

The end of food poisoning? New 'smart pack' that keeps fish, meat and veg fresher for longer by slowly releasing antimicrobials to kill E.coli and Salmonella is developed by scientists

JANUARY 2, 2022 **SCIENCE**

- **The pack was created by experts from Harvard and Nanyang Technological University**
- **It is composed primarily of a corn protein that is a by-product of ethanol production.**
- **The team infused the material with antimicrobials that only come out when needed**
- **In tests, the packaging kept strawberries for 2-3 days longer than usual**
- **The pack is transparent and looks like plastic – but it's completely biodegradable**

Scientists who developed it say smart food packaging that slowly releases antimicrobials to kill harmful bacteria such as E. coli and listeria, can keep fish, meat, fruits and vegetables fresh for longer.

In laboratory tests, the pack was found to be able to extend the shelf life of fresh fruits by about two-three days as compared to regular packaging.

Developed by researchers from Harvard and Nanyang Technological University, the waterproof pack looks exactly like transparent plastic.

It does however have the advantage of being biodegradable, which means it can help cut down on landfill waste as well as food spoilage.

According to the team, the packaging industry is the largest consumer of synthetic plastic derived from fossil fuels and accounts for the bulk of plastic waste.

The researchers tell MailOnline that the cost of producing their new packaging is comparable to that of regular plastic – and is likely to be cheaper in the future.

This, he said, is because they hope to improve the technologies used to extract the necessary material from the biomass.

scroll down for video

Smart food packaging (pictured) that slowly releases antimicrobials to kill harmful bacteria like E. coli, listeria and salmonella can keep fish, meat, fruit and vegetable fresh longer

0:00



"This invention will serve as a better alternative for packaging in the food industry," said paper author and bioengineer Mary Chan-Park from Nanyang Technological University in Singapore.

'It could serve as an environmentally friendly alternative to petroleum-based polymers used in commercial food packaging such as plastics, which have a significant negative environmental impact.

'Smart release of antimicrobials occurs when bacteria or high humidity are present. It provides protection only when needed – thus reducing the use of chemicals and preserving the natural structure of packaged foods.

'It has demonstrated superior antimicrobial properties in combating a myriad of food-related bacteria and fungi that can be harmful to humans – [and] Can be applied to various products such as fish, meat, vegetables and fruits.'

In particular, he explained, 'Vegetables are a source of waste because even if they are refrigerated, they continue to breathe, causing spoilage after a week or two.

'With anti-microbial packaging, there is a chance to extend their shelf life – and also to keep vegetables and fruits looking fresh over time.'

Smart packaging materials are created through a process called electrospinning, in which charged threads of a polymer solution are pulled into fibers.

The main ingredient for the material is a type of corn protein called a 'zine' – a waste by-product in the production of ethanol from corn starch or oils – to which the researchers added the plant starch cellulose and acetic acid.

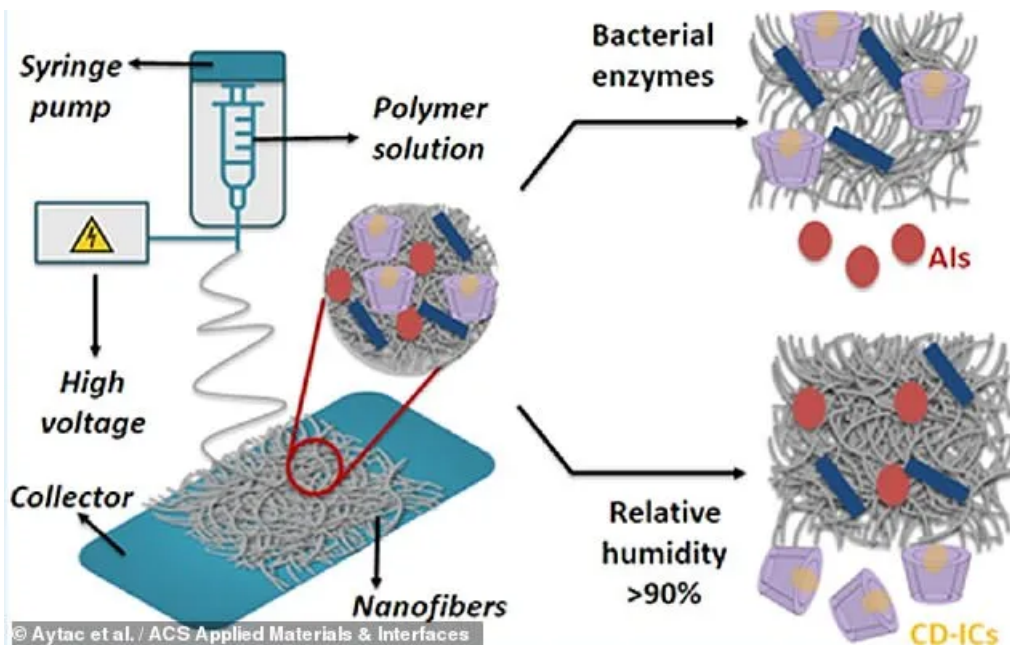
The team combined these with a cocktail of natural antimicrobial compounds derived from plants, including thyme oil and citric acid, which are found in fruits such as grapefruit, lemons, limes and oranges.

