

# food

Official publication of AIFST Inc

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FEBRUARY/MARCH 2014



## From little things big things grow

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tomorrow's food  
ingredients

*Also Inside*

MINING THE MARINE WORLD FOR INGREDIENTS  
A NOVEL APPROACH TO FOOD AND NUTRITION R&D  
DEMAND FOR RECYCLED PACKAGING CREATES CHALLENGES



# ON THE COVER

## A trusted partner in quality for 60 years

In 1954 Dairy Technical Services Limited was founded, to provide microbiological and chemical test results for export products. The business has grown and prospered for 60 years, and is now known as DTS Food Laboratories. From the first laboratory to the extensive capabilities across multi location facilities today, DTS has always provided accurate and prompt testing for the food and beverage industries.

In 2014 DTS celebrates 60 years in business. A dedication to quality, service, performance and customer focus is the driving force behind this successful Australian business – the only food testing laboratory in Australia owned by members of the food industry.

NATA accredited since 1961, DTS is passionate about understanding the needs and requirements of its clients and their businesses. DTS aligns its service portfolio to become an integral part of its client's business through the provision of a comprehensive range of analytical and assurance services.

As Australia's largest independent food testing laboratory offering the most comprehensive range of analytical services, DTS Food Laboratories is expanding its analytical capabilities to address current and future industry needs which all contribute to the

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A major global trend driving innovation across the food industry is the relationship between health, wellness and nutrition. DTS recognises this trend and has designed facilities to meet the needs and expectations of both industry and retailers alike.

Brand protection through compliance and safety is of equal concern to the industry and DTS can partner in this process through its range of contaminant and additive analysis services.

*Why not make DTS your trusted partner in quality? ☺*



*Cover image: Associate Professor Carl R. Fellers using a microscope, College of Fisheries, Seattle, 1925. Fellers posthumously received the IFT's Phi Tau Sigma award in 1984 in recognition for his contribution to food science. The award's name was changed to the Carl R. Fellers Award in 1987.*

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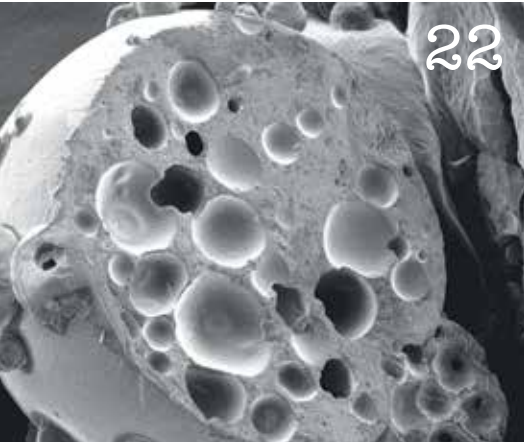
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## FROM THE PRESIDENT

Happy new year.

What will 2014 bring for the global food industry? As industry researchers and forecasters release their predictions, the trends this year centre on restoring consumer confidence in the wake of incidents like the EU horsemeat scandal, as well as the ever growing interest in health and wellbeing, and increasing attention on the integrity of the supply chain, and in particular the traceability and sustainability of food ingredients.

The continuing focus on health and wellbeing means that the market for food ingredients that deliver functional benefits also continues to grow, and this issue of *food australia* takes a closer look at bioactives – including the marine world as a source (page 16), the use of microencapsulation technology to deliver them (page 22), and some of the so far unexploited components in milk (page 36).

Closer to home, 2014 is set to be a big year for the Australian food industry with significant resources being allocated to strengthening our role as 'the food bowl of Asia'.

To support this, the National Food and Nutrition Research and Development and Technology Transfer (RD&TT) is the first time Australia has attempted the development of a national research strategy across the whole food nutrition sector. It is an extremely exciting development, and one that AIFST will take a lead role in supporting. You can read more about the strategy on page 24.

I do hope you enjoy the first issue of *food australia* for 2014.

**Dr Anne Astin**

AIFST President



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BY THE NUMBERS

# THE GLOBAL FOOD INGREDIENTS MARKET

According to Koncept Analytics *Global Food Ingredients Market Report: 2013*, the global specialty ingredients market grew by seven per cent between 2011 and 2012, driven by factors like growing world population, urbanisation and rising health awareness.

In 2012, flavours represented the largest market segment, stimulated and broadened by changing social habits and economic growth, especially in emerging markets.

High growth segments in the ingredients market include food enzymes, hydrocolloids, emulsifiers and functional ingredients like probiotics, and there is a clear and growing trend to reduce or replace artificial ingredients with natural ingredients.

The report discusses the challenges for companies operating in this market – with strict regulatory requirements and a highly research-intensive industry both noted as high entry barriers.

Here are some of the key numbers from the report.



The global specialty ingredients market grew to US\$40 billion in 2012 up from \$37.4 billion in 2011.

*Flavours represent the biggest share of the specialty ingredients market in 2012 at 28%.*



*Global sales in the specialty food starch category were at US\$1.6 billion in 2011 and are expected to reach \$1.94 billion by 2015.*

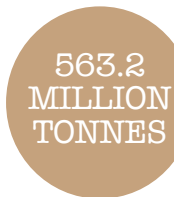


The global colourants market grew by 18% in 2012 to US\$2 billion, up from \$1.7 billion in 2011.

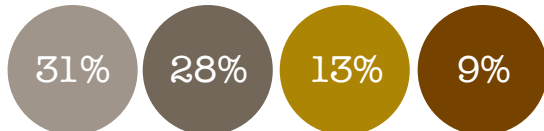
*Western Europe is the largest market for packaged food with retail sales at US\$605 billion.*



The market for probiotic-based functional food products amounted to US\$25 billion in 2011 and is expected to reach US\$32 billion by 2015.



The global retail volume sales for packaged food reached 563.2 million tonnes in 2011 up from 551.6 million tonnes in 2010.



*Around 31% of food enzymes are used in bakery applications, 28% in dairy, 13% in brewing and 9% in juice production.*

*The Global Food Ingredients Market Report: 2013 is published by Koncept Analytics and was released in May 2013. [www.konceptanalytics.com](http://www.konceptanalytics.com)*





## BIG BRANDS JOIN WITH WORLD WILDLIFE FUND TO DEVELOP PLANT-BASED PLASTICS

Eight of the world's leading consumer brand companies have joined forces with conservation group World Wildlife Fund (WWF) to form the Bioplastic Feedstock Alliance (BFA).

The group will support the responsible development of plastics made from plant material, with a view to building a more sustainable future for the bioplastics industry.

According to WWF, consumers are increasingly looking for more sustainable products and, with demand for food and fibre increasing, responsible sourcing of materials will be the key to enabling sustainable growth.

"This alliance will go a long way in ensuring the responsible management of natural resources used to meet the growing demand for bioplastics," said Erin Simon of WWF. "Ensuring that our crops are used responsibly to create bioplastics is a critical conservation goal, especially as the global population is expected to grow rapidly through 2050."

According to BFA, their primary focus will be on guiding the responsible selection and harvesting of feedstocks — such as sugar cane, corn, bulrush, and switchgrass — used to make plastics from agricultural materials.



The Alliance's eight founding companies — *The Coca-Cola Company, Danone, Ford, H.J. Heinz Company, Nestle, Nike Inc., Procter & Gamble, Unilever* — along with WWF, are supported by academic experts; supply chain partners; suppliers; and technology development companies.

## STUDY LINKS DAILY NUT INTAKE TO LOWER DEATH RATE

People who eat a handful of nuts a day are 20 per cent less likely to die from any cause over a 30-year period than those who avoid nuts, according to a major cohort study.

Published in the *New England Journal of Medicine*, the world's largest study on nut consumption and mortality examined diets of 76,464 women in the Nurses' Health Study and 42,498 men in the Health Professionals Follow-up Study.

Researchers found the consumption of nuts was inversely associated with total mortality in both men and women, independent of other predictors for death. In addition, there were significant inverse associations for deaths due to cancer, heart disease and respiratory disease.

"The most obvious benefit was a reduction of 29 per cent in deaths from heart disease," said Dr Charles Fuchs, senior report author and director of Gastrointestinal Cancer Center at Dana-Farber.

"We also saw a significant reduction, 11 per cent, in the risk of dying from cancer.

"The findings from our study and others suggest a potential benefit of nut consumption for promoting health and longevity."

Lead author, Dr Ying Bao, Department of Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, said the association was dose-dependent.

"In all these analyses, the more nuts people ate, the less likely they were to die over the 30-year follow-up period."

Dr Bao said those who consumed more nuts were also leaner, and tended to have a healthy lifestyle, such as smoking less and exercising more.

The study showed the reduction in mortality was similar both for peanuts and for tree nuts – almonds, Brazil nuts, cashews, hazelnuts, macadamias, pecans, pine nuts, pistachios and walnuts.

The latest dietary guidelines call on Australians to increase their nut consumption by 350 per cent to meet the recommended handful of nuts a day.

## COST BENEFIT ANALYSIS FOR LABELLING SYSTEM

The Department of Health has been directed to broaden the cost benefit analysis for the proposed Health Star Rating System for food products.

The directive came out of the meeting of the Legislative and Governance Forum on Food Regulation in December 2013 where it also considered refinements to the Health Star Rating Calculator - the algorithm that generates the star rating.

The forum endorsed the calculator as part of the voluntary Health Star Rating System, acknowledging that anomalies — for instance those associated with dairy — needed addressing.

However, in a statement released by the Department and Finance and Deregulation on 21 January 2014 the Office of Best Practice Regulation ruled the decision as being non-compliant with the Council of Australian Governments' (COAG) best practice regulation requirements as a Regulatory Impact Statement was not prepared.

According to the Department of Health, the cost benefit analysis will now be broadened to include evidence-based research and extensive industry consultations in the absence of a Regulatory Impact Statement.

This is designed to address the compliance issues noted by the Office of Best Practice and Regulation as well as the interests of New Zealand.

The report will be provided to the Food Minister's Forum in June 2014.

## NEW CERTIFICATION FOR FODMAP FRIENDLY FOODS

A new logo to help people advised to follow a diet low in FODMAPs (Fermentable Oligosaccharides, Disaccharides, Monosaccharides and Polyols) has been launched.



According to dietitian and founder of the logo system Dr Sue Shepherd, the *FODMAP Friendly* Certification is the first Australian government-approved labelling system for fructose-friendly and lactose-friendly foods.

"An estimated 35 per cent of Australians have an intolerance towards ingredients high in FODMAPs like wheat, rye, apple, honey, legumes, onion, garlic and milk," she said.

"FODMAPs trigger symptoms in one in eight people who suffer from irritable bowel syndrome (IBS), and can also affect sufferers of coeliac disease and other inflammatory bowel diseases such as Crohn's disease."

To qualify, a food product is independently analysed in a food-testing laboratory before it is given the *FODMAP Friendly* accreditation.

The certification is already on select foods including Kez's Low in Fructose Cereal and snacks, Well and Good baking mixes, Bayview chicken and fish products, and Sue Shepherd All Natural Confectionary.



# 22-25 June 2014 Melbourne Convention & Exhibition Centre

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## INNOVATION GRANTS TO HELP AUSSIE FARMERS

Minister for Agriculture, Barnaby Joyce, has announced 31 new projects to be funded throughout Australia as part of the government's \$21.2 million Innovation Grants program.

According to Joyce, the grants support industry and research organisations to develop tools that reduce input costs and generate better returns at the farmgate, while protecting natural resources for future generations.

"The sort of innovation these grants support has been integral to the development of our agricultural industries and will continue to be integral as we work together to secure a more profitable and vibrant future for our producers," said Joyce.

The grants will see cherry growers in South Australia work with the University of Adelaide to examine the potential for honeybees to reduce fungicide sprays, spray drift and off-target sprays.

Another grant will fund a project by Birchip Cropping Group to give grain growers new tools to farm according to the capacity of their land and the seasonal conditions, thereby improving their ability to strategic decisions.

A grant to Cotton Australia will go toward their myBMP online system which helps cotton farmers report on fertiliser, pesticide and water usage and improves the industry's competitiveness in the global marketplace.



Dairy Australia is also the recipient of a grant to help the dairy industry better manage and understand its fertiliser application, with the aim of reducing usage.

"I look forward to seeing the results of these projects and practical tools and research to help farmers," Joyce said.

A full list of projects is available at [www.daff.gov.au/innovationgrants](http://www.daff.gov.au/innovationgrants).

## PLANT-DERIVED SWEETENERS SET TO GROW

A new report from Mintel and Leatherhead Food Research predicts that stevia use as an additive in food and beverage manufacture will grow by 250 per cent over the next four years, from US\$110 million in 2013, to \$275 million by 2017.

"Plant-derived sweeteners, such as stevia, are expected to provide the main impetus for growth in the sweetener market in the coming years," said Emma Gubisch, Strategic Insight Manager at Leatherhead Food Research.

According to the report, in 2009 five per cent of sweetened food and drink products launched used solely plant-derived sweeteners (although a further two per cent used a blend of artificial and plant-derived sweeteners). In contrast, the share of plant-derived sweeteners jumped to 15 per cent in 2013 (with a further three per cent used a blend of artificial and plant-derived sweeteners). Between 2011 and 2013, plant-derived sweeteners reached a high of 28 per cent of launches in North America.

Despite this growth, artificial variants such as acesulfame K, sucralose and aspartame are still dominant in new product launches. Sucralose is the largest sector within the global intense sweeteners market in value terms (34 per cent), having overtaken aspartame in recent years and showing more potential for growth in some regions given its positioning as the most 'sugar-like' of the artificial sweeteners.

Largely driven by consumer concerns over sugar intake, the global market for intense sweeteners as additives used in the manufacture of food and beverage products is forecast to reach US\$1.4 billion in 2017, up by 9.7 per cent from levels in 2013. <sup>10</sup>





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\*Bar codes not to scale

Find out more about GS1 DataBar at [www.gs1au.org/GS1DataBar](http://www.gs1au.org/GS1DataBar)  
or speak to one of GS1 Australia's experts on **1300 BARCODE** (1300 227 263).



## PEOPLE

### New CSIRO group executive



Following an extensive international recruitment process, CSIRO has welcomed Prof Maurice Moloney to the role of group executive for the Food, Health and Life Science Industries group. Moloney's career in plant biotechnology spans more than 25 years. Immediately prior to CSIRO, he was director and chief executive at Rothamsted Research, a Biotechnology and Biological Sciences Research Council Institute in the UK. Moloney was the founder of SemBioSys Genetics Inc and served as the company's president from 1994-1998 and as chief scientific officer from 1998-2010.

### New board member



Queensland sugarcane grower Alf Cristaudo has been elected to the Australian Made Campaign Board of Directors. Cristaudo is the former chairman of Canegrowers Australia and recently completed his term as director of the National Farmers Federation.

