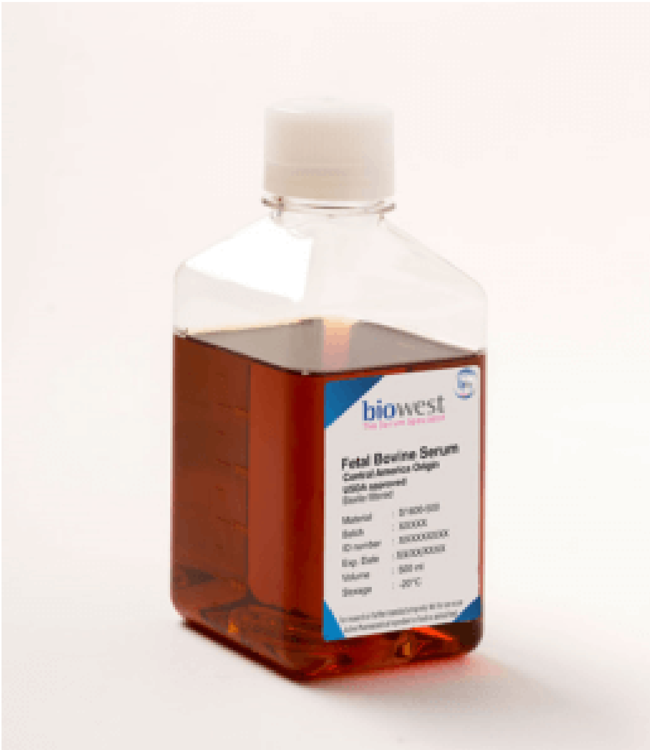
How to scale up lab-grown meat? Scientists ‘zap animal cells with a magnet’

Scientists from the National University of Singapore (NUS) have found a novel way of growing cell-based meat by zapping animal cells with a magnet. This new technique simplifies the production process of cell-based meat by reducing reliance on animal products, and it is also greener, cleaner, safer and more cost-effective.

Cultured meat is an alternative to animal farming with advantages such as reducing carbon footprint and the risk of transmitting diseases in animals. However, the current method of producing cultured meat involves using other animal products, which largely defeats the purpose, or drugs to stimulate the growth of the meat.

To cultivate cell-based meat, animal cells are fed animal serum – usually foetal bovine serum (FBS), which is a mixture harvested from the blood of foetuses excised from pregnant cows slaughtered in the dairy or meat industries – to help them grow and proliferate. This is a critical, yet cruel and expensive, step in the current cell-based meat production process. Ironically, many of these molecules come from the muscles within the slaughtered animal, but scientists did not know how to stimulate their release in production scale bioreactors. Other methods to promote cell growth are using drugs or relying on genetic engineering.



Fetal bovine serum is commonly used to create cultured meat, but plant based alternatives are also being developed. Credit: Biowest

The complex production process for cell-based meat increases cost, limits the manufacturing scale and undermines the commercial viability of cell-based meat.

To help address this challenge, a multidisciplinary research team led by Associate Professor Alfredo Franco-Obregón, who is from the NUS Institute for Health Innovation & Technology and the NUS Yong Loo Lin School of Medicine, came up with an unconventional method of using magnetic pulses to stimulate the growth of cell-based meat.

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Growing cell-based meat with the help of a magnet

The NUS technique uses a delicately tuned pulsed magnetic field developed by the team to culture myogenic stem cells, which are found in skeletal muscle and bone marrow tissue.

Assoc Prof Franco-Obregón explained, “In response to a short 10-minute exposure to the magnetic fields, the cells release a myriad of molecules that have regenerative, metabolic, anti-inflammatory and immunity-boosting properties. These substances are part of what is known as the muscle “secretome” (for secreted factors) and are necessary for the growth, survival and development of cells into tissues. We are very excited about the possibility that magnetically-stimulated secretome release may one day replace the need for FBS in the production of cultured meat.”

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This magnetic field technique could replace the need for animal based serums in the cultivated meat creation process. Credit: Macmillan Publishers Ltd and Nature

He added, “The growth-inducing secretomes can be harvested in the lab safely and conveniently, and also at low cost. This way, the myogenic stem cells will act as a sustainable and green bioreactor to produce the nutrients-rich secretomes for growing cell-based meat at scale for consumption. The muscle knows how to produce what it needs to grow and develop – it simply needs a little bit of encouragement when it is outside its owner. This is what our magnetic fields can provide.”

Applications in regenerative medicine

The harvested secretomes can also be used for regenerative medicine. The NUS team used the secreted proteins to treat unhealthy cells and found that they help to accelerate the recovery and growth of the unhealthy cells. Therefore, this method can potentially help to cure injured cells and speed up a patient’s recovery.

The research team published their findings in the August 2022 issue of the scientific journal *Biomaterials*. A patent has also been filed for this novel technology and the NUS team is currently in active discussions with potential industry partners to commercialise the technology.

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