



Nov. 7, 2019

## **Discovery of Highly Effective Components for Aging Bacteria™ Present on the Scalp ~Successfully Suppressing Aging of the Hair and the Scalp~**

Milbon Co., Ltd. (President and CEO: Ryuji Sato) has successfully developed an innovative technology that can suppress the aging of the scalp and hair. Their technology focuses on the Aging Bacteria™ in the scalp flora\*<sup>1</sup>.

Various bacteria are present on the scalp, and these are collectively referred to as the scalp flora. Although scalp flora is likely to affect the hair and scalp, most of actual effects of the scalp flora remain unidentified. We previously discovered that the genus *Enterococcus*\*<sup>2</sup> in the scalp flora promote aging of the hair and scalp\*<sup>3</sup> and named them Aging Bacteria™ (in Japanese: *Rokakin*).

(Reference: Jun. 25, 2019 "Received the "Young Scientist Support Scheme" at the 14th Asian Societies of Cosmetic Scientists (ASCS) Conference in Hong Kong"

[https://www.milbon.co.jp/english/ir/upload\\_file/m000/Received\\_the\\_Young\\_Scientist\\_Support\\_Scheme\\_at\\_the\\_14th\\_ASCS\\_Conference\\_in\\_HongKong.pdf](https://www.milbon.co.jp/english/ir/upload_file/m000/Received_the_Young_Scientist_Support_Scheme_at_the_14th_ASCS_Conference_in_HongKong.pdf)

Thus, although the relationship of Aging Bacteria™ with the hair and scalp has been clarified via previous research conducted by our company, further investigation is necessary to identify the effective components for suppressing Aging Bacteria™ influences on the scalp and hair. Therefore, based on our previous findings, we investigated the methods of reducing the growth of Aging Bacteria™ and improving the condition of the scalp after it has been affected by Aging Bacteria™, and eventually, were able to identify components that would help us achieve this goal.

We expect that highly effective hair care products can be developed using our technology, which can inhibit the bad effects of Aging Bacteria™.

Our research results were reported at the following academic meetings. These findings will be applied to hair and scalp care products available for sale from next spring.

### **External Publication**

Poster session of the 92<sup>nd</sup> Annual Meeting of the Japanese Biochemical Society

Presentation title: Identified Bacteria Colonizing on Scalp Accelerates Aging of Scalp and Hair

Presentation date: September 20, 2019

### **Research Background**

With the increase in the aging population in developed countries, there has been an increase in the demand for hair care products that can inhibit aging of the hair and scalp year by year. Many Japanese women, who tend to have thick and straight hair, experience problems with

respect to hair quality because aging reduces hair stiffness, resulting in hair appearing wavy and hardening. Owing to these conditions, the hairstyles are limited for these women. However, No definite method for essential resolving these issue has been developed now.

We previously conducted a large-scale survey on the hair and scalp with over 3,000 Japanese women and found that women with progressive aging of the hair and scalp had a lot of *Enterococcus* on their scalp. We have clarified that *Enterococcus* promotes aging of scalp cells and can affect hair formation (Figure 1). Thus, to inhibit age-related changes in the hair and scalp, we developed technology that can suppress effects of *Enterococcus* presents on the scalp.

## Research Results

We investigated various components from the following three points to inhibit age-related changes in the hair and scalp by suppressing effects of *Enterococcus*.

### 1. Inhibiting the growth of *Enterococcus*

Scalp flora is constituted of various bacteria in addition to *Enterococcus* maintaining a delicate balance. Therefore, a component that can sterilize all the bacteria on the scalp would not be ideal. That's the reason why we needed to find a component that would only inhibit the growth of *Enterococcus*. After investigating various components, we discovered that the addition of a certain concentration of glycine<sup>\*4</sup> enabled the inhibition of the growth of only *Enterococcus* (Figure 2A).

### 2. Reducing the aging-promoting components produced by *Enterococcus*

We confirmed that *Enterococcus* produces components that promote aging; therefore, we attempted to identify components that could inhibit the production of aging-promoting components. Consequently, we discovered that phytic acid<sup>\*5</sup> had marked inhibitory effects (Figure 2B).

### 3. Inhibiting cellular aging

In a previous study, we found that the aged scalp cells had an inhibitory effect on the growth of hair follicle cells that control hair formation. In addition to bacteria effects, cellular aging needs to be inhibited for effective suppression of age-related changes in the hair. As a result of investigating components that could inhibit cellular aging, we discovered that magnesium ascorbyl phosphate<sup>\*6</sup> and  $\delta$ -tocopherol<sup>\*7</sup> are particularly effective (Figure 2C).

