictive of therapeutic success/failure. Median duration of DPCP treatment was 3 years with 47% patients experiencing their first regrowth in the first 6 months of DPCP therapy, 20% between 6 months-1 year, and 8% between 1-2 years. In our study, treatment success, defined as ≥50% terminal hair regrowth, was reached in 71% of alopecia totalis patients and in 56% of alopecia universalis patients. Three factors were statistically significant predictors of poor treatment outcome—extent of hair loss prior to DPCP treatment, history of thyroid disease, and extent of body hair involvement. Relapse was observed in 44% of patients

and significantly associated with history of thyroid disease. Common side effects of DPCP therapy were itching, rash, and local lymphadenopathy.
The results of our review support our belief that DPCP therapy is a viable treatment option in the treatment of Alopecia areata which can be successfully accomplished at home, and should not be terminated before 2 years.

P018

Is Androgen Excess Masked in Alopecia Areata Patients: A Retrospective Data Analysis of 1,587 Patients

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Dr. Bergfeld's dermatology practice focuses on helping patients suffering from alopecia, pigmented lesions, melanoma, and skin tumors. She is an avid volunteer for the American Academy of Dermatology, and served as past Chair and Counsel of Communications.

G.C. Ranasinghe: None. **W. Bergfeld:** None.

LEARNING OBJECTIVES:
Standardize protocol to screen for androgen excess (total testosterone, free testosterone, free testosterone %, DHEAS and androstenedione) in patients that have menstrual irregularities, trouble conceiving, PCOS, ovarian cysts, and/or have clinical evidence of elevated androgens (hirsutism or adult acne). What may be a challenge for dermatologists is identifying hirsutism in AU patients, but the additional screening criteria should provide the physician with the essential information.

ABSTRACT:
Studies on the pathophysiology and comorbidities associated with alopecia areata (AA) are limited. The purpose of this study was to determine the prevalence of androgen excess in AA and its subtypes, in relation to demographics and comorbidities. Medical records of 1,587 Patchy AA, AT, AU, and ophiasis patients seen in the Department of Dermatology at the Cleveland Clinic Foundation in Ohio between 2005 and 2015 were reviewed. Out of this cohort, 226 patients met the inclusion criteria. There is evidence that patients with AA had significantly greater prevalence of androgen excess than the general population ($p<0.001$). Androgen excess was identified in 42.5% (n=96) of the 226 patients with AA and all subtypes ($p<0.001$). The androgen excess group was significantly more likely to present with adult acne, hirsutism, PCOS, and/or ovarian cysts ($p<0.001$). This study was limited by being retrospective. Our study demonstrated that AA is associated with androgen excess.

P019

Prevalence of Hormonal and Endocrine Dysfunction in Lichen Planopilaris Patients: A Retrospective Data Analysis of 413 Patients

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Wilma Bergfeld, MD, F.A.C.P., is the Section Head of Dermatopathology in the Department of Pathology and Staff Dermatologist and the Head of Dermatological Research in the Department of Dermatology at Cleveland Clinic. In addition, she is the Director of Cleveland Clinic's Dermatopathology Fellowship and Professor of Dermatology and Pathology at the Cleveland Clinic Educational Foundation.

Dr. Bergfeld's dermatology practice focuses on helping patients suffering from alopecia, pigmented lesions, melanoma, and skin tumors. She is an avid volunteer for the American Academy of Dermatology, and served as past Chair and Counsel of Communications.

G. Ranasinghe: None. **W. Bergfeld:** None.

LEARNING OBJECTIVES:
Standardize protocol to screen for androgen excess or deficiency (total testosterone, free testosterone, free testosterone %, DHEAS and androstenedione) in patients that are overweight, obese, PCOS, ovarian cysts, and/or have clinical evidence of elevated androgens (hirsutism and/or seborrhea dermatitis).

ABSTRACT:
Studies on the pathophysiology and comorbidities associated with lichen planopilaris (LPP) and frontal fibrosing alopecia (FFA) are limited. The purpose of this study was to determine the prevalence of androgen excess in the postmenopausal LPP population, in relation to demographics and comorbidities. Medical records of 413 LPP, FFA, and LPP/FFA patients seen in the Department of Dermatology at the Cleveland Clinic Foundation in Ohio between 2005 and 2015 were reviewed. Out of this cohort, 168 patients met the inclusion criteria.
There is evidence that LPP patients had significantly greater prevalence of polycystic ovary syndrome (PCOS) than the general population ($p<0.001$). Androgen excess was identified in 31.5% (n=53) of the 168 patients with LPP or any subtype ($p<0.001$). Androgen deficiency was identified in 32.1% (n=17) of the 53 patients with FFA ($p<0.001$). The androgen excess group was significantly more likely to present with hirsutism, PCOS, and/or ovarian cysts ($p<0.001$). This study was limited by being retrospective. Our study demonstrated that LPP is associated with androgen excess.

P020

A Novel Treatment Principle in Anti-hirsutism Management: An Osteopontin-derived Peptide Potently Inhibits Human Hair Growth in Vitro and in Vivo

Marta Bertolini, MD, PhD[1], Majid Alam[1], Aviad Keren[2], Jennifer Gherardini[1], Jennifer E. Klöpper[3], Amos Gilhar[2], Ralf Paus[4].
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Dr. Bertolini is originally from Verona, Italy. She joined Prof. Paus´ lab at the University of Lübeck, Germany, in 2009 for her Master's thesis project, graduating in Pharmaceutical Biotechnology from the University of Padua, Italy that year and continued to a PhD in "Modulation of autoimmunity" from the University of Lübeck, Germany (awarded Nov 2014, thesis title: Abnormal interactions between perifollicular mast cells and CD8+ T-cells may contribute to the pathogenesis of alopecia areata). She currently is the Lab Chief of the Paus Lab at the University of Münster, Germany.

M. Bertolini: None. **M. Alam:** None. **A. Keren:** None. **J. Gherardini:** None. **J.E. Klöpper:** None. **A. Gilhar:** Grants/Research Support; Basic research grants from Follicum AB, Sweden. **R. Paus:** Grants/Research Support; Basic research grants from Follicum AB, Sweden.

LEARNING OBJECTIVES:
Osteopontin-derived peptide is a potent, novel inhibitor of human hair growth in vitro and in vivo.

ABSTRACT:
Undesired hair growth (hirsutism, hypertrichosis) can cause major psychological distress. Since only few, and then often unsatisfactory therapeutic options are currently available, new treatment strategies need to be developed. Since the multifunctional, immunomodulatory glycoprotein, osteopontin, reportedly is expressed by rat hair follicles (HFs) only during catagen, we hypothesized that osteopontin-derived fragments may inhibit human hair growth. Here, we

have tested this hypothesis, using a newly generated, short modified osteopontin-derived peptide (FOL-005). In microdissected, organ-cultured human scalp HFs, FOL-005 highly reproducibly induced premature HF regression (catagen). This was confirmed in organ-cultured, full-thickness human scalp skin from 6-9 subjects, where FOL-005 (15nM, 150nM) significantly promoted catagen development, along with increased hair matrix keratinocyte apoptosis. When human male scalp skin was transplanted onto SCID/beige mice (three 3 mm2 grafts per mouse) and FOL-005 was injected intracutaneously, this significantly decreased the number of hairs growing per graft compared to vehicle-treated control transplants. Moreover, FOL-005 administration potently counteracted the hair growth-promoting effects of minoxidil, one of the strongest hypertrichosis-inducing agents. There was no morphological evidence of FOL-005-induced HF-toxicity, and a standard battery of toxicological tests revealed no overall FOL-005 toxicity. These data identify this osteopontin-derived peptide as a potent, novel inhibitor of human hair growth in vitro and in vivo, which deserves clinical testing as a new treatment principle for excessive hair growth (hirsutism, hypertrichosis).

P021

Do γδT Cells Contribute to Human Hair Biology and Pathology?

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Dr. Uchida graduated as a medical doctor from the Shimane medical university, Shimane, Japan, in 2004. Dr. Uchida worked for Kagoshima City hospital as resident for two years and started a dermatological residency at department of dermatology at Kagoshima University in 2006. Dr. Uchida awarded his PhD in 2012 in dermatological immunology, focusing on gamma-delta T cells. From 2013, Dr. Uchida works as assistant professor for department of dermatology at Kagoshima University, Japan. In 2014, Dr. Uchida joined Prof. Paus´ lab at the University of Münster as a guest researcher.

Y. Uchida: None. **M. Bertolini:** None. **T. Kanekura:** None. **A. Rossi:** None. **R. Paus:** None.

LEARNING OBJECTIVES:
γδTCR+ cells may play a role in human hair cycle control and possibly immune privilege under physiological and pathological conditions.

ABSTRACT:
γδT cells (γδTc) are key protagonists of the murine skin immune system regulates hair follicle (HF) cycling and neogenesis. However, their characteristics and functions in human HF biology and pathology remain completely unknown. To elucidate their role, the distribution of γδTc was characterized in human scalp skin. As expected, γδTCR+ cells were detected in the epidermis and in the epithelium of anagen and telogen HFs. Similar to murine HFs, their intrafollicular expression was strikingly restricted to the distal HF epithelium above the isthmus in anagen and telogen HFs. Interestingly, almost no γδTCR+ cells could be visualized in human catagen HFs. Peri- and intrafollicular γδTc in healthy human skin were Vδ1+. Autologous, skin-derived human γδTc induced HF cytotoxicity and up-regulated ectopic MHC class I expression, if co-cultured with stressed HFs. In patients with alopecia areata (AA), γδTCR+ cells not only densely populated the perifollicular inflammatory cell infiltrate of lesional HFs, but also prominently infiltrated into the hair bulb. Interestingly, the hair bulb-infiltrating γδTc in lesional AA HFs also expressed Vδ1TCR. While Vδ2Tc have been implicated in the pathogenesis of human autoimmune disease, an involvement of Vδ1Tc is a novel finding, suggesting that Vδ1Tc may play a hitherto unknown role in AA pathobiology. Besides perifollicular mast cells and macrophages, γδTc may be another important immunocyte population in human HF biology and pathology.

P022

Pilot Observations That the Ecto-enzymes, CD73 and CD39, May be Novel Players in the Human HF Immune System and in Hair Growth Regulation

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Dr. Bertolini is originally from Verona, Italy. She joined Prof. Paus´ lab at the University of Lübeck, Germany, in 2009 for her Master's thesis project, graduating in Pharmaceutical Biotechnology from the University of Padua, Italy that year and continued to a PhD in "Modulation of autoimmunity" from the University of Lübeck, Germany (awarded Nov 2014, thesis title: Abnormal interactions between perifollicular mast cells and CD8+ T-cells may contribute to the pathogenesis of alopecia areata). She currently is the Lab Chief of the Paus Lab at the University of Münster, Germany.

M. Bertolini: None. **Y. Uchida:** None. **L. Ponce:** None. **J. Chéret:** None. **R. Paus:** None.

LEARNING OBJECTIVES:
First spotlight on CD73 and CD39 in a hair research context, possible role in hair follicle biology.

ABSTRACT:
CD73 (ecto-5'-nucleotidase) and CD39 (ectonucleoside triphosphate diphosphohydrolase 1) are surface ecto-enzymes responsible for dephosphorylating ATP in order to produce the anti-inflammatory purine nucleoside, adenosine. This conversion is thought to contribute to the creation of an immunoprivileged signalling environment. Given that the hair follicle (HF) displays at least two sites of relative immune privilege (IP) (bulge, bulb), we investigated whether these ecto-enzymes are expressed by human scalp HFs and whether they exert any effects on HF biology, focusing on IP maintenance and hair growth. Interestingly, CD73 was expressed at the protein and mRNA level by the HF inner root sheath (IRS), including prominent expression in its mysterious "Flügel cells", and in the connective tissue sheath (CTS), while CD39 protein was detected only in the CTS. Thus, both ecto-enzymes are expressed outside of the classical sites of HF-IP. When organ-cultured human scalp HFs were treated with IFNgamma to induce HF-IP collapse, CD39 protein expression did not change in the CTS, while the number of CD73+ cells slightly declined in the IRS. Moreover, preliminary data suggest that HF transfection with CD73 siRNA slightly decreased hair shaft production. We shall also report ongoing experiments, how CD73 silencing impacted on human HF-IP and perifollicular mast cells/macrophages after IFNgamma challenge. These pilot observations cast a first spotlight on CD73 and CD39 in a hair research context.

P023

Dissecting Folliculitis in Children Post Lice Infestation

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D.L. Bet: None. **G.A. Maciel:** None. **A. Reis:** None. **A.O. michalany:** None. **T.H. Benemonte:** None. **L.A. Contin:** None.

LEARNING OBJECTIVES:
Reenforce necessity of treating vigorously lice infestation as well as recognize and treat this condition early, avoiding permanent cicatricial alopecia.

ABSTRACT:
Dissecting folliculitis is a chronic, recurrent and severe form of folliculitis that usually presents in young adults (18-40 years), men and black. Pediculosis is an infestation, common in brazilian pediatric population, and it is described as one of the rare causes of dissecting folliculitis. We report two cases of female patients, 8 and 9 years old, with previous lice infestation. They presented with loss of hair, pustules and suppurated abscesses in scalp. Direct micologic of hair shaft and secretion were negative in both cases, Bacterial culture was positive for Staphylococcus capitis in one case and negative in the other. Histopathological exam showed numerous neutrophils in subcutaneous, without fungus or bacterias. There was a complete healing of abscesses in both cases after treated with sulfametoxazole/trimetoprin. One of them evolved with complete repilation and the other one is still being treated, but it shows some areas with viable follicular ostia in trichoscopy.

P024

Variations and Similarities of Hair Follicles and Papillae from Vertex and Occipital Regions in Subjects with Androgenetic Alopecia and Healthy Controls

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Position
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A/Professor YLL School of Medicine, NUS
Director of Clinical Research Unit for Skin, Allergy and Regeneration / Senior PI Experimental Dermatology group, IMB/A*STAR
Grants (last 3 years)
2013Co-PI: Skin-on-a-chip for High-throughput Skin Absorption and Irritation Evaluation
2012Lead PI for “Clinical Research Unit for Skin, Allergy and Regeneration“
2012PI: Effects of different light qualities on skin and their use in photodynamic therapy”
Research interests
Neurodermatology (opioid receptors, interactions nerves-keratinocytes; peripheral pain/itch); clinical trials in Dermatology and hair research, Allergology and wound healing

P.L. Bigliardi: None. **S.B. Ho:** None. **S. Ramasami:** None. **C. Vaz:** None. **G.E. Chew:** None. **H. Jaffar:** None. **V. Tanavde:** None. **M. Bigliardi-Qi:** None.

LEARNING OBJECTIVES:
Explain the close collaboration between scientists and clinicians in this study and the importance for statistical analysis of RNAseq data.

ABSTRACT:
Androgenetic alopecia (AGA) is common in Singapore and better understanding of the pathophysiology behind is necessary. Therefore, we designed a study with 20 male subjects with AGA and 10 controls without AGA. The vertex and occipital region of each subject was precisely photodocumented, then follicular unit extractions (FUEs) were taken and the extracted FUEs were photodocumented and dissected into papillar region, intermediate region with sebaceous glands and infundibulum/ostium area.
The main objectives of the study are following:
1)compare the morphological differences of follicular units in AGA and normal controls in macro- and microphotographs taken from the vertex and occipital regions.
2)perform full RNA sequencing of the papillae of FUEs
3)carry out extensive bioinformatics analysis by Cuffdiff of RNAseq results and correlate them to clinical and

morphological parameters
The RNAseqr results revealed very interesting and statistically significant differences and also similarities with clustering of genes in the miniaturized hair from vertex regions from patients and normal hair follicles from the vertex region from healthy volunteers. The genes expression from hair papilla from the occipital region from healthy volunteers and AGA patients was not significant different.
The results obtained by this close collaboration between scientists and clinicians will be presented and prove how such a translational approach with integration of clinico-morphological informations will revealed new, interesting pathophysiological pathways.

P025

Relating the Biomechanical Properties of the Human Hair Follicle to its Microstructure

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Dr. Lucien Bildstein holds a PhD in physical chemistry and Drug delivery from Paris-Sud University. He currently works at the Physics Department of L'Oreal Advanced Research. His research interests include the nanoscale characterization and biophysical properties of human hair and the hair follicle.

L. Bildstein: None.

LEARNING OBJECTIVES:
Grasp the relationship between the ultrastructure and mechanical properties of the human hair follicle

ABSTRACT:
The mechanical properties of biological materials such as hair, skin or bone are determined by their underlying fibrous bionetworks. However, the influence of the local network architecture of the cytoskeleton on cell mechanics has not been thoroughly investigated at the tissue level. Here we report for the first time how microscopic changes in the underlying keratin network of the hair follicle correlate with the macroscopic mechanical properties of the tissue. Using atomic force microscopy, the soft matrix of proliferating cells present at the bulb of the follicle was found hardening within the first millimeter of the follicle from 30 kPa up to 11 MPa, corresponding to a multiplying factor of 366. This mechanical hardening correlates with an increase in diameter of macrofibrils from 137 to 333 nm, together with a continuous compaction, an increasing parallel orientation of the fibers and a progressive expression of keratins K35, K33 and K36, markers of hair fiber differentiation. While the concentration of keratin fibers increases linearly along the follicle axis, the hardening of the network follows a power law behavior, as previously described for in vitro model systems such as chemically controllable actin gels. This first thorough measurement of the mechanical properties of the hair follicle opens up opportunities for a more in-depth characterization of the physiology of the human hair follicle.

P026

Solution of Hair Strength Using the Maillard Reaction

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Amorepacific
2005~

S. Bin: None.

LEARNING OBJECTIVES:
Provides insights into a new method that could be used to improve the condition of damaged or aging hair.

ABSTRACT:
Human hair is getting thinner with age. Also Hair is damaged by external environments and chemical treatments.

These things are caused to weaken hair. In order to solve this problem, the polymer was used for coating outside of hair. However, using the polymer coating is a temporary effect. There are disadvantages that the effect disappears when the shampoo. This study provides a semi-permanent hair care solutions that persists even after shampooing, by forming macro-compound in the hair inside.
The Maillard reaction is a chemical reaction between amino acids and reducing sugars. The reactive carbonyl group of the sugar reacts with the nucleophilic amino group of the amino acid, and forms macro-compound. Here, we induced the Maillard reaction inside human hair and analyzed its effects by using Fourier transform infrared spectroscopy with a focal plane array (FTIR-FPA) detector. This compound was stable in hair and substantially increased its tensile strength. This study provides insights into a new method that could be used to improve the condition of damaged or aging hair.

P027

A Case of Foreign Body Reaction Following Hair Restoration Surgery

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Dr. Leila Bloch M.D., dermatologist and hair restoration surgeon, Clinica Bloch founder at Sao Paulo. Leila Bloch graduated from the Faculty of Medicine, University of Sao Paul(2002) and undertook Residency in Dermatology at Hospital das Clinicas(2006). She is part of the Onco-Hematology group of Hospital Israelita Albert Einstein, focused on chemotherapy-induced alopecia. Dr. Bloch participates in ongoing scientific research on cosmetics at IPclin. She has published national and international papers. Member of International Society of Hair Restoration Surgery, the North American Hair Research Society, Brazilian Society of Dermatology and Brazilian Society for Dermatologic Surgery.

L.D. Bloch: None. **L.D. Bloch:** None.

LEARNING OBJECTIVES:
Illustrate a possible side effect of Hair Restoration surgery that should be recognized and treated.

ABSTRACT:
A 48 years-old previously health patient performed a 3243 follicular - units hair restoration surgery. After 5 months, he presented with 5 eritemato-fibrotic plaques at the recipient site of the surgery. He denied associated pruritus. One of the lesions was biopsied, with the diagnosis of inflammatory lesion. The lesions were infiltrated twice with a month interval and after 3 months they had complete remission.

P028

Efficacy Assessment of a Nutraceutical in the Reduction of Telogen Effluvium in Women

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Leila has been working with clinical research for 5 years and has her own clinic focused in hair loss treatment and transplant. She has professional international experience, example: Hospital Clinic - Barcelona (2004), Zurich University Hospital - Switzerland (2005), Johns Hopkins Hospital - USA (2007), and Jackson Memorial Hospital - Miami University (2011). She graduated at USP medical school, with residency in dermatology (hospital das clínicas - FMUSP). She is member in the dermatology Brazilian society (SBD) and north american hair research society (NAHRS), and has projects published in national and international magazines, with participation in congress and courses worldwide.

L. Bloch: None. **C.C. Escudeiro:** None. **F.D. Sarruf:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to know a new possibility of treatment for telogen effluvium.

ABSTRACT:
Introduction: Telogen Effluvium may be related to the deficiency of certain nutrients. Therefore, nutraceutical products can be used to treat this condition.
Objective: The assessment of efficacy of the 6 months treatment with the test product in increasing the number of hair fibers and reducing hair loss. The study also aimed at the subjective assessment of the study participants regarding the increase of hair and nails growth, improvement of skin appearance and of life in general.
Methods: The monocentric study was conducted during 6 months in volunteers with telogen effluvium. The efficacy assessment was performed by phototrichogram and by participants' opinion based on standardized questionnaires.
Results: There was a reduction in the number of telogen hair fibers and an increase in the number of total hair fibers in 83% of the participants after 6 months of treatment. The majority noticed an improvement in hair and nails growth and in skin appearance after 6 months of treatment.
Conclusions: the product was effective in increasing total number of hair fibers and reducing Telogen Effluvium. It was also positively evaluated by the participants regarding: hair and nail growth, skin appearance and life quality improvement.

P029

Global MicroRNA Profiling Suggests Their Role in the Control of Human Hair Follicle Ageing

Serena Buscone, PhD[1], Mohammed Ahmed[2], Krzysztof Poterlowicz[1], Dragos Ilas[1], Ankit Patel[1], Nilofer Farjo[3], **Natalia Botchkareva**[1].
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Natalia Botchkareva is a Reader in Cutaneous Biology, Centre for Skin Sciences, University of Bradford. Research in Dr Botchkareva's laboratory focuses on delineating the roles for microRNAs in controlling gene expression programmes in the skin during development, hair cycle-associated tissue remodelling, postnatal regeneration and aging.

S. Buscone: None. **M. Ahmed:** None. **K. Poterlowicz:** None. **D. Ilas:** None. **A. Patel:** None. **N. Farjo:** None. **N. Botchkareva:** None.

LEARNING OBJECTIVES:
Delineate the involvement of small non-coding RNA and their target genes in the development of hair follicle aging.

ABSTRACT:
Hair aging is manifested by the reduced rate of hair growth, hair thinning, and changes in the hair fibre structure and colour. To investigate the potential role of miRNAs in hair follicle (HF) aging, RNA was obtained from anagen HF of the occipital area of healthy male patients of different age groups (30-35 year-old versus 60+ year-old) and processed for miRNA microarray analysis. Global profiling revealed decreased expression of 80 miRNAs and increased expression of 94 miRNAs in the HF of older versus young individuals. Specifically, downregulation of the members of the miR-17-92, miR-106a-363, and miR-106b-25 clusters was detected in 60+ year-old subjects. qPCR validation confirmed the decrease in expression of miR-17, miR-20a, miR-27a, miR-106a and miR-371b in the aged HF. miR-17 mimic protected anagen HF entry into catagen phase in in vitro "aging" model induced by oxidative stress. HF transfection with miR-17 mimic resulted in the decreased expression of the putative miR-17 targets BMP2, Oxr1 and Map3k8, whose expression was increased in the HF of older subjects. In addition, miR-17 mimic treatment resulted in down-regulation of anti-proliferative genes E2F1 and p21 in the hair follicles. This study suggests that miRNA mediated control of gene expression program could contribute to the aging-associated changes in the HF. Specifically, downregulation of miR-17 could promote the development of the pre-mature HF ageing.

P030

Adipose Derived Stromal Stem Cells Therapy in Alopecia

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M. Cisterna: None. **M. Diaz:** None. **M.L. Bovcon:** None.

LEARNING OBJECTIVES:
Explain the recent advances and research outcomes of SVF as an emerging cell therapy for alopecia. Show a Case Report.

ABSTRACT:
Alopecia is one of the most frequent consultations in Dermatology-Trichology. It is a medical-trichological problem with aesthetic and social implications, which requires a proper diagnosis to select the best treatment. The development of new Technical - Medical - Scientific based technologies to obtain Stroma Vascular Fraction (SVF) or Adipose-Derived Stromal/ Stem Cells (ADSC) throw us promising results for the treatment of this alteration. The skin consists of several structures, including the follicles, which originate hair and regenerate throughout our lives thanks to the presence of stem cells.
We present a patient, 30 years old, male with androgenetic alopecia, which treatment consisted of SVF obtained from their own adipose tissue as monotherapy, evolving very successfully within the first month after implanting cells.
The aim of this presentation is to describe this new technique, emphasizing that it is a simple, ambulatory, no complications or allergic reactions technique that requires no recovery time. One of our current challenges is to ensure that the VSF rich in ADSC is able to activate the cascade of biochemical signals that promotes hair growth, thus gives a new adjunctive treatment to others, enabling better results in transplanting follicles or giving solutions whenever the hair transplant surgery is not viable.

P031

Monitoring Changes in Hair Structure During Childhood

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M.L. Bovcon: None. **M. Cisterna:** None.

LEARNING OBJECTIVES:
Discover the visual changes of a boy virgin-hair since birth through 8 years old, using high resolution imaging technologies.

ABSTRACT:
Human hair changes through lifetime are highly described in bibliography. The aim of this case report is to share the visual morphological changes in the hair of a child from birth to 8 years old. For this observational study we analyze Macro, OM - Optical Microscopy, and SEM - Scanning Electron Microscopy photographies.

P032

Association of Lichen Planopilaris with Thyroid Disease: A Retrospective Case-control Study

Nikoleta Brankov, BS[1], Natasha Atanaskova Mesinkovska, MD, PhD[2], Melissa Piliang, MD[2], Angela Kyei, MD[2], Wilma F. Bergfeld, MD[2].
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Nikoleta Brankov, BS, is a third year medical student at Loma Linda University School of Medicine. Prior to medical school, she worked with Dr. Edward Maytin on improving the treatment modality of photodynamic therapy for skin disease. She also completed the AAD Diversity Mentorship Program with Dr. Wilma Bergfeld and worked on an alopecia research project, which led to a publication in JAAD. Nikoleta completed her undergraduate work in Combined Sciences and Biology at Youngstown State University. She graduated with Summa Cum Laude and received the Clarence P. Gould Society Award, recognizing the top 1% of seniors.

N. Brankov: None. **N. Atanaskova Mesinkovska:** None. **M. Piliang:** None. **A. Kyei:** None. **W.F. Bergfeld:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will understand the importance of screening for thyroid conditions in inflammatory, scarring alopecia.

ABSTRACT:
Background: We see many thyroid disease patients with lichen planopilaris (LPP) at Cleveland Clinic and studies on the particular causes and comorbidities seen with LPP are limited. The objective of this study was to determine the prevalence of thyroid diseases in patients with LPP.
Methods: This was a retrospective case-control study evaluating data from the medical records of LPP patients (n = 166) and age- and sex-matched controls (n = 81) at the Cleveland Clinic Department of Dermatology, from 2000 to 2013. The presence of thyroid disease at first evaluation and subsequent follow ups were recorded.
Results: History of thyroid disease was found in 34% (n = 57) of the 166 LPP patients and in 11% (n = 9) of the control subjects (p = 0.0001). When confined to hypothyroidism only, this disease was found in 29% (n = 48) of the LPP patients and 9% (n = 7) of the control subjects (p = 0.0003). Hashimoto's thyroiditis was found in 6% (n = 10) of LPP patients and 0% of control subjects (p = 0.033).
Conclusions: Patients with LPP have increased associations with hypothyroidism, which suggests that LPP patients should be screened for thyroid disorders. Further investigations concerning thyroid-related receptors in the skin can help to elucidate the impaired inflammatory regulation in LPP patients.

P033

Can Hair Follicles "See" the Light? Analysis of Light-Sensitive Receptors in Human Hair Follicles

Serena Buscone, PhD[1], Natallia E. Uzunbajakava[2], Gill Westgate[1], Nilofer Farjo[3], Andrey N. Mardaryev[1], Natalia V. Botchkareva[1].
[1]University of Bradford, Bradford, United Kingdom, [2]Philips, Eindhoven, Netherlands, [3]Farjo Hair Institute, Manchester, United Kingdom.

Serena Buscone is the Early Stage Researcher (PhD student) within an EU FP7 funded European Industrial Doctoral training grant awarded jointly to the Centre for Skin Sciences at the University of Bradford and Philips Electronics, the Netherlands "Impact of biophysical stimuli on the behaviour and activity of cutaneous stem cell". My goal is to leverage insights on molecular, cellular and biophysics impact of light on skin stem cells. This is a great inspiration for me to see how the results of our research will be translated in future solutions for people affected by hair loss and or hypertrichosis.

S. Buscone: None. **N.E. Uzunbajakava:** None. **G. Westgate:** None. **N. Farjo:** None. **A.N. Mardaryev:** None. **N.V. Botchkareva:** None.

LEARNING OBJECTIVES:
Demonstrate expression of light-sensitive receptors in human hair follicle as putative targets for hair growth modulation

ABSTRACT:
Light-based devices have been used for years for the management of hair growth, suggesting photosensory capability of the hair follicles (HF). The goal of this study was to evaluate the expression of light-sensitive receptors in the human HFs. Anagen HFs were obtained from healthy male and female patients of different ages. The expression of photoreceptors cryptochromes 1 and 2 (CRY1, 2) and opsins (OPN1-SW, OPN1-MLW, OPN2 (Rhodopsin), OPN3, OPN4, OPN5) was evaluated by RT-PCR, qPCR, and immunofluorescence. RT-PCR analysis revealed that HFs express CRY1, CRY2, Rho and OPN3, but not other photoreceptors. Comparison of relative expression levels by qPCR revealed that CRY1 is more abundant versus Rho and Opn3, whilst levels of CRY2 were very minimal, which was independent on subject's age and gender. CRY1 is prominently expressed throughout the HF epithelium and the dermal papilla. Rhodopsin is expressed in the outer root sheath and co-localized with the stem cell marker CD200. OPN3 expression was detected in the inner root sheath. To understand the physiological role of CRY1, anagen micro-dissected HFs were treated with KL001, a stabilizer of CRY1 that lengthens the circadian period. KL001 prevented HF anagen-catagen transition, and accelerated hair growth under insulin deprivation. Thus, this study suggests that HFs express selected light-sensitive receptors, and modulation of their activity might be used for management of hair growth.

P034

The Prevalence of Geriatric Alopecia Areata Among 572,617 Dermatology Patients Seen at a Large Dermatology Group Private Practice Throughout Florida and Ohio

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I am a 4th year medical student at the University of Central Florida College of Medicine. My research interest include topics pertaining to alopecia areata as well as skin of color.

C.C. Caldwell: None. **J.A. Solomon:** Advisory Board or Panel; member of NAAF research advisory board.

LEARNING OBJECTIVES:
Understand how the prevalence of AA in the geriatric population affects a typical dermatology practice.

ABSTRACT:
The prevalence of geriatric alopecia areata seen at dermatology practices in the US is unclear, and a large review has not been conducted. The purpose of this retrospective billing data analysis is to evaluate the age/sex prevalence among 195,334 geriatric patients presenting to a large dermatology group practice with the diagnosis of AA. Furthermore, this study aims to determine how the prevalence impacts a typical dermatology practice. Billing data from Leavitt Medical Associates of Florida d/b/a Advance Dermatology and Cosmetic Surgery (ADCS) was retrospectively collected from offices throughout Florida and Ohio, involving a total of 572,617 dermatology patients who visited ADCS offices between January 2006 and June 2012. The study population included 195,334 discrete geriatric patients (60-100 years of age). Patient data was grouped into age categories for observation of possible trends. A significance level of $p < 0.05$ was used. Of 572,617 discrete patients of all ages, 3,633 patients were found to have AA. Geriatric patients (age >60) totaled 195,334, and included 487 AA diagnoses; representing 134/1000 total AA cases (13.4%). Geriatric AA cases included 389 females and 98 males. A significant female predilection was observed in all age categories. Both sexes peaked in the 61-65 age range followed by a progressive linear decline thereafter.

P035

Safety and Efficacy of Clobetasol Propionate 0.05% E Foam for the Treatment of Central Centrifugal Cicatricial Alopecia

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Valerie D. Callender, M.D.
Dr. Valerie Callender is an internationally recognized Board Certified Dermatologist, who is known for her expertise in Pigmentation Disorders and the medical and surgical treatment of Hair Loss in Women.
Dr. Callender is the current President of the Women's Dermatologic Society. She is the founder of Callender Dermatology & Cosmetic Center, which is located in the Washington, DC Metropolitan Region. Dr. Callender received her medical degree from Howard University, where she also did her residency and currently serves as an Associate Professor of Dermatology.
1/14/15

V.D. Callender: None. **C.M. Young:** None. **J.A. Chappell:** None.

LEARNING OBJECTIVES:
1. Identify clinical manifestations of CCCA in women of color.
2. Discuss treatment options for CCCA in patients of color.

ABSTRACT:
Background: Central centrifugal cicatricial alopecia (CCCA) is the most common type of scarring alopecia in women of African descent. It is an inflammatory type of hair loss, and there are limited reports focusing on the treatment of this condition.
Objective: The purpose of this study was to evaluate the safety and efficacy of clobetasol propionate 0.05% E foam for the treatment of CCCA.
Methods: This was an open-label, prospective study evaluating the clinical and histopathological improvement of CCCA using once-daily treatment with clobetasol propionate 0.05% E foam. Pre- and post-12 week treatment scalp biopsies were obtained and assessed for inflammation. Clinical evaluations were performed by the investigator and subjects.
Results: The degree of scalp inflammation was significantly reduced in our subjects with the use of clobetasol propionate 0.05% E foam. This was noted both clinically (degree of erythema, scale, tenderness, and pruritus) as well as histologically (absence or decrease of the +inflammation).

P036

Trichotillomania Treated With N-acetyl Cysteine

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M.E. Cappetta: None. **P. González:** None.

LEARNING OBJECTIVES:
Add a new succesfull case of trichotillomania treated with N-acetylcysteine.

ABSTRACT:
Trichotillomania is a medical condition classified in Obsessive Compulsive and Related Disorders in DSM-5. It is a

self-induced disease characterized by repetitive hair pulling, which can lead to visible hair loss and it is frequently associated with other psychiatric processes. Trichotillomania significantly affects the quality of life of patients and there is no clearly effective treatment option. Recently, N-acetylcisteine a glutamate modulator has shown efficacy in the treatment of trichotillomania and other compulsive behaviors. We describe a 41 years old woman with trichotillomania successfully treated with N-acetylcysteine and significant hair regrowth after 3 months of treatment.

P037

Understanding the Genetics of Rare Hair Disorders in Children

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The Children's Hospital of Philadelphia, Philadelphia, PA, USA.

Leslie Castelo-Soccio is an Assistant Professor of Pediatrics and Dermatology at the Children's Hospital of Philadelphia and the University of Pennsylvania Perlman School of Medicine. She is board certified in dermatology and pediatric dermatology. She has a specialty pediatric hair clinic and her research time is devoted to pediatric hair disorders.

L. Castelo-Soccio: None.

LEARNING OBJECTIVES:
-Demonstrate the latest developments in genetics of pediatric hair disorder

ABSTRACT:
Usinggenetic tools and an integrated translational research approach, we canidentify new genetic causes of rare hair disorders in children and correlate how these genes function in health and disease. We have established a prospective cohort of pediatric patient with rare hair abnormalities without a known genetic cause and have collected blood and hair samples from these patients. Using whole-exome sequencing we are identifying coding variants in annotated genes. Using these variants we will characterize clinical features by gene mutation in so doing refining disease classification. Hereditary mucoepithelial syndrome and uncombable hair are among families we have identified.

P038

The Development of a Genetic Approach to Suppress an Inheritable Structure Defect of the Hair

Ying Liu[1], Elizabeth R. Snedecor[2], Xu Zhang[1], Lian-Feng Zhang[1], Richard A. Clark[2], Dennis R. Roop[3], Chuan Qin[1], **Jiang Chen**[2].
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Dr. Chen is an Associate Professor in the Departments of Pathology and Dermatology of Stony Brook University School of Medicine. Dr. Chen’s laboratory is interested in understanding molecular signaling pathways involved in hair follicle morphogenesis and testing keratinocyte stem cells-based therapeutic strategies for genetic skin disorders caused by keratin mutations.

Y. Liu: None. **E.R. Snedecor:** None. **X. Zhang:** None. **L. Zhang:** None. **R.A. Clark:** None. **D.R. Roop:** None. **C. Qin:** None. **J. Chen:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain inheritable hair disorders and potential therapeutic strategies.

ABSTRACT:
Genetic mutations are responsible for a number of inheritable hair disorders characterized by structural defects in the hair. It is unknown whether correcting genetic mutations is sufficient to suppress related hair phonotypes in vivo. In

this study, we examined whether it is feasible to suppress a hair shaft blebbing phenotype associated with the expression of a dominant mutant form of Krt75. First, allele-specific siRNAs that are capable of silencing the mutant, but not wild-type, Krt75 were developed. Subsequently, mutant Krt75-specific shRNA was expressed in epidermal keratinocyte progenitor cells isolated from mutant Krt75 mice. These genetically modified mutant cells were then used to regenerate new hair follicles in vivo. Hair formed with these genetically modified mutant keratinocyte progenitor cells developed significantly reduced number of defective hair shafts in comparison to controls. Moreover, phenotypic improvement was associated with suppressed expression of mutant Krt75 in reconstituted skin grafts. Data obtained from this study provided proof-of-concept that inheritable hair structural defects may be suppressed through genetic manipulation.

P039

The Thyroid Hormone Analogue KB2115 (Eprotirome) Prolongs Anagen in Human Hair Follicles: A Novel Strategy for Managing Telogen Effluvium?

Attila Olah[1], Jennifer Gherardini[2], Marta Bertolini[2], **Jérémy Chéret**[2], Jennifer E. Kloepper[3], Michael Soeberdt[1], Christoph Abels[1], Ralf Paus[4].
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Dr. Chéret is originally from Caen, France. He joined Prof. Paus´ lab at the University of Lübeck, Germany, in 2013 for his postdoctoral position, graduating in Neurobiology from "AgroParisTech" at the University of Paris V, France. His PhD was on "Interactions between the peripheral nervous system and human skin" (awarded April 2013, thesis title: The role of the nervous system during human skin wound healing). He currently is a postdoctorant of the Paus Lab at the University of Münster, Germany.

A. Olah: Salary, Contractual Services; A.O. is an employee of Dr. August Wolff GmbH &co. KG, Germany. **J. Gherardini:** None. **M. Bertolini:** None. **J. Chéret:** None. **J.E. Kloepper:** None. **M. Soeberdt:** Salary, Contractual Services; Dr. Soeberdt is an employee of Dr. August Wolff GmbH &co. KG, Germany. **C. Abels:** Salary, Contractual Services; Prof. Abels is an employee of Dr. August Wolff GmbH &co. KG, Germany. **R. Paus:** Grants/Research Support; This project was supported by basic research grants from Dr. August Wolff GmbH &co. KG to R.P..

LEARNING OBJECTIVES:
KB2115 (eprotirome), a synthetic thyroid hormone receptors-modulator, promotes hair follicle growth with a favorable toxicity profile compared to thyroxine.

ABSTRACT:
Thyroid hormones (THs) prolong anagen duration in human scalp hair follicles (HFs). Therefore, TH receptors (TRs) are promising targets for hair loss disorders associated with premature catagen entry, leading to telogen effluvium. However, the cardiovascular and other adverse effects of classical THs that target the myocardially expressed TRα, make it difficult to justify their therapeutic use for hair loss management. Therefore, we explored whether, KB2115 (eprotirome), a TR-modulator with higher affinity for TRβ than for TRα and an expected favorable toxicity profile compared to thyroxine, also modulates human hair growth. In organ-cultured human scalp HFs, KB2115 significantly prolonged anagen duration, along with a slight increase in hair matrix keratinocyte proliferation, down-regulated the key catagen-promoter, TGF-β2, and increased intrafollicular tyrosinase activity in situ in a donor-dependent manner. In striking contrast to THs, KB2115 did not affect the HF immunoreactivity for mitochondrially encoded cytochrome C oxidase I (MTCO1), suggesting that this TR-modulator exerts little effect on energy metabolism. Thus, this pilot study documents growth-promoting effects of a synthetic TR analogue in human scalp HFs and encourages one to explore KB2115 as a novel candidate “hair drug” for the management of telogen effluvium. Besides dissecting its mechanisms of action and toxicological profile, it will be important to evaluate, next, whether KB2115 also prolongs anagen after topical application to human scalp skin.

P040

Androgenetic Alopecia: Is Mitochondria Function Altered in Dermal Papilla Cells From Balding Scalps?

Elaine G. Chew, BSc[1], Tze Chiun Lim[2], Meng Fatt Leong[2], Adiam Bahta[3], Andrew Wan[2], Mike Philpott[3], Axel M. Hillmer[1].
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Elaine Chew received her Bachelor of Biomedical Science and Bachelor of Science (Honours) at the University of Melbourne, Australia. She is currently pursuing her PhD at the Genome Institute of Singapore under the supervision of Dr Axel Hillmer, and is interested in understanding the development of Androgenetic Alopecia in males through interrogating the transcriptome of dermal papilla cells.

E.G. Chew: None. **T. Lim:** None. **M. Leong:** None. **A. Bahta:** None. **A. Wan:** None. **M. Philpott:** None. **A.M. Hillmer:** None.

LEARNING OBJECTIVES:
Demonstrate how transcriptome comparison revealed altered mitochondria-related gene expression in balding dermal papilla cells from Androgenetic Alopecia scalp.

ABSTRACT:
Androgenetic alopecia (AGA) is a prevalent hair loss condition in males that develops due to genetic predisposition and the influence of androgens. The dermal papilla cells (DPC) are essential for hair growth and are the main site of androgen regulation in the hair follicle. We aim to identify genetic causative factors which contribute to the AGA phenotype through transcriptome comparison of balding and non-balding DPC. In this study, immortalised balding and non-balding human DPC derived from male AGA patients were three-dimensionally co-cultured with human epidermal keratinocytes (NHEK) using multi-interfacial polyelectrolyte complexation (MIPC) technique. Following treatment with dihydrotestosterone (DHT, active metabolite of androgen), DP aggregates were subjected to transcriptome analysis by RNA-seq. Up-regulated genes in balding as compared to non-balding DP aggregates following DHT treatment were highly enriched for mitochondria-related genes; indicating that mitochondria metabolism is altered in balding DP aggregates as compared to non-balding DP aggregates. Furthermore, the localisation of a significant proportion of up-regulated genes to the electron transport chain (ETC) points to the possibility of ETC complex activity differing between balding DP and non-balding DP, which may result in altered mitochondria metabolic rates, ATP production and ROS production. Ongoing effort to elucidate the biological significance of the up-regulation of mitochondrial-related genes in the balding DP aggregates is envisaged to improve our understanding of the condition of AGA.

P041

Prevention and Treatment of Alopecia Areata with Mesenchymal Stem Cells in the C3H/HeJ Mouse Model

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<Career>
1985- 1989 Graduated from Yonsei University College of Medicine
1997- 1999 Received the Ph.D. at Graduate School of Yonsei University
1999- present Clinical instructor, Assistant professor, Associate professor and Professor in the Department of Dermatology, Inha
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2005 - 2006 Visiting Investigator, Center for CutaneousResearch, Bart and London, London University

<Society>
Member of Korean Dermatological Association
Member of Korean Society for Investigative Dermatology
Director of Korean Hair Research Society
General Secretary of Korean Society for Dermatological Surgery
Director of Korean Academy of Vitiligo
Director of Korean Society for Chemical Peeling

G. Choi: None. **J. Byun:** None. **H. Kim:** None. **H. Ko:** None. **J. Shin:** None. **M. Jeon:** None.

LEARNING OBJECTIVES:
Mesenchymal stem cells provided promising therapeutic modality of AA in the C3H/HeJ model.

ABSTRACT:
Current therapeutic options for AA are limited, and there is no effective prevention for recurrent AA. Emerging evidence of the potent immunosuppressive activity of mesenchymal stem cells (MSCs) by modulation immune responses enables MSCs to be developed as a promising therapeutic modality for immune-related or inflammatory diseases.
In this study, we investigated the effects of MSCs on AA development and treatment in C3H/HeJ mice. We identified potentially important cytokines and chemokines in the treatment of AA by mcMSCs. Mice with skin graft induction of AA were injected with PBS, bone marrows from wild type C3H/HeJ mice and mcMSCs from wild type C3H/HeJ mice. Serum of C3H/HeJ mice was collected at 0, 7, 35 and 49 days after treatment and assessed for alterations in hematopoietic cytokine secretion using Luminex assays.In the result, Mice with AA development had increased secretion of IP-10 and MIG induced by IFN-γ in serum. mcMSCs injection resulted in a significant decrease in AA development, as compared with that with PBS and bone marrows injection. This result also correlated with significant decreases in IP-10, MIG after msMSCs injection.
In conclusion, our results demonstrated that mcMSCs provided effective prevention of onset of AA in the C3H/HeJ model, and warrant further studies to determine whether mcMSCs might be developed as a cell therapy for AA.

P042

A Pilot Study on Efficacy and Safety of Various Concentrations of Intralesional Triamcinolone Acetonide for Patchy Alopecia Areata

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Thomas W. Chu, MD is currently an attending dermatologist who specializes in hair disorders and hair restoration at the Far Eastern Memorial Hospital in Taiwan. After graduating from Texas A&M University HSC College of Medicine, Dr. Chu went through two years of general surgery residency training before completing his dermatology residency training at the Far Eastern Memorial Hospital. He recently finished a Hair Disorders Fellowship with Dr. Jerry Shapiro at the University of British Columbia. His current research interests include platelet rich plasma for pattern hair loss and treatments for alopecia areata.

T.W. Chu: None. **M. AlJasser:** None. **A. Alharbi:** None. **O. Abahussein:** None. **K. McElwee:** None. **J. Shapiro:** None.

LEARNING OBJECTIVES:
Understand that intralesional triamcinolone acetonide at 2.5 mg/ml concentration works just as well as 5-10 mg/ml concentrations for alopecia areata.

ABSTRACT:
IL injection of triamcinolone acetonide (TA) at concentrations of 2.5 to 10 mg/ml remains the first-line therapy for limited alopecia areata (AA). To compare efficacy in terms of hair density (HD) and hair caliber (HC), as well as side effect profile of 2.5, 5, and 10 mg/ml IL-TA for patchy AA. For each subject (N=4), a 3 x 3 cm alopecic patch was marked into quadrants. Quadrants were randomly assigned treatment with 2.5, 5, or 10 mg/ml TA or normal saline placebo injection. Each quadrant received the same TA concentration for six IL injections every 6 weeks. The patches were photographed, and HD and HC were measured from each quadrant. Significant increase of HD ($P < 0.025$) and HC ($P < 0.04$) was observed for treatment quadrants compared to placebo quadrants. However, among the treatment quadrants, the 5 and 10 mg/ml TA concentrations did not yield greater HD or HC compared to 2.5 mg/ml. Four incidences of atrophy resulted from 10 mg/ml TA and one occurred at the 2.5 mg/ml concentration. For patchy AA, IL-TA of 2.5-10 mg/ml is more effective than placebo. Injection of 2.5 mg/ml TA may be as effective as 5 or 10 mg/ml. The ability to inject an increased volume at a lower TA concentration may potentially be useful for treatment of more extensive scalp AA.

P043

Short and Long Term Tissue Changes After Heat and Steam Treatment in Hair Follicles and Skin in Mice: A Histolopathology and HD-OCT Study

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Shunjie Chua is intern in the National University Hospital System (Singapore). He is interested in research in Dermatological imaging, clinical studies which will lead to improvements in the quality of life in patients. He has been the finalist in the 2014 Singapore Young Investigator Award and the 21st Singapore General Hospital Annual Science Meeting. He is always intellectually curious and has had work published on JAAD, British Journal of Dermatology, JAMA Facial Plastic Surgery , JAMA Pediatrics, Australasian Journal of Dermatology, Journal of the German Academy of Dermatology, International Journal of Dermatology and Singapore Medical Journal.

S. Chua: None. **Y. He:** None. **M. Le:** None. **J. Li:** None. **M. Pitts:** None. **P. Lemark:** None. **B. Yan:** None. **Z. Hua:** None.

LEARNING OBJECTIVES:
Long/short term effects of high heat and humidity treatments on normal skin and hair follicles and HD-OCT utility shown.

ABSTRACT:
It is unknown how periodic exposures high temperatures and humidity affects healthy hair follicles and skin. To evaluate potential changes, C57BL/J6 mice (6 weeks) were divided into three groups (Control: 250C 60% humidity, B: 400C, 100% Humidity 30 minutes thrice a week, C: 60 400C, 100% Humidity 30 minutes thrice a week) after hair epilation, the mice were exposed to treatment for 6 weeks. At 0, 1, 3, and 6 weeks, 3 and 6 months after treatment, HD-OCT images were taken and histological and macroscopic examination was performed on the mice's skin by three independent observers. At 1, 3, and 6 weeks, group C has the thickest epidermis followed by B and control. There was no significant increase in keratinocytes. The quantity of capillaries in the dermis was most in group C followed by group B and control. Dermis was thinner in B and C. There was a significant disappearance of hair shafts at 3 weeks in C and B with slow regrowth of hairs by 3 months. By 6 months, the hair shafts and size of hair was restored. HD-OCT results correlated with histological findings. In the short term, the number of hairs and dermis thickness reduced due to acute damage. There was no long term damage. These study provides insights on potential effects of hair steaming treatments.

P044

Comparison of Quality of Life Using Hair Specific Skindex-29 between Androgenetic Alopecia and Alopecia Areata

Dong In Keum, **Hee-Chul Chung**, Won-Soo Lee.
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4th year resident, Department of Dermatology and Institute of Hair and Cosmetic Medicine, Yonsei University Wonju College of Medicine, Wonju, Korea.

D. Keum: None. **H. Chung:** None. **W. Lee:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain quality of life in AGA patients.

ABSTRACT:
Background : Androgenetic alopecia(AGA) and Alopecia areata(AA) are two most common hair loss diseases that may significantly affect a variety of psychosocial and emotional aspects of one's life and the individual's overall quality of life(QoL). Multiple previous studies on quality of life on each diseases are reported, however, comparison of QoL between two diseases has never been studied.
Objective : We aimed to compare QoL between Androgenetic alopecia and alopecia areata.
Methods : The patients in each group were assessed using hair specific skindex-29 score. The data collected were analyzed with subdivided categories of age, sex, onset age, disease duration, severity and differences between before and after treatment.
Results : AGA patients had statistically significant higher scores in symptom scale than AA patients. Qol in AGA patients was more damaged if the patient had onset age of 20s, disease duration shorter than 6 months or longer than 5 years and mild severity. QoL in AA patients were more damaged if the patient had onset age of 30s and moderate severity. **Conclusion:** This study proved that in certain aspects, differences in depth of QoL dampening between two diseases exist. In order to promote effective interventions in improving patient's well-being, clinicians need to deepen the understating about which factors influence more in QoL of AGA and AA patients.

P045

Klotho Might be an Important Regulatory Factor for Human Hair Growth

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L. Pi: None. **X. Jin:** None. **H. Chung:** None. **S.T. Hwang:** None. **W. Lee:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain Klotho's regulatory effect for human hair growth.

ABSTRACT:
Background : The klotho gene, known as an "aging-suppressor" gene, increases the life span when it is over-expressed but hastens aging when it is disrupted in mice. Klotho-deficient mice display a complex phenotype reminiscence of human aging, including skin atrophy and hair loss. To date, klotho expression has only been detected in a few human tissues and cell lines. However, it is unclear whether klotho is expressed in human hair follicles and is correlated with hair growth.
Objective : The purpose of this study was to investigate the expression and effects of klotho on human hair growth.

Methods : We examined klotho expression patterns in human hair follicles from young as well as aged donors. Furthermore, we examined the functional roles of klotho on human hair growth using klotho recombinant protein.
Results : Klotho was expressed in human hair follicles at both gene and protein levels. In hair follicles, prominent klotho expression was mainly observed in the outermost regions of outer root sheath and hair bulb matrix cells. Quantification of klotho protein expression in young and aged donors showed that klotho expression decreased with aging. In human hair follicle organ culture, klotho prolonged human hair growth and delayed premature catagen induction.
Conclusion : These results indicate that klotho might be an important regulatory factor for human hair growth.

P046

Prevalence of Female-pattern Hair Loss and Its Association with Family History of AGA in Korean Men Using BASP Classification

Bo-Kyung Kim[1], **Hee-Chul Chung**[1], Myeongsoo Jun[1], Sung-Soo Oh[2], Won-Soo Lee[1].
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B. Kim: None. **H. Chung:** None. **M. Jun:** None. **S. Oh:** None. **W. Lee:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to use BASP classification and explain FPHL of Korean men.

ABSTRACT:
Background: The men with androgenetic alopecia(AGA) could show unusual presentation, such as female-pattern hair loss(FPHL). The prevalence of FPHL remains unclear because of inconsistent results in previous studies. The basic and specific(BASP) classification can provide exact information on PHL.
Objectives: We aimed to investigate the distribution of FPHL in Korean men with AGA and to examine the association between type and family history of AGA.
Methods:We conducted population-based survey on 1042 Korean men who participated in health examination at Wonju Severance Christian Hospital. We used BASP classification for classifying hair loss and collected the data regarding family history of AGA through questionnaire.
Results: The prevalence of AGA was 64.6%(n=673). The prevalence of type M, C, U among basic(BA) types was 89.2%(n=600). The prevalence of specific(SP) type(Type F or V) was 60.5%(n=407). We observed 73 subjects(10.9%) who had SP type with type L. Type V showed higher frequency than type F(45.5% vs 34.3%). The subjects with family history of AGA had 3.27-fold higher risk of developing type M, C, U than type L.
Conclusion: More than half of men had not only BA type but also SP type. The prevalence of FPHL in our study was higher than previous studies using NH classification. We found that patients with family history of AGA tend to show recession of the frontal hair line rather than FPHL.

