

Long Chain Omega-3s

The science, recommendations for intake and making general level health claims

Tuesday, 31 October 2006 - State Library of Victoria Theatrette, Melbourne

Wendy Morgan

Executive Director, The Omega-3 Centre

Wendy Morgan is Director of innovations & solutions, a company which provides advice to the food industry and related organisations. She is an Accredited Practising Dietitian. Her expertise is in assisting clients in the application of nutritional science and consumer understandings to new product development and consumer communications. Functional foods, food regulatory issues, nutrition policy and consumer communications are special areas of interest. She has recently been appointed as Executive Director of The Omega-3 Centre.

Wendy works with universities, government departments and food companies and previously had senior executive positions with Kellogg Asia Pacific, Goodman Fielder, Qantas Airways and the National Heart Foundation where she was instrumental in developing and launching the highly successful "Pick the Tick" food approval program. She has degrees in science, nutrition and communication management and is an active member of the Food Media Club, Nutrition Society of Australia, AIFST, Dietitians Association of Australia, AFGC, ISSFAL and other professional groups.

Introducing Omega-3s and The Omega-3 Centre

Omega-3 fatty acids are essential nutrients required for the healthy functioning of the body in the same way as vitamins and minerals. Whilst the shorter chain Omega-3, ALA, can be converted in the body to the more effective long chain Omega-3s, EPA and DHA, this process is very inefficient. Therefore it is beneficial to include long chain Omega-3s in the diet on a regular basis.

Omega-3	Full name	Roles	Food sources
ALA Shorter chain	alpha-linolenic acid 18:3n-3	Very poorly converted to EPA and DPA in the body, with conversion to DHA even less effective. Other roles less certain.	Plants only: canola, flaxseed (linseed), walnut oils, soy oil
EPA Long chain	eicosapentaenoic acid 20:5n-3	Helps body produce hormone-like substances called eicosanoids – roles in blood flow, anti-inflammatory, controlling effects on hormones and the immune system.	Fish and smaller amounts in other seafood, traces in meat and eggs
DPA Long chain	docosapentaenoic acid 22:5n-3	Little known about benefits to date	Fish, lamb, beef,
DHA Long chain	docosahexaenoic acid 22:6n-3	Most complex and difficult to include in the diet. Building block of the brain, concentrated in retina, role in gene expression, nervous system, docosanoid production.	Fish and small amounts in other seafood, traces in meat and eggs

Omega-3s are polyunsaturated fatty acids (or PUFAs) and are sometimes referred to as n-3s or ω3 fatty acids.

Omega-6s are another type of polyunsaturated fatty acids and are much more plentiful in the Australian diet. The high Omega-6/Omega-3 ratio common to many Western diets has been suggested to reduce the beneficial anti-inflammatory effects of Omega-3s¹.

The mean adult intake of total Omega-6s is 12.23g per day and for total Omega-3s is 1.31g per day².

The mean intake of long chain Omega-3s is 0.25g per day and the median intake is only about half this amount (0.12g per day) indicating that a small proportion of the population eat large quantities of fish but most eat very little². A recent NSW study showed that almost 75% of surveyed children eat fish less than once a week³.

The science behind the Omega-3 story continues to grow. Health care costs from conditions associated with low intakes of long chain Omega-3s continue to spiral. The public is excited by Omega-3 nutrients but many are not sure of what they do or where they come from. The market for Omega-3 containing foods is escalating as consumer interest becomes more apparent and technological developments allow the inclusion of these highly oxidisable fatty acids into a range of foods.

Against this background, The Omega-3 Centre Inc. has recently been established in Australia and New Zealand. Our primary focus is on communicating the health benefits of long chain Omega-3s. We help translate the science of Omega-3s to actions.

