
Riddet Review

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**New Fonterra
Chair in Human
Nutrition**
Page 3

**Food Structure,
Digestion
& Health
conference
highlights**
Page 7

**Research
on starch
and protein in
extruded foam**
Page 10

Editorial



The Riddet Institute is delighted to welcome Professor Sally Poppitt as the new Fonterra Chair in Human Nutrition based at the University of Auckland. Over the past month Sally has spent time here at Riddet Institute headquarters and at the Fonterra Research Centre in Palmerston North. She will be dividing her time between Auckland and Palmerston North and we look forward to having her as part of the Riddet Institute.

The major event on the horizon is the launch of the Thought Leadership Team's contribution to a national AgriFood Research and Education Strategy. Entitled "A Call to Arms", the document will be released to key government officials and people in the food industry on the 26 July in Wellington. The Thought Leadership Team, comprising Dr Kevin Marshall, Dr Russ Ballard, Dr David Johns and Mr Graeme Avery, have spent two years consulting widely and developing a

considered approach to New Zealand's future research and education needs in the agrifood sector. Commissioned by the Riddet Institute, the final document will be pre-circulated to government ministers and selected food industry CEOs. Invitations to this event will be sent shortly.

Since our last newsletter we have lost two researchers connected to the Riddet Institute. Principal Investigator Professor Andrew

Pullan, former head of the Bioengineering Institute at the University of Auckland, tragically lost his battle with cancer. He was just 48. Also Professor Malcolm Fuller, from New York, was one of our collaborators and was co-supervising a Riddet Institute PhD student at the time of his death, also from cancer. We miss them both. Vale.

Paula McCool
Communications Officer

Experts gather in Switzerland

Post-doctoral Fellow Dr Lisa Te Morenga attended the Fourth Meeting of the WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Diet and Health in March in Geneva as an external resource person.

Dr Te Morenga, who is based at the University of Otago, presented the results of her systematic review and meta-analysis of the literature that has examined the effect of dietary sugars on changes in adiposity (body fatness). This resource has contributed to the formulation of recommendations on sugars, which the WHO is to release shortly. The formulation of the recommendations on sugar took an intensive three days to finalise with lots of debate and discussion around the

quality and importance of the evidence and the most appropriate and defensible wording for the recommendations, as these are likely to face a huge amount of scrutiny by various interest groups once released.

The experts and WHO secretariat members at the meeting learned a lot about best practice for guidelines development using GRADE (Grading of Recommendations Assessment,

Development and Evaluation) processes - a developing tool in the very complex area of nutrition and health. Dr Te Morenga said, "It was also a great privilege to get to know world experts in human nutrition research. I hope in my future career that I will be able to contribute to processes like this!"

Riddet Institute Principal Investigator Professor Jim Mann is a member of NUGAG.

Massey University Medal awarded to Dutch couple

The Massey University Medal has been jointly awarded to Professor Martin Verstegen and Mrs Mariet Verstegen-Spiertz of the Netherlands in recognition of their work in support of agriculture and food science and longstanding connections with Massey.

University Chancellor Dr Russ Ballard presented the medal at a ceremony at the New Zealand Embassy in the Hague on Tuesday. It was attended by about 50 people prominent in food and nutrition science in the Netherlands and hosted by Ambassador George Troup and his wife, Hilary.

Along with Dr Ballard, Massey was represented by staff members Distinguished Professor Paul Moughan and Professor Ravi Ravindran.

Professor Verstegen recently retired from Wageningen University, regarded as the world's

leading agri-food university, after a distinguished 45-year academic career. He is widely regarded as a world expert on human and animal energetics and calorimetry. In addition, he and his wife worked together for many years to encourage and assist the development of young scientists.

The Verstegens' association with Massey began in 1985, when they invited Professor Moughan, now co-director of the Riddet Institute, a national centre of research excellence led by Massey, to take up a residency at Wageningen.

It was the start of an ongoing relationship between the universities. Through the Verstegens' support, more than 100 Dutch interns and postgraduate students have travelled to study at Massey, where Professor Verstegen has been an honorary professor since 2001.

Professor Moughan read the citation at the ceremony. "I cannot think of two more fitting awardees for the receipt of a Massey University Medal," he said. "The Verstegens have been superb champions of Massey University and of New Zealand."



