

13th Annual Meeting of The Korean Hair Research Society

제13차 대한모발학회 학술대회



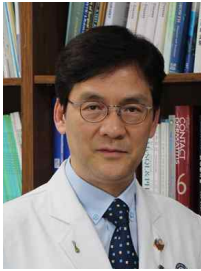
The Korean Hair Research Society

- 일시 : 2017년 5월 28일(일) 09:00~17:00
- 장소 : 연세의료원 종합관 337호, 331호

대 한 모 발 학 회



초대의 글



대한모발학회 회원 여러분 안녕하십니까?

국내외적으로 어수선한 요즈음이지만, 어김없이 찾아오는 희망찬 봄기운에 최근의 혼란스러움이 눈 녹듯이 사라지고, 아울러 회원님들의 가정과 직장에 행복과 기쁨이 충만하시기를 기원합니다. 대한모발학회에서는 다가오는 2017년 5월 28일(일)에 연세의료원(신촌) 종합관에서 『제13차 대한모발학회 학술대회』를 개최하게 되었습니다.

여러 회원들의 적극적인 참여로 12차에 걸친 지난 대한모발학회 학술대회가 성황리에 마무리되었음에 감사의 말씀을 드립니다. 이번 『제13차 대한모발학회 학술대회』는 한국어/영어 혼용(해외연자의 경우만 영어발표/국내연자는 한국어발표) 세션으로 구성되어 있으며, 1) Free communications, 2) Hair stem cell and regeneration, 3) Male pattern hair Loss, 4) Alopecia areata 5) Eye-catching issues I, II 총 6개의 세션으로 나뉘어 진행될 예정입니다.

이번 학술대회에서는 국내외 저명한 연자들을 모시고 모발 연구 및 임상 분야와 관련된 다양한 강연을 준비하였습니다. 모발줄기세포와 남성형탈모증에 대한 Luis Garza 교수(Johns Hopkins Univ., USA)와 원형탈모증에 대한 Taisuke Ito 교수 (Hamamatsu Univ., Japan)의 해외연자 강연이 준비되어 있습니다. 뿐만 아니라, 국내외 저명한 연자들께서도 모발 분야의 다양한 학문적 성과와 발전에 대하여 폭넓고 심도 있는 강연을 해 주실 예정입니다.

이번 학술대회가 회원 여러분들께 모발관련 임상과 기초 연구 그리고 정보교환에 유익한 토론의 장으로써 적극 활용되기를 기대합니다. 지금까지 대한모발학회에 보내주신 회원님들의 관심과 성원에 감사드리며 이번 『제13차 대한모발학회 학술대회』에도 열성적이고 적극적인 참여를 부탁드립니다. 감사합니다.

2017년 5월

대한모발학회 회장 이 원 수

13th Annual Meeting of The Korean Hair Research Society
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Time	Main (337)	Satellite (331)
09:00	Registration	
09:30	Session 1. Free Communications (Korean speaking session) (09:00-10:03)	
10:00	Coffee Break (10:03-10:20)	
10:30	Opening Ceremony (10:20-10:30)	
11:00	Session 2. Hair Stem Cell and Regeneration (Korean & English speaking session) (10:30-12:00)	
11:30		
12:00	Group Photo (12:00-12:10)	
12:30		
13:00	Lunch (12:10-13:30)	KHRS Board Meeting (12:10-13:30)
13:30		
14:00	Session 3. Male Pattern Hair Loss (Korean & English speaking session) (13:30-15:00)	Session 5. Eye-catching Issues I (Korean speaking session) (13:30-15:00)
14:30		
15:00	Coffee Break (15:00-15:20)	
15:30	Session 4. Alopecia Areata (Korean & English speaking session) (15:20-16:50)	Session 6. Eye-catching Issues II (Korean speaking session) (15:20-16:50)
16:00		
16:30		
17:00	Closing Ceremony (16:50-17:00)	
17:30	KHRS General Assembly (17:00-)	

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프 로 그 램

08:00-09:00 Registration

09:00-10:03 **Session 1. Free Communications** (Korean-speaking session) **(Hall 337)**
Chairs: **Chang Kwun Hong** (*Chung-Ang Univ.*), **Jee Ho Choi** (*Univ. of Ulsan*)

09:00-09:07 HMGB1 promotes hair growth via the modulation of prostaglandin metabolism
Do Young Kim et al. (*Yonsei Univ.*)

09:07-09:14 Hair growth effect of human umbilical cord blood mesenchymal stem cell-derived media
Ga Ram Ahn et al. (*Chung-Ang Univ.*)

09:14-09:21 Stress-induced senescence of dermal papilla cells restored by synthesized ceramide
Jee Hye Oh et al. (*The Catholic Univ.*)

09:21-09:28 Skin equivalent formation with hair follicular structure
Seung Hwan Paik et al. (*Seoul National Univ.*)

09:28-09:35 Distribution of microscopic change of pulled-out hair in alopecia areata patient
So Hee Park et al. (*Busan Paik Hospital*)

09:35-09:42 Is this case alopecia areata sisaipho? : A rare variant of alopecia areata
Ji Hee Jung et al. (*The Catholic Univ.*)

09:42-09:49 Efficacy of topical diphenylcyclopropenone maintenance treatment for patients with alopecia areata
Sung Jay Choe et al. (*Yonsei Univ.*)

09:49-09:56 Treatment of alopecia areata with tofacitinib: a case series
Ji Su Lee et al. (*SMG-SNU Boramae Medical Center*)

09:56-10:03 Various applications of scalp medical tattoo
Seungyong Lee et al. (*Mogun Dermatologic Clinic*)

10:03-10:20 Coffee Break

10:20-10:30 **Opening Ceremony**

Opening address **Won-Soo Lee** (*President, Korean Hair Research Society*)

Congratulatory address **Jee Ho Choi** (*President, Korean Dermatological Association*)

10:30-12:00	Session 2. Hair Stem Cell & Regeneration (Korean- & English-speaking session) (Hall 337) Chairs: Byung In Ro (<i>Catholic Kwan Dong Univ.</i>), Won-Soo Lee (<i>Yonsei Wonju Univ.</i>)
10:30-10:50	What's stem cell? Jae Ho Kim (<i>Pusan National Univ.</i>)
10:50-11:10	What's hair stem cell? Oh Sang Kwon (<i>Seoul National Univ.</i>)
11:10-11:40	Noncoding dsRNA induces hair follicle neogenesis Luis Garza (<i>Johns Hopkins Univ., USA</i>)
11:40-12:00	Clinical application of stem cell in hair disorders Chang Hun Huh (<i>Seoul National Univ.</i>)

12:00-12:10 Group Photo
12:10-13:30 Lunch, KHRS Board Meeting

13:30-15:00	Session 3. Male Pattern Hair Loss (Korean- & English-speaking session) (Hall 337) Chairs: Do-Won Kim (<i>Kyungpook National Univ.</i>), Hoon Kang (<i>Catholic Univ.</i>)
13:30-13:50	Androgen and hair follicle Won-Soo Lee (<i>Yonsei Wonju Univ.</i>)
13:50-14:10	Conventional therapy Yang Won Lee (<i>Konkuk Univ.</i>)
14:10-14:40	Will Prostaglandin D2 inhibitors treat androgenetic alopecia? Luis Garza (<i>Johns Hopkins Univ., USA</i>)
14:40-15:00	New emerging therapy including devices Beom Joon Kim (<i>Chung Ang Univ.</i>)

13:30-15:00	Session 5. Eye-catching Issues I (Korean-speaking session) (Hall 331) Chairs: Jin Soo Kang (<i>Kangskin Clinic</i>), Seong Jin Kim (<i>Chonnam National Univ.</i>)
13:30-13:50	Drug-induced hair disorders Jung Eun Kim (<i>Catholic Univ.</i>)
13:50-14:05	What blood test is needed in hair disorders? Byung Chul Park (<i>Dankuk Univ.</i>)
14:05-14:25	Role of nutritional supplements in hair disorders Jin Park (<i>Chonbuk National Univ.</i>)
14:25-14:40	Mesotherapy at now Sung Bin Cho (<i>Kangskin Clinic</i>)
14:40-15:00	A to Z of eyebrow transplantation Y. Anna Lee (<i>ANAMO Hairplant Clinic</i>)

15:00-15:20 Coffe Break

15:20-16:50	Session 4. Alopecia Areata (Korean- & English-speaking session) Chairs: Chull Wan Ihm (<i>Chonbuk National Univ.</i>), Sung Wook Park (<i>Park SungWook Clinic</i>)	(Hall 337)
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15:50-16:10	Standards in using steroid (topical and systemic) Do Young Kim (<i>Yonsei Univ.</i>)	
16:10-16:30	New emerging therapy including biologics Bark Lynn Lew (<i>Kyung Hee Univ.</i>)	
16:30-16:50	How to manage recalcitrant cases Chull Wan Ihm (<i>Chonbuk National Univ.</i>)	
15:20-16:50	Session 6. Eye-catching Issues II (Korean-speaking session) Chairs: Kyu Han Kim (<i>Seoul National Univ.</i>), Gwang Seong Choi (<i>Inha Univ.</i>)	(Hall 331)
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15:30-15:45	Korean oriental medicine in hair disorders Young Lee (<i>Chungnam National Univ.</i>)	
15:45-16:00	How to set up hair research lab Chang Deok Kim (<i>Chungnam National Univ.</i>)	
16:00-16:15	Is hair graying a marker of biological aging? Seong Jin Jo (<i>Seoul National Univ.</i>)	
16:15-16:35	Hair cosmetics Sang Seock Kim (<i>Hallym Univ.</i>)	
16:35-16:50	What's new in scarring alopecia? Dong-Youn Lee (<i>Sungkyunkwan Univ.</i>)	
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Session 1

Free Communications
(Korean-speaking session)



The Korean Hair Research Society

O1

HMGB1 promotes hair growth via the modulation of prostaglandin metabolism

Ji-Hye Hwang¹, Yuri Ahn¹, ZhenlongZheng¹², and Do Young Kim^{1*}

¹Department of Dermatology and Cutaneous Biology Research Institute, Yonsei University College of Medicine, Seoul, Korea, ²Department of Dermatology, Yanbian University Hospital, Yanji, China

Background: High-mobility group box 1 (HMGB1) is a ubiquitous nuclear protein that is released from the nuclei of cells after tissue damage. HMGB1 can be a plausible candidate to explain the mechanism of trauma-induced hair growth.

Objective: To elucidate the effect of HMGB1 on hair growth and their action mechanism.

Methods: MTT assay was conducted to check the effect of HMGB1 on hDPCs proliferation. RT-PCR and Western blot analysis demonstrated expressions of PGE2 metabolic enzymes in HMGB1-treated hDPCs. Hair growth was measured using ex-vivo hair organ culture. The Ki67 expression was measured by immunofluorescence.

Results: HMGB1 enhanced hair shaft elongation in ex vivo hair organ culture. We confirmed that the mRNA and protein expression levels of mPGES-1 was significantly increased after HMGB1 treatment on hDPCs. HMGB1 also stimulated PGE2 production from hDPCs. HMGB1-induced PGE2 production was abrogated with RAGE antagonist.

Conclusion: Our results suggest that HMGB1 plays a role in the promotion of hair growth via PGE2 production from hDPCs. These mechanism can explain a paradoxical phenomenon, trauma induced hair growth and HGMB1 may serve as an additional therapeutic target for the treatment of alopecia.

O2

Hair growth effect of human umbilical cord blood mesenchymal stem cell-derived media**Ga Ram Ahn¹, Ji Yeon Hong¹, Joon Seok¹, Eun Jung Ko²,
Kui Young Park¹, Beom Joon Kim¹, Chang Kwun Hong¹**¹Department of Dermatology, Chung-Ang University College of Medicine, Seoul, Korea²Department of Dermatology, Myongji Hospital, Seonam University College of Medicine, Goyang, Korea

Background: Identification of a safe and convenient substance capable of preventing androgenetic alopecia and promoting the growth of hair on the scalp remains problematic.

Objectives: This study was aimed to investigate the effectiveness of a newly developed topical agent containing human umbilical cord blood mesenchymal stem cell (hUCB-MSC)-derived conditioned media for the promotion of hair growth.

Methods: The study was designed as a double-blinded, placebo-controlled clinical study of outcomes in 30 patients with patterned hair loss treated with a topical agent containing hUCB-MSC-derived conditioned media. The efficacy of the treatment was determined using phototrichograms, to evaluate the density, diameter, and growth rate of hair from baseline after treatment for 4, 8 and 16 weeks.

Results: Hair density of the treatment group was significantly increased by 14.24 % whereas the density of control group was decreased by 5.2 % after 16 weeks. Hair thickness and hair growth rate of the treatment group were also increased compared to those of the control group. No severe adverse reaction was reported.

Conclusion: A topical agent containing hUCB-MSC-derived conditioned media described in this study may be a new effective treatment option in patients with androgenetic alopecia.

O3

Stress-induced senescence of dermal papilla cells restored by synthesized ceramide

**Jee Hye Oh, Kwan Ho Jeong, Ji Hee Jung, Young Jun Woo,
Ki Min Sohn, Jung Eun Kim, Hoon Kang**

Department of Dermatology, St. Paul's Hospital, College of Medicine,
The Catholic University of Korea, Seoul, Korea

Background: Dermal papilla cells (DPCs) are known to regulate the cell senescence via regulation of proliferation and apoptosis. Ceramide is a second messenger of bioactive sphingolipid that mediates a variety of cell functions involved in apoptosis, cell differentiation, proliferation and cellular senescence. However, the effects of ceramide on stress-induced senescence of hair follicles were not well identified yet.

Objective: We aimed to confirm the effects of ceramide on regulating growth factors including ERK/Akt and Wnt/ β -catenin pathway in senescence-induced DPCs.

Method: To investigate the ceramide-related pathway, we evaluated how ceramide affects ERK/Akt activation and Wnt/ β -catenin signaling in H₂O₂-treated DPCs.

Results: We found that Akt phosphorylation in H₂O₂-treated DPCs was decreased by ceramide, whereas ERK phosphorylation was significantly upregulated by ceramide. Wnt5a and β -catenin mRNA levels were increased in ceramide alone group. Interestingly, ceramide upregulated the expression of Wnt10b in H₂O₂-treated DPCs.

Conclusion: These results suggest that ceramide may be closely related to the maintenance of hair follicles in senescence environment such as aging or damaging by certain stimuli. Ceramide may be useful for adjunctive material to delay the hair senescence.

O4**Skin equivalent formation with hair follicular structure**

**Seung Hwan Paik^{1,2,3}, Soon-Jin Choi², Seong-Jin Jo^{1,2},
Kyu Han Kim^{1,2}, Ohsang Kwon^{1,2}**

¹Department of Dermatology, Seoul National University College of Medicine, Seoul, Republic of Korea ²Institute of Human-Environment Interface Biology, Seoul National University, Seoul, Republic of Korea ³Asan Medical Center, University of Ulsan College of Medicine, Seoul, Republic of Korea

Hair follicle reconstitution requires highly organized epithelial-mesenchymal interactions. Skin equivalent containing trichogenic epidermal and dermal cell could reproduce these processes. 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. 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 in medium with various concentration of Wnt3a (0, 2, 10 ng/ml) 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. 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. The number of hair follicles tended to increase according to the concentration of Wnt3a. The results demonstrate that better organized hair follicle regeneration was accomplished.

O5

Distribution of microscopic change of pulled-out hair in alopecia areata patient

So Hee Park, Gyeong Je Cho, Do Hyeong Kim, Jung Eun Seol, Hyojin Kim

Department of Dermatology, Busan Paik Hospital, College of Medicine, Inje University,
Busan, Korea

Background: Microscopic characteristics of pulled-out hair are regarded as helpful methods to diagnose AA, but the differences in these characteristics among AA patients were not studied yet.

Objective: The aim of this study is to evaluate microscopic morphology of pulled-out hair in AA patient and whether these microscopic characteristics could be useful tool to predict the AA disease activity.

Methods: We analyzed pulled-out hairs, which obtained by gentle hair pull test from alopecia areata patients. The morphologic characteristics were classified into the presence of typical clubbing, surface undulation, proximal tapering, hair breakage and depigmentation and compared the results for the clinical information such as age and AA activity.

Results: A total 137 patients were enrolled and a total 820 hairs were analyzed. There were statistically significant differences in the presence of typical clubbing, surface undulation, proximal tapering and hair breakage between age groups and between AA activities.

Conclusion: The presence of typical clubbing, surface undulation, tapering in proximal hair and broken hair could be useful markers to predict disease activity in AA.

O6

Is this case alopecia areata sisaipho? : A rare variant of alopecia areata

Ji Hee Jung, Young Jun Woo, Ki Min Sohn, Jung Eun Kim, Hoon Kang*

Department of Dermatology, St. Paul's Hospital, College of Medicine,
The Catholic University of Korea, Seoul, Korea

Alopecia areata (AA) sisaipho (or inverse ophiasis) is an uncommon variant of AA, first described by Muñoz and Camacho in 1996. We report a case with a possible diagnosis of AA sisaipho occurred in a child. A 6-year-old girl presented to our dermatology clinic with a 1 year history of large hair loss patch on the vertex area. There was nothing specific in the patient's past history and family history. On the dermatologic examination, 33% hair loss of the scalp based on the Severity of Alopecia Tool Score with no erythema or scaling was detected and hair pull test was strongly positive. The patient's eyebrows, eyelashes, and body hair were all intact. Phototrichogram examination revealed multiple yellowish spots and tiny upright hairs on the follicular orifice. The patient was diagnosed with alopecia areata on the basis of clinical and dermoscopic findings and started Diphencyclopentenone (DPCP) therapy. At recent follow up, new hair loss patches came up nearby the original site. Alopecia areata sisaipho is considered a rare variant of AA, which is characterized by the loss of all scalp hair except in ophiasis area (fronto-parieto-occipital). This type is associated more frequently with previous or concomitant disorders such as atopy, vitiligo, or thyroid disease than with other AA variants and seems to have a more benign behavior than its inverse counterpart

O7

Efficacy of topical diphenylcyclopropenone maintenance treatment for patients with alopecia areata

Sung Jay Choe, Hanil Lee, Solam Lee, Jaewoong Choi, Won-Soo Lee

Department of Dermatology and Institute of Hair and Cosmetic Medicine, Yonsei University
Wonju College of Medicine, Wonju, Korea

Background: Diphenylcyclopropenone (DPCP) immunotherapy is widely used in the treatment of alopecia areata (AA). Only a few studies have described the DPCP maintenance treatment (DPCP-MT) of patients with AA and the reported relapse rates (RR) have varied.

Objective: To clarify the efficacy of the DPCP-MT for preventing recurrence in patients who have been treated with topical DPCP immunotherapy.