### New talent scholarship



Twenty-one-year-old Emma McPherson from Lion Dairy and Drinks has been awarded the first scholarship offered by food safety development and training company AFS SAI Global. The scholarship is designed to foster talent in the Australian food safety industry.

McPherson will undertake a Diploma in Food Industry QA Management.

### Beef producers recognise scientist



Dr Stuart McLennan, a cattle nutrition specialist and principal research fellow with the Queensland Alliance for Agriculture & Food Innovation (QAAFI), has been awarded a North Australia Beef Research Council Medal. The award recognises McLennan's 30-year body of work, which includes the science behind the supplementation of beef cattle graze on tropical pastures.

Also at QAAFI, Prof Graeme Hammer was honoured with the Australian Medal of Agricultural Science while Prof Stephen Moore was awarded one of only three visiting international fellowships with Vicoso University, Brazil.

### International awards

The International Union of Food Science and Technology has recognised scientists at opposite ends of their careers. Dr Vishweshwaraiah Prakash received the Lifetime Achievement Award and Dr Alonzo A. Gabriel received the Young Scientist Award for his work towards the development of food science and technology in the Philippines.

### Vale Robert Retford, 1943-2013

It is with sadness that we report the passing of long-time AIFST member Robert Retford on 13 December 2013. At the time of his passing Robert was general manager of Ingredient Resources Pty Ltd. He had been in declining health since a major operation in February 2013. Our thoughts are with his family and friends. 🕯



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# REGULATING PREVENTIVE HEALTH

*How appropriate is full regulation in achieving health objectives and a reduction in non-communicable diseases?*

Words by *Geoffrey Annison*

One of the most useful outcomes of the Blewett Review of food labelling<sup>1</sup> was the identification of a hierarchy of labelling issues and associated range of potential regulatory responses. In brief, the issues were ranked as follows: 1) food safety, 2) preventive health, 3) new technologies, and 4) consumer value issues. Regulatory responses proposed ranged from full black letter law for food safety issues through to industry codes of practice for consumer issues. This reflects the well-established principle of proportionality, i.e. regulatory responses moderated by the level of risk to the public.

The Review did not, however, explore fully the practicalities or appropriateness of regulation for each of these issues, be it full regulation, co-regulation or industry self-regulation. And this is an important issue, particularly as full regulation (of the food industry) is frequently advocated as a means to addressing the rising levels of non-communicable diseases (NCDs) in Australia. Such regulatory proposals extend beyond food labelling, encompassing banning (some) food product advertising, restricting the composition of food products, specific taxes (e.g. ‘fat taxes’) and limiting the sale of food products from some outlets.


Of course, the food industry accepts the value of full regulation of food safety issues such as setting limits for the levels of potential hazards (i.e. toxins and contaminants) in foods. Such regulations, coupled with the technical knowhow of food technologists, form the basis for the very safe food supply we enjoy in Australia. But

FOOD SAFETY	PREVENTIVE HEALTH
Single agents such as toxic chemicals, pathogenic organisms, or physical hazards are responsible for the harmful effects or threats to health.	NCD rates are driven by risk factors (genotype, nutrition, smoking, physical activity etc.) and have a multi-factor aetiology.
Health effects are (generally) acute – onset and recovery occurs in relatively short time frames; high recovery rates, particularly if treatment is secured.	NCDs are chronic – long onset and recovery times, low recovery rates i.e. return to full health is unlikely, even with extensive treatment.
Most (but not all) in the population are vulnerable to the harmful agents.	Many in the population do not succumb to the risk factors and develop NCDs.
The harmful agents act essentially independently of each other and the environment.	The risk factors interact strongly and with environmental and lifestyle factors.
Consumption of the harmful agent can usually (not always) be linked directly to ill health, even to the individual level.	Consumption and other risk factors can only be linked to ill health at a population level.
Strong evidence of harmful agents at the food level.	Strong evidence of health effects at diet level.
Unsafe levels of harmful agents can be defined at food level.	Unhealthy levels of risk factors can only be defined at diet levels.
The health hazards are food-based and are therefore relatively easy to regulate.	The health hazards/risk factors are diet-related and are difficult to regulate as it requires altering consumer behaviour.

Table 1: Characteristics of food safety challenges and preventive health challenges.

how appropriate is full regulation in securing preventive health objectives and particularly in securing a reduction in NCDs?

In answering this question, a direct comparison between the characteristics of food safety challenges and preventive health challenges can be illuminating. Table 1 contrasts food-based hazards that can lead to ill-health with NCDs.

Food safety hazards are firmly and directly associated with food. They can be readily measured and safety levels established through appropriate technical methodologies which can underpin regulation. In contrast, risk factors for NCDs, such as saturated fat and sodium, can only be assessed at the diet level (i.e. a single high sodium  
*Continued page 14* 







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## NEWS FROM THE COUNCIL

Our goal at AIFST is to provide professional development and networking opportunities for our members and their employers, thereby supporting a strong and vibrant Australian food industry led by the world's best food science and related professionals.

To guide us in delivering our goal, Council has been hard at work finalising the strategic plan for 2014-2015. The plan sits under four pillars, which are: Continuing Professional Development, Knowledge Sharing, Professional Networking and Knowledge Value.

The programs under each pillar are being developed in close consultation with AIFST committees. These include the *Continuing Professional Development Committee* (Bronwyn Graham, David Hastings, Dean McCullum, Haelee Fenton, Roger Stanley, Gordon Young, Jenny Robertson), the *Scientific and Technical Committee* (Dr Michele Allan, Dr Geoffrey Anison, Callum Elder, Greg Harper, Marion Healy, Dr David Roberts, Dr Geoffrey Smithers, Dr David Topping, Richard Souness), the *Membership Strategy Committee* (Dr Justin Whitely, Phillip Michielin, Anthony Evans, Rob Solomon, Dr Geoff Smithers, Meagan Tan, Mel



Malloch); and the newly established Publications and Communications Committee, details below.

Our vision for a strong and vibrant Australian food industry is a one we share with other organisations, including the Australian Food and Grocery Council (AFGC), with whom we have established a strategic partnership. A key aspect of the AFGC partnership is their support of our Continuing Professional Development (CPD) program, which will strengthen the education opportunities we are providing to the membership.

### Publications and Communications Committee

Along with the CPD program, AIFST's communications assets – including *food australia*, BiteSize, branch newsletters and our social media channels Facebook and Twitter

– provide additional outlets for knowledge sharing.

The newly established Publications and Communications Committee (PCC) will oversee communications to ensure relevance and quality of content; consistency of presentation, messaging and branding; frequency and effectiveness; and integration.

The PCC will work with Scientific and Technical Committee to ensure the scientific and technical content is current, relevant and accurate.

The PCC is chaired by Fiona Fleming, director of F J Fleming Food Consulting, and includes Dr Ramon Hall, Dairy Health and Nutrition Consortium manager; Stewart Eddie, new product manager at Weiss Frozen Foods; Dr Lisa Szabo, chief scientist at NSW Food Authority; and Dr Michael Eyles, senior advisor at CSIRO.

The team's first meeting will be held in early February 2014.

*(continued from page 11)* food cannot, of itself, be considered to be a health hazard). They are simply risk factors, not health hazards, and, of course, proposing 'safe levels' for possible regulatory interventions becomes problematic.

NCDs are first and foremost lifestyle-related diseases, which require individuals to take primary responsibility for their health. The food industry can assist lifestyle and diet choices - the Australian Food and Grocery Council's (AFGC) Daily Intake Guide, which provides at-glance-nutrition information on front of pack, is a good example.

Against the background of rising levels of NCDs and the associated pressure on the government's health budget, calls for stricter regulation of the food industry will become stronger. As the table demonstrates, however, alternative policy options are likely to be more effective and more appropriate for influencing the lifestyle choices necessary to reduce NCDs and the burden of diseases on the community.

The AFGC will continue work through collaborative partnerships with other stakeholders through initiatives such as the Healthier

Australia Commitment-Together Counts<sup>2</sup> playing its part in efforts to halt and reverse the rise in NCDs.

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

### References

1. Labelling Logic. Review of Food Labelling Law and Policy. Commonwealth of Australia 2011
2. [www.togethercounts.com.au](http://www.togethercounts.com.au)



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# MINING THE MARINE WORLD FOR FOOD INGREDIENTS

*Science now suggests that the marine world may provide a proverbial treasure trove of nutrients.*



The marine world offers phenomenal potential for bioactive compounds with possible human health benefits – spanning polyunsaturated fatty acids, sterols, proteins, polysaccharides, antioxidants and pigments. Algae in particular are attracting significant interest for both their health and functional benefits in food products.<sup>1</sup>

Algae are rich in vitamins, minerals, proteins, polyunsaturated fatty acids, and dietary fibres, and numerous clinical studies have demonstrated the health benefits of seaweed consumption – immunomodulation, anti-inflammatory, anti-bacterial and anti-viral activities – and linked them to the nutrient composition of seaweed.<sup>1,2</sup>

In comparison with terrestrial plants, algae are particularly rich in iodine, which is essential to the functioning of the thyroid and of the nervous system, in vitamin B12, and in selenium.

In addition to their health benefits, seaweeds possess a wide range of important gastronomic and food-preservation properties<sup>1,3-5</sup>, including:

- food thickening, emulsifying and gelling properties (phycocolloids)
- vegetarian and vegan substitute for gelatin
- substitute for gluten
- natural food colouring
- foam stabilising properties
- cryoprotection
- moisture preservation in meat and bread; retardation of bread staling
- aroma enhancement.

## Classification

Macroalgae are classified into three main groups: brown, red and green algae. Brown algae, also known as kelp, tend to be very large and olive green or brown in colour. Their stem is attached to the substrate by a holdfast, and their blades grow up towards the water surface. Some brown algae possess gas-filled sacs and are free-floating. Red algae are typically smaller algae found in tidal pools. Their colours range from greenish to dark purple. Green algae are small and thin-layered algae found close to the water surface. They are particularly rich in chlorophyll a and b.<sup>1</sup>

Microalgae encompass unicellular green and red algae, cyanobacteria, diatoms, and dinoflagellates. Together, the microalgae form about 50 per cent of the earth's primary biomass production and the base of the marine food chain.<sup>1</sup>

## *Brown macroalgae*

Brown algae are generally rich in hydrocolloids, in iodine, and in pigments such as fucoxanthin and chlorophyll a and b. The abundance of phlorotannins and the carotenoid fucoxanthin is responsible for the anti-obesity and anti-diabetic properties of brown algae.<sup>6,7</sup>

## *Red macroalgae*

Red algae are particularly rich in phycocolloids (especially carrageenans) and in phycobiliproteins.<sup>5,7-9</sup> They are often referred to as agarophytes or carrageenophytes, and they are widely used commercially for the production of thickening and gelling agents, prebiotic fibres, and food colourings.<sup>10-12</sup> Red algae are also particularly rich in carotenoids and in B vitamins.<sup>8</sup>



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Table 1. Major nutrients found in algae commonly used for human consumption

Official name	Common name	Major types of nutrients
<b>Brown algae</b>		
<i>Alaria esculenta</i>	dabberlocks, winged kelp	rich in proteins, vitamin B3
<i>Ascophyllum nodosum</i>	rockweed, knotted wrack	rich in alginates (28% D.W.), in fucoidan (8% D.W.), in laminarin (7% D.W.), and in mannitol (7% D.W.); fucoxanthin, vitamin E
<i>Durvillaea antarctica</i>	-	rich in alginates, iodine, calcium, potassium, phosphorus, iron, vitamin A, B complex, C, D, E, and K
<i>Ecklonia</i> sp.	-	alginates; fucoidan; eckol
<i>Eisenia bicyclis</i>	aramé (Japan)	alginates; eisenin (tripeptide); vitamin A; iodine; calcium; iron; magnesium
<i>Fucus serratus</i> (and other <i>Fucus</i> species)	toothed wrack	rich in fucoidan (16% D.W.); fucoxanthin; beta-carotene, vitamin E
<i>Himantalia elongata</i>	seaspagheti, thongweed, haricotdamer (France)	fucoidan
<i>Laminaria japonica</i> (and other <i>Laminaria</i> species) (main source of raw material for the alginate industry)	<i>Saccharina japonica</i> , kelp, oarweed, kombu/konbu (Japan), haidai (China)	rich in alginates (32% D.W.), in laminarin (18% D.W.), in mannitol (14% D.W.), in proteins (10% D.W., incl. the amino acid taurine), in fucoidan (4% D.W.); iron; iodine; magnesium; calcium; fucoxanthin; beta-carotene; vitamin A, B9, C, D, E, K
<i>Macrocystis</i> sp.	giant kelp, sea ivy	rich in alginates, mannitol, and vitamin E
<i>Sargassum</i> sp.	limu kala (Hawaii)	alginates; fucoidan; mannitol (12% D.W.); taurine
<i>Undaria pinnatifida</i>	wakame (Japan)	rich in alginates (34% D.W.); in laminarin (3% D.W.); fucoidan; proteins (incl. the amino acid taurine); vitamin B3, C, E
<b>Red algae</b>		
<i>Chondrus crispus</i>	Irish moss	rich in carrageenans ( $\kappa$ and $\lambda$ ) (50% D.W.), floridoside (10% D.W.), and taurine (5% D.W.); beta-carotene; vitamin B complex
<i>Euchemadenticulatum</i> (commercial crop for carrageenan; formerly <i>Euchemadenticulatum spinosum</i> )	<i>spinosum</i>	rich in carrageenans (esp. $\iota$ ); lectins
<i>Gelidium</i> sp.	limu lo-loa (Hawaii), haitengusa (China)	rich in agar (30% D.W.)
<i>Gigartina</i> sp.	-	rich in carrageenans ( $\kappa$ )
<i>Gracilaria</i> sp. (major source of agar)	ogon, ogonori (Japan), sea moss	rich in agar (25% D.W.); carrageenans; phycobiliproteins; lectins
<i>Kappaphycus alvarezii</i> (formerly <i>Euchemadenticulatum cottonii</i> )	<i>cottonii</i>	carrageenan ( $\kappa$ ) (22% D.W.)
<i>Mastocarpus stellatus</i>	carrageen moss	carrageenans ( $\kappa$ and $\lambda$ )
<i>Palmaria palmata</i>	söl (Iceland), dulce	rich in floridoside (25% D.W.); iodine; carotenoids; vitamin B complex; taurine-
<i>Porphyra</i> sp.	nori (Japan), kim (Korea), laver, slawk	rich in proteins (up to 50% D.W., incl. the amino acid taurine), in porphyrin (up to 45% D.W.), in floridoside (up to 40% D.W.), and in chlorophyll; beta-carotene; vitamin A, B complex, C, E; potassium; magnesium; iron
<b>Green Algae</b>		
<i>Caulerpa lentillifera</i>	seagrapes, green caviar, umi-budo (Japan)	rich in iodine; phosphorus; calcium; magnesium
<i>Codium</i> sp.	dead man's finger	lectins
<i>Ulva lactuca</i> (and <i>Ulva intestinalis</i> )	sea lettuce, green laver, anaori (Japan), limu palahalaha (Hawaii)	rich in ulvan (up to 55% D.W.), fucoidan, glucuronic acid, and iron; calcium; vitamin A, B complex, and E; proteins (up to 20% D.W.; esp. lectins); chlorophyll; beta-carotene
<b>Microalgae</b>		
<i>Arthrospira</i> sp. (cyanobacterium)	spirulina	rich in phycobiliproteins (up to 70% of D.W.); chlorophyll a and b (1% D.W.), vitamin B complex, and E; proteins; linolenic acid; beta-carotene
<i>Chlorella</i> (green alga)		rich in beta-glucan; beta-carotene; astaxanthin; vitamin C; chlorophyll (3% D.W.); EPA (40% of total lipids)
<i>Cryptocodinium cohnii</i> (dinoflagellate)		high levels of PUFA (37% D.W.), esp. DHA
<i>Dunaliella</i> sp. (green alga)		rich in chlorophyll and beta-carotene
<i>Haematococcus</i> sp. (green alga)		rich in astaxanthin and chlorophyll
<i>Porphyridium</i> sp. (red alga)		rich in chlorophyll and phycobiliproteins
<i>Shizochytrium</i> sp. (fungus-like microalga)		high level of PUFA, esp. DHA
<i>Tetraselmis</i> sp. (green alga)		high level of PUFA, esp. DHA; chlorophyll; vitamin E

### Green macroalgae

Green algae tend to be found towards the top of the water column. They contain primarily chlorophyll and storage polysaccharides.<sup>7,12</sup> Green algae are also rich in magnesium, calcium, iodine, and phosphorus.<sup>8</sup>

### Microalgae

Microalgae are the largest primary biomass, covering 70 per cent of the earth's surface to a depth up to 200 m.<sup>1</sup> They include diatoms, dinoflagellates, cyanobacteria, and microscopic green and red algae.