The Omega-3 Centre is a group of committed organisations and individuals working together to improve the health status of Australians and New Zealanders by:

- promoting optimal consumption of long chain Omega-3s;
- co-ordinating authoritative evidence-based advice to regulatory and health authorities;
- supporting the development of a wider range of sources of long chain Omega-3s for the human diet; and
- facilitating and promoting research and development in this area

Communication is the focus

The Omega-3 Centre aims to be the leading Australasian authority on Omega-3s and nutritional health and will communicate with the community, the media, health professionals, educators, government, seafood, food and supplementary medicines organisations.

Sound science is the basis

All communications from The Omega-3 Centre are based on sound science. Scientific advice will always be sought from leading researchers in the area.

For more information contact wmorgan@omega-3centre.com

References

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2. Howe P, Meyer B, Record S, Baghurst K. Dietary intake of long-chain ω -3 polyunsaturated fatty acids: contribution of meat sources. *Nutrition* 2006;22:47-53.
3. NSW Schools Physical Activity and Nutrition Survey (SPANS): Food Habits – Fish intakes, 2004. Downloaded from http://www.health.nsw.gov.au/pubs/2006/spans/10_foodhabits.pdf 18 Sept 2006.

Professor Sandra Capra AM, PhD, FDAA
School of Health Sciences, Newcastle University

Prof Capra has had a long career in nutrition and dietetics which has encompassed clinical, community, food service, management, research and teaching roles. Her experience has been gained in several states within Australia as well as in New Zealand, the UK and Fiji. She is currently Professor of Nutrition and Dietetics and Head of School in the School of Health Sciences at the University of Newcastle and Adjunct Professor of Public Health at the Queensland University of Technology.

Sandra was appointed a Member of the Order of Australia in 2003 for her contribution to community health, nutrition and dietetics education, and was elected to Life Membership of the Dietitians Association of Australia in 2001. She was appointed a Fellow of the Dietitians Association of Australia in 2005. She is the current Chair of the International Confederation of Dietetic Associations. She is also a member of the National Nutrition Committee for the Australian Academy of Science, the Director of the Australian Centre for Evidence Based Nutrition and Dietetics, on a variety of committees for Food Standards Australia and New Zealand and served on the National Health and Medical Research Council of Australia nutrient reference group representing the nutrition profession. Her research interests lie in applied dietetics and nutrition.

Recommendations for intakes of long chain omega-3s - how can we reach them?

Australia has set a new benchmark in nutrient recommendations by quantifying values of some nutrients that will help with chronic disease prevention. Long chain omega 3 fats (LC n-3s) are one such nutrient group. The suggested dietary targets for these are set at the 90th centile for intake, where intake refers to the population intake of the National Nutrition Survey of 1995 (Australia) and 1998 (New Zealand).

In theory therefore, if we set guidelines regarding food groups that reflect intakes from these surveys, we should be able to reach the proposed levels through consuming a range, although a particular range, of commonly available foods. This conflicts with the current food selection guide which is based on meeting 70% of the 1991 RDIs which did not include many of the nutrients for which we now have recommendations.

One major issue to consider are the databases. If we compare the LCn-3 data from the US with the Australian database developed at RMIT, there are some clear differences. How are these to be reconciled as for some key foods such as salmon there is a two-fold difference?

Secondly we need to assume that meal patterns that reach the recommendations for those nutrients for which we have data will also reach the recommendations for those nutrients for which we do not have data.

Nevertheless, it is possible to construct meal patterns that will meet all the recommendations. But will the general population be able to eat like this? Such meal patterns are highly constrained but 3 fruit (assorted), 9 vegetables (assorted), 3 meat serves (low fat, including 1 as sardines or salmon) 8 cereals (including fortified breakfast cereals and a mixture of others), 3 cups of fat reduced high calcium milk, 15 g of salt reduced canola and 20ml of oil for cooking will meet most dietary targets for men, including the SDT for LCn-3 fats. However this "prudent diet" does imply a particular lifestyle which may well be inconsistent with what we know to be happening in the community, where the proportion of food prepared outside of the home continues to increase. It has become apparent that fortification of the food supply with folate is necessary to meet the recommendations due to low intakes of green vegetables. Will that be the solution for the LCn-3 fats as well?

