PhD Project Advertisement

Project title: A New Approach to the Production of Cultured Meat with Enhanced Texture

Project No: FBS2022-071-Hamley-ra

Lead supervisor: Prof Ian Hamley, Dept of Chemistry, University of Reading

Email: i.w.hamley@reading.ac.uk

Co-supervisors: Dr Ruth Wonfor, IBERS, Aberystwyth University (rec21@aber.ac.uk), Dr Julia Garcia and Mr Illtud Dunsford, Cellular Agriculture Ltd.

Project description:

Future food production needs to meet a growing demand for food and changing diets, as the human population is predicted to reach 9 billion by 2050. Use of resources such as phosphorous and nitrogen are already exceeded sustainable limits, with agriculture placing large requirements on these resources. Further demands on the earth systems to increase food production will not be able to be supported. However current livestock production systems are major contributors to anthropogenic climate change and so, significant increases in production to meet growing demands will be unsustainable using current systems. Yet livestock products are nutrient dense and so cannot be discounted from diets without a suitable, healthy replacement. Therefore, transformative and disruptive production methods are needed to sustainably increase food production. Cultured meat is attracting great interest as a candidate for production of livestock products with reduced environmental impacts. This exciting project is to develop a new bioreactor method to prepare cultured meat. This technology produces aligned self-releasing tissue using a templating approach within the bioreactor. The approach has exceptional potential to produce aligned tissue for cultured meat tissue production with enhanced structural and textural properties. This is a collaborative project involving the University of Reading, Aberystwyth University and CASE partner Cellular Agriculture, a UK Small enterprise based in Llanelli, Wales.

This cutting edge project will investigate the production of aligned extracellular matrix within self-releasing tissue produced from myoblasts. This will use peptide amphiphile coatings on aligned templates in cell culture plates. The peptide amphiphiles stimulate cell adhesion and facilitate release of tissue using cell-expressed matrix metalloproteases (MMPs). The alignment template is a micropatterned Teflon substrate. This is prepared by a controlled rubbing process which leads to the production of microgrooves in the substrates. This templates the alignment of extracellular matrix produced by cells including collagen and other extracellular matrix proteins. The project involves the use of commercially available mouse myoblast cell lines for this initial work before extending the research to porcine cell lines. You will culture cells and examine the extracellular matrix produced using histochemical assays of extracellular matrix components, along with morphology and property studies and meat texture analysis, at the University of Reading. The project work at Aberystwyth will utilise the knowledge and expertise within the UK small company Cellular Agriculture's currently funded research projects at Aberystwyth and Bath on myoblast muscle cell sources and bioreactor designs to test the aligned extracellular matrix.

Training opportunities:

At Reading, the project will provide training in cell culture methodologies and preparation technique for aligned tissue production using peptide amphiphiles and microgroove-patterned substrates. In addition training in cell assay methods, electron microscopy, synchrotron x-ray scattering, rheology and texture measurement methods will be provided.

At Aberystwyth, training will be in cell culture, primarily related to the culture of cells in the Cellular Agriculture bioreactor and the extraction of primary cells from muscle tissue (from abattoir samples). The student will also be trained in further cell assay methods as well as molecular methods, such as real-time PCR.

Within the four-year period of the PhD, Cellular Agriculture will provide a placement for the student covering business management and commercialisation potentials of the research. The placement will provide experience in structuring a business case, pitch, financials, details of collaboration and engaging with senior staff within the external companies. Furthermore, Cellular Agriculture are well connected within the in vitro meat production industry, collaborating internationally and will provide experience and connections within the industry throughout the project and within the placement.

Student profile:

This studentship is available only to individuals who are eligible for UK fees status. The project would be suitable for applicants with interests in biotechnology and a suitable background with knowledge of cell biology in particular. The project is interdisciplinary and also involves aspects of food science and technology, chemistry, biotechnology and agriculture. You should have a BSc or master's degree or equivalent qualification in a related field. The project involves research at Reading and Aberystwyth, as well as placements at Cellular Agriculture in Llanelli.

Stipend (Salary):

FoodBioSystems DTP students receive an annual tax free stipend (salary) that is paid in instalments throughout the year. For 2022/23 this will be £16,062 and this will increase slightly each year at rate set by UKRI. This project is co-funded by CASE partner Cellular Agriculture.

For up to date information on funding eligibility, studentship rates and part time registration, please visit the FoodBioSystems website.

Equality Diversity and Inclusion:

The FoodBioSystems DTP is committed to equality, diversity and inclusion (EDI), to building a doctoral researcher (DR) and staff body that reflects the diversity of society, and to encourage applications from under-represented and disadvantaged groups. Our actions to promote diversity and inclusion are detailed on the FoodBioSystems DTP website.

In accordance with UKRI guidelines, our studentships are offered on a part time basis in addition to full time registration. The minimum registration is 50% FT and the studentship end date will be extended to reflect the part-time registration.