Until recently, microalgae have been an untapped resource, but the recognition of their potential application for biofuel production and for protein and polyunsaturated fatty acid (PUFA) extraction for human food supplementation has led to a boom in the microalgae culture industry.

Today, microalgae are cultured in large-scale open systems and in closed fermenters. The best known examples of edible microalgae are *Arthrospira* sp. (*spirulina*) and *Chlorella* sp.<sup>1,13</sup>

*Spirulina* consists up to 70 per cent (D.W.) of proteins, 15 per cent (D.W.) of carbohydrates (primarily rhamnose and glycogen), 10 per cent (D.W.) of minerals, and only five per cent (D.W.) of fats. In other words, *spirulina* is a low-fat, low-kilojoule, virtually cholesterol-free source of proteins. Furthermore, the proteins found in *spirulina* comprise all of the essential amino acids, and, by being naturally stored as phycobiliprotein complexes, they have a high level of bioavailability.<sup>10,14,15</sup>

With up to 20 per cent phycocyanin, *spirulina* is nature's richest source of blue food colouring. *Spirulina*-derived phycocyanin is used in candies, soft drinks, ice-cream, dairy products, and wasabi.

### Applications

#### Polysaccharides

The major polysaccharides found in algae are alginates, carrageenans, agars, fucanes, laminarans, ulvans, and floridean starch. These are referred to as phycocolloids due to their hydrocolloid properties: phycocolloids form gels in water by microscopic dispersion throughout the liquid solution.

Phycocolloids function as soluble dietary fibres. As such, they offer a wide range of beneficial physiological functions, including increased satiety, increased gut transit time, reduced cholesterol and glucose absorption in the gastrointestinal tract, and reduced risk of coronary heart disease.<sup>1,5</sup>

The average fibre content of red algae (6g per 100g of wet algae) is twice the amount found in fruits, vegetables and cereals promoted today for their fibre content, such as prunes, cabbage, apples and brown rice.

As a result of their complex fibrous structures, algal polysaccharides are excellent substitutes for gluten in food processing. Also, the addition of algal polysaccharides to bread dough (0.1 per cent of the flour weight) has been shown to reduce the loss of moisture content during storage, and to retard staling.<sup>16</sup>

Algal polysaccharides can bind water at up to 20 times their own weight, which allows them to undergo gelation and form emulsions, as well as to stabilise foam in food and drinks.<sup>1</sup>

The regular consumption of even small amounts of algal polysaccharides also has a major impact on the growth of beneficial probacteria such as bifidobacteria and lactobacilli.

#### Lipids

Overall, algae have very low lipid contents (as low as 0.3 per cent D.W. in green algae), however, the lipids they do primarily consist of essential C18 polyunsaturated fatty acids (PUFAs) and long-chain PUFAs generally associated with health-beneficial fish oils.<sup>2</sup>

#### Peptides and proteins

Taurine, or 2-aminoethanesulfonic acid, occurs naturally in meat and seafood and it is also particularly abundant in brown and red algae. Taurine is essential for cardiovascular, central nervous system, and retina function, and for skeletal muscle development.

The tripeptide eisenin (L-pyroGlu-L-Gln-L-Ala) found in the brown alga *Eisenia* sp. and lectins, which are particularly abundant in red and green algae, are well known for their immunostimulatory effects.<sup>2</sup>

Phycobiliproteins, such as phycoerythrin and phycocyanin, found in microalgae and red algae, are widely used in dietary supplements as anti-inflammatory, anti-cancer, neuroprotective, and hepatoprotective agents.<sup>2</sup>

#### Vitamins and minerals

Marine algae are a rich source of vitamins A, B1, B2, B3, B9, C and E. Vitamins C and E are potent antioxidants. Marine algae are also rich in iodine, iron, potassium, magnesium, calcium, selenium and phosphorus – minerals that are widely used in health beneficial supplements.<sup>17</sup>

#### Commercialisation

Several ventures around the world have shown that the production of sea vegetables for human consumption



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provides a wealth of exploitable marketing opportunities. Examples include:

- DSM's lifeDHA – a vegetarian source of omega-3s grown from algae cultures
- Algalin by Solazyme Roquette Nutritionals, which is a lipid replacement powder used in cooking, baking and ice-cream confection to reduce the kilojoule uptake by up to 50 per cent, and to extend the shelf life of certain foods
- Aquamin by US company Marigot – algae-derived minerals specifically formulated to be added to baked products, processed meats, low-pH drinks or frozen desserts
- Yakult's probiotic drink made from milk, Lactobacillus casei and Chlorella
- US company Freeland Food's Go Raw Spirulina energy bars
- various pasta brands with wakame to enhance the gluten network within the dough to improve the sensory characteristics and/or fortified with algal PUFAs to boost the consumption of omega-3 PUFAs. 📌

*This article is a summary of a paper prepared for Scotland's Food Health Innovation Service entitled **Sea Vegetables for Health** by Professor Marcel Jaspars and Dr Florence Folmer of the University of Aberdeen.*

*Food Health Innovation Service is funded by Scottish Enterprise, Scotland's main economic development agency, and is designed to deliver practical support and market knowledge to Scottish food companies to help them exploit the growing food market.*

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- PV5 | Alkalized, dark brown | **pH 8,3** (± 0,3)
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## DELIVERING FUNCTIONAL INGREDIENTS BY MICROENCAPSULATION

*Advances in microencapsulation means it may offer targeted and precise release of bioactives throughout the gut.*

One of the key developments in functional foods in the past 10 years is the advance of microencapsulation technology that enables bioactive components to be incorporated into food products where there are challenges associated with incorporating the free component.

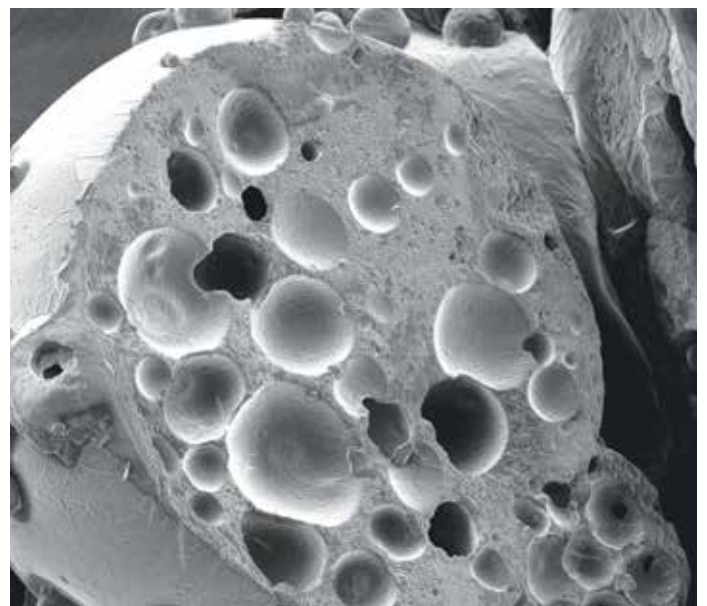
Microencapsulation involves the formulation of an active ingredient (i.e. core) with one or more secondary materials (i.e. encapsulant) and processing the formulation to produce miniature capsules that may range in size from sub-micron to several millimetres. The encapsulant isolates the core until it is released upon exposure to a desired stimulus (e.g. temperature, shear, pH, gut enzymes).

Microencapsulation offers protection of the core from degradation. It can mask unwanted flavour or taste, it can enable dilution of the core material when only small amounts are required and it can be used to separate components of the mixture that would otherwise react to each other. In many cases, it allows easier handling of sensitive core ingredients.

Microcapsules may be designed to control the release of the core quickly or slowly, or at a particular time. They may facilitate the targeted and precise release of bioactives by taking advantage of different pH and enzyme concentrations in different parts of the gut.

A range of microencapsulation technologies are used for the delivery of food ingredients such as acidulants, flavouring agents, sweeteners, colours, lipids, vitamins and minerals, enzymes and microorganisms. Common delivery systems include emulsion-based systems, solid lipid nanoparticles, complex coacervates and biopolymeric gelled microspheres.

According to Dr Mary Ann Augustin, research program leader CSIRO Animal, Food and Health Sciences, CSIRO has a leading microencapsulation technology for omega-3 oil delivery, which is used in commercial practice. The microencapsulation team at CSIRO has also developed microencapsulation technologies and applications for other bioactive components including fat-soluble bioactives – for example, vitamins and probiotics. More recently it has developed technology for the encapsulation and stabilisation of krill oil, an emerging omega-3 source.



*Image from an electron microscope showing a particle of encapsulated omega-3. Source: CSIRO.*

“CSIRO has a range of patented microencapsulation technologies, including what we call our ‘grandfather patent’ which we developed in early 2000. Clover Corporation Limited has successfully commercialised this technology for the microencapsulation of omega-3 (including HiDHA® tuna oil) and omega-6 oils,” said Augustin.

“The technology (MicroMAX®), using encapsulants based on heated protein-carbohydrate mixtures, was developed to overcome challenges associated with utilising the benefits of fish oil as a functional food ingredient. Long chain omega 3 PUFAs in fish oil are particularly sensitive to oxidation and it can give off an undesirable odour and taste. Through this technology we both masked the fishy flavour and extended the shelf life.”

Processing and storage can have adverse effects on the deterioration of bioactives, and microencapsulation can offer protection to these ingredients and also overcome other challenges associated with the introduction of



ingredients that are incompatible with the chosen food vehicle used for delivery. For examples, microencapsulated oils and oil-soluble bioactives can be directly added into aqueous based systems.

“CSIRO’s microencapsulation technology uses all-natural ingredients as encapsulating material for the formulation of the microencapsulated bioactive. In designing formulations and employing unit processing operations that are part of a normal food processing operations, we have been able to develop a suite of encapsulated ingredients with longer shelf life. And importantly, we have been able to transfer the technology to industry,” said Augustin.

While CSIRO’s initial patent focused on delivery of triglyceride omega-3 oils, it has now developed a range of patented technologies for the delivery of probiotics and more recently, for krill oil. Our technologies stabilise sensitive bioactives in the ingredient state and also when the ingredients are incorporated in processed food products.

“We are very excited about opportunities for the use of microencapsulated ingredients as there is a growing consumer awareness of the benefits of their nutritional ingredients and a growing market for functional food. Microencapsulated ingredients mean that ingredient suppliers and food manufacturers are better placed to capitalise on this market opportunity,” said Augustin.

As part of CSIRO’s research on microencapsulation for the stabilisation of bioactives for use in functional foods, it has also investigated the bioavailability of microencapsulated nutrients.

“We have shown that the intestinal absorption of omega-3 long chain polyunsaturated fatty acids [EPA and DHA] when fish oil was delivered in a gelatin capsule was similar to that when microencapsulated fish oil using CSIRO’s MicroMAX® technology in fortified food products,” said Augustin.

The CSIRO microencapsulation technology may be used to deliver single bioactives or a combination of bioactives.

“The co-encapsulation of bioactive ingredients allows the combination of bioactives to be delivered in one microencapsulated formulation. Since the biological actions vary among different bioactives, co-delivery of a mixture of bioactives may confer advantages over individual bioactive formulations. An example we have examined is the co-delivery of fish oil, tributyrin and resveratrol,” said Augustin.

Microencapsulation technology offers advantages for the successful delivery and protection of bioactive ingredients into functional foods that would not have been possible by direct addition. It also has the potential to enhance the functionality of bioactive ingredients, thereby maximising the health benefits available to consumers.

With the global food encapsulation market projected to reach US\$35.4 billion by 2014, this is certainly an area to watch.

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# FROM MINING BOOM TO DINING BOOM

*Why a novel approach to food and nutrition R&D is crucial to boost Australia's food exports to Asia.*

Words by Ingrid Appelqvist and Kelly Parsons

It has been called 'Australia's greatest responsibility and opportunity in the 21st century' – Asia's future demand for food. But to capitalise on this estimated \$2bn export opportunity, a fresh approach to research and development will be essential.

The phrase 'mining to dining' looks set to become one of the food sector's most quoted of 2013, following its popularisation earlier this year by Anthony Pratt, head of packaging and recycling business Visy.<sup>1</sup>

And with good reason. By virtue of time and location, Australia has the potential to take advantage of the dining boom, thanks to the rapid rise in Asian economies, populations, socio-economic classes and incomes – encapsulated under another increasingly ubiquitous phrase – 'the Asian Century'.

There is consumer demand for healthy, bio-functional, safe food as well as assurance of provenance and more dietary protein. In fact, one estimate suggests that, by 2020, Asian consumption of beef and other meats will have increased by up to 50 per cent, with consumption of dairy products up even higher, at 55 per cent.<sup>2</sup> Much of this protein consumption will be in the form of high value-added products.

All of this adds up to a 'perfect storm' for the food industry, and a pressing need for a new manufactured food and nutrition strategy to help the sector achieve maximum economic impact.

