

# the ashtown food innovator

the newsletter of ashtown food research centre

## Did you know...

Vitamin A is known to prevent night blindness, and carrots are a rich source of Vitamin A. One carrot provides more than 200% of recommended daily intake of Vitamin A.

## Inside...

- **Marine Functional Foods Research Initiative** - an introduction to the research and staff working in this new area
- **The Irish Phytochemical Food Network** - gain a greater understanding of these health promoting compounds
- **Better Breads for Better Health** - evaluating formulations for improved breads and low GI products
- **Enhancing Meat Products with Natural Antioxidants** - results from Department of Agriculture, Fisheries & Food funded project
- **Health-related Seafood NPD** - a look at how the AFRC industry development support programme interacts with the seafood sector

The Teagasc Food Research Directorate, encompassing Ashtown Food Research Centre (AFRC), Ashtown, Dublin 15 and Moorepark Food Research Centre (MFRC), Fermoy, Co. Cork, undertakes public and private research, training & food industry support services. Programme themes include food safety, food ingredients, meat technology, prepared foods, dairy products and functional foods. AFRC was formerly known as The National Food Centre.

## Foods of the future at AFRC

DR NIGEL BRUNTON

Ashtown Food Research Centre is embarking on an exciting new direction with the development of a nutraceutical programme to be located in the new Bio-analytical Research Centre currently under construction. The new building will house facilities aimed at extracting, isolating and characterising novel health promoting compounds from natural sources for inclusion in functional foods. The programme will work in close collaboration with Moorepark Food Research Centre where the emphasis will be on investigating health claims associated with nutraceutical components.

The marine environment has great potential as a source of new functional molecules due to its unrivalled bio-diversity and the fact that it has not been examined in detail to date. On p2, Maria Hayes

elaborates on an innovative new initiative in this area.

Terrestrial plants may also serve as a potential source of compounds with health benefits as they contain phytochemicals. As part of the Irish Phytochemical Food Network, Juan Valverde outlines how AFRC is working in conjunction with experts at a number of Irish institutes to develop ways of enhancing levels of phytochemicals in Irish grown fruits and vegetables. Evidence has also been accumulating that cereals may contain components which confer health benefits beyond basic nutrition. Eimear Gallagher outlines research which aims to develop products enhanced with health components from cereals.

Researchers are working on developing functional meat products enhanced with antioxidant compounds and extracts. Jenny

Hayes outlines some of this work on p3. Consumer awareness and acceptance of functional foods is an important consideration when bringing products to market. This issue is addressed by Sinead McCarthy as part of the Marine Functional Food Research Initiative (p2). The nutraceutical programme at AFRC aims to supply high quality, new and exciting ingredients for the Irish food sector to enhance competitiveness in the growing, but highly competitive, functional food market.



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## Functional food regulation - the opportunity of threat

DR IVAN COULTER



'In this world nothing can be said to be certain, except death and taxes', stated Benjamin Franklin in the mid-18th century. In the

current uncertain economic climate, a clear certainty exists: Ireland has the capacity to enhance agricultural, marine and fisheries production for an ever increasing global population that is demanding higher quality food products for nutrition and wellbeing.

Starting with raw materials, through a process of continuous improvement and innovation, the food sector can support significant growth. Through the adoption of more efficient production practices and the implementation of processing and product development innovations, the Irish food industry

will grow significantly over the next decade. One such area of innovation is in functional foods, namely products fortified with specific ingredients that impart certain health benefits. Ingredients include marine and milk extracts, and probiotics. The health benefits claimed range from cardiovascular to mental health to obesity.

With the exception of Japan, the regulation of functional foods remains poor and variable. However, as further health claims are attached to functional foods, consumer demand will blur the distinction between medicines and functional foods and lead to an increased requirement for human intervention studies similar to those that are obligatory in the pharmaceutical industry.

Therefore, it is inevitable that standards of practice similar to those in the pharmaceutical sector

will apply to functional food development. To meet such standards, technical innovations that have been developed for the pharmaceutical industry will need to be adopted. Such technology convergence will result in the development of higher quality products, with enhanced value and reduced waste.

Sigmoid Pharma has developed innovative technologies with the potential to add significant value to functional food ingredients and which will ensure compliance with increased regulation. Through strategic collaborations with select industrial and academic functional food innovators, Sigmoid looks forward to working with partners to ensure the launch of innovative functional food products with the potential to capture a significant share of the multi-billion functional food ingredient and finished product global markets.

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## International beef safety conference at AFRC



**Pictured from l-r:** Martin Danaher, Declan Troy, Geraldine Duffy, AFRC, Minister Brendan Smith, Gerry Boyle, Teagasc Director at the *Prosafebeef* conference.

