

# food australia

Official publication of AIFST Inc

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DECEMBER 2013/JANUARY 2014

## SKILL UP AND STAY ON TOP OF EMERGING TECHNOLOGIES



*Also inside*

**BIOSENSORS FOR FOOD SAFETY AND QUALITY  
SCIENCE - THE KEY TO ADDING VALUE TO SEAFOOD  
PUTTING STANDARD 1.2.7 TO THE TEST**

## ON THE COVER

Advancing Food Safety (AFS) is a Registered Training Organisation (RTO 90994) in operation for over 20 years. During this time it has built a reputation as a leader in food safety and HACCP training with comprehensive knowledge and experience in all aspects of the agrifood sector.

Now, as a subsidiary of SAI Global, it offers a complete business solution, with a combined experience of over 100 years.

AFS provides food safety training to clients across Australia, New Zealand and the Asia Pacific. It also convenes the Australian HACCP Conference series each year, which attracts over 250 attendees from across the agrifood chain. AFS provides a range of food safety courses which are delivered publically or in-house in individual workplaces. In addition, many courses are available online.

### Food safety courses

Free recorded webinar - Tips and Traps for SQF 7.1: Understanding Top 10 Non Conformances

- Allergen and VITAL 2.0
- HACCP & HACCP Refresher
- Food Microbiology for Non-Microbiologists

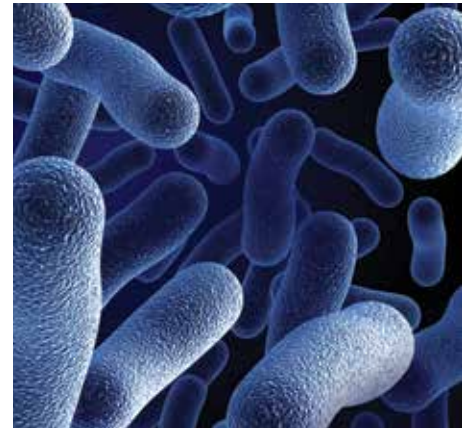
- Implementing Effective Foreign Body Controls
  - Internal Food Safety Auditor
  - Lead Food Safety Auditor
- And many more...

AFS, SAI Global understands the dynamic nature of the food safety industry and is continually changing and developing to meet the needs of the industry, including addressing new safety standards, process systems and emerging technologies. This is to ensure participants stay up to date with the most topical and relevant information in food safety. Training is conducted by experts with extensive teaching experience and hands-on industry knowledge.

### Food industry scholarship

To support the ongoing development of people in the food safety industry, AFS, SAI Global, has launched a new food safety quality management scholarship. The AFS Diploma of Food Industry QA Management is designed to provide the skills and knowledge for personnel who are expected to take on the roles and responsibilities related to QA Management.

The scholarship is designed to continue to promote and nurture highly skilled industry professionals.



The AFS Scholarship in Food Industry QA Management is valued at over \$6000. If you would like to express your interest in the 2014 scholarship opportunity, please email: [training@haccptown.com.au](mailto:training@haccptown.com.au) and put **Tell me more about the AFS scholarship** in the subject heading.

Courses include:

- HACCP Training Course
- Internal Food Safety Auditor or Lead Food Safety Auditor
- Food Safety QA Management
- Advanced Food Safety QA Management

**NOTE:** The AFS Diploma is not a nationally recognised qualification under the Australian Qualifications Framework. Upon successful completion of the individual modules, however, the incumbent will receive Statements of Attainment against nationally recognised units of competencies, issued by AFS (RTO number: 90994) <sup>A</sup>



**CONTACT:**  
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# food australia

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## FROM THE PRESIDENT

As president, I am keen to see AIFST further build its reputation as a world leader in food science and technology. With this as our vision we have completed our strategic planning for 2014.

Our key focus areas are continuing professional development (CPD), knowledge sharing, professional networking and membership value. A final copy of the 2014 Strategic Plan will be available on the AIFST website in mid-December.

Our focus on the CPD program for members is essential to ensure that Australia's food industry maintains its enviable reputation for scientific talent and research. I would particularly like to acknowledge the financial support of the Australian Food and Grocery Council for the program, which you can read more about on page 15.

Another part of our strategic review involves *food australia*. Lynn Elsey is no longer fulfilling the role of editor and we thank Lynn for her fantastic contribution over the past two years. We are currently reviewing the *food australia* model and while this is underway, the Dec/Jan and Feb/Mar editions have been outsourced to Bite Publishing.

In other news, we are very excited that the National Food and Nutrition Research and Development and Technology Transfer (RD&TT) Strategy has been formally signed off by the Primary Industries Standing Committee. Council has identified several areas where AIFST will take a lead role to support delivery of the strategy and this will be elaborated on in the Feb/Mar 2014 issue of the journal.

Until then, please enjoy this issue of *food australia* and may you have a happy and relaxing holiday season.

**Dr Anne M. Astin**

President, AIFST



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BY THE NUMBERS

# STATE OF THE INDUSTRY

The Australian Food and Grocery Council (AFGC) recently released its fifth annual economic snapshot *State of the Industry 2013*. The results showed strong growth for the food, beverage, grocery and fresh produce manufacturing industry.

Not surprisingly, the results show that the increasing costs of business present the greatest challenges for companies within the industry.

Despite this, AFGC CEO Gary Dawson said the market was showing resilience during what is a tough period for business in Australia.

"The findings of *State of the Industry 2013* demonstrates that while the Australian food and grocery manufacturing sector – Australia's largest manufacturing sector – is facing an environment where input costs are rising on everything from commodities to labour to energy, encroaching regulations are adding to compliance costs and retail price deflation continues to cut margins, there are signs of significant growth potential," said Dawson.

Here is a snapshot of the key results of the report.



In 2012-13, approximately 46,100 people were employed within the fresh produce sector.



\$1.5 million is earmarked to teach students about food and agriculture.

In 2012-13, the greatest increase of Australian exports to a single country was recorded for China, where exports rose by approximately \$770 million to \$2.5 billion.



The turnover of the fresh produce sector was approximately \$5.5 billion in 2011-12.

The total value of fresh produce exports increased by 26.1 per cent from 2011-12 to 2012-13 (\$651.6 million up to \$821.8 million).

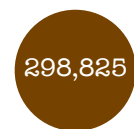


Vegetables comprised the largest product group for the fresh produce sector, accounting for 46 per cent of total turnover.

In 2012-13, total industry exports increased by 2.2 per cent and total imports decreased by 0.4 per cent.



The industry employs 298,825 people. 220,000 of these are in the food and beverage industry.



In 2012-13, there were an estimated 25,662 businesses in the industry. 222,000 people were employed in food and beverage manufacturing; 30,744 employed in grocery manufacturing and 46,081 people employed in the fresh produce sector.



In 2012-13, Australian food and beverage, grocery and fresh produce exports earned \$24.3 billion and accounted for 28 per cent of all manufacturing sector exports.



The Australian food and beverage, grocery and fresh produce industry had a total turnover of \$111.2 billion in the 2011-12 financial year.



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## AGRIFOOD INDUSTRY NEEDS TO GROW SKILLS

The Australian Workforce and Productivity Agency (AWPA) has released a new report which found that Australia's food industry needs more highly skilled workers if it is to capitalise on growth opportunities.

The *Food and Beverage Workforce Study* found that the industry is in transition, and needs skilled workers to grow new export markets in the Asian region.

AWPA chair Philip Bullock said the study showed that despite its strength, the industry faced significant challenges.

"Agriculture remains one of Australia's most productive industries and food and beverage processing is now our largest manufacturing sector in terms of employment," Bullock said.

"However, the reality is that with limited potential to grow domestic markets, the future lies in us finding new customers in rapidly growing and highly competitive Asian markets. The ongoing restructure of the industry resulting in larger farms and the growing use of new technologies in the agriculture and food processing sectors is also requiring workers to have higher level skills."

National Farmers' Federation (NFF) CEO Matt Linnegar said that the NFF had worked closely with AWPA on the development of the report and its recommendations, and welcomed its release.

"People are the agricultural sector's greatest resource, and ensuring we have a strong and sustainable workforce into the future is a priority, not only for the NFF and farmers, but also for the wider agricultural sector, as identified in our Blueprint for Australian Agriculture," Linnegar said.

CEO of Agrifood Skills Australia, Arthur Blewitt, said he was encouraged to see the food industry, training providers and government policy makers recognising how intimately skills and industry competitiveness are linked.

"This report provides further evidence that a cohesive 'all-of-industry' approach is needed to secure enough highly skilled people to position the sector and its enterprises to realise the opportunities available, and particularly those in the emerging Asian market," said Blewitt.

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## WATER BUDDIES MAKE A SPLASH

New Zealand-based beverage makers Water Buddies are looking to open an Australian production facility.

Speaking from the NZ Food Awards where it picked up two awards, Sian Leonard, co-creator of the children's drink, spoke about the success of the company, which launched in New Zealand in October 2012 and in Australia in March this year.

"Our growth has been phenomenal and we are now looking at moving Australian production to Australia to meet demand," said Leonard.

Water Buddies are stocked in 580 Woolworths stores and around 500 independent supermarkets as well as BP service stations and New Zealand Natural Ice Cream outlets throughout Australia.

The drinks contain pure New Zealand spring water with natural flavours and 1.8% sugar and come in a child-friendly, colourful bottle.





## INDUSTRY INITIATIVE ON HEALTHY LIVING

Olympic gold medallist, Susie O'Neill, the Australian Food and Grocery Council (AFGC), and members of the food and grocery industry, are joining forces to launch a new tool set to simplify healthy lifestyle choices for all Australians.

Based on the latest Australian Dietary Guidelines, the Healthy Balance Checker will allow Australians to check their daily dietary intake and weekly exercise routines online, and will offer tailored recommendations to help achieve energy balance.

"The Healthy Balance Checker has been designed to help bring the Australian Dietary Guidelines to life and ensure that Australians can make better, more informed health decisions," said O'Neill.

CEO at AFGC, Gary Dawson, says the campaign was developed to help improve the nutrition literacy of Australians.

"This Healthy Balance Checker tool is one more example of how industry is playing a role in educating Australians about making well-informed healthy lifestyle decisions," said Dawson.

The initiative is part of Together Counts, the consumer-facing platform of the AFGC's Healthier Australia Commitment. Its current members represent more than 25 per cent of the food and grocery industry, including: Unilever, Nestlé, Campbell Arnott's, General Mills, Lion, Sugar Australia, Coca-Cola South Pacific and PepsiCo Australia.



## SOUTH KOREA GETS AUSTRALIAN MADE LOGO

After three years, the Australian Made, Australian Grown logo has been trademarked in South Korea.

This means that for the first time, Australian exporters have a symbol which can be used on their locally made or grown exports into South Korea that both establishes their products as genuinely Australian and is legally protected under South Korean law.

Australian Made chief executive, Ian Harrison, said that the registration process had commenced in 2011 in response to the growing importance of South Korea as a market for Australian products.

"The Australian Made, Australian Grown logo's formal registration in South Korea now provides an essential legal framework which exporters can rely upon in the event that the logo – or product carrying it – is copied or used without proper authority," Harrison said.



### NEW PRODUCT DEVELOPMENT TECHNOLOGIST

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The role of NPD Technologist is to develop and refine product and oversee the laboratory to world's best practice standards of quality and food safety in order to achieve nominated business and operational objectives.

Key responsibilities in this role are:

- Develop and refine product through identifying and implementing continuous improvements in each stage of the manufacturing process.
- Prepare and oversee specifications for changes or reviews in existing recipes.

#### To be successful in this role, you will need to have:

- Food technologist or have a chemistry degree
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If you are looking for a change and would like to apply please email your resume and covering letter to [hr@bundaberg.com](mailto:hr@bundaberg.com)



## MOZZARELLA WORTH A MOTZA

A global shift in our eating habits has been highlighted by Fonterra's announcement that it will be investing \$72 million in expanding its mozzarella plant in New Zealand.

As fast food is becoming more widely available across the country, more people are eating food that was once traditionally confined to particular cultures and geographic areas.

In China there has been a dramatic growth in the number of pizza restaurants and companies such as Yum (Pizza Hut) and Domino's are rapidly expanding into the market.

Fonterra believes this growth is likely to continue and will be a valuable investment. Fonterra director of Foodservice, Rene Dedoncker says the growth in Asian markets is estimated to be around 13 per cent annually until 2016.

"Demand for high-value dairy products like mozzarella is being fuelled by changing dietary habits, particularly in Asia where there is a significant move towards more Westernised diets," said Dedoncker.

The expansion is due to begin in mid-2014 with completion by September 2015 and will double the capacity of the plant.

## CP KELCO EXPANSION

CP Kelco, the world's leading pectin producer has announced a \$10.7 million expansion to meet growing demand for high-quality pectin.

CP Kelco will be expanding its Genu amidated grades of pectin, which are commonly used in low sugar, and sugar-free versions of jams and fruit preparations for yoghurt. Amidated pectin is originated from the peel of citrus fruit and has a jelly-like consistency.

