‘Natural meat’ and futurist fantasies?

by Maria Grazia Quieti[1]

On 8 December 2020 the former Minister of Agriculture of France, Julien Denormandie, tweeted that in France “…meat will remain natural and never artificial” as a reaction to the approval of cultured meat, as an alternative protein product, by the Government of Singapore. The minister of Agriculture and Food Sovereignty of Italy echoed the same concern for what the Government referred to as ‘synthetic meat’. Recently, the above minister has proudly announced that Italy is the first country in Europe to ban ‘synthetic meat’. In fact, in November 2023 Italy passed a law prohibiting its production and commercialization. These positions have spurred interest in artificial or synthetic meat among the press and general public.

Synthetic, artificial or cultivated meat are just a few of the names attributed to this new technology that is part of the broader category of novel foods and of cellular agriculture, both of these terms being definitions in flux at the moment of writing.

In Europe, however, novel foods are categorized as “…products not significantly consumed by humans before 1997, including traditional foods from abroad as well as

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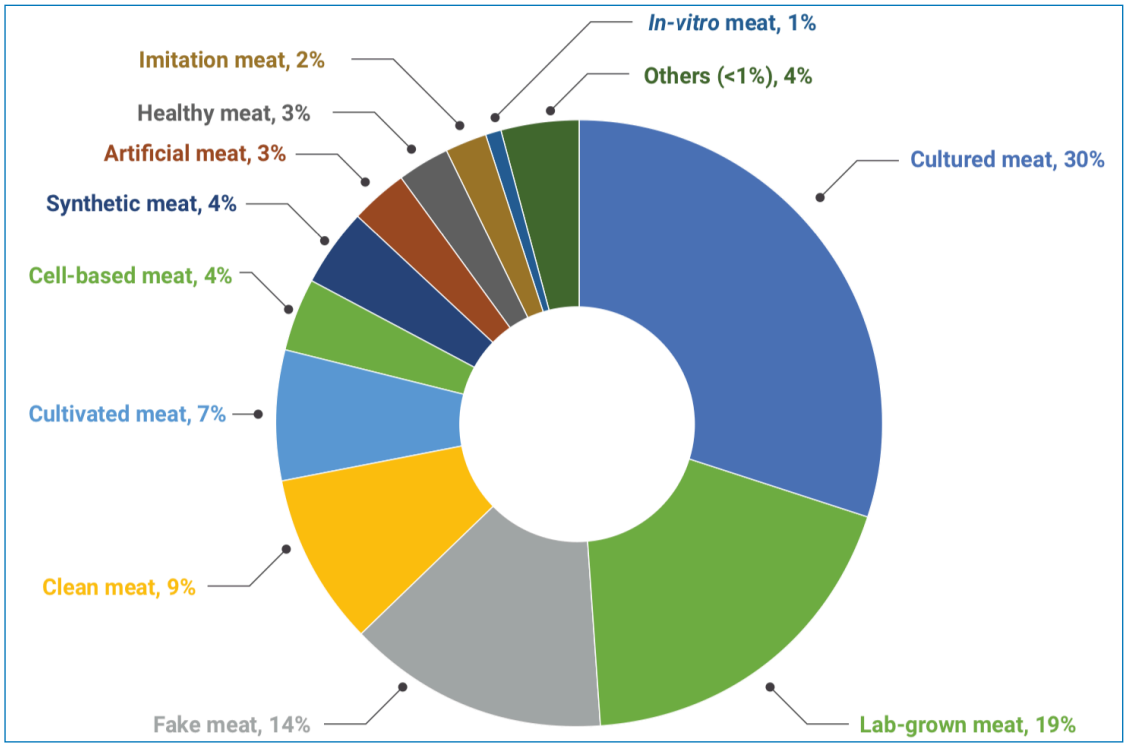
foods produced with new technologies".[2] These technologies, under the term 'cellular agriculture' encompass production methods based either on fermentation using bacteria, algae or yeast or on tissue-engineering with cells of living animals, as in the case of cultured meat.

For the sake of this article, the heading 'cultured meat' will be used, acknowledging that definitions are in progress both in the market and in the scientific literature, as shown in **Figure 1** meant to draw attention to the fact that terminology shapes perceptions and constitutes the cognitive/emotional framing of consumers (FAO and WHO, 2023).

