

# food

Official publication of AIFST Inc

# australia

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OCTOBER/NOVEMBER 2014

## CONNECTED QUALITY

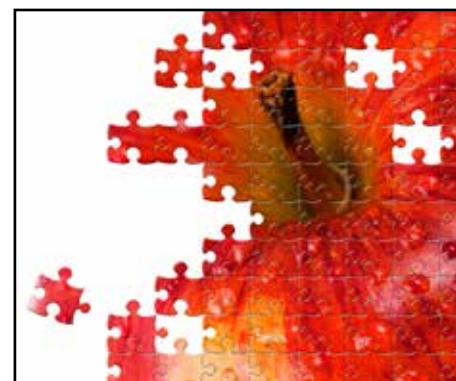
Maintain high standards,  
integrate quality needs

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*Also Inside*  
MICROBIAL FOOD SAFETY ASSURANCE  
COLLABORATING TO COMPETE  
EXPORT INSIGHTS

# ON THE COVER

## SillikerCONNECT - Integrating your quality and assurance service needs



### The State of Food & Beverage Industry Today

With ongoing pressure on margins, businesses are challenged to continually review costs while maintaining quality, integrity and continuity of their assurance programs.

A report produced by the Australian Food and Grocery Council, '2020: Industry at a Crossroads report' indicated that the different pressure points and challenges facing the industry currently, right throughout the value chain, will remain consistent.

### Reduce Quality Expenditure and Maintain High Standards

So where does Quality sit in these cost pressures and how could the Quality of your products be jeopardised?

#### Quality Components

- Certification
- Product Compliance/ Labelling
- Testing
- R&D (Science/Project)

It's worth noting that all these facets to quality likely have differing responsibilities within a business, so the aligned management of these components can be a challenge. So how can Silliker help?

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Total Silliker Connect Integration > Achieving Maximum Connection



### SillikerCONNECT - A Total Quality Solution for your operation

Even though the focus of businesses is heavily on the minimisation of direct costs, the reality is indirect costs also affect the bottom line. Silliker's new Total Quality initiative, SillikerCONNECT, provides an opportunity to consolidate these indirect quality costs into a more effective package of services from the ONE provider.

SillikerCONNECT key outcomes for the food and beverage industry are to drive the cost effectiveness of the quality component in the

indirect cost space. By saving time and money with your critical quality assurance requirements through SillikerCONNECT, your business can re-invest into other critical areas, product development and innovation!

### Silliker - Protecting Your Brand

For more information about the SillikerCONNECT program please contact Silliker today on [info@silliker.com.au](mailto:info@silliker.com.au) or visit [www.silliker.com.au](http://www.silliker.com.au)



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# food australia

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## FROM THE PRESIDENT

Welcome to the October/November 2014 issue of *food australia*.

In this issue we are thrilled to include the address from the winner of the prestigious 2014 Keith Farrer Award of Merit, Dr Tom Ross, for his outstanding contribution to food science. The award was given at this year's AIFST Convention, where Dr Ross presented on his work in the area of food safety, and in particular, predictive food microbiology. I encourage you to read his contribution on page 20.

Also, on page 24 we look at the careers of David and Polly McLennan, two of Australia's leading food scientists who have led the field in biotech protein solutions for the industry. It is a fascinating read and their careers are an inspiration for future leaders in our field.

Finally, October 2014 is a big month for AIFST. We have our Extraordinary General Meeting (EGM) to vote on changes to the constitution. I encourage you to read the update from council on page 16 of this issue as well as ensure you are familiar with the reading materials that have been sent to all members.

These changes have been carefully considered to ensure that the Institute is in the best position to deliver on our vision of being the peak body providing the leading voice in members, to develop and promote your contribution to a world-leading food industry.

I hope to see as many of you as possible at the EGM on 21 October. If you can't attend, please offer your proxy to someone who is attending by submitting your form to National Office by 17 October.

Until then, happy reading.

**Dr Anne Astin**

AIFST President





BY THE NUMBERS

## TIGHTEN UP, TOO LOOSE

### NO HOLDING BACK THE PROTEIN TREND

The strong interest in protein content and high-protein products across the food and drinks market continues to develop, despite the fact that most Westerners already get enough protein in their diets.

The trend is driven by health concerns – primarily weight management – plus the move of sports and performance products into the mainstream, and tends to be targeted at the more generally active, rather than just athletes and sportsmen.

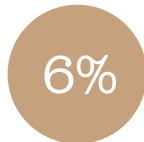
Another significant and growing trend is the Paleo diet, focusing on lean protein, while avoiding processed foods and sugars.

According to Director of Innovation at Innova Market Insights, Lu Ann Williams, the time is right for protein innovation.

“There are a number of drivers,” she said. “The need to feed a growing global population, an alarming rise in sarcopenia (declining muscle mass, particularly among an aging population), and the economic and environmental costs of existing protein sources.

“Proteins have diverse application potential, with opportunities for alternative vegetarian options, and new protein sources – such as microalgae – alongside existing and novel dairy-based and vegetable sources, such as soy, beans and grains,” she said.

According to Innova there continues to be a lot of new product activity in protein globally. Here are a few key findings from The Innova Database.



3% of global food and beverage launches in the 12 months ending 31 March, 2014, were marketed on a “high-protein” or “source-of-protein” positioning, rising to 6% in the US.

The biggest increase in proteins has been in the dairy category, where the number of products launched with a protein claim has risen more than 15% in 2013.



In 2012 whey held position eight on the list of published protein patents. In 2013, it had risen to position three.

Although health and health related issues account for most of the research papers, over 12% of the patents are for proteins in relation to sport, which is the biggest cluster of research for proteins. Health and nutrition comes in second at 8% of the patents.



Vegetables lead the list for the number of published protein patents in food and drinks.



In sports nutrition, whey is the go-to protein accounting for over 36% of patents. This is much more than other protein concentrates such as milk protein, which makes up less than 5% of the patents.

Source: Innova Market Insights, 2014

## LEVIES ON THE LINE IN SENATE INQUIRY

The future of agricultural levies in Australia hangs in the balance, with the Senate passing a motion in September for a wide-ranging inquiry into how agricultural levies are collected and used to support Australia's farmers.

Brought about by NSW Liberal Democratic Senator David Leyonhjelm and NSW and WA Liberal Senators Bill Heffernan and Linda Reynolds, the Senate will look into the industry structures and systems governing the imposition of and disbursement of marketing and R&D levies in the agricultural sector.

The concerns surrounding the \$500 million-plus rural levy funding system stem from Senator Leyonhjelm, who believes the compulsory annual levy farmers pay to fund rural marketing, R&D, biosecurity and advocacy bodies is wasteful and encourages duplication and poorly directed research.

The move comes after the Senator disallowed a grower-supported proposed increase to the levies paid by mushroom, onion and mango growers, which has signaled an horticultural industry-wide response in support of the levy.

According to Gavin Scurr, mango, pineapple and strawberry grower and Chair of the Australian Mango Industry Association, the decision to increase the mango, mushroom and onion levies followed an extensive and comprehensive industry consultation process for all three industries.

"It was the culmination of a five-year process that strictly adhered to the Department of Agriculture's Levy Principles and Guidelines. The proposals to increase the levies were



instituted by growers who recognised the need to invest in their industries for the benefit of all levy payers," he said.

"Levies are vital to the continued growth and development of the agriculture industry."

Senator Leyonhjelm says the inquiry is necessary to ensure industry R&D groups are held accountable to the farmers they represent.

"We are not going to come up with recommendations regarding how Horticulture Australia should spend onion grower levies or how the wine people should spend their levies," he said.

"But we will come up with generic recommendations that can be applied to all of them as to how levy payers can get good value for money, and also how levy payers keep the levy spenders accountable."

## BANANAS ARE THE SLIPPERIEST OF FRUITS

A team of Japanese scientists from Kitasato University has won the IgNobel Prize in Physics for their research into whether banana peel is as slippery as cartoons would have you believe.

Presented at Harvard University, the IgNobels celebrate the unusual in science, technology, engineering and maths, and reward top-rate research into the quirkiest of ideas.

For lead scientist Kiyoshi Mabuchi and his team, the prize was the icing on the cake. To establish that banana peels are indeed very slippery, the team placed 12 Cavendish banana skins interior side down on linoleum samples and trod on five different sections of each banana peel for a total

of 60 measurements. The linoleum was then placed on a force transducer, which is a sensor that measures the force, weight and pressure applied to an object. The scientists then established the coefficient of friction from the peel sliding along the floor.

To work out why bananas proved so slippery, the team crushed the fruit peels and looked at them under the microscope and found that when crushed, they produced a gel-like substance.

While enjoying the fruits of their labour, Mabuchi and his team would like to use the friction results and properties of the banana skin gel to improve artificial joints.

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## EGG PRODUCER PENALTY

Australian egg producer Pirovic Enterprises has been ordered to pay \$300,000 in penalties by the Federal Court after it was found guilty of misleading customers and wrongfully promoting its eggs as free range.

In proceedings brought about by the Australian Competition and Consumer Commission (ACCC), it was found Pirovic misled consumers by using egg cartons that included the words 'free range' and images of hens on open pasture, despite the fact that its hens did not move about freely on an open range on most days.

"Credence claims such as free range claims are powerful tools for businesses to distinguish their products. However, if they are false or misleading, they serve to mislead consumers, who pay a premium to purchase such products," said ACCC Chairman, Rod Sims.

"This decision provides very clear guidance that any free range egg claim must be backed by farming conditions and practices implemented by suppliers under which hens actually move about on an open range each day," said Sims.

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## ANCIENT AQUACULTURE KEY TO GROWING WILD RICE

Little is known about Aboriginal agricultural techniques however researchers investigating the viability of mass-producing Australian wild rice believe they could provide the answers to farming the native grain.

In his recently published book *Dark Emu: Black seeds, agriculture or accident?* Bruce Pascoe says the first Australians used a complex system of agriculture that was built on intimate knowledge of the land. He highlights the use of fire to distribute plant communities, the use of open forest to attract grazing animals, and evidence of a complex aquaculture system used to sustain inland communities' food needs.

Indeed, a network of channels connected to wetlands has been uncovered in areas of Victoria, and it is this type of ancient aquaculture that the wild rice researchers believe could be the key to growing the grain across northern Australia.

"We need to improve our understanding of how traditional people have used rice in the past. I think we need to go back and explore that with them," said Professor Robert Henry from the Queensland Alliance for Agriculture and Food Innovation.

"Using traditional methods could be a way to utilise northern Australia's so far untapped, remote wetlands to grow wild rice on a larger scale."

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## FREE TRADE CONFUSION

The Australian government's work to break down trade barriers for Australian industry could be in vain, with the majority of Australian businesses not understanding how free trade agreements can work for them.

In a survey of more than 800 companies across Asia, conducted by HSBC, just 19 per cent of Australian businesses had taken advantage of free trade agreements.

While 75 per cent of companies that have embedded free trade agreements into their business strategy have experienced a boost in exports, a wider client base and new business opportunities, the majority have not taken advantage, with most citing a lack of understanding as the reason.

Half of Australian respondents had limited or no understanding of the country's free trade agreements, citing the complexity of terms, a lack of understanding of benefits and deals with non-strategic markets as the main barriers.

James Hogan, Head of Commercial Banking for HSBC Australia says free trade agreements are negotiated to enable greater trade flow and improve Australia's economic prosperity.

"Australia is an active participant in trade agreements, with nine free trade agreements in force and seven under negotiation, including a milestone agreement soon expected with China.

"However, all the effort in negotiating these agreements will be in vain if businesses are not using them," said Mr Hogan.

Australia currently has free trade agreements with New Zealand, Chile, the United States, Malaysia, Singapore, Thailand, South Korea and most recently Japan. Negotiations with China are expected to conclude later this year.

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## DAIRY LEADS WAY IN INNOVATIVE FOOD PRODUCTION



Australian dairy producers will be better placed to meet increasing local and international demand for high quality products thanks to the Australian Research Council's (ARC) newly established Dairy Innovation Hub.

The major industry research initiative is designed to assist producers develop new products to satisfy the growing demand for high quality dairy both here in Australia and throughout Asia.

Current research projects include better tasting lactose-free and reduced-fat long life milks, butter and dairy blends with improved taste and spreadability, yoghurt that retains its texture for longer, and a wider range of more consistent, natural cheese flavours and textures.

The \$13 million, five year ARC co-funded program brings together three of Australia's leading dairy research groups including Dairy Innovation Australia Ltd, the University of Melbourne and the University of Queensland.

"Dairy manufacturing is currently worth more than \$2 billion to the Australian economy and will continue to increase as the

demand for food required in Asia doubles in coming years," said Hub Director and University of Melbourne's Associate Professor of Chemical and Biomolecular Engineering, Sally Gras.

"We will work to find solutions and opportunities for the Australian dairy industry to make the most of our geographic location and to grow our exports into the lucrative Asian market," said Gras.

Australian dairy manufacturers will also benefit from processing innovations that reduce environmental impact, provide new opportunities for water recycling, and reduce operating costs and time lost to equipment cleaning.

Over the five years of funding, the Hub expects to achieve research outcomes to understand the structures of dairy products better and how these contribute to their properties and feel in the mouth, as well as improve processes within Australian dairy manufacturing.

"These insights will help manufacturers make new products and design processes that can reduce waste and lead to water and energy savings," said Gras.



## FONTERRA PARTNERSHIP WITH CSIRO

Dairy producer Fonterra will tap into the CSIRO's innovative thinking in a move that it hopes will help it stay ahead of the game in the booming dairy industry.

The company has entered into a five-year partnership with Australia's national science agency, which will see Fonterra apply CSIRO's scientific know-how in remote sensing, resource engineering, ecosystem and food and water across its dairy supply chain. The partnership also fulfils part of CSIRO's strategy to deliver research solutions for the global dairy industry.

Fonterra's Chief Technology Officer, Dr Jeremy Hill says investing in new and different technologies and ways to operate is crucial if the company wants to meet the needs of new markets and ensure it remains commercially and environmentally sustainable.

"CSIRO has developed 3D printed devices to treat sleep apnoea, soil contamination detectors and highly



Fonterra's Dr Jeremy Hill

efficient solar technology. These technologies aren't traditionally associated with the dairy industry but it's the science and thinking behind these innovations that will benefit our focus on getting more value from our farmers' milk and doing so sustainably," said Dr Hill.

