MILBON

News Release

November 9, 2015

Discover of a New Approach for Hair Lying Down from the Roots

~ Confirming Molecular Level Recovery of the Dual Structure of Protein Density inside Hair ~

The Milbon Co., Ltd. (President and CEO: Ryuji Sato) has confirmed that in the hair of women that has started to lie down from the roots due to age, application of CMADK[*1] (S-carboxymethyl alanyl disulfide keratin protein) and a specific polyphenol[*2] allows the dual structure of protein density inside the hair to recover at the molecular level. It was already confirmed that one of the reasons for hair starting to lie down from the roots due to advancing age is the uneven breakdown of the dual structure of protein density inside the hair, but an effective way to help that dual structure recover was yet to be found.

Milbon intends to apply this discovery concerning the recovery of the dual structure to hair care products to be released in spring next year. We have announced these research results externally as follows.

[External Release]

Released At: The Society of Fiber Science and Technology Fall Research Symposium 2015
Release Title: “Investigation into components distribution in hair using an infrared microscope”
Released By: Kosuke Watanabe, Ryosuke Yamanaka, Kazuyuki Suzuta, Takaaki Maeda, Len Ito
Released On: October 22, 2015

Released At: The 67th Annual Meeting for the Society of Biotechnology, Japan
Release Title: "Age-related change of components distribution in Japanese woman’s hair using infrared microscope”
Released By: Kosuke Watanabe, Ryosuke Yamanaka, Kazuyuki Suzuta, Takaaki Maeda, Len Ito
Released On: October 26, 2015

[Research Background]

Milbon had already confirmed an uneven breakdown of the dual structure of protein density inside women’s hair that has started to lie down from the roots due to age, and that this is one of the reasons why hair starts to lie down, (http://www.milbon.co.jp/ir/pdf/20150914_dual-structure-of-protein-density.pdf). However, the relationship been the dual structure of protein density and the physical properties of the hair remained unknown, and its effects on the phenomena of hair starting to lie down at the root was also unknown. Furthermore, technology or an approach to prevent this phenomena was yet to be discovered. Milbon’s new research has not only discovered the relationship been the dual structure of protein density and the physical properties of hair, but also establishes an approach to resolving the issues of women’s hair lying down from the root by aiding the recovery of its dual structure of protein density.

[Research Results]

~ The Relationship between the Dual Structure of Protein Density and Elasticity of Hair ~

When a successive twists test was used to assess the elasticity of hair, it was discovered that hair that still stands up at the root and has a complete dual structure of protein density has higher elasticity than hair that has started to lie down at the root and in which the dual structure of protein density has started to break down (Fig. 1). These results have confirmed that the dual structure of protein density is related to the elasticity of hair. The breakdown of the dual structure of protein density lowers the elasticity of hair at the root, which in turn is thought to lead to the hair starting to lie down from the root.

~ Recovery of the Dual Structure of Protein Density via CMADK and Polyphenol ~

In order to prevent hair starting to lie down from the root, Milbon has investigated components that could recover the dual structure of protein density in hair. When the recovery of the dual structure of protein density was examined using the SPring-8 Synchrotron Radiation Facility[*3] and the microscopic FT-IR method[*4], it was discovered that application of the keratin protein CMADK developed by Milbon and a specific polyphenol led to the effective recovery of the dual structure of protein density in hair, (Fig. 2). Furthermore, when a successive twists test was performed on hair with a dual structure of protein density that had been recovered in this way, it was confirmed that the elasticity of the hair had also improved, (Fig. 3).

The above results suggest that the combination of CMADK and a specific polyphenol can restore the dual structure of protein density in hair, enhancing its elasticity and leading to a reduction in the hair starting to lie down from the root.

