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OCTOBER - DECEMBER 2018

australia

OFFICIAL PUBLICATION OF AIFST

**AIFST 2018
Convention
Wrap**

**Feeding
Your Gut
Microbiome**

**INTEGRATING
THE SUPPLY
CHAIN JOURNEY**

**Packaging
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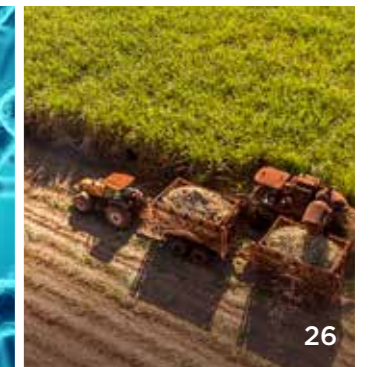
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October/November/December 2018



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COVER
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Food for Thought

Welcome to the October-December edition of *food australia*.

In this issue we share highlights from the 51st AIFST Convention, held in Melbourne in September, where we welcomed more than 550 delegates and 70 speakers, along with partners, sponsors, exhibitors and student volunteers. Over the two-day convention, we saw the wealth of industry talent that exists on our own doorstep, as well as that from overseas. We shared insights on the exciting future of the food industry in Australia and globally.

Planning has commenced for the 2019 AIFST Convention, which will be held in Sydney in early July. If you have suggestions for speakers or topics, we would love to hear them.

Other topics covered in this edition of *food australia* include feeding your gut microbiome (p20), the supply chain journey – from paddock to plate with GS1 (p23), packaging sustainability (p28), the need for pre-market approval of ingredients (p34) and the role of food in diet-related disease (p40).

Our next major event is the AIFST Summer School, which is planned for February 2019. Summer School was established in 2010 to support undergraduate and post-graduate students in food science and related disciplines. Since then more than 550 students have graduated and we look forward to welcoming our 2019 students.

We are also planning our 2019 webinar, workshop and networking event calendar. Please contact us if you have topics you would like us to consider.

The AIFST Board and team are committed to a strong, relevant and healthy Institute – one that excites and engages our future Institute leaders and young professionals. I invite and encourage all members to take an active role in engaging in the Institute. I am happy to talk to members at any time.

In the meantime, we hope you enjoy this edition of *food australia*.

Fiona Fleming

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Aussie Snacking Shows Weighty Growth

New research by global market research company The NPD Group shows continued growth in the snacking category in Australia. In 2017 it saw traffic growth of more than 25 million, to deliver a category now worth \$7 billion.

The research tracked purchases in the restaurant industry as well as ready-to-eat foods and beverages. It defined snacking as eating occasions that occur in between traditional mealtimes. These can be in the morning, afternoon and evening parts of the day.

The research shows a shift away from the more traditional chips and chocolate bars to one where consumers are looking for premium products, with an emphasis on provenance and clean foods.

“Australians are relying more and more on snacks for nourishment and fuel, not just to curb those afternoon hunger pangs. Snacks are an ideal vehicle to deliver healthy choices to those that are pressed for time,” said Gimantha Jayasinghe, NPD Deputy Managing Director – Asia Pacific.

Snacking occurs predominantly in the morning and afternoon, with afternoon snacking showing the highest growth. The 50-plus age group dominates the morning snack occasion, with millennials prominent in the afternoon and evening.

Despite the shift towards healthier snacks, the strongest growth emerged in the millennial demographic. This group drove 81 per cent of the growth in afternoon snacking, almost all of which (96 per cent) was attributable to deal occasions relating to crisps, chips, donuts and pizza.



Source: The NPD Group, Foodservice Trends Crest Report 2018.

Investigating the Perfect Snackable Watermelon

Packaging snackable watermelon that retains its “fresh-cut” taste is a challenge being tackled by a research project that combines consumer insights and the latest technology.

More than 400 Woolworths’ customers were surveyed about their perception of fresh-cut watermelon available in supermarkets. This data is being analysed by Michelle Louise Mendoza-Enano – a PhD candidate of the Australian Research Council (ARC) Training Centre for Innovative Horticultural Products.

Initial findings showed freshness is what mattered most to customers, which can be a challenge to maintain through handling and distribution. Ms Mendoza-Enano is working with Perfection Fresh Australia to develop packaging that ensures longer-lasting freshness.

She is also collaborating with CSIRO’s Dr Damian Frank to cross-check the perceived freshness from the customer survey with chemical composition. They are using advanced



analytical technology to test fruit with a proton transfer reaction, called mass spectrometry. It can sample the volatile flavours, as well as changes between freshly cut fruits and stored fruits, in just seconds.

Measuring the changes rapidly allows good understanding of what is happening, so that better systems to preserve freshness can be developed. The project is still underway.

Commercial Trials on Zapping Mould to Extend Fruit Shelf Life



The first large-scale trial using “cold lightning” to kill mould spores on fruit and extend its shelf-life is about to begin.

As the next step in commercialising the process, Murdoch University researchers will test the ground-

breaking use of cold plasma technology at a Western Australian avocado packing house.

Cold plasma technology involves application of an electrical current. It zaps the fruit to kill mould and bacteria.

Murdoch University plant pathologist Dr Kirsty Bayliss first saw the technology in 2015 on an exchange trip to Thailand, where it was being used to control insects.

Since then, Dr Bayliss and her team have been testing and refining the technology on fruit to kill mould and bacteria, which it does by stopping spores from germinating.

“The technology is based on the most abundant form of matter in the universe – plasma. Plasma kills the moulds that grow on fruit and vegetables, making fresh produce healthier for consumption and increasing shelf-life,” she said.

“It’s a chemical-free treatment that

has no effect on the produce leaving it unchanged and perfectly healthy to eat.

“In the tests that we’ve done on avocados, we’ve extended the shelf-life from about five days to almost three weeks. This has been done solely by reducing the mould that causes avocados to go black.”

The large-scale trial is at a Donnybrook packing house, in south west Western Australia, which processes more than 500,000 avocados daily. Researchers will test the practicalities of using the technology in a busy packing house and determine when and how often to apply the treatment in the packing process.

Dr Bayliss and her team have patented the process they have developed as a result of their three and a half years of research. There is strong interest in the technology coming from around the world.

Picnic Dairy Spreads Asian Export Plans

Picnic Dairy will expand its exports of premium dips and dairy products to Asia thanks to a Victorian Government grant.

The Melbourne based maker of premium dips, cheeses and yoghurts was among more than 30 Victorian businesses that benefitted from a new round of grants to support companies expanding into Asian markets.

Picnic Dairy plans to use the money to assist the company to break it into the Malaysian market and increase sales in Singapore.

Malaysia has recently experienced a rapid increase in dairy consumption, importing more than 50,000 tonnes of dairy products a year.

This is the second round of funding as part of the Boost Your Business Asia Gateway project that helps businesses partner with regional experts to access the tools they need



to succeed in fast-growing Asian markets. It has supported businesses in the food sector as well as sport, education, aged care, skin care, tourism, mining and architecture.

Celebrating Innovation Book Launch

FIAL launched the third edition of its annual showcase of food and agribusiness innovations at the 2018 AIFST Convention. The hardcover book was launched by Charlie Day, CEO of Innovation and Science Australia.

Dr Mirjana Prica, Managing Director at FIAL said, “The book not only highlights success stories but demonstrates how the industry is collectively sharing and overcoming challenges to build our competitiveness in the global marketplace.”

The book celebrates diverse innovations, from novel ingredients such as camel milk from QCamel, new methods of processing food waste such as regional biogas hubs from Utilitas, and innovative new processing technology such as E-FLO from Heat and Control.

The book is available at fial.com.au

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Hot Desk R&D Space at New Bangkok Facility

Australian food companies can now take advantage of a new research and development facility in Bangkok, which has been launched by US ingredient specialists Pecan Deluxe Candy Company.

The purpose built facility has been designed for product development with a fully-fitted kitchen and offices allowing Australian businesses to join the Pecan Deluxe R&D team for innovation days, or to host their own sessions.

Pecan Deluxe began as a US family run ice-cream business in 1950 and after a decade made the decision to sell some of its proprietary ingredients, such as its famous praline, to other companies. It now sells more than 1500 products including cookie doughs, pralines, cereal clusters and confectionary coated products world-wide. In 2014, it opened a factory in Thailand to supply its products to the Asia Pacific market.



Pecan Deluxe's team of dedicated food technologists is constantly innovating to develop new flavour and texture options tailored to both industry demand and geographical tastes.

Asia Pacific Managing Director Mr Graham Kingston said many of the company's recent product

developments for Australia had been influenced by a combination of Asian and Australian flavours and textures.

The new R&D facility is based in the popular Sukhumvit area of Bangkok and overlooks one of the city's biggest and most exciting markets, which is a source of street food inspiration.

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Edible Six Pack Rings Meet Thirst for Green Packaging

Edible six-pack rings have been introduced to Australia by a Melbourne craft brewery that is working to set new benchmarks in sustainability.

Urban Alley is the only brewery in Australia, and the fifth brewery in the world, to use the biodegradable rings created by US start-up Eco (E6PR Six Pack Ring).

Wheat and barley leftover from the brewing process are used to make the rings that are a 100 per cent biodegradable and just as efficient as the plastic rings they replace.

The technology was created to help reduce the devastating environmental problems created by plastic rings entangling marine animals and birdlife. According to E6PR, if the grain-based rings end up in a water system, they will break down within weeks and in the meantime, they can be safely ingested by marine animals.

Urban Alley founder Ze'ev Meltzer said he came across E6PR on social media and thought it was an amazing idea.

"We contacted them immediately and were really excited to be the first, of hopefully many, to bring them to

Australia," Mr Meltzer said.

The edible ring holders will be used on Urban Alley's signature "Urban Ale" and will be distributed across Victoria at leading retailers and bottle shops.

It's just one way Urban Alley is tackling sustainability. The new Docklands' brewhouse and pub is in the process of creating an on-site bio-waste plant that will break down waste product into fertiliser for use on local farms.

In addition, the brewery is partnering with its neighbouring distillery to share heated and cooled water to reduce energy consumption. The brewery will also be adopting a program to reuse its treated waste water, which is high in minerals, salts and protein, for farm irrigation.

"Breweries traditionally put heaps of water down the drain. This water often requires special sewerage treatment, which is costly financially and environmentally," Mr Meltzer.

