INNOVATION THROUGH COLLABORATION

Our Science, Your Food

Portfolio of Research, Development and Innovation Services for Industry

teagasc

Agriculture and Food Development Authority

FOOD INNOVATION GATEWAYS

Foreword

I am pleased to present the new Teagasc Portfolio of Research, Development and Innovation (RD&I) Services for Industry, entitled 'Innovation through Collaboration-Our Science, Your Food'.

This Portfolio provides just a flavour of the many Teagasc technologies and expertise available to the agri-food industry (dairy, beef, pigs, poultry, cereals/tillage, artisan etc.), government policy makers, retailers, food safety bodies etc. Our state-of-the-art research facilities and pilot plants at Teagasc, Ashtown, Co. Dublin and Teagasc, Moorepark, Co. Cork, facilitate new product development, examination of the feasibility of process up-scaling, process optimisation and final product testing.

Food Wise 2025 sets out a long-term strategy for the agri-food industry, highlighting its significant contribution to the Irish economy and the continued potential for growth. The value of Irish agri-food and drink exports reached a record high of €12.6 billion in 2017, being the eighth consecutive year of growth. The Teagasc Technology Foresight 2035 strategy will be crucial in guiding the development of relevant RD&I technologies and services for industry, to meet and hopefully exceed the targets outlined in Food Wise 2025. Teagasc RD&I will help to better address the grand challenges and opportunities associated with sustainable food production for local, national and global markets. Key opportunities exist for an Irish agri-food industry that can clearly demonstrate its comparative advantage, in terms of sustainable food production supported by sound science.

The mission statement of Teagasc is to support science-based innovation in the agri-food sector and wider bioeconomy, to underpin profitability, competitiveness and sustainability. Our vision is that Teagasc will be nationally and internationally recognised as the knowledge provider of choice for Ireland's agri-food sector. Our RD&I is mission oriented and is supported by a structured programme of innovation management and technology transfer, through the Teagasc 'Food Innovation Gateways'. Food Innovation Gateways is a key component of the Teagasc Food Technology and Knowledge Transfer Strategy to support Irish food companies. Teagasc offers individual and corporate support for clients through dedicated Customer Relationship Managers and the Teagasc Technology Transfer Office.

The Teagasc Food RD&I programme offers new technologies and training required to support the Irish agri-food industry and other key stakeholders, in achieving consistent quality and guaranteed safety, allied to novel product and process innovations. Our food programme covers the full spectrum of the innovation process; from market studies through to strategic research, technology development services, new product development, shelf-life extension, up-scaled processing, product testing and analysis and dedicated training programmes. Our RD&I services are available to a range of industry clients, including multinational subsidiaries based in Ireland, international food companies based in Ireland, small and medium enterprises, the artisan industry and food entrepreneurs.

Funding support for RD&I services are available to industry from Enterprise Ireland with whom we have a close partnership. Further details are available from Teagasc Customer Relationship Managers and the Teagasc Technology Transfer Office on +353 (0)1 8059500 or email techtransfer@teagasc.ie.

Professor Gerry Boyle
Director

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Teagasc Research, Development & Innovation

Research, Development and Innovation (RD&I) are at the core of our work in Teagasc. We offer state-of-the-art scientific expertise and research services for industry, using world-class facilities and equipment. Teagasc Customer Relationship Managers support our customers, from initial discussions on services of interest, right through to the delivery of services. The team in the Teagasc Technology Transfer Office offer dedicated support to nurture and build on our engagement with industry and other partners.

Benefits of Teagasc Research, Development and Innovation to Industry

Growing investment in Research, Development and Innovation (RD&I) by industry

Research is recognised as the path to innovation and commercialisation and RD&I proactive companies have been shown to generate higher exports and sales. There is a growing requirement to build on new markets outside of Europe and a growing interest from consumers to understand more about their food. Innovation, to deliver sustainably produced food, that is nutrient-rich and with functional properties, into extended markets, will require a continued collaboration between Teagasc and industry, and a growing investment in RD&I. By collaborating with industry partners, our Scientists deliver world-class RD&I for Your Food. Teagasc RD&I delivers sustainable and strategic growth for our customers and our customers' customers.

Our Scientific Expertise

Teagasc provides specialist expertise, facilities and services in the scientific analyses of food and ingredients. Teagasc Scientists are world-leading experts in their field, with much research published in peer-reviewed high impact factor scientific journals.

Teagasc scientists are available to deliver contract or collaborative research with industry partners, with a view to exploiting novel technologies for food and food ingredients.

Our World-Class Facilities and Equipment

Teagasc has invested in modern RD&I facilities and services, to further support and strengthen Ireland's growing agri-food industry. With world-class laboratories at Ashtown, Co. Dublin and Moorepark, Co. Cork, our Technical Services Laboratory provides testing services to industry clients. Teagasc Ashtown offers a category 3 food safety facility, a pilot-scale abattoir, meat processing plant, product development plant, a sensory analysis suite and a neutraceutical facility to clients. Horticulture research is also undertaken at this location. Teagasc Moorepark and Moorepark Technology Limited offer pilot plant facilities, from laboratory to semi-commercial scale, allowing research to be performed from raw milk intake, right through to the development of high-protein liquid streams, using membrane filtration and subsequent powder production, for example. Some examples of our Facilities and Equipment are on page 40.

Our Partners

We partner with industry from many different sectors, including meat, dairy and prepared consumer foods, in supporting and underpinning food innovation at national and international level, delivering world-class scientific services and technology for industry.

Our Services

Teagasc offers a commercial service for the Dairy, Beef, Pig, Poultry, Tillage, Infant Milk Formula, Feed, Fruit and Vegetable and Artisan industries. Some services are relevant to Government Policymakers, Regulatory bodies, Exporting bodies, Retailers, the Pharmaceutical industry and Research organisations.

Your Food

This publication, entitled 'Innovation through Collaboration. Our Science, Your Food' showcases just a number of our world-class services and technologies for the agri-food industry. Teagasc, with the support of the Department of Agriculture, Food and the Marine (DAFM) and Enterprise Ireland, offers a service to industry, delivering RD&I in many areas; including food safety, shelf-life, nutrient value, residue monitoring, flavour profiling, sensory analysis (taste, odour, appearance), prepared consumer foods research, meat technologies and whey processing capabilities, to name but a few.

Further Details

For further details on each the services outlined in this publication, please contact the lead scientist in Teagasc, as outlined for each service, or email techtransfer@teagasc.ie

Support Options to Fund Research

This Portfolio of RD&I services for industry is the starting point from which industry commences engagement with Teagasc, via various innovation support channels (e.g. Innovation Partnerships and Vouchers, through Enterprise Ireland).

Innovation Vouchers and Graduation to Enterprise Ireland

Enterprise Ireland invites Innovation Voucher applications, specifically targeting small food sector companies. The objective of the Innovation Voucher initiative is to build links between Ireland's public knowledge providers and small businesses.

Enterprise Ireland's Innovation Voucher initiative can support the development of collaborations between industry and institutions with food science and technology expertise, such as Teagasc.

