Special Edition:

Assuring Food Safety & Maximising Shelf-life

Food Programme

Technology

Portfolio

Technology for the Food Industry

Agriculture and Food Development Authority

FOOD INNOVATION GATEWAYS

Technology

teagasc
Agriculture and Food Development Authority



Teagasc, as the national agriculture and food development authority, has the responsibility of supporting innovation for food companies. Our Food Technology and Knowledge Transfer Strategy describes how we will enable food companies to engage with us in various ways to support their own food innovation plans. Developing partnerships and collaborations with industry is central to our strategy.

This Portfolio of Technologies is a tool that allows us to communicate to the food industry, and wider stakeholders, details of Teagasc technology offers, emerging technology opportunities, technical services, pilot plant facilities and key contact points. It will enable the reader to understand the depth and breadth of our food research and development capabilities within the Teagasc Food Programme.

The Portfolio is to be used as a starting point (or menu) from which food companies can begin to engage with us through various innovation support channels. It will be updated regularly.

Contact details of the key Teagasc specialists are given on each page. Feel free to engage with these personnel directly and/or contact our Technology Transfer Office staff at:

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Assistant Director of Research and
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Portfolio

Technology for the Food Industry

Technology Updates

Main findings from Teagasc food research projects focusing on key technologies at various stages of development.

Technology Expertise

Concise overviews of our high specification technical equipment and pilot plant facilities.

Technology Services

Our main technical and specialist food services offered to the industry.

Technology Offers

Summaries of available technology, owned or part-owned by Teagasc, that are currently open to potential users.

Technology Profiles

Profiles of our staff detailing their expertise and highlighting the role they can play in providing solutions and/or opportunities for food companies.

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ExMET: Investigating the Impact of Exercise and/or Whey Protein Intake on the Gut Microbiome

Key External Stakeholders

Dairy industry, sports nutrition market, food and nutritional beverage manufacturers, as well as athletes and the general public.

Practical Implications for Stakeholders

With consumers increasingly focused on health and well-being, providing scientific evidence of positive health benefits from exercise and protein intake can only positively impact stakeholders.

Main Results

- Elite athletes have a more diverse gut microbiome compared to non-athlete controls
- This diversity is associated with fitness levels and/or dietary protein intake (whey protein)
- During an 8 week intervention no significant alterations to the gut microbiome or metabolome were observed
- Intervention groups taking a daily whey protein supplement had an altered virome profile. This was confirmed to be as a result of virus cross over from the whey protein.

Opportunity/Benefit

These results demonstrate that regular exercise and increased fitness levels as well as increased protein in the diet can promote gut health.

Collaborating Institutions

Teagasc, University College Cork.

How to Proceed

For further information access the full Technology Update at:
www.teagasc.ie/publications

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Systems Microbiology Applied to the Reduction and Control of Bacterial Transmission in the Powdered Infant Formula Production Environment

Key External Stakeholders

Infant formula producers; research community

Practical Implications for Stakeholders

The integration of flow cytometry and 16S sequencing data provide additional information over a single method on the different bacterial species in a processing facility.

Main Results

- In a food processing facility with different zoned areas (low, medium and high care), the greatest number of cells (regardless of their physiological state) was detected in the low care zone, followed by the medium and high care zones, but the number of viable cells per cm^2 in medium care was nearly three times greater than that detected in both low and high care zones.
- In the dry zone, plate counting under-estimated the number of viable cells, while in the medium care, a lower number of cells were detected by flow cytometry (FCM), compared to the plate count.
- Twenty out of 30 genera which were predominantly present in the low care zone were mainly associated with soil and the general environment, which included species belonging to *Pseudomonas*, *Spirosoma,* and *Sphingomonas* genera. On the other hand, those predominantly present in the wet care zone such as *Acinetobacter*, *Chryseobacterium,* and *Paucibacter* are mainly associated with water and sewage, as well as soil and other general environment sources. In contrast, the greatest number of human and milk-associated genera such as *Streptococcus*, *Lactococcus*, *Corynebacterium*, *Lactobacillus,* and *Kocuria* were found in the high care zone.
- A closer look at the number of cells of the different species of the top three genera could be used as a good indicator of the possible transition of the cells between different zones
- No pathogens were detected

Opportunity/Benefit

The results showed that the physical segregation of a production facility into different care zones has a positive impact on reducing the microbial load within the facility. However, better control measures such as stricter monitoring of staff and personal hygiene policies might be necessary to achieve a significant reduction in the human-associated microorganisms in high care.

Collaborating Institutions

Teagasc, UCD.

How to Proceed

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Technology

UPDATES

High Pressure Processing to Control Pathogens in Ready-to-Eat Traditional Cooked Meat Products with Reduced Sodium, Lower Preservatives and No Artificial Colours or Flavours

Key External Stakeholders

Processed meats and prepared consumer foods sector, regulators and policy makers

Practical Implications for Stakeholders

Sodium chloride (NaCl) is widely used in ready-to-eat (RTE) meats, where it supports microbial preservation and safety of meat products but also improves the flavour and colour. However, excessive salt consumption has linked with negative health impacts. There is a significant challenge to reduce the level of NaCl while maintaining the positive attributes it confers to meat products and there is an opportunity for High Pressure Processing (HPP) to address this challenge. The objectives of this study were to investigate the use of a salt replacer, an organic acid mixture and high pressure processing to retain microbial stability in a reformulated ready-to-eat meat product (frankfurters) with significantly reduced NaCl levels. Microbial inactivation was investigated in reformulated vacuum packed frankfurters

(1.06% NaCl, 0.94% artisalt, and 0.24% INBAC (organic acid mix), and marinated pork (marinade 20% w/w, Inbac, 3% w/w) following the use of HPP at 400, 480 or 580 MPa. HPP was shown to be a useful intervention to maintain microbial stability and safety in RTE meat products. At low HPP levels, 400 MPa, there was < 1 log reduction in *Salmonella* and *L. monoctogenes* but 580 MPa gave 4–5 log reduction in both pathogens and extended shelf-life with a multiple-hurdle benefit from the addition of organic acid.

Main Results

- In frankfurters with reduced salt (1.2% salt), and no HPP treatment, TVC had reached 10^6 CFU/g in 5 days at 4°C while the addition of an organic acid mix (INBAC) extended this to 14 days. However, when combined with a HPP treatment (580 MPa for 2 min) synergy was observed between the two hurdles with TVC not reaching 10^6 CFU/g until day 60.
- In frankfurters with reduced salt (1.2% salt), and no HPP treatment, *Enterobacteriaceae* had reached levels of 10^4 CFU/g by day 11, but in products treated with HPP (580 MPa for 2 min), no *Enterobacteriacea* were detected throughout the 60 day storage period at 4°C.
- In frankfurters with reduced salt (1.2% salt),HPP reduced *Listeria* by ~2–3 logs after treatment at 480 or 580 MPa for 2 min respectively, but the presence of INBAC gave a significant multiple hurdle effect with HPP at 480 and 580 MPa yielding reductions of 4–5 logs in the pathogen.
- In all recipes (control, low salt, low salt and INBAC) *Salmonella* was reduced by ~Log 4–5 CFU following HPP treatment at 580 MPa for 2 min.
- HPP at 480 or 580 MPa for 2 min did not reduce levels of *Clostridium* spores in any frankfurter recipe

Opportunity/Benefit

High Pressure Processing was shown to be a useful technology to treat processed meats, giving the opportunity to develop new innovative products without traditional preservatives and to maintain microbial safety and extend shelf life. A multiple hurdle effect was noted with the addition of organic acids.

Collaborating Institutions

University College Cork

How to Proceed

For further information access the full Technology Update at:
www.teagasc.ie/publications

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Development of a Bacteriophage Technology to Control *Campylobacter* in Poultry

Key External Stakeholders

Poultry farmers, poultry processors, food safety authorities, microbiologists

Practical Implications for Stakeholders

The recommendation for the application of phages in poultry is:

- Intestinal *Campylobacter* should be reduced in broilers at slaughter to decrease the contamination levels on carcasses during processing.
- Encapsulated *Campylobacter* phages should be administered orally in water 24 hours before slaughter

Main Results

- Phages are isolatable from areas where their hosts are present, ie. *Campylobacter* phages were isolated from poultry faeces and pig farm effluent.
- The phages do not seem to lyse a high percentage of *Campylobacter* strains within species and so a cocktail of phages should be used in applications to control intestinal *Campylobacter* in broilers.
- Encapsulation of phages is necessary to avoid the inactivation of phages during gut transit.
- *Campylobacter* phage genomes do not appear to harbour any virulence genes that may increase pathogenecitiy of *Campylobacter* species.

Opportunity/Benefit

This project has looked into the feasibility of using *Campylobacter* phages as biocontrol agents in poultry to ultimately improve food safety. Phages are easily isolatable from the environment and their production is cost efficient. As they are organic and biodegradable, there is little environmental impact following their use, unlike antibiotics which may persist in water and soil. As a natural and organic entity, phage use for biosanitation is acceptable to the majority of poultry consumers above other decontamination procedures as long as there is transparency (product labelling).

Collaborating Institutions

Cork Institute of Technology

How to Proceed

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Technology

UPDATES

Milk Fermentation as a Tool to Produce Foods with Health Benefits

Key External Stakeholders

Dairy industry, infant formula companies, food and nutritional beverage manufacturers who use dairy ingredients

Practical Implications for Stakeholders

There is a growing awareness among consumers that diet as part of a healthy lifestyle can significantly impact on overall health. As a consequence, there is a demand for foods which, in addition to providing basic nutrition, have the capacity to actively support enhanced health. A number of such bioactive or functional foods are available in the market and the aim of this project was to establish if fermenting milk with food grade bacteria would result in the development of new dairy foods/ingredients displaying bioactive properties. The research focus was on foods that could address metabolic syndrome and gut health.

- A number of fermented milks were identified, which demonstrated bioactivity in *in vitro* bioassay.

- All the fermentations were undertaken with food grade Generally Regarded as Safe (GRAS) bacteria using fermentation conditions that are amenable to scaling for commercial production.
- For a number of the fermented milks bioactivity was demonstrated to survive spray drying and thus would likely be suitable for development as bio-functional food ingredients.

Main Results

- A database and sample bank of over 260 milk fermentates made using Lactic Acid Bacteria (LAB) was established.
- A number of milk fermentates with potential as functional foods for weight management and promotion of a healthy gut microbiome were identified.
- Fermentation and spray-drying were scaled to Pilot Plant level, while maintaining bioactivity indicating that these fermentates could be scaled for commercial production.

Opportunity/Benefit

This project established a platform for the production of fermented milks from laboratory to pilot scale which can now be exploited by companies interested in developing dairy foods/ingredients in this area. The study identified a number of fermented milks displaying a range of bioactivities *in vitro;* with particular reference to alleviating obesity and promoting a healthy gut microbiome, which can be further investigated to confirm *in vivo* activity and be scaled for commercial production.

How to Proceed

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NutriCerealIreland: Exploring the Properties of Irish-grown Cereals as Functional Bakery Ingredients

Key External Stakeholders

Cereal/milling industry, bakeries, food manufacturers, food ingredients companies

Practical Implications for Stakeholders

This project has shown that once the correct characterisation tests are undertaken, and appropriate processing aids applied, Irish-grown barley and oat varieties can serve as feasible ingredients in novel bakery and snack formulations.

- Currently, the use of Irish-grown barley and oat varieties is predominantly limited to livestock feed and minor food applications. This project investigated the potential of these cereals as ingredients for bakery and snack food applications; also their nutritive properties, soluble fibre, phenolics and essential amino acids were studied.

- Through science-based innovation, the researchers involved in this project have shown how new, innovative and healthy cereal-based ingredients and food products, when used in conjunction with appropriate processing aids, may be developed from Irish-grown barley and oats.

Main Results

- Irish-grown oat and barley varieties, over three successive harvests were collected, milled (wholegrain and fractionated) and utilized as ingredients 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 evaluated.
- A process for beta glucan extraction was optimized, yielding a very pure form of the polysaccharide.
- A series of bioactive peptides with ACE-inhibitory activities were identified from barley proteins.

Opportunity/Benefit

End-users can exploit the outputs from this project, which include a significant amount of new information in relation to the milling, functional properties, utilization and nutritional benefits of utilizing oat and barley milled fractions, thus adding value to Irish-grown cereals.

Collaborating Institutions

University College Cork, University College Dublin.

How to Proceed

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Technology

UPDATES

Lactobacillus paracasei: Genomics, Metabolomics and Applications

Key External Stakeholders

Commercial culture suppliers, fermented dairy food producers, flavour ingredient producers, wider dairy industry and culture and flavour research communities

Practical Implications for Stakeholders

The study discovered that strains from the *Lactobacillus casei* group are diverse in terms of their metabolic potential and their ability to diversify flavour, particularly in applications such as short-aged Cheddar cheese. The cultures studied in this project are a potential resource for companies interested in flavour diversification of their product portfolio.

Main Results

- The *Lactobacillus paracasei* species is characterised by genetic and metabolic diversity, supporting their potential for variability in volatile production.
- The increase in the complexity of environment minimises the phenotypic variation observed.
- Genome sequencing confirms the high level of diversity between *L. paracasei* strains from the same niche.
- Strains have the potential for cheese flavour enhancement, especially in short ripened cheeses.

Opportunity/Benefit

An in-depth knowledge of the metabolic potential of starter strains and the key technological properties which make their application in the industry possible, such as flavour and texture can allow starter blends to be 'tailor made' to suit industry needs. This approach also allows for the potential improvement of these and other key characteristics in existing strains, strains which are at the core of the dairy industry. Applying this knowledge to starter culture development is enabling the generation of superior starters and novel products for future market expansion.

Collaborating Institutions

University College Cork, UCC

How to Proceed

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Technology

UPDATES

Whey Protein Functionality in Beverages

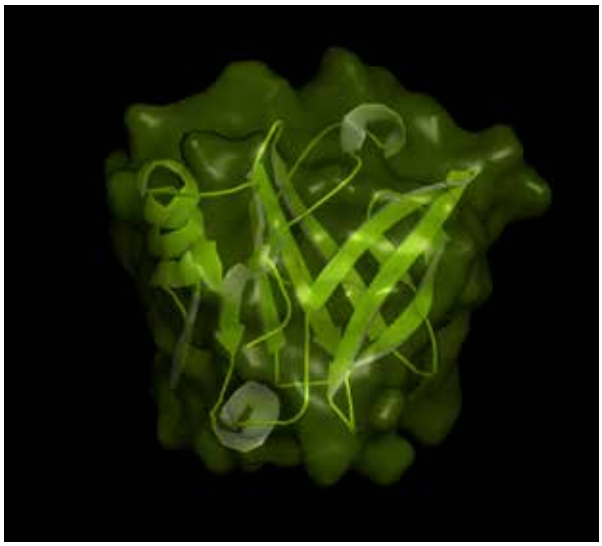
Key External Stakeholders

Dairy ingredient manufacturers, lifestyle beverage manufacturers including infant formula & sports nutrition

Practical Implications for Stakeholders

Whey proteins are increasingly used in the formulation of nutritional beverages such as infant formula and sports nutrition products due to their wide range of functionalities and high biological value. However, due to their heat sensitivity, their use can create processing and stability challenges, such as fouling on heat exchangers or phase separation and gelation, respectively.

Pre-heating whey proteins can improve the viscosity and heat stability of nutritional beverages that contain whey proteins.



Main Results

- Pre-heating whey proteins can have a profound effect on their subsequent heat stability.
- Small amounts of calcium can have a negative effect on the heat stability.
- The aggregation of whey proteins is more influential than denaturation in determining viscosity development during the heat-treatment of IMF.

Opportunity/Benefit

The primary stakeholders for this research are manufacturers of nutritional beverages containing whey proteins. The study has demonstrated that pre-heating whey proteins causes unfolding and subsequent aggregation. It is however the aggregation which is responsible for the stabilisation of the formulation containing whey proteins. It was also shown that relatively short heating times can be beneficial for stabilising the protein product.

Collaborating Institutions

University College Cork, UCC

How to Proceed

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Technology

UPDATES

Concept Protein Ingredient for Next-Generation Infant Formula

Key External Stakeholders

Dairy ingredient manufacturers, Infant formula manufacturers, dairy ingredient end-users

Practical Implications for Stakeholders

The project adopts a new approach to manufacturing infant formula by using a membrane-based integrated system to produce a new concept protein base ingredient from which a finished product can be made. This base ingredient can be used as a nutritional base to build a 1st stage infant formula from. The new process has potential benefits for the manufacturer and environment as it is less energy intensive when compared to more traditional processes.

- The objective of the work was to modify the protein composition of bovine skim milk using pilot-plant membrane filtration to produce a whey protein-dominant ingredient with a protein profile closer to human milk.

- The new process can be used to produce either a base ingredient or a finished Infant formulation. It can be implemented at commercial scale, has a low thermal load during processing, and has good reconstitution and nutritional properties.

Main Results

- Filtration was carried out at 50 or <10°C, using ceramic microfiltration (MF) membranes, followed by concentration of the permeate stream using polyethersulfone ultrafiltration (UF) membranes (10 kDa). Permeate from the cold microfiltration (<10 °C) process contained a casein:whey protein ratio of ~35:65, eniched in β-casein, with no α_s- or κ-casein present, compared to a casein:whey protein ratio of ~10:90 at 50°C.
- Processing parameters including pre-treatments, membrane operating parameters and holding times were identified, making the process ready for large scale manufacturing.

Opportunity/Benefit

The study has demonstrated the application of membrane fractionation to produce a β-casein enriched whey ingredient suitable for manufacture of infant milk formula. The concept 'protein base' ingredient, made using an integrated membrane system, allows for manufacture of infant formula directly from milk at a single location, changing the current philosophy of how infant formula is manufactured.

Collaborating Institutions

University College Cork, UCC

How to Proceed

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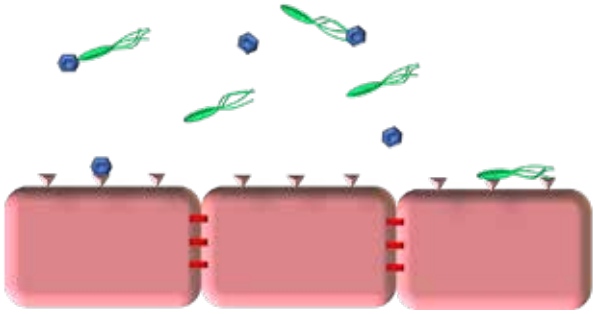
Glycomacropeptide: Potential to Reduce Infection and Improve Intestinal Cell Barrier Function

Key External Stakeholders

Infant formula companies, Cheese industry/dairy processing industry & Medical food manufacturers

Practical Implications for Stakeholders

- Developed a low-cost and reproducible bespoke genotyping platform concurrent with the associated downstream pipelines to generate the necessary DNA information for use in genomic evaluations of dairy and beef cattle.
- Developed two-step genomic evaluations used nationally in the largest cattle multi-breed genomic evaluation globally.



Main Results

- GMP significantly reduced *E. coli* (enteropathogenic and enterohemorrhagic strains) associated with human intestinal cells in a concentration dependent manner.
- GMP does not target human cell receptors but instead a direct GMP-bacterial interaction is likely responsible for the anti-infective activity.
- GMP reduced pathogen translocation and led to a decrease in trans-epithelial electrical resistance (TEER) and is therefore an effective *in vitro* inhibitor of epithelial injury caused by *E. coli*
- GMP majorly influenced intestinal expression of immune-modulatory chemokines and cytokines highlighting the potential of GMP to contribute to the development and maturation of the intestinal immune responses at the genetic level.

Opportunity/Benefit

GMP was demonstrated to prevent *E. coli* infection, improve barrier function and influence immune related gene expression *in vitro*. Hence the inclusion of this bioactive glycopeptide in functional foods may benefit the general population, as well as immuno-compromised individuals, including infants and the elderly.

Collaborating Institutions

National University of Ireland Galway.

How to Proceed

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Technology

UPDATES

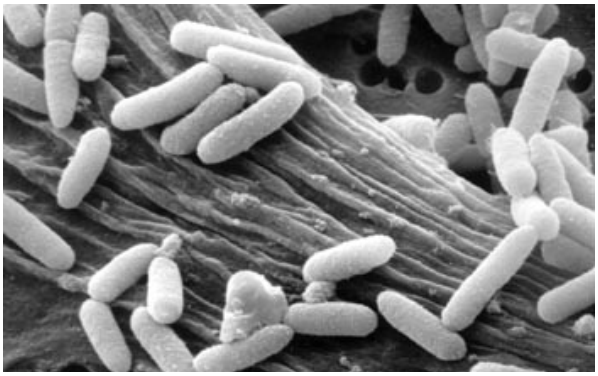
An Investigation of Verocytotoxigenic *E. coli* Supershedding in Beef and Dairy Cattle and the Factors Underpinning Human Virulence Potential and Strain Emergence as a Result of *vtx* Phage Transduction

Key External Stakeholders

Meat and dairy sector, regulators and policymakers

Practical Implications for Stakeholders

- This study showed a low prevalence of *E. coli* O157 /O26 shedding (0.5–4%) in beef and dairy cattle, but in positive animals shedding of high numbers (>10^4CFU/g faeces) of the pathogen was frequent. Some farms were persistently positive for *E. coli* O157 or O26, with both supershedding (SS) and low shedding (LS) animals detected.
- The *vtx*2 bacteriophage (24_B ::kanamycin^R) survived in water, soil, bovine faeces and slurry, albeit with reductions observed,. Under optimum temperature conditions (37°C) bacteriophage 24_B ::kanamycin^R was shown to transduce into some other *E. coli* strains at a low frequency, when the initial donor and recipient populations were both present in high concentrations.



Main Results

- In beef cattle 4.18% (55/1317) of recto-anal swab (RAJ) samples were positive for VTEC O157, and 2.13% (28/1317) were VTEC O157 supershedders (SS) (Log_{10} 4–7.7 CFU $swab^{-1}$). For VTEC O26 0.76% (10/1317) of cattle were positive and 0.23% (3/1317) were SS (Log_{10}4.1–5.8 CFU/ $swab^{-1}$). Fewer VTEC shedders and SS were noted among older animals (>37 months) and a seasonal trend was observed, with highest prevalence of shedding and SS events observed in the autumn (August to October). It was noted that some farms were persistently positive with animals being VTEC positive on repeat occasions many months apart.
- A longitudinal study on two dairy herds showed that on Farm A: 13/305 (4.3%) samples had VTEC O157 and 5 (1.6%) were positive for VTEC O26. One SS VTEC O26 (*vtx*1 and 2) was recovered. On Farm B: 7/224 (3.1%) of samples had VTEC O157 and 9 (4%) had VTEC O26. One SS VTEC O157 (*vtx*2) was detected and two SS VTEC O26 (*vtx*2). All three SS animals were only super-shedding once during the 1-year sampling period.
- The *vtx*2 bacteriophage (24B::kanamycinR) survived for the 30 days of the study in water, soil, bovine faeces and slurry, albeit with reductions observed. Under optimum temperature conditions (37°C) bacteriophage 24B::kanamycinR was shown to able to transduce into some other *E. coli* strains at a low frequency, when the concentration of the initial donor and recipient populations were both present in high concentrations.

Opportunity/Benefit

The scientific knowledge and information generated in this project is helping to direct management practices and policy for addressing VTEC by the food industry (meat and dairy), FSAI and DAFM, and is supporting export market access, including US beef markets.

Collaborating Institutions

University College Dublin, Cork County Council, Food Safety Authority of Ireland.

How to Proceed

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Targeted Low Cost Solutions for Control of *Salmonella* in Pig Production

Key External Stakeholders

Pig sector, Department of Agriculture, Food and the Marine, Food Safety Authority of Ireland

Practical Implications for Stakeholders

- Studies suggest that *Salmonella* shedding in sows is low and transmission to their progeny appears negligible. The contaminated pen environment appears to be more significant in the spread of the organism. This indicates that improving management and hygiene practices within farms would be beneficial for the control of *Salmonella* and other infections.
- Findings from studies investigating the usefulness of organic acid-based feed additives in the control of *Salmonella* in weaned and finisher pigs indicate that, although some of the additives reduced faecal shedding, feed additives are unlikely to be effective as the sole measure in controlling *Salmonella* levels on commercial pig farms. Good management including effective biosecurity and control of concurrent disease is also essential.
- Studies conducted in the abattoir showed that drying lairage pens after cleaning and disinfection with a chlorocresol-based disinfectant eliminated *Salmonella*. This is a useful finding for the industry as the role of contamination acquired in lairage in subsequent contamination of carcasses is well established.

Main Results

This project investigated a number of low cost practical solutions to control *Salmonella* carriage and transmission on Irish commercial pig farms

- *Salmonella* shedding by breeding pigs was low in all stages of the production cycle, and it appears that sows do not pose a major risk in the maintenance and transmission of *Salmonella* to their progeny. However contaminated pen environments are significant in perpetuation of the organism on farm.
- In grower pigs, a significant reduction in *Salmonella* faecal concentration was observed after supplementation with both coated sodium butyrate (Adimix®; $p = 0.001$) or a formic citric acid blend (FormaXOL™; $p < 0.001$). Average daily weight gain (ADWG) of grower pigs was significantly increased in all groups fed the supplemented feed.
- In finisher pigs, feed supplementation with Adimix®; and FormaXOL™ for 28-days prior to slaughter was effective in reducing *Salmonella* shedding and seroprevalence, but only in the absence of secondary infections.
- In the abattoir, drying lairage pens after cleaning and disinfection with a chlorocresol-based disinfectant eliminated *Salmonella*. Additionally, misting of pigs with a preoxygen disinfectant was also shown to have a beneficial role in topical treatment of pigs contaminated with *Salmonella*.
- *Salmonella* infections decrease productivity in pigs and its control, even when this costs money, can result in a cost-benefit to the farmer.

Opportunity/Benefit

The cause of *Salmonella* in pig herds is multifactorial and control measures must be part of overall health plan for the individual herd. It could be improved by enhanced biosecurity, better hygiene and management. The project results are readily applicable to farmers, abattoirs and regulatory agencies.

Collaborating Institutions

University College Dublin, Waterford Institute of Technology

How to Proceed

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Technology

UPDATES

Protecting the Health of Europeans by Improving Methods for the Detection of Pathogens in Drinking Water and Water used in Food Preparation (*Aquavalens*)

Key External Stakeholders

Water supply providers, fresh produce sector, bottled water producers, regulators and policy makers

Practical Implications for Stakeholders

- The project demonstrated the utilisation of a concentration technique which facilitates the simultaneous concentration of water samples for detection of bacterial, viral and protozoan pathogens.
- High dissolved organic content may impede the detection of bacterial pathogens by PCR based methodologies.
- In a sampling campaign undertaken in four countries no pathogens were detected in irrigation water samples or in target crops, but generic *E. coli* (not considered pathogenic to humans) were detected on a number of occasions, indicating potential contamination issues.

- Bacterial contamination arising from irrigation water can survive on edible horticultural crops for a number of weeks following the contamination event.

Main Results

- High dissolved organic content, but not turbidity, influenced the detection of bacterial pathogens by PCR.
- In a sampling campaign undertaken in Ireland, Portugal, Serbia and the United Kingdom there was no detection of the target pathogens *Salmonella, E. coli* O157, Norovirus GI or GII or Hepatitis A in any of the analysed samples but generic *E. coli* was detected on a number of occasions.
- Contamination which occurs via irrigation water can persist on the crop for a number of weeks following the contamination event.

Opportunity/Benefit

The scientific knowledge and information generated by this project will help inform the development of management practices and policy to reduce the risks associated with waterborne contamination of food crops.

Collaborating Institutions

National University of Ireland Galway; University of Belgrade, Serbia; Instituto Superior Technico, Portugal; James Hutton Institute, University of Surrey, UK; Genetic PCR Solutions, Spain; other Aquavalens consortium members

How to Proceed

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Technology

UPDATES

Low-Salt and Low-Fat Irish Traditional Meat Products

Key External Stakeholders

Primary and secondary meat processors, consumers, ingredients companies, food retailers, regulatory agencies

Practical Implications for Stakeholders

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

- Salt has an important role in meat products, as it not only provides the characteristic salty taste and helps with sensory acceptance, but it also plays a key role in preservation. Salt reduction in traditional meat products has complex effects on product quality which need to be studied, e.g. the impact on sensory acceptance and product stability properties.

- Safety and shelf-life cannot be compromised when reducing salt content; low salt and low fat traditional processed meat products developed within this project will be commercially viable in terms of safety and consumer acceptance.
- Information to help reduce sodium status of optimised traditional processed meats will improve the nutritional profile of these products, enhancing consumer appeal and thus market share to producers.

Main Results

Consumer optimised back bacon rashers with up to 50% sodium reduction were obtained using a combination of salt replacers (potassium chloride, potassium lactate and calcium chloride).

Consumer optimised cooked ham with reduced salt content (up to 1.4 g/100g) were obtained with the use of a combination of yeast extract and glycine.

The specific type of meat product (back bacon rashers, streaky rashers, black pudding, corned beef, premium cooked ham, formed cooked ham, etc.) should be taken into account when establishing sodium reduction targets, as the composition affects the quality, sensory perception and shelf-life.

Opportunity/Benefit

Irish meat processors could benefit from the reported impact of different reduced-salt formulations on product quality and shelf-life in order to develop strategies for salt reduction in commercial products.

Collaborating Institutions

University College Cork

How to Proceed

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Technology

UPDATES

The Microbiology and Shelf-Life of Cod (*Gadus morhua*) and Salmon (*Salmo salar*)

Key External Stakeholders

Seafood Processors & Bord Iascaigh Mhara (BIM)

Practical Implications for Stakeholders

Based on the data generated in this study fish processors should invest in vacuum packaging technologies to maximise shelf-life.

Main Results

- A range of different bacteria are involved in the spoilage of fish.
- Fish are at the end of shelf-life when the bacterial count reached 100,000 to 1,000,000 bacteria per square centimetre or per square gram.
- Treatment with organic acids, essential oils, or reducing the storage temperature of the fish to -2°C did not prolong the shelf-life, but vacuum packaging, especially using a high barrier film, enhanced shelf-life.

Opportunity/Benefit

Fish processors should work with Teagasc on different strategies to enhance shelf-life, thereby improving the freshness of fish available to domestic consumers and developing increased export opportunities to geographically distant markets.

Collaborating Institutions

University College Dublin

How to Proceed

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Novel Pre-Treatment Packaging Regime to Enhance the Value and Quality of Vacuum Packed Retail Cuts of Beef

Key External Stakeholders

Meat processors, retailers, policy makers

Practical Implications for Stakeholders

- A known beef exposure-time to carbon monoxide (CO) which will not mask spoilage and is safe for producers and the consumer.
- A new way to present packaged meat to the consumer that is attractive in appearance while avoiding negative aspects of MAP packaging.
- A packaging technique which is already approved in wider export markets but is currently prohibited in the EU.
- New findings to support any potential revisions to current meat packaging legislation.

Main Results

The carbon monoxide (CO) gas mixture pre-treatment time of 5 hours is of particular interest as the redness (a*) values decreased below the limit of acceptability by day 28, thus replicating the colour change that a consumer would normally expect in MAP packed meat at the end of its display life.

Opportunity/Benefit

While CO is prohibited in the EU for use in meat packaging, it is permitted in several countries worldwide. Some of these countries are established export markets for Irish beef or have the potential to become future export markets. The concern with the use of CO in beef packaging in the EU arises from fears it may mask spoilage, therefore misleading consumers. Nonetheless, it is known that the most common form of beef packaging, modified atmosphere packaging (MAP), has many disadvantages. Although vacuum and skin-packaging do not suffer from these disadvantages they can result in meat being of a darker colour than consumers expect. This project demonstrated a known quantity and exposure-time of low concentrations of CO for vacuum-packed beef whose colour would decrease prior to a shelf-life of 28 days and therefore, would not mask spoilage as indicated by colour change. If permitted, this could offer manufacturers a new form of packaging for beef which preserves meat colour of vacuum-packed meat, making it more attractive to the consumer.

Collaborating Institutions

Dublin Institute of Technology (DIT)

How to Proceed

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Technology

UPDATES

The Microbiology of Brown Crab (*Cancer pagurus*)

Key External Stakeholders

Seafood Processors and Bord Iascaigh Mhara

Practical Implications for Stakeholders

- Irish brown crab processors should continue to use high barrier films to process at 90°C for 10 minutes.
- Adding binders like sodium caseinate or potato starch increases yield and acetic acid extends microbial shelf-life.
- This new knowledge may be used to increase profits and open new, more distant, markets.

Main Results

- The shelf-life of crab meat may be extended by up to 3 days using lactic acid and more than doubled using acetic acid.
- Binders such as sodium caseinate or potato starch increase yield during processing.
- Milder processing conditions (70°C for 2 minutes) would assure the destruction of *Listeria monocytogenes* but the shelf-life would be adversely affected.
- Using a film with lower barrier properties would also reduce shelf-life.

Opportunity/Benefit

This research explored the use of different ingredients, processing conditions and packaging films to provide science-based solutions to reduce losses during processing and maximise shelf-life. The knowledge generated and expertise acquired can be used by crab processors to maximise export opportunities and profit.

Collaborating Institutions

University College Dublin

How to Proceed

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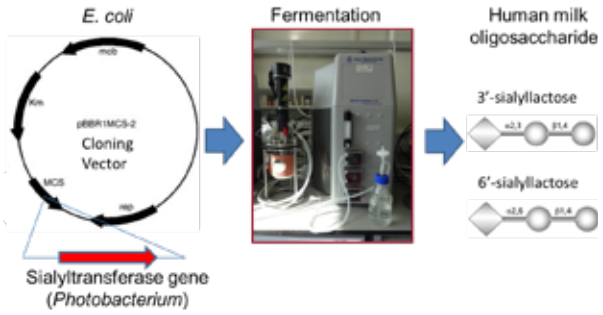
Enzymatic Generation of Sialylated Lactose from Waste Whey using Marine-Derived Sialyltransferases

Key External Stakeholders

Infant formula companies, Dairy processing industry, Irish dairy exporter organisations, Marine sector and Functional and medical food manufacturers.

Practical Implications for Stakeholders

Many biological functions have been attributed to sialylated human milk oligosaccharides (HMOs) which account for about 20% of all HMOs. These oligosaccharides can act as binding sites for specific pathogens and toxins, and are thought to play a role in brain development and regulating the immune response. However, the large amounts of HMOs which are required for clinical intervention are unavailable. Although many of these same MOs are present in bovine milk their levels are very low. This research therefore focuses on alternative sources and methods of



producing two major sialylated HMOs, 3' and 6'sialyllactose. Marine species present a valuable source of robust genes which could open the way to sequence key genes of native Irish species for novel sialyltransferases. The high purity and low cost of HMOs generated in this manner should make their use possible in new fields such as food or pharmaceutical industries.

Main Results

- Knockout strains of *Escherichia coli* were constructed using λ red recombination with the aim of generating a strain that was incapable of degrading the produced HMOs.
- Sialyltransferase genes from marine bacteria (*Photobacterium*) were selected and cloned into this *E coli* strain as well as the genes for the production of sialic acid.
- This final *E. coli* strain is capable of sialic acid synthesis from simple carbon sources and transfer of this sialic acid to lactose to produce 3'- and 6'-sialyllactose simultaneously.
- Optimised fermentation conditions were established whereby whey can act as the source of lactose for oligosaccharide production.

Opportunity/Benefit

Breast-feeding is not always possible, and therefore there is a consumer need for the availability of an infant formula, which more closely mimics that of human breast milk. Supplementing infant formula with synthetic HMO's has been considered as a way to improve infant nutrition. On a commercial level, infant nutrition companies are interested in adding HMO to their formula, however, a key obstacle is that the large quantities of purified HMO's needed for this are currently unavailable. The methods described here for the production of HMO, can be up-scaled to produce high yields of the sialylated oligosaccharides.

Collaborating Institutions

National University of Ireland Galway

How to Proceed

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Technology

UPDATES

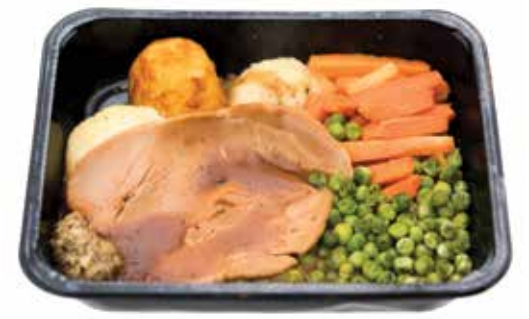
High Pressure Thermal Processing for Inactivation of *Bacillus amyloliquefaciens* and *Clostridium Sporogenes* Spores in a Range of Low Acid Commercial Prepared Foods

Key External Stakeholders

Prepared consumer foods sector, regulators and policy makers

Practical Implications for Stakeholders

Bacterial spores (*Bacillus* and *Clostridium*) are common contaminants of food products and their germination and subsequent outgrowth may cause food spoilage or foodborne illness. High Pressure Temperature Processing (HPT) is an emerging technology which involves the use of pressures in the range of 600 MPa or greater at temperatures of 90°C to 130°C and can inactivate spores. HPT thus has potential for use in commercial food processing to obtain safe high quality food products with extended shelf life. This study compared HPT with traditional thermal processing for inactivation of *B. amyloliquefaciens* and *C. sporogenes* spores in four



different prepared meals. The results showed that HPT (110 or 115°C in combination with high pressure 600 MP) reduced populations of *B. amyloliquefaciens* and *C. sporogenes* spores by 4–5 log in prepared foods in significantly shorter process times than thermal (100 or 115°C) alone. The study provides data to design process windows for application of high pressure thermal treatments.

Main Results

- Spores (10^7 CFU/g) were inoculated into four commercial low acid food products (vegetable soup, pea with ham and carrot, veal and steamed sole). Thermal treatment at 110°C showed the D value (1 log reduction at a defined temperature) for *C. sporogenes* ranged from 1.51 to 4.78 min depending on the food matrix while at the same temperature *B. amyloliquefaciens* was more resistant with D values ranging between 3.01 to 6.43 min again varying with food matrix. At 115°C for both spores the D value ranged between 0.01 min and 1.47 min.
- When HPT (high pressure, 600MPa combined with thermal 110°C) was applied to the four inoculated foods, the D value for *B. amyloliquefaciens* was significantly reduced (0.03 to 0.21 min) depending on the food matrice and further reduced with an increase in temperature to 115°C (0.004 to 0.11 min).
- When thermal treatment alone was applied, the length of heat time to achieve a 4D reduction in levels of spores in the four foods ranged from 29.6 to 64.1 min for *B. amyloliquefaciens* and 39.0 to 55.3 min for *C. sporogenes* at 110°C depending on the food matrice. When the combined high pressure thermal treatment at 600 MPA, 110°C the 4D treatment time was reduced to 0.7 to 6.8 min for *B. amyloliquefaciens* or 2.4 to 7.6 min for *C. sporogenes*.

Opportunity/Benefit

The results obtained in this study show that HPT (600 MPa at 110 or 115°C) could yield a 4 log reduction in *B. amyloliquefaciens* and *C. sporogenes* spores in significantly shorter process times than thermal alone. The study provides data that will support the design of process windows for application of HPT treatments.

Collaborating Institutions

Centro Nacional de Tecnología y Seguridad Alimentaria (CNTA)

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A Food Matrix Approach to Meat Product Development

Key external Stakeholders

Primary meat processors; Ingredients companies; SMEs; Regulatory agencies: DAFM

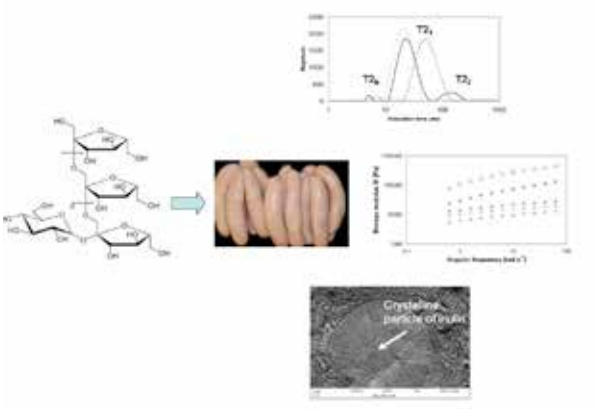
Practical Implications for Stakeholders

Processed meat products represent complex systems that can be considered as a 'matrix' of interacting components.

Increasing consumer awareness of health issues associated with high dietary intake are driving the need for change in the products available to them. Therefore, the meat industry is examining the possibilities of meat products with reduced fat salt and additives as well as meat-based functional foods as an opportunity to improve its public image and update dietary goals.

However, the removal of traditionally used ingredients with the goal of improving health and well-being, e.g. fat and salt, in processed meat products represents a significant technical challenge.

This is due to the fundamental role they play in the structure or the formation of effective gels, allowing them to function as cohesive meat products.



By improving our understanding of the impact of interactions between the food matrix and novel ingredients on technological and sensory performance, we are developing strategies to optimise healthier versions of traditional meat products such as reduced fat and salt products and products including bioactive compounds and prebiotic fibres.

Main Results

- Comminuted products (burgers, breakfast sausages, and frankfurters) formulations were optimised using consumer sensory panels and instrumental measurements with regards to salt and fat levels that represented a significant decrease in their respective contents compared to their retail counterparts (controls).
- Using advanced experimental design software, both comminuted and whole muscle products formulations containing functional ingredients, such as fibre, prebiotics, omega-3 fish oils and antioxidants were optimised.
- Detailed ultra-structural analyses better elucidated the underlying forces governing overall product quality, the knowledge of which can be used in a more systematic scientific approach to new product development.

pportunity/Benefit

A series of templates available to industry that can be used in future to predict the effects of alteration of various parameters on microstructure, molecular interactions and their relationship with product quality.

Collaborating Institutions

University College Cork

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For further information access the full Technology Update at:
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Technology

UPDATES

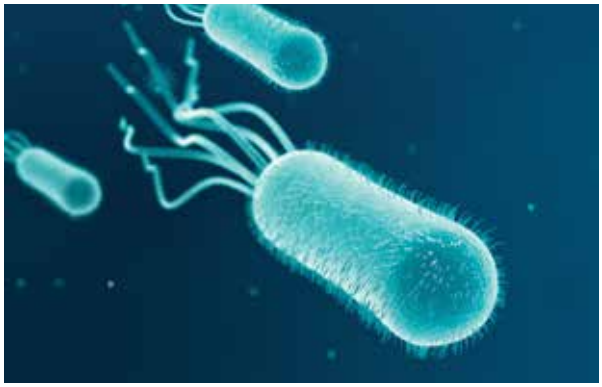
An Investigation of Verocytotoxigenic *E. coli* Super-Shedding in Beef and Dairy Cattle and the Factors Underpinning Human Virulence Potential and Strain Emergence as a Result of vtx Phage Transduction

Key External Stakeholders

Meat and dairy sector, regulators and policy makers

Practical Implications for Stakeholders

This study showed a low prevalence of *E. coli* O157 /O26 shedding (0.5–4%) in beef and dairy cattle, but in positive animals shedding of high numbers (>10^4 CFU/g faeces) of the pathogen was frequent. Some farms were persistently positive for *E. coli* O157 or O26, with both super shedding (SS) and low shedding (LS) animals detected. The study showed some possible genetic differences in strains from SS and LS animals but further analysis and phenotypic studies on SS and LS strains are required.



Main Results

In beef cattle 4.18% (55/1317) of recto-anal swab (RAJ) samples were positive for STEC O157, and 2.13% (28/1317) were STEC O157 supershedders (SS) (Log_{10} 4–7.7 CFU $swab^{-1}$). For STEC O26 0.53% (7/1317) of cattle were positive and 0.23% (2/1317) were SS (Log_{10}4.1–5.8 CFU/ $swab^{-1}$). Fewer STEC shedders and SS were noted among older animals (>37 months) and a seasonal trend was observed, with highest prevalence of shedding and SS events observed in the autumn (August to October). It was noted that some farms were persistently positive with animals being STEC positive on repeat occasions many months apart.

A longitudinal study on two dairy herds showed that on Farm A: 13/305 (4.3%) samples had VTEC O157 and 5 (1.6%) were positive for VTEC O26. One SS VTEC O26 (*vtx1* and 2) was recovered. On Farm B: 7/224 (3.1%) of samples had VTEC O157 and 9 (4%) had VTEC O26. One SS STEC O157 (*vtx2*) was detected and two SS STEC O26 (*vtx2*).

A surveillance study on 13 dairy herds recovered VTEC O157 from 4.5% animals (48/1074) and VTEC O26 from 1.2 % (13/1074). One VTEC *E. coli* O26 SS was identified. Three animals were found to be colonized with both *E. coli* O157 and O26 at the same time.

The study showed some genetic differences in SS and LS strains, with a number of genes present/ absent between these groups. Further analysis and phenotypic studies on SS and LS strains are required.

Opportunity/Benefit

The scientific knowledge and information generated in this project is helping to direct management practices and policy for addressing VTEC by food industry (meat and dairy), FSAI and DAFM, and is supporting export market access, including US beef markets.

Collaborating Institutions

University College Dublin, Cork County Council Veterinary, Food Safety Authority of Ireland

How to Proceed

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Antioxidant Status of Fully Processed Fruits, Vegetables and Their Products: Technology Optimisation to Minimise Losses

Key External Stakeholders

Vegetable processors, government authorities/ legislators, consumers, food research scientists.

Practical Implications for Stakeholders

Thermal and non-thermal processing effects on fruits and vegetables influence their antioxidant capacity.

The outcomes of the investigation are:

- Thermal processing such as *sous-vide* and post-processing storage decrease the antioxidant activity and concentration of antioxidant compound groups in fruits and vegetables.
- However the effect is not clear cut with some thermal and non thermal strategies resulting in an increase in antioxidant activity.

- In general post-processing storage at temperatures above 0°C resulted in a decrease in antioxidant levels.

Main Results

- Sous-vide processing is a promising strategy for retaining the antioxidant capacity and colour of thermally processed carrot disks.
- High hydrostatic pressure processing at ambient temperature and pressures of 400–600 MPa is an excellent food processing technology which has the potential to retain antioxidant compounds in strawberry, blackberry, tomato and carrot puree while also ensuring the foods are effectively pasteurised.
- Blast freezing and storage at -18°C is a good technique for preserving ascorbic and antioxidant activity in broccoli and greens but not carrots, provided the samples had been blanched prior to freezing.

Opportunity/Benefit

This project developed relatively novel processing techniques, sous-vide and high hydrostatic pressure processing, which are attractive options for end-users as they allow retention of antioxidants in fruits and vegetables and also aid in increasing the shelf-life of the products. Expressions of interest in this research are welcome.

Collaborating Institutions

University of Limerick

How to Proceed

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Technology

UPDATES

Bio-Actives from By-Products of Food Processing

Key External Stakeholders

Vegetable processors, government authorities/ legislators, consumers, national food research institutes.

Practical Implications for Stakeholders

Large volumes of waste are produced as a result of processing of foods. This project highlighted the potential of this waste as a source of bio-active compounds for inclusion in functional foods.

Main Results

- Fruit and vegetable by-product and waste sources in Ireland were tested for their antioxidant activity and polyphenol content. The highest levels of antioxidants measured by both ferric reducing antioxidant power (FRAP) and diphenyl-picrylhydrazyl (DPPH) assays were detected in whole kiwifruit. Of the vegetable by-products, broccoli stems showed the best antioxidant potential.
- A pressurised liquid method for the extraction of antioxidants from apple pomace utilising 60% ethanol at a temperature of 102°C was developed.
- A solid-liquid extraction method for recovering antioxidant from apple pomace was also developed utilising 56% ethanol, 80°C and 31 min.
- Chitin extraction optimisation, using different organic acids, times and temperatures, was evaluated. The optimal conditions for chitin extraction were 2M concentration, 2h steeping time 24°C temperature which resulted in 98.86% and 90.28% purity for citric acid and lactic acid, respectively, at the ratio of 1:10.
- Optimal conditions of 75% ethanol, 80°C and 22 min for the extraction of antioxidants from potato peel were determined using solid-liquid extraction. The use of pressurised liquid extraction did not enhance the extraction of antioxidants from potato peel.

Opportunity/Benefit

The potential of high volume fruit, vegetable and fish processing waste as a source of bio-active compounds has been highlighted. A number of methods for the recovery of bio-active compounds using food friendly solvents have been developed. The methodologies developed could be used as a basis for up-scaled methods to recover bio-active compounds from food waste for inclusion in functional foods.

Collaborating Institutions

Dublin Institute of Technology, National University of Ireland, Galway, Trinity College Dublin, Natures Best Ltd, Keeling Fruit Importers

How to Proceed

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BIOCONTROL: Bio-active Ingredients for the Control of Undesirable Bacteria in Ready-to-Eat Foods

Key External Stakeholders

Food manufacturers and processors.

Practical Implications for Stakeholders

In 2003, the US Food and Drug Administration issued a Final Rule which explicitly states that post-processing technologies must be included to limit the growth of *Listeria* in ready-to-eat products.

The Biocontrol project has resulted in the generation of a suite of food grade antimicrobials on which future novel anti-*Listeria* biopreservative products could be based.

- The identification of nisin derivatives with enhanced activity against Gram positive pathogens, including *Listeria*, is a major breakthrough. The fact that single amino acid changes can have such dramatic impacts is particularly noteworthy. From a commercial perspective it is significant that nisin is the only bacteriocin which has been approved as a food additive and nisin derivatives may be more likely to be approved by authorities than completely new compounds. In addition, nisin has been shown to have a number of other applications in animal and human health. Thus enhanced forms of nisin have the potential to impact on food safety, health and agriculture.

- A *Lactobacillus salivarius* strain producing an ABP118-like bacteriocin, which we designated salivaricin P, was identified. The fact that bacteriocins are produced by potentially probiotic strains is relevant to industry and consumers, since such strains could potentially be employed to control pathogens in the gut or to alter the overall gut microbial composition in a beneficial way.

Main Results

- Novel anti-*Listeria* agents were identified and developed.
- Food trials to demonstrate effectiveness were performed.
- Patented IP resulted.