## A new strategy

The National Food and Nutrition Research and Development and Technology Transfer (RD&TT) Strategy<sup>3</sup> ('The Strategy') is the first attempt to

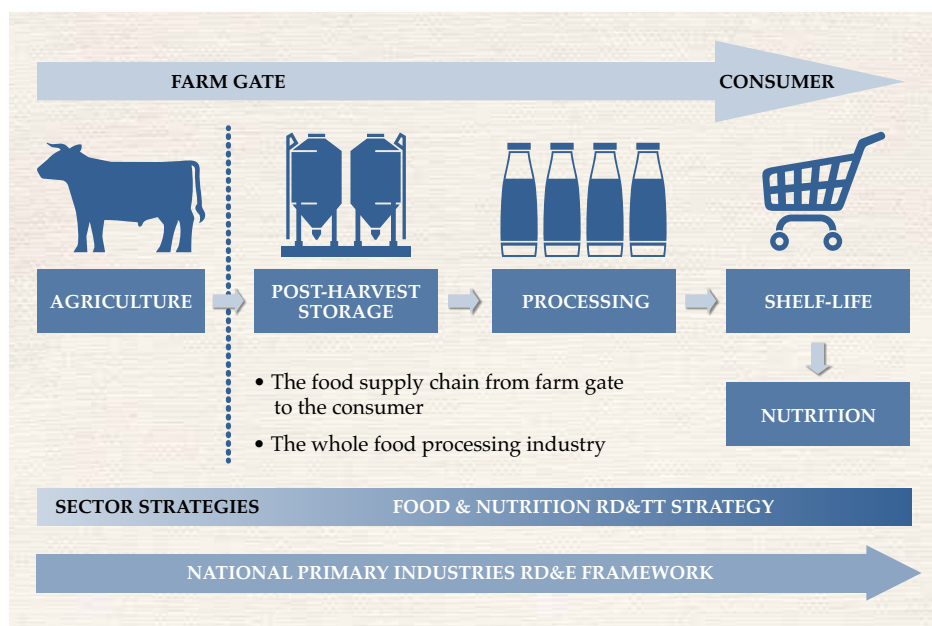


Diagram 1: Scope of the Food and Nutrition RD&TT Strategy.

develop a coherent national research strategy for the entire food and nutrition sector, and is a cross-sectoral joint initiative of several government, food and nutrition organisations, for which the implementation is being kick-started now. *The Strategy* forms part of the National Primary Industries Research, Development and Extension (RD&E) framework, which aims to develop a coherent research framework for Australia's primary industry and related sectors, the main objectives being to facilitate greater coordination, harmonise roles in RD&E and work more effectively together to maximise net benefits to Australia.

A 20-year horizon has been used in the strategy policy to identify the most significant challenges and to develop research and development (R&D)

priorities, and an implementation plan that will enable the sector to improve sustainability, productivity and global competitiveness, and also add to consumer nutrition, health and wellbeing.

While Australia has traditionally viewed itself as a commodity exporter, it has struggled to increase and focus on exports of value-added foods. *The Strategy's* focus on Australia as 'the food bowl to Asia', along with its emphasis on collaboration and support, will mean export growth of value-added Australian food products should now play a bigger part in the profitability of Australian food manufacturers. In turn, the resulting economies of scale will make Australia a much more desirable base for food manufacturing.

*The Strategy* considers the entire food supply chain, from farm gate

to consumer, and while it focuses primarily on post-farm activity, it also ensures a close alignment with the sectoral commodity plans that cover on-farm production and productivity, as illustrated in Diagram 1.

*The Strategy's* scope includes all post-farmgate handling of food, and its transformation to foods and ingredients for consumption by Australians and export customers. It encompasses the nutritional impact of food on health, and research and education related to food and diet.

Specifically, *The Strategy* aims to develop the national research portfolio for elaborately transformed food and ingredients, by building markets and consumer insights in the Asia-Pacific region, and identifying growth opportunities that will be supported by research on developing value-added packaged food for the Asian consumer.

### A central piece in the policy jigsaw

By delivering the research and innovation to underpin and address challenges for the largest Australian manufacturing industry, *The Strategy* will help to address a number of

## PRIORITIES OF THE FOOD AND NUTRITION RD&TT STRATEGY

### Future markets and industry competitiveness

*Vision, future markets and consumer insights*

Develop market and consumer insights and establish Asia-Pacific regional opportunities for Australian agriculture and food manufacturing throughout the food supply.

### The intersect between food, nutrition and health

*Value-added food for health and well-being*

Determine Asia-Pacific regional nutrition and dietary needs and opportunities to provide healthier food choices that are easy for consumers.

### Climate change and resource efficiency – sustainability

*Food manufacturing efficiency and waste reduction*

Develop tools and technologies to measure and understand impact of climate change on food manufacturing and through chain food supply for more

efficient use of energy and water and to reduce waste.

### Food safety – integrity and traceability

*Safeguarding Australian food supply and provenance*

Develop science evidence-based systems that guarantee food safety, biosecurity and market access.

### Technology translation and adoption – barriers and mechanisms

*Innovation and adoption of new technologies*

Build strategic partnerships to deliver technologies and innovation (national and international) and build science-based input for regulation of the Australian food industry.

### Skills and training

*Industry ready graduates and skilled workforce*

Deliver training and development to build skills and capacity within the food industry to enhance innovation in food and nutrition.



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government food policy priorities, including the need to support the global competitiveness and productivity growth of the food supply chain; to reduce barriers to a safe and nutritious food supply that responds to the evolving preferences and needs of all Australians and international consumers, and supports population health; and to contribute to economic prosperity, employment and community wellbeing in regional Australia.

This first National Food and Nutrition RD&TT Strategy was developed in the context and with analysis and consultation of a number of federal and state governmental policy and strategy initiatives for the food industry. These have included, among many others, the National Food Plan, the Food Processing Industry Strategy, the Primary Industries Standing Committee (PISC) Sectoral and Cross-Sectoral Strategies, and the Food Innovation Precinct.

All of these food strategies and initiatives made recommendations consistent with the goals of the National Food and Nutrition RD&TT Strategy (Diagram 2).

Government, state agencies and industry are more strongly focused on developing closer cooperation in food policy, identifying important challenges or issues that are common across different parts of the food and nutrition sector, as well as pooling resources to address key challenges. For example, a number of the sectoral strategies under the PISC RD&E framework have priorities that are common to most, if not all, industry sectors. These include: consumers and global markets; biosecurity; biodiversity; supply/value chain productivity and efficiency; climate change and resource constraints; food safety; eating and nutritional quality; and people, skills and training.

Many of these are now being tackled as a cross-sectoral initiative under the priorities of the Food and Nutrition RD&TT Strategy. These include: future markets and industry competitiveness; the intersect between food, nutrition and health; climate change and

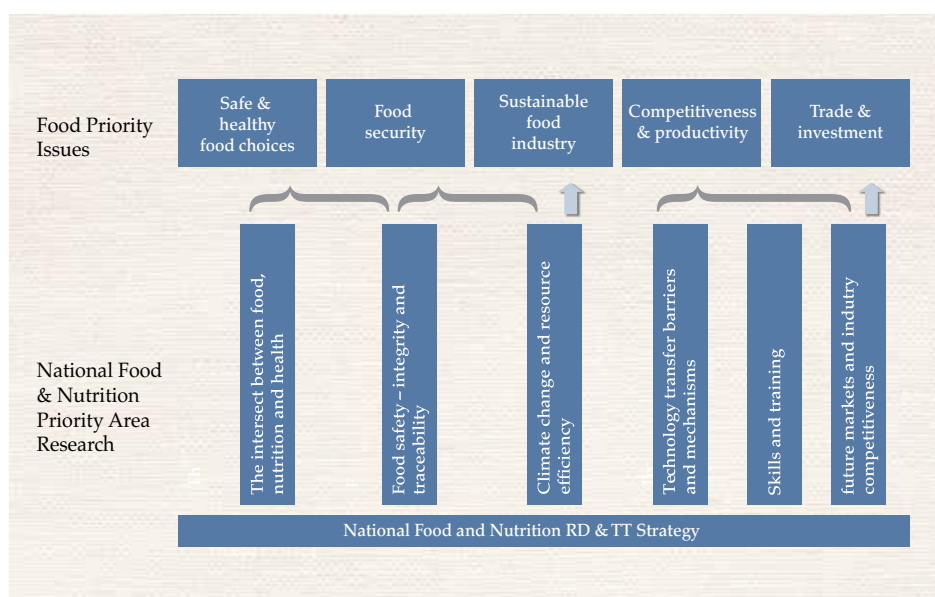


Diagram 2: The Food and Nutrition RD&TT Strategy and other food policies.

resource efficiency – sustainability; food safety – integrity and traceability; technology translation and adoption – barriers and mechanisms; and skills and training.

### How will Australian food processing benefit?

The food and nutrition sector currently lacks overarching representation to establish the vision and plan it needs to take it into the future. So *The Strategy* proposes a new committee be established, to oversee the next steps and to coordinate progress, working with some existing, new and proposed representational groups.

One important group will be Food Innovation Australia Limited (FIAL), which will be represented on the committee of *The Strategy*, and will provide links to businesses, and capability to bring industry, researchers and state agencies together to solve problems and capture opportunities for export into Asia. This will include training and the development of relevant skills for the food and nutrition sector, developing a capability and infrastructure plan and will facilitate innovation-funding opportunities to support the food industry.

### What's next?

The next steps for *The Strategy* will be to implement its recommendations. The first task is to establish an implementation structure and convene a committee reporting to the PISC RD&E sub-committee, with membership from government and industry, to deliver the objectives.

Working with groups such as FIAL, the priority action areas for *The Strategy's* implementation committee are:

- Boosting investment in innovation through increased engagement between companies and researchers. This will be achieved in collaboration with FIAL and interfacing with food companies. The focus will be on small to medium enterprises to provide greater access to infrastructure like pilot plants and laboratories to enable them to conduct translational research that will provide a more immediate benefit.
- Focusing on the growing Asian markets by developing capability in understanding the Asian consumer and improving food industry knowledge on the technical and regulatory requirements to increase market access and reduce export barriers.
- Improving skills by implementing



technical workshops and industry courses that will support graduates to be 'industry ready', including having food companies provide industry training placements.


- Establishing a national food safety forum. The forum will develop food safety systems that maintain Australia's reputation, establish safety requirements, conduct strategic research to respond to emerging threats, and support market access to the Asian region.
- Convening an annual food industry forum to review and refresh the National Food and Nutrition strategy and RD&TT priorities, guide research and provide future leadership, vision and planning for the Australian food and nutrition sector.

To ensure the resiliency of the Australian food industry, the food industry and R&D providers must take into account the interrelationships between the six RD&TT priority areas of investment presented in the research strategy.

The time is ripe for better collaboration between rural RDCs, CSIRO, federal and state government agencies, universities and food companies to address the many

food sector issues we are all grappling with, particularly market and consumer insights; linking innovative products to health and wellbeing; increasing sustainability in food manufacturing; and providing stakeholders with access to enabling technologies, food process infrastructure and training.

The National Food and Nutrition RD&TT Strategy development process has established new relationships and strengthened existing ones among industry stakeholders, federal and state agencies and research organisations. It has begun the process of building momentum for these various entities to work together to address food and nutrition challenges, and it is now vital that these relationships be maintained and developed.

The potential of the dining boom will have the best possible chance of being realised through collaboration. This involves uniting what has historically been a fragmented sector, so information and lessons learned from *The Strategy*, along with the many other attempts to formulate food industry policy, continue to be shared, and joint research is undertaken to address knowledge gaps we face. 

#### Key organisations involved with the development of the National Food and Nutrition RD&TT Strategy

- Australian Food and Grocery Council and food companies
- Federal and state agencies including CSIRO that have responsibility for research, development and extension in food and nutrition
- Research and Development Corporations (RDC) and Cooperative Research Centres (CRC)
- Universities and non-government organisations

*Dr Ingrid Appelqvist is the government and R&D policy lead in the Animal, Food and Health Sciences division of CSIRO. Kelly Parsons is a researcher at the Centre for Food Policy, City University London.*

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# EARNING A SOCIAL LICENCE TO OPERATE IN THE FOOD SECTOR

*Ongoing consultation with stakeholders is critical to address concerns of communities who now have the power of instant global communications.*

Words by Lydia Buchtmann

All of us who work in the area of food know that it is a complex and emotive issue that can easily generate consumer outrage. Like the butterfly flapping its wings in the jungle of chaos theory, food crises can have the strangest origins.

For example, last year a change to Romanian road rules banning horse drawn vehicles sent surplus horses and donkeys to the abattoir and led to the illegal addition of this excess horse meat to frozen beef products throughout Europe.

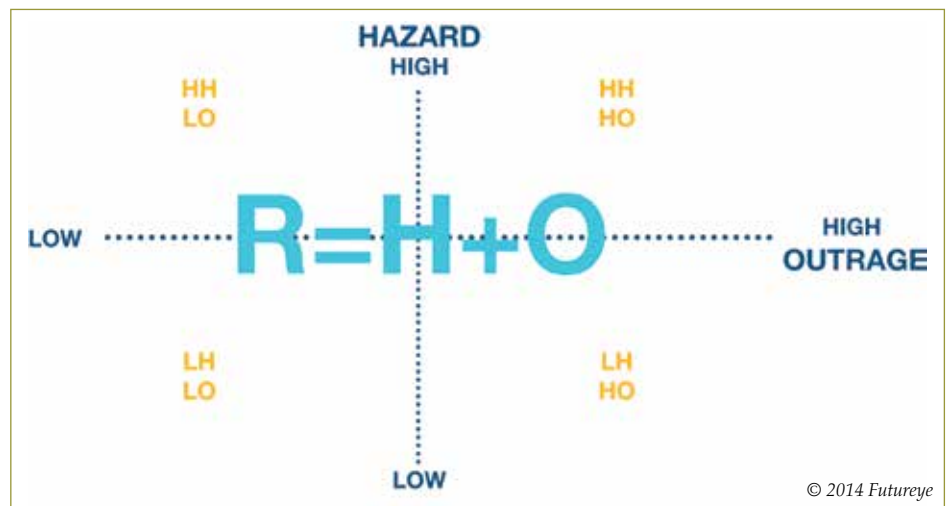
Surprisingly it is not necessarily the most hazardous food safety issues that create the greatest consumer outrage.

Dr Peter Sandman's work on risk communication notes that this is because it is not just that the **risk = hazard** but it is really the **risk = hazard + outrage**.

Current issues that score highly on the consumer outrage index include genetically modified food, animal welfare issues, red food colours and animal growth hormones.

Of course, outrage isn't limited to the food industry – we see it in the media every day with issues ranging from the environment to energy resources. But it seems magnified in the area of food because everyone consumes food and has a view about the food supply.

