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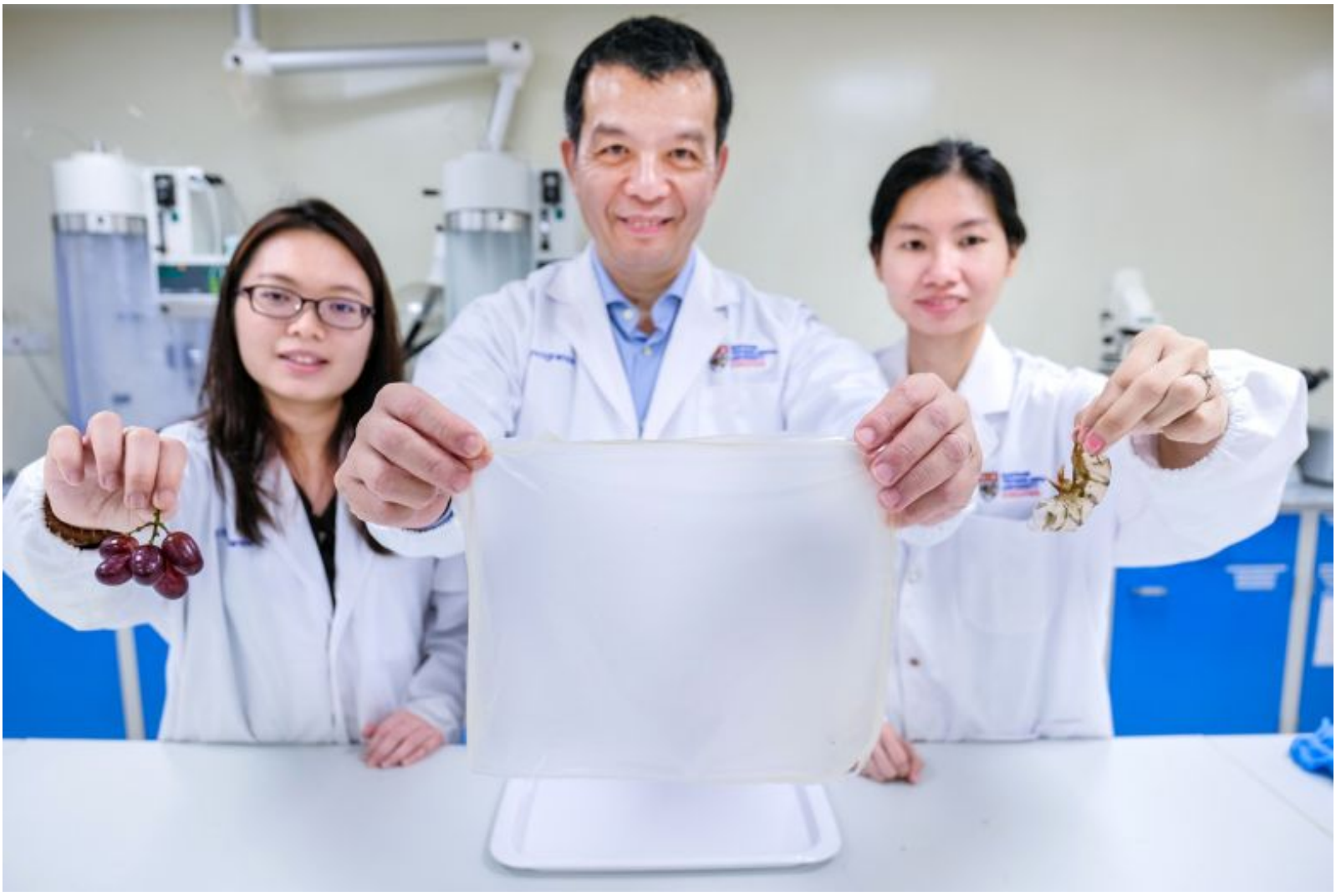
Premium

Prawn shells and grape skins turned into biodegradable packaging



(From left) NTU research officer Lee Pei Pei; Professor William Chen, director of NTU's Food Science and Technology Programme; and PhD student Tan Yun Nian with the food-grade packaging. PHOTO: NTU

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SINGAPORE - Prawn shells, orange peels and apple cores get tossed into the rubbish bin every day without a second thought.

But scientists here have found a way to turn them into chitin, a biopolymer that can in turn be made into food-grade packaging using a completely organic process.

The biodegradable packaging material could potentially replace plastic containers used for food takeaways, helping the Republic reduce the amount of single-use plastic waste it generates and helping to kill the proverbial two birds with one stone.

Plastic waste and food waste accounted for about 40 per cent of the total amount of waste disposed of in Singapore last year.Around 893,000 tonnes of plastic and 607,000 tonnes of food waste were thrown out.

In a process devised by a team from Nanyang Technological University's Food Science and Technology Programme, food waste is converted into chitin organically and without using chemicals, said Professor William Chen, the Michael Fam chair professor and director of NTU's FST, who is also the principal investigator in this project.

The prawn shells are first removed and placed in a flask of water together with some fruit waste, such as grape skin. The glucose contained in fruit waste is needed to kick-start the fermentation process that breaks the prawn shells down.

Other kinds of food waste, including mango peels, sugar cane molasses, apple cores and potato skins, were also used during the experimental process, but red grape skin proved to be the most effective in accelerating the fermentation, said Prof Chen.

After 24 hours, the water starts to turn turbid when microbes start growing in the solution. The fermentation removes minerals and protein residues from the prawn shells.

The mixture is then filtered and the prawn shells are dried in an oven to remove all moisture. Afterwards, they are ground into powder. The resultant material is chitin, a naturally occurring biopolymer found in fungi and the exoskeleton of some insects and crustaceans. It is commonly used in manufacturing cosmetics and other skincare products.

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In a separate process, chitin can be converted into chitosan by adding alkalis, such as sodium hydroxide. The solution is then put in a mould and dried to form a thin packaging film that can be used to pack food.

The entire process takes up to five days to complete.

About 20 to 30 per cent of a prawn shell is made up of chitin, which means 5g of prawn shells are needed to produce 1g of chitin.

The team, whose research findings were published in peer-reviewed journal AMB Express in January this year, is in talks with hotels and restaurants here to commercialise the process.

"The current way of extracting chitin from crustacean waste generates a lot of chemical waste," said Prof Chen.

"Our process is completely organic, as you need only food waste and water," he added.

Each year, 6 million to 8 million tonnes of crustacean waste - consisting of crab, shrimp and lobster shells - are produced globally.

Demand for seafood is growing as more people become more affluent, said Prof Chen.

"Our method takes crustacean and fruit waste and uses natural fermentation processes to extract chitin. This is not only cost-effective, but also environmentally friendly and sustainable and helps to reduce overall waste," he added.