The €5000 vouchers are available to individual companies, to help solve specific issues. Alternatively, groups of up to ten companies may 'pool' their vouchers to work with a knowledge provider, in solving an issue of common concern.

Under the Innovation Voucher initiative, a small enterprise is defined as a company, or (if part of a group) a group of companies, where the total number of full-time employees in the company (or the entire group) is less than 50 and has either an annual turnover and/or an annual balance sheet total, not exceeding €10m.

Teagasc Food Research Centres in Ashtown, Co. Dublin and Moorepark, Co. Cork are approved knowledge providers under this initiative.

Enterprise Ireland offer other supports with Innovation Partnerships. See www.enterprise-ireland.com

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Teagasc Technology Transfer Office

The mission of the Teagasc Technology Transfer Office (TTO) is to support, facilitate and enhance the transfer and commercialisation of research outputs, including intellectual property, capabilities and related information between Teagasc and the business community and other key stakeholders. This promotes the exploitation of our RD&I, delivering significant social and economic benefits. There are many ways in which the TTO facilitates engagement with industry, including negotiation of agreements for services and contract research, to collaborations and commercialisation of intellectual property. Specific skills, capabilities, know-how and specialised infrastructure are critical in professional and quality engagement with industry and other partners. The TTO facilitates collaborations across a broad range of industry sectors, to facilitate the commercialisation of key technologies developed by Teagasc and partners.

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Our Science – At Your Service

Our Portfolio of RD&I services for industry gives a flavour of the many commercial technologies on offer from Teagasc. The services documented in this Portfolio are presented by industry type, as follows:

MULTI-SECTOR EXPERTISE

Food-derived Carbohydrates. Scientific Analysis as Functional Food Ingredients for Human Health

Dairy Meat Seafood Grains Jam Fruit & Vegetables

What are Carbohydrates?

Carbohydrates are the sugars, starches and fibres found in many foods and are the main source of energy for the body.

Why Analyse for Food-derived Carbohydrates?

Analysing for carbohydrates can facilitate the development of functional foods for industry. Some food-derived carbohydrates can have a positive impact on human health, delivering prebiotic, anti-adhesive and anti-inflammatory properties in the human gastrointestinal tract.

Our Science

A number of analytical techniques have been developed by Teagasc to measure the concentration of carbohydrates (also known as oligosaccharides) in food.

Scientific Analysis – Our Expertise

- Teagasc offers an analysis service for food Oligosaccharides and Glycoproteins
- Extraction, Enrichment, Fractionation and Structural characterisation

Who Should Avail of Our Service?

- Food Industry
- Ingredient Manufacturers
- (For all food sources)

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Functional Food ingredients in Meat, Marine and Land-based Plants for Human Health

Meat *Marine* *Land-Based*

What are Functional Foods?

Functional foods deliver additional and/or enhanced benefits over and above their basic nutritional value.

Why Analyse Food for Functional Ingredients?

Identifying the functional ingredients or bioactive components in food for human health is of growing interest to industry. Scientifically measuring and quantifying the health-promoting properties of food components is required, in order to make health claims under EU regulations.

Our Science

For food components that offer potential or have already been approved by the European Food Safety Authority for specific health-claims, Teagasc provides expertise in recovery and characterisation, which can be incorporated into functional foods. A classic example of a functional food is a dairy product fortified with plant sterols. The daily consumption of these fortified dairy products has been shown to reduce cholesterol. Natural components such as polyphenols, glucosinolates, carotenoids and beta-glucans (as extracts), can be incorporated into food products.

Scientific Analysis – Our Expertise

Teagasc offers the following analytical services for Industry:

- Polyphenols
- Glucosinolates
- Carotenoids and Polyacetylenes
- Proteins and Peptides
- Polyunsaturated Fatty Acids
- Sterols
- Polysaccharides (Beta glucans/ Chitosans)

Who Should Avail of Our Service?

- Food Growers
- Food Processors
- Ingredient Manufacturers

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Measuring Food Quality and Stability

Dairy Meat Bakery Brewing

What are Emulsions and Foams?

An **Emulsion** is a mixture of two immiscible liquids (i.e. not forming a homogeneous mixture when mixed), one of which is dispersed in the other, in the form of fine droplets. A **Foam** is mixture of two immiscible components, one of which is a gas. Examples of Emulsions and Foams include milk, butter, mayonnaise and whipped cream.

Our Science

Emulsions and foams are important in the production, stability and quality of many food products. Teagasc science has shown that emulsions and foams are inherently unstable and require a surface-active material (e.g. milk proteins, phospholipids, monoglycerides etc.) to stabilise the dispersed liquid droplets or air bubbles. The physical properties of emulsions and foams are determined by the nature of the interfacial layer (i.e. the point where two layers meet) formed at the surface of the droplets. Fundamental knowledge of formation and stability of such systems is critical to the production, textural stability and quality of a wide range of foods products.

Scientific Analysis – Our Expertise

Teagasc offers the following analytical services to industry:

- Food emulsification, foaming and wetting properties
- Particle size analysis
- Emulsion/Foam stability analysis
- Droplet surface and interfacial tension measurements
- Effect of formulation and processing on emulsion stability
- Characterisation of ingredient surface properties
- Food Imaging service for quality and stability

Who Should Avail of Our Service?

- Food Companies
- Ingredient Companies
- Academic & Research Organisations

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Teagasc National Food Imaging Centre to Analyse Food Structure

Dairy · Cheese · Yoghurt · Meat · Beverages · Confectionary · Bakery · Cereals · Spreads · Fish · Fruit & Vegetables · Infant Milk Formula

What is Food Imaging used for?

Food imaging is used to identify the structure and quality of food and to identify any foreign objects. Food structure varies enormously, ranging from homogenous liquids to complex, multiphase solid-containing fats, proteins, polysaccharides, salts and water. Food components can be in many forms, e.g. fibres, droplets, crystals and networks, to name a few. The size, shape and distribution of various structures greatly influence process ability, texture, product stability, as well as sensory properties.

Our Science

Key information about food structure can be extracted using imaging tools at the National Food Imaging Centre (NFIC). These imaging tools are tailored for research and trouble-shooting for the Irish agri-food industry.

At the NFIC, researchers use:

- Light microscopes, including high speed camera
- Confocal scanning laser microscope and Confocal RAMAN spectroscopy
- Scanning electron microscope (includes cryo-stage)
- Image analysis and 3D volume rendering

Scientific Analysis – Our Expertise

Teagasc researchers provide specialist know-how, facilities and services in food microstructure characterisation. The NFIC hosts a unique set of tools dedicated to analysing food structure. The imaging of food can be assessed in various states, e.g. frozen, heated, mixed. Imaging technology can be tailored to client's individual needs.

Who Should Avail of Our Service?

- Dairy Industry
- Infant Milk Formula Manufacturers
- Meat Industry
- Bakeries
- Artisan Food Producers
- Fruit and Vegetable Industry
- Cereal Manufacturers

Teagasc Lead Scientist

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Verocytotoxigenic *E. coli* Carriage in Beef and Dairy Cattle

Dairy Beef

What are Verocytotoxigenic *E. coli*?