In laboratory tests, the team was able to show that antimicrobials are released in small amounts from fibers in packaging materials when exposed to increased humidity or certain enzymes released by harmful bacteria.

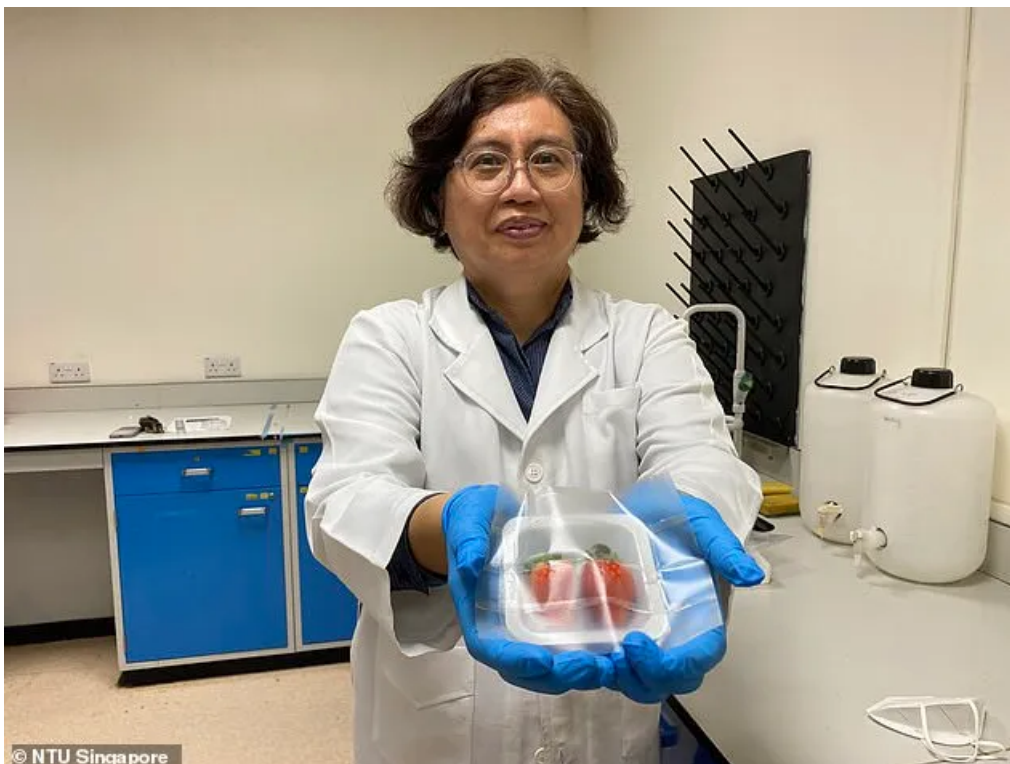
By releasing compounds only in response to potential spoilage, the packaging can endure multiple exposures, and remains viable for months, the team said.

In tests, the packaging was able to kill a variety of common bacteria, including E. coli and listeria, as well as fungi, both on the surface of the packaging and the food contained therein.

And strawberries wrapped in smart packs stayed fresh for seven days before mold developed — compared to just four days for fruits kept in traditional plastic fruit boxes.



The ingredients that make up the Smart Pack (for which the production process is depicted on the left) are made from a combination of starch, a type of corn protein called a 'zein' and other naturally derived biopolymers – which the team calls a cocktail of antimicrobial compounds. affects from. derived from plants. In laboratory tests, the team was able to show that these antimicrobials are released in small amounts from fibers in packaging materials when exposed to either increased humidity (bottom right) or enzymes released by harmful bacteria (top right). Is.



Developed by researchers from Harvard and Nanyang Technological University, the waterproof pack looks exactly like transparent plastic. Pictured: Bioengineer Mary Chan-Park holds a smart pack in the park, holding two strawberries. In tests, the new material kept fruit fresh for up to three days longer than normal plastic packaging

"Food safety and waste have become a major social challenge of our time, with enormous public health and economic implications, compromising food security," said paper author and Harvard

University nanoscientist Philippe Democritou.

'One of the most efficient ways to increase food safety and reduce perishability and waste is to develop efficient biodegradable non-toxic food packaging materials.

'In this study, we used nature-derived compounds including biopolymers, non-toxic solvents and nature-inspired antimicrobials and developed a scalable system to synthesize smart antimicrobial materials.'

They can be used not only to enhance food safety and quality, but also to eliminate environmental and health damages and reduce the use of non-biodegradable plastics globally and promote sustainable development. can also be done for

,