Opportunity/Benefit

A patent relating to the novel nisin derivatives was filed: Publication number: WO2011076903

Collaborating Institutions

University College Cork

How to Proceed

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Technology

UPDATES

Culture Collections in Teagasc Food Research Centre Moorepark

Key External Stakeholders

Dairy Industry, food manufacturers, pharm industry, research community

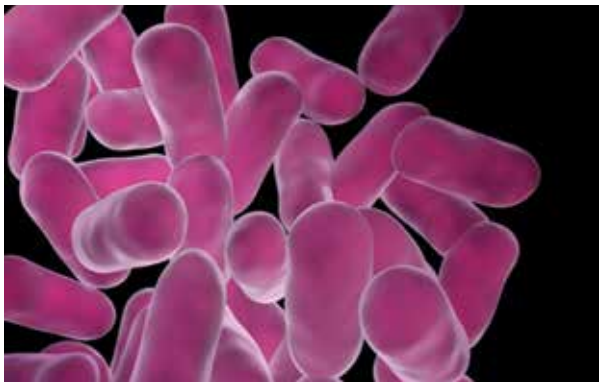
Practical Implications for Stakeholders

The culture collections in the Teagasc Food Research Centre Moorepark provide banks of bacterial cultures with potential for exploitation as dairy starters, adjunct cultures and probiotics for the Food and Pharma industries and the research community.

Main points

The main functions of the DPC and APC culture collections are:

- To provide a central repository for safe housing and cataloguing of DPC and APC Biobanks.



- To provide researchers within Teagasc and APC and interested stakeholders with accurate data regarding the potential applications, safety and quality of strains within the collections.
- To provide unambiguous traceability for IP protection and accountability.

Main Results

DPC and APC culture collections contain 7000 and 62,000 strains respectively. The DPC culture collection predominately consists of strains of lactic acid bacteria of the genera *Lactococcus*, *Lactobacillus* and *Streptococcus*. These bacteria have been isolated over many years from a variety dairy-associated sources. In addition, this collection also houses bacteria and yeasts isolated from surface ripened cheese, many food, animal and human Class 2 pathogens and also bacteriophages isolated from both dairy and environmental sources. More recently the biobank associated with the APC contains strains isolated from human intestinal samples which have potential for exploitation as probiotics for the treatment of anti-inflammatory diseases such as IBD and IBS, anti-*Clostridium difficile* probiotics and antimicrobials in addition to strains producing bioactive metabolites such as conjugated linoleic acid and exopolysaccharides.

Opportunity/Benefit

The DPC and APC culture collections are available to researchers in Teagasc Food Research Centre, researchers in the APC and companies for exploitation in the Food or Pharma or Veterinary arena.

Collaborating Institutions

University College Cork

How to Proceed

For further information access the full Technology Update at:
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Detection of Endocrine Disrupting Agents in Milk

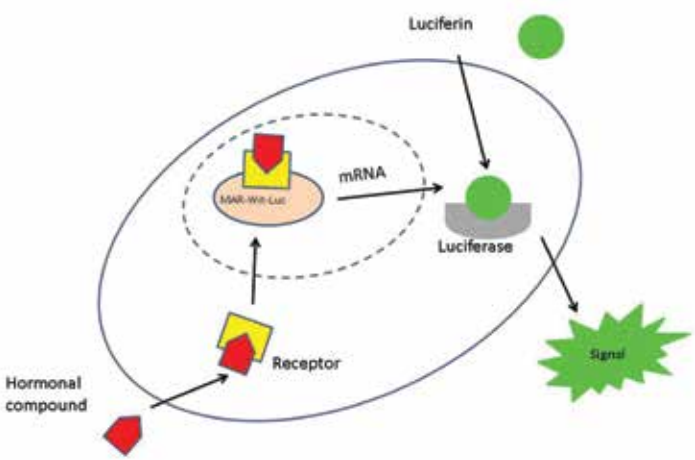
Key External Stakeholders

Dairy industry, dairy farmers, agri-businesses, policy makers

Practical Implications for Stakeholders

Endocrine disruptor agents (EDAs) comprise of both naturally occurring and synthetic chemicals. Some of these chemicals can transfer into milk due to environmental contamination, feed contamination, leaching from milking machine components, cleaning agents or processing. This research has shown that endocrine disruptors can be successfully detected in milk using receptor assays. However, chemical analysis using liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) is required to accurately measure and identify each compound. Unfortunately, a wider range of EDAs could not be detected because these are more amenable to GC-MS analysis, which was not available at the time.

Using the technology developed on this project low levels of EDAs were found in milk samples but further investigations should be carried out to identify the source of residues. More extensive methodology is required to properly investigate a wider range of phthalates, which have been detected in dairy products in other EU countries.



Reporter Gene Assay System

Main points

- The technology developed on the above project provides two validated solutions for detecting EDAs in milk.
- End-users can use the technology to screen for endocrine disrupting chemicals in milk and be confident that dairy products are safe for consumption.

Main Results

- Two new methods were developed to analyse endocrine disrupting agents in milk using an estrogenic reporter gene assay and liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS).
- The technologies were applied to a range of different types of milk and infant formula.
- A range of endocrine disruptors was detected in samples including the natural hormone progesterone and low levels antimicrobials, phytoestrogens and benzyl butyl phthalate.

Opportunity/Benefit

This technology is now available as a tool to monitor the safety of milk.

Collaborating Institutions

Queen's University Belfast

How to Proceed

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Technology

UPDATES

Developing Novel Convenient Meat Based Products by Application of High Pressure Processing (HPP)

Key External Stakeholders

Meat processors, chilled ready meal producers, state agencies.

Practical Implications for Stakeholders

The output of this research provides a broad range of data which can assist many players in the chilled meat product chain to understand the relevance of a minimal processing technology such as high pressure processing (HPP). Results also provide valuable information to assist in understanding, at a proteome level how, HPP exerts its effects on quality.

- Influence of different HPP treatment levels were observed with lower pressure (200MPa) being more appropriate than higher for meat.
- Higher pressure (600MPa) appeared to be more relevant for processing vegetables.

- Industry was positively disposed towards the availability of a HPP central treatment facility.

Main Results

- Mild pressure treatments minimally influence meat quality while improving meat hygiene.
- While high pressure levels would promote lipid oxidation, mid-range levels had no impact on fatty acid profile.
- Results suggest that increases in pressure result in increased precipitation of sarcoplasmic proteins onto myofibrils.
- Processing at 600MPa and blanching were the treatments that best preserved the antioxidant capacity of vegetables.
- The enhanced nutritional profile of the chilled ready meal concept garnered higher levels of consumer acceptance especially amongst respondents in the family life stage.
- The overall result from the 300 consumer acceptance tests, indicated that a pressure treatment of 200 MPa was most acceptable to the majority of consumers.
- Further education and technical training is warranted to increase industry awareness of HPP.

Opportunity/Benefit

This project provides valuable information for scientific and consumer audiences and provides a good starting point for further research or development by others, including industry. As a non-thermal treatment which can influence microbial safety, HPP holds potential as a minimal process technology of relevance to the production of ready-to-eat meat products which are microbiologically safe and possess superior sensory and nutritional attributes. Expressions of interest in further developing this research are welcome.

Collaborating Institutions

University College Cork

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Development of High Protein Bars as Vehicles for Functional Ingredient Delivery (PROBar)

Key External Shareholders

Dairy ingredient manufacturers, nutritional food formulators

Practical Implications for Stakeholders

- The shelf stable nature of high protein bars is largely attributable to the their controlled water activity (a_w) which creates an environment that limits the activity of spoilage microorganisms.
- Probiotic microorganisms are equally affected by such controlled a_w levels, hence this study aimed to understand how probiotic cultures such as *L. casei* may be adapted to survive when carried in a protein bar matrix. Strain adaptability was established by exposing the culture to variation in relative humidity (%RH) especially if incorporated with a prebiotic FOS/GOS mixture. Additional protection is afforded if skim milk is included in the preparation.
- Incorporation of hydrolysed protein (WPH) in bar formulations favours higher initial counts of *L. casei* (<24h) but does not sustain the initial momentum during subsequent storage at 20°C.

- Dispersal of *L. casei* in combination with a mixture of FOS-GOS and skim milk in molten chocolate prior to bar formulation provides an effective protective medium.
- Significantly better probiotics protection was afforded when co-blended with the prebiotic mixture, FOS/GOS, and dispersed in larger chocolate pieces as well as chocolate coating.

Main Results

- A high protein bar system incorporating ingredients in an experimentally-designed formulation study was used to monitor the survival added probiotic cultures.
- Advanced analysis by means of flow cell cytometry indicated that a significant proportion of the apparently 'dead' probiotics cells following storage may be capable of revival.

Opportunity/Benefit

A novel protocol by which probiotics may be added to high protein bars and their viability maintained during bar storage is outlined. Further extended storage tests are recommended in follow-up studies to validate the findings of this time-constrained project.

How to Proceed

For further information access the full Technology Update at:
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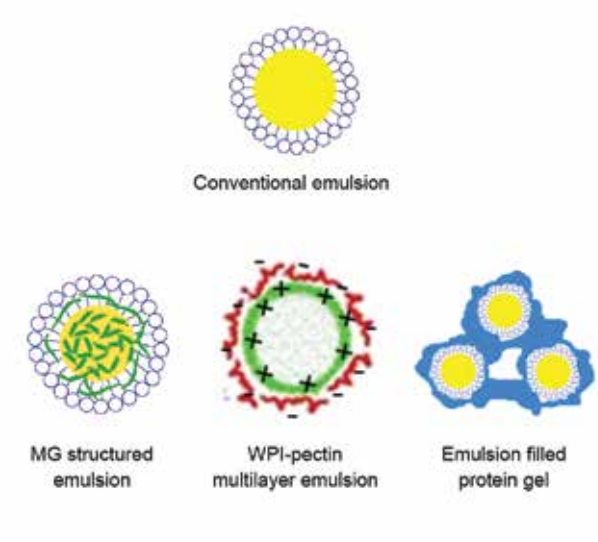
Development of Novel Food Structures Which Deliver Engineered Flavour and Health Benefits

Key External Stakeholders

Dairy and beverage industry, manufacturer of fat-reduced foods, academic and research institutes

Practical Implications for Stakeholders

The study provided important information about different structured emulsions as delivery systems for flavour compounds, and on how food structure can be designed to modulate flavour release. The findings suggested that it is possible to modulate flavor release (response to different triggers) by changing emulsion structure, which could be helpful in the development of functional foods with improved flavour profile. The emulsions studied in this research many also find applications to deliver non-volatile functional ingredients.



Main Results

- Monoglyceride formed liquid crystalline structures in the oil phase of oil-in-water emulsions, and crystalline structure worked to reduce the amount of flavour released to the headspaces.
- Headspace concentration of flavours was significantly lower in WPI-pectin multilayer emulsions than that in conventional emulsions and flavour release can be modulated by adjusting pH, salt concentration of the emulsion.
- Flavours had lower release rates and headspace concentrations in emulsion filled protein gels, and the release was more inhibited when more protein was included. Reduced flavour release in oil-reduced gels can be achieved by increasing WPI content.
- The involvement of matodextrins in the emulsions improved emulsion stability against freeze-thawing, and flavours had similar release profiles before and after freeze-thaw treatment.

Opportunity/Benefit

This research provides profound knowledge about emulsion structures and flavor release, and the designing of flavor delivery systems. Different structured emulsions with structuring of the oil phase, water phase, and interface allow better delivery of food flavors and other functional ingredients. The findings obtained in this study provided important information on designing novel food products with specific health/function claims and improved flavor profile, e.g., fat reduced food, long shelf-life foods.

Collaborating Institutions

University College Cork

How to Proceed

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Engineering of High Quality Gluten-Free Breads

Key External Stakeholders

Food manufacturers, bakeries, food ingredients companies.

Practical Implications for Stakeholders

A number of recent studies highlighted the poor nutritional quality of gluten-free cereal-based products available on the market. This project evaluated the baking and nutritive properties of the pseudocereals amaranth, quinoa and buckwheat, and their applications as functional ingredients in a gluten-free bread formulation.

The pseudocereal flours proved to be extremely viable and should play an important part in enhancing the nutritional properties of gluten-free breads. This gluten-free project has further improved the knowledge and expertise of the cereal group at Ashtown in this significant and ever-growing area. In summary:

- Pseudocereal flours are feasible ingredients in the formulation of good quality gluten-free breads.

- Pseudocereals are important energy sources, due to their starch content, and contain good quality protein, dietary fibres and lipids rich in unsaturated fats.
- Pseudocereals have adequate levels of important minerals such as calcium and iron.

Main Results

- Buckwheat and quinoa breads had increased bread volume.
- Pseudocereal containing breads had a softer texture than the control bread.
- Higher levels of protein, fat, fibre and minerals were found in the pseudocereal breads.
- Buckwheat breads had the highest total phenol content.
- Quinoa and buckwheat grains are rich sources of polyphenols.
- Amaranth, quinoa and buckwheat breads are excellent sources of vitamin E.

Opportunity/Benefit

The opportunity exists to engage with Teagasc to produce a range of nutritionally enhanced gluten-free breads using the tested pseudocereals which may provide interested companies with a competitive advantage. Companies can access the expertise gained through services provision, with the potential also to engage in research with Teagasc researchers in order to develop these products successfully.

Collaborating Institutions

University College Cork

How to Proceed

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Technology

UPDATES

Exploitation of Cheese Cultures for Flavour Diversity and Functionality

Key External Stakeholders

Dairy industry, starter supply companies, research community.

Practical Implications for Stakeholders

Microorganisms are critical for cheese manufacture and ripening and are a key contributor to its flavour development. Thus, application and control of the cheese microbial flora during manufacture and ripening offers the cheese manufacturer a means to develop cheeses with flavours and functionalities targeted to specific markets. This project was sought to determine the impact of various microorganisms on cheese flavour and functional properties with a view to identifying strains with beneficial traits that could be exploited by the industry.

The main issues addressed included investigations into:

- The potential of exopolysaccharide (EPS) producing starter to cheese manufacture and ripening.
- The contribution of *Streptococcus thermophilus* to Cheddar cheese flavour.
- Identification of new bacterial strains for cheese manufacture.

Main Results

- A bank of 142 EPS producing lactic acid bacteria was assembled.
- It was clearly demonstrated that EPS producing strains have the capacity to improve cheese yield and enhance the texture properties of reduced-fat Cheddar cheese.
- St. *thermophilius* when used as a starter or starter adjunct impacted on flavour development in a strain specific manner.

Opportunity/Benefit

The successful implementation of this project provides a range of options to cheesemakers to produce cheeses with improved and diverse flavours and functional properties. By so doing the project supports the efforts of Irish cheese makers to exploit markets for cheese with diverse and unique flavours, such as the speciality and extra mature Cheddar markets in the UK, to which only limited access is currently available. Expressions of interest from companies interested in this area are welcome.

Collaborating Institutions

University College Cork

How to Proceed

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Exploration of Irish Meat Processing Streams for Recovery of High Value Protein Based Ingredients for Food and Non-Food Uses

Key Stakeholders

Meat sector, food (human and pet), beverage, protein processors, sports, nutrition, biomedical, cosmetics.

Practical Implications for Stakeholders

Recovery of high value protein-rich functional co-products from meat processing streams represents an area of significant opportunity to enhance the economic performance and improve the environmental impact of the Irish meat Industry. ReValueProtein will capitalize on many potential opportunities to valorise meat processing secondary, by-product or waste streams. As there is no Irish based strategic initiative to support this exploitation, there is a pressing requirement for a nationally funded effort to support the meat industry in capitalizing on this opportunity. ReValueProtein is an ambitious project which brings together a multidisciplinary team [food chemistry, biosciences, tissue engineering, process (novel and pilot scale) technologies, consumer science, food and beverage technology] to generate technical know-how to develop functional co-products with applications in food, beverage, health and biomedical engineering. Intellectual property,

protocols and products generated will have relevance across all of these sectors.

The main activities fall under **three key scientific pillars:**

I. **Characterization** of source materials (offal, blood, trim etc), extracts and novel products;

II. **Processing** of source materials to generate products (including assessment of novel process technology and working up to pilot scale production);

III. Evaluation of **applications**: techno-functional (emulsification etc), health promoting, bioactive, bioavailability, tissue engineering etc.

All of these are underpinned by analysis of consumer attitudes and preferences pertaining to sustainable processing and the products generated.

Main Results

Assessing processing technologies which are of relevance for the recovery of functional proteins from low, neutral or negative value products.

Proteins exhibiting techno-functional (emulsification) properties recovered from bovine offal.

Other raw materials reviewed with a view to extracting or generating high value functional proteins or peptides.

Opportunity/Benefit

Recovery of value from meat processing streams holds strong potential for the meat sector to generate higher value products from existing low/neutral value products. These higher value products can have applications in a variety of arenas such as the food and beverage (emulsifiers, binders, flavour etc), sports/nutrition, biomedical (bioactive peptides, collagens for wound repair) sectors.

Collaborating Institutions

University College Cork, University College Dublin, NUIGalway, Tralee IT/Shannon ABC

How to Proceed

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Technology

UPDATES

Functional Beverages Containing Health-Promoting Prebiotic Milk Oligosaccharides

Key External Stakeholders

IMF manufacturers, dairy/cheese industry, dairy farmers

Practical Implications for Stakeholders

Oligosaccharides, known to have health promoting properties, are significantly higher in human milk when compared with Bovine milk. In this study, Moorepark researchers in collaboration with UC Davis, sought to extract and enrich oligosaccharides from cows' milk to provide health promoting ingredients for inclusion in infant and adult beverages.

The main findings from this research demonstrate that

- The detection of 18 new high-molecular weight oligosaccharides was observed in the enriched powders.

- Kilogram quantities of enriched powders can be produced using the developed membrane filtration process.
- The oligosaccharide powders produced have been shown *in vitro* to possess prebiotic activity and can prevent invasion of human cells by *Campylobacter jejuni*.
- The oligosaccharide powders also decreased the number of potential pathogens *in vivo* in a mouse model.

Main Results

In this study, pilot-scale enrichment of oligosaccharides from whey streams using 1kDa membranes was successful yielding as high as 17.52% enrichment of oligosaccharides as a percentage of lactose. In collaboration with UC Davis, this study revealed, for the first time, the presence of several new free oligosaccharides containing up to 10 monomers that correspond in size to the most abundant oligosaccharides present in human milk including some fucosylated structures. A variety of bioactivities were shown to be associated with the bovine oligosaccharides *in vitro* such as increased colonisation of human intestinal cells by Bifidobacteria, prebiotic effects and anti-invasive activity against *Campylobacter*. Of most importance, bovine milk oligosaccharides were found to reduce non-beneficial or pathogenic bacterial populations *in vivo* in the mouse GIT and have no adverse effects on the other health parameters measured.

Opportunity/Benefit

Whey permeate is either used for fermentation of portable alcohol, lactose crystallisation or disposed off at a cost to the industry. Extraction, enrichment or isolation of oligosaccharides with prebiotic and anti-infective activity from whey permeate or from by-products of lactose production could result in the production of value-added ingredients from waste streams, while also reducing disposal costs for companies involved.

Collaborating Institutions

UC Davis, University of California

How to Proceed

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Functional Properties of Beta-glucans from Barley

Key External Stakeholders

Food manufacturers, bakeries, food ingredients companies.

Practical Implications for Stakeholders

- Barley fractions are feasible functional ingredients that can be used in the formulation of yeast breads of a high baking, sensory and nutritional quality.
- Barley middlings, considered a by-product or waste stream, contain high levels of beta-glucan and were successfully used to produce viable bread products that may have potential for commercialisation.

Past studies have shown barley to be an excellent source of dietary fibre and beta-glucan, a polysaccharide that when consumed regularly has important health benefits including reducing the risk of heart disease. This project studied a variety of barley cultivars and evaluated their use as low cost, high beta-glucan-containing functional ingredients. Optimisation of milling procedures generated a range of milled barley fractions that

were then blended with wheat flours and used in bread formulations which were evaluated for their rheological, textural and nutritive properties.

Main Results

- A range of new and nutritious barley fractions were isolated by optimising the milling process.
- Barley middlings were found to be an important source of beta-glucan and can be used in the formulation of bread products.

Opportunity/Benefit

The opportunity exists for bakers, ingredient companies and other relevant industry personnel to link with Teagasc in order to optimise milling conditions, formulate flour blends and develop functional bread products with enhanced levels of dietary fibre and beta-glucan.

Collaborating Institutions

University College Cork, Cork Institute of Technology, University College Dublin

How to Proceed

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Technology

UPDATES

FUNLAC: Lacticin-Based Ingredients for Biopreservative and Functional Food Applications

Key External Stakeholders

Food producers.

Practical Implications for Stakeholders

- A genome sequence of the lacticin producing strain was completed, which allows identification of genes relevant to industrial and food safety applications. This genetic blueprint can additionally be used to identify and exploit other interesting traits (both fundamental and commercial) associated with the strain.
- A *Lactococcus lactis* strain identified as producing elevated antimicrobial activity was investigated. This is of relevance to the food industry given that the use of this strain results in elevated lacticin 3147 activity at no additional cost, thereby improving commercial value and impacting on the use of the antimicrobial lacticin 3147 in food industry applications.
- When assessed *in vivo*, lacticin 3147 was found to be degraded within the gastrointestinal tract by the enzyme a-chymotrypsin. Thus, lacticin 3147 was deemed safe for ingestion, given that it would not impact negatively on commensal gut flora. Additionally, the fact that lacticin 3147 is effective in the oral cavity provides the opportunity to influence dental health through the development of oral food applications.
- Lacticin 3147 has been demonstrated to be a robust antimicrobial with the ability to control food spoilage and pathogenic bacteria in non-dairy-foods. It was found to be particularly effective for the control of *Bacillus cereus* on beansprouts, with results indicating that it is more effective than the conventional hypochloride solutions, currently used.

Main Results

- The genome sequence of the lacticin 3147 producing strain was completed.
- In one of the first reports of its kind, where a lantibiotic was assessed *in vivo*, lacticin 3147 was found to be degraded within the gastrointestinal tract by the enzyme a-chymotrypsin. Thus, lacticin 3147 was deemed safe for ingestion.
- Lacticin 3147 was demonstrated to be a robust antimicrobial with the ability to control food spoilage and pathogenic bacteria in non-dairy foods.

Opportunity/Benefit

Lacticin 3147 has been demonstrated to be effective against all Gram positive bacteria tested to date, and has a free from additive status. It is a natural antimicrobial that could be the solution to a broad range of microbial problems for food producers in food biopreservation and shelf life extension applications, as well as having potential for biomedical applications. Expressions of interest are welcome from such companies to optimise this technology with a view to licensing.

Collaborating Institutions

University College Cork

How to Proceed

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Health Promoting Bioactives from Cider Yeast

Key External Stakeholders

Food manufacturers, dairy industry, pharmaceutical companies, research communities; public health agencies and health professionals; policymakers.

Practical Implications for Stakeholders

Beta glucan is a bioactive polysaccharide which has FDA approval for the reduction of cardiovascular risk, the leading cause of death and morbidity in the EU. A cardioprotective diet enriched in dietary fiber, and in particular beta glucan is recommended to protect against the development of cardiovascular disease. Furthermore, food-derived ACE (Angiotensin-I-converting enzyme)-inhibitory peptides have been shown to reduce peripheral blood pressure and exert an antihypertensive effect *in vivo* following ingestion. In this project, bioactive components

(ACE inhibitory/antihypertensive peptides and beta glucan) were isolated and characterised from Natural Yeast, which was a by-product of the cider production process.

Main Results

- Laboratory scale trials, involving autolysis and hydrolysis of spent cider yeast, were optimised for production of yeast extracts, enriched in free amino acids, flavour-enhancing components and bioactive ACE-inhibitory peptides.
- Pilot scale trials were performed but further technical trials are required.
- Economic and financial analysis of the prototype products developed in this project were undertaken, and results indicated that the process for their production (involving spray drying at 20%) was not commercially viable, with further technical trials required to overcome this difficulty.

Opportunity/Benefit

The opportunity exists to further investigate the potential waste stream of Cider production in collaboration with industrial personnel. The research group benefited from improved links with industry (Cybercolors).

Collaborating Institutions

Cybercolors

How to Proceed

For further information access the full Technology Update at:
www.teagasc.ie/publications

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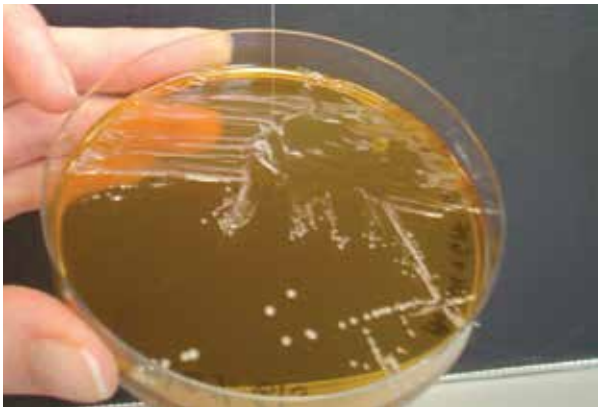
Heart Friendly Foods

Key External Stakeholders

Food manufacturers, dairy industry, pharmaceutical companies.

Practical Implications for Stakeholders

- Dairy products enriched in soluble dietary fibre and beta-glucan, based on the use of novel adjunct food-grade cultures with soluble fibre – producing capacity during milk fermentation, were developed in this project. These cultures were also used as dietary adjuncts for *in situ* production of beta-glucan in the gut, and shown to exhibit cardioprotective properties.
- A cardioprotective diet enriched in dietary fibre, is recommended to protect against the development of cardiovascular disease. Dairy products are poor sources of soluble dietary fibre and beta-glucan, therefore, this represents an opportunity for the dairy industry to produce functional foods and dried dairy ingredients for protection against the development of cardiovascular disease, for functional and medical food markets.



- With cardiovascular disease being the leading cause of death and morbidity in the EU, and on the increase among the Irish population, the availability of such functional foods within the market would be of significant benefit to consumers and food producers alike.

Main Results

- Soluble fibre-producing food-grade cultures, including beta-glucan producing cultures from culture collections and novel sources were identified and characterised.
- *In situ* production of beta-glucan by food-grade cultures resulted in increased survival of the beneficial strain in conditions of elevated heat, simulated gastric juice, acid, bile and antibiotic stress.
- The low-fat yogurt developed with these adjunct strains exhibited superior functional properties compared to product manufactured without the cultures.
- Development of dried dairy ingredients and functional dairy foods enriched with soluble fibre and beta-glucan producing cultures with excellent rheological properties were developed.
- Efficacy was demonstrated against atherosclerosis development of selected soluble fibre and beta-glucan producing cultures in an animal model of lipid-driven atherosclerosis.

Opportunity/Benefit

The opportunity exists to further investigate the potential of microbially produced soluble fibre as a potent bio-active food ingredient and potential pharmaceutical product for human health benefit with a view to commercialisation.
A patent application is in the process of being filed. Expressions of interest from relevant companies are welcome and opportunities to collaborate and license this technology can be discussed.

Collaborating Institutions

University College Cork

How to Proceed

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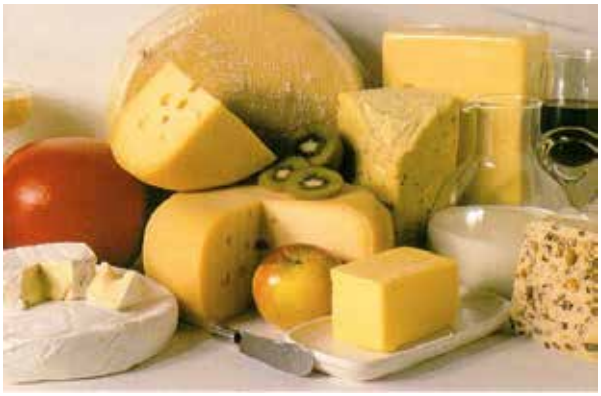
Improved Biotraceability of Unintended Microorganisms and Their Substances in Food and Feed Chains

Key External Stakeholders

Irish Farmhouse Cheesemakers (FSAI)

Practical Implications for Stakeholders

- The data obtained contributes to a better understanding of the potential risk that *L. monocytogenes* presents to cheese producers (growth on the product, if it is contaminated) and constitutes a very useful set of data for further modelling studies in food.
- Persistent strains of *L. monocytogenes*, that are more difficult to control, were identified in some processing environments



Main Results

- Sixteen cheesemaking facilities were sampled during the production season at monthly intervals over a one-year period. Thirteen facilities were found to have samples positive for *L. monocytogenes* on at least one occasion
- 19% of samples at farm level were positive for *L. monocytogenes*
- This study demonstrates the prevalence of *L. monocytogenes* in the dairy farm and processing environments and the need for good hygiene practices to prevent its entry into the food chain
- Predictive modeling is not always applicable to food

Opportunity/Benefit

- Contamination of food processing facilities (not food) was shown. There is an opportunity to use this pre-emptive knowledge to improve hygiene at processing facilities and prevent future issues with food contamination
- Predictive modeling is not always applicable to food – challenge studies are necessary
- A database of pulsed field gel electrophoresis (PFGE) profiles of *L. monocytogenes* isolates from Ireland was generated

Collaborating Institutions

Principally the Danish Technical University, Copenhagen and the University of Veterinary Medicine, Vienna. There were 45 other participants in the project.

How to Proceed

For further information access the full Technology Update at:
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Technology

UPDATES

In-situ Starch Modification in Food Formulations Using Protein

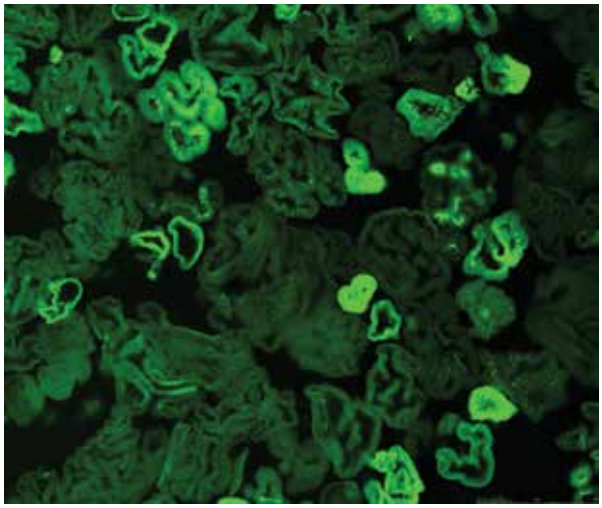
Key External Stakeholders

- Dairy ingredients and Starch Industry
- Prepared foods and Nutritional beverage manufacturers
- Academic and Research Institutions

Practical Implications for Stakeholders

The objective was to study the behaviour of mixed protein-starch systems with a view to understanding protein starch interactions as a possible mechanism for in-situ alternation to starch functionality.

- Structure of the starch pastes can be altered by the presence of the proteins (intact or hydrolysed).
- Gelatinisation temperature of starch and denaturation temperature of proteins can be synergistically used to create new food structures.
- A novel rheological reactor cell can be used for simultaneous measurement of viscosity and in-vitro digestion of protein-starch mixtures.



Main Results

- The gelatinisation temperature of potato starch is lower than the temperature for whey protein denaturation/aggregation; thus in mixtures of potato starch and whey proteins, starch granules swell before denaturation/aggregation of the protein occurs, resulting in a reduction in viscosity and change in functionality.
- Hydrolysed whey protein resulted in a reduction in potato starch granule swelling during heating.
- Different blends of dairy proteins were evaluated in the presence of pre-gelatinised starch for changes in viscosity during in-vitro digestion using a newly designed rheological reactor cell. The study found that a blend of casein and α-lactalbumin may provide viscosity increase and release of peptides/amino acids for use in commercial applications, e.g., anti-reflux infant formula.

Opportunity/Benefit

New knowledge on the effect of intact and hydrolysed dairy proteins on the pasting properties of waxy maize and potato starch can be utilised for development of structure in beverage and prepared food applications. The methodologies developed in this study can be used to evaluate ingredients under simulated (in-vitro) gastrointestinal digestion for use in development of functional, medical or therapeutic beverages.

Collaborating Institutions

University College Cork, UCC

How to Proceed

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Interaction of Gene Expression Pathways, Breed and Diet on the Nutritive and Flavour Aspects of Pigmeat

Key External Stakeholders

Pig producers and pigmeat processors

Practical Implications for Stakeholders

The outcome of this research provides more in-depth understanding of factors such as breed, muscle, sex and diet which can have a significant effect on meat quality, in particular intramuscular fat (IMF) levels.

- A number of genetic pathways which respond to these factors through alterations in their expression levels have been identified.
- Blood parameters provide potential as novel routine markers for quality characteristics with circulating triglyceride and albumin levels associated with dietary treatments.
- Many of the genes identified as differentially expressed between Duroc and Pietrain breeds are likely to harbour genetic variability in their regulatory regions that may ultimately have applications in meat management and/or genome-assisted animal selection programmes. This project shows the potential of nutrigenomics to optimise the efficacy of pork production regimes.

Main Results

- Generation of a knowledge baseline of quality and gene expression differences between two breeds (Duroc and Pietrain) with regard to IMF deposition.
- Demonstration, at a molecular level, that the degree of IMF deposition is as a result of a suite of diverse genomic responses with the importance of signaling pathways, lipid, fatty acid and steroid metabolism and the immune response highlighted.
- A muscle effect was highlighted, in relation to IMF content, in the influence of restricted lysine treatment on meat quality, with the *semimembranosus* (leg) muscle responding more strongly than the striploin muscle. Breed also influenced the response with Duroc muscle (both muscles) exhibiting a greater response to the restricted diet.

Opportunity/Benefit

Information generated in the course of this project will aid the improvement of meat quality traits in Irish pork. The results highlight the importance of breeding and selection programmes and the need to emphasise improvement in meat quality without compromising the production gains from traditional selection for lean carcass and high growth rate. The new knowledge generated about the Duroc breed is highly relevant as there is a gradual increase in the proportion of genetics of breeds such as Duroc in Irish and European commercial operations. This project may potentially open up the application of nutrigenomics to improve the efficacy of pork production regimes. The control and manipulation of these genes is a promising pathway of research for the future and Teagasc welcomes expressions of interest in this research.

Collaborating Institutions

University College Dublin

How to Proceed

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Technology

UPDATES

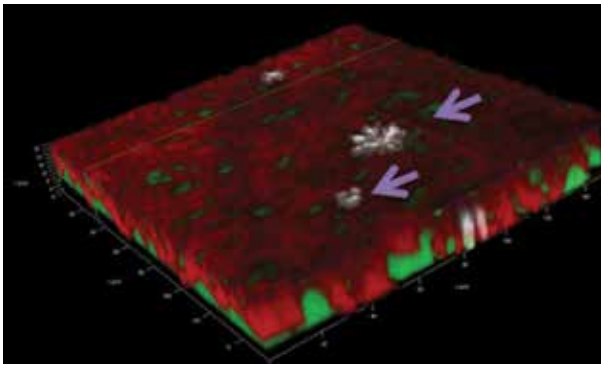
Interactions Between Cheese Matrix Physico-Chemistry, Microstructure and Microbial Metabolic Activity for Cheese Diversification and Quality

Key External Stakeholders

Irish cheese industry, dairy processing industry, dairy exporter organisations, international cheese research community

Practical Implications for Stakeholders

Cheese, is a highly complex dynamic matrix made from a constantly changing raw material, destined for international markets where the consumer demands consistency, quality and innovation. New analytical technologies from diverse disciplines have been applied to gain a new understanding of how cheese manufacture parameters influence cheese microstructure, physicochemistry and



microbial localisation and their interactions during ripening with a view to optimised consistency and innovation for the future.

Main Results

- Advanced microscopic methods were applied to enable precise localisation of individual chemical components and help to determine their spatial organisation within the cheese matrix.
- FLIM was used to demonstrate that cheese matrices are not homogenous with respect to pH but contain micro heterogeneity.
- Salting had a greater influence than process temperature on cheese bacterial growth and enzymatic activity during the ripening of cheeses produced with *Streptococcus thermophilus* and *Lactobacillus helveticus*.
- Localised areas of higher salt content within cheese matrices significantly reduced the viability of *Lactobacillus helveticus* starter with lower release of intracellular enzymes, proteolysis levels and a significant reduction in cell size and granularity. This demands new thinking regarding salt distribution within cheese matrices and its influence on cheese ripening and consistency but may also open new avenues for innovation.
- Addition of buttermilk powder to curds results in cheeses with increased healthy phospholipid levels and subtle flavour differences to Cheddar without compromising the rennet coagulation process.

Opportunity/Benefit

The global cheese industry is projected to be valued at ~$100bn by 2019. As exporters competing in a global market, Irish cheese producers benefit from the most up-to-date process knowledge in achieving optimal cheese consistency and understanding the influence of varying process parameters on the relationship between variability in cheese physicochemical components and the metabolic activity of bacteria entrapped within cheese matrices.

With high levels of exposure to potential market tariffs or displacement due to Brexit, Irish cheese producers are looking to diversify their product range and to produce cheeses with diverse characteristics on existing commercial Cheddar production plants. Developments from this research will underpin that process.

Collaborating Institutions

University of Limerick

How to Proceed

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Investigation of Bioactive Peptides in Food Through the Application of Mass Spectrometry Techniques

Key External Stakeholders

Food producers and processors, Functional/ Nutraceutical Food Manufacturers, Consumers, Pharmaceuticals, Research Communities

Practical Implications for Stakeholders

- Bioactive peptides are segments of dietary proteins, which can have salutary health-effects.
- Analysis of bioactive peptides is however difficult due to the complex nature of food samples and requires specialised analytical instrumentation and software.
- Various sources of bioactive peptides including meat, cereals and food-by-products have been investigated using mass spectrometry techniques.
- A facility and expertise is now available to support the food industry and collaborative research in the analysis of food bioactive peptides.

Main Results

- Anti-oxidant peptides from bovine liver proteins were characterised.
- An ACE-I and renin inhibitory peptides from bovine blood proteins consisting of 2–4 amino acids in length were identified.
- Anti-inflammatory, ACE-I and renin inhibitory peptides from potato peel proteins were sequenced.

Opportunity/Benefit

Mass spectrometry based analytical methods have been developed to sequence bioactive peptides in a variety of food matrix. This facility can be utilised by the food industry to identify bioactives and support functional food product development.

Collaborating Institutions

Cork Institute of Technology
University College Cork

How to Proceed

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Technology

UPDATES

Investigation of the Presence of Anti-Nutritional and Toxic Compounds in "Health Foods"

Key External Stakeholders

Manufacturers, wholesalers and retailers of health food products, general public, regulatory agencies: DAFF, FSAI, IMB.

Practical Implications for Stakeholders

The objective of this project was to investigate the occurrence of microcystin (MC) and aristolochic acid (AA) toxins in algal and herbal products, respectively.

- Methods were developed and validated to detect AA and MC toxins, which can be employed to monitor the safety of health foods.
- Contaminated products were detected and removed from the Irish market.
- A number of health alerts were published worldwide including, Ireland, the UK and Canada.

Main Results

- MC toxins were detected in Klamath Lake blue green algae (BGA) products, which are sold in health foods shops throughout the island at concentrations between <0.5 and 3 mg/kg.
- MC toxins were not detected in spirulina BGA products, which may be used as a substitute for Klamath Lake products.
- AA toxins were detected in some herbal preparations sold on the island but these products have been removed from the market.

Opportunity/Benefit

- Stakeholders can now access analytical methods for detecting AA and MC toxins.
- A novel biosensor assay was developed for detecting MC toxins, which has the potential to be exploited as a rapid test.

Collaborating Institutions

Xenosense Ltd., Belfast.

How to Proceed

For further information access the full Technology Update at:
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Technology

UPDATES

Meat4Vitality: Enhancement of texture, flavour and nutritional value of meat products for older people

Key External Stakeholders

Meat processors; Ingredients companies; Regulatory agencies: charities; nutritionists; care homes; DAFM.

Practical Implications for Stakeholders

Meat intake of elderly people is often reduced since meat is a complex matrix that can present a challenging substrate from a texture perspective. Older people pay closer attention to the texture of the food and are more demanding in this regard. There is considerable evidence that texture modified meat products will be more acceptable to older adults and lead to improvement in intakes. Meat products are ideal vehicles for fortification with extra protein, vitamins and minerals and reformed products will provide enhanced and targeted nutrition to promote healthy ageing and vitality in the older population.

Main Results

- Beef patties were enriched with plant-based protein ingredients: pea protein isolate, rice protein and lentil flour at two inclusion levels (3% and 7%) and their technological characteristics assessed.
- Preliminary results indicated that rice protein demonstrates good potential to enhance protein intakes as part of healthy beef products for the elderly.
- Currently, texture enhanced beef steaks are being developed.

Opportunity/Benefit

Healthy aging is a grand challenge of growing international importance. Red meat is intrinsically a source of certain nutrients which are particularly important for healthy aging. These include: protein for growth and repair, omega-3 fatty acids for cognitive function, as well as vitamins and micronutrients (iron, calcium, selenium and zinc).

Within the project we will optimize the meat processing formulation and packaging technologies in relation to food structure, flavour and nutritional value. We will demonstrate that meat products can be made more appealing to older adults by modifying their texture, while retaining or enhancing their nutritive value.

Eating healthy and getting active means you are less likely to develop a chronic disease at any age, “it’s never too late”.

Collaborating Institutions

University College Cork

How to Proceed

For further information access the full Technology Update at:
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Technology

UPDATES

National Food Residue Database (NFRD)

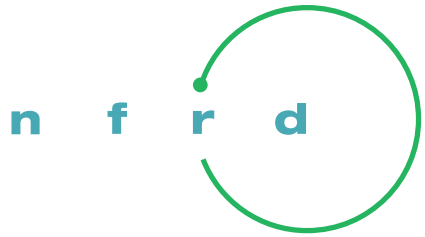
Key External Stakeholders

Food industry, state agencies (DAFF, Pesticide Control Service, FSAI, RPII, EPA, Marine Institute, State Laboratory), scientific community, general public.

Practical Implications for Stakeholders

This funding has ensured the continued development and enhancement of the National Food Residue Database (NFRD), leading it to becoming the 'one stop shop' for chemical residue information in food in Ireland.

The project resulted in 49 new datasets being published on the NFRD website, along with two NFRD annual reports. An exposure assessment to pesticide contamination in food showed that the exposure to pesticides was well below the allowable daily intake (ADI) and the risk to the consumer from pesticides was low.



Consumer and industry confidence in food production and processing is key to the sustainability of the food industry in this country. The information contained on the NFRD can be used to promote the safety and quality of Irish food, through its use by the food industry and policy/regulatory agencies. In addition, 'country of origin' for pesticide results can aid importers of fruit and vegetable products to identify countries with safer produce. The NFRD needs to be continuously developed and maintained to help ensure that food safety is at the heart of the development of the food industry in Ireland.

Main Results

- 49 new datasets were uploaded and published on the NFRD website over the duration of the project.
- Two issues of the NFRD Report (2007/2008 and 2009) were published.
- Exposure analyses were conducted for 10 of the most commonly found pesticides (captan, carbendazim, chlorpyrifos, diphenylamine, fenahexamid, imazalil, iprodione, malathion, prochloraz and thiabendazole).
- Results from this study showed that exposure to pesticides was well below the ADI and the risk to the consumer (both adult and child) from pesticides was low.
- Extensive dissemination was been carried out during the project through publication on the NFRD website, NRFD annual reports and through a workshop.

Opportunity/Benefit

The National Food Residue Database can be used as a reference tool by exporters, when queried about the safety of Irish food. It can also be used by importers and processors when buying products from outside of Ireland.

Collaborating Institutions

University College Dublin

How to Proceed

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Technology

UPDATES

New and Rapid Methods for Evaluating the Baking Characteristics of Irish Grown Wheat Varieties

Key External Stakeholders

Millers, bakeries, food ingredients companies, food manufacturers

Practical Implications for Stakeholders

Based on the results of this project, it is now possible for Teagasc to recommend rapid, scientific, accurate tests on grains, flours, doughs and baked products to the industry. Furthermore, researchers at Ashtown have the expertise to work with industry and increase capabilities in these areas, or to engage in confidential industry-led research, using these newly developed methodologies.

As some traditional methods are not deeply scientific, it is possible that some vital information relating to dough and baked properties had not previously been uncovered. Therefore, the methods which have been developed should be of significant advantage to the milling, baking and food industry for a complete analysis and better characterisation of their raw materials and end products, while complementing the more traditional cereal methods.

The new suite of modern and novel methods developed for use along the complete chain from the grain to the finished products includes spectroscopy, rapid flour protein fractionation, laser imaging and digital image analysis.

Main Results

Novel methods have been developed in the following areas:

- Near infra-red spectroscopy of grain, flour, dough and bread.
- Flour protein fractionation.
- Native starch and protein properties of flours.
- Imaging of confectionary batter and cookie dough during baking.
- Laser imaging of bread dough fermentation and density properties.
- Digital image analysis of bread crumbs.

Opportunity/Benefit

Advice, consultancy work and/or technical services, relating to the novel and/or traditional methods, in the areas of wheat chemistry, dough rheology and baking processes, can be provided through the Teagasc Food Research Centre, Ashtown.

Collaborating Institutions

University College Dublin

How to Proceed

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Technology

UPDATES

Novel Fruit Products from Apples and Other Tree Fruit (IsaFruit)

Key External Stakeholders

Vegetable processors, government authorities/ legislators, consumers, food research scientists.

Practical Implications for Stakeholders

The project developed a number of fresh cut fruit salads and ready-to-eat dessert products enriched with functional ingredients to capitalise on the growing functional food market. These products incorporated a range of functional ingredients including pre- and pro-biotics. An Irish based SME was involved in the development of these products and is interested in launching them when economic conditions improve.

Main Results

- Fruit cultivars with optimal properties for the development of fruit based desserts and fresh cut salads were selected based on their sensory, physicochemical and quality attributes.
- Novel protocols were developed for incorporation of functional ingredients using technologies such as edible films and vacuum impregnation.
- Functional ingredients were added at levels required to deliver the health benefit based on manufacturers' recommendations.
- At all points the sensory and quality attributes of the products were assessed to ensure that a real marketable product was being produced.

Opportunity/Benefit

Fruits and fruit products are seen as healthy by consumers. However, if their market share is to grow they need to take advantage of the growing functional food market which fulfils consumer demands for products which deliver a health benefit beyond basic nutrition. This project demonstrated that fruit based functional foods with optimal functional, quality and sensory properties could be developed.

Collaborating Institutions

University College Dublin, Nature's Best Ltd, IRTA

How to Proceed

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Technology

UPDATES

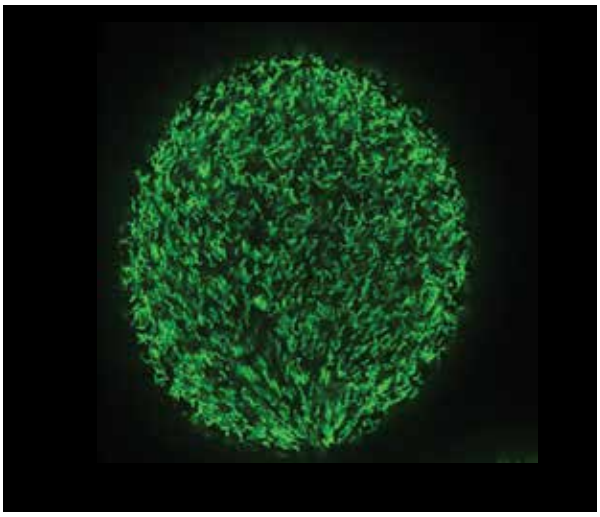
Novel Gel-Encapsulation Technology

Key External Stakeholders

Food/Medical food, pharmaceutical and animal feed companies, biotechnology start-up companies.

Practical Implications for Stakeholders

- A novel gel-encapsulation technology was developed, using dairy based micro beads which would be of interest to companies wishing to incorporate sensitive components, including probiotics, into their products.
- Encapsulation matrices are suitable for incorporation into liquid of high moisture food/feed.



Main Results

- A novel gel-encapsulation technology was developed and validated for the protection of probiotic bacteria but would also be suitable for other sensitive ingredients such as peptides or phytochemical compounds.
- Gel-encapsulation ensured high probiotic viability during extended storage in fruit-based products, such as cranberry juice.
- *In vivo* gastro-intestinal transit demonstrated delivery of high numbers of live probiotic bacteria to the lower intestine.

Opportunity/Benefit

A patent application has been filed by Teagasc covering process conditions for generating gel microbeads and application of the encapsulation method. This provides food and related companies with the opportunity to benefit from improved cost efficiency and product shelf-life through use of this robust encapsulation process. Teagasc is seeking partners for commercialisation of the technology with a view to licensing in a number of fields of use.

Collaborating Institutions

University College Cork

How to Proceed

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Technology

UPDATES

Novel Proteins and Peptides from Seaweeds

Key External Stakeholders

Protein ingredient manufacturers, marine processors

Practical Implications for Stakeholders

- Novel protein sources for use in the sports nutrition markets, Halal and Kosher as well as vegetarian markets.
- Increases essential amino acid profile of products.
- Imparts a health benefit.

Main Results

- Bioactive peptides isolated from red seaweed were found to reduce blood pressure when tested in the lab and in spontaneously hypertensive rats (animal models).
- A novel hydrolysis and purification methodology was employed and applied to red seaweed.
- Optimal conditions for developing bread products with this hydrolysate were determined and blood pressure regulation activity was maintained.

Opportunity/Benefit

Protein extracts developed as part of this project were examined for their essential amino acid content, ability to inhibit enzymes important in blood pressure control and suitability for use in cereal products such as bread. Extracts could have benefits in the manufacture of food products for the prevention of heart health associated problems such as blood pressure.

Collaborating Institutions

National University of Ireland, Galway

University College London, UK

How to Proceed

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Technology

UPDATES

Nutraceutical and Functional Food Bio-active Peptides in Beef, Bovine Offals and Fermented Meat Products

Key External Stakeholders

Beef processing sector.

Practical Implications for Stakeholders

The main outcome of this research provides support for a strategic approach to recovering value from the meat processing chain. Clear evidence has been presented that bio-active peptides can be generated from low value meat and offal. The capabilities for generating, isolating and characterising bio-active peptides from meat sources have been established at Teagasc. The assays have been optimised and are now part of a full peptide isolation, purification and characterisation infrastructure available to the Irish food industry. The potential of generating bio-active peptides from bovine offal and low value muscle has been demonstrated in this project. Research in the extraction of

commercially valuable peptides from meat and meat industry by-products is in its infancy and this project provides a solid foundation on which future development and discovery will inevitably yield scientific advancement and commercial return.

