






ALTERNATIVE PROTEIN RESEARCH IN CAMBRIDGE

WORKSHOP FOR POSTDOCS AND GROUP LEADERS

To develop proposals for alternative protein research projects, and facilitate an interdisciplinary network amongst academics, funding bodies and businesses

Friday 10th March 2023, 9AM - 2PM
Jesus College Cambridge

A collaboration between

[Cambridge Global Food Security](#) hosted this Alternative Protein Workshop in collaboration with the [Cambridge University Alternative Protein Project](#), [Cambridge Zero](#) and the [Good Food Institute](#).

Interdisciplinary research presents an opportunity for information-sharing and talent development that would enormously benefit the development of alternative protein technologies. This workshop brought together researchers from the University of Cambridge and further afield, as well as representatives from business and funding bodies, with the following goals:

- To develop proposals for alternative protein research projects, including collaborators within and outside the university.
- To facilitate a network between academics interested in alternative protein research across the University's different schools.
- To build a roadmap for how initial research projects could progress into a world-leading Centre for Alternative Protein Research.

The workshop started with keynote addresses from The Good Food Institute and UK Research and Innovation (UKRI), outlining the research, business and consumer contexts for alternative proteins, and the opportunities offered by both organisations.

Seren Kell, Senior Science and Technology Manager at The Good Food Institute Europe, a nonprofit think tank working to accelerate alternative protein innovation, highlighted the fact that the UK is the largest market in Europe for plant-based meat alternatives, but that most products are more expensive than animal products and don't taste as good. Currently about 6% of the world's population are vegetarian or vegan and demand for meat is projected to double by 2050. To appeal to the consumer, meat alternatives must compete on taste, price and convenience. Market research shows that people are less interested in whole food alternatives; instead they prefer the same products in a more sustainable way. The GFI facilitates finding collaborators and runs its own grant program. More information can be found [here](#).

Other funding opportunities in the space were introduced by Sarah Neely, Portfolio Manager of the Business Interaction Unit of the Biotechnology and Biological Sciences Research Council (BBSRC). A pre-recorded talk can be found [here](#). Notably, the UKRI published '[Alternative Proteins: Identifying UK priorities. A roadmap for the future of the alternative protein sector in the UK](#)' in June 2022. In line with this increased interest in the alternative protein space, the [UKRI's Transforming Food Production Challenge](#) has a budget of £90 million to support new ways to produce food that reduce emissions and pollution, and contribute to feeding a growing world population.

The core of the workshop consisted of four interactive brainstorming sessions in which workshop participants actively engaged, to develop proposals for alternative protein research projects and foster collaborations.

The first breakout session brought together Cambridge academics with external experts from academia, industry and the non-profit space to discuss specific alternative protein technologies (plant-based meat, cultivated meat, fermentation). A fourth breakout room was focused on the social dimensions of the alternative protein revolution.

Each room identified a number of challenges and opportunities for their focus area:

Plant-based Breakout Room Lead by <u>Seren Kell</u>	
Challenges	Opportunities
<ul style="list-style-type: none"> • Consumer decision is dictated by taste, cost and convenience • The core goal of plant-based meat is persuading plant proteins to act like animal proteins • There are a lot of available plant products that can mimic meat functionalities, however, they are not part of traditional manufacturing processes. Therefore, food manufacturing would need to change • Crop supply worldwide is calorie sufficient but protein deficient 	<ul style="list-style-type: none"> • Crop engineering: crops with a higher protein content, better amino acid profile, more resilient/ climate smart • Protein fractionation • Plant fat profiles • Texturisation methods (innovation in addition to extrusion, electrospinning, 3D printing) • Research about health profiles of these alternative products (e.g. reduction of allergenes), cost-effectiveness of replacing animal proteins with plant-based proteins and the implications for health • Research about resilience of scaling up (making supply chains visible and traceable), their impact on wider global food supply chains

Fermentation Breakout Room Lead by <u>Alessia Buscaino</u>, <u>Bernd Gerhartz</u>, <u>Craig Johnston</u>	
Challenges	Opportunities
<ul style="list-style-type: none"> • Need to decrease production costs (both for 'new' proteins and 'more established' ones like casein) • To produce at scale, the protein of interest needs to be 	<ul style="list-style-type: none"> • Strain engineering (e.g. yeast is prominently used but not ideal, need for something less picky on feedstock, more robust, no DNA secreted in the final product). Field moves toward filamentous fungus (allows faster strain engineering, streamline CRISPR technology, access to less processed feed stocks)

<p>secreted, no column purification step in between</p> <ul style="list-style-type: none"> • Talent pipeline problems in the UK (lagging behind EU with Denmark and Netherlands being hotspots for precision fermentation) • When using a new species/strain: this requires new regulatory approval • Current grant calls are not purely academic but require collaborations with companies which most likely result in IP protection of research 	<ul style="list-style-type: none"> • Research needed to address bottlenecks in the underlying fundamental biology (metabolic, protein secretion processes to enable next generation protein secretion) • Need for research in manufacturing processes considering parameters like: different feed stocks have different prices in different places in the world, where is consumer demand, price range of competing products, what is the regulatory framework • Approval process: very slow in the EU with basically no guidance, after Brexit the UK has potential to shorten this process
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Cultivated Meat Breakout Room Lead by Che Connon and Masaki Kinoshita