Because food regulation and enforcement involves not just the federal government but all the states and territories (and New Zealand), there are significant numbers of government agencies and politicians for activists to lobby. That said, this process is somewhat easier today as it can be



done through a click of a mouse either through social media campaigns on activist websites or via websites such as [www.change.org](http://www.change.org), which can help you start a petition for a fee.

Often the organisational reaction to outrage is to do all, or a combination of the following:

1. Ignore the problem
2. Provide a whole lot of technical and scientific data
3. Attack or impugn – e.g., say activists are just wrong – which can ultimately be time consuming and expensive
4. Give up and give them what they want – which may open a company up to more demands and/or offend other stakeholders.

Two recent cases of outrage that followed this traditional reaction are KitKat and palm oil and Bonsoy soy milk.

## KitKat and palm oil

In 2010 Greenpeace posted on YouTube a parody of a KitKat commercial demanding that Nestlé stop sourcing palm oil as an ingredient to protect the jungle environment of the orangutan in Indonesia. Featuring an orangutan's finger in a KitKat wrapper, the video was viewed by over 300,000 people.

Nestlé's response was to force the clip to be removed from YouTube citing copyright infringement. This, of course, generated even more outrage on social media. Since then Nestlé has joined the Roundtable for Sustainable Palm Oil and has undertaken to only use sustainable palm oil from 2015.

The Greenpeace campaign was enormously successful considering the YouTube video only had just over 300,000 views – minor compared with the cute Grumpy Cat which has over 14 million views.

## Bonsoy soy milk recall due to excessive iodine 2009

Late in 2009 Australian thyroid specialists began to report an unusually high level of patients with both underactive and overactive thyroids after they had consumed the popular Bonsoy soy milk imported from Japan. There was a national product recall on Christmas Eve 2009.

Bonsoy's Australian distributor, Spiral Foods, posted a statement on their website saying that while they were complying with the recall their product was all natural and safe.

Bonsoy's denial of any problem sparked outrage among those that were ill and their families and they responded by establishing a website and social media campaign.

Despite the recall, health warnings and outrage from those affected, there was an element of Bonsoy's consumer base that was in strong support of the company. Recalled product was being retained under the counter in a number of cafes and sold illegally to customers on request – a practice soon exposed by the media.

Although the product was reformulated and returned to the shelves in April 2010 there was still no apology from the company.

In January 2013 there was further outrage when Bonsoy was found to have known of high levels of iodine in mid-2006 but took no action. A class action has been established and more than 600 people have now joined.



## DAD to Dave – how to earn a social licence to operate

Having a social licence to operate is as important as complying with regulatory requirements.

The conventional model for organisations to cope with conflict is to **decide, announce, defend (DAD)** whereas social licence to operate requires a cooperative **'DAVE'** response, which is:

- the ability to **declare** dilemmas
- **acknowledge** past and current problems
- develop a shared **vision**
- set up an **engagement and evaluation** cycle to demonstrate improvement.

Social licences can't be bought - they have to be earned and part of that involves making a journey together

with the activists and concerned parties.

In contrast to other communication models that tend to avoid working with the highly involved (and often angry) activists and instead focus on changing public opinion, the DAVE model works with the highly involved activists who can have considerable influence on other audiences. These include 'the attentives' who keep an active eye on what is happening, 'the browsers' who dip in and out of the issue and the general public on the periphery.

Maintaining a social licence to operate is critical to address the concerns of communities who now have the power of instant global communications. They use this power to maintain message cohesion and lobby for change.

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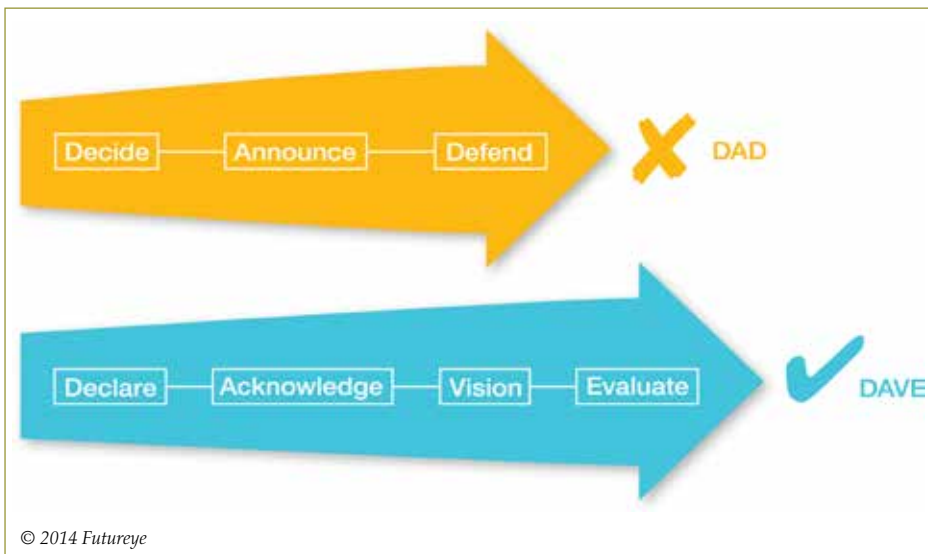
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In response, Australian Livestock Exporters' Council (ALEC) is developing an industry-wide strategy to rebuild its social licence to operate and ensure the commercial sustainability of the industry.

The project has involved a number of key activities, including engagement with ALEC board members and executives to assess the industry's current state, a workshop with board members and executives to build understanding of gaps and potential new approaches to engagement, as well as communications to mitigate outrage.

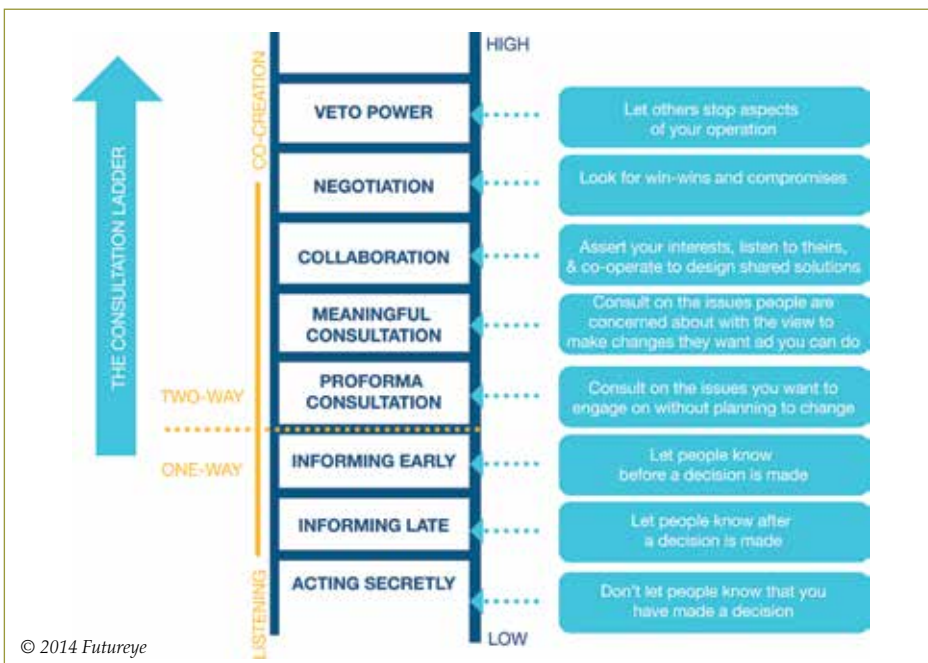
The project has resulted in an immediate change in members' perceptions of the handling of issues and a more positive media reaction. The industry has also seen increased alignment among members on a new and mutually productive approach to stakeholder engagement and communications.

The next phase will involve training on media communications and engagement strategy to make stronger in roads with the general public.

### Making life easier

The advantage of having a social licence to operate is that, although it takes time to earn one, ultimately it makes your life much easier. Remember, like a bushfire, it is much easier to catch an issue in its early stages before it generates outrage, which, once it has occurred, is much harder to undo.

Always keep a constant eye out for emerging issues that may affect your organisation, be flexible and adaptable during the process and, most of all, keep your sense of humour! 🍷



Communication power, rising societal expectations and increasing activist sophistication mean companies need to understand and resolve community concerns at each stage of a project.

You know your project or company has received a social licence to operate when you are in open communication with your host community or activists, you are aware of and monitoring emerging issues and potential outrage, stakeholders are an integral part of your system and the culture in your organisation accepts stakeholders as part of the process and engages with them regularly and openly.

Building trust is vital as part of your social licence – it takes time and you must be honest, open and transparent with all your stakeholders.

### Live exports

Let's look at an example of a journey that has recently started to gain a social licence to operate.

In Australia, the livestock export industry has become a target of animal rights activists and is at risk of a total ban as a result of some very effective campaigning – including the broadcasting graphic footage of animal cruelty.

*Lydia Buchtman headed the Communication and Stakeholder Engagement Section of Food Standards Australia New Zealand (FSANZ) from 1997 to 2010. She now consults to Futureye, a multi-disciplinary management consultancy specialising in public affairs and social licence to operate.*



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## MORE THAN A GUT FEELING

*Emerging research on gut microbiota looks at its role in optimal gut health and potential implications for human health and disease.*

Words by *Dorrain Low* and *Lucas Grant*

ILSI SEAR Australasia in association with the ARC Centre of Excellence in Plant Cell Walls held the symposium 'Gut feelings – what can we learn from recent research on gut microbiota?' in December 2013. Below is a snapshot of presentations given by prominent scientists about this emerging area of research.

### **Professor Peter Gibson**

*Professor and director of Gastroenterology at Monash University and Alfred Health*

Prof Gibson emphasised the importance of the microbiota as an 'organ' – being no less significant than the role of the liver in human health. He noted that the influence of gut microbiota on all aspects of wellbeing makes dysbiosis an important marker for clinicians. He discussed advances in methodology to classify microbes, their genes, and functions. A 'fishing expedition' to define abnormalities in microbiota across many disease states exists, in order to uncover pathogenic secrets and lead to therapeutic strategies to correct dysbiosis.

Current therapeutic intervention to clinically manipulate microbiota includes biotic therapy, which is the introduction of 'foreign' substances, i.e. antibiotics, probiotics, prebiotics, synbiotics and faecal microbiota transfer (faecal transplant). Gibson envisioned a clinical setting capable of biotic therapy based on metagenomics showing functional deficiencies leading to a diagnosis. Currently this is available at significant cost to the patient.

However, his professional concern was that it is still speculative science, and the interpretations and



recommendations are not evidence based. In his opinion, our knowledge is still too limited to answer the questions: what is a 'normal' microbiota, what specific alterations from 'normal' mean, and how to correct for these alterations and prevent disease?

### **Professor Patricia Conway**

*Professorial fellow at the University of New South Wales*

Prof Conway discussed the importance of laying down foundations of a beneficial microbiota from birth. While microbiota describes the community of the gut as a whole, Conway expressed the view that the genetic potential or microbiome is the real 'crux' of the field. The digestive tract is sterile at birth and is populated from a range of sources, most notably the maternal gut, placenta,

mode of delivery and breast milk. Post-birth, the infant receives passive immunity from the mother but there is a critical window of sensitivity between four and six months of age, where the infant is exposed to environmental and dietary challenges. These trigger the immune responses and memory, and also influence components of the emerging complex microbiome.

Differing distributions of Gram-negative and Gram-positive bacteria in African and European infant populations reflect differences in the two most represented phyla, Bacteroidetes and Firmicutes. The emerging pandemic of non-communicable diseases (NCD) in more developed countries may reflect alteration of the gut microbiota. Well-documented probiotic strains can promote infant growth and



development, and potentially assist in reversing the NCD pandemic. However, we need to apply caution as probiotics are both strain and dose specific. Conway said future research in the field requires a range of multidisciplinary perspectives to begin 're-programming' the microbiota.

### Dr Jane Muir

*Research dietitian at Monash University*

Dr Muir discussed the 'best' dietary pattern for maintaining optimal gut health. Optimal gut health is defined by good bowel habit, prevention of common inflammatory and functional gut disorders and long term protection against colorectal cancer. Maintaining gut health is dependent on a varied diet including soluble, fermentable and indigestible dietary fibre, which are all important for our colonic bacteria

The main dietary fibre groups are polysaccharides and oligosaccharides, which are largely undigested in the small intestine and pass through to the large intestine for fermentation by colonic bacteria.

Muir reiterated that dietary fibre is a complex mixture of different types of fibre that determines the production of

beneficial fermentation end products. To date, focus is on investigating isolated dietary fibre specialist ingredients but Muir noted no single type of dietary fibre supplement performs all these physiological functions. Her research looked at mixing wheat bran with resistant starch (RS) to assist in transport to the large intestine as a preventative measure for colorectal cancer. Results suggest that a wheat bran and RS composite could improve the gut environment and may have beneficial therapeutic applications. She recommended ~15-20 g/day of RS for physiological benefits and ~4-15 g/day of fructo-oligosaccharides (FOS), inulin, galacto-oligosaccharides (GOS) for selective growth of microbiota species.

People who limit their intake of cereal and grains, or follow prescribed diets, i.e. gluten-free, Paleo, low FODMAPs diets – may not be getting sufficient prebiotic fibre. Muir also stressed that the current AOAC methods for total dietary fibre analysis need to be revised, as they do not accurately capture all individual fibre types.

### Professor Mike Gidley

*Director of the Centre for Nutrition and*

*Food Sciences, University of Queensland*

Prof Gidley addressed the topic of the impact of food structure on gut fermentation. He discussed which dietary components get to the large intestine; what happens when they get there; and the health implications. All food particles and secretions that are not absorbed in the stomach or small intestine make it to the large intestine. To predict these macronutrients and 'co-passenger' micronutrients reaching the large intestine relies on calibration against data from ileostomy patients. However, results are limited by the absence of large intestinal feedback mechanisms. Animal models are more reproducible, but he questioned how representative this is of human responses. He said the complexities of in vivo passage rate are enormous and kinetics is everything in this game, and rate and site of fermentation are important. For example, the amount of RS entering the large intestine depends on the extent of salivary and pancreatic amylase hydrolysis, chewing, levels of enzymes secreted and the extent of mixing in the small intestine.

With the exception of non-starch polysaccharides (NSP) and lignin, all

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From left: Prof Yuan Kun Lee, Prof Andy Sinclair, Deakin, past ILSI SEAR Aust pres and one of meeting taskforce, Prof Patricia Conway, Prof Peter Gibson, Dr Meera Esvaran, Ms Kim Tikellis, Fonterra and ILSI president, Prof Jane Muir, Prof Mike Gidley, A/Prof Andy Holmes.

other major food components (i.e. starch, protein and lipids) have the potential to be digested and absorbed by the end of the small intestine. However, it is also clear that at least some dietary protein and starch enter the large intestine and these act as energy sources for the resident microbiota. Gidley gave examples of 'inside-out' vs 'outside-in' fermentation concepts: smaller wheat particles are fermented more rapidly, in contrast to multi-cellular carrot particles which have a faster rate of fermentation compared to single carrot cells and fragments. He also explained that carrot has a more 'open' structure where the microbes can enter to attack but wheat has a denser structure, which is potentially inaccessible. He predicts that self-measured faecal and other biomarkers will become important future tools for assessing the impacts of dietary choices or changes.

