Food
Programme

Technology

Portfolio

Technology for the Food Industry

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Agriculture and Food Development Authority

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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 in order 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 up-dated on a quarterly basis. Contact details are listed on each page.

Technology

Portfolio

Technology for the Food Industry

Offers

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

Updates

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

Expertise

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

Services

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

Profiles

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

Technology

Offers

Technology

OFFER

Novel Technology for the Manufacture of Gluten-free Ingredients and Products

Teagasc researchers are seeking commercial partners interested in evaluating and further developing this process technology and related know-how for the manufacturing of high quality gluten-free ingredients and products.

Summary

Teagasc has developed novel dairy ingredients which provide similar properties and functionality to gluten. The gluten-free ingredients are suitable for dough based systems; therefore products can be manufactured using standard production lines.

Companies interested in developing a range of gluten-free products are invited to discuss this technology.

Problem Addressed

Gluten is a protein found in wheat, rye, barley and oats. People who suffer from coeliac disease cannot eat foods containing gluten. It is responsible for network formation in batters and dough and contributes to the texture and crumb structure of many baked products. Current legislation limits gluten levels in gluten-free products to 20ppm. While there are a number of gluten free products on the market, the quality of the products need to be improved, and many products are not suitable for use in standard production lines.

Solution

Researchers at Teagasc have recently developed a dairy-based ingredient which can provide the same functionality as gluten in gluten-free breads and confectionary. It is also suitable for use in pre-mixes and in gluten-free flour.

Competitive Advantage of Technology

1. The gluten-free ingredients are designed for use in a dough based system, so can be used in standard production lines.
2. The texture of the bread is comparable to gluten breads.
3. The functionality of the dough can be varied for different applications, e.g. sliced bread, pizza bases, rolls, baguettes, bagels, confectionary etc.

Opportunity

In 2001, the US gluten free market was valued at $210m, and has grown at 27% per annum reaching $696.4m in 2006. In the UK, the market for gluten-free products in 2007 was valued at £74 million, (Mintel, October 2007). The gluten-free category in the UK is currently 41% of the total 'free-from' food and beverage market, marginally lagging the dairy-free market (Heller). The market is estimated to continue to grow at around 20-25% pa. Similar trends are observed in Ireland.

Intellectual Property Status

Proprietary know-how which can be licensed on a non-exclusive and exclusive basis.

Funding

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

How to Proceed:

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Technology

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Novel Gel-based Encapsulation Process for Sensitive Food Ingredients

Teagasc is seeking partners within the foods industry to further develop an encapsulation technology suitable for sensitive ingredients, such as probiotics, which are especially applicable for functional and medical foods, with a view to licensing.

Summary

A novel method of gel-encapsulation with applications in probiotics and other such sensitive food ingredients, has been recently developed in Teagasc, Moorepark, validated for probiotics and a patent application filed. It was proven, during *in vivo* trials, that this technology can greatly improve the viability of probiotic bacteria during storage and gastric transit. This process would be of great interest to companies working with probiotics for medical food and pharma applications. Such high probiotic viability would improve cost-efficiency and product shelf-life, while it would be of use also for encapsulation of other sensitive ingredients.

Problem Addressed

Health-promoting ingredients, such as probiotic bacteria, must be active and intact at the point of consumption to achieve a positive health effect on the host and to support health claims. However, bacteria can exhibit high mortality rates during storage and transit through the upper gastro-intestinal tract, which may result in a reduction or complete loss of its health impact. This technology overcomes this problem through the use of gel microbeads.

Solution

The use of gel microbeads, made of dairy protein matrices for entrapment of probiotics, show enhanced stabilisation of probiotic bacteria in liquid, non-dried form so as to survive and remain functional during storage and gastric transit. These novel gel microbeads show high stability during long term-storage and subsequent transit through the stomach but disintegrate in the gastro-intestinal tract, thereby overcoming the low stability problems of other commonly used polysaccharide-based encapsulation techniques.

Competitive Advantage of Technology

1. High viability of probiotics during storage and gastro-intestinal transit; in vivo trials showed up to 4 log CYCLE increase in viable probiotics in the porcine intestine.
2. Integration of a delayed release mechanism for targeted delivery of probiotics to the gut.
3. Platform technology for inclusion and protection of sensitive bioactive ingredients.
4. Exploitation of dairy proteins for gel-encapsulation.

Opportunity

This technology would be of interest to food/medical food, pharmaceutical and animal feed companies wishing to incorporate sensitive components including probiotics into their products. As some validation and optimisation is still required we are currently seeking partners for such commercialisation with a view to licensing. This technology is currently being evaluated for use in veterinary products and animal feed with positive results to date.

Intellectual Property Status

A patent application has been filed and is now at nationalisation phase and validated in a number of territories, including US, Canada, Europe.

Funding

Dairy Levy Funding

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Technology

OFFER

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

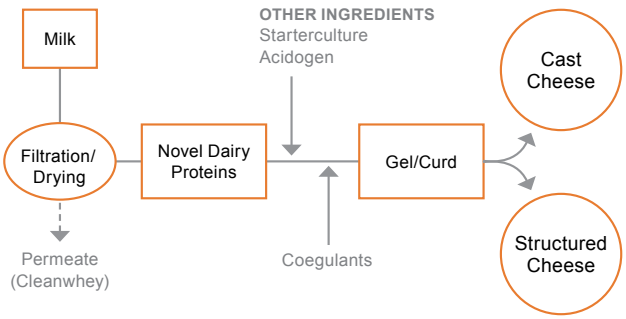
The rapidly growing market for ingredient cheese is currently being served by sourcing traditionally-manufactured table cheeses. Teagasc has developed a dedicated 2-step process for direct manufacture of ingredient cheese tailored to customer requirements. Without the need for whey expulsion it lends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

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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, Éire
University College Cork, Ireland

Funding

ENTERPRISE IRELAND

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

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Improved Control of Syneresis for Cheese Vats

Teagasc and UCD researchers are seeking commercial partners within the cheese manufacturing industry to exploit a new sensor system for cheese vats that improves control of syneresis.

Summary

Teagasc and UCD, with collaborators from University of Kentucky, have developed a new sensor system based on visible-NIR spectroscopy and RGB imaging to monitor coagulation and syneresis, critical stages in the formation of cheese curd. These sensors can be used as process analytical tools to improve the consistency and efficiency of the manufacturing process.

Problem Addressed

Lack of control of the syneresis and coagulation stages in cheese making can lead to quality issues in the resulting cheese due to the criticality of these stages in formation of the cheese curd. Improved control of the syneresis stage should therefore facilitate the production of a more consistent cheese.

Solution

Two sensor systems have been developed, based on visible-NIR spectroscopy and RGB imaging. By accurately monitoring the volume of whey produced, as well as curd moisture content, these sensor systems attached to a cheese vat as part of an on-line manufacturing process facilitate improved consistency in the final cheese product.

Competitive Advantage of Technology

The NIR spectroscopy and RGB imaging systems developed can benefit the cheese industry through the facilitation of the following:

- On-line process control
- Product consistency
- Continuous feedback
- Increased operational efficiency
- Reduction in level of downgraded cheese

Opportunity

This technology would be of interest to cheese manufacturers aiming to increase efficiencies and reduce inconsistencies in their on-line manufacturing processes. Cheese manufacturers are being sought to apply this technology at full-scale manufacturing level for trials. Funding may be sought in conjunction with an industry partner under the Enterprise Ireland Innovation Voucher or Innovation Partnership scheme.

Partners

UCD DUBLIN

Funding

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

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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, Éire
University College Cork, Ireland

Funding

ENTERPRISE IRELAND

SFI Science Foundation Ireland

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Technology

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Natural Antimicrobial Lacticin 3147

Teagasc and UCC are seeking commercial partners for the development and exploitation of a proprietary antimicrobial lacticin 3147 in food biopreservation and safety applications and potential biomedical applications.

Summary

Teagasc and UCC have extensive knowledge with respect to the structure, mechanism of action and bioactivity of lacticin 3147 and have worked with a range of companies in optimising this technology. This proprietary antimicrobial agent, with a broad range of activity against gram positive bacteria, has a free from additive status. It has proven applications in biopreservation and food safety, and potential biomedical applications are yet to be explored.

Problem Addressed

The production of foods which are safe for consumers requires continuous attention to safeguard against spoilage and pathogenic microorganisms. Increasingly consumers are demanding foods with natural, rather than chemical, preservatives. Many natural antimicrobials are not effective in controlling a broad range of gram positive populations and are effective only under specific optimal conditions, thereby limiting their applicability and effectiveness.

Solution

Lacticin 3147 is a natural antimicrobial that could be a solution to a broad range of microbial problems, as it is active against all gram positive bacteria tested to date. Lacticin 3147 is well positioned to offer the food industry the potential to reduce the incidence of morbidity and mortality associated with certain high-risk foods, to extend the shelf life of perishable foods through control of spoilage organisms, and to confer functionality and added value on commodity items. Lacticin 3147 has a demonstrated safe history of use and therefore has a free from additive status. The genome sequence of the strain is available for exploitation.

Competitive Advantage of Technology

1. Natural antimicrobial.
2. Demonstrated safe history of use.
3. Active at neutral and acid pH.
4. Active against gram positive targets not effectively controlled by other natural antimicrobials.

Opportunity

This technology would be of relevance to companies interested in natural biopreservative agents for the control of food spoilage and pathogenic bacteria, during, or following manufacture, within the food matrix, or on food surfaces.

Intellectual Property Status

The “Bacteriocins” patent is granted in the US, selected European countries, Japan and New Zealand.

Partners

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

Funding

ENTERPRISE IRELAND

Department of Agriculture, Food and the Marine
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Process for Manufacture of Probiotic Cheeses

Researchers based at Teagasc and University College Cork have developed a novel process using two proprietary strains for the manufacture of probiotic hard cheeses. The process is especially suited to Cheddar cheese. A commercial partner is being sought within the dairy/ cheese manufacturing industry to license this technology.

Summary

Teagasc and UCC have developed a novel method for the manufacture of probiotic cheeses, using novel strains of *Lactobacillus paracasei* especially, suited for Cheddar and hard cheeses.

Problem Addressed

In general it can be very expensive to add commercially available probiotic cultures to cheese during manufacture. The reason for this is that many probiotic cultures don't grow in milk and many die during cheese manufacture and subsequent ripening. As a result there is not sufficient live probiotic in the resulting cheese to elicit a probiotic effect.

Solution

A novel process for the manufacture of probiotic cheese, based on two novel proprietary strains of *Lactobacillus paracasei* which can **survive and grow** throughout long manufacturing and ripening periods has been developed and the process and resulting product patented. The resulting cheese contains, at time of consumption, the viable actively growing strain of added bacterium. This is especially applicable to Cheddar type cheeses which have long manufacturing and ripening times.

Competitive Advantage of Technology

1. Use of novel proprietary strains which can be licensed.
2. Presence of viable, actively growing, probiotic strains at time of consumption, for Cheddar type cheeses
3. Cheap to produce as the culture will grow in the cheese so relatively low amounts can be added at the start.
4. The cheese consistently has a better flavour.
5. In a double-blinded human trial (n=25) the cheese resulted in an increase in lactobacilli in the gut (probiotic effect).

Opportunity

At low cost, Cheddar and other varieties of cheese could be termed "probiotic" since they contain more than adequate amounts of the probiotic. Not alone will the cheese taste better but it will also be healthier – particularly relevant for low fat cheese. This is a significant opportunity for a cheese manufacturer to license this technology, which has been validated.

Intellectual Property Status

Patent granted in US and selected European countries, "Process for Manufacture of Probiotic Cheese".

Partners

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

Funding

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

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Technology

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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, Éire
University College Cork, Ireland

Funding

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

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Technology Updates

Technology

UPDATE

Advanced Systems for the Rapid Detection of Anti-Parasitic Drugs in Food

Key External Stakeholders:

Dairy, beef and sheep farmers, primary meat and milk processors, regulatory agencies (DAFF, FSAI, IMB).

Practical Implications for Stakeholders:

Excellent progress has been made in the development of screening assays for drug residues in food. Immunochemical screening assays were developed in this project as a rapid low cost means of detecting benzimidazole residues in food, as an alternative to chemical assays. A number of assays were successfully validated. A biochip array assay was successfully developed to detect four different drug classes and shows good potential for application in specialist laboratories or at an industry level.

The milk industry is the only industry likely to apply this technology because they are the only industry that carries out monitoring at factory level. However, the scope of the assays needs to be extended to key flukicide residues (nitroxynil, closantel, rafoxanide, clorsulon and triclabendazole) to meet industry demands if they are to be used.

With benzimidazole drugs widely used in the treatment of worm and fluke infections in food producing animals, these novel immunochemical assays are proposed as an alternative low cost means of detecting benzimidazole residues in food. These assays are applicable in specialised laboratories or at a factory level to prevent contaminated produce entering the food chain.

Main Results:

- Three working immunobiosensor assays were developed and validated to detect 17 benzimidazole residues in milk and meat.
- A novel multiplex immunoassay was developed for detecting benzimidazole and macrocyclic lactone residues in fruit juice.
- The new technologies developed were validated to meet EC 2002/657 criteria.
- These represent a rapid, low-cost, effective means of screening drug residues, and a viable alternative to chemical assays, applicable in specialised laboratories or at factory level.

Opportunity/Benefit:

Teagasc can be at the forefront of engaging with food producers relating to such low-cost screening techniques, through our extensive expertise in the field.

Collaborating Institutions:

Dublin City University

Project Number: 5556

Funding Source: DAFF (05/R&D/TN/355)

Date: January, 2011

Project Dates: Sep 2006 – Aug 2010

How to Proceed:

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

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Anti-MRSA – Phage Therapy Alternatives for Controlling MRSA

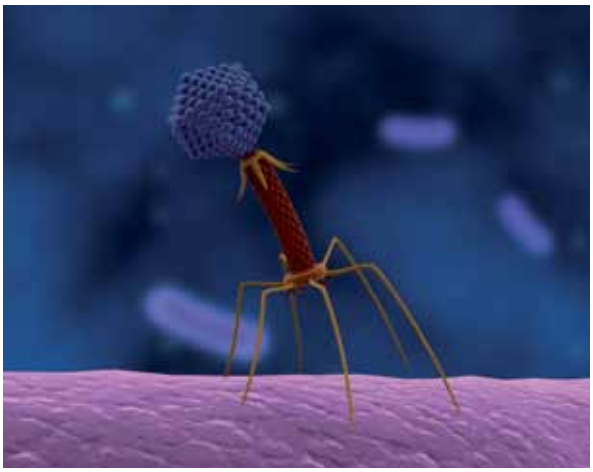
Key External Stakeholders:

Pharmaceutical companies; bacteriophage-based therapeutics companies and research communities.

Practical Implications for Stakeholders:

- A single protein called LysK, from the bateriophage staphylococcal phage K, was shown to inhibit drug-resistant strains of *Staphylococcus aureus*.
- The protein has the ability to kill live methicillin resistant *S. aureus* (MRSA) and could be a strong candidate for commercialisation.

This discovery is important because antibiotic resistant *S. aureus* strains, in particular MRSA, are major causes of hospital related infections worldwide. The emergence and increasing incidence of these so called 'superbugs' combined with the absence of new antibiotics from the pharmaceutical sector demands that alternative anti-MRSA agents are evaluated and



developed as a matter of urgency. The project exploited the use of bacteriophages, i.e. natural, specific anti-bacterial viruses, to eliminate antibiotic resistant *S. aureus* strains in biological environments.

Main Results:

- Purified LysK protein is effective at eliminating MRSA in broth, cell culture, milk and blood.
- The phage eliminated *S. aureus* in the nostrils of mice.
- MRSA was not isolated from any of the pig herds tested to date and only a small percent (<2%) of personnel involved in the pig industry in Ireland are carriers of MRSA.

Opportunity/Benefit:

There is a need for further research funding and development to further investigate the true potential of LysK as a potent pharmaceutical product against MRSA with a view to commercialisation. Expressions of interest from relevant companies are welcome.

Collaborating Institutions:

University of Limerick, University College Dublin, Athlone IT, Cork IT, National MRSA Reference Lab - St. James Hospital.

Project Number: 5601

Funding Source: SFI (05/RF/BIM004)

Date: May, 2011

Project Dates: Jun 2006 – May 2009

How to Proceed:

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

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Technology

UPDATE

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

Project Number: 5414

Funding Source: DAFF (04/R&D/UL/327)

Date: March, 2012

Project Dates: Jan 2005 - Sep 2010

How to Proceed:

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Technology

UPDATE

Artisan Food Technologist Support to the Dairy and Meat Sectors

Key External Stakeholders:

Cáis, artisan food producers, LEADER, FSAI, local authority veterinary inspectors, dairy produce inspectorate (DAFF), principal environmental health officers, Bord Bia.

Practical Implications for Stakeholders:

Teagasc deployed two two food technologists in a government-funded initiative for a two-year period (2008-9) to support emerging food safety and regulatory compliance needs by artisan food producers. The initiative proved to be highly successful in terms of adopting new knowledge necessary to ensure compliance, survival and potential development of their business. Examples of practical outcomes included:

1. **Food safety workbook for farmhouse cheesemakers**

In conjunction with FSAI and representatives of Cáis, a workbook for the implementation of HACCP by Farmhouse Cheese Producers was developed. The workbook was piloted onsite with a farmhouse cheese producer and was well received with minor adjustments needed. At the time of project termination, the workbook was being scrutinised by DAFF's Dairy Product Inspectorate ahead of a tentative roll-out date in early 2010.

2. **Technical needs survey of artisan and speciality food producers selling at farmer's markets**

The results of this survey reinforced that technical matters, food legislation and training continue to be issues of importance to the producers. Sales / selling / costing issues were also highlighted by stallholders as being difficult areas for them and confirmed the usefulness of workshops and accredited courses (such as the Artisan Food Business and Direct Selling courses) which had been developed by Teagasc. Links were also strengthened with Bord Bia and LEADER to enhance the delivery of this type of training and advice. Gaps in the types of foodstuffs being offered and opportunities for adding new products were noted. These included organic foods, farm produced bottled milk and buttermilk, value added seafood and novel bakery products. Networking with stallholders, producers and market managers led to an increase in the numbers of businesses who availed of one to one mentoring from the technologists or further help from other Teagasc staff.

Main Results:

A national survey of farmer's markets was undertaken to profile the types of food products offered as well as the technical needs of producers and traders engaged in such activities.

Opportunity/Benefit:

Direct engagement between the Artisan Technologists and end-users i.e. artisan food businesses, throughout the two-year project addressed numerous regulatory information needs, and increased skill levels via workshops and training courses

Collaborating Institutions:

N/A

Project Number: 5853

Funding Source: DCGRA

Date: March, 2012

Project Dates: Jan 2008 - Dec 2009

How to Proceed:

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Technology

UPDATE

Assessment of DNA Markers for Meat Quality Traits in Irish Beef and Pork

Key External Stakeholders:

Breeders, meat processors, diagnostics companies.

Practical Implications for Stakeholders:

The outcomes of this project highlight the importance of investigating and understanding the molecular basis of quality traits for meat, with a view to optimisation of management systems for quality. These hold potential quality prediction tools for meat management systems and/or to provide a basis for the inclusion of meat quality in selection goals. This research validated some of the DNA markers tested in Irish crossbred cattle populations, and novel SNP markers associated with tenderness in Irish crossbred cattle identified

- A number of candidate genes have been identified as potentially relevant to beef sensory and technological traits.
- DNA markers have been tested and were shown to be associated with quality parameters.

There is a need for tools to discriminate meat on the basis of quality and select sires for improved quality.

Variability in meat quality presents many problems for the industry and for consumer satisfaction. The underlying causes are multi-factorial in nature and are considered to include difference in the genetic profile (genotype) of the animal. Attributes of relevance to the consumer sensory experience include tenderness, colour, juiciness, flavour and texture; while those directly impacting on industry management systems include water holding capacity and colour. Management systems to predict and optimise these attributes require clear understanding of the factors underpinning variability. Currently eating quality is a major deficiency in breeding programmes and this is reflected along the beef chain from processors to retailers, who have highlighted the necessity for tools to accurately predict quality, in particular tenderness. Water-holding capacity has additional importance due to its ability to influence processed product quality and the financial losses incurred when it is sub-optimal.