The investment comes after the company already committed \$2.7 million for initial expansions. This facility in Demark is already the largest pectin plant in the world with the new expansions to be completed in June 2014.

## AACO TO ESTABLISH NEW PROCESSING FACILITY

Australia's oldest continuously operating company, the Australian Agriculture Company (AACo), has signed a deal with New Zealand food processing company Milmeq valued at \$21 million.

Milmeq began work in October to establish a full line of processing equipment at the Livingstone Valley facility, 50km from Darwin in the Northern Territory.

The equipment will include boning and slaughtering equipment, refrigeration, air conditioning, chilling and freezing systems and materials for handling and palletising.

AACo operates more than 600,000 head of cattle across 19 stations, two feedlots and three farms covering 7.2 million hectares. The land in both Queensland and the Northern Territory occupies approximately 1.1 per cent of the total land mass of Australia.

The Livingstone Valley facility will be capable of processing 220,000 cattle a year, ending the need to truck stock long distances.

Currently it is necessary to truck stock long distances to eastern and southern processing plants.

Stu Cruden, general manager for the AACo project, said they have worked with Milmeq throughout the design phase of the facility and believe they can create an outstanding facility.

"Having engaged Milmeq in the design phase of this facility, we have been delighted by the expertise and experience they bring to delivering results," Cruden said.

The state-of-the-art technology will put Milmeq among world leaders in the beef processing industry.

The Northern Territory operation is set to be completed in mid to late 2014.



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## GOOD EGGS?

The announcements by both Coles and Woolworths that they will be phasing out caged eggs have been met with both criticism and delight from various groups.

In July Coles announced that it would no longer stock Coles-brand caged eggs, followed by Woolworths' October announcement that it will phase out all caged eggs by 2018.

Animal welfare groups, including the RSPCA, have applauded the moves labelling the supermarkets "good eggs" after actively stating they are strongly opposed to caged egg production.

The Australian Egg Corporation Limited (AECL) has condemned the moves, saying they are unnecessary and will have disastrous consequences for Australian egg growers.

According to AECL, all egg production systems have advantages and disadvantages in relation to hen welfare, and eliminating caged eggs will not only impact the farmers who produce caged eggs, it will also reduce consumer choice and in some cases make eggs unaffordable for struggling families.

The average Australian consumes 214 eggs per year of which 50 per cent are caged eggs. On average, caged eggs cost \$3.35 per dozen while free-range eggs cost approximately \$5.38 per dozen. When the non-retail markets, including foodservice, institutional catering and food manufacturing are included, the percentage share of caged eggs increases to approximately 60 per cent of the total market.



Recent scientific research undertaken by the University of Sydney demonstrated that hen stress levels are similar across cage, barn and free-range environments, with the key determinants on hen welfare being hen husbandry, not the system used.

The industry has invested more than \$10 million over 10 years in research and development into better welfare for hens.

## INNOVATION IN WINE YEAST

The new wine yeast, Lalvin ICV OKAY, developed by Lallemand, has been recognised for innovation at the SITEVI International Exhibition for the Vine-Wine industry in France. It will be available for Australian and New Zealand winemakers for the 2014 vintage.

Lalvin ICV OKAY is recommended for aromatic white and rosé wines, ensuring low levels of volatile acidity, promoting aromatic esters and bringing freshness and balance in the mouth.

The yeast was developed through a collaborative study between the scientific Institut Cooperatif Du Vin ICV Group, Lallemand, SupAgro and INRA Montpellier. The innovation is based on successive backcrosses of a fermenting wine yeast and a yeast with very low production of sulfur compounds.

## RECALLNET WINS AWARD

GS1 Recall, an online portal that enables companies to manage a recall, has been awarded the Larry Smith Leadership in Technology Award at the Logistics Association of Australia Awards.



The system was developed in collaboration with Food Standards Australia New Zealand, the Australian Food and Grocery Council, ACCC, national retailers and food and grocery manufacturers. The system enables companies to create, approve and issue recall and withdrawal notifications to their customers and government agencies efficiently and securely.

## CERTIFIED TEST FOR E COLI



A single platform to test for pathogens in beef products has been certified by the internationally recognised group AOAC International.

The DuPont BAX system, which was designed in conjunction with the Agricultural Research Services of the United States Department of Agriculture, is now certified to test for *E. coli*. As a result, manufacturers will now be able to simultaneously test for *E. coli*, *Salmonella* and *Listeria*.

Global director for molecular diagnostics, DuPont Nutrition & Health, Doris Engesser-Sudlow said the system tests the DNA of the samples using screen-friendly prompts that allow for simple and reliable testing.

"The system has been proven to reduce false positive testings, eliminating the frequency that re-testing is required and creating a more time-efficient process," he said.

## SKIPPING BREAKFAST ON THE RISE AMONG KIDS

New research shows one in seven Australian school children are skipping breakfast, a meal linked to improve school performance and lower BMIs in children.

The CensusAtSchool survey findings, released by the Australian Bureau of Statistics, are based on voluntary responses from more than 23,700 Australian school children.

The survey reveals breakfast skipping is a bigger issue in ACT, SA, WA, Tas, Qld and the NT, all with reporting rates above the national average.

The NT tops the list with 22.3 per cent of school children skipping breakfast on the day they took the survey.

Director of the Australian Breakfast Cereals Manufacturers Forum and accredited practising dietitian Leigh Reeve said the results were worrying.

"This is the fourth year in a row breakfast skipping among school children has increased," said Reeve. "It's now up to 14.8 per cent of children skipping breakfast compared to 10.8 per cent five years ago. It's a concerning trend.

"There are more than 50 years of scientific evidence supporting the role of breakfast and better brain function in children, with the latest science linking breakfast with improved numeracy and literacy skills." <sup>31</sup>



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PEOPLE

**New chair of the board at MLA**

Michele Allan is the new chair of the board at Meat and Livestock Australia. Allan is the AIFST president elect and holds several board positions including Food Standards Australia and New Zealand. She is a non-executive director of Ruralco, chair of the William Angliss Institute and the Grains & Legumes Nutrition Council.

**GLNC MD awarded**

Georgie Aley, managing director of the Grains & Legumes Nutrition Council since 2012, has been awarded the inaugural Rabobank Emerging Agribusiness Leader Award. The award recognises an up-and-coming industry professional with a tenure of less than 10 years in the sector.

**Research chief joins Australian Made**

The Australian Made Campaign, the not-for-profit organisation that administers the Australian Made, Australian Grown logo, has appointed Michele Levine as a new director to its board. Levine is chief executive of Roy Morgan Research and was selected for her deep understanding of buyer behaviour and the Australian marketplace.

**From CSIRO to the IRRI**



Matthew Morell, future grains theme leader with CSIRO's Food Futures Flagship, leaves CSIRO at the end of this year to take up the position of deputy director general of research at the International Rice Research Institute in the Philippines. Morell will continue his role on the board of directors of the American Association of Cereal Chemists International.

**Patties appoints GM marketing**



Category and growth specialist Brenda Mitchell has been appointed general manager of marketing at Patties Foods. Mitchell has 15 years' experience in strategic marketing with Sancella and SCA Hygiene and will now be responsible for marketing some of Australia's iconic brands such as Four'N Twenty, Herbert Adams, Nanna's and Patties.

**New marketing director for Freedom Foods**

Freedom Foods has appointed former News Limited marketing director David Goldman to head its marketing and commercial division. Goldman has a 20-year career in marketing having worked for The Coca-Cola Company, McDonald's, George Weston Foods and Canon.

**From ISFR to NSW Food Authority**



David Cusack has been appointed to the position of manager, strategic policy and projects at the NSW Food Authority. He will vacate his position as senior project officer for the Australia New Zealand Implementation Subcommittee of Food Regulation (ISFR) after almost six years. Cusack will continue his role as executive councillor with AIFST.

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# AFGC AND AIFST JOIN FORCES

*Industry bodies work together in support of continuous professional development.*

Words by *Geoffrey Annison*

A formal agreement between the Australian Food and Grocery Council (AFGC) and Australian Institute of Food Science and Technology (AIFST) for the AFGC to provide financial support for AIFST's continuous professional development program has strengthened the working relationship between the two organisations.

The agreement reflects the third stage of the AFGC board's research, education and training strategy, which has been in development during recent years. The driver behind the strategy is a rising concern of a potential shortage of high calibre food technologists available for employment in the food manufacturing sector, which could potentially impede the future competitiveness and growth of the sector.

The first stage of the strategy commenced in January 2012 with AFGC supporting a new Professorship in Food Science and Technology at the University of Queensland (UQ). The objective of the partnership with UQ is to increase the numbers of high quality graduates in food science and technology and related courses.

The second stage saw AFGC, again in partnership with UQ, successfully bidding for, and receiving an Australian Research Council Industry Transformation Training Centre grant. The new training centre at UQ, entitled Agents of Change Training Centre, will provide post-graduate and post-doctoral training through young researchers undertaking technical research projects for food companies and organisations.

An integral part of the training will be extended placements in the partnering of food companies and organisations. This

will provide "business ready" young technologists well suited to employment in modern food processing businesses. Their technical skills developed from research will be augmented with an understanding of the commercial imperatives of food companies.



*Geoffrey Annison*

The new partnership in continuous professional development (CPD) represents the third and final stage of the AFGC strategy and it reflects the modern paradigm that successful careers are sustained by continuous education and skills development. Just as technical innovation and continuous improvement is a distinguishing characteristic of the food processing sector, so too, the industry's technical workforce needs to continually update its skills and competencies. The AIFST CPD program, supported by AFGC is well placed to help it do so.

AFGC's support for the AIFST CPD program is very much focused

on mutual benefit. AIFST members will benefit from access to a strong CPD program, while AFGC member companies will benefit from the enhanced skills of their technical workforce. In the longer term, AFGC shares the AIFST's objective of raising the profile of food scientists and technologists and gaining more recognition for the profession.

The partnership agreement includes editorial space in *food australia* dedicated to the work of AFGC. In coming issues AFGC will discuss the broader strategic agenda for the food and grocery sector. Many understand that AFGC is the lead national organisation for food and grocery manufacturers in Australia, but they may not be familiar with details of its role and how it works.

The organisation represents the industry's views across a range of areas of public policy including nutrition and health, international trade, sustainability, regulatory policy and innovation, education and training. AFGC has been at the forefront of many topical debates from the Goods and Services Tax in the 1990s through to Front of Pack nutrition labelling now.

In future issues of this magazine, AFGC will reflect on, and explain, its policy positions across the many public policy issues challenging the industry. Feedback will be welcomed either through the AIFST, or directly to AFGC by emailing Geoffrey Annison ([geoffrey.annison@afgc.org.au](mailto:geoffrey.annison@afgc.org.au)).

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



# CAREER TOOLS PACKAGE FOR MEMBERS

*Whether you're just starting out or looking to take a step up in your career, the AIFST Career Tools Package could be just the ticket.*

Words by *Bronwyn Graham*



The AIFST Career Tools Package has been independently developed by academics to assist members with focus and direction when planning career progression. It is equally suitable to those just starting their career in the food industry, as well as those seeking a change or enhancement to their already established careers.

If you already have specific goals, the Career Tools Package will help you to create a plan to achieve them. And if you do not have specific goals, the package can help you to develop them.

## Why plan?

Besides helping you to remain focused on your goals, planning can also help you to identify areas that you may need to develop.

The AIFST Career Tools Package has specific tools to help you to identify skill gaps, identify and anticipate barriers, take advantage of career opportunities, and to be resilient and flexible through career change.

## Using the Career Tools Package

The tools in the package are classified into four stages.

### 1. Self-assessment:

These tools will help you assess your personal profile to ensure that your goals are aligned with who you really are. The tools consider your values, personality strengths, preferred work environments and skills. It helps you to define what career success means to you, guides you in an analysis of your current work situation, assesses your career resilience and helps you to prepare a career SWOT analysis.

### 2. Develop and investigate options:

This stage is a downloadable workbook that helps you to develop your networks and investigate career options more thoroughly by comparing your self-assessment from stage one with the Food Industry Career Map developed by the federal government's Department of Employment,<sup>1</sup> which provides a breakdown of the required qualifications, skills and knowledge along with the expected day-to-day tasks for a variety of food industry roles. Through this, you will be able to identify further training, skills or personal development required to help you to reach your career goals.

### 3. Decisions and planning:

The third stage guides you in the development of a plan to reach your goals by setting specific, measurable, achievable, relevant/reliable and time framed (ie, SMART) goals.

### 4. Implementation:

The final stage of the Career Tools Package incorporates resumé development, identifying, applying and preparing for new job opportunities, preparing for interviews and identifying and attending professional development activities.

This Career Tools Package has been developed specifically for the needs of AIFST members and is an invaluable tool to help anyone in need of guidance in planning their career pathway.

If at any time you feel you require further professional career guidance there are many professional career consultants available and you should feel free to also consult with them as the need arises.

## Accessing the Career Tools Package

The Career Tools Package is available for AIFST members only via the continuing professional development (CPD) tab on the AIFST website.