New Fonterra Chair in Human Nutrition expert in clinical studies

Professor Sally Poppitt of the University of Auckland has been appointed to the new Fonterra Chair in Human Nutrition, which is part of the Primary Growth Partnership (PGP) programme between Fonterra and MPI (Ministry for Primary Industries). She will be based within the University of Auckland and the Riddet Institute.



“The Riddet Institute is central to this developing programme, so I plan to divide my time between Auckland and Palmerston North in order to consolidate links both with the Riddet Institute and also the Fonterra Research Centre where the Nutrition theme leader will be based. Clearly dairy is a key area of expertise at the Riddet Institute and so I would expect to be working with Professor Paul Moughan’s team and also other partners within the Riddet’s Centre of Research Excellence including the universities of Auckland and Otago, who have a track record of clinical efficacy studies,” said Professor Poppitt.

The role of the Chair is predominantly research-focused but Professor Poppitt will also be able to maintain a teaching role in the medical and science programmes at the University of Auckland, and there will be a significant postgraduate supervision component. She will also retain her position as Director of the University of Auckland Human Nutrition Unit, a residential nutrition intervention facility.

Professor Poppitt has a particular interest in the mechanisms that underpin appetite regulation and the control of food intake. Her research has also been focused on the prevention and treatment of conditions arising from poor nutrition such as overweight and obesity, and subsequent metabolic dysregulation, and diabetic and cardiovascular risk.

The scope of the new Chair is ambitious. Professor Poppitt said, “The wider role that I have taken on is to provide research

leadership in human nutrition within the PGP programme – and the intent is to build an internationally recognised programme in nutrition that is both scientifically credible and robust, and which underpins and develops Fonterra’s new strategic vision in dairy nutrition. As my expertise is in clinical studies, the programme is likely to have significant focus on establishing clinical evidence to support the role of dairy in maintaining health and wellness.”

In the first three months into her new role, she will put significant effort into developing the research strategy and understanding the areas of nutrition which are of specific relevance and focus within Fonterra following the recent strategy refresh by CEO Theo Spierings. “I will also build an understanding of capabilities within New Zealand and internationally,” she said.

“The PGP provides a unique and major opportunity to develop world class capabilities and innovation in dairy science so it is important that the seeds are set early and the strategy is carefully developed.”

The new role will also generate around 10 or more post doc and PhD positions. “Building capability in New Zealand and strong linkages and collaboration with international colleagues is very important and mentoring of post docs and co-supervision of PhD students is an excellent way to achieve these goals,” she said.

Originally from Cambridge in the United Kingdom, Professor Poppitt has been at the University of Auckland for more than 10 years.

World expert on functional foods becomes part of the Riddet Institute network

Professor Manohar Garg has been appointed a Resident Fellow (part-time) at the Riddet Institute. Professor Garg is based at the University of Newcastle in Australia and his research has mainly focused on the role of nutraceuticals, functional foods and dietary supplements. He has a background in biochemistry, human nutrition and dietetics.



Starch research receives Japanese award



Research Officer, Dr Jaspreet Singh, has received the FOOMA JAPAN 2012 Academic Plaza Award.

Dr Singh's work on the development and characterisation of novel food microstructure to control digestion of starch formed part of FOOMA JAPAN 2012 in early June in Tokyo, an international food machinery and technology

exhibition. Around 85 researchers exhibited their work in the Academic Plaza and Dr Singh's work was selected as the best of 20 international submissions from China, Korea, Finland, USA, Canada and many other countries.

Riddet Institute co-director Professor Harjinder Singh said, "The award confirms the Riddet Institute's reputation for excellent research and that we are truly competitive with other major research institutes around the world."

Science mission to India



A New Zealand delegation of three Ministry of Science and Innovation (MSI) officials and five scientists, including Riddet Institute co-director Professor Harjinder Singh and Dr Jaspreet Singh, travelled to India in May to participate in official discussions and scientific workshops aimed at promoting bilateral scientific collaboration.

Award for Co-director



Distinguished Professor Paul Moughan was presented with the Massey Research Medal - Individual, at Massey University's Defining Excellence Awards on Wednesday 21 March in Wellington. Professor Moughan has had a successful career over 30 years at Massey.

Associate Investigator involved in kiwifruit 'health halo'

Riddet Institute Associate Investigator Dr Juliet Ansell led a commercially funded research programme for ZESPRI Group International in alignment with their 'Health and Nutrition' strategy uncovering the prebiotic potential of whole GREEN and GOLD Kiwifruit. This large research programme was a collaboration between Plant & Food Research, AgResearch and IRL with invited expert review by Professor Gerald Tannock (a Riddet Institute Principal Investigator) and Professor Glenn Gibson.

