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Is "cultured meat" really a viable alternative?

The surge of interest in sourcing protein from plants and "cultured meat" has been fuelled by campaigns against producing livestock and eating meat. But it is also clear that globally more animal-based protein will be needed to feed a growing and richer population, and this will require a need for more innovation, and higher sustainable productivity.

The relentless criticisms of livestock and meat by the media, NGOs, academics, and policy advisors, are often based on poorly designed research studies, selective choice and interpretation of the statistical results, and rarely consider the sector in terms of the many dimensions of sustainability. Too often, simplistic solutions are proposed to deal with complex issues ignoring trade-offs and unanticipated consequences.

Whether from an environmental, nutrition and health, or socio-economic perspective, many of the critiques do not stand up to scrutiny based on the best scientific evidence, as frequently pointed out in articles in past IMS Newsletters.

Against this background Dr. Jean-François Hocquette, Research Director at INRAE in Clermont-Ferrand, France, gave an online presentation to the IMS on 7 April entitled "*In vitro meat: Is it really a viable alternative?*" summarising the conclusions of a workshop organised last November in Paris by the French Academy of Agriculture, Veterinary Academy, Association of Animal Science and Society for Human Nutrition. His considerable expertise was evident in addressing the questions: Is it possible? Is it really meat? Is it good for society? Is it acceptable to consumers?

The video of this presentation (host Juan José Grigera Naón, Chair IMS Sustainable Meat Committee) is available at https://youtu.be/PzNMzgtFegA and the presentation slides at this link.

Is it possible?

Cell cultured meat is certainly possible, as research in The Netherlands and initial commercialisation in Singapore has shown. Nevertheless, there are several technical hurdles to overcome, including the choice of appropriate media (with or without foetal bovine serum) for cell culture, questions about purity and safety, the nutrients that need to be

Figure 1. Technical Problems to Solve

Current limitations across four domains are described by Chen et al. (2020):

- cell line development,
- cell culture media (fetal bovine serum),
- scaffolding, and
- bioreactors.

Chen et al. (2022). Biomaterials 280, 121274

The great challenge is to efficiently produce "cultured meat" products at scale, this needs new concepts and bioprocesses that did not exist before

Bellani et al (2020) Front. Nutr. 7:575146.

