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APRIL - JUNE 2020

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2D BARCODES
The future of fresh foods for retail



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2DB - THE FUTURE OF FRESH FOODS FOR RETAIL

Food safety for fresh foods is entering a new era for the retail sector. Supermarket giants the world over have recognised the need to transform the way food is managed within the supply chain to ensure customer safety.

Account Director for Retail at GS1 Australia, Andrew Steele, said upon return from a recent overseas visit where he met with international retailers such as Carrefour, Tesco and Metro, "one of the major challenges to achieving increased food safety in retail is the sheer volume of data in the supply chain, from multiple sources and in disparate formats. To date the retail sector at large has not had the necessary tools to address this challenge in the context of today's market conditions and operational realities."

Enter the 2DBarcode. A content-rich, on-pack symbol that is about to transform fresh foods in the retail environment. The single symbol enables multiple data elements to be available at point-of-sale including product batch/lot number, serial number, best before date, use-by date, pack date, weight and price.

Maria Palazzolo, CEO of GS1 Australia said, "2DBarcodes can help solve many of today's retail business problems in the areas of meat, seafood, deli, dairy and bakery as well as packaged fruit and vegetables because one small barcode can reveal a wealth of information that just can't be squeezed onto a traditional linear barcode."

Woolworths have already taken a proactive approach to improving consumer food safety by piloting 2DBarcodes in a trial across several



stores in Sydney. Richard Plunkett, Woolworths' General Manager of Business Enablement said, "The (2DBarcode) trial was a complete success and demonstrates that 2DBarcodes have immense potential. We're excited to see how they can improve food safety across the entire Woolworths network."

What do 2DBarcodes mean for food safety?

A lot, actually. For customers, the sale of expired or recalled products can be stopped at the register. If an out-of-date or recalled product is scanned at point-of-sale, the information contained in the 2DBarcode will alert the customer and prohibit the product from being purchased.

For suppliers and retailers, food products can be recalled by batch lot number. The affected batch lots can be identified more accurately within the supply chain. This means only the affected products need to be removed from warehouses and supermarket shelves. Currently, the product recall process requires all recalled products

to be removed from the supply chain and disposed of.

The information supplied by 2DBarcodes will also allow retailers to pinpoint the specific batches affected by a recall or withdrawal and trace them back through the production line, making it easier to identify the source of contamination.

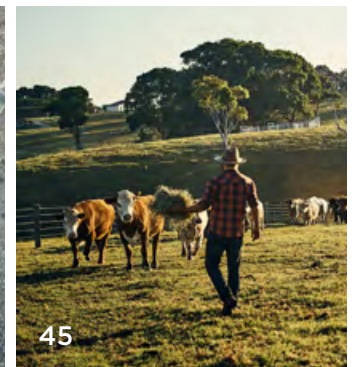
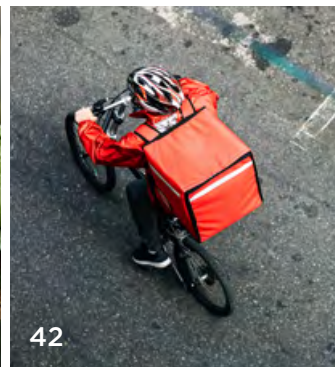
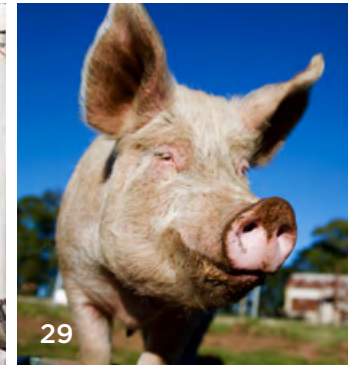
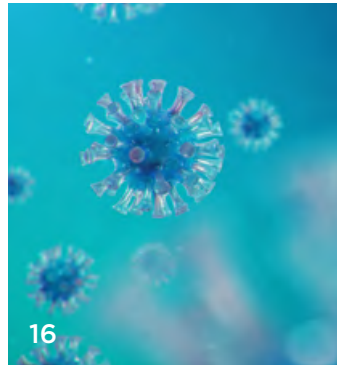
2DBarcodes also help increase food freshness and sustainability. The extra data enables improvements to date management, enhancing product rotation to increase food freshness and reduce food waste.

In the future, customers will access the information contained within 2DBarcodes on their smartphones.

For more information visit: www.gs1au.org/data-embedded-barcodes



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food australia

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Food for Thought

As I sit at my desk at home to write this, so much has changed since the team started work on this Autumn edition of *food australia* only a couple of months ago.

The past few weeks have provided all of us with challenges we have never experienced before as we navigate the landscape of our 'new normal' – social distancing, working from home, separated from colleagues and teams. The current reality of the COVID-19 world we are now living in requires us to adapt and innovate.

The following statement is often attributed to the famous scientist Charles Darwin:

It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is most adaptable to change.

It has never been more important to discuss the need for change, which makes the theme of this year's AIFST convention extremely relevant: *food science revolution - building a sustainable future*.

The AIFST is committed to sharing knowledge – whatever it takes. So as much as we love getting people together for our annual convention and other events this just isn't possible with the current restrictions. By embracing the wonders of digital connectivity, we can still do it – we have adapted and changed the way we connect so we can continue supporting our members and the food industry.

The Institute is working hard to ensure that AIFST members and our colleagues have access to the great range of topical, information-rich presentations and events normally on offer. Webinar delivery gives great flexibility – you can participate no matter where you are, ask questions and interact with other participants.

On the theme of food science revolution, this edition of *food australia* explores different aspects of change and innovation in food safety, food waste, Australian native foods, nutrition, traceability and non-refrigerated ready meals as we embrace the challenges of the food science revolution.

Check the AIFST website for information about upcoming events and let's continue to grow, learn and connect.

Please take care of yourselves and each other as we navigate the challenges of our changing times.

Fiona Fleming

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The national food waste baseline project

The National Food Waste Baseline project provides a benchmark for measuring national performance against global waste reduction targets, by establishing a consistent framework to quantify food waste generation and track progress.

More than 300 organisations across the food supply chain were consulted between March and June 2018. The project is the first detailed quantification of food waste in Australia at a national level and across the full food supply and consumption chain, from primary production through to consumption and disposal or recovery.

The Baseline project was developed in response to the National Food Waste Strategy released by the Australian Government in November 2017. It contributes toward global action to reduce food waste and aligns with the United Nations' Sustainable Development Goal (SDG) Target 12.31 which aims to ensure sustainable consumption and production patterns.

The National Food Waste Strategy helps fulfil Australia's obligations under the United Nations Framework Convention on Climate Change to reduce greenhouse gas emissions, primarily through the diversion of food waste from disposal outcomes. It also sets the objective to halve food waste along the supply and consumption chain by 2030.

The Baseline project was developed in collaboration with more than 300 Australian organisations who were engaged in a structured consultation process. Total food waste generation of 298 kilograms per capita (7.3 million tonnes nationally) constitutes the National Food Waste Baseline.



On average,
Australians are throwing away
1 SHOPPING BAG
of food every week
per household

In **2016-17**
an estimated
7.3 MILLION TONNES
of **FOOD WASTE** was
generated across the entire
supply and consumption chain

NATIONAL FOOD WASTE BY SECTOR (food waste per annum in tonnes)	
Primary production: 2,270,000	Hospitality: 324,000
Manufacturing: 1,759,000	Institutions: 209,000
Wholesale: 26,000	Households: 2,490,000
Retail: 232,000	

Australians **recycled**
1.2 MILLION TONNES
of food waste, recovered
2.9 million tonnes through
alternative uses for
food waste and **threw away**
3.2 million tonnes.

Total **national waste** was
7,310,872 TONNES

**If total food waste in Australia
was placed in semi-trailers
the line would stretch from
SYDNEY TO PERTH**

REFERENCE: Data sourced from the National Food Waste Baseline - Final Assessment Report March 2019, by Arcadis.

Sustainability rankings for food and beverage

In a ranking of the 100 most sustainable corporations in the world, developed by sustainable business magazine and research company Corporate Knights (CK), only three food and beverage producers made the cut.

With longevity used as the ultimate measure of sustainability, the index listed McCormick & Co (ranked 22nd), Vitasoy (ranked 90th) and Campbell Soup Co (ranked 93rd) worthy of global recognition for their efforts.

In its 15th year, the global ranking showed European companies had the biggest impact and made up half of the list (49), followed by the US and Canada (29) and Asia (18).

As part of its research, CK analysed 7,500 companies with US\$1B+ in revenues. The number one spot went to Danish bioscience company Ch Hansen.

The financial services sector was the most represented, with a total of 18



businesses recognised as being proactive in the sustainability space.

CK said the belief that companies must focus on maximising shareholder returns above all else is changing. They said investors are increasingly aware

that the environment, health and safety, production and supply chain have direct implications for business performance and should therefore be prioritised.

Antimicrobial film to fight foodborne illnesses

A novel composite film developed by Penn State's College of Agricultural Sciences in the US could help to decrease foodborne illness outbreaks.

The film is created by the bonding of an antimicrobial layer to conventional, clear polyethylene plastic typically used to vacuum-package foods such as meat and fish.

The antimicrobial lining of the film is made from a pullulan-based biopolymer produced from starch syrup which is already approved for use in foods.

Pullulan, a water-soluble polysaccharide, is a chain of sugar, glycerin and cellulose molecules linked together. To kill pathogens such as salmonella, listeria and pathogenic E. coli, the researchers infused the pullulan with lauric arginate, made from naturally occurring substances which are also already approved for use in foods.

A broad-spectrum antimicrobial compound, lauric arginate, was

chosen as the antimicrobial because it is effective in killing and limiting the growth of pathogens that cause foodborne illness.

Professor Catherine Cutter, researcher and Professor of food science at Penn State University said the pullulan film works by slowing the release of the antimicrobial, disbursing it at a predictable rate to provide continuous bacteria-killing activity.

"The novel composite film can give us antimicrobial properties and, at the same time, provide the strength and all the other desirable properties of polyethylene that the industry is still looking for," Professor Cutter said.

The film could help mitigate the millions of cases of foodborne illness that occur every year worldwide. According to the US Centers for Disease Control and Prevention, 76 million cases of foodborne illness occur each year in the US alone, resulting in 300,000 hospitalisations and 5,000 deaths.



Future research will evaluate how the composite antimicrobial film affects the shelf life of food products and investigate consumer perceptions and acceptability of the novel film.

Potato project



A new research initiative will make the latest independent research on the nutritional value of potatoes available to all health professionals.

The initiative, funded by Hort Innovation, the grower-owned research and development corporation for Australia's horticulture industry, aims to dispel myths about potatoes and provide an up-to-date

nutritional profile for the popular vegetable.

Accredited Practising Dietitian Jane Watson said potatoes were often getting a bad rap, especially with the rise of diets such as keto, which meant consumers were missing out on the nutritional benefits of healthy foods such as potatoes.

"Dietitians, nutritionists, doctors

and sports health specialists understand not only the nutritional value of vegetables such as potatoes but also the ebb and flow of food fads," Dr Watson said.

Dr Watson said potatoes are known to be an important source of dietary fibre, vitamin C and B6, potassium, folate and iron and, when cooked and cooled, resistant starch.

"Potatoes also contain a range of antioxidants, including phenols, flavanols, anthocyanins and carotenoids," she said.

A study by the Food and Agriculture Organization of the United Nations also found potatoes can play an important role in global food security, providing a sustainable food supply.

When completed, the evidence-based research project, Aussie Potatoes – the power packed wholefood, will include a website with links to peer-reviewed research papers, fact sheets and educational opportunities including webinars.

Snack Attack

Research from Roy Morgan found nearly 90 per cent of Australian adults consumed packaged snack food in an average week, with 'savoury' and 'healthy' snacks the two top categories.

The most popular packaged items were savoury snacks, eaten by 66 per cent of Australians, followed by healthy snacks (54.7 per cent), chocolates (48.1 per cent), yoghurt (44.8 per cent), sweet biscuits (41.2 per cent), ice cream (39.0 per cent), lollies or gum (30.2 per cent), dips (22.4 per cent) and frozen/dairy desserts (11.5 per cent).

The biggest increase occurred in the healthy snack category, which included items such as muesli bars, breakfast bars and rice crackers.

The largest decline over the past decade was in the sweet biscuit category, which included treats such as chocolate, cream filled biscuits and large cookies.

The research revealed more than one in four adults are 'heavy' snackers, meaning they eat seven or more items in an average week. A much smaller proportion – just 11.5 per cent of Australians – were considered 'non' snackers, meaning they don't eat packaged snacks in an average week.

The data came from Roy Morgan's single source survey, conducted by in-depth face-to-face interviews with more than 1,000 Australians.

Roy Morgan chief executive officer Michele Levine said despite a broader push for Australians to make healthier food choices and reduce 'packaging', we continue to eat packaged snacks at high levels.

"Over the past decade the proportion of Australians who regularly consume packaged snacks has declined slightly, moving from 90.8 per cent to 88.5 per cent," Ms Levine said.



"However, a total of 62.5 per cent of the adult population are considered heavy or medium snackers, consuming at least four packaged snacks per week, and in many cases the number would likely be far higher," she said.

Combining research expertise – Kantar acquires Colmar Brunton

Colmar Brunton, a market research agency specialising in sensory, customer and governmental research, will be fully integrated into research and consulting company Kantar, and the Colmar Brunton brand retired in Australia.

Kantar announced it will unify its brands across Australia and New Zealand (ANZ) under the single Kantar banner. The news comes two months after Kantar was acquired by American private equity giant Bain Capital, from advertising, marketing

and communications company WPP.

Rob McLachlan, formerly of WPP, was appointed chairman of Kantar ANZ and will lead the integration and branding reshuffle process.

Colmar Brunton's chief executive officer, Joan Young, will relinquish that role to become global head of syndicated products for Kantar's public division. Her job will be to scale Colmar Brunton's offering globally, and she will report to global CEO of the division, Michelle Harrison.

Kantar CEO Eric Salama, said "the



integration of Colmar Brunton and the addition of The Oru and consulting expertise and teams into Kantar, will make us a much stronger partner for our Australian clients."

Kantar said the acquisition will allow them to provide local clients with the benefit of Colmar Brunton's expertise globally.

The changing landscape of protein production

A new report, *The Changing Landscape of Protein Production*, provides analysis estimating there will be additional market opportunities worth AU\$19.9 billion for the Australian protein sector by 2030.

Although this report was completed well before COVID-19 broke out, the report shows hope for the future of the protein market once the current crisis period has passed.

Included in this is a \$3.1 billion opportunity for alternative protein from Australian agriculture. This includes growth for non-traditional proteins such as insects, algae, seaweed and cultured meat, as well as traditional plant-sourced proteins such as pulses.

Growth areas also include opportunities worth \$8.9 billion for Australian animal protein and \$7 billion for traditional plant-sourced protein.

The research - funded by Australia's national rural issues program AgriFutures, and delivered by the Australian Farm Institute - shows there is plenty of room for both animal-based and alternative

proteins in the Australian consumer market.

John Harvey, managing director of AgriFutures Australia, said the growth of our agriculture sector depends on its ability to meet the world's demand for food, especially protein, as this necessarily means cooperation between traditional and alternative protein producers.

"There's an opportunity for producers to look at a meal as a whole nutritional opportunity and stop thinking about our individual products and commodities," Mr Harvey said.

"It's not about worrying what is on people's plates - meat, vegetables, pulses, eggs, dairy, alternative proteins - but making sure there is enough protein on everyone's plates," he said.