"We're currently in the process of testing the effects of high protein alkaline brewery waste water on a couple of different fruit and vegetable varieties."

AIFST Member Gary Kennedy



In August, AIFST member Gary Kennedy presented to a group of 200 members from UNSW School of Chemical Engineering, the Chemical Engineering Undergraduate Society and the Food Science Association, sharing an overview of the role of AIFST and benefits of membership. The event provided an opportunity for current students and new graduates to learn from industry specialists, most of whom were alumni themselves. Gary highlighted the skills gained from professional industry membership, namely mentoring, networking and upskilling.

UniSA Bachelor of Nutrition Awards



Pictured is program director Dr Evangeline Mantzioris with Steve Lapidge and Shaley Paxton.

The University of South Australia hosted their Bachelor of Nutrition & Food Sciences awards on 22 August. Our congratulations go to AIFST award winner Shaley Paxton, who received the highest aggregate mark in the final year of the program.



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Inaugural National Mentoring Program

The first AIFST National Mentoring Program concluded with a graduation ceremony at the 2018 AIFST Convention. Fifty-two members participated in the program, which was set up to develop professional skills and assist in achieving personal goals. Applications for the 2019 program will open soon.



Tasty Factory Tour

July saw AIFST members enjoy a tour of the iconic Bega Vegemite and Peanut Butter manufacturing lines in Port Melbourne. The tour provided a behind-the-scenes look at the production of the popular spreads.



Food Recall Workshop

Having policies and procedures in place for a product recall is one thing, executing them is another. In August, AIFST, along with industry specialists Victual and Bite Communications, presented a comprehensive food recall workshop in Sydney. Participants were involved in a simulation exercise designed to help them develop the steps necessary to develop a program to evaluate and test your recall policies and procedures.



Foodbank Partnership Thrives

AIFST has joined forces with Foodbank to help address the rising issue of food insecurity in Australia at the same time as tackling food waste.

The inaugural AIFST Foodbank Hunger Hero Award was announced at the 2018 Convention, with Kaelene McLennan from Simplot taking the honor.

Kaelene has been a valuable internal advocate at Simplot for Foodbank, engaging the organisation to change processes and procedures to simplify the donation process. The outcome was a dramatic increase the level of surplus food flowing from the organisation.

Previously Simplot donated only ambient stock but as a result of Kaelene's tenacity, it now also provides valuable chilled and frozen stock from the QSR and Food Service divisions. Kaelene also introduced volunteering for Simplot staff at Foodbank.

Simplot has been manufacturing partner of Foodbank for five years. Last year saw the millionth jar of Leggos Pasta Sauce produced as part of the Foodbank Key Staples Program.

Also presented at the 2018 AIFST Convention were the funds raised by AIFST for Foodbank as part of its membership donation drive. From July to September AIFST donated \$25 for every new full membership, with \$1200 raised.

Foodbank CEO Brianna Casey expressed her gratitude on receiving the donation.

"Along with tackling the ongoing issues of food insecurity and food wastage, a vital and ongoing role played by Foodbank is supporting rural and regional communities affected by drought by the provision of pantry staples and household/personal care products. AIFST's contribution couldn't have come at a better time."



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GROWING COLOURS **GNT**

AIFST 2018 CONVENTION



Ros Harvey, co-founder of Australian AgTech company The Yield presenting the JR Vickery address.

More than 70 leading food and agribusiness experts from Australia and around the world faced the food industry's most pressing issues and biggest opportunities at the AIFST Annual Convention, held in Melbourne in September.

Innovate & Excite: Acting Today to Advance Tomorrow

Innovation was the central theme of the convention, which was attended by more than 550 delegates.

AIFST Managing Director Fiona Fleming said the future of the food industry relied on collaboration between industry champions.

"We need clever thinkers with expertise in their respective areas, including government and academia, to work together to find solutions to build a nutritious, secure and sustainable food supply.

"We need to bring the right people together to enable collaboration and innovation so that we are in the right place to capitalise on the enormous potential in Australia and throughout the Asia-Pacific region," she said.

"The food and agribusiness sector is a key contributor to our economy, so it's critical to facilitate opportunities for the industry to connect, collaborate and evolve.

"Events like the AIFST Convention are vital for the future of the Australian food industry."

This view was supported by key note speaker Ros Harvey, co-founder of Australian agtech company The Yield and founder of the globally-recognised Better Work program.

"A wide network of innovative collaborators working to solve an issue creates shared costs and shared benefits," she said. "Intersections between disciplines often solves our major issues. We need to apply this thinking to challenges in the food industry, such as food security."

War on Waste

Businesses were urged to value their food waste in an expert session that included Food Fight Waste Cooperative Research Centre chief executive officer Steve Lapidge, the University of Central Queensland Professor David Pearson, Food Innovation Australia General Manager food sustainability Genevieve Bateman, and Royal Melbourne Institute of Technology Associate Professor Karli Verghese.

Dr Lapidge, who is also an AIFST board member, said that by valuing food waste, companies naturally improved food-waste management and looked for opportunities to use it.

"When companies invest in creating products from food waste, the financial windfall can be as much as a 14-to-one return on investment," he said. "We need to think smart and wise-up on the opportunities food waste provides."

The session also signalled the need for greater consumer education with food thrown out at home identified as a major contributor to food waste. The experts recognised the need to teach consumers better meal planning, storage and reuse of left overs. The audience heard that this was especially appropriate for millennials.

Foodbank Australia CEO Brianna Casey said the food industry could put more focus on identifying and measuring waste in the supply chain.

"It is often the case that the audits



Prof Lynne Cobiac - CSIRO, Dr Jane Muir - Monash University and Tara Cassidy - Microgenetix speaking in the Gut Health for Good Health session.

conducted by Foodbank uncover wastage within an organisation before the organisation itself realises there is an issue," she said.

Nutrient Claims

Food & Nutrition Australia's Sharon Natoli said competition for the highly-prized space on a food label was set to heat up with consumers pushing for more information about what is in their food, including the provenance, sustainability and production. The dietitian, speaker and author said single nutrient claims alone were no longer enough to satisfy consumers' evolving definition of what constitutes healthy food.

Conference presenters agreed that information that captured the entire production cycle was now necessary to give consumers the information they wanted to make informed food choices.

Millennials will hold the largest purchasing power in the coming years. Their demand for a holistic and transparent approach to food

production and marketing is likely to result in the provision of increased information on labels and through a company's communication channels.

Health on a Budget

In health foods, single-focus health and wellness trends such as low-fat and low-sugar have been replaced by a demand for more rounded and nutrient-rich food offerings. While there remains strong demand for "healthful" products, awareness of food trends such as paleo and keto diets was high. However, consumers increasingly want health foods delivered at the lowest possible price.

Protein is King

Consumer demand for high protein foods continues to grow. Protein-fortified products are appearing in new formats, including drinks and confectionary. To meet demand for protein sources, food manufacturers are using lab grown and 3D printed protein, as well as alternate natural sources like crickets and hemp flours.

Collagen protein is also trending, as the line between health, beauty and food blurs.

Gluten Not the Culprit

Dr Jane Muir from Monash University presented the latest research on Fermentable Oligosaccharides, Disaccharides, Monosaccharides and Polyols (FODMAPs).

"There is an epidemic global war on gluten, but it may not be the enemy that people have made it out to be," she said.

According to Monash research, around 11 per cent of Australians were wheat avoiders, yet only one per cent had been diagnosed with coeliac disease.

"Consumers avoiding wheat do so for relief of gut symptoms. In our research we found that FODMAPs, not gluten, were responsible for causing gut discomfort in non-coeliacs."

Gluten-free foods tend to be naturally lower in FODMAPs, which is why they feel symptom relief from



Panel session: Harnessing Innovation to address Food Insecurity. Brianna Casey (Foodbank), Dr Steven Lapidge (FFW CRC), Dr Geoffrey Annison (AFGC), Ishan Galapathy (Capability Unlimited), Sarah Hyland (Shyland)

pivotal role played by gut microbiota in conditions such as autism, cardiovascular disease, obesity, brain function and cancer.

Associate Professor Mark Turner, from University of Queensland told delegates that studies had shown a relationship between obesity and anti-social behaviour in mice that were lacking *Lactobacillus reuteri*. Social interactivity was improved when the mice consumed the probiotic in pure form or through consumption of faeces from social mice.

Human and mice trials have found that diets high in salt reduce lactobacillus in our gut, which has a negative effect on blood pressure. "Diet significantly affects gut microbiota, and this has a flow-on effect on conditions like cardiovascular disease, obesity, brain function and cancer," Dr Turner said.

Dr Lynne Cobiac from CSIRO added to the discussion on gut health and



Thierry Sofia – bioMerieux, Scott Chandry – CSIRO, Dr Barbara Butow – FSANZ, and Jack van der Sanden speaking in the AAFP Innovation in Food Safety session.

Cobiac indicated that future treatment options may be designed based on the understanding of a patient's microbiota profile, plus their genetic background.

"Precision nutrition is the next level

remote care, predictive health profile and targeted interventions," she said. "These elements result in a more proactive approach to health of an individual."



Monique Cashion, Sarah Hyland, Shelley McMillan and Sharon Natoli answering questions after their Catering to the Changing Consumer session.

CHALLENGES AND OPPORTUNITIES

The broad range of presentations offered real challenges, but also provided tangible opportunities for industry. Some of these include:

Challenges

- **Pricing** – how will organisations marry consumer demand for increased quality, sustainability and transparency with the desire for lower pricing
- **Sugar** – how can product developers lower the sugar content of their products without resorting to artificial sweeteners or decreasing their taste
- **Supply chain** – with four out of five food groups highly perishable, it is important to look at ways to shorten the supply chain to lower the environmental and economic cost of Australia's excessive waste
- **Food as a valued social resource** – the industry needs to re-engage Australians to take pleasure in the preparation, service and consumption of food to increase

its perceived value and reduce wastage

- **Digitisation** – students and the current labour market need training to be able to understand, mine and use the data that is increasingly being made available to industry
- **Planning** – the industry needs to take a future-thinking mindset into business by better predicting scenarios and planning for them

Opportunities

- **Alternative proteins** – continue to identify and bring to market new forms of protein
- **Food safety** – adopt new technology to identify disease outbreaks earlier, and detect sources via precise tracking
- **Transparency** – leverage the demand for transparency in food processing to build consumer confidence, and therefore brand loyalty
- **Urban farming** – expand the movement capitalising on under-utilised urban spaces for vertical farming

- **Millennials** – meet the demands of the millennials, as that group becomes the demographic with the largest purchasing power
- **Clean labels** – utilise new technology such as artificial reality (AR) to enable consumers to learn more about the manufacture of a product without increasing the size of its label
- **Packaging** – create practical packaging that is easy to open, serve, reseal and save rather than single-use packaging
- **CRISPR** – further utilisation of this innovative technology for editing genomes to prevent diseases affecting crops
- **FODMAPs** – manufacturers should look at lowering the FODMAP content in packaged food instead of focusing on gluten
- **Probiotics** – consider increasing the probiotic content of foods
- **Personalised and precision health** – continue the research and application of data and DNA analytics to predict and manage disease

CONGRATULATIONS TO 2018 AIFST AWARD WINNERS

The 2018 AIFST Convention provided the opportunity to recognise the outstanding achievements of members and the contribution they have made to not only the Institute, but to the Australian food industry as a whole. All of our entrants embodied the theme of our convention – innovate and excite!



