Your unique smell can provide clues about how healthy you are

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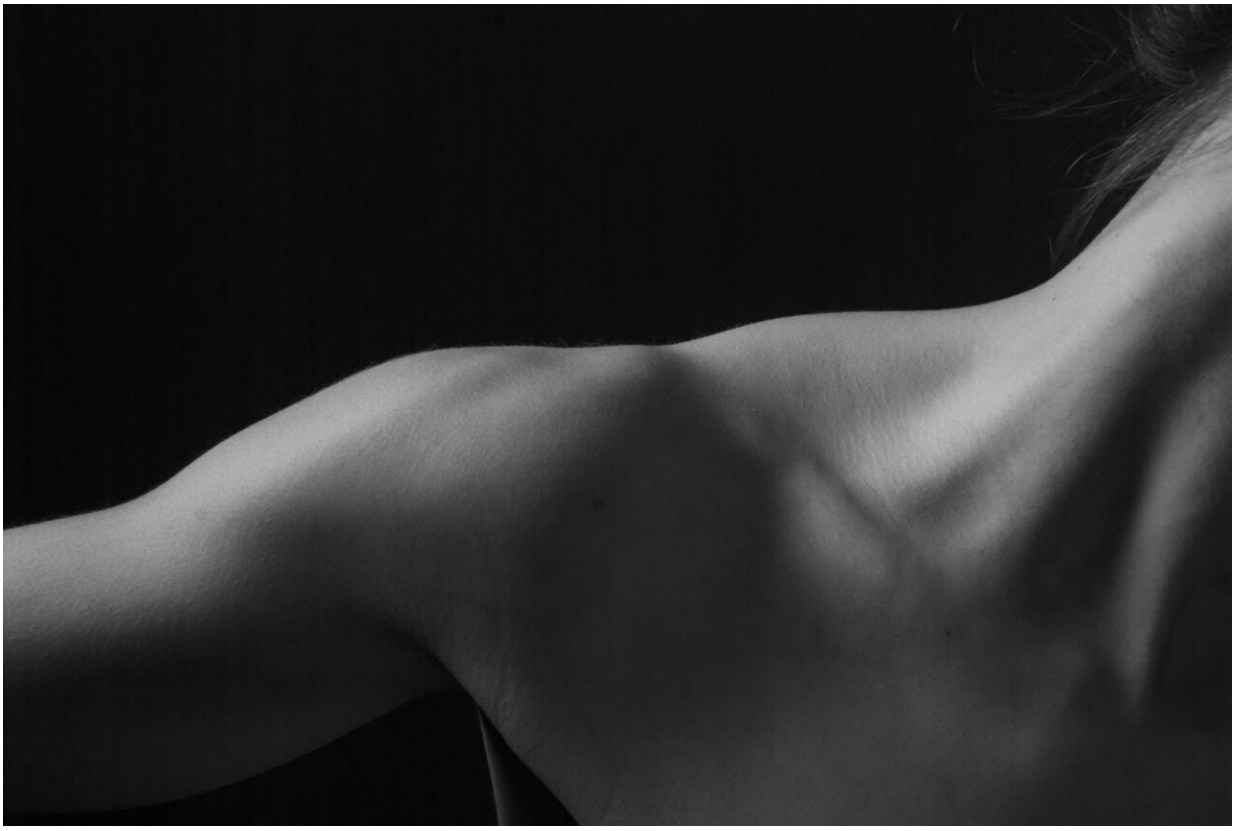

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Hundreds of chemicals stream from our bodies into the air every second. These chemicals release into the air easily as they have high vapor pressures, meaning they boil and turn into gases at room temperature.

They give clues about who we are, and how healthy we are.

Since ancient Greek times, we've known that we smell differently when we are unwell. While we rely on blood analysis today, ancient Greek physicians used smell to diagnose maladies. If they took a whiff of your breath and described it as fetor hepaticus (meaning bad liver), it meant you could be headed for liver failure.