Harvey added that this is also how we should be approaching the development of policy and regulation to sustain and improve our protein production industries.

"Both animal and plant production are needed to increase productivity and meet this challenge sustainably, and the opportunities



for complementary production will benefit producers as well as consumers and the environment," Mr Harvey said.

"Essentially, the rise of alternative proteins is a good news story for Australian farmers and something to embrace. Now we have the information to adapt and grow this sector. We can respond to consumer trends, like this one and capitalise by bridging the gap between global protein demand and supply," he said.

The full report can be downloaded from: www.agrifutures.com.au

THE PERFECT SHADE THAT WILL NOT FADE

PRESENTING NATRACOL'S VIBRA YELLOW FOR CONSISTENCY OF SHADES

Natracol Vibra Yellow is available in an easy-to-use water dispersible liquid format that ensures no change in shade and intensity of colour even when exposed to high temperatures and light, making it ideal for baked goods, soups, sauces and confectionery.



Bubbles for your beer

Over 32 billion tonnes of carbon dioxide (CO₂) is released into the atmosphere every year, so it's hard to imagine a shortage of this important gas, but during the 2018 Rugby World Cup a thirsty Europe was in fear of a beer drought when dramatically low supplies of CO₂ left brewers short on supply.

The dip in CO₂ supply in 2018 was not an isolated case, with CO₂ supply shortages experienced several times over the last decade, including in Australia. To avoid potential CO₂ shortages in the future, CSIRO scientists were tasked to find a solution.

More than 100 million tonnes of CO₂ is produced each year, but it isn't all used on beer and fizzy drinks. Many industries require CO₂ for their production processes, particularly the food industry.

CO₂ is used to extend the shelf life of packaged vegetables and meat, for controlling the temperature of agricultural greenhouses, and in industrial cleaning and public swimming pools. It's also used by the

chemicals industry in the production of other compounds and materials such as methanol and methane.

CO₂ is typically generated as a by-product of making ammonia for fertiliser, then bottled up and distributed. However, a team from the CSIRO has developed a new way to capture CO₂ directly from the air and recycle it for use on demand.

Working with Monash University, Energy Infrastructure and Resources, and H2H Energy, the technology, called Airthena, takes advantage of tiny super crystals known as 'metal-organic frameworks' which absorb CO₂ like a sponge.

CSIRO said the new process is a simple and cost-effective way to capture CO₂ already circulating in the atmosphere. The new production method is an alternative to typical methods used to generate CO₂ involving burning natural gas - a resource which is subject to price and supply fluctuations and requiring large-scale purification equipment.

Airthena can currently capture and recycle two tonnes of CO₂ a year.



While this is not enough to make a dent in global carbon emissions, it is the beginning of a more efficient and reliable way for companies to source and generate their own CO₂ supplies.

CSIRO is conducting further research and development to get Airthena ready for market, as well as exploring cost reduction for small-scale use and a scaled-up system for large-scale industry use.

Growing the business of whole grain

In July 2013, the Grains & Legumes Nutrition Council established a voluntary code of practice for whole grain ingredient content claims (the code) on food products.

The code of practice is currently an experimental voluntary approach, designed to provide guidance for whole grain claims, given the Australia New Zealand Food Standards Code does not currently regulate on-pack claims describing the amount of whole grain in foods.

The code included cut-off values and suggested wording per manufacturer serve (such as 'contains', 'high' and 'very high' in whole grain), based on a 48g whole grain daily target intake.

In August 2019 an impact assessment reported on the uptake of the code by manufacturers, changes in numbers of whole grain products, and

claims on-pack since 2013, including compliance.

The assessment was undertaken in August 2019, comparing current registered manufacturers ('users') and their products to the total number of products in the market deemed eligible for registration through The Grains & Legumes Nutrition Council product audits since 2013.

Reporting included breakfast cereals, bread products, crispbreads, crackers, rice and corn cakes, rice, pasta, noodles, couscous, other grains including quinoa, buckwheat and freekeh, and grain-based muesli bars.

The impact assessment found, as of 30 June 2019, there were 33 registered users and 531 registered products in Australia and New Zealand. This represented 43 per cent of the eligible manufacturers and 65 per cent of the eligible whole grain foods.

Three-quarters of the eligible breakfast cereals and bread products were registered with the code in 2019, followed by 62 per cent of grain-based muesli bars. Only 39 per cent of crispbread, crackers, rice/corn cakes and rice, pasta, noodles, couscous and other grains were registered.

From 2013 there has been a 71 per cent increase in the number of whole grain foods making claims, demonstrating strong uptake by industry with clearer, more consistent and compliant on-pack communication regarding whole grain content.

The full impact assessment can be downloaded from www.mdpi.com by searching for 'Growing the Business of Whole Grain in the Australian Market: A 6-Year Impact Assessment'

Nicole Sparshott takes on Unilever ANZ

Unilever has appointed Nicole Sparshott as chief executive officer of Unilever Australia and New Zealand (ANZ). This follows former CEO Clive Stiff's decision to retire after eight years in the role and 34 years in fast moving consumer goods.

Ms Sparshott, formerly chief executive officer of Unilever's speciality teas business T2, will retain leadership of the T2 business as Global T2 CEO in addition to her role as CEO for Unilever ANZ, commencing in April 2020.

Ms Sparshott brings deep experience across general management, brand development and marketing, combined with a passion for purpose-led business. She joined Unilever ANZ in 2006 as marketing director for foods, ice cream and beverages, before moving to Singapore to take up various

leadership roles in the refreshment business across Asia.

Following Unilever's acquisition of T2, she was appointed CEO T2 in 2016. She has since accelerated the business through market expansion, channel diversification and driving transformation across the value chain to enable its recently awarded B-Corp accreditation.

Prior to joining Unilever, Ms Sparshott held multi-market roles at P&G, The Coca-Cola Company and advertising agency George Patterson. She also serves on the boards of WWF-Australia and Global Sisters.

Ms Sparshott started her Unilever career in the ANZ business and is pleased to be returning to Australia for the new role.

"Consumer trends and preferences are evolving rapidly, providing brands with an opportunity to be



more innovative and dynamic than ever before," Ms Sparshott said.

"By leading Unilever ANZ during a period of significant change, Clive has laid a strong foundation of agility in the business, paving the way for our next stage of growth in this market," she said.

Arnott's appoints George Zoghbi as new CEO

Arnott's has appointed Mr George Zoghbi as the company's new chief executive officer.

Mr Zoghbi's appointment follows Arnott's acquisition from the Campbell Soup Company by global investment firm KKR in December 2019.

Mr Zoghbi returns to Australia from Chicago, where he was serving as special adviser and board director at Kraft Heinz. He also served on the board of directors of the global supply chain and logistics company Brambles.

His career began with Kraft in 2007, running its Australian and New Zealand operations. He then relocated to the US in 2009 as president of cheese and dairy at Kraft. Mr Zoghbi was chief

operating officer of Kraft Heinz's US commercial business from 2015 to 2017, following stints in several other senior leadership roles.

Prior to joining Kraft, Mr Zoghbi held a number of roles with Fonterra Cooperative and George Weston Foods.

Mr Zoghbi said he feels privileged to be able to lead a company with such deep Australian heritage and a portfolio of such unique and iconic brands.

"I look forward to working closely with the team to continue the Arnott's tradition, as well as introducing new, innovative products and avenues for growth that will make the Company even more special for years to come," Mr Zoghbi said.



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Anne Astin awarded AM

Dr Anne Astin PSM AM was honoured in this year's Australia Day Awards.

Dr Astin received a Member (AM) in the general division of the Order of Australia for significant service to the dairy industry, and to food safety regulations.

She is a Fellow and past president of the AIFST from 2013 to 2016.

Dr Astin has been non-executive chairman of Dairy Food Safety Victoria since 2017 and was the inaugural chief executive officer from 2000 to 2011.

Among other accolades, Dr Astin was inducted into the honour roll of Women Victoria in 2010 and received a public service medal in the 2011 Australian Queen's birthday honours.



Chris Downs new crop and food science GM

Dr Chris Downs has been appointed as the new general manager for crop and food science at the Queensland Department of Agriculture and Fisheries.

His new role, which commences in April 2020, is based at the food and health sciences precinct at Coopers Plains in Brisbane.

Dr Downs has undergraduate and postgraduate qualifications in plant sciences and postgraduate qualification in management, international leadership training and governance experience in a range of research and innovation

organisations.

He has held executive roles in New Zealand and Australia with a focus on strategic science leadership and industry engagement in agri-food research and innovation. He is passionate about ensuring the outcomes from science are adding value to industry and benefiting the environment, people and communities.

Dr Downs sits on the board of the AIFST, the Institute of Food Technologists in the USA and High Value Nutrition in New Zealand, and is also a Fellow of the AIFST.



Christine Giuliano appointed commercial director at Kerry

Christine Giuliano has been appointed commercial director ANZ at Kerry - The Taste and Nutrition Company.

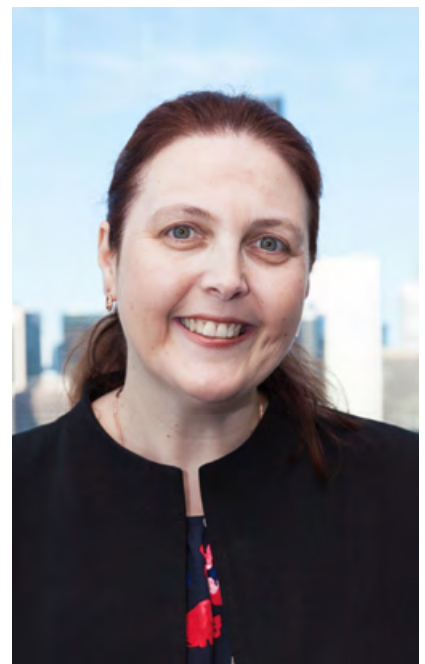
Leading the commercial team, Ms Giuliano will be focused on leveraging the breadth of the Kerry Group portfolio of products and technologies as it transforms to a full-service solutions provider for the food, beverage and wellness industries 'Inspiring Food, Nourishing life'.

"It's great to be joining Kerry at such a pivotal time as the business expands into new market categories, and builds upon its well established technical expertise providing innovative opportunities for our partners to grow," Ms Giuliano said.

Prior to joining the team at Kerry,

Ms Giuliano has held senior executive positions including chief operating officer at Natures Care, Australia's fourth largest complementary medicines manufacturer, managing director of Naturex Australia (now a part of Givaudan), the world leader in natural ingredients and botanical extracts, and managing director of Kingfood Australia (now KF Specialty Ingredients).

Ms Giuliano holds a Bachelor of Applied Science in Food and Nutrition and is a graduate member of the Australian Institute of Company Directors (AICD). She is also a professional member of AIFST, a member of Complementary Medicines Australia and a non-executive board director at the Fight Food Waste CRC.



Mary Sharma takes R&D expertise to OzScientific

Mary Sharma has been appointed chief executive officer at OzScientific, where she will provide R&D advice to the Australian and global food industry. Ms Sharma has more than 25 years of food industry, technical and corporate leadership experience in New Zealand, Denmark, Ireland and Australia.



Ms Sharma was previously at Goodman Fielder where she was Australian Head of R&D for five years. Her previous roles at Goodman Fielder include grocery R&D director and various innovation manager positions. Prior to joining Goodman Fielder, she held R&D roles at Lion Dairy and Drinks and Fonterra in New Zealand.

OzScientific is a food innovation, R&D and technical services company helping big and small dairy and food companies with their innovation, product development, market intelligence, ingredient functionality analysis and food processing.

Robin Sherlock appointed principle science officer

Robin Sherlock began a new role as principal science officer with Safe Food Production Queensland in March.

Ms Sherlock will lead the regulatory agency's science team, which helps ensure the agency's activities are evidence-based, and strengthens their scientific contribution to food safety practices.



Ms Sherlock will be responsible for providing scientific analysis and advice to inform the development, implementation and evaluation of policy, food safety schemes and proposals.

Ms Sherlock said "I'm looking forward to supporting the agency as it engages with their stakeholders and works to further shape best practise policies to support a robust food safety culture in Queensland."



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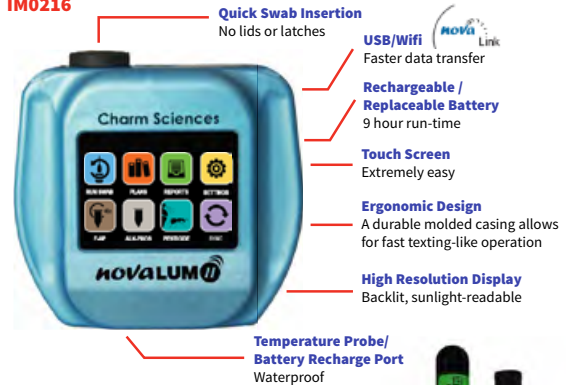
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The NZOZ sensory and consumer science symposium

Words by Dr Gie Liem



The Symposium was attended by professionals from food companies, research agencies, retail, ingredient suppliers and universities.

Can you perceive a taste just through the coldness of an object? Can you bypass complicated sensory testing with a rapid method? These and many more questions were answered during the 14th NZOZ sensory and consumer science symposium, in the leafy suburb of Eltham on Melbourne's northern fringe.

The three-day symposium was attended by professionals from food companies, research agencies, retail, ingredient suppliers and universities.

It originally started in 2006 as a small group of like-minded sensory scientists. Now, in 2020, it has grown to a group of more than 60 professionals who engage in open discussion about the advances, challenges and future of sensory and consumer science.

Professor Wender Bredie, from the University of Copenhagen, was invited as the keynote speaker for this year's NZOZ symposium, and he made a big impression on the audience with his discussion on the latest developments in sensory and consumer science.

Professor Bredie explained the importance of sensory and consumer science for the food industry, and told the conference "It is rather amazing what you all have put together" – an opinion that certainly counts, given he is one of the leading international scientists in the field.

Everybody who consumes food knows how important it is that food tastes good, but sensory science is about much more than just a nice taste.



Keynote speaker Professor Wender Bredie from the University of Copenhagen (right) with conference chair, Dr Gie Liem from Deakin University.



For example, sensory science can help wine makers who are worried that smoke from bushfires will affect the taste of their wines.

Damian Espinase Nandorfy, from the Australian Wine Research Institute, said there are ways to test this.

"When we know the chemistry of how smoke affects the taste of wine, we might be able to come up with a solution," Mr Espinase Nandorfy said.

"However, this comes with risks. Sometimes winemakers just trust their own palate for testing wine on defects, but that can be very risky as the winemaker might not be able to smell certain aromas," Mr Espinase Nandorfy said.

I was able to join an international group of sensory scientists from New Zealand, Australia, Japan and Denmark at a large round table discussion. The use of virtual reality and insights into what it can achieve in sensory and consumer science was another topic of

special interest for many participants.

Sensory and consumer science is a fascinating field. Participants at the symposium knew this, but convincing others is a common challenge. The symposium was filled with ideas and sharing of skills and knowledge and gave sensory and consumer scientists much to think about.

Hopefully, it might not take too long before more people will recognise the importance of sensory and consumer science.

To answer my earlier question: yes, some people can perceive a taste when a cold probe is placed on their tongue, and they are called 'thermotasters'.

Dr Gie Liem is Associate Professor sensory and consumer science at the Centre for Advanced Sensory Science, School of Exercise and Nutrition Sciences, Deakin University, and NZOZ conference chair. 1

AIFST summer school 2020



Our 2020 cohort ready to grow, learn and connect.

