Riddet Review

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Riddet Institute
FOOD | INNOVATION | HEALTH

Editorial

It is most satisfying to finish the year with the news that the co-directors of the Riddet Institute have been awarded jointly the Prime Minister's science prize for 2012, which was presented by the Rt Hon John Key at a ceremony at Te Papa on 29 November. This crowning achievement, coming nearly 10 years after the Institute was founded, burnishes the Institute's fine reputation for scholarship and rewards the personal achievements of Professors Harjinder Singh and Paul Moughan.

Other highlights over the previous six months include the student colloquium held in Palmerston North in November, where the energy was palpable; the release of the exciting technology Ferri Pro™, which we believe has great potential to deliver iron into food products; and the Institute's third agri-food summit in Wellington in July where we presented the independent report, "A Call to Arms", that will galvanise the food industry into determining its pathway into the future.

During the period we have also welcomed many important visitors to the Institute, including the Minister for Science and Innovation, Hon Steven Joyce; Sir Ray Avery; a delegation from Korea; Hon David Shearer; Dr Daniel Caldiz from McCain's in Argentina, and many more key people in the food industry.

Looking forward to 2013, the Riddet Institute, along with the other New Zealand Centres of Research Excellence (CoREs) reach the end of their funding term of six years and must rebid for a further term. Much effort must be put into developing the case to Government for continuing to fund the only CoRE that is focused on agri-food research and education.

We wish all our readers a happy festive season and a restful summer break.

Paula McCool
Communications Officer

Principal Investigator says gut microbiota research is changing

Riddet Institute Principal Investigator Professor Gerald Tannock from the University of Otago believes there is a transformation occurring in his field of gut microbiota research. He says, "DNA sequencing studies that amass huge quantities of phylogenetic data associated with bacterial communities in the absence of defined hypotheses are seen as counterproductive and there is likely to be a swing to physiological experiments with cultured bacteria (real experiments). Fortunately, our group has already made this transition and prospects for research in relation to modelling the microbial ecological outcomes associated with modified foods are excellent."

Professor Tannock's insights emerged from a visit to Europe under the auspices of the EU exchange programme REINFORCE-IRSES, led by Professor Patrizia Brigidi of the University of Bologna, Italy. It aims to encourage and support scientific exchange between European and New Zealand universities during a three-year period and funding for New Zealand participants is managed by the Royal Society of New Zealand. Professor Tannock visited programme partners at Wageningen University in The Netherlands, and at Bologna University. He also participated in the biennial INRA-Rowett conference in Clermont-Ferrand, France.

Professor Tannock is also an author of a new paper that is to be published in the journal of the American Society of Microbiology, *Changes in Bowel Microbiota Induced by Feeding Weanlings Resistant Starch Stimulate Transcriptomic and Physiological Responses.*

The paper reports the results of a study using rats as experimental models. Adding starch that could not be digested by the rat to the diet resulted in changes to the abundances of particular bacteria that normally live in the large bowel. This resulted in the production of more fermentation products by the bacteria. These changes in the bowel environment affected the expression of rat genes in the bowel tissue and the biochemistry of the urine. All of these changes were due to altering the bowel bacterial community because germ free rats fed the starch diet did not show any such changes. Adding extra 'dietary fibre' to food changes more than just the bowel environment. Whether all of these changes are beneficial remains to be studied. Modifications to foods with new kinds of supplements for human consumption need to be investigated rigorously so that all physiological outcomes can be predicted.

Riddet Institute co-directors win New Zealand's premier science prize

Distinguished Professor Paul Moughan and Professor Harjinder Singh, world leaders in food protein science, have won the premier science award in New Zealand, the Prime Minister's Science Prize, worth $500,000.

The two professors, whose careers in fundamental and discovery science span over 30 years, have been awarded the prize jointly.

Professor Singh's expertise is in food protein structures and how they interact in food systems while Professor Moughan's work focuses on how proteins are broken down and absorbed in the digestive system, the complex interactions of the gut interface and the resulting physiological benefits. Between them they cover the whole spectrum of food protein science, which is a rare and effective combination.

Working closely together since 2002, Professors Moughan and Singh set up the Riddet Institute, a centre of original research and scholarship, whose science underpins the development of innovative foods that promote health and wellness. In 2007 the Institute was accorded national Centre of Research Excellence status, and is one of seven such centres in the country established within universities to maximise the value of research and research training. The Riddet Institute forms a national (NZ Inc.) network of science excellence across the partners: AgResearch, Plant & Food Research, Massey University, the University of Otago and the University of Auckland.

Since 2003, the Institute has trained 80 postgraduate scholars and 30 postdoctoral fellows, creating a sustainable pipeline of fresh thinkers, who will influence the future of world food research.

"A lot of new ideas and new ways of thinking are generated at the Riddet Institute and graduates take that knowledge out into industry," says Professor Singh.

In addition to their focus on fundamental research, the two co-directors of the Riddet Institute have established strong linkages with the food industry including the Riddet Foodlink network of more than 100 New Zealand food companies interested in food innovation.

Examples of innovation resulting from their work include the development of a highly efficacious probiotic, ProBioLife; establishing the health benefits of kiwifruit, which is giving ZESPRI an edge globally; and a technology that allows high doses of fish oil-derived omega-3 fatty acids to be added to food products without a fish smell and aftertaste.

Fonterra has also commercialised a number of products and processes that build on their work.