Verocytotoxigenic *E. coli* (VTEC) are a group of pathogens that can cause serious human illness. They can be present in the gastrointestinal tract of ruminants, including cattle, sheep, goats and other farmed animals. VTEC can potentially be shed in animal faeces and transmitted to humans through contaminated water, contact with livestock, contaminated environments or contaminated food.

Our Science

Teagasc scientists studied verocytotoxigenic *E.coli* (serogroups O157 and O26) carriage and shedding in beef and dairy cattle and the factors which impacted on carriage and faecal shedding, including animal/host factors and the genetic characteristics of the VTEC strain.

Scientific Analysis – Our Expertise

Teagasc scientists can assist in the development of relevant management practices and policies for the food industry (meat and dairy), the Food Safety Authority of Ireland and the Department of Agriculture, Food and the Marine. This study will assist in supporting access for Irish food to key export markets.

Who Should Avail of Our Service?

- Beef Industry
- Dairy Industry
- Food Safety Authority of Ireland (FSAI)
- Department of Agriculture, Food and the Marine (DAFM)

Collaborating Institutes

- University College Dublin
- Cork County Council
- Food Safety Authority of Ireland

Teagasc Lead Scientist

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Encapsulating Natural Preservatives to Replace the use of Antibiotics in Animal Feed and to Promote Good Health in the Human Gut

Dairy *Feed* *Pharmaceutical*

What is High Amylose Corn Starch (HACS)?

Starch is a natural polysaccharide, consisting of chains of amylose and amylopectin. High Amylose Corn Starch (HACS) contains more amylose, which makes it harder to digest in the human small intestine. Instead, it is broken down by bacteria in the large intestine and it may offer health benefits, such as limiting spikes in blood sugar levels and also in lowering cholesterol. Use of food grade HACS can deliver beneficial biologically active compounds to the human colon. The ingestion of HACS can also have a positive impact on beneficial bacteria in the lower stomach of humans.

What is Nisin and how can it be used to Promote Gut Health in Humans?

Nisin is a natural preservative, used in various foods (e.g. meat products, dairy products, canned seafood, drinks, eggs, condiments, wine making, baked goods and convenience foods), to increase shelf-life and inhibit the growth of bacteria.

Use of Nisin to Promote Good Gut Health and Replace Antibiotics in Animal Feed

Nisin has been suggested as a possible therapeutic (i.e. to treat or cure disease), controlling harmful bacteria in the human gut. It has also been suggested as a novel ingredient to replace the use of antibiotics in animal feed. The ability of encapsulated Nisin to remain biologically active in the animal's gut, broadens its appeal for human and animal health.

Our Science

A novel process to encapsulate Nisin was developed by Teagasc, using HACS. Research demonstrated that biologically active Nisin reached the colon (lower intestine) of animal models and had a positive impact on gut bacteria.

Scientific Analysis – Our Expertise

Teagasc offers a service whereby the food matrix created using HACS could be used to deliver food grade bioactives (e.g. Nisin) to improve gut function.

Who Should Avail of Our Service?

- Feed Industry
- Dairy Industry
- Food Manufacturers
- Pharmaceutical Industry

Collaborating Institutes

- University College Cork
- University of Limerick

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Producing Safe, High-Quality Ready Meals and Prepared Foods with an Extended Shelf-life, using Novel High Pressure Thermal Processing

Ready Made Meals *Policymakers*

What is High Pressure Thermal Processing (HPTP)?

High Pressure Thermal Processing (HPTP) is an emerging technology, involving the use of high pressure, at temperatures of 90–130°C, which can inactivate spores. HPTP offers potential for use in commercial food processing, delivering safe, high-quality food, with an extended shelf-life.

Our Science

Bacterial spores (*Bacillus* and *Clostridium*) are common contaminants of food, which can cause food spoilage or foodborne illness. Teagasc scientists compared HPTP (pressure and thermal treatment combined) with traditional thermal processing techniques (thermal treatment only), to inactivate *Bacillus* and *Clostridium* spores in four different ready meals. The results showed that HPTP was more effective in reducing spores and in a much shorter processing time, than thermal processing alone.

Scientific Analysis – Our Expertise

This study by Teagasc provides data to support the application of high pressure thermal treatments.

Who Should Avail of Our Service?

- Prepared Consumer Foods Industry
- Regulators
- Policymakers

Collaborating Institutes

Centro Nacional de Tecnología y Seguridad Alimentaria (CNTA), Spain

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Identifying Novel Bioactive Peptides in Meat and Dairy Through the Application of Novel Technology

Milk Meat

What are Bioactive Peptides?

Bioactive peptides are low molecular weight protein fragments, that exhibit beneficial physiological effects *in vivo*. The generation of bioactive peptides during the manufacture of fermented foods is well documented. The analysis of these peptides is difficult, due to the complex nature of food and the requirement for specialised instruments for analysis.

Our Science

Methodology and systems were developed by Teagasc researchers, for the analysis of bioactive peptides in different animal species, using sophisticated technology called Quadrupole Time of Flight Mass Spectrometry, combined with Nano-Liquid Chromatography. A facility to deliver this analysis and expertise from Teagasc scientists is now available to support the food industry and to facilitate collaborative research projects. This novel technology was successfully applied to identify and characterise a range of bioactive peptides in meat.

Scientific Analysis – Our Expertise

Teagasc offers facilities and scientific expertise to industry for the analysis of bioactive peptides in foods, such as meat and milk. This technology can be utilised by the food industry to identify new bioactive compounds, supporting new product development.

Who Should Avail of Our Service?

- Dairy Industry
- Meat Industry
- Nutraceutical Industry

Collaborating Institutes

Cork Institute of Technology

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Irish-grown Cereals as Functional Ingredients for the Cereal and Bakery Industry

Cereals | Biscuits & Snacks | Artisan | Millers | Bakery

Why Focus on Irish Cereals?

Oats and barley contain significant levels of soluble fibre (beta glucan), phenolics and essential amino acids. However, their use is predominantly limited to livestock feed and minor food applications. The NutriCerealIreland project focussed on milling Irish-grown varieties of oats and barley and studying the potential of the milled fractions as novel functional (health-promoting) ingredients in new bakery and snack formulations.

How Does this Benefit the Food Industry and the Consumer?

Interest in healthy foods and food innovation continues to grow in the food industry and also with the consumer. Through science-based innovation, the NutriCerealIreland team at Teagasc focussed on researching new, innovative and healthy cereal-based ingredients and food products from Irish-grown cereals, targeting new market opportunities, such as functional foods and health-enhanced processed foods.

Our Science

Irish oat and barley varieties were milled at Teagasc, and new potential food-based applications for the resulting wholegrain and milled fractions were assessed in novel bakery and snack formulations.

A bread formulation containing wholegrain barley, a biscuit formulation containing milled oat fractions, a cracker product containing milled barley fractions and an extruded/puffed snack containing a blend of corn and barley were formulated and assessed.

Ingredient interactions, nutritive value, chemical composition and structural properties of the new products were characterised.

This research demonstrated that Irish oat and barley varieties offer potential for the manufacture of bread, biscuits and snack-type products, with functional properties.