Prof Sean Strain

*University of Ulster**, together with Melanie Ruffell, Executive Director, UK Joint Health Claims Initiative *Currently at Deakin University

After graduating with a BSc (Chemistry), BAgr (Agricultural Chemistry) and PhD (Nutritional Biochemistry), all from Queen's University, Belfast, Sean spent several years (1977-1980) in academia in Australia before joining his current institution in 1981. He was instrumental in creating the highly successful BSc Honours Human Nutrition and Dietetics and building up the Human Nutrition Research Group to its current position.

Sean has been Professor of Human Nutrition (since 1994) in the Northern Ireland Centre for Food & Health (NICHE) and was part of the submission in Biomedical Sciences that was top rated (5* for research excellence) in the last two (1996, 2001) UK wide Research Assessment Exercises. He has attracted over £31M in research grants and research structural monies and is an author of over 200 peer-reviewed research publications, mainly in the areas of trace element nutrition and in B vitamin and homocysteine metabolism.

In 2002, he was elected a member of the Royal Irish Academy. He is also a member of various national and international committees including: Member, Panel on Dietetic Products, Nutrition and Allergies, and Chairman, Working Group on Claims, European Food Safety Authority (EFSA) Parma; Member of Food Strategy Implementation Partners (FSIP) for Northern Ireland; MRC College of Experts; MRC Physiological Systems and Clinical Sciences Special Review Panel; Expert Committee of the Joint Health Claims Initiative; Member of Food Safety Promotions Board and past-Chair of its Scientific Advisory Committee; Member of Council of Scientific Advisors to the Children Nutrition Research Center, Baylor College of Medicine, Houston; has been: Chairman of the Scientific Committee on Nutrition of the International Life Sciences Institute-Europe; a member of SEERAD and MRC Visiting Groups; Treasurer of the Nutrition Society; Chairman of the Local Scientific Committee and Local Organising Committee of the highly successful International Conference, Trace Elements in Man and Animals (TEMA 12), which was held in Coleraine in June 2005 and attracted 250 delegates from 27 countries.

Food Regulations, health claims and Omega-3s – UK and EU perspective

The European Commission has not finalized its approach to health claims and this talk, therefore will focus on the work of the UK Joint Health Claims Initiative (JHCI). The JHCI is an unique, voluntary joint venture between consumer organizations, enforcement authorities and industry trade associations which established a voluntary code of practice for the responsible use of health claims on food, beverages and supplements. Among the benefits of JHCI is that it provides independent expert advice about the scientific validity of health claims to increase consumer confidence in such.

The definition of a health claim and the different claim categories used in the UK will be covered together with some legal and nutrition principles. The process of substantiation of health claims will be discussed using the approved generic claim in the UK "LC omega-3 PUFA and heart health" as an example.

Catherine Saxelby

Consultant Dietitian, Foodwatch Nutrition Services

Catherine Saxelby is an accredited practicing dietitian and director of Foodwatch Nutrition Services, a consultancy she founded in 1983. She has extensive experience in all forms of nutrition communication including books and articles, websites, presenting and spokesperson work on radio and television.

Her skill lies in translating the scientific research into information that the public can not only understand but find fascinating. Her writing has received awards from the Dietitians' Association (for innovation 2000) and the Food Media Club in 2001, 2003 and 2004. She is the author of 8 books on nutrition including the best-selling Nutrition for Life (Hardie Grant), now in its 20th year of continuous publication with over 400 000 copies in print.

Catherine runs her own extensive website offering nutrition information aimed at consumers at www.foodwatch.com.au. Her special interest areas are healthy eating for busy people, food facts, functional foods, omega-3 fats and diet composition for weight loss.