"On farm, CSIRO will turn their attention to herd productivity, effluent management and milk quality, and then work through our supply chain looking at processing and analytical technology, food structure and design, and consumer health benefits. We're leaving no stone unturned to ensure Fonterra stays at the cutting edge of dairy innovation," he said.

Fonterra is a New Zealand owned cooperative and largest processor of milk in the world. In Australia, it operates 10 manufacturing sites and collects around 1.6 billion litres of milk annually.

## Nikken and Langdon Ingredients

*the natural choice*



Langdon Ingredients has established their reputation as a quality service and ingredient provider for a range of quality-assured, traceable food ingredients from around the world. That is why they joined with Nikken Foods to share this unique range of nutritionally beneficial, premium, natural products.

Applicable across sweet and savoury applications, Nikken's great variety of products includes rich caramelised onion concentrate and sweet white miso powder.

Nikken's Umami Pantry of natural flavour enhancers and umami-rich products can help reduce sodium in your application while enhancing mouth-feel and offering full-bodied, balanced flavour.

Langdon Ingredients has an experienced team of sales and technical professionals to assist your innovation needs.



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- Asian Seasonings
- Miso Powders
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## SURVEY: GMO KEY TO INDUSTRY FUTURE

The use of genetically modified crops must increase if the world wants to keep up with a growing population, according to a recent survey of the global food and agribusiness industry.

In a survey of 80 senior food and agriculture executives by legal firm Norton Rose Fulbright, 53 per cent believe community attitudes to genetically modified produce have changed in recent years, and note that with global population growth, urbanisation and an expanding middle class, the industry will not be able to meet demand unless radical changes are made to existing inputs.

Respondents agreed that increasing consumption in emerging markets due to economic growth and higher incomes has placed a greater strain on dairy and protein suppliers, who are struggling to keep up with demand.

More than ever before, respondents say there is a greater need for protein feeds, which can be addressed by using genetically modified organisms (GMOs) in animal feeds, such as genetically modified soya feeds. Seventy-one per cent of respondents said they planned to increase their use of genetically modified foods over the next two years, indicating that public opinion has no choice but to change.

“Fear of GM food may have waned somewhat in developing countries, but the combination of a lack of understanding about biotechnology and a content-hungry media means we may be only one tweet away from the start of the next ‘Frankenfood’ scare campaign. Public education is key,” said Jenni Hill, Partner at Norton Rose Fulbright Australia.

“The population is forecast to increase by two billion by 2050. If productivity and yields do not improve, people will starve,” added Rabobank Regional Manager, Justin Cotter.

While the growing use of GMOs was a key finding from the survey, the impact of climate change and natural disasters was also a major issue for the industry.

Twenty-two per cent of respondents believe climate change and natural disasters will have the biggest impact on the industry over the next three years, with several citing major weather events such as the recent polar vortex that swept North America and the tropical cyclone that wiped out banana crops in Far North Queensland as examples of the industry’s unpredictable nature.

Respondents say the combination of extreme weather events and increased demand is a grave problem for the industry as it leaves little margin for error on the supply side.

Respondents say it is imperative to maximise harvests, as one weather event or natural disaster in one country or region has the potential to lead to price volatility in the global market, as seen when banana prices hit A\$15 a kilo following the 2011 cyclone.

As the global markets continue to change, the introduction of new players to the agriculture industry such as China, Brazil and Russia are seen as important to the industry’s ability to keep up with demand.



The demand from China is fueling the food and agriculture industries in other nations, particularly Australia, however respondents reflected that over time, China is likely to become more self-sufficient as it focuses on food security rather than supporting international agribusiness.

“We are seeing a lot of Chinese investment into Australia where the strategy is to secure the complete supply chain – the ‘paddock to plate’ approach, where the paddock might be in rural Queensland and the plate could be in Beijing or Guangzhou,” said Anthony Latimer, Partner at Norton Rose Fulbright.

On the other hand, Brazil has stepped up as a key global exporter, with its enthusiasm for agribusiness and subsequent success permeating into neighbouring countries such as Argentina and Chile, who are looking to improve their own industries.

Respondents note Russia will be a significant wheat producer in the future, particularly in the Black Sea region, which borders Georgia and Ukraine, but concede that political tensions are hindering the region’s potential.

# INNOVATIVE DETECTION METHODS FOR FOODBORNE PATHOGENS

Foodborne illness is on the rise around the world and between October 2011 and September 2012, there were over 32,000 reported cases in Australia alone.<sup>1</sup> Not only does this impact on people's health and wellbeing, it also causes economic losses in the form of lost productivity and healthcare costs.

As a result, there is increasing pressure on microbiology labs to provide accurate and timely results across a broader range of pathogens, often with fewer resources.

Another factor is that traditional agar methods are often unable to provide the type of information required by modern regulations or specifications.

In response to these challenges, the Food Safety department of the global innovation company 3M has developed a new platform that innovatively combines two technologies.

## Combining DNA detection with bioluminescence

The **3M™ Molecular Detection System** uses isothermal DNA amplification to amplify the specific DNA sequences of target organisms and uniquely combines this with bioluminescence to provide real-time positive results.

Designed with simplicity in mind, the system uses a single sample preparation protocol across all assays and the unique colour coding of the software and reagent tubes facilitates an easier set-up, reducing the chance of operator error.

According to Niki Montgomery, Global Business Manager 3M Food Safety, the system offers significant bottom-line benefits to businesses through faster processing time, less staff training, and reduced risk of human error.

"Because bioluminescence provides real-time detection, positive results can



be available in as little as 15 minutes. And the system is very accurate. DNA is amplified continuously, which limits the possible interference of the template or DNA polymerase by food sample inhibitors."

Isothermal DNA amplification proceeds at a constant temperature – which removes the need for complicated instrumentation. In fact, the instrumentation, which can process up to 96 tests in a single run, has a smaller footprint than a standard notebook computer. The instrument is also portable and robust, with no need for recalibration after transport and minimal maintenance requirements.

"Numerous organisms can be tested in a single run, and it was designed to help our customers perform fewer repeat tests and make critical decisions faster," said Montgomery.

Another feature is that all kits come with ready-to-use and pre-dispensed reagents that require no measuring, mixing or aliquoting, freeing up valuable laboratory staff to focus on more important tasks.

The system is intended for use in all laboratories performing pathogen testing on food and beverage samples and has been verified across multiple

food segments, including meat, poultry, fresh produce, dairy, seafood, water and processed foods.

Within a year of launch, 3M received third party certifications against reference methods on all assays. These include AOAC PTM Certification and AFNOR Certification. The Salmonella assay has subsequently gained AOAC OMA status.

*3M is a leader in innovative solutions that help the food and beverage industries optimise the quality and safety of their products to enable consumer protection. At every step, 3M Food Safety provides solutions that help mitigate risk, improve operational efficiencies and impact the bottom line.*

For more information, visit [www.3M.com.au/foodsafety](http://www.3M.com.au/foodsafety) or follow @3MNews on Twitter.

## Reference

1. OzFoodNet Quarterly Reports, 1 Oct 2011 – 30 Sept 2012



PEOPLE

**CSIRO's new Food and Nutrition Flagship**



*Professor Martin Cole.*

Two of Australia's most respected food scientists, Professor Martin Cole and Professor Lynne Cobiac, will lead CSIRO's new Food and Nutrition Flagship, an initiative to provide innovative thought to Australia's food, health and bioproducts industries.

With more than 40 years of international research experience between them, Professor Cole has been named Director of the Flagship, with Professor Cobiac as the Science and Deputy

Director charged with developing and implementing the science strategy.

Prior to his appointment, Professor Cole was Chief of CSIRO Animal, Food and Health Sciences, and has also been Chief of CSIRO Food and Nutritional Sciences, and Director of the National Centre for Food Safety and Technology in the US.

Prior to her appointment, Professor Cobiac was Director of CSIRO Preventative Health National Research Flagship and for four years, was Associate

Dean of Flinders University's Clinical and Molecular Medicine. Professor Cobiac has also worked as Co-Director of the Physical Activity and Nutrition Observatory for SA Health.



*Professor Lynne Cobiac.*

CSIRO's Food and Nutrition Flagship brings together three science programs: Dr Chris Downs will lead the Innovative Food Products program which works with food industry stakeholders to develop value added products for local and export markets; Professor Manny Noakes will lead the Food, Nutrition and Health program which explores the nexus of food, nutrition and human health and assists the food industry in substantiating the health benefits of products; and Dr Allan Green will lead the Future Bio-based Products program, which aims to build new bio-based industries for Australian and global markets, and work with stakeholders in the transition to more renewable resources.

**Families behind Bulla reap rewards**

The Royal Agricultural Society of NSW has awarded the three families behind one of Australia's most loved dairy brands, Bulla, by declaring the Victorian dairy company as 2014's best food producer.

Run by the same three families for more than 100 years, Bulla was awarded the Society's prestigious silver heritage President's Medal for its 35 per cent Thick Cup Cream and commitment to producing high quality product by sustainable means.

The product's origins date back to company founder Thomas Sloan, who established Bulla in Melbourne's Moonee Ponds in 1910. He was joined by brothers-in-law Hugh and Jack Anderson, and the company has successfully progressed down the lines to remain family owned 104 years later.

Now as Australia's largest family owned dairy manufacturing company, Thomas' grandsons Russell and Ian head the company, with descendants from the other two families represented on the company's board.

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 Research & Development | Middle and Senior Management | Operations



## HACCP awards food safety



Richard Bennett from Produce Marketing Association Australia-New Zealand has taken out the prestigious Ross Peters Memorial Award for Excellence in Food Safety at the annual HACCP Awards held in Sydney.

Mr Bennett has over two decades experience of improving industry understanding and adoption of food safety and quality management processes

in the fresh produce sector. He was awarded as part of the Australian HACCP Conference, where industry professionals gather to explore topical issues in food safety.

"It's a tremendous honour to be recognised by my peers in such a significant award category. The fresh produce industry's safety journey has been a long one with many difficult challenges along the way. At each stage I did all I could to lead, facilitate and inspire those I worked with. In turn, their work inspired me," said Mr Bennett.

Woolworths National Food Safety Manager Damien Alexander took out the most Outstanding individual nominated by an agri-food industry company, while SGS Australia's Senior Food Safety Auditor Lisa Tomassen was awarded Outstanding individual working as a registered food safety auditor.

Tasmania Dairy Products was awarded Outstanding single-site company for its bovine milk processing facility, while Golden State Foods Australasia won Outstanding multi-side company for its superior level of food safety standards.

## Horticulture Coalition SA turn over executive



Apple & Pear Growers Association of South Australia CEO Susie Green has been appointed Chairperson of the Horticulture Coalition of SA following its Annual General Meeting in September.

Ms Green takes over from Trevor Ranford, the inaugural Chairperson of the group which was established in 2013 to represent the South Australian horticultural industry.

Ms Green, who has over 20 years experience in the horticultural industry, has sat on various industry representative committees, and was also South Australian runner-up in the 2014 RIRDC Rural Women's Award.

Ms Green is joined on the executive team by Angelo Demasi, CEO of the Adelaide Produce Markets Ltd; Grant Dalwood, CEO of the Nursery and Garden Industry SA, Con Poulos of Citrus Australia and former CEO of the Nursery and Garden Industry SA, Geoffery Fuller. Former Chairperson Trevor Ranford will also remain on as Vice-Chairperson.

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AIFST

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# PROTECTING YOUR BUSINESS, BRANDS AND BACK

*Acceptable risk is determined by understanding the possible outcomes. What does that mean for the food and grocery sector and what part do company directors and officers play?*

Words by *Bronwyn Graham*

An officer or director for a company, especially one in a company that provides goods for personal consumption and/or use, has obligations that must be met. Understanding what those obligations are and the inherent risks associated, what can be done to minimise those risks and how to prepare for the advent of “when things” go wrong is information that will determine success in fulfilling these roles or success to the company represented.

This was the topic of Protecting your business, brands and back: Governance issues for officers and directors of FMCG businesses, a Continuing Professional Development (CPD) Program event, jointly offered by AIFST and the Australian Food and Grocery Council (AFGC). Held in Melbourne on 5th August at the Parkroyal Hotel, the event was designed to inform officers and directors of FMCG companies about their obligations and it attracted an audience of senior managers, CEOs and officers of FMCG companies from around Australia.

The seminar opened with AFGC’s Managing Director, Terry O’Brien providing a frank presentation on the need for companies to ensure food safety and quality is embedded into corporate governance. He discussed the need of industry to embrace continuing professional development as one way of ensuring consumer risk is minimised by the continual updating of required skills and knowledge of risks in food safety. This also ensures that those serving in companies as officers and directors are able to meet their personal obligations to consumers and the company in which they serve.

Greg D Arville from crgEssentials, representing the Australian Institute of Company Directors, continued the conversation on risk, particularly risk appetite and looking at a risk strategy and how to practice what you do not want to occur. He cited examples of companies that did not adopt a risk strategy and were at the mercy of the market place and suppliers when things went wrong and could not recover well as they did not have strategies in place. He stressed the importance of working to avoid this type of scenario by practicing what you do not want to happen.



*Pauline Ireland, Assistant Director, Food Safety and Regulation, VIC.*

Professor Martin Cole Chief, CSIRO Food and Nutritional Sciences, spoke about the complexity of the supply chain as one of the reasons that there are risks to food supply. He spoke about the current programs and initiatives in Australia to protect food safety and minimise risk, but also made the point that there are still incidences in Australia and overseas, even in the presence of all of the programs and initiatives available. He covered areas such as consumer and industry trends, emerging food safety issues, food safety technologies and risk management and the business of a food safety culture.

Using the ACCC Compliance and Enforcement policy as the reference, ACCC’s Paul Zawa and Kate Hebbard outlined the corporate obligations and the consequences for not meeting them. They noted priority areas for the ACCC in 2014 is credence claims, and in particular inaccurate product claims made by larger companies that provide a competitive edge at the expense to smaller competing companies.

Pauline Ireland, Assistant Director, Food Safety and Regulation Victoria, provided a presentation on the Model Food Act and the key legal obligations of food businesses. The main objectives of this act are to ensure food for sale is safe and suitable for human consumption; to prevent misleading or deceptive conduct in connection with the sale of food; and provide for the application of the Food Standards Code.