The AIFST summer school was established in 2011 as a face-to-face two day event supporting undergraduate, post-graduate and recent graduate students in food science and related disciplines, with more than 750 students involved since inception.

The objectives of summer school include helping students build professional food industry networks with their peers and exposing them to opportunities through food industry speakers who provide insights and advice on potential career paths.

Summer school provides attendees with inside information on careers in the food industry and gives them the opportunity to hear from speakers in areas of food science they have often not encountered in their lecture programs.

The 2020 AIFST summer school was hosted by RMIT University in Melbourne. More than 75 students were treated to a line-up of speakers who provided insights into the challenges food scientists of the future will face.

The opening keynote address was presented by AIFST fellow Deon Mahoney, head of food safety PMA Australia and chair of the AIFST Victorian branch. Mr Mahoney's topic was: "What will food science and technology bring to our future and how can we contribute?".



Summer school students visit to Carman's Kitchen.

Over the following days students heard from a diverse range of speakers on topics such as blockchain, food security, allergen management, traceability, alternative proteins, omics, gut health and sourcing humanely farmed food.

Students also heard from several foodies at different stages of their careers and will no doubt benefit from their wisdom and experiences. On day two, Carman's Kitchen hosted a group at their head office and Coles shared a retailer's perspective of food safety and quality.

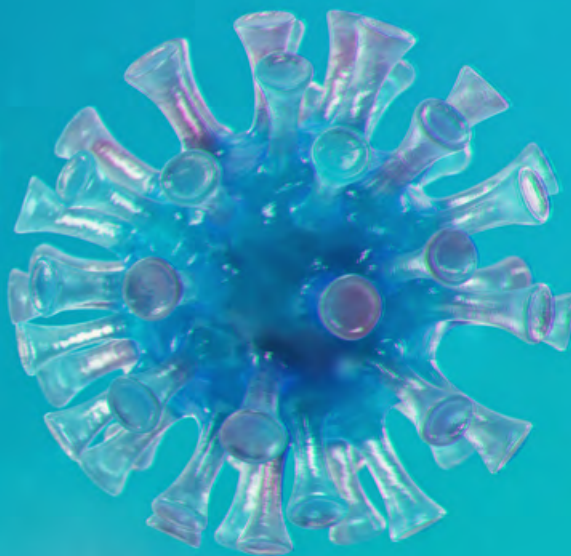
A big thank you to our sponsors - IFT, FAPIC, Coles, Carman's Kitchen, Halcyon Proteins, Australian Blending Company and Evolve Scientific Recruitment - all our speakers and to RMIT University for hosting the event.

Special thanks to Prue Bramwell and Tuyen Truong and the School of Science at RMIT University for assisting with organising the event.

Some feedback from attendees:
Had an amazing opportunity to hear about food challenges for the future, feeding the future and connecting with passionate students within the field!
(Bridget Chan)

Summer school has been very interesting and extremely insightful. On just day one we had great speakers with many years of experience and knowledge presenting about industry relevant topics such as: Industry 4.0, traceability, blockchain, vulnerabilities in supply chain, allergens, food waste, foodomics, microbes and health... and many other great topics. (Leonardo Bohorquez R.) 

Coronavirus (COVID-19) – what's the risk for food products?



Words by Dr Craig Shadbolt and Health Protection NSW

Should food business and consumers be worried about food safety linked to COVID-19? The short answer is 'no' - there is no evidence to suggest we should be concerned about domestic or imported food products.

The detection and spread of COVID-19 continues to dominate the media and shows no sign of slowing down, with a strong focus on social distancing and movement restrictions to 'flatten the curve' of infections and reduce pressure on health resources.

Increasing infections and fatalities worldwide have contributed to fear among the public about the level of risk associated with this novel disease. Confidence in the safety of imported food products and services has also been affected by misunderstanding of how the disease is spread, fuelled by misinformation circulating on social media.

What does COVID-19 mean for Australian food businesses and consumers?

There is no evidence in Australia, or anywhere else in the world, that COVID-19 is transmitted by food. Further detailed advice on this is provided by Food Standards Australia New Zealand (FSANZ) on their website. In addition to the measures already taken to prevent entry and spread of the disease, cooking and pasteurisation is sufficient to kill any virus particles that may be present on food.

For Australian businesses, other than maintaining current standards for health and hygiene, there are no additional actions or steps required to manage food safety as a result of the emergence of COVID-19.

The current Food Standards Code requirements for workers who may be suffering from a communicable disease (such as influenza, stomach bug, or

other condition), and supervisors or managers of employees, are clear and provide appropriate protection for consumers and businesses alike. Any worker suspected of being infectious should follow the advice of health authorities and self-isolate at home.


Where workers may be isolated at home due to recent travel or contact with an infected individual, employers are encouraged to support staff well, as isolation can be anxiety inducing and alienating. Practical help such as delivering groceries and phoning to check in can provide real support. At the end of a home isolation period, medical clearance is not required for people who have had no symptoms.

Maintaining a productive workforce

As there is no immunity to COVID-19 in the general population, it is reasonable to assume that infections will eventually occur among employees. Businesses should plan for this and take steps to minimise the impact of infected staff or contractors and the resulting effects on supply chains.

Practical examples include focused cleaning and sanitising of 'high-touch' points, such as door knobs, light switches and communal spaces in addition to food production areas. Enforcing social distancing measures and reducing staff interaction where possible are also important steps to reduce the impact of an infected employee. More information on this can also be found on the FSANZ and NSW Food Authority websites.

As is often the case, misconceptions about the spread of a disease, or blatantly false posts, on social media can distort the actual risk of infection, particularly from food. Consumers and businesses should take great comfort in the procedures and measures undertaken by health departments in Australia to keep the general public safe, and minimise the impact of COVID-19.

Dr Craig Shadbolt is Principal Food Safety Scientist, NSW Department of Primary Industries, Biosecurity & Food Safety. 



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Fighting food waste: ensuring a sustainable food future

Words by Dr Steven Lapidge



Fight Food Waste CRC Inaugural Annual Conference, KPMG Melbourne, November 2019.

Reducing Australia's annual 7.3 million tonnes of food waste will be key to building a sustainable food system, and it can also ensure we have a food system that is healthy, equitable and circular.

The Fight Food Waste Cooperative Research Centre (FFW CRC) brings together industry, researchers and the community to capitalise on Australia's food waste opportunities. Winning this fight could save Australia \$20 billion per annum in lost food and increase industry profitability, sustainability and food security.

Through our three research and development programs, the FFW CRC aims to reduce food waste across the supply chain, transform unavoidable waste into valuable products, and engage with industry and consumers to create change.

In line with the United Nations sustainable development goals, Australia (through its National Food Waste Strategy) has a target of halving its food waste by 2030. Although this will undoubtedly be a

substantial challenge, the good news is this challenge is solvable by treating food waste as an opportunity – using it as a resource within food businesses and households.

Here in Australia, our journey to reduce food waste is in its early days. We can learn from others and consider what is relevant for the Australian context. For example, the Courtauld Commitment, run by our program's UK-based participant Waste and Resource Action Programme (WRAP), signs up businesses to tackle their food waste issues.

Collectively, the WRAP project has generated a 27 per cent reduction in food waste with a value of £4.7 billion between 2007 and 2018, worth more than \$AU9 billion. WRAP has made this happen through national behaviour change programs like Love Food Hate Waste and Guardians of Grub. It is programs such as these that will help fix our global food system, while at the same time address food waste-related climate change.

Australians are becoming

increasingly aware of the impacts associated with food waste. The FFW CRC recently launched findings from a 5,000-household national survey. These results showed 76 per cent of Australian households were motivated to reduce their food waste, with over half predominately motivated at the thought of saving money.

The survey also showed while Australians prepare an abundance of extra food 'just in case', well over half of Australian households would usually freeze excess food to extend its shelf life. Understanding this household behaviour provides an opportunity for those in the food industry to improve food labelling and packaging which, in itself, could become a competitive advantage for food businesses.

There are some fantastic industry examples already here in Australia of action being taken to reduce food waste. FFW CRC participant Woolworths launched Loafer Ale in September 2019. In this project, surplus bread is brewed with hops,

barley and yeast. Each bottle includes one slice of bread waste, so Australians are helping to reduce food waste by drinking the problem away! Additionally, the beer has been raising funds for Feed Appeal, a not for profit organisation supporting local charities that deliver food relief programs and meals to vulnerable Australians.

The often-forgotten aspect of food waste is the squandering of natural resources including water, arable land, fertilisers, energy, and fuel for transport - all utilised in producing food we don't eat.

At a time when our country is being ravaged by fire and drought, wasting natural resources on food we don't eat should be considered completely unacceptable. What's more, the three million tonnes of food waste rotting in landfill each year in this country creates greenhouse gas emissions equivalent to one million extra cars on the road, further exacerbating climate change. Given 92 per cent of household food waste ends up in landfill, reducing this waste is one way all Australians can contribute to a more suitable climate in the future.

Of course, reducing food waste is not just about protecting our precious resources. Australian farmers currently produce enough food to feed 60 million people each year. Despite this, the Foodbank 2019 Hunger Report identified that one in five Australians are food insecure.

Again, this is an unacceptable scenario in the 'lucky country' and one that all companies in the food industry should work hard to address. Importantly, reducing food waste is now seen as one of the most critical strategies to feeding a global population that will near 10 billion people by 2050.

Over our 10-year journey, we will work with our existing and new partners to deliver


a transformational change in the way industry, governments and the community manage food waste in Australia.

Already, the FFW CRC has more than 20 active research projects that are addressing food waste with both a commodity approach (transforming surplus horticulture, seafood, red meat and dairy) as well as a sector approach (with our packaging and processing industry partners, the food rescue sector, retailers and quick-service restaurants).

Additionally, the CRC's SME

Solutions Centre with Food Innovation Australia Limited specifically focusses on providing matching funding and unparalleled expertise to address food waste within small and medium food businesses. As such, we are looking to work with food businesses of any size.

For more information visit: fightfoodwastecrc.com.au.

Dr Steven Lapidge is the CEO of the Fight Food Waste CRC. 



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MATS pilot plant control systems. Dr Lan Bui. Defence Science and Technology. Scottsdale, Tasmania

New opportunities for non-refrigerated ready meals

Words by Dr Roger Stanley

While the nutritional quality of canned and frozen foods is similar to that of fresh, the eating quality is compromised.

The extended thermal processing required to make a canned food sterile negatively influences the nutritional profile and fresh taste qualities. Frozen foods suffer ice crystal damage and slow oxidation that also degrades their fresh taste qualities, with thawing times adding an inconvenience factor.

Consumer demand has fostered the rise of alternative fresh chilled and fast food technologies that can deliver high levels of convenience and a better eating experience. However, such foods have a limited shelf life of hours to days and need to be kept either hot or cold to prevent the risk of microbial spoilage and pathogen growth.

Meeting consumer needs for convenience and quality in ready

meals is also challenging when food distribution systems involve road travel over large distances, as happens in Australia. Meeting the needs of international markets is even more demanding, with extensive logistical and biosecurity issues facing the transport of fresh chilled foods.

Shelf stable sterilised ready-to-eat foods therefore have significant potential advantages if the logistical, nutritional, taste and texture qualities can meet the desires of consumers.

Food preservation by canning was originally developed in the early nineteenth century so the military could supply foods during field campaigns. Canned vegetables, fruits and meats can still be found on supermarket shelves as cheap and often imported products.

The major development in canning has been the use of plastic instead of glass or metal containers. This

technology was enabled by the invention of 'over-pressure retorts' to prevent the sealed plastic pouches from exploding due to internal steam pressures, and by the invention of metalised plastics as a thin but highly efficient barrier to oxygen and water vapour.

Non-refrigerated heat-and-eat foods in pouches are now seeing a resurgence in sales as consumers increasingly opt for convenience. The need to microwave reheat pouches and trays of ready meals has driven the development of new generations of thin multi-laminate barrier films transparent to microwaves.

However, high food quality, specifically the retention of freshly cooked food flavours and textures, is a requirement for the eating experience to match that of freshly prepared home, restaurant or on-demand fast food products.

The rise of rapid sterilisation processes for ready meals

Improvements in food technology seek to bridge this gap. Rapid retorting and pressure assisted thermal sterilisation (PATS) technologies are approaches under development to improve shelf stable ready-meal qualities.

The fundamental issue that limits the quality of heat-sterilised foods is the time needed to guarantee that all the food has reached the time-temperature exposure required to absolutely destroy any possible level of spoilage or pathogenic organisms.

The point of slowest heating, termed the 'cold spot' in a thermally treated food product, is generally in the middle of the container. For liquid foods, the time required can be minimised by mixing the contents in a flexible pouch or rotating the can with a gas bubble during retort sterilisation.

For solid foods, where heat penetration is dependent on the heat conduction, long heating and cooling times of up to 200 minutes are required for conventional retort processes. In this scenario, the food near the outside of a container can receive up to 20 times the heating compared to the centre of the container, leading to degradation of textures, flavour and nutrition.

PATS is essentially a batch process and uses extreme pressures of 500-900 MPa and 90-120°C temperatures for up to five minutes, to achieve sterilisation. High pressure leads to 'adiabatic heating' which allows volumetric heating and cooling without relying on conductive heat processes. However, engineering developments over two decades are yet to deliver routine PATS processing production plants.

Microwave heating has also long held promise as a way to improve volumetric heating of foods to shorten processing times.¹ Many commercial systems have been developed (originally by Alfa-Laval scientist Lennart Stenstro in the 1970s) to sterilise foods by a combination of microwave energy, pressurised hot water and steam within a sealed



MATS pilot plant pre-heating, microwave and cooling sections. Defence Science and Technology. Scottsdale, Tasmania.

microwave permeable pack.

Foods were sterilised in packages using surrounding hot water to prevent edge burning at the corners due to microwave overheating. While these microwaved foods were produced and marketed commercially in Sweden, production of machines was commercially abandoned in the 1980s because they were unable to meet the regulatory standards of the US FDA for low acid retort processes.

However, the potential of microwave assisted continuous thermal pasteurisation (MAPS) and sterilisation (MATS) of packaged foods was successfully established. Improvements in packaging, computer control and validation of the processing technology, and the development of clearer regulatory pathways, are now starting to meet the growing market needs for sterilised ready-to-eat meals.

MATS technology basics

To achieve rapid sterilisation under controlled thermal conditions, the MATS unit is a retort pressure vessel with three chambers separated by pressure gates. The sealed trays or pouches of food are transferred through the vessels on a carrier that is submerged in superheated water under pressure and temperatures up to 130°C.

The carriers are linked to a chain drive mechanism with computer control for the movements through the chambers and under the 922 MHz microwave horn to provide the additional energy for internal volumetric heating. The food is

subjected to heating, typically at temperatures between 121°C and 124°C for five to 12 minutes, then transferred to a cold water vessel to arrest the thermal process and allow removal from the retort.

The rapid, accurate, controlled heating and cooling is the key to the ability to retain food flavours during the sterilisation process. Nevertheless, each product application needs to be monitored, and the packaging, formulation and heat treatment optimised for temperature uniformity in response to the microwave and the thermal process conditions.



Meals for MATS sterilisation. Defence Science and Technology. Scottsdale, Tasmania.

MATS processing developments for Australia

The military needs for nutritious, high quality, long shelf life foods not requiring refrigeration has not changed much from the original invention of canning to supply Napoleon's army. Shelf stable foods need to be available when fresh foods are not.