- You will need your login information to access the member only area of the AIFST website.
- Use the drop-down menu under CPD –access the food industry career tools.
- On the front page you will find an introductory video that will help you to decide which stages or elements are relevant to you.
- Download the tools you require so you can complete them at your leisure.

## References:

1. Job Outlook, 2012 <http://joboutlook.gov.au/about.aspx>

*Bronwyn Graham is the AIFST continuing professional development coordinator.*



# AIFST SCIENTIFIC AND TECHNICAL COMMITTEE

The Scientific and Technical Conference Committee is charged with developing AIFST's long-term technical agenda – in particular, the strategic leadership of the annual convention and major satellite meetings including the strategic thought leadership for our Continuing Professional Development program. The committee members are:

**Dr Michele Allan**  
(representing AIFST Council)

**Dr Geoffrey Annison**  
deputy chief executive and director, health, nutrition and scientific affairs, Australian Food and Grocery Council

**Mr Callum Elder**  
executive general manager quality and innovation, Simplot Australia Pty Ltd.

**Dr Greg Harper**  
director external engagement & deputy chief, CSIRO Animal, Food & Health Sciences

**Dr Marion Healy**  
executive manager risk assessment, FSANZ

**Dr David Roberts (chair)**  
food & nutrition consultant

**Dr Geoffrey Smithers**  
independent food consultant

**Dr David Topping**  
chief research scientist, CSIRO Animal, Food & Health Sciences

## VALE PETER BOARD

by Robert Steele



I had the pleasure of working with Peter Board who passed away in October. He was an ideal leader and mentor.

He joined the canning section of CSIRO in 1950 on completing his BSc (Hons) at the University of Sydney. His leadership qualities were quickly recognised by

J.R. Vickery, chief of the division who said he showed "outstanding initiative and energy". In 1970 he was made leader of the Food Technology Section, and in 1977 leader of the Applied Science Group.

Board published over 100 scientific papers and was the leading Australian authority on the safe processing

of canned foods and on corrosion. His standing was recognised by his appointment as chair of the Australian Standards Association committees on canned foods, the NHMRC committee on surgical implants and the Australian Defence Force's Food Specifications Committee. He wrote the code of practice for thermal processing of low-acid canned foods.

Board was a founding member and a fellow of the AIFST and in 1981 he was honoured with the AIFST Award of Merit.

On his retirement in 1986, J. Kefford wrote " ... he has devoted himself to the technical welfare of the industry and has successfully resolved many challenging problems by inspired thinking". After his retirement he taught specialist courses at the University of Western Sydney and established a successful consultancy practice.

CSIRO and the Australian food industry have enjoyed an excellent international reputation thanks in part to Peter Board's dedication, initiative and energy.



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# INNOVATION MASTERCLASS

*What comes after the mining boom? Australia is perfectly placed to become the food bowl for Asia but it will take innovation to get us there.*

Australia's \$111 billion food industry is at a critical juncture. We have an opportunity to become the food bowl for Asia – with a potential market of 1.6 billion people – but to get there we need to innovate across the value chain.

This was the central theme of the AIFST's second Innovation Masterclass – Innovate to Survive which was held in Melbourne on 24 October.

The Masterclass featured sessions from leaders across the industry sharing their insights, experiences and some really exciting initiatives to strengthen Australia's innovation capacity.

## Innovation drivers

Callum Elder, Simplot's executive general manager of quality and innovation, spoke about the mega-trends impacting the food industry and the associated drivers for innovation.

"We need to navigate the relentless rise in input costs and regulation, which mean decreased margins for manufacturers," said Elder. "It's a situation that particularly impacts SMEs – demonstrated through the increase we are seeing in factory closures and off-shoring."

Several speakers spoke of this desperate necessity as a significant driver for innovation. Nick Hazzell, research and development director, PepsiCo ANZ, shared the example of Uncle Ben's microwavable rice pouch. It came about when Uncle Ben's in the UK was faced with the prospect that the company's rice in a can production line was about to close.

"We knew we had a good concept – instant rice – but it wasn't selling," said Hazzell. "At the time the company was part of Mars, and we had the idea to tap into our pet food network and utilise pouch packaging which gave rise to the innovative fast-cooking rice segment."



*From left: Roger Stanley, University of Tasmania, Russel Rankin, Food Innovation Partners, and Maria Cristina Lesseur, new product development specialist.*

This segment is now bigger than the uncooked rice segment in Europe.

## The risk of the organisation

Speakers talked about the risk that organisational processes can pose to innovation.

Allan Ryan, executive director at the Hargraves Institute, said the key driver of innovation is people and it is imperative that the right people are empowered to drive innovation.

"The critical success factor in innovation is not the innovator – they are actually the second most important person," said Ryan. "It is actually the person who listens to the innovator and then makes the idea happen."

## The value of collaboration

One of the strongest themes of the day was the importance of relationships and collaboration to facilitate innovation.

According to Deakin University's Professor Paul Couchman, small businesses generally don't perform well in innovation and while some do engage with external organisations, most are sourcing their ideas for innovation from within the business.

The ability of SMEs to innovate is impacted by financial and resource constraints, lack of complementary assets, and limited capability to access new knowledge as well as the capacity to assimilate and transform it into business operations.

In order to boost assets and overcome the liability of being small, SMEs need to collaborate more. While the data clearly shows that SMEs tend to collaborate less, Couchman did note the enormous variability across the industry and warned of aggregate statistics because they definitely do not tell the whole picture.

“Some SMEs are actually very effective at innovation – generally when they are led by entrepreneurial and intensively networking CEOs who are able to establish collaborative ventures and informal linkages that compensate for their own resource limitations,” said Couchman.

### Navigating the ‘worlds’ of industry and research

One of the challenges of collaboration is the need to understand the objectives and the drivers in each player’s world.

According to Couchman, there are distinct tensions that need to be managed when public sector organisations work with the private sector to commercialise knowledge. These include aligning different timeframes, balancing the credibility of published peer-reviewed research against the commercial opportunity of unexploited information, balancing commercial advantage and public good, and generally managing relationships across divergent cultures.

Russel Rankin, director at Food Innovation Partners, emphasised the important role a ‘translator’ or intermediary can play in these

circumstances to identify the opportunity to turn research outcomes into a competitive commercial advantage or to turn a commercial opportunity into a research project.

### Establishing collaborative hubs

In partnership with the Victorian government, Mondelez International (formerly Kraft Foods) is establishing the Ringwood Confectionary Centre of Excellence.

The centre is intended to attract, develop and retain talent in food innovation and manufacturing with a view to positioning Australia as a leading food manufacturing centre in the Asia-Pacific region. It will embrace technologies to provide the opportunity for rapid product prototyping with 3D technology, facilitate opportunities for open innovation and improve consumer insight and knowledge.

“If we are to capitalise on the enormous growth potential in Asia, we need to understand the Asian consumer so that we are in a position to increase the value-added foods Australia is exporting,” said Mondelez’s Nicolas Georges, director

of premium chocolate and dairy R&D, Asia Pacific.

The benefits of effective knowledge and technology transfer were then presented from an international perspective with CSIRO’s Roman Buckow sharing the results from HighTech Europe, a network designed to achieve a durable integration of R&D and knowledge transfer capacities between academics and industry.

### FIAL

To accelerate commercially driven collaboration and innovation in the Australian food industry, Food Innovation Australia Limited (FIAL) was launched in July 2013 as part of the previous federal government’s \$1 billion Industry and Innovation Statement: A plan for Australian Jobs.

FIAL chair Peter Shultz presented an overview of the group and its potential to support the Australian food industry.

“FIAL is government funded but industry led,” he said. “We have a remit to build the quality and scale of the industry by fostering collaborative partnerships that build trust, lead to



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innovation and deliver commercial benefits.”

FIAL covers the whole food value chain from agricultural inputs to domestic and export markets. Membership is open to all food and beverage companies, primary producers, research organisations and associations and the success of the group will largely depend on the preparedness of the sector to get involved.

“Through working together and advocating for the industry as a whole, we strengthen our capacity to bring insights, network capabilities and

drive innovation that will ultimately grow the industry and improve profitability,” said Shultz.

### Measurement

Professor Don Scott-Kemmis, from University of Technology Sydney, emphasised the importance of measurement. He said the essential thing for any organisation is to be very clear about what it is they want out of innovation initiatives and R&D programs.

“R&D is a strategic investment to allow you to play in the future but you must have the right metrics to ensure

you are playing in the right area,” said Scott-Kemmis.

Finally, several speakers spoke about creating a culture of innovation. The workshop was invaluable in sharing knowledge and inspiring delegates. But ultimately it is not about what you learn in a workshop. Innovation is what you do every day, and improving on what you did yesterday.

*Innovate to Survive was held in Melbourne on 24 October 2013 and was sponsored by the Victorian state government's Department of State Development, Business and Innovation.*



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# CALL FOR NOMINATIONS 2014 AWARDS

Nominations are now open for the following 2014 AIFST awards, which will be presented at the annual convention.

## Food Industry Innovation Award

This award recognises a significant new development in a process, product ingredient, equipment or packaging or in food safety or logistics, which has achieved successful commercial application in the Australian food industry over the past five years.

## Keith Farrer Award of Merit

This is awarded for achievements in food science and technology in the fields of research, industry and education, and helps further the aims and objectives of the Institute.

## President's Award

This award recognises, acknowledges and acclaims outstanding contributions to the Institute by an individual or organisation.

## Jack Kefford Award

This award recognises an exemplary food and science and technology paper published in any peer-reviewed journal (print or electronic) by an AIFST member in the previous year.

## Malcolm Bird Commemorative Award

This award recognises members under the age of 30 who demonstrate academic achievement, leadership and integrity in their profession. Selection is based on a 1,000-word technical abstract and oral presentation on an aspect of food science which is given at the annual convention.

## Student Product Development Competition

The competition provides students with an opportunity to develop and present an innovative new product. The award, which aims to promote professionalism and innovative thinking and provide a link between students, industry and AIFST, is open to undergraduate AIFST student members.

## Bruce Chandler Book Prize

The late Bruce Chandler bequeathed funds to establish a prize for a book that has been published in the past five years and makes a great contribution to food science and technology.

*Closing date for all awards: 17 March 2014.*

Detailed information, including conditions and the nomination process, for all awards is available on the AIFST website. [🔗](#)

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# THE NOSE KNOWS

*Biosensors being developed by CSIRO provide new ways to detect and measure odours, chemicals and enzymes in food and beverages, including spoilage indicators and flavour components.*

Words by Arwen Cross

Sensors and tests already have a role in food production to ensure product quality, consistency and safety. Now a new generation of biosensors offers the opportunity to detect several target substances at once. They are also capable of continuous operation, making them well suited to integration with process streams.

Biosensor technology could be used to detect aromas that contribute to flavour, or to detect contaminants and spoilage. The sensors work for liquid or gases, so they can be used to detect odours and chemicals in, or in the air above, food and other samples.

Testing the gases above food offers an approach for detecting taints, desirable or unwanted maturation odours, flavour or taste degradation and off notes developed during storage. Testing the water-soluble components of food and

“Now, after years of research, we have made significant breakthroughs that have made the dream of an electronic nose a reality,” he said.

“What makes our sensors special is that we are using a biological basis for the sensor, which is proving to be faster, more sensitive and more discriminating than the alternatives. The system also requires only small quantities of consumables, making it cost effective for running large numbers of samples.”

Trowell and his team have built biosensors for several substances, which can be incorporated into a benchtop device. “I can see great potential for the biosensors in several industries, and the food and beverage industry certainly stands to benefit from the technology,” said Trowell.

bacteria can survive the treatment, affecting the flavour or even curdling batches of milk. This makes detecting early indicators of spoilage very important, but current methods can be time consuming or rely on expensive equipment.

One current method for detecting early milk spoilage indicators is using a flow cytometer, which is an expensive machine that can analyse milk to detect a cow’s immune response to a bacterial infection. Both the bacteria and the immune response can release proteases that lead to milk spoilage.

Biosensors have the potential to replace this equipment by looking for direct evidence of proteases in milk, says Trowell. “We have engineered biosensors that can detect the presence of proteases and their level of activity,” he said. “We’re currently testing these sensors for use in milk, and we anticipate that the technology could detect spoilage in other products too.”

“ We have made significant breakthroughs that have made the dream of an electronic nose a reality ”

beverages makes it possible to measure nutrient levels, monitor spoilage enzymes, and detect contaminants including toxins or pesticides.

Stephen Trowell, theme leader in CSIRO’s Food Futures Flagship, leads a multi-disciplinary team doing pioneering biosensor research. He says the idea of creating a machine to mimic the function of an animal’s sense of smell is at least 30 years old, but it has proven hard to achieve.

## Detecting milk spoilage

In the dairy industry, avoiding spoilage is a serious concern. Proteases in milk can affect the flavour of milk, or curdle it by breaking down the proteins that keep the fat emulsified. The amount of protease present in the milk varies depending on many factors including the breed of cow and its health.

While ultra-heat treatment can eliminate contaminating bacteria from milk, proteases produced by the

## Sensing maltose

Maltose or malt sugar is an important contributor to the taste, quality and body of beer. Maltose is also found in other beverages, cereal, pasta, and as a sweetener in many processed products.