Other recent innovations include developing a novel process to isolate proteins and peptides in low cost meat waste for use in a food product that has been shown via human clinical studies to have health benefits for older people. The product is being commercialised by a New Zealand meat company.

The Riddet Institute will use the prize money for on-going research to commercialise its own discoveries.

"We have a lot of bright minds that come up with really good ideas," says Professor Moughan. "The prize money will allow us to screen those ideas and take the most promising through to the next stage.

"Food is New Zealand's biggest industry and there is a great opportunity to leverage it further through advanced scientific understanding to grow the economy and improve our standard of living. We are privileged to be at the heart of that opportunity."

Professor Paul Moughan with Prime Minister John Key and Anne Singh, who accepted the award on behalf of Professor Harjinder Singh.

Senior scientist still enthused about problem-solving

Dr Derek Haisman is unequivocally the Riddet Institute's elder statesman. And at 85, he shows no sign of relinquishing his passion for food chemistry, revelling in the satisfaction he gets out of solving problems brought to him by food companies around the world.

From mushy peas to instant soups to fizzy milk, Dr Haisman has worked on some of the most fascinating byways in food science.

Born near Durham in northern England, Haisman came from what he describes as a humble background. His father was in the air force and he says there was little money for luxuries and that included any higher education. So he left school at 16 to pursue a career in landscape gardening. After two years of what he calls a very enjoyable job, he was called up into the army near the end of World War II.

"I was put into the Intelligence corps and spent most of my time interrogating German soldiers in Italy and Austria. I was only 18 at the time and I don't think I did a very good job but I did enjoy being abroad. Being in the forces was about the only way people got to go abroad in those days.

"Later, when the war in Europe was over I was moved into the Education corps where I helped soldiers being demobbed to get into careers and into universities. It was during this time I thought I could also better myself and so I actively looked at opportunities," he said.

"Eventually I applied for veterinary school at Edinburgh. I didn't get in, and I always maintain it was because I didn't play rugby. I knew that they were looking for more rugby players at the time!

"So I turned to night school as a way of becoming professionally qualified as a chemist, and at the same time I took up work at the Washington Chemical Co, a company that made 'milk of magnesia'. They precipitated the magnesium out of seawater at Sunderland on the coast. There was a large vat that filled up at high tide. Lime was then added and the precipitated magnesium hydroxide was taken back to the factory where we also made a range of lime products and specialty cements."

After this, Haisman joined Procter & Gamble, a soap factory on the banks of the Tyne. "It was the era of the 'detergent revolution'. Persil was being turned into a powder to replace soap blocks, which got around the problems of soap scum and having to use animal fat.

"I remember there was a traveller trying to sell this fluorescent dye that he claimed would whiten clothes if incorporated into the detergent. He tried very hard to convince companies that it worked and eventually Unilever found it did work, and patented it. Procter & Gamble then tried to copy it. It took us five years to break Unilever's patent. To do this we made hundreds of fluorescent dyes and proved that they varied in properties and in their ability to whiten. One dye actually turned everything brown! Eventually the case was settled out of court with Unilever and P&G was able also to incorporate the fluorescent dyes in their products."

"Another interesting experience was the use of radioactivity in the laboratory and I was sent for training in the handling of radioisotopes. We then used C14 and S35 to measure the kinetics of the formation of soap films and their structure."

In the meantime Haisman studied externally for his Bachelor's degree followed by his PhD at the University of London, graduating with his doctorate in 1958.

"I felt it was now time for me to get out of soap. The industry was full of advertising and I thought I should do something more meaningful, like food research, so I took a job in fruit and vegetable canning research at Chipping Campden in Gloucestershire in the West Country, which is a really pretty part of England.

"At that time, curiously, UK was considered a developing country by the US, and I was on a US lend-lease programme grant to do research into making canned peas from dried peas imported from America. The peas were either turning out very hard or very slushy after canning. My project was to find a middle ground, but I ended up in fact producing the popular 'mushy peas'. Colour was important and we used a food colour called 'Hirst pea-green' named after one of the directors of the research centre."

One of the industry representatives on the governance board of the research association was from Unilever and offered Haisman a job at Colworth House near Bedford. Again the research centre was set in grandeur, as Colworth House was a former stately home.

“At this job I had to find a way of extending the shelf life of fresh fruit and vegetables. But in fact, the project didn’t last that long as it was just before the era of long haul aircraft and shelf life was becoming less important. Then followed a variety of fruit and vegetable projects – another one was investigating what makes chlorophyll break down, so we could understand how to keep vegetables green during the cooking process.”

Work on proteins followed, including how to make soya bean products into meat substitutes and produce soya protein in fibrous form so it could be spun into soya fibres and look like meat. Haisman says, “This method is still used today using soya protein as an extender, mixing it with real meat to make it go further, as in sausages. We also used it to make vegetarian foods.”

“In the early 1970’s we acquired a Weissenberg rheogoniometer and were able to measure the rheology of gelatinised starch at very low shear rates. This was useful for investigations into soup making. The use of laser diffraction to measure particle size had just been invented, and we invested in one of the first Malvern particle sizers. At this time the machine had to be set up and calibrated by hand, but it enabled us to follow the changes in granule size when starches were gelatinised.”

Soups are basically a mixture of carbohydrate, fat and flavour. Unilever is an Anglo-Dutch firm and they wanted to produce reconstituted soups for vending machines particularly in Europe. This wasn’t easy and led to several patents and the launch of “Cup-a-Soup”. First of all, we had to find a way of making agglomerated starch and also spray dried emulsified fat disperse in hot water. We spray dried the fat and starch together and formed a composite product called a “creamer thickener “– this did the trick and the process is still being used today.”

