Poster Session 1: Wednesday 1 December

P01

Dietary echium oil rich in stearidonic (18:4ω3) acid does not increase cardiac membrane EPA or DHA

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Background

Seed oil from *Echium plantagineum* is high in omega-3 polyunsaturated fatty acids (PUFA) - stearidonic (SDA, 18:4ω3) and α-linolenic (ALA, α-18:3ω3). Recent attention has focussed on SDA as a potential precursor for ω3 long chain (LC-PUFA) - eicosapentaenoic (EPA, 20:5ω3) and docosahexaenoic (DHA, 22:6ω3).

Objective

To assess the extent of incorporation and/or conversion of SDA (and ALA) to ω3 LC-PUFA products following long-term feeding, in an attempt to evaluate its potential as an alternative dietary source of ω3 LC-PUFA.

Design

Four weeks old Sprague Dawley rats (N=18 per group) were randomly assigned to 7 groups (control + 6 experimental) and fed standard chow (control), and this diet was further supplemented with either echium (EO) or fish oil (FO). Three different dose levels (w/w) 1%, 3%, and 5% were compared. After a 12 week pre-feeding period animals were subjected to coronary artery ligation and the non-ischemic region of the heart tissue, and blood collected. Total phospholipid fatty acid compositions were determined using standard analytical techniques.

Outcomes

FO supplementation caused dose-dependent increases ($P<0.05$) in DHA both in the plasma and myocardial phospholipids. Plasma DHA ranged from 2.6 (1% diet) to 5.2% (5% diet). In contrast, EO diets showed no significant increase ($P>0.05$) in DHA compared to the control group. Similarly EO feeding did not increase cardiac EPA or DHA levels but resulted in a dose-dependent increase - 2.8%, 4.0% and 5.1% - in DPA (docoasapentaenoic acid, 22:5ω3; $P<0.05$). FO diet fed groups showed no change in DPA but displayed considerable accumulation of DHA in the heart muscle that was dose-dependent (control 8.6% vs. 14.9%, 20.8% and 24.1%). EPA content in the heart was ≤0.5% even at the highest FO supplementation, suggesting the existence of an active fatty acid desaturase and elongase enzyme complex in the rat.

Conclusion

EO rich in SDA (and/or ALA) does not lead to increased DHA accumulation in the cardiac muscle. Interestingly, the conversion of these shorter ω3 PUFA appears to be limited to the DPA (22:5ω3) stage, a finding that warrants further investigation with regard to both compositional and physiological outcomes using novel oils selectively enriched in SDA.

Source of funding: Not applicable

P02

Maternal probiotic intervention ameliorates endocrine and immune dysfunctions and restores unbalanced colonic microflora induced by early life stress

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Background

Early life stress is known to alter neuroendocrine and immune functioning and it has been proposed to play a role in the dysregualtion of colonic functioning. Previous research has linked early life stress to functional gastro-intestinal disorders such as irritable bowel syndrome (IBS). Dysregulation of neuroendocrine and immune systems along with disruption of the normal balance of the gut microbiota are common features of IBS.

Objective

This study aimed to assess whether maternal probiotic intervention can act prophylactically to prevent endocrine, immune and colonic dysfunctions induced by early life stress in Wistar rats.

Design

Female Wistar rats either received a probiotic combination of *Bifidobacterium lactis* Bb12 and *Propionibacterium jensenii* 702 from 2 weeks before mating, during pregnancy and lactation via drinking water or served as control subjects. After birth, pups were either subjected to intermittent neonatal maternal separation (NMS) for 3h/day between postnatal days (PND) 2-14 or left undisturbed (NS). At PND 24, blood samples were collected to assess plasma circulating corticosterone, haptoglobin, TNF-α and IFN-γ levels. Faecal pellets were also collected to determine the composition of microflora.

Outcomes

NMS animals born to the non-probiotic treated mothers exhibited significant increased levels of corticosterone, haptoglobin and IFN- γ but not TNF-α compared with the control ($P< 0.05$). Interestingly maternal probiotic intake normalised level of cort, haptoglobin and IFN-γ in NMS animals. NMS also altered the integrity of gut microflora. NMS significantly increased counts of Enterobacteriaceae, Enterococci, *Bacteroides* spp and Clostridia and declined counts of Lactobacilli and Bifidobacteria spp ($P< 0.05$). NMS animals born to probiotic treated mothers showed a restored bacterial gut flora with the exception of Enterobacteriaceae.

Conclusion

Our findings suggest that maternal probiotic intervention can prevent dysregulation of the HPA axis and the immune system and restore an unbalanced microflora provoked by early life stress. Underlying mechanisms however need to be further investigated.

Source of funding

Not applicable.

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P03

Wholegrain foods and legumes in health and nutrition – a review

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Background
An ever increasing body of evidence shows strong scientific support for the role of wholegrains in health and protecting against chronic disease.

Objective
To bring together the body of literature highlighting the scientific evidence for the role of grain-based foods (particularly wholegrains) and legumes in easing the burden of disease being experienced in Australia and throughout the western world.

Design
This review is a collection of predominately large prospective cohort studies which have been published in peer-reviewed international journals and have been the subject of meta-analyses by recognised authorities over the past 10 years.

Outcomes
This paper confirms the scientific evidence for the role of wholegrains in protecting against some of our most deadly and costly diseases including heart disease, cancer and diabetes, with two to three serves of wholegrain foods a day reducing the risk of cardiovascular disease, diabetes and some cancers by no less than 20%.

Emerging science suggests wholegrains may assist in the prevention of periodontal disease and asthma, as well as suggestive evidence for improvements in mood and cognitive function.

This review unveils unpublished Australian consumption data and estimates that increased wholegrain consumption is capable of reducing annual health expenditure by over 1.2 billion dollars.

Conclusion
This review presents a valuable resource to those interested in the latest evidence for grain-based foods and legumes in health and nutrition. In addition to the more established benefits of wholegrains in the prevention of chronic diseases, there is emerging science about the benefits of wholegrain consumption for prevention of periodontal disease, and asthma, as well as suggestive evidence for improvements in mood and cognitive function. Further research will be needed to confirm these findings.

Source of funding
Not applicable

P04

Effects of PGX®, a novel functional fiber on acute and delayed postprandial glycaemia

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Background
Viscous fibre in food has established health benefits but few functional fibre preparations are both effective and palatable.

Objective
To determine the most effective dose, formulation and timing of consumption of a novel fibre supplement (PGX®) in reducing postprandial glycaemia.

Design
Three trials were undertaken, each with 10 subjects (8 M : 8 F, age 24.4 ± 2.6 yr). Granular supplement was tested at four doses (0, 2.5, 5.0 and 7.5 g) with breakfast (study 1). Granular and capsule forms of the supplement were given in a single dose (5 g for granules and 4.5 g in capsules) at - 60, - 45, - 30, - 15, 0 before and + 15 min after a bread meal (study 2). Capsules at increasing doses (1.5, 3, 4.5 and 6 g) were consumed with the evening meal to determine effects on glucose tolerance at breakfast (study 3). Incremental area under the blood glucose curve was determined.

Outcomes
Granular PGX at breakfast time at doses of 2.5, 5 and 7.5 g reduced the iAUC by up to 50% in a linear dose-response fashion ($P < 0.001$). The granular form of PGX (5 g), but not the capsules, reduced glycaemia by up to 28% when consumed from -45 to +15 min ($P < 0.001$). Capsules containing 3, 4.5 and 6 g PGX consumed with the evening meal reduced glycaemia at breakfast by up to 28% ($P < 0.001$).

Conclusion
PGX has biologically important, dose-related effects on acute and delayed (second meal) postprandial glycaemia.

Source of funding
InovoBiologic Inc in Canada provided funding to the University of Sydney regarding to the research related to the abstract.

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P05

A study of metabolic syndrome comorbidities in a farming community of Australia

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Background
There is a growing body of evidence that indicates the Australian farming community experiences higher rates of lifestyle diseases including obesity, diabetes and cardiovascular disease than those living in metropolitan regions.

Objectives
This study aimed to identify the links between psychological health status and metabolic syndrome comorbidities within an Australian farming community.

Design
1813 consenting adult farm men and farm women (average age 48.9 y, ± 11.1) participated in this cross-sectional study. Participants were recruited between 2004 and 2008 from 97 locations across Australia via the Sustainable Farm Families (SFF) program. SFF is an education and service delivery program that collects anthropometric, biochemical, lifestyle and clinical data. Data were stratified into categories using cut-off values based on The National Cholesterol Education Program's (NCEP) Adult Treatment Panel III report (ATP III) guidelines.

Outcomes
The prevalence of overweight (42.5%, 95%CI, 34.2-50.8), and obese (21.8%, 95%CI, 18.3-25.3) was higher than age-standardised national averages. Abdominal adiposity (38.5% 95%CI, 24.5-52.5), hypertension risk (54.0 %, 95%CI, 34.4-73.5) and diabetes risk (27.2%, 95%CI, 17.7-36.7) were also significantly higher amongst farm men and women (P>0.05). There is a significant association between psychological distress and obesity and metabolic syndrome in older (age ≥ 50 years) participants.

Conclusion
The study population is at high risk of lifestyle diseases and psychological distress has an apparent co-morbidity with obesity and metabolic syndrome in the farming community.

Source of funding
National Centre for Farmer Health is a partnership of Deakin University with Western District Health Service, Victorian Government's funding program and the Helen and Geoff Handbury Trust)

P06

Improving the omega-3 status of sheep by feeding silage

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Background
Omega-3 concentrations in meat are significantly affected by omega-3 intake in sheep. Little information is available regarding the effects of silage on the omega-3 status of sheep in Australia.

Objective
To determine whether the omega-3 status of sheep can be improved by feeding silage high in omega-3.

Design
A parallel-group controlled trial was conducted with 30 Merino x Border Leicester ewes. Ewes were fed a diet containing an oat/pea silage (n=16) or oats/cottonseed meal (n=14) for 52 days. Blood was collected from all ewes prior to and, 14, 28, 43 and 52 days after, the introduction of experimental rations. Following extraction and methylation, concentrations of fatty acids were quantified in plasma and red blood cells (RBC) by gas chromatography. Concentrations of total lipid and fatty acids were also determined in experimental rations.

Outcomes
Approximately 45% of the total fatty acids in the oat/pea silage were α-linolenic acid (C18:3n-3). Concentrations of omega-3 fatty acids were significantly (P<0.05) increased and omega-6 fatty acids were significantly (P<0.05) decreased in plasma and RBC of ewes fed silage compared with oat grain.

Conclusion
Omega-3 fatty acid concentrations in blood were increased when ewes were fed cereal silage. Further work will determine whether the changes observed in RBC are reflected by changes in meat.

Source of funding
Supported by a grant from the EH Graham Centre for Agricultural Innovation.

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P07

WITHDRAWN

P08

Energy distribution patterns among Australian children and adults and its relationship with age, gender and BMI

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Background
Energy intake distribution may play a role in weight management. Identification of current energy distribution patterns may enable meal-based recommendations to be developed as a tool in obesity prevention.

Objective
To assess daily energy distribution among Australian adults and children, provide evidence on the relative importance of eating occasions to overall energy intake, and determine its relationship with age, gender and BMI.

Design
Dietary data collected via 24-hour recalls during the 1995 National Nutrition Survey and the 2007 National Children's Nutrition and Physical Activity Survey were analysed. Percent of total energy intake was calculated based on intake data for 10,851 adults and 4,837 children. Number, prevalence and percent of total energy intake (%en) were tabulated according to BMI, age (school-age for children) and gender to report trends and/or differences in energy distribution patterns. 'Breakfast' was defined to occur between 0600-0900 h, 'lunch' between 1200-1400 h, and 'dinner' between 1700-2030 h. Snacks were defined as the eating occasions between main meal times.

Outcomes
Both adults and children consumed a pattern of 3 main meals and 2-3 snacks. The highest %en was at dinner. Among children, %en from breakfast was 15%, lunch 19%, dinner 30% and snacks 36%. Percent of energy from breakfast decreased (19% to 12%) and post-dinner snack increased as school stage increased from primary to secondary school (3% to 11%). No difference was observed in %en intake between normal, overweight and obese children. For adults, %en from breakfast was 14%, lunch 21%, dinner 37%, and snacks 28%. Percent of energy intake during main meals increased with age (78% for >70 yr vs. 64% for 19-29 yr) while that from snacks decreased with age.

