AIFST 2023 AWARD OF MERIT CITATION – PROFESSOR MICHELLE COLGRAVE

Research Achievements

Prof Colgrave is a recognised leader in the use of proteomics to strengthen Australia's Food and Ag industries. She is internationally renowned for the application of biomolecular analysis using mass spectrometry (MS) to agricultural products, leading to safer food sources for millions of people worldwide. Prof Colgrave developed innovative MS assays to determine the exact gluten levels in novel grain varieties that underpinned the development of the world's first and only gluten-free barley. Today, Kebari® provides a novel premium grain for Australian grain growers to address the growing international export opportunity in the production of gluten-free products, bringing the nutritional benefits of whole grains to people suffering from coeliac disease.

Prof Colgrave is an internationally recognised authority in the detection of allergens and/or toxic proteins in processed food products have allowed regulators and industry to provide accuracy and transparency in food labelling. The US Food and Drug Administration released an amendment to the gluten-free labelling regulation based on her findings.

She has pioneered the application of proteomics to the deregulation of the use of genetic technologies in modified crops including omega-3-canola to ensure a commercial path to market. Omega-3 fatty acids have positive human health benefits, including brain development and reduced cardiovascular risk. The main source of dietary omega-3 is wild-harvested marine fish whose numbers are in decline.

In developing this novel canola, Prof Colgrave's team demonstrated its safety using MS-based assays that were praised by regulators (OGTR/FSANZ) for their novelty and innovation in "setting a new bar for protein stability studies". As a result, one hectare of this canola has the potential to provide the omega-3 oil yield from 10,000 kg of fish, making this an example of delivery of excellent science coupled with innovation in impact and commercialisation of omega-3-canola.

Prof Colgrave is currently conducting ground-breaking work on the causes of non-coeliac gluten sensitivity and non-responsive Coeliac disease, which relies on her laboratory's ability to detect and quantify additional grain proteins for which she employs cutting-edge technology to advance food safety analysis. Her lab's work encompassing the proteogenomic annotation of gluten and allergens in oats led to publication in the prestigious journal, Nature (2022). Moreover, her lab is developing methods for allergen detection for novel/emerging allergens, i.e., those from pulses such as lupin, and cross-reactive proteins in alternative protein sources such as crickets, mealworms, and black soldier fly.

In addition to research translation, Prof Colgrave has an excellent academic track record with a H-index of 40 from >140 research articles, >180 conference presentations, >50 invited seminars and research commercialisation via 7 patent filings. Her research outcomes have received wide media attention.

Moreover, she regularly provides media training opportunities for postdoctoral fellows and PhD candidates.

Industry achievements

Helping Australia get Technology Ready: As CSIRO's Future Protein Mission leader, Prof Colgrave led strategic applied research that supports the growth of current agrifood industry sectors and establishes new industries. Prof Colgrave was instrumental in the establishment and launch of the Future Protein Mission through her interactions across government, industry, and academia. She exerts influence, bringing together stakeholders and implementing science and technology solutions for the benefit of Australian people, the environment, and the economy. The role extended beyond research program management to strategic roadmap development and informing policy (e.g., addressing national manufacturing priorities and responses to senate inquiries).

Enhancing research collaboration, translation, and commercialisation: The Future Protein Mission exemplifies research translation and commercialisation, management of complex collaborative relationships across the innovation system, and coordination of multi-disciplinary research. The advancement of new Australian industries and science/technology areas in precision fermentation and cellular agriculture will require leadership, coordination, and facilitation. Prof Colgrave is committed to creating an enabling environment through investment in science, development of regulatory frameworks (in partnership with FSANZ), societal acceptance via communication and industry growth by supporting private-public partnerships.

Influence of public, science and industry policy: Prof Colgrave is committed to science excellence and dissemination: as Book Editor "Proteomics in Food Science: From Farm to Fork", Editorial Board Member for Scientific Reports, Journal of AOAC International, Frontiers in Sustainable Food Processing, Foods, Frontiers in Plant Science. As an international authority in food safety, she is called upon as an expert panel member of the European Commission Joint Research Centre Gluten Detection Working Group, Coeliac UK Gluten Analysis Working Group, AOAC's Gluten and Food Allergen Advisory Panel, Asia-Oceania Agricultural Proteomics Organization council member and Australasian Proteomics Society (APS) Board of Management. In support of research-industry partnerships and research dissemination, she has served on numerous committees (AgCatalyst, APS, ANZSMS). Most recently, Michelle provided input to the Codex food standards for alternative proteins and presented to the International Heads of Food Agencies Forum.