The development of a new MATS technology, based on a unimodal standing wave microwave system, operating at an electromagnetic frequency of 915 MHz, was undertaken by Washington State University in the early 2000s. It was initially supported by the US Department of Defence to provide routes to improved retorted foods for field operations.

The technology has since been commercialised through 915 Labs to build pilot testing and commercial production machines. In 2016, following a feasibility study, Australia's Minister for Defence announced a catalytic investment in MATS technology for work to be carried out at the Defence Food and Nutrition Centre in Scottsdale, Tasmania, in a Centre for Food

Innovation collaboration between DST, the University of Tasmania and CSIRO.²

A MATS B 100 pilot plant from 915 Labs was installed and commissioned in 2018 for research on ready meals for dual defence and commercial applications. The next phase of the development will seek commercial leadership for the establishment of an initial MATS production machine.

The first generation of industrial machines, processing up to 42 meals per minute, have already been commissioned internationally, and a lead MATS Australian development is sought to enable local industry to develop new products and new markets.

Market applications for non-refrigerated meals

Supermarkets in Australia are rapidly adopting strategies to provide more ready-to-use or ready-to-eat products to counter the rising consumer spend on fast foods and associated delivery systems like Uber Eats. However, in this context, chilled MAPS products are more appropriate for most users.

Applications where MATS shelf

stability of at least 12 months is a potential advantage include:

Convenient home meals and food reserves

Canned staples, such as beans and fruits, are back-of-cupboard food reserves in most households. Improved ready-to-use and ready-to-eat meal quality enables more options and greater use of shelf stable foods as a primary meal choice, which aligns with an increasing trend where apartments and rooms are only equipped with a microwave heating option.

Institutional and hospitality industry

Centralised preparation of food service meals or meal components for distribution to airlines, restaurants, cafes, hospitals and aged-care facilities is an area where shelf stability has advantages. Centralised logistics, quality control and nutritional management systems enable cheaper and more efficient operations.

Foods distributed to user facilities are subsequently re-heated, plated with any fresh food accompaniments and served at the point of use. Long shelf life, non-refrigerated meal components combined with centralised processing and distribution minimises the need for refrigeration capacity and the out-of-hours shift work for just-in-time preparation.

Military, remote and emergency or contingency needs

Military, emergency and remote situations such as on-board vessels, oil rigs and in remote mines and research stations are markets that need extended shelf life foods to minimise energy requirements and assist in meeting demand surges for food without increased preparation capacity.

Extreme and technology challenging applications are space foods, for example the Mars mission where a five-year shelf life is being targeted by NASA to establish advanced food caches. More locally relevant examples are food caches

for disaster relief applications where refrigeration is not available, or contingency food supplies such as institutions and hospitality where provision has to be made for failure of the normal food production and supply.

e-commerce food distribution systems

The logistics of product delivery are rapidly changing as online marketing platforms allow direct business to consumer sales channels. Food is challenging for this system when refrigeration is needed, but shelf stable, high quality meals are very amenable. Additionally, sterile foods are largely exempt from intercountry biosecurity controls so that, for instance, shelf stable provenance origin meals could be exported direct to consumers who will pay for the credence values intrinsic to such products.

Challenges and future opportunities for shelf stable meal technology

The preservation of flavours and textures of heat treated and stored foods is an area of research responsive to the applications of high quality natural ingredients that compensate for any drops in quality during processing.

For example, the retention of fresh flavours, largely due to reduced biochemical odorants, offsets the need for salt, enabling the same eating experience from half the salt content compared to traditionally processed food formulations. Retaining and validating the packaging integrity of thin polymer barrier films during distribution and use to guarantee the absence of microbial intrusions is vital. Smart self-indicating packaging systems will be needed.

The use of plastic packaging also raises waste and recycling concerns. Recyclable high barrier PET trays are now being used. In terms of net environmental benefits, the disconnection of food supply from the energy hungry cold chain is a major offset as well as being a necessity in many potential export countries where reliable energy and cold chain systems do not exist.

Finally, the physical limitations of microwave penetration into foods currently limits the maximum product weight to around 2kg. Improved MATS designs should enable the maximum product weights to approach 6kg, better assisting the needs of many food service operations. Incremental developments in machine design and applications of this early stage equipment will improve the technology to potentially generate a radical shift from frozen and chilled to shelf stable food choices and altered distribution systems.

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Roger Stanley is Professor of food science and technology at the University of Tasmania and director for the Centre for Food Innovation. He is leading the RD&E development of a MATS microwave processing capability for Australian production. roger.stanley@utas.edu.au

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Feeding Global Megacities

What are the best and most sustainable options for addressing the food supply challenges that await as the world's population soars and becomes increasingly urbanized?

BY DALE BUSS

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Countless efforts to feed the global megacities of tomorrow are breaking out all over the world. Scientists are teasing meat production from the lab. Hydroponic engineers are removing the requirement of soil for nurturing plants. Silicon Valley entrepreneurs are applying digital legerdemain to micro-regulate agricultural inputs. Urban farmers in cities ranging from Detroit to Dallas to Mumbai are scratching out plots for growing produce. Food waste activists are turning over every wasted onion to salvage the many that are still good enough to eat.

But will all of this, and more, be enough to sustain a human population that is expected to soar by another two billion people or more before peaking out at about 10 billion individuals around mid-century, as they increasingly pack into already dense urban areas and put stress on the food system that it never before has experienced? And will all this occur as agricultural production drops by as much as the one-quarter that some predict, due to climate change? Success is a vague and perhaps elusive—yet necessary—goal.

“Millions of farmers, companies, consumers, and every government on the planet will have to make changes to meet the global food challenge,” says Andrew Steer, president and CEO of the World Resources Institute.

The biggest urban centers, of course, will determine whether gaps can be overcome. “Cities can play a pivotal role as catalysts for growth in the system transition,” says Merijn Dols, senior director of open innovation and circular economy for food at Danone. “They can become much more than just aggregators of material and consumption because they’re actually also aggregators of demand and nutrition and ingredients.”

Encouraging Indicators

There are reasons for optimism. They include the fact that American consumers now purchase food products that rate “Great” on the HowGood scale by about 30% over products that rate only “Good” in the Brooklyn, N.Y.–based company’s system that utilizes 126 metrics to come up with sustainability scores. “We see significant uplift when the impact of our food purchases becomes more transparent,” Dols says. “People with money at the shelves vote for the world they want.”

As Dols puts it, “The world needs a system shift, not just addressing waste at the back end but also toward designing and developing products that have both a positive economic and social impact by design.”

This is an excerpt from the article “Feeding Global Megacities” by freelance writer Dale Buss, which appeared in the November 2019 issue of Food Technology magazine.



Read the complete article at ift.org/feedingmegacities

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Plant-based meat: weighing the evidence in a flexitarian age

Words by Alexandra Locke and Dr Sara Grafenauer



The food we eat is inextricably linked to our own human health, as well as the health of the environment, with data showing a greater impact from meat-based diets on our planet than plant-based diets.

But consumers don't have to resort to the strictures of a vegetarian or vegan diet, as might seem the case with 'plant-based' and 'flexitarian' becoming the latest buzzwords in good nutrition. Despite this shifting focus, meat consumption is still at an all-time high with many countries exceeding recommended intakes.¹

The Australian Dietary Guidelines recommend a maximum of 455g of red meat per week, with higher meat intakes linked to increased risk of colorectal cancer, all-cause mortality and cardiovascular disease.² The most recent National Nutrition and Physical Activity survey indicates that Australians are consuming an average of 157g of meat, of which 57g is red meat (per capita).³

With a wide variety of consumers now looking to enjoy a more plant-based diet for ethical, environmental or health reasons, an increasing focus on plant proteins has created an opportunity for food industry. In recent years this has translated to innovation in plant-based meats, with the global market recording a 114 per cent increase in the number of plant-based meat product launches, according to Mintel's Global New Product Database.⁴

In Australia, this focus is set to continue to pay off for those investing in the space, with a 2019 report by CSIRO estimating the size of the

domestic and export markets for alternative proteins at approximately \$4.1 billion and \$2.5 billion respectively, by 2030.⁵

With varying ingredients being used in the plant-based meats now on supermarket shelves, it's important to recognise that there are huge differences in the nutritional profile of each product when compared with their animal-based counterparts and within their category.

A recent study conducted by the Grains & Legumes Nutrition Council (GLNC) in Australia, published in the journal *Nutrients* in 2019, highlights these differences.⁶ One such difference is the tendency for plant-based meats to be lower in kilojoules than animal-based varieties, with significant differences seen in sausages and mince.

A similar variance in the favour of plant-based products was also observed in total and saturated fat, with significant differences for burgers and sausages. And, as expected, plant-based meats were higher in carbohydrates, sugars and beneficial dietary fibre.

Sodium can be a problem in many traditional processed meats, but the study data showed the reverse was true, with sodium in plant-based meat approximately six times higher than in traditional meat mince. Analysis of the total data revealed that just four per cent of all plant-based meats were low in sodium, highlighting a consistent trend within the category and a need for firmer guidelines to ensure consumer health is protected. There are anomalies, however, with animal-

based meat sausages containing 66 per cent more sodium than plant-based varieties.⁶

Many people associate diets lacking in animal-based meats as low in iron, a nutrient critical for carrying oxygen to tissues, yet this data showed no difference in the iron content of plant-based meats compared with meat mince or sausages.

Iron levels reported on pack were similar across all plant-based meats at around 3mg to 3.9mg/100g, yet only a fifth of products were fortified, highlighting the need for consumers to examine the nutrition information panel. Products made with whole grains and legumes may be naturally higher in iron, but these ingredients were not widely used, with only eight per cent utilising whole grains (n=11) and just 35 per cent featuring legumes (n=48), a surprising result for this category.

Vitamin B12 is another nutrient often at risk for vegetarians and those eating few animal-based meats, with very low levels potentially leading to irreversible neurological damage. This study showed fewer than a quarter of products (24 per cent) were fortified with vitamin B12, and even fewer fortified with zinc at just 18 per cent.

Currently, national food standard regulations do permit fortification where products contain no less than 12 per cent of energy from protein per 100g, and a minimum of 5g protein per serve. Almost all the products audited by GLNC met these requirements (82 per cent, n=113) permitting maximum claims (per 100g) of 0.16mg thiamin (15 per cent),

0.26mg riboflavin (15 per cent), 5.0mg niacin (50 per cent), 0.5mg vitamin B6 (30 per cent), 2µg vitamin B12 (100 per cent), 3.5mg iron (30 per cent), 4.4mg zinc (35 per cent).⁷ Folate (to 10 µg) and magnesium (to 26mg) can be fortified, but no claim can be made.⁷

The plant-protein trend is predicted to continue well into 2020 and beyond and, if adopted, may represent a 'win-win' for our health and the environment.

However, this study highlights the difficult balance all plant-based products must achieve in order to offer similar levels of nutrients as traditional animal-based meats, with Australian data showing many products are still falling short of essential nutrients.

Based on these findings, GLNC is calling for more guidance in the development of plant-based meats, alongside input from nutrition

professionals to ensure consumers can make healthy choices at the supermarket shelf.

Despite the innovation underway in this exciting new area, the data also suggests the food industry should be focusing on inclusion and promotion of both whole grains and legumes, for meat-eaters and non-meat-eaters alike, and paying strict attention to sodium levels.

Read the full 2019 audit paper here: <https://www.mdpi.com/2072-6643/11/11/2603/htm>.

Acknowledgement to Ms Felicity Curtin for her work on the published paper.

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About GLNC

GLNC is a not-for-profit health promotion charity focused on promoting evidence-based health and nutrition benefits of grains and legumes, as part of a balanced diet.

Dr Sara Grafenauer is general manager and Alexandra Locke is marketing and communications manager at the Grains and Legumes Nutrition Council.

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AIFST Annual Convention

Words by Dr Martin Palmer

In his history of Australian food science and technology, *To Feed a Nation*, published in 2005, Keith Farrer expertly charted the progress of the Australian food industry over the previous 200 years. Farrer highlighted key technological advances and the increasing importance of science-based innovation in both agriculture and food processing.

The picture was generally one of steady, incremental growth, spurred on by both necessity and opportunity. In global economic terms, much of this time corresponded to the Second Industrial Revolution – a period associated with highly standardised mass production and the extensive adoption of electrical power, chemical technologies and science-based innovation.

In the late 20th Century, economists began referring to the Third Industrial Revolution – a new period of accelerated industrial growth, associated with the development of new energy sources, computing systems and digital communication technologies.

Then in 2015, leaders of the World Economic Forum, acknowledging the dramatically increasing pace of

scientific advancement, technological development and innovation, proposed the dawn of a new, Fourth Industrial Revolution (4IR).

Revolution or not, it's clear we are experiencing a remarkable period of technological change, as well as unprecedented social, environmental and economic challenges.

Driving much of this revolution, the new digital world of 'Food Industry 4.0' presents us with an impressive but sometimes bewildering array of technologies, such as distributed ledgers, artificial intelligence, robotics, ubiquitous linked sensors, machine learning and quantum computing.

Significant new scientific developments are also occurring in fields such as gene editing, 3D printing, synthetic biology, energy capture and nanotechnology, which clearly have the potential to impact on future food production and processing systems.

The theme for this year's AIFST Annual Convention – *food science revolution - building a sustainable food future* acknowledges the significant challenge now faced by the food industry in assessing the opportunities and risks presented by these exciting new developments.


Much of the program will be devoted to discussion of these topics, with the aim of helping participants to judge the business fit, sustainability, readiness level and disruption potential of these technologies, and to make informed decisions around research and technology investments.

The Convention will also include sessions on food safety, food waste, sustainability, Australian native foods, food security and sustainability, sensory science and nutrition plus the AIFST awards.

In these uncertain times it has never been more important to discuss the need for a food science revolution.

In the spirit of embracing technology, this year's Convention will be virtual. I encourage all AIFST members to get involved.

Please direct any questions regarding the new virtual AIFST Annual Convention to aifst@aifst.com.au or watch for updates on the AIFST website or social media channels.

Dr Martin Palmer is Enterprise Fellow, Food & Agribusiness, Melbourne School of Engineering, The University of Melbourne. 



Protecting our pigs from African swine fever

Words by Dr Sarah Britton

African swine fever (ASF) is a highly infectious animal disease affecting pigs. It has been moving through South East Asia and has more recently been observed in Timor Leste (formerly East Timor), Indonesia and Greece.

ASF is not a threat to human health. It is not the same disease as Swine Flu or 2019 novel coronavirus (COVID-19). While ASF cannot be transmitted to humans through contact with pigs or consumption of pork, it is deadly for pigs.

ASF is caused by a highly pathogenic virus which has no vaccine, no cure, and is spread easily from pig to pig through contaminated pig feed, and from farm to farm through farm workers, machinery and soil. It causes pigs to develop a severe fever which impacts multiple body systems. Lethargy and death normally follow within a week. In affected pigs, mortality rates are up to 100 per cent, and ASF can survive in infected food products for months.

To put ASF in perspective, more than a quarter of the world's domestic pigs died in 2019. In China, which has close to 50 per cent of the world's domestic pig population (approximately 400 million pigs), half of these either died of ASF or been killed to stamp out the

disease. This indicates that if ASF enters Australia, it is certain to cause serious production losses to the \$1.3 billion Australia pork industry.

While ASF is not a public health or food safety issue, the food industry plays an important role in preventing the potential spread of the disease.