Main Results

- Capabilities established for the generation, isolation and characterisation of bio-active peptides from meat sources.
- Antioxidant peptides successfully generated from bovine liver.
- Peptides with antioxidant and antihypertensive activity isolated from brisket fractions.
- Peptides generated from bovine lung which exhibited antioxidant, antihypertensive and antithrombotic activity.
- Heart peptide fractions displayed antioxidant and antimicrobial activity.
- Bio-active peptides generated from proteins isolated from bovine muscle.

Opportunity/Benefit

Knowledge generated in this research will be beneficial in developing strategies to recover value from meat processing streams. Such scientific expertise and infrastructure should act as a springboard to encourage the exploitation of the protein component of offal and waste streams produced by the meat industry, as a source of high value biologically active ingredients with food and pharmaceutical applications.

Collaborating Institutions

University College Cork

How to Proceed

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Technology

UPDATES

Packaging and Chilling Technologies to Enhance Meat Quality and Safety

Key External Stakeholders

Irish beef farmers, beef processors, FSAI, DAFM, public health personnel, epidemiologists and scientists interested in beef microbiology, food safety and spoilage.

Practical Implications for Stakeholders

Hot/warm boning promotes blown pack spoilage and the survival of key pathogens (*Salmonella* and *E. coli* O157) on beef carcasses during chilling. ComBase software may be used to accurately predict *Pseudomonas* spp. and *Br. thermosphacta* growth on beef carcasses and primals. A real-time PCR technology was developed that can detect low levels of blown pack spoilage Clostridium spp. (*C. estertheticum, C. gasigenes* and *C. ruminantium*) on equipment and meat samples.

Main Results

The main results were:

- Bacterial counts on beef primals increased to 6–7 $\log_{10}$ cfu cm^{-2} after 6 weeks chilled storage.
- Significantly higher TEC, *Pseudomonas* spp. and *Br. thermosphacta* counts were observed on cold boned primals *versus* hot boned samples.
- BPS pack distension or bursting occurred considerably sooner in hot boned product.
- Any decrease in pathogenic bacteria during beef chilling may be significantly less for hot boned beef depending on the bacterial strain.

Opportunity/Benefit

This project characterised beef carcass chilling in terms of the physical parameters (temperature, relative humidity, pH and aw) and microbiology (total viable count (TVC), mesophilic (TVCm, 30°C) and psychrophilic (TVCp, 6°C), total *Enterobacteriacae* counts (TEC), *Pseudomonas* spp., *Clostridia* spp., Lactic acid bacteria (LAB) and *Brochotrix thermosphacta*). The data generated showed that significantly ($P<0.05$) higher TVC, LAB and *Clostridium spp.* concentrations were obtained on hot boned beef and that BPS pack distension or bursting occurred considerably sooner in hot boned product. Thus the beef sector should carefully review these findings before considering using hot boning as an alternative to current practices. This project also developed and validated a set of real-time PCR assays, capable of detecting 4–5 *C. estertheticum*, 2 *C. gasigenes* and 8 *C. ruminantium* spores per ml/cm^2 and transferred this technology to the Irish beef industry via the 'Blown Pack Spoilage' testing service at Ashtown.

Collaborating Institutions

University College Dublin and University College Cork

How to Proceed

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Phage-Insensitive Cultures for the Production of Fermented and Probiotic Foods

Key External Stakeholders

Commercial culture suppliers, fermented dairy food producers, wider dairy industry, lactic acid bacteria and phage research communities.

Practical Implications for Stakeholders

Bacteriophages are the primary cause of fermentation failure in the fermented dairy foods industry. Lysis of the starter culture can delay or even halt the milk fermentation process leading to low quality products, or even discarding of the milk. The destructive potential of these agents is exaggerated in modern processes which employ cultures on a more or less continuous basis and where huge numbers of starter cells are required to process large volumes of milk to cheese. The economic impact of such attacks can be significant, particularly in a commodity product such as cheese where profit margins are very tight.

The main outcomes generated from this project are:

- Food-grade strategies have been developed to improve commercial starter cultures with respect to bacteriophage resistance.

- Improved cultures have been transferred to industry where they have replaced bacteriophage-sensitive strains, thus improving the efficiency, reliability and longevity of starter cultures.

Main Results

- The molecular mechanisms underpinning phage-host interactions were characterised. The host response is strongly targeted to the cell wall, suggesting that the phage presence is sensed as an extracytoplasmic stress, affecting membrane integrity.
- Phages infecting commercial probiotic cultures were isolated and characterised.
- Classical food-grade approaches and novel mobilisable plasmids were used to improve the phage-resistance phenotype of commercial starters, some of which have been transferred to industry.

Opportunity/Benefit

There is an ongoing opportunity for other starter culture and dairy companies to benefit from the capabilities developed within this project through sponsored research or service provision. Expressions of interest from relevant companies are welcome.

Collaborating Institutions

University College Cork.

How to Proceed

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Technology

UPDATES

PLeASURe (Novel Processing Approaches for the Development of Food Products Low in Fat Salt and Sugar): Low Salt and Low Fat Mozzarella-Style Cheese

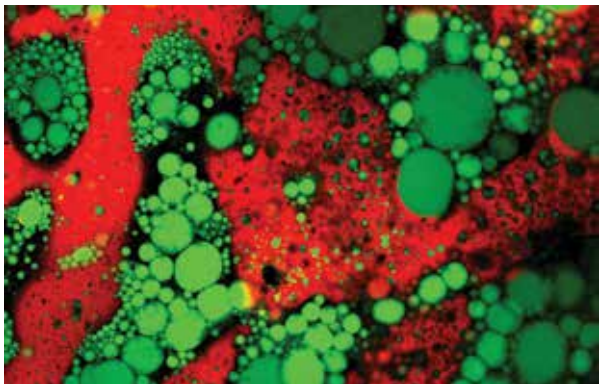
Key External Stakeholders

Irish cheese manufacturers, especially those producing cheese for pizza and interested in diversifying their product portfolio into reduced-fat, reduced-salt cheeses.

Irish consumers, interested in reducing dietary intake of salt and fat

Practical Implications for Stakeholders

- Reducing the fat content of low moisture part-skim (LMPS) Mozzarella cheese from 22 to 11% was detrimental to quality, as evidenced by excessive firmness and chewiness of the unheated cheese, the poor meltability and low oiling-off of the heated cheese, and the lack of fat-flavour in both the unheated and heated cheeses.



- The adverse effects of fat reduction were counteracted to a large extent by reducing the calcium content and adding enzyme-modified-cheese (EMC) flavour.

Main Results

- Reducing fat content of LMPS Mozzarella from 22 to 11% coincided with a significant deterioration in quality of the cheese, mainly because of excessive firmness and chewiness, poor meltability, too little release of free oil on cooking, and the 'lack of typical cheesy flavour.
- The adverse effects of fat reduction were mitigated by reducing the calcium-induced cross-linking of the casein and blending enzyme modified cheese flavour with the curd. The latter parameters can be altered to an extent commensurate with level of fat reduction and intensity of texture, melt and flavour attributes sought in the final cheese.
- The development of reduced-fat reduced-salt LMPS Mozzarella with acceptable quality provides the consumer with a means of more effectively managing dietary intake of fat and salt, while still enjoying Mozzarella in various dishes such as pizza. For manufacturers, it provides a means of optimising moisture content and product yield.

Opportunity/Benefit

A database showing how the physical and sensory properties of low-moisture Mozzarella are affected by fat and salt reduction, from 22 to 11% and from 1.7 to 1.0%, respectively.

Practical implementable strategies (lower degree of calcium mediated casein cross-linking, increased casein hydrolysis, and addition of enzyme-modified cheese flavour) to improve acceptability of reduced-fat reduced-salt Mozzarella.

Collaborating Institutions

University of Limerick

How to Proceed

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Probiotic Lactobacilli Survival and Impact in the Animal Gut

Key External Stakeholders

Animal feed manufacturers; thoroughbred racehorse industry, veterinary health professionals

Practical Implications for Stakeholders

- This project provides first time information on the microbial ecology of the equine, and other mammalian species gut.
- This project also provides information on commensal lactobacilli found in the gut microbiota of humans and animals.

Main Results

- The project provided definitive genome-based evidence to support the fermentation patterns of sixteen strains of *Lactobacillus ruminis*, and has identified prebiotic carbohydrates with the potential to promote *L. ruminis* growth *in vivo*.
- This project identified the core faecal microbiota of ruminants, hindgut fermenters and mono-gastric animals co-localised to a single farm in Ireland.
- The project provided details for the first time, on the faecal microbiota of thoroughbred racehorses, both active and at rest.
- Analysis of the thoroughbred horse microbiota has revealed *Lactobacillus equi* to be a predominant *Lactobacillus* species in the hindgut. Genome analysis identified genes and enzymes highlighting *L. equi* adaptations to the herbivorous gastrointestinal tract of the horse, including fructan hydrolases.
- Having sequenced the genome of *Lactobacillus equi*, will help to further understand the microbial ecology of the equine hindgut and the influence lactobacilli have on it.

Opportunity/Benefit

The outcomes of this project is of relevance for the basic understanding of commensals/probiotics, potential mammalian applications, and potential alternatives to in-feed antibiotics for the animal production industry and generation of information of direct relevance for human probiotic consumption.

Collaborating Institutions

Teagasc and University College Cork

How to Proceed

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Technology

UPDATES

Product Reformulation and *In Vitro* Testing of Low Glycaemic Breads

Key External Stakeholders

Food ingredients companies, bakeries, millers, food manufacturers, consumers.

Practical Implications for Stakeholders

Significant findings of the research conducted in this project include detailed information on a range of low glycaemic index (GI) grains and fibres/flours, and their application in novel low glycaemic index (GI) bread formulations. How these fibres behave under mixing, proofing and baking conditions has been assessed, and their shelf life (texture) and sensory properties have been established. This project has led to the development of new, high quality, low GI bread formulations.

A large number of new bread recipes containing a range of different low GI ingredients have now been formulated, and information is now available relating to the optimal water addition and mixing characteristics, and expected bread, shelf life and

sensory properties of the products. Both quantitative and qualitative sensory trials have shown that low GI flours may be introduced into a wheat bread formulation without significantly negating the sensory properties of the resulting breads.

Main Results

- Compositional characterisation of low GI grains.
- Flour blending and baking methods for new low GI bread formulations.
- Sensory properties of new low GI formulations.
- Fundamental rheology, baking and molecular aspects of the new formulations.
- An *in vitro* method for calculating the glycaemic index of the formulations.
- Scientific and technical publications describing the research methods and how the results and formulations may be utilised by an end-user.

Opportunity/Benefit

Advice, consultancy work and/or technical services, relating to the methods and/or formulations developed during this project can be provided at Teagasc Food Research Centre, Ashtown, particularly in the areas of cereal chemistry, dough rheology and baking processes.

Collaborating Institutions

University College Cork

How to Proceed

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www.teagasc.ie/publications

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Technology

UPDATES

Protection of Bioactive Peptides Using Novel Encapsulation Technologies

Key External Stakeholders

Dairy industry, food manufacturers, pharma companies

Practical Implications for Stakeholders

- High amylose corn starch (HACS) can be used for the delivery of peptide antimicrobials to the lower GIT and the type of starch used influences both the quantity of the antimicrobial delivered and also the impact on the beneficial gut microbiota.
- Nisin, in addition to its use as a bio-preservative, has now been suggested as a possible therapeutic for the control of gut pathogens and as a growth promoter to replace the use of antibiotics in feed for animals for human consumption. The ability of nisin peptides to retain biological activity, after encapsulation, *in vivo* in an animal model broadens the scope of its use for these applications.

Main Results

- New methods for the quantification and purification of nisin were developed
- Nisin interacts with bile under physiological conditions, forming a complex that alters the relative amounts of the nisin fragments produced by digestion highlighting the importance of including bile in simulated digestions of antimicrobial peptides.
- A novel process for encapsulation of nisin using high amylose corn starch (HACS) was developed and tested *in vivo* in a murine model. Using next generation MiSeq sequencing the results indicated that biologically active Nisin was delivered to the colon and impacted on the gut microbiota and that the starch formulation itself has a positive effect on the microbiota including *Akkermansia* which is currently being promoted as a novel functional microbe with probiotic properties.

Opportunity/Benefit

Use of food grade HACS can deliver biologically active peptides to the colon. The ingestion of HACS can also impact positively on beneficial microbes in the lower GI tract.

Collaborating Institutions

University College Cork, University of Limerick

How to Proceed

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Technology

UPDATES

Proteome Analysis to Improve Meat Tenderness

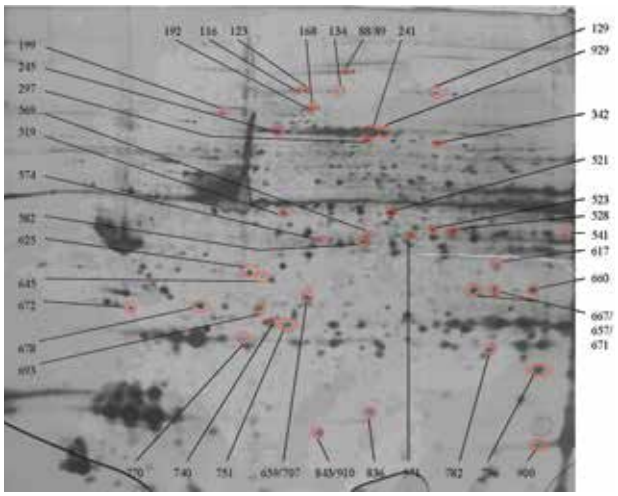
Key External Stakeholders

Meat processors, scientific community, government agencies

Practical Implications for Stakeholders

The main outcomes from this research relate to the increased understanding of factors underpinning variability in meat tenderness, with novel proteins identified, and information which will support optimisation of postmortem carcass management.

- Identification of a novel biochemical pathway which is of relevance to the development of tenderness in beef and pork.
- Increased understanding of known biochemical pathways influencing tenderness.
- Optimising postmortem interventions: importance of factors such as muscle composition, genetic makeup and animal age.



Main Results

- Structural protein degradation, metabolic enzyme systems and cell defense capability in early postmortem muscle contribute to final tenderness differences in beef and pork with a novel protein identified in cell defense pathways.
- Differential protein profiling was observed in response to postmortem interventions, in particular indicating the importance of intramuscular fat levels and the genetic makeup of the animal when using electrical stimulation.
- Tenderstretch influenced collagen solubility in both muscles while the total collagen content was not change. Microstructure analysis suggests that a greater separation of the myofibres did observed following tenderstretch treatment.

Opportunity/Benefit

Knowledge gained from this project could be beneficial in enhancing current grading systems to incorporate a tiered pricing system in terms of tenderness, and defining optimal postmortem intervention practices to provide assurance of tenderness to meet market demand.

Collaborating Institutions

University College Dublin

How to Proceed

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Technology

UPDATES

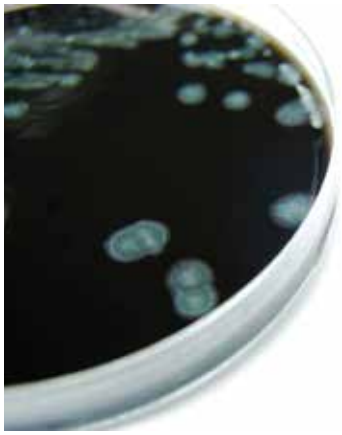
Public Health Significance of Emergent *Campylobacter* Species in the Irish Food Chain

Key External Stakeholders

Pork industry, poultry industry, public health laboratories, Food Safety Authority of Ireland

Practical Implications for Stakeholders

Campylobacter spp. is the most common cause of bacterial food borne illness in Ireland. It was considered up the mid 2000's that infection was almost exclusively linked to just two species, *C. jejuni* and *C. coli*, but new methods capable of detecting 15 other species of the pathogen indicated that these emergent species were also causing human illness. This study investigated the occurrence and human virulence potential of emergent *Campylobacter* species in Irish pork, poultry and human clinical stool samples. The key finding was that these emergent species are indeed widely prevalent in the food chain and have virulence factors which indicate their public health importance.



Main Results

- *Campylobacter* was detected in pig gut (caecal) contents (34.7%), pre chill pork carcasses (17%), pork cuts (9.5%) and chicken pieces (68%) with a wide range of species present across all sample types including *C. coli*, *C. jejuni*, and emergent species *C. lari*, *C. upsaliensis*, *C. mucosalis*, *C. curvus*, *C. sputorum*, *C. concisus*, *Arcobacter butzleri*, *Arcobacter Skirrowii*.
- *Campylobacter* was found in 4.8% of previously undiagnosed human clinical samples with emergent species *C. concisus* the second most common species recovered after known species *C. jejuni*.
- The majority of emergent species isolated had virulence genes typically found in known *C. jejuni* and *coli* giving further evidence of a link to human illness.
- *Campylobacter* isolates recovered from poultry and beef were genetically identical to isolates recovered from human stools. Isolates recovered from pork were less similar, indicating that the pork has less of a role in the transmission of human disease causing strains than other commodities.

Opportunity/Benefit

Advice, consultancy work and/or research can be provided by Teagasc on *Campylobacter*.

Collaborating Institutions

Public Health Laboratory at Cherry Orchard Hospital

How to Proceed

For further information access the full Technology Update at:
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Technology

UPDATES

Re-engineering Process Technology for the Manufacture of Infant Formula

Key External Stakeholders

Dairy Ingredients and Infant Formula Sector, Dairy Processing Equipment Manufactures and Academic and Research Institutions

Practical Implications for Stakeholders

The study aimed to re-engineer process technology for the manufacture of infant milk formula (IMF) by modification of formulation dynamics and use of steam shockwave Injector (Maklad-Fluid GmbH) technology:

- A greater understanding of the impact of macronutrient interaction (upon heating) on viscosity during IMF manufacture has been achieved and can be utilised for new formulation development.
- High solids infant formulations can be processed using a shockwave steam injector.

- IMF concentrate manufactured with a selectivity hydrolysed whey protein ingredient has application in high dry matter processes for reduced energy costs and more sustainable processing.

Main Results

The study demonstrated that heat-induced changes in infant formula associated with whey protein (denaturation, viscosity) are not only a function of concentration but are also dependent on interactions between macronutrients. Selectively hydrolysed proteins were shown to be an effective way of reducing viscosity, while maintaining good emulsification capacity, in heat-treated high solids concentrates of 1st age (0–6 months) infant formula. A new energy efficient high solids process for manufacture of infant formula with lower viscosity was developed using a shockwave steam injector.

Opportunity/Benefit

The research provides a platform for understanding the heat-induced changes associated with macro-nutrient interactions in IMF for development of new formulations. In addition, technology has been developed for processing formulations at high solids using novel energy efficient approaches based on new ingredients and processing techniques. The new knowledge/process can be exploited by end users i.e., ingredient manufactures and infant, adult and medical nutritional beverage sectors.

Collaborating Institutions

University College Cork, UCC

How to Proceed

For further information access the full Technology Update at:
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Retaining Health Promoting Polyacetylenes in Fully Processed Vegetables

Key External Stakeholders

Vegetable processors, government authorities/ legislators, consumers.

Practical Implications for Stakeholders

Technologies for the maximum retention of biologically active polyacetylenes in carrot, parsnips and fennel products were developed in this project. These technologies have been formulated and disseminated to industry stakeholders and recommendations produced for processors.

Results from the project have been formulated into a series of blueprints and fact sheets for end-users. Knowledge gained from the project can be used to formulate processing strategies which will maximise the retention of polyacetylenes in processed foods.

Polyacetylenes are a group of bio-active compounds present in carrots and other vegetables

which have recently gained scientific attention due to their ability to inhibit cancer development in rats. Carrots contain three polyacetylenes; falcarinol (FaOH), falacrindiol (FaDOH) and falcarindiol-3-actetate (FaDOAc). The present project sought to examine effective processing strategies for retaining these compounds in vegetables and facilitated key recommendations to be made to processors and consumers.

Main Results

- During minimal processing, abrasive peeling accounts for most of the losses in polyacetylene levels, when compared to other minimal processing treatments such as cutting and washing. Therefore, to maximise polyacetylene contents in minimally processed carrot products, less severe methods of peeling are recommended.
- The inclusion of a blanching step prior to sous-vide processing resulted in a significant decrease in levels of FaOH and FaDOH in parsnip disks. Subsequent sous-vide processing had little effect on levels of polyacetylene; however, chill storage for up 20 days did result in significant decreases in these compounds. Roasting resulted in significant losses of polyacetylenes from fennel bulb.
- Ultrasound-assisted hot air drying (UAHD) resulted in higher retention of polyacetylenes in dried carrot disks than blanching followed by hot air drying. Given the minimal impact of ultrasound on polyacetylene content and the general negative impact of blanching, ultrasound could be considered as a replacement for blanching.

Opportunity/Benefit

Opportunities arising from the outputs of the project derive from the ability of vegetable processors to optimise processing protocols for the retention of polyacetylenes. A series of recommendations have been made with regard to traditional and novel processing techniques and these can be used to produce premium products with optimal health promoting properties.

Collaborating Institutions

NUI Galway, Natures Best Ltd

How to Proceed

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Technology

UPDATES

Risk Assessment Network of Ireland

Industry Impact

The study assessed the impact of two food pathogens on the safety of raw milk cheese for the benefit of raw milk cheesemakers and the public in general. The study showed that risks associated with *Staphylococcus aureus* are low, while those associated with *Listeria monocytogenes* are more significant.

Key External Stakeholders

Raw milk cheese industry; Policymakers, Food researchers

Practical Implications for Stakeholders

The study assessed the risk posed by two food pathogens (*Staphylococcus aureus* and *Listeria monocytogenes*) in raw milk cheesemaking. A range of samples (n=117), including milk, curds, whey and cheese, from 5 raw milk suppliers, and 4 raw milk cheesemakers were analysed for coagulase positive *S. aureus*. Of the isolates obtained, 17% had toxin producing ability and produced only Staphylococcal Enterotoxin C (SEC) which is generally animal rather than food associated. The other classical enterotoxins SEA, SEB or SED (food poisoning associated) were not produced. No toxin was produced in raw or pasteurised milk or in sterile

reconstituted skim milk stored below 14°C for 24 h and no SEC was produced during cheesemaking. *L monocytogenes* was found at a level of 300 colony forming units/ml in the milk of one cow with sub-clinical infection. While the numbers of naturally occurring *L. monocytogenes* increased in milk and during cheesemaking, this increase did not appear to be due to growth.

This research was carried out as part of a national network, Risk Assessment Network of Ireland which focused on the application of microbial quantitative risk assessment to underpin risk management actions. Teagasc research assessed the risk posed by two pathogens on the safety of raw milk cheese.

Main Results

- None of the *S. aureus* isolates recovered from raw milk or cheese produced the endotoxins SEA, SEB or SED, nor did they harbour the enterotoxin encoding **genes** *sea*, *seb*, *sed* or *see*.
- 17% of *S. aureus* isolates produced Staphylococcal enterotoxin C (SEC).
- Cheesemaking inhibited staphylococcal toxin production as did storage temperatures below 14°C.
- Optimum conditions for toxin production in reconstituted skim milk were 37°C at pH 6.5.
- *Listeria monocytogenes* was found in raw milk from one cow at a level of 300 cfu/ml, though there was with no evidence of infection in the animal.
- Although numbers of naturally occurring *L. monocytogenes* increased in milk and during cheese making, this increase did not appear to be due to growth.

Opportunity/Benefit

The opportunity was to assess the impact of *S. aureus* and *L. monocytogenes* on the safety of raw milk cheese for the benefit of raw milk cheesemakers and the public in general. The study showed that there were different risks associated with each pathogen.

Collaborating Institutions

University College Dublin

How to Proceed

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Safe and Healthy Foods

Key External Stakeholders

Aquaculture, pork, poultry, beef, egg and honey producers; regulatory agencies, retailers, importers, animal health companies, food safety laboratories and consumers

Practical Implications for Stakeholders

Safe & Healthy Foods programme set out to improve the safety of food consumed or produced on the island of Ireland through the development of new analytical methods and food databases.

A suite of new residue test methods were developed that cover nearly 150 different analytes. The range of compounds covered included veterinary drugs, feed additives, hormonal agents and pyrrolizidine alkaloids in different foods. The application of these tests showed that food consumed on the Ireland is generally of high purity. Residues were detected in a very small proportion of samples rendering them non-compliant. However, >99.6% of samples were residue free. A range of food safety databases were developed or updated on the project including the National Food Residue Database, Veterinary Drug and Feed Additives Databases (VetFAD) and the Central Microbial Database. A new comprehensive food ingredient database (INFID), which has been used to estimate the intake of four sweeteners

(aspartame, saccharin, acesulfame K, sucralose) were within the Acceptable Daily Intake levels for preschool children. The Irish Food Compositional Database was updated with current data on nutrients and bioactive components for a range of different foods.

Main points

- The newly developed databases and technologies will allow stakeholders to significantly improve the safety and quality of food products produced on the island.
- The newly developed tools will allow the stakeholders to more effectively target resources and give better value for money.

Main Results

- New multi-residue test methods developed for nearly 150 contaminant residues in food.
- New databases were developed covering the area of food safety and food consumption.
- Food surveys and exposure assessments were completed showing that the food we eat is very safe.

Opportunity/Benefit

During the project, new knowledge and technologies have been developed that can be used to improve the quality and safety of food products consumed or produced on the island.

Collaborating Institutions

AFBI, QUB, UUJ, UCD, CVRL-DAFM, UCC, CIT

How to Proceed

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Technology

UPDATES

Sensory Acceptance of Low Salt Ready Meals

Key External Stakeholders

Food manufacturers, food policymakers, food safety policymakers, food researchers.

Practical Implications for Stakeholders

Chilled ready meals are becoming increasingly popular but often contain appreciable amounts of salt. Food manufacturers are under increasing pressure from regulators and consumers to reduce salt in food. The present project focused on the impact of salt reduction and reformulation on sensory acceptability of low salt ready meals.

- The addition of key herbs and spices individually can help compensate for shortfalls in sensory acceptability for chilled ready-meals.
- The addition of salt substitutes into all 3 frozen ready-meals made it possible to achieve the FSAI salt reduction targets of 0.63g salt (250mg sodium) per 100g in ready-meals and 0.58g salt (230mg sodium) per 100g in soup.

- By adopting a gradual salt reduction strategy the following salt reductions could be achieved without adversely affecting sensory properties and consumer preference for the meals.

Main Results

Sensory perceptions of low salt ready meals were investigated and the impact of reformulation on sensory acceptability was probed.

- A number of herb/spice blends were formulated that resulted in satisfactory sensory acceptability in comparison to meals with normal salt contents.
- The use of herbs and spices also increased the microbial stability of the meals and enhanced their antioxidant status.
- In conjunction with an industrial manufacturer the reformulated low salt meals were manufactured and analysed for sensory acceptability using a consumer panel. In all cases the reformulated meals were of comparable sensory acceptability to their full salt counterparts.

Opportunity/Benefit

The outputs of this project have shown that research driven reformulation can off-set perceived losses in flavour as a result of salt reduction. The strategies developed could be applied to a range of prepared foods and identify effective measures for reducing salt levels in foods without comprising on sensory acceptability. Expressions of interest in this research are welcome.

Collaborating Institutions

University of Limerick, Dawn Fresh Foods Ltd., All in All Ingredients

How to Proceed

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Status of the Phytochemical Compound, Falcarinol, in Minimally Processed Vegetables

Key Stakeholders

Vegetable processors, government authorities/ legislators, consumers, research community

Practical Implications for Stakeholders

Recently a group of falcarinol type polyacetylenes were shown to be protective against tumour development in humans. In comparison to other compounds with cancer protective effects, relatively little was known about the occurrence of these compounds in plant foods or the effect of industrial or domestic processing on their retention. This project examined the effect of various production processes (peeling, washing, cutting, packaging and storage) on the level of polyacetylenes in a selection of vegetables including carrots, parsnips and fennel. Protocols have been developed for the maximum retention of these polyacetylenes in minimally processed vegetables.

Main Results

- The initial washing stage had no effect on polyacetylene levels.
- Significant losses occurred after peeling in carrots.
- The best retention of polyacetylenes was observed in shredded carrots.
- Polyacetylenes were not susceptible to further degradation when subjected to low or high oxygen MAP (modified atmosphere packaging) and stored for 7 days under chill conditions.
- The use of an air-breathable film as opposed to a conventional polyester-polypropylene film did not have a significant effect on levels of polyacetylenes in stored products.

Opportunity/Benefit

The results of this project will allow vegetable processors to optimise processing protocols for the retention of health promoting polyacetylenes in vegetables including carrots, parsnips and fennel.

Collaborating Institutions

NUI Galway, Natures Best Ltd., Wonderfoods Ltd.

How to Proceed

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Technology

UPDATES

Technological Advances in Spray Drying of Functional Ingredients for Automated Beverage Vending

Key External Stakeholders

Manufacturers of milk powders and dairy ingredients

Practical Implications for Stakeholders

Technologies were developed to produce functional powders suitable for reconstitution/ dispensing as either hot or cold beverages

- Installing an in-line high pressure gas/liquid injection system on the concentrate feed to the spray atomiser of a milk-drier facilitated the production of dried ingredients with extensive foaming properties suitable for use in cappuccino-based beverage formulations.
- *Development of foaming powder for hot beverage formulation and vending* – a knowledge-base was established on the performance of different injection gases used and their interactions with concentrate formulation and process variables on powder characteristics

- *Development of cold mixed smoothie-style beverages from textured dairy-fruit dry blends* – 'smoothie' style powders containing fruit/dairy ingredient blends with desired physical characteristics e.g. texture, viscosity and phase stability were successfully developed for dispensing in prototype vending machines.

Main Results

The immediate effect of using either nitrogen gas or liquid CO_2 injection during atomisation, was improved powder agglomeration and an associated decline in bulk densities (from 0.56g/cc to 0.12g/cc) as well as reduced moisture contents. This was also reflected in changes to the particle size distribution and particle density – the latter reduced from 1.2334g/cc to 0.599g/cc.

Interrelationships were established between drying parameters and powder properties (bulk density, particle size distribution, occluded air, interstitial air, particle density, wettability, foam height using a coffee dispenser at t=0 min, foam height after 5 min, and moisture content) specific to cappuccino beverages. Significant relationships, in particular, were established between powder bulk density and cappuccino foam stability using CO_2 (foam stability = 5.556-(5.532*Bulk Density)) and N_2 (foam stability = 5.017-(4.573*Bulk Density)) dosing.

Opportunity/Benefit

This research provides the opportunity to add functionality and value to spray dried ingredients. This technology may be incorporated, with some adaptation by ingredient drying manufacturers, to prepare fat-filled base or fully-formulated powders for supply to branded food companies with channel dominance in food service markets. Relevant pilot scale technologies at Moorepark may be availed off to support technology transfer initiatives.

Collaborating Institutions

N/A

How to Proceed

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Technology

UPDATES

Technology for Healthier Pork Products

Key Stakeholders

Meat processors, ingredient companies, consumers

Practical Implications for Stakeholders

Traditional meat products such as sausages and cooked ham are often high in fat, salt and contain additives to prolong shelf life, improve colour and prevent oxidation. The information generated in this project will assist meat processing companies to develop healthier products, such as sausages and luncheon role, containing less salt and/or fat and containing natural ingredients that will appeal to consumers.

Main Results

- High pressure processing (HPP) can be used to reduce the salt content of pork sausages from 2.5% to 1.4% without a noticeable change in sensory and functional properties
- A phytosterol ester *(Vegapure)* was used successfully to improve the organoleptic properties of a reduced salt pork breakfast sausage.
- Grape seed extract (GS) and rosemary-pomegranate (RP) extract were added to sausages without any negative effect on the sensory quality of the products, demonstrating the potential of natural flavonoid containing extracts in the development of novel healthy functional meat products.
- Half the nitrite in a pork luncheon roll was replaced with tomato powder without negatively affecting sensory attributes.

Opportunity/Benefit

Meat products are commonly perceived by consumers as unhealthy due to their high fat, salt and artificial ingredient content. This research has shown that healthier versions of traditional meat products, such as sausages and pork luncheon roll, can be produced that are just as acceptable to consumers as standard versions of the same products. There are opportunities for the meat industry to:

- Reduce the salt, fat and nitrite levels in certain processed pork products,
- Replace artificial antioxidants with natural ones,
- Incorporate phytosterol esters with positive health associations

Teagasc can offer assistance in the development of these products.

Collaborating Institutions

IRTA Spain, University of Copenhagen, University of Helsinki

How to Proceed

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Technology

UPDATES

Translating Fundamental Research on *Listeria Monocytogenes* for the Benefit of a Multi-Sectoral Ready-to-Eat Food Industry

Key External Stakeholders

SME food producers, FSAI, DAFM, *safe*food, research community

Practical Implications for Stakeholders

Controlling *Listeria monocytogenes* in the processing environment can contribute to a reduction in the occurrence of *L. monocytogenes* in food.

Main Results

- There was a 50% reduction in the occurrence of *L. monocytogenes* over the 3 years of the project
- Growth of *L. monocytogenes* occurred on 8 of 13 foods tested.
- Verbenone essential oil reduced *L. monocytogenes* growth with minimal product alteration on fresh cut fruit.
- None of the isolates tested were resistant to the biocides used in the industry, but the ability to form biofilms did give resistance.
- The whole genome sequence of 300 Irish *L. monocytogenes* isolates was obtained.
- Sigma B is required for survival of *L. monocytogenes* in the presence of visible light and it has been shown that the blue light sensor is not required under certain conditions.

Opportunity/Benefit

Awareness of the issues relating to *L. monocytogenes* in food and food processing facilities was created.

Collaborating Institutions

NUI Galway, University College Cork, University College Dublin, University of Limerick

How to Proceed

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Understanding and Exploiting the Biogenesis of Cheese Flavour

Key External Stakeholders

Cheese producers, dairy industry, food manufacturers.

Practical Implications for Stakeholders

The project investigated mechanisms to control and accelerate Cheddar cheese flavour and the information generated within this project has significantly enhanced the understanding of flavour generation in Cheddar cheese which can also be applied to many other cheese varieties.

- This research has provided invaluable information on a range of factors that influence cheese quality and the rate of cheese ripening.
- Factors which impact on the activity of chymosin were elucidated.
- Mechanisms to enhance lipolysis in Cheddar cheese were identified.
- The performance of commercial accelerating ripening agents in Cheddar cheese were evaluated.

- Microfluidisation was identified as a practical method to create specific populations of attenuated lactic acid bacteria for use as adjuncts in cheese production.
- Microfluidisation was identified as a suitable method to create food grade liposomes which can be used to deliver exogenous enzymes in cheese curd, with minimum losses to the whey.
- Factors governing the encapsulation efficiency of enzymes and cell free extracts in liposomes were determined.

Main Results

This project investigated a range of factors that influence the ripening of Cheddar cheese. The major areas of focus were enhancing lipolysis and proteolysis through addition of exogenous enzymes, use of adjunct cultures and process manipulation of cheesemilk to control and accelerate cheese ripening.

Opportunity/Benefit

The capacity and expertise generated within this project is readily available and can be utilised for specific cheese applications by contacting the relevant researchers involved.

Collaborating Institutions

University College Cork; University of Limerick; Institute of Chemical Technology Prague; McGill University

How to Proceed

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Technology

UPDATES

Updating Cheesemaking Efficiency

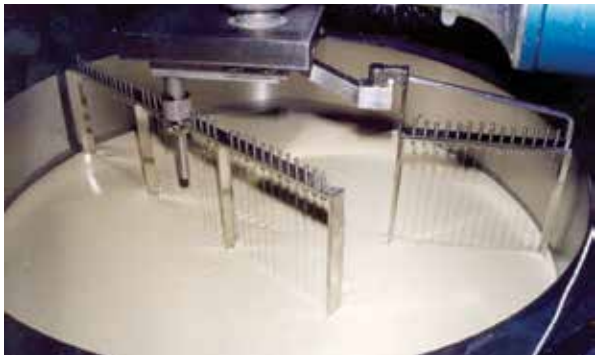
Key External Stakeholders

Irish Cheese and Dairy Industry

Practical Implications for Stakeholders

Manufacturing efficiency is a key aspect of cheese manufacture which influences cheese composition, milk component recoveries and plant profitability.

A major outcome of this project is the provision of new information on the comparative effects of bovine chymosin and camel chymosin on Cheddar cheese making efficiency, and the effects of the high heat treatment of milk at different pHs on its rennet gelation and curd forming characteristics. It also provides an extensive compendium on the effects of milk quality and cheese manufacturing



conditions on cheese making efficiency and quality in the form of 2 monographs (Moorepark Monographs 1 and 2) published in 2010.

Main Results

- The use of chymosin of camel origin (*Camelus dromedarius*) or *Rhizormucor miehei* rennet in place of bovine chymosin (*Bos taurus*) as coagulant in the experimental manufacture of Cheddar cheese had significant effects on the recovery of fat from milk to cheese, cheese yield, and age-related changes in primary proteolysis and texture. These effects depended on the level of coagulant (number of milk clotting activity units added) and firmness of the milk gel at cutting.
- The effects of increasing pH from 6.6 to 7.5 during high heat treatment of milk (80 °C for 5 min) resulted in depletion in the content of k-casein on the casein micelle and an increase in the level in the milk serum to an extent depending on pH. Desk-top cheesemaking studies indicated that increasing the milk pH during heating accentuated the adverse effects of high heat treatment on the rennet coagulability of the milk at pH 6.55 and its cheesemaking characteristics.
- Two monographs (Moorepark Monograph 1. Cheese manufacture: Quality Characteristics of the milk; Moorepark Monograph 2. Cheese Manufacture: Control and prediction of quality characteristics), on the effects of milk quality and cheese, manufacturing conditions on cheese making efficiency and quality were prepared and distributed to Irish Dairy industry in 2010.

Opportunity/Benefit

The research makes available to the dairy industry a database of information on the effects of key cheesemaking parameters on manufacturing efficiency and cheese quality. The comparative study on different coagulants provides statistically validated, practically-applicable information on the impacts of the bovine chymosin, camel chymosin and *Rhizormucor miehei* coagulants on cheesemaking efficiency and changes in the proteolysis and texture of Cheddar cheese during maturation. The cheese manufacture monographs provide a user-friendly reference source of practical information directly applicable to optimisation of cheese manufacturing efficiency and quality.

Collaborating Institutions

N/A

How to Proceed

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Technology

UPDATES

WPI impedes weight gain by reducing the size of the stomach and intestine

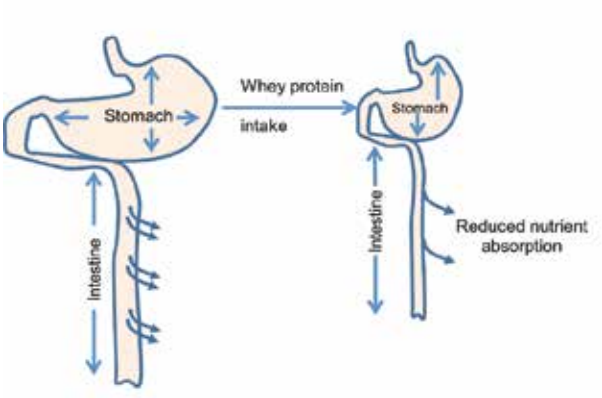
Key External Stakeholders

Dairy industry; ingredients companies; regulatory agencies; nutritionists; athletes; general public.

Practical Implications for Stakeholders

According to the World Health Organisation, nearly all Irish adults will be over-weight by year 2030. Thus, there is an urgent need to develop interventions that prevent the development of obesity.

Because whey is a by-product of cheese manufacture, there is a considerable economic benefit to using whey constituents as health promoting food products. Notably, whey protein isolate (WPI) has been shown to impede weight gain by reducing the size of the stomach and intestine. These findings provide the scientific backing for creation of whey protein enriched food ingredients or ready-made food products with anti-obesity effects.



Main Results

- Animals fed WPI show reduced weight gain compared to those fed casein.
- WPI reduced the size of the gastro-intestinal tract, which appeared to restrict the amount of food that can be ingested to support weight gain.

Opportunity/Benefit

Much attention has focused on identifying the bioactivity associated with milk proteins that reduce weigh gain by causing satiety (reduction in meal number) and satiation (reduction in meal size). We have identified a new mechanism by which WPI impedes weight gain involving the stomach and intestine. Thus, the dairy and Functional Food Industry will now be able to focus attention on WPI and develop protein enriched food ingredients or ready-made food products with anti-obesity effects. The efficacy of such products can be tested by undertaking animal feeding trials in Teagasc, which will help to further establish health claims, and commercialise the related products.

Collaborating Institutions

UCC, UCD, University of Helsinki (Finland), Chinese Academy of Sciences (Beijing, China).

How to Proceed

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Technology

UPDATES

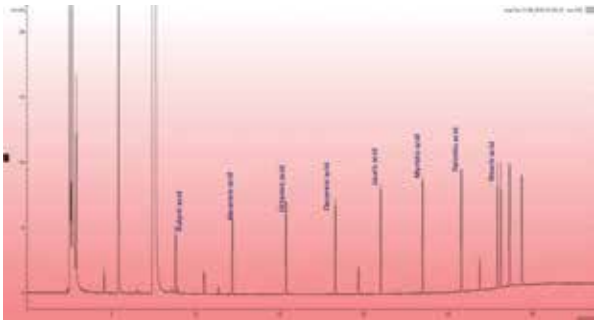
Development and Validation of Gas Chromatography Methods for Free Fatty Acid Determination in Dairy Products

Key External Stakeholders

Food manufacturers, dairy industry, technical service laboratories

Practical Implications for Stakeholders

- The two most commonly used gas chromatography flame ionization detection (GC-FID) methods (FAME & direct on-column) for the quantification of free fatty acids in dairy products were validated and shortcomings (FFA quantification for certain dairy products, method robustness and reliability) were identified.
- A novel GC-FID (FABE) method for quantification of free fatty acids in dairy products which reduces solvent usage, is robust, includes automated derivatization and is suitable for a wide range of dairy products was developed. Limits of detection, limits of quantification, accuracy and precision are comparable to the existing FAME & direct on-column methods.



- The study has highlighted shortcomings in two widely used gas chromatography methods for the quantification of free fatty acids in dairy products which were overcome in a newly developed method which has similar levels of limits of detection (LOD), limits of quantification (LOQ), accuracy and precision in comparison to the existing methods.

Main Results

- A comprehensive literature review was undertaken of pre-existing GC methods for the analysis of free fatty acids in dairy products which was published.
- A novel method for the quantification of free fatty acids in dairy products was developed that is superior to existing methods in terms of robustness, application, and uses less solvent and contains automated derivatization that is comparable in accuracy, precision, LOD and LOQ.
- FAME method: LOD (5ppm), LOQ (20ppm), Accuracy (R2>0.997) & Precision (1.5–7.2%)
- Direct on-column method: LOD (0.7ppm), LOQ (3ppm), Accuracy (R2>0.999) & Precision (1.5–7.2%)
- FABE method: LOD (5/8ppm), LOQ (15/20ppm), Accuracy (R2>0.996) & Precision (4.4–5.4%)

Opportunity/Benefit

This study has enhanced expertise in free fatty acid determination of dairy products, which can also be applied to some non-dairy products. It has also significantly enhanced the international reputation of the researchers involved in relation to lipid chromatography and strengthened our linkages with chromatography experts at Cork Institute of Technology.

Collaborating Institutions

Cork Institute of Technology

How to Proceed

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Technology

Expertise

Technology

EXPERTISE

Prepared Consumer Food Centre

Innovation is a key driver of economic growth and Teagasc is committed to supporting science-based innovation and the delivery of related services to the Irish Prepared Consumer Food (PCF) sector. Teagasc recognises the diversity and complexity of the sector and offers specialist know-how, facilities and services from its Ashtown Food Research Centre.

Background

The Prepared Consumer Food Centre (PCFC) was established by the Department of Agriculture, Food and the Marine in consultation with Teagasc, Food Drink Ireland's Prepared Consumer Food company members, Enterprise Ireland and Bord Bia, to support research, development and innovation in the Prepared Consumer Food Sector.

Benefits to Industry

The PCF Centre supports companies within the sector in piloting industry-led collaborative R&D, maximising value creation opportunities and enabling the adoption of technologies to respond to consumer demands, and enhance competiveness and sustainability within the sector.

Areas of expertise

- Meat products
- Cereal, breads, biscuits and bakery technology
- Fruit and vegetable-based products
- Savoury snacks
- Other food preparations including ready meals, sauces, confectionary
- Non-alcoholic beverages

Facilities/Capabilities

- Food Product Innovation
- Novel Protein Development Suite
- Meat Product Processing Suite
- Packaging Suite
- Advanced Technologies Suite
- Nutritional and Compositional Suite
- Sensory Analysis Suite
- Shelf-Life Suite
- Product Functionality Assessment Suite

Range of solutions

The Centre contains state-of-art pilot scale processing equipment which PCF companies can use for research and development in collaboration with Teagasc and other innovation support organisations. It also encompasses access to modern analytical and sensory laboratories to characterise foods in terms of nutritional, compositional, microbial and sensory profiles allowing complete product and process development.

Of interest to

All prepared consumer food companies

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Technology

EXPERTISE

Analytical Capabilities for Characterisation of Bioactive Compounds

The analytical capabilities at the Nutraceutical Research Facility at Teagasc Ashtown provide expertise and services 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.

Background

The Nutraceutical Research programme in Teagasc plays an important role in providing leadership in research, consultancy and support to Irish food industries in the area of functional foods. Identification of the bioactive components associated with the salutary health-effects and their quantifications are essential requisite to make health claims. Teagasc, with the generous funds largely from the Food Institutional Research Measure, has significant expertise and infrastructure in the area of bioactive component fractionation and characterisation.

Benefits to Industry

EU 2006 regulations on nutrition and health require stringent criteria to qualify novel bioactive compounds for specific health-claims. The chemical structure of the food component(s) responsible for health-promoting attributes is one key criterion. For the food components that have already been approved by EFSA for specific health-claims, or those that have the potential to be approved, Teagasc provides services and expertise in recovery (enriched fractions) and characterisation, which can be incorporated into functional foods.

Areas of Expertise

- polyphenols.
- glucosinolates.
- carotenoids & polyacetylenes.
- proteins & peptides.
- polyunsaturated fatty acids, sterols.
- polysaccharides (beta-glucans/chitosans).

Facilities/Equipment

- Pilot-scale rotary evaporator.
- Flash Chromatography/Preparative Chromatography.
- MALDI-Q-Tof Mass Spectrometer.
- UPLC-TQD Mass Spectrometer.
- GC-MS.

Of Interest to

- Food growers and processors.
- Ingredient companies.

How to Proceed

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Technology

EXPERTISE

Analysis of Food-derived Carbohydrates

Teagasc researchers can provide specialist know-how, facilities and services in carbohydrate chemistry of foods and ingredients. This includes the application of key novel technologies including high-performance anion exchange (HPAE) developed to separate carbohydrates. Coupled with pulsed amperometric detection (PAD), this permits direct quantification of non-derivatised carbohydrates at low-picomole levels with minimal sample preparation and clean-up. Researchers at Teagasc are available to carry out contract or collaborative research with companies in the aforementioned areas with a view to the exploitation of novel technologies for food and food ingredients.

Background

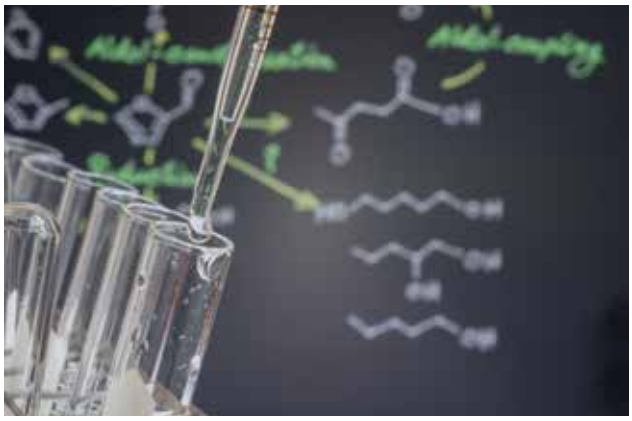
Research on food derived carbohydrates or oligosaccharides has received much attention in recent years, and there is increasing evidence of the local effects of these carbohydrates (either in free form or when attached to proteins or lipids) within the gastrointestinal tract. Such effects may include prebiotic, anti-adhesive and anti-inflammatory activities, glycome modification, an influence on brain development and growth-related characteristics of intestinal cells and other, as yet uncharacterized, effects.

Benefits to Industry

Teagasc have extensive carbohydrate chemistry capabilities and expertise. The Glyco-ingredients laboratory includes state of the art HPLC equipment with detection systems specifically tailored for the analysis of food-derived carbohydrates. These include a Dionex HPLC and a Waters HPLC with Refractive Index detector. For structural determination of unknown carbohydrates we work with our collaborators at NUIG.

Areas of expertise

- Food oligosaccharides and glycoproteins – extraction, enrichment, fractionation and structural.
- Chromatography – Size-exclusion, Affinity and Ion Exchange Chromatography.
- Development of bioassays for investigating the bioactive properties of glycans isolated from food.



Facilities/Equipment

- Dionex HPLC with pulsed amperometric detection
- Waters HPLC with refractive index detector
- Chromatography – size exclusion, affinity, ion exchange

Range of solutions

There are several possibilities by which companies can engage with Teagasc, from provision of services, to contract or collaborative research.

Of interest to

Food and ingredient companies

How to Proceed

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Technology

EXPERTISE

High Protein Powder Characterisation

Teagasc combines technological expertise with its state-of-the-art facilities in order to offer clients a range of innovative processing solutions for the development of ingredients using membrane filtration and spray drying technology. This extends from powders for dairy applications to nutritional formulations, with Teagasc consistently supporting a drive for research that meets client expectations, particularly around areas such as increasing high protein powder solubility through the use of novel and innovative techniques.