P047

Protective Effect of Korean Red Ginseng on the Chemotherapy Induced Alopecia

Dong In Keum[1], Long-Quan Pi[1], **Hee-Chul Chung**[1], Sungjoo Tommy Hwang[2], Won-Soo Lee[1].
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4th year resident, Department of Dermatology and Institute of Hair and Cosmetic Medicine, Yonsei University Wonju College of Medicine, Wonju, Korea.

D. Keum: None. **L. Pi:** None. **H. Chung:** None. **S.T. Hwang:** None. **W. Lee:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain protective effect of Korean red ginseng.

ABSTRACT:
Background : Hair loss is one of the most distressing side effects of anticancer chemotherapy. Ginseng has been widely used as a medicinal herb in Asian countries. Ginseng is a not only potent immunosuppressant but also an important modulator of hair growth.
Objective : We investigated the effects of Korea Red Ginseng (KRG) on the prevention of chemotherapy-induced alopecia (CIA).
Methods : Firstly, we used cyclophosphamide (150mg/kg) to induce hair follicle dystrophy in C57BL/6 mice as previously described. Then, we examined the effects of KRG on the regulation ofcyclophosphamide induced hair follicle dystrophy in C57BL/6 mouse.
Results : We confirmed that KRG induces active hair growth (anagen) in the back skin of C57BL/6 mice and showed that KRG also inhibits massive cyclophosphamide-induced premature catagen development in these mice.
Conclusion : This study suggest that KRG could be useful as a new alopecia-protectionstrategy, especially in the context of CIA.

P048

The Association Between Exercise and Androgenetic Alopecia

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J. Choi: None. **H. Chung:** None. **M. Jun:** None. **W. Lee:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain the association exercise and AGA.

ABSTRACT:
Background: Androgenetic alopecia(AGA) is the most common type of hair loss. It has been thought that non-genetic factors also plays an important role in development of AGA, along with genetic background.
Objectives: This study was designed to analyze the association among AGA and exercise-related environmental etiologic factors.
Materials and methods: Questionnaires of 1,182 healthy individuals were analyzed. The subjects visited occupational medical clinic for regular medical checkup, and they had no underlying diseases. The data included frequency and intensity of exercise, and basic patient information. BASP classification was used to classify AGA patients.
Results: Alopecia patients exercise more than normal population(p=0.008). In male alopecia group, the frequency of mild intensity of exercise was significantly higher(p=0.03) than normal group. In female alopecia group, the frequency of mild and moderate intensity of exercise was significantly higher(p=0.029). According to the BASP classification, there was no difference among basic type groups, but in female, M type was significantly associated with higher frequency of exercise(p=0.055). However, the frequency of exercise showed no statistically significant correlations, neither did the severity of AGA.
Conclusion: This is the first large-scaled study designed to analyze the association between exercise and alopecia. According to the result, the intensity and frequency of exercise was higherin alopecia patients, especially when it comes to mild exercise. Further study designed for pathophysiology is necessary.

P049

The Effects of Ultraviolet Radiation on Lipid Metabolism in Human Hair Follicles

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H. Chung: None. **L. Pi:** None. **S.T. Hwang:** None. **W. Lee:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain UV effect on lipid metabolism in hair follicles.

ABSTRACT:
Background: Lipids play important roles in the cell growth, differentiation, energy metabolism, signal transduction and structural components for cells.
Objective: In this study, we investigated the photo-degradation of hair lipid in human hair follicles.
Methods: Hair follicles were exposed to a single dose of UVB 20mjcm^{-2}(low-dose UVB), or 50mjcm^{-2}(high-dose UVB) as described previously, and lipid metabolism was observed.
Results: We observed that UV irradiation decreased the free fatty acid contents, but increased the ceramide contents. The expressions of genes related to lipid synthesis, including acetyl-CoA carboxylase (ACC), fatty acid synthase (FAS), stearoyl-CoA desaturase (SCD), and sterol regulatory element binding proteins (SREBPs) were also markedly decreased.
Conclusion: Our results suggest that hair lipid may play important roles in photoaging of human hair follicle.

P050

BMP Signalling and Sox2 in the Dermal Papilla Regulates the Hair Follicle Stem Cell Niche

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A*Star Institute of Medical Biology, Singapore, Singapore.

Carlos Clavel received his BS and MS in Biological Sciences from Saint Louis University in the US. He finished his PhD training in a Cell Therapy lab at the University of Navarra, Spain. He did his postdoctoral work in the lab of Dr. Catherine Verfaillie, Belgium. He subsequently joined Dr. Michael Rendl's laboratory at Mount Sinai School of Medicine in New York. Carlos has recently joined A*Star IMB in Singapore where he is starting up his own research group focusing on the regulation of the hair follicle stem cell niche and novel therapies for skin pigmentation disorders.

D. Quek: None. **J. Lim:** None. **C. Clavel:** None.

LEARNING OBJECTIVES:
To show how the dermal papilla regulates not only hair growth but also pigmentation. To show the importance of BMP signalling in the regulation of the melanocyte stem cell niche of the hair follicle.

ABSTRACT:
The Hair follicle melanocyte stem cell (SC) niche is the main melanocyte reservoir in the skin and a better understanding of the mechanisms regulating pigmentation is critical for designing novel therapy strategies for pigmentation disorders, which affect 1 in 3 people worldwide. How dermal papilla (DP) regulates the hair follicle (HF) stem cell niches remains unclear. Using novel genetic tools to study DP cells in the HF SC niche, we have recently shown how in the DP compartment the gene Sox2 is a key regulator of hair growth by controlling the BMP-mediated mesenchymal-epithelial crosstalk between the DP niche cells and the SC progeny. Now, we have identified a pigment switch in the pelage of DP-specific Sox2 knock down mice and observed abnormal BMP cell

signaling within the melanocyte compartment of the HF. This phenotype, suggests that Sox2 is also a master regulator of the melanocyte SC niche. In addition, new preliminary data in human skin biopsies indicates the presence of active BMP signaling at the Melanocyte SC compartment within the hair follicle. Finally, our novel in vitro data shows BMP regulation of melanogenesis, melanin transfer and migration in human melanocytes and keratinocyte co-cultures.

P051

Comorbidities Associated with Alopecia Areata

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Ruzica Conic is a medical student at Belgrade University School of Medicine in Belgrade, Serbia. She has pursued her research interests at the Cleveland Clinic where she has been extensively involved in the Cleveland Clinic Alopecia Registry.

R.Z. Conic: None. **R. Miller:** None. **W. Bergfeld:** None. **N. Atanaskova Mesinkovska:** None.

LEARNING OBJECTIVES:
To identify comorbid conditions associated with alopecia areata.

ABSTRACT:
Alopecia Areata(AA) is a common disease usually manifesting with round patchy non-scarring hair loss on scalp and body. Genome wide association studies have shown a possible link between AA and other conditions.
In this retrospective case-case control study, 584 patients diagnosed with AA were identified from the Cleveland Clinic alopecia registry in the period from 2005 to 2014. A control group of patients diagnosed with seborrheic dermatitis without any concomitant hair loss (n=172) was used for comparison. Data was collected on gender, age, and past medical history. Gender and age did not differ between the two groups. Eczema (14.20% vs 4.07% in control; p<0.001 OR 3.91 (95% CI 1.77-8.62)), thyroid disorders (18.80% vs 7.56%; p<0.001 Odds Ratio(OR) 2.84(95% CI 1.55-5.18)), vitamin D deficiency (39.0% vs 12.79%; p<0.001 OR 13.72 (95% CI 6.32-29.82)), and anemia (16.80% vs 7.56% p=0.0027 OR 2.45 (95%CI 1.34-4.49)) were positively associated with AA. Allergic rhinitis (17.12% vs 11.62%; p=0.083), asthma (13.5% vs 8.14%; p=0.0586), and difficulty sleeping (11% vs 9.3%; p=0.0936) trended towards a positive association with AA. Diabetes mellitus (3.6% vs 8.14%; p=0.0127 OR 0.42 (95%CI 0.21-0.85)) and irritable bowel syndrome (0.86% vs 4.07%; p=0.006 OR 0.22 (95% CI 0.07-0.70)) were negatively associated with AA.
Further investigations into positive and negative associations may give us additional insight into the pathophysiologic mechanism and new therapeutic options.

P052

The Presence of Hypopigmentation in Frontal Fibrosing Alopecia

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Ruzica Conic is a medical student at Belgrade University School of Medicine in Belgrade, Serbia. She has pursued her research interests at the Cleveland Clinic where she has been extensively involved in the Cleveland Clinic Alopecia Registry.

N. Atanaskova Mesinkovska: None. **R.Z. Conic:** None. **R. Bhalla:** None. **A. Kyei:** None. **M. Piliang:** None. **W. Bergfeld:** None.

LEARNING OBJECTIVES:
Investigate the etiology of hypopigmentation in frontal fibrosing alopecia.

ABSTRACT:
Frontal fibrosing alopecia (FFA) is a progressive scarring process characterized by symmetric, frontoparietal recession. Associated bilateral scalp hair loss involving the eyebrows is common. FFA is considered to be a variant of lichen planopilaris, primarily because of the shared histologic finding of lymphocytic inflammation localized around the upper portion of the hair follicle. Alopecic skin in FFA appears atrophic and hypopigmented, with exaggerated underlying vasculature. In our experience, these areas exhibit high-contrast hypopigmentation under a 365nm wavelength light source (Wood's lamp). This hypopigmentation frequently extends beyond the areas of hair loss, involving the adjacent scalp, forehead, and eyebrows.
To establish the nature of the observed pigment loss, we analyzed skin biopsies from patients with FFA (n=10) and compared the number of melanocytes in the epidermis with those of patients with normal scalp (n=5) and lichen planopilaris (n=5). Immunohistochemical stains for tyrosinase and melan A were utilized to identify melanocytes in the scalp biopsies. Biopsies from the atrophic areas in patients with FFA showed marked decrease of inter-follicular epidermal melanocytes (6.7 melanocytes/HPF) in comparison to normal controls (18 melanocytes/HPF) and patients with LPP (14 melanocytes/HPF).
We speculate that the melanocyte stem cells located in the hair follicle are destroyed in the inflammatory process. Whether this melanocyte loss is a simple bystander effect or a selective immunologic target remains to be determined.

P053

Alopecia Areata Universalis: Hair Regrowth with Fractioned CO2 Laser Therapy - Case Report.

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Dr. Marília Crisóstomo is a Board Certified Dermatologist and Trichologist dedicated to research and medical treatment of alopecia, hair disorders and Scalp diseases. Her practice is based in Fortaleza, Brazil, in a Medical Institute exclusively dedicated to medical and surgical baldness treatment, directed by Dr. Márcio Crisóstomo (Plastic Surgeon /American Board of Hair Restoration Surgery).

M.G. Crisostomo: None. **M.R. Crisostomo:** None. **M.C. Crisostomo:** None.

LEARNING OBJECTIVES:
- Report a hair regrowth case of Alopecia Areata Universalis with CO2 Fractioned Laser

ABSTRACT:
Alopecia Areata (AA) is a disease that affects 1-2% worldwide. Treatment is chosen depending on the severity, general health, duration and age. Alopecia Areata Universalis (AAU) is a form of AA involving hairloss over the entire body. It's difficult to treat, poor prognosis, high relapse and psychological stressing. Fractioned laser therapy (FLT) is a second-line therapy, making microscopic thermal columns, creating a healing process and also used as drug delivery.
We report a case of AAU hair regrowth with CO2 FLT and discuss the option as a treatment. 35 years old man, with AAU for 16 months after hypothyroidism. Dyslipidemia is an aggravanting problem. Treatment: monthly Ablative Fractioned CO2 Laser in low fluence and steroid topical lotion. Laser output set at 6-7w, density of 300-500µm and dwell time of 300ms (Stack 1). Treatment was tolerated with mild side effects (edema, erythema, burning). Initial hair growth after 3 months and complete regrowth after 1 year (Resistant area: occipital). No relapse during 2 years. Mechanism of FLT in AA may be: T-cell apoptosis, decrease in perifollicular lymphocytic infiltration (LI), healing process with LI, scatter perifollicular LI around lesions, minor trauma and wound healing. CO2 FLT can be an option to AAU treatment. Randomized controlled trials in more patients are required to confirm the efficacy and therapeutic parameters.

P054

Two-Center Open-Label Trial of Oral Tofacitinib in Patients with Severe, Recalcitrant Alopecia Areata

Milene Crispin, M.D.[1], Brittany G. Craiglow, M.D.[2], Justin Ko, M.D., M.B.A.[1], Anthony E. Oro, M.D., Ph.D.[2], Brett King, M.D., Ph.D.[2].
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Milène Crispin is a second year resident in Dermatology at the Stanford University School of Medicine. She received her Bachelor of Arts from Dartmouth College and her Doctorate of Medicine from Weill Cornell Medical College. Her clinical and research interests include the immunobiology of autoimmune and inflammatory diseases, as well as procedural dermatology.

M. Crispin: None. **B.G. Craiglow:** None. **J. Ko:** None. **A.E. Oro:** None. **B. King:** None.

LEARNING OBJECTIVES:
Understand the interim results of a study investigating the safety and efficacy of oral tofacitinib in patients with alopecia areata.

ABSTRACT:
Alopecia areata (AA) is a common autoimmune disease, with a lifetime risk around 2%. Recent therapeutic insights derive from the discovery that blockade of common signaling pathways downstream of cytokine receptors inhibit established AA. While treatment of a patient with the JAK3 inhibitor tofacitinib or three patients with the JAK1/2 inhibitor ruxolitinib induced inflammatory remission and hair regrowth, confirmation of efficacy and safety in larger scale studies is required. We present interim results of a two-center, open-label trial of the oral JAK3 inhibitor tofacitinib. We enrolled 70 patients to undergo treatment with oral tofacitinib 5 mg twice daily for three months. The participants had AA including patch stage with >50% scalp involvement in 16 (22.8%), totalis in 5 (7.1%), and universalis in 49 (70%). Median age was 37 years and median current episode was 9.6 years. At the time of abstract submission, 45% of patients completed the trial, with significant hair growth over three months in 75% of these patients. Responders included those with pre-treatment biopsies that included inflammatory infiltrates as well as those with no detectable infiltrates. Non-responders were more likely to have had alopecia universalis for twenty years or longer. Tofacitinib was well-tolerated without significant clinical or laboratory adverse events. Our interim results suggest Tofacitinib is a safe and efficacious therapy for the treatment of severe AA.

P055

Seborrheic Dermatitis: Clinical And Dermoscopic Aspects

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Since 1987 I work as a dermatologist in the Nigrisoli Hospital in Bologna.
Particularly intrested in dermoscopy, acne and hair diseases, I also perform aesthetic treatments

M. De Padova: None. **M. Iorizzo:** None.

LEARNING OBJECTIVES:
Dermoscopy can be useful in the diagnosis of the hair diseases and in evaluating the response to the treatment.

ABSTRACT:
Seborrheic dermatitis is a very common condition, an inflammatory chronic dermatosis affecting around 3% of the immunocompetent population. The incidence is even higher in immunocompromised patients, especially those affected by HIV (more than 50%). The disease presents itself as red, flaking, greasy-looking patches of skin that are

located most commonly on the scalp, naso-labial folds, eyebrows, ears and chest. Itching is often an accompanying symptom. It may be aggravated by changes in humidity, climate, drugs and emotional stress. Contrarly to body seborrheic dermatitis where is very easy to determine if the treatment prescribed has been successful, in scalp seborrheic dermatitis it is more difficult due to the presence of hair.
For this reason we report how the use of the dermoscope could be helpful not only in the diagnosis of the disease but also in evaluating the response to treatment. This instrument permits rapid, high-resolution viewing, together with the ability to capture the viewed images digitally and to store them for later use if connected to a camera. The pattern that makes the diagnosis of seborrheic dermatitis is arborizing vessels and atypical red vessels in the absence of red dots and globules. Scalp scaling is also present. All these features can also be utilized to determine a score of severity.

P056

Frontal Fibrosing Alopecia In Men: An Association With Leave-On Facial Cosmetics and Sunscreens

Arpita Debroy Kidambi[1], Kathy Dobson[1], Susan Holmes[2], Dawn Caruana[2], Veronique Del Marmol[3], Anja Vujovic[3], Manjit Kaur[4], Matthew Harries[5], Andrew Messenger[1].
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Arpita Debroy Kidambi is a final year trainee registrar in Sheffield Teaching Hospitals, United Kingdom.

A. Debroy Kidambi: None. **K. Dobson:** None. **S. Holmes:** None. **D. Caruana:** None. **V. Del Marmol:** None. **A. Vujovic:** None. **M. Kaur:** None. **M. Harries:** None. **A. Messenger:** None.

LEARNING OBJECTIVES:
Supports association between FFA and leave-on facial cosmetics. Sunscreens may also be linked as they are incorporated within facial moisturisers.

ABSTRACT:
The rapid increase in the incidence of frontal fibrosing alopecia (FFA) suggests it has an environmental cause. In a previous questionnaire study in women with FFA our results suggested an association with high levels of use of 'leave-on' cosmetic products.However these products are widely used by women, leading to poor discrimination between FFA and controls. We therefore repeated the questionnaire study in men, where the incidence of FFA is much lower but in whom we anticipated the population use of leave-on products would be less than in women. Nine men with FFA and 41 age-matched control subjects were recruited. All the men with FFA (100%) reported using facial moisturisers at least twice a week compared to 22% in the control group ($p<0.0001$). In addition 67% of men with FFA reported regular application of sunscreens during the summer or all year compared to 17% in the control group ($p<0.0001$). In our previous study in women the regular use of sunscreens by FFA subjects was also significantly greater than in controls (46% vs 24% $p<0.001$).
These results support an association between FFA and leave-on facial cosmetics and raise the possibility that sunscreen chemicals, which are incorporated in the formulation of many facial moisturisers, have a causative role.

P057

Treatment with Simvastatin Decreases pStat1 Levels and Reverses AA in the C3H/HeH Mouse Model

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Gina M. DelCanto is a graduate student working in the field of alopecia areata under the mentorship of Dr. Joaquin J. Jimenez, who has made significant contributions to the field of hair loss.

G.M. DelCanto: None. **V.A. Petit:** None. **A. Vila Granda:** None. **O. Alcazar:** None. **C.I. Perez:** None. **G.W. Elgart:** None. **L.A. Schachner:** None. **J.J. Jimenez:** None.

LEARNING OBJECTIVES:
At the end of the presentation, you will the effect of simvastatin treatment in alopecia areata.

ABSTRACT:
Alopecia areata (AA) is an autoimmune disorder characterized by T-cell infiltrate of the hair follicle. At present, there is no cure for AA, but JAK/STAT pathway inhibitors have recently shown considerable efficacy as treatment. We have shown previously that simvastatin, a lipid-lowering drug that has been suggested to modulate the JAK/STAT pathway in multiple cellular models, functions in combination with ezetimibe to reverse hair loss in a statistically significant number of AA patients. In this study, we examined the effects of topical simvastatin treatment on hair re-growth in the C3H/HeH mouse model. Mice with spontaneous alopecia areata received either a topical simvastatin or vehicle treatment daily for 12 weeks. Skin samples were taken from a selection of mice after 8 weeks of treatment. Samples were fixed and stained to visualize pSTAT1 and inflammatory cell infiltrate. Of the mice treated with simvastatin, 8/11 responded with hair re-growth, five completely and three only partially. No new hair growth was observed in untreated mice. Staining of skin sections revealed a relative decrease in both inflammatory cell infiltrate and levels of activated STAT1 in the skin of mice treated with simvastatin. These findings serve to highlight simvastatin as a possible treatment option for AA whose effect on alopecia areata may be mediated, at least in part, by modulation of the JAK/STAT signaling pathway.

P058

RTF-1: Characterization of its Main Components and Analysis of its Biological Effects on Hair Follicles

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2003 – MSc in Biochemistry and Molecular Biology (Autonomus University of Madrid, UAM, Spain)
2008 – PhD in Biochemistry (UAM, Spain)
2003-2004 – Researcher at Severo Ochoa Molecular Biology Center (Spain)
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2008-2014 – R&D Project Manager at Biomedical Research Center in Bioengineering, Biomaterials and Nanomedicine (CIBER-BBN, Spain). Head of Regenerative Medicine and Tissue Engineering Area
2011-2012 – Head of Traslational Research at CIBER-BBN.
2014- Present – Scientific Advisor at Industrial Farmacéutica Cantabria SA (Spain).

A. Delgado: None. **E. Sorbellini:** None. **F. Rinaldi:** None.

LEARNING OBJECTIVES:
Examine the recent advances and research outcomes of treatments for androgenetic alopecia and telogen effluvium.

ABSTRACT:
Colostrum is the first secretion of mammary glands after birth, representing a natural source of several factors that stimulate tissues turnover, regulate energetic metabolism and strengthen the immune system. Based on recent results, a new colostrum-derived cosmetic ingredient, RTF-1, may favor the renewal of hair follicles and may represent a useful natural ingredient against androgenetic alopecia (AGA). 40 hair follicles were collected from the occipital area of 10 healthy volunteers with AGA. We examined the effects of RTF1 following the standard protocol by Philpot, to evaluate its effects on the stimulation of hair growth in vitro. Hair shaft elongation was measured at 0,

24, 48, 72 and 96 hours. RTF-1 was applied by iontophoresis to 30 healthy volunteers with AGA degrees between 1 and 4 in the Hamilton scale. Subjects were randomized into 2 groups (placebo and RTF-1) and underwent 5 sessions of iontophoresis, 1 per week. Hair shaft diameter, hair density, follicle miniaturization were assessed at T0, T6 and T10 weeks. Additionally, pull and wash tests, and confocal microscopy evaluation were performed.
Our results show that RTF-1 significantly improves all the parameters evaluated, both in males and females, increasing hair diameter and hair density, and reducing the number of pulled-off or washed-off hairs when applied to AGA patients. Thus, RTF-1 could help in the management of AGA patients.

P059

Wharton Gel Complex: Rejuvenating Hair Follicles

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2014- Present – Scientific Advisor at Industrial Farmacéutica Cantabria SA (Spain).

A. Delgado: None. **E. Sorbellini:** None. **F. Rinaldi:** None.

LEARNING OBJECTIVES:
Examine the recent advances and research outcomes of treatments for androgenic alopecia.

ABSTRACT:
Androgenic alopecia (AGA) is the loss of hair mainly due to the action of dihydrotestosterone on its receptors in the hair follicle. We have recently developed Wharton Gel Complex® (WGC®), which is isolated from Wharton's jelly from the umbilical cord of pigs, constituting a unique mixture of growth factors. 180 hair follicles were collected from the occipital area of 15 healthy volunteers with AGA (males and females). We examined the effects of 2% and 10% WGC® following the standard protocol by Philpot, to evaluate its effects on the stimulation of hair growth in vitro. Hair shaft elongation was measured at 0, 24, 48, 72 and 96 hours.Additionally, WCG® was applied by iontophoresis to 28 healthy volunteers (22-47 years old) with AGA degrees between 1 and 4 in the Hamilton scale. Subjects were randomized into 2 groups (placebo and WGC®) and underwent 5 sessions of iontophoresis, 1 per week. Hair shaft diameter, hair density and hair traction resistance were evaluated at the beginning of the study and 90 days after the last session of iontophoresis.
Our results show that WGC® significantly promotes hair shaft elongation in vitro, while it increases hair diameter and hair density, and reduces the number of pulled-off hairs when applied by iontophoresis to AGA patients. Thus WGC® could provide a novel treatment for these patients.

P060

Human Long Term Deregulated Circadian Rhythm in Vvo Alters the Clonogenic Properties of Outer Root Sheath Cells

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L'Oreal R&I, Aulnay-sous-Bois, France.

Nathalie Deshayes obtained her Master degree in 2004 at Pierre and Marie Curie University of Sciences in Paris-France in the fields of bio-engineering and microbiology. She joined L'Oreal Company in the International Department of reconstructed skin to achieve her last year of training in the field of hair and skin stem cells. Since then she has been a research scientist at L'Oreal Research and Innovation in the Stem Cell lab currently leaded by Maryline Paris PhD Biological and Clinical Research Department) where her work focuses on deciphering hair and skin stem cells involvement during human aging process.

N. Deshayes: None. **G. Genty:** None. **A. Dimitrov:** None. **M. Paris:** None.

LEARNING OBJECTIVES:
To demonstrate the latest developments in research on hair follicle epidermal stem cell function and regulation by circadian oscillations.

ABSTRACT:
Humans epidermal stem cell function in vitro is regulated by circadian oscillations, the deregulation of which may contribute to skin aging. Circadian arrhythmia of hair follicle precursor cells (keratinocytes located in the outer root sheath, ORS) contributes to age-related hair cycling defect, in mice. Despite the well-described impact of circadian oscillation, involving a CLOCK gene pathway feedback loop, on keratinocyte function, little is known about changes in the clonogenic potential of human Hair Follicle keratinocytes (hHFK) after long-term alteration of the circadian rhythm in vivo. This study assessed the properties of hHFK through a CLOCK pathway alteration due to long-term regulated circadian rhythm. The physiological relevance of the study was validated. Using a 3D Spinning disk imaging approach on micro-dissected hHF, we demonstrated the expression of Per1 and Bmal1 (two CLOCK pathway proteins) in the upper and lower ORS. Comparing the CLOCK pathway protein expression and hHFK properties in two groups of women: shift and diurnal workers. Cell culture characterization, measurement of colony area and immunostaining were performed. We demonstrated that long-term circadian rhythm deregulation affected CLOCK pathway protein expression and was correlated with alteration in hHFK clone-forming efficiency. This study, for the first time in humans, provides evidence that in vivo alterations of the CLOCK gene pathway affect the clonogenic properties of hHFK and circadian protein expression.

P061

Using Mathematical Tools in the Investigation of Alopecia Areata Dynamics and Treatment Alternatives

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Atanaska Dobreva is a Ph.D. candidate in Mathematics at Florida State University in Tallahassee, FL. Her concentration is Biomedical Mathematics, and she is primarily interested in the investigation of the mechanisms of autoimmunity and immune privilege. Ms. Dobreva's dissertation research, directed by Dr. Nicholas G. Cogan, focuses on using mathematical modeling and analysis techniques to study the temporal and spatial dynamics of alopecia areata, an autoimmune disease causing hair loss. Ms. Dobreva received her Master of Science degree in Mathematics from Florida State University and her Bachelor of Arts degree from Marymount University in Arlington, Virginia.

A. Dobreva: None. **N.G. Cogan:** None.

LEARNING OBJECTIVES:
Explain the conceptual development of a spatio-temporal mathematical model for alopecia areata dynamics and the application of sensitivity analysis.

ABSTRACT:
Alopecia areata (AA) is an autoimmune disease which causes distinct patterns of hair loss. The mechanisms of AA development are still not completely understood, and treatment is difficult. Mathematical modeling and analysis can

be of great help in advancing the knowledge about disease dynamics as well as therapeutic strategies. In developing a mathematical model for AA, the goal is to create a system of dynamical equations that captures the interactions and events revealed by experiments but remains manageable for analysis. We will present the conceptual framework of our effort to model interactions between hair follicles and the immune system in light of the hair follicle immune privilege collapse hypothesis for AA pathogenesis. Our model aims to describe the qualitative features of temporal and spatial disease dynamics. Furthermore, we will show a possible way to incorporate transitions between the three main stages of the hair cycle: anagen, catagen, and telogen. In addition, we will discuss the use of global sensitivity analysis to assess the importance of individual model parameters as well as parameter combinations. Applying sensitivity analysis to the mathematical model for AA helps to not only reduce the parameter space but also to determine which model components have the greatest effect on disease development. So, the sensitivity analysis results could be used to focus the investigation of treatment options.

P062

Non-Invasive Evaluation of Forehead Skin in Normal Control Subjects and Patients with Frontal Fibrosing Alopecia: Tools to Assess Cutaneous Structure and Function

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E.M. Dodd: None. **M.K. Hordinsky:** None.

LEARNING OBJECTIVES:
Explain the use of non-invasive techniques to assess cutaneous structure and function in Frontal fibrosing alopecia (FFA).

ABSTRACT:
Frontal fibrosing alopecia (FFA) is a primary lymphocytic cicatricial alopecia characterized by progressive frontotemporal hairline recession that yields a band of pale, smooth, and atrophic-appearing skin. In many patients this process is associated with dysesthesias such as pruritus, pain or burning. We sought to evaluate and compare skin structure and function in this region of atrophic skin using non-invasive techniques. We enrolled 21 participants, eleven female patients with biopsy-proven FFA and ten unaffected, age, gender and skin type matched control subjects. Testing was performed adjacent to the mid-frontal hairline and on the mid-forehead in both groups. Extent of frontal hairline recession was evaluated with simple forehead measurements. High frequency ultrasonography was used to measure epidermal and dermal thickness and echographic density. Cutaneous nerve function was evaluated via automated Current Perception Threshold (CPT) testing and transepidermal water loss (TEWL) was measured using a closed-chamber TEWL meter. Analysis of ultrasound imaging revealed that the epidermis is thinner and with increased echographic density in affected patients versus controls. Subjects with FFA also exhibited lower current perception threshold values compared to unaffected counterparts. Finally, affected subjects had decreased TEWL values, potentially due to decreased water content in the stratum corneum as a result of the scarring process.

P063 – TBA

P064

Case Series of Central Centrifugal Cicatricial Alopecia in the Pediatric Population: A Report of 3 Cases

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A.N. Eginli: None. **N.C. Dlova:** None. **A. McMichael:** Advisory Board or Panel; Chair of Dermatology at Wake Forest Baptist Health, President of Skin of Color Society. Consultant; Galderma, Guthey Renker, eResearch Technology, Inc., Johnson & Johnson, Keranetics, Merck & Co., Inc., Merz Pharmaceuticals, Proctor & Gamble, Samumed, Incyte. Grants/Research Support; Allergan, Proctor & Gamble, Samumed. Other Financial or Material Support (royalties, patents, etc.); UptoDate, Informa Healthcare.

LEARNING OBJECTIVES:
Demonstrate the presence of CCCA in the pediatric population. Encourage physicans to look out of early signs of CCCA in children of affected patients.

ABSTRACT:
Central centrifugal cicatricial alopecia (CCCA) is a form of scaring alopecia that has been clinically recognized in African Americans for years now. True epidemiologic data regarding CCCA remains limited. Middle-aged women of African descent appear to be disproportionately affected by CCCA. To our knowledge, there are only two case series reporting CCCA in adolescents: one in an 11-year-old South African girl and the other in a 15-year-old boy of African descent. We present three biopsy-proven pediatrics cases of CCCA. The first is a16-year-old African-American girl with a 4 year history of hair loss involving the frontal and vertex scalp. The other two cases involve a 17-year-old and a 15-year-old South African male and female respectively, both with 2 years of painful papules on the vertex scalp. Examination revealed tender papules with isolated small areas of alopecia on dermoscopy. Notably, all three patients had natural virgin hair and a positive maternal history of CCCA. Pediatric cases of CCCA are rare and are likely misdiagnosed or underreported. The frequent absence of symptoms may delay diagnosis, resulting in progressive scarring of the scalp and worsening alopecia. Recognizing that CCCA can present in adolescence is of utmost importance in controlling disease progression and improving quality of life in these patients. Clinicians should check for early signs of CCCA in the offspring of affected patients.

P065

The Ovariectomized Mouse Model Mimics the Pathophysiology of Human Female Pattern Hair Loss

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2011- Life Science Research Laboratories, LION Corporation

Y. Endo: None. **M. Takahashi:** None. **Y. Obayashi:** None. **N. Aisawa:** None. **T. Serizawa:** None. **M. Murakoshi:** None. **M. Ohyama:** None.

LEARNING OBJECTIVES:
Demonstrate the useful tools for the development of therapeutic approaches of female pattern hair loss.

ABSTRACT:
Management of female pattern hair loss (FPHL) is often challenging, as its pathophysiology remains elusive and thus, treatment options supported by solid evidence are extremely limited. To better dissect the mechanism of FPHL, an animal model mimicking its pathophysiology would be essential. As the incidence of FPHL is relatively high in postmenopausal females, we hypothesized that the ovariectomized (OVX) mouse model recapitulating the state of

menopause may be useful as FPHL model. The purpose of this study is to evaluate the advantage of OVX mouse as the model for human FPHL. Morphometrical analyses revealed that OVX mice gradually showed dysregulated hair cycle and decease in hair density. Histopathological examination detected that total number of hair follicles remain unchanged, however, considerable number of hair follicles did not contain hair shafts, probably accounting for substantial decrease in hair density. These findings were analogous to those observed in human FPHL patients. In addition, these changes were enhanced by the acceleration of hair cycles by repeated hair plucking in OVX mice. Importantly, these phenotypes were improved by estradiol replacement to the mice. These findings suggested that OVX mouse mimics, at least in part, the pathophysiology of human FPHL and could provide useful tools for the development of therapeutic approaches.

P066

Excess Dietary Vitamin A Inhibits Anagen Initiation by Increasing Dermal Bone Morphogenetic Protein 4

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Dr. Everts obtained a PhD in Nutrition Science at The University of Georgia under the direction of Carolyn Berdanier, studying the role of vitamin A on mitochondrial function in diabetes. She gained additional expertise in vitamin A metabolism in a postdoctoral fellowship under the mentorship of David E. Ong at the Vanderbilt University Medical Center. Here she met Lloyd E. King, Jr. and John P. Sundberg, who trained her in hair and skin pathology. Dr. Everts is currently an Assistant Professor in the Department of Human Sciences (Human Nutrition) at The Ohio State University.

H.B. Everts: None. **J. Reu:** None. **J.P. Sundberg:** None. **L. Suo:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation you will be able to explain the effects of vitamin A on hair cycling.

ABSTRACT:
Precise levels of vitamin A are essential for the health of skin and hair. We found that dietary vitamin A impacts the severity of disease in the C57BL/6J (B6) mouse model of central centrifugal cicatricial alopecia (CCCA). Systemic retinoid therapy can also lead to alopecia. In addition to altering disease, we found that excess dietary vitamin A reduced the percent of hair follicles in anagen. We found that the retinoic acid (RA) synthesis proteins retinal dehydrogenase 2 (ALDH1A2) and cellular RA binding protein 2 (CRABP2), as well as RA degradation enzyme cytochrome p450 26B1 (CYP26B1), co-localized with bulge stem cell marker CD34 during telogen by immunofluorescence. These three proteins had different expression patterns during the two stages of telogen. We also found that B6 mice fed excess vitamin A had significantly more bone morphogenetic protein 4 (BMP4) positive cells in the dermis compared with the other two diet groups. Lowering dietary vitamin A in dams caused lower BMP4 expression, higher WNT7A (wingless-related MMTV integration site), beta catenin (CTNNB1) nuclear localization, and a higher percentage of anagen hair follicles in pups fed excess dietary vitamin A. This study is the first to provide evidence that excess dietary vitamin A inhibits anagen initiation through, at least partially, increasing dermal BMP4 expression.

P067

Dermoscopic and (Confocal) Microscopic Features of Chemotherapy-induced Alopecia

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She is coordinator in Memorandum of Understanding, for the collaboration between University of Miami and the University of Naples Federico II.

G. Fabbrocini: None. **M. Annunziata:** None. **L. Panariello:** None.

LEARNING OBJECTIVES:
You can recognize specific pattern of chemotherapy-induced alopecia and to distinguish it from other type of hair loss.

ABSTRACT:
The overall incidence of chemotherapy-induced hair loss is estimated to be 65%. The prevalence and severity of this type of hair loss are variable and related to the selected chemotherapeutic agent and treatment protocol. It is a consequence of direct toxic insult on the rapidly dividing cells of the hair follicle. Evidence exists suggesting that the hair follicle may respond to the same insult that is capable of stopping mitosis with both shedding patterns, i.e., dystrophic anagen effluvium and telogen effluvium. Accordingly, the hair may fall out very quickly in clumps or gradually. One of the factors that may influence the shedding pattern is the mitotic activity of the hair follicle at the moment of the insult. Generally, the hair loss is reversible, with hair regrowth typically occurring after a delay of 3 to 6 months. Permanent alopecia has also been reported, expecially after chemotherapy with busulfan and cyclophosphamide.
Actually there are no possibilities to predict the evolution of alopecia.The aim of our study has been to describe, through dermoscopy and confocal microscopy, specific features of chemotherapy-induced alopecia and to highlight features that could help clinicians in predicting its evolution. At the conclusion of the presentation, you will be able to recognize specific pattern of chemotherapy-induced alopecia and to distinguish it from other type of hair loss.

P068

MicroRNA Expression in Murine Skin at Different Stages of Hair Cycle: a Preliminary Study

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As a doctor and professor working in the First Affiliated Hospital of Nanjing Medical University.
As the Editor-in-Chief working for Journal of Clinical Dermatology

W. Fan: None. **Z. Li:** None. **W. Xu:** None.

LEARNING OBJECTIVES:
Seven microRNAs are identified in this study to be differentially expressed in murine skin between different stages of hair cycle

ABSTRACT:
Objective: To screen differentially expressed microRNAs at different stages of hair cycle in a murine model. Methods: This study included 30 inbred female C57BL/6 mice (age,6-8 weeks; body weight,15-18 grams).Hair growth cycle was induced in the back skin of C57BL/6 mice by application of wax/rosin followed by depilation under anesthesia witl 1% chloral hydrate.Three mice were sacrificed by cervical dislocation on day 0,8 and 20 after the induction, and skin tissue was achieved from the same depilated areas parallel to the spine.Total RNAs were extracted from the murine skin and subjected to microarray analysis of microRNA expression. Results: Compared with telogen skin,the murine anagen skin showed a higher expression of miR-690,obselote-49 and miR-1308,but a lower expression of miR-291a-5p and miR-212.The expressions of miR-690,obselote-49 and miR-31 were significantly up-regulated,while those of miR-127-3p and miR-212 were downregulated in the catagen skin in

comparison with the telogen skin. Conclusion: Seven microRNAs are identified in this study to be differentially expressed in murine skin between different stages of hair cycle,which may provide a direction for future research.

P069

Patient Support as a Psychosocial Therapeutic Intervention in Alopecia Areata

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Ronda Farah is Assistant Professor of Dermatology at the University of Minnesota Medical School in Minneapolis, MN. As Division Director of Medical Dermatology at Maple Grove, she specializes in medical, surgical and cosmetic dermatology. Dr. Farah completed dermatology residency at the University of Iowa Hospitals and Clinics in Iowa City, Iowa. Her professional interests include clinical research, teaching, patient safety, cosmetic dermatology and healthcare-related quality improvement. She is an active member of the American Academy of Dermatology as well as the North American Hair Research Society. Dr. Farah is dedicated to providing outstanding patient care in a personalized compassionate environment.

S. McFarland: None. **J. Hanson:** None. **H. Bemmels:** None. **M.K. Hordinsky:** None. **R.S. Farah:** None.

LEARNING OBJECTIVES:
1.Define the elements needed for successful social events for alopecia areata(AA) patients
2. Identify why AA patients attend social events

ABSTRACT:
In 2008, medical students and faculty from the University of Minnesota Medical School created an event known as the Alopecia Areata(AA) Bowling Social aiming to connect those with AA in the community. This annual event includes bowling, food, prizes, and resources for children and families affected by AA. In the seventh year of this program, we performed a 15-question survey of adult family members and parents of children with AA to assess event satisfaction and understand the elements that draw people to this event. The survey response rate was 83.3% (15/18). 100% of participants reported satisfaction with the event overall. Of the survey respondents, 93.3% were parents of an affected child. The majority (86.7%) indicated they attended the event to meet others with AA while 46.7% indicated they came to the event to support someone with AA. Our event marked the first outing for almost half of attendees. These findings suggest that some may view this event as a prime way to connect with others with AA in the community. This study also presents an important avenue for future research in special events for patients that could increase positive experiences for support group members more widely.

P070

Safety and Efficacy of Combined Intralesional Hyaluronic acid and Triamcinolone Acetonide 10mg/cc for the Treatment of Alopecia Areata

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R.S. Farah: Other Financial or Material Support (royalties, patents, etc.); Galderma investigator initiated grant. **C.E. Crutchfield:** None. **S. Lunos:** None. **R.S. Farah:** Grants/Research Support; Employed by Galderma

after participation in study. **M.K. Hordinsky:** Other Financial or Material Support (royalties, patents, etc.); Galderma Investigator initiated grant.

LEARNING OBJECTIVES:
-Understand the investigational use of dermal filler for alopecia areata in the scalp.
-Learn about the possibility of combination dermal filler and intralesional steroid us for treatment.
-Become familiar with reported side effects of dermal filler use in the scalp.

ABSTRACT:
Alopecia areata (AA) is a T-cell mediated disease which targets hair follicles and causes hair loss. Intralesional (IL) corticosteroids are a first-line therapy. We hypothesized that IL Restylane®, a hyaluronic acid high-molecular weight polysaccharide glycosaminoglycan, could maintain IL triamcinolone acetonide (TMC) concentrations at higher levels for a longer period, thus, providing a sustained anti-inflammatory effect which could potentially be associated with less clinic visits for IL injections. Ten subjects with extensive AA completed the study. At three visits, IL TMC 10mg/mL was injected into affected scalp. Restylane® was injected into affected scalp on one side only, prior to IL injections to the same sites. Disease severity was followed with the Alopecia Areata Half Head Severity Score (AAHHSS). Mean AAHHSS at visit one on the combination and IL steroid only sides were 87.64% (±11.39) and 86.43% (±12.42), respectively. Final visit combination and steroid only scores were 71.95% (±31.55) and 72.95% (±29.26), respectively. Paired t-tests were performed. Differences between visits were calculated and change from zero was obtained. Improvement in each group was seen (combination AAHHSS -17.75% ±23.36 and TMC 10mg/mL % only AAHHSS -12.75%±17.67). The combination treatment side demonstrated greater improvement, but was not statistically significant. After study completion, a trend for increased hair growth on the combination side was noted by the clinicians. Therefore, further long term studies are needed.

P071

Eyebrow Hair Transplant Surgery

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Graduated in 1988 from Royal College of Surgeons in Ireland. After general surgery training, in 1993, co-founded the Farjo Hair Institute in Manchester and London. Fellow, Ambassador & Past President of International Society of Hair Restoration Surgery, Past President & co-founder of the British Association of Hair Restoration Surgery, Diplomate & Past Board Director of the American Board of Hair Restoration Surgery, Fellow, Board Governor & Medical Director of the Institute of Trichologists, Fellow of the International College of Surgeons, Board Trustee of The Hair Foundation. Joint recipient of 2012 ISHRS Platinum Follicle Award for 'outstanding contribution to hair research'.

B. Farjo: None.

LEARNING OBJECTIVES:
To understand and learn the indications and application of hair transplant surgery in eyebrow and eyelash restoration

ABSTRACT:
Hair transplant surgery has become a mainstream procedure mainly for the treatment of hair loss on the scalp in both men and women. However, the techniques involved can also be adapted to restore hair to other areas such as the face and body.
One such area that has gained enormous appeal is the eyebrow, an important facial feature in the aesthetic image to both sexes. Women in particular are seeking such surgery as fashion trends change from thin and plucked eyebrows to today’s popular denser look. Many women plucked so much, that their eyebrows have more or less completely disappeared, and the image may be further complicated by unnatural -looking discolored micro-pigmentation. Of course, other indications for surgery include trauma and scarring from a variety of reasons.
Eyebrow hair transplantation requires even more meticulous attention to detail and sufficient understanding of not only what occurs naturally but also the different expectations of men and women. The author will draw on 22 years

experience in the hair transplant field to discuss the normal eyebrow structure, indications for restoration, and the fine details involved aesthetically and surgically in this process. A short video demonstration is also included.
We now know that eyebrow restoration was probably the very first indication for hair transplant surgery according to published accounts from Japan in the 1930's

P072

Asterisk Mark Hairs in Trichothiodystrophy: A New Trichoscopy Finding Depicting Hair Fragility

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Carolina Fechine, MD, was graduated in medicine from School of Medicine - State University of Ceara in 2010. Completed residency in Dermatology at the Dermatology Department at Hospital do Servidor Público Estadual de Sao Paulo in 2014. She completed a fellowship in stomatology and hair and nails diseases at University of Sao Paulo (FMUSP). Nowadays she is currently a research fellow at the Department of Dermatology, FMUSP.

C.O. Fechine: None. **A. Donati:** None. **N. Valente:** None. **R. Romiti:** None.

LEARNING OBJECTIVES:
To interpret new dermoscopy images in the setting of congenital disorders with increased hair fragility.

ABSTRACT:
Trichothiodystrophy (TTD) is a rare autosomal recessive neurocutaneous disorder in which hair abnormalities are key to diagnosis. Hair alterations include brittle hair, tiger tail banding, and decreased sulfur or cysteine content. We report a new trichoscopy sign observed in a case of TTD and discuss it in the context of hair shaft disorders with increased hair fragility.
A 12 years-old girl presented with brittle hair, short stature, dry body skin and freckles. Trichoscopy showed tortuous shafts, zigzag hairs, moderate inter-follicular scaling and distinctive broken hairs bent over themselves giving the appearance of an asterisk mark. Biochemical analysis of hair shafts showed a lower-than-normal sulfur content. Trichothiodystrophy displays a wide variety of clinical features, such as developmental and growth delay, ichthyosis, ocular abnormalities, infections and photosensitivity. Most specific hair abnormalities are tiger tail banding and decreased sulfur content of the shaft, but these may be absent in almost 30% of cases. Trichoscopy has been described as non-specific. Asterisk mark hairs are a distinctive trichoscopy finding, never before described. Increased hair fragility of the proximal shaft associated to skin xerosis are probably responsible for the observation of this finding in our TTD patient. The presence of asterisk mark hairs in other disease with hair fragility and skin scaling could be expected, but need to be confirmed.

P073

Lichen Planopilaris in Child: Case Report

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H.F. Goes: None. **M.R. Dias:** None. **C.S. Lima:** None. **S.A. Salles:** None. **L. Pantaleão:** None.

LEARNING OBJECTIVES:
-Report a rare case of lichen planopilaris in child

-Review the literature
-Discuss about treatment options

ABSTRACT:
Lichen planopilaris is a lymphocytic cicatricial alopecia, considered a follicular variant of lichen planus. It rarely affects children, with few reports in the literature in this population. We present a clinical case in a male patient of 15 years old, with two plates of atrophic alopecia at scalp. Dermoscopy showed perifollicular erythema and desquamation peripheral. The central areas were erythematous, bright, and there was absence of openings of follicular ostia. Biopsy was guided by the dermatoscope and histopathology was consistent with lichen planopilaris. There is not a defined protocol for the treatment of lichen planopilaris in children. Systemic drugs used in the treatment as hydroxychloroquine, corticosteroids, among others, due to their side effects should be initially avoided in this age group, with preference being given to potent topical corticosteroids and calcineurin inhibitors. Age must be considered when making the option more aggressive systemic treatment, however, the fact of alopecia be scarring and permanent, it is necessary rapid disease control. Our patient was instructed to apply clobetasol propionate and he is in regular outpatient treatment. It is important that cases of infant lichen planopilaris are reported to better understand the disease and establish a treatment protocol in childhood.

P074

Modulating Effects of Calcium-Pantothenate, L-Cystin and Millet Seed Extract on Functional and Regulatory Growth Parameters in Human Hair Follicles in Vitro

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T.W. Fischer: Grants/Research Support; Yes.

LEARNING OBJECTIVES:
Understand the modulating effects of Ca-Pantothenat, L-Cystin and Millet seed extract on functional/regulatory parameters of human hair growth in vitro.

ABSTRACT:
On the search for hair stimulatory substances, three compounds which supposedly have positive effects on key parameters of hair growth function and regulation were investigated in the human hair organ culture model in vitro. The three compounds were: Calcium-Pantothenat, a member of the vitamin B complex, L-Cystin, an aliphatic amino acid contained in keratin and Millet seed extract with the lead substance miliacin.
It was shown that hair shaft elongation and anagen hair rate was enhanced, while catagen hair rate was reduced (not

in L-Cystin treated HF). Proliferation (Ki67-positive matrix keratinocytes) was enhanced by Ca-Pantothenat and L-Cystin, while Millet seed extract showed rather suppression. The growth factor IGF-1 was stimulated by L-Cystin and Millet seed extract, while Ca-Pantothenat suppressed IGF-1 expression. The catagen inducer TGF-β2 was suppressed by Ca-Pantothenat, enhanced by L-Cystin and partly suppressed or enhanced by Millet extract at the concentration 10 µg/ml or 20 µg/ml, respectively. Finally, the progenitor cell marker CK15 (stem cell marker) was rather suppressed by Ca-Pantothenat and L-Cystin, but significantly enhanced by Millet extract. No cytotoxicity of the three substances was observed in the LDH-assay.
This in vitro investigation of Calcium-Pantothenat L-Cystin and Millet seed extract is the first study of these three substances showing modulatory effects in human hair follicles on a comprehensive spectrum of different markers relevant in hair biology.

P075

Frontal Fibrosing Alopecia and Concomitant Lichen Planus Pigmentosus: a Case Series

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Jacqueline was born and raised near Dayton, Ohio. She received a Bachelor of Science degree in Allied Health Professions, with a major in medical dietetics, from The Ohio State University in Columbus, Ohio. She worked as a Registered Dietitian before attending medical school at Ohio University Heritage College of Osteopathic Medicine. She is currently a dermatology resident at LewisGale Hospital Montgomery in Blacksburg, Virginia. Through her dermatology residency, she has the pleasure and privilege to work with Dr. Amy McMichael at Wake Forest Baptist Medical Center and is excited about receiving this opportunity to further research and education on alopecia.

J.C. Fisher: None. **E.H. Dothard:** None. **A.J. McMichael:** Consultant; Allergan, eResearch Technology, Inc., Galderma, Guthy Renker, Johnson & Johnson, Keranetics, Merck & Co., Inc., Merz Pharmaceuticals, Proctor & Gamble, Samumed, Incyte. Grants/Research Support; Allergan, Proctor & Gamble, Samumed. Other Financial or Material Support (royalties, patents, etc.); UpToDate, Informa Healthcare.

LEARNING OBJECTIVES:
Recognize associations between frontal fibrosing alopecia and lichen planus pigmentosus

ABSTRACT:
Frontal fibrosing alopecia (FFA) is a lymphocyte-mediated cicatricial alopecia characterized by progressive recession of the frontotemporal hairline often with loss of the eyebrows. FFA was first described in 1994 by Kossard as a rare variant of lichen planopilaris and was believed to affect mostly postmenopausal Caucasian women. Lichen planus pigmentosus (LPPigm) is an uncommon variant of lichen planus affecting primarily those individuals with Fitzpatrick skin phototypes III-V. LPPigm presents as slate gray to brown macules in either sun-exposed or flexural areas. The findings of FFA with concomitant LPPigm is rare as a current literature search yields only a few case reports and one recent case series by Dlova conducted in South Africa. Dlova proposes the hypothesis that FFA and LPPigm are on the same spectrum of disease and LPPigm may predict the future development of FFA in those patients. Given the known association between FFA and lichen planus, and seemingly LPPigm, it is important to characterize this relationship further. We present a retrospective case series of seven African American females with FFA, a rare but increasingly prevalent form of cicatricial alopecia, and concomitant LPPigm. To the best of our knowledge, this is the first case series reported in the United States of FFA and concomitant LPPigm in exclusively African Americans.

P076

Low Level Laser Therapy in Scarring Alopecia

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Dr. Shani Francis is a hair loss enthusiast who serves as the founding director of the Hair Disorders Center of Excellence at Northshore University HealthSystem, Section of Dermatology. She also holds an appointment as Clinical Assistant Professor at the University of Chicago, Pritzker School of Medicine. In her spare time, she enjoys reading, traveling, and spending time with her husband and children in the Chicagoland area. Her lifetime goal is to travel to every continent; she has currently traveled to 4 continents, but hopes to broaden this in the near future.

S. Francis: None.

LEARNING OBJECTIVES:
To explore the use of low level laser therapy in the treatment of scarring alopecia.

ABSTRACT:
Introduction: The use of low-level laser therapy (LLLT) as a helpful adjunct to wound healing has been demonstrated in animal and clinical models. The efficacy of LLLT for non-scarring alopecia has also been established. Scarring alopecia is characterized by the destruction (or wounding) of the bulge region of the hair follicle, typically via inflammatory mechanisms. There is a paucity of data exploring the relationship of LLLT in scarring alopecia.
Objective: To evaluate the use of LLLT as treatment adjunct in the clinical management of primary scarring alopecia.
Patients/Methods: This study is a proof of concept retrospective analysis of adult female patients attending a community-based Hair Disorders Clinic with biopsy-proven diagnosis of primary cicatricial alopecia. Photographs of self-selected patients were taken at baseline and at least 6 months after use of LLLT in addition to their other treatments including topical and intralesional steroids, minoxidil, and systemic anti-inflammatory agents. Photographs were evaluated for severity of hair loss in a blinded fashion at baseline and at study endpoint. Patients were surveyed for overall satisfaction with hair appearance and treatment regimen.
Results: to be presented.
Conclusion: Cicatricial alopecia management is difficult due to limited success and few treatment options. The evolving role of LLLT in scarring alopecia should be further studied as a potentially helpful adjunct in the clinical management of cicatricial alopecia.

P077

Frontal Fibrosing Alopecia Etiology: Do Environmental and Behavioral Factors Play a Role?