Figure 1 Relative share of the synonyms of "cell-based" meat modifiers



Note: "fake meat" and "imitation meat" were also used for other meat analogue types; "healthy meat" occurred in many unrelated contexts
Source: Davies, M. 2016. Corpus of News on the Web (NOW). https://www.english-corpora.org/now" quoted in FAO and WHO, 2023

What is cultured meat?

Cultured meat is meat produced from animal cells rather than slaughtered animals. A few cells are taken from a live animal through a biopsy; they grow and proliferate in a bioreactor with basic nutrients such as amino acids, glucose, vitamins and inorganic salts, supplemented with other proteins. Cells are then differentiated into skeletal muscle, fat and connective tissues, so that they are harvested and packaged into final products, as shown in **Figure 2** (Tuomisto, 2018).

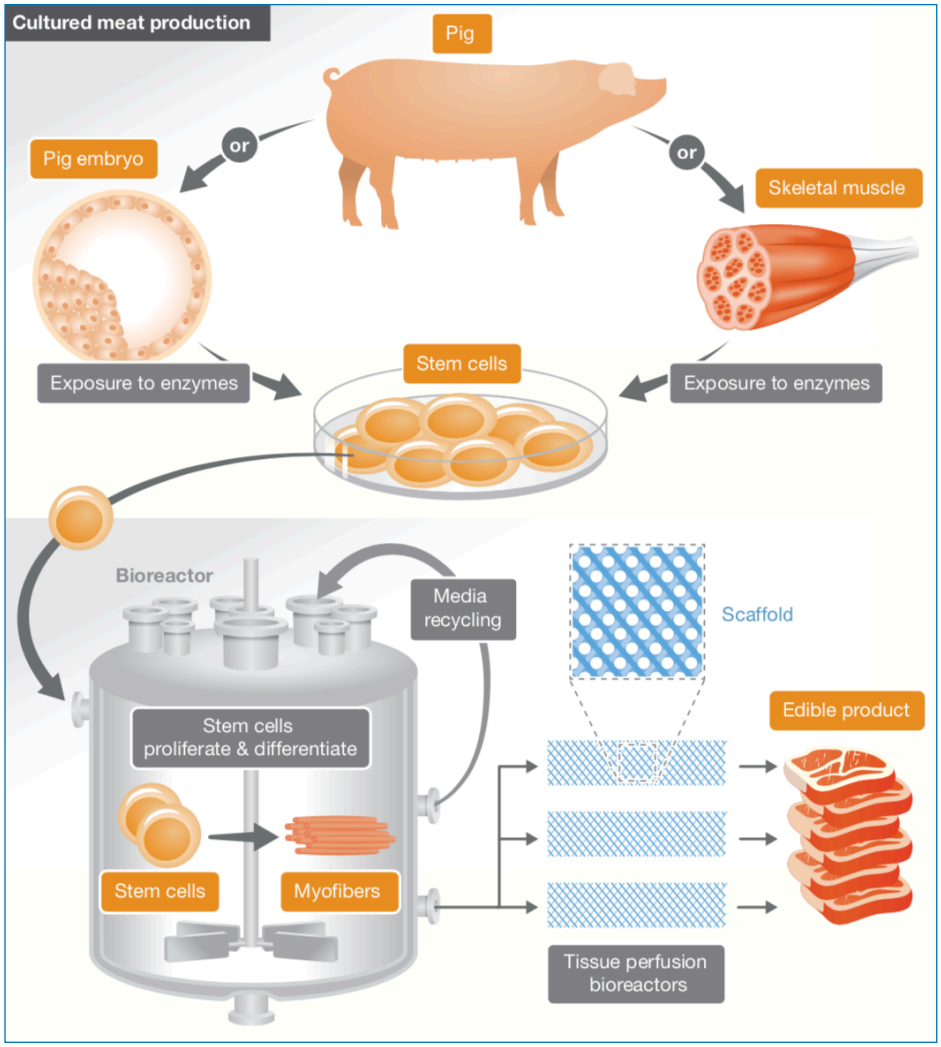
According to the type of meat desired, 6 to 8 weeks will be necessary (Good Food Institute, 2023). The experience to date is the use of cells of poultry, cattle, pig, fish, game animals (kangaroo and quail), shrimp, crab and lobster, as reported by the recent publication of FAO and WHO, 2023. However, the possibilities to produce cultured meat,

[2] EU regulation 2015/2283 - Article 3, and Novel food | EFSA (europa.eu) accessed on 27 December 2023.

appear inexhaustible when considering the experiment made by an Australian company to use the cells of an extinct mammoth (The Guardian, 2023).

