Plenary 1: Our Food Supply: Healthy, Accessible and Secure?

The effects of anthropogenic food on the body condition, biochemistry, stable isotopes and egg quality in Silver Gulls

HJ Auman[1], CE Meathrel[2], AMM Richardson[1]
[1]*School of Zoology, University of Tasmania TAS 7000*
[2]*Department of Environmental Management, La Trobe University, VIC 3689*

Background - Many studies worldwide have attested to an increase in gull populations following urbanisation, and it is widely presumed that gulls have benefited as a direct consequence. However, foraging at tips and food outlets may induce a health cost in urban birds and the benefits of eating anthropogenic food were questioned. This study was based on the premise that a negative effect on the health and hence fitness of gulls was expected from eating the equivalent of human 'junk food'.
Objective - This research investigated the potential adverse effects of an anthropogenic diet on the health of Silver Gulls (*Larus novaehollandiae*) by comparing birds breeding at a remote, non-urbanised site (Furneaux Island Group, Bass Strait) with those at an urbanised (Hobart) colony in Tasmania, Australia.
Design - Mass and body condition (measured by an index), stable isotopes ($^{13}C/^{12}C$ and $^{15}N/^{14}N$), blood biochemistry (HDL- and total cholesterol, triglycerides, glucose, insulin, calcium, sodium, potassium and corticosterone), and egg quality (physical measurements and mass, absolute and proportional chemistries, shell thickness, carotenoids and historic comparisons) were compared between the two populations.
Outcomes - Urbanised Silver Gulls were significantly heavier and had greater body condition than structurally identical non-urbanised gulls. Analyses of stable isotopes suggested that non-urbanised gulls fed from a more marine origin, while urbanised gulls fed from a different ecosystem and from a more freshwater/terrestrial origin. Assessment of regurgitations suggested that although specific dietary items were generally either human-derived or natural, some overlap existed between sites. The urbanised gulls had higher levels of HDL-cholesterol in their blood. Clutch sizes did not differ, but eggs from the Furneaux Island Group were larger, heavier and had greater yolk mass than those from Hobart, as well as greater carotenoid concentrations in the yolk.
Conclusions - Although urbanised Silver Gulls were apparently successful in laying eggs, poorer reproductive success may have resulted from smaller, lighter eggs that contained proportionally less yolk. The Silver Gull provided an excellent model to study the effects of a human-derived diet on a native species and numerous opportunities exist to focus future research in this area.

Plenary 2: Lifestyle and Health

What is a healthy lifestyle?

Kerry Chamberlain
School of Psychology, Massey University Albany, New Zealand

A healthy lifestyle is a concept that is readily understood by most people, reproduced through the various health discourses that surround healthy dieting, healthy eating, and healthy living. However, a critical examination of these "lifestyle" issues reveals that they are actually realised and practiced in complex, variable, and often contradictory ways. In this presentation I will explore some of the ways in which a healthy lifestyle is constructed, in different contexts for different purposes, and how these are shaped by issues of gender, cultural location, cast in the shadow of medicine, and produced by processes such as nutritionalisation. I will argue that the varied constructions of a healthy lifestyle, and associated concerns relating to food, eating and diet, all need to be recognised and taken into account by those working within the public health field, particularly those seeking to change lifestyles to render them "healthier".

Concurrent Session 1: Functional Foods I

Health benefits of ZESPRI ™ GOLD Kiwifruit: effects on muscle performance and fatigue and immune responses

MA Skinner[1] DC Hunter[1], M Denis [2], N Parlane[2], LM Stevenson[1], R Hurst[3]
[1]*The Horticulture and Food Research Institute of New Zealand, Auckland, New Zealand*
[2]*The Hopkirk Research Institute, AgResearch, Massey, University, New Zealand*
[3]*The Horticulture and Food Research Institute of New Zealand, Hamilton, New Zealand*

Background – Kiwifruit is one of the most nutrient dense fruits and a rich source of vitamins, minerals dietary fibre and plant phytochemicals, particularly carotenoids. It has been shown to have health benefits beyond basic nutrition and may be viewed as one of the new 'Superfruits'.

Objective – During exercise and training the body is "stressed" and immune responses may be compromised. We have focussed on muscle health and immune support, both important areas for maintaining health and 'wellness', and investigated the ability of ZESPRI ™ GOLD Kiwifruit to improve muscle cell function, reduce muscle fatigue and enhance immune responses.

Design – To investigate effects on muscle, adult male mice soleus muscles were connected to force transducers in an organ bath and stimulated with electrodes to twitch and fatigue (over 15 secs) with or without a 15-min pre-incubation with the fruit extract. For immune response effects mice were fed a ZESPRI Gold kiwifruit puree for 20 days during which time they were orally immunised with a model protein antigen, ovalbumin (OVA), plus a suboptimal dose of adjuvant and antigen-specific antibodies and cell-mediated immune response were compared with immunised mice fed a sugar control. Possible mechanisms were investigated using human blood cells where effects on phagocytosis and natural killer cell activity were determined.

Outcomes –The ZESPRI ™ GOLD Kiwifruit treated muscles displayed a marked increase in maximum force and an observable delay in fatigue onset compared to the untreated control muscles. The ZESPRI ™ GOLD Kiwifruit puree allowed the detection of significant increases in OVA-specific antibodies (total Ig and IgG) in the serum under sub-optimal immunisation conditions and an OVA-specific cell-mediated response from gut associated mesenteric lymph node cells but not from spleen cells. It also stimulated human granulocyte and monocyte phagocytosis but not human natural killer cell activity.

Conclusions – The results provide the first evidence that ZESPRI ™ GOLD Kiwifruit can improve muscle performance, prolong time to muscle fatigue and modulate antigen specific immune responses. They suggest that it could be useful as a new type of functional food ingredient for sports drinks and others foods targeted at immune support.

Concurrent Session 1: Functional Foods I

Cocoa flavanols - circulatory and heart health benefits

Peter Howe, Kade Davison, Narelle Berry, Alison Coates, Jonathan Buckley
Nutritional Physiology Research Centre & ATN Centre for Metabolic Fitness, University of South Australia, Adelaide SA 5000

Background – Recent research on cocoa flavanols adds substance to traditional beliefs in the health benefits of chocolate.

Review – In addition to generic antioxidant effects, these polyphenols can enhance endothelial nitric oxide production to influence physical and possibly mental health status through circulatory improvements. Flow mediated dilatation (FMD), a non-invasive index of endothelial function which is impaired in obesity, hypertension, high cholesterol, smoking and diabetes, increases following consumption of cocoa flavanols.[1] We recently found that flavanol-rich cocoa supplementation for 12 wks led to sustained FMD improvement, lower blood pressure (BP) and enhanced glucose metabolism in overweight/obese but otherwise healthy non-smokers (Davison et al, unpublished). Others have shown that such benefits are dose related[1] and attainable with modest flavanol intakes from chocolate.[2,3] This is consistent with epidemiological evidence of lower BP and reduced cardiovascular mortality in cocoa/chocolate consumers.[4,5] Recent studies link cognitive decline to impaired cerebral vasodilatation and show that consuming flavanol-rich cocoa can increase cerebral blood flow[6]. Thus enhanced endothelial function may be a common mechanism by which vasoactive nutrients improve cardiometabolic risk factors, mood and cognition.

Conclusion - Further evaluation of the potential role of specific cocoa flavanols in healthy ageing is warranted.

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Concurrent Session 1: Functional Foods I

The ability of kiwifruit to positively modulate key markers of gastrointestinal function

AL Molan[1], MC Kruger[1], S De[1], LN Drummond[2]
[1]*Institute of Food, Nutrition and Human Health, Massey University, Palmerston North, New Zealand*
[2]*ZESPRI International Limited, New Zealand*

Background – The consumption of kiwifruit is associated with a number of health benefits related to gastrointestinal function. These benefits are generally attributed to the high levels of vitamins, minerals, dietary fibre and bioactive phytochemicals present in kiwifruit. There is a need to investigate the biological activities of specific fractions of kiwifruit on markers of gastrointestinal health.
Objective – To further explore the potential of kiwifruit to influence specific aspects of gastrointestinal function, the edible portion and an aqueous extract from both ZESPRI™ GOLD (ZGO) and ZESPRI™ GREEN (ZGR) kiwifruit were assessed for their ability to influence the growth of both beneficial and pathogenic bacteria *in vitro*. In addition, the potential of kiwifruit to modulate the activity of ß-glucuronidase and ß-glucosidase was investigated.
Design – Aqueous solutions were prepared from the edible flesh and water-extracts of ZGO and ZGR kiwifruit. A series of *in vitro* experiments were conducted to evaluate both the antimicrobial and prebiotic properties, and intestinal bacterial enzyme activities of kiwifruit and kiwifruit extracts.
Outcomes – Solutions prepared from ZGO and ZGR kiwifruit showed high antimicrobial activities against both Gram-positive (*Staphylococcus aureus* and *Streptococcus mutans*) and Gram-negative (*Salmonella typhimurium* and *Escherichia coli*) pathogenic bacteria, with the water extracts exhibiting the greatest antimicrobial activity. The impact of the same solutions on the growth of three strains of lactic acid bacteria (*Lactobacillus rhamnosus, L. acidophilus* and *Bifidobacterium breve*) was evaluated in MRS medium *in vitro*. In general, lower concentrations (0.5 – 2.5 mg/ml) did not significantly affect the growth and viability of these bacteria, however an addition rate of 5 mg/ml resulted in a significant increase ($P< 0.05$-0.01) in the numbers of viable cells of these lactic acid bacteria. Kiwifruit, and in particular the water extract of ZGO kiwifruit demonstrated an ability to positively influence intestinal bacterial enzymes, by inhibiting ß-glucuronidase activity and promoting the activity of ß-glucosidase.
Conclusion – Both the edible flesh and particularly water extracts of ZGO and ZGR kiwifruit, exhibit antimicrobial and prebiotic activity when tested *in vitro*. Kiwifruits have also been shown to beneficially modulate the intestinal bacterial enzymes, ß-glucuronidase and ß-glucosidase, in a manner that is considered beneficial for gut health.

Synergistic interactions between different fruits for enhanced brain wellness

J Zhang[1], A Adaim[1], R Wibisono[1], DE Stevenson[2], MA Skinner[1]
[1]*The Horticulture and Food Research Institute of New Zealand, Auckland, New Zealand*
[2]*The Horticulture and Food Research Institute of New Zealand, Hamilton, New Zealand*

Background – The health benefits of polyphenolic extracts or foods rich in polyphenols such as fruit are likely to be the result of distinct components interacting at different physiological sites or on diverse cellular pathways. It is most likely that multiple compounds (in a food or extract matrix) interact synergistically and/or additively to potentiate the bioactivity of major active ingredient (s). The benefit of a diet rich in fruits and vegetables is attributed to the complex mixture of phytochemicals present in these and other whole foods
Objective – We have focussed on the brain to develop *in vitro* assays that can detect synergies between phytochemical combinations that may promote 'brain wellness' benefits.
Design – A two cell system comprising human SH-SY5Y neuronal cells exposed to supernatants from THP-1 monocytes was used as a model for neuronal damage occurring as a result of inflammatory, metabolic or ageing processes. The ability of polyphenols and complex fruit extracts alone or in combination to protect the neuronal cells from cell death was determined over a 1-20 μM catechin equivalent dose range using flow cytometry. Results were expressed as EC_{50} values derived from the Cell Death Index (CDI) and the ratio between EC_{50} values of individual fruit extracts and combinations was used to calculate a Synergistic Index (SI).
Outcomes – Common phytochemicals were found to vary in their ability to protect the neuronal cells as did polyphenol rich extracts from blackcurrant and kiwifruit extracts. The EC_{50} values for quercetin, rutin, catechin, phloretin and phloridzin were 1.48, 1.76, 1.84, 2.39 and 7.20 (in μM), respectively. The EC50 values for blackcurrant and kiwifruit extracts were 4.86 and 3.31 (in μM catechin equivalent), respectively. The EC_{50} of combinations of blackcurrant and kiwifruit extracts were 1.12, which gives a Synergistic Index of 0.27 (SI<1 indicates synergistic interaction). Thus the blackcurrant and kiwifruit extracts were more protective together than both extracts alone or any of the other common phytochemicals tested.
Conclusions – The results demonstrate that the natural combination of phytochemicals in fruits may be responsible for their potent biological activities. Synergistic interaction between different fruit extracts can be detected and quantified and may allow the development of new types of functional foods based on synergistic interaction of fruit for brain health and other targeted health areas.

Concurrent Session 1: Functional Foods I

Soy isoflavone supplementation improves spatial working memory in healthy males

A Thorp [1,2], N Sinn [1], J Buckley [1], A Coates [1] and P Howe [1,2]

[1]*Nutritional Physiology Research Centre and ATN Centre for Metabolic Fitness, University of South Australia*
[2]*School of Molecular and Biomedical Sciences, University of Adelaide, Adelaide, South Australia*

Background – Women generally perform better at certain memory related tasks than men. Such gender differences in certain aspects of cognitive performance may be attributable to higher levels of circulating oestrogen activating oestrogen beta receptors (ERβ) which are prevalent in brain regions mediating cognitive functions. Soy isoflavones and the metabolite equol can activate ERβ. Thus isoflavone supplementation in males may lead to improved cognitive performance.
Objectives – To investigate effects of chronic isoflavone supplementation on cognition, specifically memory and executive function, in healthy males and to see whether any benefit is dependent on equol production.
Design – 34 healthy males aged 18-70 yrs participated in a 12 week double-blind, placebo controlled cross-over trial. Participants were randomised to take 4 capsules/d containing IsoLife 40 (donated by Frutarom, The Netherlands; 120mg/d isoflavone equivalents: 68mg daidzein, 11mg genistein) or placebo for 6 weeks followed by the alternative for a further 6 weeks. Cognitive assessments relating to measures of memory (associative, working, spatial, short- and long-term recall) and executive function (planning, verbal fluency, mental flexibility) were performed at the beginning and end of each treatment period.
Outcomes – Isoflavone supplementation significantly improved spatial working memory (SWM) (P<0.02), a test in which females consistently perform better than males. Males taking isoflavones committed fewer working memory errors (P=0.016) and located the required information in fewer attempts (P=0.014) than while taking placebo. Isoflavones did not affect associative, short or long term memory (Paired Associate Learning, Rey's Auditory Verbal Learning Task) or executive function (Mental Rotation, Digit Span, Trail Making and Letter-Number Sequencing). Effects of isoflavones on cognitive performance did not differ significantly between equol producers (n=8) and non-producers (n=26).
Conclusion – Isoflavone supplementation in healthy males may enhance specific cognitive processes which are dependent on oestrogen activation.

Exposure to estrogenicity from phytoestrogens in food

BM Thomson
ESR, PO Box 29 181, Christchurch, New Zealand

Background – Phytoestrogens are plant derived chemicals that can mitigate a biological response via an estrogen receptor mechanism. This range of food constituents comprises coumestans, flavonoids, isoflavones and lignans that occur in commonly consumed foods such as bread, grapefruit, celery and tea. Since any biological effect will be related to dose, and foods are consumed in combination, it is useful to have a measure of total 'estrogenicity" from a typical diet and to know where this is coming from.
Objective – To review the current knowledge of intake of phytoestrogens and assess exposure to total estrogenicity from phytoestrogens in typical Western and Asian diets.
Design – Mean dietary intakes of phytoestrogens, including assessments from Australia and New Zealand, were collated from the literature and combined with relative potency data to derive a dose of estrogenicity for each phytoestrogen, with consideration of bioavailability. Assuming additivity, a total "estrogenic" dose was estimated from the sum of individual phytoestrogens.
Outcomes – Total intake of phytoestrogens is approximately 2.3 mg/kg bw/day for a Western diet and 3.0 mg/kg bw/day for an Asian diet. Genistein (43%), naringenin (18%) and apigenin (10%) make the greatest contribution to estrogenicity from phytoestrogens for an adult Western diet, with the most significant contributing foods being soy-containing processed foods (eg bread), citrus fruits, grain foods and celery. For an Asian diet, estrogenicity is dominated by the isoflavones, genistein (83%) and daidzein (9%) from the consumption of soy. Exposure in Western populations is particularly variable, depending on dietary choices.
Conclusions – Phytoestrogens will make an increasing contribution to total estrogenicty in the diet with the increasing use of soy as a food ingredient. Whether Western and Asian peoples respond similarly to these constituents, whether they have positive and/or negative impacts on human health, and whether individual phytoestrogens have an additive effect, remains to be elucidated.

Concurrent Session 2: Obesity

Fatness and fitness

EC Rush
Centre for Physical Activity and Nutrition Research, Auckland University of Technology, Auckland, New Zealand

Background – Among ethnic groups for the same body mass index (BMI) there are marked differences in body fat and distribution. For an individual it is difficult to predict for a given BMI; body fat, central body fatness or metabolic and physical fitness. Increasing BMI and waist circumference are associated with an increase in the prevalence of health risks and morbidity.
Objectives - To discuss the relationships of body fat to form and function in relation to ethnicity.
Design – Review of current research in New Zealand on ethnic differences in body composition and its relationship to function.
Outcomes – Across the lifespan measurement of body fatness by dual X-ray absorptiometry (DXA) and bioelectrical impedance analysis (BIA) in New Zealand shows marked ethnic differences in the relationship between BMI and body fat. Two groups, Asian Indian and Pacific have high risk for metabolic syndrome and type 2 diabetes but for the same BMI Asian Indian have 10% more body fat than Pacific, with European and Maori intermediate. In 3485 Maori the determination of a waist cut-off for metabolic risk is unclear and physical fitness is negatively related to both waist and dysglycaemia, $P<0.0001$.
Conclusion – As the ethnic diversity of New Zealand continues to change, and body fatness to increase it is important to develop useful screening measures of form and function to help predict risk.

The Health Select Committee of Inquiry into Obesity and Type 2 Diabetes in New Zealand

R Toomath
Capital and Coast District Health Board, Wellington, New Zealand

Background – FOE (Fight the Obesity Epidemic) was formed in 2001 with the initial aim of raising the awareness of obesity as a health issue. The group believes that strategies based on changing individual behaviour through education and information provision will not be successful and that its vision can only be realised by changing the current "obesogenic" environment. FOE called for an enquiry into obesity as part of its strategy for several years and in 2005 the organization launched a petition that called for an enquiry as one of its three demands. This was announced in December of that year with terms of reference that were derived from FOE's request with the addition of type two diabetes as an additional focus. In all there were 312 submissions. FOE's submission was substantive and the organization provided support and encouragement to many groups including public health units in the preparation of their material. Those from the health sector were most numerous (141) and there were 21 from industry – both the food and advertising industries. The final result in terms of a report will be an integration of the written and oral presentations but will be influenced – inevitably – by the additional lobbying of the committee members and their pre-formed opinions. The same influences will apply to those charged with the actual compilation. FOE was keen that the content of the submissions was not lost as a result of these external influences and with the help of the Clerk of the House obtained copies of all submissions early in 2007 and we performed our own analysis
Design – The 312 submissions were interrogated for evidence of comment on a series of key issues such as whether the effort to reducing obesity was better put into changing individual behaviour as well as specific questions relating to regulation of the marketing environment.
Results – Our analysis showing dramatic discordance between the recommendations of submissions from the health sector and those from industry. What is more, the behaviour of government is more closely aligned with the industry stance. This analysis will be presented and compared with those of the official report which will be released later in 2007. What the government chooses to do with the recommendations arising from inquiry will be of even greater interest and will be closely scrutinized by FOE and other stake-holders.

Concurrent Session 2: Obesity

Breakfast - helping to solve the obesity problem

L Kent[1], A Worsley[2]
[1]*Exercise and Nutrition Sciences, Deakin University, Vic 3125*
[2]*VicHealth, Carlton, Vic 3053*

Background – The prevalence of obesity and diabetes have been increasing at a rapid rate over the last 20 years. Furthermore, coronary heart disease is still the leading cause of death in Australia despite declines in mortality. The reasons for these changes still remain relatively unclear and to date there is limited information to help clarify this. Furthermore, longitudinal data on predictors of obesity change are scarce. The Sydney Adventist Hospital, situated in a high socioeconomic area in North Sydney has a unique 30 year data set on biomedical, lifestyle and dietary factors related to heart health. To our knowledge no other data set in Australia contains such extensive information in such a long time series that is relevant to non communicable disease.

Objective – To examine the relationship between food consumption and BMI. In particular, as breakfast has often been claimed to be of influence on biomedical indices, this paper aims to investigate its possible influence on obesity (and serum cholesterol).

Design – 300 to 725 self-reported questionnaires from the Sydney Adventist Hospital, detailing demographic, lifestyle and dietary habits, were randomly selected for the years 1976, 1986 and 2005. Analyses included simple descriptive statistics, reliability analysis, univariate analysis of variance and linear regression analysis.

Outcomes – The relative size of breakfast consumed was found to be very important in the maintenance of body weight for men (R^2=6.1%, P <0.001, 1976; R^2=5.6%, P=0.001, 1986; R^2=4.9%, P=0.044, 2005) but not for women (P = 0.869, 1976; P = 0.772, 1986; P = 0.669, 2005) for all three years. However, the addition of vegetarianism and physical activity to the regression model did not substantially attenuate the main association of breakfast and BMI. In addition, relative breakfast size was inversely related to serum cholesterol in women (R^2=3.7%, P = 0.008, 1976) but not men.

Conclusions – These findings suggest that breakfast consumption may help to control overweight and obesity but may also have broader implications for health that extend beyond body weight. Similar associations are also likely to be found with cholesterol and other biomedical factors in subsequent years.

Concurrent Session 2: Obesity

Waist-height ratio is associated with blood pressure in 11 year old Aboriginal children

D Mackerras[1,2,3], GR Singh[1,2] SM Sayers[1,2]
[1]*Menzies School of Health Research, Darwin, NT 0810*
[2]*Institute of Advanced Studies, Charles Darwin University, NT 0909*
[3]*Food Standards Australia New Zealand, Barton, 2610 ACT*

Background – The use of body mass index (BMI) as a descriptor of overweight in children is complicated because the reference curves and cutoffs depend on age and sex. Age- and sex- specific BMI cutoffs for children have been defined by Cole and can also be derived from the 2000 US Centres of Disease Control (CDC) growth charts. However, the use of BMI to identify overweight in Australian Aboriginals has been criticised because this group has a relatively long leg length in relation to height. The waist-height ratio has been proposed as a better indicator of body fatness than other indices. A cutoff of >0.5 is proposed to be suitable irrespective of age, sex or race.
Objective - To examine the association between systolic blood pressure and three body size indicators - the waist-height ratio and BMI compared to the CDC or the Cole criteria - in Aboriginal children.
Design – Participants in the longitudinal Aboriginal Birth Cohort Study were followed-up at a mean age of 11 years. Height, weight, waist circumference and blood pressure were measured on 528 children. BMI was expressed as a z-score of the CDC curves using EpiInfo, and also dichotomised as < or ≥ the 85th centile. Children were classified as normal or overweight (including obese) using the Cole cutoffs. Waist-height ratio was dichotomised as < or ≥0.5.
Outcomes – The population was, on average, short and light for age. There were 72, 57 and 55 overweight children using the waist/height ratio, the CDC and the Cole cutoffs respectively; 49 were high by all three indices. In univariate analysis with systolic blood pressure as the outcome, the dichotomous overweight variable had adjusted r^2 of 12.4, 9.1 and 8.5 respectively for waist/height ratio, 85th centile of the CDC curve and by the Cole criteria. When used as continuous variables, waist/height ratio and BMI CDC z-score had adjusted r^2 of 11.3 and 14.0 respectively.
Conclusions – In this population, waist-height ratio explains a similar amount of the variance in systolic blood pressure as two other common body fatness indexes. When assessing individuals, the waist/height ratio would be simpler because it does not require comparison to age- and sex-specific charts for interpretation. From a research viewpoint, waist/height ratio and BMI z-scores have an advantage over the Cole definition because they can be used as continuous variables in the analysis.

A multi-dimensional model for the treatment of male obesity

GS Mendoza[1], ME Barasi[2], LD Sanders[2], K Thirlaway[2]
[1]*Institute of Food, Nutrition and Human Health, Massey University, Palmerston North, New Zealand*
[2]*Centre for Nutrition & Dietetics, University of Wales, Institute Cardiff, Wales*

Background – Obesity is a major health challenge for New Zealand. The public health intelligence monitoring report "An Indication of New Zealanders' Health 2005"[1] puts levels of obese and overweight males at nearly 60% of the population. Reviewing weight loss initiatives reveals that most studies are undertaken on female subjects which may not take account of issues relevant to men.
Objective – To determine whether obese and overweight males go through set stages of behavioural change when trying to lose weight. To determine whether novice trainers can be trained to deliver an effective weight management programme.
Design – The study was a quasi-experimental intervention of longitudinal design producing quantitative data using repeated measures. Male subjects (n=61) were recruited by personal trainers, all subjects were either overweight or obese (BMI ≥25). A control group from a commercial slimming organisation was also recruited. The trainers delivered a 12 week weight management course to their subjects. At weeks 1, 4, 8 and 12 the following assessments were conducted – psychometric tests (Weight Efficacy life-style questionnaire, Decisional balance inventory, Stages of Change Algorithm, University of Rhode Island Change assessment Scale), anthropometric tests (weight, height, waist circumference, body fat %). Activity levels were assessed using pedometers and activity diaries.
Outcomes – Subjects achieved a mean weight loss of 4.65 kg (P<0.001) and mean waist circumference reduction of nearly 5cm (P<0.001). In addition, daily steps increased by 3947 (P<0.001) and energy intake decreased by 1318 kJ (P<0.05). Weight loss efficacy significantly increased (P<0.01) as did decisional balance difference (P<0.01). An increase in the level of efficacy correlated with reductions in waist measurement (P<0.05).
Conclusion – It is possible to train novice trainers to deliver an effective weight management course. Increases in self-efficacy and decisional balance were in line with transtheoretical model of change theory. It may be possible to use decisional balance and levels of efficacy as a screening tool to improve male weight loss programmes.

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Concurrent Session 3: Immune Function, Cancer, Type 2 Diabetes

Increasing prevalence of atopic disease

R Ameratunga
University of Auckland, Auckland, New Zealand

Food allergy is a common problem. It is estimated that 4-6% of children and 2-4% of adults have a definable food allergy. Epidemiological studies have however been hampered by variation in methodology. Large scale cohort studies with exposure data and allergy testing are likely to provide the most robust data on the prevalence of food allergy in a community. The testing should be followed by double blind food challenges. The expense of these studies is prohibitive and furthermore the prevalence may change rapidly as a result of immigration and the introduction of new foods into the diet. There is no data for food allergy in New Zealand. It is assumed that prevalence data are similar to Europe and North America. It should be noted however that the diet and ethnic makeup is unique and data obtained overseas may not be applicable to New Zealand. We are currently designing a large food allergy database to identify the patterns of food allergy in New Zealand. The project will be largely web-based and will seek detailed information on food allergy. It is hoped that patterns of food allergy will be identified, which may result in better medical services for patients. In the longer term we plan to follow a cohort of well-characterised food allergy patients to better understand the natural history of food allergy in New Zealand.

Effect of flaxseed lignans on biomarkers of breast cancer risk in postmenopausal women

LA Williamson[1], NJ Mann[1], AJ Sinclair[2], D Kildea[5], D Small[1], G Steinicke[3], DA Rigg[6], M Verbruggen[7], H Adlercreutz[4]
[1]*School of Applied Sciences, RMIT University, VIC Australia 3001*
[2]*Exercise and Nutrition Science, Deakin University, VIC Australia 3125*
[3]*Melrose Health, VIC Australia 3132*
[4]*Institute for Preventive Medicine, Nutrition, and Cancer, University of Helsinki, Finland FIN-00014*
[5]*PVC Science Eng & Technology, Math & Geospatial Sciences, RMIT University, VIC Australia 3001*
[6]*PhytoHealth Pty Limited NSW Australia 2077*
[7]*Frutarom Specialties, Belgium NV*

Background – Flaxseed is reported to have numerous chemoprotective effects *in vivo* and *in vitro* which may be mediated through its antiestrogenic effects and/ or its influence on endogenous sex hormone production, metabolism and biological activity.
Objective – To assess the effects of flaxseed lignans on biomarkers of breast cancer risk in postmenopausal women.
Design – Healthy postmenopausal subjects (n=41) consumed 50mg or 100mg of purified lignans or a placebo daily for a period of 7 weeks in a double blind, placebo controlled, randomized three-way cross over intervention trial. Blood and urine samples were taken from subjects at the beginning and end of each intervention and analysed for lignan metabolites enterolactone (ENL) and enterodiol (END) (Time Resolved Fluoro Immunoassay), sex hormone binding globulin (SHBG) (Radio Chemiluminescence Immunoassay), estradiol (Antibody Immunoassay) and estrogen metabolites 2-hydroxyl estrone and 16α-hydroxyl estrone (2-OHE & 16αOHE) (Enzyme Immunoassay). Dietary patterns were monitored throughout.
Outcomes – Levels of ENL and END increased in a dose responsive manner (P = 0.000). 2-OHE and 2-OHE/16αOHE-1 metabolite ratio showed an increasing trend but did not reach significance. There was no treatment effect or treatment x order effect in levels of SHBG, 16αOHE or Estradiol.
Conclusion – Flaxseed lignans were metabolized to ENL and END in a dose response manner and were therefore available to exert antiestrogenic effects and influence endogenous sex hormone production, metabolism and biological activity. Estrogen metabolism is forced to the less estrogenic 2-hydroxylation pathway due to the higher phytoestrogen (phenolics) load. Whether this decreases the risk of breast cancer remains to be established.

Concurrent Session 3: Immune Function, Cancer, Type 2 Diabetes

The effect of folic acid supplementation on DNA biomarkers of colorectal cancer risk (uracil misincorporation, global and gene-specific DNA hypomethylation): a randomised intervention study

SL O'Reilly[1], AP McGlynn[2], GR Wasson[2], I Bradbury[2],H McNulty[2], SS Strain[2], DG Weir[3], N Mahmud[3], V McKelvey-Martin[2], CS Downes[2], JM Scott[1]

[1] *Department of Biochemistry, Trinity College, Dublin 2, Ireland*

[2] *Centre for Molecular Biosciences, University of Ulster, Coleraine, Northern Ireland*

[3]*St. James' hospital, Dublin 8, Ireland*

Background – Alterations in folate status are associated with colorectal carcinogenesis. Folate's role has been postulated to be either via prevention of changes in DNA methylation or uracil misincorporation.

Objective – To investigate the effect of folic acid supplementation on colonocyte folate status and DNA biomarkers.

Design – Twenty individuals harbouring colonic adenomas were randomised to receive folic acid (600 μg daily) or placebo for 6 months post polypectomy. Systemic and colonocyte folate status was determined at baseline and following the intervention. Modified Comet assays were used to determine uracil misincorporation and global DNA hypomethylation at the site adjacent to the polyp and a site distal to the polyp.

Outcomes – Supplementation resulted in increased colonocyte folate, which approached significance, at the site adjacent to the polyp (P= 0.06) but not distal to the polyp (P= 0.36); correspondingly there was a reduction in uracil misincorporation at the site adjacent to the polyp (P = 0.02) and the distal site showed no such trend (P = 0.39). There were no significant changes in global DNA hypomethylation at either site post-intervention.

Conclusions – Folic acid supplementation resulted in increased colonocyte folate and decreased uracil misincorporation at the site of the adenoma but not distal to the adenoma. This supports the hypothesis that localised areas of folate deficiency may exist in human colonic mucosa which respond to folic acid supplementation through increasing colonocyte folate and improving folate-related DNA biomarkers of cancer risk.

Effects of dietary red and white meat, with and without high amylose maize starch, on colonic mucosal integrity

MA Conlon[1], S Toden[1, 2], AR Bird[1], DL Topping[1]

[1]*Food Futures National Research Flagship, CSIRO Human Nutrition, Kintore Avenue, Adelaide, SA 5000*

[2]*Discipline of Physiology, School of Molecular Science, University of Adelaide, Adelaide, SA 5005*

Background – We have previously carried out studies in rats which show that high levels of dietary protein, including cooked red meat, compromise colonic integrity by increasing DNA damage (single-strand DNA breaks) and by thinning the mucus barrier. Inclusion of starch in the diet which is resistant to digestion in the small intestine, termed resistant starch (RS), protected against these changes. The protection was highly correlated with increased production of short chain fatty acids (SCFA), especially butyrate, in the large bowel.

Objectives – To examine whether dietary cooked red or white meat had differential effects on colonic DNA damage and other markers of bowel health in rats and if RS provided protection.

Design – Rats were fed diets containing 15%, 25% or 35% of cooked beef or of chicken at levels to provide equivalent amounts of protein as beef both with or without 20% high amylose maize starch (HAMS; a source of RS) for four weeks. DNA single-strand breaks (SSB) and double-strand breaks (DSB) were measured in isolated colonocytes (by comet assay) along with apoptosis levels, colonic mucus thickness, large bowel SCFA, and phenols and cresols, as well as faecal bacterial population changes.

Outcomes – Both red and white meat increased colonocyte DNA SSB and DSB dose-dependently but damage was substantially greater with red meat. Dietary HAMS prevented these increases. Apoptotic cell numbers were increased dose-dependently by red meat irrespective of HAMS feeding. Apoptosis was unaffected by dietary white meat inclusion but was increased by HAMS. Red meat induced greater colonic mucus layer thinning than white meat but HAMS was protective in both cases. HAMS induced increases in large bowel SCFA, including butyrate, and significantly lowered concentrations of phenols and cresols.

Conclusions – We have demonstrated that dietary red meat causes greater levels of colonic DNA SSB and DSB than white meat, consistent with the epidemiological data. Dietary resistant starch protects against this damage and also against loss of the mucus barrier, probably through increased butyrate production.

Concurrent Session 3: Immune Function, Cancer, Type 2 Diabetes

The effect of high protein diets in the treatment of type 2 diabetes

R Smith[1], E Maclean[2], N Mann[1], J Shaw[2]
[1]School of Applied Sciences, Food Science Department, RMIT University, Victoria, 3001
[2]International Diabetes Institute, Caulfield, Victoria, 3162

Background – Short term dietary studies suggest that high protein diets enhance weight loss and improve glycemic control in people with type 2 diabetes. However, the long term effects of these diets are unknown.
Objective – To determine if high protein (HP) diets are superior in the long term to conventional high carbohydrate (HC) diets in controlling diabetes and weight.
Design – Ninety nine subjects with type 2 diabetes (BMI 27-40 kg/m^2, aged 30-75 yrs, HbA1c 6.5-10%) were recruited for a 12 month, randomised dietary intervention trial. The experimental treatment was a HP diet (30% protein, 40% carbohydrate 30% fat) and the control situation was a HC diet (55% carbohydrate, 15% protein, 30% fat). Both diets recommended carbohydrates of low glycemic index and were restricted in energy (~6400 kJ) for the initial 3 months. Subjects attended regular visits (0, 3, 6 ,9 and 12 months) for blood tests and weight measurements. Analyses were performed on an intention-to-treat basis, and study outcomes were compared using repeated measures ANOVA.
Outcomes – Body weight decreased significantly over time for both groups [-2.23 ± 0.52 (mean ± SEM) kg for HP group and -2.17 ± 0.63 kg for HC group at 12 months, $P<0.001$ for time], however there was no significant difference in the time course between groups ($P=0.93$, group × time effect). Both groups also showed similar improvements in HbA1c, serum triglycerides, total cholesterol and HDL cholesterol. Changes over time in serum creatinine and 24 hr urinary albumin excretion were not significantly different between groups.
Conclusions – These findings suggest that both diets may provide useful long-term strategies for weight reduction, and improvements in glycemic control and dyslipidemia. Consequently, energy restrictive, high protein diets may present a suitable alternative strategy for the dietary management of type 2 diabetes.

Effect of diacylglycerol on risk factors of type 2 diabetic patients

D Li[1], TC Xu[1], H Takase[2], I Tokimitsu[2], PH Zhang[3], QQ Wang[3], XM Yu[4], AZ Zhang[3]
[1]Department of Food Science and Nutrition, Zhejiang University, Hangzhou, China 310029
[2]Health Care Products Research Laboratories, Kao Corporation, Tokyo, Japan
[3]School of Medicine, Zhejiang University, Hangzhou, China 310009
[4]Department of Clinical Laboratory, Zhejiang Hospital, Hangzhou, China 310013

Background – Diacylglycerol oil (DAG) has been shown to lower postprandial and fasting serum triacylglycerol levels and reduce body fat. We hypothesised that DAG will have a beneficial effect on type 2 diabetes mellitus (DM) patients.
Objective – To investigate the effect of DAG on risk factors of type 2 DM and cardiovascular disease in type 2 DM patients.
Design – This was a double-blinded controlled parallel study with 127 type 2 DM patients (aged 40 to 65) recruited in Hangzhou, China. All subjects consumed triacylglycerol oil (TAG) in the lead-in period (14 days), then they were randomly divided into two groups and consumed DAG or TAG with a similar fatty acid composition (25g/d) for 120 days. Blood samples were collected on day 0, 60 and 120 and risk factors of type 2 DM and cardiovascular disease and biochemical parameters were measured by standard methods.
Outcome – There were a total of 112 subjects who completed the study. Diet intake did not differ significantly between groups. Body weight, BMI, waist circumference, HOMA-IR, serum insulin and leptin levels were significantly reduced from baseline in the DAG group but not in the TAG group. Serum glucose was also significantly improved in patients with higher glucose levels at baseline (>7.00 mmol/L) in the DAG group. Parameters of liver and kidney functions and essential fatty acids in serum phospholipids did not differ between groups.
Conclusions – DAG consumption improved biomarkers and anthropometric parameters of type 2 DM compared with TAG consumption. DAG is safe for type 2 DM patients and has an equivalent bioavailability as TAG in relation to providing essential fatty acids.

Concurrent Session 3: Immune Function, Cancer, Type 2 Diabetes

Wholegrains and the prevention of colon cancer

GH McIntosh
Department of Medicine, Flinders University of SA, Adelaide, South Australia 5000

Background – Wholegrain food consumption has been associated with reduced risk of a number of degenerative diseases, including cancers of the stomach, large bowel, breast and prostate. In our westernised societies cereal grain foods are still a significant component (a staple), but wholegrain use tends to reflect a diet-health conscious minority. The "mediterranean diet" with its good intakes of cereal grain foods along with vegetables and fruits has been shown to contribute to the maintenance of good health and longevity.
Objective – to review the evidence regarding wholegrain consumption, dietary fibre and colon cancer and look for possible mechanisms.
Results – Grains are the major contributor of dietary fibres to our diet, and can be a marker of wholegrain consumption. Relative risk reductions of 25-50% for colorectal cancers have been observed with wholegrain food consumption, when present in reasonable amounts as part of a balanced diet. Dietary fibre intakes of the order of 25 to 35g/day have been associated with this protective effect. A halving of colon cancer incidence with high consumption of wholegrains and/or dietary fibre has recently been reported recently from cohort studies in Sweden, Europe and Japan.
The removal of significant sources of dietary fibre, along with some associated nutrients and phytochemicals, has created highly digestible energy sources, and exposed the population to hyperglycaemic influences and insulin resistance/metabolic syndrome, increasing risk of several degenerative diseases. Technological developments with refining of flours did not help; such refined cereal foods are now part of the problem. Our knowledge of what dietary fibres and phytochemicals, major and minor nutrients are capable of contributing to disease prevention is progressing. Also some factors may be released during food preparative (fermenting) procedures, or during colonic digestion via microbes involved in fermentation. There are produced potentially beneficial nutrients (vit Bs), benzoquinones and antiinflammatory factors.
Conclusion – There is good evidence for wholegrain foods offering protection against colon cancer. Individual and interactive influences of components need better understanding, but evidence to date suggests some significant influences are operating to benefit health.

Plenary 3: The Lifestyle Dilemma

Stemming the tide of the type 2 diabetes epidemic in New Zealand

Jim Mann
University of Otago, Dunedin, New Zealand

Predicted rates of type 2 diabetes in New Zealand suggest that around 150,000 people have been diagnosed with the condition. This number is expected to rise to around 180,000 by 2011. Many more have undiagnosed diabetes and prediabetes and are therefore at risk of developing the disease and its complications. It is generally assumed that the dramatic escalation in rates is associated with the increase in overweight and obesity. New Zealand-based research has demonstrated the potential of school and community-based interventions to reduce the risk of excessive weight gain in children and demonstration projects involving a range of strategies have been established in areas where a high proportion of the population are Maori, amongst whom diabetes rates are particularly high. A special enquiry of the Parliamentary Health Select Committee has reported on public health measures aimed at reducing the diabetes epidemic and other government measures support early detection of those with diabetes and prediabetes. The potential of lifestyle measures to stem the tide of the epidemic of type 2 diabetes and the likelihood of their being successful.

Reducing sedentary behaviour: another strategy for diabetes prevention in adults? The AusDiab Study

DW Dunstan
International Diabetes Institute, Melbourne, VIC, Australia

Background – There is now increasing interest in sedentary behaviour, as distinct from lack of physical activity, as an important contributor to poor health outcomes. Television viewing, a common leisure-time sedentary behaviour, has been linked to obesity, type 2 diabetes and, impaired glucose tolerance in adults.
Objectives – We examined the associations between self-reported TV viewing time and blood glucose levels across the glucose continuum from normal to diabetes levels in Australian adults. We also examined the associations of objectively-measured sedentary time with blood glucose in a sub-sample of participants.
Design – Measures of fasting and 2-hr plasma glucose and TV viewing time were obtained in 8,357 adults aged >= 35 years who were free from diagnosed diabetes and who attended the AusDiab Baseline Study in 1999/2000. Objectively assessed physical activity and sedentary time (assessed using accelerometers) was obtained in 2004/2005 in 173 (67 men, 106 women, mean age 53yrs) AusDiab participants.
Outcomes – TV viewing time was positively associated with 2-hr plasma glucose (p for trend: women=0.02, men=0.06). Similarly, sedentary time, measured objectively by accelerometers, was independently associated with higher 2-hr plasma glucose (b=0.29, 95% CI 0.11 to 0.48, p=0.002). No significant associations were observed with fasting plasma glucose and TV viewing or objective sedentary time measures. Importantly, both the self-reported and objectively measured sedentary behaviour findings were independent of moderate-to-vigorous intensity physical activity time and waist circumference.
Conclusion – These findings suggest that time spent both in leisure-time sedentary behaviours, and sedentary time across the day, may pose a unique health risk, irrespective of leisure-time physical activity levels. The implication for public health is that prevention strategies to address type 2 diabetes should focus not only on increasing physical activity levels, but also on decreasing sedentary behaviours, especially prolonged television viewing.