*Katherine Teh White, Managing Director Futureye.*



*Gabrielle Hutton, Suncorp Group.*

All jurisdictions have adopted the core provisions of the Model Food Act including key definitions and offences. However, the enforcement arrangements, level of penalties and enforcement policies can differ among jurisdictions. Pauline Ireland encouraged companies to take an ethical approach and build an ethical culture throughout the organisation, which is increasingly what consumers expect. The other aspect is to ensure you can demonstrate due diligence.

Dr Anne Astin, AIFST President, spoke about the issues that may impact upon a brand's reputation - including food safety, food security and provenance. She discussed some of these matters in relation to the whey protein issue in New Zealand, including the important key learning that having exemplary food safety management systems and a matching organisational culture is essential to protecting your brand.

Katherine Teh White, Managing Director Futureye, spoke about minimising brand damage by ensuring your company maintains a "social licence to operate". A company or industry's reputation is built from the sum of positive experiences that people have with it in terms of the contribution it makes to the economy, environment and society. When a company or industry loses its social licence to operate, either society has become agitated about its approach or societal expectations have advanced beyond the practices of the company or industry. If this is the case, the company or industry will find it difficult to influence their environment with positive messages. According to Teh, without a social licence to operate you have no control.

Peter Lucarelli, partner with law firm Baker McKenzie covered the area of litigation, including individual and class action lawsuits and the threat they represent to businesses.



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He discussed the importance of ensuring regulatory compliance is followed as well as all reasonable duty of care to protect consumers.

Malcolm Newberry and Gabrielle Hutton of Suncorp Group, presented on insurance and posed the question 'what keeps underwriters up at night?' This led into discussion around food safety risks and the new emerging risk of contract labour hire and the importance of minimising risk by following protocols of safety inductions. This presentation also looked at risks in terms of product failure and conducting risk assessments taking into account any changes to product or process that may impose new risks to product or personnel. The take home message from this talk was to ensure you are adequately covered for insurance by conducting an annual check of insurance coverage.

Callum Elder Executive General Manager, Quality & Innovation at Simplot presented the second case study of the day, an incident that occurred at Simplot involving environmental action groups targeting the company and their brand John West. He shared key learnings including the importance of engaging crisis management experts early, having clear communication strategies and good governance, and ensuring that any statements you make are 100% accurate, to ensure that the crisis is managed with the least amount of damage done.

Finally, AFGC's Fiona Fleming spoke about the key elements in a crisis management plan and shared learnings from her years of experience in these areas within the food industry. Defining a crisis as an unplanned set of circumstances that represent an immediate and significant threat to a company, consumers,



*Fiona Fleming, Australian Food and Grocery Council.*

employees or the community, Fleming emphasised being prepared, by having an effective crisis management system that is structured around mitigation and prevention, response and recovery aimed at getting back to business as usual, and taking on the key learnings gained during the crisis and using them in future planning.

The event was an enormous success, with the high-calibre speakers generously sharing their experiences to ensure that attendees were well informed of the risks to their customers, business and themselves in the event of a crisis.

AIFST would like to acknowledge the generous support of the AFGC for the CPD program.

## UPDATE FROM COUNCIL

Words by *Dr Anne Astin*

All AIFST members should have now received the papers for the Extraordinary General Meeting, which will be held 21 October 2014. If you haven't received your papers, please contact National Office as soon as possible.

The meeting is to vote on changes to the Institute that have been designed to ensure we are in the best position to deliver on our vision of being the peak body providing the leading voice in Australia for professionals in the food industry, to develop and promote their contribution to a world-leading food industry.

To enable AIFST to realise this new vision, the Institute needs to change from the top down. AIFST needs to become a more business-like, professionally managed and responsive organisation serving an expanded membership base. We need to be able to make sound, strategic decisions in a timely way. We also must deliver more funding to ensure that the Institute has the resources required to deliver the vision.

The constitutional amendments we are asking you to vote on will support these changes. They include shifting from

an entity incorporated in NSW to a Company Limited by Guarantee under Commonwealth law. This change will better reflect the Institute's status as a national organisation.

We are also asking you to vote on the establishment of a skills-based board of directors to secure strategic leadership for the organisation now and into the future.

The other changes we are asking you to support are to establish clearer segregation of governance and management functions within the constitution to ensure accountability and transparency.

This is a turning point for the Institute and we encourage you to consider the materials closely. I want to assure you that Council has carefully considered the options to secure the future of AIFST and these recommendations have our full support.

We are keen for all members to vote by either attending their state's meeting on 21 October or by offering their proxy to someone who is attending. Proxy forms need to be submitted in advance, no later than 5pm on Friday 17 October 2014.





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# REVIEWING AFGC'S PRODUCT INFORMATION FORM

*Developed xx years ago to simplify the transfer of information and ease the burden of reporting on food companies, AFGC is reviewing the Product Information Form.*

Words by Geoffrey Annison

Nearly 15 years ago, Food Standards Australia New Zealand (FSANZ) introduced new safety standards requiring food businesses to use the principles of the Hazards and Critical Control Points (HACCP) system to produce safe, suitable food.

Through its emphasis on the identification and control of hazards in the production, manufacture and handling of food, the new approach has led to a greater focus on whole-of-chain food safety plans and the adoption of a paddock to plate approach.

Interestingly, this coincided with a rapid growth in global sourcing of raw materials, ingredients, additives and processing aids, substantially stressing the paddock to plate philosophy.

Clearly, when the paddock is half a globe away, and the supply chain stretches 12,000 km, possibly passing through several businesses and manufacturing processes, assuring the integrity of products becomes a considerable challenge.

HACCP principles and the "one step forward, one step back" approach – that is, each part of the supply chain taking responsibility for product in their care, and checking that suppliers and customers do the same – led to an increase in the information required by different parts of the supply chain.

Downstream companies demanded more information about inputs into their businesses to provide higher levels of



safety assurance, in addition to assuring other aspects of regulatory compliance, for instance labelling.

To assist the information transfer, companies developed their own product information forms usually as simple word processing or spreadsheet documents.

An unfortunate consequence was the advent of a plethora of different forms, all requiring similar information.

## **AFGC Develops PIF**

In response to this situation the Australian Food and Grocery Council

(AFGC) developed and released for general food industry use the Product Information Form (PIF).

A world first, the PIF represented an industry standardised way of transferring agreed information about food products from supplier to customer, leading to efficiencies for both parties.

Over the years, the PIF has been updated a number of times with most changes being incremental. With increasing complexity of the supply chain and greater expectations for traceability and integrity of the chain of custody of food products the capability

of the PIF in its current form has become stretched to the point that its usability is compromised.

### PIF's Future

Consequently, the AFGC is conducting an in-depth review to determine the future of the PIF.

An initial survey of users in late 2013 confirmed the PIF is still a valued tool used widely across the industry, notwithstanding the fact that some aspects of it do not work as well as they might. Opportunities have been identified for updating the PIF content, and its technology platform.

The review of the PIF commenced in August of this year. A PIF Content Review Working group drawn from AFGC member companies will review the PIF content to ensure the PIF serves the needs of industry into the future.

### Guiding Principles

From the AFGC's perspective guiding principles for the review are that the PIF should:


1. be accessible to all companies from SME's to large multinationals through requiring the minimum of investment and minimal ongoing costs to use;
2. be comprehensive in identifying core data requirements of businesses as well as being expandable to additional information needs;
3. be adaptable to advances in technologies and the future

- needs of the industry through providing additional information, data analysis and summary features; and
4. enable companies to share PIF data in a secure environment that protects IP while minimising the requirement for data manipulation.

One certainty about the future is that information needs of consumers and customers will continue to increase. Information about food provenance, production technologies, commercial arrangements (e.g. fair trade), environmental impact and many more food related issues will be routinely sought and expected by consumers.

Providing a single, common standardised way to manage and transfer such information is in the industry's interest. Not only will there be efficiency benefits, but also the integrity of the information will be secured.

If you have a view about the future of the PIF we would like to hear from you. Please drop an email to the dedicated PIF email inbox (PIF@afgc.org.au). This email is monitored daily and is available for queries about the PIF and feedback.

The AFGC is proud of its support for the PIF. It has been flagship project for the organisation providing real benefits for members and the wider industry. 

*Geoffrey Annison, PhD, is deputy chief executive and director of health nutrition and scientific affairs at the Australian Food and Grocery Council.*

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# MICROBIAL FOOD SAFETY ASSURANCE

*The 2014 Keith Farrer Award of Merit was awarded at this year's AIFST Convention to Dr Tom Ross for his outstanding contribution to food science. This article is based on his address.*

Words by Dr Tom Ross

Most people know the basic rules of food hygiene, don't they? We teach our children to wash their hands after going to the toilet, we know to keep left-overs in the fridge and to cook, or at least wash, raw foods because they might be contaminated with 'germs'. We cover foods, we avoid mixing cooked and raw and, if the food is old or we're not sure about how its been stored, we apply the old adage of "if in doubt, throw it out".

They're simple rules that reflect our awareness that invisible microbes might make us sick, to minimise contamination of food and limit growth of those organisms if contamination occurs, or to kill them before we eat the food. It's hardly rocket science, is it? And if these are simple rules that ordinary people apply, how much safer must it be when food professionals prepare and process foods?

## Foodborne disease is increasing

If it's that easy, then its hard to understand why – particularly given the enormous advances in biological science and technology over the last few decades – that there seems to have been no reduction in the incidence of microbial food-borne illness in decades.

ANZFA (1999) estimated that there were four to five million cases of microbial food-borne illness in Australia every year, or an average individual risk of foodborne illness of once every four to five years for all Australians. Since then the incidence rate has changed little.

National Notifiable Diseases Surveillance System data (NNDSS, 2014) shows that the incidence of

the foodborne illnesses such as Salmonellosis, Campylobacteriosis, Listeriosis and even typhoid have not fallen since 1999: if anything, *per capita* rates have increased slightly. The same situation seems to apply across the 'developed' world (CDC, 2013).

While some of that increase is due to better detection and surveillance systems, commentators (e.g., Altekruze and Swerdlow, 1996, Hall *et al.*, 2002, Nyachuba, 2010) point to a number of changes in the way food is provided to human populations, particularly the increasingly large proportion of people in 'first world' nations that live in urban areas and rely on the modern food industry. Our food comes from increasingly remote locations, and from increasingly large, centralised production and processing facilities, that bring increased challenges for the industry and potential risks for consumers.

## Food industry challenges

Our foods, at source, are not free from microorganisms. Irrespective of technological advances, foods are still produced in natural environments that can harbour pathogenic microbes. All common food animals have gut microbiota that can harbour pathogens. Cows udders can become infected and contaminate milk with pathogens like *Staphylococcus aureus* or *Listeria monocytogenes* that can cause human foodborne illness. Microbial hazards arise from a myriad sources, often without signs that contamination has occurred. The problem is compounded by expectations that fresh food is

inherently 'healthier', as well as by longer food supply chains that can extend across continents. Longer supply chains with more handlers, and reduced use and choices of food preservatives, increase the chance of contamination and for microbes to grow to hazardous levels before consumption.

Nonetheless, consumers expect that food should not harbour hazards, an expectation encouraged by law firms now actively specialising in compensation claims and class actions suits. There are also more people with increased susceptibility to infectious illness due to age, illness or therapies that reduces their immune function. Much higher standards of food hygiene are expected, and needed, but with fewer 'weapons' in the arsenal.

## Better testing technologies

'End product' testing is useful only for batches of product that contain a high proportion of defective units – that is, units that fail to meet relevant food safety criteria. If we assume that a *just* tolerable foodborne illness risk is one per 100 meals, to assure this incidence by testing we would need to be able to detect batches of product that have  $\geq 2$  contaminated units per 100.

We have the methods, particularly those involving enrichment and/or signal amplification (e.g. PCR), to detect a few microbes in a large volume (e.g., 25g) of food, but only if we know where to look. The problem is finding those one or two contaminated units among 100 with confidence. The probability of detection can be estimated using the binomial

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distribution equation,<sup>1</sup> that tells us how many samples are needed to be 95% certain that the batch as a whole has less than one in 100 unacceptable units.

The binomial distribution tells us we'd need to take 299 samples, and they'd all have to test negative! To be confident that the frequency of contaminated units was less than one in 10,000 (essentially the estimated *status quo*), however, we'd need to take nearly 30,000 samples and for all of them to be "clear".<sup>2</sup> Those sorts of sampling numbers are simply not feasible. So, what is the answer?

### Space: The final frontier

On May 25, 1961 then US President John F. Kennedy set a vision for his nation, 'to land a man on the moon and bring him back safely'. That vision effectively started the 'space race', but the race was not without drama.

The US space program had had many spectacular explosive failures, fortunately few of which resulted in loss of life. But the scientists realised there was a weakness in the way that the rockets were assembled and constructed. Through those failures it became clear that new techniques for assuring the quality of individual components and their final integration were needed.

Failure Mode, Effects, and Criticality Analysis (FMECA), first developed by the US Army in 1949, was applied to the Apollo program. It is a systematic process to identify components and processes that, if they fail, could lead to catastrophic outcomes, especially those that endangered the crew. That analysis focused attention on ensuring the absolute reliability of 'mission critical' components. It also became apparent that the astronauts themselves were mission critical components and that anything that affected their performance at critical moments (such as atmospheric re-entry, where an incorrect manoeuvre could lead to incineration of the spacecraft), were also critical components. Thus, the safety of the astronauts' food supply was also recognised as critical and led to the application of FMECA to food production, eventually spawning the Hazard Analysis Critical Control Points (HACCP) system. HACCP is now the most widely endorsed approach to food



safety management in the world. Like FMECA, the basic principle of HACCP is that by understanding where hazards arise in food processes and by putting in place procedures to prevent, control or remove them, those hazards can be controlled in the end product to ensure the safety of the food and to minimise reliance on "end product" testing. Indeed, before HACCP, quality assurance for space foods initially consumed most of the food prepared through testing.

Sooner or later, if you perform HACCP properly, you end up asking questions that need quantitative answers, like "how much control is needed" and "how can it be achieved"? For instance, what times, and temperatures, or product formulations are needed to control specific microbial hazards?

To answer those questions requires high-level expert knowledge because of the diversity of behaviour and environmental limits of different microbial hazards. While HACCP is founded on a logical system that allows for early detection and elimination of specific hazards, the correct application of the concept requires comprehensive expert knowledge.