Background

High protein powders are used both domestically and globally for protein standardization in fat-filled products, yogurts, therapeutic beverages and in infant milk formulas. However, while issues such as protein denaturation/aggregation and viscosity are challenges during in-process high protein ingredient manufacture, one of the most significant challenges is the subsequent rehydration of these powders. Without proper hydration and complete solubility, the functionality of these protein ingredients is dramatically decreased.

Benefits to Industry

Teagasc Moorepark and Moorepark Technology Limited have pilot plant facilities from laboratory to semi-commercial scale allowing for research to be performed from raw milk intake all the way to the development of high protein liquid streams using membrane filtration and subsequent powder production. The benefit of such facilities allows users to tap into the existing knowledge base at Teagasc and carry out novel and exciting research in areas applicable to them. The benefit to the client also comes from the ability to use advanced methodologies and techniques for analysing powder wettability, dispersability, sinkability and solubility.

Areas of Expertise

- High protein ingredient manufacture.
- Protein denaturation/aggregation kinetics.
- Powder Hydration.
- Ultrasound assisted powder hydration.
- Mineral chelating interactions.
- Infant milk formulation design and processing.

Facilities/Pilot Equipment

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

Range of Solutions

There are several possibilities by which companies can engage with Teagasc, from provision of services, to contract or collaborative research.

Of Interest to

Dairy ingredient and infant formula companies

How to Proceed

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Technology

EXPERTISE

Compositional Analysis of Dairy Products

The Technical Services Laboratory at Teagasc 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 the International Dairy Federation (IDF) reference methods which enables the delivery of accurate and quality results in a timely manner.

Background

In order to deliver high quality products, dairy processers need to be able to deliver accurate and reliable test results. The Technical Services Laboratory in Moorepark has a long history of delivering results to clients in a friendly and efficient manner.

Benefits to Industry

The Technical Services Laboratory can provide testing services to industry clients which are accredited to the international standard ISO17025. As well as our accredited tests, we offer a number of compositional analyses which may suit your needs 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.

Areas of Expertise

- Dairy chemistry.
- Wet chemistry techniques.
- International Dairy Federation techniques, specifically IDF 1, IDF 9, IDF20–3, IDF 20–4, IDF 29–1 and IDF 26.
- Milk analysis using Fourier-transform infrared spectroscopy (FTIR).
- Amino acid analysis using ion-exchange chromatography.

Facilities/Equipment

- Kjeldahl digesters and 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.

Of Interest to

- Dairy and food industry.
- Ingredient and infant formula manufacturers.

How to Proceed

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Technology

EXPERTISE

Food Surfaces and Structure

Specialised knowledge, state-of-the-art 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. Knowledge of food ingredient surface activity can be successfully applied to improved formulation, stability, trouble-shooting and product development strategies. Work can be carried out as contract or collaborative research with companies.

Background

Emulsions (mixtures of immiscible liquids) and foams play a significant role in the production, stability and quality of many food products. Examples of food emulsions include milk, infant milk formula, butter, mayonnaise and dressings. Such emulsions are inherently unstable and require a surface active material (such as milk proteins, phospholipids, monoglycerides etc.) to stabilise oil or water droplets. The physical properties of emulsions are determined largely by the nature of the interfacial layer formed at the surface of the droplets. Fundamental knowledge of such behaviours is critical to the production of emulsions, foams and surfaces in food.

Benefits to Industry

- Characterisation of ingredient surface properties.
- Determination of emulsification, foaming and wetting properties.
- Effects of formulation and processing on the emulsion stability.
- Improved product quality and stability.

Areas of Expertise

- Determination of droplet interfacial tension and surface pressure.
- Mechanical properties of emulsions and foams.
- Competitive surface active behaviour.
- Suitable for oil-in-water (o/w), water-in-oil (w/o), air-in-water (foams) and water/solids (redispersion/wettability of powders).

Facilities/Equipment

- Pendant drop tensiometer.
- Particle size analysis.
- Emulsion/foam stability analysis.
- Dedicated rheology lab.
- Advanced imaging techniques.

Range of Solutions

Various options by which companies can engage with Teagasc, include the provision of analytical services, through to contract or collaborative research.

Of Interest to

- Food and ingredient companies.
- Academic and research organisations.

How to Proceed

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Technology

EXPERTISE

National Food Imaging Centre

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, Moorepark are available to perform contract or collaborative research with companies to identify and solve product quality issues and to help develop new products.

Background

Microscopy often provides key information when troubleshooting existing food products or developing new ones. The NFIC is a major investment in state of the art imaging tools already extensively used by the food industry and other academic collaborators. The processability, texture, flavour and storage/shelf life of foods are controlled not just by chemical composition, but also by how the various ingredients are distributed and interact at the nano- and microscopic length scales. Food structures vary enormously from homogenous liquids to complex, multiphase solids containing fats, proteins, polysaccharides, salts and water in the form of fibres, droplets, crystals, glasses or networks. The size, shape and distribution of these structures greatly influence product stability as well as sensory properties and bioavailability.

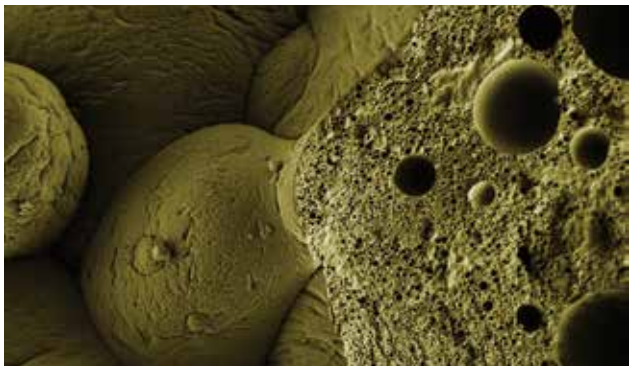
Benefits to Industry

Any food or beverage product can be examined quickly with minimal sample preparation. Typical applications include:

- Powders: morphology, occluded air, fat distribution, size, stickiness, surface features.
- Emulsions: stability – phase separation, protein aggregation, droplet sizing.
- Natural foods: fruit and vegetables, meat, fish;
- Processed foods: dairy (beverages, yogurt, cheese), meat products, bakery, confectionary, spreads.

Areas of Expertise

- Nano/Microstructure analysis of a wide range of foods.
- Relating microstructure to process conditions and product quality.
- Solving product issues.
- Developing new food products.



Facilities/Equipment

- Light microscopes, including high speed camera.
- Confocal scanning laser microscope.
- Scanning electron microscope (includes cryo-stage).
- Atomic force microscope.
- Image analysis.

Range of Solutions

There are several possibilities by which companies can engage with Teagasc, from provision of services, to contract or collaborative research.

Of Interest to

- Dairy processors.
- Ingredient companies.
- Food manufacturers across all sectors including dairy, cereals, meat, snacks, beverage, confectionery etc.

How to Proceed

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Technology

EXPERTISE

Process Analytical Technologies (PAT tools)

Teagasc researchers can provide specialist know-how and facilities in process analytical technologies (PAT tools). This includes the application of key PAT tools that meet industrial standards such as European Hygienic Engineering and Design Group (EHEDG). We also have expert knowledge and experience in the implementation of PAT sensors, for improving process control and quality i.e. through the use of inline/at-line multivariate flow and viscosity meters. Researchers at Teagasc Moorepark are available to carry out contract or collaborative research with companies in the aforementioned areas with a view to exploiting PAT tools to maximise process efficiencies.

Background

The food industry has always been at the forefront in assessing the potential that new processing analytical technologies (PAT) can offer. PAT is any strategy, method or instrument that maximises efficiencies within a process and has been widely adopted in other industries e.g. the pharmaceutical and chemical industries. Implementation of PAT tools into a process is part of the wider "quality by design" framework. The adoption of cost effective, retrofittable, robust and sanitary PAT tools which offer tangible gains from process efficiencies are currently under-utilised in the dairy industry. The benefits of PAT include increased process and product understanding, by monitoring and control of the major steps in a dairy process.

Benefits to Industry

A range of PAT tools are available in Moorepark, which can be utilised on a laboratory or pilot scale using purpose built test skids and rigs. Incorporation of such PAT tools into commercial scale processes allow for greater control and monitor of dairy concentrates, hence generating process efficiencies.

Areas of Expertise

- Evaluation and validation of process analytical technologies (viscosity, flow, pressure).
- Rheological testing of dairy concentrate behaviour.
- Testing of heat-induced protein structural changes.

Facilities/Equipment

- Promass I300 (Endress + Hauser -Viscometer & Flowmeter).
- Portable purpose built test skids with a small footprint.
- FloWave (Burkert) (multivariate flowmeter).
- Vismart (Sengenuity) – viscosity sensor.
- Laboratory scale test rigs.

Range of Solutions

There are several possibilities by which companies can engage with Teagasc, from provision of services, to contract or collaborative research.

Of Interest to

- Dairy and Food Industry.
- Ingredient and Infant Formula Manufacturers.

How to Proceed

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Technology

EXPERTISE

Elemental Analysis of Dairy Products

Teagasc provides elemental analysis for a variety of dairy products (both liquid and powdered dairy samples). Scientists at Teagasc are available for contract analysis of routine and non-routine samples using a number of advanced methodologies including Inductively coupled plasma mass spectrometry (ICP-MS) and X-ray fluorescence (XRF).

Background

Minerals are inorganic substances required by the body in small amounts for a variety of functions. These include the formation of bones and teeth; as essential constituents of body fluids and tissues; as components of enzyme systems and for normal nerve function. Minerals are often absorbed more efficiently by the body if supplied in foods rather than as supplements. Milk and dairy products are an important source of dietary minerals.

Benefits to Industry

An understanding of the role of charged ions is important from the perspective of the food processor as the mineral content can have a key determining role in the physicochemical properties of foods, including aggregation and heat stability of food stuffs and, in particular, infant formula. It is also important to be able to support label claims, from the perspectives of nutrition and toxicity.

Areas of Expertise

Inductively-coupled optical emission mass spectrometry (ICPOES), Inductively-coupled plasma mass spectrometry (ICPMS) and X-ray fluorescence (XRF) are now well-established methods for basic analysis. The purchase of an ICP-MS system at Teagasc has enhanced our ability to investigate the complex role played by minerals in both the processing and nutritive properties of foods. This technology advances our knowledge on the key role played by many of the counter ions present in dairy products. Teagasc also has expertise in XRF methods which can be applied to analyse solid, liquid, and thin-film samples for both major and trace (ppm-level) components. The analysis is rapid and usually sample preparation is minimal or not required at all.

Facilities/Equipment

- ICP-MS analysis of dairy products.
- XRF and Ion chromatographic analysis.
- Atomic absorption spectroscopy of cheese samples.
- Use of classical methods such as titration and spectrophotometric methods for powders and cheeses.

Range of Solutions

Companies can engage with Teagasc to find technical solutions to problems either as contract work or as part of collaborative research.

Of Interest to

Food and ingredient companies

How to Proceed

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Technology

EXPERTISE

Meat Technologies

Teagasc, through its food research centre at Ashtown, supports innovation in the Irish meat industry through the delivery of high quality research and industry development programmes. Areas of Expertise include meat quality, process technologies increased valorisation and non-invasive predictive technologies as well as the development of healthier and more functional added value meat products. Facilities include a research abattoir, cooked meats facility, sensory unit and state-of-the-art research laboratories.

Background

Research projects funded through DAFM, various agencies and industry collaborations have strengthened the meat research expertise and facilities at Teagasc. State-of-the-art facilities include a pilot scale meat unit incorporating a licensed abattoir, production units for meat processing and packaging under controlled refrigeration systems and a cooked meat facility for curing, smoking and cooking.

Benefits to Industry

Teagasc supports competitiveness and sustainability in the meat sector through excellence in science, technology and management systems. Advice in areas such as packaging/labelling, legislation and food assurance standards, ingredients and equipment sourcing can be provided through collaborative projects or consultancy. Various testing services are offered on a fee-paying basis as well as access to training and skills development programmes and facilities.

Areas of Expertise

- Enhancement of meat quality.
- Evaluation of meat quality.
- Development of healthier functional products and value added processed meat products.
- Exploitation of meat by-products and waste streams.
- Ingredient innovations and clean-label processed meat.
- Interventions for improved quality in primary processing.
- Predictive technologies for quality assessment.

Facilities/Equipment

- Slaughtering/boning.
- Meat processing and cooking.
- Packaging.
- Chilling and freezing.
- Analytical (incl. GC, NMR, oxidative status, texture analysis, yield studies, colour analysis).
- Sensory testing facilities.
- Product development plant/incubation units.

Testing services

- Shelf-life and microbial testing.
- Residue and chemical analysis.
- Compositional and nutritional analysis.
- Consumer and sensory studies.
- Quality testing including flavour, colour and textural analysis.

Range of Solutions

Companies have the opportunity to pay for consultancy services, product development support, access to facilities, training programmes on an individual and confidential basis. Also, routine and speciality meat testing services are available. Collaborations in meat research with academic and industrial partners are also actively undertaken.

Of Interest to

- Meat processors and manufacturers.
- Consumer food manufacturers incorporating meat into their products.
- Research institutes/universities seeking collaborators.

How to Proceed

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Technology

EXPERTISE

Innovative Dairy Flavours

Researchers based at Teagasc Food Research Centre, Moorepark have developed a strong scientific base on the understanding of dairy flavour pathways, particularly in relation to cheese, cheese concentrates, butter and yogurt which is now available for exploitation by companies. We can provide specialist know-how and analytical services in formulating and processing natural cheeses in combination with other ingredients in order to develop a range of dairy flavour ingredients to suit particular food applications in the convenience and snack-food industry.

Background

Less personal time for food preparation has led to an increase in the consumption of prepared and semi-prepared convenience foods. Food manufacturers have to target these developments to ensure competitiveness. Dairy ingredients are an important component in many foods, used to provide flavour, functional and/or visual attributes. At Teagasc a strong scientific base has been developed on the understanding of dairy flavour pathways, particularly in relation to cheese, cheese concentrates, butter and yogurt, through years of research and commercial interaction.

Benefits to Industry

Engagement with Teagasc by food companies provides:

- Access to expertise, state-of the-art infrastructure and specific technological services.
- Assistance in development of new dairy flavour ingredients.

Areas of Expertise

- Development and use of concentrated dairy and cheese flavours, and enzyme-modified cheeses.
- Selection of commercial food grade enzymes through database of key enzyme activities.
- Biotechnological approaches to flavour development.
- Selection of bacterial cultures for flavour development.
- Identification of off-flavours e.g. lipolytic & oxidative rancidity.
- Use of micro-encapsulation for flavour protection.
- Advanced microbiological, biochemical and analytical capabilities.

Facilities/Equipment

- Pilot plant facilities incl. mixers and tall-form spray drier.
- Separation, concentration, homogenisation and heating systems.

- Analytical capability incl. advanced chromatographic techniques, GC-MS, GC-O, GC-FID, GC-PFPD, HPLC.

Range of Solutions

There are several routes by which companies can engage with Teagasc, from provision of technological services, to consultancy, contract or collaborative research.

Of Interest to

- Food ingredient companies involved in development of dairy flavoured ingredients.
- Food manufacturers using dairy flavours in preparation of convenience and snack-foods.

How to Proceed

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Technology

EXPERTISE

Bio-functional Food Engineering (BFE) Facility

The Bio-functional Food Engineering facility (BFE) is a state-of-the-art facility for food technologists to process and stabilise ingredients for use in nutritional beverages including infant formula. It provides key research infrastructure to support the Teagasc Food Research Programme and collaborations with industry and is a centre of excellence for nutritional beverage research, including infant formula.

Background

The BFE facility, funded through the FIRM Strategic Equipment Fund 2006, is a state-of-the-art facility for food technologists to process and stabilise ingredients for use in nutritional beverages, including infant formula. Designed to fast track the transfer of ideas from the laboratory to pilot plant, the range of unit operations offered by BFE cover areas such as dehydration, separation, encapsulation and thermal processing.

Benefits to Industry

The BFE facility provides a 'one stop facility' for dairy based beverage applications. It has unique fully integrated research pilot scale fermenters/reactors and processing capabilities with easy access to scale-up equipment at Moorepark Technology Ltd. (MTL). The equipment has been carefully matched to allow transfer of product from one bench scale process to the next, providing a highly flexible processing environment where the goal is high throughput of experiments with complex design.

The BFE provides a technological platform for use by industry at the near market stage. Ultimately, it is expected that the facility will make a key contribution to the development of foods and beverages containing bio-active ingredients with proven stability and shelf-life.

Facilities/Equipment

- Multi-stage spray dryer with fluidising capabilities capable of drying milk derived components.
- Multifunctional membrane filtration plant suitable for separating milk and ingredients.
- Supercritical fluid extraction.
- Adsorber chromatography unit.
- Continuous decanter centrifuge for concentration and purification of bioactive substances post-fermentation, precipitation and hydrolysis of dairy and plant materials.

- Concentric nozzle encapsulator for micro-encapsulation of bio-active components 10-1000µm.
- Microthermics heat exchanger & in-line homogeniser.

Of Interest to

- Dairy and Food Industry.
- Ingredient and Infant Formula Manufacturers.

How to Proceed

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Technology

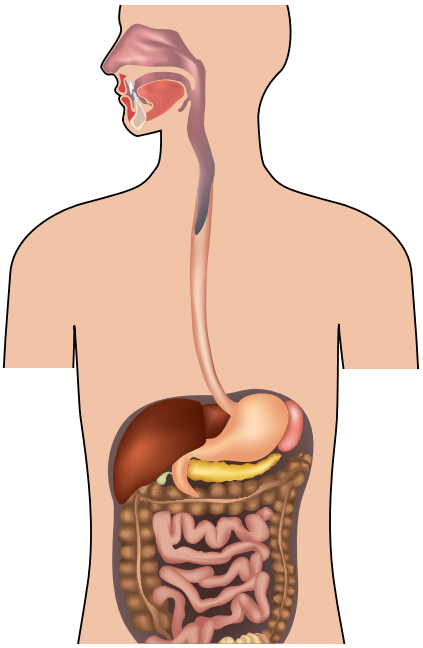
EXPERTISE

Digestion, Bioaccessibility and Bioavailability

Researchers at Teagasc Food Research Centre are available to perform contract or collaborative research with companies to map the fate of food during gastro-intestinal digestion. Expertise is available in digestion, bioaccessibility and bioavailability of food components using *in vitro* and *in vivo* animal models.

Background

With the development of foods for health, there is a need to understand how food and its components are digested. Teagasc has developed a platform to digest food and assess if /when individual components are bioaccessible and bioavailable to the body.



Benefits to Industry

Teagasc can assist clients in tracking food and its components during gastro-intestinal (GI) digestion. Such knowledge can be used to modify food processing, food formulation and food design to improve efficacy of bioactives and nutrients. Digested samples at various time points can be provided for further screening in bio-assays. Information can also be used as a pre-cursor or selection aid for larger, more costly human intervention studies.

Areas of Expertise

- Facilities/Equipment.
- Range of Solutions.

Teagasc has the capability to map the fate of food and its components during GI digestion. This can be achieved by providing information on digested food or food ingredients or by providing digested, freeze-dried samples for further testing.

Of Interest to

Functional food/ingredient manufacturers

How to Proceed

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Technology

EXPERTISE

Food BioTest Capabilities

The prevalence of major diseases such as obesity, diabetes, sacropenia and cardiovascular disease is increasing in the human population. Therefore, a major focus in the Functional Food sector is to develop food ingredients that improve health and reduce the incidence of disease. It is important to assess the functionality of the ingredients of interest by undertaking animal feeding trials representative of human consumption. Teagasc is in a position to assist companies in this process through its state-of-the-art Food Bio-test facility.

Background

As part of Teagasc's on-going commitment to improving the health of people in Ireland, a Food Bio-test facility was established to test the efficacy of food ingredients (bioactives, nutrients, probiotics, oligosaccharides and prebiotics) in pig and/or mice. With the help of state of the art technology, we are able to assess *in vivo* the health benefits of dietary ingredients in various food matrices.

Benefits to Industry

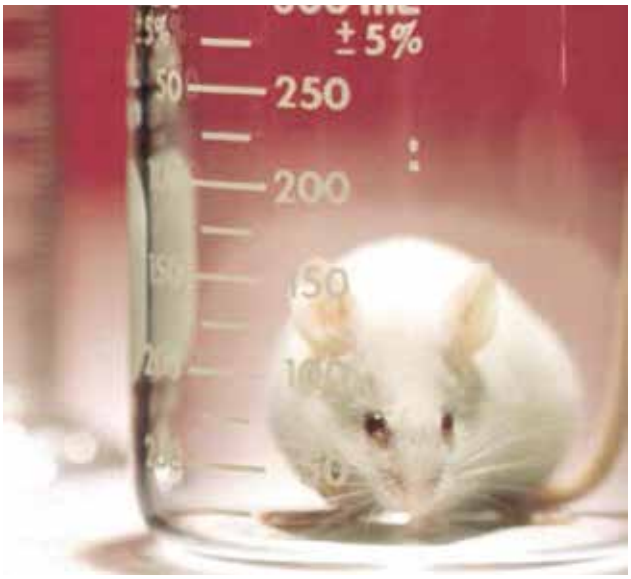
We can assist clients in testing efficacy of food ingredients using animal models. Animal studies are less costly than human studies and serve to predict biological functionality in humans.

Areas of Expertise

- foods for weight management, satiety, adiposity, muscle health, gut health and pregnancy.
- physiological, biochemical and molecular assessment of health.
- dietary challenges to pigs and mice.
- digestion and bioavailability of food ingredients.

Facilities/Equipment

- Dedicated research units to perform animal trials.
- State-of-the-art technology to measure physiological parameters such as food intake, body weight, body composition and locomotor activity, circulatory factors such as hormones, cellular activity (metabolic signals, enzymes, proteins, genes).



Range of Solutions

We are able to perform short term (days) and long term (months) feeding trials in pigs and mice. In addition we can undertake post-prandial and gestational studies in pigs. We can investigate oral bioavailability, dosage and food formulation.

Of Interest to

Functional food/ingredient manufactures

How to Proceed

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Technology

EXPERTISE

Starter Culture Technology

Teagasc researchers can provide specialist know-how, facilities and services in starter culture selection and improvement. State-of-the-art developments in genomics and metabolomics are providing the tools for a more 'knowledge-based' approach to selection of desirable cultures. By linking genomic traits to phenotypic outputs, it is now possible to mine the metabolic diversity of starter cultures and select strains with desirable and industrially significant properties which can impact on both the production and final quality of the product.

Background

Fermented dairy products are one of the key drivers of exports by the dairy industry. The starter cultures used for production of these products are of great industrial significance. However the drive for new products to meet consumer demands can push the boundaries of microbial performance, requiring the development of new starter culture blends with novel properties. Teagasc has developed valuable capabilities in starter selection and improvement, employing state-of-the-art genomic technologies in a more 'knowledge-based' approach to the selection and generation of desirable cultures.

Benefits to Industry

An in-depth knowledge of properties such as phage resistance, flavour and texture can allow starter blends to be 'tailor made' to suit industry needs. This approach also allows for the potential improvement of these and other key characteristics in existing strains, strains which are at the core of the dairy industry. Applying this knowledge to starter culture development is enabling the generation of superior starters and novel products for future market expansion.

Areas of Expertise

- Screening and selection of novel cultures.
- Starter blend deconstruction and characterisation.
- Development of starter rotation schemes.
- Food-grade approaches to starter culture improvement.
- Genomic and metabolic profiling of dairy cultures.
- Phage audits of dairy processing facilities.
- Development of phage detection systems.

Facilities/Equipment

- Specialised equipment for monitoring key technological traits, e.g. iCinac (AMS Alliance).
- Genome sequencing capabilities.
- Dedicated flavour chemistry laboratory.
- Extensive analytical facilities (e.g. HPLC, GC-MS).

Range of Solutions

There are several possibilities by which companies can engage with Teagasc, from provision of services, to contract or collaborative research.

Of Interest to

- Commercial dairy companies.
- Commercial starter culture suppliers.

How to Proceed

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Technology

EXPERTISE

Thermal Analysis of Foods

Teagasc researchers can provide specialist know-how, facilities and services in thermal analysis of foods and ingredients. This includes food materials and product process evaluation, stability studies and sample testing. Researchers at Teagasc Food Research Centre, Moorepark are available to carry out contract or collaborative research with companies in the aforementioned areas with a view to exploitation of novel ingredients, products/processes. A range of testing services and consultancy is also offered.

Background

An understanding of the influence of temperature on physicochemical/structural changes in food provides manufacturers with a mechanism for optimisation of processing conditions and, ultimately, improves product quality. Teagasc, with the support of the Teagasc Vision Program, recently installed state-of-the-art DSC and DMA instrumentation at Teagasc Food Research Centre, Moorepark. Methodologies have been developed and the instruments are validated for a comprehensive range of thermal analysis applications.

Benefits to Industry

This state-of-the-art thermal analysis equipment strengthens the research and development capabilities of the Irish food industry. This equipment enables the measurement of the physical properties of food materials and products and determination of their thermal and mechanical histories. Hence, thermal analysis will assist in the optimisation of processes used in food manufacture and the stability of foods in various environments.

Areas of Expertise

- Phase/state transitions of food ingredients.
- Crystallisation and melting behaviour of fat.
- Thermal properties of proteins, including thermal and freezing induced denaturation.
- Gelatinisation behaviour of starches and interactions with other ingredients.
- Oxidative decomposition, oxidation stability of food components.
- Mechanical relaxation of food ingredients.
- Mechanical and viscoelastic behaviour/properties of food.

Facilities/Equipment

- Differential Scanning Calorimetry (Q2000 Tzero DSC, TA Instrument).
- Dynamic Mechanical Analyser (Q800 DMA, TA Instrument).
- Humidity Control Unit and Liquid Nitrogen Cooling system.

Range of Solutions

There are several possibilities by which companies can engage with Teagasc, from provision of services, to contract or collaborative research.

Of Interest to

- Dairy and Food Industry.
- Food Ingredient and Infant Formula Manufacturers.

How to Proceed

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Technology

EXPERTISE

Whey Processing Capabilities

Teagasc has the expertise and experience to isolate and fractionate individual components of whey with a view to adding considerable value to these sought after protein ingredients. There is considerable commercial value in fractionation of individual whey proteins with well characterised functional and biological properties for use in consumer foods, nutraceutical and therapeutic applications.

Background

Whey protein is a mixture of a number of proteins that have their own unique nutritional, functional, physiological and nutraceutical properties. These properties are not fully exploited in whey protein concentrates and isolates, hence the value in characterising the individual whey proteins for their potential use in consumer foods, nutraceuticals and therapeutics. Teagasc, Moorepark, has extensive experience of working with companies in this area, as well as state-of-the-art facilities and equipment.

Benefits to Industry

Teagasc can assist manufacturers of whey products and end-users who use whey protein as an ingredient in formulated foods such as infant formula, sports and other beverage applications. Expertise is available for development, scale-up, optimisation and technology transfer of whey protein separation processes based on centrifugal and membrane filtration technologies. This should allow manufacturers of whey ingredients and nutritional beverages to develop new products centred on scientifically proven functional attributes.

Areas of Expertise

- Separation of whey protein fractions at laboratory and pilot scale and scale-up of processes.
- Optimisation/modification of existing whey protein separation processes.
- Analytical capabilities including HPLC electrophoresis, texture/rheology measurements, analysis of protein functionality, gelation, emulsification, foam formation, solubility.
- Engineering, rheology, microscopy and heat stability capabilities.

Facilities/Equipment

- Pilot plant facilities of Moorepark Technology Ltd.
- Cross-flow membrane filtration technology (tubular, spiral-wound, plate and frame).
- Centrifugal technology.

- Electro-dialysis plant 2500l/hr whey.
- Analytical instrumentation.

Range of Solutions

We can provide a range of solutions from technical services, contract production of whey fractions for market evaluation, consultancy and project management, to partnering in collaborative research in the area of whey processing.

Of Interest to

- Manufacturers of dairy ingredients and nutritional beverages including infant formula, medical and sports applications.
- Any companies using or interesting in adding value to their whey protein as an ingredient, from consumer foods to nutraceuticals to therapeutic applications.

How to Proceed

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Technology

Services

Anthelmintic Drug Residue Testing

Teagasc researchers at Ashtown are leading experts in the area of anthelmintic drug residue detection. They offer an analytical service covering a wide range of anthelmintic residues in meat, milk and dairy products. This unique method measures 40 substances and is available for the Irish agri-food industry as a specialist service from our accredited laboratories at Ashtown.

Background

Anthelmintics are one of the most widely used groups of veterinary medicines in the world. They are used in prophylaxis and therapeutic treatment of parasitic infections in livestock animals. The control of nematode (roundworm), cestode (tapeworm) and trematode (fluke) infections in food-producing animals is essential for maintaining animal health and the financial viability of primary producers of meat. Anthelmintic drugs used in livestock production include various benzimidazole compounds, imidazothiazoles, macrocyclic lactones and flukicides.

Maximum Residue Limits (MRLs) have been set for a number of these anthelmintic residues in milk and edible tissue including muscle, liver, kidney and fat to reduce the risk to human health. Only a few products are approved for dairy animals and have limits set in milk. The remainder are unapproved and a zero tolerance is applied.

Teagasc researchers developed a test that simultaneously measures 40 veterinary drug residues and are offering this test as a service to the agri-food industry.

Benefits to Clients

Under Directive 96/23/EC the food industry is required to have self-monitoring programmes in place to monitor for residues in food of animal origin.

By using this test you can be satisfied that you are in compliance with EU legislation and customer specifications.

This test will support industry in the export of food and gaining access to new markets.

Testing Details

The Ashtown method has been validated in liver, meat and milk samples according to the 2002/657/EC guidelines. The method is very sensitive and has a limit of quantitation of 1ìg/kg (ppb) for 38 residues, 2 ìg/kg for bithionol and clorsulon. The test includes avermectin, benzimidazole, flukicide and pesticide residues. The method has been accredited by the Irish National Accreditation Board.

How to Proceed

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Anticoccidial Residue Testing

Teagasc has developed an extensive test to measure anticoccidial residues in meat, milk and eggs. The method has been extensively validated at EU Maximum Residue Limits (MRLs) and Maximum Limits (MLs) set for non-target species.

Background

Anticoccidial drugs are widely used as additives in feed and as veterinary drugs for the prevention and treatment of coccidiosis in poultry and other animals.

MRLs and MLs have been set for a number of these anticoccidial residues to reduce risks to human health. In 2009, new MLs were set for non-target tissues to allow for the unavoidable carry-over of anticoccidials in non-target feed.

Teagasc has developed a test based on liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) that can measure up to 23 anticoccidials in eggs, meat and milk and is offering this test as a service to food companies.

Benefits to Clients

Under Directive 96/23/EC the food industry are required to have a self-monitoring programme in place to monitor for residues in food of animal origin.

By using this test you can be satisfied that you are in compliance with EU legislation and customer specifications.

Service Details

The Ashtown method has been validated according to the 2002/657/EC guidelines. The method is very sensitive and has a limit of quantitation of 2.5 µg/kg or less for most analytes. The method is currently accredited in egg and avian muscle. The method was accredited in 2012 by the Irish National Accreditation Board.

How to Proceed

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Table 1. The anticoccidial residues that can be measured using the Teagasc test.

Residue	Classification
EU Licensed	
Amprolium	Veterinary Drug
Cyromazine	Veterinary Drug
Decoquinate	Feed Additive & Veterinary Drug
Halofuginone	Feed Additive & Veterinary Drug
Imidocarb	Veterinary Drug
Lasalocid	Feed Additive
Maduramicin	Feed Additive
Monensin	Feed Additive & Veterinary Drug
Narasin	Feed Additive
Nicarbazin	Feed Additive
Robenidine	Feed Additive
Salinomycin	Feed Additive
Semduramicin	Feed Additive
Toltrazuril	Veterinary Drug
Toltrazuril Sulphoxide	Veterinary Drug
Toltrazuril Sulphone	Veterinary Drug
Not licensed in the EU	
Arprinocid	Feed Additive
Clopidol	Feed Additive
Diaveridine	Feed Additive
Laidlomycin	Feed Additive
Nequinate	Feed Additive

Technology

SERVICES

Blown Pack Spoilage Testing (T-Bio®)

Teagasc researchers have developed a specialist blown pack spoilage (BPS) test which is available at Teagasc Food Research Centre, Ashtown as a service to the meat industry.

Background

Blown pack spoilage occurs in correctly chilled batches (0 to 2°C) of vacuum packaged beef after 4 to 6 weeks and is caused by Clostridium estertheticum and Clostridium gasigenes. This type of spoilage is characterised by the production of large volumes of gas (carbon dioxide), a putrid smell and a metallic sheen on the meat. Meat spoiled in this way has no commercial value.

Service Details

As part of the TBio technology transfer project, Teagasc (Ashtown) offers a testing service for Clostridium estertheticum and Clostridium gasigenes. Each test currently costs €15 and results are provided within 24–48 hours.

Of Interest to

The **T-Bio**® test is primarily of interest to the meat industry.

T-Bio®

How to Proceed

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Bioactive Peptide Discovery Unit

The Bioactive Peptide Discovery Unit at Teagasc is a world class facility, equipped to purify and characterise bioactive peptides produced by microorganisms, protein hydrolysis or fermentation. This facility and related capabilities can be accessed by research institutes, SME's, national and multinational companies with an interest in purifying, identifying, analysing or synthesising bioactive peptides at research scale for food or biomedical applications.

Background

Many dietary proteins contain 'encrypted' peptides, released upon enzymatic cleavage, identified as having specific bioactivities of commercial interest. Examples include peptides that can influence blood pressure (anti-hypertensive), inhibit undesirable microorganisms (antimicrobial) and prevent infection (anti-infectives). The bioactive peptides associated with these biological properties may be developed as functional food ingredients or for pharma/biomedical preparations. The identification and characterisation of these molecules is the first step in their path to commercialisation.

Competitive Advantage to Clients

The Bioactive Peptide Discovery unit is a unique facility offering a one-stop shop for those interested in any aspect of peptide identification, purification, analysis or synthesis.

Service Details and facilities

The unit is equipped with analytical and semi-prep HPLCs, FPLCs, a MALDI TOF mass spectrometer, a peptide synthesiser, an amino acid analyser, and a DIGE 2D electrophoresis unit.

Areas of Expertise include:

- Purification of peptides using reversed phased and ion exchange HPLC and FPLC.
- Molecular mass determination of peptides and proteins, protein identification via peptide mass fingerprinting and peptide sequence confirmation of small peptides via MS/MS using MALDI TOF mass spectrometry.
- Microwave Fmoc synthesis of peptides 2–60 amino acids long at 0.1 or 0.25 mM scale.
- Free amino acid analysis of biological samples and compositional analysis of proteins.
- Whole cell protein profiling using Difference In Gel Electrophoresis (DIGE).

Of Interest to

This facility is primarily of interest to research institutes, SME's, national and multinational companies with an interest in purifying, analysing or synthesising bioactive peptides at research scale for food or biomedical applications.

How to Proceed

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Technology

SERVICES

Grain Monitoring

Teagasc offer a National Grain Quality Monitoring Scheme to the grain trade, through Teagasc Food Research Centre, Ashtown. The purpose of this scheme is to ensure that all instruments, used in the measurement of the quality of grain at intake point during the harvest period, are providing uniform results.

Background

As grain is sold on a weight basis one of the most important characteristics at intake is the moisture level. Teagasc facilitate a National Grain Moisture Monitoring Scheme that ensures the standardisation of methods and instruments used across the country to measure grain quality at intake point during the harvest period.

Benefits to Clients

- Ensures moisture levels are accurate and grain producers are receiving adequate prices for their products.
- Participants of the Scheme can request additional moisture testing through Teagasc at a reduced rate.
- Protein determination is also provided at a rate of €30 per sample to Scheme participants. Protein levels are important as they can determine the end use of the grain and therefore the price.

Testing Details

Teagasc select raw grain samples from 8 different intake points around the country and analyse the grain for moisture content. Replicate samples are then sent to participating members of the Scheme who are asked to duplicate the analysis using their own equipment and the methods provided. Each member is provided with large standard samples at the beginning of the harvest. These standard samples are approximately 400g each for oven/protimeter testing or 1000g for other moisture meters requiring a larger test sample. All samples will be provided in an airtight container to prevent moisture loss over the course of the harvest. The samples available are wheat, barley & oats.

Of Interest to

Grain producers

Nineteen companies are currently subscribed to the Scheme.

How to Proceed

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Carbamate Pesticide Testing

This addition to Teagasc testing services allows for reliable and sensitive detection of 31 carbamate pesticides in animal tissue. This test confirmatory has now been validated to EU criteria.

Background

Carbamate pesticides are used worldwide to protect crops against a range of pests, due to their broad spectrum of insecticidal activity, effectiveness, and the nature of non-persistence in the environment. Despite their benefits, low levels of pesticide residues may remain in the crops, animal feeds or environment leading to contamination of the food chain. Exposure to pesticide residues in food is of considerable concern to consumers, food producers and regulators due to their subacute and chronic toxicity. Carbamates are of particular concern due to their anticholinesterase activity in the nervous system, which leads to an accumulation of the neurotransmitter, acetylcholine, at nerve terminals, causing subtle and long-lasting neurobehavioral impairment in humans. Symptoms of toxicosis include abdominal cramps, nausea, diarrhoea, salivation, miosis, dizziness, tremor, anxiety and confusion.

Service Details

By using this test you can be satisfied that you are in compliance with EU legislation and customer specifications. This will support you in exporting food and gaining access to new markets.

Benefits to Clients

The carbamates test, developed by Teagasc, allows the analysis of 31 residues in liver tissue using liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS). The method uses a rapid QuEChERS sample preparation procedure, which can give faster turnaround time on your analysis.

The carbamates method was validated in liver samples according to the 2002/657/EC guidelines. The method is very sensitive and has a limit of quantitation ranging from 2 to 7.6 µg/kg. The method has been accredited by the Irish National Accreditation Board.

Table 1: The 31 residues that can be measured using the carbamates test.

Carbamate residue	
2,3,5 Trimethacarb	Methiocarb
3-Hydroxycarbofuran	Methiocarb sulphone
Aldicarb	Methiocarb sulphoxide
Aldicarb sulphone	Methomyl
Aldicarb sulphoxide	Molinate
Aminocarb	Oxamyl
Bendiocarb	Oxamyl oxime
Benthiavalicarb	Pebulat
Carbaryl	Pirimicarb des methyl
Carbofuran	Pirimicarb
Diethofenocarb	Propamocarb
Fenobucarb	Propoxur
Fenoxycarb	Prosulfocarb
Indoxacarb	Thiobencarb
Iprovalicarb	Triallat
Isoprocarb	

How to Proceed

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Technology

SERVICES

Consultancy in Food Quality Assurance

Teagasc, through its Food Research Centre at Ashtown, provides a unique specialist technical service package to state bodies, regulatory agencies and industry, especially SMEs. This package encompasses specialist technical advice and standards development, technology/information transfer of research programme outputs and benchmarking through advanced technical assessment of completed processes.

Background

Emerging stringent legislative principles and quality assurance standards clearly place the responsibility for assuring food safety on food sector management. Commercial customers and retailers are conscious of the realities of market-place incidents and seek assurance from their suppliers on the adequacy and effectiveness of the control systems that are in place.

To address these requirements, food quality management systems (incorporating food safety) must increasingly be robust to meet such demands, whilst also remaining cost effective in order to meet commercial objectives. There is an increasing focus on the quality assurance chain incorporating traceability from farm to fork. This, together with renewed government support, has provided unprecedented challenges and opportunities for the Irish food sector and supporting organisations.

Benefits to Clients

Companies who implement and operate world class quality assurance standards enjoy the following benefits:

- Increased market access.
- Customer and consumer confidence.
- Enhanced ability to meet stringent legislative requirements.

Service Details

This is a confidential service. We work with the client to put together the most suitable package in terms of assessment, consultancy and implementation and may include the following service options:

- Independent audits of food/feed businesses against appropriate industry standards.
- Supplier audits.
- Pre-certification audits for various standards including Bord Bia, BRC etc.

- Confidential reports on levels of compliance and non-compliance with relevant legislation/ standards.
- Technology capability assessments and advice.
- Trouble-shooting/ problem-solving.

Of Interest to

This service is relevant to food SMEs, state agencies and regulatory bodies, who wish to benefit from such specialist technical advice.

How to Proceed

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Flavour Profiling of Foods and Beverages

Teagasc has a state of the art flavour chemistry facility at the Teagasc Food Research Centre, Moorepark. Here, we can analyse the volatile and non-volatile components of food that directly impact on flavour perception, using a wide range of advanced chromatographic equipment and software.

Background

Flavour is derived from approximately 75% aroma (odour) and 25% taste. The number of taste compounds is relatively limited to 'sweet', 'sour', 'salty', 'bitter' and 'umami', however other sensations and interactions exist that increase the complexity of taste, such as 'acid', 'hot', 'cooling', 'astringency' and 'mouth-coating'. The number of odour compounds is in the thousands which are made of a wide range of different chemical classes. We have extraction and separation methodologies designed to elucidate compounds that influence flavour either positively or negatively. Flavour chemistry can be used to support sensory analysis or as a standalone discipline. The flavour chemistry facility undertakes research in a wide range of food and beverages directly within Teagasc research programs but also in collaboration with external research groups. It also provides a very active service to industry and has an extensive database of flavour compounds, whose origin and odour properties are known.

Capabilities on Offer

- Flavour profiling.
- Identification of odour active compounds.
- Olfactory analysis.
- Preference mapping.
- Product matching.
- Flavour shelf life.
- Identification of taints/off-flavours.
- Oxidative rancidity.
- Predictive modelling.
- Product quality.

Service Details

- Advanced chromatography mass spectrometry.
- Extraction Techniques.
- Thermal Desorption, Solid Phase Micro-Extraction, InTube-Extraction, Sorptive Extraction.
- Sniffing ports.

Of Interest to

Industry and academia involved in food and beverages from production to packaging.

How to Proceed

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Technology

SERVICES

High Throughput DNA Sequencing Platform

The Teagasc Sequencing Platform, available though resources at Teagasc Food Research Centre, Moorepark can bring the power of the cutting edge technologies to your DNA sequencing projects. This technology can be employed for whole genome di novo sequencing, transcriptome profiling, characterisation of the microbiology of food, environmental, animal and human samples, amplicon sequencing and more.

The Platform also has a dedicated, highly experienced, bioinformatics team to analyse and interpret the sequencing outputs.

Background

DNA Sequencing technologies have been revolutionised in recent years. The Teagasc sequencing platform contains cutting edge technologies from Illumina, Ion and Oxford Nanopore.

These instruments have a range of applications:

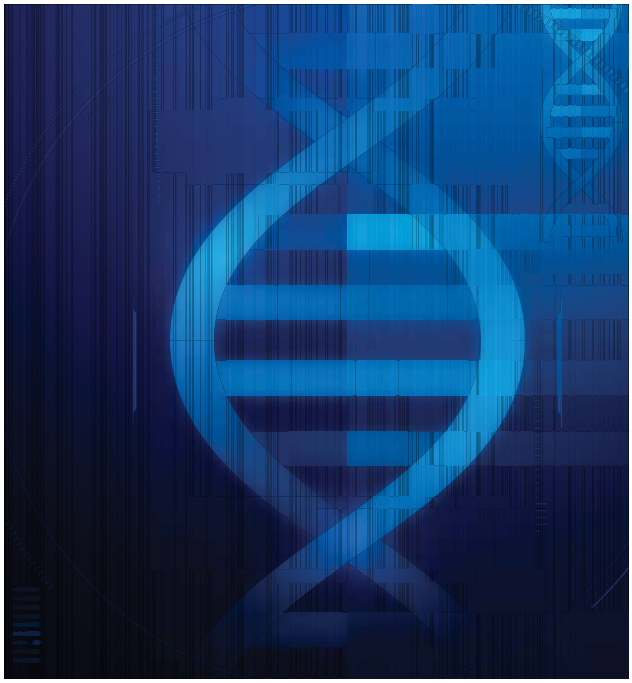
- Whole genome sequencing.
- Targeted resequencing.
- 16S/ITS amplicon sequencing.
- Shotgun metagenomics.
- (Meta)transcriptome sequencing.

Competitive Advantage to Clients

- Range of different technologies available.
- Dedicated staff responsible for operating the technology and carrying out the associated bioinformatic analysis.
- Can contribute to DNA extraction, library preparation, quantification, QC where needed.
- Complementary equipment (PCR, qPCR, Qubit, Nanodrop, Bioanalyser, PCR workchambers)
- Software to facilitate analysis.
- Option of multiplexing multiple samples.
- Competitive prices.
- Dedicated bioinformatics team.

Service Details

Prices available on request



Of interest to

Institutes or bodies engaged in sequencing projects interested in accessing facilities providing improved sample throughput. There are also numerous potential industry-related applications such as assessing the impact of specific foods and ingredients on the gut microbiota and gut health, sequencing of probiotic strains, investigating animal genetics and many more.

How to Proceed

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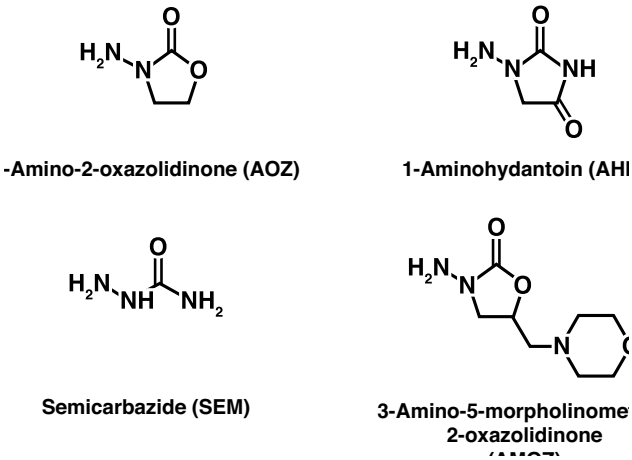
Nitrofuran Residue Testing

The Chemical Residues Laboratory at Ashtown offers a suite of analytical testing services. One of the most important of these is the nitrofuran test method, which tests for residues of nitrofuran antibiotic drugs in meat, plasma, fish, eggs and honey. This method represents an essential service for both importers and exporters of animal products.

Background

Nitrofurans are a class of broad-spectrum antibiotics that were widely used in food-producing animals. Concerns about their potential toxicity resulted in them being banned for use in the EU in the 1990s. Despite this, nitrofuran contaminants remain a frequent source of alerts in the EU Rapid Alert System for Food and Feed (RASFF), with 72 cases of semicarbazide (the marker residue for nitrofurazone) in shrimp in 2009.

Teagasc have developed an assay that employs liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) to detect and quantify in a single analysis the metabolites of four of the main nitrofuran drugs (shown below). We are offering this test as a service to food companies. The test can ensure the absence of nitrofuran drug residues down to extremely low levels.



Benefits to Clients

Under Directive 96/23/EC the food industry are required to have a self-monitoring programme in place to monitor for residues in food of animal origin.

By using this test you can be satisfied that you are in compliance with EU legislation and customer specifications.

Testing Details

The Nitrofurans test has been validated in liver, muscle, fish, plasma, egg and honey samples according to the 2002/657/EC guidelines. The method is very sensitive and has a limit of detection of <0.10 µg/kg for all four residues in most matrices. The method has been accredited by the Irish National Accreditation Board.

Figure 1: Analyst placing sample extracts for injection into liquid chromatograph for LC-MS/MS analysis

How to Proceed

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Technology

SERVICES

New Product Development for Food SMEs

Teagasc researchers and technologists have extensive knowledge, expertise and facilities available to support food businesses in new product development at its two food research centres at Ashtown and Moorepark. There is a special focus on supporting new product development (NPD) in SME and start-up food businesses.

Background

Advances in the food sector are accelerating the development of a wide range of new and improved, added-value products and services. The future success of the Irish food industry depends in large on its ability to be at the forefront of this scientific and innovative activity. Teagasc is committed to supporting the food processing sector and provides a range of supports including new product development services.

Benefit to Clients

The competitive position of food businesses is very dependent on their capacity to absorb new knowledge and skills and develop innovative products. Teagasc recognises the constant challenge faced by food companies and aims to support and assist them in the new product development process.

Product development supports are backed by the wide-ranging food research programme at Teagasc which has extensive linkages with food research institutes worldwide.

Support and Facilities

- Food development facilities are available at Teagasc Food Research Centres in Ashtown, Dublin and Moorepark, Cork.
- These include pilot and full scale regulatory approved production facilities containing modern equipment for the development of dairy, beverage, meat, bakery and prepared foods.
- Specially designed incubation units are available for sole use by client companies.
- Well-equipped and modern laboratories are available for microbiological, chemical, physical and sensory testing of products.

Of Interest to

Product development support is of interest to food processing businesses, and to suppliers of materials, services and development support to the food processing sector.

Service Contracts

Service contracts are agreed with clients and work is carried out on a confidential basis.

A schedule of fees is available on request for the various services provided.

How to Proceed

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Sensory Analysis

Teagasc, through its researchers and technologists at both its food research centres at Ashtown and Moorepark, has extensive knowledge, expertise and facilities available to identify the sensory requirements of food businesses and devise suitable testing methodologies.

Background

Sensory analysis is a scientific discipline used to measure and interpret reactions to foods as they are perceived by the senses (sight, sound, smell, taste and touch). It provides valid and accurate information on sensory characteristics using precise, documented techniques. People closely involved with a product frequently find it difficult to be objective when comparing it with those of competitors. Sensory analysis is used to judge the acceptability of products at many stages of product development (from concept to launch) and in quality control and quality assurance.

Benefits to Clients

Sensory Analysis provides a powerful tool in terms of new product development, and can be used anywhere in the NPD process from concept to launch and beyond in terms of quality assurance.

Teagasc sensory staff work closely with other Teagasc experts to correlate sensory and instrumental data. Off-flavour investigation is carried out in conjunction with our flavour chemists. Each client's needs are assessed and advice given on appropriate test methodology.

Service Details

- We carry out the full range of discrimination tests including triangle tests, tetrad, duo trio, paired comparison, and other tests as required.
- We have a trained descriptive panel experienced in the sensory analysis of a range of products.
- We provide expert advice to food businesses and help them devise the most suitable methodologies for their needs.
- Bespoke sensory training courses can also be developed on request.