Methods: The study included 63 patients who showed a marked response (MR) after topical DPCP immunotherapy and maintained low disease activity for more than 6 weeks. The follow-up treatment was defined as DPCP-MT. Data were analyzed using Kaplan-Meier plots and a Cox proportional hazards regression model. Disease- and treatment-associated factors, affecting the outcome of treatment, were also analyzed within the group who received DPCP-MT

Results: Of the 63 patients, 41 patients received DPCP-MT and 22 patients did not receive DPCP-MT. Of the 41 patients who received DPCP-MT, 10 relapsed; of the 22 patients who did not receive DPCP-MT, 15 relapsed. Univariate analysis showed that the DPCP-MT was correlated with a low RR (mean duration after MR, 38.65 vs 15.52 months; $p < 0.001$). Multivariate analysis showed DPCP-MT was an independent prognostic factor for AA relapse (hazard ratio=16.656; 95%CI, 4.159-66.700; $p < 0.001$).

Of the patients who received DPCP-MT, mean maintenance treatment interval (MTI) was shorter in patients who did not relapse compare to the patients who relapsed ($p = 0.022$). The ratio of the mean MTI to the mean treatment interval until reaching the MR was higher in the relapsed group than in the non-relapsed group ($p = 0.021$). Additionally, the ratio of the duration until the MTI was first increased to the treatment duration until reaching the MR was higher in the non-relapsed group than in the relapsed group ($p < 0.01$).

Conclusion: DPCP-MT is effective in preventing AA relapse. Furthermore, rapid changes in the MTI increase the risk of relapse.

O8

Treatment of alopecia areata with tofacitinib: a case series

**Ji Su Lee¹, Min-woo Kim¹, Hyun-sun Park¹, Jung Yoon Ohn¹,
Hyun-sun Yoon¹, Chang-Hun Huh², Ohsang Kwon³, Soyun Cho¹**

¹Department of Dermatology, SMG-SNU Boramae Medical Center, Seoul, Korea, ²Seoul National University Bundang Hospital, Gyeonggi, Korea, ³Seoul National University Hospital, Seoul, Korea

Background: Treatment of alopecia areata (AA) is often empiric and not yet satisfactory. Recently, Janus kinase inhibitor showed promising results in Caucasians.

Objective: To investigate efficacy, tolerability, and hair growth trajectory of oral tofacitinib monotherapy for Korean AA patients over extended period.

Methods: This is a retrospective study of adult AA patients treated with tofacitinib monotherapy for least 4 months.

Results: Thirty-six Korean patients with median initial SALT score of 98.9 were included; 91.7% had refractory AA. Twenty-nine (80.6%) patients demonstrated more than 5% SALT change. Twenty patients (55.6%) achieved 50% SALT change at median 7.5 months with 5 mg twice dosage. There were significant differences between SALT 50 achievers and non-achievers: duration of current episode ($\rho = 0.009$), duration of disease since first onset ($\rho = 0.026$) and age at onset of first episode ($\rho = 0.011$). Tofacitinib was well tolerated and there was no any serious adverse effect such as malignancy or tuberculosis reactivation.

Conclusions: Oral tofacitinib monotherapy may be effective and tolerable in patients with AA. SALT 50 achievement was associated with followings: duration of current episode, duration of disease since first onset, and age at onset of first episode.

O9
Various applications of scalp medical tattoo

Seungyong Lee, Daewoo Kim

Mogun Dermatologic Clinic

Tattoo is a procedure of inserting ink into the dermis of the skin to present the desired design and color. Tattoo is being used in medical treatment called medical tattoo and it is becoming more prevalent in the medical field. Furthermore, tattoo is widely used as complementary treatment of alopecia including androgenic alopecia. Our clinic has various scalp medical tattoo cases as well as many cases of androgenic alopecia; the cases on scalp scar, post-operation scar on philtrum due to cleft lip and palate, thin-haired area of hairline with or without hair transplantation, and an unsatisfactory hair density on genital area after hair transplantation with atrichia patient. Moreover, primary or secondary scarring alopecia patient, untreatable alopecia areata patient with long duration, congenital hair shaft disorder patient such as wooly hair, and permanent alopecia patient after chemotherapy were had notable improvement with scalp medical tattoo. Lastly, scalp medical tattoo is an invasive procedure and has limitation. It shows two-dimensional effect, not a hair-volume effect, and ink remains permanently in the skin. Unwanted events (side effects) including color blurring, run-in color, skin allergic reactions, skin infections, and scarring may also occur. Therefore, both the person who wants to get a medical tattoo and the physician who is undergoing this procedure should consider carefully to achieve satisfactory results.



Session 2

Hair Stem Cell & Regeneration
(Korean- & English-speaking session)



The Korean Hair Research Society

What are stem cells?

Jae Ho Kim, Ph.D.

Department of Physiology, School of Medicine, Pusan National University, Yangsan,
Republic of Korea

Stem cells have the remarkable potential to develop into many different cell types in the body during early life and growth. In addition, in many tissues they serve as a sort of internal repair system, dividing essentially without limit to replenish other cells as long as the person or animal is still alive. When a stem cell divides, each new cell has the potential either to remain a stem cell or become another type of cell with a more specialized function, such as a muscle cell, a red blood cell, or a brain cell. Stem cells are distinguished from other cell types by two important characteristics. First, they are unspecialized cells capable of renewing themselves through cell division, sometimes after long periods of inactivity. Second, under certain physiologic or experimental conditions, they can be induced to become tissue- or organ-specific cells with special functions. In some organs, such as the gut and bone marrow, stem cells regularly divide to repair and replace worn out or damaged tissues. In other organs, however, such as the pancreas and the heart, stem cells only divide under special condition. The use of cellular therapy in the treatment of dermal wounds is currently an active area of investigation. Multipotent adult stem cells are an attractive choice for cell therapy because they have a large proliferative potential, the ability to differentiate into different cell types and produce a variety cytokines and growth factors important to wound healing. This presentation focused on the roles of adult stem cells, such as endothelial progenitor cells and mesenchymal stem cells, during dermal wound healing process and their therapeutic potentials for the treatment of chronic wounds, which remain a major clinical problem, especially in diabetic patients.

[CURRICULUM VITAE]

Jae Ho Kim, Ph.D.

Professor and Chair, Department of Physiology, School of Medicine, Pusan National University



Education and Training:

- 1987-1991 Seoul National University, Dept. of Animal Science, BS
- 1991-1993 POSTECH, Dept of Life Science, MS
- 1993-1997 POSTECH, Dept of Life Science, PhD

Current and Past Professional Positions:

- 1997-1999 POSTECH, Dept of Life Science, Post-doctoral fellow
- 1999-2002 Johns Hopkins University, School of Medicine, Post-doctoral fellow
- 2002-2006 Pusan National University, School of Medicine, Assistant professor
- 2006-2011 Pusan National University, School of Medicine, Associate professor
- 2011-present Pusan National University, School of Medicine, Full professor
- 2009-2010 University of Virginia, School of Medicine, Visiting professor
- 2013-2015 Pusan National University, School of Medicine, Director for research affairs
- 2014-2016 National Research Foundation, Review board member
- 2013-present PNU BK21 Plus Biomedical Science Education Center, Director
- 2015-present Department of Physiology, School of Medicine, Pusan National University, Chair

Awards:

- March 2016 The 15th Busan Science and Technology Award, Society for Busan Science and Technology
- Dec 2015 Academic Research Award, Biomedical Research Center, PNUH
- Oct 2011 Yundang Academic Science Award, Korean Physiological Society
- May 2011 Dongchun the Best Investigator Award, Korean Society for Biochemistry and Molecular Biology
- May 2011 Research Award for Basic Biomedical Science, Basic Biomedical Science Society
- Feb 2009 Blue Ribbon Lecture Award, Korean Society for Molecular & Cellular Biology
- Dec 2008 The Best Research Award, Pusan National University Hospital

Society Memberships:

Board members: Korean Society for Biochemistry and Molecular Biology, Korean Society for Stem Cell Research, Vascular Science and Medicine Organization, Korean Physiological Society, Korean Human Proteome Organization

Featured Publications:

1. Heo, S. C., et al. (2011) Tumor Necrosis Factor- α -Activated Human Adipose Tissue-Derived Mesenchymal Stem Cells Accelerate Cutaneous Wound Healing through Paracrine Mechanisms. *J. Invest. Dermatol.* 131(7):1559-67.
2. Shin, S. H., et al. (2012) Proteomic identification of betaig-h3 as a lysophosphatidic acid-induced secreted protein of human mesenchymal stem cells: paracrine activation of A549 lung adenocarcinoma cells by betaig-h3. *Mol Cell Proteomics*, 11(2):M111.012385.
3. Lee MJ, et al. (2012) Macrophages Regulate Smooth Muscle Differentiation of Mesenchymal Stem Cells via a Prostaglandin F2 α -Mediated Paracrine Mechanism. *Arterioscler. Thromb. Vasc. Biol.* 32(11):2733-40
4. Yoo, C. H., Na, H. J., Lee, D. S., Heo, S. C., An, Y., Cha, J., Choi, C., Kim, J. H., Park, J. C., Cho, Y. S. (2013) Endothelial progenitor cells from human dental pulp-derived iPS cells as a therapeutic target for ischemic vascular diseases. *Biomaterials* 34(33):8149-60.
5. Heo, SC et al. (2014) WKYMVm-induced activation of formyl peptide receptor 2 stimulates ischemic neovascularogenesis by promoting homing of endothelial colony forming cells. *Stem Cells.* 32(3):779-90
6. Do. E. K. et al. (2014) Reptin regulates pluripotency of embryonic stem cells and somatic cell reprogramming through Oct4-dependent mechanism. *Stem Cells.* 32(12):3126-36.
7. Choi, Y. H. et al. (2015) Injectable PLGA microspheres encapsulating WKYMVm peptide for neovascularization. *Acta Biomater.* 25:76-85.
8. Injectable PLGA microspheres encapsulating WKYMVm peptide for neovascularization. *Acta Biomater.* 25:76-85.
9. Heo, S. C. et al. (2017) Formyl Peptide Receptor 2 is Involved in Cardiac Repair after Myocardial Infarction Through Mobilization of Circulating Angiogenic Cells. *Stem Cells.* 35(3):654-665.
10. Kwon, Y. W. et al. (2017) N-acetylated proline-glycine-proline accelerates cutaneous wound healing and neovascularization by human endothelial progenitor cells. *Sci Rep.* 7:43057

What's Hair Stem Cells?

Ohsang Kwon, M.D., Ph.D.

Department of Dermatology, Institute of Human-Environmental Interface Biology,
Seoul National University College of Medicine, Seoul, Korea

The homeostasis of all self-renewing tissues, including the hair follicle, is thought to be maintained by stem cells. The hair follicle (HF) remodels itself during cycling periods of degeneration (catagen), rest (telogen) and regeneration (anagen). The ability of the follicle to maintain its regenerative capacity rests upon resident HF epithelial stem cells that lie in a region called the bulge, located at the base of the upper permanent portion of follicular outer root sheath (ORS) and dermal papilla cells that have mesenchymal stem cell characteristics.

Furthermore, the number of hair follicles is determined during embryonic development and continues to decrease during the lifetime after birth. The main modalities for the treatment of alopecia are topical agents, systemic medication such as 5α -reductase inhibitors or surgical hair implantation procedure. However, those treatments will be limited for the subjects with severe hair loss due to advanced androgenetic alopecia, burn scar or chemotherapy-induced permanent alopecia. To overcome the deficient number of remnant hair follicle, there is unmet needs to generate new hair follicles. Current approaches for hair follicle regeneration would be classified into three directions, firstly, the cell therapy using two kinds of hair follicle cell components, hair follicle epithelial stem cells and follicular dermal papilla cells, secondly, hair follicle neogenesis after wounding that utilizes epithelial-mesenchymal interactions and de novo hair follicle formation, and lastly, differentiation into hair follicle precursor cells and implantation from multipotent stem cells.

The basic background knowledge and approaches will be presented for introduction in the field of hair follicle regeneration

[CURRICULUM VITAE]

Ohsang Kwon, M.D., Ph.D.

Professor, Department of Dermatology, Seoul National University College of Medicine, 101 Daehak-ro, Jongno-gu, Seoul 110-744, Korea



Education and Training:

- 1988-1994 M.D. Seoul National University College of Medicine, Seoul, Korea
- 1995-1999 Resident, Department of Dermatology, Seoul National University Hospital, Seoul, Korea
- 1997-1999 M.S. in Medicine (Dermatology), Graduate School, Seoul National University, Seoul, Korea
- 2002-2005 Ph.D. in Medicine (Dermatology), Graduate School, Seoul National University, Seoul, Korea

Professional Experiences

- 2002.5-2003.2 Research Fellowship, Department of Dermatology, Seoul National University College of Medicine, Seoul, Korea
- 2003.3-2003.4 Visiting Fellowship, Elective Course for Dermatological Surgery, Department of Dermatology, Oregon Health Science University, Portland OR, USA.
- 2003.4-2005.2 Clinical Instructor, Department of Dermatology, Seoul National University Hospital, Seoul, Korea
- 2005.3-2015.2 Assistant Professor, Associate Professor, Department of Dermatology, Seoul National University College of Medicine, Seoul, Korea
- 2007.7-2009.7 Visiting Scholar, Department of Dermatology, University of Pennsylvania, Philadelphia PA, USA.
- 2015.3-present Professor, Department of Department of Dermatology, Seoul National University College of Medicine, Seoul, Korea

Memberships & Academic Appointments

- 2016, 6- Board Member, Director of Educational Affairs, Korean Hair Research Society (KHRS)
- 2015. 3- Director of Academic Affairs, Korean Society for Investigative Dermatology (KSID)
- 2011.11- Annals of Dermatology (SCIE), Editorial Board
- 2016. 1- Journal of Dermatology (SCI) International Editorial Board,

Recent Publications

1. Kim JY, Yoon JS, Yum H, Yang YS, Han SC, Koh WS, Lee JI, Jung KC, Kim KH, Kwon O. Allogeneic Hair Transplantation with Enhanced Survival by Anti-ICAM-1 Antibody with short-term rapamycin treatment in Nonhuman Primates. *J Invest Dermatol* 2017;137(2):515-518
2. Jo SJ, Kim JY, Jang SH, Choi SJ, Kim KH, Kwon O. Decrease of versican levels in the follicular dermal papilla is a remarkable aging-associated change of human hair follicles. *J Dermatol Sci* 2016 Dec;84(3):354-357
3. Shin H, Youn JS, Koh W, Kim JY, Kim CH, Han KM, Kim EJ, Kwon O. Nonpigmented hair removal using photodynamic therapy in animal model. *Lasers Surg Med* 2016;48(8):748-762
4. Yoon JS, Choi M, Shin CY, Paik SH, Kim KH, Kwon O. Development of a model for chemotherapy-induced alopecia: Profiling of histological changes in human hair follicles after chemotherapy. *J Invest Dermatol* 2016;136(3):584-592
5. Cho AR, Kim JY, Munkhbayer S, Shin CY, Kwon O. p21 upregulation in hair follicle stem cells is associated with telogen retention in aged mice. *Exp Dermatol* 2016;25(1):76-78
6. Shin H, Jo SJ, Kim DH, Kwon O*, Myung SK*. Efficacy of Prevention for Chemotherapy-induced alopecia: A Meta-Analysis of Randomized Controlled Trials and Controlled Clinical Trials. *Int J Cancer* 2015;136(5):E442-E454
7. Han J, Lee E, Kim E, Yeom M, Kwon O, Yoon TH, Lee TR, Kim K. Role of epidermal $\gamma\delta$ T cell-derived interleukin 13 in the skin-whitening effect of Ginsenoside F1. *Exp Dermatol* 2014;23(11):860-862
8. Choi M, Kim MS, Park SY, Park GH, Jo SJ, Cho KH, Lee JW, Park KD, Shin HY, Kang HJ, Kwon O. Clinical characteristics of chemotherapy-induced alopecia in childhood. *J Am Acad Dermatol* 2014;70(3):499-505
9. Yoon SY, Jo SJ, Shin CY, Shin JY, Kim JI, Kwon O,* Kim KH*. A role of placental growth factor in hair growth. *J Dermatol Sci* 2014;74(2):125-134
10. Jo SJ, Choi SJ, Yoon SY, Lee JY, Park WS, Park PJ, Kim KH, Eun HC, Kwon O. Valproic acid promotes human hair growth in vitro culture model. *J Dermatol Sci* 2013;72(1)Oct:16-24

Noncoding dsRNA induces hair follicle neogenesis

Luis Andres Garza, M.D., Ph.D.

Associate Professor, Department of Dermatology, Johns Hopkins School of Medicine

Humans and mice are not thought capable to regenerate new organs as adults. However, during wounding, adult mice can recapitulate embryogenesis and make an entirely new hair follicle from only migrating cells from the wound periphery.

In my presentation, I will present our discovery that noncoding dsRNA promotes hair follicle organogenesis during wounding.

[CURRICULUM VITAE]

Luis Andres Garza, M.D., Ph.D.