It was about this time that I was sent out to New Zealand to Unilever’s Hastings factory, which was having some difficulties in drying green peas – these were the ones used in the brand ‘Surprise Peas’, which will be familiar to many New Zealanders. I was sent out for six months and while there I met some people from Massey University and was invited to apply for a job at what was then New Zealand’s only food research centre, founded by Professor Mary Earle, the Food Technology Research Centre (FTRC) at Massey University in Palmerston North.

“At FTRC I worked on a patent for puffing dried apple pieces, which landed me a trip to Yakima in Washington State one very cold winter.” This was followed by research into such diverse topics as the acid processing of meat,the texture of yoghurt, the extraction of collagen from mutton flaps, oxygen absorbers in food packaging, and bacterial thickeners for milk.

However, in the 90’s the FTRC was in competition with the Crown Research Institutes, which had been set up by the Government, and eventually Massey University decided to disband the FTRC and put the resources into its Institute of Food, Nutrition and Human Health (IFNHH). The current co-director of the Riddet Institute, Professor Paul Moughan was head of IFNHH at the time, and when setting up the Riddet Institute in 2003 he invited Haisman across to provide some of the practical expertise he foresaw would be required by industry.

“By that time I had dropped my working hours down to two days a week after a long career. That also gave me time to indulge my passion for an outdoor life and gardening. In fact I married a gardener whom I met while we were both working at FTRC.

“The Riddet Institute has also provided a stimulating variety of projects as well as the added pleasure of supervising students. Some of the projects have included chromatographic separation of different sugars, obtained from the hydrolysis of lactose, to get relatively pure galactose; making fizzy milk; and making powdered milk drinks for the Indian market.

The latter project for PepsiCo involved acid milk drinks. “There were problems with discoloration and off-flavour because of the effects of sunlight on milk. We had to use different natural antioxidants to preserve colour and flavour. They were also interested in using oats as a basis for a drink – oats contain betaglucan which is a prebiotic, so I was formulating stable oat milk drinks.

“A recent project for a Chinese company Yashili revolved around milk powder for infants, which needs to be very high in fat and so there were stability issues that needed to be resolved.”

Haisman has also co-supervised a number of students for their MSc and PhD degrees, and together with Dr Mike Boland is currently supervising Master’s student, Sumon Saha, who is isolating fish protein from fish heads, trying to find a better use for them than their current fate of being used for animal food or fertiliser. Haisman laughs when he recalls the day two tonnes of fish heads arrived at the Riddet Institute. “We asked a fishing company for some samples– we imagined we’d get a couple of cartons....”

“The high points of my career – well, I think they are when a new experiment actually works –it doesn’t happen often, but when it does there is huge satisfaction. But generally I love all my work – there are always interesting things going on. I think I’m pretty lucky to still be involved at a time when science is expanding on so many frontiers.”

Institute's third agri-food summit throws back a challenge to industry

"A Call to Arms", an independent report commissioned by the Riddet Institute on the future of New Zealand's agri-food sector, is calling for a joint approach from industry and government to drive the activities needed to treble the value of exports by the sector by 2025.

The report was launched in Wellington in July at the Riddet Institute's third agri-food summit, which was attended by Minister for Primary Industries, Hon David Carter, agri-food industry leaders and senior government officials.

The report contains options on how sector leaders can work together, and argues why industry should lead the strategy implementation work.

Developed by an independent team led by Dr Kevin Marshall, the report was prepared in response to a call by industry senior executives, who challenged the Institute in 2010 at its annual summit to develop a strategy for science and education-led economic advancement of the New Zealand food industry.

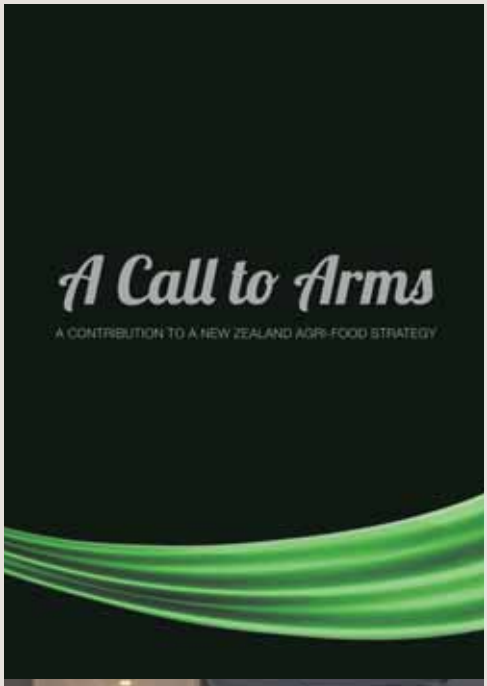
Dr Marshall described the strategies as neither new nor unique, but, in the past, he said, implementation by industry has failed. "Crucially we have provided a pathway and a proposed mechanism for action that will work. There is urgency now, because New Zealand faces a mediocre economic future if we don't drive the major recommendations in this report to fruition.

"Agri-food leaders need to know what to do, how to do it and how to develop the resources they need to do it effectively."

