

A New Era Of Meat Processing: Cultured Meat

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Cellular agriculture is the key to meeting future global demands for protein, says Henk Hoogenkamp, author of *Protein Transition: Technological, Economic & Societal Impact of Global Protein Sustainability*.

To meet the 2050 challenge of feeding a rapidly growing human population, it is essential to carefully consider how to produce enough protein. Based on today's current supply realities, a significant move to plant-based protein nutrition simply is neither sustainable nor desired. Although more plant protein for human dietary consumption is much needed, a world that overwhelmingly chooses plant-based foods as its protein source will not be able to truly sustain humanity going forward.

Making meat without the animals is rapidly emerging new concept. In the future, the words "meat" and "animal" will be decoupled. Meat without animals is the new notion of cellular biotechnology using stem cells and bioreactors as the basic platform to "brew" healthy and nutritious clean meat. The ultimate goal is to remove the animal from the meat production—it is time that the world moves past needing to kill animals and destroy the environment for food.

Cultured meat, also termed clean meat, is biologically identical to conventional slaughtered meat. All of this progress is possible due to advancements in chemical engineering, genetics, stem cell biology and regeneration. This method is a better way of bringing meat for human consumption with a very transparent production process signaling an inevitable shift towards an ecologically sustainable food system.

The age of the successful emerging start-ups within the food tech space has arrived and cellular agriculture is one of the most cutting-edge spaces in food technology today. It will change the fundamental structure of the entire food supply chain.

POST-ANIMAL CELLULAR AGRICULTURE

The finite amount of agricultural land and the availability of clean water combined with resource depletion will force government policy makers to rebalance diets towards more plant-based foods. In other words, they will accept the need to reduce the consumption of foods with a higher environmental impact like slaughtered animals for meat consumption and using dairy cows for milk production, while increasing production of lower-impact foods like cultured cellular meat to enrich the diet with plant proteins derived from cereal grains, legumes, potatoes, vegetables, and fruits. Considering cellular agriculture like the emerging animal protein sources is vital to create cultured meat, natural cultured dairy foods, insects and other post-animal biotechnology and bioeconomy developments to boost food security and affordability.

RIDING THE REVOLUTION



(Partly) replacing or reducing conventionally-killed animals for meat supply with cultured meat can significantly reduce land, water, and crops needed to feed animals, while benefitting people's health and reducing outbreaks of diseases. For the next generation, sustainability of food security will be a major challenge. Besides the fundamental economic and technological challenges, the biggest hurdle is how to convince consumers to try the plant-based equivalent and the food "harvested" from cell cultures instead of the "real or original" food.

When exponential technologies stride forward, consumers have the tendency to become suspicious. The question is: will consumers will embrace cellular bioengineered foods like animal-free milk supplanting traditional cow's milk? This question is difficult to answer, but the fact remains that the world population is growing at unprecedented pace and innovation will be the key to providing every citizen with great tasting healthy foods now and in the future.

IN BASIC TERMS

By relying less on an inefficient traditional meat protein-delivery system, people should instead utilise the nutritive value of the world's five major commodity crops—rice, corn, wheat, soy, and potatoes—as well as embrace cellular agriculture which can be further explored for the production of meat and animal-free dairy that could fundamentally reshape our food supply.

Put simply, the process of cultivating clean meat involves feeding the cells the correct nutrients to produce muscle and fat, as it would ordinarily happen were they grow inside the animal's body.

Cultured clean meat will be hugely beneficial in reducing the environmental impact that industrial farming has, as well as reducing the spread of food-borne illnesses, especially in light of salmonella contamination, and the fast-developing antibiotic resistance.

Clean meat will allow a reduction of up to 98 percent in greenhouse gas emissions, 99 percent in land exploitation, and up to 96 percent in water usage.

The major hurdles to cross are both in terms of the core science of growing meat, and developing a manufacturing process that will enable “clean meat farms” to grow in scale and produced at a cost that can compete with animal-reared meat.