In tests using beer as the proof of concept, Trowell’s team at CSIRO have demonstrated that their biosensor could accurately measure maltose content at levels relevant to beverage and food samples.

Current methods used by the food industry require expensive and specialised equipment. Biosensors offer an opportunity to take the



The CYBERNOSE technology breaks with traditional electronic nose design in using microfluidic channels that allow the sensors to flow continuously, eliminating the problem of sensor drift. Image: Carl Davies, CSIRO.

measurements using a less complex device.

The biosensor for maltose provides proof-of-principle that biosensors could be developed to measure other sugars and amino acids. It makes use of the maltose-binding protein, which is a member of a large family of soluble proteins that are found in bacteria called periplasmic binding proteins. Utilising this protein family, it is conceivable that similar sensors could be designed to bind to other sugars and amino acids, which would

be useful for the food and beverage industry.

### Sensing aromas from ketones

Ketones are volatile aromas that contribute to the flavour of food. Measuring them is relevant to ensuring a consistent flavour, or as part of a suite of aromas for provenance testing.

“We know that various ketones contribute to desirable and undesirable aromas in food and beverages, so biosensors for ketones would be relevant in their production,” said Trowell. “So

far we’ve developed biosensors that respond to several ketones, including buttery odours.”

### Multi-purpose sensors

At present, detectors for spoilage factors or flavour components come in many different shapes and forms, from machines to paper test strips. One piece of equipment that can simultaneously measure multiple factors would increase screening efficiency, reduce the time and cost of screening using multiple methods and



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Scientist Murat Gel loads a liquid sample onto prototype biosensor equipment.  
Image: Carl Davies, CSIRO.

avoiding the risks associated with not screening.

So far, the technology can measure up to four different chemicals simultaneously in a single sample using the biosensor equipment developed at CSIRO but this range could be expanded in the future.

Multi-purpose biosensors address a need for rapid screening for multiple contaminants in today's global food industry. As manufacturers source ingredients from around the world, ingredients produced under different regulatory standards may need to be screened for contaminants such as antibiotics, pesticides, natural toxins or adulterants.

In a project addressing toxin screening, Trowell's team is developing a sensor to detect aflatoxin which is relevant to food security in sub-Saharan Africa and elsewhere.

Multiple biosensors in a single instrument could also allow for

## HOW BIOSENSORS WORK

Inspired by nature and a result of pioneering research, patented Cybernose and Cybertongue sensors being developed by the team at CSIRO mimic the sophisticated smell receptors of simple animals to detect and measure odours and chemicals in a range of substances. The sensors can be used in a benchtop bio-electronic device to rapidly and accurately detect odours and chemicals in, or in the air above, food, beverages and other samples.

After years of research in biosensors, Cybernose technology is a major advance, which can detect chemicals at the level of one drop in 20,000 Olympic-sized swimming pools. The Cybertongue instrument works on a similar principle, but measures chemicals in liquids rather than gases, 'tasting' rather than 'smelling' them.

Smell receptors in animals work by changing shape when an odour molecule binds to them, sending a signal that is perceived as smell. These smell receptors have been re-engineered by the researchers so that they emit a mixture of blue and green light. It's the varying colour of this light that is at the heart of the biosensors.

When an odour or other chemical binds to the biosensor, it changes shape causing the colour of the light to change, which is easy to measure. Optical detectors are used

to measure the light and a computer analysis indicates whether a particular substance is in the test sample. The quantity can be measured too, because the degree of colour change is related to the amount of the substance that is present.

Eight biosensors have been designed at CSIRO so far, and they are all based on the fundamental principle of a biological sensor emitting light that can be measured. While the odour and maltose sensors change shape when an odorant binds to them, the protease sensors are cleaved by the protease. The cleavage changes the light emitted by the sensor, allowing both the presence and quantity of protease to be measured.

"Another thing that makes our biosensors different is that they don't rely on a sensing surface," says Trowell. "Instead the molecular sensors are mixed with the sample and continuously flow through a microfluidic channel. This design avoids the challenges of slow sensor regeneration and drift over time because each sensor is used only once and replaced by others in real time."

The work has progressed to allow the sensors to be incorporated in a benchtop Cybernose or Cybertongue device, which is being tested for a range of applications.



provenance or anomaly testing of foods using fingerprints. Measuring multiple chemical components in a product could provide a fingerprint for a regional product's characteristics. For example, if a fingerprint profile was developed for a wine from a particular region, then other samples could be compared with a fingerprint library to determine whether a sample had the expected provenance or not.

Fingerprinting also forms the basis of simple anomaly testing, which is useful for finding unexpected contaminants or adulterants. While most tests currently used in the food industry are targeted at finding a single chemical in a food sample, fingerprinting using multiple biosensors in a single scan can pull out anomalies that don't fit the normal pattern. This provides first pass detection of adulterants that are unexpected or can't be directly tested.

### Applications in food and beyond

Biosensor technology can be adapted to and applied across a wide range of industries and uses, wherever rapid or ongoing information about

a chemical environment is needed. This could include food and beverage manufacturing, the diagnosis of infectious diseases, environmental monitoring or biosecurity.

In addition to the research in biosensors for the food and beverage industries, Trowell and his team are working with the Australian Department of Defence to develop a prototype instrument to detect explosives.

They are also working on non-invasive disease detection using chemicals in human breath that can indicate an individual's health, metabolic status or food intake.

"We see great potential for biosensors in the food industry to help to satisfy consumer demand for greater product quality, consistency and safety," said Trowell.

"They can detect specific taste and smell components to enhance flavour, improve consumer appeal, and avoid spoilage and contamination. Now we're looking to hone our biosensors in close collaboration with the food industry and the makers of testing equipment." ●

*Arwen Cross is communications advisor to CSIRO's Food Futures Flagship.*

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### Trademark information

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# PROCESSING TECHNOLOGIES

*A look at innovative processing technologies with the potential to improve the ‘fresh-like’ qualities of processed foods.*

Rising demand for fresh, clean label food products with an acceptable shelf life continues to drive new processing technologies. In this article we look at some of the latest processing technologies and where research is taking them.

## High pressure processing

High pressure processing (HPP) subjects food to intense hydrostatic pressures near room temperatures, inactivating microbes and some spoilage enzymes while preserving the taste, flavour and vitamin content of the product.

Unlike heat, HPP does not disrupt chemical bonds and this means that the nutrient and flavour components of the food are left largely intact.

“The result is a product with a fresher taste and colour, crisper texture and higher nutritional value than its thermally processed counterparts. In fact, research suggests that the bioavailability of many active food compounds can actually be enhanced by HPP,” said Dr Roman Buckow, stream leader of CSIRO Animal, Food and Health Sciences.

“In Australia, HPP is used for the processing of fruits and juices, ready-to-eat meats and guacamole. It can also be used to separate raw shellfish meat from its shell and is used as an intervention to inactivate *Vibrio vulnificus* bacteria found in oysters grown in warm waters,” he said.

HPP alone is not without its limitations, however. Bacterial spores are a major challenge and the level of inactivation achieved by a single pressure cycle at ambient temperatures is not significant enough to provide

microbial sterility in low-acid foods.

Research is currently focused on techniques that combine HPP with other microbial hurdles, such as mild heat, to promote more effective inactivation of bacterial and fungal spores and achieve commercial sterility and high-quality shelf stable products.

## Pulsed electric field processing

Pulsed electric field (PEF) processing applies very short, high voltage pulses to a food disrupting the functionality of the cell membrane, enhancing the extraction of intracellular liquid. It is used in the production of fruit and vegetable juice, sugar and winemaking.

“PEF often provides a similar yield in fruit juice processing as the more cost- and time-intensive enzymatic maceration. It can also provide ‘fresh-like’ juice quality and a higher concentration of functional constituents,” said Buckow.

As an effective non-thermal (<50 °C) food preservation technology, PEF has been shown to successfully inactivate vegetative microorganisms without affecting proteins, vitamins and volatiles.<sup>1</sup>

The new area of focus for PEF research is the conditioning or texturing of plant tissue – for instance apples, carrots, potatoes, for cutting or drying applications, a process that has been successfully commercialised for some food ingredients and products already.<sup>2,3</sup>

## Ozone technology

Gaseous and aqueous ozone technology was approved by the USFDA in 2001 as an antimicrobial agent for the treatment, storage and processing of foods. Ozone has many advantages over other

antimicrobial agents – it is a triatomic allotrope of oxygen (a form of oxygen in which the molecule contains three atoms instead of two as in the common form) and rapidly breaks down into oxygen, leaving no residues on foods. It is claimed that it can destroy all forms of microorganisms at relatively low concentrations.

“Ozone technology alone has its limitations, including the formation of free radicals and oxidation of lipids in some applications,” said Dr Kai Knoerzer, CSIRO Animal, Food and Health Sciences.

And like HPP, ozone is less effective with superdormant spores (ie, those that germinate slowly compared to the majority of the spore population), which are around 20 per cent more resistant to ozone treatment than heterogeneous spore populations.

Researchers are investigating combined technologies as a way of overcoming resistance to superdormant spores. Ozone-HPP hurdle technology has been shown to reduce superdormant spores and reduce the risk of foodborne illness in refrigerated food products.<sup>4</sup> So too, the combination of ozone and heat treatment has been shown to be effective for the inactivation of *E. coli*, *Salmonella* and *Listeria* while still maintaining product quality.<sup>5</sup>

## Ultrasound processing

Ultrasound is a non-thermal, non-chemical, physical processing technology with a broad range of widely differing applications in food processing. These include defoaming, improved extraction and cleaning of wine barrels to increase their useful life.

Ultrasound uses variations in acoustic pressures that cause the formation of small water vapour bubbles in a liquid, which expand and contract extremely rapidly. Depending on the application and the sound frequency, the bubbles are either mostly stable (at >100 kHz) or grow to a point where they violently collapse. The effect of high-frequency ultrasound results from either the stable bubbles changing the structure of the liquid on a submicron scale or the pressure waves and associated microstreaming from the collapsing bubbles. Most ultrasonic systems require a liquid to couple and deliver energy.

“Ultrasound can increase process efficiency through enhanced yields, increased mass transfer, reduced pipe friction and viscosity, enhanced drying, defoaming, enhanced agglomeration and crystallisation. Ultimately this means reduced processing cost,” said Knoerzer.

High-powered ultrasound (HPU) is currently being commercialised by processing technology company Cavitus in a number of industries worldwide, including palm oil, olive oil, dairy/soy and wine. The company anticipates that HPU will continue to

increase in importance throughout the world, citing the UK Department of Trade and Industry’s description of it as a ‘key technology for the future’.

Research is currently investigating ways to reduce convective drying times and temperatures through ultrasound, including promising data that suggests it can reduce convective drying times of fresh produce (apples and prunes) by more than 50 per cent at 40°C.<sup>6</sup>

Innovative processing technologies that have the potential to improve the ‘fresh-like’ qualities of processed foods, enhance shelf life and minimise the risk of foodborne illness continue to be developed and assessed. Increasingly researchers are combining technologies – like high-pressure processing (HPP) and mild heat, ozone and HPP, ozone and heat – however, in many cases, commercialisation remains the challenge. 🍌

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# WHAT DOES 'HIGH IN WHOLE GRAIN' REALLY MEAN?

*New industry code sets the standard for whole grain ingredient content claims.*

Words by *Michelle Broom*

How much whole grain does your breakfast cereal, bread or crisp bread need to have to be considered 'high in whole grain' or 'very high in whole grain'? Even food industry experts can be forgiven for not knowing, as there is currently no regulation for content claims to describe the different amount of whole grain in different foods.

However clarity for all Australians around labels and advertising of the whole grain content of foods is on the horizon, through the *Code of Practice for Whole Grain Ingredient Content Claims* (the Code).

The Grains & Legumes Nutrition Council (GLNC) – the independent authority on the nutrition and health benefits of grains and legumes in Australia and New Zealand – developed the voluntary Code to set a standard for the labelling of whole grain foods, which vary widely in whole grain content.

Under the new Code, from 2014 consumers will begin to see consistent messages for the whole grain ingredient content of foods on food packaging and advertising. It covers the use of content claims and statement of the foods contribution to the whole grain Daily Target Intake (DTI), as well as GLNC certification for use on packaging. The Code is a big win for public health, for brands and for consumers.

The food industry is welcoming the new standard. It will encourage manufacturers to increase whole grain content to meet a higher level of claim. It also offers a point of difference for brands with higher amounts of whole

grain and opportunities for on-pack content claims and off-shelf promotion.

The standard will also help consumers make informed food choices and more easily identify foods higher in whole grain, thereby assisting people in meeting the recommended amount of whole grain each day.



Among the first to sign as Registered Users of the Code are three of Australia's largest core grain food manufacturers – Goodman Fielder, Sanitarium and Bakers Delight. All three have chosen to use the whole

grain DTI statement. Goodman Fielder and Bakers Delight will use both the DTI statement and content claims, with Goodman Fielder using them on pack, initially on Helga's bread products. Sanitarium will use the DTI statement across its Weet-Bix range from 2014.

