The PINNACLE summit where prominent researchers from across the AMERICAS will share the most recent discoveries in hair disorders research and treatments.
How to read this book

- Abstracts are included for oral presentations and poster presentations, for those who submitted abstracts.
- The oral abstracts are listed in this book in the order they are scheduled to present in the General Session, from 01-69, and then poster abstracts are listed separately, from P001-P083.
- There is an author index and topic index. The indices reference the abstract numbers.
- Disclosures of conflict of interest are included in the introductory pages as well as next to each presenter’s abstract throughout this book.

Abstract Number

Title of Presentation

Author Block
Bold name is presenting author.

Biography of Presenting Author

Disclosure of Conflict of Interest Block

Take Home Message

Abstract

KEYNOTE: Self-organization process in newborn skin organoid formation inspires strategy to restore hair regeneration of adult cells
Cheng Ming Chuong, MD.
University of Southern California, Los Angeles, CA, USA.

Dr. Cheng-Ming Chuong received M.D. from Taiwan University and Ph.D. from Rockefeller University. He moved to University of Southern California and is currently a professor of pathology. Dr. Chuong directs the Laboratory of Tissue Development and Engineering (http://www-hsc.usc.edu/~cmchuong/ cmchuong@usc.edu). He has published more than 220 papers on the biology of integuments in top journals, including multiple research papers and commentaries in Nature, Science, CELL. In 2008, he was elected to the National Academy equivalent of Taiwan. In 2014, he was elected as an AAAS fellow for “Distinguished contribution to advance new understanding in the development, regeneration and evolution of patterns in ectodermal organs”. His also works on Evo-Devo of feathers contributing new understanding in the “The Birth of Birds” which was chosen by Science as one of the 10 major breakthroughs in 2014. His work is covered by mainstream media including New York Time, LA times, BBC, CNBC, etc.

C. Chuong: None.

TAKE HOME MESSAGE:
1. Self-organizing process is driven by biophysical processes and molecular processes, through feedback loop and sensors.
2. It is possible to apply these principles to help human adult skin cells generate new appendages. The principles are also applicable to other organs.

ABSTRACT:
Integument forms the interface between an organism and its environment, to serve the function of defense, communication, endothermy, etc. Periodic patterning evolved as an effective design endowing animal with more functional adaptability. Current therapy after severe skin injury can form epidermal layer and dermis to save patients’ lives but without appendages for functional restoration. We aspire to restore morphogenesis competence to generate periodically patterned appendage primordia. Skin organoids made from dissociated progenitor cells can undergo self-organization. This in vitro self-organization process is not identical to embryonic organ formation, yet it achieves a similar phenotype as in vivo. This implies genetic codes do not specify morphology directly; instead, complex tissue architectures may be achieved through several intermediate layers of crosstalk between genetic information and biophysical processes. We use newborn and adult skin organoids for analyses. Dissociated cells from newborn mouse skin form hair primordia bearing organoids that grow hairs robustly in vivo after transplantation to nude mice. Detailed time-lapse imaging of three-dimensional cultures revealed unexpected morphological transitions between five distinct phases: dissociated cells - cell aggregates - polarized cysts - cyst coalescence - planar skin - hair-bearing skin. Transcriptome profiling reveals the sequential expression of adhesion molecules, growth factors, Wnts, and MMPs. In contrast, adult cells form small aggregates but then development stalls in vitro. Comparative transcriptome analyses suggest suppressing epidermal differentiation in adult cells is critical. These results inspire a new strategy that can restore morphological transitions and rescue the hair-forming ability of adult organoids: 1) continuous PKC inhibition; and 2) timely supply of growth factors (IGF, VEGF), Wnts, and MMPs. This comprehensive study demonstrates alternating molecular events and physical processes are in in play during organoid morphogenesis, and that the self-organizing processes can be restored via environmental reprogramming. Efforts are made toward applying these principles to human cells.

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All faculty were asked to disclose both via our online abstract submission system and at the podium or on their posters. The disclosures are listed below as well as next to each abstract in this book.

The following faculty have disclosed relevant financial relationships. (Listed in Abstract Number order.)

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<td>T.W. Siah: None. H. Guo: None. T. Chu: None. L. Santos: None. H. Nakamura: None. J. Shapiro: None. K.J. McElwee: Other Research Support (receipt of drugs, supplies, equipment, or other in-kind support); Replicel Life Sciences Inc.. Ownership Interest (owner, stock, stock options); Replicel Life Sciences Inc.. Consultant/Advisory Board; Replicel Life Sciences Inc.. Independent Contractor (includes contracted research); Replicel Life Sciences Inc..</td>
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<td>A.J. McMichael: Research Grant (principal investigator, collaborator or consultant); Allergan, Cassiopea, Proctor &amp; Gamble, Samumed. Ownership Interest (royalty, patent, or other intellectual property); Informa Healthcare, UpToDate. Consultant/Advisory Board; Aclaris, Allergan, Bioniz, Cassiopea, Covance, eResearch Technology, Galderma, Guthey Renker, Incyte, Johnson &amp; Johnson, Keranetics, Merck, Merz Pharmaceuticals, Pfizer, Proctor &amp; Gamble, Samumed.</td>
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<td><strong>E. Wang</strong>: None. <strong>A.M. Christiano</strong>: Consultant/Advisory Board; Aclaris Therapeutics.</td>
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**Posters**

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<td><strong>H. Endo</strong>: None. <strong>G. Leung</strong>: None. <strong>K.J. McElwee</strong>: Other Research Support (receipt of drugs, supplies, equipment, or other in-kind support); Replicel Life Sciences Inc.. Ownership Interest (owner, stock, stock options); Replicel Life Sciences Inc.. Consultant/Advisory Board; Replicel Life Sciences Inc.. Independent Contractor (includes contracted research); Replicel Life Sciences Inc..</td>
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<td><strong>M. Gosch Caroca:</strong> Consultant/Advisory Board; La Roche-Posay. <strong>J. Larrondo:</strong> Consultant/Advisory Board; ROL in La Roche-Posay. <strong>P. Rojas:</strong> None. <strong>M. Ruz:</strong> None. <strong>F. Mardones:</strong> None. <strong>A. McMichael:</strong> None.</td>
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<td><strong>G. Naughton:</strong> Employment; Histogen. <strong>M. Hubka:</strong> Employment; Histogen. <strong>M. Zimber:</strong> Employment; Histogen. <strong>M. Latterich:</strong> Employment; Histogen.</td>
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Additionally, speakers are also required to know and disclose to their audiences the FDA approval status of all medical devices and pharmaceuticals for the uses discussed, described or demonstrated in their educational presentations.

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The views and techniques of the presenters are not necessarily those of the American Hair Research Society, but are presented in this forum to advance scientific and medical education.
KEYNOTE: Self-organization process in newborn skin organoid formation inspires strategy to restore hair regeneration of adult cells
Cheng Ming Chuong, MD
University of Southern California, Los Angeles, CA, USA.

Dr. Cheng-Ming Chuong received M.D. from Taiwan University and Ph.D. from Rockefeller University. He moved to University of Southern California and is currently a professor of pathology. Dr. Chuong directs the Laboratory of Tissue Development and Engineering (http://www.hsc.usc.edu/~cmchuong/cmchuong@usc.edu). He has published more than 220 papers on the biology of integuments in top journals, including multiple research papers and commentaries in Nature, Science, CELL. In 2008, he was elected to the National Academy equivalent of Taiwan. In 2014, he was elected as an AAAS fellow for “Distinguished contribution to advance new understanding in the development, regeneration and evolution of patterns in ectodermal organs”. His also works on Evo-Devo of feathers contributing new understanding in the “The Birth of Birds” which was chosen by Science as one of the 10 major breakthroughs in 2014. His work is covered by mainstream media including New York Time, LA times, BBC, CNBC, etc.

C. Chuong: None.

TAKE HOME MESSAGE:
1. Self-organizing process is driven by biophysical processes and molecular processes, through feedback loop and sensors.
2. It is possible to apply these principles to help human adult skin cells generate new appendages. The principles are also applicable to other organs.

ABSTRACT:
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Crosstalk between androgen and Wnt/b-catenin signaling in Androgenetic Alopecia
María Eugenia Balañá, PhD
Cesar Milstein Institute of Science and Technology – CONICET, Buenos Aires, Argentina.
Breezula™ (cb-03-01) A Novel, Topical Anti-androgen In Phase Ii Development For The Treatment Of Androgenetic Alopecia (AGA)

Maria K. Hordinsky, MD, Caridad Rosette, PhD, Luigi Moro, PhD, Alessandro Mazzetti, MD, Mara Gerloni, PhD, Diana Harbort, MBA, Martina M. Cartwright, PhD.

1University of Minnesota, Minneapolis, MN, USA, 2Bellatrix Pharmaceuticals, San Diego, CA, USA, 3Cassiopea SpA, Milano, Italy, 4University of Arizona, Tucson, AZ, USA.

Dr. Maria K. Hordinsky is Professor and Chair of the Department of Dermatology at the University of Minnesota. Dr. Hordinsky’s clinical and research interests include hair and scalp diseases and neurodermatology. She is the current President of the North American Hair Research Society, immediate past chair of the Clinical Research Advisory Council of the National Alopecia Areata Foundation and is a past president of the Association of Professors Dermatology. She is also a member of the Board of Directors of the Cicatricial Alopecia Research Foundation and is Section Editor on Hair Diseases for UpToDate, an evidence-based clinical decision support system. Dr. Hordinsky is the author of numerous journal articles and book chapters and regularly lectures and teaches on hair diseases.


TAKE HOME MESSAGE:
Breezula™ targets local testosterone receptors & topical application results in scalp hair growth with minimal systemic exposure & no reported sexual side effects. Breezula™ has a favorable safety profile & holds promise as a new potential long-term treatment for adult androgenetic alopecia.

ABSTRACT:
Introduction: Breezula™(CB-03-01) is an investigational, topical peripherally selective, anti-androgen treatment for adult AGA. Results from a double blind, 3-arm parallel, proof-of-concept (POC) study & an open-label, comparative study are described. Methods: For the POC study, 95 male subjects, 18-50 years with mild-to-moderate AGA & on-going hair loss were enrolled: Breezula™-5% (N=31), vehicle (N=33) and Minoxidil-5% (n=31), for 6-months of BID treatment. Co-primary endpoints: change from baseline in total area hair counts (TAHC) & subject hair growth assessment (HGA) at Month 6. Secondary endpoints: Change from baseline in target area hair width (TAHW) & target area hair darkness (TAHD); subject satisfaction/changes at Months 2 and 4; & local tolerability, local/systemic Adverse Events (AEs), & clinical markers. Seventy adult men & women with AGA also participated in an open-label European study, where CB-03-01-1% CB-03-01-5%, cyproterone acetate-1%, or 17α-estradiol-1% were applied via hydro-electrophoresis. Assessments of scalp sebometric measurements, hair shaft diameter, hair follicle density, & pull & wash tests occurred at baseline & one & four weeks after the end of the treatment period. Results: Seventy-eight completed the POC study treatment period. Active treatment groups showed larger TAHC changes from baseline vs. vehicle (p=0.0971). “Favorable” scalp hair growth was higher in Breezula™(39%) and Minoxidil (36%) groups vs. vehicle (16.0%) (p=0.2213) per HGA scores. Change from baseline in TAHC was larger in Breezula™ & Minoxidil groups vs. vehicle. Minoxidil efficacy peaked at Month 4. Skin reactions were mostly minimal/mild. No significant systemic AEs were reported. The open-label study revealed Breezula™ was more effective than cyproterone acetate or 17α-Estradiol in all efficacy measures Conclusions Breezula™ targets local testosterone receptors & topical application results in scalp hair growth with minimal systemic exposure & no reported sexual side effects. Breezula™ has a favorable safety profile & holds promise as a new potential long-term treatment for adult AGA.
**04**

**Hair Management of Transgender and Gender Nonconforming Patients**

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**Anthony Ho** is a 2019 MD candidate at SUNY Downstate College of Medicine and Dr. Jerry Shapiro's Research Fellow at NYU’s The Ronald O. Perelman Department of Dermatology. His research interests include cicatricial and noncicatricial hair disorders.

**A. Ho:** None. **C.C. Motosko:** None. **J. Shapiro:** None. **K. Sukhdeo:** None.

**TAKE HOME MESSAGE:**
Health care providers must understand the physiologic changes of hair and counsel their transgender and gender nonconforming patients on supplemental therapies that may be required to achieve the desired hair growth patterns.

**ABSTRACT:**

Introduction: Transgender health, including skin and hair care, is an understudied and underappreciated aspect of dermatology. The gender affirming process may involve accompanying alterations of hair distribution. Dermatologists are poised to guide transgender patients in this process; however, a paucity of data exists to inform providers on goal setting, hair management, and treatment options. **Objective:** To synthesize the transgender hair management considerations and recommendations from existing literature as well as expert opinion. **Methods and Materials:** MEDLINE, Embase, and Cochrane databases were queried for articles published through January 1, 2018. A Boolean search of the index terms “transgender” and “hair” was performed. Transgender patients and physicians with expertise in transgender hair care were consulted. **Discussion/Results:** Few reports address the trichologic considerations of the transgender population. Medical, surgical, and procedural interventions to masculinize the appearance are notable for efforts to increase hair thickness and density in targeted areas (ie, beard, eyebrows). Induced androgenetic alopecia is a poorly recognized and undesired potential sequela of testosterone-driven gender affirming therapy. Conversely, feminizing therapy may require efforts to reduce hair in select locations as well as reverse possible pattern hair loss. Our study further identifies and reports on unpublished management and treatment recommendations based on extensive experience with transgender patients. We also describe how a coordinated approach between dermatology and plastic surgery can facilitate optimal appearance outcomes for the benefit of patients. **Conclusion:** Increased awareness and reduced stigmatization of the transgender population drives an increased number of patient encounters with dermatologists. The unique needs of this population to achieve the desired appearance and texture of hair requires an understanding of physiologic, temporal, and societal challenges involved, which we summarize and present in this study.

**05**

**Hair Follicle Neogenesis**

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Kevin McElwee is currently a Professor (50th anniversary chair) in the Center for Skin Sciences at the University of Bradford, UK. Until recently, he was an Associate Professor in the Department of Dermatology at the University of British Columbia, Vancouver, Canada. The research program of Prof. McElwee is focused on the diverse roles of hair follicles in cutaneous disease and tissue regeneration. For many years, alopecia areata research has been a key theme, but more recent work has focused on cytokines in hair follicle cycling and disease, and the role of hair follicle mesenchymal cells in immune regulation and follicular neogenesis. Research interests have most recently expanded to encompass investigation of melanoma, basal cell carcinoma, and squamous cell carcinoma. Prof. McElwee is also a co-founder and Chief Scientific Officer for Replicel Life Sciences Inc., a regenerative medicine company developing autologous cell therapies for skin, hair, and tendon rejuvenation.
TAKE HOME MESSAGE:
Hair follicle dermal papilla cells and dermal sheath cells have significant regenerative potential. The properties and characteristics of these cells, can be developed into practical treatments for hair loss, as well as other regenerative treatments for conditions with cellular deficits. Achieving cGMP during cell culture, and regulatory issues for clinical treatments, have a significant influence on how cell therapeutics are developed.

ABSTRACT:
Research published over many years, and using a variety of in vivo hair growth models, has demonstrated that, under certain experimental parameters, damaged hair follicles exhibit significant regenerative capacities. Research has also shown that hair follicle-derived dermal tissues can promote new follicle formation after surgical implantation adjacent to epithelial tissue or cells. More recently, cultured cells have been used to induce follicle neogenesis as well as modification of follicles in situ. Cumulatively, the research shows that dermal papilla (DP) cells are essential for hair follicle regeneration, and that dermal sheath cup (DSC) cells likely maintain the DP structure over multiple hair cycles. Not surprisingly, these unique properties have caught the attention of many scientists in academic laboratories as well as the biotech industry. Several companies have been launched with the aim of developing DP or DSC cells, and possibly even stem cells, into a practical treatment for androgenetic alopecia. Cell-based clinical therapy is a new field with numerous challenges to address in making any treatment cGMP compliant and suitable for approval by regulatory authorities. Never-the-less, a manufacturing protocol for culturing DSC cells has been developed for AGA treatment in humans. Safety of autologous DSC cell injection has been demonstrated in a phase I/IIa clinical trial (clinicaltrials.gov identifier: NCT01286649). While the future road map is challenging, the potential remains for developing a compliant and effective cell therapy treatment for hair loss.

06
Hair Follicle Stem Cell Stimulation By Naturally Secreted Growth Factors Induces New Hair Growth In Men And Women
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Gail K. Naughton, Ph.D., has been in tissue engineering research for 30 years, holds over 105 patents, and founded two regenerative medicine companies. Her current venture, Histogen, is focused on novel products from hypoxia induced stem cells. She is the Company’s CSO/CEO and invented its core technology. She was the founder/co-inventor at Advanced Tissue Sciences, oversaw the design and development of the world’s first up-scaled manufacturing facility for tissue engineered products, established major corporate development partnerships, raised over $350M, and brought four products from concept through market launch. At Histogen Dr. Naughton developed a new skin care product, ReGenica, which was recently acquired by Allergan. Dr. Naughton has been extensively published and a frequent speaker in the field of tissue engineering. In 2000, Dr. Naughton received the 27th Annual National Inventor of the Year award by the Intellectual Property Owners Association in honor of her pioneering work in regenerative medicine.


TAKE HOME MESSAGE:
Delivering key natural growth factors as a replacement therapy to stimulate hair follicle stem cells, keratinocyte growth and migration, and increase blood flow to the follicle induces significant terminal hair growth in men and women.

ABSTRACT:
We have evaluated injecting a bioengineered human cell-derived formulation produced by hypoxia-induced multipotent stem cells, termed Hair Stimulating Complex (HSC), as a replacement therapy to induce hair growth activity in androgenetic alopecia and female diffuse hair loss. HSC contains cytokines including KGF, VEGF, and follistatin, the last of which antagonizes activin and BMPs. HSC is released based on growth factor levels measured by ELISAs and cell-based bioassays.
The initial clinical pilot study was a single site, double-blind, randomized, placebo-controlled trial involving 26 males with androgenetic alopecia. At baseline one area of the scalp received four 0.1cc intradermal injections of HSC with placebo receiving identical treatment. HSC showed an excellent safety profile and a statistically significant increase at 3 months in hair shaft thickness (p<0.05) and hair density (p <0.03) at 1 year, as assessed by Trichoscan image analysis. Increased terminal hairs were seen within the HSC injection sites supporting the hypothesis that HSC stimulated resting and miniaturizing follicles to increase terminal hair growth.
A Phase I/II 56 subject trial with 8 injections of HSC and placebo at baseline, and a repeat dose at week 6, reached 12-week primary safety and efficacy endpoints. No product related adverse effects and no evidence of toxicity were observed. In addition, statistical significance was noted in all efficacy endpoints which include increase in total hair count (p=0.0013), terminal hairs (p=0.0135), vellus hairs (p=0.033) and cumulative thickness density (p=0.0026). An additional physician-sponsored investigator-initiated trial (IIT) to evaluate the safety and efficacy of HSC also produced cosmetically relevant hair growth effects in patients with diffuse female hair loss.
A phase 1 trial in women and a phase 2b dose-ranging trial for men are planned for 2018 in North America, pending regulatory approval. The results seen with HSC represent a novel regenerative medicine approach in hair growth treatment.

Clinical: PRP Clinical Trials in AGA
Jerry Shapiro, MD.
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Jerry Shapiro is Professor in the Ronald O. Perelman Department of Dermatology at New York University School of Medicine and Director of Disorders of Scalp and Hair Disorders. He has published over 200 peer reviewed articles, 5 books and 10 book chapters. He has trained 29 hair fellows from 4 continents. His practice is restricted to disorders of the scalp and hair.

J. Shapiro: Research Grant (principal investigator, collaborator or consultant); RegenLab. Speakers Bureau/Honoraria (speakers bureau, symposia, and expert witness); ISDIN. Ownership Interest (owner, stock, stock options); Replicel Life Sciences. Consultant/Advisory Board; Pfizer, Aclaris, Incyte.

TAKE HOME MESSAGE:
PRP is a new tool that can be utilized in the treatment of androgenetic alopecia. We need however more trials to determine exact efficacy.

ABSTRACT:
Platelet rich plasma (PRP) therapy is a novel therapeutic modality that has seen broad applications for a number of medical indications. In dermatology, its uses have included treatment of chronic wounds and facial rejuvenation. More recently, anecdotal reports have suggested some efficacy in the treatment of hair loss. Androgenetic alopecia is the most common form of hair loss world-wide. Although there are currently numerous treatment options for this indication including minoxidil, 5-alpha reductase inhibitors and follicular unit transplantation, many of the medical treatment options have undesirable side effects, particularly in women of child bearing age. There are currently 9 studies listed on ClinicalTrials.gov on the use of PRP for AGA worldwide, but only 1 has published results. On
PubMed, there are 3 controlled studies listed for PRP on AGA, including this clinical trial which was conducted in Barcelona and showed platelet-rich plasma increased hair density when comparing with placebo. At NYU, we are now conducting a single site, double-blinded, randomized, active- and placebo-controlled split-scalp study to evaluate the clinical effectiveness of Platelet-rich Plasma (PRP) in the treatment of androgenetic alopecia. We will go through methods, inclusion criteria and outcomes in this talk.

Take Home Message: PRP for AGA is still an off-label indication, so there is a need for controlled studies to show efficacy and safety

**09**

*Comparison Of Platelet Growth Factor Expression With Cancer Cells And Its Potential Implications In Platelet Rich Plasma Therapy.*

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Dr. Javed Mohammed, PhD, is an Assistant Professor in Department of Dermatology at the University of Minnesota. He has a long standing interest in skin cancer and immunology research.

**J. Mohammed:** None. **M. Abedin:** None. **R.S. Farah:** None. **A. Wipf:** None. **M. Hordinsky:** None.

**TAKE HOME MESSAGE:**

A thorough review of medical history and clinical examination of injection sites is highly recommended prior to platelet-rich plasma treatment for androgenetic alopecia.

**ABSTRACT:**

Platelets contain α-granules that are reservoirs of growth factors (GFs) PDGF, TGFβ1, VEGF, EGF, bFGF, IGF-1 and HGF thereby regulating cellular proliferation, migration, differentiation and angiogenesis. Since platelet secreted GFs play critical roles in the natural healing process, platelet-rich plasma (PRP) prepared from blood is injected to sites of injury delivering high concentrations of autologous GFs. Several studies have evaluated and documented effectiveness of PRP to treat hair loss disorders such as androgenetic alopecia. It is believed that GFs released from platelets upon PRP injection act on skin and hair follicle stem cells thereby promoting neovascularization and follicle differentiation. However, platelet GFs can also play key roles in several pathological processes, including tumor biology. Therefore, a PRP injection resulting in 300%-700% enrichment of platelets could potentially lead to an undesirable outcome when injected into a site harboring precancerous/cancerous cells. Since cancer progression is influenced by interaction of cancer cells with those in stroma and the resulting paracrine signaling mediated by GFs, we compared expression profiles of human platelet GFs in PRP samples of patients with androgenetic alopecia to primary and metastatic human melanoma and SCC cell lines by quantitative PCR. Platelet expression of TGFβ1 was highest and was consistent with GF analysis in PRP samples. While low to undetectable transcript levels were noticed for IGF and HGF in both platelets and cancer cells, platelets had significantly higher expression of EGF (300-10,000x), TGFβ1 (50-120x), PDGF-A (5-70x) and PDGF-B (3-16x) mRNA. VEGF expression was higher in cancer cells while bFGF expression in metastatic cell lines was similar to platelets. Thus, adverse effects following PRP injection in context of precancerous lesions may be a theoretical risk due to significant contribution of platelet GFs. A thorough review of medical history and clinical examination of injection sites is highly recommended prior to PRP treatment.

**10**

*The Role Of Platelet-rich Plasma In Alopecias As Quantitatively Measured By Optical Coherence Tomography: Prospective Pilot Study At A Single Center*

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University Of California Irvine, Irvine, CA, USA.
Natasha Atanaskova Mesinkovska MD PhD is a dermatologist and dermatopathologist, and the Director for Dermatology Clinical Research at the University of California Irvine. She trained at Mayo Clinic and Cleveland Clinic, where she completed her dermatopathology fellowship with Dr. Wilma Bergfeld. She currently serves as the Chief Scientific Officer for the National Alopecia Areata Foundation.

N. Mesinkovska: None.

TAKE HOME MESSAGE:
Hair loss conditions create a continuous challenge because of the lack of effective treatments. Preliminary results using PRP treatment for scarring and non-scarring alopecia are promising. OCT represents a non-invasive imaging technology that can be used to quantify hair growth, by computing hair follicle counts and hair shaft diameters.

ABSTRACT:
Introduction: Platelet-rich plasma (PRP) is a treatment modality with widespread use as panacea for various skin conditions, including alopecia. There is currently prolific literature on the supposed positive effects of PRP for hair loss. However, the uncertainty of who will benefit from this procedure and the lack of proven treatment guidelines pose a challenge. Optical coherence tomography (OCT) is a non-invasive imaging system that can be used to quantify hair growth by measuring hair follicle density and diameter.

Hypothesis: PRP is an effective treatment technique for certain non-scarring alopecias, but has a limited potential in scarring alopecias.

Objective: To quantify hair growth by measuring hair follicle density and diameter in different points on scalp using OCT imaging at baseline and after PRP treatments.

Study Design: This is a prospective study of 30 patients, 20 with non-scarring (androgenic alopecia and alopecia areata) and 10 with scarring alopecia (cutaneous lupus, lichen planopilaris, central centrifugal cicatricial and frontal fibrosing alopecia). The patients received three standardized PRP injection treatments at 4 week intervals. The study was performed at the Center for Dermatology Clinical research, at University of California, Irvine.

Results: Quantification of hair growth was achieved by non-invasive OCT measurements with J image analysis, at baseline and at 12 weeks of treatment. Response to PRP was noted across different hair loss conditions, and these numbers along with their statistical significance will be discussed. Surprisingly, scarring hair loss types also showed significant reduction in inflammatory parameters and even hair regrowth after treatment in certain cases, with decrease in symptoms of pruritus and scaling.

Conclusion: PRP can be an effective treatment for both scarring and non-scarring alopecias with improvement in both hair follicle count, hair shaft diameter and reduction of inflammation. OCT is a reliable and accurate method to quantitatively measure hair regrowth after PRP treatment.

11
Efficacy Of Platelet Rich Plasma For Androgenetic Alopecia May Be Determined By Growth Factor Concentration
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Kevin McElwee is currently a Professor (50th anniversary chair) in the Center for Skin Sciences at the University of Bradford, UK. Until recently, he was an Associate Professor in the Department of Dermatology at the University of British Columbia, Vancouver, Canada. The research program of Prof. McElwee is focused on the diverse roles of hair follicles in cutaneous disease and tissue regeneration. For many years, alopecia areata research has been a key theme, but more recent work has focused on cytokines in hair follicle cycling and disease, and the role of hair
folicle mesenchymal cells in immune regulation and follicular neogenesis. Research interests have most recently expanded to encompass investigation of melanoma, basal cell carcinoma, and squamous cell carcinoma. Prof. McElwee is also a co-founder and Chief Scientific Officer for Replicel Life Sciences Inc., a regenerative medicine company developing autologous cell therapies for skin, hair, and tendon rejuvenation.

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TAKE HOME MESSAGE:
Platelet rich plasma (PRP) may be an effective treatment for androgenetic alopecia, but there is room for significant improvement and optimization of PRP processing and treatment protocols.

ABSTRACT:
Introduction: In dermatology, autologous platelet rich plasma (PRP) therapy has been used in the treatment of chronic wounds and ulcers, scar tissue, and as a skin rejuvenation therapy. Recently, PRP has been used in the treatment of androgenetic alopecia and alopecia areata. Objective: To determine the efficacy of PRP for hair growth promotion in AGA patients in a randomized, double blinded, placebo controlled, pilot clinical trial (NCT02074943). Methods: We determined the efficacy of an 8 week, 5 session, PRP treatment course by measuring hair density (HD) and hair caliber (HC) changes in 10 AGA affected patients. We quantified the presence of FGFb, EGF, HGF, VEGF, GDNF, PDGF-BB, and TGFb in PRP to evaluate potential correlations between growth factor (GF) concentrations and hair growth measurements. Results: At 16 weeks, 8 weeks after the last PRP injection, treated areas exhibited an increased mean hair density (+12.76%) over baseline compared to the placebo treated area (+0.99%). Unexpectedly, mean hair caliber decreased in both treated and placebo regions (-16.22% and -19.46% respectively). GF concentration in PRP was highly variable between individuals, and to a lesser extent within individuals, over time. Multiple linear regression analysis did not identify significant correlation between GF concentration and hair growth. However, analysis of individual GF concentrations identified correlation between GDNF and hair density (p= 0.004). Trends, though not statistically significant, were also observed for FGFb and VEGF. Conclusions: This study suggests a potential beneficial effect for PRP treatment of AGA. The variable hair growth response, and the apparent reduction in hair caliber, suggest there is a significant opportunity to improve PRP therapy protocols for hair growth promotion. The variability in PRP GF concentration suggests standardization of GFs post-processing could improve hair growth responses. A larger cohort study may help with development of new and improved PRP protocols for AGA.

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Genetic Biosginatures Driving Cranio-facial Hair Follicle Patterning And Androgenetic Alopecia
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Dr. Yanne Doucet's research focuses on understanding the molecular mechanisms underlying androgenetic alopecia. As a post-doctoral research scientist in Dr. Angela Christiano's lab, she conducts research projects on hair regeneration in human hair regrowth. During her Engineering Master's thesis work with Dr. Geraldine Guasch, she characterized an in vitro model of human sebaceous glands and the role of TGFb in sebum production. Her Ph.D. research, under the supervision of Dr. David Owens at Columbia University, focused on studying the molecular mechanisms of differentiation and homeostasis of an epidermal progenitor niche that resides within the touch dome, and that gives rise to the Merkel cell lineage. In 2015, she co-chaired the Epithelial Differentiation and Keratinization Gordon Research Seminar and in 2017, she was appointed as the NYSTEM training fellow under the Columbia Stem Cell Initiative.
TAKE HOME MESSAGE:
Gene expression profile analysis of different scalp region in control and AGA patients, has identified a number of key master regulators (transcription factors) implicated in AGA pathogenesis as well as in developmental processes underlying hair patterning.

ABSTRACT:
Introduction: Androgenetic alopecia (AGA) is a complex genetic trait that is characterized by regional hair follicle miniaturization in response to androgens. While female-pattern hair loss is characterized by a diffuse thinning of the scalp, male pattern can be induced upon elevation of testosterone levels. What confers regional susceptibility vs. refractivity on different regions of the scalp is unknown. Donor Dominance refers to the phenomenon by which hair follicles retain the characteristics of the donor site when transplanted to a recipient site. This property forms the basis for the success of hair transplantation. Objective: We noticed that the hair pattern in AGA overlaps precisely with the demarcations of scalp dermis/underlying bones, which have a dual origin neuroectoderm (for parietal bone), vs. mesoderm (for occipital bone). Since the calvarium begins to develop shortly prior to hair follicle induction, we hypothesized that the craniofacial dermis epigenetically/differentially influences hair follicle patterning and development.

Methods: We used a system biology approach by first comparing RNA seq profile from parietal and occipital scalp of matching control and AGA affected volunteers, followed by gene profile expression analysis using the ARACNe algorithm to identify transcription factors or master regulators (MRs) that govern the molecular mechanisms of AGA.

Results: Our analyses revealed a striking differential gene expression profile along the cranial-caudal axis defining two distinct biosignatures that reflect: 1) the developmental origins of the skin and 2) the susceptibility to develop AGA. Functional annotation of the differentially expressed genes shows enriched pathways in AGA samples, including genes implicated in cartilage-ECM interaction (ADAMTS4), in immunity (CD300c, FCGR1A), and epigenetic factors. This list of MRs was used to perform functional studies. Conclusion: Altogether, we present novel insights into the genetic, epigenetic, and developmental factors required for temporal specification of the skin and the interdependence of hair follicle, skull and craniofacial development.

Markers Of Ageing In The Hair Follicle Environment - A Glimpse Into The Human Scalp
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I have a BSc (hons) and a MSc in Biomedical Sciences. I am currently studying for a PhD in the Centre for Skin Sciences at the University of Bradford, West Yorkshire, UK. My PhD project is investigating changes in the human hair follicle environment with increasing age and how this impacts on female scalp hair.

TAKE HOME MESSAGE:
The ageing female scalp shows striking histological and biological changes, which may lead to significant changes in the hair follicle environment and impact hair ageing.

ABSTRACT:
Hair ageing is complex, involving shortened cycles and production of thinner hair fibers. While ageing leads to impaired dermal structure, little is known about changes in the hair follicle environment. We have compared scalp in situ and corresponding cultured primary dermal fibroblasts (DFs) from 16 women aged between 19 and
Changes in expression of 29 biomarkers with age were quantitated in DFs using qRT-PCR. Longitudinal scalp sections from the same donors were analysed by immuno/histological staining. Seven of 29 biomarkers significantly (p<0.05) changed with age in cultured DFs. In DFs from women over 50yrs (n=6) expression of MMP-1 increased. In contrast, collagen XVI (COL16A1), sirtuin-1 (SIRT-1), hyaluronic acid synthase type 2 (HAS2), protease-nexin 1 (SERPINE2), versican (VCAN) and vascular endothelial growth factor A (VEGF-A) were all reduced in DFs from women over 40yrs (n=8).

In situ, the papillary/reticular boundary was indistinguishable in younger donors, but evident in women over 40yrs, accompanied by a reduction in the height of the papillary dermis. The depth of the anagen hair follicle decreased with age, while in younger women the bulb was surrounded by adipose. Trichrome staining highlighted collagen changes in the papillary dermis. Expression of podoplanin, a marker of papillary fibroblasts, was reduced in women over 60yrs. While HAS2 was highly expressed throughout the scalp there was no change with age. However, in women over 40yrs MMP-1 was increased in the dermal papilla, sheath and reticular dermis, SERPINE2 increased in the dermal papilla and sheath. Versican increased in the sebaceous gland and papillary dermis. The ageing female scalp shows striking histological and biological changes, which may lead to significant changes in the hair follicle environment and impact hair ageing. Further studies are underway to look at changes in biomarker expression in different hair follicle cell types and how they alter with age.

Successful Regrowth Of Hair In Alopecia Areata Using Platelet-rich Plasma As Quantitatively Measured By Optical Coherence Tomography
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Dr. Juhasz is the current Clinical Research Fellow at the University of California, Irvine, Department of Dermatology. While here, she has served as a sub-investigator on multiple studies, and has been involved in testing novel therapeutic options for hair loss, as well as imaging techniques to characterize different types of alopecia. She graduated from the Icahn School of Medicine at Mount Sinai, receiving the prestigious, four-year Mount Sinai Scholars as Leaders Merit Scholarship, was chosen as a fellow for the highly competitive Howard Hughes Medical Institute Summer Medical Fellows Program, and completed research under Dr. Ellen Marmur. She holds a Master of Science from the University of British Columbia where she was awarded the Faculty of Medicine Graduate Award, and completed her undergraduate studies on full scholarship. Before embarking on her career in medicine, she was a professional concert pianist making her Carnegie Hall debut at 14 years old.


TAKE HOME MESSAGE:
AA is a devastating form of non-scarring hair loss associated with high levels of patient psychological morbidity. With limited treatment options, new therapies such as PRP are necessary. Preliminary results using PRP treatment for AA are promising, however, controversial due to a lack of reliable and accurate quantitative measurement tools.

ABSTRACT:
Introduction: Alopecia areata (AA) is an inflammatory, non-scarring condition causing hair loss. Current treatment modalities are limited due to side effects and recurrence after therapy cessation. Platelet-rich plasma (PRP) is a new treatment modality that has been used for multiple applications including skin rejuvenation, joint injection and hair growth. Thus far, results of PRP-induced hair regrowth have been controversial due to the inability to obtain accurate and reliable quantitative results.

Case Report: A 60-year-old female with a nine-year history of AA presents to the office for evaluation and treatment. Her last treatment with intralesional triamcinolone occurred in April 2017; since that time the patient has not used any hair regrowth therapies. The patient received intradermal injections of 9 mL PRP throughout the scalp.
Using photographs, SALT scores and OCT, we accurately assess the patient’s hair pre- and post-treatment. Six weeks after PRP treatment, the patient exhibits 9% improvement in SALT score (baseline 42.1, post-treatment 38.2), with a 28% increase in hair follicle count on the right side of the scalp and 14% on the left. Hair shaft diameter within the follicle increases three-fold on the right side, however, no improvement is noted on the left. 

**Discussion:** The use of PRP for the treatment of AA has been previously described, however, reports of treatment success are limited and controversial especially without the ability to reliably measure therapeutic efficacy. This represents the first case of quantitatively measured PRP treatment success in a patient with AA.

**Conclusion:** PRP is an effective treatment for AA with improvement in both hair follicle count and hair shaft diameter. OCT is a reliable and accurate method to quantitatively measure hair regrowth after PRP treatment.

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**Histopathological Findings Of Persistent Inflammatory Scalp, A Prelude To Primary Cicatricial Alopecia?**

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Jorge Larrondo G, MD, MSc, is a dermatologist graduated from the University of Chile. He trained in Trichology and Hair Restoration Surgery at the University of Alcalá de Henares. He is currently working at Clinica Alemana, Hospital Padre Hurtado and Hospital del Salvador, in Santiago de Chile. His main interests are: cicatricial alopecias, trichoscopy and hair restoration surgery.

**J. Larrondo:** Consultant/Advisory Board; ROL in La Roche-Posay. **M. Gosch:** Consultant/Advisory Board; La Roche-Posay. **R. Cabrera:** None. **A. Castro:** None. **A. McMichael:** None.

**TAKE HOME MESSAGE:**  
Persistent inflammatory scalp could represent an early stage to some primary cicatricial alopecias, we need to better characterize this entity in order to make a prompt diagnosis and treatment.

**ABSTRACT:**

**Introduction.**  
Primary cicatricial alopecias (PCA) are inflammatory scalp conditions that may lead to permanent hair loss. Diagnosis is often delayed because a significant amount of hair is usually lost before the alopecia becomes apparent. Nevertheless, studies have shown that hair loss may progress subclinically, and even “normal” appearing areas could show histologic evidence of disease. Here, we characterize 12 patients with persistent inflammatory scalp that resembles to PCA in histopathology.

**Objective.**  
Characterization of patients with persistent inflammatory scalp.

**Methods.**  
Retrospective review of cases with diagnosis of inflammatory scalp but not evident signs of alopecia seen at Clinica Alemana during 2016-2017. Inflammatory scalp conditions like contact allergic dermatitis, psoriasis and seborrheic dermatitis were ruled out. Clinical, demographics and laboratory features were established. Clinical and dermatoscopic images were recorded. Biopsy specimens (two, 4mm punch) were guided by dermatoscopy and direct immunofluorescence (DIF) was performed.

**Results.**  
12 patients (1 male and 11 females) with ages ranged from 24 to 52 years (mean: 41) consulted because of intermittent shedding. 7 cases presented with pruritus and 3 with trichodynia. Appearance of symptoms (shedding, trichodynia and pruritus) was within two years for the majority of patients. Dermatoscopy mainly showed mild hair tufting, peripilar casts and perifollicular erythema. In biopsy specimens, perifollicular lymphocytic inflammation (around infundibulum and isthmus) was seen in all of
the samples, being mild in most cases. Perifollicular fibrosis was present in 8 cases. An average of 30 hairs were found in the samples. No significant mucin deposit was present and DIF resulted positive in two cases.

**Conclusion.**
The histopathological findings of our patients shared similar features of some PCA entities but in a milder way. Our findings resemble to those reported in unaffected areas of PCA patients and other subclinical inflammatory conditions. This entity could represent an early stage of PCA.

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**Fibrosing Alopecia In A Pattern Distribution (fapd) In 16 African Descent And Hispanic Female Patients: A Challenge Diagnosis.**

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**TAKE HOME MESSAGE:**
Fibrosing Alopecia in a Pattern Distribution in the patient of color shares common clinical and dermatoscopy features with Central Centrifugal Cicatricial Alopecia, but scalp biopsy show a lichenoid cicatricial alopecia associated with androgenetic findings in the same sample.

