# Humans can use smell to detect levels of dietary fat

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New research from the Monell Center reveals humans can use the sense of smell to detect dietary fat in food. As food smell almost always is detected before taste, the findings identify one of the first sensory qualities that signals whether a food contains fat. Innovative methods using odor to make low-fat foods more palatable could someday aid public health efforts to reduce dietary fat intake.

"The human sense of smell is far better at guiding us through our everyday lives than we give it credit for," said senior author Johan Lundström, PhD, a cognitive neuroscientist at Monell. "That we have the ability to detect and discriminate minute differences in the fat content of our food suggests that this ability must have had considerable evolutionary importance."

As the most calorically dense nutrient, fat has been a desired energy source across much of human evolution. As such, it would have been advantageous to be able to detect sources of fat in food, just as sweet taste is thought to signal a source of carbohydrate energy.

Although scientists know that humans use sensory cues to detect fat, it still remains unclear which sensory systems contribute to this ability. The Monell researchers reasoned that fat detection via smell would have the advantage of identifying food sources from a distance.

While previous research had determined that humans could use the sense of smell to detect high levels of pure fat in the form of fatty acids, it was

not known whether it was possible to detect fat in a more realistic setting, such as food.

In the current study, reported in the open access journal *PLOS ONE*, the researchers asked whether people could detect and differentiate the amount of fat in a commonly consumed food product, milk.

To do this, they asked healthy subjects to smell milk containing an amount of fat that might be encountered in a typical milk product: either 0.125 percent, 1.4 percent or 2.7 percent fat.

The milk samples were presented to blindfolded subjects in three vials. Two of the vials contained milk with the same percent of fat, while the third contained milk with a different fat concentration. The subjects' task was to smell the three vials and identify which of the samples was different.

The same experiment was conducted three times using different sets of subjects. The first used healthy normal-weight people from the Philadelphia area. The second experiment repeated the first study in a different cultural setting, the Wageningen area of the Netherlands. The third study, also conducted in Philadelphia, examined olfactory fat detection both in normal-weight and overweight subjects.

In all three experiments, participants could use the sense of smell to discriminate different levels of fat in the milk. This ability did not differ in the two cultures tested, even though people in the Netherlands on average consume more milk on a daily basis than do Americans. There also was no relation between weight status and the ability to discriminate fat.

"We now need to identify the odor molecules that allow people to detect and differentiate differentiate levels of fat. Fat molecules typically are

not airborne, meaning that they are unlikely to be sensed by sniffing food samples," said lead author Sanne Boesveldt, PhD, a sensory neuroscientist. "We will need sophisticated chemical analyses to sniff out the signal."

**More information:** dx.plos.org/10.1371/journal.pone.0085977

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