



**Health •**  
NTU scientists  
develop  
coating to  
improve  
probiotics | B5

THE STRAITS TIMES, WEDNESDAY 30 MARCH 2022, PAGE B5

## NTU team's coating for probiotics can better deliver health benefits



**Clara Chong**



Associate Professor Joachim Loo and PhD student Tan Li Ling are part of the team that developed the edible coating for probiotics. The coating allows probiotic bacteria to reach the intestine successfully and deliver health benefits.

A team of scientists from Nanyang Technological University (NTU) has developed an edible coating for probiotic bacteria that allows them to reach the intestine successfully and deliver health benefits.

According to multiple studies, the bulk of probiotics delivered in commercial supplements and yogurts die off within the first 30 minutes of exposure to the harsh acidic environment of the stomach.

The NTU scientists cultivated *Lactocaseibacillus* bacteria before washing them in a salt solution.

The bacteria were then packed together.

The team then used a spray-drying technique to produce gastric acid-resistant probiotics where alginate – a seaweed-derived carbohydrate – was used to encapsulate the bacteria.

The whole process takes about an hour.

The NTU team shared these developments in a virtual media briefing last Friday.

Encapsulated by the coating, the bacteria are released only when reaching the small intestine, as the coating breaks down upon reacting with the phosphate ions present there.

Spray drying is an industrially scalable technique. It produces dry powder from a liquid by rapid drying with hot gas, and is the preferred method of drying many thermally sensitive materials, such as food and pharmaceuticals.

Probiotics are live microorganisms, usually bacteria, that provide health benefits when consumed at appropriate doses.

They are found naturally in food such as yogurt and pickles, and are also available in pills and powders.

If refrigerated, the coated probiotic bacteria could survive for more than eight weeks, the scientists discovered.

The coating does not degrade at all and so can protect the probiotics from gastric acid.

In comparison, probiotic drinks have a shelf life of up to seven weeks when refrigerated, but the probiotics they contain start to die off after being left at room temperature for a few hours.

The NTU team's leader, Associate Professor Joachim Loo from the School of Materials Science and Engineering (MSE) at the university, said: "Probiotics are delicate microorganisms and cannot survive the harsh environment of our stomach.

"To increase the efficacy of probiotics as a dietary supplement, we sought to 'parcel-wrap' and deliver them to specific sites of the intestine where they function best."

This process also extends the shelf life of the probiotics, keeps them stable and provides them with protection at extreme pH conditions, he added.

The alginate coating was selected also because it is safe for human consumption, of natural origin, and relatively low cost, said Ms Tan Li Ling, a PhD student at MSE and first author of the study.

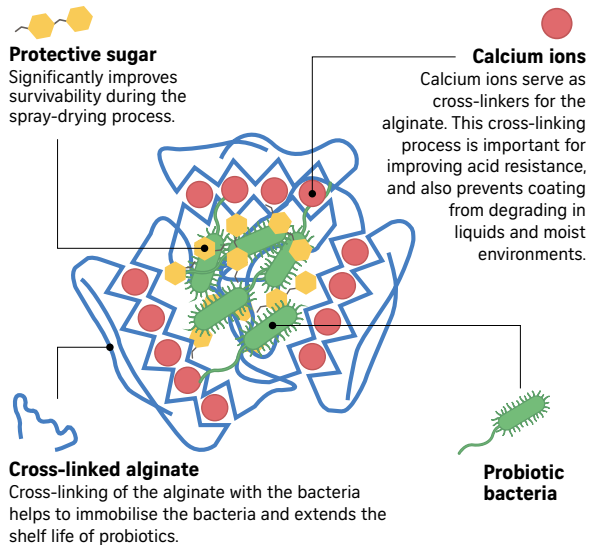
Alginate also exhibits acid-buffering properties, limiting pH fluctuations in the bacteria's environment, thereby protecting them against the harsh conditions caused by the gastric acid.

Slated to reach the market in about three years, this low-cost and industrially viable method to encapsulate probiotics can enhance the functionality of existing probiotic products without increasing costs significantly.

The NTU scientists are also exploring using their innovation to

### How probiotics are made to withstand harsh acidic conditions in the stomach

- 1 The probiotic bacteria are mixed with alginate and protective sugar.
- 2 The alginate-probiotics solution is subjected to a spray-drying process and simultaneously sprayed with calcium ions to encapsulate the bacteria, yielding acid-resistant probiotics.



- 3 The whole process takes about an hour.
- 4 Spray drying produces dry powder from a liquid through rapid drying with hot gas and is the preferred method of drying many thermally sensitive materials, such as food and pharmaceuticals.

Source: NANYANG TECHNOLOGICAL UNIVERSITY STRAITS TIMES GRAPHICS

enrich food and drinks, such as beer and other canned beverages, with probiotics.

They will be working with the Singapore Food Agency on testing the innovation on other types of probiotics, which would enable it

to be applied to the agrifood technology industry.

It could be used to enrich the diets of reared animals – such as fish and chicken – with probiotics.

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