**ABSTRACT:**

**Introduction:** Since the first description of Fibrosing Alopecia in a Pattern Distribution (FAPD) only included Caucasian patients, the African descent and Hispanic (ADH) patient with Cicatricial Pattern Alopecia (CPA) needs to be revisited to allow the differential diagnosis in different ethnicities. **Material and Methods:** We present 16 African descent and hispanic female patients with progressive scarring alopecia in a pattern distribution. **Objective:** African descent and mixed race patient have a different presentation of FAPD that may resemble Central Centrifugal Cicatricial Alopecia, as well as Lichen planopilaris and Frontal Fibrosing Alopecia. It is of great importance that the ethnic scalp is recognized as having its own peculiarities and it has to be analyzed with a different approach. **Results:** 10 patients presented cicatricial female pattern hair loss (CFPHL), 4 patients had cicatricial male pattern hair loss (CMPH) and 2 patients had cicatricial female pattern hair loss associated with recession of the frontal hairline (CFPHL + FHL). Dermatoscopic features showed perifollicular erythema and scaling (14/16), hair fiber diameter diversity (16/16), loss of follicular ostia (16/16), follicular keratosis (3/16). Late stages showed a honeycomb pigmented network (12/16), hyperpigmented perifollicular halo (12/16) and small white patches (12/16). Histopathological features showed lichenoid perifollicular infiltrate (14/16), follicular miniaturization (16/16), concentric fibrosis (16/16), perifollicular lymphocytic infiltrate (16/16) and vellus hair involvement (10/16); premature desquamation of the inner root sheath (PDIRS) was found in 11 patients. Conclusion: Lichen Planopilaris (LPP), FAPD, Central Centrifugal Cicatricial Alopecia (CCCA) and Frontal Fibrosing Alopecia (FFA) are the most important differencial diagnosis in ADH patients with CPA. **Conclusion:** The concomitant finding of PCA, hair fiber diversity, histological findings of Androgenetic Alopecia (AGA), vacuolar interface alteration of the upper portion of the follicular epithelium and/or concentric perifollicular fibrosis are the main key features to suggest the diagnosis of FAPD.
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**Vitamin D Status In Scarring And Non-scarring Alopecia**

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Ruzica is a PhD student at Case Western Reserve University with an interest in hair loss.

**R.Z. Conic:** None. **N.A. Mesinkovska:** None. **M. Piliang:** None. **W. Bergfeld:** None.

**TAKE HOME MESSAGE:**
Low vitamin D is associated with all hair loss types and those with LPP are at 8 times higher odds of having a severe vitamin D deficiency compared to those with AA.

**ABSTRACT:**
Introduction: Vitamin D is produced in the skin and is an important factor in keratinocyte proliferation and differentiation, as well as regulation of the hair follicle cycle. It is implicated in the pathogenesis of various human diseases, including hair loss. We aim to evaluate the prevalence of vitamin D deficiency in patients with alopecia areata(AA), androgenic alopecia(AGA), central centrifugal scarring alopecia(CCCA), lichen planopilaris(LPP), and telogen effluvium(TE).

Methods: Patients diagnosed with AA, AGA, CCCA, LPP and TE from 2009-2010, were identified(n=358). Patients taking vitamin D supplements at the time of their visit were excluded. Vitamin D deficiency was defined as vitamin D levels < 30 ng/ml, and this was further categorized into mild(21-30 ng/ml), moderate(12-21 ng/ml), or severe(<12 ng/ml).

Results: The majority of patients had TE(n=121), followed by AA(n=77), AGA(n=73), LPP(n=58) and CCCA(n=29). Median age at the time of vitamin D evaluation was 49.5 years. LPP patients tended to be older, while AA were youngest(p<0.001). Males comprised 9.8%(n=35) of patients, and were most likely to have AA(p<0.001). Vitamin D deficiency was present in 64.8% of patients, with 32.96% having mild, 17.60% moderate and 14.25% severe deficiency. Vitamin D values were significantly associated with all hair loss type (p=0.02), with CCCA having lowest vitamin D levels, and AGA the highest. Patients with LPP had an 8.3 times higher odds of severe vitamin D deficiency(p<0.001), while TE patients had 3.7 times higher odds when compared to AA(p=0.024), after adjusting for sex, age, and race. African Americans had 6.3 times the odds of severe vitamin D deficiency and Asians 6.1(p=0.004) compared to Caucasians(p<0.001). Men had a higher incidence of vitamin D deficiency, regardless of other factors.

Conclusion: Future studies should evaluate the effects of vitamin D supplementation on anagen to telogen ratios in scalp biopsies of patients with TE.

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**Association Of Frontal Fibrosing Alopecia And Lichen Simplex Chronicus: Trichoscopy And Histopathological Features**


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Carolina Oliveira Costa Fechine, MD, was graduated in Medicine from School of Medicine, State University of Ceara (UECE) in 2010. After that, she completed her residency in Dermatology at Hospital do Servidor Estadual de Sao Paulo (IAMSPE) in 2014. She has been a research fellow in hair and nails diseases at the Department of Dermatology of the University of Sao Paulo (FMUSP) since 2014. She is currently a PhD student at the Department of Dermatology of the University of Sao Paulo (FMUSP).
TAKE HOME MESSAGE:
Lichen Simplex Chronicus (LSC) is a chronic skin disease characterized by lichenified patches, which occurs as a result of constant scratching of the skin. Scalp pruritus has been reported as the most presenting symptom in Frontal Fibrosing Alopecia (FFA). We described one case with association of FFA and LSC, featuring its trichoscopy and histopathological findings. Trichoscopy suggested the presence of concomitant diseases in the same patient. In addition, histopathology findings confirmed the diagnose of LSC and FFA.

ABSTRACT:
Lichen simplex chronicus (LSC) is a recalcitrant skin disease characterized by lichenified patches, which occurs as a result of constant scratching or rubbing of the skin. It is commonly located on neck, ankles, scalp and anogenital region but any area of the skin may be affected. Frontal fibrosing alopecia (FFA) is a scarring alopecia, characterized by progressive frontotemporal hairline recession. Here, we report a case with coexistence of FFA and LSC and describe the trichoscopy and histopathological features.

A 69-year-old postmenopausal woman presented with a 3-year history of hair and eyebrows loss and complaints of severe itching. On examination, she had absence of eyebrows and frontal hair line recession, associated with lichenified skin and short broken hairs affecting the left frontoparietal region. Trichoscopy findings of the lichenified frontal hairline included absence of vellus hairs and follicular openings, perifollicular scaling and perifollicular erythema as well as red and scaly scalp with broken hairs associated with broom hair fibers. Histopathology findings confirmed the diagnoses of LSC and FFA at the same site.

FFA is a lymphocytic scarring alopecia, and scalp pruritus has been reported as the most common symptom. Trichoscopy findings include absence of follicular openings and vellus hairs on frontal hairline, follicular hyperkeratosis, perifollicular scaling and perifollicular erythema. The coexistence with other hair scalp diseases has already been reported.

LSC is a common pruritic skin disorder which can arise on normal skin, as a primary dermatological disorder, or secondary to other disorders such as atopic dermatitis, psoriasis, anxiety, obsessive–compulsive disorder, and pruritus related to systemic disease.

Although both LSC and FFA are not uncommon, the association of both conditions has never been reported before. We describe one case, featuring its trichoscopy and histopathological findings, and regarding the importance of trichoscopy to suggest the presence of concomitant diseases.

The Use Of Platelet Rich Plasma To Treat Radiation-induced Scarring Alopecia: A Case Report
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Chloe Ekelem is a dermatology clinical research post-doc at the University of California, Irvine. She graduated from Morehouse School of Medicine in Atlanta, Georgia and completed her intern year in Family Medicine at Ventura County Medical Center in Ventura, California. She is interested in pursuing a career in hair loss disorders and is currently under the mentorship of Dr. Natasha Mesinkovska for that purpose. Her particular interests include non-invasive imaging, laser use among various skin types, and public health in medicine.

TAKE HOME MESSAGE:
Platelet rich plasma should be considered in treatment of recalcitrant radiation-induced alopecia.
ABSTRACT:

Case Description: We report the case of a 33-year-old female with history of a teratoma at age 27 with metastasis to the brain at age 30. As chemotherapy was unsuccessful, she underwent generalized head radiation and presented in 2015 with asymptomatic diffuse thinning hair loss, more prominent on frontal, vertex, and parietal scalp. Diagnosis is consistent with radiation-induced scarring alopecia. Treatments in the past two years have included intralesional kenalog, microneedling, and fractional photothermolysis. Although the condition is stable, these treatments have yielded minimal improvements and the patient opted for a trial of platelet rich plasma (PRP). She has received three rounds of PRP, six weeks apart and reports improvement in hair texture and frontal and vertex hair volume at her 6 week follow up appointment. Non-invasive in-vivo laser imaging data, suggest 20% improvement in hair follicle and hair shaft amount compared to pre-PRP treatment.

Discussion: This case shows that PRP may be an effective treatment for radiation-induced scarring alopecia. The patient presented here is satisfied with her results and is validated by quantitative measures of change. We intend to report results at even longer term follow-up of three and six months post-third-PRP-treatment, as it is important to further develop guidelines for dosing frequency of PRP in radiation-induced alopecia.

Effectiveness Of Laser Technology For Non-scarring And Scarring Alopecia
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Andrea Tovar-Garza finished her dermatology residency in Guadalajara, Mexico n 2016. She did a two year research fellowship at UT Southwestern focusing on pigmentary disorders with Dr. Amit Pandya. She is currently an international observer at Wake Forest focusing on hair loss with Dr. Amy McMichael.

A. Tovar-Garza: None. L. Uwakwe: None. A. McMichael: None.

TAKE HOME MESSAGE:
Laser technology is a potential new therapeutic option for non-scarring alopecia. Fractional Er:Glass and Diode laser have shown some effectiveness on alopecia areata. Excimer laser has certainly been reported to improve hair regrowth in three placebo-controlled studies. Fractional Er:Glass laser has shown promising results in androgenetic alopecia. Studies in scarring conditions are lacking and need further research.

ABSTRACT:

Introduction: Hair loss caused by different types of alopecia has a negative impact on the individual’s quality of life. The use of laser technology for hair loss has been recently reported for scarring and non-scarring conditions with inconsistent results.

Objective: To perform a literature review to evaluate the effectiveness of laser technology in scarring and non-scarring alopecia.

Materials and Methods: A broad literature search using Pubmed, Google and Google Scholar was performed in January 2018. The search terms employed included: alopecia, laser, Nd:YAG, Er:Glass, excimer, alopecia areata, androgenetic alopecia and lichen planopilaris. Titles and abstracts were reviewed for relevance. Prospective and retrospective clinical trials, case series and case reports were included in the literature review.

Results: 14 studies were included. 9 studies focused on alopecia areata (AA), 2 on androgenetic alopecia, 2 on lichen planopilaris (LPP) and 1 on dissecting cellulitis (DC). In AA, fractional Er:Glass laser reported >75% hair regrowth in 40 patients at 2 to 6 months. Infrared diode laser reported >90% complete hair regrowth in 16 patients with patchy AA at 2 months. Infrared radiation showed effectiveness in 47% to 75% of patients with AA as adjuvant treatment. A study using Nd:YAG and CO2 failed to show improvement when compared to placebo. Excimer laser has shown to be effective in three placebo-controlled studies for AA. Fractional Er:Glass laser reported 70% to 80% hair regrowth in 48 patients with androgenetic alopecia. In LPP, excimer laser reported mainly decrease in symptoms and only 23% hair regrowth. One study failed to show efficacy of Er:Glass for FFA. One case report of DC, treated with isotretinoin and CO2 laser reported > 75% improvement after 17 sessions.
Conclusion: Laser technology is a potential new therapeutic option in alopecia areata, androgenetic alopecia and lichen planopilaris. However, additional randomized controlled trials are necessary.

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Multiphoton Microscopy For Diagnostic Indices In Alopecia Areata
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Jessica Lin is a third year medical student at the University of California, Irvine. She has been working on optical imaging for hair research under the mentorship of Dr. Natasha Mesinkovska for 2.5 years.


TAKE HOME MESSAGE:
In this study, MPM was able to visualize disease-related changes of the hair follicle. The sub-micron resolution of the scalp epidermis and dermis provided non-invasive and label-free access to the evaluation of the presence of inflammation and hair follicle changes. Though there are technical limitations of MPM, there is no doubt that future models may be valuable tools in the clinic for diagnosing and managing alopecia areata.

ABSTRACT:
Alopecia Areata (AA) is a nonscarring type of alopecia that commonly presents as well-circumscribed patches of hair loss on the scalp. AA, an autoimmune disease, causes a lymphocytic infiltration of the follicular bulb, predominantly catagen or telogen hairs, fibrous tracts, and intact sebaceous glands on histology. In vivo imaging studies using devices like the confocal microscopy (CM) and ultrasound (US) are becoming increasingly prevalent among clinicians because of their noninvasive nature and minimal risks. Our study explores the utility of multiphoton microscopy (MPM), which has greater resolution than both CM and US, as an adjunct to histological studies and a diagnostic tool for alopecia areata (AA). With the MPM, cellular details of the epidermal portion of the follicular unit can be visualized using autofluorophores and infrared wavelengths of light. Using MPM, differentiation of follicular structures can be visualized in real time without using any stains or contrast material. MPM also allows the clinician to examine multiple sites during the same imaging sessions without having to perform any incisions. The most impactful improvement of using MPM is that the same area can be followed through time to track disease progression, which is not possible with biopsy techniques. Many hallmark features of AA can be confirmed using MPM like exclamation point and vellus hairs. Our pilot study using MPM to study AA bridges laser-based technological advances with modern clinical practice. In our results, features seen in histology and MPM are compared.

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Optical Coherent Tomography In The Diagnosis Of Scalp Disorders
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I am a dermatologist from Mexico City with special interest in hair diseases. My professor is Dr. Antonella Tosti, with who I have the great opportunity to learn about hair disorders in Bologna and in Miami. I am part of the Mexican Trichology society.

TAKE HOME MESSAGE:
OCT is a useful tool in the diagnosis and follow up of patients with inflammatory scalp disorders.

ABSTRACT:
Introduction Clinical manifestations of inflammatory scalp disorders sometimes overlap. It is important, before initiating treatment to establish diagnosis and severity of the disease. D-OCT is a non-invasive imaging modality using optics to acquire real-time cross-sectional and en face images of tissue up to 2 mm below the skin surface and can capture blood vessels and their distribution. Allowing understanding of skin architecture and vascularization in vivo. Objective To describe the structural and vascular findings in different inflammatory scalp disorders using D-OCT Methods This was a retrospective observational study aimed to evaluate the characteristic features in scalp disorders in OCT. In this study 9 patients with psoriasis, lupus erythematosus, contact dermatitis, and seborrheic dermatitis were evaluated. Results Normal scalp vessels has an interfollicular granular pattern, more intense at deeper plexus. In Psoriasis, superficial plexus showed spindle like scattered vascular dilations, more evident at deeper levels and on cross-sectional view (CSV) spiral network of vessels at dermal papila. Seborrheic dermatitis showed a network of arborizing vessels, more dilated and ramified at deeper levels. Contact dermatitis has a dilated network of vessels at deeper levels and a diffuse pattern of enlarged vessels present along all dermis on CSV. In Lupus at the inflammatory areas with alopecia, were almost absence of the superficial plexus and at deeper levels giant dilated serpiginous capillaries. On CSV, showed clusters of capillaries around the hairs, while in cicatricial areas dilated vessels were prominent and distributed homogenously. Conclusion. OCT is a useful tool in the diagnosis and follow up of patients with inflammatory scalp disorders.

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Anagen Hair Follicle Repair: A Regenerative Scheme Utilizing Ectopic Stem Cells To Resume Anagen After Follicular Injury
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Dr. Sung-Jan Lin is Professor of Institute of Biomedical Engineering and Department of Dermatology at National Taiwan University and a dermatologist in National Taiwan University. He received his MD in National Taiwan University College of Medicine and PhD. He takes hair follicles, with a distinct structure and the unique arrays of arrangement, as a model to understand how an organ is damaged or lost in pathological states and to decipher the repair and regeneration machinery in response to insults. His lab employs a multidisciplinary approach by combing the knowledge in biology and tissue engineering to enhance hair follicle regeneration.His work has been recognized by Award for Junior Research Investigators in Life Science of Academia Sinica, Physician Scientist Award of Taiwan National Health Research Institutes and Distinguished Research Award of Taiwan Ministry of Science and Technology. In 2014, he was elected as Taiwan Bio-development Foundation (TBF) Chair in Biotechnology.

S. Lin: None.

TAKE HOME MESSAGE:
Understanding anagen hair follicle repair, a distinct regenerative scheme, can help to develop new strategies to enhance regeneration and to prevent hair loss from insults.

ABSTRACT:
The growing phase, or anagen, of human scalp hair can persist for longer than 30 years. Premature disruption of the ongoing anagen can lead to unwanted hair loss or alopecia. How anagen hair follicles attempt to repair themselves following various injuries to bypass premature catagen/telogen entry is not well studied. We employed genotoxic injury of radiotherapy and chemotherapy to explore the mechanisms of anagen hair follicle repair. Though stem cells are considered not present in the lower segment of anagen hair follicles, we found that physiologically unipotent lower proximal cup cells or outer root sheath cells are mobilized to regenerate lost follicular structures of various cell differentiations according to the severity of injuries to resume the ongoing anagen. After anagen repair, the
progeny of outer root sheath cells can further home back to the stem cell niche to regenerate the next anagen. We demonstrated that enhancing the mobilization of these unconventional progenitor cells can prevent hair loss induced by radiotherapy and chemotherapy. Anagen hair follicle repair represents a regenerative scheme that is distinct from telogen-to-anagen regeneration. Understanding how anagen hair follicle repair is regulated can help to develop new strategies to prevent hair loss from insults.

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A Method To Produce A Hair Follicle Like Organoid Using Matrix Cells
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As a senior research in the field of hair growth at l'OREAL, I have been working for many years in the goal to better understand the physiology and cells interactions within the human hair follicle. Convinced that these well orchestrated interactions are keys for future, I developed in vitro approaches to increase the knowledge and to improve the methods in the goal to bring solutions for the treatment of androgenic alopecia.

K. Bakkar: None.

TAKE HOME MESSAGE:
Isolation of matrix cells, amplification, production of dermal papilla fibroblasts spheroids and production of hair follicle like organoids.

ABSTRACT:
In the functional adult human hair follicle unit, two specialized types of cells continuously interact to form the hair fiber and the different hair sheaths. First, a specialized keratinocyte lineage called matrix cells which have a high proliferation rate only when located below the so-called Auber’s line and which ended in a differentiation process to form the hair fiber as well as the different hair sheaths, and second a population of highly specialized non proliferative fibroblasts embedded in an ovoid structure, the dermal papilla (DP), made of a rich protein/GAG network. Numerous reports demonstrated in vivo DP cells’ inductive properties in mice. However the challenge to reproduce in vitro a human hair follicle morphogenesis remains very high. Recently it was shown that a skin organoids from mouse pluripotent stem cells were able to produce hair follicles in vitro (Jiyoon Lee, 2017). Of note, in vitro human hair follicle-like structures from human epithelial and dermal cells were also previously reported. In the goal to produce in vitro human hair follicle structures, we isolated and amplified human matrix cells from adult human hair follicle. These isolated matrix cells were further characterized by immunohistology. In parallel, DP spheroids were prepared from human dermal papilla fibroblasts, and further characterized by alkaline phosphatase activity and expression of specific markers. Finely tuned combinations of matrix cells and DP spheroids resulted in the formation of few millimeters long rod like organoids. Results will be presented in time for the meeting.

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Sebaceous Gland Transcriptome for Lichen Planopilaris
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Animal Models of Scarring Alopecias
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Dr. Sundberg earned his DVM in 1977 from Purdue University College of Veterinary Medicine and a PhD in 1981 from the University of Connecticut. He has worked on mouse models of human diseases for over 30 years as a
scientist at The Jackson Laboratory. His research focuses on mouse models for skin, hair, and nail diseases. He is the chairman of the Cicatricial Alopecia Research Foundation (CARF) Scientific Advisors.

J.P. Sundberg: None.

**TAKE HOME MESSAGE:**
An ever growing number of mouse models are available in biorepositories and more are being developed by researchers worldwide as well as in large scale mutation programs, such as the Knockout Mouse Program. These biomedical tools will help expand our understanding of many complex diseases including the cicatricial alopecias.

**ABSTRACT:**
An evolving theme in human primary cicatricial alopecias is that sebaceous glands are involved in the pathogenesis of some forms of scarring alopecia. This hypothesis, while first reported in 1992 in humans, was actually first described as sebaceous adenitis in dogs and later detailed in the asebia mouse model. An increasing number of simple autosomal recessive mutations have been identified in laboratory mice that affect sebaceous glands in a negative way resulting in scarring alopecias; however, many others do not. These observations suggest that more detailed studies of sebaceous gland and sebum function in humans and rodent models will provide valuable insights into the pathogenesis of specific forms of human primary cicatricial alopecias. Other mouse models reveal primary defects in the hair follicles as well as the possible role of diet in the pathogenesis of other forms of primary cicatricial alopecias. A brief summary of these models will be presented to reveal the diversity of biomedical tools that are currently available to study this group of diseases.

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**Hair follicle epithelial stem cells undergo EMT in LPP, which can be antagonized PPARg Agonists**

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**Histopathology Of Facial Papules In Frontal Fibrosing Alopecia And Therapeutic Response To Oral Isotretinoin**

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**TAKE HOME MESSAGE:**
• Perifollicular inflammation alone is not responsible for the formation of facial papules (FP) in patients with frontal fibrosing alopecia (FFA).• Perifollicular architecture derangement (destruction of elastic fibers + remodeling of sebaceous lobules) contributes to the clinical formation of FP.  • Successful treatment of FP with oral isotretinoin corroborates this idea.

**ABSTRACT:**
**INTRODUCTION:**
Facial papules (FP) were first reported in frontal fibrosing alopecia (FFA) patients in 2007. Even though FP have been linked to facial vellus hair follicle involvement by the disease, how this finding alone could lead to the formation of clinically evident FP has not been addressed. Currently, there are no therapeutic options for these
lesions.

**OBJECTIVES:** To describe histopathological findings of FP in the context of FFA, highlighting features that may be linked to their clinical formation. In addition, to evaluate oral isotretinoin in the treatment of FP in FFA patients.

**METHODOLOGY:** Cutaneous FP biopsies of FFA patients performed between January 2016 to May 2017 were retrieved from our pathology database and reexamined by two pathologists. In addition, three patients with FFA with prominent facial papules were given oral isotretinoin for three months.

**RESULTS:** Histological sections of thirteen 3.0-mm punch biopsy specimens from seven patients demonstrated prominent sebaceous glands in 11 specimens and dilated sebaceous ducts in 10. Pinkus-acid-orcein staining revealed reduction and fragmentation of elastic fibers in 12 samples. In seven of these, this finding was observed both in papillary dermis and reticular dermis, especially around sebaceous lobules. Vellus hair follicle involvement was seen in two samples only. Regarding therapeutic results, at the end of the third month of treatment with oral isotretinoin, FP had completed disappeared or were considered minimal in all patients studied.

**CONCLUSION:** Prominent sebaceous lobules with dilated ducts associated with an abnormal elastic framework seem to be the main explanation for the formation of facial papules in the context of FFA. The dramatic response observed after isotretinoin, a drug known to cause atrophy of sebaceous glands, corroborates this idea. Finally, our study is the first to show that oral isotretinoin may be a therapeutic option for facial papules in FFA patients.

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**New Techniques: Methods of Assessment of Cicatricial Alopecia**

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**Central Centrifugal Cicatricial Alopecia Clinical Presentation and Treatment Approaches**

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Dr. Amy McMichael is Professor and Chair of Dermatology at the Wake Forest University School of Medicine. She received her MD at the University of Pennsylvania School of Medicine, dermatology training at the University of Michigan and advanced training in epidemiology at the Wake Forest School of Medicine Department of Public Health Sciences. Dr. McMichael is a diplomat of the American Board of Dermatology. Her research focuses on hair and scalp disorders and skin disease of deeply pigmented skin. Her publications include many peer-reviewed articles, chapters, and invited articles on these topics. She is the also the co-editor of the text *Hair and Scalp Diseases: Medical, Surgical, and Cosmetic Treatments*. Dr. McMichael is on the Editorial Board of Cosmetic Dermatology and JAMA Dermatology and has served as a consultant to the pharmaceutical industry. She has served as a member of the Scientific Advisory Council to the National Alopecia Areata Foundation, is the immediate past-President of the Skin of Color Society, and Chair, Career Advancement Committee of Womens Dermatologic Society. She has served as Vice-President of the Womens Dermatologic Society, Secretary-Treasurer of the North American Hair Research Society, and Chair of the Dermatology Section of the National Medical Association.

**A.J. McMichael:** Research Grant (principal investigator, collaborator or consultant); Allergan, Cassiopea, Proctor & Gamble, Samumed. Ownership Interest (royalty, patent, or other intellectual property); Informa Healthcare, UpToDate. Consultant/Advisory Board; Aclaris, Allergan, Bioniz, Cassiopea, Covance, eResearch Technology, Galderma, Guthey Renker, Incyte, Johnson & Johnson, Keranetics, Merck, Merz Pharmaceuticals, Pfizer, Proctor & Gamble, Samumed.

**TAKE HOME MESSAGE:**

It is of great benefit to determine if there is any advantage in using a particular therapy over the others that are conventionally used to treat CCCA.
ABSTRACT:
Central centrifugal cicatricial alopecia (CCCA) is a chronic and progressive scarring alopecia affecting predominately African American women. The disease progression usually results in permanent hair loss and can cause significant psychosocial consequences. CCCA has been postulated as the most common cause of permanent scarring hair loss in African American women. The management of CCCA is approached symptomatically rather than through evidence-based recommendations. To relieve inflammation and decrease pruritus, intralesional and topical steroids, oral antibiotics, increasing the frequency of hair washing, and antidandruff shampoos are commonly used treatments. Potentially damaging hair care practices are discouraged. Since there is limited data on the most effective treatment approach for CCCA patients, it is of great benefit to determine if there is any advantage in using a particular therapy over the others that are conventionally used to treat CCCA. A previous study at our institution collected data on 15 patients. Photographs of these patients were analyzed by two investigators. Data showed 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. Further analysis of a larger sample size will be needed for more specific prediction of outcome based on epidemiologic data collected.

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Prevalence of Centrifugal Cicatricial Alopecia in a Cohort of African American Women: Analysis of CCCA in the Black Women’s Health Study
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Dr. Yolanda Lenzy is a board-certified dermatologist specializing in medical, cosmetic, skin and hair care for adults and children. Her research and clinical practice focuses on hair and scalp disorders and skin disease in skin of color. 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. She has authored numerous publications for academic journals, book chapters and nationally distributed patient education materials. She serves on the Board of Directors of the Cicatricial Alopecia Research Foundation. Dr Lenzy is a Clinical Associate at University of Connecticut Health Sciences Center and the Medical Director of Lenzy Dermatology & Hair Loss Center in Chicopee, MA.

Y.M. Lenzy: None.

TAKE HOME MESSAGE:
96 Normal 0 false false false EN-US X-NONE X-NONE /* Style Definitions */ table.MsoNormalTable {mso-style-name:"Table Normal"; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-priority:99; mso-style-parent:""; mso-padding-alt:0in 5.4pt 0in 5.4pt; mso-para-margin:0in; mso-para-margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:12.0pt; font-family:"Calibri"; mso-ascii-font-family:Calibri; mso-hansi-font-family:Calibri; mso-theme-font:minor-latin;} Hair loss ranks in the top 5 reasons for which women of color see a dermatologist. In this largest study of hair loss in African American women, 47.6% of the 5594 women who participated in this study of the Black Women’s Health Study cohort reported ever hair loss on top of scalp. Of these, advanced hair loss (grades 3-5) was reported in 8.8% reported a prior diagnosis of CCCA of which 6.7% were biopsy proven. These findings confirm that the true prevalence is much higher than suggested in previous smaller studies.
ABSTRACT:
Hair loss is a common complaint among women of African descent. Centrifugal Cicatricial Alopecia (CCCA) is the primary reason that African American women seek medical consultation for their hair. Despite the frequency of the condition, there has been a paucity of data on the exact prevalence, cause and evidence-based therapies. To date, the literature reveals a 1.9% to 5.6% prevalence rate, but a higher than reported prevalence of CCCA is suspected given the high incidence of CCCA among new alopecia patients in our clinical practices. The purpose of this study is to determine the prevalence of hair loss among a cohort of 59,000 African American women across the United States and to examine the independent and interactive role of hair grooming practices, genetics, other forms of concomitant hair loss, inflammatory conditions and nonmalignant growths. The Black Women’s Health Study (BWHS) is a follow-up study of 59,000 African American women that began in 1995. The participants are from across the US and are followed by biennial health questionnaires. Participants who completed the main 2015/2016 questionnaire, either by mail or on the web, were invited to fill out a web questionnaire about hair loss. 5594 women out of 31,000 who completed the main questionnaire so far have answered the hair loss questionnaire. 47.6% of the 5594 women reported ever hair loss on top of scalp. Fifty-five percent (55%) self-reported a grade of 2+ using the NAHRS Central Hair Loss Grading scale. Of these, advanced hair loss (grades 3–5) was reported in 37.2% of these respondents, a score consistent with clinically evident CCCA. 8.8% reported a prior diagnosis of CCCA of which 6.7% were biopsy proven. These findings confirm that the true prevalence is much higher than suggested in previous smaller studies.

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Tofacitinib Shows Efficacy In Treatment Of Lichen Planopilaris
Brigitte N. Sallee, MD.
Columbia University, New York, NY, USA.

Brigitte Sallee MD is a translational medicine fellow in the lab of Angela Christiano PhD at Columbia University. She works on scarring and lymphocytic alopecia projects partnering with faculty clinicians from Columbia University Department of Dermatology. Brigitte earned her MD in 2016 from the University of Oklahoma College of Medicine and completed her internship training in Chicago, June 2017. She is a graduate of the University of Oklahoma Honors College with a BS in Zoology and BA in Classics and Letters.

B.N. Sallee: None.

TAKE HOME MESSAGE:
JAK inhibitors represent a promising new treatment option for LPP.

ABSTRACT:
Introduction: The clinical management of lymphocytic scarring alopecias such as lichen planopilaris (LPP) varies widely, with a lack of evidence to guide treatment for patients with this disfiguring disease. LPP is a dermatologic emergency requiring immediate, effective treatment to prevent scarring and preserve the hair follicle (HF). Both AA and LPP HFs show evidence for immune privilege collapse, characterized by increased expression of MHC-I and II, however, the location of the immunological attack is anatomically distinct. In AA, the inflammatory infiltrate involves the lower anagen HF bulb region, whereas in LPP, the infiltrate is primarily found in the upper follicle, around the bulge region. The composition of the inflammatory infiltrate in AA and LPP involves primarily a Th1 cytotoxic CD8+ T-cell response, with increased expression of the interferon-inducible chemokines, including CXCL9/10/11. A variety of immunoactive therapies have been tried in both AA and LPP including topical, intraleional and oral corticosteroids with inconsistent results. Objective: We previously showed that the small molecule pan-JAK inhibitor, tofacitinib, is effective in modulating the inflammatory response in AA patients and restoring hair growth in affected individuals. Methods: We investigated whether tofacitinib would be similarly effective in the treatment of LPP. Results: We successfully treated 8 patients with oral tofacitinib, showing improvement in the LPP activity index (LPPAI) from 30-94% after treatment (paired t-test, p=0.0014). Two of our 8 successfully treated patients required dose escalation from 5mg BID to TID for measurable response. We also show LPP flaring upon tofacitinib withdrawal, and disease rescue upon re-initiation of therapy. Importantly, no adverse
effects were reported, and there were no significant changes from pre-treatment values in complete blood count,
complete metabolic, or lipid panel laboratory values. Conclusions: JAK inhibitors represent a promising new
treatment option for LPP, and these early open label studies invite further randomized placebo-controlled trials.

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Genetics, Immunology, Therapeutic Targets
Angela Christiano, PhD
Columbia University, New York City, NY, USA.

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Experience with JAK Inhibitors
Wilma F. Bergfeld, MD
Cleveland Clinic, Cleveland, OH, USA.

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Preclinical to Clinical Translation of JAK Kinase Inhibitors
Paul Changelian, PhD
Aclaris Therapeutics, Inc, Confluence Discovery Technologies, Wayne, PA, USA.

The idea to target JAK inhibitors as immune-suppressive drugs was first conceived following the demonstration that
“The Bubble Boy” had a genetic defect that prevented him from signaling via the JAK3/gamma chain signaling
module. Pfizer sought to recapitulate this immune suppression as an approach to prevention of organ transplant
rejection. The resulting drug discovery program resulted in a compound that was equipotent on JAK3 and JAK1,
with about 20-fold selectivity for JAK2. This drug (tocafitinib) successfully treated renal transplant patients for up
to 5 years post-transplant – preventing organ rejection. In parallel, it was shown that lower doses of this drug were
effective in treating rodents and people with rheumatoid arthritis and was approved for this indication in 2012.
Since then, as safety data has accumulated with tofacitinib in RA patients, other autoimmune and inflammatory
diseases have been studied in clinical trials. In addition, numerous other companies have developed novel JAK
kinase inhibitors with different specificity profiles (JAKinibs). Finally – while tofacitinib and other JAKinibs have
shown excellent efficacy – the potential for over-immune suppression remains a concern. One solution to this
problem - in the case of dermal diseases - is to prepare topical versions of these drugs. Dual goals of such an
approach are to have a drug that is active in the appropriate level of the skin, but does not result in high levels of
systemic exposure – thereby limiting the risk of immune suppression and infectious sequelae. This history and the
current efforts to expand the range of diseases that can be targeted with these strategies will be discussed, with a
special emphasis on disorders of the hair including alopecia areata and androgenetic alopecia.

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Janus Kinase Inhibitor CTP-543: Emerging Treatment Option for Alopecia Areata
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Concert Pharmaceuticals, Lexington, MA, USA.

Dr. James Cassella is the Chief Development Officer at Concert Pharmaceuticals where he leads the company’s drug
development efforts with direct responsibility for the CMC, preclinical, clinical, and regulatory functions. Prior to
joining Concert, Dr. Cassella was Chief Scientific Officer and Executive Vice President, R&D of Alexza
Pharmaceuticals where he was responsible for the development of various CNS products, including the marketing
approval of ADASUVE® in the US and EU. Prior to Alexza, Dr. Cassella was one of the original scientists at
Neurogen Corporation and held various management positions, including Senior Vice President of Clinical Research
& Development. Before joining the biotechnology industry, Dr. Cassella was Assistant Professor of Neuroscience at
J. Cassella: Employment; Employee of Concert Pharmaceuticals. Ownership Interest (owner, stock, stock options); own stock and receive stock options from Concert Pharmaceuticals.

**TAKE HOME MESSAGE:**

- Janus Kinase (JAK) is a family of intracellular tyrosine kinases that play a central role in the signaling of cytokine and growth factor receptors.
- Therapies that target the downstream JAK effectors have shown efficacy in autoimmune disorders such as atopic dermatitis, psoriasis, and rheumatoid arthritis.
- Alopecia Areata (AA) is an autoimmune disorder characterized by non-scarring alopecia affecting scalp and body hair. There is no preventative therapy or cure for AA.
- The mechanism of hair loss in AA appears to be mediated by cytotoxic T cell attack of the hair follicle after loss of immune privilege, regulated by upstream JAK signaling.
- Inhibition of JAK1/JAK2 has been shown to be effective in reversing hair loss in patients with AA.
- CTP-543, a deuterated analog of ruxolitinib, is an oral, selective JAK1/2 inhibitor in Phase 2 clinical development for the treatment of moderate to severe AA.

**ABSTRACT:**

Alopecia areata (AA) is an autoimmune disease characterized by non-scarring hair loss. There is currently no preventative therapy or cure. The mechanism of hair loss in AA is believed to involve cytotoxic T cell attack of the hair follicle after loss of immune privilege, regulated by upstream Janus Kinase (JAK) signaling. A pilot study conducted by investigators at Columbia University demonstrated clinical efficacy of oral ruxolitinib, a selective JAK1 and JAK2 inhibitor, in patients with moderate to severe AA [Xing, 2014]. The majority of patients exhibited extensive hair regrowth within 3 to 6 months of treatment initiation [Mackay-Wiggan, 2016].

Concert has applied its deuterium chemistry platform to ruxolitinib. CTP-543 is an oral JAK1/2 inhibitor with a selective cytokine inhibition profile structurally identical to ruxolitinib except for selective substitution of eight deuterium atoms in place of hydrogen. It has been shown that, in certain cases, deuterium substitution can positively impact the metabolic properties of a drug while preserving its intrinsic pharmacology. Differences in drug exposure and dosing regimens may be important determinants of clinical benefits and risks. CTP-543 may provide therapeutic efficacy on AA-relevant pathways while potentially reducing undesirable adverse effects associated with ruxolitinib or other JAK inhibitors.

CTP-543 is in clinical development for the treatment of moderate to severe AA, and more than 125 individuals have received CTP-543 to date. CTP-543 has completed Phase 1 testing in healthy subjects where it demonstrated a favorable safety and pharmacokinetic profile. We subsequently initiated a 24-week double blind, placebo-controlled, dose-ranging Phase 2 trial in patients with moderate to severe AA, which is currently ongoing. Initial clinical findings from Phase 1 and ongoing development plans will be discussed.
TAKE HOME MESSAGE:
Pfizer has discovered and is developing JAK inhibitors with varying selectivity profiles and has adopted a novel approach (the platform study) to studying them for the treatment of AA.

ABSTRACT:
In an effort to tailor potential medicines for specific diseases, Pfizer has discovered and is developing JAK inhibitors with varying selectivity profiles against the 4 members of the JAK family, JAK1, JAK2, JAK3 and TYK2. Two of these drugs, PF-06651600 (“JAK3”) and PF-06700841 (“TYK2/JAK1”), are each predicted to target signaling pathways for key cytokines (including interleukin [IL]-2, IL-15, IL-21, IL-12/23 and interferon gamma) involved in the pathogenesis of alopecia areata (AA). Pfizer has therefore adopted a novel approach to studying them for the treatment of AA: the platform study design, which allows for efficiently comparing each against placebo and the other during the early stages of development. The expectation is that study B7931005 (ClinicalTrials.gov Identifier: NCT02974868) will permit selection of one of these drugs to be advanced into dose-ranging and registrational studies.

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Role Of The Autophagy Protein, Syntaxin 17, In Melanogenesis And Alopecia Areata
Stephanie O. Erjavec, B.S., Alexa Abdelaziz, B.S., Lynn M. Petukhova, PhD, Angela M. Christiano, PhD. Columbia University, New York, NY, USA.

I am 3rd year PhD student in the Genetics & Development and Dermatology departments at Columbia University Medical Center. My research broadly focuses on elucidating the underlying genetic mechanisms contributing to Alopecia Areata (AA) disease onset and progression. I am particularly interested in the intersection of pigmentation and immunology in the setting of AA as pigmented hair follicles are preferentially targeted in disease. Furthermore, my research focuses on how the biological process of autophagy contributes to follicular pigmentation and autoimmunity in the context of AA. I incorporate my genetics training into my research through large genetic studies of human AA patients and the identification of mutations in autophagy genes that lead to aberrant system functioning and subsequent improper immune responses and autoimmune attack of the hair follicle.

S.O. Erjavec: None. A. Abdelaziz: None. L.M. Petukhova: None. A.M. Christiano: None.

TAKE HOME MESSAGE:
Autophagy protein, STX17, is implicated in AA disease through previous GWAS and meta-analysis studies. We report a plausible role for STX17 in AA disease pathogenesis through the melanogenesis pathway. The autophagy protein, STX17, plays a vital role in melanogenesis and depletion of this protein results in upregulation of immunogenic antigens capable of inciting an immune response.

ABSTRACT:
Introduction: Sudden whitening of the hair is a clinical observation in Alopecia Areata (AA) that is known as ‘canities subita’, a phenomenon in which scalp hair appears to turn completely white due to the rapid and preferential attack of pigmented hair follicles (HF). This observation led to the hypothesis that HF melanocyte-specific antigens play a key role in AA disease onset. Recently, essential autophagy proteins have been found to have pleiotropic roles in the regulation of the melanogenesis pathway. Interestingly, our previous GWAS and meta-analysis in AA uncovered risk gene, STX17 ($P=3.6 \times 10^{-7}$), which plays a known role in autophagy. Furthermore, STX17 is involved in hair pigmentation of gray horses, in which an intronic mutation was identified as causal for the premature loss of pigmentation. Objective: Our objective is to determine the role that autophagy protein, STX17, plays in melanogenesis in the context of Alopecia Areata. Materials/Methods: In order to probe for this question, we used primary melanocyte cell cultures for knockdown experiments using siRNA targeted against STX17. Furthermore, we assayed protein levels using western blot and melanin content using absorbance microscopy. We
also employed fluorescence microscopy to visualize STX17 localization in hair follicle tissue and sub-cellular localization in primary melanocytes. **Discussion/Results:** We found that STX17 is expressed in hair follicle melanocytes and that STX17 subcellular localization changes in response to melanogenesis stimulation as STX17 appears to migrate distally towards the dendritic tips. Knockdown of STX17 led to inhibition of αMSH-stimulated melanin production and increased expression of MART1 and Tyrosinase, two antigens capable of eliciting T-cell responses in human patients with vitiligo and AA. **Conclusion:** In conclusion, autophagy protein, STX17, plays a role in melanogenesis and disruption of this pathway causes subsequent upregulation of immunogenic antigens, which may be capable of initiating the autoimmune attack on the HF in AA.

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**Peptide Inhibitors Of Gamma-chain Cytokine Signaling In Development For The Treatment Of Alopecia Areata**

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**TAKE HOME MESSAGE:** Specific inhibition of key disease driving cytokines in AA by BNZ-1, including IL-15 and IL-2, could potentially provide a safe and effective treatment for AA.