Facilities

- We have state-of-the-art food preparation and sensory facilities.
- The testing facility comprises 8 individual booths each equipped with Compusense® 5.0 software for sensory data collection from panellists.
- The area is equipped with adjustable lighting and the temperature, ventilation and odour can be controlled.
- Training and conference rooms are also available for panellist training sessions and focus groups.

Of Interest to

Sensory evaluation is relevant to food processing businesses, ingredient manufacturers and suppliers, food service companies, retailers and distributors.

Service Contracts

Contracts are agreed with clients and work is carried out on a confidential basis. Cost is dependent on the method of testing used and sample numbers involved.

How to Proceed

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Technology

SERVICES

Specialised Training and Seminars

Teagasc provides specialised technical training and seminars for the food sector, in areas that include food safety, quality management, compliance with food legislation, and product development, through its Food Industry Training Programme. This programme is offered as a schedule of public courses to industry, development agencies and competent authorities each year. Delivery of customised training to companies is available on request. Seminars are also held each year covering topical issues of interest.

Background

The food sector is a knowledge intensive industry sector, with a continual need to upgrade knowledge and skills. The environment in which the industry operates is constantly changing in relation to regulatory, customer requirements, product lines and innovations. The Teagasc Food Industry Training Programme, through effective knowledge transfer and certification, enables the sector to keep abreast of these changes. The programme is quality assured, and course topics are updated regularly to reflect the changing needs of the sector.

Benefits to Clients

The Teagasc Food Industry Training Programme provides food businesses with up-to-date knowledge and skills required to keep up to date with changes in legislation, technology and good practice. This enables clients to compete effectively in the sector.

Courses are updated to ensure information is current and represents best practice. All trainers are highly qualified and experienced and many of the courses on offer are certified through the National Framework Quality Qualifications Ireland (QQI).

Service Details

The programme includes training in the following areas:

- Food Safety Management (HACCP).
- Quality Management (based on Third Party Standards).
- Systems Auditing.
- Laboratory Quality Management & Auditing.
- Trainer Skills.
- Compliance with Legislation & Labelling.
- Innovation Management and NPD.
- Dairy Product Manufacture & Cheese-making.
- Dairy Plant Operation, Spray-drying etc.
- Meat Processing & Butchery Skills.

A range of seminars are scheduled annually. Themes are chosen based on current topical issues and input from the food sector. Expert speakers are drawn from competent authorities, industry and the retail sector.

Of Interest to

This service is relevant to food industry personnel involved in technical or quality management, as well as supervisory staff, business owners & entrepeneurs, regulatory and development agency staff.

How to Proceed

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Testing for Agrochemical Residues

Teagasc is offering a range of analytical tests for the food industry for the detection and quantification of agrochemical residues in foods, through their well established laboratories at Teagasc Food Research Centre, Ashtown. Tailored analytical solutions can be developed upon request to provide more cost effective analysis.

Background

Veterinary drugs, feed additives and pesticides are used in the treatment of infections in food producing animals and can result in undesirable levels of residues in food. Regulatory agencies such as the Committee for Veterinary Medicinal Products and the European Food Safety Authority have set maximum residue limits (MRLs) for a range of agrochemical residues in food. The purpose of these MRLs is to protect public health and promote trade between countries.

Product labels on agrochemical products have been carefully prepared to ensure good agrochemical practice including application rates of products and withdrawal periods. If label claims are not carefully followed, non-compliant levels of residues can occur in food. The European Commission require each member state within the European Union to carry out national surveillance of their food production annually and demonstrate compliance with legislation. In addition, there are requirements on industry to carry out self-monitoring for residues, and it forms a basic part of a company's HACCP plan.

Competitive Advantage

- Teagasc has a long history in veterinary drug residue detection and the laboratories at our Food Research Centre, Ashtown have been accredited for this work for over 25 years.
- State-of-the-art ultra high performance liquid chromatography coupled to tandem mass spectrometry is used in the majority of such analyses, giving the best possible result to clients.
- Tailored analytical solutions can be developed on request to provide more cost effective analysis.

Testing Details

Some of the drug residues that we cover include:

- **Nitrofuran antibiotics** – 4 residues in liver, meat, eggs, honey and aquaculture products.
- **Anticoccidials** – 21 residues in eggs and meat.
- **Anticoccidials** – 8 residues in liver.
- **Anthelmintics** – 40 residues in liver, meat, milk.
- **Carbamate pesticides** in eggs, honey and liver.
- **Pyrethroid pesticides** in egg, fat and honey.

Of Interest to

These tests are relevant to all sectors of the Irish food industry. If we do not carry out a specific type of testing on site we can outsource the work at a highly competitive rate.

How to Proceed

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Technology

SERVICES

Residue Monitoring Services

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 offer a range of ISO17025 accredited analysis for ~125 residues in different food matrices. Methods can be adapted to client needs on request. The 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.

Background

In order to ensure the health of animals and good hygiene, veterinary drugs/pesticides and disinfectant are routinely used on farms. In order to ensure compliance with international food safety legislation, self-monitoring must be carried out by food companies to ensure that the products they are manufacturing are safe to put in the market place. Residue monitoring can be carried out on a risk-based approach, where residues can be monitored using a targeted approach by looking for residues where they are likely to occur. Although, priority is often placed on substances such as antibiotics and banned veterinary drugs.

Benefits to Industry

The Teagasc residue laboratories are based in Dublin and can provide rapid analysis of samples for clients if short turnaround times are required. Once samples arrive in the laboratory, results can be generated within 48 h if needed depending on the analytical test method used.

Areas of Expertise

- Chemical analysis of residues in food.
- Veterinary drug residues including anthelmintics and antibiotics.
- Pesticides.
- Biocides including chlorates and quaternary ammonium compounds.
- Mycotoxins.

Facilities/Equipment

- Range of sample extraction and clean-up equipment.
- Five modern laboratories.
- Five triple quadrupole mass spectrometers.
- One ultra-sensitive QTRAP mass spectrometer.
- One High resolution time of flight mass spectrometer.

Range of Solutions

We can provide a range of advice and technical services to meet your needs.

Of Interest to

Food and ingredient companies

How to Proceed

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Technology

Commerical Offers

Technology

COMMERICAL OFFERS

Toddler Milk

Teagasc and University College Cork (UCC) researchers have developed a method for production of a low-protein milk product, in reduced and full-fat formats, based on adaptation of cow's milk to meet toddlers' nutritional needs but usable by the whole family. We are seeking a commercial partner within the infant nutrition/dairy industry to optimise and commercially exploit this technology.

Summary

Levels of childhood obesity continue to increase as part of the European obesity epidemic. Toddlers in the Western World typically have a far greater intake of protein than they need, and studies have shown a significant association between high protein intake in early childhood and a later risk of obesity.

To address potential issues for toddlers with high protein intake, Teagasc/UCC researchers, in collaboration with key opinion leaders in the infant nutrition space, have developed a process that adapts cow's milk to meet such toddlers' nutritional needs, but which can also cater for the whole family.

Problem Addressed

Dairy products play an important role in toddler nutrition and are by far the lowest cost source of dietary calcium and riboflavin. However, studies have shown that infants in the Western World have an average protein intake of approximately 2.5g/kg of body weight/day, which exceeds the recommended intake of 1–1.5g/kg of body weight/day. Documented observational data increasingly indicates a link between high protein intake during early childhood and a risk of obesity in later life. Many such toddlers are fed formulated toddler milk with altered nutritional and taste profile when compared to natural milk, and at a premium cost to consumers. To date there has been an absence of natural milk product alternatives in this growing and premium toddler market, which this technology aims to address.

Solution

This invention relates to a process enabling the production of a novel natural reduced-fat, or full-fat, low-protein dairy product from cow's milk, which has been tailored to meet a toddler's typical nutritional needs. As the product is based on cow's milk, it has a superior taste that is much closer to natural cow's milk than competing formulated toddler milk. Hence this novel product should represent an opportunity for the producer, purchaser and end-user to benefit from such an innovation.

Competitive Advantage of Technology

1. Through the application of mild processing technologies, a natural low-protein alternative to cow's milk tailored to the nutritional profile of toddlers' needs, but without altering the great taste of cow's milk is possible.
2. As this toddler milk, which is producible as both full-fat and reduced-fat products, tastes just like regular cow's milk, it can be consumed by the whole family.
3. This resulting milk product can be produced in fresh, Ultra-High Temperature (UHT) and powder formats, and is easily scalable.
4. This product is suitable as a carrier for fortification of other nutrients not naturally abundant in milk, but often lacking in toddlers' diets, for example iron.

Stage of Development

A prototype has been developed to a pre-commercial scale, with positive consumer feedback on taste. Available in fresh, UHT and powder formats.

Opportunity

Teagasc, as lead, wish to partner with a company in the infant nutrition and/or dairy industry in optimising and commercialising this process and resulting product, through a collaborative/licensing arrangement.

Intellectual Property Status

A patent application was filed by Teagasc and UCC in 2015, claiming a novel dairy product, based on cow's milk, suitable as a substitute milk for a toddler.

Funding

Food for Health Ireland (Enterprise Ireland)

How to Proceed

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Technology

COMMERICAL OFFERS

Rapid Detection of Toxin-Encoding *Bacillus Cereus*

Teagasc is seeking partners within the diagnostics industry to exploit a novel qPCR-based test capable of rapid, simultaneous detection of all *Bacillus cereus* toxin encoding genes ("CereusToxTest"), of benefit to the food industry.

Summary

Teagasc researchers have developed a novel q-PCR based assay capable of rapid, simultaneous detection of all *Bacillus cereus* toxin encoding genes. This assay offers significant advantages in time and specificity compared to what is currently commercially available.

Value Proposition

Rapid and reliable detection of this target species is necessary to identify B.cereus-contaminated food and thereby reduce/prevent such food poisoning outbreaks in consumers, and lessen economic losses and reputational damage to food producers, caused by such recalls and/or outbreaks.

Bacillus cereus is a pathogenic, spore-forming soil-dwelling bacterium that is commonly encountered in raw milk and subsequent dairy products. It is resistant to industrial pasteurisation processes due to the presence of endospores and is therefore a major concern for the dairy industry. The various strains of B.cereus produce several potentially pathogenic substances, linked to foodborne emetic and diarrhoeal syndromes and are known causative agents of food poisoning for over forty years. The emetic syndrome is caused by cereulide, (synthesised by a non-ribosomal peptide synthetase encoded by the ces gene), while the diarrhoeal syndrome is caused by at least three known heat-labile enterotoxins.

No commercially available kits (immunoassays or molecular kits) are capable of simultaneously detecting the 4 toxins produced. Existing assays either detect only a subset of toxins or do not reliably distinguish between B.cereus and closely related, harmless bacteria, leading to false negatives and positives, which this assay circumvents.

Solution

CereusToxTest is a probe-based qPCR approach to simultaneously detect and quantify levels of each of the 4 toxin gene types. It is a multiplex assay based on bespoke fluorophore-labelled probes, whereby detection and quantification of the 4 toxins is possible in a 2 –hour real-time PCR run.

Competitive Advantage of Technology

- Addresses the issues associated with the non-specificity (leading to false positives) or excessive specificity (detection of a subset of toxins only, leading to false negatives) of other tests.
- More rapid than existing assays and avoids the need for downstream analysis, such as melting curve analysis and monitoring of PCR replicon size.
- Offers simultaneous detection and quantification of all 4-toxin encoding gene types in a high throughput single assay. Toxin profiling may allow for more informed treatment options.

Status/Development Stage

Fully functional multiplex real-time PCR assay, available through licensing of know-how

Fields of Application

Development of kits for molecular biology/DNA-based diagnostics for testing of food production and processing environments, raw materials, foods and food ingredients to ensure food safety.

Funding

Walsh Fellowships Programme

Irish Dairy Board

How to Proceed

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Technology

COMMERICAL OFFERS

Detection of Cause of Pink Discolouration Effect in Cheeses

Teagasc is seeking partners within the diagnostics industry to exploit a novel qPCR-based test for supply of assay/kit for detection of the bacterial cause of pinking discolouration defect, to the dairy and cheese industry.

Summary

Teagasc researchers have developed a novel q-PCR based test capable of detecting the bacterial cause of pinking discolouration defect in the dairy and cheese industry for the first time. This technology helps to solve a significant problem for the global dairy industry and will be of interest to the diagnostics industry.

Value Proposition

Pinking discolouration defect, primarily in cheese, is a global problem for dairy producers. Such pinking defect, which can manifest itself in various forms, on block surfaces or below the surface, can lead to downgrading or rejection of cheeses, and hence significant economic losses to the producer. To date, the cause of the defect has been unknown, but subject to much debate. By understanding and being able to identify the cause and origin of such a defect, this would facilitate removal/treatment of the cause at the source, thereby significantly reducing the occurrence of costly pinking defect discolouration events and increasing efficiencies and quality of cheese manufacturing plants. This hasn't been possible to date, as the cause of such discolouration defect remained unknown.

Technology & Opportunity

By discovering the source of pink discolouration to be bacteria not associated with cheese production, and developing an assay to identify sources of such defect through identification of the causing bacteria, this invention provides a method of assaying cheese manufacturing plants, at ingredients and cheese processing plants level to identify the source of the pinking defect. Such testing of cheese systems, for the risk of pinking in cheese, will allow timely treatment of either ingredient or machinery/plant surfaces to eliminate the bacteria, before the defect arises, thereby minimizing/avoiding the occurrence of such pinking discolouration defects at commercial scale.

Competitive Advantage of Technology

- A novel method of determining presence in cheese sample of source of pink discolouration defect.
- A method of testing a cheese manufacturing system for a risk of pinking discolouration, allowing modification of system to remove/ treat the origin of the defect.
- Resulting qPCR assay, and/or a kit comprising a diagnostic reagent, to detect the source.

Opportunity

This technology would be a valuable addition to laboratories providing diagnostic solutions to dairy industry to develop kits/assay based on this invention, and is available to licence.

Intellectual Property Status

A patent application was filed in 2014, (UK Application No. 1410948.2), claiming a method to determine the presence of such a source, due to the presence of the novel bacteria.

Funding

icos

WP WALSH FELLOWSHIPS PROGRAMME

How to Proceed

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Technology

COMMERICAL OFFERS

Highly Efficient Protein Recovery from Food By-products

Teagasc is seeking commercial partners within various food processing industries to exploit a novel technology for extracting proteins from solid by-products or waste from food (fish, meat, poultry), with over 95% protein recovery, based on improved sequential isoelectric solubilisation.

Summary

Teagasc researchers have developed a highly efficient protein recovery technology from food by-products with greater than 95% protein recovery. This technology is ready for scale-up and Teagasc is seeking companies to exploit this novel technology.

Value Proposition

This technology addresses the issue that almost 50% of the total weight of fish is considered a waste or a low-value product, composed mainly of heads, internal organs, tail, fins, frames and skin. Protein content and amino acid profile in these by-products are similar to that in fillets hence there is a significant amount of high quality protein currently not harnessed. As most by-products from fish processing are used in composting, pet food or animal feed, so provide a very low value-add, there is a desire to generate alternatives with a higher value-add. This represents an opportunity to such industries to significantly increase total protein recovery from such waste, with significant costs implications, through increased profits through generation of protein-based added-value products.

This novel technique, allows solubilisation of more than 95% of total proteins, a significant improvement compared to the previous 65% reported. Furthermore, reagent consumption is not increased despite the additional step of extraction, and no expensive equipment investment is required, since regular equipment are employed in the process (tanks, centrifuges, blenders, stirring and pH probes), rendering this easily transferable to industry.

Technology

This invention is based on a substantial modification of isoelectric precipitation-solubilisation (ISP) methodology, whereby protein from by-products are extracted in alkaline conditions and the remaining insoluble proteins are subsequently extracted under acidic conditions. Finally, both solutions are mixed to reach a pH close to 5.5 where all proteins precipitate and thus can be easily recovered by centrifugation or filtration. The process yields purified protein and a precipitate formed by scales and bones.

Competitive Advantage of Technology

- 95% of total proteins extracted from fish by-products, significant improvement from 65% previously.
- No expensive equipment required, or increased reagent consumption.
- Should be easily scalable and transferable to industry, and can be combined with other extraction processes

Fields of Application

Although specifically developed using fish by-products, this could be applied to solid by-products or meat processing and poultry wastes and is ready for scale-up.

Intellectual Property Status

An EPO patent application was filed by Teagasc (July 2015), claiming a novel method of sequential isoelectric solubilisation of animal by-products.

Funding

NutraMara

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

How to Proceed

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Technology

COMMERICAL OFFERS

LABocol: Cholesterol Lowering Probiotic Yoghurt

Teagasc and UCC researchers have developed an invention which allows a novel Lactic acid bacterial (LAB) strain, Lactobacillus mucosae, to be used in a nutritional approach to lowering cholesterol, e.g. in a probiotic yoghurt. Teagasc and UCC seek a commercial partner in the functional food space to further develop this technology with a view to commercialisation and further validation of the supporting health claims.

Summary

Globally, a third of ischemic heart disease is attributable to high cholesterol, with raised cholesterol estimated to cause 2.6 million deaths annually.

Teagasc and UCC researchers have produced scientific data showing that a novel probiotic yoghurt containing novel exopolysaccharide (EPS) producing *Lactobacillus mucosae* DPC6426 can lower blood cholesterol, a risk factor in the development of coronary heart disease, by 53% in 12 weeks.

Problem Addressed

The invention broadly relates to a LAB strain that has been found to express an EPS and confers cardio-protective properties when consumed. It provides for the use of DPC 6426 as a possible nutritional approach to lowering cholesterol.

LAB strains are widely added as starter cultures in the dairy industry and have a long history of safe use. The presence of EPS in dairy products improves texture, decreases the risk of syneresis (whey separation) and improves the techno-functional properties of the products. It has been suggested that EPS produced by LAB interacts with cholesterol in a manner like dietary fibre.

Significantly increased cholesterol excretion was found for the probiotic yoghurt fed group.

Competitive Advantage of Technology

1. LAB are generally regarded as safe (GRAS) according to the FDA.
2. In-situ production of EPS throughout storage resulted in higher quality yoghurt with improved textural and rheological qualities compared to other yoghurts.
3. Blood cholesterol reduced by 53% in 12 weeks.

Opportunity

There is an opportunity to partner with Teagasc/UCC in developing and commercialising a cholesterol lowering probiotic yoghurt, including:

- Establishing the efficacy of the cholesterol lowering properties and effects on plaque stability of the probiotic in animal studies.
- Determining the mechanism of action and benchmarking against plant sterol esters and oat beta-glucan.
- Conducting a human intervention trial to compile a dossier to support a health claim application.

Intellectual Property Status

A patent application was filed by Teagasc and UCC in 2012.

Partners

UCC
Coláiste na hOllscoile Corcaigh, Éir
University College Cork, Ireland

Funding

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

How to Proceed

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Technology

COMMERICAL OFFERS

Whey-less Cheese Manufacture Based on Novel Cheese Technology Platform (NCTP)

Teagasc is seeking industrial partners within the ingredient and retail cheese industry to assist in refinement of NCTP for innovative cheese ingredient solutions and health cheeses tailored to specific customer requirements.

Summary

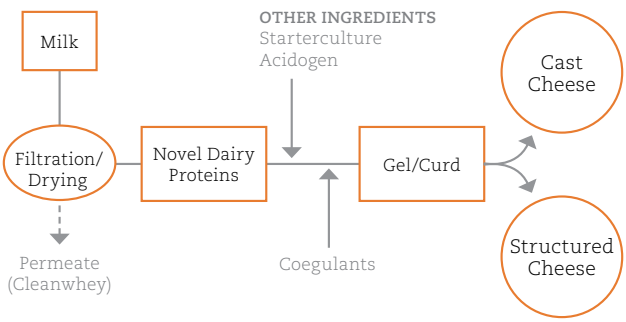
The rapidly growing market for ingredient cheese is currently being served by sourcing traditionally-manufactured table cheeses. Teagasc has developed a dedicated 2-step process for direct manufacture of ingredient cheese tailored to customer requirements. Without the need for whey expulsion it lends itself to the development of new generation health cheeses and increased control of cheese characteristics.

Problem Addressed

Conventional manufacture of natural cheese is quite limited in terms of cost-competitive, customised ingredient solutions, reliance on a source of fresh milk and a large volume of 'unclean' whey, i.e. loss of added materials (e.g., prebiotic materials). Until now, it has not been possible, due to technological constraints and functional limitations, to reconstitute available dairy ingredients in the concentrated form that corresponds to the final compositional specification of targeted cheese types, thereby allowing increased control of ingredient cheese solutions.

Solution

This NCTP provides a platform for design and manufacture of cheeses with varying dry matter content and customised properties using three basic steps. The concept relies on customising the functionality of a milk protein-based ingredient and its subsequent transformation into cheese according to demand. Resultant cheeses may be either cast cheese (<48% dry matter, DM) formed by rennet/acid treatment of re-assembled milk in final package and/or structured cheese (up-to 60% DM) formed by further curd treatment (see figure below).



Competitive Advantage of Technology

1. NCTP capable of making cheese without fresh milk source.
2. No (or very limited) whey expulsion (cast cheeses)
3. Complete retention of any added materials, with potential for development of new generation health cheeses.
4. Greater opportunity to design/control cheese characteristics of ingredient cheeses.

Opportunity

This technology allows the development of a novel range of prototype, functional, casein-based ingredients whereby the pH, buffering capacity and casein-to-whey protein ratio of the resultant cheese can be targeted.

The aim is to link up with relevant cheese ingredient manufacturers to prepare and evaluate prototype cheeses (at moisture levels > 53% with functionality suitable for ingredient cheese applications) with a view
to licensing this technology.

Intellectual Property Status

PCT patent Application WO 2009/1 50183.

Funding

ENTERPRISE IRELAND

How to Proceed

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Technology

COMMERICAL OFFERS

Probiotic Cocktail as Animal Feed Additive ("Live5")

Teagasc and UCC researchers are seeking a commercial partner within the animal feeds industry to exploit a new technology. Based on a natural probiotic mix, for growth and good health promotion in animals (specifically pigs), the objective is to develop stable and commercially relevant probiotic product prototypes ready for market.

Summary

The microbial feed additive (or direct-fed microbial), is based on a five strain mix "Live5". It is a natural probiotic mix that can be used as an alternative to chemicals and antibiotics in pig husbandry, both as a means of controlling pathogen carriage and improving growth rate and feed conversion. The five live beneficial bacteria help maintain a healthy intestinal balance for optimum animal performance.

Problem Addressed

Antibiotic growth promoters are currently being phased out of use because they impose a selection pressure for bacteria that are resistant to antibiotics. There is a need for alternative solutions that do not depend on antibiotic usage.

Subclinical salmonellosis is a relatively common problem in pigs, usually causing no obvious animal health problems. Affected pigs are carriers of *Salmonella*, and can excrete large numbers of *Salmonella* organisms intermittently, and particularly when stressed. *Salmonella* in pigmeat has long been associated with outbreaks of foodborne illness.

Solution

The mixture (*Lactobacillus murinus* DPC6002 and DPC6003, *Lactobacillus pentosus* DPC6004, *Lactobacillus salivarius* DPC6005 and *Pediococcus pentosaceus* DPC6006) has been shown to be effective in reducing *Salmonella* shedding in pigs, in protecting against the clinical signs associated with *Salmonella* infection, and in improving growth rates. Live5 has also demonstrated the potential to modulate host immunity in pigs.

Competitive Advantage of Technology

Live5 offers huge potential for use in pig production; in enhancing health status, reduction of subclinical carriage of pathogens (gram negative *Salmonella* and *E. coli* in particular) and in acting as an alternative to antibiotic therapy. Furthermore, one of the Live5 microbes, *L. salivarius* DPC6005, produces a heat stable, two-component bacteriocin, Salivaricin P, which is highly active against a number of gram positive bacteria, including *Enterococcus* sp. and *Listeria innocua*.

Opportunity

It is in the interests of both industry and consumers to reduce the significance of *Salmonella Typhimurium* as a pigmeat-associated food borne pathogen.

The potential fields of applications in animal health include:

- Microbial animal feed additive.
- Alternative to antibiotic growth promoters.
- Therapeutic application.

Intellectual Property Status

A patent application was filed by Teagasc and UCC and the patent "Probiotic composition suitable for animals" was recently granted in the US and Europe.

Partners

UCC
Coláiste na hOllscoile Corcaigh, Éir
University College Cork, Ireland

Funding

ENTERPRISE IRELAND

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

How to Proceed

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Technology

COMMERICAL OFFERS

Enhanced Derivatives of Nisin

Teagasc and UCC are seeking commercial partners within the food and pharmaceutical industries to further develop and commercialise superior derivatives of nisin bacteriocins, for applications in the food areas of bio-preservation and medical devices.

Summary

Teagasc and UCC have developed foodgrade derivatives of nisin A, and producers thereof, with greatly enhanced antimicrobial activity. This offers potential in a greater range of food products and other products within medical/medical device areas, when compared to commercial nisin A.

Problem Addressed

Nisin A is an antimicrobial peptide which is used as a natural food biopreservative in over 50 countries. Nisin and nisin-producing foodgrade *Lactococci* are extensively used in food nisin is the only peptide to have been added to the European food additive list (E234) and approved by the US Food and Drug Agency (FDA) and World Health Organisation. Despite its success, its application is limited in some instances due to its relative inactivity against particular target species and strains and/or its poor activity at non-acidic pHs.

Solution

Recently developed foodgrade derivatives of nisin and its producers have been found to display greatly enhanced antimicrobial activity against problematic pathogenic and spoilage microbes. They are also active at non-acidic pHs and are effective not only against a broader range of gram positive bacteria but also some gram negative bacteria. With the added benefit of being effective at non-acidic pH, this ingredient has the potential to be applied in a greater range of food products. The availability of enhanced forms of nisin could result in the replacement of nisin A and make other applications a reality.

Competitive Advantage of Technology

1. Enhanced antimicrobial activity.
2. Active at non-acidic pHs.
3. Extended applications of nisin.

Opportunity

This technology would be of interest to companies in the fields of food biopreservatives and medical devices and it is currently being evaluated by a company in the animal health field. Companies are invited to discuss this technology with a view to further development in the following areas:

- Demonstration of safety of variants.
- Demonstration of shelflife extension properties.
- Development of foodgrade applications.
- Scale-up manufacturing.

Intellectual Property Status

Patent applications on the various nisin derivatives have been filed by Teagasc and UCC.

Partners

UCC
Coláiste na hOllscoile Corcaigh, Éir
University College Cork, Ireland

Funding

ENTERPRISE IRELAND

SFI Science Foundation Ireland

How to Proceed

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Technology

COMMERICAL OFFERS

Probiotic-based Treatment of Mastitis

Teagasc and University College Cork researchers are seeking a commercial partner within the animal health industry to exploit a novel technology involving the treatment of bovine mastitis with foodgrade probiotic bacteria – a natural and effective alternative to antibiotic therapy.

Summary

This technology represents a biological approach to mastitis prevention and is based on live foodgrade cultures of probiotic bacteria, specifically a proprietary strain of *Lactococcus lactis*, effective in treating animal and human infectious diseases and proven to be at least as effective as antibiotics, in the treatment of mastitis.

Problem Addressed

Current treatments for mastitis rely heavily on antibiotics, both for prophylaxis and therapy. This strategy is costly and frequently ineffective. Additionally there are concerns regarding the overuse of antibiotics in veterinary medicine, as it may contribute to the increased spread of antibiotic resistance to human and animal pathogens. Recent legislation in the EU curtailing the use of antibiotics in animal feed should lead to greater controls and limitations in their use. Use of antibiotics may be limited to situations where they are deemed critical.

Solution

There are several advantages to this treatment regime. The bacterium can be produced cheaply in large quantities and it is a foodgrade organism with GRAS status and hence should not require significant with-holding periods for the milk produced by recovering animals, as in the case of treatment with antibiotics.

Competitive Advantage of Technology

1. Natural, effective alternative to antibiotic therapy for treatment of both mild and severe mastitis. Effective against mastitis caused by gram positive and negative bacteria.
2. Using live preparation, cure rates of subclinical and clinical infections were comparable to standard antibiotic therapy
3. Based on use of a foodgrade organism, significant withholding periods should not be required for milk produced by recovering animals, thereby reducing milk losses.
4. Could improve milk quality from clinically infected quarters.

Opportunity

Mastitis causes significant economic losses to the dairy industry. Economic loss in Ireland is estimated at €189.56 per cow, in severe cases, and €45.31 in mild cases. Taking the average incidence of mastitis as 25%, a mean economic value per case of mastitis of €71.84 is estimated (EBI 2007). With an Irish dairy herd population of 1.1m, this gives an estimated annual cost of €20m in Ireland alone.

This represents a significant opportunity for an animal health company to validate and commercialise this technology.

Intellectual Property Status

Patent granted in US and in selected European countries, "Use of Probiotic bacteria in treatment of infection".

Partners

UCC
Coláiste na hOllscoile Corcaigh, Éir
University College Cork, Ireland

Funding

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

How to Proceed

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Technology

Profiles

Declan J. Troy

Assistant Director of Research and Head of Technology Transfer

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Education

M.Sc. (Biochemistry) University College Dublin. 1987.

Graduateship of Royal Society of Chemistry, RSC, UK. 1982.

Career

2010–Present: Assistant Director of Research, Teagasc.

Head of Centre, Ashtown Food Research Centre, Teagasc.

Head of Meat Technology Department, Ashtown Food Research Centre, Teagasc.

Principle Research Officer, Ashtown Food Research Centre, Teagasc.

Expertise

Declan has published over 100 scientific peer reviewed publications, book chapters and scientific articles, mainly in the area of food / meat quality. The main focus of his research was on the biochemistry of muscle proteins and their effects on meat tenderness. Declan has always encouraged the up-take of science based innovations by the food industry and has interacted widely with the sector to this end. His work has contributed to the introduction of new technologies at industrial level particularly in Irelands competitive beef sector.

He has coordinated numerous EU meat science projects and has coordinated *ProSafeBeef*, a €20 million project with 41 transnational partners aimed at advancing beef safety and quality through research and innovation. This landmark project included close interaction with the meat science and industry community. He also coordinated two EU Framework Marie Curie Training Sites for early stage career meat science Ph.D. students in meat biochemistry and functional meat products. Currently he is the Director of the Marine Functional Food Research Initiative (NutraMara) a multidisciplinary programme aimed at discovering bioactive components from Irish marine sources for use in added value functional food products. He has collaborated in his research programme with many different research groups from all around the world including Australia, Korea and USA. He has been invited to speak at many international scientific conferences and industry seminars. He has supervised numerous Ph.D. students to completion. Declan sits on many national and international committees formulating research priorities in food science and advising state agencies and companies. Currently as Assistant Director of Research and Head of Technology Transfer, Declan is leading the Teagasc Technology Transfer Strategy.

Selected Publications

1. Byrne, C.E., Troy, D.J. and Buckley, D.J. (2000). Postmortem changes in muscle electrical properties of bovine *M.longissimus dorsi* and their relationship to meat quality attributes and pH fall. Meat Science, 54, 23–34.
2. Byrne, C.E., Downey, G., Troy, D.J. and Buckley, D.J. (1998) Non-destructive prediction of selected quality attributes of beef by near-infrared reflectance spectroscopy between 750 and 1098nm. Meat Science, 49 (4), 399–409.
3. Tsitsilonis, O.E, Stoeva, S., Echner, H., Balafas, A., Margomenou, L., Katsoulas, H.L., Troy, D.J., Voelter, W., Papamichail, M. and Lymberi, P. (2002) A skeletal muscle troponin –t ELISA based on the use of an antibody against the soluble troponin T (16–31) fragment. Journal of Immunological Methods 268 (2), 141–148.
4. Troy, D. J. and Kerry, J. (2010) Consumer perception and the role of science in the meat industry. Meat Science, 86, (1), 214–226.
5. Juárez, M., Marco,A., Brunton, N.,Lynch, B., Troy,D.J. and Mullen, A.M. (2009). Cooking effect on fatty acid profile of pork breakfast sausages enriched in conjugated linoleic acid by dietary supplementation or direct addition Food Chemistry, 117, (3), 1 393–397.

Dr. Mark Fenelon

Head of Food Research Programme

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Education

Diploma in Process and Chemical Engineering University College Cork. 2007.

Ph.D Food Science and Technology, University College Cork. 2000.

B.Sc. Dairy and Food Science, University College Cork. 1994.

Higher Diploma in Food Science and Technology. 1993.

Career

March 2015 –Present: Head of Food Programme (Ashtown and Moorepark Centres), Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork

Jun 2010–Present: Head of Food Chemistry & Technology Department, Teagasc Food Research Centre.

2004–2010: Principal Research Officer, Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork.

2000–2004: Food Technologist/ Project Manager at Wyeth Nutritionals, Askeaton, Co. Limerick.

Expertise

- Current programme focuses on ingredient interaction, i.e., protein – protein, protein – carbohydrate and protein – mineral interactions and impact during processing. Research includes improving the functional aspects of re-formulated foods in the nutritional beverage sector.
- Responsible for the recent development and implementation of the new separations / dehydration and ingredients facility located at Teagasc Food Research Centre, Moorepark.
- Experience includes chemistry and process related knowledge of dairy products including cheese, ingredients and infant formula. Knowledge of project management systems from both an academic and industrial perspective.

Selected Publications

1. Maher G. P., M. A Auty, Y. H. Roos, L.M. Zychowski and M. A. Fenelon. 2015. Microstructure and lactose crystallization properties in spray dried nanoemulsions. Food Structure Vol 3; 1–11.
2. Murphy, E.G., Y. H. Roos, S. A. Hogan, P. G. Maher, C. G. Flynn, and M. A. Fenelon. 2015. Physical stability of infant milk formula made with selectively hydrolysed whey proteins. *International Dairy Journal* 40; 39–46.
3. Maher G. P., Y. H. Roos and M. A. Fenelon. 2014. Physicochemical properties of spray dried nanoemulsions with varying final water and sugar contents. *Journal of Food Engineering*. Volume 126; 113–119.
4. Murphy, E.G., M.A. Fenelon, Y.H. Roos and S. A. Hogan. 2014. Decoupling Macronutrient Interactions during Heating of Model Infant Milk Formulas. Journal Agricultural & Food Chemistry 62; 10585–10593.
5. McCarthy, N. A., P. M. Kelly, P. G. Maher and M. A. Fenelon. 2014. Dissolution of milk concentrate (MPC) powders by Ultrasonication. *Journal of Food Engineering*. 126; 142–148.

Tara Heffernan

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Education

M.Sc. (New Food Product Development and Culinary Innovation) Dublin Institute of Technology, Ireland. 2015

B,Sc. (Culinarly Arts Science), Johnson and Wales University, USA. 2007

H.Cert (Culinary Arts), Tralee Institute of Technology, Ireland. 2005

Career

2016–Present: Food Processing Technologist, Food Industry Development Department, Teagasc, Ashtown, Dublin

2015–2016: Innovation Technologist, FDL, UK

2001–2015: Previous work experience in the culinary food industry in Ireland, USA and Australia

Expertise

- The work area and research interests of Ms. Heffernan include food processing technologies, food ingredients, sustainable innovation and new product development.
- Previous work has included:
- The development of new products for SME's and assistance in overcoming technical issues through process and ingredient innovations.
- The facilitation of equipment and processing technologies in the pilot plant in Ashtown.
- Providing technological support to Irish Food Companies through information and consultancy.
- Promotion of innovative research developments and transfer of information and technological developments to the food industry.
- Establishment of collaborative projects with innovative food companies.
- Research and sourcing new food technologies and equipment in the prepared consumer food industry.

Dr. Shivani Pathania

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Education

Ph.D. Punjab Agricultural University, India. 2013

M.Sc. Punjab Agricultural University, India. 2008

B.Sc. Guru Nanak Dev University, India. 2006

Career

2018–Present: Food Formulation Scientist, Food Industry Development Department, Teagasc

2016–2018: Post-Doctoral Researcher, DPTC, Teagasc

2015–2016: Post-Doctoral Fellow, INIAV, Portugal

2014–2015: Assistant Professor, CSKHPKV, India

2013–2014: Senior Research Fellow, PAU, India

Expertise

The research interests of Dr. Pathania include novel processing technologies, technology development, ingredient interaction, by-product utilization and ready-to-eat food products. Previous research work included the assessment of novel processing technologies such as hydrodynamic cavitation to improve the rehydration characteristics of high protein dairy powders and forward osmosis for cold concentration of high protein dairy streams. During previous roles, Dr. Pathania has gained a strong knowledge on high temperature short time extrusion, waste product utilization, product development and shelf life studies of food products. She has diverse experience in working at lab as well as pilot scale technologies. She has strong skills regarding ingredient interactions in a range of cereal and dairy based ingredients as well as processed products. Dr. Pathania recently joined Teagasc as a Food Formulation Scientist and is interested in researching effect of matrix and processing on ingredient interactions and assessment of novel processing technologies.

Selected Publications

1. Pathania, S., Ho, Q. T., Hogan, S. A., McCarthy, N., & Tobin, J. T. (2018). Applications of hydrodynamic cavitation for instant rehydration of high protein milk powders. *Journal of Food Engineering*, 225, 18–25.
2. Carbas, B., Pathania, S., Castanho, A., Lourenço, D., Veiga, I. M., Patto, M. C. V., & Brites, C. (2018). Elucidating potential utilization of Portuguese common bean varieties in rice based processed foods. *Journal of Food Science and Technology*, 55(3), 1056–1064.
3. Ferreira, A. R., Oliveira, J., Pathania, S., Almeida, A. S., & Brites, C. (2017). Rice quality profiling to classify germplasm in breeding programs. *Journal of Cereal Science*, 76, 17–27.
4. Alam, M. S., Pathania, S., & Sharma, A. (2016). Optimization of the extrusion process for development of high fibre soybean-rice ready-to-eat snacks using carrot pomace and cauliflower trimmings. *LWT-Food Science and Technology*, 74, 135–144.
5. Pathania, S., Singh, B., Sharma, S., Sharma, V., & Singla, S. (2013). Optimization of extrusion processing conditions for preparation of an instant grain base for use in weaning foods. *International Journal of Engineering Research and Applications*, 3(3), 1040–1049.

Dr. Ciara McDonnell

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Education

PhD. University College Dublin, Ireland. 2013

B.Agr.Sc. (Food Science), University College Dublin, Ireland. 2009

Career

2016–Present: Research Officer, Food Quality and Sensory Science, Teagasc.

2014–2016: Research Manager, AllinAll Ingredients.

2013–2014: Technical Manager, Mark & Chappell.

2013: Research Assistant, University College Dublin.

Expertise

Ciara McDonnell (Ph.D.) is a Research Officer at the Teagasc Research Centre, Ashtown. Following completion of her PhD on novel meat processing technologies, Dr. McDonnell spent three years working in the food industry. During her time as Research Manager for a leading ingredient supplier to the processed meat industry, Dr. McDonnell assisted various meat processors in overcoming technical issues through ingredient and process innovations.

Her research interests are strongly focused on technologies for improved meat production in both the fresh and processed meat sectors. This includes technologies for carcass evaluation with the objective of improved product consistency and predictive output. In the processed meat sector, Dr. McDonnell is leading projects on clean processing technologies for the development of healthier processed meats, produced by environmentally friendly and efficient processes.

Dr. McDonnell was the co-ordinator of the 63rd International Congress of Meat Science and Technology which took place in August 2018 and Guest Editor for the international journal, Meat Science. Dr. McDonnell also represents Teagasc at EU Expert Group meetings on the monitoring of water in poultry and technology updates on pig and beef carcass classification.

Selected Publications

1. McDonnell, C. K., Allen, P., Duane, G., Morin, C., Casey, E., Lyng, J. G. (2018). One-directional modelling to assess the mechanistic actions of power ultrasound on NaCl diffusion in pork, *Ultrasonics Sonochemistry*, 40, 206–212.
2. Warner, R.D., McDonnell, C.K., Bekhit, A.E.D., Claus, J., Vaskoska, R., Sikes, A., Dunshea, F.R., Ha, M. (2017) Systematic review of emerging and innovative technologies for meat tenderisation, *Meat Science*, 132, 72–89.
3. McDonnell, C. K., Tiwari, B. K. (2017). Ultrasound: A clean, green extraction technology for bioactives and contaminants (2017), *Comprehensive Analytical Chemistry*, Volume 76, Pages 111–129.
4. McDonnell, C. K., Allen, P., Arimi, J. M., Lyng, J.G. (2014). Optimisation of pilot-scale production of ultrasound-accelerated pork curing. *Innovative Food Science and Emerging Technologies*, 26, 191–198
5. McDonnell, C. K., Allen, P, Morin, C., Lyng, J. G. (2014). The effect of ultrasonic curing on meat protein and water-protein interactions in meat. *Food Chemistry*, 147, 245–251.
6. McDonnell, C. K., Allen, P., Duggan, E., Arimi, J. M., Casey, E., Duane, G., Lyng, J. G. (2013). The effect of salt and fibre direction on water dynamics, distribution and mobility in pork muscle: a low field NMR study. *Meat Science*, 95, 51–58.
7. McDonnell, C. K., Allen, P, Chardonnereau, F., Arimi, J. M., Lyng, J. G (2013). The use of pulsed electric fields for accelerating the curing of pork. *LWT – Food Science and Technology*, 59, 1054–1060

Dr. Emily Crofton

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Education

PhD in Sensory and Consumer Science, University College Dublin (2009–2013).

Postgraduate Diploma in Education (PGDE), NUI Maynooth (2007–2008).

BSc in Food Science, University College Dublin (2003–2007).

Career

2016–Present: Research Officer, Teagasc Food Research Centre, Ashtown, Dublin 15.

2014–2016: Manager – Sensory Food Network Ireland, Teagasc Research Centre, Ashtown, Dublin 15.

Sep–Dec 2014: Online Tutor for the Principles of Sensory Science module as part of the MSc in Food, Nutrition and Health, University College Dublin.

2009–2010: Sensory Analysis Lecturer, UCD Institute of Food and Health, University College Dublin.

2007–2008: Secondary School Teacher in Biology and Science, St. Joseph's Secondary School, Dublin 7.

Expertise

Dr. Emily Crofton is a research officer at Teagasc. She has extensive experience in applying a range of sensory evaluation techniques for both product development and quality control applications, in addition to using both qualitative and quantitative research methods to study consumer behaviour. Emily also spent time as a postdoctoral researcher managing the development of a national sensory science network called Sensory Food Network Ireland. She has over 10 years teaching and lecturing experience having designed and delivered sensory analysis courses within an academic and industry setting. Emily is currently co-ordinating the sensory evaluation component of Meat Technology Ireland, which aims to elucidate novel sensory data for establishing a more consistent meat product for the consumer in terms of quality, tenderness and shelf-life. Emily is also leading a project which aims to capture the complexity of how different production systems impact the sensory profile, consumer liking and emotional appeal of beef. She is passionate about science communication, and has organised and spoken at many different events throughout her career. Emily currently represents Sensory Food Network Ireland on the European Sensory Science Society (E3S) Education Working Group.

Publications

1. Crofton, E.C., Markey, A. and Scannell, A.G.M. (2014). Perceptions of healthy snacking among Irish adolescents: A qualitative investigation. International Journal of Health Promotion and Education, 52: 188–199.
2. Crofton, E.C., Markey, A. and Scannell, A.G.M. (2013). Consumers' expectations and needs towards healthy cereal based snacks: An exploratory study among Irish adults. British Food Journal, 115: 1130–1148.
3. Ktenioudaki, A., Crofton, E., Scannell, A.G.M., Hannon, J.A., Kilcawley, K.N. and Gallagher, E. (2013). Sensory properties and aromatic composition of baked snacks containing brewer's spent grain. Journal of Cereal Science, 57 (3): 384–3.

Dr. Cristina Botinestean

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Phone: +353 (0)18059747

Education

PhD, Food Engineering, BUASVMT, Timisoara, Romania (2010–2013)

MSc, Integrated Systems of Processing and Food Additives, BUASVMT, Timisoara, Romania (2008–2010)

B.Eng, Food Processing Technologies, BUASVMT, Timisoara, Romania (2003–2008)

Career

2017–Present: Research Officer – Sensory Panel Manager, MTI, Teagasc Food Research Centre, Ashtown, Dublin, Ireland

2014–2017: Postdoctoral Researcher, Teagasc Food Research Centre, Ashtown, Dublin, Ireland

2010–2013: PhD Fellow, BUASVMT, Timisoara Romania and University of Natural Resources and Life Sciences, Vienna, Austria

2008–2011: Quality Assurance Engineer/Production Engineer – Meat Industry, Timisoara, Romania

Expertise

Dr. Cristina Botinestean is currently a Research Officer at Teagasc where she is managing the comprehensive sensory evaluation activities of Meat Technology Ireland. Within this role, Cristina is responsible for co-ordinating and designing descriptive sensory trials for the sensory quality assessment of meat which take place on an on-going basis. She is also responsible for managing the extensive collection of data, statistical analysis and interpretation of results, monitoring panel performance and prompt reporting of outcomes to the relevant scientific groups, project leaders and collaborators within the MTI.

Prior to her current role, Cristina was previously working as a Postdoctoral Researcher on the Meat4Vitality project, funded by the (11/F/045) FIRM programme administered by DAFM. The aim of her research was to enhance the textural attributes of meat products to increase appeal for older consumers.

Cristina spent three years working in the meat industry as a Quality Assurance Engineer, where she assisted in the development of innovative processing technologies for the meat industry. Cristina has also spent time supervising undergraduate students throughout her research career.

Cristina's expertise includes sensory evaluation techniques, analytical chemistry and chemical engineering, chromatographic techniques (GC-MS, HPLC, TLC), food ingredients, structure, formulation and functionality.

Selected Publications

1. Botinestean C., Kerry J.P., Hamill R., Possibilities to develop texture-modified beef steaks suitable for elderly consumers using fruit-derived proteolytic enzymes, *Journal of texture studies*, 2017.
2. Botinestean C., Keenan D.F., Kerry J.P., Hamill R.M. The effect of thermal treatments including sous-vide, blast freezing and their combinations on beef tenderness of *M. semitendinosus* steaks targeted at elderly consumers, *LWT Food Science and Technology*, 2016.
3. Baugreet S., Botinestean C., Kerry J., Allen P., Hamill R.M. Development of novel fortified beef patties with added functional protein ingredients for the elderly, *Meat Science*, 2016.
4. Hamill R. and Botinestean C. Meat: Structure and Composition, In: B. Caballero, P. Finglas and F. Toldrá. *Encyclopedia of Food and Health*, vol.3: 701–710. Oxford: Academic Press, 2016.
5. Keenan D.F., Resconi V.C., Smyth T.J., Botinestean C., Lefranc C., Kerry J.P., Hamill R.M. The effect of partial-fat substitutions with encapsulated and un-encapsulated fish oils on the technological and eating quality of beef burgers over storage. *Meat Science*, 107:75–85, 2015.

Dr. Carlos Álvarez García

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Education

BSc. Univerisity of Oviedo, Spain. 2004

Master's degree, University of Oviedo. 2006

PhD. University of Oviedo, Spain. 2012

Career

2012–2013: Researcher in "Bloodin" project. University of Oviedo, Spain.

2013–2014: Technical Advisor in Chemical Engineering Department, University of Oviedo, Spain.

2014–2014: Post-Doctoral Research at Teagasc, project NutraMara.

2014–2018: Contracted Research Officer

From 2018: Permanent Research Officer

Expertise

Carlos Álvarez obtained his doctorate in the University of Oviedo (Spain) in 2012, the topic of the research work was focused on characterization of isolated proteins from porcine blood, based on their functional and antioxidant properties. Through this project he has collaborated with several companies aiming to develop new food products containing blood purified proteins. After that he joined the NutraMara project as a Post-doctoral student; within this project new techniques were developed aiming to recover proteins, peptides, amino acids, minerals and fatty acid from several fisheries wastes (frames, guts, heads, shells or mollusc flesh). Currently he is Research Officer in the FIRM funded project ReValue Proteins, focused on recovery and re-valorisation of molecules of high-added value from wastes and by-products of the meat industry such as blood, lungs, heart and other offal.

Currently, his research topics are developing novel protein-based materials; the use of proteins from meat co-products as novel techno-functional ingredients and the use of metabolomics and proteomics techniques to optimize the meat tenderness.

Selected Publications

1. Álvarez, C., Drummond, L., & Mullen, A. M. (2018). Expanding the industrial applications of a meat co-product: Generation of low-haemoglobin content plasma by means of red cells crenation. Journal of Cleaner Production.
2. Álvarez, C., Lélu, P., Lynch, S. A., & Tiwari, B. K. (2018). Optimised protein recovery from mackerel whole fish by using sequential acid/alkaline isoelectric solubilization precipitation (ISP) extraction assisted by ultrasound. LWT-Food Science and Technology, 88, 210–216.
3. Marcet, I., Álvarez, C., Paredes, B., Rendueles, M., & Díaz, M. (2017). Transparent and Edible Films from Ultrasound-Treated Egg Yolk Granules. Food and Bioprocess Technology, 1–13.
4. Mullen, A. M., Álvarez, C., Zeugolis, D. I., Henchion, M., O'Neill, E., & Drummond, L. (2017). Alternative uses for co-products: Harnessing the potential of valuable compounds from meat processing chains. Meat science, 132, 90–98.
5. Álvarez, C., Tiwari, B. K., Rendueles, M., & Díaz, M. (2016). Use of response surface methodology to describe the effect of time and temperature on the production of decoloured, antioxidant and functional peptides from porcine haemoglobin by sub-critical water hydrolysis. LWT-Food Science and Technology.

Dr. Olivia McAuliffe

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Education

PhD Microbiology (1995–1999), University College Cork.

BSc Microbiology (1991–1995), University College Cork.

Career

2017–Present: Principal Research Officer, Teagasc Food Research Centre, Moorepark.

2009–2017: Senior Research Officer, Teagasc Food Research Centre, Moorepark.

2003–2009: Research Officer, Teagasc Food Research Centre, Moorepark.

2000–2003: Post-Doctoral Research Fellow, North Carolina State University, Raleigh, NC, USA.

1999–2000: Post-Doctoral Research Fellow, National Food Biotechnology Centre, University College Cork.