The programme integrated traditional physicochemical investigations with prebiotic research (microbial ecology and metabolism in response to foods), mucosal immunology and carbohydrate chemistry. This enabled the team to analyse the chemical changes to the kiwifruit carbohydrates during fermentation to close the circle on substrate usage; degradative enzymes possessed; microbes present; and microbial by-products produced. Several outputs with

relevance for gut health have now resulted from this work, which ZESPRI intend to use to promote the health halo around consumption of fresh whole kiwifruit.

Dr Ansell has also been selected as an invited expert for the 10th International Scientific Association for Probiotics and Prebiotics (ISAPP) to be held in Cork, Ireland this year. ISAPP is an independent group of



scientists that discusses recent progress in the fields of probiotics and prebiotics with relevance to legislation and commercial considerations. They produce definitions and lobby regulatory bodies.

She has also been invited by the ANR (French National Research Agency) to act as an expert reviewer in the 'Sustainable Food Systems' portfolio.

Research examines the motivations behind functional food choice by older adults in Singapore and China

Qualitative research is relatively new to the food industry, and research being conducted by Riddet Institute PhD scholar Heather Bunting aims to use this methodology to study the major factors motivating food choice and preferences in the realm of functional foods.

Since the early 1990s, new forms of food products have emerged in an attempt to bridge the gap between food and medicine and functional foods have been defined as a new category of food products, which by either nature or design, have been marketed as having specific health benefits above and beyond that of their basic nutritional value.

Ms Bunting says, "There is a drive to understand the physiological effects nutrition may have on the reduction of chronic disease mechanisms. For example, margarines and spreads containing plant stanol and sterol esters, and pro and prebiotic cultures added to yoghurt and dairy products are just some of an ever-increasing number of products introduced to the market enabling consumers to actively take responsibility for their health.

"But research specifically evaluating the understanding and experience of functional food use in at-risk subgroups of the population appears to be scarce, and the use of qualitative methodological techniques to gain an understanding of the knowledge and use of functional food in specific subgroups of the population is largely absent from previous scientific literature. Therefore my research aims to fully conceptualise, within context, how older adult consumers (those more at risk from chronic disease) and healthcare professionals understand functional and bioactive food ingredients within the context



From left, Professor Kerry Chamberlain, PhD scholar Heather Bunting, and Dr John Grigor.

of health, culture and their daily lives. If we are able to more accurately understand the major drivers behind patterns of food choice and consumption, this holds a number of implications for the marketing of such functional food products within industry."

In addition to focusing upon the older adult consumer sector, this research also aims to capture the impact that culture may have upon the decision to purchase bioactive food products. The rapid expansion of the Asian marketplace in recent years, together with an ageing society and increased and personal accountability for health suggests that it is necessary to understand where functional food products fit within the food industry at an international level. Ms Bunting's research therefore aims to capture the understandings of older adults in both Singapore and China in an attempt to map the future directions for functional foods within the international food industry.

Ms Bunting says that historically, consumer understandings and perceptions surrounding

functional foods and bioactive ingredients have predominantly been rooted within quantitative methodology, with the limited number of qualitative research studies appearing both limited and vague. "Research to date has primarily drawn sample groups from the whole adult age spectrum, but this research project draws samples from the older adult sector, and is specifically designed to reveal motivations behind food choice and recommendation within this consumer group."

The research will be used to establish an evidence base within functional foods and bioactive food ingredients, specifically within the context of an ageing population and those consumers more likely to purchase products specifically marketed as having health benefits.

The project is part of the Riddet Institute's Centre of Research Excellence Platform 4 programme and Ms Bunting is supervised by Professor Kerry Chamberlain and Dr John Grigor at Massey University.



Visiting Canadian Scientists run workshop on Colloidal Particles

Professor Douglas Dalgleish and Professor Milena Corredig from the University of Guelph ran a workshop on colloidal particles over two weeks in Palmerston North in February. There were 35 attendees from universities, Crown research institutes and industry and the focus was on colloidal particles, their properties, and their function in creating food structure. The Riddet Institute was very fortunate to have two such highly prominent international specialists in this area deliver this intensive course.



