

Mandom Reveals that Sensitivity to the Molecule that Causes Middle-Aged Oily Odor, Diacetyl, Differs Remarkably across Persons
Analysis of Olfactory, Age, and Sex Differences in the Sensitivity to Body Odor Compounds

Mandom Corporation (Headquarters: Osaka; President Executive Officer: Motonobu Nishimura; hereafter, Mandom) has, in collaboration with research partner Associate Professor Nobuyuki Sakai of the Tohoku University Faculty of Arts and Letters, has conducted an analysis of human olfactory sensitivity to the primary components of body odor and found that individual differences in sensitivity to diacetyl are incredibly large, and that people can be divided into sensitive and insensitive groups. This finding implies that Japanese people with normal olfactory ability can either be good at detect diacetyl or bad at it; hence, some individuals are unable to detect their own smell, and hence fall victim to “smell harassment¹.” Moreover, we found that women are more sensitive than men to isovaleric acid, a compound responsible for sweat and foot odor.

This research will be presented at the 49th Annual Meeting of the Japanese Association for the Study of Taste and Smell (to be held on Sep 24-26, 2015).

1. Analyzing the Olfactory Threshold of Diacetyl², Which Can be Perceived as Unpleasant by Women

At Mandom, we have been investigating body odors of men; in November 2013, we found that the causative molecule of the “characteristic, oily, sweaty smell of middle-aged men (middle-aged oily odor),” is diacetyl. As part of that research, we revealed that the odor of diacetyl tends to make women, in particular, feel unpleasant (Figure 1). Thus, in order to clarify age- and sex-related differences in the sensitivity to body odors, we assessed 55 healthy Japanese men and women and analyzed their olfactory threshold values for the primary components of human body odor: diacetyl, isovaleric acid, and 2-nonenal.

2. People Are either Sensitive or Insensitive to the Causative Compound of Middle-Aged Oily Odor, Diacetyl

We found that, unlike other components of body odor (isovaleric acid and 2-nonenal), diacetyl has the unique characteristic that individual differences in olfactory threshold for the molecule are large; individuals can have low (sensitive) or high (insensitive) threshold (Figure 2). Individuals who were the most insensitive to diacetyl could not detect diacetyl concentrations 10,000 times greater than those detectable by the most sensitive individuals. Furthermore, the percentages of individuals insensitive to diacetyl were 35% and 21% for men and women, respectively: 1 in 3 men and 1 in 5 men are insensitive to diacetyl.

3. Women in Their 20s Are More Sensitive to Isovaleric Acid than are Men in Their 40s

After analyzing the olfactory threshold of isovaleric acid, a primary component of sweat and foot odor, we found that women had lower thresholds than men, indicating that they were more sensitive to the compound (Figure 3). In particular, we found that women in their 20s were significantly more sensitive than men in their 40s. Conversely, no clear differences caused by sex or age were noted in sensitivities to 2-nonenal or diacetyl (Figure 4).

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Therefore, we thought that the compound responsible for old-people odor, 2-nonenal, can be detected by all, whereas the compound responsible for middle-aged oily odor, diacetyl, can be perceived by certain people, but not by others. These findings indicate that, when a middle-aged man insensitive to diacetyl produces middle-aged oily odor, he might remain unaware of it, despite sensitive people being able to perceive the odor. This difference in sensitivity is likely to the cause of smell harassment.

<Reference Material>

Figure 1: Difference in Unpleasant Feeling between Men and Women in Response to a Model Head Odor