Preventing the spread of ASF

Don't swill feed

The practice of feeding food scraps containing meat (otherwise known as 'swill') to pigs is well recognised as a significant risk factor for the introduction and spread of many emerging animal diseases, including ASF.

In NSW, prohibited pig feed ('swill') includes any mammalian meat, meat products and illegally imported dairy products not of Australian origin, or anything that has come into contact with mammalian meat or meat products. This includes supplying any food waste as feed intended for pigs in containers that have previously held meat. ASF can survive in infected food products for months.

It is illegal to feed swill to pigs in all Australian states and territories. This includes allowing or directing another person to feed swill to pigs, or allowing pigs to have access to swill.

Correct disposal of food waste

Businesses that prepare and/or sell meat and meat products have a responsibility to dispose of food waste appropriately.

Cafés, supermarkets, green grocers and food retail outlets (including bakeries), festivals, community events, garbage sites and garbage from residential areas (table scraps) should be securely disposed of in the correct bins.

Restrictions on pork products from overseas

Pork meat and pork meat products from overseas, especially Asia and parts of Europe, have the potential to introduce ASF to Australia. All legal imports of pork products have been stopped for countries currently impacted by an ASF outbreak.


Biosecurity checks at Australia's borders have increased, including heightened screening for pork products at airports and mail centres. Under recent changes to Australian migration law, tougher penalties are also now in place for passengers who breach the federal Biosecurity Act 2015 by failing to declare high-risk biosecurity items.

Collaboration between government, industry and the community is helping to ensure the 'don't pack pork' messaging is adopted nationally to further reinforce the seriousness of the breach and help prevent the spread of disease.

Report immediately

ASF is notifiable in Australia, meaning any suspected cases need to be reported immediately. Contact the 24 hour Emergency Animal Disease Watch Hotline on 1800 675 888 if you suspect or have evidence of ASF.

For more information about African swine fever, please visit the NSW Department of Primary Industries website.

Dr Sarah Britton is NSW Chief Veterinary Officer, NSW Department of Primary Industries. 

The Australasian Recycling Label program – get on board

Words by Nerida Kelton



Examples of ARL on pack.

More than 300 companies have re-designed their on-pack labelling to incorporate the Australasian Recycling Label (ARL) since the program was launched in 2018.

The ARL program was originally designed to ensure consumers can understand the true recyclability of all packaging components that are disposed of in Australia and New Zealand. More than 10,000 individual products now use the ARL on-pack, with more businesses signing up to the program every day.

The companies come from a broad range of industries and include early adopters and big names such as Nestlé, Officeworks, Australia Post, Blackmores, Unilever, Coles and Woolworths, with more ready to go with their next product or packaging change.

What is the Australasian Packaging Recycling Label Program?

The Australasian Packaging Recycling Label Program is a labelling program that provides designers and brand owners with the tools to help consumers understand how to correctly dispose of packaging.

Led by Australian Packaging Covenant Organisation (APCO), in collaboration with Planet Ark and PREP Design, the program aims to significantly reduce consumer confusion, increase recycling recovery rates and contribute to cleaner recycling streams.

The two elements of the program are the Packaging Recyclability Evaluation Portal (PREP) and the ARL.

What makes the program unique is the PREP tool component, which provides packaging technologists and

designers with the correct information on whether their packaging format is recyclable in the majority of household kerbside collection systems and then how it will be handled and recovered by the Material Recovery Facilities (MRFs).

The PREP tool also indicates if there are other closed loop recycling systems that the majority (80 per cent) of the population has access to, such as 'soft plastic' which can be returned to a Coles or Woolworths store via the REDcycle program.

The PREP tool then works hand-in-hand with the second part of the process – the ARL program. The ARL symbol represents how the MRF recognises materials, inks, weight, shape, adhesives and how each component will behave in the recycling ecosystem in Australia and New Zealand.

The ARL is an evidence-based standardised labelling system that provides clear and consistent on-pack recycling information to inform consumers of the correct disposal method. As packaging is made up of separable components, each with differing recyclability, the ARL will identify each item as either recyclable, conditionally recyclable or not recyclable.

Using the datasets from the PREP tool, the ARL identifies the correct symbols to use on-pack for all components of the product, including the lid, tray, cap, bottle, box and film. It is not possible for a piece of packaging to have the ARL without a formal PREP assessment that backs up disposal claims.

The ARL symbols used on-pack in turn help consumers understand which packaging components belong in the recycling bin, or the general rubbish bin, or which parts should be returned to a Coles or Woolworths store through the soft plastic collection bins.

As consumers become more aware of the ARL symbols on packaging they will gain confidence in the program and recognise that labels are an important link to the current recycling capabilities of Australia and New Zealand.

The use of ARL symbols on-pack should also encourage consumers to become more active in disposing of waste correctly which will limit contamination in our waste streams and keep recyclable material out of landfill.

I for one get excited when I see the ARL on-pack, as I can finally understand which bin each component goes into and make a conscious effort to separate each material and put them in the right bin.

The ARL is certainly a step in the right direction to better educate consumers on true recyclability of materials and encourage improved consumer recycling behaviour. If your business has yet to sign on to the Australasian Packaging Recycling Label program, then we would encourage you to talk to APCO.



Recyclable: This label communicates to the consumer that the specific packaging component identified is recyclable at kerbside.

Conditionally Recyclable: This label communicates to the consumer there is another destination that allows recycling. The specific packaging component with this label either requires action for it to be classified as recyclable at kerbside, or it requires an alternate decision for recycling to occur. Examples of conditionally recyclable include labels that say 'crush bottle and replace cap', 'rinse and store drop off', 'only at transfer stations', 'flatten to recycle', 'scrunch into a ball', 'separate to recycle', 'place in used envelope', 'remove handles', and 'return to store'.

Not Recyclable: This label communicates that the separable packaging component is not recyclable at kerbside and needs to be disposed of with general rubbish.

AIP training

The Australian Institute of Packaging (AIP) have also developed a number of training courses that will greatly assist your Sustainable Packaging journey including 'Tools to Help you Meet the 2025 National Packaging Targets: PREP and ARL', 'Introduction to Sustainable Packaging Design', 'Lifecycle Assessment Tools for Sustainable Packaging Design', 'Flexible Packaging: Now and Into the Future', 'Plastics Technology: Introduction to Polymers and

Recycling', 'How to implement Sustainable Packaging Guidelines into your Business', 'Suitable, functional and sustainable labelling' and 'The Future of bioplastics and compostable packaging' which are run on a regular basis across Australia, New Zealand and Asia.

Nerida Kelton MAIP is executive director of the Australian Institute of Packaging (AIP) and a board member of the World Packaging Organisation (WPO).

Role of the dietitian in new product development

Words by Nicole Senior APD



New product development (NPD) is an important business growth strategy. In this era of health and wellness and enhanced scrutiny of the food sector, a dietitian/nutritionist is an important team player in the NPD process, either in-house or as a consultant.

How can dietitians help in a food business?

Most dietitians have high levels of food literacy, making them well suited to food industry settings. In other words, they are ‘foodies’ – they love food and enjoy cooking and eating. A core competency of dietitians is translating nutrition and food science to real world situations and creating practical food-based solutions. They have strategic and critical thinking skills.

New product development (NPD)

Developing new food products is a way to maintain an effective product mix and promote sales growth. The process can be conceptualised as the NPD funnel to reflect the idea that few ideas make it to launch after a vetting process (see figure 1). Dietitians can be involved in each stage from concept to launch. A dietitian can consult as needed in the NPD process as outlined in Figure 1.

Ideas, trends and insights

Dietitians can impart valuable food ideas, trends and insights because they work across both the consumer and scientific worlds. They regularly connect with consumers, health professionals, media and government / non-government organisations about

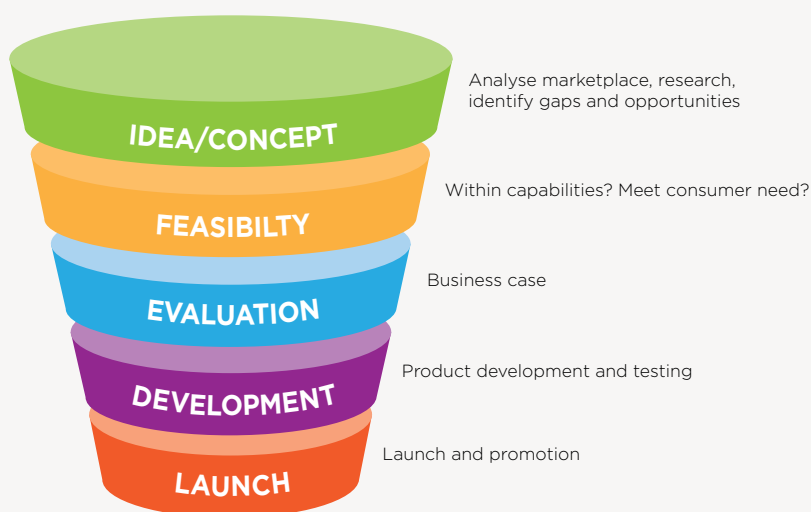
food and health.

Dietitians are informed about nutrition science research and can deep dive into consumer trends to sort fact from fiction, such as the low-carb phenomenon, plant-based eating or gut health. Health is a key driver of food choice, however, what is healthy can vary between individuals.

Nutrition personalisation of food is a global marketing trend and describes the consumer desire for food products that meet their personal nutrition, health and lifestyle needs. Dietitians can work with marketers to identify the target market for a new concept (such as the fitness or weight loss market) and develop appropriate food products.

More broadly, dietitians assist the food industry to create healthier foods, generally by increasing

Figure 1. The New Product Development Funnel



the application to FSANZ including a systematic literature review if required.


Dietitians can also help establish serving sizes and generate Nutrition Information Panels (NIPs), Health Star Ratings (HSR) for food labels, and develop recipes and advise on product usage. For example, how a food ingredient or meal component can be used to create a balanced meal or help meet the nutrition and health objectives of target consumers.

Launch

Dietitians work in collaboration with marketers and communication/advertising agencies to achieve promotional objectives. In the new product launch period, dietitians can assist with nutrition communications to ensure messaging is accurate and compelling and meets brand requirements.

Dietitians can communicate effectively to both consumer and professional audiences. Consumers are increasingly seeking engagement with nutrition experts and/or health influencers and dietitians can fulfill this role. Consumers are also seeking lifestyle advice beyond the food label and dietitians can develop accompanying diet and lifestyle advice to support a brand or product community.

If health professionals are an important influencer group for the brand or product, dietitians can help reach them too.

Nicole Senior is an experienced Accredited Practising Dietitian (APD) and freelance nutrition consultant. 

Role of the dietitian in new product development

A dietitian/nutritionist is a scientifically trained, university educated nutrition professional who can translate nutrition science into action in different contexts, including food industry. A nutritionist may be a dietitian by another name, or a nutritional professional without the clinical training of a dietitian. You will find both groups working in the food industry. The roles of dietitians working in this setting are diverse and include regulatory compliance, policy development, nutrition research, safety and quality assurance, consumer and health professional communication and education, food service management, nutrition marketing and product and recipe development.

The Dietitians Association of Australia (DAA) is the leading professional body for dietitians and has an interest group for dietitians working in the food industry. Look for Accredited Practising Dietitians (APD) who have met DAA professional standards – the term APD is protected by law. The Nutrition Society of Australia also have a registered nutritionist program to ensure minimum education standards. Both these terms protect the public and employers as nutrition practice is unregulated in Australia.

beneficial ingredients such as wholegrains, pulses/legumes and fibre, reducing nutrients of public health concern, such as added salt and sugar. Dietitians can also incorporate environmental sustainability of food systems into their professional practice.

Is nutrition research available to substantiate the concept? What are the desired nutritional criteria for the finished product? If scientific research is required, dietitians can collaborate with appropriate nutrition researchers to demonstrate health benefits of an innovation.

Feasibility assessment

Dietitians put their translational research skills into action to answer questions about new concepts, such as, does it fulfil a consumer health need or solve a nutritional challenge?

Development

Dietitians can assist with regulatory compliance for nutrient or health related claims and ensure claims are fully substantiated. For 'high level' health claims, dietitians can prepare



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FOOD FILES

Words by Drs Russell Keast, Clinton Maleki, Gie Liem



Children and sugar

Children's food intake is closely related to what they like. For example, children's liking for sweet taste is reflected in the high percentage (between 16 to 26 per cent) of daily energy intake from added sugar. In comparison, adults, who generally have a lower liking for sweet taste than children, consume about 15 to 21 per cent of total energy intake from added sugar.

As is commonly known, repeated consumption of high-energy foods (often high in sugar and fat) increases the likelihood of becoming overweight. Parents, as the main food provider, play an instrumental role in the foods served to children. The foods parents serve might reflect the taste profiles parents like themselves. It would therefore be interesting to investigate the association between children and parents' taste preferences and the association with the weight status of both children and their parents.

In an observational study with 150 children aged eight to 15 years, and their mothers, Sobek and colleagues measured children's and parents' preference for sweet (in apple juice) and fat taste (in crackers) with a paired wise methodology, namely a choice between low and high sugar apple juice and a choice between low and high fat crackers.

The results suggest that, overall, children were more likely to prefer the sweeter apple juice. This is

consistent with many previous studies. No difference was found for the preference of fat in crackers, for which both children and mothers showed a higher preference for the fat version of the cracker.

Also, the hypothesised association between children and their parents, with respect to sweet and fat preferences, yielded no significant association. Interestingly, children's preference for the sweeter apple juice was related to a higher likelihood of being obese, where such association was not found for their mothers.

Preference for fat taste was not associated with the likelihood of being overweight in children nor parents. However, it needs to be said that by far the majority of children and adults (between 70 and 76 per cent) preferred the high fat cracker. Also, such fat preference for a single food might not be able to distinguish people who prefer fat in their general diet. Nor does such a test estimate the sensitivity to fat. Both measures are important when investigating the relationship between fat taste and the risk for obesity.

Interestingly, mothers' high liking for fat was positively related to the likelihood of their children being overweight. The authors speculate that mothers' high preference for fat might be reflected in dishes they prepare for the family. However, such interaction is highly speculative and needs further investigation.

This study investigated a potential

interesting relationship. Future studies focusing on sweet and fat taste dietary behaviour and fat taste sensitivity in both children and their parents are needed, to shed more light on this potential relationship.

Véronique Azaïs-Braesco, Diewertje Sluik, Matthieu Maillot, Frans Kok, and Luis A. Moreno. "A review of total and added sugar intakes and dietary sources in Europe." *Nutrition Journal*, 2017; 16: 6. Grzegorz Sobek, Edyta Łuszczki, Mariusz Dabrowski, Katarzyna Deren, Joanna Baran, Aneta Weres and Artur Mazur. "Preferences for Sweet and Fatty Taste in Children and Their Mothers in Association with Weight Status." *International journal of environmental research and public health*, 15 January 2020.

Mouth behaviour and texture perception

For certain foods, texture is the most important factor driving product 'liking' and 'preferences', with the textural relationship with liking forming an inverted U curve. This optimum texture varies by food type and, when consumers' expectations of texture are not met, rejection may follow.

Research in the area of oral processing has identified variations in chewing behaviours that may be an indicator of differences in food texture perception and consumer rejection of foods. The concept of various chewing behaviours has led to the development of mouth-behaviour group classification (chewers, crunchers, smoothers and suckers) in which individuals have idiosyncratic chewing strategies for different food textures.