AIFST Allergen Bureau Julie Newlands Award

This award recognises excellence in food allergen management in Australia. The 2018 recipient is Sue Wilkinson, Robern Menz in recognition of her consistent, science-based approach to food allergen risk assessment, guiding industry best practice and aiding allergen sensitive consumers to make informed choices. Sue has over 30 years' experience in quality assurance and a broad skill set in allergen management.

The award was presented to Sue by judge Deon Mahoney, Chief Scientist, Dairy Food Safety Victoria.



AIFST Research Poster Competition

The AIFST Research Poster Competition is held during the annual convention each year. The challenge for entrants is to effectively condense their research without losing the quality of their research.

The 2018 competition winners were Xin Yang, Matthew Flavel, Yafang Zhu, Julian Neoh & Barry Kitchen, The Product Makers for their poster "Could foods that inhibit digestive enzymes help fight type 2 diabetes?"

The prize was presented to Matthew Flavel by AIFST Non-Executive Director, Dr Steven Lapidge.



Student Product Development Competition

This is an exciting initiative that gives our student and graduate members an opportunity to undertake a real-life product development process and demonstrate their skills, knowledge and creativity.

The 2018 competition was won by Kinga Wokciechowski, Adelaide Spicer and Edina Odor, for their product Pulse Granola Clusters.

This year's prize was presented by Ruth Truswell from Sanitarium and Richard Hollands from Simplot.



AIFST Peter Seale Food Industry Innovation Award

This award acknowledges a significant new development in a process, product, ingredient, equipment or packaging, which has achieved successful commercial application in the Australian food industry. The 2018 winner was CBH Fresh, Made by Cow for its processing method and packaging that ensures raw milk can be safely consumed without heat pasteurisation, maintaining enzymatic activity and essential vitamins.

The award was presented to Wade Porter CEO - Made By Cow by AIFST Non-Executive Director, Dr Steven Lapidge.



AIFST Anthony (Tony) Williams Sensory Award

This award is for young members who demonstrate academic achievement, interest, enthusiasm and integrity in sensory research. The 2018 award was presented to winner Piyali Chakraborty and runner up Jasmine Ngo by Jodie Hill from Sensory Solutions.



AIFST Bruce Chandler Book Prize

The late Dr. Bruce Chandler bequeathed a grant to AIFST to establish the Bruce Chandler Book Prize. The 2018 prize was awarded to Hilton Deeth and Michael Lewis, for their book *High Temperature Processing of Milk and Milk Products*. The award was presented by AIFST Non-Executive Director, Dr Steven Lapidge and accepted by Associate Professor Mark Turner on behalf of the recipients.



AIFST President's Award

This award recognises an individual or an organisation that has made an outstanding contribution to the Institute. The 2018 award was presented to two AIFST Fellows, Josephine and George Davey, who have been members of the Institute for many years and have worked extensively throughout the Australian food industry, specifically in the dairy sector. The award was presented by AIFST Board Chair Peter Schutz.

AIFST FELLOWS

Over the course of the last 12 months, three members have been elevated to Fellows of the Institute. To be appointed a Fellow, a member must have given outstanding service to AIFST and contributed to the profession of food science and technology. The three new fellows were presented with their certificates by AIFST Managing Director, Fiona Fleming.



Dr Ramon Hall.



Dr Ajay Shah.



Associate Professor Tom Ross.

SNAPSHOTS FROM THE 2018 CONVENTION



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Feeding the Gut Microbiome

Words by Associate Professor Mark Turner

Breakthroughs in DNA sequencing technology are underpinning an explosion of new insights into how our gut microbiome affects our health. This is currently one of the most popular areas of biological research, with articles appearing in top journals almost weekly.

The important role that microbes play not only locally in the gastrointestinal system, but also in distal locations affecting the cardiovascular and immune systems

as well as brain function are being unveiled. The gut microbiota has been linked to colon cancer, obesity, diabetes, mental health and heart disease with varying levels of scientific support.

Importantly for the food industry however, the diet we consume can have significant impact on groups of bacteria present and also the diversity. It is generally recognised that a diverse gut bacterial population is desirable. This can be achieved through a varied diet that includes

a significant amount of fibre that can reach our 'bioreactor', the large intestine.

Analysing the Gut Microbiome

The term 'microbiome' refers to all the microorganisms in an environment, which includes bacteria, viruses and fungi. The human body is composed of more microbial cells than human cells (estimates range from 10:1 to 1.3:1) with the majority of these present in the large intestine. The focus so far

has been on bacteria, however there are likely to be even more viruses present in the gut microbiome.

The task of culturing and identifying thousands of bacteria from faecal samples was, until recent times, nearly impossible. This was largely due to the difficulty in getting bacteria from the intestine to grow in the laboratory.

Around eight years ago there was a major advance in DNA sequencing technology which allowed researchers to identify thousands of bacteria simultaneously without the need for culturing. DNA is purified directly from the faecal sample and polymerase chain reaction (PCR) is used to amplify a region of a gene (16S rDNA) which is found in all bacteria. This PCR product mix is then sequenced and those sequences are compared to sequences of known bacteria in a database to identify what they are.

New advances are also allowing the sequencing of all the genes present in all the gut bacteria, which gives a picture of the metabolic potential of the community (as well as viruses), not just the bacterial identities. This technology now allows researchers to compare the gut microbiome of different individuals, such as 'sick versus healthy', or during diet interventions.

Such is the interest in gut microbiome analysis testing, companies have popped up including Microba and Allele Microbiome, which will do testing directly for the public. This is done via an 'at home faecal sampling kit'. Once the results are in, they are compared with those of the general population and it is likely that advice on diet, exercise or supplements (probiotic or prebiotic) will be provided.

This is a significant development in the area of personalised nutrition and with more research and more data becoming available, the interpretation of microbiome test results will continue to improve.

Changing Our Microbiome

Studies have shown that diet has a major impact on the gut microbiome. In a landmark Harvard study (David *et al* 2014), subjects were placed on either a plant-based diet or an animal-based diet for five days and monitored

for their gut microbe populations. The plant-based diet consisted of grains, legumes, fruits and vegetables while the animal-based diet consisted of meats, eggs and cheeses. The animal-based diet triggered an increase in bile salt tolerant microbes, which is in agreement with greater bile salt secretion upon consumption of higher fat containing foods. This diet also resulted in a decrease in proportion of microbes that break down dietary plant polysaccharides and produce beneficial short chain fatty acids (SCFA) butyrate and acetate. These results suggest that the gut microbiome is able to adapt rapidly in response to food source.

Very recently, researchers at the Weizmann Institute of Science in Israel identified that the gut microbiome composition is influenced more by environmental factors than our genetic ancestry (Rothschild *et al* 2018). This study involved more than 1000 participants including related and unrelated subjects. It found that there are significantly similar gut microbiome profiles in genetically unrelated subjects who share a household, but no similarity for genetically related subjects who don't have a history of household sharing. It is likely that the diet of household sharing subjects is similar and impacting on microbiome composition.

The good news from these studies is that we are not 'sentenced' to a specific gut microbe population by our own genetics.

Pinpointing the Roles of Specific Bacterial Species

The majority of the research into the role of gut microbiome in health uses animal studies, in most cases rodents. While this is a means to examine the effect of severe diet interventions on gut microbe compositions, it also has the limitation of uncertainty if the results are transferable to humans.

Nevertheless, this research is providing a growing body of evidence, with several studies pinpointing a single bacterial species which had become depleted in animals with ill health. These potentially could then be subsequently administered to restore normal health.

Lactobacillus reuteri and brain health: The role of the gut microbiome in modulating brain development and behaviour is an area of emerging evidence. Researchers in the Bayer College of Medicine, USA carried out a study in which the offspring of obese female mice fed a high fat diet were analysed for their social behaviour and gut microbiota composition (Buffington *et al* 2016). Deficits in social behaviour were identified in the offspring from obese mice, compared with those from control normal weight mice, which was correlated with an altered gut microbiome population. The researchers then went looking for bacterial species absent in the less social mice and found that *Lactobacillus reuteri* was the most depleted (>nine-fold). Remarkably, treatment with a single pure strain of *L. reuteri* was able to rescue normal social behaviour in these mice. This species was found to stimulate levels of oxytocin, a well-known 'pro-social hormone'.

Lactobacillus murinus and blood pressure: Recent work by Wilck *et al* (2017) has identified links between a high salt diet, the gut microbiome and blood pressure. Mice were fed a high salt diet to mimic a Western diet, and various health markers including the gut microbiome were analysed. It found the bacteria group which was most depleted upon high salt intake was *Lactobacillus murinus*. Dietary supplementation of this single bacterium was able to reduce hypertension in the mice with a high salt diet. To determine if these results translate to humans, a pilot trial was conducted involving 12 healthy adults. They received 6g sodium chloride a day for 14-days on top of their normal diets. As well as the expected increase in blood pressure, the overall abundance of *Lactobacillus* species declined, most likely due to their salt sensitivity. The authors speculate that high salt diets may be part of the reason for the reduction in *Lactobacillus* abundance in Western diet gut microbiomes.