Expertise

Olivia is a Principal Research Officer in the Dept. of Food Biosciences at Moorepark. Her research programme focuses on bacterial cultures for fermentation and biotransformation, and the bacteriophages that infect them. Her research group has developed valuable capabilities in strain discovery, selection and improvement, implementing a genomics-based approach to studying these organisms, their metabolism and their potential applications in food fermentations. She has published over 90 peer-reviewed publications on these topics. She works closely with a number of high profile national and international companies, providing research services and delivering 'knowledge-based' solutions to the selection and generation of desirable cultures for new product development.

Selected Publications

1. Stefanovic E, Kilcawley KN, Rea MC, Fitzgerald GF, McAuliffe O. 2017. Genetic, enzymatic and metabolite profiling of the *Lactobacillus casei* group reveals strain biodiversity and potential applications for flavour diversification. *Journal of Applied Microbiology* 122(5):1245–1261.
2. Stefanovic E, Thierry A, Maillard MB, Bertuzzi A, Rea MC, Fitzgerald G, McAuliffe O, Kilcawley KN. 2017. Strains of the *Lactobacillus casei* group show diverse abilities for the production of flavor compounds in 2 model systems. *Journal of Dairy Science* 100(9):6918–6929.
3. Stefanovic E, Fitzgerald G, McAuliffe O. 2017. Advances in the genomics and metabolomics of dairy lactobacilli. *Food Microbiology* 61:33–49.
4. Casey A, Jordan K, Coffey A, Fox EM, McAuliffe O. 2016. Comparative genomic analysis of two serotype 1/2b *Listeria monocytogenes* isolates from analogous environmental niches demonstrates the influence of hypervariable hotspots in defining pathogenesis. *Frontiers in Nutrition* 3:54.
5. Casey A, Jordan K, Neve H, Coffey A, McAuliffe O. 2015. A tail of two phages: genomic and functional analysis of *Listeria monocytogenes* phages vB_LmoS_188 and vB_LmoS_293 reveal the receptor-binding proteins involved in host specificity. *Frontiers in Microbiology* 6:1107.
6. Cavanagh D, Casey A, Altermann E, Cotter PD, Fitzgerald GF, McAuliffe O. 2015. Evaluation of non-dairy *Lactococcus lactis* with potential dairy applications reveals extensive phenotype-genotype disparity: implications for a revised species. *Applied and Environmental Microbiology* 81:3961–3972.

Dr. Paul Cotter

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Education

1996 B.Sc. (Hons) 1st class Microbiology, University College Cork (UCC), Ireland (Graduated in 1st position)

2001 Ph.D. Molecular Biology, University College Cork (UCC), Ireland

Career

2009 Principal Research Officer, Teagasc Food Research Centre

2009 Manager of Teagasc Next Gen DNA Sequencing platform

2009 PI, APC Microbiome Institute

2007–09 Lecturer Microbiology Dept., UCC

2002–06 Post-Doc/Senior Research Fellow UCC

Expertise

- Microbiology of foods and the role of microbes in health, spoilage and disease.
- Microbiology of the gut and its modulation by diet and exercise.
- Food grade antimicrobials to control spoilage and pathogenic bacteria.
- Next generation DNA sequencing technologies.
- Spore-forming bacteria; control and testing.

Selected Publications (of >200)

1. Quigley L, O'Sullivan DJ, Daly D, O'Sullivan O, Burdikova Z, Vana R, Beresford TP, Ross RP, Fitzgerald GF, McSweeney PLH, Giblin L, Sheehan JJ, Cotter PD. 2016. Thermus and the pink discoloration defect in cheese. mSystems 1:e00023–16
2. Clarke, S.F., E.F. Murphy, O. O'Sullivan, A.J. Lucey, M. Humphreys, A. Hogan, P. Hayes, M. O'Reilly, I.B Jeffery, R. Wood-Martin, D.M. Kerins, E. Quigley, R.P. Ross, P.W. O'Toole, M.P. Molloy, E. Falvey, F. Shanahan and P.D. Cotter. 2014. Exercise and associated dietary extremes impact on gut microbial diversity. Gut. 63:1913–20
3. O'Sullivan, D., P.D. Cotter, O. O'Sullivan, L. Giblin, P. McSweeney and J.J. Sheehan. 2015. Temporal and spatial differences in microbial composition during the manufacture of a Continental-type cheese. Appl Environ Microbiol. 81:2525–33.
4. Field, D., N. Gaudin, F. Lyons, P.M. O'Connor, P.D. Cotter, C. Hill and R.P. Ross. 2015. A bioengineered nisin derivative to control biofilms of Staphylococcus pseudintermedius. PLoS One 10:e0119684.
5. Walsh, C.J., C.M. Guinane, P.W. O'Toole and P.D. Cotter. 2014. Beneficial modulation of the gut microbiota. FEBS Letts Epub. doi: 10.1016/j.febslet.2014.03.035
6. Doyle, C.J., D. Gleeson, K. Jordan, T.P. Beresford, R.P. Ross, G.F. Fitzgerald and P.D Cotter. 2014. Clostridia and their significance with respect to milk and dairy products. Int J Food Microbiol. 197:77–87.

Dr. John Tobin

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Education

Ph.D. Food Science and Technology, University College Cork (UCC), Ireland. 2012

B.Sc. (Hons) Food Science and Technology, University College Cork. 2006

Career

2014–2015: Senior Process Technologist – Danone Nutricia Early Life Nutrition – Utrecht NL

2011–2013: Process Specialist – Danone Nutricia Early Life Nutrition – Utrecht NL

2009–2011: Research Officer – Teagasc Food Research Centre, Moorepark, Fermoy, Cork, Ireland

Expertise

My primary research interests include the links between dairy science, process technology and process engineering. Process technology platforms I am involved in include thermal processing, evaporation, spray drying, homogenisation, high shear technologies and separation/fractionation technologies. In particular my primary areas of expertise revolve around the complete deconstruction of milk by filtration and separation technologies, coupled with mapping of the physical partition of milk components during fractionation. I am also extensively involved in thermal processing particularly relating to the controlled denaturation and aggregation of protein streams in both low and high dry matter environments. My experience in thermal processing covers both direct (PHE/THE) and indirect (steam injection/infusion) technologies and also delves into the stability and interactions of complex nutritional formulations within all facets of thermal and concentration processes.

Selected Publications

1. Tobin, J. T., Heffernan, S. P., Mulvihill, D. M., Huppertz, T., & Kelly, A. L. (2015). Applications of High-Pressure Homogenization and Microfluidization for Milk and Dairy Products. Emerging Dairy Processing Technologies: Opportunities for the Dairy Industry, 93.
2. Tobin, J. T., Fitzsimons, S. M., Chaurin, V., Kelly, A. L., & Fenelon, M. A. (2012). Thermodynamic incompatibility between denatured whey protein and konjac glucomannan. Food Hydrocolloids, 27, 1, 201–207.
3. Tobin, J. T., Fitzsimons, S. M., Kelly, A. L., & Fenelon, M. A. (2011). The effect of native and modified konjac on the physical attributes of pasteurized and UHT-treated skim milk. *International Dairy Journal*, 21, 790–797.
4. Tobin, J. T., Fitzsimons, S. M., Kelly, A. L., Kelly, P. M., Auty, M. A. E., & Fenelon, M. A. (2010). Microparticulation of mixtures of whey protein and inulin. *International Journal of Dairy Technology*, 63, 32–40.
5. Murphy, E. G., Tobin, J. T., Roos. Y. H., & Fenelon, M. A. (2013). A high-solids steam injection process for the manufacture of powdered infant milk formula Dairy Science & Technology 93, 463–475.

Dr. Geraldine Duffy

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Education

Ph.D. on "Development of rapid methods for the isolation and detection of *Listeria monocytogenes* from meat" University of Ulster, Jordanstown, N.I. (1994)

Bachelor of Science Degree, University College Dublin, Belfield, Dublin 4.

Career

Head of Food Safety, Teagasc, Food Research Centre, Ashtown, Dublin (2005 to present)

Principal Research Officer, Teagasc Food Research Centre, Ashtown, Dublin

OECD Postdoctoral fellowship, Eastern Regional Research Centre, Agricultural

Research Service, U.S.D.A., Philadelphia (1996)

Post Doctoral Fellowship at University of Nottingham and Unilever, UK (1994)

EU training fellowship, TNO, The Netherlands Organisation for Applied and Scientific Research (1993)

Expertise

Research focuses on transmission, behaviour and control of microbial pathogens, in particular verocytotoxigenic *E. coli*, *Salmonella* and *Campylobacter* along the farm to fork chain. The research is applied to the development of food safety management systems including quantitative risk assessment models and novel interventions for control of known and emergent food borne pathogens. She has published widely in the field of microbial food safety with over 100 publications including books and book chapters. Dr. Duffy has considerable experience in the co-ordination of national and international research programmes and under the European Commission Framework Research Programme she has co-ordinated a 41 partner multi-national European Union Framework integrated research project on beef safety and quality (*Prosafebeef*). She is member of a number of professional committees including the Scientific Committee of the Food Safety Authority of Ireland and has served as a food safety expert for the European Food Safety Authority (EFSA) W.H.O / FAO and I.L.S.I. (International Life Science Institute).

Selected Publications

1. Burns AM, Duffy G, Walsh D., Tiwari, B, Grant, J., Lawlor, P.G., and Gardiner GE, (2016). Survival characteristics of monophasic Salmonella Typhimurium 4,[5],12:i:-strains derived from pig feed ingredients and compound feed. *Food Control* 64, 105–114.
2. Lawal, D., Burgess, C., McCabe, E., Whyte, P. and Duffy, G. (2015). Development of a quantitative real time PCR assay to detect and enumerate Escherichia coli O157 and O26 serogroups in bovine recto-anal swabs J. Micro methods 114:9–15.
3. O'Leary, D., McCabe, E.M., McCusker, M.P., Martins, M., Fanning, S. and Duffy, G. (2015). Acid environments affect biofilm formation and gene expression in isolates of Salmonella enterica Typhimurium DT104. Int J Food Microbiol. 3; 206: 7–16
4. Thomas, K.M., McCann, M., Collery, M.M, Logan, A., Whyte, P., McDowell, D.A. and Duffy, G, (2013). Transfer of Verocytotoxigenic Escherichia coli O157, O26, O111, O103 and O145 from Fleece to Carcass during Sheep Slaughter in an Irish export abattoir. Food Micro. 34 (1) 38–45.
5. Thomas, K.M., McCann, M., Collery, M.M, Logan, A., Whyte, P., McDowell, D.A. and Duffy, G, (2012). Tracking Verocytotoxigenic Escherichia coli O157, O26, O111, O103 and O145 in Irish Cattle at slaughter. Int J. Food Micro 153(3):288–96

Dr. Eimear Gallagher

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Education

Ph.D. University College Cork (2005)

M.Sc. University College Cork (2000)

B.Sc. University College Cork (1997)

Career

2000–Present: Senior Research Officer, Teagasc Research Centre, Ashtown, Dublin 15.

1999–2000: Research Scientist, Scientific Support team, Nestlé PTC, York, YO1 1XY, England. (7 month contract).

1997–1997: Research Assistant, Dept. of Food and Nutritional Sciences, National University of Ireland, Cork.

Expertise

Dr. Gallagher's expertise lies predominantly in cereal and bakery research. She has extensive experience in grain milling, empirical dough rheology, confocal and scanning microscopy, digital imaging and sensory analysis. She has developed a particular capability in the gluten-free area, where she has conducted research in product reengineering, instrumental texture analysis, fundamental rheology and nutritional profiling. She is also a coordinator of Sensory Food Network Ireland, a national network of excellence in sensory food science. As well as conducting publicly funded research, Dr. Gallagher also has a number of confidential, industry-led short-term projects

Selected Publications

1. O'Shea, N., Kilcawley, K. and Gallagher, E. (2016). Influence of α-amylase and xylanase on the chemical, physical and volatile compound properties of wheat bread supplemented with wholegrain barley flour. European Food Research and Technology DOI: 10.1007/s00217–016–2651-y.
2. Ktenioudaki, A., Alvarez, L., Kilcawley, K., Gallagher, E. (2015). Application of bioprocessing techniques (sourdough fermentation and technological aids) for brewer's spent grain breads. Invited paper for the special issue of Food Research International, doi:10.1016/j.foodres.2015.03.008.
3. O'Shea, N., Ktenioudaki, A., Smyth, T.P., McLoughlin, P., Doran, L., Auty, M., Arendt, E.K. and Gallagher, E. (2015). Physicochemical assessment of two fruit by-products as functional ingredients: Apple and orange pomace. *Journal of Food Engineering*, 153: 89–95.
4. Ktenioudaki, A., Alvarez-Jubete, L. and Gallagher, E. (2015). A review of the process-induced changes in the phytochemical content of cereal grains: The breadmaking process. Critical Reviews in Food Science and Nutrition. 55(5):611–9.
5. Ktenioudaki, A., Crofton, E., Scannell, A.G.M., Hannon, J.A., Kilcawley, K.N. and Gallagher, E. (2013). Sensory properties and aromatic composition of baked snacks containing brewer's spent grain. Journal of Cereal Science, 57 (3): 384–390.

Ciara McDonagh

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Education

M.Sc. (Agricultural Science) 1998–2000 National University College Dublin (UCD).

B.Sc. (Applied Sciences – Food Science and Technology) 1993–1997. Dublin Institute of Technology, Kevin St. – awarded by Trinity College Dublin.

Career

2010–Present: Food Industry Development, Teagasc Food Research Centre, Ashtown.

2005–2010: Innovation Unit Manager, Teagasc Food Research Centre, Ashtown.

2001–2004: Research Officer, Meat Technology Department, Teagasc.

2000–2001: Research Assistant, National Food Biotechnology Centre, NUI, Cork.

Expertise

Ciara plays an integral role in the food industry development programme, providing direct technology development support to the food processing industry through product development, contract research, training, consultancy and information services. Working with the Technology Transfer Office, Ciara has developed the Teagasc Portfolio of Technologies to ensure the early transfer to industry of knowledge generated from the Teagasc food research programme. She is also responsible for the delivery of the Food Innovation Gateways Events, showcasing these technologies to industry. In addition, she manages the Teagasc Customer Relationship Management System, which has been developed to support interactions with industry, streamline information exchange and ensure innovation needs are being met.

Selected Publications

1. McDonagh, C. (2009). Technology Transfer Guides for the Meat Sector
2. McDonagh, C., Sommerfield, A., O'Neill, E., and McCarthy, P. (2006). From Concept to Completion – A Roadmap for Entrepreneurs.
3. Mc Donagh, C., Mullen, A.M, Kerry J.P. & Troy, D.J. (2006). Evaluation of inherent variation in porcine M. *thoracis* et *lumborum* and M. *semimembranosus*. *Journal of the Science of Food and Agriculture*. 86(2), 292–298.
4. Mc Donagh, C., Kerry J.P., Troy, D.J. & Mullen, A.M. (2005). Relationship between the subjective and objective assessment of pork M. *semimembrosus* and prediction of further processed pork quality. Food Science and Technology International. 11(2), 149–154
5. 2005–2012: Confidential Research Reports for client companies.

Dr. Gerard Barry

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Education

Ph.D. Factors Affecting Milk Protein Composition, 1980

B.Sc. Biochemistry with Microbiology, 1977

Career

1988–Present: Food Industry Development, Teagasc Food Research Centre, Ashtown

1982–1986: Technical & Operations Management Meat Processing Sector

1980–1982: Teagasc Researcher, Dairy Research Centre, Moorepark.

Expertise

- Design, development and delivery of training courses.
- Food Safety Systems / HACCP
- Implementation of Quality Management Systems in.
- Food, Feed & Laboratory areas.
- Internal & Third Party auditing of Food Safety & Quality Management Standards.
- Internal auditing in Competent Authorities.
- Standards Development.

Projects include:

- Development of Certified Training Programmes.
- Design & delivery of specialised training to Competent Authorities and Development Agencies.
- Delivery of training across a range of food safety related topics including microbiology, HACCP, food standards, auditing, laboratory accreditation etc.
- Organisation and delivery of a range of seminars on topics of interest to the food industry.
- Addressing varied client queries in the area of food safety & quality, including legislative and standards requirements (e.g. BRC, Bord Bia, ISO 22000 etc).
- Problem solving and shelf-life extension.

Selected Publications

1. Barry G, Clancy M (1998) Food Catering, A Serious Business. *Hotel and Catering Times* October/ November Ed. P 4–7.
2. Doyle T, Barry (1994). Food Safety The Systematic Approach. *Food Ireland*, June Edition, P17–20.
3. Barry G (2010). Ensuring Good Food Standards, *T Research*, Volume 5, Number 1, Spring 2010 Pages 20–21 (ISSN 1649–8917).
4. Barry (2012) Shelf-life of Food, *T Research*, Volume, Number 1, Spring 2012 Pages 20–21 (ISSN 1649–8917).

Dr. Tom Beresford

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Education

B.Sc. University College, Cork, Ireland. 1985

Ph.D. University College, Cork, Ireland. 1991

Research Experience

1990–1991: Post Doctoral Research Scientist BioResearch Ireland, University College Cork.

1991–1993: Post Doctoral Research Scientist New Zealand Dairy Research Institute.

1993–2000: Research Officer.

2000–2002: Senior Research Officer.

2002–2005: Principle Research Officer.

2005–Present: Senior Principle Research Officer Teagasc Food Research Centre, Moorepark.

Management Experience

2000–2004: Acting Head, Cheese Department.

2004–2009: Head, Food Cultures & Safety Department.

2009–Present: Head, Food Biosciences Department.

Expertise

My primary research interests relate to aspects of cheese microbiology, in particular, the influence of various starter and non-starter organisms on the biochemistry of cheese ripening. Of particular interest is the contribution of *Lactobacillus helveticus* as a cheese ripening organism. As part of this work the complete sequence of DPC4571, an *L. helveticus* strain with interesting technological characteristics from the Moorepark culture collection, has been elucidated. A particular focus of my current research relates to the potential of bacterial exopolysaccharide to impact on both the techno – and bio-functionality of dairy products. In addition, I am interested in microbial fermentation with particular reference to the capacity of a range of bacteria to release bioactive peptides from protein molecules. I also undertake research on microbial quality of milk.

Selected Publications

1. Callanan, M.J., Kaleta, P., O'Callaghan, J., O'Sullivan, O., Jordan, K.N., McAuliffe, O., Sangrador-Vegas, A., Slattery, L., Fitzgerald, G. F., Beresford, T.P., Ross, R.P. (2008) Genome sequence of *Lactobacillus helveticus*, an an organism distinguished by selective gene loss and insertion sequence element expansion. *Journal of Bacteriology*, 190, 2, 727–735.
2. Kaleta, P., O'Callaghan, J., Fitzgerald, G.F., Beresford, T.P., Ross, R. P. (2010) Crucial role for insertion sequence elements in *Lactobacillus helveticus* evolution as revealed by interstrain genomic comparison. *Applied & Environmental Microbiology* 76, 1, 212–220.
3. Costa, N.E., Hannon, J.A., Guinee, T.P., Auty, M.A.E., McSweeney, P.L.H and Beresford, T.P. (2010) Effect of exopolysaccharide produced by isogenic strains of *Lactococcus lactis* on half-fat Cheddar cheese. *Journal of Dairy Science* 93, 3469–3486.
4. Slattery, L., O'Callaghan, J., Fitzgerald, G.F., Beresford, T.P., and Ross, R.P. (2010) Invited review: *Lactobacillus helveticus* – A thermophilic dairy starter related to gut bacteria. *Journal of Dairy Science* 93, 4435–4445.
5. Quigley, L., O'Sullivan, O., Beresford, T., Ross, R.P. Fitzgerald, G.F. and Cotter, P. (2011). Molecular approaches to analyzing the microbial composition of raw milk and raw milk cheese. *International Journal of Food Microbiology* 150, 81–94.

Dr. Declan Bolton

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Education

B.Sc. University College Dublin, Ireland. 1991

Ph.D. University College Dublin, Ireland. 1995

Grad. Dip. Business, NCEA, Ireland. 1996

Career

Research Assistant (University College Dublin) (1990)

Research Scientist (USDA-ERRC, Philadelphia) (1996)

Research Officer, Teagasc (1996–2003)

Senior Research Officer, Teagasc (2003–2006)

Principal Research Officer, Teagasc (2006 to date)

Member of the European Food Safety Authority, Biohazard Panel, Parma, Italy, (2012 to date)

Expert Consultant, FAO/WHO, Rome, Italy (2015)

Expertise

- **Food safety microbiology** including *Campylobacter*, *Escherichia coli* O157/VTEC, *Salmonella* and other foodborne bacterial pathogens.
- **Food spoilage microbiology** including blown pack spoilage (*Clostridium estertheticum, Clostridium gasigenes*, etc.) and shelf-life.
- **Food safety, shelf-life, HACCP and pre-requisites (GMP and GHP)** for beef, pork lamb, poultry, fish and foods of non-animal origin (vegetables, cereals, fruit, etc.) including primary production, processing, transport, retail and catering.

Selected Publications

1. Leonard Koolman, Paul Whyte, Joseph Meade, James Lyng, Declan Bolton (2014). Use of chemical treatments applied alone and in combination to reduce Campylobacter on raw poultry. *Food Control*, 46, 299–303.
2. Declan J. Bolton (2015) Campylobacter virulence and survival factors. Food Microbiology, 48, 99–108.
3. Leonard Koolman, Paul Whyte, Catherine Burgess and Declan J. Bolton (2015). Distribution of virulence-associated genes in a selection of Campylobacter isolates. Foodborne Pathogens and Disease, 12 (5), 424–433.
4. Declan J. Bolton, Des Walsh and Joan Carroll (2015). A four year survey of blown pack spoilage Clostridium estertheticum and Clostridium gasigenes on beef primals. Letters in Applied Microbiology, 61(2), 153–157.
5. Leonard Koolman, Paul Whyte, Catherine Burgess and Declan Bolton (2016) Virulence gene expression, adhesion and invasion of Campylobacter jejuni exposed to oxidative stress (H2O2). *International Journal of Food Microbiology*, 220, 33–38.
6. Tara Battersby, Paul Whyte and Declan J. Bolton (2016) The pattern of Campylobacter contamination on broiler farms; external and internal sources. *Journal of Applied Microbiology*, 102, 1108–1118.
7. Tara Battersby, Paul Whyte and Declan Bolton (2016). Protecting broilers against Campylobacter infection by preventing direct contact between the farmer and broilers. *Food Control*, 69, 346–351.

Kevin Brennan

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Education

M.Sc. Food Science, University of Reading (UK).

Food Microbiology, Institute of Technology, Co. Carlow.

Certificate in IT (computer systems) Institute of Technology, Blanchardstown.

Certificate in Equine AI and veterinary treatment.

Career

Current since 1996: Teagasc Food Research Centre, Ashtown, Dublin 15.

SGS Yarsley Ltd, Leopardstown Business Park, Co. Dublin.

Bioresearch Ireland Ltd, National Biotechnology Research Centre, University College Cork.

SGS Yarsley UK Ltd, Redhill, Surrey, UK.

Expertise

- Providing specialised training, consulting & independent contract technical auditing services (Bord Bia MPQAS, BRC and contract internal auditing) to the food sector, regulatory authorities and development agencies.
- Development and implementation of food safety and quality assurance standards. (incorporating: animal welfare, farm to fork traceability, food safety and quality).
- Technology/knowledge transfer of ready to use food safety research outputs to SMEs.
- Development of practical interpretative guides for SMEs in relation to application of food safety legislation.
- Animal welfare training and competency assessment in line with current animal welfare regulations.

Selected Publications

1. Brennan, K.A. (2013) Traceability and identification of Horse meat, Teagasc TReseach.
2. Brennan, K.A. (2012) Quality assurance and microbiological criteria regulations, Teagasc TResearch.
3. Brennan, K.A., Compliance with EC reg 2073/2005 – red meat sampling, Institute of Food Science and Technology 'Food Science and Technology Ireland' Volume 2, July 2008.
4. Brennan, K.A., Guidance note NFC/3/2007 'Microbiological Criteria for Food Stuffs – red meat specific', April 2007, ISBN 1 84170 449 0.
5. Brennan, K.A. & Langan J.W. (2003), Guidance Note on the implementation of the microbiological testing procedures and interpretation of results as required by European Communities (Fresh Meat and Poultry Checks on General Hygiene) Regulations 2003 (redmeat specific), Training Guidance Note No: NFC/Meat/1/2003, ISBN 1 84170 331 1.
6. Brennan, K.A. (2003), Guidance Note on the implementation of the microbiological testing procedures and interpretation of results as required by European Communities (Fresh Meat and Poultry Checks on General Hygiene) Regulations 2003 (poultry specific), Training Guidance Note No: NFC/Meat/2/2003, ISBN 1 84170 346 X.
7. Brennan, K.A., Food Safety Management and Audit, proceedings of EU-RAIN international conference, Dublin December 1–2nd 2006.
8. Brennan, K.A. (1999), HACCP Certification and I.S. 343, Proceedings of International Quality Conference, Dublin, October 1999.
9. Brennan, K.A. (1998), Dissemination of Food Safety and Quality Research in Europe, Proceedings of International Meat Conference, Madrid, Spain.

Dr. André Brodkorb

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Education

1995: Degree in Chemistry, Friedrich Schiller Universität Jena, Germany

2001: Ph.D. in Bio-physical Chemistry, Université Libré de Bruxelles, Belgium

Career

2001–2002: Post-doctorate in Bio-physical Chemistry, Trinity College Dublin

2002–Present: Research officer in Teagasc Food Research Centre, Moorepark

Expertise

- Protein Structure/Function relationship; Structure = molecular structure (primary, secondary and tertiary), modification, and aggregation; Function = physico-chemical properties (e.g. gelation, viscosity, emulsification, hydrophobicity), bio-activity.
- *In vivo* and *in vitro* gastro-intestinal digestion of food and food components.
- Bioencapsulation – protection of sensitive food ingredients e.g. probiotic bacteria, during processing, storage and gastro-intestinal digestion.
- Bioactivity and structure of novel protein/ligand complexes.
- Separation and fractionation of proteins/peptides – development and evaluation of novel chromatographic and non-chromatographic purification and fractionation of mainly globular proteins and proteolytic fractions thereof.
- Food colloids – structure, stability and function.

Selected Publications

1. Gough, R., O'Connor, P. M., Rea, M. C., Gómez-Sala, B., Miao, S., Hill, C., & Brodkorb, A. (2017). Simulated gastrointestinal digestion of nisin and interaction between nisin and bile. *LWT – Food Science and Technology*, 86, 530–537.
2. Minekus, M., Alminger, M., Alvito, P., Ballance, S.,Bohn, T., Bourlieu, C., Brodkorb, A. (2014). A standardised static *in vitro* digestion method suitable for food – an international consensus. *Food & Function*, 5(6), 1113–1124.
3. O'Loughlin, I. B., Murray, B. A., FitzGerald, R. J., Brodkorb, A., & Kelly, P. M. (2014). Pilot-scale production of hydrolysates with altered biofunctionalities based on thermally-denatured whey protein isolate. *International Dairy Journal*, 34, 146–152.
4. Sullivan, L. M., Kehoe, J. J., Barry, L., Buckley, M. J. M., Shanahan, F., Mok, K. H., & Brodkorb, A. (2014). Gastric digestion of α-lactalbumin in adult human subjects using capsule endoscopy and nasogastric tube sampling. *British Journal of Nutrition*, 112, 638–646.
5. Doherty, S. B., Auty, M. A., Stanton, C., Ross, R. P.,Fitzgerald, G. F., & Brodkorb, A. (2012). Survival ofentrapped *Lactobacillus rhamnosus* GG in wheyprotein micro-beads during simulated ex vivo gastrointestinaltransit. *International Dairy Journal*, 22(1),31–43.
6. Kehoe, J. J., Wang, L., Morris, E. R., & Brodkorb, A. (2011). Formation of non-native β-lactoglobulin during heat-induced denaturation. *Food Biophysics*, 6(4),487–496.

Dr. Kaye Burgess

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Education

Ph.D. Microbiology, University College Cork
B.Sc. (Hons) Microbiology, University College Cork (1H)

Career

March 2017–Present: Senior Research Officer, Teagasc Food Research Centre Ashtown

Sept 2005–Feb 2017: Research Officer, Teagasc Food Research Centre Ashtown

June 2005–Aug 2005: Postdoctoral researcher, Department of Microbiology, University College Cork

Expertise

Dr. Burgess's research focus is on using molecular tools to provide an understanding of the behaviour and virulence of microbial pathogens, in particular Gram-negative pathogens, along the farm to fork chain. She is particularly interested in the role that stresses encountered in the food chain may have on the virulence and persistence of foodborne pathogens, such as verocytotoxigenic *E. coli* (VTEC). Current activities include coordination of projects on identifying traits which contribute to persistence of VTEC in the primary production environment and reducing *L. monocytogenes* biofilm formation on food industry surfaces. She is a work package leader on the EU FP7 funded project *Aquavalens*, which is focused on technologies to ensure the safety of European drinking water supplies. Other areas of interest include novel detection methods for pathogens and spoilage organisms, the use of biological agents for the control of foodborne pathogens and antimicrobial resistance and horizontal gene transfer in food production.

Selected Publications

1. Lenahan M., Sheridan A., Morris D., Duffy G., Fanning S., and C.M. Burgess (2014). Transcriptomic analysis of triclosan-susceptible and – tolerant *Escherichia coli* O157:H19 in response to triclosan exposure. *Microb Drug Resist.* 20(2): 91–103.
2. Sheridan Á., Lenahan M., Condell O., Bonilla-Santiago R., Sergeant K., Renaut J., Duffy G., Fanning S., Nally J.E., and C.M. Burgess. (2013) Proteomic and phenotypic analysis of triclosan tolerant verocytotoxigenic *Escherichia coli* O157:H19. *J Proteomics* 80: 78–90.
3. Sheridan Á., M. Lenahan, G. Duffy, S. Fanning and C.M. Burgess (2012). The potential of biocide tolerance in *Escherichia coli* and its impact on the response to food processing stresses. *Food Control*, 26:98–106.
4. Murphy S, Gaffney M, Fanning S and Burgess CM (2016) Potential for transfer of *Escherichia coli* O157:H7, *Listeria monocytogenes* and *Salmonella* Senftenberg from contaminated food waste derived compost and anaerobic digestate liquid to lettuce plants. *Food Microbiol* 59:7–13.
5. Burgess CM, Gianotti A, Gruzdev N, Holah J, Knøchel S, Lehner A, Margas E, Esser SS, Sela Saldinger S, Tresse O (2016). The response of foodborne pathogens to osmotic and desiccation stresses in the food chain. *Int J Food Microbiol* 221:37–53.
6. Nyambe S, Burgess CM, Whyte P, O'Kiely P and Bolton D (2017). The fate of verocytotoxigenic *Escherichia coli* C600ϕ3538(Δvtx2 ::cat) and its vtx2 prophage during grass silage preparation. *J Appl Microbiol.* 122(5):1197–1206.
7. Lawal D, Burgess CM, McCabe E, Whyte P, Duffy G. (2015). Development of a quantitative real time PCR assay to detect and enumerate *Escherichia coli* O157 and O26 serogroups in bovine recto-anal swabs. *J Microbiol Methods* 114:9–15.

Sarah Cahalane

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Education

BA. Natural Science, Trinity College Dublin, 2002

M.Sc. Dublin City University, 2004

Career

2004–2006: Immunology Research Assistant, St. Vincent's University Hospital, Dublin 4

2006–2008: Research Funding and Lab Manager, Comparative Immunology Lab, Trinity College Dublin, Dublin 2

2008–2010: Evaluation Officer, Teagasc, Carlow

2010–Present: Intellectual Property Support Officer, Teagasc, Carlow

Expertise

My scientific background is essential to my position within the Teagasc Technology Transfer Office (TTO). In my role in the TTO I assist and provide support to the Head of the Intellectual Propoerty (IP) Management unit and facilitate interactions between Teagasc research staff, Industry and other research performing organisations through the use of transparent, consistent and equitable IP management and technology transfer policies.

I am involved in drafting, reviewing and negotiating research agreements which range from simple non-disclosure agreements to more complex consortium agreements, contract research and collaboration agreements. I am responsible for presenting the
Teagasc TTO's capabilities and activities on our website (www.teagasc.ie/research/collaboration) and I actively participate in the promotion of Teagasc's technologies at Technology Transfer events.

Selected Publications

1. Higgs, R., Cormican, P., Cahalane, S., et al. (2006) Induction of a novel chicken toll-like receptor following *Salmonella enterica* serovar *Typhimurium* infection. *Infection and Immunity* 74, 1692–1698.
2. Higgs, R., Lynn, D.J., Cahalane, S., et al. (2007) Modification of chicken avian beta-defensin-8 at positively selected amino acid sites enhances specific antimicrobial activity. *Immunogenetics* 59, 573–80.
3. Meade, K.G., Cahalane, S., Narciandi, F., et al. (2008) Directed alteration of a novel bovine beta-defensin to improve antimicrobial efficacy against methicillin-resistant *Staphylococcus aureus* (MRSA). *International Journal of Antimicrobial Agents* 32, 392–97.
4. Cormican, P., Meade, K.G., Cahalane, S., et al. (2008) Evolution, expression and effectiveness in a cluster of novel bovine beta-defensins. *Immunogenetics* 60, 147–56.

Dr. Alka Choudhary

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Education

PhD. National Institute of Pharmaceutical Education and Research, S.A.S. Nagar, India, 2015.

M.S. (Pharm.) Natural Products, National Institute of Pharmaceutical Education and Research, S.A.S. Nagar, India, 2011.

Career

2016–Present: Postdoctoral fellow, Food Biosciences Department, Teagasc Food Research Centre, Ashtown

2015–2016: Research Associate, ICAR-CIPHET, India

Expertise

At Teagasc, Dr. Alka Choudhary is involved in characterization of bioactives from marine bacteria using mass spectrometry. She completed her PhD on natural products where she focused on phytochemical investigations including qualitative and quantitative analysis using various spectroscopy and spectrometry techniques. She is interested in structure elucidation of natural and synthetic compounds based on MS, UV, FT-IR, and NMR techniques. She has also worked on the development of food biopolymer-based micro- and nano-scale delivery systems for bioactive ingredients in functional foods.

Publications

1. Choudhary, A, Mittal, A. K., Radhika, M, Tripathy, D., Chatterjee, A., Banerjee, U. C., Singh, I. P. Two new stereoisomeric antioxidant triterpenes from *Potentilla fulgens*. *Fitoterapia 2013, 91, 290–297.*
2. Choudhary, A., Manukonda, R., Chatterjee, A., Banerjee, U. C. , Singh, I. P. Qualitative and quantitative analysis of *Potentilla fulgens* roots by NMR, Matrix-assisted Laser Desorption/Ionisation with Time-of-Flight MS, Electrospray Ionisation MS/MS and HPLC/UV. *Phytochemical Analysis* 2015, 26, 161–170.
3. Choudhary, A., Kumar, R., Srivastava, R. B., Surapaneni, S. K., Tikoo, K., Singh, I. P. Isolation and characterization of phenolic compounds from *Rhodiola imbricata*, a Trans-Himalyan food crop having antioxidant and anticancer potential. *Journal of Functional Foods*, 2015, 16, 183–193.
4. Choudhary, A., Naughton, L.M., Montánchez, I., Dobson, A.D.W., Rai, D.K. Current Status and Future Prospects of Marine Natural Products (MNPs) as Antimicrobials. *Marine Drugs 2017*, 15, 272.

Sarah Cooney

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Education

B. Sc. In Food Science and Technology, University College Cork. 2009

Higher Certificate in Good Laboratory Practice and Core Skills, Waterford Institute of Technology. 2017

Career

2014–Present: Laboratory Technician, Food Chemistry and Technology Department, Teagasc, Moorepark, Co. Cork

2014–2014: Assistant Quality Manager, Irish Bacon Slicers, Ballincollig, Co. Cork

2014–2014: Technical Manager, Glenisk, Killeigh, Co. Offaly

2011–2013: Quality Assurance, Dew Valley Foods, Thurles, Co. Tipperary

Expertise

- Preparation of the Milk Standards which are sent to Co-ops and creameries across the country.
- ISO standard methods for analysis of milk, cheese and dairy powders. Including Kjeldahl for protein analysis and Rose-Gottlieb for fat analysis.
- Operation and calibration of the DairySpec FT for rapid analysis of raw milk.
- Technical Manager for the laboratory which was recently awarded INAB accreditation for standard ISO 17025:2005. The scope of this accreditation includes, fat and protein on liquid milk and dairy powders. Moisture on dairy powders and total solids on liquids.
- Laboratory Health and Safety Compliance Supervisor for the Technical Services Laboratory.
- Conducts the Split Sample Appeal Scheme for Co-ops and dairy farmers.
- Performs analysis including ash content, % intact casein, % non-protein nitrogen and % non-casein nitrogen.

Bernard Corrigan

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Education

Diploma in Food Science

B.Sc in Biochem. And Analytical Science

Career

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

Previously worked in the phama. Industry UK including Genzyme and Glaxo.

Expertise

- Elemental Analysis of dairy products.
- Analysis of dairy products esp powder testing.
- Protein
- Chromatography

Dr. Fiona Crispie

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Education

BA Nat. Sci. Trinity College Dublin

Ph.D. Microbiology University College, Cork.

Career

2001–2002: Post-Doctoral Researcher, University College Cork.

2002–2006: Post-Doctoral Researcher, University College Cork/Teagasc.

2006–2009: Research Officer, Teagasc.

2009–Present: Senior Post-Doctoral Researcher, Next Generation Sequencing Platform, APC (Teagasc).

Expertise

- Next generation DNA sequencing technologies.
- Microbiology of the gut.
- Antimicrobials to control spoilage and pathogenic bacteria.

Selected Publications

1. Pusceddu MM, El Aidy S, Crispie F, O'Sullivan O, Cotter P, Stanton C, Kelly P, Cryan JF, Dinan TG. 2015. N-3 Polyunsaturated Fatty Acids (PUFAs) Reverse the Impact of Early-Life Stress on the Gut Microbiota. *PLoS One*. 10(10):e013972.
2. Golubeva AV, Crampton S, Desbonnet L, Edge D, O'Sullivan O, Lomasney KW, Zhdanov AV, Crispie F, Moloney RD, Borre YE, Cotter PD, Hyland NP, O'Halloran KD, Dinan TG, O'Keeffe GW, Cryan JF. 2015. Prenatal stress-induced alterations in major physiological systems correlate with gut microbiota composition in adulthood. *Psychoneuroendocrinology*. 60:58–74.
3. Desbonnet L, Clarke G, Traplin A, O'Sullivan O, Crispie F, Moloney RD, Cotter PD, Dinan TG, Cryan JF. 2015. Gut microbiota depletion from early adolescence in mice: Implications for brain and behaviour. *Brain Behav Immun*. 48:165–73.
4. Davey KJ, Cotter PD, O'Sullivan O, Crispie F, Dinan TG, Cryan JF, O'Mahony SM. 2013. Antipsychotics and the gut microbiome: olanzapine-induced metabolic dysfunction is attenuated by antibiotic administration in the rat. *Transl Psychiatry* 1;3:e309.
5. Dobson A, Crispie F, Rea MC, O'Sullivan O, Casey PG, Lawlor PG, Cotter PD, Ross P, Gardiner GE, Hill C. 2011. Fate and efficacy of lacticin 3147-producing *Lactococcus lactis* in the mammalian gastrointestinal tract. *FEMS Microbiol Ecol*. 76(3) 602–14.
6. Rea MC, Dobson A, O'Sullivan O, Crispie F, Fouhy F, Cotter PD, Shanahan F, Kiely B, Hill C, Ross RP. 2011.
7. Effect of broad – and narrow-spectrum antimicrobials on *Clostridium difficile* and microbial diversity in a model of the distal colon. *Proc Natl Acad Sci U S A*. 108(1):4639–44.

Dr. Martin Danaher

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Education

Ph.D. in Analytical Chemistry, University College Cork 2003.

B.Sc. Industrial Chemistry, University of Limerick, 1997.

Career

2002–Present: Teagasc Food Researcher.

1997–1998: R&D Chemist, Gerard Laboratories.

1998–2002: Ph.D. student – "Teagasc Walsh Fellow."

Expertise

- Analytical chemistry: Chromatographic separations, sample purification, mass spectrometry, biosensors and immunoassays.
- Residue analysis: Agrochemical, environmental, natural toxins and medicinal adulterants.
- Databases: Coordinator of Ireland's "National Food Residue" and "Veterinary Drug and Feed Additive" Databases.
- Exposure and Risk Assessment: Exposure and risk assessment to contaminants from food.

Selected Publications

1. O'Mahony, J., Moloney, M., McConnell, R.I., Benchikh, E.O., Lowry, P., Furey, A., and Danaher. M., (2011). Simultaneous detection of four nitrofuran metabolites in honey using a multiplexing biochip screening assay. *Biosensors and Bioelectronics* 26 (10), pp. 4076–4081.
2. Vinogradova, T., Danaher, M., Baxter, A., Moloney, M., Victory, D. and Haughey, S.A. (2011). Rapid surface plasmon resonance immunobiosensor assay for microcystin toxins in blue-green algae food supplements. *Talanta*, 84 (3), pp. 638–643.
3. Whelan, M., Kinsella, B., Furey, A., Moloney, M., Cantwell, H., Lehotay, S.J. and Danaher, M. (2010). Determination of anthelmintic drug residues in milk using ultra high performance liquid chromatography-tandem mass spectrometry with rapid polarity switching *Journal of Chromatography A*, 1217 (27), pp. 4612–4622.
4. Kinsella, B., Lehotay, S.J., Mastovske, K., Lightfield, A.R. and Danaher, M. (2009). New method for the analysis of flukicide and other anthelmintic residues in bovine milk and liver using liquid chromatography-tandem mass spectrometry. Analytica Chimica Acta, 637(1–2), pp. 196–207.
5. Kinsella, B., O'Mahony, J., Malone, E., Moloney, M., Cantwell, H., Furey, A. and Danaher, M. (2009). Current trends in sample preparation for growth promoter and veterinary drug residue analysis. Journal of Chromatography A, 1216(46), pp. 7977–8015.

Dr. Gonzalo Delgado-Pando

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Education

PhD. Universidad Complutense de Madrid, Spain, 2013

M.Sc. (Food Safety and Biotechnology), Universidad de Burgos, Spain 2007

B.Sc. (Food Science and Technology), Universidad de Burgos, Spain 2006

Career

2017–Present: Research Officer, Meat Technology Ireland, Food Quality and Sensory Department, Teagasc

2015–2017: Postdoctoral Researcher, Food Quality and Sensory Department, Teagasc

2013–2015: Research fellow, Institute for Global Food Security, Queen's University Belfast

Expertise

The research interests of Dr. Delgado-Pando include functional foods, novel technologies and meat products. Gonzalo joined Teagasc as a postdoctoral researcher for the DAFM-funded project called PROSSLOW. Within this project he worked on obtaining successful ways of reducing the salt content of traditionally processed Irish cured meats without impacting the consumer acceptance, quality and safety of the products. During previous roles, Dr. Delgado-Pando has gained a strong knowledge of novel technologies such as high pressure processing, cold plasma and novel continuous microwave and how these technologies affect the technological and nutritional properties of the food products. He also has strong skills regarding development of functional meat products, chemometrics and multivariate analysis. Dr. Delgado-Pando recently joined Meat Technology Ireland, at Teagasc, working on novel meat characterisation technologies with potential to be implemented for in-line use. Some of the technologies under scrutiny are: video imaging analysis, ultrasound, computed tomography, and dual-energy x-ray absorptiometry. The objective of this MTI project is to improve process efficiency in the Irish meat industry.

Selected Publications

1. Delgado-Pando, G., Fischer, E., Allen, P., Kerry, J. P., O'Sullivan, M. G., & Hamill, R. M. (in press). Salt content and minimum acceptable levels in whole-muscle cured meat products. *Meat Science*
2. Delgado-Pando,G., Stratakos,A., & Koidis,A. (2016). Nutritional Properties of Ready-to-Eat Pasta Salads: Effect of Processing and Storage Conditions. *Journal of Food Processing and Preservation*. doi:10.1111/jfpp.13124
3. Stratakos, A., Delgado-Pando, G., Linton, M., Patterson, M.F.,& Koidis, A. (2016). Industrial scale microwave processing of tomato juice using a novel continuous microwave system, *Food Chemistry*, 190(1), 622–628
4. Stratakos, A. C., Delgado-Pando, G., Linton, M., Patterson, M. F., & Koidis, A. (2015). Synergism between high-pressure processing and active packaging against Listeria monocytogenes in ready-to-eat chicken breast. *Innovative Food Science & Emerging Technologies*, 27,41–47
5. Delgado-Pando, G., Celada, P., Sanchez-Muniz, F. J., Jimenez-Colmenero, F., & Olmedilla-Alonso, B. (2014). Effects of improved fat content of frankfurters and pates on lipid and lipoprotein profile of volunteers at increased cardiovascular risk: a placebo-controlled study. *Eur J Nutr,* 53(1), 83–93.
6. Jiménez-Colmenero, F., & Delgado-Pando, G. (2013). 16 – Fibre-enriched meat products. In J. A. D. Poutanen (Ed.), *Fibre-Rich and Wholegrain Foods*, (pp. 329–347): Woodhead Publishing.

Kieran Downey

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Education

BSc. Food Science, University of Cork. 2003

Diploma in Project Management. 2007

MBS. Business Practice, IMI. 2015

Career

2000–2003: Laboratory / Production – Dairygold

2003–2005: Assistant Production Manager – Carbery Group

2005–2008: Research Technologist – Wyeth Nutritionals

2008–2009: Food Technologist – Teagasc

2010–2011: Technical Manager – Moorepark Technology ltd (MTL)

2011-Present: General Manager – Moorepark Technology Ltd (MTL)

Expertise

Kieran Downey was appointed General Manager in 2011 of Moorepark Technology Ltd (MTL) which is a Food Industry Pilot Plant Facility with seven operating units. MTL's core business is the rental of the pilot plant to food companies and public research institutions for the purposes of carrying out product and process development, training, or small scale start-up manufacture.

Kieran leads a staff of sixteen, comprising food technologists, process engineers and plant operators and maintains MTL as a leading international provider of pilot-plant services, with particular expertise in wet processing, separation technologies and spray drying.

Competencies include the following food technology areas:

- Dairy technologies
- Infant formula technologies
- Separation technologies: mechanical and membrane separation – UF, MF, NF, clarification, decantation
- Evaporation and spray drying technologies
- Wet processing – HTST/UHT, homogenisation equipment

The main focus of Kieran's research and development work has been:

- New product development
- Product optimisation
- Cost optimisation
- Contract research
- Process engineering and efficiency
- Client training courses

Dr. Anna Fenelon

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Education

PhD. National University Ireland, Maynooth, 2003

B.Sc. (Chemistry), National University Ireland, Maynooth, 1999

Career

2008–Present: Technologist, Environment, Soils and Land Use Department, Teagasc

2004–2008: R&D Engineer, Hewlett Packard Manufacturing, Leixlip, Co. Kildare, Ireland

2003–2004: Post Doctoral Researcher, National University Ireland, Maynooth, Ireland

Expertise

Dr. Fenelon is the laboratory manager in the Teagasc Environmental Research Centre, Johnstown Castle. She manages a team of 8 experienced technical staff who work in combination with the research team across a suite of laboratories to deliver project goals of the Teagasc Environmental Research programme.

In addition to management duties, Dr. Fenelon's research area of interest is Analytical Chemistry. She is focused on mid/near-infra red spectroscopy and X-ray fluorescence spectroscopy for the application of rapid analysis techniques. In recent work, Dr. Fenelon has developed a rapid, multi-element method for the analysis of major nutrients in grass using energy dispersive X-ray flouresence. This work in now being extended to trace analysis in grass and other matrices, such as soil, dairy waste and milk powders. Dr. Fenelon is also currently part of a team developing methods which predict chemical parameters such as % organic matter, particle size and cation exchange capacity using molecular spectroscopy techniques. This work is comprised of scanning samples in the MIR and NIR region of the electromagnetic spectrum and combining chemometric techniques to build calibration models which predict these parameterscf.

Selected Publications

1. Daly, K. and Fenelon, A. 2017. A rapid and multi-element method for the analysis of major nutrients in grass *(lolium perennae)* using energy dispersive X-Ray fluorescence spectroscopy. *Irish Journal of Agriculture and Food Research*. 1–11. DOI: 10.1515/ijafr-2017–0001
2. Dunne, K. Holden, N., Fenelon, A. and Daly, K. 2017. The application of DRIFT in mid-Infrared spectroscopy for the prediction of soil phosphorus sorption capacity. 18th ICNIRS (International Conference on Near Infrared Spectroscopy) – NIR Spectroscopy at work in Industry, 2017. 11th – 15th June 2017, Bella Center, Copenhagen, Denmark.
3. Massey, P., O'Connor, C., Sills, P., Fenelon, A., Moloney-Finn, Stone, D. Reidy, B. and Creamer, R. Irish soil Information system: Laboratory Standard Operating Procedures, *STRIVE report*; 2014.

Laura Finnegan

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Education

B.A. Human Genetics, Trinity College Dublin (2015)

Career

2016–Present: Technician, Next Generation Sequencing Platform, APC (Teagasc).

2012–2015: Guinness Storehouse, St James' Gate, Dublin

Expertise

The Next Generation Sequencing Facility in Teagasc is one of the platform technologies of the APC – a national institute which aims to study the complexity of the gastrointestinal bacterial community and its links to human health, disease and mental well-being. The centre features Illumina NextSeq and MiSeq platforms, as well as Ion Torrent PGM and Proton sequencers and an Oxford Nanopore MinION. In her role as NGS technician, Laura is primarily involved in DNA library preparation, library QC and sequencing on the selected platform. While in this position, Laura has developed expertise in the following areas:

- DNA and RNA extraction – from food and human/animal samples.
- EMA extraction – for removal of dead bacteria DNA from a sample.
- 16S and ITS metagenomic library preparation and sequencing.
- Whole-genome shotgun library preparation and sequencing.
- Library QC – using nanodrop, Qubit quantification, Agilent Bioanalyser and qPCR.
- Total bacterial quantification by qPCR.
- Scientific Communication – through involvement in Education and Public Engagement programmes organized with the aim of informing society, engaging with industry and inspiring future young scientists. Laura has represented Teagasc and the APC Microbiome Institute at UCC open days and family-focused events in Cork city and surrounding towns, giving talks to primary school children on the importance of a good diet for a healthy microbiome, as well as mentoring transition year and third-level students during work placements.

