



Advanced Analytical Methodologies for the Food Industry

Teagasc Food Research Centre,
Moorepark, Fermoy, Co. Cork.

16 November 2017

Welcome to Food Innovation Gateways: Advanced Analytical Methodologies for the Food Industry

9.30-10.00 Registration/Tea/Coffee

10.00-10.30 Welcome and Introduction.

10.30-11.00 **Iain MacLaren-Lee, Oxford Nanopore Technologies, UK**
Rapid detection and deep characterisation of microbes in food production.

11.00-11.30 **Rupasri Mandal, University of Alberta, Edmonton, Canada**
Metabolomics: applications to food science and nutrition research.

11.30-12.00 Tea/Coffee

12.00-12.30 **Kathy Ridgway, Anatune, UK**
Determination of volatiles in foods: sample preparation strategies and techniques.

12.30-13.00 **Martin Danaher, Teagasc Food Research Centre, Ashtown, Ireland**
Recent developments in the analysis of residues in milk and dairy products.

13.00-13.30 **Katrina Campbell, Queens University Belfast, Northern Ireland**
Food forensics in the 21st century.

13.30-14.30 Light lunch and viewing of exhibits.

Exhibition Stands

- 1 Residue Monitoring Service
- 2 Flavour Chemistry
- 3 Peptide Analysis
- 4 Analysis of Food-Derived Carbohydrates
- 5 Food Bioactive Characterisation
- 6 Elemental Analysis of Dairy Products
- 7 Teagasc Next Generation DNA Sequencing Facility
- 8 Food Surfaces and Structure
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Stand
1

Residue Monitoring Service

Presenters: Martin Danaher, Mary Moloney, Deirdre Haren, Padraig McLoughlin and Mohammad Hossain.

Teagasc have extensive expertise in the area of residues analysis and provide analytical capabilities for the detection of nearly two hundred residues in food using our suite of analytical tests that have been validated on our site. We cover a range of ISO17025 accredited analysis for ~125 residues in different food matrices. Methods can be adapted to client needs on request. Our laboratories use a range of modern equipment, which include six tandem mass spectrometer instruments. The methods used in our laboratories are comprehensive and sensitive to meet the demands of your clients.



Stand
2

Flavour Chemistry

Presenters: Kieran Kilcawley and David Mannion

The Teagasc Food Research Programme has extensive sensory and flavour chemistry capabilities and expertise. Our flavour chemistry facilities include state-of-the-art gas chromatography detection systems with various automated discrimination techniques specifically tailored for the analysis of aromatic compounds. All research facilities and associated expertise are available to support industry in product development, characterisation of flavour/aroma, product matching and identification of off-flavours/taints from food and beverages.



Stand
3

Peptide Analysis

Presenter: Paula O'Connor

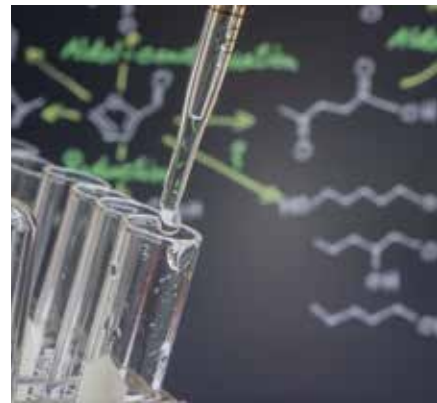
The Bioactive Peptide Discovery Unit (BPDU) at Teagasc Food Research Centre, Moorepark, is a purpose-built facility set up to purify and characterise bioactive peptides produced by micro-organisms, protein hydrolysis and fermentation. It is equipped with analytical and semi-prep HPLCs, FPLCs, a MALDI TOF mass spectrometer and peptide synthesiser. Over the last 10 years, the BPDU has amassed considerable expertise in both peptide purification and peptide synthesis. This facility can be accessed by research institutes, SMEs, national and multinational companies with an interest in purifying, identifying, analysing or synthesising bioactive peptides at research scale for food or biomedical applications.

Stand
4

Analysis of Food-Derived Carbohydrates

Presenters: Rita Hickey, Mariarosaria Marotta and Helen Slattery

Teagasc has extensive carbohydrate chemistry capabilities and expertise. The Glyco-ingredients laboratory includes state-of-the-art HPLC systems equipped with detection devices specifically tailored for the analysis of food-derived carbohydrates. These include a Dionex HPLC for detection and quantification of oligosaccharides and monosaccharides (e.g. sialic acid, fucose, mannose) and a Waters HPLC with Refractive Index detector for monosaccharide, disaccharide (e.g. glucose, galactose and lactose) and galacto-oligosaccharide (quantification of polymers in a mixture according to their degree of polymerisation) analysis. The laboratory also performs size exclusion chromatography for the detection and quantification of glycoproteins e.g. GMP, α -lactalbumin, β -lactoglobulin and lactoferrin. Glycosidase assays have been developed to assess levels of these enzymes in foods. For structural determination of unknown carbohydrates and monitoring changes in protein glycosylation, we work with our collaborators in NUIG. Teagasc also provides the research infrastructure to mine and validate carbohydrate-based bioactives from food, and can potentially provide the expertise for carbohydrate production at large scale in a commercially viable manner.

