



Queen's University
Belfast

Institute for Global
Food Security

WELCOME

Welcome to the fourth edition of the IGFS newsletter. It seems that food security is being discussed by more stakeholders in more countries than ever before. During our recent ASSET2014 conference held at Queen's University the topic of food supply chain integrity was the main talking point. Many of the main issues pertaining to accidental and deliberate contamination of food were presented and debated. In October, the European Commission holds its first conference on food fraud in Rome showing how such issues need to be dealt with at a multinational level. IGFS is one of Europe's leading Institutes undertaking cutting edge research on behalf of many regulators and industry to provide novel solutions to a range of highly complex problems. Our research portfolio covers many other food security topics and I hope reading this newsletter and visiting our website will provide you with a better insight the global nature of our efforts to support the provision of safe, authentic and sustainable food supplies. - Professor Chris Elliott



ASSET2014 Conference heralded as a success



Professor James McElroy (left) pictured with NI Agriculture Minister Ms Michelle O'Neill MLA, Dr Gary Kearney (*safefood*) and Professor Chris Elliott

The Institute for Global Food Security, in partnership with Queen's University Belfast and *safefood*, recently hosted the 2nd Food Integrity and Traceability Conference. The event was well attended with over 350 delegates coming to Belfast from over 30 different countries. The three-day programme included a range of internationally important and distinguished speakers including Professor Junshi Chen from the China National Center for Food Safety Risk

Assessment and Dr Ladislav Miko from DG SANCO, to name just two. The Conference also hosted an interactive, and at times fiesty, GM debate discussing the role GM food has to play in future European food security.

Speaking about the conference Dr Gary Kearney of *safefood* said "This major international food safety conference will involve participants operating across all parts of the food chain and will

facilitate the sharing of new technical developments and information from across the globe. A key outcome will be a demonstration of the benefits of joined-up thinking which is essential to the provision of safe food and protecting consumers on the island of Ireland"

Delegates attending the conference were pleased with both the content and the organisation with one commenting that it was a "Very good event with lots of interesting oral presentations and posters. A good balance in the topics and methodologies. Sufficient amount of time for poster presentation, discussion and networking" while another commented "The whole event, was useful, it gave me an appreciation of the diversity of issues that need to be resolved for food safety"

The ASSET2014 Organising Committee would like to thank all those that were involved in the organisation and management of the conference as well as the exhibitors and the hundreds of delegates that travelled from across the world to attend and contribute.

Causeway Sensors nanostructured gold making advances for food safety

Researchers from Queen's University Belfast's Centre for Nanostructured Media and the Institute for Global Food Security (IGFS) have developed a biosensor platform based on a novel nanostructured surface that consists of billions of gold nanostructures that is seeing early adoption of food safety.

The potential of this nanostructured surface and a straightforward optical detection scheme has led to the formation of a new company to commercialise the technology through investment by QUBIS and a business angel. "Causeway Sensors Ltd" has been established to manufacture and market the new technology.

Causeway Sensors has developed the use of the nanostructured chips for generic use in the characterisation of protein-to-protein interactions (for example in proteomics or interactomics); real-time kinetic analysis of receptor-ligand binding (for example in pharmaceutical drug discovery/development); detection of specific markers of disease, toxins and contaminants. One area where technology is already seeing success is in food safety.

Now, funded by an Invest Northern Ireland Proof of Concept award, researchers in IGFS are currently using the Causeway Sensors biosensor prototype chips and detection system to characterise collections of antibodies and antibody mimetics (from phage libraries) that are directed against *Campylobacter jejuni* (the most common cause of "food poisoning" from poultry). The work aims to give precise affinity measurements of the various anti-*Campylobacter* sensor proteins, to develop ways of extracting the *Campylobacter jejuni* antigens from raw meat. The ultimate aim of the work would be develop assays suitable for a portable biosensor for use in the field.

For more information visit www.causewaysensors.com or follow on Twitter [@causewaysensors](https://twitter.com/causewaysensors)

Early-stage Researchers shine at ASSET2014

Not only was ASSET 2014 the perfect place to witness all the work going on in the field of Food Integrity and Traceability but it also provided a wonderful opportunity for postgraduate students to be involved in an international conference. From helping behind the scenes, attending workshops, networking with experts, chairing sessions of the conference, to presenting their research; it was vital not to miss out. The early stage researcher session hosted 11 international candidates to present their research by oral presentation, to be judged by the scientific committee. Up to 100 posters were also displayed and assessed with prizes for the first, second and third place within the three themes. It was here that the Institute for Global Food Security stood out, with Queen's University students receiving top prizes from Elsevier and Waters. The early stage research award went to Sara McNamee in third place and Ruth Kinkead in first place.