Camila Fátima B Gavioli, MD[1], Priscila Ramos Lóta[2], Anne Melina Ambrósio Avelar[2], Cláudia Kimie Suemoto[2], Aline Donati[2], Neusa Yuriko Sakai Valente[2], Ricardo Romiti[2].
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Camila Fátima Biancardi Gavioli, MD, has completed her residency in Dermatology at the Department of Dermatology of Medical School of University of Sao Paulo (FMUSP) in 2015. Currently, she is a fellow at the Hair Diseases Unit at FMUSP and research fellow at the Department of Dermatology, FMUSP.

C.F. Gavioli: None. **P.R. Lóta:** None. **A.A. Avelar:** None. **C.K. Suemoto:** None. **A. Donati:** None. **N.Y. Valente:** None. **R. Romiti:** None.

LEARNING OBJECTIVES:
Demonstrate a possible association of medical variables and cosmetic behaviors with frontal fibrosing alopecia, through a case-control study.

ABSTRACT:
Increasing worldwide incidence of frontal fibrosing alopecia (FFA) raises the question of a possible involvement of environmental and behavioral changes in disease etiology. To evaluate this hypothesis, we performed a case-control

study with 51 FFA patients and 51 age and sex-matched controls. A questionnaire was developed to investigate factors previously associated with FFA as well as cosmetic use behaviors and reactions that had never been investigated before.No previously associated factors (post-menopause, smoking status, autoimmune comorbidities) showed statistical significance in our study, suggesting they might be related to age and sex of FFA population. A weak association cannot be completely ruled out due to our small sample size. Concerning newly investigated cosmetic variables, even though exposure of FFA patients to products or procedures did not differ from controls, FFA patients referred a greater incidence of cosmetic-induced dermatitis ($p<0.0001$) - defined as any allergic or irritant skin reaction after exposure to any cosmetic product. Reactions on the face ($p=0.039$) and over the body ($p=0.0032$) skin were more frequent in FFA patients. This is the first time a possible link between FFA and cosmetic allergic or irritant reaction is suggested. The possibility of cosmetic products as trigger in FFA could explain some particularities of the disease such as its increasing incidence, female preponderance and facial skin involvement (papules and lichen planus pigmentosus).

P078

Minoxidil Dose Response Study in Females Identified with IVD Testing as Non-Responders to 5% Topical Minoxidil

Andy Goren, MD[1], John McCoy[1], Janet Roberts[2], Nisha Desai[2], Sharon Keene[3].
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Prof. Andy Goren has over 15 years of experience in research, development and launch of breakthrough medical technologies. Among the list of many firsts in dermatology, Prof. Goren was the first to develop a clinical genetic test for predicting androgenetic alopecia and the first to discover epigenetic markers predicting anti-androgen therapy response in female androgenetic alopecia. Prof. Goren currently serves as a Professor of Dermatology at the University of Rome "G.Marconi", Italy. He is a member of several dermatology societies, a scientific reviewer for Dermatologic Therapy, and a lecturer in several international dermatology societies.

A. Goren: Salary, Contractual Services; Salary. **J. McCoy:** Salary, Contractual Services; Salary. **J. Roberts:** None. **N. Desai:** None. **S. Keene:** None.

LEARNING OBJECTIVES:
Compare the efficacy of increased minoxidil dosages.

ABSTRACT:
5% topical minoxidil is the maximum dosage approved by the US FDA for the treatment of female androgenetic alopecia (AGA). While topical minoxidil exhibits a good safety profile, the efficacy in the overall population is relatively low i.e., 30-40% re-grow hair following 24 weeks of treatment.
Minoxidil is a prodrug. To elicit a clinical response, minoxidil must be converted to its active form, minoxidil sulfate, by a sulfotransferase enzyme found in the hair follicle. We have developed an in-vitro diagnostic test that correctly identifies, prior to initiating therapy, 95.9% of non-responders to 5% topical minoxidil. The diagnostic test assays the sulfotransferase enzymatic activity in hair follicles to determine if a sufficient amount of minoxidil will be converted to the active form required to induce hair growth. Patients with low enzymatic activity experience little or no therapeutic benefit and concomitantly a reduced frequency of adverse events.
We hypothesized that in patients with low enzymatic activity an increased minoxidil dosage will elicit a therapeutic response with little or no increase in the frequency of adverse events. It is thus the primary purpose of this study to identify the optimal safe topical minoxidil dosage (above 5%) that will yield the largest conversion of non-responders to responders in a population of female AGA patients identified a priori as non-responders to 5% topical minoxidil.

P079

Minoxidil Response Testing in Females with Androgenetic Alopecia: A 24 Week Multi-Center Prospective Study

Andy Goren, MD[1], John McCoy[1], Janet Roberts[2], Nisha Desai[2], Sharon Keene[3].
[1]Applied Biology, Inc., Irvine, CA, USA, [2]Northwest Dermatology & Research Center, Portland, OR, USA, [3]Physician's Hair Institute, Tucson, AZ, USA.

Prof. Andy Goren has over 15 years of experience in research, development and launch of breakthrough medical technologies. Among the list of many firsts in dermatology, Prof. Goren was the first to develop a clinical genetic test for predicting androgenetic alopecia and the first to discover epigenetic markers predicting anti-androgen therapy response in female androgenetic alopecia. Prof. Goren currently serves as a Professor of Dermatology at the University of Rome "G.Marconi", Italy. He is a member of several dermatology societies, a scientific reviewer for Dermatologic Therapy, and a lecturer in several international dermatology societies.

A. Goren: Salary, Contractual Services; Salary. **J. McCoy:** Salary, Contractual Services; Salary. **J. Roberts:** None. **N. Desai:** None. **S. Keene:** None.

LEARNING OBJECTIVES:
Relate the clinical response to minoxidil to sulfotransferase enzyme activity in the hair follicle.

ABSTRACT:
Topical minoxidil is the only US FDA approved drug used for the treatment of female androgenetic alopecia (AGA). Recently the US FDA approved 5% minoxidil foam for women. While the 5% topical foam addresses some of the shortcomings of the 2% solution, the efficacy of the new 5% minoxidil foam remains low i.e., 30-40% of patients re-grow hair.
Minoxidil is a prodrug converted in the scalp to its active form, minoxidil sulfate, by the sulfotransferase enzyme SULT1A1. The enzyme expression is variable among individuals. In several retrospective pilot studies, we have demonstrated the ability of the SULT1A1 enzymatic assay to accurately identify non-responders to topical minoxidil based on global photographic assessment.
Here we report the results of a 24 week multi-center prospective study of 5% minoxidil foam using target area hair count (TAHC) as the primary clinical endpoint. This is the first prospective study demonstrating that the SULT1A1 enzymatic test predicts with high confidence patients that are likely not to benefit from 5% topical minoxidil therapy based on mean change in TAHC from baseline. Further, the study demonstrated a high concordance between mean change in hair counts and global photographic assessment in patients deemed non-responders by the test.

P080

α1-AR Agonist Induced Piloerection Protects Against the Development of Traction Alopecia

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Prof. Goren has over 15 years of experience in research, development and launch of breakthrough medical technologies.
Among the list of many firsts in dermatology, Prof. Goren was the first to develop a clinical genetic test for predicting androgenetic alopecia, the first to discover epigenetic markers predicting anti-androgen therapy response in female androgenetic alopecia, the first to develop a clinical acne vulgaris antibiotic response test based on P. Acnes bacterial genomics, and the first to develop a rapid test for predicting minoxidil response in androgenetic alopecia.

J. McCoy: None. **A. Goren:** None. **M. Kovacevic:** None. **J. Shapiro:** None.

LEARNING OBJECTIVES:
Illustrate and examine the recent advances and research outcomes of a novel treatment for traction alopecia.

ABSTRACT:
Traction alopecia affects a large number of women undergoing cosmetic hair procedures, such as, blow drying, flat ironing, braiding, ponytails, hair extensions, and repeated brushing. Traction alopecia develops from the force applied to hair follicles during mechanical procedures. Each hair follicle in the human scalp contains an arrector pili muscle that, when contracted, erects the hair. The smooth muscle in the arrector pili expresses α1 adrenergic receptors (α1-AR). As such, we hypothesized that contraction of the arrector pili muscle via an α1-AR agonist would increase the threshold of force required to pluck hair during cosmetic procedures. Female subjects, ages 18-40, were recruited to study the effect of topically applied phenylephrine, a selective α1-AR agonist, on epilation force and hair loss during cosmetic procedures. In our blinded study, 80% of subjects demonstrated reduced hair loss on days using phenylephrine compared to days using a placebo solution. The average reduction in hair loss was approximately 44%. In addition, the force threshold required for epilation increased by approximately 172% following topical phenylephrine application. To our knowledge this is the first study demonstrating the utility of α1-AR agonists in the treatment of traction alopecia and excessive hair loss resulting from cosmetic procedures.

P081

Release of Hair Growth Regulatory Factors by Hair Follicle Stem Cells When Cultured in Four Different Culture Media: A Preliminary Study

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Tharini Gunawardena, is a current PhD student under the University of Malaya, Faculty of Dentistry. Her postgraduate research focuses on hair growth studies utilizing stem cell conditioned media. She completed her Master of Science, specializing in Biotechnology in 2011 from University of Leeds, United Kingdom and received her Bachelor of science degree in 2009, from Bangalore University, India. The area of research interest involves in evaluating the potential of stem cell conditioned media for regenerative therapy. She is also a member of the Sri Lanka Association for the Advancement of Science (SLASS), medical, dental and veterinary science division, Sri Lanka.

T.N. Gunawardena: None. **S.T. Ramasamy:** None. **M.T. Rahman:** None. **H.N. Abu Kasim:** Grants/Research Support; University of Malaya, High Impact Research-Ministry of Higher Education, Malaysia UM.C/HIR/MOHE/DENT/01.

LEARNING OBJECTIVES:
To identify different hair growth regulatory factors secreted by hair follicle stem cells when cultured under different culture media conditions.

ABSTRACT:
Stem cell conditioned media is widely studied for its therapeutic application for regenerative purposes. This study aims to compare the release of both positive and negative hair growth regulatory factors secreted by hair follicle stem cells(HFSC) when cultured in media combinations of DMEM-KO as basal media and chemically defined STK2 media, namely; 1)DMEM-KO+10%FBS, 2)DMEM-KO+10%FBS+bFGF, 3)STK2+2%FBS and 4)STK2- under serum free condition. Three positive(VEGF-A,HGF,PDGF-bb) and five negative(IL-1a,IL-1b,TGF-α,TGF-β,bFGF) hair growth regulatory factors were plexed in a multiplex immunoassay combined with 34 cytokines that were reported to be secreted by stem cells. The secretomes were analyzed using Procata® Immunoassay from Affymetrix. Positive hair growth regulatory factor VEGF-A, was found to be secreted in similar quantities in all

media(1071.9-2946.9pg/ml). HGF was detected in large quantity in STK2+2%FBS media(704.9-827.6pg/ml), moderate in STK2(232.7-257.2pg/ml) and low in DMEM-KO+10%FBS(14.9-29.8pg/ml) and DMEM-KO+10%FBS+bFGF(not detectable-23.3pg/ml). However, PDGF-bb was secreted in STK2(not detectable-179pg/ml). The negative hair regulatory factors IL-1a was detected in DMEM-KO+10%FBS(5.6-7.8pg/ml), DMEM-KO+10%FBS+bFGF(0.1-1.3pg/ml) and STK2(7.8-15.5pg/ml), TGFα in DMEM-KO+10%FBS(not detectable-0.55pg/ml) and STK2(0.2-2.2pg/ml), and IL-1b in DMEM-KO+10%FBS(0.2-0.4pg/ml). TGF-β and bFGF secretions were not detectable in any media. The current findings suggest that STK2 when combined with 2%FBS released only hair growth stimulatory factors and that STK2 based HFSC conditioned media may act as a promising candidate for hair regeneration. However, further studies are required to be conducted in order to validate this recommendation.

P082

Nrf2 Regulates Glutathione Homeostasis Pathways in Human Hair Follicles

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Dr Iain Haslam has worked with Professor Ralf Paus in the Centre for Dermatology Research at the University of Manchester since 2011. Since joining the Paus lab, he has worked on defining the role of Nrf2 in the hair follicle, investigating how this transcription factor can modulate inflammatory and oxidative stress. He has also introduced a new field of research into the lab, specifically the role of ABC transporter proteins in hair follicle biology. The focus of this research is centred around protection against chemotherapy-induced alopecia, a psychologically traumatic side-effect of cancer therapy.

I. Haslam: None. **L. Jadkauskaite:** None. **J. Mustermann:** None. **R. Bhogal:** None. **G. Jenkins:** None. **R. Paus:** None.

LEARNING OBJECTIVES:
Explain the role of Nrf2 in regulating oxidative stress and the implications of modulating its activity in human hair follicles.

ABSTRACT:

Recent evidence has highlighted a potential role for oxidative stress in the pathogenesis of androgenetic alopecia, with dermal papilla cells from balding scalp showing altered glutathione (GSH) levels and a higher susceptibility to reactive oxygen species (ROS). Extended periods of oxidative stress reduce free GSH, which can activate apoptotic pathways. As GSH homeostasis can be controlled by the redox regulating transcription factor Nrf2, we sought to determine the impact of Nrf2 activation in the human hair follicle (HF) and primary outer root sheath keratinocytes (ORSKs). An Nrf2 activator (sulforaphane; SFN) increased expression of glutathione reductase (GSR), glutamate-cysteine ligase (GCLM and GCLC) and the GSH efflux pump ABCC1, whereas siRNA knockdown of Nrf2 reduced these transcript levels. Nrf2 knockdown truncated the ability of SFN to upregulate all genes. Treatment of HFs and ORSKs with H_2O_2 resulted in lower levels of GSH, which was not prevented by pre-treatment with SFN. This may result from the conjugation and efflux of SFN via ABCC1, which may also deplete GSH levels. These results indicate that Nrf2 regulates genes involved in GSH synthesis, recycling and efflux in human HFs. The functional impact of Nrf2 regulation of GSH homeostasis deserves further exploration as a potential novel pathway for regulating HF ageing and response to redox stress.

P083

Shh Signaling Regulates the Damage Response of Murine and Human Hair Follicles in Chemotherapy-induced Alopecia

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Dr Iain Haslam has worked with Professor Ralf Paus in the Centre for Dermatology Research at the University of Manchester since 2011. Since joining the Paus lab, he has worked on defining the role of Nrf2 in the hair follicle, investigating how this transcription factor can modulate inflammatory and oxidative stress. He has also introduced a new field of research into the lab, specifically the role of ABC transporter proteins in hair follicle biology. The focus of this research is centred around protection against chemotherapy-induced alopecia, a psychologically traumatic side-effect of cancer therapy.

I. Haslam: None. **G. Xie:** None. **Z. Xue:** None. **H. Han:** None. **Y. Zhou:** None. **Y. Sun:** None. **R. Paus:** None. **Z. Yue:** None.

LEARNING OBJECTIVES:
Demonstrate the impact of chemotherapy on Shh signaling in the hair follicle.

ABSTRACT:
Traditionally, chemotherapy-induced alopecia (CIA) is considered to be a consequence of the pan-antimitotic toxicity of chemotherapeutic agents. Previous work emphasized the critical role of p53-mediated apoptosis in the pathogenesis of CIA. Recent work shows that, in the feather follicle, a sonic hedgehog (Shh)-dependent mechanism also contributes to chemotherapy-induced tissue damage. Therefore, we have investigated the role of the Shh pathway in CIA in mice and humans. Through whole genome expression profiling analysis, we show that, in the best-studied murine CIA model (C57BL/6 mice), Shh signaling is significantly down-regulated during the early response, within 24 hours of treatment. Disruption of Shh signaling by cyclopamine recapitulated key features of CIA, while supplementation with exogenous Shh protein partially prevented chemotherapy-induced hair loss. Using organ cultured human hair follicles, we show that chemotherapeutic agents (4-hydroxycyclophosphamide and doxorubicin) also down-regulated genes in the Shh pathway. In addition, qRT-PCR analysis of plucked hair follicles from patients under demonstrated consistent downregulation of SHH gene expression in response to several chemotherapy regimens. We propose that down-regulation of Shh signaling plays a significant role in the pathogenesis of CIA, and provides an important novel target for future management of the disease. This raises the question of whether downregulation of Shh signaling is a common pathomechanism of chemotherapy-induced adverse effects such as hemocystitis, infertility, memory loss and GI syndromes.

P084

Ectopic Growth of Hair on the Nude Mouse Spinal Cord After Transplantation of Gelfoam® Histocultured Whisker Follicles

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Robert M. Hoffman received his PhD from Harvard University in 1971. He received his post-doc training at Harvard Medical School and the Shemyakin Institute for Bioorganic Chemistry, Moscow. Hoffman has been a member of the faculty of the UCSD Medical School since 1979 where he is a Professor of Surgery.

W. Cao: None. **L. Li:** None. **S. Mii:** None. **Y. Amoh:** None. **F. Liu:** None. **R.M. Hoffman:** None.

LEARNING OBJECTIVES:
Transplantation of long-term histocultured whisker follicles enable extensive hair shaft growth in vitro and after transplantation to the injured spine.

ABSTRACT:
We have applied Gelfoam® histoculture to mouse whisker follicles from nestin-driven green fluorescent protein (ND-GFP) transgenic mice. The histocultured whisker follicles demonstrated continuous elongation of pigmented and unpigmented hair shafts. Hair shaft length increased significantly by day-4 and continued growing until day-9 after which the hair shaft length was constant. By day-63 in histoculture, the number of ND-GFP hair follicle stem cells increased significantly. After Gelfoam® histoculture of ND-GFP-expressing whiskers for 3 weeks, the elongated hair shaft was cut off, and the remaining part of the whisker follicle, with increased GFP-nestin expressing pluripotent stem cells, was transplanted along with the Gelfoam® into the injured spinal cord of nude mice. After 90 days, the mice was sacrificed and the spinal cord lesion was observed to have healed. ND-GFP expression was intense as observed by fluorescence microscopy demonstrating that the hair follicle stem cells healed the spinal cord. To our surprise, the transplanted whisker follicles sprouted out remarkably long hair shafts in the spinal cord during the 90 days after transplantataion of Gelfoam® whisker histocultures. The pigmented hair fibers grown from the transplanted whisker histocultures curved and enclosed the spinal cord. The unanticipated results demonstrated the great potential of hair growth after Gelfoam® hair follicle histoculture in vitro and in vivo, even at an ectopic site.

P085

Long-Term Gelfoam® Whisker Follicle Histocultures Promote Recovery of Severed Peripheral Nerves and the Spinal Cord When Transplanted to the Injury Site

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Robert M. Hoffman received his PhD from Harvard University in 1971. He received his post-doc training at Harvard Medical School and the Shemyakin Institute for Bioorganic Chemistry, Moscow. Hoffman has been a member of the faculty of the UCSD Medical School since 1979 where he is a Professor of Surgery.

W. Cao: None. **L. Li:** None. **S. Mii:** None. **Y. Amoh:** None. **F. Liu:** None. **R.M. Hoffman:** None.

LEARNING OBJECTIVES:
Long-term Gelfoam® histocultured hair follicle pluripotent stem cells can be used for peripheral nerve and spinal cord repair.

ABSTRACT:
In order to increase the efficacy of hair follicle pluripotent stem cells for nerve and spinal cord regeneration, Gelfoam® mouse whisker follicle histocultures, in which the hair-follicle sensory nerve is growing from nestin-expressing stem cells, were transplanted to the injury site of the severed sciatic nerve and spinal cord of nude mice. Nestin driven-green fluorescent protein (ND-GFP)-expressing mouse-whisker hair follicles, histocultured for 3 weeks on Gelfoam®, were transplanted along with the Gelfoam® as a scaffold, at the injury site of transected sciatic nerves in nude mice. Within 2 weeks after Gelfoam® whisker histoculture transplantation, the sciatic nerve regained function, determined by a walking track analysis footprint test. Furthermore, balance walking on a narrow cylinder at 10 weeks after transaction, showed that whisker follicle Gelfoam® histoculture transplantation conferred better body balance and locomotion than comtrol mice, which had frequent limping and poor balance. Whisker follicle-Gelfoam® histocultures were also transplanted to mice with partial spinal cord severence at T-10. Whisker follicle-Gelfoam® histocultures transplantation achieved significantly greater locomotor recovery than control animals, as measured by Basso Mouse Scale (BMS) quantitative walking analysis. These results suggest that transplantation of Gelfoam® histocultures of whisker follicles promote perpherial nerve and spinal cord regeneration. Gelfoam® histoculture of hair follicles provides an accessible, effective, stem-cell scaffold for nerve and spinal cord injury repair and regeneration.

P086

Diagnosing and Managing the Painful, Burning Scalp.

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Maria K. Hordinsky, M.D. is Chair of the Department of Dermatology at the University of Minnesota. She is the Chair of the Clinical Research Advisory Council of the National Alopecia Areata Foundation and is a member of the Board of Directors of the Cicatricial Alopecia Research Foundation. Dr. Hordinsky is the current Secretary Treasurer of the North American Hair Research Society and is the Section Editor for hair diseases in UpToDate. She has been a mentor to many medical students, residents and faculty who have come to spend time with her to learn about hair diseases and neurodermatology.

M. Hordinsky: None. **G. Crabb:** None. **B. McAdams:** None. **W. Kennedy:** None.

LEARNING OBJECTIVES:
Explain application of a technology to improve the treatment of patients with a symptomatic scalp.

ABSTRACT:
Managing the patient with a painful or burning scalp is difficult. In this study, 12 patients referred to the University of Minnesota Hair Disease Clinic with localized or diffuse scalp symptoms underwent 4-mm scalp biopsies of affected and unaffected scalp. Samples were drop-fixed both formalin as well as Zamboni's fixative for 24 hours, transferred to cryopreservative, sectioned and incubated with primary antibodies to (1) protein gene product 9.5 (AbD Serotec), Tryptase, SP, CGRP (Chemicon Intl.), and Collagen IV (Southern Biotech). ENFs/mm were counted using Neurolucida 5.05.4 Tracing Software (MBF Bioscience, Williston, VT) and SP and CGRP staining nerve fibers in the subepidermal nerve plexus with conventional epifluorescence microscopy (Nikon Microphot-SA). Mast cells and mast cell degranulation were qualitatively described. We found the H&E analyses to be minimally helpful but did find 3 major patterns of expression in affected specimens preserved in Zamboni's: (1) decreased ENF expression indicative of a scalp neuropathy as compared to normal or unaffected scalp specimens studied, (2) alterations in neuropeptide expression or (3) significant diffuse mast cell degranulation particularly in the lower dermis. Treatment approaches now are more focused to using topical gabapentin or non-sedating antihistamines based on the immunostaining findings.

P087

Eosinophilic Esophagitis: an Important Atopic Trigger of Alopecia Areata

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O. Ibrahim: None. **C. Bayart:** None. **W. Bergfeld:** None. **M. Piliang:** None.

LEARNING OBJECTIVES:
Propose that EoE be considered as a trigger of AA and screened for in suspected patients.

ABSTRACT:
Alopecia areata is associated with atopy in 10-22% of patients, twice the prevalence in the general population. Patients can present with concomitant atopic dermatitis, hay fever, asthma, and even allergies to dust mites. In many cases, severity and flares of these atopic diatheses correlate with severity of alopecia areata.
Herein we present 3 patients with alopecia areata affected by contemporaneous eosinophilic esophagitis (EoE). These patients, ages 11, 12, and 15, presented with alopecia areata affecting greater than 50% of their scalp. One of the three patients also had involvement of his body hair. These patients also had asthma, eczema, and most

importantly, eosinophilic esophagitis. Two of the patients responded well to treatment with intralesional or topical corticosteroids, and the third patient responded favorably to anthralin. All patients however displayed increased shedding and significant hair loss with flares of their EoE.
EoE is a recently recognized allergic disorder, mediated by eosiniphils and histamine. It is characterized by esophageal dysfunction and intraepithelial microabscesses. Patients exhibit dysphagia, acid reflux, and impaction. EoE is frequently associated with food or airborne allergy. Rates of allergic rhinitis, asthma, and eczema in patients with EoE are reported to be more than 50%. We propose that EoE be considered as a condition falling within the realm of atopic diseases, and a potential trigger of AA in affected patients.

P088

Treatment of Moderate to Severe Alopecia Areata with the Janus Kinase Inhibitor, Tofacitinib: The Cleveland Clinic Experience

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Dermatology resident, Cleveland Clinic Foundation, Cleveland, OH.

O. Ibrahim: None. **C. Bayart:** None. **M. Piliang:** None. **W.F. Bergfeld:** None.

LEARNING OBJECTIVES:
Propose that JAK-inhibition is a possible novel treatment of alopecia areata.

ABSTRACT:
The treatment of alopecia areata (AA) can be difficult and many of the available options yield marginal results. Novel therapies are constantly under study. Herein we describe 8 AA patients treated with the oral janus kinase (JAK) inhibitor, tofacitinib. Review of the medical records at Cleveland Clinic revealed 8 patients with AA treated with tofacitinib. Seven of the 8 patients were female. Disease duration ranged from 3 to 34 years. AA severity ranged from 50-60% scalp involvement to alopecia universalis. One patient ended her treatment after 1 week of therapy due to the development of a rash on her trunk and severe peripheral edema in her hands and feet. Two patients prematurely ended treatment after 3 months due to loss of insurance. Remaining 5 patients currently continue on treatment, with cumulative duration of therapy ranging from 1 to 4 months. Early preliminary results demonstrate up to 50% regrowth in 1 patient after 4 months of treatment, and 0-25% regrowth in the remaining patients after 1 week to 2 months total treatment. Adverse effects included mild increase in creatinine from 0.91 to 1.5 mg/dL (1 patient), rash (1 patient), peripheral edema (1 patient), and upper respiratory infection (2 patients). We present these patients and their updated data to discuss the potential role of JAK-inhibition in the treatment of AA.

P089

Protection by Fullerene for Hair Shaft and Wig Fiber Damage by UV and Cosmetic Treatments

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S. Inui: Other Financial or Material Support (royalties, patents, etc.); Vitamin C60 Bioresearch Co. Ltd.. **C. Kakimoto:** None. **S. Itami:** None.

LEARNING OBJECTIVES:
Demonstrate a new reagent for protection of hair shafts and wig fibers

ABSTRACT:
Fullerene is well known as a radical scavenger, which can act as a safeguard against harmful effect by reactive oxygen species (ROS). Therefore, fullerene can protect hair shaft cuticles from damage by UV exposure or other treatments, which can generate ROS. After exposure of 2-4J/cm2 UV, electron microscopy (EM) observation revealed the cuticles detachment from hair surface. However, when pretreated with fullerene for 1 hour, such detachment did not occur, indicating that fullerene protects the cuticles against the UV insult. Next, we examined whether fullerene shows similar protective effects against other irritants such as bleach and permanent to hair shafts. As a result of EM observation, bleach and permanent treatment for 1 hour caused cuticle detachment but, by pretreated with fullerene for 1 hour, cuticle detachment could not be observed, indicating that similar protective roles of fullerene against the bleach and permanent damages. In addition, we investigated whether fullerene can protect artificial wig fibers from UV-induced denaturation. After exposure of 4J/cm2 UV, EM observation revealed the perforation of artificial wig fiber surfaces. However, by pretreated with fullerene for 1 hour, such perforation did not occur, suggesting again protective roles of fullerene against artificial wig fibers.

P090

Clinical, Histological and Genetic Insights into the Pathophysiology Underlying Phenotypic Variation of Autosomal Recessive Hypotrichosis/Wooly Hair Caused by c.736T>A LIPH Mutation

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M. Ise: None. **A. Kubo:** None. **N. Umegaki:** None. **M. Amagai:** None. **M. Ohyama:** None.

LEARNING OBJECTIVES:
Illustrate the pathophyisology of autosomal recessive wooly hair/hypotrichosis by LIPH c.736T>A mutation underlying clinical variety and discuss possible therapeutic approaches

ABSTRACT:
Autosomal recessive wooly hair/hypotrichosis (ARWH/H) is an inherited hair disorder caused by mutations in lipase member H (LIPH) gene. The most prevalent genotype in Japan is homozygous c.736T>A mutation, which yields varying degrees of hair loss. In this study, we performed clinicopathological characterization of six Japanese cases of ARWH/H with this LIPH mutation and provided insight into the pathophysiology underlying phenotypic divergence.
ARWH/H cases were clinically classified into three groups (mild, severe, very severe) based on hypotrichosis severity. Just one case was categorized as very severe. Morphometrical dermoscopic comparison revealed that visible hair sparseness correlated not with hair density but with decreased ratio of terminal/ medium-sized-vellus hairs except in a very severe case, in which total hair number was reduced. Histopathological investigation of a case in the mild group detected pronounced hair miniaturization and high telogen /anagen ratio without the decrease in total hair count, endorsing dermoscopic observation. In mild and severe group, child cases demonstrated gradual improvement without any therapy and adult cases responded to topical minoxidil with visible clinical improvement.

Very severe phenotype remained unchanged. The current study suggested that major factor putatively contributing to clinical diversity in ARWH/H caused by LIPH c.736T>A mutation is the frequency of underdeveloped hairs. Hence, pharmacological modification by thickening existing hairs may provide a therapeutic strategy at least in moderately affected individuals.

P091

Chemokine Receptor CCR5 is the Novel Target for the Treatment of Alopecia Aerate

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I have been studied hair biology, especially alopecia areata, and seen a lot of hair loss patients.

T. Ito: None. **T. Suzuki:** None. **A. Funakoshi:** None. **Y. Tokura:** None.

LEARNING OBJECTIVES:
Chemokine and its receptor is one of the strong candidate for the future target of alopecia aerate treatment.

ABSTRACT:
Alopecia areata (AA) is an organ-specific autoimmune disease with cell-mediated autoimmune reactions. T lymphocytes densely surround hair bulbs in the lesion of acute-phase AA, referred to as “swarm of bees”. The pathological mechanisms of “swarm of bees”, can be induced by the upregulation of Th1 chemokine expression from hair follicles that result in the resultant infiltration of CXCR3+ and CCR5+ Th1 or Tc1 cells into AA lesions. Here, C3H/HeJ mice with AA were treated with CCR5 inhibitor, Maraviroc, that is HIV drug by negative allosteric modulator of the CCR5 receptor. AA was induced by intracutaneous injection of activated LN cells derived from C3H/HeJ mice. Then, maraviroc is orally administerated. Interestingly, 4/5 maraviroc-treated C3H/HeJ mice with AA showed improvement of hair loss lesions after 2 weeks. Immunohistological assessments revealed decreased number of CD4+CCR5+ and CD8+CCR5+ T cells in the lesions after maraviroc treatment. Furthermore, FACS analysis also supports revealed the reduced frequency of CD4+CCR5+ T cells in skin-infiltrating cells. In addition, EZTaxiscan showed the significant inhibition of the chemotactic activity of CD4+ LN cells toward RANTES by maraviroc compared to PBS.
In conclusion, inhibition of chemokine receptors/chemokines can be the novel target for the treatment of AA.

P092

Specialist Needs of Ageing Hair - Product Optimisation to Address Specific Requirements of Hair Types

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K. Ivanova: None. **J. Yates:** None. **G. Coenen:** None. **C. Roberts:** None. **J. Das:** None.

LEARNING OBJECTIVES:
illustrate the provision of specific technical benefits delivered by hair care products designed specifically for the ageing consumer.

ABSTRACT:
It is well documented that older hair undergoes many changes in composition, appearance, texture and overall

appearance, and presents an expanding opportunity for specialist products which confer the associated technical benefits required when compared to many mass market hair care products. Reviews of existing literature and additional research from consumer focus groups have provided insights as to the specialised requirements of ageing hair, enabling a single-minded focus on the key attributes which drive consumer preference. In addition to guiding the formulation strategy for wash and care products, this informs the choice of specialist product formats most suited to deliver of the benefits an older consumers desires. Formulations were developed meeting the balance between the prevention of dryness, a surface effect with negative consequences such as decreased manageability, shine and roughness, and the creation and retention of volume of the hair, thereby, preventing flat and limp hair appearance, and also enabling a greater propensity for manageable style creation and natural hold.
In-vitro measures including wet combing force, surface friction whilst dry, lustre, repeated grooming, and digital image analysis of hair shape and shine, were used to provide support data for the product benefits. In-vivo consumer test data was also generated in different markets, taking account of hair variance globally. Analysis is presented which correlates in vivo and in-vitro observations.

P093

Interesting Finding of Scalp Biopsy in a Patient with Rickets and Clinical Similar to Atrichia with Papular Lesions.

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C.B. Jacob: None. **A. Donati:** None. **N.Y. Valente:** None. **R. Romiti:** None.

LEARNING OBJECTIVES:
Demonstrate through the scalp biopsy the probable relationship of rickets and atrichia with papular lesions and their genes.

ABSTRACT:
Hereditary vitamin D resistant rickets and Atrichia with Papular Lesions (APL) have a similar congenital hair loss disorder caused by mutations in Vitamin D Receptor (VDR) and Hairless (HR) genes, respectively. HR is a VDR corepressor, and it is suspected that VDR/HR supress gene expression during specific phase of hair cycle.Here we describe a case of woman, 20 years old, that birth with normal hair on scalp and hair loss completely when she was 2 years old. There was repilation failed and sparse hair.Her skin showed an absence of normal hair follicles , similar to the clinical of APL.She exhibited hereditary vitamin D rickets.No history of consanguinity. On the scalp biopsy demosntrated increase telogens germinatives units with increase in the number of hairs in the telogen phase. Presence of normal sebaceous glands.This shows a picture of patient carrier alopecia associated with rickets and has clinical and biopsy similar to APL, which is probably a defect in the same location, the lack of contact on bulb and papilla of hair follicle, preventing hair re-enter the anagen phase and the consequent increase in the number of hairs in the telogen phase. Which favors the hypothesis of HR and VDR action.

P094

Investigation on the Role of Necroptosis in Alopecia Areata: A Preliminary Study

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Y. Jang: None. **M. Kim:** None. **W. Lee:** None. **S. Lee:** None. **M. Jin:** None. **S. Kim:** None. **D. Kim:** None.

LEARNING OBJECTIVES:
Demonstrate whether necroptosis is involved in mediating the deleterious autoimmune processes in alopecia areata.

ABSTRACT:
A new caspase-independent mode of programmed cell death, termed necroptosis, has recently been identified. Tumor necrosis factor-α, a proinflammatory cytokine implicated in alopecia areata (AA), can activate necroptosis, a necrotic cell death pathway regulated by receptor interacting protein 1 (RIP1) and RIPK3 under caspase-8-deficient conditions. The initiation of necroptosis is principally mediated by the release of RIP1 and RIP3 from suppression by caspase-8. Currently, little is known about events occurring downstream of RIP1 and RIP3 that regulate necroptosis. However, it has recently been suggested that the mixed lineage kinase domain-like (MLKL) factor, an interacting target of RIP3, functions downstream of RIP1 and RIP3 and is recruited to the necrosome through its interaction with RIP3. This study aims at investigating the occurrence of necroptosis in patients with AA and its contribution to cell death following autoimmunity. Biopsy samples were collected from scalp skin of 10 patients with AA and 10 healthy controls. RIP1, RIP3, caspase-8, and MLKL mRNA and protein expression levels were evaluated by real time PCR and western blotting respectively. From results of our preliminary study, necroptosis has unclear roles in the pathogenesis of AA. Further large scale studies will be needed.

P095

The Changes of NKG2D+CD4+ T Cells in Alopecia Areata According to Disease Severity, Activity, Subtype, and Treatment Modalities

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Y. Jang: None. **S. Moon:** None. **W. Lee:** None. **S. Lee:** None. **J. Choi:** None. **S. Kim:** None. **D. Kim:** None.

LEARNING OBJECTIVES:
Demonstrate the changes of NKG2D+CD4+ Tcells in alopecia areata & correlation with disease severity, activity, subtype, and treatment modalities.

ABSTRACT:
NKG2D receptor expressed on CD8+ T cells and NK cells has been reported as important in the initiation of alopecia areata (AA). Autoreactive role for NKG2D+CD4+ T cells has been shown in various autoimmune diseases. However, in AA, the role of NKG2D+CD4+ T cells is currently not known. We investigated the changes of NKG2D+CD4+ T cells in AA and correlation with disease severity, activity, subtype, and treatment modalities. The proportion of NKG2D+CD4+, NKG2D+CD8+ T cells and NKG2D+ NK cells was analyzed by flow cytometry on peripheral blood samples of patients with AA (n=43) and healthy controls (n=26). For subgroup analysis, AA patients were subdivided according to disease severity, activity, subtype and treatment modalities. In addition, tissue expression and distribution of NKG2D+CD4+ T cells was examined on human AA samples. NKG2D+CD8+ T cells and NKG2D+ NK cells were increased in AA patients as previously reported. Interestingly, subset of

NKG2D+CD4+ T cells was also increased in the peripheral blood from AA patients compared with healthy controls ($p<0.05$). The proportion of NKG2D+CD4+ T cells showed low tendency in patients with mild severity and received systemic immunosuppressant therapy. In addition, we identified some NKG2D+ cells co-expressed CD4 in the scalp skin of AA patients using double immunostainings. Results of this study suggest that NKG2D+CD4+ T cells may involve in the pathogenesis of AA.

P096

Clinical and Trichoscopic Features of Scalp Dermatomyositis.

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J.C. Jasso-Olivares: None. **A. Tosti:** None. **M. Miteva:** None. **J. Domínguez-Cherit:** None. **J.M. Díaz-González:** None.

LEARNING OBJECTIVES:
Demonstrate the clinical features of scalp dermatomiositis and its correlation with trichoscopy.

ABSTRACT:
Background: Dermatomyositis (DM) is an autoimmune disease with an overall incidence of 10.2 cases million/year and more common in Hispanics. Scalp involvement is common and scalp activity (SADM) is defined in the presence of erythematosquamous plaques with or without alopecia. Information of SADM is scarce, but frequency is relatively high (28.82%).
Methods: Descriptive, prospective, cross-sectional study on patients with or without SADM and diagnosis of classical DM (Cl-DM) or amyopathic DM (A-DM) in the period of one year.
Results: A total of 31 patients were included. 25 (80.7%) were female with a mean age of 56 years, 27 had a diagnosis of Cl-DM (87%), 4 (13 %) A-DM, 5 (16.1%) paraneoplastic and 3 (9.6%) associated with another connective tissue disease. Eighteen (58%) had active disease with classic cutaneous symptoms and scalp activity. This was also observed in 6 patients without active skin disease. Trichoscopy showed characteristic findings in 27 (87%) patients. These included, according to the stage of the disease, enlarged capillary (64.5%), whitish scalp (51.6%), peripilar cast (51.6%), interfollicular scale (45.1), tufting (45.1), bushy capillary (38.7%) and interfollicular pigmentation (38.7%).
Conclusions: In this group of patients we report the prevalence of SADM, its relation with DM activity (especially with flare of cutaneous symptoms) and its correlation with trichoscopy features in direct proportion to the stage of the disease.

P097

Tianeptine Attenuates Dickkopf-1-induced Hair Growth Inhibition in Explanted Human Hair Follicles

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H. Jeong: None. **M. Kwack:** None. **M. Kim:** None. **J. Kim:** None. **Y. Sung:** None.

LEARNING OBJECTIVES:
Demonstrate tianeptine plays an inhibitory role in catagen progression by regulating the activity of DP cells in human hair follicles.

ABSTRACT:
Recent study showed that tianeptine, an antidepressant, inhibits ultrasonic wave-induced anagen to catagen transition in animal model, suggesting that tianeptine may regulate hair growth and cycling. In this study, we investigated effects of tianeptine on human hair follicles. We observed growth stimulation in dermal papilla (DP) cells when tianeptine was added into growth medium. Tianeptine at 100nM stimulated the growth of DP cells the most. We also observed that tianeptine treatment increases the expression of growth factors implicated in the regulation of hair growth, such as IGF-1, HGF, VEGF, KGF, as examined by real-time PCR analysis. We, however, did not observe significant elongation of hair shaft in explanted human hair follicles when tianeptine was added. On the other hand, we observed that tianeptine significantly attenuated the dickkopf-1-induced hair growth inhibition in explanted human hair follicles. Altogether, our data suggest that tianeptine plays an inhibitory role in catagen progression by regulating the activity of DP cells in human hair follicles.

P098

Viabilities of Androgen Stimulated Dermal Papilla Cells are Modulated with GPR44 Antagonist

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K. Jeong: None. **Y. Lee:** None. **Y. Park:** None. **J. Kim:** None. **H. Kang:** None.

LEARNING OBJECTIVES:
The effect of GPR44 antagonist on DPC viability.

ABSTRACT:
Androgenetic alopecia (AGA) is the most common type of hair loss and occurs in both men and women. In AGA, 5α-reductase converts testosterone to dihydrotestosterone (DHT). DHT binds to androgen receptors and activates genes responsible for the gradual miniaturization of terminal hair follicle. Prostaglandin D2 (PGD2) is involved in various kinds of inflammatory disorders, and recently some evidences suggest that it has a role in the pathogenesis of AGA. PGD2 binds to G protein coupled receptors referred to a GPR44/CRTh2. We conducted study to evaluated changes of PGD2 and its related molecules on the dermal papilla cell (DPCs) in the androgen stimulated environment. To determine the effect of GPR44 antagonist or COX inhibitor such as TM30089, indomethacin and refoxcib, they were applied to DHT-treated DPCs. According to real time-PCR and Western blot assay, androgen receptor (AR), PGD2 synthase and GPR44/CRTh2 was upregulated in 1-100nM DHT treated samples. The GPR44 antagonist or COX inhibitor inhibited the level of AR, type 2 5α-reductase (5αR2), and PGD2 synthase. These effects positively act on DPCs viability. Until now, effect of GPR44 antagonist on hair follicular level is not known very well. This preliminary experiment arise the possibility of therapeutic role of GPR44 antagonist on the AGA treatment.

P099

Are Eccrine Glands Part Of The Pilosebaceous Unit?

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E. Poblet: None. **F. Jimenez- Acosta:** None. **J. Hardman:** None. **R. Paus:** None.

LEARNING OBJECTIVES:
Illustrate the relation that ecrine glands maintain with the pilosebaceous unit

ABSTRACT:
Background: The pilosebaceous unit and the eccrine sweat glands (EGs) are classically described as completely independent skin appendages. However, subtle, often overlooked morphological evidence, especially when the whole EG trajectory is examined, reveals that the distal eccrine duct and the secretory coils come very close to the hair follicle and surround the latter.
Material and Methods: For the present work we have made a complete follow up of the whole itinerary of the sweat glands through serial transversal sections of scalp skin stained with hematoxilin-eosin.
Results: Morphological association of the pilosebaceous unit with the eccrine glands is not obvious observing the classic histological perspectives of skin sections. However, an observation of the whole eccrine gland trajectory reveal that the distal eccrine duct and the secretory coils are associated to the hair follicle units. We propose the term “hair field unit (HFU)” for this association.
Relevance: If confirmed by systematic 3D modelling and functional studies, the inclusion of EGs into follicular unit hair is clinically important, while the hitherto separate fields EG and pilosebaceous research need to cross-fertilize each other.We speculate that EG activities, such as secretory activies of the EG epithelium and stromal progenitor cells, impact on the overall function of the hypothetical HFU in health and disease.

P100

Punch Hair Grafts Transplanted into Chronic Leg Ulcers: Punch Grafts Harvested From the Scalp Induce a Better Healing Response Than Non-hairy Punches

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F. Jimenez: None. **M. Martínez:** None. **E. Escario:** None.

LEARNING OBJECTIVES:
Discuss punch hair grafting as a therapetic tool for healing chronic ulcers. Show how to perform the procedure.

ABSTRACT:
Introduction: Clinicians have observed that the healing of skin wounds starts around the hair follicles and that wounds made in hairy skin areas heal faster than those in non-hairy skin. Accordingly, if punch skin grafts has been used in healing chronic wounds it would make more sense to harvest those grafts from areas such as the scalp with a

high density of anagen terminal hairs, where the pool of epithelial and mesenchymal stem cells is at its highest.
Objective: To compare the clinical difference in the healing capacity of punch hair grafts harvested from the scalp versus non-hairy skin punches, transplanted in the wound bed of chronic leg ulcers.
Methods: We performed a clinically controlled trial with 12 patients with chronic venous ulcers. Each ulcer was divided into two halves. One half was transplanted with punch grafts obtained from the occipital scalp and the other with punch grafts obtained from abdominal non-hairy skin.
Results: At the end of the study we obtained a reduction in the ulcer area of 75.15% in the half transplanted with hair punches vs. 33.7% in the half transplanted with non-hairy punches.
Conclusion: This study demonstrates that transplantation of hair follicle punch grafts in the wound bed of chronic ulcers represents a better alternative than non-hairy punch grafting for inducing healing of the ulcer.

P101

Various Wavelengths of Light-emitting Diode Light Regulate the Proliferation of Human Dermal Papilla Cells and Growth of Hair Follicles viaWnt/β-catenin and the ERK Pathways

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H. Kang: None. **K. Jeong:** None. **U. Yeo:** None. **J. Kim:** None. **H. Joo:** None.

LEARNING OBJECTIVES:
LED inhibits IFN-γ-induced catagen-like changes on hDPCs.

ABSTRACT:
Light emitting diode (LED) has been demonstrated to promote hair growth in clinical trials. However, the underlying mechanisms are not fully understood. IFN-γ involved in the regulation of hair follicle (HF) cycling and recent studies suggested that IFN-γ is a potent catagen inducer in normal human scalp HFs. The aim of this study was to determine the effect of LED irradiation on IFN-γ-treated human dermal papilla cells (hDPCs). The effect of the LED irradiation on cell proliferative effect of DPCs was examined by MTT assay. hDPCs were irradiated using four ranges of LED wavelengths from 415nm to 830nm. The proliferation of hDPCs was significantly increased by LED irradiation at 660 nm with 1, 5 and 10 J/cm^2 compared to non-irradiated cells. LED irradiation at 660 nm significantly counteracted the inhibitory effect of IFN-γ on hDPCs proliferation. The effect of LED irradiation on the expression of IFN-γ-regulated genes including IFN-γ receptor, IL-1β, IL-18, ICAM-1, MICA, and JAK/STAT-1 pathway in IFNγ-treated hDPCs, was examined by real-time PCR and Western blot assay. LED irradiation at 660 nm significantly decreased mRNA expression of IL-1β, IL-18, IFN-γ receptor, and cleaved caspase-3 and also inhibited the phosphorylation of Stat1 in IFN-γ-treated hDPCs. Therefore we suggest that LED inhibits IFN-γ-induced catagen-like changes on hDPCs.

P102

Combination Topical Finasteride and Growth Factors Applied After Non-ablative Fractional Laser Treatment Leads to Improvement of Androgenetic Alopecia

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A. Junqueira Bertin: None.

LEARNING OBJECTIVES:
Demonstrate the effect of emerging technologies and therapies in hair loss disorders.

ABSTRACT:
Androgenetic alopecia has long been a difficult disease to treat. While minoxidil and finasteride have shown efficacy for hair growth, patients continue to look for additional treatments and more improvement. Fractioned laser has been proposed to assist in penetration of topical medications to the cutaneous tissue. We evaluated the use of a non-ablative erbium glass fractional laser followed by the application of topical finasteride 0,05% and growth factors including BFGE, IGF, VEGF and Copper Peptide 1%, for the treatment of androgenetic alopecia. A retrospective chart review of 25 subjects treated with non-ablative, 1550nm erbium -glass fractional laser was conducted. Those with a clinical diagnosis of androgenetic alopecia were included. Chart documentation of physical exam and photography was used to assess clinical change. No adverse events were noted. Combination topical finasteride and growth factors applied after non-ablative fractional laser treatment was found to lead to clinical improvement of all subjects with androgenetic alopecia. Further studies are required to elucidate the mechanism of this improvement. Additionally, studies investigating fractionated non ablative laser delivery of finasteride and growth factors separately, as well as the laser capacity of inducing hair growth when applied alone, should also be performed.

P103

The Effects of Non-ablative Fractional Laser on Hair Growth: A Case Series of 28 Patients With Hair Loss Disorders

Ana Carina Junqueira Bertin, MD[1], Adriana Vilarinho, MD[1], Ana Lucia Junqueira, MD[2], Natalie Haddad, MD[1], Ruzica Z. Conic[3], Natasha Atanaskova Mesinkovska, MD, PhD[3].
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Runs a successful hair loss clinic in Brazil. Innovative and resourceful. Completed hair research fellowship with Dr. Maria Hordinsky, University of Minnesotta.

A. Junqueira Bertin: None. **A. Vilarinho:** None. **A. Junqueira:** None. **N. Haddad:** None. **R.Z. Conic:** None. **N. Atanaskova Mesinkovska:** None.

LEARNING OBJECTIVES:
Evaluate and demonstrate the effects of non-ablative erbium glass fractional lasers in the treatment of non-cicatricial and cicatricial alopecias.

ABSTRACT:
Hair disorders are known to have a chronic course and be resistant to treatments. More recently, fractional lasers have been applied to such conditions in order to induce hair growth.
We aimed to evaluate and demonstrate the effects of non-ablative erbium glass fractional lasers in the treatment of non-cicatricial alopecias and cicatricial alopecias. A retrospective review of 28 patients treated with non-ablative, 1550nm erbium-glass fractional laser was conducted. All patients were previously diagnosed with a hair disease, which included androgenetic alopecia (AGA), telogen effluvium (TE), alopecia areata (AA) and lichen planopilaris (LPP). Patients with AGA and/or TE received topical finasteride, endothelial growth factors and minoxidil 5% right after the procedure. Patients with AA received topical triamcinolone after the procedure. Patients with LPP received topical triamcinolone and finasteride after the procedure. Clinical improvement was observed in 75 % of the patients. The improvement was assessed by physical examination, and photographs by 2 independent observers. Characteristics of patients who improved were analyzed. Patient satisfaction scores were assessed.
This data demonstrated that non-ablative fractional lasers can induce hair growth in patients with hair diseases and could be a new modality of treatment for hair loss in the near future.

P104 – TBA

P105

Differentiation Potential of Non-Cultured Interfollicular Epithelial Stem Cells into Hair Follicles

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K. Kanayama: Grants/Research Support; Regience Corp. **A. Yuasa:** Salary, Contractual Services; Regience Corp. **K. Kinoshita:** Grants/Research Support; Regience Corp. **Y. Hosoi:** Salary, Contractual Services; Regience Corp. **M. Inamatsu:** Salary, Contractual Services; Regience Corp. **K. Yoshizato:** Salary, Contractual Services; Regience Corp. **K. Yoshimura:** Grants/Research Support; Regience Corp..

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain and compare various emerging therapies for hair loss.

ABSTRACT:
Differentiation capacity into hair follicles (HFs) of epithelial cells as well as HF-inducing capacity of dermal cells is

critical for establishing a cell-based therapy for hair regeneration. Although follicular epithelial stem cells in the bulge can differentiate into hair, it is a problem that they quickly lose the differentiation capacity into HFs once cultured. Interfollicular epithelial stem cells (IFESCs) regenerate the epidermis after wounding, but it is unclear if IFESCs can differentiate into HFs. Using our experimental method for trichogenesis (modified hemi-vascularized sandwich method), we examined the differentiation potential of IFESCs in rat sole skin. The epidermis isolated from the sole skin of adult GFP-rat by enzymatic digestion was transplanted together with dermal cells of neonatal rats into a skin defect of nude mice with a chamber. Three weeks after transplantation, outgrowth of hairs was observed, indicating that non-cultured IFESCs from adult rat can differentiate into hair. Immunohistochemical analysis revealed that GFP-positive cells constituted the epithelial portion of new HFs. We also histologically checked expression of undifferentiating markers including CK15. Although fresh epidermis and isolated fresh epithelial cells expressed CK15, they lost the expression after cultured. In conclusion, IFESCs in the freshly isolated epidermis from adult skin has a potential to give rise to new HFs and can be used with hair-inducing cells in a cell-based therapy for hair regeneration.

P106

A Study of Mean Interfollicular Distances and Mean Hair Counts per Follicle in Korean Patients With AGA

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Dermatologist and hair specialist.

H. Kang: None. **K. Sohn:** None. **Y. Woo:** None. **H. Joo:** None. **J. Kim:** None.

LEARNING OBJECTIVES:
Mean interfollicular distances was larger and mean hair counts per follicle was smaller in patients with AGA.

ABSTRACT:
Androgenetic alopecia (AGA) is a common disease in Korean adults, and presents as a non-scarring alopecia under the influence of androgens. Several studies of phototrichogram (PT) analysis of hair density and thickness in normal populations and patients with AGA in Korea were reported. However, information about mean interfollicular distances and mean hair counts per follicle in Korean has not been reported. To investigate mean interfollicular distances and mean hair counts per follicle in Korean, a retrospective chart review and PT results of patients with AGA (n=150) and normal population (n=50), were analyzed. Six scalp sites, including front (S1), top (S2), back (S3), and the left (S4) and right sides (S5) were targeted. Mean interfollicular distances was larger and mean hair counts per follicle was smaller in patients with AGA than normal populations. As severity of AGA increase, mean interfollicular distances in S1, S2, S3, S4 and S5 showed tendency of increase and mean hair counts per follicle showed tendency of decrease. This is the first study analyzed mean interfollicular distances and mean hair counts per follicle in patients with AGA in Korea.

P107

Comparative Study of the Efficacy of Finasteride 1mg/day on Different Aged Groups with Androgenetic Alopecia Using Phototrichogram Analysis: A Preliminary Single-center Retrospective Analysis

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H. Kang: None. **Y. Woo:** None. **Y. Kim:** None. **H. Joo:** None. **J. Kim:** None.

LEARNING OBJECTIVES:
Finasteride 1mg/day administration is effective in patients with AGA aged over 41 years as well as 18 to 41 years.

