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Milbon Confirms that Facial Skin Condition can be Predicted from Scalp Yellowing, Barrier Function, and Sebum Amount

Milbon Co., Ltd. (head office: Chuo-ku, Tokyo, President and CEO: Hidenori Sakashita), a manufacturer of salon-exclusive haircare products and cosmetics, has confirmed that facial skin condition can be predicted by analyzing the relationship between the scalp and facial skin—specifically through scalp yellowing, [*1] barrier function, [*2] and sebum amount. These scalp conditions are readily observable in salon environments. The results of this research were presented at the following academic conference.

[Presentation]
Academic conference: ASCS Conference 2025
Title of presentation: Can we predict the facial skin condition without makeup removal?
Date of presentation: June 4-5, 2025

[Research Background]
Hair professionals observe and touch the scalps and hair of many people every day and are skilled in observing scalp and hair conditions. This allows them to select and recommend beauty care methods tailored to each customer's scalp and hair conditions, taking into account seasonal changes and the effects of aging.

Milbon has been conducting research on the relationship between the scalp and hair (Milbon Received Johann Wiechers Poster Award at 30th International Federation of Societies of Cosmetic Chemists [IFSCC] Congress in Munich [News Release in Japanese, September 27, 2018]), and is now able to assess hair condition from the condition of the scalp, thereby expanding the range of beauty care methods that can be suggested by hair professionals to their customers (gray box in Figure 1).

When customers visit hair salons, being able to assess both scalp and facial skin conditions enables hair professionals to offer optimal beauty care, including skincare and makeup. This helps improve beauty awareness and foster a relationship of trust between hair professionals and their customers. However, since many people wear makeup when visiting hair salons, it was difficult to directly observe the condition of their bare facial skin.

Therefore, we hypothesized that if facial skin condition could be predicted from the condition of the scalp— which hair professionals can observe during consultation and treatment—it would be possible to offer optimal beauty care across a wide range of areas, including hair, scalp, and facial skin (red box in Figure 1). Although the scalp skin is continuous with the facial skin, few studies have explored the correlation between scalp and facial skin conditions. Therefore, a study was conducted on 249 Japanese women to examine the relationship between facial skin and scalp conditions as observed by hair professionals during consultations and treatments.
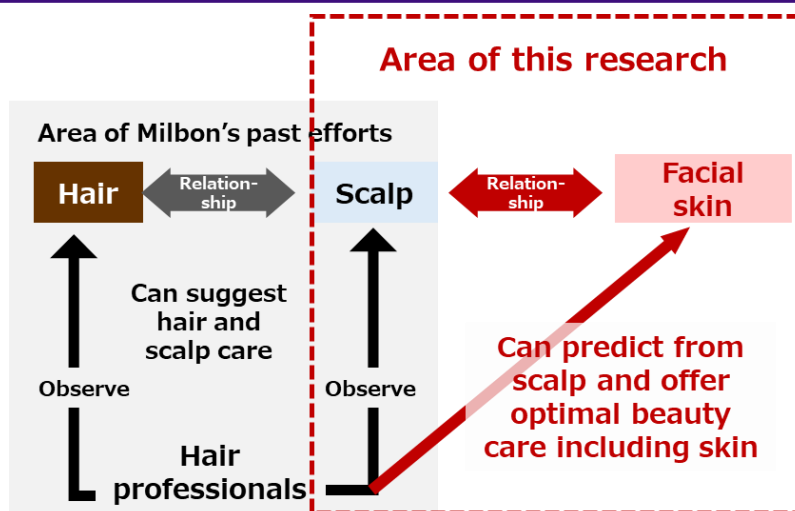
Figure 1. Expansion of the scope of optimal beauty care offerings by hair professionals

[Study Findings]

1. **Confirmed that the surface texture of the facial skin and the state of melanin can be predicted based on scalp yellowing**

As a result of investigating various aspects of scalp and facial skin conditions, scalp yellowing was found to be related to both surface irregularities and melanin levels in the facial skin. [*3] Scalp yellowing is a sign of aging caused by oxidation and glycation of the skin. It is also known to be related to hair aging and is therefore an important aspect for hair professionals to consider when observing the scalp. It is also believed that oxidation and glycation can cause an increase in surface texture of facial skin and promote melanin production. The 249 subjects in this study were divided into two groups—those with weak scalp yellowing, and those with strong yellowing—to compare facial skin surface texture and melanin levels. The results confirmed that the group with pronounced scalp yellowing had more pronounced facial skin surface texture (Figure 2a) and high facial skin melanin level (Figure 2b).
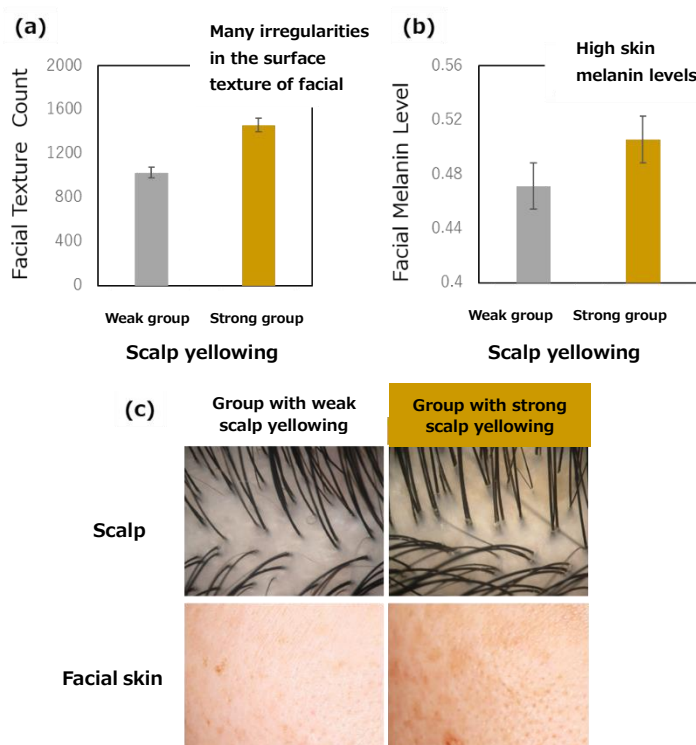
Figure 2. Relationship between scalp yellowing and facial skin surface texture, and melanin level