Ruth's presentation entitled "Non-targeted proteomic plasma profiling to screen for glucocorticoid administration in bovines", was focused on showcasing new biomarker candidates which can be used to discriminate cattle treated with growth promoting agents. Her research is focused on promoting new screening techniques by way of omics approaches. This means instead of looking for drug residues in food matrices, tests can be carried out to identify the biological response of the animals and is carried out by looking at protein and metabolite expression differences. This was the first time Ruth conducted an oral presentation at an international conference. She is currently in her 2nd year of PhD study under supervision of Dr Mark Mooney and Professor Chris Elliott and has also secured funding to present her research at the Seventh International Symposium on Hormone and Veterinary Drug Residue Analysis in Ghent, Belgium in June 2014. Sara McNamee's oral presentation was entitled "Phycotoxin analysis of European water samples"

Two other IGFS students, Joanna Keenan and Alexandros Stratakos, were awarded a 1st and 2nd prize respectively for their posters, entitled "Monitoring of pre-slaughter stress responses in food-producing animals by metabolomic based profiling techniques" and "Combined effect of high pressure processing and antimicrobial packaging to control the growth of *Listeria monocytogenes* on ready-to-eat chicken breast"

Congratulations to all the prize winners and the sincere thanks of the ASSET2014 Organising Committee to all those students that volunteered their time to assist during the event.



Ruth Kinkead (centre) is pictured with Rupal Malde from Elsevier and Professor Chris Elliott

Institute for Global Food Security welcomes Chinese delegation

The Institute for Global Food Security recently hosted a high level delegation from the Chinese Ministry of Agriculture and the Chinese Academy of Agricultural Sciences. Also in attendance were representatives of AB Agri and the EU-China Trade Project.

Professor Chris Elliott formally welcomed the delegation and gave an overview of the research and work carried out at the Institute. This was followed by a presentation on the very successful multi-national FP7 EU QSAFFE project that was co-ordinated by IGFS.

The world leading Food Fortress initiative which affords the Northern Ireland feed food supply chain with a unique level of quality assurance was also presented.

The participants also discussed areas of mutual beneficial research with a view to setting up more formal link in the areas of feed and food quality and safety.

The distinguished visitors were also given a tour of the Advanced ASSET



The Chinese Delegation along with representatives from IGFS and AB Agri pictured outside the Northern Ireland Technology Centre.

Technology Centre where they had the opportunity to view the world-class equipment currently being utilised for IGFS research as well as to ask questions of the researchers based in the centre. The delegation were particularly

impressed by the Waters Corporation supplied Mass Spectrometry equipment and the future developments and new equipment planned for the Advanced ASSET Technology Centre.

Planning application for the new Institute submitted

The planning application for the new building that will house the Institute and the School of Biological Sciences has been submitted for planning approval. The new c£30m building will provide state-of-the-art facilities and support the future growth and development of the Institute as well as providing enhanced

provision for our students and staff. The plan has been deemed of significant economic importance by the Environment Minister and will be fast tracked through the planning process with a decision made by late November.

The new building will be constructed on the site of the former Science Library and

the building is designed to respect the scale and context of its surroundings in the Malone Conservation Area.

The building has a gross internal area of 11,165m² over four floors and a basement. It is designed around a central atrium or glazed 'street' that acts as the social hub and heart of the School and allows daylight to penetrate deep into the building. A second more private atrium provides a less public focus for research work, whilst echoing the open, airy and light filled environment of the 'main street'. The undergraduate facilities and labs occupy the bottom floor of the building, with postgraduate and research space located in the upper levels.

A new plaza is being created at the main entrance, located off Chlorine Gardens, allowing level access to the School. An enhanced pedestrian route between Chlorine Gardens and Lennoxvale will provide both a landscaped pathway for pedestrians, wheelchairs users and cyclists as well as an attractive public realm space.



New Building Main Entrance on Chlorine Gardens, viewed from Stranmillis Road

Total Confinement vs. Pasture Systems: What does the science say?

Globally, there is increasing interest in the use of total confinement and zero-grazing dairy systems, whereby cows are permanently housed and do not have access to pasture grazing. These systems are widely used in North America and many producers are currently looking to capitalise on a strong and expanding global dairy market. However, maintaining growth in the UK dairy sector is a major challenge, particularly since land availability is a considerable limiting factor. In this environment, many dairy producers are questioning what the best production system for their situation is.