Wide adoption of the Code is vital to help Australians choose foods that will help them meet the whole grain DTI. This will bring greater understanding about the value of enjoying grain foods three to four times a day, and legumes two to three times a week.

While the revised Australian Dietary Guidelines (ADG) placed increased emphasis on whole grain foods, GLNC consumption study data (2009 and 2011) confirms Australians aren't eating enough whole grain foods. In fact, whole grain food intake decreased about 20 per cent over this time, attributable in part to mixed messages about the whole grain content of foods, which can create confusion among consumers.

The Code content claim levels were developed through consultation with the public health and nutrition research community, and the food industry, based on scientific rationale. They are in line with international labelling and characterisation of whole grain foods, including that of the American Association of Cereal Chemists (AACC) International.

## Unpacking the code of practice

Under the new standard, whole grain ingredient content claim levels, summarised in Table 1, are based on a



contribution to the 48 gram DTI and fit with the ADG.

The new Code also enables whole grain, high fibre grains or legume foods to be certified by GLNC, and permits on-pack use of GLNC’s certification statement and logo by registered users.

On-pack use of the GLNC logo and certification can help consumers to identify healthier grain and legume foods, and should start to appear in 2014. Certification criteria are based on specific nutrient criteria.

GLNC is pleased to have taken the leadership role in the development of an industry standard to provide a best practice platform for whole grain ingredient content claims.


The whole grain ingredient content claims will highlight product choices for consumers that will help them meet the ADG and the whole grain DTI. The additional certification will highlight healthier choices for consumers within the grains and legumes category.


GLNC is now working with food industry representatives towards the wide uptake of content claims across the grain foods category. Ultimately, the end goal is to provide clear consistent messages to consumers and enhance the promotion of more nutritious grain and legume foods. 🍌

TABLE 1: Whole grain ingredient content claim levels

Whole grain ingredient content per manufacturer serve	Permitted whole grain ingredient content claim
< 8g whole grain	No whole grain ingredient content claim permitted
≥ 8g whole grain	Contains whole grain
≥ 16g whole grain	High in whole grain
≥ 24g whole grain	Very high in whole grain

*Michelle Broom is code manager and nutrition program manager for the Grains & Legumes Nutrition Council.*





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## GROWTH IN PLANT PROTEINS

*Consumer demand is seeing an increase in the use of plant proteins, such as pea and potato.*

Demand for protein is on the rise and the US is leading the charge on this latest global food trend. Products carrying high protein claims are spanning a wide variety of food categories and extending far beyond naturally protein-rich foods such as dairy, meat, poultry and fish. And with many consumers embracing the trend toward eating less meat, much of this demand is for high protein plant-based foods.

According to global research agency Mintel, the US is launching more high-protein products onto the market than anywhere in the world, but the trend is starting to spread. In 2012, the US accounted for 19 per cent of new food and beverage products making a 'high-protein' claim, followed by India and the UK at nine per cent and seven per cent respectively.<sup>1</sup>

Recent US launches include Kellogg's FibrePlus Antioxidants Protein Bars as well as higher protein cereals; the birth of a booming low-fat high-protein Greek-style yoghurt market driven by Chobani; and a growing meat substitutes market, driven by consumer concerns about their health and the environmental impacts of excessive red meat consumption.

In fact, products combining high protein and vegan claims have shown 54 per cent growth in the past five years in the US and this demand is seeing an increase in the use of plant proteins, including those from pea and potato.<sup>1</sup>

In Australia, 10 per cent of people claim the food they eat is all, or almost all, vegetarian – that's 1.9 million Australians, a figure that has increased

*“ Products combining high protein and vegan claims have shown 54 per cent growth in the past five years ”*

by more than 300,000 in four years, according to 2013 Roy Morgan data.<sup>2</sup>

One of the challenges for plant sources of protein is ensuring protein quality. Earlier this year the Food and Agriculture Organization of United Nations (FAO) recommended a new method for assessing the quality of dietary proteins. The Digestible Indispensable Amino Acid Score (DIAAS) determines amino acid digestibility at the end of the small intestine, whereas the previous method estimated digestibility over the whole digestive tract and generally overestimated the amount of amino acids absorbed.

The DIAAS method allows researchers to differentiate protein sources by their amino acid bioavailability. By using this method, FAO was able to demonstrate the bioavailability of whole milk powder of 1.22 compared to the DIASS score of 0.64 for peas.

While they may not offer the same bioavailability, plant proteins are satisfying a consumer demand. And as food manufacturers consider ways to satisfy this demand, new ingredients are being launched.

Netherlands company Solanic has launched a new protein from potatoes – Pro Go – claiming it provides good bioavailability compared to other plant proteins. While the company hasn't had Pro Go's DIASS score calculated,

it cited a protein efficiency ratio (ie, g weight gain vs g protein intake) of 2.3, compared to soy protein isolate with a value of 1.6 and pea protein with a value of 2.0.

“Pro Go is low allergenic, unlike functional proteins from soy, milk, wheat or egg. We have a very sound offering based on the high bioavailable amino acid profile of the proteins we extract from potatoes,” said Solanic's managing director Michiel Puttman.

“The product has a broad range of applications from use in protein bars and protein powders to use in high-protein snacks and ready-to-drink beverages, and claims to provide the ability to create crisp textures in snacks.”

Like potato protein, pea protein is also gaining in popularity.


Canadian Burcon Nutrascience Corporation launched Peazazz Pea Protein at this year's Institute of Food Technologists annual meeting and expo. The product has a wide range of applications from sports nutrition beverages, citrus-based drinks, fruit-flavoured beverages, fruit juice blends, fortified waters, dairy alternative products and powdered beverage mixes.

While soy and wheat protein are still widely used in vegetarian foods, they are also allergens so it is interesting to see these new ingredients entering the market.



When it comes to processing, the functionalities of plant proteins are generally not as well understood as those from animal proteins, in particular dairy. As demand for plant protein increases, there is an opportunity for the development of technologies that will further enhance

their nutritional and functional properties.<sup>3</sup>

As processing technologies continue to improve, the next challenge will be for marketers to develop meat alternative products that attract more mainstream consumers who do not identify with a 'vegetarian' label. 

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# SEAFOOD SCIENCE

*Science holds the key to adding value to seafood.*

Words by Allan Bremner

At this year's AIFST annual convention, value adding seafood through food science was a key theme. Graham Fletcher, team leader, Seafood Technologies at the New Zealand Institute for Plant & Food Research delivered a compelling keynote address 'Seafood Technology: Where have we been and where are we going'.

A microbiologist by training, Fletcher has 30 years' experience in many aspects of seafood science, technologies and processing and collaborates with other institutes across the globe. His main interests are in safety, spoilage, shelf life, processing and packaging of chilled seafood and other foods.

Fletcher provided an overview of the latest innovations in seafood safety, packaging and enhancement for post-harvest processing from around the world. Here are some of the highlights.

## Aquaculture

At US\$125 billion, global aquaculture production in fresh-, brackish- and marine-waters has well exceeded the value of the wild catch. While aquaculture is more labour-intensive, which makes it more expensive in developed countries, it is less weather-dependent and therefore offers more predictable production with more control over the raw material.

However no matter which species are farmed, it is important they are of high value and that means focusing on premium fish with high margins such as salmon.

## Harvesting

New Zealand is increasing its tonnage of exports and more mechanised methods of harvesting are being employed. Special emphasis is given to techniques

of 'rested harvest' in which fish with superior flesh qualities is produced by harvesting in ways that minimise the stresses on the fish resulting in better products suited to more discriminating markets.

## Transport

Sea transport is limited mainly to frozen product as we can't restrict autolytic changes in flesh that is chilled, whereas additives and gas packing can inhibit spoilage bacteria. Research into foam boxes made from expanded polylactic acid is promising as it offers the same insulation properties of Styrofoam but it is biodegradable in compost.

## Handling

Better handling for an improved end product, achieved by flow ice and salt water, ice systems are used

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to keep fish temperatures to below -0.6°C to substantially reduce deterioration. Quality Index schemes are available for many species and automated NIR/Vis instruments are being investigated for online and at-line rapid assessments. Temperature control at the retail level must also improve in order to extend shelf life. While most supermarket fridges run at 4°C, chilled seafood should ideally be stored at 0°C to -1.5°C.

### Automation

New Zealand designed and built automatic mussel openers are replacing people as 28 of these machines can open 90,000 mussels per hour compared with 36 workers who can only open 28,700 per hour. This increased automation isn't necessarily bad news for employees as a reduced unit cost and increase in production means that employees are still employed in other capacities.

To date automation has mainly been used on high-throughput species but greater adaptability in software and robotics in which operational heads can be exchanged on a prime machine base will provide the diversity to handle different tasks.

### Safety

Better design of process plants with better fittings, materials, drains (stainless steel pipes) and surfaces allows for far greater sanitary compliance, which can avoid the need for the thousands of dollars spent on testing for listeria.

### Shelf life

Consumer preference is for chilled over frozen fish, so the shelf life of fresh seafood must be increased.



*While automation of mussel opening is replacing people, it isn't all bad news for employees as a reduced unit cost and increase in production means they are still employed in other capacities.*

New technologies other than heat to reduce bacterial content at the start of the shelf life include high-pressure processing for added value products (not raw fish), pulsed light, electric fields and cold plasma.

Modified atmosphere packaging and the use of carbon dioxide generated within the pack can prolong shelf life in new-style consumer packs. <sup>30</sup>

*Allan Bremner is consultant at Allan Bremner and Associates and adjunct associate professor in Food Technology at the University of the Sunshine Coast.*

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# PUTTING STANDARD 1.2.7 TO THE TEST

*Vitalis Nutrition puts Standard 1.2.7 to the test in labelling their first consumer-direct product.*

Words by Peta Brenes

Food manufacturers have been making food-related health claims for decades. Back in the 1960s, advertising for Vegemite claimed vitamin B1 was the ‘anti-neuritic vitamin’, and one-third of a teaspoon of Vegemite three times per day in milk was the cure-all for jumpy nerves, dull tiredness, constipation, weight loss, restlessness and more.

Interestingly, this is not far removed from those health-related claims for vitamin B1 in standard 1.2.7 today, for example, that it contributes to normal psychological function. However, can the manufacturers of Vegemite make vitamin B1 health claims today, as they did back in the 1960s? I’ll revisit this later in the article.

But first, I’ll take you through the step-by-step process we took in considering the labelling of our first consumer-direct product, Regenervite Vital.

## What is Regenervite Vital?

Regenervite Vital is a powdered, formulated meal replacement

standardised under 2.9.3 of the Food Standards Code. The product is targeted at people 45 years and over who may: need to lose weight; have elevated blood cholesterol; or are seeking to prevent osteoporosis. At all times, claims were considered with this target population in mind.

Each serve of Regenervite Vital contains:

- Less than 1200kJ energy
- Over 12 grams protein
- Over 10 grams dietary fibre
- 3 grams oat bran beta-glucan
- Over 300mg calcium
- 25% recommended dietary intake (RDI) for vitamin D

Given the target market and unique benefits of key ingredients, it was determined that:

- Nutrition content claims would be made in relation to protein, fibre, beta-glucan, calcium and vitamin D.
- General level health claims

made regarding energy (weight management); and

- High-level health claims made regarding beta-glucan (cholesterol), and calcium and vitamin D (osteoporosis).

Standard 1.2.7 allows three levels of claims: nutrition content claims (Schedule 1); general level health claims (Schedule 3); and high-level health claims (Schedule 2).

## Nutrition content claims (Schedule 1)

Generally, nutrition content claims use descriptors to highlight the presence or absence of certain properties of a food, for instance: gluten free; increased protein; low fat; no added salt, etc.

To make a nutrition content claim, a product must first meet the general claim conditions stipulated in Column 2 of Schedule 1 (Table 1). Any product meeting these conditions can claim that the product is a ‘source of’ the property of the food, eg, source of dietary fibre. However, to use a specific descriptor,

Table 1 – Example of nutrition content claim table from Schedule 1 (Dietary fibre)

Column 1	Column 2	Column 3	Column 4
Property of food	General claim conditions that must be met	Specific descriptor	Conditions that must be met if using specific descriptor in Column 3
Dietary fibre	A serving of the food contains at least 2g of dietary fibre unless the claim is about low or reduced dietary fibre	Good source	A serving of the food contains at least 4g of dietary fibre
		Excellent source	A serving of the food contains at least 7g of dietary fibre
		Increased	(a) the reference food contains at least 2g of dietary fibre per serving; and (b) the food contains at least 25% more dietary fibre than in the same quantity of reference food

**Table 2 – Example of high-level health claim table from Schedule 2 (Calcium and vitamin D)**

Column 1	Column 2	Column 3	Column 4	Column 5
Food or property of food	Specific health effect	Relevant population	Context claim statements	Conditions
Calcium and vitamin D	Reduces the risk of osteoporosis Reduces the risk of osteoporotic fracture	Persons 65 years and over	Diet high in calcium, and adequate vitamin D status	The food must – (a) Contain no less than 290mg of calcium per serving; and (b) meet the general claim conditions for making a nutrition content claim about vitamin D

eg good/excellent/increased, the product must also meet the conditions set out in Column 4.