Riddet Institute co-director Professor Paul Moughan said, "New Zealand has unrealised potential in agri-food. But until all key parts of the sector work together in a planned way, New Zealand's economic growth will not be maximised. It's time for action by the agri-food industry and action that has a good chance of success. This is not just another strategy, but a blueprint for action."

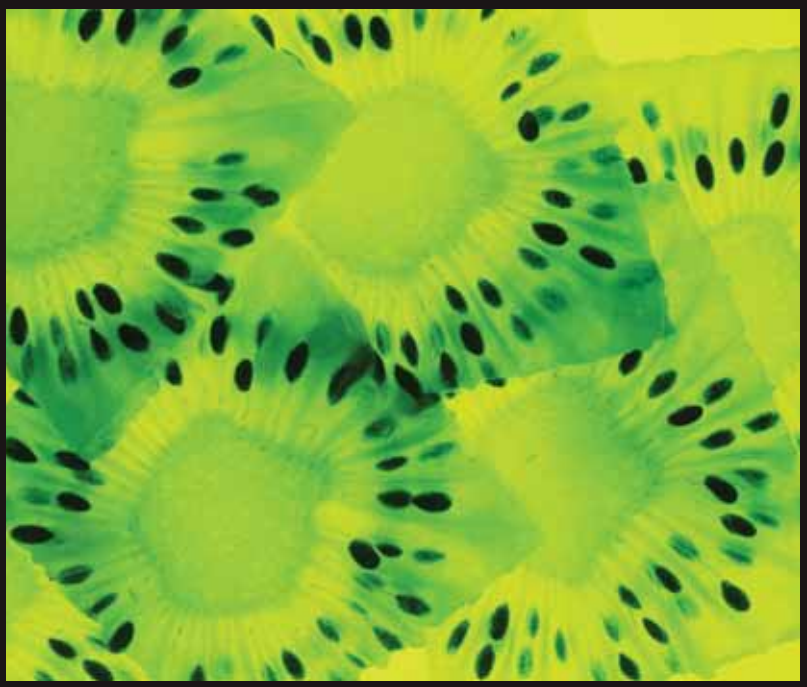
The report was on the agenda at the Primary Industry Chief Executives' Boot Camp in August at Stanford University in California, led by John Brakenridge of the New Zealand Merino Company.

A copy of the report is available from the Riddet Institute website www.riddet.ac.nz



Open Innovation model promoted at Zespri's Momentum Conference

Riddet Institute co-director Professor Paul Moughan and Associate Investigator Dr Juliet Ansell both took part in the Zespri Momentum growers' conference in mid-October in Tauranga.



Professor Moughan's presentation was entitled, "Innovation in kiwifruit: health and nutrition" and described how Zespri's investment in research has allowed it to develop a health value proposition around its product. He pointed out that while New Zealand accounts for about a third of the global volume of kiwifruit exported from the three leading export countries, it captures two thirds of total net market returns.

Professor Moughan said that science has allowed Zespri to associate kiwifruit with healthiness in several ways:

- green kiwifruit is a digestive aid, breaking down protein in the stomach;
- kiwifruit helps in maintaining a healthy gut;
- kiwifruit is an ideal weight-loss food; and
- kiwifruit is a power-packed source of Vitamin C.

Much of Dr Ansell's work at Plant & Food Research centres on showing that kiwifruit fibre has a prebiotic effect, triggering the growth of healthy bacteria in the gut and her presentation, "Kiwifruit and gut health – research update", focused on this.

Professor Moughan went on further to say that that the one team open innovation approach that had been adopted for Zespri's kiwifruit research was a superb model for harnessing the available scientific expertise in New Zealand. This involves regular meetings with senior Zespri marketing and technical staff and the research staff from the Riddet Institute partners.

Awards and honours

Professor Jim Mann

Professor Jim Mann, a Principal Investigator at the Riddet Institute, was presented with the inaugural Himsworth Award at the end of June. The European Association for the Study of Diabetes, and its Diabetes and Nutrition Study Group, conferred the award on Professor Mann in Athens at the 30th International Symposium on Diabetes and Nutrition. The award is in recognition of his research in nutrition and diabetes and his role in founding the study group, 30 years ago, and subsequently supporting it.

Sir Harold Himsworth was a British physician and endocrinologist, who was one of the first researchers to recognise the importance of nutrition both as a potential cause of diabetes, and in its treatment.

Professor Mann is director of the Edgar National Centre for Diabetes and Obesity Research at the University of Otago.

Davide Mercadante

PhD scholar Davide Mercadante is principal author of an article that has led to the cover image on the latest issue of BioPhysical Journal, a prestigious publication published by the BioPhysical Society.

The article is entitled, *Bovine β-Lactoglobulin Is Dimeric under Imitative Physiological Conditions: Dissociation Equilibrium and Rate Constants over the pH Range 2.5 to 7.5,* by authors Davide Mercadante, Laurence D. Melton, Gillian E. Norris, Trevor S. Loo, Martin A.K. Williams, Renwick C.J. Dobson and Geoffrey B. Jameson.

Mercadante has recently submitted his PhD dissertation and has begun looking for a post-doctoral position. His main supervisor is Professor Laurence Melton at the University of Auckland.

Professor Juliet Gerrard

Professor Juliet Gerrard has been elected as a Fellow of the Royal Society of New Zealand.

A Riddet Institute Principal Investigator, Professor Gerrard is based at the University of Canterbury and IRL. Her research interests are focused on proteins and how they assemble and have been applied to the design of novel therapeutics; the assembly of novel materials; and the alteration of food texture.