The zenith of the US space program is the International Space Station (ISS), orbiting some 330 km above Earth. It is so large that it can easily be seen from

Earth when the sun has gone down, by reflection of sunlight or moonlight. NASA provides an email alert service that, for any location on Earth, advises when, where and for how long the ISS will become visible each night. Given the complexity of interactions of the ISS's orbit, and position of the sun and moon, that this information is accurately calculated for any point on Earth for any day of the year, seems incredible. At some levels, the universe is very predictable.

Despite the experience of many food scientists, food microbiology is also predictable. While not with the same confidence as the position and visibility of the ISS, the reproducibility of microbial behaviour in foods does offers great potential to food safety managers.

### Predictive microbiology

Bacteria and fungi can't think. They don't have free will. As such, they tend to behave reproducibly in response to their environment, which has led to the development of the discipline of *predictive food microbiology*.

The basic premise of predictive food microbiology is that the behaviour (growth potential, growth rate, inactivation) of microorganisms is *deterministic* and able to be predicted from:

- specific characteristics of the micro-organism itself



## Examples of Predictive Microbiology Software

Software	Description	Source
ComBase	A searchable database of quantified microbial responses to the food environment, including both pathogens and spoilage organisms, and including models	<a href="http://www.combase.cc">http://www.combase.cc</a>
Seafood Spoilage and Safety Predictor (SSSP)	predict growth of spoilage and pathogenic microorganisms in food, particularly those relevant to lightly preserved fish products; and including <i>L. monocytogenes</i> growth rate and potential	<a href="http://sssp.dtuqua.dk/">http://sssp.dtuqua.dk/</a> Mejlholm and Dalgaard (2009)
Refrigeration Index	predicts the growth of <i>E. coli</i> on meat from temperature, and pH, water activity and lactate concentration	<a href="http://www.foodsafetycentre.com.au/refrigerationindex.php">http://www.foodsafetycentre.com.au/refrigerationindex.php</a>
<i>E. coli</i> Inactivation in Fermented Meats	Estimates the effectiveness a fermented meat process for killing <i>E. coli</i> .	<a href="http://www.foodsafetycentre.com.au/fermenter.php">http://www.foodsafetycentre.com.au/fermenter.php</a>
Sym'Previous	a collection of tools for food safety calculations designed for food sector businesses	<a href="http://www.symprevious.net">http://www.symprevious.net</a>
Pathogen Modeling Program (PMP) on-line	a collection of tools for food safety calculations designed for food sector businesses	<a href="http://pmp.errc.ars.usda.gov/PMPOnline.aspx">http://pmp.errc.ars.usda.gov/PMPOnline.aspx</a>
Oyster Refrigeration Index	estimates the growth and survival of <i>V. parahaemolyticus</i> and total viable count (TVC) bacteria in Pacific oysters	<a href="http://www.explorerrisk.com/FSVibrio/Default.aspx">http://www.explorerrisk.com/FSVibrio/Default.aspx</a>
Unilever database/expert system	models and decision support for company experts to define windows-of-opportunity for safe product innovation	Membré and Lambert (2008)

- the immediate environment of the micro-organism (i.e., food composition and storage conditions)
- time the organism is in those conditions and – sometimes -
- the previous environment (because it affects lag time, and may affect resistance to inimical conditions).

In practice, the information is derived from systematic studies in research laboratories or gleaned and collated from the published scientific literature. The patterns of response are characterised and the data and patterns summarised as mathematical equations, called “predictive microbiology models”. In essence, these equations represent condensed quantitative knowledge of the microbial ecology of foods.

No matter how much a researcher knows, or how well that knowledge can be summarised in a mathematical

model, to be useful that knowledge still needs to be communicated and made accessible to people in the food industry in a form that they can use to improve food safety or shelf life. Accordingly, the equations are usually integrated into computer software that automates the calculations to enable quick predictions of microbial changes in foods over time.

Many of these models can be used for free. Examples are presented in Table 1. As an example of the depth of information ComBase, which is the most developed predictive microbiology application in the world, is based on around 50,000 determinations of microbial growth, or inactivation rate, or survival, relevant to foods.

Australia is an international leader in the use of predictive microbiology, having adopted the “Refrigeration Index” (RI), a predictive microbiology

model, into legislation. The RI evaluates the effects of temperature and time on the safety of red meat by converting that data into the potential growth of *E. coli*. The RI is enshrined in Australia’s Export Controls (Meat and Meat Products) Orders (1985). In consequence of the Garibaldi EHEC outbreak in Adelaide in 1995 another Australian model, which predicts the inactivation of enterohaemorrhagic *E. coli* in fermented meats, was developed and adopted by industry and regulators for evaluation of process safety.

Recently, Australia adopted Codex Alimentarius Commission (CAC) criteria for *L. monocytogenes* in foods. In those regulations for foods that do not support its growth, tolerance for *L. monocytogenes* is much higher ( $\leq 100$  CFU/g) than in products that do support growth ( $<1$ CFU/25g), greatly reducing the probability of product recalls and the burden of microbiological testing. The use of predictive models (e.g., such as in the SSSP software, see Table 1) to make this distinction, is specifically endorsed.

### Known & unknown unknowns

There are limits of application of predictive microbiology. Predictions about the number of bacteria in a specific food over time, and in given storage conditions, require that we know the initial number, and also how storage conditions fluctuate over time.

Low-cost data logging technology now exists that can wirelessly communicate details of product storage conditions over time. But other sources of variability might include differences between strains, and inhomogeneity in foods that might allow some cells to grow, while others of the same population cannot.

Worse still, under certain conditions, bacteria are genetically programmed to behave unpredictably and for multiple phenotypes, with very different physiology, to be present among a single population. Fortunately, this so-called ‘bet-hedging’ behaviour is based on quorum sensing and would only be expected to occur when cell densities are very high (Veening *et al.*, 2008).

For these reasons, many models take this variability into account and can provide predictions that include the probability of different responses occurring in different environments.

## Conclusions

Both theory and experience show that end-product testing isn't practical for food safety assurance, particularly for the low incidence of contamination that consumers expect.

The HACCP approach provides the most reliable means of food safety assurance, but for that approach to be practical it's necessary to prioritise among potential hazards and understand how to control them: from among the myriad potential hazards we need to identify those that represent the greatest risks. We need to understand their individual behaviour and environmental limits to design foods and processes that limit their growth or inactivate them, while minimising affects on product quality.

This challenge requires expert knowledge of the physiology of individual microbial hazards, which is increasingly being made available through the development of predictive microbiology mathematical models and software.

While basic principles of food safety aren't rocket science, the complexities of the modern food industry mean that food safety managers can gain much from lessons learnt and technologies developed in the space program.

The HACCP concept had its genesis



in the USA space program. The modelling approaches and software now being used to optimise food safety management rely on high level mathematics to develop tools and strategies to best satisfy consumer expectations of minimally processed foods with maximum levels of safety. 📌

## Notes

1. To be strictly correct, we should use another, related, equation called the 'hypergeometric distribution', but for almost all practical purposes the binomial distribution gives the same result.
2. Reliable on-line tools that can perform these calculations to design or assess the reliability of sampling plans can be found at: [http://www.icmsf.org/main/software\\_downloads.html](http://www.icmsf.org/main/software_downloads.html), or <http://www.fstools.org/samplingmodel/>
3. see <http://spotthestation.nasa.gov>

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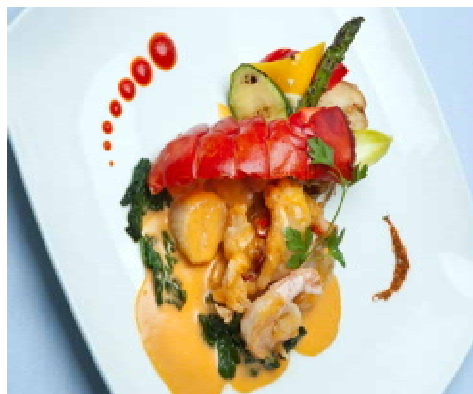
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## WHEN DAVID MET POLLY

*Sustainable food production's future lies both in the field and the lab. For more than 50 years, Australian scientists David and Polly MacLennan have been leading the way.*

When David MacLennan met Mary De zouche Hall, otherwise known as Polly, the sum was greater than their two parts.

The year was 1961, Robert Menzies was Prime Minister, the oral contraceptive pill went on the market, and the international space program was in full swing. David was a 25-year-old biochemist fresh out of university in Sydney, and excited to start his first job in the research department of renowned biopharmaceutical company, Commonwealth Serum Laboratories in Melbourne.

Polly was a 25-year old English girl who said goodbye to her family, after completing university in Reading, and moved to Melbourne to take up work as a scientist at Commonwealth Serum Laboratories. She hadn't been there long when the new recruits, among them David, arrived in the labs from Sydney.

"I had been warned about these guys who were coming down from Sydney, particularly not to believe a word they said," laughs Polly, now 78.

But there was something about David. As the two worked together, a respect for one another developed, and with that, the realisation they made a pretty good team.

"I courted Polly in the laboratory," laughs David.

"She taught me large areas of microbiology which I didn't know, and I taught her quite a lot of micro physiology which she didn't know. We found we worked very well together, so we got married and then moved to England."

And just like that, the brains that would help transform the food industry's approach to sustainable food



production were united. More than 50 years later, the pair is responsible for more than 25 patents and publications, has founded nine research and development companies across Australia, and now, both well into their seventies, continue to work in the lab for their 29-year-old food innovation venture, Agritechnology.

The pair put their entrepreneurial spirit and passionate pursuit of innovative food solutions down to their time in England, where David worked as a biochemist for Imperial Chemical Industries (ICI) Agricultural Division. There he led the research into developing a single cell protein process to produce feed protein from natural gas and methanol for feedstock. The project led to his first patent on the process of producing the feed-grade protein concentrate from methanol.

"It was at a time when there was a perceived world shortage of protein, and there had been a discovery of

natural gas in the North Sea. ICI was working on how we could come up with a solution by converting the natural gas into food and feed," said David.

"It was an unbelievable project to be a part of but more than anything, it taught me to look for advantages. And that persists with Pol and I through to today. We look around at Australia and think 'what are the advantages?' Agricultural produce, grains, starch, farming, food production, low cost protein – there are many opportunities here.

"And that's how we got into the food industry - by producing bacterial protein for food."

In 1972, David and Polly returned to Sydney where David worked as a Senior Lecturer in chemical engineering at the University of Sydney and Polly worked as a researcher while also looking after the pair's growing family. Five years later, they founded



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Biotechnology Australia, the country's first, and for 20 years its largest, private sector biotechnology company.

"We employed the research Pol and I had been into protein production and partnered with a major oil company, a major mining company and a well known brewer to design, build and operate a commercial continuous fermentation plant which exported product to the United States and Japan," said David.

The company gained significant funding for its work in fermentation, and as success grew, moved into the genetic engineering sphere. However, for David and Polly, food science is where their passion lay.

While Biotechnology Australia was taking off, Polly spent years behind the scenes as R&D Manager at Techno-Proteins, another MacLennan enterprise that developed solid-state fermentation technology for producing high quality textured meat alternatives from grains and other starch-based raw materials.

"We gained a worldwide patent for that technology over 30 years ago. We

developed a meat-like substance by growing and treating the hyphae of mushrooms to mimic the fibrous texture of meat," said Polly.

"We had developed it to a point where it was a beautiful piece of technology, and we had vegetarians tell us that they preferred it to many other meat substitutes, but the public wasn't ready for it then. Back then putting fungus on a food label would send people running to the lavatory. Now is probably the right time to launch that product."

Through simple trial and error, David and Polly learnt that timing is everything when it comes to successful business.

"We've had brilliant ideas which were a disaster at the time yet 20 years later they're spot on because the wider community is ready for it. You want to be just far enough ahead of the research so that you're in a position to gauge the public's readiness. And you need to always be looking for where the opportunities are," said David.

With their passion for food innovation always bubbling, the pair launched

Agritechnology in 1985, a company designed to research, develop and commercialise novel technology and products in the agricultural high tech field. Based in Orange in New South Wales' central west, Agritechnology has undertaken extensive research into improving aquaculture farming, continued the MacLennan's work in fermentation by producing a reduced alcohol wine, developed fruit nutraceutical technology and is working to modify the traditional fuel ethanol process to enable co-production of food grade products.

Now almost 30 years on, David and Polly believe Agritechnology's greatest achievement has been to survive as large corporate investment into research companies declines. They say now more than ever, patenting is a crucial tool for research companies to be able to work with large corporations, who are now searching for ready-to-use innovative improvements and solutions for their food production, environmental impact, and bottom lines.

## AGRITECHNOLOGY'S ACHIEVEMENTS

### *Sydney Rock Oysters*

David and Polly developed new technology for Sydney Rock Oyster production, which included laboratory scale algal feed production systems and a special warm water culture hatchery using waste heat from a power station. And later expanded to include Pacific oysters.

### *Australian Native Fish*

Agritechnology took a major role in building ANF, a Silver perch farm in Northern NSW. The role included the design and build of the largest warm water fish farm at the time, complete with designing, trialing and manufacturing the ideal diets and feed for the fish.

### *Reduced alcohol wine*

David and Polly used fermentation technology to develop a wine that is less alcoholic but still has the taste, aroma and body of regular wine. This project has taken considerable time and investigated a number of different approaches to solving the fundamental problem with low alcohol wine, which is lack of body.

### *Cherries*

Building on cherries' high levels of anthocyanins and low glycemic index properties, Agritechnology sought to find value in the waste stream of second grade cherries by converting the waste into food and extracting valuable nutraceutical compounds through a controlled enzymatic process to develop shelf stable juice or homogenate. This process created a product with a high yield, well-defined organoleptic texture and flavour properties, and most importantly, the end product retained a high level of anthocyanins.

### *Agritechnology today*

The company founded by David and Polly and in which they still have a significant role, offers a range of R&D services from technologies developed internally, to proving solutions for customers and joint ventures to develop and commercialise new products and technologies both locally and with international partners. The team focuses on scaling up technology to create industry ready packages, often including test production, quality assurance, regulatory and marketing.

"Big companies want a patent, and not only do they want a patent, they want something they can sell straight away," said Polly.

"Small research companies really have to judge very carefully the paths it goes down because you can easily spend hundreds of thousands of dollars experimenting for a project to then not work or be too new and not accepted by the wider community. So it can be tricky," she said.

"But we're in a fortunate position now that David and I can work in the labs away from the main business and test out different opportunities without disrupting the general timetable of operation of the company."