To help inform this debate, AgriSearch, the organisation which administers the dairy levy within Northern Ireland, are funding a literature review entitled "Total Confinement vs. Pasture Systems: What does the science say?" This project, conducted jointly by researchers at the Institute for Global Food Security at Queen's University Belfast and dairy scientists at the Agri-Food and Biosciences Institute, is reviewing global dairy science literature to examine the advantages and disadvantages of total confinement and pasture systems. A holistic approach is being used to assess the production, health and welfare, economic and environmental implications of each production system. To date, 196 relevant studies have been identified and results are still being collated. However, a number of major themes have already emerged.

The primary benefits of total confinement systems arise from the high levels of cow management that can be achieved. Within these high input systems, cows typically attain higher levels of performance (increased milk and milk solids yield). These systems can also enable more consistent management of the diet, resulting in increased dry matter intake, thus combating negative energy balance and helping to maintain body condition. In addition, cows are not exposed to adverse weather conditions, nor is the land damaged by poaching. However, costs of production within total confinement systems are typically considerably higher than within pasture-based systems. Indeed, it is only with larger herds that the benefits of economies of scale can really be achieved. This raises the related issue

regarding attitudes to herd size, with the idea of 'mega-dairies' proving controversial in the UK.

On the other hand, grass is the cheapest feed available and systems incorporating pasture are less costly and typically achieve higher profitability (per litre and per cow) when compared with similarly sized herds in total confinement systems. Furthermore, studies have shown that the profitability of pasture based systems is less variable, and can more readily accommodate fluctuations in milk price, with producers facing less income risk. A decreased reliance on purchased feed combined with lower production costs make pasture systems less vulnerable to volatility in commodity prices. Lower financial risk is likely to become an increasingly important advantage in a globalised market where volatility is likely to increase.

Additional important benefits of systems incorporating pasture include; improved health (decreased lameness, mastitis, mortality and culling rates), increased cow welfare (increased comfort / lying behaviour, and decreased aggression), improved reproductive performance and fertility, improved milk composition (e.g. milk FA profiles with potential positive human health benefits), and lower environmental impacts, including greenhouse gas emissions. These are considerable benefits. However, there are still significant challenges to making pasture based systems work. High levels of grazing management are required to meet the nutritional needs of lactating dairy cows. Indeed, for modern high producing North American type Holstein cows pasture alone cannot meet their genetic potential and an element of supplementary feeding is required.

Preliminary results clearly indicate there are advantages and disadvantages of each system. Could it be that with the conventional UK system of winter housing and seasonal pasture, producers are already adopting a 'best of both worlds' approach? It is also worth noting that the majority of consumers (95% in a recent UK study) do not think it is acceptable to keep cows permanently housed indoors. Surely this represents a marketing opportunity for the UK with its current clean, green producer image. Other

countries are already embracing this approach, with grazing in the Dutch dairy sector being encouraged by premiums from dairy companies and recent industry announcements supporting systems incorporating outdoor grazing, while other countries (e.g. Finland and Sweden) have regulations that mandate access to pasture. Is it sensible for the UK dairy industry to put its positive pasture based image at risk by a move to total confinement systems?

The dairy industry is at a cross roads in terms of translating 'sustainable intensification' goals into reality and some see a move to total confinement systems as inevitable. However, initial results of this review, with full results due in summer 2014, highlight there are still considerable benefits of incorporating pasture grazing into production systems. Ultimately this is more than a scientific question, with the choice of system depending on individual circumstances, ethics, policy and personal views on the meaning of 'sustainable intensification'.

An article by Dr Gareth Arnott (AgriSearch funded Dairy Research Fellow) and Dr Niamh O'Connell



Dr Gareth Arnott (right) is pictured with the AgriSearch Project Manager Jason Rankin

Graduate employment stories from IGFS food students

The recent Highfliers report into the UK Graduate recruitment market highlighted the increasing numbers of finalists making graduate applications and planning ahead earlier each year. The survey carried out with 18,000 students found that this academic year, 43% of finalists made job applications by the end of October, compared with 31% five years ago. The poll suggests they are making an average of 7.5 applications - an all-time high!, in addition three-quarters of those surveyed had started researching their career options before the start of their final year at university, compared with 61% in 2010 and 57% in 2008.

Students on our BSc Food Quality, Safety and Nutrition programme are no exception and our current cohort of students who are graduating this year have been competing very successfully to secure to excellent graduate jobs. We have spoken to some of them about their experiences and hopes for the future. We will be featuring their stories over the coming months.