She is an Honorary Governor of the Sydney University Nutrition Research Foundation, a position held since 1993.

Omega-3s - What do consumers understand?

Consumers view omega-3s in a positive light even if they know little about what their role in the body or whether they're getting enough of them.

Apart from research by Patch et al, there are almost no Australian studies of consumer perceptions of omega-3s. Overseas surveys, however, have reported that consumers:

- rank them in the top ten ingredients/nutrients of importance to health
- are aware of the links to health which have been increasing over the past 10 years
- believe they don't get enough
- are planning to increase their consumption in the future.
- Associate them with fish and fish oil capsules, followed by fortified products.

Omega-3's role in health can be viewed in 3 main phases since the 1980s:

1. heart and blood (lowering high BP, triglycerides, anti-arrhythmia, anti-thrombotic)
2. anti-inflammatory (IBS, rheumatoid arthritis, psoriasis)
3. brain function (depression, ADHD, learning enhancement, infant growth)

All good news

Media coverage has been almost entirely positive for omega-3. Unlike the vitamin E and beta-carotene supplement trials, there have been few negative studies so there has not been a 'reversal' of professional opinion on omega-3s. Consumers are left with a positive around omega-3

Short-chain omega-3s from non-fish sources such as flaxseed or canola remain of interest to vegetarians and those with fish/seafood allergies.

Omega-enriched foods are viewed as convenient ways to obtain the valuable omega-3s without having to consume fish. Fish is increasingly coming under a cloud due to high mercury content, allergy, sustainability issues and dioxin contamination. Coupled to consumers' unease with cooking fish at home and its rising costs, the outlook is bright for such products.

Omega-3 will continue to be a positive driver for consumers in the future.

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Patch CS, Tapsall L, Williams PG. Overweight consumers' salient beliefs on omega-3-enriched functional foods in Australia's Illawarra region. J Nutr Educ Behav 2005;37:00-00.

Prof Andrew J Sinclair, B Agric Sci, PhD

School of Exercise and Nutrition Sciences, Deakin University, Victoria, Australia

2006 – Professor of Human Nutrition, Deakin University
1994-2005 Professor of Food Science, RMIT University
1990-1994, Research Fellow, Deakin University, Geelong, Victoria
1988–1989, Principal Lecturer, Department of Applied Biology, RMIT.
1985–1988, Senior Lecturer in Nutritional Biochemistry, Department of Applied Biology, RMIT.

Awards

Supelco/Nicholas Pellick AOCS Research Award, 1999
Elected Fellow of the Australian Institute of Food Science & Technology, 2001
Elected Fellow of the Nutrition Society of Australia, 2003

Honorary Positions

Nutrition Society of Australia (NSA), 2006 President Elect, 2004-2005 Honorary Secretary
American Oil Chemists' Society, 1995 – to date :
Member Books & Special Publications Committee,
1999 - to date: Member Inform Advisory Board,
2006 – Senior Associate Editor, Lipids,
1996 - 2005: Associate Editor, Lipids
Editorial Board – Prostaglandins, Leukotrienes & Essential Fatty Acids

Current Research Interests

Food Science (composition of food), Nutrition (fatty acid metabolism in man and animals), Functional foods (omega3 PUFA, lycopene, olive oil, polyphenols, stearic acid), effect of omega 3 fatty acids, meat-containing and vegetarian diets on cardiovascular health in humans, Neuroscience (the role of omega 3 polyunsaturated fatty acids in brain and retina on neural function including blood pressure regulation, zinc transporters and Alzheimer's disease in mammals). Professor Sinclair has more than 200 publications in peer-reviewed journals.

