Making fragrances last longer

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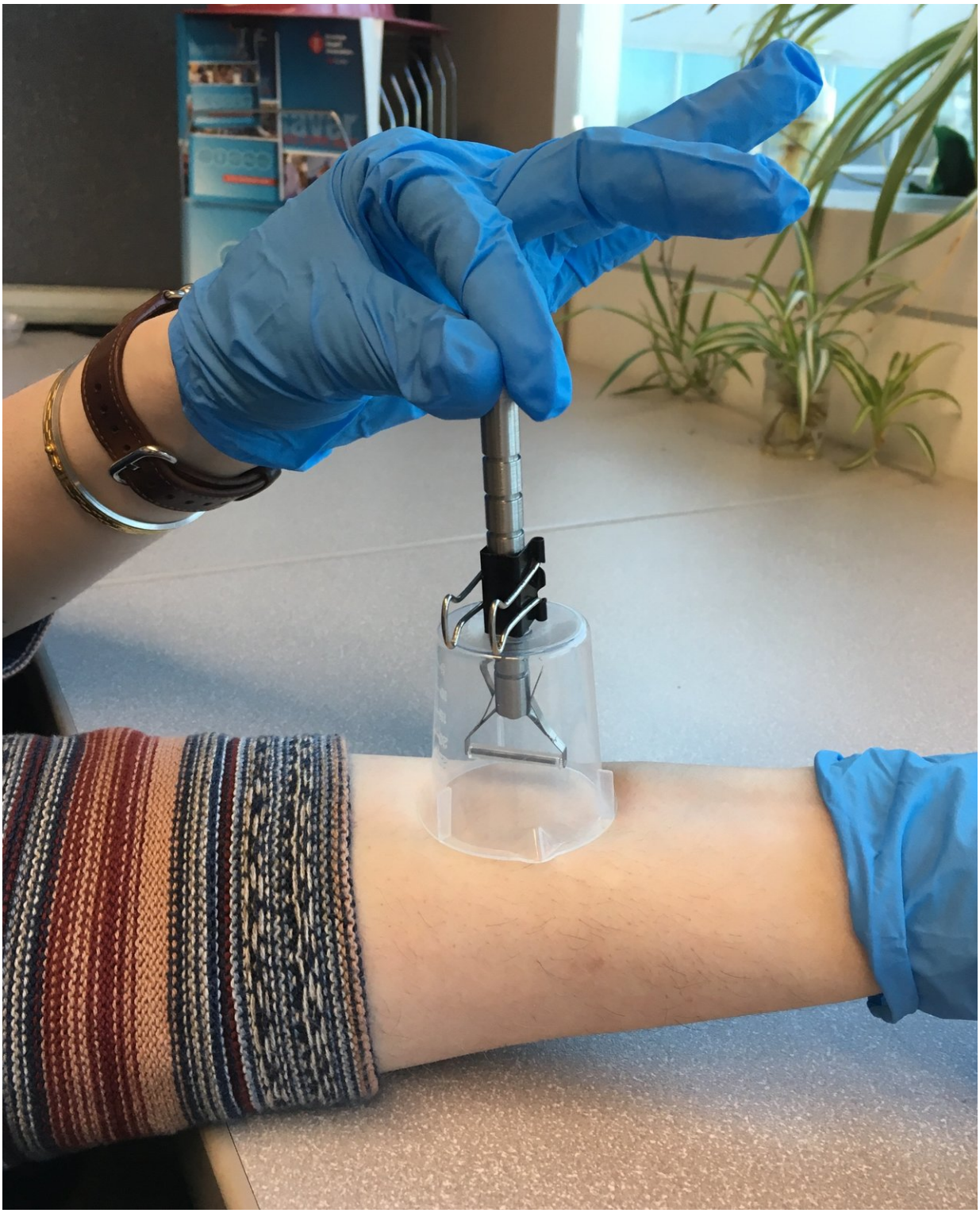

A sensor commonly used in the food industry can detect how long fragrances last on skin. Credit: Ashland

From floral perfume to fruity body wash and shampoos, scents heavily influence consumer purchases. But for most, the smell doesn't last long after showering before it fades away. Scientists have now developed a way to get those fragrances to stick to the skin longer instead of washing down the drain immediately after being applied.

The researchers are presenting their results today at the 255th National Meeting & Exposition of the American Chemical Society (ACS).

"Companies incorporate a lot of fragrance oils in wash-off products, such as face washes and body scrubs, but the majority of these oils get washed away," Martin S. Vethamuthu, Ph.D., says. "My research team of solvers wants to help other companies amplify the efficacy, add to the allure and ensure the integrity of the retention of these fragrance notes in their products for skin and hair."