ABSTRACT:
Finasteride is a 5 alpha-reductase inhibitor indicated for the treatment of men with androgenetic alopecia (AGA) and various clinical trials of finasteride have confirmed its beneficial effects in AGA. In Korea, finasteride 1mg/day is only approved for the treatment of men with AGA aged 18 to 41 years by Ministry of Food and Drug Safety. There was no previous study comparing the efficacy of finasteride on different aged groups in Korea. The purpose of our study is to compare the efficacy of finasteride on patients with AGA of two different aged groups which are 18 to 41 years and over 41 years. We reviewed retrospectively 53 patients with AGA receiving finasteride 1mg/day from January, 2010 to December, 2015 at our department. Follow up was made by every 3 to 6 months. The efficacy was evaluated by comparing phototrichogram results of baseline and 1 year-follow up. Phototrichogram analysis was done by unblinded, two investigators at same site on frontal, vertex, occiput, and temporal areas. Finasteride increased hair density and thickness in all regions in both groups at 1 year follow up. There is no significant difference in hair density and thickness change between two groups. In conclusion, finasteride 1mg daily administration is effective in patients with androgenic alopecia aged over 41 years as well as 18 to 41 years.

P108

Hair Growth Promoting Effects of Different Alternating-Current Parameter Settings are Mediated by the Activation of Wnt/β-catenin and MAPK Pathway

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Dermatologist and hair specialist

H. Kang: None. **K. Sohn:** None. **K. Jeong:** None. **H. Joo:** None. **J. Kim:** None.

LEARNING OBJECTIVES:
Electric stimuli induces activation of Wnt/-catenin and MAPK pathway in hair follicles, thus stimulating hair follicle proliferation.

ABSTRACT:
Electrical stimulation is being used in variable skin therapeutic conditions. There have been clinical studies demonstrating the positive effect of electrical stimuli on hair regrowth. However, the underlying exact mechanism and optimal parameter settings are not clarified yet. The objective of this study is to investigate the effects of different parameter settings of electrical stimuli on hair growth by examining changes in human dermal papilla cells (hDPCs) in vitro and by observing molecular changes in animal tissue. At low voltage power and low frequency, in vitro proliferation of hDPCs was successfully induced. A significant increase in Wnt/-catenin, Ki67, p-ERK and p-AKT expression was observed under the afore-mentioned settings. In animal model, hair follicle proliferation was observed in the stimulated skin, microscopically. Expression of hair-related genes in the skin significantly increased on 6th week of treatment. There are optimal conditions for electric stimulated hair growth and they might be different in the cells, animal, and human tissue. Electric stimuli induces mechanisms like, activation of Wnt/-catenin and MAPK pathway in hair follicles, thus stimulating hair follicle proliferation.

P109

Effect of Minoxidil Topical Foam on Frontotemporal and Vertex Androgenetic Alopecia in Men: A 104-week Open-label Clinical Trial

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V. Kanti: Grants/Research Support; The study was supported by an unrestricted medical grant by Johnson & Johnson Consumer & Personal Products Worldwide, A Division of Johnson & Johnson Consumer Companies, Inc., USA. **K. Hillmann:** Grants/Research Support; The study was supported by an unrestricted medical grant by Johnson & Johnson Consumer & Personal Products Worldwide, A Division of Johnson & Johnson Consumer Companies, Inc., USA. **J. Kottner:** Grants/Research Support; The study was supported by an unrestricted medical grant by Johnson & Johnson Consumer & Personal Products Worldwide, A Division of Johnson & Johnson Consumer Companies, Inc., USA. **A. Stroux:** Grants/Research Support; The study was supported by an unrestricted medical grant by Johnson & Johnson Consumer & Personal Products Worldwide, A Division of Johnson & Johnson Consumer Companies, Inc., USA. **D. Canfield:** Grants/Research Support; The study was supported by an unrestricted medical grant by Johnson & Johnson Consumer & Personal Products Worldwide, A Division of Johnson & Johnson Consumer Companies, Inc., USA. Stock/Shareholder (self - managed); owner of C Scientific, Inc. **U. Blume-Peytavi:** Consultant; is consultant for Johnson & Johnson Consumer & Personal Products Worldwide. Grants/Research Support; The study was supported by an unrestricted medical grant by Johnson & Johnson Consumer & Personal Products Worldwide, A Division of Johnson & Johnson Consumer Companies, Inc., USA.

LEARNING OBJECTIVES:
Assess long-term effect and tolerability of minoxidil topical foam in frontotemporal and vertex areas in men with moderate androgenetic alopecia.

ABSTRACT:
Minoxidil formulations are effective in treating androgenetic alopecia (AGA) during 12 months. Efficacy and safety in both frontotemporal and vertex regions over longer application periods haven't been studied so far. Objective was to evaluate the effect of 5% minoxidil topical foam (5%MTF) in the frontotemporal and vertex areas in patients with moderate AGA over 104 weeks. An 80-week, open-label Extension phase was performed, following a 24-week randomized, double-blind, placebo-controlled study in men with AGA grade IIIvertex to VI. Group1 (n=22) received ongoing 5%MTF for 104 weeks, Group2 (n=23) received placebo topical foam (plaTF) until week 24, followed by 5%MTF until week 104 during the extension phase. Frontotemporal and vertex target area non-vellus hair counts (f-TAHC, v-TAHC) and cumulative hair width (f-TAHW, v-TAHW) were assessed at baseline and weeks 24, 52, 76 and 104. In Group1, f-TAHW and f-TAHC increased significantly from baseline to week 52 and week 76 respectively, returning to baseline values at week 104. No significant differences were found between baseline and week 104 in v-TAHC in Group1 as well as in f-TAHC, v-TAHC, f-TAHW and v-TAHW in Group2. Topical 5%MTF is effective in stabilizing hair density, hair width and scalp coverage in both frontotemporal and vertex areas over 104 weeks, while showing a good safety and tolerability profile with a low rate of irritant contact dermatitis.

P110

Evaluation of Trichodynia During Treatment With Chemotherapy or Tamoxifen in Breast Cancer Patients: A Cohort Study

Varvara Kanti, MD[1], Julia Lindner[1], Rima Nuwayhid[1], Andrea Stroux[2], Ulrike Blume-Peytavi[1], Natalie Garcia-Bartels[1].
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V. Kanti: None. **J. Lindner:** None. **R. Nuwayhid:** None. **A. Stroux:** None. **U. Blume-Peytavi:** None. **N. Garcia-Bartels:** None.

LEARNING OBJECTIVES:
Objectify trichodynia and compare frequency and quality of these symptoms.

ABSTRACT:
Chemotherapy-induced alopecia is widely dreaded by breast cancer patients. Hair loss is often accompanied by distressing hair or scalp sensations, such as hair pain (trichodynia) and pruritus. The course and characteristics of these unpleasant sensations has not been objectively evaluated so far.
In a monocentric, prospective observational cohort study, 34 breast cancer patients, after surgery treated with either chemotherapy (group C) or tamoxifen (group T), were included. Patients experiencing hair pain and/or scalp pruritus were required to complete a specially developed diary, based on a modification of pain questionnaires. Sensations were journalized in terms of time of onset, duration, intensity on a numeric rating scale, dependence on touching the scalp or hair and character of the sensation. In group C, all patients who completed the questionnaire experienced hair and scalp sensations: 87% both, trichodynia and pruritus, and 13% trichodynia only (insensity 1-10). In group T, 31% of participants reported hair and scalp sensations: 12% both (trichodynia,´pruritus) and 12% pruritus only, 7% trichodynia only (intensity 1-5). No sensations were reported after week 11 in either group.
This study reveals that frequency, duration and quality of trichodynia differs comparing chemotherapy and tamoxifen. The occurrence of trichodynia in chemotherapy patients corresponded with the onset of hair loss, suggesting a possible correlation.

P111

Frontal Fibrosing Alopecia: Epidemiologic Data From a Patient Registry

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Sep. 2012 - today Clinical Study Investigator, Development and execution of clinical studies according to GCP and AMG in the field of skin and hair physiology in children and adults, CRC, Department of Dermatology and Allergy, Charité-Universitätsmedizin Berlin, Germany
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V. Kanti: None. **E. Barbosa Pfannes:** None. **J. Meinhard:** None. **A. Vogt:** None. **P. Reygagne:** None. **U. Blume-Peytavi:** None.

LEARNING OBJECTIVES:
Assess the epidemiologic characteristics of frontal fibrosing alopecia, with prospective and retrospecive data from a patient registry.

ABSTRACT:
Frontal fibrosing alopecia (FFA), first described by Kossard in 1994, is a cicatricial alopecia of the frontotemporal hairline, regarded as a lichen planopilaris variant. Despite the increasing FFA incidence, few literature data exist on epidemiology, pathogenesis and influencing factors. A FFA patient registry was created, including retrospective patient data from France (n=135) and Germany (n=85). Since 2013 the German national registry is being carried on prospectively. Standardized questionnaires were developed to collect demographical data, dermatological assessment, laboratory test results, concomitant diseases, medication and cosmetic product use.314 patients were included: 96,5% female, 76% of which were postmenopausal. Age at diagnosis ranged from 26-86 years, averagely 3 years after first reported disease onset. 9% reported familial predisposition. Reduction or complete loss of eyebrows, axillary and pudental hair or hair of the extremities was found in 76%, 46% and 41% respectively. Beard involvement was found in 30% of the male patients. LPPAI score was rather low (2,3±1,8). 27% of the patients presented lipid metabolic disorders. Thyroid disorders, lichen planus, other autoimmune diseases or hepatitis were found in individual patients. Topical and intralesional corticosteroids were the mostly used treatments, followed by tetracyclines, hydroxychloroquine, finasteride, mycophenolate mofetil and methotrexate.The establishment of this FFA patient registry will help enhancing the current understanding of this increasingly common disease and developing diagnostic and therapeutic recommendations.

P112

Frontal Fibrosing Alopecia: A Psychological Review

Sanja Karanovic, MBBS, BSc, MRCP, Paul Farrant, MBBS BSc FRCP.
Brighton General Hospital, Brighton, United Kingdom.

I am currently undergoing specialist registrar training in Dermatology in the United Kingdom. I graduated from University College London Medical School in 2009. I have a keen interest in hair research and have worked in close collaboration with Dr Paul Farrant, a consultant dermatologist with a special interest in hair disorders. As well as continuing to expand my knowledge of treating patients with a variety of hair disorders I look forward to continuing my research interests in this field.

S. Karanovic: None. **P. Farrant:** None.

LEARNING OBJECTIVES:
To investigate the psychological impact and influence on quality of life of frontal fibrosing alopecia compared with unaffected controls.

ABSTRACT:
Twenty years since it was first described, Frontal fibrosing alopecia is still a poorly understood disease of unknown aetiology. We were interested to compare affected patients with age and sex matched controls to explore the psychological impact of the disease.
We enrolled 33 patients and 31 age-matched controls in a case controlled study. The study was approved by the Brighton and Sussex National Research Ethics Committee. All recruited cases were asked to complete four questionnaires examining the impact on psychological well being and quality of life. The measures used included: Disease Life Quality Index (DLQI), Generalised Anxiety Disorder-7 (GAD-7), Patient Health questionnaire-9(PHQ-9), Derriford Appearance Scale-24(DAS 24).
We are currently in the process of data analysis and hope to provide new information about the psycho-social impact of FFA. This will hopefully contribute to the future development of psychological interventions in order to provide a holistic approach to the management of this fascinating condition.

P113

Frontal Fibrosing Alopecia: Evaluation of Hair Loss Using a Stereotactic Device

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I am currently undergoing specialist registrar training in Dermatology in the United Kingdom. I graduated from University College London Medical School in 2009. I have a keen interest in hair research and have worked in close collaboration with Dr Paul Farrant, a consultant dermatologist with a special interest in hair disorders. As well as continuing to expand my knowledge of treating patients with a variety of hair disorders I look forward to continuing my research interests in this field.

S. Karanovic: None. **P. Farrant:** None.

LEARNING OBJECTIVES:
Provide new information and contribute to the development of a measuring device to accurately assess Frontal fibrosing alopecia.

ABSTRACT:
Since Frontal fibrosing alopecia (FFA) was first described in 1994 it remains a poorly understood condition with an unknown aetiology. There is little conclusive evidence about its natural history and assessing response to treatment is challenging as no clear cut outcome measure for treatment success exists. Clinicians rely on measurements to assess disease progression but in our experience there is a large variation in the standard of documentation.
As a result of this, we were interested to explore the optimum way to assess the extent of hair loss and develop a stereotactic device to standardise assessment which could be used in the outpatient setting. We enrolled 33 patients with a clinical or biopsy proven diagnosis of FFA. Each patient was examined independently by three trained physicians (two dermatology consultants and a senior dermatology registrar). Measurements of the degree of hair loss were made with a traditional tape measure from five pre-defined facial landmarks. The measurements were repeated using a stereo-tactic device developed in the department. The study was approved by the Brighton and Sussex National Research Ethics Committee. We are currently in the process of data analysis and hope that we will provide new information in order to contribute to the future development of a tool to improve the assessment of FFA and guide management decisions in this fascinating disease.

P114

Limitations of Devices, Published Research & Clinical Trial Designs to evaluate LLLT for treatment of hair loss

Sharon A. Keene, MD.
PHI, Tucson, AZ, USA.

Dr. Sharon Keene trained in general surgery at the University of AZ and subsequently specialized in the field of hair restoration surgery. As immediate past president of the ISHRS, she is actively involved in teaching, and has engaged in scientific research to study genetics/ epigenetics of hair loss as it relates to rates of hair loss and response to medical therapy. She recently assisted in research examining follicle sulfotransferase levels and response to topical Minoxidil. Her current presentation critically reviews LLLT devices, research protocols and their limitations to accurately assess efficacy, as well as approaches to improve future studies.

S.A. Keene: None.

LEARNING OBJECTIVES:
1) Review the properties of low level laser therapy to achieve bio stimulation for hair growth
2) Discuss the inherent obstacles to deliver biostimulation with current devices, or limits to measuring an accurate clinical response
3)Suggest possible options for future study

ABSTRACT:
Recently, a series of relatively small clinical trials have published data to bolster claims of apparent efficacy of low level laser therapy (LLLT) devices to treat hair loss in men and women. However, on closer examination of the characteristics of low level laser light, historical research on wavelength efficacy for biostimulation, in combination with study trial designs, there appears to be sound scientific reason to question and reassess clinical conclusions. This presentation will discuss properties of LLLT that influence its ability to promote hair growth, and necessary considerations for devices, and future studies in order to draw accurate conclusions.

P115

Human Scalp Hair Follicles Express Prostaglandin E and D2 Synthase Enzymes to Synthesise De Novo Prostaglandin E2 and D2

Karzan G. Khidhir, PhD[1], Nilofer P. Farjo, MBChB[2], Bessam Farjo, MBChB[2], Neil J. Poloso, PhD[3], Jenny W. Wang, PhD[3], David F. Woodward, MD[3], Steve M. Picksley, PhD[4], Valerie A. Randall, PhD[5].
[1]University of Sulaimani, Sulaimani, Iraq, [2]Farjo Medical Centre, Manchester, United Kingdom, [3]Allergan Inc, Irvine, CA, USA, [4]Centre for Skin Sciences, University of Bradford, Bradford, United Kingdom, [5]University of Bradford, Bradford, United Kingdom.

The Author's Research interests at possible roles of prostaglandins and related compounds in the regulation of hair growth and studying genes involved in hair growth. The organ culture of hair follicle, prostaglandin biology, RT-PCR, qPCR, Immunohistochesty, Immunocytochemistry, lipidomic analysis, electrospray tandem mass spectrometry coupled to liquid chromatography (LC/ESI-MS/MS) and DNA microarray; the in vivo study of hair growth regulation using mouse mode.

K.G. Khidhir: None. **N.P. Farjo:** None. **B. Farjo:** None. **N.J. Poloso:** None. **J.W. Wang:** None. **D.F. Woodward:** None. **S.M. Picksley:** None. **V.A. Randall:** None.

LEARNING OBJECTIVES:
Demonstrate latest developments in research on hair follicle development and whether scalp follicles express the enzymes to synthesise common prostaglandins.

ABSTRACT:
The prostaglandin (PG) and prostamide (PM) F2α analogues used for the treatment for glaucoma, stimulates eyelash growth. The mechanism of action by which these drugs stimulate eyelash hair growth is poorly understood, but we have recently shown receptors for FP and prostamide F2α in scalp hair follicles; and the main enzymes to synthesize either PGs or PMs de novo from their precursor phospholipids. This suggests that both PGF2α and prostamide F2α may play role in the hair follicle. To determine whether scalp follicles also express the enzymes to synthesise other common prostaglandins, prostaglandin E2 and D2, de novo from phospholipids, RT-PCR and sequence analysis were carried out. Non-balding scalp skin obtained with appropriate ethical approval (n=5) and lower hair follicles

were individually isolated for RNA extraction. Isolated scalp hair follicle expressed genes for prostaglandin E and D2 synthase enzymes to synthesise de novo prostaglandins E2 and D2 respectively from phospholipids (n=5). Thus, isolated human scalp follicles express the prostaglandin E and D2 synthase enzymes which would enable the local synthesis of prostaglandins E2 and D2 lipid mediators from phospholipids, suggesting that they may play a role in regulating hair growth. More analysis of the actual roles of these prostaglandins E2 and D2 lipid mediators in hair follicle may lead to a new approach for hair loss treatment.

P116

Allogeneic Hair Transplantation with Enhanced Survival by Anti-ICAM-1 Antibody in Nonhuman Primate

Jin Yong Kim, PhD[1], Ji-Seon Yoon[2], Seong Hoe Park[3], Kyeong Cheon Jung[3], Wooseok Koh[4], Seong Jin Jo[1], Kyu Han Kim[1], Ohsang Kwon[1].
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J. Kim: None. **J. Yoon:** None. **S. Park:** None. **K. Jung:** None. **W. Koh:** None. **S. Jo:** None. **K. Kim:** None. **O. Kwon:** None.

LEARNING OBJECTIVES:
- Demonstrate therapeutic potential of anti-ICAM-1 antibody for antigen-specific T cell tolerance and hair allograft model in nonhuman primate.

ABSTRACT:
Alopecia patients with severe hair loss cannot benefit from autologous hair transplantation. However, it would be possible to utilize allogeneic hair follicles as the donor source with the induction of antigen-specific T cell tolerance. Recently, anti-ICAM-1 antibody (MD-3) was developed to induce dendritic cell arrest in a semi-mature stage and antigen-specific T cell tolerance in situ. In this study, we evaluated the tolerogenic potential of MD-3 under the skin immune system in hair allograft model of nonhuman primate. Following the preparation of recipient sites with a hair removing diode laser in the upper back skin of cynomolgus monkeys, hair follicles from monkey's thick eyebrow were transplanted in recipient sites under MD-3 pretreatment and short-term immunosuppressant. The number of visible hair allograft maintained in MD-3 group, whereas those of immunosuppressant and control group became rapidly decreased. In histological examination, outer root sheath of hair allograft was intact over several weeks in MD-3 group while those of other groups were impaired. MD-3 significantly delayed and diminished perifollicular CD3+ T cell infiltration. Although long-term survival was not achieved, MD-3 markedly enhanced hair allograft survival regardless concomitant immunosuppressant. In conclusion, MD-3 pretreatment proved to have therapeutic potential for preventing allograft rejection, and hair allograft model in nonhuman primate, an effective model for transplantation research.

P117

The Advanced Hair Growth Effect of the Panax Ginseng Extracted using the Repeated Differential Pressure Method

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S. Kim: None. **Y. Hong:** None. **S. Shin:** None. **S. Kim:** None. **Y. Lee:** None. **B. Park:** None. **J. Lee:** None. **Y. Na:** None.

LEARNING OBJECTIVES:
Understand that ginsenosides were the essential component for hair growth and apply the new extracting method with Panax ginseng.

ABSTRACT:
The hair growth effect of *Panax ginseng*, especially its active component ginsenosides were previously investigated. This study aimed to establish the new method for enhancing the ginsenoside contents in the *Panax ginseng* extract and identify the advanced effect of the newly developed ginseng extract on hair growth. The general *Panax ginseng* extract was prepared by boiling with water for 2 hours. The advanced *Panax ginseng* extract was prepared using the newly developed repeated differential pressure method for 2 hours. The ginsenoside contents of each ginseng extract were analyzed by HPLC. The effects of the two ginseng extracts on hair growth were identified with the human dermal papilla cell proliferations, potassium channel assay and human hair follicle organ culture. The advanced ginseng extract using repeated differential pressure method contained ten-fold more ginsenosides than general ginseng extract. The advanced ginseng extract significantly enhanced the proliferation of human dermal papilla cells and potassium channel opening activity than the general extract. In addition, the advanced ginseng extract showed the improved hair growth promoting effect than general extract in human hair follicle organ culture. This study suggested the new extracting method for enhancing the ginsenoside contents in the *Panax ginseng* extract for improving the hair growth effect of ginseng.

P118

Aging-related Clinical Evaluation Study of Hair and Scalp in Chinese Women

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Researcher of AMOREPACIFIC corporation.

S. Kim: None. **S. Kim:** None. **S. An:** None. **J. Lee:** None. **J. Yeon:** None. **W. Park:** None. **Y. Na:** None.

LEARNING OBJECTIVES:
This study shows the physicaland physiological changes in the hair and scalp of Chinese women.

ABSTRACT:
Background: There have been previous studies about hair and scalp changes with aging in Caucasians and some Asians, but not in Chinese who lives in enormous territory.
Aim: The purpose of this study is to investigate aging features in Chinese women's hair and scalp, also their regional differences.
Methods: In total, 1,343 normal Chinese women from six cities in China aged 20 to 65 participated in this research. We studied their hair and scalp features by instrumental measurements, investigations and surveys.
Results: Hair density decreased gradually in their 20s, while hair diameter reached a peak in their 40s. Hair color lightened because of increasing gray hair and color fadedness. Scalp sebum and dandruff were higher at young ages. In contrast, scalp erythema became more severe with aging. Most aging features were similar, but Shenyang and Wuhan had their own characteristics.
Conclusions: This study shows the physical and physiological changes in the hair and scalp of Chinese women. Aging features were remarkably revealed in women in their 40s except hair density which started to decrease from 30s. Some characteristics appeared differently among 6 cities.

P119

Characteristic Features in Chemical Damaged Hair Shaft

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Researcher of AMOREPACIFIC corporation

A. Kim: None. **S. Kim:** None. **Y. Na:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you'lll be able to examine the mechanical/ chemical changes of hair shaft chemical damaged.

ABSTRACT:
Hair shaft has protective function for head and scalp, and also used for expressing personality and styling by chemical-treatments (perming, color-dyeing, bleaching), but those chemical treatments cause extrinsic damage to the hair shaft structure. This study was to investigate the changes in the ultra-structure morphology, protein profile, minerals, moisture content, roughness, and hydropobicity of chemical damaged hair shaft. Hair tresses were divided into control and treatment groups (perming, color-dyeing, bleaching). Hair cuticle ultra-structure morphology was observed by using 3D laser confocal microscope (OLYMPUS, OLS-4100) with 50,000 magnificent.
Damaged Hair proteomics study show decreased peptide numbers, lost of specific hair keratins. Nutritional minerals profiles assay of damaged hair shafts results Phosphorous increase, Copper, Boron, Chromium, and Selenium decrease. Damaged hair moisture contents were significantly decreased. Hair cuticle square roughness results measured by using 3D laser confocal microscope show chemical treatment increase hair cuticle friction force significantly. We also assessed hair surface hydrophobicity with Contact angle data by using Tensiometers (KRUSS, K100C). This results show contact angle in chemical damaged hair shaft was decrease, and indicate hydrophobic hair surface changed to hydrophilic. This study suggests that specific sites and compositions in hair structure are damaged by chemical treat, especially bleaching. These results could give unique insights into how cares chemical damaged hair.

P120

Etiologic Factors of Malassezia Species in East Asian Scalp Seborrheic Dermatitis and Dandruff: Malassezia Fungi, Sebaceous Lipids, and IL-8

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S. Kim: None. **S. Kim:** None. **S. Kim:** None. **A. Kim:** None. **Y. Kim:** None. **W. Park:** None. **J. Lee:** None. **Y. Lee:** None.

LEARNING OBJECTIVES:
M.restricta and *M.globosa* is considered the main pathogenic species underlying SD/D in east Asian patients by inducing IL-8.

ABSTRACT:
Malassezia yeasts are believed to be involved in the development of seborrheic dermatitis (SD) and dandruff. The

main pathogenic species responsible for scalp SD and dandruff (SD/D) in East Asian patients are not well established, and it remains unclear how *Malassezia* yeasts influence the pathogenesis of these conditions. This study investigated the distribution of *Malassezia* yeasts in scalp SD/D patients of 120 Chinese and 20 Korean. ITS1 and ITS2 polymerase chain reaction (PCR) and 26S rDNA PCR-restriction fragment length polymorphism were used to identify *Malassezia* species. Bioactivities of *each strain* were examined by quantifying the sebum lipid and IL-8 inflammatory cytokine production *in vitro* in response to five nonviable *Malassezia* strain extracts: *M. globosa*, *M. restricta*, *M. sympodialis*, *M. dermatis*, and *M. slooffiae*. *M. restricta* and *M. globosa* were the most frequently isolated species on the scalp of both Chinese and Korean SD/D patients. Among the extracts of *Malassezia* strains, *M. restricta* and *M. globosa* induced the most remarkable augmentation of IL-8 production by primary sebocytes and HaCaT keratinocytes, and promoted the sebum secretion though there was no significance. *M. restricta* and *M. globosa* may be considered the main pathogenic species underlying SD/D in Chinese and Korean patients. These species may be implicated in the pathogenesis of SD/D by augmenting the production of IL-8.

P121

Projecting Hair Loss Dysmorphic Disorder from Parent to Child

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University of Portsmouth (UK), PhD; City University of New York, BA (highest honors); Board Certification/Fellow in Trichology. Past associate professor at CUNY; current adjunct professor at Huntington College for Health Sciences (USA); current President of the World Trichology Society (USA), and its director of trichological studies; president of British Science Corporation (USA); director of World Trichology Limited (UK). Adjunct member of the American Academy of Dermatology, the first adjunct member of the International Society of Hair Restoration Surgeons, a member of the North American Hair Research Society, and a member of the International Society for Quality of Life Research.

D.H. Kingsley: None.

LEARNING OBJECTIVES:
This presentation will introduce the concept of 'projection HLDD'.

ABSTRACT:
Hair Loss Dysmorphic Disorder (HLDD) is a preoccupation with hair and sufferers have a distorted view of what their hair looks like. Any minimal hair defect is vastly exaggerated and obsession about their hair affects their quality of life. HLDD has been described mainly in women and as being often caused by an unhappy marriage or work environment. Additional factors such as general life stress (combining work with looking after children and/or elderly parents) and, conversely, being unmarried (or not in a long-term relationship) were also found to be important factors in HLDD. No previous studies, however, have discussed the projection of HLDD on to offspring. The case studies in this presentation found that in this previously undescribed form of HLDD-the author calls 'projection HLDD'- there was a projection from HLDD mothers to their teen-age daughters. These HLDD women claimed that their daughters were losing hair, though none of the daughters had any discernible hair loss problems. This presentation discusses specific case histories and outcomes of families with 'projection HLDD'.

P122

Using T-cell Identification to Diagnose Alopecia Areata

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Dr. Kolivras is a clinical dermatologist and dermatopathologist with dermatopathology expertise in hair loss.

A. Kolivras: None. **C.T. Thompson:** None.

LEARNING OBJECTIVES:
The objective it to learn the utility of CD3+ T-cell identification in the diagnosis of subacute alopecia areata.

ABSTRACT:
Histologically, it is sometimes impossible to distinguish between subacute alopecia areata (AA) and pattern hair loss (PHL). Both may be diffuse clinically, and, histologically, they are both characterized by decreased terminal hair/vellus hair ratio (TVR) and increased catagen and telogen hair percentage. The usual peribulbar lymphocytes ("hive of bees") of acute AA are usually not present in subacute AA. Lymphocytes from superimposed seborrheic dermatitis further often complicate this histologic distinction.
We demonstrate the novel utility of a T-cell immunohistologic marker, CD3 in making a histologic distinction between subacute AA and PHL. Using 4mm biopsies processed only with the new HoVert technique, we demonstrate that subtle CD3+ T-cell lymphocytes persist in follicular stela below the miniaturized follicles of subacute AA. Overall, there are also significantly more dermal lymphocytes that are seen in PHL, even when superimposed seborrheic dermatitis is present. The readily available technique of CD3 immunohistochemistry has significant utility for the dermatopathologist, allowing for more definitive diagnoses of subacute AA and PHL.

P123

Standardized Scalp Massage Results in Increased Hair Thickness

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T. Koyama: Grants/Research Support; Research supported by Angfa Co., Ltd.. **K. Kobayashi:** None. **R. Ogawa:** None. **K. Murakami:** Salary, Contractual Services; An employee of Angfa. **T. Hama:** Salary, Contractual Services; An employee of Angfa.

LEARNING OBJECTIVES:
Admit that scalp massage has possibility of delivering mechanical stress on subcutaneous tissue and increasing hair thickness.

ABSTRACT:
Background: When you recognize your hair loss, you will be interested in hair care products and treatment methods such as scalp massage prior to medication. In this study we evaluated the effect of scalp massage on hair in Japanese males.
Methods: Nine Japanese males aged 25 to 46 (mean 34.8±8 years old) with no obvious hair loss received 4-minutes of standardized scalp massage per day for 24 weeks using a scalp massage device, Panasonic EH-HM75 (Panasonic, Japan). Hair number, hair thickness and hair growth rate were evaluated at 4, 12 and 24 weeks after initiation of massage. The mechanical effect of scalp massage on subcutaneous tissue was analyzed using a finite element

method with KSWAD Ver 7.10 (Kubota System Inc., Osaka, Japan) and ADVENTURECluster Win Ver4.5 (Allied Engineering Corporation, Tokyo, Japan).
Results: Hair thickness increased 24 weeks after initiation of scalp massage, however no significant increase could be shown in hair number and hair growth rate. Finite element method showed that scalp massage caused von Mises stress on subcutaneous tissue containing dermal papilla cells.
Conclusion: Scalp massage is a way to transmit mechanical stress to human dermal papilla cells in subcutaneous tissue. Hair thickness was shown to increase with scalp massage.

P124

Efficient Two Step Procedure For Scalp Scar Repair Combining Fat and Hair Grafting

Gorana Kuka, MD.
Colic hospital, Belgrade, Serbia.

Gorana Kuka, MD is formally trained as plastic and reconstructive surgeon at the Medical School at University of Belgrade, Serbia. Dr. Kuka is a chief resident at Colic hospital. She is highly interested in regenerative medicine and use of fat tissue. For more than 7 years she has been performing hair restoration with more than 600 cases done so far using the latest method- FUE (Follicular Unit Extraction).
Dr. Kuka is board certified by Serbian Medical Society. She is a member of ISHRS, ISPRES (International Society of Plastic and Regenerative Surgery) and AAFPRS (American Academy for Plastic and Reconstructive Surgery).

G. Kuka: None.

LEARNING OBJECTIVES:
Present an optional and efficient way to treat scalp scars combining fat and hair grafting.

ABSTRACT:
Efficient two step procedure for scalp scar repair combining fat and hair grafting. Scars are areas of fibrous tissue that replace normal skin after injury. Scalp scars are very common as a result of accidents, burns, disease or surgery. Usually they could be successfully reconstructed with hairs so the area is fully covered. However, due to very tense scalp tissue, scars could be very thin and grafts don't have enough subcutaneous tissue as a foundation to grow. Sometimes, when transplanting into very thin skin, it can result with buried grafts that leads to another excision therefore another scar. This problem can be resolved when patient's own fat is harvested from one body area (abdomen, outer or inner thighs, neck) and then injected into the area of thin skin in order to recreate that missing subcutaneous layer of skin. A couple of months later, successful hair transplant can be done.
This is to present an innovative two-step scalp scar repair method which provides a solution when single transplanting into scar tissue doesn't work.

P125

Follicular Unit Extraction Technique in Hair Restoration Surgery

Gorana Kuka, MD.
Colic hospital, Belgrade, Serbia.

Gorana Kuka, MD is formally trained as a plastic and reconstructive surgeon at the Medical School at University of Belgrade, Serbia. Dr. Kuka is a chief resident at Colic hospital. She is the author of the website www.haircenter.rs. Seven years ago, she started to perform hair restoration by the latest method- FUE (Follicular Unit Extraction). To date she performed over 600 procedures.
Dr. Kuka is board certified by Serbian Medical Society. She is a member of ISHRS (International Society for Hair Restoration Surgeons).

G. Kuka: None.

LEARNING OBJECTIVES:
Present the most efficient way to perform Follicular Unit Extraction and to achieve best aesthetic results.

ABSTRACT:
Follicular Unit Extraction Technique in Hair Restoration Surgery. Hair transplantation still remains the only safe method to restore hair. The fastest growing technique in hair restoration is follicular unit extraction, due both to its main advantages (avoidance of a linear donor site scar, need for fewtechnicians, obtaining natural result) and the marketing of newly available devices for assisting with the harvesting of grafts. The technique involves a different approach to obtaining grafts than with traditional FUG, extracting individual follicular unit grafts one at a time from the donor area using tiny punches, instead of dissected from a linear strip. Given its popularity with patients and surgeons, the FUE procedure will continue to evolve as more physicians learn about this procedure, gain experience with it in their practices and offer major improvements to the technique.

P126

Dexamethasone-Induced Dickkopf 1 Inhibits Hair Follicle Growth

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I have received my PhD degree from School of Medicine, Kyungpook National University, Korea in 2008. During 2008-2011, I was a postdoctoral fellow at the Brain Korea 21 Center, Kyungpook National University, Korea. Since 2012, I have been working as a research fellow of Professor Young Kwan Sung's laboratory at the department of Immunology, Kyungpook National University School of Medicine, Korea.

M. Kwack: None. **M. Kim:** None. **J. Kim:** None. **Y. Sung:** None.

LEARNING OBJECTIVES:
Understand DKK-1 is involved in stress-associated suppression of hair growth.

ABSTRACT:
The stress-related neurohormones including glucocorticoids (GCs) are secreted by human hair follicles and GCs suppress murine hair growth in vivo. Recent in vitro study also showed that dexamethasone (Dex), a synthetic GC, inhibits the proliferation of human dermal papilla (DP) cells, translocates glucocorticoid receptor (GR) into the nucleus and decreases the expression of growth factors required for hair growth. These results suggest that stress-associated suppression of hair growth may be due to GC-induced changes in DP cells. In this study, we investigated whether dickkopf 1 (DKK-1), a known catagen inducer, is involved in stress-associated suppression of hair growth. DKK-1 mRNA is upregulated after 100nM Dex treatment and DKK-1 is secreted from DP cells into culture medium in response to Dex. RU486, a synthetic GR antagonist, blocked the expression of Dex-induced DKK-1 in human DP cells. Also, Dex inhibited hair shaft elongation and suppressed matrix cell proliferation in cultured human hair follicles, and the neutralizing DKK-1 antibody reversed the Dex-induced inhibition of hair shaft elongation. In addition, Dex caused premature onset of catagen and decreased hair follicle length in mice, whereas neutralizing DKK-1 antibody delayed Dex-induced catagen progression and decline of hair follicle length of mice. Taken together, our data strongly suggest that Dex-induced DKK-1 is involved in stress-associated suppression of hair growth.

P127

Is IL-17 a Targetable Marker for Lichen Planopilaris?

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University of Miami Miller School of Medicine, Miami, FL, USA.

Charlotte is in her fourth year of medical school at the University of Miami. She received her bachelor degree from the University of Miami, graduating magna cum laude with a degree in Neurobiology and minors in Chemistry and Italian. She recently completed a year long research fellowship with Dr. Paolo Romanelli and Dr. Antonella Tosti in

the Department of Dermatology and Cutaneous Surgery at the University of Miami Miller School of Medicine. Currently she is applying to residency in Dermatology.

C. LaSenna: None. **P. Romanelli:** None. **A. Tosti:** None.

LEARNING OBJECTIVES:
Evaluate IL-17 involvement in the pathogenesis of lichen planopilaris.

ABSTRACT:
The etiology of lichen planopilaris (LPP) is unknown, but is likely similar to that of lichen planus (LP). Available treatment options act to broadly suppress the effects of the immune system on hair follicles and are limited in effectiveness. Targeted therapy is an appealing goal in the management of this disease. Recent studies have demonstrated elevated expression of the pro-inflammatory cytokine IL-17 in LP. IL-17 is significantly increased in the serum of patients with LP and in the mucosal tissue of oral LP, where it is thought to induce T cell mediated immune reactions. Like LP, LPP has an inflammatory infiltrate characterized by a predominance of CD8 cells, especially around the infundibulum and bulge. However, expression of IL-17 has not yet been evaluated in LPP. We hypothesize that IL-17 expression is increased in the lesions of LPP, similarly to LP. We present preliminary data using immunohistochemistry staining of cases of LPP with IL-17 to evaluate the expression of IL-17 in this disease process. Studying the expression of IL-17 will help further the understanding of the pathogenesis of this disease and has potential to uncover a new, targetable marker for treatment.

P128

Frontal Fibrosing Alopecia in Circular Patchs: New Presentation of Frontal Fibrosing Alopecia? Clinical e Histopathological Analsys

Yana Lya Almeida Léda, PhD, Letícia Arsie Contin, Daniela Sanchez Facci, Marcelo Neira Ave, Gabriela Horn, Diego Leonardo Bet.
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Yana Lya de Almeida Leda (born 21 September 1984) is a Brazilian doctor, currently in trainning as a Dermatology resident to the São Paulo County Civil Servant's Hospital (Hospital dos Servidores Municipal de São Paulo; HSPM) from 2013 to 2016. Dr. Leda has also completed trainning as an Internal Medicine resident from 2010 to 2012 at São Paulo State Civil Servant's Hospital (Hospital dos Servidores Estadual de São Paulo, IAMSPE).
Her current insterests in the field of Dermatology are Hair Diseases and Dermatological Manifestation of Internal Diseases.
She enjoys watching movies, reading and jogging in her spare time.

Y.A. Léda: None. **L.A. Contin:** None. **D.S. Facci:** None. **M.N. Ave:** None. **G. Horn:** None. **D.L. Bet:** None.

LEARNING OBJECTIVES:
To demonstrate clinical and histopathological aspects of six pacientes with a new presentation of frontal fibrosing alopecia.

ABSTRACT:
Frontal fibrosing alopecia is a variant of lichen planopilaris that predominantly affects the scalp margin. It is presented as a demarcated definitive alopecia area, linear and progressive, predominantly in the frontotemporal regions but eventually all the edge of the scalp and eyebrows. It is observed perifollicular erythema and hyperkeratosis in the active transition areas between the affected area and not yet affected, and in the majority of cases this transition is well defined. In regions where the process has already occurred, this perifollicular inflammation ceases and the affected skin become atrophic, without the presence of hair follicles. We present six patients with alopecia in frontal and temporal areas presented in circular patchs with little sign of perifollicular inflammation, with progressive evolution. The histopathology showed reduction in the number of follicles, perifollicular lymphocytic infiltrate, and in some cases vacuolar degeneration of the basal layer with peripilar fibrosis, compatible with lichen planopilaris. However, the clinical presentation of these patients differs clinically

and in its evolution from classical form of the disease itself and from classical frontal fibrosing alopecia and the differential diagnosis can yet be made with lupus discoid and brocq pseudopelade which can have the same clinical presentation.The cases presented here may be considered a diferent presentation of frontal fibrosing alopecia considering anatomopathological findinds and evolution of the disease.

P129 – TBA

P130

New-formula Shampoo for Scalp Seborrheic Dermatitis Containing Extract of Rosa Centifolia Petals and Epigallocatechin Gallate

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Academic Appointments
2000-2006 Internship, Residency, Fellowship training in Dermatology, Konkuk University Hospital.
2007-2011 Assistant professor in Dermatology, Konkuk University Hospital.
2010-2011 Visiting professor in Dep. of Biomechanical Engineering, Michigan State University
2011-present Associate professor in Dermatology, Konkuk University Hospital.

Social Activities
2013-The present Treasurer, Korean Society for Medical Mycology
2006-The present Member of International society for human and animal mycology (ISHAM) *Malassezia* working group
2013-The present Planning director, Korean Society for Aesthetic and Dermatologic Surgery
2010-The present Member of board of directors, The Korean Hair Research Sociey

Y. Lee: None. **B. Choi:** None. **H. Youn:** None. **M. Kim:** None. **S. Kim:** None. **Y. Kim:** None. **Y. Choe:** None. **K. Ahn:** None.

LEARNING OBJECTIVES:
Extract of *Rosa centifolia* petals or EGCG could be useful ingredients in treatments for scalp seborrheic dermatitis.

ABSTRACT:
Background: Ketoconazole or zinc-pyrithione shampoos are common treatments for scalp seborrheic dermatitis. However, shampoos comprising different compounds are required to provide patients with a wider range of treatment options.
Objective: To evaluate a new-formula shampoo that contains natural ingredients, extract of *Rosa centifolia* petals and epigallocatechin gallate (EGCG), that exert antioxidative, anti-inflammatory and sebum secretion inhibitory effects, and antifungal agents for the treatment of scalp seborrheic dermatitis.
Methods: Seventy-five patients were randomized into three groups: new-formula shampoo, 2% ketoconazole shampoo and 1% zinc-pyrithione shampoo. Clinical severity scores, sebum levels, user satisfaction and irritation were assessed at week 0, week 2 and week 4 after.
Results: The efficacy of the new-formula shampoo was comparable to that of both the 1% zinc-pyrithione shampoo and the 2% ketoconazole shampoo. Furthermore, it was found to provide a more rapid response than the 1% zinc-pyrithione shampoo for mild erythema lesions and was associated with greater user satisfaction compared to the 2% ketoconazole shampoo. However, the new-formula shampoo did not exhibit the previously reported sebum inhibitory effect.
Conclusions: Extract of *Rosa centifolia* petals or EGCG could be useful ingredients in treatments for scalp seborrheic dermatitis.
Limitations: The formula is a complex compound, therefore the exact mechanism of the formula is not clear.

P131

Morphological Phase Transition of Self-Organizing Mouse Skin Progenitor Cells

Mingxing Lei, PhD[1], Linus Schumacher[2], Chao-Yuan Yeh[1], Ting-Xin Jiang[1], Ruth Baker[2], Randall Widelitz[1], Li Yang[3], Cheng-Ming Chuong[1].
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I received my PhD degree from Chongqing University. I studied hair follicle biology. Now as a Postdoctoral fellow at the University of Southern California, I have turned my attention toward understanding the self-organization process involved in hair morphogenesis.

M. Lei: None. **L. Schumacher:** None. **C. Yeh:** None. **T. Jiang:** None. **R. Baker:** None. **R. Widelitz:** None. **L. Yang:** None. **C. Chuong:** None.

LEARNING OBJECTIVES:
We want to understand molecular and cellular aspects regulating the self-organization process used to form hairs.

ABSTRACT:
The transformation process from dissociated multipotent stem or progenitor cells into an organized tissue is a poorly understood and yet fundamental issue in regenerative medicine. To explore this we established an in vitro transwell three-dimensional mixed culture of dissociated newborn mouse epidermal and dermal cells which allows time lapse videography. First, epidermal cells collide to form small aggregates in a stochastic manner. As cells and small aggregates further interact, large aggregates form via adhesion and de-adhesion, reaching a stable size that is surrounded by layers of dermal cells. In these large aggregates, the outer epidermal layer develops apical-basal polarity, forming a basement membrane outside and a cyst like cavity inside. When epidermal cysts contact, the ECM breaks down, enabling epidermal cells to invade, forming protruding chains of epidermal cells and coalescing cysts, leading to a planar layer of epidermis subjacent to a layer of dermis. This is followed by the formation of dermal condensations and periodic induction of hair placodes. When transplanted to the backs of nude mice, these reconstituted cultured skin grafts robustly formed hairs. The findings demonstrate that the self-organizing process from dissociated progenitor cells to reconstituted skin is based on multi-stage morphological phase transitions. The molecular and physical-chemical processes will be discussed.

P132

Psychotrichology and Psychossomatics - Patients Histories and Clinical Presentations

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A.C. Leite Jr: None. **T. Katzer:** None. **D.G. Ramos:** None.

LEARNING OBJECTIVES:
Describe and analyze three cases of hair problems from the standpoint of psychossomatic and analytical psychology.

ABSTRACT:
Psychotrichology is the science that comprises the psyche-body phenomena involving diseases of the hair and scalp. Approaches in psychotrichology may include psychiatric bases, psychoanalysis and analytical psychology. An evaluation from the standpoint of analytical psychology, theory developed by the doctor Carl Gustav Jung, favors a

symbolic view at the disease, giving it a meaning that goes beyond the signs and symptoms of the body. This study aims to describe and analyze three cases of hair and scalp diseases associating clinical pictures with relevant historical and symbolic aspects in life of patients as possible causes of clinical manifestations from the standpoint of analytical psychology. The first is the history of an 8 year old girl who attended a father's aggression against her mother and developed an alopecia areata totalis. The second case is a 43 year old woman who developed scalp infringed dermatitis due to a severe anxiety. Finally, the case of a telogen effluvium on a 23 year old woman who developed hyperprolactinemia after the death of her mother having to replace the mother in the care of her father and brothers.
Analyse the medical history and symbolic issues of hair problems of these three cases allowed a greater understanding of the psycho-emotional suffering of the patients that may be linked to the initiation and maintenance of their clinical condition.

P133

Evaluation Of Low-Level Laser Cytotoxicity In L-929 Fibroblasts

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A.C. Leite Júnior: None. **A.O. de Souza:** None. **S.S. de Souza:** None. **A.T. Bertolletti:** None. **C. Rocha:** None.

LEARNING OBJECTIVES:
Evaluate the cytotoxicity of low-level laser application on the L-929 fibroblasts, in three different models of method exposure.

ABSTRACT:
In vitro cytotoxicity assay is the first test to evaluate the biocompatibility of any material for use in biomedical devices. Low-level laser therapy has been proposed for the treatment of some skin and hair problems, including androgenetic alopecia.
This study aims to evaluate the cytotoxicity of low-level laser application (λ = 660 nm) on the L-929 fibroblasts, in three different schemes of exposure:
-1: 4 Joules/cm2 (44 seconds) directly on the cells four times a day during 15 days;
-2: 4 Joules/cm2 (44 seconds) directly on the cells twice a week during 15 days;
-3: 4 joules/cm2 (44 seconds) directly on the cells once a day during 5 days.
The study was developed at the Molecular Biology and Cell Culture Laboratory of the Health Sciences School of the Universidade Anhembi Morumbi. After the treatment the cell viability was analyzed and the results show that the intensity of low-level laser used in this study was not cytotoxic. Besides it was observed a significant cell proliferation after irradiation for five consecutive days (scheme 3).

P134

Prevention & Earlier Detection of Cicatricial Alopecia in African American Women by Partnering with Hair Stylists

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Dr. Lenzy is a board-certified dermatologist and owner of Lenzy Dermatology in Chicopee, MA. Her research and clinical practice focuses on hair and scalp disorders and skin of color. Prior to college, Dr. Lenzy trained in cosmetology and has been a licensed cosmetologist for 16 years. Her background as a hair stylist fueled her passion to focus her career on optimizing care for the hair and scalp from a medical perspective. Dr. Lenzy has participated in numerous studies, including partnering with local hair salons to educate stylists on identifying the early signs of hair loss in their clients.

Y.M. Lenzy: None.

LEARNING OBJECTIVES:
Analyze the results of a multi-center community-based trial that trains hairstylists to recognize early signs of alopecia in their clients

ABSTRACT:
Alopecia is a common problem for many and a frequent concern for African American women. Central Centrifugal Cicatricial Alopecia is the most common form of hair loss in African American women. If identified early, interventions are more likely to be successful in preventing the progression of extensive scarring hair loss. By discussing use of hair stylists to identify early signs of alopecia, this session intends to raise awareness about the utility of community educators as “physician extenders” beyond those who are traditionally medically trained. These individuals can serve as community health advocates. Other disciplines have explored use of beauty salons to disseminate information to the community. Such a format has been used relating to diabetes, hypertension, breast cancer and other medical conditions. While there is no exact measure of community health advocates used in dermatology, the paucity of literature on this subject suggests that they are rarely used. The dermatology and hair loss community should be made aware of the distinct utility of community health advocates as it relates the early identification of and intervention for scarring alopecia which is reaching epidemic proportions in certain populations.

P135

Association Between Thyroid Abnormalities and Clinicopathological Features in Korean Alopecia Areata Patients

Young Jun Oh, Dong woo Suh, **Bark lynn Lew**, Woo young Sim.
College of Medicine, Kyung Hee University, Seoul, Korea, Republic of.

She is an instructor of the Department of dermatology. Her specialties are in the areas of atopic dermatitis, laser, hair diseases and dermatologic surgery. She is also a contributor to the Korean Dermatologic association.

Y. Oh: None. **D. Suh:** None. **B. Lew:** None. **W. Sim:** None.

LEARNING OBJECTIVES:
To determine whether clinicopathologic features of AA is associated with thyroid function abnormalities and autoimmunity.

ABSTRACT:
Alopecia areata (AA) is a common form of localized, non-scarring hair loss. The pathogenesis is still unclear, but there is evidence of autoimmunity and endocrine dysfunction. The aim of this study was to determine whether clinicopathologic features of AA is associated with thyroid function abnormalities and autoimmunity.
In this retrospective epidemiologic study, we investigated the thyroid autoantibodies [TgAb, ATMAb,TSHAb], & hormones [T4, T3 and TSH],& clinicopathologic features, such as onset age, duration, severity , family history, atopic dermatitis, nail involvement & other illness in 1,408 AA patients who visited our clinic between June of 2006 & March of 2014. With the result, we investigated the relationship between them. Thyroid function abnormalities found in 206(12.68%),& autoimmune Abs in 65(4.00%). 1.We looked for the difference of function or Ab abnormalities between the groups divided according to each features. By function abnormalities, there were significant difference in all features except duration & presence of other illness. 2. For the difference of the

proportion of patients with each features between the group with function or Ab abnormalities and the group without. There was the difference of extent of AA between 2 groups. We could see that alopecia areata patients might have thyroid function abnormalities or thyroid disease, and the significant relationship between thyroid function or autoantibody abnormalities and prognostic factors of AA.

P136

Alopecia Areata Bulbs Show Significant Transcriptional Abnormalities Before, During and After Active Hair Loss

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Dr Jane Li is a PhD student and dermatology trainee from The University of Melbourne. Currently, she is based at the Peter Doherty Institute for Infection and Immunity. Jane obtained her MBBS (Hons) from the University of Melbourne in 2010, and commenced her PhD in 2013, studying gene expression of hair follicles in alopecia areata.

J. Li: None. **C. van Vliet:** None. **N.W. Rufaut:** None. **L. Jones:** None. **R. Sinclair:** None. **F.R. Carbone:** None.

LEARNING OBJECTIVES:
Describe the transcriptional abnormalities present in alopecia areata hair bulbs during different stages of the disease.

ABSTRACT:
Anagen bulbs are the primary targets of autoimmune attack in alopecia areata (AA). In this study, we investigated the transcriptional profile of AA bulbs during different disease stages.
Biopsies were collected from AA and healthy volunteers, with AA biopsies obtained from areas of active hair loss, regrown areas, and previously unaffected areas. We used laser capture microdissection to isolate mRNA specifically from anagen bulbs, then performed PCR with primers targeting immune- and hair-related genes, including all known chemokines. We found that multiple chemokines were significantly upregulated in active AA compared to normal controls. Furthermore, we observed strong correlations in the expression of several chemokine-receptor pairs, suggesting that these chemokines were recruiting immune cells bearing the corresponding receptors. Although the transcription pattern in regrown AA was attenuated compared to active AA, it remained significantly abnormal. This finding implies that permanent changes may persist in regrown AA despite clinical remission, potentially predisposing to future relapse. Unaffected AA bulbs also showed transcriptional abnormalities compared to normal controls, including a relative decrease in CST6 expression. Interestingly, CST6 deficiency is known to cause scarring alopecia in mice. Finally, we identified 5 genes that were significantly overexpressed in all AA categories: CCL5, CXCL9, CCL19, HLA-C and CD4. This "core signature" supports the existence of an underlying abnormality in AA that is present before overt hair loss.

P137

Inducing Hair Follicle Organogenesis with Defined Protein Factors

Sabrina Mai-Yi Fan[1], Chia-Feng Tsai[2], Chien-Mei Yen[1], Su-Hua Pan[1], Yu-Ju Chen[2], **Sung-Jan Lin, MD, PhD**[1].
[1]National Taiwan University, Taipei, Taiwan, [2]Academia Sinica, Taipei, Taiwan.

Dr. Sung-Jan Lin, MD, PhD, is now an associate professor in Institute of Biomedical Engineering, National Taiwan University. He is also a dermatologist in National Taiwan University. His research interest includes tissue engineering, hair follicle regeneration, responses of hair follicles to various insults, pigment loss and biomedical optics.

S. Fan: None. **C. Tsai:** None. **C. Yen:** None. **S. Pan:** None. **Y. Chen:** None. **S. Lin:** None.

LEARNING OBJECTIVES:
To demonstrate a new method to induce hair follicle neogenesis with defined protein factors.

ABSTRACT:
Hair follicle neogenesis depends on the initiation and perpetuation of cross-talk between keratinocytes and dermal cells. When skin is injured, it is usually repaired with fibrosis except in embryos that exhibit scarless healing with formation of new hair follicles. We ask whether similar neogenesis of hair follicles can be reinitiated in postnatal life. We found that protein extract from embryonic skin of specific developmental stage was able to induce hair follicle neogenesis both in a full thickness wound and a modified patch assay in mice without the help of inductive mesenchymal cells. Hair follicle organogenesis here was mediated mainly through the effect on fibroblasts. When adult fibroblasts, but not keratinocytes, were cultured with the protein extract, they were conferred the ability to induce new hair follicles. In search for the molecular mechanisms involved through phosphoproteomic analysis, we found that insulin/IGF signaling was activated and required for the hair follicle inductivity in adult fibroblasts. Through proteomics analysis with mass spectometry, we identified 3 extracellular proteins enriched in embryonic skin that together were required and sufficient to induce hair follicle neogenesis in vivo. Therefore, hair follicle regeneration could be initiated by creating a pro-regeneration environment with defined extracellular factors enriched in the developmental stages. Identification of such environmental signals can be incorporated with other approaches to enhance hair follicle regeneration.

