



# NZIFST Conference 2017

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## SPEAKER ABSTRACTS

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Rutherford Hotel, Nelson  
4-6 July  
[www.nzifst.org.nz](http://www.nzifst.org.nz)



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## Day 1 Speaker Abstracts

### Session A1: Opening Plenary: Setting the scene - brand trust and global update

#### **What it takes to be New Zealand's most trusted brand.**

***Philip Poole, Whittaker's***

Whittaker's is a family owned New Zealand chocolate manufacturer. It was founded in 1896 by James Henry Whittaker.

Whittaker's is the only major chocolate manufacturer in New Zealand to do the whole manufacturing process. The cocoa beans are imported and roasted in the factory in Porirua and the whole chocolate making process is controlled through to the end product. By doing this Whittaker's can maintain a high quality product. It is a true 'Bean to bar' company.

#### **Global trends in Food Safety.**

***Arie Havelaar, University of Florida and Rob Lake, ESR***

The WHO Foodborne Disease Burden Epidemiology Reference Group (FERG) has estimated that annually, there are approximately 600,000 cases of foodborne diseases (FBD) and 420,000 deaths. The most frequent causes of foodborne illness were diarrheal disease agents, particularly norovirus and *Campylobacter* spp. Diarrheal disease agents, especially non-typhoidal *Salmonella enterica*, were also responsible for the majority of deaths due to FBD. The global burden of FBD is 33 million disability-adjusted life years (DALYs). The 14 subregions, defined on the basis of child and adult mortality, had considerably different burdens of FBD, with the greatest burden falling on the subregions in Africa and South-East Asia. Children under five years of age bear 40% of this burden, although they represent only 9% of the global population. The burden of foodborne disease in industrialized countries, expressed in DALYs, is considerably less than the global average. This is mainly due to lower incidence of foodborne deaths. Industrialized countries have been less successful in reducing the incidence of non-fatal foodborne illness. Priority hazards in these countries include non-typhoidal *Salmonella enterica*, *Campylobacter* spp., *Toxoplasma gondii*, norovirus and *Listeria monocytogenes*. Novel control methods are necessary to further reduce the incidence of these diseases.

To inform risk management activities, attribution of foodborne disease to specific commodities is necessary. FERG has estimated the proportion of foodborne disease related to major food groups such as different types of meats, vegetables and seafood. More detailed data on specific food-hazard pairs can be obtained from outbreak reports, which will be illustrated using data on produce related outbreaks in the US, the EU, New Zealand, Australia and Japan.

FERG encourages individual countries to examine the published subregional estimates in the light of local foodborne disease information. The foodborne disease burden for diarrhoeal disease agents in New Zealand have been estimated and periodically updated since 2007, in projects for the Ministry for Primary

Industries. These estimates will be presented, in the context of FERG subregional estimates.

## **Session B1: International Food Safety update**

### **Introduction to the New Zealand Food Safety Science Research Centre. *Nigel French, NZFSSRC***

In July 2016 the New Zealand Food Safety Science and Research Centre ([www.nzfssrc.org.nz](http://www.nzfssrc.org.nz)) was established, creating a new centre of excellence that brings together food safety scientists from across New Zealand. The research providers include three universities (Massey, Otago and Auckland) and four research institutes (Plant and Food Research, AgResearch, Environmental Sciences and Research Ltd and the Cawthron Institute), in a partnership with the Ministries for Business Innovation and Employment and Primary Industries, and our dairy, meat and horticulture industries. The Centre's research spans the food chain from farm to consumer, and encourages interdisciplinary collaboration between scientists from diverse fields; ranging from genomics to chemometrics, big data and consumer science. This talk will outline progress with establishing the Centre, our ongoing work programmes and plans for the future. I will also describe aligned international initiatives, including the New Zealand-China Food Protection Network.

### **The relevance of food safety risk management metrics for industry**

#### ***Leon Gorris, Unilever***

The concept of Risk Analysis is advocated by international organizations such as the World Health Organization (WHO) and Food and Agriculture Organization of the United Nations (FAO). Risk analysis integrates science-based risk assessment and risk communication with risk management. Risk assessment evaluates the risk posed to consumer by particular foodborne hazards in order to provide options to risk managers in choosing actions that are proportional and effective in controlling food safety. Risk communication provides for an interactive exchange of information throughout the risk analysis process concerning hazards and risks, risk-related factors and risk perceptions, among all stakeholders. More and more competent authorities around the world have embraced Risk Analysis principles as the international gold standard for food safety decision-making related to public health protection and international trade. It allows increasingly consistent local and international decision-making and focuses resources on the priority issues. A hierarchy of risk-based metrics have been established to connect from government policy to industry level management. From an industry's point of view, aligning food safety management with outcomes of risk-based governmental decisions is extremely relevant and has many advantages. It can help guide the adoption of appropriate control measures in relation to the level of risk from possible food safety hazards, thus ensuring the best level of protection for consumers. It is not necessary for the food industry at large to adopt risk analysis for food safety management in every day practice, as their current focus in many parts of the world still should be on more adequate and consistent application of good food safety practices and management systems. However, some food companies have successfully applied risk analysis principles in designing food products and food processing methods that have food safety "built-in" before food products are brought to market.

## **Survival on the outside: roles of biofilms and genetic variation in Campylobacter transmission through the food chain**

*Arnoud van Vliet, University of Surrey*

The foodborne pathogen *Campylobacter* is a leading bacterial cause of infectious intestinal disease in the developed world, with contaminated poultry meat seen as the most prominent source of infection. One of the conundrums of *Campylobacter* is that it is highly sensitive to air in laboratory conditions, but survives for extended periods in agricultural environments, on meat surfaces and in food-chain relevant conditions. *Campylobacter* can form biofilms on abiotic surfaces, a process strongly assisted by organic materials, such as those provided by meat exudates. However, there is still debate on the role of *Campylobacter* biofilms in transmission. Although biofilm formation is a commonly tested phenotype for *Campylobacter*, many of these studies use monospecies biofilms, formed in standard microaerobic conditions and growth media, which do not correspond to conditions encountered by *Campylobacter* in the food chain. In addition, the use of non-specific staining methods such as crystal violet, which is sensitive to organic contaminations and does not distinguish between biofilm matrix and bacteria. Finally, there are significant differences in biofilm formation between isolates of *Campylobacter*, but these differences have not really been correlated to specific markers, transmission capability or virulence. Despite these caveats, biofilms need to be taken into account when developing new anti-*Campylobacter* strategies, with future research requiring investigation of matrix components, *Campylobacter* control of biofilm formation, the role of preformed biofilms or multi-species biofilms, as well as the identification of the role of biofilms in transfer of genetic markers including AMR amongst *Campylobacter* cells, or to other bacteria.

## **Digital disruption, big data and 21st century food safety**

*Anne Astin, William Angliss Institute*

Global food production needs to double by 2050 and the opportunity that presents to Australia's food industry is enormous. Yet we are lagging behind our international competitors in preparing for a digital future.

"Imagine if we farmed in the knowledge we'll be feeding 9 billion people by 2050, nearly every one of them with developed-country calorie and protein expectations."

Dr Alan Finkel AO, Australia's Chief Scientist

The scale for future AgTech in Australia (and New Zealand) is tremendous and an increase in agricultural productivity by 70% is needed to meet future global food demand. There is the opportunity to be "builders, buyers or bystanders". Whatever the choice, embracing new technologies is critical to retaining market competitiveness, reputation and leadership.

A new Cooperative Research Centre for Food Agility has recently been announced and supported with a \$50M Commonwealth Government investment over the next decade. This investment will provide a game changing impact to address the challenges facing Australia's food industry. The three critical challenges spanning the whole supply chain to meet the needs and expectations of consumers and markets are – knowledge, capability and connection. These challenges are the focus for the Food Agility CRC working collaboratively with some 54 partners currently. The implications and impact of digital agriculture and big data for Australia's primary production, food and nutrition across the entire supply chain is significant. Powering growth and realising the potential of Agtech for Australia is the key driver

for the Food Agility CRC. Our vision is to empower Australia's food industry to grow its comparative advantage through digital transformation.

## **Session B2: Developing innovation**

**Titiro whakamuri, hoki whakamua - we are the future, the present and the past.  
Doing things better, doing better things - the Wakatū Innovation Journey**

***Miriana Stephens, Wakatū***

Wakatū is a Māori family business with approximately 4,000 shareholders who descend from the original Māori landowners of the Nelson, Tasman and Golden Bay Regions. The purpose of Wakatū is to preserve and enhance our taonga (legacy) for the benefit of current and future generations. Te Pae Tāwhiti, our intergenerational 500 year vision ensures that we align our goals and objectives to achieve our purpose which are guided by our values. Whenua is the foundation of Wakatū with 70% of our assets held in land and water space. Kono NZ LP (Kono) is the food and beverage business of Wakatū which specialises across all aspects of its operations from farming, harvesting, processing and the marketing of seafood, wine, cider, apples, pears, kiwifruit, hops and natural fruit bars with a geographical spread of export partners across the world.

Wakatū has recently developed their innovation strategy with a goal to commercialise high value science food and beverage solutions to address global nutrition, health and well-being challenges. We are now focusing on the following work programmes over the next 5 years:

Land and Water Wellness;

The development of a portfolio of high value add opportunities; and

The development of a connected regional technology hub.

These programmes will be outlined in more detail including the opportunities and the challenges!

**The challenges and opportunities of innovation – finding the right idea for the right market**

***Hamish Conway, Goodman Fielder***

Innovation is a widely used word in business these days but seems that everyone has a different interpretation of it. This presentation will explore the challenges and opportunities in innovation in a rapidly changing world where innovation has become a cliché.

**New Zealand as a smart food producer**

***Mike Boland, Riddett Institute***

The new digital age is changing the world in ways that few yet fully understand. It will enable new ways of marketing our food and new relationships with our customers. The change is happening faster than many realise and will have profound implications for all, including the food industry. It will change how food is perceived, purchased and used by the consumer, and its implications for convenience, diet and health.

The Internet of Things (IoT) has more than 15 billion devices connected: this is expected to increase to 200 billion by 2020. These devices include smart refrigerators that know what they contain and can order resupply online from the

supermarket and similarly smart rubbish bins that can also re-order. There is a myriad of internet-connected fitness and health monitoring devices and even personal food analysis devices that will enable personalised and customised nutrition.

New Zealand is recognised as a smart producer of good, healthy food products. The new environment offers the possibility of an intimacy with the consumer never possible before. The nature of supply chains, value chains and labelling is going to change, and will offer new opportunities for our food industry and for brand “New Zealand”. But only if we are prepared and take up the opportunity!

### **Turning Innovation into Gold** *Stephanie Hadley, James & Wells*

Innovation is on the boardroom agenda like never before. Everyone is talking about it, but what is the point of innovation and building a brand, if you cannot transform it into sustainable commercial success?

James & Wells will share their insights of successful Kiwi businesses who have used intellectual property to turn their innovation into gold.

From brands, ideas, health claims, strategic partnerships and exporting, learn from others who have maximised innovation in today's fragmented and challenging business world.