Scientific Analysis – Our Expertise

Teagasc scientists have developed a comprehensive bakery research programme, of significant relevance to industry. Teagasc offers expertise in the science of baked products, particularly in the areas of dough rheology, texture profiling, imaging, sensory analysis and flavour profiling.

Who Should Avail of Our Service?

- Cereal Manufacturers
- Milling Industry
- Bakeries
- Biscuit and Snack Manufacturers
- Food Manufacturers
- Food Ingredients Industry

Collaborating Institutes

- University College Cork
- University College Dublin

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DAIRY EXPERTISE

Chemical Analysis for High Quality Milk and Dairy Ingredients

Dairy/Milk *Infant Milk Formula*

Why Analyse Milk and Dairy ingredients?

Dairy processers require an accurate and reliable analysis of nutrient content to deliver high quality dairy products and ingredients for consumers.

Our Science

Teagasc's Technical Services Laboratory offers an award-winning chemical testing service (e.g. INAB Accreditation to ISO17025) to the dairy industry across the world, using techniques to analyse components, such as fat, protein, moisture, ash, mineral and amino acid composition based on International Dairy Federation reference methods.

Our Subscription Service for Co-ops

Teagasc offers a subscription service to weekly Milk Standards, acting as an accurate reference point for Co-ops to ensure correct payments to suppliers. Milk Standards are vials of milk, with an accompanying certificate, stating the fat, protein, lactose and total solids composition of the milk. These standards are then used as control samples, to ensure instruments are reading correctly.

Scientific Analysis – Our Expertise

Teagasc offers an analytical service for: ash, casein, D/L-Lactic acid, non-casein nitrogen, non-protein nitrogen, amino acids, fat, protein, moisture and total solids, minerals, free-Fat content of dairy powders

Who Should Avail of Our Service?

- Dairy Industry
- Infant Milk Formula Manufacturers

Teagasc Lead Scientists

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Mineral Analysis of Dairy

Dairy/Milk | Infant Milk Formula | Casein & Whey powders | Cheese

What are Minerals?

Minerals are required by the body in small amounts for the formation of bones and teeth, as essential constituents of body fluids and tissues and as components of enzyme systems and for normal nerve function. Minerals are often absorbed more efficiently by the body if supplied via a food matrix, as opposed to supplements.

Why Analyse Dairy Products for Minerals?

Milk and dairy products are important sources of dietary minerals for human health.

The mineral content of dairy can affect the properties of food, e.g. aggregation and heat stability, particularly for infant milk formula. For example, if the mineral profile of constituents in infant milk formula is incorrect, or its heat stability is poor, this can clog up the processing plant upon heating. This would result in lost product, an increased production time and significant cleaning would be required, all of which would result in lost revenue.

Measuring the mineral content of dairy is required to manage and support label claims, in terms of the nutrient content and toxicity. For example, insufficient mineral levels would not provide sufficient nutrition for an older person or a growing infant. Equally, excessive mineral levels in dairy could result in ill health.

Our Science

Teagasc offers a mineral analysis service for both liquid and powdered dairy samples.

Scientific Analysis – Our Expertise

Teagasc offers an analytical service for major minerals including Calcium, Magnesium, Sodium, Phosphorus, Potassium and Zinc and minor elements, including Manganese, Iron, Copper and Selenium.

Who Should Avail of Our Service?

- Dairy Industry (Milk, Cheese and Dairy Ingredients)
- Infant Milk Formula Manufacturers

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High-Protein Powder Characterisation to Optimise The Nutrient Content and Stability of Yoghurt, Beverages, Infant Milk Formula and More

Milk/Dairy

What are High-Protein Powders?

High protein powders are increasingly consumed as a nutrient-rich food. They are used in shakes, yogurts, therapeutic beverages and in infant milk formula.

Why Analyse High Protein Powders?

Rehydration of high-protein powders can be a significant challenge. Without correct hydration and complete solubility of the powder, the functionality of the protein is reduced dramatically.

Our Science

Teagasc offers a range of scientific services to optimise the nutrient content and stability of foods derived from high-protein powders.

Scientific Analysis – Our Expertise

Services and analyses offered by Teagasc include:

- Powder wettability/hydration
- Powder dispersibility
- Powder sinkability
- Powder solubility
- High protein ingredient manufacture from milk, using membrane filtration
- Protein denaturation/aggregation kinetics
- Mineral chelating interactions
- Infant milk formulation design and processing

Who Should Avail of Our Service?

- Dairy Ingredient Manufacturers
- Infant Milk Formula Manufacturers

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Maximising Efficiency and Quality in Dairy Processing, using Process Analytical Technologies (PAT)

Milk/Dairy

What are Process Analytical Technologies (PAT)?

Process Analytical Technologies (PAT) refer to any strategy, method or instrument that maximises efficiency within a process, and has been widely adopted in other industries, i.e. the pharmaceutical and chemical industries. The adoption of cost effective, retrofittable, robust and sanitary PAT tools (e.g. inline flow and composition measurements) which offer tangible gains from process efficiencies, are currently under-utilised in the Irish dairy industry. The major benefit of PAT is an improved process and product understanding, by monitoring and controlling the major steps in a dairy process.

Our Science

A range of PAT tools are available in Teagasc Moorepark. These tools can be utilised at laboratory or pilot scale, using purpose-built test skids and rigs. These PAT tools can be used to measure inline process parameters of test formulations (e.g. viscosity, temperature, pressure, density). The incorporation of such PAT tools into a commercial-scale process reduces waste, whilst allowing greater control and monitoring of a process e.g. better control of dairy concentrates, resulting in process efficiencies.

Scientific Analysis – Our Expertise

Teagasc offers the following commercial services to industry:

- Evaluation and validation of PAT processing parameters, i.e. viscosity and flow of dairy concentrates, pressure
- Rheological testing of dairy concentrate
- Testing heat-induced protein structural changes e.g. gelling properties of high protein ingredients

Who Should Avail of Our Service?

- Dairy Industry
- Food Industry
- Ingredient Manufacturers
- Infant Milk Formula Manufacturers

Collaborating Institutes

University College Dublin

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Optimising the Nutrient Content of Infant Milk Formula using Functional Ingredients

Infant Milk Formula

What are Functional Ingredients?

Functional ingredients in foods deliver additional and/or enhanced benefits, over and above their basic nutritional value.

Why Optimise the Nutrient Content of Infant Milk Formula with Functional Ingredients?

Identifying and optimising the functional ingredients in food for human health is of growing interest to industry. It is important to understand how early infant nutrition influences the development of a healthy gut in babies. Optimising the composition of infant milk formula with functional ingredients, e.g. probiotics and prebiotics, may programme the bacteria in the babies' gut in a manner that is closer to human breast milk. This will help to optimise the babies' immune system, protecting he/she from disease and illness.

Our Science

Teagasc science has demonstrated that the method of delivery of babies and gestation period can have an impact on the bacteria in the gut, therefore influencing the immune system. Bacteria have been identified and isolated to optimise the nutrient content of infant milk formula, to promote good health.

Scientific Analysis – Our Expertise

Teagasc Researchers provide new opportunities for optimization of infant milk formula composition, with appropriate new bioactive ingredients such as milk fractions, probiotics to effectively programme the early infant gut microbiota in a manner closer to mother's milk."