### **Associate Professor Andy Holmes**

*School of Molecular Bioscience and Charles Perkins Centre, University of Sydney*

A/Prof Holmes presented on the topic of defining gut microbiome targets for management of obesity and metabolic disease. Our gut microbiota has more cells than our own body, and all humans are distinct so common mechanisms can lead to different outcomes in terms of diagnostic approaches. We differ because of our own genome, lifestyle and environment plus unique differences in our 'other genome', the microbiome. "Our birthday is indeed our

inoculation date," he said.

Diet and lifestyle are major causal factors of gut microbiota shifts and it is possible that gut microbiota may be associated with the increase in obesity rates. Holmes suggests two opportunities for improving healthcare – using the microbiome as a metric to improve diagnosis and targeting the microbiome for therapeutic intervention. He discussed recent links between the microbiome and diet-induced metabolic disease.

His research compared a western versus a Korean diet, noting that diets of different macronutrient distribution may induce microbiome change but do not necessarily drive the same microbiota outcomes in individuals. For example, although kilojoule intake was vastly dissimilar, weight loss outcomes were comparable. The correlation between energy intake, adiposity and metabolic disease is not uniform, and dietary patterns drive different relationships between obesity and disease. Holmes also stressed that successful dietary weight loss strongly correlates with successful microbiota community change. He also spoke about rational engineering of the microbiome as part of diet intervention strategies and a need to identify people with unique genetic or microbiome signatures to define obesity subtypes that require distinct intervention.

### **Dr Meera Esvaran**

*Microbiologist and immunology researcher,*



*University of New South Wales*

Dr Esvaran spoke about the role of probiotics in immune function. Immune disorders are on the rise and this high rate can be linked to lower incidences of infectious disease, overuse of antibiotics, diet and metabolic disorders. Patients with irritable bowel syndrome have lower diversity in their gut microbial community. Esvaran acknowledges that the gastrointestinal microbiota is vital in the maintenance of homeostasis in the gut and immune function.

We know the microbiota plays a pivotal role in health and immune function from experiments conducted using germ-free mice where sterile guts led to underdeveloped tissue and a decrease in subsets of immune cells, important in differing disease states. Clinical trials have demonstrated that the gut microbiota constitutes an ecosystem regulating inflammation beyond the GI tract and shows potential for vaccine adjuvants.

### **Professor Yuan Kun Lee**

*Department of Microbiology, Yong Loo Lin School of Medicine, National University of Singapore*

Prof Lee posed the question, 'Does diet or gene determine human intestinal microbiota?' and presented research investigating the gut microbiome of young Asian children. He stated that individuals have their greatest exposure to a developing microbiota during infancy and this changes with age, with diet playing a direct role. He described a collaborative Asian Microbiome project consisting of 10 cities across five countries, representing both rural and metropolitan city locations.

In this Phase 1 study, gut microbiota could be differentiated into two major cluster types where Prevotellaceae was prevalent in cities of Thailand and Indonesia, and Bifidobacteriaceae and Bacteroidaceae were dominant in China, Japan and Taiwan. Lee explained that high meat consumption in Chinese and Japanese diets is not a good indication of this microbial enterotype distribution as seasonal dietary patterns within three to five months could alter the resident microbiota community.

A Mongolian study illustrated how changes in dietary patterns from a high meat diet in winter to dairy products in summer changed the microbial community between seasons. Lee emphasised that staple carbohydrates, and specifically the type of rice consumed, reflects the gut bacterial distribution. Japonica or 'sticky' rice, typically consumed in Japan, China and Taiwan is high in amylopectin as compared to Indica or 'loose' rice that is consumed in Thailand and Indonesia.

He said clusters of geographical influence have a strong association with dietary habits, and possibly are related to genetic disposition too. He added that a Phase 2 study involving mothers, infants, adults and the elderly, from cities of Korea, Mongolia, Malaysia and Singapore is currently underway. ☺

*Dorrain Low and Lucas Grant are PhD candidates at the Queensland Alliance for Agriculture & Food Innovation (QAAFI) Centre for Nutrition and Food Sciences, University of Queensland.*



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## FUNCTIONAL FOODS ROUNDUP

*Healthy ingredients in milk may provide new options to develop diet-based solutions for better health outcomes.*

Words by Ranjan Sharma

With lifestyle-related health concerns and diseases like obesity, cancer, hypertension and weak immune systems on the rise, dairy may offer diet-based solutions. There is enough published evidence to suggest that milk and dairy products are rich in healthy bioactive ingredients, many of which are buried inside the complex structures of dairy components. Therefore, a systematic mining of dairy may lead to the development of novel bioactive ingredients that can be used in a range of food products.

The most well-researched bioactive components in milk include colostrum,  $\kappa$ -Casein,  $\beta$ -Casein, whey protein,  $\alpha$ -lactalbumin,  $\beta$ -lactoglobulin, immunoglobulins, lactoferrin, lactoperoxidase, casein and whey protein hydrolysate. Figure 1 shows summarises general processing steps that can be used for fractionation of milk into bioactive ingredients and Table 1 outlines their potential health benefits.

In order to fractionate, isolate and concentrate bioactive components from milk, the first step is separation of fresh milk into cream and skim milk. The cream part contains almost all of the fat globules, and the associated fat globule membrane that is a rich source of several bioactive components (see Figure 1).

Skim milk is usually treated with acid or rennet to separate casein from whey proteins; both casein and whey streams then become raw materials for isolation of bioactive components. Although many biologically active peptide segments have been identified in casein (identified as casokinins),

the current commercial product range is limited to casein hydrolysates and phosphopeptides.

During cheese manufacture, part of  $\kappa$ -casein released in whey during rennet action is commercially available as glycomacropeptide (GMP). In the dairy industry, whey available from cheese manufacture remains the most abundant source of whey-based bioactive ingredients. Several bioactive ingredients can be commercialised from whey as shown in Figure 1.

Among these are ingredients enriched in whole proteins (e.g.  $\beta$ -lactoglobulin,  $\alpha$ -lactalbumin, lactoferrin and lactoperoxidase), hydrolysed forms of proteins (e.g. whey protein hydrolysates with varying degrees of hydrolysis), and milk minerals.

### Colostrum

One of the most bioactive-rich fluids produced by the cow is the colostrum. Colostrum provides life-supporting immune and growth factors that ensure the health and vitality of the newborn and it is a rich source of several bioactive components, including immunoglobulins, lactoferrin, lactoperoxidase and lysozyme.

Colostrum contains over 10 times the amount of immunoglobulins present in normal milk. Immunoglobulins are very heat-sensitive proteins, which makes the processing of colostrum into an ingredient a difficult process.

Colostrum is also a rich source of growth factors. Growth factors are key regulators of a variety of cellular functions and are involved in the control of tissue growth and repair.

Extensive research has identified a number of applications for their use in clinical medicine and biotechnology. The most important of these is likely to be a therapeutic with potential in wound healing. China remains one the world's largest consumers of bovine colostrum, however, its use in infant formula was banned in 2012. This was mainly to prevent infant formulae being contaminated with low-quality colostrum products.

### Whey proteins

Despite having been considered as a waste that pollutes the environment, whey has shown enormous potential as a result of its proteins and it has been used as a popular protein supplement in various functional foods. In fact, components from whey exhibit a number of functional, physiological and nutritional features that make them potentially useful for a wide range of medical food applications.

Research has shown that whey-derived components can reduce the risk of metabolic syndrome, which can lead to various chronic diseases such as cardiovascular disease and diabetes. Health problems associated with HIV, hepatitis B and osteoporosis have also been reduced, either directly or indirectly, by the use of whey derived components. Although whey protein concentrate and isolate are widely available, individual fractions have not been widely commercialised.

Whey protein's biological activities are partially attributed to specific peptides encoded in proteins, which can be obtained by enzymatic

hydrolysis of proteins. Whey proteins are also a source of branched-chain amino acids (BCAAs) such as leucine, isoleucine and valine. Leucine is known to be an important factor for tissue growth and repair. Whey proteins also contain high levels of sulphur-containing amino acids cysteine and methionine, which enhance immune function upon intracellular conversion to glutathione, a potent antioxidant.

### Glycomacropeptide

Glycomacropeptide (GMP) is a hydrophilic peptide (amino acid residue 102 to 169) of  $\kappa$ -casein that provides stability to casein micelles in milk. When rennet acts on  $\kappa$ -casein during the manufacture of cheese, GMP is released into the whey. GMP makes up about 15 to 20 per cent of the whey proteins. GMP is unique among some of the whey proteins in that it is a glycoprotein so it has an oligosaccharide chain attached to it. It also is unique because it contains no phenylalanine, tryptophan or tyrosine.

A small percentage of the population has phenylketonuria (PKU), meaning they are unable to digest phenylalanine. GMP is one of the few amino-acid sources PKU patients can



tolerate because the pure GMP does not contain phenylalanine.

GMP also has high levels of the branched-chain amino acids, leucine, isoleucine and valine. Published research has linked GMP with many physiological functions, including: promotion of bifidobacterial growth; suppression of gastric secretions; inhibition of bacterial and viral adhesion; modulation of immune-system responses; and binding of cholera and E. coli enterotoxins. In simpler terms, GMP offers potential

benefits to intestinal health, appetite control, reduced dental caries, enhanced immunity and protection against diarrhoea.

### Lactoferrin

Lactoferrin is an iron-binding glycoprotein present in colostrum, milk and whey. Lactoferrin can provide several physiological functional (bioactive) properties, which are mainly derived from its ability to bind iron. The main bioactive properties of lactoferrin include antibacterial and antiviral



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BIOACTIVE INGREDIENT	POTENTIAL BIOLOGICAL FUNCTION	POTENTIAL FOOD APPLICATIONS
Colostrum	Immune factors, growth factors, anti-microbial	Sports formulations, hospital and medical nutrition
□-Casein	Immunomodulatory, anti-microbial, mineral binding, opioid agonist/ antagonist, antioxidant, ACE-I	Enteral and adult medical nutrition
□-Casein	Immunomodulatory, mineral binding, antioxidant, ACE-I, opioid agonist, cytomodulation, mineral binding	
Whey protein	Anti-cancer, anti-hypertensive, immune enhancing, anti-bacterial, anti-viral, cholesterol reduction, anti-thrombic	Infant and adult medical nutrition, sports beverage, hospital meals
□-Lactalbumin	Sleep enhancement, ACE-I activity, immunomodulation, anti-microbial, opioid agonist, anti-cancer	Drinks and beverages
□-Lactoglobulin	ACE-I activity, opioid agonist, anti-microbial	Drinks and beverages
Immunoglobulins	Antibacterial and immune enhancing, passive immunity	Infant formula
Lactoferrin	Iron binding ability responsible for many functions such as bacteriostatic effect, cell growth promotion, antioxidation and iron delivery and absorption	Health supplements, supplements for the elderly or immune-compromised patients, functional foods and drinks, infant formulas, cosmetics and oral care products, supplements for recovery from gastrointestinal infections
Lactoperoxidase	Preservation effect. Bacteriostatic effect against Gram +ve bacteria and bactericidal effect against Gram -ve bacteria, e.g. pseudomonads, coliforms, salmonella, Listeria	Food preservation in general, meat products
Casein and whey protein hydrolysate	Reduced allergenicity, increased protein absorption, increased peptide bioactivity, lowering blood pressure	Infant and enteral formulation, geriatric products, sports beverages, weight control diets
Casein and whey peptides	Fast absorption of peptides. Non-allergenic source of proteins	Infant and enteral formulation, isotonic beverage, sports nutrition
Caseinophopeptide (CPP)	Mineral carrier, helps in re-mineralisation and mineral absorption, protection against dental caries, antibacterial	High mineral beverages, chewing gum, breakfast cereals
Glycomacropeptide (GMP) or Caseinomacropeptide (CMP)	Satiety, low phenylalanine, branched chain amino acids	Dental care products such as toothpaste and mouthwash for prevention of dental caries and remineralisation. Supplements and diets for Phenylketonuric (PKU) sufferers. Prebiotic for probiotic supplements and foods. Sports nutrition products as source of branched chain amino acids. High protein diets for weight control
Milk minerals and milk calcium	Prevention of osteoporosis and growth of healthy bones and teeth, blood pressure and cardiovascular disease control, lower effect on hypertension, prevention of colon cancer, control of weight gain and obesity	Dairy products such as recombined milk, flavoured milk, yogurt and cheese. Nutritional and functional foods such as sports and adult nutritional beverages, weight loss products and sports bars. Bakery products such as breads and cakes, confectionery products and breakfast cereals. Convenience foods such as soups, sauces and frozen desserts and food supplements such as capsules and tablets.
Conjugated linoleic acid (CLA)	Tumour inhibition, immune modulation	Spreads, health foods and supplements
Bovine serum albumin (BSA)	Fatty acids binding, antioxidant, prevention of cancer	Adult and medical nutritional supplements
Phospholipids	Immune modulation, anti-infection, anti-tumour,	Infant formula, cholesterol lowering beverages and spreads
Osteopontins	Immune functions	Infant formula



properties, antioxidant properties, immune modulation, and ability to carry iron.

Lactoferrin inhibits the growth of pathogenic bacteria and fungi, due to its ability to bind large quantities of iron. Lactoferrin binds iron very strongly, thus rendering this essential nutrient unavailable to support microbial growth. Lactoferrin also disrupts bacterial digestion of carbohydrates, further limiting their growth. In addition, the action of pepsin in the stomach converts lactoferrin into lactoferricin, which has broad-spectrum activity against pathogenic bacteria and yeast. Lactoferrin also has the ability to bind to parasites and the outer membrane of Gram-negative bacteria, making the cell wall more permeable, thereby improving the efficiency of antibiotics.

### Casein and whey protein hydrolysates

The enzymatic hydrolysis process produces protein ingredients designed for nutritional, dietetic and medical foods. Both casein and whey proteins can be hydrolysed to produce protein hydrolysates with variations in the degree of hydrolysis. Enzymatic protein hydrolysates containing short chain peptides with characteristic amino acid profiles and defined molecular size are used in specific formulations such as those used for feeding hospitalised patients.

Hydrolysis of cow milk proteins into smaller peptides reduces the risk of allergenicity and allows the use of hydrolysate as a substitute for human milk protein in infant formula. Milk protein hydrolysates are also suitable for replacement of intact proteins in adult nutritional formulations where reduced allergenicity is needed. Food applications that can benefit from reduced allergenicity are infant formula, adult nutritional formulations, isotonic sports, enteral formulations and medical nutritional formulations.