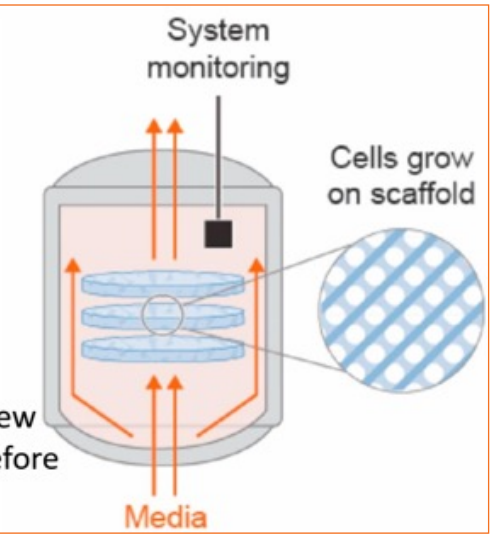
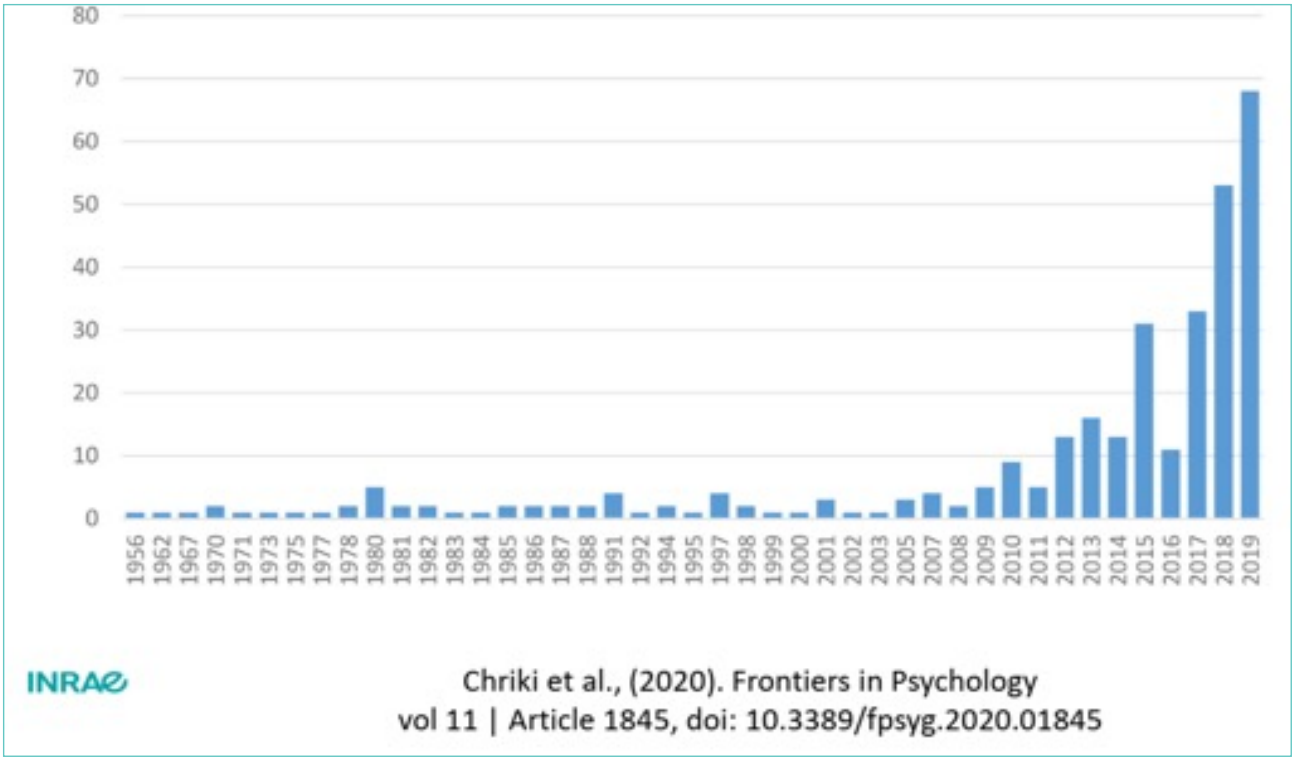


Figure 2. Number of Scientific Papers on "Cultured Meat"



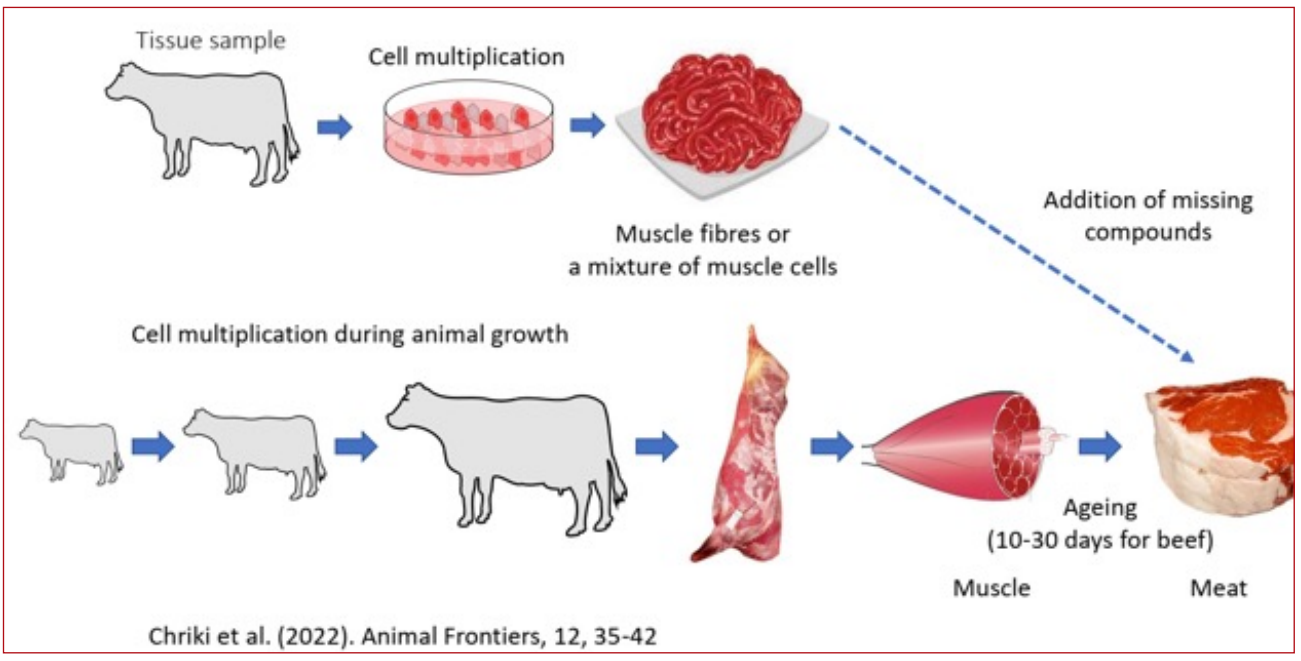
added, and the efficiency (and sustainability) of the whole process.