Francine Hammond

BSc Food, Quality, Safety and Nutrition with Professional studies

Work experience - I completed a one year placement at Premier Bakeries Ireland who produce established brands such as Hovis, Ormo and many other supermarket own brand products. My role entailed completing all complaint investigations for the site, completing various machine calibrations and carrying out all product quality assessments. It was an enjoyable and varied role and was a valuable experience.

Graduate employment - I recently secured a place on the Tesco Technical Science graduate scheme based just outside London. I believe I will be placed within the Impulse Goods department, particularly working with Crisps and Chocolate.

Process involved - The Tesco recruitment process involved completing a detailed application form followed by passing various online tests (verbal, numerical, situational and logical). After this I completed a telephone interview and was then invited to attend an assessment day which involved performing well in an individual presentation, interview and 2 group exercises.

Future plans - I aim to work my way up through the Tesco business and become a Technical manager in the years to come.



Elaine Holywood

BSc Food, Quality, Safety and Nutrition with Professional studies

Work experience - Grahams Bakery, Dromore, County Down. My role was predominantly as technical manager with the aim of implementing the BRC issue 6 standard, once this was put in place I also had the opportunity to gain experience in other roles including new product development and sales.

Graduate employment - Technical and Product manager (ASDA) for Scott's Bakery and Jennings Bakery. My time will be split between the two bakeries in a technical role, however, I will also be responsible for selling products to ASDA as the retailers put more trust in sales pitches from technical staff who know the processes and products rather than 'detached' sales personnel.

Process involved - I secured my graduate role as a result of placement, recruitment involved sending CV's to bakeries as this was my area of interest, no local bakeries were advertising jobs early in the year so I approached some with a speculative application and secured a few interviews.

Future plans - This graduate role will act as a 'stepping stone' and will look good on my CV as I am working directly with one of the 'big four' retailers and gaining new connections through networking. This is not a long term job as it involves a lot of travelling. I hope to stay in this role for a few years to build my knowledge and confidence and decide if it's a technical or a sales role I want to pursue a long term career in.

Dementia is an expanding and more inter-disciplinary research theme within IGFS

Research into dementia appears to be an expanding area of research within IGFS. Established ARUK-funded work is undertaking some of the most detailed profiling ever performed on human brain and blood metabolome of patients with Alzheimer's disease (AD). However, some new collaborative and multi-disciplinary projects are emerging. The team are now collaborating with Prof Andy Meharg to profile the changes in many of the trace elements (sometimes referred to as 'elementomics'). Part of this ongoing work has reported age-related changes in both iron and copper levels in the brain of AD subjects (recently accepted for publication in Journal of Alzheimer's disease).

Additionally, a new collaboration with Dr Jonny Dalzell is investigating whether the existing *C.elegans* models of AD can be surpassed by the use of other nematode species.

Michael Hills, who recently took on the role of Administrator for the Northern Ireland ARUK Network Centre, organised a free Public Meeting on dementia in The MAC, Belfast which was held on 27th May 2014. Further scientific events are planned to take place within the coming months.

New Invest NI funded research project to develop novel animal nutrition products

IGFS staff have initiated a new research programme in collaboration with AFBI and leading agri-technology company Devenish Nutrition to develop novel nutritional products aimed at ameliorating the effects of disease in animals. This Invest NI funded 3 year project will be led at QUB by Prof Gordon Allan and Dr Mark Mooney, by Dr Violet Beattie and Dr Charlotte Stewart at Devenish Nutrition, and by Dr Michael Welsh at AFBI. Dr Anna Marco-Ramell from the Universitat Autònoma de Barcelona has joined IGFS as a post-doctoral Research Fellow to work on the project where she will focus on providing an insight into the biological pathways responding to various nutritional scenarios. The overall objective will be to develop new nutritional feed strategies which can improve animal performance facilitating targeted dietary intervention at different phases of animal production and enable more economical use of supplemented feed materials.



Dr Mark Robinson wins a BBSRC new investigator award

Fasciolosis, caused by the parasitic worm *Fasciola hepatica*, is a common and economically important disease of livestock. Whilst effective drugs to combat *Fasciola* infection are available, the spread of drug resistant parasites is making their use increasingly difficult. This, together with the absence of an effective commercially-available vaccine against *Fasciola*, means that new strategies for the control of the parasite are most urgent.