**ABSTRACT:** The common gamma chain (γc) family of cytokines is comprised of IL-2, IL-4, IL-7, IL-9, IL-15, and IL-21, which control major immune responses and lymphocyte development. However, aberrant γc cytokine activity contributes to or pathologically drives human diseases including, alopecia areata (AA). IL-2, IL-9 and IL-15 have been shown to be elevated in skin lesions from patients with AA and in animal models of AA (Xing 2014; Suarez-Farinas 2015). Importantly, single cytokine mAB therapy is not effective in multi-cytokine diseases like AA, we developed BNZ-1. BNZ-1 is a PEGylated peptide that binds to the γc receptor and inhibits IL-2/IL-9/IL-15 signaling, while leaving intact the signaling of IL-4/IL-7/IL-21. BNZ-1 prevents signaling through the JAK-STAT, PI3K/Akt/mTOR and Raf/ERK/MAPK pathways, which provides a more complete disruption of pathologic cytokine signaling than approaches that target individual signaling pathways (e.g., JAK inhibitors).
BNZ-1 has been tested in a humanized mouse model of graft-versus-host (GVH) disease that manifests as an immune-mediated loss of fur that’s used as a model of AA. In this preclinical proof-of-concept model, humanized NSG mice are transplanted with human lymphocytes and allowed to develop GVH with significant hair loss prior to initiating treatment with BNZ-1 (2 mg/kg IV 2x/wk), anti-IL-2 mAb (5 mg/kg IV 2x/wk), anti-IL-15 mAb (5 mg/kg IV 2x/wk), anti-IL-2 + anti-IL-15 mAbs (2x/wk), or ruxolitinib (30 mg/kg po BID). After 4 weeks of treatment, BNZ-1 was more effective at promoting fur regrowth, as compared to the four other treatment groups (BNZ-1>IL-2+IL-15 mAb = IL-15 mAb > IL-2 mAb >> Rux).

These preclinical PoC results along with IND-enabling safety studies supported a US IND for the conduct of single- and multiple-dose BNZ-1 clinical studies in healthy volunteers that have been successfully completed, with the planning for a Phase 2 Proof-of-Concept study of BNZ-1 in AA underway.

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Photobiomodulation for Treatment of Hair Loss: Mechanisms, Wavelengths, and Future Directions
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Light Devices with Narrowband UVB
Maryanne M. Senna, MD.
Massachusetts General Hospital, Boston, MA, USA.

Maryanne Makredes Senna, MD is a board certified dermatologist and Instructor in Dermatology at Harvard Medical School. She is co-director of the Hair Loss Clinic at Massachusetts General Hospital and is Principal Investigator of the Hair Academic Research Unit at MGH, a clinical trials research unit dedicated to hair loss disorders.

M.M. Senna: None.

TAKE HOME MESSAGE:
Narrowband UVB devices may provide therapeutic benefits to patients with inflammatory forms of hair loss.

ABSTRACT:
This talk will focus on the different types of nbUVB devices available for treating hair loss disorders and provide an overview of how these devices may be utilized in treating hair loss conditions.

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Photobiomodulation: An Update On Novel Clinical Data For The Management Of Alopecia
Ronda Farah.
University of Minnesota Medical School, Minneapolis, MN, USA.

Ronda Farah is an Assistant Professor of Dermatology at the University of Minnesota. She is also the Director of Cosmetic Dermatology and Laser Surgery within the Department of Dermatology. Dr. Farah's special interests include cutaneous applications of photobiomodulation. She also has interests in the use of lasers and other minimally invasive procedures for the management of alopecia. She is the recipient of the University of Minnesota Department of Dermatology Innovation Award. In addition to patient care and clinical research, her passions include teaching and mentoring.

R. Farah: None.
TAKE HOME MESSAGE:
Photobiomodulation is a rapidly growing direct-to-consumer market. However, it is possible that optimal device treatment parameters and design have yet to be fully elucidated. With regards to risks, short term data to-date does not suggest an increased risk of skin cancer when using these devices. Subjects have preferences regarding these devices and their design and this should be incorporated into the patient-physician discussion when selecting a device. Data from a device comparison study suggests that these devices are efficacious in at least a subset of patients.

ABSTRACT:
Since FDA clearance in 2007, photobiomodulation is a rapidly growing therapy for the management of pattern hair loss. Numerous direct-to-consumer devices have since appeared, each with unique design characteristics. Additionally, data from users is lacking. Herein, we present our clinical experience and emerging data on the efficacy of these devices along with their risks. Additionally, we explore these device characteristics and how they may impact patient care.

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Lasercomb On Hair Regrowth In The C3H/HeJ Mouse Model Of Alopecia Areata And Rat Model Of Chemotherapy-induced Alopecia
Jessica Cervantes, Tongyu C. Wikramanayake, Ph.D, Joaquin J. Jimenez, MD.
University of Miami Miller School of Medicine, Miami, FL, USA.

Jessica Cervantes was born in Havana, Cuba in 1990 and immigrated to the United States in 1996. At the age of 16, Jessica founded her own cupcake business, PopsyCakes, as a means to fund her college education. Although she continues to be highly involved in PopsyCakes, her passion for medicine took precedence, culminating in a bachelor's degree in Microbiology and Immunology with highest honors (summa cum laude) from the University of Miami. Jessica is currently a third-year medical student at the University of Miami Miller School of Medicine. She is very passionate about pursuing a career in dermatology, both as a clinician and investigator. In 2016, she completed a one-year research fellowship in the Department of Dermatology, under the mentorship of Dr. Keyvan Nouri, Dr. Antonella Tosti, and Dr. Joaquin Jimenez. Her interests include hair and nail disorders, clinical dermatology and dermatopathology.

J. Cervantes: None. T.C. Wikramanayake: None. J.J. Jimenez: None.

TAKE HOME MESSAGE:
Low-level laser (LLL) treatment is a safe and effective option for stimulating hair growth in the C3H/HeJ mouse model of alopecia areata and rat model of chemotherapy-induced alopecia and should be further explored.

ABSTRACT:
Alopecia areata (AA) is a common autoimmune disease that presents with non-scarring alopecia. We present findings of using a low-level laser (LLL) device (HairMax LaserComb) in a C3H/HeJ mouse model for AA. C3H/HeJ mice were induced with heat treatment for AA development and randomized into two groups; group I received HairMax LaserComb for 20s daily, three times per week for a total of 6 weeks; group II received sham treatment (with the laser turned off). After 6 weeks, hair regrowth was observed in all the mice in group I (laser-treated) but none in group II (sham-treated). Our findings suggest that LaserComb may be an effective device for the treatment of AA in the C3H/HeJ mouse model. We also investigated whether LLL could promote hair regrowth after chemotherapy-induced alopecia (CIA) in a young rat model for CIA. Young rats were randomized into three groups: group 1 (control) received chemotherapy alone, group 2 received chemotherapy followed by LLL therapy and group 3 received chemotherapy followed by sham treatment (with the laser turned off). Chemotherapy agents were administered on day 11-13 after birth to young rats, and LLL or sham treatment was administered once daily on day 13-22. Seven to 10 days after receiving chemotherapy, all rats developed alopecia on the dorsal and ventral trunk. Rats receiving laser treatment regrew hair 5 days earlier than rats receiving chemotherapy alone or sham laser
treatment. The accelerated hair regrowth in laser-treated rats was confirmed by histology. In addition, LLL treatment did not provide local protection to subcutaneously injected Shay chloroleukemic cells. Our results demonstrate that LLL treatment significantly accelerated hair regrowth after CIA, without compromising the efficacy of chemotherapy in our rat model. Findings from our study suggest LLL treatment is a safe and effective option for stimulating hair growth and should be further explored.

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A Clinical Comparison Of FDA-cleared Photobiomodulation Devices For The Treatment Of Alopecia
Ronda Farah, MD1, Angela Wipf, BS1, Molly Hirt1, Alex Holocomb, MS Candidate2, Lindsey Voller, BS1, Margo Winter, BS1, Maria Hordinsky, MD1.
1University of Minnesota, Department of Dermatology, Minneapolis, MN, USA, 2University of Minnesota, Department of Dermatology and University of Minnesota Graduate Studies in Genetic Counseling Program, Minneapolis, MN, USA.

Angela Wipf is a medical student at the University of Minnesota and current research fellow within the University of Minnesota Department of Dermatology. Angela has a passion for hair disease research and has launched numerous alopecia related projects within her institution. She has a special interest photobiomodulation and its effect on hair growth.


TAKE HOME MESSAGE:
There are numerous emerging photobiomodulation devices available for the management of androgenetic alopecia, each with unique characteristics. Ongoing studies are needed to compare their efficacy.

ABSTRACT:
Introduction: Photobiomodulation therapy, also referred to as low-level laser therapy, is an emerging treatment for androgenetic alopecia. Various devices are FDA-cleared for in-office and patient use. However, no known trials to date have directly compared their outcomes against one another.
Objective: To clinically compare and evaluate the use of six FDA-cleared photobiomodulation devices and their effects on hair growth among subjects diagnosed with androgenetic alopecia.
Materials and/or Methods: Male and female subjects with androgenetic alopecia were randomized to one of six FDA-cleared photobiomodulation devices and received treatments as per manufacturer’s recommendations over three months. Photographs of the scalp were obtained at baseline and then each subsequent month using Canfield Scientific photography. Self-assessment questionnaires were administered monthly throughout the study.
Discussion/Results: Fourteen subjects were enrolled in the study; 9 completed the study. Using the Hamilton-Norwood Scale, Ludwig Scale, and Savin Scale to assess degree of hair disease, improvement was seen in 44.4% of subjects, no change seen in 33.3%, and worsening seen in 22.2%. Available data showed 66.7% of patients had improved satisfaction with the overall appearance of their hair from the start of treatment to the final visit. Of subjects that completed the study, 83.3% felt that the devices were easy to use and 50% would recommend or greatly recommend photobiomodulation treatment.
Conclusion: Preliminary data obtained from this study demonstrate variable improvement in subject scores on standardized hair grading scales as well as variable responses on self-assessments. Greater patient numbers and, therefore, continued enrollment is needed.
Fractional Photothermolysis And Induction Of Hair Follicle Growth: A Systematic Review And Single Academic Center Experience

Natasha Mesinkovska, Nica Sabouni, Jessica Lin, Margit Juhasz.
University Of California Irvine, Irvine, CA, USA.

Natasha Atanaskova Mesinkovska MD PhD is a dermatologist and dermatopathologist, and the Director for Dermatology Clinical Research at the University of Irvine. She trained at Mayo Clinic and Cleveland Clinic, where she completed her dermatopathology fellowship with Dr. Wilma Bergfeld. She currently serves a Scientific Officer for the National Alopecia Areata Foundation.


TAKE HOME MESSAGE:
96 Normal 0 false false false EN-US X-NONE X-NONE /* Style Definitions */ table.MsoNormalTable {mso-style-name:"Table Normal"; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-priority:99; mso-style-parent:""; mso-padding-alt:0in 5.4pt 0in 5.4pt; mso-para-margin:0in; mso-para-margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:12.0pt; font-family:"Calibri",sans-serif; mso-ascii-font-family:Calibri; mso-ascii-theme-font:minor-latin; mso-hansi-font-family:Calibri; mso-hansi-theme-font:minor-latin;} The potential use of fractional lasers for treatment of alopecia can have advantages including small to invisible wounds, little bleeding and minimal damage to terminal hair. According to current studies low-energy, high-density protocol should be effective to induce hair growth with fractional laser treatment. There appears to be utility in both scarring and noscarring types of alopecia, but more studies are needed.<!--EndFragment-->

ABSTRACT:
Background: The use of fractional laser therapy for alopecia has been controversial due to varying results as to whether the therapy is truly beneficial. Fractional laser treatments create microthermal injury zones that stimulate the healing process and can lead to increased blood flow, delivery of cytokines and growth factors, as well as stimulate the dermal papilla. This can purportedly accelerate the hair cycle from telogen to anagen, and stimulate transformation of vellus hairs to terminal.

Objective: To review the scientific evidence for the use of ablative and non-ablative fractional lasers for the treatment of alopecia in both animal and human models. To reproduce the parameters in a group of patients with androgenic alopecia (AGA) in clinic.

Materials and Methods: Literature was reviewed from the MedLine database including randomized clinical trials, prospective clinical trials, case studies, and case series. The level of evidence of each study was assessed using the Oxford Centre for Evidence Based Medicine system. In addition, the author will discuss non-published data from clinical patients with androgenic alopecia and scarring alopecia treated with non-ablative fractional lasers.

Results: Lasers used for treatment include the 1064 nm Nd:YAG, 1550 nm erbium glass, 1927 nm thulium, and 10, 600 nm ablative fractional CO2. Published studies indicate that patients on average experienced a 20-60% increase in hair density after multiple treatment sessions. This contradicted the experience that the authors had in clinic. According to current studies low-energy, high-density protocol should be effective to induce hair growth with fractional laser treatment. There appears to be utility in both scarring and noscarring types of alopecia, but more studies are needed.

46
Combination Therapies For Hair Loss Using Energy Based Devices

Neil Sadick.
Sadick Dermatology, New York, NY, USA.
Neil Sadick, MD, FAAD, FAACS, FACP, FACPh Dr. Sadick holds board certifications in internal medicine, dermatology, cosmetic surgery, hair restoration surgery and phlebology. He is one of the world’s most respected dermatologists and is the medical director and owner of Sadick Dermatology, as well as director of Sadick Research Group, which runs multiple FDA clinical trials each year.

- Clinical Professor of Dermatology at Weill Medical College of Cornell University
- Serves on the Board of Directors for the American Academy of Dermatology and Noah Worcester Dermatological Society.
- President of the International Society of Dermatologic Surgery

Dr. Sadick is actively involved in various research projects in the areas of fillers/toxins, cosmetic/dermasurgery, phlebology, cellulite, adipocyte structure and function, stem cells and lasers. He is on the Editorial Board of the Journal of the American Academy of Dermatology, Phlebology, Cosmetic Dermatology, and the Journal of Cosmetic and Laser Therapy.

N. Sadick: Research Grant (principal investigator, collaborator or consultant); Venus concept, endymed, Cutera, cynosure, nutrafol, eclipse. Speakers Bureau/Honoraria (speakers bureau, symposia, and expert witness); Venus concept, endymed, Cutera, cynosure, nutrafol, eclipse. Ownership Interest (owner, stock, stock options); Venus concept.

TAKE HOME MESSAGE:
Combination therapies including microneedling with PRP and nutraceuticals or low-level laser light with PRP and topical minoxidil have been proven to be superior in efficacy than any modality alone.

ABSTRACT:
Topical minoxidil and oral finasteride are the gold standard therapies for AGA and the only two drugs currently that have US Food and Drug Administration (FDA)-approved indications for the treatment of hair loss. Emerging treatment modalities for hair loss include injectable platelet rich plasma (PRP), low-level laser therapy (LLLT), microneedling and oral nutraceuticals. Several peer reviewed studies have demonstrated the safety and efficacy of these methodologies although no standardized protocols exist to date. A new trend of combining therapies in order to achieve maximum synergy of results is increasing embraced. Examples of applying combination therapies in practice for androgenetic alopecia and female pattern hair loss will be presented. Case studies will be shown with a breakdown of protocols, techniques, clinical results and suggested treatment programs.

47
Chemotherapy-induced Alopecia: Prevention and Permanence
Mario Lacouture
Memorial Sloan Kettering Cancer Center, New York, NY, USA.

Dr. Lacouture is an Associate Professor and director of the Oncodermatology Program at Memorial Sloan Kettering Cancer Center. He completed his postdoctoral work at Brigham and Women’s Hospital in Boston, MA, an internship in General Surgery at Cleveland Clinic and residency in dermatology at The University of Chicago. He received his M.D. degree from Javeriana University in Bogota, Colombia, where he grew up. His research interests include dermatologic conditions in cancer patients, and those that arise because of chemotherapy, radiotherapy or stem cell transplants. Dr. Lacouture is currently the Principal Investigator for “The CHANCE Trial”, a longitudinal study of Chemotherapy-Induced Hair Changes and Alopecia, Skin and Nail Changes in Women with Non-Metastatic Breast Cancer. Dr Lacouture has published over 180 articles in peer-reviewed journals and is the author of Dr Lacouture’s Skin Care Guide for People Living With Cancer and Editor of the textbook Dermatologic Principles and Practice in Oncology.
TAKE HOME MESSAGE:
Despite the significant cosmetic and devastating psychosocial impact of CIA and other anticancer therapy-induced alopecias, research into pathophysiology and preventive and reactive management strategies are still needed. At present, the only proven effective strategy of preventing CIA is the use of scalp cooling in patients receiving cytotoxic chemotherapies for breast cancer. However, there is an urgent need to develop better preclinical animal models, hair follicle stem cell protective agents (devoid of cancer stem cell promoting properties), standardized clinical grading systems, and individualized risk prediction strategies.

ABSTRACT:
The most commonly encountered dermatologic adverse event in cancer patients, alopecia, is generally associated with chemotherapy, also known as chemotherapy-induced alopecia (CIA). This is typically reversible within 2-6 months after chemotherapy completion, however, it may be persistent in up to 30% of breast cancer patients treated with taxane-based chemotherapy. Scalp cooling has become the most widely utilized method for the prevention of CIA. This include static devices, and the recently FDA-cleared dynamic scalp cooling systems (DigniCap, 2015; Orbis Paxman, 2017). In a prospective study in 124 breast cancer patients receiving taxane-based chemotherapy, DigniCap™ scalp cooling conferred protection against hair loss in 66% compared to 0% in the uncooled group. In another randomized study using the Orbis Paxman scalp cooling system, hair preservation was observed in 50% (cooling group) vs. 0% (controls) after the 4th chemotherapy cycle (taxane/ anthracycline/ or both). Differences between devices are likely related to operator experience and types of chemotherapy regimens. There is no data on the efficacy of scalp cooling on persistent CIA, hence their use cannot be recommended for this indication. In addition to cytotoxic chemotherapy, targeted and endocrine therapies may also result in alopecia. Endocrine therapy-induced alopecia results from selective estrogen receptor modulators and aromatase inhibitors used in the adjuvant setting in breast cancer survivors, and is noteworthy for its high incidence (up to 30% of patients) and a pattern alopecia similar to androgenetic type. Radiation therapy may also result in persistent alopecia, which is amenable to restorative procedures, that are currently underutilized. Further efforts should be made to understand the mechanism of hair follicle destruction and to identify strategies for possible prevention of persistent CIA in cancer survivors, which have a negative impact on patients’ quality of life.

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Dermoscopy for scarring alopecias
Isabella Doche, MD, PhD
University of São Paulo, São Paulo, Brazil.

Isabella Doche MD, PhD
Board-certified dermatologist
Researcher at the University of Sao Paulo (BRA)
Private practice in Sao Paulo (BRA)

I. Doche: None.

ABSTRACT:
Scarring alopecias can be very tricky sometimes and some hair changes may not always be evident during our clinical examination. Dermoscopy of scalp and hair disorders, also known as trichoscopy, is a non-invasive and practical tool that can help to diagnose and quick distinguish many scalp and hair shaft conditions. Dermoscopy can also help to better select the proper biopsy sites and to enhance the post therapeutic follow-up of many scarring and non scarring alopecias. This presentation will be focused on the main trichoscopic findings of the most frequent scarring alopecias and on how trichoscopy can help dermatologists to enhance their daily practice.
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Dermoscopy for non-scarring alopecias
Rodrigo Permez, MD
Santa Casa da Misericórdia of Rio de Janeiro, Rio de Janeiro, Brazil.

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Hair Cosmetics/Ingredients
Maria Fernanda Gavazzoni-Dias, MD, MsC, PhD
Universidade Federal Fluminense, Niterói, Brazil.

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New Animal Models of Androgenetic Alopecia
Jeff Wu, PhD1, Amos Gilhar, MD2.
1Johnson & Johnson, New Brunswick, NJ, USA, 2Technion - Israel, Haifa

TAKE HOME MESSAGE:
The novel humanized mouse model of AGA holds great potential to systematically explore new candidate anti-AGA agents at the preclinical level and to better characterize the as yet incompletely understood mechanisms of action of traditional agents such as minoxidil.

52
Mechanisms For K_{ATP} Channel In Cultured Human Dermal Papilla Cells Associated With Minoxidil-induced Hair Growth
Hiroya Takada1, Kishio Furuya2, Yasutaka Osada3, Takanori Hama3, Taro Koyama4, Kazuhiro Kobayashi5, Rei Ogawa1.
1Nippon Medical School Graduate School of Medicine, Tokyo, Japan, 2Nagoya University Graduate School of Medicine, Nagoya, Japan, 3Angfa Co., Ltd., Tokyo, Japan, 4Men's Health Clinic Tokyo, Tokyo, Japan.

HIROYA TAKADA, Ph.D.
EDUCATION
2014 PhD of Medicine, Department of Physiology, Graduate School of Medicine Nagoya University, Japan
1999 PhD of Engineering, Department of Energy and Hydrocarbon Chemistry, Graduate School of Engineering, Kyoto University, Japan

PROFESSIONAL EXPERIENCE
2017- Research Fellow of Japan Agency for Medical Research and Development (AMED), Department of Plastic, Reconstructive and Regenerative Surgery, Nippon Medical School Graduate School of Medicine, Japan
2009- Research Fellow, Department of Physiology, Graduate School of Medicine Nagoya University, Japan
2006-2017 Pixy Corporation, Central Institute, Japan
2003-2006 Mitsubishi Corporation (VC60 BioResearch Corporation), Japan
2000-2002 Research Fellow, Centre National de la Recherche Scientifique, Ecole Normale Supérieure de Paris, France
1999-2000 Research Fellow, Department of Chemistry, University of Warwick, UK
1997-1999 Research Fellow of Japan Society for the Promotion of Science (JSPS), Department of Energy and Hydrocarbon Chemistry, Graduate School of Engineering, Kyoto University, Japan

TAKE HOME MESSAGE:
We investigated the cellular response on extracellular ATP release and on the level of K⁺ channel gating in human dermal papilla cells (HDPC) with the addition of an ATP-sensitive K⁺ (K_{ATP}) channel opener, minoxidil sulfate as the active form of minoxidil, and K_{ATP} channel (mainly Kir6.1/SUR2B) blocker, U-37883A. Our data revealed upstream first responses of K_{ATP} channel (extracellular ATP release and K⁺ channel gating) in HDPC induced by minoxidil sulfate. U-37883A remarkably suppressed these responses to the contrary. The opening of K_{ATP} channel by minoxidil sulfate critically contributes to the promotion of therapeutic potency for hair growth. The amplification of signaling via K_{ATP} channel activation may be essential and effective strategy for androgenic alopecia.

ABSTRACT:
(Background) Topical minoxidil therapy is treated with androgenic alopecia. The effect of minoxidil seems that intracellular Ca^{2+} increase and vascular endothelial growth factor production evoked by extracellularly released ATP are crucial factors for maintenance of human hair growth, however, the mechanism involved remains unclear in human dermal papilla cells (HDPC).
(Objectives) We investigated here the cellular response on ATP release and on the level of K⁺ channel gating in HDPC with the addition of an ATP-sensitive K⁺ (K_{ATP}) channel opener, minoxidil sulfate as the active form of minoxidil, and K_{ATP} channel blocker, U-37883A.
(Methods) ATP release was detected using a luciferin-luciferase bioluminescence real-time imaging method. The opening of K⁺ channels was evaluated by the use of a fluorescence-based Tl⁺ flux assay. Ca^{2+} influx images during addition of minoxidil sulfate were obtained by fluorescence microscopy using Fluo-8 AM.
(Results) The continuous and slow extracellular ATP release induced by minoxidil sulfate was observed. The addition of minoxidil sulfate significantly stimulated the opening of K⁺ channels. In the presence of U-37883A (10 μM), a blocker of the K_{ATP} channel, minoxidil sulfate did not evoke the opening of K⁺ channels.
(Conclusion) Our data revealed upstream first responses of K_{ATP} channel in HDPC induced by minoxidil sulfate. The opening of K_{ATP} channel by minoxidil sulfate critically contributes to the promotion of therapeutic potency for hair growth. The amplification of signaling via K_{ATP} channel activation may be essential and effective strategy for androgenic alopecia.

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Hair Health – Lipid Pathways And Hair Biology
Apostolos Pappas.
Nestle Skin Health, Lausanne, Switzerland.

Dr. Pappas is the Head of Programs at Nestle Skin Health (SHIELD Lausanne). He began his career as a research biochemist in the Skin Research Center of J&J in 1999 and later, in 2001, served as a group leader at Munich Biotech, where he worked on cancer research. In 2003, he returned to J&J, where he was a Research Manager and Fellow focusing on skin and lipid metabolism research. He is an adjunct faculty with the Department of Food Science at Rutgers University, a member of the Rutgers Center for Lipid Research, of the scientific advisory board of CARF and visiting faculty at TRI Princeton. Dr. Pappas has authored 40 peer-reviewed scientific publications, patent applications, and four books and he is one of the first to culture cells that were previously not cultured; as human primary sebocytes and human facial preadipocytes.

A. Pappas: Employment; Nestle Skin Health.

TAKE HOME MESSAGE:
Lipid pathways are essential to the existence, health and development of hair follicle; since the major lipid pathways that have been knocked out in preclinical models they universally yielded hair loss, as the first manifestation and phenotypic change. Lipid transcriptional factors and the subcutaneous fat are playing an important role on the fate of the hair follicle stem cells and the anagen growth phase of the hair

ABSTRACT:
The skin is the largest organ of the human body. Numerous lipids are fundamental for skin functions and they seem unusual, as they are not found in other tissues within the human body. Skin lipids are mainly of sebaceous and keratinocyte origin while the subcutaneous layer is consisted mainly of fat cells. Triglycerides, waxes and squalene are secreted by the sebaceous glands and are deposited via the hair canal on the surface of the skin. Sebaceous lipid synthesis are involved in the pathogenesis of acne but also seborrheic dermatitis and oily hair. The unique and complex pilosebaceous lipids such as unusually desaturated fatty acids, waxes and unusual squalene accumulation are unique manifestations for hair biology and health. Impairment of these and related lipid pathways in animal models resulted in severe skin but mainly hair loss phenotypes. More specifically, genes involved in the monounsaturated fatty acid and triglyceride synthesis were proven fundamental for proper hair development. In addition, more evidence has been advocating that essential dietary fatty acids, their metabolites and their nuclear receptors are influencing the hair follicle and fur in several preclinical models. Understanding the roles of skin lipids is fundamental for decoding the basic physiology of healthy skin and hair.

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Transplantation Of Cell Enriched Adipose Tissue For Follicular Niche Stimulation In Early Androgenetic Alopecia

Gorana Kuka Epstein1, Jeffrey Epstein, MD1, Ken Washenik, MD PhD2, Joel Aronowitz, MD3, Mark Glasgold, MD4, Roy Geronemus, MD5, Wilfred Brown, MD5, Eric Daniels, MD6.

1Foundation for Hair Restoration, Miami, FL, USA, 2Bosley medical, Los Angeles, CA, USA, 3Joel Aronowitz MD PA, Los Angeles, CA, USA, 4Glasgold Group, Highland, NJ, USA, 5Laser Skin Surgery Center, New York, NY, USA, 6Kerastem, San Diego, CA, USA.

Dr. Gorana Kuka Epstein is a board-certified plastic surgeon from Belgrade, Serbia, specializing in FUE hair transplant techniques, along with the medical management of hair loss. In addition to her Belgrade practice, she is closely affiliated with the Foundation for Hair Restoration in Miami and NYC, as well as actively conducts FDA-approved research studies. She is a PhD candidate at the Medical School of the University of Novi Sad, Serbia.


TAKE HOME MESSAGE:
Fat + ADRCs is safe and tolerable therapy. In early male hair loss, this therapy demonstrated a statistically significant increase in terminal hair counts relative to the matching control population at 24 weeks and represents a promising new approach for the treatment of early androgenetic alopecia.

ABSTRACT:

Introduction: The objective of this clinical study is to evaluate the safety and feasibility of autologous fat grafts enriched with ADRCs in the treatment of early alopecia. Materials & Methods: A total of 71 subjects were randomized and treated accordingly: 16 with Puregraft fat + 1.0 x 10^6 ADRCs/cm² scalp; 22 with Puregraft fat + 0.5 x 10^6 ADRC/cm² scalp; 24 with Puregraft fat alone; and 9 saline control. Treatments were delivered in the adipose layers of the scalp via two injections - the first a subcutaneous injection of either 0.1ml/cm² scalp of adipose or saline followed by a second intradermal injection of ADRCs or saline in each square centimeter of scalp. In each subject, hair count and width were obtained at baseline, 6-weeks, and 24 weeks. Results: There were zero unanticipated adverse events associated with STYLE. At 24 weeks, there were no statistical differences between any of the treatment groups with respect to terminal or vellus hair counts or width when evaluating all subjects. When evaluating males with early stage hair loss (Norwood-Hamilton 3), a statistically significant increase in terminal hair count (p<0.05) was observed in patients receiving Puregraft Fat + Low Dose ADRCs compared to the Control Population at 24 weeks (mITT; n=29). This population also showed a trended increase in terminal hair width (p=0.065) compared to controls. In the Norwood-Hamilton 3 Per Protocol populations (n=22), terminal hair counts remained statistically significant (p<0.05) in the Puregraft Fat + Low Dose ADRCs versus controls and the terminal hair width also remained statistically trended (p=0.056) versus controls. Conclusions: In early male hair loss, this
therapy demonstrated a statistically significant increase in terminal hair counts relative to the matching control population at 24 weeks and represents a promising new approach for the treatment of early androgenetic alopecia.

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Hair Follicle Microbiome
Heidi H. Kong, MD, MHSc
National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Cancer Institute, Dermatology Branch, Bethesda, MD, USA.

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Hair Follicle Stem Cells
George Cotsarelis, MD
University of Pennsylvania, Philadelphia, PA, USA.

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Regulation of Dermal Papillae
Michael Rendl, MD, PhD
Icahn School of Medicine at Mount Sinai, New York, NY, USA.

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Hair Germ Stem Cell Kinetics
Panteleimon Rompolas
University of Pennsylvania, Philadelphia, PA, USA.

Pantelis Rompolas holds an M.B.A. in Management and a Ph.D. in Biomedical Science from the University of Connecticut Health Center. He trained at Yale University School of Medicine as a New York Stem Cell Foundation - Druckenmiller Fellow, where he developed a system that established for the first time the ability to visualize stem cell activity and hair regeneration in real-time the intact skin of mice. Dr. Rompolas’ work has provided novel insights on the cellular mechanisms of hair follicle growth and epidermal differentiation in adult skin. For this work he has received the Merton Bernfield Memorial Award from the American Society for Cell Biology, the Blavatnik Award in Life Sciences and the American Skin Association Research Scholar Award. Since 2016 Dr. Rompolas is an Assistant Professor of Dermatology at the University of Pennsylvania Perelman School of Medicine. His laboratory focuses on the regulation of stem cells in adult epithelia.

P. Rompolas: None.

TAKE HOME MESSAGE:
TBD

ABSTRACT:
The hair follicle is an incredibly complex, yet efficient organ with a regenerative capacity that can be impaired by disease or aging. Understanding the cellular basis of hair regeneration will lead to better therapeutic approaches to address hair loss. The hair follicle machinery consists of various cell types and non-cellular components that have different requirements and contributions to the regeneration process. Recent advances in mouse genetics combined with live imaging have illuminated the cellular dynamics during hair regeneration, demonstrating that stem cell activation and proliferation is temporally and spatially regulated during the initial stages of hair growth. Gene-specific fluorescent reporters are used to mark single cells in different compartments of the hair follicle, including the secondary hair germ and bulge, in order to trace their activity in real time, in vivo, to determine their specific contribution as the regeneration program unfolds. Such experiments have shown that progenitors in the secondary hair germ undergo a number of asymmetric cell divisions to generate exclusively all the differentiated inner root
sheath and hair shaft lineages that make up the new hair fiber in the subsequent hair cycle. However, these progenitors are terminally differentiated during Catagen and are replaced by new ones emanating from the bulge. Cell ablation experiments show that the physical interaction between the secondary hair germ and the dermal papilla is required for hair growth. Injuring the epithelial component of the hair follicle does not impair hair regeneration as long as the integrity of the interaction with the Dermal Papilla is maintained. Under these conditions non-hair epidermal progenitors can become functional hair follicle stem cells following injury.

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Noncoding Double-stranded RNA And Hair Regeneration
Luis A. Garza, MD-PhD.
John Hopkins University School of Medicine, Baltimore, MD, USA.

Associate Professor, Johns Hopkins University School of Medicine

L.A. Garza: None.

TAKE HOME MESSAGE:
Noncoding dsRNA stimulates wound-induced hair follicle neogenesis.

ABSTRACT:
In my talk I will discuss novel mechanisms which control Wound Induced Hair Neogenesis.

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SHH Signaling In Wound Induced Hair Follicle Neogenesis
Mayumi Ito, Chae Ho Lim.
NYU School of Medicine, New York, NY, USA.

Mayumi Ito graduated Nagoya University in Japan (Ph.D 2003) and then performed postdoctoral research in the laboratory of George Cotsarelis at University of Pennsylvania where she studied the regulation of hair follicle stem cells and hair follicle regeneration during skin wound healing. As she started her own laboratory at NYU school of medicine in 2008, she expanded her interest to include investigations on melanocyte stem cells and nail stem cells during wound healing.

M. Ito: None. C. Lim: None.

TAKE HOME MESSAGE:
Mammalian wound healing typically ends by fibrotic repair and no hair follicle regeneration. We find in mice that scar and wound repair could be remodeled to promote healing with regeneration by modulating developmental pathways.

ABSTRACT:
Mammalian wounds typically heal by repair, leaving behind a scar and the absence of skin appendages, but large wounds in adult mice are known to induce de novo hair follicle regeneration. Adult hair follicle neogenesis undergoes a similar process to embryonic hair follicle development and activates key signaling pathways for hair follicle morphogenesis. Understanding mechanisms underlying adult hair follicle neogenesis has direct implications for treatment of alopecia and wounds. Our group has been dissecting developmental signals during hair follicle neogenesis including Wnt and SHH signaling pathways. We find that scar and wound repair could be remodeled to promote healing with regeneration by modulating SHH pathway. In addition, we have been examining how melanocyte stem cells are regulated during wound healing and contribute to regeneration of melanocytes in the neogenic hair follicles. Based on these studies, we will be discussing how primary mechanisms of wound healing crosstalk with those for hair follicle development. The information will be helpful in developing new strategies to regenerate new hair follicles through modulating developmental/regenerative signals during wound healing.
Dissecting The Hair Follicle Dermal Progenitor Lineage Towards Understanding Their Role In Hair Growth And Hair Loss
Jeff Biernaskie
University of Calgary, Calgary, AB, Canada.

Dr. Jeff Biernaskie is an Associate Professor in Stem Cell Biology and Regenerative Medicine at the University of Calgary. He is a member of the Alberta Children’s Hospital Research Institute and holds the Calgary Firefighters Burn Treatment Society Chair in Skin Regeneration and Wound Healing. He completed his PhD in Neurobiology at Memorial University and undertook postdoctoral training at SickKids Research Institute in Toronto. His lab is interested in understanding how specialized niche cells modulate stem cell behavior and how these cellular interactions ultimately influence tissue homeostasis and regeneration. He is particularly interested in understanding the diverse functions of mesenchymal cells within the skin and adult hair follicle, with the ultimate goal of exploiting these cells to improve tissue regeneration following injury or disease.

J. Biernaskie: None.

TAKE HOME MESSAGE:
Hair follicle dermal stem/progenitor cells function to repopulate the dermal papilla and dermal sheath of growing hair follicles. With advanced aged, hfDSCs exhibit progressive dysfunction which may contribute to the pathogenesis of hair loss.

ABSTRACT:
Hair follicles are one of few adult mammalian tissues capable of continuous degeneration and regeneration throughout life. This regenerative capacity is due to the presence of multiple stem/progenitor populations that reside within each follicle. Understanding their identities and contributions to this process, and the molecular signals that regulate their behavior may provide important insight toward restoration of hair follicle growth and improved skin health. The role of specialized mesenchymal cells that comprise their niche remains poorly understood. I will present fate-mapping experiments that identify the existence of an adult hair follicle dermal stem/progenitor cell (hfDSC) that functions to repopulate the mesenchymal compartments of follicles (dermal papilla and dermal sheath) at the onset of each new regenerative cycle. I will describe experiments examining the molecular cross talk between mesenchymal compartments and the impact of advanced age on hfDSC function.

Skin Equivalent Formation With Hair Follicular Structure
1Department of Dermatology, Seoul National University College of Medicine and Asan Medical Center, University of Ulsan College of Medicine, Seoul, Korea, Republic of; 2Institute of Human-Environment Interface Biology, Seoul National University, Seoul, Korea, Republic of; 3Department of Dermatology, Seoul National University College of Medicine, Seoul, Korea, Republic of.

- Education -2002/03 ~ 2008/02 M.D., Seoul National University College of Medicine, Seoul 2011/03 ~ 2013/02 M.S. in Clinical Medicine, Seoul National University College of Medicine, Seoul2016/03 ~ present PhD. in Medicine, Seoul National University College of Medicine, Seoul - Post-graduate training - 2008/03 ~ 2009/02 Internship in Seoul National University Hospital 2009/03 ~ 2013/02 Residency in Department of Dermatology, Seoul National University Hospital2013/02 ~ 2016/04 Medical officer, Navy, Korea 2016/05 ~ 2017/02 Fellowship in Department of Dermatology, Seoul National University Hospital 2017/03 ~ present Fellowship in Department of Dermatology, Asan medical center

TAKE HOME MESSAGE:
The 3D skin culture system regenerates better organized hair follicles than chamber assay, and this approach can be used for the assessment of a test agent of hair growth-promoting effect.

ABSTRACT:
Background: Hair follicle reconstitution requires highly organized epithelial-mesenchymal interactions. Skin equivalent containing trichogenic epidermal and dermal cell could reproduce these processes, however is not yet well established. Objective: This study is aimed at exploring hair follicle producing 3D skin culture system using trichogenic mouse neonate epidermal and dermal cell. Furthermore, hair growth-promoting signaling was investigated in this system. Methods: The skin equivalent comprised of neonate mouse dermal cells (MDC) embedded in type I collagen and overlaid with neonate mouse epidermal cells (MEC) is used in this study. MDC were mixed with type I collagen and cultured for 7 days. 1 day after adding MEC on top, the composites were grafted onto nude mice. MDC cultured in 2D plate for 7 days mixed with MEC as negative control and freshly isolated MDC and MEC mixture (chamber assay) as positive control were also grafted. 6 weeks after grafting, hair follicles were observed in grafted nude mice and analyzed using hair count assay. To investigate the effect of 3D culture system on hair regeneration, hair inducing gene expression was compared between 2D culture system and 3D culture system. Results: Our 3D skin culture system reproducibly regenerated hair follicles, while MDC precultured in 2D model with MEC did not. Compared to chamber assay which rendered randomly oriented hair follicles, almost every regenerated hair follicle of our system extruded through the skin and the number of regenerated hair follicle was comparable to that of chamber assay. Conclusion: The results demonstrate that better organized hair follicle regeneration was accomplished with this system, and this approach can be used for the assessment of a test agent of hair growth-promoting effect.

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Hair Patterning and telogen kinetics
Maksim Plikus, PhD
University of California-Irvine, Irvine, CA, USA.

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Metabolic Regulation of Hair Follicle Growth
William Lowry.
UCLA, Los Angeles, CA, USA.

William Lowry, Ph.D., uses human pluripotent stem cells to study the process by which the ectoderm, the outermost layer of cells in the early embryo, splits into two distinct lineages of cell types: the cells that comprise the nervous system and the cells that make up the outer surface of the body including skin, hair and nails. Through examining how the ectoderm gives rise to these two stem cell types, Lowry hopes to gain an understanding of how the development process can go awry, leading to intellectual disability syndromes such as autism in the case of neural cells, or a predisposition to cancers like carcinoma in the case of skin cells.

B.S. University of Washington
Ph.D. Cornell Medical College
Postdoctoral Training The Rockefeller University

W. Lowry: Ownership Interest (owner, stock, stock options); Pelage Pharmaceuticals. Ownership Interest (royalty, patent, or other intellectual property); Pelage Pharmaceuticals, University of California Regents.
Consultant/Advisory Board; Carthronix.

TAKE HOME MESSAGE:
Metabolic manipulation can control hair follicle stem cell activation

ABSTRACT:
Dr. Lowry’s research on skin stem cells focuses on how they are prompted to make new hair or heal wounds, and how abnormal skin stem cell activity can lead to tumor development. In examining this process, he studies external factors including how cells interact with one another and their environment, and internal factors such as how they metabolize, or break down, available nutrients. This research has already resulted in the discovery of two drugs that promoted hair growth in animal models by altering the metabolism processes of hair follicle stem cells. Dr. Lowry is now working to manipulate metabolic processes of hair follicle stem cells to stop the initiation and progression of tumors, such as squamous cell carcinoma.

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IL-1 Mediated Activation Of γδT Cells Promotes Tissue Regeneration In A Cutaneous Wound

Rupali Gund1, Abhik Dutta2, Colin Jamora3.
1IFOM-inStem Joint Research Laboratory, Institute for Stem cell biology & Regenerative Medicine, Bangalore, India, bangalore, India, 2IFOM-inStem Joint Research laboratory, Institute for Stem cell biology & Regenerative Medicine, bangalore, India, 3IFOM-inStem Joint Research Laboratory, Institute for Stem cell biology & Regenerative Medicine, Bangalore, India.

