

Researchers create packaging tray that warns of contamination before food is unwrapped

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Researchers at McMaster University have created a new packaging tray that can signal when *Salmonella* or other dangerous pathogens are present in packages of raw or cooked food such as chicken.

The new technology will enable producers, retailers and consumers to tell in real time if the contents of a sealed food package are contaminated without having to open it, preventing exposure to contamination while simplifying cumbersome and expensive lab-based detection processes that today add significant time and cost to food production.

The prototype tray, shaped like a shallow boat, is lined with a food-safe reagent that allows a built-in sensor to detect and signal the presence of Salmonella. The technology can readily be adapted to test for other common food-borne contaminants, such as E. coli and Listeria.

"This is something that can benefit everyone," says researcher Akansha Prasad, the co-lead author of a paper that describes the invention, published June 26 in the journal *Advanced Materials*. "We're hoping this technology will save lives, money and [food waste](#)."

"There is so much at stake with [food safety](#)," says researcher Shadman Khan, co-lead author on the paper. "We wanted to develop a system that was reliable, quick, affordable and easy to use."

The sloped sides of the tray direct juices to a sensor embedded in a window at the bottom. Without the need for any additional lab work, users can scan the underside of the sealed package with a cell phone and know immediately whether the food is contaminated.

Having easy, instant access to such information would allow public health authorities, producers and retailers to trace and isolate contamination quickly, reducing potentially serious infections while also cutting back significantly on food waste by identifying precisely which lots of food need to be recalled and destroyed, compared to today's often broad recalls that end up wasting unspoiled foods.

Further, the researchers say, protecting consumers from contaminated foods will create significant health-care savings. Globally, there are about 600 million cases of food-borne illness every year, largely attributed to the consumption of pathogen-contaminated food products.

The McMaster researchers and their colleagues have been working for several years on related technologies, all aimed at creating simple, inexpensive tools to prevent and detect food contamination.

Their work is part of McMaster's broader Global Nexus School for Pandemic Prevention & Response.

Co-author Tohid Didar, an associate professor of mechanical and [biomedical engineering](#) who holds the Canada Research Chair in Nanobiomaterials, says package-based sensors that measure other conditions such as humidity are already becoming common in Japan and elsewhere.

He said the McMaster research team on the Lab-in-a-Package project—featuring 11 colleagues from the fields of biomedical, mechanical and chemical engineering, medicine and biochemistry—has worked to make the new contamination sensor as adaptable and economical as possible, knowing food producers are under pressure to keep costs low.

"It's really just a matter of time before technology like this becomes common all over the world," Didar says. "Now that we've shown that one kind of food package can reveal contamination without even being opened, we can adapt it to other forms of packaging for other types of foods."

Didar and his colleagues Yingfu Li, a professor of Biochemistry and Biomedical Sciences, and Carlos Filipe, McMaster's Chair of Chemical Engineering, supervised the research.

"Being able to combine packaging and Salmonella detection in one system is already very promising," says Li. "It also shows that we can add sensing probes for other food-borne pathogens to the same system so the package will check for all of them at once. That's the next step for us, and we're already working on it."

More information: Akansha Prasad et al, Advancing in Situ Food Monitoring Through A Smart Lab-in-a-Package System Demonstrated by The Detection of Salmonella in Whole Chicken, *Advanced Materials* (2023). [DOI: 10.1002/adma.202302641](https://doi.org/10.1002/adma.202302641)

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