P138

Two Distinct Spontaneous Regenerative Activities to Repair Ionizing Radiation-induced Dystrophy in Anagen Follicles

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National Taiwan University, Taipei, Taiwan.

Dr. Sung-Jan Lin, MD, PhD, is now an associate professor in Institute of Biomedical Engineering, National Taiwan University. He is also a dermatologist in National Taiwan University. His research interest includes tissue engineering, hair follicle regeneration, responses of hair follicles to various insults, pigment loss and biomedical optics.

W. Huang: None. **H. Chiu:** None. **S. Lin:** None.

LEARNING OBJECTIVES:
There are two distinct repair activities to restore the anagen hair follicle structure following radiation injury.

ABSTRACT:
Whether and how anagen hair follicles attempt to repair themselves in response to ionizing radiation (IR) have not been characterized. We found, depending on doses of IR, anagen hair follicles undergo dystrophic anagen or dystrophic catagen. For dystrophic anagen response, there was a dose-dependent effect of IR on the severity of dystrophy. According the severity of dystrophy, anagen hair follicles were able to initiate two spatially and temporally distinct early and late repair activities to restore their structure. At low dose of IR, lineage tracing showed that K5+ hair bulb cells, but not bulge stem cells, compensatorily proliferated at 12 to 48hr to restore hair bulb structure. At higher dose of ionizing radiation, Lgr5+ cells in the more dystrophic hair follicle proliferated at 72 to 120hr to restore anagen hair follicle structure and this was later followed by activation of bulge stem cells to repair upper outer root sheath. RNA sequencing showed that the apoptosis-driven dystrophy was p53-dependent and the severity of dystrophy was associated with the duration of Wnt signaling inhibition by IR. Restoration of Wnt signaling preceded the repair attempts. We demonstrated that boosting Wnt signaling was able to prevent hair loss by enhancing self-repair at an earlier stage. Thus, radiation-induced alopecia can be prevented by modulating Wnt signaling to enhance spontaneous anagen repair.

P139

Changes in Hair Follicle Morphology and Hair Shaft Dimensions After Hair Transplantation Surgery are Depend on the Grafting Technique

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Dr. Gerd Lindner is a renowned expert in biomedical research with a 15- year track record in tissue engineering and skin and hair organogenesis. He received his Ph.D. degree in Biochemistry with a focus on hair physiology from the Free University of Berlin. Doctor Lindner researches into hair disorders and the science and applications of stem cells residing in the skin and other organs. He could recently succeed to culture a fully in vitro established human hair follicle equivalent. He filed worldwide patent families on this technology and has published several high-ranked peer reviewed articles on hair and skin biology.

R.P. Azar: None. **A. Thomas:** None. **G. Lindner:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will learn about the changes in follicle morphology after hair transplantation surgery

ABSTRACT:
Follicular unit transplantation (FUT) is the most commonly performed technique in hair transplantation surgery. It relies on the acquisition of intact micro-dissected follicular units (FUs) from scalp skin strips and their subsequent transplantation into the recipient regions affected by alopecia. Ideally, this translocation of FUs should not result in any morphological change of the grafts. However, the insults associated with surgical intervention present grafted follicles to mechanical and chemical cues different from those of the physiological steady-state conditions in undamaged skin.
In this study, we analyzed native and grafted scalp hair follicles that were biopsied years after FUT surgeries. Electron microscopy and light microscopy-based histomorphometry revealed a marked enlargement of follicular structures in the grafts with a concomitant increase in hair shaft diameter. Immunohistological staining confirmed a thickening of the dermal sheath in transplanted hair follicles that harbored a denser vascular network.
Taken together, these results show that the analyzed grafted hair follicles were subjected to marked morphological changes during their residence in the recipient site and that this phenomenon is associated with a modulation of follicular vascularization. The disruption of the normal follicular micro-environment might alter important aspects of hair biology in grafts, e.g. hair cycle and pigmentation, and in turn could lead to differences in hair appearance.

P140

A Topical Botanical Lotion Improves Recovery From Chemotherapy Alopecia and Persistent Hair Issues in Cancer Survivors Through Local Modulation of Apoptosis and Anti-inflammation

Tadafumi Shiiba, Reiko Kondo, Saad Harti, Angelo Mello, Geert Cauwenbergh, Ph.D., **JiaWei Liu, Ph.D.**.
Legacy Healthcare, epalinges, Switzerland.

Dr. Liu received his Ph.D. training from University of Geneva, clinical trial training from Harvard Medical School and post-doctoral fellowship from Dermatology Department of Lausanne University Hospital, Switzerland. Being active in international academic & industry sectors, he successfully developed numerous high quality research projects. Also, held senior positions in a Swiss drug development company and engaged in teaching activities of the PPCR course at Harvard Medical School (2013, 2014). He has published over 27 peer-reviewed papers and meeting abstracts and co-holds a patent in collaboration with Astellas Pharma. As the Vice President, he oversees Legacy Healthcare's R&D activities.

T. Shiiba: Salary, Contractual Services; Salary. **R. Kondo:** Salary, Contractual Services; Salary. **S. Harti:** Stock/Shareholder (self-managed); Salary, Contractual Services; Salary. **A. Melle:** Salary, Contractual Services; Salary. **G. Cauwenbergh:** Stock/Shareholder (self-managed); Salary, Contractual Services; Salary. **J. Liu:** Salary, Contractual Services; Salary.

LEARNING OBJECTIVES:
Demonstrate the strategy to modulate apoptosis and scalp micro-inflammation in the management of hair loss due to cancer treatments

ABSTRACT:
Chemotherapy induced alopecia (CIA), with 65% incidence, is among the most distressing side effects of cancer therapies. 70% of cancer survivors still complain from persistent hair issues several years after hair regrowth. In human scalp biopsy, we demonstrated that the product, a topical botanical lotion, normalized follicular cell apoptosis and attenuated scalp micro-inflammation, two unresolved key issues in CIA and chemotherapy persistent hair disorders (CPHD). To further assess the product potential, we conducted two pilot studies aiming at:
1. Efficacy in reducing CIA baldness period
2. Recovery from CPHD, especially improvement of hair thinning and hair volume.
First study (n=9) in female cancer patients treated with chemotherapy showed that product application allowed faster hair recovery (5-16 weeks quicker than historical control). Baldness period, from maximum hair loss to first hair regrowth, lasts 20 weeks on average in non-treated references.
Second study (n = 21) in cancer survivors complaining from CPHD revealed first improvement was observed in 33%, 52% and 76% of subjects after 1, 2 and 3 months, respectively, following product application. Product compliance was good (twice-daily) and no side effect was reported in both studies. The initial outcome showed that the product application reduced baldness period in cancer patients treated with alopecia chemo-agents, improved hair pattern in most subjects complaining from CPHD, as early as 1-3 months.

P141

Late-onset Alopecia Areata: Epidemiology, Clinical Characteristics and Prognosis

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Anna Lyakhovitsky, MD
Education: Hadassah Medical School, Hebrew University, Jerusalem.
Postgraduate training: Internal Medicine: Kaplan Medical Center, Hebrew University. Dermatology: Chaim Sheba Medical Center affiliated to Tel-Aviv University.
Academic & Hospital Affiliations: 2003-present: Attending dermatologist at the Chaim Sheba Medical Center.
Honors & Awards: Hadassah Medical School Faculty prize on excellent clinical work. The Israel Society of Dermatology and Venereology prize for the best research: "Expression of E-cadherin and beta-catenin in cutaneous quamous cell carcinomas and precursors".
Memberships in professional societies: Israeli Medical Association, Israeli Society of Dermatology and Venereology, American Academy of Dermatology, European Hair Research Society.

A. Lyakhovitsky: None. **A. Eshkol:** None. **S. Baum:** None. **A. Barzilai:** None.

LEARNING OBJECTIVES:
To define epidemiology, clinical features and course of late-onset alopecia areata.

ABSTRACT:
Alopecia areata (AA) is autoimmune disease characterized by nonscarring hair loss. Several studies have shown worse prognosis in cases of early onset AA. Little is known about adult-onset AA. In order to define epidemiology, clinical features and course of late-onset AA, from all AA patients who visited the outpatient clinic of department of dermatology, Chaim Sheba Medical Center from 01.2009 to 01.2014, patients with onset of AA at age 45 years and above were retrospectively recruited. Twenty six AA patients including 21 females (80.8%) and 5 males (19.2%)

with age ranged from 45 to 68 years were enrolled. Family history of AA was reported in 3 (11.5%) of cases. Four patients (15.4%) had hypothyroidism, two had vitiligo, one psoriasis and one fibromyalgia. Association with atopy was found in 7 (26.9%) patients. Most common clinical pattern was multifocal patchy AA observed in 22 (84.6%) patients and 20 (76.9%) of patients had less than 20% of scalp hair involvement. A complete hair regrowth was observed in 23 (88%) patients within 1 year, two patients had partial hair regrowth and one patient developed alopecia totalis. In conclusion, late-onset AA is characterized by female predominance and milder disease activity. Similarly to the early-onset AA, the atopic background and family history are common.

P142

Conventional Grading Classifications Or Trichoscopy For Diagnosis Of Early and Un-patterned Female Androgenetic Alopecia ?

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Biography – Dr. Sukesh M S
Qualifications - M.B.B.S; M.D; DNB (Dermatology), IADVL Training Fellowship in LASERS
Members of Scientific Organizations: ISD ,EADV, IADVL ,ASCI , Special Interest Group –Trichology IADVL
Academic Honors:
Editorial Board Member IJSD; Reviewer of IJDVL; Associate faculty member for review on trichology studies in F1000 journal
Assistant editor and contributor to textbook on 'hair transplantation by Indian authors'; Co-editor and author on textbook on 'Platelet rich plasma'; authored 2 chapters in national textbooks
6 publications, 6 International and 9 National- Paper presentations; 8 International and 6 National- poster presentations, 7 best paper presentation awards

S. M s: None. **R. Dhurat:** None.

LEARNING OBJECTIVES:
Explain and compare various emerging technologies and therapies as they relate to hair loss and hair growth.

ABSTRACT:
Introduction: Clinical diagnosis of Female pattern Hair Loss(FPHL) according to the Conventional Grading Classifications(CGC) is based mainly on thinning and widening over mid scalp.However,early cases can be missed when the thinning may not be evident.Also, FPHL is a diffuse process,which may present without patterned hair loss.Hair Diameter Diversity (HDD) > 20% on trichoscopy provides a valuable tool in assessing miniaturisation process,characteristic of FPHL.
Aims: To assess whether CGC or Trichoscopy is useful for early diagnosis of FPHL and also to document apparent sparseness of hair as per CGC and HDD on trichoscopy[10x], separately at standard scalp sites of the scalp to prove the unpatterned nature of FPHL
Methodology:250 Indian females complaining of increased shedding of hair of more than 6 months duration with either Grade II of Sinclair Classification or Grade I (normal mid parting) but with positive hair diameter diversity present anywhere on the scalp were enrolled.Clinical sparseness and HDD were assessed and compared separately at midscalp[MS],bi-frontal[BF],temporal[T] and occipital[O] areas at specific sites.
Results:Out of 250 cases only 172[68.8%] were diagnosed by CGC as FPHL,while trichoscopy diagnosed these and also the rest 78 cases [31.2%] which also included sites other than midscalp where thinning was not clinically evident.
Conclusion: Trichoscopy serves as a valuable tool to detect the miniaturisation process in Early FPHL and in non-patterned cases,which could be missed through CGC.

P143

Establishing and Prioritizing Research Questions for the Treatment of Hair Loss of all Types: the Hair Loss Priority Setting Partnership

Abby E. Macbeth, MBChB MRCP(UK) PhD[1], Julia Brockley[2], Jairabanu Mohd Kassim[3], Alexa Shipman[2], Weronika Szczecinska[4], On behalf of the Hair Loss PSP Steering Group[1].
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Dr Abby Macbeth is a Dermatology Registrar at the Norfolk and Norwich University Hospital, Norwich, UK with a clinical interest in hair disorders, in particular Alopecia areata. She has a research interest in clinical trials of therapies and predictive and response biomarkers in autoimmune and connective tissue disease. Abby has recently completed a research fellowship at Cambridge University Hospital, UK as the recipient of the Maxwell Charnley Dermatology Research Fellowship and was awarded the UK Dermatology Clinical Trials Network Registrar Fellowship.

A.E. Macbeth: None. **J. Brockley:** None. **J.M. Kassim:** None. **A. Shipman:** None. **W. Szczecinska:** None. **O. the Hair Loss PSP Steering Group:** None.

LEARNING OBJECTIVES:
Understand the clinical research priorities of UK clinicians, researchers and patients as determined by robust and transparent pre-determined research methods.

ABSTRACT:
The Hair Loss Priority Setting Partnership(PSP) was proposed by the British Hair and Nail Society to identify research priorities across all hair loss conditions. The process was funded by Alopecia UK and was a unique partnership of patients, carers, clinicians, researchers and other allied professionals. To our knowledge it is the first of its type worldwide.
The aim was to identify the top ten research priorities in ‘Alopecia areata’ and in ‘Other Hair Loss Disorders’. Research priorities will be publicized with the aim of stimulating future clinical research and opening further research funding streams. The methods followed the guidelines of the James Lind Alliance, a project hosted by the National Institute of Health Research with support from the Medical Research Council. An initial online survey (Survey Monkey™) and paper surveys at key events reached representatives from wide-ranging hair loss conditions. Of 912 survey responses, 81% were completed by patients, or carers, and 12.6% by healthcare professionals or organizations. Following exclusion of out of remit questions by steering group consensus, 1823 research questions remained. Interim priority setting was followed by a second ranking survey. The priorities in each group were determined by workshops using the Delphi technique.
We announce the top 10 research priorities in ‘Alopecia areata’ and ‘Other Types of Hair Loss’ and discuss the PSP process and pitfalls encountered.

P144

EZH2 is Required for Human Hair Follicle Growth and Epidermal Differentiation

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[1]University of Bradford, Bradford, United Kingdom, [2]Farjo Hair Institute, Manchester, United Kingdom.

Dr Mardaryev is a Research Investment Lecturer at University of Bradford (UK). Dr Mardaryev's laboratory is primarily focused on the role of epigenetic mechanisms driving skin epithelial stem/progenitor cells differentiation during development and regeneration.

I. Asamaowei: None. **N. Farjo:** None. **V. Botchkarev:** None. **N. Botchkareva:** None. **A. Mardaryev:** None.

LEARNING OBJECTIVES:
Understand the role of epigenetic factor Ezh2 in regulation of human hair follicle growth and epidermal differentiation.

ABSTRACT:
Enhancer of zeste homolog 2 (Ezh2) is a catalytic subunit of the polycomb repressive complex 2 which methylates 'Lys-27' of histone H3 leading to transcriptional repression of target genes. Ezh2 functions as a critical regulator of stem cell identity and their differentiation in embryonic and adult tissues. In mouse skin, Ezh2 prevents premature differentiation of epidermal progenitor cells, and is required for proliferative activity of hair follicle stem cells. The role of EZH2 in human skin homeostasis remains unclear. Here, we show that in human skin Ezh2 is predominantly expressed in the epithelial cells. In the epidermis, its expression is increased in differentiating cells of the suprabasal layer. Indeed, Ezh2 expression is markedly up-regulated in Ca2+-induced differentiation in primary human keratinocytes. In anagen hair follicles, Ezh2 is expressed in Keratin15/Keratin 19/CD34-positive progenitor cells in the outer root sheath, as well as in differentiating cells of the inner root sheath and precortex, whilst no Ezh2 expression was detected in the dermal papilla and connective tissue sheath. Inhibition of Ezh2 with a selective small molecule, 3-Deazaneplanocin A, caused a dose-dependent retardation of hair growth ex vivo. The latter was associated with decreased proliferation and increased apoptosis in the outer root sheath. These results suggest that Ezh2 might play a critical role in the control of human epithelial progenitor cells proliferation and differentiation.

P145

Role of Lipids in Hair Health

Jennifer Marsh, PhD[1], Michael J. Flagler[1], Ron Walker[1], Shane Whitaker[1], Ramon Grimalt[2].
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Jennifer Marsh has been working with P&G 20 years in a variety of roles including consumer research, product development and technology development. Her early career was spent in the UK working as a technologist in hair color and for the past 8 years she has been based in the Beauty Technology Division working on hair color and hair care technologies in Cincinnati, Ohio. Jennifer has presented and published papers in the area of hair structure science and hair color. She hold >20 patents.

J. Marsh: None. **M.J. Flagler:** None. **R. Walker:** None. **S. Whitaker:** None. **R. Grimalt:** None.

LEARNING OBJECTIVES:
At the end of reading the poster content you will be able to understand how lipids influence hair health.

ABSTRACT:
Structural internal lipids are important components of hair but there is limited data in the literature regarding their exact role in hair structure, how these lipids vary from one person to the next and their impact on hair health properties such as shine, feel, manageability etc. In this study a method was developed to measure both 'unbound' and 'bound' internal lipids using extraction followed by Supercritical Fluid Chromatography Tandem Mass Spectrometry (SFC/MS/MS). This allowed us to characterize 37 different lipids and measure how these change as hair is subjected to different insults such as shampoo and conditioner treatment. This method was also applied to hair samples from individuals to understand the variability at root of endogenous lipids levels and also how these levels change over time from root and tip hair. Lipids were found to change from root to tip and studies were performed to correlate changes in lipids with changes in single fiber and bulk hair health properties

P146

Alopecia Areata in Kidney Transplantation: Case Report

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Received my medical degree from Buenos Aires University with greatest honours (2008). Residence in Dermatology at the Italian Hospital of Buenos Aires (HIBA). Trained with one of the lider trichologist,Prof. Francisco Camacho-Martinez in Spain and trained on FUE technique with Dr Alejandro Chueco in Buenos Aires. National and International presentations on dermatologic and hair congresses. Member of the Argentinian Dermatology Society (SAD) and Hair Recovery Argentinian Association. Professor at the SAD Hair course. Author of chapters of the Argentinian book " 50 diagnósticos dermatológicos". Coordinator of medical athenaeums and fellow at the Capilar Center at the the HIBA dermatology service.

M.S. Martin: None. **G. Alcala:** None. **M.P. Caviedes:** None. **C. Navarro Tuculet:** None. **R.L. Galimberti:** None.

LEARNING OBJECTIVES:
Present an infrequent case of autoimmunity and inmuno dysregulation in a context of immunosuppression.

ABSTRACT:
The development of AA in patients who are immunosuppressed for a long period of time, especially with multiple agents, is a fascinating phenomenon that emphasizes the lack of understanding of this disease.Further research isA woman aged 61 was referred to consultation because of a 2-month history of hair loss. She received a kidney transplant ten years earlier due to cystic fibrosis and had no previous history of hair loss. By the time she developed alopecia she was receiving prednisone 8mg/day, tacrolimus 1.5mg/day and azathioprine 50mg/day. Numerous patches 2 to 5 cm of non-scarring alopecia were observed throughout the scalp. Thyroid tests were normal and antinuclear antibodies were negative. She was diagnosed and treated for alopecia areata (AA). Development of an autoimmune condition after a kidney transplant in the context of immunosuppression is unexpected. AA is a well-known organ specific autoimmune disease of unknown mechanism. Although most studies suggest a role for cell-mediated immunity, there is controversy in the pathogenesis of this disease. Similarly to the 3 cases reported in the literature, our patient was a woman, who was receiving tacrolimus and developed the disease years after transplantation. However, no changes were made to the immunosuppressive drugs, and serum levels of tacrolimus were maintained within the therapeutic range needed to clarify the mysteries of this immune dysregulation, culminating in AA.

P147

Kerion Celso With Scarring Alopecia and FUE Technique Treatment

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Dr. Hugo V. Martinez, Dermatology resident in Hospital General de México, México city. Medical Sub-specialty in Skin cancer. Fellow in hair diseases and hair transplantation in Spain. Mexican Academy of Dermatology member. Speaker in symposiums and discussion forums in Mexico and Latin America. Review article "Tinea Capitis Revisión de casos en 20 años" in revista mexicana de dermatología. President of the Dermatology Local Academy. Dermatologist certified for the mexican college.

H.V. Martinez: None.

LEARNING OBJECTIVES:
At the conclusion, you will be able to think in FUE for scarring alopecia due Kerion Celso.

ABSTRACT:
The case of a male patient of 13 years old, originally from Guerrero, Mexico is presented. He lives in a rural community. As important antecedent Ringworm head had five years ago with severe inflammatory response resulting in a complicated kerion Celso. He received attention for fungoides and belatedly to the inflammation adding a secondary infection, with a residual scarring alopecia areas surrounded by some areas with hypertrophic scarring. Later, he received multiple corrective affected areas with little improvement treatments. The patient was forced to cover his head permanently with wearing hats or caps. He sent us to assess surgical treatment doctor, so we decided to perform hair transplant with FUE technique, trying not only the hypertrophic zones. The aim was to

provide a larger amount of hair and cover over the areas of alopecia. The result after 6 months post-transplant is very good and the patient feels self-confident and improved their quality of life.
The aim of this paper is to demonstrate that hair transplantation is a useful treatment in some subsequent scarring alopecia infections, and may allow improvement in the appearance of lesions of the scalp although we know that the results are only partially successful.

P148

Tinea Capitis in an Elderly Patient. Case Report and Review of Literature

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Allow me to present myself as Karla Martinez, I'm a
third-year Dermatology resident from the University of San Luis Potosí.
I consider myself as an independent and respectful young adult
with a strong work ethic.
Dermatology is a beautiful and noble specialty; we are able
to treat patients of all ages, as well we can diagnose diseases with neoplastic, infectious, inflammatory and immune physiopathology.
I'm looking forward to do a fellowship once I finish my
residence and I think these major academic events are key to create work networks that may allow achieving a higher level of education.

K. Martinez: None.

LEARNING OBJECTIVES:
Illustrate the spectrum of uncommon infectious diseases affecting hair and scalp in elderly patients.

ABSTRACT:
A 72-year old female presented with a 1-year history of itchy plaques on her face and scalp. The patient was treated with systemic, topical antibiotics and corticosteroids without improvement. Physical examination revealed pruritic erythematous scaly plaques on face, mild alopecia located on the hair line and small black dots. Dermoscopy showed multiple corkscrew and comma hairs. Direct microscopic examination of scalp hairs showed ectothrix type parasitism. A culture from hairs revealed *Trichophyton tonsurans*. The diagnosis of tinea capitis was made and treatment with terbinafine was started. Complete resolution of lesions was achieved within 3 months. Tinea capitis is a superficial fungal infection of the skin and hair. It was considered a pediatric disease; however recents reports proved that it also affect elderly patients. The disease is usually caused by *T. tonsurans* and *M. canis*. Dermoscopy is an important diagnostic tool and several features have been described such as: bar code like, zig-zag and broken hairs. Diagnosis is based on clinical history and laboratory tests such as culture and direct examination techniques. Treatment is based on terbinafine or itraconazole; however there are reports of resistance to the latter in fungi from the genus *Trichophyton*. The differential diagnosis of an itchy scaly disorder in scalp of elderly patients should include tinea capitis, especially after initial therapeutic approach has failed.

P149

Hair Follicle Mesenchyme Cells Exhibit Immune Privilege and Can Improve Islet Allograft Survival

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Dr. McElwee is an Associate Professor in the Department of Dermatology and Skin Health at the University of British Columbia, Canada, and Director of the Hair Research Laboratory in the Vancouver Coastal Health Research Institute at Vancouver General Hospital. He is Chief Scientific Officer for Replicel Life Sciences Inc.

K. McElwee: Consultant; Replicel Life Sciences Inc.. Grants/Research Support; Replicel Life Sciences Inc.. Stock/Shareholder (self [illegible] **X. Wang:** None. **J. Hao:** None. **G. Leung:** None. **E. Wang:** None. **N. Akhoundsadegh:** None. **G. Warnock:** None. **J. Shapiro:** Stock/Shareholder (self-managed); Replicel Life Sciences Inc..

LEARNING OBJECTIVES:
Understand hair follicle mesenchyme immune privilege and its potential exploitation in inflammation modulation.

ABSTRACT:
We investigated the immune privilege (IP) of hair follicle mesenchymal cells. Cultured dermal papilla (DP), dermal sheath cup cells (DSCC), and non-bulbar dermal sheath (DS) cells were evaluated for IP related gene and protein expression against non-follicular fibroblasts (FB). DP and DSCC exhibited significantly reduced H2d (MHC II) expression by mRNA, and DP, DSCC, and DS expressed Inhibin A (Inhba) mRNA and protein. DSCC also expressed higher Fgf2. DP, DSCC, and DS expressed BMP6 notionally supportive of islet survival. In vitro assays using allogeneic C57BL/6J derived spleen cells mixed with cultured BALB/cJ DSCC or FB cells demonstrated a significantly reduced activation response, as measured by IFN gamma, to DSCC from both CD4+ and CD8+ cells. BALB/cJ mouse islets were co-transplanted with syngeneic hair follicle DSCC (group 1) or FB (group 2) under the kidney capsule of immune-competent, streptozotocin induced, diabetic C57BL/6J recipients. Group 1 allografts survived significantly longer than group 2 (32.2 +/- 12.2 vs. 14.1 +/- 3.3 days, $p<0.001$). Analysis of transplants revealed increased blood vessel formation and lower inflammatory cell infiltration in group 1 post-transplantation. Analysis of cells from the renal lymph nodes of transplanted mice revealed higher frequencies of CD4+Foxp3+, and CD25+Foxp3+ cells, and lower CD8+CD69+ effector cell percentages in Group 1. This novel finding demonstrates the functional IP of cultured hair follicle derived mesenchymal cells.

P150

Frontal Fibrosing Alopecia: Expanding the Clinical Picture

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Dr. Messana completed her undergraduate degree at the University of Minnesota before graduating from the Lake Erie College of Osteopathic Medicine. She completed her residency training in dermatology at the St. Joseph Mercy Hospital, and will begin her dermatopathology fellowship at the Cleveland Clinic in June 2015. She is a clinical faculty member at the Michigan State University College of Osteopathic Medicine. She has accepted a number of leadership roles including student government president of her medical school, the national research representative for the council of osteopathic student government presidents, and chief dermatology resident of her dermatology program.

K. Messana: None. **C. Messana:** None. **K. Heidelberg:** None.

LEARNING OBJECTIVES:
Highlight the association of frontal fibrosing alopecia and lichen planus pigmentosus in African American women.

ABSTRACT:
Frontal fibrosing alopecia (FFA), a lymphocyte-mediated primary scarring alopecia and lichen planus (LP) pigmentosus, a lymphocyte-mediated inflammatory dermatosis fall within the spectrum of lichenoid disorders. Interestingly, few reports in the literature show that they occur simultaneously in the same patient. A retrospective observational review of 17 African American women was performed. All patients were older than 18 years of age, had a Fitzpatrick skin type of three or greater and were clinically diagnosed with FFA and LP pigmentosus. Facial dyschromia was the most common chief complaint (47%) followed by both facial dyschromia and hair loss (27%)

and hair loss alone (24%). Associated symptoms included pruritus (76%) and trichodynia (24%). Associated findings included eyebrow alopecia (59%), facial papules (12%) and eyelash alopecia (6%). FFA and LP pigmentosus were both misdiagnosed in the majority of cases (59%) due to confounding factors including a history of traumatic hairstyle practices (47%), primary inflammatory disorders (65%) and photosensitizing medications (18%).
This study highlights the significance of facial dyschromia and frontotemporal hairline recession in African American women. The presence of one should prompt the physician to examine for the other and the presence of both may aid the clinician in more accurately diagnosing FFA and LP pigmentosus. The coexistence of these two disorders suggests that they may be manifestations of a single systemic inflammatory condition.

P151 – TBA

P152

Nestin Expressing Cells in the Hair Follicle Innervated Injured Nerve Differentiate into Neurons in Vitro and Vivo

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S. Mii: None. **J. Duong:** None. **A. Uchugonova:** None. **F. Liu:** None. **B. Tran:** None. **Y. Amoh:** None. **R.M. Hoffman:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to know possibility of nerve regeneration from hair follicle nerve.

ABSTRACT:
We have previously reported that nestin-expressing hair follicle stem cells can differentiate into neurons, Schwann cells, and other cell types. In the present study, vibrissa hair follicles, including their sensory nerve stump, were excised from transgenic mice in which the nestin promoter drives green fluorescent protein (ND-GFP), and were placed in 3D culture supported by Gelfoam. ND-GFP-expressing cells were located in the terminal end of hair follicle sensory nerve and extended their processes and migrated toward the whisker sensory nerve stump in 3D culture. These processes expressed beta-III tubulin. In addition, beta-III tubulin-positive fibers, consisting of ND-GFP-expressing cells extended from the whisker nerve stump in 3D culture. The growing fibers had growth cones on their tips expressing F-actin. These findings indicate that beta-III tubulin-positive fibers elongating from the whisker follicle sensory nerve stump were growing axons. The growing whisker sensory nerve was highly enriched in ND-GFP cells which appeared to play a major role in its elongation and interaction with other nerves in 3D culture. This phenomenon was observed not only in 3D culture but in vivo study. The results of the present report suggest a major function of the nestin-expressing stem cells in the hair follicle is for growth of the follicle sensory nerve.

P153

Prostaglandin F2α May Be Useful to Stimulate the Growth of Small Hairs After Skin Surgery

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Benjamin Miranda received his medical degree (MB BS; University of London) in 2004 and achieved Membership of the Royal College of Surgeons, London in 2007. Awarded a University of Bradford Plastic Surgery & Burns Unit Fellowship, he studied hair follicle research supervised by Professor Randall and co-supervisors, Professors Sharpe and Tobin graduating with his PhD in 2011. He is continuing surgical training in London having successfully gained a rare plastic surgeon specialist position. He also runs training courses to prepare clinicians for surgical examinations and has edited 2 relevant books. His publications include over 20 clinical and basic science papers.

B.H. Miranda: None. **K.G. Khidhir:** None. **D.F. Woodward:** Salary, Contractual Services; Previously employed by a company which may have an interest in this area.. **D.T. Sharpe:** None. **V.A. Randall:** Grants/Research Support; I have received unrestricted grant funding froma company who may have an interest in this work..

LEARNING OBJECTIVES:
Appreciate female intermediate facial follicles as a clinically relevant model and the potential of PGF2α to stimulate small follicle growth.

ABSTRACT:
When surgical repair involves transplanting skin from less hairy regions the conspicuous visibility of the repair can have negative effects on the patient's quality of life post-surgery. Recently, bimatoprost, a prostamide F2α analogue, has been shown to stimulate eyelash and terminal hair growth (Khidhir et al 2013). Therefore, we aimed to see whether the natural prostaglandin F2α (PGF2α) would stimulate the growth of small female intermediate facial human hair follicles in organ culture. We recently identified these follicles as a more clinically relevant, albeit technically difficult, model more closely-related to those requiring therapeutic stimulation in vivo than the usually used terminal scalp follicles (Miranda et al 2010).
Microdissected intermediate facial hair follicles from 5 women were cultured with, and without, 100nM PGF2α for 9 days. Each individual follicle was measured, photographed and its anagen status classified under the microscope every 24 hours. These daily measurements enabled analysis of the rate of growth, the length of time follicles were able to stay in anagen, i.e. continue to grow, and the overall amount of hair produced in organ culture.
PGF2α stimulated intermediate follicle growth, prolonged anagen and increased the amount of hair produced. This suggests that the natural ligand PGF2α may play a biological role in hair growth and may become a useful topical treatment to promote post-surgery hair growth.

P154

Lichen Planus Pigmentosus and Lichen Planus Pigmentosus Inversus Associated With Frontal Fibrosing Alopecia: Is There a Shared Environmental Trigger?

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Dr. Paradi Mirmirani completed residencies in Internal Medicine and Dermatology and a clinical hair research fellowship at the University of California San Francisco. Dr. Mirmirani is practicing at the Kaiser Permanente in Vallejo, California where she serves as the Northern California referral center for hair disorders. Dr. Mirmirani co-authored "Cicatricial Alopecia: An Approach to Diagnosis and Management", the first book dedicated to the topic. She is on the scientific advisory board of the Cicatricial Alopecia Research Foundation and is a past member of the Board of Directors for the North American Hair Research Society.

P. Mirmirani: None. **F. Kamangar:** None.

LEARNING OBJECTIVES:
Following the session you will be able to describe pathogenic mechanisms of frontal fibrosing alopecia, Lichen planus pigmentosus, LPP inverses.

ABSTRACT:
Since its first description in 1994, there have been increased reports of frontal fibrosing alopecia (FFA) worldwide (1). FFA has been recently associated with lichen planus pigmentosus (LPPigm) in patients from South Africa(2) India(3) and the United States(4). We present four patients with skin types V and VI, 3 with diagnoses of FFA and LPPigm and one patient with a diagnosis of FFA and LPPigm-inversus. To our knowledge this is the first presentation of FFA and LPPigm-inversus.
In FFA, it has been postulated that environmental triggers may lead to the loss of PPAR-gamma receptor or mitochondrial function in the sebaceous glands(5,6). Additionally, altered inflammatory pathways including tumor necrosis factor gamma (TNF-gamma) signaling lead to a collapse of the normal follicular immune milieu(7). The lichenoid tissue reactions in LPPigm and LPPigm-inversus are also reported to occur in response to environmental triggers; including ultraviolet light, contact allergens, and human herpes simplex virus among others(8). Induction of intercellular adhesion molecule-1(ICAM-1) by IFN-gamma leads to dysregulation of immune pathways and increased interactions of cutaneous lymphocytes and basal cells in lichenoid tissue reactions(9). We propose that in a subset of patients there may be a shared environmental trigger that leads to altered inflammatory processes in both FFA and LPPing/LPPigm-inversus. Further study of these patients may provide insights into the pathology of both conditions.

P155

Using Teledermatology to Improve Access and Care for Hair Disorders: The Kaiser Permanente Experience

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Dr. Paradi Mirmirani completed residencies in Internal Medicine and Dermatology and a clinical hair research fellowship at the University of California San Francisco. Dr. Mirmirani is practicing at the Kaiser Permanente in Vallejo, California where she serves as the Northern California referral center for hair disorders. Dr. Mirmirani co-authored “Cicatricial Alopecia: An Approach to Diagnosis and Management”, the first book dedicated to the topic. She is on the scientific advisory board of the Cicatricial Alopecia Research Foundation and is a past member of the Board of Directors for the North American Hair Research Society.

P. Mirmirani: None.

LEARNING OBJECTIVES:
Discuss the use of teledermatology for improving access and care for hair disorders.

ABSTRACT:
Kaiser Permanente Northern California (KPNC) is a large integrated health care delivery system providing care for more than 3.3 million members. In addition to store and forward of clinical and dermatoscopic images, mobile video visits are available for physician-physician and physicians-patient consults. Over 4000 store and forward teledermatology cases are evaluated per month. Given the difficulty of photographing the scalp, evaluation of hair disorders does not lend itself easily to telemedicine however use of the technology can be leveraged to improve care. Teledermatology workflows for hair disorders in the KPNC system include the following:
1. Referral from a primary care physician(PCP) to dermatology for hair loss: -PCP collects a history and necessary labs. Teletechnician takes standardized photographs and dermatoscopic images of the scalp. Images are reviewed by a dermatologist and triaged for advice and treatment recommendations vs. in-person appointment.
2. Referral from a dermatologist to the hair disorders clinic for hair loss: The treating dermatologist can request one of the following:

· A review of images and the chart for advice on diagnosis or management
· A telephone or video visit with the patient
· An in-person visit
Given the high demand for specialty evaluation for hair disorders, there is a great incentive to consider the use of teledermatology for improving access and care for patients with hair disorders.

P156

A Very Rare Case of Woolly Hair Nevus, Hutchinson Group No.1 and Post category No. 1, with Decalvans Folliculitis and Neurological Sensitive Disorders

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Member, College of Physicians of Costa Rica.
Member, Costa Rican Association of Dermatology.
Member, ISHRS and ESHRS.

M.F. Mora de Miranda: None.

LEARNING OBJECTIVES:
Illustrate how the hair loss is an issue the health and not only an estetic problema.

ABSTRACT:
The Woolly Hair Nevus, its a very rare condition, especially when the diagnosis is completed in the adult life of the patient.
This case is very interesting to revise because its the typical late diagnosis case in skin diseases, 33 years after birth of the patient; only when start the sensorial cutaneous manifestation (Disestesias) and scalp infections with sudden hair loss and cicatricial alopecias like result; is when the patient take the decision to check what is the problem with an specialist in Dermatology and Trichology.
Whit this report the Dermatologists who study more deep the differents forms of hair loss and the relationship between this and other diseases, can try out that "the hair loss is an issue the health".

P157

First Epidemilogical Analysis of the Most Common Forms of Hair Loss in a Country of Central America: Costa Rica

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Member, ISHRS and ESHRS.

M.F. Mora de Miranda: None.

LEARNING OBJECTIVES:
Compare the most common forms of hair loss in Costa Rica with first world countries reports.

ABSTRACT:
This is the first epidemilogical analysis of the most common forms of hair loss in a country of Centralamerica, Costa Rica, in 616 patients sampling. Taking into account, age, gender and geografic distribution, we make a comparation with the internationals reports in others countries, specially at the countries of first world. This is because the countries with a better economic and social condition have more major reports about the differents hair loss forms and diseases relationship with these situations. With this comparation we pretend to see if the trend in the way most frecuent hair loss is the same, regardless of the development of the country or whether factor such as nutrition, access to medical services and social trends affect this porcentages.

P158

Relationship Between Diffuse Hair Loss and High Levels of Ammonia in Blood Test in a Sample of 42 Patients

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M.F. Mora de Miranda: None.

LEARNING OBJECTIVES:
Recommended blood test ammonium as a routine in all patients with diffuse hair fall.

ABSTRACT:
One of the more sensitive cell in our biologic economy is the hair stem cell, like the liver cell (hepatocyte). It is well known that the color hair with ammonia can be a important factor in the diffuse hair loss (Diffuse Telogen Effluvium).
Taking into account the above we start to do ammonia blood test in all the patients with diffuse hair loss in a period of 2 years, and find 42 adults patients with high levels of ammonia, normal liver function, mild clinical manifestations (somnolence, fatigue). All the others tests (laboratory and cabinet) were normal. We treat this anomaly with the gastroenterology service and in a small time period the hair loss was reduced and stopped. I make

a review of how the ammonia can produce effects in stem cells, and recommendations about the tests and treatments.

P159

Comparison of 2D- and 3D-Cultures of Dermal Papilla Cells Submitted to In Vitro Aging

Catherine Gondran[1], Armelle Perrin[1], **Paul Mouser, PhD**[2], Karine Cucumel[1], Nouha Domloge[1].
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Dr Paul Mouser is an innovative and passionate scientist with strong knowledge and expertise in all aspects of skin and hair biology. From 2000-2004 he was a research scientist in Dermatology, Imperial College, Hammersmith Hospital, London. During this time he completed his PhD. In 2004 he joined Unilever as a cell biologist in the skin and hair category. In 2008 he joined ISP (now ASI) as global R&D scientist where his main research interest focuses on the development of innovative skin and hair care technologies.

C. Gondran: None. **A. Perrin:** None. **P. Mouser:** None. **K. Cucumel:** None. **N. Domloge:** None.

LEARNING OBJECTIVES:
Develop a 3D-model of aged dermal papilla cells to characterize the role played by these cells during hair aging.

ABSTRACT:
The dermal papilla plays a pivotal role during hair growth and regeneration. Throughout the hair cycle, dermal papilla cells (DPC) stay under the influence of their microenvironment, which is essential to maintain their functionality. In particular, it was previously demonstrated that DPCs have aggregative and inductive properties that are lost when the cells are isolated from their environment and put into in vitro culture. Recently, it was described that these characteristics could be partially preserved if DPCs are cultivated in a 3D-model. The role played by DPCs during hair aging is rather poorly understood. In the present study, our aim was to develop a model of in vitro aged DPCs by using a chemical agent known to induce accelerated senescence (methylglyoxal, MGO) in 2D- and 3D-cultures. First, the aged phenotype of MGO-treated DPCs in 2D-culture was confirmed by altered cell morphology, increased beta-galactosidase staining, reduced alkaline phosphatase activity and disorganized fibronectin network. Furthermore, electron microscopy revealed vacuolization and decreased in intracellular organelles in stress-induced senescent cells.
When DPCs were grown in 3D-sphere, MGO treatment generated an increased beta-galactosidase staining. Moreover, we observed a disorganized structure as seen by fibronectin staining, indicating increased cell fragility. In conclusion, our results showed that the 3D-model of aged DPCs could be appropriate to characterize the role played by DPCs during hair aging.

P160

Current Treatment Modalities of Androgenetic Alopecia

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Novia Mozart is one of the medical doctors practicing at the Hair Science Institute Amsterdam. Besides performing the Partial Longitudinal - Follicular Unit Transplantation or known as Hair Stemcell Transplantation®, she is also responsible for the educational programme of the Hair Science Institute.

N. Mozart: None.

LEARNING OBJECTIVES:
To find the ideal treatment modalities for AGA by comparing the efficacy, costs and benefits of each option.

ABSTRACT:
Androgenetic alopecia (AGA) is a common form of hair loss affecting both men and women. The incidence of androgenetic alopecia is generally considered to be greater in males than females, although some evidence suggests that the apparent differences in incidence may be a reflection of different expression in males and females.(1) There are several remedies and possibilities in order to prevent and to cure AGA, ranging from doing nothing to surgical intervention.
A temporary halt of hair loss progression can be achieved in short- and medium- term with drug treatment, but in long- term, hair transplantation is the best solution and it gives a permanent result. The choice of the treatment modality does not only depends on the costs and/or benefits and/or the efficacy of the treatment, but also on the expectation and degree of the hair loss of the patient itself.

P161

Kerion-like Alopecia Due to Epidermal Growth Factor Receptor Inhibitor

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Andreia Munck is a dermatologist member of the North American Hair Research Society. Her professional experience is to focus in trichology and she has international medical publications in this area. In 2013, she did a fellowship in trichology at Haarcenter Prof. Trüeb (Switzerland). During 2014, she made a fellowship in Trichology at the University of Sao Paulo and now she is doctor contributor to this outpatient. In this year, she did a presentation at the Brazilian Congress of Dermatology with the title "The use of low level laser therapy as monotherapy or concomitant therapy for male and female androgenetic alopecia."

A. Munck: None. **A. Donati:** None. **N.S. Valente:** None. **R. Romiti:** None.

LEARNING OBJECTIVES:
Discuss and show similarities between EGFR inhibitors alopecia and inflammatory tinea capitis.

ABSTRACT:
CASE REPORT:
A 61-year-old woman presenting with red, scaly and tender scalp that started few weeks after erlotinib prescription for metastatic lung adenocarcinoma 2 years before. On examination, there was a suppurative painful alopecic plaque over the crown. Dermoscopy showed broken hairs, comma and zig-zag figures over an erythematous crusty scalp. Histology showed epidermal atrophy and perifollicular lymphoplasmocytic infiltrate. Abnormally shaped extruded hair shafts surrounded by granulomatous tissue were observed. Potassium hydroxide exams of hair shafts resulted negative for mycotic infection as well as fungal culture of scalp tissue. DISCUSSION: Epidermal growth factor receptor (EGFR) inhibitors are a new class of drugs used to treat some types of advanced cancer. EGFR is present in the epidermis and in the hair follicle so its inhibition will cause adverse cutaneous reactions including follicular rash and eczematous changes. Alopecia related to EGFR inhibitors is usually associated with follicular pustules, erythema and crusts. This is the first description of dermoscopy in EGFR inhibitor alopecia and findings resemble inflammatory tinea capitis. This similarity can be explained by increased hair fragility associated with both disorders: fungal infestation of the shafts and hair growth alterations and epidermal changes associated to the drug. Kerion-like alopecia due to EGFR inhibitors must be recognized to avoid misleading investigation in future cases.

P162

New Insight of Androgenetic Alopecia: The Influence of Hair Density and Hair Diameter to the Appearance and Progression of Baldness

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Y. Nakazawa: None. **A. Ishino:** None. **T. Iwabuchi:** None. **J. Suzuki:** None. **M. Tajima:** None. **J. Kishimoto:** None.

LEARNING OBJECTIVES:
Demonstrate the relative contributions of hair density and hair diameter to androgenetic alopecia.

ABSTRACT:
The progression of androgenetic alopecia (AGA) is associated with the gradual miniaturization of hair follicles and successive hair loss. The relative contributions of hair density and hair diameter to AGA are still unclear. Male Japanese subjects (n=369) with or without AGA were included in this study. The appearance of baldness at the vertex was evaluated by comparison with standard photographs. Hair density and hair diameter were measured using a phototrichogram-based digital-microscopy technique. The ratio of thick hairs (≥ 80 μm diameter) in AGA subjects was significantly lower than that in non-AGA subjects, and also the ratio of vellus hairs (< 40 μm diameter) in AGA subjects was significantly higher. By contrast, the mean hair density in AGA subjects did not significantly differ from the density of non-AGA. Hair density decreases in subjects aged ≥ 25 years, regardless of the presence or absence of AGA. In addition, the contribution of hair density and hair diameter in other races were considered. Present study indicates that hair loss in men with AGA results mainly from the miniaturization of hair follicles rather than the hair shedding.

P163

Cannabinoid Receptor (CB) 1 Signaling Regulates Laminin-511 Expression of Human Hair Follicle

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Education:
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A. Natsumi: None. **K. Sugawara:** None. **M. Yasumizu:** None. **R. Paus:** None. **D. Tsuruta:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will learn the mechanism by which cannabinoid receptor signaling effects on hair growth.

ABSTRACT:
The endocannabinoid system has been recognized as an important regulator of epithelial cell biology. We have previously shown that human hair follicle (HF) expresses cannabinoid receptor (CB)-1 mainly by outer root sheath keratinocytes and the endogenous CB1 agonist, anandamide significantly inhibits human hair growth by inhibiting the proliferation of hair matrix keratinocytes proliferation and inducing their apoptosis in organ culture. We have also shown that laminin-511 (composed of α5, β1 and γ1 chains), a key basement membrane components in skin,

stimulates human HF growth. Now we investigated whether CB1-mediated signaling also impacts on the expression of laminin-511 by using HF and skin organ cultures.
We found that CB1 specific agonist, ACEA significantly decreased laminin-α5 expression in HaCaT cells which have CB1, while CB1 antagonist, AM251 significantly increased laminin-α5 expression. In line with this, ACEA significantly down-regulated laminin-α5 expression within the organ cultured human skin samples, while AM251 significantly increased it. Furthermore, ACEA inhibited human hair shaft elongation of organ cultured HFs. Similar with human skin organ culture, ACEA significantly decreased laminin-α5 expression along the basement membrane of organ cultured human HFs, while AM251 increased it. Considering that laminin-511 is a HF growth stimulator, our results may unveil a new mechanism by which CB1 regulates human HF growth and this mechanism could be a new target for treating human hair diseases.

P164

Induction of Hair Growth in Subjects with Male Pattern Baldness by Hypoxia Induced Multipotent Stem Cell-Secreted Proteins

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Dr. Gail Naughton founded Histogen, Inc, a regenerative medicine company, in 2007, and serves as its CEO and Chairman of the Board. She was the founder of Advanced Tissue Sciences and has spent more than 30 years extensively researching the tissue engineering process, holds more than 100 U.S. and foreign patents, and has been extensively published in the field. In 2000, Dr. Naughton received the National Inventor of the Year award by the Intellectual Property Owners Association in honor of her pioneering work in tissue engineering.

G. Naughton: Salary, Contractual Services; Employee, Histogen, Inc. **M. Hubka:** Consultant; Histogen, Inc.. **C. Ring:** None. **M. Zimber:** Salary, Contractual Services; Employee, Histogen, Inc..

LEARNING OBJECTIVES:
Show the role of growth factors on the stimulation of bulge cells and interfollicular stem cells to induce hair growth.

ABSTRACT:
Stimulation of telogen to anagen and subsequent hair growth involves Follistatin, FGF-7, VEGF, and other growth factors. We studied the effects of a human cell-derived formulation, termed Hair Stimulating Complex (HSC), in two double-blind, placebo-controlled trials in male pattern baldness. 26 subjects received four 0.1cc intradermal injections at baseline in our proof-of concept (POC) study. Trichoscan analysis of HSC-treated sites at 12 and 52 weeks showed improvements in hair growth over the placebo. At the 12-week evaluation period, HSC-treated sites demonstrated an increase in hair shaft thickness (6.3%±2.5% vs. -0.63%±2.1%; p=0.046), thickness density (12.8%±4.5% vs. -0.2%±2.9%; p=0.028), and terminal hair density (20.6±4.9% vs. 4.4±4.9%; p=0.029). At one year, an increase in total hair count (p=0.032) continued to be seen. Doubling the number and frequency of injections in a Phase I/II 56 subject study resulted in a 46.5% increase in total hair at week 12 as compared to the POC trial (p=0.0013). The primary efficacy endpoint of increased terminal hair at 12 weeks was met, with a 49.5% increase over the same endpoint in our proof-of-concept trial. At the 48 week time point there continued to be an increase in total hairs over baseline (p=0.028). Additional dose ranging clinicals utilizing the isolated growth factors are being conducted to evaluate the safety and efficacy of this formulation in subjects with androgenetic alopecia.

P165

Lichen Planopilaris with Tufted Hair and White Fibrotic Patches: a Challenging Diagnosis

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L.R. Nogueira: None. **M.F. Dias:** None. **N.S. Pizani:** None. **J.P. Andrade:** None. **L.A. Pereira:** None. **M.S. Teixeira:** None. **M.C. Rochael:** None. **R.D. Pinto:** None.

LEARNING OBJECTIVES:
Demonstrate the importance of dermoscopy in the diagnosis of scarring alopecia. Present an atypical case of LPP with tufted hair.

ABSTRACT:
Scarring alopecia occur with permanent destruction of the hair follicle and residual fibrosis. The Lichen Planopilaris (LPP), considered a variant of classic lichen planus, represents 40% of alopecia. Tufted hair is reported in only 5% of cases of LPP. This report is justified by the rare find of tufted hair in LPP and the difficult to differentiate between discoid lupus erythematosus (DLE) and this disease, using dermoscopy to aid diagnosis.We present woman, 54 years old, progressive hair loss and scaling since 2008. Bright alopecia plate in the parietal region, 7 x 4 cm, central dyschromia, erythema and scaling on the periphery of the plate. Dermoscopy showed tufted hair, erythema and perifollicular and interfollicular scaling. Histopathology showed interfollicular fibrosis with atrophy of the infundibular epithelium and fibroplasia in periinfundibular area. Presence of scarce inflammatory perifollicular lymphocytic infiltrate. Epidermis presents hypergranulosis wedge, orthokeratosis and parakeratosis. Changes suggestive of lichen planopilaris associated with scar area. In many cases, trichoscopy can be used to diagnose LPP and DLE clinically, avoiding skin biopsy. But the finding of tufted hair, depigmented patches and perifollicular erythema and scaling are features usually found in three different kinds of cicatricial alopecia, respectively: decalvans folliculitis, lupus erythematosus and lichen planopilaris. Scalp biopsy was necessary to differentiate the three conditions.

P166

A Multi-scale Model for Hair Follicle Reveals Phase Separation Mechanism Drives Rapid Hair Growth Patterning

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JI WON OH had his MD from Kyungpook National University School of Medicine. And he got his PhD at the same University. He is currently working as postdoctorate researcher at Maksim Plikus' lab investigating the regenerative potential of skin and the role of adult stem cells under physiological and pathological environment. He is working to learn how activities of adult stem cells are regulated and how they can be directed to undergo embryonic-like regeneration events as hair biologist and physician.

J. Oh: None. **Q. Wang:** None. **Q. Nie:** None. **M. Plikus:** None.

LEARNING OBJECTIVES:
Demonstrate a systems biological approach to reveal previously unrecognized hair cycle dynamics contributing to rapid evolution of mouse skin pattern.

ABSTRACT:
Biological dynamics can refer to the behavior of a group that results from the interactions of its individual components. Recognized for its dynamics including periodicity and patterning, the hair follicle (HF) is becoming a preferred biological system for the mathematical modeling of biological dynamics. Cyclic growth of each individual HF is regulated both by signaling interactions of different cells within the HF (micro-environmental networking) and by long-range signals between neighboring HFs and other skin cells (macro-environmental networking), leading to biological complexity. We performed a detailed hair growth pattern analysis during the first two hair cycles. Indeed, we found a previously unrecognized spatio-temporal complexity of hair morphogenesis. Furthermore, we identified

previously unknown interactions between anatomically distinct HF populations at the onset of the second anagen biologically. A 3D mathematical model based on the coupling of activator and inhibitor signals and captures critical features of HF growth including cyclic HF growth and communication among a population of HFs was used to analyze the dynamical properties of each HF domain, and more importantly, the interactions among different HF domains based on their geometric vicinity. We try to apply a systems biological approach to reveal previously unrecognized hair cycle dynamics that contribute to rapid evolution of the hair growth pattern complexity in mouse skin.

P167

A Case of Male Androgenetic Alopecia Involving the Temporal Scalp and Sparing the Vertex

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I am Dr. Deren Özcan from Başkent University Faculty of Medicine, Ankara, Turkey. I have graduated from Hacettepe University Faculty of Medicine in 2001 and started my Dermatology education in Başkent University in 2002. After completing my thesis investigating the diagnostic value of vertical and transverse sections of scalp biopsy specimens in different types of alopecia, I have become a dermatologist in 2008. In 2010 I have started to study as an instructor in Dermatology Department of Başkent University and since 2011 I have been working as an Assistant Professor in the same department.