As of today, cultured meat is beginning to reach the market (in Singapore and the U.S.); its production costs and prices are still higher than conventional meat and there is uncertainty as yet about the estimates of the energy use and GHG emissions, but certainly they are greater than those associated with plant-based meats (Frezal et al., 2022).

Figure 2 The production process of cultured meat



Source: Tuomisto, 2018.

Research on cultured meat dates back to the 1990s, with the first patent filed in 1994; in 2013 with the Mosa Meat by the Dutch researcher Marc Post the question of cultured meat became very visible in the public sphere, including in arts performances.[3]

While Chefs welcome an addition to their inventory of culinary revolutions (Saneski, 2023), the scientific literature related to the broad disciplinary fields of food and agriculture, point to the potential benefits of cultured meat to respond to the issues of the global diets and sustainability taking also into consideration the socio-political and regulatory challenges that cultured meat inevitably poses.

[3] A NASA group and a bio-arts team conducted taste-tests as part of an arts performance piece (Stephens et al., 2018).

Cultured meat as one of the responses to which problems?

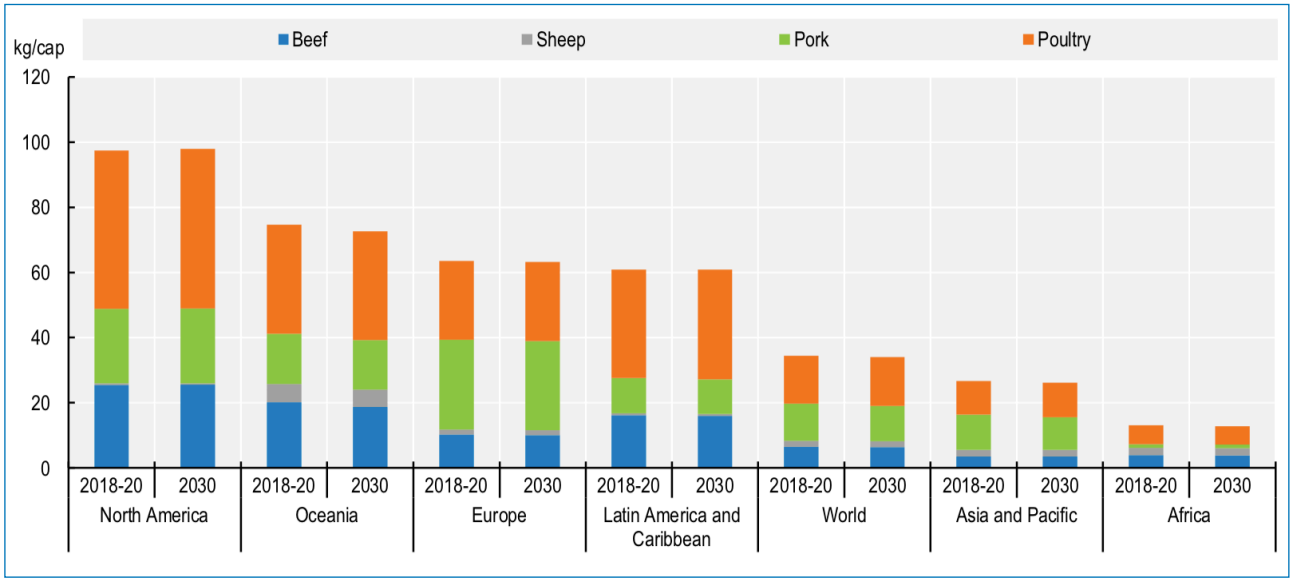
Irrefutable evidence has now been gathered about meat consumption and its impact on the environment and health (Godfray et al. 2018, Tilman and Clark, 2014). With increasing income and population growth, there is an increase in meat demand with consumers from low and middle-income countries adopting the meat overconsumption habits of high income countries.

