

## **Cultivated meat is closer than you think**

Che Connon, Chief Executive of 3D Bio Tissues

Investment in the cultivated meat market is growing at an unprecedented rate. The latest figures suggest the sector is set to record a compound annual growth rate (CAGR) of 410 per cent between now and 2030, reaching a £25 billion market according to McKinsey. A key driver of this is that new solutions to tackle climate change and food security - producing consistent yields for farmers - continue to grow in priority for governments, businesses, and other key stakeholders.

The consumer and environmental cases are equally as compelling. Cultivated meat can offer the same nutritional value as conventionally produced beef, pork, poultry, and seafood, and targeted at a considerably wider customer base that could include vegetarians and vegans as well as meat eaters.

From an environmental perspective, growing meat from cells in bioreactors could have an immeasurably positive impact on combating climate change. Livestock agriculture is directly responsible for 24 per cent of all greenhouse gas emissions, with methane from animals having 80 times the warming power of carbon dioxide in its first 20 years in the atmosphere.

Perhaps still more damaging is the huge number of resources taken up by livestock agriculture, which remains hugely inefficient. Currently, livestock farming is responsible for 25 per cent of the world's land surface and more deforestation than the next three contributors combined. Therefore, alongside improving sustainability, cultivated meat can help play a considerable role in restoring the long-threatened biodiversity of our planet.

In addition, companies can produce meat closer to home, reducing the amount of fuel needed to deliver products. Meanwhile, farmers can grow cultivated meat indoors or incorporate it into vertical farming techniques to increase their yield. There are also considerable medical benefits, as livestock farming consumes 66 per cent of the world's antibiotics, contributing to the increasing prevalence of resistant bacteria.

However, very little is still known about the biological makeup of cultivated meat produce or the procedure of cell extraction to move the process from cell conception to the complete meat product.

The process begins by extracting cells from a living animal - such as a cow - using a single, painless biopsy. The cells are then put into a tissue bioreactor, where they are added to specific nutrients to replicate and increase the number of cells. These are then placed in a cell bank before being transferred to a 'tissue bioreactor', which stimulates the cells to turn into the structured fibres you find in muscles.

Today, more than 100 companies around the world are trying to create cell-based protein, ranging from lab-grown lamb, lab-grown meatballs, and lab-grown oysters. However, the different protein structures present various complications. Meat is made up of complex tissue arrangement (structure), and resultant texture can be difficult to construct in vitro. Universal amongst industry players is the use of plant-based scaffolds to hold together the muscle, fat and connective tissue, such that the end product is not 100 per cent meat.

At 3D Bio Tissues, we have been working to address this issue. One of our proprietary technologies - entitled City-Mix™ - uses a cell boosting process, which enhances the growth of tissues during the bioreactor phase, to the point that the need for a scaffold is eliminated, to give a 100 per cent meat end product.

The growth of cells also traditionally uses serum, a blood-product, taken from animals that have been slaughtered as part of the traditional meat production process. However, City-Mix™ is serum-free, ensuring that the suffering of animals is entirely removed in the making of cultivated meat.

This year we were able to produce three small meat fillets of approximately 30 millimetres (mm) in height and 15mm in diameter, with an average weight of five grammes, utilising innovative proprietary methods. We then tested the prototypes across a variety of attributes to ascertain their quality and similarity to conventional meat, with comprehensively positive results.

In their raw state the lab-grown fillets exhibited structural integrity and resistance to breaking when being manipulated and compressed. The fillets resembled conventional farm grown meat to touch with similar consistency and elasticity and no obvious aroma.

Two of the fillets were then pan fried, cooking rapidly and throughout while maintaining integrity and shape and exhibiting only minimal shrinkage, as would be expected during the preparation of high-quality farm grown meat. The fillets seared easily, showed heavy caramelisation with charring and crisping on the surface, and the aromas were identical to those of barbecued meat. In summary, the test results met, and in many areas exceeded, our expectations in all respects.

Without plant-based scaffolds and the use of serum, these prototypes can claim to be some of the first-ever cultivated products that were completely cruelty-free and 100 per cent meat.

The success of these prototypes puts us firmly on the path to producing our first showcase fillet of meat early this year. 'Meat as you Know it', as we like to call it, can transform the prospect of commercialising cultivated meat products for the mass market in the future.

High-quality cultivated meat could be coming sooner than you think.