Rupali Gund acquired her Ph.D. degree in immunology from National Institute of Immunology in India in 2014. While there she published a first author publication describing how density/affinity of antigenic pMHC modulates the intensity of CD8 T cell response. Her research interests in T cell biology led her to work in a biotech company to discover novel anti-cancer therapies designed to enhance tumor immunity. After a short stint in industrial research, she moved to basic research and joined as a postdoc in IFOM-inStem Joint Research laboratory in bangalore, India. Here she worked on understanding immune mechanisms involved in tissue repair, particularly in skin tissue. Gund published a first author manuscript demonstrating how immune cells interact with local stem cell to facilitate tissue repair. Recently, she started working with Dr. Angela Christiano at Columbia University to understand the immunological pathogenesis of autoimmune skin disease-Alopecia Areata.

R. Gund: None. A. Dutta: None. C. Jamora: None.

TAKE HOME MESSAGE:
Our Findings unveil a novel role of skin γδT cells in activating and recruiting hair follicle stem cells during a wound healing response. These interactions extend the functional repertoire of immune cells beyond their role in protection against pathogens.

ABSTRACT:
Introduction: The wound-healing program is a combination of complex interactions among diverse cell types within the skin. One fundamental process mediated by these reciprocal interactions is the mobilization of local stem cell pools to promote tissue regeneration and repair. Objective: The factors that promote the recruitment of stem cells in a wound environment are unknown. Here, we analysed the signalling components that awaken the stem cells from quiescence and drive their proliferation to facilitate tissue repair.
Materials: The experiments were performed on two models of mouse wound healing-excisional wounds made on 7-8 weeks old adult mice when hair follicles are in quiescent telogen stage & conditionally mutant mice with epidermis specific ablation of caspase-8. Discussion: We found that IL-1α and IL-7 secreted from keratinocytes work synergistically to expand the activated population of resident epidermal γδ T-cells. A downstream effect of activated γδ T-cells is the preferential proliferation of hair follicle stem cells. On the other hand, IL-1α dependent stimulation of dermal fibroblasts optimally stimulates epidermal stem cell proliferation. Conclusion: These findings provide new mechanistic insights into the regulation and function of epidermal-immune cell interactions and how components classically associated with inflammation can differentially influence distinct stem cell niches within a tissue.
**Adipocytes and Hair Cycling**
Valerie Horsley, PhD
Yale University, New Haven, CT, USA.

**Oncostatin M Produced By TREM2+ Macrophages Maintains Quiescence Of Hair Follicle Stem Cells Via JAK-STAT5 Signaling**
Etienne Wang, MBBS, PhD, Angela M. Christiano, PhD.
Columbia University Medical Centre, New York, NY, USA.

Dr Etienne Wang is a Consultant Dermatologist from the National Skin Center in Singapore, and he has just completed his graduate studies in Cellular, Molecular and Biological Sciences in Columbia University in the laboratory of Dr Angela Christiano. His work integrates hair cycling, epidermal stem cell biology, immunology and computational biology.

E. Wang: None. A.M. Christiano: Consultant/Advisory Board; Aclaris Therapeutics.

**TAKE HOME MESSAGE:**
A specialized subset of TREM2+ macrophages contribute to the maintenance of HFSC quiescence during telogen by producing Oncostatin M, which inhibits HFSC proliferation.

**ABSTRACT:**

**INTRODUCTION** Our lab previously demonstrated that topical JAK inhibition was sufficient for inducing hair growth (anagen) when applied topically to telogen skin in C57BL/6 mice. **OBJECTIVE** We aim to identify the nature of the JAK-STAT signal that maintains quiescence during murine telogen and define its source.

**METHODS** We identified candidate factors that promote HFSC quiescence via JAK-STAT signaling with **in vivo** experiments. These effects were confirmed with genetic models, small molecule inhibitors and neutralizing antibodies. Single-cell RNA sequencing was used to identify the cellular source of this factor.

**RESULTS** We show that Oncostatin M (OSM), a member of the IL-6 family of cytokines, is a negative regulator of proliferation, upstream of JAK-STAT5 signaling in hair follicle stem cells (HFSCs), to maintain quiescence in the telogen hair follicle. We show that the OSM receptor (OSMRβ), co-receptor gp130 and activated pSTAT5 are co-expressed in telogen HFSCs, and OSM is produced in the telogen dermis. Conditional epidermal ablation of OSMRβ or STAT5 during early- and mid-telogen (P42 - P60) shortens the telogen phase significantly, and promotes activation of HFSCs both **in vivo** and **in vitro**. Single-cell RNA sequencing of dermal CD45+ immune cells across murine telogen identifies a distinct subset of TREM2+ macrophages as the source of OSM. We further show that this distinct subset of TREM2+ macrophages predominate during telogen, particularly during early-to-mid telogen. Moreover, inhibition of macrophages by way of neutralizing antibodies, small-molecule inhibitors, and genetic ablation (with Csf1r-CreER::R26-iDTR mice) during telogen also promotes hair growth by removing the endogenous source of OSM. **CONCLUSION** This discovery highlights the role of immune cells in establishing a quiescent niche for HFSCs, and suggests they may be a novel extrafollicular therapeutic target for treating disorders of arrested or prolonged telogen.

**KEYWORDS:** Hair cycle, Hair growth, Macrophages, Oncostatin M, Stem cells

**Wnt Signaling, Hair Cycling, And Wnt As A Therapeutic Target For Androgenetic Alopecia**
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Sarah E. Millar, PhD is Albert Kligman Professor and Vice-Chair for Basic Research in the Dermatology Department at the University of Pennsylvania. Dr. Millar received her PhD from London University and trained as a post-doctoral fellow at the NIH and Stanford University. She is Director of the Penn Skin Biology and Diseases Resource-based Center, and PI of the Penn Dermatology Research Training Grant. Dr. Millar is recognized as a leading researcher in epithelial biology. Her research group has made seminal discoveries on the roles of Wnt signaling and epigenetic regulatory mechanisms in development and regeneration of the skin and its appendages. She is an Editorial Board member for Developmental Cell and Experimental Dermatology, and a Deputy Editor for the Journal of Investigative Dermatology. Dr. Millar received an NIH MERIT Award and the 2017 William Montagna Lectureship Award of the Society for Investigative Dermatology in recognition of her research.

S.E. Millar: Consultant/Advisory Board; Samumed.

TAKE HOME MESSAGE:
Wnt/β-catenin signaling is a central regulator of hair follicle stem cells. Predicted loss of function mutations in human WNT10A are associated with adult-onset defects in hair growth, and a WNT10A variant with lower expression levels is associated in GWAS with androgenetic alopecia. We found that inducible deletion of epithelial Wnt10a in mice decreases Wnt/β-catenin signaling, hair follicle progenitor cell proliferation, and hair growth, and delays anagen onset. As mutant mice age, their hair follicles retain stem cell populations, but miniaturize and develop enlarged sebaceous glands, similar to hair follicles in balding human scalp. Our data identify WNT10A as a critical ligand controlling hair follicle progenitor cell proliferation. Together with the observation that hair follicle stem cells are maintained in the absence of WNT10A and in balding scalp, our results suggest downstream β-catenin pathway activation as a potential approach to ameliorate androgenetic alopecia in patients who carry a WNT10A variant.

ABSTRACT:
Wnt/β-catenin signaling is a central regulator of hair follicle stem cells, and is activated in epithelial progenitors as hair follicles enter the anagen growth phase. Using lineage tracing approaches, we found that self-renewing Wnt-active stem cells give rise to all of the epithelial lineages of the hair follicle, and are also present in the hair follicle dermal sheath and dermal papilla. By inducibly deleting β-catenin globally in skin epithelia, only in hair follicle stem cells, or only in interfollicular epidermis and comparing the phenotypes with those caused by ectopic expression of the Wnt/β-catenin inhibitor Dkk1, we showed that Wnt/β-catenin signaling is necessary for hair follicle stem cell proliferation. However, β-catenin is not required within hair follicle stem cells for their maintenance, and follicles resume proliferating after ectopic Dkk1 is removed, indicating persistence of functional progenitors. Despite the established importance of Wnt signaling for hair growth, the identities of the responsible Wnt ligands have been less clear. However, predicted loss of function mutations in human WNT10A are associated with adult-onset defects in hair growth, and a WNT10A variant with lower expression levels is associated in GWAS with androgenetic alopecia. Using genetic mouse models, we found that inducible deletion of epithelial Wnt10a causes reduced Wnt/β-catenin signaling, delayed anagen onset, decreased proliferation of hair follicle progenitor cells, and reduced hair growth. As mutant mice age, their hair follicles retain stem cell populations, but miniaturize and develop enlarged sebaceous glands, similar to hair follicles in balding human scalp. Our data identify WNT10A as a critical ligand controlling hair follicle progenitor cell proliferation. Together with the observation that hair follicle stem cells are maintained in the absence of WNT10A and in balding scalp, our results suggest downstream β-catenin pathway activation as a potential approach to ameliorate androgenetic alopecia in patients who carry a WNT10A variant.

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Translational Development of a Wnt Pathway Modulator (SM04554) as a Potential Treatment for Androgenetic Alopecia
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POSTERS

P001

Functional Genomic Investigation Of IL2RA Susceptibility Region In Alopecia Areata
Alexa Abdelaziz, PhD Candidate, Stephanie Erjavec, Lynn Petukhova, Sahar Gelfman, Iuliana Ionita-Laza, Angela Christiano.
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Alexa Abdelaziz is a 3rd year PhD Candidate in the Nutritional and Metabolic Biology Program at Columbia University Medical Center. She graduated from Rutgers University magna cum laude with a degree in Materials Science Engineering and has spent two years working in the specialty chemical industry. She currently is working on using deep sequencing to identify new variants in candidate genes, followed by functional genomics of variants, allowing her to determine the nature of the specific variants contributing to AA susceptibility and the mechanism(s) by which they contribute to disease pathogenesis.


TAKE HOME MESSAGE:
Using targeted resequencing, whole exome sequencing, and an algorithm (FUN-LDA) that predicts functional effects of certain non-coding genetic variants in tissue types, we have discovered and placed rare enriched disease variants in the context of specific cell types for future functional studies.

ABSTRACT:

Introduction - Alopecia areata (AA) is a prevalent autoimmune disease that causes hair loss by T-cell autoimmune reaction against the hair follicles. We previously published a GWAS/meta-analysis to search for common alleles contributing to AA risk, and identified 14 genomic regions harboring potential susceptibility genes, one of which being the IL2RA locus. Interleukin-2 (IL2) is involved in T-cell proliferation and survival, making it essential for maintaining immune tolerance. Various IL2RA haplotypes have been shown to regulate IL2 Receptor expression on CD4+ T cells inducing Tregs. Several polymorphisms surrounding the IL2RA locus have been reported to be associated with type 1 diabetes, rheumatoid arthritis, vitiligo, and AA. Objective - We conducted targeted resequencing on several of our GWAS regions in 122 cases and focused on the functionally relevant IL2RA locus.

Methods - Using targeted resequencing, whole exome sequencing, and an algorithm (FUN-LDA score) that predicts functional effects of certain non-coding genetic variants in tissue types, we expected our discovered variants to replicate and fall into certain cell type clusters.

Discussion - We identified novel variants in the IL2RA region that show rare enrichment in AA and were replicated in our exome sequencing studies, thus prioritizing these variants as candidates for functional studies. We discovered 458 variants, 65 of these we classified as ‘rare enriched’ defined as a variant present in less than 1% of the population in population databases and present in 3 or more patients in our cohort. These ‘rare enriched’ variants fall mainly within introns, intergenically or downstream of IL2RA. Using FUN-LDA score, we localized majority of these 65 rare enriched variants in cell type context and found they mostly fall in the immune cell cluster.

Conclusion - Overall, this analytical pipeline helps discover and place rare enriched disease variants in the context of specific cell types for future functional studies.

P002

Treatment Of Severe Alopecia Areata With The Oral Janus Kinase Inhibitor Tofacitinib Citrate: The Cleveland Clinic Experience
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Wilma Fowler Bergfeld, MD, FAAD, FACP is Co-Director of Dermatopathology, Departments of Dermatology and Pathology, Senior Staff Dermatologist and Past Head of the Section of Dermatological Research in the Department
of Dermatology, Cleveland Clinic. She also is Director of the Cleveland Clinic’s Dermatopathology Fellowship. Her specialty interests include clinical dermatology (hair disorders, androgen excess, photoaging, and cosmetic dermatology) and dermatopathology. Dr Bergfeld completed her undergraduate work at the College of William and Mary in Williamsburg, VA, and is a graduate of Temple University School of Medicine in Philadelphia. She completed her dermatology residency at Cleveland Clinic and dermatopathology fellowship at Armed Forces of Pathology in Washington DC. She is Immediate Past President of North American Hair Research Society (2011-2014), the 2008-9 President of the American Society of Dermatopathology, the 1992 President of The American Academy of Dermatology and past president of the Ohio Dermatological Association, and the Women's Dermatological Society.

W.F. Bergfeld: None.

TAKE HOME MESSAGE:
The majority of our patients treated with oral tofacitinib citrate experienced regrowth independent of age, disease severity, and disease duration, though the extent of regrowth varied greatly. Large clinical trials and continued scientific research are needed to elucidate the reason behind such variation.

ABSTRACT:
Though the causative stimulus of alopecia areata (AA) remains unclear, clinical and pathologic clues have historically pointed towards an autoimmune pathogenesis. Several studies have shown that both topical and systemic small molecule janus-kinase (JAK) inhibitors were highly effective in reversing AA in mice and humans. In light of these studies, a treatment protocol was developed to investigate the utility of JAK-inhibition in the treatment of AA. Twenty patients received tofacitinib citrate started at the initial dose of 5mg orally twice daily. Doses were increased monthly as tolerated. CBC, CMP, and lipid panel were checked monthly, and after maintenance dose was achieved, every 3-4 months. Standardized photos and SALT scores were taken with each clinic visit. Of the 20 patients who received treatment and had follow-up, 10 patients have taken tofacitinib for 12 or more months. Analysis of data found that SALT scores decreased over time and scores at 3, 9 and 12 months were significantly lower than baseline. At 3 months, 70% showed regrowth, and 76% showed regrowth at 6 months. At 9 and 12 months, the estimated regrowth was 94%. Nail improvement was lower, with estimated levels of 10% at 3 months and 22.9% at 6 months and beyond. In general, lab values were stable over time. There were 6 clinical adverse events (e.g. chest palpitations, herpes zoster, hypertension), and each happened in a different patient. In our patient population, of the 20 patients treated, 47% experienced regrowth of hair by 12 months. However, the extent of regrowth in varied greatly - with impressive results in some, and disappointing results in others. Overall the majority of patients experienced regrowth independent of age, disease severity, and disease duration.

P003
No Association Between Alopecia Areata And Visceral Or Hematopoietic Cancers
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1Case Western Reserve University, Cleveland, OH, USA, 2University of California Irvine, Irvine, CA, USA, 3Cleveland Clinic, Cleveland, OH, USA.

Ruzica is a PhD student at Case Western Reserve University with an interest in hair loss.


TAKE HOME MESSAGE:
AA does not increase risk of developing visceral or hematopoietic cancers, however larger studies are needed to confirm this claim.
ABSTRACT:
Introduction: Alopecia areata (AA) is a polygenic non-scarring hair loss presenting on the scalp and body. Associations between AA and various autoimmune and AA and skin cancers have been explored. We aim to evaluate the association between AA and visceral cancers.
Methods: We performed a retrospective chart review of all AA patients, with varying degrees of severity, from the Cleveland Clinic Alopecia registry in the period from 2005-2016 (n=636). A control group of age-matched patients diagnosed with seborrheic dermatitis (SD) without hair loss was randomly selected (n=215). Hair loss specialists assessed for absence of hair loss in control group patients to ensure validity. Data was collected on gender, age, and presence of visceral cancers. The inclusion criteria were diagnosis of AA or SD by a Cleveland Clinic dermatologist. The presence of visceral cancers in AA and control group was determined by manual chart review. A statistical comparison of demographic and clinical variables was performed by T-test, Chi square test and Fisher exact test where deemed appropriate.
Results: In our study population of 636 AA patients, mean age was 39.72±18.91 with a predominantly female subset (71.7%). There were no differences in breast, bladder, lymphoma, endometrial, prostate, and colon cancer incidence between AA and the control group. Interestingly, thyroid cancers (0.16%) and leukemia (0.16%) were noted only in the AA group, while lung cancers (0.93%) were present only in the control group, though the significance of these findings is uncertain.
Conclusion: The findings presented here do call for additional, larger studies to further validate the claim that AA does not increase risk of developing visceral or hematopoietic cancers. These findings could potentially aid in understanding potential risks associated with AA.

P004
Decreased Incidence Of Melanoma And Non-melanoma Skin Cancers In Patients With Alopecia Areata
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Ruzica is a PhD student at Case Western Reserve University interested in hair loss.


TAKE HOME MESSAGE:
Patients with alopecia areata have a decreased risk of melanoma, squamous cell carcinoma and basal cell carcinoma.

ABSTRACT:
Introduction: Alopecia areata (AA) is a T lymphocyte mediated autoimmune disease characterized by round patches of non-scarring hair loss on the scalp and body. Little information is available on the incidence of sun-induced skin cancers in AA patients.
Methods: We conducted a retrospective case control study using the electronic medical records of patients over the age of 18 diagnosed with AA (n=498) at the Cleveland Clinic department of dermatology in the past decade (2005-2014). Patients were matched on age and gender to a group of patients with a diagnosis of seborrheic keratosis (SK) and without any concomitant hair loss. The incidence of melanoma and non-melanoma skin cancers (NMSC) (subdivided into basal cell carcinoma (BCC), and squamous cell carcinoma (SCC)) in AA group was compared to the control group using t-test and chi-square test as appropriate.
Results: Our study population consisted of 498 AA patients, and a matched group of control patients. Average age was 42.16±14.25 with 368 (73.9%) female and 130 (26.1%) male patients (Table 1). The rate of NMSCs was lower in the AA group when compared to control (7.1% vs 32.5%, p<0.001). The majority of NMSCs were BCC with 4.7% in AA group and 23.3% among control (p<0.001), while SCC was present in 2.4% and 9.6% respectively (p<0.001). Rates of melanoma were also lower among AA patients (0.4 vs 3.4%, p<0.001).
Conclusion: These findings suggest the necessity for larger studies to expound on possible lower incidence of sun-induced skin cancers among AA patients.
P005
Role Of The Autophagy Protein, Syntaxin 17, In Melanogenesis And Alopecia Areata
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Columbia University, New York, NY, USA.

I am 3rd year PhD student in the Genetics & Development and Dermatology departments at Columbia University Medical Center. My research broadly focuses on elucidating the underlying genetic mechanisms contributing to Alopecia Areata (AA) disease onset and progression. I am particularly interested in the intersection of pigmentation and immunology in the setting of AA as pigmented hair follicles are preferentially targeted in disease. Furthermore, my research focuses on how the biological process of autophagy contributes to follicular pigmentation and autoimmunity in the context of AA. I incorporate my genetics training into my research through large genetic studies of human AA patients and the identification of mutations in autophagy genes that lead to aberrant system functioning and subsequent improper immune responses and autoimmune attack of the hair follicle.

S.O. Erjavec: None. A. Abdelaziz: None. L.M. Petukhova: None. A.M. Christiano: None.

TAKE HOME MESSAGE:
Autophagy protein, STX17, is implicated in AA disease through previous GWAS and meta-analysis studies. We report a plausible role for STX17 in AA disease pathogenesis through the melanogenesis pathway. The autophagy protein, STX17, plays a vital role in melanogenesis and depletion of this protein results in upregulation of immunogenic antigens capable of inciting an immune response.

ABSTRACT:
Introduction: Sudden whitening of the hair is a clinical observation in Alopecia Areata (AA) that is known as ‘canities subita’, a phenomenon in which scalp hair appears to turn completely white due to the rapid and preferential attack of pigmented hair follicles (HF). This observation led to the hypothesis that HF melanocyte-specific antigens play a key role in AA disease onset. Recently, essential autophagy proteins have been found to have pleiotropic roles in the regulation of the melanogenesis pathway. Interestingly, our previous GWAS and meta-analysis in AA uncovered risk gene, \( STX17 \) (\( P=3.6x10^{-7} \)), which plays a known role in autophagy. Furthermore, STX17 is involved in hair pigmentation of gray horses, in which an intronic mutation was identified as causal for the premature loss of pigmentation. Objective: Our objective is to determine the role that autophagy protein, STX17, plays in melanogenesis in the context of Alopecia Areata. Materials/Methods: In order to probe for this question, we used primary melanocyte cell cultures for knockdown experiments using siRNA targeted against STX17. Furthermore, we assayed protein levels using western blot and melanin content using absorbance microscopy. We also employed fluorescence microscopy to visualize STX17 localization in hair follicle tissue and sub-cellular localization in primary melanocytes. Discussion/Results: We found that STX17 is expressed in hair follicle melanocytes and that STX17 subcellular localization changes in response to melanogenesis stimulation as STX17 appears to migrate distally towards the dendritic tips. Knockdown of STX17 led to inhibition of \( \alpha \)MSH-stimulated melanin production and increased expression of MART1 and Tyrosinase, two antigens capable of eliciting T-cell responses in human patients with vitiligo and AA. Conclusion: In conclusion, autophagy protein, STX17, plays a role in melanogenesis and disruption of this pathway causes subsequent upregulation of immunogenic antigens, which may be capable of initiating the autoimmune attack on the HF in AA.

P006
Suspected Herpes Zoster Associated Encephalitis During Treatment With Oral Tofacitinib In Alopecia Areata
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UC Irvine Department of Dermatology, Irvine, CA, USA.
Anna-Marie Hosking is a 4th year medical student at the University of California, Irvine. She is currently conducting research in hair disorders in the Department of Dermatology under the mentorship of Dr. Natasha Atanaskova Mesinkovska.

A. Hosking: None. M. Juhasz: None. C. Ekelem: None. N. Mesinkovska: None.

TAKE HOME MESSAGE:
Given the increasing use of systemic JAKi in dermatologic practice for the treatment of alopecia areata, physicians should be acutely aware of rare infections associated with immunosuppressive medications. For patients taking oral JAKi who present with characteristic herpes zoster vesicular lesions and associated neurologic symptoms, clinicians should suspect HZAE.

ABSTRACT:
Introduction: Tofacitinib is an oral Janus kinase inhibitor (JAKi) used to treat alopecia areata. JAKi are associated with increased risk of infection, specifically reactivation of varicella-zoster virus. Case Report: An 18-year-old male with a nine-year history of alopecia universalis with eyebrow/eyelash involvement was started on oral tofacitinib 5 mg twice daily. The patient demonstrated successful therapeutic response with complete regrowth after JAKi initiation. Three months after starting JAKi, the patient presented to his family physician with painful, erythematous vesicles localized to the left chest wall in a dermatomal distribution associated with fever, malaise, new-onset severe headache, generalized weakness, mild cognitive impairment, confusion and psychomotor agitation. The diagnosis of herpes zoster with complications was made and he received oral valacyclovir 1000 mg three times a day for seven days with instructions to go to the emergency department if symptoms worsened; a spinal tap was not performed. Oral tofacitinib was immediately discontinued. After anti-viral treatment, the patient’s symptoms gradually improved to resolution without sequelae. Oral tofacitinib was restarted, however, the patient kept losing hair and after two months JAKi was discontinued. Discussion: Herpes zoster is a known adverse event to immunosuppression with oral JAKi. Serious neurologic conditions such as herpes zoster associated encephalitis (HZAE) are uncommon and under-recognized. HZAE presents with fever, malaise, headache, cognitive impairment and concomitant skin eruption, most commonly in immunosuppressed patients. The clinical diagnosis of HZAE depends on the presence of the characteristic rash and the development of clinical encephalitis. As brain CT-scans are unremarkable, the best diagnostic test is PCR identification of varicella-zoster virus in cerebrospinal fluid. JAKi therapy should be discontinued and intravenous acyclovir should be administered as early as possible. Conclusion: Oral JAKi therapy can be associated with herpes zoster skin lesions accompanied by systemic neurologic symptoms, which in this case clinically presented as encephalitis.

Elevated Blood Plasma Matrix Metalloproteinase Function In Androgenetic Alopecia Patients
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PrimaryAuthor.Biography:
Kevin McElwee is currently a Professor (50th anniversary chair) in the Centre for Skin Sciences at the University of Bradford, UK. Until recently, he was an Associate Professor in the Department of Dermatology at the University of British Columbia, Vancouver, Canada. The research program of Prof. McElwee is focused on the diverse roles of hair follicles in cutaneous disease and tissue regeneration. For many years, alopecia areata research has been a key theme, but more recent work has focused on cytokines in hair follicle cycling and disease, and the role of hair follicle mesenchymal cells in immune regulation and follicular neogenesis. Research interests have most recently expanded to encompass investigation of melanoma, basal cell carcinoma, and squamous cell carcinoma. Prof. McElwee is also a co-founder and Chief Scientific Officer for Replicel Life Sciences Inc., a regenerative medicine company developing autologous cell therapies for skin, hair, and tendon rejuvenation.
TAKE HOME MESSAGE:
Alopecia areata patients do not exhibit elevated blood plasma levels of net matrix metalloproteinase function compared to subjects with no hair loss. In contrast, both men and women with androgenetic alopecia have a small, but statistically significant, elevation in plasma matrix metalloproteinase function.

ABSTRACT:
Introduction: Matrix metalloproteinases (MMPs) are capable of degrading extracellular matrix proteins in skin and hair follicles. Research suggests MMP activity may increase in association with autoimmune disease development and elevated blood plasma levels can be identified in rheumatoid arthritis, multiple sclerosis, and psoriasis patients. MMPs are also known to regulate remodeling processes in cardiovascular disease. Several studies indicate that cardiovascular disease is more prevalent in young males with androgenetic alopecia (AGA). Methods: In this study, we investigated the functional presence of MMPs in the plasma of 79 alopecia areata (AA) patients and 66 AGA patients compared to 36 people with no hair loss (NHL). We used a fluorescent collagen degradation assay to quantify the net activity of plasma MMPs and their inhibitors. Results: Unexpectedly, the mean net MMP function in blood plasma was similar for both AA patients and NHL subjects (0.084 vs. 0.086 U/ml respectively). In contrast, AGA patients exhibited a statistically significant increase in mean plasma MMP activity (0.105 U/ml). Both males and females with AGA presented with higher plasma MMP function respectively compared to male and female NHL subjects, though males exhibited significantly higher plasma MMP function than females (0.122 vs. 0.091 U/ml respectively). A protein expression array analysis of selected samples indicated plasma MMPs were predominantly MMP3 and MMP9, with TIMP1 as the primary inhibitor, in AA, AGA, and NHL subjects. Conclusions: Though AA is generally accepted as an autoimmune disease, we did not observe an elevated plasma MMP function. Any MMP activity may be localized to alopecia affected skin and may not affect plasma levels. The elevated levels of plasma MMP activity in AGA patients could be consistent with hair follicle miniaturization and perifollicular fibrosis. Whether increased MMP activity puts AGA patients at risk for subclinical heart tissue remodeling is unknown.

P009
Genetic Biosignatures Driving Cranio-facial Hair Follicle Patterning And Androgenetic Alopecia
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Dr. Yanne Doucet's research focuses on understanding the molecular mechanisms underlying androgenetic alopecia. As a post-doctoral research scientist in Dr. Angela Christiano's lab, she conducts research projects on hair regeneration in human hair regrowth. During her Engineering Master's thesis work with Dr. Geraldine Guasch, she characterized an in vitro model of human sebaceous glands and the role of TGFb in sebum production. Her Ph.D. research, under the supervision of Dr. David Owens at Columbia University, focused on studying the molecular mechanisms of differentiation and homeostasis of an epidermal progenitor niche that resides within the touch dome, and that gives rise to the Merkel cell lineage. In 2015, she co-chaired the Epithelial Differentiation and Keratinization Gordon Research Seminar and in 2017, she was appointed as the NYSTEM training fellow under the Columbia Stem Cell Initiative.

TAKE HOME MESSAGE:
Gene expression profile analysis of different scalp region in control and AGA patients, has identified a number of key master regulators (transcription factors) implicated in AGA pathogenesis as well as in developmental processes underlying hair patterning.

ABSTRACT:
Introduction: Androgenetic alopecia (AGA) is a complex genetic trait that is characterized by regional hair follicle miniaturization in response to androgens. While female-pattern hair loss is characterized by a diffuse thinning of the scalp, male pattern can be induced upon elevation of testosterone levels. What confers regional susceptibility vs. refractivity on different regions of the scalp is unknown. Donor Dominance refers to the phenomenon by which hair follicles retain the characteristics of the donor site when transplanted to a recipient site. This property forms the basis for the success of hair transplantation. Objective: We noticed that the hair pattern in AGA overlaps precisely with the demarcations of scalp dermis/underlying bones, which have a dual origin neuroectoderm (for parietal bone), vs. mesoderm (for occipital bone). Since the calvarium begins to develop shortly prior to hair follicle induction, we hypothesized that the craniofacial dermis epigenetically/differentially influences hair follicle patterning and development.

Methods: We used a system biology approach by first comparing RNA seq profile from parietal and occipital scalp of matching control and AGA affected volunteers, followed by gene profile expression analysis using the ARACNe algorithm to identify transcription factors or master regulators (MRs) that govern the molecular mechanisms of AGA.

Results: Our analyses revealed a striking differential gene expression profile along the cranial-caudal axis defining two distinct biosignatures that reflect: 1) the developmental origins of the skin and 2) the susceptibility to develop AGA. Functional annotation of the differentially expressed genes shows enriched pathways in AGA samples, including genes implicated in cartilage-ECM interaction (ADAMTS4), in immunity (CD300c, FCGR1A), and epigenetic factors. This list of MRs was used to perform functional studies.

Conclusion: Altogether, we present novel insights into the genetic, epigenetic, and developmental factors required for temporal specification of the skin and the interdependence of hair follicle, skull and craniofacial development.

P010
The Oral Contraceptive Androgen Index: Relating Androgenicity And Progestin Content With Androgenetic Alopecia
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Anthony Ho attends SUNY Downstate College of Medicine and is currently a hair research fellow with Dr. Jerry Shapiro at NYU School of Medicine.

A. Ho: None. J. Shapiro: None. K. Sukhdeo: None.

TAKE HOME MESSAGE:
OCPs with low androgen indices are preferred in patients with hair loss.

ABSTRACT:
Introduction: Oral contraceptive selection to prevent or limit hair loss requires an understanding of the various hormonal formulations and strengths. Androgenetic alopecia (AGA) and telogen effluvium (TE), the two most common causes of hair loss in women, may be triggered after OCP initiation or cessation. Progestins are progesterone analogues used in OCPs that bind progesterone receptor with varying affinity and mimic actions of endogenous hormone. Unlike natural progesterone, progestins can be either agonists or antagonists to androgen receptors. Objective: Define the androgen index of progestin-containing OCPs as potential promoters or inhibitors of AGA.

Methods: The androgenicity of eight progestins relative to progesterone was calculated using the Hershberger assay as a reference standard. Androgenicity of each progestin was then multiplied by the cumulative monthly dose of progestin contained in OCPs to generate an androgen index. Results: We report on a rank-ordered androgen index of the used in OCPs sold in the United States. Cyproterone acetate (CPA), a 17α-hydroxyprogesterone
derivative, acts as an androgen receptor antagonist and therefore has negative androgenicity and the lowest androgen index score. Dienogest and drospirenone (DRSP), exhibiting 40% and 30% anti-androgen activity of CPA, respectively, are also anti-androgens and have low androgen indices. In contrast, all other progestins are androgen receptor agonists with a higher androgen index. Conclusion: Physicians and patients choosing OCPs should be aware of hormonal sequelae related to hair loss. Negative or low androgen indexes may protect against developing AGA. Diane-35® containing CPA, has the least androgencity and lowest androgen index. DNG-(Natazia®) and DRSP-containing (Gianvi®, Loryna®, Nikki®, Ocella®, Syeda®, Vestura®, Yasmin®, Yaz®, Zarah®, Beyaz®, Safyral®) OCPs also have negative androgen indices. Loestrin 1.5/30® and Ovral® containing high doses of norethindrone and norgestrel, respectively, are least likely to inhibit pattern hair loss and may promote AGA.

P011
Trichologic Response Of Combination Therapy Is Maintained After Initiation Of Platelet-rich Plasma In Androgenetic Alopecia
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Anthony Ho attends SUNY Downstate College of Medicine and is currently a hair research fellow with Dr. Jerry Shapiro at NYU School of Medicine.

A. Ho: None. K. Sukhdeo: None. J. Shapiro: None.

TAKE HOME MESSAGE:
PRP as combination therapy is an effective treatment in androgenetic alopecia.

ABSTRACT:
Introduction: Platelet-rich plasma (PRP), a concentrated suspension of platelets in plasma harvested from venous blood, is an emerging treatment for androgenetic alopecia. Investigations of PRP for hair loss show augmentation of hair growth, but mostly test PRP as monotherapy. However, most AGA patients in dermatologic clinics considering PRP are on at least one other therapeutic agent. Objective: Assess the trichologic responses of PRP while employed in combination with other hair restorative modalities. Methods: We assembled 24 AGA patients’ records who received PRP while using concomitant hair restoration therapy. PRP was prepared by venipuncture of 8mL blood then centrifuged for 5 minutes at 1500g (RegenKit-BCT-1®; New York, NY). Baseline trichologic assessments of hair density and diameter at the midcrown (12cm from glabella) were taken prior to an initial scalp treatment consisting of PRP on two consecutive months. Patients were then reassessed; if hair density increased ≥ 10 hairs/cm² over baseline, monthly treatments were continued for four additional months followed by maintenance injections every 3-6 months. Mean trichoscopic measurements throughout treatment were compared with baseline using unequal t-tests.

Results: All PRP patients used topical 5% minoxidil and 83.3% (20/24) used oral anti-androgen medications. Positive response to PRP was seen in 70.8% (17/24). Overall, mean hair density after PRP showed a statistically significant increase from baseline on the anterior crown (+24.5 hairs/cm², p=0.022). Most patients achieved maximal trichologic benefit between 2 and 4 months of treatment. No shock loss was seen. Changes in hair shaft diameter did not reach statistical significance. Earlier disease onset and lower baseline hair counts were associated with worse responses. Conclusion: PRP as combination therapy demonstrated a significant increase in density of hairs but not caliber. These findings represent real-world outcomes that can be used to inform patients’ decision-making, as PRP represents a substantial financial, emotional, and time investment.

P012
The Efficacy And Use Of Finasteride In Women: A Systematic Review
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Allison Hu is a second-year medical student at the University of California, Irvine. A Southern California native, Allison attended Claremont McKenna College where she played for the women's varsity water polo team (with plenty of sunscreen!) and worked for the University of Southern California during her gap year as a science grant writer. In her spare time, she enjoys playing with her dog, watching war movies, and doing yoga.

A.C. Hu: None. L.W. Chapman: None. N.A. Mesinkovksa: None.

TAKE HOME MESSAGE:
Although there have been recent advances in understanding the use of finasteride, its therapeutic role in women remains controversial, with published reports describing both successes and limitations of treatment. RCTs suggest finasteride treatment for hirsutism or polycystic ovarian syndrome. Other prospective and retrospective studies report finasteride to improve hair loss in women with female pattern hair loss or frontal fibrosing alopecia. Smaller studies introduced finasteride therapy for acne, alopecia, lichen planopilaris, and hidradenitis suppurativa. The studies reviewed here also provide a good starting point for assessing finasteride dosage and length of treatment in the management of candidate conditions that may benefit from finasteride therapy. However, due to finasteride’s potential teratogenicity, it is important to not only caution finasteride use in women who are considering pregnancy, but also administer a contraceptive to reproductive age women throughout the duration of finasteride use.

ABSTRACT:
Background: Physicians are beginning to use finasteride as treatment for hair loss, hirsutism, and other dermatologic conditions in women. However, the reported efficacy and use of finasteride in the female population varies widely. Objective: To better define the efficacy and use of finasteride in women and identify research gaps that require further investigation. Methods: A systematic review of the current literature describing finasteride use in women. Discussion/Results: A total of 2,656 patients participated in 65 studies involving finasteride use in women published between 1997 and 2017. Most randomized controlled trials (RCTs) evaluated finasteride use in women with hirsutism (48.7%) or female pattern hair loss (FPHL) (34.7%). While other forms of hair loss were studied such as alopecia, lichen planopilaris, and frontal fibrosing alopecia, no RCTs evaluating finasteride therapy were identified. Many studies suggest that oral and topical finasteride can effectively improve hirsutism scores. Current research on FPHL has demonstrated finasteride use in high (5mg/day), medium (2.5mg/day), low (1.25mg/day), and lower (1mg/day) doses. This range has predominantly improved hair loss symptoms, but evidence from some RCTs suggest otherwise for high and lower-doses. Furthermore, the ability for AG-CAG repeats on the androgen receptor gene to predict finasteride efficacy in women with FPHL has been shown in Caucasian women, but yielded variable results amongst Japanese women. Two studies suggested finasteride use to treat acne, while various case reports observed improved hidradenitis suppurativa lesions following therapy. Overall, doses of oral finasteride ranged from 0.5-5mg/day, in females ages 6-88, over a duration of 6-12 months (57.6%), as monotherapy (88.9%), and for continuous use (96.4%). Conclusion: The studies reviewed highlight finasteride dosage, length of treatment, and candidate conditions that can benefit from finasteride therapy. Future long-term studies remain necessary to fully assess the therapeutic mechanisms and potential consequences of finasteride use, and to optimize treatment protocols.

P014
Efficacy Of Platelet Rich Plasma For Androgenetic Alopecia May Be Determined By Growth Factor Concentration
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Kevin McElwee is currently a Professor (50th anniversary chair) in the Center for Skin Sciences at the University of Bradford, UK. Until recently, he was an Associate Professor in the Department of Dermatology at the University of British Columbia, Vancouver, Canada. The research program of Prof. McElwee is focused on the diverse roles of hair follicles in cutaneous disease and tissue regeneration. For many years, alopecia areata research has been a key theme, but more recent work has focused on cytokines in hair follicle cycling and disease, and the role of hair follicle mesenchymal cells in immune regulation and follicular neogenesis. Research interests have most recently expanded to encompass investigation of melanoma, basal cell carcinoma, and squamous cell carcinoma. Prof. McElwee is also a co-founder and Chief Scientific Officer for Replicel Life Sciences Inc., a regenerative medicine company developing autologous cell therapies for skin, hair, and tendon rejuvenation.

T.W. Siah: None. H. Guo: None. T. Chu: None. L. Santos: None. H. Nakamura: None. J. Shapiro: None. K.J. McElwee: Other Research Support (receipt of drugs, supplies, equipment, or other in-kind support); Replicel Life Sciences Inc.. Ownership Interest (owner, stock, stock options); Replicel Life Sciences Inc.. Consultant/Advisory Board; Replicel Life Sciences Inc.. Independent Contractor (includes contracted research); Replicel Life Sciences Inc..

TAKE HOME MESSAGE:
Platelet rich plasma (PRP) may be an effective treatment for androgenetic alopecia, but there is room for significant improvement and optimization of PRP processing and treatment protocols.

ABSTRACT:
Introduction: In dermatology, autologous platelet rich plasma (PRP) therapy has been used in the treatment of chronic wounds and ulcers, scar tissue, and as a skin rejuvenation therapy. Recently, PRP has been used in the treatment of androgenetic alopecia and alopecia areata. Objective: To determine the efficacy of PRP for hair growth promotion in AGA patients in a randomized, double blinded, placebo controlled, pilot clinical trial (NCT02074943). Methods: We determined the efficacy of an 8 week, 5 session, PRP treatment course by measuring hair density (HD) and hair caliber (HC) changes in 10 AGA affected patients. We quantified the presence of FGFb, EGF, HGF, VEGF, GDNF, PDGF-BB, and TGFb in PRP to evaluate potential correlations between growth factor (GF) concentrations and hair growth measurements. Results: At 16 weeks, 8 weeks after the last PRP injection, treated areas exhibited an increased mean hair density (+12.76%) over baseline compared to the placebo treated area (+0.99%). Unexpectedly, mean hair caliber decreased in both treated and placebo regions (-16.22% and -19.46% respectively). GF concentration in PRP was highly variable between individuals, and to a lesser extent within individuals, over time. Multiple linear regression analysis did not identify significant correlation between GF concentration and hair growth. However, analysis of individual GF concentrations identified correlation between GDNF and hair density (p= 0.004). Trends, though not statistically significant, were also observed for FGFb and VEGF. Conclusions: This study suggests a potential beneficial effect for PRP treatment of AGA. The variable hair growth response, and the apparent reduction in hair caliber, suggest there is a significant opportunity to improve PRP therapy protocols for hair growth promotion. The variability in PRP GF concentration suggests standardization of GFs post-processing could improve hair growth responses. A larger cohort study may help with development of new and improved PRP protocols for AGA.

