

Scientists discover natural plant-based food preservative

August 17 2018



Scientists at NTU Singapore have discovered a plant-based food preservative that is more effective than artificial preservatives. Credit: NTU Singapore

Nanyang Technological University, Singapore (NTU Singapore) scientists have discovered a plant-based food preservative that is more

effective than artificial preservatives. The organic preservative comprises naturally occurring flavonoids, a diverse group of phytonutrients found in almost all fruits and vegetables. The flavonoids created by NTU scientists have strong antimicrobial and antioxidant properties, two key traits of preservatives that inhibit bacterial growth and extend food freshness.

In tests carried out on meat and fruit juice samples, the organic [preservative](#) kept its samples fresh for two days without refrigeration, compared to commercial-grade artificial [food](#) preservatives. The experiment was conducted at room temperature (about 23 degrees Celsius), at which other food samples with artificial preservatives succumb to bacteria contamination within six hours.

The NTU research team was led by Professor William Chen, director of NTU's Food Science & Technology programme. The team is already in talks with multinational companies to further develop the new food preservative. The team's findings were published last month in the scientific journal *Food Chemistry* - one of the top three research-based food science publications.

Prof Chen said, "This organic food preservative is derived from plants and produced from food grade microbes, which means that it is 100 percent natural. It is also more effective than artificial preservatives and does not require any further processing to keep food fresh. This may open new doors in food preservation technologies, providing a low-cost solution for industries, which will in turn encourage a sustainable food production system that can produce healthier food that stay fresh longer."

Flavonoids are naturally occurring chemicals in plants responsible for defending them against pathogens, herbivores, pests, and even environmental stressors such as strong ultraviolet rays from prolonged

hours of sunshine.



In tests carried out on meat samples, the organic preservative (pictured left) discovered by NTU Singapore scientists, kept its samples fresh for two days without refrigeration, compared to commercial-grade artificial food preservative. Credit: NTU Singapore

Found in almost all fruits and vegetables, they are responsible for inducing vivid colours. These include onions, tea, strawberries, kale and grapes. Though [flavonoid](#) anti-microbial potential has been reported, they have not been used as a food preservative because they require further processing before they can mitigate bacteria. This is known as 'prenylation,' a process involving the addition of hydrophobic molecules onto a protein to facilitate cell attachment, which is not cost-effective or

sustainable.

NTU researchers have found a way to grow flavonoids with high anti-microbial and antioxidant properties in a natural and sustainable manner. They achieved this by implanting the flavonoid-producing mechanism from plants into baker's yeast (a species known as *Saccharomyces cerevisiae*). Similar to how vaccines are manufactured using yeast, the researchers found that the yeast produced flavonoids with high anti-microbial properties not present in pure flavonoid samples extracted directly from plants.

Prof Chen said, "Antimicrobial and antioxidant properties are key elements in food preservation. Flavonoids extracted directly from plants need to be further processed to be antimicrobial, whereas our flavonoids produced from yeast do not require this. Secondly, there have been no reports on anti-oxidant properties in flavonoids, while our yeast-based flavonoids naturally come with it."

This research comes at a time when there is a growing body of scientific evidence on how artificial preservatives affect the body's long-term growth and development. Last month (23 July), the American Academy of Pediatrics, which represents some 67,000 pediatricians in the United States, issued an announcement expressing concerns about chemicals used in food preservatives, especially for meat products. These include nitrates and nitrites, which can interfere with thyroid hormone production that is essential for the regulation of metabolic processes, and has also been linked with gastrointestinal and nervous system cancers.

Sharing an independent view on the research, Dr. Gabriel Oon Chong Jin, a Consultant Medical Oncologist at Mount Elizabeth Hospital, said, "The new source of natural food preservatives from flavonoids safely produced from yeast by NTU is brilliant, as this species of yeast has been used in brewing beer and in the manufacture of hepatitis B

vaccines."

Dr. Oon, a former consultant and adviser to the World Health Organisation and a pioneer in implementing the universal vaccination programme in Singapore, added, "Flavonoids are important natural food supplements with vitamins, but also used as food additives, without causing harm to the human system. This is unlike currently available artificial preservatives used in most processed foods such as aspartame and nitrates, which may cause cancer among other adverse health effects."

The NTU research team aims to further develop their findings with the food industry and enhance its efficacy and safety so that it can be used in all packaged food products.

More information: Kuan Rei Ng et al, Antimicrobial and antioxidant activities of phenolic metabolites from flavonoid-producing yeast: Potential as natural food preservatives, *Food Chemistry* (2018). [DOI: 10.1016/j.foodchem.2018.07.077](https://doi.org/10.1016/j.foodchem.2018.07.077)

Provided by Nanyang Technological University

Citation: Scientists discover natural plant-based food preservative (2018, August 17) retrieved 19 April 2024 from <https://phys.org/news/2018-08-scientists-natural-plant-based-food.html>

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