Some Recent Publications

- Wolyniak CJ, Brenna T, Murphy KJ, Sinclair AJ. Gas chromatography-chemical ionization-mass spectrometric fatty acid analysis of a commercial supercritical carbon dioxide lipid extract from New Zealand green-lipped mussel (*Perna canaliculus*). *Lipids*. 2005;40:355-60.
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- Jayasooriya AP, Ackland ML, Mathai ML, Sinclair AJ, Weisinger HS, Weisinger RS, Halver JE, Kitajka K, Puskas LG. Perinatal omega-3 polyunsaturated fatty acid supply modifies brain zinc homeostasis during adulthood. *Proc Natl Acad Sci U S A*. 2005;102:7133-8.
- Ponnampalam EN, Egan AR, Sinclair AJ, Leury BJ. Feed intake, growth, plasma glucose and urea nitrogen concentration and carcass traits of lambs fed isoenergetic amounts of canola meal, soybean meal and fish meal with forage based diet. *Small Ruminant Res* 2005;58:245-52.
- Li D, Mann NJ, Sinclair AJ. A significant inverse relationship between concentrations of plasma homocysteine and phospholipid docosahexaenoic acid in healthy male subjects. *Lipids*. 2006 Jan;41(1):85-9.

The role of omega 3 fatty acids in brain and retinal function

The brain is a lipid-rich organ containing mostly complex polar glycerophospholipids, sphingolipids, gangliosides and cholesterol. These lipids are involved in the structure and function of cell membranes in the brain. The glycerophospholipids in the brain contain a high proportion of polyunsaturated fatty acids (PUFA), the main PUFA being docosahexaenoic acid (DHA, all cis 4,7,10,13,16,19-22:6) an omega 3 fatty acid, and arachidonic acid (AA, all cis 5,8,11,14-20:4) and docosatetraenoic acid (all cis 7,10,13,16-22:4), both omega 6 fatty acids. Rod outer segment membrane glycerophospholipids are also highly enriched in DHA.

The main way that the role of omega 3 PUFA in neural tissue has been examined is by placing animals on diets containing very low levels of these PUFA (omega 3 PUFA deficient diets). In order to create these diets natural oils, low omega 3 PUFA but very rich in omega 6 PUFA, such as safflower or sunflower oil are used.

These studies in various species (rats, guinea pigs, monkeys) have shown that diets lacking or very low in omega 3 PUFA lead to disturbances in neural function, altering learning and memory, olfactory and auditory responses and visual function. Most changes can be restored by the inclusion of omega 3 PUFA in the diet. From a mechanistic point of view, DHA plays a crucial role in cell membrane function, influencing the activity of receptors, membrane-bound enzymes, neurotransmission, signal transduction, and glucose uptake. DHA (in phosphatidyl serine) also protects cells from apoptosis, stimulates nerve cell growth and neuron size. Addition of or depletion of omega 3 PUFA from the diet alters the neural level of DHA in the brain and influences the expression of many genes, involved in a wide variety of neural processes.

It is clear from this type of research that DHA influences many processes in neural cells and that its role is far more complex than simply influencing cell membrane properties.

Dr Trevor A Mori

Senior Lecturer, School of Medicine and Pharmacology, University of Western Australia and the Cardiovascular Research Centre, Perth, Western Australia.

Dr Mori is a Senior Lecturer at the University of Western Australia's School of Medicine and Pharmacology, at Royal Perth Hospital. He is a medical research scientist with an interest in various aspects of nutrition, hypertension, atherosclerosis and cardiovascular disease. He has an international reputation for his work with omega-3 fatty acids, with over 20 years experience in the area. His research has primarily focused on the potential beneficial effects of omega-3 fatty acids on cardiovascular and atherogenic risk factors.

This research has encompassed omega-3 fatty acids in obesity, diabetes and hypertension, and their interaction with other lifestyle modalities, such as exercise, weight reduction and sodium restriction. He has given numerous invited presentations at international and national conferences. He has published more than 120 papers in leading medical and scientific journals.