D. Özcan: None. **Ö. Özen:** None. **D. Seçkin:** None.

LEARNING OBJECTIVES:
Explain an unusual clinical presentation of male androgenetic alopecia.

ABSTRACT:
Androgenetic alopecia (AGA) is a common form of hair loss characterized by progressive hair follicular minaturization which results from the effects of dihydrotestosterone on androgen-sensitive hair follicles. Male AGA generally presents with bitemporal recession of the frontal hairline, followed by diffuse thinning over the vertex. A 36-year-old man presented with a 8-month history of hair loss on the temples. He had been treated with topical and intralesional steroids without improvement before. Dermatological examination revealed bilateral diffuse thinning of hair on the temporal scalp and a mild bitemporal recession of the frontal hairline. On trichoscopy, hair thickness heterogenity, vellus hairs, single hair pilosebaceous units and honeycomb pigmentation were noted on the temporal regions, while it showed normal findings on the vertex. Histopathological examination of transverse sections of lesional scalp biopsy specimens disclosed a reduced number of terminal follicles with a terminal to vellus follicle ratio of ½. Vertical sections yielded an atrophic epidermis and increased vellus follicle number. TrichoScan procedure performed at temporal region and vertex revealed a 47.1% and 22.8% of vellus hairs, respectively. In light of the above findings, the patient was diagnosed with AGA and started on treatment with minoxidil 5% solution. Although AGA has very classical clinical findings, it may unusually present with a pattern which diffusely involves the temporal regions with sparing the vertex in men.

P168

Folliculitis Decalvans: Clinical, Trichoscopic and Histopathological Characteristics and Treatment Outcomes in 22 Cases

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I am Dr. Deren Özcan from Başkent University Faculty of Medicine, Ankara, Turkey. I have graduated from Hacettepe University Faculty of Medicine in 2001 and started my Dermatology education in Başkent University in 2002. After completing my thesis investigating the diagnostic value of vertical and transverse sections of scalp biopsy specimens in different types of alopecia, I have become a dermatologist in 2008. In 2010 I have started to study as an instructor in Dermatology Department of Başkent University and since 2011 I have been working as an Assistant Professor in the same department.

D. Özcan: None. **A. Güleç:** None. **Ö. Özen:** None. **D. Seçkin:** None.

LEARNING OBJECTIVES:
Explain clinical, trichoscopic and histopathological features, and demonstrate the treatment outcomes.

ABSTRACT:
Background: Folliculitis decalvans (FD), a rare type of primary neutrophilic cicatricial alopecia, represents a therapeutic challenge as hair regrowth is unlikely.
Objective: To evaluate the clinical, trichoscopic and histopathological features, and assess the treatment outcomes.
Materials and Methods: After collecting related data from the medical charts of 22 patients with FD, scalp biopsy specimens were reevaluated according to standard set criteria.
Results: All patients were male whose median age was 19.5 years. Vertex (90.9%) and occipital area (63.6%) were the most frequently involved sites, while the most common clinical findings were cicatricial alopecic patches (90.9%), follicular pustules (81.8%), crusts (77.3%) and tufted hairs (63.6%). Trichoscopic findings, noted only in 9 subjects, were absence of follicular openings (100%), follicular pustules (100%), milky-red areas (88.9%), tufted hairs (88.9%), yellowish tubular scaling (88.9%) and crusting (77.8%). Histopathologically, intrafollicular and perifollicular, predominantly neutrophilic infiltration and follicular destruction were observed in all patients. Treatment with oral antibiotics (tetracycline, rifampicin with clindamycin, cephalexin) alone or in combination with topical/intralesional corticosteroids resulted in clinical improvement with hair regrowth in 75% of the patients. The disease relapsed in 70% within 2 weeks to 3 years after the treatment.
Conclusion: Although the clinical, trichoscopic and histopathological findings of FD in the current study were compatible with the previous data, our findings showed that hair regrowth is possible after treatment.

P169

Combination of a Non-Ablative 1,550 nm Erbium:Glass Fractional Laser and Mesotherapy Using Autologous Platelet-rich Plasma in Treatment of Both Male and Female Androgenetic Alopecia

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Dr. Ratchathorn Panchaprateep is certified dermatologist and diplomate American Board of Hair Restoration Surgery(ABHRS). She graduated Master and PhD (hair stem cells) in dermatology from Chulalongkorn University. She also completed a dermatologic and cosmetic surgery fellowship from Dermatology, laser and vein specialists of the Carolinas, North Carolina,USA and fellowship in hair restoration surgery (ISHRS).
She is now working as clinical instructor in Division of Dermatology, Chulalongkorn University, Bangkok,Thailand. Dr.Panchaprateep is active member of ISHRS and has authored many medical papers and has presented a wide range of scientific presentations in the fields of hair transplantation, hair disorders,laser and cosmetic dermatology.

R. Panchaprateep: None.

LEARNING OBJECTIVES:
consider using of this novel combination of non-ablative fractional laser and PRP as an adjunctive therapy for androgenetic alopecia.

ABSTRACT:
This study was conducted to investigate the efficacy and safety of a combination of a 1,550 nm erbium:glass

fractional laser and platelet-rich plasma (PRP) for the treatment of both male and female androgenetic alopecia (AGA).
Six women (Ludwig I-III) and three men (Norwood-Hamilton IIIv-IV) with AGA underwent two sessions of non-ablative fractional laser followed by PRP injection on the affected area at 1-month interval. Clinical efficacy was analyzed by global photography, target area hair counts, hair mass index (Haircheck®) and patient self-assessment. At 6 months after complete the treatment, all patients were improved by the global photography of vertex area (two slightly, three moderately, and four markedly improved) compared to baseline. Hair density (terminal hair count) significantly increased by 17.8% (105.7±4.5 to 124.6±41/cm2) (p=0.008). Hair mass index also showed significant increase by 17.3% (30.22±9.1 to 35.44±11.9) (p=0.008). The treatment is fair-tolerated and the mean VAS for pain was 2.7(0-5) and 5.8(3-8) for laser treatment and PRP injection, respectively. Adverse effects were limited to transient erythema and mild burning sensation on treated area. Broken hair shaft from laser was observed in four out of nine patients.
A combination of a 1,550 nm erbium:glass fractional laser and PRP is a safe and effective adjunctive treatment for both male and female AGA. However, larger and longer, randomized, placebo-controlled trials are suggested.

P170

3D Spinning Disk Imaging of Human Hair Follicle Epidermal Precursor Cells

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Maryline Paris graduated from the University Paris VII (France) in 2003 with a PhD in developmental biology. Then, she initiated her postdoctoral experience in Ourania Andrisani's laboratory at Purdue University (Indiana, USA) followed with a training in Freda Miller's laboratory at The Hospital for Sick Children (Toronto, ON, Canada) that allowed her to develop the key concept of skin stem cell and aging. She joined L'Oreal Company in 2009 where she is leading an independent research group in a scientifically dynamic environment focusing on skin and hair stem cells and cosmetic application.

A. Dimitrov: None. **F. Berthelot:** None. **G. Genty:** None. **M. Paris:** None.

LEARNING OBJECTIVES:
Explain and compare various technologies used in research on hair follicle epidermal stem cells

ABSTRACT:
Human hair follicles (hHF) possess several populations of epidermal precursor cells in the outer root sheath (ORS). Cells with the highest regenerative potential, expressing high levels of CD200 and K15, are located in the upper ORS. Epidermal precursor cells of the lower ORS express a high level of CD34. These populations are affected differentially in androgenic alopecia where the stem cell population is not altered whereas epidermal precursor cells number decreases. The precursors are usually quantified by flow cytometry and localized by immunofluorescence on thin transversal sections. Due to the small amount of precursors these two methods may lead to loss of information. In addition, they are technically laborious, time consuming and require a large number of samples. We therefore developed a new method where the immunostaining is performed without sectioning. hHF are dissected and detached from the dermal sheath to enable antibody penetration. Images of the whole hHF are acquired on a spinning disk confocal microscope and reconstructed by stitching algorithms. Optical sections are acquired at higher magnification throughout the sample in several regions of interest. Ultimately, this technique will allow us to quantify different populations of precursors, to characterize their distribution in the hHF and to analyze the intracellular localization of their
proteins, therefore complementing flow cytometry and transversal sections approaches.

P171

The Role of Wigs in Patients with Severe Alopecia Areata: Assessing the Psychosocial and Economic Aspects

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J. Park: None. **D. Kim:** None. **S. Park:** None.

LEARNING OBJECTIVES:
Study hopes to prove that wigs should be approved as medical assisting devices officially in alopecia areata patients.

ABSTRACT:
Alopecia areata causes serious cosmetic and psychosocial distress in patients, in consequences, it creates a negative effect on their quality of life. The wigs, one of the therapeutic options in severe cases of alopecia areata, can enhance the patient's psychosocial impacts and self-esteem. However, most of countries including Korea have not officially approved the wigs as medical assisting devices in their medical policy so that patients have to buy and manage them at their own expenses. Herein, we evaluate the role of wigs as medical assisting devices in patients with severe alopecia areata using questionnaire measuring its impact in psychosocial aspects and economic loss. Thirty patients with severe alopecia, who had been wearing wigs, were enrolled in this study. The Severity of Alopecia Tool score and Visual analog scale was used to investigate the severity of alopecia areata. The psychosocial effects from wearing wigs were evaluated with Psychosocial Impact of Assistive Device Scale, and the evaluation of the quality of life was assessed with modified Hairdex. The economic expenses purchasing and managing wigs have been measured by patients answering a questionnaire. Our expectation from this study is that wigs would be approved as medical assisting devices officially in most of countries, and furthermore help patients with severe alopecia areata to get financial and institutional support from national medical insurance program.

P172

A Pragmatic, Refined Guide for the Classification of Human HF Cycle Stages

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Prof. Paus graduated as a medical doctor from the Free University of Berlin (1987). Following post-doctoral research at Yale University (1987-90), Prof. Paus trained as a clinical dermatologist in Berlin. He has been Professor and Vice-Chair of the Dept. of Dermatology of the University of Hamburg (1999-2004) and Professor and Head of Experimental Dermatology, University of Luebeck (2005-2013). Prof. Paus joined the University of Manchester in 2008 as Professor of Cutaneous Medicine and the University of Münster in 2013 as Professor of the Laboratory for Hair Research and Regenerative Medicine. Prof. Paus has been Editor of Experimental Dermatology since 2007.

J.E. Kloepper: None. **E.A. Langan:** None. **J.T. Seykora:** None. **D.A. Whiting:** None. **E. Poblet:** None. **D. Langan:** None. **C. Rose:** None. **R. Paus:** None.

LEARNING OBJECTIVES:
This presentation provides a pragmatic, morphology-based guide for the classification of cycling human scalp HFs.

ABSTRACT:
Since disturbances of the hair follicle (HF) cycle underlie or are associated with all of the hair growth disorders seen most frequently in clinical practice, it is clinically important to be able to recognize and classify, on the basis of well-defined morphological criteria, individual hair cycle phases in human skin biopsies. However, this requires

experience and can be a frustrating and confusing exercise. For mice, histologic guidelines for hair cycle recognition and classification exist, and cycling HFs in human skin transplanted onto mouse skin have been reported, but a hair cycle classification guide for unmanipulated human scalp HFs is missing. Building upon earlier versions we had previously reported (EHRS 2012, IID 2013), we have modified, refined, and up-dated a comprehensive human HF cycle guide that combines basic histological classification criteria based on simple H&E-stained paraffin sections with widely available auxiliary read-out parameters (Ki-67/TUNEL immunohistology, Masson-Fontana histochemistry) along with schematic drawings that facilitate orientation for newcomers to the field. We also distinguish between vellus and terminal HFs, and show how hair cycle phases can still be identified even if key human HF structures are only partially visible. This pragmatic, morphology-based guide for the classification of cycling human scalp HFs is expected to provide an essential tool for basic and applied human hair research.

P173

Case Report: An Overlap of Primary Essential Cutis Vertice Gyrata, Folliculitis Decalvans and Folliculitis Keloidalis Nuchae Due to Traction

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L.A. Pereira: None. **N. Pizani:** None. **M.D. Teixeira:** None. **L.R. Nogueira:** None. **J. Pacheco Bicalho de:** None. **M. Rochael:** None. **M.F. Gavazzoni:** None. **M. Kalil:** None.

LEARNING OBJECTIVES:
Illustrate the association of cicatricial alopecia and uncomum conditions as cutis vertice gyrata, highlighting traction as a possibly cause.

ABSTRACT:
Cutis verticis gyrata is a rare condition characterized by convoluted ridges and folds upon the scalp. It may be primary (essential and nonessential) or secondary. In the primary essential form, it presents only folding skin formation on the scalp, mimicking cerebral gyri, without a definite cause. We report a 29 year-old, black male, with deep linear skin folds on the scalp, resembling the gyri of the brain, on the temporoparietal regions. He had an area of scarring alopecia on the vertex with multiple papules, pustules, and tufted hairs and inflammation and keloidal scarring on the occiput. He had history of use of dreadlocks for 5 years. Scalp biopsy on cutis vertice gyrate area demonstrate no significant alterations on epidermis, edema, proliferation, dilatation and vascular congestion on dermis and mild fibrosis on interfollicular areas. The biopsy of the vertex and nuchae confirmed the diagnosis of folliculitis decalvans and folliculitis keloidalis, respectively. We report a rare case of overlap of these three conditions associated to chronic traction.

P174

Air-Compressed Topical Minoxidil (MX) May Improve the Therapeutic Response to Daily Topical Minoxidil-5% (M5) in Male Androgenetic Alopecia Patients (MAGA): A Controlled Pilot-Study on 27 Patients

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Nicolas Perez-Mora obtained his MD PhD Degree in Madrid, SPAIN. Then he was trained in Clinical Research at Baylor University Medical Center, Dallas, Texas, and at Northwestern Memorial Hospital, Chicago, Illinois during the 90`s. He is author of 40 PubMed registered publications. He also worked as Senior Spain Manager for UpToDate www.uptodate.com A worldwide trusted evidence-based medicine support resource. He currently works

as Medical & Scientific Advisor for Svenson Medical. A hair-care private corporation owning over 60 hair-care centers in Spain, Germany, Switzerland and Portugal. He recently received the Best Clinical Poster Award of WCHR 2014 in Jeju, Korea.

N. Perez-Mora: None. **F. Perez Ordas:** None. **C. Velasco:** None.

LEARNING OBJECTIVES:
Show that air-compressed topical minoxidil application may increase the therapeutic effect of home-based topical minoxidil.

ABSTRACT:
We hypothesize that MX may increase the therapeutic effect of M5 home-based treatment in MAGA patients. Methods: 27 MAGA patients were assigned to M5 Group: home-based M5 topical application once a day (n=11) or to MX Group: home-based M5 topical application once a day, plus a 5-ml air-compressed application of M5 every other week (n=16). Patients were assigned to each group depending on their availability to come regularly to a hair-care center for receiving MX application. Hair count, total-hair density, terminal-hair density, vellus-hair density and terminal-vellus ratio were calculated by using a Handyscope Fotofinder® device with Trichoscale Fotofinder® software. Each patient underwent hair count analysis. A: the day of starting therapy; B: after 6 months of therapy. Each hair parameter variation was classified as: loss progression (< -10% B-A); maintenance (± 10% B-A) or hair regrowth (> +10% B-A). All hair parameters showed a higher patient-rate of hair regrowth in MX group as compared with M5 group. M5: 2/11 patients; MX: 7/16 patients; $p<.05$. Mann-Whitney U test. The average rank of terminal-hair density response was also increased in MX group (16.3) as compared with M5 group (9.6); $p<.01$. Wilcoxon signed-rank test. Conclusions: MX application may increase the therapeutic effect of home-based M5 therapy in MAGA patients. A larger prospective study is necessary to further validate these preliminary results.

P175

Clinical, Immunological, and Histological Evaluation of 55 Patients with Scalp Cutaneous Lupus Erythematosus

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Medical dermatologist with a special interest in the diagnosis and management of hair disorders.

M. Pierre-Louis: None. **S.H. Allam:** None. **W.F. Bergfeld:** None.

LEARNING OBJECTIVES:
To define and characterize clinical, immunological, and histologic features of scalp discoid lupus erythematosus and associated alopecia.

ABSTRACT:
Discoid lupus (DLE) is the most common subtype of chronic cutaneous lupus erythematosus with a predilection for the scalp and typically progresses to scarring alopecia. Clinical, immunological, and histopathologic data are critical to the diagnostic work-up and may confirm distinct features in early disease that influence disease burden and patient outcome. This study aimed to define and characterize features of scalp DLE and associated alopecia within a healthcare system. We retrospectively reviewed clinical, immunological, and histological data from 55 patients to determine whether certain features could better confirm diagnosis, guide management, and confer prognosis. 82% of patients were female with an average age of 52 years. 65% of cases had a chief complaint of hair loss. The most prevalent symptoms were itch (42%), dyspigmentation (29%), and redness (16%). The most prevalent clinical findings were alopecia (60%), erythema (40%), and post-inflammatory dyspigmentation (33%). 11% of patients had a reported history of SLE. 65% of cases with smoking status reported had a history of smoking. Key histological features were a predominantly dermal and perivascular lymphocytic inflammatory infiltrate (98%), decreased arrector pili muscle (87%), basement membrane thickening (82%), follicular drop-out (73%), and absent sebaceous

glands (53%). This study demonstrates salient histological features of DLE scarring alopecia and affirms the essential role of clinicopathologic correlation in disease diagnosis and management.

P176

Hair Changes Due to Target Therapies: Helping Hope

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University of Bologna, Bologna, Italy.

Bianca Maria Piraccini is a Professor of Dermatology at the University of Bologna. Her main research is focused on nail and hair clinical and histopathologic alterations. She has actively published her research in the last years in the latter arguments..

B. Piraccini: None. **E. Dika:** None. **P. Fanti:** None. **M. Starace:** None. **A. Patrizi:** None.

LEARNING OBJECTIVES:
Describes the histopathologic and genetic changes of the hair matrix cells in the course of treatment with BRAF - inhibitors.

ABSTRACT:
In the era of new target therapies, with challenging progresses in the treatment of metastatic melanoma the role of dermatologists has become increasingly important. Cutaneous adverse events (AEs) are the most frequently reported in patients in the course of treatment with target therapies.
Hair changes, frequently observed (18- 46 % of patients) are described with the aspecific term of “alopecia” but there are no reported studies up to date investigating the pathogenesis of hair loss induced by target therapies.
We describe a genetic, histopathologic and clinical study of 24 patients (18 females / 6 male) presenting hair changes due to Braf- inhibitors therapy and investigate the pathogenesis of the latter. Therapy with BRAF-inhibitors, may cause a paradox activation of the RAS pathway in keratinocytes, resulting in the development of acanthopapillomas, a recently described subtype of cutaneous neoplasms.
RAS mutational analysis was performed in hair matrix follicle cells of patients affected by BRAF inhibitors- hair loss and the relative hair changes correlated with the genetic and histopathologic analysis.
The occurrence of alopecia in metastatic patients does not lead to drug discontinuation,but understanding pathogenesis and treating the hair aspects, especially in female patients, increases treatment compliance and ameliorates their quality of life .

P177

The Pseudo-"Fringe Sign" in Frontal Fibrosing Alopecia

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R. Pirmez: None. **B. Duque-Estrada:** None. **L.S. Abraham:** None. **G.M. Pinto:** None. **D.C. de Farias:** None. **Y. Kelly:** None. **I. Doche:** None.

LEARNING OBJECTIVES:
Identify a new clinical presentation of frontal fibrosing alopecia, in which an unusual retention of the hairline produces a misleading pseudo-"fringe sign."

ABSTRACT:
Frontal fibrosing alopecia (FFA) is a clinically distinct variant of lichen planopilaris mainly characterized by a progressive band of alopecia of the frontotemporal hairline. Traction alopecia (TA) is one of the main differential diagnoses especially in black patients. The 'fringe sign', the presence of retained hairs along the frontotemporal rim, is a useful clinical marker of TA, helping in the differential diagnosis between both entities. We describe a series of FFA patients in which an unusual retention of the hairline produced a misleading pseudo-'fringe sign'. Currently, FFA is considered an epidemic by several authors and dermatologists will certainly come across an increasing number of exceptions and new presentations of the disease. Awareness of this newly described clinical presentation may prevent incorrect diagnoses, thus allowing early treatment and halting of disease progression.

P178

Preview Long Hair Transplantation

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Exclusively Dedicated to Hair Restoration
Director - Clínica Marcelo Pitchon
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M. Pitchon: None.

LEARNING OBJECTIVES:
Understand the conceptts, characteristics and indications of the Preview Long Hair technique of hair transplantation.

ABSTRACT:
Preview Long Hair Follicular-Unit Transplantation is a hair-transplant technique and a whole methodology in which the surgeon transplants the patient's hair follicle with also its accompanying visible external hair shaft in order to perform the surgery in the most precise, meticulous, personalized, and artisanal way possible, with all the artistic, aesthetic, technical advantages originated by the intraoperative vision of the hairs he is planting and by the emotional advantage caused by the patient's instantaneous reaction of excitement and elevation of self-esteem triggered by the visualization of the postoperative, transitory preview of the final result. OBJECTIVE The core objective of the Preview Long Hair methodology is to provide to each hair-transplant patient the possibility of achieving the maximal, individual, aesthetic image improvement possible for his specific type of hair, per hairtransplanted, per surgical session, no matter the number of grafts used, no matter the size of the session, with the minimum possible aesthetic risk, minimum possible medical risk, and minimum possible surgical trauma with the most comfortable possible postoperative period and the quickest possible return to work, social activities, and exercise.

P179

Folliculitis Decalvans Mimicking Frontal Fibrosing Alopecia

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Medical doctor. Universidade Federal Fluminense, Niteroi, Rio de Janeiro, Brasil. December/2013. Currently resident in Dermatology at Hospital Universitario Antonio Pedro. Universidade Federal Fluminense.

N.S. Pizani: None. **W.B. Vasques:** None. **M.R. Dias:** None. **M.S. Teixeira:** None. **L.R. Nogueira:** None. **J.P. Andrade:** None. **L.A. Pereira:** None. **L. Pantaleão:** None.

LEARNING OBJECTIVES:
Expand diagnostic hypothesis considering cicatricial alopecias with similar clinical presentation but different management.

ABSTRACT:
Folliculitis decalvans (FD) is a neutrophilic scarring alopecia with peripheral spreading patches of alopecia with pustules, crusting and tufted hair. Frontal fibrosing alopecia (FFA) is a lymphocyte-mediated primary cicatricial alopecia affecting the frontal hairline and eyebrows.
We present a 27 year-old black male with scarring alopecia with symmetrical retreat of the frontal and temporal borders of the hair implantation and eyebrow thinning. The border of the hair line shows erythema and perifollicular scaling with centripetal activity. The parietal area and vertex exhibit numerous tufted hairs with perifollicular scaling and erythema. Vertex and occiput show alopecia patches with centrifugous activity. The patches show atrophic center, erythema, scaling, crusts and tufted hair on the border. The histopathology shows compact orthokeratosis with corneal plugs, regular acanthosis, superficial and deep perivascular and periadnexal inflammatory infiltrate. Folliculitis is present besides numerous plasmocytes, Russell bodies and extensive fibrosis. This is compatible with FD. We report a case of FD mimicking FFA with retreat of hair line implantation and thinning of the eyebrows.

P180

New Transcriptomic Signature of Human DPCells Cultured in 3D Spheroids

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Florence Berthelot is currently a research scientist at L'Oréal Research and Innovation since 2012. She is part of the Micro-tissue lab under the direction of Thomas Pocard PhD, at Predictive Methods and Models Department where she centers her work on the development of in vitro model of hair and the development of read-out in hair loss research. She obtained her Master degree in 2011 at Pierre and Marie Curie University of Sciences in Paris in the fields of bio-engineering and biotechnologies.

T. Pocard: None. **F. Berthelot:** None.

LEARNING OBJECTIVES:
present the transcriptomic characterization of a spheroid model of human DP cells, and investigate a signature.

ABSTRACT:

The hair follicle is a complex mini organ with distinct roles in physical protection, thermal regulation, sebum excretion, sensory functions and aesthetical or social life. Hair follicle neogenesis is initiated by dermal papillae cells (DP), hich after aggregation in the dermal layer orchestrate the formation of a hair follicle. DP is a cluster of specialized fibroblasts, believed to have a key role in hair growth and cycling by regulating activity of various cells in the follicle. However, two-dimensional (2D) cultured DP cells gradually lose hair-inductive capacity during subculture. A number of recent studies strongly suggest that hair-inducing capacity of human DP cells is restored by three-dimensional (3D) spheroid cultures.
In the present study, DPs were dissected out from scalp biopsies obtained from three donors (one man, two women). DP cells were further expanded in culture. Through using mild centrifugation, we aggregated into spheroids either these DP cells (passage 5) or skin fibroblasts. A global transcriptional profiling was then performed using Affymetrix array. A number of mRNAs were found modulated in 3D versus 2D cell culture, including genes of the wnt/BMP ignalling pathway as well as TGF beta pathway Some of these modulations were confirmed by immunofluorescence on spheroid frozen sections.

P181

Monitoring Penetration of Actives Into Whole Hairs Using Raman Spectroscopy

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Paul is now a science leader in vibrational spectroscopy at unilever discover's, strategic science group. He has applied spectroscopy in a number of innovative ways to gain further understanding of both consumer products and their behaviour when they interact with our consumers. He has approximately 60 peer reviewed publications. He was nominated as one of the 'Prominent Young Vibrational Spectroscopists' in special addition of Vibrational Spectroscopy journal in 2004. He won the Meggers award in 2013, as well being runner up in 2012. In 2014 he was elected as a fellow of the Society of Applied Spectroscopy.

P.D. Pudney: None. **E.Y. Bonnista:** None. **K.J. Mutch:** None. **R. Nicholls:** None. **H. Rielly:** None. **S. Stanfield:** None.

LEARNING OBJECTIVES:
Illustrate how confocal Raman spectroscopy coupled with MCR analysis can follow the penetration of active molecules into hairs.

ABSTRACT:
Locating how and where an active molecule penetrates into hair is fundamental in understanding any benefit it may impart. Here we show how confocal Raman spectroscopy coupled with multivariate curve resolution (MCR) analysis, which separates spectral differences arising due to depth, can be used to do this on whole hair fibres. Previously similar methodologies have proved difficult because hairs are relatively opaque and spatial resolution diminishes with depth from the fire surface because of the change in refractive index.
A Raman depth profile map was collected for hairs were treated with a solution of resorcinol. The results illustrate that the resorcinol penetrates extensively and has an approximately uniform concentration throughout. After rinsing resorcinol was observed to be retained within the hair and remained evenly distributed. We have also looked at delivery of glycerol from a fully formulated product. In products multiple band overlap can become too much of a problem and require acquisition of a very large dataset. Using MCR we show that the glycerol penetrates the hair cortex overcoming the issues associated with less sophisticated Raman methods.

P182

Understanding the Changes in Structure-Mechanical Behaviour of Hair with Humidity Using Raman Spectroscopy

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Paul is now a science leader in vibrational spectroscopy at unilever discover's, strategic science group. He has applied spectroscopy in a number of innovative ways to gain further understanding of both consumer products and their behaviour when they interact with our consumers. He has approximately 60 peer reviewed publications. He was nominated as one of the 'Prominent Young Vibrational Spectroscopists' in special addition of Vibrational Spectroscopy journal in 2004. He won the Meggers award in 2013, as well being runner up in 2012. In 2014 he was elected as a fellow of the Society of Applied Spectroscopy.

P.D. Pudney: None. **D. Tiemessen:** None. **C. Marsh:** None.

LEARNING OBJECTIVES:
Tounderstand the structural changes in keratin during mechanical strain with high and low humidity from Raman spectroscopy observations.

ABSTRACT:
Changes in humidity result in changes to hair water content and consequently its mechanical behaviour and style retention properties. There are a number of different structural models in literature that attempt to explain the mechanical behaviour of hair during deformation. To differentiate between these models a molecular/conformationally sensitive method that observes structural changes under strain conditions is required. Here we use a confocal Raman spectrometer with a microscope stress-strain cell, and within which the humidity can be controlled, to investigate these changes in hair.
Raman spectra were collected from white virgin hairs at 5% strain intervals at low relative humidity, 20% and 35%, and high relative humidity, 80%. It was be observed that α-helical structures of the keratin changed to β-sheet under strain and that there was a loss of S-S bonds. 2D correlation and perturbation-correlation analysis identified two α-helix to β-sheet transitions, one at low strain and one at high strain, with S-S breakage only observed under higher strains. α-helical unfolding was also observed to proceed to the β-sheet configuration via a disordered state. The first α-β transition had a delayed onset at high humidity, with the high strain transition being unchanged.
These results do not fit exactly with any of the presently proposed mechanical models of hair but have some similarity with the Series-Zone model.

P183

Human Hair Follicle Organ Culture Shows Exciting Potential as an In Vitro Catagen Model Since Apoptotic Signals Increase During Follicular Catagen-like Changes

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I Dr. Heero Najeeb Rahman, PhD in Human Hair Follicle Biology, Centre for Skin Sciences, Faculty of Life Sciences, University of Bradford. I am a postdoctoral research assistant in the Centre for Skin Sciences University of Bradford. I have experience in Laboratory experiments, setting up laboratory equipment, designing project and data analysis. My research area: is investigating the effects of different paracrine modulators in human hair follicles using advanced techniques. I am a member of European Hair Research Society. I have several publications in International Journal of Trichology, BJD, JID and attending different conferences such as BSID, SID and WCHR.

H.N. Rahman: None. **M. Shalbaf:** None. **N.P. Farjo:** None. **B.K. Farjo:** None. **V.A. Randall:** None.

LEARNING OBJECTIVES:
Inhibition of stimulatory factors and stimulation of inhibitory factors correlated with growth cessation indicating their involvement in entry into catagen.

ABSTRACT:
Altering how long a hair grows (anagen) changes the length of the final hair, but the factors promoting anagen's end (catagen) are unclear. Understanding these should lead to better therapies for poorly controlled hair disorders. Since the lack of suitable in vitro catagen models slows progress, we investigated human follicle organ culture's suitability by determining whether apoptotic signals were altered in scalp follicles undergoing catagen-like changes. Microdissected follicles were observed, measured and photographed daily in organ culture for 4 days. Anagen ending was identified by observing catagen-like changes in the hair bulb microscopically and confirmed histologically. Total RNA was extracted from matched follicles exhibiting catagen-like changes and those maintaining anagen (3 pools of 5 individuals). Catagen-like follicles showed altered gene expression, determined by DNA microarray analysis and qPCR, of several paracrine signaling molecules. Levels of growth-promoting FGF10 ($P<0.01$), and its receptor FGFR2 ($P<0.05$), were significantly decreased while those of inhibitory factors TGFB1, BDNF and TNF ($P<0.05$), and their receptors, TGFBR1, p75NTR and TNFRSF1A ($P<0.01$), were increased. This simultaneous inhibition of stimulatory factors and stimulation of inhibitory factors correlated directly with hair growth ceasing indicating their involvement in entry into catagen. Further investigations using this model system should facilitate the development of novel therapeutics targeted at prolonging anagen or initiating catagen for hair disorders.

P184

A Stable Polyamine Analogue, N1-methylspermidine, Prolongs Anagen and Regulates Human Hair Follicle Stem Cells via Anti-oxidative, Anti-inflammatory and Peripheral Clock-related Mechanisms

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Dr. Yuval Ramot holds an MD and an MSc degree in Biochemistry from the Hebrew University of Jerusalem, and is currently a senior dermatologist in the Department of Dermatology and a researcher in the Center for Genetic Diseases of the Skin and Hair in Hadassah Medical Center. He is the recipient of the Minerva Post-doctoral Fellowship and the Young Dermatologist International Achievement Award. He has co-authored 4 chapters in books and more tha 90 articles in peer-reviewed journals. His main fields of interest are genodermatoses and genotrichoses, and endocrine regulation of keratin expression in the hair and skin.

Y. Ramot: Grants/Research Support; Travel support from Giuliani S.p.A. **B. Marzani:** Salary, Contractual Services; Employed by Giuliani S.p.A. **D. Pinto:** Salary, Contractual Services; Employed by Giuliani S.p.A.. **J.E. Kloepper:** None. **R. Paus:** Consultant; Served in a consultancy function for Giuliani S.p.A., Milan. Grants/Research Support; received basic research grants from Giuliani S.p.A., Milan.

LEARNING OBJECTIVES:
Demonstrate the benefits of polyamines to hair growth and stem cells, and the potential underlying mechanisms

ABSTRACT:
Polyamines are instrumental for hair follicle (HF) growth and function. However, they are readily interconvertible and physiologically unstable because they can be quickly metabolized. Therefore, we used a metabolically-stable polyamine, the spermidine analogue N1-methylspermidine (N1-MeSpd), to assess its functional effects on HFs, using microdissected, organ-cultured human scalp HFs as a clinically relevant assay system. Potential effects were further dissected in a human keratinocyte cell line (NCTC-2544). First, we confirmed that N1-MeSpd is a stable compound, with a half-life of 90 hours. 0.5µM N1-MeSpd had a strong anagen-prolonging effect on HFs after 6 days in culture, accompanied with increased expression of the epithelial stem cell-associated keratin, K15. Furthermore, N1-MeSpd decreased lactate dehydrogenase activity in the culture supernatant, a parameter of cell death and cell lysis. We showed that N1-MeSpd decreased the mRNA and protein expression of PER1 and mRNA expression of CLOCK, two peripheral clock core genes that are associated with catagen induction. Gene and protein expression of MTCO1, a subunit of respiratory chain complex IV, were decreased after N1-MeSpd application, in addition to reduced intracellular reactive oxygen species production in cultured keratinocytes. N1-MeSpd also reduced TNF-α gene and protein expression after lipopolysaccharide stimulation. Taken together, these results suggest that the anagen-promoting effects of N1-MeSpd on HFs are mediated by a combined effect of anti-oxidative, anti-inflammatory and peripheral clock-related mechanisms.

P185

Keratoderma and Woolly Hair Caused by Mutation in KANK2, a Novel Player in the Regulation of Hair Structure

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Dr. Yuval Ramot holds an MD and an MSc degree in Biochemistry from the Hebrew University of Jerusalem, and is currently a senior dermatologist in the Department of Dermatology and a researcher in the Center for Genetic Diseases of the Skin and Hair in Hadassah Medical Center. He is the recipient of the Minerva Post-doctoral

Fellowship and the Young Dermatologist International Achievement Award. He has co-authored 4 chapters in books and more than 90 articles in peer-reviewed journals. His main fields of interest are genodermatoses and genotrichoses, and endocrine regulation of keratin expression in the hair and skin.

Y. Ramot: None. **V. Molho-Pessach:** None. **T. Meir:** None. **R. Alper-Pinus:** None. **I. Siam:** None. **S. Tams:** None. **S. Babay:** None. **A. Zlotogorski:** None.

LEARNING OBJECTIVES:
Describe the importance of the sequestration of steroid receptor coactivators to normal hair and skin functions

ABSTRACT:
Keratoderma and woolly hair are the characteristic manifestations of Naxos and Carvajal syndromes, and should alert the physician to the presence of cardiomyopathy. They are caused by mutations in the genes JUP, DSP and DSC2, which encode components of the desmosome. We identified two large consanguineous families, with autosomal-recessive palmoplantar keratoderma and woolly hair. The patients also had leukonychia and pseudoainhum of the fifth toes. None of the patients had evidence of cardiomyopathy or mutations in known culprit genes. Using whole-exome and direct sequencing, a homozygous missense c.2009C>T mutation in KANK2 in the patients was identified. KANK2 encodes the steroid receptor coactivator (SRC)-interacting protein (SIP), which sequesters SRCs in the cytoplasm via its ankyrin repeats, thus controlling the activation of several nuclear receptors, including the vitamin D receptor. Since the mutation is located in the ankyrin repeat domain of the protein, it is predicted to affect the sequestering capabilities of SIP, and indeed, SRC2 and SRC3 were localized to the nucleus of the patients, in contrast to the cytosplasmic distribution in the carrier, and vitamin D-induced transactivation was increased in patient's keratinocytes. This finding unveils the sequestration of SRCs as a new mechanism for regulation of hair structure and growth. It is also the first report of keratoderma and woolly hair caused by mutations in a non-desmosomal gene.

P186

PPARγ-mediated Signalling: A Novel Player in the Regulation of Human Hair Follicle Energy Metabolism?

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Dr. Yuval Ramot holds an MD and an MSc degree in Biochemistry from the Hebrew University of Jerusalem, and is currently a senior dermatologist in the Department of Dermatology and a researcher in the Center for Genetic Diseases of the Skin and Hair in Hadassah Medical Center. He is the recipient of the Minerva Post-doctoral Fellowship and the Young Dermatologist International Achievement Award. He has co-authored 4 chapters in books and 90 articles in peer-reviewed journals. His main fields of interest are genodermatoses and genotrichoses, and endocrine regulation of keratin expression in the hair and skin.

Y. Ramot: Grants/Research Support; travel support from Giuliani S.p.A, Milan, Italy. **M. Alam:** None. **M. Bertolini:** None. **R. Paus:** Consultant; Consultancy function for Giuliani S.p.A., Milan, Italy. Grants/Research Support; Basic research grants from Giuliani S.p.A., Milan, Italy.

LEARNING OBJECTIVES:
Demonstrate the potential effects of PPARg stimulation on mitochondrial functions in human hair follicles.

ABSTRACT:
Peroxisome proliferator-activated receptors (PPARs) are nuclear receptors expressed in human skin and hair follicle (HF), which are increasingly recognized as being important for skin and HF homoeostasis. In human HF biology, PPARγ-mediated signalling may exert protective effects for epithelial stem cells, while agonistic PPARγ modulators can inhibit hair growth by inducing catagen and inhibiting matrix keratinocyte proliferation. PPARγ stimulation has been shown to enhance mitochondrial function, e.g. in adipose and muscle tissue and the brain. However, it remains

unknown whether PPARγ-stimulation impacts on intrafollicular mitochondrial function, a key factor in HF energy metabolism. We have probed this hypothesis by stimulating microdissected, organ-cultured human scalp HFs with GMG-43AC (0.01-1mM), a selective PPARγ modulator. Preliminary microarray analysis results suggested that this PPARg modulator may regulate the intrafollicular transcription of several genes involved in the control of mitochondrial function. Indeed, RT-PCR revealed increased transcription of key genes of mitochondrial biology (PGC1α, MTCO1, TFAM and SLC25A3). GMG-43AC significantly increased immunoreactivity for MTCO1, a key enzyme in the respiratory chain, for TFAM, a key transcription factor for mtDNA synthesis and porin, a marker for mitochondria mass, in the proximal outer root sheath cells and hair matrix keratinocytes in situ. These pilot observations suggest that PPARγ-mediated signalling is a novel, therapeutically targetable player in the energy metabolism of human scalp HFs in health and disease.

P187

Nail Abnormalities and Disease Severity in Alopecia Areata

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Rubina Ratnaparkhi is a second-year medical student on a Dean's Scholarship at Case Western Reserve University. She completed a summer research rotation at the Cleveland Clinic Foundation under Dr. Wilma Bergfeld and Dr. Melissa Piliang, which sparked her interest in hair research. Her research interests also include curriculum design in medical education. In 2015, Rubina served as Co-Chair for the Cleveland Miles for Melanoma 5K to benefit the Melanoma Research Foundation. From 2012-2014, she advised pharmaceutical and biotechnology companies on drug development and commercialization at Leerink Partners. Rubina holds a B.S. in Neuroscience from Brown University.

R. Ratnaparkhi: None. **A. Tellez:** None. **M. Piliang:** None. **W.F. Bergfeld:** None.

LEARNING OBJECTIVES:
Understand the prevalence of different nail abnormalities in alopecia areata (AA) and their association with severe phenotypes.

ABSTRACT:
Nail abnormalities are reported in 7-66% of cases of alopecia areata (AA), but previous results vary widely and data from U.S. centers is lacking. Our aim was to characterize the types of nail involvement in AA and clarify the association between nail changes and disease severity.
An IRB-approved retrospective study of 587 AA patients seen at the Cleveland Clinic from 2004-2015 was conducted. Patients were categorized into one of six severity levels, and nail examinations were reviewed. Statistical comparisons were evaluated using student's t test, chi-squared test, or logistic regression as appropriate.
Nail examinations were completed for 347 patients, and 145 (41.8%) had nail abnormalities. Pitting (57.8%), onychorrhexis (11.6%), and onychomycosis (8.7%) were observed most frequently. Patients with nail abnormalities were 3 times more likely to have severe disease when compared to controls (OR=3.14; $p<0.001$). This association was independent of family history of autoimmune disease or AA, though patients with co-morbid autoimmune diagnoses overall were found to have severe disease (OR=1.65; $p=0.029$). Nail abnormalities were also associated with earlier disease onset, with a mean age of onset of 26.5 versus 31.9 in controls ($p<0.05$).
The present study showed that nail abnormalities were more prevalent among AA patients with more severe hair loss and were associated with earlier disease onset. Nail examinations may provide useful prognostic information to aid clinical management.

P188

An Integrated Transcriptome Atlas of Embryonic Hair Follicle Progenitors, their Niche and the Developing Skin

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Michael Rendl is an Associate Professor of Developmental and Regenerative Biology and Dermatology, and a member of the Black Family Stem Cell Institute at Icahn School of Medicine at Mount Sinai in New York City. Michael received his M.D. from the Medical University of Vienna in Austria. He then performed postdoctoral training in the laboratory of Dr. Elaine Fuchs at The Rockefeller University. In 2008 he joined the faculty at Mount Sinai where he established his own laboratory.

M. Rendl: None.

LEARNING OBJECTIVES:
Learn about gene expression signatures of embryonic hair follicle placode and dermal condensate cells.

ABSTRACT:
Defining the unique molecular features of progenitors and their niche requires a genome-wide, whole-tissue approach with cellular resolution. Here we co-isolate embryonic hair follicle (HF) placode and dermal condensate cells, precursors of adult HF stem cells and the dermal papilla/sheath niche, along with lineage-related keratinocytes and fibroblasts, Schwann cells, melanocytes, and a population inclusive of all remaining skin cells. With next-generation RNA-sequencing we define gene expression patterns in the context of the entire embryonic skin, and through transcriptome cross-comparisons we uncover hundreds of enriched genes in cell type-specific signatures. Axon guidance signaling and many other pathway genes are enriched in multiple signatures, implicating these factors in driving the large-scale cellular rearrangements necessary for HF formation. Finally, we share all data in an interactive, searchable companion website. Our study provides an overarching view of signaling within the entire embryonic skin and captures a molecular snapshot of HF progenitors and their niche.

P189

Intralesional Corticosteroids in the Treatment of Eyebrow Loss in Alopecia Areata

Jan Ricar, MD, Petra Cetkovska.
Charles University in Prague, Pilsen, Czech Republic.

My name is Jan Ricar, M.D. (born September, 8, 1981). I have studied medicine at Charles University in Pilsen and obtained a M.D. degree with honours in 2006. In 2008 I was appointed to the position of assistant professor at the Department of Dermatovenereology of Charles University, Pilsen. Since 2008 I am Trichologist of the Hair centre of our university. I have published and lectured on different topics in Trichology. In May 2015 I have been awarded the Fulbright scholarship (with the project described in my abstract) to visit from September 2015 prof. Hordinsky in Minnesota and research alopecia areata.

J. Ricar: None. **P. Cetkovska:** None.

LEARNING OBJECTIVES:
To demonstrate an effective treatment method of eyebrow loss in therapy-resistant alopecia areata totalis and universalis.

ABSTRACT:
Objectives: To evaluate the efficacy of intralesional bethametason dipropionate with trimecain hydrochloride in the treatment of eyebrows loss in therapy-resistant alopecia areata totalis and universalis. To describe safety and tolerability of the procedure, duration of clinical response in the follow-up period and to identify the adverse effects. Methods: The patients were injected to eyebrows with solution containing bethametason dipropionate in

combination with trimecain hydrochloride and after the treatment followed-up for up to 6 years. The treatment response and adverse effects were evaluated by clinical examination and documented by photography.
Results: All included patients showed initial treatment response. Patients with alopecia areata totalis achieved faster hair regrowth during the treatment period than the patients with alopecia universalis. Noted relapses in the follow-up period occurred mainly 2 to 6 months after the last treatment session. Some patients needed no reapplication in the follow-up period. The treatment was generally well tolerated. Localised and transient fat atrophy was found in some patients. No other side effects were noted.
Conclusions: Intralesional bethametason with trimecain proved to be both safe and effective for the treatment of eyebrow loss in therapy-resistant alopecia totalis and universalis. Further studies are necessary to explain the described treatment effect as well as to determine which patients are likely to be among the observed long-time responders.

P190

Clinical Study of Patients with Female Pattern Hair Loss in Korea (2007-2015)

Byung In Ro, MD, PhD, Suk Young Lee, Hyun Ok Son, Sin Wook Chun.
Myongji Hospital, Goyang, Korea, Republic of.

Graduated Catholic Medical College, 1969
29 years as Proffessor of the Dept. of Dermatology in Chung-Ang Univ. College of Medicine, 1978-2007
Founding member, President of the KHRS
Chairman of the Dept. of Dermatology, Myongji Hospital and
Invited Proffessor of the Kwandong Univ. College of Medicine, 2007-2015
Chairman of the Dept. of Dermatology, Myongji Hospital and
Invited Proffessor of the Seonam Univ. College of Medicine since March 1, 2015
Attended 1st to 8th World Hair Congress Meeting

B. Ro: None. **S. Lee:** None. **H. Son:** None. **S. Chun:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to understand clinical status of patients with FPHL in Korea.

ABSTRACT:
Background : The number of patients with female pattern hair loss seems to be gradually increasing for the last 2 decades in Korea.
Purpose : The aim of this study is to evaluate current ratio of male to female AGA patients and the clinical characteristics of the Korean FPHL patients.
Methods : Total 2,001 patients with AGA visited at the Alopecia Clinic, Department of Dermatology, Myongji Hospital from March 2007 to February 2015. Of the 856 female patients were evaluated by reviewing medical records.
Results : The number of male patients was 1.3 times more (1,145) than that of female patients (856). The reversal in the ratio of male to female occurred only in 2012(0.98:1). Of the 856 female patients, Ludwig's type I (63.9%) was dominant. By age, patients in their 30's with 210 patients(24.5%) were the highest and followed by those in their 20's with 171 patients(20.0%). Family history of AGA observed in 438 patients(51.2%). The most common associated diseases were seborrheic dermatitis(44.4%), and followed by diabetes mellitus and hypertension(28.0%), allergic disease(7.1%), alopecia areata(4.4%), anemia(3.1%), thyroid disease(2.1%), and polycystic ovarian disease(1.9%).
Conclusions : In conclusion, this study showed increasing number of patients with FPHL in Korea. Out of all the patients with FPHL, those in their 30's were the most prominent in numbers.

P191

Microneedle Treatment of Growth Factor Cocktail on the Patients with Androgenetic Alopecia(2012-2014)

Byung In Ro, MD, PhD[1], Suk Young Lee[1], Hyun Ok Son[1], Sin Wook Chun[1], Hang Cheol Shin[2].
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Graduated Catholic Medical College, 1969
29 years as Proffessor of the Dept. of Dermatology in Chung-Ang Univ. College of Medicine, 1978-2007
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Chairman of the Dept. of Dermatology, Myongji Hospital and
Invited Proffessor of the Seonam Univ. College of Medicine since March 1, 2015
Attended 1st to 8th World Hair Congress Meeting

B. Ro: None. **S. Lee:** None. **H. Son:** None. **S. Chun:** None. **H. Shin:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to learn about GFC treatment on patients with AGA.

ABSTRACT:
Background : Among the various stimulants of treatment in androgenetic alopecia(AGA), growth factor is known to be an effective agent in hair regeneration. BI Ro in conjunction with other authors reported Systematic Growth Factor(SGF) treatment on the patients with AGA at the 7th World Congress for Hair Research in 2013.
Purpose : The aim of this study is to evaluate the efficacy of GFC treatment in the patients with AGA after previous report.
Methods : GFC were topically applied by medical devices of microneedle in 2~4 weeks interval. Efficacy was evaluated by phototrichogram and digital photograph analysis after 10 times of treatment within 6 months. Totally 71 patients, age between 14 to 76 years old, were enrolled (MPHL II to V: 39 patients, FPHL I and II: 32 patients) through 24 months, from October 2012 to September 2014.
Results : Phototrichgram showed 7.4% increase in hair density and 4.9% increase in hair width. In hair density, 32.4% showed 5~10% increase, and 11.3% patient showed more than 15% increase. In hair width, 53.5% presented 0~5% increase, and 12.7% patients presented more than 10% increase. Adverse effects were not observed except mild tingling sensation.
Conclusions : GFC therapy was effective and safe for the treatment of AGA and this will be one of the treatment options for AGA.

P192

Overlap of Lichen Planopilaris and Androgenetic Alopecia: Evaluation of Clinical and Histologic Features

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Gabriela Rosa is a third year pathology resident at the Cleveland Clinic, with a subspecialty interest in dermatopathology.

G. Rosa: None. **W. Bergfeld:** None.

LEARNING OBJECTIVES:
Understand the clinical and histologic overlap of lichen planopilaris with androgenetic alopecia and its implications.

ABSTRACT:
Recent literature highlights the co-existence of LPP with AGA in failed hair transplants. We reviewed scalp biopsies, clinical photographs and patient outcomes where AGA and LPP were both considered in the diagnosis. A search of one institution's pathology files and clinical records over 20 years for patients where LPP and AGA were both considered yielded 26 patients. After excluding patients without photographs and/or biopsies, 8 patients remained. All patients were women. In 3 patients, LPP and AGA were considered only clinically. In 3 patients, LPP and AGA were considered only on biopsy. In two patients, LPP and AGA were considered both in the clinical and histologic diagnosis. Thinning/loss of central scalp hair was seen in all patients. Frontal hair thinning was seen in 3/8 patients. Perifollicular erythema was seen in 5/8 patients. Histologic findings supportive of LPP were a lichenoid infiltrate around hair follicles (6/8), wedge-shaped scars (5/8) and perifollicular scars (5/8) . Histologic findings supportive of AGA were miniaturization (5/8) and follicular fibrous tracts (7/8). All patients were treated with aldactone or minoxidil. Six of seven patients with available clinical follow up showed improvement. Awareness of the histologic and clinical overlap in these entities can be important, not only in the setting of hair transplantation, but also to identify patients who may benefit from AGA treatment.

P193

Significant Hair Growth Following Effective Medical Treatments in Men and Women With Pattern Hair Loss Does Not Involve the Conversion of Vellus Hair to Terminal Hair. Where Does the Observed Hair Growth Originate?

D. Hugh Rushton, PhD, DSc[1], Dominique Van Neste[2].
[1]University of Portsmouth, London, United Kingdom, [2]Brussels Hair Research, Brussels, Belgium.

I have a DSc from the University of Cardiff and a PhD entitled from The Welsh School of Pharmacy, University of Wales. I have published over 55 research papers in peer-reviewed journals and written or co-authored book chapters concerning scalp hair loss, treatment modalities, hair care and associated matters.

D. Rushton: None. **D. Van Neste:** None.

LEARNING OBJECTIVES:
Conversion of vellus to terminal hair is not responsible for the observed increase in total hair density (hair per cm2).

ABSTRACT:
Background: Hair regrowth following effective medical treatments for female and male pattern hair loss has historically been attributed to the reversal of miniaturised (vellus) hair to terminal hair. This position stemmed from publications reporting reductions in the percentage of vellus hair in those patients who had significant increases in total hair density (hair per cm2). A situation that has remained unchallenged apart from one small study in 2006 by Van Neste.
Methods: A retrospective analysis of the raw data from peer-reviewed publications, employing the same quantitative, validated hair evaluation method (Unit Area Trichogram, UAT), by the same researcher employing a standardised pre-sampling protocol. The raw data was re-analysed to determine the absolute vellus hair count at baseline and after 12 months in treated or 24 months in untreated men and women experiencing pattern hair loss.
Results: Male and female subjects exhibiting pattern hair loss, treated for 12 months with various medical therapies (minoxidil, finasteride, anti-androgens) in whom significant increases in total hair density (THD) per cm2 occurred, did not experience a significant change in the vellus hair population per cm2.
Conclusion: There is no evidence supporting the hypothesis that the reversal of vellus to terminal hair is responsible for the observed increase in THD initiated by effective medical treatment of male and female pattern hair loss.

P194

The Role of Inflammation and Immunity in the Pathogenesisof Female-Pattern Hair Loss

Neil Sadick, MD.
Sadick Dermatology, New York, NY, USA.

Dr. Sadick holds four board certifications in internal medicine, dermatology, cosmetic surgery, hair restoration surgery and is a Diplomat of the American Board of Phlebology. Dr. Sadick is one of the world's most respected dermatologists and the medical director and owner of Sadick Dermatology. Dr. Sadick is also the director of Sadick Research Group, which runs multiple FDA clinical trials each year.

N. Sadick: None.

LEARNING OBJECTIVES:
Learning about novel theories regarding female patter hair loss.

ABSTRACT:
Background:
Female-pattern hair loss (FPHL) affects a significant percentage of women with increased prevalence with aging. While follicular pathology and pathophysiology of male androgenetic alopecia are widely considered to be resolved, FPHL is still under investigation; particularly as no androgen excess is found in more than 50% of the affected women.
Objective:
The objective of this study was to determine the role of immunity and inflammation in FPHL as immunoglobulin deposition within the epidermal basement membrane zone was a finding in androgenetic alopecia. A second objective was to evaluate a modulated therapy according to inflammatory and immunoreactant profiles in a clinical study.
Conclusion:
A lymphocytic microfolliculitis targeting the bulge epithelium along with deposits of epithelial basement membrane zone immunoreactants are frequent findings in female pattern hair loss and point toward an immunologically driven trigger. Cases showing a positive immunoreactant profile respond well to combined modality therapy compared to those with a negative result.