Lactococcus and Cholera: A recent study at the Massachusetts Institute of Technology, USA, identified that the commonly used cheese starter bacterium *Lactococcus* has potential

as an anti-infective agent (Mao *et al.*, 2018). It was able to reduce infection rates and improve the survival in mice fed *Vibrio cholerae*, the causative agent of cholera. It was shown that the *Vibrio* were inhibited by lactic acid production by *Lactococcus* in situ in the intestine. This simple biocontrol strategy holds potential for reducing cholera, which is a major water and foodborne disease primarily found in developing countries.

Lactococcus and Parkinson's Disease: In other recent work, *Lactococcus* abundance has been found to be lower in the faecal microbiome of Parkinson's disease (PD) patients (Tetz *et al.*, 2018). Thirty one patients with this neurodegenerative disease and 28 healthy controls were analysed for their bacterial as well as bacterial virus (bacteriophage) contents. Significantly higher levels of lytic bacteriophage which attack and lyse *Lactococcus* were identified in PD patients. It was subsequently suggested that the virus-induced killing of *Lactococcus*, which produce the neurotransmitter dopamine, may influence PD since it is directly linked with decrease in dopamine.

More work in this area is needed, along with broader analysis of the gut microbiome to incorporate viruses, in order to obtain a more complete picture.


Fortunately, this once largely ignored area is now receiving much-deserved attention and it is likely in the future, when more data is obtained and understood, that gut microbiome analysis will form a routine clinical

diagnostic test.

Research may provide opportunities for the development of 'personalised probiotics', identified using individual microbiome analysis to restore key missing species. However, this approach is unlikely to work in the long term unless other factors including diet are modified to provide suitable substrates for growth in the competitive large intestinal environment.

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Simplifying and Integrating the Supply Chain Journey

Words by Andrew Steele

Behind every food and beverage product on the shelf is a supply chain journey that starts with ingredients. The Australian food manufacturing industry is an intricate maze of ingredient and packaging suppliers, most with different supply chain management solutions.

To manage ingredient safety and increase the visibility of food ingredients and raw materials in these complex supply chains, a new project, titled the Supply Chain Improvement Project, is being implemented with the objective of strengthening integration between upstream supply chains in the Australian food manufacturing industry.

An industry working group has been set up to drive the project using GS1 standards. The group will work to achieve consensus across the industry to improve food safety, deliver efficiencies and reduce costs. Representatives from Nestlé, Ingham's, SPC, Lion Dairy and Drinks, Sanitarium, CHR Hansen, Newly Weds Foods, FPC Food Plastics,

Labelmakers, Matthews Australasia and Visy Industries currently make up the group.

The ability to capture material movements from 'paddock to plate' provides data integrity and timeliness from receipt to delivery, with traceability back to the source. Through automation, many of the manual processes are eliminated and companies can be proactive with inventory management and handling systems.

The capability to support information and production flow within existing systems for integrated supply chains is critical to businesses. The project has the capacity to eliminate waste within an organisation's value stream, reduce non-value-added tasks and ensure cost-effective solutions for customers, leading to a 'right-first-time' approach for all deliveries.


Sourcing ingredients without a traceability and food safety protocol today invites counterfeit products into the food chain and increased risk

of contamination.

The adoption of GS1 standards as the common language for identification, data capture and data sharing will enable automation of key ingredient sourcing, and traceability between ingredient suppliers and food manufacturers.

Using GS1 standards for upstream integration allows companies to translate their internal processes and approaches into a common language that all trading partners can use and understand without having to translate data formats across different supply chain management systems.

The Supply Chain Improvement Project has the potential to confer many benefits to industry, including increased visibility of food ingredients and raw materials, unique identification and traceability to improve food safety, and reduced costs with automated business transactions.

Andrew Steele is Industry Manager - Food & Beverages at GS1 Australia. 



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IFT18 Spotlight: Clean, Green, and Lean

This July over 23,000 attendees converged on Chicago to learn about the latest products and innovations in the food and beverage industry showcased at IFT18. 1,200 food expo exhibitors representing companies from all over the globe shared their latest products and ingredients designed to deliver on consumers' expectations for taste, texture, and nutrition.

Emerging Trends from IFT18

CLEAN

When it comes to flavors that consumers crave, clean and natural continue to be top of mind. Whether savory or sweet, globally-inspired, a winning flavor profile must have sensory appeal and be free of artificial taste. At IFT18, ingredient manufacturers demonstrated their commitment to creating delicious flavors through creative concept foods that deliver tang, zest, and zing.

GREEN

It's no secret that plant-based innovations are growing exponentially. Preferred by younger consumers, who increasingly identify themselves as vegetarians, green eating has moved from fad status to having a solid foothold in the future of food. According to Innova

Market Insights, plant-based product claims increased globally by a CAGR of 62% between 2013 and 2017, with claims appearing on everything from plant proteins and sweeteners to herbs, seasonings, and even food coloring.

One area in which components of plants play an important role is food quality and safety. The ingredients derived from plants contribute many functions to foods and beverages and also appeal to consumers interested in green eating and who want more clean label products. Antioxidants and other compounds from plants can successfully protect foods against the growth of foodborne pathogens and improve the overall taste, color, and aroma of foods in ways comparable to synthetic preservatives.

LEAN

The demand for sweetener alternatives continues to rise, along with a growing awareness of the health benefits of reducing sugar intake. New formulations and blends that reduce bitterness and aftertaste were a focus at IFT18, as exhibitors showcased innovations that satisfy a sweet tooth while slashing calories and retaining a natural sweet flavor.

Excerpted from Food Technology magazine, September 2018 issue.

More IFT18 Food Expo highlights available at ift.org/expohighlights

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Unlocking the Goodness of Sugarcane

Words by Dr Matthew Flavel*, Xin Yang, Yafang Zhu and Dr Barry Kitchen.

Indigenous to Oceania, sugarcane has been used by the Polynesians for more than 5000 years. It was first introduced to the Pacific islands and then reached the banks of the Indus. Persian Emperor Darius' invasion of the Indian sub-continent in 500BC saw him bring back to Persia "the reed which gives honey without bees".

Sugarcane made its way to Western Europe with Alexander the Great's armies in 326BC. Admiral Nearchus described a plant the Persians called a "honey-yielding reed". The Arabs introduced it to the Mediterranean area in the 7th Century, and Crusaders brought it to Europe in the 12th Century with cultivation ranging from Italy and Spain to southern France.

Despite this history, sugarcane no longer exists as a wild species. The species that can be found worldwide are all derived from the *Saccharum officinarum* species.

Today, sugarcane production yields more than 130 million metric tonnes of sugar globally. Brazil is the largest global sugar producer (20 per cent).¹

The top 10 producers, which include India, China and Thailand, produce 75 per cent of the total volume. Australia

is not on the list of top producers of sugarcane, but it is the second largest raw sugarcane exporter in the world, after Brazil.¹

The local food and beverage industry has a unique opportunity to take advantage of the full spectrum of capabilities of this plant.

Sugar is a cost-effective ingredient that contributes to the sensory characteristics of a product and supplies energy.

It has been shown that the addition of polyphenol rich extracts from sugarcane as a food ingredient were able to reduce the insulin response and total glycaemic index of food products.²

Products on the market such as CSR's LoGiCane, the world's first Low GI sugar, are examples of how they have had a functional improvement. This is made by creatively using sugarcane as an ingredient. Phytolin, a patented sugarcane extract owned by The Product Makers, can be incorporated as an ingredient to food applications, beyond sugar, to assist in healthy carbohydrate metabolism or provide support for antioxidant defences.³

The rich polyphenol content of sugarcane extracts also allows for potential future applications to be explored, for example for its anti-inflammatory properties, improvements in cognition and contribution to sustaining a healthy microbiome.

Other companies such as natural functional foods producer KFSU have taken a different approach by working to include sugarcane fibre, known as Kfibre, as an ingredient to increase the overall fibre content of food products.

These creative uses of the full variety of compounds available in the sugarcane plant should be considered.

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Drs Matthew Flavel, Xin Yang and Barry Kitchen are part of the Bioactives Division at The Product Makers Australia Pty. Ltd.



After the success of Futurals, Roha introduces Futurals Pro, a range of natural food colors that is absolutely e-number free and even more fit for the natural ingredient market. As the name suggests Futurals Pro is more advanced than Futurals. It is a premium coloring foodstuff range that has higher stability to heat and light, resulting in a longer shelf life at ambient temperatures. With these advances we're sure this new range will win the hearts of consumers and people in the food industry alike.


FUTURALS
 NATURE AT ITS BEST

The Path to Sustainability

Words by Brooke Donnelly

This year has been a remarkable year for environmental milestones in Australia. Our supermarket giants have stepped up their efforts in the war on plastic. Woolworths has announced a ban on the sale of plastic straws by the end of the year, stopping more than 134 million straws being circulated. Both Coles and Woolworths have introduced a ban of single use plastic bags, in addition to pledging to reduce plastic wrapping on fruit and vegetables.

In April Australia's State and Federal Environment Ministers announced a landmark recycling target to ensure all packaging is 100 per cent reusable, recyclable or compostable by 2025. The announcement came in response to Australia's growing recycling crisis, a product of the China Ban decision to restrict the importation of 24 categories of recyclable materials. The target signals a monumental call to action and one of the most decisive environmental targets to be supported in Australia. The Australian Packaging Covenant Organisation (APCO) is the agency charged by government to make this ambitious target a reality.

Bringing this target to life will mean overcoming a range of challenges. According to 2016 World Bank figures, Australia's population density was three people per square kilometre – far behind the UK figures of 271 people per square kilometre, 90 times that of our country. This makes the collection of recycled materials a more complex and daunting task when considering the sheer amount of ground that needs to be covered. It also means it is not possible to simply look at other markets and adopt their approaches.

Reaching the landmark goal set by the Environment Ministers will require a complete transformation of the way our society thinks about packaging. As a nation we need to start recognising packaging as a valuable resource and not just waste that is destined for landfill. At APCO, we know this is achievable, but we



can't do it in isolation.

In July, APCO conducted a brand audit to identify liable businesses that are unaware of or not meeting their obligations under the National Environmental Protection (used packaging materials) Measure 2011 (NEPM). The audit covered a wide range of sectors and industries, including pharmaceuticals, packaging manufacturers and retail – with a key focus on the food and beverage industry.

Consumer awareness is a crucial piece of the puzzle. APCO also recently launched the Australasian Recycling Label Program in conjunction with Planet Ark and PREP Design. This is Australia's first nationally consistent, evidence-based labelling program to help consumers understand how to recycle effectively. It is the first step towards helping drive change in consumer recycling behaviour. Major brands from across a range of industries, including Australia Post, Blackmores, Nestlé, Officeworks, Unilever and Woolworths, have already pledged their commitment to implementing the program.