Food Structures, Digestion & Health conference highlights

The Riddet Institute's international conference, Food Structures, Digestion & Health, held in March in Palmerston North, has been acclaimed as setting the direction for food research and development for the next 20 years. The conference was devoted to the unique and challenging interface between food science and nutrition and brought together scientists across several disciplines to address cutting edge research issues.

Professor Mark Wahlqvist, from the National Health Research Institutes in Taiwan and a Fellow of the Royal Australasian College of Physicians, said the conference was groundbreaking. "I was here at a conference on dietary fibre in the 1970s, and that changed thinking throughout the food industry internationally. This conference is going to have a similar ability to reform current thinking on how researchers can work together across disciplines linking the science of food structure and not just its components, to sustainability and health. This understanding has been missing from food and health policy until now....."

Professor Wahlqvist has an international reputation as a leading physician and is a member of the Riddet Institute Scientific Advisory Panel.

The conference attracted over 150 delegates from more than 19 countries as far away as Russia, Portugal, Spain, France and UK, who gathered together to gain more understanding of how food structures change as they transverse the entire gastro-intestinal tract. This knowledge will enable the design of a whole new generation of foods with enhanced health and sensory attributes.

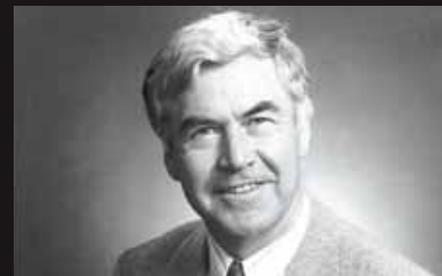
Chairman of the Conference Organising Committee Professor Harjinder Singh said, "This conference provided a unique opportunity to bring together the science of human nutrition and food. New knowledge in this interface between food science and nutrition is vital to the international food industry, and building research capacity in this area will allow the design of a new generation of foods with enhanced health and sensory attributes."

Selected papers from the conference will be published next year in book form.





Vale to two friends of the Riddet Institute



We have lost two stalwart friends of the Riddet Institute. The following tributes show how much these two men were part of our lives at the Riddet Institute.

Dr Malcolm F Fuller

The Riddet Institute records with sadness the death of Dr Malcolm Fuller, scientific colleague, collaborator and friend and a long-time supporter of the Institute.

Dr Fuller had a stellar scientific career publishing some 250 scientific papers and two text books. He was a world renowned expert on mammalian protein metabolism, having graduated MA and PhD from Trinity College, Cambridge. His scientific prowess was recognised by Cambridge University by the award of ScD, the highest degree awarded by a university and given for distinguished contributions to science. Professor Moughan, Co-Director of the Riddet Institute, commented on Malcolm's formidable intellect and inventiveness. "One could be assured, that a Malcolm Fuller scientific paper would always be based on insight, an inspired hypothesis coupled with an ingenious experimental design, he never published what might be called rote papers. Malcolm made a huge contribution to knowledge in his chosen field and will be greatly missed".

Upon his retirement from the Rowett Institute, Scotland in 1998, Malcolm ran a boat-repair business in Stony Brook, New York leaning on his talent for craftsmanship particularly with wood, but also remained active in science and held a research position at New York University,

Stony-Brook. At the time of his death he was involved in a number of Riddet Institute programmes and was Co-Supervisor of Warren Miner-Williams's PhD project investigating the nature of protein secretions into the human gut. The Institute extends its deepest sympathies to Malcolm's wife, Dr Margaret McNurlan.

Tribute to Dr Malcolm Fuller from Dr Warren Miner-Williams

Malcolm Fuller was my co-supervisor throughout my PhD studies, determining the protein composition of endogenous losses in the human gut. He was a very intelligent and enthusiastic supervisor who assisted me not only in drafting a number of the papers that we published; he also assisted with the analysis of data and to clarify the statistics required. Malcolm knew how to cut through my verbosity and clarify the arguments and conclusions necessary for publication. Although Malcolm lived in the U.S. he came to New Zealand on a number of occasions and met with me and over the years, through the internet, he was never far away. When things were not going to plan and falling apart, with thoughts of giving up, Malcolm encouraged me to keep going. When Malcolm was ill himself, enduring cancer therapy, he still wrote encouraging e-mails and offered his assistance.

I was very lucky, and privileged, to have such an eminent scientist as Malcolm as my supervisor.

Researcher appointed to expert panel

In May Senior Research Officer Dr Shane Rutherford was invited by AOAC INTERNATIONAL in Maryland, USA, to be a member of the stakeholders' panel on infant formula and adult nutritionals (SPIFAN). The panel's role is to discuss the issues around determining the whey protein:casein ratio in infant formulas.

