

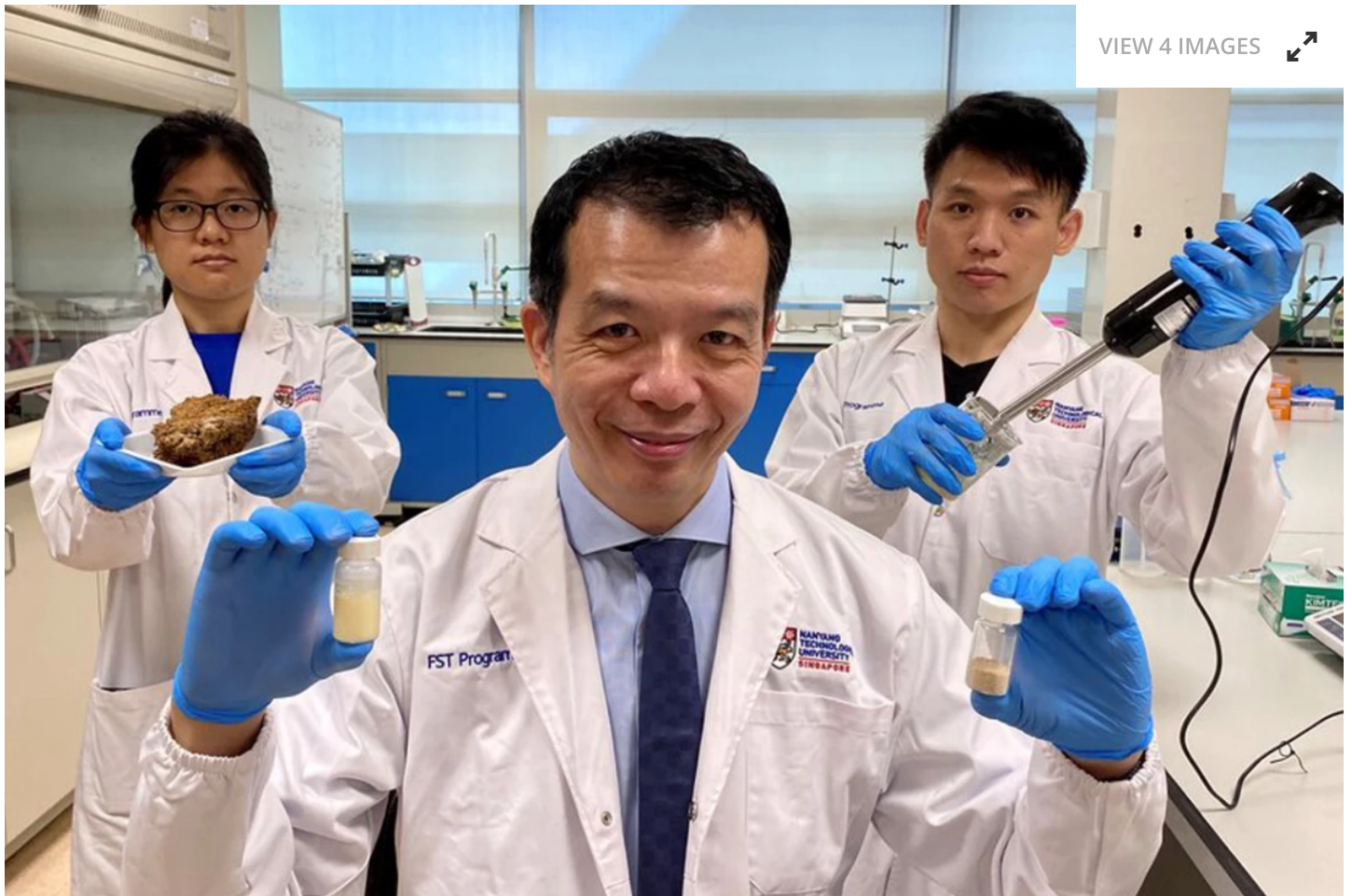
ENVIRONMENT

Beer-brewing waste used in eco-friendly, nutritious food emulsifier

By Ben Coxworth
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From left to right: PhD student Chin Yi Ling (with a sample of the spent brewer's grain), Prof. William Chen (with a sample of mayonnaise, and the extracted proteins used as its emulsifier) and research fellow Dr. Josh Chai Nanyang Technological University

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Food additives known as emulsifiers are widely used to combine two liquids which ordinarily don't mix, such as oil and water. And while most emulsifiers are made from dairy proteins or egg yolks, a new one uses spent brewer's grain which might otherwise be discarded.

First of all, there *are* already plant-based emulsifiers which utilize ingredients like gaur gum, soy lecithin, agar agar and acacia gum. One of the things that makes this latest one special, however, is the fact that it utilizes an existing waste material which is often dumped in landfills. Additionally, *this* emulsifier is claimed to actually boost the nutritional content of the foods in which it's used.

Led by Prof. William Chen, scientists at Singapore's Nanyang Technological University started by adding *Rhizopus oligosporus* fungus to spent brewer's grain, then leaving the mixture to ferment. During the fermentation process, the fungus secreted enzymes which broke down the complex molecular structure of the grain, allowing key proteins and antioxidants to be easily extracted.

Those compounds were dried and then used in the emulsifier, which was in turn used as an alternative to traditional emulsifiers in a mayonnaise.



A sample of store-bought mayonnaise (left) alongside a sample made with the grain-based emulsifier Nanyang Technological University

First and foremost, a panel of volunteers found that the mayo tasted identical to a conventional store-bought mayonnaise, yet it also had a better, more spreadable texture. Additionally, it was determined that the brewer's grain mayonnaise contained more nutrients, antioxidants and certain essential amino acids. Its fat and calorie content was similar to that of the store-bought product.

"Our emulsifier is as an impactful solution to not only cut down on waste but potentially improve human diets by introducing plant-based protein that is widely accessible," says Chen. "Furthermore, our emulsifier allows us to upcycle a would-be waste product. The environmental benefits of upcycling are immense, aside from minimizing the volume of discarded materials and waste being sent to landfill each year, it also reduces the need for production using new or raw materials."

The scientists are now working on boosting the yield of the protein extraction process, and plan on trying the emulsifier out in other food products such as ice cream and soy milk. A paper on the research was recently published in the journal *Food Chemistry: X*.

It should be noted that other teams have developed methods of converting spent brewer's grain into [nutritional supplements](#), [biofuel feedstock](#) and [charcoal](#).

Source: [Nanyang Technological University](#)



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