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Singapore develop plant-based cell culture scaffold meat which can be 3D printed

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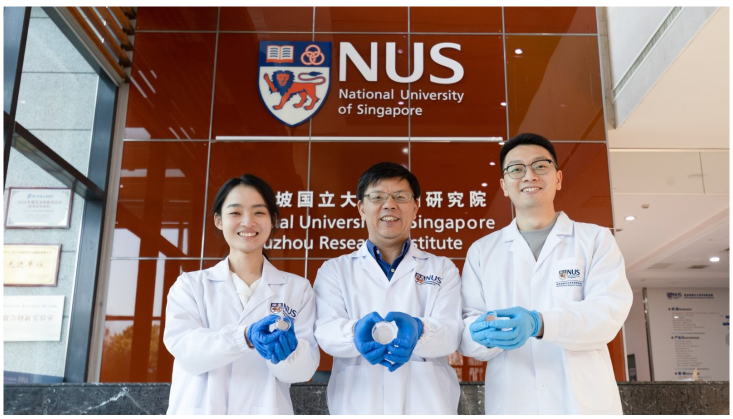

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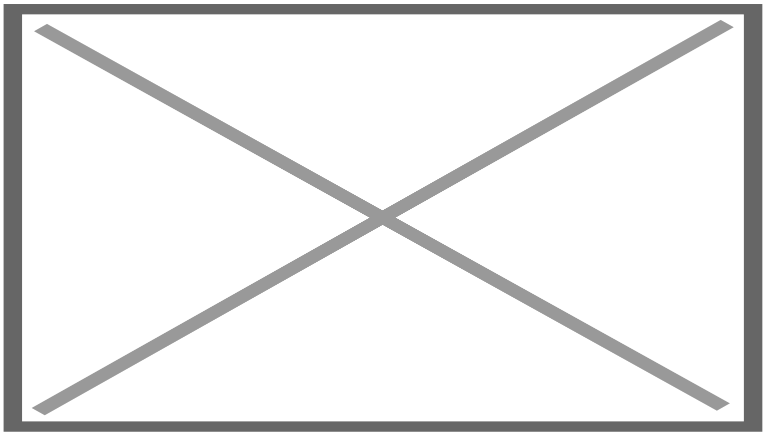
A research team from the National University of Singapore (NUS) has successfully used common plant proteins to 3D-print an edible cell culture scaffold, allowing more affordable and sustainable lab-grown meat to be served on the table. The research team has successfully cultured meat that is similar in texture and overall appearance to real animal meat.

Lab-grown meat has become an increasingly popular source of dietary protein, as consumers become more conscious of the environmental and ethical ramifications of their protein source. Cultured meat or cell-based meat is produced by taking skeletal muscle cells from animals and growing them on three-dimensional constructs called scaffolds, which provide structural support as the cells multiply and develop into tissues.

â??Scaffolds made from plant proteins are edible and have diverse and variable peptide sequences that can facilitate cell attachment, induce differentiation, and speed up the growth of meat. In contrast, synthetic scaffolds such as plastic beads used for cultured meat have no functional group which makes it difficult for animal cells to attach and proliferate. In addition, synthetic scaffolds are not edible and extra steps are required to separate the scaffolds from the meat culture,â? elaborated Prof Huang.



However, cell culture scaffolds are typically made from synthetic or animal-based materials, which are either too expensive or inedible. In search of an alternative, the team led by Professor Huang Dejian, Deputy Head of theÂ NUS Department of Food Science and Technology, turned to plant proteins. These proteins are biodegradable and biocompatible with animal cells. Crucially, plant proteins also satisfy common food consumption requirements, making the resulting scaffold suitable for culturing meat.

The researchers used mixtures of prolamins derived from corn, barley and rye flour, also known as zeins, hordeins and secalins, respectively. These mixtures then acted as the ink for electrohydrodynamic printing, a high-precision 3D printing technology commonly employed in biomedical applications.

â??By using readily available cereal prolamins as biomaterials for high-precision 3D printing technology, we open up a new method for manufacturing edible and structured scaffolds to produce cultured muscle meat slices with fibrous qualities,â?? said Prof Huang.

For scaffolds to be of any use in cultivating meat, they need to be biocompatible with muscle cells from agricultural animals, meaning that they need to be able to accommodate these cells and support their growth and development. Researchers found that the cells divided extensively on the scaffolds, when seeded the prolamin constructs with stem cells from pig skeletal muscle, reaching a maximum count 11 days after they were inoculated. The stem cells grew comparably well in both zein/hordein and zein/secalin scaffolds.

Of significance, when compared against a standard polycaprolactone scaffold, a common tool in tissue engineering, pig cells seeded onto the prolamin constructs proliferated much faster, demonstrating that the plant protein-based scaffold was more feasible for cultured meat production than standard synthetic polymers.

These results further verify the potential of the proposed prolamin-based scaffolds in cultivated meat production. Prof Huang and his team are actively working on refining the plant protein-based technology