Associate Professor, Department of Dermatology, Johns Hopkins School of Medicine



Education and Training:

- 1994 B.A., Neurobiology, School of Arts and Science, Cornell University,
- 2001 M.D./Ph.D., Medicine/Molecular Biology, School of Medicine, University of Pennsylvania
- 2005 Residency, Department of Dermatology, University of Michigan
- 2009 Postdoctoral, School of Medicine, University of Pennsylvania

Current and Past Professional Positions:

- 2005-09 Instructor, Department of Dermatology, University of Pennsylvania, Philadelphia, PA.
- 2009-2015 Assistant Professor, Department of Dermatology, Johns Hopkins Medicine, Baltimore, MD
- 2011-2014 Assistant Director Hopkins Wound Clinic
- 2015-present Associate Professor, Department of Dermatology, Johns Hopkins Medicine, Baltimore, MD

Awards:

- 1994 Distinction in All Subjects, and Cum Laude
- 1994 Medical Scientist Training Program Award
- 2002-05 Multiple University of Michigan “You’re Super” Awards for Excellence in Patient care.
- 2005 National Young Investigator Award, Clinical Research AAD
- 2005 North American Clinical Dermatologic Society Resident Clinical Research Award
- 2005 Michigan Dermatological Society Ralph Coskey Resident Research Award
- 2005 University of Michigan Department of Dermatology Upjohn Resident Research Award
- 2005 TAMS University of Michigan Medical Student Appreciation Award for Mentoring.
- 2007 Beerman-Johnson Philadelphia College of Physician and Surgeons Derm Research Award
- 2007 Dermatology Foundation Career Development Award
- 2008 American Skin Association Research Scholar Award

Society Memberships:

2003-05	Resident/Fellow Representative to the Board of Directors, Society for Investigative Dermatology
2002-present	Member,, American Academy of Dermatology
2003-present	Member, Society for Investigative Dermatology
2012-present	Associate Editor, Journal of Investigative Dermatology
2012, 2013	Session Presider, Hair Biology and Regeneration, SID Annual meeting
2013-15	Ad-Hoc Roster member, NIH NIAMS AMS study section (K and T grants)
2015-present	Standing member, NIH NIAMS AMS study section (K and T grants)

Featured Publications:

1. Nelson AM, Reddy SK, Ratliff TS, Hossain MZ, Katseff AS, Zhu AS, Chang E, Resnik SR, Page C, Kim D, Whittam AJ, Miller LS, Garza LA. dsRNA Released by Tissue Damage Activates TLR3 to Drive Skin Regeneration. *Cell Stem Cell*. 2015;17(2):139-51. Epub 2015/08/09. doi: 10.1016/j.stem.2015.07.008. PubMed PMID: 26253200; PubMed Central PMCID: PMC4529957.
2. Nelson AM, Loy DE, Lawson JA, Katseff AS, Fitzgerald GA, Garza LA. Prostaglandin D2 Inhibits Wound-Induced Hair Follicle Neogenesis through the Receptor, Gpr44. *J Invest Dermatol*. 2013;133(4):881-9. PMCID: PMC3593761
3. Nelson AM, Katseff AS, Ratliff TS, Garza LA. Interleukin 6 and STAT3 Regulate p63 Isoform Expression in Keratinocytes During Regeneration. *Exp Dermatol*. 2015. Epub 2015/11/15. doi: 10.1111/exd.12896. PubMed PMID: 26566817.
4. Zhou AS, Li A, Melsom M, Ratliff TS, Garza LA. During wounding, noncoding dsRNA coordinates Wnts and Prostaglandins to promote regeneration. *J Invest Dermatol*. 2017 (Accepted; In Press).

Clinical application of stem cell in hair disorders

Chang-Hun Huh, M.D., Ph.D.

Seoul National University Bundang Hospital, Seongnam, Gyeonggi

The term of “Stem Cell Therapy” has expanded greatly over the last few years in many medical fields. Hair loss treatment also regards as one of the good indications of stem cell therapy. But unfortunately, no commercially available “Stem Cells” for hair loss has been approved by KFDA. We could see follicular neogenesis in animal experiment, but reproduction in daily practice is hardly achieved.

However, the term “Stem Cell Therapy for Hair loss” is widely used in Korea. Some doctors advertise that they do stem cell treatment nevertheless they use PRP, SVF of adipocytes, or even cytokines, which is not true stem cell treatment.

In this lecture, I would like to discuss about the current status of so called “stem cell treatment” in Korea and the future direction of hair loss treatment using stem cells.

And I would like to propose what conditions should be fulfilled for the optimal stem cell treatment for hair loss.

[CURRICULUM VITAE]

Chang-Hun Huh, M.D., Ph.D.

Associate Professor, Department of Dermatology, Seoul National University Bundang Hospital



Education:

- 1989-1995 Seoul National University, College of Medicine.
- 2001-2003 Graduate School (Master Course) of Seoul National University, College of Medicine <Thesis: The influence of photo-epilation on wound healing>
- 2004-2007 Graduate School (Ph.D. Course) of Seoul National University, College of Medicine <Thesis: Influence of adipose-derived adult stem cells on epidermis of living skin equivalents>

Postgraduate Training:

- 1995 - 1996 Internship in Seoul National University Hospital
- 1996 - 1999 Military service as an Army Doctor. (lieutenant)
- 1999 - 2003 Residency in the Department of Dermatology, Seoul National University Hospital
- 2003 - 2004 Clinical Instructor of Dept. of Dermatology, Seoul National University Hospital
- 2004 - 2012 Clinical Assistant Professor of Dept. of Dermatology, Seoul National University Bundang Hospital.
- 2012 - Present Clinical Associate Professor of Dept. of Dermatology, Seoul National University Bundang Hospital.
- 2010 - 2012 Visiting Physician of Sharp Health Care Center, San Diego, CA, USA
- 2012 Visiting Physician of Mayo Clinic, Rochester, MN, USA

Awards:

- 2003. 5 International Investigative Dermatology (IID) 2003 Travel Grant awarded by Japan Society for Investigative Dermatology (JSID)
- 2004. 2. American Academy of Dermatology (AAD) 2004 Travel Grant awarded by AAD
- 2004. 6. The 4th International Meeting of Hair Research Society (IMHRS) Travel Grant awarded by Korean Hair Research Society (KHRS)
- 2006. 6. The 12th European Hair Research Society (EHRS) Meeting Travel Grant awarded by EHRS.
- 2006.10. Imrich Sarkany Non-European Exceptional Cases Grant awarded by the European

- Academy of Dermatology and Venereology.(15th EADV Meeting)
- 2008.5. International Investigative Dermatology (IID) 2008 Travel Grant awarded by Japan Society for Investigative Dermatology (JSID)
2011. 8. International Preceptorship Recipient by American Society for Dermatologic Surgery (ASDS)

Membership and Society Activity:

- Domestic (Korean)
 - Treasurer of the Korean Dermatologic Laser Association (2006-present)
 - Treasurer of the Korean Society of Cosmetic Dermatology (2012- present)
 - Treasurer of Korean Hair Research Society (2006~2011, 2016-present)
 - Secretary General of the Korean Society for Aesthetic and Dermatologic Surgery (2017-present)
 - Director of the Korean Society for Skin Cancer (2012-present)

- International:
 - Deputy Secretary General, International Society for Dermatologic Surgery 2015.
 - International Mentor of American Society for Dermatologic Surgery (2011-present)
 - International Society for Dermatologic Surgery preceptor (2014-present)
 - International Advisory Committee for the WCHR2017 (2016-present)
 - Secretariat of the 3rd Asian Society for Pigment Cell Research Meeting 2009
 - Board of organizing committee of 22nd World Congress of Dermatology 2011
 - Director of dermatological surgery Ancillary Meeting at WCD 2011.
 - Treasurer of Korean bidding committee of World Congress of Hair Research 2014.
 - Ceremony & Social Director of committee of World Congress of Hair Research 2014.

Publications:

Over 100 articles of domestic and SCI ranked international journals since 2001.



Session 3

Male Pattern Hair Loss
(Korean- & English-speaking session)



The Korean Hair Research Society

Androgen and hair follicle

Won-Soo Lee, M.D., Ph.D.

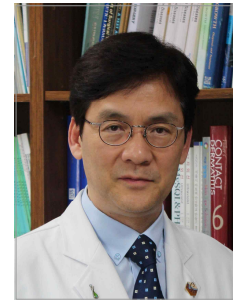
Department of Dermatology, Yonsei University Wonju College of Medicine

Hair growth and cycling are regulated by many hormones, and the effect of androgens, in particular, has been well known for a long time. Androgens regulate human hair growth, and their effects vary depending on body sites. Before puberty, there is only vellus hair in the pubic and axillary areas, but when androgens increase in puberty, vellus hair follicles develop into terminal ones, producing larger, curlier and darker hair shafts. In males, androgens stimulate beard growth but suppress hair growth in androgenetic alopecia (AGA) and this reciprocal effect is known as the 'androgen paradox'. Human pilosebaceous units possess enough enzymes to form the active androgens testosterone and dihydrotestosterone. In hair follicles, 5 α -reductase type 1 and 2, androgen receptors (AR) and AR coactivators can regulate androgen sensitivity of dermal papillae (DP) cells. To regulate hair growth, androgens stimulate production of IGF-1 as positive mediators from beard DP cells and of TGF- β 1, TGF- β 2, dickkopf1 and IL-6 as negative mediators from balding DP cells. Moreover, AGA involves crosstalk between androgen and Wnt/ β -catenin signaling. During follicular development and homeostasis there is reciprocal activation of the AR and β -catenin in cells of the hair bulb. AR activation reduce β -catenin-dependent transcription, block β -catenin-induced induction of hair follicle growth. Conversely, AR inhibition enhance the effects of β -catenin activation, promoting follicular proliferation and differentiation.

[CURRICULUM VITAE]

Won-Soo Lee, M.D., Ph.D.

Professor and Chairman, Department of Dermatology,
Yonsei University Wonju College of Medicine, Wonju, Korea



Education & Previous Career:

- 1979-1985 Yonsei University College of Medicine, Seoul, Korea (MD)
- 1985-1989 Dermatologic Residency, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea (Dermatologist, Korean Board of Dermatology)
- 1989-1992 Flight Surgeon, Air Force, Republic of Korea
- 1986-1992 Yonsei University Graduate School of Medicine (PhD)
- 1992-2004 Research fellow, Instructor, Assistant, Associate Professor of Dermatology, Yonsei University Wonju College of Medicine, Wonju, Korea
- 1996-1998 Visiting Clinical Assistant Professor, Department of Dermatology, University of Minnesota, Minneapolis, USA
- 2000-2006 Chairman, Department of Dermatology, Yonsei University Wonju College of Medicine
- 2006-2008 Secretary General, Korean Society of Cosmetic Dermatology,
- 2007-2011 Executive board, Publication Chairman, 2011 World Congress of Dermatology
- 2008-2014 Secretary General, Korean Hair Research Society
- 2010-2014 Congress President, 2014 World Congress for Hair Research

Current Position:

- 2003-present Director, Institute of Hair and Cosmetic Medicine, Yonsei University Wonju College of Medicine
- 2004-present Professor and Chairman (2000-2006, 2012-present), Department of Dermatology, Yonsei University Wonju College of Medicine,
- 2008-present International Board, World Congress for Hair Research
- 2010-present Regional Editor, International Journal of Trichology
- 2016-present Guest Editor, Hair Care Cosmetics
- 2016-present President, Korean Hair Research Society

Summary of Academic Activities:

Author or editor of 9 textbooks

More than 220 peer-reviewed scientific publications

More than 80 international invited lectures and 170 domestic invited lectures

Sixteen academic awards internationally (3) and domestically (13) including;

- Best Research Poster Award. 16th European Hair Research Society (2012. 6. Barcelona, Spain)
- Woo-Am Academic Award. Korean Society for Investigative Dermatology (2008. 3)
- Excellent academic faculty award. Yonsei University (2005. 3)
- Best Clinical Poster Award. 1st International Meeting of Hair Research Societies. (1997. 7. Melbourne, Australia)
- Young Investigator Award. 1st Tricontinental Meeting of Hair Research Societies. (1995. 10. Brussels, Belgium)

Conventional treatment of male pattern hair loss

Yang Won Lee, M.D., Ph.D.

Department of Dermatology, Konkuk University School of Medicine

Male pattern hair loss, also known as androgenic alopecia, is shown to occur in about 50% of both sexes. Although it has predilection to affect mainly adults in their 40's to 50's, adolescents may also develop the disorder in severe cases.

In both males and females, hair loss begins in the parietal area and gradually spreads toward the entire scalp; in males, hair loss most commonly manifest as fronto-temporal recession; in females, so-called "Christmas-tree" pattern, mainly involving the parietal area, is very typical, while the hairline in the fronto-temporal areas is fairly well maintained.

5AR is involved in the pathogenesis of androgenetic alopecia, as it converts testosterone to dihydrotestosterone, the principal androgen causative of the condition in men. 5AR exists as 3 isoenzymes: types 1, 2, and 3. Type 1 is mainly located in the skin, including the hair follicles and sebaceous glands, whereas type 2 is predominantly found in male genitalia, including the prostate, but is also present in the inner root sheath of hair follicles.

Topical minoxidil and oral finasteride (1 mg/d) have been approved by the US Food and Drug Administration for the treatment of male androgenetic alopecia. Finasteride, a type 2 5-alpha reductase (5AR) inhibitor (5ARI), significantly improves hair growth, slows hair loss versus placebo, and is the most commonly used treatment for the condition.

Dutasteride is a dual inhibitor of both type I and type II 5AR; it has been found to improve symptomatic benign prostatic hyperplasia and is well tolerated at doses of 0.5mg daily for many years. In 2009, dutasteride 0.5 mg, a type 1 and 2 5ARI was approved in Korea for the treatment of androgenetic alopecia based on the results of a phase III, 6-month study showing a significant increase in hair growth versus placebo.

[CURRICULUM VITAE]

Yang Won Lee, M.D., Ph.D.

Professor, Department of Dermatology, Konkuk University



Education:

- 1996-2000 Konkuk University College of Medicine (MD), Seoul, Korea
- 2001-2003 Konkuk University College of Medicine (MS), Seoul, Korea
- 2003-2006 Konkuk University College of Medicine (PhD), Seoul, Korea

Training and Fellowship Appointments:

- 2001-2005 Dermatology residency, Konkuk University Hospital, Seoul, Korea
- 2005-2006 Dermatology fellow, Konkuk University Hospital, Seoul, Korea
- 2010-2011 Visiting scholar, Dep. of Biomechanical Engineering, Michigan State University, USA

Faculty Appointment:

- 2006-2007 Clinical Assistant professor, Dermatology, Konkuk University Hospital, Seoul, Korea
- 2007-2011 Assistant professor, Dermatology, Konkuk University Hospital, Seoul, Korea
- 2011-2016 Associate professor, Dermatology, Konkuk University Hospital, Seoul, Korea
- 2016-present professor, Dermatology, Konkuk University Hospital, Seoul, Korea

Memberships:

- 2015-present Editor , The Korean Hair Research Society
- 2012-present Director of ethics legislation, Korean Society for cosmetic Dermatology
- 2015-present Secretary general, Korean Society of Medical Mycology
- 2016-present Editor, Korean Society for Dermatologic Laser Surgery

Will Prostaglandin D2 inhibitors treat androgenetic alopecia?

Luis Andres Garza, M.D., Ph.D.

Associate Professor, Department of Dermatology, Johns Hopkins School of Medicine

Although male pattern hair loss affects most adult men to some degree, its pathogenesis remains unclear.

In my presentation, I will present our discovery that PGD2 likely promotes male pattern hair loss and suggests new medications currently in clinical trials to treat male pattern hair loss.

[CURRICULUM VITAE]

Luis Andres Garza, M.D., Ph.D.

Associate Professor, Department of Dermatology, Johns Hopkins School of Medicine



Education and Training:

- 1994 B.A., Neurobiology, School of Arts and Science, Cornell University,
- 2001 M.D./Ph.D., Medicine/Molecular Biology, School of Medicine, University of Pennsylvania
- 2005 Residency, Department of Dermatology, University of Michigan
- 2009 Postdoctoral, School of Medicine, University of Pennsylvania

Current and Past Professional Positions:

- 2005-09 Instructor, Department of Dermatology, University of Pennsylvania, Philadelphia, PA.
- 2009-2015 Assistant Professor, Department of Dermatology, Johns Hopkins Medicine, Baltimore, MD
- 2011-2014 Assistant Director Hopkins Wound Clinic
- 2015-present Associate Professor, Department of Dermatology, Johns Hopkins Medicine, Baltimore, MD

Awards:

- 1994 Distinction in All Subjects, and Cum Laude
- 1994 Medical Scientist Training Program Award
- 2002-05 Multiple University of Michigan "You're Super" Awards for Excellence in Patient care.
- 2005 National Young Investigator Award, Clinical Research AAD
- 2005 North American Clinical Dermatologic Society Resident Clinical Research Award
- 2005 Michigan Dermatological Society Ralph Coskey Resident Research Award
- 2005 University of Michigan Department of Dermatology Upjohn Resident Research Award
- 2005 TAMS University of Michigan Medical Student Appreciation Award for Mentoring.
- 2007 Beerman-Johnson Philadelphia College of Physician and Surgeons Derm Research Award
- 2007 Dermatology Foundation Career Development Award
- 2008 American Skin Association Research Scholar Award

Society Memberships:

2003-05	Resident/Fellow Representative to the Board of Directors, Society for Investigative Dermatology
2002-present	Member, American Academy of Dermatology
2003-present	Member, Society for Investigative Dermatology
2012-present	Associate Editor, Journal of Investigative Dermatology
2012, 2013	Session Presider, Hair Biology and Regeneration, SID Annual meeting
2013-15	Ad-Hoc Roster member, NIH NIAMS AMS study section (K and T grants)
2015-present	Standing member, NIH NIAMS AMS study section (K and T grants)

Featured Publications:

1. Nelson AM, Reddy SK, Ratliff TS, Hossain MZ, Katseff AS, Zhu AS, Chang E, Resnik SR, Page C, Kim D, Whittam AJ, Miller LS, Garza LA. dsRNA Released by Tissue Damage Activates TLR3 to Drive Skin Regeneration. *Cell Stem Cell*. 2015;17(2):139-51. Epub 2015/08/09. doi: 10.1016/j.stem.2015.07.008. PubMed PMID: 26253200; PubMed Central PMCID: PMC4529957.
2. Nelson AM, Loy DE, Lawson JA, Katseff AS, Fitzgerald GA, Garza LA. Prostaglandin D2 Inhibits Wound-Induced Hair Follicle Neogenesis through the Receptor, Gpr44. *J Invest Dermatol*. 2013;133(4):881-9. PMCID: PMC3593761
3. Nelson AM, Katseff AS, Ratliff TS, Garza LA. Interleukin 6 and STAT3 Regulate p63 Isoform Expression in Keratinocytes During Regeneration. *Exp Dermatol*. 2015. Epub 2015/11/15. doi: 10.1111/exd.12896. PubMed PMID: 26566817.
4. Zhou AS, Li A, Melsom M, Ratliff TS, Garza LA. During wounding, noncoding dsRNA coordinates Wnts and Prostaglandins to promote regeneration. *J Invest Dermatol*. 2017 (Accepted; In Press).

Androgenic alopecia: New emerging therapies including devices

Beom Joom Kim, M.D., Ph.D.

Department of Dermatology, Chung-Ang University

Androgenic alopecia (AGA) is the most common form of hair loss in men, affecting 30-50% of men by age 50. AGA occurs in a highly reproducible pattern, preferentially affecting the temples, vertex and mid frontal scalp. It is a genetically determined condition that is clearly an androgen-dependent trait, mainly driven by dihydrotestosterone action on the hair follicles, leading to miniaturization. Although this condition is socially accepted as a natural process in a man's life, for some individuals it might significantly impact quality of life, reducing self-esteem and increasing stress. Despite its prevalence, there are two medications to be frequently prescribed in clinical practice. Topical minoxidil and oral finasteride to treat this condition are approved by FDA for the treatment of AGA. Considering the many pathogenetic mechanisms involved in AGA, various treatment options are available: topical and systemic drugs may be used and the choice depends on various factors including grading of AGA, patients' pathological conditions, practicability, costs and risks. Considering the multifactorial etiology of AGA, besides the treatment with minoxidil and finasteride and, more successfully, hair transplantation, other active principles were investigated. Herein, some advices about treatment of hair loss in a clinical situation and recent researches of AGA will also be discussed.