Finally, in August the business community came together to celebrate the annual APCO Awards event, which recognises the organisations leading the way in sustainable packaging innovations. Companies recognised on the night include Campbell Arnott's, Qantas and Zara.

China's ban on waste imports offers challenges, but with every challenge comes opportunity. The potential value of a circular economy created locally is \$26 billion, as estimated by the World Economic Forum in 2015.

Creating a circular economy and end market for our own recycled materials should be our goal. In order to achieve it we need to have clean recycling streams and reduced contamination. With this important issue now thrust into the public spotlight, now is the time to create new opportunities through greater industry and government collaboration and defined focus.

Bringing the 2025 target to life isn't something that will happen overnight. Unpacking the specifics of the target is underway – with a national roadmap of activities in development.

If Australia is to succeed in minimising the harmful impact of packaging on our communities, we must work together toward a collaborative solution that addresses all parts of the product lifecycle – from sustainable packaging design right through to creating a valuable end market for recycled materials. It's a challenge we must rise to and APCO looks forward to leading the charge.

Brooke Donnelly is Chief Executive Officer at the Australian Packaging Covenant Organisation.



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When Compromise is Not the Best Ingredient

Words by Dr Geoffrey Annison

The new financial year kicked off with a bang for many of us working in the scientific and technical domain of the food industry.

With little to no warning consultations have been fired out from various parts of Government all driven by same policy objective – holding the food industry to account for the rising levels of obesity and associated non-communicable diseases.

The Food Regulation Sub Committee (FRSC) has presented seven possible options for providing added sugar labelling on food packages; the Healthy Food Partnership (HFP) secretariat has released draft targets for reformulation across 18 food categories; and a Senate Inquiry into Obesity is now well into its stride having taken formal submissions and conducted a number of public hearings, with more to come; and of course, there's the Health Star Rating (HSR) review, moving towards further rounds of consultation.

Health Star Rating Review

Any changes to the HSR must be supported by a strong evidence and a fact base if the support of major stakeholders is to be maintained. More specifically, to protect the HSR System proposed, changes should be tested against a framework describing system integrity:

- a. Are the ratings of individual foods solely determined by the scientific evidence underpinning the current Australian and New Zealand dietary guidelines for consistency? Or does a proposed alternative frame of reference allow for variation based on individual subjective interpretation?
- b. Is the system consistent and predictable in its outcomes? Are relative HSR scores of similar or like foods maintained by the system – ie not re-ordered. The exception being when the system itself is changed based on scientific evidence
- c. Are the ratings of foods that have not changed compositionally over time maintained, avoiding

perceptions that the system has had substantial flaws which needed correcting or that the composition of foods had changed when they had not (recognising that some compositional changes are possible without impact on displayed HSR scores)?

- d. Can changes to the ratings of foods be explained to consumers and end-users as being important to the integrity of the system (for example, as a result in changes to scientific evidence) rather than being an adjustment to counter a lack of integrity or flaw in the system?

Senate Obesity Inquiry

Moving on to the Senate Inquiry into Obesity, stakeholders to the inquiry can be broadly separated into three main groups:

- Health service providers at the coalface of dealing with patients who are greatly overweight or obese. They point out that the plight of obese individuals is

grave, the challenges of providing adequate health care are substantial, and the demands on government resources are great;

- Public health and consumer activists who blame the modern food industry almost entirely for the rise in obesity. In a well-choreographed adherence to their key messages, they all supported the latest public health policy manifesto, putting style before substance, and downplaying the need for evidence in calling for more regulation of industry;
- The food industry itself attempting to illustrate what had been done, and what more can be done through collective, collaborative and partnership approaches.

How the Senators will weave a path to sensible public policy proposals remains obscure against the backdrop of such polarised positions.

Healthy Food Partnership

In contrast, the Healthy Food Partnership (HFP) has enjoyed a strong collaborative partnership between government, public health, and industry. Consultation is now underway with the Department of Health and Aging (HFP secretariat) encouraging submissions from all stakeholder groups – industry (of course) but also public health groups.

Public health advocates will no doubt complain that the targets are not ambitious enough and that they should be mandatory. The reality is that proposed reformulation targets for some product categories for some companies, are likely to be doable, for others it will be harder and there are bound to be some products which companies, for a variety of reasons will not be able to be reformulated to the target amounts.

Unfortunately, this may tempt the Department to consider a 'compromise', imagining that there are satisfactory halfway points between opposing views on what is achievable. This risks industry efforts being diverted from products, where real gains in product reformulation can be made undermining the

potential benefits, to consumers through enhancement of the food supply.

Added Sugars Labelling

Finally, let's consider the added sugar labelling issue - an issue dogging regulators and other stakeholders around the world. The Food Regulation Standing Committee (FRSC) has released a consultation document which seeks views on the Ministerial Forum of Food Regulation's (FoFR) desired outcome that "food labels provide adequate contextual information about sugars to enable consumers to make informed choices in support of the dietary guidelines".

The practical difficulties of implementing this type of labelling are well known to industry and enforcement agencies, and have been described recently in detail by regulators and health bureaucrats reporting to FoFR. Notwithstanding the advice in a number of national dietary guidelines, these reports have confirmed that added sugars and intrinsic sugars are indistinguishable nutritionally.

Added sugar labelling for industry is really a challenge about first deciding on a definition of added sugars (a number have been mooted) and second, how to estimate their levels in products from the range of ingredients which carry sugars with them.

At the moment none of this is clear. For some products, under some circumstances, it may be quite straight forward, but for others it will be more difficult. Once again, the problem will be to avoid compromise with a solution which fails industry on a practicality level and fails consumers on a utility level. Taking the lead from FoFR's desired outcome for contextual information will require industry to be clearer on the amount of added sugars in products, and the ingredient(s) containing them. This will require a better information gathering by industry on the nature of some of its ingredients and, specifically, the sugars they



contain. It then needs to manage that information in a considered form, to allow it to be passed on to consumers.

Ingredient information management through the supply chain is becoming more sophisticated. New IT tools like the Australian Food & Grocery Council (AFGC) Authorised Food Data System now allow companies to provide almost limitless information regarding ingredients, foods and beverages down the supply chain. And this information can be provided directly to consumers through the internet. Consumers are seeking ever-more information about the foods they buy in the supermarkets, and the industry is moving to a much better position for providing it. Having said that, it is critical that agreement on how to best to provide this is established across industry and across wider stakeholder groups, including government. This must be driven by outcome rather than driven by compromise.

Dr Geoffrey Annison is Deputy Chief Executive at the Australian Food & Grocery Council and Professional Member of AIFST.

Food for Thought: CSIRO's Future for Health Report

Words By Sian Stringer



Our cultures, lifestyles and social systems are built around preparing, sharing and consuming food – it plays an intrinsic role in our lives.

But although research has existed for many years on the huge role food also plays in our long-term health, we're just not walking the talk when it comes to eating balanced diets to keep ourselves healthy. Data from the Australian Institute of Health and Welfare (2018) shows the majority of Australians do not eat the recommended number of any of the five food groups.

In September, Australia's national science agency, CSIRO, launched its

Future of Health report to help guide the country to a healthier future. The report looked at how to shift the focus of health from treating illness to preventing illness and stated a key part of this preventative and proactive approach to staying healthy is through diet and lifestyle.

Precision Health Lead at CSIRO Nathan O'Callaghan said that while research continued to uncover the importance of nutrition and diet on mental and physical health, many people didn't realise its significance until they reached a critical point.

"Often we don't make necessary changes to improve our health until a medical professional sits us down

and delivers a wake-up call about health issues we're bound to face," Dr O'Callaghan said.

"It is confusing for the consumer with so many products and claims on the market, though, and it can be difficult to know what is real and scientifically supported, and what isn't."

The Future of Health report found that 60 per cent of 15-74 year olds have low levels of health literacy, meaning they don't have the knowledge and skills needed to understand and use information on health issues, including disease prevention and management, and staying healthy.

Australians," Dr O'Callaghan said.

"Unless we shift our approach to health, including addressing health inequity and health literacy, a rising population and increases in chronic illnesses such as obesity and mental illness will add further strain to the system.

"We need to develop solutions tailored to communities, including early childhood education programs, improved access to healthy foods, and incentives for engagement in personal health and wellbeing."

The report stated that more than 11 million adults are considered overweight or obese and the health system is struggling to keep up with associated health issues, including type 2 diabetes. In its vision for Australian health, the report recommended technology be used to decrease costs and increase access to care, and to encourage dietary and lifestyle-based interventions to help prevent or manage chronic diseases.

"In shifting our focus from illness treatment to prevention, we'll be switching from accepting one-size-fits-all approaches to precision health solutions," Dr O'Callaghan said.

Precision health offers the promise of keeping people healthy by better anticipating and preventing disease, by taking into account a person's individual genetics, lifestyle, and environment. Dr O'Callaghan said evidence-based health apps, tailored to a person's individual requirements, could help broaden people's relationships with food to encompass its role as preventative medicine.

"For example, in the future, a pregnant woman may use an evidence-based health app which provides tailor-made food recommendations based on the nutrition requirements of both herself and her baby," he said.

"Apps like these could recommend foods based on a person's personal taste preferences partnered with genetic, biological and environmental data, collected by sensors inbuilt in a person's home."

Dr O'Callaghan said these visions of the future will require a shift in how

people see health and food – rather than viewing the health sector as something to engage with when sick, it will be a series of integrated activities designed to sustain good health.

"There will be a broader appreciation of the roles that nutrition, exercise, meaningful employment, social equity, stress levels, education, and environment play in managing health," Dr O'Callaghan said.

"This means improvements in health outcomes will need to be delivered by a system that brings together all of Australia's expertise.

"There will be huge opportunity for Australia's food and nutrition industry to collaborate with medical and allied health providers, alongside technology companies, research organisations, not-for-profits, supermarkets, gyms and more, to combine pooled data and resources and create more comprehensive and integrated services," he said.

"There's also opportunity for to develop food products designed to promote health, such as vegetable products tailored to the taste preferences of specific age groups."

The CSIRO Future of Health report provides numerous recommendations for improving the health of Australians over the next 15 years, with the aim of providing quality healthcare that leaves no-one behind.