Regenervite Vital, with over 10 grams of fibre per serve, meets the general claim conditions and also the conditions for making a claim it is an ‘excellent source of dietary fibre’. Similarly, with over 12 grams of protein per serve, the product contains sufficient protein to use the specific descriptor ‘good source of protein’. Standardised under 2.9.3 of the Code, the product is also considered a ‘good source of calcium and vitamin D’.

In cases where the property of the food is not listed in Schedule 1, eg, Beta-glucan, only a statement of its

presence can be made. For example, ‘contains beta-glucan’, or ‘contains 3 grams beta-glucan per serve’. A statement regarding the presence of beta-glucan was considered essential as it was a unique ingredient, and relates to the high-level health claim for cholesterol management.

**General and high-level health claims (Schedules 3 and 2)**

To make a general or high-level health claim, the product must either (a) meet the requirements of the nutrient profile scoring criterion (Schedules 4 and 5), or (b) be standardised under Part 2.9 of the Food Standards Code – as is the case for Regenervite Vital (Std 2.9.3).

As a formulated meal replacement, the product has the capacity to contribute to weight management. A general level health claim is permitted provided that the food meets certain conditions for energy.

With less than 1200kJ energy per serve, Regenervite Vital meets the conditions for making a claim that, in conjunction with a reduced energy diet and regular exercise, the product can contribute to weight loss.

Schedule 2 stipulates the conditions (Column 5) which must be met to make high-level health claims regarding beta-glucan and calcium and vitamin D (Table 2).

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The tables in schedule 2 also outline the context claim statements and relevant population (Columns 4 and 3 respectively) that must be referenced on a label.

### The final claims

The standard does not prescribe the wording of the final health claim statement, but it must include the following:

- Statement that the health benefit must be considered in the context of a healthy diet (Subclause 19(4a));
- Context claim statement (Schedule 2, Column 4), or reference to Dietary Context (Schedule 3, Column 4);
- Reference to the specific health effect (Column 2); and
- Reference to any relevant population as indicated in the table of the schedule (Column 3).

The claims on the label and associated advertising for Regenervite Vital may read:

- Contributes to weight loss
- Contains oat bran beta-glucan to aid in lowering blood cholesterol
- Good source of calcium and vitamin D to help reduce the risk of osteoporosis
- Excellent source of dietary fibre
- Good source of protein

Any health claim is further substantiated and, in this example, may read as follows:

- Regenervite Vital should be considered as part of a varied, well-balanced diet and active lifestyle (*healthy diet statement*);
- A diet lower in energy, saturated fat and including regular exercise (*dietary context*), can contribute to weight loss (*specific health effect*), and 3g beta-glucan per day (*context claim statement*), can reduce blood cholesterol (*specific health effect*); and,
- A diet high in calcium and adequate vitamin D (*context claim statement*) reduces the risk of osteoporosis (*specific health effect*) in persons aged 65 years and over (*relevant population*).

### Nutrient profiling scoring criterion (NPSC)

In the introduction, I asked whether health claims could be made about vitamin B1 in Vegemite, according to the new standard. This seemed like a good example to put the NPSC to use.

Schedule 5 of Standard 1.2.7 outlines the process for determining the nutrient profiling score (NPS) of a food. The final score is determined by considering a food in terms of:

- Energy, saturated fat, total sugar and sodium content (baseline points), and
- Protein, fibre, fruit, vegetable, nut and legume content (modifying points)

Baseline points are dependent on the food category. Vegemite falls into Category 2, and its energy, saturated fat, sugar and sodium content result in a total of 12 baseline points.

Modifying points are calculated by determining fruit and vegetable points (V), protein points (P) and fibre points (F). There is no indication on the product label that the product contains any fruit or vegetable, resulting in no modifying points for these properties. However, the protein and fibre content contributes 10 modifying points.

The final score is determined by subtracting the modifying points from the baseline points. In order to make health claims, a category 2 product must have a NPS less than 4 (Schedule 4). With a calculated NPS of 2, health claims can be considered for vitamin B1 in Vegemite.

I'll be keeping up my intake of this traditional Aussie condiment, but think I'll stick to having it on toast! 🍞

*Disclaimer: Not all elements of the standard were covered in this article. It should be considered as an example only, and persons considering claims should conduct a comprehensive review of the standard to determine compliance requirements.*

*Peta Brenes is technical director and co-owner of Vitalis Nutrition, a supplemented food manufacturer, based in Western Australia.*

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## Nigel Preston

*Dr Nigel Preston is the acting director of CSIRO's Food Futures Flagship, which aims to transform the international competitiveness of the Australian agrifood sector by applying frontier technologies to high potential industries.*

*Preston joined CSIRO in 1999 and has a strong track record of working with Australia's livestock and aquaculture industries to develop animal breeds and improve nutrition. His research experience includes: marine biology and ecology, the environmental management of aquaculture and the development and application of advanced genetics and nutrition technologies to livestock and aquaculture industries. Preston holds a Bachelor of Science (Hons) from the University College of North Wales, Bangor, UK and completed his PhD Science at the University of Sydney in 1985.*

**Q Where do you see the most innovation happening in food science and technology at the moment?**

**A** Rapid advances are being made in our understanding of food-related health issues. The critical challenge is to accelerate the pace of innovations that enable this knowledge to be used to reduce the overconsumption of unhealthy foods and increase the production and consumption of healthier foods.

**Q CSIRO partners with industry on various aquaculture research projects. What have been the most successful collaborations in the past 10 years?**

**A** They include: developing knowledge and technology so the industry can operate with no adverse impacts on the health of adjacent ecosystems; applied selective breeding programs that are delivering greater than ten per cent gains in growth per generation in salmon, prawns and oysters; and novel feed additive replacement of wild harvest marine ingredients in farmed prawn diets.

**Q Where do you think there is a need for more research in terms of food production from aquaculture species?**

**A** Currently around 60 to 70 per cent of the seafood that Australians consume is imported. There is a critical need to expand Australian aquaculture research on selective breeding, feed technology, health and environmental management. This will help Australia to become more self-sufficient in sustainably produced, high quality seafood.

**Q What is the most important issue currently facing the beef industry? How might it be addressed?**

**A** Issues differ among producers and between regions. There is an overarching need to find ways to enable Australian producers to continue to respond to the increasing global demand for beef. This includes selective breeding for optimal, region specific, production and market quality traits.

There is also a critical need for processing technology and infrastructure to enable the industry to respond to global demands for a broad range of beef products.

**Q How will genetics research in the area of grains be of most benefit to the food processing industry in the future?**

**A** Population growth and increasing scarcity of vital inputs, including water and fertilisers, mean that grains genetics research is as vital as ever. Genetics research is critical to maintaining a consistent supply of grains with the specific functionality required by the food processing industry.

**Q What is likely to become the main source of omega-3 oils in the future?**

**A** In the near-term, wild harvest of fish and krill will continue to be the main source of long chain omega-3 oils. However, recent advances in plant biotechnology indicate that long chain omega-3 oils produced in land plants could play an increasingly important role in meeting future demands.

**Q What do you think will be the most important breakthrough in food processing technology in the next 10 years?**

**A** It will be technology that reduces the content of compounds associated with known health risks and increases the content of beneficial compounds in commonly consumed processed foods. Advances in technology will only be effective if accompanied by a shift in consumer awareness and consumption behaviour.

**Q In what area of food science and technology is Australia leading the world?**

**A** I'm constantly amazed by the work my CSIRO colleagues are doing in the development of novel, high value grains and oilseeds that are more productive and provide substantiated health benefits. I believe we are world leaders in this area. ●



# FORMULATING FOODS FOR HEALTH

*This article is based on a presentation made at the Food Structures, Digestion and Health international conference held in Melbourne in October 2013.*

Words by Mike Gidley

The goal of improving the health of 'over-nourished' individuals and populations through food is a complex one with multiple and often divergent facets.

If we accept that the foods that we eat and the lifestyle we adopt combine with genetic predispositions to determine many of our future health outcomes, this throws up a number of challenges and opportunities for the food industry.

The evidence that diet plays a role in many non-communicable diseases, such as diabetes, cardiovascular disease and a number of cancers, is strong and well understood by many consumers. Dietary risk factors associated with such diseases include excess salt, saturated fat and sugar, as well as rapidly digested carbohydrates, combined with low levels of fibre and micronutrients.

## **Challenge 1: How to re-formulate foods to reduce risk factors**

The food industry has risen to the challenge of re-formulating products so that they contain, for example, lower levels of salt and saturated fat, without impacting adversely on consumer acceptability.

A notable example over the past five to 10 years has been the shift in grain content of baked goods and breakfast cereals from refined grains (low fibre, low micronutrient, often rapidly digested starch) to whole grains (higher fibre, higher micronutrients, and in some cases slower digested starches).

The successes that have been achieved are testament to the skill

and inventiveness of food product developers. The focus is now shifting to designing food structures that deliver the minimum amount of salt or saturated fat, for example, that is required for taste or other product qualities.

One of the main opportunities in this area is to build on our understanding of how food structures are broken down in the mouth and how sensory signals are perceived, in order to maximise the impact of a low level of salt, sugar, or fat.

## **Challenge 2: Health outcomes arise from diet x lifestyle x genetics, so how can an individual know what food choices to make?**

In the near future, advances in measurement technologies, particularly genome sequencing and health biomarker assessment, will make much more information available to individuals on which to base food choices.

Within a few years, individuals will be able to assess not only their genetic predispositions but also their health and well-being status. The costs of genome sequencing are still falling, and the concept of a \$100 genome is being addressed. The challenge will then be to interpret genome sequences in terms of predisposition for health and disease factors, the subject of large investments around the world that should start to flow through to individual consumers in the near future.

To understand the health status of an individual, there are currently a limited number of options for self-assessment

(weight, temperature), with more information available through clinical analysis (blood pressure, blood cholesterol/glucose/lipids).

As knowledge of the relationships between biomarkers of health status and dietary intake become better understood, it can be predicted that this will stimulate the greater use of health status self-assessment measurement tools. Consumer technologies are already available for breath and urine analysis so we should expect to see health biomarker self-assessment devices based on these technology platforms. Although not yet established, faecal analyses may also be a good future source of information of relevance not only to bowel health but also immune status and other systemic features.

As more self-assessment tools become available, there will be more opportunities for food scientists and technologists to develop product offerings which help consumers to address their current biomarker(s) status.

## **Challenge 3: In healthy foods, the whole is often more than the sum of the parts**

The traditional approach of classifying foods or nutrients as either 'good for you' (we should eat more of) or 'bad for you' (we should eat less of) has become too simple. We now appreciate that it is not only the composition of foods, but also their physical structure and how this is broken down in the body, which determines nutritional value.

This is particularly true for naturally-structured foods such as whole grains, meat, fish, nuts, fruits and vegetables, but also applies to some assembled foods where the final structure survives at least some digestive processing. Food structure plays a major role in determining the rate (and hence the site) and extent of digestion, and often controls the rate at which sugars, amino acids and lipids are taken up from the food into the blood stream, with knock-on effects on insulin and other hormonal responses.

Food structure can have a major impact on satiation (stopping eating) and satiety (reducing the desire to eat again) through both direct mechanical effects in the stomach as well as causing sugars, amino acids and lipids to be absorbed further along the gastrointestinal tract. The latter causes hormonal feedback that prolongs nutrient delivery and satiety. The design of foods that increase gastric residence time presents an opportunity to help control total energy consumption through enhanced satiety.

#### **Challenge 4: Understanding the relationships between large intestinal fermentation and health**

The role of the large intestine and the microbial fermentation that occurs there is a subject of intense interest at the moment. This is driven by the ability to identify large numbers of bacteria that had previously been difficult to characterise because they could not be readily cultured in the laboratory.

It will be important to understand what parts of our ingested food survive through to the large intestine. With the exception of non-starch polysaccharides and lignin ('dietary fibre'), all other major food components have the potential to be digested and absorbed by the end of the small intestine. However, it is clear that at least some dietary protein and starch can also enter the large intestine and thereby act as energy sources for the resident microflora.

In addition, many micronutrients may also partly escape absorption in the small intestine because they are either bound to, or trapped within, food structures that are not digested.

This includes all cellular plant-based foods that have been shown to be capable of transporting starch, proteins, lipids and a range of micronutrients to the large intestine.

It is now understood that it is important that carbohydrate fermentation outweighs protein fermentation in the large intestine to avoid the production of harmful products from protein fermentation. However the effects of delivery of a significant fraction of plant-derived micronutrients to the large intestine are not yet known.