With their son Donald now calling the shots as Agritechnology's Managing Director, David and Polly work everyday at their home on New South Wales' Central Coast, in their specially built in-house laboratory both for Agritechnology and themselves.

"We're both work fanatics," says David.

"We just like working in the lab and we still spend a lot of time there growing things. It's our main relaxation. Even now, we're working on growing algae feeds to supply the aquaculture market. It always comes back to looking for ways of growing and doing things more efficiently in today's world effected by carbon emissions, environmental impacts, and low investment levels in R&D."

It is this special combination of the pair's scientific talents together with David's opportunistic entrepreneurial spirit and Polly's tireless microbiological research and knowledge of domestic and international patenting requirements, that has made their ventures like Biotechnology Australia and Agritechnology successes. And although there have been failed projects along the way, the pair agree that scientific curiosity and experimentation must continue if Australia is serious about increasing its capacity for innovative, sustainable food production.

"Back when we were working for ICI in England, it was quite something to be working on a project that was providing food for millions of hungry people. The same pride in scientific research needs to here in Australia, where there is so much potential," said David.

"We need scientists in policy making positions and to continually have science on the agenda because it feeds almost every area of our economy. Science must always be at the very highest level."



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# COLLABORATING TO COMPETE

*Building a collaborative business model, which integrates skills and capabilities in ways that are difficult for competitors to replicate, can deliver competitive advantage.*

Words by Peter Carney



When it comes to the supply chain, the notion of collaborating seems a natural way of operating. Supply chain managers have for many years been synchronising supply with demand along the supply chain between supplier and customers. Technology is making this easier, as it is possible to propagate demand signals to suppliers almost instantaneously.

More broadly however, companies have been poor collaborators. They have tended to act as distinct entities, and be measured on their discrete activities.

To act more collaboratively is an area of opportunity. It requires companies to conceive of themselves as managers of skills and capabilities, some of which they hold in-house and some of which they source from elsewhere.

Collaborating companies create

value when they add value to the web of suppliers and customers in which they operate. And companies that create value for their customers tend to stay in business.

In the logistics world, a collaborative model might therefore see businesses combining their freight tasks to achieve higher than individually possible utilisation of assets, such as warehouses and trucks. They could achieve this by exploiting a backhaul opportunity or a cyclical opportunity, where one company may require the assets for the winter and another for the summer.

It is perhaps easier to conceive such a collaboration occurring for regionally located businesses, where critical mass might be difficult to achieve.

Along the supply chain, the most common form of collaboration has

been in action for years – the sharing of order books and forecasts. This could be characterised as essentially transactional.

A more powerful model of collaboration, however, is more than transactional. Companies have knowledge, personnel, relationships, systems, facilities, suppliers, competitors and customers. How valued would the company be that can support its customers by providing knowledge, systems and facilities and services; or the one that can support a web of related businesses along a supply chain? And in turn, how efficient, effective and profitable might such a company be?

Good examples of elaborate collaboration are evident in food cooperatives, such as New Zealand's Fonterra and Australia's Murray

Goulburn, where farmers collaborate in marketing, milk production and milk product distribution.

The New Zealand fruit industry has several companies that are mutually supportive, including collaboratively conducting research and marketing, as well as jointly use pack-houses and distribution networks.

Two organisations that demonstrate this level of cooperation are Zespri, a corporatised cooperative with origins in a single desk system established by the New Zealand Government and The New Zealand Avocado Company Ltd, which exports avocados under the AVOCO trademark.

Zespri had sales revenues of NZD 1.6 billion and it uses an integrated production and distribution system, which is supported by all growers, and is underpinned by a history and practice of planning, scientific and technical research and practical developments.

The New Zealand Avocado Company Ltd, which exports avocados under the AVOCO trademark, resulted from the coming together of the two biggest avocado exporters in New Zealand, Southern Produce Ltd, and Primor Produce Ltd. AVOCO recorded sales of

NZD 130 million in the season ended 30 April 2014.

A reason for success in New Zealand is the realisation that an individual organisation does not have all the skills, knowledge and resources it might need to be successful. In today's complex world companies need a range of skills and it is unlikely a single organisation can hold them all.

The challenge for managers is to select the skills and capabilities they need to create sustained competitive advantage. They can achieve some of this with intuition, and some using mathematical modeling to determine where they might find efficiencies, both internally and among the web of customers and suppliers in which they operate.

According to Harvard University's Professor Michael Porter, to be sustainably successful, the nature of the collaboration between companies should be unique in that it provides access to sets of skills and capabilities that are difficult for competitors to replicate.

In contrast, the non-collaborative model, where organisations with market power may draw more value from the supply chain than they add to it, may stifle growth. While there may be short-term gain, the risk of slower industry or

supply chain growth over the long-term is likely to translate to suboptimal profit for the companies concerned.

Technology is driving changes in company and market structures. It is potentially redefining what occurs within a company's walls and is potentially making those walls more porous. In this environment, a nuanced approach to competition and collaboration is highly desirable and may be a more sure way to create sustainable competitive advantage. ☉

*Peter Carney is global the leader of supply chain advisory and analytics at Aurecon, an engineering, management and specialist technical services firm for government and private sector clients globally. Peter holds BSc (Hons) and MBA degrees from the University of Melbourne, and has over 25 years of experience in working with and advising Australia's largest corporates in mining and manufacturing on matters of marketing, strategy, business development and supply chain improvement.*



## Trade Director Technical Market Access

• Red meat processing industry • Sydney

The **Australian Meat Processor Corporation (AMPC)** is a national Research & Development Corporation for the red meat processing industry with a mandate to improve the sustainability and efficiency of the sector. New strategic initiatives have led to the establishment of a market-led Technical Market Access Program to develop and implement strategies and tactics which effectively maintain and improve technical market access for Australian beef and sheep meat. Through the implementation of the Market Access Program, the industry seeks to capitalise on an evolving business environment and opportunities for innovation, to resolve selected technical barriers to trade, with the initial priorities being in China and the Middle East.

The new position of Trade Director – Technical Market Access is now available to lead and direct coordinated technical market access activities to achieve results in line with the red meat industry's export development agenda. As Trade Director you will

- develop and maintain strong working relationships, negotiating and consulting with the Australian government, red meat industry organisations and red meat exporters
- work with all stakeholders to develop a unified approach to resolve technical barriers
- work with processing sector leaders to re-orient technical market access investments and capabilities to measurably increase impact, value for money and accountability
- provide relevant and accurate reporting and advice
- develop a long term strategy for pursuing technical market access for the red meat processing industry

This role requires a sound understanding of the political landscape and how to effectively work with policy-makers and government agencies, along with strong commercial awareness. The ability to strategically manage relationships across multiple stakeholders and drive collaboration and cooperation between parties (sometimes with competing interests) is essential. While experience in the international meat industry and agrifood R&D is ideal, candidates who can demonstrate success in international market access in similar industries are also encouraged to apply.

This role represents a terrific career opportunity and an attractive remuneration package. To enquire, please phone Sharon Moloney on 07 3878 3411 or Dave Compton on 02 9006 1214. Applications via [www.rimfireresources.com.au](http://www.rimfireresources.com.au)



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# INSIGHTS TO HELP AUSTRALIAN COMPANIES MEET ASIAN DEMAND

*Reporting on recent inbound Asian trade missions, Najib Lawand shares key insights on what different regions around Asia are looking for in their partnerships with Australian businesses.*

Words by Najib Lawand

Asian interest in Australian food and beverage products is at an all-time high and there is significant opportunity for local manufacturers to leverage the demand for premium Western-style products that are healthy and safe.

Key advantages for the Australian market are our renowned reputation for quality, safety and traceability, as well as our proximity to Asia, which means longer in-market shelf life. Combining these advantages with the push in Asian markets to provide imported ranges beyond European and USA products, the opportunity for Australian exporters has never been better.

In order to support the Australian industry to increase exports to Asia, Food Innovation Australia Limited (FIAL) recently undertook an inbound trade mission to gather intelligence.

## Diversifying supply

At the moment, the vast majority of imported western processed foods and beverages come from USA and Europe, but other Asian market imports are also growing, particularly products manufactured in Japan, Korea, Thailand and Malaysia.

Buyers are looking for products that have both a strong marketable story and unique attributes. While price is not the main factor for high-end supermarkets, it is still plays a part in the decision-making process so needs to be taken into consideration.



That said, buyers are not open to all new suppliers. They are seeking businesses that can show they: are reliable suppliers of consistently high quality products; take a strategic and long term view to their markets; are prepared to support buyers with promotional activity; and don't have minimum quantities for initial orders, to enable new buyers to test the product before committing to larger volumes.

Categories of interest include cereals, biscuits, condiments, baby foods, health products and organic

products, but the highest demand category is Australian dairy.

## Direct relationships

Another key insight is that supermarket retailers are looking for ways to improve the on-shelf price. This means they are increasingly looking to import product directly where possible. Along with this, buyers are keen to build relationships with the brand owners, even if product is supplied to market via distributors or consolidators, to identify new opportunities and increase product offtake.

## Whole country approach

Asian markets are looking for a ‘whole country’ approach to supporting the importation of new products into these markets, instead of being ‘region-led’ or ‘state-led’, which is where FIAL can play an important role.

Government agencies in New Zealand, Europe, North and South America as well as Asia are very active in promoting their countries’ products, but unfortunately Australia has a recent history of state agencies promoting the state, rather than Australia as a whole, which has minimal impact on overseas consumers.

We also know that country support through promotions helps move product off the shelf, and is therefore increasingly important.

While the market understands that Australia is a producer of quality beef, dairy, wine, seafood and fresh produce, it would be beneficial to communicate to Asian markets that Australia is also a diverse producer of high quality processed goods, where provenance is paramount due to products being produced from our home grown, fresh produce.

## Individual market insights

Along with overall market insights, our mission was very successful in identifying specific country-based insights. The table (right) provides a snapshot of important facts relevant to businesses looking to export to the most popular Asian markets.

Currently, the three countries that are easiest to do business with are Singapore, Hong Kong and United Arab Emirates, although their markets are highly competitive. All three markets import almost everything they sell, and they have high expat communities while also being travel and tourism hubs.

On the other hand, the most challenging markets are Japan, Korea and Indonesia, with product registration processes being exceptionally difficult and time-consuming. But for those who have the patience to see the process through, and who also have the right product, the sheer volume of the market makes the effort worthwhile. 🍷

Country	Key high-end supermarkets	Interesting insights
<b>Indonesia</b>	Hero Supermarkets Ranchmart Food Hall	Supermarkets do not import direct but still want relationships with suppliers. They often have key importers that they will work with. The long registration process presents an opportunity as many suppliers avoid Indonesia for this reason.
<b>Singapore</b>	Cold Storage (including Jasons and Marketplace) NTUC Fairprice (including Finest)	Imports represent 95% of products listed in Cold Storage. Cost of retailing is high in Singapore (land and labour costs) and therefore supermarket margins are high. Retailers can be demanding with regard to listing fees and promotional rebates.
<b>Malaysia</b>	Cold Storage Malaysia Village Grocer Jaya Grocer	The proportion of imported product to local product is approximately 30:70 for high-end stores. Masterchef Australia is one of the most popular television shows in Malaysia
<b>Thailand</b>	Central Food Retail: Food Central TOPS Villa Market Foodland	The Thai economy is resilient, despite political instability. High-end supermarket retailers have experienced an average 15% growth year-on-year. Central Food Retail was voted Best Asian Food Retailer last year.
<b>Hong Kong</b>	ParknShop Wellcome City Super	Australian products represent 4% of sales at ParknShop, with wine the largest proportion, followed by meat and then dairy products. The Food Service sector is significant in Hong Kong, with over 10,000 licensed premises in a very densely populated area. Multipliers are high in Hong Kong, varying from x2.5 to x3.0.
<b>China</b>	Ole Supermarkets City Shop Jenny Lou’s April Gourmet  All of these chains are embarking on significant expansion	Promotions are largely focused around Chinese festivals and seasons. Online retail is growing rapidly: Yihaodian has grown from CNY2m in turnover to CNY10.2b in five years and has 1,127 Australian SKU’s listed. Online prices are approximately 10% cheaper than supermarket pricing. Customer profile is 60% females from white collar backgrounds. Orders received from hand-held devices are fast becoming the preferred method.
<b>Korea</b>	Lotte Shinsagae Emart	Direct imports by supermarkets is small but growing. FTA may open new opportunities: Tariffs on Australian products range currently from 8% to 50%. In-store sampling is extensively used
<b>Japan</b>	Seijo Ishii Kaldi Coffee Meidi-ya AEON Supermarkets	Small packaging is the key: (I) Supermarket outlets shelf space is limited (II) Kitchen pantries and fridges are small (III) Consumers travel predominantly by public transport and therefore cannot carry heavy loads FTA will potential open some opportunities

*Najib Lawand is general manager market development at Food Innovation Australia Limited (FIAL), an industry-led, government-funded initiative that aims to accelerate innovation within Australia’s*

*food, beverage and agribusiness sector by providing information, tools connections in a new culture of collaboration.*



## Makis Galanos

*Dr Makis Galanos is an expert in food safety assessment and currently holds the position of managing lead assessor at Lloyd's Register's Quality Assurance (LRQA) Australasia. He has over 18 years' experience in the certification industry and is currently the company's product specialist in relation to food schemes and standards.*

*Dr Galanos holds a degree in Agriculture and Food Science and Technology from the University of Athens and a PhD in Chemical Engineering from the University of Birmingham.*

### **Q** What changes have you seen in the way that food safety is viewed by key stakeholders in Australia over the past ten years?

**A** There have been many changes in the past ten years. One of the major ones has been the improved level of standardisation and harmonisation within food safety. Ten years ago there were countless food safety standards and all kinds of different certification schemes, certification products, audits and a lot of duplication of these audits in the food supply chain. Some food manufacturers were audited three, four, five times on the same topics. Since then, food safety has become more standardised through the work of the Global Food Safety Initiative (GFSI) and International Organisation for Standardisation (ISO), which publishes ISO 22000.

In Australia the industry has moved from a checklist type of auditing to more of a management system approach, which endeavours to ensure that when things go wrong there is a system in place to (a) ensure that the right actions are taken, (b) that the organisation learns from these mistakes and (c) they look to prevent them from happening in the future.

### **Q** How are food manufacturers influencing their supply chains?

**A** Certified food manufacturers are increasingly cascading the value of certification into their supply chains. As an example, big manufacturers of beverages that use a lot of packaging materials like bottles, glass or PET, are now asking their suppliers to have their management system and third party certifications in place.