The report is focussed around five central themes: empowering people, addressing health inequity, unlocking the value of digitised data, supporting integrated and precision health solutions, and integrating with the global sector.

CSIRO has been continuing to grow its expertise within the health domain and is focussed on research that will help Australians live healthier, longer lives. More than 30 organisations across the health sector were engaged in the report's development, including government, health insurers, educators, researchers, and professional bodies.

Sian Stringer is Communications Advisor - Health and Biosecurity at CSIRO.



Red Light, Green Light: When Ingredients Need Pre-market Approval

Words by Chris Preston

In an era where innovation and difference are critical to market success, the use of special or new ingredients is on the rise. As food manufacturers, it is important to have the knowledge to distinguish ingredients that need pre-market approval from those that you can use right away.

Most ingredients in a typical food are not specifically regulated. Sometimes there may be a glet chemical residue limits, maximum levels of some metals and in rare cases micro-organism limits, but most commodity ingredients can safely be used in your recipes (see Food Standards Australia New Zealand (FSANZ) Standard 1.1.1-10(2)). Securing pre-market approval for ingredients will take at least 18-months unless you are willing to pay for the assessment. Some approvals take significantly longer. In fact, there are applications with FSANZ that are more than four years old.

There is also the unfortunate reality that your application can both notify your competitors of your plans and, with some limited exceptions, provide them with equal permission to use

your ingredient. This is the so-called 'free rider' effect of code variations. These issues mitigate strongly against making an application. Consequently companies will usually go to some length to avoid the need for pre-market approval.

Interestingly, most applications made for pre-approval originate from the ingredient supplier rather than the food manufacturer.

Below is a list of ingredients to consider when you are presented with a recipe for a new product:

Food Additives: Since the 2015 revised Code, food additives are no longer regulated by identity alone but by function. To be regulated as an additive, something must be "used as a food additive" to perform a Schedule 14 function. Any traditional food (legally the double-negative 'not a non-traditional food') may be used as a food additive, as can substances identified in Schedules 15 and 16. **Any non-traditional food extract used for a Schedule 14 function, that is not specified in Schedules 15 and 16, requires pre-market approval prior to use.**

A common question from industry relates to the European

Union's naturally-derived colouring substances, which are increasing in popularity among food manufacturers around the world. Generally these will fall into three areas: (i) those already approved as colouring substances in Schedule 16; (ii) those where the source of the colour is a traditional food and so it is not captured by the definition of 'food additive'; and (iii) those where the colour is derived from a non-traditional food source. In these cases, so if the substance is used for the technological function of colouring (ie adds or restores colour to foods), it would most likely require pre-market approval. If the substance exists principally to perform functions other than colouring, there would need to be solid technological evidence to back this up to avoid potential compliance problems.

Processing Aids are regulated by use in much the same way as additives, except that the technological functions they perform are not expressly listed in the Code, and they must not be used to perform a Schedule 14 function in the final food. Approved processing aids include GMP additives as well as Schedule 18 substances.

Novel Foods are one of the more problematic classes to identify. The definition refers to a non-traditional food that requires an assessment of the public health and safety considerations, having regard to a range of factors. As the word 'requires' is subjective, this definition has severe legal problems relating to uncertainty, and it is enforced largely by regulators indicating their own judgement as to when the assessment is required. This definition is under active review by FSANZ to seek to redress this uncertainty. In practical terms, it is better to work with the 'non-traditional food' part of the definition. That is, if you can show that the ingredient (not simply the food from which the ingredient was derived) has a history of human consumption in Australia or New Zealand, then the food is not considered to be a novel food. Interestingly, the definition does not state the degree of evidence necessary to establish a history of consumption nor the extent of that consumption, leaving these issues open for debate.

Nutritive Substances, like additives and processing aids, are regulated by use to achieve a nutritional purpose. This includes vitamins and minerals, which are regulated separately. The absence of any definition of nutritional purpose is problematic. A dictionary understanding involves concepts such as to sustain with food or nutriment, or to supply with what is necessary for maintaining life. It is best to assume that anything not added for a technological purpose is likely to be taken to be added for a nutritive purpose, although if this were the intent, then the Standard might have easily just stated that and saved everyone some angst. The current definition in Standard 1.1.2-12 excludes inulins, galacto-oligosaccharide and a substance normally consumed as food from the ambit of nutritive substance.

Added vitamins and minerals require express approval. This does not include vitamins and minerals naturally present in foods or ingredients of foods, nor does it cover substances

INGREDIENTS AND FSANZ STANDARDS

Food Additives - Standard 1.1.1-10(6)(a), Standard 1.3.1 and Schedules 14-16

Processing Aids - Standard 1.1.1-10(6)(c), Standard 1.3.3 and Schedule 18

Novel foods- Standard 1.1.1-10(5)(b), Standard 1.1.1-10(6)(f), Standard 1.5.1 and Schedule 25

Nutritive Substances - Standard 1.1.1-10(6)(b)

Added vitamins and minerals - Standard 1.1.1-10(6)(b), Standard 1.3.2 and Schedule 17

GMO-derived foods - Standard 1.1.1-10(5)(c), Standard 1.1.1-10(6)(g), Standard 1.5.2 and Schedule 26

Irradiated foods - Standard 1.1.1-10(5)(d), Standard 1.1.1-10(6)(h) and Standard 1.5.3

Prohibited Botanicals - Standard 1.1.1-10(5)(a), - Standard 1.1.1-10(6)(e), Standard 1.4.4 and Schedules 23 and 24

Kava or raw apricot kernels - Standard 1.1.1-10(5)(e) - (f), Standard 1.1.1-10(6)(i) - (j) and Standard 2.6.3

that are used for non-nutritional functions, for example vitamin E used as an antioxidant food additive. The limits on maximum claims do not apply where the vitamin or mineral in question is only present as a natural constituent from ingredients, but they do apply where the vitamin or mineral has been added in its own right, including in cases where the substance is both added and naturally present.

Genetically Modified Organisms-derived foods (GMO) always require pre-market approval. Not all the GM approvals relate to food that is actually and intentionally in the ANZ market. There have been a number of GM applications made to deal with adventitious presence of small amount of GM material in commodity products due to overseas market admixture or previous use of transport containers. It is important to be aware of the difference between approval and labelling here. A GM substance needs to be approved even if it may not need to be declared in labels.

Irradiated foods are treated in a similar fashion to GM-derived foods. It is important not to mistake the labelling obligation with the pre-approval obligation. The fact that the Code requires the pre-approval and labelling of a process that makes food safe for consumption is questionable, and one that regulators could re-

consider.

Prohibited botanicals is a regulation that many applicants overlook, although the recent approval relating to hemp seed has brought it more attention. The regulation lists a number of plant species that may not be used in or as food, or which may only be so used in specified circumstances. Reading the list of common names is actually one of the more enjoyable parts of the Code, and you can see why they are prohibited ingredients. No-one wants hemlock in their stew.

Finally, **kava and raw apricot kernels** are separately regulated and prohibited as ingredients, due to particular incidents that have arisen in the past.

If this list seems daunting, remember that most traditional food ingredients are not caught by any of the above and may be used without the need for regulatory pre-market approval. It is worth noting that the regulation of nutritive substances and novel foods is currently up for debate, so industry has a role in making sure your thoughts are conveyed when FSANZ consults on these issues.

Chris Preston is Principal Legal Counsel, Australia at ComplyANZ.

Q&A



Ros Harvey – The Yield

Ros Harvey is founder and managing director of Australian agricultural technology company The Yield. Its mission is to transform food and farming practices by building secure, scalable digital technology. Ms Harvey describes herself as a political economist, an international development specialist, and someone who firmly believes that collaboration is key to solving major issues. Ms Harvey has recently been included in the *Australian Financial Review* 100 Women of Influence Awards.

Q What has driven your passion in agtech?

A I first realised the power of data when I founded the globally-recognised Better Work program, a landmark joint program of the World Bank and the United Nations. The program encompassed corporate social responsibility, global supply chains and pro-poor development.

On returning to Australia, my goal was to apply data insights to the field of agriculture to determine how we achieve sustainable food production and, at the same time, increase global readiness for future challenges.

Q At what pace are innovative farm technologies being adopted in Australia, and how do you see it playing out in the future?

A Australia is the perfect breeding ground for agtech innovation. Growers are innovative because they need to be. We are seeing much innovation come out of the tough growing conditions we face in Australia.

In 2017, investors put \$700 million into agtech, more than double the investment in 2016 and triple that of 2015.

As the agtech sector matures, we're likely to see big disruption and innovation at every stage of the agriculture supply chain.

The fundamental thing we need is better technology that is accessible to growers. Often when technology is created for growers by technology providers and the research community, it simply isn't user friendly.

If you have to train someone to use an app in today's digital economy, the developer has failed.

At The Yield, we spent years with growers discovering how they use technology and what information they need when designing our end-to-end agtech system, Sensing+. The system helps growers make smarter decisions and optimise irrigation through the combination of farm sensors, data, predictions and apps.

Q Do you see farm technology easing the pressure of drought on Australia?

A Times of drought can force the tech sector to really focus on what growers need, particularly when it is putting increased pressure on water use and resources.

At The Yield we focus on taking the

uncertainty out of weather. Growers know that every crop is different. The way limited resources and inputs are used needs to match the requirements of the crop in each part of the field on individual farms.

We provide decision support tools to help growers make better and faster decisions using real time, localised data and artificial intelligence to create highly localised predictions.

Our customers are reporting an up-to-30 percent reduction in water usage, simply through having access to accurate real time data from their farms.

Q Are there many women leading the Agri 4.0 sector in Australia?

A There are some incredible women leading the agriculture, agtech and Internet of Things (IoT) sectors in Australia. Women like Emma Weston at AgriDigital, Anastasia Volkova at FluroSat, and Catherine Caruana-McManus.

Agriculture and technology have traditionally been male-dominated industries. I feel strongly that we need to do more to make both industries more diverse. This is how we will tap the best talent.


We're proud to say that our team at The Yield is made up of 50 per cent women, including our engineering team, and we come from 13 different countries, speaking 14 languages.

Q Do you have a personal or professional 'Big Hairy Audacious Goal'?

