

< Presenting Aderans R&D Team's research results to the world >

**Discovery of distinctive proteins among
patients with alopecia through
“proteome analysis” of hair applying deep learning**

Attracting attention at the 12th World Congress for Hair Research

Aderans Co., Ltd. (Head Office: Shinjuku-ku, Tokyo, Japan; Group CEO, Representative Director, and President: Yoshihiro Tsumura), promoting the wellness industry of hair, beauty, and health on a global scale, has successfully discovered distinctive proteins in the hair of people with androgenetic alopecia (AGA) and female androgenetic alopecia (FAGA), using a technology for the proteome analysis* of hair. The results were presented at the 12th World Congress for Hair Research (WCHR 2022), which took place at the Melbourne Convention and Exhibition Centre (Melbourne, Victoria, Australia) from Friday, November 18 to Monday, November 21, 2022.

* Analyzing the structure and functions of proteome (all proteins in biological samples)

In this research, we have established the proteome analysis of hair, which enables us to detect numerous proteins contained in hair, by combining our technology to analyze the components of hair and deep learning. By analyzing proteins in hair with this technology, we have confirmed the smaller amount of the protein TGM3 in the hair shafts of people with alopecia. We will take further steps by examining the functions of TGM3 in hair and applying its results to hair care products, with a commitment to continuing research aiming to help address alopecia.

AGA is a hair loss condition experienced by adult males, with gradual hair thinning and loss along the frontal hair line and over the crown. While several therapeutic agents are available for AGA, they also have limitations including side effects and individual differences in efficacy. As for FAGA, since its specific mechanism is still unknown, effective treatment methods are yet to be developed.

To address these serious issues, Aderans makes continued research efforts by applying the hair technology it has developed for over 50 years since the foundation, aiming to offer solutions to people with AGA and FAGA and enable them to smile from the bottom of their hearts.

Background

Hair consists of different parts, including the hair shaft exposed at the skin's surface and the hair follicle within the skin. It is formed through the division of hair matrix cells, following instructions from the hair dermal papilla at the end of the hair follicle, and the subsequent change called keratinization. The nutrients and various cell components, which the hair dermal papilla obtains through capillary vessels, will be fixed along with keratinization and remain in the hair for a long time. While the protein called keratin is said to be the dominant component of hair, accounting for over 80%, little is known about other proteins in hair.

We have worked to develop a technology that enables us to extract and analyze various components of hair, such as minerals and amino acids, in an accurate and efficient manner. By combining this technology and deep learning, which has been showing remarkable progress in recent years, we have established the proteome analysis of hair, a method of detecting numerous proteins contained in hair. Since this proteome analysis can identify around 10 times as many proteins as other research teams, it is effective in studying proteins in hair.

Methods

The study was conducted with five males without alopecia, five males with AGA, and four females with FAGA. We took hair shafts produced in the anagen phase from the parietal and occipital regions of each subject, with which we conducted the proteome analysis. Using the obtained data, we compared the hair shafts of people with and without alopecia, and searched for key proteins in alopecia.

Results

More keratin was extracted from the hair shafts of people with alopecia.

We have confirmed the extraction of more keratin from the hair of people with alopecia than those without it (Figure 1). The extraction of more keratin means the lower level of keratin cross-linking. Since keratin cross-linking is known as one of the factors that give firmness to hair, the result suggests that people with alopecia have more fragile hair than those without it.