Plenary 3: The Lifestyle Dilemma

Our modern lifestyle – its effects on vitamin D status and health

RKR Scragg
School of Population Health, University of Auckland, Private Bag, Auckland

Background – Recent publications from New Zealand national nutrition surveys have reported lower than expected levels of serum 25-hydroxyvitamin D (25OHD), with mean levels being 50 nmol/L in both children and adults. These low levels are primarily the result of a modern lifestyle that is spent mainly indoors, resulting in much reduced sun exposure among modern urban populations compared to the outdoor agrarian lifestyle of our forebears. There is increasing evidence that low vitamin D status increases the risk of a range of chronic diseases, including osteoporosis, cancer, hypertension and diabetes. However, there is uncertainty among health professionals as to the serum 25OHD levels required for optimum health.
Objective – to review the epidemiological evidence on the association between blood 25OHD levels and risk of chronic disease.
Design – evidence from a range of epidemiological study designs, including cohort, nested case-control and cross-sectional studies is reviewed, including The Third National Health and Nutrition Examination Survey (NHANES III), a large cross-sectional survey representative of the general US population carried out in 1988-1994, in which about 19,000 participants had serum 25OHD measurements.
Outcomes – inverse associations exist between serum 25OHD levels and a range of diseases, including colon cancer, bone density, diabetes, hypertension, coronary heart disease and lung function. Disease risk is lowest in people with serum 25OHD levels above 80 nmol/L.
Conclusions – the current definition of vitamin D deficiency based on a blood 25OHD cut-point of 50 nmol/L is not supported by recent epidemiological evidence which suggests that 25OHD levels need to be above 80 nmol/L for optimum health. A range of public health strategies is required to increase vitamin D levels in the general population, including regular safe sun exposure (without getting burnt), fortification of food and increased availability of vitamin D supplements.

Concurrent Session 4: Dietary Interventions for Metabolic Syndrome & Obesity

***Shape up for Life*: a community-based diet and lifestyle program for metabolic syndrome**

TL Pettman[1, 2,3], GMH Misan[1,2,3], AM Coates[1,3], JD Buckley[1,3], PRC Howe[1,3]

[1]ATN Centre for Metabolic Fitness, [2]Spencer Gulf Rural Health School, Whyalla SA 5608, [3]Nutritional Physiology Research Centre, University of South Australia, Adelaide SA 5000

Background – Diet and exercise modifications are recommended to counteract obesity and the metabolic syndrome (MetS) but there is limited evidence of their feasibility and effectiveness in a community setting.

Objective – To conduct a randomised controlled community-based trial to evaluate sustainable effects of a 4-month combined diet (non-energy restricted) and physical activity intervention on body composition and metabolic health.

Design – 111 females and 42 males (mean age 45 years) with MetS (IDF criteria) were matched and randomly allocated to intervention (n= 103) or control (n= 50). The 4-month intervention comprised weekly education and peer support to increase physical activity (1 session/wk) and improve diet quality according to national guidelines. The latter focused on dietary fat, salt and glycemic index, aided by provision of healthy food samples. Weekly group exercise sessions were held to encourage additional physical activity. Controls maintained their customary lifestyle. Outcome measures included anthropometry and body composition (DXA), blood pressure and arterial compliance, fasting blood lipids, glucose and insulin and measures of physical fitness. Diet was monitored using food frequency questionnaires.

Outcomes – Data (mean ± SEM of change from baseline for intervention and control groups respectively) obtained from n= 120 participants who completed to 4 months reveal several significant improvements compared with the control group, including greater improvements in weight (-2.45 ± 0.42 vs -0.64 ± 0.54 kg, P=0.02), BMI (-0.94 ± 0.15 vs -0.25 ± 0.17 kg/m^2, P= 0.01), waist circumference (-4.4 ± 0.6 vs -1.2 ± 0.8 cm, P= 0.007), whole body fat mass (-2.18 ± 0.31 vs -0.51 ± 0.44 kg, P= 0.007), body percent fat (-1.29 ± 0.19 vs -0.15 ± 0.36%, P= 0.004), abdominal fat mass (-223 ± 26 vs -71 ± 38 g, P = 0.004) and mean arterial pressure (-1.5 ± 0.8 vs +2.0 ± 1.6 mmHg, P = 0.05).

Conclusions – Preliminary analysis demonstrates the potential of this combined lifestyle approach to counteract MetS.

Concurrent Session 4: Dietary Interventions for Metabolic Syndrome & Obesity

Comparison of weight loss over 18 months in overweight people randomized to a group encouraged to eat wholegrain foods and pulses or to a control group

BJ Venn[1], T Perry[2], TJ Green[2], CM Skeaff[2], W Aitken[2], JI Mann[2], A Wallace[3], A Bradshaw[2], RC Brown[2], K Doel[2], C Frampton[4], J Monro[3]

[1]*Food Safety Authority of Australia New Zealand, Wellington, NZ*

[2]*Department of Human Nutrition, University of Otago, Dunedin, NZ*

[3]*The New Zealand Institute for Crop & Food Research Limited, Lincoln & Palmerston North, NZ*

[4] *Christchurch School of Medicine and Health Science, University of Otago, Christchurch NZ*

Background – Observational studies suggest that consuming diets high in wholegrain foods and pulses are associated with a smaller weight gain over time. There are no long-term intervention trials in which a high consumption of wholegrain foods and pulses has been used as a strategy for weight loss in overweight people.

Objective – To compare two diets differing in wholegrain and pulse content on weight loss in overweight adults.

Design – A randomised-control parallel study of 18 months duration with 113 volunteers with a BMI $\geq$ 28kg/m^2. The intervention group was encouraged to consume wholegrain foods and pulses, the control group followed the New Zealand Food Pyramid. Intensive support was given and key foods provided during the first six months.

Results – At six months, the mean (SD) amounts of wholegrain consumed by the control and intervention groups were 34.7 (25.6) and 52.2 (24.6) g/d ($P < 0.001$); for pulses it was 23.5 (44.3) and 165.1 (86.6) g/d ($P < 0.001$), respectively. Mean (SD) weight loss at 6-mo was 7.6 (0.9) kg in the control group and 7.4 (0.8) kg in the intervention group; at 18-mo weight loss was 4.0 (1.8) and 5.2 (1.4) kg, respectively. There was no difference in weight loss between the two groups at either 6 or 18-mo ($P > 0.05$).

Conclusion – Both groups experienced substantial weight loss (~10%) during the trial but the diet that emphasised wholegrains and pulses was no more effective than a diet based on the NZ food pyramid.

This study was funded by FoRST (Contract C02X0401) and the Lifestyle Foods programme industry partners.

High protein diets decrease serum triacylglycerol, total and abdominal body fat in overweight and obese men and women with elevated triacylglycerol

PM Clifton[1], K Bastiaans[1], JB Keogh[1], M Noakes[1]

[1]*CSIRO Human Nutrition, Adelaide, SA 5000*

Background – High protein weight loss diets may have greater beneficial effect on markers of cardiovascular disease (CVD) risk than conventional low fat diets.

Objective – Our objective was to determine the effect of high protein compared to standard protein diets on weight loss, fat distribution and CVD risk markers in overweight & obese adults with raised triacylglycerol (TAG) concentration.

Design – Data from three randomised parallel design trials with subjects assigned to either a high protein (HP) or standard protein (SP) hypo-caloric diet (5500-6500kJ/day) for 12 weeks were pooled. Weight, body composition, lipids, insulin and glucose were measured before and after weight loss.

Outcomes – Data from 215 subjects (49.9 ± 9.8yr, BMI 33.5 ± 3.7 kg/m^2), 108 HP, 107 on SP were analysed. Weight loss (HP diet 7.82 ± 0.37kg; SP diet 7.65 ± 0.39kg) and total fat loss were not significantly different between groups. The reduction in TAG concentration was greater on HP, 0.48 ± 0.07 mmol/L than on SP 0.27 ± 0.06 mmol/L, ($P<0.001$). Subjects with serum TAG>1.7mmol/L at baseline lost more total (HP 6.17 ± 0.50 kg; SP 4.52 ± 0.52 kg, $P=0.012$) and abdominal fat (HP 1.92 ± 0.17 kg ; SP 1.23 ± 0.19 kg, $P=0.005$) on HP. Serum TAG concentrations were also decreased to a greater extent in these subjects ($P=0.004$) on HP (0.99 ± 0.15 mmol/L, 35%) than SP (0.54±0.10 mmol/L, 20%). Changes in HDL and LDL cholesterol were not different between the TAG groups. There were interactions between diet and TAG group for TC ($P=0.010$), between diet and insulin group (above and below median), for glucose ($P=0.046$) and between diet and IGT group (<6.1mmol/L vs >6.1mmoml/L) for LDL-C ($P=0.007$).

Conclusion – We conclude that high protein weight loss diets may have a beneficial effect on markers of CVD risk particularly in subjects with elevated TAG who lost more total and abdominal fat.

Concurrent Session 4: Dietary Interventions for Metabolic Syndrome & Obesity

Bowel, renal and bone health markers during weight loss on a high protein high red meat diet compared to an isocaloric high carbohydrate diet in overweight/obese men at 1 year

M Noakes[1], B Benassi[12], N O'Callaghan[1], G Brinkworth[1], J Keogh[1], A Bird[1], P Clifton[1], M Fenech[1]

[1]CSIRO Human Nutrition, Adelaide SA 5000

[2] Department of Physiology, University of Adelaide SA 5000

Background – Little data are available on the long term safety of high protein high red meat weight loss diets compared to high carbohydrate high fibre diets.

Objectives – To assess bowel, renal and bone health markers during weight loss on a high protein high red meat diet (HP) compared with a high carbohydrate diet (HC) in overweight/obese men.

Design – We randomised 123 overweight/obese men to one of two parallel isocaloric weight loss diets - HP (n=61) and HC (n=62). Blood samples, 24 hr urine, 24 hr faecal samples and rectal biopsies were collected at baseline, wk 12 and at wk 52. Diets were HP: 6.9±0.7(SD) MJ, protein 33±3%en (energy), carbohydrate 37±4%en, fat 27±3%en, fibre 30±6 g/day; red meat 300 g 4 times per wk and HC: 6.7± 0.6 MJ, protein 21±2%en, carbohydrate 51±4%en, fat 25±4%en, fibre 38±4 g/day; red meat <100 g per wk.

Outcomes – Completers (wk 12 n=111; wk 52 n=65) had similar weight loss on both diets: wk 12: 8.4±3.4%; wk 52:10.8±6.5%. Faecal weight, pH, moisture, short chain fatty acids, phenol/*p*-cresol excretion were not significantly different between HP and HC at wk 12 or wk 52. Faecal water genotoxicity did not differ by diet at wk 12 ($P>0.1$) or wk 52 ($P>0.4$). In rectal tissue cells, telomere length, **a** measure of genome stability**,** increased on HP and HC at wk 12 and wk 52 ($P<0.0001$). Increase in telomere length correlated with weight loss r=0.697, $P<0.01$. Bone mineral density at wk 52 decreased less on HP than HC ($P=0.002$). Creatinine clearance declined on both diets at wk 12 but did not differ by diet and at wk 52 was not different from baseline ($P<0.01$).

Conclusion – Weight loss on HP showed no short term or long term adverse effects on safety markers compared with HC.

Consumer understanding of the attributes and consequences of high protein foods

DN Cox, HJ Lease

CSIRO Human Nutrition, Adelaide, SA

Background – People have difficulty in sustaining diets for weight control. Behavioural decision making theory (1) suggests that cognitive decision making leads to improved intention - behaviour consistency. Furthermore a model (2) pertaining to "functional food" use, argues that both attribute and consequence knowledge of foods are required to sustain use. While foods that induce satiety may reduce food consumption at the next eating occasion, different macronutrients exert a hierarchical effect on satiety with considerable evidence suggesting that protein exerts the most satiety.

Objectives – To elicit knowledge (cognitions) of high protein foods.

Design – Randomly selected (current dieters or past dieters) adults (n = 226) answered a postal questionnaire.

Outcomes – The sample comprised of males (42%) and females (58%), who, by self report, were classified as overweight (43%) and obese (24%) with 34% reporting current use of diet for weight control and 14% reporting being on a high protein diet (general high protein diet, 7% and CSIRO Total Well Being Diet [TWD], 7%).

Unprompted, knowledge of high protein foods mostly comprised of growth, muscle repair and development. When focused upon weight control, knowledge of high protein foods in respect to satiety was modest although when forced to rate (19) food "functions" across food groups, 'satiety'; 'helps me eat less' and 'controls hunger' were rated generally high (and similar to high fibre foods) and grouped together in factor analysis. However, 'weight control' was rated low (absolutely and relative to other food groups, $P<0.05$) and was found to be a distinct factor suggesting a disconnection between the function of satiety and the consequence of weight control. Those reporting being on high protein or TWD had no greater knowledge than others.

Conclusions – Our results suggest that participants possessed "attribute knowledge" but not "consequence knowledge" indicating that there is incomplete knowledge with implications for consequent lack of sustained adoption of high protein foods for weight control.

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Concurrent Session 5: Functional Foods II

Relative glycaemic impact of foods determined by *in vitro* digestive analysis of potentially glycaemic carbohydrate

JA Monro[1], A Wallace[2], S Mishra[1], S Eady[2], JA Willis[3], RS Scott[3], D Hedderley[1]
[1]*New Zealand Institute for Crop & Food Research Limited, Palmerston North, New Zealand*
[2]*New Zealand Institute for Crop & Food Research Limited, Christchurch, New Zealand*
[3]*Lipid and Diabetes Research Group, Canterbury District Health Board, Christchurch, New Zealand*

Background – Relative glycaemic impact (RGI) is defined as glycaemic carbohydrate yield from digestion of a food intake, expressed as glycaemic glucose equivalents (GGE), that is, as the weight of glucose required to induce the same glycaemic response as the specified food quantity. It is a food property theoretically measurable *in vitro* to describe the relative glycaemic potency of foods.
Aims – To develop a method for *in vitro* digestive determination of relative glycaemic impact, and to establish the relationship between the GGE content of foods measured by the method, and by *in vivo* blood glucose responses.
Design – A method was developed to measure soluble sugar release from food carbohydrates during simulated gastric (pepsin-HCl) and then ileal (pancreatin/amyloglucosidase) digestion of foods, and used to measure the GGE content of 83 foods in 11 food groups. Glycaemic responses to the same foods were measured in human volunteers to allow comparison of *in vivo* and *in vitro* GGE values by linear regression and Bland-Altman methods analysis.
Outcomes – *In vitro* GGE values predicted *in vivo* GGE values for five of the food groups: breads (R^2 = 0.59, P<0.001), crackers/cakes/bars (R^2 = 0.77, P = 0.001), snack foods (R^2 = 0.93, P <0.001), fruits (R^2 = 0.79, P <0.001), and vegetables (R^2 = 0.60, P <0.001). The relationship was not significant for breakfast cereals, "sundry cereals", dairy-based foods and combination foods. The *in vitro* method had far greater precision than the clinical method, but a Bland-Altman analysis showed a consistent bias, with the *in vitro* method over-predicting *in vivo* GGE as GGE intake increased, in all food groups except breads.
Conclusion – *In vitro* digestive analysis has potential to provide an economical measure of the glycaemic potency of foods, but more research on modulators of glycaemic response is required to allow adjustment factors to be built into equations relating *in vitro* and *in vivo* determinations of glycemic impact. Then, high precision, state-independent *in vitro* values for RGI may be more useful than low precision, state-dependent *in vivo* values.

Glycaemic carbohydrates: standardisation of *in vitro* methods

JW Woolnough[1,2], JA Monro[1], T Bird[3,4], CS Brennan[1]
[1]*New Zealand Institute for Crop and Food Research Ltd., Palmerston North, New Zealand*
[2]*Institute of Food, Nutrition & Human Health, Massey University, Palmerston North, New Zealand*
[3]*CSIRO Human Nutrition, Adelaide, Australia*
[4]*CSIRO Food Futures National Research Flagship, North Ryde, NSW, Australia*

Background – *In vivo* methods for determining GI are slow, costly and hence unsuitable for routine analysis (e.g. for food product development purposes). An array of *in vitro* methods for the glycaemic analysis of foods currently exists, including our own high throughput *in vitro* method which is a precise and validated predictor of glycemic response to carbohydrate-based foods.
Objective – To quantify effects of differing conditions used by various *in vitro* carbohydrate digestion methods on the results they provide, in order to develop a robust, standardised method capable of economically measuring the glycaemic potency of foods with accuracy and precision.
Design – Relative effects of *in vitro* methodological variables on the rate and pattern of sugar release from five food types were measured. Variables included mode of food comminution, method of stirring, digestive enzyme concentrations and combinations, as well as pH, temperature and duration of enzyme incubations. The standard test foods used were wheat grains, lasagne, chick peas and potato, all boiled, and white bread.
Outcomes – Measurements of rapidly and slowly digestible, and resistant starch for the five foods differed depending on the mode of sample comminution, particularly for wheat and pasta. Pancreatin retained a high digestive capacity across a range of concentrations (0.001% - 2%), pH values (4 – 7), and beyond the duration (2 h) used to determine slowly digested starch, based on its capacity to digest additional substrate. An amyloglucosidase digestion needed to be used in conjunction with pancreatin but could be included as a secondary digestion of digesta aliquots.
Conclusions – Early work demonstrates that variation between methods can introduce significant differences in the in estimates of glycaemic potency that they yield. Hence, a thorough investigation of the parameters defining different steps in the determination of glycaemic potency by *in vitro* digestion is warranted before a robust and standardised method is decided on.

Concurrent Session 5: Functional Foods II

The effects of cocoa, coffee, tea and fenugreek on diet-induced obesity in mice

SA Cichello[1], DP Begg[2], M Jois[1], RS Weisinger[2]
[1]School of Life Sciences, [2]School of Psychological Sciences La Trobe University, VIC 3086

Objective – Previous studies have shown that many common drinks can influence the development of obesity and insulin resistance. The aim of the present experiments was to investigate the effects of cocoa, coffee, green tea and fenugreek, when incorporated into a high fat diet, on growth, body composition and insulin sensitivity of obesity-prone mice (C57BL/6J).
Design – Sixty 8-week old male C57BL/6J mice were housed individually and maintained on a high fat diet (21% fat) and randomly assigned to one of four treatment groups (cocoa, coffee, green tea or fenugreek; 2% of the diet w/w) or a control group (no addition to the diet). Body weight was recorded weekly and water and food intake recorded daily. A glucose tolerance test was performed at week 14 and body composition was determined at week 16 by dual-energy x-ray absorptiometry (DEXA). Mice were killed at week 18 and blood samples collected for analyses of plasma metabolites.
Outcomes – Weight gain by mice in the green tea group was significantly lower (20%) than that in the control group. Body composition analysis by DEXA showed that the mice in the green tea group had 18% higher lean mass and 38% lower fat mass when compared to control group. Neither the weight gain nor body composition was affected by cocoa, coffee or fenugreek. Glucose tolerance test showed no differences in any of the treatment groups when compared to control. Plasma non-esterified fatty acids concentration was significantly elevated (28%) in the green tea group consistent with increased lipolysis.
Conclusions – The results show that addition of green tea to foods may help prevent obesity induced by high fat diets.

The effects of dairy proteins and peptides on satiety in humans

SMS Chung[1], PJ Moughan[1], A Awati[1], HR Morton[2]
[1]Riddet Centre and Massey University, Palmerston North, New Zealand
[2]Institute of Food, Nutrition and Human Health, Massey University, Palmerston North, New Zealand

Background – It is widely believed that protein is more satiating than either carbohydrate or fat, which might improve compliance with energy restricted diets. The satiating effect of dairy proteins may be due in part to the peptides derived from them and their physiological actions relevant to food intake regulation. Such a candidate peptide is glycomacropeptide (GMP).
Objective – To investigate the effects of whey proteins and glycomacropeptide (GMP) on food intake and subjective appetite in healthy humans.
Design – The study was designed as a randomised crossover Latin Square design. On 4 separate days, fifty healthy subjects received a subject-specific standardised breakfast, an iso-caloric test drink (time 0) and lunch. The test drink consisted of maltodextrin carbohydrate (control), whey protein isolate (WPI) with no GMP, WPI with naturally present 21% GMP (21% GMP WPI) or 21% GMP WPI and added GMP. Appetite profile was determined using visual analogue scales (VAS) and subsequent food intake was measured at the lunch meal (cafeteria method).
Outcomes – Subjects consumed a similar amount of food during lunch after the 4 drinks although there was a tendency within the females towards a lower food intake at the highest GMP level. The VAS data (0-30 min) indicated that the GMP-containing drinks induced a lower appetite and a greater feeling of fullness ($P<0.05$) compared with the WPI with no GMP.
Conclusions – Dairy proteins and GMP appear to influence satiety over a short-term period. Further studies are needed to understand the role of dairy proteins and peptides in the regulation of food intake with more focus on satiety hormones.

Concurrent Session 5: Functional Foods II

Small intestinal digestion of dietary FODMAPs and effects on luminal water content

JS Barrett, RB Gearry, PM Irving, JG Muir, ML Haines, PR Gibson
Departments of Medicine & Gastroenterology, Box Hill Hospital, Box Hill, Victoria 3128

Background – FODMAPs (Fermentable Oligo-, Di-, Mono-saccharides And Polyols) are a newly described group of poorly absorbed, short-chain carbohydrates and include; fructose, lactose, fructans, galactooligosaccharides and sugar alcohols. Fructans (eg. inulin) are prebiotic with putative health benefits. Our research group has provided recent evidence that FODMAPs may exacerbate symptoms in irritable bowel syndrome (IBS). Malabsorbed FODMAPs are rapidly fermented and are osmotically active, leading to luminal distension of the distal small bowel and proximal colon, a stimulus for IBS symptoms. However, the proposed mechanism(s) by which FODMAPs exert their effects are untested.
Objectives – To determine the digestive and absorptive capacity of FODMAPs in the human small intestine and define their effect on the volume and nature of ileal effluent
Design - 12 patients with an ileostomy, but no clinical evidence of small intestinal disease undertook two 4-day dietary periods, comprising diets differing only in FODMAP content (high vs low), with at least 14 days washout between. All food was provided. The ileal effluent was collected during waking hours (14 h) on the last day of each diet. The FODMAP content of the diet and effluent was measured by enzymatic and HPLC methods.
Outcomes – The high FODMAP diet significantly increased total output weight by 19% (P = 0.01). This additional weight was contributed by greater water volume (P=0.01) and dry weight (P=0.03), demonstrating the poor absorption and osmotic activity of FODMAPs.
Conclusions – Data support the hypothetical mechanism of action of FODMAPs. A high FODMAP diet is recommended for the general population considering the known benefits of fermentation including prebiotic effects, laxation and short chain fatty acid production. However, a reduction of dietary FODMAPs is suggested for managing IBS symptoms.

Vitamin D_3 fortified milk improves nutritional status in Australian aged care residents

J Grieger, CA Nowson
School of Exercise and Nutrition Sciences, Deakin University, Burwood, VIC 3125

Background – Nutrient status could be improved through use of nutritional supplements or consumption of nutritionally enhanced foods. While low intakes of calcium, folate and vitamin D frequently occur in Australian aged care residents, it is not known if fortified foods can improve nutritional status in this population.
Objective – To determine whether consumption of milk fortified with calcium, vitamin D and folate for six months improves nutritional status in a group of Australian aged care residents
Design – One hundred and seven subjects (61% female) with a mean (SD) age of 79.9 (10.1) years, completed the study. Fortified milk containing (per 100 mL) calcium 190 mg, cholecalciferol vitamin D 5 μg and folate 75 μg, was provided for use in tea, coffee, milk drinks and with cereals. Fasting blood samples, measurement of body weight, muscle strength, mobility and bone quality were performed at baseline and six months and assessment of dietary intake and milk intake was performed throughout the study.
Outcomes – The median milk consumption over the study period was 160 mL/d (range, 0-989 mL/d). Serum 25(OH)D increased from 30 ± 2 (mean ± SEM) to 45 ± 2 nmol/L (P<0.001) and folate from 19 ± 15 to 21 ± 13 nmol/L (P<0.001). Consumption of fortified milk ≥ 150 mL/d (n = 56) raised serum 25(OH)D into the adequate range, 45 (19) nmol/L, and PTH was 23% lower in this group (P<0.05). No effect on bone quality, muscle strength or mobility was observed.
Conclusions – Supplementation of fortified milk can be a useful strategy to improve nutritional status, and may be useful adjunct to other strategies required to improve nutritional status in this group. Larger a longer term studies, are needed to assess the impact of fortified foods on risk of falls and/or fracture and quality of life.

Concurrent Session 6: Micronutrients

Being outdoors is good for bones - the skeletal response to sunlight deprivation

S Iuliano-Burns[1], J Ayton[2], G Jones[3], E Seeman[1]
[1]*Endocrine Centre of Excellence, University of Melbourne / Austin Health, VIC 3081*
[2]*Polar Medical Unit, Australian Antarctic Division, TAS, 7050,*
[3]*Menzies Research Institute, TAS, 7000*

Background – Insufficient sunlight exposure results in decreased serum 25(OH) vitamin D levels and increased parathyroid hormone (PTH) and bone turnover. For reasons not well understood, the bone loss that follows appears to be confined to cortical bone, sparing trabecular bone. This regional specificity may account for the increased risk for hip fractures with vitamin D deficiency.
Objective – To investigate the site-specificity of the skeletal response, and the magnitude of the endocrine changes to decreased vitamin D, we used Antarctic expeditioners as a model for sunlight deprivation as UV exposure is limited for the majority of the expedition.
Design – Fifty-nine healthy expeditioners (mean age 42.5 yrs, range 20-62 yrs) provided blood samples and had lumbar spine (LS) and femoral neck (FN) region bone mineral density (BMD) assessed using densitometry (DXA) before departure and on return from Antarctica one year later. An additional blood sample was taken, and dietary intake assessed mid-expedition. Serum samples were tested for vitamin D, PTH, and calcium (normal and adjusted). Changes over time were determined using repeated measures ANOVA, with adjustments for multiple comparisons.
Outcomes – Vitamin D and serum calcium (unadjusted) were lower ($P < 0.01$) and PTH higher ($P < 0.09$) at 6 and 12 months compared to baseline. BMD at the trochanteric, inter-trochanteric, and total hip regions, but not the LS (-0.4% NS) were 1-2% lower at 12 months than baseline ($p < 0.05$). When all data were pooled, inverse relationships were observed between vitamin D and PTH ($r = - 0.23$, $P < 0.01$), and PTH and calcium (normal and adjusted) ($r = - 0.22$, $P < 0.01$), and BMD ($r = - 0.19 - 0.22$, $P < 0.06 – 0.09$). By expedition end, 90% of expeditioners were vitamin D deficient. A baseline vitamin D of > 100 nmol/l was needed to maintain adequacy for the expedition.
Conclusions – Limited sunlight exposure in normal healthy adults results in a rapid decline in vitamin D and a concomitant reduction in BMD at predominantly cortical sites. Without nutritional sources of vitamin D it is unlikely that vitamin D adequacy can be maintained. If BMD losses are not reinstated following repetitive periods of prolonged sunlight deprivation then such individuals may be at heightened risk of hip fractures.

Vitamin D status of South Asian women living in New Zealand

PR von Hurst, W Stonehouse, MC Kruger, J Coad
Institute of Food, Nutrition & Human Health, Massey University, Auckland, New Zealand

Background – A role for vitamin D deficiency is implicated in an ever-increasing list of diseases, including the conditions associated with metabolic syndrome. South Asian populations in New Zealand and abroad, have demonstrated low levels of serum vitamin D, and increased rates of type 2 diabetes and cardiovascular disease.
Objective – To determine the serum 25-hydroxyvitamin D [25(OH)D] levels of South Asian women living in Auckland, New Zealand, and to investigate attitudes to sun exposure.
Design – 189 women, aged 20-plus years and of South Asian origin living in Auckland, NZ, were tested for serum 25(OH)D. They also completed a questionnaire about attitudes to sun exposure. Exclusion criteria included taking vitamin D supplements > 1000 IU/day. Deficiency cut-offs were based on the position statement of the Australia New Zealand Bone and Mineral Society.
Outcomes – Only 17.5% of this group had sufficient serum 25(OH)D concentrations (>50nmol/L), while 11.1% demonstrated severe deficiency (< 12.5nmol/L), 28.0% moderate deficiency (12.5–25nmol/L) and 43.4% mild deficiency (25–50nmol/L). Of the 87 questionnaire responses available, 34 (39%) confirmed that they did not actively avoid the sun, whilst 22 (26%) named their main reason for avoiding the sun as NZ's Public Health messages. Only 2 women claimed to avoid the sun for cultural or religious reasons, 11 for specific health reasons, and 17 to avoid darkening their skin.
Conclusions – This data suggests that the South Asian population resident in New Zealand is at high risk of being vitamin D deficient. The remedy may lie in increased fortification of the food supply, or widespread supplementation, but the level of effective supplementation is yet to be determined.

Concurrent Session 6: Micronutrients

Evidence for marginal selenium deficiency in Tasmania?

JM Beckett, MJ Ball, IK Robertson
School of Human Life Sciences, University of Tasmania, Launceston, TAS 7250

Background – Tasmanian populations are hypothesised to be at risk of suboptimal selenium status. Sparse evidence from the field of veterinary science suggests historical deficiency problems in grazing animals. Human studies to date have been limited in nature and have provided conflicting results.
Objectives – The aims of this study were to determine the selenium status of a sample of northern Tasmanian adults as a pilot to a larger population study.
Design – A sample of 130 adults aged 20 – 78 yrs were recruited from the northern Tasmania region, an area hypothesised to be at risk of inadequate selenium intakes due to low soil content. Responses from a 121 item semi-quantitative FFQ, standard serving size data and food content data were used to produce dietary selenium intake estimates. Serum selenium levels were determined by graphite furnace atomic absorption and serum glutathione peroxidase activities by a spectrophotometric method (Randox Laboratories Ltd., United Kingdom).
Outcomes – Men had significantly higher estimated selenium intakes than women (P=0.003); mean (sd) intakes of men (n=55) were 95.4 (40.7) µg/day while women (n=75) consumed 75.9 (26.3) µg/day. Serum selenium levels were not significantly different between genders; mean serum selenium was 1.08 (0.19) µmol/L; 73% of subjects had serum selenium levels below 1.20 µmol/L, a level reported as a glutathione peroxidase maximal activity threshold. Accordingly, there was also a strong association between serum selenium and serum glutathione peroxidase (P <0.001). Current smokers and people under 35 years of age had lower selenium intakes and serum selenium levels.
Conclusion – Using these dietary estimates, greater than 85% of this cohort consume sufficient selenium as defined by EAR values. However, the biochemical results suggest that selenium intake is insufficient for maximal selenoprotein activity. There is increasing evidence that marginal selenium status may result in increased chronic disease risk. Further investigation into the selenium status of the Tasmanian population is warranted to identify groups that may be most at risk.

Tatura-Bio® Se increases plasma and muscle selenium, plasma glutathione peroxidase and expression of selenoprotein P in the colon of artificially-reared neonatal pigs

R Uglietta[1,3], PT Doyle[2], GP Walker[2], JW Heard[2], CM Leddin[2], GH McIntosh[4], GP Young[4], FR Dunshea[1,5]
[1] *Department of Primary Industries, Werribee, VIC 3030.*
[2] *Department of Primary Industries, Kyabram, VIC 3620.*
[3] *Swinburne University of Technology, Hawthorn, VIC 3123.*
[4] *Flinders University of South Australia, Bedford Park, SA 5042.*
[5] *The University of Melbourne, Parkville, VIC 3010*

Background – While Se intakes of Australian and New Zealand consumers are sufficient to ensure no overt signs of deficiency, the relatively low intakes may increase the risk for some cancers. However, Se supplementation is problematic, as high Se intake can be toxic, particularly if the source is inorganic. Protein-bound Se is more bioactive and less toxic than inorganic forms of Se and there is interest in delivering Se in organic forms in food products. The full value-chain approach was used to increase the Se content of milk by feeding yeast-bound Se to dairy cows and to produce a high-Se dairy supplement (Tatura-Bio® Se) for use in animal and clinical studies.
Objectives – To determine biomarkers of Se status in neonatal pigs consuming Tatura-Bio® Se.
Design - Neonatal pigs (n=20 at 2d of age were trained to drink cow's milk and after a further 3d, were randomly allocated to one of two milk replacers containing Tatura-Bio® Se (1070 µg Se/kg DM) or placebo product (135 µg Se/kg DM) their respective diets (up to 1.7 MJ/kg BW) and bleed and sacrifice times (0, 7, 14, 28 and 42 d of feeding). .
Outcomes – Plasma (52 v. 210 µg/L, P<0.001) and muscle (63 v. 463 µg/kg, P<0.001) Se and plasma glutathione peroxidase (0.124 v. 0.153 nmol NADPH oxidised/mg protein per min, P<0.001) were increased in pigs consuming Tatura-Bio® Se. Tatura-Bio® Se increased the colonic expression of selenoprotein P (+112%, P=0.06) while expression of colonic glutathione peroxidase was unchanged (P=0.15).
Conclusion – These data suggest that dietary Se as Tatura-Bio® Se, a high-Se dairy supplement, can improve biomarkers of Se status and may be a useful means of increasing Se intake and reducing colonic cancer risk in humans.

Concurrent Session 6: Micronutrients

Thiamin status during pregnancy and pregnancy outcome

L Brough[1], GA Rees[2], MA Crawford[3]
[1]*Institue of Food Nutrition and Human Health, Massey University, Palmerston North, NZ*
[2]*School of Biological Sciences, University of Plymouth, UK*
[3]*Institute of Brain Chemistry and Human Nutrition, London Metropolitan University, UK*

Background – Thiamin requirements increase during pregnancy. Inadequate thiamin status has been demonstrated amongst low income, ethnically diverse pregnant women in the UK. During the first trimester of pregnancy thiamin intake has been associated with birth weight and thiamin status has been correlated with gestational age at birth.
Objective – To determine thiamin status during pregnancy in a low income, ethnically diverse population. To investigate the effect of supplementation on thiamin status and the effect of thiamin status on birth outcome.
Design – Women were recruited at their first antenatal (booking) appointment in East London. Venous blood was obtained from women at booking (n=208) and 34 weeks gestation (n=66). Participants took either a multiple-micronutrient supplement (containing 3mg thiamin) or placebo daily. Thiamin diphosphate (TDP) in whole blood was calculated after directly measuring TDP in red blood cells using HPLC coupled with a spectrofluorimeter and reagent kit. Gestational age was determined by ultrasound scan.
Outcomes – At booking 12% of participants were thiamin deficient (TDP in whole blood <66.5 nmol/l). Significant differences were seen in TDP levels by ethnicity (P<0.001; ANOVA); *post hoc* analysis (Scheffe) showed Caucasians had significantly higher mean TDP levels than Asians (P =0.018) and Africans (P <0.001). At 34 weeks gestation participants receiving the treatment had a higher mean TDP than those receiving placebo (100.3 vs. 88.7 nmol/l), although not significant. By 34 weeks gestation the proportion of women who were thiamin deficient increased to 24% (32% vs. 20% for placebo and treatment groups respectively). Spearman's rank correlation showed gestational age at birth was weakly, positively correlated with TDP levels at booking (P =0.037, r=0.152) and 34 weeks gestation (P =0.006, r=0.342).
Conclusions – Inadequate thiamin status exists within this low income, ethnically diverse population and ethnic differences are seen in thiamin status. Supplementation appears to improve thiamin status. Thiamin status may play a role in length of gestation, but this needs further investigation.

Could low population iodine intake be identified using neonatal TSH surveillance results?

IK Robertson
School of Human Life Sciences, University of Tasmania, Locked Bag 1320, Launceston TAS 7250

Background – Iodine intake in the Tasmanian population is potentially deficient. Adequate intake has been maintained in recent decades by intentional and unintentional supplementation. In the 1990s, an episode of unintended deficiency occurred as detected by urinary iodine testing in samples of school students, later reversed by opportunistic advice by obstetricians to expectant mothers (2000 to June 2002) and a program of use of iodised salt by bakers responsible for 80% of commercial bread production in Tasmania (July 2002 onwards). The question arose as to whether this episode of deficiency could be detected by the neonatal TSH surveillance program results.
Objective – To estimate the differences in the distribution of neonatal TSH results between 1992 and 2005 to evaluate the utility of the neonatal TSH surveillance program as surveillance of population iodine intake.
Design – Census of all Tasmanian neonatal TSH results between 1992 and 2005. 3 periods were examined: 1992-1999 (no intentional iodine supplementation), 2000-June 2002 (intermittent antenatal advice) and July 2002 to 2005 (iodised salt in commercial bread). 2 neonatal age groups were analysed: 36-60 hours and 60-96 hours. Proportions of population above 5 mU/L were compared, and TSH values and CI95% for centiles (50^{th} to 99^{th}) were estimated, for the 3 time periods and 2 age groups.
Outcomes – Proportions of population above 5 mU/L were 10.8% (CI95% 9.3%-12.5%), 9.3% (7.9%-11.1%) and 7.6% (6.4%-9.0%) (P <0.001) in the 3 time periods. TSH levels at centiles above 90^{th} were significantly higher at age 36-60 hours in 1999 compared to 2000 to 2005: eg 90^{th} centile for 1992-1999 was 5.2 (CI95% 4.91-5.49), for 2000-June 2002 was 4.9 (4.56-5.24; P =0.11) and for July 2002 to 2005 was 4.7 (4.39-5.01; P =0.006); 95^{th} centile for 1992-1999 was 6.8 (6.25-7.35), for 2000-June 2002 was 6.2 (5.62-6.78; P =0.061) and for July 2002 to 2005 was 5.7 (5.13-6.27; P =0.001); 99^{th} centile for 1992-1999 was 10.4 (7.59-13.2), for 2000-June 2002 was 9.6 (6.72-12.5; P =0.60) and for July 2002 to 2005 was 8.0 (5.22-10.8; P =0.183). No clear difference was found at ages 60-96 hours.
Conclusions – TSH level distributions at times corresponding to different population iodine intakes were distinguishable by the neonatal TSH surveillance results. The neonatal TSH surveillance program would provide extended coverage of a population more sensitive to adverse effects of low iodine intake than the school students currently sampled, at minimal extra cost. Sub-population analysis would also be possible.

Concurrent Session 7: Cardiovascular Disease

Working with the food industry to reduce health inequalities: A case study on sodium reduction in bread

N Jayasinha, D Monro
The National Heart Foundation of New Zealand

Background – New Zealanders consume excessive amounts of sodium in their diet. Given the strong association between high sodium intake and high blood pressure, the Heart Foundation in partnership with the food industry, has begun a campaign to reduce sodium levels in bread. The target nutrient and food category is the result of a literature review and gap analysis which considered foods consumed by New Zealanders, nutrients implicated in cardiovascular disease and global food formulation interventions focusing on improving the nutrient profile of commercially prepared foods. This initiative is part of a wider project funded by the Ministry of Health.
Objective –To work with bread manufacturers to reduce sodium levels to at least 450mg/100g of bread.
Design – The Heart Foundation has presented a compelling proposition to bread manufacturers and enlisted other key stakeholders who can support the intervention. The proposition included the public health problem, the basis for targeting specific branded foods, nutrient reduction targets, success stories from other parts of the globe, impact on the food supply and the alignment of the sodium reduction initiative with calls of action from key public health organisations. Literature reviews, market audits, Nielsen scan data and an analysis of global food formulation interventions formed the basis of the case presented to key stakeholders.
Outcomes – Since May 2007 several major bread brands have been successfully reformulated and introduced to the market. The target was set at a level that meets technological, food safety and sensory requirements and helps achieve high sector uptake. This target is also in line with other successful international salt reduction initiatives focusing on bread. 60 tonnes of salt will be removed from the food supply by reformulating just 12 chosen bread lines in the first phase of the campaign. Major bread manufacturers are committed to drive this change across most of their breads.
Conclusions – To date bread companies have responded to calls of action from the public health sector to voluntarily reduce salt levels despite the absence of commercial gains. A compelling proposition, a framework for a staged nutrient reduction programme and proposing viable targets have been key success factors.

Effect of a low sodium, DASH diet, including red meat on blood pressure in post-menopausal women

CA Nowson, N Wattanapenpaiboon, A Pachett
School of Exercise and Nutrition Sciences, Deakin University, Burwood, VIC 3125

Background – The DASH type dietary pattern which consists of high fruit, vegetable and dairy products and low saturated fat, is "base-producing" but restricts red meat with no clear justification.
Objective – To compare the BP-lowering effect of Vitality diet (VD), a moderately low sodium, "base" producing modified DASH diet, containing 6 serves/week of lean red meat to a " high carbohydrate, low fat diet (HCLF diet), with a higher dietary acid load in post-menopausal women.
Design – Ninety-five hypertensive post-menopausal women (46 VD and 49 HCLF) completed a 14-wk randomised parallel study. Home BP was measured daily. Repeat 24-h dietary records and 24-h urine samples were collected fortnightly. Dietary acid load, expressed as potential renal acid load (PRAL), was calculated from nutrient intakes.
Outcomes – During the intervention, the VD group had an average daily consumption of 85 g cooked red meat. They had a mean (± SEM) reduction of 38 ± 7 mmol/d in urinary sodium excretion (P <0.0001), and a 7 ± 4 mmol/d increase in urinary potassium (P = 0.0681), with an estimated 23.1± 2.3 mEq/d lower PRAL than the HCLF group (P <0.0001). The fall in systolic pressure in the VD group tended to be greater by 3 ± 2 mmHg (P = 0.08) than the fall in systolic pressure seen with the HCLF diet. A greater BP-lowering effect of VD was observed among those taking anti-hypertensive medication (n = 17) with a greater 5.5 ± 2.7 mm Hg (P = 0.0518) reduction of systolic BP and greater reduction in diastolic BP by 3.6 ± 1.7 mm Hg (P = 0.0388) compared to the HCLF diet. However, no relationship between BP and PRAL was observed.
Conclusions – A low sodium DASH type dietary pattern with the inclusion of lean red meat was effective in reducing BP in post-menopausal women, particularly in those taking anti-hypertensive medication. This dietary pattern could be recommended for this group who are at increased risk of cardiovascular disease.

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Concurrent Session 7: Cardiovascular Disease

Modification of the sodium, potassium, calcium and magnesium content of commonly consumed foods reduces blood pressure in hypertensive South Africans

KE Charlton[1], K Steyn[2], NS Levitt[3], N Peer[2], D Jonathan[2], T Gogela[2], N Gwebushe,[4] CJ Lombard[4]
[1]ARC Smart Foods Centre, University of Wollongong, NSW 2522, Australia
[2]Chronic Diseases of Lifestyle Unit & [3]Biostatistics Unit, Medical Research Council, Tygerberg 7505, South Africa
[4]Division of Diabetes and Endocrinology, Department of Medicine, University of Cape Town, South Africa

Background – There is now international consensus that countries around the world need to urgently adopt national approaches to reduce the salt content of foods and that co-operation of the food industry is required for this purpose.
Objective – To assess the impact of a community-based dietary intervention on blood pressure (BP) in men and women aged 50 - 75 y with drug-treated mild-to-moderate hypertension (BP ≤ 160/95 mmHg) in Cape Town, South Africa.
Design – Randomized, double blind, parallel group controlled trial. Subjects were allocated to a control group (n = 40) or a reduced Na, increased K, Mg, and Ca diet group (n = 40) for 8 weeks. The intervention diet comprised provision of 6 commonly consumed food items (salt replacement (Solo™), bread, margarine, stock cubes, soup mixes, flavour enhancer) with a modified electrolyte content, and 500 ml/day of fermented milk product (maas). Control diet was standard commercial composition of these foods in similar quantities. Artificially sweetened cooldrink replaced maas.
Outcomes – Between-diet difference in change in office blood pressure was -6.19 (SEM = 2.64) mmHg (*P*=0.021) for systolic BP and -0.60 (1.22) mmHg for diastolic BP. Mean 24-h ambulatory blood pressure monitoring (ABPM) between-diet change was -4.53 (2.27) mmHg (*P* = 0.050) for systolic BP and -2.49 (1.34) mmHg (*P* = 0.066) for diastolic BP.
Conclusions – An 8-week dietary intervention, in which high salt foods with modified Na, K, Mg and Ca content are provided, together with a fermented milk drink, resulted in clinically significant reductions in BP in treated hypertensive patients from a low socioeconomic setting. The food industry-academia approach is in line with the strategy recommended by the World Action on Salt and Health initiative.