The May meeting was in response to new regulations in China that dictate that the whey protein:casein ratio in infant formulas must be at least 60:40. A call for analytical methods will now go out and a working group co-chaired by Dr Rutherford will assess the suitability of those

methods for determining whey protein:casein ratios.

The next meeting to evaluate a suitable method will take place in Rockville, Maryland from June 18-22.



Riddet Institute Degree Completions January to June 2012

PhD Visaka Anantawat (Massey University)
MSc Arnab Sarkar (Massey University)

PhD Warren Miner-Williams (Massey University)
MSc Minako Kataoka (University of Otago)



Professor Andrew Pullan PhD FRSNZ

Andrew graduated with a PhD in Engineering from the University of Auckland in 1988 was a former head of that university's Department of Engineering Science. He specialised in mathematical modelling of biomedical structures. Below is a tribute to him as a supervisor from Riddet PhD scholar Tim Angeli.

Tribute to Andrew from PhD scholar Tim Angeli

"I first met Andrew at the airport in Jackson, Mississippi in 2009. I had been accepted for a PhD position with him, and, while waiting for my visa and immigration paperwork to be approved, I had volunteered to join a member of his NZ research team conducting a study in Mississippi. Andrew flew into Jackson for a short visit to see the facilities and meet with our collaborators there. His trip turned into a travel nightmare with flight delays and cancellations, but when I picked him up from the airport he was as energetic as ever. I was greeted with a kiwi, "g'day, mate", handshake, and vibrant description of the travel adventure that had turned his Auckland to Jackson journey into a multi-day affair. Without further ado, we were on our way to a whirlwind 24-hours of work before dropping him at the airport to return to Auckland. From that first meeting on, I knew that Andrew and I would get on well. I figured that any person that was willing to fly halfway around the world for 24-hours of necessary meetings and studies was someone that I would forever respect and be happy to work with.

Andrew soon became like a father to me, setting me up with the PhD position in his research group and helping me get settled into life in New Zealand. I was soon on a first-name basis with his wife and kids, and I

felt like he was as much a friend as a PhD supervisor. The gastrointestinal research group that Andrew led was like a family. We were very close, and he fostered an environment where we all had the means necessary for success. His dedication and work ethic were infectious, and it showed in the group outputs. Grants, publications, and conference presentations were consistently being produced. It was obvious that Andrew had both a clear vision and the dedication necessary to turn that vision into a reality, which further fostered a desire within the entire group to push onwards and upwards, constantly striving for further success. Under Andrew's supervision, I made large strides on my PhD project of mapping the small intestine bioelectrical activity, and within my first year we were well on the way to a productive project, already having achieved a number of accomplishments recognized at international conferences.

On June 25, 2011, everything changed. That is the day that I received an email from Andrew that I will never forget. Andrew had cancer, and not just any cancer, but advanced metastatic melanoma. A quick Google search and a couple of emails exchanged with medical colleagues did nothing to ease the sickness in the pit of my stomach. Andrew's ailment was worst case scenario. Nonetheless, Andrew fought, and like everything Andrew ever did, he gave it everything he had. I knew that if anyone could survive this situation, it would be Andrew. However, even Andrew could not beat cancer. In early March, 2012, we lost Andrew. He was so much to many, a husband, a father, a professor, a supervisor, a colleague, a collaborator, a friend. The void that Andrew left will never be filled, but for me, I am determined to carry on Andrew's legacy through hard work, determination, and the mentality that anything short of perfection is not good enough. I am sure that is what he would have wanted.

Recent Papers

Below are ten recent papers from Riddet Institute researchers. Copies of these papers can be obtained from Ansley Te Hiwi, a.tehiwi@massey.ac.nz.

Bagga, P., **Brisson, G.**, Baldwin, A., and **Davies, C.E.** (2011 online). Stick-slip behaviour of dairy powders: Temperature effects. *Powder Technology*, 223, 46-51.

Beltrand, J., Soboleva, T.K., **Shorten, P.R.**, Derraik, J.G.B., Hofman, P., Albertsson-Wikland, K., Hochberg, Z., and Cutfield, W.S. (2012). Post-term birth is associated with greater risk of obesity in adolescent males. *Journal of Pediatrics*, 160(5), 769-773.

