Processed Food and Health

Food Science & Nutrition 1

Results for today **Ideas for tomorrow**

Contents

Aims and scope

As a member of the CSIRO and Victorian Government's Department of Primary Industries family of research centres, Food Science Australia aims to provide research outcomes that contribute to public well-being while providing competitive advantages to Australian industry.

Additionally, we aim to respond to challenges from the scientific, commercial and wider communities for thought leadership in food-related sciences. This bulletin provides a mechanism for helping you identify and manage emerging challenges and opportunities, as well as profiling developments of interest to the food industry.

Food Science Australia plans a minimum of two issues per year. Each issue of *Food Science & Nutrition* will have a specific topic focus. It will feature an editorial identifying the main concerns, written by the issue's editors, then a series of snapshots of related research challenges and achievements. By combining a focus on issues with mini-articles on research activities, Food Science Australia will demonstrate that it invests in science to address issues critical to its stakeholders and that the organisation recruits science leaders to ensure deliverables are world-class in quality.

Food Science & Nutrition will address emerging technologies and scientific developments that may impact stakeholder markets and their business operations. Opportunities and threats to the food industry will be covered, ranging from consumer trends and concerns, regulatory changes, food safety challenges, among other topics.

FOOD SCIENCE AUSTRALIA

A joint venture of CSIRO & the Victorian Government

Processed food

and its impact on human health

For manufacturers of processed foods, sustained competitive advantage is achieved only by navigating the perilous waters of consumer satisfaction while ensuring cost-effective production and distribution.

Safety, convenience, good taste, value for money, once delivered, are then assumed to be standard cargo. In addition, today's consumers want to manage their own well-being, and they want healthy alternatives to their favourite food products to help do it. Manufacturers are of course aware of this trend. The proliferation of advertising for low GI, low fat, high fibre or other 'healthy' products is testimony to how processed food manufacturers are energetically trying to respond to consumer demands and health concerns.

Potentially undermining the success of manufacturers' efforts is the increasing awareness among some consumers that some processing techniques that delivered on their demands for improved taste and convenience may compromise some health-promoting nutrients.

Moreover, studies are emerging that question the impact of some nutrients that have nearly achieved 'silver bullet' status among consumers, such as omega-3 fats, widely promoted as being protective in relation to heart health.

"There is an increasing awareness among some consumers that some processing techniques that delivered on their demands for improved taste and convenience may compromise some health-promoting nutrients."

Food manufacturers are still under pressure to change the composition of food products to address consumer preferences almost as quickly as they emerge, while providing the expected levels of sensory satisfaction and safety. Shelf stability and the high cost of specialised ingredients may not be front of mind for consumers, but they certainly are back at corporate headquarters.

This first issue of *Food Science & Nutrition* aims to shed some light, if not to a safe harbour where health-conscious consumers may meet product manufacturers and retailers in profitable harmony, then at least to illuminate some challenges and suggest where potential life boats may be moored! The subject of this issue, the impact of food processing on human health, could fill many volumes. The editors of this issue have selected a few emerging challenges to the food industry and focused on emerging new scientific research capabilities and developments that are helping address those challenges.

An invitation to help identify emerging research and industry challenges

For the technically minded, this issue contains a few research snapshots of projects in progress at Food Science Australia and affiliated research organisations that promise to help industry better capture healthy food-related product opportunities.

We hope the readers of *Food Science & Nutrition* will contribute their own insights and experience to help set the course of future food science research. Log on to Food Science Australia's website to send us your comments or to suggest bulletin topics.