### Milk minerals

Calcium and phosphorus are the major minerals required for the growth and development of bones and teeth. Calcium deficiency is far too common in diet, and awareness of this deficiency has led to calcium fortification of a range of food products including breakfast cereals and fruit juices. Although consumers consider milk and dairy products to be the richest sources of calcium, many have limited their consumption to reduce fat in their diets, or because of their intolerance to lactose.

Milk minerals are a rich source of calcium used for calcium fortification of food and beverage products. Commercial milk mineral complex is obtained from cheese whey after removal of proteins, which are converted into protein concentrates, and lactose, which is dried into lactose powder.

In summary, although milk contains bioactive components both in the lipid and in the skim part, by far, skim milk and whey are the major sources of bioactive components. To date, many of the bioactive components from milk remain unexploited as commercial ingredients. However, developments in new processing technologies and a desire to add value to dairy may stimulate further commercialisation of healthy bioactive components from milk. 🍌

*Ranjan Sharman 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

## **New Nordic Diet helps reduce weight and lower blood pressure**

A research team from the University of Copenhagen in Denmark has found that by feeding centrally obese people a New Nordic Diet – which is based on a gastronomically driven regional, organic and environmentally friendly foods – they were able to help those individuals lose weight and lower blood pressure compared to individuals on a standard Danish diet (Poulsen *et al.*, 2013).

The New Nordic Diet is a food-based dietary approach recently developed in the Nordic countries in collaboration with Michelin-acclaimed Copenhagen gourmet restaurant Noma. It concentrates on regional foods in season with a strong emphasis on palatability, healthiness and sustainability.

The purpose of conducting this study was to understand if a Nordic-based diet could achieve similar health benefits as seen with the Mediterranean and DASH (Dietary Approaches to Stop Hypertension) diets. The study was a non-blinded, parallel, randomised controlled dietary intervention involving 181 centrally obese men and women of mean age 42 years with a mean body mass index of 30.2 and waist circumference of 100cm.

Participants were randomly assigned to either the New Nordic Diet (high in fruit, vegetables, whole grains and fish) or a typical Danish diet for a total of 26 weeks. Participants were provided with cookbooks and all foods *ad libitum* and free through a dedicated shop.

The primary endpoint for the research study was weight change.

Over 80 per cent of participants



completed each treatment arm. The study showed that the New Nordic Diet achieved significantly greater weight loss ( $-4.7 \pm 0.5$  kg) compared with the typical Nordic diet ( $-1.5 \pm 0.5$  kg) and also greater reductions in diastolic and systolic blood pressure (adjusted difference:  $-5.1$  mm Hg;  $-3.2$  mm Hg respectively).

The authors concluded that “the health potential of the New Nordic Diet is considerable, and the New Nordic Diet seemed to be accepted by the participants, which supports its potential as an alternative to other regional diets such as the Mediterranean

diet. Overall, we believe that, taken together, the many strengths of the study design make the results transferable for practical use in a Danish population”.

These encouraging results suggest that regionally based dietary approaches such as the New Nordic Diet may help to mitigate increasing waistlines in other regions. It is interesting that this approach focused on high palatability and use of foods featured high within most dietary guidelines.

Poulsen *et al.*, (2013) “Health effect of the New Nordic Diet in adults with increased waist circumference: a 6-mo randomised controlled trial”. *American Journal*



### Milk may help short-term memory in girls

A recently published study conducted by CSIRO provides support for the short-term memory benefits of higher protein, lower glycemic load beverages, such as milk (Brindal *et al.*, 2013). The aim of the study was to examine the effect that varying glycemic load and beverage composition might have on appetite, energy intake and cognitive function in children.

The study involved a total of 40 children (10-12 years) and in a double-blind randomised cross-over design, the participants received three isoenergetic beverages (~1,100 kJ): a glucose beverage (GI 100; GL 65); a full milk beverage (GI 27; GL 5) and a half milk/ glucose beverage (GI 84, GL 35). On each session after consuming the products, subjective appetite and cognitive performance was assessed for three hours and was followed by a lunch buffet to assess food intake. Blood glucose assessments were also undertaken at regular time intervals using a Continuous Glucose Monitoring System.

As expected, the blood glucose

responses were significantly different between the treatments, with the full milk beverage having the lowest area under the curve (AUC) value and the glucose-only product having the highest AUC value. None of the three beverages sustain blood glucose levels above baseline (fasting levels) for the whole three hours and there were no significant differences between treatments on measures of subjective appetite or energy intake.

There was, however, a difference in response to the beverages by the boys and girls in relation to subjective appetite and energy intake at the next meal suggesting that the girls were more satisfied by this liquid breakfast than the boys. The milk-containing beverages had a significant effect on a short-term memory task within the girls, whereby they were able to recall 0.7-0.8 more words, compared with 0.5 less on the glucose-only treatment. There was no such benefit detected within the boys, however this may have been partially related to the size of the breakfast.

The researchers concluded that “the present findings suggest that girls may respond more favourably to lower-GI, dairy beverages in terms of short-term

memory, however, further research investigating solid meals with higher preloads may assist in assessing the consistency of these findings”.

Brindal *et al.* (2013) “The effect of beverages varying in glycemic load on postprandial glucose responses, appetite and cognition in 10-12-year-old school children”. *British Journal of Nutrition*, 110, 529-537 (doi:10.1017/S0007114512005296).

### Human gut microbiome can rapidly respond to diet

A recent study published in *Nature* by a research group from Harvard University has suggested that the microbiome can be rapidly changed by an altered diet regime (David *et al.*, 2013). The researchers acknowledged that long-term dietary intake can influence the balance and activity of the trillions of microorganisms within the human gut, but they were interested in understanding more about the short-term dietary changes that occur with macronutrient changes.

The researchers studied two different dietary approaches in nine subjects who were given two extreme diets for five days, per diet, with a six-day washout between diets. The two diets were quite extreme in nature with an animal-based diet (higher protein: primarily meat, cheese and eggs) and



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a vegetable based diet (higher dietary fibre: very little animal products, mainly rice, lentils, granola, fruits and vegetables). The researchers examined the participants' microbiota at different time points, before, during and after each intervention.

The study revealed that these extreme dietary regimes started changing individual microbiota profiles within a day of changing diets. The animal based diet increased the abundance of bile-tolerant microorganisms (*Alistipes*, *Bilophila* and *Bacteroides*) and decreased the levels of Firmicutes that metabolise dietary plant polysaccharides (*Roseburia*, *Eubacterium rectale* and *Ruminococcus bromii*).

The researchers commented that the microbial activity seen in this experiment "mirrored differences between herbivorous and carnivorous mammals, reflecting trade-off between carbohydrate and protein fermentation". In both diets, foodborne microbes transiently colonised the gut, including bacteria, fungi and viruses. An interesting observation was that there was an increase in the abundance and activity of *Bilophila wadsworthia* on the animal-based diet, which the researchers suggest could have implications for conditions such as inflammatory bowel disease.

Using extreme dietary approaches this research group has shown that it is possible to change human microbiota within a very short period of time. It is unclear how this would apply to the general population, as the dietary guidelines suggest a more balanced diet inclusive of animal and vegetable based foods. The researchers suggest that it may be possible to use particular foods to manipulate the microbiota to help with gut-based disease management.

David *et al.* (2013) "Diet rapidly and reproducibly alters the human gut microbiome". *Nature*, Published online ahead of print (doi:10.1038/nature12820).

### Protein intake protects against weight loss in older adults

A research team from McGill University in Quebec, Canada, found that protein intakes greater than 1g/kg body weight per day are protective against weight

loss in healthy older adults (Gray-Donald *et al.*, 2013). Weight loss in older adults is an important risk factor for frailty, mobility limitation, disability, and institutionalisation and has been linked to decreased survival.

The aim of this study was to assess the relationship between protein intake and incident one-year weight loss ( $\geq 5\%$ ) in community dwelling older adults. The researchers used a nested prospective case-control study design utilising 1793 community living elderly participants of the Quebec Longitudinal Study of Nutrition as a Determinant of Successful Aging (NuAge). They studied 211 incident cases of one-year weight loss ( $\geq 5\%$ ) and 211 weight stable controls match for age and sex. Dietary assessment was measured using three non-consecutive 24h food recalls.

The results of the study revealed that individuals that had lower protein intakes ( $< 0.8$  g/kg per day) were 2.56 times more likely to have significant 1 year weight loss ( $\geq 5\%$ ) than individuals with a very high protein intake ( $> 1.2$  g/kg per day) after adjustment for confounding factors. As protein intake increased (moderate (0.8 -  $< 1.0$  g/kg per day); high (1.0 -  $< 1.2$  g/kg per day) the odds ratio for significant one-year weight loss ( $\geq 5\%$ ) reduced, thereby suggesting higher protein levels may help retain body weight in this vulnerable age-group.

The author concludes that "our results suggest that protein intakes  $> 1.0$  g/(kg per day) are protective against weight loss in healthy older adults. These findings add epidemiologic evidence in support of higher optimal protein intakes than the current guidelines for healthy older adults".

Gray-Donald *et al.* (2013) "Protein Intake Protects against Weight Loss in Healthy Community-Dwelling Older Adults". *Journal of the American College of Nutrition*, Published online ahead of print (doi: 10.1080/07315724.2013.791186).

### Low vitamin B12 status linked to greater fracture incidence in elderly men

Researchers from the University of Gothenburg in Sweden have identified that lower levels of cobalamins and

holotranscobalamin in a cohort of older men was associated with lower risk of fracture after accounting for other known risk factors (Lewerin *et al.*, 2013). The study was designed to investigate whether serum cobalamins or holotranscobalamin (the metabolic active cobalamins) status can predict incident fractures in old men. The study used older men (aged 70-81 years) who were participating in the population-based Osteoporotic Fractures in Men (MrOS) Sweden cohort (n=790 participants) who were also not taking ongoing vitamin B supplementation.

The study found that over an average follow-up period of 5.9 years, 110 men had sustained X-ray verified fractures including 45 men with vertebral fractures. After adjustment for known confounding factors (age, smoking, BMI, BMD, falls, prevalent fractures, tHcy, cystatin C, 25-OH-vitamin D, intake of calcium and physical activity), the study identified that fracture risk increased for each standard deviation decrease in cobalamins and holotranscobalamin. Also men in the lowest quartile of cobalamins and holotranscobalamin had an increased risk of all fractures compared with quartiles (2-4).

The authors suggested that although their novel data showed that low levels of cobalamins and holotranscobalamin predicted incident fracture risk, any causal relationship between low cobalamins status and fractures should be explored using a prospective treatment study.

These results may have implication for promoting foods naturally containing B12 (i.e. liver, meat, milk, eggs) and for manufacturers of fortified foods and supplements.

Lewerin *et al.* (2013) "Low holotranscobalamin and cobalamins predict incident fractures in elderly men: the MrOS Sweden". *Osteoporosis International*, Published online ahead of print (DOI 10.1007/s00198-013-2527-y).

*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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# RECYCLED PACKAGING CONCERNS

*Increasing demand for recycled packaging presents challenges for the packaged food industry, especially in the absence of relevant global standards.*

Words by Dr Roya Khalil

According to the World Packaging Organisation (WPO), the packaging category increased in value from US\$320 million to US\$560 million between 1999 and 2009. Food packaging accounts for around half (by weight) of total packaging sales and almost two-thirds (by volume) of total packaging waste.

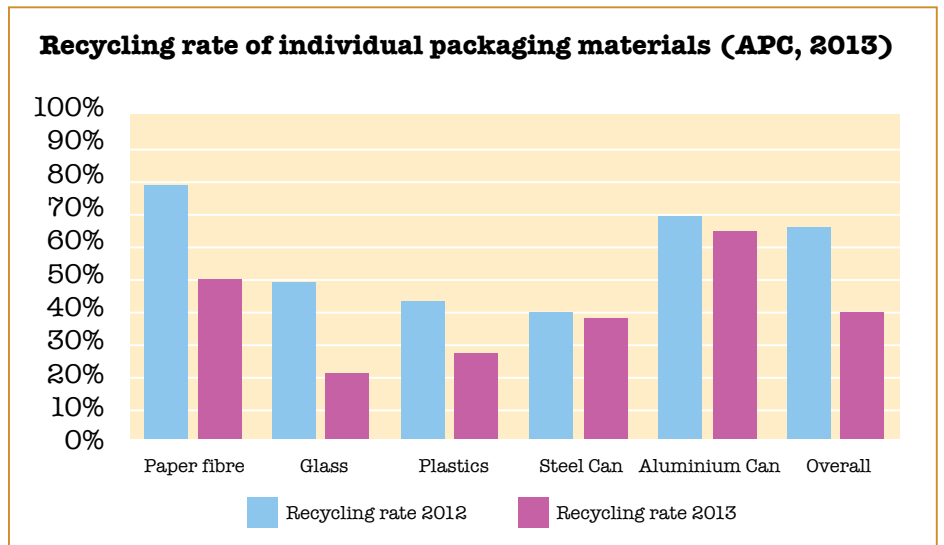
The growth in food packaging consumption is largely driven by food safety and protection, convenience, portion control, marketing and transportation. Increasingly, packaging technology needs to ensure it takes into consideration heightened social and environmental consciousness, strict regulations on pollutants and solid waste, recyclability and product safety and food safety.

## Growth in recycling

Environmental awareness is at the forefront of considerations for the packaging supply chain. This is because as packaging consumption increases, so does packaging waste. Therefore waste minimisation programs and initiatives such as recycling, reducing and reusing of materials, have been implemented in many forms.

While the industry has actively recycled packaging materials for some time, the advancement of technologies and back-up of government legislation and infrastructure has seen a substantial increase over the past 10 years.

According to the Australian Packaging Covenant (APC), the recycling rate for post-consumer



packaging in Australia was 63.8 per cent in 2012, up from 39 per cent in 2003. The establishment of the Packaging Covenant itself has directly contributed to the increased national recycling rate. APC-funded projects have accounted for up to 32.4 per cent of the overall increase in recycling tonnes from 2005 to 2012.

This industry achievement has been strongly supported by the Australian Food and Grocery Council (AFGC) through their packaging stewardship forum (PSF). The AFGC developed the Future of Packaging White Paper to drive more strategic and tangible action on packaging sustainability, which complements existing achievements by AFGC members through the APC and the Packaging Stewardship Forum.

Between 2003 and 2012, the Australian packaging industry has achieved impressive rates of recycling

– superior to those of most other industries, and achieved on a voluntary basis. The recycling rates for individual types of packaging are shown in the graph above.

Industry programs to further increase recycling rates continue under the AFGC stewardship as do initiatives to introduce new materials into the recycling streams such as flexible plastics, which are now recycled by RED Group in Victoria. These joint efforts are praise worthy from a waste minimisation and sustainability perspective.