Who Should Avail of Our Service?

- Food Manufacturers
- Dairy Industry
- Pharmaceutical Industry
- Research Communities
- Public Health Agencies
- Health Professionals
- Policymakers

Collaborating Institutes

- APC Microbiome Institute, University College Cork
- Cork University Maternity Hospital

Teagasc Lead Scientist

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New Method to Quantify Free Fatty Acid levels in Dairy products

Milk/Dairy Laboratories

Why Analyse Dairy Products for Free Fatty Acids?

There is an increasing interest in Free Fatty Acids levels in dairy products, due to their associated health benefits, flavour potential, impact on texture, antimicrobial activity and for legislative purposes.

Our Science

Teagasc Scientists have international expertise in quantifying Free Fatty Acid levels in dairy products.

Scientific Analysis – Our Expertise

Teagasc Gas Chromatography analysis is suitable for wide range of dairy products; including milk, cheese, butter, whey, ice cream, yoghurt, cheese powder, enzyme-modified cheese, butter powder, infant milk formula and processed cheese.

Who Should Avail of Our Service?

- Dairy Industry
- Technical Service Laboratories
- Infant Milk Formula Manufacturers

Collaborating Institutes

Cork Institute of Technology

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Supplementing Infant Milk Formula with Oligosaccharides that More Closely Mimics Human Breast Milk

Milk/Dairy *Marine* *Medical Food Manufacturers*

What are Human Milk Oligosaccharides?

Human Milk Oligosaccharides (HMO) are unique to human breast milk, despite not being digestible by human infants. HMO function as a prebiotic, helping the infant to establish important gut bacteria. These oligosaccharides (sugars) have many important functions, e.g. they can act as binding sites for pathogens and toxins, thereby removing them safely from the infant gut and they are also thought to impact on brain development and can influence immunity.

Why are Human Milk Oligosaccharides Important for Infant Milk Formula?

Breast-feeding is not always possible, and some consumers require infant milk formula which aims to mimic human breast milk. Supplementing infant milk formula with synthetic HMO has been considered an important way to improve infant nutrition. Infant nutrition companies are interested in adding HMO to their infant milk formula. However, a key obstacle is that the large amounts of HMO required for this are unavailable.

Our Science

Teagasc research focused on alternative sources and methods of producing beneficial HMO, using marine bacteria. The high purity and low-cost of HMO generated from marine bacteria could make their use possible in new fields, such as the food or pharmaceutical industries.

Scientific Analysis – Our Expertise

Teagasc offers a service that screens marine bacteria for proteins to produce HMO.

Who Should Avail of Our Service?

- Infant Milk Formula Manufacturers
- Dairy Processors
- Dairy Exporters
- Marine Industry
- Functional and Medical Food Manufacturers

Collaborating Institutes

National University of Ireland, Galway

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Extracting Novel Proteins from Whey to Produce Functional Foods with Health Benefits

Milk/Dairy | Cheese | Medical Food Manufacturers | Infant Formula

What is a Functional Food?

Functional foods deliver additional and/or enhanced benefits over and above their basic nutritional value.

Why Analyse Food for Functional Ingredients?

Identifying the functional ingredients or bioactive components in food for human health is of growing interest to industry. Scientifically measuring and quantifying the health-promoting properties of food components is required in order to make health claims under the EU regulations.

What is the Functional Ingredient in Whey?

Glycomacropeptide (GMP) is a protein that is released in whey, during cheese-making. It is a biologically-active component and has unique functional (health-promoting) properties. The unique set of amino acids in GMP makes it a sought-after ingredient, with functional properties. New alternative uses for GMP provide a novel opportunity for the profitable utilisation of cheese whey by the dairy industry.

Our Science

In Teagasc lab-based studies, the GMP derived from whey prevented *E. coli* infection and also improved barrier function. An improved barrier function prevents the passage of harmful bacteria and their toxins. The inclusion of this bioactive protein from whey in functional foods may benefit the general population and individuals with a compromised immune system, e.g. infants and the elderly.

Scientific Analysis – Our Expertise

Teagasc has developed tissue culture-based bioassays, to establish the ability of food ingredients to prevent infection, caused by a number of pathogenic bacteria. Methods to isolate glycoproteins such as GMP from whey, are also established. These services are available to industry.

Who Should Avail of Our Service?

- Infant Milk Formula Manufacturers
- Cheese Industry
- Dairy Processors
- Dairy Exporters
- Functional and Medical Food Manufacturers

Collaborating Institutes

National University of Ireland, Galway

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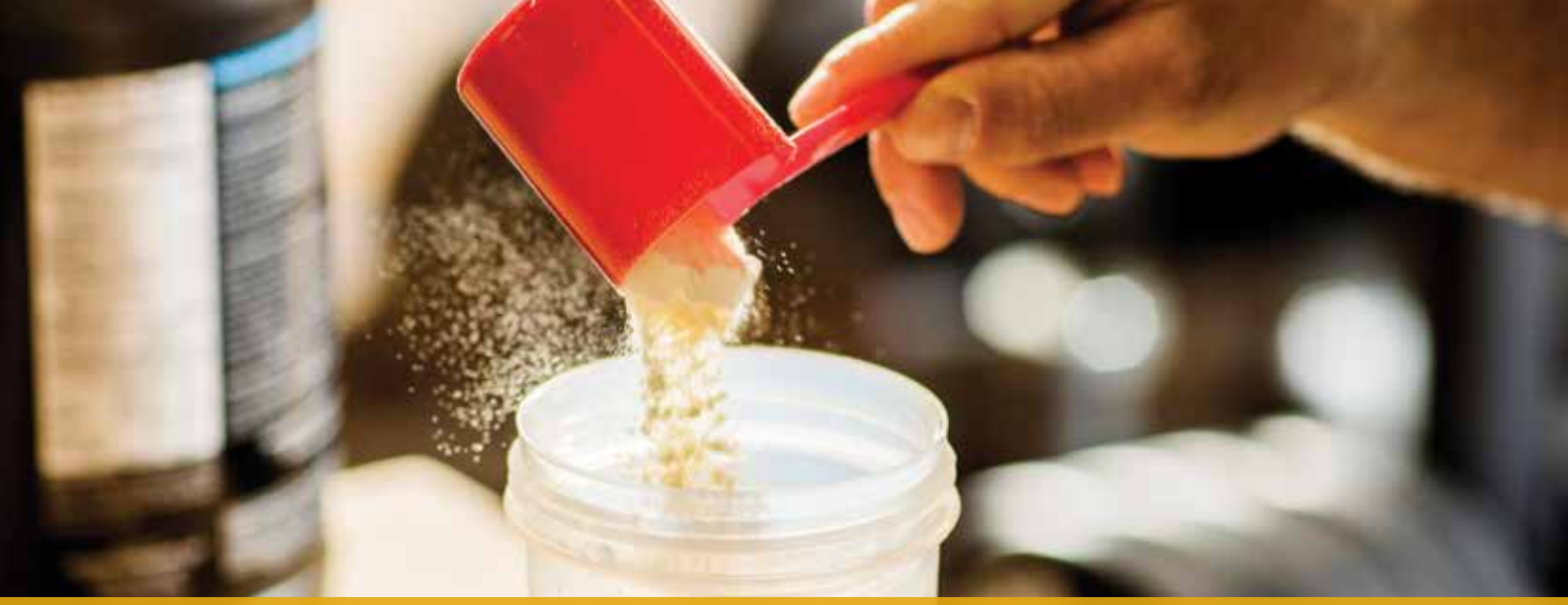

Casting Light on the Aggregation and Gelation Characteristics of High Protein Dairy Ingredient Powders

Milk/Dairy

Why Analyse the Aggregation Behaviour of Dairy Ingredients?