www.foodscience.csiro.au/fsn

Peter Clifton & Lyndon Kurth – Issue editors

In this issue: emerging health-related food research at Food Science Australia

- **New cross-disciplinary food research expertise:** The application of materials science to food product formulation and manufacture is relatively recent, but, as our invited expert columnist explains, is already grappling with enormous research challenges.
- **Towards customised nutrient consumption:** Human health is of course the product of a complex set of factors, including the individual's genetic predisposition to good health, as well as his or her diet and lifestyle patterns. This issue profiles some emerging research on prevention of DNA damage and the micronutrients needed for DNA repair, with significant market implications for 'customised' products.
- **Recovery of bioactives from processing by-products:** Waste streams resulting from product processing may constitute a significant cost to a manufacturer, as well as result in undesirable environmental impacts. Food Science Australia's research snapshot on phenolic compounds focuses on research into bioactive recovery from waste streams, the optimal processing stages for introduction of bioactives into products, and the impact on sensory and structural properties of the product.
- **Innovative technologies for preservation of bioactives:** Traditional food processing methods often destroy bioactives in food. Synthetic ingredients are often unacceptable to consumers. Alternative forms of food preservation that may preserve the benefits of nutrients such as antioxidants and research concerning appropriate applications and benefits are emerging. This issue includes a spotlight on innovative, non-thermal processing capabilities that have been shown to have a less deleterious effect on some bioactive ingredients in foods, often resulting in products with superior taste and appearance.

Research challenges for materials science and the food industry

Professor Peter Lillford, internationally recognised food science expert and a Fellow of CSIRO's Food Futures Flagship, shares his view of the challenges ahead for materials scientists working in the food industry.

Our modern society depends heavily upon technologies for processing and preserving food. In the past, objectives for food industry innovation focussed on providing products that were safe, as well as pleasant to eat. Successful companies have been able to deliver these benefits by understanding how to control their materials and processes to achieve the maximum benefit at the minimum cost, through the creation of products with elegant microstructure. The people responsible for cost-effectively delivering these benefits are the materials scientists of food. I would like to use this space to mention a few of the challenges materials scientists are facing in food processing.

Materials science is a well established discipline in the study of non-food solid state systems such as metals, ceramics and polymers. Materials science provides the link between molecular assembly, engineering construction and product properties.

Although nature builds structures, as do food processors, the application of materials science to biological systems and food in particular is relatively recent. Food materials science will enable predictive design and manufacture of new ingredients and outstanding foodstuffs, to better enable us to maximise eating satisfaction and health benefits.

Those of us who have worked in the food industry for some time know the industry has never been permitted to rest on its laurels. After (generally successfully) providing safe, tasty foods on a massive scale, the next challenge has been to respond to consumer demand for the addition of ingredients to food products that promote long and short-term health benefits. A laudable objective, but the devil is in the detail of this challenge.

To begin with, many additives are questioned by consumers. Additives that are safe, but that serve simply as process aids are not acceptable to consumers. Alternative routes to more 'naturally' stabilised foods had to be achieved, and sadly, for a trained chemist like myself, chemistry was frowned upon as a mechanism for achieving stability.

Having coped with the stabilisation hurdle, fat levels in food products had to be reduced whilst not detracting from pleasant texture and taste sensations. Now fat composition needs to be further adjusted to match enhanced nutritional recommendations, and lower-calorie, lower-GI and modified-carbohydrate foods are in demand. Because these fats and carbohydrates are also structuring elements in most processed foods, materials scientists must revise formulation and processes to meet demand *(see Case Study: Resistant starch and processing, page 5)*. As well as optimising texture, the chemistry of flavour delivery has to be understood from within these new product structures. We have to achieve all this using natural materials, no new chemicals and with complete safety. The materials scientist must become a designer.

> "We have to achieve this using natural materials, no new chemicals and with complete safety"

We are now learning that micronutrients can be effective against menopausal symptoms, cardiovascular disease, Alzheimer's disease and even short-term mood and energy levels (*see Research Snapshots, page 4*). The clinicians provide the evidence, but not the mechanisms of action. The marketers see the opportunity but the materials scientist is responsible for the processing and product design.

Adding, say, one per cent of anything to a product formulation is a piece of cake, but delivering bioactives into the human system is a real challenge. Their release must be controlled and targeted, not only in the mouth but also throughout the digestive tract; otherwise the addition of these expensive ingredients will be nothing more than an advertising gimmick.

Today's materials scientist has to have a detailed understanding of how foods behave throughout the entire digestive process and use this knowledge to build the capability to design food structures to achieve maximum benefit.

Peter Lillford

And of course, that isn't the end of the challenges to materials science in delivering healthier food products. Consumers will soon know much more about their individual requirements, by analysis of their genetic makeup and the effects of their lifestyle on their ageing and disease susceptibilities. Part of their needs will be catered for by medical practice, but food has the opportunity to become 'the best medicine'.