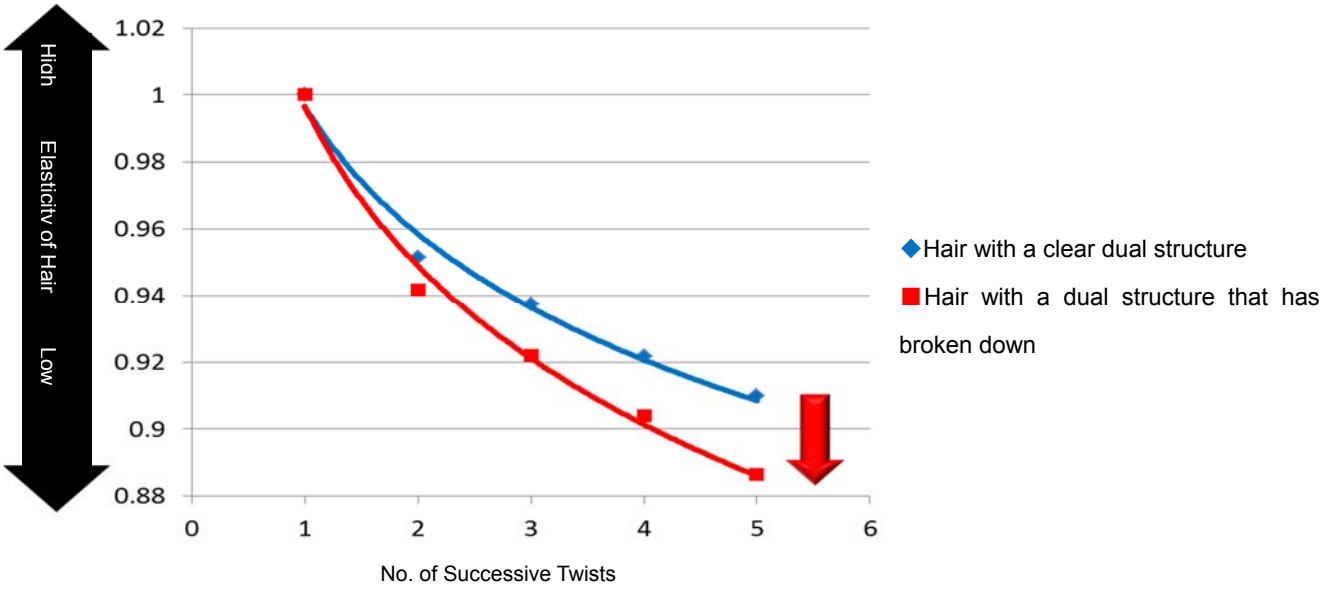
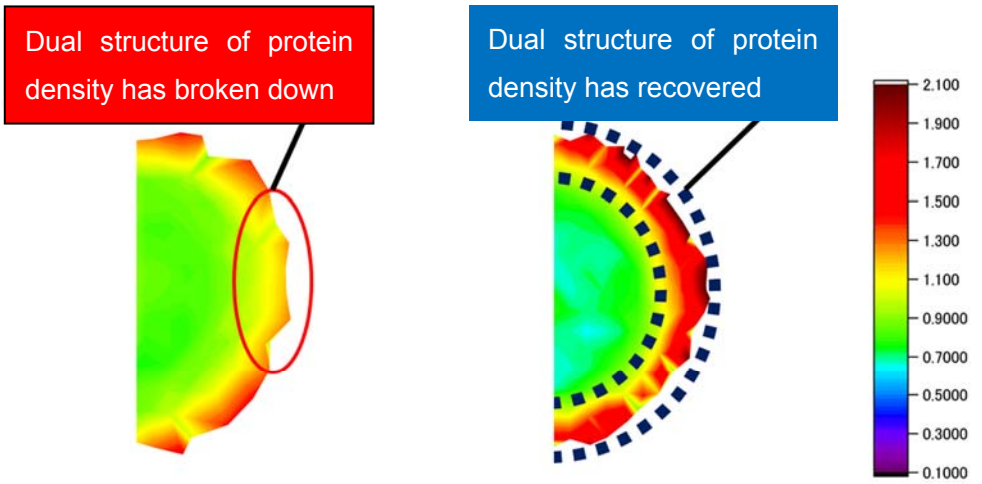


Fig.1 Dual Structure of Protein Density and Elasticity of Hair

When the dual structure of protein density starts to break down, the elasticity of hair decreases.



Untreated Hair

Hair Treated with CMADK and Polyphenol

Image of Amide III Band*5 peak strength rendered in 3D through analysis of SPring-8 microscopic FT-IR data

Fig. 2 Dual Structure of Protein Density via CMADK and Polyphenol

Use of CMADK and a specific polyphenol restored the dual structure of protein density.