Does dairy consumption increase risk of cardio-metabolic disease?

KJ Murphy, KA Boyd, AM Coates, TL Pettman[1], C Milte, GMH Misan[1], JD Buckley, PRC Howe
Nutritional Physiology Research Centre and ATN Centre for Metabolic Fitness, University of South Australia, Adelaide SA 5001 and [1]Spencer Gulf Rural Health School, Whyalla SA 5608

Background – The relationship between saturated fat and blood cholesterol and risk of cardiovascular disease has impacted negatively on consumer perception of dairy as a healthy food. However, a number of epidemiological studies, observational studies and intervention studies have independently shown that dairy intake can improve cardiovascular disease (CVD) risk factors such as obesity, blood pressure and dyslipidemia (1).
Objective – To explore relationships between consumption of dairy macronutrients and cardio-metabolic risk factors.
Design – A retrospective cross-sectional analysis was undertaken with data from food frequency questionnaires and assessments of fasting blood lipids and glucose, blood pressure and body composition obtained at baseline from 187 overweight or obese individuals enrolled in clinical trials. Linear regression analyses were controlled for age, gender and total energy intake. Statistical significance was set at P<0.015 to allow for multiple comparisons.
Outcomes – There was a positive relationship between total fat intake and BMI but no relationship between total or saturated fat from dairy and BMI or any other cardio-metabolic risk factor. No relationship existed between total intake of protein and any risk factor. However, dairy protein as a proportion of total protein was negatively related to BMI (ß= -0.11, *P*=0.014, n=187), % body fat (ß= -0.26, *P*=0.012, n=122) and waist circumference (ß= -0.20, *P* = 0.003, n=122). These data indicate that an increase in the contribution of dairy from 20% to 25% of total protein intake would be associated with a 1.0 cm reduction in waist circumference, which equates to a 2% decrease in the relative risk of a CVD event[2].
Conclusion - These data provide further evidence that consumption of dairy may reduce, rather than increase, the risk of metabolic disease.

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Concurrent Session 7: Cardiovascular Disease

Cardiovascular disease risk in women of South Asian origin in Auckland, New Zealand

W Stonehouse, LJ King, PR von Hurst, C Matthys, C Conlon, J Coad
Institute of Food, Nutrition & Human Health, Massey University, Auckland, New Zealand

Background – Hospitalisation and mortality due to cardiovascular disease (CVD) in South Asian women in New Zealand exceed those from women in the total New Zealand population. Little is known about the risk factors responsible for the increased CVD risk in this fast growing population of New Zealand.
Objective – To investigate the risk factors for CVD in women of South Asian origin living in Auckland, New Zealand.
Design – Cross-sectional data were collected from 224 South Asian women aged >20 years. The subjects were recruited throughout Auckland with a strong focus on Central and South Auckland where the majority of the South Asian community reside. Subjects using medication for diabetes were excluded.
Outcomes – The women's mean (±SD) age was 41.2 ± 10.3 years, they were highly educated (75% ≥ 15 years of education) and 79% of the women have been residing in New Zealand for ≤10 years. Overweight and obesity were prevalent in 72% (BMI ≥23 kg/m^2), central obesity in 30% (waist circumference ≥ 85 cm), waist/stature ratio was increased in 51% (>0.5), TC/HDL-C was increased in 22% (≥4.5), triglyceride concentrations were increased in 20% (≥1.7 mmol/L, 150 mg/dL), hypertension was prevalent in 19% (SBP ≥140 mmHg and/or DBP ≥90 mmHg) and metabolic syndrome in 17% (according to the International Diabetes Federation (IDF) criteria for South Asians), 51% of women had HOMA-insulin resistance (IR) values ≥1.9 and 10% ≥4. Very few women smoked (n=2) and most abstained from alcohol consumption (92%). BMI and waist stature ratio were significantly ($P \leq 0.05$) correlated (controlling for age and years of education) with HOMA-IR (R = 0.51 and 0.46), HDL-C (R = -0.29, -0.31), TC/HDL (R = 0.25, 0.29), triglycerides (R = 0.25, 0.24), systolic blood pressure (R = 0.27, 0.27) and diastolic blood pressure (R = 0.38, 0.31).
Conclusions – The overall prevalence of most risk factors was high, with BMI and waist/stature probably playing an important role in the increased risk. Strategies to improve the CVD risk profile of this population are urgently required.

Epigallocatechin gallate lowers the serum lathosterol to squalene ratio, a novel index of cholesterol synthesis, in the hypercholesterolaemic rabbit model

N Naumovski, PD Roach
School of Environmental and Life Sciences, University of Newcastle, Ourimbah, NSW 2258 Australia

Background – Epigallocatechin gallate (EGCG) is a major green tea catechin which is related to the reduction of plasma cholesterol in animal models possibly through inhibition of cholesterol synthesis. Consistent with this, *in vitro* studies have shown EGCG to be a non-competitive inhibitor of squalene epoxidase (1). *In vivo,* inhibition of squalene epoxidase could be expected to reduce, relative to squalene, the amount of lathosterol produced; lathosterol is a cholesterol precursor which is produced after squalene in the cholesterol synthetic pathway.
Objective – To determine the effect of EGCG on lathosterol relative to squalene in the hypercholesterolaemic rabbit.
Design – New Zealand White rabbits (n=12) were fed a rabbit chow with 0.25% (w/w) cholesterol for 2 weeks to render them hypercholesterolaemic. This was followed by a 4-week treatment period during which the control group (n=6) remained on the 0.25% (w/w) cholesterol diet while the treatment group (n=6) was fed the same diet plus 2% (w/w) EGCG added. Serum cholesterol (enzymatic), lathosterol (GC) and squalene (HPLC) were measured.
Outcomes – After the 4-week treatment period, serum lathosterol was significantly reduced in the treatment group compared to control (P=0.03) but the serum squalene did not differ between the groups (P=0.46). Therefore, the serum lathosterol to squalene ratio, a novel index of cholesterol synthesis, was significantly lower in the treatment group compared to control (P=0.03). The EGCG treatment also reduced serum cholesterol by 85% (P=0.02).
Conclusions – These *in vivo* results support the *in vitro* observation that EGCG is an inhibitor of sqalene epoxidase.
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Concurrent Session 8: Dietary Patterns and Intakes

Change in portion size and associated energy contribution of commonly consumed foods between the 1983 and 1995 Australian nutrition surveys

AM Rangan[1], SK Schindeler[2], IHE Rutishauser[3], TP Gill[1], K Webb[1]
[1] *NSW Centre for Public Health Nutrition, University of Sydney, NSW 2006*
[2] *NSW Department of Health, North Sydney, NSW 2059*
[3] *Faculty of Health, Medicine, Nursing and Behavioural Sciences, Deakin University, VIC3217*

Background – Increase in portion size is a potential contributor to increasing rates of overweight and obesity. However, little data are available in Australia examining changes in portion size over time.
Objective – To compare the portion size (i.e. the weight of a particular food consumed at one time) of commonly consumed foods in the1983 and 1995 national nutrition surveys, and to estimate the effect of any change in portion size on energy contribution.
Design – Database codes for foods commonly consumed in 1983 were matched as closely as possible with codes for the same foods reported in 1995. NUTTAB91/92 values were used to determine energy contribution (1). For both surveys the average portion size was determined by sex and age group (25-44, 45-64y). From these data the difference in portion size and the associated energy contribution, between 1983 and 1995, were calculated.
Outcomes – For two-thirds of the foods mean portion size was larger in the 1995 survey. On average portion size increased by 8-14% in all age/sex subgroups between 1983 and 1995. Some of the foods showing the greatest absolute increases in energy contributed from a single portion, in all subgroups, included white bread and rolls, breakfast cereal, rice, pasta, orange juice, fruit drinks, soft drinks, beer, wine, chicken and peanuts. Only a few foods, including beefsteak and oranges, showed a decrease in energy contribution by a single portion, across all subgroups.
Conclusions – The portion size reported by Australian adults for many commonly consumed foods has increased between 1983 and 1995.

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Dietary patterns among Australian women at different stages of the life-course

GD Mishra[1], SA McNaughton[2], WJ Brown[3], K Ball[2], GG Giles[4], AJ Dobson[1]
[1]*School of Population Health, University of Queensland, Brisbane, QLD 4006, Australia.*
[2]*Centre for Physical Activity and Nutrition Research, Deakin University, Melbourne, VIC 3125, Australia*
[3]*School of Human Movement Studies, University of Queensland, Brisbane, QLD 4072, Australia*
[4]*Cancer Epidemiology Centre, Cancer Council Victoria, Melbourne, VIC 3053, Australia*

Background – Food intakes and dietary patterns are known to vary with age but there has been little work investigating whether distinct dietary patterns exist at different stages of the life-course among women.
Objectives – To assess variations in dietary patterns between two age cohorts of Australian women and assess the variations according to socio-demographic and behavioural characteristics.
Design – Dietary intake was assessed using a 74-item food frequency questionnaire among women aged 50-55 years (n=10580; "mid-age") in 2001 and aged 25-30 years (n=7460; "young") in 2003, from the Australian Longitudinal Study on Women's Health. Dietary patterns were identified using factor analysis.
Outcomes – Five similar dietary patterns were identified for each age group. The main differences related to meat and fish consumption. Patterns emerging among the young women were labeled "*semi-vegetarian*", "*fruit*", "*vegetables & meat*", "*high fat foods and snacks*" and "*reduced fat dairy*". Among the mid-age women, the dietary patterns were labeled "*vegetables*", "*vegetarian*", "*fruit & fish*", "*high fats foods, snacks and meat"* and "*reduced fat dairy*". Dietary patterns among young women were associated with education and smoking status, whereas the patterns among mid-age women showed fewer associations and were more likely to be associated with region of residence. For both the young and mid age women, the "reduced fat dairy" pattern was associated with physical activity.
Conclusion – Future follow-up of these cohorts will help identify whether these differences are age or cohort effects and the impact of these differences on chronic disease outcomes.

Concurrent Session 8: Dietary Patterns and Intakes

Degree of balance of televised health promotion in New Zealand

JD Pérezgonzález
School of Aviation, Massey University, PO Box 11222, New Zealand

Background – Society is growing more conscious of the benefits of a balanced lifestyle. Notwithstanding this, information and persuasion through televised advertising may not be reflecting such balance, thus promoting a health climate biased towards a particular lifestyle (i.e. health climate).
Objective - To establish a baseline of the advertising balance offered in New Zealand's free-to-air television as a precursor of the health climate which is both reflected and promoted by such advertising.
Design – An estimated 230 hours of observations of health advertising were carried out on five free-to-air New Zealand television channels. Observations were statistically controlled by month, day and time as possible intervenient variables. The two main dependent variables were the type of product being advertised and the nutritional balance of specific food products. The main independent variable was the channel in which the products were advertised. Statistical analysis focused on means differences between channels by way of t-test analyses.
Outcomes – Health promotion in New Zealand is heavily unbalanced towards nutrition and in detriment of fitness. TV1 offers a significantly more balanced health climate than the remaining channels ($T>3.11_{(df\ 265)}$, $P<.01$), with a load of 85% of nutrition-related advertising, versus 15% of fitness-related advertising. Furthermore, when the nutritional balance of specific food products is analysed, results show that these food products are highly unbalanced for all channels (BNI=112 –in contrast, a balanced BNI=0). Significant differences among channels only appear when the amount of advertising is taken into account. In general, TV1, TV2 and TV3 advertise more products at a relatively low rate (ratio=1/5), and render a more balanced climate (BNI<111). These are significantly different to Channel 4 and Prime, which advertise less products at a higher rate and render a more extreme climate (BNI>139).
Conclusions – The existing marketing efforts in New Zealand reflect and/or sustain a health climate where nutritional content is advertised six times more often than fitness content. This nutritional content is not balanced, either. The 'quality' of the products is poor, although similar for all channels. However, it gets amplified by a differential advertising across channels. Overall, TV1, TV2 and TV3 seem to be the channels preferred by manufacturers and retailers, and tend to promote a less unbalanced health climate. Channel 4 and Prime, however, are the channels preferred by selected manufacturers and retailers, and offer the most unbalanced health climate.

Eating behaviour and biomarkers of nutritional status in young women

F Fayet[1], AS Truswell[1], P Petocz[2], J Franklin[3], I Caterson[1], S Samman[1]
[1] Human Nutrition Unit, University of Sydney, [2] Department of Statistics, Macquarie University, [3]Metabolism and Obesity Services, Royal Prince Alfred Hospital, Sydney

Background – Restrained eating behaviour is reported as an adaptation to limit weight gain or promote weight loss and is prominent amongst young women[1]. The effects of such behaviour on key biochemical markers of nutritional status are not known.
Objective – To investigate biochemical markers of nutrient status and eating behaviour in women.
Design – Females (n=308; age 22.6 ± 3.8y; BMI 21.4 ± 3.2 kg/m^2; mean ± SD) were recruited to participate in a cross-sectional study. Inclusion criteria were: existing enrolment at The University of Sydney, not taking any medication, and when applicable, cessation of nutritional supplements. Blood samples were obtained and analysed for biomarkers of iron, folate and vitamin B12 status, and the concentration of homocysteine (Hcy) in serum. Eating behaviour was assessed by using the Three-Factor Eating Questionnaire (TFEQ).
Outcomes – Iron deficiency anaemia was found in 11% of subjects (haemoglobin <120g/L), 32% of subjects had iron stores below 15 ug/L, and 16% had serum transferrin saturation below the optimal level (< 15%). Eight % and 5% of subjects were vitamin B12 deficient based on their vitamin concentration in plasma or methylmalonic acid concentration, respectively. Serum folate concentrations above the optimal range for serum and erythrocytes were found in 62% and 94% of all subjects, respectively. One female had serum Hcy concentration above the reference range (>15umol/L). Mean restraint was 8.1 ± 5.2 (equivalent to medium restraint), mean disinhibition was 6.5 ± 3.4 (low) and mean hunger was 5.1 ± 3.1 (medium). Vitamin B12 levels were positively correlated with restrained eating ($P < 0.001$). In addition, restraint was positively correlated to disinhibition or overeating ($P < 0.001$).
Conclusion – Disordered eating and a deficit of iron and vitamin B12 are present in educated women of childbearing age, including those studying nutrition. The effects of dietary restraint and food choices on markers of micronutrient status require further investigation.

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Concurrent Session 8: Dietary Patterns and Intakes

Beverage consumption in Belgian adolescents

C Matthys[1, 2], S. De Henauw[1, 3], M. Bellemans[1], M. De Maeyer[1], G. De Backer[1]
[1] *Department of Public Health, Ghent University, Belgium*
[2] *Institute of Food, Nutrition and Human Health, Albany Campus, Massey University, New-Zealand*
[3] *Department of Health Care, Division of Nutrition and Dietetics, Vesalius-Hogeschool Gent, Belgium*

Background – Water is a nutrient and most of the time overlooked. Less is known about the consumption of the nutrient water and of beverage in general in an adolescent population.
Objective – To monitor beverages consumption in adolescents (13-18 y) and to compare with recommendations. To estimate the intake of the nutrient water.
Design – A random sample of adolescents (129 boys and 212 girls between 13 and 18 y) was drawn from secondary schools in the region of Ghent, Belgium. A 7-day estimated food record method was used to quantify nutrient and food intake. The Belgian recommended fluid intake (without milk) is 1500ml. For milk(products) the recommended intakes is 450-600ml. The recommendation depends on the scientific body: the Belgian health council recommends between 55 – 65 ml/kg body weight/day, ILSI recommends 3300 ml/day for boys and 2300 ml/day for girls. Other sources recommend 1ml per 1 kcal consumed.
Outcomes – The total median consumption of all non-alcoholic beverages is 1200 ml. The median consumption of non-alcoholic beverages without milk(products) is 1011ml. The median intake of milk(products) is 133ml. The median water consumption is 423ml. Almost 5% of the adolescents never drink water. More than 90% of the adolescents consume soft drinks. Only 12.6% of the adolescents reached the age-specific fluid recommendation., Only 4% of the adolescents reached the recommendation of the Belgian Health Council and respectively ILSI, 15% of the adolescent had a water intake above their energy intake.
Conclusions – The fluid intake is too low; especially the water intake is worrisome. Health promotion campaigns should take into account the issue of fluid intake.

A food coping strategy index applied to a community of farmworker households

R Kruger[1,2], MI Moopa[2], HC Schönfeldt[2]
[1] *Institute of Food, Nutrition & Human Health, MasseyUniversity, Auckland, New Zealand*
[2] *School of Agricultural and Food Sciences, University of Pretoria, Pretoria, South Africa*

Background – In South Africa, households living in informal urban/rural settlements and on commercial farms experience various levels of dietary variety, food intake or household hunger. Low incomes, poor food production, availability and low spending power (less on food), characterize these households. Households employ various food coping strategies (FCS) to alleviate the hardship of food stress or low food availability.
Objective – To apply an existing FCS-index to assess household food security in farmworker households and its usefulness to identify the level of food stress. Food coping scores were used to describe coping patterns.
Design – A cross-sectional survey was conducted. A structured food coping questionnaire and a standardized FCS-index were used to gather data from women (23-65 yrs) responsible for food provision in a small farmworker community, in the Fouriesburg district, SA. Focus groups were used to rank the FCS (severity).
Outcomes – Individual scores were used to rank the FCS. The most common FCS were relying on cheaper (chicken feet)/less-preferred (meat bones) food and food seeking strategies (wild foods). Seasonal patterns of food coping behaviour emerged per household, varying according to the level of food stress experienced. Most in late summer (78) and spring (73.4); mean community score of 66.8 ($\leq$55 indicates food security). Frequency of use decreased with increased severity of FCS but increased in households' using them.
Conclusions – The FCS index of utilized practices constructed from the data assessed food coping behaviour in households successfully (early, clear signals of the level of food distress – if any). These results could be used to allocate appropriate food aid (food type) and to design nutrition education programs using positive (food gathering or bartering) and avoiding negative (only starchy food) FCS to prevent suboptimal health.

Concurrent Session 9: Animal Nutrition

Effects of fibre source and whole wheat inclusion on the performance, starch digestibility and gut parameters of broiler chickens

AM Amerah, V Ravindran, RG Lentle, DG Thomas
Institute of Food, Nutrition and Human Health, Massey University, Palmerston North, New Zealand

Background – The current use of highly processed ingredients in poultry diets has negative effects on the development of the digestive tract of poultry. Broilers housed in a litter floor system consume wood shavings, possibly to compensate for the low levels of coarse fibrous materials in their diet. The coarse fibrous nature of whole wheat may improve the development of the gizzard allowing improved nutrient utilisation.
Objectives – To examine the effects of diluting wheat-based diets with insoluble fibre sources and whole wheat inclusion on the performance, starch digestibility and gut parameters of broilers.
Design – The following treatment diets were formulated. (i) control diet based on ground wheat, (ii) same as control except that 200 g kg^{-1} whole wheat replaced ground wheat prior to pelleting, (iii) control diet diluted (6:100 w/w) with cellulose and (iv) control diet diluted (6:100 w/w) with wood shavings. Each diet was fed *ad libitum* to six replicate groups (8 birds/replicate) from days 1 to 21 post-hatch.
Outcomes – Wood shavings increased (P<0.05) the relative gizzard weight and, improved (P<0.05) ileal starch digestibility and feed efficiency, compared to other dietary treatments. All gut components were shorter (P<0.05) in birds given feeds containing cellulose and wood shavings compared to those fed the control and whole wheat diets.
Conclusion – Gizzard stimulation using wood shavings improved starch digestion and the performance of broiler chickens.

The role of functional carbohydrate feed ingredients in promoting immunity in monogastric animals

LATucker[1], A Kocher[2], M. Lazarevi[3], P Spring[4]
[1]*Waiti Hill Ltd, PO Box 307, Feilding 4740*
[2]*Alltech Biotechnology Centre, Catnip Pike, Nicholasville, KY, USA*
[3] *University of Belgrade, Belgrade, Serbia*
[4] *Swiss College of Agriculture, Zollikofen, Switzerland*

Background – Promoting correct development of the immune system and ensuring adequate protection in young animals is key to their growth and survival. It is now known that certain types of carbohydrates can interact with the immune communication channels in the digestive tract, which modulate immune responses. As farmed monogastric animals often have poorly developed immunity, using such functional ingredients may assist in their health and welfare.
Objective – To determine the immune responses of different animal species to diets supplemented with mannan-oligosaccharides (MOS).
Design – The first trial was conducted with 48 broiler chickens, from 8-48 d of age and housed in four pens, which were vaccinated against Newcastle's Disease at 15 and 33 d. The trial compared a control diet against a diet supplemented with 1 kg/t MOS. Antibody titres were measured by commercial ELISA kits at 48 d. Two further randomised and replicated piglet trials (using 48 and 60 piglets respectively), supplemented the animals orally with 0.75 g/d MOS at birth and 1 day old. Growth was monitored, and Ig status by radial immuno-diffusion from blood samples taken at 2 days old was recorded as a measure of immunity status.
Outcomes – Broilers receiving MOS had significantly higher antibody titres compared to the negative control group (1568 vs 671; P=0.045). Piglets supplemented orally with MOS at birth and day old had 32% higher IgG levels (P<0.001) in the first trial and 23% higher IgG (P<0.01) and 9% increased weight gain (P=0.023) in the second trial.
Conclusions – Supplementing monogastric animals with MOS may improve their immuno-competence, which is important for their future health and welfare.

Concurrent Session 9: Animal Nutrition

The effect of selection for muscling on insulin sensitivity

SFP Bonny, P McGilchrist, DW Pethick, GE Gardner
Beef Genetic Technologies Cooperative Research Centre
School of Veterinary and Biomedical Science, Murdoch University, Murdoch, WA 6150

Background – Uptake of glucose from the blood and storage as glycogen in the muscle is stimulated by insulin. The beef industry has increased selection pressure on muscling through quantitative selection for retail beef yield estimated breeding value (EBV) and gene markers (myostatin mutation), which increases the proportion of fast glycolytic type IIB fibres (2). These fibres are associated with increased rates of glucose uptake (1), thus high muscled animals are likely to store more muscle glycogen, decreasing the incidence of dark cutting.

Objective – Determine the impact of selection for muscling on glucose uptake and insulin sensitivity in cattle.

Design – This study examined insulin sensitivity of progeny from a herd selected for muscling (using a visual scoring system) and gene markers using the hyperinsulineamic-euglyceamic (HIEG) clamp technique. 24 angus steers, 10 low muscled, 10 high muscled and 4 carrying the myostatin mutation gene marker were constantly infused with insulin, firstly at 0.6 µIU/kg/min, and then 6.0 µIU/kg/min, while glucose was concurrently infused to maintain basal blood glucose levels. The concurrent glucose infusion rate indicates insulin sensitivity, and was analysed using linear mixed effects models, with liveweight and fat depth as covariates, and animal within sire as a random term.

Outcomes – At 0.6 µIU/kg/min insulin infusion, glucose infusion rate was between 60 and 100% higher in high muscled ($P<0.01$) and myostatin mutated ($P<0.05$) cattle than low muscled cattle. At 6.0 µIU/kg/min insulin infusion, the high muscled and myostatin mutation cattle required about 50% higher glucose infusion rate to maintain basal glucose levels ($P<0.01$).

Insulin Challenge (µIU/kg/min)	High Muscling	Low Muscling	Myostatin Mutation
0.6	174 ± 18.2[a]	88 ± 16.6[b]	140 ± 26.9[a]
6.0	367 ± 18.2[c]	237 ± 16.6[d]	347 ± 28.1[c]

([a,b,c,d] = sign. diff.)

Conclusions – Cattle selected using breed indices and genetic markers for muscling are more sensitive to insulin. This is likely to increase glucose uptake by muscle and adipose tissue, increasing muscle glycogen storage, and potentially reducing the incidence of dark cutting.

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The effect of selection for muscling on adipose tissue sensitivity to adrenaline

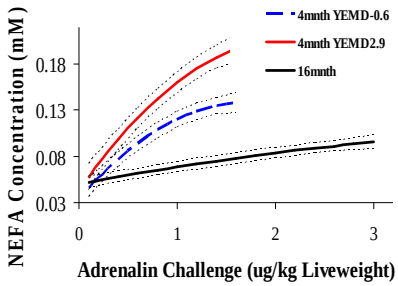
P McGilchrist[1], KM Martin[2], JM Thompson[2] and GE Gardner[1]
Australian Sheep Industry CRC
[1]*School of Veterinary and Biomedical Science, Murdoch University, Murdoch, WA 6150*
[2]*School of Rural Science and Agriculture, University of New England, Armidale, NSW 2351*

Background – Carcass weight and fat depth (GR tissue depth) are used extensively within the Australian lamb industry as indicators of saleable meat yield, an important determinant of profitability. Estimated breeding values (EBV) for muscling (eye muscle depth; YEMD) are increasingly used by producers to select animals with superior saleable meat yield, with these animals also tending to be more lean (1). The physiological mechanisms which underpin this relationship are not clear, but could be due to changed hormonal sensitivity in adipose tissue.

Objective – Determine the impact of YEMD EBV on adrenaline sensitivity in the adipose tissue of lambs.

Design – 10 Merino and 14 Crossbred progeny were selected from Merino ewes joined to Merino or Poll Dorset sires displaying either high or low YEMD EBV within each breed. At 4 and 16 months of age they were challenged with adrenaline at 8 levels ranging between 0.1 to 1.6 µg/kg liveweight and 0.1 to 3.0 µg/kg liveweight respectively. Blood samples were taken at 16 time points between -30 to 130mins relative to administration of challenge. Peak NEFA concentration in response to challenges was analysed using a linear mixed effects model, with animal within sire as a random term.

Outcomes – In 4 month old lambs, the peak NEFA concentration at 1.6 µg/kg adrenalin challenge, was 40% greater in lambs with high YEMD sires compared to low YEMD. At low adrenalin challenges there were no differences. At 16 months there were no YEMD effects, and the adrenalin sensitivity of all sheep was far less compared to 4 months.



Conclusions – Adrenalin sensitivity of adipose tissue is greater in high YEMD (muscled) lambs, but these differences diminish as sheep approach maturity. Adrenalin causes rapid lipolysis within adipose tissue, thus greater lipolysis in high YEMD lambs may partly explain why they are leaner, particularly at a younger age.

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Concurrent Session 9: Animal Nutrition

Peri-renal and Subcutaneous adipose tissue gene expression in sheep

FT Fahri[1, 2, 3], IJ Clarke[4], DW Pethick[1, 2], BG Tatham[3], RD Warner[2, 3], FR Dunshea[1,3, 5]
[1] *School of Veterinary and Biomedical Sciences, Murdoch University, Murdoch, WA, 6150, Australia*
[2] *Australian Sheep Industry CRC, University of New England, Armidale, NSW, 2350, Australia*
[3]*Department of Primary Industries, Werribee, VIC, 3030, Australia*
[4]*Department of Physiology, Faculty of Medicine, Monash University, Clayton, VIC, 3800, Australia*
[5] *Faculty of Land and Food Resources, The University of Melbourne, Parkville, VIC, 3010, Australia*

Background – Many adipose tissue (AT) genes can regulate adipogenesis and lipolysis. Uncoupling protein (UCP2), common in white AT and involved in thermogenesis, peroxisome proliferator-activated receptor-gamma (PPARγ), the master switch of adipogenesis, the feed regulatory gene leptin, and hormone sensitive (HSL) and lipoprotein (LPL) lipase which are involved in lipolysis, are some of these genes. It is important to evaluate AT gene expression in order to manipulate an animals lean to fat ratio, and target specific sites for obesity and diabetes research.
Objectives – To investigate the *in vivo* regulation of UCP2, PPARγ leptin, HSL, and LPL mRNA expression in peri-renal (PR) and subcutaneous (SC) AT depots in sheep.
Design – 60 mixed sex lambs representing 5 breed combinations selected for their growth and muscling development potential were grown to 22 months of age. At slaughter, PR and SC AT samples were collected and carcases were scanned by dual x-ray absorptiometry to determine carcase lean and fat content. Animals were ranked according to carcase fat % and both AT depots were analysed for adipogenic and lipolytic mRNA expression by reverse transcription polymerase chain reaction (RT-PCR).
Outcomes – UCP2, HSL and LPL expression was higher in PR than SC AT ($P \leq 0.005$) whereas leptin expression was higher in SC then PR AT ($P<0.001$). PPARγ expression was similar in both AT sites, with expression decreased as body fat % increased ($P=0.002$).
Conclusion – These data suggest that mRNA expression differs between AT depots in sheep and PPARγ expression decreases with increasing adiposity.

Plenary 4: Cardiovascular Disease and Omega-3: Can We Turn The Tide?

Is our lifestyle killing us? Apparently not at the moment.

Rod Jackson
Epidemiology, School of Population Health, University of Auckland, New Zealand

Despite rising levels of obesity and an obesity epidemic, morbidity and mortality from cardiovascular diseases (CVD) – the main lifestyle diseases – continue to plummet in New Zealand and elsewhere. While trends in CVD are not consistent across ethnic and social groups they appear to be going in the right direction for everybody. The reason is simply that the main risk factors for cardiovascular diseases – smoking, high blood cholesterol and high blood pressure – are falling. This presentation will describe current trends in cardiovascular disease morbidity, mortality and risk factors and the interventions we should invest in to make sure these favourable trends continue.

Cardiovascular benefits of omega-3 fatty acids

WS Harris
Sanford School of Medicine, University of South Dakota, Sioux Falls, USA

The cardioprotective properties of the long-chain omega-3 fatty acids found in fish oils (EPA and DHA) have become clearer in recent years. Intakes of 500-1000 mg/d, either from foods or from supplements (as recommended by the AHA) have been generally associated with significantly reduced risk for CAD events, in particular, sudden cardiac death. Low intakes or blood levels of EPA & DHA are independently associated with increased risk of death from CHD. In randomised secondary prevention trials, fish or fish oil have been demonstrated to reduce total and CHD mortality at intakes of about 1 g/d. The evidence for beneficial effects of the long-chain omega-3 FA from fish is stronger than the evidence for benefit from the short-chain precursor, ALA, from plants. These fatty acids appear to have anti-arrhythmic properties which are unrelated to their effects on blood lipids. The mechanism by which low doses of omega-3 FA (500-1000 mg/d) reduce risk for fatal events is not clear, but may involve reducing the heart rate. Similarly, the biochemical basis for their beneficial effects may include alteration of membrane structure and function, modulation of transcription factors, increased plaque stability, and changes in eicosanoid metabolism. Red blood cell fatty acid composition reflects long-term intake of EPA+DHA. It is proposed that the RBC EPA+DHA (hereafter called the Omega-3 Index) maybe a new risk factor for death from CHD. When the relationship between this putative marker and risk for CHD death was evaluated using published primary and secondary prevention studies, an Omega-3 Index of approximately 8% was associated with the greatest cardioprotection, whereas an Index of less than 4% was associated with the least. The Omega-3 Index is a validated surrogate of cardiac EPA+DHA in humans. Preliminary data are now suggesting that the Omega-3 Index may be a risk marker, not just for CHD fatality, but also for acute coronary syndromes. The Omega-3 Index may represent a novel, physiologically-relevant, easily-modified, independent and graded risk factor for both CHD events and for death from CHD that could have significant clinical utility.

Plenary 4: Cardiovascular Disease and Omega-3: Can We Turn The Tide?

Long chain omega-3 fatty acids and the food supply

ML Garg[1,2]

[1]*Nutraceuticals Research Group, School of Biomedical Sciences, University of Newcastle, NSW, Australia*

[2]*Hunter Medical Research Institute (HMRI), NSW, Australia*

Long chain omega-3 fatty acid supplementation is highly recommended for the dietary management of hypertriglyceridemia, secondary cardiovascular disease prevention and high blood pressure. Functional foods can be used as vehicles to provide the recommended levels of long chain n-3PUFA, including for those who already have had a cardiovascular event and those at a high risk of developing coronary heart disease. It is noteworthy that although foods fortified with higher levels of long chain n-3PUFA need to be developed, the total fat content, particularly the level of saturated fatty acids, must not exceed the dietary guidelines. The fortified food must be convenient, palatable, with no fishy odour/flavour and no fishy eructation following consumption. The food matrix should provide minimum or no resistance for release of long chain n-3PUFA in the gastrointestinal tract to ensure maximum bioavailability. Particular attention needs to be paid to the material used for micro-emulsification (type of polysaccharides, proteins or phospholipids) as this may be an important criterion for the bioavailability of long chain n-3PUFA (1).

Quantitative data on bioavailability of long chain n-3PUFA from the n-3PUFA enriched foods is lacking in the literature, although acute and chronic effects of consuming these foods on n-3PUFA incorporation have been extensively reported. Other factors, dietary or physiological, that may affect the bioavailability of long chain n-3PUFA also merit further investigation. The development and testing of functional foods enriched with larger amounts of long chain n-3PUFA with improved bioavailability, site-specific delivery, biological and clinical effects requires a concerted team effort including food scientists/technologists, human/clinical nutritionists and food producers.

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Concurrent Session 10: Omega 3s

Technologies for bioprotection of marine omega-3 fatty acids

AK Anal, H Singh, PJ Moughan
Riddet Centre, Massey University, Palmerston North, New Zealand

Background - The life-prolonging benefits of regular consumption of long chain essential PUFAs, particularly marine omega-3 are now well recognized. Literature evidence exists for health benefits including; prevention of cardiovascular diseases (thrombosis, cardiac arrhythmias, sudden cardiac death, hypertension), inflammatory diseases (rheumatoid arthritis, ulcerative colitis, lupus, psoriasis), dyslexia and conditions of hyperactivity and depression.
Objective - Omega-3 oils are costly ingredients and it is critical, if omega-3 functional foods are to be produced at realistic prices, to maximise absorption (bioavailability) in the gastro-intestinal tract and thus minimise the required levels of the oils in food. Microencapsulation is a technology of entrapping some active materials or ingredients into a sealed matrix which can release their contents at controlled rates under specific conditions.
Method - The problems of eliminating undesirable fishy odour and taste have largely been overcome using micro-encapsulation technology with our research group making important contributions to solving these problems. Novel technology for making nano-emulsions containing high levels of omega-3 has been developed in our laboratory, and recently patented. Concurrently, these oils have been encapsulated in food-grade biopolymer matrices in the form of nanoparticles or microparticles with a view to developing systems for targeted delivery to the lower gastrointestinal tract. Interfacial engineering techniques have been used to deposit these materials onto the surface of small emulsion droplets, containing high concentrations of omega-3 fatty acids.
Results - The results showed that the designed multilayered emulsions and microparticles were resistance to harsh conditions of gastric environment without release of oil droplets while they disintegrate or collapse slowly to provide sustained release of oil in the lower intestine. All the polymeric particles loaded with omega-3 emulsions were found to be stable in simulated gastric fluid (SGF), even in presence of pepsin enzyme. The release of intact emulsions was observed in the simulated intestinal fluid (SIF). These polymeric microparticles also showed protection of omega-3 fish oil from oxidation.
Conclusions - The absorption of these oil droplets in the small intestine is expected to enhance the bioavailability of omega-3 fatty acids. The local absorption of omega-3 fatty acids in the colon will be beneficial for preventing the inflammatory bowel disease and colon cancer.

Nutrition, learning and behaviour: omega-3 fatty acids and micronutrients for childhood developmental difficulties

N Sinn
Nutritional Physiology Research Centre, University of South Australia, SA 5000

The brain requires a range of synergistically acting nutrients to function optimally. Accordingly, there is evidence that nutrition is important not only for children's health but also for their learning and behaviour. Particular attention has been given in recent decades to the role of omega-3 polyunsaturated fatty acids (PUFA) in the brain and mental health. Over half of the dry weight of the brain is composed of lipids, of which about 35% are phospholipids containing omega-6 PUFA arachidonic acid (AA) and omega-3 PUFA docosahexaenoic acid (DHA). DHA is highly concentrated in neural phospholipids, with important roles associated with membrane fluidity and neural transmission. Its precursor eicosapentaenoic acid (EPA) is required for synthesis of eicosanoids with a range of biological functions including anti-inflammatory, anti-thrombotic and vasodilatory effects. Consumption of omega-3 PUFA has declined in Western societies and low omega-3 levels have been associated with a range of psychiatric conditions including developmental disorders in childhood. It is of concern to note that 14% of Australian children suffer from a mental health problem, with the most commonly occurring symptoms being those associated with attention deficit hyperactivity disorder (ADHD). A recent study conducted in South Australia found improvements in these symptoms, notably hyperactivity, impulsivity and inattention, following omega-3 supplementation, supporting results of a similarly large study in the UK. More work needs to be done in this area to identify children most likely to benefit from supplementation, underlying biological mechanisms, the nature of the PUFA supplement that assists with symptoms, and objective cognitive and academic outcomes. Furthermore, a number of nutrients are involved in PUFA metabolism and functions, and children with ADHD have also been identified as having deficiencies in nutrients such as zinc and magnesium. Therefore future studies could also explore combined nutritional influences on learning and behaviour in children.

Concurrent Session 10: Omega 3s

Long chain polyunsaturated fatty acids and bone health; epidemiological and human data

MC Kruger
Institute of Food Nutrition & Human Health, Massey University, Palmerston North, New Zealand

Osteoporosis represents a major challenge to health care services. Polyunsaturated fatty acids (PUFAs) may be required for renal calcium metabolism and for the regulation of the normal balance between bone and ectopic calcification. Experimental animal and human studies have indicated that PUFAs enhance calcium absorption, reduce urinary calcium excretion, and increase bone calcium content and density. Long chain PUFA (LCPUFA) may therefore play a role in bone maintenance as well as prevention of bone loss. Epidemiological studies indicate that frequent consumption of fish is positively associated with changes in bone mineral density (BMD). These observations have been made in a female population in Norway as well as in Japan where higher n-3 status is linked to higher BMD. A recent investigation of the association between the ratio of dietary n-6 to n-3 fatty acids and BMD indicated a significant inverse relationship between the ratio of dietary linoleic acid to α-linolenic acid and BMD at the hip of men and women. This study further showed that an increasing ratio of total dietary n-6 to n-3 fatty acids was significantly associated with lower BMD in women. Some interaction with hormone replacement therapy was also shown. In contrast a longitudinal observational study reported negative associations between total PUFA intake and bone mass when dietary calcium was also low. There have been minimal studies on bone accretion and the effects of the LCPUFA in children. A study in 1996 indicated that total dietary PUFA were associated with increases in bone density in girls aged eight – 16 years but not in boys of the same age. In the NO_2 Study (2007), 95 healthy adolescent white males were recruited and factors important for development of BMD and body composition were assessed after five years. Serum docosahexaenoic acid (DHA) and total n-3 were positively correlated with BMD of the total body whilst changes in BMD of the spine between the ages of 16 and 22 were positively correlated with arachidonic acid, DHA and total n-3. Experimental studies in humans are controversial. In elderly women a mixture of evening primrose and fish oils together with calcium enhanced femoral bone mass by 1.3% compared to a decline in the placebo group of 2.1% over 18 months. However, no benefit or harm to bone mass was observed in premenopausal women after supplementation with a similar mixture plus 1000mg of calcium for one year. These finding suggest that long term intervention studies are needed to clarify the role of LCPUFA in maintenance of bone.

Lipid-lowering potential of combined phytosterols and long chain omega-3 polyunsaturated fatty acids (LCn-3PUFA) in hyperlipidemia

MA Micallef, ML Garg
Nutraceuticals Research Group, School of Biomedical Sciences, University of Newcastle, NSW 2308

Background – Hyperlipidemia is a major risk factor in the development of cardiovascular disease (CVD). Fish oils rich in LCn-3PUFA can reduce circulating triacylglycerides (TG) and raise high density lipoprotein (HDL) cholesterol. Phytosterols, incorporated into fat spreads have been shown to reduce total cholesterol (TC) and low density lipoprotein (LDL) cholesterol in normocholesterolemic and hyperlipidemic subjects.
Objective – To investigate the synergistic effects of phytosterols and LCn-3PUFA on plasma lipid profile in hyperlipidemic subjects.
Design – Double-blind randomised controlled trial in four parallel groups. Thirty-one (male n=17; female n=14) participants with established hyperlipidemia ([mean±SEM] TC 6.56±0.15mmol/L; TG 1.69±0.11mmol/L) were randomised to receive either LCn-3PUFA (1.5g/day EPA+DHA) or placebo (sunola oil) supplements alone, or in combination with a phytosterol-enriched spread (25g/day margarine) providing 2g/day of phytosterols, for three consecutive weeks. Outcome measures included plasma total-, LDL-, HDL-cholesterol and TG concentration and projected risk analysis of CVD was calculated.
Outcomes – The combination of phytosterols and LCn-3PUFA significantly reduced TG concentrations by 30.25±7.42% (P=0.005) after three weeks. Changes in other lipoproteins included a reduction in TC and LDL-cholesterol (9.50±1.24%; 11.23±5.97% respectively) and an increase in HDL-cholesterol (10.18±4.29%), although not significant. Highest CVD risk reduction was noted in the combined group (14.01±5.24%) followed by phytosterol (11.67±7.26) and LCn-3PUFA (9.26±7.99) supplementation alone.
Conclusions – The combination of phytosterols and LCn-3PUFA may be a more effective dietary strategy in the management of hyperlipidemia and associated CVD risk, than either of these alone.

Concurrent Session 10: Omega 3s

Long chain polyunsaturated omega-3 fatty acids for weight loss in obese subjects

IA Munro, C Smith, ML Garg
Nutraceuticals Research Group, School of Biomedical Sciences, University of Newcastle, NSW 2308

Background – Obesity is characterised by increased levels of pro-inflammatory biomarkers which are linked to CVD risk, insulin resistance and type 2 diabetes. LCn-3PUFAs have a known anti-inflammatory effect and consuming fish oil results in suppressed production of pro-inflammatory cytokines. Reduced inflammation is linked to weight loss.
Objective – To determine whether consumption of LCn-3PUFAs will assist in weight loss.
Design – A double blind randomised control trial with two parallel groups. Both groups followed a reduced kJ diet (5000-6000 kJ) for 12 weeks. Group 1 consumed 6x1g capsules/day placebo (n=19) and Group 2, 6x1g capsules/day of n-3PUFA fish oil (n=17). Fasting blood samples, anthropometric measures, 3-day food diaries, and health surveys were collected at baseline (BL) and post intervention (PI).
Outcomes – Blood levels of DHA and EPA increased by 49% and 46%, respectively, in Group 2, indicating compliance with capsule consumption. There were no significant differences in changes in body weight, body composition, plasma cholesterol, HDL, LDL and triglycerides following supplementation with LCn-3PUFA.

Group	22:6n-3 (DHA) µg/mL		20:5n-3 (EPA) µg/mL		Weight kg		Total body fat kg		Fat free mass kg	
	BL	PI	BL	PI	BL	PI	BL	PI	BL	PI
1 (n=19)	22.7	27	10.9	13.7	94	90.4	39.2	35.9	53.7	54.5
2 (n=17)	25.5	50.3	11.7	21.6	97.7	94.7	40.9	38	56.8	56.7

Conclusions – No correlation was apparent between the change in LCn-3PUFAs and change in body weight (r = 0.288, ns) following LCn-3PUFA supplementation. It is apparent that individual commitment to weight loss may be more effective than supplementation.

