

Mandom Discovers a Sweat-Like Scalp Odor Characteristic of Women in Their 40s

—Providing solutions for women's odor problems—

Mandom Corporation (head office: Osaka City, President Executive Officer & Director: Ken Nishimura, hereinafter referred to as “Mandom”) aims to elucidate the factors causing odors and to develop odor care products that address these factors, so as to solve problems related to odors in consumers. Mandom has so far clarified the actual situation of body odor in various parts of the body in individuals in a diverse range of ages.

In a recent study, it was found that the scalps of women in their 40s had a characteristic sweat-like odor, and that lower aliphatic aldehydes were involved as the cause.

The study findings were presented at the 1st Annual Congress of the Society of Cosmetic Chemists of Japan held from December 5 to 7, 2023.

Study Background

As we investigate consumers' problems relating to body odors, we received many responses from women in their 40s or older who said that they felt a change in body odor. Mandom's awareness survey^{*1} of 10,000 women aged between 30 and 54 revealed that women in their early 40s in particular felt a change in their body odor. Therefore, with the aim of clarifying the actual situation of body odor in women in their 40s, we evaluated their body odor, focusing on their recognition of the change in their body odor compared to when they were in their 20s. It was revealed that characteristic conditions were identified, particularly of scalp odor, in women in their 40s who felt a change in body odor. So, we evaluated the scalp odor of women in their 40s in detail and analyzed the odor components.

1. The scalps of women in their 40s who actually feel a change in body odor have a characteristic sweat-like odor

In a questionnaire survey of women in their 40s, it was found that the group of women in their 40s who felt a change in body odor had a higher proportion of individuals who felt an increase in sweating on the head and stickiness of the scalp and hair than the group that did not notice any change.

In order to understand in detail the body odor of women in their 40s who felt a change in body



odor, we conducted odor evaluations, where evaluations were made by directly sniffing in through the nose the body odors of the following groups: a group of women in their 40s who felt a change in body odor; a group of women in their 40s who did not notice any change in body odor; and a group of women in their 20s. As a result, it became clear that there was a significant difference between groups in terms of body odor, especially scalp odors. When the main odor types were compared among the three groups, it was found that the scalp odor type of the group of women in their 40s who felt a change in body odor was a sweat-like odor type. Meanwhile, the odor type of the group of women in their 40s who did not notice any change in body odor was a sebum-like odor, which was similar to the scalp odor of the group of women in their 20s (Fig. 1). The sweat-like odor characteristic of the group of women in their 40s who felt a change in body odor, was an odor that gives out a wet and damp smell. This odor was very different from the middle-aged oily odor, which smells like used-up cooking oil, characteristic of the scalp odor in men in their 40s or older.

Furthermore, when scalp odor intensities were compared, it was found that the intensity of the sweat-like odor was significantly higher in the group that felt a change in body odor (Fig. 2). In addition, when the degree of scalp odor unpleasantness was evaluated using the Visual Analogue Scale (VAS) method², the group of women in their 40s who felt a change in body odor was found to have a higher level of unpleasantness than the group that did not notice any change in body odor (Fig. 3).

From the above, it became clear that women in their 40s who felt a change in body odor had a characteristic sweat-like scalp odor, and the odor intensity and unpleasantness were high.