### **Session B3: Value-add Processing**

#### **In farm milking cooling with night storage** *Refat Al-Shannaq, The University of Auckland*

New Zealand's Dairy Industry accounts for 30% of the country's total exports, earning \$14 billion NZD per annum. Cooling of milk amounts to 30% of the daily energy use at a dairy farm. A new set of regulations for cooling of in-farm are ready to come into effect from 2016 for new dairy farms and would apply to all farms from 2018. This new regulation will require dairy farms upgrading their milk cooling systems. Any milk not meeting the new cooling criteria stands the risk of being rejected and discarded. This would mean big losses for dairy farms. This upgrading would result in higher upfront cost as well as higher energy costs to run these systems. Development of affordable state-of-the-art milk chilling and storage equipment to maximise milk quality for minimum installed capital cost is the main objective of this paper. A novel cold energy storage device with high rate of ice making and melting is developed at University of Auckland for chilling of milk in-farm. From the technical point of view our novel system is twice faster in making ice in comparison to the existing ice-on-tube technology in the market. However, it is inferior to ice on tube during discharge (ice melting). The rate of delivery the coolness in our system depends mainly on the inlet temperature and flow rate of the heat transfer fluid. From commercial point of view the system has a high competitive landscape in the market based on estimated materials cost analysis.

## **Protein hydrolysates from low-value meat processing streams as potential functional ingredients in textured meat analogues**

*Santanu Deb-Choudry*

Co-products and waste streams from meat industry processing have the potential for value generation beyond current levels. These streams can be a rich source of ingredients with functionalities that can be exploited, leading to the development of new products. A beef waste stream (BWS) has been identified as one such low value source. The hydrolysis of BWS using commercial enzymes used in the food industry, is being explored as a viable option to create meat protein extracts. A possible application is the use of the extract as a flavouring agent in plant protein based extruded products. Extruded products from plant proteins such as soy, wheat and pea, can potentially be consumed as meat analogues with properties that closely mimic sensory properties such as the taste and texture of meat. The addition of concentrated meat extracts could further improve the flavour while maintaining the desired texture of the products. Work to date has shown the importance of sulphide bonding in gluten proteins in achieving the fibrous structure of the analogues. For the meat extracts, a process is being developed that utilises low value meat trimmings to obtain functional protein extracts that perform well during the extrusion process of plant proteins. Additional functional properties that are tailored towards creating new textured food with enhanced flavour and stability, are also being explored.

## **How can we spray dry sugar rich fruit juices: problem definition and FIET approach**

*Tony Paterson, Massey University*

The drying of fruit juices has always been a problem because of their high fruit sugars content which means that at room temperatures the powders become a sticky conglomerate. It also means that when you try to spray dry them the powders stick to the walls of the dryer unless an excess of drying aid is added. In order to better understand this problem the FIET approach was to go back to the fundamentals to be able to predict the glass transition temperatures of the sugar and drying aid mixtures, especially to understand why such an excess of drying aid is required, and to combine this with possible alternative drying aids such as inert fibres. Thus three projects were conceived: Prediction of the glass transition temperatures, the breakdown of pomaces to produce an inert fibres and possible long chain polysaccharides to increase the Tg and lastly to look at how sugar solutions with added fibres could be sprayed. This talk will go into the background of how these gaps in knowledge were identified and briefly outline the approaches taken by the three projects.

## **Process Optimisation of Atmospheric Freeze Drying**

*Jim Q Chen, Massey University*

Although conventional vacuum freeze drying (VFD) has the merits of retaining nutrients, colour and shape in products as they are dried, its high investment and operating costs make freeze-dried food products less competitive. This project aims to develop an innovative atmospheric freeze-drying (AFD) process for the New Zealand food industry to fulfil the need for a style of dryer which performs like a freeze dryer with economics closer to hot air drying.



An engineering arrangement of AFD process consisting of an insulated drying chamber, a desiccant wheel and small supporting heat pumps has been proposed. A mathematical model shows this to be promising. Over a range of products it looks to be energy efficient and offer lower capital and operating costs than VFD. Very low operating temperature of the dryer leads to low water vapour carrying capacity for drying air which may limit AFD to low sugar products that remain frozen at approx. -10°C. If operated in batch mode, for much of the cycle-time the drier is operating well below capacity. However, AFD is easily able to operate continuously unlike VFD. And there is almost no practical limit to the size of drying chamber that can be built.

## **Session B4: Advances at the fundamental/commercial interface**

### **Tailoring processes for producing foods with nutritional advantages** ***Dongxiao Sun-Waterhouse, University of Auckland***

Market drivers and food supply challenges necessitate food innovation to maximize the use of food resources whilst increasing the efficiency of delivering natural goodness to consumers. Accordingly, food innovation and manufacturing are presently focused on novel ways to transfer desired nutrients and bioactives to everyday foods. In this talk, some interesting new research with this focus will be presented. Food chemistry-guided approaches for optimizing the interactions among food components and the interplay between processing steps are described. The importance of tailoring food formulation, processing and analysis based on synergies between individual molecules and food matrices to ensure food safety, quality, efficacy and consumer acceptability is highlighted.

### **Nano-vehicles in Functional Foods** ***Rahau Shirazi, Callaghan Innovation***

Functional food is the largest category within the health industry. Food-grade nano- and micro-particles are novel delivery systems. Using food grade acceptable methods, we have developed protein and lipid-based micro- and nano-vehicles to encapsulate bioactives such as vitamins. Using LCMS techniques, we have assessed the sunlight and UV stability of vitamins D3 present in commercially available fortified milk and infant formula compared with samples containing additional micro-encapsulated vitamin D3 and formulated olive oil as a carrier. We have developed lipid-based vehicles rich in glycosyl inositol phosphoceramides (GIPC), extracted from a plant source. GIPC are known as major lipids of the plant plasma membrane, in which inositol-1-phosphate is linked to the primary hydroxyl of Cer to form a phosphodiester and the inositol end is further extended by oligosaccharide chains. GIPC spontaneously form bilayers in solution. We present on GIPC-rich formula containing nano-vehicles (<100 nm in size), suitable for nano-encapsulation of hydrophilic and hydrophobic bioactives in functional food.

PEER REVIEWED

## **Sulphite-reducing clostridia in New Zealand dairy products**

*Tanya Soboleva, MPI*

Sulphite-reducing clostridia (SRC) include a number of species widely found in the environment and in faeces. Presence of SRC in dairy products may originate from the raw material or via contamination within the process. While their occasional presence in low numbers in milk and milk products is not of immediate concern as the spores survive pasteurisation, high numbers may serve as an indicator for unhygienic processing. Similarly, because some SRCs are foodborne pathogens, their presence in elevated numbers can have food safety implications.

This study aimed to estimate baseline levels of SRC in New Zealand raw milk and nutritional dairy powders to facilitate comparison with unexpected results.

## **Innovations in commercial microbiological laboratory testing**

*TekLok Wong, Asure Quality*

The current transitional implementation period of the Food Act 2014, from 2016-2019, would drive the food industry to own and operate under Food Control Plans or Risk Management Programmes. Food manufacturers have obligations to remove pathogenic microbial hazards such as Salmonella and Listeria in a timely manner in food production and manufacturing to prevent risk of infection to consumers. Likewise, the Commercial Microbiology Laboratory needs to be proactively contributing to this cause by introducing innovative methods. Faster turn-around times (TATs) for results would help customers achieve their obligations to the Food Act. AsureQuality has been actively validating newer PCR methods to provide faster result notification by removing more than a day off current TATs. That means earlier release of food products that tested negative and earlier notification of suspicious results when tested positive, an advantage that would greatly benefit customers in managing the logistical movement of export food commodities. These newer PCR kits have improved specificity and reproducibility that allow the transition from being tools that are mainly applied in research laboratories to become routine molecular test procedures in a commercial microbiology laboratory. This adds another layer of technical sophistication to routine microbiology testing. Technicians are now required to think not only microbial but also potential molecular DNA cross-contamination. Complementing these molecular methods requires support from a knowledgeable technical team, an alternative newer generation of immunoassays for pathogen screening and a Bruker Biotyper that uses MALDI-TOF Mass Spectrometry to identify bacteria and yeasts within minutes of presentation to the instrument.

## **Session C1: Food Microbiology 1**

### **From Acrylamide to Zen – 26 tweets from FSANZ**

*Glen Neal, FSANZ NZ*

Join Glen as he takes you on a tweet-filled tour of 26 matters, all in 140 characters or less, that are front-of-mind for FSANZ.

**Validation,  
*Roy Biggs, Tegel Foods***

The topic of validation is current, with many custom Food Control Plans required over the next two years. Roy is keen that people keep things simple and do not spend time and money unnecessarily. Roy will attempt to remove the confusion between validation and verification and give a simple overview of validation requirements to make it less scary.

The topics covered include; what needs to be in a validation protocol, sources of information, establishment of sample size and a basic analysis of the data. This is followed by the structure and content of the validation report and subsequent recommendations for verification.

If you want a simple explanation of validation for custom FCPs & RMPs then come to this session.

**HPP validation, opportunities and challenges  
*Jon Palmer, Massey Univeristy***

High-pressure processing (HPP) is a non-thermal process capable of eliminating pathogenic and food spoilage microorganisms and inactivating browning enzymes in a wide range of food products. This novel technology has the potential to control food spoilage, improve food safety and extend product shelf life while retaining the characteristics of fresh, preservative-free foods. However, the efficacy of a HPP process to eliminate bacterial pathogens is significantly affected by the composition of each food product and consequently each product must be validated individually. The design of the HP process and validation of the lethality achieved relies on an accurate risk assessment of the pathogens that need to be controlled in each food product. This talk will outline what HPP can offer and the basic requirements around HPP validation in NZ.

**Botulinum, is it a hazard that needs control in New Zealand?**

***Marion Castle, MPI***

Abstract not received

**Session C2: Seafood innovation**

**Musseling up: high-value Greenshell™ mussel foods**

***Matt Miller, Cawthron Institute***

Greenshell™ mussels (GSM) are a major aquaculture export product for New Zealand. Cawthron Institute (Nelson, New Zealand) is a world leader in GSM research, including spat culturing systems and selectively breeding. Cawthron is now developing a science platform to link GSM foods and extracts with validated health outcomes building on our longstanding, successful collaboration with Sanford Limited (largest GSM producer and exporter). There is a growing body of evidence that GSM extracts are beneficial in reducing inflammation although the component (or components) and/or the mechanism is not fully elucidated. Dr Miller leads the NZ high value nutrition science challenge “Musseling up: New Zealand’s iconic Greenshell™ mussel for mobility-enhancing, high-value, functional foods.” This project is an international multi-institute programme to define the bioactive ingredient/s in GSM, develop efficacy and biomarkers/bioassays for inflammation

and joint and bone health, develop commercially useful methods to measure efficacy of bioactives, define the bioavailability of the bioactive lipids in GSM and develop novel food products for international markets. This presentation will give a quick overview of the program and update on progress over the first year. New rapid analytical techniques using Near Infrared (NIR) spectroscopy have been developed to analyse composition and bioactives in GSM. NIR is a technique that uses vibrational energies of molecules for rapid determination of the content of fat, protein, moisture and carbohydrates as well as levels of the important omega 3 eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in GSM. The work to date has laid the foundation for adding value to mussel exports and enhancing consumer understandings of the benefits of consumption of GSM.

### **Implementing science and research towards commercialisation**

***Sabrina Tian, Sanfords***

Sanford is proud of its heritage and the growth achieved in its more than 130 years as a seafood company delivering a diverse range of quality products to our domestic and international customers. Sanford's vision is to be the "Best Seafood Company in the World", and it is committed to investing in innovative and new marketing ideas. The company objective is to maximise returns by fully-utilising marine resources.

Sanford Innovation team has developed partnerships with New Zealand universities and research institutes on a range of collaborative programmes. The team has researched and demonstrated ways to utilise and extract value from various seafood resources. Pilot work has been conducted at the Foodbowl, and Foodpilot, supported by a Callaghan Innovation R&D project grant. Other key projects include working with Cawthron Institute for the High Value Nutrition National Science Challenge in order to understand anti-inflammatory properties of Greenshell™ Mussels, and working with Callaghan Innovation to produce high-grade Greenshell™ Mussels extracts. The company is actively working on commercialisation plans that will take these products from prototypes, into product ranges available for both human and animal consumption.