Main Results:

- Novel single nucleotide polymorphisms (SNPs) developed which are associated with tenderness (shear force on day 14 and sensory tenderness) and intra-muscular fat (flavour, juiciness) content.
- SNP in CAST, PRKAG3, GHR and SCD genes were associated with muscle colour and PRKAG3 was also shown to be associated with cook loss in beef.
- SNP in CAPN1 and ANK1 were confirmed to be associated with shear force (tenderness).
- A GHR polymorphism was associated with composition of muscle including moisture, intra-muscular fat and protein content in loin and rump muscles.
- Commercially available markers were tested (and subset validated) for association with Irish beef quality.

Opportunity/Benefit:

This research validates the genomic approach to meat quality and expansion of this research area is recommended. The further development of these and other markers for independent traits to create tools for prediction of quality would have a wide range of potential applications spanning animal production and meat management systems.

Collaborating Institutions:

University College Dublin

Project Number: 5421

Funding Source: DAFF (04/R&D/TN/258)

Date: October, 2011

Project Dates: Feb 2006 – Jul 2008

How to Proceed:

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UPDATE

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 24ºC 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, 80ºC 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

Project Number: 5713

Funding Source: DAFM (06RDTAFRC519)

Date: November, 2011

Project Dates: Dec 2006 – Nov 2010

How to Proceed:

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UPDATE

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

Project Number: 5367

Funding Source: DAFF (04/RD/C/232)

Date: March, 2012

Project Dates: Jul 2005 – Jun 2009

How to Proceed:

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www.teagasc.ie/publications

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Technology

UPDATE

Biocontrol of Verocytoxigenic *Escherichia coli* at Key Stages of the Beef Chain

Key External Stakeholders:

Beef industry.

Practical Implications for Stakeholders:

Verocytotoxigenic *Escherichia coli* (VTEC), particularly *E. coli* O157:H7 are a major food safety concern worldwide. Healthy ruminants can harbour VTEC in their gastrointestinal tract and can shed the pathogen in their faeces, leading to contamination of the hide, carcass and/or meat products posing a potential public health risk and commercial damage to the beef sector. There is a need for targeted controls against *E. coli* O157 at key points of the beef chain coupled with a demand for natural biological controls, due to increased consumer resistance to use of chemicals. The key finding from this study was that biocontrol

agents (particularly phages and carvacrol) show great potential as novel controls against *E. coli* O157:H7 at key stages of the beef chain and further research on their development and application is being pursued.

Main Results:

- Carvacrol and thymol were shown to inhibit and kill *E. coli* O157:H7 and other VTEC in a model broth system and retained their antimicrobial activities across a wide range of environmental conditions tested (e.g. temperature, pH, water activities etc).
- Carvacrol (3%) reduced *E. coli* O157:H7 numbers by 10 fold on beef hide and carcass.
- Bacteriophages e11/2 and e4/1c inhibited and killed *E. coli* O157:H7 in a model broth system and retained activity under a range of environmental conditions.
- Bacteriophage significantly reduced *E. coli* O157:H7 in a model rumen system without affecting the natural microflora or fermentation.
- Bacteriophage sprayed on to hide could reduce *E. coli* O157:H7 by 100 fold.

Opportunity/Benefit:

Advice, consultancy work and/or technical services can be provided by Teagasc in the area of pathogen biocontrols.

Collaborating Institutions:

N/A

Project Number: 5638

Funding Source: DAFF (05/R&D/TN/356)

Date: November, 2010

Project Dates: Jan 2007 – Dec 2009

How to Proceed:

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Technology

UPDATE

BioCop – Detecting Chemical Contaminants in Food

Key External Stakeholders:

Dairy, beef and sheep farmers, regulatory agencies e.g. DAFF, FSAI, IMB.

Practical Implications for Stakeholders:

- It is now possible to screen a large series of samples for the biological effects caused by the use of a growth promoting hormone using BioCop, a cost-efficient, protein based biomarker biosensor assay that has been developed.
- Rapid, improved diagnostic methods that are able to detect low concentrations of fluoroquinolone antibiotics have been developed and can be used in a range of animal products, including chicken muscle, eggs and fish.

BioCop addressed the issue of hormone growth promoters because they are banned for use in cattle fattening in the EU. Hormone abuse is a concern from food safety, animal welfare and law enforcement perspectives as residues in meat are a potential health threat, especially for vulnerable populations such as preadolescents. Current analytical methods are restricted, (i) to a limited number of known substances and, (ii) by the relative high cost. Therefore unexpected compounds will be overlooked and the number of samples analysed is limited by the cost.

BioCop addressed the issue of veterinary drug residues in food (fluoroquinolone antibiotics and hormone growth promoters) because overuse and/or illegal use of fluoroquinolone antibiotics in animal production is of particular concern to humans. Repeated exposure to fluoroquinolones, via the food chain, will limit the future effectiveness of these drugs by increasing the risk of antimicrobial resistance developing.

Main Results:

- New biosensor assay developed to detect fluoroquinolone antibiotics in different foods.
- A new high throughput biosensor assay was developed to detect hormone abuse in cattle.

Opportunity/Benefit:

This range of novel screening assays for chemical contaminants in food will provide the industry with a more cost effective and efficient food testing service allowing for an increase in safety and reduction in expenses. Expressions of interest in this research and the novel assays developed are welcome.

Collaborating Institutions:

Queens University Belfast

Project Number: 5442

Funding Source: EU (FOOD-CT-2005-006988)

Date: July, 2011

Project Dates: Apr 2005 – Sep 2009

How to Proceed:

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UPDATE

Biologically Active Complexes of Bovine Milk Proteins

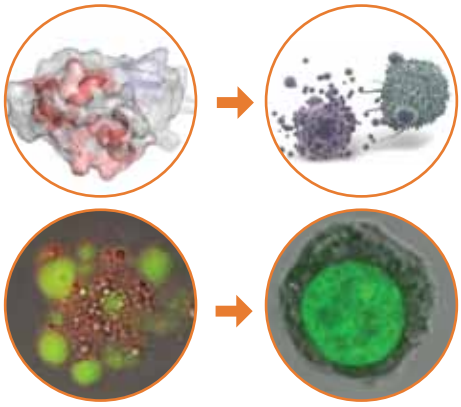
Key External Stakeholders:

Scientific community, biotechnology start-up companies, Irish dairy companies, infant formula manufacturers.

Practical Implications for Stakeholders:

- Processing of the whey protein α-lactalbumin does not impair its potential anti-tumour properties.
- Some protein/fatty acid complexes may have the potential to be used for pharmaceutical purposes.

Milk Protein Complexes → Cancer Cell Death



Main Results:

Globular proteins such as α-lactalbumin and β-lactoglobulin can act as vehicles for delivering oleic acid to tumour cells, thereby inducing cell death by apoptosis.

Opportunity/Benefit:

The expertise and techniques developed for screening proteins as molecular delivery systems of bio-active components is available for interested companies and academic institutes.

Collaborating Institutions:

University College Cork, Trinity College Dublin

Project Number: 5452

Funding Source: Dairy Levy Fund

Date: February, 2010

Project Dates: Jul 2005 - Dec 2009

How to Proceed:

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

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UPDATE

Biomarkers to Authenticate Irish Grass-Fed Beef

Key External Stakeholders:

Regulatory agencies, Bord Bia, beef producers/ processors.

Practical Implications for Stakeholders:

- Biomarkers to authenticate Irish grass-fed beef have not been identified and, therefore, the marketing advantage that should accrue by being able to prove unequivocally that beef is Irish and grass-fed has not been exploited.
- This project produced a unique and extensive dataset consisting of marker elemental isotopes, molecules, and differentially expressed genes characterising (i) Irish beef produced solely off grass or off concentrates or off silage/grass/ concentrate combinations and (ii) non-Irish beef.
- The approach taken will be useful for individual producers seeking to market beef produced to a unique and defined regional production system.

Main Results:

- Stable isotope analysis and fatty acid analysis permitted 100% correct classification of grass-fed beef from concentrate-fed beef and from beef from animals fed a 50:50 combination of grass and concentrates.
- Discriminant analysis of stable isotope data from 146 international samples showed that 84.9% were correctly assigned to their country of origin.
- Stable isotope analysis of bovine tail hair provided an archival record of the pre-slaughter diet of beef cattle and, importantly, of changes (e.g. grass to concentrates) to the pre-slaughter diet.

Opportunity/Benefit:

Commercialisation of this research could involve the setting up of a food authentication testing facility involving the establishment and maintenance of databases against which routine or suspect samples would be tested.

Collaborating Institutions:

University College Dublin

Project Number: 5644

Funding Source: DAFF (06/R&D/D/481)

Date: November, 2011

Project Dates: Sep 2006 – Nov 2010

How to Proceed:

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UPDATE

Buttermilk Powder and Cheese Yield

Key External Stakeholders:

Dairy processing industry.

Practical Implications for Stakeholders:

Buttermilk powder is readily available and despite containing high levels of potential natural emulsifiers, its use to fortify cheese milk protein levels results in significantly reduced adjusted cheese yield due to increased losses of both fat and protein to whey.

- Fortification of cheese milk with buttermilk powder results in cheeses with significantly higher levels of moisture and moisture-in-non-fat-substance levels .Fortification with milk ultra filtration retentate produces cheeses with significantly lower levels of moisture and moisture-in-non-fat-substance levels, in comparison to cheeses produced from control cheese milks.
- Fat losses to whey were higher (20-30%) in cheeses produced from milks fortified with buttermilk powder compared to control cheeses (15-18%). They were also significantly higher when compared to cheeses produced from milks fortified with milk ultra filtration retentate (9-12%).

- Analysis of moisture adjusted cheese yields in which fat and protein contents adjusted to reference levels showed yields of cheeses produced from milks fortified with buttermilk powder (10.48%) were lower than control cheeses (10.85%) and were significantly lower than cheeses produced from milks fortified with milk ultra filtration retentate (11.42%).

Main Results:

- This study concluded that despite containing high levels of potential natural emulsifiers, the use of buttermilk powder to fortify cheese milk protein levels results in significantly reduced cheese yield due to increased losses of both fat and protein to whey.
- However the study does highlight the potential for the cheese industry for fortification of cheese milk with milk ultra filtrate to reduce losses to whey and to increase cheese production efficiencies.

Opportunity/Benefit:

The enhanced knowledge base arising from this study is available to industry decision makers in order to assist them in increasing cheese manufacture yield efficiency.

Collaborating Institutions:

N/A

Project Number: 5980

Funding Source: Dairy Levy Fund

Date: March, 2012

Project Dates: Jun 2009 - Jun 2011

How to Proceed:

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UPDATE

Characterisation and Enrichment of "Buttermilk" Fat Globule Membrane Composition Using Novel Technologies

Key External Stakeholders:

Dairy processors, butter manufacturers, ingredient innovators.

Practical Implications for Stakeholders:

This project has demonstrated that the milk fat globule membrane (MFGM) residue contained within buttermilk possesses biological activity and offers potential for greater commercial exploitation and adding value.

A key implication for dairy producers and processors is a realisation that buttermilk as a by-product of buttermaking is presently under-utilised through processing into a relatively low-value commodity buttermilk powder.

- Expertise and analytical capability were developed, in relation to bioscience aspects and technological features of MFGM, which is key to understanding the fate of MFGM proteins and phospholipids during processing.

- Specific analytical capabilities developed during the project were made available to interested dairy processors thereafter to enable them to characterise the composition of buttermilk and MFGM fractions generated by their processes. This, in turn, led to international food and nutritional company reaction e.g. expressions of interest on the part of infant milk formula manufacturers.

Main Results:

- Analytical techniques were established which enabled, for the fist time, the fate of MFGM proteins and phospholipids to be tracked during processing simulations performed on freshly-produced milk.
- MFGM proteins are partitioned mainly into buttermilk during cream churning, some of these proteins were also detected in the resulting butter. All major MFGM phospholipids, i.e. PE (phosphotidylethanolamine), PI (phosphotidylinositol), PC (phosphotidylcholine), PS (phosphotidylserine), SM (sphingomyelin), as well as high quantities of LC (lactosylceramide) were detected in the various sample streams irrespective of mechanical action and/or heat treatment of cream prior to processing.
- Significant anti-cancer effects were detected in the various buttermilk fractions produced experimentally.

Opportunity/Benefit:

Follow-on research is necessary to elaborate our scientific understanding of MFGM and document further biological evidence to support health benefit claims but the expertise developed from this project would be key to such commercially focused research and possible links with industry.

Collaborating Institutions:

Dublin City University

Project Number: 5552

Funding Source: DAFF (05/R&D/TD/370)

Date: March, 2012

Project Dates: Oct 2008 – Mar 2009

How to Proceed:

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UPDATE

Cheese 2030 – New Technology Platform

Key External Stakeholders:

Manufacturers of cheese and milk protein ingredients.

Practical Implications for Stakeholders:

A novel SMART cheese technology platform has been developed for the manufacture of specialised protein powders and recipes for converting these into cheeses with different functional properties. Key features of the technology include:

- Cheesemaking process without whey release in cast cheeses or limited whey release in structured cheese (e.g. ~ 25-30% of normal).
- Complete retention of any added materials (e.g. pre-biotics, minerals, vitamins) in cast cheese types.
- Enables cheesemaking operations in regions where fresh milk is not readily available.

- Ingredient manufacturing step resulting in production of clean 'whey' ideal for the manufacture of specialised whey products e.g. functional whey protein fractions, powders for inclusion in infant milk formula.

This platform technology provides more opportunity to design/control cheese characteristics such as texture, cooking properties and greater potential for the development of new generation health cheeses.

Main Results:

A technology was developed for the manufacture of milk protein ingredients (MPI) with characteristics suited to the manufacture of cheeses with different physical properties.

The dispersion, hydration and gelation properties of the MPI were affected by mineral composition, protein concentration, time, solvent quality factors (including ionic strength, pH, temperature).

A process for the conversion of MPI into:

- 'Cast' cheese variants with dry matter levels ≤ 50% without whey expression.
- 'Structured' cheese variants (with ≥ 50% dry matter) by subjecting the cast cheese to further curd handling and whey expression steps.

The composition, physical and sensory properties of the cheeses were altered by the following process variables: formulation (type and level of MPI, salt level, pH), ingredient dispersion/blending conditions (shear, temperature, duration), sequence of ingredient addition, gelation conditions (coagulant type, pH, temperature, time), curd handling processes, and addition of polysaccharides.

Opportunity/Benefit:

This technology allows the development of prototype functional MPIs with unique technological characteristics for conversion into cheeses. Irish dairy companies have an opportunity to supply export markets with cheese ingredient solutions (MPIs and cheese conversion processes) which can be converted by *in-situ* re-hydration into local products.

Collaborating Institutions:

N/A

Project Number: 5857

Funding Source: EI (TD/2007/0128)

Date: March, 2012

Project Dates: Apr 2008 – Oct 2011

How to Proceed:

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UPDATE

Detection of Flukicide Residues in Milk and Meat

Key External Stakeholders:

Meat and milk processors, Irish baby food industry, regulatory agencies e.g. DAFF, FSAI, IMB.

Practical Implications for Stakeholders:

- The first analytical test to detect all of the major anti-parasitic drug residues has been developed through a collaboration with the US Department of Agriculture.
- A new group of residues in milk and meat samples were detected for the first time; nitroxynil, closantel, triclabendazole and rafoxanide were detected in milk at low levels. However, with setting of provisional Maximum Residue Limits (MRLs) for some flukicides in milk, this will become less of a problem from 2011 on.
- The technology developed under this funding has been comprehensively validated according to international guidelines and was accredited to the ISO 17025 standard. The technology has been applied to some 3000 test samples.
- The main recommendation for primary processors is that flukicide residues should be monitored in milk, particularly during the spring period post-calving.

Main Results:

- A sensitive test was developed and validated to detect 38 anti-parasitic drug residues in milk and animals tissue.
- The technology was satisfactorily evaluated through application in inter-laboratory studies.
- The technology was accredited to ISO17025 standard in 2009.
- The technology has been applied to approximately 3000 test samples.

Opportunity/Benefit:

This analytical test is now available as a tool to monitor the safety of milk and meat products through accurate determination of flukicide residue levels, and offers an opportunity for food processors to prevent contaminated product entering the food chain and potential product recalls, with all of the economic fallout this entails.

Collaborating Institutions:

US Department of Agriculture - EARC

Project Number: 5579

Funding Source: DAFF (06/RD/TAFRC/479)

Date: January, 2011

Project Dates: Nov 2006 – Nov 2009

How to Proceed:

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Technology

UPDATE

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

Project Number: 5580

Funding Source: DAFF (R&D/TAFRC/521)

Date: March, 2012

Project Dates: Nov 2006 – Jun 2010

How to Proceed:

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UPDATE

Development of Food Ingredients for Modulation of Glycaemia

Key External Stakeholders:

Ingredient suppliers, nutritional beverage manufacturers.

Practical Implications for Stakeholders:

This research provides scientifically validated knowledge on how to combine dairy proteins and carbohydrates for controlled structure development and glucose release in foods. This included studying the effect of the interaction between carbohydrates and dairy proteins on viscosity development and susceptibility to enzymatic hydrolysis and explored the possible modulating effects of dairy proteins, i.e. alpha(α)-casein, beta(β)–casein, beta(β)-lactoglobulin & alpha(α)-lactalbumin on the gelatinisation characteristics and related functional behaviour of starch (waxy maize) in food formulations.

We found that it is possible to develop different physical properties in solution due to the interactive effects of varying combinations of carbohydrates (konjac glucomannon, starch, maltodextrin and inulin) and proteins (alpha(α)-casein, beta(β)-casein,

alpha(α)-lactalbumin and beta(β)-lactoglobulin). Rheological analysis demonstrated that under suitable gelling conditions;

- Inulin had little effect on the gel-strength of β-lactoglobulin compared to konjac glucomannon
- Konjac glucomannon enhances gelling properties
- Adding maltodextrin to starch in solution results in higher viscosity than starch alone during pasting and the gelatinisation profiles of starch alter when maltodextrin is present.

Main Results:

- Inulin had little effect on the gel-strength of β-lactoglobulin compared to konjac glucomannon which enhances gelling properties.
- The gelatinisation profiles of starch alter when maltodextrin is present, e.g. the addition of maltodextrin to starch in solution results in higher viscosity than starch alone during pasting.
- It is hypothesised that gelatinisation of starch in structured casein networks provides a method for decreasing the digestion rate of the starch and can thus contribute to modulation of postprandial glucose fluctuations.
- Different proteins, in particular α- casein and β-casein, have different abilities to alter the viscosity and subsequent glucose release of food systems.
- Caseins reinforce the structure of starch granules during gelatinisation.

Opportunity/Benefit:

The combination of different proteins and selected carbohydrates creates new opportunities for developing functionality in dairy based beverages. The project can contribute to the development of nutritional formulations designed for sports and/or medical applications such as patients with Type 2 diabetes and/or glucose intolerance. Expressions of interest in accessing or furthering this research are welcome.

Collaborating Institutions:

University College Cork

Project Number: 5590

Funding Source: DAFF (06/R&D/TMFRC445)

Date: October, 2011

Project Dates: Sep 2006 – Nov 2010

How to Proceed:

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Technology

UPDATE

Early Detection of Mushroom Bruising Using Imaging Technology

Key External Stakeholders:

Mushroom producers, mushroom packers, supermarket chains.

Practical Implications for Stakeholders:

- The capability to identify damaged mushrooms before browning becomes visible has been developed.
- The technology has the potential to reduce acceptance problems for mushroom lots at both wholesale and retail level.