[CURRICULUM VITAE]

Beom Joom Kim, M.D., Ph.D.

Professor, Department of Dermatology, Chung-Ang University



Career:

- 현) 중앙대학교병원 피부과 주임교수 및 과장
- 현) 보건복지부 한국보건산업진흥원, 한국연구재단 의학학분야 전문위원
- 2013년 BRIC “한국을 빛낸 사람들” 등재
- 2014년 과학기술유공자 대통령표창 수상
- 2015년 과학기술총연합회 우수논문상 수상



Session 4

Alopecia Areata
(Korean- & English-speaking session)



The Korean Hair Research Society

Who is a key player in the pathogenesis of alopecia areata?

Taisuke Ito, M.D., Ph.D.

Assistant Professor, Department of Dermatology, Hamamatsu University,
School of Medicine, Hamamatsu, Japan

The current understanding of alopecia areata (AA) is that it is a tissue-specific autoimmune disease, and tyrosinase-related protein 1/2 and tyrosinase are strongly believed to be hair follicle autoantigens in the anagen phase of the hair cycle. The collapse of the hair follicle immune privilege leads to autoimmune reactions against hair follicle autoantigens. AA is sometimes triggered by viral infections such as influenza that cause excess production of interferons (IFN). IFN- γ is one of the key factors that lead to the collapse of immune privilege. IFN- α might be also strong inducer of AA. Immunohistochemical staining and real-time RT-PCR reveal that hair follicles of acute-phase AA expressed a high level of Th1-associated chemokine CXCL10, and CXCR3⁺CD4⁺ (TH1) and CXCR3⁺CD8⁺ (Tc1) T cells infiltrate in the juxta-follicular area. Anti-CXCR3 antibody can inhibit the induction of AA in C3H/HeJ mice. In recent AA studies, NKG2D⁺CD8⁺ T cell is a key effector cells for AA that accumulates around the hair follicle, and NKG2D ligands, such as MICA, is highly expressed on outer root sheath of hair follicles in AA lesions. IL-15 is another significant cytokine that is produced by hair follicle keratinocytes. IL-15 binds to IL-2R β/γ c that activates NKG2D⁺CD8⁺ T cell *via* JAK1/3 and STAT5. This activated NKG2D⁺CD8⁺ T cell produces IFN- γ that binds to IFN-gR1/2 that induces IL-15 from keratinocytes. In our studies, plasmacytoid DCs are also another player in the pathogenesis of AA.

The pathogenesis of AA is actually complicated, and might be different between the type of AA. Each immune players will be discussed in this session.

[CURRICULUM VITAE]

Taisuke Ito, M.D., Ph.D.

Assistant Professor, Department of Dermatology, Hamamatsu University,
School of Medicine, Hamamatsu, Japan



Education and Training:

- 1994 Graduate from University Occupational and Environmental Health, Kitakyushu, Japan
- 1995 Department of Dermatology, Hamamatsu University School of Medicine, Hamamatsu, Japan
- 1996 Shizuoka General Hospital, Shizuoka, Japan
- 2002-2004 Department of Dermatology, Hamburg University (Prof. Ralf Paus), Hamburg, Germany

Current and Past Professional Positions:

- 2004 Department of Dermatology Hamamatsu University School of Medicine 2009-2015
- 2006-present Assistant Professor of Department of Dermatology Hamamatsu University School of Medicine

Society Memberships:

- Delegate of Japanese Dermatological Association
- Councilor of Japanese Society for Investigative Dermatology
- Councilor of Japanese Society for Dermatoallergology and Contact Dermatitis
- Director of the Society for Hair Science Research
- Section editor of "Journal of Dermatology"

Standards in using steroid (topical and systemic)

Do-Young Kim, M.D., Ph.D.

Department of Dermatology and Cutaneous Biology Research Institute,
Yonsei University College of Medicine, Seoul, Korea

Alopecia areata is an autoimmune disease that causes emotional distress by disfiguring. The most frequently used treatments are topical or intralesional corticosteroids, with systemic treatments used in more severe cases. For widespread alopecia areata, current guidelines merely recommend topical immunotherapy using diphenylcyclopropenone (DPCP) and the use of a wig. Systemic treatments with corticosteroids, methotrexate and, in individual cases, cyclosporine as well as azathioprine are mentioned. The best and most rapid response rates can be achieved with high-dose systemic corticosteroids, however, relapse following treatment discontinuation is inevitable. Due to systemic side effects, various regimens for systemic corticosteroids including conventional daily medication and intravenous, intramuscular, or oral pulse corticosteroid treatment were tried.

Any randomized-controlled trial using daily oral corticosteroids are still lacking. From uncontrolled trials, daily oral corticosteroids shows unsatisfactory efficacy with relative high relapse after discontinuation. Adverse effects noted included abdominal discomfort, dysmenorrhea, worsening acne, weight gain, weakness, and moon face. Sometimes regimen in combination with cyclosporine shows better therapeutic outcomes.

Among pulse therapies, the intravenous route is the most common treatment protocol. However, for dosing, interval, and proper clinical indication, standardized clinical protocols for pulse therapy are required. For personal experience, refractory cases to conventional treatments can be improved by intramuscular triamcinolone 40 mg injection every 1 month for 6 months.

In conclusion, no therapy is completely effective for severe alopecia areata. Especially for topical and systemic use of glucocorticoid, clinician should analyze the risk and benefit in individualized medicine approach.

[CURRICULUM VITAE]

Do Young Kim, M.D., Ph.D.

Assistant Professor, Department of Dermatology and Cutaneous Biology Research Institute Yonsei University College of Medicine, Yonsei-ro 50, Seodaemun-gu, Seoul, Korea



Education and Training:

- 1997.3-2003.2 Yonsei University College of Medicine, Seoul, Korea (summa cum laude)
- 2003.3-2004.2 Internship, Severance Hospital, Yonsei University College of Medicine
- 2004.3-2008.2 Resident, Department of Dermatology, Severance Hospital, Yonsei University College of Medicine, Seoul, Korea
- 2005.3-2007.8 MS in medical Sciences, Department of Medicine, the Graduate School of Yonsei University, Seoul, Korea
- 2011.3-present Ph. D. candidate in Medical Sciences, Department of Medicine, the Graduate School of Yonsei University, Seoul, Korea

Current and Past Professional Positions:

- 2011.5 -2012.2 Instructor, Department of Dermatology and Cutaneous Biology Research Institute, Yonsei University College of Medicine, Seoul, Korea
- 2012.3-2014.2 Clinical Assistant Professor, Department of Dermatology and Cutaneous Biology Research, Yonsei University College of Medicine, Seoul, Korea
- 2014.3-Present Assistant Professor, Department of Dermatology and Cutaneous Biology Research, Yonsei University College of Medicine, Seoul, Korea

Membership to Societies:

- The Korean Dermatological Association
- The Korean Society for Investigative Dermatology
- The Korean Society for Behçet's disease
- The Korean Hair Research Society

Publications related with hair research:

1. Seo J, Lee JW, Choi MJ, Cho S, Kim DY. Serial trichoscopy vs. modified hair pull test for monitoring the disease activity and treatment response of localized alopecia areata. *J Eur Acad Dermatol Venereol* 2017 Mar;31(3):e149-e150
2. Seo J, Lee YI, Hwang S, Zheng Z, Kim DY. Intramuscular triamcinolone acetonide: An under-

- valued option for refractory alopecia areata. *J Dermatol*. 2016 Jul 23. doi: 10.1111/1346-8138.13533
3. Shin S, Kim DY. Suprabulbar thinning of hair in telogen effluvium. *Yonsei Med J*. 2017 May;58(3):682-683
 4. Shin D, Kim DY, Park JM. Microstrip technique in follicular unit extraction. *Dermatol Ther*. 2015 Sep-Oct;28(5):269-70.
 5. Shin D, Seo J, Kim DY. A simple method to visualize the regrowth of white vellus hairs using superficial cryotherapy. *Eur J Dermatol*. 2014;24(1):98.
 6. Kang JS, Zheng Z, Choi MJ, Lee SH, Kim DY, Cho SB. The effect of CD34+ cell-containing autologous platelet-rich plasma injection on pattern hair loss: a preliminary study. *J Eur Acad Dermatol Venereol*. 2014 Jan;28(1):72-9.
 7. Cho S, Choi MJ, Zheng Z, Goo B, Kim DY, Cho SB. Clinical effects of non-ablative and ablative fractional lasers on various hair disorders: a case series of 17 patients. *J Cosmet Laser Ther*. 2013 Apr;15(2):74-9

New emerging therapy including biologics in alopecia areata

Bark-Lynn Lew, M.D., Ph.D.

Department of Dermatology, School of Medicine, KyungHee University, Seoul, Korea

There is neither a cure for alopecia areata (AA) nor any universally proven therapy that induces and sustains remission in patients afflicted with this autoimmune disease. AA can be relatively easy to treat when the disease is patchy and limited; but when children and adults present with long standing extensive scalp and body hair loss, successful management can be challenging. Treatment options are frequently based on several parameters including disease activity, location, age, disease extent & duration, cost of therapy, and the presence of other co-morbidities. In this lecture, the current and evolving treatments for AA will be reviewed.

I. Current treatment of AA

Table 1. update of evidence for current treatments of AA

Treatments	References	Recommendation in Guidelines	
Topical steroids	[82,83]	BAD 2012 [79]	JDA 2010 ^a
Steroid injections	[84–86]	C ^b	C1 ^d
Topical immunotherapies	[97–101]	C ^b	B ^b
Steroid pulse therapies	[89–93]	C ^c	B ^c
Children	[94–96]		C1 ^e
Narrowband UVB phototherapy	[105–108]		
Immunosuppressants	[110–115]		C2 ^f
Cryotherapies	[116]		C1 ^b

Lesional injections of steroids and topical immunotherapies are found to be effective.

II. Other treatments of AA

III. Treatments of AA in the future

Table 2. treatments expected in future

New treatments		Expected effect
JAK inhibitors	ruxolitinib, and others	Inhibit IFN- γ receptor pathways
Immunomodulators	utstekinumab abatacept apremilast	Inhibit IL-12/IL-23 Promote CTLA4-mediated immunoregulation Inhibit the PDE4-induced production of TNF
Tregs	Stem cell educator therapy	Re-education of PBMCs with TGF- β and others
Platelet-rich plasma therapy		Promotes cell proliferation and hair growth
Statins	simvastatin/ezetimibe	Regulation of lymphocytes
Prostaglandin analogues	latanoprost	Induce eyelash hypertrichosis
Prevention of topical steroids side effects	spironolactone	Limits epidermal atrophy

1. JAK inhibitors

- Janus kinase (JAK) is a receptor tyrosine kinase regulating a number of cytokine receptor signaling pathways and its inhibitors have been applied for the treatment of several chronic inflammatory skin diseases such as psoriasis and atopic dermatitis.
- Based on the results of GWAS study of Christiano's group
 - : CD8+NKG2D+ lymphocytes produced IFN- γ and attacked HF γ s in AA animal model
 - : the blockade of IFN- γ receptor-JAK pathway by treatment with general or topical JAK inhibitors has a curative effect
- The treatment effect of JAK inhibitors on AA
 - : ruxolitinib
 - a few clinical reports of hair regrowth
 - : tofacitinib
 - a few reports of good effect
 - our result: no hair growth effect in 9 AT patients

2. Immunomodulators

- Utstekinumab
 - : IL-12/IL-23p40 antibody
 - : increase in IL-12/IL-23p40 cytokine levels in lesional AA compared to normal scalp
 - : a few clinical reports of hair regrowth
- Anti-TNF therapies
 - : the effect was controversial
 - Abatacept

- : CTLA4 is related to AA in GWAS
- : the report effective in 3 out of 15 AA patients
 - Phosphodiesterase (PDE) 4 blocker (apremilast)
- : suppresses the production of TNF
- : suppressive effect of AA in mouse model

3. Tregs

- IL-2
- : promote Tregs
- : subcutaneous injection with IL-2
 - report of partial regrowth of hair
 - Stem cell educator therapy
- : human cord blood-derived multipotent stem cells (CB-SCs) express immunoregulatory ligands
- : increased the number of TGF- β producing cells in the peripheral blood and around HFs
- : report of hair regrowth in AA

4. Statins

- Statins, lipid-lowering drugs
- : simvastatin/ezetimibe
- : modulate the functions of lymphocytes and used to treat inflammatory skin diseases
 - Effect of treatment
- : Lattouf report - effective in 14 out of 19 patients with AA
- : our result - not satisfactory
 - only 4 had partial regrowth among 14 patients with extensive AA

[CURRICULUM VITAE]

Bark-Lynn Lew, M.D., Ph.D.

Associate Professor, Department of Dermatology, College of Medicine,
KyungHee University, Seoul, Korea



Education and Training:

- 2001 Graduate of College of Medicine, Kyunghee University, Seoul, Korea
- 2002 Internship, Kyunghee University hospital
- 2005 Master of Medicine, Kyunghee University, Seoul, Korea
- 2006 Residency in Dermatology, Kyunghee University hospital
- 2007 Doctor of Medicine, Kyunghee University, Seoul, Korea

Current and Past Professional Positions:

- 2006-2008 Clinical Instructor, Clinical Assistant Professor, Dept. of Dermatology, Kyunghee University hospital at Gangdong
- 2008-2010 Instructor, Dept. of Dermatology, Kyunghee University hospital at Gangdong
- 2010-2014 Assistant Professor, Dept. of Dermatology, Kyunghee University hospital at Gangdong
- 2014-present Associate Professor and Head, Dept. of Dermatology, Kyunghee University hospital at Gangdong

Awards:

- 2004 Travel Grant, Korean Hair Research Society
- 2006 Best Poster, the 58th Annual Meeting of KDA
- 2009 Best Paper, College of Medicine, Kyunghee University
- 2012 Best Poster, the 9th Annual Meeting of Korean Hair Research Society
- 2013 Research scholarship, Amore pacific
- 2014 Faculty Excellence prize, College of Medicine, Kyunghee University
- 2015 Faculty Excellence prize, College of Medicine, Kyunghee University
- 2017 Basic research grant, National Research Foundation of Korea

Medical Society Membership:

- Korean Atopic Dermatitis Association, Financial Director
- Korean Hair Research Society, Financial Director
- Korean Society of Dermatologic Surgery, Educational program Director

Korean Society of Chemical Peeling, Financial Director
Korean Society for Cosmetics, Board
Korean Dermatologic Association, Educational program Assistant Director
Journal of American Academy of Dermatology, Reviewer
American Academy of Dermatology, Member
Society for Investigative Dermatology, Member

Interests:

Atopic dermatitis, Hair and hair diseases, Laser and Dermatologic surgery

How to manage recalcitrant cases of alopecia areata

Chull-Wan Ihm, M.D., Ph.D.

Chonbuk National University, Jeonju, Rep of Korea

Compared to common patchy type of alopecia areata showing good prognosis, the recalcitrant alopecia areata(RAA) with long standing extensive lesions is known to have different HLA molecules to develop autoimmunity and more numbers of causative genes. At present time doctors are spending time to search the genetics of alopecia areata. We can not control the genes located within the chromosome yet. It would be impossible in near future. That is why we can not properly treat the recalcitrant case of alopecia areata.

To manage RAA, dermatologists firstly should admit the fact that there is no cure for the disease yet. From their heart, they must be honest with themselves and patients. The present attempts, whatever they are, give the patients only a false hope. Almost all of the reports for the treatment of the RAA are showing the result with such as excellent, good, fair and poor in a limited time of observation. But what patients want is, needless to say, the continuous hair regrowing for their life time after the treatment. The patients of RAA comply with time-consuming treatments with that hope and eventually end in vain.

The only definite help for the patients of RAA is to provide hair prosthesis.

Considering the role of human scalp hair, the hair prosthesis should be regarded substitute of natural hair like prosthetic leg for a man whose leg was amputated. At present patients are seeking to live with RAA on their own help without any benefit from health insurance even though they are paying insurance fee.

The present health insurance law of the country for the patients with different impairments includes the impairment of facial area, or exposed area of the body. But It is extremely ignorant decision of the government that scalp should be excluded from the exposed area of the body. Dermatologists should be responsible to correct the wrongly made article of the law. for the patients of RAA. Meanwhile, dermatologists should protect the patients against many useless treatments with keeping good patient-physician relationship.

[CURRICULUM VITAE]

Chull-Wan Ihm, M.D., Ph.D.

Honorary Professor, Medical School Chonbuk Natl. University



Education and Training:

- 1970 M.D., Chonnam University Medical School
- 1971-1975 Resident, Department of Dermatology, Chonnam University Hospital
- 2000 Ph.D., Medicine, Chonnam University Graduate School of Medicine

Overseas Training:

- 4 weeks in Ehime University, Japan and
- 7 weeks in Oklahoma University in America

Current and Past Professional Positions :

- 1978-2011 Faculty member of Chonbuk National University Medical School
- Previous President of Korean Hair Research Society, Korean Dermatopathology Society, Korean Leprology Society, and Korean Dermatological Association



Session 5

Eye-catching Issues I
(Korean-speaking session)



The Korean Hair Research Society

Drug-induced hair disorders

Jung Eun Kim, M.D., Ph.D.

Department of Dermatology, St. Paul's Hospital,
College of Medicine, The Catholic University of Korea

Drugs may induce hair loss, stimulate hair growth, more rarely, induce changes in the hair shape and color. Drug-induced hair loss presents with a diffuse, non-scarring, reversible alopecia, and is, in most cases, a consequence of a toxic effect of the drug on the hair follicle matrix. Depending on the type of drug, dosage and patient's susceptibility, hair loss mostly presents as telogen effluvium, anagen effluvium, rarely alopecia areata or scarring alopecia. If drug-induced hair loss is suspected, it is essential to consider all drugs taken until 4 months before the onset of hair loss. In almost all cases, there is a recovery of hair loss within 3 months following the discontinuation of the medication. Although a huge number of drugs have been occasionally reported to induce hair loss or changes, only for a few drugs the relation between drug intake and hair change has been proven. Drug-induced telogen effluvium mainly involves premature interruption of hair growth with an early entry of anagen follicles into the resting phase. Telogen effluvium has been reported after the use of antipsychotics, anticoagulants, β -adrenoceptor antagonists, retinoids, antituberculosis medication, and antiretroviral agents. Anagen effluvium follows an administration of chemotherapeutic agent or radiation treatment. Anagen effluvium is induced by most commonly alkylating agents, antimetabolites, vinca alkaloids, and topoisomerase inhibitors. In rare cases, alopecia may be permanent, especially after the use of busulphan. Scalp cooling has been proven to prevent chemotherapy-induced alopecia. Alopecia areata has been rarely reported after vaccination or during the use of pegylated interferon alpha-2b and ribavirin therapy and TNF-alpha antagonist by increasing by Th1 cytokines. Several cases of scarring hair loss associated with the use of biologics have been reported. Those include TNF-alpha antagonist, human epidermal receptor and the epidermal growth factor receptor inhibitors. Hypertrichosis is induced by several drugs such as cyclosporine, prostaglandin analogs and topical minoxidil. Some drugs rarely induce hair graying, darkening, straightening or curling/kinking.