This presentation will showcase Sanford's R&D capability and highlight the importance of R&D in generating innovative ideas which can be commercialized.

PEER REVIEWED

### **Precision seafood harvesting. It's all about product quality**

***Suzy Black, Plant and Food Research***

Product quality is often focussed on only after the raw material has been delivered to the point of processing. In the case of fish, once it is landed on a vessel the quality cannot be increased, only maintained. It is then the maintenance of quality after capture that is paramount for the supply chain. But what if loss of quality was occurring during the capture process? How would we go about applying control to this part of the process? Our group's background in pre- and post-harvest physiology research strongly suggested that we move away from the mechanics of the fishing process and focus on fitting the process to the requirements of the fish.

In the 1990's we sought out a model species to develop our understanding of the effects of harvesting on post-harvest quality. We settled on King salmon, an excitable aquaculture species that was experiencing harvest-related quality

problems. From this research it was clear harvesting fish within their physical and physiological tolerances eliminated many quality defects and revealed surprising unexplored properties of the tissue. The success of this fish-centric, quality-focussed, rested harvesting process gave us the confidence to apply the same approach to New Zealand's largest wild fishery (hoki). This presentation will look at the background and development of the Modular Harvesting System (currently being commercialised within the PGP Precision Seafood Harvesting programme) and how fish-focussed industrial fishing technology is not only feasible but great business.

### **Lactic fermentation applied to New Zealand seafoods** *Owen Young, AUT University*

The bulk of New Zealand seafoods is exported in relatively unprocessed forms that typically rely on the cold chain and speed-to-market management enabling the products to be marketed under the banner of 'fresh'. While this is generally profitable and sustainable, other options may also be commercially viable and far less demanding of a cold chain, which can be a problem in many emerging markets. Fermentation is one of these options, in particular lactic fermentation. Lactic fermentation of milk, meats and vegetables is widespread internationally, spanning yoghurts, cheeses, salami, sauerkraut and kimchi, to name a few. Fermented seafood products are rarer but good examples exist in Southeast Asia where fermentation of fin fish and rice mixtures is an habituated domestic activity. Where refrigeration is limited, fermentation offers a way to safely preserve fish that would otherwise rapidly deteriorate in a hot climate. In the past few years, our group at AUT has explored fermented product options with three New Zealand seafoods. These are marine fin fish, and the cheap molluscs, squid and green shell mussel. Progress with each of these will be discussed with an emphasis on green shell mussel where three product types have been fully or partially developed. In all cases, the principal envisaged export market is East Asia, where fermented food products are widely accepted and a massive middle class has the money to buy new foods from trusted countries of origin.

PEER REVIEWED

### **Session C3: Value-add processing**

#### **Enhancing bioactive extraction using Pulsed Electric Field processing** *Indrawati Oey, University of Otago*

Plants are outstanding sources of bioactives such as anthocyanins, carotenoids, phenolics, vitamins etc. These compounds possess health benefits however some of them are strongly bound to plant matrices leading to low extractability and bioaccessibility. To reduce the use of solvent and extraction time, several processing techniques have been developed for example Pulsed Electric Fields (PEF). Depending on processing intensities, PEF could result in irreversible electroporation of cell membranes and modification of plant structure. Therefore this technique could facilitate the extraction of bioactives.

This presentation will showcase various successful bioactives extractions assisted by PEF processing and how this finding could add value to various New Zealand-grown plant foods including anthocyanins and phenolics extraction from grapes and cherries and carotenoids extraction from carrots etc. Cell health biomarkers will be

used as a proxy to assess the antioxidant capacity of PEF-treated plant foods. In this project, we will also demonstrate the potential to integrate PEF into a current processing line for example winemaking in order to enhance the release of anthocyanins and phenolics during maceration. Our findings show that as a processing-aid, PEF has potential not only to increase the concentration of bioactives extracted but also to tailor the profile of bioactives during extraction and to improve the bioprotective capacity.

PEER REVIEWED

### **Innovative sterilisation technologies – a hurdle approach**

***Marilya Ismail, University of Auckland***

In conventional thermal sterilization, low acidic liquid food products are heated to very high temperatures to inactivate microbial spores and thereby preserve food. However, exposure to high temperature (130 - 140 o C) results in the deterioration of nutrition value, texture, colour and flavour of food. Numerous studies have been done to reduce the heat intensity during sterilization by using combination of thermal and non - thermal preservation methods. This research outlines the potential of Pulsed Electric Field (PEF) and Ultraviolet (UV) combined with heat treatment and also assesses the applicability of Pressure Assisted Thermal Sterilization (PATS). The main objective of such hurdle approaches is to achieve sterilization at reduced temperature/time in order to retain quality factors of the food. In these studies, *Bacillus subtilis* ATCC 6633 spores were used to inoculate different media. PEF in combination with heat showed that D - value of spores in skim and whole milk for combined treatment are much lower than that of thermal sterilization conducted at the same temperature. Similarly, studies carried on a modified UV reactor in combination with heat gave considerable log reductions for skim milk as well as for whole milk. Furthermore, PATS used a combination of pressure and heat for baby food sterilization and revealed that D - value in PATS was lower than that of thermal only treatment. In conclusion, the results on different technologies indicated that sterilization is achievable at temperatures lower than conventional methods using a hurdle approach.

### **Pulse waters**

***Luca Serventi, Lincoln University***

Food ingredients are often expensive due to tight supply chain and market fluctuations. Moreover, consumers are demanding more plant based foods and sustainable supply. Management of legume processing waters could lead to the development of sustainable, plant-based food ingredients. The waters obtained from five legumes (garbanzo chickpeas, haricot beans, soybeans, split yellow peas and whole green lentils) were tested for nutritional composition, physicochemical properties and food applications. Various amount of carbohydrates were quantified in the legume waters, as well as protein, ash and phytochemicals. Activities observed ranged from foaming to emulsifying and gelling. Legume waters were used to enhance the texture of sweet and savoury applications. Each legume resulted in water of different composition and functional properties, with promising improvements of food quality. Legume processing waters can be valuable, low-cost functional ingredients.

## **Smoking food with native New Zealand woods** *Georg Ripberger, Massey University*

Food smoking is a value-add process commonly applied to products like fish. This research, as part of the Food Industry Enabling Technology (FIET) research programme, aims to foster the smoked food industry in NZ by developing the capability to produce tunable smokes of superior quality with a NZ flavour signature. This study compares NZ smoking woods (Manuka, Manuka bark, Pohutukawa, Silver Beech, Tawa, and Rewarewa) to the most common European wood (Oak). Two analytical techniques are used, thermogravimetric analysis (TGA) and pyrolysis gas chromatography mass spectrometry (Py-GC/MS). Both air and nitrogen were used as the carrier gas. TGA analysis revealed that smoke generation is more affected by the atmosphere than the feedstock, with faster and more extensive conversion of the wood to the gas phase when air is present. Wood has the same basic wood building blocks: hemicellulose, cellulose and lignin, and so decomposition differences are more subtle. The most marked difference is between the Manuka and Manuka bark, due to its high ash content of the bark. Also Tawa, which has a higher cellulose and hemicellulose content than the other woods, exhibits a shift in the peak temperature of decomposition. A first attempt non-targeted analysis by Py-GC/MS to characterise the flavour signature showed subtle differences revealing the need for more detailed analysis by methods like olfactometry. Overall, these results support our previous findings that there is a scope to tune smoke generation.

## **Session C4: Predicting and modelling food properties**

### **Molecular Motors and Food,** *Laurie Melton, University of Auckland*

In 2016 the Nobel Prize in Chemistry was awarded for the creation of synthetic molecular motors. These artificial molecular motors, nanomachines, mimic full-sized machines with propellers rotating blades and gears. More excitingly, a large number of molecular motors are found throughout biological systems including you and your food. Cells simply couldn't function without these tiny motors. For example a molecular motor winds DNA into the famous double strand and helicase unwinds the double strand; myosins are responsible for muscle contraction; collagenase acts as motor to hydrolyze collagen; the key fruit ripening enzyme, pectic methylesterase, motors along pectin lopping off successive methyl groups as it goes. I shall describe how these and other molecular motors are relevant to understanding the nature of foods and hence the potential benefit for the food industry. Cutting edge research done in New Zealand as well as overseas will be used to illustrate the talk.

### **Prediction of the glass transition temperature of low molecular weight mixtures** *Sebastian Linnenkugel, Massey University*

The prediction of the glass transition temperature ( $T_g$ ) on the basis of the sugar and organic acid composition is of high interest in food science relating stickiness issues. Common analytical models result in over or underestimation of  $T_g$  of

multicomponent systems due to deviations from ideal mixing. In this study the composition dependent deviations of  $T_g$  in binary sugar and organic acids blends were implemented into an analytical model and tested for different multicomponent systems resembling typical fruit juice compositions, as well as real fruit juices and compared to the predicted values of  $T_g$  from existing analytical models.

### **From fingerprinting to kinetics: insight into food quality changes**

***Beniam Kebede, University of Otago***

Food quality changes, be it during processing or storage, are due to changes at the chemical, biochemical, physical and microbial levels. When the aim is to steer such reactions in a desired way, there is a need to understand the type of the reactions taking place and the rate at which these reactions take place. Kinetic modelling is commonly used to obtain a quantitative insight into the effect of individual intrinsic and extrinsic variables, which has been an essential step towards process design and optimization. However, the complexity of food quality changes has been and still is a challenge to identify, characterize and model at least the most significant reaction pathways. In that context, one of the bottlenecks is the lack of an effective analytical and data analysis strategy to increase insight into these complex changes. Fingerprinting is an -omics approach. By definition, it is an 'untargeted, multi-variate approach' in which as many compounds as possible of a particular food extract are detected using cutting-edge analytical equipment. Using appropriate chemometrics tools, chemical fingerprinting should lead to the selection of markers. Therefore, using state of the art analytical techniques, advanced data analysis, and the current knowledge of the design of kinetic experiments and associated data analysis techniques, it is now feasible to study food quality changes using a hypothesis-free approach. Starting from a fingerprint, markers can be selected from which enhanced mechanistic and quantitative insight can be obtained in a targeted, kinetic study.

### **Mathematical Modelling of Salt Transport in Dry Salted Cheeses**

***Meghan Keck, Massey University***

Sodium chloride is vital to the production of safe and consistent cheese products through its effects on preservation, texture and functionality, and flavour. Understanding the mechanisms and modelling the movement of salt through fresh cheese curd, especially for dry-salted cheeses, is essential to optimizing production and improving consistency to meet growing global market demand. Current models for salt transport in cheeses have primarily used an unsteady-state Fickian diffusion approach to describe salt mass transfer in cheeses. While simple, these models fail to account for the underlying mechanisms and interactions between the transported salt ions, moisture, and proteinaceous curd matrix that ultimately control the rate of salt uptake during the dry salting process, especially the effects of local moisture content and moisture expulsion. A fundamentally-derived, one-dimensional mathematical model was developed to model the uptake and transport of salt and moisture through fresh, dry-salted cheese curds by defining the curd as a proteinaceous matrix with whey-filled, interconnected pores and accounting for the effects of osmotic pressure induced moisture expulsion. Despite not being validated yet, the model provides an essential first step to fundamentally describing the mechanisms that control the uptake and transport of salt and moisture during the salting process of cheese making.

