

Scanning electron microscope image showing bacteria distributed over the adaxial surface of shredded lettuce leaf at the end of its shelf life (image by Dr Mary Parker, IFR).

Science+ Innovation

Institute of Food Research

Issue 1:07

Institute Update

New Research Leaders

This time last year, I informed our stakeholders of our plans to appoint new research leaders. I am delighted to welcome **Thomas Wilhelm** and **Arnoud van Vliet** to the Institute. I am pleased with progress within 'Innovation' and also the launch of 'IFR in the City', our new outreach lecture series.

Thomas Wilhelm is a systems biology expert from the Leibniz Institute for Age Research - Fritz Lipmann Institute, Jena and the Jena Centre for Bioinformatics, Germany. His group analyses new static and dynamic structures in large-scale data sets and develops dynamic models to give mechanistic explanations for such patterns. A major co-investment is in progress involving IFR, John Innes Centre (JIC) and the University of East Anglia (UEA) which aims to make Norwich a leading centre for biomathematics.

Arnoud van Vliet graduated from the University of Utrecht, the Netherlands, where he also obtained his PhD in molecular microbiology. He carried out post-doctoral work in the Department of Genetics, University of Leicester where he worked on gene regulation in *Campylobacter jejuni*. In 2001 he became Lecturer at the Department of Gastroenterology and Hepatology of the Erasmus MC - University Medical Center in Rotterdam, the Netherlands, leading research on pathogenesis of *Helicobacter* infections. He joins IFR to lead our work on *Campylobacter*.

Innovation

IFR Innovation is the arm of the Institute responsible for exploitation and knowledge transfer activities including our Exploitation Platforms (see page 5), Food and Health Network and the development of intellectual property. Dr Reg Wilson, former Head of Food Materials Science has been appointed to lead IFR Innovation. In addition, Reg is responsible for Science Operations at IFR and has over thirty years experience of food research.



'Science+Innovation' is published triennially and is available via e-mail, from our website ifr.ac.uk and in print format. It reflects our science discoveries, and demonstrates our economic impact. The newsletter addresses a wide stakeholder-base. If it isn't suitable for your needs, please contact us

'IFR in the City'

Dame Deirdre Hutton, Chair of the Food Standards Agency presented the inaugural lecture in IFR's new outreach programme, IFR in the City. She delivered the Read Lecture, "Does Food Science Make Your Mouth Water?", as part of National Science Week, to an enthusiastic and appreciative audience of more than 150 at the Assembly House in Norwich.

Over a 40 year period, Bryan Read had a distinguished career in milling and the grain industry, and gave extraordinary service to science management. We were delighted that Bryan and several members of his family were able to join us, together with two former Directors of IFR.

Contact: David White



Dame Deirdre Hutton

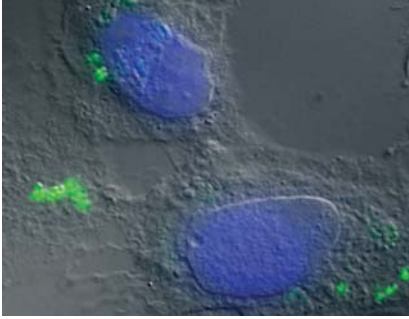


Questions from the floor



A vital link in the food chain

ifr.ac.uk



Infected human epithelial cells [DIC phase image; grey - human epithelial cells; blue - nuclei; green - invading *Salmonella*] (Image by Isabelle Hautefort, IFR)

Jay Hinton's team, in collaboration with microbiologists at the Max Planck Institute for Infection Biology, have discovered how *Salmonella* uses a surveillance loop to respond quickly to stress in its bacterial membrane or "skin", allowing it to adapt rapidly to a multitude of harsh environments.

Surveillance loop stops *Salmonella* getting stressed out

To infect its host, the bacterium must survive a range of extreme conditions from strong acids in the stomach, to anaerobic and salty environments in the intestine. The bacterium adapts to these conditions by changing the composition of its outer "skin" by inserting outer membrane proteins (OMPs) that regulate transport of salts and allow it to communicate with its environment. However, if too many OMPs are produced, the microbe becomes extremely stressed. They found that *Salmonella* avoids this problem by using a surveillance loop to constantly monitor OMP levels and is able to switch off OMP

production quickly using molecules called small RNAs (sRNAs). These bind to and block the molecules responsible for OMP production.

A better understanding of how *Salmonella* copes with stress will lead to new ways of fighting and preventing infections.

Contact: Jay Hinton

Funding: BBSRC Core Strategic Grant

Further reading: Papenfort et al. (2006) σ E-dependent sRNAs of *Salmonella* respond to membrane stress by accelerating global omp mRNA decay. *Molecular Microbiology* **62** 1674-1688

When *Salmonella* becomes overly-sensitive

Salt not only acts as a flavour enhancer, it also acts as a preservative, protecting food against pathogenic bacteria such as *Salmonella*. Commonly, food manufacturers use two or three preservatives in combination to ensure the quality and safety of our food.