Dr. Linda Giblin

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Education

Ph.D. University College Cork, Ireland. 1989

B.Sc. Biotechology, Dublin City University, Ireland 1995

Career

2002–Present: Senior Research Officer, Food BioSciences Department, Teagasc Food Research Centre, Moorepark, Ireland.

1999–2002: Research/Senior Scientist, Xanthon Inc (biotech start-up), Research Triangle Park, North Carolina, U.S.A.

1997–1998: Post-doctoral Scientist, Institute of Molecular BioSciences, Massey University, New Zealand.

1994–1997: Wellcome Post-doctoral Scientist, Biochemistry Department, University College Cork, Ireland.

Expertise

- Foods for Health, Food Bioactives.
- Life Stage Nutrition: Foods for pregnant women, foods for the elderly, foods for the infant.
- Food Bioavailability and Bioaccessibility.
- Foods for weight management, in particular satiety.
- Adipocyte and muscle health.
- Genotype-phenotype interactions.
- Large animal trials: Porcine post-prandial studies, Porcine models for pregnancy, Bovine mammary challenges.

Selected Publications

1. Kondrashina, A., Papkovsky, D., Giblin L. (2017). Physiological Gut Oxygenation Alters GLP-1 Secretion From the Enteroendocrine Cell Line STC-1. *Mol Nutr Food Res*., doi10.1002/mnfr.201700568.
2. McCarthy, T., Bruen, C., O'Halloran, F., Schellekens, H., Kilcawley, K., Cryan, J. F., Giblin, L. (2017). Aroma compound diacetyl suppresses glucagon-like peptide-1 production and secretion in STC-1 cells. *Food Chem.,* 228, 35–42.
3. Giblin, L., McGrath, B. A., Murray, B. A., le Roux, C. W., Docherty, N. G., McSweeney, P.L., Kelly, A.L. (2017). Letter to the Editor Regarding Equivalent Increases in Circulating GLP-1 Following Jejunal Delivery of Intact and Hydrolysed Casein: Relevance to Satiety Induction following Bariatric Surgery. *Obes Surg.,* 27, 816–817.
4. O'Halloran, F., Beecher, C., Chaurin, V., Sweeney, T., Giblin, L. (2016). Lactoferrin affects the adherence and invasion of Streptococcus dysgalactiae ssp. dysgalactiae in mammary epithelial cells. *J Dairy Sci.,* 99(6), 4619–28
5. Schellekens, H., De Francesco, P. N., Kandil, D., Theeuwes, W. F., McCarthy, T., van Oeffelen, W. E., Perello, M., Giblin, L., Dinan, T. G., Cryan, J. F. (2015). Ghrelin's Orexigenic Effect Is Modulated via a Serotonin 2C Receptor Interaction. *ACS Chem Neurosci*., 6, 1186–1197.
6. Power-Grant, O., Bruen, C., Brennan, L., Giblin, L., Jakeman, P., FitzGerald, R. J. (2015). In vitro bioactive properties of intact and enzymatically hydrolysed whey protein: targeting the enteroinsular axis. *Food Funct*., 6(3),972–80.
7. O'Sullivan, D. J., Fallico, V., O'Sullivan, O., McSweeney, P. L., Sheehan, J. J., Cotter, P. D., Giblin, L. (2015). High-throughput DNA sequencing to survey bacterial histidine and tyrosine decarboxylases in raw milk cheeses. *BMC Microbiol*., 15, 266-doi10.1186/s12866–015–0596–0.
8. Giblin, L., Darimont, C., Leone, P., McNamara, L. B., Blancher, F., Berry, D,. Castañeda-Gutiérrez, E., Lawlor, P. G. (2015). Offspring subcutaneous adipose markers are sensitive to the timing of maternal gestational weight gain. *Reprod Biol Endocrinol*. 13–16 doi10.1186/s12958–015–0009.

Carol Griffin

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Education

M.Sc. (Agr.) Degree in Food Science & Technology UCD 1993.

Graduate Diploma in Food Science & Technology (IFST, UK) DIT, Kevin St. 1991.

B.Sc. (Biochemistry, Physiology, Human Nutrition) NUI, Galway 1989.

Career

Jan 2010–Present: Food Industry Support (NPD & Sensory Analysis) – Teagasc, Food Research Centre, Ashtown.

Jan 2008–Jan 2010: Artisan Meat Technologist – Teagasc, Food Research Centre, Ashtown.

Feb 2002–Jan 2008: Food Safety Consultant & Trainer, Teagasc, Food Research Centre, Ashtown.

Sep 2000–Feb 2002: Food Safety Consultant with Verner Wheelock Associates (VWA).

Jan 1999–Sep 2000: Food Safety Consultant (self employed).

Mar 1994–Dec 1998: Quality Assurance Manager Goldstar Meats (renamed Kepak, Glasnevin).

Jun 1992–Mar 1994: Quality Technician – Batchelors Ltd. Bannow Road, Cabra, Dublin 7.

Expertise

Areas of expertise include:
Working as part of the Food Industry Development Department to support food businesses through advice, consultancy, auditing and training, in the areas of sensory analysis, product development, innovation, food safety, labelling and food business technical process development.

Consultancy projects undertaken include:

- Product reformulations, new product development from concept to production trials, sensory analysis of a wide range of food products for food businesses and to support the research programme in Teagasc. A major proportion of product and process development projects undertaken focus on shelf life extensions through product, process and packaging re-design.
- Development, delivery, piloting and validation of certified training programmes for all sectors of the food industry to meet client's customer & legislative requirements (topics include product & process development, food legislation, food labelling, hygiene, food safety, HACCP, plant design & food assurance standards, NPD and sensory).
- Descriptive Sensory Panel set up and training.
- Management of the Sensory Analysis Unit in Ashtown.
- Implementation of quality assurance and food safety management systems in a wide range of food businesses.
- Providing a technical advisory service to the meat & speciality food sector through mentoring, training and consultancy in the areas of food product and process development, food safety management systems and regulatory compliance.

Prof. TP Guinee

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Education/Career

Professor Timothy P. Guinee is a Principal Research Officer in Food Chemistry and Technology at Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork, Ireland. He graduated with a B.Sc. in Dairy Science (1980) and a Ph.D. in Dairy Chemistry (1985) from University College Cork. He was employed as a lecturer in Food and Environmental Sciences at Sligo Regional Technical College between 1984–1986. From 1986 to 1990, he worked in commercial R&D, as a Senior Researcher Scientist in Ireland, Germany and US on various aspects of cheeses (natural, processed, analogue types) and applications of milk protein ingredients in cheese and fermented milk products. He was appointed as a Senior Research Officer in Teagasc in 1990 and was promoted to Principal Research Officer in 2000.

Expertise

His particular interests include the study of the rheology and functional properties (e.g., viscosity, gelation, texture, heating behaviour) of composite high protein food matrices, and the exploitation of these properties in food manufacture and assembly/ formulation, with particular emphasis on gels and cheese-based systems. He has investigated the influences of various factors on the properties of cheeses, including milk composition/ treatments, gelation conditions, processing treatments, added ingredients, cheese composition and maturation conditions. A key aspect of his research involves the optimization of protein-protein, protein-mineral and protein-water interactions for the control of structure-functional relationships of foods, such as texture and heat stability. This approach has been applied in the development of reduced-fat cheese and a new cheese technology platform (based on gelation of reassembled milks). He has been an editorial board member for *International Dairy Journal* (from 2005) and formerly a co-editor. In 2011, he was appointed Adjunct Professor to the College of Science, Engineering and Food Science, University College Cork.

Selected Publications

1. Guinee, T.P. (2016). Protein in cheese products: structure-function relationships. In P.L.H. McSweeney and S.A. O'Mahony (Eds), Advanced Dairy Chemistry, Vol. 1 B Proteins: Applied Aspects (4th ed.) Springer Science+Business Media, New York, 347–415.
2. Guinee, T.P. and O'Callaghan D.J. (2013). Effect of increasing the protein-to-fat ratio and reducing fat content on the chemical and physical properties of processed cheese product. *J. Dairy Sci.* 6830–6839.
3. Guinee, T.P., Pudja, P., Miočinović, J., Wiley, J., & Mullins, C.M. (2015). Textural and cooking properties and viscoelastic changes on heating and cooling of Balkan cheeses. *Journal of Dairy Science*, 98, 7573–7586.
4. Henneberry, S., Kelly, P.M., Kilcawley, K.N., Wilkinson, M.G., Guinee, T.P. (2015). Interactive effects of salt and fat reduction on composition, rheology and functional properties of Mozzarella-style cheese. *Dairy Science and Technology*, 95, 613–638.
5. Henneberry, S., O'Sullivan, M. G., Kilcawley, K. N., Kelly, P. M., Wilkinson, M. G., & Guinee, T. P. (2016). Sensory quality of unheated and heated Mozzarella-style cheeses with different fat, salt and calcium levels. *International Journal of Dairy Technology*, 69, 38–50.
6. Hickey, D.K., Guinee T.P., Hou, J., and Wilkinson M.G. (2013). Effects of variation in cheese composition and maturation on water activity in Cheddar cheese during ripening. *Int. Dairy J.* 30, 53–58.
7. Hou, J., Hannon, J.A., McSweeney, P.L.H., Beresford, T.P. and Guinee, T.P. (2012). Effect of curd washing on composition, lactose metabolism, pH, and the growth of non-starter lactic acid bacteria in full fat Cheddar cheese. *Int. Dairy J.*, 25, 21–28.
8. Hou, J., Hannon, J.A., McSweeney, P.L.H., Beresford, T.P. and Guinee, T.P. (2014). Effect of curd washing on cheese proteolysis, texture, volatile compounds, and sensory grading in full fat Cheddar cheese. *Int. Dairy J.*, 34, 190–198.

Dr. Ruth Hamill

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Education

Ph.D. (Population Genetics), School of Biology and Environmental Science, UCD

B.Sc. (Zoology, 1H1), School of Biology and Environmental Science, UCD

Experience

2006–Present: Research Officer, Muscle Molecular Biology, Teagasc Food Research Centre, Ashtown

2002–2005: Post-doctoral Research Fellow, Population Genetics, University of St Andrews, Scotland

Expertise

My expertise focuses on muscle biology and meat science with a view to increasing understanding of the biological processes underpinning meat quality, the development of biological (genomic) markers of quality and understanding the structure/function relationship in meat products. My research programme is collaborative and nationally (FIRM/RSF) and European (FP7/COST) funded and I have also worked on confidential industry projects. I am currently a collaborator on a number of active projects in the healthier meat products area (e.g. Prosslow) and I am PI and Co-ordinator of a FIRM-funded project (Meat4Vitality) focused on developing novel meat products targeting the specific nutritional needs of older people and I previously co-ordinated a project (MeatMatrix) in this area focused on applying spectroscopic, microscopy, calorimetric and rheology techniques in model meat and myofibrillar systems to enhance understanding of the molecular mechanisms underpinning technological and sensorial quality. Through these projects the aim is to help facilitate the adoption of a more knowledge-based approach to the generation of targeted food systems and novel meat products delivering desired characteristics.

Selected Publications

1. Keenan, D. F., Resconi, V. C., Smyth, T. J., Lefranc, C., Botinestean, C., Kerry, J. P., Hamill, R. M. (2015). The effect of partial-fat substitutions with encapsulated and unencapsulated fish oils on the technological and eating quality of beef burgers over storage. Meat Science, available online, doi:10.1016/j.meatsci.2015.04.013
2. Tobin, B. D., M. G. O'Sullivan, R. Hamill and J. P. Kerry (2014). European consumer attitudes on the associated health benefits of neutraceutical-containing processed meats using Co-enzyme Q10 as a sample functional ingredient. Meat Science 97(2): 207–213.
3. Keenan, D. F., Auty, M. A. E., Doran, L., Kerry, J.P., Hamill, R. M. (2014). Investigating the influence of inulin as a fat substitute in comminuted products using rheology, calorimetric and microscopy techniques. Food Structure, 01: 2014
4. Hamill, RM, Aslan, O, Mullen, AM, O'Doherty, JV, McBryan, J, Morris, DG and Sweeney, T (2013). Transcriptome analysis of porcine *M. semimembranosus* divergent in intramuscular fat as a consequence of dietary protein restriction. BMC Genomics.2013, 14:453
5. McArdle, R, Hamill, R.M. and Kerry, J.P. (2011). Utilisation of hydrocolloids in processed meat systems. In: Processed meats: improving safety, nutrition and quality, p. 243–269. Edited by J.P. Kerry and J.F. Kerry, Woodhead Publishing.

Dr. Maria Hayes

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Education

B.Sc. University College Dublin, Ireland. 2002

Ph.D. University College Cork, Ireland. 2007

Leadership Development Diploma. 2016

Career

May 2016–July 2016: Guest researcher at Chalmers University of Technology, The Biology and Biological Engineering Unit, Gothenburg, Sweden.

February–March 2015: Hosted researcher at NMBU, Oslo, Norway.

October 2008–Present: Natural Products Chemist, Teagasc Food Research Centre, Ashtown, Dublin 15

October 2008–Present: Guest lecturer Dublin Institute of Technology module TFFP3055 Nutraceutical Product development.

June 2007–October 2008: Researcher at the Centre of Applied Marine Biotechnology, Letterkenny Institute of Technology, Donegal, Ireland.

December 2006–June 2007: Researcher at Teagasc Moorepark Biotechnology Centre and University College Cork.

Expertise

- High quality scientific research skills.
- Novel proteins from marine, meat and cereal sources – WP leader on NutraMara, ReValueProtein and NutriCereals Ireland.
- Isolation and characterization of techno-functional and health ingredients.
- Project management/evaluation.
- Technology & knowledge transfer.
- Innovation and new product development.
- Bioassay development – Heart health, renin, PAF-AH, ACE-I inhibitory, diabetes, mental health, antimicrobial PEP inhibitory, anti-oxidative, opioid.
- Allergenicity – member of EU COST Action ImPARAS EU FA1402
- Seaweed and microalgae – member of EU COST Action EU ALGAE EU 1408
- Event organization and moderation (conferences & workshops)
- Book editor and writer.

Selected Publications

1. Lafarga, T., & Hayes, M. (2016), Meat-derived bioactive protein hydrolysates and peptides as food ingredients: overcoming current challenges. Food Reviews international, DOI: http://dx.doi.org/10.1080/87559129.2016.1175013.
2. Dave, L. A., Hayes, M., Mora, L., Montoya, C. A., Moughan, P. J., Rutherfurd, S. M. (2016), Gastrointestinal endogenous protein-derived bioactive peptides: An in vitro study of their gut modulatory potential. International Journal of Molecular Sciences, 17, 482; doi:10.3390/ijms17040482.
3. Dave, L. A., Hayes, M., Montoya, C. A., Rutherfurd, S. M., Moughan, P. (2016), Human gut endogenous proteins as a source of angiotensin-I-converting enzyme (ACE-I), renin inhibitory and antioxidant peptides. Peptides, 76, 30–44. doi:10.1016/j.peptides.2015.11.003.
4. Dave, L. A., Hayes, M., Moughan, P. J., Rutherfurd, S. M. (2016), Novel Dipeptidyl Peptidase IV inhibitory and antioxidant peptides derived from human gastrointestinal endogenous proteins. Int. J. Pept. Res. Ther. 1–15. DOI 10.1007/s10989–016–9515-y.
5. Gangopadhyay, N., Wynne, K., O'Connor, P. Gallagher, E., Brunton, N. and Hayes, M. (2016), In silico and in vitro analysis of the angiotensin-I-converting enzyme inhibitory activity of hydrolysates generated from crude Barley (Hordeum vulgare) protein concentrates. Food Chemistry, 203, 367–374.

Dr. Rita Hickey

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Education

2008 FETAC Level 6 Advanced Certificate in Agriculture.

2003 Ph.D. Microbiology from NUI Cork (UCC).

1998 B.Sc. Hons (1H) from NUI Dublin (UCD).

Career

2007–Present Senior Research Officer, Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork, Ireland.

2005–2007 Process Specialist, Abbott Diagnostics, Sligo.

2004–2005 Research Officer, APC, Teagasc, Ireland.

2003–2004 Postdoctoral Researcher, MFRC, Teagasc, Ireland.

Expertise

Dr. Hickey's main research interests focus on the investigation of the biological properties of sugars isolated from food sources. She is the lead PI on the FHI Infant Nutrition workpackage for Food for Health Ireland and was a funded PI on the SFI-funded Alimentary Glycobiology Research Cluster (AGRC). She is a faculty member of the APC Microbiome Institute (APC). She has close linkages with Prof. Joshi's group in NUIG, through various AGRC- and DAFM-funded projects. Rita also collaborates with Prof. Douwe van Sinderen and Dr. Seamus O'Mahony in UCC. A major area of interest is the effect of food derived oligosaccharides on host-microbial interactions in the gut. For instance, milk oligosaccharides can alter intestinal glycosylation, which in turn contributes to early immune development and maturation of the newborn intestinal tract. Rita's research team focus on the development of strategies to characterise and produce food derived carbohydrates.

- Food oligosaccharides and glycoproteins – extraction, enrichment, fractionation and structural analysis.
- Development of bioassays for investigating the bioactive properties of glycans isolated from food sources.
- Manager of tissue culture facilities at Moorepark.
- Chromotography – Size-exclusion, Affinity and Ion Exchange Chromatography.

Selected Publications

1. O'Riordan N., Kilcoyne M., Joshi L. and Hickey R.M. (2017) Exploitation of SPR to Investigate the Importance of Glycan Chains in the Interaction between Lactoferrin and Bacteria. *Sensors* 17, 1515 (1–10).
2. Kavanaugh, D., O' Callaghan J. C., Kane, M., Joshi, L. and R. M. Hickey. (2015). The intestinal glycome and its modulation by diet and nutrition. *Nutrition Reviews*. Special article. (6):359–75.
3. O'Riordan, N., Kane, M., Joshi, L., Hickey, R. M.* (2014). Structural and functional characteristics of bovine milk protein glycosylation. *Glycobiology* 24: 220–236. Most downloaded article from 2014 in Glycobiology
4. O'Riordan, N., Kane, M., Joshi, L. and Hickey, R. M. (2014). Glycosidase activities in bovine milk over lactation. *International Dairy Journal*, 35 (2): 116–121.
5. Kavanaugh, D., O'Callaghan, J, Buttò, L. F., Slattery, H., Lane, J. A. Clyne, M., Kane M., Joshi, L. and R. M. Hickey. (2013). Exposure of *Bifidobacterium longum* subsp. *infantis* to milk oligosaccharides increases adhesion to epithelial cells and induces a substantial transcriptional response. PLoS ONE 8(6):e67224.

Dr. Sean Hogan

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Education

PhD. University College Dublin, Ireland. 2000.

MSc.Agr.Sc. (Food Science), University College Dublin, Ireland. 1995.

Career

2007–Present: Research Officer, Food Chemistry and Technology Department, Teagasc

2001–2006: Post-Doctoral Researcher, Department of Food Technology, University College Cork.

1995–2000: Teaching Assistant, Department of Chemistry, DIT, Bolton Street.

Expertise

Dr. Sean Hogan has extensive research experience in dairy chemistry, formulation and processing. His career with Teagasc has focused on the relationships between composition and behaviour during spray drying, ingredient interactions in concentrated dairy systems, development of functional lipid structures and the effects of diet on dairy product quality and functionality. His current research interests include the development of human milk-fat substitutes for infant formula manufacture, identification of nutri-biomarkers in whey, dietary influences on fatty acid and phospholipid profiles of milk and the application of novel technologies to milk processing and dairy products analysis. He is also involved in projects on valorization of dairy co-products through concentration and drying technologies and development of an *in vitro* infant digestion model. He is also focused on the development of a lipid chemistry platform to enhance analytical capabilities within Teagasc. His areas of expertise include colloidal and macro-ingredient interactions in dairy systems, formulation, rheology and food structure.

Selected Publications

1. Kondor, A., and Hogan, S. A. (2017). Relationships between surface energy analysis and functional characteristics of dairy powders. *Food Chemistry,* 237, 1155–1162.
2. Hogan, S.A. O'Loughlin, I.B. and Kelly, P.M. Soft matter characterization of whey protein powders systems. (2016). *International Dairy Journal*, 52, 1–9.
3. Murphy, E. G., Fenelon, M.A., Roos, Y. H. and Hogan, S. A. (2014). Decoupling macronutrient interactions during heating of model infant milk formulas. *Journal of Agriculture and Food Chemistry,* 62, 10585–10593.
4. Murphy, E. G., Roos, Y. H. Hogan, S. A. Maher, P. G., Flynn C.G. and Fenelon, M.A. Physical stability of infant milk formula made with selectively hydrolysed whey proteins. (2015). *International Dairy Journal,* 40, 39–46.
5. Hogan, S.A. and O'Callaghan, D.J. (2013). Moisture sorption and stickiness behaviour of hydrolysed whey protein/lactose powders. *Dairy Science & Technology,* 93, 205–221.

Dr. Mohammad B. Hossain

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Education

MSc. Leibniz University of Hannover, Germany. 2006

PhD. Dublin Institute of Technology, Ireland. 2012

Career

2010–present: Research Officer, Food Biosciences, Teagasc Food Research Centre, Ashtown.

Expertise

My research focuses primarily on the extraction, enrichment and characterisation of antioxidant, antimicrobial, anti-inflammatory, anticarcinogenic and cholesterol-lowering phytochemicals from plant sources. My research involves utilisation of various novel extraction techniques such as pressurised liquid extraction, ultrasound assisted extraction, pulsed electric field assisted extraction and enzyme assisted extraction for efficient and environmentally friendly extraction of these compounds with a view to valorising the low – or no-value agro-industrial by-products. My expertise includes a range of separation and analytical techniques such as size exclusion, ion exchange, normal phase, reversed phase, hydrophilic interaction liquid chromatography combined with various detection systems such as mass spectrometry, UV-Vis, fluorescence and refractive index.

Selected Publications

1. Hossain, M. B., Rai, D. K., & Brunton, N. P. (2015). Optimisation and validation of ultra-high performance liquid chromatographic-tandem mass spectrometry method for qualitative and quantitative analysis of potato steroidal alkaloids. *Journal of Chromatography B, 997*, 110–115.
2. Hossain, M. B., Aguiló-Aguayo, I., Lyng, J. G., Brunton, N. P., and Rai, D. K. (2015). Effect of pulsed electric field and pulsed light pre-treatment on the extraction of steroidal alkaloids from potato peels. *Innovative Food Science & Emerging Technologies*, 29, 9–14.
3. Hossain, M. B., Camphuis, G., Aguiló-Aguayo, I., Gangopadhyay, N., and Rai, D. K. (2014). Antioxidant activity guided separation of major polyphenols of marjoram (Origanum majorana L.) using flash chromatography and their identification by liquid chromatography coupled with electrospray ionization tandem mass spectrometry†. *Journal of Separation Science*, 37(22), 3205–3213.
4. Hossain. M.B., Patras, A., Barry-Ryan. C., Martin-Diana. A.B. and Brunton. N.P. (2011). Application of principal component and hierarchical cluster analysis to classify different spices based on *in-vitro* antioxidant activity and individual polyphenolic antioxidant compounds. *Journal of Functional Foods*, 3, 179–189.
5. Hossain. M.B., Barry-Ryan. C., Martin-Diana. A.B. and Brunton. N.P. (2010). Optimisation of accelerated solvent extraction of antioxidant compounds from rosemary (*Rosmarinus officinalis* L.), marjoram (*Origanum majorana* L.) and oregano (*Origanum vulgare* L.) using response surface methodology. *Food Chemistry,* 126, 339–346.
6. Hossain. M.B., Rai, D.K., Brunton. N.P., Martin-Diana. A.B. and Barry-Ryan. C. (2010). Characterization of phenolics composition in Lamiaceae spices by LC-ESI-MS/MS. *Journal of Agricultural and Food Chemistry*, 58, 10576–10581.
7. Kenny, O. M., McCarthy, C. M., Brunton, N. P., Hossain, M. B., Rai, D. K., Collins, S. G., Jones, P. W., Maguire, A. R., & O'Brien, N. M. (2013). Anti-inflammatory properties of potato glycoalkaloids in stimulated Jurkat and Raw 264.7 mouse macrophages. *Life Sci*, 92(13), 775–782.

Dr. Kieran Jordan

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Education

B.Sc. (University College Galway).

M.Sc., Ph.D. (University College, Cork).

Teagasc Food Research Centre.

Expertise

Dr. Jordan works on survival and occurrence of foodborne pathogens in dairy products, including *Listeria monocytogenes, S. aureus* and pathogenic *E. coli*, including adaptive tolerance responses and applications of molecular methodology in the study of foodborne pathogens.

Recent research projects funded include:

- Translating fundamental research on Listeria monocytogenes for the benefit of a multi-sectoral ready-to-eat food industry.
- Assuring the safety of mushrooms by the introduction of novel processes to reduce Listeria monocytogenes biofilms and environmental contamination in mushroom production facilities.
- Dairy Processing Technology Centre.
- Milk quality for a changing dairy industry.
- Safe and Healthy Foods.
- Risk assessment in relation to coagulase positive *Staphylococcus aureus*.

Selected Publications

1. Robin Condron, Choreh Farrokh, Kieran Jordan, Peter McClure, Tom Ross and Olivier Cerf. 2015. Guidelines for experimental design protocol and validation procedure for the measurement of heat resistance of microorganisms in milk. International Journal of Food Microbiology 192, 20–25.
2. Kieran Jordan. 2014. Monitoring occurrence and persistence of Listeria monocytogenes in foods and food processing environments in the Republic of Ireland. Frontiers in Microbiology 5, 436.
3. Kieran Jordan, Marion Dalmasso, Juergen Zentek, Anneluise Mader, Geert Bruggeman, JohnWallace, Dario De Medici, Alfonsina Fiore, Estella Prukner-Radovcic, Maja Lukac, Lars Axelsson, Askild Holck, Hanne Ingmer andMindaugas Malakauskas. 2014. Microbes versus microbes: control of pathogens in the food chain. *Journal of the Science of Food and Agriculture*, 94, 3079–3089.
4. Karen Hunt, Francis Butler and Kieran Jordan. 2014. Factors affecting Staphylococcal Enterotoxin C bovine production in milk. *International Dairy Journal* 39, 41–46.
5. David O'Beirne, E. Gleeson, M. Auty and K. Jordan 2014. Effects of processing and storage variables on penetration and survival of Escherichia coli O157:H7 in fresh-cut packaged carrots. *Food Control* 40, 71–77.

Dr. Kieran Kilcawley

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Education

BSc. University of Westminster, UK. 1994
PhD. University College, Cork, Ireland. 2002.

Career

1990–1996: Research Technician, Imperial Biotechnology Ltd, London, UK

1996–2004: Research Officer, Teagasc Food Research Centre, Moorepark

2004–2008: Senior Research Office

2008–Present: Principle Research Officer

Expertise

Dr. Kilcawley's research interests are primarily focused on the impact of volatile compounds on sensory perception of foods and beverages. Most of his experience is directly related to biochemistry and enzymology of foods with a particular emphasis on cheese flavour. He is actively involved in flavour research and in providing a service to industry. The flavour chemistry facility has extensive gas chromatography mass spectrometry capability, including gas chromatography olfactory and uses a range of different automated volatile extraction techniques.

Dr. Kilcawley is a member of the Sensory Food Network Ireland, International Dairy Federation, American Dairy Science Association and Irish Mass Spectrometry Society.

Dr. Kilcawley has have published >50 peer review research articles and 11 book chapters. He is a member of the editorial board for Dairy Science & Technology and the Journal of Dairy Research. He is a reviewer for a wide number of international peer reviewed journals.

Dr. Kilcawley was actively involved in the organisation of the Eight & Ninth International Cheese Symposia in Cork in 2011 & 2014 in association with the French National Institute for Agricultural Research (INRA) and University College Cork, Ireland (UCC). He was a member of the scientific committee for the IDF Symposia on Cheese in 2016.

Selected Publications

1. Faulkner, H., O'Callaghan, T.F., McAuliffe, S., Hennessy, D., Stanton, C., O'Sullivan, M.G., Kerry, J.P & Kilcawley , K.N (In Press). Impact of different forage types on the volatile and sensory properties of bovine milk. *J. Dairy Sci.*
2. O'Callaghan, T.F. Hennessy, D, McAuliffe, S, Kilcawley, K.N, O'Donovan, M, Dillon, P., Ross, R.P, Stanton, C (2016). Effect of pasture versus indoor feeding systems on raw milk composition and quality over an entire lactation. *J. Dairy Sci*, 99, (12), 9424–9440.
3. Mannion, D.T. Furey, A, Kilcawley, K.N (2016). Comparison and validation of 2 analytical methods for the determination of free fatty acids in dairy products by gas chromatography with flame ionization detection. *J. Dairy Sci*, 99, 5047–5063.
4. Yarlagadda, A.B., Wilkinson, M.G., Ryan, S.P., Doolan, I.A., O'Sullivan, M.G., & Kilcawley, K.N (2014). Utilisation of a cell-free extract of lactic acid bacteria entrapped in yeast to enhance flavour development in Cheddar cheese. International *J. Dairy Tech*, 67, 1, 21–30.
5. Rulikowska, A. Kilcawley, K.N, Doolan, I.A. Alonso-Gomez, M. Nongonierma, A.B. Hannon, J.A, Wilkinson, M.G (2013). The impact of reduced sodium chloride content on Cheddar cheese quality. *Int. Dairy J*, 28, 45–55.
6. Kilcawley, K,N, Nongonierma, A.B, Hannon, J.A, Doolan, I.A, Wilkinson, M.G (2012). Evaluation of commercial enzyme systems to accelerate Cheddar cheese ripening. *Int. Dairy J.* 26, 50–57.
7. Hickey, D.K, Kilcawley, K.N, Beresford, T.P, Sheehan, E.M, Wilkinson, M.G. (2006) Starter bacteria are the prime agents of lipolysis in Cheddar cheese. *J. Agri. and Food Chem*, 54, 8229–8235.
8. Kilcawley, K.N, Wilkinson, M.G, Fox, P.F. (1998). Review enzyme-modified cheese. *Int. Dairy J.* 8: 1–10

Dr. Valentyn Maidannyk

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Education

PhD. University College Cork, Ireland. 2017

M.Sc. (Colloid Chemistry),Lomonosov Moscow State University, Moscow, Russian Federation. 2012.

Career

2017–Present: Post-Doctoral researcher, Food Chemistry and Technology Department, Teagasc.

Expertise

Research interests include Food Material Science, Food Technology, Microscopy, Food Processing and Colloid Chemistry. Dr. Maidannyk has extensive experience and practical skills in preparation, analysis and dehydration of various carbohydrate; carbohydrate-protein; carbohydrate-protein-lipid and partially crystalline systems. Previous research work includes creation and developing of a new fundamental approach, named “Strength” concept (including mathematical definition and statistics). The main methods: DSC, DMA, DEA, Volume Rheology, Light Optical Microscopy, Confocal Laser Scanning Microscopy and Scanning Electron Microscopy which were employed to characterize varied food systems. The FIRM-funded project (11-F-001) involved experimental design, scale-up and analysis of various technological properties of modelled food and dairy systems.

Selected Publications

1. Maidannyk, V. A., Roos, Y. H. (2016). Modifications of the WLF model for characterization of the relaxation time-temperature relationship in trehalose-whey protein isolate systems. *Journal of Food Engineering, 188, 21–31.*
2. Nurhadi, B., Roos, Y.H., Maidannyk, V. (2016). Physical properties of maltodextrin DE 10: Water sorption, water plasticization and enthalpy relaxation. *Journal of Food Engineering 174, 68–74.*
3. Maidannyk, V. A., & Roos, Y. H. (2017). Water sorption, glass transition and “strength” of lactose–Whey protein systems. *Food Hydrocolloids, 70, 76–87.*
4. Maidannyk, V. A., Nurhadi, B., & Roos, Y. H. (2017). Structural strength analysis of amorphous trehalose-maltodextrin systems. *Food Research International, 96, 121–131.*
5. Maidannyk, V. A., Roos, Y. H. (2018). Structural strength analysis of partially crystalline trehalose. *LWT-Food Science and Technology, 88, 9–17.*

David T. Mannion

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Education

MSc. Cork Institute of Technology, Ireland. 2015

B.Sc. (Chemical Instrumentation and Analytical Science), Limerick Institute of Technology, Ireland. 2009

Career

2016–Present: Technologist, Food Quality and Sensory Department, Teagasc

2015–2016: Technician, Food Bioscience Department, Teagasc

2013–2015: Walsh Fellow, Food Bioscience Department, Teagasc

Feb 2013-Nov 2013: Technician (Intern), Food Bioscience Department, Teagasc

Expertise

David's main research interests are related to instrumentation and analytical method development, particularly in relation to flavour in food and beverages, fatty acid profiling and lipid oxidation. His key interests involve identification of aroma compounds involved in sensory perception, measuring of fatty acids for product quality and flavour impact, identification of biomarkers responsible for food authentication and traceability, effect of lipid oxidation on product stability, particularly in dairy products. He is involved in the provision of gas chromatography and mass spectrometry analysis and cover areas of advanced extraction techniques for isolation and detection of compounds, method development and validation, data processing and chemometrics.

Selected Publications

1. Mannion, David T., Ambrose Furey, and Kieran N. Kilcawley. "Free fatty acids quantification in dairy products." *International journal of dairy technology* 69.1 (2016): 1–12.
2. Mannion, David T., Ambrose Furey, and Kieran N. Kilcawley. "Comparison and validation of 2 analytical methods for the determination of free fatty acids in dairy products by gas chromatography with flame ionization detection." *Journal of dairy science* 99.7 (2016): 5047–5063.

Dr. Mariarosaria Marotta

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Education

Certified Diploma in Project Management, Institute Project Manangement, Ireland. 2015

PhD. Second University of Naples, Italy. 2005

Post-grad degree (Clinical Biochemistry and Chemistry), Second University of Naples, Italy. 2001

M.Sc. (Biological Sciences), University 'Federico II', Naples, italy. 1997

Career

2013–Present: Research Officer, Food Biosciences Department, Teagasc (Food for Health Ireland)

2009–2013: Research Officer, University College Cork (Food for Health Ireland)

2008–2009: Research Officer, Food Biosciences Department, Teagasc

2005–2007: Science Teacher, Secondary Schools, Italy

Expertise

Dr. Marotta's research focuses on the sourcing of milk carbohydrates with health promoting properties for inclusion in in infant formula. Previous research work has included investigating anti-infective properties of milk carbohydrates and enzymes for application in the food industry. Dr Marotta has vast experience in assay development (enzymatic, cell-based, quantitative and qualitative), chromatography and ultrafiltration/diafiltration methods from laboratory to pilot scale.

In 2009, Dr Marotta joined Food for Health Ireland and she is currently working as the Programme Manager for the Infant Nutrition workpackage.

Selected Publications

1. Ross S., Lane J.A., Marotta M., Kavanaugh D.W., Ryan J.T. Joshi L. and Hickey R.M. (2016) "The role of oligosaccharides in host-microbial interactions for human health" Journal of Clinical Gastroenterology 50 Suppl 2, S131-S132
2. Marotta M., Ryan J.T. and Hickey R.M. (2014) "The predominant milk oligosaccharide 6'-sialyllactose reduces the internalisation of *Pseudomonas aeruginosa in human pneumocytes" Journal of Functional Foods* 6: 367–373
3. Mehra R., Barile D., Marotta M., Lebrilla C.B., Chu C. and German J.B. (2014) "Novel high-molecular weight fucosylated milk oligosaccharides identified in dairy streams" *PLOS ONE*: 8;9(5):e96040
4. Marotta M. and Hickey R.M. (2014) "The role of human milk oligosaccharides in preventing respiratory infections in infants". In: *Oligosaccharides: Food Sources, Biological Roles and Health Implications, Nova Science Publishers, Inc.*, New York, pp. 115–142
5. Mariño K., Lane J.A., Abrahams J.L., Struwe W., Harvey D., Marotta M., Hickey R.M. and Rudd P.M. (2011) "Method for milk oligosaccharide profiling by 2-aminobenzamide labelling and hydrophilic interaction chromatography (HILIC)" *Glycobiology* 21(10): 1317–1330
6. Barile D., Marotta M., Chu C., Mehra R., Grimm R., Lebrilla C.B. and German J.B. (2010) "Neutral and acidic oligosaccharides in Holstein-Friesian colostrum during the first 3 days of lactation measured by high performance liquid chromatography on a microfluidic chip and time-of-flight mass spectrometry" *Journal of Dairy Science* 93: 3940–3949

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Education

B.Sc. (Food Science and Technology), University College Cork, Ireland. 2009

QQI Level 5 in Safety and Health at Work. 2017

Career

2011–Present: Laboratory Technician, Food Chemistry and Technology Department, Teagasc, Moorepark

2010–2011: Microbiologist, Newmarket Co-Op, Newmarket, Co. Cork

Expertise

- Dairy Support Technician in the Technical Services Laboratory.
- Quality manager of an ISO17025 accredited laboratory.
- Technical support to the Teagasc Food Programme and to industry clients.
- Production of milk reference standards for the Irish Dairy industry.
- Compositional analysis of dairy products using International Standards, specifically % Protein by Kjeldahl, % Fat by Rose Gottlieb, % Total solids on liquid dairy products and % moisture on dairy powders.
- Performance of multiple other techniques including D/L-lactic acid assay, % ash, % non-casein nitrogen, % non-protein nitrogen and intact casein.
- Amino acid composition using ion-exchange chromatography.
- Administrator of the Moorepark split sample appeal scheme for dairy farmers.
- Health and safety co-ordinator for the Food Chemistry and Technology Department.

Dr. Noel McCarthy

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Education

Ph.D. Food Science and Technology – 2013, University College Cork. (Title: The impact of protein profile on the physical stability of infant formulae)

B.Sc. Food Science and Technology (2008), University College Cork.

Career

2014–Present: Research Officer (Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork)

2013–2014: Food Technologist – Abbott Nutrition (Cootehill, Co. Cavan)

2012–2013: Post-Doctoral Researcher (Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork)

Expertise

- Emulsification and rheological properties of dairy systems.
- Separation and purification of milk protein fractions by membrane filtration.
- Factors affecting powder characteristics and functionality during spray drying.
- Protein powder solubility and dispersion mechanisms.

Selected Publications

1. McCarthy, N. A., Kelly, A. L., O'Mahony, J. A., Hickey, D. K., Chaurin, V., & Fenelon, M. A. (2012). Effect of protein content on emulsion stability of a model infant formula. *International Dairy Journal, 25*, 80–86.
2. McCarthy, N.A., Kelly, A.L., O'Mahony, J.A., Fenelon, M.A., (2013). The physical characteristics and emulsification properties of partially dephosphorylated bovine β-casein. *Food Chemistry, 138*, 1304–1311.
3. McCarthy, N. A., Kelly, A. L., O'Mahony, J. A., & Fenelon, M. A. (2014). Sensitivity of emulsions stabilised by bovine β-casein and lactoferrin to heat and CaCl2. *Food Hydrocolloids, 35*(0), 420–428.
4. McCarthy, N.A., Kelly, A.L., O'Mahony, J.A., Fenelon, M.A., (2013). The physical characteristics and emulsification properties of partially dephosphorylated bovine β-casein. *Food Chemistry, 138*, 1304–1311.
5. McCarthy, N. A., Kelly, P. M., Maher, P. G., & Fenelon, M. A. (2014). Dissolution of milk protein concentrate (MPC) powders by ultrasonication. *Journal of Food Engineering, 126*(0), 142–148.

Dr. Sinéad McCarthy

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Education

Dr. Sinéad McCarthy graduated with a B.Sc from UCC in 1993. She also completed an M.Sc in UCC in 1996, where she studied dietary vitamin E and lipid stability in turkey tissues. In 2003, she graduated from UCC with a Ph.D., in the area of public health nutrition which examined the predictors and prevalence of obesity in Irish adults.

Career

For nearly two decades, Sinéad has been involved in many areas of nutrition research, with a focus on food and health and has published extensively.

Sinéad's first research post in UCC was the area of human nutritional physiology, examining the anti – oxidative effects of carotenoid and fish oil consumption, as a part of two multi centred EU projects. In 1997, Sinéad moved to TCD as a research officer on the Irish National Food Consumption programmes, from which she was awarded her Ph.D. and attained funding to conduct additional food consumption surveys. She was the Scientific Officer on the Framework 6 Lipgene project and was actively involved in the human nutrition dietary intervention work-package of Lipgene. In 2007, Sinéad

joined Teagasc at Ashtown Food Research Centre, where she is responsible for leading Teagasc's consumer behaviour research programme in relation to food and health. She is actively involved in the area of consumer food choice determinants and its potential impact on health. Sinéad is a member of the Food Safety Authority of Ireland Public Health Nutrition sub-committee and the Nutrition and Health Foundation Scientific committee. She is also an active member of the Nutrition Society.

Expertise

Sinéad has significant expertise in the areas of consumer behaviour in relation to nutrition, food and health. She has extensive experience in designing national food consumption surveys in addition to designing and validating consumer behaviour questionnaires. She is experienced in qualitative research techniques such as focus groups and in-depth interviews and has extensive analytical skills using large consumer databases and biostatistics. She has developed a reputation in this area both nationally and internationally and this has been demonstrated in her success in securing external funding. She is involved in many on-going projects covering sensory science, consumer food and health behaviour, food expenditure patterns, consumer acceptance of novel food technologies, consumer acceptance of marine derived functional foods and drivers of cheese consumption. Sinead is also one of the co-ordinators of the newly formed Sensory Food Network Ireland.

Selected Publications

1. McCarthy SN. Weekly patterns, diet quality and energy balance Physiology & Behaviour 2014:555–59.
2. Greehy, G.M.; McCarthy, M.B.; Henchion, M.M.; Dillon, E.J.; McCarthy, S.N. Complexity and conundrums. Citizens' evaluations of potentially contentious novel food technologies using a deliberative discourse approach Appetite, 2013:37–46.
3. Newcombe M, McCarthy M, Cronin JM, McCarthy SN, "Eat like a man": A Social Constructionist Analysis of the Role of Food in Men's Lives. Appetite, 2012:391–8.
4. Shaw D, Tierney A, McCarthy S, Upritchard J, Vermunt S, Gulseth H, Drevon CA, Blaak E, Saris WHM, Karlstrom B, Helal O, Defoort C, Gallego R, Lopez – Miranda J, Siedlecka D, Malczewska-Malec M, Roche HM and Lovegrove JA. LIPGENE food-exchange model for alteration of dietary fat quantity and quality in free-living participants from eight European countries. British J Nutr (2009), 101, 750–759.
5. Joyce T, McCarthy SN, Gibney MJ. Relationship between energy from added sugars and frequency of added sugars intake in Irish children, teenagers and adults. Br J Nutr. 2008 May;99(5):1117–26.

Lauren McMaster

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Education

Professional Diploma in Digital Marketing, Digital Marketing Institute, 2016

MSc. Communications for Rural Business with Strategic Marketing Management, Queen's University Belfast, 2014

BSc. Consumer Studies, University of Ulster, 2010

Career

2017–Present: Manager Sensory Food Network Ireland, Teagasc

2015–2017: International Marketing Executive, CDE Global

2012–2015: Coordinator safefood Knowledge Networks, safefood

2008–2009: Marketing Assistant, Livestock and Meat Commission for Northern Ireland

Expertise

Lauren is the manager of Sensory Food Network Ireland. The Network delivers a comprehensive sensory science service to the food and beverage industry on the island of Ireland by fostering collaboration between industry and research organisations and by driving performance improvements throughout the Network.

Combining her experience in food industry support and commercial marketing roles, Lauren is focussed on the growth and further development of the Network. This includes expanding the dissemination programme for the Network to include workshops, articles, digital campaigns and outreach activities.

Lauren is the point of contact for Sensory Food Network Ireland for any sensory-related industry enquiries from the food industry.

Dr. Song Miao

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Education

Ph.D. in Food Science and Technology, National University of Ireland, University College Cork, Ireland

M Sc. in Food Technology, Shanghai Ocean University, China

B. Eng. in Food Engineering, Shanghai Ocean University, China

Careers

May 2009–Present: Senior Research Officer (Permanent), Department of Food Chemistry and Technology, Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork, Ireland.

Dec 2014–Present: Adjunct Professor, College of Food Science, Fujian Agriculture and Forestry University, China

Feb 2006–May 2009: Research Manager/Drying Granulation Scientist, Foods Structural Design, Unilever Food and Health Research Institute, Unilever R&D Vlaardingen, the Netherlands.

Jan 2005–Feb, 2006: Postdoctoral Research Officer, Biotechnology Centre, Moorepark, Teagasc, Fermoy, Co. Cork. Ireland

Oct 2001–Dec 2004: Research Scientist/Ph.D. Candidate, Department of Food and Nutritional Sciences, University College Cork, Ireland.

Jan 1995–Sep 2001: Senior Lecturer, Faculty of Food Science and Technology, Shanghai Fisheries University.

Jan 1996–Sep 2001: Senior Research Fellow, Faculty of Food Science and Technology, Shanghai Fisheries University.

Expertise

- Physico-chemical properties of biomaterials.
- Dehydration and granulation.
- Novel foods structural and textural designs.
- Stickiness and flowability of powders.
- State transition and phase transition in foods.
- Encapsulation and functional food ingredients.
- Structured emulsions for functional delivery.
- Stabilization of probiotics.
- Dairy ingredients.

Selected Publications

1. Like Mao, Yrjö H. Roos, Costas G. Biliaderis and Song Miao*. 2015. Food Emulsions as Delivery Systems for Flavor Compounds – A Review, *Critical Reviews in Food Science and Nutrition*, in Press. DOI: 10.1080/10408398.2015.1098586
2. Mao, L.; Roos, Y.H.; Miao, S.*, 2015, Effect of maltodextrins on the stability and volatile release behavior of oil-in-water emulsions subjected to freeze-thaw treatment, *Food Hydrocolloids*, 50: 219–227.
3. Lu, W., Kelly, A.L., Miao, S.*, 2016, Emulsion-based encapsulation and delivery systems for polyphenols, *Trends in Food Science and Technology*, 47:1–9
4. Li, R., Roos, Y. H., Miao, S.* 2016.Flavor release from spray-dried amorphous matrix: effect of lactose content and water plasticization. *Food Research International*, 86, 147–155.
5. Ji, J., Fitzpatrick, J., Cronin, K., Maguire, P., Zhang, H., Miao, S.*, 2016. Rehydration behaviours of high protein dairy powders: The influence of agglomeration on wettability, dispersibility and solubility. *Food hydrocolloids* 58, 194–203.
6. Ji, J., Cronin, K., Fitzpatrick, J., Maguire, P., Zhang, H., Miao, S.*, 2016. The structural modification and rehydration behaviours of milk protein isolate powders: The effect of granule growth in the high shear granulation process. *Journal of Food Engineering* 189, 1–8.

Dr. Mary Moloney

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Education

B.Sc. University of Limerick, Ireland. 2000

Ph.D. University of Limerick, Ireland. 2004

Career

2002: R&D Analyst, Clonmel Healthcare

2004: Research Assistant, Universtiy of Limerick

2004–2005: Quality Analyst, Medtronic Vascular, Galway

2005–2006: Research Officer, Residue Laboratories, Teagasc Food Research Centre, Ashtown

2006–Present: Laboratory Technologist, Residue Laboratories, Teagasc Food Research Centre, Ashtown

Expertise

I assist in the management of the Residues laboratories as Deputy Head of Laboratory and Deputy Quality Manager. The Residue laboratories are accredited to ISO 17025 and function as a national reference laboratory.

My expertise is primarily in the area of contaminant analysis, focussing on foods of animal origin. I have worked extensively in the area of coccidiostat feed additives and veterinary drugs developing and validating multi-residue methods for the determination of coccidiostats in target and non-target tissues. Other areas of interest include nitrofurans, nitroimadazoles, carbmates and anthelmintics. I am currently working on multi-residue methods for antibiotics in aquaculture and pesticides in animal fat in particular the pyrethroid pesticides. I work primarily with UHPLC coupled to tandem mass spectrometry but also have some experience screening technologies.

Selected Publications

1. Moloney, M., Clarke, L., O'Mahoney, J., Gadaj, A., O'Kennedy, R., Danaher, M. (2012) Determination of 20 coccdiostats in egg and avian muscle tissue using ultra high performance liquid chromatography coupled to tandem mass spectrometry. *Journal of Chromatography A*, 1253, 94–104.
2. Clarke, L., P., Moloney, M., O'Mahoney, J., O'Kennedy, R., Danaher, M. (2013) Determination of 20 coccdiostats in milk, duck muscle and non-avin muscle using UHPLC-MS/MS. *Food Addtives and Contaminants*, Part A, 30, 6, 958–969.
3. Whelan, M., Kinsella, B., Furey, A., Moloney, M., Cantwell, H., Lehotay, S.J., Danaher, M (2010) Determination of anthelmintic drug residues in milk using ultra high performance liquid chromatography-tandem mass spectrometry with rapid polarity switching. *Journal of Chromatography A*, 1217, 27, 4612–4622.
4. Radovnikovic, A., Moloney, M., Byrne, P., Danaher, M. (2011) Detection of banned nitrofuran metabolites in animal plasma samples using UHPLC-MS/MS. *Journal of Chromatography B*, 879, 2, 159–166.
5. Vinogradova, T., Danaher, M., Baxter, A., Moloney, M., Victory, D., Haughey, S.A. (2011). Rapid surface plasmon resonance immunobiosensor assay for microcystin toxins in blue green algae food supplements. *Talanta*, 84, 3, 638–643.

Dr. Sheila Morgan

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Education

B.Sc., NUI Maynooth.

Ph.D., University College Cork.

Career

1997–Present: Teagasc, Food Research Centre, Moorepark.

1995–1997: Microbiology Department, University College Cork.

Expertise

- Antimicrobial research (food and biomedical).
- Antimicrobial powder development.
- Gut microbiology and the effect of antimicrobials on gut populations.
- Scientific administration and project management.