Tailoring food products to the needs of individuals is the next, daunting, hurdle for materials scientists. Fortunate it is for the food industry that materials scientists are alive, well and fascinated by their tasks.

Materials scientists do not work alone, of course. Often the multidisciplinary skills supporting technology and sophisticated equipment they need to deliver innovative research outcomes are not available within commercial organisations charged with delivering shareholder value on a daily basis.

Just as materials scientists face considerable challenges in contributing to the development of healthier food products, food product manufacturers need to face the challenges and risks of innovation, and ensure that sources of complementary technology and skill sets continue to be available.

Multidisciplinary organisations like Food Science Australia and CSIRO are invaluable in this regard but increasingly rare internationally. Australia has the skills to generate globally competitive, highly innovative commercial outcomes, if it is willing to effectively manage investment risks. Industries which are alert to technical opportunities are the winners of the future. This means they need to engage actively with government and research organisations to set each other world-beating research objectives and to ensure the resources are available to meet them.

Recovery of phenolic compounds for **antioxidant-rich food products**

Scientists at Food Science Australia are looking into the challenges of producing a new generation of antioxidant-rich processed food products that incorporate phenolic compounds to protect against oxidative stress.

Phenolics represent the largest group of biologically-active, non-nutritive plant compounds called phytochemicals. Phenolics are present in fruits, vegetables, cereal grains, legumes, nuts and beverages such as tea, coffee, cocoa, beer, wine and fruit juices.

The antioxidant activity of phenolics captured the attention of researchers after it was realised that consumption of a diet rich in fruit and vegetables was positively correlated with a reduction of oxidative stress in humans. A higher antioxidant capacity of human blood serum ensures better protection from free radicals generated as by-products of both normal and stress-related metabolic activity.

Free radicals can damage the molecules they react with. In the human body, this damage contributes to a general decline in optimum body functions as part of the ageing process and to the development of diseases. The widely publicised French Paradox made millions aware of the inverse relationship of red wine consumption with coronary heart disease.
Studies suggested that red wine polyphenols are able to modulate the metabolic reactions and stimulate beneficial physiological effects, that is, reduce the likelihood of heart disease.

"When incorporated into these foods, **Vin***life*® could not be detected with regard to colour, taste or flavour, but it was able to offer the manufacturers an edge in the competitive healthy options markets" *– Suzanne Roe, Tarac*

The importance of antioxidant activities of phenolic compounds and the identification of opportunities to re-incorporate these compounds into processed foods to provide natural antioxidants is attracting growing interest in the scientific community.

Researchers face challenges in assisting food companies to develop these novel products. The development of processing mechanisms that do not degrade the bioactives will be a priority, as will the incorporation of these compounds in a way that does not negatively impact sensory and shelf-stable characteristics of the foods.

Although considerable work remains to be done to address these challenges, researchers at Food Science Australia have experimented with minimal food processing using high hydrostatic pressure, processing of fruits and vegetables by pulsed electric field technology and vacuum impregnation to protect phenolic compounds from degradation.

The reintegration of phenolic compounds is also an opportunity for organisations to increase capital return from waste streams. Australian grape by-product is estimated to be 200,000 tonnes per year, much of which is processed by Tarac Technologies to recover alcohol, grape marc extract, tartaric acid and stock feed. Tarac also produces grape seed and skin extracts rich in antioxidants, branded **Vin***life*®, for the food industry.

In clinical trials, **Vin***life*® grape seed extract was found by CSIRO to have a positive benefit for aspects of heart health. When incorporated into yoghurt over a four week period, **Vin***life*® was found to improve the ability of the arteries to expand in response to a need for greater blood flow. The first to offer ice cream enhanced with **Vin***life*® was Wendy's Supa Sundaes. Wendy's added the bioactive to their 99 per cent fat free Chocollo™ ice treat, adding to the health benefits of a treat that was already endorsed by the National Heart Foundation "Pick the tick" program. **Vin***life*® has now been incorporated into foods such as dairy products, sausages, chocolates and beverages. "We have been pleased with the adoption of **Vin***life*® into such a wide variety of products. When incorporated into these foods, **Vin***life*® could not be detected with regard to colour, taste or flavour, but it was able to offer the manufacturers an edge in the competitive healthy options markets," says Suzanne Roe, Research and Development Manager and Vinlife Business Manager at Tarac Technologies. *- Izabela Konczak*

Processed foods and genome health

An emerging field of research, genome health nutrigenomics, focuses on the micronutrients required by the body to maintain a healthy genome, and the variation in these requirements between individuals.

