

## **Mandom Clarifies the Differences in the Axillary Odors of Men and Women**

### **Applying a Body Odor Evaluation Method Developed for Men to Research on Women**

Mandom Corporation (Headquarters: Osaka; President Executive Officer: Motonobu Nishimura; hereafter, Mandom) has been researching and developing methods to improve the functionality of cosmetic products (non-medicinal products). Previously, as a part of our study into the field of male body care, at Mandom, we conducted sensory evaluations of the axillary odor of Japanese men, clarified the current state of body odor among them, and applied our findings to our products.

At present, we have implemented the established method for evaluating axillary odors of men to the evaluation of the axillary odors of men and women. We found the following: Japanese women have lower axillary odor strength than Japanese men; the trend of “increases in age lead to a decrease in axillary odor strength” noted in men does not apply to women; there is a direct correlation between women who have dry earwax, axillar (underneath the axillary) transepidermal water loss (TEWL, water lost through the skin), and high axillary odor strength; fewer women have A-type (acidic) odors than men do; and birth experience does not affect axillary odor strength.

We plan to present these research results at the 17<sup>th</sup> International Symposium on Olfaction and Taste, ISOT, to be held on June 5-9, 2016, and the 78<sup>th</sup> Annual SCCJ Research Workshop, to be held on July 12, 2016.

#### 1. Differences in Axillary Odor of Japanese Men and Women

Mandom reported the following findings in a January 18, 2007 news release: (1) approximately 40% of Japanese men have an axillary odor strength of 4+ (strong axillary odor); (2) axillary odor is the strongest among Japanese men in their teens and 20s and decreases in men in the 30s and beyond; and (3) the three main odor types were M-type (milky), C-type (curry-like/spicy), and A-type (acidic), and the fraction of C- and A-type odors decreases in men in their 30s and beyond.

At present, in order to clarify the state of axillary odors among women, we applied our method established in the evaluation of male axillary odors to evaluate a total of 169 subjects: 82 Japanese females in their 20s to their 50s and 87 Japanese males in their 20s to their 40s.

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**[Axillary Odor Sensory Evaluation Method]**

- Survey subjects: 82 Japanese females between 20 and 55 year old and 87 Japanese males between 20 and 40 year old.
- Survey period: July-August 2014, July~August 2015
- Evaluation method: Subjects washed their axillae with unscented soap and wore an odorless T-shirt. After 24 h, we performed direct sensory evaluation from a distance of 2-3 cm of their axillary odor.
- Odor strength: By using our 6-point scale as a reference, we developed an 11-point scale to score odor strength.
- Odor type: We categorized odors into the 8 types revealed in our study conducted on men; to ensure that the prevalence percentages of each type of odor added up to 100%, we used cutoffs at every 10%.

**Axillary Odor Strength Index**

Score	Odor Strength
0	Odorless
0.5	
1	Faintly detectable axillary odor (detection threshold)
1.5	
2	Able to determine type, but weakly
2.5	
3	Odor type is clear (recognition threshold)
3.5	
4	Strong odor (able to directly smell, but is strong)
4.5	
5	Extremely odor (felt as an irritant)

**Odor Types**

Type:	
M-type:	milky
A-type:	acid (sharp, sour)
K-type:	moldy
C-type:	curry-like/spicy
E-type:	meaty (like steamed meat)
W-type:	watery
F-type:	ferric (iron-like)
Other	Other

- (1) Unlike men odors, female odors are generally weaker, and no differences in strength were noted across different age groups.

After comparing the odors of men and women in their 20s and 40s, we found that the odors of women in both age groups were weaker than those of men in that same age group (Figure 1). In addition, in contrast to the already reported result of “male axillary odors decreasing in older age groups,” we found no decrease in odor among women as the age of each group increased—from women in their 20s to women in their 50s (Figure 2).

- (2) The relationship between earwax type and axillary odor strength differs for men and women.