Sheila currently works as a project manager for a number of large funded projects including the APC Microbiome Institute (www.apc.ucc.ie), Food for Health Ireland (www.fhi.ie) and the Dairy Processing Technology Centre (www.dptc.ie).

Selected Publications

1. Fate of the two-component lantibiotic lacticin 3147 in the gastrointestinal tract. Gardiner GE, Rea MC, O'Riordan B, O'Connor P, Morgan SM, Lawlor PG, Lynch PB, Cronin M, Ross RP, Hill C. Appl Environ Microbiol. 2007 73: 7103–9.
2. A lacticin 3147 enriched food ingredient reduces Streptococcus mutans isolated from the human oral cavity in saliva. O'Connor EB, O'Riordan B, Morgan SM, Whelton H, O'Mullane DM, Ross RP, Hill C. J Appl Microbiol. 2006 100:1251–60
3. Sequential actions of the two component peptides of the lantibiotic lacticin 3147 explain its antimicrobial activity at nanomolar concentrations. Morgan SM, O'Connor PM, Cotter PD, Ross RP, Hill C. Antimicrob Agents Chemother. 2005 49: 2606–11.
4. Evaluation of a spray-dried lacticin 3147 powder for the control of Listeria monocytogenes and Bacillus cereus in a range of food systems. Morgan SM, Galvin M, Ross RP, Hill C. Lett Appl Microbiol. 2001 33: 387–91.
5. Efficient method for the detection of microbially-produced antibacterial substances from food systems. Morgan SM, Hickey R, Ross RP, Hill C. J Appl Microbiol. 2000 89: 56–62.

Dr. Anne Maria Mullen

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Education

B.Sc. Biochemistry (1991), University College Galway
Ph.D. (1995) Pharmacology, University College Galway

Career

Current: Principal Research Officer, Teagasc Food Research Centre, Ashtown

1996–1998: Contract Research Officer, Teagasc Food Research Centre, Ashtown

Expertise

Dr. Mullen is currently overseeing the research programme for recovery of value from meat by-product and waste streams. Her research interests also address issues relating to various aspects of meat processing (post slaughter interventions) and meat quality (technological, eating etc.). In particular she has focused on biochemical and molecular factors underpinning variability in meat quality and the impact of post-mortem process interventions on product quality. Dr. Mullen was responsible for expanding the meat research programme to incorporate the application of relevant genome and proteome platforms in addressing issues of importance in meat quality. She has co-ordinated and collaborated on projects funded through EU Framework, FIRM (Irish) and Enterprise Ireland. In addition, Dr. Mullen served as Head of Department leading a staff of up to 20 comprising permanent and contract researchers, technical personnel and students. Publications relate to molecular basis of meat quality, recovery of value from meat processing streams, and general meat quality. She has presented her research on many occasions at international and national conferences; she is a member of the Enterprise Ireland – Global Skills Team (Pet Food). She regularly contributes to proposal and Ph.D. evaluations at national and international levels and is also involved with training and information programmes in meat technology for the Irish meat industry and relevant agencies.

Selected Publications

1. Mullen, A.M. and Álvarez C. (2016) Offal: Types and Composition, In Encyclopedia of Food and Health, Academic Press, Oxford, Pages 152–157, ISBN 9780123849533.
2. Lomas, A.J., Ryan, C.N.M., Sorushanova, A., Shologu, N., Sideri, A.I., Tsioli, V., Fthenakis, G., Tzora, A., Skoufos, G., Quinlan, L., O'Laighin, G., Mullen, A.M., Kelly, J.L., Kearns, S., Biggs, M., Pandit, A., Zeugolis, D.I. (2015) 'The Past, Present and Future in Scaffold-based Tendon Treatments.' Advanced Drug Delivery Reviews. 84, 257–277.
3. Anne Maria Mullen, Carlos Álvarez, Milica Pojić, Tamara Dapčević Hadnadev and Maria Papageorgiou (2015) Chapter 2 – Classification and target compounds, In Food Waste Recovery, edited by Charis M. Galanakis,, Academic Press, San Diego, Pages 25–57, ISBN 9780128003510.
4. Marcos, B. and Mullen, A.M. (2014) High pressure induced changes in beef muscle proteome: Correlation with quality parameters, Meat Science, Volume 97, Issue 1, May 2014, Pages 11–20.
5. Claire C. O'Flynn, Malco C. Cruz-Romero, Declan Troy, Anne M. Mullen, Joe P. Kerry (2014), The application of high-pressure treatment in the reduction of salt levels in reduced-phosphate breakfast sausages, Meat Science, Volume 96, Issue 3, Pages 1266–1274.
6. Di Luca, A, Elia, G.,, Hamill, R. and Mullen, A.M. (2013). 2-D DIGE proteomic analysis of early post mortem muscle exudate highlights the importance of the stress response for improved water-holding capacity of fresh pork meat. Proteomics 13, 9, 1528–1544.
7. Hamill, R., Ozlem Aslan, Mullen, A.M., O'Doherty, JV, McBryan, J, Morris, D.G. and Torres Sweeney (2013). Transcriptome analysis of porcine M. semimembranosus divergent in intramuscular fat as a consequence of dietary protein restriction. BMC Genomics 14:453–467.

Dr. Sean Mulvany

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Education

PhD. University College Dublin, Ireland. 2003

Career

2017–Present: Head of Technology Transfer, Teagasc

2015–2016: ICT Technology Transfer Case Manager, Trinity College Dublin

2006–2015: Commercialisation Specialist, Enterprise Ireland

2004–2006: Founder and Director of Berand Ltd.

Expertise

Sean has worked at the cutting-edge of industry relevant innovation as it arises in public research performing organisations for many years. In that time, he inhabited each of the key stakeholder roles. As a basic researcher investigating how the brain encodes memories, he moved as a postdoc into discovering new therapeutic targets to treat disorders of memory, such as Alzheimer's, in partnership with Wyeth (now part of Pfizer). As an entrepreneur, he cofounded a university spinout based on state-funded research capability. Latterly, he has supported research and innovation in universities and companies through his position in Enterprise Ireland. As a Technology Transfer Case Manager in Trinity College, he had responsibility for driving industry collaboration from initial problem statement to closing deals on research funding, contracts and IP access. In Teagasc, Sean leads the Technology Transfer team with responsibility for the identification, protection and commercialisation of Teagasc innovations and works collaboratively with companies to ensure these innovations are commercialised to maximum societal and economic impact in Ireland.

Dr. Eoin Murphy

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Education

PhD. University College Cork, Ireland. 2015

B.Eng (Hons). Chemical and Biopharmaceutical Engineering, Cork Institute of Technology, Ireland. 2008

Career

2016–Present: Research Officer, Food Chemistry and Technology Department, Teagasc

2015–2016: Senior Process Technology, Danone Nutricia Early Life Nutrition

2013–2015: Product Technologist, Biostime Pharma

2009–2013: Walsh Fellow, Teagasc

Expertise

The research interests of Dr Murphy include novel processing technologies, powdered food ingredients and nutritional formulations. His main research focus is in the area of optimisation of spray drying processes and development of next generation dehydration technologies. Previous research work has focused on the interactions between processing and composition during the manufacture of Infant Milk Formula (IMF) powders. The research demonstrated the potential to improve efficiency during IMF manufacture by understanding the effects of processing on physicochemical properties of formulations e.g. protein aggregation, viscosity. Dr Murphy has worked in the IMF industry, gaining a strong knowledge of new product development, novel process design and quality issues related to dairy ingredients and nutritional formulations. Main areas of expertise/interest:

- Spray drying.
- Evaporation.
- Membrane processing.
- Novel process development.
- Dairy process engineering.
- Powder functionality.

Selected Publications

1. Murphy EG, Tobin JT, Roos YH, & Fenelon MA (2011). The effect of high velocity steam injection on the colloidal stability of concentrated emulsions for the manufacture of infant formulations. *Procedia Food Science*, 1, 1309–1315.
2. Murphy EG, Tobin JT, Roos YH, & Fenelon MA (2013). A high-solids steam injection process for the manufacture of powdered infant milk formula. *Dairy Science & Technology*, 93, 463–475.
3. Murphy EG, Fenelon MA, Roos YH & Hogan SA (2014). Decoupling Macronutrient Interactions during Heating of Model Infant Milk Formulas. *Journal of agricultural and food chemistry*, 62, 10585–10593.
4. Murphy EG, Roos YH, Hogan SA, Maher PG, Flynn CG, & Fenelon MA (2015). Physical stability of infant milk formula made with selectively hydrolysed whey proteins. *International Dairy Journal*, 40, 39–46.

Dr. Kanishka N. Nilaweera

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Education

Ph.D. Neuroscience, University of Aberdeen, UK. (2002).

B.Sc., University of Aberdeen, UK. (1998).

Careers

2009–Present: Senior Research Officer, Teagasc, Moorepark Food Research Centre, Fermoy, County Cork, Ireland.

2007–2009: Post-doctoral Research Associate, School of Biomedical Sciences, University of Nottingham, UK.

2005–2007: Post-doctoral Research Associate, Rowett Research Institute, Aberdeen, UK.

2002–2005: Post-doctoral Research Assistant, Rowett Services Ltd, Aberdeen UK.

1996–1997: Industrial Student Placement, Molecular and Cell Biology Department, Zeneca Pharmaceuticals, UK.

Expertise

My research aims to identify nutrients that reduce weight gain, so that these could be commercialised as Functional Food ingredients to tackle the obesity problem. This work involves animal feeding trials. Utilising this approach, we have shown that whey protein isolate (a by-product of cheese manufacture) reduces weight gain by decreasing the size of the gut. Moreover, bovine serum albumin, a constituent protein within the isolate, has a greater suppressive effect on weight gain.

Selected Publications

1. McAllan, L, Speakman, J.R., Cryan, J.F. and Nilaweera, KN. Whey protein isolate decreases murine stomach weight and intestinal length and alters the expression of Wnt signalling associated genes. *British Journal of Nutrition* 2015,113; 372–379.
2. McManus BL, Korpela R, Speakman JR, Cryan JF, Cotter PD, Nilaweera KN. Bovine serum albumin as the dominant form of dietary protein reduces subcutaneous fat mass, plasma leptin and plasma corticosterone in high fat-fed C57/BL6J mice. *British Journal of Nutrition* 2015;114; 654–662.
3. McManus BL, Korpela R, O'Connor P, Schellekens H, Cryan JF, Cotter PD, Nilaweera KN. Compared to casein, bovine lactoferrin reduces plasma leptin and corticosterone and affects hypothalamic gene expression without altering weight gain or fat mass in high fat diet fed C57/BL6J mice. *Nutrition & Metabolism* 2015, 12;53.
4. Finucane OM, Lyons CL, Murphy AM, Reynolds CM, Klinger R, Healy NP, Cooke A, Coll R, McAllan L, Nilaweera KN, O'Reilly M, Tierney AC, Morine MJ, Alcala-Diaz JF, Lopez-Miranda J, O'Connor DP, O' Neill L, McGillicuddy FC, and Roche HM. Monounsaturated fatty acid enriched high fat-diets impede adipose NLRP3 inflammasome mediated IL-1β secretion and insulin resistance despite obesity. *Diabetes* 2015;64:2116–28.
5. McAllan L, Skuse P, Cotter PD, O'Connor P, Cryan JF, Ross RP, Fitzgerald G, Roche HM, Nilaweera KN. Protein quality and the protein to carbohydrate ratio within a high fat diet influences energy balance and the gut microbiota in C57BL/6J mice. *PLoS One* 2014; 10;9(2):e88904.

Dr. Tom O'Callaghan

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Education

PhD. University College Cork 2014–Present (Pending)

B.Sc. (Food Science), University College Cork, 2014

Career

2017–Present: Research Officer, Food Chemistry and Technology Department, Teagasc

2014: Assistant production manager Carbery Food Ingredients Ltd.

Expertise

Tom O'Callaghan recently joined Teagasc as a Dairy Chemistry Scientist. Tom is manager of the Dairy Chemistry Laboratory in Teagasc Moorepark. His research interests focus on the effects of primary production systems on the composition and quality of milk and dairy products and the effects of food processing technologies on the quality and functionality of dairy ingredients.

Previous research work has included examining the effects of pasture versus indoor total mixed ration feeding systems on the nutritional composition, characteristics and sensory quality of milk and dairy products. This project demonstrated the beneficial effects of pasture feeding on the fatty acid profile of products with increased proportions of CLA and Omega 3 fatty acids.

These projects have also investigated various methods for verification of pasture derived milk and dairy products which include fatty acid profiling and NMR metabolomics.

Tom has an on-going collaboration with the University of Alberta, where he is a guest researcher and has carried out research in collaboration with The Metabolomics Innovation Centre examining the rumen and milk metabolome.

During previous roles, Tom has gained a strong knowledge of analytical chemistry, product development and dairy processing for the production of high value dairy products.

Selected Publications

1. O'Callaghan, T. F., H. Faulkner, S. McAuliffe, M. G. O'Sullivan, D. Hennessy, P. Dillon, K. N. Kilcawley, C. Stanton, and R. P. Ross. 2016. Quality characteristics, chemical composition, and sensory properties of butter from cows on pasture versus indoor feeding systems. *Journal of Dairy Science*.
2. O'Callaghan, T. F., D. Hennessy, S. McAuliffe, K. N. Kilcawley, M. O'Donovan, P. Dillon, R. P. Ross, and C. Stanton. 2016. Effect of pasture versus indoor feeding systems on raw milk composition and quality over an entire lactation. *Journal of Dairy Science*.
3. O'Callaghan, T. F., D. T. Mannion, D. Hennessy, S. McAuliffe, M. G. O'Sullivan, N. Leeuwendaal, T. P. Beresford, P. Dillon, K. N. Kilcawley, J. J. Sheehan, R. P. Ross, and C. Stanton. 2017. Effect of pasture versus indoor feeding systems on quality characteristics, nutritional composition, and sensory and volatile properties of full-fat Cheddar cheese. *Journal of Dairy Science* 100(8):6053–6073.
4. Murphy, K., D. Curley, T. F. O'Callaghan, C.-A. O'Shea, E. M. Dempsey, P. W. O'Toole, R. P. Ross, C. A. Ryan, and C. Stanton. 2017. The Composition of Human Milk and Infant Faecal Microbiota Over the First Three Months of Life: A Pilot Study. *Scientific Reports* 7:40597.
5. Ntemiri, A., F. N. Chonchúir, T. F. O'Callaghan, C. Stanton, R. P. Ross, and P. W. O'Toole. 2017. Glycomacropeptide Sustains Microbiota Diversity and Promotes Specific Taxa in an Artificial Colon Model of Elderly Gut Microbiota. *Journal of Agricultural and Food Chemistry* 65(8):1836–1846.

Paula O'Connor

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Education

M.Sc. University College Cork, Ireland. 1992

B.Sc. (Hons) in Food Microbiology, University College Cork, Ireland. 1989

Career

1995–Present: Research Technician, Food Biosciences Department, Teagasc

1993–1995: Laboratory technician, Waterford Foods plc.

1991–1993: Microbiologist, Slaney Cooked Meats

Expertise

Paula runs the Bioactive Peptide Discovery Unit (BPDU) which is a unique facility designed to purify and characterise bioactive peptides from a number of sources. Her main areas of expertise are peptide purification, MALDI TOF mass spectrometry, peptide synthesis and amino acid analysis. She is interested in the development of novel antimicrobials as alternatives to antibiotics with a particular interest in bacteriocins which are small peptides produced by bacteria that kill closely related strains (narrow spectrum) or different genera (broad spectrum). She routinely purifies known bacteriocins such as nisin, lacticin and thuricin using reversed phase HPLC and ion exchange chromatography. Her expertise in peptide purification has been further enhanced through the purification and characterisation of 11 novel bacteriocins to date. Paula is also a skilled peptide chemist and routinely synthesises peptides from 2–60 amino acids in length. Her work allows her to collaborate extensively with other research institutes and industry and she has published extensively in her fields of expertise. She is currently doing a part time PhD entitled 'Bacteriocins from the mammalian gut' and through her studies purified and characterised a novel nisin variant, nisin H, from a porcine streptococcal isolate. She has also identified the key residues and structures required for activity within the anti-staphylococcal bacteriocin Bactofencin A using a peptide synthesis approach.

Selected Publications

1. Collins F.W.J, O'Connor P.M., O'Sullivan O., Gomez-Sala B., Rea M.C., Hill C and Ross R.P. (2017) Bacteriocin Gene-Trait matching across the complete Lactobacillus Pan-genome. *Scientific Reports* DOI: 10.1038/s41598–017–03339-y
2. Collins F.W.J., O'Connor P.M., O'Sullivan O. Rea M.C., Hill C. and Ross R.P. Formicin-a novel broad-spectrum two-component lantibiotic produced by *Bacillus paralicheniformis* APC 1576 *Microbiology*: 162:1662–1671
3. O'Connor P.M., O'Shea E.F., Guinane C.M., O'Sullivan O., Cotter P., Ross R.P. and Hill C. (2015) Nisin H is a new nisin variant produced by the gut-derived strain *Streptococcus hyointestinalis* DPC6484. *Applied and Environmental Microbiology* 81:3953–3960
4. O'Connor P.M, Ross R.P., Hill C. and Cotter P.D. (2015) Antimicrobial antagonists against food pathogens; a bacteriocin perspective. *Current Opinion in Food Science* 2:51–57
5. O'Shea E.F., O'Connor P.M., O'Sullivan O., Cotter P.D., Ross R.P. and Hill C. (2013) Bactofencin A, a new type of cationic bacteriocin with an unusual cognate immunity protein. *mBio* 4:1–13 doi:10.1128/mBio.00498–13
6. Rea M.C., O'Connor P.M., Crispie F., Hill C. and Ross R.P. (2010) Thuricin CD, a posttranslationally modified bacteriocin with a narrow spectrum of activity against *Clostridium difficile*. *Proceedings of the National Academy of Sciences* 107:9352–9357
7. Cotter P.D., O'Connor P.M., Draper L.A., Lawton E.M., Deegan L.H., Hill C. and Ross R.P. (2005) Posttranlational conversion of L-serines to D alanines is vital for optimal production and activity of the lantibiotic lacticin 3147. *Proceedings of the National Academy of Sciences* 102:18584–18589

Dr. Norah O'Shea

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Education

BSc. University College, Cork, 2008

MSc. University College, Cork, 2009

PhD. University College, Cork, 2014

Career

2016–Present: Research Officer, Food Chemistry and Technology Department, Teagasc

2016–2017: Post-Doctoral Research Scientist (DPTC)

2014–2016: Post-Doctoral Research Scientist

Teagasc Food Research Centre, Ashtown

Expertise

The research interests of Dr O'Shea include:

- Process analytical technologies (PAT, inline viscometers) for process improvements in the development of dairy concentrates and production of dairy powders.
- Assessing how to implement and validate PAT instruments and sensors at a pilot and commercial scale.
- Development of rheological test methods to evaluate PAT tools (process viscometers).
- Gaining an understanding of the rheological properties of dairy structures e.g. dairy concentrate behavior, heat induced protein changes.

Dr O'Shea has previously worked on FIRM funded projects that looked at cereal ingredients and food structures (gluten-free formulations, cracker, extrudates and bread formulations). Part of this work included investigating the nutritional (composition), rheological (dough structure), texture and sensory properties of the different formulations.

Selected Publications

1. O'Shea, N., Kilcawley, K.N. and Gallagher, E. (2017) Aromatic Composition and Physicochemical Characteristics of Crackers Containing Barley Fractions. *Cereal Chemistry* 94:3, 611–618.
2. O'Shea, N., Ktenioudaki, A., Smyth, T.P., McLoughlin, P., Doran, L., Auty, M.A.E., Arendt, E.K., Gallagher, E. (2015) Physicochemical assessment of two fruit by-products as functional ingredients: Apple and orange pomace. *Journal of Food Engineering*, 153, 89–95.
3. O'Shea, N., Roessle, C., Arendt, E.K., Gallagher, E. (2015) Modelling the effects of orange pomace using response surface design for gluten-free bread baking. *Food Chemistry*, 166, 223–230
4. O'Shea, N., Arendt, E.K., Gallagher, E. (2014) State of the art in gluten-free research. *Journal of Food Science*, 79, 6, R1069
5. O'Shea, N., Arendt, E.K., Gallagher, E. (2014) Enhancing an extruded puffed snack, by optimising die head temperature, screw speed and apple pomace inclusion. *Food Bioprocess Technology*, 7, 1767–1782
6. O'Shea, N., Doran, L., Auty, M.A.E., Arendt, E.K., Gallagher, E. (2013) The rheology, microstructure and sensory characteristics of a gluten-free bread formulation enhanced with orange pomace. *Food & Function* 4, 1856–1863

Dr. Orla O'Sullivan

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Education

BSc. University College, Cork, Ireland. 2000

PhD. University College, Cork, Ireland. 2001

Career

2004: Post-Doctoral Research Scientist, Conway Institute, University College Dublin

2005: Senior Demonstrator/Lecturer, Department of Biochemistry, University College Cork

2006–2007: Research Officer, Teagasc Food Research Centre, Moorepark

2008–2013: Researcher, ELDERMET, University College Cork and Teagasc Food Research Centre, Moorepark

2014: Research Fellow, Alimentary Pharmabiotic Centre and Teagasc Food Research Centre, Moorepark

2014–Present: SIRG Research Fellow, Teagasc Food Research Centre, Moorepark

Expertise

Orla is a bioinformatician working on the food programme in Teagasc. Her primary research focus is on the genomics of single bacteria and phage and metagenomics of various environments including human gut and lung, rumen and food. Understanding the genomes of bacteria and phage can aid in the identification of genes responsible for certain traits including flavour and textures in food and probiotics and antibiotic resistance in health. Metagenomic analysis allows both the community profiling and functional analysis of the microbiota of an environment and lends itself to identifying fluxes in bacterial populations in health versus disease, at stage of life (e.g. infant versus elderly) and causative factors in food spoilage. Of particular interest to her is the role of exercise and diet, particularly whey protein, on the human gut microbiome in elite athletes, and in healthy and diseased cohorts.

Selected Publications

1. Claesson, M. J., Jeffery, I. B., Conde, S., Power, S. E., O'Connor, E. M., Cusack, S., Harris, H. M., Coakley M., Lakshminarayanan, B., O'sullivan, O., Fitzgerald, G. F., Deane, J., O'Connor, M., Harnedy, N., O'Connor, K., O'Mahony, D., Van Sinderen, D., Wallace, M., Brennan, L., Stanton, C., Marchesi, J. R., Fitzgerald, A. P., Shanahan, F., Hill, C., Ross, R. P. & O'Toole, P. W. (2012) Gut Microbiota composition correlates with diet and health in the elderly. *Nature,* 488, 178–84.
2. Clarke, S. F., Murphy, E. F., O'Sullivan, O., Lucey, A. J., Humphreys, M., Hogan, A., Hayes, P., O'Reilly, M., Jeffery, I. B., Wood-Martin, R., Kerins, D. M., Quigley, E., Ross, R. P., O'Toole, P. W., Molloy, M. G., Falvey, E., Shanahan, F. & Cotter, P. D. (2014) Exercise and associated dietary extremes impact on gut microbial diversity. *Gut,* 63, 1913–20.
3. O'Sullivan, O., Rea, M. C., Shanahan, F., O'Toole, P. W., Stanton, C., Ross, R. P. & Hill, C. (2012) Clostridium difficile carriage in elderly subjects and associated changes in the intestinal microbiota. *J Clin Microbiol,* 50, 867–75.
4. Lavelle, A., Lennon, G., O'Sullivan, O., Docherty, N., Balfe, A., Maguire, A., Mulcahy, H. E., Doherty, G., O'Donoghue, D., Hyland, J., Ross, R. P., Coffey, J. C., Sheahan, K., Cotter, P. D., Shanahan, F., Winter, D. C. & O'Connell, P. R. (2015) spatial variation of the colonic microbiota in patients with ulcerative colitis and control volunteers. *Gut.*
5. O'Sullivan, O., Cronin, O., Clarke, S. F., Murphy, E. F., Molloy, M. G., Shanahan, F. & Cotter, P. D. (2015) Exercise and the Microbiota. *Gut Microbes,* 6, 131–6.

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Education

Ph.D.: Karolinska Institute, Stockholm, Sweden. 2003.

B.Sc.: Trinity College Dublin, Ireland, 1998.

Diploma: DIT Kevin Street, Dublin, Ireland, 1998.

Career

2009–Present: Senior Research Officer, Teagasc Food Research Centre, Ashtown, Dublin 15.

2013–Present: Adjunct Lecturer, School of Chemistry and Chemical Biology, University College Dublin.

2014–Present: Scientific Committee Member of the EU COST Action FA1403: Plant Bioactives inter-Individual Variation.

2003–2008: Post-Doctoral Research Scientist, Centre for Synthesis and Chemical Biology, University College Dublin.

Expertise

Dr. Rai leads a research team in the field of nutraceuticals in recovering and characterising food molecules that possess health-promoting effects. He has published numerous research articles in assessing the effect of various food-processing (domestic, industrial and novel physical) technologies on the levels of health-benefiting plant – molecules with emphasis on Irish grown plant foods such as barley, carrots, broccoli, mushrooms and onions. He currently leads research projects focusing on valorisation of food-processing by-products to generate sustainable sources of functional food ingredients (molecules) and bio-fuels.

Selected Publications

1. Hossain, M.B., Brunton, N.P., and Rai, D.K. (2016). Effect of drying methods on the steroidal alkaloid content of potato peels, shoots and berries. *Molecules*, 21(4): 403–413.
2. Gangopadhyay, N., Rai, D.K., Brunton, N.P., Gallagher, E., and Hossain, M.B.(2016). Antioxidant-guided isolation and mass spectrometric identification of the major polyphenols in barley (Hordeum vulgare) grain. *Food Chemistry*, 210, 212–220.
3. Lafarga, T., Rai, D.K., O'Connor, P., and Hayes, M. (2016). Generation of bioactive hydrolysates and peptides from bovine hemoglobin with in vitro renin, angiotensin-I-converting enzyme and dipeptidyl peptidase-IV inhibitory activities. *Journal of Food Biochemistry*, DOI: 10.1111/jfbc.12259.
4. Gangopadhyay, N., Wynne, K., O'Connor, P., Gallagher, E.,., Brunton, N.P., Rai, D.K., and Hayes, M. (2016). In silico and in vitro analyses of the angiotensin-I converting enzyme inhibitory activity of hydrolysates generated from crude barley (Hordeum vulgare) protein concentrates. *Food Chemistry*, 203, 367–374.
5. Aguiló-Aguayo, I., Suarez, M., Plaza, L., Hossain, M. B.; Brunton, N.; Lyng, J.G.; and Rai, D.K. (2015). Optimization of pulsed electric field pre-treatments to enhance health-promoting glucosinolates in broccoli flowers and stalk. *Journal of the Science of Food and Agriculture*, 95 (9): 1868–1875.

Dr. Mary C. Rea

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Education

B.Sc., M.Sc. and Ph.D. in Microbiology from University College Cork.

Career

1976–1977: Research Assistant Clinical Biochemistry Department, St Finbarr's Hospital Cork.

1977–1981: Contract Research Officer, An Foras Taluntais, Moorepark.

1989–2008: Contract Research Officer, Cheese Microbiology and Biotechnology Departments and member of the SFI funded Alimentary Pharmabiotic Centre.

2008–Present: Senior Research Officer in the Biosciences Department, Teagasc Food Research Centre, Moorepark.

Expertise

- Food preservation and biomedical applications of bacteriocins.
- Mining the GIT for antimicrobial producing bacteria targeting gut pathogens including *Clostridium difficile*, *Salmonella* sp, *Listeria monocytogenes* and *Cronobacter sakazakii*.
- Cheese microbiology including the microflora of smear ripened cheese.
- *Mycobacterium avium paratuberculosis*: survival in dairy foods.

Selected Publications

1. M.C. Rea, O. O'Sullivan, F. Shanahan, P.W. O'Toole, C. Stanton, R.P. Ross and C. Hill. (2012). *Clostridium difficile* carriage in elderly subjects and associated changes in the intestinal microbiota J. Clin. Microbiol., 50:867–875.
2. M.C. Rea, A. Dobson, O.O'Sullivan, F. Crispie, F. Fouhy, PC. Cotter, F. Shanahan, B. Kiely, C. Hill and RP. Ross (2011). Effect of broad – and narrow – spectrum antimicrobials on *Clostridium difficile* and microbial diversity in a model of the distal colon. Sackler Symposium Microbes and Health Proc. Natl. Acad. Sci. USA, 108 Suppl 1: 4639–4644.
3. K. Murphy, O'Sullivan O, Rea MC, Cotter PD, Ross RP, Hill C. (2011). Genome mining for radical SAM protein determinants reveals multiple sactibiotic-like gene clusters. PLoS One 6:e20852. Epub 2011 Jul 8.
4. Dobson A, Crispie F, Rea MC, O'Sullivan O, Casey PG, Lawlor PG, Cotter PD, Ross P, Gardiner GE, Hill C (2011) Fate and efficacy of lacticin 3147-producing Lactococcus lactis in the mammalian gastrointestinal tract.FEMS Microbiol Ecol.76:602–14.
5. Field, D., Quigley, L., O'Connor, P., M.C. Rea, Daly, K., Cotter, P., Hill, C. and Ross, R.P. (2010). Studies with Bioengineered Nisin peptides highlight the broad-spectrum potency of Nisin V. Microbial Biotechnology 3: 4, 473–486.
6. M.C. Rea, CS. Sit, E. Clayton, PM. O'Connor, RM. Whittal, J. Zheng, JC. Vederas, R P. Ross and C Hill (2010). Thuricin CD, a novel post-translationally modified bacteriocin with a narrow spectrum of activity against *Clostridium difficile*. Proc. Natl. Acad. Sci. USA, 107: 9352–9357.

Dr. Diarmuid Sheehan

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Education

Ph.D. Food Science and Technology (Food Chemistry). M.Sc. Food Science and Technology (Food Technology). B.Sc. Food Science and Technology.

Career

2011–Present: Programme Manager – Cheese, Dairy Innovation Centre.

2001–Present: Research Officer, Teagasc. 1995–2001: Cheese Technologist, M.T.L. /Teagasc.

Expertise

Diarmuid's research programme is focused on technological and biochemical aspects of cheese manufacture and ripening key to enabling diversification of a predominantly Cheddar based Irish cheese industry. His research is also focused on investigation of factors influencing cheese quality and consistency. In particular, his research seeks to determine the influence of varying cheese manufacture parameters on localised variability in curd microstructure, compositional profile, physico-chemical parameters and on bacterial profiles and metabolic activity. This serves to underpin development of (i) novel hybrid cheeses, combining characteristics of diverse cheese types but capable of manufacture on Cheddar-type process plants and (ii) diverse continental cheese types for manufacture on plants with brine salting facilities. In addition his programme focuses on determining the influence of underlying biochemical and microbial factors on specific quality issues (e.g. pink defect, eye quality and split defects) of continental – type cheeses manufactured from a seasonal Irish milk supply.

Selected Publications

1. Hickey, C. D., Auty, M.A.E., Wilkinson, M.G., and Sheehan, J.J. (2015). The influence of cheese manufacture parameters on cheese microstructure, microbial activity and their interactions during ripening: A Review. *Trends in Food Science and Technology (In press)*.
2. El-Bakry M, and Sheehan, J.J. (2014). Analysing Cheese Microstructure: A Review of Recent Developments, *Journal of Food Engineering*, 125, 84–96.
3. Sheehan, J.J. (2013). Milk quality and cheese diversification. *Irish Journal of Agricultural and Food Research*, 52, 243–253.
4. O'Sullivan, D., Giblin, L., McSweeney, P.L.H., Sheehan, J.J., and Cotter, P. D. (2013). Nucleic acid-based approaches to investigate microbial-related cheese quality defect, *Frontiers in Microbiology*, http://www.frontiersin.org/Journal/Abstract.aspx?s=441&name=food_microbiology&ART_DOI=10.3389/fmicb.2013.00001.
5. Daly, D.F.M., McSweeney, P.L.H. and Sheehan, J.J. (2010). Split defect and secondary fermentation in Swiss-type cheeses – a review. *Dairy Science and Technology*, 90, 3–26.

Dr. Sharon Sheahan

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Education

B.Sc. Biotechnology (Hons), National University of Ireland (Galway), Galway, 1996

Ph.D. University of Edinburgh, Edinburgh, 2002

Career

2003–2005: Post-doctoral Research Scientist, The University of Glasgow, Glasgow

2005–2007: Post-doctoral Research Scientist, The University of Oxford, Oxford

2007–2014: Intellectual Property Manager, Alimentary Pharmabiotic Centre, University College Cork

2014–Present: Commercialisation Manager, Teagasc TTO

Role and Responsibilities

In 2013, Teagasc, UCC and Cork IT TTOs formed the UCT Consortium, supported by Enterprise Ireland through the Technology Transfer Strengthening Initiative (TTSI), whereby Teagasc TTO benefits from the close partnership and experience of its partners to increase efficiencies in technology and knowledge transfer. My role as Commercialisation Case Manager under this Consortium is to facilitate the commercialisation of Intellectual Property developed by Teagasc. This involves identifying and creating opportunities to develop and protect novel IP and innovations, the goal being to maximise exploitation of research outputs. This is becoming an increasingly important part of National policy, to optimise return on investment in publicly-funded research, to develop benefits of economic and social importance, and to improve competitiveness in industry.

Responsibilities include performing invention, technology, patentability and commercial evaluations, prior art and market analysis, drafting and negotiation of agreements for research collaborations, technology licensing, confidential disclosures, and material transfers, as well as providing grant application support. This requires extensive interaction and communication across a broad spectrum of researchers, funding agencies, industry representatives, technology transfer professionals, and patent attorneys, to deliver impact in the area of agri-food.

Selected Publications

1. Jansson, M., Durant, S.T., Cho, E.C., Sheahan, S., Edelmann, M., Kessler, B., La Thangue, N.B. (2008). Arginine methylation regulates the p53 response. *Nat. Cell. Biol.* 12, 1431.
2. Sheahan, S., Bellamy, C.O., Harland, S.N., Harrison, D.J., Prost, S. TGF-b induces apoptosis and EMT in primary hepatocytes independently of p53, p21Cip1 or Rb status. (2008). *BMC Cancer* 8, 191.
3. Sheahan, S., Bellamy, C.O., Dunbar, D.R., Harrison, D. J., Prost, S. (2007). Deficiency of G1 regulators P53, P21Cip1 and/or PRb decreases hepatocyte sensitivity to TGF-b cell cycle arrest. *BMC Cancer* 7, 215.
4. Sheahan, S., Bellamy, C.O.C., Treanor, L., Harrison, D.J., Prost, S. (2004). Additive effect of p53, p21 and Rb deletion in triple knockout primary hepatocytes. *Oncogene* 23, 1489.
5. Prost, S., Sheahan, S., Rannie, D., Harrison, D. J. (2001). Adenovirus-mediated Cre deletion of floxed sequences in primary mouse cells is an efficient alternative for studies of gene deletion. *Nucleic Acids Res.* 29, E80.
6. Prost, S., Sheahan, S., Rannie, D. (2000). Induced deletion of the retinoblastoma gene (Rb) from mouse hepatocytes rapidly changes p53, cell cycle and polyploidy regulation. Journal of Pathology, 190, 63A.

Dr. Paul James Simpson

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Education

Hull University 1983–1986, B.Sc. (Hons) Biology, Second Class, Division One.

University College Cork, 1986–1988, M.Sc. Biotechnology.

Antibiotic inhibition of fungal pathogens by root colonizing fluorescent Pseudomonas species.

University College Cork, 2002–2005, Ph.D. Microbiology.

Pediococci and Bifidobacteria: Isolation, Genomic Characterisation and Evaluation for Probiotic Applications in Humans and Animal.

Career

1999–Present: Research Officer, Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork.

1995–1999: Higher Scientific Officer, Medical Research Council, Radiation and Genome Stability Unit, Harwell, Oxon, England.

1988–1995: Scientific Officer, Medical Research Council, Radiation and Genome Stability Unit, Harwell, Oxon, England.

Expertise

My principle areas of expertise include the isolation, characterization and fermentation of bacteria, relating to probiotic applications and functional food ingredients. Techniques encompass the use of molecular genetic methods such as Pulse-Field-gel-Electrophoresis and PCR, proteomics, specifically 2D Gels, HPLC, Gas Chromatography, Mass Spectroscopy, Spray and Freeze-drying.

Selected Publications

1. Simpson, P.J., Stanton, C., Fitzgerald, G. F., and Ross, R.P. Genomic diversity within the genus *Pediococcus* as revealed by randomly amplified polymorphic DNA PCR and pulsed-field gel electrophoresis. Appl. Environ. Microbiol., 68: 765–771, 2002.
2. Simpson, P.J., Stanton, C., Fitzgerald, G. F., and Ross, R.P. Genomic diversity and relatedness of bifidobacteria from a porcine cecum. J. Bacteriology, 185: 2571–2581, 2003.
3. Simpson, P.J., Fitzgerald, G. F., Ross, R.P., and Stanton, C. The evaluation of a mupirocin based selective medium for the enumeration of bifidobacteria from probiotic animal feed J. Microbiol. Methods, 57:9–16, 2004.
4. Simpson, P.J., Fitzgerald, G. F., Ross, R.P., and Stanton, C. *Bifidobacterium psychraerophilum* sp. nov. and *Aeriscardovia aerophila* gen. nov., sp. nov., isolated from a porcine caecum. Int. J. System. Evol. Microbiol., 54:401–406, 2004.
5. Simpson, P. J., C. Stanton, G. F. Fitzgerald, and R. P. Ross. Intrinsic tolerance of Bifidobacterium species to heat and oxygen and survival following spray drying and storage. J. Appl. Micro. 99:493–501, 2005.

Helen Slattery

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Education

NCEA Certificate Applied Chemistry, CIT, 1979.

Career

1990–Present: Research Technician, Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork.

1986–1990: Research Assistant, Food Chemistry Dept., UCC.

1983–1986: Research Technician, Biocon Biochemicals, Carrigaline, Co. Cork.

1979–1983: Technician, Research Department, Kerry Co-op, Ardfert, Co. Kerry.

Expertise

Helen's expertise relates to the identification and quantification of oligosaccharides and other sugars using various HPLC methods. Earlier research projects involved the fractionation and separation of oligosaccharides from various whey streams using membrane filtration and chromatographic processes.

Previous research projects involved the purification and analysis of different milk and whey proteins to enhance their functional properties.

Other projects have involved development of HPLC methods to measure biogenic amines in cheese and for the analysis of phospholipids and triglycerides.

Selected Publications

1. Slattery, H, Fitzgerald, R.J., (1998). Functional properties and bitterness of sodium caseinate hydrolysates prepared with a Bacillus proteinase. *Journal of Food Science, No. 63, Vol 3, 1998.*
2. O'Halloran, F, Slattery, H, Fitzgerald, G, Ross, R.P., and Stanton, C. (2004). Development of bioactive whey protein hydrolysates for fortification of beverages. *Poster (2004).*
3. Ryan, J.T., Slattery, H., Hickey, R., Marotta, M. (2017). Bovine Milk Oligosaccharides as anti-adhesives against the respiratory tract patogen Streptococcus pneumonia. *International Dairy Journal 2017. submitted.*

Prof. Catherine Stanton

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Education

B.Sc (Hons, 2.1) Nutrition/Food Chemistry, (1983) University College Cork (Awarding Body: NUI).

M.Sc Nutrition (1986) University College Cork (NUI) (Awarding Body: NUI).

Ph.D Biochemistry (1988) Bournemouth University, UK (Awarding Body: Council for National Academic Awards, CNAA, UK).

D.Sc. (2008) National University of Ireland (Awarding Body: NUI).

Career

2016: Research Professor, College of Medicine and Health, University College Cork.

2012: Adjunct Professor, College of Medicine and Health, Dept. of Psychiatry, University College Cork.

2003–Present: Principal Investigator, Alimentary Microbiome Institute, (APC)

2003–Present: Principal Research Officer, Teagasc , Moorepark, Fermoy, Co. Cork

2001–2002: Senior Research Officer, Teagasc, Moorepark, Fermoy, Co. Cork

1994–2000: Research Officer, Teagasc, Moorepark, Fermoy, Co. Cork

1992–1994: Research Associate, Wake Forest Univ. Medical Center, NC, USA

1990–1992: Postdoctoral Fellow, Wake Forest University Med. Center, NC, USA

1989–1990: Senior Research Scientist, Johnson & Johnson UK, Glasgow, Scotland

Expertise

- Nutritional aspects of dairy foods, functional foods.
- Probiotic cultures: health benefits, bioactive metabolite production and host health.
- Infant gut microbiota: Influence of Dietary and Environmental Factors.
- Probiotics: technological aspects, development of functional foods.
- Bioactive lipids: Microbial production of bioactive FA, CLAs, SCFA, n-3 FA, lipids and health benefits.
- Bioactive peptides.

Selected Publications

1. Marques TM, Patterson E, Wall R, O'Sullivan O, Fitzgerald GF, Cotter PD, Dinan TG, Cryan JF, Ross RP, Stanton C. (2016). Influence of GABA and GABA-producing Lactobacillus brevis DPC 6108 on the development of diabetes in a streptozotocin rat model. Benef Microbes. Mar 25:1–12. [Epub ahead of print]
2. Ryan PM, Burdíková Z, Beresford T, Auty MA, Fitzgerald GF, Ross RP, Sheehan JJ, Stanton C. (2015). Reduced-fat Cheddar and Swiss-type cheeses harboring exopolysaccharide-producing probiotic Lactobacillus mucosae DPC 6426. J Dairy Sci. Dec;98(12):8531–44. doi: 10.3168/jds.2015–9996. Epub 2015 Sep 26.
3. Ryan PM, Ross RP, Fitzgerald GF, Caplice NM, Stanton C. (2015). Functional food addressing heart health: do we have to target the gut microbiota? Curr Opin Clin Nutr Metab Care. Nov;18(6):566–71. doi: 10.1097/MCO.0000000000000224.
4. Robertson RC, Guihéneuf F, Bahar B, Schmid M, Stengel DB, Fitzgerald GF, Ross RP, Stanton C. (2015). The Anti-Inflammatory Effect of Algae-Derived Lipid Extracts on Lipopolysaccharide (LPS)-Stimulated Human THP-1 Macrophages. Mar Drugs. Aug 20;13(8):5402–24. doi: 10.3390/md13085402
5. Marques, T. M., Wall, R., O'Sullivan, O., Fitzgerald, G. F., Shanahan, F., Quigley, E. M., Cotter, P. D., Cryan, J. F., Dinan, T. G., Ross, R. P. & Stanton, C. (2015). Dietary trans-10, cis-12-conjugated linoleic acid alters fatty acid metabolism and microbiota composition in mice. British Journal of Nutrition, 113: 728–738.

Dr. Brijesh Tiwari

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Education

B.Sc. Govind Ballabh Pant University of Agriculture and Technology, India. 2001

M.Sc. Central Food Technological Research Institute, India, 2003

Ph.D. University College Dublin, Ireland, 2009

Career

2013–Present: Senior Research Officer, Teagasc Food Research Centre, Dublin

2015–Present: Adjunct Senior Lecturer, Dublin Institute of Technology, Dublin.

2011–2013: Senior Lecturer, Manchester Metropolitan University, UK

2010–2011: Lecturer, Manchester Metropolitan University, UK

2008–2010: Lecturer, University College Dublin, Ireland

2004–2006: Research Scientist, Indian Institute of Crop Processing Technology, India

Expertise

My primary research interests relate to novel food processing, extraction and preservation technologies, with a strong focus on investigation of biochemical and microbial kinetics in food and food products. I am particularly interested in the investigation of technological aspects (nutritional, microbial, enzymatic and chemical inactivation phenomena) in thermal and non-thermal processing studies.

A particular focus of my current research relates to the investigation of green and sustainable solutions to food industry challenges. In addition, I am interested in extraction technologies with particular reference to extraction of biomolecules from food processing by-products and waste streams

Selected Publications

1. Ojha, K. S., Mason, T. J., O'Donnell, C. P., Kerry, J. P., & Tiwari, B. K. (2017). Ultrasound technology for food fermentation applications. *Ultrasonics sonochemistry*. 34, 410–417.
2. Ojha, K. S., Kerry, J. P., Alvarez, C., Walsh, D., & Tiwari, B. K. (2016). Effect of high intensity ultrasound on the fermentation profile of Lactobacillus sakei in a meat model system. *Ultrasonics sonochemistry, 31*, 539–545.
3. Ojha, K. S., Alvarez, C., Kumar, P., O'Donnell, C. P., & Tiwari, B. K. (2016). Effect of enzymatic hydrolysis on the production of free amino acids from boarfish (Capros aper) using second order polynomial regression models. *LWT-Food Science and Technology, 68*, 470–476.
4. Ojha, K. S., Keenan, D. F., Bright, A., Kerry, J. P., & Tiwari, B. K. (2016). Ultrasound assisted diffusion of sodium salt replacer and effect on physicochemical properties of pork meat. *International Journal of Food Science & Technology, 51*(1), 37–45.
5. Hayes, M., & Tiwari, B. K. (2015). Bioactive Carbohydrates and Peptides in Foods: An Overview of Sources, Downstream Processing Steps and Associated Bioactivities. *International Journal of Molecular Sciences, 16*(9), 22485–22508.
6. Kadam, S. U., O'Donnell, C. P., Rai, D. K., Hossain, M. B., Burgess, C. M., Walsh, D., & Tiwari, B. K. (2015). Laminarin from irish brown seaweeds ascophyllum nodosum and laminaria hyperborea: Ultrasound assisted extraction, characterization and bioactivity. *Marine drugs, 13*(7), 4270–4280.
7. Tiwari, B. K. (2015). Ultrasound: A clean, green extraction technology. *TrAC Trends in Analytical Chemistry, 71*, 100–109.

Dr. Miriam Walsh

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Education

B.Sc. (Hons), Analytical Science, Dublin City University (DCU) 1992

Ph.D. (Chem), DCU, 1997

M.Sc. (Technology Management), UCD, 2005

Diploma in IP and Technology Law, 2014

Career

1996–1997: Assistant Lecturer, Dublin City University

1997–2000: Technical Support Chemist, Chemoran,

2001–2002: Technical Support, Unitech, Dublin

2003–2005: Programme Manager, Chemistry Dept., UCD

2005–2006: IP Officer, Trinity College Dublin

2006–Present: Teagasc Technology Transfer Office

Role and Responsibilities

Teagasc Technology Transfer Office (TTO), aims to be a conduit for technology transfer of Teagasc research outputs. From 2013, Teagasc TTO with UCC and Cork IT TTOs formed the UCT consortium, supported by Enterprise Ireland through Technology Transfer Strengthening Initiative (TTSI), whereby Teagasc TTO benefits from close partnership and experience of its partners to increase efficiencies in knowledge transfer.

As head of the Intellectual Property (IP) unit, my role involves working closely with the head of TTO, Declan Troy, to ensure an effective TTO through implementation of transparent and consistent policies and procedures for management of IP and technology transfer, in line with best practice and National IP policy.

We strive to facilitate the professional management of our research outputs through strategic management, by close alignment with our research and technology transfer strategic priorities and by evidence of impact on research community and related industry.

I manage the unit involved in negotiating research agreements emanating from formal links with Irish and international companies and peer research institutes, especially within agri-food space. This ranges from non-disclosure agreements, to collaboration and license agreements. This unit also manages Teagasc patent and IP portfolio, facilitating the licensing of such IP to industry and other end users. We also provide support and guidance to Teagasc staff in this area, including applying for commercially focused state funding. Other important responsibilities include close engagement with key stakeholders, including all funding agencies, Knowledge Transfer Ireland (KTI), the government, collaborating parties and tracking and reporting on the performance of Teagasc research directorate in terms of predefined metrics of technology transfer activities.

Teagasc uses a range of mechanisms in order to engage with industry/stakeholders at varying levels of complexity, ranging from consultancy provision and commercial services to large scale collaborations and licenses. While we use National IP protocol and template agreements to facilitate formalisation of such interactions, we are flexible in the specifics of the interaction and happy to discuss various options with each individual party.

Relevant Articles

1. “Harnessing the Power of IP”, TResearch, Vol. 2, No. 1, Spring 2007.
2. “Encouraging Innovation”, TResearch, vol 5, no.2, Summer 2010.
3. “Gateways to Technology Transfer”, TResearch, Vol. 7, No. 2, Summer 2012.

Ita White

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Education

M.Sc. Education & Training Management, Dublin City University 2002.

M.Sc. Agricultural Chemistry, University College Dublin 1990.

B.Sc. Industrial Microbiology, University College Dublin 1986.

Career

2011–Present: Food Industry Development, Teagasc Food Research Centre, Ashtown.

2004–2010: European Commission Food & Veterinary Office.

1998–2004: Food Safety & Quality Consultant & Trainer, Teagasc Food Research Centre, Ashtown.

1994–1998: Quality/ Regulatory Affairs Manager, Medical Devices Industry.

1991–1994: Medical Devices Directorate, Department of Health (UK).

1990–1991: Irish Sea Fisheries Board (BIM).

Expertise

- Delivery of consultancy, auditing and training projects to food industry clients.
- Design & delivery of specialised training and events including microbiology, hygiene, HACCP, food standards development, auditing, food law, and labelling.
- Providing training to support change management and delivery to multi-cultural groups.
- Establishing and updating quality management systems.
- Auditing and developing internal audit procedures and systems.
- Addressing varied client queries in the area of food safety & quality including legislative compliance, standards requirements and product development.
- Initiating and organising multi-agency projects to better serve the food industry.
- Developing industry standards.

Selected Publications

1. White, I. (2014) Food Labelling & Allergen Awareness, T-Research Volume 9: Number 1, Spring 2014 pp30–31
2. White, I, (2013) Tips for Producers & Suppliers of Packaging to the Food Industry, The Irish Packaging Directory
3. White, I, (2012) Facing the Future for Food Labelling Laws, The Irish Packaging Directory, pp18–21
4. White, I. (2011) Package Your Way to New Markets, *T Research* Volume 6: Number 4, Winter 2011, pp 14–15
5. European Commission Decisions (2008/654/EC) (2007/363/EC) (2006/677/EC) relating to auditing, developing and reporting on multi-annual national control plans within Member States' Competent Authorities.

Notes


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