We prepared a scalp serum containing the four above-mentioned components; 10 female monitors continuously used it for 6 months. As a result, we confirmed that the percentage of *Enterococcus* in the scalp flora decreased, hair loss reduced, and torsional rigidity modulus<sup>\*8</sup> of newly grown hair increased (Figure 3). In the future, Milbon Co., Ltd will develop hair and scalp care products focusing on scalp flora utilizing this technology to help affected women with limited hairstyles, and result in keeping their hair beautiful throughout their lives.

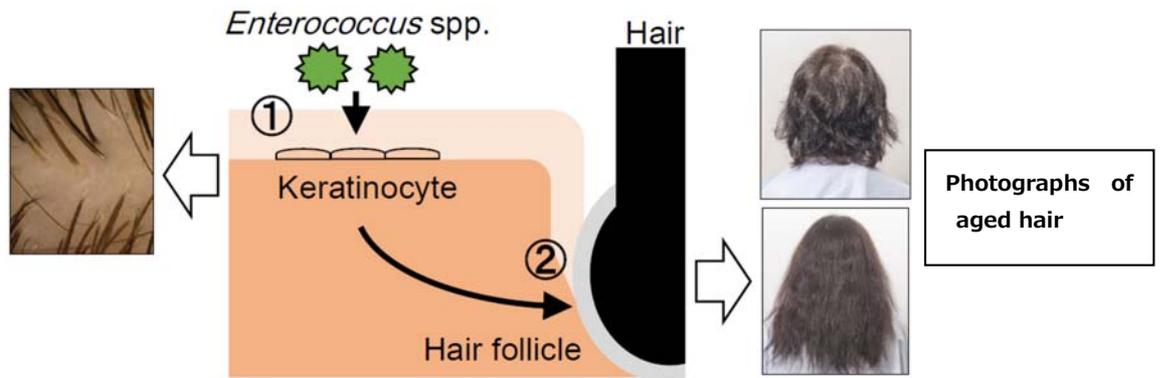


Figure 1. Mechanism by which *Enterococcus* promotes aging

- ① *Enterococcus* ages scalp cells.
- ② Aged scalp cells inhibit the growth of hair follicle cells.

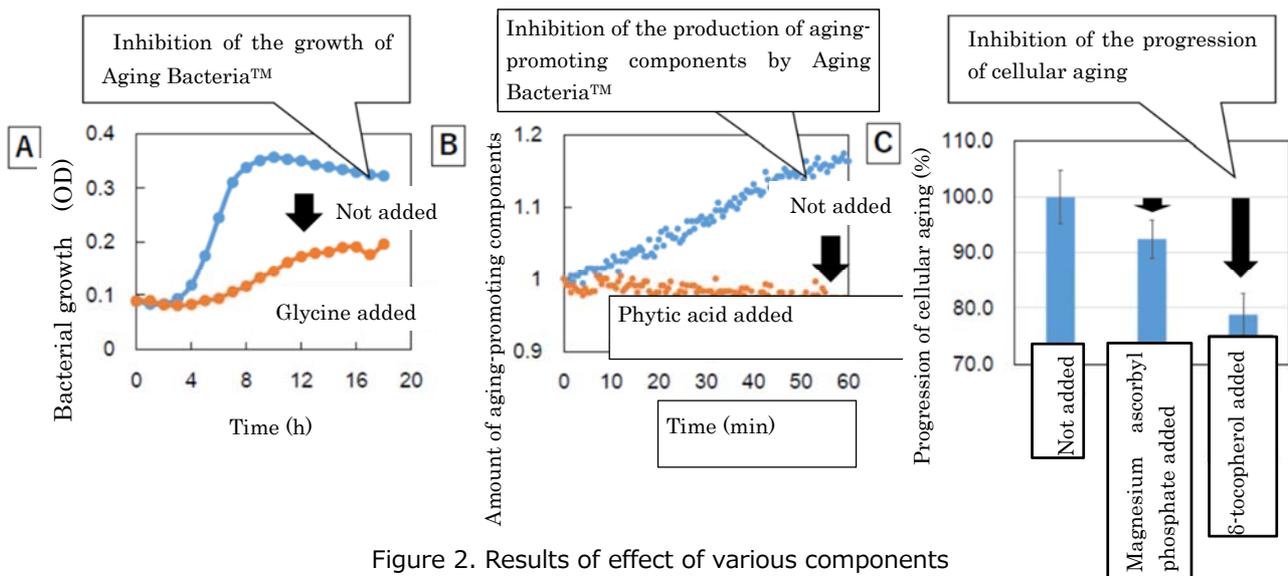


Figure 2. Results of effect of various components

- A** Inhibitory effect of glycine on the growth of *Enterococcus*. The addition of glycine suppresses the growth of *Enterococcus*.
- B** Suppressing effect of phytic acid on the production of aging-promoting components by *Enterococcus*. The addition of phytic acid results in almost no production of aging-promoting components otherwise produced normally.
- C** Inhibitory effects of magnesium ascorbyl phosphate and  $\delta$ -tocopherol on the progression of cellular aging. Decreases in cellular  $\beta$ -galactosidase activity<sup>\*9</sup> are found with the addition of these components than those with no addition; such addition thereby suppresses the progression of cellular aging.