Data from Western countries show the rise in cardiovascular diseases, diabetes, colorectal cancer due to meat consumption.

With respect to the environment numerous studies demonstrate that livestock production contributes about 14.5% of global anthropogenic emissions, may cause overgrazing and erosion and uses a third of the freshwater consumed for agriculture. It is also a major driver of deforestation thereby indirectly contributing to biodiversity loss by exploiting 33% of available croplands for feed.

Even though there is a trend towards less consumption of beef, the projections indicate that, unless changes occur in diets, the demand for meat will remain high in the years ahead, as shown in **Figure 3**. For some scholars (Whitton et al., 2021) "peak meat consumption" will only occur at a GDP per capita of approximately U.S.$40,000 as is now occurring in Canada, New Zealand and Switzerland with heightened public awareness about health and environment.

Figure 3 Meat consumption per capita (2018-2030)



Note: Per capita consumption is expressed in retail weight
Source: OECD/FAO, 2021.

It is believed that shifts in social norms and eating patterns can take place with appropriate public policies (Godfray et al. 2018). However, it is also considered that despite the increasing spread of vegetarianism, veganism and flexitarianism in countries with the highest consumption of meat, changes are happening too slowly to affect in a significant manner the effects of livestock production on health and the environment, notwithstanding the slaughter of billions of animals (Dagevos, 2021).

If there is consensus that changes in diets are necessary and it is important that they occur soon, cultured meat becomes one of the alternative protein technologies that can satisfy the demand for meat. This is the response of the eco-industry that is producing cultured meat.