(a) Texture counts based on image analysis (b) Melanin levels based on image analysis

(c) Examples of conditions

The group with strong scalp yellowing (114 subjects) had significantly more facial skin surface texture and higher facial skin melanin levels compared to the group with weak scalp yellowing (135 subjects).

2. **Confirmed that facial skin barrier function can be predicted from scalp barrier function, and that facial sebum amount and pore condition can be predicted from scalp sebum amount**

Milbon also investigated the scalp's barrier function—an essential factor for healthy skin—as well as sebum amount. Upon measuring transepidermal water loss[*4] (TEWL), an indicator of barrier function, it was confirmed that the group with high scalp TEWL also had high facial skin TEWL (Figure 3).
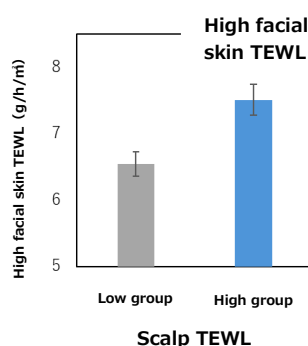

Figure 3. Relationship between scalp TEWL and facial skin TEWL

The group with high scalp TEWL (124 subjects) had significantly higher facial skin TEWL than the group with low scalp TEWL (125 subjects).

It was also confirmed that the group with a high scalp sebum amount had high facial skin sebum amount (Figure 4a) and a high number of prominent pores (Figure 4b).
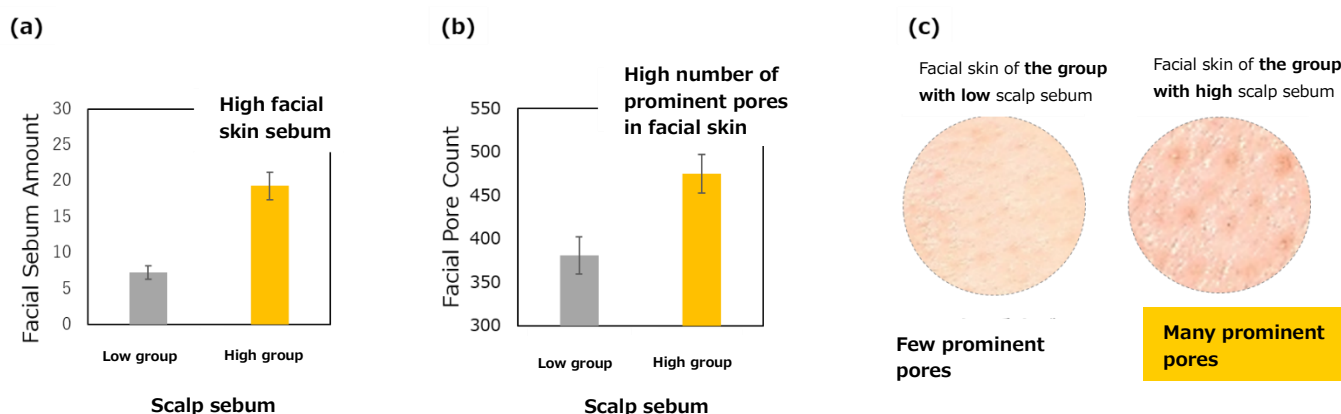

Figure 4. Relationship between scalp sebum and facial skin sebum and the number of prominent pores

(a) Facial skin sebum measurement results (b) Pore counts based on image analysis

(c) Examples of condition

The group with high scalp sebum (125 subjects) had significantly higher facial skin sebum and more prominent pores compared to the group with low scalp sebum (124 subjects).

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[Future Vision]

Milbon will continue to collect and analyze big data on scalp, hair, and facial skin to develop methods that allow highly accurate and convenient predictions from scalp to facial skin condition at hair salons. We will also investigate the underlying causes of the relationships identified between the scalp, hair, and facial skin to develop effective care methods.

≪Terminology≫

*1 Scalp yellowing

A condition in which the scalp loses its transparency and becomes yellowish. It is caused by oxidation and glycation of the skin.

Milbon has previously conducted research on the relationship between scalp yellowing and hair aging phenomena.

*2 Barrier function

One of the functions of the skin for protecting the body. It protects the body from entry of external substances and reduces the loss of water from inside the body.

*3 Melanin level

A value obtained by measuring melanin concentration based on its known absorption spectrum of melanin to calculate the average melanin concentration per unit area.

*4 Transepidermal water loss

The amount of water that evaporates from the body's surface through the stratum corneum. This value is used as an indicator of the skin's barrier function; the greater the water loss, the weaker the barrier function is considered to be.