P015
A Case Series Of Spironolactone As An Effective Treatment for Female Pattern Hair Loss
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Lauren Penzi is a clinical research fellow in the Department of Dermatology at Massachusetts General Hospital. She is a co-investigator for the H.A.I.R. (Hair Academic Innovative Research) Unit clinical research studies. She also plays an integral role in the MGH alopecia clinic. Dr. Penzi believes there is a great need for more research on the pathogenesis of hair loss disorders, as this understanding will lead to the development of more effective treatment methods.
TAKE HOME MESSAGE:
This case series demonstrates that spironolactone is a safe, well-tolerated, and effective treatment for patients with female pattern hair loss (FPHL). Spironolactone is an especially good treatment option for patients with FPHL and other signs of hyperandrogenism. 83% of patients in this case series improved on spironolactone alone by six months, supporting our conclusion that monotherapy with spironolactone should be considered as a first-line treatment for FPHL.

ABSTRACT:
Female pattern hair loss (FPHL) is the main cause of hair loss in adult women characterized by progressive loss of terminal hairs over the frontal and vertex scalp that has a major impact on patients’ quality of life. This case series aims to determine the efficacy of spironolactone as a primary treatment for FPHL. A retrospective review of patients seen in the alopecia clinic in the Department of Dermatology at Massachusetts General Hospital from March 2015 to December 2017 was performed. We included patients who had a diagnosis of FPHL (no concomitant causes of hair loss including telogen effluvium) and were treated with spironolactone for a minimum of 6 months. Six female patients meeting these criteria were identified. At each visit, clinical examinations using the Sinclair grading scale were performed, in addition standard clinic photography. Intake forms including past medical history, family history of alopecia, and other treatments tried for hair loss were also reviewed. The six patients ranged in age from 20 to 43 years old. Three patients reported a history of irregular menses, and two patients had polycystic ovarian syndrome. Two patients had a family history of androgenic alopecia. Five patients were treated with spironolactone as monotherapy. One patient had plateaued after five months of treatment with low level laser light therapy three times weekly, before spironolactone was added. Doses of spironolactone ranged from 25mg twice daily to 100mg twice daily (mean 125mg daily). All six patients reported improvement in hair loss by six months, and no patients reported side effects. Average improvement in Sinclair Scale was 1.0 (range 0.5 - 2.0). This case series highlights the efficacy of spironolactone as a primary treatment for FPHL. Future studies are needed to better determine which populations are most responsive to spironolactone, and which combination treatments yield the greatest results.

P016
Alopecia In A Postmenopausal Woman Secondary To Leydig Cell Tumor: Successful Outcome With Tumor Excision And Topical Minoxidil 5% Solution
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TAKE HOME MESSAGE:
Dermatologist should take special considerations when evaluating androgenetic alopecia in women. As pattern alopecia could be part of virilizing signs, androgen-secreting tumors should be ruled out in some patients

ABSTRACT:
INTRODUCTION. Virilizing manifestation on postmenopausal woman can be secondary to physiological changes, suprarenal or ovarian tumor. Androgen-secreting tumors constitute fewer than 1% of ovarian tumors and Leydig cell tumor is one of the most common. We report the case of a patient with alopecia as a presenting manifestation of a virilizing ovarian Leydig cell tumor. CASE. 62-year-old woman concerns of alopecia of 1 year duration. At the initial evaluation alopecia in a female patter III Ebling scale was remarkable. She also presented hirsutism on
extremities and seborrhea. Patient was sent for endocrinology evaluation. The hormonal profile was consistent with ovarian tumor, with normal levels of DHEA-S 10.73 µg/dL and plasma testosterone elevated (658 ng/dl). Minoxidil 5% topical solution was also started. After clinical suspect and image studies bilateral oophorectomy was performed. Histology revealed a 2 x 1.1. right ovarian Leydig cell tumor. Five months after surgery the patient had an important improvement and normalized testosterone levels. DISCUSSION. Androgenetic alopecia (AGA) in women, also known as female pattern hair loss (FPHL), is caused by androgens in genetically susceptible women. Topical minoxidil 5% is an approved treatment for promoting hair growth in women with AGA. Extensive hormonal testing is usually not recommended unless symptoms and signs of androgen excess are present such as hirsutism, severe acne, irregular menses, infertility, galactorrhea and insulin resistance. Androgen secreting tumors are uncommon, but must be suspected in cases of rapid onset of virilizing manifestations mostly on postmenopausal woman with elevated androgen levels. Tumor excision normalize androgen levels. Because most of the time tumors are not detectable by imaging techniques, exploratory surgery by an experienced team based on strong hormonal and clinical suspicion is frequently necessary. CONCLUSION. The evaluation of women with AGA should consider signs and symptoms of virilizing and androgen secreting tumor screening if necessary.

P017
Androgenetic Alopecia (aga) And Polycystic Ovary Syndrome (pcos) In Adolescent Girls: A Retrospective Chart Review
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Sapna Sundar, BA is a 2nd year medical student at Case Western Reserve University. Dr. Melissa Piliang, MD, FAAD, is a dermatologist at Cleveland Clinic, where she has joint appointments in the Departments of Dermatology and Anatomic Pathology. She is board-certified in both dermatology and dermatopathology, and she focuses on general medical dermatology. Wilma Fowler Bergfeld, MD, FACP is Emeritus Director, and past Director and Co-Director of Dermatopathology, Departments of Dermatology and Pathology and Senior Staff Dermatologist 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, Cleveland Clinic Educational Foundation and Associate Clinical Professor, Department of Dermatology, Case Western Reserve University. Dr. Bergfeld’s specialty interests include clinical dermatology (hair disorders, androgen excess, photo aging, and cosmetic dermatology) and dermatopathology.

S. Sundar: None. M. Piliang: None. W. Bergfeld: None.

TAKE HOME MESSAGE:
Among adolescent girls who present with AGA, the incidence of PCOS is high. These patients should be screened for PCOS to prevent further complications.

ABSTRACT:
Background: Androgenetic alopecia (AGA) is the most common cause of hair loss in adolescents. Due to an underlying hormonal imbalance, these patients are at an increased risk of developing polycystic ovary syndrome (PCOS). Goals: To characterize the common symptoms, lab findings, medical history, and family history of patients with both androgenetic alopecia and PCOS; to make recommendations on PCOS screening for children diagnosed with AGA; to characterize the presentation of children with AGA. Methods: A retrospective single-center chart review on all patients <18 years of age seen in an outpatient dermatology clinic between 2007-2017 and clinically diagnosed with AGA was conducted. Demographics, presenting symptoms, medical history, family history, and lab findings were collected for 63 adolescents. Results: Acne (54%) and menstrual irregularities (37%) were the most common symptoms during the initial presentation of AGA. Less common were facial hair (21%), seborrheic dermatitis (13%), depression (11%), and nail changes (5%). Of the 15 (24%) patients with PCOS, the most common symptoms were menstrual irregularities (80%, OR=15.9), acne (67%, OR=2.33), and hirsutism (20%). Total serum testosterone was significantly elevated (p=0.034) in the PCOS group compared to the entire AGA cohort, and
associated with higher incidence of acne, menstrual irregularities. Free serum testosterone and dehydroepiandrosterone (DHEAS) were not significantly different between the groups. **Conclusion:** These results support the notion that young women with AGA should be screened and followed for PCOS, particularly if they present with menstrual irregularities, acne, hirsutism, or elevated total serum testosterone. Timely intervention is important to prevent many of the metabolic, reproductive, dermatologic, and psychological complications of both AGA and PCOS.

**P018**

Mechanisms For K\(_{\text{ATP}}\) Channel In Cultured Human Dermal Papilla Cells Associated With Minoxidil-induced Hair Growth

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HIROYA TAKADA, Ph.D.

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2017- Research Fellow of Japan Agency for Medical Research and Development (AMED), Department of Plastic, Reconstructive and Regenerative Surgery, Nippon Medical School Graduate School of Medicine, Japan
2009- Research Fellow, Department of Physiology, Graduate School of Medicine Nagoya University, Japan
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2000-2002 Research Fellow, Centre National de la Recherche Scientifique, Ecole Normale Supérieure de Paris, France
1999-2000 Research Fellow, Department of Chemistry, University of Warwick, UK
1997-1999 Research Fellow of Japan Society for the Promotion of Science (JSPS), Department of Energy and Hydrocarbon Chemistry, Graduate School of Engineering, Kyoto University, Japan


**TAKE HOME MESSAGE:**

We investigated the cellular response on extracellular ATP release and on the level of K\(^+\) channel gating in human dermal papilla cells (HDPC) with the addition of an ATP-sensitive K\(^+\) (K\(_{\text{ATP}}\)) channel opener, minoxidil sulfate as the active form of minoxidil, and K\(_{\text{ATP}}\) channel (mainly Kir6.1/SUR2B) blocker, U-37883A. Our data revealed upstream first responses of K\(_{\text{ATP}}\) channel (extracellular ATP release and K\(^+\) channel gating) in HDPC induced by minoxidil sulfate. U-37883A remarkably suppressed these responses to the contrary. The opening of K\(_{\text{ATP}}\) channel by minoxidil sulfate critically contributes to the promotion of therapeutic potency for hair growth. The amplification of signaling via K\(_{\text{ATP}}\) channel activation may be essential and effective strategy for androgenic alopecia.

**ABSTRACT:**

(Background) Topical minoxidil therapy is treated with androgenic alopecia. The effect of minoxidil seems that intracellular Ca\(^{2+}\) increase and vascular endothelial growth factor production evoked by extracellularly released ATP are crucial factors for maintenance of human hair growth, however, the mechanism involved remains unclear in human dermal papilla cells (HDPC).

(Objectives) We investigated here the cellular response on ATP release and on the level of K\(^+\) channel gating in HDPC with the addition of an ATP-sensitive K\(^+\) (K\(_{\text{ATP}}\)) channel opener, minoxidil sulfate as the active form of minoxidil, and K\(_{\text{ATP}}\) channel blocker, U-37883A.
ATP release was detected using a luciferin-luciferase bioluminescence real-time imaging method. The opening of K⁺ channels was evaluated by the use of a fluorescence-based Tl⁺ flux assay. Ca²⁺ influx images during addition of minoxidil sulfate were obtained by fluorescence microscopy using Fluo-8 AM.

Results: The continuous and slow extracellular ATP release induced by minoxidil sulfate was observed. The addition of minoxidil sulfate significantly stimulated the opening of K⁺ channels. In the presence of U-37883A (10 μM), a blocker of the K_{ATP} channel, minoxidil sulfate did not evoke the opening of K⁺ channels.

Conclusion: Our data revealed upstream first responses of K_{ATP} channel in HDPC induced by minoxidil sulfate. The opening of K_{ATP} channel by minoxidil sulfate critically contributes to the promotion of therapeutic potency for hair growth. The amplification of signaling via K_{ATP} channel activation may be essential and effective strategy for androgenic alopecia.

P019
Tinea Capitis Mimicking Lichen Planopilaris In Adults
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Master Degree: T helper and T regulatory cells in skin diseases. WDS award.
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- CCF. Dermatopathology Workshops Dermatopathology: Ackerman Academy 2012 Doctoral degree thesis at Cleveland Clinic: BAFF In Myosis Fungoides and Psoriasis.
Supervisor: Dr. Wilma Bergfeld.

S.H. Allam: None.

TAKE HOME MESSAGE:
Please consider the new presentations of TC in adults. The importance of scalp biopsies in order to confirm the diagnosis of hair loss, especially when patients are not responding positively on current treatment regimen.

ABSTRACT:
Introduction: Tinea capitis is a rare disease in adults, often presenting with an atypical appearance. Its atypical presentation can lead to misdiagnosis, particularly when it mimics other diseases. We report a series of 6 cases of adult tinea capitis, each with features that mimic lichen planopilaris. Objective: We aim to highlight new presentations of tinea capitis for practitioners to consider. By noting the similarities in presentation of the two diseases. Conclusion: We conclude that tinea capitis should be considered a differential diagnosis when adults are suspected of being affected by different types of cicatricial alopecias such as lichen planopilaris, and a scalp biopsy should be performed to avoid misdiagnosis.

P020
Comorbid Conditions In Lichen Planopilaris: A Retrospective Data Analysis Of 334 Patients
Nikoleta Brankov, MD¹, Ruzica Z. Conic, MD², Natasha Atanaskova-Mesinkovska, MD, PhD³, Melissa Piliang, MD², Wilma F. Bergfeld, MD².
Nikoleta Brankov, MD, is a first year dermatology resident physician at Eastern Virginia Medical School. She graduated from Loma Linda University School of Medicine.


TAKE HOME MESSAGE:
In conclusion, to our knowledge, this is the second largest series of patients given the diagnosis LPP that has been reported in the literature to date. Sleep problems, hirsutism, vitamin D deficiency, depression, diabetes mellitus type II, Hashimoto’s thyroiditis, hyperlipidemia, and allergic rhinitis. Although we did not observe a significant association between several other comorbidities with LPP, we were able to report that these comorbidities are prevalent in the LPP population. Our study further emphasizes that dermatologists should screen LPP patients for autoimmune disorders associated with LPP and complete full metabolic workup to avoid missing other abnormalities. Further larger scale studies investigating a larger LPP population are needed to confirm the significance of these findings. It is important for the clinician to understand the importance of atopy, autoimmune disorders, endocrine disorders, nutritional deficiencies, psychological problems, and skin cancers in scarring alopecia patients.

ABSTRACT:
Title: Comorbid Conditions in Lichen Planopilaris: A Retrospective Data Analysis of 334 Patients
Authors: Nikoleta Brankov MD, Ruzica Z. Conic MD, Natasha Atanaskova-Mesinkovska MD, PhD, Melissa Piliang MD, Wilma F. Bergfeld MD

Background: Lichen planopilaris (LPP) is a rare cicatricial, lymphocyte mediated alopecia. It is thought to have an autoimmune pathogenesis, and possibly related to other autoimmune diseases; however, data are limited. In addition, studies examining comorbid conditions are lacking.

Objective: We sought to determine the prevalence of systemic comorbid conditions, nutritional deficiencies, psychological problems and skin cancers in patients with LPP.

Methods: We identified 334 patients with LPP seen in the Department of Dermatology at the Cleveland Clinic Foundation between 2000 and 2016. LPP patients were compared to 78 control subjects with a diagnosis of seborrheic dermatitis.

Results: There were more female LPP patients compared to controls (93.1% vs. 79.5%, p<0.001), and average age did not differ (54.77±12.83 vs. 52.19±15.37 p=0.12). Conditions positively associated with LPP were Hashimoto’s thyroiditis (6.3% vs. 0%, p=0.023), hypothyroidism (24.3% vs. 12.8%, p=0.028), and hirsutism (11.4% vs. 1.3%, p=0.006). Negatively associated conditions were allergic rhinitis (15% vs. 24.4%, p=0.046), diabetes mellitus II (11.7% vs. 21.8%, p=0.019), hyperlipidemia (38.6% vs. 52.6%, p=0.024), vitamin D deficiency (50% vs. 65.4%, p=0.014), depression (15.6% vs. 28.9%, p=0.018), and sleep problems (7.5% vs. 29.5%, p<0.001). Atopic dermatitis, asthma, systemic lupus erythematosus, rheumatoid arthritis, psoriasis, sarcoidosis, celiac disease, ulcerative colitis, vitiligo, Sjogren’s syndrome, limited scleroderma, systemic sclerosis, hyperthyroidism, goiter, thyroid nodules, subacute thyroiditis, hyperparathyroidism, anemia, skin cancers, obesity and anxiety were not associated with LPP.

Limitations: The retrospective design is a limitation.

Conclusion: In our patients, LPP was positively associated with Hashimoto’s thyroiditis, hypothyroidism and hirsutism and negatively associated with allergic rhinitis, diabetes mellitus II, hyperlipidemia, vitamin D deficiency, depression and sleep problems.

P021
Distinct Trichoscopic Features Of The Sideburns In Frontal Fibrosing Alopecia Compared To The Frontotemporal Scalp
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Jessica Cervantes was born in Habana, Cuba in 1990 and immigrated to the United States in 1996. At the age of 16, Jessica founded her own cupcake business, PopsyCakes, as a means to fund her college education. Although she continues to be highly involved in PopsyCakes, her passion for medicine took precedence, culminating in a bachelor’s degree in Microbiology and Immunology with highest honors (summa cum laude) from the University of Miami. Jessica is currently a third-year medical student at the University of Miami Miller School of Medicine. She is very passionate about pursuing a career in dermatology, both as a clinician and investigator. In 2016, she completed a one-year research fellowship in the Department of Dermatology, under the mentorship of Dr. Keyvan Nouri, Dr. Antonella Tosti, and Dr. Joaquin Jimenez. Her interests include hair and nail disorders, clinical dermatology and dermatopathology.

J. Cervantes: None. M. Miteva: None.

TAKE HOME MESSAGE:
Early FFA presenting exclusively or mostly with sideburn involvement should not be misdiagnosed as traction alopecia or alopecia areata due to absence of peripilar casts and peripilar erythema. While dermoscopy guided biopsy of hair shafts with peripilar erythema and casts is usually diagnostic for FFA and lichen planopilaris, in FFA of the sideburns the transparent proximal hair shaft emergences, rather than the surrounding smooth hairless skin, can provide a good source for dermoscopy guided biopsy.

ABSTRACT:
Distinct Trichoscopic Features of the Sideburns in Frontal Fibrosing Alopecia Compared to the Frontotemporal Scalp
The trichoscopic features of frontal fibrosing alopecia (FFA) have been described in the frontotemporal area, yet there is no data detailing the trichoscopic features of the sideburns, which can be the initial or exclusive area of involvement. In this retrospective cohort study, 236 trichoscopic images of the frontotemporal and sideburn area obtained via dry trichoscopy from patients with biopsy-proven FFA were examined by two independent researchers to determine the trichoscopic features of FFA in the sideburns. The images of the sideburns were compared to 44 trichoscopic images of 11 healthy volunteers with intact sideburns. Transparent proximal hair emergence surrounded by patches of paler smooth skin was the most prominent finding in the sideburns. Peripilar casts and peripilar erythema were rare in the sideburns compared to the frontotemporal area. Although less common, transparent proximal hair emergence was also seen in the sideburns of healthy controls, yet it was shorter and restricted to individual hairs. Early FFA presenting exclusively or mostly with sideburn involvement should not be missed due to absence of peripilar casts and peripilar erythema. Dermoscopy-guided biopsy obtained from hair shafts with transparent proximal hair emergence should be considered to make the diagnosis in this location.

P022
Lichen Planopilaris And Hyperlipidemia: A Case Control Study
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Ruzica is a PhD student at Case Western Reserve University with an interest in hair loss.


TAKE HOME MESSAGE:
Hyperlipidemia is not associated with lichen planopilaris.

ABSTRACT:
**Introduction:** Lichen planopilaris (LPP) is a lymphocytic cicatricial alopecia characterized by follicular hyperkeratosis, perifollicular erythema, and loss of follicular orifices. The pathogenesis is similar to lichen planus, with some considering LPP a follicular variant of lichen planus. Chronic inflammatory skin diseases including lichen planus, have been associated with dyslipidemia and metabolic syndrome. However, to our knowledge, no studies evaluated the relationship between LPP, hyperlipidemia and metabolic syndrome.

**Materials and methods:** LPP patients seen from 2003-2011 were identified using the Cleveland Clinic Alopecia Registry (n=187). Patient characteristics were compared to patients with seborrheic dermatitis (n=56). The electronic health record was reviewed for demographic (age, sex, body mass index (BMI)), clinical (diabetes, hypertension, and dyslipidemia), and laboratory characteristics. Continuous variables were analyzed with the Mann-Whitney U-test and Chi-square or Fisher’s exact test was used for categorical variables.

**Results:** The study included 243 subjects, 187 patients with LPP and 56 controls. No differences were observed in age (p=0.09), sex (p=0.60), and BMI (p=0.24) between the two groups. In addition, no difference in serum glucose levels (p=0.19) and serum glycosylated hemoglobin (p=0.86) was found between LPP and controls. Presence of hypertension was noted in 25%(n=46) of LPP patients and 36%(n=20) of controls (p=0.18). Lipid lowering drugs were used in 19%(n=35) of LPP group and 27% (n=15) of control group (p=0.19). Total cholesterol levels (p=0.84), HDL-c (p=0.7), LDL-c p=0.28), and triglyceride levels(p=0.89) did not differ between the two groups.

**Conclusion:** Interestingly, despite the connection between hyperlipidemia and lichen planus, no differences were found in this LPP group. Confounding factors such as age, BMI, and hypertension were homogeneous in both groups, however, we cannot definitively exclude the possibility of a correlation between dyslipidemia and LPP. Prospective studies with larger number of patients are required to further investigate the potential correlation between dyslipidemia and LPP.

**P023**

**Association Of Frontal Fibrosing Alopecia And Lichen Simplex Chronicus: Trichoscopy And Histopathological Features**


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**TAKE HOME MESSAGE:**

Lichen Simplex Chronicus (LSC) is a chronic skin disease characterized by lichenified patches, which occurs as a result of constant scratching of the skin. Scalp pruritus has been reported as the most presenting symptom in Frontal Fibrosing Alopecia (FFA). We described one case with association of FFA and LSC, featuring its trichoscopy and histopathological findings. Trichoscopy suggested the presence of concomitant diseases in the same patient. In addition, histopathology findings confirmed the diagnose of LSC and FFA.

**ABSTRACT:**

Lichen simplex chronicus (LSC) is a recalcitrant skin disease characterized by lichenified patches, which occurs as a result of constant scratching or rubbing of the skin. It is commonly located on neck, ankles, scalp and anogenital region but any area of the skin may be affected. Frontal fibrosing alopecia (FFA) is a scarring alopecia, characterized by progressive frontotemporal hairline recession. Here, we report a case with coexistence of FFA and LSC and describe the trichoscopy and histopathological features.
A 69-year-old postmenopausal woman presented with a 3-year history of hair and eyebrows loss and complaints of severe itching. On examination, she had absence of eyebrows and frontal hair line recession, associated with lichenified skin and short broken hairs affecting the left frontoparietal region. Trichoscopy findings of the lichenified frontal hairline included absence of vellus hairs and follicular openings, perifollicular scaling and perifollicular erythema as well as red and scaly scalp with broken hairs associated with broom hair fibers. Histopathology findings confirmed the diagnoses of LSC and FFA at the same site.

FFA is a lymphocytic scarring alopecia, and scalp pruritus has been reported as the most common symptom. Trichoscopy findings include absence of follicular openings and vellus hairs on frontal hairline, follicular hyperkeratosis, perifollicular scaling and perifollicular erythema. The coexistence with other hair scalp diseases has already been reported. LSC is a common pruritic skin disorder which can arise on normal skin, as a primary dermatological disorder, or secondary to other disorders such as atopic dermatitis, psoriasis, anxiety, obsessive-compulsive disorder, and pruritus related to systemic disease. Although both LSC and FFA are not uncommon, the association of both conditions has never been reported before. We describe one case, featuring its trichoscopy and histopathological findings, and regarding the importance of trichoscopy to suggest the presence of concomitant diseases.

**P024**

**An Overlap Of Dissecting Cellulitis And Secondary Cutis Verticis Gyrata In A Patient With Frequent Use Of Hats: A Potential Risk Over Our Heads?**

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**TAKE HOME MESSAGE:**
Cutis verticis gyrata and Dissecting cellulitis of the scalp may both coexist in the same patient, having hair traction as a possible trigger.

**ABSTRACT:**
**Introduction** Cutis verticis gyrata (CVG) is a rare skin condition characterized by the presence of convoluted ridges and folds on the scalp, due to excessive growth of the scalp skin. Dissecting cellulitis of the scalp (DCS) is a chronic inflammatory condition, associated with relapsing folliculitis and fluctuant abscesses in the scalp, which can lead to scarring alopecia. We present a rare case of an overlap of CVG and DCS in a patient previously exposed to hair traction.

**Objective** To demonstrate the association between prolonged traction in the scalp and the development of neutrophilic folliculitis, such as DCS, which can be linked to CVG.

**Materials/Methods** A case report of a 27-year-old black male patient, who developed painful fluctuant abscesses in the vertex, parietal and occiput region five years ago, which evolved to scarring alopecia. He also presented a folded scalp pattern in a cerebriform appearance and diffuse impairment of the scalp. He refers chronic use of hats.

**Results** Traction caused by the habit of wearing hats may facilitate colonization of the scalp by *Staphylococcus aureus* (Sa). Sa secreted cytotoxic proteins, frequently detected in active DCS lesions, can act as superantigens, activating the secretion of inflammatory cytokines, which may induce thickening of collagen. These cytokines activate the fibroblasts, causing overproduction of the extracellular matrix, which leads to fibrosis due to its progressive accumulation.

**Conclusion** The traction on the scalp seems to be an important trigger for the colonization of the scalp by SA, being linked to the...
development of both CVG and neutrophilic folliculitis as DCS. Must we recommend patients not to wear hats or any other type of props that increase the traction in the scalp based on reports of the onset of these diseases, or is it still too early for this type of action? Further studies are needed to answer this question.

**P025**

**Fibrosing Alopecia In A Pattern Distribution (fapd) In 16 African Descent And Hispanic Female Patients: A Challenge Diagnosis.**

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**TAKE HOME MESSAGE:**
Fibrosing Alopecia in a Pattern Distribution in the patient of color shares common clinical and dermatoscopy features with Central Centrifugal Cicatricial Alopecia, but scalp biopsy show a lichenoid cicatricial alopecia associated with androgenetic findings in the same sample.

**ABSTRACT:**

**Introduction:** Since the first description of Fibrosing Alopecia in a Pattern Distribution (FAPD) only included Caucasian patients, the African descent and Hispanic (ADH) patient with Cicatricial Pattern Alopecia (CPA) needs to be revisited to allow the differential diagnosis in different ethnicities. **Material and Methods:** We present 16 African descent and hispanic female patients with progressive scarring alopecia in a pattern distribution. **Objective:** African descent and mixed race patient have a different presentation of FAPD that may resemble Central Centrifugal Cicatricial Alopecia, as well as Lichen planopilaris and Frontal Fibrosing Alopecia. It is of great importance that the ethnic scalp is recognized as having its own peculiarities and it has to be analyzed with a different approach.

**Results:** 10 patients presented cicatricial female pattern hair loss (CFPHL), 4 patients had cicatricial male pattern hair loss (CMPHL) and 2 patients had cicatricial female pattern hair loss associated with recession of the frontal hairline (CFPHL + FML). Dermatoscopic features showed perifollicular erythema and scaling (14/16), hair fiber diameter diversity (16/16), loss of follicular ostia (16/16), follicular keratosis (3/16). Late stages showed a honeycomb pigmented network (12/16), hyperpigmented perifollicular halo (12/16) and small white patches (12/16). Histopathological features showed lichenoid perifollicular infiltrate (14/16), follicular miniaturization (16/16), concentric fibrosis (16/16), perifollicular limphocytic infiltrate (16/16) and vellus hair involvement (10/16); premature desquamation of the inner root sheath (PDIRS) was found in 11 patients. **Conclusion:** Lichen planopilaris (LPP), FAPD, Central Centrifugal Cicatricial Alopecia (CCCA) and Frontal Fibrosing Alopecia (FFA) are the most important differential diagnosis in ADH patients with CPA. **Conclusion:** The concomitant finding of PCA, hair fiber diversity, histological findings of Androgenetic Alopecia (AGA), vacular interface alteration of the upper portion of the follicular epithelium and/or concentric perifollicular fibrosis are the main key features to suggest the diagnosis of FAPD.
P026
Characterizing PPAR Gamma Gene Expression In Central Centrifugal Cicatricial Alopecia

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TAKE HOME MESSAGE:
In patients with lichen planopilaris and frontal fibrosing alopecia, non-scarring hair loss of the limbs occurs years before scalp alopecia and may serve as an important predictor of impending disease.

ABSTRACT:
Introduction Central Centrifugal Cicatricial Alopecia (CCCA) is a primary cicatricial alopecia (PCA) which occurs most commonly in black women. Destruction of sebaceous glands has been implicated in the pathogenesis of PCAs, with histology often showing an early loss of sebaceous glands. In lichen planopilaris (LPP), the prototypical PCA, this dysfunction of sebaceous glands has been attributed to loss of peroxisome proliferator-activated receptor gamma (PPARγ) expression.

Objective In this study, we aim to determine if PPARγ expression is lost in CCCA using immunohistochemical (IHC) staining and microarray analysis.

Methods Seven cases of biopsy proven CCCA, six cases of LPP and four cases of non-cicatricial alopecia were selected for analysis via IHC. Two dermatopathologists evaluated stained slides to determine the extent of PPARγ expression and preservation of sebaceous glands. Additionally, two board-certified dermatologists (C.A. and G.O.) independently determined the clinical stage of CCCA patients. Gene-chip microarray was performed on paired samples of affected and unaffected scalp tissue to assess the expression of PPARγ in five patients with CCCA.

Results There was no difference in PPARγ expression in CCCA affected tissue when compared to normal tissue using gene-chip microarray (P = 0.15). Immunohistochemical staining showed widespread preservation of sebaceous glands in four of the seven CCCA cases. The intensity of PPARγ staining was similar to that of non-cicatricial alopecia cases. Cases positive for PPARγ expression occurred independent of clinical staging.

Discussion In this study, PPARγ expression on IHC was noted in more than half of CCCA cases and PPARγ expression occurred independently of clinical staging. Taken together, these findings suggest that loss of PPARγ expression may not be a primary mediator in the development of CCCA.

P027
The Use Of Platelet Rich Plasma To Treat Radiation-induced Scarring Alopecia: A Case Report

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TAKE HOME MESSAGE:
Platelet rich plasma should be considered in treatment of recalcitrant radiation-induced alopecia.

ABSTRACT:
Case Description: We report the case of a 33-year-old female with history of a teratoma at age 27 with metastasis to the brain at age 30. As chemotherapy was unsuccessful, she underwent generalized head radiation and presented in 2015 with asymptomatic diffuse thinning hair loss, more prominent on frontal, vertex, and parietal scalp. Diagnosis is consistent with radiation-induced scarring alopecia. Treatments in the past two years have included intralesional kenalog, microneedling, and fractional photothermolysis. Although the condition is stable, these treatments have yielded minimal improvements and the patient opted for a trial of platelet rich plasma (PRP). She has received three rounds of PRP, six weeks apart and reports improvement in hair texture and frontal and vertex hair volume at her 6 week follow up appointment. Non-invasive in-vivo laser imaging data, suggest 20% improvement in hair follicle and hair shaft amount compared to pre-PRP treatment.

Discussion: This case shows that PRP may be an effective treatment for radiation-induced scarring alopecia. The patient presented here is satisfied with her results and is validated by quantitative measures of change. We intend to report results at even longer term follow-up of three and six months post-third-PRP-treatment, as it is important to further develop guidelines for dosing frequency of PRP in radiation-induced alopecia.

P028
The Prevalence Of Misdiagnosis Of Scarring Alopecia From A Facebook Scarring Alopecia Support Group Member Survey
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TAKE HOME MESSAGE:
Misdiagnosis of scarring alopecia is a common problem. Due to the permanent nature of scarring hair loss, a misdiagnosis for any length of time can have detrimental effects on the long-term outcome for patients. This study highlights the importance of a thorough history and exam to identify patients with scarring hair loss conditions so that proper treatments may be initiated early in the disease course.

ABSTRACT:
Cicatricial alopecia is characterized by permanent damage to the hair follicle resulting in irreversible hair loss. Three of the more common scarring hair loss conditions are lichen planopilaris (LPP), frontal fibrosing alopecia (FFA) and central centrifugal cicatricial alopecia (CCCA). Administrators of a closed Facebook cicatricial alopecia support group called “LPP Let’s Put Out the Fire” designed and conducted an anonymous member survey in October 2017. The results of this survey were shared by the group’s administrators with a physician member at the Massachusetts General Hospital H.A.I.R. (Hair Academic Innovative Research) Unit. The survey was completed by 197 respondents (female: 96.4%, male: 3.6%). All respondents self-reported biopsy confirmed LPP, FFA or CCCA at the time of the survey. Most respondents were Caucasian (86.8%), with African American (6.1%), Asian (2.6%), and Hispanic (1.0%) racial demographics.

TAKE HOME MESSAGE:
C. N. Ekelem: None. M. Juhasz: None. A. Hosking: None. N.A. Mesinkovska: None.

TAKE HOME MESSAGE:
C. N. Ekelem: None. M. Juhasz: None. A. Hosking: None. N.A. Mesinkovska: None.

TAKE HOME MESSAGE:
C. N. Ekelem: None. M. Juhasz: None. A. Hosking: None. N.A. Mesinkovska: None.

TAKE HOME MESSAGE:
C. N. Ekelem: None. M. Juhasz: None. A. Hosking: None. N.A. Mesinkovska: None.
American (4.1%), Hispanic (4.1%), Asian/Pacific Islander (3.6%), American Indian/Alaskan Native (1%) and biracial (0.5%) populations also represented.

Of the 197 survey respondents, 98 (49.7%) were initially misdiagnosed with scalp dermatitis or a non-scarring alopecia. The most common misdiagnoses were dandruff/seborrheic dermatitis (22.4%), alopecia areata (22.4%), female pattern hair loss/androgenic alopecia (21.4%), and telogen effluvium (14.3%), followed by tinea capitis, psoriasis, traction alopecia, contact dermatitis, and folliculitis.

Members also reported the duration of time between their initial misdiagnosis and receiving the correct diagnosis, which ranged from one month to twenty years.

Based on data from this Facebook survey, misdiagnosis of scarring alopecia is a common problem. Due to the permanent nature of scarring hair loss, a misdiagnosis for any length of time can have detrimental effects on the long-term outcome for patients. This study highlights the importance of a thorough history and exam to identify patients with such scarring hair loss conditions so that proper treatments may be initiated early in the disease course.

**P029**

**Increased Prevalence Of Frontal Fibrosing Alopecia In A Specialized Hair Clinic**

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Anthony Ho attends SUNY Downstate College of Medicine and is currently a hair research fellow with Dr. Jerry Shapiro at NYU School of Medicine.

A. Ho: None. K. Sukhdeo: None. J. Shapiro: None.

**TAKE HOME MESSAGE:**
Prevalence of FFA in the dermatologic office has increased in recent years.

**ABSTRACT:**

**Introduction:** Once considered a rare condition, frontal fibrosing alopecia (FFA) has markedly increased in prevalence since it was first described by Kossard in 1994. FFA is a subtype of lichen planopilaris (LPP) characterized as a scarring alopecia in the distribution of the frontotemporal hairline with eyebrow involvement. The causes of this condition is poorly understood and few studies exist on the epidemiology of FFA and other hair loss conditions. **Objective:** Determine the frequency of FFA and other subtypes of alopecia seen in an outpatient clinic setting. **Methods:** We identified the records of 200 consecutive patients consulted for alopecia from September 2017 to October 2017 in a specialized hair clinic at NYU Langone Health. Data collected included age, gender, visit type (new consult or follow-up visit) and subtype of alopecia. **Results:** Frontal fibrosing alopecia was the second largest subtype of alopecia seen (23% of patients, 46/200) after androgenetic alopecia (33% of patients, 66/200). The mean age of FFA patients was 61 years (range 31-81 years). Women constituted 97.8% (45/46) of FFA patients. New cases of FFA were seen in 2.2% (1/46) of patients. LPP was only the fifth most common subtype of alopecia (10% of patients, 20/200). The mean age of LPP patients was 48.3 years (range 27-75 years). Women constituted 75% (5/20) of LPP patients. **Conclusion:** FFA is an increasingly common diagnosis encountered by dermatologists since its first description in 1994. Although a subtype of LPP, FFA is more commonly seen than classical LPP in our specialty hair clinic and the demographics of these conditions differ. FFA is seen almost exclusively in women and occurs in an older patient population.

**P030**

**Histopathological Findings Of Persistent Inflammatory Scalp, A Prelude To Primary Cicatricial Alopecia?**

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**TAKE HOME MESSAGE:**
Persistent inflammatory scalp could represent an early stage to some primary cicatricial alopecias, we need to better characterize this entity in order to make a prompt diagnosis and treatment.

**ABSTRACT:**

**Introduction.**
Primary cicatricial alopecias (PCA) are inflammatory scalp conditions that may lead to permanent hair loss. Diagnosis is often delayed because a significant amount of hair is usually lost before the alopecia becomes apparent. Nevertheless, studies have shown that hair loss may progress subclinically, and even “normal” appearing areas could show histologic evidence of disease. Here, we characterize 12 patients with persistent inflammatory scalp that resembles to PCA in histopathology.

**Objective.**
Characterization of patients with persistent inflammatory scalp.

**Methods.**
Retrospective review of cases with diagnosis of inflammatory scalp but not evident signs of alopecia seen at Clínica Alemana during 2016-2017. Inflammatory scalp conditions like contact allergic dermatitis, psoriasis and seborrheic dermatitis were ruled out. Clinical, demographics and laboratory features were established. Clinical and dermatoscopic images were recorded. Biopsy specimens (two, 4mm punch) were guided by dermatoscopy and direct immunofluorescence (DIF) was performed.

**Results.**
12 patients (1 male and 11 females) with ages ranged from 24 to 52 years (mean: 41) consulted because of intermittent shedding. 7 cases presented with pruritus and 3 with trichodynia. Appearance of symptoms (shedding, trichodynia and pruritus) was within two years for the majority of patients. Dermatoscopy mainly showed mild hair tufting, peripilar casts and perifollicular erythema. In biopsy specimens, perifollicular lymphocytic inflammation (around infundibulum and isthmus) was seen in all of the samples, being mild in most cases. Perifollicular fibrosis was present in 8 cases. An average of 30 hairs were found in the samples. No significant mucin deposit was present and DIF resulted positive in two cases.

**Conclusion.**
The histopathological findings of our patients shared similar features of some PCA entities but in a milder way. Our findings resemble to those reported in unaffected areas of PCA patients and other subclinical inflammatory conditions. This entity could represent an early stage of PCA.

**P031**

5 Alpha Reductase Inhibitor Treatment For Frontal Fibrosing Alopecia: An Evidence Based Treatment Update

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I am a Consultant Dermatologist with a special interest in hair disorders, practising in the Mater Misericordiae University Hospital, Dublin, Ireland.
TAKE HOME MESSAGE:
This review demonstrated that FFA patients treated with 5ARI could achieve either disease stability or reduction in the rate of progression in selected cases.

ABSTRACT:
Background: Treatment for frontal fibrosing alopecia (FFA) is challenging and its treatment regimen often mirrors other lymphocytic-predominant cicatricial alopecia. 5 alpha-reductase inhibitor (5ARI) has been reported with some treatment success in severe cases of FFA. Objective: To carry out evidence-based analysis of articles published on treatment efficacy and safety of 5 alpha-reductase inhibitor for the treatment of FFA. Methods: Articles published on the use of 5ARI to treat FFA between 2005 to 2017 were reviewed, analysed and graded according to the American College of Physicians outcome study grading system. Results: There were two studies with moderate-level of evidence that described the efficacy of 5ARI for treatment of FFA. 5ARI was commonly used as adjunctive therapy with positive results in recalcitrant disease. Mild to moderate hair regrowth was reported in one grade 2 and three lower grade (one grade 3 and two grade 4) studies. There is limited evidence on the safety aspects of this medication in most studies that were analysed. Limitations: Database studies might not fully account for confounders and is subjected to variations in methodology and data collection. Conclusion: This review demonstrated that FFA patients treated with 5ARI could achieve either disease stability or reduction in the rate of progression in selected cases. A well designed randomised, double-blind, controlled study would strengthen the role of 5ARI as part of treatment armamentarium for FFA.

P032
A Systematic Review Of The Outcome Of Hair Transplantation In Primary Scarring Alopecia
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Christine Pham is a second year medical student at the University of California, Irvine School of Medicine. She graduated with a B.S. in Biological Sciences at the University of California, Irvine where she was involved in both clinical and basic science research. Her interest in dermatology led her to engage in research in the dermatology department, where she studies the role of hair transplantation in skin disorders. In the future, she hopes to work as dermatologist while remaining involved in research.

TAKE HOME MESSAGE:
Primary scarring alopecia, otherwise known as primary cicatricial alopecia, refers to irreversible inflammatory follicular damage associated with scarring and hair loss. There is currently no Food and Drug Administration (FDA) approved treatment options however, hair transplantation can be an effective treatment option for well selected patients with controlled primary scarring alopecia. A review of literature has shown hair transplant surgery to work best for patients with controlled CCCA, en coup de sabre, DLE, pseudolade de brocq, and folliculitis decalvans. However, caution needs to be exercised particularly in patients with lichen planopilaris and frontal fibrosing alopecia as both positive and negative results have been reported.

ABSTRACT:
Importance: Hair loss, or alopecia, is one of the most commonly presented problems in dermatology. Scarring alopecias are considered particularly damaging due to limited success in slowing permanent disease progression and current treatment methods, such as intralesional and topical steroids and topical minoxidil, are largely ineffective. Objective: Hair transplantation is a debated treatment option for advanced cases of primary scarring alopecia. This study reviews the efficacy of hair transplantation as a treatment option for primary scarring alopecia. Methods: A primary literature search was conducted using PubMed to identify articles in scarring alopecia and hair
transplants published from 1960 to present time.