The relationship between earwax type and axillary odor has already been reported; in our research, among men, individuals in the caramel-like earwax group had significantly stronger axillary odor than those in the moist, yellow earwax group and the dry earwax group. Conversely, in women, individuals in the dry earwax group tended to have stronger axillary odor than those in the caramel-like and moist, yellow earwax groups, but this difference was not significant (Figure 3).

- (3) In women, axillary skin condition is related to axillary odor strength. This relationship is more pronounced in women with dry earwax.

After investigating the relationship between axillary odor strength and axillary skin condition in women, we found a weak correlation between odor and TEWL. After analyzing in more detail, we found that, in the group of women with dry earwax, a correlation was noted between axillary odor strength and TEWL, and women with high TEWL had stronger odors (Figure 4).

- (4) A-type odor (common among men) is uncommon among women.

After comparing axillary odor types among men and women, we found that the most common type among

women was the same as that among men: M-type (milky). The next most common odor types, in the order of decreasing frequency, were A-type (acidic) for men and K-type (moldy) for women, C-type (curry-like), and E-type (steamed meat; Figure 5).

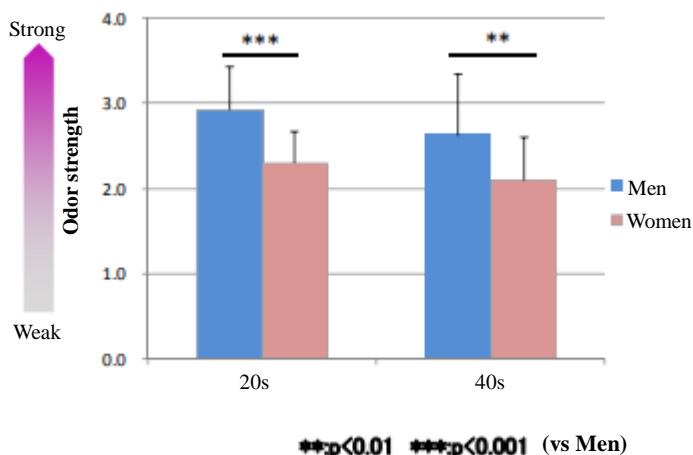
**2. Metabolism Changes in Postpartum Women**

We found a correlation between birth experience and TEWL in women in their 30's; postpartum women have higher TEWL (Figure 6). However no significant difference in axillary odor strength was found between nonparous and postpartum women (Figure 7). Thus we concluded that, while pregnancy and childbirth do have some effects on TEWL at the surface of the skin of the axillary, they are not the primary factors causing increases in axillary odor.

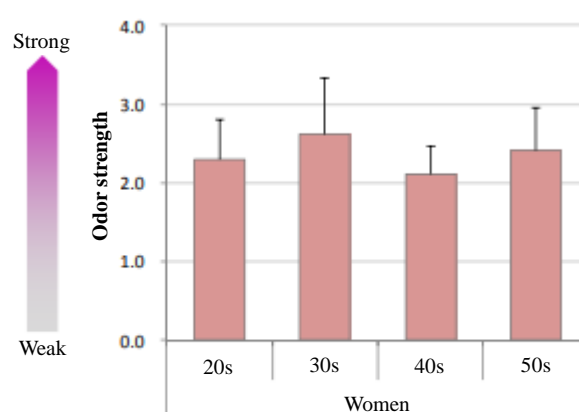
Taken together, we can conclude that the mechanisms by which smells and body odors are produced differ between men and women. At Mandom, we will apply this knowledge in the future to develop deodorant products for women.