In a study of 100 participants

aged 18 to 65 years, Kim and Vickers (2020) measured participants' mouth-behaviour, oral physiology parameters (saliva flow rate, chewing efficiency, maximum biting force and particle size difference threshold) and liking of different textures. The results suggested the largest proportion of participants were 'chewers' and 'crunchers' compared to 'smooshers' and 'suckers', which was consistent with previous studies.

Mouth-behaviour groups were hypothesised to relate to defined texture liking, however, no associations were found with a list of texture descriptors provided. This result may be due to the use of a questionnaire instead of sampling an array of different food textures.

In a similar study, Wilson et al. (2018) found 'chewers' and 'crunchers' utilise similar cyclical jaw movements when consuming Mentos, Cheetos, Twix and Shortbread. Further, the authors identified members of a mouth-behaviour group share similar chewing behaviours when presented with different textured foods. For example, 'smooshers' prefer manipulation of food using their tongue and upper palate, yet introduce significantly more chews compared to 'suckers', despite similar food manipulation processes.

Mouth-behaviour classifications may only represent an individual's preferred chewing behaviour, and individuals may alter their chewing behaviours depending on the food texture. Such alterations may be due to variations in oral-tactile sensitivity for optimal satisfaction when consuming food.

Future studies investigating the relationship between mouth-behaviour groups, oral-tactile sensitivity and food texture-liking are needed to shed light on this potential relationship.

Kim, S., and Vickers, Z. (2020). Liking of food textures and its relationship with oral physiological parameters and mouth-behavior groups. *Journal of Texture Studies*, 1-14. doi:10.1111/jtxs.12504
Wilson, A., Jeltena, M., Morgenstern, M. P., Motoi, L., Kim, E., and Hedderley, D. (2018). Comparison of physical chewing measures to consumer typed Mouth Behavior. *Journal of Texture Studies*, 49(3), 262-273. doi:10.1111/jtxs.12328



What is Kokumi?

Discovery of effective taste and flavour enhancers has multiple potential advantages for the food industry and public alike. For example, a flavour enhancer may allow a food producer to cut costs by decreasing the level of an expensive ingredient while also maintaining consumer acceptance of the product.

From a health perspective, a component like sodium may be able to be decreased while maintaining saltiness. So, an effective flavour enhancer is something worth searching for.

One that is gaining greater prominence is Gamma-glutamyl-peptides – small peptides that contain a γ -carboxyl group of glutamic acid at the N-terminus. Many of these compounds are naturally present in foods such as legumes, onions, mushrooms, cheese, fermented fish and yeast extracts. The interest in these compounds stems from the discovery that they have the ability to impart thickness, richness and so-called 'mouthfeel' in foods, as well as taste enhancement.

The adjective given to this class of compounds is 'Kokumi'. Only when kokumi compounds are added to a solution containing two or three kinds of basic taste substances can the kokumi taste be perceived. This is not a problem for foods as there are multiple tastes activated during consumption.

One recent study from Singapore investigated the influence of kokumi compounds in calorie reduced foods. This is an important area, as the thickness or richness experienced

in a food is often due to the energy contained within that food, and reducing the energy content results in a lack of richness.

A sensory panel examined beef broth with different levels of umami and kokumi compounds added (it was a kokumi yeast extract that was added). Descriptive analysis and a temporal check-all-that-apply approach were used to profile the broths. The study found there was no difference in the energy content of broths, but broths with a higher intensity of 'beef flavour', 'savouriness', 'body thickness', 'mouth-coating' and 'flavour aftertaste' were positively related to higher calorie ratings, illustrating the point that kokumi compounds effectively provide thoughts of energy density.

There are still many basic questions that need to be answered regarding kokumi compounds and their effective use in flavour enhancement. The research published so far is positive, and there will be many potential opportunities for the food industry to use kokumi compounds to enhance future foods.

Claudia S. Tang, Vicki W.K. Tan, Pey Sze Teo and Ciarán G. Forde (2020). "Savoury and Kokumi Enhancement Increases Perceived Calories and Expectations of Fullness in Equicaloric Beef Broth." <https://doi.org/10.1016/j.foodqual.2020.103897>

Dr Russell Keast is Professor and Dr Gie Liem is Associate Professor at the Centre for Advanced Sensory Science at Deakin University. Dr Clinton Maleki is an academic in the School of Exercise & Nutrition Science at Deakin University. ⓘ

Australian natives: new opportunities based on traditional knowledge

Words by Dr Heather Smyth and Dr Yasmina Sultanbawa



The UNICEF State of the World's Children Report has been published annually since 1980. In the most recent report, food and children's growth was the focus.

According to UNICEF's executive director, Henrietta Fore: "Good nutrition paves the way for a fair chance in life." In Australia, we can work to provide all our children with a fair chance through access to good nutrition, so they too can have a fair go at becoming great Australians.

Providing healthy diets from sustainable food systems is a hot topic in the scientific world.

Two recent reports, *The EAT-Lancet Commission on Food, Planet, Health from a global perspective* and *Nourishing Australia: A decadal plan for the science of nutrition from Australia*, both reinstate the importance of consuming a balanced diet with more plant foods.

These reports emphasise making sure we look after the planet by sourcing food from sustainable food systems. Further, the UN sustainable development goals – which are aimed at building a world with equal opportunity for everyone – target access to affordable food, employment, education and clean water by 2030.

Native Australian plant foods provide promise in helping us meet global and local food targets because they are nutrient dense (in both macro and micronutrients), tolerant to

diverse climate conditions, and can be sustainably and ethically produced.

The link between plant food and health has been an integral part of indigenous culture in Australia for thousands of years. Analysis of the charred plant food remains from Madjedbebe – a rock shelter in western Arnhem Land in Northern Australia – shows evidence of Australian plant foods in indigenous diets dating back 65,000 to 53,000 years.¹

The use of native plant foods by indigenous communities included complex processing methods, sophisticated storage methods, and knowledge on how to make plants safe to eat by removing known plant toxins.

Better known examples of native Australian plant foods include the kakadu plum (*Terminalia ferdinandiana*) which is a good source of vitamin C, green plum (*Buchanania obovata*) which is rich in folates, and wattle seeds (*Acacia* spp) which are high in dietary fibre and trace elements.

There is an urgent need to develop strategies that include these food crops as ingredients in nutrition intervention programs and promote them as healthy food choices for both Aboriginal and Torres Strait Islander peoples and the wider Australian community.

Through the Australian Research Council-funded Transformation Training Centre for Uniquely Australian Foods, there is an opportunity to rediscover the nutrient-dense, climate-

resilient and biologically unique value of these Australian native plant foods.

The scientific evidence required to convert traditional knowledge into branded products will be achieved through the centre, working in partnership with industry partners, indigenous enterprise groups and international collaborators. The centre aims to train a cohort of industry-ready higher degree research students and postdoctoral researchers in the translational journey of promising native plant groups – already identified as having potential value in foods – into branded products with high commercial value.

The centre will not only assess the sensory, nutritional and toxicological properties that underlie successful product development, but also address the social factors and indigenous participation in investable entities that facilitate sustainable business models.

Key enablers include identification of social factors contributing to indigenous participation in enterprises and developing intellectual property and benefit sharing agreements to ensure indigenous ownership and control.

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Keeping nutrition in the sustainability equation

Words by Sharon Natoli

Sustainability is a growing influencer of consumer food purchasing decisions and is high on the agenda of forward thinking food companies. According to Innova Market Insights, the percentage of global consumers expecting businesses to invest in sustainability has increased significantly from 60 per cent in 2018 to 87 per cent in 2019.

This growing level of interest reflects a shift in consciousness that is driving consumers to be more mindful of their food choices. People are now looking for products to do more than simply satisfy their hunger or thirst and are favouring brands that make them feel good about their purchases. Given this, sustainability has become an integral part of business operations and future planning.¹

When it comes to sustainability initiatives however, one key area that can be overlooked is that of nutrition. When sustainability is tabled, discussions frequently turn to environmental impact and target setting around areas such as reducing energy or water use, reducing waste or moving toward more sustainable packaging.

While these are all important issues for the establishment of strategies and plans, nutrition can fall off the radar. It may be addressed in one area of the business, but may be overlooked in discussions that centre on sustainability.

For example, when the global Dairy Sustainability Framework was announced recently², eleven

sustainability criteria were outlined, none of which included maintaining or improving the nutritional profile of the dairy products produced by the industry.

Similarly, new product development and marketing initiatives that bolster consumer perception that switching from animal-based protein rich foods to plant-based alternatives is better for the environment and therefore a more sustainable choice, may be questionable for some products when nutritional value is taken into account.

For example, an egg-free egg substitute on the market that is made from mung bean protein isolate provides no vitamin A or vitamin B12 and is likely (based on a review of the ingredient list) free from iodine, selenium, folate, vitamin D, vitamin E, long chain omega-3s, lutein and zeaxanthin – all nutrients found in high amounts in eggs derived from laying hens. Despite this nutritional discrepancy, the company claims that part of its mission is to “build a food system that makes it really easy for people to eat well”.

Eating well means eating well for the planet and for the population, as well as for personal health. Now more than ever, getting ‘more from less’ means getting more food from fewer resources, but also getting more nutrients from less food.

The Food and Agricultural Organisation defines sustainable diets as “those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for

present and future generations”.

Like healthy eating, sustainability is complex and is best approached through a broad and inclusive lens, especially when it comes to food and the food system.

Focusing on environmental initiatives while leaving nutrition to the side, or vice versa, is not enough for companies looking to remain competitive in the future. This view was reinforced by Mintel in their 2030 Global Food & Drink trends survey. When outlining the trends that will arise in the coming decade, Mintel refer to “Change, Incorporated”, stating that successful companies will be those that address both the health of the population and the planet together.

The implications of “Change, Incorporated” are that businesses now need to take the lead and demonstrate they care not only about environmental issues and ethical practises, but also proactively care about public health and personal wellbeing.

Business consciousness needs to match, and even surpass, rising consumer consciousness.

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Managing *Listeria monocytogenes* in the Australian rockmelon industry

Words by Prof Tom Ross and Zoe Bartlett, University of Tasmania



Figure 1 - Rockmelon seedlings in the field, showing the plastic mulch.

Over three months of the 2018 Australian summer an outbreak of listeriosis occurred across four eastern states. The outbreak was traced – by whole genome sequencing – to rockmelons from a single Australian grower/packhouse.

Before the source was identified and the product removed from sale, several million rockmelons from the implicated producer were released onto the Australian market. The outbreak led to 22 cases of systemic listeriosis and resulted in seven adult deaths and one miscarriage.

Apart from the public health consequences, the effects on the rockmelon industry were devastating with loss of consumer confidence and massive losses in sales causing many rockmelons growers to withdraw from the industry.

Globally, there are only three documented outbreaks of listeriosis from rockmelons. The first occurred in Australia in 2010 resulting in nine documented cases and two deaths. Australia's second outbreak was the incident summarised above. The third

and largest outbreak occurred in 2011 in the US with 147 cases and 30 deaths. In that outbreak, all cases were also traced back to a single grower/packhouse.

The dire consequences of these listeriosis outbreaks from rockmelons prompted studies to better understand the causes of such incidents to prevent recurrences. In late 2019, Hort Innovation (see acknowledgements) commissioned a scoping study to identify and evaluate authoritative data on efficacy of sanitisation/disinfection methods to eliminate *L. monocytogenes* from the surfaces of harvested whole rockmelons, as a way to reduce the risk of listeriosis to consumers.

This paper describes the project and report.

The project

The 'desk-top' project sought to:

- (i) Review best practice recommendations that have previously been provided to the rockmelon industry, either in Australia or internationally, to reduce the prevalence of *L.*

monocytogenes on rockmelons (from primary production to packaging and transport)

- (ii) Review previous outbreaks to identify whether there were similarities across those outbreaks and whether additional risk management practices could be identified
- (iii) Identify, review and summarise research on the effectiveness of current, or potential, interventions for control of *L. monocytogenes* on whole melons at all stages from primary production to when melons leave the farm gate
- (iv) Identify other relevant data (for example growth rates, prevalence, or internalisation of *L. monocytogenes* in/on rockmelons from primary production to consumption) that can contribute to risk assessments for minimising the risk of listeriosis from rockmelons.

For relevant context, knowledge of the ecology of *L. monocytogenes* and of human susceptibility to listeriosis was also included. Key findings from the review are presented over.

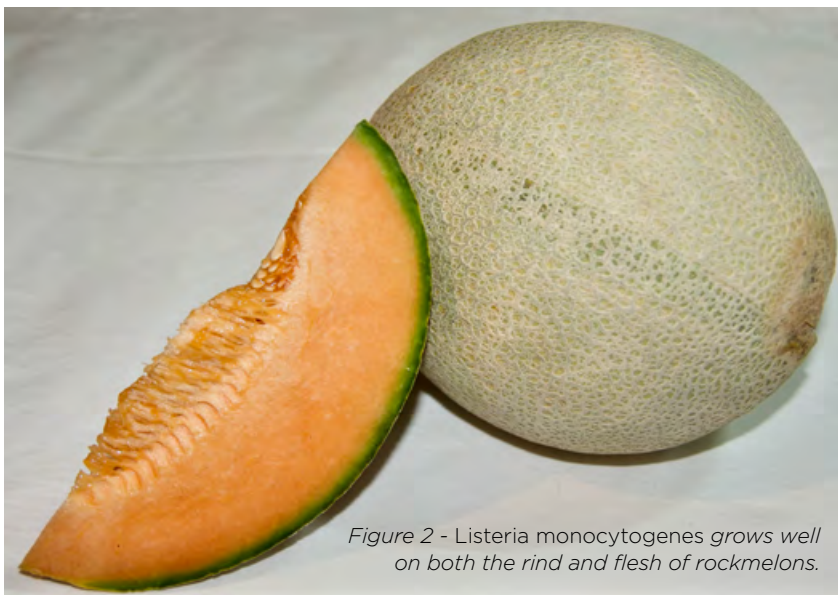


Figure 2 - *Listeria monocytogenes* grows well on both the rind and flesh of rockmelons.

Eco-physiology of *Listeria monocytogenes* and rockmelon growing, processing and distribution

L. monocytogenes can occur in fields where rockmelons are grown, but it is also often found in cool and wet environments where there are food residues or decaying plant material, whether in the field or in a packhouse.

In food processing factories, like packhouses, *L. monocytogenes* can establish itself in niches that provide moisture and simple nutrients and contaminate fruit that enters the packhouse. Examples are pockets of water under peeling paint, food contact surfaces or brushes that are difficult to clean, pads that can absorb water, or damaged belts on processing lines (such as rough surfaces or cracks) that can retain water and food residues.

In the field it can become established in places where there is decaying vegetation, such as compost heaps or mounds containing spent plant material, or where water stands for long periods of time. It can also be introduced to the growing environment, and then the packhouse, from other sources during unusual weather events such as heavy rain or dust storms that could carry contamination from animal faeces, or compost from nearby agricultural activities.

Importantly, rockmelons have characteristics that support the attachment, survival and growth of *L. monocytogenes*. *L. monocytogenes* can attach to the netted rind and can grow on it almost as well as it grows on the flesh of rockmelons (figure 2).

Unlike most other fruits, the edible flesh of rockmelons is not acidic and does not inhibit listerial growth. Internalisation of *L. monocytogenes* into rockmelons has been suggested and has been convincingly demonstrated for other bacterial pathogens.

Listeriosis and susceptible populations

In general, *L. monocytogenes* causes severe illness only in the 'susceptible population', such as people whose immune system is weakened. The term 'YOPI' is used to describe this susceptible population, including the young, old, pregnant, and immunocompromised.