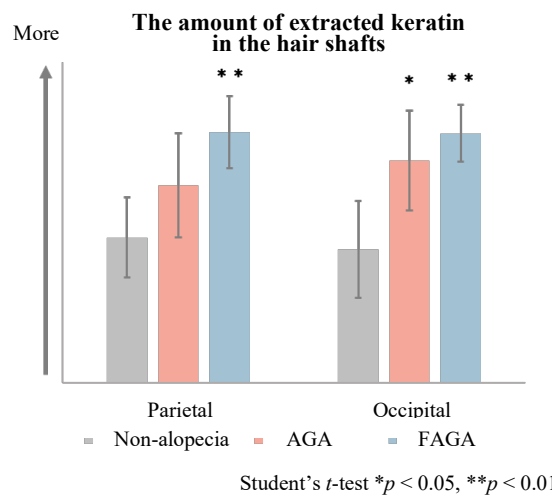


Figure 1. The amount of extracted keratin in the hair shafts of people without alopecia (Non-alopecia) and with alopecia (AGA for males, FAGA for females)

Less TGM3, an essential protein for hair formation, was found in the hair shafts of people with alopecia.

We have confirmed the smaller amount of the protein TGM3 in the hair shafts of people with alopecia (Figure 2). While few reports are available on TGM3, one of them (John, et al., 2012) observed a wavy pattern in the hair of mice with no TGM3. We have started additional analyses on causal relationships between the anagen hair shafts of people with alopecia and the wavy pattern.

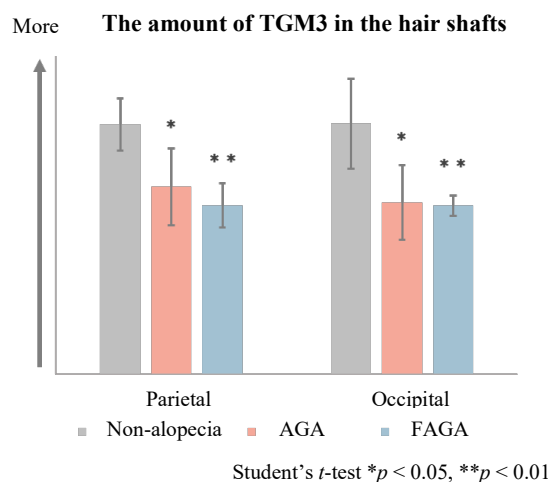
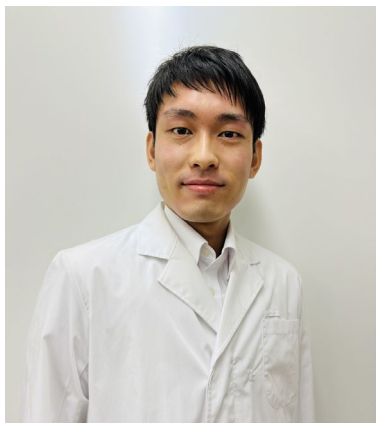


Figure 2. The amount of TGM3 in the hair shafts of people without alopecia (Non-alopecia) and with alopecia (AGA for males, FAGA for females)

Based on the numerous proteins we have detected in this study, we will conduct further research to identify those associated with TGM3.

Overview of the Conference

Title : The 12th World Congress for Hair Research
Dates : Friday, November 18 to Monday, November 21, 2022
Venue : Melbourne Convention and Exhibition Centre (Melbourne, Victoria, Australia)
Presentation title : New findings in androgenetic alopecia and female androgenetic alopecia are revealed by proteomics.
Presenter : Keigo Sugimoto (R&D Department, Aderans Co., Ltd.)



As a leading company in the field of total hair solutions, Aderans actively engages in a wide range of hair-related research, such as research and development of functional artificial hair and medical wigs, research related to hair growth and hair scalp care, and research on prevention of chemotherapy-induced alopecia. Through these efforts, we strive to enhance “product excellence,” which is one of our management philosophies, and facilitate the development of the hair-related industry.

Presenting the findings of such research at academic conferences in Japan and overseas will further advance the hair-related industry, and we also hope that such initiatives will then contribute to solving hair problems facing many people as well as improving their physical and mental health.

< Media Inquiries >

Group CSR and Corporate Communications Office, Aderans Co., Ltd.

TEL: +81-3-3350-3268 E-mail: pr@aderans.com

Aderans website: <https://www.aderans.co.jp/corporate/english/>