Conclusion
A variety of energy distribution patterns occur in Australia that are moderated by age rather than by gender or BMI. Snacks and the dinner meal were an important part of total energy intake. Recommending a daily energy distribution pattern consisting of 3 meals and 2 snacks would be culturally acceptable, provides guidance on the energy content of food and beverages and potentially reduces the likelihood of overconsumption.

Source of funding
The Australian Food and Grocery Council.

Poster Session 1: Wednesday 1 December

P09

Zinc transporter and metallothionein mRNA expression in a healthy human population

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Background
An intricate arrangement of cellular homeostatic mechanisms has evolved to regulate the intracellular zinc content and its distribution within the mammalian cell. The mechanisms include the regulation of two recently discovered classes of zinc transporters, the ZnT (SLC30) and Zip (SLC39) transporter families, and the trafficking of zinc through the cell by metallothionein (MT). Little is known about zinc transporter and MT gene expression in humans and its relationship to plasma and dietary zinc.

Objective
To investigate the relationship between plasma and dietary zinc and the expression levels of a range of zinc transporter and metallothionein mRNAs in the peripheral blood mononuclear cells (PBMCs) of healthy humans.

Design
Forty healthy subjects (20 men, 20 women) were recruited and fasting blood samples collected. Plasma zinc concentrations were determined. Total RNA from PBMCs was isolated and transcribed into cDNA using reverse transcription. Quantification of the mRNA levels of ZnT1, ZnT5, ZnT6, ZnT7, ZnT8, Zip1, Zip3, Zip7, Zip10, MT-1A, and MT-2A was conducted using Taqman real-time PCR. Results were expressed relative to 18S mRNA. Dietary zinc intake was determined using a zinc-specific food frequency questionnaire and estimated food records.

Outcomes
The age and dietary zinc intake of the participants were 40.1 ± 12.8 y (mean ± SD) and 14.8 ± 5.1 mg/d, respectively. Plasma zinc concentrations ranged from 10.5-16.8 µmol/L. In a regression analysis, plasma zinc variability was not explained significantly by gender, age, zinc intake, MT, or any individual or combination of zinc transporters. ZnT1 and Zip1 were highly correlated with each other ($r=0.9$, $P<0.001$) and with ZnT5, ZnT7, Zip3, and Zip10 ($P<0.001$ in all cases). MT-2A was positively correlated with Zip3 ($r=0.413$, $P<0.05$), ZnT6 ($r=0.572$, $P<0.001$), and MT-1A ($r=0.568$, $P<0.001$) and negatively correlated with Zip7 ($r=-0.366$, $P<0.05$). ZnT8 mRNA expression was detected in only 10 subjects.

Conclusion
The positive association between ZnT1 and Zip1, which have reciprocal roles in zinc transport, illustrates the coordinated nature of zinc homeostasis in humans. There is no clear relationship between plasma and dietary zinc levels, which are commonly-used indicators of zinc status, and the expression of zinc transporter and MT mRNAs.

Source of funding
Sydney University Nutrition Research Foundation.

P10

Shiitake mushroom beta-glucan but not oat beta glucan prevents body weight gain in rats fed a high fat diet

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Background
The effect of beta-glucan on body weight gain (BWG) and accumulation of white adipose tissue (WAT) is unknown.

Objective
To assess the effect of beta-glucan on body weight gain (BWG) and accumulation of WAT in rats fed a high-fat diet (HFD).

Design
A 6 weeks randomised, controlled, dose response study was conducted on 80 male wistar rats (with starting weight of 345 g) to compare different doses of beta-glucan from shiitake mushroom and oats in preventing BWG and accumulation of WAT in rats fed a HFD compared with rats fed a low fat diet (LFD). The different doses used were low dose (LD) (0.06 g); medium dose (MD) (0.18 g) and high dose (HD) (0.54 g) which are comparable of 3, 9 and 27 g beta-glucan for humans. Body weight and food intake was measured every week. WAT was collected immediately after the rats were sacrificed. Outcomes were analysed using ANOVA and followed by: post-hoc Tuckey Kramer. Differences were considered significant when $P<0.05$.

Outcomes
There was a trend towards a 34% increase in body weight gain in the HFD (125 ± 8.6 g) compared to LFD (92 ± 4.7 g) but it was not significant. WAT in HFD (42 ± 3.3 g) significantly increased by 82% compared with the LFD (23 ± 0.9 g). All doses of oat beta-glucan and LD and MD shiitake mushroom beta-glucan significantly increase BWG, approximately 67% and 50% respectively, compared with the LFD. However the HD shiitake mushroom beta-glucan significantly prevented this increase in BWG as the BWG (92 ± 8.1 g) was the same as the LFD group. Similar results were obtained with WAT with significant increases of more than 50% in all doses of oat beta-glucan and LD and MD shiitake mushroom. However HD shiitake mushroom beta-glucan prevented the accumulation of WAT (28 ± 2.1 g) which was similar to LFD (23 ± 0.92 g).

Conclusion
Beta-glucan from shiitake mushroom is more effective than oat beta-glucan to prevent BWG and accumulation of WAT induced by short-term high-fat diet in rats.

Source of funding
Directorate General of Higher Education Indonesia and University of Brawijaya Indonesia sponsored Dian Handayani (Lecturer form University of Brawijaya) as PhD student in UoW

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P11

The Dietary Guidelines Index for Children and Adolescents (DGI-CA)

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Background
Diet quality indices capture whole diets better than single nutrients or food groups, and are thought to reflect overall dietary patterns. The use of an index can help to understand how the complex mix of foods we eat influences health.

Objective
To develop a food-based dietary index to reflect adherence to the 2003 Dietary Guidelines for Children and Adolescents in Australia.

Design
Data were analysed from 4-16 year old participants of the 2007 Australian National Nutrition and Physical Activity Survey (n=3416). The Dietary Guidelines Index for Children and Adolescents (DGI-CA) comprises eleven components representing the dietary guidelines, including the five core food groups, whole grain breads and cereals, reduced fat dairy foods, extra foods (nutrient poor foods that are high in fat, sugar and salt), healthy fats and oils, water as a drink and overall diet variety (a total possible score of 100). A higher score reflected increased compliance with the dietary guidelines. The index criteria were age specific. Data was weighted for survey design.

Outcomes
The mean DGI-CA score was 53.0±15.3 (range 6.0-92.3). Adherence to the guidelines differed significantly by age – the youngest children scored significantly higher (60.6±13.9) than the oldest children (48.6±14.9; P<0.001). Of the five core food groups, children were most likely to meet the guidelines for 'Meat and alternatives' (49-64%) and 'Fruit' (31-76%), and least likely to meet the guideline for 'Breads and Cereals' (4-5%). Intake of vegetables was below recommendations – 9-15% of children met the guideline; and this decreased significantly with age (P<0.001). Few children met the recommendations for 'Extra foods' (20-38%), whole grain breads and cereals (12-18%) and reduced fat dairy (14-22%). Water was not the drink of choice for most Australian children and diet variety was poor across all age groups.

Conclusion
The DGI-CA is the first food-based index appropriate for use with Australian children. This secondary analysis of the 2007 National survey suggests Australian children's are not adhering to the dietary guidelines. With further validation, this index could be used for population monitoring and surveillance, and to inform and evaluate interventions.

Source of funding: Nil to declare

P12

Parental strategies and children's consumption of vegetables: a cross cultural comparison

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Background
Australian children are not meeting the dietary guidelines for fruit and vegetable intake. Parents play an important role in regulating the food supply as well as modelling children's food choices and eating behaviours. Advice given to parents need to take into account parents current practises, attitudes and cultural beliefs. Australia is a multi-cultural society, yet little is known about potential cross cultural differences with respect to parents' practices, attitudes and beliefs concerning vegetable consumption of their children.

Objective
The present quantitative study aimed to investigate cross-cultural parental strategies used in encouraging children's consumption of vegetables and to determine the strategies which are associated with high vegetable intake.

Design
To this end we sent questionnaires to parents with different ethnic backgrounds who all lived in the wider Melbourne area (50 Thai, 30 Dutch & 50 Australian parents). The questionnaire included questions about parental beliefs, attitudes and practices.

Outcomes
The different ethnic communities did not differ in their strategies concerning vegetable consumption of their children. Different strategies did also not relate to difference in vegetable consumption.

Conclusion
Inadequate vegetable consumption amongst children is an important issue. Effective strategies must be determined to guide parents on how to positively influence and improve vegetable intake in a supportive environment.

Source of funding
Funding support provided by Deakin University.

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P13

Accurate and inaccurate weight perception: lifestyle behaviours and psychological measures in overweight and obese adolescents

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Background
Accurate overweight perception is associated with weight control behaviours, but little is known about lifestyle behaviours.

Objective
To compare overweight and obese adolescents with accurate and inaccurate self-reported weight perception by demographic characteristics, lifestyle behaviours and measures of psychological well-being.

Design
Cross-sectional survey of Grade 7 to 12 students in 2008. Overweight and obese students were classified as accurate perceivers (weight perception was 'too fat') or inaccurate perceivers (weight perception was 'about right' or 'too thin').

Outcomes
Almost half (49.1%) of overweight/ obese students did not consider themselves overweight. Accurate perceivers (boys and girls) were more likely to express a desire to lose weight and were twice as likely to feel depressed in the past 6 months vs. misperceivers. Among boys, accurate perceivers were less physically active, consumed less fruit and more soft drinks and were more likely to feel nervous or stressed. Boy accurate perceivers consumed less fast food, spent less time on computers for fun and were less likely to be in trouble for misbehaving. Among girls, accurate perceivers were more likely to consume fast food and soft drinks, less physically active, more likely to have higher television viewing time, and more likely to smoke. Accurate girl perceivers consumed more fruit and fewer snacks, spent less time on computers for fun and were less likely to consume alcohol.

Conclusion
Accurate overweight perceivers are more likely to express weight loss intention, engage in unhealthy lifestyle behaviours and have poor psychological status. Weight perception should be considered before counselling and behavioural interventions.

Source of funding
Not applicable.

P14

Wanting and liking as predictors of children's vegetable consumption

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Background
About 97% of children in Australia between 6 and 11 years of age do not meet the recommended daily intake of two to three serves of vegetables. As a first step in designing well targeted in-home strategies it is important to understand what drives children's vegetable consumption.

Objective
The present study investigated the association between children's consumption, liking and wanting of vegetables

Design
In a controlled school setting, 32 children (7-9 years) tasted six vegetables, and completed a flavour-liking and a computer guided wanting test for their most liked vegetable. Parents reported on children's vegetables consumption at home and potential difficulties they experienced with offering their children vegetables.

Outcomes
Wanting, but not flavour-liking, was significantly associated with children's vegetables consumption during the sensory test ($P<0.05$). Children's wanting, but not liking was positively associated with the variety of vegetables children consumed at home ($P<0.05$). Furthermore, parents' common practice of hiding vegetables was associated with children's lower wanting ($r=-0.35$, $P<0.05$), and liking ($r=-0.36$, $P<0.05$) for vegetables

Conclusion
The results point in the direction that wanting is a more important driver of children's vegetable consumption than liking.

Source of funding
Sponsored by Deakin University

Poster Session 1: Wednesday 1 December

P15

Probiotics for rumen acidosis

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Background
Rumen acidosis is one of the most significant disorders among all the digestive disorders in the cattle industry and especially in intensively reared animals. This disorder is directly caused by lactic acid accumulation in the rumen and results in significant negative effects on both productivity and animal health. The use of direct-fed microbials to promote general animal health and improve productivity has long been considered in the cattle and dairy industry. Dairy propionibacteria is part of the indigenous micro-flora in cattle rumen and it can metabolise lactate to produce acetate and propionate which both contribute to the energy source for cattle. Thus, dairy propionibacteria could be a natural and effective way to manage the issue of acidosis in cattle.

Objective
The current study aims to investigate the feasibility of using dairy propionibacteria to treat rumen acidosis and compare the ability of lactate conversion to acetate and propionate by the different dairy propionibacteria.

Design
Cattle rumen contents were used for simulation of the acidosis condition. Dairy propionibacteria was inoculated to the simulated acidosis environment. Fermentation process was monitored by measuring lactic, acetic and propionic acid levels with HPLC.

