

Smoked foods are tastier, less harmful with a tip from the auto industry

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Infusing foods with smoke can impart delicious nuanced flavors, but

could also come with an unwelcome side of carcinogens. To reduce the carcinogen content of smoked foods, researchers took a lesson from the automobile industry, running the smoke through a zeolite filter to remove harmful compounds. It worked, and with a happy bonus: superior smoke flavor.

The researchers will present their work today at the 255th National Meeting & Exposition of the American Chemical Society (ACS).

"The [smoking](#) process can cause carcinogens to form in foods. Not all smoked foods are dangerous, but we do know most can contain low levels of these substances, so we should try to remove them. If we could produce a smoke with fewer carcinogens, but that still has the same great taste, that would be ideal," says Jane K. Parker, Ph.D., leader of the study. "Zeolite filters, which are put in a tailpipe, have been used in the car industry to reduce environmental pollutants, but they haven't been applied to food yet. We want to change that."

As a first step, engineers from Besmoke, a company that specializes in natural smoking, teamed up with Parker, who is at the University of Reading (U.K.). They optimized [filters](#) made from zeolite, a porous aluminosilicate mineral, with the goal of maximizing the removal of carcinogenic [polycyclic aromatic hydrocarbons](#) (PAHs) from smoke. PAHs are a ubiquitous side product of fuel consumption, long known to increase the risk for a variety of cancers, as well as cardiovascular disease. The U.S. and European Union regulate environmental levels of PAHs.

The best filter they developed removed as much as 93 percent of benzo[a]pyrene, a known [carcinogen](#). "There have been a couple of attempts to reduce carcinogens in smoke using other technologies, but they aren't as effective as our approach," Parker says. But the question remained about how [food](#) flavored with the filtered smoke compared to

that produced by unfiltered smoke.

To address this question, the researchers smoked tomato flakes, coconut oil and water using either filtered or unfiltered smoke. Then, they added the smoked tomato flakes to cream cheese and used the water to brine some chicken. A panel of expert tasters trained to describe differences in flavor profiles with standard terminology tried the cream cheese, [coconut oil](#) and chicken. "To the tasters, the chicken made with filtered smoke had a bit of a 'Christmas ham' aroma and a more rounded balanced flavor," Parker says. Foods made with the unfiltered smoke, by contrast, tended to score higher in the categories of "ash tray" and "acrid smoke."

Parker's team attempted to figure out why the filtered smoke tasted better by taking a closer look at how the filtering affected the chemical content. They used mass spectrometry to analyze the compounds in the two types of smoke. "The profiles showed that it was largely the higher molecular weight components that were being removed by the filter," Parker says. "These chemicals may be the ones giving the foods a harsher flavor and aroma profile."

The researchers' next steps are to understand why the filter selectively removes these compounds. "We think there is interesting science at work," Parker says. "If we can figure out how the higher molecular weight compounds are sticking to the filter, we can manipulate the zeolite to improve the removal efficiency."

More information: Title: Changes in aroma and sensory profile of food products smoked in the presence of a zeolite filter

Abstract

During smoking of foods, the formation of desirable smoky compounds and the formation of carcinogenic polycyclic aromatic hydrocarbons

(PAH) are inextricably linked. In this work we developed a zeolite filter which reduces the PAH content of a smoke stream, in particular reducing the concentration of benzo[a]pyrene, a known carcinogen, by up to 93%. Various foods and ingredients were cold-smoked using either the zeolite filtered smoke or the control (unfiltered) smoke. The filtered smoke produced products with a much reduced PAH content compared to the control smoke but with some noticeable changes to the flavour profile. This paper focuses on the changes in the volatile and sensory profiles of various products, prepared by smoking with either the filtered smoke or the control smoke. Three food matrices were selected, providing both lipophilic (coconut oil) and hydrophilic (water) environments, as well as a dry product (dried tomato flake). The coconut oil was analysed as is, whereas the smoked water was used to brine chicken goujons prior to cooking, and the smoked tomato flakes were added to cream cheese in order to simulate real applications for sensory evaluation.

The volatile profiles were analysed by SPME GC-MS. A group of characteristic smoky compounds were selected based on the SPME GC-Olfactometry of smoked tomato paste and on previously reported GC-O data for smoked fish, and they were monitored in all ingredients and all products. In tomato paste they were quantified using external calibration curves prepared in unsmoked paste. The characteristic smoky compounds such as 2-methoxyphenol (guaiacol), 2,6-dimethoxyphenol (syringol) and 4-ethenyl-2-methoxyphenol (p-vinylguaiacol) tended to decrease significantly (p

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