

# Cultured meat and responsible research when the future is an illusion for financial speculation

R. Helliwell<sup>1,\*</sup>, E. Bjørnerud<sup>2</sup> and T. Nerby<sup>3</sup>

<sup>1</sup>Ruralis, Institute for Rural and Regional Research, Loholt Alle 81, N-7049 Trondheim, Norway; <sup>2</sup>Østfold University College, Høgskolen i Østfold, P.O. Box 700, N-1757 Halden, Norway; <sup>3</sup>Norwegian Board of Technology, Kongens gate 14, N-0153 Oslo, Norway

Corresponding author, e-mail: [richard.belliwell@ruralis.no](mailto:richard.belliwell@ruralis.no)

## Abstract

Developments in cultured meat promise transformative societal and environmental impacts through remaking animals in the bioreactor. However, in contrast to many emerging technologies, the innovation niche of cultured meat is almost entirely sustained through private venture capital investment. The financial infrastructure of Silicon Valley, and its constantly shifting frontiers of hype and financial speculation is the foundation upon which cultured meat — as a product and as a vision — is based. In this paper we seek to reflect on the consequences of these financial dynamics for examining emerging technologies and future promissory discourses. Specially, we note how this financial context lends credibility to start-up founders and their future visions, who achieve legitimacy as the result of an entirely transactional arrangement: securing investment. It produces promissory narratives that are fabricated, from the start, to appeal to a set of private investors and financial interests. Equally, there are major incentives to deceive, in terms of technical possibilities, moral progress, and societal prospects, to sustain an illusion of imminent breakthrough and lucrative investment returns. The danger for futures analysis is in reifying promissory discourses that are inseparable from their ability to function convincingly as an investment pitch. In turn telling us little about possible socio-material futures because investment dynamics drive trajectories towards realising financial returns not promised social and ethical outcomes. There is a pressing need to involve voices beyond those of advocates and other immediately interested parties, and to develop critical and alternative narratives around these technologies. Otherwise, our own academic incentives to produce novel research creates the risk that scholarship becomes trapped in chasing only what is presently attractive within dynamics of financial speculation on innovations.

**Keywords:** anticipation, cultured meat, futures, speculation

## Looking at the future of cultured meat

The future has undoubtedly become a lively and productive area of social science research, notably within Science and Technology Studies, and the critical Future Studies literature. The key premise of this literature is that promissory narratives, future expectations and visions should be taken seriously because they perform important political and material work in the present. Future orientated discourses are key for coordinating actors, creating shared agendas, legitimising certain trajectories of change over others, attracting financing from public and private sources, and initiating governance of the present in the name of the future (Alvial-Palavicino, 2015; Granjou *et al.*, 2017).

Innovation is one of the important modes through which present actions are being shaped by and are shaping the future. Emerging technologies loom large in this literature because they are positioned as being more radically open. By definition they have yet to arrive, they exist primarily in the future, “what is said, shared, visualised and even traded only exists as speculative statements about their possibilities.” (Alvial-Palavicino, 2015: p. 135).

## Section 2

In this article we contribute to literature on futures and place that grapples with impacts of the place specific cultural milieu within which futures are being articulated, emerging innovations are being developed, and — importantly — financed (Geiger, 2020; Sexton, 2020; Tarvainen, 2022). In particular, we want to reflect on the challenges that the dominance of Silicon Valley venture capital, private equity and investment incubators have for researching and considering the politics of the future, using the example of cultured meat.

### Cultured meat and ‘present futures’

Cultured meat involves cultivating animal proteins, including muscle cells, fat and connective tissues in vitro via tissue engineering (Stephens *et al.*, 2018). As an emerging food technology cultured meat has been no stranger to articulating ambitious and desirable future visions. At time of writing, it promises a safe, ‘clean’, efficient, more environmentally sustainable, and more humane system of animal protein production. This is contrasted with animal agricultures’ perpetuation of animal slaughter and suffering, potential zoonotic disease risks, high antibiotic use, and broad environmental impacts: pollution, green-house gas emissions, land, water and energy use (Helliwell and Burton, 2021). Developing these technologies is claimed to be urgent because of both climate change impacts on agriculture and projections that agricultural production must rise significantly to meet the needs of growing populations (both size and affluence) and their protein demand (FAO, 2017). This urgency amounts to a broad imaginary in which environmental crisis and animal suffering are averted through profitable biotechnology whilst perpetuating dominant capitalist political-institutional configurations and markets (Broad, 2020; Jönsson, 2016). Cultured meat therefore appears to be another technical fix par excellence.