One of the curiosities on the apparent enthusiasm for cell cultured meat is that while only 327 scientific papers had been published between 2013 and 2019, around 5000 articles appear every year in the media. It is becoming a substantial business opportunity with around at least 60 companies investing over $US 1 billion of capital. However, despite all this activity, product launch dates have been consistently missed.

Is it really meat?

Livestock produce a very wide range of meat, from prime cuts to offals, as well

Figure 3. "Cultured Meat" vs Meat from Animals



as co-products such as skins, wool and hides, as well as ingredients for medicines and industrial products. At present, cell culture is creating muscle fibres or a mixture of muscle cells and, with the addition of missing compounds, essentially fabricates only ground meat or burgers.

The American Meat Science Association do not yet consider "in vitro meat" to "be comparable in composition and sensory characteristics to meat derived naturally from animals", but maybe could do so in the future. It is also not "meat" according to EU Novel Food regulations, which require foods to be safe for consumers, properly labelled, and must not differ nutritionally from the food it is intended to replace.

Moreover, a narrow majority of polled consumers do not consider it "meat". The debate is mirrored in some respects by the controversy over the question of whether "plant-based milk" can legally use the name "milk" or should, as in some countries, be termed "plant-based drink".

Good for society?

Cultured meat should be compared against alternatives to meet future *protein* needs. In some rich countries some folks consume too much protein, but across the world many more are deficient in high quality sources. Reducing food waste and improving livestock farming practices can help. With respect to *health*, most government dietary recommendations advise adopting a moderate diet with a balanced variety of foods, coupled with an active lifestyle adapted to local conditions.

And that advice overwhelmingly includes consuming meat and dairy products, while reducing sugar and sugar rich foods. Current research shows that cultured meat differs significantly from traditional meat in its nutritional properties and might be associated with genetic alterations of the cultured cells.

Concerning the *environmental* impact, while there is a vigorous debate about the impacts of livestock on the environment, especially on net greenhouse gas emissions, there are currently very few on the effect of cultured meat, and those tend to be highly cautious and limited to its production in bioreactors. But life cycle assessments suggest that while cultured meat requires very little land, it is a significant user of energy and emitter of CO2.

The *welfare of animals* is one of the main concerns of people rejecting the consumption of livestock-based food. Cultured meat has the potential to avoid animal slaughtering, but not if fetal bovine serum is used, which is still the case, including for the recently commercialized chicken meat in Singapore. Moreover, animal biodiversity will be reduced with fewer animals and the ecological balance between grazing livestock, soil, water, and landscapes risks being disrupted. In the bigger context, we are challenged to examine the nature and relationships of "humans" and "animals".

