

damage have been documented, and roughly it can be divided into physical causes and chemical causes. Among them, daily damaging causes, especially heat damaging is a severe cause to avoid in daily life. Although heat damage by hair dryer is a severe and important damaging cause in a grooming point of view, daily heat damaging patterns are not clear. Grossly, Damaged hairs by hair dryer tend to be rough and dry, and usually lose their color and strength. Objective: In this study, we investigated the differences in patterns of damage among various temperatures, using scanning and transmission electron microscopy, hair soluble protein analysis, and measurements of water contents. Results: In studying of electron microscopy, hair is damaged by repeating of hair dryer and washing. Especially, cuticle and cell membrane complex are severely damaged in high temperature. In case of natural drying, there is no damage of cuticle layer, cortex and melanin granule, but damaging of cell membrane complex are existed. In studying of spectrophotometer, hair color is changed by repeating of hair dryer and washing. Especially, hair color is severely changed over in high temperature. In analysis of moist contents, there are not statistical differences in various temperature.

#### P070

##### Effect of several monoterpenes on hair growth

Department of Dermatology, School of Medicine, Chungnam National University

**Yu Jin Kim, Nari Kim, Dae-Kyoung Choi, Yoo Bin Kwon, Young-Joon Seo, Jeung-Hoon Lee, Jang-Kyu Park, Chang Deok Kim**

Hair loss is a common and distressing phenomenon affecting the quality of life negatively. Thus it is important to develop new therapeutic materials to stop hair loss and to enhance hair growth. monoterpenes are used in topical agents as a penetration enhancer. In this study, we tested the effects of several monoterpenes, including ( $\pm$ )- $\beta$ -citronellol, (-)- $\beta$ -citronellene, (+)- $\beta$ -citronellene and linalool oxide, on hair growth using in vivo and in vitro test models. After topical application of ( $\pm$ )- $\beta$ -citronellol onto the back of C57BL/6 mice, earlier conversion of telogen-to-anagen was induced. To investigate the action mechanism, we treated cultured dermal papilla cells with monoterpenes. The growth of dermal papilla cells, however, was not affected by monoterpenes. RT-PCR analysis

showed that ( $\pm$ )- $\beta$ -citronellol induced mRNA levels for keratinocyte growth factor (KGF), suggesting that the effects of ( $\pm$ )- $\beta$ -citronellol on hair growth may be mediated through the regulation of growth factors in dermal papilla cells. We further investigate the effect of ( $\pm$ )- $\beta$ -citronellol on the Wnt signaling pathway using adenovirus expressing TOPflash. Interestingly, ( $\pm$ )- $\beta$ -citronellol induced the luciferase activity in a dose dependent manner, suggesting that ( $\pm$ )- $\beta$ -citronellol may have impact on intracellular  $\beta$ -catenin signaling. Taken together, these results suggest that ( $\pm$ )- $\beta$ -citronellol has hair growth promoting potential.

#### P071

##### The effect of proopiomelanocortin-derived peptides on the human hair follicles immune system

Department of Dermatology and Institute of Hair and Cosmetic Medicine, Yonsei University Wonju College of Medicine, <sup>1</sup>Department of Dermatology, College of Medicine, Soonchunhyang University

**Sang-Hoon Lee<sup>1</sup>, Young-Lip Park<sup>1</sup>, Kyu-Uang Whang<sup>1</sup>, Long-Quan Pi, Soo-Young Jeon, Won-Soo Lee**

It is well known that neuropeptides derived from proopiomelanocortin (POMC) are created in many organs including skin and display various immune regulation effects. In this study we examined the effect of POMC-derived peptides on the Immune privilege (IP) of human hair follicles, and its effect on the cytokine release of follicular cells using reverse transcriptase-polymerase chain reaction and immunohistochemistry. As results, Adrenocorticotrophic hormone (ACTH),  $\alpha$ -melanocyte stimulating hormone ( $\alpha$ -MSH),  $\beta$ -endorphin down-regulated INF- $\gamma$  induced eczematous HLA class I expression, especially on the concentration of 10-7M ACTH, 10-6M  $\alpha$ -MSH, 10-6M  $\beta$ -endorphin and immunohistochemical staining shows similar effect. On outer root sheath cell culture, POMC-derived peptides suppress proinflammatory and hair growth inhibitory cytokine (IL-1 $\alpha$  and IL-1 $\beta$ ) release. These results indicate that POMC-derived peptides (ACTH,  $\alpha$ -MSH,  $\beta$ -endorphin) might be an immune modulator of the hair follicle biology.