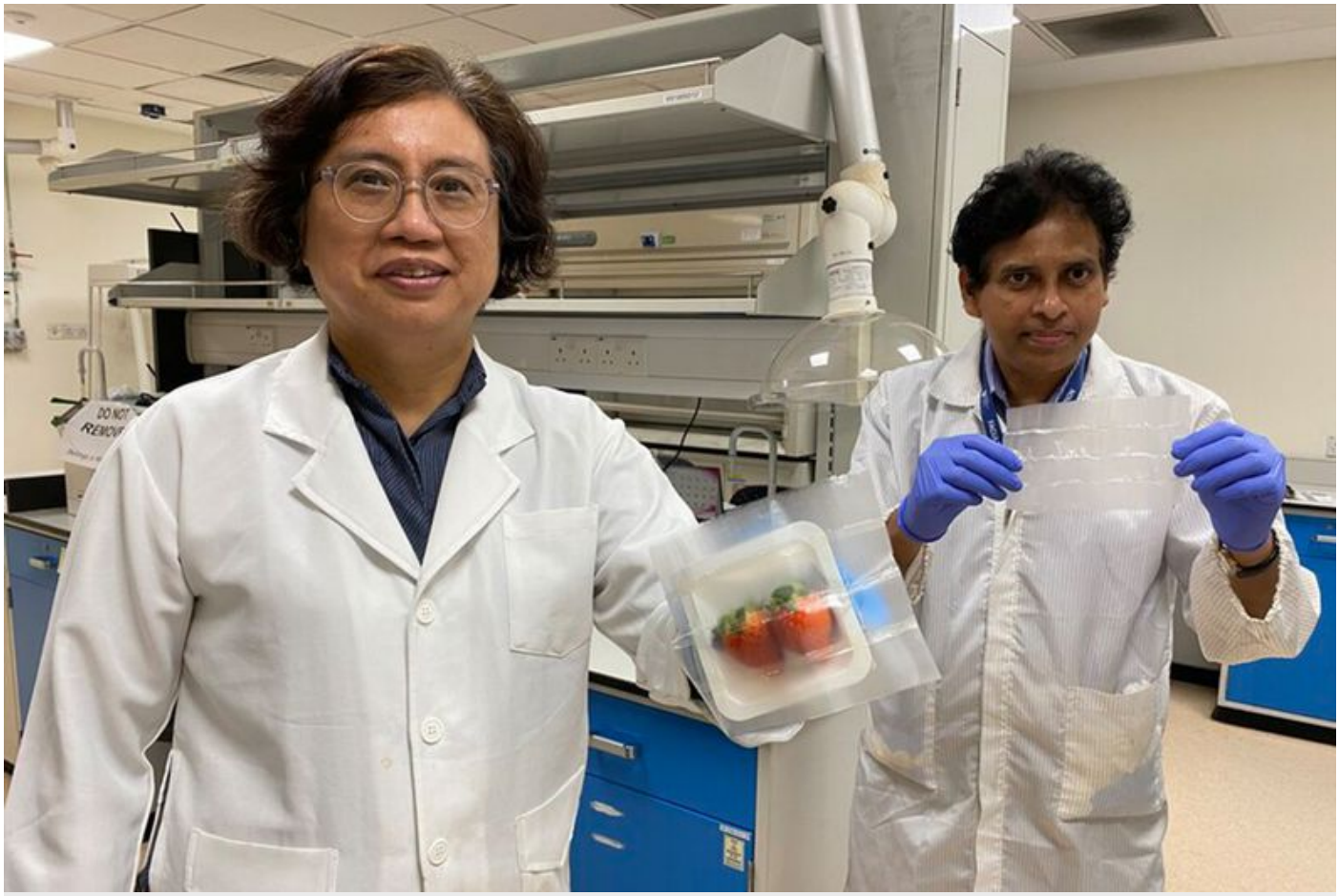
January 03, 2022 10:45 AM | 16 HOURS AGO

Smart and sustainable food packaging made from corn protein

KAREN LAIRD



NTU and Harvard Chan School researchers develop new antimicrobial food packaging material.

Scientists from Singapore's Nanyang Technological University, working in collaboration with a team from Harvard T.H. Chan School of Public Health in the USA, have

successfully developed a new ‘smart’ food packaging material that is both biodegradable and anti-microbial.

The new material is based on ‘nature-derived compounds including biopolymers, non-toxic solvents, and nature-inspired antimicrobials’, said study co-leader Professor Philip Demokritou, Adjunct Professor of Environmental Health at Harvard Chan School, and offers the potential to enhance food safety and quality and to reduce the impact on both the environment and on human health. Among others, the new packaging is made from a type of water-insoluble corn protein called zein - a by-product of corn starch and corn syrup production for food and bioethanol - as well as from other naturally derived biopolymers, infused with a cocktail of natural antimicrobial compounds such as thyme oil and citric acid. It is produced by electrospinning the zein, the antimicrobial compounds with cellulose, a natural polymer starch that makes up plant cell walls, and acetic acid, which is commonly found in vinegar.

Lab experiments showed that the antimicrobial effect was due to the fact that when exposed to an increase in humidity or enzymes from harmful bacteria, the antimicrobial compounds in the fibres were released in miniscule quantities, killing common harmful fungi and bacteria such as E. Coli and Listeria on both the surface of the packaging and on the food itself. This mechanism also ensures that the anti-microbial effect remains intact throughout numerous exposures, with as added benefit an extended shelf life of fresh produce of up to several days.

In an experiment, strawberries that were wrapped in the packaging stayed fresh for seven days before developing mould, compared to counterparts that were kept in mainstream fruit plastic boxes, which only stayed fresh for four days.

“The packaging can be applied to various produces such as fish, meat, vegetables, and fruits,” said project co-leader Professor Mary Chan, Director of NTU’s Centre of Antimicrobial Bioengineering. “The smart release of antimicrobials only when bacteria or high humidity is present, provides protection only when needed thus minimising the use of chemicals and preserving the natural composition of foods packaged.”

The team of NTU and Harvard Chan School researchers hope to scale up their technology with an industrial partner, with the aim of commercialisation within the next few years.

They are also currently working on developing other technologies to develop biopolymer-based smart food package materials to enhance food safety and quality.

The research paper entitled *Enzyme- and Relative Humidity-Responsive Antimicrobial Fibers for Active Food Packaging* appeared in ACS Applied Materials & Interfaces on 14