[CURRICULUM VITAE]

Jung Eun Kim, M.D., Ph.D.

Assistant Professor, Department of Dermatology, St. Paul's Hospital
College of Medicine, The Catholic University of Korea



Education and Training:

- 2004 M.D., College of Medicine, The Catholic University of Korea
- 2004-2005 Internship, Department of Dermatology, Catholic Medical Center
- 2005-2009 Resident, Department of Dermatology, Catholic Medical Center
- 2008-2012 Ph.D. Department of Dermatology, Graduate School of Medical Science, The Catholic University of Korea

Current and Past Professional Positions:

- 2009-2011 Clinical Instructor, Dermatology, Catholic Medical Center
- 2011-2015 Clinical Assistant Professor, Department of Dermatology, St. Paul's Hospital
- 2016-present Assistant Professor, Department of Dermatology, St. Paul's Hospital

Major Interest:

Hair, Atopic Dermatitis

Society Memberships:

- Korean Dermatological Association
- American Academy of Dermatology
- The Korean Society of Dermatopathology
- The Korean Atopic Dermatitis Association
- The Korean Hair Research Society

What blood test is needed in hair disorders?

Byung Cheol Park, M.D., Ph.D.

Associate Professor and Chair, Department of Dermatology, Dankook Medical College, Korea

In the hair clinic, we met various kinds of hair disorders including hair loss, hair shaft disease and hair color disease. To find what cause above hair disorders, we usually check the laboratory(lab) test and the result of blood test might give clues to us for diagnosis.

In this session, we are going to review the usefulness of blood test on the hair loss.

In male pattern baldness (MPB), routine lab test (CBC, chemicals and urine test) is not recommended for diagnosis of MPB. However, we usually check the lab test regularly for detecting any change when the patient takes various kinds of medication for MPB. Especially, we should monitor the level of PSA of the patient who takes finasteride or dutasteride and I will tell you the revised guideline about how to monitor the level of PSA.

In female pattern hair loss or telogen effluvium in women, we usually check the routine lab test and various kinds of trace element or hormonal level. In most cases of female pattern hair loss or telogen effluvium, the lab test could not give a precise clue for diagnosis, but we find often abnormal ferritin, zinc, selenium level or thyroid function. However, it still remains unclear whether isolated iron deficiency is a cause or whether iron supplementation is helpful although nutritional deficiency is well established as a cause of hair loss,

In alopecia areata(AA), we usually screened the autoimmune related lab test because AA could be related to other systemic autoimmune disease. Especially we often met abnormal TFT. According to the recent report, AA had a lower serum level of zinc and selenium than the healthy controls. In conclusion, the blood test could give us a lot of information about the patient health state, the cause of hair loss and the treatment although it would not be helpful greatly in the diagnosis of hair disorders.

[CURRICULUM VITAE]

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Education and Training:

- 1994-2000 M.D., School of medicine, KyungPook National University(KNU)
- 2004-2008 Resident, Department of Dermatology, KNU hospital, Korea
- 2011-2015 Ph.D. School of Medicine, ChoongNam University Graduate school

Current and Past Professional Positions:

- 2008-2009 Research Fellow, Department of Dermatology, Ajou University hospital
- 2010-2016 Assist, Professor, Department of Dermatology, Dankook Medical College
- 2016-present Associate Professor and Chair, Department of Dermatology, Dankook Medical College

Awards:

- 2010 Travel grant for 6th Meeting of World Hair Research Society
- 2014 Travel grant for 8th Meeting of World Hair Research Society
- 2015 Travel grant for 23rd Meeting of World Congress of Dermatology

Society Memberships:

- Korean Dermatological Society (Board member)
- Korean Hair Research Society
- Korean Society for the Hair Restoration Surgery
- American Board of Hair Reconstruction Surgery (diplomat)

The role nutritional supplements in hair disorders

Jin Park, M.D., Ph.D.

Department of Dermatology, Chonbuk National University Medical School, Jeonju, Korea

Patients with hair loss often inquire whether nutritional supplements can help restore hair growth or prevent further hair loss. In fact, many will start dietary supplements without consultation in the hope that the supplements will help. While hair follicles are among the most metabolically active in the body, and hair structure or growth may be impacted by calorie and protein malnutrition as well as micronutrient deficiencies, the links are complex. A caloric deprivation or deficiencies of several components, such as proteins, minerals, essential fatty acid, and vitamins, caused by genetic and acquired malabsorption deficiencies or insufficient uptake, can result in structural abnormalities, pigmentation changes, or hair loss. Some studies have also reported potential associations between nutritional deficiencies and acute or chronic telogen effluvium, androgenetic alopecia, and alopecia areata, although exact data are still lacking. While multiple nutrient deficiencies may result in hair loss, screening for such deficiencies must be guided by the careful history and physical examination. If risk factors of nutritional deficiencies (i.e. malnutrition, malabsorption disorders, long term parenteral nutrition, chronic illness vegetarians, alcoholism, crash diet) are identified, then laboratory screening may be indicated to confirm the specific deficiencies. An area that requires further research is the role of nutritional supplements. It is clear that nutrient deficiencies must be corrected. Specific treatment of deficiencies will lead to improved hair parameters with 3 to 6 months. However, there is a currently limited evidence for their use in individuals without nutritional deficiency, although many nutritional supplements have been tried to prevent or treat various hair disorders. Unspecific treatment of hair loss without confirmed deficiencies has only been effective in telogen effluvium with a supplement containing L-cysteine. Therefore, in patients with hair loss or healthy individuals but without any known risk factors for nutrient deficiencies, laboratory testing or nutritional supplementation is not generally recommended.

In this presentation, I will review the available literature on nutrient deficiencies that result in hair loss, detail the risk factors for these deficiencies, and review the available evidence of the effects of nutritional supplementation on hair loss.

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Associate professor, Department of Dermatology, Chonbuk National University Medical School



Education and Training:

- 1997-2003 M.D., Wonkwang University College of Medicine (M.D.), Korea
- 2007-2010 Resident, Department of Dermatology, Chonbuk National University Hospital, Korea
- 2007-2009 M.S., Chonbuk National University College of Medicine, Korea
- 2013-present Ph.D. course, Chonnam National University College of Medicine, Kwangju, Korea

Current and Past Professional Positions:

- 2011-2012 Full-time instructor, Department of Dermatology, Chonbuk National University Medical School
- 2012-2015 Assistant professor, Department of Dermatology, Chonbuk National University Medical School
- 2015-present Associate professor, Department of Dermatology, Chonbuk National University Medical School

Awards:

- 2010 Best Paper Award, the 62th Annual Meeting of Korean Dermatological Association (The 24th Hyundai Pharm Academic Award)
- 2016 Best Paper Award, the 8th Korean society of medical mycology

Society Memberships:

- Korean Dermatological Association
- Korean Hair Research Society
- Korean Society of Medical Mycology

Mesotherapy at now

Sung Bin Cho, M.D., Ph.D.

Kangskin Clinic

Mesotherapy, which refers to “treatment of the mesoderm”, has been used for treating pattern hair loss (PHL). However, the efficacy and safety of mesotherapy have not been fully evaluated, and the injectable solutions and treatment settings have not been optimized. Meanwhile, the intra-perifollicular injections of polydeoxyribonucleotide (PDRN), placenta extract, or autologous platelet-rich plasma preparation, generate clinical improvements in hair thickness and density in PHL patients.

Our study group recently evaluated the efficacy of combined treatment with a 1,927-nm fractionated thulium laser and PDRN injections for treating PHL to compare with a mesotherapy and PDRN injections. We compared clinical outcomes in PHL patients treated with 12 sessions of combined treatment with thulium laser and PDRN injections to those in another PHL patients treated with 12 sessions of mesotherapy and PDRN injections. One week after the final treatment session, patients treated with the thulium laser and PDRN exhibited clinical improvements in mean hair counts ($20.4 \pm 15.7\%$; $P = 0.005$) and mean hair thickness ($53.1 \pm 31.1\%$; $P < 0.001$), compared to baseline values. Patients treated with mesotherapy and PDRN also demonstrated clinical improvements in mean hair counts ($9.7 \pm 7.4\%$; $P = 0.007$) and mean hair thickness ($16.1 \pm 25\%$; $P > 0.05$). Further statistical analysis revealed that combined treatment with the thulium laser and PDRN injections generated greater improvement in hair thickness ($P = 0.029$) than combined application of mesotherapy and PDRN, but not in hair counts ($P > 0.05$).

In this presentation, I would like to mainly discuss on the “injection therapy” and “laser therapy” for the restoration of hairs that can effectively and safely replace the conventional mesotherapy.

[CURRICULUM VITAE]

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Education and Training:

- 2001 M.D., Yonsei University College of Medicine, Seoul, Korea
- 2001-2002 Internship, Severance Hospital, Yonsei University Health System, Yonsei University College of Medicine, Seoul, Korea
- 2002-2006 Resident, Department of Dermatology and Cutaneous Biology Research Institute, Yonsei University College of Medicine, Seoul, Korea
- 2009-2010 Fellow, Department of Dermatology and Cutaneous Biology Research Institute, Yonsei University College of Medicine, Seoul, Korea, 2009-2010
- 2011 Ph.D., Graduate School, Yonsei University College of Medicine, Seoul, Korea

Current and Past Professional Positions:

- 2006-2009 Army Medical Doctor: Department of Dermatology, Armed Forces Yangju Hospital, Yangju, Korea
- 2010-2012 Assistant Clinical Professor: Department of Dermatology and Cutaneous Biology Research Institute, Yonsei University College of Medicine, Seoul, Korea
- 2012-2013 Assistant Clinical and Research Professor: Department of Dermatology and Cutaneous Biology Research Institute, Yonsei University College of Medicine, Seoul, Korea
- 2013-2016 Post-doc Researcher: Department of Dermatology and Cutaneous Biology Research Institute, Yonsei University College of Medicine, Seoul, Korea
- 2016-present Post-doc Researcher: Department of Dermatology and Cutaneous Biology Research Center, International St. Mary's Hospital, Catholic Kwandong University, College of Medicine, Incheon, Korea

Society Memberships:

- Korean Dermatological Association
- Korean Society for Behçet's Disease
- The Korean Hair Research Society
- The Korean Society of Laser Medicine and Surgery
- Editor-in-Chief - Medical Lasers (The Korean Society of Laser Medicine and Surgery)

Recent Publications:

1. Ahn KJ, Zheng Z, Kwon TR, Kim BJ, Lee HS, Cho SB. Pattern analysis of laser-tattoo interactions for picosecond and nanosecond-domain 1,064-nm neodymium-doped yttrium-aluminum-garnet lasers in tissue-mimicking phantom. *Sci Rep* 2017; in press.
2. Jung YS, Bae JM, Kim BJ, Kang JS, Cho SB. Periorbital melasma: Hierarchical cluster analysis of clinical features in Asian patients. *Skin Res Technol.* 2017; e-pub.
3. Ahn KJ, Kim BJ, Cho SB. Simulation of laser-tattoo pigment interaction in a tissue-mimicking phantom using Q-switched and long-pulsed lasers. *Skin Res Technol.* 2016; e-pub.
4. Cho SB, Kwon TR, Yoo KH, Oh CT, Choi EJ, Kim BJ. Transcutaneous pneumatic injection of glucose solution: a morphometric evaluation of in vivo micropig skin and tissue-mimicking phantom. *Skin Res Technol.* 2017;23(1):88-96.
5. Na J, Zheng Z, Dannaker C, Lee SE, Kang JS, Cho SB. Electromagnetic Initiation and Propagation of Bipolar Radiofrequency Tissue Reactions via Invasive Non-Insulated Microneedle Electrodes. *Sci Rep* 2015;5:16735.
6. Kim HJ, Kim HG, Zheng Z, Park HJ, Yoon JH, Oh W, Lee CW, Cho SB. Coagulation and ablation patterns of high-intensity focused ultrasound on a tissue-mimicking phantom and cadaveric skin. *Lasers Med Sci* 2015;30(9):2251-8.
7. Zheng Z, Sohn S, Ahn KJ, Bang D, Cho SB. Serum Reactivity Against Herpes Simplex Virus Type 1 UL48 Protein in Behçet's Disease Patients and a Behçet's Disease-like Mouse Model. *Acta Derm Venereol* 2015;95(8):952-8.
8. Lee SH, Zheng Z, Kang JS, Kim DY, Oh SH, Cho SB. Therapeutic efficacy of autologous platelet-rich plasma and polydeoxyribonucleotide on female pattern hair loss. *Wound Repair Regen.* 2015;23(1):30-6.
9. Zheng Z, Kang HY, Lee S, Kang SW, Goo B, Cho SB. Up-regulation of fibroblast growth factor (FGF) 9 expression and FGF-WNT/ β -catenin signaling in laser-induced wound healing. *Wound Repair Regen* 2014;22(5):660-5.
10. Zheng Z, Goo B, Kim DY, Kang JS, Cho SB. Histometric analysis of skin-radiofrequency interaction using a fractionated microneedle delivery system. *Dermatol Surg* 2014;40(2):134-41.

The A-to-Z of eyebrow transplantation

Young-ran Lee, M.D., Ph.D.

Anamo Hair Transplant Clinic, Seoul, Korea

Eyebrows are highly aesthetically important structures of the face. To date, restoration surgery of the eyebrows has usually been reserved for those who have scarring alopecia caused by trauma, surgery and so on. However, East Asians may personally choose aesthetic surgery for the purpose of improving their eyebrow shape, as people of East Asian origin have eyebrows characterized by notably thin and sparse hair, due to genetic traits.

The eyebrows are hairs that grow in the shape of a bow above the eye. They are located just below the orbital rim in Caucasians. In East Asians, however, the eyebrows are just above the orbital rim and more remote from the eye. This makes a difference in the flow of hair between the two ethnic populations. In addition, it is also noteworthy that East Asians have wider, shorter eyebrows and more sparse hair as compared with Caucasians. Furthermore, East Asians have thicker individual hairs and higher-contrast skin tones than Caucasians. This explains the main reasons for the use of single-hair grafts in eyebrow transplantations.

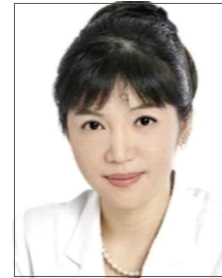
The overall surgical technique is similar to that used for hair transplantation of male pattern hair loss. Two or more follicular unit grafts are divided into single-hair grafts during graft preparation process. An implanter needle of SS size (0.6 mm) is usually easy to insert without a slit. In some cases, however, dense packing may be difficult due to scar tissue or tough skin; it is then possible to use the no-touch technique where a slit is made using a 23-G needle. The grafts should be inserted as flat as possible. Currently, the author is transplanting about 200-400 grafts per session.

What is important for making a natural-looking eyebrow is to insert the transplanted hairs in a direction, angle, and depth similar to those of the natural eyebrow hairs.

[CURRICULUM VITAE]

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Director, Anamo Hair Transplant Clinic



Education and Training:

- 1988 M.D., School of Medicine, Ewha Womans University
- 1993-1998 Postgraduate & Clinical trainee, Department of Dermatology, School of Medicine, Juntendo University, Japan
- 2000 Ph.D., Medicine, Graduate School of Medicine, Juntendo University, Japan
- 2007 American Board of Hair Restoration Surgery (Experience Route), International Society of Hair Restoration Surgery

Current and Past Professional Positions:

- 2000 Research Fellow, Department of Dermatology, School of Medicine, Juntendo University, Japan
- 2001-2009 Director, Hair Transplantation Center, Arumdaunnara Dermatology & Plastic Surgery Clinic
- 2009-present Director, Anamo Hair Transplant Clinic
- 2013-present Fellow, International Society of Hair Restoration Surgery

Awards:

- 1997 Shiseido Award, Japanese Society for Investigative Dermatology
- 2000 Diploma, Japanese Society for Investigative Dermatology
- 2003 2nd Place, International Society of Hair Restoration Surgery
- 2003 Honorable Mention, International Society of Hair Restoration Surgery
- 2007 Bronze Award, Japanese Society of Clinical Hair Restoration

Society Memberships:

- International Society of Hair Restoration Surgery
- Japanese Society of Hair Restoration Surgery

Featured Publications:

1. Lee IJ, Jung JH, Lee YR, Kim JC, Hwang SJ. Guidelines on Hair Restoration for East Asian Patients. *Dermatol Surg* 2016;42: 883-892
2. Lee YR, Hair Transplanting in the Pubic Area. In: Unger WP, Shapiro R eds. *Hair*

- Transplantation, 5th ed, New York: Informa Healthcare; 2011: 450-452.
3. Lee YR, Cosmetic and Reconstructive Eyelash Transplantation. In: Unger WP, Shapiro R eds. Hair Transplantation, 5th ed, New York: Informa Healthcare; 2011: 453-455..
 4. Lee YR, Lee SJ, Kim JC, Ogawa H. Hair Restoration Surgery in Patients with Pubic Atrichosis or Hypertrichosis: Review of Technique and Clinical Consideration of 507 Cases. *Dermatol Surg* 2006;32:1327-1335
 5. Lee YR, Yamazaki M, Mitsui S, Tsuboi R, Ogawa H. Hepatocyte growth factor (HGF) activator expressed in hair follicles is involved in in vitro HGF-dependent hair follicle elongation. *J Dermatol Sci* 2001;25:156-163
 6. Yamazaki M, Tsuboi R, Lee YR, Ishidoh K, Mitsui S, Ogawa H. Hair Cycle-Dependent Expression of Hepatocyte Growth Factor (HGF) Activator, Other Proteinases, and Proteinase Inhibitors Correlates with the Expression of HGF in rat Hair Follicles. *J Invest Dermatol* 1999;4:312-315
 7. Lee YR, Oshida Y, Tsuboi R, Ogawa H. Combination of Insulin-like Growth Factor (IGF)-1 and IGF-Binding Protein-1 Promotes Fibroblast-Embedded Collagen Gel Contraction. *Endocrinology* 1996;5278-5283



Session 6

Eye-catching Issues II
(Korean-speaking session)



The Korean Hair Research Society

DPCP and wig stories to get insurance coverage

Gwang Seong Choi, M.D., Ph.D.