PEER REVIEWED



## Session D1: Food Microbiology 2

### **Delving deeper to control New Zealand strains of Listeria**

***Graham Fletcher, Plant and Food Research***

Abstract not available

### **How to manage *Vibrio parahaemolyticus* and *V. vulnificus* in New Zealand shellfish (Pacific Oysters)**

***Nicola King MPI and Brian Roughan, ESR***

*Vibrio parahaemolyticus* and *Vibrio vulnificus* are bacteria that live naturally in coastal marine environments and can become concentrated inside bivalve molluscan shellfish (BMS). Foodborne exposure can cause gastroenteritis. Septicaemia can develop in people with underlying health conditions. Both *Vibrio* species have been detected in oysters from New Zealand waters, *V. parahaemolyticus* also in mussels and *V. vulnificus* in pipi and cockles. The distribution and concentration of these vibrios increase with rising water temperature, so with increased summer harvesting of commercial shellfish and oceanic warming, the Ministry for Primary Industries commissioned two Risk Profiles to support future risk management activities. The available information suggests there is a risk of *V. vulnificus* or *V. parahaemolyticus* infection from BMS harvested from New Zealand waters and eaten raw, particularly from BMS harvested from the northern half of the North Island during summer months. However, limited public health surveillance data suggest that *V. vulnificus* infections are rare in New Zealand and cases are not necessarily foodborne. New Zealand BMS have been implicated in sporadic cases of *V. parahaemolyticus* gastroenteritis but not outbreaks. The risk of illness might be being reduced by low concentrations of vibrios, low prevalence of pathogenic strains, low consumption of raw BMS (based mostly on BMS harvested during cooler seasons or from southern locations) and post-harvest cooling requirements.

There are important data gaps that make risk management decisions challenging. Some countries manage risk through harvest restrictions and post-harvest requirements. What do we need to do in New Zealand to protect domestic and international shellfish consumers and trade?

### **The Brave New World of molecular methods for confirmation of foodborne pathogens**

***Helen Withers, MPI***

Abstract not available

### **Microbiological validation of low temperature sous-vide**

***Lisa Olsen, MPI***

Delegates are invited to move to Wairau Room to view this presentation. See session D3-4 for abstract.

## **Session D2: Packaging innovation**

### **Wonderful world of packaging, *Sharon Humphries, Packaging Council***

Packaging touches everybody, everyday, but how many of us appreciate the complex decision process which ultimately determined the size, shape and material, not to mention the design decisions ensuring the packaging appeals to our tastes, our beliefs, our lifestyles and our wellbeing; and as if all those considerations weren't enough thought will have been given to the value-add of the packaging such as convenience formats for preparation, usage, portion control, safety features, closure features, anti-tamper evidence, theft deterrent - welcome to the wonderful world of packaging!

### **Self-adhesive labels and their impact on package sustainability *Carol Lawrence, UPM Raflatac, Sponsored by Australian Institute of Packaging***

Food labelling is the most diverse of all label end-uses, providing eye-catching branding whilst displaying critical consumer information - and the selection of the right label is key to the fine balance in ensuring the package can be disposed of responsibly at the end of life. Carol will discuss the environmental implications of the film and paper labels, adhesives and liners manufactured by UPM Raflatac, including the LCA analysis, Label Life that is based on comprehensive lifecycle assessment methodology and conducted in accordance with internationally recognized ISO 14040/44 standards. LCA studies indicate that the environmental impacts of a label's lifecycle are distributed over a variety of processes, but significantly centred around the raw material selection. Carol will highlight how to match the right paper or film label with the package to achieve the most sustainable outcome.

### **Food design: changing commodities into consumer goods *Hanne van Beek and Matthijs Siljee, Massey University***

While the export of commodities still dominates the way of thinking in the NZ agri-food sector, food design is an emerging component in the drive to multiply the value of New Zealand food in the coming decades.

Food designers examine the intangible qualities of food consumption experiences. They understand the ever-changing subjective attitudes they activate in consumers. Food design is a fundamental, front-end part of food product development. In a successful food design process, it helps to anticipate how food products are received in various markets by examining the social settings of consumption, the cultural connotations and the sensorial qualities beyond the mouth alone. This informs the design of rewarding, meaningful and desirable consumer experiences. Although industrial food design has longer traditions elsewhere, the New Zealand food industry has a growing awareness of its potential.

Invited speakers Hanne van Beek and Matthijs Siljee give an insight in how food design works and how to engage with it, by discussing existing and speculative design examples, of which some are in collaboration with Whittaker's Chocolate.

PEER REVIEWED

## Session D3: Value-add processing - sous-vide

### The kinetics of sous-vide – fixing the race

*John Bronlund - Massey University*

Sous vide is widely used in restaurants and homes and is emerging as a commercial technique to add value to meat. The intermediate temperature-long time conditions used in sous vide can provide a number of benefits to meat including tenderisation, microbial stabilisation and convenience, with less changes to meat structure and function than occur at higher temperature cooking. The final outcome of a sous vide product is the result of a race between a range of competing reactions (denaturation of various proteins, nutrient losses, colour change, microbial inactivation), that have different temperature dependences. This talk will demonstrate how analysis of these kinetics can be used to identify optimal sous vide conditions to achieve a desired product outcome.

### Sous-vide cooking and enzyme treatments: effects on beef protein digestibility

*Lovedeep Kaur, Massey University*

Cooking of meat at high temperatures results in protein oxidation by the generation of free radicals, which can lead to various amino acid side-chain modifications such as formation of amide bonds, disulfide linkages and dityrosine bridges, thus affecting its nutritional value. Our previous results have shown that sous vide cooking of beef (eye of round) at low temperatures (53 and 58 °C) for shorter periods of time (~ 9 h) results in an improvement in free amino N release during simulated gastro-small-intestinal digestion.

We have investigated the effects of sous vide cooking on the texture and protein digestibility of low-value meat cuts such as brisket. Pre-treatments of meat with actinidin (from kiwifruit) were also studied, in order to reduce the sous vide cooking times along with achieving faster and more complete protein digestion. Studies on the application of actinidin have shown it has a less intensive effect on meat compared to traditional plant-derived enzymes (e.g. papain). However, the added enzyme activity must be able to be stopped once it has reached a desired degree of tenderness to prevent further post-processing digestion and loss of structure. We investigated the use of heat under sous vide conditions to inactivate actinidin in green kiwifruit extract. The enzyme was effectively inactivated by heating the extract at 60 °C in less than 3 min. Interestingly, the inactivation temperatures and times increased significantly when the extract was added to meat, showing a protective effect of meat on enzyme's stability.

These results will be presented and discussed in detail.

Funding from the Riddet CoRE and FIET programmes is gratefully acknowledged.

PEER REVIEWED

### Sous Vide: commercial applications

*Dan Fraser, Executive Chef*

Dan was 1st introduced to the method of sous-vide cookery in 2008 while working at Euro restaurant and questioned "what!?! we are now going to throw away our amazing wood char-grilled steaks and replace them with "boil & the bag cookery"

Nearly 10 years later and he is catering for thousands of people a day and could only achieve the consistency he requires with the aid of sous-vide cookery.

### **Microbiological validation of low temperature sous-vide.**

*Lisa Olsen, MPI*

Sous vide is a method of cooking where food is vacuum-sealed in plastic packs before heating. To heat, the plastic packs are usually submerged into a temperature controlled water bath for a set period of time. Sous vide is becoming an increasingly popular cooking method in the food service sector & restaurants.

A review by Stringer et al. (2012) of recipes used in restaurants in the UK, and recorded in books or on the internet suggested people may be cooking fish at temperatures as low as 38.5°C, red meat below 50°C and poultry at 50°C and above. At these low temperatures, the combination of cooking temperature and time may not reduce foodborne pathogenic micro-organisms sufficiently to avoid illness in consumers and may actually promote growth. To ensure the safety of sous vide cooked food it is important to understand how pathogenic micro-organisms will be affected during cooking. This presentation looks at some of the microbiological food safety issues associated with low temperature sous vide cooking.

### **Session D4: Addressing consumer requirements**

#### **Consumer responses to a graphic equivalent of mandated nutrition information tables**

*Owen Young, AUT University*

The objective was to compare understanding of a graphic equivalent to a minimal mandatory nutrition information panel on packaged foods. A horizontal bar graphic equivalent of a nutrition information table was devised. The graphic's single number shows the percent content of the dominant nutrient, marked 'Most', contrasting with 'Least' at the graphic's origin. A separate bar for energy is expressed as percentage of 3,700 kJ, the energy in 100 g of fat. Colours chosen for the five nutrient data bars were non-judgemental, avoiding 'traffic light' colours. Six randomized table and equivalent graphic images were shown to subjects who answered questions about the food's energy, its dominant nutrient and percent content, and relative abundance of the seven mandated nutrients. The subjects were 40 food science students in New Zealand, and 100 online consumers throughout Australasia. The dwell time on the two formats was the same for both trials. Correct online consumer responses were: food energy - 18% (tables), 71% (graphics) ( $P < 0.001$ ); dominant nutrient - 81%, 96% ( $P < 0.001$ ); percent dominant nutrient - 43%, 82% ( $P < 0.001$ ). Relative abundance questions created a 7 nutrient x 6 food matrix (42 combinations) where tables were more accurately understood 14 times (3 significant) compared to 28 times for graphics (12 significant). Responses in the student trial paralleled the consumer trial; differences were less marked but with similar statistical significances. The graphic format was much more understandable than the mandatory table format, and would be useful in internet-based applications, at least.

PEER REVIEWED

**The social construction of consumer trust in high-involvement food brands. The case of infant formula consumption in urban China**  
*Ivy Gan, University of Auckland*

Food consumption plays a crucial part in everyday life. It is believed that the delinking of consumers and food production systems creates uncertainty and fear (Fischler, 1980), and the potential risks involved in modern food systems have increased the research of trust in food (e.g., Kjærnes, Harvey, & Warde, 2007). This work is a longitudinal study on consumer trust in high-involvement food brands, in the context of infant formula consumption in urban China. Based on two sets of in-depth interviews with the same group of participants from four major cities of China, this work explores how Chinese mothers select trusted infant formula brands for future infant feeding when still in pregnancy, and how their trust in chosen brands may develop over time with ongoing infant feeding experience after giving birth. Findings indicate that consumer trust in the brand is socially constructed through interactions between individual consumers, brands, interpersonal relationships, and social institutions in the specific context. A certain level of initial trust is needed for consumers to engage in the exchange relationship with a brand, and this initial trust may develop over time in actual consumption experience. While brand reliability and brand intention is essential in consumer-brand relationships, word-of-mouth communication between consumers and their interpersonal relationships, and the country-of-origin of the brand were also found to play fundamental roles in trust building, particularly the initial trust building. This empirical work provides both theoretical insights and managerial implications on how consumer trust is socially constructed in a social-cultural background different from western markets.

PEER REVIEWED

**Whey beverages ewe to market**  
*Maheeka Weerawarna, Massey University*

A major waste stream for sheep cheese manufacturers is whey, currently used as animal feed. Conversion of this stream to a more profitable product is desirable due to its nutritionally beneficial constituents. It is likely that potential products for whey will be liquid based i.e. beverages, or soup stocks. To comply with food safety regulations such a product will need to be heat treated. This project investigated the impact that key manufacturing variables (whey/curd separation pH, and salt concentration) on the stability of whey when heated at 90°C/5 min at pH 3.5 and pH 4.5. The main findings were that all whey samples were unstable, resulting in a large volume of sediment (13 to 40%) on heating at pH 4.5. In contrast whey samples heated at pH 3.5 are generally very stable (<0.5%). The exception to stability at pH 3.5 was when salt was added to the whey (either to the cheese milk before curd formation and separation or after curd separation). Addition of salt up to 0.1 mol L<sup>-1</sup> of added Na resulted in stable whey however additions of 0.15 mol L<sup>-1</sup> Na and greater resulted in sediment volumes of >40%. The nature of the sediment changed from soft aggregates to a sandy texture with increasing salt concentrations. In addition to laboratory produced whey streams, data is also presented from commercially manufactured whey streams.