Browning of mushrooms because of damage during harvesting and transportation results in a monetary loss for the mushroom industry. This project investigated the use of a rapid, non-destructive system, near infrared (NIR) spectroscopy and hyperspectral imaging (NIR-HSI), which has the potential to identify the damaged mushrooms before browning is visible. The technique is capable of on-line installation and operation and could eventually be deployed for screening of sample or whole lots.

Main Results:

- Conventional NIR spectroscopy can discriminate between damaged and undamaged mushrooms with almost 100% accuracy.
- Conventional NIR spectroscopy is capable of predicting post-harvest age in damaged and un-damaged mushrooms with a high level of accuracy.
- NIR–HSI can discriminate between damaged and undamaged mushrooms within 1 day of harvest at rates of 72 and 86% respectively.

Opportunity/Benefit:

Expressions of interest from mushroom producers or distributors relating to exploitation of this emerging technology through engagement with Teagasc are welcome. Teagasc can develop turnkey applications for interested companies on request.

Collaborating Institutions:

Dublin Institute of Technology, University College Dublin

Project Number: 5708

Funding Source: DAFF (06/R&D/DIT487)

Date: February, 2011

Project Dates: Nov 2006- Jul 2010

How to Proceed:

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Technology

UPDATE

The Effect of Diet on *Salmonella* Survival in the Bovine Rumen and Abomasum

Key External Stakeholders:

Beef farmers, beef processors, FSAI, DAFM and EFSA.

Practical Implications for Stakeholders:

The aim of this study was to examine if diet could be used as a pre-harvest control strategy aimed at reducing the risk of *Salmonella* contamination at slaughter. This study concluded that dietary manipulation is not an effective means of reducing *Salmonella* carriage and shedding in beef animals.

Main Results:

Although the high grain diet resulted in significantly higher volatile fatty acid (VFA) concentrations in the rumen, overall diet did not affect *Salmonella* survival in the rumen, abomasum nor the faeces. Dietary manipulation is not an effective strategy for reducing *Salmonella* carriage and shedding in cattle.

Opportunity/Benefit:

The hypothesis that diet may be manipulated to reduce *Salmonella* carriage and shedding in cattle thereby reducing carcass contamination levels, protecting public health, exports, etc. was tested in this project and shown to be ineffective. The results are available for interested parties.

Collaborating Institutions:

University College Dublin

Project Number: 5635

Funding Source: DAFF (06RDTAFRC471)

Date: June, 2011

Project Dates: Dec 2006 – Dec 2009

How to Proceed:

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Technology

UPDATE

Emerging Verocytotoxigenic *Escherichia coli* (VTEC) on Irish Beef Farms

Key External Stakeholders:

Irish beef farmers, beef processors, FSAI, DAFF, public health personnel, epidemiologists and scientists interested in VTEC research.

Practical Implications for Stakeholders:

This study discovered that VTEC were widespread on Irish beef farms and some serotypes were capable of causing serious illness in humans. A range of different VTEC serotypes were also detected on cattle hides and carcasses in the abattoir. New, more virulent serotypes are emerging and will join *E. coli* O157 in causing serious disease outbreaks in the future.

Main Results:

- VTEC are widespread on Irish beef farms.
- VTEC are present on hides and carcasses in the abattoir.
- VTEC survive well in Irish clay and sandy soils
- Several serotypes of potential clinical significance are emerging.

Opportunity/Benefit:

The data generated, especially on non-O157 VTEC will be used to formulate new risk based meat inspection procedures and in the development of public health protection policy. It strongly supports the case for expanding current microbiological criteria in meat monitoring and identifies novel VTEC that should be tested for in seriously ill patients not infected with O157.

Collaborating Institutions:

University College Dublin; University of Ulster, Jordanstown; US Department of Agriculture-ARS

Project Number: 5554

Funding Source: FIRM (06/R&D/TN/357)

Date: October, 2011

Project Dates: Oct 2006 – Sep 2009

How to Proceed:

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Technology

UPDATE

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

Project Number: 5472

Funding Source: DAFF (FIRM) & EI

Date: June, 2011

Project Dates: Mar 2006 – Mar 2009

How to Proceed:

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www.teagasc.ie/publications

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Technology

UPDATE

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

Project Number: 5431

Funding Source: DAFM (04/R&D/TD/309)

Date: March, 2012

Project Dates: Jan 2005 – Sep 2009

How to Proceed:

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Technology

UPDATE

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

Project Number: 5715

Funding Source: DAFF (06/RD/C/462)

Date: June, 2011

Project Dates: Sep 2006 – Sep 2010

How to Proceed:

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UPDATE

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

Project Number: 5363

Funding Source: DAFF (04/R&D/TD/317)

Date: December, 2010

Project Dates: Oct 2005 – Aug 2009

How to Proceed:

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www.teagasc.ie/publications

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Technology

UPDATE

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

Project Number: 5647

Funding Source: FIRM (06RDTMFRC450)

Date: November, 2012

Project Dates: Jan 2007 – Dec 2010

How to Proceed:

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Technology

UPDATE

Identification and Molecular Characterisation of Genes Influencing Irish Pork Meat Quality

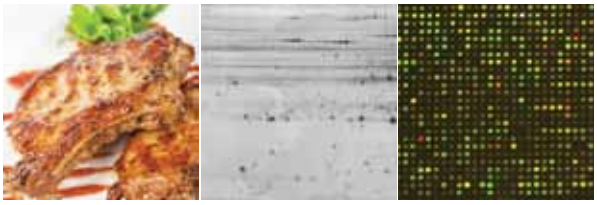
Key External Stakeholders:

Pig producers, pigmeat processors, diagnostics companies.

Practical Implications for Stakeholders:

Tools to provide early prediction of the ultimate quality of meat, i.e. shortly after slaughter, would help facilitate logistical decisions of pork processors in relation to meat management. However measurements that are currently applied by industry, e.g. carcass pH measured at 45 minutes postmortem, are not considered satisfactory as accurate predictors of ultimate quality.

- Molecular approaches applied in this project have led to the identification of biological markers which are associated with quality parameters. These have considerable potential as tools to predict quality in meat management systems and/or to provide a basis for the inclusion of meat quality in selection goals.
- Gene expression profiles and novel DNA markers in these gene regions were shown to be linked with meat quality in large pig populations representing Large White, Duroc and Pietrain breeds. Interestingly, several of the associations were breed-specific. Results have applications in meat management systems and breeding.
- Exudate from muscle was shown to be a readily accessible biological resource and a rich source of potential protein biomarkers of quality. More than two-hundred proteins/fragments were altered through postmortem ageing and are thus linked to quality. Twenty proteins were linked to drip loss. The findings provide a means for the future development of high-throughput protein diagnostics for diverse aspects of meat quality in an industrial setting.



Main Results:

- A detailed meat quality database (tenderness, fat content, water-holding capacity etc.) for three breeds (Large White, Pietrain, Duroc) was established.
- More than 600 candidate genes were identified whose expression levels were associated with tenderness, intramuscular fat content, drip loss or PSE-like / DFD-like meat.
- Many novel associations have been identified between 190 novel markers (SNPs) discovered in the most promising candidate genes and meat quality measurements in four cohorts (total 724 animals).
- 2D proteomics resulted in the identification of protein spots significantly associated with drip loss at the one day postmortem point. These have potential to serve as early biomarkers of water-holding capacity.

Opportunity/Benefit:

A panel of proteomic markers associated with a highly relevant pork quality trait for pigmeat processors, i.e. drip loss, was identified in the course of this project. The results could be further developed into rapid tests for drip loss in a commercial context. This approach could also be highly relevant for palatability traits, such as tenderness, juiciness and flavour. Expressions of interest in further developing this research are welcome.

Collaborating Institutions:

National University of Ireland, Galway; University College Dublin.

Project Number: 5643

Funding Source: DAFF (06/R&D/NUIG/470)

Date: October, 2011

Project Dates: Jan 2007 – Jun 2010

How to Proceed:

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Technology

UPDATE

Inlet Air Humidity Control Project on TFD Spray Dryer

Key External Stakeholders:

Dairy ingredient manufacturers, infant milk formula manufacturers.

Practical Implications for Stakeholders:

The outcome is:

- The pilot-scale tall-form dryer (TFD) in MTL, Moorepark, is now capable of humidity control of incoming air used in drying.
- This feature provides better control over drying conditions in R&D trials, enabling experimental variation due to air variable humidity to be removed.
- It enables the influence of air humidity in the manufacture of a new product to be investigated. This assists product development in that issues with stickiness and plant blockage can be addressed at the pilot stage.
- As a demonstration project it is a model for the uptake of such technology by the dairy ingredients manufacturing sector.
- This facility is now available to the industry and to Teagasc researchers as a development tool.

Main Results:

In commissioning it was demonstrated that air humidity can be controlled between a dew point of -8°C and 25°C. Product related results will come through other projects.

Opportunity/Benefit:

Interested parties can gain access to the TFD in order to carry out trials under controlled air humidity conditions, i.e. humid or dry conditions can be simulated, and to develop new products and ingredients.

Collaborating Institutions:

N/A

Project Number: 5982

Funding Source: Dairy Levy Fund

Date: July, 2011

Project Dates: Jul 2009 - Dec 2010

How to Proceed:

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Technology

UPDATE

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

Project Number: 5420

Funding Source: DAFF (04/R&D/TN/262)

Date: October, 2011

Project Dates: Mar 2005 – Mar 2010

How to Proceed:

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Technology

UPDATE

Investigation of Stickiness of Milk Powder for the Purpose of Improved Process Control in Milk Powder Manufacture

Key External Stakeholders:

Dairy ingredient manufacturers, infant milk formula manufacturers.

Practical Implications for Stakeholders:

- Partial substitution of lactose with proteins or maltodextrin can reduce stickiness problems during drying, crystallisation and storage.
- New measurement techniques have been developed and are applicable to industry.

Understanding the effects of specific formulation components (type of sugar, type of protein) on stickiness is of immense practical benefit with regard to new product development. To this end the project has demonstrated the role of different powder constituents (proteins, maltodextrins and lactose) on stickiness and has developed measurement techniques that are in use in our laboratories.

Modelling was used to show how to deal with the constraints of drying sticky products (including infant formula and other high lactose formulations) and how to optimise process control to maximise production while avoiding plant blockage (and downtime) while air humidity varies.

Main Results:

- Partial substitution of lactose with proteins (i.e. higher molecular weight components) is a means of reducing stickiness problems.
- Maltodextrin inclusion in skim milk powder decreases susceptibility to sticking during drying and crystallisation during subsequent storage.
- Modelling was used to show how to deal with the constraints of drying sticky products (including infant formula and other high lactose formulations).

Opportunity/Benefit:

Teagasc can assist interested parties in improving process efficiencies in the manufacture of dried products. The opportunity exists for further research in this area and expressions of interest from relevant companies are invited.

Collaborating Institutions:

University College Cork

Project Number: 5632

Funding Source: DAFF (06/RD/TMFRC/443)

Date: July, 2011

Project Dates: Nov 2006 - Nov 2010

How to Proceed:

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

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Technology

UPDATE

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.

Project Number: 5429

Funding Source: DAFF (Safefood 04CR-06)

Date: January, 2010

Project Dates: Oct 2005 – Oct 2008

How to Proceed:

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Technology

UPDATE

Kinetic Trapping: A Novel, Energy-Efficient Approach to Designing Protein-Based Fat Replacers

Key External Stakeholders:

Dairy & food industry, ingredient manufacturers.

Practical Implications for Stakeholders:

Kinetic trapping is a novel low-energy process for producing nano- and micro-sized protein particles. The technology relies on precise process control of standard food ingredient mixtures using readily available food manufacturing equipment. The kinetic trapping process represents a **new platform technology** for producing size-controlled protein particles in the nano- and micro-size range which was developed and used in this project to produce novel fat replacer ingredients. The benefits of such ingredients when compared to other fat replacers include reduction in capital costs, lower energy demand, enhanced nutrition & functionality and improved sensory quality. Also the use of non-chemically modified i.e. natural ingredients is significant.

Because of health concerns relating to Olestra, a chemically modified oil-based fat replacer, the demand for protein and polysaccharide based fat replacers is increasing. With the market for fat-replacers globally expected to be **280,100 metric tons** with a compound annual growth rate of 6.03% between 2011 and 2015 (Global Industry Analysts), the availability of such a novel fat replacer ingredient has significant implications for the dairy and food industry and specifically ingredient manufacturers.

Scanning electron micrograph of spray dried protein particles

Main Results:

- A new whey protein-based fat replacer ingredient was produced using kinetic trapping.
- The novel fat replacer ingredient was produced in dried form with and without konjac gum (soluble dietary fibre) and had creamy texture when added to ice cream. It was whey protein particles size-optimised (100 nm – 10 mm) and calcium enriched (~100mM Ca+).
- Conditions for production were optimised and ingredients produced in spray dried form.

Opportunity/Benefit:

This novel platform technology represents a significant advancement in production of fat replacer ingredients and a patent application is currently being filed to protect the novel process and resulting unique products. Teagasc is keen to engage with dairy and food industry and ingredient manufacturers to consider collaborative opportunities as a means of optimising, validating and ultimately commercialising this technology.

Collaborating Institutions:

N/A

Project Number: 6041

Funding Source: EI (POC-2009-260)

Date: January, 2012

Project Dates: Jan 2009 – Dec 2010

How to Proceed:

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www.teagasc.ie/publications

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Technology

UPDATE

National Food Residue Database (NFRD)

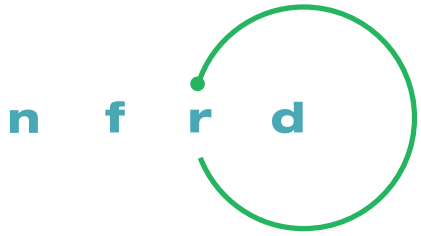
Key External Stakeholders:

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

Project Number: 5640

Funding Source: DAFF (06RDTAFRC535)

Date: January, 2012

Project Dates: Nov 2006 – Nov 2009

How to Proceed:

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

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Technology

UPDATE

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

Project Number: 5412

Funding Source: DAFF (04/R&D/TN/249)

Date: June, 2011

Project Dates: Jul 2005 – Jan 2009

How to Proceed:

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

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Technology

UPDATE

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

Project Number: 5548

Funding Source: EU FP6 (016279)

Date: July, 2011

Project Dates: Jan 2006 – Sep 2010

How to Proceed:

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

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Technology

UPDATE

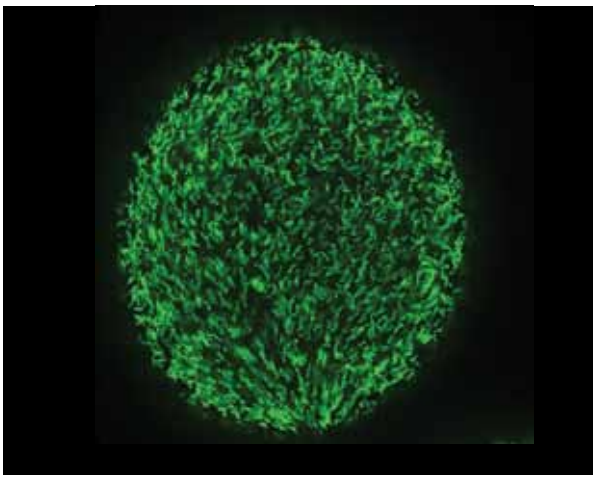
Novel Gel-Encapsulation Technology

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

Project Number: 5457

Funding Source: Dairy Levy Fund

Date: February, 2010

Project Dates: Jul 2005 - Dec 2009

How to Proceed:

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

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Technology

UPDATE

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

Project Number: 5636

Funding Source: DAFF (06RDTAFRC472)

Date: March 2012

Project Dates: Dec 2006 – Nov 2010

How to Proceed:

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

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Technology

UPDATE

Pathogenic *Escherichia coli* Network

Key External Stakeholders:

Farmers, food processors, scientists, regulatory personnel, medical doctors, veterinarians, epidemiologists, microbiologists, consumers, European Food Safety Authority (EFSA).

Practical Implications for Stakeholders:

Up-to-date information and advice on the different *Escherichia coli* pathogens, detection, epidemiology, pathogenicity, virulence, ecology and control in the farming and beef processing stages of the food chain.

Main Results:

Six reports were published on current knowledge, identifying data gaps and making a range of key recommendations designed to improve food/medical testing, epidemiological investigations, control and our overall understanding of these serious pathogens.

Opportunity/Benefit:

This project furthered the existing knowledge base by bringing together international experts on pathogenic *E. coli*, especially verocytotoxigenic *E. coli* (VTEC), to discuss and resolve issues relating to culture and molecular detection, virulence, pathogenicity, epidemiology, ecology and control.

Collaborating Institutions:

See full Technology Update

Project Number: 5704

Funding Source: FP6 (FOOD-CT-2006-036256)

Date: June, 2011

Project Dates: Jan 2007 – Jan 2010

How to Proceed:

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

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Technology

UPDATE

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.

Project Number: 5458

Funding Source: Dairy Levy

Date: October, 2011

Project Dates: Jun 2005 – Dec 2010

How to Proceed:

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

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Technology

UPDATE

Pork Food Safety

Key External Stakeholders:

Irish pork producers, Irish pork processors, regulatory agencies (FSAI & DAFM), retailers.

Practical Implications for Stakeholders:

- Pig farm: Urea or ammonia may be used to disinfect *Salmonella* and/or *Yersinia enterocolitica* contaminated pig slurry.
- Pig abattoir: A time-temperature combination of 2.67 min at 60°C is required to achieve a 1 log reduction in *Y. enterocolitica* in scald tank water. The predicted equivalent at 65°C is 0.59 min.
- Pig abattoir: Cross contamination occurred in the lairage and during carcass processing. More effective sanitation is recommended.

Main Results:

The incidence and spread of *Salmonella* and *Y. enterocolitica* on Irish pig farms could be reduced through the application of urea or ammonia to disinfect animal waste. *Y. enterocolitica* contamination on pork carcasses would be reduced if the time-temperature combination in the scald tank was set at a minimum of 2.67 min at 60°C or equivalent and cross contamination of carcasses could be prevented if the lairage area was disinfected more efficiently. All of this would result in reduced pathogen contamination on pork carcasses and in pig products thus protecting public health and pork consumers.

Opportunity/Benefit:

This project provided information on the control of key pathogens in Irish pork at the farm and processor stages. Interested industry and regulatory personnel should contact Dr. Declan Bolton directly to discuss implementation. The main benefit of implementing the results of the project would be a reduced risk of pork associated illness thus protecting public health and the reputation of the Irish food industry. Furthermore, the current status of the Irish pig industry in European Food Safety Authority (EFSA) league tables would improve.

Collaborating Institutions:

University College Dublin

Project Number: 5706

Funding Source: FP6 (FOOD-CT-2007-036245)

Date: March, 2012

Project Dates: Jan 2007 - Dec 2011

How to Proceed:

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

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Technology

UPDATE

Prevalence and Epidemiology of Emergent Strains of Verocytotoxigenic *E. coli* (O157, O26 And O111) in Irish Food Animals at the Pre-Harvest and Harvest Levels of the Food

Key External Stakeholders:

Meat and dairy industry, Food Safety Authority of Ireland.

Practical Implications for Stakeholders:

Verocytotoxigenic (VTEC) *E. coli*, and in particular serogroup O157, are highly significant food borne pathogens. More recently, other non-O157 VTEC serogroups, in particular O26 O111, O103, and O145 have emerged and been associated with human illness. This project focused on establishing the risk posed by *E. coli* O26, O111, O145, and O103 as well as O157 in ruminant food animals (cattle and sheep) and on their transmission from hide/fleece to meat carcases during the slaughter and dressing

operations. The project also generated data on these pathogens in dairy cattle and raw milk from selected dairy herds. The key message from the study is that *E. coli* O157 remains the most common serogroup. In the meat chain, the hide and fleece are the most important sources of contamination.