However, one notable difference with earlier fixes, such as bio- and nanotechnologies, has been that cultured meat has developed almost entirely independently of public research initiatives that target sustainability in food and agriculture. It has been absent or, at best, a latecomer to relevant innovation policy agendas. Key lobby groups have lamented the lack of government interest and public funding for cultured meat and alternative proteins more broadly (Dale, 2019). Perhaps because of the growing profile of cultured meat and this lobbying pressure, 2022 saw a notable uptick in public financing activity. Collective global public funding in 2022, which includes Europe, Asia, North America, and the Middle East, amounted to roughly \$142,5 million dollars, to be distributed in various annual and multi-year research investment programmes (Good Food Institute, 2022). But state support is highly uncertain, with both French and Italian governments looking to create legal frameworks to ‘defend’ national agriculture against these products.

Instead, as noted by Sexton (2020) ‘Silicon Valley is especially conspicuous for its sustained concentration of alternative protein (AP) activity. Many AP companies have physical headquarters in the San Francisco Bay Area, were founded through local tech accelerators, and have received a considerable portion of their funding from investors based in the region’ (p. 451). Venture capital, private equity and other private investors, between 2021 and 2022 provided \$2.2 billion in financing, the majority from the USA (Good Food Institute, 2022).

Accordingly, not just the ideologies but the financial infrastructure of Silicon Valley is the foundation upon which the creation of cultured meat, as a product and as a vision, is based. Thus, cultured meat has emerged within an innovation niche that is almost entirely sustained through private sources of investment. Our contention is that this has significant implications for analysis of promissory futures and anticipatory governance.

## **It started with an investment pitch!**

On August 5, 2013, Mark Post, a scientist from a research group at Maastricht University (now known as Mosa Meat), unveiled the ‘world’s first laboratory grown burger’ at a press conference in London. Although it was neither the first instance of laboratory meat production, nor the first tasting of an in-vitro burger, it remains the most high-profile demonstration in the emerging sectors history and has been repeatedly positioned as a founding moment for the industry (e.g., Jönsson, 2016; O’Riordan *et al.*, 2017). The press conference undoubtedly brought public attention to the project but it was primarily a very high-profile pitch to prospective investors.

O’Riordan *et al.* (2017), in their examination of this event, note that the involved scientists and initial financier were explicitly motivated by, and acutely aware of, the need to weave a story that appealed to ‘real big money’ (O’Riordan *et al.*, 2017: p. 153). The result was the now familiar promissory narrative outlined earlier in this article. However, much of the subsequent analysis of promissory narratives fails to acknowledge this reality: That the trademarks of cultured meat futures emerged in the context of a pivot towards attracting private investment, and away from public research financing which had seeded initial experimental work (O’Riordan *et al.*, 2017). This has had discursive and financial consequences. The main ‘victim’ was an earlier imaginary of cultured meat within the context of space travel and planetary colonisation, linked to research investments made by NASA in the early 2000s. Such a future was perhaps too futuristic to appeal to the interests of venture capital in 2013. Certainty it has remained peripheral since in favour of a shifting prospectus of expectations that address entirely terrestrial concerns.

The broader point though, is that cultured meat and its promissory narratives have been fabricated, from the start, to appeal to a set of private investors and financiers, their egos, visions, ideologies, and financial interests. It raises a key reflection; the analytical task of exploring futures has largely neglected the degree to which promissory narratives have been formulated and tested to provide compelling futures for private investors. Given the widespread replication of the story set forth by Mark Post, it would appear this story has proven very persuasive, with time, to venture capital and private equity.

## **Financial speculation and imminent breakthrough**

Financial speculation is differentiated from investment principally in relation to the scale of the risk, expectations of returns and timeframe. Future orientated innovation projects are, like any investment, characterised by a degree of risk. Cultured meat has emerged as an investment prospect in a context of a broader explosion of interest in alternative proteins. A category which includes cultured meat, precision fermentation and plant-based materials (Sexton *et al.*, 2019). Although often discussed together they constitute largely discrete emerging food sectors. All three innovation areas have received significant private financing. But this has arisen in a context where plant-based substitutes in particular, and to a lesser extent fermented milk proteins, have a demonstrated product portfolio, with the former being present across multiple markets and having a proven ability to upscale production.

Since its inception cultured meats have been repeatedly described as imminent, ‘oven ready’, with product launches across multiple companies nearly all anticipated within a 3-5 year timeline from the point of prediction/announcement (Philpott, 2021). At the end of 2023, only two California based companies, Upside Foods and Good Meat (formerly EATJUST), can boast an available product to purchase. Following much hyped regulatory approval in the USA these two companies now produce cultured chicken sufficient for two high-end, fine dining restaurants in the US, with further small quantities being supplied by Good Meat to restaurants in Singapore since 2019 (Faguy, 2023; Yu, 2023). Furthermore, both faced separate but similar allegations that this modest production capacity is based on a fabrication,

## Section 2

not sustained through pilot bioreactor facilities often shown in public media, but backroom lab-scale equipment largely managed by hand (Reynolds, 2023; Shanker and Anand, 2023).