A At The Yield, we have some particularly ambitious big hairy audacious goals (BHAG) which help us focus the direction of the company. Importantly, these goals are driven by our purpose and values. We want to be essential to 500 of the top companies along the entire agrifood supply chain around the world. This will support our second BHAG of becoming one of the biggest tech and data philanthropists for sustainable food production in the world. Doing public good with private effort is an important part of who we are at The Yield.

Q Have there been any major hurdles or stumbling blocks in your career, and how did you navigate around them?

A There have been many, as is normal for everyone in life. In fact, The Yield would not exist if it hadn't been for my son. I was at the height of my international career and had just moved my family to Geneva when my son Jules, who was nine years old at the time, was diagnosed with a serious illness. I promised my family that we would return home once Better Work was stable. It took three years.

I returned to Tasmania with a great passion for the transformative power of technology, scaling and diversity including empowerment of women and I needed a new project. So The Yield was born and I have Jules to thank for that. He is now a 21-year-old young man of whom I am extremely proud. 



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Food Files

Words by Drs Russell Keast and Gie Liem

Ingredients for Pleasure and Obesity

Food companies, quite rightly, produce foods that appeal to our appetitive desires. But, driven by appetite we consume excess quantities of energy, salts and sugars which lead to a variety of diet-related diseases including obesity, hypertension and related pathologies. The answer is to produce foods that are appetitive and nutritious, with reduced levels of salt, sugar, and fat. This will not be easy.

Salt: Sodium, in the form of manufactured sodium chloride (salt), is found in abundance in the modern diet, and excessive sodium consumption is linked to hypertension, cardiovascular disease and other diseases. Predicted health gains with a modest 15 per cent reduction in dietary salt may avert 8.5 million cardiovascular related deaths worldwide over 10 years, making

salt reduction a priority for food industries and governments alike.

In Westernised societies approximately 75 per cent of our dietary salt intake comes from manufactured foods. Pressure is on food companies to reduce the level of added salt. While salt has certain functionality in foods, palatability and consumer acceptance is the most commonly cited constraint to salt reduction by the food industry.

Large reductions in salt content of foods often result in declines in palatability and consumer acceptance of those foods. This can be illustrated using a bliss point graph. The bliss point region represents the intensity of saltiness and the concentration of sodium at which the optimal level of liking occurs. For example, salt added to a food at low concentrations may result in the food not being salty enough to be perceived and therefore too bland to be liked, while a higher

concentration will increase liking until an optimal level of liking is reached.

However, further increases in salt concentration will result in the food becoming too salty, and liking will then decrease. The challenge remains: how can salt be removed while maintaining consumer liking and acceptance of a product? For a review on the effects salt has on flavour, refer to Liem *et al* (2011).

Sugar: There is significant epidemiological evidence associating sugar consumption with obesity and type-2 diabetes, particularly in relation to consumption of sugar-sweetened beverages. The World Health Organisation has recommended sugar intake to be less than 10 per cent of total energy intake, and Public Health England published a report based on food industry stakeholder consultation proposing a 20 per cent sugar reduction in a variety of food

products by 2020. The American Heart Association states that the average daily intake of sugar is 77 grams, while the maximum amount should be 32 grams.

Similar to salt, reducing sugar in manufactured foods is not as simple as just removing the sugar. Sugar has multiple functions in the body and in the food, aside from the obvious sweet taste. Sugar is vital for texture and flavour, and consequently sugar reduction without influencing sensory perception is a technically difficult challenge for food manufacturers.

The encouraging news is that there are a variety of strategies for sugar reduction including: discontinuous stimulation of taste receptors, modification of serum release, modification of fracture mechanics, viscosity, and gradual sugar reduction. For a review on the effects and strategies for sugar reduction see Hutchings *et al* (2018).

The food environment has changed significantly over the past 50 years. This has coincided with increased prevalence of diet-related diseases. Our appetitive response to salt and sugar helped the hunter gather survive by making appropriate food choice, but we now have a secure food supply and our appetite is leading us down a path to disease states. The challenge is to develop a food supply that meets not only our nutritional needs, but also fulfils our hedonic requirements.

Liem G, Miremadi F, Keast R (2011). "Reducing sodium in foods. The effect on flavour." Nutrients 3 694-711
Hutchings S, Low J, Keast R. "Sugar reduction without compromising sensory perception. An impossible dream?" Critical Reviews in Food Science and Nutrition. 2018 DOI: 10.1080/10408398.2018.1450214

Sound as an Ingredient

Although we might say that a food has a nice flavour, flavour as such is not an inherent quality of a food. Food consists of ingredients such as sugar, but it does not become sweet until we taste it. The link between ingredients and what we taste is often not as simple as it seems. Some breads contain more salt than the



average crisp, but those breads do not taste that salty. What we taste is an interpretation of what our taste buds sense. Likewise, flavour is the interpretation of what we sense in our mouth and nose. Is it possible to influence what we perceive without changing ingredients of food, without changing what our taste buds sense?

The answer is yes, it is certainly possible. We can manipulate the sensory input of one modality to influence another. This can be a powerful tool in marketing and is also called "sensory marketing". Some sensory inputs naturally occur together, such as the sound of crunchiness and the texture experienced in our mouth. Researchers indeed showed that the sound of crunchiness can increase your perception of crunchiness in your mouth (Spence 2015).

This can be explained by cross modal correspondence, which is the tendency of one sensory system (eg sound) to influence the response of another system (eg touch). The combination of sounds in a piece of music is also known to influence our perception of foods. This is partly due to cross modal correspondence and partly due to the mood changing capacity of music.

Simply put, listening to uplifting music can uplift your experience and

fruity notes of a nice white wine. With the rise of virtual and augmented reality, we can immerse customers in an environment which triggers all senses and improve customers' eating experience, without changing the ingredients of food.

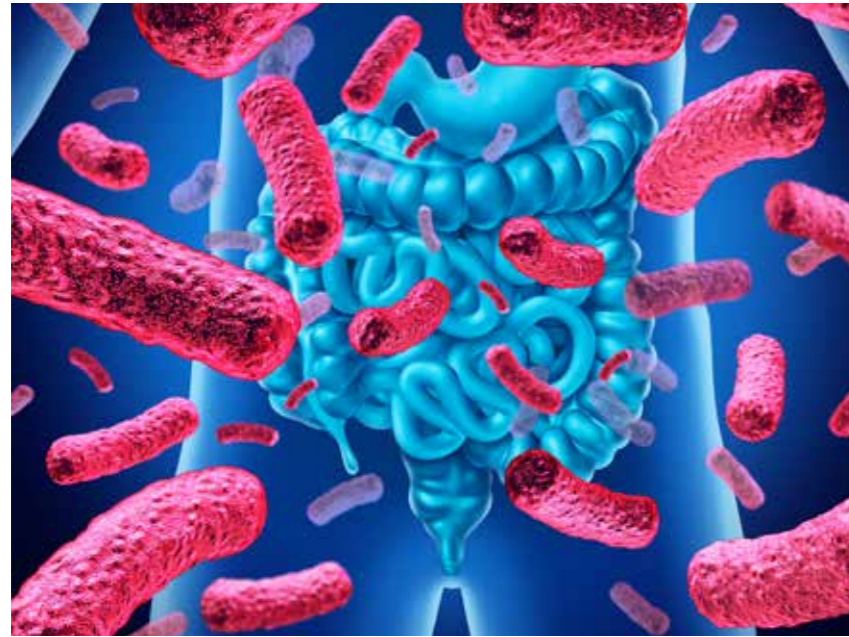
In a recent review, Professor Charles Spence lays out the opportunity for sensory marketing in wine (Spence 2019). Sensory marketing is gaining momentum, but most marketing messages only trigger one or two senses at the time. The opportunity lies in using multiple senses (eg the sound of spring, the smells and visuals of flowers) to change the taste experience. Changing the taste experience should not limit itself to a change in ingredients. When we start thinking about how our senses work together, we might be able to limit unhealthy flavour-adding ingredients without compromising perceived flavour. In such a way, we can make the healthy choice the easy choice.

Spence C. (2015) "Eating with our ears: assessing the importance of the sounds of consumption on our perception and enjoyment of multisensory flavour experiences". Flavour, 4, 3; Spence C. (2019) "Multisensory experiential wine marketing". 71, 2019, 106-116

Drs Russell Keast and Gie Liem are from The Centre for Advanced Sensory Science, School of Exercise and Nutrition Sciences at Deakin University.

What's New in Nutrition?

Words by Dr. Ramon Hall



Role of Gut Microbiota in Nutrition and Health

In a recently commissioned *British Medical Journal* review article, a team of researchers collaborated to produce a current account of the science underpinning the role of gut microbiota in nutrition and health (Valdes *et al.*, 2018).

These findings should be of interest to manufacturers of probiotics and prebiotic products and practitioners interested in the role of microbiota in benefiting health and nutrition.

The researchers examined topics such as how scientists study microbiota, the role of microbiota in our bodies, gut microbiota and obesity, the effects of food and drugs on microbiota, microbiota diversity and health, manipulating microbiota through diet (probiotics and prebiotics) and personalised nutrition.

The review summarised a series of pertinent clinical intervention studies that have been conducted in relation to nutrition and microbiota.

The authors propose five key messages coming out of their review: gut microbiota influences many areas of human health from

innate immunity to appetite and energy metabolism; targeting the gut microbiome with probiotics or dietary fibre benefits human health and could potentially reduce obesity; drugs, food ingredients, antibiotics and pesticides could all have adverse effects on the gut microbiota; microbiota should be considered a key aspect in nutrition, and the medical community should adapt their education and public health messages to address this; 5. fibre consumption is associated with beneficial effects in several contexts.

Interestingly, the authors have stipulated areas of consensus and uncertainty in relation to probiotics and microbiota with a couple of important messages: that probiotic supplementation has several benefits on human health and that the microbes in our gut influence human energy metabolism.

The authors conclude that, "We are entering an era where we can increasingly modify health through food and measure the effects through our microbes or metabolites.

Fibre is a key nutrient for a healthy microbiome and has been overlooked while debates have raged about sugar

and fat. The adverse effects on the microbiome of drugs and processed food ingredients can no longer be ignored.

Given the current gaps in knowledge, we need clinical evidence that can be translated into clinical practice, ideally through randomised controlled studies that use consistent matrices of prebiotics or probiotics or faecal microbiota transplantation to assess changes in gut microbiota composition and in health outcomes."

Valdes *et al.* (2018) "Role of the gut microbiota in nutrition and health". *British Journal of Medicine*, 361: k2179, (doi: <https://doi.org/10.1136/bmj.k2179>).