**Discussion/Results:** Thirteen reports with thirty-two patients were included in this review. Twenty-five patients experienced moderate to positive results, while seven patients experienced negative results or recurrence of disease. Positive hair transplantation results have been reported in patients with central centrifugal cicatricial alopecia, en coup de sabre, discoid lupus erythematosus, pseudopelade de brocq, and folliculitis decalvans. Positive and negative results were observed in patients with lichen planopilaris and frontal fibrosing alopecia.

**Conclusion:** Findings show that hair transplant surgery can be considered a treatment option for certain primary scarring alopecias. However, the data needs to be interpreted with caution as of concern for positive-result publication bias.

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**P033**

**Histopathology Of Facial Papules In Frontal Fibrosing Alopecia And Therapeutic Response To Oral Isotretinoin**

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**TAKE HOME MESSAGE:**

- Perifollicular inflammation alone is not responsible for the formation of facial papules (FP) in patients with frontal fibrosing alopecia (FFA).
- Perifollicular architecture derangement (destruction of elastic fibers + remodeling of sebaceous lobules) contributes to the clinical formation of FP.
- Successful treatment of FP with oral isotretinoin corroborates this idea.

**ABSTRACT:**

**INTRODUCTION:**

Facial papules (FP) were first reported in frontal fibrosing alopecia (FFA) patients in 2007. Even though FP have been linked to facial vellus hair follicle involvement by the disease, how this finding alone could lead to the formation of clinically evident FP has not been addressed. Currently, there are no therapeutic options for these lesions.

**OBJECTIVES:** To describe histopathological findings of FP in the context of FFA, highlighting features that may be linked to their clinical formation. In addition, to evaluate oral isotretinoin in the treatment of FP in FFA patients.

**METHODOLOGY:** Cutaneous FP biopsies of FFA patients performed between January 2016 to May 2017 were retrieved from our pathology database and reexamined by two pathologists. In addition, three patients with FFA with prominent facial papules were given oral isotretinoin for three months.

**RESULTS:** Histological sections of thirteen 3.0-mm punch biopsy specimens from seven patients demonstrated prominent sebaceous glands in 11 specimens and dilated sebaceous ducts in 10. Pinkus-acid-orcein staining revealed reduction and fragmentation of elastic fibers in 12 samples. In seven of these, this finding was observed both in papillary dermis and reticular dermis, especially around sebaceous lobules. Vellus hair follicle involvement was seen in two samples only. Regarding therapeutic results, at the end of the third month of treatment with oral isotretinoin, FP had completed disappeared or were considered minimal in all patients studied.

**CONCLUSION:** Prominent sebaceous lobules with dilated ducts associated with an abnormal elastic framework seem to be the main explanation for the formation of facial papules in the context of FFA. The dramatic response observed after isotretinoin, a drug known to cause atrophy of sebaceous glands, corroborates this idea. Finally, our study is the first to show that oral isotretinoin may be a therapeutic option for facial papules in FFA patients.
**P034**

**Updates In Therapeutics For Folliculitis Decalvans: A Systematic Review With Evidence Based Analysis**

**Pooja H. Rambhia**¹, Ruzica Z. Conic, MD¹, Aizuri Murad, MRCS, MRCP², Natasha Atanaskova-Mesinkovska, MD, PhD³, Melissa Piliang, MD⁴, Wilma F. Bergfeld, MD⁴.

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Pooja H. Rambhia is a third year student at Case Western Reserve University School of Medicine, in Cleveland, OH. Pooja recently completed an elective research year funded by the NIH and American Skin Association. Under the mentorship of Dr. Wilma Bergfeld and Dr. Melissa Piliang, Pooja has pursued a number of clinical hair loss related projects, and hopes to pursue a career in academic dermatology with a focus on hair disorders.

**P.H. Rambhia:** None. **R.Z. Conic:** None. **A. Murad:** None. **N. Atanaskova-Mesinkovska:** None. **M. Piliang:** None. **W.F. Bergfeld:** None.

**TAKE HOME MESSAGE:**

Treatment with combination of clindamycin and rifampicin demonstrated the best overall outcome according to response and level of evidence for moderate to severe FD. The longest remission was achieved in patients treated with more than one 10-weeks course of clindamycin and rifampicin and slower tapering doses of oral antibiotics regimens and ILT for recalcitrant cases. These data also suggest initiating tetracycline as first-line therapy for mild FD. Randomized controlled trials would strengthen the role of different agents used in FD patients.

**ABSTRACT:**

**Introduction:** Folliculitis decalvans (FD) is the most common neutrophilic scarring alopecia and represents 11% of primary cicatricial alopecia. Currently, there is a paucity of data pertaining to FD-specific treatments as well as data analyzing the their efficacy. **Objective:** This study aimed to provide an evidence-based analysis of current treatment efficacy for FD.

**Materials and methods:** Using PRISMA guidelines, PubMed, Medline, SCOPUS and Cochrane library were searched for articles published in English from 1998 to 2017 and data regarding treatment regimen and efficacy were extracted. Grading was based on the American College of Physicians Grading System with grade 1 being the highest level of evidence and grade 4 the lowest.

**Results:** Nineteen publications involving 196 patients fulfilled the selection criteria, of which 123 (67.9%) were male. Articles with the highest level of evidence were five Grade 2 studies, which involved 167 patients. A multi-center study showed that patients treated with a 10-week course of clindamycin and rifampicin achieved the longest disease remission at an average 7.2 months. Remission period was shorter among those treated with doxycycline or azithromycin for 3-6 months. (Grade 2, Vano-Galvan et al., 2015) Another study demonstrated that a 10-week course of clindamycin and rifampicin achieved remission in ten patients (55.6%) for 2-22 months, and 5 additional patients responded to 2-3 more courses. (Grade 2, Powell et al., 1999) In another study, seven patients (30.4%) treated with combination of ILT, clobetasol lotion and tetracycline for 6-12 months reported disease remission for four years. (Grade 2, Bunagan et al., 2015) All studies in the moderate evidence category had small number of patients, lacked randomization and control group.

**Conclusions:** Treatment with combination of clindamycin and rifampicin demonstrated the best overall outcome according to response and level of evidence for moderate to severe FD.

**P035**

**Updates In Therapeutics For Lichen Planopilaris: A Systematic Review With Evidence-based Analysis**

**Pooja H. Rambhia, BA**¹, Ruzica Z. Conic, MD¹, Aizuri Murad, MRCS, MRCP², Natasha Atanaskova-Mesinkovska, MD, PhD³, Melissa Piliang, MD⁴, Wilma F. Bergfeld, MD⁴.

**Abstract:**

**Introduction:** Lichen planopilaris (LP) is a chronic inflammatory condition of the hair follicle that often manifests with scarring. The exact etiology is unknown, but an autoimmune and genetic component is postulated. The aim of this systematic review was to evaluate the efficacy of various treatment modalities for LP.

**Materials and methods:** A systematic search of PubMed, MEDLINE, SCOPUS, and Cochrane Library was conducted to identify relevant studies published in English from 2000 to 2017. Studies were included if they reported on treatment efficacy for LP. Methodological quality was assessed using the STROBE criteria. Data extraction was performed by two independent reviewers.

**Results:** A total of 14 published studies met the inclusion criteria. Most studies were small in sample size and lacked a control group. Topical treatments such as corticosteroids, retinoids, and calcineurin inhibitors were commonly used. Oral medications including isotretinoin and tetracyclines were also evaluated. The combination of topical and systemic treatments showed promising results for LP. However, the efficacy of these treatments was variable, and randomized controlled trials with larger sample sizes are needed to confirm these findings.

**Conclusions:** The current evidence suggests that a combination of topical and systemic treatments may be effective for Lichen planopilaris. Further research is needed to establish the optimal treatment regimen and to evaluate the long-term efficacy and safety of these treatments.

**TAKE HOME MESSAGE:**

The combination of topical and systemic treatments may be effective for Lichen planopilaris. Further research is needed to establish the optimal treatment regimen and to evaluate the long-term efficacy and safety of these treatments.
TAKE HOME MESSAGE:
This systematic review found the strongest evidence for use of methotrexate in treatment of LPP. Randomized control trials are needed to better define LPP treatment guidelines.

ABSTRACT:
Introduction: Lichen planopilaris (LPP) is a rare, chronic lymphocyte mediated cicatricial alopecia. Due to its rarity, there are no well defined, current treatment guidelines, and therapy initiation often depends of physician preference. Objection: The objective of this study is to carry out an evidence-based analysis of studies published on treatment efficacy for LPP. Materials and methods: Using PRISMA guidelines, electronic databases were searched for articles published in English. Data regarding treatment regimen and efficacy were extracted. Grading was based on the American College of Physicians Grading System with grade 1 being the highest level of evidence and grade 4 the lowest. Results: In total, 368 patients were described in one Grade 1, one Grade 2, five Grade 3, and 17 Grade 4 studies, published from 1992-2017. This analysis included 1 randomized controlled trial, 5 prospective studies, 10 retrospective reviews, 6 case reports/series. Strongest evidence was found for use of methotrexate with a randomized controlled trial finding a 70% decrease in LPPAI score compared to less than 45% in the hydroxychloroquine group. In another study, hydroxychloroquine treatment for 6 months, resulted in reduced LPPAI score for 65% of patients and by 12 months, 92.5% had either a full or partial response. Tetracycline use was shown to significantly reduce LPP disease activity in 6/11 patients, and was more efficacious compared to intralesional and topical corticosteroids alone. Pioglitazone was also shown to be effective in controlling symptoms, inflammation, and disease progression in 13/18 patients, though 2/13 patients exhibited disease relapse post treatment discontinuation. Additional treatments for LPP with low evidence included oral/topical cyclosporine, mycophenolate mofetil, thalidomide, acitretin, isotretinoin, radiation, hair transplant, griseofulvin, doxycycline, and ustekinumab. Conclusion: This systematic review found the strongest evidence for use of methotrexate in treatment of LPP. Randomized control trials are needed to better define LPP treatment guidelines.

P036
Treatment Of Cicatricial Alopecia Due To Ccle
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Dermatologist for 14 years, coordinator of Hair and Nails Department of UMC, FOS Clinic own practice

F.O. Schalch: None.

TAKE HOME MESSAGE:
Bleomycin microinfusion may be seen as a safe, alternative therapy for scarring alopecias.

ABSTRACT:
Introduction Chronic Cutaneous Lupus Erythematosus (CCLE) is one of the causes of scarring alopecia. Its management remains challenging due to the failure of usual therapeutic methods. Objective To report a case with
good progress with the use of bleomycin, applying an innovative microinfusion method. Materials and methods
The procedure is performed by infusing a mixture of 1ml of bleomycin, 1ml of triamcinolone 20mg/ml, and 1ml of
lidocaine employing a microinfusion technique using tattoo equipment. Case report The patient was a 41-year-old
female, suffering from hair loss and scalp sores for five months. Examination of her scalp revealed alopecia plaques
with atrophic centers, some of them ulcerated and covered with fibrin, and yellow-green discharge. The biopsy
confirmed the diagnosis of cutaneous lupus, which was treated with intralesional injection of bleomycin 1ml,
Triamcinolone 1ml, and Lidocaine 1ml, using a tattoo machine (microinfusion). After 5 sessions, the patient evolved
showing improvement of the scarring areas and partial epilation. Discussion The CCLE significantly destroys the
hair follicles. Early and effective diagnosis and treatment are necessary to avoid an irreversible scarring effect.
Bleomycin is an anti-tumor, anti-viral, and bactericidal substance. It also shows potential anti-fibrotic effect in the
treatment of keloids, as there is a hypothesis that it reduces the synthesis of collagen and stimulates the apoptosis of
fibroblasts. In the case of fibrotic scarring lesions of the CCLE, our study suggests the occurrence of an important
anti-fibrotic effect of bleomycin on the injected site, which stimulates the underlying follicles that were quiescent by
the fibrosis. Conclusion Bleomycin microinfusion may be seen as a safe, alternative therapy for scarring alopecias.

P037
Atypical Presentations of Frontal Fibrosing Alopecia
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Departments of Dermatology and Anatomic Pathology. She received her medical degree from Indiana University
School of Medicine. She completed both her residency in dermatology and a fellowship in dermatopathology at
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Sarah Schneider, PGY-3 Dermatology resident at Cleveland Clinic. She received her medical degree from Indiana
University School of Medicine.
Sagar Vallabh is a is a 3rd year medical student at Case Western Reserve University.

S. Schneider: None. M. Piliang: None. S. Vallabh: None.

TAKE HOME MESSAGE:
Clinical suspicion for frontal fibrosing alopecia should remain high despite atypical patient presentations.

ABSTRACT:
Introduction: Frontal fibrosing alopecia (FFA) is a cicatricial alopecia that has a major impact on the quality of life
of affected patients. As with all alopecia, the diagnosis for the clinician and dermatopathologist is challenging. There
are often delays in diagnosis when the clinical presentation is outside of the typical pattern. Early diagnosis and
prompt treatment are necessary to prevent further scarring. Objective: Currently, there is little literature on the topic
of uncommon presentations of FFA and therefore our attempt is to characterize our patients with atypical
presentations. Methods: A retrospective single-center chart review was performed from August of 2015 to
September of 2017. All diagnoses of FFA were confirmed via biopsy. Relevant demographics and patient histories
were obtained from an electronic medical record. Discussion/Results: Our experience over two years led to the
discovery of six patients with atypical presentations including posterior hairline and temporal-parietal scalp without
frontal hairline involvement. Conclusion: All six patients had seen multiple dermatologists, experienced
substantially delayed diagnosis and disease advancement while awaiting proper diagnosis. We hope this will add to
the knowledge of unusual presentations of this unique variant of scarring alopecia in order to aid in expedited
diagnosis of future patients.
P038
Sebaceous Gland Abnormalities In Fatty Acyl Coa Reductase 2 (Far2) Null Mice Result In Follicular Dystrophy And Primary Cicatricial Alopecia

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Dr. Sundberg earned his DVM from Purdue University in 1977 and a PhD from the University of Connecticut in 1981. He has been studying mouse models of human diseases for over 3 decades at The Jackson Laboratory in Bar Harbor, ME, most of which focus on diseases of the skin, hair, and nails. He is currently the chairman of the Scientific Advisors for the Cicatricial Alopecia Research Foundation (CARF) that has helped to organize this section of the meeting.


TAKE HOME MESSAGE:
Mouse models provide insight into the molecular pathogenesis of many diseases including primary cicatricial alopecias. Many mouse models for cicatricial alopecia are currently available from biorepositories and more will be developed through the international knockout mouse program in the years to come. Discoveries can define the underlying pathophysiology and provide preclinical tools to test new diagnostic and therapeutic approaches to this group of diseases that are currently difficult to treat.

ABSTRACT:
In a large scale screen for skin, hair, and nail abnormalities in null mice generated by The Jackson Laboratory’s KOMP center, homozygous mutant Far2tm2b(KOMP)Wtsi/2J mice were found to develop focal areas of alopecia due to a subtle sebaceous gland abnormality. As sebocytes matured in normal wildtype mice they become pale with fine, uniformly sized clear lipid containing vacuoles. By contrast, the Far2/Far2 null mice had sebocytes that become brightly eosinophilic but did not rupture as they entered the sebaceous gland duct. Scattered throughout the dermis and often at the dermal hypodermal fat junction, were dystrophic hair follicles or ruptured follicles with a foreign body granulomatous reaction surrounding a free hair shaft (trichogranuloma). The Meibomian gland in the eyelid is one of several specialized sebaceous glands in the mouse. These glands had moderately to markedly dilated ducts associated with similar changes in the sebocytes as seen in the truncal skin. Skin surface lipid analysis of Far2 null mice revealed a lower level of wax esters, cholesterol ester, ceramides, and diacglycerols compared to wildtype control mice. Similar changes have been reported in asebia (stearoyl-Coenzyme A desaturase 1, Scd1), bareskin (gasdermin A3, Gsdma3), and other mutations affecting lipid metabolism that result in primary cicatricial alopecias suggesting mutations in a common pathway can result in primary cicatricial alopecias in mice.

P039
Frontal Fibrosing Alopecia Associated Facial Papules: Report Of Seven Cases And A Literature Review

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Sarika Uppaluri is a student researcher and scribe within the University of Minnesota, Department of Dermatology. She has a special interest in frontal fibrosing alopecia and associated facial papules. Sarika recently graduated from Case Western Reserve University with a Bachelor’s in Honors Art History and Chemistry. She hopes to attend medical school and continue her research in hair diseases.
TAKE HOME MESSAGE:
Treatment options are limited for patients affected by FFA associated facial papules. Our literature review reveals that some patients may benefit from treatment with isotretinoin. One patient at our institution improved the appearance of facial papules with ferulic acid.

ABSTRACT:

Introduction – In recent years, there has been concern for a possible increase in frontal fibrosing alopecia cases (FFA). Facial papules have been associated with this disease and reported in the literature. Despite recognition of these papules, there remains a lack of resources synthesizing these reports.

Objective – Herein, we report seven cases of facial papules in FFA patients, their characteristics, and a review of cases in the literature.

Materials and/or Methods – A case series of facial papules in those with a diagnosis of FFA seen within our institution from December 2017 to January 2018 are presented. A literature review of FFA facial papules was performed and characteristics including gender, race, menopausal status, brow involvement, histopathology, clinical description, and reported treatments were collected.

Discussion/Results – Seven cases of FFA with facial papules were reported from our institution. Our cases included six Caucasian women and one Caucasian male. Facial papules were noted on the cheeks, temples, and under the eyes. Six cases had eyebrow involvement. One patient demonstrated improvement with ferulic acid applied daily to the face for three months. An analysis of 11 articles demonstrated 191 cases of FFA (6 M, 66 F, 119 unknown) with facial papules. Histopathology from 9 reports suggested lichenoid inflammation associated with vellus hair follicles. More recently, two reports described yellow facial papules treated successfully with isotretinoin.

Conclusion – Facial papules are an associated finding in FFA. They are most often described clinically as skin colored papules. Facial papules in patients with FFA may be more common than previously reported. Ferulic acid may be a novel treatment option. Further studies are needed to understand etiology, histopathology, and treatment options.

P040
Intralesional Triamcinolone Acetonide For Treatment Of Traction Alopecia
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Laura N. Uwakwe is a Nigerian-American physician from Brooklyn, NY. She attended Tufts University, where she received her bachelor’s in International Relations. She also spent one of her undergraduate years at the University of Paris-La Sorbonne, and is nearly fluent in French. She obtained her MD from SUNY Downstate College of Medicine, and completed an internship in internal medicine in Philadelphia. She is currently in a dermatology clinical research fellowship at Wake Forest School of Medicine, through which she has completed several poster presentations and publications in the field of dermatology.

TAKE HOME MESSAGE:
Patient education is essential in the prevention and management of traction alopecia. It is essential that dermatologists caution against hairstyles that pull excessively at the hairline. Triamcinolone acetonide injections are an effective method of treating traction alopecia, particularly in the early stages of the disease.

ABSTRACT:
INTRODUCTION: Traction alopecia (TA) is a form of hair loss caused by continuous and prolonged tension to the hair. This condition is most commonly seen in Black/African American women and children, who commonly wear...
hairstyles that pull excessively at the frontotemporal hairline. Dermatologists have recommended the use of
intralesional triamcinolone acetonide injections (ILK) to decrease the inflammatory process, however, evidence-
based proof is lacking in the literature.

**OBJECTIVE:** In this case series, we evaluate the effectiveness and safety of ILK in the TA management of 5
African American women.

**METHODS:** A retrospective chart review was done of patients with a TA diagnosis, who were treated with ILK at a
dermatology clinic between January 2016 to December 2017. All subjects had before and after photos of their TA
managed with ILK in their medical record. Management of TA was assessed by comparing the photographs for
changes in hair density along the frontotemporal hairline.

**RESULTS/ DISCUSSION:** 5 African American females were included in the study. Each subject had 1-2
treatments of ILK. All subjects demonstrated visible increase in hair density along the frontotemporal hairline
following their first or second treatment. None of the patients reported any adverse effects due to the ILK. ILK
injections are usually done at a concentration of 5mg/mL. Common adverse effects are pain, and subsequent
transient atrophy at the injection site. The small denting is not an indication to stop treatment. Avoidance of treating
dented areas is sufficient to allow it to revert.

**CONCLUSION:** More studies need to be done to standardize the treatment of TA. The use of ILK is currently an
effective and safe method of treating TA. Patient education is pivotal in the prevention and management of TA. It is
imperative that dermatologists caution against grooming practices that exert tension on the hairline.

**P041**

Markers Of Ageing In The Hair Follicle Environment- A Glimpse Into The Human Scalp

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I have a BSc (hons) and a MSc in Biomedical Sciences. I am currently studying for a PhD in the Centre for Skin
Sciences at the University of Bradford, West Yorkshire, UK. My PhD project is investigating changes in the human
hair follicle environment with increasing age and how this impacts on female scalp hair.

**R. Sutherland-Sedman:** None. **A.D. Pawlus:** None. **G.E. Westgate:** None. **D.J. Tobin:** None. **M. Thornton:**
None.

**TAKE HOME MESSAGE:**
The ageing female scalp shows striking histological and biological changes, which may lead to significant changes
in the hair follicle environment and impact hair ageing.

**ABSTRACT:**
Hair ageing is complex, involving shortened cycles and production of thinner hair fibers. While ageing leads to
impaired dermal structure, little is known about changes in the hair follicle environment. We have compared scalp *in
situ* and corresponding cultured primary dermal fibroblasts (DFs) from 16 women aged between 19 and
81 yrs. Changes in expression of 29 biomarkers with age were quantitated in DFs using qRT-PCR. Longitudinal scalp
sections from the same donors were analysed by immuno/histological staining. Seven of 29 biomarkers significantly
(*p*<0.05) changed with age in cultured DFs. In DFs from women over 50 yrs (n=6) expression of MMP-1 increased.
In contrast, collagen XVI (*COL16A1*), sirtuin-1 (*SIRT-1*), hyaluronic acid synthase type 2 (*HAS2*), protease-nexin 1
(*SERPINE2*), versican (*VCAN*) and vascular endothelial growth factor A (*VEGF-A*) were all reduced in DFs from
women over 40 yrs (n=8). *In situ*, the papillary/ reticular boundary was indistinguishable in younger donors, but
evident in women over 40 yrs, accompanied by a reduction in the height of the papillary dermis. The depth of the
anagen hair follicle decreased with age, while in younger women the bulb was surrounded by adipose. Trichrome
staining highlighted collagen changes in the papillary dermis. Expression of podoplanin, a marker of papillary
fibroblasts, was reduced in women over 60 yrs. In situ, the papillary/reticular boundary was indistinguishable in younger donors, but evident in women over 40 yrs, accompanied by a reduction in the height of the papillary dermis. The depth of the anagen hair follicle decreased with age, while in younger women the bulb was surrounded by adipose. Trichrome staining highlighted collagen changes in the papillary dermis. Expression of podoplanin, a marker of papillary fibroblasts, was reduced in women over 60 yrs. While HAS2 was highly expressed throughout the scalp there was no change with age. However, in women over 40 yrs MMP-1 was increased in the dermal papilla, sheath and reticular dermis, SERPINE2 increased in the dermal papilla and sheath. Versican increased in the sebaceous gland.
and papillary dermis. The ageing female scalp shows striking histological and biological changes, which may lead to significant changes in the hair follicle environment and impact hair ageing. Further studies are underway to look at changes in biomarker expression in different hair follicle cell types and how they alter with age.

**P042**

**Oncostatin M Produced By Trem2+ Macrophages Maintains Quiescence Of Hair Follicle Stem Cells Via JAK-STAT5 Signaling**

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Dr Etienne Wang is a Consultant Dermatologist from the National Skin Center in Singapore, and he has just completed his graduate studies in Cellular, Molecular and Biological Sciences in Columbia University in the laboratory of Dr Angela Christiano. His work integrates hair cycling, epidermal stem cell biology, immunology and computational biology.

E. Wang: None. A.M. Christiano: Consultant/Advisory Board; Aclaris Therapeutics.

**TAKE HOME MESSAGE:**
A specialized subset of TREM2+ macrophages contribute to the maintenance of HFSC quiescence during telogen by producing Oncostatin M, which inhibits HFSC proliferation.

**ABSTRACT:**

**INTRODUCTION** Our lab previously demonstrated that topical JAK inhibition was sufficient for inducing hair growth (anagen) when applied topically to telogen skin in C57BL/6 mice. **OBJECTIVE** We aim to identify the nature of the JAK-STAT signal that maintains quiescence during murine telogen and define its source. **METHODS** We identified candidate factors that promote HFSC quiescence via JAK-STAT signaling with **in vivo** experiments. These effects were confirmed with genetic models, small molecule inhibitors and neutralizing antibodies. Single-cell RNA sequencing was used to identify the cellular source of this factor. **RESULTS** We show that Oncostatin M (OSM), a member of the IL-6 family of cytokines, is a negative regulator of proliferation, upstream of JAK-STAT5 signaling in hair follicle stem cells (HFSCs), to maintain quiescence in the telogen hair follicle. We show that the OSM receptor (OSMRβ), co-receptor gp130 and activated pSTAT5 are co-expressed in telogen HFSCs, and OSM is produced in the telogen dermis. Conditional epidermal ablation of OSMRβ or STAT5 during early- and mid-telogen (P42 - P60) shortens the telogen phase significantly, and promotes activation of HFSCs both **in vivo** and **in vitro**. Single-cell RNA sequencing of dermal CD45+ immune cells across murine telogen identifies a distinct subset of TREM2+ macrophages as the source of OSM. We further show that this distinct subset of TREM2+ macrophages predominate during telogen, particularly during early-to-mid telogen. Moreover, inhibition of macrophages by way of neutralizing antibodies, small-molecule inhibitors, and genetic ablation (with Csf1r-CreER::R26::iDTR mice) during telogen also promotes hair growth by removing the endogenous source of OSM. **CONCLUSION** This discovery highlights the role of immune cells in establishing a quiescent niche for HFSCs, and suggests they may be a novel extrafollicular therapeutic target for treating disorders of arrested or prolonged telogen.

**KEYWORDS:** Hair cycle, Hair growth, Macrophages, Oncostatin M, Stem cells

**P043**

**Hair Management Of Transgender And Gender Nonconforming Patients**

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Catherine Motosko is a 2019 MD candidate at NYU School of Medicine and current Research Fellow at NYU’s Hansjörg Wyss Department of Plastic Surgery. Since graduating from Duke University with a Bachelor of Science Degree in Biology, she has completed three years of medical school before taking time off to pursue research in
gender affirming care in NYU’s Hansjörg Wyss Department of Plastic Surgery. As a student interested in dermatology, her research interests include the dermatologist’s role in gender-affirming care, hormonal changes of the skin, and the treatment and prevention of sun-related skin damage.

C.C. Motosko: None. J. Shapiro: None. K. Sukhdeo: None.

TAKE HOME MESSAGE:
Health care providers must understand the physiologic changes of hair and counsel their transgender and gender nonconforming patients on supplemental therapies that may be required to achieve the desired hair growth patterns.

ABSTRACT:
Introduction: Transgender health, including skin and hair care, is an understudied and underappreciated aspect of dermatology. The gender affirming process may involve accompanying alterations of hair distribution. Dermatologists are poised to guide transgender patients in this process; however, a paucity of data exists to inform providers on goal setting, hair management, and treatment options. **Objective:** To synthesize the transgender hair management considerations and recommendations from existing literature as well as expert opinion. **Methods and Materials:** MEDLINE, Embase, and Cochrane databases were queried for articles published through January 1, 2018. A Boolean search of the index terms “transgender” and “hair” was performed. Transgender patients and physicians with expertise in transgender hair care were consulted. **Discussion/Results:** Few reports address the trichologic considerations of the transgender population. Medical, surgical, and procedural interventions to masculinize the appearance are notable for efforts to increase hair thickness and density in targeted areas (ie, beard, eyebrows). Induced androgenetic alopecia is a poorly recognized and undesired potential sequela of testosterone-driven gender affirming therapy. Conversely, feminizing therapy may require efforts to reduce hair in select locations as well as reverse possible pattern hair loss. Our study further identifies and reports on unpublished management and treatment recommendations based on extensive experience with transgender patients. We also describe how a coordinated approach between dermatology and plastic surgery can facilitate optimal appearance outcomes for the benefit of patients. **Conclusion:** Increased awareness and reduced stigmatization of the transgender population drives an increased number of patient encounters with dermatologists. The unique needs of this population to achieve the desired appearance and texture of hair requires an understanding of physiologic, temporal, and societal challenges involved, which we summarize and present in this study.

P044
Non-invasive Imaging Methods For Diagnostic And Prognostic Purposes In Alopecia
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Natasha Atanaskova Mesinkovska MD PhD is a dermatologist and dermatopathologist, and the Director for Dermatology Clinical Research at the University of Irvine. She trained at Mayo Clinic and Cleveland Clinic, where she completed her dermatopathology fellowship with Dr. Wilma Bergfeld. She currently serves a Scientific Officer for the National Alopecia Areata Foundation.


TAKE HOME MESSAGE:
While histological analysis is the gold standard for
diagnosing and monitoring alopecia, OCT demonstrated to be a promising and invaluable tool to non-invasively and rapidly assess and quantify hair loss. We intend to use OCT to study changes in hair density, hair follicle and fiber diameter in different hair loss diseases.

**ABSTRACT:**
Non-invasive imaging technologies for in vivo characterization of androgenic alopecia

**Background:** Androgenic alopecia (AGA) is the most common type of alopecia in men and women, characterized by progressive hair follicle miniaturization. In the quest to better understand the etiology of AGA and obtain effective treatments, non-invasive imaging technologies can advance the characterization of hair loss processes. Optical Coherence Tomography (OCT) is a non-invasive, non-ionizing tomographic imaging technology that produces high resolution three-dimensional tissue cross-sectional images.

**Objective:** In this study we demonstrate the capability of OCT to differentiate and quantify hair loss in patients with androgenetic alopecia.

**Materials and Method:** The study population comprised of patients with diagnosis of androgenic alopecia and healthy control subjects. We utilized a portable OCT system and a hand-held 3D scanning probe to analyze scalp hair. The OCT system used comprised of a 1310nm center wavelength super luminescent diode in fiber based Michelson interferometer setup. Three dimensional OCT scans were obtained from distinct and corresponding scalp areas in patients. The OCT images were then analyzed using ImageJ to quantify hair follicle and hair shaft measurements.

**Results:** OCT scans allowed for visualization of a 4mm field of view and provided accurate assessment of the number and character of hairs per field. In patients with AGA, we detected a decrease in hair diameters with an increased hair follicle - hair shaft diameter ratio. In addition, even in areas of AGA that clinically corresponded to complete hair loss, we were still able to detect miniaturized hairs. We also discuss changes that we see after treatment success and induction of hair growth.

**Conclusion:** While histological analysis is the gold standard for diagnosing and monitoring alopecia, OCT demonstrated to be a promising and invaluable tool to non-invasively and rapidly assess and quantify hair loss.

**P045**

**Hyperpigmented Upper Eyelid: A Clue To Diagnosis Of Facial Lichen Planus Pigmentosus**

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**A. Lofeu:** None.  
**R. Trüeb:** None.  
**E.A. Vilar:** None.  
**R.V. Morais:** None.

**TAKE HOME MESSAGE:**
The upper eyelids sign is a potential noninvasive tool to diagnosis of facial lichen planus pigmentosus

**ABSTRACT:**
Lichen planus pigmentosus (LPPig) is a rare variant of classic lichen planus, which may affect, amongst other body sites, the face and neck. Dlova has recently reported 24 patients diagnosed with LPPig who lately developed frontal fibrosing alopecia; since that time point, this coexistence has also been highlighted by
The authors of this paper describe a 56-year-old postmenopausal woman with frontal fibrosing alopecia who displayed an intense brown-grayish facial hyperpigmentation affecting both malar regions and the upper eyelids. Histopathology analysis of a skin fragment obtained from the facial lesion was compatible with LPPig. **Objective:** To call attention for the hyperpigmented upper eyelid as a sign of facial LPPig in patients with frontal fibrosing alopecia. **Materials and/or Methods:** The patient here described was diagnosed with frontal fibrosing alopecia based on clinical and histopathological criteria. Facial hyperpigmentation of both malar regions and upper eyelids were examined with a handheld dermatoscope and pictures were taken to comparative evaluation. **Discussion/Results:** Despite the absence of well-established diagnostic criteria for facial LPPig based on histopathology features, some dermoscopic patterns have yet been described as extremely suggestive of this condition. In this case, the dermoscopic presentation observed on the malar regions was reliably compatible with LPPig and was also evident on the hyperpigmented upper eyelids. **Conclusion:** Despite the fact that other differential diagnosis ought to be ruled out, especially melasma for hyperpigmented malar regions, the involvement of the upper eyelid with characteristic dermoscopy may be a clue to the diagnosis of facial LPPig.

**P046**

**The Utility Of Non-invasive In Vivo Imaging In Monitoring Hair Loss Disorders: A Pilot Study**

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**C.N. Ekelem:** None. **M. Juhasz:** None. **J. Yu:** None. **A. Hosking:** None. **N.A. Mesinkovska:** None.

**TAKE HOME MESSAGE:**
Non-invasive in vivo imaging has utility in monitoring alopecia as it shows consistency with existing clinical assessments of hair loss progression or improvement.

**ABSTRACT:**
**Importance:** Hair loss disorders afflict people of all subtypes, are often difficult to treat, and extremely disruptive to the psychological well being of patients. Unfortunately, clinicians are often limited in optimally addressing alopecia by imperfect diagnostic and monitoring methodologies, currently hinged on the gold standard of scalp biopsies and hair follicle histology. Researchers are currently investigating the potential and practicality of non-invasive imaging in order to enhance general alopecia care.

**Objective:** The aim of this study was to evaluate the ability of non-invasive in-vivo imaging to aid clinicians in diagnosing, characterizing, and monitoring various types of alopecia.

**Methods:** Optical coherence tomography (OCT) was used to capture quantitative scalp measurements including number of hair shafts, number and diameter of hair follicles, and epidermal thickness. These measurements were recorded for several separate 5x7mm scalp locations commonly effected by alopecia on 20 subject scalps before and after respective treatment. Measurements were then compared across alopecia types.

**Results:** Twenty subjects participated in this observational study. Ten subjects have scarring and ten have non-scarring alopecia, fifteen underwent various scalp injections and five underwent other procedural treatments, such as localized fractional photothermolysis. Non-invasive imaging data for monitoring treatment course is consistent with clinician global assessments in over 80% of cases. **Conclusion:** Findings of this study show that OCT has significant potential for clinical relevance in addressing alopecia. The process of image analysis elucidated the importance of developing systematic methods of characterizing the sub-epidermal qualities of hair. This imaging modality potentiates the tracking of follicular units over an alopecia course that is unattainable by and safer than scalp biopsy.
Determining The Value Of Hair Maintenance For Cancer Patients During Chemotherapy Treatment

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Dr. Juhász is the current Clinical Research Fellow at the University of California, Irvine, Department of Dermatology. While here, she has served as a sub-investigator on multiple studies, and has been involved in testing novel therapeutic options for hair loss, as well as imaging techniques to characterize different types of alopecia. She graduated from the Icahn School of Medicine at Mount Sinai, receiving the prestigious, four-year Mount Sinai Scholars as Leaders Merit Scholarship, was chosen as a fellow for the highly competitive Howard Hughes Medical Institute Summer Medical Fellows Program, and completed research under Dr. Ellen Marmur. She holds a Master of Science from the University of British Columbia where she was awarded the Faculty of Medicine Graduate Award, and completed her undergraduate studies on full scholarship. Before embarking on her career in medicine, she was a professional concert pianist making her Carnegie Hall debut at 14 years old.


TAKE HOME MESSAGE:
CIA is a devastating adverse event of chemotherapy cancer treatment for many patients, resulting in psychological morbidity as well as decreased quality of life. Although CIA-preventive measures have been shown to be efficacious and cost-effective, many medical providers in the United States do not offer or cover the expenses of such services. Cancer patients undergoing chemotherapy are interested in CIA-preventive measures and the current medical system should consider providing these therapeutic modalities to patients.

ABSTRACT:
Background: Chemotherapy-induced alopecia (CIA) is one of the main adverse events of chemotherapy and can be experienced by 22 to 65% of cancer patients undergoing treatment. As many as 8% of cancer patients have considered forgoing chemotherapy because of the potential for CIA and its associated decrease in quality of life. Preventive treatment options such as scalp-cooling exist, and have been shown to significantly decrease hair-loss in patients with solid tumors undergoing chemotherapy. European studies have shown that such devices are cost-effective. However, only 17 cancer centers throughout the United States offer devices for patients undergoing chemotherapy due to lack of insurance coverage and excessive medical cost.

Hypothesis: Patients are interested in the use of novel preventive therapies to minimize CIA incidence and duration.

Objective: To determine cancer patients’ baseline understanding of CIA, their interest in minimizing hair-loss or increasing the chance of hair regrowth, and the cost patients are willing to accrue for novel preventive measures. Using these data we aim to predict the demographic of patients who are motivated in reducing CIA and to demonstrate that patients with non-solid tumor diagnoses are also interested in CIA-preventive strategies.

Study Design: A survey-based, cross-sectional study of 100 patients currently undergoing or previously treated with chemotherapy at the Chao Comprehensive Cancer Center located at the University of California, Irvine.

Results: Patients overwhelming express their interest in CIA-preventive devices. Demographic characteristics such as age, gender, race and socioeconomic status play an integral role in patients’ medical literacy regarding CIA, as well as their interest in preventing hair loss with novel therapeutics.

Conclusion: CIA-preventive treatments and devices, such as scalp-cooling, are wanted and needed by solid tumor and non-solid malignancy cancer patients. It is our hope that this research will evoke change in the medical system to provide coverage for such preventive measures.
Successful Regrowth Of Hair In Alopecia Areata Using Platelet-rich Plasma As Quantitatively Measured By Optical Coherence Tomography

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Dr. Juhász is the current Clinical Research Fellow at the University of California, Irvine, Department of Dermatology. While here, she has served as a sub-investigator on multiple studies, and has been involved in testing novel therapeutic options for hair loss, as well as imaging techniques to characterize different types of alopecia. She graduated from the Icahn School of Medicine at Mount Sinai, receiving the prestigious, four-year Mount Sinai Scholars as Leaders Merit Scholarship, was chosen as a fellow for the highly competitive Howard Hughes Medical Institute Summer Medical Fellows Program, and completed research under Dr. Ellen Marmur. She holds a Master of Science from the University of British Columbia where she was awarded the Faculty of Medicine Graduate Award, and completed her undergraduate studies on full scholarship. Before embarking on her career in medicine, she was a professional concert pianist making her Carnegie Hall debut at 14 years old.


TAKE HOME MESSAGE:
AA is a devastating form of non-scarring hair loss associated with high levels of patient psychological morbidity. With limited treatment options, new therapies such as PRP are necessary. Preliminary results using PRP treatment for AA are promising, however, controversial due to the lack of reliable and accurate quantitative measurement tools. OCT represents a novel, quantitative, non-invasive imaging technique that can be used in the clinic setting to track changes in hair follicle count and hair shaft diameter after treatment with PRP.

ABSTRACT:
Introduction: Alopecia areata (AA) is an inflammatory, non-scarring condition causing hair loss. Current treatment modalities are limited due to side effects and recurrence after therapy cessation. Platelet-rich plasma (PRP) is a new treatment modality that has been used for multiple applications including skin rejuvenation, joint injection and hair growth. Thus far, results of PRP-induced hair regrowth have been controversial due to the inability to obtain accurate and reliable quantitative results. Optical coherence tomography (OCT) is a novel, non-invasive imaging system that can be used to measure hair follicle density and hair shaft diameter.

Case Report: A 60-year-old female with a nine-year history of AA presents to the office for evaluation and treatment. Her last treatment with intralesional triamcinolone occurred in April 2017; since that time the patient has not used any hair regrowth therapies. The patient received intradermal injections of 9 mL PRP throughout the scalp. Using photographs, SALT scores and OCT, we accurately assess the patient's hair pre- and post-treatment. Six weeks after PRP treatment, the patient exhibits 9% improvement in SALT score (baseline 42.1, post-treatment 38.2), with a 28% increase in hair follicle count on the right side of the scalp and 14% on the left. Hair shaft diameter within the follicle increases three-fold on the right side, however, no improvement is noted on the left.

Discussion: The use of PRP for the treatment of AA has been previously described, however, reports of treatment success are limited and controversial especially without the ability to reliably measure therapeutic efficacy. This represents the first case of quantitatively measured PRP treatment success in a patient with AA.

Conclusion: PRP is an effective treatment for AA with improvement in both hair follicle count and hair shaft diameter. OCT is a reliable and accurate method to quantitatively measure hair regrowth after PRP treatment.

"Effect Of A Zinc Supplementation In Preventing Alopecia After Bariatric Surgery."
Marianne Gosch Caroca, MD, MSc1, Jorge Larrondo, MD, MSc2, Pamela Rojas, MD, MSc2, Manuel Ruz, PhD3, Felipe Mardones, MD4, Amy McMichael, MD, FAAD5.
TAKE HOME MESSAGE:
Alopecia is frequently seen in patients after bariatric surgery, although literature is scarce. The exact cause still remains unknown. Iron and zinc deficiency and a possible hormonal (hypothyroidism and sex hormones) imbalance during postoperative have been proposed. Patients were evaluated clinically, nutritionally and a trichogram were performed in each patient (baseline and after 4 months). We observed that the supplementation with oral zinc did not appear to prevent its development.