One of the few public assessments of the technical and economic challenges of cultured meat to be conducted by a non-advocate organisation or individual concluded that at food scale the cell-culture process will be plagued by extreme, intractable technical challenges (Fassler, 2021). When it comes to the promissory claims regarding the environment and animal welfare, a 2023 review concluded that there is “very little publicly available evidence that these claims hold true at present” (Olenic and Thorrez, 2023).

The most straight forward observation is that these announcements of imminent breakthrough and product release have been repeatedly and reliably failed, whilst currently existing products are scarce and potentially produced from labour intensive lab-based methods to sustain an image of progress. Equally, it highlights that there are major incentives to deceive, in terms of technical possibilities, moral progress, and societal prospects, to sustain an illusion of imminent breakthrough and lucrative financial return on speculative investments.

### Reshuffling the future and the pivot to chicken

The clearly felt pressure to deliver, and deliver now, is not without material and discursive consequence. Both Upside Foods and Good Meat have positioned chicken as the breakthrough product. Although chicken has always been a product category of interest in the sector, the beef burger has been the talisman product. But current beef cell lines simply do not reproduce quickly enough for the scale and throughput required for commercial viability. Since beef burgers are not just an iconic western product providing a familiar aesthetic for the sector the production of beef has been routinely positioned by scientists, founders and various advocates as the most environmentally and climate damaging element of the livestock industry and thus a key inspiration and target for substitution (Tuomisto *et al.*, 2022). Beef then is intimately linked with the discursive environmental and social mission of the emerging industry.

With a shift to chicken has come a shift in promissory narratives. Animal welfare concerns and ‘relieving’ the maximum amount of animal suffering are now prominent. Animal welfare concerns have always been a part of the story, but conventional chicken production already achieves significant energy and material efficiencies. Consequently, this shift highlights that promissory narratives are a mosaic that can be pieced together in diverse forms to appeal to investors and then reformulated to justify more immediate choices in response to harsh financial realities and investor expectations of returns. But the consequences are not just discursive. The promissory futures of cultured meat have laboured to legitimate a set of environmental claims that are receding further into the future. Pending a breakthrough in beef cell cultivations the realisation of the environmental promises of cultured meat shift further into the future, whilst a material reality emerges in which conventional chicken production is potentially positioned as more environmentally beneficial than the emerging cultured chicken sector.

## Conclusion

We end with a set of reflections on what the growing dominance of private investment, in driving the narratives and material practices of innovation, might mean for engaging with and analysing the future. Firstly, it means that there is a danger of reifying a promissory narrative that tells us nothing about the future, because it is inseparable from its ability to function convincingly as an investment pitch. The pertinent question is not to just examine the content of futures but also ensure critical assessment of the context within which they are being articulated. In this case, why these futures can be sold, to whom, and why? The anticipatory value of these visions is principally with regards to what they say about the cultural and financial context within which they are having success in attracting investment.

Secondly, promissory analysis has consistently foregrounded the voices of scientists, advocates and investors operating in this space. Although it routinely notes that these individuals have a distinct interest in the proliferation of positive narratives (Helliwell and Burton, 2021; Painter *et al.*, 2020), there is less reflection on how these individuals are able to speak in the first place. The threshold for legitimacy is not sober analysis of anticipated technical, social, and environmental prospects, but the ability to sell a lucrative investment prospect whilst generating and sustaining hype. Those most likely to succeed are those who can make seem real and lucrative that which does not exist. That these individuals are legitimated through these transactional arrangements should be a source of significant reflection for social scientists seeking to examine such futures. After all investors in Silicon Valley have been repeatedly shown by fiascos such as the collapse of Theranos Inc. and FTX/Alameda, to be readily taken in by aesthetic parlour tricks, fear of missing out, herd mentality, and blinded by greed. At the least, there is a need to involve voices beyond those of advocates and other immediately interested parties, to develop alternative narratives around these technologies.

Thirdly, examining these futures is a double edge sword. On the one hand, earnest analysis of promissory narratives can legitimate these hyped technologies. Certainly, public financing and reactionary legislation seeking to ban such products has recently begun to emerge. Although not to overstate the importance of futures studies in these dynamics, they will have certainly contributed to shaping these perceptions and responses. On the other, STS and futures studies risk delegitimizing itself in its response to each and every frontier of innovation hype. Our own incentives to produce novel research creates the risk that scholarship becomes trapped in chasing cycles of hype that offer little insight into the future, but only what is presently attractive within dynamics of financial speculation on innovation.

## **Acknowledgements**

This research has been funded by RCN grant no. 336136, “ARRIVAL of cellular agriculture- Enabling biotechnology for future food production”.