### **Q** LRQA has been quoted saying that food safety is not competitive. What does this mean?

**A** When you look at food safety it can be perceived non-competitive because a food safety crisis involves and impacts all stakeholders in the food supply chain. You can

see it with the horsemeat crisis in the UK and the peanut butter salmonella contamination in the US. A crisis also involves competitors because when there is a problem with a specific product - even if caused by one manufacturer - you see an impact on other providers in the market. Given this, manufacturers and retailers have a significant interest in avoiding food scares and food crisis. In response to this they will look to collaborate on key issues that may affect their business performance.

### **Q** Can food safety certification support all suppliers of all sizes?

**A** There can be a perception that food safety certification is too difficult and of limited value for small suppliers. I do not agree. I think that food safety and its certification is important to businesses of all sizes. From the consumer's perspective and experience, food is either considered safe or not safe. The minimum level of food safety has to be the same around the globe and for suppliers of all sizes. I think the opportunity is now smaller suppliers are supported. We have to provide them with training and guidance so these businesses can create a system that fits their purpose and activities.

### **Q** What does auditor calibration mean and why is it important to help drive food safety across global supply chains?

**A** The calibration or alignment of auditors is very important. With only small number of recognised certification schemes under the Global Food Safety Initiative (GFSI), we have an unknown number of certification bodies around the world delivering audits against these schemes. Globally, the minimum requirements of the auditors have to be the same, and the outputs of the audits have to tell the same story. In order for retailers and global food manufacturers to have confidence in the certificates, they have to trust the certification process. 🌐





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# BREAKFAST CEREALS AND HEALTH

*A systematic literature review published in Advances in Nutrition examines the scientific evidence relating to the role of breakfast cereal in health.*

Words by Professor Peter Williams

Breakfast cereals play an important role in the diet of Australians. According to the most recent release of the Australian Health Survey,<sup>1</sup> around 43 per cent of Australians ate breakfast cereal, including ready-to-eat cereal (RTEC) and hot porridge, on the day of the survey.

Understanding the impact this important category has on health outcomes was the primary objective of this research review. Published in international review journal *Advances in Nutrition* in September 2014, *The Benefits of Breakfast Cereal Consumption: A Systematic Review of the Evidence Base* examines published research on breakfast cereals over the last 30 years (to October 2013).<sup>2</sup> It examines the evidence related to the role of breakfast cereals in nutrient intake, weight, diabetes, cardiovascular disease, hypertension, digestive health, dental and mental health, and cognition.

Using the methodology and format recommended by the National Health and Medical Research Council (NHMRC),<sup>3</sup> the review established 21 evidence statements ranked from A to D, where Grade A evidence is to be trusted to guide clinical practice, Grade B is to be trusted to guide practice in most situations, Grade C provides some support but care should be taken in its application, and Grade D is suggestive, where the body of evidence is weak and the statement should be applied with caution.

By way of context, the evidence base for the Australian Dietary Guidelines uses primarily Grade B and C evidence.

## Breakfast cereals and healthy diets

The evidence for the role that breakfast cereals can play in delivering healthy diets is strong, with breakfast cereal eaters being more likely to meet daily nutrient requirements than non-eaters. In terms of the evidence base, there have been three major reviews, 11 intervention studies and 51 cross-sectional studies.

The research shows that children and adolescents who eat breakfast cereal regularly:

- Are less likely to have vitamin and mineral intakes below the recommended daily requirements, especially for calcium;
- Have better diets overall, measured by the Healthy Eating Index score;
- Have lower daily cholesterol intakes; and
- Have better nutritional status (assessed by blood measures), especially vitamins thiamin, riboflavin, pyridoxine and iron.



When it comes to adults, those who consume breakfast cereals regularly have daily diets that are:

- No different in total energy intake, sodium or energy from protein;
- Higher in energy from carbohydrate, total sugars, dietary fibre, vitamins A and D, thiamin, riboflavin, niacin, pyridoxine, folate, calcium, iron, magnesium and zinc;
- Lower in energy from fat (3-4%);
- Are less likely to have vitamin and mineral intakes below the recommended daily requirements, especially for thiamin, riboflavin, niacin, folate, vitamin C, calcium, magnesium, iron, zinc and fibre;
- Have better diets overall, measured by the Healthy Eating Index score; and
- Have better nutritional status (assessed by blood measures), especially vitamins thiamin, riboflavin, folate.

The research also demonstrates the benefits of a breakfast cereal meal pattern, including that:

- Eating breakfast cereal facilitates greater milk consumption in children and in adults;
- Those who eat breakfast cereal regularly have higher wholegrain consumption per day, both in children and in adults; and
- Children and adults eating RTEC also eat a greater range of different foods at breakfast meals.

Because almost all of the studies are with RTEC, many of the micronutrient differences are related to the fortification profile, but the increased milk intake would contribute significantly to the higher daily calcium and riboflavin intakes.

### Impact of pre-sweetened cereals

One of the areas the review also considered was the impact that the consumption of pre-sweetened and minimally pre-sweetened breakfast cereals had on the overall added sugars intakes in children.

Analysis of data from the 2007 Australian National Children’s Survey, compared the intakes of children aged two to 16 years who consumed pre-sweetened breakfast cereals with 15 per cent or more total sugars to children who consumed minimally pre-sweetened breakfast cereals. It showed that total daily energy and nutrient intakes were not significantly different, including intake of total sugars.

Another analysis of the same data showed that RTECs contributed just seven per cent of the total sugars consumed over the whole day and a recent study of 312 Australian breakfast cereals showed that there was no relationship between the total sugars content and the energy density of breakfast cereals, both ready-to-eat and other breakfast types.

SUMMARY EVIDENCE STATEMENT	GRADE
Regular consumption of breakfast cereals is associated with diets that are higher in vitamins and minerals for adults, adolescents and children	B
Regular consumption of breakfast cereals is associated with diets that are lower in fat	B
Regular consumption of breakfast cereals is associated with a greater likelihood of meeting recommended nutrient intakes	C
Consumption of breakfast cereals is associated with higher daily milk intake	C
Consumption of pre-sweetened breakfast cereals does not increase the total daily energy intake in children’s diets	C
Consumption of pre-sweetened breakfast cereals does not increase total daily sugar intake in children and adolescents	C
Consumption of breakfast cereals does not increase the total daily sodium intake	C

### Weight gain, overweight and obesity

The impact of breakfast cereal consumption on weight was assessed by reviewing a meta-analysis of 14 studies in 33,205 children and adolescents, three other systematic reviews and 16 intervention studies. The evidence shows that regularly eating breakfast cereal is associated with a lower body mass index (BMI) compared breakfast skippers or other breakfast consumers.

Perhaps the best evidence for a preventive effect of breakfast cereal on weight gain comes from the single cohort study that has examined this – the Physicians’ Health Study – which found those who consumed at least one serve of

breakfast cereal per day were 12 per cent less likely to become overweight during 13 years of follow-up.

In its consideration of pre-sweetened breakfast cereals, the review considered whether they had any impact on the weight status of children. It found no difference in the risk of overweight or obesity whether children consume pre-sweetened breakfast cereals or other breakfast cereals.

In terms of mechanisms, it is possible that a breakfast including breakfast cereal, especially one that is higher in fibre, may provide better satiety and reduce self-assessed hunger (the research suggests by up to 76 per cent) thereby preventing overconsumption later in the day. Another possible mechanism could be that breakfast cereal consumption increases energy expenditure via better insulin sensitivity in the morning, but this is unlikely to be a food specific effect.

Alternatively, breakfast cereal consumption may simply be a marker for an overall healthy lifestyle and merely indicate eating and physical activity patterns that are more favourable overall for weight maintenance.

SUMMARY EVIDENCE STATEMENT	GRADE
Regular consumption of breakfast cereal is associated with a lower BMI and a reduced risk of being overweight or obese in adults and children	B
Consumption of breakfast cereals as a meal or snack replacement can assist in weight loss in adults	B
Consumption of presweetened breakfast cereal does not increase the risk of being overweight or obese in children	C
Consumption of high-fibre breakfast cereals improves satiety and reduces hunger after a meal	C

### Diabetes, glucose intolerance and metabolic syndrome

The review found that eating wholegrain and high-fibre bran-based breakfast cereal everyday is associated with a 27 per cent reduced risk of developing type II diabetes by 24 per cent. It also found that high-fibre breakfast cereals – particularly those high in soluble fibre – may help to manage blood glucose, with research showing plasma glucose is 21-67 per cent lower in people who have eaten a high-fibre cereal for breakfast.

The evidence-base for a role for breakfast cereal in diabetes, glucose intolerance and metabolic syndrome is determined from a meta-analysis of 16 cohort studies, along with two additional cohort studies, three cross-sectional studies and 11 intervention trials.

Several intervention trials have reported improved glucose or insulin responses with oat, barley or psyllium-based cereal or muesli breakfasts compared to other breakfast cereals in diabetic subjects, and the effect was also seen in some studies with normal subjects consuming cereals with beta-glucan.

In normoglycemic subjects, higher fibre breakfast cereals seemed to reduce postprandial plasma glucose responses but



two studies found no difference between oat- and wheat-based breakfast cereals in this regard.

SUMMARY EVIDENCE STATEMENT	GRADE
Regular consumption of wholegrain and high-fibre breakfast cereals is associated with a reduced risk of diabetes	B
Consumption of high-fibre breakfast cereals, especially those high in soluble fibre, may assist in the management of hyperglycemia in people with diabetes	C
Regular consumption of breakfast cereals is associated with a reduced risk of diabetes	D

### Cardiovascular disease

The review found that regularly eating wholegrain and high-fibre bran-based breakfast cereal is associated with a 20 to 28 per cent reduced risk of death from cardiovascular disease and that the consumption of oat, barley or psyllium-based breakfast cereals can help lower total and LDL cholesterol by up to 0.3mmol/L (about five per cent).

The evidence-base for the role of breakfast cereal in reducing cardiovascular disease risk considers five meta-analyses on wholegrain foods, two additional meta-analyses on the effect of dietary fibre and blood cholesterol, a Cochrane review of wholegrains and heart disease, and meta-analyses reporting significant cholesterol-lowering effects of barley and psyllium-enriched cereals.

There are also eight other systematic literature reviews, which have all reported a finding of reduced risk of coronary heart disease with oat, barley or psyllium consumption, ranging from 19-30 per cent reductions in cholesterol levels with the highest intakes of three or more servings per day.

There have also been four cohort studies, one case-control study, several intervention trials, which have measured short-term effects on blood lipids or blood pressure, and three RCTs with oat-based breakfast cereals, which have confirmed their cholesterol lowering effects.

The evidence base for hypertension is limited to three RCTs, one cohort and two cross-sectional studies. The Physicians' Health Study found a 19 per cent reduction in hypertension risk with daily breakfast cereal consumption, with a stronger relationship found for wholegrain compared to refined grain cereals. The two cross-sectional studies analysed data from the NHANES national US surveys and found that consumption of ready-to-eat breakfast cereal is associated with a 36 per cent reduction in hypertension risk. Results from the RCTs are less consistent and limited to hypotensive subjects. As a result of the limited evidence base the findings are at best suggestive that breakfast cereal may reduce risk of hypertension and this has been reflected in the evidence statements.

SUMMARY EVIDENCE STATEMENT	GRADE
Regular consumption of oat, barley- or psyllium-based breakfast cereals can help lower total and LDL cholesterol levels	A
Regular consumption of wholegrain breakfast cereals is associated with a lower risk of cardiovascular disease	C
Regular consumption of breakfast cereals is not associated with an increased risk of hypertension	C
Regular consumption of breakfast cereals is associated with lower total and LDL cholesterol levels	D
Regular consumption of breakfast cereals may reduce the risk of hypertension	D

### Digestive and bowel health

The effect of dietary fibre on stool weight has been estimated in a meta-analysis of over 100 studies. Breakfast cereals provide eight to 12 per cent of the dietary fibre in adult diets in the USA, Britain and Australia and therefore have an important role in supporting healthy laxation, but clearly this varies depending on the type of breakfast cereal and its fibre content. The review suggests that eating high-fibre, wheat-based breakfast cereals helps to prevent constipation and improves bowel function, increasing regularity by at least 25 per cent.

Four randomised trials and one cross-sectional study have directly examined the association of breakfast cereal consumption with digestive problems and consistently found that breakfast cereals can improve constipation, decrease stool hardness and improve digestion.

In addition, several studies have shown that adding dietary fibre, via bran or other means, to breakfast cereals in institutional settings such as nursing homes can alleviate problems of constipation.

SUMMARY EVIDENCE STATEMENT	GRADE
Consumption of high-fibre wheat-based breakfast cereals helps prevent constipation and improves bowel function	A

### Dental health

Three published studies have examined the relationship between breakfast cereal consumption and dental health in children and adolescents. All three studies showed no relationship between breakfast cereal consumption, although interestingly all showed lower (but non significant) caries incidence among cereal consumers. This might be related to the known role of breakfast cereal consumption in promoting high milk intakes.

SUMMARY EVIDENCE STATEMENT	GRADE
Consumption of breakfast cereals by children is not associated with increased risk of dental caries	B

### Summary

*The Benefits of Breakfast Cereal Consumption: A Systematic Review of the EvidenceBase* demonstrates breakfast cereal eaters are more likely to have a healthier diet and to weigh less, and are less likely to suffer from certain diseases, than people who eat other options, or who have no breakfast at all.

The review also clarifies important questions about the contribution breakfast cereals make to sodium and total sugars intakes in the overall diet. Despite common belief, breakfast cereal eaters do not have higher sodium intakes than non-breakfast cereal eaters – a finding consistent with recent Australian Bureau of Statistics data, which shows ready-to-eat breakfast cereals actually provide only around two per cent of the sodium in Australian diets.<sup>1</sup> The review also found that for children who consume breakfast cereal, there is no difference in their overall daily energy intake, total sugars intake or risk of overweight or obesity, whether they consume pre-sweetened breakfast cereals or other breakfast cereals.

Breakfast cereals are relatively inexpensive, nutrient-dense and convenient foods, which are recommended as part of a healthy balanced diet. Their regular consumption can help ensure an adequate nutrient intake and may assist in reducing the risks of being overweight, or developing CVD or diabetes.