The DNA inherited from our parents is, from conception, constantly under threat of change due to a variety of environmental and life style factors, including a deficiency of micronutrients. These factors can limit the DNA's ability to replicate itself properly and thus cause accelerated ageing and reduce the body's ability to fight diseases. Nutrition has a critical role in DNA metabolism and repair. Awareness of the importance of this role is leading to the development of the new field of Genome Health Nutrigenomics[1]. Specific micronutrient deficiencies that cause genome damage may themselves cause developmental defects in the foetus or increased risk of cancer later in life.

Excessive genome damage is the most fundamental cause of developmental and degenerative disease. Genome damage caused by micronutrient deficiency is preventable. It has been shown that above average intake of certain micronutrients such as calcium, vitamin E, retinol, folate, vitamin B12, nicotinic acid and phenolic compounds such as caffeic acid and catechin is associated with a reduction in the rate of genome damage.

It is increasingly evident that optimal concentration of micronutrients for prevention of genome damage is dependent on polymorphisms that alter the function of genes involved directly or indirectly in DNA repair and metabolism. In order to optimise the potential benefits, we must consider the genomic characteristics of the individual.

Opportunities exist for development of functional foods that are specifically designed to improve genome health maintenance in humans with specific genetic backgrounds. These foods will provide an important contribution to a new disease prevention strategy based on the diagnosis and individualised nutritional treatment of genome instability, the hypothetical Genome Health Clinic[1]. The emerging interest in prevention of genome damage is expected to open up new markets for functional foods that can deliver optimal amounts of micronutrients required for genome health maintenance. Food processing will become increasingly important in this segment to ensure optimal bioavailability and stability of the required micronutrients.

– Michael Fenech

[1] *Fenech M (2005) The Genome Health Clinic and Genome Health Nutrigenomics concepts: diagnosis and nutritional treatment of genome and epigenome damage on an individual basis. Mutagenesis 20, 255-269*

Case Study:

Resistant starch and processing

Consumer interest in health benefits of foods has presented opportunities for processors to capitalise on the many health benefits of a naturally-occurring form of starch, resistant starch.

Resistant starch is found in many cereal grains, unripe fruits and some processed foods. Resistant starches are defined as the starch that is not digested in the small intestine and passes into the large intestine where it is a substrate for bacterial fermentation.

The bacteria in the large intestine produce short chain fatty acids from the resistant starch which may help maintain the health of cells lining the colon (colonocytes) and prevent bowel cancer. These health benefits of resistant starch have made it a topic of considerable interest over the last few years, and the understanding and potential uses of resistant starch are continuing to grow.

National Starch and Chemical Company, a member of the international ICI group, has bred a high amylose corn, from which the starch is extracted and marketed as Hi-maize®. Researchers at CSIRO have recently modified the wheat genome to increase the amylose content of wheat to greater than 70 per cent[1].

Researchers working within the Food Futures Flagship used CSIRO-developed RNAi gene silencing techniques to suppress the expression of two starch-branching enzymes in an experimental wheat. The wheat has a significantly altered starch composition, with an amylose content increased from 25 to 70 per cent. This higher level of amylose increases the resistant starch level of the wheat.

Careful consideration of processing methods can offer food producers the possibility of increasing the resistant starch content of processed food and foodstuffs.

Processing of starch can affect the level of resistant starch in foods. High moisture, high temperature (boiling or pressure cooking) processes increase starch availability to enzymes, that is, lower the levels of resistant starch. When starch is heated in excess water, starch granules swell and are disrupted. This process, known as gelatinisation, makes the starch much more accessible to digestive enzymes.