Outcomes
Lactic acid was significantly reduced while acetic and propionic acids were significantly increased by dairy propionibacteria under simulated rumen acidosis. The ability to metabolise lactate was significantly different between strains of dairy propionibacteria with*P. Jensenii* 702; *P. acidopropionici* 341, and *P. acidopropionici* 25562 having higher conversion rate of lactate to acetate and propionate.

Conclusion
The current studies have demonstrated that dairy propionibacteria can reduce the levels of lactic acid in cattle rumen under simulated conditions however the outcomes are highly dependent upon the selection of bacterial strains.

Source of funding
The University of Newcastle, Australia.

P16

The effectiveness of community-based group dietary education programs in facilitating behavioural change in individuals with type 2 diabetes

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Background
Community nutrition education programs are an integral component in the treatment of people with type 2 diabetes in the health care system in Australia; however their effectiveness is rarely evaluated.

Objective
To evaluate the stage of behavioural change of newly diagnosed patients with type 2 diabetes and the effectiveness of a community-based group nutrition education program in modifying food choice and influencing self efficacy in the short term.

Design
Twenty-nine adult subjects with newly diagnosed type 2 diabetes who attended the second and final nutrition education session of a diabetes education program across three community health centres in Canberra were invited to participate in the study. Current dietary habits, stage of behavioural change, levels of self-efficacy and barriers to change were measured at the beginning of this session using a self-reported questionnaire based on the Transtheoretical Model of Behavioural Change. The same questionnaire was re-administered by telephone three weeks after the session and included additional questions to assess compliance with nominated changes in dietary habits.

Outcomes
At baseline, women (n=14) had a higher BMI than men (n=15) and were better predictors of actual weight status ($P<0.05$). Twenty-four participants (aged 30-86 yrs) completed both the pre- and post-questionnaire. At baseline, eight participants reported no need for dietary change. The rest (n=16) nominated and successfully implemented at least one positive dietary change at three weeks. Although, taste was the key determinant influencing food choice, the importance of reducing total fat content and saturated fat content increased ($P<0.05$) in the group three weeks after the intervention. Weekly consumption of fruit and vegetables also increased ($P<0.05$) at three weeks after the intervention.

Conclusion
Most participants reported positive dietary changes in the short term, although no significant changes were observed in the measures of self-efficacy after intervention. Future research should utilise a larger sample and determine whether these participants are actively maintaining these positive health behaviours in the long term.

Source of funding
Not applicable.

Poster Session 1: Wednesday 1 December

P17

The influence of plasma micronutrients and parental age on telomere length

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Background
Telomeres are repeats of the hexamer sequence $(TTAGGG)_n$, which associate with the telosome protein complex and cap the end of all human chromosomes. The length of the telomeric sequence is known to decline with ageing until the telomere becomes critically short, typically signalling cellular senescence and resulting in programmed cell death. Investigating the relationship between micronutrients and telomere length may enable the establishment of nutrient profiles required for optimal maintenance of telomere length.

Objective
The aim of this study is to investigate the effect of micronutrients and parental age on telomere length.

Design
Our cross-sectional study population consisted of 209 middle-aged men (41%) and women (59%). Whole blood samples were collected with blood plasma and peripheral blood lymphocytes (PBL) both isolated. Levels of various micronutrients in the blood plasma were measured and absolute telomere length in PBL was determined by a qPCR assay.

Outcomes
We also observed a significant positive correlation between paternal age at birth and telomere length in the adult offspring ($r = 0.14$, $P = 0.04$, $n = 206$), and a similar positive trend with maternal age ($r = 0.12$, $P = 0.08$, $n = 208$). High levels of plasma zinc were significantly weakly correlated with shorter PBL telomere length in the study population ($r = -0.15$, $P = 0.03$, $n = 209$).

Conclusion
As increasing parental age was associated with increased telomere length, we postulate that the inheritance of parental subtelomeric methylation patterns in the offspring may influence telomere length maintenance. The association of increased zinc with shorter telomere length demonstrates that diet may impact telomere length maintenance. The underlying mechanism for this relationship warrants further investigation.

Source of funding
This research was supported by the National Health and Medical Research Council of the Australian Government, Grant ID 464895.

P18

Intestinal epithelial cell adhesion characteristics of probiotic combinations included in orange juice

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Background
In order to confer health promoting properties of probiotics on the host, they need to survive in sufficiently high number and colonise the gastrointestinal tract. A prerequisite for intestinal colonisation is adherence to intestinal epithelial mucosa. Therefore, adhesion is considered as an important criterion for selection of probiotic microorganisms. It is not as yet known however, whether delivery vehicles and storage duration may impact the adhesion of probiotics to intestinal epithelial mucosa.

Objective
The aim of this study was to examine the adhesion of single strains and combination of probiotics incorporated in orange juice to Caco-2 human intestinal epithelial cells *in vitro* under refrigerated storage conditions for the duration of one month.

Design
Lactobacillus rhamnosus GG and *Lactobacillus reuteri* ATCC 55730 either alone or in combination with *Bifidobacterium lactis* Bb12 and/or *Propionibacterium jensenii* 702 were added to orange juice and stored at 4 °C for one month. Bacterial adhesion to Caco-2 human intestinal epithelial cells was examined on day 0, 10, 20 and 30 during the storage period.

Outcomes
The adhesion rate of *Lb. rhamnosus* GG either alone or in combinations was mostly stable throughout the storage period. The percentage adhesion of *Lb. reuteri* either alone or in combination with *Bif. lactis* Bb12 appeared to improve significantly over the study time ($P<0.05$), however the viability of this bacterium decreased during the storage period. Little change in the adhesion rate of *Lb. reuteri* was apparent in the presence of *P. jensenii* 702.

Conclusion
Orange juice could be considered as a suitable carrier for *Lb. rhamnosus* GG and *Lb. reuteri* as the adhesion ability of these probiotics was either enhanced or unaffected during the storage at 4 °C.

Source of funding
Not applicable.

Poster Session 1: Wednesday 1 December

P19

Gender: a determinant of weight loss through diet

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Background
Body composition of males and females differs in the distribution and amount of fat mass (FM), muscle mass (MM) and fat free mass (FFM).

Objective
The purpose of this study was to investigate whether gender is a determinant of changes in weight, FM, MM and FFM when men and women follow the same weight loss diet.

Design
A weight loss trial was conducted with participants following a very low kilojoule diet (3000 kJ/day) for a period of 4 weeks. Seventy two participants, BMI 30-40 kg/m2, aged 18-60 years, completed the study. Anthropometric measurements were recorded at the commencement and conclusion of the weight loss period. FM, MM and FFM were measured using bioelectrical impedance.

Outcomes
The reductions from baseline for weight, BMI, FM, FFM, MM, waist, hip and WHR within each group were significantly different (P<0.001) for all. Between groups, the reduction from baseline for weight, FM and MM was significantly greater for males. Males had a greater reduction in waist circumference while in females there was a greater reduction in hip circumference. For females there was a positive and significant correlation between weight loss and a reduction in both waist and hip circumference but not for males.

Conclusion
Males appear to experience greater benefits from weight loss through diet than females, particularly with a greater reduction in waist circumference which decreases the risk of CVD.

Source of funding
Not applicable.

P20

The effects of epigallocatechin-3-gallate on blood lipids in humans with moderately elevated cholesterol - a pilot study

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Background
A high consumption of green tea has been linked with lower blood cholesterol, an effect primarily ascribed to its most abundant polyphenolic compound epigallocatechin gallate (EGCG). However, studies investigating the effects of EGCG on blood lipids in humans are scarce.

Objective
The aim of this pilot study was to determine the effect of EGCG supplementation on blood lipids in moderately hypercholesterolaemic humans.

Design
Ten participants (6 males and 4 females) with moderately elevated cholesterol between 5.5 and 7.5 mmol/l were recruited. A double blind, randomised, placebo-controlled, parallel design was used to study the effects of 1g EGCG/day (treatment) or 1g/day gelatine (control), given in 4 X 250 mg capsules, for 4 weeks. Fasting blood samples were collected at baseline and at the end of the study and total cholesterol, HDL cholesterol and triglycerides were measured in plasma using commercially available kits. The LDL cholesterol was calculated using the Friedewald equation. Participants were asked to record their dietary intake on three consecutive days at baseline and at the end of the study and the macronutrient profile of their diets was analysed using FoodWorks 2009 Professional (v6 Xyris Software).

Outcomes
The LDL cholesterol significantly increased during the 4-week treatment period in the control group (+13.3%, P=0.016) but there was no significant change in the EGCG group (+4.8%, P=0.365). The same trend was seen for total cholesterol in the control group (+8.6%, P=0.060) but it did not reach statistical significance. In the EGCG group, there was no change in total cholesterol (+0.77%, P=0.768). There were no significant differences in triglycerides in either group during the treatment period (P>0.05). There were also no changes in the dietary intake of macronutrients in either group during the 4 weeks of treatment (P>0.05).

Conclusion
The results of this pilot study indicate that EGCG suppressed the rise in LDL cholesterol which was seen in the control group. Therefore, further studies investigating EGCG as an hypocholesterolaemic agent are warranted in higher numbers of subjects.

Source of funding
N Naumovski was the recipient of an APA Scholarship from the University of Newcastle.

Poster Session 1: Wednesday 1 December

P21

A community pharmacist-led primary care intervention can effect change in dietary behaviours

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Background
Cardiovascular disease (CVD) is the largest chronic disease burden worldwide. Identification and treatment of modifiable risk factors is largely the domain of general practitioners but remain sub-optimally implemented.

Objective
To examine whether a primary care intervention led by community pharmacists could result in changes in dietary behaviours.

Design
Pharmacists recruited 70 participants (50-74 yr), treated for hypertension or hyperlipidaemia but without diabetes or CVD. At baseline, research assistants conducted clinical assessments of anthropometric and biomedical risk factors, and interviewed patients to examine diet and health behaviours, medicines use and related issues. Data was analysed by consultant pharmacists and summary reports produced, containing recommendations and targets for risk reduction. Participants addressed recommendations with their community pharmacists over five monthly sessions. At follow up, the relative 5 year risk reduction for CVD onset was 24%, contributed to by reduced mean systolic (-7 mmHg) and diastolic BP (-5 mmHg), total:HDL cholesterol ratio (-0.2), and waist circumference (-2 cm males,-0.7 cm females)

Outcomes
Significant changes were seen with improved overall diet quality (P<.0001), reduced saturated fat (P<.0001 and, salt (P=.0002), increased fibre (P=.02) and omega 3 fatty acid (P=.05) intake scores. The main areas that significantly influenced change in overall diet quality were goal setting (participant dietary goal setting P=.0004, satisfaction with goals identified P=.017 and changes made to goals P=.019) and the participant/pharmacist relationship in that process (total lifestyle goals agreed on P=.035).

Conclusion
Community pharmacists were able to deliver healthy lifestyle advice in an effective manner. The potential health benefits from this intervention need to be confirmed via larger, controlled clinical trials.

Source of funding
The Department of Health and Ageing through the Fourth Community Pharmacy Agreement administered by the Pharmacy Guild of Australia.

P22

Dietary change and risk factors in Australian adults at increased risk of cardiovascular disease

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Background
Lifestyle change is advocated as an important component of first-line therapy for cardiovascular disease (CVD) prevention.

Objective
To examine the relationships between lifestyle behaviour change and risk factors for CVD.

Design
The *cv*TRAC study was a cohort study which enrolled independently living adults with at least one CVD risk factor through general practitioners (GPs) across Australia in 2000-2005. The data collected included dietary and physical activity behaviours and levels of conventional CVD risk factors (lipids, glucose, blood pressure). The study aimed to assist GPs in identifying appropriate risk reduction strategies for their patients, and GPs were invited to submit a review their patient's risk factors and management three months after the baseline assessment.