Stand
5

Food Bioactive Characterisation

Presenters: Dilip Rai, Alka Choudhary and Ramon Aznar

The analytical capabilities at the Nutraceutical Research Facility at Teagasc Ashtown provide services and expertise in the structural elucidation and quantification of bioactive compounds from marine, meat and terrestrial plant sources. Expertise in fractionation and enrichment technologies of bioactive compounds that can serve as potential functional food ingredients is also available.





Stand
6

Elemental Analysis of Dairy Products

Presenters: Bernard Corrigan and Anna Fenelon

An understanding of the role of minerals in food plays a key part in food analysis. Robust, accurate and sensitive methods are required. Advanced methods are available at Teagasc to quantify the levels of minerals in dairy products, including ICP-MS (Inductively coupled plasma mass spectrometry) and XRF (X-ray fluorescence).



Stand
7

Teagasc Next Generation DNA Sequencing Facility

Presenters: Fiona Crispie and Laura Finnegan

The Teagasc Next Generation Sequencing Facility, comprises several cutting-edge DNA sequencers based at Teagasc Food Research Centre, Moorepark. It can be used to analyse complex microbial communities in foods and other environments, to mine the gut microbiota for probiotics, and to investigate the interplay between diet (including probiotic/prebiotic supplementation) and the microbiota and health. It can also be employed for *de novo* whole genome sequencing, e.g. to demonstrate the absence of virulence genes in a novel food culture and for identifying food contaminants and their entry point into the food chain.



Stand
8

Food Surfaces and Structure

Presenters: Sean Hogan and André Brodkorb

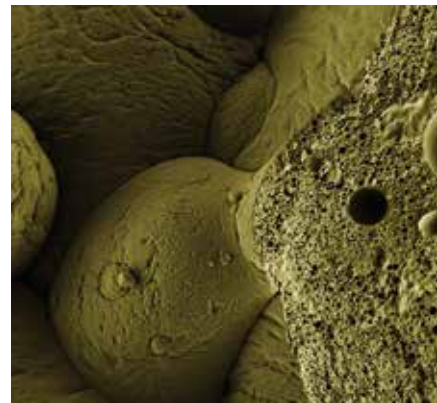
Specialised knowledge, facilities and services are available in Teagasc for the production and characterisation of food emulsions and foams using a range of advanced analytical techniques. Expertise includes the application of pendant drop tensiometry, emulsion particle size analysis and rheology to processing, storage and final product end-use. Such techniques offer state-of-the-art approaches to understanding the surface-active behaviour of food ingredients, the structures formed during their production and how these impact subsequently on food quality. Knowledge of food ingredient surface activity can be successfully applied to improve formulation, stability, trouble-shooting and product development strategies. Researchers at Teagasc are available to carry out contract or collaborative research with companies to characterise surface-active ingredients and their impacts on food product quality.

Stand
9

National Food Imaging Centre

Presenters: Mark Auty, Valentyn Maidannyk and Sharon Montgomery

Teagasc researchers provide specialist know-how, facilities and services in food nano- and micro-structure characterisation. The National Food Imaging Centre (NFIC) is a unique and powerful set of tools dedicated to the Irish agri-food sector. Researchers at the Teagasc Food Research Centre are available to perform contract or collaborative research with companies to identify and solve product quality issues and to help develop new products.



Stand
10

Sensory Food Network Ireland

Presenters: Emily Crofton, Lauren McMaster and Sinéad McCarthy

Teagasc is currently co-ordinating a national network of excellence in the area of sensory food science. This network brings together experts in all areas of sensory food science from 10 research institutions throughout the island of Ireland. The network combines all existing sensory services, expertise and capabilities in the country, and works as a sustainable unit to address documented needs/gaps by the food industry in relation to sensory science. It ensures that good practice and the highest level of service will be assured to industry. The network actively encourages and facilitates collaboration between industry and research groups. Sensory Food Network Ireland supports the food and beverage industry in new product development, product matching, flavour development and enhancing understanding of consumer behaviour within specific market segments. As well as a first class service to industry, an ultimate goal of the network is to aspire to the highest level of scientific excellence in sensory food science research.