Vethamuthu explains that after consumers take a shower, they want their friends and loved ones to notice whatever scent they are wearing. This is why consumers are willing to spend a lot of money on these products but many are left dissatisfied and disappointed because the scent doesn't even last the average time of a commute.

The goal of this research is to increase the efficiency of the fragrance oils. Fragrance oils are expensive, and maintaining a scent is a complex process. "To build a scent profile in a body wash, it is a creative and artistic process of blending the fragrances," Vethamuthu, who is at Ashland, says. There are three categories, the top note, middle note and base note. "Each of these has a purpose, and some scents are meant to evaporate during the shower while others are meant to remain on the skin even after toweling off," he says. These factors play a critical role in determining whether a consumer will repurchase a product.

To develop fragrance profiles, researchers use panels of people who have an exceptional sense of smell. But this practice is time consuming and costly. Every time a technician blends a fragrance, the oil is sent to evaluators. Each change made to the perfume means the formula must be remade and re-evaluated by the panelists until the final product is perfected. In addition, the evaluators provide an impression of the overall fragrance, so they might miss some faint fragrance notes.

To overcome this challenge, Vethamuthu is reporting that his group has adapted a device known as the twister bar headspace sorption extraction sensor, commonly used in the food industry to detect chemicals that could contribute to off-flavors or scents. The sensor absorbs trace amounts of volatile fragrances deposited on the skin after a shower. Combined with gas chromatography-mass spectrometry, the team can gather a profile of the scents that remain on skin after rinsing off. Then, fragrance evaluators are only brought in at the last step to validate and verify the results.

Vethamuthu also looked at ways to ensure the fragrances lasted longer by mixing them with various polymers, which help the scents remain on the skin. "Polymers impact different fragrances in diverse ways," he says. "By studying synthetic and naturally derived polymers, manufacturers can select the types of polymers they want to use that will correspond with the fragrance notes they want to prevail." Vethamuthu's group used the sensor to assess which fragrances still lingered on the skin several hours after the scents were applied.

But there was a lot of trial and error to get to this point, since companies use many different combinations of scents, and the identities of those compounds are often kept secret. "It's a difficult process because many manufacturers do not want to share their perfume formulas in detail," Vethamuthu states. "If you don't know what to look for going in, then you will never be able to determine which polymers would work best."

As a result, he works closely with the manufacturers to pry as much information from them as he can. If he knows the precise perfume formula, he can tailor the polymers for the manufacturer. Increasing the retention can mean that manufacturers won't need to add as much fragrance oil, which could lead to lower costs for both the industry and consumers.

Vethamuthu plans to continue to optimize and refine these methods. He also hopes to validate the instrumental values with the actual sense of smell.

More information: Title: Role of polymers on fragrance retention, release and sensory perception from surfactant rich rinse-off cosmetics

Abstract
Fragrance is a critical component in most personal care and household products. Fragrance release and perception is an essential product attribute that influences the consumer at the point of sale and, when truly successful in use, encourages re-purchase and eventually builds brand loyalty. The emotive effects of fragrance are such that it can even contribute to the user's perception of a product's functionality, even if there is no factual basis for such a judgment.
The first part of this study discusses an effective in-vivo methodology, validated by expert sensory evaluation, of fragrance release from surfactant rich rinse-off cosmetics by a non-invasive method for dynamic head space sampling of the volatile fragrance components deposited from a cleanser after rinse-off. The twister bar headspace sorptive extraction (HSSE) method used for sampling the vapor phase was introduced with the aim of increasing the concentration capability of the solid phase micro extraction (SPME needle) method. After dynamic sampling of washed skin for 15 minutes the twister bar is placed in a glass tube and transferred to a thermo-desorption system where the recovered analytes are thermally desorbed and analyzed by GC-MS. This

novel approach has been used for quantitation of fragrance headspace components or perfume notes retained on skin.
The second part of this presentation focuses on the results of using this method to screen how different polymers impact this fragrance deposition on skin. Polymer chemical composition, charge density, molecular weight distribution and hydrodynamic size are key variables that have been investigated to differentiate performance with respect to the various perfume notes retained and released on skin after rinse-off.
In conclusion, the headspace GC instrumentation coupled with the appropriate twister bar methodology can monitor the time dependent release/ retention profiles of volatile fragrance components from the skin. The results from these studies show that polymeric deposition technology provides a novel approach to significantly improving fragrance delivery and perception from rinse-off cosmetics.

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