The majority (~80 per cent) of the YOPI group are the elderly (above 65 years of age) who are at higher risk of illness because natural human immunity starts to decline with age. In the 2018 Australian outbreak, all cases were in the YOPI group, most due to advanced age (the average age of cases was 70 years).

Among the YOPI group, people more than 75 years old are 20 times

more susceptible to listeriosis, and pregnant women are roughly 120 times more susceptible than 'average', healthy, adults. Usually, however, high numbers of *L. monocytogenes* are required to cause infections, even among the YOPI group.

To give some idea, the ID₅₀¹ for *L. monocytogenes* in pregnant women, that would potentially harm their foetus, is about 10 million to 100 million cells (about 1 million cells per gram for a typical meal size). Much lower levels of *L. monocytogenes* cells can also cause illness in any consumer – but it is much less likely to occur.

Managing *Listeria monocytogenes* risk on rockmelons

Rockmelons are grown in open fields and close to the ground and soil. Irrigation is usually by underground pipes which minimises water contact with the melons, and melons are grown on plastic mulch to minimise direct contact with soil (figure 1). Because *L. monocytogenes* can grow on, and in, rockmelons, risk management requires minimising its presence and growth on rockmelons. This requires actions at all stages of the farm-to-market chain.

Prevalence

The review identified *L. monocytogenes* is infrequently found in soils, on whole melons, or in the rockmelon production environment suggesting that, if present, the concentration is so low that it is hard to detect.

Investigations after the 2011 US outbreak, however, revealed very high prevalence of contamination on rockmelons from the implicated factory, when tested in the market. Similarly, in the 2018 Australian outbreak, when rockmelons from the implicated processor were sampled in the marketplace, a very high proportion were contaminated with the outbreak strain of *L. monocytogenes*, despite that they were not detected in the field.

Temperature (°C)	Time (h)		
	1	10	24
30°C	2 cells	-1700 cells	-50 million cells
20°C	no growth	-30 cells	-3100 cells
10°C	no growth	2 cells	-10 cells
4°C	no growth	no growth	no growth

Table 1. Predicted growth of *L. monocytogenes* on/in rockmelon for different time/temperature combinations.

Colonisation of processing plants

In the 2011 US outbreak, it was clear the implicated packhouse had become colonised with multiple strains of *L. monocytogenes* that were then transferred to fruit processed in the packhouse.

Various external sources of the colonising strains were proposed, including introduction and use of second-hand packing equipment not easily cleaned and previously used for another commodity, or from a truck used to transport unsaleable fruit as feed to a cattle farm.

The investigation also uncovered that the business had discontinued use of sanitiser in their melon wash waters. In the 2018 Australian outbreak, the outbreak strain was found in only one site in the factory and from a composite swab from melons. While the source of contamination was never definitively shown, unusual weather - including heavy rain and dusty, windy conditions - were believed to have contributed to the contamination of fruit, and potentially the packhouse (though that route of contamination was not reliably established).

Effect of sanitisers

Published research for the sanitisers currently used within the Australian industry was reviewed in detail. In summary, available research demonstrated that chlorine (hypochlorite or bleach), applied at 100ppm or 200ppm for two minutes can achieve a 2 log reduction in *L. monocytogenes* on the surface of whole melons.

Aqueous chlorine dioxide applied at 3ppm or 5ppm for two minutes can provide 2.4 to 2.9 *L. monocytogenes*

log reductions on melon surfaces. Peroxyacetic acid (or PAA) used at 80ppm for two minutes is reported to induce a 1.4 log reduction.

Ozone applied in water at 3ppm for two minutes caused the highest reported reductions of *L. monocytogenes* on the surface of whole rockmelons (3 log). However, there was limited data (and of varying quality) reported for these sanitisers.

Thus, while sanitisers are an essential part of risk minimisation, they cannot be solely relied upon to eliminate microbial contamination on fruit. Other actions are required to recognise and react to events that could lead to unusually high levels of contamination. The review also identified and summarised research on other sanitisers not currently used that might be applied to whole rockmelons.

Growth on melons

The full research report provides a detailed review of authoritative papers reporting growth rate data for *L. monocytogenes* in the flesh and on the rind of melons. One of the findings of the 2011 outbreak was that...” to “One of the findings of the 2011 outbreak investigation was that melons were still warm when packed and shipped and that, where melons touched each other, the residual moisture and warmth was enough to allow *L. monocytogenes* to grow to high levels on the melon rind.

While the rind is not eaten, when the melon is cut, *L. monocytogenes* on the surface can be transferred to the edible part of the fruit. Temperature is a strong determinant of *L. monocytogenes* growth on, or in, rockmelon.

Table 1 gives estimates of the

amount of growth from a single cell of *L. monocytogenes* on a rockmelon for different time/temperature conditions. In general, it is considered that a dose of 10,000 cells has a low probability of causing infection, even among the YOPI group. If the initial contamination were higher, however, the final contamination level would be higher, for example 10 times more cells at the time of consumption, and 10 times more risk of infection.

Conclusions

The full report includes detailed reference to, and analysis of, authoritative sources of data relevant to the risk management of listeriosis from Australian rockmelons from which recommendations for industry ‘best practice’ have been developed.

In summary, risk management of *L. monocytogenes* in Australian rockmelons will require an understanding of the ecology of *L. monocytogenes* in the environment and in rockmelon processing plants, attention and response to unusual conditions in the field, including weather events, strict control of fruit and packhouse sanitation, and temperature control during and after processing and in transport.

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1. ID₅₀: The dose of the pathogen required to induce illness in 50% of the exposed population.

Acknowledgements

The project was funded by Hort Innovation using the melon research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au. The full report, including a summary of the findings, is available for download from <https://www.mdpi.com/2072-6643/11/11/2603>

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Continuing Professional Development

Education and continuing professional development

Nelson Mandela said education is the most powerful weapon which you can use to change the world.

The world of food science and technology is changing rapidly and, as an industry, we need to ensure we keep up to date with changes.

Education is a major focus for AIFST, built around our key priorities of grow, learn, connect and champion.

Why a CPD program?

In today's increasingly competitive and changing world, food scientists and technologists must stay at the cutting edge of new developments throughout their careers. It is no longer possible to rely on basic studies or on-the-job training to provide professional advice and service to our employers, customers and clients.

This means to continually improve our technical knowledge and skills we need to engage in continuing professional development (CPD). AIFST also recognises that in modern organisations, food scientists and technologists are increasingly responsible for developing their own careers. CPD allows you to enhance your future.

A CPD program reflects the professionalism of the members, improves their professional standing and enhances their employability by formalising and documenting CPD activities. It assists in keeping knowledge up to date and illustrates an ability to adapt to changing roles in the food industry and food production environment. Ensuring currency in a complex job market can be difficult and companies look for staff who bring a broad range of skills.

What is a CPD program?

A continuing professional development program is an active self-planned and structured program for developing and enhancing your professional skills. Ideally, the program is designed with clear objectives, extends your professional knowledge and capabilities, and allows you to engage in a broad range of activities to increase your career options.

The AIFST CPD program

The AIFST CPD program was launched in 2019. It is voluntary and designed to encourage members to maintain currency of skills and knowledge and assist with career planning. It will provide recognition

of experience and interests and align food scientists with other well-respected professions.

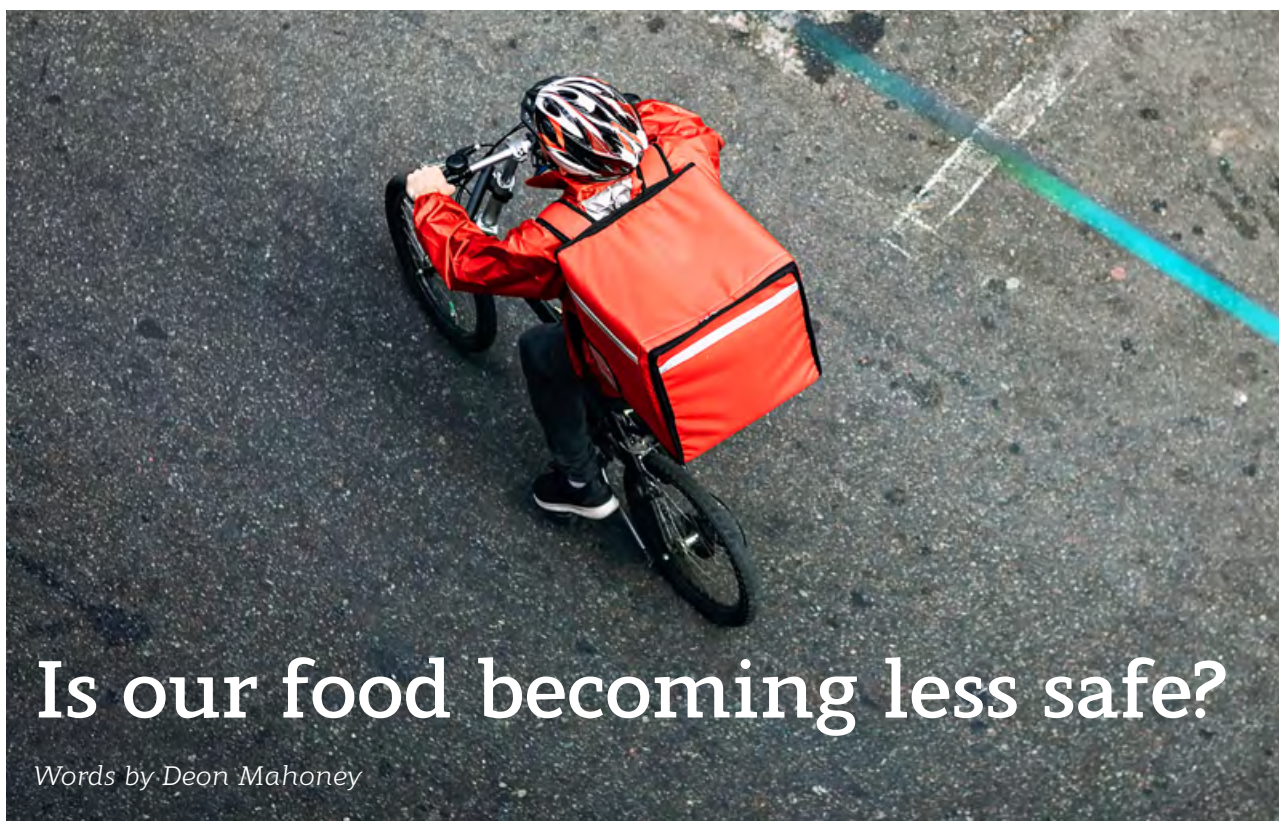
Much of AIFST members' skill set is developed over their working life but is not always part of their formal qualifications. The CPD program is intended to provide recognition of these activities and skills by formalising and recording the process in a straightforward and transportable way.

The best outcome for the food science community is to develop a recognised professional identity. The competence of members is vital to the development and credibility of food science practitioners and AIFST is committed to providing value to members by developing and supporting this program.

How do I get involved?

Keep an eye out for member communications, visit the CPD page on the [AIFST website](#) or contact AIFST (education@aifst.com.au).





Is our food becoming less safe?

Words by Deon Mahoney

Anyone subscribing to receive alerts about food safety will find barely a day passes without some major food safety incident or a large food recall grabbing headlines around the world.

Recently in Australia we have observed a sequence of recalls including peanut allergens in a range of pesto products, foreign matter (plastic fragments) in confectionery, and *E.coli* in milk. Internationally, there have been ongoing issues with the presence of hepatitis A virus in blackberries in the US and alerts for salmonella contamination of fresh sprouts in Canada and the US.

In Australia we have experienced large outbreaks of foodborne illness in recent years linked to a range of food commodities including dairy products, fresh produce, eggs and meat – many were domestically produced foods, but there were also imported foods.

Can consumers trust their food supply?

It is a regrettable fact that foodborne illness is relatively common in Australia. On average, every Australian will endure a bout of foodborne illness

approximately every five years.

While foodborne illness is often not considered serious, the cost to society through medical expenses and days of lost work is considerable, and infection by some pathogens may lead to debilitating life-long injuries and even death.

Data published by Kirk *et al* (2014) determined there are an estimated 4.1 million cases of food poisoning in Australia each year.¹ Contaminated food was estimated to be responsible for 30,840 gastroenteritis-associated hospitalisations, 76 deaths, and 5,140 non-gastrointestinal illnesses.

Much of the data published in the paper involves estimates of community incidence of illness which is calculated by applying an underreporting multiplier to scale-up data collected from notifiable disease surveillance.

Campylobacter spp., nontyphoidal *Salmonella* spp., pathogenic *Escherichia coli* and norovirus are the most common causes of foodborne gastroenteritis in Australia. However, a very large proportion of foodborne illnesses are caused by unknown or unidentified pathogens, despite

extensive investigation of outbreaks and cases.

Most of the time, these foodborne illnesses are either preventable or avoidable.

A review of data on notified cases of gastrointestinal illness across Australia over the last 20 years demonstrates significant increases in campylobacteriosis and salmonellosis and worrying increases in illnesses caused by shiga toxin-producing *Escherichia coli* (STEC) and *Shigella* spp. (figures 1 and 2).

What influences these statistics?

It is important to note that the source of gastrointestinal pathogens includes both foodborne and other exposure routes such as environmental, zoonotic, international travel and person-to-person. Because gastrointestinal illnesses are not solely foodborne, source attribution supports the proportioning of illness to sources and transmission routes.

For example, in Canada around 76 per cent of cases of listeriosis (credible interval 42.1 - 89.1 per cent) are considered to be foodborne, while

for hepatitis A only 29.5 per cent (credible interval 4.8 - 71.9) of cases are considered to be foodborne.³ Other sources include waterborne, animal contact and via person-to-person contact.

Source attribution is specific to each country because there can be quite large variations due to climate, environmental factors, demographic features and dietary risk factors.

A further issue is that these data only report confirmed cases. Under reporting is a significant issue and public health authorities must resort to using multipliers to estimate actual community burden. Australian data indicate the multiplier for salmonellosis was estimated at seven, for campylobacteriosis at 10, and for STEC at eight.⁴

Are we seeing an increasing incidence of foodborne illness?

The data we observe is impacted by a range of factors. The Australian population is growing at around 1.6 per cent per annum, so we can expect more people to become ill.

Our surveillance systems are improving and therefore enable us to capture more data, and we employ analytical tests which support improved identification of foodborne pathogens. Advanced analytics, such as whole genome sequencing, are increasingly used to support molecular surveillance of foodborne pathogens and lead to enhanced outbreak detection and investigation.

Are our food standards and regulatory system failing us? Is the food industry adopting best practice to ensure food safety? Are changes in the way food is traded increasing the risk of foodborne illness? Are practices and behaviours in the food service sector and among consumers exacerbating the problem?

The exact causes are difficult to pinpoint, but it is probably due to a combination of all the above.