## **Biological control of foodborne pathogens**

***Craig Billington, ESR***

Over the last 10 years interest in the use of biological control (biocontrol) for pathogens in foods has grown rapidly. This has been driven by a need for new, effective, types of interventions as consumer food preferences shift, and also by the movement to reduce environmental impacts and chemical use. There are now regulatory approvals and commercial biocontrol products being sold in several countries. During this period our laboratory has tested a number of biocontrol approaches in different foods, with numerous types of bacterial pathogens including Shiga-toxigenic *E. coli* (STEC) and *Listeria*. In this talk we will describe some potential approaches for the use of biocontrol and provide some examples of our experimental work in various types of foods.

## Day 2 Speaker Abstracts

### Session E1: Plenary and Panel Discussion: Global trends, update and discussion

#### Key global trends that will impact the food industry

*Ian Proudfoot, KPMG*

The future success of the agri-food sector is dependent on everybody involved in the industry putting consumers at the centre of everything they do. Capturing more of the quarter of a trillion dollars our products realise in market relies on the industry collectively shifting its focus towards the consumers of the food and beverage, fibre and timber products it produces. While there is huge potential available, the biggest risk to success is complacency. It is critical we recognise the impact that structural changes in the Agri-Food sector globally, driven by innovation and consumer preferences, will have on our traditional markets. Some large traditional markets have the potential to literally vanish overnight, there is no place for any comfort or complacency.

#### Panel Discussion

*Facilitator: Glen Neal, FSANZ NZ*

*Presenters:*

*Ian Proudfoot KPMG*

*Lou Sherman, SCION Research*

*Miranda Miroso, University of Otago*

*Jake Hatton, Mondelez*

**Global trends- Ian Proudfoot**

**Ethical Ingredient Sourcing - Jake Hatton, Mondelez**

**The way forward in food packaging - Lou Sherman**

**Food waste: global trends and consequences of the issue - Miranda Miroso**

### Session F1: Nutrition - hot topics and emerging trends

#### Olaf van Daalen, Fonterra Brands

*Healthier options that kids love to eat... sugar reduction in Anchor UNO - kids fruited yoghurt*

Fonterra Brands has successfully reduced the sugar in Anchor Uno by over 40% to deliver the lowest-sugar kids' yoghurt brand\* in the New Zealand market. This was achieved with no complaints or comments from consumers around changes to the taste or texture. Despite some competitors launching into this space, Anchor Uno remains the lowest-sugar kids yoghurt brand in the market.

To achieve this so successfully, FBNZ had to manage competing demands – some within direct conflict with each other. These include:

- ✓ FBNZ's pledges for reducing added sugar and improving the health status of our products.
- ✓ What is Added Sugar in Foods? What naturally occurs in the milk and fruit? Are maltodextrin and refined starches added sugar? How much is too much?
- ✓ Keep it Natural! The tension of reducing sugar without introducing suspicious ingredients with strange names. The use of natural sweetness modulators to enhance sweetness without sacrificing taste.
- ✓ Hit the right price! Sugar is cheap. Sweetness modulators are not. How we formulated high-quality yoghurt with lower sugar at a competitive price-point.
- ✓ Maintain consumer's faith in our messages – being clear with sugar reduction messages but not misleading or confusing to ensure the sustainability of the claims.

\*Based on the average sugar content per 100g of the top 5 kids yoghurt brands (7/03/2017).

### **Let's shape fermented food trends – A dietitian perspective** *Josephine Greer*

This dietitian-led presentation will discuss the evidence around probiotics and fermented food and their potential to shape health and drive consumer demand for fermented food and beverage sales.

Josephine will discuss when dietitians and nutrition professionals recommend probiotics and where fermented foods would be preferable over probiotic supplements.

She will also discuss current fermented foods on the market and what makes an ideal fermented food product.

She will mention current restraints around labelling of these products and making health claims. The presentation will finish by discussing future products and labelling that would benefit consumer health.

### **Health Star Rating - implementation and consumer insights** *Antoinette Laird - Foodstuffs*

Foodstuffs, as owners of PAK'nSAVE, New World, Four Square and Pams (New Zealand's largest grocery brand) has a keen interest in promoting health and well-being in a multi-faceted way. In August 2014 Foodstuffs announced it would be rolling out the Health Star Rating across its private label products (Pams and Value), this was re-confirmed last year when Foodstuffs pledged to support Government's plan to reduce childhood obesity and improve health outcomes in the community. In New Zealand the Health Star Rating has now been routinely included on a wide range of products for three years so the team at Foodstuffs thought it would be interesting to see where customers are sitting in terms of their understanding of the tool and its benefits in terms of informing healthy eating. Research results from



over 700 respondents gives a revealing insight into customers' general awareness of the tool, its benefits and perceived limitations. The insights open the door for ways in which the tool could be adapted to ensure it remains relevant and meets customers' needs into the future.

### **FODMAPs – a new diet therapy for a common gut problem: Opportunities for food industry**

***Jane Muir, Monash University***

Digestive disorders are widespread in our community. Common problems include; constipation, disturbed balance of gut microbiota and undesirable gastrointestinal symptoms associated with certain food intolerances (eg. bloating, abdominal discomfort and 'wind'). Consumers are demanding more products based on proven health benefits. Manipulating the indigestible carbohydrates in food can assist with managing some of these problems. For example, products that are high in dietary fibre have been used to help prevent constipation and promote laxation. The importance of dietary fibre is now well accepted by the food industry and the consumer

Low FODMAP food is a recent 'newcomer' to appear on our supermarket shelves. FODMAPs stand for Fermentable, Oligosaccharides, Disaccharides, Monosaccharide's and Polyols. These are short chain carbohydrates that are not absorbed in the small intestine but are very rapidly fermented by the gut bacteria to produce gas. FODMAPs trigger gastrointestinal symptoms (bloating, abdominal pain and discomfort) associated with irritable bowel syndrome (IBS). IBS affects one in seven adults. The Low FODMAP diet is an evidence-based therapeutic diet that was developed by the research team at Monash University and is becoming the first line of management for IBS. There are great opportunities for the food industry to produce products that are low in FODMAPs. The team at Monash have developed a smartphone app (Monash University Low FODMAP diet App) and food certification program (Monash University Low FODMAP Certified) to help deliver this new research information and certified products to consumers with IBS.

## **Session F2: Positioning the New Zealand meat industry for future growth**

### **Meat and market trends**

***Nick Beeby, Beef + Lamb NZ***

No abstract available

### **Meat Industry Association leading the way with collaborative research**

***Richard McColl, MIA***

The MIA leads the industry collaborative research and development programme focusing on the following key areas;

- Food safety
- Automation with a focus on high injury jobs
- Meat quality
- Animal welfare

The MIA has facilitated and invested (directly and indirectly) in two research partnerships along with co-investment from the crown; - Meat industry innovation limited - Ovine automation limited.

Both research partnerships are providing fundamental building blocks for our industry members. The MIA is also inaugural investor along with DCANZ and ZESPRI in the New Zealand Food Safety Research centre an investment that underpins our recognition of the importance of food safety and one of which we are very proud.

### **Partnering with industry to add value to NZ red meat: Exploring the health benefits of grass-fed beef**

***Emma Bermingham, AgResearch***

The NZ meat industry thrives on free-range pasture-based farming and is well placed to differentiate its products based on health benefits. This could appeal to international consumers who are increasingly aware of the risks of chronic illness and the importance of diet in its prevention. For example meat from forage-fed animals is rich in bioactive complex lipids that have unexploited potential to improve metabolic health. These lipids may be an effective dietary intervention for managing blood cholesterol, which is one of the key metrics of metabolic health and cardiovascular disease. When extracted from foods such as milk and eggs and added to meals, they can reduce cholesterol absorption. The effect of similar complex lipids extracted from grass-fed bovine sources is yet to be validated.

This project is a partnership of Firstlight Foods, AgResearch and the University of Auckland. Our aim is to discover and demonstrate the health benefits of lipids found naturally in NZ red meat. As proof of concept we will generate food-grade extracts of complex lipids from beef co-products, characterise their composition, and use them for a clinical feeding trial where cholesterol response can be evaluated. Robust scientific evidence could support future products appealing to high-end “Worried Well” consumers in the USA and Asia who are health-conscious and enjoy eating meat. Ultimately, we aim to increase the contribution of the NZ red meat industry to the High-Value Nutrition National Science Challenge goal of an additional \$1B in export revenues by 2025.

### **The Impact of consumer trends on value added meat innovation**

***Andrew Powell and Vivienne Stein - Newly Weds Foods***

As food manufacturers, marketers and creators we need to recognise what drives the consumer in their purchasing decision. In order to develop innovative new products for launch into the dynamic, ever evolving food industry it is critical to understand what is of interest to the consumer at the moment and into the future. The environment of the meat industry has changed, with “non-meat” options and with the “fickleness” of the Millennials there needs to be a focus to make sure the products and services offered retain relevance. Our presentation today looks at the key consumer trends impacting value added development in the meat industry and the products we are seeing hit the shelves. We will review the consumers demand for healthier alternatives, time saving options, ethical consciousness and increasing need for satisfaction and quality in terms of flavour and food experience.

## **Session F3: Compliance cost versus risk**

**Title TBC**

***Seema Narayan, Spotless Facility Services (NZ) Ltd***

Abstract not available

**Title TBC**

***Genevieve Knights, Genevieve's Cuisine***

Abstract not available

**Update on Food Safety requirements for food manufacturers**

***Sally Johnston - MPI***

Abstract not available

## **Session F4: Sustainability/Value creation: Case studies**

**Love Food Hate Waste – why wasting less food is good for consumers, businesses and the environment**

***Jenny Marshall, Waste MINZ***

One third of all of the world's food goes to waste while one in every eight people are going to bed hungry. It is clear that food waste is one of the big issues of the 21st Century. The Love Food Hate Waste (LFHW) campaign, which launched in 2016, investigated the extent to which food is wasted by Kiwi households. By going through rubbish bins to find out what Kiwis were throwing away, LFHW found that New Zealand families are wasting \$872 million worth of food every year. The campaign aims to not only raise awareness of the issue of food waste and the associated environmental impacts, but also give Kiwis the motivation and skills to waste less food. This presentation will look at how the food manufacturing industry can engage with the LFHW initiative and the opportunities to add value to their customers by doing so.

**Creating value from primary industry secondary streams.**

***Anna Yallop - Bioresource Processing Alliance***

The word 'sustainability' with regards to companies is not just about environmental responsibility, it's also about the long term viability of organisations and their products. Companies, of course, need to think about how they can limit their impact on the environment and this can lead to value creation in a number of ways. Being able to sell the story of how a company is acting responsibly will certainly attract customers, which brings increased revenue but being able to generate whole new product lines from previously wasted raw material will also generate additional income and/or save costs.

New Zealand already has a reputation for being a country that produces high quality, safe food products for the world market. By capitalising on this strategic advantage, food companies are now looking at ways to create additional value from their lower-value secondary streams and by doing so, are extending their product range, creating collaborative alliances and moving up the value chain.

The Bioresource Processing Alliance is a Ministry of Business, Innovation and Employment funded R&D programme that works with the primary sector to take its low value, biological waste and by-products and turn them into high value products

for export. Project case studies from the food sector will be discussed with a view to inspiring companies to concurrently look for ways to minimise harm to the environment and see their by-products as opportunities for revenue generation.