Processing can also be modified to enhance the level of resistant starch in foods. When starch that has been heated is cooled, retrogradation occurs converting some of the gelatinised starch to a crystalline form which is resistant to digestion. Foods, such as baked beans, cornflakes, cooked and cooled potato, rice and pasta contain retrograded starch that is resistant to digestion.

Resistant starch also has functional properties as an ingredient. When used as a fibre supplement, its properties of fine particles and bland taste can increase consumer acceptability over traditional fibres. As it is non-digestible, resistant starch can also be used in reduced fat and reduced sugar applications. *- Aung Htoon*

[1] *Regina A, Bird A, Topping D, Bowden S, Freeman J, Barsby T, Kosar-Hashemi B, Li Z, Rahman S, and Morell M (2006) High-amylose wheat generated by RNA interference improves indices of large-bowel health in rats. PNAS, 103:10,3546-3551*

Regulation of Nutrition, Health and Related Claims set to change

Food Standards Australia New Zealand (FSANZ) is developing new standards for health claims on food.

Currently high level health claims on packaged food that refer to a disease or medical condition such as "reduces your risk of cancer" are not permitted on Australian food products . The only exception is a claim about the benefit of mothers consuming folate and reducing the risk of neural tube defects in unborn babies.

The regulation of the claims in Australia is set to change and acceptability will be determined by the level of the claim. All claims made will need to be substantiated by scientific evidence; however verification of a health outcome is not necessary for claims that refer to the content, such as "low in fat". General level claims are claims that refer to a component and its relationship to health and will need substantiation. An example of a general claim would be "this food contains calcium which is good for strong bones and teeth".

The requirements for substantiation are greater for high level claims. High level claims are claims that reference a serious disease or condition or a biomarker of a serious disease or condition, such as "This food is low in Y, which may reduce your risk of having a stroke through Z". Substantiation of these claims will require human studies as well as an assessment of all available scientific evidence, taking into account the relevance for Australians and New Zealanders.

Currently under review for pre-approved high level claims are the following diet-disease relationships:

- Sodium (with or without potassium) AND hypertension;
- Fruit and vegetables AND coronary heart disease;
- Wholegrains AND coronary heart disease;
- Saturated fat and/or trans fat AND elevated serum cholesterol or heart disease;
- Calcium (with or without Vitamin D) AND osteoporosis;
- Folate AND neural tube defects; and
- Omega-3 fatty acids AND coronary heart disease.

Within this pre-approval framework, once validated, claims related to these diet-disease relationships will not require additional substantiation. A manufacturer that wishes to make a claim referencing a serious disease or condition not in the above list will therefore need to provide scientific evidence for review by FSANZ.

The CSIRO Human Nutrition Centre, managed by Food Science Australia, has extensive experience in clinical trials and health claim substantiation.

"Substantiation of the health benefits of dietary and lifestyle changes is an important focus of CSIRO's Human Nutrition Centre," says Dr Peter Clifton, Centre Director. "We have a unique combination of the skills and abilities in nutrition, psychology, public health, consumer and sensory science, medicine, and exercise physiology that can help our partners in industry respond quickly and effectively to emerging regulatory demands. We have worked successfully with partners in the dairy, livestock and processed food industries and expect to provide even greater support in the future."

Innovative processing

Non-thermal processing

Much of the nutrient lost in the production of food occurs due to heat, required either in the sterilisation or processing phases. Innovative non-thermal processing technologies can deliver a range of product and process benefits depending on the product application. Often these technologies may deliver fresher tasting, minimally processed food products at a level of safety equivalent to, or better than, traditional approaches. Some of the product benefits achieved by Food Science Australia and their research partners are summarised in the following tables.

High pressure processing (HPP)

High-pressure processing (HPP) involves subjecting food to intense pressures of 300 to 700 MPa that causes fatal damage to the outer cell membrane of microbes. The microbes are killed leaving a safe product that is free of additives and retains its taste for an extended period of time. The pressure causes only minimal damage to the product because the water contained in the food is relatively incompressible.

Pulsed electric fields (PEF)

Pulsed electric field (PEF) kills microbes in liquid foods without compromising the fresh flavour, colour and texture of the foods. PEF involves the use of high voltage (20-40 kV/cm) electric field pulses to produce holes in the cell membranes of microbes that cause their death.