As more information emerges of the effects of food structure on what gets to the large intestine and what happens there, this should provide new opportunities for food scientists and technologists to design foods that go beyond the current simplistic probiotic and prebiotic concepts. ●

*Mike Gidley is director of the Centre for Nutrition and Food Sciences, Queensland Alliance for Agriculture and Food Innovation and a chief investigator in the ARC Centre of Excellence in Plant Cell Walls at the University of Queensland.*

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# FUNCTIONAL FOODS ROUND-UP

*Older Australians and high-pressure processing provide opportunities for the functional foods market.*

Words by Ranjan Sharma

## Older Australians – an untapped market?

Australia's ageing population means that growth in consumer spending is increasingly likely to come from older generations. According to Euromonitor<sup>1</sup>, despite the tough economic conditions, consumers will continue to spend on products that reduce the signs of ageing yet it seems the Australian food and drink industry continues to overlook the opportunities associated with this population group.

The health complications associated with age are well documented and include poor bone health and osteoporosis, rheumatoid arthritis, compromised heart health, increased hypertension, diabetes and erratic glycaemic response, poor mental health, and Alzheimer's disease. This considerably long list presents an opportunity and a challenge for manufacturers in developing functional foods and drinks with specific health benefits.

### A role for functional foods

In 2010, the International Longevity Centre published a report<sup>2</sup>, 'Older people and functional foods: The importance of diet in supporting older people's health; what role for functional foods?'. It reviewed dietary recommendations for older people, looked at consumer behaviour towards functional foods, and asked whether functional foods could play a role in older people's diets.

The report concluded that good nutrition was vital to maintain good health and prevent disease,

and that functional foods could play a significant role including the prevention and management of chronic disease.

### Research required

The report also suggested that there was a need for further research into older people and their requirements of functional foods. In addition to strengthening the offerings to this market, manufacturers may also need to undertake a systematic analysis of their needs at home and in independent living villages, hospitals and rest homes, as well as an analysis of the key trends affecting the seniors' health market including functional, anti-ageing and convenience.

### Market opportunities

**Weight management:** Obesity remains a cause of concern for older Australians. Losing weight becomes more challenging as we age and there is a demand for weight management strategies.

**Cardiovascular disease:** Products such as plant sterols, soy proteins and omega-3 fatty acids have been shown to benefit cardiovascular diseases and presenting them in suitable formats may offer some opportunities.

**Gut health:** Research suggests that poor gut health may be a main cause of deteriorating health in the elderly. Ingredients such as pre- and probiotics are touted to offer benefits however delivering them to older Australians still remains a challenge.

### Age-related macular degeneration

**(AMD):** Although the scientific evidence is limited, various nutrients,

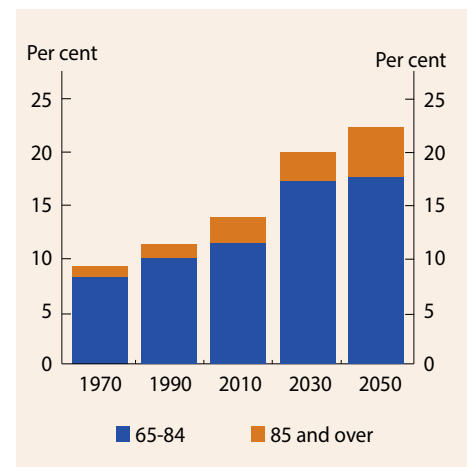


Figure 1: Growth projection for older Australians.

such as omega-3 fatty acids, lower glycemic index diets and, perhaps, some carotenoids, may be employed in diminishing the risk of onset or progression of AMD and these ingredients may provide an opportunity for manufacturers.

**Quality of life:** Foods and drinks that can aid in improving the quality of life are likely to be welcomed by this market. The desire to look young may lead to development of so-called functional cosmeceutical products (ingredients for youthful skin, hair or nails).

**Bone health:** Although bone health deteriorates with age, it is not clear if the vast amount of high calcium and vitamin D products have benefited the ageing population. This area may require further scrutiny and a new strategy for new product development.



### Convenient food formats

Due to their convenient formats, packaging innovations from the baby food market have potential for the senior citizens' market. Desirable product attributes may include squeezable food pouches of ready-to-eat liquid or semi-solid food ingredients.

There is also a need for packaging formats with appropriate size, shape and weight that allow easy handling and adapt to reduced dexterity by using closures that can be manipulated with one hand without pain or frustration by older people.

### Sweeter tastes

A recent study<sup>3</sup> by Roy Morgan showed that sweeter spreads such as jams, conserves and marmalade are considerably more popular among older Australians than the rest of the population. According to the study, in the year to June 2013, 47 per cent of Australians aged 65 or over ate jam, conserves or marmalade in an average seven-day period: more than double the percentage of those aged 14-24 (21 per cent). Delivering sweeter functional foods to this segment could be a fresh challenge for food companies.



### High pressure processing gains momentum

Recently high pressure processing (HPP) has taken centre stage with Starbucks launching its Evolution Fresh HPP juice products nationwide through its cafe chain in the US.

While many may not understand the technical aspects of HPP, those who have consumed an HPP drink are often certain about one thing – the product offers an extremely high level of freshness and flavour.

Recent product launches of HPP



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include juice and smoothie products like Aartizen and Coldpress in UK and Suja Elements' Green Charge and 100% Raw tea by Harmless Harvest in US.

Since the successful launch of Preshafood juice products in 2010, a number of new HPP products have now been launched in Australia. Examples include Reboot Your Life juices, EasyWay Power smoothie, PressureFresh avocados and guacamole and Moira Mac's ready-to-eat chicken pieces.

To capitalise on the growth of HPP products, the two main HPP machine manufacturers, Avure and Hyperbaric, have recently launched 525L machines – their largest to date.

According to Avure, the 525L delivers an unprecedented 8,135 pounds (3,690 kg) of HPP processing per hour, which is nearly a 200 per cent increase in throughput over the current processing options.

Meanwhile the competition among the manufacturers of equipment for HPP has also increased with the entry of a new manufacturer of HPP equipment in the US. According to reports, Fresher Evolution LLC is launching a complete line of HPP equipment including a 175L, 350L, and 525L in the US market.

According to the company, there are several patent-pending designs on this new line of equipment that will improve operating times, reduce maintenance, improve uptime, and

provide validation of cycles for HPP processing.

The area of HPP is definitely worth watching as the technology offers not only fresher tasting products but also has potential to help launch functional foods and beverages with superior health and nutrition attributes in consumer-friendly packs.

### Is sugar tax an answer?

Credit Suisse Research Institute's 2013 study<sup>4</sup>, 'Sugar: Consumption at a Crossroads' found that close to 90 per cent of general practitioners surveyed in the US, Europe and Asia believe excess sugar consumption is linked to the sharp growth in health problems. Credit Suisse Research recommended that a sugar tax is the best way to combat excess sugar consumption.

It appears that global sugar consumption has been on the rise in recent times and is now considerably higher than recommended by the health authorities. American Heart Association recommends six teaspoons of sugar a day for women and nine teaspoons a day for men, but it seems that average sugar consumption globally is 17 teaspoons or higher. The US tops the sugar consumption levels with on average 40 teaspoons of sugar – primarily coming from sugar-sweetened soda.

Although research is yet to prove conclusively that sugar is the leading cause of obesity, type II diabetes

or metabolic syndrome, there is considerable pressure from health and consumer groups for mandatory control and taxing sugar.

The debate on taxing sugar or so called "soda tax" on beverages such as Coca-Cola and Pepsi has been around for many years with no clear mandate from consumers, processors or regulators.

Concerning growth in the incidence of obesity and associated health conditions have reignited this debate and led to some countries imposing a compulsory sugar tax. France imposed a sugar tax on beverages in 2011 while Mexico is currently debating whether to place a special tax on sugary soft drink.

While the long-term impact of a sugar tax is yet unknown, Denmark repealed a similar tax on saturated fat and cancelled plans for a sugar tax earlier this year as a result of its negative effect on businesses and the fact that consumers found other ways to purchase the products.

Australian health organisations including Diabetes Australia, Cancer Council and National Heart Foundation started a campaign to impose tax on soft drinks in Australia earlier this year. Grocery councils in both Australia and New Zealand have strongly opposed such taxes given the insufficient evidence for a link between sugar and health concerns.

The bottom line is that the debate on regulating sugar is likely to continue; meanwhile consumers need to take responsibility for their daily intake of sugars rather than blaming the food industry for excess sugar in beverages. 🍷

*Ranjan Sharma is the editor of the market intelligence newsletter, Functional Foods Weekly, [www.functionalfoods.biz](http://www.functionalfoods.biz).*

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# NUTRITION WATCH

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

Words by *Dr. Ramon Hall*

## **Meta-analysis suggests flavonoids intake reduces cardiovascular disease risk**

Researchers from Shandong University in Jinan, China, have provided new evidence to support the association of dietary intake of flavonoids with reduced risk of cardiovascular disease (CVD) (Wang *et al.*, 2013).

The authors undertook a systematic review and meta-analysis of eligible prospective cohort studies to investigate any relationship between dietary flavonoid consumption with risk of CVD and also to estimate any dose-response relationship.

A total of 14 prospective cohort studies were included in the meta-analysis involving 344,488 subjects with 12,445 CVD cases and included specific meta-analyses on individual classes of flavonoids including: anthocyanidins, proanthocyanidins, flavonol, flavones, flavanones and flavan-3-ols.

The results found that flavonoid consumption was significantly inversely associated with CVD risk when comparing highest versus lowest categories of intake for total flavonoid intake and for the six individual classes of flavonoids (anthocyanidins, proanthocyanidins, flavonol, flavones, flavanones and flavan-3-ols). In addition, a dose-response analysis revealed that there was a five per cent risk reduction of CVD for an average increase of 10 mg/d of flavonol intake.

The author indicates that these results support recommendations for higher consumption of flavonoid-rich foods to help reduce the risk of CVD. Flavonoids are found in most abundance in fruits, vegetable, nuts, wine and tea.

Consistent with the current Australian Dietary Guideline (2013), this data adds additional supports to the message encouraging consumers to enjoy plenty of vegetables (minimum 2.5-7.5 serves dependant on life stage) and to enjoy fruit (minimum of 1-2 serves dependant on life stage) and also may support the addition of ingredients rich in flavonoids to other food products creating potential product development opportunities.

Wang *et al.* (2013) "Flavonoid intake and risk of CVD: a systematic review and meta-analysis of prospective cohort studies". *British Journal of Nutrition*, published online 16 August 2013.

## **Dairy lipid biomarkers associated with better insulin sensitivity**

A team of researchers from Baker-IDI in Melbourne have provided additional evidence in support of a potential protective role of dairy in relation to type 2 diabetes.

They showed that heightened levels of plasma lipids closely linked to the consumption of regular fat dairy products were associated with improved insulin sensitivity (Nestel *et al.*, 2013).

The authors investigated insulin resistance/sensitivity in 86 individuals with metabolic syndrome. They used four different measures based on an oral glucose tolerance test and analysed plasma levels of phospholipids, sphingolipids and fatty acids using lipidomic analysis and gas-chromatography-mass spectrometry. They also examined food records to determine levels of dairy food intake and identified plasma lipids associated with dairy lipid consumption. Finally,

they determined associations between plasma lipids and measure of insulin resistance/sensitivity.

The results revealed a number of strong correlations between the amount of full fat dairy product consumed and a number of lipid species. Lysophosphatidylcholine and lyso-platelet-activating factor were significantly associated with greater insulin sensitivity (Matsuda index) and were inversely associated with insulin resistance (HOMA-IR). Also phospholipid fatty acid C17:0 was also associated with better insulin sensitivity and inversely related to insulin resistance.

This study has highlighted some new objective biomarkers of dairy lipid consumption and has identified plasma lipid species that may play a role in the protective role of dairy in relation to diabetes as suggested by epidemiological studies.

Nestel *et al.* (2013) "Specific plasma lipid classes and phospholipid fatty acids indicative of dairy food consumption associate with insulin sensitivity". *American Journal of Clinical Nutrition*, Published online 23 October 2013 (doi: 10.3945/ajcn.113.071712).

## **Olive oil aromas provides sensory signalling to brain**

Researchers from the Institute for Medical Psychology and Behavioural Neurobiology at the University of Tübingen in Germany have provided new insights into the ability of flavour-active compounds to simulate fat-triggered sensations in the brain that the body may associate with fat consumption (Frank *et al.*, 2013).

The researchers undertook a randomised controlled trial to investigate the long-lasting effect of



fat-free flavour-active compounds of olive oil on the brain to understand whether those aroma components can trigger fat-associated brain responses in homeostatic and gustatory regions. The study involved 11 male participants who undertook two separate treatments on different days involving the consumption of a standard low-fat yoghurt product (control) and an active product with the addition of olive oil extract.

Functional magnetic resonance imaging (fMRI) testing was used to determine cerebral blood flow in different regions of the brain and was

undertaken before consumption of the yoghurt and again at 30 minutes and 120 minutes after the yoghurt was consumed.

The results revealed that the olive oil extract containing yoghurt elicited significantly higher cerebral blood flow (CBF) in the frontal operculum (part of the primary taste cortex) at both 30 and 120 minutes after the meal compared to the control product. CBF activity in the anterior insula (part of the primary taste cortex) was positively associated with glucose change in the olive oil extract treatment, but not the control treatment at 30 minutes. There were no changes

in the CBF activity in the hypothalamus (homeostatic region of the brain).