ABSTRACT:
"Effect of a zinc supplementation in preventing alopecia after bariatric surgery."

Introduction. Alopecia is frequently seen in patients after bariatric surgery, although literature is scarce. The exact cause still remains unknown. Iron and zinc deficiency and a possible hormonal (hypothyroidism and sex hormones) imbalance during postoperative have been proposed.

Objective. Characterize alopecia in a group of female patients undergoing postoperative vertical sleeve gastrectomy (VSG). Evaluate their clinical, nutritional and hormonal status before and after the intervention. Assess the role of zinc supplementation in preventing alopecia.

Materials and methods. Randomized, double-blind, placebo-controlled study of women from surgery department of the Clinical Hospital of the University of Chile who underwent VSG. Patients were evaluated clinically and nutritionally before and 4 months after surgery. Serum levels of iron, zinc, TSH, free T3, FSH, LH, total and free testosterone, SHBG, 17 beta-estradiol and copper were assessed. Trichogram (baseline and after 4 months) was performed in each patient. They were randomly supplemented with 110 mg of zinc sulfate or placebo. Spearman correlation coefficient and multiple linear regression were made to analyze results.

Results. 15 patients were evaluated (8 placebo and 7 control). 10 patients (from both groups) referred hair loss after surgery, although all patients demonstrated telogen effluvium in the trichogram during the fourth month. A non-significant tendency between the amount of weight loss and extent of telogen was observed in the control trichogram. Serum zinc, iron, free T3, FSH, LH, total and free testosterone, 17 beta-estradiol and copper levels did not show significant differences between groups before and after surgery. In those who received zinc supplementation, significantly increased zinc serum levels were observed.

Conclusions. Although only a percentage of patients referred alopecia, everyone demonstrated telogen effluvium after VSG. A supplementation with oral zinc did not appear to prevent its development.

P050
Optical Coherent Tomography In The Diagnosis Of Scalp Disorders
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Jorge Larrondo G, MD, MSc, is a dermatologist graduated from the University of Chile. He trained in Trichology and Hair Restoration Surgery at the University of Alcalá de Henares. He is currently working at Clínica Alemana, Hospital Padre Hurtado and Hospital del Salvador, in Santiago de Chile. His main interests are: cicatricial alopecias, trichoscopy and hair restoration surgery.

M. Gosch Caroca: Consultant/Advisory Board; La Roche-Posay. J. Larrondo: Consultant/Advisory Board; ROL in La Roche-Posay. P. Rojas: None. M. Ruz: None. F. Mardones: None. A. McMichael: None.
I am a dermatologist from Mexico City with special interest in hair diseases. My professor is Dr. Antonella Tosti, with whom I have the great opportunity to learn about hair disorders in Bologna and in Miami. I am part of the Mexican Trichology society.


TAKE HOME MESSAGE:
OCT is a useful tool in the diagnosis and follow up of patients with inflammatory scalp disorders.

ABSTRACT:

Introduction Clinical manifestations of inflammatory scalp disorders sometimes overlap. It is important, before initiating treatment to establish diagnosis and severity of the disease. D-OCT is a non-invasive imaging modality using optics to acquire real-time cross-sectional and en face images of tissue up to 2 mm below the skin surface and can capture blood vessels and their distribution. Allowing understanding of skin architecture and vascularization in vivo. 

Objective To describe the structural and vascular findings in different inflammatory scalp disorders using D-OCT 

Methods This was a retrospective observational study aimed to evaluate the characteristic features in scalp disorders in OCT. In this study 9 patients with psoriasis, lupus erythematosus, contact dermatitis, and seborrheic dermatitis were evaluated. Results Normal scalp vessels has an interfollicular granular pattern, more intense at deeper plexus. In Psoriasis, superficial plexus showed spindle like scattered vascular dilations, more evident at deeper levels and on cross-sectional view (CSV) spiral network of vessels at dermal papila. Seborrheic dermatitis showed a network of arborizing vessels, more dilated and ramified at deeper levels. Contact dermatitis has a dilated network of vessels at deeper levels and a diffuse pattern of enlarged vessels present along all dermis on CSV. In Lupus at the inflammatory areas with alopecia, were almost absence of the superficial plexus and at deeper levels giant dilated serpiginous capillaries. On CSV, showed clusters of capillaries around the hairs, while in cicatrical areas dilated vessels were prominent and distributed homogenously. Conclusion. OCT is a useful tool in the diagnosis and follow up of patients with inflammatory scalp disorders.

P051

Seborrheic Dermatitis, Describing Three Novel Trichoscopic Signs And Its Correlation To Malassezia Colonization 

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My name is Abril Martínez, I am a dermatologist from Mexico City with special interest in hair diseases. I have trained with Dr.Antonella Tosti In Miami and Bologna and now I am part of the Mexican society of trichology.


TAKE HOME MESSAGE:
We describe three novel signs of which the ‘dandelion’ vascular pattern was the only trichoscopic sign to correlate with Malassezia colonization.

ABSTRACT:
Seborrheic Dermatitis (SD) or seborrheic eczema is a chronic recurrent erythemato-squamous condition that affects seborrheic areas causing flaking, erythema, and pruritus. It is a multifactorial disease where the role of Malassezia spp. keeps being controversial. Methods We present a series of 16 patients subjected to a trichoscopic examination and to a direct microscopic exam to quantify Malassezia spp. In order to analyze and determine which one of the SD trichoscopic signs has a real correlation to the amount of Malassezia spp. in the scalp. Results We found 16 cases of
patients diagnosed with seborrheic dermatitis where trichoscopic images were located. The clinical variables analyzed were: adherent scale, interfollicular white scale, interfollicular oily scale, peripilar white scale, peripilar oily scale, arborizing vessels, glomerular vessels, ‘Cherry blossom’ vascular pattern, comma vessels, serpentine vessels, ‘dandelion’ vascular pattern, concretions, yellow dots, intrafollicular oily material, clusters of scales, interfollicular pustules, Ostium terminal hyperplasia, and the amount of Malassezia spp. Quantity of Malassezia spp. correlated only with one clinical sign, the ‘dandelion’ vascular conglomerate (p= 0.05). Conclusion We describe three novel signs of which the ‘dandelion’ vascular pattern was the only trichoscopic sign to correlate with Malassezia colonization. This is the only study that have correlated trichoscopic signs in SD and the quantity of Malassezia spp. until now. We describe three new signs that can be useful to determine indirectly the fungal colonization of the scalp in SD.

P052
Trichoscopy in Dark Scalp
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Mexican dermatologist with special interest in hair diseases.


TAKE HOME MESSAGE:
Although most dermoscopic features are similar in dark-skinned individuals, there are some characteristics of the pigmented scalp that are unique and important to be known.

ABSTRACT:
Introduction Trichoscopy (dermoscopy of the hair and scalp) is a technique that improve the diagnostic accuracy and follow-up of hair and scalp disorders. Although several studies have been made about the trichoscopy in the Caucasian and Asian populations, little has been published regarding the trichoscopy findings in skin of color, despite the great prevalence of hair diseases in this population. Objectives of the study Describe the trichoscopic features of the normal scalp and of hair disorders in patient with dark phototypes. Material and methods: A literature search of PubMed/MEDLINE to identify case reports, case series, review articles, and clinical trials using the search terms (hair dermoscopy, trichoscopy or trichoscopic) was performed. Results: Sixty-one articles were included as well as three books published between 1993 and 2017 on trichoscopy of dark skinned individuals. Normal Dark-Skinned Scalp: A perifollicular pigmented network or honeycomb pattern is normally visible in the whole scalp. A unique feature of the pigmented scalp is the presence of pinpoint white dots. Scarring versus non-scarring alopecia: In non-scarring alopecias, punctiform white spots are regular and often contain miniaturized or broken hairs, whereas in scarring alopecias they have an irregular distribution, and the scalp between the dots contains irregular white patches. Androgenetic alopecia: The peripilar sign is uncommon, possibly owing to the difficulty in identifying this feature in dark skin. Alopecia areata: Yellow dots are uncommon, as empty follicles appear white instead than yellow. Tinea Capitis: The corkscrew hairs are a characteristic finding in patients of African descent. Central centrifugal cicatricial alopecia (CCCA)): A peripilar grey white halo around the emergence of the hairs is a specific and sensitive sign for the diagnosis of CCCA Conclusion Although most dermoscopic features are similar in dark-skinned individuals, there are some characteristics of the pigmented scalp that are unique and important to be known.

P053
The Role Of Platelet-rich Plasma In Alopecias As Quantitatively Measured By Optical Coherence Tomography: Prospective Pilot Study At A Single Center
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Natasha Atanaskova Mesinkovska MD PhD is a dermatologist and dermatopathologist, and the Director for Dermatology Clinical Research at the University of California Irvine. She trained at Mayo Clinic and Cleveland Clinic, where she completed her dermatopathology fellowship with Dr. Wilma Bergfeld. She currently serves as the Chief Scientific Officer for the National Alopecia Areata Foundation.

N. Mesinkovska: None.

TAKE HOME MESSAGE:
Take Home Message: Hair loss conditions create a continuous challenge because of the lack of effective treatments. Preliminary results using PRP treatment for scarring and non-scarring alopecia are promising. OCT represents a non-invasive imaging technology that can be used to quantify hair growth, by computing hair follicle counts and hair shaft diameters.

ABSTRACT:
Introduction: Platelet-rich plasma (PRP) is a treatment modality with widespread use as panacea for various skin conditions, including alopecia. There is currently prolific literature on the supposed positive effects of PRP for hair loss. However, the uncertainty of who will benefit from this procedure and the lack of proven treatment guidelines pose a challenge. Optical coherence tomography (OCT) is a non-invasive imaging system that can be used to quantify hair growth by measuring hair follicle density and diameter.

Hypothesis: PRP is an effective treatment technique for certain non-scarring alopecias, but has a limited potential in scarring alopecias.

Objective: To quantify hair growth by measuring hair follicle density and diameter in different points on scalp using OCT imaging at baseline and after PRP treatments.

Study Design: This is a prospective study of 30 patients, 20 with non-scarring (androgenic alopecia and alopecia areata) and 10 with scarring alopecia (cutaneous lupus, lichen planopilaris, central centrifugal cicatricial and frontal fibrosing alopecia). The patients received three standardized PRP injection treatments at 4 week intervals. The study was performed at the Center for Dermatology Clinical research, at University of California, Irvine.

Results: Quantification of hair growth was achieved by non-invasive OCT measurements with J image analysis, at baseline and at 12 weeks of treatment. Response to PRP was noted across different hair loss conditions, and these numbers along with their statistical significance will be discussed. Surprisingly, scarring hair loss types also showed significant reduction in inflammatory parameters and even hair regrowth after treatment in certain cases, with decrease in symptoms of pruritus and scaling.

Conclusion: PRP can be an effective treatment for both scarring and non-scarring alopecias with improvement in both hair follicle count, hair shaft diameter and reduction of inflammation. OCT is a reliable and accurate method to quantitatively measure hair regrowth after PRP treatment.

P054
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Dr. Javed Mohammed, PhD, is an Assistant Professor in Department of Dermatology at the University of Minnesota. He has a long standing interest in skin cancer and immunology research.


TAKE HOME MESSAGE:
A thorough review of medical history and clinical examination of injection sites is highly recommended prior to platelet-rich plasma treatment for androgenetic alopecia.

**ABSTRACT:**
Platelets contain α-granules that are reservoirs of growth factors (GFs) PDGF, TGFβ1, VEGF, EGF, bFGF, IGF-1 and HGF thereby regulating cellular proliferation, migration, differentiation and angiogenesis. Since platelet secreted GFs play critical roles in the natural healing process, platelet-rich plasma (PRP) prepared from blood is injected to sites of injury delivering high concentrations of autologous GFs. Several studies have evaluated and documented effectiveness of PRP to treat hair loss disorders such as androgenetic alopecia. It is believed that GFs released from platelets upon PRP injection act on skin and hair follicle stem cells thereby promoting neovascularization and follicle differentiation. However, platelet GFs can also play key roles in several pathological processes, including tumor biology. Therefore, a PRP injection resulting in 300%-700% enrichment of platelets could potentially lead to an undesirable outcome when injected into a site harboring precancerous/cancerous cells. Since cancer progression is influenced by interaction of cancer cells with those in stroma and the resulting paracrine signaling mediated by GFs, we compared expression profiles of human platelet GFs in PRP samples of patients with androgenetic alopecia to primary and metastatic human melanoma and SCC cell lines by quantitative PCR. Platelet expression of TGFβ1 was highest and was consistent with GF analysis in PRP samples. While low to undetectable transcript levels were noticed for IGF and HGF in both platelets and cancer cells, platelets had significantly higher expression of EGF (300-10,000x), TGFβ1 (50-120x), PDGF-A (5-70x) and PDGF-B (3-16x) mRNA. VEGF expression was higher in cancer cells while bFGF expression in metastatic cell lines was similar to platelets. Thus, adverse effects following PRP injection in context of precancerous lesions may be a theoretical risk due to significant contribution of platelet GFs. A thorough review of medical history and clinical examination of injection sites is highly recommended prior to PRP treatment.

**P055**
Tofacitinib Shows Efficacy In Treatment Of Lichen Planopilaris
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Brigitte Sallee MD is a translational medicine fellow in the lab of Angela Christiano PhD at Columbia University. She works on scarring and lymphocytic alopecia projects partnering with faculty clinicians from Columbia University Department of Dermatology. Brigitte earned her MD in 2016 from the University of Oklahoma College of Medicine and completed her internship training in Chicago, June 2017. She is a graduate of the University of Oklahoma Honors College with a BS in Zoology and BA in Classics and Letters.

B.N. Sallee: None.

**TAKE HOME MESSAGE:**
JAK inhibitors represent a promising new treatment option for LPP.

**ABSTRACT:**
Introduction: The clinical management of lymphocytic scarring alopecias such as lichen planopilaris (LPP) varies widely, with a lack of evidence to guide treatment for patients with this disfiguring disease. LPP is a dermatologic emergency requiring immediate, effective treatment to prevent scarring and preserve the hair follicle (HF). Both AA and LPP HFs show evidence for immune privilege collapse, characterized by increased expression of MHC-I and II, however, the location of the immunological attack is anatomically distinct. In AA, the inflammatory infiltrate involves the lower anagen HF bulb region, whereas in LPP, the infiltrate is primarily found in the upper follicle, around the bulge region. The composition of the inflammatory infiltrate in AA and LPP involves primarily a Th1 cytotoxic CD8+ T-cell response, with increased expression of the interferon-inducible chemokines, including CXCL9/10/11. A variety of immunomodulatory therapies have been tried in both AA and LPP including topical, intralesional and oral corticosteroids with inconsistent results. Objective: We previously showed that the small molecule pan-JAK inhibitor, tofacitinib, is effective in modulating the inflammatory response in AA patients and
restoring hair growth in affected individuals. Methods: We investigated whether tofacitinib would be similarly effective in the treatment of LPP. Results: We successfully treated 8 patients with oral tofacitinib, showing improvement in the LPP activity index (LPPAI) from 30-94% after treatment (paired t-test, p=0.0014). Two of our 8 successfully treated patients required dose escalation from 5mg BID to TID for measurable response. We also show LPP flaring upon tofacitinib withdrawal, and disease rescue upon re-initiation of therapy. Importantly, no adverse effects were reported, and there were no significant changes from pre-treatment values in complete blood count, complete metabolic, or lipid panel laboratory values. Conclusions: JAK inhibitors represent a promising new treatment option for LPP, and these early open label studies invite further randomized placebo-controlled trials.

**P056**

**Effectiveness Of Laser Technology For Non-scarring And Scarring Alopecia**

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Wake Forest Baptist Medical Center, Winston-Salem, NC, USA.

Andrea Tovar-Garza finished her dermatology residency in Guadalajara, Mexico in 2016. She did a two year research fellowship at UT Southwestern focusing on pigmenary disorders with Dr. Amit Pandya. She is currently an international observer at Wake Forest focusing on hair loss with Dr. Amy McMichael.

A. Tovar-Garza: None. L. Uwakwe: None. A. McMichael: None.

**TAKE HOME MESSAGE:**

Laser technology is a potential new therapeutic option for non-scarring alopecia. Fractional Er:Glass and Diode laser have shown some effectiveness on alopecia areata. Excimer laser has certainly been reported to improve hair regrowth in three placebo-controlled studies. Fractional Er:Glass laser has shown promising results in androgenetic alopecia. Studies in scarring conditions are lacking and need further research.

**ABSTRACT:**

**Introduction:** Hair loss caused by different types of alopecia has a negative impact on the individual’s quality of life. The use of laser technology for hair loss has been recently reported for scarring and non-scarring conditions with inconsistent results.

**Objective:** To perform a literature review to evaluate the effectiveness of laser technology in scarring and non-scarring alopecia.

**Materials and Methods:** A broad literature search using Pubmed, Google and Google Scholar was performed in January 2018. The search terms employed included: alopecia, laser, Nd:YAG, Er:Glass, excimer, alopecia areata, androgenetic alopecia and lichen planopilaris. Titles and abstracts were reviewed for relevance. Prospective and retrospective clinical trials, case series and case reports were included in the literature review.

**Results:** 14 studies were included. 9 studies focused on alopecia areata (AA), 2 on androgenetic alopecia, 2 on lichen planopilaris (LPP) and 1 on dissecting cellulitis (DC). In AA, fractional Er:Glass laser reported >75% hair regrowth in 40 patients at 2 to 6 months. Infrared diode laser reported >90% complete hair regrowth in 16 patients with patchy AA at 2 months. Infrared radiation showed effectiveness in 47% to 75% of patients with AA as adjuvant treatment. A study using Nd:YAG and CO2 failed to show improvement when compared to placebo. Excimer laser has shown to be effective in three placebo-controlled studies for AA. Fractional Er:Glass laser reported 70% to 80% hair regrowth in 48 patients with androgenetic alopecia. In LPP, excimer laser reported mainly decrease in symptoms and only 23% hair regrowth. One study failed to show efficacy of Er:Glass for FFA. One case report of DC, treated with isotretinoin and CO2 laser reported >75% improvement after 17 sessions.

**Conclusion:** Laser technology is a potential new therapeutic option in alopecia areata, androgenetic alopecia and lichen planopilaris. However, additional randomized controlled trials are necessary.
**P057**

**The Rise Of Transcutaneous Drug Delivery For The Management Of Alopecia: A Review Of Existing Literature And An Eye Towards The Future**

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Angela Wipf is a fourth year medical student at the University of Minnesota and a clinical research fellow in the University of Minnesota Department of Dermatology from June 2017 through May 2018.

**A. Wipf:** None.  **N. Boysen:** None.  **E. Dando:** None.  **M.K. Hordinsky:** None.  **N. Sadick:** None.  **R.S. Farah:** None.

**TAKE HOME MESSAGE:**
Fractional lasers and microneedling devices are increasingly being used in tandem with topical drug administration to treat various skin conditions, including alopecia. Utilizing these devices should improve drug access to dermal structures such as the hair follicle and cutaneous vasculature. There is preliminary evidence demonstrating increased hair regrowth compared to topical therapy alone. However, data are limited and further studies are needed to elucidate optimal treatment parameters and appropriate device selection, while maximizing patient safety.

**ABSTRACT:**

**Introduction**
Fractional lasers and microneedling devices are increasingly being used in tandem with topical drug administration to treat a variety of various skin conditions, including alopecia. Utilizing these devices should improve drug access to dermal structures such as the hair follicle and cutaneous vasculature.

**Objective**
To review existing literature on transcutaneous drug delivery in the treatment of alopecia.

**Methods:**
PubMed, Embase, and Ovid Medline databases were systematically searched from 1946 to 2017 using terms including: alopecia, microneedling, lasers, androgenetic alopecia (AGA), alopecia areata (AA), drug delivery. Inclusion criteria were as follows: diagnosis of alopecia regardless of type, use of fractional laser or microneedling devices, and subsequent administration of a topical medication.

**Results:**
Eight studies met the inclusion criteria. Six were prospective clinical trials, two were case series, and two were published abstracts. Five studies examined subjects with alopecia areata (AA); three studies examined subjects with androgenetic alopecia (AGA). Four of the five AA studies used microneedling as the means for transcutaneous access, with one study using ablative fractioned radiofrequency or CO₂ laser, followed by ultrasound. Three studies included a form of triamcinolone as the topical agent for AA, two studies used photodynamic therapy. Regarding AGA, two studies used topical minoxidil plus microneedling, and one study used topical finasteride with a fractional erbium glass laser. Improvement was seen in 6 of the 8 studies including 4 clinical trials, of note the two studies that failed to show improvement examined use of methyl 5-aminolevulinic acid plus photodynamic for AA. **Conclusion:** Transcutaneous drug delivery via fractional laser and microneedling is a promising therapeutic modality with preliminary evidence that this it promotes demonstrating increased hair regrowth over topical therapy alone. However, data are limited and further studies are needed to elucidate optimal treatment parameters and appropriate device selection, while maximizing patient safety.

**P058**

**Alopecia Induced By Sorafenib: A Case Report**

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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 PhD Candidate at the Department of Dermatology, FMUSP.


TAKE HOME MESSAGE:
Sorafenib is a multikinase inhibitor for the treatment of some advanced carcinomas. Most prominent side effects of Sorafenib are dermatological toxicities, including alopecia and hair shaft changes. We report a case of alopecia induced by sorafenib, whose histopathological examination revealed inflammatory changes. More studies are necessary to elucidate the pathophysiology of this alopecia.

ABSTRACT:
Sorafenib is a multikinase inhibitor targeting growth signalling and angiogenesis. It blocks Raf serine/threonine kinase that controls cell division and proliferation and inhibits vascular endothelial growth factor receptor (VEGFR)-2, VEGR-3 and platelet derived growth factor (PDGF) receptor-b signalling cascade, which blocks tumour angiogenesis. It also targets the receptor tyrosine kinases KIT and Fms-like tyrosine kinase (FLT)-3, which have activity against tumour progression. Most prominent side effects of Sorafenib are dermatological toxicities as rash/desquamation, hand–foot skin reaction (HFSR), alopecia, dry skin and pruritus. Alopecia due to Sorafenib is frequent (26-35%) and affects patient’s quality of life. Nonetheless, the mechanism by which sorafenib induces hair loss has not been well established. Here, we report a case of alopecia induced by sorafenib, whose histopathological examination revealed inflammatory changes.

Case report:
A 41-year-old Brazilian woman with papillary thyroid carcinoma with lung metastases presented sudden scalp hair loss three months after the start of Sorafenib. Moreover, her hair became more brittle, curly, and hipopigmented than her original hair. She also presented hand-and-foot skin reaction and generalized keratosis pilaris, other cutaneous toxicity related to the drug. Thicoscopy showed yellow dots and short regrowing hair on her scalp. Histopathological examination of scalp skin specimens demonstrated decreased follicular density, inflammatory infiltrate composed of lymphocytes and histiocytes around follicular infundibulum and hair bulb, and perifollicular fibrosis.

Discussion:
Alopecia induced by Sorafenib usually presents as a mild thinning or patchy hair and slow beard growth and begins 2 to 28 weeks after onset of therapy. The shaft can also be affected, with color and texture modifications. The mechanism by which Sorafenib induces hair changes is still unknown. Our case suggests that it can be related to inflammation directed to the hair follicle. More studies are necessary to elucidate the pathophysiology of this alopecia.

P059
Hair Loss In The Elderly: An Observational Study
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Ruzica is a current PhD student at Case Western Reserve University with an interest in hair loss.
TAKE HOME MESSAGE:
Hair loss in the elderly is a rising issue and hormonal and metabolic derangements may worsen the hair loss these patients suffer from.

ABSTRACT:
Introduction:
Modern medicine has significantly increased the human lifespan, with many changes including hair loss. An estimated 53% of men and 37% of women over 65 are balding; however, data regarding frequency and representation of hair loss conditions with advancing age is lacking. We aim to evaluate hair loss characteristics among elderly patients.

Materials and methods:
Patients ≥65 years with any type of hair loss were identified in the period from 2004-2014 (n=163). Clinical data collected included gender, race, age at first hair loss, hair loss type, and associated symptoms. Vitamin D, ferritin, zinc, thyroid stimulating hormone (TSH), testosterone, dehydroepiandrosterone sulfate, glucose and lipid levels were collected.

Results:
The most common types of hair loss were telogen effluvium (42.9%, n=70), lichen planopilaris (22.7%, n=37), androgenetic alopecia (16.6%, n=27). Less common were alopecia areata (11%, n=18), frontal fibrosing alopecia (4.3%, n=7) and central cicatricial centrifugal alopecia (2.5%, n=4). Low vitamin D was present in 49.4%, and low TSH in 6% of patients.

Conclusion:
Hair loss in the elderly is a rising issue and further attention needs to be given to these patients. The hormonal and metabolic derangements may worsen the hair loss these patients suffer from, and treating these derangements could reduce some of the observed hair loss.

P060
Vitamin D Status In Scarring And Non-scarring Alopecia
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Ruzica is a PhD student at Case Western Reserve University with an interest in hair loss.

TAKE HOME MESSAGE:
Low vitamin D is associated with all hair loss types and those with LPP are at 8 times higher odds of having a severe vitamin D deficiency compared to those with AA.

ABSTRACT:
Introduction: Vitamin D is produced in the skin and is an important factor in keratinocyte proliferation and differentiation, as well as regulation of the hair follicle cycle. It is implicated in the pathogenesis of various human diseases, including hair loss. We aim to evaluate the prevalence of vitamin D deficiency in patients with alopecia areata(AA), androgenic alopecia(AGA), central centrifugal scarring alopecia(CCCA), lichen planopilaris(LPP), and telogen effluvium(TE).

Methods: Patients diagnosed with AA, AGA, CCCA, LPP and TE from 2009-2010, were identified(n=358). Patients taking vitamin D supplements at the time of their visit were excluded. Vitamin D deficiency was defined as vitamin D levels < 30 ng/ml, and this was further categorized into mild(21-30 ng/ml), moderate(12-21 ng/ml), or severe(<12 ng/ml).
Results: The majority of patients had TE (n=121), followed by AA (n=77), AGA (n=73), LPP (n=58) and CCCA (n=29). Median age at the time of vitamin D evaluation was 49.5 years. LPP patients tended to be older, while AA were youngest (p<0.001). Males comprised 9.8% (n=35) of patients, and were most likely to have AA (p<0.001). Vitamin D deficiency was present in 64.8% of patients, with 32.96% having mild, 17.60% moderate and 14.25% severe deficiency. Vitamin D values were significantly associated with all hair loss type (p=0.02), with CCCA having lowest vitamin D levels, and AGA the highest. Patients with LPP had an 8.3 times higher odds of severe vitamin D deficiency (p<0.001), while TE patients had 3.7 times higher odds when compared to AA (p<0.024), after adjusting for sex, age, and race. African Americans had 6.3 times the odds of severe vitamin D deficiency and Asians 6.1 (p=0.004) compared to Caucasians (p<0.001). Men had a higher incidence of vitamin D deficiency, regardless of other factors.

Conclusion: Future studies should evaluate the effects of vitamin D supplementation on anagen to telogen ratios in scalp biopsies of patients with TE.

P061

Scalp Psoriasis-like Crusted Scabies: A Challenge To Overcome
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Last updated on LATTES: 01/25/2018 Address to access this CV: http://lattes.cnpq.br/4381120632492186 Professional Address: Universidade Federal Fluminense, Centro de Ciências Médicas, Hospital Universitário Antônio Pedro. Rua Marques de Paraná 303 Centro , 24033900 - Niterói, RJ - Brasil Phone: (21) 26299000

M.R. Dias: None. M.S. Teixeira: None. H.D. Rezende: None. A. Lofeu: None.

TAKE HOME MESSAGE:
In the disease scabies, areas that are not usually affected may also be possible targets, leading to a wide range of clinical presentations and frequent misdiagnosis.

ABSTRACT:
Introduction: The disease scabies is one of the earliest diseases of humans for which the cause was known. Although typically localized in specific parts of the body, such as hands, wrists, axillae and elbows, other less ordinarily affected areas may also be possible targets, leading to a wide range of clinical presentations and frequent misdiagnosis. The authors herein describe a crusted scabies presentation in a 46-year-old patient with Down syndrome initially diagnosed as having scalp psoriasis. The correct diagnosis was made based on microscopic demonstration of mites. The patient was treated with oral ivermectin and recovered well. Objective: This paper aims to highlight crusted scabies as a neglected disease of the scalp. Materials and/or Methods: In order to rule out crusted scabies, the patient was examined carefully and some skin scrapings were collected using a scalpel blade. Scabies mites were captured and looked at under the microscope. Discussion: Crusted scabies is a rare and severe form of infestation by Sarcoptes scabies var. hominis, which affects immunocompromised patients and those with developmental disability (including Down syndrome), regardless of immune status. Due to its potential of simulating other scaling scalp dermatoses, such as psoriasis, making the correct differential diagnosis may turn into a hard medical challenge. Crusted scabies is characterized by profuse hyperkeratosis containing over 4000 mites per gram of skin, which makes skin scrapings a valuable and easy diagnostic tool. It is especially true for those patients suffering from mental conditions, whose taking skin samples for histopathological analysis may be of great inconvenience. Conclusion: Crusted scabies affecting the scalp ought to be listed into the vast group of hypothesis for scaling scalp conditions, especially for patients with developmental disability and those with impaired immune system. Moreover, skin scraping may be considered a reliable diagnostic tool.
**P062**

**Hair Transplantation: Technology, Science And Art**

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Foundation for Hair Restoration, Miami, FL, USA.

Dr. Gorana Kuka Epstein is a board-certified plastic surgeon from Belgrade, Serbia, specializing in FUE hair transplant techniques, along with the medical management of hair loss. In addition to her Belgrade practice, she is closely affiliated with the Foundation for Hair Restoration in Miami and NYC, as well as actively conducts FDA-approved research studies. She is a PhD Candidate at Medical School of the University of Novi Sad, Serbia.

**G. Kuka Epstein:** None.

**TAKE HOME MESSAGE:**
Hair transplantation has tremendously evolved just in the past decade offering different devices and methods. We have witnessed expansion in technology that combined with science and artistic view can ensure natural results.

**ABSTRACT:**
Hair transplant procedures are almost two centuries old. At first, there was only an attempt to transplant hairs, but today we are witnessing a true revolution in results and natural outcomes that this procedure can offer. Supported by latest technology and knowledge on hair biology and healing has brought hair transplantation of the 21st century as a true, life-changing procedure that can ensure natural results. Many factors have influenced development of hair transplantation, especially improvement in Follicular Unit Excision (FUE) method and instrumentation that is currently used during this procedure. Better understanding of the healing of the donor area enables surgeons to use them evenly, enabling patient to undergo this procedure several times. The aim of this presentation is to depict this surgical procedure as a contemporary method that combines technology, science and art, all three elements that any aesthetic procedure should. It will list safe indications for it, and present what kind of results should be aimed for.

**P063**

**Multiphoton Microscopy For Diagnostic Indices In Alopecia Areata**

**Jessica Lin, BSc, Mihaela Balu, PhD, Griffin Lentsch, BSc, Bruce Tromberg, PhD, Natasha Atanaskova Mesinkovska, MD, PhD.**
University of California, Irvine, Irvine, CA, USA.

Jessica Lin is a third year medical student at the University of California, Irvine. She has been working on optical imaging for hair research under the mentorship of Dr. Natasha Mesinkovska for 2.5 years.

**J. Lin:** None.  **M. Balu:** None.  **G. Lentsch:** None.  **B. Tromberg:** None.  **N. Atanaskova Mesinkovska:** None.

**TAKE HOME MESSAGE:**
In this study, MPM was able to visualize disease-related changes of the hair follicle. The sub-micron resolution of the scalp epidermis and dermis provided non-invasive and label-free access to the evaluation of the presence of inflammation and hair follicle changes. Though there are technical limitations of MPM, there is no doubt that future models may be valuable tools in the clinic for diagnosing and managing alopecia areata.

**ABSTRACT:**
Alopecia Areata (AA) is a nonscarring type of alopecia that commonly presents as well-circumscribed patches of hair loss on the scalp. AA, an autoimmune disease, causes a lymphocytic infiltration of the follicular bulb, predominantly catagen or telogen hairs, fibrous tracts, and intact sebaceous glands on histology. In vivo imaging studies using devices like the confocal microscopy (CM) and ultrasound (US) are becoming increasingly prevalent among clinicians because of their noninvasive nature and minimal risks. Our study explores the utility of multiphoton microscopy (MPM), which has greater resolution than both CM and US, as an adjunct to histological studies and a diagnostic tool for alopecia areata (AA). With the MPM, cellular details of the epidermal portion of the
follicular unit can be visualized using autofluorophores and infrared wavelengths of light. Using MPM, differentiation of follicular structures can be visualized in real time without using any stains or contrast material. MPM also allows the clinician to examine multiple sites during the same imaging sessions without having to perform any incisions. The most impactful improvement of using MPM is that the same area can be followed through time to track disease progression, which is not possible with biopsy techniques. Many hallmark features of AA can be confirmed using MPM like exclamation point and vellus hairs. Our pilot study using MPM to study AA bridges laser-based technological advances with modern clinical practice. In our results, features seen in histology and MPM are compared.

**P064**

**Patient Reported Stress Caused By Hair Loss Using A Numeric Rating Scale**

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Athena Manatis-Lornell is the clinical research coordinator for the H.A.I.R. (Hair Academic Innovative Research) Unit at Massachusetts General Hospital Department of Dermatology. With a background in project management and an interest in clinical research, Athena is responsible for organizing the set up of hair research studies and aiding in their implementation.


**TAKE HOME MESSAGE:**

This study explores the various factors that influence the patient experience when dealing with alopecia by using patient reported Numeric Rating System scores. The study found the three most stressed populations were telogen effluvium, female pattern hair loss and as a group, lichen planopilaris and frontal fibrosing alopecia. These findings were further deconstructed based on different variables such as sex, race, age, how long ago hair loss was noted, whether the patient regularly suffers from anxiety and the physician assessment score based on available scales and metrics for each diagnosis.

**ABSTRACT:**

Too frequently, alopecia-associated stress causes patients to turn to ineffective, expensive treatments online or elsewhere. Understanding the emotional impact that hair loss has on our patients is imperative in caring for and counseling this vulnerable population.

New patient intake forms for alopecia patients seen at the Hair Loss Clinic in the Department of Dermatology at Massachusetts General Hospital were reviewed. Forms include a numeric rating scale (NRS), asking patients to circle the number (0-10) that best indicates the degree of stress their hair loss is causing them (0 being no stress and 10 being worst stress imaginable).

Data for 219 patients seen between August 2016 and December 2017 was analyzed. 76.7% were female, with an average age of 45 years. The population was further categorized by diagnosis: female pattern hair loss (FPHL) (27%), telogen effluvium (TE) (16.4%), alopecia areata (11.9%), lichen planopilaris (LPP) and frontal fibrosing alopecia (FFA) (10.5%), male pattern hair loss (MPHL) (9.6%), and central centrifugal cicatricial alopecia (CCCA) (2.3%).

Patients with TE, a self-resolving type of alopecia, were most stressed by their hair loss, averaging an NRS score of 7.54. The second most stressed group were women with FPHL who had an average NRS score of 7.43. The most severe FPHL patients (Sinclair scale ≥3) had an average score of 7.84, and were more stressed than their male counterparts (Hamilton Norwood ≥4), who had an average score of 5.75.

As a group, LPP and FFA patients had an average NRS score of 6.29. Patients with the most severe degree of global hair loss and those with no significant global hair loss, but a more recent LPP/FFA diagnosis, ranked their stress level higher (average scores of 8 and 7, respectively) than those with mild to moderate hair loss (average score of 5.5).
**P065**

**Pemphigus Vegetans Of The Scalp**

**Fabia O. Schalch.**

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Dermatologist for 14 years, Coordinator of Hair and Nails Department of UMC for 5 years, FOS Clinic own practice

F.O. Schalch: None.

**TAKE HOME MESSAGE:**

The rarity of this case and the complete remission after extensive scalp involvement demonstrates that the association of corticosteroids and Dapsone is an effective option for therapeutic success, with fewer side effects compared to other immunosuppressants.

**ABSTRACT:**

**Introduction**

Pemphigus Vulgaris is a bullous disease that mainly affects the mucosa and flexural areas of the skin. The Vegetans variant corresponds to one to two percent of occurrences and is considered benign. **Objective** To present and discuss an unusual case of Pemphigus Vegetans characterized by an extensive involvement of the scalp, which evolved to complete remission after using a combination of Prednisone and Dapsone for a period of two months. **Clinical Case** Patient is a 56 year-old female, phototype V, from São Paulo, Brazil, suffering from a scalp lesion for five years. Dermatological examination identified exulcerations in oral mucosa and one eroded, vegetative plaque, covered by scales, and crusts showing purulent discharge at the left parietal region. In addition, patient was hypertensive and was taking Enalapril. Biopsies were performed for the histopathological study and the direct immunofluorescence exam, where Pemphigus Vulgaris was determined. The choice of treatment for this patient was the discontinuation of Enalapril and an association of Dapsone 100mg and Prednisone 20mg taken orally once daily, which resulted in the complete remission of the lesion after 60 days. **Discussion** Pemphigus Vegetans is a rare vegetative variant of Pemphigus Vulgaris, and is characterized by flaccid blisters or erosion forming vegetations, especially in intertriginous areas, the face, and less commonly, the scalp. Usual triggers include Enalapril, viruses, burns, and UV exposure. Oral administration of corticosteroids alone does not always induce disease remission. The combination of systemic steroids and other immunosuppressants may improve remissions rates and allow a steroid-sparing effect. Dapsone is less expensive than other immunomodulatory agents and has less side effects. **Conclusion** The rarity of this case and the complete remission after extensive scalp involvement demonstrates that the association of corticosteroids and Dapsone is an effective option for therapeutic success, with fewer side effects compared to other immunosuppressants.

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**P066**

**A Comprehensive Literature Review Of The Efficacy Of Biotin For The Management Of Alopecia**

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Cassandra Warth is a Medical Student at the University of North Dakota

C. Walth: None. L. Wessman: None. A. Wipf: None. A. Bertin: None. M. Hordinsky: None. R. Farah: None.

**TAKE HOME MESSAGE:**

Biotin is a commonly used hair growth supplement. However, data backing its efficacy are lacking.

**ABSTRACT:**
Introduction: Biotin is a B complex vitamin and coenzyme necessary in humans for the proper functioning of multiple metabolic processes. This over-the-counter vitamin is often employed for the management of numerous alopecias and can be identified in an overwhelming number of hair growth supplements. Given this direct-to-consumer use, we sought to investigate the literature for supportive evidence.

Objective: Herein, a comprehensive review of the literature focused on the collection of evidence for biotin use in the treatment of alopecia was performed.

Materials and/or Methods: The following search criteria were applied using the PubMed, Embase, and Ovid Medline databases and relevant publications in English were reviewed with date restriction of 1980 to current: (biotin AND dermatology), (biotin AND hair), (biotin AND hair disease), (biotin AND hair loss), (biotin AND alopecia). The following parameters were collected and reported (Table 1): source, design, time period, population, application/use, dose and results.

Discussion/Results: Our search returned 35 articles including diagnoses of sparse hair growth, hair fragility, uncombable hair syndrome, alopecia totalis, telogen effluvium, androgenetic alopecia, drug induced hair loss, poor hair growth, and trichorrhexis nodosa. Biotin use resulted in observable improvement in 34 of these articles. Thirty-one of these results were case reports or case series, 4 were controlled trials. One study compared the response of “low” and “high” dose biotin in subjects with drug-induced alopecia and noted improvement. Length of use ranged from two months to two years. Seventeen articles found in the database search were excluded as they discussed biotinidase deficiency in childhood.

Conclusion: Data on the use of biotin for alopecia is lacking, with the majority of data presented as case reports and case series. Given its commonplace use in hair supplements and this limited evidence, future studies are needed to evaluate whether its use in hair supplements is warranted.

P067

Trichoscopy Features Of Syphilitic Alopecia: A Report Of 5 Cases
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Alfredo da Matta Foudation, Manaus, Brazil.

Danielle Cristine Westphal is a Dermatologist in Amazonas, North of Brazil and finished the residency program in 2015. Furthermore, She was a fellow in the Trichology at the University of São Paulo in 2016. Now she is the dermatologist responsible for the Trichology practice at Alfredo da Matta Foundation in Manaus - Amazonas. She is a preceptor in residency program of dermatology and is involved in hair research. She is member of Brazilian Society of Dermatology and became a member in American Hair Research recently.


TAKE HOME MESSAGE:
- It’s important to considerer the laboratory screening for syphilis in the investigation in all cases of focal (areata-like) and diffuse alopecia.- The presence of coudability hair, elbow-shaped hair and segmented hypopigmentation hair could be trichoscopy tips to diagnosis syphilitic alopecia.

