Health

Biodegradable transparent pack promises to end food poisoning

By **Guardian Nigeria**

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New ‘smart pack’ that keeps fish, meat, vegetables fresher for longer by slowly releasing antimicrobials to kill Escherichia coli, Salmonella typhi is developed by scientists

Smart food packaging that slowly releases antimicrobials to kill harmful bacteria like E. coli and Listeria can keep fish, meat, fruit and veg fresher for longer, scientists who developed it say.

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

The waterproof pack — developed by researchers from Harvard and the Nanyang Technological University — looks exactly like transparent plastic.

However it has the benefit of being biodegradable, meaning that it could help cut down on landfill waste as well as food spoilage.

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

The full findings of the study were published in the journal ACS Applied Materials & Interfaces.

The researchers told MailOnline that the cost to produce their new packaging is comparable to regular plastics — and will likely become cheaper in the future.

This, they added, is because they anticipate improvements in the technologies used to extract the necessary ingredients from biomass.

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

"It could serve as an environmentally friendly alternative to petroleum-based polymers used in commercial food packaging, such as plastic, which have a significant negative environmental impact. The smart release of antimicrobials occurs when bacteria or high humidity is present. It provides protection only when needed — thus minimising the use of chemicals and preserving the natural composition of the packaged foods.

"It has demonstrated superior antimicrobial qualities in combating a myriad of food-related bacteria and fungi that could be harmful to humans — [and] can be applied to various produce such as fish, meat, vegetables and fruits."

In particular, she explained, "vegetables are a source of wastage because even if they are refrigerated, they continue to respire, leading to spoilage after a week or two.

“With the antimicrobial packaging, there is a chance to extend their shelf life — and also make the vegetables and fruits stay looking fresh with time.”

The smart packaging material is made via a process called electrospinning, in which charged threads of polymer solution are drawn out into fibres. The main ingredient for the material is a type of corn protein called ‘zein’ — which is a waste by-product in the production of ethanol from cornstarch or oils — to which the researchers added plant starch cellulose and acetic acid. The team infused these with a cocktail of natural antimicrobial compounds derived from plants, including thyme oil and citric acid, which is found in fruits like grapefruit, lemons, limes and oranges.

In laboratory tests, the team was able to show that the antimicrobials are released in miniscule amounts from the fibres in the packaging material when exposed to either a rise in humidity or certain enzymes released by harmful bacteria.

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

In tests, the packaging was capable of killing various common bacteria including E. coli and Listeria, as well as fungi, on both the surface of the packaging and the food contained within it.

Strawberries wrapped in the smart pack remained fresh for seven days before developing mould — as compared to just four days for those fruits kept in conventional plastic fruit boxes.

“Food safety and waste have become a major societal challenge of our time with immense public health and economic impact which compromises food security,” said paper author and Harvard University nano-scientist Philip Demokritou.

“One of the most efficient ways to enhance food safety and reduce spoilage 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 scalable systems to synthesise smart antimicrobial materials.”

These, he added, “can be used not only to enhance food safety and quality but also to eliminate harm to the environment and health and reduce the use of non-

biodegradable plastics at a global level and promote sustainable agri-food systems."

With their initial proof-of-concept complete, the team members are now looking to scale up their technology with the aid of an industrial partner.

They have said they hope to be able to bring a commercial product to market within a few years.