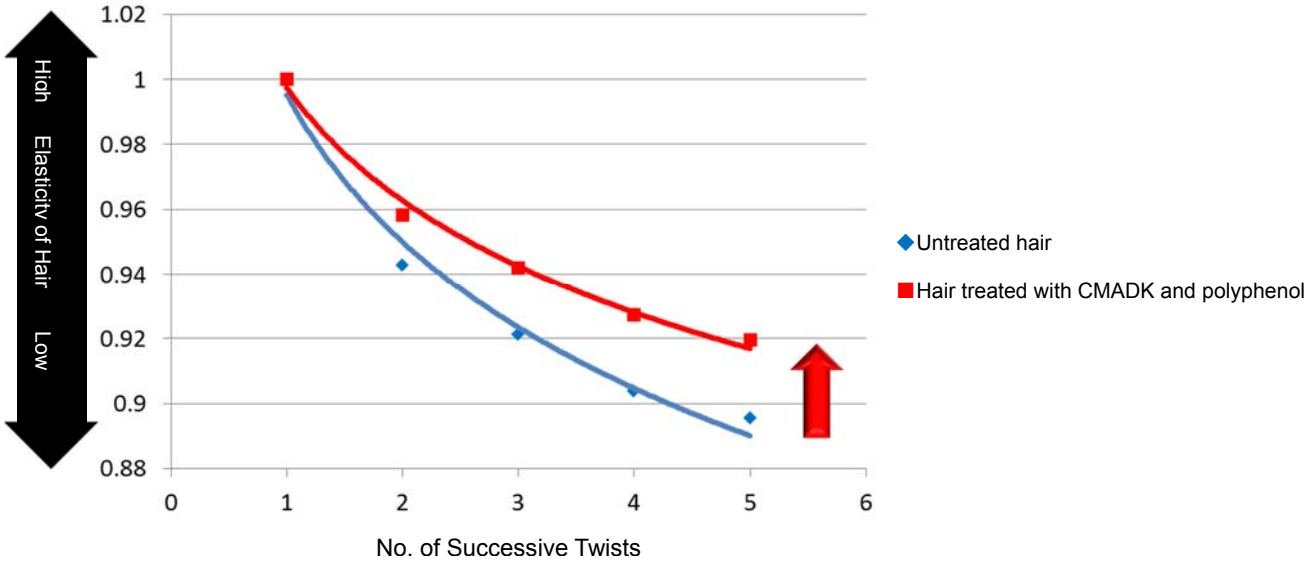


Fig. 3 Increase in Hair Elasticity due to CMADK and Polyphenol

Use of CMADK and a specific polyphenol increased the elasticity of hair.

Part of this experiment uses results from the Japan Synchrotron Radiation Research Institute (SPring-8/JASRI) industrial use general research 2015A1654.

<Terminology>

*1 CMADK S-carboxymethyl alanyl disulfide keratin protein

Also known as carboxymethyl disulfide keratin, this is a new soluble keratin protein with a disulfide bond (a bond found in hair that is shared by two sulfur (S) atoms). The properties of these disulfide bonds cause CMADK to bond tightly with the protein found in hair, and expectations for CMADK are high as a material that retains its properties even after repeated washing.

*2 Polyphenol

Polyphenol is found in the large majority of plants. It is a pigment that is generated via photosynthesis and can provide an astringent or bitter flavor. There are over 5,000 different varieties of polyphenol, it is known as a material with potent antioxidative effects, and it is widely used in food and cosmetics products.

*3 SPring-8 Synchrotron Radiation Facility

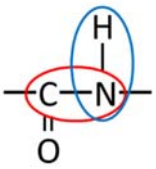
A Riken managed facility capable of producing the highest levels of synchrotron radiation in the world, located in the Harima Science Park City, Hyogo Prefecture. There are only two comparable facilities in the world, one in America and one in Europe. The name SPring-8 is taken from the full name of the facility, the Super Photon ring-8 GeV. Synchrotron radiation is the name given to the powerful electromagnetic waves generated when electrons are accelerated to almost the speed of light and then their direction of travel is altered using magnets. At SPring-8, this synchrotron radiation is used in a wide range of research, including into nanotechnology, bio-technology and manufacturing.

*4 Microscopic FT-IR Method

The “microscopic FT-IR method” refers to the “microscopic Fourier Transform-Infrared Spectroscopy method,” an analytical device that is used to determine the composition of compounds. Molecules are exposed to infrared rays, during which the vibrational energy between the atoms comprising those molecules absorbs a certain amount of those rays. Measuring the volume absorbed therefore allows the composition of the compound to be established. The microscopic FT-IR method is an especially effective means of performing analysis in the microdomain, a scale at which the normal FT-IR method cannot obtain any measurements. This procedure is applied in a variety of different fields, including quality control of a range of industrial products, scientific investigation and biomedical composition analysis.

*5 Amide III Band

From among the peaks acquired from hair using infrared spectroscopy, the Amide III Band is the peak in the vicinity of 1240 cm-1 that expresses the C-N stretching vibration (inside the red circle on the diagram below) and the N-H bending vibration (inside the blue circle on the diagram below) of the peptide bonds found inside protein.



Peptide Bond

■Inquiries relating to the press release

MILBON Co.,Ltd. Public Relations Unit, 2-3-35 Zengenji-cho, Miyakojima-ku, Osaka
Phone: +81-6-6928-2331, Fax: +81-6-6925-2301