Stand
11

Process Analytical Technologies

Presenters: Norah O'Shea and Kieran Downey

Teagasc Food Research Centre has a research program examining the use and adoption of new Process Analytical Technology (PAT), in order to maximise process efficiency in dairy processes. PAT is any strategy, method or instrument that maximises efficiency within a process and has been widely adopted in both the pharmaceutical and chemical industries. Implementation of cost-effective, retrofittable, robust and sanitary PAT tools which offer tangible gains in process efficiencies are researched in this program. PAT tools investigated include, but are not limited to, multivariate instruments that measure flow, viscosity and process composition. State-of-the-art purpose-built test skids have been fabricated for evaluation and validation of such PAT tools. PAT tools selected are robust, cost-effective solutions for real-time monitoring of the behaviour of dairy products across a number of product categories.



Stand
12

High Protein Powder Characterisation

Presenters: Noel McCarthy and Eoin Murphy

Research initiatives at Teagasc have led to a greater understanding of the impact of processing (membrane filtration, ionic environment, thermal heat treatment, concentration and dehydration) on the development of functional high protein milk powders. This knowledge can be utilised to predict viscosity and reduce fouling during powder development and to produce powders with high solubility and subsequent superior functionality. New microscopy techniques are currently being developed as part of the DairyDry project which will add to the knowledge base on the influence of processing conditions on powder morphology and behaviour during rehydration.

Stand
13

Compositional Analysis of Dairy Products

Presenters: Anne Marie McAuliffe and Sarah Cooney

The Technical Services Laboratory provides chemical testing services to clients from the dairy industry worldwide. We have recently been awarded INAB accreditation in ISO17025 for chemical testing (fat, protein and moisture/total solids) of dairy powders and liquid dairy products. The techniques employed by the Technical Services Laboratory are the gold standard in wet chemistry. Our methods are based on IDF reference methods which enables delivery of accurate and quality results in a timely manner. In addition to our accredited tests, we offer a number of other testing services including: ash, intact casein, D/L-lactic acid, non-casein nitrogen, non-protein nitrogen and amino acids. We also offer a subscription service to our weekly Milk Standards, which act as accurate reference points for creameries thereby ensuring correct payments to suppliers.



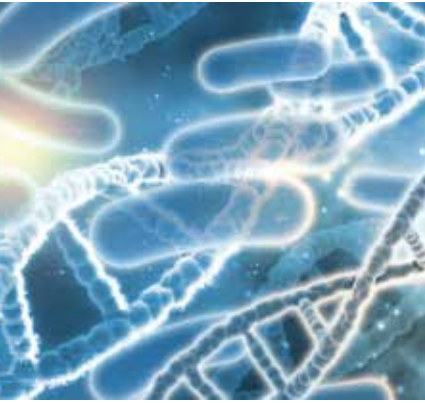
Stand
14

Food Assurance and Industry Supports

Presenters: Kevin Brennan, Gerard Barry, Ita White, and Eddie O'Neill

Food assurance is a principal driver of standards and trade in the food sector with strong promotion both on the national and international markets by state agencies. A key requirement of successful food businesses is the capacity to produce high quality and safe food products and the ability to innovate to meet consumer and market demands. Teagasc is committed to assisting the food sector by providing access to applied research knowledge, product development facilities, tailored consultancy and training programmes. Teagasc's team of highly skilled food technologists, microbiologists, chemists, trainers and consultants can work alongside food companies to develop new and innovative products and provide technical solutions to in-company problems. Teagasc (through the Food Industry Development Department) can develop and deliver continuing professional development programmes and training courses/workshops including bespoke training to assist in skills development.





Stand
15

Food Safety Capacity

Presenters: Declan Bolton and Kaye Burgess

A set of real-time PCR methods for the detection of *Clostridium estertheticum*, *Clostridium gasigenes*, *Clostridium ruminantium*, the causative agents of blown pack spoilage (BPS) in vacuum packaged beef, have been developed in Teagasc. These highly sensitive methods, (detection limit of < 10 spores), are suitable for testing both product and equipment and may be used in the early detection of contaminated beef and/or to validate sporicidal cleaning procedures for critical pieces of equipment such as the vacuum packaging machine. They are available to the Irish food industry through the Teagasc 'TBio' testing service.