Outcomes
15,478 participants enrolled in *cv*TRAC completed a follow-up assessment. The mean age of these participants was 60 years and 51.6% of participants were female. Mean CVD risk factor levels were: body mass index of 29.75 kg/m^2 and levels of total cholesterol and fasting plasma triglyceride were 5.59 and 2.01 mmol/l respectively. Mean baseline blood pressure (BP) of the follow-up cohort was 136/81 mmHg. At baseline 52% reported following a low-salt diet, whilst 62% reported following a low-fat diet. Those who reported uptake of a low-salt diet over the three-month follow-up had significantly greater reductions in systolic BP than those who reported no change in their dietary salt behaviour (5.5 ± 0.3 mmHg vs 3.3 ±0.1 mmHg, P<0.001). Whilst those who reported uptake of a low-fat diet had significantly greater reductions in cholesterol (0.57±0.02 mmol/l vs 0.34±0.01 mmol/l), systolic BP (5.9±0.3 vs 3.2±0.1 mmHg) and BMI (0.51±0.03 vs 0.17±0.02 kg/m^2) (all P<0.001), than those who reported no change in their dietary fat intake.

Conclusion
These findings suggest that as part of a clinical management plan, efforts by individuals to address dietary behaviour may significantly improve their cardiovascular risk factor levels.

Source of funding
*cv*TRAC was funded by an educational grant from AMRAD Pharmaceuticals/Merck Sharp & Dohme.

Poster Session 1: Wednesday 1 December

P23

Increasing children's acceptance for vegetables through modification of sensory properties

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Background
Sensory preferences are a key factor influencing children's vegetable consumption.
Objective
To investigate whether children's acceptance for vegetables can be influenced by modification of sensory properties through preparation method and the use of novel coloured varieties.
Design
Children's acceptance was measured among a group of 104 five-and-six year olds. Each child tasted and evaluated three vegetable types (sweet potato, cauliflower and French beans), presented in four different ways each, using different cooking methods and a typically or an atypically coloured vegetable. Expected preference, acceptance and ranked preference were determined within each vegetable type. Background information for children was collected from parents. A trained sensory panel determined the vegetables' sensory characteristics.
Outcomes
Preparation method affected acceptance for cauliflower and beans, with baked/stir fried samples accepted less than boiled samples. Presence of a browned flavour and a high odour intensity were negatively related to acceptance. Differences in texture and flavour properties induced by different boiling times did not affect acceptance. Atypical colour positively influenced expected preference but not on actual preference upon tasting. Familiarity, variety in number of vegetables liked and reported liking of target vegetables increased acceptance, whereas variety in the number of vegetables consumed did not. Preparation method was more important for acceptance for children who liked fewer vegetables than those who liked many vegetables. At home, the majority of parents (72%) used strategies to make vegetables more attractive for their children to eat, such as combining with other ingredients or mixing in a meal. Parents reported smell primarily as the reason for their child disliking a vegetable, whereas appearance, taste and texture were associated with likes and dislikes.
Conclusion
Baking and stir frying processes were a barrier to vegetable acceptance for two of three vegetables. Atypical colour may facilitate willingness to try through its positive effect on expected preference.
Source of funding
This research was funded by Horticulture Australia Limited using the vegetable levy and matched funds from the Federal Government.

P24

WITHDRAWN

Poster Session 1: Wednesday 1 December

P25

Viscosity and diffusion characteristics of arabinoxylan and beta-glucan: Implications for nutrition

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Background
Viscosity and diffusion properties of cereal non-starch polysaccharides may play an important role in imparting beneficial effects for human health.

Objective
To identify relationships between viscosity, probe diffusion and macromolecular structure for two non-starch polysaccharides – arabinoxylan and beta-glucan – and assess the potential impact on nutrition studies.

Design
Aqueous solutions of three barley beta-glucans and three rye / wheat arabinoxylans differing in solution viscosity were investigated over a range of concentrations (0.2% to 10% (w/v)). Fluorescence recovery after photobleaching (FRAP) was used to measure the diffusion coefficient of a polymer probe (FITC-dextran) similar in size to digestive enzymes or bile salt micelles. Macromolecular structural distributions were characterised using multiple detection size exclusion chromatography (SEC).

Outcomes
The diffusion coefficient of the probe molecule in beta-glucan solution decreases with increasing viscosity and concentration, as expected for a system where macroviscosity and microviscosity have a common origin. For arabinoxylan solutions, probe diffusion coefficients also decrease with concentration, but for a given concentration, the highest viscosity sample had the highest probe diffusion coefficient. This apparently anomalous result shows that macroviscosity (as measured in a viscometer) and microviscosity (as inferred from probe diffusion) do not have a common origin. Local aggregation of polymer chains is proposed to be the cause. SEC results indicated differences in arabinoxylan branching structure that may be the origin of aggregation differences.

Conclusion
The structure – property correlations identified here have significant nutrition implications. In the past, reduced diffusion rate of enzymes due to increased viscosity was considered as one of the explanations for beneficial health effects of dietary fibres. However, the present study indicates that viscosity and diffusion may not be correlated and should be measured independently.

P26

Predictors of maternal iodine status in tribal pregnant women from Ramtek, Nagpur, India

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Background
Good iodine status is critical during pregnancy in order to ensure optimal fetal growth and development, particularly of the brain.

Objective
To assess the iodine status of tribal pregnant women from Ramtek, Nagpur, India (i.e. central India), and to determine the factors that affect maternal iodine status.

Design
A prospective, observational study of 220 pregnant women from 3 tribal primary health centres who were recruited between 13-22 wk, and followed up at 35 wk gestation. Socio-demographic, anthropometric, clinical, and biochemical data was obtained from each subject including the collection of household salt, blood and urine samples.

Outcomes
The median urinary iodine concentration (MUIC) at recruitment (mean gestation age=17.5 wk) was 106 µg/L and at 35 wk was 71 µg/L, below the 150 µg/L cut-off, indicating that these pregnant women were iodine deficient. Multivariate analysis found that increased duration of pregnancy (wk gestation), increasing maternal age (yr), and <8 yr of education significantly decreased UIC by 2%, 5%, and 21%, respectively, while increased household salt concentration (ppm) increased UIC by 2%. Thyroid stimulating hormone and free thyroxine concentrations (fT4) fell within the normal reference range; only increasing maternal age (yr) was a significant predictor of fT4.

Conclusion
Despite government strategies to improve iodine status, such as a ban on the sale non-iodised salt, pregnant women living in this region of central India were iodine deficient. The consumption of adequately iodised salt (>15 ppm), particularly as pregnancy progresses, might improve iodine status.

Source of funding
University of Otago Research Grant

Poster Session 1: Wednesday 1 December

P27

The use of travel diaries to assess food access and acquisition in a young adult population

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Background
Neighborhood food environments can influence food access, and therefore dietary habits. Methods describing how individuals interpret food neighborhoods rely on geographic mapping combined with various dietary intake assessments. Non-food-centric reference frameworks may provide additional insight into food acquisition.

Objective
Travel, a key driver of food access, was assessed for feasibility as a framework for describing food acquisition.

Design
A purposive sample of 47 young adults (18-25 years) recorded their travel movements for one week (incorporating all food acquired). Food outlets within 2 km of each subject's home were mapped.

Outcomes
Of the 97.7% of subjects with car access, 44% used a car for the primary purpose of grocery shopping and 19% purchased groceries via trip chaining (secondary to a primary purpose such as travel to/from work). A similar proportion of car trips were made to buy groceries and to buy food for immediate consumption (44.7 vs 42.6%) although the maximum distance travelled for each varied (19.8 vs 99 km, respectively). Car travelers made most (91.5%) trips for reasons unrelated to food acquisition, in contrast to walkers (10.6%). Acquisition of food via trip chaining indicates that domiciliary food environments may be a less important determinant in some groups.

Conclusion
The travel diary framework provides significant scope to align food acquisition with other health behaviours such as physical activity, alcohol intake, and smoking, as well as social networking, work/school commitments, shopping and environmental sustainability factors.

Source of funding
Not applicable

P28

Dietary intake, food access and physical activity in vision-impaired adults

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Background
Vision is an important conduit for determinants of food intake. It plays key roles in developing and expressing food preferences, and access to both food and information about food and health.

Objective
To investigate vision impaired adults' nutrition knowledge, dietary intake, food access and physical activity patterns.

Design
A purposive sample of nine vision-impaired adults was recruited from a local vision loss support group. Anthropometric measurement, a validated nutrition knowledge questionnaire and physical activity survey (pedometer validated) were applied, and dietary intake was assessed via two non-consecutive 24-hour diet recalls. Semi-structured interviews were used to collect data on food acquisition and preparation. Details of the neighbourhood food environments were assessed via travel diaries combined with online GIS mapping.

Outcomes
There was a high rate (78%) of overweight and obesity in the sample. Dietary intakes lacked variety and were inconsistent with recommendations (consumption of fruits/vegetables low, meat and 'extras' high). Physical activity and nutrition knowledge were lower compared to representative samples of the Australian population. Subjects had minimal autonomy in food acquisition and preparation, and lived in areas of varying food outlet density, with the total number of food outlets within 2km varying from 0 to 19.

Conclusion
Interventions to enhance autonomy of access to healthful food and nutrition knowledge are needed in this highly vulnerable and dependent population.

Source of Funding
Not applicable

Poster Session 1: Wednesday 1 December

P29

Dietary intake status of university students

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Background

Food consumption varies between the individuals. A balanced, healthy diet and physical activity can reduce significantly the incidence of "life-style' diseases and have been demonstrated to be the most effective ways in prevention of these diseases. The dietary consumption of students studying different course could be different. This is due to several factors including the level of awareness of nutrition and health, financial circumstances, and amount of time available for food preparation. This study investigates the dietary intake of science students studying at the Victoria University, Melbourne.

Design

The study focused on the average daily intake of the macronutrients including protein, carbohydrates and fats in comparison with the recommended daily allowance (RDA) by National Health and Medical Research Council (NHMCR) and WHO. It also detailed student's average intake of micronutrients including vitamin A, thiamin (B1), riboflavin (B2), niacin (B3), and vitamin C. Furthermore the intake of fibre and cholesterol were examined. Ninety six second year science students (aged 17-35) enrolled in the Diet and Nutrition course in the School of Biomedical and Health Sciences, Victoria University were surveyed. Data were collected from 50 students (11 males and 39 females) who returned their survey. The dietary intake was recorded by the students over one week and the final analyses were completed by researchers using the Foodworks software.

Outcomes

The average energy intake was 5779 kJ. Higher intake of proteins (64.3 ± 9.1 g/day) was recorded, and this constitutes 18.5% of the total daily energy intake. Carbohydrate intake was lower (182.6 ± 14.9 g/day) than the RDA and it makes up only 46% of the total daily energy intake. Fibre intake was also lower (20 ± 9.7 g/day) than the RDA. The daily intakes of total fat and saturated fatty acids (SFA) were slightly higher than the RDA with 30.7% and 11.2% of total daily energy intake being recorded respectively. Polyunsaturated fatty acids and cholesterol intakes were both in the right range of RDA with 5.5% of total daily energy intake and 173.0 ± 24.9 mg/day being recorded respectively. The intakes of vitamin A and C were below the RDA (550 ± 84 µg and 63.4 ± 21 mg/day respectively) while the intakes of Vitamins B1, B2 and B3 were above the RDA.

Conclusion

This group of young students should increase the intake of carbohydrates and fibres. In addition the reduced total fats and SFA intake would also be beneficial for their health and wellbeing.

Source of funding: Not applicable

P30

Efficacy of a multimicronutrient fortified drink in reducing the prevalence of iron deficiency, iron deficiency anemia and improving micronutrient status in school children in India

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Background

Iron deficiency coexists with deficiencies of several micronutrients in Indian school children. A multimicronutrient fortified beverage could be effective in reducing the burden of micronutrient deficiencies including iron deficiency and iron deficiency anemia.

Objective

To evaluate the efficacy of a 2 month administration of a micronutrient fortified drink in reducing iron deficiency (ID), iron deficiency anemia (IDA) and improving micronutrient status in school children.

Design

A two-month, randomised, double-blind, placebo-controlled school-based feeding trial was carried out in Bangalore, India. Iron-depleted (serum ferritin, SF <20 µg/L), 6 -13 year old children (N=246) were randomly assigned to either receive a micronutrient fortified drink (fortified with Fe: 6mg, Zn: 0.6mg, Folic acid: 35µg, Vitamin A: 243µg, Vitamin C: 27mg, Vitamin B_2: 0.6mg, Vitamin B_{12}: 1.26 µg) or an identical unfortified control drink. The drinks were administered under supervision at school during the mid morning break. Hemoglobin (Hb) and micronutrient status were measured at baseline and were repeated at the end of 2 months to assess the efficacy of intervention.