Bordoloi, A., **Kaur, L.**, and **Singh, J.** (2012). Parenchyma cell microstructure and textural characteristics of raw and cooked potatoes. *Food Chemistry*, 133, 1092-1100.

Bordoloi, A., **Singh, J.**, and **Kaur, L.** (2012). In vitro digestibility of starch in cooked potatoes as

affected by guar gum: Microstructural and rheological characteristics. *Food Chemistry*, 133, 1206-1213.

Gallier, S., and **Singh, H.** (2012). Behavior of almond oil bodies during in vitro gastric and intestinal digestion. *Food and Function*, 3(5), 547-555.

Jumongpon, R., Chaiseri, S., Hongsprabhas, P., Healy, J.P., Meade, S.J., and **Gerrard, J.A.** (2012). Cocoa protein crosslinking using Maillard chemistry. *Food Chemistry*, 134(1), 375-380.

Monro, J.A., Paturi, G., Butts, C.A., Young, W., De Guzman, C.E., McLachlan, A., **Roy, N.C.**, and **Ansell, J.** (2011 online). Prebiotic effects of fermentable carbohydrate polymers may be modulated by the faecal bulking of non-fermentable polysaccharides in the large bowel of rats. *International Journal of Food Science and Technology*, 47(5), 968-976.

Paturi, G., Butts, C.A., Stoklosinski, H., and **Ansell, J.** (2012). Effects of early dietary intervention with a fermentable fibre on colonic microbiota activity and mucin gene expression in newly weaned rats. *Journal of Functional Foods*, 4(2), 520-530.

Rutherford, S. M., Chung, T. K., Thomas, D. V., Zou, M. L. and **Moughan, P. J.** (2012). Effect of a novel phytase on growth performance, apparent metabolizable energy, and available of minerals and amino acids in a low-phosphorus corn-soybean meal diet for broilers. *Poultry Science*. 91, 1118-1127.

Tannock, G.W., Wilson, C.M., Loach, D., Cook, G.M., Eason, J., O'Toole, P.W., Holtrop, C., and Lawley, B. (2012). Resource partitioning in relation to cohabitation of *Lactobacillus* species in the mouse forestomach. *ISME Journal*, 6(5), 927-38.

Dispersing starch and protein in extruded foam



Riddet Institute PhD scholar Ms Lakshmi Madinani is exploring how protein is dispersed in extruded foams containing starch, and how the distribution of starch and protein is affected by high pressure CO₂ injection and varying shear. The work is being carried out at the Institute of Food, Nutrition and Human Health at Massey University, under the supervision of Allan Hardacre, Richard Love and Dr Nigel Larsen (Plant & Food Research).

Extrusion is a very common high temperature, high shear, short time cooking process that is used to make low moisture expanded snacks, usually from starch rich cereal flours. One example of an extruded food familiar to many is “Cheezels”.

Ms Madinani’s project is aimed at finding ways to improve the texture of extruded foods made at high protein levels. It is expected that a combination of choice of protein type and gas injection into the extruder barrel will offer the best route to develop expanded pellets containing high levels of protein with

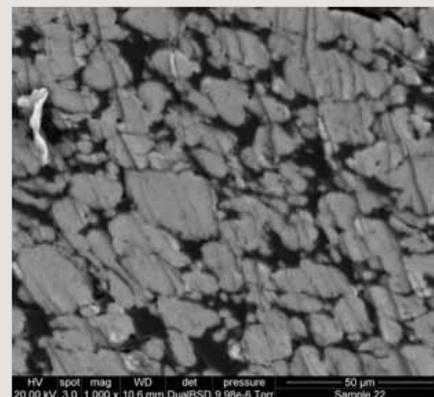
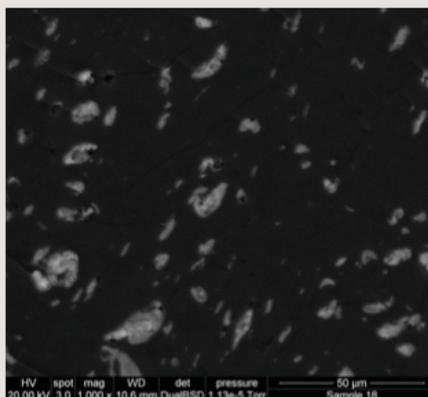
improved structure and sensory qualities.