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1. DPCP

DPCP treatment has been widely used for a long time in the alopecia areata, but it is still not covered by national health service(NHS) of Korea. It is also true that there is no clear regulation or standard of manufacturing from FDAs of global country. In Korea, making or using DPCP is decreasing although its usage is not illegal. The main reason is that DPCP is actually a chemical not a drug. Korean Hair Research Society (KHRS) tried for a long time to get DPCP treatment insurance covered by NHS. After long debates between the KHRS and the Korean FDA, they came to a conclusion of establishing the minimum regulations that will enable DPCP to be made and used in Korea without any concerns about legality. For this process, the Korean FDA decided to find out if there are any chemical quality regulations for DPCP in other countries that approve DPCP and asked the KHRS to collect information of it. Korean FDA also assigned a research project to verify whether the chemical quality and quantity of DPCP solution that are used for clinical application is appropriate. In the near future, KHRS and Korean FDA will establish the authorized regulations of DPCP.

2. Wig(Cranial Prosthesis)

A wig is a prosthetic supply for hair loss. Although wig is one of main and beneficial treatment modalities in alopecia totalis and universalis, the insurance coverage of Korean NHS is still unavailable. In USA, insurance coverage for wigs are possible when wigs are medically necessary for the following conditions: Chemotherapy, Radiation therapy, Alopecia areata, totalis, and universalis, etc.

To place wigs as a treatment modality that can be covered by Korean NHS, it is necessary to change the concept of disability inappropriately applied to alopecic patient. KHRS tried many times to change the 'Regulation of Classification of Disability' that was made by Korean Ministry of Health and Welfare.

We still have no meaningful achievements, but will try endlessly to get an approval by the Korean NHS for coverage of wigs.

[CURRICULUM VITAE]

Gwang Seong Choi, M.D., Ph.D.

Professor and Director, Department of Dermatology, Inha University College of Medicine

Chairman of Institutional Review Board (IRB), Inha University Hospital.

Director of Medical Center Branch, Inha University Research and Business Foundation



Education:

- 1983-1989 Graduated from Yonsei University College of Medicine,
- 1994-1996 Received the Master's degree at Graduate School of Ajou University
- 1997-1999 Received the Ph.D. at Graduate School of Yonsei University

Career:

- 1989-1990 Internship in Severance Hospital, Yonsei University College of Medicine
- 1993-1997 Resident in the Dept of Dermatology, Severance Hospital
- 1997-1999 Research instructor in the Dept of Dermatology, Inha University Hospital
- 1999-present Clinical instructor, Assistant professor, Associate professor and Professor in the Department of Dermatology, Inha University College Medicine
- 2005-2006 Visiting Investigator, Center for Cutaneous Research, Bart and London, London University
- 2015-present Chairman of Institutional Review Board (IRB), Inha University Hospital.
- 2016-present Director of Medical Center Branch, Inha University Research and Business Foundation

Society:

- 1997-present Member and Director of Korean Dermatological Association
Member and Director of Korean Society for Investigative Dermatology
- 2008-present Academic, Treasurer, Planning Director, General Secretary of Korean Hair Research Society
- 2010-present Educational, Treasurer, General Secretary, Vice-president of Korean Society for Aesthetic and Dermatological Surgery
- 2012-present Academic, General Secretary, Inspector of Korean Academy of Vitiligo

Korean oriental medicine in hair disorders

Young Lee, M.D., Ph.D.

Department of Dermatology, School of Medicine, Chungnam National University, Daejeon, Korea

Korean Oriental medicine (KOM) originated in ancient times but is still practiced widely. During the period of the Three Kingdoms, traditional Korean medicine was influenced by other traditional medicines, such as those from ancient China. It flourished during the Joseon dynasty, when many books on various medical specialties were published. In the beginning, KOM treatments were based on the use of herbal medicines, acupuncture, moxibustion, and meditation to control Yin and Yang energies. However, Western medicine has recently been introduced into KOM practices for the treatment of several dermatological diseases.

Hair disorders constitute a specialized field in dermatology; thus, doctors require extensive periods of training to properly diagnose and treat them. Many KOM clinics now provide treatment for hair loss and scalp disorders. According to data from the National Health Insurance Service, the annual cost of health insurance in the dermatological field in KOM is gradually increasing; however, the diagnostic accuracy and satisfaction among patients treated at KOM clinics is relatively low. Furthermore, on average, patients spend more on medical care at KOM clinics. Western medicine is perceived by the public to have numerous side effects, while KOM is believed to be beneficial for the body and devoid of side effects because oriental medicine is prescribed according to the five elements of Yin and Yang. In this review, we discuss the use and cost-effectiveness of KOM for hair disorders.

[CURRICULUM VITAE]

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Associate Professor, Department of Dermatology, School of Medicine,
Chungnam National University, Daejeon, Korea



Education and Training:

- 2002 M.D., Chungnam National University, Daejeon, Korea
- 2005.2 M.S. in Dermatology, Chungnam National University, Daejeon, Korea
- 2008.2 Ph.D. in Dermatology, Chungnam National University, Daejeon, Korea

Professional Experiences:

- 2003.3-2007.2 Resident, Department of Dermatology, Chungnam National University, Korea
- 2007.3-2009.2 Fellow, Department of Dermatology, Chungnam National University, Korea
- 2009.3-2011.2 Instructor, Department of Dermatology, Chungnam National University, Korea
- 2011.3-2014.8 Assistant Professor, Department of Dermatology, Chungnam National University, Korea
- 2014.9-present Associate Professor, Department of Dermatology, Chungnam National University, Korea

Awards:

- 2015 Research award (Daejeon Medical R&D Forum)
- 2017 Uam award (The Korean Society for Investigative Dermatology)

Memberships:

- Member of the Korean Hair Research Society
- Member of Korean Society for Investigative Dermatology
- Member of Korean Society of Dermatology

Featured Publications:

1. Shin JM, Choi DK, Sohn KC, Kim SY, Ha JM, Lee YH, Im M, Seo YJ, Kim CD, Lee JH, Lee Y. Double-stranded RNA induces inflammation via the NF- κ B pathway and inflammasome activation in the outer root sheath cells of hair follicles. *Sci Rep* 2017 Mar 7;7:44127
2. Chang YH, Shin YA, Kim JH, Kim HM, Lee DW, Chung HK, Kim SJ, Kim CD, Lee JH, Seo YJ, Im M, Lee Y. Use of whole-exome sequencing to determine the genetic basis of signs of skin youthfulness in Korean women. *J Eur Acad Dermatol Venereol* 2017;31:e138-e141
3. Shin JM, Chang IK, Lee YH, Yeo MK, Kim JM, Sohn KC, Im M, Seo YJ, Kim CD, Lee JH,

- Lee Y. Potential Role of S100A8 in Cutaneous Squamous Cell Carcinoma Differentiation. *Ann Dermatol* 2016;28:179-85
4. Kwak TJ, Chang YH, Shin YA, Shin JM, Kim JH, Lim SK, Lee SH, Lee MG, Yoon TJ, Kim CD, Lee JH, Koh JS, Seo YK, Chang MY, Lee Y. Identification of a possible susceptibility locus for UVB-induced skin tanning phenotype in Korean females using genomewide association study. *Exp Dermatol* 2015;24:942-6
 5. Lee Y, Shin JM, Jang S, Choi DK, Seo MS, Kim HR, Sohn KC, Im M, Seo YJ, Lee JH, Kim CD. Role of nuclear factor E2-related factor 2 (Nrf2) in epidermal differentiation. *Arch Dermatol Res* 2014;306:677-82
 6. Shin JM, Kim MY, Sohn KC, Jung SY, Lee HE, Lim JW, Kim S, Lee YH, Im M, Seo YJ, Kim CD, Lee JH, Lee Y, Yoon TJ. Nrf2 negatively regulates melanogenesis by modulating PI3K/Akt signaling. *PLoS One* 2014 24;9:e96035
 7. Choi DK, Li ZJ, Chang IK, Yeo MK, Kim JM, Sohn KC, Im M, Seo YJ, Lee JH, Kim CD, Lee Y. Clinicopathological roles of S100A8 and S100A9 in cutaneous squamous cell carcinoma in vivo and in vitro. *Arch Dermatol Res* 2014;306:489-96

How to set up hair research lab

Chang Deok Kim, Ph.D.

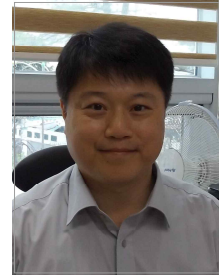
Department of Dermatology, School of Medicine, Chungnam National University, Daejeon, Korea

Hair growth is highly sophisticated process in which many cell types participate to coordinately regulate various molecular events. For example, dermal papilla cells secrete the positive regulators that can affect the proliferation of epithelial cells located in the outer root sheath cells as well as hair matrix cells. The complexity of hair growth control makes it difficult to investigate the precise regulatory mechanism underlying hair morphogenesis and growth cycle. Thus, it is needed to study the hair biology in both the in vivo and in vitro aspects, then integrate these information to understand the complex hair growth control. To investigate the regulatory events in cellular level, cell culture is a good model to disseminate the molecular events restricted to each cell types. For example, dermal papilla cell culture is useful to find the secreted positive and negative regulators for hair cycle. In contrast outer root sheath cell culture can be used for the studying of hair stem cell characteristics. Other investigation system for hair research include mouse models in which various target genes can be delineated using transgenic and knockout technologies. Information obtained from various experimental models can be integrated and provide the insights into the precise molecular mechanism underlying hair growth control. In this presentation, we will discuss several experimental models that can be usefully adopted in performing hair research.

[CURRICULUM VITAE]

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Professor, Department of Dermatology, School of Medicine, Chungnam National University, Daejeon, Korea



Education:

- 1986.03-1990.02 Department of Zoology, School of Natural Sciences, Seoul National University, Seoul, Korea (BS)
- 1990.03-1992.02 Department of Molecular Biology, School of Natural Sciences, Seoul National University, Seoul, Korea (MS)
- 1992.03-2002.08 School of Biological Sciences, Seoul National University, Seoul, Korea (PhD)

Career:

- 1992.01-2001.01 LG Household & Health Care Ltd., Daejeon, Korea (Researcher)
- 2003.09-2006.02 Department of Dermatology, School of Medicine, Chungnam National University, Daejeon, Korea (Postdoctoral researcher)
- 2006.03-Present Department of Dermatology, School of Medicine, Chungnam National University, Daejeon, Korea (Professor)
- 2010.10-2012.03 Department of Dermatology, University of Pennsylvania School of Medicine, Philadelphia, PA (Visiting Scholar)

Publications:

1. Shin JM, Choi DK, Sohn KC, Kim JY, Im M, Lee Y, Seo YJ, Shong M, Lee JH, Kim CD. Targeted deletion of Crif1 in mouse epidermis impairs skin homeostasis and hair morphogenesis. *Sci Rep.* 2017;7:44828.
2. Shin JM, Choi DK, Sohn KC, Kim SY, Ha JM, Lee YH, Im M, Seo YJ, Kim CD, Lee JH, Lee Y. Double-stranded RNA induces inflammation via the NF- κ B pathway and inflammasome activation in the outer root sheath cells of hair follicles. *Sci Rep.* 2017;7:44127.
3. Kim KI, Jeong DS, Yoon TJ, Jung EC, Lee JH, Kim CD. Inhibition of collagen production by ICG-001, a small molecule inhibitor for Wnt/ β -catenin signaling, in skin fibroblasts. *J Dermatol Sci.* 2017;86:76-78.
4. Jung YR, Lee JH, Sohn KC, Lee Y, Seo YJ, Kim CD, Lee JH, Hong SP, Seo SJ, Kim SJ, Im M. Adiponectin signaling regulates lipid production in human sebocytes. *PLoS One.* 2017;12:e0169824.
5. Zhou MW, Yin WT, Jiang RH, Lee JH, Kim CD, Lee JH, Zhu MJ, Yoon TJ. Inhibition of collagen synthesis by IWR-1 in normal and keloid-derived skin fibroblasts. *Life Sci.* 2017;173:86-93.

Is hair graying a marker of biological aging?

Seong-Jin Jo, M.D., Ph.D.

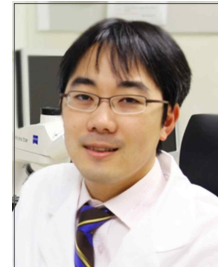
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Hair graying is one of the natural aging processes. It is generally not a medical problem, but a cosmetic concern. Because of the strong association between hair graying and chronological aging, however, many researchers have been concerned that early and severe hair graying is a predictor of some medical problems. It has been reported that early and severe hair graying occurred in patients with pernicious anemia, thyroid disease, and Werner syndrome. In addition, several studies suggested the association of premature hair graying (PHG) with osteopenia or coronary artery disease. A recent GWAS study showed that hair graying has genetic background, an association with interferon regulatory factor 4 gene (IRF4). However, the association of hair graying with life-span and mortality has not been proved yet. In a large cross-sectional study, we noted that PHG is associated with smoking, family history of PHG, and obesity in Korean males. However, we did not find an association of PHG with alcohol consumption, exercise, diet, and psychological stress. In a further study including both males and females, it was found that PHG is associated with some metabolic risk factors such as larger waist circumference, higher blood pressure, and dyslipidemia. Thus, hair graying is not only a manifestation of chronological aging, but also a potential marker that reflects medical conditions of an individual. Further studies are needed to elucidate its association with biological aging.

[CURRICULUM VITAE]

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Clinical Associate Professor, Department of Dermatology,
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Education and Training:

- 2009-2012 Postgraduate school of Seoul National University, Seoul, Korea, Ph.D. of Dermatology
- 2003-2005 Postgraduate school of Seoul National University, Seoul, Korea
M.S. of Dermatology
- 2001 M.D. in Korea
- 1997-2001 Seoul National University College of Medicine, Seoul, Korea, B.S.

Current and Past Professional Positions:

- 2017-present Department of dermatology, Seoul National University Hospital, Seoul, Korea
Clinical Associate Professor
- 2012-2017 Department of dermatology, Seoul National University Hospital, Seoul, Korea
Clinical Assistant Professor
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Fellowship
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- The Korean Hair Research Society

Featured Publications:

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- 2016; 84(3):354-7
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Hair cosmetics

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Hair care, color, and style play an important role in people's physical appearance and self-perception. Among the earliest forms of hair cosmetic procedures in ancient Egypt were hair setting by the use of mud and hair coloring with henna. In ancient Greece and Rome, countless ointments and tonics were recommended for the beautification of the hair, as well as remedies for the treatment of scalp diseases.

Cosmetics for hair are applied topically to the scalp and hair and an important tool that helps to increase patient's adhesion to alopecia and scalp treatments. Through the development of cosmetics with pharmaceutically active compounds, products are evolving that are becoming more similar to topical therapeutic agents.

The various components of hair at the molecular level regulate the efficacy of various hair cosmetic products, allowing their classification as follows:

Category 1: Those that work on the exocuticle. These hair cosmetics include shampoos, conditioners, serums, hair sprays, waxes, gels, and mousses.

Category 2: Those that work on the cortex or alter the structural integrity of the hair shaft. These include hair colors, bleaching agents, straightening, and perming agents.

Hair cosmetics including bleaching and coloring agents are widely available and manipulate the structural properties of hair. While most procedures are safe, there is considerable potential for damage to the hair and hair problems of acute onset, including hair breakage, hair loss and loss of condition. Hair coloring is widely used by women and men either to change their natural hair color. A wide variety of natural and synthetic hair coloring agents is available. Vegetable and metallic dyes are natural colorants, but these have largely been replaced by synthetic organic dyes. The size of the coloring molecule, the swelling of the hair at the time of application and the basicity of the dye determines whether the dye penetrates the cortex or precipitates on the cuticle. The most successful dyes are small, basic molecules. Hair dyes are classified according to their resistance to

washing and the length of time the coloring will remain on the hair: permanent, semipermanent, temporary and gradual. Although dermatologists are experts in managing scalp and hair diseases, the esthetic applications of newer cosmetic therapies still remain elusive. Knowing their mode of action, safetiness and ingredients will enable the physician to better assess different problems secondary to cosmetic treatments. The dermatologist's knowledge of hair care products, their use, and their possible side effects can extend to an understanding of cosmetic resources and help dermatologists to better treat hair and scalp conditions according to the diversity of hair types and ethnicity.

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What's new in scarring alopecia?

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Scarring alopecia or cicatricial alopecia results from follicular damage that causes the destruction and replacement of pilosebaceous structures by scar tissue. Primary scarring alopecias represent a group of disorders that primarily affect the hair follicles, as opposed to secondary scarring alopecias, which affect the dermis and secondarily cause follicular destruction. Inflammation may predominantly involve lymphocytes or neutrophils. Cicatricial alopecias that are characterized by lymphocytic inflammation include discoid lupus erythematosus, lichen planopilaris, frontal fibrosing alopecia, central centrifugal alopecia, and pseudopelade (Brocq). Cicatricial alopecias that are characterized by neutrophilic inflammation include folliculitis decalvans, tufted folliculitis, and dissecting cellulitis of the scalp. Folliculitis keloidalis is a cicatricial alopecia showing a mixed inflammatory infiltrate. In this presentation, I will talk about what is new in scarring alopecia.

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POSTER



The Korean Hair Research Society

P01 Quality of life of alopecia areata versus androgenetic alopecia

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Introduction: Alopecia areata(AA) and androgenetic alopecia(AGA) have deteriorating impact on the quality of life(QoL). Since its introduction, Skindex-29 has been used as a QoL indicator.

Subjects and Methods: A total of 541 hair loss patients(380 AGA and 161 AA) were assigned to QoL evaluation using Hair-specific Skindex-29. The results were evaluated regarding age, sex, disease duration, onset age, disease severity, and the changes before and after the treatment. Ultimately, whether these QoL deteriorations differ between AA and AGA was assessed.

Results: Whereas AA showed a functioning deterioration, AGA showed a significant decrease in symptom parameter. The functioning deterioration was prominent in AA patients in their 30s, whereas in patients younger than 20s the decrease in QoL was more prominent in AGA. When the duration of disease was ≥ 5 years, the decrease of functioning was remarkable in AA. However, when the disease duration was ≤ 6 months, the decrease of symptom QoL was remarkable in AGA. Mild hair loss patients showed significantly lower functioning-related QoL before and after treatment, whereas patients with severe hair loss showed no significant QoL difference between AA and AGA.

Discussion: We objectively confirmed the negative impact of AA and AGA on patients' QoL. The effect of two diseases on QoL is significantly different according to age, onset age, and disease duration, suggesting that a personalized approach to QoL is needed when dealing with hair loss patients. Further studies involving sociocultural factors are required.