ABSTRACT:
Introduction: Syphilitic alopecia (SA) is an uncommon manifestation of secondary syphilis varying its incidence from 2.9 to 7%. It can manifest as the only clinical presentation of syphilis (essential alopecia) or associated with other symptoms (symptomatic alopecia). To date, few reports have been published of the trichoscopic findings of SA. Objective: To describe the triscoscopic features found in cases of SA. Materials and/or Methods: All patients with clinical and serological diagnosis of syphilis who presented with alopecia from September 2016 to December 2017 at Alfredo da Matta Foundation were selected for this study. All patients were clinically and trichoscopically evaluated in search of hair and scalp alterations. Discussion/Results: In total, five patients with alopecia were selected: three male patients and two female patients with a mean age of 25.8 years; only two were classified as symptomatic syphilitic alopecia. There was only one case of moth-eaten alopecia and one case of mixed alopecia (diffuse alopecia + localized alopecia); the three other patients were cases of focal areata-like alopecia. The main
dermatoscopic findings were: black dots, yellow dots, hypopigmented hairs, tapered hairs and elbow-shaped hair. It was also observed in two patients the presence of segmented hypopigmentation hair in the alopecica areas. All patients had a positive treponemal test and VDRL between 1/8 and 1/512. Treatment with benzathine penicillin was performed in all patients with total repilation after a mean of four months of treatment. **Conclusions:** With the increase in the number of cases of syphilis in the world, the inclusion of laboratory screening for this disease in the investigation of cases of focal and diffuse alopecia is of fundamental importance. There are still few published studies on dermatoscopic findings in SA. We report here for the first time the presence of elbow-shaped hair and segmented hypopigmentation hair in SA.

**P068**

**Patient Design And Treatment Preferences Among Home-use Photobiomodulation Devices**

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University of Minnesota, Department of Dermatology, Minneapolis, MN, USA.

MacKenzie Griffith, BA, is a student researcher in the Department of Dermatology at the University of Minnesota. She has been working with the Dermatology Department for one year, specifically on hair loss studies, and she is interested in the use of lasers and other forms of light for the treatment of alopecia. MacKenzie recently graduated *summa cum laude* from the University of Minnesota with a bachelor’s degree in Physiology and Biology, Society, and the Environment. MacKenzie hopes to attend medical school and to continue working in dermatology.

**M. Griffith:** None. **A. Wipf:** None. **M. Hirt:** None. **M. Hordinsky:** None. **S. Uppaluri:** None. **M. Winter:** None. **R. Farah:** None.

**TAKE HOME MESSAGE:**
The results of this survey demonstrate that patients may have preferences for certain photobiomodulation device shapes and frequency of use. Additionally, patients may be willing to allow for a six-month trial of the device.

**ABSTRACT:**

**Introduction:** Photobiomodulation, also known as low level laser therapy, is a rapidly growing subset of the therapeutic alopecia device industry. Numerous photobiomodulation home-use devices have become commercially available since their FDA approval in 2007. There have been minimal reported adverse effects of using devices per manufacturer’s recommendations including scalp itching, pain, burning, warmth, and irritation. No reports exist in the literature regarding patient experiences with these devices. **Objective:** To determine patient preferences among photobiomodulation devices on the market for the management of alopecia. Secondary endpoints include understanding device usage habits. **Methods:** Patients with alopecia treated at University of Minnesota Dermatology clinics that had considered purchasing or had purchased a home-use photobiomodulation device were surveyed. **Results:** Fifteen subjects were surveyed and both quantitative and qualitative responses were recorded. The majority of subjects preferred three treatment sessions per week as opposed to less frequent or daily sessions. Over 86 percent of subjects indicated they would prefer a treatment time between 10 and 15 minutes per session. Over 93 percent of subjects agreed that they would be willing to use a photobiomodulation device for six months to decide if the device is effective. Subject device design preferences varied when presented with both hands free (helmet) and handheld (comb and band) options. **Conclusion:** The survey results revealed varying preferences in device design, disproving the researchers’ suspicion that photobiomodulation device users would strongly prefer a hands-free device. Overall, subjects were willing to use a device for at least six months to determine it was effective, preferred treatment session times between ten and fifteen minutes, and would prefer to use a device a maximum of three times per week.

**P069**

**Fractional Photothermolysis And Induction Of Hair Follicle Growth: A Systematic Review And Single Academic Centerexperience**
**TAKE HOME MESSAGE:**

The potential use of fractional lasers for treatment of alopecia can have advantages including small to invisible wounds, little bleeding and minimal damage to terminal hair. According to current studies low-energy, high-density protocol should be effective to induce hair growth with fractional laser treatment. There appears to be utility in both scarring and noscarring types of alopecia, but more studies are needed.

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**ABSTRACT:**

**Background:** The use of fractional laser therapy for alopecia has been controversial due to varying results as to whether the therapy is truly beneficial. Fractional laser treatments create microthermal injury zones that stimulate the healing process and can lead to increased blood flow, delivery of cytokines and growth factors, as well as stimulate the dermal papilla. This can purportedly accelerate the hair cycle from telogen to anagen, and stimulate transformation of vellus hairs to terminal.

**Objective:** To review the scientific evidence for the use of ablative and non-ablative fractional lasers for the treatment of alopecia in both animal and human models. To reproduce the parameters in a group of patients with androgenic alopecia (AGA) in clinic.

**Materials and Methods:** Literature was reviewed from the MedLine database including randomized clinical trials, prospective clinical trials, case studies, and case series. The level of evidence of each study was assessed using the Oxford Centre for Evidence Based Medicine system. In addition, the author will discuss non-published data from clinical patients with androgenic alopecia and scarring alopecia treated with non-ablative fractional lasers.

**Results:** Lasers used for treatment include the 1064 nm Nd:YAG, 1550 nm erbium glass, 1927 nm thulium, and 10, 600 nm ablative fractional CO₂. Published studies indicate that patients on average experienced a 20-60% increase in hair density after multiple treatment sessions. This contradicted the experience that the authors had in clinic. According to current studies low-energy, high-density protocol should be effective to induce hair growth with fractional laser treatment. There appears to be utility in both scarring and noscarring types of alopecia, but more studies are needed.

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**P070**

**Photobiomodulation Laser Light Transmission On Cadaver Sheepskin**

Shannon Smith, MS, Ronda S. Farah, MD.

University of Minnesota, Minneapolis, MN, USA.

An Apparel Design graduate of the University of Minnesota Shannon has designed apparel throughout the fashion and outdoor industries. Despite her love of design, a deep desire to improve the lives of others, steeped with a family background in medicine, led her back to the University where she completed her pre-med studies with the intent to apply to medical school. Quite serendipitously she discovered the University's Technological Leadership Institute's Medical Device Innovation Master’s program which allowed her to combine her design skills, medical interests and commitment to make life better for others.
Though Shannon's design interests are wide and varied, she has particular interests in fabrics and wearables and anything that has the potential to improve health and enhance quality of life while disrupting the unsustainable escalation of health care costs. She believes the best medical devices are those that can be seamlessly incorporated into daily life.

S. Smith: None. R.S. Farah: None.

TAKE HOME MESSAGE:
Photobiomodulation (PBM) is a rapidly growing treatment option for patients with androgenetic alopecia. However, there is limited literature on the degree of reflection and scattering of PBM when used over terminal hair on the scalp. This study demonstrated that light from a 655nm photobiomodulation device was physically able to transmit light through fresh cadaver sheepskin with varying lengths of wool to the level of superficial subcutaneous fat, and is thus capable of penetrating to the anatomic level of the hair follicle bulb and dermal papillae.

ABSTRACT:
Background: Photobiomodulation (PBM) is a rapidly growing treatment option for patients with androgenetic alopecia. However, there is limited literature on the degree of luminostity of PBM when used over terminal hair on the scalp.
Objective: To evaluate the luminosity of PBM with sheepskin with varying depths of wool coverage and to determine if light from the 655 nm laser comb is capable of penetrating sheepskin to the depth of hair follicle bulb and dermal papilla.
Methods: Fresh sheepskin cadaver was obtained and debulked to the level of the superficial fat (measured skin depth of 0.35 mm). Under sterile and controlled conditions, a photobiomodulation device (HairMax® Ultima 12 Laser Comb with hair parting teeth) was applied to sheepskin under three different scenarios: full wool + skin (6.4 cm), cut wool + skin (1.8 cm), shaved wool + skin (0.4 cm). (Image 1) A camera placed beneath the sheepskin captured laser light transmission. (Image 2) Rendered images were analyzed with Photoshop to determine luminosity (measure of brightness) and resultant histograms were compared to determine the extent to which wool hindered light transmission. (Image 3 and 4).
Results: Results demonstrated that light from the 655 nm laser comb transmitted all studied scenarios of wool length, and the shorter the wool the greater the luminosity.
Conclusion: This study demonstrated that light from a 655nm photobiomodulation device was physically able to transmit light through sheepskin with varying lengths of wool to the level of superficial subcutaneous fat, and is thus capable of penetrating to the anatomic level of the hair follicle bulb and dermal papillae. Additionally, wool length is inversely related to luminosity.

P071
A Clinical Comparison Of FDA-cleared Photobiomodulation Devices For The Treatment Of Alopecia
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1University of Minnesota, Department of Dermatology, Minneapolis, MN, USA, 2University of Minnesota, Department of Dermatology and University of Minnesota Graduate Studies in Genetic Counseling Program, Minneapolis, MN, USA.

Angela Wipf is a medical student at the University of Minnesota and current research fellow within the University of Minnesota Department of Dermatology. Angela has a passion for hair disease research and has launched numerous alopecia related projects within her institution. She has a special interest photobiomodulation and its effect on hair growth.

TAKE HOME MESSAGE:
There are numerous emerging photobiomodulation devices available for the management of androgenetic alopecia, each with unique characteristics. Ongoing studies are needed to compare their efficacy.

ABSTRACT:
Introduction: Photobiomodulation therapy, also referred to as low-level laser therapy, is an emerging treatment for androgenetic alopecia. Various devices are FDA-cleared for in-office and patient use. However, no known trials to date have directly compared their outcomes against one another.
Objective: To clinically compare and evaluate the use of six FDA-cleared photobiomodulation devices and their effects on hair growth among subjects diagnosed with androgenetic alopecia.
Materials and/or Methods: Male and female subjects with androgenetic alopecia were randomized to one of six FDA-cleared photobiomodulation devices and received treatments as per manufacturer's recommendations over three months. Photographs of the scalp were obtained at baseline and then each subsequent month using Canfield Scientific photography. Self-assessment questionnaires were administered monthly throughout the study.
Discussion/Results: Fourteen subjects were enrolled in the study; 9 completed the study. Using the Hamilton-Norwood Scale, Ludwig Scale, and Savin Scale to assess degree of hair disease, improvement was seen in 44.4% of subjects, no change seen in 33.3%, and worsening seen in 22.2%. Available data showed 66.7% of patients had improved satisfaction with the overall appearance of their hair from the start of treatment to the final visit. Of subjects that completed the study, 83.3% felt that the devices were easy to use and 50% would recommend or greatly recommend photobiomodulation treatment.
Conclusion: Preliminary data obtained from this study demonstrate variable improvement in subject scores on standardized hair grading scales as well as variable responses on self-assessments. Greater patient numbers and, therefore, continued enrollment is needed.

P072
A Method To Produce A Hair Follicle Like Organoid Using Matrix Cells
Khalid BAKKAR.
LOREAL, aulnay sous bois, France.
As a senior research in the field of hair growth at l'OREAL, I have been working for many years in the goal to better understand the physiology and cells interactions within the human hair follicle. Convinced that these well orchestrated interactions are keys for future, I developed in vitro approaches to increase the knowledge and to improve the methods in the goal to bring solutions for the treatment of androgenic alopecia.
K. Bakkar: None.

TAKE HOME MESSAGE:
Isolation of matrix cells, amplification, production of dermal papilla fibroblasts spheroids and production of hair follicle like organoids.

ABSTRACT:
In the functional adult human hair follicle unit, two specialized types of cells continuously interact to form the hair fiber and the different hair sheaths. First, a specialized keratinocyte lineage called matrix cells which have a high proliferation rate only when located below the so-called Auber’s line and which ended in a differentiation process to form the hair fiber as well as the different hair sheaths, and second a population of highly specialized non proliferative fibroblasts embedded in an ovoid structure, the dermal papilla (DP), made of a rich protein/GAG network. Numerous reports demonstrated in vivo DP cells’ inductive properties in mice. However the challenge to reproduce in vitro a human hair follicle morphogenesis remains very high. Recently it was shown that a skin organoids from mouse pluripotent stem cells were able to produce hair follicles in vitro (Jiyoon Lee, 2017). Of note, in vitro human hair follicle-like structures from human epithelial and dermal cells were also previously reported. In the goal to produce in vitro human hair follicle structures, we isolated and amplified human matrix cells from adult human hair follicle. These isolated matrix cells were further characterized by immunohistology. In parallel, DP
spheroids were prepared from human dermal papilla fibroblasts, and further characterized by alkaline phosphatase activity and expression of specific markers. Finely tuned combinations of matrix cells and DP spheroids resulted in the formation of few millimeters long rod like organoids. Results will be presented in time for the meeting.

**P073**

**Novel Tools To Study The Hair Follicle Stem Cell Niche And Its Regulation During Ageing**

Carlos Clavel

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 at the University of Navarra, Spain. After his PhD he joined the laboratory of Dr. Catherine Verfaillie, where he worked with Multipotent Adult Progenitor Cells at her laboratories of Minnesota (US) and Leuven (Belgium). His research then shifted to understanding how stem cells are instructed to display their potential, and he subsequently joined Dr. Michael Rendl’s laboratory at Mount Sinai School of Medicine in New York where he study the transcriptional control of the hair inducing fate of Dermal Papilla niche cells. Carlos has recently joined the A*Star Institute of Medical biology in Singapore where he is a Principal Investigator starting up his own research group focusing on understanding the regulation of the hair follicle stem cell niche and its implication in novel therapies for skin pigmentation disorders.

**C. Clavel:** None.

**TAKE HOME MESSAGE:**

Hair follicle stem cell regulation during hair growth, pigmentation and ageing

**ABSTRACT:**

Skin homeostasis is tightly controlled by its stem cell niche. And, within the skin, the hair follicle stem cell niche is the main reservoir of stem cells. To study and target the hair follicle stem cells and its niche, we are developing and characterizing novel genetic tools. Using these tools, we have targeted different hair follicle compartments and ablated signature genes to impair hair growth and normal hair follicle pigmentation. Interestingly, even though dermal papilla (DP) cells are well known for their hair induction capacity, we have found that the DP compartment is also a strong regulator of hair follicle pigmentation by conditionally knocking down genes in the DP and inducing a pigment switch in the pelage of cKO mice. In addition, we are using in vivo and in vitro models to study two of the most common consequence of human skin aging: hair loss and depigmentation. To this end, we are using novel biomarkers to identify senescent cells within pigmented vs. non-pigmented human hair follicles. Moreover, we have developed an in vivo mouse model to induce senescence in the dermal papilla and/or hair follicle stem cells. Preliminary data from our inducible-senescence in vivo model indicates that we have generated a novel mouse model resembling the human AGA phenotype. To establish causality, we are using our hair greying and hair loss mouse models to induced senescence within different hair follicle compartments. Identifying the mechanisms resulting in hair loss and hair de-pigmentation during ageing would allow for the development of novel translational programs.

**P074**

**IL-1 Mediated Activation Of γδT Cells Promotes Tissue Regeneration In A Cutaneous Wound**

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Rupali Gund acquired her Ph.D. degree in immunology from National Institute of Immunology in India in 2014. While there she published a first author publication describing how density/affinity of antigenic pMHC modulates the intensity of CD8 T cell response. Her research interests in T cell biology led her to work in a biotech company to discover novel anti-cancer therapies designed to enhance tumor immunity. After a short stint in industrial research, she moved to basic research and joined as a postdoc in IFOM-inStem Joint Research laboratory in Bangalore, India. Here she worked on understanding immune mechanisms involved in tissue repair, particularly in skin tissue. Gund published a first author manuscript demonstrating how immune cells interact with local stem cell to facilitate tissue repair. Recently, she started working with Dr. Angela Christiano at Columbia University to understand the immunological pathogenesis of autoimmune skin disease-Alopecia Areata.

R. Gund: None. A. Dutta: None. C. Jamora: None.

TAKE HOME MESSAGE:
Our Findings unveil a novel role of skin γδT cells in activating and recruiting hair follicle stem cells during a wound healing response. These interactions extend the functional repertoire of immune cells beyond their role in protection against pathogens.

ABSTRACT:

Introduction: The wound-healing program is a combination of complex interactions among diverse cell types within the skin. One fundamental process mediated by these reciprocal interactions is the mobilization of local stem cell pools to promote tissue regeneration and repair. Objective: The factors that promote the recruitment of stem cells in a wound environment are unknown. Here, we analysed the signalling components that awaken the stem cells from quiescence and drive their proliferation to facilitate tissue repair.

Materials: The experiments were performed on two models of mouse wound healing—excisional wounds made on 7-8 weeks old adult mice when hair follicles are in quiescent telogen stage & conditionally mutant mice with epidermis specific ablation of caspase-8. Discussion: We found that IL-1α and IL-7 secreted from keratinocytes work synergistically to expand the activated population of resident epidermal γδ T-cells. A downstream effect of activated γδ T-cells is the preferential proliferation of hair follicle stem cells. On the other hand, IL-1α dependent stimulation of dermal fibroblasts optimally stimulates epidermal stem cell proliferation. Conclusion: These findings provide new mechanistic insights into the regulation and function of epidermal-immune cell interactions and how components classically associated with inflammation can differentially influence distinct stem cell niches within a tissue.

P075
Regulation Of Skin Regeneration By Non-coding RNA Sensing
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Nasif is currently a pre-doctoral candidate in the biochemistry, cellular, and molecular biology (BCMB) program at the Johns Hopkins University School of Medicine. He is currently investigating the roles of non-coding RNAs within the context of skin regeneration. Prior to coming to Hopkins, Nasif completed his undergraduate work at Cornell University.

N. Islam: None. R.H. Silverman: None. L.A. Garza: None.

TAKE HOME MESSAGE:
A major consequence of impaired wound healing is the inability to fully restore normal, uninjured tissue, resulting in a fibrotic scar. Here we investigate the mechanism of skin regeneration through a rare mammalian neotenic phenomenon known as Wound Induced Hair Neogenesis (WIHN). We have shown that tissue damage triggers the release of non-coding dsRNA as well the activation of various antiviral and inflammatory pathways that are crucial
for initiating core morphogenetic programs required for WIHN. We also define a novel role of ribonucleases in skin regeneration and identify an endogenous small non-coding RNA that can promote hair regeneration.

ABSTRACT:
The molecular and physiological processes governing wound healing and regeneration have not yet been fully defined. Here we investigate the mechanisms of skin regeneration after injury through a rare event of mammalian regeneration known as Wound Induced Hair Neogenesis (WIHN). We have shown that non-coding dsRNA released by tissue damage stimulates TLR3 and β-catenin to promote WIHN. However, the RNases which either promote or inhibit dsRNA biogenesis remain unresolved. Following injury or exogenous dsRNA (polyI:polyC) treatment, we find significant overlap and upregulation of OAS transcripts (≤15/19,234 transcripts, p=8.3*10^{-13}) in microarray data. The antiviral dsRNA-activated OAS family is responsible for producing metabolites that activate the endoribonuclease RNase L. We hypothesized RNase L might normally promote the degradation of dsRNA containing transcripts by cleaving single-stranded regions in these RNAs in a negative feedback loop and effectively limit regeneration. To explore this, we show that an Rnasel−/− mouse model exhibits a significantly enhanced regenerative capacity and a 5-fold increase in WIHN (N=10, P<0.001). RNAi-mediated ablation of RNase L in keratinocytes significantly increases core morphogenetic markers in response to polyI:polyC, including WNT7b, TLR3, Sonic hedgehog, and interferon-β (N=3, P<0.01). Furthermore, we show that a specific non-coding dsRNA, U1 RNA, is induced 10-fold after tissue injury (N=3, P<0.05) and even more so in Rnasel−/− mice. In vitro transcribed U1 RNA can potently stimulate morphogenesis and regeneration both in vitro and in vivo; WT mice treated with U1 RNA exhibit nearly a 4-fold increase in WIHN compared to vehicle (N=3, P<0.05). Keratinocytes treated with U1 RNA exhibit similar induction as polyI:polyC of WNT7b, TLR3 and KRT15, a hair follicle stem cell marker. Altogether, these results suggest a novel role for RNase L in regulating non-coding dsRNA levels and sensing during regeneration.

P076
Non-coding dsRNA Induces Retinoic Acid Synthesis And Retinoid Signaling To Control Regeneration
Dongwon Kim, PhD1, Ruosi Chen1, Lloyd Miller1, Sewon Kang1, Jiansh Yu2, Weiliang Huang2, Maureen Kane2, Luis Garza1.
1Johns Hopkins Medical Institute, Baltimore, MD, USA, 2University of Maryland, Baltimore, MD, USA.

My long term research goal is to investigate functions of skin stem cells to develop the treatment of skin diseases. I have industrial trainings in stem cell and cosmetic research fields for 3 years. I was involved in discovering peptide candidates to differentiate embryonic stem cells into specific lineages and developing peptide-based anti-wrinkle cosmetics. I completed my PhD focused on the self-renewal mechanism of spermatogonial stem cells and the selection mechanism of female ovarian follicles. Thus, my academic and industrial research experience have provided me with various fundamental and applicable biological knowledge to convey scientific results to human health. To this end, I joined in Dr. Luis Garza's lab at department of dermatology, Johns Hopkins and am currently studying about the positional skin identity to understand how the different level of gene expression contributes to maintain site-specific skin identity and the role of innate immunity in hair regeneration.


TAKE HOME MESSAGE:
dsRNA stimulates ALDH1A3 expression to robustly increase RA synthesis in normal mice but not in TLR3-deficient mice. Additionally, a dsRNA induces RA morphogen gradient correlates to areas of future regeneration. We find the RA receptor alpha is required for WIHN under homeostatic conditions and for exogenous dsRNA induction of stem cell markers and WIHN. Eventually, exogenous RA rescues the impaired regeneration in TLR3-deficient mice and stimulates hair follicle neogenesis in human subjects.

ABSTRACT:
Wound induced hair follicle neogenesis (WIHN) is a model of tissue regeneration in adults where hair follicles develop de novo following deep wounding. dsRNA generated after wounding activates TLR3 to induce WIHN in mice but mechanisms involved and the translatability to humans is unclear. By transcriptome and proteomic analysis, we unexpectedly found a highly significant (p<3.6x10^-15 and p<8.2x10^-80, respectively) overlap of upregulated genes in keratinocytes following treatment with dsRNA or retinoic acid (RA). Further, mass spectrometry analysis of dsRNA stimulated cultured human keratinocytes indicated highly induced RA synthesis but not other retinoid metabolites (retinol and retinyl ester) (n=3, p<0.001). Similarly, in the skin of wild type mice, stimulation with dsRNA during wounding induced an RA morphogen gradient that correlated to future areas of WIHN (n=4, P<0.01). The induction of RA by dsRNA was dependent upon TLR3 as the skin of TLR3-deficient mice had lower baseline RA levels and failed to induce RA following wounding (n=4, p<0.05). In addition, mice with keratinocyte-specific deletion (n=4-6, p<0.01) or global deletion (n=6-11, p<0.001) of RA receptor alpha (RARα) had an almost entirely absent WIHN and were resistant to exogenous administration of dsRNA (Poly I:C). Finally, exogenous RA induced hair follicle stem cell markers such as KRT15 and KRT19 (n=3, p<0.05) and rescued the impaired WIHN in TLR3-deficient mice (n=6-11, p<0.05). In a preliminary human trial, ablative CO2 laser wounding combined with retinoic acid appeared to induce the formation of small vellous follicles. Taken together, these results define a novel mechanism involving dsRNA/TLR3 innate immune responses and RA nuclear hormone receptor pathways in tissue regeneration.

**P077**

Transplantation Of Cell Enriched Adipose Tissue For Follicular Niche Stimulation In Early Androgenetic Alopecia

*Gorana Kuka Epstein¹, Jeffrey Epstein, MD¹, Ken Washenik, MD PhD², Joel Aronowitz, MD³, Mark Glasgold, MD⁴, Roy Geronomus, MD⁵, Wilfred Brown, MD⁶, Eric Daniels, MD⁶.*

¹Foundation for Hair Restoration, Miami, FL, USA, ²Bosley medical, Los Angeles, CA, USA, ³Joel Aronowitz MD PA, Los Angeles, CA, USA, ⁴Glasgold Group, Highland, NJ, USA, ⁵Laser Skin Surgery Center, New York, NY, USA, ⁶Kerastem, San Diego, CA, USA.

Dr. Gorana Kuka Epstein is a board-certified plastic surgeon from Belgrade, Serbia, specializing in FUE hair transplant techniques, along with the medical management of hair loss. In addition to her Belgrade practice, she is closely affiliated with the Foundation for Hair Restoration in Miami and NYC, as well as actively conducts FDA-approved research studies. She is a PhD candidate at the Medical School of the University of Novi Sad, Serbia.

**G. Kuka Epstein:** None. **J. Epstein:** None. **K. Washenik:** None. **J. Aronowitz:** None. **M. Glasgold:** None. **R. Geronomus:** None. **W. Brown:** None. **E. Daniels:** Ownership Interest (owner, stock, stock options); stock options.

**TAKE HOME MESSAGE:**
Fat + ADRCs is safe and tolerable therapy. In early male hair loss, this therapy demonstrated a statistically significant increase in terminal hair counts relative to the matching control population at 24 weeks and represents a promising new approach for the treatment of early androgenetic alopecia.

**ABSTRACT:**

**Introduction:** The objective of this clinical study is to evaluate the safety and feasibility of autologous fat grafts enriched with ADRCs in the treatment of early alopecia. **Materials & Methods:** A total of 71 subjects were randomized and treated accordingly: 16 with Puregraft fat + 1.0 x 10⁸ ADRCs/cm² scalp; 22 with Puregraft fat + 0.5 x 10⁸ ADRC/cm² scalp; 24 with Puregraft fat alone; and 9 saline control. Treatments were delivered in the adipose layers of the scalp via two injections - the first a subcutaneous injection of either 0.1ml/cm² scalp of adipose or saline followed by a second intradermal injection of ADRCs or saline in each square centimeter of scalp. In each subject, hair count and width were obtained at baseline, 6-weeks, and 24 weeks. **Results:** There were zero unanticipated adverse events associated with STYLE. At 24 weeks, there were no statistical differences between any of the treatment groups with respect to terminal or vellus hair counts or width when evaluating all subjects. When evaluating males with early stage hair loss (Norwood-Hamilton 3), a statistically significant increase in terminal hair count (p<0.05) was observed in patients receiving Puregraft Fat + Low Dose ADRCs compared to the Control.
Population at 24 weeks (mITT; n=29). This population also showed a trended increase in terminal hair width (p=0.065) compared to controls. In the Norwood-Hamilton 3 Per Protocol populations (n=22), terminal hair counts remained statistically significant (p<0.05) in the Puregraft Fat + Low Dose ADRCs versus controls and the terminal hair width also remained statistically trended (p=0.056) versus controls. **Conclusions:** In early male hair loss, this therapy demonstrated a statistically significant increase in terminal hair counts relative to the matching control population at 24 weeks and represents a promising new approach for the treatment of early androgenetic alopecia.

**P078**
**The Emerging Role Of Adipose Derived Tissue In The Treatment Of Alopecia And Scars Of The Scalp**

Gorana Kuka Epstein, MD PhD Candidate, Jeffrey Epstein, MD FACS.
Foundation for Hair Restoration, Miami, FL, USA.

Dr. Gorana Kuka Epstein is a board-certified plastic surgeon from Belgrade, Serbia, specializing in FUE hair transplant techniques, along with the medical management of hair loss. In addition to her Belgrade practice, she is closely affiliated with the Foundation for Hair Restoration in Miami and NYC, as well as actively conducts FDA-approved research studies. She is a PhD candidate at Medical School of the University of Novi Sad, Serbia.

**G. Kuka Epstein:** None. **J. Epstein:** None.

**TAKE HOME MESSAGE:**
Our early work with adipose tissue used to treat different types of alopecia, showed promising results. While working on determining possible mechanisms of actions, we are also standardizing protocols of fat preparation as well as injecting techniques. Encouraged by early clinical results it is mandatory to conduct more detailed studies to determine the most effective application of adipose derived tissue.

**ABSTRACT:**
Autologous adipose tissue transfer has been in the surgical armamentarium for over 100 years. While the technique has waxed and waned in interest during the past century, in the past ten years the procedure has enjoyed a considerable renaissance and routinely used in the field of plastic and reconstructive surgery. While autologous fat is transplanted primarily for the restoration of diminished volume in the breast or mid-face, many authors have noted positive skin and hair changes post transplantation. More recently, investigators have reported initially promising results of hair growth in genetic alopecia following subcutaneous transplantation of adipose enriched with stromal vascular fraction (SVF). This early clinical work supports the emerging notion that adipocyte lineage cells may help drive the complex hair growth cycle. As our group has extensive experience in both aesthetic and reconstructive fat grafting as well as alopecia, we became interested in the potential overlap and began exploring the role of fat grafting in both non-inflammatory and inflammatory alopecias. In addition, we began to use subcutaneous fat grafting to reconstruct scarred sections of scalp prior to potentially improve the outcomes of hair transplantation. Herein we present our work in and results with autologous fat transplantation. Indications have included alopecia areata, frontal fibrosing alopecia, circumferential cicatricial alopecia, as well androgenic pattern hair loss. For scalp scarring, fat transfer as a pretreatment prior to scalp and eyebrow transplantation has been utilized to enhance hair regrowth. While our work continues in this area, we are excited to share our experiences to date. Initial results from this varied group of patients appear promising and we will report on our techniques on fat preparation and transfer, and how we coordinate this therapy in the treatment of a variety of hair loss conditions.

**P079**
**Anagen Hair Follicle Repair: A Regenerative Scheme Utilizing Ectopic Stem Cells To Resume Anagen After Follicular Injury**

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Dr. Sung-Jan Lin is Professor of Institute of Biomedical Engineering and Department of Dermatology at National Taiwan University and a dermatologist in National Taiwan University. He received his MD in National Taiwan University College of Medicine and PhD. He takes hair follicles, with a distinct structure and the unique arrays of arrangement, as a model to understand how an organ is damaged or lost in pathological states and to decipher the repair and regeneration machinery in response to insults. His lab employs a multidisciplinary approach by combing the knowledge in biology and tissue engineering to enhance hair follicle regeneration. His work has been recognized by Award for Junior Research Investigators in Life Science of Academia Sinica, Physician Scientist Award of Taiwan National Health Research Institutes and Distinguished Research Award of Taiwan Ministry of Science and Technology. In 2014, he was elected as Taiwan Bio-development Foundation (TBF) Chair in Biotechnology.

S. Lin: None.

TAKE HOME MESSAGE:
Understanding anagen hair follicle repair, a distinct regenerative scheme, can help to develop new strategies to enhance regeneration and to prevent hair loss from insults.

ABSTRACT:
The growing phase, or anagen, of human scalp hair can persist for longer than 30 years. Premature disruption of the ongoing anagen can lead to unwanted hair loss or alopecia. How anagen hair follicles attempt to repair themselves following various injuries to bypass premature catagen/telogen entry is not well studied. We employed genotoxic injury of radiotherapy and chemotherapy to explore the mechanisms of anagen hair follicle repair. Though stem cells are considered not present in the lower segment of anagen hair follicles, we found that physiologically unipotent lower proximal cup cells or outer root sheath cells are mobilized to regenerate lost follicular structures of various cell differentiations according to the severity of injuries to resume the ongoing anagen. After anagen repair, the progeny of outer root sheath cells can further home back to the stem cell niche to regenerate the next anagen. We demonstrated that enhancing the mobilization of these unconventional progenitor cells can prevent hair loss induced by radiotherapy and chemotherapy. Anagen hair follicle repair represents a regenerative scheme that is distinct from telogen-to-anagen regeneration. Understanding how anagen hair follicle repair is regulated can help to develop new strategies to prevent hair loss from insults.

P080
Treatment Of Androgenetic Alopecia Using Intradermal Injections Of Cultured Autologous Dermal Sheath Cup Cells
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Dr. McElwee is a co-founder of Replicel Life Sciences Inc. and the Chief Scientific Officer for the company. Dr. McElwee received his BSc degree from the University of Aberdeen, Scotland and his PhD from the University of Dundee, Scotland. Postdoctoral training included 3 years at the Jackson Laboratory in Maine, USA, and 4 years at the University of Marburg, Germany. After 13 years at the University of British Columbia, Vancouver, Canada, Dr. McElwee is now a Professor at the University of Bradford, UK.

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Occipital scalp hair follicle mesenchyme tissue derived cells can be used to develop autologous rejuvenative cell therapies for hair loss.

ABSTRACT:
Introduction: Androgenetic alopecia (AGA) involves terminal scalp hair follicle miniaturization, associated with loss of hair follicle mesenchyme cells in the dermal papilla (DP). Numerous studies with rodent models show that cultured hair follicle DP or adjacent dermal sheath cup (DSC) cells can induce new follicular neogenesis and/or modification of resident follicles. Methods: A phase I/IIa clinical trial for AGA with intradermal injections of cultured, autologous DSC cells (RCH-01) was recently completed (NCT01286649). The trial was designed primarily to gather safety data through 24 months post-injection, but was not designed for statistical significance related to efficacy. Biopsies taken from the scalp occiput of ten men and nine women with mild to moderate AGA. After transportation to a GMP certified cell production facility, the biopsies were processed to isolate and culture DSC cells. Cultured cells were then transported back to the clinic for injection into respective biopsy donors. Using a validated semi-automatic injector and a randomized, double-blind, placebo-controlled design, subjects received cultured autologous DSC cells or vehicle alone in two separate predefined, tattoo-marked, contralateral scalp areas with thinning hair. Subjects returned to the clinic at regular intervals over 5 years for safety evaluation and for hair growth assessments at 6 and 24 months post injection. Results: Over the 5 year follow-up period there were no serious adverse events reported. On average, hair loss stabilization was observed at 24 months for all per-protocol subjects. The top 10 trial participants with greater than 5% increase in hair density at 6 months post-injection, demonstrated a sustained response at 24 months averaging a 4.2% increase over baseline hair density. Conclusions: The clinical trial data supports the continued optimization of autologous DSC cell production and treatment protocols to be evaluated in phase II clinical trials.

P081
Identifying The Key Niche Signals For Hair Follicle Formation
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During my PhD and first post doctoral training in The University of Hong Kong and The Population Council (2009-2014), I focused on Sertoli cells, which are the niche cells of the spermatogonial stem cells. I discovered that after germ cell depletion, Sertoli cells were essential for re-initiation of spermatogenesis by providing a functional blood-testis barrier. To deepen my explorations into stem cell niche, I joined Dr. Rendl’s laboratory at the Icahn School of Medicine at Mount Sinai since 2014. Our laboratory focuses on defining the regulation of hair follicle stem cells by specialized dermal papilla (DP) cells that act as instructive niche to orchestrate hair follicle formation, growth and regeneration. My work is to tease out the earliest hair inductive signals from the earliest DP precursors that I have identified. I also established a novel strategy to isolate these previously unrecognized cells for characterization.


TAKE HOME MESSAGE:
I hope the audience can appreciate our discovery of previously undescribed pre-DC at stage 0 HF which is the earliest stage of HF during HF formation. Furthermore, we have successfully isolated pre-DC along with the two consecutive DC from stage 0 to 2 HF respectively. This allows us to establish a time-lapse of signature genes from DC formation to further DC development. The signature genes identified from pre-DC are likely containing clues for DC formation and HF morphogenesis initiation while the signature genes identified from DC at later stages are likely to be essential for HF development.
ABSTRACT:
Specialized mesenchymal cells in dermal condensates (DC) play a crucial role in regulating hair follicle (HF) progenitors in epidermal placodes (Pc) to orchestrate HF morphogenesis. Nevertheless, to date the inductive signals during DC specification and how DC cells interplay with Pc progenitors to facilitate HF development remain unknown. Here we identify precursor cells of the DC (pre-DC) before it appears as specialized cell cluster. With fluorescence-activated cell sorting we co-isolate pre-DC and the DC as it matures, together with the Pc at stage 0 HFs, and other lineage-related populations. We then define the gene expression patterns in each population with next-generation RNA sequencing. Through cross-comparisons we define a molecular time-lapse of dynamically changing gene signatures in consecutive developmental stages during the three earliest HF formation stages. Within the stage-specific pre-DC and DC molecular signatures we uncover several putative key hair inductive signals. With genetic manipulation in live embryonic skin cultures we aim to effectively test the role of newly identified signals in their interplay between the niche and placode progenitors that govern hair follicle formation.

P082
Hair Follicle Stem Cell Stimulation By Naturally Secreted Growth Factors Induces New Hair Growth In Men And Women

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Gail Naughton, Ph.D., has been in tissue engineering research for 30 years, holds over 105 patents, and founded two regenerative medicine companies. Her current venture, Histogen, is focused on novel products from hypoxia induced stem cells. She is the Company’s CSO/CBDO and invented its core technology. She was the founder/co-inventor at Advanced Tissue Sciences, oversaw the design and development of the world’s first up-scaled manufacturing facility for tissue engineered products, established major corporate development partnerships, raised over $350M, and brought four products from concept through market launch. At Histogen Dr. Naughton developed a new skin care product, ReGenica, which was recently acquired by Allergan. Dr. Naughton has been extensively published and a frequent speaker in the field of tissue engineering. In 2000, Dr. Naughton received the 27th Annual National Inventor of the Year award by the Intellectual Property Owners Association in honor of her pioneering work in regenerative medicine.


TAKE HOME MESSAGE:
Delivering key natural growth factors as a replacement therapy to stimulate hair follicle stem cells, keratinocyte growth and migration, and increase blood flow to the follicle induces significant terminal hair growth in men and women.

ABSTRACT:
We have evaluated injecting a bioengineered human cell-derived formulation produced by hypoxia-induced multipotent stem cells, termed Hair Stimulating Complex (HSC), as a replacement therapy to induce hair growth activity in androgenetic alopecia and female diffuse hair loss. HSC contains cytokines including KGF, VEGF, and follistatin, the last of which antagonizes activin and BMPs. HSC is released based on growth factor levels measured by ELISAs and cell-based bioassays. The initial clinical pilot study was a single site, double-blind, randomized, placebo-controlled trial involving 26 males with androgenetic alopecia. At baseline one area of the scalp received four 0.1cc intradermal injections of HSC with placebo receiving identical treatment. HSC showed an excellent safety profile and a statistically significant increase at 3 months in hair shaft thickness (p<0.05) and hair density (p <0.03) at 1 year, as assessed by Trichoscan image analysis. Increased terminal hairs were seen within the HSC injection sites supporting the hypothesis that HSC stimulated resting and miniaturizing follicles to increase terminal hair growth. A Phase I/II 56 subject trial with 8 injections of HSC and placebo at baseline, and a repeat dose at week 6, reached
12-week primary safety and efficacy endpoints. No product related adverse effects and no evidence of toxicity were observed. In addition, statistical significance was noted in all efficacy endpoints which include increase in total hair count (p=0.0013), terminal hairs (p=0.0135), vellus hairs (p=0.033) and cumulative thickness density (p=0.0026). An additional physician-sponsored investigator-initiated trial (IIT) to evaluate the safety and efficacy of HSC also produced cosmetically relevant hair growth effects in patients with diffuse female hair loss.

A phase I trial in women and a phase 2b dose-ranging trial for men are planned for 2018 in North America, pending regulatory approval. The results seen with HSC represent a novel regenerative medicine approach in hair growth treatment.

**P083**

**Skin Equivalent Formation With Hair Follicular Structure**

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  - 2016/05 ~ 2017/02 Fellowship in Department of Dermatology, Asan medical center


**TAKE HOME MESSAGE:**

The 3D skin culture system regenerates better organized hair follicles than chamber assay, and this approach can be used for the assessment of a test agent of hair growth-promoting effect.

**ABSTRACT:**

Background: Hair follicle reconstitution requires highly organized epithelial-mesenchymal interactions. Skin equivalent containing trichogenic epidermal and dermal cell could reproduce these processes, however is not yet well established. Objective: This study is aimed at exploring hair follicle producing 3D skin culture system using trichogenic mouse neonate epidermal and dermal cell. Furthermore, hair growth-promoting signaling was investigated in this system. Methods: The skin equivalent comprised of neonate mouse dermal cells (MDC) embedded in type I collagen and overlaid with neonate mouse epidermal cells (MEC) is used in this study. MDC were mixed with type I collagen and cultured for 7 days. 1 day after adding MEC on top, the composites were grafted onto nude mice. MDC cultured in 2D plate for 7 days mixed with MEC as negative control and freshly isolated MDC and MEC mixture (chamber assay) as positive control were also grafted. 6 weeks after grafting, hair follicles were observed in grafted nude mice and analyzed using hair count assay. To investigate the effect of 3D culture system on hair regeneration, hair inducing gene expression was compared between 2D culture system and 3D culture system. Results: Our 3D skin culture system reproducibly regenerated hair follicles, while MDC precultured in 2D model with MEC did not. Compared to chamber assay which rendered randomly oriented hair follicles, almost every regenerated hair follicle of our system extruded through the skin and the number of regenerated hair follicle was comparable to that of chamber assay. Conclusion: The results demonstrate that better organized hair follicle regeneration was accomplished with this system, and this approach can be used for the assessment of a test agent of hair growth-promoting effect.
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