**Marine waste utilisation: state of the art**  
*Alaa El din Bekhit, University of Otago*

Economic and consumer pressures have led to large quantities of seafood to be processed before marketing yielding large amounts of marine by-products. Several bioconversion processes have been proposed to transform some of these by-products. In addition to their conventional use as animal feed and fertilizers, viscera, heads, skins, fins, trimmings and crab and shrimp shells have demonstrated great potential in the generation of lipids, bioactive peptides, enzymes, other functional proteins and chitin that can be used in food and pharmaceutical applications. However, limited applications have been proposed for marine shells (which are still treated as waste). Waste shells can cause many environmental issues such as generation of off-odours, air and soil pollution, and damage to the marine ecosystem. The research of our lab has been focused on exploring opportunities for the utilization of the marine by-products, in particular seashells. Several valuable products such as pigments, amino acids, hydroxyapatite, chitin and chitosan can be obtained from these by-products. The presentation will discuss various products that can be obtained from waste marine shells and describe various methods that can be used to produce these products with the aim of highlighting opportunities to add value to this waste stream, opportunities for novel sources of bioactive compounds for health.

PEER REVIEWED

**Converting fruit and vegetable pomace into a high grade food ingredient**  
*Silas Villas-Boas and Ninna Granucci, Green Spot Technologies*

Every year several million tonnes of fruit and vegetable by-products are produced by the food and beverage industries worldwide. It has been estimated that 15 to 50 percent of fruits and vegetables become by-products when processed, which usually ends up in landfills. Green Spot Technologies, a spin out company from the University of Auckland and Callaghan Innovation, has developed a range of low calorie fermented flour ingredients that present high levels of protein and dietary fibre, and low levels of sugars and fat. Our fermented flours are all plant-based, naturally produced from the fermentation of fruit and vegetable by-products. They are all free from gluten, free from GMOs, and naturally rich in vitamins, essential minerals, omega-6 and omega-9 fatty acids and beta-glucan prebiotics (b-1,3 and b-1,6-glucans). These incredible new ingredients can be used for substitution of existing flours in some cases, as base material for food scientists to develop market designed products (particularly relating to high protein, low carb foods), substituting for higher priced ingredients and allergens (e.g.; whey protein, egg white, soy flour), or increasing shelf lives and as key ingredient to help reach demanding food development specifications without compromise. Our first flours are based on fermented apple, orange and carrot pomaces. These pomaces are the pulp, peels and seed of fruits and vegetables after juice extraction. Other fermented

flours are under development using white and red grape marcs, which are by-products of the wine industry; as well as kiwifruit, beetroot, and parsnip pomaces.

### **Session G1: NZIFST AGM**

Agenda on the NZIFST Website in members area.

### **Session G2: J C Andrews Award Presentation**

*Speaker will be announced at AGM*

### **Session G3: 150 Year Celebration: Royal Society of New Zealand**

*Speaker: Andrew Cleland, CEO, Royal Society*

### **Session G4: Global update on trade.**

*Crawford Falconer, Lincoln University*

### **Session H1: Sports nutrition - giving New Zealand the edge, naturally**

#### **Consumption of New Zealand Blackcurrant Anthocyanins Support Exercise and Fitness Benefits**

*Roger Hurst, Plant & Food Research*

A normal serve of New Zealand blackcurrant gives a measurable health benefit that consumer's value – blackcurrant complements the health benefits of exercise. Adequate recovery following physical exercise/training is essential for gaining optimal health benefits. Insufficient recovery may result in healing delays, fatigue and a decline in physical and mental health. Certain natural fruit polyphenols may provide effective support – a concept being evaluated by the New Zealand Institute for Plant & Food Research Ltd. Blackcurrant anthocyanins (defined single dose range) suppressed (34%) rowing exercise-induced oxidative stress (plasma protein carbonyls  $0.9 \pm 0.1$  v.  $0.6 \pm 0.1$  nmol/mg protein, placebo v. blackcurrant). Subsequent timed intervention studies designed to maximise exercise recovery demonstrated reduced muscle damage biomarkers following repetitive quadriceps contractions (creatine kinase  $210 \pm 74.7$  vs.  $64 \pm 22.7$  Units/L, [day 3], placebo vs. blackcurrant) and alleviated perceived muscle soreness. Moreover, daily consumption (5 weeks) showed a 25% improvement in recovery 2 hrs after exercise (plasma protein carbonyls  $0.54 \pm 0.02$  v.  $0.44 \pm 0.02$  nmol/mg protein, [week 1 v. week 6], compared to placebo). These and other data suggest that blackcurrant food preparations may appropriately modulate body oxidative and inflammatory stresses to aid recovery, complement the health benefits of regular exercise and hence could support the creation of new functional foods. These and other findings from studies conducted by Plant & Food Research will be discussed.

## **Are pomegranate products the next 'superfood' for endurance athletes?** *Emma Crum, Massey University*

Today's high performance athletes are competing in an environment in which the differences in ability at the pointy end of competition are very small. This has led to a greater emphasis on so-called 'marginal gains', to gain an edge over the opposition. However, such methods do not have to involve complicated pharmaceutical substances; rather, improvements in performance may be achieved through the diet.

Pomegranate fruit was used in traditional medicine to treat a variety of medical conditions, and its anti-inflammatory properties are now attributed to its high concentration of flavonoid polyphenols, a group of phytochemicals which exhibit strong antioxidant activity. The interest in pomegranate products as ergogenic supplements are due to the protective and stimulatory effects of these polyphenols on the body's major vasodilator, nitric oxide. Accordingly, the intake of pomegranate as an extract or juice has been shown to reduce blood pressure and increase blood flow, suggesting the possibility for faster and more efficient oxygen transport.

Research conducted as part of my PhD has shown that pomegranate products do indeed have an effect on oxygen transport in athletes. However, this effect differs depending on the training status of the athlete, the length of supplementation and the environment in which they are exercising. This presentation will highlight the key findings of my research, and discuss the potential for pomegranate and other polyphenol-rich foods to improve performance.

## **Low Carbohydrate – High Performance** *Will O'Connor, Massey University*

Within the sports nutrition world strong opinions are held by some that low carbohydrate diets can severely inhibit athletic performance. However, the research undertaken as part of my PhD qualification shows eating less than 1 gram of carbohydrate per kg body weight per day (<1g CHO/kg/day) for two weeks does not affect exercise capacity in highly trained male athletes. Similarly women performed better and became leaner on a four week low carbohydrate diet (<2 g CHO/kg/day) compared to a four week high carbohydrate diet (>5 g CHO/kg/day). The impact of these findings, in the context of endurance sporting performance, is twofold; firstly, an increased capacity to burn stored body fat allows the athlete to become leaner and thus improves power to weight ratios and secondly, the greater an athlete's capacity to burn body fat, the less reliant they are on their limited carbohydrate stores. Both of these factors have been shown to influence endurance performance. The secondary arm of my PhD was to test a novel ketone supplement in order to investigate its potential to induce the same favourable changes achieved by eating a low carbohydrate diet without the requisite carbohydrate restriction. Initial findings indicate there is a possible application for these type of supplements within endurance sports. Although the overall results correlate with positive benefits to performance there were mixed responses to how each athlete felt throughout each diet. Therefore, it is suggested that an individual assessment of each athlete is the best way to ensure maximum performance benefit of any dietary, training or nutritional supplementation protocol.

## **Fish oils and exercise recovery** *Katherine Black, University of Otago*

Nutritional interventions that could improve recovery from the training stimulus allowing improved performance in the next training session, is of interest. In particular, nutritional recovery strategies to attenuate the rise in muscle damage and muscle soreness could be beneficial. Anecdotal evidence suggests that fish oil supplements are popular amongst athletes who believe they improve recovery.

Fish oils are rich in n-3 polyunsaturated fatty acids, n-3 fatty acids appear to have anti-inflammatory properties. As eccentric exercise-induced muscle damage, is associated with an elevated inflammatory response, it would therefore seem that the anti-inflammatory properties of fish oils might be beneficial for reducing inflammation and thus may ameliorate symptoms of muscle damage during exercise recovery.

Of the research available fish oil supplementation has been shown to incorporate into the phospholipid bilayer of cell membranes. This incorporation leads to the stimulation of inflammatory markers and a protective effect following muscle damage. Further, supplementation with fish oil has been shown to upregulate cell signaling involved in stimulating muscle protein synthesis (a marker of muscle growth). During resting conditions, fish oil supplementation has shown to sensitize the muscle to anabolic stimuli such as insulin and amino acids. This also has beneficial effects for athletes who are looking to repair training induced muscle damage as well as muscle growth.

## **Session H2: Getting more value from protein**

### **The New Zealand rendering industry – an overview** *Kevin Cresswell, MIA*

The New Zealand Rendering industry is a responsible, sustainable and essential NZ industry taking meat waste and converting it to useable and valuable products. The paper gives an overview of the NZ Rendering industry as well as its products and markets. It also discusses why it is an essential industry, its importance to the NZ economy, its achievements and some of the challenges the industry faces.

### **Earning more from recovered meat protein** *Rob Archibald, Taranaki Bio Extracts*

Traditionally parts of the animal carcass that were not used for meat or edible offal production have been rendered and sold primarily to the animal feed industry. In a world where the demand for animal protein for human consumption is increasing, maximizing the utilization of the non-meat parts of the carcass, should be one of the areas of focus for New Zealand. Developing new businesses that add value to the non-meat protein streams is not for the faint hearted. New businesses in this area can be capital intensive, and demand significant technical and marketing resource. This paper discusses: the current opportunities, the challenges, and the future requirements for New Zealand to added value to this under-utilized protein resource.

### **Meat peptides to enhance iron uptake from dietary supplements**

*Peter Purslow, National University of Central Buenos Aires*

Iron deficiency is the most common of all nutritional deficiencies in the world. Iron deficiency anaemia is estimated to affect 3.5 billion people. One major cause is poor iron-bioavailability due to the presence of vegetable-derived inhibitors (e.g. phytates and tannins) in the diet. Conventional iron supplements are only poorly absorbed and so must be given in high doses, with unpleasant side effects. Meat proteins promote iron uptake from phytate-rich vegetable diets in humans, probably by preventing chelation of iron by phytates. The objective of our work is to identify which fractions of meat proteins maximise iron uptake, and to determine the optimal conditions for iron uptake from iron supplements in combination with meat peptides. An epithelial cell-line and explants of pig duodenum are being used as models of uptake in the gut. Iron uptake from a 40  $\mu\text{M}$  iron concentration is maximal at pH 6.0, at and when the peptide size is less than 30 kDa compared to larger peptides. Current developments of this work focus on microencapsulation of iron-peptide complexes together with other adjuvants.

### **Understanding the bioactive peptides of meat as part of the future for adding value to meat waste/by products.**

*Santanu Deb-Choudbury, AgResearch,*

Co-products and waste streams from meat industry processing have the potential for value generation beyond current levels. These streams can be a rich source of ingredients with functionalities that can be exploited, leading to the development of new products. A beef waste stream (BWS) has been identified as one such low value source. The hydrolysis of BWS using commercial enzymes used in the food industry, is being explored as a viable option to create meat protein extracts. A possible application is the use of the extract as a flavouring agent in plant protein based extruded products. Extruded products from plant proteins such as soy, wheat and pea, can potentially be consumed as meat analogues with properties that closely mimic sensory properties such as the taste and texture of meat. The addition of concentrated meat extracts could further improve the flavour while maintaining the desired texture of the products. Work to date has shown the importance of sulphide bonding in gluten proteins in achieving the fibrous structure of the analogues. For the meat extracts, a process is being developed that utilises low value meat trimmings to obtain functional protein extracts that perform well during the extrusion process of plant proteins. Additional functional properties that are tailored towards creating new textured food with enhanced flavour and stability, are also being explored.