P02

A new therapeutic option for scalp seborrheic dermatitis: a shampoo containing natural extracts

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Background: Scalp seborrheic dermatitis (SD) is a common disease of the scalp characterized by flaking and itching of the skin. Conventional treatment options such as topical corticosteroids and antifungal agents may cause adverse effects and lower user satisfaction; thus, it is important to explore other treatments for SD.

Objective: We aimed to evaluate the efficacy and safety of a new-formula shampoo containing natural ingredients including extract of *Rosa centifolia* petals, epigallocatechin gallate, zinc pyrithione, and climbazole.

Methods: Fifty patients with SD were enrolled and divided into two groups, a new-formula shampoo treated group and a 1.5% ciclopirox olamine shampoo treated group. The clinical severity scores, sebum secretion, and inflammatory cytokines were assessed and patient satisfaction and adverse events were also assessed by a questionnaire.

Results: The new-formula shampoo was comparable to ciclopirox in reducing the clinical severity score and decreasing sebum secretion. The patients' improvement scores and user satisfaction were higher in the new shampoo group. Inflammatory cytokines levels significantly changed in both groups during the course of the study.

Conclusions: This new-formula shampoo could be a therapeutic option for treatment of patients with SD.

P03

Therapeutic effects of growth factor cocktail including FGF 9 in patients with androgenetic alopecia

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Background: Growth factor cocktail(GFC) including fibroblast growth factor 9(FGF9) is an effective and safe treatment for AGA patients.

Objective: This study aimed to evaluate the effect of GFC including FGF9 in AGA patients, and compare the differences in efficacy according to microneedle depth.

Methods: The study was performed on 22 patients(11 males and 11 females) with AGA who were treated with topical GFC including FGF9 with microneedling once in 2 weeks for 3 months. The scalp was divided into two sides, and treated with GFC including FGF9 (right side) and normal saline (left side). The microneedle depth was 0.8 mm for both sides. GFC including FGF9 was topically applied with a microneedle medical device. Treatment efficacy was evaluated through phototrichogram and digital photograph analyses after 6 repeated treatments for 3 months.

Results: The phototrichogram images showed that 3 months of treatment with GFC including FGF9 with microneedling increased hair density($27.4 \pm 4.4/\text{cm}^2$) and diameter($2.7 \pm 2.7/\text{cm}^3$); increases in hair density($5.7 \pm 4.4/\mu\text{m}$) and diameter($2.2 \pm 2.3/\mu\text{m}$) were also seen in the normal saline scalp. The treatment effect was not significantly different between microneedle depths of 0.8mm(used in this study) and 0.5mm(used in our previous study) in terms of both hair density and hair diameter.

Conclusion: GFC including FGF9 with microneedling is an effective and safe treatment for AGA patients. According to the results of this study and our previous report, we believe that microneedle depths of 0.5–0.8 mm can sufficiently stimulate the scalp.

P04
**Clinical study of male pattern hair loss patients during
ten years (2007-2016)**

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Background: To date, numerous studies have investigated the epidemiology and clinical characteristics of male pattern hair loss (MPHL).

Objective: The purpose of this study was to evaluate a large number of long-term MPHL patients and to compare them to shorter term ones from other studies.

Methods: A retrospective chart review was conducted at the Alopecia Clinic of Myoungji Hospital, Department of Dermatology with MPHL patients during a ten-year period (2007-2016).

Results: Among 3,549 alopecia patients who had visited the hospital's alopecia clinic, there were 1,360 MPHL patients (38.3%). The most frequent age group was in the twenties (30.1%) followed by the thirties (28.2%), forties (17.2%), fifties (9.9%), and teenagers (8.9%). There were 599 MPHL patients (44.0%) with a paternal familial predisposition, 182 (13.4%) with a maternal familial predisposition, and 118 (8.7%) with both familial predispositions. MPHL was classified according to the Norwood-Hamilton classification: type 2 (20.0%), type 3v (19.4%), and type 3a (16.3%) were most frequent. Abnormalities in serum total cholesterol were shown in 15.1% and triglycerides in 36.1% of the patients. The most common co-morbidity was seborrheic dermatitis, followed by hypertension, hyperlipidemia, diabetes mellitus, and gastrointestinal diseases.

Conclusion: This study demonstrated that the period of MPHL diagnosis and treatment becomes earlier in age and milder regarding MPHL type, which may be due to early puberty in teenagers.

P05

Modified contact immunotherapy for alopecia areata with 0.01% diphencyproprone: three case reports

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Alopecia areata is a chronic, non-scarring hair loss disorder. The contact immunotherapy using diphencyproprone (DPCP) or squaric acid dibutylester is the mainstay of treatment in severe cases. Conventionally, sensitization with 1% or 2% DPCP is followed by weekly to biweekly challenges. Its concentration is starting from 0.001% or lower, increasing to higher doses (to a maximum concentration of 2%) until eczematous reaction appears during treatment. As a result, the patient experiences discomfort such as erythema, pruritus, pigmentation. We report three patients treated by modified immunotherapy using 0.01% DPCP on fixed concentration. Three patients were 70-year-old male, 37-year-old and 27-year-old female. They had multiple alopecic patches on both sides of scalp. After sensitization with 0.1% DPCP, 0.01% was applied on the right side of scalp every two weeks. After 3 months, the right side showed a marked improvement compared to the left side. Since then, the treatment was extended to both sides. As a result, both showed marked improvement after 3 months. Patients did not complain of any discomfort during 6 months. This result suggest that the efficacy is satisfactory with the contact immunotherapy using suberythematous concentration. Therefore, it is not compulsory to increase the concentration until the eczematous reaction occurs. In contrast to conventional method, this modified regimen would not cause significant adverse effect. A larger prospective and comparative study will be needed to confirm its efficacy.

P06**An open clinical trial of a new zinc pyrithione, rosa centifolia extract shampoo in the management****Young Jun Woo, Ji Hee Jung, Ki Min Sohn, Jung Eun Kim, Hoon Kang**Department of Dermatology, St. Paul's Hospital, College of Medicine,
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Background: Dandruff is a common persistent, unpleasant, relapsing inflammatory condition affecting the areas rich in sebaceous glands. As *Malassezia* species play an important role in pathogenesis, various anti-fungal and anti-inflammatory agents are used to treat that condition.

Objective: We aimed to examine the efficacy of new-formula shampoo which contains 0.3% zinc pyrithione, 0.01% extract of *Rosa centifolia* petals, 0.005% epigallocatechin gallate and 0.45% climbazole in patients suffering from dandruff.

Method: 25 Patients with varying degrees of dandruff were asked to use the new formula shampoo regularly. And using Folliscope[®] and Sebumeter[®], we assessed the change of dandruff and sebum levels on the four different sites of the scalp at baseline, and at week 2 and 4 after using the shampoo and at week 6 and 8 after stopping it. Patient's self-assessment and satisfaction score were also checked for each visit.

Results: Significant clinical improvement in the amount of dandruff and sebum production was observed on all scalp sites during the period of use and its effect maintained for a while after discontinuing it. All patients tolerated it without any adverse effects.

Conclusion: The new-formula shampoo was useful in the management of dandruff and the control of sebum production. This study illustrates successful use of new formula shampoo in managing patients with dandruff.

P07

Effects of light emitting diode with wavelength of green light on hair loss and skin aging

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Background: Light emitting diode (LED) is recently used in variable conditions to stimulate wound healing, skin restoring and hair growth. Previously, we showed that LED irradiation upregulated the hair growth related factors in dermal papilla cells (DPCs) and the irradiation with certain wavelength improved the skin lesion of atopic dermatitis in a mouse model.

Objective: We aimed to determine the effect of LED irradiation on the interferon (IFN) gamma-treated dermal papilla cells and H₂O₂-induced fibroblast cells (FBCs).

Method: DPCs were exposed to LED irradiation with a wavelength of 475, 500, 505nm and a dosage of 10 J/cm². FBCs were exposed to LED irradiation with a wavelength of 415, 475, 515nm and a dosage of 10 J/cm². Cell proliferation was examined using MTT assay and Wnt/ β -catenin pathway and apoptosis related genes (p53, pRb, Bcl2, and Bax) were measured by real-time PCR and western blot assay.

Results: The LED irradiation significantly promoted cell proliferation. Furthermore, LED irradiation at 505nm upregulated Wnt5a and β -catenin expressions remarkably and suppressed IFN receptor in DPCs. Also, LED irradiation significantly downregulated the H₂O₂ induced-expression of p53 and p21 in FBCs. And LED irradiation at 515nm upregulated Bcl2 and suppressed Bax expression in H₂O₂-induced FBCs.

Conclusion: In conclusion, we found that LED irradiation, especially with wavelength of green light, has therapeutic potential to treat hair loss and skin aging in vitro and it was mediated via Wnt/ β catenin and apoptosis signal pathway.

P08**The effect of human mesenchymal stem cell therapy on in vitro model of alopecia areata****Jung Eun Kim, Young Jun Woo, Jee Hye Oh, Kwan Ho Jeong, Hoon Kang**

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Background: Mesenchymal stem cell therapy has been illuminated as a new therapeutic strategy for immunologic disorders. Recently, there have been only few attempts to treat alopecia areata (AA) with mesenchymal stem cell therapy. However, their efficacy and mechanisms are not known.

Objective: We sought to investigate the therapeutic efficacy of human hematopoietic MSCs (hHMSCs) on in vitro model of AA and to explore relevant mechanisms that regulate their efficacy.

Methods: AA-like environment was induced in the human dermal papilla cells (hDPCs) by pretreatment of IFN- γ . hHMSCs were administered to the hDPCs, and cell viability assay was determined. The change of expression of Wnt/ β -catenin pathway and JAK-STAT pathway-related molecules, cytokines and growth factors in hHMSCs-treated DPCs was also examined by reverse transcription-PCR and western blot assay.

Results: Cell therapy with hHMSCs enhanced the cell viability of the hDPCs dose-dependently. hHMSCs activated several molecules in the Wnt/ β -catenin signaling pathway and reversed the inflammatory response of IFN- γ -related genes such as caspase-1, interleukin-1 β (IL-1 β) and IL-18 and JAK-STAT pathway-related molecules in human DPCs. hHMSCs-treated DPCs also showed increased levels of several growth factors, especially FGF2.

Conclusion: These data suggest that the cell therapy with hHMSCs may promote hair growth and recover the hair follicle-immune privilege by modulating JAK-STAT pathway and could be a new therapeutic option in treating AA.

P09

Isolation of NCSC from hair follicle bulge and differentiation induction into melanocyte precursor

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Background: The repigmentation in the combination treatment of follicular unit extraction (FUE) graft and NBUVB is much superior to that in epidermal micropunch graft and NBUVB, due to survival of hair follicle melanocytes. Various stem cells such as melanocyte stem cells (MSCs) and Neural crest stem cells (NCSCs) are present in the bulge of human hair follicle.

Objective: The aim the study is to ascertain whether the NCSCs could be isolated directly from human hair follicle bulge instead of embryonic stem cells, and induced to differentiate along the melanocyte lineage.

Methods and Results: After we obtained a population of cells with NCSC marker, SOX10, during the emigrated cell culture from hair follicle bulge portions of adult human scalp; Firstly, a promoted proliferation of SOX10(+) cells by basic FGF were observed compared to control. Secondly, the emigrated hair bulge cells did not spontaneously differentiate into MITF-expressing cells, but into SOX2-expressing Schwann cell progenitors after prolonged cultivation. Thirdly, the differentiation into MITF-expressing cells was promoted after BMP-4 and α -MSH treatment.

Conclusion: Basic FGF promoted the proliferation and survivals of NCSCs with spontaneous differentiation into SOX2(+) Schwann cell progenitors, but not into MITF-expressing cells. And BMP-4 and α -MSH promoted a differentiation into MITF-expressing cells.

P10**Pdgf-aa affects the activity of human DP cells and promotes hair growth on human follicles in vitro****Hyun-sik Jeong, Jung Chul Kim, Moon Kyu Kim, Young Kwan Sung**

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Background: Platelet-derived growth factor (PDGF) is a potent mitogen for cells of mesenchymal origin, including fibroblasts in mouse and human. PDGF is known to contribute to the induction and maintenance of anagen phase of hair cycle in mice. It is also known that PDGFR- α is activated in the dermal papilla (DP) during the anagen phase. PDGF-AA, an isoform of PDGF, binds to PDGFR- α .

Objective: We investigated the effects of PDGF-AA on DP cells and human hair growth in vitro.

Method: PDGFR- α expression in human hair follicle was examined by immunohistochemical staining. PDGFR- α expression in DP cells was examined by RT-PCR and real-time PCR. The MTT assay was used to check cell viability of DP cells. Hair-shaft growth was measured using the in vitro hair-follicle organ-culture system. For 3D spheroid cultures, 2D cultured DP cells were seeded into a 96-well hydrocell plate. Microarray analysis using Affymetrix array was performed to identify genes regulated by PDGF-AA in DP spheres.

Result: PDGFR- α was expressed in the DP and CTS (connective tissue sheath) of human anagen hair follicles. PDGFR- α expression was significantly increased by sphere formation of DP cells. PDGF-AA treatment induced an increase in proliferation of 2D cultured DP cells and elongated the hair shaft in cultured human hair follicles. A number of genes were differentially expressed by PDGF-AA treatment in 3D DP cells.

Conclusion: PDGF-AA promotes hair growth on human follicles in vitro by affecting the activity of DP cells.

P11

Evaluations of relationship between alopecia areata and sleep disorder through questionnaire

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Background: Sleep disturbances are observed frequently before and after onset of alopecia areata (AA), but the relationship between AA and sleep disturbance was not studied enough.

Objective: We investigated this study to identify the relationship between sleep quality and clinical features of AA.

Methods: We reviewed the clinical features of AA patients who experienced sleep disturbance and evaluated sleep quality of the patients using 3types of self-administered questionnaire; Pittsburgh Sleep Quality Index (PSQI), Insomnia Severity Index (ISI), Epworth Sleepiness Scale (ESS).

Results: A total 53 patients were enrolled. In PSQI, mean score was 8.9 (score of bad sleep quality) and 41 patients (77.4%) had a poor sleep quality. There was statistically significant relationship between sleep quality and stressful event ($p=0.019$), but disease severity, duration, activity, the number of disease occurrence and initial disease onset age did not have significant relationships with sleep quality. In ISI, mean score was 9.6 (score of subclinical insomnia), and 11 patients (20.7%) had clinical insomnia. In ESS, mean score was 5.9 (score of no abnormal daytime sleepiness), and 8 patients (15.1%) had excessive daytime sleepiness. Both ISI and ESS did not show any significant relationships with clinical features of AA.

Conclusion: PSQI could be useful method to measure patient's sleep quality in AA. Stress factor of the patients seem to have bad effects in patient's sleep quality, but there are no significant relationship between sleep quality and AA severity

P12

Two cases of radiation induced anagen effluvium

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Radiation induced anagen effluvium is becoming more common due to an increasing use of endovascular procedures. We report two cases of 49-year-old man and 45-year old woman presenting with asymptomatic, demarcated alopecic patch on the occipital scalp. Both patients underwent cerebral angiography for fistula embolization under fluoroscopy and stent angioplasty of the brain vessels respectively. Hair pulling test were negative in both patients. Both cases clinical features are compatible with radiation induced anagen effluvium. Herein, we report rare cases of anagen effluvium following a therapeutic angiography.

P13

Formation of hair barrier in human hair follicles according to the hair keratinization

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Background: Integral hair lipid (IHL) plays an important role in all compartments of hair and skin substructures and also in involvement of hair development and function.

Objective: In this study, we described the expression profile of IHL, lamellar granule-associated proteins and cornified cell envelope (CCE) precursor proteins in human hair follicles according to the hair keratinization.

Methods: Transmission electron microscopy was performed to observe the ultrastructure of the hair lipid, Immunofluorescence analysis was performed to observe the lamellar granule-associated proteins (Caveolin-1, Glucosylceramides, Cathepsin V) and CCE precursor proteins (Involucrin, Transglutaminase 5).

Results: Ultrastructure of anagen hair follicle at the level where Henle layers are keratinizing, showed the intercellular lipid layer (IL) and lamellar structure (LS). Ultrastructure of anagen hair follicle at the level where the inner root sheath (IRS) is completely keratinized showed multiple LS and lamellar granules (LG). Multitudes of LS and IL are observed between the keratinized cells in IRS. Lamellar granule-associated proteins and CCE precursor proteins were mainly detected in the IRS region.

Conclusion: The IHL in the hair follicle may be regarded as hair barrier to be similar to the epidermal lipid layer functioning as skin barrier.

P14

The effects of ultraviolet radiation on lipid metabolism in human hair follicles

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Background: Lipids play important roles in the cell growth, differentiation, energy metabolism, signal transduction and structural components for cells.

Objective: In this study, we investigated the photo-degradation of hair lipid in human hair follicles.

Methods: Hair follicles were exposed to a single dose of UVB 20mjcm⁻²(low-dose UVB), or 50mjcm⁻²(high-dose UVB) as described previously, and lipid metabolism was observed.

Results: We observed that UV irradiation decreased the free fatty acid contents, but increased the ceramide contents. The expressions of genes related to lipid synthesis, including acetyl-CoA carboxylase (ACC), fatty acid synthase (FAS), stearoyl-CoA desaturase (SCD), and sterol regulatory element binding proteins (SREBPs) were also markedly decreased.

Conclusion: Our results suggest that hair lipid may play important roles in photoaging of human hair follicle.

P15 Clinical efficacy of 2.5 mg/day finasteride in female pattern hair loss

**Yong-Yon Won, Seung-Hee Loh Dong-Woo Suh,
Bark-Lynn Lew, Woo-Young Sim**

Department of Dermatology, Kyung Hee University hospital at Gang-dong,
Kyung Hee University School of Medicine, Seoul, Korea

Background: The pattern hair loss in women (female pattern hair loss, FPHL) presents with diffuse thinning over the mid-frontal scalp. Various treatments have been attempted for FPHL. Currently oral 5-reductase inhibitor has been used. However, clinical efficacy of finasteride in FPHL is still controversy.

Objective: To evaluate the clinical efficacy of oral finasteride (2.5 mg/day) in post-menopausal FPHL.

Methods: A retrospective study of 544 post-menopausal patients with FPHL who were prescribed finasteride 2.5mg/day was conducted. Among those patients, patients with a follow-up period of < 3 months and patients prescribed other FPHL treatment modalities including topical minoxidil were excluded. Finally, 112 patients were evaluated according to medical records and clinical photographs, using a 7-point scale.

Results: Among total 112 patients, 60 patients were grade I, 47 were grade II and, 5 were grade III as Ludwig scale at initial visit. Mean age at initial visit was 54.20 years, mean age of onset was 42.88 years, mean follow-up duration was 17.95 months and mean duration between onset and treatment was 11.49 years. In global photographs, 76 of the 112 patients were slightly increased, 16 were moderately and 2 were greatly increased. Thirteen showed no change and slightly decreased was recorded in 5

Conclusion: The effectiveness of finasteride in FPHL has been controversial. However, our study had the largest population compared to other studies and proved the efficacy of 2.5 mg/day finasteride.