Outcomes

Prevalence of ID, IDA, Vitamin C and Vitamin B_{12} deficiency significantly reduced by 42%, 18%, 21% and 5% respectively in the intervention arm when compared to placebo ($P<0.01$). The concentration of Hb, SF, body iron stores, vitamin A, vitamin B_{12}, vitamin C and red cell folate were all significantly higher following the intervention. Serum zinc status did not change with either treatment.

Conclusion

A multimicronutrient fortified drink is efficacious in reducing the prevalence of iron deficiency, iron deficiency anemia, vitamin C deficiency, vitamin B_{12} deficiency and in improving micronutrient status in school children.

Funding

Financial support and products used for the study were provided by Coca-Cola India.

Poster Session 1: Wednesday 1 December

P31

Children's liking and wanting for vegetables

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Background
Understanding the predictors of children's vegetable intake is important for improving children's low consumption of vegetables. Liking and motivation to eat are suggested to be important drivers of children's food intake but have not been investigated together in relation to vegetables.

Objective
The present studies aimed to investigate whether children's likes and wants for vegetables can be used as predictors of children's vegetable consumption at home.

Design
To this end 60 children (5-9 yo) participated in a one hour experiment at school and at home in which their likes and motivation to consume vegetables were assessed. In addition parents filled out questionnaires related to their children's vegetable consumption and parenting styles.

Outcomes
There were no significant differences between home and school environment measures of wanting. Liking and wanting were both related to vegetable consumption of children.

Conclusion
Determinants of children's vegetable consumption are complex and intertwined. Children's wants and likes could potentially prove to determine children's vegetable consumption yet further investigation is required.

Source of funding
Deakin University

P32

WITHDRAWN

Poster Session 1: Wednesday 1 December

P33

Utilisation of EGCG in tofu as functional food

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Background
Epigallocatechin gallate (EGCG) is the most powerful antioxidant among catechins and it is linked to a variety of health benefits. However, only drinking tea may not provide sufficient EGCG to achieve these health benefits. Utilisation of EGCG in functional foods, such as tofu, is an alternative way of providing EGCG in the diet. However, EGCG may interact with soy protein and could be lost during the processes and thermal treatments used in tofu production.

Objectives
To determine the impact of EGCG on tofu production; the level of EGCG recovery in tofu with various amounts of EGCG added; and to identify the best combination giving both high yield of tofu and high levels of EGCG recovery.

Design
Firm and soft tofu were produced from soy protein isolate (SPI) (6% (w/w)) using 30 mM Nigari and 20 mM glucono delta-lactone (GDL) as coagulants, respectively. The EGCG was added at three different levels: 0.25 %, 0.5% and 1% (w/w) in both types of tofu. The yield of firm and soft tofu was measured and the recovery of EGCG in tofu was analysed by HPLC.

Outcomes
The highest yield of both firm and soft tofu, 35% and 45% respectively, was obtained when EGCG was added at a level of 0.5% (w/w). Highest level (83%) of EGCG recovery in firm tofu was observed when 1% EGCG was added whereas 76% of EGCG was recovered when 0.5% EGCG was added. The highest level of EGCG (89%) was recovered in the soft tofu at 0.5% level of EGCG addition.

Conclusion
EGCG recovery was higher in the soft tofu than the firm one. For both types of tofu the suggested level of EGCG addition is at a level of 0.5% (w/w) to provide a serve of 100 g firm tofu containing 0.97 g of EGCG and 100 g of soft tofu with 0.95 g of EGCG. However, future studies however need to address the conditions of tofu production to maximise the yield of tofu and the bioavailability of EGCG incorporated in tofu. In addition, the quality of tofu after fortification with EGCG needs to be further investigated.

Source of funding
QV Vuong is supported by an Endeavour Scholarship.

P34

Body composition assessment by dual energy X-ray absorptiometry (DXA): an inter-machine comparison

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Background
Dual energy X-ray absorptiometry (DXA), although originally designed for the measurement of bone mineral content (BMC), is increasingly used for the assessment of soft-tissue (lean and fat) body composition. DXA is not considered a gold standard for this purpose, however, due to relatively poor agreement with the reference method of multi-compartment models, a problem compounded by inter-instrument differences.

Objective
To assess the agreement in body composition measures between DXA instruments from each of the three manufacturers: Hologic, Norland and Lunar.

Design
Twenty-one healthy subjects (8M:13F) were recruited. In a single 4-h measurement session, each subject underwent whole body DXA scans with a Norland XR36 (N), Lunar Prodigy (L) & Hologic Discovery (H) instruments using the manufacturers' recommended settings. Scans were analysed by an operator experienced with each instrument. Three subjects were scanned 3 times on each instrument to determine intra-instrument reliability and, for instruments L and H, scans were each analysed by two experienced operators to assess inter-operator reliability (intra-class *r*). Data were analysed by one-way ANOVA, pair-wise correlation and limits of agreement analyses.

Outcomes
Total body lean was highly correlated (r = 0.97 to 0.99) between all instruments although the bias between instruments varied from -2.7% (L *vs* H) to 5.3% (L *vs* N) with wide limits of agreement, e.g. -2.1 to 5.3 kg (L *vs* N). All instruments were also highly inter-correlated for total body fat (r = 0.87 to 0.95). Again biases and agreement limits were large, e.g. -17.4% (H *vs* N) and -4.9 to 2.1 kg (L *vs* N). Surprisingly, agreement was worst for BMC with the correlation between H and N being only 0.64 and a bias of -20.7%. Intra-instrument SDs were < 2% and inter-operator reliability was high, e.g. r = 0.999 for fat by Lunar.

Conclusion
The magnitude of differences between devices varied with the instruments being compared and with composition variable, i.e. fat, lean or BMC, and could be either a constant offset or varying with magnitude. Thus, although instruments are not interchangeable, high correlations, with small scatter in data, between instruments allows for correction algorithms to be derived for use in multi-centre studies where different instruments are used.

Source of funding
The University of Queensland.

Poster Session 1: Wednesday 1 December

P35

The association of liver fat content and VLDL apo-B metabolism: The effect of weight loss by hypocaloric diet

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Background
Nonalcoholic fatty liver disease (NAFLD) is highly prevalent in obese individuals and strongly associated with dyslipidaemia. Weight reduction through dietary intervention is the cornerstone of management of obesity and/or NAFLD.

Objective
To examine the association between liver fat content and VLDLD-apolipoprotein (apo) B-100 kinetics, and the corresponding responses to weight loss in obese subjects.

Design
VLDL-apoB-100 kinetics were assessed using stable isoptope tracers, and the fat content of liver, abdomen and skeletal were determined by magnetic resonance techniques in twenty-five obese subjects.

Outcomes
In univariate analysis, liver fat content was significantly ($P<0.05$ in all) associated with BMI ($r=0.649$), visceral fat area ($r=0.447$), triglycerides ($r=0.401$), HOMA score ($r=0.396$), VLDL-apoB-100 concentrations ($r=0.444$) and secretion rate ($r=0.450$). Of these 25 subjects, 9 subjects with NAFLD underwent a weight loss program. Weight loss significantly (all $P<0.05$) reduced body weight (-6%), visceral (-18%) and subcutaneous (-10%) adipose tissues, insulin resistance and plasma triglycerides (-22%), VLDL-apoB-100 (-23%), apoC-III (-14%), fetuin-A (-40%), retinol-binding protein-4 (-14%), and increased plasma adiponectin concentrations (16%). Plasma hs-CRP and skeletal fat were not altered significantly with weight loss. The percentage reduction of liver fat with weight loss was significantly associated with the corresponding decreases in VLDL-apoB-100 secretion ($r=0.671$) and visceral fat ($r=0.843$).

Conclusion
In obesity, hepatic steatosis increases VLDL-apoB-100 secretion and weight loss can reduce both these abnormalities.

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WITHDRAWN

Poster Session 2: Thursday 2 December

P37

Effects of Emu Oil during the recovery phase of chemotherapy-induced intestinal mucositis in rats

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Background
Mucositis, a serious disorder resulting from cancer chemotherapy, is characterised by inflammation and ulcerating lesions lining the gastrointestinal tract. We have previously demonstrated that Emu Oil (EO; extracted from Emu adipose tissue) administered during the earlier stages of experimentally-induced mucositis, highlighted the possibility of a more rapid recovery rate.

Objective
The current study evaluated orally administered EO for its potential to promote recovery from chemotherapy-induced mucositis in rats.

Design
Female Dark Agouti rats (six groups; n=8/group) were gavaged with water (1 ml), Olive Oil (OO; 1 ml) or EO (1 ml) for 10 days and received an intraperitoneal injection of 5-Fluorouracil (5-FU: 150 mg/kg) or saline, on day five. Metabolic parameters (body weight, water and food intake, urine and faecal output) were recorded throughout the trial. Organ weights and lengths were recorded at kill. $P<0.05$ was considered significant (ANOVA).

Outcomes
5-FU decreased body weight in all groups, however, weight loss was greater in rats treated with OO and EO compared with 5-FU control ($P<0.05$). Total water intake during the post 5-FU period (days 5-10) was decreased in EO-treated 5-FU rats compared to 5-FU controls. 5-FU decreased food intake in all groups, however, rats treated with OO and EO ingested less feed compared with 5-FU control. Total urine output was significantly greater in the 5-FU control compared to healthy control; however, urine output in EO-treated 5-FU rats was significantly less compared to 5-FU control. Total measurable faecal output was significantly less in all 5-FU groups compared to healthy control (5-FU control: 4.3±0.5 g; OO: 3.2±0.4 g; EO: 3.6±0.5 g; healthy control: 5.5±0.4 g [days 5-10]; $P<0.05$), however, there was no significant effect of EO. 5-FU significantly reduced thymus and spleen weight, and increased liver weight compared to healthy controls. EO increased colon weight and SI weight and length compared to 5-FU control.

Conclusion
At the five day time point following 5-FU injection, Emu Oil did not show significant effects on metabolic indicators of mucositis. Further investigations of tissue histology and biochemistry are in progress. Future studies could address the effects of alternative administration regimens.

Source of Funding: not applicable

P38

Omega-3 (n-3) fatty acid levels are inversely related to telomere length in an elderly cohort with mild cognitive impairment.

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Background
Telomeres are structures that cap the ends of chromosomes, protecting them from degradation and maintaining overall genomic stability.
Telomere length decreases as we age and accelerated telomere shortening is associated with increased risk of Alzheimer's disease. Cognitive ability and n-3 polyunsaturated fatty acid (n-3 PUFA) concentration in the brain also decline with aging and people with mild cognitive impairment (MCI) are at increased risk of Alzheimer's disease. Epidemiological data suggests that increased intake of n3 PUFA is linked to improved cognitive performance in older adults and may also influence telomere length.

Aim
To explore relationships between erythrocyte n-3 PUFA levels, telomere length and MCI.

Design
Participants ≥65 yrs with MCI (n=35) and healthy controls (n=27) were tested for memory function, cognition and depressive symptoms using cognitive assessments and questionnaires. Erythrocyte PUFAs were measured in fasted blood samples. Absolute telomere length was measured in whole blood using qPCR.

Outcomes
Preliminary analyses indicate no difference in telomere length between the MCI and control participants. Telomere length was negatively associated with erythrocyte n3 PUFAs: eicosapentaenoic acid (EPA) ($r=-0.359$, $p=0.03$) and docosahexaenoic acid (DHA) ($r=-0.343$, $p=0.04$); in the MCI group but not in the controls (EPA ($r=0.234$, $p=0.2$) and DHA ($r=0.304$, $p=0.12$)).

Conclusion
Our study provides new evidence suggesting that n-3 PUFAs may impact on telomere length dynamics in people with MCI.

Source of funding
This study was funded in part by the Mason Foundation.

Poster Session 2: Thursday 2 December

P39

Novel soy foods, are they a good source of isoflavones?

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Background
Isoflavones are a group of polyphenols (consisting of 12 separate isomers including the aglycones, glucosides, malonyl glucosides and acetyl glucosides) found abundantly in soybeans and have been linked to the prevention and treatment of a range of chronic disease states including cardiovascular disease, osteoporosis and hormone dependent cancers. Only a small number of soy foods have been analysed for their isoflavone content and consist mainly of the traditional Asian foods including soy milk, tofu and miso.