Dr Juliet Ansell

Dr Juliet Ansell, an Associate Investigator based at Plant & Food Research in Palmerston North has been invited to be on the Board of Directors of ISAPP (International Scientific Association for Probiotics and Prebiotics).

Charith Hettiarachchi

Charith Hettiarachchi at the University of Auckland has had a paper accepted in the prestigious journal, Biomacromolecules. One of his supervisors, Dr Simon Loveday, describes the journal as “very rigorous” and hard to get into. He added: “It’s quite an achievement for a PhD student’s first paper.”

Delivering iron into food products made easy

A new iron delivery system has been invented by PhD student Vikas Mittal and Dr Ashling Ellis. This unique technology is based on the iron-binding ability of proteins to form soluble complexes that can be spray dried into a powder for addition to a very wide range of foods. Iron loadings of 5% have been achieved for the ingredients to date, and further improvements to this are expected. Two types of iron-protein ingredients (under the Ferri-Pro™ name) have been developed by the Riddet Institute.

Dr Ellis said, "The basic principles of metal binding to protein are involved in this technology. The most important features of the ingredients produced are dispersibility and high stability under heating and other processing operations. The ideas emerged from work done by Vikas Mittal for his PhD thesis . "We have tried incorporating Ferri Pro™ into milk, yoghurt and chocolate milk with promising results; however it could also be added to other foods like cereals, snack bars, pasta and spreads. The iron fortification using Ferri Pro™ ingredients has been shown to have little effect on sensory characteristics and shelf-life of these products. In fact the stability of these iron-protein complexes under heat treatment ensures its application to a wide range of food products, including high heat treated beverages. The next steps for us are to further optimise iron loading, do some more sensory work and scale the technology up, so that larger product trials can be undertaken," she said.

The Riddet Institute is undertaking bioavailability trials, to test whether the technology increases iron absorption. This phase will depend on securing further funding.

Iron deficiency is the world's largest nutritional disorder with approximately 1.62 billion people being affected by anaemia. The higher levels of iron needed by the body during the growth phase in pre-school children and pregnant women make them the most vulnerable groups worldwide.

The technology used to produce these ingredients has now been patented and the Institute is looking for commercial partners to take the product to the world market. This invention follows the very successful omega-3 and probiotic delivery technologies that have emerged from the Institute within the past five years.

Australian Synchrotron visit

The Riddet Institute has been successful in its proposals to use Synchrotron time in Melbourne. In October Dr Ashling Ellis and PhD student Devastotra Poddar travelled to Melbourne accompanied by Professor Geoff Jameson, Principal Investigator with the Riddet Institute and Professor Richard Haverkamp of Massey University.

The group is investigating the characterisation of speciation of manganese in probiotic lactobacillus bacteria using x-ray absorption spectroscopy (XAS) facilities available at the Synchrotron.

Lactobacillus sp. accumulates large amounts of inorganic manganese, which may provide a defence against oxidative damage. *Lactobacillus paracasei* was immobilised in a dairy matrix to stabilise the probiotic bacterium, and the matrix was subjected to varying levels of stress. High relative humidity resulted in increased rate of bacterial death and the use of the synchrotron was used to determine oxidation states and coordination geometry of the manganese ions, structural changes in the manganese environment under different levels of oxidative stress, and uniformity of the manganese environment.

The team was unable to observe differences in the manganese compounds present in live and dead bacteria, which supports the results of previous studies.

Mr Poddar returned to Melbourne with Professor Jameson in early December to look in further detail at his samples using the x-ray fluorescence microprobe (XFM) beam time. He also attended a user meeting at the Australian Synchrotron at the end of November and presented a poster about his work.

Results have suggested that storage conditions and changes to bacterial viability of various probiotic encapsulates do not alter the oxidation state and speciation of manganese in a way that might be harmful for human consumption.

FAO Report takes a new look at protein quality

Professor Paul Moughan, co-director of the Riddet Institute, chaired the FAO Expert Consultation on Dietary Protein Quality held in Auckland in March 2011. The Consultation has proposed a new method for assessing the quality of dietary proteins. Once adopted, it will replace the currently used PDCAAS method.

The new method is partly based on a body of scientific work conducted by the Riddet Institute. The ability of a protein to meet the amino acid requirements of an infant, child or adult human is referred to as its protein quality. Professor Moughan said: "Not all proteins are equal nutritionally, some having higher rates of amino acid absorption from the digestive tract and amino acid patterns more closely matching the physiologically required patterns of amino acids. Some foods may have high protein contents, but this doesn't mean that the protein will be well used by the human consumer. Protein quality describes digestibility, availability and post-ingestive utilisation of the amino acids, the building blocks that make up the protein."

The FAO Consultation, held in New Zealand, has proposed a completely new method termed Digestible Indispensable Amino Acid Score (DIAAS), for the description of dietary protein quality. The new scoring system relies on measures of true ileal amino acid digestibility and lysine availability. Riddet Institute work over the years has greatly contributed to the development of such sophisticated methods for determining amino acid uptake. DIAAS will allow a more accurate approach to describing dietary protein quality, and will for the first time demonstrate the superior protein quality of food proteins such as meat and milk. The score will also highlight the ability of proteins such as meat, milk, egg and vegetable protein isolates to complement other dietary proteins, by being a rich source of dietary amino acids.

The new method will shortly be published by the FAO, Rome and will be of great practical significance to the meat and dairy industries.