Cheese: Impact of Food Matrix on Blood Lipids

Researchers have undertaken a study to investigate the effects of food matrix on the consumption of 40g of dairy fat over a six week period (Feeney *et al.*, 2018). The study was a six-week randomised controlled parallel design trial, involving 164 participants.

This article should be of great interest to manufacturers, and practitioners, of dairy foods.

The study was split into four treatment groups including: 120g full-fat Irish cheddar cheese; 120g reduced-fat Irish cheddar cheese + butter (21g); butter (49 g), calcium caseinate powder (30 g), and calcium supplement (CaCO₃) (500 mg) (BCC) (n = 42); and 120 g full-fat Irish cheddar cheese (group additionally completed a six-week run-in the period before the test period commenced).

A range of blood parameters and anthropometric measurements were undertaken before and after the dietary treatments including weight, height, glucose, insulin, total cholesterol and LDL-cholesterol.

The results showed no differences in anthropometry; fasting glucose or insulin between the groups. There were significant step-wise matrix effects seen in relation to total cholesterol and LDL-cholesterol, with significantly lower post-intervention total cholesterol and LDL-cholesterol

when all of the fat was contained within the cheese matrix, compared to when fats were not within the cheese matrix.

The author concludes that, "Dairy fat, eaten in the form of cheese, appears to differently affect blood lipids compared with the same constituents eaten in different matrices, with significantly lower total cholesterol observed when all nutrients are consumed within a cheese matrix."

Organisations taking part in the study were the Institute of Food and Health, University College Dublin (Ireland), the Food For Health Ireland, Dublin, (Ireland) and Teagasc Food Research Centre, Cork (Ireland).

Feeney *et al.* (2018), Dairy matrix effects: response to consumption of dairy fat differs when eaten within the cheese matrix—a randomized controlled trial. *American Journal of Clinical Nutrition*, 108: 1-8, (<https://doi.org/10.1093/ajcn/nqy146>).

Impact of Pea Protein on Insulin and Glucagon in Type 2 Diabetic Individuals

This study should be of interest to manufacturers of food products aimed at type 2 diabetics and also researchers and practitioners interested in protein based foods for use with type 2 diabetics.

In a collaborative study conducted at the German Institute of Human Nutrition Potsdam-Rehbruecke, Nuthetal (Germany), researchers investigated the effects of isolated pea protein compared with casein protein meals differing in amino acid compositions on endocrine responses to meal tolerance tests in patients with type 2 diabetes (Markova *et al.*, 2018).

In a parallel design randomised controlled trial, 37 individuals with type 2 diabetes were allocated to receive meals with either pea protein or casein protein for a six-week period. Participants received standardised high-protein (30 per cent of energy) meals two times a day containing either casein protein or pea protein. Blood measures using meal tolerance testing regimes included

amino acid appearance, glucose, insulin C-peptide and glucagon.

The results revealed that the two meals produced differences responses in insulin, C-peptide, glucagon, and glucose-dependent insulintropic peptide release. Total areas under the curve after casein meals were significantly lower than the pea protein meal by 40 per cent for insulin and 23 per cent for glucagon. Indexes for insulin sensitivity and secretion were significantly improved for the second casein protein meal tolerance test, which coincided with different rates of amino acid appearance compared to the pea protein meal. The pea protein meal resulted in significant increases in amino acids after both meals with a decline between meals, whereas the casein meal resulted in an increase after the breakfast meal but no further increase after the lunch meal.

The authors concluded that "pea protein elicits greater postprandial increase in glucagon than does casein protein and consequently requires higher insulin to control glucose metabolism, which appears to be related to the rate of amino acid appearance. The metabolic impact of protein quality could be used as a strategy to lower insulin needs in patients with type 2 diabetes."

Markova *et al.*, (2018), Rate of appearance of amino acids after a meal regulates insulin and glucagon secretion in patients with type 2 diabetes: a randomized clinical trial. *American Journal of Clinical Nutrition*, 108: 279-291, (<https://doi.org/10.1093/ajcn/nqy100>).

Fish Consumption Associated with Reduced Risk of Depression in Korean Women

In a recently published study, authors from the Department of Food and Nutrition, Kyung Hee University, Seoul, (South Korea), undertook work to examine the association between fish consumption and depression in Korean adults (Yang *et al.*, 2018).

This article should interest to manufacturers of fish and fish products, as well as researchers and practitioners with an interest in food and its relationship with depression.

Using a cross-sectional study design, the researchers looked at 9183 Korean adults aged between 19 and 64 years who participated in the sixth Korea National Health and Nutrition Examination Survey (2013–2015).

Fish consumption and depression status were assessed using questionnaires. The study utilised physician diagnosed clinical depression within the statistical approach.

The results reveal that of the 9183 participants, 389 (4.2 per cent were diagnosed with clinical depression). After adjusting for confounding factors, there was a significant inverse association for fish consumption ≥ 4 times per week and reduced odds-ratio of clinical depression in women (compared to consuming fish < 1 time per week). There was no such significant association in men.

The authors stated: "Our findings suggest that high consumption of fish is associated with lower odds of depression in Korean adults, particularly in women. These results warrant further prospective studies to verify the association between fish consumption and the risk of depression in Korean adults."

This study highlights an interesting association between fish consumption and depression, but further randomised controlled trials are required to show a cause and effect relationship.

Yang *et al.*, (2018), "Fish consumption and depression in Korean adults". Korea National Health and Nutrition Examination Survey, 2013–2015? *European Journal of Clinical Nutrition*, 72: 1142-1149, (<https://doi.org/10.1038/s41430-017-0083-9>).

Dr. Ramon Hall is a Senior Lecturer in Food and Nutrition Sciences with the Centre for Advanced Sensory Sciences within the School of Exercise and Nutrition Sciences at Deakin University; Principal Scientist/Registered Nutritionist at NutraRegs Pty Ltd - Nutrition and Regulatory Consulting and Director of Hallsome Foods Pty Ltd.



Dr Jennifer Moss

Jennifer is currently VP R&D for Asia Pacific, New Ventures and Global Expansion at Campbell Arnott's, where she has held a succession of global and regional leadership positions for the past eight years. She has guided the organisation on their strategic journey towards a more agile and consumer-centric healthy snacking provider. Jennifer currently leads a regional R&D and innovation team that is on track to deliver above industry benchmark results.

How do you think Australia's R&D efforts compare globally?

Australian food R&D technological advances are leading-edge on the global stage. The combination of cutting-edge food technologies, quality produce and highly educated scientific workforce makes Australia revolutionary when it comes to breakthrough advances.

What are some recent R&D innovations that inspire you?

I am inspired by R&D innovation that combines great-tasting food with both wellness and sustainability outcomes. Campbell Arnott's recent launches that deliver deliciousness with health and wellbeing benefits are prime examples. These include the Vita-Weat Cracker launch, Fruits & Roots Vegetable and Fruit Juices and Campbell's premium stocks and bone broths. I

am also inspired by Campbell Arnott's achievement providing significant packaging sustainability benefits with no loss of value to the consumer. These benefits were recognised at the 2018 Australian Packaging Covenant Organisation (APCO) Awards with Campbell Arnott's announced as the winner of the Food & Beverage Sector and receiving an Outstanding Achievement Award.

Are there significant challenges facing the R&D sector currently?

There are many challenges facing the R&D sector today. Consumers are increasingly demanding transparency on ingredients and lower costs, both of which require breakthrough technological solutions. This is during a time when our STEM graduates have a wide variety of career choices. This means that our approach to meeting

FAST 5

these challenges must be balanced to ensure our sector remains attractive to new talent.

Which of your products make successful exports, and why do you think that is?

Whether products are designed for export or for local innovation, the ingredients for success are aligned. Differentiated products from purpose-driven brands that deliver to consumers' needs and are positioned at the correct price point will always result in success.

What advice would you give to students or graduates starting out in the industry?

We have entered the Fourth Industrial Revolution and change is exponential. This means that the role in which you start your career will change multiple times throughout your professional life. Students and graduates now need to shift their thinking from the completion of a degree being an end-point, to one instead that marks the first steps in a lifetime of learning. My advice is to take every opportunity that is put in front of you, keep learning, stretch yourself constantly and enjoy the ride!

Australia and New Zealand 2018/2019

November 12-13 2018 28th World Nutrition Congress Sydney, www.worldnutrition.conferenceseries.com

November 20 2018 ChemLinked Food Regulatory Conference - Oceania Melbourne www.aifst.asn.au/other-event/chemlinked-food-regulatory-conference-oceania-2018

November 24-25 2018 International Conference on Food and Agricultural Engineering Melbourne, www.10times.com/icfae-melbourne

December 3-4 2018 International Conference on Food and Agricultural Engineering Sydney, www.10times.com/icfsh-sydney

February 12-15 2019 Australian Agricultural & Resource Economics Society Annual Conference Melbourne, www.aares.org.au/imis_prod/AARES2016/Events/AARES2016/Events.aspx

February 25-26 2019 21st International Conference on Food Science and Risks in Food Security Sydney, www.waset.org/conference/2019/02/sydney/ICFSRFS

May 13-16 2019 The 3rd Food Allergen Management Symposium - FAMS2019 State Library Victoria, Melbourne allergenbureau.net/events-2

International 2018

October 23-27 2018 World Congress of Food Science and Technology IUFoST CIDCO Exhibition Centre: Mumbai, India, www.iufost2018.com/index.php

November 15-16 2018 5th Dairy Asia Pacific Summit 2018 Singapore, www.duxes-foodbeverage.com/dairy-ap/index.html

November 21-23 2018 ANUFOOD China 2018 Beijing, China, www.anufoodchina.com

November 29-30 2018 3rd International Conference on Food Microbiology and Nutrition Dublin, Ireland, www.foodmicrobiology.foodtechconferences.com

December 3-4 2018 International Conference on Food Safety and Regulatory Chicago, USA, www.foodregulatory.conferenceseries.com

December 10-12 2018 World Congress on Food and Nutrition Dubai, UAE, www.food-technology.nutritionalconference.com

February 25-28 2019 Global Food Safety Initiative Conference 2019 Nice, France, www.mygfsi.com/events/global-food-safety-conference.html

June 2-5 2019 IFT Meeting and Food Expo New Orleans USA, www.10times.com/ift-meeting-food-expo



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