Stand
16

Novel Food Processing Technologies

Presenters: Ciara McDonnell, Brijesh Tiwari, and Gonzalo Delgado-Pando

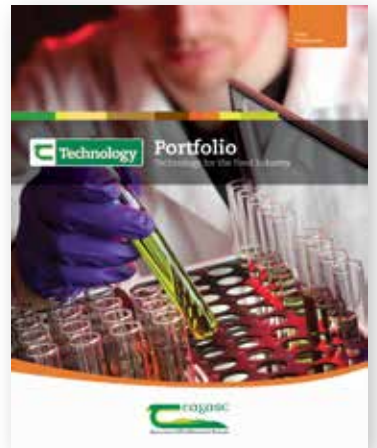
Teagasc has research capabilities for the application of novel processing technologies and analytical techniques in the meat, dairy and prepared consumer foods sectors. Research is being conducted on technologies for carcass characterisation leading to improved process efficiency. Near-infrared and hyperspectral spectroscopies are also being assessed as tools for the non-invasive prediction of eating quality. Power ultrasound has been shown to improve emulsification, homogenisation and encapsulation processes. High-pressure processing offers the potential to produce cleaner labelled healthier food products with fewer additives. In addition, plasma can be used as a surface decontamination tool, potentially leading to prepared consumer foods with an extended shelf-life. Available technologies range from lab-scale to pilot-scale and can be implemented in the development of new products or to reformulate existing products. We can provide advice on the implementation of these technologies for the accelerated and sustainable processing of healthier food products of improved quality and consistency. In addition, our laboratories are equipped to perform analysis such as texture analysis, oxidative status and nutritional values.

Stand
17

Technology Transfer Office

Presenters: Sean Mulvany, Miriam Walsh, Sarah Cahalane and Sharon Sheehan

Teagasc Technology Transfer Office (TTO) aims to be a major conduit for effective technology transfer of research outputs to end users, especially through partnering with industry and joint research and licensing opportunities. In implementation of the Teagasc technology transfer strategy, the TTO serves to facilitate and support the transfer of IP and research outputs between Teagasc and end users, with benefits of social and economic importance. For further information, or enquiries on how to partner with Teagasc research, contact techtransfer@teagasc.ie or visit www.teagasc.ie/research/collaboration/



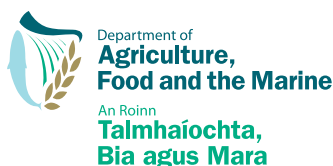
Stand
18

UCC Teagasc Alliance

Presenters: Karen McCarthy, Tom Beresford and Seamus O'Mahony

Teagasc and UCC enjoy a long history of collaboration in food science and technology which has been to the benefit of the food and related industries in Ireland, and in 2010, formalised the UCC-Teagasc Strategic Alliance in Food Research. The Alliance has increased close interaction between Teagasc and UCC, resulting in a number of highly successful partnerships and resource-sharing. Together, this collaboration enhances Ireland's reputation as a world centre for fundamental and applied research focused on excellence, innovation, development of human capital and technology transfer to industry. Joint programmes of learning which are available include the Postgraduate Certificate in Dairy Technology & Innovation, and annual workshops in Food Labelling, Waste Management and Thermal Processing (in partnership with the UCC Food Industry Training Unit).

UCC / Teagasc
Food Innovation Alliance



Additional Exhibitors

Department of Agriculture, Food and the Marine

Presenters: Ruairí Colbert and Helen Murphy

The Department of Agriculture, Food and the Marine's (DAFM) mission is to lead the sustainable development of the agri-food, forestry and marine sectors and to participate in the sustainable development of the circular bioeconomy sector. The Department, its staff and State Agencies, play a vital leadership role in providing and encouraging an environment which can deliver on this mission and on the strategic objectives set out for the agri-food sector in FoodWise 2025. The strategy is complimented by the Strategic Research Agendas for the Agri-food, Forestry and Marine sectors, namely SHARP - "Sustainable Healthy Agri Food Research Plan"; FORI - "Forest Research Ireland"; and 'HOOW - "Harvesting Our Oceans Wealth' which set out the research and innovation priorities and objectives as agreed by all relevant stakeholders.

In pursuit of this, DAFM funds collaborative, national pre-competitive type research projects across the agri-food spectrum under its three competitive research funding programmes namely FIRM, Stimulus and CoFoRD. DAFM also uses these competitive funding programmes to enable Irish researchers participate in transnationally conducted research under programmes such as European Research Area Networks (ERA-NETS), Joint Programming Initiatives (JPI's), European Joint Programmes (EJP's), and the US-Ireland R&D Partnership.

DAFM also promotes and supports participation in the Societal Challenge 2 and the Biobased Industries Joint Undertaking elements of the EU Horizon 2020 Framework Programme on research and innovation relating to agriculture, food, forestry, marine and the bioeconomy.

Enterprise Ireland

Presenter: Dorothy Timmons

Enterprise Ireland is the government organisation responsible for the development and growth of Irish enterprises in world markets. In this way, we support sustainable economic growth, regional development and secure employment. We have over 30 international locations facilitating access to more than 60 countries worldwide and all of our services are geared toward helping Irish companies build an international business. We work in partnership with Irish food entrepreneurs and food companies to help them to develop an export-led business, expand, innovate, become more competitive and develop their management capability so they are well placed to win export sales on global markets and in turn create new jobs in Ireland. Enterprise Ireland will present a number of supports available to companies to develop their business, including collaborative R&D with Teagasc and third-level institutes.