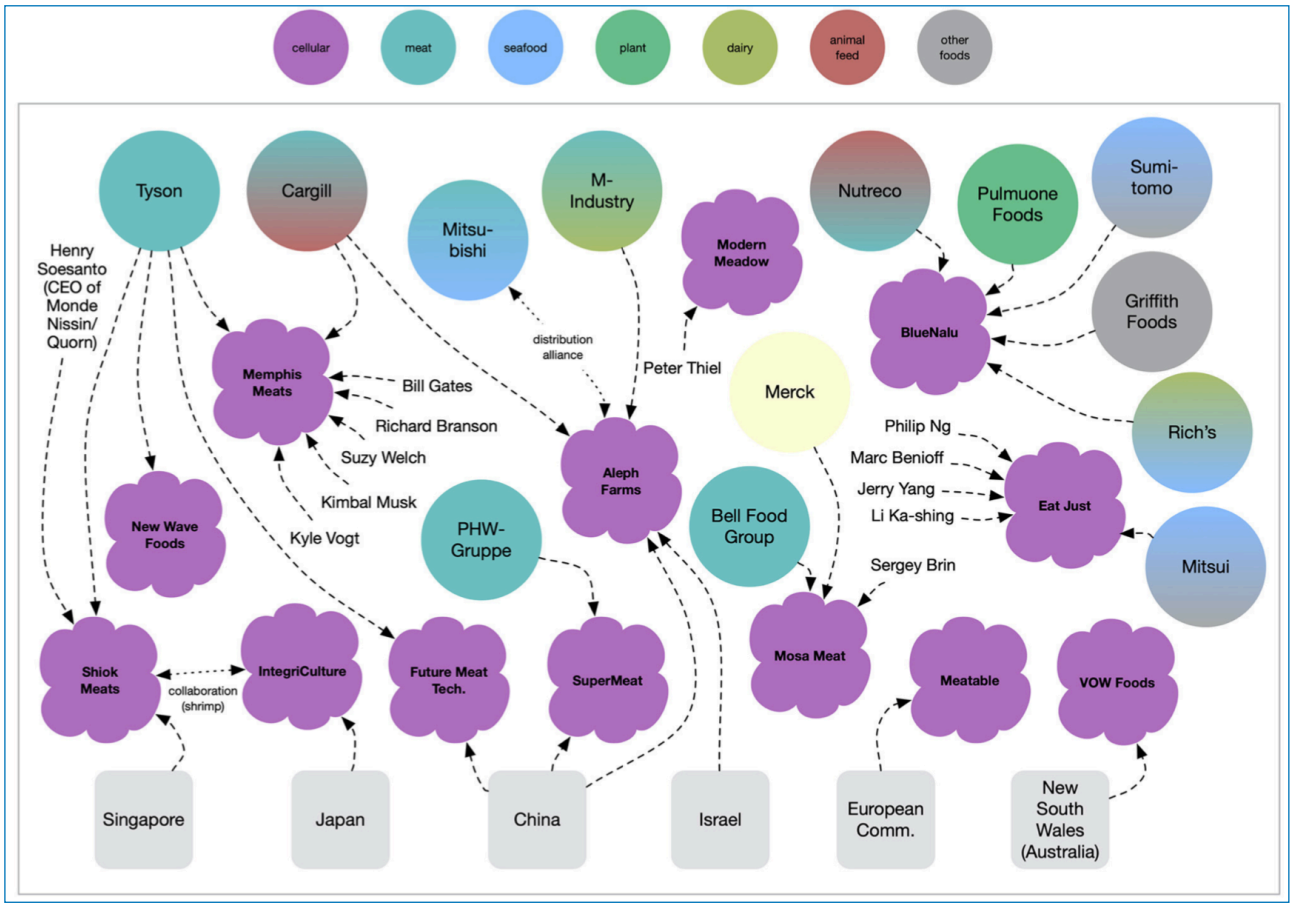
The eco-industry actors

In the name of both making a business and saving the environment, numerous startups have proliferated particularly in the U.S. and to a lesser extent in Europe, in Israel and Asia.

The giant corporations that are involved in 'natural meat' are also investing in cultured meat, such as Tyson, Cargill, Memphis, JBS (ETC, 2019, Howard et al., 2021), as well as non-profit organizations like 'New Harvest' or 'People for the Ethical Treatment of Animals' (PETA).

Public investments are taking place among countries as well, as can be seen from **Figure 4**, where it can be inferred that governments are concerned with their own food security and food self-reliance, in the light of either high food import dependency (e.g. Singapore) or agricultural land scarcity for China, coupled with the geopolitical situation in the case of Israel.

Figure 4 Investments in cellular meat and fish firms by key actors



Source: Howard et al. 2021.

So much more to find out

While there is plenty of literature on the scientific and food safety aspects of cultured meat (FAO and WHO, 2023), researchers in the social sciences and humanities are starting to scrutinize the rather impenetrable business world of cultured meat, their patenting of ingredients and of the production process, as well as the overall socio-economic, political and institutional impacts of this new disruptive technology.

Not least, cultured meat has also been included in the work of political scientists and philosophers for the questions posed on human-animal relations and animal rights respecting legal frameworks (Dutkiewitz and Abrell, 2020, Milburn, 2023).

Sociologists and anthropologists point to the deliberate obfuscation of the complex processes involved with the bioreactors and their 'blackboxing', as if the science is settled and there is no need to enquire further (Guthman and Biltekoff, 2020).

Journalists like Zimberoff (2021) disclose in an almost ethnographic account the missionary spirit of the entrepreneurs in Silicon Valley who want to have a successful business while also wishing to save the world with their vision of a better achievable future.

A well articulated and systematic set of questions on the potential impacts of the development of cultured meat is posed by Stephens et al. (2018): who are the winners and losers in the production and consumption of cultured meat? Will the cultured meat industries continue to be predominantly in the Global North or will China, Brazil and other countries develop the industry of cultured meat to the same extent? Which regulations to prevent frauds, mislabeling and use of cells for non-livestock species, including humans? Will there be a similar market concentration as for conventional meat, with the associated market dominance, lack of transparence and influence on public policies? Or, as prognosticated by George Monbiot (2022) and Milburn (2023) the possibility is there for humans to have animals in their backyard or urban farms with the opportunity of using their cells to produce cultured meat with bioreactors. Or as hoped for by New Harvest, mail-order cells could be available through lab supply catalogues, like open-source software.

Most importantly, why is it assumed that cultured meat will replace the conventional, natural meat and not be an addition to the consumption of the latter, therefore annulling all the positive impacts expected from cultured meat, both in terms of health and environmental consequences? What will happen to the farming labour force and to agriculture production as we know and experience today? Could we imagine that cultured meat, and the other technologies of cellular agriculture, will contribute to de-industrialize and de-animalize current agricultural practices and thereby enable the return to small-scale farming and agro-ecological practices, no longer constrained by the dwindling natural resources of land and water? (Wilkinson, 2023).