P195

The Prevalence of Pediatric Alopecia Areata Among 572,617 Dermatology Patients

Chauncey C. Caldwell, MD, **Sami K. Saikaly**, James A. Solomon, Assistant Professor, UCF College of Medicine. UCF College of Medicine, Orlando, FL, USA.

Sami Saikaly, a third-year medical student at the UCF College of Medicine, has a wide array of research experience in dermatology, cardiology, and urology. His interest in dermatology originates through physician shadowing and exposure through the UCF College of Medicine's curriculum. Sami's dermatology areas of interest include alopecia areata and melanoma. He is currently involved in research projects that investigate pediatric alopecia areata and intravascular lymphoma.

C.C. Caldwell: Other Financial or Material Support (royalties, patents, etc.); NAAF has funded travel costs for a research conference. **S.K. Saikaly:** None. **J.A. Solomon:** Other Financial or Material Support (royalties, patents, etc.); NAAF has funded poster costs for a research conference.

LEARNING OBJECTIVES:
Evaluate the prevalence/age/sex among 71,519 pediatric alopecia areata patients and to determine how the prevalence impacts a typical dermatology practice.

ABSTRACT:
Children with alopecia areata (AA) may have an impaired quality of life due to their altered physical appearance. The prevalence of pediatric AA seen at US dermatology practices is unclear. This retrospective billing data analysis aims to evaluate the prevalence/age/sex among 71,519 pediatric patients presenting to a large dermatology group practice with the diagnosis of AA, and to determine how the prevalence impacts a typical dermatology practice. Billing data from Leavitt Medical Associates of Florida d/b/a Advance Dermatology and Cosmetic Surgery was retrospectively collected from offices throughout Florida and Ohio, involving a total of 572,617 dermatology

patients, including 71,951 discrete pediatric patients (1-17 years of age). Recorded demographics included patient age and gender. Statistical analysis of de-identified data was conducted using SPSS, utilizing cross tabulations for proportional analysis and χ^2 to determine significance ($p < 0.05$). Of 572,617 discrete patients of all ages, 3,633 were found to have AA. Pediatric visits (age 17 and younger) totaled 71,591, and included 656 AA diagnoses (291 males; 365 females); representing 18% of total AA cases. While both sexes displayed the appearance of a bell shaped curve, males peaked at 12 years and females peaked at 9 years. Pediatric patients with AA represent approximately 1 per thousand total patients presenting to dermatology offices. The prevalence was found to vary by age and sex.

P196

Integrity Analysis of Hair Thread According to the Use of Different Tools and Haircut Techniques

Luma G. Sakamoto, Luma Sakamoto[1], Jefferson Eugenio da Silva, Jefferson Eugenio[1], Leonardo Ferreira Costa, Leonardo Ferreira Costa[1], Lucas Offenbecker Guerra, Lucas Guerra[2], Miguel Angel Cisterna, Miguel Cisterna[3], Maria Laura Bovcon, Laura Bocvon[4], Ademir Carvalho Leite Junior, Ademir Leite Jr[1], Ana Carolina Henriques Ribeiro Machado, Ana Carolina Ribeiro[1].
[1]Anhembi Morumbi University, Sao Paulo, Brazil, [2]Investiga - Instituto de Pesquisa, Campinas, Brazil, [3]Asociación Argentina de Tricología, Buenos Aires, Argentina, [4]Maimónides University, Buenos Aires, Argentina.

Graduated in Business Management at FATEC - Faculdade de Tecnologia de São Paulo (2010). Graduated in Visagism and Hair Therapy at Anhembi Morumbi University (2014). Specialization student in Trichology and Hair Therapy at the University Anhembi Morumbi. Administrator, visagism professional and hair therapist at company Kimio Hair in the state of Sao Paulo - Brazil. Speaker at 3rd Trichology Congress of Hair Brazil. Scientific work presenter at Cosmoprof Worldwide Bologna, Italy.

L.G. Sakamoto: None. **J.E. Silva:** None. **L.F. Costa:** None. **L.O. Guerra:** None. **M.A. Cisterna:** None. **M.L. Bovcon:** None. **A.C. Leite Junior:** None. **A.H. Machado:** None.

LEARNING OBJECTIVES:
Understand the microscopic differences of various haircut techniques and correlates them to the variation of preservation of the hair fiber.

ABSTRACT:
Haircut is present in the routine of most people and over time techniques and tools were developed to perform it. The professional's choice for his work instrument has always been based on texture and finishing effects to achieve esthetic results. Therefore, to understand better the importance of the choice of instrument and hair cutting techniques, it was asked if the hair ends assumed different physical standard after various cuts. Also, the necessity of attention to the haircut was raised due to assimilation of the concept of fiber, whose section sense can change its resistance strength. For this study it was used Caucasian, brown and innate hair tresses cut with four techniques and three tools a) horizontally cutting with scissors; b) vertically cutting with scissors; c) razor at 45 degrees from the hair shaft; d) horizontally cutting with clippers. The samples were exposed to mechanical action of a combing machine and then they were subjected to analysis of optical microscopy, scanning electron microscopy, split ends and breakage. After the evaluations, it was possible to identify four different patterns of cutting and consequent difference in hair thread integrity behavior, which showed correlation of tools and techniques with damage to the hair fiber.

P197

Bearing the Burden of Cicatricial Alopecia

Kimberly Salkey, MD.
Eastern Virginia Medical School, Norfolk, VA, USA.

Dr. Kimberly Salkey obtained her undergraduate degree at Spelman College before attending medical school at the Medical College of Virginia. She completed her dermatology residency at Eastern Virginia Medical School and then immediately joined the faculty. During her faculty appointment, Dr. Salkey has cultivated her clinical interests in patients with alopecia as well as her academic interests in medical student and resident education. She serves as a module co-director for the medical student Skin Muscle and Bone curriculum and as the assistant program director of the dermatology residency program. Dr. Salkey is also dedicated to providing care for the underserved.

K. Salkey: None.

LEARNING OBJECTIVES:
Recognize the emotional and financial burdens of scarring alopecia.

ABSTRACT:
A 48yo woman presents with gradual, progressive hair loss for the last 15 years. You are her 3rd dermatologist- the previous 2 told her that her hair loss was her own fault, could not be reversed and would likely lead to total baldness. She initially used hair weaves at a cost of about $200/month for years to cover the loss. More recently, she saw several different hairstylists who offered a series of expensive, high end “protein treatments” to no avail. Finally, when her husband left, stating he didn’t want to be married to a bald woman, she comes to see you.
Patients like these are a common occurrence for many dermatologists. A modest amount of research has been dedicated to determining prevalence and identifying the pathogenesis of scarring alopecia, however, little has been done to directly evaluate the patient costs of scarring alopecia. Undoubtedly, there is a significant psychosocial impact. It has been demonstrated that patients with alopecia experience more anxiety and depression as well as marital and career problems compared with their unaffected counterparts. The financial impact of alopecia has been even less well studied. Costs include, but are not limited to hair products, supplements, camouflage as well as doctor visits and time lost from work. The goal of this presentation is to elucidate the hidden costs of alopecia.

P198

Histopathologic Findings in Dermatomyositis of the Scalp

Leopoldo D N Santos, MD, Magdalena Martinka, MD, Jerry Shapiro, MD, Jan Peter Dutz, MD.
University of British Columbia, Vancouver, BC, Canada.

Dr. Leopoldo Santos is a medical doctor and dermatologist. He pursued further training in hair and scalp disorders at the University of British Columbia (Vancouver, Canada) under supervision of Drs. Shapiro and McElwee. Dr. Santos has a special interest in alopecia areata and pattern hair loss research, hair histopathology and trichoscopy.

L.D. Santos: None. **M. Martinka:** None. **J. Shapiro:** None. **J.P. Dutz:** None.

LEARNING OBJECTIVES:
Describe the histopathological features of dermatomyositis of the scalp.

ABSTRACT:
While there are clinical descriptions of scalp dermatomyositis (DM), there are no published descriptions of histopathology of the scalp. The objective is to describe the histopathologic features of DM of the scalp. Scalp biopsies of two patients with typical cutaneous features of dermatomyositis were examined and compared to scalp biopsies of patients with cutaneous forms of lupus erythematosus (LE). Horizontal and transverse sections stained with hematoxylin and eosin and transverse sections stained with PAS and mucin stains were examined. DM histopathology showed the following features within the epidermis; follicular plugging and mild vacuolar interface changes. Within the dermis, superficial and deep perivascular and peri-adnexial lymphocytic infiltrates that extended to the subcutis in one case. Both cases showed basement membrane thickening on PAS stain and increased mucin. The control case showed within epidermis; mild atrophy, subtle vacuolar interface change and follicular plugging. Within the dermis, dense superficial and deep perivascular, perifollicular and perieccrine lymphocytic infiltrates which extended to the superficial subcutis. However, basement membrane thickening and increased mucin were absent features. The dermatopathological features of scalp dermatomyositis include superficial and deep

perivascular lymphocytic infiltrates, the presence of lichenoid interface changes, colloid bodies, a thickened basement membrane and mucin deposition. In conclusion, scalp dermatomyositis may mimic cutaneous lupus erythematosus of the scalp and a pathological distinction may not be possible.

P199

P-3074, a New HPCH Topical Formulation for the Treatment of Androgenetic Alopecia in Male Subjects

Antonella Tosti, MD[1], Matilde Iorizzo[2], Renata Palmieri[3], **Francesco Scarci**[3], Maurizio Caserini[3].
[1]Department of Dermatology and Cutaneous Surgery, Miami, FL, USA, [2]Private Practice, Dermatology, Bellinzona, Switzerland, [3]Polichem SA, Lugano-Pazzallo, Switzerland.

Francesco Scarci is Clinical Project Manager at Polichem SA

A. Tosti: Consultant; Polichem SA, Kythera. **M. Iorizzo:** Consultant; Polichem SA. **R. Palmieri:** None. **F. Scarci:** None. **M. Caserini:** None.

LEARNING OBJECTIVES:
Illustrate the development of a new topical solution, candidate for the treatment of androgenetic alopecia in men

ABSTRACT:
AGA is an androgen-dependent disorder, which leads to progressive miniaturization of hair follicles. It depends on an increased rate of conversion of testosterone into dihydrotestosterone (DHT) in scalp, through the action of 5α-reductase enzyme. Oral finasteride is an effective treatment for AGA, potentially associated with sexual side effects. A new topical formulation of finasteride (P-3074), vehicled in Hydroxypropyl Chitosan (HPCH) Technology, able to control the release of finasteride in hair and scalp, minimizing the systemic exposure, has been developed. A pharmacokinetic phase I study, tested P-3074 b.i.d. vs oral finasteride 1 mg o.d., revealing a finasteride systemic exposure 15 times lower in the topical formulation. A pharmacodynamic study compared P-3074 b.i.d. and o.d. vs oral finasteride 1 mg o.d. in DHT inhibition in scalp (vertex) and in serum. The results showed comparable serum/scalp DHT inhibitions across formulations, suggesting that the achievement of comparable levels of DHT inhibition vs the oral form could be attained by a lower dose of P-3074. A following dose-response study evaluated whether P-3074 lower doses could achieve consistent inhibitory effects on scalp DHT, minimizing the systemic effect. At doses up to 200 mcL, topically applied P-3074, allowed to significantly and consistently decrease DHT in scalp (comparable to oral finasteride)and only marginally in serum, potentially minimizing the untoward side effects linked to a systemic DHT reduction.

P200

Using Signaling Pathway Activation Analysis to Identify Prospective Drugs that May Be Used for Treatment of Androgenetic Alopecia

Evgeniya Schastnaya, Polina Mamoshina, Alexander Aliper, Artem Artemov, Anton Buzdin, Alexey Moskalev, Alex Zhavoronkov.
Insilico Medicine, Baltimore, MD, USA.

Evgeniya is a scientist working for Insilico Medicine, Inc - a bioinformatics company focused on drug discovery for aging and age-related diseases located at the Johns Hopkins Eastern Campus.

E. Schastnaya: None. **P. Mamoshina:** None. **A. Aliper:** None. **A. Artemov:** None. **A. Buzdin:** None. **A. Moskalev:** None. **A. Zhavoronkov:** None.

LEARNING OBJECTIVES:
Present new candidate drugs for treatment of androgenetic alopecia, that were identified by analysing activation of signaling pathways.

ABSTRACT:
Androgenetic alopecia or male pattern baldness is the most common form of hair loss in men. It is suspected that to some extent, this type of baldness is mediated by both androgen and non-androgen signals, however the underlying mechanisms remain largely unexplored.
To explore signaling and metabolic pathway regulation during balding we used the GeroScope platform, based on the OncoFinder algorithm used in personalized medicine in oncology. We used samples of dermal papilla cells from balding and non-balding regions of the scalp of men to analyze pathway dysregulation during the development of androgenetic alopecia. We evaluated the activity of over 40,000 compounds for their ability to mimic signaling pathway activation profiles characteristics of non-baling regions of the scalp to shortlist potential candidates. We cross-reference the candidate molecules with the recently launched Geroprotectors.org database. We applied the PharmAtlas tools to estimate the possible adverse effects of compounds with reports odds ratio (ROR) and predicted adverse effects for compounds that did not have reports of adverse effects using signaling pathway activation similarity.

P201

Side Effects of 5 alpha Reductase Inhibitors for Treatment of Hair Loss in Women: A Review

Lauren Seale[1], Amy McMichael, MD[2].
[1]University of Michigan Medical School, Ann Arbor, MI, USA, [2]Wake Forest University School of Medicine, Winston Salem, NC, USA.

Lauren Seale is a 2012 graduate of the University of Michigan and member of the class of 2018 at the University of Michigan Medical School.

L. Seale: Grants/Research Support; North American Hair Research Society Grant. **A. McMichael:** Advisory Board or Panel; NAAF, CARF. Consultant; Allergan, Guthey-Renker, Merz, Procter & Gamble, Sanumed, Johnson and Johnson, Galderma. Grants/Research Support; Johnson & Johnson, Galderma.

LEARNING OBJECTIVES:
At the end of this presentation, learners will be aware of the dearth of characterization of side effects related to treatment with finasteride or dutasteride for hair loss in women, especially those related to changes in sexual function.

ABSTRACT:
Five alpha reductase inhibitors such as finasteride and dutasteride have been studied for the treatment of hair loss in men, with finasteride being the only FDA approved treatment. Increasingly, in recent years, off-label use of these drugs has been employed in the treatment of female pattern hair loss (FPHL) and frontal fibrosing alopecia (FFA) in women. Side effects with 5 alpha reductase inhibitors can include changes in sexual function, and recent publications have characterized an increasing prevalence of these in men. A review of 20 peer-reviewed articles found that very few side effects related to sexual function have been reported in studies in which dutasteride or finasteride has been used to treat hair loss in women. Future publications should investigate not only the efficacy of these drugs in treating FPHL and FFA, but the side effect profile in patients as well.

P202

Activin A is Overexpressed in Three-Dimensional (3D) Cultured Human DP Spheres and Affects Hair Inductive Potency of Neonatal Mouse Dermal Cells

Chang Hoon Seo, BSc, Mi Hee Kwack, Young Kwan Sung.
School of Medicine, Kyungpook National University, Daegu, Korea, Republic of.

I have received my BSc degree from Kyungpook National University School of Life Sciences, Korea in 2013. I am currently enrolled in the PhD program at the Kyungpook National University School of Medicine, Korea under the supervision of Professor Young Kwan Sung.

C. Seo: None. **M. Kwack:** None. **Y. Sung:** None.

LEARNING OBJECTIVES:
Understand the latest research on hair follicle neogenesis

ABSTRACT:
Acquisition of potent human dermal papilla (DP) cells which can induce hair follicle neogenesis is an overarching concern and various approaches have been accordingly attempted to solve the concern. As a way of approaches to acquiring hair-inducing DP cells, we have previously applied three-dimensional (3D) culturing method. We then observed de novo formation of hair follicles when conducting patch hair reconstitution assay using 3D cultured DP spheres with mouse epidermal cells. Stepping further, in this study, we have focused on the secretory proteins from DP spheres. Activin A, the most up-regulated protein in DP spheres, has been selected for further study assuming that overexpressed Activin A by sphere formation might bind to its receptors on mouse epidermal cells resulting in successful hair induction using DP spheres. As we observed expression of Activin A in neonatal mouse dermal cells and its receptor in mouse epidermal cells, we performed patch assay using Activin A knock-down mouse dermal cells in combination with mouse epidermal cells. The results of our patch assays showed that the Activin A knock-down mouse dermal cells are severely impaired in hair follicle neogenesis. Consequently, we demonstrate that Activin A affects hair induction potency of mouse dermal cells.

P203

Angiogenesis Factors in Alopecia Areata

Inessa Serbina, Julia Ovcharenko.
Kharkiv Medical Academy of Postgraduate Education, Kharkiv, Ukraine.

Associate Professor of the Department of Dermatovenerology Kharkov Medical Academy of Postgraduate Education, Kharkov, Ukraine. Author of more than 85 scientific works, including textbooks and methodological guidelines. Hair and scalp diseases prioritized areas of my research in my practical and scientific activities for the last 8 years. "Alopecia areata: clinical and morphological and pathogenetic aspects, treatment and diagnostic tactics" is the current topic of scientific research. As a member of the EHRS I attended the recent 7th WCHR in Edinburgh and 8th WCHR in Korea.receiving travel grant from the European Hair Research Society.

I. Serbina: None. **J. Ovcharenko:** None.

LEARNING OBJECTIVES:
Take into account an imbalance of angiogenic factors in pathogenesis of AA, which is important for new treatment approaches.

ABSTRACT:
Angiogenesis is involved in the regulation of hair follicles life cycle. Vascular endothelial growth factor (VEGF) is a potent angiogenic factor with an immunomodulatory effect. We aimed to determine the serum levels of VEGF, its soluble receptor (sVEGFR1), and epidermal growth factor (EGF) in patients with alopecia areata (AA) in relation to disease severity and activity. Levels of VEGF, sVEGFR1, and EGF were determined by the enzyme-linked immunosorbent assay among 42 patients with AA and 15 healthy individuals. In the active phase of moderate and severe AA, VEGF levels were significantly higher ($p<0.05$) than in the control group and in patients with mild involvement. In the chronic stage of severe AA, VEGF levels were significantly lower ($p<0.05$), than in patients with mild and medium severity. Opposite changes were observed for sVEGFR1 in patients with severe AA: it decreased in active and increased in chronic stage ($p<0.05$). No significant difference from the reference values was observed in patients with moderate and mild severity. A similar trend was observed for EGF. We revealed correlations between the studied parameters. Our study demonstrates that there is an imbalance of angiogenic factors

among AA patients, which might reflect a dysfunction of endothelial development, which might be involved in AA formation. These findings might be harnessed in the future for better staging and potential therapeutic approach.

P204

Bimatoprost, a Hair Growth Promoting Prostamide Analogue, Stimulates Prostamide Synthetic Enzymes, While Inhibiting Prostaglandin Synthesis in Hair Follicles and Dermal Papilla Cells

Heero Rahman, PhD[1], **Mohammad Shalbaf**[1], Nilofer Farjo[2], Bessam Farjo[2], Neil Poloso[3], Jeny Wang[3], David Woodward[3], Valerie A. Randall[1].
[1]University of Bradford, Bradford, United Kingdom, [2]Farjo Medical Centre, Manchester, United Kingdom, [3]Biological Sciences, Allergan Inc, Irvine, CA, USA.

I graduated as a Doctor of Veterinary Medicine (DVM) in 2001, Iran. I worked two years as a veterinary surgeon in Tehran, Iran, and then I moved to the UK in 2003 for further education. In 2005, I started my PhD at the University Bradford, Department of Biomedical Sciences. My main area during my PhD was working with skin and hair, particularly vitiligo as a model disease. I did my research studying the effect of oxidative stress on the enzymes involved in pigmentation. I am currently working as a Post Doctorate Research Fellow and Lecturer at the University of Bradford.

H. Rahman: None. **M. Shalbaf:** None. **N. Farjo:** None. **B. Farjo:** None. **N. Poloso:** None. **J. Wang:** None. **D. Woodward:** None. **V.A. Randall:** None.

LEARNING OBJECTIVES:
Bimatoprost is under trial for alopecia, increased prostamide, but reduced PG,synthetic pathways indicating that altering this increase hair growth.

ABSTRACT:
Certain prostaglandins and prostamides and their analogues have been found to effect hair growth. Bimatoprost, a prostamide F2α analogue, stimulates eyelash growth in vivo, scalp follicle growth in culture and is under trial for alopecia. Function of these mediators in hair growth is unclear. Therefore, we aimed to determine whether human scalp follicles contain all the enzymes necessary for the synthesis of PGs and prostamides from phospholipids and whether bimatoprost alters these pathways.
Microdissected scalp hair follicles and dermal papilla cells were cultured with, or without, bimatoprost (100nM) for 2 days. RNA was extracted for enzyme gene expression identification by gene microarray and qRT-PCR (3 sets of pooled samples each from 6 different people and 3 different human scalp dermal papilla cell lines). Protein expression was examined in frozen scalp skin sections using
immunohistochemistry.
Follicles expressed all enzymes necessary to synthesise PGF2α and
prostamide F2α: phospholipase A2, FAAH 1 & 2, COX 1 & 2, PGF synthase,
NAPE-PLD, and prostamide/PGF synthase. Bimatoprost increased prostamide synthesizing enzymes & decreased PG
equivalents.
Thus individual scalp follicles and dermal papilla cells possess the necessary enzymes for local synthesis of both PGF2α and prostamide F2α suggesting that these mediators may have important roles in hair follicles. Interestingly, bimatoprost increased prostamide, but reduced PG synthesis. Further understanding may lead to novel therapies for hair disorders.

P205

Fibrofolliculomas and Trichodiscomas Identify the Birt-Hogg-Dubé Syndrome

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Divya Sharma is a third-year medical student and AOA member at Rutgers New Jersey Medical School. She has published peer-reviewed academic research in dermatopathology under the guidance of Dr. WC Lambert. She was also funded by the National Cancer Institute - Cancer Education Program at University Hospital Cancer Center and awarded 2nd place for her presentation on "Telomere Dysfunction-Induced Cellular Senescence in Human Thyroid Cancer Precursor Lesions". Sharma has published abstracts for the International Stroke Conference and American Association of Neurological Surgeons/CNS Cerebrovascular Section. Recently, she was honored as a recipient of the AMA Foundation's 2015 National Leadership Award.

D. Sharma: None. **M.Z. Handler:** None. **W.C. Lambert:** None.

LEARNING OBJECTIVES:
Suspect BHDS based on criteria, such as skin findings and ethnic prevalence, and provide anticipatory guidance to at-risk patients.

ABSTRACT:
Fibrofolliculomas and trichodiscomas are tumors that result from proliferation of the follicular mantle and present as 2-4 millimeter dome-shaped flesh-colored papules. They may occur as isolated findings or in conjunction with Birt-Hogg-Dubé syndrome (BHDS). BHDS results from mutations in the folliculin (FLCN) gene and is characterized by multiple fibrofolliculomas, trichodiscomas, acrochordons, pulmonary cysts, spontaneous pneumothorax, and renal neoplasms. As of 2009, approximately 200 families with BHDS and pathogenic FLCN mutations were reported in the literature, but BHDS may be underdiagnosed because of the variability in its clinical presentation. Cutaneous findings, such as fibrofolliculomas, typically manifest at age 20 years. Affected patients have a 27% risk of renal tumors and a 25% risk of spontaneous pneumothorax. Approximately 80% of patients with BHDS have multiple pulmonary cysts that may be detected by computed tomography (CT). At this time, prevalence of BHDS by ethnic background has been extrapolated based on case reports, but has not been studied extensively. Based on our experience, there may be an increased prevalence of BHDS in the Portuguese community. Therefore, a diagnosis of fibrofolliculomas in a patient of Portuguese descent may warrant genetic testing for FLCN, evaluation by a pulmonologist, surveillance for renal cancer, counseling against cigarette smoking, display of a medic-alert bracelet indicating susceptibility for spontaneous pneumothorax, and possession of a Heimlich valve for emergent chest drainage.

P206

Panaz Ginseng Prevents Lipid Peroxides-induced Production of Reactive Oxygen Species (ROS) and Inhibition of Human Hair Growth

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AMOREPACIFIC Corp. R&D Unit

S. Shin: None. **S. Kim:** None. **A. Kim:** None. **S. Kim:** None. **B. Park:** None. **J. Lee:** None. **Y. Na:** None.

LEARNING OBJECTIVES:
Demonstrate the effects of PANAX GINSENG in research on hair follicle.

ABSTRACT:
The harmful effects of lipid peroxides on hair growth have previously been investigated. Lipid peroxides produce reactive oxygen species (ROS), such as peroxyl and alkoxy radicals. ROS induces the apoptosis of hair matrix and epithelial cells by stimulating the expression of *p53*. Also, lipid peroxides induce the catagen phase in murine hair cycles, which indicates that lipid peroxidation may play a role in the pathogenesis of hair loss. In this study, we investigated the effects of Panax ginseng on lipid peroxides-induced hair loss. The prepared PG extract contained 19.48% of total ginsenosides content including Rb1, Rb2, Rc, Rd, Re and Rg1. As expected, Lipid peroxides

induced reactive oxygen species (ROS) and inhibited human hair growth. On the other hand, The PG extract prevented lipid peroxides-induced production of reactive oxygen species (ROS) and inhibition of hair growth. These results suggest that Panax ginseng play an important role in regulating hair loss by lipid peroxides.

P207

Gray Hair: Technological Pathway to Control This Process

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Chemical technician and graduated in Bachelor Industrial Chemistry (UNICAMP-BRAZIL), specialist in Surfactants and Polymer (UNICAMP-BRAZIL), course Human Hair/Cosmetics Interactions (TRI PRINCETON-USA). MBA Engineering and Innovation (USP/UNISEB-BRAZIL). Current Senior Researcher at Grupo Boticario (BRAZIL), responsible for developing technologies for cosmetic products. Former Researcher at Hypermarcas (BRAZIL), responsible for developing technologies suitable to nail enamels. Former Researcher at Natura (BRAZIL), responsible for developing products in Hair Care.

A.M. Silva: None. **M.A. Frazon:** None. **M.C. Baptista:** None. **C.M. Carvalho:** None. **K.S. Machado:** None. **C.A. Brohem:** None. **O. Kruger:** None. **G.D. Dieamant:** None.

LEARNING OBJECTIVES:
Demonstrate the latest developments in research on gray hair and technological way to control this process.

ABSTRACT:
There are several theories that explain the causes of gray hair and control of your causative mechanisms. However the minority of them presents *in vivo* tests expressing potential to modulate this process. Therefore this work aimed to develop a solution to influence the foremost mechanisms of gray hair, suitable to apply in cosmetic product. Main causes related to gray hair suggests that we should focus on melanocytes that, for some reasons stop producing melanin, but also in possible transfer interruption between melanocyte-keratinocyte produced pigments. Then we came up with a combination of vegetable extracts, peptides and salts to act on these causes.To demonstrate the potential *in vitro* efficacy tests of this combination of raw materials were performed to evaluate pigmentation, *ex vivo* tests to measure genes expression and *in vivo* tests to analyze white hair quantity and colorimetric parameter L*. In *in vitro* experiments were observed a significant increase by 40% in melanocyte pigmentation. Regarding the gene expression, the *ex vivo* results indicated modulation of the most genes selected and related to melanogenesis, apoptosis and oxidative stress.
Finally, in *in vivo* evaluation, the results revealed a significant reduction by 12% in the colorimetric parameter which indicates no increase in the white hair quantity. Thus were concluded that these results have great potential to control the gray hair process.

P208

Localized Telogen Effluvium Following Hair Transplantation

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He is the Head and Professor in the Department of dermatology. His specialties are in the areas of hair and nail. His special interests include alopecia, acne and nail disorders. He is also a contributor to the American Academy of Dermatology, Korean Hair Research Society and so on.

S. Loh: None. **D. Suh:** None. **B. Lew:** None. **W. Sim:** None.

LEARNING OBJECTIVES:
Illustrate telogen effluvium following hair transplantation.

ABSTRACT:
Telogen effluvium is a form of nonscarring alopecia, characterized by diffuse scalp hair thinning and shedding in response to triggering events such as physiologic stress and several illnesses. Commonly described in women after childbirth, telogen effluvium can occur after febrile illnesses, major surgery, emotional stress, crash dieting, chronic diseases, or the administration of certain medications.
Case 1; A 51-year-old female patient visited our department with a 3-week history of frontal and bitemporal shedding and thinning. She underwent hair transplantation of 2,000 hair follicles into her frontal scalp 1 month before the abrupt hair loss. The patient was otherwise healthy and taking no medications. Case 2; A 40-year-old healthy male patient complained of a 2-week history of frontal and bitemporal shedding. He had a surgical history of hair transplantation 3 weeks before his hair loss. Physical examination of the both patients revealed some diffuse hair loss, especially in the frontal and temporal area. Normal follicular density and increased numbers of telogen hair follicles were observed on their temporal scalp biopsy specimen. Moreover, there was no perifollicular inflammatory cell infiltration. These histopathological characteristics were consistent with telogen effluvium. Both of them were reassured and placed on close follow-up without any treatment.

P209

Trochorhinophalangeal Syndrome

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He is the Head and Professor in the Department of dermatology. His specialties are in the areas of hair and nail. His special interests include alopecia, acne and nail disorders. He is also a contributor to the American Academy of Dermatology, Korean Hair Research Society and so on.

S. Loh: None. **Y. Won:** None. **D. Suh:** None. **B. Lew:** None. **W. Sim:** None.

LEARNING OBJECTIVES:
Demonstrate a rare autosomal syndrome.

ABSTRACT:
Trichorhinophalangeal syndrome is characterized by sparse and slowly-growing hair, a long pear-shaped nose with a bulbous tip, and finger deformities. The latter were due to cone-shaped epiphyses with irregular premature fusion, resulting in clinodactyly, bradydactyly and in some cases finger contractures. TRPS I is a rare autosomal dominant hereditary syndrome. TRPS1 gene was first identified in 2000 and mapped on chromosome 8 that includes 7 exons and encodes a polypeptide of 1,281 amino acids. We describe here 5 patients with facial features resembling TRPS, 2 of them are families. The patients' ages ranged from 6 years to 49 years. They all showed a pear-shaped nose with bulbous tip and a long philtrum and all patients had the typically fine, sparse hair, sometimes of poor quality, breaking and pulling out easily. Most referred to absent or very slow growth, and rarely needed a haircut. In radiographic findings, those 2 adult patients showed cone-shaped epiphyses of the middle phalanges in their both hands. For these patients, the problems were cosmetic rather than functional. According to these findings, all patients were diagnosed as TRPS, however, further chromosomal and mutation analyses are needed to confirm this syndrome.

P210

Female Pattern Hair Loss: Combination Therapy With Low Dose Oral Minoxidil and Spironolactone

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University of Melbourne, Melbourne, Australia.

Rodney Sinclair is Professor of Dermatology at the University of Melbourne and Director of Epworth Dermatology. He is Past-President of the Australasian Society for Dermatology Research and the Australasian Hair and Wool Research Society. He is the co-author of the section on Dermatology in the Oxford Textbook of Medicine, the Hair Chapters in Rook and Bologna, 13 textbooks of dermatology and 400 research publications. Prof Sinclair convened the World Congress of Cosmetic Dermatology in 2006 and the World Congress of Hair Research in Cairns in 2010 and the Annual Meeting of the Australasian Society for Dermatology Research from 1999-2012.

R.D. Sinclair: Other Financial or Material Support (royalties, patents, etc.); patent.

LEARNING OBJECTIVES:
Oral minoxidil is an anti-hypertensive that causes hypertrichosis and may have a role in the treatment of Female Pattern Hairloss.

ABSTRACT:
Oral minoxidil stimulates hair growth, but its use in female pattern hair loss (FPHL) is limited by potential adverse events including postural hypotension, fluid retention and hypertrichosis. Spironolactone, another oral antihypertensive with antiandrogen activity, may arrest hair loss in FPHL.
To investigate the use oral minoxidil and spironolactone in FPHL, 100 women with a Sinclair stage 2-5 FPHL were enrolled in a pilot study and followed for 12 months. Hair shedding was scored using a 6 point visual analogue scale.
Mean age was 48.44 years (range 18-80). Mean hair loss severity at baseline was Sinclair 2.79 (range 1-5). Mean hair shedding score at baseline was 4.82. Mean duration of diagnosis was 6.5 years (range 0.5 -30). Mean reduction in hair loss severity score was 0.85 at 6 months and 1.3 at 12 months. Mean reduction in hair shedding score was 2.3 at 6 months and 2.6 at 12 months. Mean change in blood pressure was -4.52mmHg systolic and -6.48mmHg diastolic.
Side effects were seen in 8 of women but were generally mild. Six continued treatment while 2 women who developed urticarial discontinued treatment.
In this prospective uncontrolled open label observational pilot study, once daily minoxidil 0.25mg and spironolactone 25 mg appears to be safe and effective in the treatment of FPHL. Placebo controlled studies to investigate this further are warranted.

P211

Hair Shedding In Women: How Much is Too Much?

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Rodney Sinclair is Professor of Dermatology at the University of Melbourne and Director of Epworth Dermatology. He is Past-President of the Australasian Society for Dermatology Research and the Australasian Hair and Wool Research Society.
He is the co-author of the section on Dermatology in the Oxford Textbook of Medicine, the Hair Chapter in Rook and Bologna, 13 textbooks of dermatology and 400 research publications.
Prof Sinclair convened the World Congress of Cosmetic Dermatology in Melbourne in 2006, the World Congress of Hair Research in Cairns in 2010.and the Annual Scientific Meeting of the Australasian Society for Dermatology Research from 1999-2012

R.D. Sinclair: Other Financial or Material Support (royalties, patents, etc.); patent and copyrite.

LEARNING OBJECTIVES:
Learn to define and score the amount of hair shedding in women that is normal versus excessive.

ABSTRACT:
There is no consensus on the amount of hair shedding in women that is normal versus that which is excessive and no simple tool to assess hair shedding. To develop a tool that defines normal and excessive hair loss, 900 long hairs

from a woman with FPHL were separated into 6 bundles, photographed and used to create a visual analogue hair shedding scale. The scale was piloted for usability in 50 women attending a hair loss clinic. Shedding scores were subsequently obtained from 209 women newly diagnosed with female pattern hair loss (FPHL). Normal shedding was defined among a100 adolescent school girls.
In the pilot study, there was strong agreement between scores at week 0 and weeks 2 (r=0.98). Among the 209 consecutive women with previously untreated FPHL, with a mean age of 46.3 and with shoulder length hair , 142 (68%) reported grade 5 or 6 shedding. The mean shedding score was 4.96. Among the 100 school girls with a mean age of 13.51 year and no hair loss. 99 girls had shedding scores < 4 and 1 girl had grade 5 shedding. The mean score was 2.68 The difference was 2.28 ($p<0.0001$).
I consider grades 1-4 shedding normal. Grades 5 and 6 shedding indicate excessive hair shedding. Excessive hair shedding is found in 70% of women with FPHL.

P212

Hair Transplantation for the Treatment of End-Stage Scarring Alopecia

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Dr. Meena Singh
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School, trained at the Mayo Clinic, and completed a fellowship with the International Society for Hair Restoration Surgery under Dr. Marc Avram. She has performed clinical trials in laser hair stimulation and hair transplantation for scarring hair loss. She has numerous publications in many journals, book
chapters, and has been published in the New England Journal of Medicine and been featured on the cover of New York Times.

M.K. Singh: None.

LEARNING OBJECTIVES:
-Determine which patients are good hair transplant candidates.-Understand technical considerations.-Properly counsel patients about all treatment options.

ABSTRACT:
Patients with end-stage cicatricial alopecia should be offered hair restoration surgery as an option for treatment of their cosmetically disfiguring condition. However, hair transplantation
into scarring alopecia can be more challenging as the patient not only needs a suitable donor area, but the inflammatory stage of the scarring alopecia must be inactive. In addition, scalp fibrosis and diminished vascularity may lead to decreased graft survival. Therefore, when a patient seeks consultation for hair restoration an accurate diagnosis should be obtained. It is highly recommended to perform a small, test area before undergoing a larger transplantation session. In 9-12 months, depending on the assessment of graft survival in the test area, a larger session can be performed. Smaller incisions and transplanting at lower densities of 10-25 follicular units per square centimeter is recommended. The patient is counseled that 2-4 sessions may need to be performed every 9-12 months minimum and that with each session higher densities can be achieved. It is important to set expectations for hair transplantation patients with scarring alopecia. Those who accept the limitations of the procedure are generally satisfied with any cosmetic improvement.This will be a case-based talk will discussing the above background and technical considerations.

P213

A Novel Ingredient for Improved Hair Surface

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Eric Spengler, B Pharm, MAS.
Eric is currently Sr. V.P R&D at Living Proof. Eric has a Bachelor's in Pharmacy and Masters in Business and has focused his career on developing technology based consumer care products. He was among the first employee's at Living Proof. Since joining in 2007, his primary research has focused on Octafluoropentyl Methacrylate's effect on hair. Prior to joining Living Proof, Eric was also in R&D at Procter & Gamble, Clairol & Matrix.
Other contributors include:
Soo-Young Kang, Ph.D. Living Proof; David Puerta, Ph.D. Living Proof, Roger York, Ph. D. M.I.T., David Scurr, Ph.D. Univ Nottingham.

E. Spengler: Salary, Contractual Services; Employee of Living Proof. **S. Kang:** Salary, Contractual Services; Employee of Living Proof. **D. Puerta:** Consultant; Consulting for Living Proof. **R. York:** Consultant; Consultant to Living Proof. **D. Scurr:** None.

LEARNING OBJECTIVES:
Illustrate and examine recent advances in hair cosmesis which can be an adjuvant therapy for improving hair quality.

ABSTRACT:
The integrity of hair decreases with weathering. This includes repeated grooming, shampooing, UV exposure and chemical treatments. Weathering causes gradual damage and ultimate removal of the protective cuticle, exposing the weaker cortex - leading to breakage and loss. The most controllable way to minimize cuticle damage is to protect it and decrease the frequency of shampooing.
Octafluoropentyl methacrylate (OFPMA) is a novel material that possesses lipophobic, hydrophobic and very low surface energy properties. OFPMA imparts surface protective properties to hair, reducing weathering and extending the interval between shampooing.
We conducted a series of experiments to assess OFPMA's interaction with the surface of human hair and its consumer benefits. Tof-SIMS and AFM were used to assess deposition of OFPMA. OFPMA preferentially deposited at the edge of cuticles, significantly reducing friction. Dynamic Vapor Sorption experiments on hair treated with OFPMA showed a significant decrease in hysteresis isotherms indicating a decrease in moisture vapor flux. A cornstarch particulate experiment demonstrated OFPMA resists accumulation of particulates; helping keep hair cleaner longer. Finally a consumer use study showed shampooing frequency decreased while impressions of hair quality improved when using an OFPMA product.
Results demonstrate novel and beneficial effects from OFPMA, not available via current treatments.

P214

Wound Healing Protects Against Chemotherapy-induced Alopecia by the Up-Regulation of Interleukin-1ß-mediated Signaling

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Dr. Olivera Stojadinovic is a Research Assistant Professor in the Department of Dermatology at the University of Miami. Her research career starting from her post-doctoral training at the NYU School of Medicine, followed by the Hospital for Special Surgery has been focused on the mechanisms controlling wound healing. Her work has broken new grounds in the field of chronic wounds defining the first molecular markers of the non-healing chronic wounds.

Dr Stojadinovic's current research interests focus on molecular mechanisms of innate and adaptive immunity in skin biology with an ultimate goal to translate new discoveries from bench to bedside.

O. Stojadinovic: None. **A.C. Villasante:** None. **T.C. Wikramanayake:** None. **E. Hinde:** None. **D. Ansel:** None. **M. Tomic-Canic:** None. **R. Paus:** None. **J. Jimenez:** None.

LEARNING OBJECTIVES:
Dissect the mechanisms of wound healing-associated protection from chemotherapy-induced hair loss for the development of novel intervention strategies.

ABSTRACT:
While interactions between wounded skin and the hair follicle (HF) that induce HF neogenesis or promote wound healing have been described, it remains unknown how the wound healing-associated signaling environment impacts on chemotherapy-induced alopecia (CIA). Utilizing a neonatal rat model of CIA, we demonstrate that skin wounding protects from CIA caused by several clinically relevant chemotherapeutics, and that this protection is time-dependent. Gene profiling data unveiled a significant increase in interleukin-1-beta (IL-1β)-mediated signaling upon wounding. Furthermore, local administration of IL-1ß to unwounded rats exhibited CIA protection, while IL-1β neutralization abrogated CIA protection by wounding. Mechanistically, IL-1β retarded postnatal HF morphogenesis, which resembles anagen development. During HF development and the early stages of anagen, the HF is relatively damage-resistant; instead, during late-stage HF morphogenesis or anagen VI, its rapidly proliferating hair matrix cells are vulnerable to cytotoxic agents. Our data suggest that a wound healing-induced switch of the cutaneous cytokine milieu to an IL-1ß-dominated state renders the HF more resistant to chemotherapy-induced damage and that therapeutic mimicking a wound healing induced signaling milieu represents a promising novel strategy for combating CIA, one of the most distressing adverse effects of chemotherapy. Further profiling studies of wound healing-associated gene expression changes are under way which we hope to identify additional molecular targets for future CIA management strategies besides the promotion of IL-1β signaling

P215

Topical Minoxidil Treatment for Congenital Alopecia in Siblings With Hypohidrotic Ectodermal Dysplasia

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Maria Gabriela Studart s a Dermatology resident in the Northeast of Brazil.
She already had the experience in an exchange program during medical school in the US and Canada, and she is always curious and open to new cultures and knowledge.
Dermatology Hair and scalp is the part that most interests and fascinates.

M.G. Studart: None.

LEARNING OBJECTIVES:
At the end of the presentation,I will be able to use minoxidil with good response in cases of genetic alopecia.

ABSTRACT:
Topical minoxidil treatment for congenital alopecia in siblings with hypohidrotic ectodermal dysplasia**.** The ectodermal dysplasias are a group of inherited disorders that share common developmental defects involving at least two of the major structures derived from the embryogenic ectoderm, including hair, teeth, nails, and sweat glands. The most frequently affected structure in individuals with ectodermal dysplasias is hair, on the scalp and on other parts of the body. Hair findings include abnormal structure, quality, quantity, and patterns of distribution. Scalp hair is usually sparse, fragile, and dry. Hypohidrotic ectodermal dysplasia is the most common form of ectodermal dysplasia and is characterized by hypohidrosis, hypotrichosis, hypodontia, periorbital hyperpigmentation, and sculpted noses. Alopecia is due to decrease in number and degree of maturation of the hair follicles. Minoxidil has a mitogenic effect on epidermal cells, increases the duration of anagen hair, and enlarges miniaturized follicles.

We report two cases of alopecia, siblings with hypohidrotic ectodermal dysplasia who responded to treatment with topical minoxidil 5% solution, 1mL twice daily. Following 6 months of therapy, the density of hair on the scalp increased, which was evident on the standardized clinical photographs taken before and after treatment.

P216

Phototrichogram of Female Pattern Hair Loss in Asians

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Poonkiat Suchonwanit, MD, is an instructor at Division of Dermatology, Ramathibodi Hospital, Mahidol University, Thailand. He is a dermatologist who is interested in hair disorders and hair transplantation. After graduating from Srinakarinwirot University, Thailand with Doctor of Medicine degree, He studied dermatology residency at Ramathibodi Hospital, Thailand. He subsequently completed fellowship training in hair disorders and hair transplantation at Siriraj Hospital, Thailand and a one year hair research fellowship at Department of Dermatology, Wake Forest University, North Carolina. Dr. Suchonwanit's research interests include hair biology, hair loss in women, alopecia areata, scarring alopecia, hair pathology and hair transplantation.

S. Rojhirunsakool: None. **P. Suchonwanit:** None.

LEARNING OBJECTIVES:
Understand and familiarize the applied phototrichogram technique for hair loss evaluation particularly in Asians with female pattern hair loss.

ABSTRACT:
Background: Female pattern hair loss (FPHL) is common but the studies about quantitative measurement are still limited.
Objectives: To study the characteristics of the phototrichogram in normal Asian females and FPHL patients, and further correlating quantitative measurement with clinical presentation.
Materials and Methods: Forty-six FPHL and 48 normal female volunteers were included. All subjects' scalps were evaluated by using office-based phototrichogram with digital image analysis in 4 areas, including frontal, parietal, midscalp, and occipital area. The results of hair density (hair/cm2), large hair diameter (micrometers), and percentage of miniaturized hair (%) were statistically analyzed with FPHL staging.
Result: The highest and lowest hair density of normal group was observed on midscalp (172.7 ± 27.4) and parietal area (113.3 ± 17.7) respectively. In FPHL, the number of hair density is lower and the pattern was different. The lowest hair density area was parietal, but the highest hair density area was occipital. Moreover, increasing in percentage of miniaturized hair with severity of clinical staging was observed in FPHL. The statistical analysis showed a significant different of values measured between normal and FPHL group especially on midscalp and parietal areas.
Conclusion: Automated phototrichogram can be helpful method in clinical practice and researches. The values established in our study will be a reference for hair evaluation in Asians.

P217

Alterations of Vitamin A Metabolism and Signaling in Central, Centrifugal, Cicatricial Alopecia Patients

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Liye Suo received her MD degree from Peking University Health Science Center in 2010. She is matched to Baylor College of Medicine Pathology program 2015. She is currently a Ph.D candidate in The Ohio State University Ph.D. Program in Nutrition. Her advisor is Dr. Helen B. Everts. She got the 2014 mentorship grant from NAHRS for

CCCA (central, centrifugal, cicatricial, alopecia) project. Her advisor is Dr. Wilma F. Bergfeld in the Cleveland Clinic.

L. Suo: None. **W.F. Bergfeld:** None. **N. Mesinkovska:** None. **H. Everts:** None.

LEARNING OBJECTIVES:
Expand the knowledge of pathogenesis of CCCA and emphasize the importance of vitamin A in the skin and hair.

ABSTRACT:
Central, centrifugal, cicatricial alopecia, or CCCA is the most common scarring hair loss among African American women. Vitamin A plays an important role in the development of CCCA. Previously, in mice we found that many key components in vitamin A metabolism and signaling were altered in CCCA including: DHRS9 (dehydrogenase reductase member 9); ALDH1A1 (retinal dehydrogenase 1); CYP26A1 (cytochrome P450 26A1); and RARB (retinoic acid receptor beta). Their expression increased in mild disease and decreased in severe disease. The purpose of this study was to examine the possible alteration of those proteins among CCCA patients. Reviewed were African American women diagnosed with CCCA at the Cleveland Clinic in the past eight years. Totally, we had 11 mild disease, 11 moderate disease, 5 severe disease and 12 controls. Immunohistochemistry (IHC) on all the scalp biopsy samples using antibodies against DHRS9, ALDH1A1, CYP26A1 and RARB were examined. The results were a decrease of all four proteins in the basal layer of the severe group as compared to controls. Also found was a decrease of RARB expression in the sweat glands and dermis in the severe group as compared to the mild group. These findings expand the knowledge of pathogenesis of CCCA and emphasize the importance of vitamin A metabolism and signaling in the health of skin and hair.

P218

Fibrosing Alopecia in a Patterned Distribution in Association with Ectodermal Dysplasia

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S. Talasila: None. **B.J. Ortel:** None. **T.A. Victor:** None. **S. Francis:** None.

LEARNING OBJECTIVES:
Recognize the clinical and pathologic features of ectodermal dysplasia

ABSTRACT:
A 23-year-old female presents with a history of alopecia on the central scalp and hypohydrosis. She reported normal hair density until age 16. Physical exam showed characteristic facies, absent body and pubic hair, and diffuse thinning of the frontal and vertex scalp with preservation of the hairline in a Ludwig II pattern. A telogen pull test was positive without breakage. Bilateral eyebrows were sparse with mild perifollicular erythema. She had irregular enamel defects with oligodontia, onychomalacia, and onychoschizia. Two 4mm punch biopsies of the scalp demonstrated follicular miniaturization and perifollicular fibrosis suggestive of fibrosing alopecia in a pattern distribution. Eccrine glands were absent. Laboratory investigations included ferritin (29; Range: 11-207), thyroid stimulating hormone (1.275; Range: 0.34-5.6), and vitamin D (11; Range: 32-100). A diagnosis of fibrosing alopecia in a patterned distribution was made, which has not been previously described in association with ectodermal dysplasia (ED). She is currently undergoing treatment with minoxidil, ketoconazole 2% shampoo, intralesional and topical corticosteroids as well as iron and vitamin D supplementation. Hypohidrotic ED is the most common phenotype of ED characterized by sparse hair, oligodontia, and hypohydrosis. Alopecia occurs due to decreased number and degree of maturation of hair follicles. Minoxidil acts by enlarging miniaturized hair follicles. We present this case for clinical interest and to discuss clinical and pathologic features of ectodermal dysplasia.

P219

Comparison of Four Regimens for the Treatment of Central Centrifugal Cicatricial Alopecia

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Dr. Tang is originally from Los Angeles, California and graduated from Brown University with both her undergraduate degree and medical degree before entering residency at St. Luke's-Roosevelt Hospital in New York City. She has a special interest in cutaneous oncology/Mohs micrographic surgery, skin of color, and medical education.

N. Tang: None. **M. Coley:** None. **S. Shah:** None. **Y. Argobi:** None. **C.M. Burgess:** None. **S.C. Taylor:** None. **A.F. Alexis:** Advisory Board or Panel; Aclaris, Amgen, Bayer, Galderma, Leo, Suneva, Valeant. Consultant; Allergan, Amgen, Anacor, Galderma, J&J, L'Oreal, Roche, Schick, Valeant. Grants/Research Support; Allergan, Novartis. Other Financial or Material Support (royalties, patents, etc.); Cipla (speaking fee).

LEARNING OBJECTIVES:
Understand the effectiveness of the four most common treatment options for central centrifugal cicatricial alopecia (CCCA).

ABSTRACT:
Evidence of effective treatment methods for central centrifugal cicatricial alopecia (CCCA) is lacking. Anti-inflammatory agents, oral antibiotics, topical steroids, and intralesional steroids are all commonly utilized but effectiveness has not been assessed. A limited scale, randomized trial was conducted to investigate the comparative efficacy of four anti-inflammatory treatment regimens. Thirteen patients, determined to have biopsy-verified CCCA, were randomized to four treatment arms: 1) Oral doxycycline, 100mg twice daily, 2) Clobetasol lotion, 2 week cycles, 3) Triamcinolone acetonide injections(TAC), 5mg/cc intralesionally every 4 weeks. 4) Oral rifampin 300mg and cephalexin 500mg, twice daily for 2 weeks, repeated up to 24 weeks. Patients underwent treatment for 6 months followed by Minoxidil 5%. Using last-observation-carried-forward (LOCF) analysis, the mean improvement of involved area was 32.8cm2/19.1% (doxycycline), 48.3cm2/34.5% (clobetasol), 70.3cm2/32.5% (TAC), and -12.3/-8.9% (rifampin/cephalexin). Due to the small sample size, results approached but did not achieve statistical significance. Pooling all participants into a single group, mean change in involved area was 34.6cm2 (95% CI -5.9cm2, 75.1cm2, p = 0.09). Symptoms that improved during treatment included pruritus (10/13, 77%) and pain (6/13, 46%). This is the first clinical trial to investigate the effectiveness of treatment for CCCA and the first to compare steroidal and antibiotic therapy options. Further investigation of treatment options of CCCA are warranted.

P220

Hair Disorders in HIV-infected Patients: A Review

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28-year MD, took the degree in 2011 at University of Rome, "La Sapienza" with an experimental thesis on "psoriasis and cardiovascular risk".
Third-year Dermatology resident at the Catholic University of the Sacred Heart in Rome, Italy.
Interested in the field of Hair research, doing a Mentorship training, thanks to the NAHRS support, with Dr Tosti at

the University of Miami Hospital, about hair disorders and a specific project about Hair Disorders in HIV patients, of which this article is about.

F. Tassone: None. **M. Miteva:** None. **A. Tosti:** None.

LEARNING OBJECTIVES:
Explain and differentiate the different types of hair disorders during HIV infection.

ABSTRACT:
HIV infection is associated with various dermatologic conditions, mostly related to the abnormal CD4+ count. Hair loss abnormalities are not uncommon, yet less studied. We performed a review of the literature using the search engines PubMed and Medline to identify the most common forms of hair and scalp disorders in HIV patients, including those on HAART therapy. We used key words to collect all publications in English from 1986 through March 2015.
Papulosquamous dermatoses of the scalp, (primarily Seborrheic Dermatitis) are the most common scalp abnormalities during the earlier phase of HIV. Diffuse hair loss, mainly Telogen Effluvium, is the most characteristic hair abnormality in patients with a late-stage disease (CD4 count less 200/mm3). Hair shaft abnormalities are also common in a late-stage disease, and include trichomegaly, hair straightening (especially in black patients), hair breakage and hair graying. Antiretroviral-related alopecia is a mild to severe hair loss, which appears from 2 weeks to 2 years after the therapy onset. The most involved drugs are the protease inhibitors (Indinavir), followed by the nucleotide reverse transcriptase inhibitors, (Lamivudine). Several cases of Alopecia Areata, including Alopecia Universalis, have been reported in HIV patients in an early phase or after HAART therapy inception. Hair and scalp abnormalities are not uncommon in HIV patients and dermatologists should be aware of their different presentations

P221

Fibrosing Alopecia in a Pattern Distribution

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M.D. Teixeira: None. **M.R. Dias:** None. **L.M. Araujo:** None. **L.R. Nogueira:** None. **L.A. Pereira:** None. **J.P. Bicalho:** None. **N. Piazi:** None. **M.C. Rochael:** None.