Main Results:

- **Beef:** *E. coli* O157 was detected in 15.96% of hide, 2.33% of faeces, 0.59% carcass (pre-wash), 0.63% (post-wash) and 3.03% environmental samples. The majority of isolates were highly virulent. *E. coli* O26 was isolated from 0.25% of hide, 1.48% of faeces and 0.56% of environmental samples but no other sample types. *E. coli* O145 was isolated from 0.74% of faeces samples and 0.56% of environmental samples but not on carcass surfaces. *E. coli* O111 was not detected in any of these samples. Of the non O157 serogroups, only a small proportion were virulent.
- **Sheep:** *E. coli* O157 was found in 1.0% of fleece and 0.8 % of carcass samples. *E. coli* O26 was recovered from 2.4 % of fleece, 1.8% of carcass and 4.1% of environmental samples. O103 was found in 16.0% of fleece and 12.6% of carcass swabs and *E. coli* O145 was recovered from 0.2% of fleece samples. *E. coli* O111 was not detected in any of the samples processed.
- **Dairy:** 1% of dairy faecal samples contained O157, O26 or O103 strains but none of the milk or milk filter samples yielded any virulent isolates.

Opportunity/Benefit:

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

Collaborating Institutions:

University College Dublin, Cork County Council Veterinary Unit

Project Number: 5555

Funding Source: DAFF (05/R&D/D/364)

Date: January, 2011

Project Dates: Jun 2006 - May 2009

How to Proceed:

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

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Technology

UPDATE

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

Project Number: 5714

Funding Source: DAFF (06/R&D/TAFRC/522)

Date: March, 2012

Project Dates: Oct 2006 – Mar 2010

How to Proceed:

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

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Technology

UPDATE

Proteome Analysis to Improve Meat Tenderness

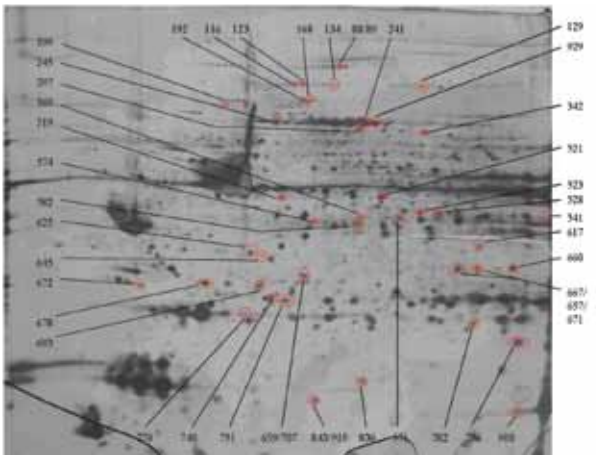
Key External Stakeholders:

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

Project Number: 5422

Funding Source: DAFF (R&D/TN/254)

Date: March, 2012

Project Dates: Apr 2006 – Mar 2009

How to Proceed:

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

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Technology

UPDATE

Research Providing a Knowledge Base to Support the Sustainable Development of the Farmhouse Cheese Industry

Key External Stakeholders:

Irish Farmhouse Cheesemakers Association, Food Safety Authority of Ireland.

Practical Implications for Stakeholders:

This research has had an impact as follows:

- The results of the analysis have been given to each producer giving them valuable information on their product and process.
- Assistance and advice was given to the farmhouse cheesemakers on issues not directly related to the project, facilitating the building of a good working relationship.
- A HACCP workbook is being implemented in the farmhouse cheese sector, which will have implications in the production of safer, higher quality cheese.
- Teagasc are working with the stakeholders to support the setting of limits for flukicides.
- The sector has an understanding of the food safety attributes valued by consumers and the importance in adopting a supply-chain approach when managing food safety policy. This can be used in the development of marketing strategies that will address market requirements.
- The results provide strong positive feedback on the contribution of the regulatory authorities to the artisan food sector.

Main Results:

- Cheeses and cheesemaking facilities tested were generally within quality/safety parameters. Support was given to cheesemakers, and pre-emptive action taken where any issues were identified.
- Anti-parasitic drug residues are not an issue in cheeses.
- Consumers have confidence in the safety of Irish farmhouse cheese and its producers, and that the sector is well-regulated. They also perceive it to be a quality product.

Opportunity/Benefit:

- Farmhouse cheese manufactured in Ireland is safe and produced in hygienic processing facilities.
- This evidence-base provides an opportunity to build a strong competitive advantage for Irish farmhouse cheese in the domestic and export market.
- A HACCP booklet is available to assist producers in their efforts to continue producing safe high-quality product.

Collaborating Institutions:

N/A

Project Number: 5611

Funding Source: DAFF (06/RDT/MFRC/434)

Date: March, 2011

Project Dates: Oct 2006 - Mar 2011

How to Proceed:

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

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Technology

UPDATE

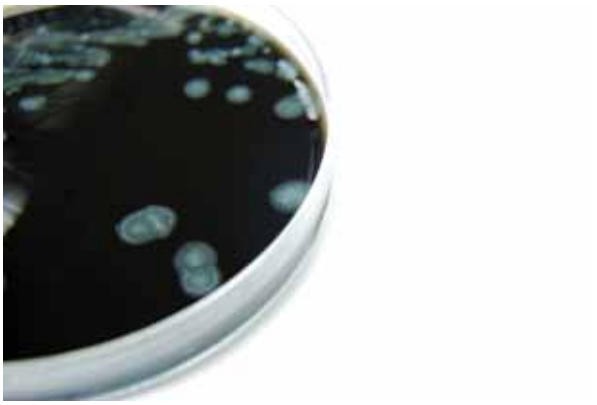
Public Health Significance of Emergent *Campylobacter* Species in the Irish Food Chain

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

Project Number: 5553

Funding Source: DAFF (05/R&D/TN/356)

Date: September, 2010

Project Dates: Jul 2006 – Jun 2009

How to Proceed:

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

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Technology

UPDATE

Rapid Methods for Food Authentication and Quality Confirmation

Key External Stakeholders:

Food manufacturers, consumers, regulatory agencies.

Practical Implications for Stakeholders:

The outcome is a clear indication of the power and utility of rapid, non-destructive spectroscopic methods for demonstrating conformance to specification of foods and food ingredients.

- Variations in raw material quality may be detected and defective material rejected.
- In-process changes may be mapped and controlled.

Trace

- Final product consistency may be measured and assured.
- This technology facilitates the application of PAT (Process Analytical Technology) in the food industry.

Main Results:

- Spectroscopic models have been developed which are capable of discriminating between closely-related food products e.g. extra virgin olive oils from Liguria and other regions in Italy, Corsican honey and honey from neighbouring territories.
- A spectroscopic method for confirming the identity of a branded product was demonstrated. Spectroscopy combined with mathematical modelling has been demonstrated to be suitable for demonstrating conformance to specification in a range of food products.

Opportunity/Benefit:

By interaction with this expertise at Teagasc Food Research Centre Ashtown, food processors can reduce variability in the functional and other characteristics of their products, and move towards a PAT approach in food processing.

Collaborating Institutions:

See full Technology Update

Project Number: 5430

Funding Source: FP6 (2003-Food-2A-0060942)

Date: January, 2011

Project Dates: Jan 2005 – Dec 2011

How to Proceed:

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

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Technology

UPDATE

Rapid Methods for Detection of Anti-Protozoan Drugs

Key External Stakeholders:

Meat, egg and poultry sectors, feed mills, regulatory agencies, e.g. DAFF, FSAI, IMB.

Practical Implications for Stakeholders:

The objective of this research was to develop and validate a range of rapid methods for detection of three key anti-protozoan drug residues – diclazuril, halofuginone and toltrazuril. The technologies currently available for residue detection are often highly specialised (and costly) and generally not suitable for application within industry. Therefore low-cost, effective means of screening such components will benefit food producers. A comprehensive liquid chromatography method was developed to detect 21 anti-protozoan and anticoccidial residues in eggs and meat and validated to meet EC 2002/657 criteria.

Anti-protozoan drugs are used in the treatment of Eimeria and Cryptosporidium parvum infections in poultry, pigs, lambs and calves. Residues of these drugs can occur in food because of feed contamination or failure to observe withdrawal periods

following administration. To date, there has been little knowledge on the incidence of antiprotozoan drug residues in food of animal origin due to the lack of suitable analytical methods and the difficulty in analysing these substances. This new development therefore has significant implications for meat, egg and poultry sectors and can be applied to the detection of anti-protozoan drug residues within food at factories, feed mills, or on-line processing monitoring in large-scale food production plants.

Main Results:

- Novel antibodies were developed to halofugionone and diclazuril.
- A range of biosensor assays were developed for these residues including a novel multiplex immunoassay, capable of simultaneous detection of diclazuril, halofuginone and toltrazuril.
- A comprehensive liquid chromatography method was developed and validated to detect 21 anti-protozoan and anticoccidial residues in eggs and meat.

Opportunity:

A new analytical test was developed and validated to detect 21 anti-protozoan and anticoccidial residues in eggs and meat. This comprehensive test is currently the best available for these residues and is now available as a commercial service to the Irish food industry to ensure that they are in compliance with HACCP and their produce is safe.

Collaborating Institutions:

Dublin City University

Project Number: 5578

Funding Source: DAFF (06/RDCU478)

Date: July, 2011

Project Dates: Sep 2006 – Aug 2010

How to Proceed:

For further information access the full Technology Update at:
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Technology

UPDATE

Red Holsteins – Knowledge of Genetic Variations to Breed a More Robust Dairy Cow

Key External Stakeholders:

Dairy farmers, cattle breeders, AI companies, suppliers of mastitis treatments and prophylactics.

Practical Implications for Stakeholders:

The main objective of this study was to test the Irish dairy herd for genetic variations in key genes and to determine whether these variations are associated with differences in cow performance. The main outcome is the identification of genetic variations associated with energy balance and fertility. This information can be used in breeding programs to select for more robust dairy cows.

- Of 24 genetic variations tested, 17 exhibited associations with energy balance traits.
- We identified a variant in the milk protein gene, *lactoferrin* that associated with calving interval.
- We detailed the immune response to the probiotic mastitis therapeutic *Lactococcus lactis*.

Main Results:

- 17 genetic variations were associated with energy balance in the Irish dairy herd and this knowledge can be used in breeding programs to aid in the selection of dairy cows with shorter periods of negative energy balance in early lactation.
- The significance of finding lactoferrin variants that are associated with calving interval is important in our efforts to improve dairy cow fertility.
- *L. lactis* has been proposed as a probiotic treatment for mastitis. We have proven that, once introduced into the udder, it rapidly stimulates the cow's immune system helping it fight the bacteria that cause mastitis.
- We found no associations between polymorphisms in immune genes with milk somatic cell count. Therefore these polymorphisms should not be used in breeding programmes for improved mastitis resistance in the Irish dairy herd.
- We observed a delayed immune response by the udder when infected with the mastitic bacteria *Streptococcus dysgalactiae* spp. *dysgalactiae*. This will aid in the development of effective therapeutics to treat *S. dysgalactiae* infections, particularly persistent and sub-clinical infections.
- Immune signals which exhibited a delayed response to the mastitic bacteria *S. dysgalactiae* are targets for mastitis therapeutics.
- Understanding the mode of action of *L. lactis* as a mastitis therapy is important in our efforts to commercialise this probiotic.
- We have developed expertise in intramammary challenge trials. Queries are welcome from companies interested in performing animal trials to test potential mastitis therapeutic products.

Opportunity/Benefit:

- Polymorphisms associated with energy balance and fertility can be included in breeding programs to select for more robust dairy cows in the Irish dairy herd.

Collaborating Institutions:

University College Dublin, University College Cork, Irish Cattle Breeding Federation

Project Number: 5463

Funding Source: Dairy Levy Fund

Date: September, 2011

Project Dates: Mar 2005 – Dec 2009

How to Proceed:

For further information access the full Technology Update at:
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Technology

UPDATE

Releasing the Potential of Bovine Lactoferrin

Key External Stakeholders:

Dairy farmers, cattle breeders, AI companies, dairy food companies.

Practical Implications for Stakeholders:

- The project results provide genetic information to cattle breeders to select cows programmed to produce higher levels of lactoferrin in milk. These cows are more fertile, have improved milk quality and survive longer in the dairy herd than their herdmates, hence the significant implications to cattle breeders, farmers and AI companies. This project identified cows that naturally produce more of this protein while also showing that different lactoferrin proteins have different levels and types of bioactivity.

- lactoferrin is a bio-active protein found in milk with anti-microbial, anti-cancer, anti-viral and anti-oxidative properties. Milk with increased lactoferrin content or increased lactoferrin bioactivity is an ideal raw material for producing lactoferrin ingredients for the food supplement, infant formula and food safety markets, hence the importance of this research to these sectors.

Main Results:

- Associations between genetic variations in lactoferrin with performance traits in 848 Holstein-Friesian sires were quantified. Associations with calving interval, improved survival and lower milk somatic cell score were found. Selecting for these variants in breeding programmes will benefit the health and fertility of the national dairy herd.
- A lactoferrin genotype in cows was identified which produced higher levels of lactoferrin protein in milk.
- The naturally occurring variation in the lactoferrin protein was studied. Six novel lactoferrin proteins were purified from milk of genotyped cows and dried in powder form. Several were found to have enhanced anti-microbial activities against bacterial pathogens *Listeria innocua, Escherchia coli* and *Streptococcus dysgalactiae* compared to current commercially produced bovine lactoferrin preparations.

Opportunity/Benefit:

The project outputs are of benefit to the cattle breeding industry through the provision of genetic information to select cows programmed to produce higher levels of lactoferrin in milk. Milk with increased lactoferrin content or increased lactoferrin bioactivity is an ideal raw material for producing lactoferrin ingredients for the food supplement, infant formula and food safety markets. These ingredient producers can benefit from this research also, although further research would be required.

Collaborating Institutions:

University College Dublin, Irish Cattle Breeding Federation

Project Number: 5582

Funding Source: DAFF (06RDTMFRC437)

Date: September, 2011

Project Dates: Nov 2006 – Mar 2010

How to Proceed:

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Technology

UPDATE

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

Project Number: 5711

Funding Source: DAFF (06/R&D/TAFRC/518)

Date: March, 2012

Project Dates: Dec 2006 - Nov 2010

How to Proceed:

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UPDATE

Secondary Cheese Processing

Key External Stakeholders:

Irish manufacturers of cheese, processed cheese and milk protein powders, scientists with interest in the field of secondary cheese processing.

Practical Implications for Stakeholders:

Key production variables that significantly affect the characteristics of processed cheese products (PCPs) were identified: characteristics of the natural cheeses used, types and levels of emulsifying salts, product pH, and processing conditions. The research provided insights into the mechanisms by which these variables affect PCPs. They alter protein hydration, protein voluminosity and fat emulsification, all of which in turn influence the structure and continuity of the protein network that forms the structural framework of the PCP.

Main Results:

Using a given generic formulation and product composition, PCPs with widely different functionalities could be achieved by alteration of natural cheese characteristics, emulsifying salt type and level, product pH and processing conditions.

Processing was accompanied by a large increase in the solubility of the protein of natural cheese and other ingredients (e.g. rennet casein) used in the formulation, as a consequence of emulsifying-salt mediated demineralisation; nevertheless, most of the calcium and phosphorous in PCP remain insoluble in the form of insoluble calcium phosphate or calcium citrate inclusions.

Reducing the level of emulsifying salt below a critical level prevented the successful formation of PCP, owing to insufficient calcium removal from, and solubilisation of, the natural cheese protein.

Increasing processing time, temperature and shear had similar effects on PCP properties, albeit differing in magnitude of effect: significant increases in firmness and elasticity modulus and reductions in the fracture strain and in the flowability and fluidity of the melted PCP.

Opportunity/Benefit:

The research provides an extensive database on how the functional properties of PCPs (e.g. texture, rheology and melt characteristics) may be altered by changing different process variables. It provides scientifically supported insights into the mechanisms operating during the manufacture of PCPs, and how these may be modulated for control of potential defects (such as *overcreaming*, oiling-off, low heat-stability) or customisation of product characteristics. This database is available to Irish dairy companies by way of scientific publications and provision of customised workshops.

Collaborating Institutions:

N/A

Project Number: 5451

Funding Source: Dairy Levy

Date: February, 2011

Project Dates: Jan 2005 – Dec 2007

How to Proceed:

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UPDATE

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

Project Number: 5712

Funding Source: DAFF (06/R&D/AFRC/519)

Date: March, 2012

Project Dates: Oct 2006 - Sep 2011

How to Proceed:

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Technology

UPDATE

Survival of *Mycobacterium avium* Subspecies *paratuberculosis* (MAP) in a Raw Milk Smear Type Cheese

Key External Stakeholders:

Artisanal farmhouse cheese producers, dairy industry, dairy farmers.

Practical Implications for Stakeholders:

Johne's disease is caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP) and affects cattle, sheep and goats. Because of the similarity of the pathogenesis of Johne's disease in cattle and Crohn's disease in humans there is ongoing debate regarding the potential of animal derived MAP in the food chain to cause Crohn's disease in humans however, this link has never been definitively established.

The main recommendation from this research is that milk from cows suffering from Johne's disease and shedding large numbers of MAP should not be used

for the manufacture of smear type cheese made from unpasteurised milk as these bacteria will survive cheese manufacture and ripening.

Main Results:

To establish the fate of MAP in a raw milk smear type cheese the survival of MAP in a smear type cheese made from raw milk and the effect of the natural antimicrobial lacticin 3147 on the survival of MAP were assessed during manufacture and ripening.

- MAP can survive the manufacturing and ripening conditions employed in the making of a raw milk smear type cheese when the milk is artificially contaminated before cheese manufacture.
- The use of a lacticin 3147 producing starter did not affect MAP numbers after 4 weeks of ripening when compared to the control.

Opportunity/Benefit:

This research provides important information as the results show that raw milk from cows suffering from Johne's disease and shedding *Mycobacterium avium* subspecies *paratuberculosis* should not enter the food chain if the milk is to be used to make unpasteurised smear type cheese.

Collaborating Institutions:

See full Technology Update

Project Number: 5654

Funding Source: EU FP6 (023106)

Date: August, 2011

Project Dates: Oct 2006 – May 2010

How to Proceed:

For further information access the full Technology Update at:
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Technology

UPDATE

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

Project Number: 5433

Funding Source: DAFF(04/R&D/C/238)

Date: March, 2011

Project Dates: Jan 2005 – Jun 2009

How to Proceed:

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Technology

UPDATE

Understanding the Perception of Creaminess in Dairy Foods

Key External Stakeholders:

Food and food ingredient manufacturers, dairy industry.

Practical Implications for Stakeholders:

- High pressure processing was shown to enhance the creaminess of yogurts and produce low-fat yogurts as creamy, or *even creamier,* than their conventionally produced full-fat counterparts.
- A better understanding of the relationship between product structure and creaminess perception, based on composition and processing has been developed.

The results of this work have led to further funding from Enterprise Ireland under the Commercialisation Fund and Teagasc researchers are currently developing a new platform technology for manufacturing size controlled protein particles, specifically to be used as novel fat replacer

ingredients. Access to such an energy efficient and innovative food processing technology would benefit dairy and food ingredient companies greatly by allowing them to produce higher quality, low fat dairy-based products with enhanced nutrition at significantly lower production costs.

Main Results:

- High pressure milk processing (microfluidisation) was shown to significantly improve the creaminess of low fat yogurts.
- The development of a new dynamic imaging technique for assessing product quality.
- A predictive model for creaminess based on composition, rheology and microstructure.
- Increased understanding of how microstructure can be controlled to enhance creaminess.
- Demonstration that fat release from food matrices can be controlled by pH and emulsifier type.

Opportunity/Benefit:

There is an opportunity for dairy food ingredient manufacturers to partner with Teagasc to investigate the true potential of such high quality low fat dairy based ingredients using this novel approach through optimisation and validation for specific applications. Expressions of interest from relevant companies are welcome.