If a person's whiff was sweet or fruity, physicians thought this meant that sugars in the digestive system were not being broken down, and that person had probably diabetes. Science has since shown the ancient Greeks were right—liver failure and diabetes and many other diseases including infectious diseases give your breath a distinctive smell.

In 1971, Nobel Laureate chemist Linus Pauling counted 250 different gaseous chemicals in breath. These gaseous chemicals are called volatile organic compounds or VOCs.

Since Pauling's discovery, other scientists have discovered hundreds more VOCs in our breath. We have learned that many of these VOCs have distinctive odors, but some have no odor that our noses can perceive.

Scientists believe that whether a VOC has an odor that our noses can detect or not, they can reveal information about how healthy someone is.

A Scottish man's Parkinson's disease onset was identified by his wife, retired nurse Joy Milner, after she was convinced the way he smelled had changed, years before he was diagnosed in 2005. This discovery has led to research programs involving Joy Milner to identify the precise smell of this disease.

Dogs can sniff out more diseases than humans because of their more

sophisticated olfactory talents. But technological techniques, like analytical tool mass spectrometry, picks up even more subtle changes in VOC profiles that are being linked to gut, skin and respiratory diseases as well as neurological diseases like Parkinson's. Researchers believe that one day some diseases will be diagnosed simply by breathing into a device.

Where do VOCs come from?

Breath is not the only source of VOCs in the body. They are also emitted from skin, urine and feces.

VOCs from skin are the result of millions of skin glands removing metabolic waste from the body, as well as waste generated by bacteria and other microbes that live on our skin. Sweating produces extra nutrients for these bacteria to metabolize which can result in particularly odorous VOCs. Odor from sweat only makes up a fraction of the scents from VOCs though.

Our skin and also our gut microbiomes are made up from a delicate balance of these microbes. Scientists think they influence our health, but we don't yet understand a lot about how this relationship works.

Unlike the gut, the skin is relatively easy to study—you can collect skin samples from living humans without having to go deep into the body. Scientists think skin VOCs can offer insights into how the microbiome's bacteria and the human body work together to maintain our health and protect us from disease.

In my team's laboratory, we are investigating whether the skin VOC signature can reveal different attributes of the person it belongs to. These signals in skin VOC signatures are probably how dogs distinguish between people by smell.

We are at a relatively early stage in this research area but we have shown that you can tell males from females based on how acidic the VOCs from skin are. We use mass spectrometry to see this as the average human nose is not sophisticated enough to detect these VOCs.

We can also predict a person's age with reasonable accuracy to within a few years from their skin VOC profile. This is not surprising considering that oxidative stress in our bodies increases as we age.

Oxidative stress happens when your antioxidant levels are low and causes irreversible damage to our cells and organs. Our recent research found by-products of this oxidative damage in skin VOC profiles.

Not only are these VOCs responsible for personal scent—they are used by plants, insects and animals as a communication channel. Plants are in a constant VOC dialogue with other organisms including pollinators, herbivores, other plants and their natural enemies such as harmful bacteria and insects. VOCs used for this back and forth dialogue are known as pheromones.

What has science shown about love pheromones?

In the animal kingdom, there is good evidence VOCs can act as aphrodisiacs. Mice for example have microbes which contribute to a particularly smelly compound called trimethylamine, which allows mice to verify the species of a potential mate. Pigs and elephants have sex pheromones too.

It is possible that humans also produce VOCs for attracting the perfect mate. Scientists have yet to fully decode skin—or other VOCs that are released from our bodies. But evidence for human love pheromones so far is controversial at best. One theory suggests that they were lost about 23 million years ago when primates developed full color vision and

started relying on their enhanced vision to choose a mate.

However, we believe that whether human pheromones exist or not, skin VOCs can reveal who and how we are, in terms of things like aging, nutrition and fitness, fertility and even stress levels. This signature probably contains markers we can use to monitor our health and diagnose disease.

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