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Singapore develops food inks from frozen vegetables

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Researchers from Nanyang Technological University, Singapore (NTU Singapore), Singapore University of Technology and Design (SUTD) and Khoo Teck Puat Hospital (KTPH) have developed a new way to create “food inks” from fresh and frozen vegetables, that preserves their nutrition and flavour better than existing methods.



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Pureed foods are usually served to patients suffering from swallowing difficulties known as dysphagia. To present the food in a more visually appetising way, healthcare professionals have used silicone moulds to shape pureed foods, which is labour and time intensive, and requires storage.

While 3D food printing means food can be easily produced in a desired shape and texture in a shorter time, the dehydrated food and freeze-dried powders used as food inks usually contain a high percentage of food additives such as hydrocolloids (HCs) to stabilise the ink and enable a smoother printing process. High concentration of hydrocolloids usually changes the taste, texture and aroma of the printed food, making it unappetising to patients with dysphagia. This may lead to reduced food consumption and malnutrition among patients.

To overcome this challenge, the research team explored various combinations of fresh and frozen vegetables to make the food inks stable.

Asst Prof Yi Zhang, the principal investigator from the NTU team said, “Our technology helps to provide dysphagic patients with adequate nutrient-rich and safe diets. Their feeding is more dignified, enabling them to socialise and consume meals that look, feel and taste like regular food. Our method of 3D printing fresh vegetables can be used easily in hospitals, nursing homes, day care centres for the ageing population with dysphagia and other swallowing disorders. Our research is also another step forward in digital gastronomy, where we can cater to specific requirements prescribed by dieticians, such as nutrition customisation and visual appeal.”

Prof Chua Chee Kai, corresponding author and the Head of Pillar, Engineering Product Development at SUTD, added: “The next frontier of additive manufacturing is 3D food printing. As the 3D food printing landscape is increasingly evolving, we are excited to continue pushing the boundaries of this industry to find innovative solutions for global issues such as food security and sustainability.”

Gladys Wong, co-principal investigator and Senior Principal Dietitian from KTPH said: “3D Food Printing is more than a novelty. I believe it will be a viable approach in the near future in providing sustenance and nourishment to our increasing ageing population. Our frail, elderly patients as well as those with swallowing difficulties will be able to enjoy a visually presentable and pleasurable dining experience even with a restrictive diet of smooth pureed dishes.”