NUS National University of Singapore

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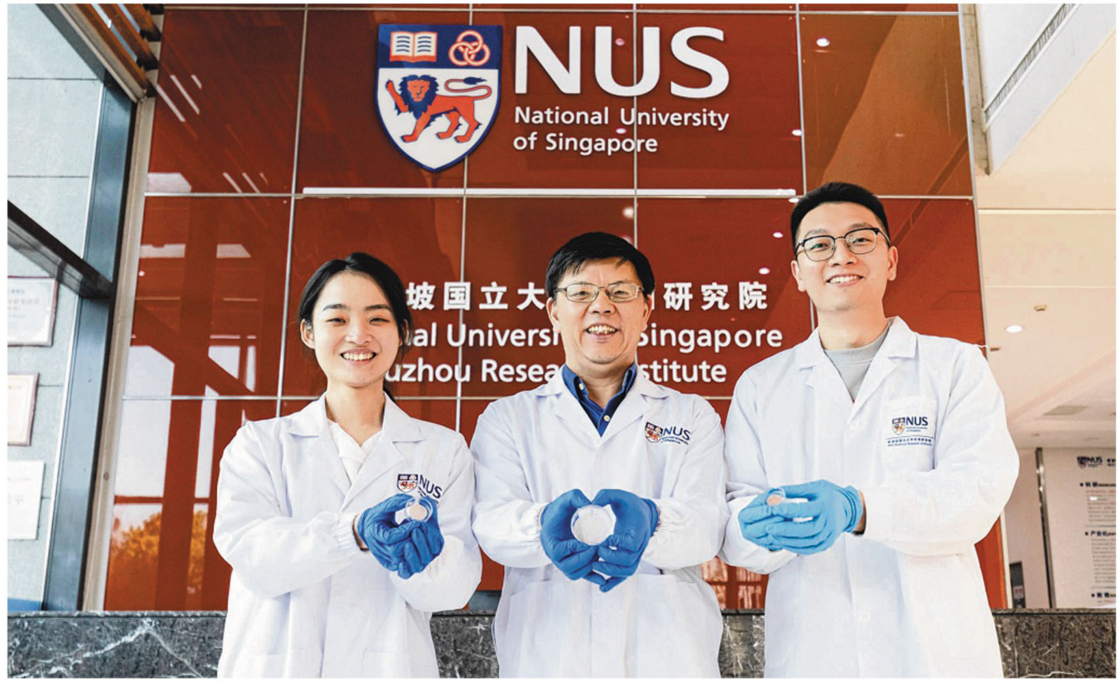
New ink can be used to 3D-print scaffolds to grow meat

NUS team develops plant-based ink which could make cultivation more cost-effective



Professor Huang Dejian (centre), principal investigator of the project, and his research team members, Ms Su Lingshan and Dr Jing Linzhi. They were developing the 3D-printing method for biomedical uses when they realised it had another potentially important application. PHOTOS: NATIONAL UNIVERSITY OF SINGAPORE

Hana Chen and Alexandria Ee

Researchers from the National University of Singapore (NUS) have developed a new plant protein ink they can use to create scaffolds on which to grow meat in laboratories in a more cost-effective way.

The edible ink is made from the by-products of agricultural grains like maize and barley, and the team uses it to 3D-print the scaffolds, which provide the micro-sized structure for cells to form into the intended shape.

Cell culture scaffolds provide the structural support for cells to multiply and develop into tissue. However, they are typically made of synthetic or animal-based materials that are expensive and inedible, making meat cultivation difficult on a massive scale, said Professor Huang Dejian, principal investigator of the project.

The team was actually developing the 3D-printing method for biomedical uses when it realised it had another potentially important application.

"As the demand for scaffolds for meat culture is on the rise and remains a bottleneck in the development of lab-based meat, the idea of using 3D-printed scaffolds for meat culture came naturally to us," explained Prof Huang, deputy head of the Department of Food Science and Technology at NUS.

He added that because the plant protein-based scaffolds provide a conducive environment, the cells grow three times faster than they do on traditional plastic-based scaffolds. A process originally known to take up to a month is now shortened to approximately 10 days.

As proof of concept, the team cultured pig muscle stem cells on the scaffold, adding beet extract to simulate the reddish colour of meat.

Their experiment was a success – within 12 days, the team had cultured meat that was similar in texture and overall appearance to real animal meat.

Another advantage of the plant-based scaffolds is that they are edible, making them suitable to be eaten along with the lab-grown meat. When cells are cultivated on plastic scaffolds, they have to be separated from the scaffolds through a rigorous process.

Prof Huang and his team are now focusing on the production of meat so that it fulfils the criteria for market consumption in terms of nutritional value and in compliance with regulatory safety requirements.

One important task for the team is to improve the plant-based protein ink.

More studies are needed to better determine how the biomaterial in the ink can impact the growth of animal stem cells before they grow into muscle tissue.

There are also plans to refine the production process and improve the economies of scale by developing other materials from the ink so that the scaffold does not need to be 3D-printed.

Prof Huang hopes to partner manufacturers of lab-grown food when the project becomes commercially viable.

Beyond that, the team is also actively involved in intensive research on biomedical applications of the 3D-printed scaffolds. Other potential uses include regenerative medicine, to grow eye cells for retina repairs, and 3D-cell models for anti-cancer drug screening.

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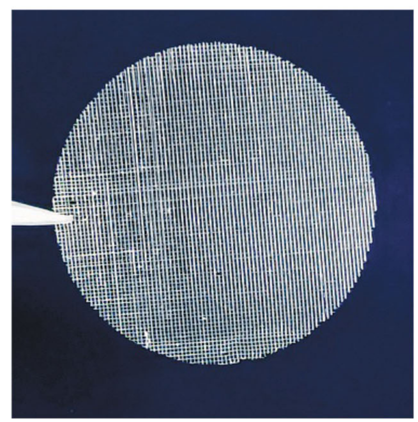

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