Regular consumption of omega-3 pork reduces triglyceride levels in healthy subjects

AM Coates[1,2], S Sioutis[3], JD Buckley[1, 2], PRC Howe[1, 2]
[1]Nutritional Physiology Research Centre, University of South Australia, SA 5001; [2]ATN Centre for Metabolic Fitness; [3]Discipline of Physiology, School of Molecular Life Sciences, University of Adelaide SA 5001

Background – Feeding PorcOmega® (a fortified tuna fishmeal product provided by Bartlett Grain Pty Ltd) to pigs has previously been shown to be a viable method of increasing the long chain omega-3 polyunsaturated fatty acid content of pork (1), however the health benefits of this product have previously not been evaluated.
Objective - To see whether omega-3 enriched pork can deliver cardiovascular health benefits to healthy adults.
Design – Female pigs were fed either a regular finisher diet or one containing 15% PorcOmega® for 6 weeks prior to slaughter. Meat was butchered into five cuts (leg steak, diced, stir-fry strips, mince and sausage) and packaged into 200 g serves. In a double-blind intervention trial, 33 healthy adult subjects (16 F, 17 M) were randomised to ingest either omega-3 or regular pork (one of each cut totalling 1000 g/week) for 12 weeks. Fasting blood samples were collected every 2 weeks and analysed for serum lipids, maximally stimulated thromboxane production and erythrocyte fatty acid composition.
Outcomes –The omega-3 enriched pork provided subjects with 1.3g of long chain omega-3 per week. This resulted in a 15% increase in erythrocyte DHA levels in the omega-3 group compared with a 5% reduction in the control group over 12 weeks (P =0.001), with no significant changes in other long chain omega-3 fatty acids. Serum triglycerides decreased in the omega-3 group compared with the control group (P =0.039) while serum thromboxane production tended to decline (P =0.059). The latter was negatively associated with the change in erythrocyte DHA incorporation (R=-0.48, P =0.008).
Conclusions – Modest increases in omega-3 intake resulting from regular consumption of enriched pork can deliver cardiovascular health benefits.
References
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Concurrent Session 11: "Brain food" and School Nutrition

The nutritional value of packed lunches consumed by New Zealand primary school children: what is eaten and not eaten

E Dresler-Hawke[1], J Coad[2]
[1]*Dept of Marketing, Massey University, Palmerston North, New Zealand*
[2]*Institute of Food, Nutrition & Human Health, Massey University, Palmerston North, New Zealand*

Background – Most New Zealand primary schools enforce a packed lunch policy. The content of lunch boxes makes a significant contribution to a child's daily nutritional intake.
Objective - To determine children's food consumption at school by undertaking a cross-sectional survey of school lunchboxes and analysing unconsumed foods deposited in provided food waste disposal bins.
Design – A cross-sectional survey was conducted in 6 different urban primary schools (age range 5-11 years) throughout December 2005 in the Manawatu Region of New Zealand. 927 individual lunch boxes were photographed at the beginning of the school day before the first food break. After the lunch break, all the rubbish bins from each school were collected. The photographed food items were categorised by food group and judged according to the UK *Balance of Good Health* guidelines. Unconsumed food items were categorised according to portion size and food group.
Outcomes – Bread was the most popular food item in the lunch boxes. Fruit or vegetables were present in 70% of lunch boxes; 32.4% of lunches met the recommendation of two servings. 57% of lunch boxes contained potato crisps and 15% contained confectionary. The majority of foods belonged to the moderate to high fat, sodium and sugar groups. Only 11% of lunchboxes met the guidelines. Over 80% of unconsumed food items were sandwiches, fruit and dairy products.
Conclusions – The lunch boxes in this study were high in saturated fat, sugars and sodium. The inclusion of snack and convenience foods appears to be at the expense of more nutritionally desirable items such as fruit. The results identify areas for educational activities designed to improve awareness of the need to include fruit and vegetables and to increase the ratio of starch to sugars.

The influence of the school canteen on children's food intake at school

N Hampson, LJ Riddell
School of Exercise and Nutrition Sciences, Deakin University, 221 Burwood Highway, Burwood, VIC 3135

Background – Developing relevant and practical guidelines for healthy school canteens requires a greater understanding of how school children use the canteen and how this use influences the nature of foods brought to school.
Objectives – To compare the type of foods and beverages purchased from the school canteen with the type of foods and beverages brought to school between canteen users and non-users.
Design – An exploratory study of a representative sample of metropolitan Melbourne government and catholic schools. Four hundred and sixteen (37% response rate) Grade 5 and 6 students aged 9-12 years consented to take part in the study of which 384 provided a completed data set. Children were classified as a canteen user if they purchased from the school canteen 'everyday', 'most days' and 'sometimes', or as a non-user if they 'hardly ever' or 'never' purchased from the school canteen. The frequency and type of foods and beverages purchased from the school canteen and brought to school was determined using a 26 item food check list. Differences between users and non-users of the school canteen was determined using chi-square analysis.
Outcomes – Canteen users purchased significantly more junk food items than non-canteen users, in particular more pies/pasties/sausage rolls, lollies, and potato chips (P <0.05). Non-canteen users tended to purchase more vegetables (P= 0.09) and soft drink (P =0.02) than canteen users. Canteen users not only purchased significantly more junk food items they also brought to school significantly more of these items than non-canteen users, in particular more cake, potato chips and soft drink (P <0.05). On average, both canteen user groups brought to school more junk food items than what canteen users purchased from the school canteen (P <0.05).
Conclusions - School children brought to school more high energy dense foods and beverages than what was purchased from the school canteen. These findings suggest that healthy canteen policies alone may not be able to significantly change unhealthy eating behaviours at school as the majority of poor food choices are coming from outside of the school canteen environment.

Concurrent Session 11: "Brain food" and School Nutrition

Skipping breakfast (fasting longer) alters glucose metabolism in lean young adults

GA Heruc[1], V Tan[1], JC Brand-Miller[1], FS Atkinson[1], P Petocz[2]
[1]*Boden Institute of Obesity, Nutrition and Exercise, University of Sydney, NSW*
[2]*Division of Economic and Financial Studies, Macquarie University, NSW*

Background – Extended fasting is linked with a deterioration of glucose tolerance. Skipping breakfast on a regular basis has been associated with a 4.5 times increased risk of obesity (1). The effect of prolonged overnight fasting, ie. 'skipping' breakfast, on postprandial glucose and insulin responses is largely unknown.
Objective – To determine the effect of the duration of overnight fasting on postprandial glycemia and insulinemia, acute insulin sensitivity and subsequent *ad libitum* food intake.
Design – A within-subject, repeated measures study was conducted in 24 lean, young adults (12 males, 12 females; mean ± SD age 23.0 ± 2.6 years, BMI 22.1 ± 2.5 kg/m^2). Subjects consumed a standard breakfast after an overnight fast of 12, 14 and 16 h, following consumption of a standard evening meal at 1900 h. Each treatment was studied three times in each subject (3 x 3). Fingerprick capillary blood samples were taken at -20, -10, 0 (3 fasting samples) and 15, 30, 45, 60, 90, 120 minutes after eating had commenced for measurement of postprandial glucose and insulin. Responses were quantified as the area under the curve (AUC) and insulin sensitivity was estimated using homeostasis modelling assessment (HOMA-IR). Subsequent *ad libitum* energy intake following completion of the 120 min experimental sessions was also measured.
Outcomes – Increasing fasting duration resulted in an increase in postprandial glucose AUC, with a significant effect of gender (P<0.01). After the 16 h fast, females showed a 37% increase in glucose AUC compared to the 12 h fast (P<0.01), accounting for the overall difference in the total group. Paradoxically, in females, but not males, HOMA-IR improved as the fasting period increased (P<0.01). There was a significant increase in *ad libitum* energy intake with increased fasting duration for all subjects (P<0.01).
Conclusions – In females, skipping breakfast (fasting longer) has detrimental effects on glucose tolerance despite apparent improvement in insulin sensitivity. Males show no significant changes with an increased duration of overnight fasting.

The relationship of dietary intake to mood and cortisol

SJ Torres, CA Nowson
School of Exercise and Nutrition Sciences, Deakin University, VIC 3125

Background – Dietary therapies are routinely recommended to reduce disease risk; however, there is concern they may adversely affect mood and psychological wellbeing.
Objectives – To determine if there were any differential effects on mood of a low-sodium, high-potassium diet rich in fruits and vegetables (LNAHK) and a high-calcium diet rich in low-fat dairy foods (HC) compared to a moderate-sodium, high potassium, high-calcium "DASH" diet, high in fruits, vegetables and low-fat dairy foods (OD). To evaluate the relationship between salivary cortisol and dietary factors.
Design – In a crossover design, subjects were randomized to two diets for 4 wk, the OD and either LNAHK or HC, each preceded by a 2 wk control diet (CD). Dietary compliance was assessed by 24 h urine collections. Mood was measured weekly by the Profile of Mood States (POMS). Saliva samples were collected to measure cortisol. The change in mood between the preceding CD and the test diet (LNAHK or HC) were compared with the change between the CD and OD.
Outcomes – Of the 38 women and 56 men that completed the OD, 43 completed the LNAHK and 48 the HC. The mean (SD) age was 55.6 (9.9) yr and the mean BMI was 29.0 (3.8) kg/m^2. POMS ratings for anger, depression and tension improved during LNAHK (P<0.05). Compared with OD, there was an improvement in the global mood score for LNAHK (P <0.05). Higher cortisol levels were associated with greater vigour and lower fatigue (P<0.05), and greater urinary excretion of potassium and magnesium (P<0.05).
Conclusions – A LNAHK diet resulted in the greatest improvement in mood. The mechanism whereby dietary factors can alter mood is not clear, but the hypothalamic-pituitary-adrenal axis and cortisol may be implicated.

Concurrent Session 11: "Brain food" and School Nutrition

Short-term effects of a very low carbohydrate diet compared to a high carbohydrate, low fat diet on mood and cognitive function

GD Brinkworth[1], AK Halyburton[1], C Wilson[1], JD Buckley[2], M Noakes[1], J Keogh[1], PM Clifton[1]
[1]*CSIRO Human Nutrition, SA 5000*
[2]*ATN Centre for Metabolic Fitness, University of South Australia, SA 5000*

Background - Very low carbohydrate diets are often used to promote weight loss, but their effects on psychological function are largely unknown.
Objective - We investigated the short-term effects of a very low carbohydrate diet (LC) and a conventional high carbohydrate, low fat diet (HC) on mood and cognitive function in obese men and women.
Design - 92 subjects (mean±SE, age: 50.4 ± 0.8; BMI 33.6±0.4 kg/m^2) were randomly assigned to either an energy restricted (~6-7 MJ, 30% deficit), planned isocaloric LC or HC with mixed carbohydrate sources (age: 49.8±1.3 yrs; BMI 33.8±0.6) for 8 weeks. Body weight and psychological well-being (Profile of Mood States, Beck Depression Inventory and Spielberger State Anxiety Inventory) were measured at baseline and fortnightly. Cognitive functioning (working memory and speed of processing) was assessed at baseline and Week 8.
Outcomes - LC resulted in significantly greater weight loss compared to HC (LC 7.7 ± 0.4 kg, HC 6.4 ± 0.4kg, P = 0.03). Both groups demonstrated improvements in psychological well-being during the 8-week treatment period (P<0.01 for time), with the greatest effect occurring after 2 weeks, but the improvements were not different between groups. There were no between-group differences for working memory (P=0.68), but there was a significant time x diet interaction for speed of processing (P=0.04), such that this measure improved to a greater extent in HC compared with LC.
Conclusion - Both dietary patterns significantly reduced body weight and were associated with improvements in mood. There was some evidence for a greater relative improvement in cognitive functioning in HC for speed of processing, but further studies are required to determine the replicability of this finding.
Funding support from the National Heart Foundation of Australia and the NH&MRC of Australia.

Dietary habits of people with and without schizophrenia: relationship to stress

S Monterrubio[1,2], D Ghedia[3], Yeatman H[3], N Solowij[1,2], BJ Meyer[3,4]
[1]*School of Psychology, University of Wollongong, NSW 2522*
[2]*Scizophrenia Research Institute, Sydney, NSW 2010*
[3]*School of Health Sciences, University of Wollongong, NSW 2522*
[4]*Metabolic Research Centre, University of Wollongong, NSW 2522*

Background – Dietary fatty acids can affect our health and wellbeing. Studies have shown that the essential fatty acids alpha-linolenic acid (LNA) and linoleic acid (LA) have an impact on the symptoms of schizophrenia patients.
Objective - To compare the fatty acid composition in diets of individuals with schizophrenia and healthy individuals by using a validated polyunsaturated fatty acid questionnaire and to determine if there is a relationship between diet and stress.
Design – A case control observational study of 44 individuals with schizophrenia and 56 healthy individuals. Subjects were recruited via community centres, hospitals, mental health clinics, the university campus and a schizophrenia research register. All 100 subjects completed the PUFA questionnaire and 83 subjects were assessed for stress using the Depression Anxiety and Stress Scales.
Outcomes – There were no significant differences in total, saturated, monounsaturated and polyunsaturated fat, LA, arachidonic acid, EPA and DHA intakes. The individuals with schizophrenia did consume 30% higher intakes of LNA intake and more total fat. The intakes of LNA and LA varied greatly and each of these intakes accounted for 47% and 46% of the intake of the other (respectively). Both LA and LNA were significantly correlated with stress levels (partial r=0.43 and -0.33, respectively, both P <0.005), and LA and LNA accounted for 19% of the variation in stress scores. The correlations were significant in the schizophrenia (n=43, P<0.02) and control (n=40, P <0.05) groups individually.
Conclusion – The quality of dietary fat is related to stress in individuals, including those with a diagnosis of schizophrenia.

Concurrent Session 12: Animal Nutrition

Improving human antioxidant status via increasing selenium levels in food products from animals supplemented with organic mineral sources

LATucker[1], P' Spring[3], P Surai[2]
[1]Waiti Hill Ltd, PO Box 307, Feilding 4740, New Zealand
[2]Alltech Biotechnology Centre, Catnip Pike, Nicholasville, KY, USA
[3] Swiss College of Agriculture, Zollikofen, Switzerland

Background – Selenium deficiency has become a major problem in animals and humans, and is linked to many diseases, including infertility and cancer. Se is involved in key antioxidant systems, performing a protective role in cells and tissues in all species, and comprises not only a functional ingredient for animals, but also allows the production of value-added functional foods for humans. Inorganic Se is associated with toxicity, but forms produced within yeast are safer, more bio-available and more efficiently transferred into tissues.
Objective – To review the research concerning the transfer of Se from animals fed Se-enriched yeast into milk, meat and egg products, and to discuss how this can be used to supplement human diets, especially in regions with Se deficiencies and high oxidation exposure, such as New Zealand.
Design – Data from replicated research and commercial trials on dairy cows, pigs and chickens where feeds were supplemented with Se-enriched yeast was collated. Responses in the levels of Se expressed in meat or eggs as a result of this supplementation were quantified and compared, and related back to human recommended daily intakes for Se. The opportunities for increasing Se status in humans by producing meat and eggs with higher Se profiles were assessed.
Outcomes – Supplementation with Se-enriched yeast significantly increased levels of Se in meat and eggs and improved antioxidant status. Milk Se improvements varied from five to sixteen fold, depending on cow status and dietary inclusion levels. In meat, chicken breast Se increased by 25% to 0.3 ug/g, beef enrichment was two fold, reaching 0.22 ug/g, and pork loin content increased by nearly 4 times to 0.33 ug/g. An average of 31 ug per egg (around 50% of the RDI recommended by the EU (65 ug), USA (55 ug) and NZ/AUS (70 ug)) resulted from hens fed 0.4 mg/kg Se. Inorganic Se did not realise the same improvements.
Conclusions – Feeding organic Se to animals and producing enriched food materials as a result can provide a route to improving the Se intake in humans, allowing the RDA to be ingested in a highly form an thus reduce the risk of deficiencies and associated diseases.

Colonic selenoproteins increase with level of dietary selenised yeast in finisher pigs

R Uglietta [1,2], SD Jayasooriya [1,3], JR Pluske [3], DJ Cadogan [4], EN Ponnampalam [1],
GH McIntosh [5], FR Dunshea [6]
[1] Department of Primary Industries, 600 Sneydes Road, Werribee, VIC, 3030
[2] Swinburne University of Technology, Hawthorn, VIC, 3123
[3] School of Veterinary and Biomedical Sciences, Murdoch University, Murdoch, WA, 6150
[4] Feedworks, Pty Ltd, Romsey, VIC, 3434
[5] Department of Medicine, Flinders University of South Australia, Bedford Park, SA, 5042
[6] Faculty of Land and Food Resources, The University of Melbourne, Parkville, VIC, 3010

Background – Selenoproteins are Selenium (Se) dependant enzymes, which protect against oxidative damage in the gastrointestinal tract. The expression of glutathione peroxidase 2 (GPx2) and selenoprotein P (SelP) rely on the Se status, with Se deficiency being associated with decreased GPx activity and increased risks of colon cancer. This study examined the effects of 0, 3 and 9 ppm of selenised yeast with 0, 100 and 1000 ppm of iron supplements on the colonic expression of GPx2 and SelP in the pig, study funded by Pork Cooperative Research Centre.
Objectives – To determine the gene expression of important selenoproteins in the colon of the pig fed 0, 3 or 9 ppm of selenised yeast diets using Real-Time Polymerase Chain Reaction (RT-PCR).
Design – Crossbred finisher pigs (n=18 males and 18 females) were offered *ad libitum* access to one of six experimental diets: 1) Basal: 0.13 mg/kg sodium selenite + 50 mg/kg iron (II) sulphate; 2) 3 mg/kg Se as selenised yeast (Diamond V); 3) 9 mg/kg selenised yeast Se; 4) 100 mg/kg iron; 5) 1000 mg/kg iron; 6) 3 mg/kg selenised yeast Se + 100 mg/kg iron. Pigs were sacrificed after 28 days. Data was analysed using delta Ct and ANOVA.
Outcomes – Colonic expression of GPx2 was 138 and 195% (P<0.001) of basal values in pigs consuming diets containing 3 and 9 ppm selenised yeast Se, respectively. Colonic expression of SelP was 156 and 225% (P<0.001) of basal values in pigs consuming diets containing 3 and 9 ppm selenised yeast Se, respectively. There was no effect of sex (P=0.80 and 0.63) or iron (P=0.15 and 0.80) on the expression of GPx2 or SelP, respectively.
Conclusion – These data suggest that dietary selenised yeast can increase the expression of key biomarkers of Se status in a dose-dependent manner.

Concurrent Session 12: Animal Nutrition

Performance and digestive tract development effects of green tea supplementation in broiler starters fed wheat-based diets

DV Thomas, AL Molan, V Ravindran
Institute of Food, Nutrition and Human Health, Massey University, Palmerston North, New Zealand

Background - Green tea has been shown in rodent studies to modify intestinal microflora, which may impact upon the digestibility of nutrients, and may affect performance and digestive tract development in young, growing broiler chickens.
Objective - To determine the effect of green tea supplementation on the performance and digestive tract development of the newly hatched broiler chick.
Design – Three wheat-based diets, containing 0, 0.5 or 1% green tea, were formulated and each diet was fed *ad libitum* to six replicate groups (8 birds/replicate) from day 1 to 21 post-hatch. Body weights and feed intake were recorded at weekly intervals. On day 21, two birds per replicate were euthanased and digestive tract traits were measured.
Outcomes – Green tea supplementation significantly ($P<0.05$) reduced feed intake on days 7 and 21, and improved feed efficiency on days 7 and 14. Green tea supplementation had no effects ($P>0.05$) on the relative weights of digestive organs and intestinal tract, but intestinal length was reduced ($P<0.05$) in birds fed diets containing 0.5% green tea.
Conclusion – Green tea supplementation improved feed efficiency in broiler starters fed wheat-based diets.

Apple polyphenols and protein bioavailability in growing rats

CA Butts, D Hedderley, JL Rhodes, S Martell
New Zealand Institute for Crop & Food Research Limited, Palmerston North, New Zealand

Background - Polyphenols (flavonoids, phenolic acids, tannins) are found in fruit and vegetables and are being added to dairy products to provide additional nutritional benefit, extend shelf-life, or improve functionality. However, the binding and precipitation of polyphenolic compounds to macromolecules such as dietary protein, carbohydrate, and digestive enzymes have been implicated in reduced food digestibility.
Objective – To determine the effect of apple extract rich in polyphenols on the digestion and absorption of protein from skim milk powder using the rat as a model of the mammalian digestive system.
Design – Twenty-four weanling Sprague Dawley male rats were housed individually in metabolic cages and a nitrogen (N) balance study was carried out to measure weight gain, dry matter intake, dietary N intake, biological value, true faecal digestibility, net protein utilisation, and apparent and true N balance. Apple extract was included in the diet at 10 g kg^{-1}. The study was carried out with approval from the AgResearch Grasslands Animal Ethics Committee (#10368).
Outcomes – Biological value was significantly higher when apple extract was included in the diet. Weight gain, dry matter intake, dietary N intake, true faecal protein digestibility, net protein utilisation, and apparent and true N balance were significantly ($P\leq0.002$) reduced in the presence of apple extract.
Conclusions – The high (>81%) overall utilisation and retention of dietary N in rats indicate that the effects of apple extract are not of significance unless dietary N intake is not sufficient to meet physiological requirements. However, where there is a physiological need for increased dietary N requirement and appetite is reduced such as for the elderly, the very young, the immune-compromised, or the unwell, care must be taken to ensure dietary polyphenols are not consumed in quantities that could reduce dietary protein bioavailability.

Concurrent Session 12: Animal Nutrition

Genistein and daidzein do not affect puberty onset or oestrus cycle parameters in the domestic cat (*Felis catus*)

KM Bell[1], CE Ugarte[1], LA Tucker[2], DG Thomas[1]
[1]*Centre for Feline Nutrition, Institute of Food, Nutrition and Human Health, Massey University, Palmerston North,4410 New Zealand*
[2]*Waiti Hill, PO Box 307, Feilding 4740 New Zealand*

Background – Dietary isoflavones (genistein and daidzein) possess oestrogenic properties and are present in commercially available feline diets. These isoflavones are reported to influence the reproductive system in a variety of mammalian species, although evidence is disparate and conflicting.
Objective – To determine if dietary isoflavones influence the onset of puberty and oestrus cycle parameters in the domestic cat when consumed during the developmental period.
Design – Kittens were maintained on either treatment (base diet + 300μg/g DM isoflavones, n=6) or control (base diet + vehicle, n=9) diets for up to 480 days post-weaning. Vaginal smears were taken thrice weekly and examined for oestrogen-induced cellular degradation. The first sign of oestrogen activity, onset of regular cycling, duration of oestrus and inter-oestrus periods and the incidence of spontaneous ovulation (inter-oestrus periods >20 days) were recorded and compared between groups.
Outcomes – No significant difference (P >0.05) was found in the onset of puberty or any oestrus cycle parameter examined. However, cats in the treatment group demonstrated a significantly greater incidence of spontaneous ovulation compared to control group cats (13.6% versus 3.9% of observed inter-oestrus periods, respectively, P =0.03).
Conclusions – Genistein and daidzein, when consumed at levels representative of commercially available feline diets, do not alter puberty onset or oestrus cycle parameters in the domestic cat. However, the greater incidence of spontaneous ovulation induced by these isoflavones may be of clinical significance and warrants further investigation.

POSTERS

P01

In-vitro model of mineral and organic acid absorption from tropical crops

H Sabboh, F Valla, MJ Gidley
Centre for Nutrition and Food Sciences, University of Queensland, St Lucia, Australia.

Background – The mineral and organic acid components of plant foods make a contribution to the nutritional quality of fruits and vegetables alongside other micro- and macronutrients that are studied more extensively. The nutrient composition of many tropical crops has not been described in detail; in particular there is a lack of information on mineral and organic acid components. In addition to content, the bioavailability of nutritional components needs to be determined in order to quantify likely effects of food on nutritional status. Here we report a study of the release of minerals and organic acids during simulated digestion and subsequent uptake as mimicked by Caco-2 cell monolayers.
Objective – The development of an *in-vitro* human mimetic model of digestion and absorption, and the study of the release of minerals and organic acids from tropical fruits and their absorption in the small intestine.
Design – Freeze-dried or raw samples of a range of tropical crops are cut into slices of 4g. An *in-vitro* mimic of human digestion is used, comprising oral (human α-amylase 100 units/L, pH 6.9), gastric (porcine pepsin 800-2,500 units/mg, pH 2), and pancreatic (pancreatin activity 4 X USP specification and bile extract, pH 6) digestion models followed by an *in-vitro* model of small intestine absorption using Caco-2 cell monolayers.
Outcomes – Mineral and organic acid contents of a range of tropical crops, their release during simulated digestion, and their uptake by Caco-2 cells will be reported.
Conclusion – This information will be useful in defining the opportunity for tropical crops to contribute to mineral nutrition. The potential for fruits and vegetables to be a prime source of balanced mineral nutrition opens up an under-exploited opportunity for both food industry innovation and public health messages, through incorporation of relevant plant materials into a range of food products and provision of evidence for new marketing messages promoting fresh produce.

P02

Anti-inflammatory effects of kiwifruit

JM Farr[1], SM Hurst[2], MA Skinner[1]
[1]*The Horticulture and Food Research Institute of New Zealand, Auckland, New Zealand*
[2]*The Horticulture and Food Research Institute of New Zealand, Hamilton, New Zealand*

Background – Inflammation is a normal physiological immune response to injury or foreign insult, however, tissue can become damaged when inflammation is prolonged. This chronic inflammation appears to play a fundamental role in many chronic diseases such as arthritis, cancer, heart disease and even diabetes and obesity but it may be possible for fruit to modify or attenuate the inflammatory response.
Objective – We explored the anti-inflammatory properties of kiwifruit, specifically the ability to attenuate the production of the inflammatory cytokines tumour necrosis factor (TNF)α and interleukin (IL)-1β by human cells after stimulation with bacterial lipopolysaccharide (LPS).
Design – Two cell types were used in this study. These were a human monocyte THP-1 cell line and whole blood from three donors which were pre-incubated with solvent or aqueous extracts from in-house and commercially available ZESPRI™ kiwifruit cultivars and then stimulated with LPS. This was followed by an ELISA assay of the cell media supernatant to investigate attenuation of TNFα and IL-1β production.
Outcomes – Induction of TNFα and IL-1β by LPS was demonstrated. Both cell types responded to LPS in a dose responsive manner, however, the whole blood of each donor was shown to respond differently to increasing LPS dose. After an initial screen of TNFα attenuation in THP-1 cells, two aqueous extracts from ZESPRI™ GOLD and ZESPRI™ GREEN kiwifruit were shown to reduce TNFα production in a dose dependent way. Further analysis of these extracts to investigate the attenuation of IL-1β production in THP-1 cells, as well as attenuation of TNFα and IL-1β production in whole blood from three donors was carried out. It was demonstrated that these two extracts were able to reduce IL-1β production by THP-1 cells in a dose dependent manner. These extracts also reduced TNFα and IL-1β production in whole blood from three donors, although the response was donor dependent.
Conclusions – ZESPRI™ GOLD and ZESPRI™ GREEN Kiwifruit aqueous extracts were demonstrated to give good anti-inflammatory activity in human THP-1 cells and whole blood *in vitro*. The extent of the anti-inflammatory effect in whole blood was donor dependent. These specific fruits may be useful for inclusion in diets to help combat the inflammation underlying many chronic diseases associated with our current lifestyle.

P03

Glycaemic and potential prebiotic impact of potato carbohydrates: Influence of processing and cultivar

S Mishra[1], JA Monro[1], J Anderson[2], R Genet[3]
New Zealand Institute for Crop and Food Research Limited, Palmerston North[1], Pukekohe[2], and Christchurch[3], New Zealand

Background – Potatoes have become regarded as a staple of doubtful nutritional quality because they often have a high glycaemic index and a low content of dietary fibre. However, as potatoes are starchy, their nutritional impact can be greatly affected by conditions that influence the digestibility of starch in them. One such condition is cold treatment after cooking, which reduces the rate of starch digestion in potatoes by inducing conversion of rapidly digested starch (RDS) to slowly digestible starch (SDS) and digestion-resistant starch (RS).
Objective – To determine the effect of cold treatment after cooking on the glycaemic impact of potatoes, measured as the release of sugars during starch digestion *in vitro* under simulated physiological conditions. To measure cultivar differences and processing effects on formation of SDS and RS with cold treatment after cooking.
Design – Supermarket potatoes were screened to determine the tendency of different cultivars to form slowly digestible starch after cooking and cooling. A cultivar showing a relatively strong tendency to form SDS was then used to systematically investigate the influence of cooking, cooling, milling, coarse mincing, pasting, freezing, freeze-drying in over 20 combinations.
Outcomes – Potatoes digested immediately after cooking were predominantly RDS. Cooling the cooked potatoes for 2 days at 4 ºC caused a marked reduction in RDS and increased SDS and RS, with large intercultivar differences. The formation of SDS and RS was markedly influenced by processing conditions and the relative proportions of SDS and RS formed depended on the conditions chosen.
Conclusions – Cold treatment of potatoes after cooking can be used to enhance them nutritionally by lowering their glycaemic impact and increasing their dietary fibre content. As the reduced glycaemic impact results largely from a reduced rate of available carbohydrate digestion, the glycaemic index of the potato carbohydrate is reduced. However, despite having a moderate or high glycaemic index, the glycaemic impact of freshly cooked potatoes is only moderate because they contain a low density of available carbohydrate.

P04

Does heat degrade the concentration of phenolic compounds in extra virgin olive oil thereby negating their healthful properties?

S Cicerale[1], X Conlan[2], A Sinclair[1], R Keast[1]
[1] School of Exercise & Nutrition Sciences, Deakin University, VIC 3125
[2] Institute of Biotechnology (BioDeakin), Deakin University, VIC 3217

Background – The phenolic fraction of extra virgin olive oil has generated much interest regarding its possible health promoting properties. Studies (human, animal, *in vivo* and *in vitro*) have revealed that olive oil phenolics have positive effects on certain bio-markers of health, such as: plasma lipoproteins, oxidative damage, inflammation, platelet and cellular function and antimicrobial activity. However, a number of factors have the ability to alter the concentration of key health promoting phenolic compounds in extra virgin olive oil. For instance, heat application during cooking has been shown in a limited number of studies to alter the concentration of particular olive oil phenolics. This is of significance as extra virgin olive oil is often used as an ingredient in a number of cooked meals. Therefore, it is of great importance to understand this factor in greater detail in order to preserve the essential health promoting benefits of olive oil phenolic compounds.
Objective – To determine if heating degrades key phenolic compounds (hydroxytyrosol, deacetoxy oleuropein, oleuropein aglycon, ligstroside aglycon and oleocanthal) in extra virgin olive oil.
Design – One extra virgin olive oil containing a significant level of olive oil phenolics (>200 ppm) was heated to 100°C, 170°C & 240°C for 1, 5, 20 and 60 minutes, using a full-factorial design. Olive oil phenolics were isolated, identified and quantified by high performance liquid chromatography-mass spectrometry (HPLC-MS).
Outcomes – There was differential and significant ($P<0.05$) degradation among the key health benefiting olive oil phenolic compounds during cooking. The extent of degradation was dependent upon the temperature applied and the time period of heat application.
Conclusions – Olive oil phenolics are heat labile, but to varying degrees. Therefore, the health promoting benefits of phenolic compounds in olive oil are maximized when the application of heat is minimised.

P05

Effect of resveratrol and carbohydrate restriction on pituitary function and ageing

N Nemazannikova[1], C Chen[2], P Lewandowski[3]
[1] *School of Biomedical and Clinical Sciences, Victoria University, VIC 8003*
[2]*Prince Henry's Institute of Medical Research, VIC 3168*
[3]*School of Medicine, Deakin University, VIC 3217*

Background – Caloric restriction (CR) is shown to extend life span in mammals and is a well known intervention that improves endogenous Growth Hormone (GH) secretion. GH plays an important regulatory role in metabolism and its secretion declines with age. Low glycemic index (GI) diets and resveratrol supplementation have been reported to decrease the appearance of age-related pathologies and influence pituitary GH activity. GH plays an important regulatory role in metabolism and its secretion declines with age. Rat pituitary adenoma GH3 cells were used as an vitro model to examine the effect of low GI carbohydrate and resveratrol on the GH synthesis.
Objective – To determine the effects of low GI carbohydrate and resveratrol on pituitary GH production. Through the use of a pituitary GH3 cell culture system to we hope to gain insight on how low GI carbohydrate and resveratrol stimulate GH production.
Design – GH3 cells with the seeding density of 3×10^5 were grown in glucose (high GI) or fructose (low GI) media or glucose media ± resveratrol (10mg/L) or fructose media ± resveratrol (10mg/L). Viable cell count, growth rates and doubling time were measured. The level of GH gene expression was examined using RT PCR and expressed as arbitrary units (AU).
Outcomes – After 78 hours cells grown on fructose + resveratrol media exhibited diminished growth rates (5.7×10^5 cells) compared to glucose based media (7.5×10^5 cells), $p<0.05$. In contrast cells grown in fructose rich media (21.9 AU), resveratrol + fructose media (99.7 AU) and glucose + resveratrol media (15.3 AU) showed a significant increase in GH expression compared to the cells grown in glucose media (3.7 AU) $P<0.05$.
Conclusions – Low GI carbohydrate and resveratrol slow cell growth while stimulating GH gene expression in cultured pituitary cells. These results indicate that a low GI diet and resveratrol supplementation may enhance GH secretion in this in mammals and if this was to occur in vivo possibly lead to the life span extension.

P06

FODMAPs are substrates for colonic fermentation:

possible implications for gastrointestinal health

J Muir[1], J Barrett[1], S Mitchell[2], D Ong[2], R Rose[1],O Rosella[1],S Shepherd[1],P Irving[1], S Smith[2], P Gibson[1].
[1]*Departments of Medicine & Gastroenterology, Monash University, Box Hill Hospital, Box Hill, Victoria 3128*[2]
School of Exercise and Nutrition Sciences, Deakin University, Burwood, Victoria, 3125.

Background – FODMAPs (Fermentable Oligo-, Di-, Mono-saccharides And Polyols) are a newly described group of poorly absorbed, short-chain carbohydrates and include; fructose, lactose (in hyperlactasic people), fructans (inulin and fructooligosacharides (FOS)), galactooligosaccharides (GOS) stachyose and raffinose) and sugar alcohols (sorbitol and mannitol). FODMAPs are commonly found in a wide variety of foods including garlic, onions, rye, legumes, stone fruits, fruit juices and products made with high fructose corn syrup. Malabsorbed FODMAPs act as substrates for bacterial activity in the gastrointestinal tract producing gases (CO_2, CH_4, H_2) and short chain fatty acids (SCFA). Some FODMAPs, i.e. FOS and GOS are prebiotic in nature. We have established analytical methods (HPLC and enzymatic) to quantify levels of FODMAPs in foods, and have developed 2 diets that vary greatly in FODMAP composition.
Objectives – To measure the short-term effects of 2 diets that differ in FODMAP content on colonic fermentation and gastrointestinal symptoms in healthy people.
Design - 15 healthy people were randomised to 2 diets that differed only in the quantity of FODMAPs (low and high FODMAP). The diets were consumed for 2 days each separated by at least one week. All food was provided. Hourly breath hydrogen samples were collected for 14 hours on day 2 of each diet and symptom questionnaires were completed.
Outcomes – The high FODMAP diet significantly increased breath hydrogen production (over 4 fold, $P<0.01$) and produced more wind and looser stools ($P<0.02$) when compared with the low FODMAP diet.
Conclusions – The results suggest that foods containing FODMAPs provide carbohydrate substrate for colonic fermentation. FODMAPs may have a number of important implications for the health of the gut and for controlling undesirable symptoms in individuals with gastrointestinal disorders such as Irritable Bowel Syndrome.

P07

Dietary fibres, functional foods and human well-being

D Sun-Waterhouse[1], LD Melton[2], MA Skinner[1]
[1]*The Horticulture and Food Research Institute of New Zealand, Auckland, New Zealand*
[2]*Food Science, Chemistry Department, The University of Auckland, Auckland, New Zealand*

Background – There has been much debate on the definition of dietary fibres (DFs), as well as the choice of methods used for characterizing them. The nutritional benefits of DFs are well accepted. Interest in the application of DFs in functional foods has been growing among adult consumers, food processors, ingredient suppliers and health professionals. In a meal, a variety of food components, including DFs, are consumed together. These food components will probably interact with one another during digestion. The physiological effects of DFs depend not only on the property or the dose of fibre ingested but also on the composition of a meal or diet.
Objective – From the nutritional point of view, whole plant cell walls and their components are considered as the major sources of DFs. We have focused on the interactions between plant cell wall preparations and other active components including nutrients and non-nutrients, and applications of these defined interactions in functional food development.
Design – Fruit and vegetable cell walls or their polysaccharide preparations were produced using a near-natural aqueous method. Interactions between fibre components and other food components under simulated biological conditions were examined and characterised using different techniques, such as Ferric Reducing Antioxidant Power assay, cyclic voltammetry, HPLC/LC-MS, and solid-state ^{13}C CP/MAS NMR.
Outcomes – Interactions between DFs and other food components occur during their movement through the human gastrointestinal tract. Apple and onion fibre preparations stabilised ascorbic acid effectively, but offered little protection against quercetin degradation. The inhibitory effects of soluble and insoluble fibres on lipolysis catalysed by lipase will also be addressed.
Conclusions – Plant origin fibres and their complex polysaccharides have significant influences in food properties, antioxidant activity and bioavailability. Not only the physiological and nutritional functions of DFs, but also the resulting synergistic beneficial effects arising from the tailored interactions, could be delivered to consumers in different functional food formats.

P08 withdrawn

P09

Tea is the major source of flavonoids in older women in South East Queensland

P Cedaro[1], P Lyons-Wall[1], S O'Neill[2], B Newman[1]

[1] *Institute of Health and Biomedical Innovation, Queensland University of Technology, Kelvin Grove, QLD 4059*

[2] *The Betty Byrne Henderson Centre, Royal Brisbane and Women's Hospital, Herston QLD 4006*

Background – Flavonoids are biologically active polyphenolic compounds ubiquitously distributed in plants that have been linked to various cardio- and chemoprotective effects. Data on dietary intake in Australia are limited.

Objective – To determine the dietary flavonoid consumption (mg/d) and major food sources in a sample of healthy women aged 40-80 years from South East Queensland.

Design – An individual diet history interview was conducted with 470 women (mean ± SD age 61.3 ± 10.6 y) participating in the Longitudinal Assessment of Ageing in Women based in Brisbane, Queensland. Data were analysed for 26 individual flavonoids within five major subclasses, using the US Department of Agriculture database (Release 2.0, 2006).

Outcomes – Mean (SEM) daily intake for total flavonoids was 610 ± 22.5 mg/d, with the individual subclasses providing 534 ± 21.8 mg/d for flavan-3-ols, 34.9 ± 0.83 mg/d for flavonols, 18.7 ± 0.94 mg/d for flavanones, 18.1 ± 0.80 mg/d for anthocyanidins, and 4.09 ± 0.26 mg/d for flavones. The major food sources were: black tea (90%), green tea (6%), and apples (with and without skin) (1%) for flavan-3-ols; black tea, onions and apples (with skin) for the flavonols; oranges and orange juice, mandarins and red wine for flavanones; banana, red wine, red grapes, strawberries and apples (with skin) for anthocyanidins, and fresh parsley, olives and red wine for flavones. Black tea accounted for 497 mg/d (81%) of the total daily flavonoid intake followed by green tea with 34.2 mg/d (6%), red wine 9.72 mg/d **(**1.6%), apples 7.97 mg/d (1.3%), oranges 7.21 mg/d (1.2%) and bananas 6.93 mg/d (1.1%).

Conclusion – Black tea was the major dietary source of flavonoids in this group of women in South East Queensland. Flavan-3-ols were the major subclass, comprising 87.6% of total daily intake, followed by the flavonols (5.7%), flavanones (3%), anthocyanidins (3%) and flavones (0.7%). Establishing flavonoid composition data for Australian foods and standardised tools specifically designed for the measurement of flavonoid intake would greatly assist the accuracy of local intake assessment as well as aiding comparisons at the national and international level. Improved estimations of flavonoid intake and bioavailability will be crucial in determining the proposed relations between these compounds and chronic disease states.

P10

Incorporation and metabolism of punicic acid in rats

GF Yuan[1], JQ Yuan[2], D Li[1]

[1]*Department of Food Science and Nutrition, Zhejiang University, Hangzhou, China 310029*

[2]*Center of Analysis, Zhejiang University, Hangzhou, China 310029*

Background – It was reported recently that conjugated linolenic acid (CLNA) has a cytotoxic effect on cultured human tumor cells, inhibiting carcinogenesis and altering the lipid metabolism in animals. Punicic acid (9*c*, 11*t*, 13*c*-CLNA, PA) is a main isomer of CLNA in *Trichosanthes kirilowii* Maxim (TK seed) in China.

Objective – The aim for this study was to investigate the incorporation and metabolism of punicic acid (PA) in tissues and plasma in rat.

Design – Thirty male Sprague-Dawley rats were fed a fat-free diet during a two-week acclimatization period. All animals had free access to food and water. The rats were fasted for 12 h, 2g of TK seed oil was given intragastrically, and then rats were randomly divided into 5 groups (n= 6), no food was allowed throughout the experiment. The rats were killed under anaesthesia (diethyl ether) at 0, 4, 8, 12, 24 h thereafter, blood and tissue samples were collected. Fatty acid composition in plasma and tissues were measured by HPLC and GC-MS.

Outcome – PA was incorporated and metabolized to 9*c*, 11*t*-CLA in rat plasma, liver, kidney, heart, brain and adipose tissue. The level of PA and CLA in liver and plasma was higher than in brain, heart, kidney and adipose tissue, and the lowest accumulation occurred in the brain.

Conclusions – PA can be converted into 9c, 11t-CLA. This has gained increased importance since it has been demonstrated that 9c, 11t-CLA exerts many biological activities. Therefore natural resources containing CLNA, especially edible TK seed could be a good dietary resource of CLA, following PA metabolism. PA is expected to be used as a functional food and nutraceutical.

P11

The effects of vinegar powder on hepatic and renal function in healthy subjects

ZG Zhang, AM Xu, TC Xu, GQ He, D Li

Department of Food Science and Nutrition, Zhejiang University, Hangzhou, China 310029

Background – Vinegar has long been used as a traditional seasoning. Results from animal and human studies showed that vinegar has beneficial effects on enhancing calcium absorption, reducing blood pressure, improving blood flow velocity and blood viscosity, attenuating postprandial serum glucose and insulin resistance in healthy subjects and diabetic patients. These beneficial effects have been claimed to be caused by the acetic acid content. We hypothesized that other compound, apart from acetic acid, formed during fermentation contributes to vinegar's beneficial effect.

Objective – To investigate the effect of vinegar powder on selected parameters in relation to hepatic and renal function in healthy subjects.

Design – Forty-six healthy volunteers aged from 20 to 31 years were recruited from Zhejiang University with the exclusion of subjects with hepatic or renal dysfunction or cardiovascular disease history. The subjects were randomly assigned into the vinegar powder group (female=14, male=10) and the control group (female=13, male=9). The study lasted 16 wks (from September to January in the next year), which just spanned from the fall to the winter. Each subject in the vinegar powder group was asked to ingest 5 vinegar powder tablets daily during the study period, and the control group took nothing.

Outcome – Vinegar powder intake was associated with the blunted seasonal decrease in serum total protein, albumin, uric acid but significantly seasonal decrease in serum direct bilirubin, total bilirubin and fasting glucose levels ($P<0.05$). Compared with baseline, fasting Serum glucose was significantly decreased in vinegar powder group ($P<0.001$).