Objective
To determine the total concentration and distribution of all 12 isoflavone isomers in a range of commercially available novel soy products.

Design
A total of 11 novel soy foods were selected and purchased in triplicate from three separate Coles and Woolworths stores, including unprocessed soybeans for the purpose of a base comparison. HPLC standards for five isoflavones were obtained from Sigma Aldrich, including Daidzein, Genistein, Daidzin, Glycitin and Genistin, the remaining seven isoflavones were identified using indirect data (Delmonte et al. 2008). Representative samples of each product were freeze dried and extracted in duplicate, using a method adopted from Griffith and Collison (2001). The extracted samples were then analysed in duplicate (n=12) using RP-HPLC with a 5µm C18 column via a modified method by Ribeiro et al. (2007). Data was expressed as mean ± standard deviation.

Outcomes
Unprocessed soybeans contained a total isoflavone concentration of 76.3 ± 13.5 mg/100 g (based on all 12 isoflavones), with high levels of genistin in particular (19.5 ± 0.8 mg/100 g dry mass). Of the 11 foods, cream cheese, yoghurt, canned soybeans and chips had total isoflavone levels close to or higher than that of unprocessed soybeans (165.3 ± 11.3, 129.4 ± 15.3, 120.3 ± 10.1 and 72.5 ±14.6 mg/100 g dry mass respectively). Daidzin, malonyl daidzin and acetyl daidzin were the most abundant isoflavones detected, while acetyl and malonyl genistin were the least concentrated isoflavones across all 11 foods.

Conclusion Cream cheese contained the highest level of total isoflavones, followed by yoghurt and canned soybeans. Of the 11 novel soy foods tested, all were poor sources of acetyl and malonyl genistin.

Source of funding
Not applicable

P40

Simulation of fish intake in women of childbearing age

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Background
Current data indicate that fish consumption is low in women of childbearing age; a dietary intake of ≥200 mg/day of docosahexanoic acid (DHA) is recommended for optimal infant development.

Objective
To identify the percentage of women who would meet DHA recommendations using current, and simulated, fish consumption patterns.

Design
Simulation analysis using 2 models: (1) Fish (finfish only, excludes crustacea and other seafood) intake based on females (18-49 years) participating in the 1995 National Nutrition Survey (NNS). Fish that were more frequently consumed had a greater percentage of being selected in the model. (2) Manipulating 1995 NNS data to include at least one serve of fish high in DHA. Fish serving sizes ranged between 80-150 g.

Outcomes
Model 1: Using current fish consumption patterns, 1, 2, 3, 4 and 5 serves/week of any type of fish each week would meet DHA recommendations in 2%, 13%, 37%, 65% and 86% of women, respectively. Mean daily DHA intakes with 1-5 serves of fish would be approximately 69 mg, 127 mg, 187 mg, 245 mg and 322 mg, respectively.
Model 2: Consuming 1, 2, 3, 4 and 5 serves of fish/week with ≥1 serve of high DHA fish would meet recommendations in 10%, 38%, 71%, 92% and 99% of women respectively. Mean daily DHA intakes with 1-5 serves of fish would be approximately 134 mg, 192 mg, 251 mg, 310 mg and 368 mg, respectively.

Conclusion
Current consumption patterns suggest a high intake of fish (≥4 serves/week) needs to be consumed for two-thirds of women to meet recommendations. Choosing higher DHA fish enables this target to be met more easily with a greater percentage of women achieving recommendations.

Source of funding
L Chan receives a stipend from the Australian Seafood Cooperative Research Centre.

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P41

WITHDRAWN

P42

Beverage intake and obesity in Australian children

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Background
There have been significant increases in the obesity and overweight rates in Australian children over the past 25 years and it has been assumed that sugar sweetened beverages (SSB) have played a significant role in this increase.

Objective
To examine SSB intakes in the 2007 Children's Nutrition Survey and relate them to rates of overweight and obesity, socio economic status (SES), TV viewing, activity levels and compare them to data from the 1995 National Nutrition Survey and manufacturers data.

Design
A secondary analysis of the recent 2007 Children's Nutrition and Activity survey performed by Flinders University was utilised and compared with published data from the 1995 survey and a variety of smaller surveys.

Outcomes
In the 2007 survey 42% of children drank an SSB with 25% consuming soft drinks. The median consumption of soft drink was 435g/d, (556g/d in the 14-16 age group).
Television viewing was positively related to soft drink consumption with a difference of 55g/day from bottom to top tertile of TV viewing (p=0.003) in children aged 9-16. Fifty% of SSB consumption occurred at home and only 10% occurred at school. Activity levels were unrelated to SSB consumption. Lower SES status was associated with greater SSB consumption- 30% for the lowest SES quartile vs 19% in the highest quartile. There was little difference in mean intakes in consumers. Despite these differences the proportion of overweight and obese children who consumed SSBs (which excludes 100% fruit juice) was only marginally different from the non overweight children (50% vs 47%, unadjusted p=0.046). There would appear to be a decrease since 1995 in the proportion of children aged 2-3 years and aged 4-7 years who consumed SSBs with a drop from 25.8% to 12.8% in the 2-3 year olds and from 33.6% to 20.5% (p<0.001 for both by Chi squared analysis). Manufacturers data show a small decrease in SSB from 2002-2006.In the 2007 survey 23% of children were overweight or obese while in the 1995 survey this figure was 21%.

Conclusion
SSB consumption decreased in some groups from 1995 to 2007 while overweight and obesity rates increase slightly. There was little relationship between overweight and obesity and sugar sweetened beverage consumption but lack of causation cannot be inferred from this.

Source of funding
Beverage Council of Australia.

Poster Session 2: Thursday 2 December

P43

Digestion of its diet by a male Asian elephant (Elephas maximus)

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Background
Elephants digest fibre to a limited extent when fed hay alone to appetite. It is not known to what extent digestion might be affected when a mixed diet is given at reduced intake to avoid excessive body weight (W) gain.

Objective
To measure diet digestibility by the sub-adult (9 yr old) male Asian elephant at Taronga Zoo.

Design
The diet consisted of (%DM): lucerne (6.3), oaten (36.5) and rye (24.7) hays; pineapple foliage (16.9); concentrate pellets (4.5); and produce (11.1; chopped apple, carrot and kumera for training and enrichment). Meals were given during the day at different times and locations within the male elephant facility at the zoo. The proportions of the feeds in the diet were kept constant for nine days. Feed samples were taken on days seven and eight and faecal samples were collected on days eight and nine in the morning and afternoon. The analysis of the samples for dry matter (DM), organic matter (OM), crude protein as N x 6.25 (CP), crude fat (CF), neutral-detergent insoluble OM (NDIOM = cell walls), neutral-detergent soluble OM (NDSOM = cell contents) and acid-detergent lignin (ADL) allowed the calculation of gross energy (GE) and of digestibility by the marker ratio technique with ADL as the marker.

Outcomes
Body weight was 3104 kg, intake 20.3 kg DM/day (ie, 0.65% W/day or 48.7 g/(day.kg$^{0.75}$)) and gain 4.9 kg/day.
The diet contained: OM 917.4, CP 58.9, NDIOM 438.3, NDSOM 479.1; CF 54.7 g/kg DM; GE 17.7 MJ/kg DM.
Apparent digestibility was: DM 0.708; OM 0.724; CP 0.715; NDIOM 0.536; NDSOM 0.896; GE 0.723.
Of the OM truly digested, 66% was NDSOM, ie, cell contents (assuming true digestibility of NDSOM to be 0.95).

Conclusions
Digestibility was greater than expected, probably because the DM intake of the elephant was considerably less than the reported DM intake capacity of elephants (1.4-1.6% W/day) and he is not yet fully grown. The results suggest that the digestion of cell contents is more important than the digestion of cell walls in the nutritional strategy of elephants.

Source of funding
Not applicable

P44

Four dietary models using fish, lean red meat and LC n-3 PUFA enriched foods are able to meet national dietary recommendations for LC n-3 PUFA

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Background
There is a need to explore a range of dietary options to achieve the recommended intake of LC n-3 PUFA (DHA, EPA, DPA), as many Australians are low fish consumers.

Objective
To develop a database on LC n-3 PUFA enriched products and to undertake a dietary modeling exercise using four dietary approaches to meeting the national targets for LC n-3 PUFA intake for different life-stages.

Design
Six LC n-3 PUFA enriched foods were identified; bread, eggs, yoghurt, milk, flavoured beverage powder, and almond meal. Fish was categorised by LC n-3 PUFA content as high (≥1200 mg/100g), medium (200-1200 mg/100 g) and low (<200 mg/100g). The four dietary models were; (i) ≥2 high LC n-3 PUFA fish serves per week (no meat or enriched foods), (ii) >1 < 2 high LC n-3 PUFA fish serves per week (with meat and enriched foods), (iii) meats and enriched foods only (no fish) and (iv) lacto-ovo vegetarian diet (enriched foods only). Serves of fish, red meat, dairy, eggs and cereals were modeled based on current National Dietary Guidelines for Australians. Diets were modeled using NUTTAB2006 foods database and calculated to meet both the Adequate Intake (AI) and the Suggested Dietary Targets (SDT) in the Nutrient Reference Values. Energy intakes were used to calculate an SDT-equivalent for children <14 yr.

Outcomes
The AI and SDT were achieved for all life-stages with all four models. The weekly food intake to meet the LC n-3 PUFA SDT for all life-stages for each dietary model were: (i) 2 serves of LC n-3 PUFA fish, (ii) 1 serve of high and 1 serve of medium LC n-3 PUFA fish, 3-4 serves of lean red meat, 0-2 serves of eggs and 3-26 serves of enriched foods, (iii) 4 serves of lean red meat, and 20-59 serves of enriched foods, (iv) 37-66 serves of enriched foods.

Conclusion
The SDT can be achieved with two high LC n-3 PUFA fish serves per week. Fish avoiders who consume red meat can meet SDT recommendations via four serves of red meat/week supplemented by at least 20 serves of enriched foods, while lacto-ovo vegetarians need at least 37 serves of enriched foods. The high amount of enriched foods required in the models with low fish or no fish highlights the need for a greater variety of enriched foods in these diets and/or the use of supplements.

Source of funding
The Omega-3 Centre.

Poster Session 2: Thursday 2 December

P45

Diet and physical activity differences in adolescent boy consumers and non consumers of ready-to-eat cereals

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Background
It is unclear how breakfast choices influence dietary intake and lifestyle characteristics in Australian adolescent boys.
Objective: i) To assess the proportion of ready-to-eat cereal (RTEC) consumers and non-RTEC consumers at breakfast; ii) to compare nutrient intakes, density and physical activity levels (PAL); iii) to compare daily nutrient intakes against estimated average requirements (EAR) or adequate intakes (AI).

Design
Cross-sectional analysis of 12-16 year old boys (n=767) from the 2007 Australian National Children's Nutrition and Physical Activity Survey. Nutrient intakes were adjusted for age, BMI and energy intake.

Outcomes
43% consumed an RTEC at breakfast, 38% did not, and 19% did not consume any breakfast. There was no significant difference in BMI or waist circumference between consumers of breakfast. At breakfast and over the day, RTEC consumers had a significantly higher intake of sugar, a lower intake of total fat and a more nutrient dense diet (calcium, iron, thiamin, riboflavin, dietary folate equivalents (DFE), iodine, magnesium and zinc, all P≤0.05) vs. non RTEC consumers. More 12-13 and 14-16 year old RTEC consumers met the calcium (71% vs. 32%, P=0.036; 82% vs. 45%, P=0.002) EARs. More 14-16 year old RTEC consumers met the fibre, DFE and iodine AI/EARs (all P<0.05). RTEC consumers had a higher PAL compared to non-RTEC consumers (1.73 vs. 1.67, P=.048).

Conclusion
RTEC provide valuable nutrients that may assist boys in meeting nutrient recommendations. Despite a higher sugar intake, RTEC consumers appear to have an overall healthier diet and lifestyle.

Source of funding
Supported by Kellogg Australia Pty Ltd

P46

In vivo starch digestion in small intestine

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Background
In mammals, starch is digested mostly in the small intestine. However, most *in vivo* starch digestion studies have been carried out using digesta from terminal ileum, colon, and feces, and thus cannot give unambiguous information on starch digestion in the small intestine. Furthermore, many *in vitro* studies have tried to stimulate the digestion in the small intestine without reference to *in vivo* studies of starch digestion in the small intestine. Therefore, current *in vitro* methods might not reflect *in vivo* digestion.