*Peter Williams is Adjunct Professor of Nutrition and Dietetics, University of Canberra and Honorary Professorial Fellow, University of Wollongong. He was commissioned to prepare this review by the Australian Breakfast Cereal Manufacturers Forum (ABCMF). ABCMF is a forum of the Australian Food and Grocery Council. It provides evidence-based, practical information so Australians can have a better understanding of the value of breakfast and the benefits of eating breakfast cereal as part of a healthy lifestyle.*

### References

1. Australian Bureau of Statistics. *Australian Health Survey: Nutrition First Results - Foods and Nutrients*, 2011-12. Canberra: ABS; 2014.
2. Williams PG. *The Benefits of Breakfast Cereal Consumption: A Systematic Review of the Evidence Base*. *Adv Nutr* 2014;5:636S-673S. doi:10.3945/an.114.006247
3. National Health and Medical Research Council. *How to review the evidence: assessment and application of scientific evidence*. Canberra: AusInfo; 2000.

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# NUTRITION WATCH

*What's new in nutrition? The following research has been recently published.*

Words by *Dr Ramon Hall*

## Predicting human energy intake using mathematical models

In a study conducted at the Centre of Quantitative Obesity Research, Montclair State University, New Jersey, USA, researchers investigated why some individuals undergoing clinical managed weight loss plateaued at six months, as opposed to the validated models of dynamic energy balance, which suggest that weight loss should plateau at between one to two years (Thomas *et al.*, 2014).

Weight plateau are defined as when the rate of weight change is zero and a state of energy balance is achieved with energy intake equalling energy expenditure. The researchers developed two mathematical models based on the first laws of thermodynamics to investigate the difference between predicted weight loss plateaus and early weight plateaus.

The first model (metabolic adaption model) was based on energy-expenditure adaption and looked at the level of metabolic adaption needed to generate the plateau. The second model (lack of adherence model) was based around intermittent lack of adherence and looked at the randomly fluctuating energy intake term to account for the intermittent non-compliance in dietary intake required to reach the plateau.

The models were validated and tested using four different US-based studies including: US NHANES 1999-2004; Comprehensive assessment of long-term effects of reducing intake of energy (CALERIE) weight loss study; Bouchard twin overfeeding study; and the Minnesota starvation experiment. The researchers were able to compare



free-living weight loss regimes and residential, supervised programs.

In testing the two mathematical models, the researchers found that the metabolic adaption model increased final weight but it was unable to explain the predicted plateau time point, whereas the lack of adherence model showed that a six-month weight loss plateau is attainable even in programs that are considered as high compliance. The researchers noted that the intermittent lack of adherence model generated oscillating weight loss graphs that are observed in weight loss studies.

The authors concluded that "An intermittent lack of diet adherence, not metabolic adaptation, is a major contributor to the frequently observed early weight-loss plateau".

The researchers suggested that weight loss oscillations may be suggestive of intermittent periods of diet non-compliance, which may last for several days and it may be useful for practitioners and patients to detect these periods to help achieve weight loss targets. The researchers have also

developed a downloadable application that incorporates intermittent lack of adherence, and can be used as to help health professionals and patients understand realistic levels of compliance required to achieve weight loss targets.

This research should be of interest to health professionals interested in weight loss and also manufacturers of foods products and services related to weight management.

Thomas *et al.* (2014) "Effect of dietary adherence on the body weight plateau: a mathematical model incorporating intermittent compliance with energy intake prescription". *American Journal of Clinical Nutrition*, 100(3): 787-95 (doi: 10.3945/ajcn.113.079822).

## Dairy intake improves nutrient density and reduces association to obesity in Australian adolescents

Researchers from Edith Cowan University in Western Australia have recently completed a study that investigated associations between dairy intake, energy density, nutrient density and relationships with obesity in adolescents (O'Sullivan *et al.*, 2014).

This cross-sectional study investigated a cohort of 1613 fourteen year olds who were part of the Western Australian Pregnancy Cohort (Raine) Study. All participants completed a validated 212 item semi-quantitative food frequency questionnaires that contained information on amounts of dairy products consumed. Energy density was calculated by dividing energy intake of food (kJ/day) by weight of food (g/day). The study created two separate energy density values for food only, ED (F) and energy density for food and calorie containing beverages, ED (FB). Nutrient density was calculated using the Nutrient Rich Food Index 9.3 algorithm which is comprised of a positive sub-score of nine key nutrients: protein, fibre, vitamin A, vitamin C, vitamin E, calcium, iron, potassium, and magnesium, minus a sub-score of three 'nutrients to limit': saturated fat, added sugar and sodium. Categorisation of obesity risk used age specific body mass index (BMI) and height-weight cut-offs.

The study revealed that dairy intake on average was 2.62 (SD  $\pm$  1.5) serves per day, and that intake of dairy was significantly inversely associated with energy density and positively associated with nutrient density, suggesting that the dairy products consumed tended to be more nutrient rich but less energy dense compared to other foods and beverages eaten.

Interestingly, the chances of being overweight significantly increased by 1.24 (95% CI. = 1.09-1.42) with each 100 point increase in nutrient density, even after adjustment for potential confounding factors and energy intake. The researchers suggest that this could be driven by excess consumption of refined but fortified foods. However, dairy intake was inversely associated with obesity, despite the higher nutrient density after adjustment for confounding factors - although associations became non-significant after energy adjustment.

The authors concluded that "Although, increased intake of dairy foods was associated with increased ND in the present study, dairy was inversely associated with being overweight or obese, with the association attenuated by energy. Our results support dairy consumption



in adolescents, particularly because there was a shortfall in the mean intake of dairy in our group compared to recommendations."

O'Sullivan *et al.* (2014) "Dairy product consumption, dietary nutrient and energy density and associations with obesity in Australian adolescents". *Journal of Human Nutrition and Dietetics*, published online ahead of print. (doi: 10.1111/jhn.12264).

### **Protein has lesser effect on appetite in older compared with younger adults**

A study team from the University of Adelaide in South Australia have recently completed a study investigating whether aging influences the effects of protein loads when delivered directly to the small intestine on energy intake, gut motility and appetite (Soenen *et al.*, 2014). The authors were interested to gain greater insights into whether the common use of protein rich supplements for the prevention and management of under-nutrition in older people may have limitations by potentially reducing appetite and overall energy intake.

This double-blinded randomised controlled trial involved 10 young men (aged 19-29 years) and 10 healthy older men (aged 68-81 years) who were studied on four occasions, separated by three days to determine the effects of three different levels of intraduodenal protein loads (hydrolysed whey protein loads of 30, 90 and 180 kcal) and a saline control (all infused for 60 min)

and was followed by an *ad libitum* buffet meal. The study measured energy intake, antro-pyloro-duodenal motility, perceptions of appetite, and gastrointestinal symptoms in all patients over the four treatments. Suppression of energy intake at the meal was calculated using protein infusion treatment compared to control treatment.

The study showed that in young subjects, a dose-response suppression of energy intake was found at the buffet meal by protein (suppression at 30 kcal treatment:  $7 \pm 8\%$ ,  $P = 0.189$ ; suppression at 90 kcal treatment:  $17 \pm 8\%$ ,  $P = 0.054$ ; suppression at 180 kcal:  $33 \pm 7\%$ ,  $P = 0.002$ ), whereas, in the older participants suppression was only observed after the 180 kcal load (30 kcal:  $7 \pm 4\%$  increase,  $P = 0.126$ ; 90 kcal:  $6 \pm 7\%$  increase,  $P = 0.291$ ; 180 kcal:  $17 \pm 6\%$  suppression,  $P = 0.016$ ). Suppression of energy intake by protein was therefore significantly greater in younger than older subjects. The total energy intake (meal and infusion) for the 180 kcal protein treatment was lower than that of the control day in the younger subjects, but in older subjects it was greater on the 30 kcal and 90 kcal protein infusion days compared to the control. The research also showed that suppression of energy intake by protein was inversely related to the changes in isolated pyloric pressure waves and positively related to duodenal pressure waves.



The authors conclude that “Intraduodenal protein suppresses appetite and energy intake less in healthy older than in young adults. In older subjects, intraduodenal protein at low doses increased overall energy intake, which supports the use of protein supplements in undernourished older people”.

These results should be of great interest to manufacturers of supplemental foods for the undernourished elderly and healthcare professional dealing with dietetic needs of the elderly.

Soenen *et al.*, (2014) “Effects of intraduodenal protein on appetite, energy intake, and antropyloroduodenal motility in healthy older compared with young men in a randomized trial”. *American Journal of Clinical Nutrition*, Published online ahead of print, (doi: 10.3945/ajcn.1140.87981).

### Estimating insulin demands for protein foods

Researchers from the University of Sydney have conducted a study to compare two approaches - carbohydrate counting and food insulin index - to estimate insulin dosages for a variety of protein-containing in type 1 diabetics (Bell *et al.*, 2014). In a double-blinded randomised within-subject crossover design study, a total of eleven type 1 diabetic adults using insulin pump therapy consumed six individual foods

(steak, battered fish, poached eggs, low-fat yoghurt, baked beans and peanuts) on two occasions in a random order, either predicting the insulin dose using carbohydrate counting or by using the food insulin index algorithm.

Carbohydrate counting is currently considered the gold standard in determining mealtime insulin dose, whereby the insulin doses are matched to the carbohydrate content of the meal. The food insulin index is a novel algorithm of ranking foods on the basis of the insulin response ‘demand’ in healthy subjects, relative to an isoenergetic reference food. Post-meal glucose was measured using capillary blood glucose at regular intervals over three hours.

The study revealed that the food insulin index algorithm significantly reduced the mean blood glucose level compared to the carbohydrate counting method ( $5.7 \pm 0.2$  compared to  $6.5 \pm 0.2$  mmol/L,  $P = 0.003$ ) and mean change in blood glucose levels. Also, the time taken for blood glucose to reach the peak concentration was achieved earlier when using the food insulin index algorithm compared to the carbohydrate counting method ( $34 \pm 5$  compared to  $56 \pm 7$  minutes,  $P = 0.007$ ). The risk of hypoglycaemia was considered similar for both approaches.

The authors concluded: “in adults with type 1 diabetes, compared with carbohydrate counting, the novel food insulin index algorithm improved postprandial hyperglycemia after consumption of protein-containing foods.

Although this study provides evidence supporting the use of the novel food insulin index algorithm as a promising tool for predicting meal insulin dose in adults with type 1 diabetes, the authors acknowledge that further studies should be conducted over a longer time frame with larger numbers of subjects to confirm these interesting results.

Bell *et al.* (2014) “Estimating insulin demand for protein-containing foods using the food insulin index”. *European Journal of Clinical Nutrition*, 68 (9), 1055-9 (doi:10.1038/ejcn.2014.126).

### Meta-analysis on low calorie sweetener suggests benefit to weight loss

A research team from the Centre for Epidemiology, Biostatistics and Computational Biology, Exponent Inc., Chicago, USA, has conducted a systematic review and meta-analysis of randomised controlled trials and prospective cohort studies that examine the relationship between low calorie sweeteners and body weight and body composition (Miller and Perez, 2014).

The systematic review identified a total of 15 randomised controlled trials and nine prospective cohort studies that met the selection criteria for inclusion in the meta-analyses. Studies included needed to examine low calorie sweetener use from food or beverage or low calorie sweeteners consumed as table top sweeteners. Weighted mean differences in body weight and composition between the low calorie sweetener group and the control group were used for the randomised controlled trials meta-analysis. Also, weighted mean correlations for low calorie sweetener intake were used for body weight and composition in prospective cohort studies. The included randomised controlled trials were from three weeks to 78 weeks in duration and



prospective cohort studies had follow-up periods from 0.5 to 7.5 years.

The meta-analysis for the randomised controlled trials revealed that there was modest significant reductions for the low calorie sweeteners on all outcomes measured including: body weight (-0.80 kg; 95% CI: -1.17, -0.43), body mass index (BMI (kg/m<sup>2</sup>): -0.24; 95% CI: -0.41, -0.07) fat mass (-1.10 kg; 95% CI: -1.77, -0.44) and waist circumference (-0.83 cm; 95% CI: -1.29, -0.37). There were no significant associations between low calorie sweetener intake and body weight or fat mass amongst the prospective cohort studies. There was however a significantly slightly higher BMI associated with low calorie sweetener use (BMI 0.03; 95% CI: 0.01, 0.06).

The authors conclude that “on the basis of the available scientific literature to date, substituting low calorie sweetener options for their regular-calorie versions results in a modest weight loss and may be a useful dietary

tool to improve compliance with weight-loss or weight maintenance plans.”

In the related editorial by Professor James Hill, entitled “What do you say when your patients ask whether low-calorie sweeteners help with weight management?”, he suggests that on the basis of meta-analysis conducted by Miller and Perez, it is hard to understand why health professionals would advise against the use of low calorie sweeteners for people trying to achieve healthy weights. He does also suggest that further research is required to understand the effects of different sweeteners, potential effects on the intestinal microbiome and the effects over many decades of use on weight management. He also discusses that low calorie sweeteners should be part of several strategies to address weight management issues. Overall, Professor Hill is suggesting that low calorie sweeteners based on current evidence should be encouraged as part




of a plan to help patients with their weight loss goals.

Miller and Perez (2014) “Low-calorie sweeteners and body weight and composition: a meta-analysis of randomized controlled trials and prospective cohort studies”. *American Journal of Clinical Nutrition*, 100 (3), 765-77, (doi: 10.3945/ajcn.113.082826).

Hill (2014) “Editorial: What do you say when your patients ask whether low-calorie sweeteners help with weight management?”, *American Journal of Clinical Nutrition*, 100 (3), 739-40, (doi: 10.3945/ajcn.114.094466).

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# SENSORY RESEARCH

*What's new? Recent highlights in sensory research.*

Words by Drs Russell Keast, Sara Cicerale, Gie Liem and Megan Thornton



## Hedonic rating better than facial expression

Research has suggested humans have emotional responses that are universal across cultures: happiness, sadness, surprise, disgust, anger, fear and contempt each of which has unique facial response. Emotional research has become accepted over recent years as a method to help gain further insight into consumer's like or dislike of food products.

A recent study from the University of Copenhagen looked at facial expression as a measure emotional response to taste primaries – they had specially trained a panel of experts (n=6) in emotional facial response, who rated the facial expression of trained taste testers (n=21).

This would appear like a good study, excessive bitter, and sour are both

unpleasant, while sweet, salty and umami will be appealing (depending on the food of course). The belief was the facial expression would form more accurate assessment of an individual's like/dislike than asking the person to rate like/dislike on a scale.