Collaborating Institutions:

University College Cork

Project Number: 5606

Funding Source: DAFF (06/RD/TMFRC/431)

Date: July, 2011

Project Dates: Nov 2006 – Dec 2010

How to Proceed:

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Technology

Expertise

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EXPERTISE

Cheese Technology

Teagasc, through its resources at its Food Research Centre, Moorepark has extensive knowledge on the science and technology of a range of cheese types including Cheddar, Mozzarella and novel hybrid varieties. This knowledge, combined with an active ongoing research programme, offers the cheese industry a range of leading edge technologies to support the innovation of cheese products and optimisation of cheese making efficiency.

Background

The fundamental knowledge on the critical factors affecting the composition, yield, biochemistry, rheology, and cooking properties of natural cheeses and processed cheese products are well understood. Teagasc has been engaged in this research for many years with food research institutes and universities on national and international platforms.

Benefits to Industry

Engagement of cheese manufacturers with Teagasc gives access to state of the art facilities and an extensive research expertise in all aspects of cheese science and technology. This facilitates the innovation of new cheese products and optimisation of manufacturing efficiency.

Areas of Expertise

- Texture and functionality of natural cheese and processed-/analogue-cheese.
- Manufacturing efficiency and component recoveries.
- Cheese flavour control and diversification.
- Development, scale-up and diversification of a range of cheese types: brine salted, dry salted, reduced-fat variants.
- Advanced methodologies for assaying cheese texture and functionality.
- Range of analytical capabilities for composition, biochemistry, microbiology, rheology, and functionality.
- Ripening rooms, mixers, culture production unit for specialised starter blends.
- Filtration and dehydration equipment for manufacture of ingredients for use in cheese products.

Range of Solutions

Teagasc can provide a range of solutions through consultancy services, contract research and collaborative arrangements with industry, including:

- Identification and selection of micro-organisms with potential to influence flavour development.
- Development and scale-up of different cheese types.
- Increasing cheese making efficiency.

Facilities/Equipment

- Pilot plant facilities for milk standardisation equipment, pilot scale cheese vats 500-3000L.
- Cookers for processed-/analogue-cheeses.

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

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 and safety, process 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 especially through DAFF, but also Enterprise Ireland and industry 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 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.

Facilities/Equipment

- Slaughtering/boning.
- Meat processing and cooking.
- Packaging.
- Chilling and freezing.
- Analytical (incl. GC, GC-MS, HPLC, NMR).
- 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.

Offer may interest

- 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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EXPERTISE

Seafood Technology

Teagasc, through it's food research centre at Ashtown, supports innovation in the seafood sector through delivery of high quality, commercially-relevant research. Researchers and technologists have wide-ranging expertise and work closely with industry to develop innovative concepts with unique selling points and world-leading technologies.

Background

As an island country, off the mainland of Europe, Ireland has a vast marine biodiversity that can be exploited in a variety of ways. Over twenty years of seafood research funded by DAFF, Enterprise Ireland, Bord Iascaigh Mhara (BIM), EU funding and private industry has provided world-class knowledge in the areas of packaging, ingredients and processing technologies. Teagasc works closely with BIM to ensure that Irish seafood SME's have access to emerging technologies and assistance in applying them within their businesses. The Marine Functional Food Research Initiative, led by Teagasc Ashtown, is focused on the identification of novel marine food ingredients and products which will allow for diversification into new markets. Teagasc is currently investigating the use of fish processing waste, the sustainable exploitation of underutilised species of fish and seaweed, and the development of value-added products from finfish and shellfish.

Benefits to Industry

Research staff and technologists at Teagasc, Ashtown recognise that viable seafood concepts are underpinned by strong science and an understanding of the interactions between the product, process and packaging. The wide ranging expertise and interdisciplinary team approach ensures solutions can be developed to maximise product quality and eating experience. Teagasc works closely with industry and has established linkages with international experts in the field of seafood R&D including NOFIMA, CSIC, SEAFISH-UK and other world-class institutions. Industry-relevant workshops ensure companies are kept up to date with relevant packaging, labelling, food safety and processing developments and Teagasc scientists ensure that knowledge is transferred from research to industry via close interactions with BIM and seafood sector businesses.

Areas of Expertise

- Processing technologies.
- Packaging technologies.
- Temperature mapping.
- Effect of processing on eating quality and nutrition.
- Interaction of multi-component ready meal solutions.
- By-product utilisation and nutraceutical development.

Facilities/Equipment

- Seafood processing and cooking equipment.
- Packaging equipment.
- Chilling, freezing and freeze-drying facilities.
- Analytical equipment (GC, GC-MS, HPLC, NMR).
- Sensory testing facilities.
- Product development plant/incubation unit.

Range of Solutions

Teagasc provides a range of services to seafood companies and undertakes collaborative/contract research incorporating new product development, pilot scale trials, packaging solutions, ingredient sourcing, consumer research and testing (microbial, quality, sensory, residue etc.).

Offer may interest

- Seafood processors and related companies.
- Seafood ready-meal manufacturers.
- Food industry companies wishing to incorporate marine ingredients.

How to Proceed:

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Technology

EXPERTISE

Cereal and Bakery Technologies

Teagasc researchers can provide specialist know-how, facilities and services in cereal science and bakery technology. This includes, but is not limited to, product formulation, innovation and sample testing. Researchers at Teagasc are available to provide consultancy or carry out contract/collaborative research for companies in the aforementioned areas with a view to exploitation of novel products/processes in bread and baked goods markets. A range of testing services is also offered from shelf life to microbial to residue analysis.

Background

Through internally and externally funded research Teagasc researchers have developed significant expertise in the area of baked goods and cereals technology. Numerous collaborations with third level institutions and companies have produced many successful research outputs, and we continue to encourage such links and to work with companies to assist in product innovation, new product development and service provision.

Benefits to Industry

The expertise and facilities, primarily at Teagasc Food Research Centre in Ashtown allows millers, bakers and food companies access to state-of-the-art facilities and specialist knowledge, as well as offering a range of specialist and routine services.

Areas of Expertise

- Wheat flour chemistry and rheology.
- Gluten-free formulations.
- Low glycaemic breads.
- Beta-glucan enriched breads.
- Health/functional snacks.

Facilities/Equipment

- Mill Room.
- Test bakery.
- Dough rheology laboratory.
- Access to National Imaging Centre.
- Sensory testing facility.
- Product development plant/incubation units.

Range of Solutions

Depending on the nature of work requested and the inputs from each party, contract research or collaborations can be considered. This could range from new product development, to pilot scale trials. Ingredient sourcing, consumer research and testing services (shelflife, microbial, quality testing, residue analysis etc.) are other options available.

Offer may interest

- Millers, bakers and those in the snack food industry who incorporate cereal and flours into their products.
- Niche baked goods manufacturers.
- Health food specialists in breads/confectionary/baked goods market.

How to Proceed:

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Technology

EXPERTISE

Consumer Behaviour and Food Marketing

Improving strategic marketing performance of the Irish agri-food sector is the main objective of the Consumer and Market Insights Research team at Teagasc Food Research Centre, Ashtown. We carry out both consumer and market research on many food related topics and use qualitative and quantitative research techniques. The team provide advice on consumer behaviour, innovation management, new product development, market development and food policy.

Background

Through internally and externally funded research Teagasc researchers have developed significant expertise in the area of consumer behaviour and food marketing. Numerous collaborations with third level institutions and companies have produced many successful research outputs, and we continue to encourage such links and to work with companies to assist in new product development through market insights and understanding the target consumer.

Benefits to clients

Knowledge and insights regarding consumers' wants, needs and perceptions are essential for focusing innovation efforts developing and marketing new products. The market insights covers innovation management, strategic market planning, marketing channels, and supply chain and relationship management.

Areas of Expertise

- Consumer-led new product development.
- Segmentation and consumer profiling.
- Insights into consumers e.g. behaviour and attitudes.
- Risk perception and communication.
- Market analysis and planning.

Facilities/Equipment

- Quantitative research
  - Consumer surveys
  - Product testing
- Qualitative research
  - Individual depth interviews
  - Mini-group discussions
  - Telephone depth interviews
  - Focus groups
- Executive interviews

Range of Solutions

Depending on the nature of work requested and the inputs from each party, contract research or collaborations can be considered. This can range from surveys to smaller focused studies to market trends and reviews.

Offer may interest

Expertise and services will be of interest to

- Food manufacturers.
- Food retailers.
- Business start-ups.
- Public agencies and policy makers.
- Researchers interested in commercialising their research.

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Technology

EXPERTISE

Development of Ingredients Using Spray Drying

Teagasc through its resources at Moorepark combines considerable 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 spray drying technology. This extends from powders for food service applications to nutritional formulations and tailored ingredients.

Background

Ongoing adaptation of the spray drying process is extending beyond milk to the wider food ingredient sector. Through extensive research, the know-how and facilities are available at Teagasc to address most client demands in spray drying for the purpose of ingredients development.

Benefits to Industry

Through engaging with Teagasc, access to state-of-the-art facilities and extensive expertise in ingredient evaluation and development is available to offer companies a range of innovative processing solutions, including powders for food service applications, nutritional formulations and tailored ingredients.

Areas of Expertise

(a) Powders for Food Service Applications

- Coffee-stable powders, imitation creamers.

(b) Powders for Nutritional Applications

- Evaluate ingredient behaviour on end-product stability.
- Intermediate ingredient pre-mixes with defined performance.
- Stabilised mineral fortified powders.
- High protein ingredients for sports nutrition use.
- Protein hydrolysates.

(c) Business-to-Business tailored ingredients

- High fat & microencapsulated fat-containing powders.
- High free fat powders for chocolate applications.
- Yogurt and other fermented powders.
- Powders customised to client needs.

Facilities/Equipment

- Pilot processing facilities.
- Moorepark Technology Ltd.
- Tall-form spray drying-Niro TFD-20 pilot scale drier to industrial specifications.

- Reconstruction processor, separation processor, evaporator and heating systems.
- Analytical facilities for analysis of powders.

Range of Solutions

Teagasc can provide a range of solutions including

- Evaluation of scale-up considerations during drying of new ingredients.
- Provision of innovative milk powder ingredients for evaluation.
- Evaluation and diagnosis of ingredient performances in spray dried formulations.
- Optimisation of pre-processing treatments.
- Analysis of powders.
- Advice on quality and food safety issues.

How to Proceed:

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Technology

EXPERTISE

Food Authenticity and Quality Confirmation

Teagasc researchers can provide specialist know-how, facilities and services in food quality and authenticity confirmation, with a view to the development of appropriate solutions to issues of quality control and product authenticity. This includes, but is not limited to, raw material analysis, in-process testing and final product clearance. Specifically, this includes the use of infrared spectroscopy combined with sophisticated mathematical procedures to perform direct, rapid, non-destructive and real-time analysis of composition and quality.

Background

Over the years, Teagasc researchers have developed world-class expertise in the area of infrared spectroscopy and multivariate data analysis. Extensive collaborations with third level institutions and companies both in Ireland and abroad have produced a wide-range of successful research outputs. Teagasc encourages the growth of such links nationally to assist in the development of rapid, non-destructive and low-cost solutions to the problems of confirming conformance to specification of incoming raw materials, in-process and finished goods in companies all across the food processing industry. Such solutions also contribute to effective traceability systems.

Benefits to Industry

Through Teagasc staff and infrastructure, food companies operating across all sectors can access state-of-the-art facilities and specialist knowledge. This expertise is of significant value for the protection of brand integrity through confirmation of conformance to specification of raw, intermediate or finished products.

Areas of Expertise

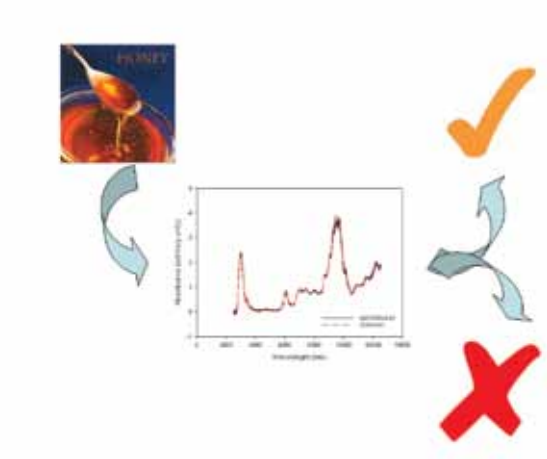
- Near and mid infra-red spectroscopy.
- Multivariate data analysis.
- Calibration development for quantitative applications.
- Discriminant and class-modelling analysis for quality assurance and authenticity applications.

Facilities/Equipment

- Near infrared scanning instrument.
- Mid-infrared scanning instrument.
- A full range of accessories for both.
- Access to a wide suite of appropriate software packages.

Range of Solutions

Depending on the nature of work, service provision or contract/collaborative research can be considered. This could range from new, off-line testing protocols, batch conformance to specification analysis through to on-line systems and quality monitoring. Equipment sourcing, evaluation of the role of hand-held equipment, software identification and early-stage training are other options.



Of interest to

- Companies in all sectors of the prepared foods industry.
- Food ingredient manufacturers.
- Companies in the beverage and spirits industries.
- Commodity producers in the meat and milk sectors.

How to Proceed:

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Technology

EXPERTISE

Food Bio-test Capabilities

The prevalence of major diseases such as obesity and diabetes is increasing in the human population. Therefore, a major focus of the industry involved in the Functional Food sector is to develop food ingredients that could improve our health and reduce diseases. An important aspect of assessing such ingredients is feeding trials. Teagasc is in a position to assist companies in this process through its state-of-the-art Food Bio-test facility and related experience, based at Moorepark, by testing the food ingredients of interest *in vivo*.

Background

As part of Teagasc's on-going commitment to improving the health of people in Ireland, a Food Bio-test facility was established with the aim of identifying bioactive nutrients, prebiotics, probiotics and their derivatives. In this facility, feeding trials are being carried out on pigs and mice in two dedicated research units. By utilisation of state-of-the-art technology, we are able to assess how each potential dietary ingredient that we test affects physiology and cellular activity.

Benefits to Industry

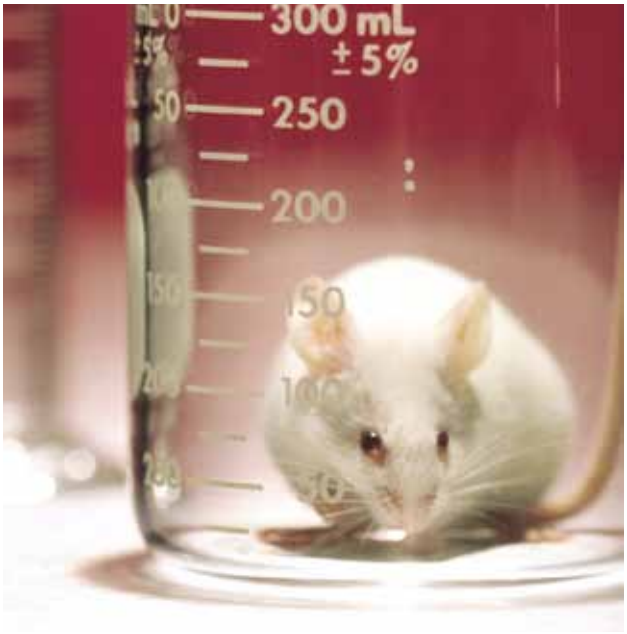
By carrying out feeding trials on behalf of clients, we can assist food ingredient manufacturers interested in functional foods in the establishment of health claims for food ingredients.

Areas of Expertise

- Human diseases such as obesity and associated clinical conditions.
- Gut health.
- Physiology, biochemistry and molecular biology.
- Dietary challenges to mice and pigs.

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 including expression of genes.



Range of Solutions

We are able to perform either short term (days) or long term (months) trials to understand how the food ingredients may influence health over time. In addition, quantity and quality of the food ingredients could also be varied to identify the optimum dietary challenges that give rise to the most beneficial effects on health.

Of interest to

Companies and any institute involved in the functional food sector.

How to Proceed:

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Technology

EXPERTISE

Generation and Characterisation of Bioactive Compounds

The Functional Foods Facility at Teagasc provides specialist know-how and services in the field of bioactive compound generation, isolation and chemical and biological characterisation with a view to exploitation of novel products/processes in the development of functional food and beverages. Expertise available include the generation of bioactive compounds from a myriad of raw material sources, including meat and fish by-products, cereal, plant and milk processing waste streams.

Background

The Food for Health research programme is central to Teagasc's role in the development of the knowledge based bio-economy, since it aims to assist Irish food companies to set more ambitious targets for innovation and technology development. Teagasc has significant expertise and infrastructure in the area of bioactive component isolation and characterisation. Numerous collaborations with third level institutions and companies have led to many successful research outputs, and we encourage such links and work with companies to assist in product innovation, new product development and service provision.

Benefits to Industry

Functional food research is particularly important at the present time due to the European Food Safety Authority regulations with regards to functional food health and novel food claims, both of which are of interest to food and beverage manufacturers alike. Teagasc Food Research Centre, Ashtown incorporating the new nutraceutical research facility allows food companies access to state-of-the-art facilities and equipment as well as specialist knowledge through a variety of means.

Areas of Expertise

- Marine carbohydrates, proteins, peptides, lipids.
- Flavour ingredients from terrestrial and marine sources.
- Meat and marine bioactive peptides.
- Beta-glucan ingredients.
- Heart health, antimicrobial and anti-diabetic functional ingredients.
- Low salt ingredients.
- Alternative natural flavour ingredients and preservatives.

Facilities/Equipment

- HPLC, NMR, MS facilities and expertise.
- Sensory testing facility.
- Product development plant/incubation units.

Range of Solutions

Depending on the nature of work requested, service provision or contract/collaborative research can be considered. This ranges from new product development, to pilot scale trials, ingredient sourcing, consumer research and testing (shelf-life, microbial, quality, residue etc.).

Of interest to:

- Food, beverage and snack companies.
- Niche manufacturers and entrepeneurs.

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

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 Services

Technology

SERVICE

Technical Food Information Support

Teagasc provide a food information service that can help address the technical and practical questions that arise in the food industry. This is a key service for many food companies where keeping up-to-date may seem impossible with the amount of information being produced and the number of journal articles being published each week.

Background

Teagasc Food Research Centre, Ashtown provides an Information Service to help meet the continuous need of food companies for reliable and expert information. The service aims to address the technical and practical questions that can arise for the food industry. Topics include food safety issues, new developments and technologies, food marketing and food legislation.

Benefits to Clients

Teagasc have access to external databases and other information sources, including information generated from the extensive research programme of Teagasc plus national and international scientific linkages. These can be used to provide rapid food information solutions to companies operating in a competitive sector.

Service Details

Teagasc can provide the following Food Information Solutions:

- We can work with bespoke projects whether it is a food safety issue or processing problem.
- We can carry out an information search on a range of topics and provide a customised review to suit a product sector.
- We offer advice on accessing technology information sources.
- We can supplement a company's own resources and help to fill knowledge gaps.

This is a confidential service where we will work with the client to put together the most relevant information solution.

An appropriate fee will be agreed in advance.

Of Interest to

This service is of benefit to any food and related industries who need asistance in keeping up-to-date with technical and practical issues arising in the food industry.

How to Proceed

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Technology

SERVICE

Bioactive Peptide Discovery Unit

The Bioactive Peptide Discovery Unit at Teagasc Food Research Centre, Moorepark 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 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

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.

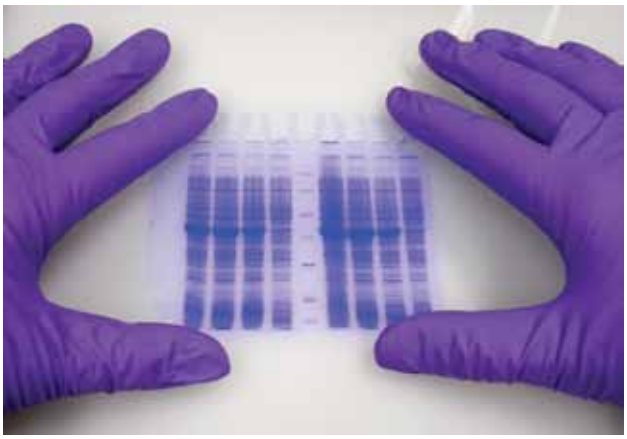
Facility and Service Details

The unit is equipped with:

- Nano, analytical and semi prep HPLCs.
- MALDI TOF mass spectrometer.
- Peptide synthesiser.
- Amino acid analyser.
- DIGE and 2D electrophoresis units.