Conclusions – Vinegar powder might be beneficial to human health in relation to improving liver function and blood antioxidative capacity, lowering blood glucose.

P12

Amylase inhibition *in vitro* by bioactives from fruit and vegetables is reversed by milk

JA Monro[1], S Mishra[1], R. Wibisono [2]

[1]*New Zealand Institute for Cr p& Food Research Limited, Palmerston North, New Zealand*

[2]*The Horticulture and Food Research Institute of New Zealand, Auckland, New Zealand*

Background – Evidence for a role for plant bioactives in health has led to these compounds being included in a range of food products, including dairy products. Several studies have now shown that some bioactives may have an inhibitory effect on digestive enzymes. The question therefore arises as to whether bioactives affect digestion when added to milk.

Objective – To determine the capacity of bioactives from fruit and vegetables to inhibit digestive enzymes during simulated digestion *in vitro*. To measure any modulatory effect of milk on enzyme-inhibition by bioactives under ileal conditions, after simulated gastric digestion.

Design – Concentrated bioactive extracts of apple, boysenberry, carrot, grape seed and tomato were supplied by HortResearch. Preliminary trials identified pancreatin/polyphenol concentrations at which amylase inhibition could be demonstrated. These concentrations were then used to measure amylase inhibition by the extracts in the presence and absence of milk reconstituted from milk powder. Prototype milk products containing boysenberry and grape seed extracts were also tested for their impact on amylase activity against pregelatinised starch suspended in the products.

Outcomes – After *in vitro* digestion, apple and grape seed extracts severely inhibited pancreatic amylase activity, while boysenberry, carrot and tomato extracts had no effect. When the digestion was carried out in the presence of milk the apple and grape seed extracts had no effect on amylase activity, and the rates of starch digestion in the presence of all of the extracts plus milk were similar. Bioactives in the prototype milk products had no influence on digestion of starch in the products by pancreatin after a simulated gastric (HCl/pepsin) digestion.

Conclusions – Milk protects intestinal amylase from inhibition by apple and grape seed polyphenols.

P13

The effect of temperature on (-)-epigallocatechin gallate, the major catechin in green tea

JC Krahe, PD Roach

School of Environmental and Life Sciences, University of Newcastle, Ourimbah NSW 2258, Australia

Background – Epigallocatechin gallate (EGCG) is a green tea catechin to which many beneficial biological functions have been attributed. It is available as a purified preparation for inclusion in functional foods but its stability is questionable. For example, it is known that heating a solution of EGCG can cause its epimerisation to gallocatechin gallate (GCG). This may therefore affect the bioavailability and bioactivity of EGCG in any product which needs heating. Therefore, it is important to have an understanding of the effects of heating on EGCG in order to better control the catechin profile and the functionality of products intended to be functional foods.
Objectives – To determine the extent of epimerisation of EGCG to GCG caused by incubation of pure EGCG at various temperatures over time.
Design – Solutions of 2mM EGCG were incubated at temperatures between 25-120°C for up to 90 minutes using a pressure cooker. High Pressure Liquid Chromatography (HPLC) analysis was used to monitor the epimerisation of EGCG to GCG.
Outcomes – The EGCG was stable up to temperatures of 100°C with epimerisation to GCG only occurring at levels of less than 5%. However the stability of EGCG was adversely affected at 110°C and 120°C with around 50% of the EGCG being converted to GCG when the reaction reached a state of equilibrium after 60 minutes of incubation.
Conclusions – These results demonstrate that care will need to be taken if pure EGCG is to be included in a functional food which requires exposure to temperatures higher than 100°C because the catechin may be converted to GCG and therefore the intended bioavailability and bioactivity of the EGCG may be lost in the functional food.

P14

An *in vitro* study on adhesion of probiotic combinations to Caco-2 human intestinal epithelial cells

M Moussavi, J Barouei, MC Adams

School of Environmental and Life Sciences, University of Newcastle, NSW 2308, Australia

Background – The role of probiotic microorganisms in intestinal ecosystems has received much attention in respect to their beneficial effects on both human and animal health. Adhesion to intestinal epithelial cells is one of the main functional criteria for selection of probiotic microorganisms. Probiotic adhesion to intestinal epithelial cells using single strains has been extensively studied, however few studies are available on the adhesion properties of probiotic combinations in the intestinal system *in vitro* and *in vivo.*
Objective – The aim of this study was to evaluate the adhesion ability of various probiotic strains (*Lactobacillus casei* 01, *Lactobacillus plantarum* HA8, *Lactobacillus rhamnosus* GG, *Lactobacillus reuteri* and *Bifidobacterium lactis* Bb12), either alone or in combination with *Propionibacterium jensenii* 702 to Caco-2 human intestinal epithelial cells.
Design – Bacterial suspensions were added to post confluent monolayers of Caco-2 cells in 24 well micro-plates. After 3 hours incubation at 37°C in 5% CO_2/95% air, adherent bacteria were released from Caco-2 cells and serially decimal diluted bacteria were plated on LBS, BIM and YEL agar for selective enumeration of *Lactobacillus*, *Bifidobacterium* and *Propionibacterium spp* respectively. Bacterial colony counts were then undertaken to measure the adhesion rate.
Outcomes – Only the adhesion of *Lactobacillus reuteri* was improved in the presence of *Propionibacterium jensenii* 702; the adhesion ability of other lactobacilli and *Bifidobacterium lactis* Bb12 decreased. The adhesion of *Propionibacterium jensenii* 702 to Caco-2 cells was found to be enhanced in combination with *Lactobacillus rhamnosus* GG or *Lactobacillus plantarum* HA8.
Conclusion – Our results suggest that some combinations of probiotic bacteria may have synergistic influences on adhesion to epithelial cell lines. Such potential synergies should also be evaluated *in vivo*.

P15

Functional extruded snack products based on chickpea (*Cicer arietinum L.*) and fenugreek *(Trigonella foenum-graecum)* flours

G Ravindran[1], S Gamlath[2]

[1]*Institute of Food, Nutrition and Human health, Massey University, Palmerston North, New Zealand*
[2]*School of Exercise and Nutrition, Faculty of Health Medicine, Nursing and Behavioural Sciences, Deakin University, Melbourne, Australia*

Background – Chickpea and fenugreek are both legumes that confer several nutritional and functional virtues, especially to diabetes and associated metabolic syndrome conditions. They are high in protein and fibre, low in fat and prove to be low glycaemic. They also provide a gluten-free alternative to those suffering from celiac disease. Though these seeds are locally available, hardly any products appear on the supermarket shelves.
Objectives – The aim was to utilise the health and nutritional benefits of chickpea and fenugreek and develop acceptable snack products by extrusion technology.
Design – Preliminary trials were conducted with different proportions of rice and chickpea at a range of extruder conditions to optimise the raw material and processing conditions. Studies were then conducted at optimum processing conditions using a 7:3 chickpea and rice combination replacing with 2% fenugreek or 5, 10, 15 and 20% FenuLife® (deodorized fenugreek powder). Products were evaluated for their physical (expansion, crunchiness and colour) and sensory (texture, colour, flavour and overall acceptability) characteristics in order to identify their suitability as snack products.
Outcomes – Addition of chickpea up to 70% with rice showed increased expansion and stable product characteristics. Addition of fenugreek and FenuLife®, indicated slight reduction in product expansion (radial) and crunchiness. However, the product made with 20% FenuLife® had significant changes in expansion, crunchiness and colour values. The median scores of sensory evaluation indicated that all products were within the acceptable range. Inclusion of fenugreek showed lower ratings for flavour due to the strong bitter taste of fenugreek. There were no significant differences between products containing FenuLife® (5-15%) in their colour, flavour, texture and overall quality.
Conclusion – This study demonstrates an opportunity for using chickpea and fenugreek in functional product development. Fenugreek in the form of deodorize powder (fenulife®) could be incorporated up to 15% in a mixture of chickpea and rice to develop snack products of acceptable physical and sensory properties.

P16

Changes in fatty acid profiles in chicken eggs following oral supplementation of the probiotic, *Propionibacterium jensenii* 702, to layers

J Luo, M C Adams

School of Environmental and Life Sciences, University of Newcastle, NSW 2308, Australia

Background – Probiotic supplementation to the diet of layer chickens has been demonstrated to improve egg quality in respect to mass, weight, size and specific gravity. In addition, supplementation with certain probiotic strains has also resulted in changes in the egg cholesterol level and the composition of fatty acids.
Objective – The aim of this study was to investigate the effect of daily oral supplementation of the probiotic *Propionibacterium jensenii* 702 on fatty acid profiles of chicken eggs.
Design – In this study, twenty eight starter pullets were divided equally into a control and treatment group. A novel probiotic, *Propionibacterium jensenii* 702, which was originally isolated from raw bovine milk, was orally administered to the treatment group daily at a dose of 10^7 cfu. Over an eight week period, 10 eggs from each group were selected weekly for measurement of egg cholesterol and fatty acid content. Cholesterol and fatty acids composition of whole egg was detected by GC-MS.
Outcomes – The results demonstrated changes in the egg cholesterol and fatty acids in the treatment group compared to the control group associated with the probiotic supplementation. Significantly lower levels of Myristic acid (P<0.001), Palmitoleic acid (P=0.001) and all-*cis*-11, 14- Eicosadienoic acid (P=0.02) were observed in the treatment group.
Conclusions – Dietary supplementation with the probiotic *Propionibacterium jensenii* 702 has the potential to alter fatty acid profiles in egg. If probiotic supplementation is going to be safely implemented in animal food production, consideration of the alterations to the final food product should be undertaken to ensure the overall outcomes of the supplementation are beneficial to the end product consumer.

P17

Does the food substrate influence the functionality of probiotics?

RDCS Ranadheera, J Luo, P-H Ho, MC Adams
School of Environmental and Life Sciences, University of Newcastle, NSW 2308, Australia

Background – Food substrate (diet) is considered as one of the major factors in regulating colonization of microorganisms in the gastrointestinal tract, and therefore may play a major role in the successful application of probiotics into human and animal diets. Indeed, food helps to buffer the bacteria through the stomach and contains other functional ingredients, such as bioactive compounds, that may interact with the probiotics to alter their functionality. This interaction may be species specific. Although probiotics originally were intrinsically linked to food, there is now an increasing trend in using probiotics as nutraceuticals, such as in capsules. This changing trend in probiotic delivery may lead to a reduced functional efficacy due to the exclusion of the potential synergistic effect of the food.
Objective – To evaluate the influence of food substrate on functionality of probiotics, with special reference to their ability to influence *in vitro* cytokine production.
Design – Three newly identified probiotic strains *Propionibacterium jensenii 702, Lactobacillus gasseri HA 4, L. acidophilus HA 12* and commercially available *Bifidobacterium lactis* Bb 12 were grown in different samples of pasteurised goat milk, bovine milk and standard mediums. After sonication cell free fractions were collected and polymorphonuclear cells were stimulated. Cytokines produced (IFNγ, IL-2, IL-4 and IL-10) were measured by ELISA.
Outcomes – *P. jensenii 702, L. gasseri HA 4* and *L.acidophilus HA 12* demonstrated satisfactory growth in both bovine and caprine milk compared to standard mediums (maximum bacterial count range from $5x10^7$-$1.4x10^8$ cfu/ml). However, their growth patterns were different. Considerable number of substrate samples demonstrated different levels of cytokine production responding to different bacterial strains. Selection of probiotic strains for novel functional foods promoting immune modulation are selected based upon food probiotic interactions.
Conclusions – It is apparent that substrate may influence *in vitro* cytokine production, and therefore selection of probiotic strains for functional foods should be made only after careful investigation of potential interactions between the probiotic and food substrate. It is acknowledged that further *in vivo* research will be necessary to determine the true extent of the influence food substrates have on individual probiotic strain clinical efficacy.

P18

Fatty acid composition of edible oils derived from certified organic and conventional agricultural methods

MJ Foster[1], JWY Chow[1], ZI Ahmad[1], JL Phuyal[1], P Petocz[2], S Samman[1]
[1] *Human Nutrition Unit, School of Molecular and Microbial Biosciences, University of Sydney, NSW 2006*
[2] *Department of Statistics, Division of Economic and Financial Studies, Macquarie University, NSW 2109*

Background – One of the primary reasons for the purchase of organic food is the perception that it conveys nutritional advantages over conventional products. Despite a growing scientific interest in the nutrient composition of organic products, only a limited number of studies have investigated the fatty acid composition of edible oils.
Objective – To analyse and compare the fatty acid composition of commercially available edible oils derived from certified organic and conventional agricultural methods.
Design – A total of 59 certified organic and 53 conventional oils were purchased from local Sydney retail markets and matched for comparison. Fatty acid composition was determined by gas chromatography. The organic and conventional samples were compared with respect to Saturated, Monounsaturated, and Polyunsaturated classes of fatty acids (SFA, MUFA, and PUFA, respectively) using an analysis of variance model with type of oil and method of production (organic or conventional) as fixed factors, and sample pair as a random factor. Further analyses were conducted for each oil type separately, including non-parametric testing of categories with a small number of pairs.
Outcomes – No consistent overall trend of difference in fatty acid composition was observed between organic and conventional oils. SFA, MUFA, and PUFA were all significantly different between types of oil ($P<0.001$ in all three), and each had significant interaction between type and production method ($P=0.002$, $P<0.001$, and $P<0.001$, respectively) indicating that organic and conventional oils differed in these components in an inconsistent fashion. Despite this, some specific pairs of oils showed large differences between MUFA and PUFA components.
Conclusion – The absence of an overall difference in the fatty acid composition of organic and conventional oils does not support the tenet that organic foods are of a higher nutritional quality than their conventional counterparts. At least with respect to oils, consumers need to consider other reasons for purchasing organic products, such as the support of food production systems that minimise environmental damage (1).

Reference

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P19

Effect of thermal processing on caloric value, water, ash and mineral levels of Greek free-range and caged hen eggs

K Gerothanasi[1] , S Papadopoulou[1], K Diamantopoulos[2], G Dimitrelia[2], M Hassapidou[1], E Kiranas[1]
[1]*Department of Nutrition & Dietetics, Alexandreion Technological Educational Institution of Thessaloniki, Greece*
[2]*Department of Food Technology, Alexandreion Technological Educational Institution of Thessaloniki, Greece*

Background – Eggs have high nutritional value and are easy accessible to the general population.
Objective – The purpose of this study was to examine the effect of domestic thermal processing (boiling, poaching and pan-frying in virgin olive oil) on the energy, water, ash and mineral elements (calcium, magnesium, iron, zinc, copper and phosphorus) content of free-range and caged hen eggs from a Mediterranean country (Greece).
Design – The individual samples of commercial eggs were obtained from local producers and industries in amounts proportional to their annual production and consumption in Greece. Samples were prepared by mixing the selected individual commercial samples in order to represent the bulk of the annual production. Moisture and ash were analysed by the methods described in AOAC, phosphorus photometrically, the other minerals by flame atomic absorption spectrometry with deuterium background correction lamp and energy value was determined by means of an adiabatic bomb calorimeter.
Outcomes – Except for increased concentration of calcium (5% on average) in the free-range hen eggs compared to caged ones, there was no statistically significant difference in ash and mineral contents, according to their origin. Also, no significant differences were observed in the above ingredients with criterion the method of cooking. The energy value of free-range hen eggs was higher by 10% in comparison with caged ones. This is partially attributed to the lower moisture of free-range hen eggs compared to caged ones. Furthermore, after thermal processing, the energy value of raw eggs decreased, in boiled eggs by 3% and in poached eggs by 13.5%. Pan-fried in virgin olive oil eggs, due to partial replacement of their water with oil, showed significantly higher energy content compared to boiled eggs (by 50%) and poached ones (by 67%).
Conclusions – Dieters wishing to loose weight should seriously take into account the previous observations.

P20

Glycaemic control of extruded breakfast cereals: use of dietary fibres

MA Brennan[1], JW Woolnough[1,2], JA Monro[2], I Merts[1], CS Brennan[1]
[1]*Institute of Food, Nutrition & Human Health, Massey University, Palmerston North, New Zealand*
[2]*New Zealand Institute for Crop and Food Research Ltd., Palmerston North, New Zealand*

Background – Extruded breakfast cereals are regarded as high glycaemic index food items. Previous research has shown that dietary fibre can reduce the rate of the glycaemic response of an individual. The extrusion process has the effect of significantly altering the physiological attributes of ingredients, however there exists a potential to utilise dietary fibres in reducing the glycaemic impact of extruded food products.
O**bjective** – To quantify effects of differing dietary fibre inclusions into an extruded breakfast cereal product and determine the physico-chemical and nutritional properties of the extruded food products.
Design – Dietary fibre (guar and wheat bran at 5 and 10 % w/w) were included into a wheat flour base preparation. Extruded breakfast cereals were made from the base preparations. Expansion ratio, cereal texture and chemical composition were determined. In vitro starch digestibility was measured to determine the effect of dietary fibre and extrusion processing on readily, slowly digestible starch fractions.
Outcomes – Measurements of rapidly and slowly digestible for the dietary fibre enriched breakfast cereals were significantly reduced (between 28-32 %) compared to the standard breakfast cereal control (without fibre addition). Texture and expansion ratio of the breakfast cereals were also significantly affected by the inclusion of dietary fibre (a general reduction in expansion ratio related to an increase in texture).
Conclusions - Early work demonstrates that the utilisation of dietary fibre in extruded breakfast cereals can significantly reduce the potential glycaemic response due to the ingestion of such food products. It is therefore possible to manufacture reduced glycaemic index extruded breakfast cereals.

P21

In vitro fermentative activity of human fecal micro flora on rice fibre

WMADB Fernando[1], KKDS Ranaweera[2], A Bamunuarachchi[2], CS Brennan[3]
[1]*Open University of Sri Lanka, Sri Lanka,*
[2]*University of Sri Jayewardenepura, Sri Lanka,*
[3] *Institute of Food, Nutrition & Human Health, Massey University, Palmerston North, New Zealand*

Background – Dietary fibre has been linked to an increased production of short chain fatty acids (SCFA) which in turn have been associated with a reduction in colonic cancer. Rice varieties are consumed widely in Sri-Lanka and have varying amounts of dietary fibre depending on cultivar grown.
Objective – To assess the effect of dietary fiber of rice on fermentative activity of human fecal microflora in relation to SCFA production.
Design – Four different Sri Lankan red rice and white rice varieties named respectively LD 356, AT 353, BG 352, BG 358 were selected to extract dietary fiber. Four human subjects including 3 men and one female were given diets containing the above 4 rice verities for more than three months prior to the study. Fiber was extracted from the above rice varieties and separated into total dietary fiber (TDF), insoluble dietary fiber (IDF) and soluble dietary fiber (SDF). Fiber incubated anearobically with the fecal microflora of the above subjects was taken at 0, 2, 4, 6, and 24 hour-intervals for SCFA (short chain fatty acid) analyses by Gas Chromatography .
Outcomes – Among the SCFAs, acetate was the most abundant one to be formed in all rice varieties, whereas amounts of propionate and butyrate were less. The rice variety LD 356 gave the highest yield of SCFAs while the variety BG 358 gave the least. As the variety LD 356 contained the highest quantity of fiber (TDF-16.73% IDF-2.9%, SDF-2.57%), it can be suggested that the quantity of SCFA production was directly correlated with the amount of the fiber in the rice variety. Total dietary fiber of all rice varieties contributed to produce more SCFA than soluble dietary fiber and insoluble dietary fiber did. The SCFA production was found to be subject specific.
Conclusions – The results from this study illustrate that the fermentable dietary fibres in rice varieties differe depending upon variety used and also the characteristics of the fibre (soluble or insoluble). This will also alter the amount and type of SCFA production observed.

P22

Pulse incorporation and microencapsulation strategies to enhance the nutritional attributes of Asian Noodles

J Harvey, D Small
School of Applied Science, RMIT University, Melbourne Australia

Background – Asian noodles have become increasingly popular around the world as a distinctive product which maybe confused with the popular pasta foods from Europe. The difference between noodles and pasta is noodles are made from soft wheat and pasta is from Durum (Hard) wheat. One of the most common yellow noodles selling in Australian Supermarkets is "*Hokkien*" noodles which is partially cooked.
Objective – Hokkien noodles is prepared with the incorporation of pulse and wheat flours and supplemented by microencapsulated vitamins. As noodles is a staple diet, it is relevant that issues of good dietary level and having lower GI value should be considered seriously. As this is often consumed daily and in large quantities by the general public, a blend of good nutrition and process of production enhancing the quality of noodle is vital to general health.
Outcomes – Combination of wheat and pulse gives full range of amino acids with no animal saturated fats. As wheat is lacking in lysine, tryptophan and other amino acids and these shortcomings can be overcome by appropriate blending of legume providing the full range of amino acids. Together with using the technology of microencapsulated vitamins, the capsulated vitamins endured the process of production which maintained the nutrition levels that supplemented.
Conclusion – The end product of the noodle production reveals that the supplemented nutrition through microencapsulation and the blend of pulse and wheat made it possible to have a wholesome dietary provision with low GI.

P23

Determinants of milk choice amongst young New Zealand men

CA Wham[1], DW McLean[2]
[1]*Institute of Food Nutrition & Human Health, Massey University, Auckland*
[2]*Dietetic Training Programme, University of Otago, Dunedin*

Background – The National Nutrition Survey showed that young men aged 19 to 24 years use standard milk (3.3% fat) more so than lower fat alternatives and are among the most frequent consumers of milk. Milk is a significant contributor of saturated fat for men in this age group. As there is a negative relationship between the intake of foods high in saturated fat and the incidence of chronic disease it is important that factors contributing to the milk selection bias towards standard milk be understood.
Objective – To identify milk choice influences and barriers to shifting milk choice from standard milk to healthier, lower fat alternatives among young men.
Design – A cross sectional survey whereby a group of young men completed a self-administered questionnaire on a restricted-entry web-page hosted by the New Zealand Heart Foundation. The questionnaire was designed to determine usual milk consumption behaviour, influences and perceptions towards choice of milk type and barriers to shifting milk choice to lower fat alternatives.
Outcomes – A convenience sample of 86 young men completed the questionnaire. Standard milk was the milk type used most often by 35% of the respondents. The primary influences in choice of standard milk were taste and habit. Consumers of standard milk did not perceive the lower fat alternatives to be 'healthier' or 'more refreshing'. Lower fat milk choices were viewed to be feminine -'for chicks not guys'. Among young men who consumed lower fat alternatives the key influences of milk selection were perceived health benefits and maintenance of a healthy body weight.
Conclusions – Amongst this group of young men there were differences in attitudes and beliefs between those who consumed standard milk and lower fat alternatives. These perception differences translated into different milk choice. These findings were limited by a small sample size. Nutrition promotion initiatives which attempt to modify milk type selection need to consider the perceptions held by a larger representative sample of this demographic group.

P24

Trim Pork: Becoming part of a healthy lifestyle

S Cumarasamy, S McIvor, H Smith, P Duncan
New Zealand Pork Industry Board

Background – Pork is the most consumed animal protein in the world. During the past five years the per capita consumption of pork has increased significantly in New Zealand. Understanding the key consumer trends, purchase behaviour, needs and wants of the New Zealand consumers is critical to grow pork consumption in New Zealand
Objective – To identify factors that influence the food consumption patterns and its effect on the growth of pork consumption in New Zealand.
Design – Twelve focus groups covering urban and rural New Zealanders were conducted in 2007. The panel members were pork consumers selected based on a set criteria.
Outcomes – The key trends identified that have implications to pork consumption are an increase in the pace of life, information overload, desire for a healthier diet, a redefinition of convenience, increasing use of a global menu, increase in demand for responsibly produced food and the greater importance for safe food that has no negative impact in the short as well as long term. Balancing the need to consume goodness food and the want to enjoy a pleasurable eating experience is considered a constant battle.
Conclusions – Pork is currently considered unique with a distinctive taste, healthy with heart tick assurance for specific cuts, versatile, quick and easy to prepare and a celebratory meal solution. Further growth can be achieved by increasing the convenience of pork preparation, enhancing the nutritional attributes, and achieving a better consistency in quality. Getting the balance right so that pork is a good choice for short and long term health, provides the required sustenance to fuel the body and finally, satisfies the emotive indulgence, is critical for future success. Trim pork is considered best suited to take this position.

P25

Cross-sectional analysis of the characteristics of young women in a weight loss trial and factors related to attrition

SS Lim[1,3], RJ Norman[2], PM Clifton[3] M Noakes[3]

[1]*Discipine of Physiology, School of Molecular and Biomedical Science, Adelaide University, SA 5000*
[2]*Discipline of Obstetrics and Gynaecology, Adelaide University, SA 5000*
[3]*CSIRO Human Nutrition, Adelaide, SA 5000*

Background – Young women are at high risk of weight gain. They also have poorer lifestyle pattern and more likely to drop out of weight loss interventions compared to older women. Identifying factors associated with BMI, lifestyle behaviour and treatment attrition may assist in program development for this group.
Objective – To determine the correlates of BMI, lifestyle behaviours, and attrition in overweight and obese young women registered for a weight loss trial.
Design – Cross-sectional analysis of the characteristics of young women in a weight loss trial (n=113, mean age 28.19 $\pm$ 4.72, mean BMI 34.17 $\pm$ 4.65). Socio-demographic characteristics, psychological outcomes (GHQ—General Health Questionnaire, RSE-B—Bachman's revision of Rosenberg's Self-Esteem Scale) and health behaviours such as alcohol consumption and smoking were assessed through an online questionnaire administered prior to weight loss intervention. Dietary intakes were obtained from a pre-intervention 3-day weighed food diary. The relationships between variables were assessed using bivariate correlation and one-way ANOVA.
Outcomes – Lower self esteem (r=0.23, P<0.05) and lower internal weight locus of control (r=-0.30, P<0.01) was associated with higher BMI. Higher self-esteem was reported by those who exercised for at least 1 hour per week (19.9 $\pm$ 6.1 vs 22.9 $\pm$ 6.9, P<0.05). Internal weight locus of control was significantly correlated to diet quality as shown in the intakes of iron, total vitamin A equivalents and magnesium (P<0.05). In terms of attrition, drop-outs had greater psychological morbidity reflected in higher GHQ scores compared to completers (mean score 15.08 $\pm$ 6.06 vs 12.83 $\pm$ 4.84, P<0.05). Drop-outs also reported a poorer diet as shown in lower intakes of all micronutrients assessed, of which differences in niacin, magnesium, phosphorus and iron reached statistical significance (P<0.05).
Conclusions – Psychological factors such as self-esteem and internal weight locus of control are important correlates of obesity and lifestyle behaviours in young women. Young women with greater psychological distress and poorer lifestyle patterns are more likely to drop out of weight loss interventions.

P26

Ethnic differences in body composition of 2 year old children

N Snowling[1], E Rush[1], J Rowan[2]

[1] *Centre for Physical Activity and Nutrition Research, Auckland University of Technology, Auckland, New Zealand*
[2] *National Women's Health, Auckland District Health Board, Auckland, New Zealand*

Background – Throughout the life cycle body composition, including the distribution of fat and muscle, has important relationships to future health. In particular, central obesity is a risk factor for diabetes. There are known ethnic differences in body composition in adults, but little is known about the differences in very young children.
Objective – To investigate ethnic and gender differences in body composition differences in two year old children
Design – Longitudinal follow up of children born to women with gestational diabetes who were randomised to metformin or insulin treatment, aiming to show that metformin is an effective alternative treatment to insulin. As part of this study body composition of the offspring at two years was measured using anthropometry. In addition, whole body dual energy Xray analysis (DEXA) scans and measurements were performed when possible.
Outcome – Based on the data collected to date 45 children (16M, 29F) with a mean age 2.2 yrs (range 1.9-3.1) have been scanned with appropriate quality. There were no differences between male and female in height or weight or any of the body composition variables measured by DEXA. When separated by ethnicity, there were 15 European, 8 Pacific, 8 Chinese, 7 Indian, 4 Maori, and 3 Other children. Analysis of covariance with adjustment for age revealed that European (17.0%) had significantly less percentage abdominal body fat than Pacific (23.7%, *P*=0.04), Chinese (23.2%, *P*=0.04) and Indian (25.1%, *P*=0.01) but not Maori (16.8%, *P*=0.99). No differences in abdominal body fat percent were found between the insulin and metformin treatment groups corrected for age and ethnicity.
Conclusion – These initial findings provide early evidence for ethnic differences in the distribution of fat and may have implications for the prediction of risk for chronic disease including type 2 diabetes. Understanding the differences between ethnic groups, especially at such a young age, should be a focus of future research.

P27

The effects of 1-sarcosine – angiotensin II infusion on food intake, weight loss, energy expenditure and skeletal muscle UCP3 gene expression in rats

SA Cichello[1], RS Weisinger[2], J Schuijers[3], M Jois[1]

[1]School of Life Sciences, [2]School of Psychological Science, [3]School of Human Biosciences, La Trobe University, VIC 3086

Background – Previous work has shown that infusion of angiotensin II (Ang II) results in weight loss and that the effects of Ang II are mediated by its binding to angiotensin II type 1 (AT1) receptors. The mechanism by which Ang II causes weight loss is not fully understood. Here we report the effects of 1-sarcosine angiotensin II (1-Sar-Ang II), a potent AT1 receptor agonist, on weight loss, energy expenditure and on expression of uncoupling protein-3 (UCP3), inner mitochondrial membrane protein implicated in energy expenditure, in the skeletal muscle.

Objective – The aim of the present experiment was to determine the effects of 1-Sar-Ang II on weight loss, food intake, energy expenditure and skeletal muscle UCP3 gene expression.

Design – Twenty one female Sprague Dawley rats were housed in individual metabolism cages and maintained on a commercial rat chow diet. The rats were randomly allocated to one of three groups: (1) 1-Sar-Ang II group: subcutaneous infusion of 1-sarcosine angiotensin II (500 ng/kg body weight/min for 7 days; osmotic minipumps, Alzet model 2001), *ad libitum* food intake; (2) pair fed group: sham-operated and offered restricted amounts of food to match the food intake of animals in the 1-Sar-Ang II group; (3) control group: no infusion, *ad libitum* food intake. Body weights and fluid intake were monitored daily. After one week, the rats were killed and a small piece of quadriceps muscle was taken for analysis of UCP3 gene expression. Energy contents of food and whole body were determined by bomb calorimetry. Energy expenditure was estimated from food intake and change in whole body energy content.

Outcomes – Relative to the control, food intake and body weight were reduced in the 1-sar-Ang II group. Weight loss in the 1-Sar-Ang II group was ~50% higher than that in the pair fed group. Energy expenditure in the 1-Sar-Ang II group was ~30% higher than in the pair fed group but was not different from that in the control group. No differences between the 3 groups were observed in the expression UCP3 gene in skeletal muscle.

Conclusions – The results show that 1-sarcosine angiotensin II induces weight loss by decreasing food intake without an accompanying decrease in energy expenditure. Results do not support a role for UCP3 gene expression in skeletal muscle in the weight loss.

P28

Weight cycling, metabolic rate and eating behaviours in non-obese females

AJ Braakhuis[1], J Collins[1], E Rush[2]

[1]Sport & Exercise Science, Waikato Institute of Technology, NZ

[2]Centre for Physical Activity and Nutrition Research, Auckland University of Technology, NZ

Background & Objective – Previous studies state that repeated weight loss followed by weight gain (weight cycling) causes women to become metabolically efficient and therefore regain weight after dieting. Metabolic efficiency, referring to the body's ability to survive with a low metabolic rate, has been observed in obese subjects, but not in non-obese weight dieters. The aim of this study is to investigate what effect long term weight cycling has on metabolic function and eating behaviour in non-obese group.

Design – Subjects were matched for body composition and grouped by previous weight fluctuates, (weight cyclers, WC) versus those who have remained weight stable (non-weight cyclers, NWC). Indirect calorimetry, 7-day nutritional intake and activity diaries, three-factor eating questionnaire and fat and fat free mass by dual Xray absorptiometry were measured.

Outcomes – There were no significant differences in resting metabolic rate adjusted for fat mass and fat free mass, however the WC did tend to be lower (4.8 ± 1.0 versus 5.0 ± 1.0 MJ/day). Reported dietary intake was not different. WC had higher levels of restrained eating and disinhibition than NWC (6.7 $\pm$ 3.7 vs 3.9 ± 2.9, P=0.04; and 7.8 ± 3.7 vs 5.1 ± 2.2 , *P*=0.03; respectively). Self reported daily activity was higher in the weight cyclers than the non-weight cyclers (1.7 ± 0.2 vs 1.5 ± 0.2, *P*=0.03).

Conclusions – Resting metabolic rate did not differ between groups, however will power, resistance to eating cues and daily activity levels did. Therefore, in order for subjects who have dieted to obtain the same body composition they must have compensatory psychological and physical behaviours.

P29

Testing dietary interventions in obese adolescents: the 'Eat Smart' study

H Truby[1], S Elliott[1], K Cojean[1], PSW Davies[1], J Warren[1], J Batch[2]
[1] *The Children's Nutrition Research Centre, University of Queensland, Qld 4029*
[2]*Dept of Endocrinology, Royal Children's Hospital, Brisbane, Qld 4029*

Background – Childhood obesity and overweight is accelerating, with 21% of Queensland children aged 5-17 years reported to be overweight or obese. The lack of an effective evidence based treatment approach limits implementation of best dietetic practice.
Objectives – This pilot is designed as a 'proof of concept' study to test the acceptability of three different dietary treatment strategies for community living overweight adolescents who are wishing to lose weight.
Design – Subjects are recruited via doctor referral. The inclusion criteria are:- aged 10-17 years, body mass index (BMI) >90th percentile, exclusion criteria include:- diabetes or those taking insulin sensitizers, or who have a metabolic/endocrine cause of their obesity. Subjects choose one of 3 approaches:-a structured low fat diet using a modified TEMplate™ system, an unstructured low fat diet with kilojoule counting or a modified carbohydrate approach using a carbohydrate exchange system. Subjects undergo a range of medical and body composition measures at baseline and after 3 months of treatment. Energy prescriptions are based on measured resting energy expenditure and estimated physical activity level derived from a self reported 3-day activity diary.
Outcomes – Nineteen subjects (68% female) have enrolled, mean age 13.3 (range 10-16 yr) average BMI 33.3 (SD 7.2), mean weight Z score 2.4 (SD 0.5). Activity diaries show an average of 10.24 (SD 1.60) hours/day of seated behaviours (including attending school, transport and 4.43 hours of screen time). Playing outside and sports accounted for only 1.4 (SD 2.8) hours/day. Obesity related complications were already apparent in 63% (n=12), such as hypertension (n= 1); dyslipidaemia (n=6), altered liver function tests (n=5) or have evidence of insulin resistance such as *acanthosis nigrans* (n= 3). When given a choice of diet, 42% chose the structured low fat diet, 10% unstructured low fat diet with 48% opting for modifying their carbohydrate intake. Generally, subjects were unwilling or unable to undertake exercise of sufficient duration or intensity to affect a change in energy balance.
Conclusions – Adolescents, seeking help with weight reduction, have a preference for structured dietary advice, and in particular seek guidance with portion size and meal planning. In very inactive obese adolescents, exercise recommendations need to focus on reducing sedentary behaviour, such as screen time.

P30

Dietary patterns and nutrient intake in obese adolescents prior to starting a weight management programme

K Cojean[1], J Batch[2], S Elliott[1], PSW Davies[1], J Warren[1], H Truby[1]
[1] *The Children's Nutrition Research Centre, University of Queensland, Qld 4029*
[2]*Dept of Endocrinology, Royal Children's Hospital, Brisbane, Qld 4029*

Background – Despite the increasing prevalence of obesity, there is little current information as to dietary intake and food choices made by obese adolescents.
Objectives – This analysis aimed to examine dietary patterns and nutrient intake in community based obese 10 -17 year olds prior to starting a weight management programme.
Design – Subjects were recruited from 'Eat Smart' – a feasibility study comparing different dietary approaches in the treatment of adolescent obesity. Volunteers completed a 3-day food diary prior to arriving for baseline tests. Diet diaries were analysed for nutrient intake using Food Works (Xyris software). Core food group (CFG) analysis was performed; by counting serves from the records using the Australian Guide to Health Eating serving sizes.
Outcomes – Nineteen subjects (68% female); mean age 13.3 years and mean BMI 33.6 (SD 7.2; range 24.8 – 48.7) provided data. Average energy intake reported was 8424kJ/day, or 100 kJ/kg body weight (SD 30). CFG analysis showed a mean consumption of 1.3 serves of fruit/day, over half being in the form of fruit juice and 2.2 serves/day of vegetables (excluding fried potato). Sweetened beverages contributed significantly to energy intake. Children showed a preference for regular sweetened drinks as opposed to 'diet' varieties and consumed on average over 1 serve/day (accounting for an estimated 6% of daily energy intake). Milk as a beverage, both plain and flavoured, was not regularly consumed, with an average intake of 0.3 serve/day. Fifty six percent of children reported having consumed fast foods in the form of 'takeaway' at least once over the 3 day recording period.
Conclusions – These preliminary results indicate that obese adolescents have an intake of fruits and vegetables below the recommended levels and that sweetened beverages and takeaway meals make a significant contribution to energy intake. Weight management strategies for overweight/obese adolescents should target a reduction in sweetened beverage and takeaway consumption, and focus on establishing healthy eating patterns including a move towards greater fruit and vegetable intake. Calcium intake has the potential to be inadequate in many due to irregular consumption of milk as a beverage.

P31

The effect of captopril on growth, body composition and insulin sensitivity of mice fed diets containing different types of starch

TK Stanley[1], M Jois[1], D. Begg[1], HS Weisinger[2], RS Weisinger[2]
[1]School of Life Sciences, [2]School of Psychological Sciences La Trobe University, VIC 3086

Background – The renin-angiotensin system (RAS) is in adipose tissue and contributes to lipogenesis and differentiation of adipocytes. Captopril, an angiotensin converting enzyme inhibitor, prevents the formation of angiotensin II, the biologically active component of the RAS, has been shown to decrease body fat.
Objective –The present experiment assessed the effect of captopril on growth, body composition and insulin sensitivity of obesity-prone mice fed diets that were high in fat (21%) and that contained one of two different starches - amylose or amylopectin.
Design – 8-week old male C57BL/6J mice were housed individually and maintained on a high fat (21%) diet with 40% starch - either amylose (AM), a starch thought to be relatively resistant to digestion, or amylopectin (AP), an easily digested starch. Half of the animals in each of the dietary groups received water containing captopril (0.2 mg / ml), whereas the remainder had plain water to drink. Thus, 4 groups (n=12 per group) were studied (i.e., AM ± captopril, AP ± captopril). Body weight was recorded weekly. Water and food intake were recorded daily. Glucose tolerance testing (I.P. glucose, 2 g/kg) was performed at week 12. Body composition was determined at week 14. Mice were killed at week 16 and blood samples collected for analyses of plasma metabolites and hormones.
Outcomes – Compared with initial measurements, mice not receiving captopril had a 30% increase in body weight by week 16 (not influenced by the type of starch), while body weight of captopril-treated mice had decreased by 57%. Most of the weight loss in the captopril-treated animals occurred within the first four weeks, during which time the food intake was not affected. The weight loss associated with captopril was greater in the animals maintained on the AM diet. Body fat was lower in captopril-treated mice, with the greatest loss seen in those maintained on the AM diet. Over the course of the experiment, captopril increased energy expenditure as estimated by food intake and changes in body composition. Captopril increased plasma adiponectin and improved glucose tolerance. Type of starch did not alter glucose tolerance or blood glucose level.
Conclusions – The results suggest that captopril decreases body weight through increased energy expenditure. The effect of captopril on body fat and glucose tolerance may be mediated by increased levels of adiponectin.

P32

Metabolic effects of weight loss on a very low carbohydrate diet compared to an isocaloric high carbohydrate, low fat diet in obese subjects

GD Brinkworth, J Tay, M Noakes, J Keogh, Clifton PM
CSIRO Human Nutrition, SA 5000

Background – Despite the popularity of very low carbohydrate diets (LC), no long term studies have compared their effects of weight loss and metabolic change to a conventional high carbohydrate, low fat diet (HC) under isocaloric conditions.
Objective – This study compared the effects of an energy reduced, isocaloric LC and a HC on weight loss and cardiovascular disease (CVD) risk outcomes after 6 months.
Design – 88 obese adults were randomly assigned to either an energy restricted (~6-7 MJ,30% deficit), planned isocaloric LC or HC for 24 weeks in an outpatient clinical trial. Body weight, blood pressure, glucose, lipids, insulin, apoB and C-reactive protein were measured at Week 0 and 24.
Outcomes – Weight loss was similar in both groups (mean ± SD: LC -11.9 ± 6.3kg, HC -10.1 ± 5.7kg; P=0.17). Blood pressure, C- reactive protein, fasting glucose and insulin reduced similarly with weight loss in both diets. LC produced greater decreases in triacylglycerol (LC -0.64 ± 0.62mmol/L, HC -0.35 ± 0.49mmol/L; P=0.01) and increases in HDL-C (LC 0.25 ± 0.28mmol/L, HC 0.08 ± 0.17mmol/L; P=0.002). LDL-C decreased in HC but remained unchanged in LC (LC 0.03 ± 0.79mmol/L, HC -0.46 ± 0.71mmol/L; P<0.001). However a high degree of individual variability for the LDL response in LC was observed, with 24% of individuals reporting an increase of at least 10%. ApoB levels were not significantly different from baseline in either diet group.
Conclusion – We conclude that under isocaloric conditions a LC and HC result in similar weight loss. Overall, although both diets had similar improvements with weight loss for a number of metabolic risk markers, HC had more favourable effects on the blood lipid profile. This suggests the potential long-term effects of LC for CVD risk remains a concern and that blood lipid levels should be monitored.
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Short-term effects of a very low carbohydrate diet compared to a high carbohydrate, low fat diet on physical function in overweight and obese subjects

GD Brinkworth[1], JD Buckley[2], M Noakes[1], PM Clifton[1]
[1]*CSIRO Human Nutrition, SA 5000*
[2]*ATN Centre for Metabolic Fitness, University of South Australia, SA 5000*

Background - Dietary restriction and increased physical activity are recommended for obesity treatment. Very low carbohydrate diets are increasingly used to promote weight loss, but there is some concern that a low carbohydrate intake may impact negatively on exercise function.
Objective – To determine the short-term effects of a very low carbohydrate diet (LC) and a conventional high carbohydrate, low fat diet (HC) on aerobic capacity, fuel utilization and the heart rate response to exercise and muscle strength in obese men and women.
Design - 58 subjects (mean±SD, age: 49.1 ± 8.5; BMI 33.5 ± 4.0 kg/m^2) were randomly assigned to either an energy restricted (~6-7 MJ, 30% deficit), planned isocaloric LC or HC with mixed carbohydrate sources for 8 weeks. At Weeks 0 and 8 subjects performed an incremental treadmill test to exhaustion and handgrip and isometric knee extensor muscle strength were assessed. Subjects were asked to maintain their habitual levels of physical activity during the study.
Outcomes – At Week 0, there was no difference between groups in aerobic capacity ($VO2_{peak}$; LC 27.6 ± 6.5 ml/kg/min-^{1}, HC 27.7 ± 4.9 ml/kg/min^{-1},P=0.96) or peak heart rate (LC 171.3 ± 13.6 beats/min^{-1}, HC 166.6±13.8 beats/min^{-1}; P=0.21) and these did not change during the study in either diet group (P≥0.18). After weight loss, heart rate recovery (HRR-defined as the reduction in heart rate from the cessation of exercise to 1 minute recovery) had improved in both groups by Week 8 (LC 0.9±6.2 beats/min^{-1}, HC 3.4±9.5 beats/min^{-1}, P<0.05 for time) with no effect of diet (P=0.21). Fat oxidation during submaximal exercise increased in LC but remained unchanged in HC (LC 0.12 ± 0.03 g/min^{-1}, HC -0.03 ± 0.02 g/min^{-1}; P<0.001 time x diet effect). Maximal handgrip strength decreased similarly in both groups (P<0.001 time effect). Peak isometric knee extensor muscle strength did not change in either diet group (P=0.51).
Conclusions – Metabolic adaptation occurs following a LC weight loss diet that causes a shift in fuel utilisation to favour greater fat oxidation during exercise, but has no detrimental effect on other markers of aerobic exercise performance or muscle strength compared to an isocaloric HC diet. Both diets improved HRR suggesting both a HC and LC diet could be used in lifestyle interventions that combined increase physical activity with energy restriction; but further studies are required to determine the long-term health effects.
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Body size and body composition in NZ Chinese

J Wen [1], EC Rush [2], LD Plank [3], C Zinn [4]
[1,2,4] *Centre for Physical Activity and Nutrition Research, AUT University, Auckland, NZ*
[3] *Dept of Surgery, Faculty of Medical and Health Sciences, University of Auckland, Auckland, NZ*

Background – Using World Health Organisation obesity criteria, Chinese, which is the largest Asian group in New Zealand, apparently has the lowest obesity rate in all Asian groups, yet is at higher risk of disease than NZ Europeans at equivalent body mass index (BMI).
Objective – To compare the relationships between BMI and percentage body fat (%BF) of European (M29F37), Maori (M23F23), Pacific Island (M15F23), and Asian Indian (M29F25) people (existing data) with NZ Chinese aged 30-39y.
Design – Stratified (men and women) convenience study of NZ Chinese (M20F23) selected by BMI to cover a range of body fatness. Total body fat was measured by whole-body dual X-ray absorptiometry.
Outcomes – For the same %BF of 21.2%, BMI in Asian Indian and Chinese men was 4.8 and 1.6kg.m^{-2} lower than European men respectively. The table shows BMI equivalents in five NZ ethnic groups for women and men at two levels of body fat (corresponding to BMI 25.0 and 30.0 kg.m^{-2} in Europeans).