The structure of the snack matrix varies greatly with the ingredients and the degree of processing. When the protein to starch ratio in the melt is about 1:1 it becomes more difficult to make low density foams with a fine, uniform bubble structure, the reason for this is not fully known but it could be competition for water or the uneven distribution of protein and starch.

Scanning electron microscopy (SEM) in back scattered electron mode (BSE) of iodine

stained extruded pellets show the protein as well contrasted lighter regions on the image and starch as darker regions (Figure 1 A,B). These images also show that starch and protein are immiscible in extruded snacks and starch-rich and starch-poor regions were clearly defined for a range of protein types. Increasing mixing in the extruder by increasing shear generated by more ‘aggressive’ screw profiles or by injecting CO₂ gas into the barrel has little effect on the sizes of the starch-rich and starch-poor regions although processing was easier and the pellets were drier. The greatest effect on the distribution of starch and protein in the snacks was due to protein source.

Figure 1: SEM images of extrudates based on rice flour containing various levels of the dairy protein whey protein isolate, WPI895; (A) 0% (B) 60%. The protein (light grey areas) in image A is native rice protein (6%), in all other images the light grey regions represent a mixture of WPI and rice protein.



Pellets made with 60% whey protein concentrate (WPC) that contain small amounts of fat and lactose showed that the protein was incorporated as much larger aggregates within the matrix, compared to WPI (Figure 1B) while the dairy protein MPC

4850 (Figure 3 B) produced a much finer distribution of protein than either of the two whey proteins. Other dairy proteins and soy proteins (data not shown) had distributions of protein aggregates that were similar to those obtained for WPI.

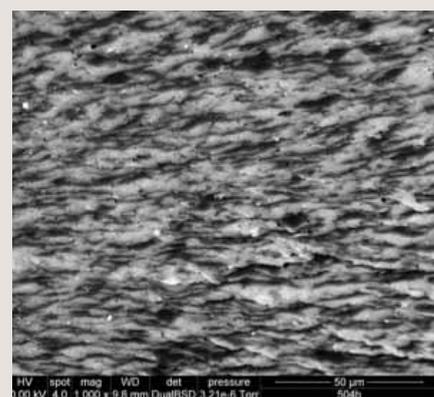
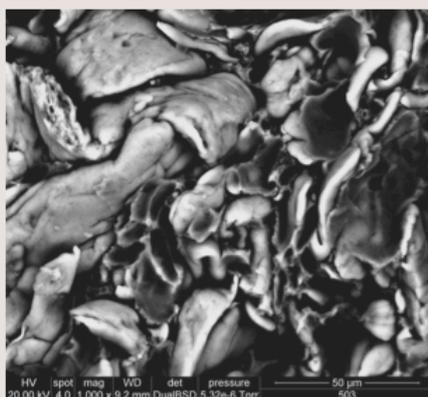


Figure 3: A mixture of 40% of rice flour with 60% of whey protein concentrate (WPC) (A) or 60% of milk protein concentrate MPC4861 (B) extruded under standard conditions. All ratios on a weight basis.



Image analysis was shown to accurately predict the protein content from the area of the lighter regions on the images ($R^2 > 0.99$) and is being further developed to estimate texture from

the numbers of contiguous lighter and darker pixels in the SEM images (Figure 4)

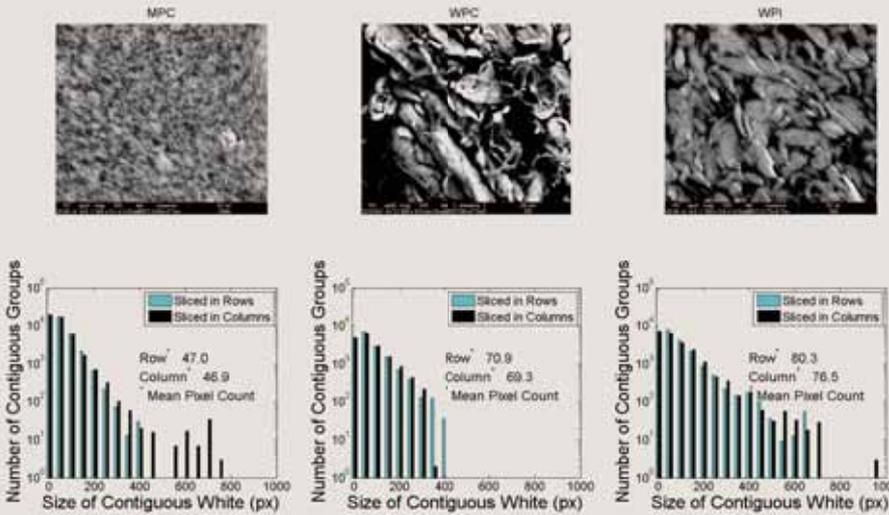


Figure 4. Histogram of the number of contiguous white pixels in the row and column directions for images of three of the protein types at 60% incorporation. This may give information about the directionality of texture in the product. The smaller the mean number of pixels, the smaller (on average) the particles.