Areas of Expertise Include:

- Reverse phase, ion exchange, hydrophobic interaction and gel filtration chromatography.
- Molecular mass determination of peptides, and proteins, protein identification via peptide mass fingerprinting and peptide sequence confirmation via MS/MS using MALDI TOF mass spectrometry.
- Microwave Fmoc synthesis of peptides 6-50 amino acids long at 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.

Service Interest to

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

How to Proceed

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Technology

SERVICE

Blown Pack Spoilage Testing (T-Bio®)

Teagasc researchers have developed a specialist blown pack spoilage (BPS) test which uniquely detects all three species of Clostridia known to cause BPS. This test is available at Teagasc Food Research Centre, Ashtown as a service to the meat industry specifically and other food industries where Clostridia bacteria are a concern.

Background

Blown pack spoilage destroys vacuum packaged chilled meats and is caused by cold loving Clostridia. The meat pack swells like a balloon rendering the meat unfit for sale resulting in significant economic loss. Teagasc has developed a blown pack spoilage assay based on years of experience working, with Irish abbatoirs, to control and reduce the problem. Teagasc was the first to identify a third Clostridia strain which causes this spoilage problem and has succeeded in developing a unique assay to detect all three species.

Competitive Advantage

- **T-Bio**® test is based on novel intellectual property generated at Teagasc and represents a trademarked service.
- It is unique in that it detects all three species of Clostridia known to cause blown pack spoilage.
- It is 100% accurate.
- Test results can be expected back in 3-4 working days.

Testing Details

This **T-Bio**® test will identify, in a short timeframe, whether a sample is contaminated with 100% accuracy, and costs €30 per sample. Results are available within 3-4 working days. Meats, meat drip and swabs of surfaces in contact with food can be tested.

T-Bio®

Of Interest to

The **T-Bio**® test is primarily of interest to abbatoirs and meat processing plants but could be used to examine all types of foods and food contact surfaces.

Intellectual Property

Teagasc has registered the service under the Trademark **T-Bio**.

How to Proceed

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Technology

SERVICE

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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Technology

SERVICE

Flavour Profiling of Foods and Beverages

Teagasc has significantly enhanced its flavour chemistry capability in terms of expertise and equipment. The expertise and instrumentation available are used in research but also as a resource to carry out services for industry. The service based on such capabilities can be used to work with companies to improve processes, as an aid in new product development, product mapping, stability testing, shelflife analysis or to identify taints and off-flavours.

Background

Approximately 75% of the perception of the flavour is related to odour and 25% to taste. The odour of a product is due to the balance of volatile odour active compounds that are present. Over the last few years, Teagasc has developed a strong capability in the identification of odour active compounds in foods and beverages through the use of sophisticated extraction techniques and advanced chromatographic methodologies. Such resources can be used to identify both positive and negative compounds associated with specific sensory attributes. Flavour chemistry can also be used in tandem with descriptive sensory analysis to identify the compounds directly responsible for sensory perception. Multivariate statistical analysis is used to interpret complex volatile data sets in order to distinguish discriminating differences in the volatile components within samples/products.

Capabilities on Offer

- Optimisation of product quality.
- Identification of odour active compounds.
- Product mapping.
- Process modification – impact on flavour.
- Product comparison/matching.
- Stability/storage evaluation.
- Predictive modelling.
- Taints/off-odours.

Equipment

- Extraction.
- Solid Phase Micro-Extraction.
- Purge & Trap.
- Model Mouths.
- Steam Distillation.
- ITEX.
- Gas Chromatography.
- Triple Quadrupole Mass Spectrometry.

Of Interest to

Food, beverage and packaging companies.

Nature of Service

Service contracts are agreed with clients and all work is carried out on a confidential basis. A schedule of fees is available for the different services provided. Flavour profiling can also be incorporated into a larger contract or collaborative research project.

How to Proceed

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Technology

SERVICE

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. If the results do not correspond to those generated in the Teagasc laboratories, it will be necessary to consult with the company and determine if a problem exists in terms of equipment or measurement methods. The cost of the Scheme is €250. This includes the analysis of 8 standard samples during harvest time (2 samples per week) and any related advice/information as required.

Of Interest to:

Grain producers

Nineteen companies are currently subscribed to the Scheme.

How to Proceed

For further information contact:

Karen Hussey
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Technology

SERVICE

High Throughput DNA Sequencing Platform

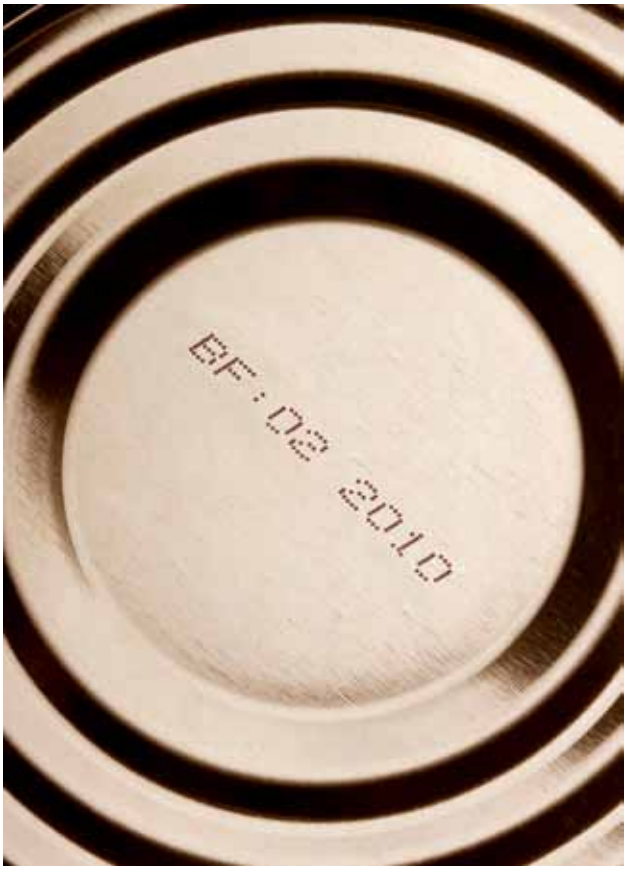
The Teagasc 454 Sequencing Platform, available through resources based at Teagasc Food Research Centre, Moorepark can bring the power of the GS FLX Titanium series to your DNA sequencing projects. This technology can be employed for whole genome de novo sequencing, transcriptome profiling, metagenomic characterisation of environmental samples, amplicon sequencing and more.

Background

DNA sequencing technologies have been revolutionised in recent years. The Roche 454 GS FLX Titanium series instrument is noteworthy by virtue of the fact that it generates up to 1 million reads, >400 base pair read length, in a run.

This 454 sequencing platform has a range of applications

- Whole genome sequencing.
- Targeted resequencing.
- Metagenomics.
- Transcriptome sequencing.



Competitive Advantage to Clients

- Long read lengths.
- Dedicated Roche software to facilitate initial analysis.
- Option of multiplexing multiple samples.
- Paired-end sequencing options available.
- Competitive prices.

Service Details

Prices available on request.

Concentrations of DNA required as follows:

- Amplicon Library > 5 ng/ul Amplicon
  Genome: 10mg double stranded DNA, minimum concentration 50ng/ml in TE buffer. OD260/280 ≥ 1.8.
- Paired End Genome: 30mg double stranded DNA, minimum concentration 200ng/ml in Tris-CL buffer, pH 7.5-8.5 or molecular grade water. OD260/280 ≥ 1.8.

Of Interest to

For any 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

For further information contact:

Paul Cotter
Email: paul.cotter@teagasc.ie

Fiona Crispie
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or Email: 454sequencing@teagasc.ie

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Technology

SERVICE

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

For further information contact:

Ciara McDonagh
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Carol Griffin
Email: carol.griffin@teagasc.ie

Eddie O'Neill
Email: eddie.oneill@teagasc.ie

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Technology

SERVICE

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 to bench mark a new product against competitor's products.

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, duo trio, paired comparison, and other tests as required.
- We use an established panel of assessors experienced in the sensory analysis of a range of products. The panel was recruited and screened following International Standard ISO 8586-1, 1993.

Facilities

- Our sensory facilities consist of a preparation area and an adjoining controlled testing facility.
- 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.

How to Proceed

For further information contact:

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SERVICE

Specialised Training and Seminars

Teagasc provides specialised technical training and seminars for the food sector, in the 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 regulatory bodies each year. In-house delivery of customised training is available on request. Seminars are also held each year covering topical issues of interest.

Background

As the food sector is now a knowledge intensive industry sector, there is a continual need to upgrade knowledge and skills. The environment in which the industry operates is constantly changing in relation to regulatory and 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 the knowledge and skills required to keep up to date with changes in legislation, technology and good practice and thus compete effectively in a highly populated sector.

Courses are continually 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 Further Education & Training Awards Council (FETAC).

Service Details

The programme includes training in the following areas:

- Food Safety Management (HACCP).
- Hygiene Management.
- 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.
- Thermal Process Validation.

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 agencies, 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

For further information contact:

Margaret Hennessy/Ann Harrison
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Visit:www.teagasc.ie/food/research/training/

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SERVICE

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

For further information contact:

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Technology

Profiles

Technology

PROFILE

Prof. Paul Ross

Head of Food Programme

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Education

2009 - D.Sc. Degree on Published Work The National University of Ireland

Ph.D. Microbiology (1984-1989) University College, Cork – Under the joint supervision of Professors Seamus Condon and Fergal O'Gara. 'Cloning and characterisation of the chromosomal genes from Lactococcus: nucleotide sequence of lactococcal thymidylate synthase gene and its use as a selectable genetic marker.'

B.Sc. (Hons) Microbiology/Biochemistry University College, Cork.

Professional Experience

Head of Teagasc Food Research Programme (Moorepark/Ashtown Food Centres), Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork, Ireland (July 2009–Present)

Senior Principal Research Officer , Alimentary Pharmabiotic Centre, UCC, Cork, Ireland (2001-Present)

Other positions held at Teagasc Moorepark Food Research Centre, Fermoy, Co. Cork, Ireland, between 1993–2009: Head of Biotechnology Centre, Head of Dairy Quality Department.

Managing Director, Moorepark Technology Ltd., Moorepark, Fermoy, Co. Cork, Ireland (July 2009–Present)

Adjunct Professor, Alimentary Pharmabiotic Centre, UCC, Cork, Ireland. (2004–Present).

Adjunct Assistant Professor (1993–Present), Dept. of Biochemistry, Wake Forest University Medical Centre, Winston-Salem, NC, USA.

Expertise

Food and Health Research particularly:

- Antimicrobials and anti-infectives (applied and fundamental aspects)
- Gut flora and gut health
- Bacteriophage (phage therapy and phage hardening)
- Human, animal and gut pathogens

Selected Publications

1. E. Rosberg-Cody, C. Stanton, L. O'Mahony, R. Wall, F. Shanahan, E.M. Quigley, G.F. Fitzgerald and R.P. Ross. (2011). Recombinant lactobacilli expressing linoleic acid isomerise can modulate the fatty acid composition of host adipose tissue in mice. Microbiology. 2011 Feb:157(Pt 2):609-15.
2. A.A. Hennessy, R.P. Ross, R. Devery and C. Stanton. 2011. The health promoting properties of the conjugated isomers of α-Linolenic Lipids, 46(2):105-19.
3. Rea, M.C., A. Dobson, O. O'Sullivan, F. Crispie, F. Fouhy, P.D. Cotter, F. Shanahan, B. Kiely, C. Hill and R.P. Ross. (2011). Microbes and Health Sackler Colloquium: Effect of broad- and narrow-spectrum antimicrobials on Clostridium difficile and microbial diversity in a model of the distal colon. Proc. Natl. Acad. Sci. USA;108 Suppl 1:4639-44.
4. C.S. Sit, R.T. McKay, C. Hill, R.P. Ross and J.C. Vederas. (2011). The 3D structure of Thuricin Cd a two-component bacteriocin with cysteine sulphur to x-carbon cross links. J. Am. Chem. Soc., 133(20):7680-3.
5. C.M. Guinane, R.M. Kent, S. Norbery, C. Hill, G.F. Fitzgerald, C. Stanton and R.P. Ross. (2011). Host specific diversity in lactobacillus johnsonii as evidenced by a major chromosomal inversion and phage resistance mechanisms. PLoS One., 6(4):e18740. Epub ahead of print PMID 21533100.

Technology

PROFILE

Declan J. Troy

Assistant Director of Research and Head of Technology Transfer

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Phone: +353 (0)1 8059500

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 PhD 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 PhD 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

- 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.
- 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.
- 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.
- Troy, D. J. and Kerry, J. (2010) Consumer perception and the role of science in the meat industry. Meat Science, 86, (1), 214-226.
- 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.

Technology

PROFILE

Dr. Tom Beresford

Head of Department

E-mail: tom.beresford@teagasc.ie
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Education

BSc. University College, Cork, Ireland. 1985

PhD. 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

Technology

PROFILE

Mr. Pat Daly

Head of Department

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Education

Honours Degree in Chemistry and MSc, Food Science

Career

He is a Principal Research Officer and Head of Food Industry Development at Teagasc, the Irish Agriculture and Food Development Authority.

Expertise

He has worked with Teagasc since 1988 where he leads the Teagasc Food Industry Development programme. He leads a team of scientists and technologists providing technology development support for the food processing sector through product development supports, training programmes, scientific seminars, consultancy services, food market research and technical information service. The work programme operates from two Teagasc Food Research Centres, Ashtown, Dublin and Moorepark, Co. Cork. The team also support food research knowledge and technology transfer to industry through training courses, seminars, consultancy work and R&D supports. A wide range of expertise, pilot scale processing facilities and product testing services are available to industry for business start-up, new product development and innovation supports. A focus of the work programme is supporting small and medium sized (SME) enterprises and start-up food businesses. This work is carried out in conjunction with Enterprise Ireland and other national and regional food development agencies. Previously he worked as a technical consultant and trainer in the food industry and other sectors with the Irish Institute for Industrial Research and Standards. He has over twenty years experience working with the food processing sector as a trainer and consultant, specialising in the area of food safety and quality management systems. During this time he worked with a large number of leading international food manufacturing companies with production operations in Ireland and also with the many SMEs throughout the country. He has also carried out several projects for Government Departments and other state agencies. He has participated in EU food research projects, international assignments and study visits in relation to the food processing sector. He has represented Teagasc on many national food technical committees and contributed to the development of a number of national policy documents and standards for the food sector.

Technology

PROFILE

Dr. Paul Allen

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Education

B.Sc. Biological Sciences, University of Exeter

M.Sc. Applied Genetics University of Birmingham

PhD Faculty of Agriculture, NUI University College Dublin

Certified Diploma in Accounting and Finance, ACCA

Career

1977–1978: Genetics Advisor, Meat and Livestock Commission, UK

October 1978–Present: Member of the Research Staff at Teagasc Food Research Centre Ashtown in the Food Chemistry and Technology Department, specialising in meat research.

Expertise

- Automated and non-invasive methods of carcass grading and evaluation
- Factors affecting meat quality
- Meat packaging
- Meat processing
- Healthier meats
- Imaging methods to predict eating quality
- Novel processing

Selected Publications

1. Jackman, P., Sun, D.-W., Allen, P., Brandon, K. and White, A. (2010). Correlation of consumer assessment of *longissimus dorsi* beef palatability with image colour, marbling and surface texture features. Meat Science, 84, 564–568.
2. Hayes, J., Stepanyan, V., Allen, P., O'Grady, M.N. and Kerry, J.P. (2010). Effect of lutein, sesamol, elagic acid and olive leaf extract on the quality and shelf-life stability of packaged raw minced beef patties. Meat Science 84, 613–620.
3. Romvari, R., Dobrowolski, A., Repa, I., Allen, P., Olsen, E., Szabo, A. and Horn, P. (2006). Development of a computed tomographic calibration method for the determination of lean meat content in pig carcasses. Acta Veterinaria Hungarica, 2006, 54, 1–10.
4. Beggan, M., Allen, P. and Butler, F., (2006). Effect of oxygen concentrations on blooming ability of aged beef *longissimus lumborum* steaks following ultralow oxygen and vacuum storage. Journal of Muscle Foods, 2006,17, 267–276.
5. Sorenson, D., Henchion, M., Marcos, B., Ward, P., Mullen, A.M. and Allen, P. (2011). Consumer acceptance of high pressure processed beef-based chilled ready meals: The mediating role of food-related lifestyle factors. Meat Science 87, 81–87.

Technology

PROFILE

Dr. Mark A.E. Auty

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Phone: +353 (0)25 42222

Education

PhD Dairy Chemistry (University College Cork) 2004

BSc Microbiology (Surrey) 1985

Fellow of the Royal Microscopical Society

Career

1997–Present: Senior Research Officer, Food Chemistry and Technology Department, Moorepark; manager of the National Food Imaging Centre. Since joining Teagasc, Mark has published 39 peer reviewed scientific articles and generated > €2m in research funding.

1985–1996: Senior Scientist at Leatherhead Food International.

Expertise

Dr. Auty is a food structure expert with over 25 years' experience in applying microstructural and rheological analysis to understanding food functionality. Particular research interests include food nanotechnology and relating the microstructure of food ingredients and products to processing and consumption. Mark provides specialist expertise for a wide range of projects at Teagasc, including projects on protein functionality, powders, cheese, probiotics, fermented milks, cereals and meat products. His expertise is in regular demand from industry. With a strong international reputation, he gives many invited and keynote presentations in Europe, the US and China.

Selected Publications

1. Ciron, C.I.E., Kelly, A.L. and Auty, M.A.E. (2012). Modifying the microstructure of low-fat yoghurt by microfluidization of milk under different pressures to enhance rheological and sensory properties. Food Chemistry, 130: 510–519
2. Abhyankar, A.R., Mulvihill, D.M. and Auty, M.A.E. (2011). Combined microscopic and dynamic rheological methods for studying the structural breakdown properties of whey protein gels and emulsion filled gels. Food Hydrocolloids, 25: 275–282. (8th out of top 25 hottest topic articles in 2011).
3. Oboroceanu, D., Wang, L., Kroes-Nijboer, A., Brodkorb, A., Venema, P., Magner, E. & Auty, M.A.E. (2011). The effect of high pressure microfluidization on the structure and length distribution of whey protein fibrils. International Dairy Journal, 21: 823–830.
4. Ciron, C.I.E, Kelly, A.L., Auty, M.A.E. (2011). Effect of microfluidization of heat-treated milk on rheological and sensory properties of reduced-fat yoghurt. Food Hydrocolloids, 25: 1470–1476.
5. Oboroceanu, D., Wang, L., Brodkorb, A., Magner, E., Auty, M.A.E. (2010). Characterization of β-lactoglobulin fibrillar assembly using atomic force microscopy, polyacrylamide gel electrophoresis and *in situ* Fourier transform infrared spectroscopy. Journal of Agricultural and Food Chemistry, 58: 3667–3673. (Top 20 cited article in past 3 years).

Technology

PROFILE

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: PhD 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.

Technology

PROFILE

Professor Gerard Downey

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Education

BSc Queen's University, Belfast 1972

PhD University College Dublin 1997

DSc Queen's University, Belfast 2005

Career

1976–1980: Research Officer, An Foras Talúntais.

1980–2004: Senior Research Officer, An Foras Talúntais and Teagasc.