Sex	%BF	BMI equivalents (kg.m^{-2})				
		European	Maori	Pacific Island	Asian Indian	NZ Chinese
F	34.0%	25.0	24.7	26.3	21.3	23.7
F	40.6%	30.0	29.7	31.5	25.5	28.4
M	21.2%	25.0	25.4	26.5	20.2	23.4
M	28.1%	30.0	30.5	31.8	24.2	28.0

Conclusions – The results show that Asian Indian and Chinese differ in the relationship between body fat and BMI. Therefore different BMI thresholds for obesity may be required for these ethnic groups.

P35

Measuring body fat in obese adolescents: a comparison of two methods

S Elliott[1], J Batch[2], K Cojean[1], PSW Davies[1], J Warren[1], H Truby[1]
[1] *The Children's Nutrition Research Centre, University of Queensland, Qld 4029*
[2]*Dept of Endocrinology, Royal Children's Hospital, Brisbane, Qld 4029*

Background – Measuring body composition in obese adolescents is fundamental for evaluating the success of various treatment strategies. To date, there are limited data available on the body composition of obese adolescents, and suitable methods for measuring change in percentage body fat are required.
Objectives – These data are derived from the baseline measurements of body composition of obese adolescents enrolled in the Eat Smart study which is testing the acceptability of three different dietary treatment strategies for weight loss and on outcomes of weight loss such as changes in body composition and percentage body fat.
Design – Subjects recruited via doctor referral. Inclusion criteria: aged 10-17 years, body mass index (BMI) >90th percentile, exclusion criteria: diabetes or those taking insulin sensitizers, or who have a metabolic/endocrine cause of their obesity. Measurement of body composition compared two methods: Bioelectrical Impedance Analysis (BIA, TANITA TBF - 305) and the BodPod for estimation of body fat. The two different methods used to measure % body fat were compared using Bland-Altman analysis, in order to evaluate the differential between the two measurement instruments.
Outcomes – Twenty subjects (7 male, 13 female), mean age 13.3 years and mean BMI of 33.6 (SD 7.2; range 24.8 – 48.7) have enrolled to date. Average % body fat measured by BIA was 45.1% (SD 12.2), and with the BodPod 47.5% (SD 6.1). There was reasonable agreement between the 2 methods with the Bland-Altman bias of 3.23. However, the 95% CI limits were considerable (-3.28 to 9.74 95% CI). There was a significant correlation ($r=0.61$, $p<0.001$) between the two measurements of body fat and their difference indicating that the bias was not consistent across the measured % body fat in this study to date.
Conclusions – Precise methods to accurately assess and track body composition in obese adolescents need to be validated if small weight changes are to be apportioned accurately to different body compartments in clinical studies. Although there was reasonable agreement between the measures at a population level, the usefulness of using both the BodPod and BIA as a measurement for determining alteration in body fat in individual obese adolescents needs to be determined.

P36

Evaluation of web based delivery of a weight loss programme based around low glycaemic load food concepts

A Campbell[1], T Lindley[2], J Campbell[2], I Waters[2]
[1]*Campbell & Associates, Christchurch, NZ*
[2]*Crop & Food Research, Christchurch, NZ*

Background – As a Food + Information objective, the "Lifestyle Foods" programme run by Crop & Food Research, aims to identify optimal ways of communicating information relating the control of food energy to the consumer. Previous studies have demonstrated the efficacy of a low glycaemic load diet in promoting weight loss when delivered with intensive dietary counselling. No studies have investigated the efficacy of a low glycaemic load diet when delivered via a web- based program.
Objective – This study aimed to evaluate whether an **on- line** weight management approach, with low glycaemic load principles, could be successfully used to promote weight loss in a free living population.
Design – In March 2007, 103 volunteers with a BMI >28 were enrolled into a six month trial. A dietitian counseled participants over the web via weekly interactive chat rooms and monthly personalised e-mails. Lifestyle advice, motivational tips and low glycaemic load recipes were delivered through the online program, and participants recorded body weight and food intake directly onto the web site. Weight, BMI and waist circumference were measured, and a 3DDR collected, at baseline and six months, Questionnaires assessing various aspects of the website and usability of information were administered at three months and six months.
Outcomes – Seventy participants (68%) completed the trial. Weight, BMI and waist circumference significantly decreased by 3.5 (95% CI 2.3, 4.7) kg, 1.2 (95%CI 0.8, 1.7) kg/m^2 and 4.8 (95%CI 2.8, 6.8) cm, of baseline values respectively (P <0.001). Twenty five people (36%) lost a clinically significant amount of weight (>5% of initial body weight).
C**onclusions** – This study has been demonstrated the web to be a cost effective media for delivering weight loss information for some people. Further research is necessary into who may be best served by online diets.

P37

The M.E.D.O.W. (Macadamia Enriched Diets for Overweight subjects) study: Baseline characteristics of volunteers for a community-based weight loss trial.

S Somerset[1,2]. K Markwell[1], L Graham[1], M Spencer[1], K Kostner[3]
[1]School of Public Health, and [2]Heart Foundation Research Centre, Griffith University, and [3]Department of Cardiology, University of Queensland, Brisbane, Australia

Background – MEDOW is an 18-month randomised trial comparing effects of a low fat versus a monounsaturated fatty acid (MUFA)-enriched diet (35-40%E as fat, mainly from macadamia nuts) on cardiometabolic (CM) health indicators (body weight, lipidaemia, endothelial function and glycaemia). These diets plus physical activity (PA) plans according to Australian National PA Guidelines will be given to 60 overweight/obese, but otherwise healthy adults. Intrinsic Motivation Theory will be used as a guiding framework to identify themes related to program adherence and CM outcomes.
Objectives – To describe characteristics of volunteers for inclusion in the MEDOW trial, and to summarise baseline CM characteristics of the subpopulation accepted into the trial.
Design – Cross-sectional; Respondents to local newspaper advertisements for volunteers in a weight loss study.
Outcomes – Of 116 volunteers expressing interest to date, 29 (25%) met inclusion criteria for the study, and consented to participate. Their mean BMI was 35.2 (range 27.5-43.5), with 48% and 52% being overweight and obese, respectively. Mean total, HDL and LDL cholesterol levels were 5.2 (range 4.1-6.7), 1.5 (range 0.9-2.6) and 3.1 (range 2.0-4.8) mmol/L, respectively. Baseline levels of C-reactive protein, IL-6 and Lp(a) were also taken. Of those excluded (n=87), 8 (no reason given) and 9 (personal reasons) dropped out before screening. The most common reason for screening out (27%) was the presence of a medical condition requiring medication (hypertension, glucose intolerance, hypercholesterolaemia, arthritis, depression, and diabetes). Several volunteers had personal contact with included subjects, which compromised randomisation. Food sensitivities and fish oil supplementation also were common reasons for exclusion.
Conclusions – Volunteers screened out of clinical trials are a rich, but underutilised, source of information on enhancing reach and effectiveness of community-based lifestyle interventions. These data indicate a range of sub-populations of overweight subjects, with differing health risk profiles, often requiring tailored interventions.

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Public health nutrition competencies and registration of nutritionists: implications for workforce development

VM Flood[1], CY Louie[1], T Gill[1], R Hughes[2]
[1]NSW Centre for Public Health Nutrition, University of Sydney, NSW 2006
[2]Nutrition Unit, School of Public Health, Griffith University, Gold Coast, Queensland 4217

Background – In May 2007 both the Nutrition Society of Australia (NSA) and Dietetians Association of Australia (DAA) proposed separate systems to allow members to claim registration as Registered Public Health Nutritionists or Accredited Nutritionists, respectively. There is confusion among professionals about what each system offers.
Objective – To investigate the differences between each proposed registration system in relation to a standard set of competencies, as described in the "Competency framework for public health nutrition workforce development" (1).
Design – Specialist competencies for registration by the NSA and DAA were compared to a standard set of competencies for public health nutritionists (PHN) (1)..
Outcomes – The DAA standard is designed for an entry level dietitian / nutritionist and does not provide recognition of advanced level practice, at this level. The NSA system requires a science degree with a major in nutrition and post-graduate training in PHN or nutritional epidemiology or other formal education or training in PHN, and three years of relevant professional experience. The DAA standard focuses on community nutrition (in the relevant section), with little development of concepts related to population health. The NSA standard addresses a similar range of PHN competencies as the framework, including surveillance, food systems, food policy, community work, leadership, and research. The NSA standard generally has fewer specific detailed criteria than the PHN framework and some areas have not been included, such as workforce development and advocacy.
Conclusions – It is useful to consider PHN competencies as a tool which can be used by educational institutions and employers to improve skills and knowledge of the PHN workforce. However, for registration to provide any effective contribution to skills development, there needs to be some recognition by the wider profession and employers that this is a credible system that identifies the particular skills and knowledge required by the PHN workforce, and that this is used as an incentive for appropriate remuneration in recognition of competencies attained.
Reference:
1. Hughes R. *A competency framework for public health nutrition workforce development.* Australian Public Health Nutrition Academic Collaboration (APHNAC). 2005.

P39

Effect of calcium and vitamin D on postprandial vascular function in Indian males

MJ Soares[1], R Kuriyan[2], Kurpad AV[2]
[1]*Program of Nutrition, School of Public Health, Curtin University of Technology, Perth 6845, Australia.*
[2]*IPHCR, St. John's National Academy of Health Sciences, Bangalore 560034, India.*

Background – Postprandial metabolism is acutely influenced by calcium and vitamin D intake (1).
Objective – To determine the effect of calcium and vitamin D on postprandial vascular function.
Design – Seven lean males aged (mean ± SD) 26 ± 4.6 y and BMI 21 ± 1.7 kg/m^2 completed a within-subject, single blind design. After an overnight fast, subjects randomly consumed a standardised 2300 kJ breakfast where calcium and vitamin D intakes were varied (meal A ~200 mg/15 IU, meal B ~450 mg/140 IU, and meal C ~700 mg/265 IU), by including powdered calcium carbonate & vitamin D3 (Shelcal-500, Elder Pharmaceuticals Ltd. India). Non-invasive measures of endothelial function, stiffness indexes (SI), reflective index (RI) and heart rate (HR), were assessed from the digital volume pulse by photoplethysmography (Pulse Trace PT-1000, Micro Medical, UK). Serial measurements were made before, every 30min for 2h and hourly thereafter for 5h.
Outcomes – Incremental area under the curve (Δ) over 2h and 5h for each variable were analysed by repeated measures ANOVA. There was no difference in any fasting endpoint on the three visits. SI did not change with meal ingestion. ΔRI was significantly suppressed only following meal A, and this response was significantly different from the other meals at 2h (meal A vs. B, $P = 0.04$; meal A vs. C, $P = 0.018$) and at 5h (meal A vs. B, $P = 0.25$; meal A vs. C, $P = 0.043$). There was no difference in Δglucose, Δinsulin and ΔHR between meals.
Conclusions – The data provide preliminary evidence for the modulation of postprandial vascular tone by calcium and vitamin D.
References

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P40

Measurement of dietary vitamin B_{12} and folate intakes in vulnerable groups

LP Xin[1], PC Chhichhia[1], EC Rush[1], P Lucas[1], N Power[1]
Centre for Physical Activity and Nutrition Research, Auckland University of Technology, Auckland, New Zealand

Background – Vitamin B_{12} is only found in animal and yeast products, furthermore B_{12} and folate are essential for cell division throughout life. A recent study of a folic acid fortified population with low maternal B_{12} status during pregnancy, found the risk of neural tube defects almost tripled. Low B_{12} status is related to adverse health effects in each stage of life.
Objectives – To investigate the validity of B_{12} and folate intakes by dietary reports (24hrs recall and 7-day diet dairy) against the biomarkers: serum B_{12}, folate, and holotranscobalamin II (Holo-TC, a specific marker for B_{12}).
Design – Investigation of Child Nutrition Survey 2002 (CNS2002) data to identify at risk groups; analysis of a pilot study of meat-eating and non-meat-eating preadolescent Indian girls; and the validation of B_{12} and folate intakes by dietary reports in 40 child-bearing-age women.
Outcomes – In CNS2002, 0.7% of children reported avoiding all meat, 3.6% avoided red meat, and 1.5% avoided dairy food. The pilot study of six meat-eating and 6 non-meat-eating preadolescent Indian girls in Auckland showed two non-meat-eaters were low in serum B_{12} (<170 pmol/L), while all participants had adequate folate status (range 23.0-30.8 pmol/L), and most participants exhibited low Holo-TC. Reported dietary B_{12} and folate intake were correlated with blood status (r=0.74 and 0.72 respectively $P<0.01$). The study in child-bearing-age women has not yet been completed.
Conclusion – An imbalance of diet low in B_{12} with adequate folate, especially among non-meat-eaters, may lead to reduced health outcomes for future generations. B_{12} status of vulnerable groups needs further investigation.

P41

Vitamin B_{12}: Is there a need for dietary supplements?

PC Chhichhia, EC Rush, LP Xin

Centre for Physical Activity and Nutrition Research, Auckland University of Technology, Auckland, New Zealand

Background – The Indian dietary pattern is highly influenced by intergenerational religious practices. Some of these dietary practices have resulted in the exclusion of some meat products, which compromise the intake of vital nutrients such as vitamin B_{12}. B_{12} is only available in animal and yeast products. Previous studies in the Indian population have shown a high B_{12} deficiency in the presence of a high folate status with undesired metabolic effects in both meat-eating and non-meat-eating populations. B_{12} and folate are nutrients essential for cell division.
Objective – To establish the presence of B_{12} deficiency in migrant Indian non-meat-eating preadolescent girls and to investigate dietary and supplementation options for optimising B_{12} intake in non-meat-eaters.
Design – A cross sectional pilot study was conducted in 12 migrant Indian preadolescent girls (6 non- meat-eating and 6 meat-eating) girls living in Auckland. Seven day dietary intake and biomarkers of B_{12} status (serum B_{12} and methylmalonic acid, MMA) were measured. Whole foods that can provide B_{12} were ranked and compared in cost and composition to B_{12} supplements available in central Auckland shops.
Outcome – A frank vitamin B_{12} deficiency was present in two of the six non meat eating participants i.e. serum B_{12} <170pmol/L, [398±221pmol/L (range 110-870pmol/L), n=12]. Reported intake of B_{12} was lower in non-meat-eaters compared with meat-eaters (1.8 ± 0.6 vs. 2.5±0.8 µg/day, P = 0.11). Serum folate and intake were adequate in both the groups (27 ± 8 pmol/L, 342 ± 269 µg/day). B_{12} status was further confirmed using specific biomarker MMA. To provide the daily requirement of 2 µg/day of B_{12}, an adult would need 200 ml of trim milk (0.8 µg), 1 egg (0.98 µg), one teaspoon marmite (0.5 µg) and a slice of reduced fat cheese (0.3 µg). An average supplement per day would cost $0.30 and would provide 37 µg of B_{12}, which is approximately 18 times the daily requirement.
Conclusion – Low B_{12} status is present in non-meat-eating Indian preadolescents. Selected easily available foods can provide adequate daily B_{12} for at risk groups. Compared to supplements, whole foods are part of, rather than additional to a balanced diet. If B_{12} needs cannot be met by diet then supplementation and fortification of some commonly consumed foods should be considered.

P42

Role of sunlight exposure and food fortification in maintaining vitamin D status in Australian aged care residents

CA Nowson[1], M Kimlin[2], N Wattanapenpaiboon[1], J Grieger[1], P Van Der Pligt[1]

[1]*School of Exercise and Nutrition Sciences, Deakin University, Burwood, VIC 3125*

[2]*Australian Sun and Health Research Laboratory, Institute of Health and Biomedical Innovation, Queensland University of Technology, Brisbane, QLD 4059*

Background – Vitamin D deficiency is prevalent in aged care residents as access to sunlight is difficult and dietary intake is low because few foods contain vitamin D.
Objective – To determine the contribution of sun exposure and dietary vitamin D intake to vitamin D status in residents in an Australian residential aged care facility.
Design – A group of 83 residents were drawn from a larger study which examined the effect of vitamin D fortified milk supplementation (cholecalciferol 5 µg/100 mL) for six months on nutritional status. Serum 25(OH)D concentrations were measured at baseline and six months. The estimation of personal UV exposure over a period of two days was made using a UV dosimeter.
Outcomes – Baseline serum 25(OH)D concentration, mean (SD) 31.5 (18.0) nmol/L, was positively correlated to UV exposure (r = 0.28, P = 0.0118). Vitamin D from the fortified milk was the major factor contributing to the improvement of vitamin D status (21% of variance, P = 0.0049). Serum 25(OH)D at six months, 47.9 (18.4) nmol/L, was positively related to total vitamin D intake when fortified milk was provided (r = 0.52, P = 0.0003), but not to UV exposure (r = –0.02, P = 0.9185). The mobility level, as expressed as total Activities of Daily Living score, explained about 16% variance of serum 25(OH)D concentration at six months (P = 0.0072)
Conclusions – Results of this study indicate that many Australian care residents are suffering from vitamin D insufficiency/deficiency. Increased exposure to sunlight in combination with vitamin D fortified milk could assist in improving vitamin D status. However it is not clear if the adoption of these strategies will be sufficient to raise serum 25(OH)D to a level high enough to prevent falls and fractures.

P43

Dietary copper and zinc intake estimates of a cohort of Northern Tasmanian adults

JM Beckett, MJ Ball, IK Robertson
School of Human Life Sciences, University of Tasmania, Launceston, TAS 7250

Background – Marginal intakes of copper and zinc may be a problem in many countries worldwide. There is very little reported data relating to Australian intakes.
Objectives – The aim of this study was to estimate the copper and zinc intake of a sample of northern Tasmanian adults; to determine the major contributing food groups and investigate age and gender effects.
Design – A sample of 124 adults aged 20 – 78 yrs were recruited from the Northern Tasmania region. Responses from a 121 item semi-quantitative FFQ, standard serving size and food content data were used to determine dietary copper and zinc intake estimates.
Outcomes – There were significant gender differences in intakes of copper and zinc. Mean (sd) copper intakes for men (n = 53) were 1.55 (0.64) mg/day, while women (n = 71) consumed 1.27 (0.50) mg/day (P = 0.008). Mean zinc intakes of men were 12.93 (5.00) mg/day; higher than that of women, who consumed 10.27 (3.45) mg/day (P = 0.001). Contributing food groups were similar for both genders; vegetables (31.2%), cereal based foods (26.4%) and fruit (16.7%) were major contributors to copper intake; for zinc, major contributing food groups were meat & fish (29.9%), dairy (19.6%), cereal based foods (18.1%) and vegetables (16.2%). Intakes of copper and zinc were lowest in subjects between 45-64 years of age.
Conclusion – Mean copper intakes were below Australian adequate intake (AI) values for men but not for women. Mean zinc intakes were higher than Australian EAR values for both men and women, however >50% of men consumed less than the EAR value of 12 mg/day. Overall, dietary intakes of copper and zinc were lower than previous Australian estimates and lowest intakes were seen in middle aged adults.

P44

Iron status and dietary intakes of young non vegetarian women living in New Zealand

KL Beck and J Coad
Institute of Food, Nutrition and Human Health, Massey University, Palmerston North, New Zealand

Background – Nutrient Reference Values for Australia and New Zealand were published in May 2006 which included an increased Recommended Dietary Intake for calcium, folate and iron in young women. The 1997 National Nutrition Survey found that young women were most likely to be affected by iron deficiency. However, the estimated prevalence of iron deficiency was lower than the number of women estimated to have an inadequate intake of dietary iron.
Objectives – To assess dietary intakes, iron status and determinants of iron status in non vegetarian women.
Design – A cross-sectional study of 94 New Zealand women aged 18-40 years. Exclusion criteria included vegetarianism, pregnancy or breastfeeding in the past 12 months, smoking, excess alcohol consumption and recent blood donation. Dietary intakes were estimated using a 24 hour recall and a non validated food frequency questionnaire. Dietary intakes were analysed using FoodWorks Professional Edition Version 4.00. Iron status was determined for 86 women using serum ferritin and haemoglobin.
Outcomes – Nearly one quarter of women consumed less than the Estimated Average Requirement for iron while 85.1% of women consumed less than the Recommended Dietary Intake for iron. Two women (2.4%) had iron deficiency anaemia (serum ferritin <20μg/L and haemoglobin <120g/L) and 9 women (10.6%) had depleted iron stores (serum ferritin <20μg/L). All other women had a serum ferritin >20μg/L. Serum ferritin was positively associated with total dietary iron intake and age. Over 50% of women consumed less than the Estimated Average Requirement for folate (320μg/day) and calcium (840mg/day). More than 75% of women consumed less than the Estimated Average Requirement for selenium (50μg/day).
Conclusions – Most women did not meet the Recommended Dietary Intake for iron. However, only 13% of women had depleted iron stores or iron deficiency anaemia. In addition, young non vegetarian women appear to be at risk of consuming inadequate intakes of folate, calcium and selenium.

P45

Joint association of magnesium and iron intake with anemia among Chinese adults

Z Shi[1,2], X Hu[1], K He[3], B Yuan[1], ML Garg[2]

[1] *Jiangsu Provincial Center for Disease Control and Prevention, Nanjing, China.*

[2] *Research Center for Gender, Health and Ageing, Hunter Medical Research Institute, The University of Newcastle, Australia.*

[3] *University of North Carolina at Chapel Hill, USA*

Background –Inflammation and iron deficiency are two important causes of anemia. Magnesium intake is inversely associated with inflammation. However, little is known about how magnesium intake modifies the association between iron intake and anemia.

Objective – To investigate the joint association of magnesium and iron intake with anemia among Chinese adults.

Design: A cross-sectional household survey of 2849 men and women aged 20 years or older was conducted in 2002. Nutrient intakes were assessed by three day weighed food records. Serum ferritin, and hemoglobin were measured.

Results – The prevalence of anemia was 18.3% in men (mean age=47.2; SD=14.6) and 31.5% in women (mean age=46.8; SD=14.4). Both magnesium and iron intakes were positively associated with hemoglobin levels and inversely related to the prevalence of anemia. The risks of anemia were reduced by 26% (*P* for trend=0.03) and by 52% (*P* <0.01) respectively for iron and magnesium intake comparing the fourth quartile to the first with adjustment for potential confounders. The lowest risk of anemia was observed among participants with the highest intakes of magnesium and iron (OR=0.46, 95% CI: 0.31-0.68). The inverse association of iron intake and anemia but not the association of magnesium intake and anemia was modified by serum ferritin levels. The observed relations were not appreciably modified by gender.

Conclusion – This study suggests that magnesium and iron intakes are jointly associated with lower risk of anemia. Magnesium, along with iron may play an important role in the prevention and/or treatment of anemia.

P46

Provision of manganese and other trace elements for parenteral nutrition

C Khoo[1], A Spencer[2], G Hardy [1]

[1] *Faculty of Medical and Health Sciences, University of Auckland, New Zealand*

[2]*Department of Nutrition, Gold Coast Hospital, Qld. Australia*

Background – Micronutrient requirements for parenteral nutrition (PN) patients are not well understood and the AuSPEN Guidelines for Intravenous Trace Elements & Vitamins (1999) are outdated. As Home PN becomes more routinely employed, commercial supplements of multiple trace elements (TE) in fixed formulations may not be suitable for long term use. Excessive doses of TE such as manganese (Mn) can lead to Parkinson-like symptoms in certain individuals.

Objective – To ascertain the mode of use and monitoring frequency of TE in Australasian PN centres.

Design: A survey of nutrition support personnel in 70 hospitals who are members of AuSPEN, and/or the Australasian PN Pharmacists group plus a systematic review of the literature between 1986 and 2006. Data are reported as mean %

Outcomes – A 60% response rate indicated that 49% of respondents are members of an adult nutrition support team (NST) while 22% provide a paediatric PN service. There are approximately 120 HPN patients in Australasia. Almost all centres (97%) buy ready-made PN bags containing fixed concentrations of multiple trace elements (TE). Some individual TE are aseptically added: zinc (45%), selenium (30%) but Mn is never separately supplemented. Most NST begin PN supplementation within 2 weeks but, despite the fact that 32% have observed zinc deficiencies (58%) which many monitor weekly (16%) , the majority monitor other TE levels only once a month (Paediatric) or 3 monthly (Adult). Mn toxicity was identified as a potential problem with long term HPN patients by 11% of respondents and 75% were concerned that current TE formulations restrict prescribing options.

Conclusions – These data highlight the variability in Australasian PN practices and the need for updated micronutrient guidelines and reformulated products for long-term therapy.

P47

No effect of Proton Pump Inhibitor (PPI) medications on vitamin B_{12} status in elderly rehabilitation patients. Is there a dietary component?

F O'Leary[1, 2], J Wai[1], L Wormald[1], J Bennett [2], P Petocz[3], V Flood[1], AS Truswell[1], S Samman[1]
[1] *Human Nutrition Unit, School of Molecular and Microbial Biosciences, University of Sydney,*
[2] *Calvary Health Care Sydney ,*[3] *Department of Statistics, Macquarie University*

Background – PPI medications that are used to treat oesophageal reflux disease have been shown in some studies to adversely affect vitamin B_{12} status, mainly due to its decreased absorption, but there have been no investigations into the contribution of the background diet.
Objective – To compare the dietary intakes and vitamin B_{12} status in PPI users compared to non-users.
Design – Cross-sectional study of elderly rehabilitation inpatients. Diet was assessed by food frequency questionnaire and blood samples collected for the analysis of serum vitamin B_{12}, serum and red blood cell folate, plasma total homocysteine and methylmalonic acid (MMA) concentrations.
Outcomes – PPI users (n=27) had significantly higher serum vitamin B_{12} (P=0.049) and dietary calcium intakes (P=0.008) compared to non-users (n=23). The length of time on PPI medications was not related to markers of vitamin B_{12} status, but was mildly correlated with dietary calcium intake (r=0.4, P <0.01). PPI users of > 1 year had similar serum vitamin B_{12} concentrations but significantly higher dietary calcium intake compared to controls (P<0.05). In subjects with vitamin B_{12} status in the normal range, total calcium intake (diet and supplements) was correlated with serum vitamin B_{12} concentrations (r=0.33, P<0.05). Folate status and plasma homocysteine concentrations were similar in the two groups.
Conclusions – Use of PPI did not affect vitamin B_{12} status in this population. PPI users had a higher dietary calcium intake, and calcium intake was correlated with serum vitamin B_{12} concentrations in non-deficient subjects. Additional research is needed to investigate the effect of calcium on the absorption of vitamin B_{12}.

P48

Micronutrient status of an elderly population in a poor peri-urban settlement in South Africa

WH Oldewage-Theron[1], FO Samuel[1]
[1]*Institute of Sustainable Livelihoods, Vaal University of Technology, South Africa*

Background – Elderly people in low-income communities are particularly vulnerable to malnutrition.
Empirical data about the micronutrient status of elderly people living in resource-poor settings in South Africa is lacking. Data are needed to suitably address any deficiencies particularly within the local context of this increasing elderly population.
Objective – Performing dietary and biochemical assessments to determine the nutritional status of elderly persons attending a day-care centre in Sharpeville, South Africa.
Design – Cross-sectional, descriptive study of 170 randomly selected elderly people out of a total of 300 attending a care centre in Sharpeville. The methods included 24-hr recalls for dietary intake, weight and height measurements, and venous blood samples for biochemical indicators.
Outcomes – The mean age of the subjects was 71.7 years. The main source of food intake was carbohydrates. Mean daily micronutrient intakes (mean ± SD) were deficient for vitamin A (649.2±1689.0 µg), vitamin C (38.3 ± 73.4 mg), iron (6.0 ± 3.4 mg), iodine (33.4 ± 52.6 µg), thiamine (0.7 ± 0.4 µg) and selenium (30.2 ± 35.0 µg). The mean values of all the biochemical indices assessed were within the normal range, except for zinc 61.8 ± 8.5 µg/dL (9.4 ± 1.3 µmol/L), with 76.3% of the subjects having zinc values less than the cut-off of 70 µg/dL (10.7 µmd/L).
Conclusions – These findings suggest poor dietary intake and zinc deficiency among these elderly. Sustainable community-based interventions are needed to address the nutritional vulnerability in this community.

P49

Rowing ergometer induced oxidative stress is altered by chronic dietary antioxidant intake

AJ Braakhuis[1,2], WG Hopkins[1], TE Lowe[3], EC Rush[1]
[1]*Institute of Sport and Recreation Research, AUT University, Auckland, NZ;*
[2]*Waikato Institute of Technology, Hamilton, NZ;*
[3]*Health and Food Group, HortResearch, Hamilton, NZ*

Background – Rowing is regarded as an extremely demanding and competitive sport requiring large volumes of oxygen utilization, therefore potentially increasing oxidative stress.
Objectives – To investigate the effect of an acute rowing protocol on non-enzymatic antioxidant status in rowers and the relationship to dietary antioxidant intake
Design – The subjects were 58 elite highly trained rowers (24 males, 34 females). Blood samples were taken before and one hour after the termination of a 30-minute rowing ergometer test on a wind-resistance braked rowing ergometer, in which rowers were tested in groups competing against each other. The rowers completed an antioxidant food-frequency questionnaire.
Outcomes – Post exercise ascorbic acid concentration increased (mean ± SD: Pre 68.4 ± 18.4 µM versus Post 80.6 ± 20.5 µM), as did uric acid (Pre 450 ± 120 µM versus Post 550 ± 110 µM). Total dietary antioxidant consumption had a small correlation with the change in plasma ascorbic acid concentration (r=0.12; 90% confidence limits ± 0.22). Supplementation with vitamin-C had a small to moderate correlation with pre- (r=0.28;± 0.22), and post-exercise (r=0.33;±0.22) ascorbic acid concentrations. In addition, vitamin-C supplementation had a small but clear correlation with the change in plasma ascorbic acid concentrations with exercise (r=0.22;±0.22). These outcomes differ from those of acute supplementation studies that report no difference in resting ascorbic acid concentrations but rather with the change following exercise. Dietary factors are thought not to influence uric acid concentrations, however this study showed that antioxidant consumption did correlate with resting (r=0.20;±0.22) and post exercise (r=0.17;±0.22) uric acid concentrations.
Conclusion – Dietary practices can impact on the ability of elite and highly trained athletes to deal with oxidative stress and the non-enzymatic antioxidant status.

P50

Exercise, antioxidant restriction and the immune response in athletes

BA Plunkett, TA Watson, R Callister, ML Garg
School of Biomedical Sciences, University of Newcastle, NSW, Australia

Background – Exercise is beneficial for the immune system but excessive exercise has detrimental effects and can lead to chronic immunosuppression and decreased exercise performance in athletes [1].
Objective – To determine the effect of exercise on the immune system and the effect of dietary antioxidant restriction on the inflammatory process and antioxidant defence, which could exacerbate the effects of excessive or chronic exercise in athletes.
Design – Twenty athletes performed an overnight fasted treadmill VO_2max test (acute maximal exercise). Another seventeen athletes performed two overnight fasted treadmill exercise tests (short duration maximal exercise) separated by two weeks. Participants followed their habitual diet (H-AO) before completing the first exercise test. Participants then followed a restricted antioxidant diet (R-AO) for two weeks and then completed the same exercise test. Blood was collected at baseline and post-exercise for analysis. All participants completed a 4-day weighed food record.
Outcomes – Acute maximal exercise increased whole blood monocyte concentration 117% (P<0.00001) but did not increase pro-inflammatory cytokines in athletes. Short duration maximal exercise decreased the plasma carotenoids lycopene 54% (P<0.01) and β-carotene 56% (P<0.01) in the H-AO diet group. R-AO diet decreased baseline carotenoids to similar concentrations as post-exercise in the H-AO diet. R-AO diet increased TNF-α concentrations compared to the H-AO diet at baseline (28.30 vs 612.86 ng/ml; P<0.01) and post-exercise (34.23 vs 468.50 ng/ml; P<0.001). Perceived effort of short duration maximal exercise increased in the R-AO diet.
Conclusion – Dietary restriction of carotenoid containing foods can increase the inflammatory and oxidative response to exercise and may compound the negative effects of excessive exercise on the immune system. A diet high in carotenoid containing foods and/or carotenoid supplementation may help in maintaining a healthy immune system in athletes.

Reference

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P51

Non-communicable disease risk, lifestyle factors and socioeconomic position of Africans in transition: the THUSA study

A Kruger[1], HH Vorster[1], CS Venter[1], BM Margetts[1], UE Macintyre[2]

[1] *Africa Unit for Transdisciplinary Health Research (AUTHeR), North-West University, Potchefstroom Campus, South Africa*

[2] *Institute for Human Nutrition, University of Limpopo (Medunsa Campus), Medunsa 0204, South Africa*

Background – In many developing countries in advanced stages of the nutrition transition, the burden of non-communicable diseases (NCDs) has shifted from the rich to the poor. In South Africa, the African poor population is most affected by rapid urbanisation and the nutrition transition. It is not clear where the burden of NCDs lies in this population group.

Objectives – We tried to answer this question by comparing NCD risk factors within African groups of different socioeconomic positions (characterised by total household income and education level) and lifestyle (smoking habit, physical activity and nutrient intakes) who participated in the THUSA study from 1996-1998.

Design – The THUSA survey was a cross-sectional population-based epidemiological study which examined the influence of urbanisation and related changes in lifestyles and eating patterns on health and disease risk. A total of 1854 "apparently healthy" African volunteers were recruited from 37 randomly chosen sites in rural and urban areas of the North-West Province of South Africa.

Outcomes and Conclusion – The results indicated a high prevalence of obesity among women of all socioeconomic groups. Although the men and women with the highest socioeconomic position experienced the benefits of a wealthier lifestyle with significantly lower serum glucose levels, systolic blood pressures, higher micronutrient intakes, and fewer smokers, consistently higher total and saturated fat intakes, serum total and LDL-cholesterol levels and body mass indeces suggest that even at that point in time and probably in the foreseeable future, the burden of NCDs will also be carried by those Africans with higher socioeconomic positions.

P52

Dietary acculturation among Chinese in New Zealand in relation to the risks for type 2 diabetes

Y Jin[1], J Coad[1], J Lawless[2]

[1]*Institute of Food, Nutrition and Human Health, Massey University, Palmerston North, New Zealand*

[2] *16 Gunderman Rd, Ithaca, NY 14850 USA*

Background – Chinese is one of the largest Asian migrant groups in New Zealand; the acculturation process affects their food choices, eating habits and lifestyle.

Objectives – To classify participants by their different acculturation levels; to examine the association between dietary acculturation levels and the presence of risk factors for type 2 diabetes.

Design – Acculturation and food frequency questionnaires were used to collect information about the acculturation levels and recent eating habits of 46 self-selected participants. Three 24-hour dietary recalls were also used to gather dietary information. Body weight, height, waist and hip circumferences were measured to estimate the risks for type 2 diabetes. Fasting serum glucose (FG), glycosylated hemoglobin (HbA_{1c}) and total cholesterol (TC) were measured among those who volunteered to undertake blood tests.

Results – 6% of the participants had abnormal FG ($\geq$ 6.0mmol/l) and HbA1c levels(>6%), and 45% of the females and 54% of the males had total cholesterol levels over 5.0mmol/l, which is the recommended cut-off point considered by the New Zealand Heart Foundation as the lower border of 'high' risk. The differences between males and females in FG, HbA1c and TC values were not significant (P >0.05). The total cholesterol levels in the low education group were higher than that in the high education group, and the difference between these two groups was significant (P <0.05).

Conclusions – Highly acculturated participants gradually adopt some of Western food patterns and sedentary lifestyles, when compared to the participants in the low acculturation groups. With the increased acculturation levels of the participants, they adopt more Western eating patterns and lifestyles, which are potential increased risks for type 2 diabetes when taken together with their Chinese genetic backgrounds.

P53

Salt and hypertension: is blood vessel function affected by dietary salt intake?

AS Todd, RJ MacGinley, JBW Schollum, WHF Sutherland, JI Mann, RJ Walker
Department of Medical and Surgical Sciences, Otago University, PO Box 56, Dunedin, New Zealand

Background – Epidemiological studies of salt restriction have demonstrated an association with blood pressure and cardiovascular disease. Reduction of salt in clinical and experimental studies improves both blood vessel function and blood pressure levels however often dietary counselling for sodium reduction is not given until hypertension has developed.
Objectives – To determine if dietary advice and counselling by a dietitian is an effective method for reducing blood pressure in normotensive healthy volunteers.
Design – Randomised controlled crossover intervention study with 24 healthy volunteers aged 20-60years who have no history of cardiovascular disease, renal disease or diabetes were recruited. All participants were non-smokers and had normal blood pressure (SBP<130mmHg). Participants were given dietary advice and counselling by a dietitian to reduce their salt intake to 3.5g salt (60mmol sodium) per day.
Outcomes – Dietary salt reduction as measured by urinary sodium excretion was shown to significantly reduce systolic blood pressure (P = 0.001) in normotensive healthy volunteers. Dietary advice and counselling from a dietitian was found to be an effective way to lower blood pressure in normotensive healthy volunteers and is being used in further studies of dietary salt and blood vessel function.

P54

Does body water status affect mortality?

LC Ward[1], BL Heitmann[2], P Frederiksen[2]
[1]*Department of Biochemistry and Molecular Biology, University of Queensland, QLD 4072*
[2]*Research Unit for Dietary Studies at Institute of Preventive Medicine, Copenhagen University Hospital, Denmark*

Background – Water is the single largest compartment in the body, approximately 60% of total body mass in the normal healthy adult, and although having a high rate of turnover, body fluid status is highly regulated and hydration state is held within very narrow limits. Chronic mild to moderate hypohydration has been linked to increased risk for a variety of adverse health consequences, e.g. cardiovascular disease, but its relation to overall mortality is uncertain.
Objective – To examine the relationship between body water status and total mortality in Danish men and women aged 35-65 years.
Design – A prospective observational study of an age stratified sample (30, 40, 50 & 60 years at initial examination) of 2121 Danish men and women from the Danish MONICA project. Data collected at examination, in 1993/94, were measurements of total body water (TBW), extra- and intracellular water (ECW & ICW respectively) by bioimpedance spectroscopy and comprehensive health and life-style information by questionnaire. There was an average of 8.6 years of follow-up for total mortality. Relative risk was assessed using the Cox proportional hazard model.
Outcome – Subjective report of dry mouth was positively and significantly (P < 0.0001) correlated with decrease ECF and ICF, most notably in older females. In an unadjusted model, both high and low quintiles for ECF were associated with an increased hazard for death (ratio 2.5) in females but not in males. This U-shaped association was maintained following adjustment for body weight, smoking, exercise, diuretic medication, alcohol intake and health status (CVD, CHD, diabetes etc) as co-variates although the log hazard ratios were decreased slightly to 2.0 and 2.5 for the high and low ECF quintiles respectively. No association with ICW was found for either males or females.
Conclusion – These data suggest that low ECW volume is associated with a higher mortality risk and that subjective assessment of a dry mouth may be a surrogate indicator of this condition. However, an expanded ECW volume, for which a simple subjective marker is not readily available, may also be associated with increased risk.

P55

Effects of exercise on cardioprotection – down-regulation of Ras homolog gene family member A

A Matsumoto[1], LC Ward[2], PA Wilce[2], SR Mason[2], SA Marsh[3], JS Coombes[1]
[1] *School of Human Movement Studies, University of Queensland, QLD 4072*
[2] *Department of Biochemistry and Molecular Biology, University of Queensland, QLD 4072*
[3] *Department of Physiology, University of Alabama, Alabama 35487, USA*

Background – Oxidative stress plays a role in developing cardiovascular disease (CVD) and regular exercise is believed to be cardioprotective. However, the molecular mechanisms are poorly understood. Recent data suggest that exercise-induced alteration in the heart and vascular endothelial cells (ECs) may provide cardioprotection.
Objective – To investigate the effects of exercise and/or antioxidant supplement on myocardial and vascular endothelium gene expression.
Design – Male rats (12 per group) were divided into four groups: i) exercise (90 min at 70% VO_2 max/d, 4 d per week); ii) antioxidant-treated; iii) antioxidant and exercise-treated and iv) control. The exercise group underwent 14 weeks of endurance running on treadmill. The supplement group received Vitamin E (1000 IU/kg diet) and α-lipoic acid (1.6 g/kg diet) mixed with rat chow. After 14 weeks, rats were killed and myocardial and coronary artery ECs were isolated from the hearts. cDNA microarray analysis (27K rat genome) was performed using purified EC RNA.
Outcome – 2-way ANOVA revealed that expression levels of 35, 40 and 40 genes were altered for group i, ii, and iii respectively compared to control and differentially expressed genes were analysed using the KEGG pathway database and hierarchical cluster analysis. Most notably one gene that is involved in cardioprotection, Ras homolog gene family member A (RhoA), was down-regulated by the effect of exercise (P <0.02), an effect being confirmed by real-time PCR.
Conclusion – Previous studies have revealed that gene expression level of RhoA was increased in patients with CVD. RhoA has also been shown to regulate important cell functions which contribute to CVD. Therefore, this pathway might be one of the mechanisms to explain the positive effect of exercise-induced cardioprotection.

P56

Dairy intake and resistance exercise during energy restriction in abdominal obesity: effects on endothelial function and blood pressure.

