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S'pore, US scientists create bacteria-killing, biodegradable food packaging material



Shabana Begum

The waterproof packaging kills harmful bacteria and fungi that sprout on fresh produce. PHOTO: NTU

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SINGAPORE - Perishables such as fruit and meat are often at the mercy of harmful bacteria, especially when left for a long time outside the refrigerator.

To salvage such food items, scientists have created a biodegradable packaging material that can kill harmful bacteria and fungi that sprout on fresh produce.

The waterproof packaging also extends the lifespan of strawberries by up to a week. Berries kept in ordinary boxes stay fresh for only four days.

The material - which resembles plastic - was created by researchers from Nanyang Technological University (NTU) and Harvard T.H. Chan School of Public Health in the United States.

The material is made from corn protein, starch and other naturally derived substances, and is infused with a cocktail of natural antimicrobial compounds such as the oil from thyme, and citric acid.

Lab experiments found that when the material detected rising humidity levels and enzymes from harmful bacteria, its fibres released minuscule amounts of the antimicrobial compounds that got rid of the bacteria.

The compounds can kill bacteria or fungi growing on both the food and the material. Dangerous microbes that thrive in food include E.coli and listeria, which causes one of the most serious forms of food poisoning.

The packaging is suitable to hold food items such as raw meat, fish, fruit, vegetables and ready-to-eat meals, said Professor Mary Chan, the director of NTU's Centre for Antimicrobial Bioengineering who co-led the project.

She added: "The smart release of the antimicrobials only when bacteria are present or humidity is high provides protection only when needed, thus minimising the use of chemicals, and preserving the natural composition of foods packaged."

The new material was made through a process called electro-spinning - where the corn protein, the antimicrobial compounds with cellulose and an acid are drawn into tubes using electric force, and turned into fibres.

Harvard T.H. Chan School's Adjunct Professor Philip Demokritou, an environmental health expert, noted that the new packaging would help to manage the triple threats of food safety, food waste and unsustainable packaging.

The research team's project was published in October in the peer-reviewed journal ACS Applied Materials & Interfaces.

Packaging waste, including plastics, makes up about one-third of domestic waste in Singapore, and is a key waste stream.

The researchers hope to scale up their technology with an industrial partner, and to commercialise their food packaging within a few years.

Local urban rooftop farm ComCrop had assessed the viability of the scientists' packaging material.

ComCrop chief executive Peter Barber said: "As ComCrop looks to ramp up products to boost Singapore's food production capabilities, the volume of packaging we need will increase.

"The wrapping's antimicrobial properties could potentially extend the shelf life of our vegetables."

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