<Reference Materials>

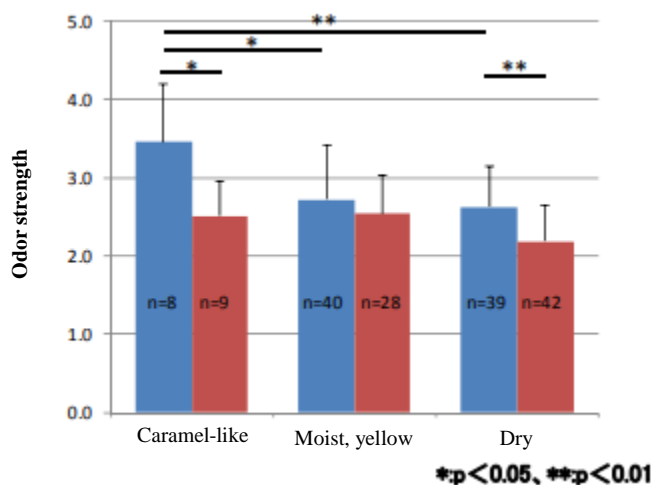
**Figure 1: Comparison of Axillary Odor Strength between Men and Women**



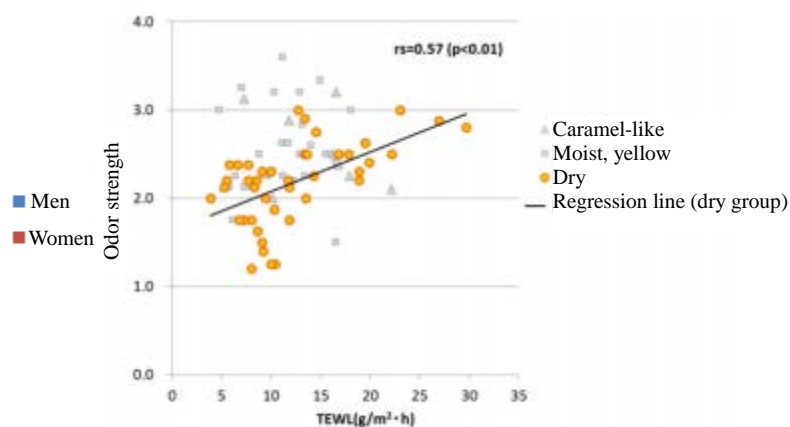
**Figure 2: Changes in Axillary Odor Strength in Women across Age Groups**



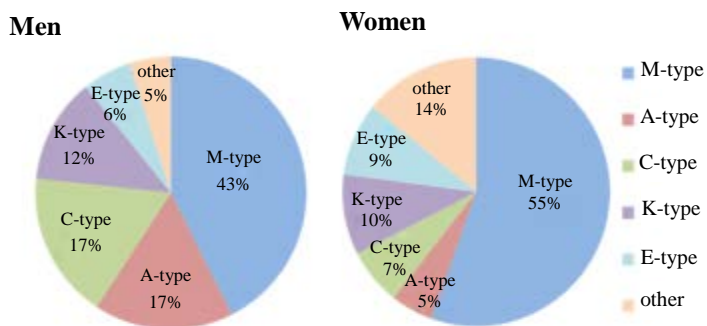
**Figure 3: Comparison of Axillary Odor Strength by Earwax Type in Men and Women**



**Figure 4: Relationship between Transepidermal Water Loss (TEWL) and Odor Strength in Women with Dry Earwax**

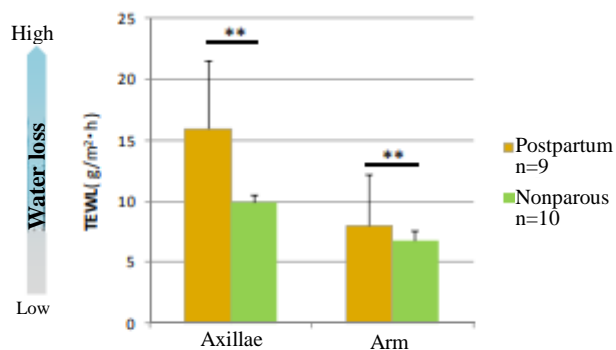


**Figure 5: Comparison of Axillary Odor Types in Men and Women**



\*Odor types with less than 5% prevalence were grouped into "other."

**Figure 6: Birth Experience and Transepidermal Water Loss (TEWL)**



\*\*p<0.01 (vs Postpartum)

**Figure 7: Birth Experience and Axillary Odor Strength**