The aggregation behaviour of proteins describes their tendency to self-interact to form assembles or aggregates or to interact with water. The aggregation behaviour of protein affects its functionalities (e.g. its capacity to bind water, impart viscosity, emulsify, gel) and, hence, the texture, stability, and applications of the food matrix in which it is included as an ingredient. Understanding the basis of aggregation behaviour and how it can be manipulated, provides an effective approach to the design of dairy ingredients that are ideally suited to specific food formulation applications.

Why are High-Protein Dairy Powder Ingredients Important?

High-protein dairy powders may be defined arbitrarily as powders containing a protein content of 35–85%. They include products such milk protein concentrates, phosphocaseins/ micellar caseins, rennet-casein, caseinates and skim milk powders. They are used ubiquitously in formulated foods (e.g. protein bars, ice cream, imitation cheeses, dairy spreads, coffee whitener, bakery, cooked meat products and mayonnaise) and dairy-based beverages (e.g. UHT beverages, infant milk formula, high protein beverages, cream liqueurs) where they confer nutritional value and techno-functionality.

Our Science

Teagasc studies showed that key factors influencing the aggregation behaviour of dairy ingredients include: temperature treatment of skim milk, pH during heat treatment, degree of mineralisation and the solvent used for reconstitution.

This research provides new insights into the manipulation of dairy protein ingredient functionality, by altering the conditions during ingredient manufacture and reconstitution.

Scientific Analysis – Our Expertise

Teagasc offers an expert service in ingredient manufacture, as follows:

- In-depth scientific understanding of the factors affecting dairy ingredient composition and functionality
- Quantification of ingredient characteristics-including composition, physicochemical and functional properties
- Capability to undertake pilot-scale manufacture of skim milk powders, micellar caseins and milk protein concentrates.

Who Should Avail of Our Service?

- Dairy Ingredient Manufacturers
- Food Formulators

Collaborating Institutes

University College Cork

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Enhancing the Quality of Reduced-Fat and Reduced-Salt Mozzarella Cheese

Cheese

Why produce High-Quality, Reduced Fat and Reduced Salt Mozzarella?

Improving the quality of reduced-fat, reduced-salt Mozzarella cheese offers greater choice to consumers, in terms of managing dietary intake of fat and salt, whilst enjoying Mozzarella cheese in various foods, e.g. pizza.

Our Science

Teagasc science demonstrated that reducing the fat content of Mozzarella from 22 to 11%, resulted in a significant deterioration in cheese quality. This was mainly due to excessive firmness and chewiness of the cheese, its poor meltability, the limited release of free-oil during cooking and the absence of a typical 'cheesy' flavour. Reducing salt content had relatively minor effects compared to those associated with fat reduction. The adverse effects of reducing fat and salt were counteracted to a large extent, by reducing the calcium content from 30 to 18mg/g and adding Enzyme-Modified-Cheese (EMC) flavour to the hot plasticised cheese curd at levels of 0–2.5%, prior to moulding.

Scientific Analysis – Our Expertise

Teagasc expertise offered in pizza cheese; including reduced-fat, reduced-salt Mozzarella, includes:

- Scientific understanding of factors affecting the quality of Mozzarella and how to influence quality and shelf-life.
- Quantification of product quality characteristics.
- Pilot-scale manufacturing facility, with four cheese vats (480l each).

Who Should Avail of Our Service?

Cheese Manufacturers, particularly those specialising in the pizza market/ reduced-fat cheese/ reduced-salt cheese

Collaborating Institutes

University of Limerick

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Improving the Safety of Milk and Infant Milk Formula via Monitoring Endocrine Disruptors

Milk/Dairy *Infant Milk Formula*

What is an Endocrine Disruptor?

Endocrine (hormone) disruptors are chemicals that can interfere with the endocrine system at certain doses. These disruptions can result in urogenital tract abnormalities, reduced reproductive function, infertility, or even cancer. Any system in the body that is controlled by hormones can be derailed by hormone disruptors.

Why Examine Milk for Endocrine Disruptor Agents?

Endocrine Disruptor Agents (EDA) are comprised of both naturally-occurring and synthetic chemicals. Some of these chemicals can transfer into milk, via environmental contamination, feed contamination, leaching from milking machine components, cleaning agents or during processing.

Our Science

Teagasc research has shown that endocrine disruptors can be successfully detected in milk and infant milk formula, using two validated procedures, as follows:

1) Receptor Assay
2) Chemical analysis, using Liquid Chromatography, coupled with Mass Spectrometry

Using these two technologies, low levels of EDA were detected in milk samples, but further work is required to identify the source of residues.

End-users can adopt this technology to screen for endocrine disrupting chemicals in milk and infant milk formula and can be confident that they are safe for consumption.

Scientific Analysis – Our Expertise

Teagasc technology is available to industry, as a tool to monitor and manage the safety of milk and infant milk formula.

Who Should Avail of Our Service?

- Dairy Industry
- Ingredient Manufacturers
- Infant Milk Formula Manufacturers

Collaborating Institutes

Queen's University Belfast

Teagasc Lead Scientist

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Cheese Structure, Chemistry and Microbial Activity and Their Impact on Cheese Quality, Flavour, Product Choice and Innovation

Cheese

Why is Cheese Structure Important?

Cheese is a highly complex dynamic matrix, made from a constantly changing raw material and destined for international markets, where the consumer demands consistency, quality and innovation. New analytical technologies from diverse scientific disciplines including Microscopy and Flow Cytometry were adopted, to gain a new understanding into how cheese manufacture can influence cheese microstructure, chemistry, the location of bacteria, and their interaction during ripening. This is with a view to optimising cheese consistency and innovation for the future.

Our Science

Advanced microscopic methods were applied to determine the precise location of individual chemical components in cheese and to help determine their spatial organisation within the cheese matrix.

Research showed that salting had a greater influence on bacterial growth and enzymatic activity during the ripening of cheeses produced with *Streptococcus thermophilus* and *Lactobacillus helveticus* bacteria, than the varying temperatures utilised during manufacture of the cheese curd.

Localised areas of higher salt content within cheese matrices significantly reduced the viability of a *Lactobacillus helveticus* starter culture. This demands new thinking and innovation, regarding salt distribution within cheese matrices and its influence on cheese ripening and consistency.

The addition of buttermilk powder to cheese curds produced cheese with increased healthy phospholipid levels and subtle flavour differences to Cheddar, without compromising the rennet coagulation process.