LEARNING OBJECTIVES:
Demonstrate a case of patient with a kind of alopecia that shows features of fibrosing alopecia in a pattern distribution.

ABSTRACT:
Fibrosing alopecia in a pattern distribution (FAPD) shows peculiar features that allow it to be considered as a unique entity. The clinical characteristics are area of alopecia in the distribution of typical male or female pattern, perifollicular erythema and hyperkeratosis. Histopathological features are miniaturization of hair follicles, perifollicular lamellar fibrosis associated with lymphocytic infiltration around the isthmus and infundibular area of the hair follicles, fibrotic tract replacing the portion of the original follicular infundibulum and decrease in sebaceous gland. The histology of FAPD shares histological features with other scaring alopecias such as frontal fibrosing alopecia, follicular degeneration syndrome and pseudopelade of Brocq, as well as lichen planopilaris. We reported a 74 year-old, black female, with a history of progressive hair loss in the frontoparietal area. She also complained of mild pruritus. Physical examination revealed decrease in follicular density with absence of follicular orifices and some follicular erythematous scaly lesions with a brownish hue involving the remaining hair follicles in the

midscalp. In the alopecia area, there were interfolicular whitish patches, with important atrophy and fibrous aspect. We performed a skin biopsy that showed miniaturization of hair follicles, concentric perifollicular lamellar fibrosis and fibrosed follicular tracts. The overlap of these features concludes the final diagnosis of FAPD.

P222

Alopecia Areata Caregivers Guidelines

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Mrs. Yolandas Thomason is native of Greenville, South Carolina and a current resident at Danville Regional Medical Center. She is a first generation college graduate, and is an active leader and mentor in her community. At the age of 8 years old she was diagnosed with AA, and she allowed her disease to become a catalyst to pursue her career goals. In May 2015 Mrs. Thomason graduated from Debusk College of Osteopathic Medicine as the first doctor in her family. It is her goal to encourage others to pursue their dreams and make a difference in the lives of others.

Y.R. Thomason: None. **W. Bergfeld:** Advisory Board or Panel; Melissa Piliang. Consultant; National Alopecia Areata Foundation Health and Research Ambassador Program.

LEARNING OBJECTIVES:
Demonstrate the development of Caregivers Guidelines to address the psychological needs and sensitivity training for the care of AA patients.

ABSTRACT:
Children and adolescents diagnosed with Alopecia Areata (AA) bear a significant psychological burden throughout their lifetime. If this burden is overlooked in the treatment and management strategies of patients coping with AA it can lead to poor prognosis and quality of life. When compared to other chronic dermatologic conditions, some clinicians do not have a grasp on the psychological, emotional, and social aspects of AA on children and adolescents. Psychodermatology puts a focus on the relationship between the skin and mind, and offers clinicians a novel approach for the management and treatment of patients and their caregivers dealing with the psychosocial aspect of AA.
This study will utilize the well-validated methodologies and expertise of Cleveland Clinic consultants and in collaboration with the National Alopecia Areata Foundation's Health and Research Ambassador Program (HARA) to assemble the "Alopecia Areata Caregivers Guideline ", a form that will define a psychological standard of care and give caregivers as well as clinicians the insight and sensitivity necessary for long-term treatment and management of patients with AA. This study will build upon findings of HARA's pilot study which is currently assessing the mental health burden of AA. We will then utilize NAAF's Support Group Network to survey patients and recruit patient partners to participate in the development of the guidelines.

P223

Absence of Catagen/telogen Phase and Loss of Cytokeratin 15 Expression in Hair Follicles in Lichen Planopilaris

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Dr. Thompson is a dermatopathologist with expertise in hair loss and nail diseases. Dr. Thompson also currently performing basic science research in melanocyte biology.

A. Habashi-Daniels: None. **J. Roberts:** None. **N. Desai:** None. **C.T. Thompson:** None.

LEARNING OBJECTIVES:
We present evidence of decreased catagen/telogen phase follicles in lichen planopilaris from the loss of CK15+ stem cells.

ABSTRACT:
Lichen planopilaris (LPP) is a lymphocyte-mediated cicatricial alopecia in which the focus of inflammation and scarring is centered around the bulge region of the follicle. The origin of LPP is unknown, and treatment may not prevent disease progression. As a useful tool for both histologic diagnosis and an explanation of for LPP disease progression, we demonstrate a decrease in the number of catagen-/telogen-phase follicles and confirm the loss of cytokeratin 15 (CK15+) expression in the stem cells of LPP-affected follicles.
In this study, 55 cases were stained immunohistochemically for the CK15 antigen, and 40 cases were sufficient for analysis. Catagen/telogen phase was significantly decreased or absent in all cases of LPP, a novel clue useful in histologic diagnostics. The loss of CK15+ stem cells in most affected follicles in LPP was also confirmed, with unaffected follicles retaining CK15+ stem cells. The finding explain why damaged follicles that have lost their CK15+ stem cells disappear when they enter catagen phase.
In conclusion, CK15+ stem cell loss explains LPP progresses despite immunosuppressive therapy. For dermopathologists, the absence of catagen/telogen hair follicles is a helpful diagnostic clue for LPP.

P224

A Comparison of Cultured Human Dermal Fibroblasts Derived from Donor-matched Terminal and Vellus Hair Bearing Skin

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University of Bradford, Bradford, United Kingdom.

Ola Kamala has recently been awarded her PhD

O. Kamala: None. **A. Graham:** None. **M. Thornton:** None.

LEARNING OBJECTIVES:
Identify phenotypic differences between interfollicular dermal fibroblasts associated with the formation of terminal human hair follicles and vellus hair follicles

ABSTRACT:
Dermal fibroblasts (DF) arise from two lineages; t1upper papillary required for hair follicle formation. Although a higher percentage of DFs from haired skin express alpha-smooth muscle actin, differences between DFs from skin containing terminal (T) & vellus (V) follicles have not been explored. We compared donor-matched papillary DFs from female scalp {DF(T)} and adjacent facial {DF(V)} skin and their responses to estradiol. FACS analysis, scratch assays, qRT-PCR, immunocytochemistry and ELISA were used to compare size, proliferation, migration, mRNA, protein expression and caspase-3 activity in donor-matched DFs (n=8). DF(V) were smaller, with a granular cytoplasm and proliferated faster. Both expressed estrogen receptors; with higher ERα and GPER1 expression in DF(T). Estradiol had no effect on proliferation, but stimulated DF(T) migration in a scratch assay; incubation with estradiol increased expression of ERα and ERβ in DF(T), and ERα and GPER1 in DF(V). Expression of t1X-linked inhibitor of apoptosis (XIAP) was similarly upregulated by estradiol in both. In a scratch assay, estradiol further increased XIAP expression in DF(T), but decreased expression in DF(V). While XIAP inhibition reduced viability, survival was restored by estradiol, which also reduced caspase 3 activity only in DF(T). Donor-matched DF(T) & DF(V) exhibit significant differences in vitro. Reciprocal signalling between t1dermal environment & t1dermal sheath may be important in maintenance of t1anagen hair follicle.

P225

Evidence for Alopecia Areata and Celiac Disease Cross-reactive Epitopes Expressed by Anagen Hair Follicle Inner Root Sheath - Implications for Alopecia Areata Autoantigen(s) Discovery

Desmond J. Tobin, PhD[1], Sonia Manaf[1], Haleema Sajid[1], Asram Munir[1], Stephen K. Sikkink[1], Rachael Sedman-Sutherland[1], Reem Hashem Ahmed[1], David A. Fenton[2].
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Dr Desmond J. Tobin is Professor of Cell Biology and Director of the Centre for Skin Sciences at University of Bradford. He holds a BSc from NUIM, Ireland, a PhD from University of London and post-doctoral training from NYU Medical School. He has researched in basic and applied skin/hair sciences, with focus on biology of human melanocytes/ pigmentation and immune-mediated hair growth disorders (esp. alopecia areata). He was first to identify specific immune response to hair follicle-specific antigens in AA, and first to establish human hair follicle melanocytes in long-term culture. He has published over 140 publications, incl. 3 books.

D.J. Tobin: None. **S. Manaf:** None. **H. Sajid:** None. **A. Munir:** None. **S.K. Sikkink:** None. **R. Sedman-Sutherland:** None. **R. Hashem Ahmed:** None. **D.A. Fenton:** None.

LEARNING OBJECTIVES:
Appreciate how different immune-mediated disorders can affect the skin and other organs via their sharing of cross-reactive antigenic epitopes.

ABSTRACT:
Alopecia areata (AA) and celiac disease (CD) are disorders of the immune system with skin-associated impact (e.g., hair loss in AA and dermatitis herpetiformis in CD). Evidence from the literature suggests that some AA patients with CD have poorer outcomes, but benefit from treatment for their CD. A recent GWAS also identified AA-associated risk loci in common with CD and the striking epithelial relatedness between skin and gut prompted us to explore whether AA and CD may target similar epitopes on hair follicle (HF) and gut epithelium (GE) respectively. Using a combined immunohistochemistry and immuno-blotting approach, we observed that antibody to an immunogenic target epitope in CD reacted specifically with the inner root sheath (IRS) in human scalp anagen HF, and in a pattern that co-localized with the IRS-associated structural protein trichohyalin (THH). Moreover, anti-gliadin antibody raised to the deamidated gliadin peptide reacted with urea-extracted human anagen HF protein by immuno-blotting. Finally, the majority of AA sera tested reacted to an α-gliadin peptide by western blotting. Together with our previous identification of THH (or a component cross-reacting epitope) as a potential immuno-dominant antigen in AA using a proteomics approach, the current findings further support the view that the anagen-specific formation of the IRS may indeed be both a target-site and target-time for the immune response to hair follicles in AA.

P226

In Vitro Model to Resolve and Evaluate Hair Inductive Signalling Networks

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Helena Topouzi is a PhD student, who is based in Dr. Claire Higgins's lab in the Department of Bioengineering at Imperial College London. Her thesis work is focused on developing a gene network to model interaction between the dermal papilla and overlying keratinocytes, which drives hair follicle induction.

H. Topouzi: None. **P. Farrant:** None. **C.A. Higgins:** None.

LEARNING OBJECTIVES:
Demonstrate how in vitro models can be used to detect early commitment of epidermal keratinocytes to a hair follicle fate.

ABSTRACT:
Dermal Papilla (DP) are mesenchymal cells that reside at the base of the hair follicle (HF), and have the capacity to induce formation of de novo HFs in non-hairy epidermis. DP, or cultured DP cells, are often deemed inductive if they can instruct de novo hair growth, however, this process takes several weeks to occur. We have developed an in vitro assay using human cells, to enable us to study the interaction between DP and epidermal keratinocytes (KC) over a period of days rather than weeks. DP cells and KC are cultured together, but are separated via a porous polyethylene terephthalate membrane. The porous nature of the membrane enables contact and communication between the cells, yet separation so we can resolve transcriptional profiles in each cell type. Using PCR and immunofluorescence to characterise KC after co-culture with DP cells, we observed expression of early (Lef1), and late (K6hf) hair fate markers. However, we did not observe Lef1 and K6hf expression in KC after they had been co-cultured with non-inductive interfollicular fibroblasts. We are now performing RNASeq of KC, after they have been co-cultured with either DP or interfollicular fibroblasts, to identify transcripts that are regulated by interaction with DP. We plan to reverse engineer an inductive signalling network, to determine key transcripts within DP that promote HF fate in KC.

P227

Cosmetic Utility of Topical Minoxidil for Congenital Hypotrichosis

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- Professional Society -
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Society of Hair Science Research
Japanese Society of Allergology
Japanese Society of Recklinghausen Disease

M. Uchiyama: None. **M. Fukunaga:** None. **Y. Shimomura:** None. **R. Tsuboi:** None.

LEARNING OBJECTIVES:
Demonstrate the utility of topical minoxidil for lengthening the hairs of the patients with congenital hypotrichosis.

ABSTRACT:
Congenital hypotrichosis is a hereditary disorder characterized by sparse or absent scalp hair with or without other ectodermal or systemic abnormalities. Most of the patients with congenital hypotrichosis, including localized autosomal recessive hypotrichosis with sparse and wooly hair caused by a mutation of the LIPH gene, which is most often responsible for this condition in the Japanese population, present no systemic abnormalities. However, this condition is incurable and negatively impacts the patients' quality of life. We present 9 cases of congenital

hypotrichosis (male, n = 3; female, n = 8; average age, 12.7 years old), including those proven to harbor the LIPH gene mutation by genetic testing, which were treated with topical minoxidil. The application of topical 1% or 5% minoxidil twice daily resulted in the lengthening of hair in all of the patients, although the morphological abnormality remained unchanged. This report demonstrates the cosmetic utility of topical minoxidil for lengthening the hairs and creating the appearance of increased volume.

P228

A Study of the Scalp Blood Flow Promotion Effect from High Concentration Artificial Carbonated Spring Devices

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R. Ueki: None. **H. Sakai:** None. **K. Hibi:** None. **M. Taneike:** None.

LEARNING OBJECTIVES:
Demonstrate the efficasy of the scalp blood flow promotion by using the high concentration artificial carbonated spring devices.

ABSTRACT:
Carbonated springs are used in various places, with the expectation of improved blood flow in ischemic limbs and esthetic effects, but there are no reports with quantitative evaluation of the effects on scalp/hair. Hence, the scalp blood flow promotion effect from high concentration artificial carbonated spring devices was studied. The scalp of 10 healthy adults was subjected to a 10 minute shower with each of a 38°C high concentration artificial carbonated spring and regular tap water, after which, using a laser Doppler device, the mean blood flow amount was measured over time. The difference in values between that at the start of measurement and that at 10, 20 and 40 minutes subsequently, was compared for the high concentration artificial carbonated spring and the tap water. At 20 and 40 minutes after starting measurement, the carbonated spring showed a significantly ($p<0.05$) high value for the mean blood flow amount. It is believed that the high concentration carbonated spring (1000 ppm) for this device may possess a hair growth effect, from the fact that it promoted scalp blood flow over a long period, compared to tap water. Going forward, we plan to study the effects on hair growth.

P229

Hair Transplant in Hypertrophic Scars Using PL-FUT

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Kristel van Herwijnen(1977). After completing the study of medicine in 2003, my proffesional career started under guidance of Dr. Coen Gho. After learning how to perform a genaral hair transplant (mostly people suffering from AGA), the urge to copy Mother Nature as much as possible grew. Over the years we were capable to treat more difficult scars, younger patients and in the end more satisfying results. I make it my personal goal to spread this knowlegde and cooporate with other diciplines in order to get the best possible outcome for the client, and change their lives in a positive way.

K.B. van Herwijnen: Salary, Contractual Services; Hair Science Institute.

LEARNING OBJECTIVES:
It demontrates that by PL-FUT hair growth is possible in any type of scar while maitaining original donor area features.

ABSTRACT:
Introduction:
We use human follicular stem cells [1] to implant in cicatricial alopecia in order promote hair growth. We aim to reconstruct nature as closely as possible.
Method:
The donor site needs to be a non-scarring high density zone on the scalp. PL-FUT (Partial Longitudinal Follicular Unit Transplantation) [2] is preferred because of its minimum invasive character to harvest follicular units out of a donor site. Almost full regeneration in the donor site is expected. Recipient area is marked based on: number of grafts, clients goals for the result and aesthetic rules. The recipient area is prepared with a curved needle, grafts are immediately implanted.
Results:
After nine months, the final result is established. The recipient area seems more flexible and better perfused then before PL-FUT. Donor area shows no visible scars and is ready for a desirable next treatment.
Discussion:
Despite the fact that initially there is no hair growth on the scars, it is possible to initiate this through implantation of autologous follicular stem cells. In case of a limited donor area we noticed a limitation in possibilities. Collaboration with surgeons in a burn units is essential in order to get the best possible result in complex cases.
Conclusion:
We have shown that hair growth is possible in (hypertrophic) scars.

P230

Optical Properties of the Medulla and the Cortex of Human Beard and Scalp Hair

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Dr. Babu Varghese is a Senior Scientist and a project leader in the Biomedical Systems division at Philips Research. He has 13 years of Industrial and Academic Research experience in Biophotonics. He holds PhD degree from Biomedical Photonics Imaging group, University of Twente, Netherlands and Master of Technology degree in Photonics from International School of Photonics, Cochin University, India. His research interests include novel Biophotonic solutions for non-invasive optical imaging of hair and skin and light-based (energy-based) skin treatment. Co-authored 41 scientific publications, 35 Patent filings and 85 Invention disclosures.

B. Varghese: None. **J. Alexandra Holz:** None. **R. Verhagen:** None. **N. Uzunbajakava:** None.

LEARNING OBJECTIVES:
Demonstrate quantitative results on hair properties, follicle depth at different locations and novel methods for hair imaging.

ABSTRACT:
Non- and minimally invasive methods for hair diagnostics and treatment, including cosmetic procedures for hair

care, photoepilation, hair re-growth create a need for knowing the optical properties of hair and its depth in the skin. Here we report the total attenuation coefficient of the cortex of scalp and beard hairs measured using the principle of collimated transmittance measurements in a confocal setup from 409 to 1064 nm. Our quantitative results show a very large scattering coefficient of the medulla of lightly pigmented hair compared to Asian black hair. This is consistent with what is known from hair biology, where light-pigmented and grey hair develop large medulla. Also, we demonstrate the dependence of the total attenuation coefficient of the cortex and the medulla on the polarization of incident light, resulting from birefringent properties of the hair cortex formed by highly aligned keratin fibers. In-vivo and ex-vivo measurements shows that the average follicle depth of male beard hair is significantly deeper compared to female leg hair and male chest and leg hair. Also chin seems to have the highest follicle depth of all beard areas with a range of 2.4-3.7mm, followed by the cheek with 1.7-3.5mm, the upper lip 2.7mm, the submax 1.8-2.8mm and the front neck has the lowest follicle depth with a range of 1.3-2.4mm.

P231

Alopecia Areata is Transferred via Activated T-lymphocytes: A Novel Rodent Model to Study Human Alopecia Areata

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Dr.Eddy Wang obtained his PhD in 2014 under the supervision of Dr.Kevin McElwee and Dr.Jerry Shapiro at the University of British Columbia. He studied the autoantigen epitopes that could trigger T-cell activation in alopecia areata (AA) patients and linked the disease with heart tissue damage. He also developed a simplified method to generate AA mice via injection of cultured cells instead of performing skin graft. Right now, he is working as a post-doctoral research scientist under the mentorship of Dr.Angela Christiano at Columbia University where he continues his research on AA and explores the roles of epigenetics on disease progression.

E. Wang: None. **M. Khosravi-Maharlooei:** None. **R. Jalili:** None. **R. Yu:** None. **A. Ghahary:** None. **J. Shapiro:** None. **K.J. McElwee:** None.

LEARNING OBJECTIVES:
Transfer alopecia areata development in mice via injection of cultured, activated skin-draining lymph node cells instead of skin graft.

ABSTRACT:
Currently, the most practical method to generate large quantities of alopecia areata (AA) mice for research is via grafting full-thickness skin from affected donors to healthy C3H/HeJ recipients. However, the invasive procedures and long monitoring time on grafted mice in this procedure potentially limits the accessibility of this model to investigators. In our study, we cultured the skin-draining lymph nodes cells (LNCs) from AA affected C3H/HeJ mice for six days in the presence of anti-CD3/anti-CD28-coated beads and cytokines (IL2, IL7 and IL15). Intra-dermal injection of naïve C3H/HeJ mice with cultured AA LNCs (10^7 cells/mouse) induced AA (>90% success rate), with onset as early as two weeks post-injection. AA mouse derived LNCs showed similar levels of common CD4+ and CD8+ T-cell subpopulations compared to control LNCs derived from non-AA affected mice, both before and after culture, but control LNCs didn't induce AA. Histological analysis showed similar lymphocyte localization around the dystrophic anagen hair follicles as observed in other models; however labelled injected cells were not present in the AA lesions. The results indicate an indirect transfer of AA via complex interactions between injected LNCs and the host immune system, and potentially involve special T-cell populations. Our study demonstrates a simplified, non-invasive method to generate large numbers of AA mice that provides a robust alternative to current rodent models for AA research.

P232

DNA Methylation Profile of Monozygotic and Dizygotic Twins Discordant for Alopecia Areata

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Dr.Eddy Wang obtained his PhD in 2014 under the supervision of Dr.Kevin McElwee and Dr.Jerry Shapiro at the University of British Columbia. He studied the autoantigen epitopes that could trigger T-cell activation in alopecia areata (AA) patients and linked the disease with heart tissue damage. He also developed a simplified method to generate AA mice via injection of cultured cells instead of performing skin graft. Right now, he is working as a post-doctoral research scientist under the mentorship of Dr.Angela Christiano at Columbia University where he continues his research on AA and explores the roles of epigenetics on disease progression.

E. Wang: None. **L.M. Petukhova:** None. **J. Cerise:** None. **A.M. Christiano:** None.

LEARNING OBJECTIVES:
Demonstrate the differences in the DNA methylation profile of twins discordant for AA and how it may affect gene expression.

ABSTRACT:
Alopecia areata (AA) is a disfiguring autoimmune hair-loss disease with strong genetic predisposition. However, previous epidemiological and genetic studies revealed only a 55% concordance rate among monozygotic twins, suggesting that epigenetic factors may contribute to the manifestation of AA. We performed an Illumina Infinium 450k methylation assay on 6 pairs of monozygotic (MZ) and 4 pairs of dizygotic (DZ) twins that were discordant for AA. We have found a scarcity of overlap between the sites that were differentially methylated in MZ compared to DZ. Also, the DNA of AA siblings was mostly hyper-methylated in MZ, but instead was hypo-methylated in DZ. The distributions of hyper-methylated sites in MZ AA were also over-represented in the promoter regions of nearest genes, consistent with a transcriptionally repressive state. Gene ontology analysis revealed dysregulation of biological processes such as limb morphogenesis and antigen presentation in MZ (neural/sensory process in DZ). Interrogation of gene expression profiles of an independent AA cohort with the genes we found to be differentially methylated in MZ twins revealed an increase of HLA-DRB1 expression consistent with decrease of methylation. HLA-DRB1 dysregulation is associated with autoimmune diseases like rheumatoid arthritis and multiple sclerosis affecting antigen presentation. Our results indicate that differential DNA methylation status and epigenetic factors may influence the expression of susceptibility genes in AA and contribute to disease pathogenesis.

P233

Pharmacologic Inhibition of JAK-STAT signaling Promotes Hair Growth

Etienne Wang, MBBS, MA[1], Sivan Harel, PhD[1], Claire Higgins, PhD[2], Jane Cerise, PhD[1], Zhenpeng Dai, PhD[1], James Chen, PhD[1], Raphael Clynes, MD, PhD[1], Angela M. Christiano, PhD[1].
[1]Columbia University Medical Centre, New York, NY, USA, [2]King's College, London, United Kingdom.

Etienne Wang is a dermatologist from the National Skin Centre in Singapore. He is currently a graduate student in the laboratory of Angela Christiano in Columbia University.

E. Wang: None. **S. Harel:** None. **C. Higgins:** None. **J. Cerise:** None. **Z. Dai:** None. **J. Chen:** None. **R. Clynes:** None. **A.M. Christiano:** None.

LEARNING OBJECTIVES:
This presentation provides data that JAK-STAT signaling plays an important in the hair cycle, and therapeutic targeting may be justifiable in hair diseases.

ABSTRACT:
The JAK-STAT pathway has been implicated in regulation of the immune system, but has not been examined in the non-inflammatory context in the skin. Our recent studies showed that JAK inhibition can both prevent and reverse disease in murine AA. Unexpectedly, topical treatment with JAK inhibitors resulted in more hair regrowth compared to systemic treatment, suggesting a localized effect of JAK-STAT inhibition on initiation of the hair cycle. We confirmed that topical JAK-STAT inhibitors in normal mice in telogen resulted anagen onset within 10 days of treatment. This effect was not T-cell dependent. To define the state of JAK-STAT signaling in the hair follicle (HF), we found that activation of signaling components Stat3 and Stat5 in stem cell compartments such as the bulge, hair germ and dermal papilla. Functional studies suggest that JAK-STAT inhibition promotes HF stem cell activity, as well as enhances the inductive capacity of dermal papillae in patch assays. To establish relevance in human HFs, we treated grafted human scalp skin with JAK-STAT inhibitors, and showed that inhibition of JAK-STAT signaling is sufficient to stimulate human hair growth. JAK-STAT inhibition also resulted in the elongation of the hair shaft in human organ culture assays. Our findings suggest that blockade of the JAK-STAT pathway represents a new therapeutic target for the promotion of hair growth.

P234

Low-level Laser Treatment for Chemotherapy-induced Alopecia: a Preclinical Study in Rats

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Dr. Wikramanayake obtained training in developmental biology and genetics during her Ph.D. and postdoctoral work. Her research focuses on using murine models to understand the mechanisms regulating skin and hair development and homeostasis, and to translate novel therapies of alopecia from preclinical testing to the bedside. She is currently an Associate Professor in the Department of Dermatology and Cutaneous Surgery, University of Miami Miller School of Medicine.

A. Lens: None. **K. Nouri:** None. **J. Jimenez:** None. **T. Wikramanayake:** None.

LEARNING OBJECTIVES:
Determine whether low-level laser therapy can promote hair regrowth after chemotherapy-induced alopecia in rats.

ABSTRACT:
Chemotherapy-Induced Alopecia (CIA) is one of the most common and most distressing side effects of cancer chemotherapy. CIA exerts significant negative impact on patients, and can also deprive patients the privacy of having cancer. Whereas CIA is almost always reversible, hair regrowth can take 3-6 months. Therefore, effective interventions are urgently needed in the clinic to prevent or reduce CIA, or accelerate hair regrowth post CIA. In recent years, low-level laser therapy (LLLT) using FDA-cleared home devices has been shown to promote hair growth in other hair loss situations, such as male and female pattern hair loss. In this study, we investigated the effects of LLLT on CIA in a rat model. Young rats were injected with chemotherapeutic agents to induce total alopecia, treated with LLLT or sham, and monitored for hair loss and regrowth. All the injected rats, treated with LLLT or sham, developed total alopecia on the trunk, indicating that LLLT did not prevent CIA with our treatment regimen. However, LLLT-treated rats showed significantly accelerated hair regrowth than sham-treated rats, and this observation was verified by histology. Our results suggest that LLLT should be explored for the treatment of CIA in clinical trials because its positive safety profile could translate to increased compliance and improved chemotherapy efficacy.

P235

The Role of Mpzl3 in Skin and Hair Development

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Dr. Wikramanayake obtained training in developmental biology and genetics during her Ph.D. and postdoctoral work. Her research focuses on using murine models to understand the mechanisms regulating skin and hair development and homeostasis, and to translate novel therapies of alopecia from preclinical testing to the bedside. She is currently an Associate Professor in the Department of Dermatology and Cutaneous Surgery, University of Miami Miller School of Medicine.

H. Mitchell: None. **T. Wikramanayake:** None.

LEARNING OBJECTIVES:
Better understand Mpzl3 function in the skin.

ABSTRACT:
We have recently identified a novel immunoglobulin (Ig) protein, Myelin Protein Zero-like 3 (Mpzl3), that plays a crucial role in skin and hair development. Loss of Mpzl3 function, either through a spontaneous missense mutation or gene knockout (Mpzl3 -/-), results in severe skin and hair abnormalities. Within 2 weeks after birth, Mpzl3 -/- mice showed unkempt and greasy hair coat, and hair loss soon after. Mpzl3 -/- skin showed severe sebaceous gland hypertrophy and increased dermal thickness, sometimes accompanied by epidermal hyperplasia. In addition, Mpzl3 -/- mice frequently developed dermatitis phenotype with dandruff-like flaking. In this study, to better understand Mpzl3 function during skin and hair development, we analyzed Mpzl3 promoter activity during skin differentiation, using a knocked-in lacZ reporter gene (encoding beta-Gal) driven by the endogenous Mpzl3 promoter. We detected beta-Gal activity in all the +/- and -/- skin samples after embryonic day 17, and higher beta-Gal activity during the hair follicle growth phase (anagen) than the regression or resting phase. beta-Gal activity was detected in the exterior layers of the epidermis, sebaceous gland, and the companion layer and the inner root sheath of the anagen hair follicles, but not in the outer root sheath. Our results will help us understand Mpzl3 function in the skin.

P236

Genomics Comparison of Hair Follicles from FUT, FUE, and Plucks

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Bradley Wolf M.D. has been treating hair loss patients, exclusively, since 1990. He has presented numerous lectures at meetings throughout the world and was director of workshops at the 2002 ISHRS meeting in Chicago. He is the author of "Anesthesia" in the 5th Edition of Hair Transplantation and a chapter on repair using FUE in the textbook, Hair Transplant 360. He is a current member of the ISHRS CME and FUE Research committees. He is Board Certified by the American Board of Hair Restoration Surgery (ABHRS) and was a member of the Board of Directors of the ABHRS from 2000-2005.

B.R. Wolf: Consultant; The Procter & Gamble Company. **S. Youngquist:** None. **P. Hu:** None. **X. Wei:** None. **D. Whittenbarger:** None. **K. Juhlin:** None. **E. Jewel-Motz:** None. **T. Dawson:** None.

LEARNING OBJECTIVES:
At the conclusion of the presentation, you will be able to explain genomic variations of FUE and FUT grafts.

ABSTRACT:
Traditional hair transplantation using grafts microscopically dissected from a strip of excised occipital scalp (FUT) has proven to be effective. The survivability of grafts obtained using the newer follicular unit extraction method (FUE) has been questioned.
To determine if there are biologic differences in follicles gathered by different techniques, we sought to compare follicles obtained by FUE, FUT, and plucks, by examining their genetic composition using gene chip analysis. Samples were collected from 30 pre-menopausal women aged 35-50. RNA was isolated with the Qiagen RNeasy Kit and gene chip analysis performed using the Illumina platform. Gene expression heat map representing 132 hair relevant keratin and keratin associated protein encoding transcript probes revealed that FUE and FUT follicles

expressed similar genes, while plucks held a demonstrably different signature. Hair relevant keratin genes were detected in plucks, general markers such as bioenergetics and metabolism as well as stem cell markers were more highly expressed in FUT and FUE follicles. Stem cell markers K15 and CD200 showed no significant difference in FUE and FUT follicles.
This analysis indicates follicles obtained by FUE and FUT are very close in their genomic profile, are likely very close in their cellular profile, and both have components necessary to regenerate a new follicle.

P237

Development and Mechanistic Understanding of Novel Drug Delivery Technologies for Hair Loss Treatment

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Jeff Wu is leading the therapeutic hair care innovation at Johnson & Johnson Consumer Product Companies. He had a Ph.D. in Physical Chemistry and is passionate about creating health care solutions and experiences for consumer and patients. He has a track record of delivering platform technologies and products in skin and hair care, contributing to iconic brands of Rogaine, Neutrogena, and Aveeno. He has 23 granted patents and 40+ patent applications in drug delivery, therapeutic actives and medical devices. He is an author of 40+ peer reviewed publications and invited speaker at US and international dermatology and cosmetics conferences.

J. Wu: Salary, Contractual Services; empoloyee of J&J. **F. Koschier:** Salary, Contractual Services; empolyee of J&J. **V. Tyndall:** Salary, Contractual Services; employee of J&J. **X. Yao:** Salary, Contractual Services; J&J employee.

LEARNING OBJECTIVES:
Introduced to new mechanistic understandings of drug delivery technologies for hair loss treatment using preclinical studies and mRNA microarray analysis.

ABSTRACT:
Hair loss is a widespread, highly emotional and chronic consumer need. It impacts over half of men & one-third of women. Minoxidil is an antihypertensive vasodilator medication and used in the FDA approved Rogaine® Hair Regrowth Treatment. We present a novel drug delivery technology for enhancement of minoxidil delivery in vitro within a pigskin screening model and in-vivo within mouse skin tissue. A rat pharmacokinetic study established a comparable systemic minoxidil delivery vs. the current minoxidil product, while a mouse efficacy model demonstrated a faster anagen onset and a full-grown mice hair for 5% minoxidil in combination with the new technology. To understand the specific effect of minoxidil on hair growth, the impact of current and new formulations on gene expression patterns in murine follicles was assessed by microarray analysis. Using differential gene expression analysis and Gene Set Variation Analysis (GSVA) among treatments, minoxidil was found to reduce the gene expression that inhibits the activation of hair growth. When minoxidil was combined with the new technologies, the reduction was further potentiated in scale and magnitude. These findings give new insights into the understanding of mechanism of action of minoxidil on hair regrowth.

P238

Safety and Efficacy of a Topical Treatment (SM04554) for Androgenetic Alopecia (AGA): Results from a Phase 1 Trial

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Dr. Yazici is the Chief Medical Officer of Samumed, LLC. Additionally, Dr. Yazici is an Assistant Professor at New York University School of Medicine Department of Rheumatology, where he serves as Director of the Seligman

Center for Advanced Therapeutics and Director of the Behcet's Syndrome Center, the largest US center for Behcet's Disease. Recognized nationally and internationally, Dr. Yazici has more than 250 publications. After receiving his medical degree from Istanbul University, his Rheumatology Fellowship was completed at the Weill Medical College Hospital for Special Surgery of Cornell University and his Internal Medicine Residency at Creighton University in Nebraska.

Y. Yazici: Salary, Contractual Services; Samumed, LLC. **S.R. Smith:** Consultant; Samumed, LLC. **C.J. Swearingen:** Salary, Contractual Services; Samumed, LLC. **I. Simsek:** Salary, Contractual Services; Samumed, LLC. **A. DiFrancesco:** Salary, Contractual Services; Samumed, LLC. **J.D. Hood:** Salary, Contractual Services; Samumed, LLC.

LEARNING OBJECTIVES:
To evaulate the safety and efficacy of a topical treatment for androgenetic alopecia (AGA) in a phase 1 clinical trial

ABSTRACT:
AGA is a common form of hair loss with only two approved drugs in the US. A randomized, double-blind, placebo-controlled, single-center trial for AGA assessing safety and efficacy of SM04554, a novel small molecule modulating the Wnt pathway, was conducted. The trial treated male subjects topically once daily for 14 days with either 0.05%, 0.15% or 0.45% SM04554 or vehicle; subjects returned 14 days post-treatment for final evaluation. Safety data, including pharmacokinetics (PK), electrocardiogram (ECG), laboratory parameters, application site assessments and vital signs, were collected throughout treatment, with subject-reported efficacy outcomes collected at end of study. 29 subjects (7-0.05%, 8-0.15%, 8-0.25%, 6-vehicle, average age 44.6) were enrolled; 13 (45%) were Norwood-Hamilton score 5 (range 4-7). 15 treatment-emergent adverse events (TEAEs) were reported by 11 (38%) subjects. The most frequently reported TEAE was eye irritation / hyperaemia (N=2 [7%]). ECGs, labs and vital signs were unremarkable. One vehicle subject presented with minimal scalp erythema; no other subject reported application site irritation. Systemic exposure was dose-dependent. In the 0.15% group, 6 (75%) subjects reported slowing of hair loss and 3 (37%) reported increased hair growth compared to zero (P=0.01) and 1 (17%, P=0.58) of vehicle subjects, respectively, at end of study. SM04554 appears to be safe, well-tolerated, and potentially efficacious. These results will help guide future AGA trials using this treatment.

P239

Characterization of Human Dermal Sheath Cell and Implication of its Key Role for Capillary Blood Vessel Formation in Hair Follicles

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M. Sc., Bioscience (Developmental Biology), Osaka University, Suita, Osaka, JAPAN. March 2005.
2005-2012 Research Scientist, Shiseido Research Center
2013- Research Scientist, Shiseido Life Science Research Center

Y. Yoshida: None. **T. Soma:** None. **T. Matsuzaki:** None. **J. Kishimoto:** None.

LEARNING OBJECTIVES:
Understand the function of dermal sheath cells in hair cycling and homeostasis of hair follicles.

ABSTRACT:
Dermal sheath located at most outer border of hair follicle, is connective tissue sheath of follicles, and dermal sheath cells (DS cells) are known to contribute the hair cycling and neogenesis of the follicles. However, the underlying mechanisms to have potency of hair formation are currently unclear. We investigated the global transcriptional profile of human DS cells compared with human dermal papilla cells (DP cells) and dermal fibroblasts in early passaged culture. Vascular related genes are highly expressed in DS cells, and the expression of multi-ligands receptor CD36 in DS cells was 12 to 130-fold significantly higher than DP cells. Further analyses with whole-mount

imaging technique showed that the dense network of blood capillaries was formed in dermal sheath of the human anagen hair follicles, on the other hands, regresstion of blood capillaries are observed in the telogen and catagen hair follicles. We focused on CD36 positive DS cells which represent 5-15% of DS cells populations, CD36 positive cells are rarely observed in DP cells and fibroblasts populations. Further studies indicated the possibility that the CD36 positive DS cells participate the angiogenesis and also regression of blood capillaries with interacting distinct molecules. Therefore, we conclude CD36 positive DS cells may be one of the modulator of the blood capillaries in hair follicle, leading hair cycling.

P240

Efficiacy of a New Nutritional Supplement in Androgenetic Alopecia

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Born and raised in Miami Beach, Fl, Dr. Zaiac obtained his medical degree at the Medical College of Wisconsin School of Medicine. Dr. Zaiac is the Director and co-founder of the Greater Miami Skin and Laser Center offering services in Hallandale, Key West, and Madrid, Spain. Dr. Zaiac is the Chairman of Dermatology at the Florida International University HWCM. As chief, he is actively involved in clinical practice, research, and teaching.
Experience & Certifications:
-25 + years in the field of Dermatology
- Board Certified in Dermatology
- Board Certified in the American Society for Mohs Surgery

M.N. Zaiac: None. **A. Canazza:** None. **G. Fabbrocini:** None.

LEARNING OBJECTIVES:
To Demonstrate the efficacy and safety of a new nutritional supplement in Androgenetic Alopecia.

ABSTRACT:
We present preliminary data on efficacy and tolerability of a nutritional supplement in androgenetic alopecia. The ingredients of the supplement include antioxidants and botanical 5 alfa reductase inhibitors.
Methods: 20 patients (10 men and 10 women) aging 18 to 65 years were included in the study. Inclusion criteria were androgenetic alopecia (Sinclair 2 for women and Hamilton III for man). The nutritional supplement (Forti5R) was administered at the dosage of 2 tablets a day for 24 weeks.
Efficacy measures: Hair Mass Index (Trichometer). Trichogram Investigator Global Photography Assessment Dermoscopy of an area chosen using the trichometer tab.
Results: Interim results (12 weeks) of Trichometer and Trichogram data showed an increase of the hair max index and a decrease of the telogen values at trichogram as compared with baseline. The paired t-test showed a two tailed P value equal to 0.0036 for the hair max index and equal to 0.0417 for telogen hair at trichogram after supplementation. The supplement was well tolerated.
Discussion: Trichogram results show that the hair shedding was statistically reduced. A statistical increase of the hair mass index measured with the trichometer indicates that thickness and density of the hair in the target area have increased.

P241

The Figure 8: A New Hair Biopsy Technique

Martin N. Zaiac, MD[1], Romi Bloom, BS[2], Brian W. Morrison, Medical Doctor[2], Antonella Tosti, Medical Doctor[2].
[1]The Greater Miami Skin & Laser Center, Miami Beach, FL, USA, [2]The University of Miami School of Medicine, Miami, FL, USA.

Born and raised in Miami Beach, Fl, Dr. Zaiac obtained his medical degree at the Medical College of Wisconsin School of Medicine. Dr. Zaiac is the Director and co-founder of the Greater Miami Skin and Laser Center offering

services in Hallandale, Key West, and Madrid, Spain. Dr. Zaiac is the Chairman of Dermatology at the Florida International University HWCM. As chief, he is actively involved in clinical practice, research, and teaching.
Experience & Certifications:
-25 + years in the field of Dermatology
- Board Certified in Dermatology
- Board Certified in the American Society for Mohs Surgery

M.N. Zaiac: None. **R. Bloom:** None. **B.W. Morrison:** None. **A. Tosti:** None.

LEARNING OBJECTIVES:
Demonstrate a new hair biopsy technique that is efficient and cost effective.

ABSTRACT:
This new technique provides for the best possible pathologic diagnosis of hair and scalp disorders in women with non scarring alopecia. Obtaining 2 biopsy specimens from a location such as the scalp can be a challenging task, and bleeding is common. This causes stress while increasing the amount of time required for the procedure.
Two 4-mm punch biopsy specimens are obtained directly adjacent to one another, leaving a narrow isthmus of skin between them. A small nick with a #15 scalpel is made in the center of the isthmus, providing 2 small peninsulas that act as flaps. The 2 holes are closed as 1 wound because the superior peninsula moves inferiorly and to the right while the inferior peninsula moves superiorly to the left. Using a non-absorbable suture, a simple interrupted stitch is placed, attaching the right inferior border to the right superior-medial border of the defect. A second stitch attaches the left superior-medial border to the left inferior border of the defect to close the wound. The 2 biopsy specimens are closed into a single S-shaped linear lesion.
Executing the biopsies of 2 adjacent specimens using this technique is efficient, and time effective. The procedure allows the surgeon to obtain biopsies from both horizontal and vertical locations with minimal stress, as well as, a lower probability of bleeding.

P242

Inulin and SLES Effect on Properties of Hydrated Hair by 1H-NMR and Sorption Isotherm

Dorota J. Zalitacz, Hubert Harańczyk, Ewelina Baran, Agata Ciułkowska, Katarzyna Pieńkowska, Piotr Nowak. Jagiellonian University, Cracow, Poland.

I'm in my fourth year at Jagiellonian University in Cracow in Poland, where I'm studing PhD in Biophysics. My research for a master's thesis included the effect of humidity on DNA. I have been studing human hair for 3.5 years. In my research I use the techniques of kinetics hydratation, sorption isotherm, and nuclear magnetics resonance (NMR). These tools allow for the study amount of water absorbed by the hair from the atmosphere. So far I investigated a natural hair which different color. Now my research focuses on the effects of cosmetics moisture (for example: hydrolized silk, collagen, inulin etc.).

D.J. Zalitacz: None. **H. Harańczyk:** None. **E. Baran:** None. **A. Ciułkowska:** None. **K. Pieńkowska:** None. **P. Nowak:** None.

LEARNING OBJECTIVES:
Explain the effect of inulin on the absorption of humidity from the air.

ABSTRACT:
Inulin is biological polysacharid produced by many types of plants. We used inulin was prepared from *Cichorium intybus*. Inulin improves the hair smoothness and moisture absorption. The hydration process of human hair can be described by the multilayer sorption of bond water saturating primary and then secondary water binding sites. Using hydration kinetics, sorption isotherm, ^{1}H-NMR spectroscopy we analysed the effect of Inulin on a human terminal hair of the female individual. Terminal human hair came from 35 old Caucasian female. Before experiments hair was purified with a 25% sodium lauryl ether sulfate (SLES) and then rinsed with water. Next on

inulin on the hair surface was imposed. The results were compared with the the ones on control sample solely purified using SLES. The hydration kinetics shows three fractions of bound water, namely a very tightly bound water fraction, a tightly bound water, and a loosely bound water. The sorption isotherm is sigmoidal in form, fitted well using Dent (GAB) model. The relative mass of water saturating primary water binding sites is equal to $\Delta M/m_0=0.065$ for hair washed with a SLES and $\Delta M/m_0=0.059$ for hair with Inulin. ^{1}H-NMR spectra performed for air dry samples at room temperature show are the superpositions of one Gaussian component, coming from solid matrix of hair, and one Lorentz component, coming from residual water bound.

P243

Increased Expression of IL-17 in Scalp Psoriasis, Implication of a New Targeted Therapy

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Mina Zarei M.D. is currently an Entry Scientist at the Department of Dermatology at University of Miami. She is the author and Co-author of more than 42 peer-reviewed publications, presentation, and abstracts at top ranked national and international journals and conferences. She is the editorial board member and reviewer of more than 9 medical journals and US national and international conferences. Dr. Zarei's research interests include Hair and Nail Disorders, Psoriasis and its comorbidities, and Immunohistochemistry Staining. Recently she has received the North American Hair Research Society(NAHRS) Mentorship Award and participated in clinical and research activities at University of Minnesota.

M. Zarei: None. **E. Norton:** None. **P. Romanelli:** None.

LEARNING OBJECTIVES:
Demonstrate the role of IL-17 in scalp psoriasis and suggest the possible application of IL-17 inhibitors for the treatment.

ABSTRACT:
Up to 79% of patients with chronic plaque psoriasis may have scalp involvement which many patients describe it both psychologically and socially distressing. The current treatment of this condition is difficult due to the limited drug delivery to the scalp and also time-consuming and cosmetically undesirable treatments. Several studies have been shown that the Interleukin-17 (IL-17) level is increased in lesional skin and blood of patients with psoriasis, and the level is correlated with disease severity. Neutralization of IL-17 in psoriasis patients has been leaded to histological improvement in skin biopsy specimens of these individuals. The objective of our study was to find out if the IL-17 has increased expression in the psoriatic scalp as a possible treatment target. For this purpose, seven biopsy-proven plaque psoriasis specimens pulled from our database including three cases of scalp psoriasis and four cases of leg psoriasis. Standard immunohistochemistry staining was performed on formalin-fixed paraffin-embedded tissue sections with polyclonal IL-17 antibodies. Results indicated positive IL-17 antibody staining in both lesional scalp and leg specimens. In conclusion, the result of this study demonstrates the role of IL-17 in scalp psoriasis and suggests the possible application of IL-17 inhibitors in the treatment of scalp psoriasis. However, there is still a need to perform more advanced studies in comparison with non-lesional skin.

P244

Clinical Management of Chinese Patients with Alopecia Areata

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- Education -
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Ocular Immunology Laboratory and Adult Bone Marrow Transplant Program, OHSU, Portland, Oregon. USA
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8/1988-6/1996:Associate professor
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12/1982-9/1985: Residency

X. Zhang: None. **Y. Ye:** None. **Y. Yang:** None. **H. Cao:** None. **Z. Zhu:** None. **Y. Ling:** None.

LEARNING OBJECTIVES:
Handle Chinese patients with AA, at different age, disease duration and severity, coexisting diseases, and previous treatment.

ABSTRACT:
Alopecia areata (AA) is a non-scarring inflammatory hair loss of unknown etiology. For children with severe type of AA, we use topical occlusion of the whole scalp with halometasone cream overnight and a shower cap, to achieve an efficient rate of over 80%. In adult patients with mild type of alopecia areata with a single patch, oral compound glycyrrhizin and topical minoxidill is usually efficient for hair regrowth. However, for extensive and progressive AA of adult patients, systemic treatments with steroids such as intramuscular injection of long-acting corticosteroids such as compound betamethasone for 3-4 times at an interval of 3 weeks, to achieve an efficient rate around 80%. In diffuse type of AA, or AA incognita, multiple muscular injections with long-acting steroids should be used immediately to interfere with the inflammatory infiltration at the early stage. Only in long-standing AT/AU, do we use topical immunotherapy with sensitizers (eg, diphencyprone, DPCP), for a hair-regrowth rate of 50-60%. Moreover, in patients with long term seasonal relapse and allergic to dust mites, we introduce desensitizer of dust mites sublingually and daily for 2 years, with or without antihistamines. In our hands, patients with short duration and smaller hair loss area have a better outcome. Therefore, we propose an early and effective intervention to ensure a better outcome with fewer relapses.

P245

Early Events in the Border of Patchy Hair Loss Lesions of Alopecia Areata Revealed by Serial Transverse Sections

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H. Cao: None. **Y. Yang:** None. **K.J. McElwee:** None. **X. Zhang:** None.

LEARNING OBJECTIVES:
Understand early events in hair loss lesions of AA, the importance of T lymphocytes and impact on upper hair follicles.

ABSTRACT:
Biopsies from 3 patients with patchy alopecia areata (AA) at the active border, and 4 normal controls, were transversely sectioned at different levels along the hair follicle. HE and immunohistochemical staining were performed. Follicular regression areas with mainly catagen and telogen were discerned from normal appearing areas of mostly anagen (pre-regression). Therefore, the lesion could be divided into a regression zone (RZ) and a pre-regression zone (PRZ). Mononuclear cells were found more in RZ than in PRZ ($P<0.05$), but distribution was similar in PRZ and normal controls; with more in the upper dermis than the lower cutaneous area ($P<0.05$). The numbers of both CD4+ and CD8+ T cells were higher in RZ than in PRZ(Ps<0.05), but only CD4+ T cell numbers in PRZ were greater than normal controls ($P<0.05$). Moreover, CD4+ T cells in the upper dermis were more frequent than in lower cutaneous areasin both RZ and PRZ ($P<0.05$), similar to CD8+ T cells in RZ but notin PRZ. CD68+ monocyte-macrophages were more common in RZ than in PRZ in lower cutaneous areas, but not in upper dermis($P<0.05$). In summary, in the early phase of AA, inflammatory cell infiltration around follicles was found earlier in the upper dermis than in lower cutaneous areas. Spreading of T-lymphocytes may be the mechanism underlying extension of the hair loss lesion.

P246

Sequential Cyclic Change of Hair Roots of Dystrophic Anagen Followed by Catagen and Telogen in The Mechanism of Alopecia Areata Incognita Revealed by Dermoscopy

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LEARNING OBJECTIVES:
Presentation ofdermoscopy of hair roots to reveal the cycle status of hair follicles at the time of hair loss.

ABSTRACT:
Material and methods: Hair roots were collected by pull test or combing from 23 patients with alopecia areata incognita (AAI), throughout their hair loss duration,and examined by dermoscopy. Scalpel dermoscopy and histopathology was also carried out. Result:Sequential cyclic changes of hair roots werefound, i.e., dystrophic anagen effluvium followed by catagen and telogen effluvium, with prominent depigmentation was also found in hair roots and proximal hair shafts in the later course. The morphology of the hair roots waswell correlated to dermoscopy of the hair shafts on the scalp, i.e., dystrophic anagen with black dots, catagen/telogen hair roots with broken hairs, and discolored hair shafts. Histology features of AAI at early stages of hair loss with dystrophic anagen effluvium revealed prominent acute inflammation and early stages of hair follicle regression;anagen follicles couldbe seen in the close vicinity of catagen follicles. At the later stage with telogen/exogen hair effluvium, less inflammatory infiltration and increased hair follicle regression were found. Conclusion: The sequential cyclic staging of shed hairs in patients with AAI indicates the insult maybe hair cycle specific and a “one-hit” event, leading to dystrophic anagen release for some follicles, disturbance of pigment production, and subsequent catagen or telogen release for the other follicles, according to the hair cycle stages they are in. Anti-inflammatory management should be instigatedearly in the disease duration cycle.

P247

CRTH2/ PTGDR2 Antagonists Reverse the Hair Growth Inhibition Caused by Elevated PGD2 Level

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LEARNING OBJECTIVES:
Demonstrate pharmacological intervention of PTGDR2 may be an effective approach in preventing and/or treating alopecia in patients sensitive to PGD2.

ABSTRACT:
Prostaglandin D2 (PGD2) and its synthesizing enzyme, PGD2 synthase, are present at higher levels in balding versus non-balding scalp in men with androgenetic alopecia. Our previous observations in a mouse model that

PGD2 inhibits hair growth via CRTH2/ PTGDR2, led us to hypothesize that PTGDR2 is the key receptor mediating the hair growth inhibitory activity of PGD2 in human follicles. In this study we tested several pharmacological PTGDR2 antagonists for their anti-PGD2 activity on human hair growth. We found that PTGDR2 antagonists reversed the growth inhibition mediated by PGD2 in a dose-dependent manner by reducing PGD2-triggered apoptosis and maintaining proliferation of keratinocytes. Topical administration of a PTGDR2 antagonist to mice extended anagen, resulting in longer hair. We also found that hair follicles from 2/5 of the alopecia patients exhibited little susceptibility to PGD2's effect in our culture assay. By sequencing the entire PTGDR2 gene, including the flanking regions, we identified SNPs in the human PTGDR2 gene that are associated with sensitivity of hair growth to PGD2. Our findings here further underscore the key role of PTGDR2 in regulating hair growth and suggest that pharmacological intervention of PTGDR2 may be an effective approach in preventing and/or treating alopecia in patients sensitive to PGD2. Furthermore, the SNPs identified here may serve as markers for identifying patients with high risk to PGD2's effect.

P248

Cocking the Eyebrows to Find the Missing Hairline in Frontal Fibrosing Alopecia: a Useful Clinical Maneuver

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LEARNING OBJECTIVES:
Identify the original frontal hairline in FFA by an anatomic site, which is useful in clinical measurements and follow-up evaluations.

ABSTRACT:
A 67 year-old woman with hyperthyroidism presented with progressive loss of her widow's peak over the last 2.5 years. On exam, there was frontotemporal hairline recession with loss of follicular orifices and perifollicular erythema at the active border. Both eyebrows had patchy thinning. When the patient cocked her eyebrows, a sharp demarcation was noted between her forehead and her scalp which highlighted a prominent "V" where her widow's peak used to be located. This striking exam finding of the sharp delineation of the former hairline, including our patient's distinctive widow's peak helped quantify the extent of hairline recession. A scalp biopsy confirmed the diagnosis of frontal fibrosing alopecia(FFA). Anatomically, the superior portion of the frontalis muscle inserts on the galea aponeurotica of the scalp(1). The frontal hairline is morphologically defined by this anatomic location(1). When the eyebrows are lifted, the contraction of the frontalis muscle leads to wrinkling of the forehead but above the insertion site there is no wrinkling as the galea has no muscle fibers. Photodamage has been a classic means of identifying the old hairline in FFA, but it is not seen in all patients(2). We propose that cocking or lifting the eyebrows is a potentially more reliable means of identifying the original frontal hairline in FFA which could be useful in clinical measurements and follow-up evaluations.

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