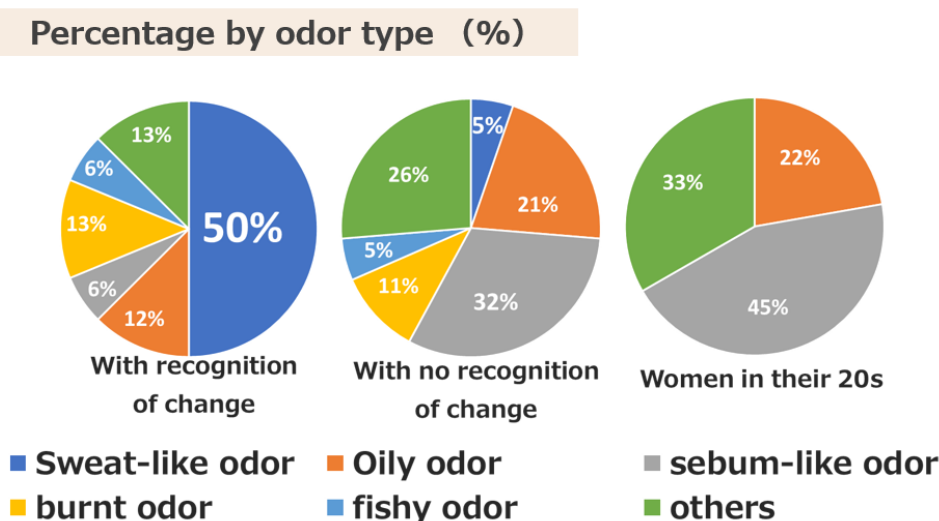


Figure 1. Distribution of the main odor types of the scalp

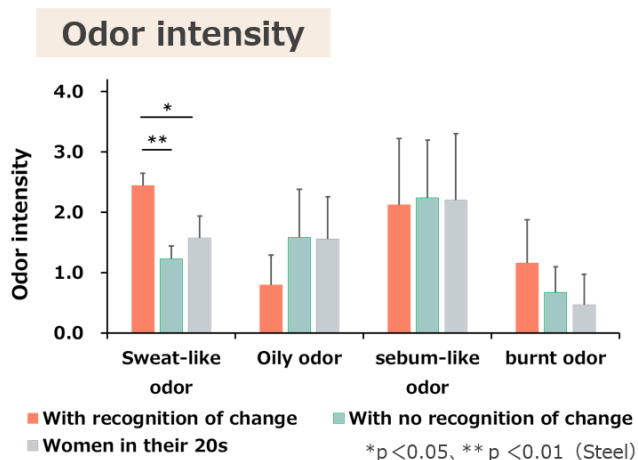


Figure 2. Odor intensity for each odor type of scalp odors

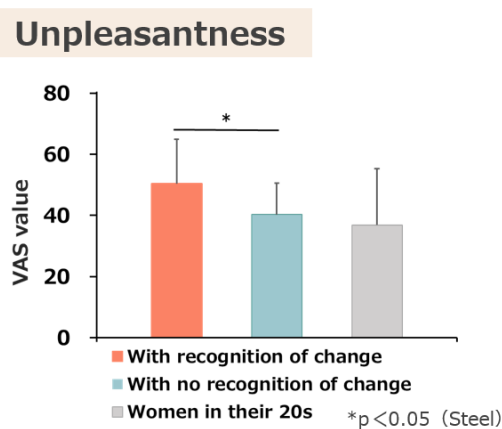


Figure 3. Unpleasantness of scalp odors

2. Sweat-like scalp odor is related to lower aliphatic aldehydes

In order to clarify the odor components that cause this sweat-like odor, we collected scalp odors from sweat-like odor group with women in their 40s who felt a change in body odor, non-sweat-like odor group with women in their 40s who did not notice any change in body odor, and women in their 20s. Approximately 200 volatile substances were detected in the collected scalp odor samples when the odors of volatile substances were evaluated using gas chromatography - mass spectrometry-olfactometry, and the causative components were searched. Since the sweat-like odor is characterized by a "wet and damp smell," the odor was considered to be related to lower aliphatic aldehydes among the approximately 200 volatile components that were analyzed in detail. As a result, it was found that the scalp odors of the sweat-like odor group contained a significantly greater amount of seven lower aliphatic aldehydes (Fig. 4). It was also found that the intensity of the sweat-like odor and the amount of lower aliphatic aldehydes in the odor evaluation showed a positive correlation (Fig. 4).

In addition, a detailed analysis of the seven lower aliphatic aldehydes revealed that butanal, 2-butanal, 3-methylbutanal, and pentanal were significantly more detected in the sweat-like odor group. When we confirmed the relationship between these four substances and the intensity of sweat-like odor in the odor evaluation of scalp odors, a positive correlation was observed in all four substances, and a correlation coefficient of around 0.5 was obtained for butanal, 3-methylbutanal, and pentanal (Fig. 5). Each odorous volatile substance has its own olfactory threshold³. Of the seven lower aliphatic aldehydes, 3-methylbutanal in particular had a low olfactory threshold and was characterized by the ease of being perceived, even in trace amounts.

Based on the above, it is considered that the scalp odors that many women in their 40s perceive as

a change compared to when they were in their 20s are sweat-like odors in which butanal, 3-methylbutanal, and pentanal, among the lower aliphatic aldehydes, are strongly involved.

The occurrence of this sweat-like odor may be involved in the increase in "stickiness of the scalp and hair" and "sweating on the head" in women in their 40s, and we will also confirm this relationship.