Scientific Analysis – Our Expertise

Teagasc is acknowledged as a leading international cheese research provider, offering expertise in cheese innovation and in quality and consistency optimisation. These services are available to partner in both contract and collaborative projects. Teagasc also offers some specialist analytical techniques.

Who Should Avail of Our Service?

- Cheese Industry
- Dairy Processors
- Dairy Exporters
- International Cheese Research Community
- Artisan Cheese Producers

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Producing Novel Artisan Cheeses from Young Cheddar

Cheese Artisan

Why Produce Artisan Cheeses from Young Cheddar?

Small or artisan cheese makers can produce novel cheeses from young cheddar cheese. This could be in conjunction with a commercial cheddar cheese manufacturer, which could eliminate the need for investment in expensive cheese-making equipment.

Aroma and Flavour Development in Cheese

Some bacteria and yeasts establish themselves successfully on the surface of young cheddar cheese curd, producing novel surface-ripened cheeses. These cheeses can develop a range of aromas and flavours within a short ripening time. The composition of bacteria that develop on the cheese surface influences the colour, flavour and aroma.

Our Science

Teagasc can select bacteria and yeasts for specific applications, based on their genotypic flavour potential and their ability to express these activities *in situ*. Prospective strains are then evaluated in targeted fermented applications, as either single strains or in strain combinations, for augmentation of existing products or in product development.

Scientific Analysis – Our Expertise

Teagasc technology is available to produce novel cheeses, with a diverse range of flavours and aromas within a short time frame, for artisan/small cheese producers.

Who Should Avail of Our Service?

- Cheese Makers
- Farmhouse Cheese Producers
- Artisan Food Producers

Collaborating Institutes

University College Cork

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MEAT EXPERTISE

Packaging and Chilling Technologies to Optimise Meat Quality, Safety and Shelf-life

Beef Lamb

How does Packaging and Chilling Affect Meat Quality, Safety and Shelf-life?

Meat quality is important to consumers when making a purchase, and shelf-life has a direct impact on quality changes in meat. The shelf-life of meat is determined by its processing, distribution and storage conditions in both retail stores and in households. Packaging should ensure the preservation of high quality and safe food, until the best-before date indicated on each package. A rapid deterioration in meat quality is observed in improperly stored meat. This may result in sensory changes (taste, smell, appearance) that are unacceptable to consumers and may also pose safety risks, due to the impact on shelf-life. The shelf-life of different meat varies with its composition.

Meat Spoilage – Causes

The hot/warm boning of a carcase after slaughter promotes Blown Pack Spoilage (BPS). BPS can cause great losses for the meat industry. This spoilage is mainly caused by bacteria called *Clostridium* and it is characterised by a putrid odour, and the production of large volumes of gas (mainly carbon dioxide and hydrogen), which result in severe distention of the packaging. Sophisticated software can be used to accurately predict bacterial growth on beef carcasses and primary cuts (primals). This software can detect low levels of BPS on equipment and meat samples.

Our Science

This project characterised beef carcass chilling in terms of temperature, relative humidity, pH, available water and bacterial count. Significantly higher levels of bacteria were recorded on hot-boned beef, compared to beef boned out after chilling and BPS pack distension or bursting occurred considerably sooner in hot-boned beef. The beef sector should carefully review these findings, before considering using hot-boning as an alternative to the current practice of chilling the carcass before deboning.

Scientific Analysis – Our Expertise

Teagasc researchers offer an analytical service, via a PCR (Polymerase Chain Reaction)-based detection of *Clostridium* species causing BPS (i.e. *Clostridium estertheticum* and *Clostridium gasigenes*).

Who Should Avail of Our Service?

- Beef Farmers
- Beef Processors
- Food Safety Authority of Ireland (FSAI)
- Department of Agriculture, Food and the Marine (DAFM)
- Public Health Bodies
- Epidemiologists and Scientists interested in Beef Microbiology, Food Safety and Shelf-life

Collaborating Institutes

- University College Dublin
- University College Cork

Teagasc Lead Scientist

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High-Pressure Processing Technology to Control Pathogen Levels in Cooked Meat

Cooked Meats

What is High-Pressure Processing Technology?

High-Pressure Processing Technology of food refers to the cold pasteurisation of food products that are already sealed in their final package. Such sealed food items are then introduced into a vessel and are subjected to a high level of pressure.

The Healthy Challenge for Meat Processors

Sodium chloride (salt) is widely used in cooked meats, supporting microbial preservation and meat safety. It also improves the flavour and colour of meat. However, as excessive salt consumption can have a negative impact on human health, there is a requirement to replace food preservation using salt, with other technologies. High-Pressure Processing Technology provides an opportunity to address this challenge. This technology has been adopted worldwide at industrial level, to preserve a wide variety of food products, without using heat or chemical preservatives.

Our Science

Teagasc researchers investigated the use of a salt replacer and High-Pressure Processing to retain microbial stability in cooked meats (frankfurters) with a significantly reduced level of salt. High-Pressure Processing has shown to be a useful technology to treat processed meats, providing an opportunity to develop new innovative products, without using more traditional preservatives and maintaining microbial safety and an extended shelf-life.

Scientific Analysis – Our Expertise

Teagasc works with food companies to optimise High-Pressure Processing in relation to extension of shelf-life and reduction of salt in a range of food products.

Who Should Avail of Our Service?

- Processed Meats sector
- Prepared Consumer Foods Sector
- Regulators and Policymakers

Collaborating Institutes

University College Cork

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Low-cost, High-impact Control of *Salmonella* in Pigs

Pigs | Pig Meat

What is *Salmonella*?

Salmonella are bacteria that can infect a wide range of animals, including mammals. It can cause salmonellosis in humans and is second only to *Campylobacter*, as the most common cause of food poisoning. *Salmonella* reproduces in the gut and in the faeces of pigs, but it can also be found on their skin or in manure.

Controlling Salmonella in Pig Herds

The cause of *Salmonella* in pig herds is multifactorial. Control measures must be part of an overall health strategy for the individual pig herd. *Salmonella* levels could be reduced by improving biosecurity and practicing better hygiene and management on the farm and in the abattoir.

Our Science

Teagasc researchers investigated low-cost practical solutions to optimise the control of *Salmonella* in pig herds. Such solutions included the use of: (1) Feed additives and (2) Lairage decontamination strategies.

The contaminated pen, where pigs are housed, appears to be more significant in the spread of *Salmonella*, indicating that improving management and hygiene practices within pig farms would be beneficial for the control of *Salmonella* and other infections.

Findings indicated that although the use of some feed additives reduced faecal shedding of *Salmonella*, feed additives are unlikely to be effective as the sole measure in controlling *Salmonella* levels on commercial pig farms. Good management is also essential.

Studies conducted in the abattoir showed that drying lairage pens after cleaning and disinfecting afterwards eliminated *Salmonella*.

These scientific findings are readily applicable to farmers, abattoirs and regulatory agencies and add novel insight into the field of *Salmonella* control in pigs.

Scientific Analysis – Our Expertise

Teagasc expertise is available to farmers, abattoirs, processors and regulatory bodies, in terms of developing a strategic plan to measure and manage *Salmonella* in pig production and processing.