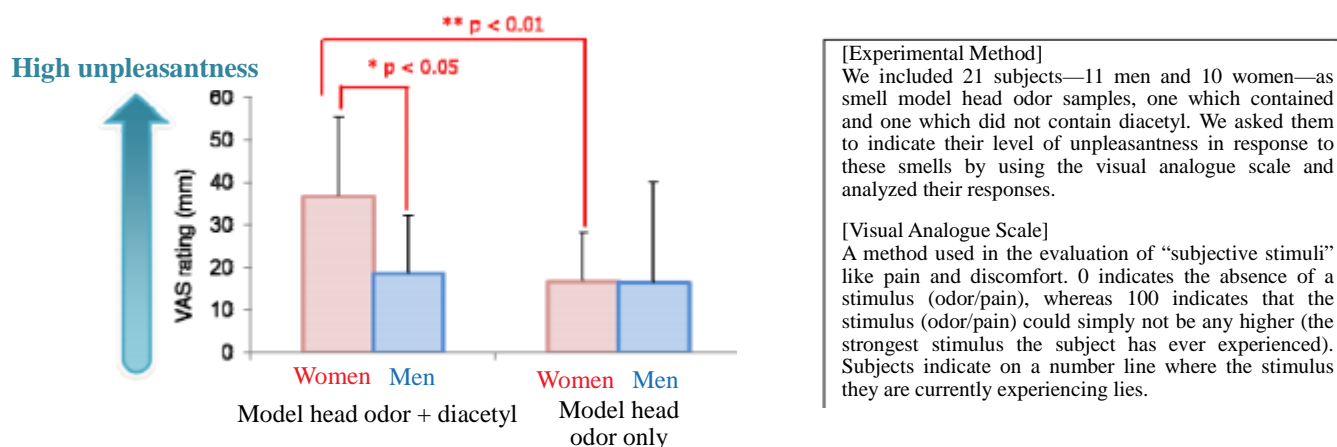


Figure 2: Variance in Olfactory Thresholds

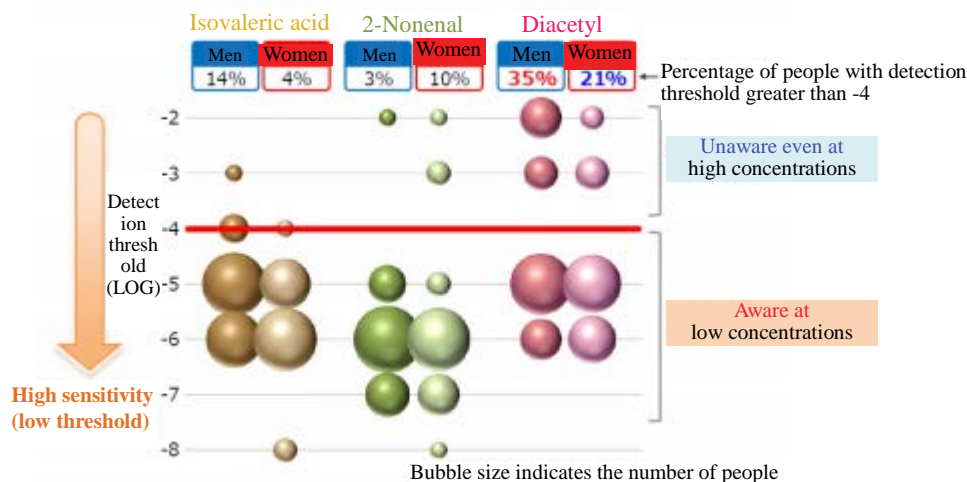


Figure 3: Age- and Sex-related Differences in Olfactory Threshold for Isovaleric Acid

Isovaleric acid (sweat/foot odor component)

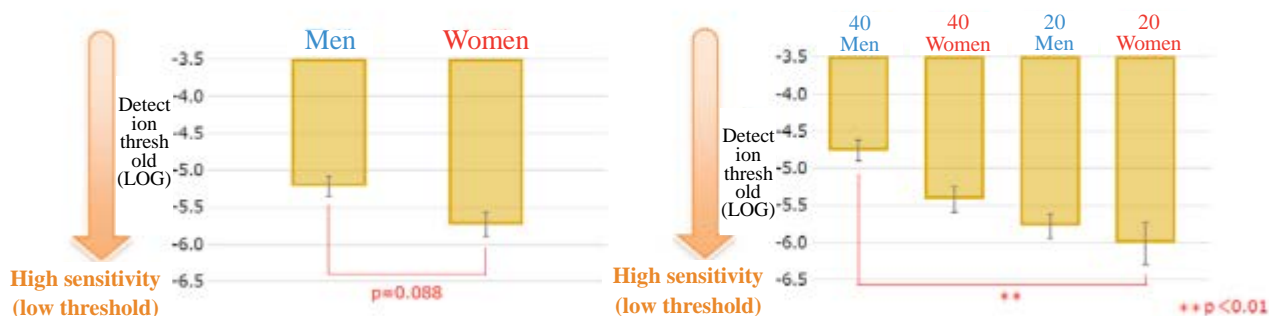
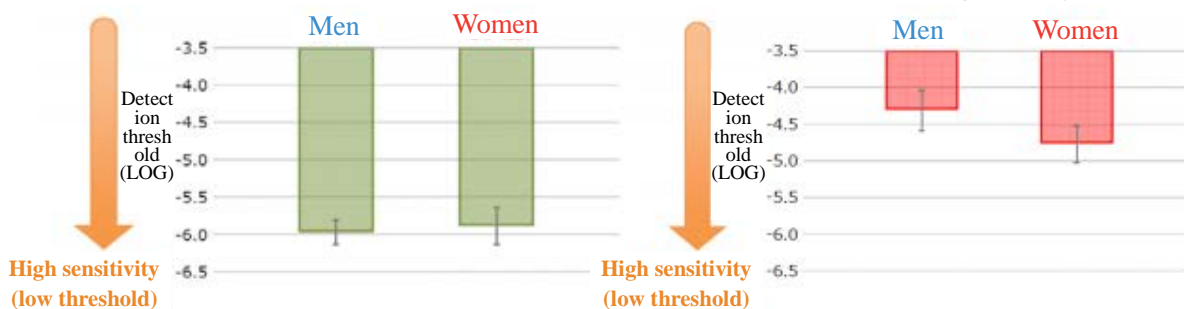


Figure 4: Sex-related Differences in Olfactory Thresholds to Diacetyl and 2-Nonenal

2-Nonenal (old-people odor compound)

Diacetyl (middle-aged oily odor compound)



Notes

※1. Smell harassment

The infliction of annoyance or discomfort to those in the vicinity, either knowingly or unknowingly, because of strong smells—such as body odor, bad breath, very strong perfume, or fabric softener—that one has made no attempt to address.

※2. Olfactory Threshold

The smallest concentration that a particular individual can smell. Low olfactory thresholds indicate that an individual can smell that particular compound even when it is very weakly present; therefore, such individuals are more sensitive to its smell.