Objective
This study explores the *in vivo* starch digestion in the pig small intestine and compares it with a standard *in vitro* method.

Design
Digesta were collected from different sections of small intestine of seven pigs fed with a diet containing 47% (dry weight basis) raw normal maize starch. Starch contents of the digesta were analysed using Megazyme total starch kits. The pig diet was also digested using a modified *in vitro* method (Sopade and Gidley, *Starch*, 2009, 61, pp. 245). Starch was extracted from the *in vivo* and *in vitro* digesta following the method of Syahariza et al. (*Carbohydr. Polymers*, 2010, 82, pp. 14) and analyzed using size exclusion chromatography (SEC, fully branched and debranched using isoamylase) following the methods of Witt et al. (*J. Agric. Food Chem*., 2010, 58, pp 8444).

Outcomes
The starch digestion in mouth and stomach was minor compared with that in the small intestine, and raw normal maize starch was almost completely digested in the first half of the small intestine. The time evolution of the size distributions (fully branched and debranched) of starch molecules during *in vivo* and *in vitro* digestion analyzed using SEC showed a qualitative difference between the two digestion methods. The former showed a degradation of starch molecules to a more uniform size, whereas the latter show a complex mechanism, which preserved the size distribution of native starch at the beginning of the digestion before producing a multimodal distribution.

Conclusion
The heterogeneous nature of the *in vivo* digestion cannot be reproduced by current *in vitro* methods, which are more homogenous. Nutritional claims of starch products based on *in vitro* methods need to take account of this phenomenon.

Source of funding
This study is financially supported by the Australian Research Council (DP0985694). The small intestine digesta were provided by the High Fibre Grains Cluster (supported by a grant from the CSIRO Flagship Collaboration Fund via the Food Futures Flagship).

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P47

Pilot study assessing sodium and potassium intakes in Australian farm families

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Background
Raised blood pressure (BP) is a major risk factor for cardiovascular disease (CVD) and those living in rural areas have higher rates of CVD. High dietary sodium and low dietary potassium intakes are associated with high BP.

Objective
To determine intakes of sodium and potassium in people residing in rural Victoria.

Design
A pilot study was undertaken with participants enrolled in the Sustainable Farm Families program residing around the Hamilton and Benalla areas of Victoria. Daily intakes of sodium and potassium were estimated from a single 24 hr urine sample provided by participants.

Outcomes
The mean age of participants (men n=17, women n= 11) was 57.2 (8.1) (SD) years and body mass index (BMI) was 26.2 (3.4) kg/m^2. The mean urinary sodium was 156.7 (55.7) mmol/day (9 g salt/day) for men and 135.0 (57.5) mmol/day (7.8 g salt/day) for women. Mean urinary potassium was 90.3 (22.2) mmol/day for males and 85.1 (23.7) mmol/day for women. Seventy-one % of participants (20/28) consumed more than the Upper Level recommended for sodium (100 mmol/day) and 89% (25/28) consumed more than the Suggested Dietary Target (70 mmol/day). Eighty-two % (23/28) of participants had a potassium intake below the recommended daily level of 100 mmol/L.

Conclusion
The dietary intakes of sodium and potassium in this group appears comparable to adults in capital cities and most participants were consuming in excess of the recommended levels of sodium for health. A population-wide strategy is required to reduce dietary sodium intakes to recommended levels.

Source of funding
Not applicable

P48

Breastmilk production: perception and measurement

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Background
Breastmilk provides the optimum nutrition for infants for at least the first 6 months of life. However, one of the most common reasons for mothers giving up breastfeeding early is a perception of insufficient milk supply.

Objective
This study aimed to assess mothers' perceptions of their breastfeeding before and after an objective measurement of their breastmilk production.

Design
Mothers who were participants in breastfeeding studies carried out by the Human Lactation Research Group at UWA and mothers who had a perception of insufficient milk supply and consulted a Lactation Consultant (LC) at the Breast Feeding Centre of WA were invited to complete a questionnaire on their confidence in their breastfeeding experience and their perception of their feeding frequency, amount of milk transferred each feed and total amount of milk produced over 24-h. Mothers then test-weighed (BabyWeigh scales, Medela AG) their infants at home before and after each feed from each breast over a 24 to 26-h period. After receiving the results of the calculation of the above breastfeeding parameters and consultation with the LC they completed a second similar questionnaire.

Outcomes
Of the 107 mothers, when initially asked if they were confident about their breastfeeding experience, 29 strongly agreed, 51 agreed and 27 disagreed. There were no significant differences in the feeding frequencies between these groups, but there were differences in the amount of milk transferred per feed (69 ± 3 g, 52 ± 4 g and 43 ± 8 g (mean ± s.e.), respectively, P<0.001) and total milk production (760 ± 35 g, 597 ± 35 g and 609 ± 35 g, respectively, P<0.005). After receiving their results and consultation with the LC the mothers who strongly agreed or agreed that they were confident did not change their perception, but the mothers who originally disagreed reported an increase (P<0.0001) in confidence. Of the mothers who initially perceived that the average amount of milk transferred each feed was too low (n=26) and/or total amount of milk produced was too low (n=22), 11 and 6, respectively, showed a positive change in their perception after receiving their results and consulting the LC.

Conclusion
Objective measurement of breastmilk production did not undermine the confidence of mothers who were already confident. When mothers who initially lacked confidence received objective evidence of their normality they gained confidence and would continue to breastfeed.

Source of funding
This research was funded by Medela AG.

Poster Session 2: Thursday 2 December

P49

Enhancing the theanine content to strengthen green tea as a functional food

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Background
Green tea is not only a refreshing beverage but a heterogeneous mixture of many biologically-active constituents. As such it appears to be the archetypal functional food. Research investigating the functional properties of green tea, particularly its major catechin constituent epigallocatechin gallate (EGCG), links it with protective benefits for CVD and cancer. Another unique constituent, theanine, is also known to improve alpha brainwave patterns and induce a calming concentration-focusing effect. Maximising the content of theanine without affecting the catechin levels would make for an improved functional food.

Objective
To determine if agricultural shading can significantly improve the content of theanine without causing detrimental effects to the EGCG content.

Design
Groups of green tea plants (n=6) were grown in conditions of ambient solar intensities of 100% (control) or 40, 10 and 0% for a two-week period prior to harvest using shade cloth over the plants. The theanine and EGCG content was measured in leaves and stems using HPLC analysis. The results were compared by one-way ANOVA and the Bonferroni post-hoc test to determine differences.

Outcomes
The leaves of the tea plants shaded to ≤10% ambient solar intensities were found to have a significantly higher content of theanine but the level of EGCG and other catechins was not significantly different from that of the control plants after the two-week period. The greatest increase in theanine was measured in the plants grown under 0% solar intensity; the absence of light significantly improved the theanine content by +44.6% ($P<0.001$) compared to the control group. However, the EGCG and catechin content was similar to control levels. A similar trend in theanine content (+23.1%, $P<0.01$) was seen in the stems but the EGCG content was decreased (-23.0%, $P<0.01$) in the absence of light (0% solar intensity).

Conclusion
Shading green tea plants for two weeks prior to harvest enhanced the content of theanine in the leaves without causing any loss of EGCG or other catechins. This style of green tea production has the potential to increase the dosage level of theanine within green teas, thereby improving this archetypal functional food.

Source of funding
J Krahe was the recipient of a Rural Industries Research and Development Corporation PhD Scholarship.

P50

Modification of a food frequency questionnaire to assess dietary iron intake

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Background
An Australian, iron specific semi-quantitative food frequency questionnaire (FFQ) is available and comprises of 68 food items in 10 food categories. The FFQ consists of foods and beverages identified in past National Nutrition Surveys that contain at least 0.66 mg/serve of iron. A broad range of iron-fortified products are now available and the FFQ may not be reflective of the current food environment.

Objective
To modify the iron-specific FFQ by incorporating new foods and beverages containing at least 0.66 mg of iron/serve.

Design
A survey of supermarkets in metropolitan Melbourne. Foods and beverages were added if the iron content was reported in the nutrition information panel as at least 0.66 mg/serve. A hypothetical diet was designed based on the Australian Guide to Healthy Eating for women 19-60 years containing either four or nine serves from the cereal group. The diets consisted of one serve of iron fortified milk, either one or two serves of iron fortified breakfast cereal and one or two serves of iron fortified bread depending on the total number of serves from the cereal group. Dietary iron content was estimated using the original and modified FFQ.

Outcomes
In total, 10 new food items were added; breakfast cereals (one item), milk based drinks and additives (four items) and breads (one item) and an additional food category created, soy foods & meat replacements (four items). Estimating the iron intake in a diet with four or nine serves of cereals using the original FFQ resulted in daily iron intake of 16.2 mg and 21.5 mg respectively. Using the modified FFQ intakes increased to 18.7 mg and 25.7 mg iron respectively.

Conclusion
Including a broader range of foods in the iron-specific FFQ has the potential to better estimate iron intakes in people consuming widely available iron fortified foods.

Source of funding
Supported by Deakin University, Australian Red Cross Blood Service and Meat and Livestock Australia.

Poster Session 2: Thursday 2 December

P51

Ultrasound imaging of nutritive tongue movements during breastfeeding

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Background
Controversy exists as to whether or not a peristaltic tongue action is used to remove milk during breastfeeding.

Objective
We aimed to determine the pattern in tongue movement during nutritive sucking by performing measurements of submental ultrasound images.

Design
Nipple diameter (ND) was measured at 2 (tip), 5, 10 and 15 mm (base) from the distal tip of the nipple for two frames, tongue up and tongue down, based upon minimal and maximal excursion of the tongue from the hard/soft-palate junction (HSPJ), of three nutritive suck cycles (n=15). For three infants the medial tongue surface was tracked using Edgetrak software. Linear mixed effects models were used to compare the effect of tongue position on nipple diameter at each measurement location. Changes in the tongue surface were visualised by creating response surface contour diagrams with multiple nonparametric regressions.

Outcomes
Movement from tongue up to tongue down resulted in a mean increase in ND of 2.3 mm ($P<0.01$) and the increase in the base of the nipple was significantly smaller ($P=0.01$). Milk flow was observed simultaneously with downward movement of the tongue from the HSPJ. Tongue contour diagrams demonstrated that tongue movements were initiated distally and the range of tongue movement was largest near the HSPJ, and decreased proximally and distally to the HSPJ. Downward movement of the tongue began distally, prior to the proximal tongue region reaching the hard palate. Similarly the distal tongue moved upwards slightly before the proximal tongue reached its most inferior point.

Conclusion
The larger magnitude of tongue motion level with the HSPJ during nutritive sucking is consistent with the vacuum theory of milk removal. The change in diameter at the base of the nipple when the posterior tongue was at its lowest point may have been less marked due to either the decreased range of distal tongue motion or initiation of compression by the tongue distally, prior to maximal movement of the proximal tongue. The initiation of upward movement distally may help in maintaining a seal during the oral phase of swallowing and also directing the milk bolus to the pharyngeal region.

Source of funding
Medela, AG Switzerland.

P52

Consumption of milk by quokka (*Setonix brachyurus*) young

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Background
When investigating growth of the young, in addition to the composition of the milk, it is critical to study the amount of milk consumed by the young. Some studies have been conducted on milk production and energetics in marsupials. No studies have been published on the consumption of milk by the young in the quokka. The application of a minimally invasive, non-toxic technique for measuring milk consumption in the quokka would benefit future studies of other marsupial young's development during lactation.

Objectives
We investigated the consumption of milk by the young quokka using the stable isotope deuterium oxide.

Design
Deuterium oxide (D_2O) is used as a tracer to follow the movement of water into and out of body water pools of a mother and her milk-fed young. Ten female quokkas housed in captivity, that had given birth to pouch young at least 55 days previously, were given D_2O. Six hours later, a sample of urine was collected. Ten to thirteen days later, a urine sample was collected from the adult and young quokkas. Samples were analysed for levels of D_2O enrichment at the MRC Human Nutrition Research at Cambridge in the UK. The milk intake was calculated using a mathematical formula based on a two-compartment steady-state water flow model; using values for the concentrations of D_2O, volume of body water pools of the mother and her young, rate constants of water flow from one pool to another, sampling time and the water content of the milk.