Challenges	Opportunities
<ul style="list-style-type: none"> • The research landscape of tissue engineering is currently dominated by creating organ-like structures • Bioreactors used in pharmaceutical industry have limited suitability for needs of cultivated meat production • Creating a meat like structure/texture of product (that determines mouth feel, a steak like product), research gap: of how do we translate single cells into a stake like product • Decreasing the cost of the media solution that is fed to the cells • UK is leading in bioprocessing, however, funding is lacking/ inappropriate 	<ul style="list-style-type: none"> • Tissue engineering approaches can be readily translated from medical applications to food applications, but innovations needed (e.g. bioreactor design) • Hybrid products (e.g., cultivated fat used together with plant-based structure) • Advantage that academic research is able to take a longer-term perspective, which allows researchers to explore the future, rather than solve immediate challenges, e.g.: <ul style="list-style-type: none"> ○ Digestive profile of the cultivated meat compared to normal meat ○ Medical aspect of cultivated meat research: With age people have problems creating saliva or chewing so products can be created to stimulate saliva production • Novel approaches, e.g. start the cell culture from day 0 with inclusion of mechanical information • New solutions for antimicrobial aspects, e.g., introducing simplified immune system into the bioreactor

Social Dimensions Breakout Room Lead by Inanna Hamati-Ataya, Tamsin Blaxter and Chris Bryant

Challenges	Opportunities

<ul style="list-style-type: none"> • Public perceptions are driving consumption • Threat to increasing the gap between Global South and North with the latter harbouring technology/knowledge • Headwind from the meat industry, e.g. meat lobby emphasised gate-keeping language about calling products meat 	<ul style="list-style-type: none"> • Alternative protein research taking into consideration factors such as food culture and infrastructure • Earn consumer trust; for example by naming products appropriately • Key role for governments to mediate the protein transition, to avoid negative consequences, if left to the market • Support through government policies (e.g. alerting agricultural subsidies, meat tax), see Canada's plant-based food investment as example • Novel approaches: is it better to promote alternative proteins in countries where less meat is consumed (but increasing trajectory) rather than in countries where meat consumption is already high? Developing vs. developed countries
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Alternative proteins is an inherently broad and interdisciplinary field. Many products will likely be hybrids of plant-based, fermentation and cultivated meat technologies. It also requires close collaboration between natural and social scientists to develop products that will meet food safety requirements, that consumers will want, and that ultimately will have a positive impact on the world.

Acknowledging this, the second breakout session brought together attendees from different academic backgrounds and research interests for interdisciplinary discussion, reflecting on and sharing learnings from the first breakout session. Key takeaways included:

Interdisciplinary Breakout Rooms

- The potential for disease prevention and enriched nutritional content of alternative proteins should be explored. It is technically feasible to make these foods more nutritious, but is another cost factor with a too-small market advantage. This is because, despite consumers being motivated by health, they (we) are prone to be manipulated by industry/media. How can alternative protein producers have a good conversation with consumers?
- Benevolent patent sharing should be incentivised. Open access research would prevent big players taking over. Investment should be coupled to openness. Creating intellectual property is lucrative for companies, which means that it is only after this runs out and the technology becomes accessible for everyone, that there is an explosion of adoption. The [Go FAIR initiative](#) is an example of good practice in this area.
- Research calls are often industry-led, based on specific late technology readiness levels, but this is often not where the science is focussed; so there is a disconnect between funding calls and the technology landscape

Worldwide, the field is moving towards the formation of hubs for alternative protein academic research. David Meyer, CEO of Food System Innovations, gave the closing keynote on their multi-year vision to build the Sustainable Protein Innovation Institute (SPII) in the US. In collaboration with GFI, Accenture and the Bryson Family Foundation, their mission is to accelerate the transition to an alternative-protein-first food system by addressing the highest-impact research needs with explicit commercial intent in time it aims to help reverse the worst consequences of climate change.

Building on the interest in the recent alternative protein workshop in Cambridge, the GFS and collaborators envision to continue to grow the interdisciplinary Cambridge Alternative Protein Network and spark research projects and collaborations.

Feedback from workshop attendees:

'The alternative proteins workshop was a fantastic event, bringing together researchers from across multiple departments and disciplines to identify how Cambridge can become a world leader in these research fields. It is clear that there is both the desire and expertise to build on this momentum, and I look forward to seeing this realised in the coming months. With increasing government support for alternative proteins R&D channelled through research councils such as BBSRC and Innovate UK, this is an exciting time to join the race to build a more sustainable, secure, and just food system.' **Seren Kell, Senior Science and Technology Manager GFI Europe**

'We were delighted to attend this important event which brought together academics from the University of Cambridge and the wider UK academic community. This was a valuable opportunity for researchers working on sustainable protein innovations to come together across disciplines and we look forward to seeing new projects come out of these collaborations. To foster further research and development in the sector, the Collier Startup Competition has partnered with the Cambridge Judge Business School and Creator Fund to offer a £100,000 investment into the winning venture.' **Collier Foundation**

'The Alternative Proteins Association (APA) believes there is a great opportunity for the UK to lead the alternative protein sector, leveraging its strong heritage of academic excellence. The APA found the University of Cambridge event to be a valuable opportunity for industry and leading academics to foster collaboration, and we look forward to seeing new projects emerge. We look forward to supporting future events for our members and the wider alternative protein sector.' **Alternative Proteins Association**



CAMBRIDGE
ALTERNATIVE PROTEIN
NETWORK