



Real-Time Meat Quality Assurance for Irish Beef Using Advanced Mass Spectrometry

Walsh Scholars Reference Number: 2026012

University: Queen's University Belfast (QUB)

Funding: Teagasc

Research Institution: Teagasc

Location: Teagasc Ashtown, Dublin 15

Proposed Start Date: September 2026

Project Summary

Ensuring consistent beef eating quality is essential for consumer satisfaction, yet current industry methods based on visual assessment and carcass traits have limited capacity to predict key attributes such as flavour and tenderness. This PhD project will evaluate and validate advanced ambient mass spectrometry (AMS) techniques, including REIMS, DESI-MS and DART-MS, for close-to-real-time assessment of beef eating quality. The research will address whether AMS can reliably predict eating quality, particularly flavour, and identify the molecular or volatile signatures that underpin quality classification.

Beef samples with controlled variation in composition will be generated through animal-level factors (breed and diet), muscle-level differences, and post-mortem interventions such as carcass suspension, tenderisation and dry ageing. Samples will be analysed using AMS techniques alongside conventional meat quality assessments, including muscle biochemistry and sensory evaluation. Detailed profiling of volatile compounds will be carried out using advanced GC-MS with olfactometry and chemometric analysis. This integrated approach will link chemical fingerprints with sensory and biochemical traits to identify robust biomarkers of flavour and tenderness.

The project will deliver mechanistic insight into AMS-based quality classification and support the development of rapid, accurate tools for on-slaughter-line beef quality evaluation. Outcomes will enhance processing efficiency, reduce waste, and strengthen consumer confidence in Irish beef products.

Supervision

The project will be supervised by Dr Jingjing Liu and Professor Kieran Kilcawley at Teagasc, with co-supervision provided by Dr Nick Birse at Queen's University Belfast. Together, the supervisory team brings expertise in meat science, flavour chemistry, and advanced mass spectrometry, providing a strong and well-aligned supervisory framework that integrates mechanistic, analytical, and applied aspects of the research.

Research Environment

You will be registered at Queen's University Belfast and based at Teagasc Ashtown Food Research Centre, a national centre of excellence for food science and technology research, for the duration of your studies. The project offers access to pilot-scale meat processing facilities, advanced sensory science laboratories, and state-of-the-art analytical chemistry infrastructure. As a Walsh Scholar, you will be part of a vibrant interdisciplinary research community and benefit from strong national and international collaborations across meat science, flavour chemistry, and food quality assurance.

Career and Training Opportunities

The Teagasc Walsh Scholars Programme provides a structured four-year training and development framework designed to support academic excellence and long-term career readiness. Scholars develop advanced scientific and analytical expertise alongside transferable skills in communication, project management, and stakeholder engagement through expert-led training, workshops, and tailored professional development.

Scholars have opportunities to present their research at national and international conferences, supporting professional networking and active engagement with the wider research community. Dedicated final-year career supports focus on preparing graduates for impactful roles across research, industry, advisory

services, and policy, in Ireland and internationally. Through the Teagasc International Training Awards, scholars may also undertake an international research placement of up to 12 weeks aligned with their PhD project, with outstanding achievement recognised through the Walsh Scholars of the Year and Gold Medal Awards.

This PhD offers additional opportunities for international collaboration with Queen's University Belfast and other partners, industry engagement with the Irish beef sector, and hands-on training in advanced analytical techniques for real-time meat quality assessment. Scholars will also gain experience in pilot-scale meat processing at Teagasc Ashtown and contribute to policy-relevant research on quality assurance and sustainable beef production.

Candidate Profile and Eligibility

Applicants should ideally:

- Hold a First or 2.1 Honours degree in food science, meat science, chemistry, analytical science, or a related discipline (an MSc is advantageous)
- Demonstrate experience in meat processing and/or meat quality assessment
- Have experience in laboratory-based chemical and biochemical analysis
- Be familiar with omics-based approaches (e.g. proteomics, metabolomics, lipidomics)
- Have experience with mass spectrometry-based analytical techniques (advantageous but not essential)
- Demonstrate strong data handling, statistical analysis, and interpretation skills
- Possess excellent written and verbal communication skills and the ability to work effectively in a multidisciplinary research team
- Meet QUB postgraduate entry requirements, including English language requirements where applicable
- [QUB English Language Requirements](#)

Funding Details

This is a fully funded four-year PhD funded by Teagasc, including:

- €25,000 annual stipend
- University fees covered up to €6,000 per annum

How to Apply

Applicants should complete the [online application form](#) by **5:00pm on Wednesday, 18 March 2026**.

Applications must include a curriculum vitae and a 1–2 page statement of motivation submitted as part of the online application.

Interviews

Shortlisted candidates will be invited to interview in early to mid-April 2026. Online interviews can be accommodated.

Further Information

Informal enquiries are welcome and may be directed to: Dr Jingjing Liu – jingjing.liu@teagasc.ie

Further information on the Walsh Scholars Programme is available at:

<https://www.teagasc.ie/about/research-innovation/the-walsh-scholars-programme/about-the-programme/>