Future work will further develop image analysis techniques and will investigate the effect ultrasound energy to improve the dispersion of starch and protein in these products.

Portuguese researcher working on nanostructure

Portuguese researcher Ana Cristina Pinheiro arrived in February for a three month visit and worked with Dr Mita Lad on gastric digestibility of nanostructures using the Riddet Institute's human gastric simulator. Her visit was part of a short term scientific mission of COST (European Cooperation in Science and Technology) action FA1001: The Application of Innovative Fundamental Food-structure-property Relationships to the Design of Foods for Health, Wellness and Pleasure.

The Riddet Institute is part of this COST action and more about it can be found on the website www.foodstructuredesign.net Ms Pinheiro was also a speaker at the Riddet Institute international conference in March this year in Palmerston North.

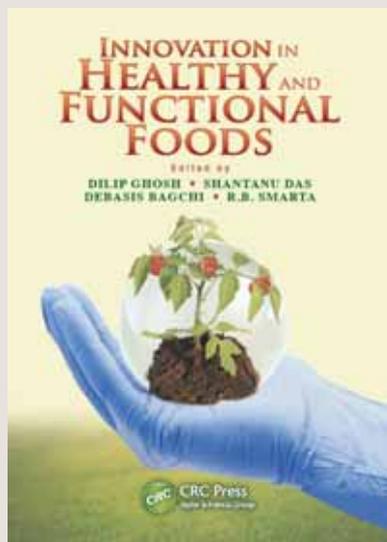


Healthier fruit juice on the horizon

Fruit juice with new functionality is under development at the Riddet Institute. Funded by Frucor and the Ministry of Science and Innovation, the project is being run by post-graduate intern Suman Saha under the supervision of Riddet Institute Food Technologist Arup Nag and Product Development Manager, Dr Shantanu Das. The six-month project finishes in July. Suman completed a research project for a Postgraduate Diploma in Biotechnology last year, while working within the Riddet Institute product development team.



Out Now – new books co-edited by Riddet Institute’s Product Development Manager



Dr Shantanu Das is the co-editor of a new book, 'Innovation in Healthy and Functional Foods' by CRC Press (ISBN: 9781439862674). This book contains 34 chapters covering innovation models, market trends, consumer insights, emerging technologies, selected functional ingredients, the relationship of innovation with other parts of the business, and future trends. Dr Das says, "The inspiration behind this book was the emerging open innovation model in the food industry, especially the leveraging of the research-industry relationship".

Experts from academia and industry around the world have contributed in this book, including Riddet Institute researchers Professor Harjinder Singh, Professor R. Paul Singh, Professor Srikanta Chatterjee, and Dr Ashling Ellis.

Dr Das says, "The book gives an overview of contemporary food innovation and is intended

for a broad audience associated with food and allied industries. I think it will be useful for professionals working in universities and research institutions, in food, nutraceutical and pharmaceutical industries as well as for students studying food technology and food business.

Binding: Hardcover - List Price: \$139.95



Selected Topics in Management with examples from the Food Industry

For the professionals with no formal management training – perspective from a practising manager in food innovation.

This book discusses selected topics in various aspects of management with real life examples from the food industry, especially from innovation and R&D. The examples are mostly based on author's experience gathered over fifteen years in various roles in the food industry. This book is written from a practitioner's point of view and targeted to the people working in the research, development, innovation and related areas in the food industry, especially the professionals without formal management training.

Chapter 1 and 2 discuss aspects of leadership

and management, focusing on the impact of the environment and experience. Examples from various food companies have been presented to explain the concepts. Chapter 3 discusses two contemporary organisation structures - professional bureaucracy and adhocracy with examples from food R&D in industry and academia. Chapter 4 discusses aspects of management communication focusing on two important concepts - communication audit (Chapter 4.1) and community of practice (Chapter 4.2). The concepts have been explained using a scenario of the R&D department in an imaginary multinational food company.

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