Going forward, Mandom aims to elucidate the mechanism of the occurrence of this sweat-like odor, to suppress its occurrence, and to conduct research on how to deal with the odor after it occurs, thereby providing solutions for the problem of odors in women.

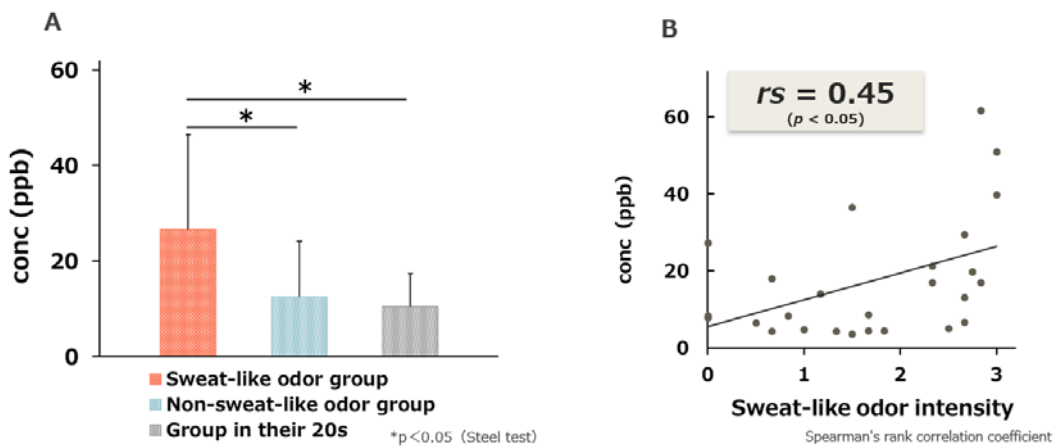


Figure 4. A) The amount of lower aliphatic aldehydes group and B) Correlation between the sweat-like odor intensity and the amount of lower aliphatic aldehydes group

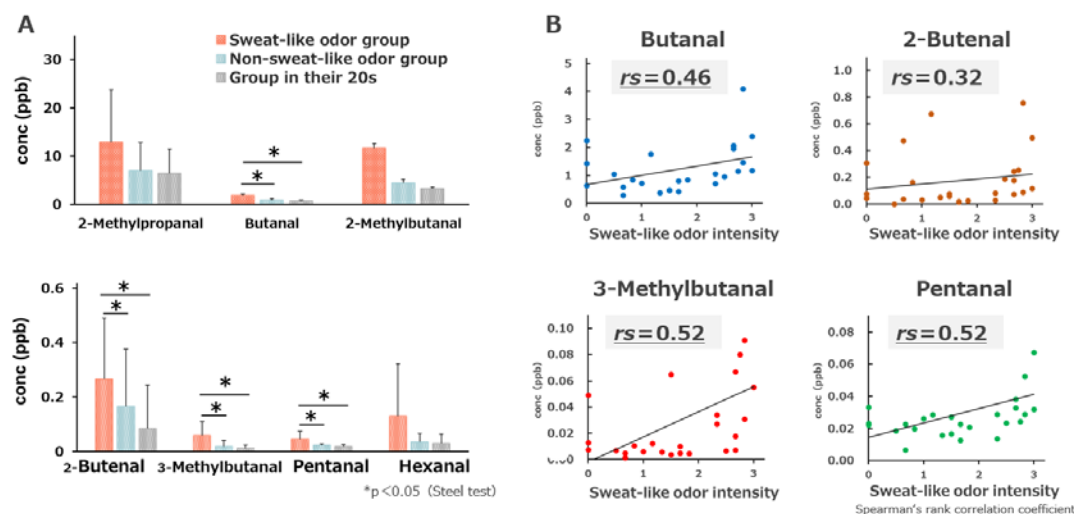


Figure 5. A) Comparison of the amount of lower aliphatic aldehydes and B) Correlation between the sweat-like odor intensity and the amount of each lower aliphatic aldehyde

Annotations and glossary

*1 October 2021 / Women at age 30-54 / n=10,000 / Internet survey / conducted by Mandom

*2 A method in which the lowest and highest standards are indicated at both ends of a 100 mm horizontal line segment, and the current sensation is recorded on the line segment.

In this study, the minimum and maximum criteria were defined as "non-unpleasant odor" and "the most unpleasant odor I have ever experienced," respectively.

*3 The minimum concentration of a chemical substance for which humans can perceive an odor. The lower the value, the more humans can sense the odor in trace amounts.