While these findings are important to the general population, they are critical to the nutrition of highly vulnerable groups such as; malnourished children at risk of stunting, those suffering from malnutrition due to food insecurity, seniors, and all patients using supplementary and medical nutrition products.

Riddet Institute's Principal Scientist comments on genetically engineered cow's milk

While the Riddet Institute does not carry out any work in the field of genetic engineering, recently our Principal Scientist, Dr Mike Boland was asked to comment on RNA interference, a process that inhibits the expression of certain target genes, to engineer a dairy cow capable of producing high-protein milk with hypoallergenic qualities.

Work done by researchers using a mouse model has resulted in a 96% reduction of the milk protein beta-lactoglobulin (BLG), a whey component known to cause allergic reactions. The researchers next produced a female calf that was genetically engineered to express the same two micro RNAs used in the mouse model. When lactation was induced, the calf produced milk containing high levels of protein and a dramatic reduction in BLG levels compared with non-engineered calves. In the future, the authors suggest, the methods could potentially serve as an efficient tool to target additional genes and modify other livestock traits.

Dr Boland said, "This is an exciting and interesting piece of work. Beta-lactoglobulin is the major whey protein in bovine milk, making up about half the whey protein or 10% of the total protein in cows' milk. The role of beta-lactoglobulin in the milk of some species has never been properly understood – it does not occur in human milk – and a true purpose of this protein has never been found; yet there are no reports in the scientific literature of bovine milk occurring without it. The fact that these scientists have produced a viable calf that does not produce this protein is therefore scientifically very interesting. Any commercial potential of this knockout is still some distance away. Although the composition of milk from this experimental animal has been shown to be quite unusual, this composition must be viewed with caution, as it was artificially produced (induced by hormones) rather than from natural lactation. It also remains to be seen if this animal is able to breed.

"Beta-lactoglobulin has long been regarded as the major allergen in cows' milk and so a niche opportunity must exist for milk such as this, for use in hypoallergenic infant formulas and the like. The absence of beta-lactoglobulin also has the potential to improve some processing properties of milk. This protein, however, is the main source of branched-chain amino acids in whey, and these are important for muscle metabolism – which is why whey powders are favoured by sports people and body builders. It is also the source of gelling functionality in whey products. And, of course, most people are not allergic to cows' milk. There is therefore not a case for getting rid of beta-lactoglobulin from all milk."

Institute at the forefront of research into the chemistry of the potato

The Riddet Institute continues to be a leader in potato research. A special issue of the journal, *Food Chemistry,* containing the latest research on potato chemistry and edited by three Riddet Institute researchers, has been released by international academic publisher, Elsevier. This is the first time new developments in the field have been gathered together in one publication.

From left: Dr Lovedeep Kaur, Mr Ron Gall (Potatoes New Zealand), Mark Ward, Shaun Slattery (consultant) and Dr Jaspreet Singh.

Dr Jaspreet Singh, Dr Lovedeep Kaur, and Distinguished Professor Paul Moughan have presented a comprehensive presentation of a wide range of research on the chemistry, nutrition and technology of the potato. *"Advances in Potato Chemistry, Nutrition and Technology"* includes contributions on: composition and functional components of potatoes; potato texture measurements; thermal processing and quality optimisation; fried, frozen and dehydrated potato products; the nutritional value of potatoes; organic potatoes; genetic improvement/modification of potatoes for food applications; recent developments in potato starch chemistry; use of potato by-products in industry; and novel methods of characterisation of potato quality.

Dr Jaspreet Singh said, "Potato chemistry and the technologies used to produce potato products play a major role in determining the processing quality and nutritional value of potatoes. Of particular note are several new developments in the area of potato glycaemic index, potato digestibility and the role of potatoes in human nutrition. There is much interest in the latest research from China and India, two of the largest potato producers in the world, as these countries are increasing their consumption of processed potatoes."

Following publication of the journal a delegation of key people interested in potato science visited the Riddet Institute in September. Dr Daniel Caldiz Global Director, Agriculture Research, McCain Foods (Argentina); Dr Lindsay Fung R&D Manager, Horticulture New Zealand; Mr Ron Gall Business Manager, Potatoes New Zealand and Horticulture New Zealand; and Mr Terry Olsen, former Chairman, Potatoes New Zealand and Director, Horticulture New Zealand, met with the Institute's co-directors, General Manager Mark Ward and Drs Lovedeep Kaur and Jaspreet Singh.

Riddet Institute Board member elected President of the International Dairy Federation

Dr Jeremy Hill has been elected IDF President. The announcement was made at the IDF General Assembly during the IDF World Dairy Summit, in November in Cape Town, South Africa.

The IDF is the peak body for dairy in the world, representing the whole value chain from *grass to glass.* Its aim is to provide scientific and technical expertise for its members and to represent the sector at an international level.

Dr Hill, who is currently Director Research, Science, Technology and Development, Fonterra Co-operative Group, has been involved in the work of the Federation for over two decades and has been an IDF Board member since 2002. His new role as President is for a single four-year term, in line with the IDF constitution.

Dr Hill says, "IDF represents 80% of global milk producing nations, including China and India. It has 111 current projects and around 2,000 experts drawn from member nations who work on those projects. New Zealand is very involved in dozens of these."