MEAT MINUS SLAUGHTER

For cultured or clean meat, the slogan is: “There is no need to cause death for food”. Meat minus slaughter equals meat without animals. The “next-gen meat” will be produced with no traditional animal agriculture and no animal raised for slaughter.

Clean meat is produced using cell cultures and these “slaughter-free” cells are cultured to become the constituent parts like myocytes (=muscle), chondrocytes (=connective tissue), and adipocytes (=fat). All these components are assembled and will ultimately provide the structural integrity of the product.

In a nutshell: using animal cells, and infusing grow cultures ultimately transitions in a few weeks to clean and nutritious food to make the cells grow into muscle. This whole process from start to finish takes about four to six weeks, depending on the organoleptic parameters. Memphis Meat has successfully created cultured beef, chicken- and duck meat. Duck meat might sound odd at first, but it is popular in China, which consumes more of it than the rest of the world combined.

Cultured meat is a significant and huge technological leap for humanity, as well as an incredible business opportunity to transition a huge global legacy industry while solving some of the most urgent sustainability issues of our time, with significant reduction of greenhouse gases and feed-to-meat conversion inefficiencies. It is the new way forward to feed the world.

CAPITAL VENTURE: THE DRIVERS OF CHANGE

The road to successful large-scale industrial cultured meat is still quite long. However, looking at the pressures on natural resources in the coming decades, the world has no choice but to embrace this new biotechnology, which can become an integral strategy as part of combining it with plant meat formulated products. The tandem or hybrid of an integrated animal-free cultured meat and plant protein-derived diet is probably the most logical way forward.

For example, Memphis Meat, San Leandro, Silicon Valley, California, debuted the world’s first chicken strip from animal cells in March 2017, following the animal-free meatball introduction in 2016.

Memphis Meat received financial backing from Cargill and household-name individuals like Sir Richard Branson and Bill Gates. Memphis Meat mission is bringing cultured meat to the plate in a more sustainable, affordable and delicious way. Meat is still universally enjoyed as an integral part of world cultures and traditions—however, it is time to switch from conventional slaughtered meat that creates challenges for the environment to a humane and clean method of meat production.

To turbo-charge change and create a disruption of the status quo, capital venture companies which include Horizons Ventures (Hong Kong), DFJ, Temasek Singapore, Viking Global Investors, Khosla Ventures, PHW (Wiesenhof Germany), Stray Dog Capital, New Crop Capital, and Kleiner Perkins provide assistance and strategic advice to entrepreneurs working on these breakthrough technologies. Moreover, legacy companies such as Tyson Foods and Cargill, have started to take part-ownership in “disrupting companies” like Beyond Meat and Memphis Meat.

More to the point, most new technology introductions are taken with scepticism and often driven by a “can’t do” attitude. It is precisely the entrepreneurial spirit of many capital venture companies that are uniquely able to select the true innovators and provide the financial means to make their dream come true. With this in mind, it seems easier to fund a disruptive plant protein startup than to find capital support for an animal protein startup company.

LOOKING TO THE FUTURE



Like with any other disruptive innovation, there is usually a pushback from the industry for fear that their “monopoly” business model might be threatened. It is always wise to take a step back to view change in light of the greater good, a changing ethical and moral landscape, acknowledgement of knowledge gaps, implications on a larger time scale, unforeseen effects on ecosystems, and much more.

For example, the pharma and cosmetics industry heavily relies on animal by-products to produce their consumer products. Especially in the time of backlash against synthetic, the same flexitarian consumers are pushing the pharma and cosmetics industry to look for natural alternatives, which may or may not be animal-derived. This is potentially an impasse and will lead to more industrial backing for the meat industry to protect the current supply chain of by-products.

Ultimately, the implementation of new technology will still progress due to the numerous inherent socioeconomic issues, health concerns, and food safety matters in the global market.