Shouldn't these developments be accompanied by questioning the disproportionate focus, or 'hype' on alternative proteins, justified by the misleading claims of feeding the world now and in the future (IPES-Food, 2022)? For the high meat consumers, particularly of Western countries, why not 'nudge' them into eating less meat, eat traditional proteins from legumes and nuts or tofu and seitan?

As Prof. Wilkinson (2023) stated in his keynote speech at the Conference on Novel Foods held at The American University of Rome in March 2023, referring to both novel foods and

novel forms of food production like controlled environmental agriculture, they “Promise less pressure on planetary resources, possibilities for rewilding and all types of planetary respectful farming”. They are part of open-ended “…moments of transition… when alternative technical applications and social practices can be negotiated and contested”.

Temporary conclusion

By way of temporary conclusion, cultured meat, and the other technological innovations in cellular agriculture and novel foods, open a world of possibilities on ways of producing that are totally new and that have never been done before. They are not to be dismissed out of hand; as acknowledged in the 6th assessment report of the IPPC (2022) “Novel protein sources may have considerable potential for sustainably delivering protein for food and feed alike”, while also recognizing the need for further research and evaluation of their nutritional, environmental, technological and socio-economic impacts.

Cultured meat is not a futurist fantasy; its consumption is allowed in Singapore, Israel and the United States. A cultured meat ingredient, soy leghemoglobin produced by brewing a genetically modified microbe, is already being used by Impossible Foods “…to badge its plant-based burgers with blood” (Monbiot, 2022). The video of a group of friends eating chicken nuggets in a garden, while the chicken that has provided the cells scratches and pecks happily at the ground under their grateful eyes, epitomizes the vision and the reality of how cultured meat could be part of our lives (Good Meat, 2021).

In the light of the problematic issues posed by this new technology, the defensive nationalism of both France and Italy rejecting drastically their so-called ‘artificial’ and ‘synthetic’ meat can be understood, and it can also be understood how it is widely shared and strongly supported by the farmers’ associations (e.g. Coldiretti in Italy). They see an existential threat to their way of living, to their connection with the land and animals (Slow Food, 2023; Coldiretti, 2023). On the other hand, their stands could also be understood as a reflection of the cultural power of the agriculture industry in our societies which, in the words of George Monbiot (2022), “insulates from both criticism and regulation”, favouring “…a bucolic nostalgia [that] shuts down our moral imagination”.

But the comments of the ministers of Agriculture of France and Italy force us to reflect about the proclaimed ‘naturalness’ of the meat we eat. As Dutkiewicz and Rosenberg (2021) remind us, “…after thousands of years of selective breeding and, more recently, the widespread use of gene editing, artificial insemination, growth hormones, and antibiotics, the vast majority of today’s livestock is as distant from pristine nature as you, reading this on your computer or phone, are from an ape. Nature doesn’t build abattoirs, force-feed chickens to bursting, or pack swine into concentrated animal feeding operations. Humans do.”

A further consideration could more forcefully assuage the anxieties raised by the ministers of France and Italy. In cultured meat the animal cells “…are a small proportion of the materials compared with the culturing media which may or may not be animal-based … and cell-lines may be considered a processed product” (Stephens et al., 2018). If this is the composition of cultured meat and if we define ‘meat’ as “…skeletal muscle deriving from specified animal species, which may include edible offal and blood” (Lautenschlaeger and Upmann, 2017) and also consider it as food of animal origin “…from the moment animals are ready for slaughter” (FAO, 2019) can we still consider ‘cultured meat’ as meat?

Or will we have to continue to call it ‘meat’ because of the associated gustatory, sensorial and emotional satisfaction that we get only if we think that we are eating ‘meat’?

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To know more:

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Selection of articles on hungerexplained.org related to this topic:

- Synthetic biology: solution or dangerous delusion? 2022.
- Climate is changing,… food and agriculture too, 2021.
- Animal welfare: a cause that makes progress thanks to civil society, 2018.
- Are industrial megafarms the solution for feeding the world? 2018.
- Food, Environment and Health, 2017.