**A major international** conference on beef safety entitled '*Advancing Beef Safety Through Research and Innovation*' took place at AFRC in March. The conference was opened by Brendan Smith TD, Minister for Agriculture, Fisheries and Food. It was organised as part of the EU-funded project *Prosafebeef* which is coordinated by Mr Declan Troy and Dr Geraldine Duffy. The conference brought together international experts who presented their latest results in the areas of microbial pathogens, chemical contaminants in beef and the assurance of beef safety. The conference was attended by over 120 delegates from Europe, North and South America, Australia and New Zealand with representatives from the beef industry in attendance. Conference proceedings are available at [www.teagasc.ie/publications](http://www.teagasc.ie/publications). Congratulations to Kate Thomas, a PhD student in the Food Safety Department who won the student poster prize for her presentation on tracking verocytotoxigenic *E. coli* in the beef chain.

## Extraction and chemical characterisation of marine bioactive molecules at AFRC

**DR MARIA HAYES**

**Ashtown is currently** leading the Marine Functional Foods Research Initiative/*NutraMara* project funded by the Department of Agriculture, Fisheries and Food and the Marine Institute. This initiative 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. Previous studies have shown that a number of isolated metabolites from marine sources display anti-cancer, antimicrobial, antioxidant, anti-ACE-I-inhibitory and neuropharmacologically-active behaviour.



Ashtown's role in this multi-institutional project (which includes UCD, UCC, UL, MFRC, NUIG and UUC) is involved in extraction, purification and chemical characterisation of marine fractions from marine discard sources and macroalgae. Carbohydrates such as chitinoligosaccharides, glucans, and galactans will be extracted and characterised both chemically and for bioactivities. Bioassays to determine the heart-health benefits of marine fractions and the antimicrobial activities of marine fractions are

available at AFRC.

Ashtown researchers will also conduct a series of focus groups in the coming months to explore Irish consumer perceptions, intentions and attitude formation with regard to functional foods with particular emphasis on marine-based functional foods. In addition to informing the *NutraMara* project, and thus ensuring the technical research is consumer-led, this research will inform the wider debate on consumer acceptability of functional foods.

The market for new effective bioactive formulations can be considered supply-limited in that many diseases and ailments remain uncured with currently available drugs and nutritional products. Moreover, there is a need to make screening for novel bioactive compounds more effective and to lower their costs of production for industry. These factors provide tremendous market and AFRC opportunity for the identification and commercialisation of new marine bioactive compounds.

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## From farm to fork: the Irish phytochemical food network

**DR JUAN VALVERDE**

**As part of** the dissemination activities of the Irish Phytochemical Food Network (IPFN), a new website has been launched ([www.ipfn.ie](http://www.ipfn.ie)). The aim of the website is to promote the activities of the network and to share information on recent developments in the phytochemical area.

Phytochemicals are compounds that are found naturally in plants which some studies have shown to have biological activity against chronic diseases such as cancers and cardiovascular disease. The IPFN brings together scientists from various research fields (horticulturist/agronomist, food engineers, food chemists, nutritionists, consumer behaviour researchers, economists) to gather and exchange knowledge on naturally-occurring phytochemicals in Irish fruits and vegetables. It includes researchers from AFRC, Kinsealy Research Centre, UCD, DIT, NUIG, UCC and UL. The IPFN is focused on three families of vegetables: (a) Brassicaceae

family e.g. cabbages, cauliflowers, broccoli (b) Apicaceae e.g. carrots and parsnips and (c) Allium family e.g. onions. The network is expected to increase understanding of the role and biological modes of action of phytochemicals at molecular, cellular and whole-organism levels. A greater understanding of the roles of phytochemicals in promoting health will lead to improved formulation of foods and recommendations for consumers concerning the specific contribution made by individual phytochemicals in foods. The IPFN had its inaugural symposium on the 17th of April 2009.



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## Better breads for better health

DR EIMEAR GALLAGHER



In recent years, cereal-based research at Ashtown has diversified into a range of novel and functional areas. As the incidence of coeliac disease and gluten intolerance continues to increase, our research is focusing on the formulation of healthy, high quality, gluten-free breads. For example, the use of inulin (a gluten-free prebiotic dietary fibre) increased the fibre content of selected breads four-fold, without affecting sensory or textural properties of the breads.

The use of pseudocereal grains (buckwheat, amaranth, quinoa) has also been studied as alternative ingredients to the normally used refined gluten-free starches such as rice/potato/corn flours. They have proven to be rich sources of dietary fibre, minerals, antioxidants, polyphenols, vitamin E compounds and micronutrients, and therefore viable ingredients for healthy gluten-free formulations.