Dr Mark Robinson of the Institute for Global Food Security has won a £474K (FEC) New Investigator Award from the Biotechnology & Biological Sciences Research Council (BBSRC) to investigate the role of exosome-like extracellular vesicles in the host-parasite interaction. These vesicles represent a recently-discovered route of export of virulence factors and other effector molecules that help the parasite to survive within the host. It is envisaged that specific targets will emerge from this research for control of *Fasciola* infections (by new drugs or vaccines) that will be commercially attractive and transferable to other parasitic infections of humans and animals.

Vegetable oils authenticity

Have you found the term "vegetable oil" in processed foods (confectionary products, bakery products, pastries etc)? What oil is it? As European and National food labelling legislation is changing, food companies have to declare the type of this oil or blend of oils that are used to produce these foods. The aim of the QUB research at IGFS, led by Dr Tassos Koidis and commissioned by the Department of Environment, Food, Agriculture and Rural Affairs, was to identify the oil species present in refined vegetable oil blends using a combination of advanced analytical technologies and decision-making algorithms.

The method was developed as a 2 stage procedure with a screening step (spectroscopic analysis using FTIR) and a confirmation step (gas chromatography analysis of key oil components). The validation of the newly developed method showed 100% correct identification with 20 external oil samples in a blind study. This research is currently applied to model food products (chocolate bars, biscuits) to confirm the performance of the method and results so far are very positive.

Currently, research in this area is extended to vegetable oils that are imported into Northern Ireland (especially virgin olive oil) as well as oils produced here in NI (rapeseed oil) in order to help producers and regulators to fight food fraud and characterise their products better.



Student and Staff News

PhD student **Alexandros Stratakos**, pictured to the right, has been awarded the Jubilee award from the Institute of Food Science and Technology (IFST) for the Northern Ireland branch, after participating in the post-graduate student competition. The award included travel, accommodation and attendance at the IFST Jubilee Conference and dinner which took place on 14-15 May in London. As well as an invitation to become a young Ambassador of the IFST during the Jubilee year.



Alexandros Stratakos (centre) is pictured with IGFS PhD supervisor Dr Tassos Koidis and AFBI co-supervisor Professor Margaret Patterson.

Suprama Datta, a PhD student at the Indian Institute of Chemical Technology, Mumbai will be joining Dr David Timson's research group (and collaborating with Chris Allen's group) this autumn. Suprama will be funded by a split-site Commonwealth scholarship – the only one to be awarded to an Indian student this year. She is truly one in a billion!

Suprama's project will be to investigate the production of polyphenols in an unusual strain of yeast. Some of these compounds may have value as food additives of flavours.

Anna Gillespie has been awarded the Silver Sponsorship package from PrimerDesign. This sponsorship enables Anna to tap into this invaluable resource of PCR expertise and improve the quality of her real-time PCR work. Not only will Anna benefit but, on the 13th June PrimerDesign will give a presentation 'A beginners guide to Real-Time PCR', allowing the whole team at IGFS to gain insight into this technique and add a molecular aspect to their work. This award backs-up Anna's previous real-time PCR training in London at Birkbeck University in January this year. Anna's place was funded by Anachem to the value of £460.

Daniel McDowell has been selected as IFST's 2014-15 POST Fellow. Daniel will take part in a fully-funded three month placement at the Parliamentary Office of Science and Technology (POST), where he will author a POSTnote to inform Parliamentarians on a scientific topic (to be determined). Daniel will undertake the POST Fellowship in late 2014. Of being selected as the 2014-15 POST Fellow,

Daniel said: "Over the past two years I have spent much of my time in our laboratory at QUB, where I have been using a wide range of analytical techniques to gather data for my PhD. The POST fellowship will be a complete change of environment for me, regarding both the nature of work and the colleagues I will be working with. I look forward to learning from the diverse range of people I will be in contact with and seeing first hand how science can inform UK policy."

Just over a year since arriving at IGFS **Professor Andy and Dr Caroline Meharg** have been linking with other members of IGFS to increase activity in plant science. The focus has been combining advanced molecular approaches (Caroline) with analytical chemistry (Andy) to tackle key problems facing crop science in the 21st century such as food safety (toxins, pathogens and toxic metals), adapting agriculture

to fertiliser shortages (phosphate primarily) and adapting plants to marginal lands (low pH, salinity etc.). The group built around these research foci has a distinctly international feel, with scientists from the UK, Thailand, Spain, China, Brazil & Bangladesh, working on biological systems that vary in scale from single cell organisms to landscapes.

If you have an article, research announcement or staff/student news you would like to see featured in the next IGFS Newsletter then please email Michael Hills at m.hills@qub.ac.uk

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