Four key areas are on Dr Hill's mind. "Members need to be committed and convinced that the organisation is worthwhile, so I want to ensure the work IDF does is relevant and that we get input from the membership on proposed projects; in addition I think there needs to be more globalisation through partnerships; and obviously, the IDF needs to be in a robust financial position in order to carry out all this work; and lastly and very importantly, we need to improve our communications to members, partners and to the public generally about the work of the IDF."

Refreshing the strategy is also an early item on Dr Hill's agenda. "I was heavily involved in development of our last strategy but that was some years ago. Since then there has been a lot of change in the sector which is far more dynamic and global, with a range of significant issues including nutrition; sustainability; food safety; food security; and analytical advances outpacing regulations to name but a few where the sector will need strong support from the IDF."

"Having been involved in the dairy industry in a number of roles along the dairy value chain over the past 25 years, I feel I have a lot of experience to bring to the table."

Dr Hill will continue his role with Fonterra and will remain based in Palmerston North. His next overseas trip as President of IDF will be in February, when he will attend the IDF Board meeting at IDF headquarters in Brussels, Belgium.

Institute to discover high value food opportunities for Marlborough

Mark Ward, the Riddet Institute's general manager, has been asked to prepare a strategy for the Marlborough region to build the international profile of its natural marine and seafood-based extracts and nutrients.

Marlborough Research Centre chief executive Gerald Hope said, "The expertise and overseas connections Mr Ward can offer will help enormously in bringing together a strategy to foster clever and innovative businesses based on Marlborough's fine primary products.

"We want to develop an approach which will elevate Marlborough to be nationally and internationally recognised as a region synonymous with food and beverage innovation," said Mr Hope.

Mr Ward said there is an opportunity for Marlborough businesses to actively pursue a strategy of partnering with science and government at both central and local government level, focusing on innovations within the primary sector, in particular aquaculture and wine.

"Marlborough can aspire to a world leadership role in key areas through accelerating innovation in its unique food and beverage sector. It can lead in natural marine and seafood based extracts and nutrients that promote human health and well being.

"The potential around the marine environment is significant as Marlborough represents 80% of New Zealand's existing aquaculture industry. The region has opportunities for scale from the abundance of natural products and natural waste products, produced and harvested sustainably, in one of the world's most pristine environments."

Mr Ward travelled to Marlborough in mid-December to meet representatives from companies in Marlborough's primary sector.

The work is being funded by the Marlborough Research Centre and is supported by Marlborough District Council to encourage high-value enterprise within the region.

Increased communication with industry in 2013

Next year the Riddet Institute will step up its communication with the New Zealand food industry through its Riddet Foodlink network. General Manager Mark Ward said, "We have to get more engagement between industry and science and education to move the country forward. We will continue to play our part in this."

The existing quarterly newsletter for Riddet Foodlink members will be merged into the monthly e-newsletter that is sent only to the researchers and staff of the Riddet Institute. It will contain more detail on global food trends, commentary on recent scientific papers explaining their relevance to the food industry, and details of IP opportunities offered by the Riddet Institute. A four-page supplement will also be included in the half-yearly Riddet Review, specifically for Riddet Foodlink members, which will contain stories on food companies that use science to create innovative products.

The Riddet Institute celebrates its 10th anniversary in 2013 and is aiming to lift its membership of Riddet Foodlink to 500 food companies.

International KBBE workshop held in Palmerston North

The Riddet Institute played a key role in the three-day International KBBE workshop held in Palmerston North in September.

Australia, Canada, the EU and New Zealand are part of the International KBBE whose activities within the Food and Health theme aim to develop a framework for training and development of early stage researchers and students, and build joint research between established researchers.

Dr Nicole Roy, an Associate Investigator with the Riddet Institute, was one of the workshop organisers and gave two presentations; other Riddet Institute members presenting were Dr Mike Boland (Principal Scientist and Executive Officer); Dr Eric Altermann (Associate Investigator); and Professor Gerald Tannock (Principal Investigator).

The workshop was funded by MBIE, CSIRO, Agriculture and Agri-Food Canada, and the European Commission.

Graduate finds job in New Zealand food industry

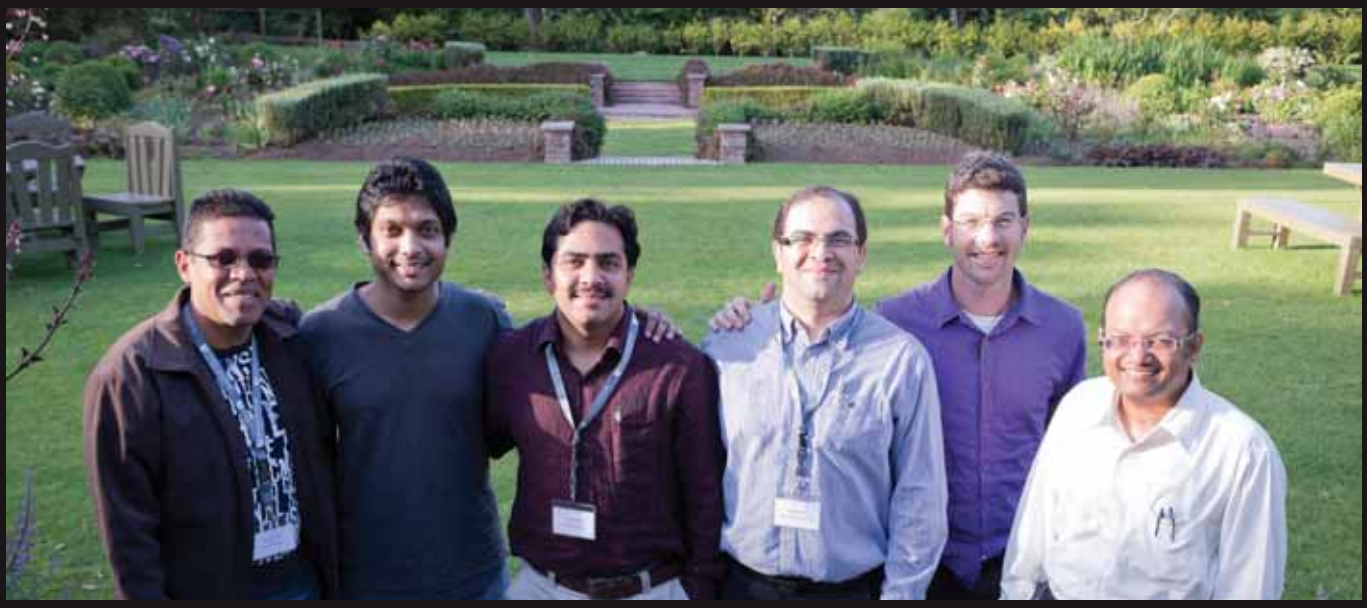
Student Jessie Li has just taken on a role with the Tatua Co-operative Dairy Company near Morrinsville. Tatua is the oldest independent dairy company in New Zealand.

