FOOD TECHNOLOGY

Cultured meat on a plant-based frame

Textured soy protein can now provide scaffolding for bovine skeletal muscle cells to adhere to and form meat-like 3D cell cultures, thus advancing the generation of cultured meat and reducing the reliance on animal agriculture.

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The cultured burger was first introduced to the public in 2013[1]. High production costs remain a challenge; growing meat in vitro requires many expensive and inedible cell culture reagents, including scaffolding material to support the growth of cells in three dimensions. In this issue of *Nature Food*, Ben-Arye and colleagues[2] develop a protein scaffold from textured soy protein (TSP), reported as an economical — and, on-trend, plant-based — scaffolding structure. Here, they show that TSP can support the growth of bovine skeletal muscle cells for a prototype of cultured meat.

Three-dimensional tissue engineering was first developed in the medical field for tissue regeneration and transplantation using tissue matrices, natural hydrogels and synthetic polymers for scaffolds[3]. Currently, the food sector is pursuing suitable scaffolding materials to produce a cultured meat product that is suitable for human consumption. Such scaffolding materials include hydrogels based on naturally derived biopolymers such as fibrin, collagen, hyaluronic acid, alginate and chitosan. Synthetically derived polyamide and polyethene glycol[4,5] polymers are also of interest. Smart surface coatings, that enable the harvesting of cells[6], can also produce a 'purer' meat product. However, these materials remain costly. Highly porous plant-based scaffolds like de-cellularized plant tissue[7], have potential to mitigate issues of cost and sustainability.

TSP, utilized by Ben-Arye and colleagues to develop a scaffold, is a by-product of soybean oil processing and is widely used in foodstuffs. The researchers show that co-culturing a combination of bovine satellite, smooth muscle and endothelial cells produces 3D cell cultures that are 'meat-like', according to three volunteer taste testers. Although this work offers advances for the scaffolding of cultured meat, challenges ahead for developing a viable food product include the elimination of foetal bovine serum and an extensive list of specific growth factors used in the culture medium, and intensive exploration of parameters such as overall texture, palatability and nutritional value.

In the short term, bringing cultured meat to the market will be highly influenced by the availability of economical and environmentally sustainable scaffolding material, highly proliferative cells and optimized media composition. Here, Ben-Arye and colleagues show that bovine muscle cells can be grown in three-dimensional culture on an affordable, widely available and sustainable plant-based scaffold. ❐

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