Ultimately, the market test is whether cultured meat *is acceptable for consumers*. Over 90% of consumers polled in France, Brazil and China want to pay less or much less (even nothing) for cultured meat, although Chinese consumers would be more willing than the French to eat it regularly, especially if it requires no farming, is less expensive and more nutritious. French consumers are less convinced because of the negative impacts on farmers and rural life, the "unnaturalness" of cultured meat and lack of trust in laboratories.

Another study observed that males are more willing to eat cultured meat than females, while others found the opposite, but the likelihood of being willing to eat "cultured meat" decreases with age across gender.

Overall, a complex set of factors will influence the future of sources of protein, whether traditionally from animals, plant-based or cell cultured – or a mixture. Relative prices will always play a big role. At present cultured meat is prohibitively expensive but is likely to fall if production can be effectively scaled up and other technical problems can be overcome.

However, historical, cultural, symbolic, emotional, and socio-economic developments remain very important factors in the equation. While there is aggressive marketing underway (targeting the younger generation?) impartial evidence on the costs and benefits of cultured meat compared to alternatives is sparse. Moreover, ensuring a regulatory level playing field is a challenge for governments, law makers, and the global trade rules.

Wilfrid Legg, Consultant

Undaunted by the pandemic, the organic meat market grows in the U.S.

The niche market for organic meats in the U.S. isn't going away. In fact, it's growing — fast.

In the way that glaciers receding after the last Ice Age left behind a changed landscape, so the COVID-19 pandemic, which at last appears to be on the wane (at least more or less), leaves behind big changes in the social, economic, and cultural landscapes, including in the U.S. food market. As noted in last month's column, one surprising change is that American home cooks, quarantined for sometimes weeks at a time, not only rediscovered meat but along the way improved their "meat IQ" to an unprecedented degree.

Another food outcome of the pandemic is huge growth in the market for organic foods, including meat. As reported in April in *Supermarket News*, "Organic meat is booming. In the past year, organic meat sales have grown 37 per cent versus two years ago, outpacing the meat department, which grew 20 per cent, according to Nielsen data."

To be sure, the organic market segment is still small: just five per cent of total dollars spent on food in the U.S. per year. Organic meat, poultry, and fish remained the smallest organic food category in 2019 with US$1.4 billion in sales, according to the report "Organic Meat Products Global Market Report 2021: COVID-19 Growth and Change to 2030," published by the market research firm Mordor Intelligence.

However, the segment saw nearly 10 per cent growth, as measured by the Organic Trade Association, which is the highest of any organic food group. Globally, North America accounted for the largest share of the market for organic meat in 2020.

"The domestic demand is being primarily driven by the increasing preference for chemical-free high-quality meat from health-conscious consumers across the region," states the Mordor report. "Asia-Pacific was the fastest-growing region with the expanding per capita income growth and consumer concerns over the defamed meat industry, thus, allowing numerous players to penetrate the market with diversified product portfolios."

Another report, "Organic Meat Products Global Market Report 2021: COVID-19 Growth and Change to 2030," from www.ResearchandMarkets.com," forecasts the global organic meat products market to grow from US$15.01 billion in 2020 to US$15.71 billion in 2021 at a compound annual growth rate (CAGR) of 4.7 per cent.

"The growth is mainly due to the companies resuming their operations and adapting to the new normal while recovering from the COVID-19 impact, which had earlier led to restrictive containment measures involving social distancing, remote working, and the closure of commercial activities that resulted in operational challenges," states this report, adding that the global market is expected to reach US$20.83 billion in 2025 at a CAGR of an impressive seven per cent.

Incredible Credibility

While their overall market share remains small even as growth is large, what organic producers have in spades is brand credibility. Consumers look for the word "organic" on meat labels for a variety of reasons, including perceived health benefits over conventionally produced meat, environmental stewardship, and social consciousness.

"People tend to scrutinize the labels of their grocery items after major life events such as the birth of a child or a health setback," Jenny Burns, senior director of innovation and brand equity for Applegate, a natural and

organic meats processor based in New Jersey, told *Supermarket News*. "The organic label serves as their shorthand for the spectrum of benefits impacting them personally but also their community and the world around them."