Ultrasonics (US)

Ultrasonic cavitation creates physical and/or chemical effects that can be used in stand alone processes or as an adjunct to existing processes. The range of possibilities is large ranging from enhancing heat and mass transfer to creating novel structures from food components. In extraction shear forces break cell walls mechanically and improve material transfer. For this, ultrasound is faster and more complete than maceration or stirring. At high frequencies cavitation produces high yields of hydroxyl radicals that can usefully be employed to chemically modify and stabilise novel structures such as micro-spheres for encapsulation of sensitive bioactives.

High intensity light (HIL)

Ultraviolet radiation is used in several food processes to remove unwanted microorganisms. UV light can be used to pasteurise fruit juices by pumping the juice over a high intensity ultraviolet light source.

35 Litre High Pressure Processing unit at Food Science Australia

Pulsed Electric Fields Processor at Food Science Australia

Demonstrated Effects	HPP	PEF	HIL	US
Quality and flavour improvements over thermally processed products	✔	✔	✔	✔
Equivalent level of food safety to thermal pasteurisation	✔	✔	✔	
Improved nutrient retention	✔	✔		✔
Shelf-life extension	✔	✔	✔	
Can create 'new' product textures	✔			
Uniform treatment of food, regardless of shape or size	✔			
Can be used as a continuous process	✔	✔	✔	✔
Can be used for in-pack foods	✔		✔	
May be useful for uniform freezing to improve quality of frozen foods due to the immediate formation of tiny ice crystals	✔			
May assist in avoiding production peaks and lags via potential to hold stock	✔	✔		
Can be used for solid foods	✔		✔	
Can be used for liquid foods	✔	✔	✔	
Has the potential to reduce energy consumption (in comparison to pasteurisation)	✔	✔		
Suitable for decontamination of food contact materials like process surfaces, bottles, trays and other equipment			✔	
Suitable for washing systems				✔
Can be coupled with other processes	✔	✔	✔	✔
Process efficiency improvements			✔	

We have used these technologies	We applied them to	We delivered improvements in opportunities for	We see further opportunities for
Ultrasonics	• Salads • Vegetables • Poultry (fresh) • Sauces • Beverages • Confectionary (chocolate) • Juices & purees • Dairy products • Meat • Water	• Washing • Extraction • Extended shelf-life • Homogenisation • Emulsification • Viscosity alteration • Fermentation • Process efficiency • Food safety	• Enhancement of sanitised washing practices, treatment of waste water (e.g. for horticulture, poultry, meat) • Improved cleaning and anti-fouling for membranes • Insect-disinfestation (horticulture) • Extraction of horticulture components for ingredients • Meat tenderising, cutting
High Intensity Light	• Bake-off bakery products • Cheese • Eggshells • French fries • Fish (fresh) • Fish (processed) • Mushrooms • Conveyor belts • Process lines • PET bottle decontamination • Flexible packaging material	• Extended shelf-life • Food safety • Decontamination • Sterilisation	• Chilled beverages (chilled waters, mineral waters, sports drinks, chilled fruit/tea drinks) • Arresting wine fermentation (may halt growth of yeasts) • Protein solutions, for related pharmaceutical and nutraceutical products • Treatment of drinking and processing water • Decontamination of air in food factories • Extended shelf-life for fresh-cut vegetables and chilled, fresh pasta
High Pressure Processing	• Sauces • Beer • Juices • Fish • Salads • Vegetables • Fruits • Dairy products • Ready-to-eat meals • Ready-to-eat sliced meats • Oysters and other seafoods	• Fresh-like attributes • Extended shelf-life • Food safety • Nutrient retention	• Novel 'consumer products', including nutraceuticals, functional food products and health drinks • Novel products with previously heat-incompatible ingredients (e.g. ice cream) processing • Minimally processed ready to eat meals • Value-added products with high moisture content ingredients (e.g. flavoursome fruit fillings) • Low acid product processing (e.g. vegetable) • Pasteurised liquid egg products • Longer shelf-life export products (may decrease freight expense) • Minimally processed organic products • Faster ripening hard cheeses
Pulsed electric fields	• Juices • Water • Liquid egg • Sauces • Dairy products	• Extended shelf-life • Food safety	• Treatment of water systems and waste water
Novel Packaging Solutions	• Novel oxygen scavenging coupled with HPP products • Flexible packaging material and cans, combined with HIL and HPP	• Product effects • Impact on material properties • Decontamination • Sterilisation • Extended shelf-life	• Non-food applications for the cosmetic and pharmaceutical industries (e.g. vaccine development, serum products, cosmetic oils including avocado)

