

Paper stickers to monitor pathogens are more effective than swabs

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Using paper stickers to collect pathogens on surfaces where antiseptics is required, such as in food processing plants, is easier, and less expensive than swabbing, yet similarly sensitive. The research is published in *Applied and Environmental Microbiology*, a journal of the American Society for Microbiology.

"The porous structure of paper seems able to collect and accumulate [bacterial] contamination," said first author Martin Bobal, technical assistant, Christian Doppler Laboratory for Monitoring of Microbial Contaminants, Department for Farm Animal and Public Health in Veterinary Medicine, The University of Veterinary Medicine, Vienna, Austria. "This requires mechanical contact, for example by hand, or by splashed liquids."

In the study, the investigators, who specialize in monitoring cheese production, chose to target the organism *Listeria monocytogenes*, a pathogen that commonly contaminates raw milk and other raw dairy products, including soft cheeses such as Brie, Camembert, and Feta. They used qPCR, a method of quantifying DNA samples to determine the numbers of these bacteria, as well as of *Escherichia coli*.

Surfaces in food processing plants must be cleaned regularly. Unlike swabs, artificially contaminated stickers provided a record of contamination that took place over at least two weeks, despite washing, flushing with water, or wiping with Mikrozid, an alcohol-based disinfectant, to simulate cleansing practices. "Recovery [of DNA] from the stickers was rather variable, at around 30%, but did not distinctly decrease after 14 days of storage," the report stated. "This suggests the possibility of sampling over two weeks as well."

In a proof of concept experiment, the researchers placed stickers at multiple locations that frequently undergo hand contact— such as on light switches

and [door handles](#) —for one to seven days. Both [bacterial species](#) were detected repeatedly from these stickers.

Unlike stickers, swabbing is impractical on complex surfaces, such as door handles, light switches, and other fomites (objects likely to be contaminated with, and spread infectious organisms) and does a poor job of taking up bacteria from dry surfaces, according to the report.

"In the food production facility, conventional swabbing as a standard method can only expose a momentary snapshot," the investigators wrote. "For example, it is not possible to reconstruct information about yesterday's status after cleansing has been performed. In addition, when moistened swabs or contact-plate sampling methods are used, they bring with them growth medium into a supposedly [clean environment](#), making subsequent disinfection necessary."

The investigators showed that plain paper stickers could trap not only bacterial pathogens and related DNA, but dead, and viable but non-culturable pathogens, which also can pose a threat to [public health](#).

"A major advantage of stickers is in handling: they are easy to distribute and to collect," the authors concluded. "We put the stickers directly into the DNA-extraction kit's first protocol step. We did not encounter any inhibition or loss of information during DNA-extraction, nor during qPCR," said Mr. Bobal.

Provided by American Society for Microbiology

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