W Chan She Ping-Delfos[1], J Sherriff[1], LS Piers[2] & MJ Soares[1]
[1] *Curtin University of Technology, Perth WA 6845*
[2] *Department of Human Services, Melbourne, VIC*

Background – Sustained weight loss benefits endothelial function and the metabolic profile in abdominal obesity.
Objectives – To determine, (i) the specific impact of serves of dairy with, and without resistance exercise (RE), on C-reactive protein levels, micro albumin to creatinine ratio (ACR), stiffness index (SI), reflective index (RI), mean arterial pressure (MAP) and plasma lipids, (ii) whether insulin resistance at baseline modified these responses.
Design – 36 abdominally obese Europid Australians (20M, 16F), aged (mean ± SD) 57 ± 8.9 y were randomised to one of three dairy groups while consuming an energy deficient diet for 12 weeks: 3 serves/d (3S, ~1311 mg calcium & 50 IU vitamin D/day, n = 13), 5 serves/d (5S, ~ 2124 mg calcium & 100 IU vitamin D/day, n = 12) and 5 serves/d plus RE (5S+RE, n = 11). Blood pressure and non-invasive endothelial function (PT-1000, Micro Medical, UK) was recorded at weeks 0 and week 12. All measurements were made in the supine position, after an overnight fast and following a mandatory 1h rest. Blood samples and timed urines were also collected. The change over 12 weeks (Δ) was analysed using multivariate 2x2 ANOVA with appropriate covariates (age, gender, machine, Δfat and Δfat free mass). Diet effects, HOMA-group effects (group 0 < 1.52 vs. group 1 = ≥ 1.52) and their interaction were examined.
Outcomes – Data are mean ± SE. ΔMAP showed a significant diet x HOMA-group interaction (P = 0.048), where HOMA-group modified the direction of change only on the 3S diet, while ΔMAP decreased in both groups on the other diets. ΔRI was significantly higher on the 5S+RE diet (3S: - 2.4 ± 3.11; 5S: -6.1 ± 3.21; 5S-RE: +6.5 ± 3.38 %, P = 0.034), and ΔSI showed a similar trend between diets (P = 0.084). There was no statistical difference in any other plasma or urinary biomarker.
Conclusion – The inclusion of 5 serves of dairy per day in an energy restricted diet lowered resting MAP, RI and SI irrespective of HOMA scores at the start. The addition of RE to 5 serves of dairy preserved the blood pressure effects, but impaired both vascular tone (RI) and arterial stiffness (SI).

P57

Effects of a high saturated fat diet on endothelial function during weight loss

JB Keogh[1], GD Brinkworth[1], M Noakes[1], J Buckley[2], D Belobrajdic[3], PM Clifton[1]
[1]*CSIRO Human Nutrition, Adelaide, SA 5000*
[2]*ATN Centre for Metabolic Fitness, University of South Australia, Adelaide, SA 5000*
[3]*CSIRO Molecular Health Technologies, Adelaide, SA 5000*

Background – It is unclear if weight loss on a very low carbohydrate-high saturated fat diet has detrimental effects on endothelial function.
Objective – Our aim was to determine whether weight loss on a low carbohydrate-high saturated fat, diet impaired endothelial function compared with a conventional high carbohydrate low fat diet.
Design – Randomised parallel design of two energy restricted diets in an outpatient setting. Flow mediated dilatation (FMD), fasting glucose, insulin, lipids, adiponectin and adhesion molecules were measured at baseline and after 8 weeks of weight loss.
Outcomes – 80 subjects (BMI >27, <40 kg/m^2) were randomised to a low carbohydrate-high saturated fat (LC) or a high carbohydrate-low saturated fat diet (LF). FMD did not change on either diet, 5.3 ± 3.3 to 5.3 ± 3.3% (LC) and 6.2 ± 3.7 to 6.3 ± 4.3% (LF) despite weight loss of 8% and 7%, LC and LF respectively. Adiponectin did not change with weight loss 5.6 ± 2.2 to 6.0 ± 2.2 ug/ml. Adhesion molecules fell, ICAM1 15%, E-selectin 32% & P-selectin 6% (all $P < 0.01$). PAI-1 ng/ml also fell (43%, $P<0.001$). There were no effects of diet.
Conclusion – Short term weight loss on a very low carbohydrate-high saturated fat diet does not impair FMD. Most traditional and novel cardiovascular risk factors improved after weight loss.

P58

Synergistic effects of phytosterols and long chain omega-3 polyunsaturated fatty acids (LCn-3PUFA) on cardiovascular risk reduction in hyperlipidemic subjects

MA Micallef, ML Garg
Nutraceuticals Research Group, School of Biomedical Sciences, University of Newcastle, NSW 2308

Background – Hyperlipidemia is associated with an increase in inflammation and elevated risk of cardiovascular disease (CVD). Dietary supplementation with phytosterols or LCn-3PUFA has been shown to improve lipid profiles and systemic inflammation in hyperlipidemic subjects.
Objective – To investigate the combination of dietary supplementation with phytosterols and LCn-3PUFA on cardiovascular risk and biomarkers of systemic inflammation in subjects with established hyperlipidemia.
Method – Double-blind randomised controlled trial in four parallel groups. Thirty-one (male n=17; female n=14) participants with established hyperlipidemia ([mean ± SEM] TC 6.56 ± 0.15mmol/L; TG 1.69 ± 0.11mmol/L) were randomised to receive either LCn-3PUFA (1.5g/day EPA+DHA) or placebo (sunola oil) supplements alone, or in combination with a phytosterol-enriched spread (25g/day margarine) providing 2g/day of phytosterols, for three consecutive weeks. Projected risk analysis of CVD and immunoassay determination of inflammatory biomarkers and adipokines was undertaken.
Outcomes – The combined intake of phytosterols and LCn-3PUFA yielded the greatest risk reduction (14.01±5.24%), followed by phytosterol (11.67±7.26) and LCn-3PUFA (9.26±7.99) supplementation alone. The combination was also the most effective in reducing the acute-phase inflammatory marker C-reactive protein (CRP), followed by LCn-3PUFA and phytosterol supplementation alone (46.15±27.89%; 40.07±13.14%; 7.22±8.48%, respectively). No significant changes to BMI, blood pressure or body composition were noted.
Conclusion – Phytosterols and LCn-3PUFA may have synergistic effects in reducing CVD risk and inflammation in hyperlipidemic subjects.

P59

Calorie restriction prevents enteric neurodegeneration and restores cardiac ischemic tolerance in aged mice

PJ Johnson[1,2], JN Peart[1], N Blanch[2] , J Headrick[1]
[1] *Heart Foundation Research Centre, Griffith University, Gold Coast, QLD, Australia*
[2] *School of Pharmacy, Griffith University, Gold Coast, QLD, Australia*

Background – Long-term calorie-restriction (CR) with optimal nutrition is known to protect against many aging-related disorders. However, the effects of shorter duration CR, and the mechanisms responsible, are not well characterised.
Objective – To investigate the effects of CR on two important deficits associated with aging - 1) decreased cardiac ischemic tolerance; and 2) degeneration of enteric nerves that regulate intestinal motility.
Design – 3 groups of mice were compared: mature *ad libitum*-fed (MA, 14 weeks old), aged *ad libitum*-fed (AA, 48 weeks) and aged calorie-restricted (ACR, 48 weeks), which consumed a 40% calorie-restricted (but not nutrient-deficient) diet from 34-48 weeks of age. Immunohistochemical methods were used to measure density and proportions of different neurochemical classes of enteric neurons. For studies of ischemic tolerance, isolated perfused mouse hearts were subjected to 25min ischemia followed by 45min reperfusion. End-diastolic (EDP) and left ventricular developed pressures (LVDP) were measured, and perfusate was assayed for LDH and troponin as indices of myocardial damage. Results indicate means ± s.e.m.
Outcomes – Myenteric neuron density decreased by 35% in AA compared to MA mice, predominantly due to a loss of excitatory cholinergic neurons. This loss was completely reversed in aged CR mice. AA hearts displayed a significantly greater post-ischemic contractile dysfunction (EDP, 43±2 mm Hg; LVDP, 25±3%) compared to younger MA hearts (EDP, 21±2 mmHg; LVDP, 57±4%). In contrast, ACR hearts recovered similarly to MA hearts (EDP, 7±1 mm Hg; LVDP, 60±3%). LDH and troponin release was significantly elevated in AA mice, but not in the ACR group.
Conclusions – Calorie restriction for 14 weeks prevented enteric neurodegeneration and restored cardiac ischemic tolerance in aged mice. Understanding the mechanisms responsible for these effects will assist in the development of therapies to treat aging-related disease.

P60

Market research: Australian general practitioners talk about nutrition

F Bakas, M Riley
Dairy Australia, Melbourne VIC 3006

Background – General medical practitioners (GPs) in Australia are seen by up to 85% of the population at least once a year (1). They have potential to be an important source of diet and nutrition advice for the population.
Objective – To determine the extent of diet and nutrition advice given by GPs, and to what type of patients.
Design – Cross-sectional survey conducted in April 2007of 98 randomly selected GPs working in metropolitan Melbourne and Sydney. Face to face interviews were conducted by independent interviewers who follow the international code of good marketing practice.
Outcomes – The mean percentage of consultations during which GPs stated that they give diet and nutrition advice was 34% (95% CI 29% - 38%), ranging from 2% to 100%. When asked the most common conditions where diet and nutrition was discussed in their practices, the most frequently nominated conditions were obesity (95% of GPs), type II diabetes (82%), hypercholesterolemia (74%), type I diabetes (72%), hypertension (61%), osteoporosis (60%), and allergies (16%).
Conclusion – These findings indicate that metropolitan GPs discuss diet and nutrition with many of their patients, most often in relation to chronic disease. They are in a position to provide useful dietary advice and appropriate referral.

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P61

Nutrient profiling systems: Use in Australasia and an example from the Supermarket Healthy Options Project (SHOP)

D Gorton, H Eyles, C Ni Mhurchu

Clinical Trials Research Unit, School of Population Health, University of Auckland, Auckland 1142

Background – Nutrient profiling systems are becoming increasingly popular in nutrition research. They can be used to develop new foods, to assess the nutrient quality of food purchases and intakes, and to rank foods into groups to indicate their relative healthiness. Ranking foods provides researchers and consumers with an indication of the contribution a food might make to a healthy, balanced diet.

Objectives – To examine nutrient profiling systems developed and used in the Australasian region and to describe the development and use of the nutrient profiling system for the Supermarket Healthy Options Project (SHOP) in New Zealand (NZ).

Design – A review of the published English language literature using key electronic databases was completed to locate relevant articles. Key informants were also consulted and a hand search performed of the bibliographies of retrieved articles. The profiling system for use in the SHOP study was developed in partnership with the National Heart Foundation Pick the Tick programme and using the National Food and Nutrition Guidelines for NZ.

Outcomes – Several nutrient profiling systems have recently been developed and used in the Australasian region, including the Unilever system, and the New South Wales and NZ school food and beverage classification systems for canteens. Nutrient profiling systems are unique and each assesses or groups foods differently. The SHOP nutrient profiling system was successfully developed and used to place foods into healthy and less healthy groups that were in turn the basis of a tailored nutrition education programme.

Conclusion – Nutrient profiling systems provide researchers and consumers with a helpful tool to compare the relative healthiness of foods. However, to ensure consumers receive a consistent message, it may be necessary to consider a more harmonised approach to developing and using nutrient profiling systems in the future.

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P63

"A spoonful of sugar": delayed effects of coffee, tea and sucrose on postprandial glycemia in lean, young, healthy adults

JCY Louie[1], F Atkinson[1], P Petocz[2], JC Brand-Miller[1]

[1]*Human Nutrition Unit, School of Molecular and Microbial Biosciences, The University of Sydney, NSW, 2006, Australia*

[2]*Department of Statistics, Macquarie University, Sydney, Australia*

Background – In observational studies, habitual coffee consumption has been linked to a lower risk of type 2 diabetes. We hypothesized that the mechanism may be related to delayed effects on postprandial glycemia.

Objective – To investigate the glycemic and insulinemic effects of consumption of caffeinated and decaffeinated coffee, sweetened and unsweetened, tea and sucrose, 1 h prior to a high carbohydrate meal.

Design - On separate occasions in random order, lean young healthy subjects (n = 8) consumed a potato-based meal 1 h after consumption of 250 mL of black coffee (COF), black coffee sweetened with 10 g of sucrose (COF+SUC), decaffeinated coffee (DECAF), black tea (TEA), 10 g sucrose (SUC) or hot water (CON). Fingerprick blood samples were taken at regular intervals over 2 h and the glucose and insulin responses quantified as area under the curve.

Outcomes – Compared to CON, COF caused a 28% increase in postprandial glycemia (P=0.022). In contrast, COF+SUC decreased glycemia compared with either COF (-38%, P<0.001) or CON (-20%, P=0.100) but had no effect on insulin responses. DECAF, TEA and SUC had no significant effects on postprandial responses. SUC and DECAF reduced the absolute glucose concentration at the start of the meal (P<0.01).

Conclusion – Only sweetened coffee significantly reduces postprandial glycemia. This observation may explain the paradoxical findings of observational and clinical studies relating coffee drinking to diabetes risk.

P64

Theoretical limits to the accuracy of glycaemic impact, glycaemic load and glycaemic index as linear predictors of glycaemic response

JA Monro, A Wallace

New Zealand Institute for Crop & Food Research Limited, Palmerston North, New Zealand

New Zealand Institute for Crop & Food Research Limited, Christchurch, New Zealand

Background – Glycaemic glucose equivalents (GGE) and glycaemic index (GI), from which glycaemic load (GL) is calculated, are usually measured on a single food quantity and extrapolated linearly to other quantities. As glycaemic response is non-linear such extrapolations lose accuracy with distance from the measurement point.

Objective – To determine the effect of non-linearity in the glucose dose-blood glucose response curve on the accuracy of GGE and GI, and therefore of GL, and on the inaccuracy generated by using linear summations of GGE or GL values of individual foods to predict the glycaemic impact of meals.

Design – A universal, quadratic glucose dose-response curve was generated by combining normalized results of published glucose (GGE) dose-glycemic response studies. Reference points on the curve were identified for 10, 20, 30, 40, 50 and 60 g glucose doses, and disparities between the linear extrapolations to zero from these points and the quadratic ("true") response were quantified. True GGE values, and linear estimates of them based on the references, were determined for the foods in 20 realistic meals. For each reference, and for each meal, the sums of GGE estimates of foods in a meal were compared with the true GGE values for the whole meals.

Outcomes − For individual foods, quadratic-linear disparities were equivalent in effect to a few grams of glucose within the normal range of food intakes. In meals, linear addition of GGE values of individual foods lead to disparities of more than 5 GGE between true meal GGE and the estimate based on linear summation. However, the disparity could be kept to within acceptable bounds (< 5 GGE) by not exceeding recommended GGE intakes in a meal, by basing GGE determinations on glucose references in the same range as the true meal GGE, and by limiting the number of foods that would contribute to the inaccuracy.

Conclusions – In general, GGE database values for foods based on equiglycaemic analysis provide an accurate measure of the relative glycaemic impact of individual foods, but simple linear addition of GGE values for foods in meals could lead to inaccuracies depending on the number of foods added, and the total GGE intake in the meals.

P65

Effect of high and low glycemic index recovery diets on intramuscular lipid oxidation during aerobic exercise

M Trenell [1], E Stevenson [2], K Stockmann [3], J Brand-Miller [3]

[1]Diabetes Research Group, Newcastle University, UK. [2] School of Psychology and Sports Sciences, Northumbria University, UK. [3] Human Nutrition Unit, University of Sydney, NSW

Background – Intra-myocellular triglyceride and plasma free fatty acids (FFA) are important skeletal muscle fuel sources. By raising blood insulin concentrations, carbohydrate ingestion inhibits lypolysis and reduces circulating FFA.

Objective – We tested the hypothesis that differences in the postprandial glycemic and insulin response to carbohydrates (ie glycemic index [GI]) alter FFA availability and intramuscular lipid use during subsequent exercise. All data presented are mean ± SE.

Design – Seven endurance-trained male cyclists (30 ± 6 yrs of age, 80 ± 8 kg body weight) cycled for 90 min at 70% $\dot{V}O_{2peak}$ and then consumed either high GI or low GI meals over the following 12 h. Mean work rate at 70% $\dot{V}O_{2peak}$ was 216 ± 8W. At the end of the first 90 min cycle, participants were provided with food for the following 24 h containing either a high or low GI carbohydrate component. Carbohydrate was provided at 8 g·kg body mass with 11% protein and 17% fat content. The GI of the high GI diet was 73 and the low GI diet 34. The following day after a 10 hour fast, the 90 min cycle was repeated and metabolic parameters measured. Intra-myocellular triglyceride content of the vastus lateralis was quantified using magnetic resonance spectroscopy before and after exercise. Blood samples were collected at 15 min intervals throughout exercise and analysed for FFA, glycerol, glucose, insulin, and lactate. Substrate oxidation was calculated from expired air samples.

Outcomes – The 90 min cycle resulted in >2-fold greater reduction in intra-myocellular triglyceride in the high GI trial (3.5 ± 1.0 mM·kg wet wt) than the low GI trial (1.6 ± 0.3 mM·kg wet wt, $P < 0.05$). During exercise, FFA availability was reduced in the high GI trial compared to the low GI trial (area under curve 2.36 ± 0.14 mEq·L·h vs 3.14 ± 0.28 mEq·L·h, $P < 0.05$ respectively). No other differences were significant.

Conclusions – The findings reveal that consumption of high GI carbohydrates in recovery from exercise reduce FFA availability during exercise and increase reliance on intra-myocellular triglyceride as a substrate source during moderate intensity exercise. It is possible that these findings hold implications for exercise performance in both health and disease.

P66

Formulation and evaluation of a muesli bar with low glycaemic index

G Ravindran, P Hammond

Institute of Food, Nutrition and Human health, Massey University, Palmerston North, New Zealand.

Background – Muesli bars are construed and promoted as healthy snacks. However, a large proportion of the bars in the market are high in sugar, and/or fat, and only few make claims about glycaemic potency, as measured by glycaemic index (GI) and glycaemic load (GL).

Objective - To formulate a muesli bar with low GI, and evaluate in addition to glycaemic impact, its nutritive value, texture, and shelf life.

Design - The development process involved idea generation and screening techniques to gather consumer driven ideas, formulation of a low glycaemic binding syrup with polydextrose and fructose, and the actual bars incorporating chick pea (*Cicer arietinum* L.) processed by two methods, namely, extrusion or boiling and roasting, as the main low glycaemic ingredient. A total of four formulations, in two replicates, without and with chocolate were evaluated. Standard tests were carried out to determine the GI, nutritional potential, texture, acceptability and shelf life stability of the formulations.

Outcome – All the formulations were determined to have a GI of less than 55 and a GL of less than 15. Nutritionally, the products (per 50 g serving) ranged from low to moderate in fat content (1.5 – 2.8g); high in fibre (3.5 – 4.0g); good in protein (3.2 – 3.7g) and very low in sodium (55mg). The water activity ranged from 0.60 – 0.63 at 18.7 ^{0}C and a shelf life of at least 6 months as determined by yeast, mould and standard plate counts, and no coliforms during the testing period.

Conclusion – In addition to low GI and shelf life stability**,** the bars conferred overall nutritional benefits.

P67

In vitro glycaemic effects of inclusion of fenugreek (*Trigonella foenum-graecum)* as functional ingredient in rye bread

G Ravindran, C Hall, S Pinnamaneni

Institute of Food, Nutrition and Human health, Massey University, Palmerston North, New Zealand

Background - Fenugreek seeds are therapeutically used for lowering blood sugar and cholesterol. One of the mechanisms of hypoglycaemic action is the delay in sugar release as a result of the high levels of both soluble (20%) and insoluble fibre (30%) present in this seed. The fibre is a galactomannan type of viscous polysaccharide that could provide a novel functional ingredient to the food industry.
Objective - To investigate the effect of inclusion of the fenugreek on the glycaemic response of rye (*Secale cereale*) bread.
Design - Ground fenugreek seed flour was added to a standard rye bread formulation at three different levels, namely, 5, 10 and 15%, and the resultant breads from two replicate experiments were subjected to *in vitro* digestion by amylolytic and proteolytic enzymes. The percent carbohydrate released as maltose equivalents was estimated and based on the degree of hydrolysis, with white bread as the reference for comparison, the glycaemic index (GI) and glycaemic load (GL) were calculated.
Outcome – The control rye bread had a GI and GL, 54 and 14, respectively. Inclusion of 5, 10 and 15% fenugreek further lowered the GI to 46, 40, 37 and GL to 12, 11 and 10, respectively.
Conclusion - The incorporation of fenugreek flour markedly reduced the rate of starch hydrolysis and, the GI and GL of fenugreek-enriched rye bread.

P68

Feeding honey long-term in rats leads to reduced weight gain and improved HDL-cholesterol and blood glucose levels compared with a sucrose-based diet

LM Chepulis

Honey Research Unit, Department of Biological Sciences, Waikato University

Background - Many aspects of health are known to deteriorate in older age, and a lot of this can depend on dietary influences. Hyperglycemia and prolonged intakes of high GI foods, in particular, have been correlated with increased weight gain, low HDL-cholesterol levels and increased oxidative stress. As well, there are strong correlations between hyperglycemia and sucrose intake with the progression of diseases such as Diabetes.
Objective - To determine if long-term feeding of honey (low GI) versus sucrose (high GI) or a sugar-free diet would have differential effects on weight gain, cholesterol and blood sugar levels.
Design - Forty five rats, aged 8 weeks at the start of the trial, were fed diets that were sugar-free or contained 8% sucrose or 10% honey (honey is 20% water) for 12 months (n=15 per treatment). Weight gain was assessed every 1–2 weeks, and food intake recorded every 2 months. At completion of the study, blood samples were taken and analysed for total-, LDL- and HDL-cholesterol as well as triglyceride and HbA1c levels.
Outcomes - Mean weights were significantly reduced by >20% in honey-fed rats compared with those fed sucrose after 12 months, with weight gains being comparable between animals fed honey or the sugar-free diet. No differences in food intake were observed. In addition, HbA1c levels were significantly reduced, and HDL-cholesterol levels significantly increased in honey-fed rats compared with those fed sucrose after 12 months.
Conclusions - Consuming honey rather than sucrose, as a part of a standard diet, may offer advantages with weight gain and cholesterol. This is likely due to differences in glycemic index, as well as other non-sugar components of the honey.

P69

Women's beliefs about diet and health in the preconception period

C Conlon[1], J Proctor[2], W Stonehouse[1], J Coad[1]
[1]*Institute of Food, Nutrition & Human Health, Massey University, Auckland, NZ*
[2]*Centre for Health Services Research & Policy, School of Population Health, University of Auckland, NZ*

Background - About 50% of pregnancies in New Zealand are planned yet little data is available on women's beliefs about diet and perceived health behaviours in the preconception period.
Objective- The objective of this study was to explore women's beliefs about diet and perceived health behaviours if they were to plan pregnancy.
Design - 115 women of reproductive age (18-44 years) were recruited from the Auckland region by responding to advertising for volunteers. The subjects completed a general questionnaire with specific questions on beliefs, attitudes and perceived health behaviours related to the preconception period.
Outcomes - Most of the women recruited to the study reported consuming alcohol (83%). However perceptions differed with 57% advocating total abstinence from alcohol consumption during the preconception period and 37% of the women advocating that alcohol intake should be limited. Women are often concerned about body image with 47% of the women trying to lose weight and 77% indicating that they used strategies to control their weight. Most of the women (90%) thought that body weight could affect fertility but only 22% of these women (n=23) were aware that this related to being underweight. 75% of the women said they would change their dietary habits if they were trying to conceive; 20% of these women said they would eat more fruit and vegetables, 7% would eat more dairy products and 4% would try to eat less processed foods or refined sugar. Women cited their main source of nutritional information as the media and half the women said they would seek advice from a health professional if they were to plan a pregnancy.
Conclusions – This study highlights that changes in women's beliefs could improve their nutrition and other risk factors if they were to plan a pregnancy and potential opportunities exist to give targeted advice by health practitioners.

P70

Food variety and dietary diversity as indicators of the dietary adequacy and health status of an elderly population in Sharpeville, South Africa

WH Oldewage-Theron[1], R Kruger[2]
[1]*Institute of Sustainable Livelihoods, Vaal University of Technology, Vanderbijlpark, South Africa*
[2] *Institute of Food, Nutrition & Human Health, MasseyUniversity, Auckland, New Zealand*

Background - Ageing individuals in low-income societies may be intrinsically vulnerable to malnutrition and its associated disease risks. Poverty is a root cause of poor diets and subsequent diseases. People living at subsistence levels often have no choice but to consume monotonous diets that are poor in nutrients resulting in poor diet quality.
Objective - A comprehensive health assessment focusing on dietary adequacy in relation to nutritional status of the elderly attending a day-care centre for two days a week in Sharpeville (SA). Furthermore, to assess diet quality in characterising dietary patterns, as measured by scores of dietary diversity (DDS) and food variety (FVS).
Design - This cross-sectional, analytical study of 170 randomly selected elderly respondents in Sharpeville. Methods included socio-demographic, health, FFQ, 24h-recall questionnaires, anthropometric and biochemical measurements.
Outcomes - The low mean ±SD DDS (3.41±1.34) and FVS (4.77±2.2) compared to poverty parameters confirmed household food insecurity. Although three (58.8%) or two (28.8%) daily meals were mostly consumed, these were mainly carbohydrate-based and nutrient deficient. The cereal group (2.01±0.81) had the highest mean FVS±SD, followed by dairy (0.62±0.53) and flesh foods (0.40±0.53). When a mean adequacy ratio (MAR) of 70% was used as a cut-off point for nutrient adequacy, the FVS must be 8 or higher and the DDS at least 6. These indicators show a high ability to identify those with an inadequate diet, but lower ability to identify those with a nutritionally adequate diet. The data further showed that with a higher FVS and DDS, a better MAR is reached for this low-income elderly group.
Conclusions - The results showed that FVS and DDS give a fairly good assessment of the adequacy of the diet and scoring dietary diversity is a significant, yet simple tool to identify the elderly at risk of food and nutrition insecurity.

P71

Positional distribution of palmitic acid (16:0) in triglyceride moiety of palm oil beneficially alters LDL- and HDL-cholesterol synthesis and fat deposition in young weaner piglets: a biomedical model for young children

EN Ponnampalam[1], K Nesaretnam[2], RD Warner[1], P Lewandowski[3], FR Dunshea[4], SW Lin[2], H Gill[1]

[1]*Food, Nutrition and Biomedical Sciences, Department of Primary Industries, 600 Sneydes Road, Werribee VIC 3030, Australia*

[2]*Malaysian Palm Oil Board, 43000 Kajang, Selangor, Malaysia*

[3]*School of Medicine, Deakin University, Geelong VIC 3217, Australia*

[4]*The University of Melbourne, Melbourne, VIC 3010, Australia*

Background - Studies have shown that the absorption of palmitic acid is lower when a greater proportion of dietary palmitic acid occurs at Sn-1 & -3 than Sn-2 position. Palm olein (PO), the liquid fraction of palm oil, contains 70% oleic acid (18:1) occurring at Sn-2. As a result, the level of palmitic acid in the lipoprotein complex in the circulatory systems of people consuming palm oil would be lower and may result in lower blood cholesterol.

Objective - To investigate the effect of palmitic acid distributed at Sn-1, -2 & -3 positions in palm oil on cardiovascular health and the development of obesity.

Design - Forty weaner piglets were randomly allocated to one of four dietary treatments: 1) pork lard; 2) natural palm olein (NPO); 3) chemically inter-esterified PO (CPO) or 4) enzymatically inter-esterified PO (EPO) as the fat source. Pigs were fed for 12 weeks and fasting blood samples were collected on days 0, 28, 56 & 84 of feeding.

Outcomes - Back fat depth was reduced by 22, 10 and 13% for NPO, CPO and EPO, respectively compared with lard diet. In a sub-sample of 16 pigs, plasma LDL-C content of pigs fed NPO, CPO and EPO was reduced by 22, 14 and 1% while HDL-C content was increased by 30, 1 and 10%, respectively compared with the lard diet. The ratio of LDL-C/HDL-C was 1.72, 1.39, 1.63 and 1.56 for lard, NPO, CPO and EPO diets, respectively.

Conclusions - These preliminary results suggest that palm oil may have a beneficial effect in preventing the development of cardiovascular disease and obesity in childhood compared to lard. This effect appears to be related to palm oil's positional distribution of palmitic acid (16:0) at triglyceride moiety.

P72

Randomised controlled trial of probiotics on diarrhea in tube-fed critically ill patients

TJ Frohmader[1], W Chaboyer[2], IK Robertson[3], J Gowardman[4]

[1]*Launceston General Hospital, Launceston, Tasmania, Australia*

[2]*Research Centre for Clinical Practice Innovation, Griffith University, Queensland, Australia*

[3]*School of Human Life Sciences, University of Tasmania, Launceston*

[4]*Royal Brisbane and Women's Hospital, Brisbane, and Senior Lecturer, University of Queensland, Australia.*

Background - In critically ill patients, diarrhea may be painful and distressing to the patient and inhibit recovery from sickness or injury, as well as diverting staff effort and attention from more effective therapeutic concerns. Probiotics have the potential to prevent this diarrhoea. VSL$^{\#}$3 is a multi-component, high bacterial count probiotic (Bifidobacterium breve, longum and infantis, Lactobacillus acidophilus, plantarum, casei and bulgaricus, and Streptococcus thermophilus in fixed ratios; $450*10^9$ per dose; Orphan Australia Pty. Ltd., Berwick, Victoria 3806).

Objectives - To estimate the effect of the probiotic VSL$^{\#}$3 on number of episodes and volumes of liquid and loose stools in tube-fed critically ill patients.

Design – Double-blind randomized placebo-controlled single-centre trial of adults expected to require tube feeding for over 3 days received either VSL$^{\#}$3 or placebo twice daily. Diarrhea was measured using the validated King's College Stool Chart. Statistical analysis was by Poisson regression.

Outcomes - A total of 45 patients were recruited. The probiotic (n=20) and placebo (n=25) groups had similar demographic and clinical characteristics. Participants were tube-fed for 8.5 ± 5.4 days, and observed for on average 12.4 ± sd 5.6 days. Episodes of liquid stools were reduced from 7.0 (CI95% 4.8-10.2) in the placebo group to 3.6 (2.3-5.7) in the probiotic group (IRR 0.51 (0.28 to 0.93); *P*=0.029). When adjusted for potential confounders and weighted for the duration of enteral feeding the beneficial effects increased (IRR 0.46 (0.26 to 0.86); *P*=0.015). There was a comparable reduction in diarrhoea episodes by the WHO definition (IRR 0.45 (0.22 to 0.92); *P*=0.028), and a 50% reduction in volume of liquid stools (95 ml (-191 to 0); *P*=0.05).

Conclusions - Probiotic VSL$^{\#}$3 was effective in reducing enteral feed associated diarrhea in critically ill ICU patients, and the effect increased when adjusted for longer duration of enteral feeding. Further and larger studies are needed to establish the positive or negative health outcomes (mortality and severe morbidity effects) that might be associated with routine VSL$^{\#}$3 use in this patient group.

P73

Does the inclusion of moderate amounts of red meat in the diet of exercising older women impact on faecal markers of bowel health, including faecal lactoferrin?

S Smith[1], J Muir[2], D Cameron-Smith[1],
[1]*School of Exercise and Nutrition Sciences, Deakin University, Australia*
[2] *Department of Gastroenterology, Monash University, Australia*

Background – High intakes of red meat may be associated with increased risk of colorectal cancer (CRC), however, to determine CRC risk, it is important to assess faecal changes related to protein and carbohydrate metabolism.
Objective - To determine the influence of three weekly meals rich in red meat as opposed to a carbohydrate control diet on faecal markers which are involved in the aetiology of CRC.
Design – Twenty post-menopausal women (aged 60-75) undertook, 3 times a week for 12 weeks, a 30 minute exercise session followed immediately by a cooked meal that was high in lean red meat, low in carbohydrate (n= 10) or low in lean red meat, high in carbohydrate (n=10). Dietary fibre intake and macronutrients were kept constant. At the beginning and end of the study, three-day faecal samples were collected and by-products of protein fermentation and carbohydrate metabolism, undigested fibre residues, and faecal output and colonic bacterial microbiota changes measured.
Outcomes – No significant differences were observed in subjects on either diet when comparing faecal output, faecal pH, other faecal markers, nor faecal lactoferrin. There was a trend observed in changes in the population of colonic microbiota using FISH analysis. *Bacteroides* spp. and *Prevotella* spp. appeared to decrease in women consuming a high red meat diet compared with an increase in women consuming a high carbohydrate diet.
Conclusions – In this pilot study the trend in colonic microbiota change is interesting and suggests that dietary influence of colonic microbiota, especially changes in Bacteroidetes, may be indicative of risk of gut damage and disease compared to other faecal markers.

P74

Anti-inflammatory effects of lycopene enrichment on the infected cultured airway epithelial cells

A Saedisomeolia[1, 2], ML Garg[1,2], LG Wood[2], PG Gibson[2], PA Wark[2]
[1]*Nutraceuticals Research Group, School of Biomedical Sciences, University of Newcastle, NSW, Australia, and*
[2]*Hunter Medical Research Institute (HMRI) and University of Newcastle, NSW, Australia*

Background – Rhinovirus (RV) is known to trigger acute asthma. The bronchial epithelial cell is the site of RV infection and is known to lead to the release of pro-inflammatory mediators. Lycopene (an antioxidant) supplementation has been shown to reduce inflammation in asthma patients.
Objective – The aim of this study was to determine the effects of lycopene supplementation on the inflammatory response of airway epithelial cells infected by RV and treated with lipopolysaccharide (LPS).
Design – Confluent airway epithelial cells (Calu-3 cells, passages 28-30) were incubated with lycopene for 24 h, and then infected for 48 h with RV-43, RV-1B or treated with LPS 10 ng/ml. Lycopene (2.5 µg/mL) was delivered to the cells by dissolving in tetrahydrofuran (THF) as a co-solvent. THF alone and UV inactivated RV were used as negative controls. Release of interleukin-6 (IL-6), IL-8, and interferon-gamma induced protein-10 (IP-10) by epithelial cells was measured by ELISA. Gene expression of mentioned cytokines was measured by real time polymerase chain reaction (RT-PCR), after RNA extraction and reverse transcription to cDNA.
Outcomes – Pre-treatment with lycopene resulted in a 24% reduction in IL-6 after RV-1B infection (P=0.026), 9% reduction in IL-8 after LPS exposure (P=0.01), and 31% reduction in IP-10 after RV-43 infection (P=0.0001). A similar reduction was seen in mRNA induction with lycopene supplementation.
Conclusions – Pre-treatment of airway epithelial cells with lycopene moderately reduces inflammation following infection with rhinovirus 43, rhinovirus 1B, and LPS infection. This suggests a potential role for lycopene in suppressing airway inflammation that results from RV infection in acute asthma.

P75

Growth performance and carcass characteristics of beef cattle fed soybean meal, sunflower meal and distiller's grain as protein sources in China

X X Su[1], CH Hu[1], HW Qi[1], DG Wang[1], XF Yu[1], D Zhang[2], X Li[2]
[1]*Institute of Animal Science, Jilin Academy of Agricultural Sciences, JILIN, China*
[2]*School of Animal Studies, University of Queensland, Gatton, QLD 4343Australia*

Background - Soybean meal, sunflower meal and dried distiller's grain are the three major protein sources for beef cattle in Northeast China. There are substantial differences in protein and amino acid contents among these three ingredients. Therefore the cost of each ingredient differs significantly from one another with soybean meal the most expensive and dried distiller's grain the cheapest.
Objective - To investigate the effect of soybean, sunflower meals and distiller's grain on growth performance and carcass characteristics of beef cattle.
Design - Thirty Chinese Red oxen with average body weight of 230 kg were allocated into 30 individual pen. Three experimental diets composed of soybean meal, sunflower meal or dried distiller's grain as protein sources and the rest of diets were similar and had the same nutrient content. Each diet was fed to 10 pens. During the experimental period of 268 days, dietary formulation was adjusted according to the growth stage of cattle. Feed intake was recorded daily and body weight was measured monthly. At the end of experiment the cattle were slaughtered and carcass characteristics were compared.
Outcomes – Results in the same row were not significantly different (P>0.05).

Parameter	Soybean meal	Sunflower meal	Dried distiller's grain
Body weight gains (g/d/h)	1033 ± 50	986 ± 57	1022 ± 62
Carcass percentage of live weight (%)	57.9 ± 1.62	58.6 ± 2.30	57.4 ± 2.38
Crude fat content of meat (%)	39.9± 2.56	40.9± 2.11	38.1± 2.87
Crude protein content of meat (%)	16.9± 1.02	17.5± 0.87	17.3 ± 0.92
pH of meat	6.25 ± 0.32	6.56 ± 0.28	5.81 ± 0.36
Shearing strength of meat (kg)	3.71± 0.26	4.20 ± 0.18	3.50 ± 0.30

Conclusions – These results indicate that growth performance and carcass characteristics of beef cattle were similar irrespective of the protein source fed. Therefore dried distiller's grain which is approximately half the price of soybean meal can be used as a dietary protein supplement without affecting performance and carcass characteristics.

P76

A link between diet form and weight change in domestic cats (*Felis catus*)?

K Weidgraaf[1] , LA Tucker[2], DG Thomas[1]
[1]*Centre for Feline Nutrition, Institute of Food, Nutrition and Human Health, Massey University, Palmerston North*
[2]*Waiti Hill Ltd, PO Box 307, Feilding*

Background – Obesity levels in companion animals frequently mirrors that of their owners. Recent studies suggest the incidence of overweight or obese animals is between 25 and 40%. However, there is little information from controlled studies showing the extent of the effects of modern commercial diets on weight changes in cats.
Objective – Determine energy levels in commercially available feline diets and the effects of a representative dry diet on feline bodyweight.
Design – Gross energy and proximal analysis of a range of commercial canned and dry kibble diets were determined by standard AOAC methods. Sixteen adult cats (8♂: 8♀), normally fed canned diets, were randomly assigned to two weight and sex-balanced groups and were *ad lib* fed dry diets for 17 weeks. After 17 weeks, eight cats within one group (B) were assigned to an *ad lib* canned diet whilst the remaining group (A) continued to receive dry food for a further nine weeks. Bodyweight was assessed at weekly intervals. Bodyweight data was plotted and polynomial regression analysis was applied to the two distinct treatment periods to assess the significance of any changes in weight.
Outcomes – Analyses showed the dry food had approximately four times the energy content of canned food on a g/g basis (4.34 vs 1.09 kcal/g). During the first 17 weeks, when both groups were fed the dry diet all animals showed increases in bodyweight (17.8% and 20.7%). Subsequently, after group B cats were changed to the canned diet they showed a 5.72% loss in bodyweight over the next nine weeks. In contrast, cats in group A remaining on the dry diet showed a further 5.73% increase in bodyweight over the same period.
Conclusions – There is a large discrepancy in energy levels between canned and dried cat diets on an as fed basis. Feeding cats dry diets resulted in significant weight gain in all animals (P <0.05). Reversion back to a canned diet resulted in a loss of weight, whereas continued feeding of the dry diet led to further bodyweight increases.

P77

Copper as an anthelmintic for goats

P Mayuni[1], AJ Cawdell-Smith[1], ML Murphy[2], MR Knox[3], WL Bryden[1]
[1] *School of Animal Studies, University of Queensland, Gatton, Qld*
[2] *Animal Research Institute, Yeerongpilly, Qld*
[3] *CSIRO Livestock Industries, Armidale NSW*

Background - Internal parasite infections are a major cause of lost goat productivity around the world. There are a number of pharmaceutical anthelmintics that have been developed to reduce internal parasites but many parasites have become increasingly resistant to these drugs. There is an international effort to examine alternate methods for the control of internal parasites in domestic animals.
Objective - To determine the effect of copper oxide wire particles (COWP) on gastrointestinal nematodes in weaner goats under natural grazing conditions.
Design - Weaner goats of both sexes at approximately 210 days of age and weighing 32kg ±1 (±S.E.) were allocated to four groups of ten goats each. Each group contained the same number of males and females and 16 days prior to the commencement of the trial, each goat was inoculated with larvae of *Haemonchus contortus* at a rate of 100 larvae/kg bodyweight. At the commencement of the trial each animal in the 4 groups was orally administered with 0, 1.25g, 2.50g or 5g of COWP. The animals grazed together and were monitored weekly for bodyweight, faecal egg counts and packed cell volume (PCV).
Outcomes - There was a significant anthelmintic effect of COWP on *H. contortus* from 13 days after initial COWP administration (P<0.001) in all groups compared to control, while the level of reduction varied with 1.25g and 2.5g treatments groups with time. The 5g group showed a greater reduction in faecal egg counts compared to the control group throughout the trial (P<0.001). In this latter group egg counts were reduced to 98% of the control group. Following inoculation with the nematode larvae all PCV values were reduced but with reduction in faecal egg counts following COWP treatment there was a significant improvement in PCVs by day 40 after the initial dose of COWP (P<0.01).
Conclusions - The results indicate that COWP has a significant anthelmintic against *H. contortus* in weaner goats. Additional studies are required to determine the extent of the anthelmintic properties of copper in goats.

P78

The relationship between the crude protein content and the apparent ileal digestible amino acid content of wheat and sorghum

WL Bryden, X Li, D Zhang
School of Animal Studies, the University of Queensland, QLD 4343Australia

Background – Provision of adequate levels of essential amino acids is very important in the compilation of diets, especially for monogastric animals. We (Ravindran and Bryden, 1999; Li *et al.,* 2002) have found that formulating diets based on digestible amino acid values was superior to those based on total amino acids. Amino acid analysis and digestible amino acid determination are too costly and time consuming for routine investigation in the feed industry and it would be helpful if the apparent ileal digestible amino acid content of a feedstuff could be deduced from its total crude protein content, which is routinely determined. Wheat and sorghum are the major components of poultry diets and contribute a substantial proportion of dietary protein.
Objective – To investigate the relationship between the total crude protein and apparent ileal digestible amino acid content of Australian wheat and sorghum.
Design – Male broilers at 35 days of age were allocated to pens with 7 birds per pen. Twenty-one wheat and seven sorghum with total crude protein contents ranging from 94-172 and 80-118 g/kg (air dry basis), respectively were incorporated as the sole source of dietary protein in experimental diets. Celite, a source of acid insoluble ash, was added (20 g/kg) to all diets as an indigestible marker. Each experimental diet was fed to three pens for 5 days. At the end of trial all birds were sacrificed and the digesta from the lower portion of the ileum was collected and pooled with the contents of the other birds from the same group. Freeze-dried digesta were analysed for crude protein, amino acids and acid insoluble ash.
Outcomes – There were strong and significant (P <0.01) positive correlations between total crude protein and apparent ileal amino acid contents of both cereal grains except for methionine in sorghum (P <0.05).
Conclusion – Total crude protein content of wheat and sorghum is a reasonable indicator of the apparent ileal amino acid value of these cereals for broiler chickens

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P79

Toll-like receptor expression in the small intestine of hand-reared dairy calves

BB Babatunde, VCM Quezada, TL Frankel
Department of Agricultural Science, La Trobe University, Victoria 3086

Background – Toll-like receptors (TLRs) recognise pathogens and are important in linking innate and active immune systems and the development of active immune responses. Immaturity of the active immune system contributes to high incidence of infections and the development of diarrhoea in neonatal dairy calves. Dietary yeast cell wall preparations (YC) contain mannan-oligosaccharides (MOS) to which pathogens bind thus reducing disease. The morphology of Peyer's patches (PP) is altered by feeding a YC preparation to neonatal calves but there is no information of whether such changes can influence expression of cell surface TLRs.
Objective – To determine the effect of a dietary yeast cell wall preparation, high in MOS, on TLR2 and TLR4 expression in the small intestine of calves.
Design – Two groups of Friesian bull calves (5 calves/ group) were fed from 3 d of age on commercial milk replacer (CMR) with 4 g commercial YC MOS/ d (Group MOS) or CMR without additives (Control). Calves were killed at 21 d and samples collected from jejunal and ileal Peyer's patches (PP) and areas of jejunum without PP. Quantitative real time polymerase chain reaction (qRT-PCR) was used to determine mRNA expression of TLR2 and TLR4 relative to GAPDH expression.
Outcomes – Expression of both TLR2 and TLR4 was unaffected by the addition to CMR of 4 g / d of a yeast cell wall preparation.
Conclusion – In these young calves fed for three weeks, YC MOS did not affect the expression of TLR2 and TLR4 in the small intestine.