These tables are the result of combined work of Lisa Szabo, Cindy Stewart, Martin Cole, Kees Versteeg, Jay Sellahewa, Darren Bates, Jason Wan and Judy Marcure.

Contact us

Adelaide
Atul Kacker
Centre Director

Gate 13 Kintore Avenue
Adelaide SA 5000

PO Box 10041
Adelaide BC SA 5000

T + 61 8 8303 8800
F + 61 8 8303 8899

Brisbane
Phil Clarke
Centre Director

Cnr Creek & Wynnum Roads
Cannon Hill QLD 4170

PO Box 3312
Tingalpa DC QLD 4173

T + 61 7 3214 2000
F + 61 7 3214 2062

Melbourne
Phil Clarke
Centre Director

671 Sneydes Road
Werribee VIC 3030

Private Bag 16
Werribee VIC 3030

T + 61 3 9731 3200
F + 61 3 9731 3201

Sydney
David Tanner
Centre Director

11 Julius Avenue
Riverside Corporate Park
North Ryde NSW 2113

PO Box 52
North Ryde NSW 1670

T + 61 2 9490 8333
F + 61 2 9490 8499

info@foodscience.csiro.au
www.foodscience.csiro.au

FOOD SCIENCE AUSTRALIA

A joint venture of CSIRO & the Victorian Government

News

Employment opportunities at Food Science Australia

Food Science Australia is Australia's largest and most diversified food research organisation and a joint venture of CSIRO and the Victorian Government.

Areas of research include food safety and quality, processing innovation, food structure and obesity and health. Food Science Australia is looking to appoint several senior and mid-career scientists to enhance the organisation's scientific excellence.

To express your interest in opportunities at Food Science Australia, please contact ***csiro-careers@csiro.au, or visit http://recruitment.csiro.au***

Food Science Australia staff presenting at International Dairy Federation Conference

Louise Bennett, Ross Crittenden, Geoffrey Smithers, Peter Roupas, Jason Wan, Phil Clarke and Mary Ann Augustin are all invited speakers at the International Dairy Federation World Dairy Summit and Congress in Shanghai, China (October 2006).

Food Science Australia presents at FOOD EXPO®

America's Institute of Food Technologists is a non-profit scientific society with 22,000 members working in food science, food technology, and related professions in industry, academia and government.

IFT conducts the world's largest annual convention on food grown, processed, manufactured, distributed and eaten worldwide, the IFT FOOD EXPO®.

This year's expo will be held in Florida, USA from June 24-28 and features a special seminar on dairy ingredients, co-presented by Food Science Australia staff.

Dairy ingredients - underpinning science, commercial success will be held on June 28 as a part of the conference program, featuring contributions from Food Science Australia's Geoffrey Smithers and Mary Ann Augustin, and CSIRO Human Nutrition's Peter Clifton and Manny Noakes. The seminar will shed light on innovative dairy ingredients and global consumer trends, highlighting novel dairy ingredients and the role of dairy in a balanced diet.

For more information: www.ift.org/amfe

Events

Future Foods for Future Health Conference
14th & 15th June, 2006, Melbourne.
Department of Primary Industries, Victoria.
This event is by invitation only.
www.dpi.vic.gov.au/ff

Festival of Food
9th -12th July, 2006, Adelaide.
The Australian Institute of
Food Science & Technology Incorporated.
www.aifst.asn.au

Food Innovation: Emerging Science Technologies and Applications (FIESTA)
16th & 17th October, 2006, Melbourne.
3rd Innovative Foods Centre Conference,
Food Science Australia.
The conference aims to emphasise the applications and the benefits of emerging technologies for the marketplace.
www.innovativefoods2006.com