P16

Telogen effluvium due to drug induced hyperthyroidism

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Background: Telogen effluvium(TE) is a nonscarring, diffuse, hair loss of the scalp that occurs around 3 months after a triggering event and is usually self-limiting, lasting for 6 month. Various metabolic alterations such as pregnancy, malnutrition and other stressful conditions are causes of influencing the biological clock within hair follicles and it is possible of abnormally large number of hair follicles to enter the telogen phase simultaneously.

Objective: To report a case of telogen effluvium due to drug induced hyperthyroidism

Methods: A 54-year-old female visited our clinic for diffuse hair loss with 5 months duration. She had undergone thyroidectomy for thyroid cancer 3 years ago and had been taking oral levothyroxine continuously. More than 5 hairs were pulled on the pulling test. On the laboratory studies, free T4 was elevated and thyroid stimulating hormone(TSH) was decreased (Free T4 = 1.69 ng/dL, TSH < 0.01 μ IU/dL).

Results: Histologic examination revealed reduced anagen hair follicles and increased telogen to anagen ratio with mild perifollicular fibrosis. The diagnosis of TE due to oral levothyroxine induced hyperthyroidism was made on the clinical and histological results. We recommended her to reduce the dose of levothyroxine, and after 2 months she showed regrowth of hairs.

Conclusion: Clinically both hyper- and hypothyroidism are associated with hair loss. However, the pathogenesis of hair loss in hyperthyroidism is unknown. Herein, we report a case of telogen effluvium due to oral levothyroxine induced hyperthyroidism.

대한모발학회 회칙

제 1 장 총 칙

제 1 조 (명칭) 본회는 대한모발학회(The Korean Hair Research Society)라 하며 대한피부과 학회의 산하학회이다.

제 2 조 (구성) 본회는 모발 및 모발과 관련된 질환을 다루고 연구하는 사람으로 구성한다.

제 3 조 (목적) 본회는 모발에 대한 연구, 교육 및 학술활동을 수행하고 회원 간의 친목을 도모함을 목적으로 한다.

제 4 조 (사업) 본회는 전항의 목적을 달성하기 위하여 다음과 같은 사업을 수행한다.

1. 총회 및 학술대회 개최
2. 초록집, 학술지 및 소식지의 발간
3. 모발 및 모발질환에 대한 연구, 교육 등 제 문제에 대한 사업
4. 국내외 관련 학술단체와의 교류 및 제휴
5. 기타 본 학회 목적 달성에 필요한 사업

제 2 장 회 원

제 5 조 (자격) 본회의 회원은 모발 관련 진료 및 연구에 종사하거나 관심을 가지고 본 학회의 취지에 찬동하는 자로서 소정의 입회 수속을 밟고 이사회회의 의결을 거쳐 총회에서 인준을 받은 자로 한다.

제 6 조 (구분) 본회의 회원은 다음과 같이 구분한다.

1. 정회원: 대한피부과학회 정회원 자격자로 본 회 목적에 찬동하는 자로한다.
2. 명예회원: 모발 관련 진료 및 연구 업적이 탁월하고 본 회 발전에 공헌이 지대한 자로 한다.
3. 연구회원: 생명과학 관련분야에 종사하는 박사학위 소지자이거나 이 에 준하는 경력자로 본 회 목적에 찬동하는 자로 한다.
4. 전공의준회원: 대한피부과학회 준회원 자격자로 피부과 수련병원에서 수련 받는 전공의로 한다.
5. 연구준회원: 정회원 또는 연구회원의 지도를 받거나 생명과학 관련분야에 종사하는 연구원 또는 이에 준하는 경력자로 본 회 목적에 찬동 하는 자로 한다.

제 7 조 (의무) 회원은 본 회의 회칙, 제 규정 및 결의 사항을 준수하여야 하고, 정회원, 명예회원 및 연구회원은 회비 및 기타의 부담금을 납부할 의무가 있다.

제 8 조 (권리) 모든 회원은 본회에서 발간하는 소식지 및 학회지를 배부 받을 권리가 있으며 정회원은 선거권, 피선거권 및 기타 소정의 의결권을 가진다.

제 9 조 (제명) 본회의 의무를 준수하지 않거나 명예를 훼손한 회원은 이사회를 거쳐 총회의

인준을 받아 제명할 수 있다.

제 3 장 임 원

제 10 조 (임원) 본회는 회장, 부회장 3명 이내, 총무, 학술, 교육, 재무, 홍보, 간행정보, 기획, 의무, 무임소 상임이사, 감사 2명 및 약간 명의 고문을 두며 이사의 정원은 30명 내외로 한다. 무임소 상임이사는 2-5명으로 한다.

제 11 조 (선임)

1. 회장은, 감사는 총회에서 선출한다.
2. 부회장, 상임이사는 회장이 위촉한다.
3. 이사는 상임이사회에서 추천하여 회장이 위촉한다.
4. 고문은 회장이 위촉한다.

제 12 조 (임기) 임원의 임기는 2년으로 하며 연임할 수 있다.

전임자의 유고로 인해 보선된 임원의 임기는 전임자의 잔여 임기로 한다.

제 13 조 (직무)

1. 회장은 본회를 대표하여 업무를 총 관리하고 총회, 이사회의 의장이 된다.
2. 부회장은 회장의 유고시 그 직무를 대행하며, 본 회 운영의 주요한 사항을 심의하고 제반 업무를 집행한다.
3. 총무이사는 본 회 운영의 주요한 사항을 심의하고 제반 업무를 집행한다.
4. 학술이사는 학술 모임에 관한 업무를 집행한다.
5. 교육이사는 회원 교육에 관한 업무를 집행한다.
6. 재무이사는 재무에 관한 업무를 집행한다.
7. 홍보이사는 홍보 및 대중 매체에 다루어지는 업무를 집행한다.
8. 간행정보이사는 간행 및 정보에 관한 업무를 집행한다.
9. 기획이사는 기획에 관한 업무를 집행한다.
10. 의무이사는 의무에 관한 업무를 집행한다.
11. 무임소이사는 특정 사업이나 지속적 업무를 집행한다.
12. 간사는 상임이사의 업무를 보좌한다.
13. 감사는 본 학회의 재산 상황과 사업과 관련된 사항을 감사하고 이를 총회에 보고한다.
14. 이사는 이사회를 구성하여 본 학회 운영의 주요 사항을 심의 의결한다.
15. 고문은 본 학회의 운영 전반에 대한 자문을 한다.

제 4 장 회 의

제 14 조 (구분) 본회에는 총회와 이사회, 상임이사회를 둔다.

제 15 조 (총회)

1. 정기총회는 연 1 회 회장이 소집한다. 단 정회원 5분의 1이상의 요구나 이사회의 요청이 있으면 임시 총회를 소집하여야 한다.

2. 총회는 출석 정회원으로 성립되고 재석 인원 과반수로 의결한다.
3. 총회는 다음과 같은 사항을 의결한다.
 - (1) 회장, 감사 선출
 - (2) 예산과 결산의 인준
 - (3) 회칙 개정의 인준
 - (4) 기타 이사회에서 제출한 사항

제 16 조 (이사회)

1. 이사회는 임원과 이사로 구성하며 회장이 의장이 되어 회의를 진행한다.
2. 이사회는 과반수 출석으로 성립하고 재석 인원 과반수로 의결한다.
3. 이사회는 총회에 제출하여 인준 또는 의결할 사항, 제 규정의 제정과 개정, 회원의 자격과 제명 및 기타 필요한 사항에 대하여 심의 의결 또는 인준한다.

제 17 조 (상임이사회)

1. 상임이사회는 상임이사로 구성하며 회장이 의장이 되어 회의를 진행한다.
2. 상임이사회는 이사회 및 총회에 제출하여 인준 또는 의결할 사항을 포함하여 회무 전반에 관한 사항을 심의 의결 또는 인준하여 집행한다.

제 18 조 (각종 위원회)

1. 이사회 의결을 거쳐 각종 위원회를 둘 수 있다.

제 5 장 재 정

제 19 조 (재원) 본 회의 재원은 회비, 입회비, 찬조금 및 기타 수입금으로 한다.

제 20 조 (회계년도) 본 회의 회계연도는 매년 정기 총회 일에서 다음 정기 총회 전일까지로 한다.

제 21 조 (입기) 본 회의 수지 결산은 감사의 감사를 거쳐 차기 정기 총회에 보고한다.

제 6 장 부 칙

제 22 조 본 회칙에 규정되지 않은 세칙은 일반 관례에 준한다.

제 23 조 본 회칙의 개정은 이사회의 심의를 거쳐 총회의 인준을 받아야 한다.

제 24 조 본 회칙은 공포일로부터 시행한다.

2004. 7. 1. 제정
 2006. 5. 28 개정
 2009. 5. 24 개정
 2010. 10. 16 개정
 2012. 6. 3 개정
 2012. 10. 20 개정
 2014. 10. 18 개정
 2016. 10. 15 개정

대한모발학회 임원명단

(2014년 6월 - 2016년 5월)

- 고 문 노병인, 임철완, 박장규, 강진수, 김도원, 심우영
- 회 장 이원수
- 부 회 장 강 훈

- 총무이사 최광성
- 기획이사 이동윤
- 학술이사 김문범
- 재무이사 허창훈
- 교육이사 권오상
- 간행정보이사 이양원
- 홍보이사 김범준
- 의무이사 조성빈
- 무임소이사 이 영
- 무임소이사 유박린
- 무임소이사 김상석
- 무임소이사 박병철
- 무임소이사 이상훈
- 무임소이사 김도영
- 총무간사 박 진
- 학술간사 김정은
- 감 사 김성진, 강광영

- 이 사 계영철, 김규한, 김기호, 김정철, 김효진, 김창덕, 민복기, 박경훈, 박성욱, 서구일, 서수홍, 성영관, 신기식, 신정원, 원종현, 윤태영, 이드보라, 이인준, 이종록, 임이석, 장승호, 장용현, 전지현, 조성진, 조성환, 조항래, 최유성, 홍창권, 황성주

대한모발학회 연혁

● 대한모발학회 소개 ●

대한모발학회는 1998년 10월 29일 대한피부과학회 내에 모발연구분과위원회를 설립하기 위한 발기인 모임을 가진 것을 시작으로 하여 태동이 되었습니다. 이후 모발연구분과위원회의 주도로 매년 대한피부과학회 춘추계학술대회 때마다 모발심포지엄을 개최하여 왔습니다. 이후 기존의 모발연구분과위원회를 확대 개편하여 대한모발학회를 창립하기로 하고 2004년 7월 11일 제주도 샤인빌 호텔에서 창립총회를 가졌습니다. 초대회장으로 노병인 교수를 비롯한 임원진이 선출되었고, 이후 본격적인 활동을 시작하였습니다.

현재 대한모발학회는 북미모발학회, 유럽모발학회, 일본모발학회 및 호주모발학회와 함께 세계모발연구학회를 구성하는 5대 학회로서 당당히 어깨를 겨루는 세계 속의 학회로 성장하게 되었으며 2006년 5월 28일 제2대 회장으로 박장규 교수, 2008년 5월 25일 제3대 회장으로 임철완 교수, 2010년 6월 13일 제4대 회장으로 강진수 원장, 2012년 6월 3일 제5대 회장 김도원 교수가 선출되어 임기동안 학회를 훌륭히 이끌었습니다. 현재는 2016년 5월 29일 가톨릭대학교 서울성모병원에서 개최된 제12차 대한모발학회 학술대회에서 제7대 이원수 교수가 회장으로 선출되어 제7기 집행부를 구성하여 회무를 담당하고 있습니다.

● 학술활동 소개 ●

1. 대한모발학회 학술대회

대한모발학회 학술대회는 1년에 한 번 개최되며, 해외학자 초청강연, 특강 및 교육 강연, 각종 구연 및 포스터 연제 발표 등으로 이루어지는 대한모발학회의 꽃이라고 할 수 있습니다. 제 1차 및 제 2차 심포지엄을 거쳐 2006년 제 3차 대회 때부터 정식 학술대회의 면모를 갖추게 되었습니다.

- 1) 제1차 대한모발학회 심포지엄
 - 2004년 11월 7일 밀레니엄 힐튼 호텔
 - 탈모에서 Mesotherapy 외 9 강좌
- 2) 제2차 대한모발학회 심포지엄
 - 2005년 6월 19일 밀레니엄 힐튼 호텔
 - 탈모증의 진단 외 12강좌

- 3) 제3차 대한모발학회 학술대회
 - 2006년 5월 28일 밀레니엄 힐튼 호텔
 - 원형탈모증의 임상적 특징 외 8강좌 및 일반연제
- 4) 제4차 대한모발학회 학술대회
 - 2007년 5월 27일 밀레니엄 힐튼호텔
 - 원형탈모증의 원인과 발생기전 외 10강좌 및 일반연제
- 5) 제5차 대한모발학회 학술대회
 - 2008년 5월 25일 밀레니엄 힐튼호텔
 - 모낭과 안드로겐 외 15강좌 및 일반연제
- 6) 제6차 대한모발학회 학술대회
 - 2009년 5월 24일 밀레니엄 힐튼 호텔
 - 모낭의 발생 외 12 강좌 및 일반연제
- 7) 제7차 대한모발학회 학술대회
 - 2010년 6월 13일 밀레니엄힐튼호텔
 - New insights into hair biology 외 14 강좌 및 일반연제
- 8) 제8차 대한모발학회 학술대회
 - 2011년 9월 18일 코엑스 회의실 Hall E (3층)
 - Current and new aspects of female pattern hair loss 외 23 강좌 및 일반연제
- 9) 제9차 대한모발학회 학술대회
 - 2012년 6월 3일 백범김구기념관
 - Defining the function of genes in differentiation of hair follicle stem cells 외 13 강좌 및 일반연제
- 10) 제10차 대한모발학회 학술대회
 - 2013년 5월 26일 백범김구기념관
 - Latest news about the genetics of alopecia areata 외 18 강좌 및 일반연제
- 11) 8th World Congress for Hair Research
 - May 14 (Wed) ~ 17 (Sat), 2014 Jeju Island, Korea

12) 제11차 대한모발학회 학술대회

- 2015년 5월 31일 가톨릭대학교 서울성모병원 지하1층 대강당
- Wnt/ β -catenin signaling controls proliferation but not survival of hair follicle stem cells의 14 강좌 및 일반연제

13) 제12차 대한모발학회 학술대회

- 2016년 5월 29일 가톨릭대학교 서울성모병원 지하1층 대강당
- Clinical aspect of alopecia areata on pathogenic factors and treatment의 10 강좌 및 일반연제

2. Hair Forum

2001년 시작하여 해마다 참석하는 인원이 늘어나고 있는 Hair Forum은 모발학회 회원들 간의 격식 없는 모임입니다. 이는 자유로운 토론과 회원 상호간의 친목도모를 위하여 마련되고 있으며, 주로 진단 및 치료가 어려운 증례에 대한 토론, 그동안 연구했던 내용 발표, 해외모발학회 참관기 소개 등 다른 회원들과의 의견공유를 위해서 밤늦은 시간까지 진행됩니다. 최근에 개최된 Hair Forum 현황은 다음과 같습니다.

- 1) 2004년 8월 28일 대전 유성 스파피아 호텔
모낭유래세포에서의 androgen receptor, estrogen receptor의 발현 양상 외 13건 발표
- 2) 2005년 8월 20일 대전 유성 스파피아 호텔
원형탈모증 환자 400명의 임상적 고찰 외 8건 발표
- 3) 2006년 8월 19일 대전 유성 레전드호텔
Acute diffuse alopecia areata 외 11건 발표
- 4) 2007년 8월 18일 대전 유성 리베라 호텔
모낭유래세포의 특성분석 외 13건 발표
- 5) 2008년 8월 23일 대전 유성 리베라호텔
전두탈모증 환자에서 모반 제거후 모발재생의 치료 경험 외 18 건 발표
- 6) 2009년 8월 22일 대전 유성 리베라 호텔
원형 탈모증 환자에서 스트레스 평가에 대한 예비 연구 외 9건 발표
- 7) 2010년 8월 21일 대전 유성 리베라호텔

Effect of radiofrequency radiation on human hair follicle cells 외 16건 발표

8) 2011년 8월 27일 대전 유성 호텔아드리아

Ultraviolet radiation alters lipid metabolism in human hair follicle 외 11건 발표

9) 2012년 8월 18일 대전 유성 호텔아드리아

Effects of Mycophenolic acid and Rapamycin on hair growth 외 12건 발표

10) 2013년 8월 17일 대전 유성 호텔아드리아

How can we enhance follicular penetration? 외 14건 발표

11) 2014년 7월 26일 대전 호텔 리베라 유성

털깍질(hair-cuticle)이 모발색조에 미치는 영향 외 6건 발표

12) 2015년 8월 22일 대전 호텔리베라 유성

Hair graying: Clinical features & significance 외 8건 발표

13) 2016년 8월 27일 대전 유성호텔

HMGB1 and hair growth: a potential role of prostaglandin metabolism 외 10건 발표

3. 대한피부과학회 학술대회 시 모발심포지엄 개최

대한모발학회는 대한피부과학회 산하의 모발연구분과위원회이기도 하므로, 1999년부터 매년 대한피부과학회의 춘추계 학술대회에서 모발심포지엄을 진행하고 있습니다. 2009년부터는 대한피부과학회 춘추계학술대회시 한 번에 한해 분과심포지엄을 개최할 수 있는 대한피부과학회의 새로운 자체 규정에 따라 추계학술대회에서 모발심포지엄을 개최해 오고 있습니다.

대한모발학회 학술대회 전시 및 광고회사

● 전시회사

No.	회사명	연락처
1	MSD	02-331-2079
2	GSK	02-709-4429
3	갈더마코리아	02-6717-2076
4	동화약품	02-2021-9495
5	에스트라	02-3780-9492
6	한독테바	02-527-5507
7	종근당	02-02-6200-3117
8	후파마	02-447-8060
9	인텍	031-423-5355
10	현대약품	02-2600-3886
11	에스메드	02-444-0889
12	하이로닉	031-525-7266
13	리드엠	02-599-4929
14	정우의학	02-822-1361

● 광고회사

No.	회사명	연락처
1	MSD	02-331-2079
2	GSK	02-709-4429
3	현대약품	02-2600-3886
4	보령제약	02-708-8456
5	바름메디	02-733-2900



The Korean Hair Research Society

**2017년 제13차 대한모발학회
학술대회**

인 쇄 2017년 5월 24일

발 행 2017년 5월 28일

발행처 대 한 모 발 학 회

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