2004–2010: Principal Research Officer, Teagasc

2006–2010: Acting Head Of Prepared Foods Department, Ashtown Food Research Centre, Teagasc

2009: Adjunct full professor in School of Agriculture, Food and Veterinary Science, UCD

Expertise

My research interests lie in direct measurement of quality in foods and food ingredients. I have concentrated on the application of near and mid-infrared spectroscopic techniques to qualitative issues in foods. This has involved research activity on the topic of food authenticity and food adulteration, together with confirmation of ingredient or food quality. In recent years, this has expanded to include studies on the detection and identification of bacteria on meat products. A new development has been made on the application of hyperspectral imaging to food issues. Aligned with this spectroscopic research, has been the development of expertise in the multivariate analysis of the complex datasets arising from modern sophisticated analytical instruments.

Selected Publications

1. Woodcock, T., Downey, G. & O'Donnell, C.P. (2008). "Better quality food and beverages: the role of near infrared spectroscopy." J. Near Infrared Spectrosc., 16, (1), 1–29.
2. Sinelli, N., Casiraghi, E. and Downey, G. (2008). "Studies on proofing of yeasted bread dough using near- and mid-infrared spectroscopy." J. Ag. Fd. Chem., 56, 922–931.
3. Hennessy, S., Downey, G. and O'Donnnell, C. (2008). "Multivariate Analysis of ATR/FT-IR spectroscopic data to confirm the origin of honeys." Appl. Spectrosc., 62(10), 1115 1123
4. Alexandrakis, D., Downey, G. and Scannell, A. (2012). "Rapid non-destructive detection of spoilage of intact chicken breast muscle using near infra-red and Fourier-transform mid-infrared spectroscopy and multivariate statistics." Food and Bioprocess Technology. 5(1), 338-347.
5. Esquerre, C., Gowen, A.A., O'Donnell, C.P. and Downey, G. (2009). "Water absorbance pattern of physically-damaged mushrooms stored at ambient conditions." J. Near Infrared Spectrosc., 17(6), 353–362.

Technology

PROFILE

Dr. Mark Fenelon

Head of Department

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Education

Diploma in Process and Chemical Engineering (with Distinction), University College Cork. 2007

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

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

Graduated with a Higher Diploma in Food Science and Technology. 1993

Career

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 research programme focuses on protein-carbohydrate interactions and their role in 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 knowledge of project management systems from both an academic and industrial perspective.

Selected Publications

1. McCarthy, N.A., Kelly, A.L., O'Mahony, J.A., Hickey D.K., Chaurin, V. and M. A Fenelon,. 2012. Effect of protein content on emulsion stability of a model infant formula. International Dairy Journal. In Press
2. Tobin, J.T., S.M. Fitzsimons, A.L. Kelly, and M.A. Fenelon. 2011. The effect of native and modified konjac on the physical attributes of pasteurised and UHT-treated skim milk. International Dairy Journal. 2011. 21:790–797
3. Hanley, K.J., Byrne, E.P., Cronin, K., Oliveira, J.C., O'Mahony, J.A. and M.A. Fenelon, 2011. Effect of pneumatic conveying parameters on physical quality characteristics of infant formula. Journal of Food Engineering 106: 236–244
4. Tobin, J.T., S.M. Fitzsimons, A.L. Kelly, P.M. Kelly, A.E. Auty and M.A. Fenelon 2010. Microparticulation of mixtures of whey protein and inulin. International Journal of Dairy Technology. 63:32–40
5. Kearney N., Stack H. M., Tobin J. T., Chaurin V., Fenelon M. A., Fitzgerald G. F., R. Ross P., Stanton C. 2011. Lactobacillus paracasei NFBC 338 producing recombinant beta-glucan positively influences the functional properties of yoghurt. 21:561–567
6. Abhyankar A. R., Mulvihill D. M., Fenelon M.A. and Auty M.A.E. 2010 Microstructural characterisation of b-lactoglobulin–konjac glucomannan systems: Effect of NaCl concentration and heating conditions. 24:18–26

Technology

PROFILE

Dr. Eimear Gallagher

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Education

National University of Ireland, Cork, and Ashtown Food Research Centre, Teagasc, Ashtown, Dublin 15. Ph.D. in Food Science and Technology. 2001–2005

National University of Ireland, Cork. M.Sc. in Food Science and Technology. 1997–2000

National University of Ireland, Cork. B.Sc. in Food Science and Technology. (2H1). 1993–1997

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 re-engineering, instrumental texture analysis, fundamental rheology and nutritional profiling. As well as conducting publicly funded research, Dr. Gallagher also has a number of confidential, industry-led short-term projects.

Selected Publications

1. Tiwari, U., Cummins, E., Sullivan, P., O'Flaherty, J., Brunton, N., and Gallagher, E. (2011). Probabilistic methodology for assessing the changes in the level and molecular weight of barley beta glucan during bread baking. Food Chemistry, 124 (4):1567–1576.
2. Ktenioudaki, A., Butler, F. and Gallagher, E. (2011). Studying the dough characteristics of Irish wheat varieties I. Rheological properties and prediction of baking volume. LWT – Food Science and Technology, 44: 594–601.
3. Ktenioudaki, A., Butler, F. and Gallagher, E. (2011). Studying the dough characteristics of Irish wheat varieties II. Aeration profile and baking quality. LWT – Food Science and Technology, 44: 602–610.
4. Sullivan, P., O'Flaherty, J., Brunton, N., Arendt, E.K. and Gallagher, E. (2011). The utilisation of barley middlings to add value and health benefits to white breads. Journal of Food Engineering, 105: 493–502
5. Alvarez, L.A., Wijngaard, H., Arendt, E.K. and Gallagher, E. (2010). Polyphenol composition and in vitro antioxidant activity of amaranth, quinoa and buckwheat as affected by sprouting and baking. Food Chemistry, 119 (2): 770–778.

Technology

PROFILE

Dr. Linda Giblin

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Qualifications

B.Sc. (2.1H) Biotechnology, Dublin City University 1989

Ph.D. Microbiology Dept., University College Cork 1995

Career Path and Current Position

2003–Present: Research/Senior Scientist Molecular Biologist Key responsibilities include strategy planning (Animal Biotechnology Programme & Teagasc Food Vision), strategy implementation, research management, funding acquisition, postgraduate supervision and establishment & maintenance of the Mooreparks Bovine Bank.

1999–2002: Research/Senior Scientist R&D Xanthon Inc. (start-up biotech company), RTP, NC-27709, U.S.A. Responsible for leading a substantial research group in bioassay development on a solid phase hybridization platform, Managed multi-million dollar research projects, Reported directly to Vice-President of R&D.

1997–1999: Post-doctoral Scientist, Institute of Molecular BioSciences, Massey University, New Zealand.

1994–1997: Wellcome Post-doctoral Research Scientist, Biochemistry Dept., U.C.C, Ireland.

Expertise

- Foods solutions for weight management and glycemia
- Nutrient sensing/transport in the gut
- Foods for prenatal development
- Food Bioactives
- Genotype-phenotype interactions
- Mastitis

Selected Publications

1. Kett A, Bruen C, O'Halloran F, Chaurin V, Lawlor PG, O'Mahony JA, Giblin L and Fenelon MA. 2012. The effect of α- or β-casein addition to waxy maize starch on post prandial levels of glucose, insulin and incretin hormones in pigs as a model for humans. Food And Nutrition Research 56, 7989–7998.
2. Bruen CM, Kett AP, O'Halloran F, Chaurin V, Fenelon MA, Cashman KA, Giblin L. 2012. Effect of gelatinisation of starch with casein proteins on incretin hormones and glucose transporters in vitro. British Journal of Nutrition 107, 155–163.
3. Wijga S, Bastiaansen JWM, Wall E, Strandberg E, de Haas Y, Giblin L and Bovenhuis H. 2012. Genomic Associations with Somatic Cell Score in First Lactation Holstein Cows. Journal of Dairy Science 95:899–908.
4. Bahar B, O'Halloran F, Callanan MJ, McParland S, Giblin L and Sweeney T. 2011. Bovine lactoferrin (LTF) gene promoter haplotypes have different basal transcriptional activities. Animal Genetics 42(3):270–9.
5. McNamara LB, Giblin L, Markham T, Stickland NC, Berry DP, O'Reilly JJ, Lynch PB, Kerry JP and Lawlor PG. 2011. Nutritional intervention during gestation alters growth, body composition and gene expression patterns in skeletal muscle of pig offspring. Animal 5: 8, 1195–1206.

Technology

PROFILE

Professor TP Guinee

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Education/Career

Professor Timothy P. Guinee is a Principal Research Officer in the Department of Food Processing and Functionality at Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork, Ireland. He graduated with a BSc 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 extensively studied the influences of various factors on the properties of cheeses, including milk composition/treatments, gelation conditions, processing treatments, added ingredients (proteins, biopolymers), environmental conditions, and ageing. Currently, his research involves the optimisation of protein-protein, protein-mineral and protein-water interactions in the development of low-fat cheese and a new cheese technology platform (based on gelation of reassembled milks). He is currently an editorial board member for International Dairy Journal (from 2005) and Egyptian Journal of Dairy Science (1995), and was formerly a co-editor of the International Dairy Journal (2001–2005). He was a member of the Irish Research Council for Science Engineering and Technology from 2006 to 2010. In January 2011, he was appointed Adjunct Professor to the College of Science, Engineering and Food Science, University College Cork. He is currently on the IDF action team for salt reduction in cheese.

Selected Publications

1. Guinee, T.P., Kelly, O'Kennedy, B.T. and Kelly, P.M. (2008). Micellar casein powders with different levels of calcium and cheeses prepared therefrom. Publication No. WO 2009/150183 A1.
2. Guinee, T.P. (2009). The role of dairy ingredients in processed cheese products. In Dairy-Derived Ingredients: Food and Nutraceutical Uses (ed. M. Corredig), pp. 507–538. Woodhead Publishing Ltd., Cambridge, UK.
3. Guinee, T.P., Kelly, O., B.T. (2009). The effect of calcium content of Cheddar-style cheese on the biochemical and rheological properties of processed cheese. Dairy Science and Technology, 89, 317–333.
4. Guinee, T.P. and Kilcawley, K.N. (2010). Strategies for low-fat, reduced-sodium cheese. Proceedings of 'Dairy Foods Symposium: Microbiology and flavor of cheese: Impact of Lower Salt-In-Moisture Content of Low Fat and Reduced Sodium Cheeses', July 12, 2010, Denver, CL, 2010. Journal of Animal Science 88, E-Suppl. 2/Journal of Dairy Science. 93, E-Suppl. 1/Poultry Science 89, E-Suppl. 1 (Abstract). http://www.innovatewithdairy.com/ADSA/Documents/2010-ADSA-Presentations/2010_ADSA (Presentation).
5. Guinee, T.P. and O'Callaghan, D.J. (2010). Control and Prediction of Quality Characteristics in the Manufacture and Ripening of Cheese. In Technology of Cheesemaking (eds. B.A. Law and A.Y. Tamime), 2nd edition, pp. 260–329. John Wiley & Sons Ltd, Chichester, West Sussex, UK.
6. Guinee T.P (2011). Effects of natural cheese characteristics and processing conditions on rheology and texture of processed cheese. In Processed Cheese and Analogues (ed. A. Y. Tamime), pp. 81–109, Wiley Blackwell Publishing Ltd., Chichester, West Sussex, UK.

Technology

PROFILE

Dr. Ruth Hamill

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Education

PhD (Population Genetics), School of Biology and Environmental Science, UCD

BSc (1.1 Zoology), School of Biology and Environmental Science, UCD

Career

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 molecular biology and meat science with a view to increasing understanding of the biological processes underpinning meat quality, the development of biological markers of quality and understanding the structure/function relationship in meat products. I am applying 'omics' approaches to help identify the physiological pathways influencing fresh meat quality such as tenderness, juiciness and flavour, as well as water-holding capacity in pork. An important goal is to identify proteomic and genomic biomarkers of quality. Through participating in the management of two European Union funded COST actions in the area of pig genomics and rapid methods to assess meat quality, I have developed collaborative links with international colleagues in this area. I have expertise in the analysis of sensory and technological aspects of fresh and processed meat quality, including tenderness, intramuscular fat level, waterholding capacity and colour. This has facilitated undertaking a number of consultancy projects for industry focused on meat quality analysis. As a technical partner on an Enterprise Ireland project, I am currently working closely with an Irish breeding company. My research group includes two Research Officers working in the area of meat structure/functionality and I have supervised three PhD students to completion. I am currently a collaborator on a number of active projects in genomics and meat quality and co-ordinator of a project focused on understanding the interactions at the food matrix level that influence the macro-scale properties of processed meat systems (FIRM08TAFRC671). In this project, through analysis of model meat and myofibrillar systems we are applying spectroscopic, microscopy, calorimetric and rheology techniques with a view to elucidating the key physico-chemical parameters underpinning sensory performance and technological functionality of processed meat systems. The aim is to enhance 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. Hamill, RM, Marcos, B, Rai, DK and Mullen AM (2012). Omics approaches to meat quality management. In: Omics Technologies: Tools for Food Science, p. 249-282. Editor Noureddine Benkeblia, Taylor and Francis Group Publishing
2. Tobin, B.D., O'Sullivan, MG, Hamill, R.M., Kerry JP (2012). Effect of varying salt and fat levels on the sensory quality of beef patties. Meat Science, 91, 4, 460-465
3. Di Luca, A, Mullen, AM, Elia, G, Davey, G and Hamill, RM (2011). Centrifugal drip is an accessible source for protein indicators of pork ageing and water-holding capacity. Meat Science, 88, 2, 261-270
4. McArdle, R, Hamill, RM and Kerry, JP (2011). Utilisation of hydrocolloids in processed meat systems. In: Processed meats: improving safety, nutrition and quality, p. 243-269. Edited by JP Kerry and JF Kerry, Woodhead Publishing
5. Aslan, O, Sweeney, T, Mullen, AM and Hamill, RM (2010). Regulatory polymorphisms in the bovine Ankyrin 1 gene promoter are associated with tenderness and intra-muscular fat content. BMC Genetics. 11, 111
6. Reardon, W, Mullen, AM, Sweeney, T and Hamill, RM (2010). Association of polymorphisms in candidate genes with colour, water-holding capacity and composition traits in bovine *M. longissimus* and *M. semimembranosus*. Meat Science, 86, 2, 270-275.

Technology

PROFILE

Dr Maria Hayes

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Education

B. Sc. Honours (2.1) Degree in Industrial Microbiology and Chemistry (1999–2002)

Ph.D from University College Cork, Cork, Ireland (2002–2007)

Expertise

Dr. Maria Hayes, BSc., PhD is a microbiologist by training and is currently a natural products research scientist based at the Teagasc Food Research Centre, Ashtown. Her research areas include the isolation and biological and chemical characterisation of bioactive peptides from protein sources using enzymes, microbial strains and acid/base systems.

Maria is the acting Scientific Project Manager of the Marine Functional Foods Research Initiative (NutraMara Project) which encompasses 5 Irish Universities (University College Dublin (UCD), University of Limerick (UL), University of Ulster Coleraine (UU), University College Galway (NUIG), University College Cork (UCC)) and Teagasc. She is also the principle investigator (PI) of the bioactive discovery work package. Maria's specific area of interest lies in the development of strategies for the recovery of compounds from natural sources with health promoting properties. Her activities in this area have concentrated on bio-active compounds including peptides and chitin oligosaccharides derived from milk, fish by-products including shell materials and fish, shellfish and meat by-products. Maria's work on the Marine Functional Foods Research Initiative (NutraMara project) aims to provide seed capital to develop marine-origin functional foods and to create a sustainable network of researchers dedicated to innovative research in this area. Maria has experience in the isolation and characterisation of chitinolytic enzymes from marine waste streams. She was previously involved in the generation and characterisation of bioactive carbohydrates, specifically chitinoligosaccharides (COS) from shellfish waste such as crab and prawn. These have associated heart health benefits and antimicrobial activities and Maria was involved in the development of bioassays for these. Indeed she is also involved in the development of bioassay guided fractionation techniques for natural products, and subsequent chemical characterisation of natural products, utilising techniques such as controlled fermentation, RP-HPLC, fractionation, Accelerated Solvent Extraction (ASE®) and bioassays such as ACE-I-inhibitory, PAF-AH, renin-inhibitory and Factor Xa inhibitory assays and antimicrobial assays.

Selected Publications

1. Tierney, M. S., Croft, A. K., Hayes, M., (2010) A review of antihypertensive and antioxidant activities in macroalgae, Botanica Marina, 53 (2010), 387–408.
2. Di Bernardini, R., Harnedy, P., Bolton, D., Kerry, J., O' Neill, E., Mullen, A. M., Hayes, M., (2011), Antioxidant and antimicrobial peptidic hydrolysates from muscle protein sources and by-products. Food Chemistry, 124, 1296–1307.
3. Di Bernardini, R., Rai, D. K., Bolton, D., Kerry, J., O' Neill, E., Mullen, A. M., Harnedy, P., Hayes, M., (2011), Isolation, purification and characterization of antioxidant peptidic fractions from a bovin liver sarcoplasmic protein thermolysin hydrolyzate. Peptides, 32, 388–400.
4. Valverde, J., Hayes, M., (2010), EuroFoodChem XV: Food for the future, The contribution of chemistry to improvement of food quality, European Food Research and Technology, 230, 5, 687–691.
5. Hayes, M., Barrett, E., Ross, R. P., Fitzgerald, G. F., Hill, C., Stanton, C., (2009), Evaluation of an antimicrobial ingredient prepared from a Lactobacillus acidophilus casein fermentate against Enterobacter sakazakii. Journal of Food Protection, 72(2), 340–346.

Technology

PROFILE

Dr. Maeve Henchion

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Education

Dr Maeve Henchion holds a BAgrSc from University College Dublin (UCD). She also was awarded her MAgrSc and PhD by UCD; both focused on food marketing, the former on farmhouse cheese and the latter on Irish beef.

Career

Maeve stared her research career as a research assistant in University College Dublin during which time she was awarded her PhD for research related to the marketing of Irish beef. She started employment with Teagasc as a research officer in 1996 on a research project that focused on logistics and supply chain management. She has broadened her research interests since then to include innovation management and consumer behaviour. She became Head of the Food Market Research Unit in 2006. In 2006 she was appointed to the Organic Market Development Group (subsequently renamed Foras Orgánach – Organic Market Development Group), while in 2010 she was appointed director to the Institute for International Trade in Ireland. She has published in several international journals relating to marketing, management and economics. In addition she has acted as referee for the British Food Journal, Supply Chain Management: An International Journal, Anthropology of Food, Meat Science, Journal of the Science of Food and Agriculture and the Italian Journal of Food Science. She is a member of the European Association of Agricultural Economists, the Irish Academy of Management and the Agricultural Economics Society of Ireland.

Research interests: Maeve is currently researching projects related to the acceptance by consumer and industry of novel food technologies, innovation management and sustainable food consumption within a portfolio of 10 projects. The majority of these are funded by FIRM, however a project examining the role of networks in the innovation activities of food SMEs is funded by the EU.

Expertise

Maeve has significant experience of conducting market research on various sectors of the food industry using qualitative (e.g. focus groups and individual depth interviews) and quantitative research methodologies (e.g. surveys and product testing). She has an understanding of food science and supply chain issues and hence can relate market research findings to real-world contexts in the research and business world. Based on her research, she can provide advice on consumer behaviour, innovation management, new product development, market development and food policy.