The Roles of Long-Chain Omega-3s: The Cardiovascular System

There is considerable evidence from clinical, experimental and epidemiological studies that ω 3 fatty acids derived from fish and fish oils, specifically eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), protect against cardiovascular disease. Prospective population studies and secondary prevention trials have demonstrated that increasing consumption of ω 3 fatty acids reduced coronary mortality and/or sudden death, particularly among patients with pre-existing coronary disease.

Meta-analyses have shown an inverse relationship between ω 3 fatty acid intake, and coronary heart disease and ischaemic stroke, providing strong evidence of cardiovascular risk reduction. Furthermore, the inclusion of evidence based on a range of biomarkers in intervention trials demonstrates a clear causal relationship. It is most likely that the benefits of ω 3 fatty acids in cardiovascular disease reduction are attributable to the integral effect of ω 3 fatty acids acting on multiple physiological mechanisms rather than through a single mechanism.

ω3 Fatty acids have multiple biological effects leading to a reduction in blood pressure and cardiac function; improved arterial compliance, endothelial function and vascular reactivity, a more favourable blood lipid profile; reduced neutrophil / monocyte cytokine formation, anti-thrombotic and anti-inflammatory effects, and reduced oxidative stress. Recent evidence from our research group has also demonstrated that in humans, EPA and DHA, the two main ω3 fatty acids, have differential effects on blood lipids, blood pressure and heart rate, and vascular reactivity. This presentation will address the effects of ω3 fatty acids on the abovementioned cardiovascular risk factors, where possible drawing from results from our research group in Perth.

Natalie Sinn

Nutritional Physiology Research Centre, University of South Australia and ATN Centre for Metabolic Fitness, University of South Australia

Natalie Sinn completed her undergraduate honours degree in Psychology in 2002. She has just been awarded her PhD by the University of South Australia for a highly successful project undertaken at the CSIRO Human Nutrition which investigated effects of omega-3 fatty acid supplementation on learning and behaviour problems associated with child ADHD and resulted in 2 publications in press and one in preparation, together with numerous media interviews and presentations.

Natalie is now a postdoctoral researcher in the Nutritional Physiology Research Centre at the University of South Australia where she is responsible for input into investigation of cognitive and behavioural outcomes of nutritional and lifestyle interventions. She plans to continue her work in the area of omega-3 fatty acids and their mental health benefits.

Omega-3 fatty acids for learning and behaviour problems in children

Omega-3 fatty acid deficiencies have been found in various mental health and developmental disorders including attention deficit hyperactivity disorder (ADHD).

A double-blind, placebo-controlled intervention trial was undertaken in 2004 with 132 South Australian children aged 7-12 years to investigate effects of omega-3 and micronutrient supplementation on learning and behaviour problems associated with ADHD. Outcome measures were parent and teacher ratings of learning and behaviour and a series of individual cognitive assessments.

Significant improvements in hyperactivity, impulsivity and inattention as rated by parents were found in children taking fish oil (containing omega-3 fatty acids) for 15 weeks compared with placebo. Fish oil also improved the children's ability to switch and control their attention and define the meaning of words. No significant improvements were found in teacher ratings or other cognitive assessments. No additional benefits were found with micronutrients. Improvements were also observed in the placebo group when they switched to the fish oil after 15 weeks and those originally assigned to the fish oil continued to improve. By 30 weeks, up to half the children taking fish oil showed notable improvements. Thus children with ADHD might benefit from regular omega-3 fatty acid supplementation.

Dr Dave Roberts

Scientific & Technical Director, Australian Food & Grocery Council

Dave is Deputy Chief Executive of the Australian Food and Grocery Council which he joined as the Scientific and Technical Director in January 2002. Prior to that he held the Foundation Chair in Nutrition and Dietetics at the University of Newcastle for 10 years and was at Sydney University for 12 years teaching and researching in nutritional biochemistry. He is past Chairman of the Federation of Australasian Nutrition Organisations, was President of the Nutrition Society of Australia for 5 years, and Chaired the Complementary Medicines Evaluation Committee of the Therapeutic Goods Administration in Canberra for a period of 5 years.