Our food supply has evolved over the past 30 years and the industry is now highly globalised. There is increasing urbanisation resulting in

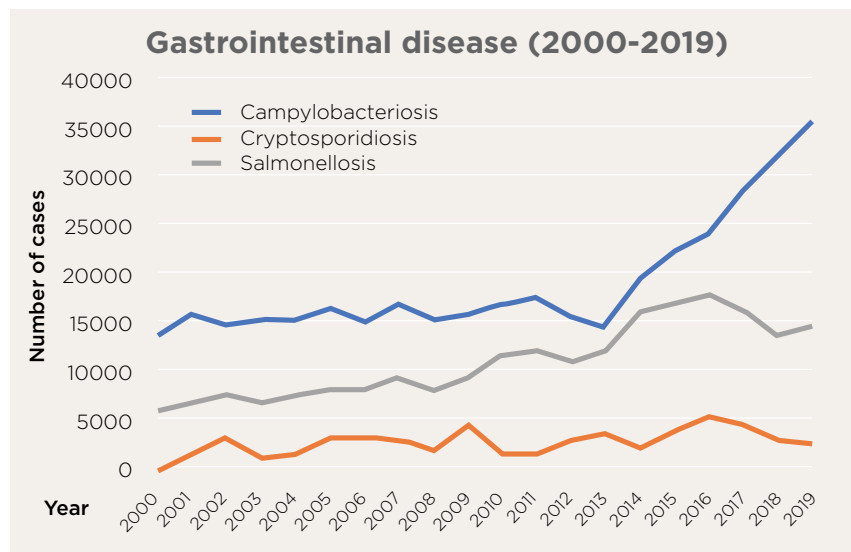


Figure 1: Notified cases of selected gastrointestinal disease in Australia.²

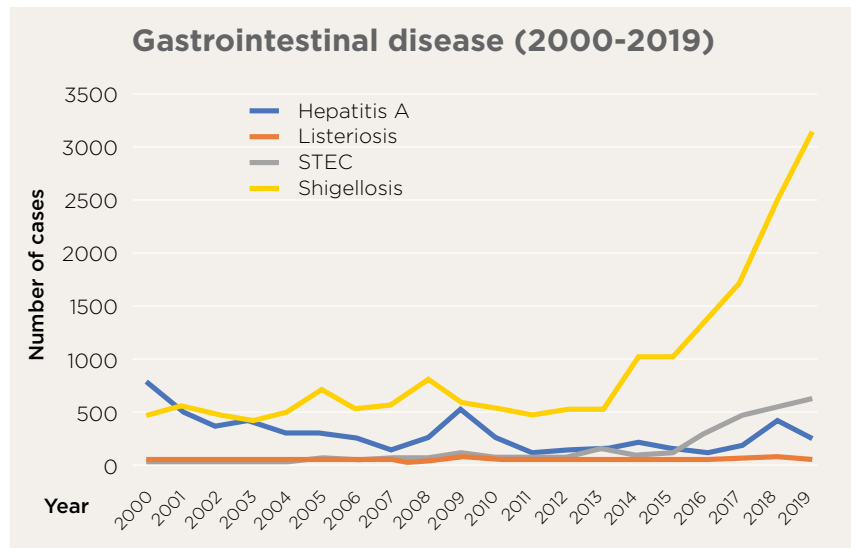


Figure 2: Notified cases of selected gastrointestinal disease in Australia.²

longer food supply chains, we have increasing numbers of vulnerable consumers (including the elderly and those with underlying health conditions) and our food consumption habits and lifestyles are radically changed.

For example, disruptive technologies such as meal delivery services and the trading of food using social media means some foods are falling outside any regulatory oversight. In-home preparation of food for an individual or a small group is increasingly being sold via online platforms.

The development of longer and more complex supply chains means

there is the need for food producers and manufacturers, and the food service sector, to take a greater role in implementing approaches which assess foodborne hazards, identify measures which reduce risk to consumers, and implement them effectively.

Furthermore, the consumer must take some responsibility for the safe handling and preparation of food. This includes attention to making safe food choices and the adoption of good hygienic practices in the home.

We are consuming an increasing range of minimally processed foods, and these expose consumers to an increased risk if these foods are not



handled correctly. Consumers are also often unaware of the risks associated with raw food, cross-contamination and leftovers in the kitchen.

What needs to be done?

The implementation of outcomes-based food standards has placed greater responsibility upon food producers and manufacturers to effectively assess their food safety hazards (not just microbiological, but also the potential presence of allergens, physical and chemical contaminants) and to implement food safety management programs that address these hazards.

Unfortunately, they often have incomplete knowledge, or lack the skills to adequately identify and assess the importance of food safety hazards. The industry then needs to ensure their food safety management systems and infrastructure focus on these hazards and apply measures that reduce their likelihood of occurrence.

In recent times we have observed the importance of organisational culture within the food industry, and its role in ensuring unswerving compliance with regulations and standards – fostering staff involvement and responsibility in the management of food safety.

What is sometimes missing is senior management commitment

to setting the food safety scene, adequate resourcing of food safety management activities, and appropriate education of personnel as key factors in ensuring improvements in food safety.

FSANZ is currently progressing a proposal to mandate the use of food safety management tools in the food service and retail sector (proposal P1053: *Food safety management tools for the food service and closely related retail sectors*).⁵

The ministers responsible for food regulation have expressed concern that current risk-management measures are not reducing foodborne risks in these sectors. The proposal will consider regulatory options such as mandatory food safety training for food handlers, requirements for certified food safety supervisors and retention of monitoring data demonstrating key activities and processes are being adequately controlled.

The drivers for this proposal include concerns about a lack of basic skills and knowledge in hygiene, food handling and temperature control, and the challenges of inadequate resources and high staff turnover. These challenges are not unique to the food service sector and highlight the need for nationally consistent arrangements across all sectors of the food industry to

support reduction of foodborne illness.

Summary

Australia is considered to have a strong food safety management system, however, we continue to observe rising numbers of outbreaks of foodborne illness and increased recall notifications. This is impacting public health, influencing consumer confidence and can hinder market access.


Food producers, manufacturers, and the food service sector must take greater responsibility for safeguarding food safety and protecting public health. A safe and suitable food supply is predicated on the food industry accessing and using safe raw materials, and the implementation and oversight of hygienic food processing and handling practices.

A key element is ensuring the highest standards of personal and food hygiene practices along the food supply chain, particularly in the food service sector and in the home.

By understanding the risks and managing food safety along the entire supply chain, we can better protect consumers and reduce the incidence of foodborne illnesses.

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The future of animal agriculture in Australia

Words by Jessica Ramsden

In his 2005 history of Australian food science and technology, Keith Farrer notes: “The more that was learned about food, the greater the consumer expectations. Whether it was tighter control, or yet more esoteric products, science and technology became more and more involved in food production, processing and packaging.”¹

Over time, Australian consumer expectations have grown beyond taste and safety to include nutrition, convenience, affordability and variety. As consumer expectations evolve further – to include the environmental and ethical impacts of production, particularly of meat – food scientists and technologists need to also take these factors into consideration.

This is partly because these expectations create demand for new types of products, and partly because the way ingredients are grown can change the chemical and physical properties that are the building blocks of the work of food scientists and technologists.

Where have these consumer expectations come from? The following is an extract from the winning essay in the Australian Farm Institute’s annual John Ralph Essay Competition, reflecting on the history of debates about animal source foods, and what they mean for the future of livestock in Australia:²

With seemingly endless headlines like “why Australians are turning away from meat”² and “the best way to save the planet: drop meat and dairy”³, it is easy to feel despondent about the future of animal agriculture in Australia.

Despite the apparent shrillness of daily headlines, alarm about the ecological expense of animal source foods is nothing new. Food

historian Warren Belasco traces a history of debates about food futures, revealing the remarkable persistence of concerns about meat in particular – starting with Socrates over 2,400 years ago, who argued that “domesticated meat’s lavish land requirements inevitably lead to territorial expansion and war with neighbours.”

Through the eighteenth and nineteenth centuries, arguments were often framed in terms of the number of people able to be fed on vegetarian diets versus animal-centred diets. These Malthusian-style concerns about overpopulation leading to food scarcity persist today, but according to Belasco, so are similarly persistent themes of egalitarianism (enough food is produced, it just needs to be better distributed) and cornucopianism (humanity’s ingenuity is limitless, we will always be able to innovate our way out of trouble).

The rapid rise of alternative protein markets also seems astounding, given the amount of shelf space and menu items given over to new plant-based products in just the last year, though it might not surprise some who saw it coming fifty or a hundred years ago. Winston Churchill in 1932, for example, envisioned “synthetic foods, concocted from ‘microbes’ in ‘vast cellars’ and ‘practically indistinguishable’ from the natural variety,”⁴ and in 1953, the idea of synthetic foods was framed “as a conservationist reform.”³

These historical perspectives are not intended to suggest a ‘do nothing’ or ‘business as usual’ approach, but to sharpen our sights on what exactly is different now, to be clear about why animal agriculture is worthy of a significant future, and to help us sort

through the complexities of creating futures we can be proud of.


There are hundreds of stories about new technologies and approaches that support animal welfare, reduce the emissions intensity of animal production, maintain animal production alongside ecological conservation, and offer supply chain transparency to build consumer trust.

Examples include chicken welfare monitoring via drone-mounted camera technology, internal sensors that detect the onset of calving in animals in remote areas to prevent mortalities, feed supplements that reduce rumen methane, the Bullo River Station partnership with the Australian Wildlife Conservancy, and the Eggs Australia and CSIRO consumer attitudes research project.

As current challenges are solved, or evolve into new challenges, the cycle of debate about animal source foods will continue, as will the influence of many other complex issues with which animal agriculture intersects, such as foreign investment, energy security, transport infrastructure, biosecurity, digital connectivity, labour, governance of water resources and geopolitical trade disruptions.

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From little things, big things grow - a new incubator down under

Words by Dr Hazel MacTavish-West

Seedlab Tasmania is a new incubator for Tasmanian startups with global potential in the areas of food, drink, agri-food and agri-tourism.

The new incubator will provide access to advice and assistance, introductions, expertise, resources and training to de-risk export and drive profitable growth.

Seedlab is led by Tasmanian food consultant Dr Hazel MacTavish-West, in partnership with the University of Tasmania, and supported by Woolworths and the Australian Government, among other stakeholders.

Over the next two years, Seedlab Tasmania aims to connect over 200 Tasmanian food, drink, agri-food and agri-tourism startup businesses with recognised experts who will provide training, support and mentorship.

Seedlab Tasmania came about after Dr MacTavish-West spoke with over 30 Tasmanian food and drink businesses at farmers' markets about their interest in exporting. She was surprised to find how many had already done some exporting and were keen to do more.

Unfortunately, however, a large proportion of new products are bound to fail. Barriers to entry include perceived high risk, lack of deep insight about consumers and customers in export markets, access to freight consolidators, short shelf-life products, a lack of protectable export brands and lack of information about correct labelling.

Paul Harker, Director of Fresh Foods, Woolworths, said Tasmania is perfectly positioned to take advantage of export opportunities with a strong agricultural sector, innovative food manufacturing and a global reputation for clean, safe food.

"Woolworths looks forward to helping Seedlab's startup businesses become export-ready by providing



Fiona Makowski Freshfield Grove Olives and Hazel MacTavish-West talking about the food technology requirements for Seedlab Tasmania in Nov 2019

insights and guidance on what successful retail partnerships look like," Mr Harker said.

"In doing so we hope to see some great new Tassie to products launch around the world and here in Australia."

The program is run over two years and includes three cohorts passing through:

Germinate: A two-day bootcamp to upskill in export market opportunities and core entrepreneurial skills.

Cultivate: An accelerator to upskill startups in export market opportunities and core enterprise skills.

Propagate: A six-month incubator program to improve the startups' proposition and craft an export business model. Providing monthly masterclasses on specific topics of interest featuring globally recognised speakers, individual mentoring, access to factories for scaleup, office space and other practical requirements, plus market testing.

There will also be an alumni program for continual involvement, growth, and an opportunity to give back.

Seedlab Tasmania received more than \$860K in cash and in-kind support from the Australian Government Department of Industry, Innovation and Science through Incubator Support initiative funding as part of the entrepreneurs' program; from Woolworths, the University of Tasmania, and other private individuals and companies.

Those interested in registering as a Seedlab topic specialist can find more information at www.seedlabtasmania.com.au

Dr Hazel MacTavish-West is a food scientist with more than 25 years' experience working with crops grown for the food, pharmaceutical and personal care industries, globally. She has been an independent consultant in the UK since 2003 and in Tasmania and mainland Australia since 2010. In addition to being the founder of Seedlab, Dr MacTavish-West is a Churchill Fellow and an adjunct senior researcher at the University of Tasmania. 



What's the biggest innovation or new technology you think we'll see in the food science revolution over the next 5-10 years?

Barry McGookin

General Manager Innovation, FIAL

There is a rapidly increasing ability to discover who we are and what we're made of, and how we respond to our environment. At the same time, sensors are becoming more capable, reliable and smaller. It's a perfect match.

Over the next 10 years the combined worlds of 'omics and digital' will be at the forefront of a revolution in personalised nutrition, health management and new food formats. Both technologies are needed.

Understanding of our body's makeup without improved sensors to gather real time data on our health and performance, and vice versa, won't make the same impact. Staple products and ingredients we've known and loved for centuries will still be key, but what to mix and match is likely to change.

If we take that a step further, tailored solutions for health will pick up on the component foods movement, ie, food made entirely from the chemical building blocks. The challenge will be bringing the wider community on the journey.

Hugh Dircks

Senior Microbiologist, Carlton & United Breweries (AB InBev)

The resurgence in fermented foods, particularly the trend towards kitchen and craft scale fermentation, foreshadows the emergence of completely novel fermented foods and beverages. We are already seeing previously niche fermented products such as kimchi, kombucha, kefir and tempeh go mainstream.

Consumer understanding of the basics of fermentation is driven

by a curiosity of the magic of microbiological transformation of base foods to gastronomical (and perceived nutritional and therapeutic) gold.

Large manufacturers, researchers and science savvy entrepreneurs are exploring how to better utilise byproducts, and fermentation provides the means. Chefs (the team at world leading Danish restaurant NOMA are a great example) are riffing with brewing and bubbling ingredients, and imaginative biotechnologists and microbiologists who have sensitivity and flair with flavour have a future in exploiting and applying the past few centuries of study of food microbiomes.

Polly Burey

Senior Lecturer USQ, AIFST QLD Branch Co-Chair

The advent of changes to our climate will greatly affect how we tackle food production into the future.

Some of the biggest innovations will come from developing food production processes that can utilise fewer resources. One exciting development is the work done by NASA almost half a century ago, and now being realised through the company Solar Foods, which claims to produce a product called solein - a protein powder formed by utilising CO₂, water, microbes, some added nutrients and electricity.

Not only could this be produced on earth, but also has the potential to be produced in space.

Ashna Gobin

Senior Chef, B Food & Nutr Sc student

Blockchain technology (BCT) is going to be the food science revolution over the next five to 10 years.

BCT is a collection of existing technologies such as cryptography, database, network management and distribution of data. It aims to move from a centralised database network to a transparent decentralised network, without intermediaries.

BCT could transform the entire food industry by increasing efficiency, transparency, trust and collaboration throughout the food chains. It could be used for food certification, reducing food fraud and tracking logistic processes. It also provides a single layer of truth that will secure information.


Tom Ross

Professor in Food Microbiology at University of Tasmania

Bioinformatics and 'omics technologies offer incredible opportunities to change the way we feed the world.

These technologies may involve individual gastric microbiome analyses to develop personalised diets that help people to better health, both physical and psychological, by dietary modification.

'Omics technologies include 'whole genome sequencing' (WGS) and, together with further advances in bioinformatics, will reduce the cost of WGS, enabling its more widespread use.

WGS of pathogens provides earlier resolution of food-borne disease outbreaks, it can identify even very small food-borne outbreaks across time and space and should minimise the number of people affected. Bioinformatics and WGS will enable improved traceability and enable proof of provenance of foods, thus minimising food fraud. 

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