IFR scientists have found that although both acetic and lactic acid induce acid resistance in *Salmonella* Typhimurium, the two acids produced differing secondary effects. Acetic acid also enabled *Salmonella* to survive in a high-salt environment, but lactic acid exposure increased salt sensitivity. The fact that lactic acid-treated *Salmonella* are hypersensitive to oxidative stress raises the exciting possibility of "rational design" of processes to kill bacteria for the food industry. Our functional genomic approach could be used

to discover whether any food processing hurdle can generate cross-sensitivity or cross-resistance in bacteria.

Contact: Tim Brocklehurst & Jay Hinton

Funding: BBSRC Core Strategic Grant

Further reading: Greenacre et al. (2006) The lactic acid-induced acid tolerance response in *Salmonella enterica* serovar Typhimurium induces hypersensitivity to hydrogen peroxide. *Applied & Environmental Microbiology* **72** 5623-5625

Greenacre E. J. & Brocklehurst T.F. (2006) The acetic acid tolerance response induces cross-protection to salt stress in *Salmonella* Typhimurium. *International Journal of Food Microbiology* **112** 62-65

New books

The GM Debate: Risk, Politics and Public Engagement

The UK Government sponsored a debate about the possible commercialisation of genetically modified crops in 2002-3. IFR's Gene Rowe was heavily involved in evaluating the process and is a significant contributor to this recently-published book, which provides a unique and systematic account of the debate.

Horlick-Jones, T., Walls, J., Rowe, G., Pidgeon, N., Poortinga, W., Murdock, G. & O'Riordan, T. (2007) ISBN 978-0-415-39322-5, Routledge

Managing Allergens in Food

Controlling allergens in food is a matter of increasing importance for the food industry, especially in light of recent legislation. Clare Mills is lead editor of *Managing Allergens in Food*, an essential reference for producers, manufacturers, retailers and all those wishing to improve safety in the food industry.

Mills, E. N. C., Wichers, H. & Hoffman-Sommergruber, K. (2006) ISBN 1 84569 028 1 Woodhead Publishing Ltd, Cambridge



Exploitation Platforms in the Spotlight

Our commercially-driven science areas are being developed with the support of external Business Partners. The first four 'EPs' were launched in 2005, with a further two in 2006. Although a recent development, the Platforms are showing increasing commercial success and a steady stream of patents is emerging. Over the next two or three years we will be hoping to launch a number of spin-out operations and new IFR subsidiaries.



The Model Gut

Technology Platforms

... are based around discrete technologies which have originated from our mainstream programme. Largely with external funding these technologies are being developed to the proof-of-principle stage, at which point new start-up companies will be formed or the inventions licensed to third parties. The two in this category are the **Model Gut**, headed by Dr Martin Wickham, and **MRI**, based around a portfolio of novel applications of magnetic resonance imaging for use in on-line quality inspection and for medical applications. MRI is headed by Dr Brian Hills.

Applied Science Platforms

... are aimed at exploiting our science for the benefit of a range of stakeholders (e.g. industry, DEFRA, EU) and operate in a 'conveyor belt' mode, linking basic science to real-world applications. The aim of **Sustainability of the Food Chain** (Dr Keith Waldron) is to exploit food-chain residues and co-products and provide commercial opportunities. By understanding the molecular basis of plant structures the EP will invent new approaches for disassembly and create novel and marketable ingredients streams. The aim is to ensure total co-product exploitation, ensuring that methods developed are acceptable in relation to legislation, consumer and safety issues. The most recent funding stream is from DTI to address 'Functional peat replacement made from composted food processing waste'.

Launched in 2006 by Professor Tim Brocklehurst, the **Microbial Ecology** Platform focuses on food safety microbiology, food spoilage and food decontamination and on the bio-conversion of food waste streams using beneficial microorganisms. Current research projects are funded by government, industry and the

European Union. All of the projects are built on the Platform's extensive knowledge and skill base in microbial ecology and are examples of underpinning research combined with innovation leading to application.

The two platforms have recently received EU funding for work on 'Nutritional and structural design of natural foods for health and vitality'.

National Resource Platforms

... IFR is the proud home for the National Collection of Yeast Cultures (NCYC), a valuable national resource. **NCYC** has also established itself as an Exploitation Platform to make its services more widely available and to offer commercial yeast identification services; the supply of fully authenticated yeast cultures for both challenge-and product-testing; rapid and precise identification services for contaminant yeast strains by DNA sequence analysis; and commercial safe-deposit services for yeast cultures. NCYC maintains a strong link to basic research and looks to contract research on both a short- and long-term basis resulting from exploitation of novel yeast strains in industrial innovation. NCYC is headed by Dr Ian Roberts.

..., **Food Databanks** under Paul Finglas is our sixth Exploitation Platform, to manage the UK food composition database and related activities in close co-operation with the Food Standards Agency. It will further develop and exploit specific European Food Information Resource (EuroFIR) Network of Excellence outputs including databank systems and software to deliver food composition information (including labelling) to a variety of users including industry, consumers and regulators.