He is the Australasian correspondent for the British Nutrition Foundation. He has published one book, 6 chapters in books and many articles in refereed journals. His current role is a natural extension to his past activities, combining as it does his passion for sound science with the establishment of good regulation based on appropriate risk management principles and policy settings.

Professor L G Cleland

Royal Adelaide Hospital. Adelaide SA 5000

Les has been Director of Rheumatology Royal Adelaide Hospital since 1982 and Clinical Professor Adelaide University since 2000

Research Interests include:

- Health related effects of dietary n-3 fatty acids, particularly in relation to inflammatory and cardiovascular diseases.
- Pathways of eicosanoid synthesis including substrate alternatives, enzymology and pharmacological inhibitors, especially cyclo-oxygenase-2 inhibiting non steroidal anti-inflammatory drugs.
- Systems for improved outcomes in bone and joint diseases, including early intervention and preventive approaches.
- Immunobiology of polyarthritis, with particular reference to T cell-dendritic cell interactions.

Dietary Omega-3 fatty Acids and Arthritis

There are two principal aspects to the use of dietary omega-3 fatty acid enrichment and the management of arthritis: therapy and prevention.

The level of evidence is strongest for therapeutic use with many randomized controlled trials showing reduced symptoms in rheumatoid arthritis (RA) with anti-inflammatory doses of fish oil. These doses typically deliver 3 to 4.5g daily of the long chain omega- fatty acids EPA + DHA. Data for long term use at these levels suggests excellent tolerance without evident treatment related toxicity. Furthermore, within the context of a standardised treatment regimen, disease control is generally better, multiple cardiovascular risk factors are reduced and discretionary resort to problematic nonsteroidal anti-inflammatory agents is reduced in fish oil users. The experience with long term use of high dose fish oil in RA (more than 8 years in lead members of our cohort) gives confidence for extension of such doses to other applications, including prevention of RA and systemic lupus, in those identified as being at special risk.

Evidence for preventive effects of fish oil in inflammatory diseases is less direct. Dietary fish oil can reduce the expression of spontaneous inflammatory disease in genetically prone mice. Population and case control studies suggest reduced incidence of RA in groups with high dietary long chain omega-3 fatty acid intakes. Better definition of factors that define risk for occurrence and severity of RA and lupus gives impetus to prospects for randomized trials of potentially preventive interventions in subjects at special risk. While fish oil in pharmacological doses appears necessary for anti-inflammatory therapy, more conventional dietary approaches may prove sufficient for preventive applications.

Professor Peter Howe

*Nutritional Physiology Research Centre and ATN Centre for Metabolic Fitness,
School of Health Sciences, University of South Australia*

Professor Peter Howe is Director of the Nutritional Physiology Research Centre, School of Health Sciences, University of South Australia and Director of the ATN Centre for Metabolic Fitness, a new national research collaboration. He has a distinguished career spanning 35 years in university, CSIRO, hospital and pharmaceutical-industry based research.

An authority on cardiovascular and metabolic health benefits of bioactive nutrients, his goal is the scientific substantiation and promotion of health benefits of functional foods through collaborative research and partnerships with industry. He established the Smart Foods Centre, an ARC Key Centre at the University of Wollongong, and built strategic alliances with both primary producers and food manufacturers to develop healthier foods.

Returning to Adelaide in 2002 as a joint research professor at the University of Adelaide and the University of South Australia, he established the cross-institutional Nutritional Physiology Research Centre with its multidisciplinary focus on diet and physical activity interventions to optimise health. He has made significant contributions to research on health benefits of omega-3 fatty acids and to regulatory policy development, including the omega-3 nutrition claim, the nutrient reference values for omega-3 and the current health claims review.