Education achievements

She is a Chief Investigator on the Australian Research Council Centre for Excellence in Peptide and Protein Science, an $35m, 7-year program with a vision to discover, decode and develop new proteins and peptides from Australia's diverse flora and fauna for the benefit of health, agriculture and the environment. The Centre will train >100 early career researchers and her role is to train the researchers specifically in the field of food science.

Michelle is an advocate for STEM careers and Women in Science: Prof Colgrave is dedicated to training the next generation of food and agricultural scientists, currently supervising 5 PhD candidates and 4 postdoctoral researchers (6 females; 3 males; from diverse backgrounds) and mentors 4 ECRs.

She hosts symposia/workshops for the proteomics community, directs the Food & Agricultural Proteomics group at ECU, and facilitates access of these cutting-edge facilities to food and agricultural scientists.

As examples, she has supported career development via initiatives such as CSIRO's Network of Women, Japan Women's Innovative Network, National Science Week, high school STEM engagement and local workshops. Most recently, Michelle has recently accepted a role in ATSE's Industry Mentoring Network in STEM (IMNIS) Engage program.

Describe the nature and significance of the nominees' contributions to the Institute

Michelle is Deputy Director (Impact) for CSIRO Agriculture and Food, former leader of CSIRO's Future Protein Mission bringing together diverse science disciplines from across the innovation system to create new protein-based products, companies, and industries. She deftly communicates science to diverse audiences. Specifically, Michelle has contributed to AIFST writing three articles for Food Australia in the last two years, delivering multiple seminars to disseminate research findings. She has presented on gluten detection (November 2019) and insect-seafood cross-reactivity (July 2021). Moreover, she has participated in workshops, symposia and conferences aiming to provide insights to AIFST members and food technologists on the state-of-the-art in protein research & development. Examples include the WA Food for Thought workshops (July 2019, December 2021, upcoming 2023), the AIFST Convention (2021 and 2022) and Food Tech QLD meeting (July 2022) wherein she has assisted with coordination of the session on "Protein alternatives, Precision fermentation, Cellular Agriculture". She supervises and mentors early career scientists through her CSIRO and university appointments and seeks out opportunities to share her knowledge with food professionals. For example, she contributed to the 2022 AIFST Summer School (February 2022) delivering two presentations covering plant-based proteins and precision fermentation and participating in a panel discussion.

Describe the impact of the nominee's contribution in assisting to further the aims and objectives of the Institute

AIFST's purpose of uniting the food industry in the science of feeding our future is highly aligned with Michelle's work in CSIRO's Future Protein Mission wherein she brought innovative science and technology to create new Australian protein products and ingredients that earn an additional $10 billion in revenue by 2030. Michelle embodies the principles of AIFST through Grow – Learn – Connect – Champion. Under Grow, Michelle is inspiring and enabling food scientists and technologists to deliver new protein-based solutions across animal, plant, and alternative protein categories. Under Learn and Connect, Michelle actively participates in education, dissemination and most importantly enables collaboration across food science fields – connecting value chain participants, connecting industry and academia, and working alongside government and food safety agencies. Recent examples include the CSIRO-FSANZ "Lunch & Learn" workshops and her contributions to IHFAF/Codex on alternative protein food standards. Lastly, under Champion, Michelle, as Future Protein Mission leader, was an advocate for science innovation, infrastructure support, fostering partnerships, providing training/mentorship opportunities, and creating pathways for impact delivery. Michelle actively seeks to strengthen partnerships between the food industry and scientists to ensure that fit-for-purpose solutions can be co-created that will be readily deployed and highly valued.

Bibliography

Michelle Colgrave is a Professor of Food and Agricultural Proteomics, and chief investigator on the

Australian Research Council Centre of Excellence for Innovations in Peptide and Protein Science.

Professor Michelle Colgrave is Deputy Director (Impact) for CSIRO Agriculture and Food, former Leader of CSIRO's Future Protein Mission. The Future Protein Mission is centred on principles of sustainable growth delivering high quality, affordable and nutritionally optimised protein for Australia. It is developing protein-based industries (including traditional protein, plant-based protein, insect, and microbial protein) along the value chain from production to the customer, delivering premium protein ingredients and products, addressing the rapid growth of the protein-based sector.

Michelle Colgrave also leads the Food and Agricultural Proteomics team at Edith Cowan University (and formerly at CSIRO), using revolutionary technology to identify key proteins that will benefit Australia's food and agriculture industries and improve human health.

Professor Colgrave is recognised for major breakthroughs in the analysis of gluten, the proteinaceous elicitors of coeliac disease. Her research has had profound impact in the development of an ultra-low gluten barley, now known as Kebari® which is used in the production of gluten-free cereals, beers and food products that contribute the nutritional benefits of whole grains, while being safe to be enjoyed by coeliac sufferers.