Ms Li graduated with an MTech from Massey University at the end of November. One of her supervisors was Dr Aiqian Ye, a Senior Research Officer at the Riddet Institute. Ms Li's thesis was on digestion of emulsions and an exploration of the relationship between interfacial composition and lipolysis in both the gastric and intestinal regions.

Jessie Li and Dr Aiqian Ye shortly after the graduation ceremony.

Student Colloquium 2012

Every year the Riddet Institute brings its full complement of students together from around New Zealand for a three-day colloquium in Palmerston North. Face-to-face interaction is crucial for sharing of ideas and energising the interactions between researchers and students.



This year abstracts were called for from around 60 students and 15 of those were selected for oral presentations by their authors, while the others were presented as scientific posters.

The programme included a range of speakers from government, industry and academia and attendees at the colloquium were also invited to a public lecture being held on the campus by Professor Patrick Cunningham from the Office of the Chief Science Advisor in Ireland. His lecture was entitled: "Translating science to build the knowledge economy – lessons from Europe."

Top honours at the colloquium were accorded to PhD scholar Niranchan Paskaranandavadivel for best student presentation. Nira is studying at the University of Auckland within the Bioengineering Institute. His presentation title was "Automatic Detection of Spurious Fiducial Markers for Gastric Slow Wave Events."

Nira completed both his Bachelor's and Master's degrees at the University of Auckland. His research focus is on experimental recordings and analysis of bioelectrical events in the gastrointestinal system.

Dulantha Ulluwishewa was runner-up. His presentation was: "Development and validation of an apical anaerobic model of the intestinal barrier." Dulantha is completing his PhD at Massey University and is based at AgResearch. His research is in the area of 'host-microbe interactions.'

Highly commended were: Hayley Stewart (Massey University) and Ofir Benjamin (University of Otago).

The award for the best poster was presented to Lucile Tercinier. Lucile is studying for her PhD at Massey University and is based at Fonterra. Her field of interest is calcium fortification of dairy beverages, covering the interactions between milk proteins and calcium salts both in model systems and in commercially relevant systems. Lucile gained her Master's degree in Food Science and Technology from Montpellier Sup Agro in France and has been involved in practical work in dairy companies both in France and New Zealand.

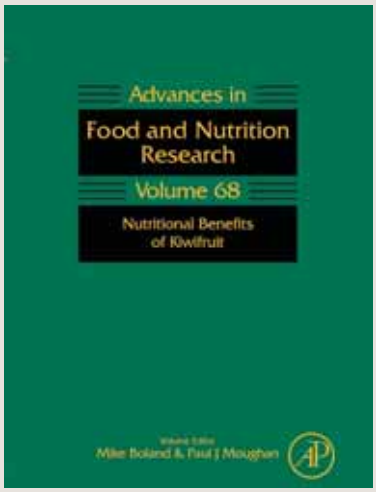
Out Now

Dietary Protein Symposium proceedings published

The Riddet Institute, supported by FAO and Health Canada, organised the International Symposium on Dietary Protein for Human Health 2011. It was held at SkyCity Auckland from 27-20 March 2011.

The Symposium brought together some 29 invited experts and other speakers and gave a contemporary view of knowledge and perspectives on protein nutrition and metabolism, especially concerning dietary protein quality assessment. This knowledge has important ramifications for health and human nutrition, food planning, and the planned production and international trading of protein. Regulatory issues were also covered.

Selected papers have now been published by the British Journal of Nutrition in a special supplement edited by Professor Paul Moughan. (Volume 108, Supplement 2, Dietary Protein for Human Health, August 2012).



Kiwifruit book brings experts together

Dr Mike Boland and Professor Paul Moughan are editing a comprehensive book on the nutritional benefits of kiwifruit, which will be published by Academic Press next year. Other contributors from the Riddet Institute include Drs John Monro, Lovedeep Kaur, Sharon Henare, Juliet Ansell, Shane Rutherfurd; other authors are from the University of Oslo, the Medical University of Vienna, ZESPRI, Plant & Food Research, IRL and the Otago Medical School.