### **Session H3: Capturing the value of milk**

**Title TBA**

*George Joseph, AsureQuality*

Abstract not available



## **Adding value through processing**

***Michael Matthews***

Adding value by application of new and novel process technologies has a proud and distinctive history in the New Zealand dairy industry. Examples include cream vacreation, continuous cheese making, post-process consumer-ready Mozzarella cheese, high speed automated powder packaging, high-yield lactose production, and use of ion exchange resins and membranes to make protein concentrates. Added value refers most commonly to products that generate profit greater than would be derived if the raw material were processed into a commodity. Adding value through processing requires understanding of the chemistry and behaviour of raw materials. It also requires clear and measurable targets in finished products to meet product specifications and customer expectations. Such knowledge helps guide process design and equipment selection. Knowledge of new and emerging technologies can also lead to better process design and products. However, new technologies can bring unforeseen challenges. For example, large food contact surface areas in modern, high capacity separators and evaporators, often run warm for long periods, provide expanded opportunities for biofilm formation. Vastly expanded surface areas in ion exchange and membrane plants can be even more problematic. New technologies bring new product opportunities but the need for old fashioned vigilance and hazard assessment has never been greater.

## **Adding value through understanding Milk composition**

***Tom Wheeler, Cawthron***

The composition of milk has evolved in mammals to support the growth and wellbeing of their neonates. Most obviously this is manifested through the major constituents of milk, the caseins, triglycerides, lactose, which together with micronutrients provide the metabolic energy and basic ingredients to facilitate tissue growth. Currently, the large majority of dairy products are produced and marketed based on this function. However technological advances over the last ten years have facilitated a more detailed understanding of the low-abundance constituents of milk, which in turn has revealed a more complex and nuanced view of its functionality. This presentation will summarise the findings from studies characterising the milk proteome using mass spectrometry, and their implications with regard to additional functions of milk beyond nutrition. These include host defence against microbial pathogens, micronutrient absorption, and optimising gut function. The findings provide insight into the holistic benefits of consuming milk, as well as the possible effects of processing on milk's functionality. Finally, they reveal new opportunities for commercialising milk ingredients.

## **From runny to frothy: Toward the enzymatic production of foams from milk proteins**

***Dominic Agyei, University of Otago***

Whether found in ice cream, mousse, marshmallow, or on coffee, foams play a huge role in influencing the physical and sensorial properties of many modern cuisines. The stabilization of soft matter foams is therefore of huge interest in many food processing activities and this is usually achieved by the use of surfactants obtained from chemical or biological sources. Whereas bio-surfactants are environmentally

friendly, low in toxicity, and more diverse, their production at large scales is hampered by the high cost involved. Interestingly, many food proteins have emulsifying and foaming abilities-particularly after limited enzymatic hydrolysis. Enzymatic production of bio-surfactants is attractive and gives 'tailored' protein hydrolysates with high quality. The wide abundance of milk proteins and food enzymes (often from lactic acid bacteria) also makes this production approach more industrially viable. In this study, hydrolysates were prepared from milk proteins (casein,  $\beta$ -lactoglobulin [ $\beta$ -LG], and whey protein isolates, [WPI]) using immobilized proteolytic enzymes of *Lactobacillus delbrueckii* subsp. *lactis* 313. The foaming properties and interfacial structures of the intact proteins and hydrolysates differed based on the extent of hydrolysis. While hydrolysis of proteins improved the foaming abilities, extensive hydrolyses compromised the foaming stability. X-ray reflectometry data also provided useful information on how foam-film thickness changes with extensive hydrolysis. This study demonstrates that enzymes can be used in a sustainable, food grade process for making milk-derived surface active hydrolysates which can be explored as stable foams in food products.

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## Session H4: Remaining raw materials

### **Nutraceutical extracts from plant remaining raw materials**

*Mike Turner, NZ Extracts*

No abstract available

### **Remaining Raw material case study**

*Simon Thomas, NZ King Salmon*

No abstract available

### **Transformative technologies for sustainable wastewater treatment and process control**

*Daniel Drew, Greenchip*

An innovative and transformative technology to treat industrial and municipal wastewater and a powerful new water, wastewater and process control monitoring technology are presented

Continuous Backwash Oxidizing Microfiltration (CBOM) is a non-biological wastewater treatment process involving the initial removal of the majority of suspended solids (raw biosolids) for later conversion to energy or value-added products, followed by 2 oxidizing microfiltration stages using upflow media. The CBOM process exhibits a performance equal to or better than any competing technology, producing recyclable water to meet any re-use requirements, is fully-engineered, modular, on a small footprint and has the lowest capital and operating cost of any modern wastewater treatment system. The process is remotely monitored and managed via the internet.

CBOM Operating data is presented from different sites over periods in excess of 12 months to demonstrate the exceptional performance of the system. Comparison data is also presented to demonstrate the superiority of the CBOM technology with respect to performance, capex and opex. The entire process is flexible, can cope with large variability in flow and able to treat wet weather flows of 3 to 4 times the design volume with no reduction in performance.

A case study of the CBOM installation at Fontana, California will be presented. The Liquid Monitoring Station from Zaps Technologies (USA) is a transformative new optical technology for real time continuous monitoring of water, wastewater or industrial process streams that allows for unattended measurement of multiple parameters (up to 10) without chemical reagents.

**Produced locally, consumed globally.... wasted responsibly? How can we minimise the impact of food production on the New Zealand environment?**  
*Alzbeta Bouskova, ADI Systems*

The food industry is the largest exporter of goods in New Zealand, generating approximately 75% of the national export revenue. Food processing such as dairy, beverage production and food packaging is often associated with the production of large volumes of wastewater. Due to its origin, the food processing wastewater contains mainly organic highly degradable matter in soluble and particulate form, nutrients, minerals and a small portion of inert non-degradable matter. From the environment's perspective, this wastewater poses a substantial threat if discharged untreated. However, from a resource perspective, the food production wastewater is a bundle of water, energy and nutrients, which can have value if recovered.. The traditional way of treatment and disposal often leads to greenhouse gas emissions, pollution of waterways and permanent removal of nutrients from the environment. A commitment to environmentally sustainable practices calls for closer examination of energy conservation, nutrients recovery and water recycling opportunities. The presentation will include full-scale industrial treatment plant case studies where energy, nutrient and/or water recovery has been successfully implemented.

## Day 3 Speaker Abstracts

### Session I: Plenary Session - Finding and targeting market opportunities

#### Target marketing – Millennials

***Claire O'Connell, The Classroom, University of Otago***

Claire's presentation will look at the recent shift in consumer attention to social media, and the opportunities and challenges that presents to modern marketers.

#### High Value Nutrition Foods: What are the export opportunities for New Zealand?

***Bill Kaye-Blake, Price Waterhouse Coopers***

Worldwide, there is strong interest in foods with health benefits, which should create good opportunities for New Zealand exports. By meeting the demand for these foods, exporters can achieve higher prices and better returns. To establish a baseline, we estimated the current value of New Zealand food exports under three categories: scientifically validated health claims, specific health claims and especially nutritious food. We also interviewed local companies about their current and planned product offerings, and conducted market research in Asian markets about perceptions of New Zealand. The research showed three things. First, New Zealand has few exports that meet the most stringent definition of scientifically validated high-value nutrition products. Secondly, the large number of products and export value in lower categories suggests potential for improvement: moving a few products into higher categories could greatly increase export returns, and there are products in the pipeline. Finally, there is market potential for these products, as long as they can meet requirements both for validated health claims and for demonstrated food safety. A key success factor for a New Zealand food manufacturer in Asia is food safety.

In addition to the baseline analysis using 2014 data, we repeated the analysis for 2015 and plan to analyse 2016 data. The repeated analysis is creating a picture of growth over time, to inform the High-Value Nutrition National Science Challenge about progress towards its goal of increasing New Zealand exports.

#### Miraka's vision of capturing the value of milk

***Kusal Perera - Miraka***

Abstract not available

### Session J1: Worksite Health and Safety

#### Health and Safety: The New Zealand food industry's reputation

***Speaker from Worksafe***

Abstract not available

#### Employee engagement in Health and Safety.

***Steve Carden, CEO, Landcorp***

Abstract not available

## **Five things you need to know to keep your worksite safe**

***Sharon McDonald, KIS health and Safety Solutions***

Abstract not available

## **Session J2: Targeting Exports**

### **E-commerce Exports: If you're trading on-line to the US, what additional food safety rules must be complied with?**

**Food Safety Rules - Case Studies for the US Market**

***Kathy Lloyd, Waka Kuaka Market Access***

Newcomers to E-commerce can avoid business bloopers by incorporating research of market requirements into their product development process. Global transformation of increasingly complex global food supply has created vast opportunities and rewards for fraud. Food safety risks and scares now have the potential to affect thousands of consumers, and these increasing safety and security risks have confronted regulators globally.

The US Food & Drug Administration is currently rolling out a major reform of food legislation - partly to address post-9-11 security threats and partly to refine risk-based controls. Controls are applied across all food types and right back through supply chains regardless of international boundaries.

Exporters trading through on-line sales should be aware of these global trends and also of the need to play an active part in protecting New Zealand's integrity as a trusted supplier of safe food, a reputation that has been built up over many decades. Protecting your own brand as well as New Zealand's reputation through consumer confidence depends on establishing trust in your brand.

Having your product delayed or rejected at the overseas border, or being subject to warnings and recalls can take a huge toll on your business. Don't be caught out by developing your product, without considering the additional rules that will need to be complied with, and understanding the timeframes and processes involved.

This presentation takes a "regulatory journey" to the US for several different processed food and pet food products and highlights current requirements exporters will need to consider.

**Rebecca from Eat Right Foods** will share her personal experience around some of the challenges, opportunities and pitfalls of exporting to the US.

### **New Zealand Functional foods in China – perceptions and opportunities**

***Bill Kaye-Blake, Price Waterhouse Coopers***

Perceptions are shifting towards healthy foods in Asia. From market analysis and interviews, we established that the functional food and beverage market is very large in Asia, the market is growing quickly, and there is a heightened interest in New Zealand food products. Over 90% of the consumers surveyed in Asia are willing to pay a premium for foods with health benefits, and there is double-digit growth in China, Hong Kong and Vietnam. Internet search data verifies that there is interest in functional foods from New Zealand, which ranks highly on searches for milk, manuka honey and kiwifruit. Success factors for a New Zealand food manufacturer in Asia are food safety and good quality products. Following recent scandals, food trust is playing a key role in food consumption decisions in Asia.

For future opportunities, the challenge is to fit with dietary trends while addressing health concerns and providing trust. Economic development and population growth are increasing overall food consumption, while the growing middle class and informed consumers are demanding better quality and variety. Mobile connectivity and social media have become fundamental ways to obtain information and buy goods and services. Digital technologies enable people to be better informed and empowered: they provide information about what food companies do and the impacts of their actions, as well as their products. Navigating these trends will continue to be a major challenge for food companies.

### **The challenges and opportunities of innovation – finding the right idea for the right market**

***Hamish Conway, Sell Global***

In the World of Online retail in the western world there is one platform to rule them all. Amazon. With a 50% market share of online sales in the USA and soon to be opening in Australia, traditional distribution channels are in for a rough ride. Hamish Conway from Sell Global is an expert on the Amazon platform and how it can be used by New Zealand food companies to reach big consumer audiences, directly and fast.