Omega-3 fatty acids, exercise and metabolic fitness

Long chain omega-3 fatty acids (LCn3) from marine sources are essential nutrients which mediate a wide range of physiological functions. Target intakes of 430 and 610 mg/day are recommended for women and men respectively to optimize health¹. Although there is little evidence to attribute specific health benefits to such modest intake levels, it is generally recognized that LCn3 can contribute through multiple mechanisms, particularly circulatory and metabolic, to both physical and mental fitness. Moreover, the potential benefits of LCn3 are more likely to be realized when increased intakes are combined with other features of a healthy lifestyle such as regular exercise.

Exercise-induced heart rate elevations in athletes can be attenuated by LCn3 supplementation^{2,3} and we have recently shown that overweight individuals can lose body fat by combining LCn3 supplementation with regular, moderate intensity aerobic exercise, a benefit not seen with either intervention alone⁴. In an obesogenic environment, this combined diet and lifestyle approach may have important implications for attaining and maintaining optimal body composition, as well as counteracting adverse cardiovascular, metabolic and inflammatory conditions that are usually associated with obesity.

Subtle metabolic benefits, e.g. reduction of blood triglycerides (TG) in hyperlipidaemic subjects, may be achievable at modest LCn3 intakes which are more consistent with diet than medication. However, such outcomes are difficult to demonstrate in controlled trials in a healthy population. LCn3 levels in erythrocytes provide a useful surrogate marker of potential benefit in adults. We find that increases in erythrocyte DHA are linearly related to reductions in fasting TG, such that intakes of less than 1g/day may be beneficial⁵.

In conclusion, increased intakes of LCn3, as part of a healthy lifestyle, can help to maintain adult fitness. However, further research is needed to determine intake requirements for specific LCn3.

1. National Health and Medical Research Council. Nutrient Reference Values for Australia and New Zealand. Commonwealth of Australia, Canberra, 2006
2. Peoples GE, McLennan PL, Howe PRC, Groeller H. Fish oil reduces apparent myocardial oxygen consumption in trained cyclists but does not change time to fatigue. 4th International Conference on Nutrition and Fitness, Olympia, 2000.

3. JD Buckley, S Burgess, KJ Murphy, PRC Howe. Effects of omega-3 polyunsaturated fatty acids on cardiovascular risk, exercise performance and recovery in Australian Football League (AFL) players. *Asia Pac J Clin Nutr* 14:S57, 2005.
4. Hill AM, JD Buckley, KJ Murphy, PRC Howe. Running on fish oil: benefits of omega-3 supplementation and exercise. 7th ISSFAL Congress, Cairns, July 2006.
5. AM Coates, CM Milte, JD Buckley, A Ferrante and PRC Howe. Dose dependent changes in plasma triglycerides with DHA supplementation. Nutrition Society of Australia, Sydney, Nov 2006.

Kevin Krail

Chair, The Omega-3 Centre

Kevin Krail was appointed as general manager of the new regional office of Ocean Nutrition Canada in Sydney Australia in early 2005.

As general manager, Kevin's responsibilities include the oversight and management of both the Dietary Supplement Ingredient (DS) and Healthy Food Ingredient (HFI) businesses in Australia, New Zealand, Southeast Asia and India . He provides local leadership and business development support to existing business and will also be responsible for identifying and developing new business opportunities that exist in the Australian and New Zealand functional food market for Omega-3s.

Prior to joining ONC, Krail had extensive experience in AUS/NZ in both the food ingredient and dietary supplement industries. He was general manager of Nutrition Imports Pty Ltd., the regional distributor for nutritional food and sports nutrition products for GNC, including the Atkins range of low-carb products. Throughout his career, he was also the general manager and CEO at Healthy Life Pty Ltd. and the general manager of Functional Foods at the H.J. Heinz Company. Krail came to Australia in 1989 as the area director of the Asia/Pacific division at The NutraSweet Company.

Kevin holds a Bachelor of Science degree in engineering from the United States Air Force Academy and a Master of Business Administration from the University of Colorado. He also has a diploma in physical education and sports nutrition.