The authors conclude that “Modulation of the frontal operculum by the yoghurt containing the olive oil extract suggests that it might be possible to simulate fat-triggered sensations in the brain on the gustatory level, possibly by ingredients the body implicitly associates with fat.”

The results from this experiment combined with the earlier results from this team suggest that replacement of fat with a flavour associated with fat does not activate energy homeostatic regions of the brain (ie. hypothalamus); however, it appears possible to activate regions of the primary taste cortex using these flavour-active compounds.

Frank *et al.* (2013) “Olive oil aroma extract modulates cerebral blood flow in gustatory brain areas in humans”. *American Journal of Clinical Nutrition*, 98:1360–6 (doi: 10.3945/ajcn.113.062679).

### Low vitamin D associated with reduced muscle mass and mobility in elderly

A research group from Wageningen University and Maastricht University in the Netherlands have provided insightful data that suggests that frail elderly populations may be at risk of low vitamin D status that may have implications for muscle mass and physical performance.

The researchers undertook a cross-sectional study among 127 pre-frail and frail elderly people



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in the Netherlands with the aim of investigating the association between vitamin D intake and serum 25(OH)D status with muscle mass, strength and physical performance in a pre-frail and frail elderly population. They measured whole body and appendicular lean mass using dual energy X-ray absorptiometry, leg strength, handgrip strength and physical performance. In addition blood samples were collected for the assessment of serum 25(OH)D status and habitual dietary intake and physical activity data was collected.

The results showed that 53% of the participants had a serum 25(OH)D level below 50 nmol/l and considered deficient. 25(OH)D status was associated with appendicular lean mass (ALM) and with physical performance. Additionally, vitamin D intake was associated with physical performance but not with appendicular lean mass.

The researcher concluded that "In this frail elderly population, 25(OH)D status is low and suggests a modest association with reduced ALM and impaired physical performance. In addition, vitamin D intake tended to be associated with impaired physical performance."

The researchers suggest that randomised controlled trials are required to assess the impact of vitamin D supplementation on 25(OH)D status, muscle mass and physical performance in pre-frail and frail elderly people.

Tieland *et al.* (2013) "Low vitamin D status is associated with reduced muscle mass and impaired physical performance in frail elderly people". *European Journal of Clinical Nutrition*, 98:1360-6 (doi:10.1038/ejcn.2013.144).

### Different types of whey proteins have similar effects on satiety

A research team from the University of Auckland has recently published a study in collaboration with Fonterra Co-operative Group to compare the efficacy of different fractions of whey protein from dairy on measures of appetite control and have also related this to appearance of amino acids within the serum (Poppitt *et al.*, 2013). Whey proteins have developed a reputation as being highly satiating ingredients as they can empty from the stomach and be absorbed more quickly and act on short-term satiety cues more quickly than other proteins. There had been little research to understand how different whey fractions impact on satiety; however, glycomacropeptide had been purported from earlier trials as a potential active satiety component of whey protein.

The current study provided four variants isoenergetic whey protein shakes (each with 25g protein) to 18 healthy males in a randomised double-blind controlled post-meal trial. The four protein variants included in the trial were: glycomacropeptide, beta-lactoglobulin, colostrum whey protein concentrate and a standard whey protein concentrate control. Participants received a standardised breakfast and after 90 minutes consumed each of the four variant shakes on different occasions and after another 90 minutes consumed an *ad libitum* lunch. Subjective measures of appetite and blood measurements were undertaken throughout the day.

The results from this study showed that glycomacropeptide provided the greatest increase in

total amino acids during the 90 minutes after consumption of the test beverage compared to the other protein fractions. However, the beta-lactoglobulin enriched beverage provided a significantly greater subjective feeling of fullness compared to the glycomacropeptide enriched beverage. Overall, the four beverages performed similarly for other measures of subjective satiety and participants consumed a similar amount of energy at the *ad libitum* meal.

The authors concluded that total serum amino acid concentration was a poor indicator of satiety with little evidence of differential satiety between these whey proteins other than a modest enhancement of fullness by beta-lactoglobulin. <sup>10</sup>

Poppitt *et al.* (2013) "Evidence of Enhanced Serum Amino Acid Profile but Not Appetite Suppression by Dietary Glycomacropeptide (GMP): A Comparison of Dairy Whey Proteins". *Journal of the American College of Nutrition*, 32(3):177-86. (doi: 10.1080/07315724.2013.791186).

*Dr. Ramon Hall is manager of the Dairy Health and Nutrition Consortium at Dairy Innovation Australia and is an Honorary Research Fellow at the School of Exercise & Nutrition Sciences, Deakin University.*

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## ON THE NOSE

*There's more to this famous fungus than meets the eye.*

They're up there with the world's most expensive gourmet delicacies even though some people think they smell like sweaty armpits or rotting seaweed.

If they smell like forest floor, hay or fruit cake, it means they're top quality and can fetch up to \$1,800/kg; not so good if they remind you of wet dog or ammonia, those ones are only worth \$800/kg.

They're truffles, and despite what you think of their smell, truffles are highly sought after in the export market and Australian growers are taking on Europe for a piece of the action.

The Australian industry, valued at \$10 million per annum, consists almost exclusively of the French or Perigord black truffle (*Tuber melanosporum*) that grows underground on the roots of oak and hazelnut trees. First grown in Tasmania in 1999 from imported stock, there are now more than 200 truffle growers in WA, Tasmania, Victoria, NSW and the ACT.

"It's important to have good quality control mechanisms in place if the local industry is going to attract and keep international buyers who look to Australia for truffles out of their northern hemisphere season," said Garry Lee, professor of food science at the University of Western Australia.

"That's the basis for our research into developing a quality grading scale for truffles based on aroma. While you can judge a truffle by its appearance, what really defines its quality is its aroma.

"Typically a good quality truffle is one that has a nice rounded shape, about the size of an apricot or small

apple, and is black inside and out. But the true test is the aroma, although to date there hasn't been a standardised grading scale based on aroma that can be used across the industry.

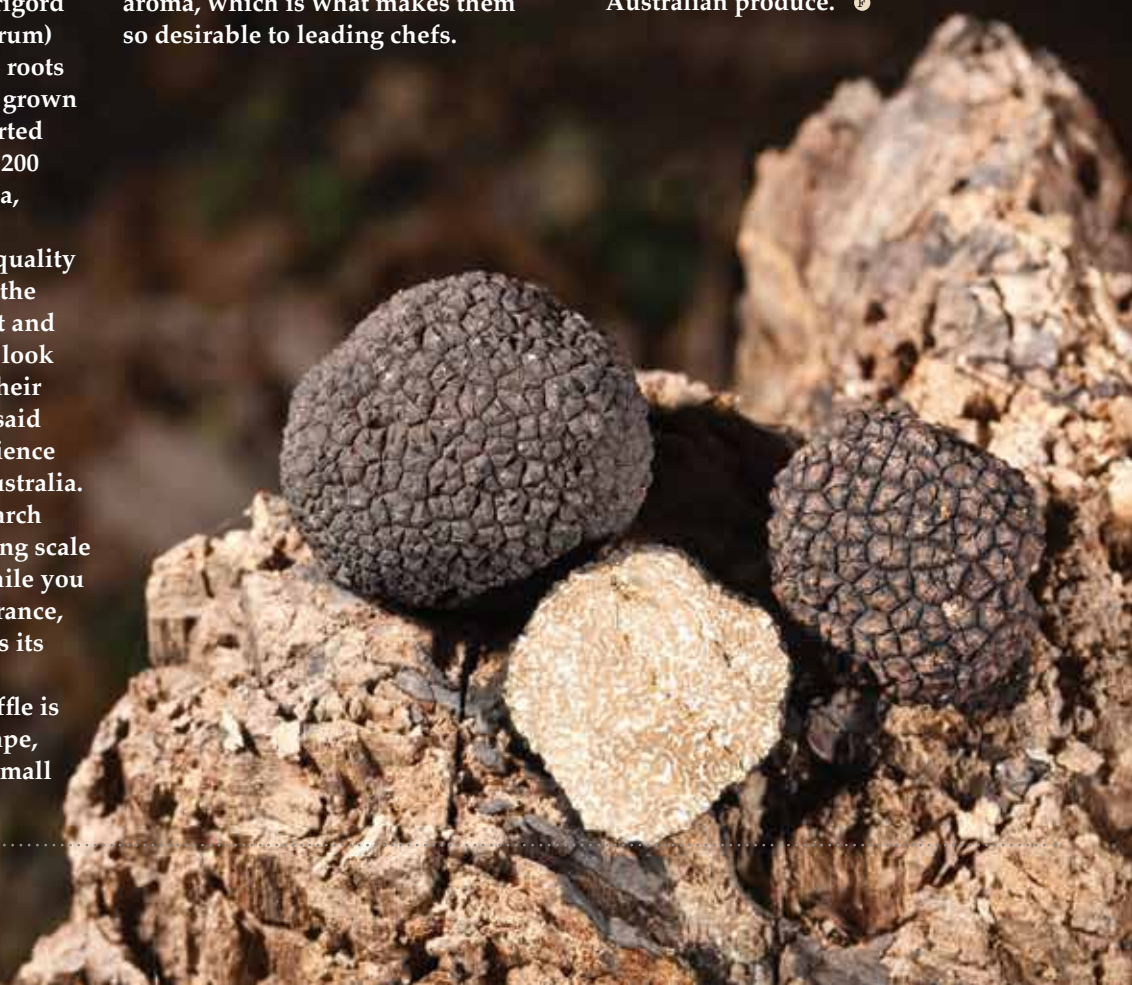
"In order to develop reliable aroma grading models, we first need to understand the relationship between the volatile profiles of truffles and the aroma quality," says Lee.

Funded by the Rural Industries Research and Development Corporation (RIRDC), Lee and his team used the latest technology (solid phase micro extraction head space gas chromatography mass spectrometry) and sensory science techniques to accurately identify the chemicals that give truffles their distinctive aroma, which is what makes them so desirable to leading chefs.

The research has only just been submitted but Lee hopes growers will recognise its value to them.

"A standard scale based on aroma will mean that growers will be paid fairly based on the quality of their produce," said Lee. "For example, they won't be paid less for a truffle that doesn't look so good, because it might be smaller or more knobbly than normal, when it's actually top quality, based on its aroma.

"It's about making sure that Australian truffles are held in high regard in Europe so the industry can make the most of export opportunities. By having a standard system for ranking high, medium and low grade truffles, they'll know they can trust the Australian produce." ☺





DIARY

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**February 25-27. Australian Dairy Conference.** Deakin University and surrounding venues, Geelong, Vic.  
[www.australiandairyconference.com.au](http://www.australiandairyconference.com.au)

**March 26. NSW Waste Management Minimisation and Utilisation in Food Industry.** CSIRO North Ryde, NSW.

**April 30. ConTech2014 Australasia's Confectionery and Food Industry Technical Conference.** Pullman Melbourne Albert Park (formerly The Sebel), Melbourne, Vic. [www.contech.aigroup.com.au](http://www.contech.aigroup.com.au)

**May 2-3. 8th Congress of International Society of Nutrigenetics/ Nutrigenomics.** Gold Coast, Qld.  
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**June 22-25. 47th Annual AIFST Convention. Food – The Final Frontier. Challenges and Opportunities in the 21st Century.** Melbourne Convention & Exhibition Centre, Melbourne, Vic. [www.aifst.asn.au](http://www.aifst.asn.au)

## INTERNATIONAL 2014

**January 6-8. Food Innovation Conference.** Hotel Intercontinental, Manila, Philippines. [www.novelapproachsystems.com](http://www.novelapproachsystems.com)

**January 26-29. ISM International Trade Fair for Sweets and Snacks.** Cologne, Germany. [www.prosweets.de/de/prosweets/diemesse/prosweets\\_cologne\\_conference/index.php](http://www.prosweets.de/de/prosweets/diemesse/prosweets_cologne_conference/index.php)

**February 26-28. Global Food Safety Conference. One World, One Safe Food Supply.** Hilton Anaheim, California, USA. [www.mygfsi.com/events/internationalfood-safety-conference.html](http://www.mygfsi.com/events/internationalfood-safety-conference.html)

**April 8-10. 3rd China International Import Food Exposition.** National Agriculture Exhibition Center, Beijing, China.  
[www.chinaexhibition.com/trade\\_events/4593-IF\\_China\\_2014\\_-\\_The\\_3rd\\_China\\_International\\_Import\\_Food\\_Exposition.html](http://www.chinaexhibition.com/trade_events/4593-IF_China_2014_-_The_3rd_China_International_Import_Food_Exposition.html)

**June 21-24. Institute of Food Technologists (IFT) Annual Meeting & Food Expo.** New Orleans Morial Convention Center, New Orleans, USA. [www.ift.org](http://www.ift.org)

**August 17-21. IUFOST 17th World Congress of Food Science and Technology & Expo. Research That Resonates.** Montreal, Canada.  
[www.iufost2014.org](http://www.iufost2014.org)



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