Kay Cornelius, general manager of Panorama Organic Grass-Fed Meats in Colorado, said the pandemic stimulated interest in organic and grass-fed meats and that this interest shows no signs of declining. "Even now as the pandemic becomes 'end-demic,' consumers are still going to the grocery store at a higher click, and their meat purchases reflect that," she said. "They've tried to cook different things during the pandemic and they want to stick with that. We're seeing more organic cuts sticking at retailers because people are demanding it."

"Animal welfare is at the forefront of consumers' minds," Dawn Burns, senior brand manager at Organic Valley, based in Wisconsin, told *Meat & Poultry* magazine. "They want transparency when it comes to what they're feeding their family and themselves. They want to know about space per animal, outdoor access, whether or not growth hormones are being used. Consumers are beginning to make the correlation that it's not only better for the animal but better for themselves." She added: "The key to establishing a strong organic program is always moving toward higher standards."

"A Trend We'll See Continue"

Aaron Corbett, CEO of longtime natural and organic processor North Country Smokehouse in New Hampshire, told *Supermarket News* that organic consumers are becoming increasingly more aware of the regenerative aspects of farming. "Consumers understand the role they play in the food system, and how the choices they make impact the soil, air and water," he said.

"This is a trend we'll continue to see, and we're well aligned because we've been doing it this way for years. In many cases, producers see an opportunity and pivot to meet the needs of the consumer. In our case, we've been operating in the best interest of a sustainable future for the last 16 years, and we're happy to see the market begin to adopt a more sustainable food-philosophy."

North Country was able to avoid the supply chain issues that plagued many producers during the pandemic because the company owns organic family farms and works with a network of farmer partners. "We were able to step in and guarantee fulfillment at a time when many other suppliers were having immense challenges keeping the shelves stocked," said Corbett.

Even though the market base for organic meats in the U.S. is loyal, there are still opportunities for greater marketing of organic meats, industry executives said. "If a retailer doesn't know a consumer has it at the store, you've missed the boat," Panorama's Cornelius told *Supermarket News*. Corbett thinks stores can do their part in increasing organic meat knowledge by making information easily accessible with store signage and case display and good use of website and digital assets to tell the organic meat story.

"It's also important to make sure the USDA Organic seal is evident and that shoppers understand the credibility of the claims labeled this way, to know that farms are third-party audited and have proven their programs and claims to be true," he added. "We've seen some retailers go as far as to hold webinars or instore cooking demonstrations so consumers can engage with brands first-hand and ask questions. That's a wonderful approach."

Steve Bjerklie, Contributing Editor, *Meat & Poultry* Magazine; correspondent, The Economist

SAVE THESE DATES

IMS Economics Workshop, Animal Care and Sustainable Meat Committee meetings

You are cordially invited to participate in the following IMS Meetings, which will take place at IMS headquarters (5 rue Lespagnol, Paris 75020, France). These meetings are restricted to IMS members only. There is no fee for attendance.

18-19 October 2022
Economics Workshop

This two day workshop is intended for economists, analysts and other experts with meat industry knowledge. The programme will follow a similar pattern to previous workshops giving an opportunity for participants to discuss key topical issues for the meat and livestock sector as well as providing a forum for an exchange of information on the short-term market situation and forecasts for major world meat producing and consuming countries.

20 October 2022
Animal Care Committee

This committee will discuss ongoing collaboration with the World Organisation for Animal Health (OIE), Codex Alimentarius, etc. Your suggestions for topics are welcome.

21 October 2022
Sustainable Meat Committee

This committee will discuss ongoing collaboration with the Food and Agriculture Organisation (FAO), United Nations (Food Systems Summit, UNFCCC), etc. Your suggestions for topics are welcome.

Further details on agendas for these meetings will be provided over the summer on the IMS Website at this link. The dates have been chosen to allow the possibility of combining your trip with the SIAL (Food Exhibition https://www.sialparis.com/) 15-19 October 2022, Paris Nord (Villepinte), France.