Amelie ROUGER

Institution: Meat Technology Ireland; Teagasc Food Research Centre, Ashtown
Academic Mentor: Dr Kaye Burgess
Commercial Partner: Kepak Ltd
Commercial Mentor: Jane O'Hara

Amelie is a molecular microbiologist who obtained her primary degree from the University of Poitiers in France. She completed an MSc in Food Science and Human Nutrition at the University of Nantes before undertaking a PhD in food microbial ecology at INRA (National Institute of Agricultural Research) also in Nantes.

Her work involved understanding bacterial community dynamics in modified-atmosphere packaging of chicken meat by high-throughput sequencing methods. This informs management of spoilage bacteria to extend the shelf-life of poultry meat products.

Amelie's Marie Sklodowska-Curie fellowship, awarded in association with Meat Technology Ireland, continues her research in this vein. Her focus is the utilisation of next-generation sequencing technology to monitor microbial communities through meat production and storage. The objective is to follow bacterial communities during each stage of slaughter – and in the plant environment – in order to support meat safety and shelf-life extension. *See case study overleaf*

Dr Kaye Burgess

Dr Kaye Burgess is a senior research officer in food safety at Teagasc. Her research focuses on understanding the behaviour and virulence of food-borne bacterial pathogens and spoilage bacteria from farm to fork. She has extensive experience in molecular technology, including DNA, RNA and protein techniques. She currently coordinates a number of nationally funded research projects and has been proactive in building multidisciplinary research consortia.

Jane O'Hara

Jane O'Hara has worked in red meat, processing and packaging for over a decade. She oversees the technical function for Kepak Meat Division, with responsibility for seven plants. She is responsible for compliance and the implementation of best practice procedures. She also mentors technical teams, identifying and supporting research and development projects such as shelf-life improvements, processing interventions, packaging improvements and product improvements.

Teagasc Food Research Centre, Ashtown

Teagasc, the Irish Agriculture and Food Development Authority, has a world-renowned reputation for meat safety and shelf-life research. Teagasc Food Research Centre in Ashtown has ten multidisciplinary meat research laboratories, an experimental abattoir, boning hall, packaging hall, cooked meats facility and food processing pilot plant if needed.

Kepak Ltd

Kepak is one of Europe's leading meat protein processing, marketing and trading companies, with a turnover in excess of €800 million. It has manufacturing facilities throughout Ireland and the UK, with sales offices in Europe, Asia and Africa. Its Centre of Excellence has 3500 head of cattle and is pivotal as a knowledge transfer hub for Kepak's supply base.

Amelie's project

The shelf-life of meat products, and identifying ways it can be extended without the addition of preservatives, are critical concerns for Ireland's meat industry.

In an increasingly globalised market, there is an urgency to gain greater understanding of meat spoilage and how it can be delayed. Despite strict controls, the beef carcass gets unavoidably contaminated when an animal is slaughtered, impacting on the rate of spoilage of the resulting meat products.

The primary hypothesis of this research is that the hygiene status of an animal presented for slaughter impacts on the microbial community profile of the resulting meat cuts, ultimately impacting on product shelf-life.

While culture-based studies may provide evidence of this, more specific biomarkers of spoilage may exist in the non-culturable microbial community, enabling the development of more accurate spoilage prediction methodologies.

The secondary hypothesis is that interventions to increase shelf-life will change the total numbers of bacteria present – and the microbial community composition and its metabolic dynamics. Such information is not readily available through culture-based methodologies but can be obtained through metagenomic analysis.

This project will focus on the use of the next-generation sequencing technology which will target specific sequences in all bacteria present in samples, giving more complete information about the total bacterial community and how it changes as spoilage develops.

This metagenomic approach involves monitoring the microbial community alterations of beef from slaughtered animals through to retail meat. This will facilitate the identification of more specific microbial biomarkers of spoilage development.

Additionally, metagenomic analysis on a selected number of samples and appropriate bioinformatics pipelines will help to examine meat plant microbial populations for specific genetic determinants, including antimicrobial resistance and virulence genes.

A particular focus will be placed on resistance determinants for the classes of antimicrobials most commonly used in beef production, informing the industry of the relative risk posed.