P80

Lipogenic enzyme activity in sheep subcutaneous and peri-renal adipose tissue

FT Fahri[1, 2, 3], KL Butler[3], IJ Clarke[4], DW Pethick[1, 2], BG Tatham[3], RD Warner[2,3], FR Dunshea[1,3, 5]
[1] School of Veterinary and Biomedical Sciences, Murdoch University, Murdoch, WA, 6150, Australia
[2] Australian Sheep Industry CRC, University of New England, Armidale, NSW, 2350, Australia
[3]Department of Primary Industries, Werribee, VIC, 3030, Australia
[4]Department of Physiology, Faculty of Medicine, Monash University, Clayton, VIC, 3800, Australia
[5] Faculty of Land and Food Resources, The University of Melbourne, Parkville, VIC, 3010, Australia

Background – Development of adipose tissue (AT) is influenced by sex, age, genotype, and nutritional state of the animal. Lipogenic enzymes including glycerol-3-phosphate dehydrogenase (G3PDH), glucose-6-phosphate dehydrogenase (G6PDH), and fatty acid synthase (FAS) regulate AT development, by catalysing reactions converting carbohydrates to fatty acids and triglycerides. It is important to understand further the regulation of AT deposition and nutrient partitioning between AT and muscle in order to manipulate the lean to fat ratio of the animal.
Objectives – To determine whether lipogenic enzyme activity differs between the peri-renal (PR) and subcutaneous (SC) AT depots in sheep, and whether animal genotype influences body fat %.
Design – 120 lambs representing 4 genotypes selected for growth: (i) Border Leicester x Merino (BL x M), (ii) Poll Dorset x Border Leicester x Merino (PDxBLxM), (iii) Poll $Dorset_{growth}$ x Merino (PD_g x M), (iv) Merino x Merino (MxM), and 1 genotype selected for muscling: (v) Poll $Dorset_{muscling}$ x Merino (PD_m x M) were grown to 22 months of age. At slaughter, AT samples were collected from PR and SC depots and analysed for G3PDH, G6PDH, and FAS enzyme activity, and carcases were scanned by Dual X-ray absorptiometry to determine AT and lean content.
Outcomes – G3PDH and G6PDH activity decreased in PR AT and increased in SC AT as body fat increased. PR AT exhibited a higher G6PDH and FAS activity than SC AT ($P<0.001$). Genotype influenced body fat % ($P<0.001$) with animals selected for growth higher in body fat% then animals selected for muscling.
Conclusion – These data suggest that there is differential enzymatic activity within AT depots in mature sheep. The PR AT exhibits a higher enzymatic potential than SC AT and animal genotype can influence body fat %.

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Feed restriction and weaning weight affects lipogenic activity in sheep adipose tissue

FT Fahri[1, 2, 3], KL Butler[3], IJ Clarke[4], DW Pethick[1,2], BG Tatham[3], RD Warner[2,3], FR Dunshea[1,3, 5]

[1] *School of Veterinary and Biomedical Sciences, Murdoch University, Murdoch, WA, 6150, Australia*

[2] *Australian Sheep Industry CRC, University of New England, Armidale, NSW, 2350, Australia*

[3]*Department of Primary Industries, Werribee, VIC, 3030, Australia*

[4]*Department of Physiology, Faculty of Medicine, Monash University, Clayton, VIC, 3800, Australia*

[5] *Faculty of Land and Food Resources, The University of Melbourne, Parkville, VIC, 3010, Australia*

Background – Adipose tissue (AT) development is influenced by sex, age, genotype, and nutritional state of the animal. Lipogenic enzymes including glycerol-3-phosphate dehydrogenase (G3PDH), glucose-6-phosphate dehydrogenase (G6PDH), and fatty acid synthase (FAS) regulate AT development, by catalysing reactions converting carbohydrates to fatty acids and triglycerides. It is important to understand further the regulation of AT deposition and nutrient partitioning between AT and muscle in order to manipulate the lean to fat ratio of the animal.
Objectives – To determine the effect of nutritional restriction, weaning age, sex, and genotype on lipogenic enzyme activity of ovine subcutaneous AT.
Design – Approximately 600 mixed sex, Merino x Poll Dorset genotype lambs were selected for i) growth, ii) growth and muscling , iii) muscling, or iv) control, and allocated to 1 of 4 treatment groups: 1) Weaning at either, 20 kg (early), or 2) 30 kg (late) live weight; 3) continuous growth from weaning to 45kg; or 4) maintenance growth for a period of 8 weeks from weaning followed by re-alimentation to 45kg. At slaughter, AT was collected and analysed for enzyme activity, and carcases were scanned by dual x-ray absorptiometry (DXA) to determine carcase fat %.
Outcomes – Early weaned animals had higher activities for all enzymes (P<0.001) and carcase fat% (P=0.002) than animals that were late weaned. Nutritionally restricted animals had higher activities ($P \leq 0.003$) for all enzymes. Wethers had higher G3PDH (P<0.05) and G6PDH (P=0.026) activities then ewes, and the growth and muscling genotype animals had a lower G3PDH ($P \leq 0.05$) activity then the control genotype animals.
Conclusion – These data suggest that nutritional restriction followed by re-alimentation, early weaning, sex, and genotype can influence AT lipogenic enzyme activity and body composition in market weight sheep.

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Dietary intake assessments by FSANZ: validation of National Nutrition Survey data

P Chubb[1], J Boorman[1], J Baines[1]

[1]*Food Standards Australia New Zealand, ACT 2600*

Background – FSANZ undertakes dietary intake assessments for nutrients as part of their food standards development. Data on foods people have eaten are combined with recent analysed levels of nutrients in individual foods. The most recent food consumption data for individuals are from the 1995 National Nutrition Survey (NNS) for Australia and the 1997 New Zealand NNS, both of which used a 24-hr food recall methodology. Limitations of the NNS data relate to their age and inability to reflect changes in eating patterns since 1995/97. FSANZ seeks to validate NNS data using more recent information on food consumption. *Trans* fatty acids (TFA) are used as an example.
Objective – To determine whether food consumption patterns have changed markedly since the NNS data were collected and therefore, whether predicted TFA intakes determined in a recent risk assessment based on the NNS data were valid.
Design – Data from the Roy Morgan Single Source survey (2001-2006) on the frequency of consumption of particular foods were compared with either the 24-hr recall or Food Frequency Questionnaire (FFQ) components of the NNSs.
Outcomes – Major contributors to TFA intake included milk, fat spreads, cheese, yoghurt and potato crisps. The proportion of people reporting consuming milk and fat spreads appears to have remained the same from 1995 to 2006 as did the proportion consuming cheese on a weekly basis. The Single Source data indicate a trend to decreasing consumption of full fat and increasing consumption of low or no fat milk, which may result in a lower TFA intake from natural sources than predicted. The proportion reporting consumption of yoghurt and potato crisps was much higher in the more recent Single Source data, but it is not possible to determine if this is because they are occasionally consumed or if food patterns have actually changed in the last ten years. However, as these foods were minor contributors to total TFA intakes, potential change will not influence the outcome significantly.
Conclusion – Recent consumer surveys can be used to assess the validity of the 1995/97 NNS data by comparing reported food consumption patterns.

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NZ Key Foods Programme: Relationship to the 2008 Adult Nutrition Survey

K McLachlan[1], LP Lesperance[2], M Turley[1], J McLaughlin[2]
[1] *Public Health Intelligence, Ministry of Health, Wellington*
[2] *Nutrition and Health, New Zealand Institute for Crop & Food Research Limited, Palmerston North*

Background – The New Zealand Food Composition Database (NZFCD) is a joint programme between the Ministry of Health and Crop & Food Research (CFR). Due to resource constraints (nutrient analysis is costly and time consuming) and the rapidly changing food supply, it is impractical to analyse the nutrient levels in every food available for consumption. The USDA Nutrient Data Laboratory and Food Standards Australia New Zealand (FSANZ) employ key food methods (1) that utilize existing nutrient profiles and nationally representative food consumption survey data.
Objective – With the upcoming 2008 New Zealand Adult Nutrition Survey, the key food approach can assist with identifying foods that are likely to be major contributors to the population's nutrient intakes and, thus, ensure there is up-to-date analytical nutrient data for these foods in the NZFCD. The aim is to have approximately 40 foods on the Key Foods List, considering the available budget.
Design – FSANZ's Dietary Modeling of Nutritional Data computer program (DIAMOND) contains a list of the foods consumed in the NZ 1997 National Nutrition Survey and their corresponding nutrient values. For each nutrient listed, foods were ranked in order of contribution from highest to lowest. The nutrient scores for each food were summed to create a score representing the overall nutrient contribution of that food to the diets of adult New Zealanders.
Outcomes – The top five key foods identified by the cumulative contribution of all nutrients: food groupings i.e. beef, white bread, chicken and wholemeal bread or individual foods i.e. standard homogenised milk.
Conclusions – The key foods approach will ensure that more samples will be collected and prepared for foods that provide important amounts of nutrients of public health significance to the diet and not every sample will be analysed for all the nutrients currently in the NZFCD.
Acknowledgements – Judy Cunningham and Julie Boorman FSANZ, Australia
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P84

Sialic acid concentration in conventional foods of Australia

C Zeng, B Wang
School of Molecular and Microbial Biosciences, University of Sydney, NSW, Australia

Background - Sialic acid (Sia) is a family of 9-carbon sugars usually expressed as terminal residues on mammalian glycoconjugates. They play a key role in neural growth, development and function, cell signalling and recovery of injured neuronal tissues. *N*-acetylneuraminic acid (Neu5Ac) is the predominant Sia in humans, while most mammalian tissues contain both Neu5Ac and *N*-glycolylneuraminic acid (Neu5Gc). Ketodeoxynonulosonic acid (KDN) is the newest member of the Sia family. Neu5Gc is absorbed into human tissues as a result of eating red meat and milk products, and is associated with inflammation in human tissues. The concentration of Sia in Australian food products is unknown.
Objective - To determine the concentration of Sia in uncooked and cooked red meat, seafood and poultry.
Design – The following uncooked food products were purchased from an Australian supermarket: pork, beef, lamb, prawns, salmon, chicken and chicken eggs. Cooked ham and turkey were also analyzed. All tissues were homogenized and hydrolyzed in 0.05M H_2SO_4 for 30 min at 80^{o}C. The concentrations of Neu5Ac, Neu5Gc and KDN were determined using Dionex HPAEC, pulsed amperometric detection with an ion exchange column. All samples were analysed in triplicate.
Results - The concentration of total Sia (µg/g wet tissue) in Australia raw meat was highest in pork (65), followed by chicken (53), lamb (40) and beef (17). The percentages of Neu5Gc were 14%, 0%, 33% and 0%, respectively. Salmon contained higher levels of Sia (55) than prawns (25). KDN was the predominant form of Sia in salmon (60%), followed by Neu5Ac (36%). Cooked ham contained 56 µg/g of Sia and turkey only 7. Eggs contained the highest levels of Sia (642 µg/g), of which 57% was in the egg white.
Conclusion - The highest concentration of Sia in the Australian foods examined was found in eggs, followed by pork, ham, salmon, chicken, prawns, lamb, beef and turkey. Knowledge of the Sia content in conventional foods may help us better understand possible medical disorders involving the uptake of the "non-human" Neu5Gc from our diet.

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Changes in the mineral profile of cooked vegetables consumed in Greece

E Kiranas[1] , S Papadopoulou[1] , K Gerothanasi[1] , G Dimitrelia[2] , K Diamantopoulos[2] , M Hassapidou[1]
[1]*Department of Nutrition & Dietetics, Alexandreion Technological Educational Institution of Thessaloniki, Greece.*
[2]*Department of Food Technology, Alexandreion Technological Educational Institution of Thessaloniki, Greece.*

Background – Due to the increasing recommendations all over the world for a healthier diet, the consumption of vegetables is rising around the world and in Mediterranean countries the traditional uses are still alive.
Objective – The purpose of this study was to assess the content of specific minerals in five Greek vegetables commonly consumed in Greece. This study is part of a research project aiming at the construction of the Greek food composition tables.
Design – Vegetables were taken from local shops and bazaars in amounts proportional to their annual production and consumption in Greece. The samples consisted white cabbage (*Brassica oleracea capitata var. alba*), celery (*Apium graveolens var. rapaceum*), dill (*Anethum graveolens L.*), lettuce (*Lactuca sativa var. romana*) and dry onion (*Allium cepa var. rossa brunswick*), vegetables that are widely used in Greek cuisine. All samples were cooked for 15 minutes in quantity of water equal with half their weight. As soon as they were boiled, they were strained and dried at room temperature. The contents of raw and cooked vegetables in six dietary important minerals (calcium, magnesium, iron, zinc, copper and phosphorous), water, ash and energy were analyzed. Moisture and ash were analyzed by the methods described in AOAC, phosphorus with a spectrophotometric method, other minerals by flame atomic absorption spectrometry and energy value was determined by means of an adiabatic bomb calorimeter.
Outcomes – The results have shown that water content of vegetables (raw and boiled) fluctuated from 91% to 96.5%. Reduction in ash varied from 27.7% to 67.7% in the raw samples and from 2.59 to 31.33% in the cooked samples in the dry matter. Losses in minerals were on average: 36.2% for Ca, 33.7% for Mg, 36.4% for Fe, 30.5% for Zn, 34.8% for Cu and 34.4% for P. Boiled root celery had lower concentrations in Ca and Fe and higher concentration in P compared to the sprout celery. Vegetables' energy content was very low and fluctuated from 25 Kcal/100g in the boiled cabbage up to 57 Kcal/100g in the boiled dry onions.
Conclusions – The above data are useful for the evaluation of nutrient composition of Greek plants that are commonly consumed.

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A Biomarker for changes in dietary fat intake: a pilot study

KA Jackson[1,2], NM Byrne[1], AP Hills[1]
[1]*Institute of Health & Biomedical Innovation & School of Human Movement Studies, Queensland University of Technology, QLD 4059*
[2]*School of Health Sciences, University of South Australia, SA 5000*

Background – Accurate dietary measurement can be affected by systematic error (under-or over-reporting). Dietary fat intake is often the most under-reported nutrient among the overweight and obese, and yet a robust biomarker for absolute or changes in dietary fat intake has received little attention.
Objective - To determine the responses of plasma Apolipoprotein A-IV (apoA-IV) to a dietary fat load, as a pilot to further investigation of the ApoA-IV-dietary fat intake biomarker relationship.
Design - Proof of concept study with a convenience sample of 6 non-obese adults (3 males, 3 females), fed a daily fat load (102.9g fat) for 7 days in addition to a baseline diet followed by a low fat week (baseline minus fat load). Daily dietary intakes were assessed using the multiple pass 24-h recall method. Fasting venous blood samples were analysed for plasma apoA-IV concentrations using an ELIZA immunoassay.
Outcomes - Mean plasma apoA-IV concentrations were elevated by 13.8% during the fat load compared to baseline week. The dietary fat load corresponded to a 23.7% increase in total energy from fat. During the low fat week, mean plasma apoA-IV concentrations decreased by 7.5% after the fat load was removed, corresponding to a 21.2% decrease in total energy from fat.
Conclusions – Fasting plasma apoA-IV concentrations may be a useful biomarker to validate changes to dietary fat intakes. Further investigations are required with a larger cohort to determine sensitivity of the apoA-IV response to smaller changes in dietary fat intake, particularly among an overweight and obese population.

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Lycopene enrichment of cultured epithelial airway cells

A Saedisomeolia[1, 2], ML Garg[1,2], LG Wood[2], PA Wark[2], PG Gibson[2]
[1]*Nutraceuticals Research Group, School of Biomedical Sciences, University of Newcastle, NSW, Australia*
[2]*Hunter Medical Research Institute (HMRI), NSW, Australia*

Background - Lycopene is a fat soluble carotenoid, therefore must to be solubilised in water based media in cell culture experiments for in vitro studies. The solvent or the carriers must be non-toxic and deliver lycopene efficiently into the cultured cells. In vitro enrichment of airway epithelial cells with lycopene is important for examination of the mechanisms by which dietary lycopene supplementation may be used for prevention and/or treatment of airway disease.
Objective - The aim of this study was to compare two commonly used lycopene enrichment methods in cell culture experiments namely tetrahydrofuran (THF), and lycopene liposomes.
Design - Confluent airway epithelial cells (Calu-3) were incubated (for 24 h) with different concentrations of lycopene dissolved in THF, and different concentrations of lycopene carried by liposomes. Cells were visually inspected and both the mediums and the cells were collected to analyse interleukin-6 (IL-6), lactate dehydrogenase (LDH), and lycopene concentrations.
Outcomes – Airway epithelial cells incubated with all concentrations of lycopene carried by liposome underwent cytolysis. Cells incubated with low concentrations of lycopene/THF (2.5 µg lycopene/mL, dissolved in 0.5% THF *v/v*, and 5 µg lycopene/mL, dissolved in 1% THF *v/v*) were viable. Furthermore, intracellular lycopene levels increased in a dose-dependent manner after incubation. Cells incubated with higher levels of lycopene/THF (10µg lycopene/mL, dissolved in 2% THF *v/v*, and 25 µg lycopene/mL, dissolved in 5% THF *v/v*) underwent cytolysis, with cell necrosis, release of LDH and increased IL-6 release.
Conclusion - Lycopene liposome is not a suitable carrier of lycopene into the Calu-3 cells possibly due to the toxic effect of sodium taurocholate (one of the liposome's components). However, enriching airway epithelial cells with lycopene dissolved in low concentration of THF for 24 h is a safe method.

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The prediction of body fat using BIA in people taking antipsychotic medication

JK Sharpe[1,2], NM Byrne[1], TJ Stedman[2], AP Hills[1]
[1] *Institute of Health and Biomedical Innovation, Queensland University of Technology, QLD 4059*
[2] *The Park – Centre for Mental Health, QLD 4077*

Background – People with serious and persistent mental illness, particularly those with schizophrenia tend to have higher obesity rates than the general population. Antipsychotic medications are commonly used as an integral part of therapeutic treatment, and are known to induce clinically significant amounts of weight.
Objectives – The purpose of this study was to compare estimates of body fat derived from bioelectric impedance analysis (BIA) with body fat determined using the isotope dilution technique of deuterium dilution
Design – Forty-three people (31 males, 12 females) with psychotic illnesses, predominantly schizophrenia who had been taking atypical antipsychotic medications for more than four months, were recruited to participate in this study. A comparison between percentage body fat (%BF) measured using deuterium dilution and that predicted using the direct output of the single frequency BIA (Imp DF50, Impedimed) was made. Further comparisons were made using additional BIA equations – those of Lukaski et al (1), Kyle et al (2) and Sun et al (3). Statistical analysis included paired t tests and the limits of agreement (LoA) method for determining agreement between two measures.
Outcomes – The mean ± SD for age, weight and %BF was 34 ± 10yrs, 94.4 ± 19.7 kg, 32.4 ± 8.0% for the males and 38 ± 10yrs, 93.5 ± 28.7 kg, 42.3 ± 9.2% for the females. Paired t tests revealed that the 4 predictions of %BF were significantly different from %BF measured using deuterium dilution in the males, whereas the prediction of %BF was significantly different in the females only when using the equations of Kyle *et al.,* (2) and Sun *et al*., (3). The best prediction of % was made using the Lukaski *et al*., (1) equations. They had the lowest bias and narrowest LoA – 1.3 ± 3.5% and -5.6 to 8.1% respectively in males and 0.3 ± 2.8% and -5.2 to 5.8% respectively in females.
Conclusions – In males and females taking atypical antipsychotic medication, the equation of Lukaski *et al.,* (1) proved to be the most suitable to convert BIA data an estimate of percentage body fat.

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Use of bioelectrical impedance spectroscopy (BIS) to monitor hydration following exercise-induced hypohydration and rehydration

SP van Rosendal[1], LC Ward[2], G Wilson[1], MA Osborne[3], JS Coombes[1]
[1]*School of Human Movement Studies, University of Queensland, QLD, 4072*
[2]*Molecular & Microbial Sciences School, University of Queensland, QLD, 4072*
[3]*Queensland Academy of Sport, QLD, 4111*

Background - Monitoring of body fluid stores is of crucial importance for those who live and work in hot/humid environments such as athletes or fire-fighters. Presently, there exist few techniques capable of providing such individuals with rapid, easy to obtain, information about their hydration status. Bioelectrical impedance spectroscopy (BIS) has gained acceptance for predicting body fluid volumes of individuals in a resting homeostatic state but has not been extensively studied where fluid balance is in a state of flux.
Objectives - To examine the ability of BIS to monitor hydration status following exercise-induced hypohydration and subsequent rehydration.
Design - Subjects were 24 healthy males (aged 28.5 ± 7.7 y, weighing 79.4 ± 7.9 kg (mean ± SD). Whole-body resistance was measured at 3 time points: i) baseline (B), ii) post-exercise (70% VO_2max)-induced hypohydration of 1% body weight (PE) and iii) post-rehydrating (PR) with 150% of fluid lost during PE.
Outcomes - At PE, all 24 subjects exhibited decreases (5.4 ± 2.2%, $P < 0.02$) in resistance at zero frequency (R0, an index of extracellular fluid), returning to baseline values at PR. Resistance at infinite frequency (R∞, an index of total body fluid)) changed similarly (5.7 ± 3.3%, $P < 0.03$) in all but one of the 24 subjects.
Conclusions - These results were unexpected since a decrease in resistance is indicative of an increase in fluid volume contraindicated by the loss in body weight. The body's electrical resistance is determined however not simply by the volume of fluid but also the resistivity (inverse of conductivity) of body fluids. Resistivity is determined by the ion content of body fluids and it is likely that loss of hypotonic sweat during dehydration increased the concentration of ions in tissue fluids thereby decreasing its resistivity. This would be consistent with a decrease in measured resistance and an apparent increase in fluid volume. This study suggests that for BIS to be a useful tool to monitor fluid status during dehydration caused by excessive sweating, prediction of fluid volumes must account for changes in tissue fluid ion status.

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Digital volume pulse and endothelial function: reproducibility and comparison of instruments

W Chan She Ping-Delfos[1], J Sherriff[1], LS Piers[2], MJ Soares[1]
[1]*Curtin University of Technology, Perth WA 6845*
[2]*Department of Human Services, Melbourne, VIC*

Background – Non-invasive techniques of endothelial function are gaining favour in clinical and epidemiological research. Characteristics of the digital volume pulse (DVP) can be assessed by photoplethysmography to obtain surrogate measures of endothelial function.
Objectives – To examine biological variation, influence of measurement protocol, and to compare two identical devices that measure stiffness index (SI) and reflective index (RI) from the DVP (Pulse Trace, PT-1000, Micro Medical UK).
Design – *Study 1*: 12 participants aged (mean ± SD) 55 ± 5.4 y and BMI 31 ± 5.3 kg/m^2 reported at the same time (morning or afternoon) on two occasions, 2 h after their last meal. Subjects rested for 15 min in a temperature-controlled room, before 3 baseline recordings of SI and RI were made in the supine position. Triplicate measurements of blood pressure (BP) were followed by recordings of SI and RI at 1 min interval for 3 min. *Study 2*: 17 subjects, aged 45 ± 14.6 y and BMI 27 ± 6.7 kg/m^2 participated in a paired comparison of two instruments of the same make and model. Duplicate measurements of SI and RI were simultaneously made with each device on opposite arms. The devices were then swapped, recordings repeated, and the average of each device analysed.
Outcomes – There was no difference between visits in resting SI (change in mean +1.0% [95% CI -7.2, 10], typical error CV = 9.9%), and RI (change in mean +1.2% [95% CI -2.2, 4.8], typical error CV = 3.8%). Intra class correlation coefficients for SI and RI were 0.86 and 0.89 respectively. There was no change in SI following BP, however RI declined significantly by 3% at min 3 (RM-ANOVA, P=0.03). There was a significant difference between devices in SI (bias +20.5% [95% CI +8.5, +33.9]) and in RI (bias +24.4% [95% CI +13.9, +35.8]).
Conclusions – Resting SI and RI by the PT-1000 have good reproducibility in overweight and obese subjects, though RI is sensitive to the protocol of measurement. The consistent bias in SI and RI would necessitate cross-validation of devices of the same make and model.

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The role of long chain polyunsaturated omega-3 fatty acids in weight maintenance

IA Munro, C Smith, ML Garg

Nutraceuticals Research Group, School of Biomedical Sciences, University of Newcastle, NSW 2308

Background – Maintaining deliberate weight loss for one year is more difficult than losing the original weight, with an estimated 20% success rate. LCn-3PUFAs have a known anti-inflammatory effect and consuming fish oil results in suppressed production of pro-inflammatory cytokines. Reduced inflammation is linked to weight loss and could also assist with weight maintenance.

Objective – To determine whether consumption of LCn-3PUFAs will assist in weight maintenance.

Design – Individuals who had lost >4 kg (mean 7kg) in a 12-week double blind randomised control trial with two parallel weight loss groups continued to weight maintenance for 10 weeks in the same groups, i.e. Group 1 continued to consume 6x1g capsules/day placebo (n=6), and Group 2, 6x1g capsules/day of n-3PUFA fish oil (n=6). Fasting blood samples, anthropometric measures, 3-day food diaries, and health surveys were collected at commencement (BL) and completion (PI) of the maintenance diet.

Outcomes – Both groups maintained their weight, body composition, plasma cholesterol, HDL, LDL and triglyceride levels. Fatty acid composition of plasma lipids was not altered significantly during the weight maintenance phase in the respective dietary groups. However LCn-3PUFA (EPA $P<0.05$, DHA $P<0.001$) remained higher in the fish oil group compared with the placebo group post intervention.

Group	22:6n-3 (DHA) µg/mL		20:5n-3 (EPA) µg/mL		Weight kg		Total body fat kg		Fat free mass kg	
	BL	PI	BL	PI	BL	PI	BL	PI	BL	PI
Placebo	35.2	31.6	21.1	19.9	85	85.6	31.5	32	53.5	53.6
Fish oil	52.1	45.2	24.4	16.2	94.3	94.3	36.1	36.2	58.3	58.2

Conclusions – No correlation was apparent between the change in LCn-3PUFAs and maintenance of body weight (r = -.328, ns). Thus, the consumption of LCn-3PUFAs did not appear to assist weight maintenance. However, a study on a larger scale is required to further investigate the findings from this pilot study.

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Dose-response effect of DHA rich fish oil on resting heart rate and heart rate variability

N Sjoberg[1], C Milte[2], A Coates[2], J Buckley[1,2], PRC Howe[1,2], DA Saint[1]

[1]*Discipline of Physiology, School of Molecular and Biomedical Sciences, University of Adelaide, SA, 5005*

[2]*Nutritional Physiology Research Centre and ATN Centre for Metabolic Fitness, University of South Australia, SA, 5001*

Background – Heart rate variability (HRV) refers to the beat-to-beat (R-R) fluctuations in heart rate (HR) mediated by changes in autonomic nervous activity. Reduction of HRV is associated with pathological conditions including hypertension and myocardial infarction. Docosahexaenoic acid (DHA) has cardiovascular health benefits but its effect on HRV is yet to be quantified.

Objectives – To investigate the effects of DHA-rich tuna oil supplementation on HRV.

Design – 37 overweight adults (17 males and 20 females aged 51 ± 2 yrs, BMI > 25 kg/m^2) with elevated blood triglycerides (> 1.6 mmol/L) but otherwise healthy were recruited. Participants were divided into 4 groups and allocated to take 6 g/day sunola oil (control group) (n = 11), 2 g/day HiDHA (NuMega Ingredients; 26 % DHA+ 6 % EPA) + 4g/d Sunola (n = 8), 4 g/day HiDHA + 2g/d Sunola (n = 9) or 6 g/day HiDHA (n = 9). Resting heart rate and HRV were recorded supine at baseline and at 6 and 12 weeks after treatment. Low frequency and high frequency components of HRV were differentiated by spectral analysis.

Outcomes – Resting heart rate decreased with increasing dose of HiDHA at both 6 (r = -0.38, $P<0.05$) and 12 weeks (r = -0.37, $P<0.05$). The Low Frequency / High Frequency ratio of HRV (reflecting the balance between sympathetic and parasympathetic nerve activity) also decreased with increasing dose of HiDHA at both 6 (r = -0.58, $P<0.001$) and 12 weeks (r = -0.40, $P<0.01$), indicating improvements in vagal control of heart rate.

Conclusion – Increased consumption of DHA can improve both resting HR and HRV.

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Coronary heart disease risk reduction and consumption of foods rich in omega-3 polyunsaturated fatty acids: A psychosocial perspective using information to mediate between attitudes, intentions and decision-making behaviour

JM Summers[1, 2], PH Delfabbro[1], DN Cox[2]
[1] *University of Adelaide, SA 5005 Australia*
[2] *Food Futures National Research Project & CSIRO Human Nutrition, Adelaide, SA 5000 Australia*

Background – Long chain omega-3 polyunsaturated fatty acids (n-3) are thought to benefit human health, particularly in respect to reducing risk of heart disease. However, most Australians do not consume enough n-3. Socio-demographic variables and psychological variables such as perceptions, attitudes and beliefs impact on food-orientated health behaviours. Furthermore, consumers are demanding information on the health-promoting properties of food with conflicting evidence as to whether this knowledge increases consumption of certain foods.
Objective – The aim of this research was to understand what demographic, situational and psychological variables influence people's attitudes, beliefs, and ability to consume beneficial quantities of n-3 foods.
Design – A quantitative longitudinal study involved a survey of 500 adult South Australians. Using an adaptation of Protection Motivation Theory (1), the study examined facilitators of and barriers to the consumption of n-3 foods. A 3 x 2 x 2 informational source design was used. Half the sample was provided with information about n-3 foods at baseline, with further provision of additional information over a 6-month period. The effect of this intervention on attitudes, intentions and subsequent follow-up behaviour was compared across people with varying levels of heart disease risk.
Outcomes – Results of preliminary analyses at baseline show significant attitudinal and intentional differences toward the consumption of n-3 foods dependent upon level of heart disease risk. Information provision was also found to affect the likelihood of increasing consumption of some n-3 foods.
Conclusions –The study has implications for how health-related information relating to n-3.and cardiac risk may be provided to enhance people's awareness and behaviour.

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Dietary omega-3 polyunsaturated fatty acids counteract murine experimental periodontitis

A Bendyk[1], V Marino[2], P Zilm[2], P Howe[3], M Bartold[1]
[1]*Colgate Australian Clinical Dental Research Centre and* [2]*School of Dentistry, University of Adelaide, SA, 5005,*
[3]*Nutritional Physiology Research Centre, School of Health Sciences, University of South Australia, SA, 5001, Australia*

Background - Periodontitis is an infective disease caused predominantly by Gram negative anaerobic bacteria. However it is becoming apparent that alveolar bone loss, which characterises periodontitis, results from the host inflammatory response to pathogenic bacteria and not the infectious agents directly. Omega-3 polyunsaturated fatty acids (PUFA) have recognised anti-inflammatory effects and their oxygenated derivatives are key mediators in resolving inflammation.
Objective - To test the hypothesis that dietary supplementation with tuna fish oil rich in the omega-3 PUFA docosahexaenoic acid would reduce alveolar bone loss in mice inoculated with periodontopathic bacteria.
Design - 80 mice were fed experimental diets containing either 10% tuna oil (HiDHA; NuMega Ingredients, Australia) or sunola oil (placebo) for 57 days. After two weeks each dietary set was split into four groups of ten mice, which were a) untreated or inoculated with b) *Porphyromonas gingivalis,* c) *P.gingivalis* and *Fusobacterium nucleatum,* d) carboxymethylcellulose (treatment control). Oral cavity soft tissues were taken from mice at sacrifice for gas chromatographic determination of fatty acid composition. The maxilla was removed, stained with methylene blue and digitally imaged to assess bone loss around the upper molars.
Outcomes - Omega-3 PUFA levels were substantially higher in oral soft tissues of mice fed tuna oil compared to those fed sunola oil. Eicosapentaenoic acid increased from 1.9 ± 1.1 to 18.0 ± 2.6 mg/100g and docosahexaenoic acid from 335 ± 41 to 579 ± 72 mg/100g. Mice fed tuna oil exhibited 72% less alveolar bone resorption in response to infection with *P.gingivalis* and 54% less bone resorption following the combined inoculum than those fed sunola oil ($P<0.05$).
Conclusions - Fish oil dietary supplementation may have potential benefits as a host modulatory agent in the prevention and/or adjunctive management of periodontitis.

P95

Effects of two cooking methods on omega-3 polyunsaturated fatty acid contents of Yellow Belly Flounders

XQ Su, LS Chung

School of Biomedical & Clinical Sciences, Victoria University, Melbourne, VIC 8001, Australia

Background – Seafoods are good sources of omega-3 long chain polyunsaturated fatty acids (n-3 LC-PUFA), eicosapentaenoic acid (EPA) and docosashexaenoic acid (DHA). These fatty acids have beneficial effects on health and can reduce the risk of coronary heart diseases, lower blood pressure and plasma triacylglycerol levels, as well as a range of other disorder. Understanding the effects of different cooking process on n-3 PUFA content could improve the intake of these beneficial fatty acids.

Objective – To investigate the variation of n-3 PUFA contents of flounders processed by different cooking methods.

Design – Muscle samples of five fish processed by steam and deep-fry were examined. The total lipid was extracted with chloroform/methanol (2:1 v/v) containing butylated hydroxytoluene. The fatty acid methyl esters (FAMES) were prepared by saponification using KOH, followed by transesterification in BF_3 in methanol. The FAMES were separated by gas chromatography for analysis. One-way ANOVA and Scheffe's multiple comparisons were performed to determine differences in individual fatty acid level between different cooking methods.

Outcomes – Fried flounders had significantly higher concentrations of n-6 PUFA, monounsaturated fatty acids (MUFA), and saturated fatty acids (SFA) than steamed and fresh fish. The highest contents of EPA and DHA were found in steamed fish. Steamed flounders also showed higher contents of MUFA, total n-3 and n-6 PUFA than fresh fish. There was no significant change in n-3/n-6 PUFA ratio in steamed flounders while fried fish showed a markedly lower ratio. In addition, fried flounders also showed a higher total lipid content than steamed and fresh fish.

Conclusion – n-3 LC-PUFA content of flounders is significantly affected by the cooking methods. Steaming is a better process than frying as it concentrates the health-benefiting n-3 LC-PUFA without the addition of other components from the cooking oil.

P96

Dietary intake and food source of omega-3 and omega-6 poly-unsaturated fatty acids in the Belgian population

I Sioen[1,2], J Van Camp[2], C Matthys[1,3], S De Henauw[1]

[1] *Department of Public Health, Ghent University, Belgium*

[2] *Department of Food Safety and Food Quality, Ghent University, Belgium*

[3] *Institute of Food, Nutrition and Human Health, Albany Campus, Massey University, New Zealand*

Background - Health benefits are considered to be related to omega-6 (n-6) and omega-3 (n-3) poly-unsaturated fatty acids (PUFAs). But, modern diets in developed countries are very poor in n-3 PUFAs.

Objective - The aim of the study is to assess (1) the intake and dietary sources of PUFAs in three Belgian subgroups: linoleic acid (LA), α-linolenic acid (LNA), arachidonic acid (AA), eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA) and docosahexaenoic acid (DHA).

Design - The used food consumption data originate from (1) parentally reported 3-day dietary records collected in 2002-2003 of 661 children (2.5-6.5 years), (2) 7-day food diaries collected in 1997 of 341 adolescents (13-18 years), (3) 2-day food diaries collected in 2002 of 641 women (18-39 years). A food composition database was developed using existing data and included the content of total fat, LA, LNA, AA, EPA, DPA, DHA. Belgian nutrient recommendations were used to evaluate PUFA intakes.

Outcomes - Mean LA and overall n-6 PUFA intake corresponded with the recommendations, with a part of the population exceeding the upper level. Conversely, the population showed a large deficit for LNA and total n-3 PUFA (mean n-3 PUFA intake was 0.57, 0.66 and 0.75 %E for pre-school children, adolescents and women, respectively). The major food LA and LNA source was fats & oils, followed by cereal products. The main sources of LC-PUFA were fish & seafood, and meat, poultry & eggs.

Conclusion - Population intake for n-3 PUFAs is low compared to recommendations. From a public health perspective, it seems desirable to tackling this problem. Belgian people would benefit from higher consumption of n-3 rich products in order to decrease the n-6/n-3 ratio. Replacement of meat products rich in saturated fats by fatty fish consumption needs to be encouraged, as it is a rich source of LC n-3 PUFAs.

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Translating the science of omega-3 fatty acids into action for children's health

W Morgan[1], AJ Sinclair[2]
[1]*The Omega-3 Centre Inc, North Sydney, NSW 2059*
[2]*School of Exercise and Nutrition Sciences, Deakin University, VIC 3125*

Background – Scientific understanding of the essential roles of long chain omega-3 fatty acids is growing rapidly. Data on dietary intakes and food contents is increasingly available and health authorities around the world are starting to make official recommendations on optimal intakes of long chain omega-3 fatty acids.
Objective – [i] To assess current evidence on the health benefits of omega-3s for children over 2 years and their dietary intakes, [ii] to develop recommendations for optimal intakes and [iii] to communicate these to key audiences.
Design – A group of researchers expert on relevant aspects of long chain omega-3s drafted papers, based on current evidence, and then met together to discuss the evidence and reach a consensus on recommendations targeting parents, health professionals, government and researchers.
Outcomes – Current evidence indicates children cannot adequately convert α-linolenic acid (ALA) to long chain omega-3s. Deficiencies are associated with symptoms and features of ADHD and related developmental disorders affecting more than 10% of children. A daily intake of 500mg EPA and DHA should be the target for children 14 years and over with this level adjusted for the smaller body weight of younger children. Parents and health professionals require information on accessible sources of long chain omega-3s and addressing barriers to consumption. Nutrition policy needs to take account of the key roles of long chain omega-3 fatty acids in children's health and development. National databases of red blood cell EPA and DHA in children should be established, using the Omega 3 Index as a guide to healthy levels (1).
Conclusions – Children in New Zealand and Australia are at risk of less than optimal health and development based on their intake of long chain omega-3 fatty acids. The evidence supports a range of actions by parents, health professionals, policy makers and researchers.

Reference

1. Harris WS. Omega-3 fatty acids and cardiovascular disease: a case for omega-3 index as a new risk factor. Pharmacol Res 2007 Mar;55(3):217-23.

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Tea and bone health: A review of the literature

AL Molan, MC Kruger
Institute of Food, Nutrition and Human Health, Massey University, Palmerston North, New Zealand

Background – Tea is a good source of fluoride and it is known that fluoride is protective against bone loss. Moreover, tea is a major source of flavonoids, which were shown to have several biological actions, including phytoestrogenic effects.
Objective – This review focuses on human and animal studies examining the association between tea consumption and bone health.
Design – Databases were searched for relevant epidemiological and clinical studies of humans and animal studies.
Outcomes – Epidemiological studies, which investigated tea (mainly black and green) intake and bone mineral density (BMD), have suggested that older people who drank black tea had higher BMD (3 studies) and lower risk of hip fractures (2 studies) than those who did not drink tea. In contrast, two large epidemiological studies of US women found no relationship between tea consumption and the risk of hip or wrist fracture over 4-6 years of follow up; however one of them showed higher tea consumption was associated with higher BMD in postmenopausal women. Many animal studies have been undertaken to evaluate the impact of different tea extracts on bone health, especially osteoporosis induced by ovariectomy. The results showed that tea extracts (mainly black and green) or their polyphenols were effective in preventing bone loss due to ovarian hormone deficiency. Although most of the health benefits of tea have been attributed to the antioxidant and free radical-scavenging activities of polyphenols, tea contains many beneficial elements such as fluoride, potassium, magnesium, zinc and amino acids which may contribute directly or indirectly to the health of the skeletal system.
Conclusion – The published studies suggest that consumption of tea, especially black and green teas have moderately positive effect on BMD, especially in older people.

P100

Australian food and nutrition policies – world leaders or followers?

HR Yeatman
School of Health Sciences, University of Wollongong, NSW Australia 2522

Background – In 2002 the World Health Organization adopted the Global Strategy on Action for Diet, Physical Activity and Health. The European Region of the WHO has been very active in the development of national policy approaches to reflect the Global Strategy. Achievements against the goals of the First Action Plan for Food and Nutrition Policy for the WHO European Region, 2000-2005 have been assessed, and the Second Action Plan will be considered for adoption in September 2007. Strategic priorities have been set out and include food safety, nutrition and sustainable food supply, thus linking lifestyle (eating habits) with both human and environmental health costs. In Australia, action to implement the Global Strategy has been less systematic.
Objective – Assess the food and nutrition policy and program actions of Australian national, state and local level governments against the Global Strategy, using principles consistent with the New Nutrition Science and the framework adopted by the European Region.
Design – Document analysis of key Australian food and nutrition policies and surveys of key government departments, agencies and committees.
Outcomes – At the national level, clearly progress has been achieved in some areas (specific strategies to address childhood obesity), but far less progress is evident in other areas, (consistency between nutrition, food safety and agricultural policies or fiscal policies). Some state level policies are more reflective of the Global Strategy principles, for example Tasmania, but little is reported on their achievements against policy objectives. At the local level, integrated food and nutrition actions have generally been wound back, with local governments in most states reporting less activity in 2007 than they did in 1995, with the exception of Victoria where specific support has been provided to advance local food and nutrition initiatives.
Conclusions – Australian governments have not been held accountable for progress toward public health nutrition goals and actions. Without such public and professional accountability, opportunities to progress public health nutrition agendas may be lost. Recommendations are made on strategies for nutrition professional engagement in food and nutrition policy actions, and implications for professional training and related issues.

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1. Tomaino RM, Decker EA. High fat meals and endothelial function. Nutr Rev. 1998;56:334–43.
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Book

2. Fildes VA. Breasts, bottles and babies. A history of infant feeding. Edinburgh: Edinburgh University Press; 1986.

Chapter in a Book

3. Willett WC. The use of biomarkers in nutritional epidemiology. In: Kok FJ, Veer PV, editors. Biomarkers of dietary exposure. London: Smith-Gordon; 1991. p. 9–14.

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Healthy Eating Club Pty Ltd
ABN : 93 078 641 906
PO Box 4121,
McKinnon, Victoria 3204
Australia
Mob +61 0408551702
info@healthyeatingclub.org
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