Not surprisingly facial expression was a function of taste quality (sweet, sour, salty, bitter or umami) and also intensity. Bitter (caffeine), sour (citric acid) and salty (sodium chloride) led to clear disgust and surprise responses, whereas, sweet (sucrose) and umami (glutamic acid monosodium salt) taste gave weakly noticeable facially expressed emotions. But even for the really intense solutions facial responses were relatively mild.

The conclusion was that rating of like/dislike gave better data than facial

expression, and that facial expression may not be the best measure of emotion.

Thinking about this, perhaps the findings make sense. Taste informs us about nutrition (carbohydrate, minerals, protein) and it is possible that our facial expression for nutrients or non-nutrients is not going to evoke high emotion. Possibly, if the study was on texture (something slimy in the mouth), which provides information on quality, or smell (think goaty), which provides information on safety, the responses may have evoked more emotion.

Even though this study found that facial expression was not the best measure of an individual's like/dislike, emotional research is a rapidly evolving field that is welcomed as another measure to help understand the consumer.

Bredie WLP, Tan HSG, Wendin K (2014) *A Comparative Study on Facially Expressed Emotions in Response to Basic Tastes*, Chem. Percept. 7:1–9 DOI 10.1007/s12078-014-9163-6

## Salt my bitter vegetables please

One of the reasons people avoid consuming vegetables is due to bitterness – why willingly consume something that tastes bad even if it is meant to be good for you?

Researchers at Arizona State University used salt (NaCl) as a bitterness suppressor to see if it helped with liking of vegetables. The vegetables used were cauliflower and brussel sprouts and if you believe various earlier studies using solutions (not foods), salt should effectively suppress bitterness and also increase liking of the vegetables.

The researchers found that NaCl suppressed bitterness, but only for those subjects who thought the vegetables were highly bitter. Salt also increased liking, but only in those who disliked the vegetables.

So, a conundrum – those who find vegetables highly bitter should potentially add salt so they are more liked, and therefore more consumed. But in doing this they are adding more salt to the diet, which is associated with development of hypertension.

Wilkie LM, Capaldi Phillips ED, Wadhera D. (2014) *Sodium Chloride Suppresses Vegetable Bitterness Only When Plain Vegetables Are Perceived as Highly Bitter*. Chem. Percept. 7:10–22 DOI 10.1007/s12078-013-9159-7

### Winemakers induce grapes to smell like smoke, clove or whisky

This is an area of research that began after it was noted that grapes from areas that had experienced forest fire activity were producing wines with a smokey flavour. It was discovered that the foliar treatment of certain volatile aroma compounds to grape vines, such as those present in smoke, was allowing the storage of these compounds as non-volatile glycosides, by joining the volatile to a sugar molecule. During the winemaking process, the volatiles



were then released to provide their associated smell.

In this research study, Gas Chromatography-Mass Spectrometry (GC-MS) was used to identify the aroma and/or volatile compounds in the grapes and wine. In addition, the amount of glycosidic compounds was analysed by both High Performance

Liquid Chromatography (HPLC) and sensory analysis by a team of eight expert judges.

These analyses were completed at three stages of the winemaking process: at the end of the alcoholic fermentation; at malolactic fermentation (the addition of bacteria); and at six months post-fermentation.

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Using eugenol and guaiacol, which are smoke aroma compounds, as well as whiskey lactones in Monastrell red grapes, the researchers identified an increase in glycoside content, but noted that there was little transfer to wines, suggesting that these glycosides are stored in the grape's skins.

Another finding was that the storage of guaiacol in grapes was associated with lower sugar content, leading to lower alcohol levels in wine. Even though the transfer of aroma compounds to wines was quite small (an increase of 8-12% at most), tasters were still able to identify clove (eugenol and guaiacol) and woody/oak (whiskey lactone) flavours.

Definitely an interesting area of research, but no word as yet on when we will be receiving the first batch of 'bacon' wine.

Pardo-García AI, Serrano de la Hoz K, Zalacain A, Alonso GL, Salinas MR. (2014) Effect of vine foliar treatments on the varietal aroma of Monastrell wines. *Food Chemistry* 163 258-266

### The taste of cutlery

Research has shown that consumption behaviours can change with differing tableware but little is known about the influences of differing cutlery on consumer response and consumption.

A recent study by researchers from the University of Oxford set out to

investigate if food tasted differently when the visual and tactile properties of cutlery were altered. Three experiments were carried out with 35 participants.

In the first, plastic spoons were made to be of different weights by hiding weights in the handles of the cutlery. Yoghurt was sampled from four different spoons, two large and two small. One of each size was artificially weighted.

In the second experiment, the colour of the spoons was varied (red, blue, green, white, black) as well as the colour of the yogurt sampled (white, pink).

In the third experiment, the effect of the shape of cutlery was assessed. Two cheeses – a young cheese and aged cheddar – were sampled from four types of cutlery (fork, spoon, knife and toothpick).

The researchers found that the yoghurt sampled from the lighter spoons was perceived to be denser and more expensive and also that the yoghurt eaten with the smaller-lighter spoon was less sweet than the smaller-heavier, larger-light and larger-heavier spoons. The authors speculate that because smaller spoons are usually used to eat desserts, there may be an expectation that food eaten with a smaller spoon would normally be sweeter.

When it came to the colour of cutlery and the perceived taste of the white and pink yoghurts, the subjects rated the pink yoghurt sampled from the blue spoon saltier than the white yoghurt. Blue packaging is regularly used for salty food products in the United Kingdom and so the authors propose that consumers may assume that the white yogurt on the blue spoon would be saltier than that for the pink yoghurt and when their expectation was not met, they have rated the saltiness of the white yoghurt as lower than for the pink samples. Consumption of both white and pink yoghurts with the black spoons also resulted in a lower sweetness rating than for the white spoons, which is consistent with previous research on white and black tableware.

Finally, the cheese sampled from a knife was perceived as saltier. The authors propose that due to the fact cheese is often given directly from a knife in cheese shops where they tend to sell more aged and therefore saltier cheese, eating it in this way may have brought about a higher saltiness perception.

These interesting results demonstrate that the properties of cutlery can indeed affect people's taste perception of food and is that this is perhaps a way to change environmental cues in order to modify people's eating habits.

Harrar V, and Spence C. (2014) The taste of cutlery: how the taste of food is affected by the weight, size, shape, and colour of the cutlery used to eat it. *Flavour* 2:21. <http://www.flavourjournal.com/content/2/1/21>

### A soothing cup of tea

Tea is perceived as a calming and soothing beverage, but how can a food/beverage have such an influence on mood?

The effect of food on mood and creativity is a very difficult area of research because it is difficult to reliably measure. There are questions about which stimuli to use as a control and how to determine which food compounds may be responsible for an effect.

Some researchers have argued that a bioactive compound or metabolite must

be measurable in the blood stream in order to quantify an effect. But what if it is the tea drinking ritual itself that influences mood? What if aromas from the tea trigger happy memories without the active tea ingredients being measurable in the blood stream?

A recent study in Food Quality and Preference tried to determine the influence of the tea drinking experience on mood and creativity. Participants (n=150) were randomly allocated to three conditions: 1) tea preparation and drinking; 2) drinking cold water; and 3) positive affect induction, where participants were asked to write down happy thoughts. After consumption of tea, water or writing down happy thoughts participants were asked to fill out a number of questionnaires that measured mood and creativity.

Researchers found that those in the tea group showed an improved mood compared to those in the water group. Although the results are interesting they also leave us with a lot of questions. Which part of the tea



drinking experience actually influenced mood – is it the temperature, the aroma, past experiences or something else? Also, because participants could add as much milk and sugar as they liked, the observed effects may just be a result of drinking something you like opposed to drinking cold water.

In the future more studies on mood-foods will be published. Some of these studies will give important insights

into the design of mood foods, whereas other studies may just be nice to read, while sipping your hot cup of tea.

Einöthera SJ, Baasb M, Rowsonc M, Giesbrechta T. (2014) Investigating the effects of tea, water and a positive affect induction on mood and creativity. Food Quality and Preference 39, Pages 56–6

*Dr Russell Keast, Dr Sara Cicerale, Dr Gie Liem and Megan Thornton are members of the Deakin University Sensory Research Group.*

An advertisement for ERKAT Natural Colours. The background is a close-up of various colorful cereal loops in shades of pink, orange, yellow, blue, and purple. The text 'APPETIZING' is in white, 'TRUE' is in large pink letters, and 'COLOUR' is in large white letters. The ERKAT logo is in the top right corner, and the text 'by Ringe and Kuhlmann' is at the bottom right. The Cathay Industries logo is in the bottom left corner.

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## CRAZY KALE GROWTH

*As the health conscious among us drive demand for kale, can Aussie farmers keep up?*

It's green, frilly and firmly in fashion. Once the daggy vegetable fed to us by our grandparents, kale is now the latest food to take on 'superfood' status. But, as the health-conscious among us drive demand for the leafy green, can our farmers keep pace?

Recent reports from international kale seed supplier Bejo Seeds would have us believe no. Bejo sent health nuts into a tailspin when it warned a worldwide kale shortage was imminent because suppliers and producers could not keep up with the vegetable's rapid surge in popularity.

But as it turned out, Bejo Seeds' declaration was premature. The company had in fact misinterpreted the latest trends surrounding their produce. Instead of the unprecedented spike in kale seed sales and the temporary marketplace shortage it would cause being a consequence of overwhelming demand, it was in fact due to a competitor's seed shortage.

Here in Australia, vegetable farmers with kale on their crop roster are rejoicing. Kale's popularity is off the charts with supermarket giant Coles calling it their fastest-growing product.

The frost resistant vegetable is lauded for its high levels of antioxidants, vitamin A, vitamin C, fibre, iron – pretty much every vitamin and mineral that's good for us – and has been a popular choice in the Netherlands and Germany for centuries. But it didn't make its way to Australia until the 1950s, when Dutch farmer Joh Bruyen brought it from his homeland.

"I had trouble selling it because they didn't know what it was," he said.

"I brought it to the market and the butchers bought it to decorate their shops because it looked like parsley which they used in between the meat."

Sixty years on, the marketplace is completely different, with some farmers are planting up to 150,000 seedlings

a week. It is a gem crop for many growers due to its hardiness. It grows all year round, requires very little fertiliser and is relatively simple to harvest. For vegetable producers, it is a product with tremendous bang for its buck, nutritionally and otherwise.

So should the vegetable's quick rise to fame be a sign that farmers jump on the kale bandwagon or an indication that it's reached its peak?

Despite the hype, kale is still only a relatively small market according to grower Kim Martin.

"We would love to see it go the way of baby spinach and become a commodity that is loved by the broader marketplace.

"At the moment we have markets for every bit of kale we grow because of the global seed shortage – if that hadn't happened, I imagine there would be more kale in the ground.

While he currently has no trouble finding buyers for his kale harvests, selling into retail, juicing and food service, he says investing in progressive vegetable varieties is always a gamble fraught with risk and potential failure. Success is all about timing.

"The work you do in the early stages is just investing in product development and hopefully at some point in time, it starts to pay the bills," he said.

He frequently travels and looks abroad in the hope of pre-empting local trends.

"I travel a bit around the world [for] that opportunity to see a product performing in a marketplace where it doesn't currently exist in Australia, and then basically you just steal shamelessly.

"You take from what you see working elsewhere, then you start small in your marketplace and work from there.

"You build your market up, you listen to what your customers are saying, and you react."



## DIARY

### AUSTRALIA & NEW ZEALAND 2014

**October 21** AIFST Extraordinary General Meeting. Satellite meetings in Melbourne, Sydney, Brisbane, Adelaide, Perth. [www.aifst.asn.au](http://www.aifst.asn.au)

**October 22-23** Innovation Reloaded. University NSW, CBD Campus. Level 7, 1 O'Connell St, Sydney. [www.aifst.asn.au](http://www.aifst.asn.au)

**October 30-31** Annual Asia Pacific Food & Fibre Summit. Hilton on the Park, Melbourne, Victoria. [www.informa.com.au/conferences/food-conference/asia-pacific-food-fibre-summit](http://www.informa.com.au/conferences/food-conference/asia-pacific-food-fibre-summit)

**October 30-31** Agriculture & Food Biotechnology Symposium - Where is Australia's Global Niche? Gold Coast Convention & Exhibition Centre, Qld. [ausbiotechnc.org](http://ausbiotechnc.org)

**December 3-5** 15th Scientific Meeting of the Australasian Association for ChemoSensory Science (AACSS). Brisbane (UQ St Lucia Campus, Brisbane) [www.aacss.org/details.html](http://www.aacss.org/details.html)

### AUSTRALIA & NEW ZEALAND 2015

**July 20-22, 2015** International Conference on Aquaculture and Fisheries. Brisbane. [aquaculture-fisheries.conferenceseries.com](http://aquaculture-fisheries.conferenceseries.com)

**August 11-13** AIFST Annual Convention Food for All 48th Annual AIFST Convention and 15th Australian Food Microbiology Conference. Luna Park, Sydney. [www.aifst.asn.au/food-for-all.htm](http://www.aifst.asn.au/food-for-all.htm)

### INTERNATIONAL 2014

**October 27-31** IDF World Dairy Summit. Tel Aviv, Israel. [www.idfwds2014.com](http://www.idfwds2014.com)

**October 28-30** II International Congress Food Technology, Quality and Safety and XVI Feed Technology Symposium. Novi Sad, Serbia. [www.foodtech2014.uns.ac.rs](http://www.foodtech2014.uns.ac.rs)

**November 9-11** Sweets & Snacks Middle East. Dubai International Convention and Exhibition Centre, Dubai, U.A.E. [www.sweetsmiddleeast.com](http://www.sweetsmiddleeast.com)

**November 18-20** Food Matters Live. ExCeL London exhibition and convention centre, London, United Kingdom. [www.foodmattersglobal.com](http://www.foodmattersglobal.com)

**November 26-28** Sweets & Snacks China. China National Convention Center, Beijing, China. [www.sweets-snackschina.com](http://www.sweets-snackschina.com)

**December 8-9** Australian Nutrition Promotion Leadership Program for early-career researchers and academics. Deakin University, Melbourne.

### INTERNATIONAL 2014

**August 10-12, 2015** 4th International Conference and Exhibition on Food Processing and Technology. London, UK.



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