The area of glycaemic index (GI) is extremely topical at the moment. It is well known that white wheat bread has a high GI, whereby the starch present is rapidly digested and absorbed in the small intestine producing undesirably high blood-glucose and insulin levels. Regular consumption of high GI foods is associated with the

development of diseases such as type 2 diabetes, certain forms of cancer and an increased risk of cardiovascular disease and obesity. At Ashtown, bread products are being formulated with the aim of achieving a nutritious, slowly-digestible status, rich in dietary fibre/resistant starch and functional ingredients (such as whole grains and brans). A laboratory-based method for measuring starch hydrolysis (simulating what happens in the gut) has also been developed to enable accurate prediction of the effects of recipe variations on the sensitivity of starch-rich foods such as white bread.

The importance of soluble fibre such as beta glucan to health has long been recognised. Cereals (such as barley and oats) are good sources of this functional ingredient. Currently, varieties of barley grains are being milled, and the beta glucan levels and bioactive compounds present in the resulting fractions (endosperm flour, bran and middlings) are being assessed. The potential of these fractions as functional ingredients in breads is also being studied using dough rheological tests, microscopy and baking trials. To date, the middlings fraction (i.e. the by-product of milling) has been found to have high soluble fibre levels, and may be used in bread formulations to replace up to 30% of wheat flour



without negatively affecting the macromolecular structure or sensory properties of the resulting breads.

A half-day seminar focusing on new developments in the gluten-free area is being held at Ashtown on May 21st. See diary section for more details.

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## Enhancing meat products with natural antioxidants

MS JENNY HAYES



New research at AFRC indicates that the natural plant ingredients lutein, sesamol, ellagic acid and olive leaf extract show strong potential as effective natural antioxidants. Such ingredients may offer considerable commercial

possibilities to the meat industry in addressing concerns about the safety and toxicity of synthetic antioxidants and for application in novel functional healthy meat products. Heightened consumer awareness of the relationship between diet and health/disease prevention has fostered growth in the development of healthier food products and there has been an explosion of research activities and new products in the field of functional foods. Recently, research funded by the Dept. Agriculture, Fisheries & Food (FIRM) which examined the development of functional healthier meat products has been completed by Paul Allen and Jenny Hayes at AFRC in collaboration with Joe Kerry and Nora O'Brien at UCC.



They investigated the potential beneficial effects of a number of nutraceuticals in raw and cooked pork and beef products. Firstly, the effects of selected functional ingredients on the antioxidant status of cells were determined to establish their inhibitory concentration. A dose response study was then carried out to assess the effect of these ingredients on colour and lipid stability in pork and beef model muscle systems. Finally, pork and beef products (whole and

comminuted muscle) were manufactured containing the selected ingredients at chosen levels. The effects of the functional ingredients on meat quality characteristics such as colour, lipid oxidation, microbiological status, cook loss, water holding capacity, texture and sensory properties were evaluated.

Lutein, sesamol, ellagic acid and olive leaf extract were found to significantly enhance lipid stability in beef and pork products while ellagic acid and olive leaf extract also enhanced colour stability. The addition of these natural ingredients not only enhanced product colour and reduced lipid oxidation but also improved the microbial safety of the meat products.

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# Scientist profile

## DR MARIA HAYES



**Maria Hayes** was recently appointed as a natural products research scientist at Ashtown. She graduated from University College Dublin (UCD) in 2002 with a B.Sc.(Hons) in Industrial Microbiology. She has previous experience of

working with Teagasc having obtained a Walsh Fellowship to undertake a PhD in Food Microbiology and Biotechnology at Moorepark Food Research Centre (MFRC) and University College Cork (UCC). Her PhD involved isolation and characterisation of bioactive peptides from milk proteins using microbial strains and enzymes through controlled fermentations. She completed her PhD in June 2007 and subsequently was employed as a postdoctoral scientist at the Centre of Applied Marine Biotechnology (CAMBio) at Letterkenny Institute of Technology. At CAMBio, Maria was involved in the isolation and characterisation of chitinolytic enzymes from

marine waste streams. She was also involved in the generation and characterisation of bioactive carbohydrates, specifically chitinoligosaccharides (COS) from shellfish wastes such as crab, that had heart health benefits and antimicrobial activities. Within the new nutraceutical programme at AFRC, Maria will apply her skills to the area of bioassay guided fractionation and 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 assays, anti-thrombotic and antioxidant assays (heart health functionality in vitro) and antimicrobial assays (food safety). Research in this area will provide knowledge to support the development of nutraceutical formulations by industry to improve the health and quality of life of humans and animals. Maria is also the scientific manager of the Marine Functional Foods Research Initiative (NutraMara Project) which encompasses 5 universities and Teagasc (see p2).