Selected Publications

1. Sorenson, D., Henchion, M. Marcos, B., Ward, P., Mullen, AM and Allen, P (2011) Consumer acceptance of high pressure processed beef-based chilled ready meals: the mediating role of food-related lifestyle factors, *Meat Science* Vol 87(1) 81–87 ISSN 0309–1740
2. Fischer, C., Hartmann, M., Reynolds, N., Leat, P., Revoredo Giha, C., Henchion, M., Albisu, L.M. and Gracia, A. (2009). Factors influencing contractual choice and sustainable relationships in European agri-food supply chains, European Review of Agricultural Economics, 36(4), 541-569.
3. Albisu, L. M , M. Henchion, P. Leat and D. Blandford (2010) Improving Agri-food Chain Relationships in Europe: the Role of Public Policy Chapter 16, Agri-Food Chain Relationships C. Fischer and M Hartmann eds, CAB International.
4. Canavan, O., Henchion, M. and S. O'Reilly, (2007), The use of the internet as a distribution channel for Irish speciality food International Journal of Retail and Distribution Management, 35 (2), 178–195
5. Fisher, C., Gonzalez, M., Henchion, M. and P. Leat, (2007), Trust and economic relationships in selected European agri-food chains, Food Economics, 4 (1) 40–49

Technology

PROFILE

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

- Food oligosaccharides – extraction, enrichment, fractionation and structural analysis for nutraceutical applications.
- Development of bioassays for investigating the bioactive properties of glycans isolated from food sources.
- Manager of tissue culture facilities at Moorepark
- Electrophoresis including 1D and 2D SDS-PAGE, Western Blotting, protein overproduction, concentration and renaturation.
- Chromotography - Size-exclusion, Affinity and Ion Exchange Chromatography.
- Microbial molecular biology techniques

Selected Publications

1. Lane, J. A., Kavanaugh, D., Mariño, K., Rudd, P.M. Carrington, S.D., Naughton, J., Clyne, M. and Hickey, R.M. (2012) Anti-infective bovine colostrum oligosaccharides: *Campylobacter jejuni* as a case study. International Journal of Food Microbiology (In press).
2. Lane, J. A., Marino, K., Slattery, H., Carrington, S. D., Rudd, P. M., and Hickey, R.M. (2012) Methodologies for screening of bacteria-carbohydrate interactions: anti-adhesive milk oligosaccharides as a case study. Journal of Microbiological Methods (In press).
3. Hickey, R. (2012). The role of oligosaccharides from human milk and other sources in prevention of pathogen adhesion. International Dairy Journal, 22: 141-146.
4. Lane, J.A., Carrington, S.D., Mehra, R.K. and Hickey, R.M. (2011) Screening whole bacterial cell adherence to the human milk oligosaccharide, 2'- fucosyllactose using Surface Plasmon Resonance (SPR) technology.m Analytical Biochemistry. 410, 200-205
5. Lane, J.A., Mehra, R.K., Carrington, S.D. and Hickey, R.M. (2010). The Food Glycome: a source of protection against chronic infection in the gastro-intestinal tract. International Journal of Food Microbiology, 142; 1-13.
6. Hickey, R. M. (2009). Harnessing Milk Oligosaccharides for nutraceutical applications. In: Dairy-derived ingredients: food and nutraceutical uses. Corredig, M (ed), p308–343.

Technology

PROFILE

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 *Enterobacter sakazakii*, *Listeria monocytogenes* and pathogenic *E. coli*, including adaptive tolerance responses and applications of molecular methodology in the study of foodborne pathogens.

Recent research projects funded include:

- Improved bio-traceability of unintended microorganisms and substances in food and feed chains
- Milk quality for a changing dairy industry.
- Safe and Healthy Foods.
- Investigation of anti-parasitic drugs in milk, their effect on cheese manufacture and stability during processing.
- Risk assessment in relation to coagulase positive *Staphylococcus aureus*.

Selected Publications

1. Edward M. Fox, Nola Leonard and Kieran Jordan. (2011). Physiological and transcriptional characterisation of persistent and non-persistent *Listeria monocytogenes* isolates. Applied and Environmental Microbiology, 77, 6559-6569.
2. Edward M. Fox, Niall deLappe, Patricia Garvey, Paul McKeown, Martin Cormican, Nola Leonard, and Kieran Jordan. (2012). Pulsed-field gel electrophoresis (PFGE) analysis of *Listeria monocytogenes* isolates of clinical, animal, food, and environmental origin from Ireland. Journal of Medical Microbiology, in Press.
3. M.S. Schvartzman, X. Belessi, F. Butler, P. Skandamis, K. Jordan. (2012). Comparison of growth limits of *Listeria monocytogenes* in milk, broth and cheese. Journal of Applied Micro, 109, 1790-1799.
4. Y. Le Marc, P. N. Skandamis, C. I. A. Belessi, S. I. Merkouri, S. M. George, A. S. Gounadaki, S. Schvartzman, K. Jordan, E. H. Drosinos, and J. Baranyi. (2010). Modelling the effect of abrupt acid and osmotic shifts within the growth region and across the growth boundaries on the adaptation and growth of *Listeria monocytogenes*. Applied and Environmental Microbiology, doi:10.1128/AEM.00847-10
5. M.S. Schvartzman, A. Maffre, F. Tenenhaus-Aziza, M. Sanaa, F. Butler, K. Jordan. (2010). Modelling the fate of *Listeria monocytogenes* during manufacture and ripening of smeared cheese made with pasteurised or raw milk. International Journal of Food Microbiology, doi: 10.1016/j.ijfoodmicro.2010.11.032

Technology

PROFILE

Dr. Olivia McAuliffe

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Phone: +353 (0)25 42609

Education

Ph.D. Microbiology (1995–1999), University College Cork.

B.Sc. Microbiology (1991–1995), University College Cork.

Professional Experience

2009–Present: Senior Research Officer, Moorepark Food Research Centre

2003–2009: Research Officer, Moorepark Food Research Centre

2000–2002: Post-Doctoral Research Fellow, Dept. of Food Science, North Carolina State University, Raleigh, NC 27695, USA.

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

Research Activities/Interests

- Genetics and genomics of food cultures, including probiotics and fermentation starter cultures.
- Genomic analysis and characterisation of bacteriophage infecting food cultures and food pathogens.
- Influence of bacteriophage on the microbial ecology of the human gastrointestinal tract.
- Development of therapeutic uses for bacteriophage against multi-drug resistant pathogens including MRSA, *E. coli* O157:H7, *Clostridium difficile* and *Pseudomonas aeruginosa*.
- Development of new genetic tools for application in food cultures used in biotechnology/food industry.

Selected Publications

1. D. Alemayehu, R. P. Ross, O. O'Sullivan, A. Coffey, C. Stanton. G. F. Fitzgerald and O. McAuliffe. (2009). Genome of a virulent bacteriophage Lb338–1 that lyses the probiotic *Lactobacillus paracasei* cheese strain. Gene, 448: 29–39.
2. V. Fallico, O. McAuliffe, G. F. Fitzgerald, C. Hill and R. P. Ross. (2009). The presence of pMRC01 promotes greater cell permeability and autolysis in lactococcal starter cultures. Int. J. Food Microbiol, 133: 217–24.
3. M. Horgan, G. O'Flynn, J. Garry, J. Cooney, A. Coffey, G. F. Fitzgerald, R. P. Ross and O. McAuliffe. (2009). Phage lysin, LysK, can be truncated to its CHAP domain and retain lytic activity against live antibiotic-resistant staphylococci. Appl. Environ. Microbiol, 75: 872–4.
4. O. McAuliffe, R. J Cano and T. R. Klaenhammer. (2005). Genetic analysis of two bile salt hydrolase activities in *Lactobacillus acidophilus* NCFM. Appl. Environ. Microbiol, 71: 4925–9.
5. O. McAuliffe, T. O'Keeffe, C. Hill, and R. P. Ross. (2001). Regulation of immunity to the two-component lantibiotic, lacticin 3147, by the transcriptional repressor, LtnR. Mol. Microbiol, 39: 982–993.

Technology

PROFILE

Ms. Ciara Mc Donagh

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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

- Provision of technological support to Irish food companies, through information and consultancy, product and process development and technical services.
- Development and adoption of technology transfer methodologies.
- Promotion of innovative research developments and transfer of information and technological developments to industry.
- Establishment of collaborative projects with innovative food companies.
- Fostering associations with funding organisations and support agencies such as Enterprise Ireland, Bord Iascaigh Mhara, Bord Bia, IBEC, FSAI in order to provide an integrated support to Irish food SMEs.

Selected Publications

1. McDonagh, C. (2009). Technology Transfer Guides for the Meat Sector
   - A Guide to Intellectual Property for Irish Meat Sector Companies
   - A Guide to Intellectual Property for Meat Researchers
   - A Guide to Technology Development for Meat Researchers
   - A Guide for Technology Developers in the Irish Meat Sector
   - Extracting Ideas from Meat Research
   - A Guide to Commercialising Technologies arising from Meat Research Projects
   - Promotion of Linkages between Research Providers and the Irish Meat Industry
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

Technology

PROFILE

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 15 years, Sinéad has been involved in many areas of nutrition research, with a focus on food and health and has published 23 peer reviewed papers.

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 PhD 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 five on-going projects covering 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.

Selected Publications

1. 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
2. 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.
3. Quinio C, Biltoft-Jensen A, De Henauw S, Gibney MJ, Huybrechts I, McCarthy SN, O'Neill JL, Tetens I, Turrini A, Volatier JL. Comparison of different nutrient profiling schemes to a new reference method using dietary surveys. Eur J Nutr. 2007 Dec;46 Suppl 2:37–46.
4. AP Hearty, SN McCarthy, JM Kearney and MJ Gibney. Attitudes towards healthy eating and dietary behaviour, lifestyle and demographic factors in a representative sample of Irish adults. Appetite 2007 48(1):1–11
5. E. Duffy; A. P. Hearty; S. McCarthy; M. J. Gibney Estimation of exposure to food packaging materials. 3:Development of consumption factors and food-type distribution factors from data collected on Irish children Food Add & Contam; 2007 24(1):63–74.

Technology

PROFILE

Dr. Song Miao

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Education

Ph.D. in Food Science and Technology, National University of Ireland, University College Cork, Ireland (2001–2005)

M Sc. in Food Technology, Shanghai Fisheries University, China (1991–1994)

B. Eng. in Food Engineering, Shanghai Fisheries University, China (1987–1991)

Careers

May 2009–Present: Senior Research Officer (Permanent), Department of Food Chemistry and Technology, Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork, Ireland

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: Research Officer, Biotechnology Centre, Moorepark, Teagasc, Fermoy, Co. Cork. Ireland

Oct 2001–Dec 2004: Research Scientist/PhD 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
- Foods structural and textural designs
- Stickiness and flowability of powders
- State transition phase transition in foods
- Encapsulation and functional food ingredients
- Stabilisation of probiotics

Selected Publications

1. Mao, L., O'Kennedy B., Roos, Y.H., Hannon, J., Miao,S.*. (2012). Effect of monoglyceride self-assembled structure on emulsion properties and subsequent flavor release. Food Research International. Doi:10.1016/j.foodres.2012.04.002.
2. Miao, Song, Chiharu Inoue. (2009). Water soluble carrier, Patent published No.US2009/0196975A1
3. Miao, Song, Mills, Susan, Stanton, Catherine, Fitzgerald, Gerald F., Roos, Yrjo and Ross, Paul. (2008). Effect of disaccharides on survival during storage of freeze dried probiotics. Dairy Science and Technology, 88(1):13–30.
4. Miao, Song, Roos Yrjö H. (2006). Isothermal study of nonenzymatic browning kinetics in spray-dried and freeze-dried food systems at different RVP environments. Innovative Food Science and Emerging Technologies, 7:182–194.
5. Miao, Song, Roos, Yrjö H. (2005). Nonenzymatic browning kinetics in low-moisture food systems as affected by matrix compositions and crystallization. Journal of Food Science, 70:69–77.
6. Miao, Song, Roos, Yrjö H. (2004). Comparison of nonenzymatic browning kinetics in spray-dried and freeze-dried carbohydrate food model systems. Journal of Food Science, 69(7): 322–331.
7. Miao, Song, Roos, Yrjö H. (2004). Nonenzymatic browning kinetics of a carbohydrate-based low-moisture food system at temperatures applicable to spray drying. Journal of Agricultural and Food Chemistry, 52: 5250–5257.

Technology

PROFILE

Dr. Sheila Morgan

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Education

BSc, NUI Maynooth

PhD, 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

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.

Technology

PROFILE

Dr. Kanishka N. Nilaweera

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Education

Ph.D. Neuroscience, University of Aberdeen, UK. (1998–2002)

BSc Upper Second Class (Division 1) Honours in Genetics, University of Aberdeen, UK. (1993–1998)

Careers

2009–Present: Senior Research Officer (Permanent Academic Position), Moorepark Food Research Centre, Teagasc, Ireland (http://www.teagasc.ie/).

2007–2009: Post-doctoral Research Associate (Contract Academic Position), School of Biomedical Sciences, University of Nottingham, UK.

2005–2007: Post-doctoral Research Associate (Contract Academic Position), Rowett Research Institute, Aberdeen, UK.

2002–2005: Post-doctoral Research Assistant (Contract Industrial-based Position), Rowett Services Ltd, Aberdeen UK

1996–1997: Industrial Student Placement (as part of the undergraduate degree), Molecular and Cell Biology Department, Zeneca Pharmaceuticals, UK.

Expertise

Mechanisms controlling food intake and body weight in mammals and identification of nutrients, using *in vitro* and *in vivo* screens, that could target these mechanisms and reduce the development of obesity and associated clinical conditions, including diabetes.

Selected Publications

1. McAllan L, Cotter PD, Roche HM, Korpela R, Nilaweera KN. Bioactivity in whey proteins influencing energy balance. J. Metabolic Syndrome, 2012 (in press).
2. McAllan L, Cotter PD, Roche HM, Korpela R, Nilaweera KN. Impact of leucine on energy balance. J. Physiol Biochem, 2012(in press).
3. Clarke SF, Murphy EF, Nilaweera K, Ross PR, Shanahan F, O'Toole PW, Cotter PD. The gut microbiota and its relationship to diet and obesity; New insights. Gut Microbes 2012; 3:4, 1–17.
4. Murphy M, Jethwa PH, Warner A, Barrett P, Nilaweera KN, Brameld JM, Ebling FJ. Effects of manipulating hypothalamic triiodothyronine concentrations on seasonal body weight and torpor cycles in Siberian hamsters. Endocrinology. 2012 Jan;153(1):101–12.
5. Nilaweera K, Herwig A, Bolborea M, Campbell G, Mayer CD, Morgan PJ, Ebling FJ, Barrett P. Photoperiodic regulation of glycogen metabolism, glycolysis, and glutamine synthesis in tanycytes of the Siberian hamster suggests novel roles of tanycytes in hypothalamic function. Glia. 2011 Nov;59(11):1695–705.

Technology

PROFILE

Dr. Mary C. Rea

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Education

BSc, MSc and PhD 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

Technology

PROFILE

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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

Teagasc Principal Research Officer

Senior Research Officer, Teagasc Moorepark.

Research Officer, Teagasc, Moorepark, Fermoy, Co. Cork.

1991–1994: Post-doc/Research Associate, Wake Forest Univ. Medical Center, USA

1990–1991: 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. Stanton, C., Ross, R. P., Fitzgerald, G. F and Van Sinderen, D. (2005). Fermented functional foods based on probiotics and their biogenic metabolites. Current Opinion in Biotechnology, 16: 198–203.
2. Coakley, M., Johnson, M. C., McGrath, E., Rahman, S., Ross, R. P., Fitzgerald, G. F., Devery, R. and Stanton C. (2006). Intestinal bifidobacteria that produce trans-9, trans-11 conjugated linoleic acid: a fatty acid with antiproliferative activity against human colon SW480 and HT-29 cancer cells. Nutrition and Cancer, 56: 95–102.
3. Wall, R., Ross, R.P., Ryan C.A., Hussey, S., Murphy, B., Fitzgerald G.F and Stanton C., (2009). Role of Gut Microbiota in Early Infant Development. Clinical Medicine: Pediatrics, 3, 45–54.
4. Wall, R, Ross, R.P, Shanahan, F, O'Mahony, L, O'Mahony, C, Coakley, M, Hart, O, Lawlor, P, Quigley, E.M, Kiely, B, Fitzgerald, G.F and Stanton, C. (2009). The metabolic activity of the enteric microbiota influences the fatty acid composition of murine and porcine liver and adipose tissues. Am. J. Clin. Nutr. 89: 1393–1401.
5. Rosberg-Cody, E., Liavonchanka, A., Göbel, C., Ross, R.P., Fitzgerald, G.F., Feussner, I. and Stanton, C. (2011) Myosin reactive protein from *Bifidobacterium breve* is a FAD dependent fatty acid hydratase which has a function in stress protection BMC Biochem, 2011 Feb 17;12:9.
6. Wall, R., Marques, T.M., O'Sullivan, O., Ross, R.P., Shanahan, F., Quigley, E.M., Dinan, T.G., Kiely, B. Fitzgerald, G.F., Cotter, P.D., Fouhy, F. and Stanton, C. (2012). Contrasting effects of *Bifidobacterium breve* NCIMB 702258 and *Bifidobacterium breve* DPC 6330 on the composition of murine brain fatty acids and gut microbiota. Am J Clin Nutr, 95: 1278–1287.

Technology

PROFILE

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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 - 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).
- 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 (in conjunction with the Rural Development Unit of the Advisory Services) through mentoring, training and consultancy in the areas of food product and process development, food safety management systems and regulatory compliance.

Technology

PROFILE

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. This is key to enabling diversification of a predominantly Cheddar based Irish cheese industry. He also focuses on investigation of factors influencing cheese quality and consistency. His research seeks to determine the relationships between manipulation of cheese manufacture parameters associated with novel hybrid cheese-types (e.g. high thermal profiles, milling, dry salting of curd) and their influence on localised variability in curd microstructure, compositional profile, physicochemical parameters and on bacterial microflora and activity. This serves to underpin development of novel hybrid cheeses, combining characteristics of diverse cheese types but capable of manufacture on Cheddar-type process plants. In addition his programme is focused 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 and Mediterranean-type cheeses manufactured from a seasonal milk supply.

Selected Publications

1. Daly, D.F.M., McSweeney, P.L.H. and Sheehan, J.J. (2012). Pink discolouration defect in commercial cheese: a review, Dairy Science and Technology, 92, In Press.
2. 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.
3. Sheehan, J.J., Patel, A.D., Drake, M.A. and P.L.H. McSweeney. (2009). Effect of partial or total substitution of bovine for caprine milk on the compositional, volatile, non-volatile and sensory characteristics of semi-hard cheeses. International Dairy Journal, 19, 498–509.
4. Kelly, A.L., Huppertz, T. and Sheehan, J.J. (2008). Pre-treatment of cheese milk: principles and developments. Dairy Science and Technology, 88, 549 -572.
5. Sheehan, J.J., Wilkinson, M.G. and P.L.H. Mc Sweeney (2008). Influence of processing and ripening parameters on starter, non-starter and propionic acid bacteria and on the ripening characteristics of semi-hard cheeses. International Dairy Journal, 18, 905–917.
6. Sheehan, J.J., Fenelon, M.A., Wilkinson and P.L.H. Mc Sweeney. (2007). Effect of cook temperature on starter and non-starter lactic acid bacteria viability, cheese composition and ripening indices of a semi-hard cheese manufactured using thermophillic cultures. International Dairy Journal, 17, 704–716.

Technology

PROFILE

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 manipulation of bacteria, yeast and mammalian cell-lines and molecular genetic techniques involving DNA and proteins, fluorescent in situ hybridization, pulsed-field-gel-electrophoresis, polymerase chain reaction, denaturing gradient gel electrophoresis, 2-D gel electrophoresis, 16S sequencing, HPLC and Gas Chromatography.

Selected Publications

1. Casey, P. G, Butler, D., Gardiner, G. E., Tangney, M., Simpson, P., Lawlor, P. G., Stanton, C., Ross, R. P., Hill, C., and Fitzgerald, G. F. Salmonella Carriage in an Irish Pig Herd: Correlation between Serological and Bacteriological Detection Methods. J. Food Prot., 67:2797–2800, 2004
2. 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.
3. Simpson, P. J., C. Stanton, G. F. Fitzgerald, and R. P. Ross. Enumeration and identification of pediococci in power-based products using selective media and rapid PFGE. Journal of Microbiological Methods, 64:120–125, 2006
4. Danielsen, M., Simpson, P., O'Connor, E.B., Ross, R.P., Stanton, C. Susceptibility of Pedicoccus spp. to antimicrobial agents. Journal of Applied Microbiology 102: 384–389, 2007.
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