Who Should Avail of Our Service?

- Abattoirs
- Pig Farmers
- Pig Industry
- Department of Agriculture, Food and the Marine (DAFM)
- Food Safety Authority of Ireland (FSAI)

Collaborating Institutes

University College Dublin
Waterford Institute of Technology

Teagasc Lead Scientists

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Ensuring Food Safety via a Risk Register for the Pig and Poultry Meat Sectors in Ireland

Pigs Poultry

What is a Risk Register?

A Risk Register is a tool that documents risks and the actions required to manage such risk. As risks are identified, they are logged on the register and actions are taken to respond to the risk.

Why Develop a Risk Register for Pig Meat and Poultry Meat?

The pig and poultry industries in Ireland are major employers and major exporters of pig and poultry meat. The quality and safety of this meat is of paramount importance. Due to complex value chains, there will always be potential risk from both chemical and microbiological contamination. As such, it was important to develop a Risk Register for both chemical and microbiological hazards in poultry and pig meat production.

Our Science

This research demonstrated that residue surveillance programmes carried out by government agencies and industry are a necessary deterrent to ensure food safety. Food businesses should carry out continuous self-monitoring to satisfy regulatory compliance and demonstrate due diligence to their customers. The research in this project identified a list of priority substances that should be monitored in both pork and poultry meat. In addition, sample compositing strategies were developed to reduce sample analysis costs and/or allow a more extensive sample analysis to be conducted.

This residue monitoring strategy will be of significant benefit to the pork and poultry industry because:

1) It will identify potential residue contamination problems at an early stage and thus prevent large product recalls
2) The sample compositing strategy developed from this work has the potential to reduce analytical costs and increase the volume of samples analysed at any one time

Scientific Analysis – Our Expertise

Teagasc offers a risk-based surveillance system service (Risk Register) for pig and poultry companies for food safety moitoring.

Who Should Avail of Our Service?

- Pig Slaughter Plants
- Poultry Slaughter Plants
- Food Manufacturers
- Retailers

Collaborating Institutes

- Queen's University Belfast
- University College Dublin

Teagasc Lead Scientist

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Reducing Salt in Cured and Processed Meats, whilst Optimising Food Safety, Shelf-life, Quality and Flavour

Pig Beef

Why do we Need to Reduce Sodium Levels (via salt) in the Human Diet?

Due to increased risk of disease, the World Health Organisation recommends a maximum sodium intake of 2000 mg/day. In Ireland, the average daily consumption of sodium is 3000 mg/day, with cured and processed meats accounting for almost 20% of sodium consumption.

The Role of Salt in Meat Preservation, Quality and Safety

The addition of salt to meat provides the characteristic 'salty taste' and assists with sensory acceptance. Salt also plays a pivotal role in food preservation. Salt reduction in traditional meat products has a complex effect on quality, sensory acceptance (taste, smell, appearance), stability and safety. Reducing salt in traditional processed meats will improve the nutritional profile of the meat, enhancing consumer appeal and thus market share.

Our Science

Low-salt and low-fat traditional processed meat products were developed by Teagasc researchers. These meat products will be commercially viable, in terms of food safety, quality and consumer acceptance. The specific type of meat product (back bacon rasher, streaky rasher, black pudding, corned beef, premium cooked ham, formed cooked ham, etc.) should be noted, when establishing sodium reduction targets. Meat processors could benefit from the extensive analysis available on the impact of different reduced-salt formulations on product safety, quality and shelf-life. These data will assist in developing strategies for salt reduction at commercial level.

Scientific Analysis – Our Expertise

Teagasc researchers offer a service to examine the interactive effects of ingredients and processing on product quality and technological performance in model products.

Who Should Avail of Our Service?

- Primary Meat Processors
- Secondary Meat Processors
- Consumers
- Ingredient Companies
- Retailers
- Regulatory Bodies
- Food Safety Authority of Ireland (FSAI)
- SafeFood

Collaborating Institutes

University College Cork

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FURTHER INFORMATION

Our Facilities and Equipment

All Sectors

TEST

Food-derived Carbohydrates

Facility

- Glyco-ingredients
- laboratory
- Tissue culture Laboratories

Equipment

- Chromatography: Size-exclusion, Affinity and Ion Exchange
- Dionex ICS-3000 Series system (Dionex Corporation, Sunnyvale, CA) equipped with an electrochemical detector
- Bioassays to investigate
- the bioactive properties of food-derived glycans
- Waters HPLC, with Refractive Index detector

TEST

Food Imaging to measure Food Quality, Food Safety, Shelf-life and Sensory attributes

Equipment

- Light microscopes, including high speed camera
- Confocal scanning laser microscope
- Scanning electron microscope (includes cryo-stage)
- Atomic force microscope
- Image analysis and 3D/4D immersive softwares

TEST

Functional food ingredients in Meat, Marine and Land-based Plants for human health

Equipment

- Pilot scale Rotary Evaporator
- Flash Chromatography/Preparative chromatography
- MALDI-Q-Tof Mass Spectrometer
- UPLC-TQD Mass Spectrometer
- GC-MS Mass Spectrometer

TEST

Measuring Food Quality and Stability

Facility

- Dedicated Rheology lab

Equipment

- Pendant drop Tensiometer
- 5 x TA and Anton-Paar rheometers
- Range of rheometer geometries
- TA.XT Texture analyser
- Attension Theta Pendant Drop Tensiometer

Dairy Sector

TEST

High-Protein Powder Characterisation to optimise the nutrient content and stability of Yoghurt, Beverages, Infant milk formula etc.

Facility

- Multiple evaporation and spray drying facilities

Equipment

- GEA multi-membrane pilot scale
- Y-Tron high shear mixer
- Cavitation Pump
- Microthermics Tubular Heat Exchanger
- Pilot scale Homogenizer (Niro)
- Malvern Particle Size Analyser
- Malvern Morphology unit
- Surface Tension
- Pycnometer
- Microscopy (light, confocal and scanning electron microscopy)

TEST

Mineral analysis of Dairy

Equipment

- ICP-MS analysis
- XRF and Ion chromatographic analysis
- Atomic absorption spectroscopy of cheese samples
- Classical methods e.g. Titration and Spectrophotometric methods for powders and cheese

TEST

Chemical analysis for high quality Milk and Dairy Ingredients

Equipment

- Kjeldahl digester with
- 60 place automatic distiller
- Jeol AminoTac amino acid analyser
- Bentley DairySpec FT
- Leco TGA gravimetric oven
- Thermo Spectronic Genesis 2 UV-visible spectrophotometer
- Gerhardt Soxtherm
- Protein HPLC

TEST

Maximising Efficiency and Quality in Dairy Processing via Process Analytical Technologies

Facility

- Portable purpose-built test skids with a small footprint
- Laboratory scale test rigs

Equipment

- Promass I300 (Endress + Hauser -Viscometer & Flowmeter)
- FloWave (Burkert) (multivariate flowmeter)
- Vismart (Sengenuity) – viscosity sensor

Notes

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Notes

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teagasc
Agriculture and Food Development Authority

FOOD INNOVATION GATEWAYS