# The seafood sector and health-related NPD

## MR PAT DALY

**AFRC interacts closely** with the Irish seafood sector under a joint initiative with Bord Iascaigh Mhara (BIM) which is termed the Seafood Innovation Link (SIL) and advises small, medium and large processors on cutting-edge technologies in the areas of packaging, ingredients, processing, extending shelf-life and quality technologies.



One only has to walk into any retail outlet in Ireland to appreciate the numerous technological advancements being made in the areas of convenience products. Ashtown is currently working with several companies involved in prawn, whitefish, crab, mackerel and scallop processing, and are tailoring R&D to meet their requirements. Numerous packaging solutions for fresh, frozen, cooked and pasteurised product are being tested and health-related new product development (NPD) aimed at reducing salt levels in food products and cleaning up ingredient lists is being supported within the seafood industry.



Ashtown has generated a huge database of knowledge for most food groups and these technologies can be applied directly to seafood products. Seafood companies can avail of Enterprise Ireland Innovation vouchers through AFRC or work with staff in developing proposals for further funding applications to carry out applied product development and research in one of the centre's incubation units, cooked meats facility, sensory suites or laboratories.

Additionally Teagasc provides industry development support for all other sectors and sizes of food businesses and has embarked on a specific support initiative for small to medium sized businesses (SMEs). This support programme is available nationally and at the Ashtown (Dublin) and Moorepark (Cork) Food Research Centres.

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## AFRC diary of events

### SUMMER 2009

Date	Events/Training Courses/Demonstrations	Venue
May 11th	<b>Cost Optimisation in Formulating Meat Products Seminar (1 Day)</b> Sponsored by Healy Group Ireland. Gain insights into the current profit pressures, an understanding of routes to alleviate these pressures, clear knowledge of the opportunities to formulate cost out of your product and appreciate the technical challenges and market opportunities of cost engineering. For further information contact: <a href="mailto:margaret.hennessy@teagasc.ie">margaret.hennessy@teagasc.ie</a> , tel: 01 805 9520	Dublin
May 12th-13th	<b>HACCP in Food Safety (FETAC), (2 days)</b> Participants will develop their own HACCP plan over the 2 days. For further information contact: <a href="mailto:margaret.hennessy@teagasc.ie">margaret.hennessy@teagasc.ie</a> , tel: 01 805 9520	Limerick
May 21st	<b>Gluten-free Seminar: New Developments for Bakery Products (Half-day)</b> The seminar will focus on the new coeliac food list, new guidelines for businesses, packaging and labelling issues and recent research. For further information contact: <a href="mailto:carmel.farrell@teagasc.ie">carmel.farrell@teagasc.ie</a> , tel: 01 805 9572	Dublin
May 27th	<b>Global Standard for Food Safety - Third Party Auditor Update Issue 5</b> Attendance at this course will allow you to become thoroughly familiar with the changes in Issue 5 and the reasons for those changes. The course is designed to refresh audit skills of already qualified BRC Third Party Auditors. For further information contact: <a href="mailto:margaret.hennessy@teagasc.ie">margaret.hennessy@teagasc.ie</a> , tel: 01 805 9520	Dublin
June 15th	<b>Food Processing Equipment &amp; Packaging Demonstration</b> See the Urschel range of cutting equipment in action and Alert Packaging's range - why not bring your own product to trial? For further information contact: <a href="mailto:john.rae@teagasc.ie">john.rae@teagasc.ie</a> , tel: 01 805 9546	Dublin
June 16th-17th	<b>Laboratory Auditing (FETAC), (2 days)</b> Gain detailed knowledge of the NAB requirements for the operation of an ILAB accredited laboratory quality system under ISO 17025. For further information contact: <a href="mailto:margaret.hennessy@teagasc.ie">margaret.hennessy@teagasc.ie</a> , tel: 01 805 9520	Dublin
July 1st-2nd	<b>Legal Labels - The Essential Guide to Irish Food Labelling</b> Presented by Leatherhead Food International, covers all major labelling considerations with emphasis placed on more topical and complicated issues. For further information contact: <a href="mailto:carmel.farrell@teagasc.ie">carmel.farrell@teagasc.ie</a> , tel: 01 805 9572	Dublin

If you have any comments or suggestions regarding **The Ashtown Food Innovator**, please email **Carmel Farrell** at [carmel.farrell@teagasc.ie](mailto:carmel.farrell@teagasc.ie); Telephone: +353 (0) 1 805 9572; Facsimile: +353 (0) 1 805 9550; **Ashtown Food Research Centre**, Teagasc, Ashtown, Dublin 15. **Website:** [www.teagasc.ie/ashtown](http://www.teagasc.ie/ashtown)