In this presentation Hamish will share why the Amazon platform is the perfect low risk, low cost market entry strategy for exporters to the USA, UK, Europe and Japan. He'll also talk about the common mistakes companies make when listing on platforms like Amazon and how to know if your product fits the ideal criteria to be a success on Amazon.

### **Session J3: Ensuring Commercial Success**

#### **Ensuring commercial success**

***Angus Brown, Food Innovation Network, Patrice Feary, KPMG and Duncan Kerr, Proper Crisps***

Business Development Managers from The New Zealand Food Innovation Network (NZFIN) will showcase various case studies of how clients have leveraged the use of the NZFIN to develop, prototype and ultimately commercialise new food, beverage and nutraceutical products successfully into the local and export markets. They will explain what the critical success factors were and what the important learnings are for each example.

The NZFIN will also provide an update on new technologies available to industry within the hubs.

#### **Duncan Kerr - Proper Crisps**

Export markets are big unknown for many small and medium size business. How do you pick the right market - let alone the task of picking the right importer, distributor and customer channel? Then there is the supply, production planning, logistics, pricing, and import regulations to consider. It can seem quite challenging when first going in but the excitement and opportunity in volume and value in some of these markets are considerable.

Spending the time upfront is difficult when you have no sales generation over the early set up, many small business' wonder if it is all worthwhile. How do you do the

pre work, who is there to help and what are some simple go to market options for small business.

## **Essence Compliance, Food Marketing Law 10**

***Ciska de Rijk***

A presentation that explores the laws that govern food marketing including food-specific court case studies (and Advertising Standards Authority decisions) and analysis of television commercials and advertising and food labelling examples. The presentation will include discussions for various claims such as “free” claims, “100%”, “premium”, “fresh”, “organic”, “wholefood”, “natural”, and “traditional”. The presentation hopes to fully explain the legal framework that governs food marketing claims including what happens when businesses gets it wrong and what the regulator can do.

## **Session J4: Ensuring Commercial Success**

### **Role of gastric juice diffusion into steamed and fried orange-fleshed sweet potatoes on the macro- and micro-structural changes and nutrient release during static in- vitro gastric digestion**

***Geeshani Somaratne, Massey University,***

Initial material properties of natural solid foods play a key role in influencing the diffusion of gastric juice and release of nutrients during gastric digestion. The objective of this study was to investigate the role of gastric juice diffusion into sweet potatoes on the macro- and micro-structural changes and nutrient release during static in-vitro gastric digestion as influenced by processing methods. As a rich source of carbohydrates and  $\beta$ -carotene, orange fleshed sweet potatoes were used in this study. In-vitro INFOGEST oral-gastric digestion protocol was performed for steamed and fried sweet potatoes cubes (5x5x5 mm<sup>3</sup>). Solid loss,  $\beta$ -carotene loss and hardness changes were measured after 8 digestion times (0 to 240 min). Softening half time ( $t_{1/2}$ ) during digestion was estimated using the Weibull model. Light and scanning electronic microscopy were used to study the change in microstructure after digestion. The effective diffusivity of gastric juice into cylindrical steamed and fried sweet potatoes (2cm diameter, 2.5 cm length) was determined using the Fick's second law. Cooking method, digestion time, and their interaction significantly ( $p < 0.05$ ) influenced initial hardness changes. Digestion time significantly ( $p < 0.05$ ) influenced the release of solids and  $\beta$ -carotene from sweet potatoes. There is a trend of higher rate of softening ( $t_{1/2} = 315.40$  mins) and effective diffusivity ( $D_{eff} = 3.98 \times 10^{-10} \text{m}^2/\text{s}$ ) in fried sweet potatoes compared to steamed sweet potatoes ( $t_{1/2} = 443.44$  mins and  $D_{eff} = 3.17 \times 10^{-10} \text{m}^2/\text{s}$ ). The observations of micrographs revealed that frying created a porous network that can directly contribute to the observed difference in the rate of softening and effective diffusivity of gastric fluid.

### **Pulsed electric field-induced tissue structure changes produce healthier kumara chips**

***Tingting Liu, University of Otago***

The aim of this research was to study how pulsed electric field processing modifies the structure of raw kumara (*Ipomoea batatas* cv. Owairaka) tubers to produce

healthier kumara chips. Whole unpeeled kumara tubers were treated at 1.2 kV/cm with a specific energy of 22 kJ/kg and structural changes after PEF treatment were studied. Structure changes caused by PEF were evaluated using cryo-scanning electron microscopy (cryo-SEM). The results showed that the structure of dermal tissues was not affected by PEF, while the mid ground tissue was disrupted by PEF treatment, with extensive cell lysis. PEF treatment resulted in significant softening of the mid ground tissues, but not the dermal layer, as determined by texture analysis. PEF-treated and untreated kumara tubers were sliced and fried at different temperatures ranging from 150 °C to 190 °C. Chips from tubers pre-treated with PEF and fried at 190 °C had 18% less oil compared to untreated samples. Chips from PEF treated kumara tubers achieve the same colour intensity at a lower temperature, for the same frying time, and hence reduces the chance of significant acrylamide formation. This study provides evidence that using PEF treatment prior to frying could produce healthier low-fat kumara chips.

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### **Exploring the inter-relationship between food structure, oral processing behaviour and sensory perception**

*Nan Luo - Massey University*

The breakdown behaviour of food gels in the mouth impacts sensory texture perception and flavour release. This study aims to investigate the effect of gel structure on in vivo oral processing behaviour and sensory perception. Emulsion gel system was chosen as a model system where whey protein isolate (WPI) was used as a gelling agent and WPI or polysorbate 80 (Tween 80) was used as an emulsifier. Capsaicin, a lipophilic anti-cancer compound with pungent / burning sensations, was encapsulated in emulsion oil droplets of the gels. Emulsion gel structure was manipulated through oil droplet size, emulsifier type and ionic strength. In WPI stabilized emulsion gels, at low ionic strength (10 mM), gels became weaker with a decrease in oil droplet size; while at high ionic strength (100 mM), gels became stiffer with lowering oil droplet size. Gels with oil droplet size ( $d_{3,2}$ ) of 0.1  $\mu\text{m}$  at low ionic strength had significantly lower chewing duration and frequency; no significant difference was found in chewing behaviour for other gels. Perceived 'hotness' sensation increased with the decrease in gel hardness. Tween 80 stabilized emulsion gels were harder than WPI stabilized emulsion gels at low ionic strength and weaker at high ionic strength. Flocculation of oil droplets was found in the structure of Tween 80 stabilized emulsion gels. This difference in structure may also lead to difference in chewing behaviour and sensory perception of capsaicin. This study provides an insight on how to design or manipulate food structure for targeted texture and flavour.

### **Dynamic digestion behaviour of milk protein ingredients: the impact of gastric structuring on the rate of protein hydrolysis**

*Xin Wang - Massey University*

Milk protein is an important source of nutrients for humans through the different stages of life. Milk protein ingredients are not just useful for improving the functional properties but also provide excellent nutritional value for food and nutritional products. Understanding the digestion behaviour of proteins in milk protein ingredients is of interest to both dairy and food industry. The coagulation of casein micelles can be induced by pepsin in the gastric environment, but individual



caseins are not coagulated by pepsin. Therefore, the formation of structured curd is expected to be determined by not just the composition of protein but also the assembling structures of protein. The study aims to investigate the dynamic digestion behaviour of different milk protein ingredients with a range of different structures. Advanced in vitro dynamic gastric digestion model, Human Gastric Simulator (HGS), was applied to determine the formation of curd and kinetics of protein hydrolysis from skim milk powder, MPC, calcium-depleted MPC, sodium caseinate, WPI and heated WPI (90°C, 20 min). Skim milk powder and MPC with intact casein micelles formed a curd with closely knitted network under gastric conditions, but a loose network with large voids was observed in the calcium depleted MPC and caseinate, which contained no intact casein micelles. There was no curd formation in WPI and heated WPI. The rate and composition of the digesta released from HGS was significantly different for various protein ingredients. This is attributed to the formation of different structured curds under gastric conditions. These findings are useful for the application of these ingredients in the high value added nutritional foods.

### **Retrogradation of potato in tuber and starch digestion in vitro** *Nicole Chen - Massey University*

The effects of retrogradation of potato in tuber were studied by low field NMR and by starch digestion in vitro. The fully gelatinised tubers were stored at 4°C for 1, 3 and 7 days and then reheated at 50, 70, and 90°C. Three different water populations in tuber with relaxation time T<sub>21</sub> (<15ms), T<sub>22</sub> (70-200ms), and T<sub>23</sub> (>400ms) were detected by low field NMR. The relaxation time of each water population decreased during refrigerated storage. The relaxation time of 1, 3 and 7 day retrograded tuber increased during reheating but not to the level of freshly cooked. The relaxation time T<sub>22</sub> of retrograded potato reheated at 50°C were from 73 to 87ms, at 70°C were from 66 to 119ms, and at 90°C were from 85 to 130ms. All were less than the relaxation time of freshly cooked potato (212ms). Starch hydrolysis of freshly cooked, retrograded and retrograded+reheated samples with average particle size of 0.1 mm<sup>2</sup> was studied by using a gastro-small intestinal digestion model in vitro. Starch hydrolysis (%) decreased in the following order: freshly cooked (93.08±3.23) ≈ 1 day retrograded+reheated (95.6±4.9) > 1 day retrograded (77.6±5.3) > 7 days retrograded+reheated (67.8±6.3) > 7 days retrograded (57.1±4.2). The 7 days retrograded+reheated sample showed a significantly lower starch hydrolysis (%), similar to those of 1 day retrograded sample without reheating. The relaxation time of different water populations may correspond to the digestibility of retrograded and retrograded+reheated tuber. The relaxation time of a water population indicates mobility-the water with slow relaxation time is more mobile and less restricted which could facilitate enzyme diffusion leading to higher starch hydrolysis (%).

### **Effect of *Faecalibacterium prausnitzii* on intestinal homeostasis** *Eva Maier - AgResearch*

*Faecalibacterium prausnitzii*, an abundant obligate anaerobe of the human intestinal microbiota, may exert beneficial effects and was proposed as a next-generation probiotic. However, only few studies have investigated its mechanisms of action, partly due to the difficulty of co-culturing live obligate anaerobes with oxygen-requiring human cells. The novel apical anaerobic co-culture model used in

this study allows this co-culture by separating anaerobic and aerobic compartments. This model was used to investigate the effects of live *F. prausnitzii* on intestinal barrier function, measured by trans-epithelial electrical resistance (TEER) of the intestinal epithelial cell line Caco-2, and on immune homeostasis, specifically on Toll-like receptor (TLR) activation. Method development was required to adapt these assays to the novel model and to optimise the growth of *F. prausnitzii* co-cultured with Caco-2 cells and TLR-expressing cell lines. Using the optimised co-culture conditions, it was determined that live *F. prausnitzii* induced greater TLR2 and TLR2/6 activation than dead *F. prausnitzii*. In addition, live *F. prausnitzii* did not alter TEER of healthy Caco-2 cells. However, under tumour necrosis factor alpha mediated inflammatory conditions, dead *F. prausnitzii* decreased TEER whereas live bacteria maintained TEER. Collectively, these results indicate greater immunostimulatory effects of live *F. prausnitzii*, which is potentially linked to its barrier maintaining properties and together may contribute to maintenance of gastrointestinal homeostasis. Deciphering the mechanisms of action of obligate anaerobes such as *F. prausnitzii* could lead to the development of a next generation of probiotics originating from indigenous beneficial bacteria.