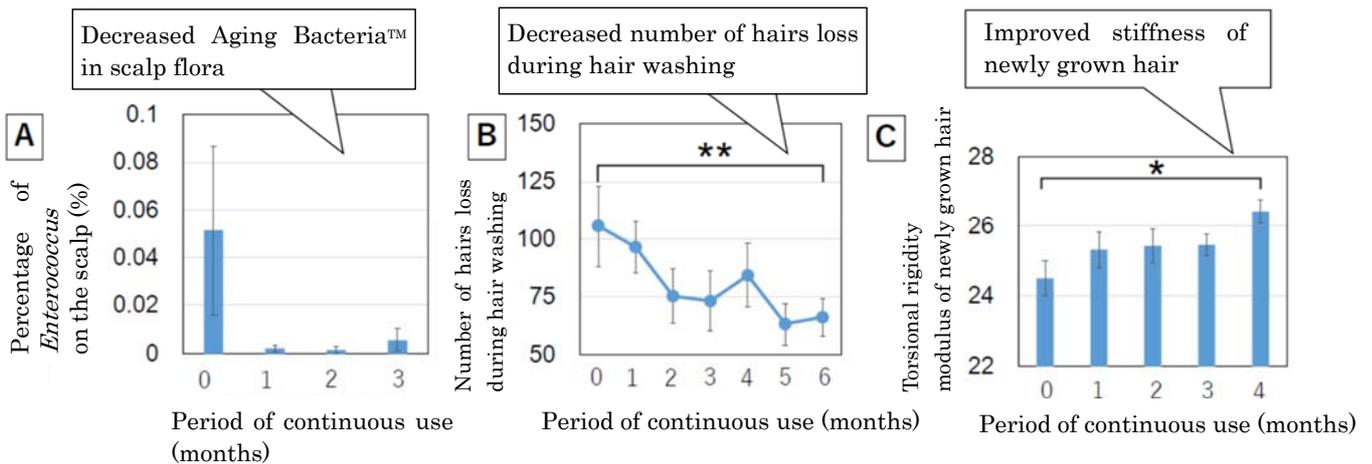


Figure 3. Results of the effects of continuous use of scalp serum containing components

《Definition of Terms》

※1 Scalp flora

Bacteria referred to as resident bacteria are present in all areas throughout the human body. The resident bacteria on the scalp are termed as scalp flora. As in plants, resident bacteria grow in colonies to form bacterial plexuses. Therefore, these are referred to as flora and bacterial plexuses on the scalp are called scalp flora.

※2 The genus *Enterococcus*

These bacteria are lactic acid bacteria and spherical. Although there have been reports of these bacteria being present in the gastrointestinal tract or oral cavity, they have not previously garnered attention as resident bacteria on areas of the body surface, such as the skin or scalp.

※3 Aging of the hair and scalp

The symptoms of aging of the hair include increased number of gray hairs; decreased hair amount per unit area; increased thin hair; increased wavy hair; loss of shine, and stiffness; and decreased resistance to damage. The symptoms of aging of the scalp include increased hair loss, yellowing and browning of the scalp color, and decreased scalp flexibility.

※4 Glycine

This amino acid is present in large quantities in the human body. Its uptake into the cell wall of bacteria inhibits cell division; therefore, it is used as a bacteriostatic agent in foods. It does not affect animal or human cells because these cells do not have cell walls. Occasionally, glycine is used as a moisturizing ingredient in cosmetic products.

※5 Phytic acid

This component is contained in large amounts in plants and particularly in seeds and has the property to bind to iron. *Enterococcus* needs iron to produce aging-promoting components; phytic acid can inhibit this function.

※6 Magnesium ascorbyl phosphate

This is a derivative of vitamin C. It inhibits cellular aging through its antioxidant effects.

※7 δ-Tocopherol

This is a type of vitamin E. Similar to magnesium ascorbyl phosphate, it inhibits cellular aging via antioxidant actions. It is also known that vitamin E and vitamin C have synergistic effects.

※8 Torsional rigidity modulus of hair

This is a physical property of hair that is related to stiffness.

※9 β-galactosidase activity

An enzyme that breaks down some sugars; it is widely used as a marker of cellular aging. β-galactosidase activity is known to increase with aging.

■ For inquiries relating to this press release

**m i l b o n** Co.,Ltd.

PR Office, Kyobashi Edogrand, 2-2-1 Kyobashi, Chuo-ku, Tokyo  
Phone: +81-3-3517-3915, Fax: +81-3-3273-3211

Milbon Co., Ltd. / Head Office: Chuo-ku, Tokyo; President & CEO: Ryuji Sato; Securities Code: 4919 (First Section of the Tokyo Stock Exchange)