## **References**

- Alvia-Palavicino, C. (2015). The future as practice. A framework to understand anticipation in science and technology. *Tecnoscienza — Italian Journal of Science and Technology Studies*, 6(2), 135–172.
- Broad, G.M. (2020). Making meat, better: the metaphors of plant-based and cell-based meat innovation. *Environmental Communication*, 14(7), 7.
- Dale, J. (2019). How government-funded research on alternative proteins can grow the bioeconomy. Good Food Institute, available online at <https://gfi.org/blog/ostp-comment/>
- Faguy, A. (2023). USDA Approves ‘Lab-Grown’ Chicken—Here’s Where To Buy It. *Forbes*. available online at <https://www.forbes.com/sites/anafaguy/2023/06/21/usda-approves-lab-grown-chicken-heres-where-to-buy-it/>
- FAO. (2017). The future of food and agriculture: Trends and challenges. FAO, Rome.
- Fassler, J. (2021). Lab-grown meat is supposed to be inevitable. The science tells a different story. *The Counter*, available online at <https://thecounter.org/lab-grown-cultivated-meat-cost-at-scale/>
- Geiger, S. (2020). Silicon Valley, disruption, and the end of uncertainty. *Journal of Cultural Economy*, 13(2), 169–184, DOI: 10.1080/17530350.2019.1684337
- Good Food Institute. (2022). 2022 State of the industry report: Cultivated meat and seafood. Good Food Institute, available online at <https://gfi.org/wp-content/uploads/2023/01/2022-Cultivated-Meat-State-of-the-Industry-Report-2-1.pdf>
- Granjou, C., Walker, J. and Salazar, J.F. (2017). The politics of anticipation: On knowing and governing environmental futures. *Futures*, 92, 5–11.
- Helliwell, R. and Burton, R.J.F. (2021). The promised land? Exploring the future visions and narrative silences of cellular agriculture in news and industry media. *Journal of Rural Studies*, 84, 180–191.

## Section 2

- Jönsson, E. (2016). Benevolent technotopias and hitherto unimaginable meats: Tracing the promises of in vitro meat. *Social Studies of Science*, 46(5), 5.
- Olenic, M. and Thorrez, L. (2023). Cultured meat production: What we know, what we don't know and what we should know. *Italian Journal of Animal Science*, 22(1), 749–753.
- O'Riordan, K., Fotopoulou, A. and Stephens, N. (2017). The first bite: Imaginaries, promotional publics and the laboratory grown burger. *Public Understanding of Science*, 26(2), 2.
- Painter, J., Brennen, J. S. and Kristiansen, S. (2020). The coverage of cultured meat in the US and UK traditional media, 2013–2019: Drivers, sources, and competing narratives. *Climatic Change*, 162(4), 4.
- Philpott, T. (2021). Is lab meat about to hit your dinner plate? Mother Jones, available online at <https://www.motherjones.com/food/2021/08/is-lab-meat-about-to-hit-your-dinner-plate/>
- Reynolds, M. (2023). Insiders reveal major problems at lab-grown-meat startup upside foods. *Wired*, available online at <https://www.wired.com/story/upside-foods-lab-grown-chicken/>
- Sexton, A.E. (2020). Food as software: Place, protein, and feeding the world Silicon Valley-style. *Economic Geography*, 96(5), 5.
- Sexton, A., Garnett, T. and Lorimer, J. (2019). Framing the future of food: The contested promises of alternative proteins. *Environment and Planning E: Nature and Space*, 2(1), 1.
- Shanker, D. and Anand, P. (2023). The Biggest problem with lab-grown chicken is growing the chicken. *Bloomberg.com*, available online at <https://www.bloomberg.com/news/features/2023-12-14/upside-foods-struggles-with-lab-grown-chicken-despite-600-million>
- Stephens, N., Di Silvio, L., Dunsford, I., Ellis, M., Glencross, A. and Sexton, A. (2018). Bringing cultured meat to market: Technical, socio-political, and regulatory challenges in cellular agriculture. *Trends in Food Science and Technology*, 78, 155–166.
- Tarvainen, A. (2022). The modern/colonial hell of innovation economy: Future as a return to colonial mythologies. *Globalizations*, 1–23.
- Tuomisto, H.L., Allan, S.J. and Ellis, M.J. (2022). Prospective life cycle assessment of a bioprocess design for cultured meat production in hollow fiber bioreactors. *Science of The Total Environment*, 851, 158051.
- Yu, D. (2023). Eat just to scale up cultured meat production on gaining new regulatory approval in Singapore. *Forbes*, available online at <https://www.forbes.com/sites/douglasyu/2023/01/18/eat-just-to-scale-up-cultured-meat-production-on-gaining-new-regulatory-approval-in-singapore/>