NCYC publicity

Food & Health Network Update

Although Exploitation Platforms (see 'spotlight') represent our most commercially-driven science and are most-outward looking, all IFR science programmes expect to engage with a wide range of stakeholder and to work with industry to some extent.

In order to improve our effectiveness in communication with the industry sector we established the Food and Health Network and its associated Interest Clusters in 2001. We have developed a new operating plan for FHN for 2007 onwards. FHN will increase our presence at major food events, run regular FHN Conferences across the country and offer FHN Direct as means of exploring possibilities of working with industry. In order to facilitate this process, Professor Tim Brocklehurst has been appointed as the Head of FHN, with continued support from Lesley Swift.



Forthcoming Cluster Meetings 2007

Cluster	Date	Venue	Topic	Information
Allergy	10 May	RHM, High Wycombe	Tools and test-kits what are they telling you	
PRIMA	13 June	IFR, Norwich	ComBase Workshop	www.combase.cc/training.html

To reserve your place on either of the these events, please e-mail - lesley.swift@bbsrc.ac.uk

A series of Food & Health Network Conferences is in the planning stage for venues in Leeds, London and Norwich. More information will be available on these events shortly via the Food & Health Network Website; any enquiries regarding the Conferences should be directed to Lesley Swift.

Contact: Tim Brocklehurst

Web: www.foodandhealthnetwork.com

New on NRP

Preventive Medicine

This Spring sees the launch of a new website for the Norwich Centre for Preventive Medicine. The initiative formalises the active links between researchers and clinicians from UEA's Faculty of Health and Faculty of Science, IFR, the John Innes Centre and Norfolk and Norwich University Hospital.

The Centre underpins the strengths of current NRP research, and emphasises our position as a world leader in this field, with a unique capability for translational research from fundamental science through to patient care.

Website: www.preventivemedicine.nrp.org.uk

Contact enquiries@nrp.org.uk or

tel. +44 (0)1603 450969



Bioactives

The Centre for Delivery of Bioactive Molecules is an initiative being developed primarily between IFR and the School of Chemical Sciences and Pharmacy at UEA. At IFR it draws on the science developed in the Structuring Food for Health programme and the Model Gut Exploitation Platform. It has a broad remit including foods, nutraceuticals and traditional drugs with a unique skill base ranging from colloid and biopolymer science to the design of delivery systems. It has a focus on behaviour in the gastrointestinal tract regarding the design of delivery systems and the study of biodegradation and absorption mechanisms.

For further information contact the convenors: Dr Clare Mills, Head Structuring Food for Health at IFR clare.mills@bbsrc.ac.uk and Professor Duncan Craig, Head of Pharmacy, UEA D.Craig@uea.ac.uk.

Sue joins School of Health

Minerals expert Professor Sue Fairweather-Tait has joined UEA's School of Health and will remain a close collaborator with IFR. We will maintain a nutrition presence, and new appointments are planned in molecular nutrition.

International networking

Claudio Nicoletti recently visited Japan and China, at the invitation of Yakult. He gave 3 talks, at 3 different meetings, on the interaction between probiotics and the gut immune system.

The MD of Yakult China (left), Claudio Nicoletti (centre), Head of Yakult Res laboratory (right)



Paul Finglas gave an invited plenary talk on "New Trends in food science and technology: a European perspective from the food quality and safety thematic programme in FP6 and FP7" at Congreso Internacional de Ciencia y Tecnologia de los Alimentos, Cordoba, Argentina recently. He also visited Universidad de Chile, Santiago to discuss collaborative links between EuroFIR and LatinFoods, especially for training exchanges and international harmonisation of standards for food description and data quality assessment systems.

Pradeep Malakar was part of a five-person UK delegation which participated in a two-day scientific Workshop in Zhengzhou, Henan province, jointly funded by the British Council and the National Natural Science Foundation of China. This Workshop, aimed to develop a platform for research exchanges between UK and Chinese experts was followed by visits to local academic laboratories and the Shuanghui Corporation pork processing factory. On its return to Beijing the delegation visited the Chinese Centre for Disease Control (CCDC), attended a press conference, and then supported the British Council's Café Scientifique presentation.



French Connection

INRA scientists Dr. Sophie Jeanson and her partner Dr. Didier Dupont are spending a year at IFR funded by Marie Curie Intra-European Fellowships; these aim at providing advanced training tailored to the researchers' individual needs with a view to adding different/complementary scientific competencies. Sophie is working with Claire Shearman on the response of *Lactococcus lactis* to reducing environmental conditions. Didier is working on a project with Alan Mackie to understand why casein is a major food allergen.



Our Mission is

- To undertake international quality scientific research relevant to food and human health
- To work in partnership with others to provide underpinning science for consumers, policy makers, the food industry and academia

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