## Recycled materials in food packaging

The growing rates of recycling provide a new source of materials to be used in various applications, and one of these is food packaging. However, this is not without its issues.





There is a general public perception that recycling is always environmentally beneficial and that a certain minimum of recycled content in each package (including food packaging) would help to reduce waste, promote efficient resource use, and guarantee markets for recycled content.

While high temperature recycling processes for glass, steel and aluminium – 1500°C for glass and 680°C for aluminium and steel – mean that contamination is not a major concern for those materials,

this may not be the case with recycled cardboard, paper and plastics.

### **Chemicals associated with plastic recycling**

Plastic recycling is more complex than that of metal or glass due to the many different types of plastic and because mixed plastic cannot be used in manufacturing without delivering poor quality products.

As a result, plastic recycling starts with the sorting of the polymers followed by a washing process, where

the labels and adhesives are removed. The products are then shredded into small particles, which are identified and separated for extrusion into resin. These recycled resins of polymers are added to virgin polymer resins, which are used to make new plastic products.

Not all plastic materials are made from one type of polymer. Raw materials for plastic recycling can be a mix or composite of different plastics or materials. However, the additives and constituents in these products bring a range of contaminants into

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the recycling stream, which may reduce the physical and functional performance of the final product as well as pose a risk for migration into food.

### Polymer transfer to food products

When plastics are exposed to repeated thermal processes (also used for melting polymers in the recycling process), it can lead to polymer degradation through ‘chain scission,’ whereby the molecular units which make up the polymeric chains get smaller and smaller. Small molecules have the tendency to migrate more easily from the package into the food particles and potentially into the digestive systems of humans.

The interaction between packaging materials and products, for instance the absorption of liquids by paper and cardboard or the staining of plastic packaging with coloured food products, must be a consideration for recycled content in food packaging. Evidence of this type of interaction is clearly demonstrated when opening a jar of food – for example marinated fetta and olives in olive oil, where staining from the olive oil is often noticeable on the inner plastic wadding of the lid. The chemical molecules of polymers and oil are very similar and reaction between them is almost expected.

But is this chemical reaction a safe one? Is there a migration of constituents from the packaging into the food product? And if so, what are the implications for food safety and human health?

Because recycled materials have a higher tendency of migration and/or reaction due to smaller molecules, the answers to these questions must be understood when opting for recycled content packaging for food applications.

### Research to understand impacts

The UK’s Waste and Resource Action Program (WRAP) has undertaken research to understand the impact of recycled content in beverage containers



(often polyethylene terephthalate [PET], plastic identification 1) and milk bottles (high density polyethylene (HDPE), plastic identification 2).

The studies were in collaboration with major retailers, brand owners and plastic recycling specialist Closed Loop Recycling, UK, and they covered sourcing, production, processing and testing, and consumer acceptance. The trials showed that it is perfectly possible to package food, beverages and beauty products in containers consisting of up to 50 per cent of recycled material without compromising performance, storage stability or visual appeal. The implementation of recycled content is however dependent on the process capability and individual application.

While neither report from WRAP made reference to migration testing being completed as part of the

qualification of recycled content, they did stress the efforts made to ensure the recycling process complied with closed loop food grade system.

### Chemicals associated with paper recycling

Similar to plastic, cardboard and paper for recycling could come from a broad range of waste products such as old newspapers and magazines, used boxes and cardboards and office paper waste.

Paper is generally recycled via pulping; chopping paper into small particles and adding water to the pulp. This forms slurry, which is then screened to remove contaminants and centrifuged to remove big pulps. Slurry is then washed with more water before it is dehydrated back into recycled paper. Printing inks are removed with the use of surfactants and bleach is added to the slurry if white paper is the required end product.



“

*In the absence of any specific Australian standards, guidance or case studies, both the EU and the US FDA directives on plastics and packaging can be used as a reference point.*

”

Mineral oil can migrate from recycled paper and board when print materials are used as raw materials for recycling. An extensive study by researchers from the Food Safety Laboratory in Zurich, Switzerland found that toxic chemicals from recycled newspapers converted into cardboard for food packaging had contaminated the food in many of the cardboard boxes, even passing through the inner plastic bags. The study included 119 products bought from German supermarkets and found quantities of mineral oils coming from the packaging, between 10 and 100 times above the agreed limits, in foods such as pasta, rice and cereals contained in cartons made from recycled cardboard.

Mineral oils from printing inks have been linked to the inflammation of internal organs and promotion of tumours (Smithers Pira, 2012).

In addition to polymer transfer to food, recycled plastics and cardboard may have reduced functional benefits, such as strength, colour and clarity (for clear plastics) when repeatedly exposed to recycling processes.

### **Need for global standards**

The vast range of raw materials that can be recycled and the resulting composition of the recycled products present significant complexities for industry. While organisations worldwide are working towards testing technologies and guidelines for the use of different recycled materials in food packaging applications, these are yet to be standardised globally.

The use of recycled material is mainly at the discretion of manufacturers at levels that maintain functional performance parity. In the absence of global standards,

there is increased responsibility on food and packaging professionals to understand the intricacies associated with packaging made from recycled content and the due diligence required to ensure food safety when selecting packaging for individual applications.

In the absence of any specific Australian standards, guidance or case studies, both the EU and the US FDA directives on plastics and packaging can be used as a reference point. Both have been developed to ensure the type of interaction between packaging and food is identified, and migrations are measured against the allowable limits of known chemicals from a select list of identified risks.

It is anticipated that globalised standards and regulatory compliance to safeguard different food packaging applications for recycled content will be developed over the next few years, most likely led by European groups, given their progress and advancement in the field to date. ●

*Dr Roya Khalil, FAIP is senior packaging technologist at SPC Ardmona.*

*References available on request.*

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# ARE YOUR SYSTEMS UP TO SCRATCH?

*Australian food businesses may be falling short of customer expectations because they haven't developed a quality management system.*

Words by David Gray

In a climate of increasingly demanding customer expectations, how does a food or hospitality business provide outstanding quality without hurting profit and growth? In order to meet high expectations, businesses must focus not just on what they do but how they achieve their outcomes.

Delivering an impressive customer result is often linked to the quality of a company's internal operations. While most businesses understand this synergy, many fall short of having a strong quality management system (QMS) in place.

It's surprising that most organisations in the food industry continue to operate without implementing an effective QMS. The consequences may include ongoing operational delays, budget overruns, and a waste of precious resources. As a result, both reputation and profit may be at serious risk.

A common issue is that the employees responsible for quality management may have morphed into the role without any official training



or education. While this may have been a natural step within the business structure, it may be detrimental to overall performance.

An efficient QMS, managed by a qualified staff member, improves performance and internal efficiency, identifies inconsistencies and problems

and recognises ways to resolve them. As a result, staff morale and productivity is increased and consumers are given confidence in the business, which in turn results in them coming back time and time again.

Quality managers looking to improve need to evaluate their skill sets in

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Yeast & Mould	5 days	2 days	14 - 24 hours
Lactic Acid Bacteria	3 to 5 days	2 days	30 - 35 hours

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accordance with recognised standards and should aim to reach international benchmarks for implementing a QMS. There are a number of training courses available that provide the necessary knowledge and skills in accordance with industry standards.

### Fool-proof steps to quality management

Based on industry standards, there are six fool-proof steps to instill quality processes in your business.

- 1. Document your business model:** As a first step, ensure there is a person responsible for quality management. This person is to ensure the company has a policy in place that defines its 'quality promise', underpinned with stated objectives and targets for employees. Be sure to include instructional documents as well as a defined 'roadmap' to guide employees through to fulfilling that promise. This information is to be accurate, accessible to those that need it, and detailed to a sufficient level.
- 2. Build relationships:** Have a clear understanding of your point of difference in the marketplace – this means you must know your competitors. Know your customers, too, and what they value most about your products and services. Communicate this information to your employees, ensuring they understand what is needed to ensure happy and satisfied customers.
- 3. Enable and empower your people:** Engage employees by delegating responsibility and authority to deliver the promise of quality made by the organisation to its customers. Remember if you spell out these aspects of operation, employees understand what is expected of them. Without these fundamental guidelines, employees will not understand the rules and they will develop their own which may not align with the expectations of the organisation or the customer. You must also ensure that employees have the knowledge and skills to perform their work with confidence.
- 4. Deliver on your promises:** Make sure all operational aspects of the organisation are working cohesively to deliver the promise of quality, ensuring not to forget those aspects that are outsourced to external third-party providers. Do they understand what your promise of quality is and their role in keeping this promise?
- 5. Evaluate and seek improvement:** Objectives and targets are of little value, unless they are used as the baseline to gauge success. Monitor and measure performance results to determine whether the promise of quality was achieved. And if not, determine why not. Using these results, seek to understand what needs to change in your business roadmap and operations.
- 6. Apply the wisdom:** Up to now you've assessed the possible roadblocks to quality. Now you must remove them through controlled changes in your operations. If you have a sufficient quality plan in place, you will be able to assess which process is most appropriate to the issue and apply the solution in a timely manner to achieve results. ©

*David Gray is a trainer and quality expert at business improvement organisation SAI Global.*

## PRINCIPAL SCIENTIST – FOOD SAFETY AND INNOVATION

The South Australian Research and Development Institute, a division of Primary Industries and Regions South Australia, has an opportunity for a Principal Scientist (Food Safety and Innovation) based in Adelaide, South Australia. They require a candidate with outstanding ability and specialist experience who has a proven track record of delivering high quality research outcomes to Government, Industry clients and the community. The successful candidate will be responsible for helping to set the programs' science direction and excellence to enhance SARDI's national and international reputation as a key provider of food safety and innovation research and development.

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**Enquiries to:** Prof Alan Tilbrook, telephone 8313 7666; email alan.tilbrook@sa.gov.au

If you are interested in applying for the role please contact Sandy Wyatt for copies of the Role Description, Application Guidelines and Pre-employment Declaration of employment in the SA Public Sector. Quote Vacancy Number C121/2014.

**Applications to:** Ms Sandy Wyatt, JS Davies Building, Roseworthy Campus, Roseworthy, 5371; email sandy.wyatt@sa.gov.au

**Closing Date:** 25 February 2014

**Location:** Adelaide

**Special Conditions:** This is a contract position for up to 5 years with a possible extension subject to satisfactory performance and availability of funds. The role is located at the Waite Research Precinct, Urrbrae. Intrastate, interstate and international travel will be required. A current Class 1 drivers license is essential.

**Award:** SA Government Wages Parity (Sal) Enterprise Agreement 2012. Employment Act: PS Act





## ARE YOU GAME FOR OSTRICH MEAT?

*Popular overseas, this relatively unknown red meat is being considered for Aussie tables.*

What do some of the best Hermés and Gucci handbags, American cowboy boots and feather dusters have in common? They're made from ostrich. This flightless bird has long been famous for its quality leather and static producing feathers that pick up dust rather than just move it around. But what about the meat?

Australian-produced ostrich meat has predominately been grown for the export market where it is considered among the best in the world. This however might all be about to change with the growing threat of avian influenza meaning that we could soon see this lesser-known red meat on Aussie supermarket shelves.

Ostrich farming in Australia started in the mid-to late 1880s based on feathers but crashed during the First World War and the Depression. It then kicked off again around 25 years ago, according to Michael Hastings, from Hastings Ostrich Australia, the country's largest ostrich producer.

"Back then one South African co-operative had the monopoly on the world market mainly supplying leather, followed by meat and feathers, and the profitability they were achieving made it look very appealing," said Hastings.

"In 1991 ostrich farming in South Africa was deregulated so within a couple of years an industry that had produced about 300,000 birds per annum was suddenly producing 1.5 million birds driving down prices and resulting in a worldwide crash.

While a lot of farmers went out of business, the upside of the short-term plunge in prices meant that the market expanded to new countries that had previously not been able to access ostrich products.

"By about 2004 the value of the meat product sold into the EU and US actually surpassed the value of the leather," said Hastings.

"We made a conscious decision to shift our supply to Canada, US and Japan – markets that South Africa wasn't supplying. We were struggling to meet demand in these markets so there was no surplus to sell domestically.

These days, the local market is looking more appealing. "This is in part due to the push to free-range poultry farming which has seen an increase in outbreaks of avian influenza in Australia, creating significant export market access issues. We now see the domestic market as our insurance policy so we are making a conscious effort to develop it," said Hastings.

"We're supplying restaurants and game meat suppliers. We also supply to South African meat distributors, as they're a market that are already very familiar with the product so there's demand for it. We've also had initial talks with Coles."

Hastings admits the main challenge ahead is educating and enticing Australians to eat ostrich for the first time but believes there are great opportunities for local farmers.

"Opportunities are opening up and we're really excited to be working with more farmers to help them re-enter the industry," he said.

"For the first time in years there's a world shortage of ostrich skins and meat at the same time. The markets have expanded and demand is continuing to grow.

"We've also done a lot of work on genetics and the quality of the Australian breeding stock is regarded as superior to that of other countries."

Could it be a case of Wagyu watch out? 







DIARY

## AUSTRALIA & NEW ZEALAND 2014

### February 25-27. Australian Dairy Conference.

Deakin University and surrounding venues, Geelong, Vic.  
[www.australiandairyconference.com.au](http://www.australiandairyconference.com.au)

**March 3-7. Second IDF Symposium on Microstructure of Dairy Products and Fifth IDF Symposium on Science and Technology of Fermented Milk.** Rendezvous Grand Hotel Melbourne, Vic.  
[www.dairyscienceconf.com](http://www.dairyscienceconf.com)

**March 18-19. Food & Drink Technology Africa.** Gallagher Convention Centre, Johannesburg, South Africa.  
[www.fdt-africa.com](http://www.fdt-africa.com)

**March 26. NSW Waste Management Minimization 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. [www.isnn2014.org/invitation/](http://www.isnn2014.org/invitation/)

**May 15-17. Dietitians Association of Australia 31st National Conference, Brisbane, Qld.** [daa.asn.au](http://daa.asn.au)

**June 22-25. 47th Annual AIFST Convention. Food - the final frontier. Challenges and Opportunities in the 21st Century.** Melbourne Convention & Exhibition Centre, Melbourne, Vic. <http://www.aifst.asn.au> held in conjunction with Foodpro 2014. [www.foodproexh.com](http://www.foodproexh.com)

## INTERNATIONAL 2014

**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)

**March 20-21. IFT Wellness 14. Developing and Marketing Healthy Food Snacks with Sensory Appeal.** Chicago, Illinois, USA.  
<http://www.ift.org/meetings-and-events/wellness.aspx>

**April 8-10. 3rd China International Import Food Exposition.** National Agriculture Exhibition Center, Beijing, China. [www.chinaexhibition.com](http://www.chinaexhibition.com)

**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)

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

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

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



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