Outcomes
The volume of milk consumed increased from 1.6 mL d^{-1} at 55 days *post partum* to 32.5 mL d^{-1} at 165 days. The daily energy intake ranged from approximately 22 to 151 kJ d^{-1} during pouch life. The crude growth efficiency (g of growth per ml of milk consumed) increased from an average of 0.35 to 0.46 g mL^{-1} in the early stages of pouch life, and then decreased to 0.24 g mL^{-1} during Phase 2b of lactation.

Conclusion
The crude growth efficiency measured in our study indicates that quokkas are equally efficient in converting milk energy to body mass as other marsupials reported in the literature. Measuring milk intake with this method offers a non-toxic, minimally invasive alternative to other techniques for measuring milk consumption in marsupials, when milk is the only source of water intake.

Source of funding
Not applicable

Poster Session 2: Thursday 2 December

P53

Omega-3s for Maternal and Infant Health: a review of the science and recommendations for stakeholders

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Background
International guidelines recommend pregnant and breastfeeding women should aim to achieve a docosahexaenoic acid (DHA) intake of at least 200mg per day to meet the long chain omega-3 fatty acid (LCO3) requirements for infant neurological development and maternal health. Yet, Australian women's median LCO3 intakes are 90mg/day, well below the 200mg DHA recommendation. There is no data on intakes of infants less than 2 years.

Objective
To hold an expert consensus meeting to explore the strength of evidence for the health benefits of LCO3s for maternal and infant health and development and prepare an evidence-based report for communication to government, health professionals and researchers.

Design
A full day Scientific Consensus Meeting was held. The format was a facilitated discussion between nine expert participants, who each presented current evidence in their area of expertise. The expert panel developed consensus recommendations and ranked evidence from positive indication of benefit to conclusive for effects on pregnancy outcomes, maternal health and infant development.

Outcomes
There is good evidence of benefit for the effect of LCO3s on visual acuity in term infants and of reduced risk of early premature births in high risk pregnancies. There is a possible role for LCO3 supplementation during pregnancy or early infancy as a preventative measure against allergic disease. There are beneficial effects of maternal dietary intakes of DHA particularly in the third trimester on the development of visual acuity, motor activity and various cognitive functions in term infants after birth. Evidence is convincing for pre-term infants in relation to high dose DHA-supplementation in the maternal diet effects on neurodevelopment and visual acuity.

Conclusion
Both government agencies and health professionals can play an important role in the promotion of optimising intakes of LCO3s. Their activities should address barriers to increased consumption at this crucial life stage and provision of consumer-relevant guidelines on dietary sources. Research is recommended including studies to determine optimal DHA and LCO3 intake in infants.

Source of funding
Financial support for the Workshop was received from the International Society of the Study of Fatty Acids and Lipids (ISSFAL), MARTEK and the International Life Sciences Institute (ILSI) Australasia.

P54

Plum polyphenol composition in relation to total antioxidant capacity

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Background
Dietary polyphenols have been associated with reduced risk of cardiovascular disease. Fruit such as plums are a rich source of polyphenolic antioxidants.

Objective
To evaluate and quantify selected individual polyphenolics and the antioxidant capacity of 32 new Western Australia plum cultivars

Design
Selected individual polyphenolic compounds from each plum variety were determined using reversed-phase high-performance liquid chromatography (HPLC) with photodiode array detection set at 280 nm, 350 nm and 520 nm. The total antioxidant capacity of the plum samples were measured using antioxidant inhibition of oxygen radicals (AIOR) assay. The main polyphenol compounds detected in the plums were then correlated with the antioxidant capacity data using Pearson's correlation test

Outcomes
Neochlorogenic acid and quercetin glycosides were found to be the predominant polyphenol compounds in the plum cultivars with a mean of 28 ± 0.55 mg/kg (ranging from 0 to 220 mg/kg) and 51 ± 0.42 mg/kg (ranging from 9 to 240 mg/kg) respectively. Mean of the total antioxidant capacity in the plum cultivars was found to be 1.097 ± 0.492 mM Trolox equivalents. The concentration of the major polyphenolic compounds did not significantly correlate with the total antioxidant capacity of the plums, suggesting that there were potentially other additional factors and compounds that contribute to the antioxidant capacity of plums. Thus, we will evaluate the total polyphenol content, ascorbic acid, glutathione and total thiols to further determine the relation of these components with the antioxidant capacity in the tested plum cultivars.

Conclusion
Neochlorogenic acid and quercetin glycoside were found to be the predominant polyphenol compounds in the 32 new Western Australia plum cultivars, but these do not individually contribute to the antioxidant capacity measured in plum extracts.

Source of funding
ARC Linkage grant #LPO883979

Poster Session 2: Thursday 2 December

P55

Personality as a predictor of diet induced weight loss and weight management

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Background
A major challenge for successful weight management is tailoring weight loss programs to meet individual needs.
Objective
The aim of this study was to determine the effectiveness of measuring individual personality traits to identify successful weight loss and management using two different weight loss programs.
Design
Two weight loss trials were conducted with participants either following a healthy eating weight loss plan of 5000 kilojoules (kJ)/day for 12 weeks (Trial 1) or a very low kilojoule diet of 3000 kJ/day for four weeks followed by 10 weeks of weight maintenance (Trial 2). Nutrition education sessions were provided for both groups. Anthropometric measurements were recorded at baseline, at the end of the weight loss period and, for Trial 2, at the end of weight maintenance. Personality traits for all participants were measured using three scales based on the Five Factor Model plus the Tangney Self Control Scale.
Outcomes
Fifty four participants, body mass index (BMI) 30-40 kg/m^2, aged 18-60 years, took part in the study, n=22 in Trial 1, and n=32 in Trial 2. The mean weight loss in the two trials was significantly different at 4.11% reduction in Trial 1 and 7.38% reduction in Trial 2 ($P<0.0001$). Successful weight change in Trial 2 was positively correlated with the personality trait, Neuroticism ($r=0.5$, $P<0.005$) and negatively correlated with the personality facets Assertiveness ($r=-0.378$, $P<0.05$) and Dutifulness ($r=-0.376$, $P<0.05$). There was no link between weight loss and the personality trait, self control, in either trial.
Conclusion
The personality factor, neuroticism, was linked to successful weight loss with a particular weight loss treatment, suggesting that there is the potential to use measures of personality to identify appropriate weight loss and weight management strategies for individuals.
Source of funding
Not applicable.

P56

Utilisation of complementary nutrition therapy in a Crohn's Disease population in Auckland, New Zealand

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Background
Crohn's Disease (CD) is an inflammatory condition that may affect the entire gastrointestinal tract and is associated with significant morbidity. Individuals with CD may utilise complementary nutrition therapies to alleviate symptoms or prevent micronutrient deficiencies.
Objective
To describe the self-reported utilisation and efficacy of complementary nutrition therapies in an Auckland CD population.
Design
Supplementary and dietary questionnaires completed by 165 adults with CD as part of the 'Genes and Diet in Inflammatory Bowel Disease' study in Auckland, New Zealand were analysed to determine self reported utilisation and perceived efficacy of complementary nutrition therapies including probiotics, enteral nutrition and vitamin supplementation. Frequencies and Chi Squared analyses to determine whether proportionate gender differences in use of complementary nutrition therapies exist were calculated using SPSS (V15.0 1989-2006, SPSS Inc., Chicago Il, USA).
Outcomes
Survey results indicated that 55.2% of CD subjects were consuming non prescriptive medications/supplements. Of these individuals, multivitamins, omega 3 and iron supplements were the most frequently consumed at 42.0%, 17.0% and 13.6% respectively. There were no significant gender differences in the proportion of patients consuming these supplements ($\chi^2=1.073$, $P=.300$).
Probiotics were utilised by 25.5% of the study population, with 70.7% of individuals consuming these products reporting a beneficial effect on CD symptoms. Enteral nutrition formula was reportedly consumed at least once by 31.5% of respondents, with 50% of these patients reporting that they alleviated CD symptoms.
Conclusion
Complementary nutrition therapies were widely utilised within this Auckland sample, possibly reflecting a desire to self-manage CD symptoms and associated nutritional deficiencies. The high variability reported for perceived efficacy of probiotics and enteral nutrition formula within this group reinforced the complexity of this condition and reflects the many factors which may influence individual response to these items.
Source of funding
Deborah Nolan is a recipient of an Australian Endeavour Research Fellowship.

Poster Session 2: Thursday 2 December

P57

Relative validity of adolescent dietary patterns: comparison of a food frequency questionnaire and 3-day food record

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Background
Interest in empirically derived dietary patterns has increased over the past decade. However, relatively few studies have evaluated dietary patterns using different dietary methods, or in young populations.

Objective
We quantitatively compared dietary patterns from a food frequency questionnaire (FFQ) with those in a 3-day food record (FR) in a cohort of adolescents.

Design
Subjects from the Western Australian Pregnancy Cohort (Raine) Study completed a semi-quantitative FFQ and a 3-day FR at 14 y of age (n=783). Major dietary patterns were identified using exploratory factor analysis on 38 food groups. Dietary pattern z-scores were compared using 95% limits of agreement (LOA) and Spearman's *r*.

Outcomes
Two major dietary patterns were identified in the FFQ and FR. A 'Healthy' pattern was high in fresh fruit, vegetables, whole grains and grilled or canned fish. A 'Western' pattern was high in takeaway foods, confectionery, soft drinks, crisps and fried potato. The nutrient profiles of these dietary patterns were similar when estimated by the FFQ and FR. The LOA between dietary pattern scores from the FFQ and FR were -1.69 to 1.75 ('Healthy') and -1.89 to 1.82 ('Western'). Minor differences in agreement were observed when boys and girls were analysed separately. Spearman's correlation coefficients between the FFQ and FR were r=0.45 ('Healthy') and r=0.36 ('Western').

Conclusion
Comparable dietary patterns may be obtained from a FFQ and FR using exploratory factor analysis. This supports the use of major dietary patterns identified using a FFQ in this adolescent cohort.

Source of funding
Raine Medical Research Foundation, NH&MRC, Telstra Foundation, WA Health Promotion Foundation, Australian Rotary Health Research Fund, Heart Foundation of Australia and Beyond Blue, the Telethon Institute for Child Health Research and the UK Medical Research Council (MRC).

P58

High-amylose maize starch modulates colonic contractility and expression of associated genes in rats fed a western diet

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Background
Altered gastrointestinal motility is linked with inflammatory bowel disease and other gut disorders. Poor diets which contain high protein, high fat, and low fibre (Western-type) may contribute significantly to the development of diseases of the gastrointestinal tract. While data on colonic contractility is limited, animal and human studies suggest dietary fibre, including resistant starch (RS) may help protect against the effects of the Western-type diet.

Objective
To investigate if RS, as high amylose wheat (HAW) or high amylose maize starch (HAMS), added to a Western-type diet alters colonic smooth muscle contractility and the expression of the genes associated with contractility.

Design
Four groups of rats (n=8) were fed a high fat, high protein Western-type diet for 11 weeks supplemented with: 44% (w/w) low amylose wheat (LAW); 50% high amylose wheat (HAW); 28% low amylose maize starch (LAMS); and 28% high amylose maize starch (HAMS). SCFA pool sizes were measured in gut digesta by GLC. Ileal and colonic tissue sections (3-5 cm) were induced to contract *in vitro* electrically and by non-receptor dependent (KCl) and receptor dependent agonists (carbachol and angiotensin II). Expression of genes associated with gut contractility was assessed using Affymetrix microarray technology.

Outcomes
Both HAW and HAMS groups generated higher caecal pools of acetate, propionate, butyrate and total SCFA and higher colonic pools of acetate, propionate and total SCFA compared to the LAW and LAMS groups. For the colon, the HAMS group had lower maximal values for electrical, carbachol and angiotensin II-induced contractions compared to LAMS. The HAMS group also had lower colonic expression of specific genes related to cholinergic (*Chrm2*, *Chrm3*), prostanoid (*Ptgs2*, *Ptgr2)*, serotonergic (*Htr4, Htr5a, Htr7*) and protease-activated receptor (*F2r*) systems with increased expression of inducible nitric oxide synthase (*Nos2*), prokineticin 1 (*Prok1*) and prokineticin receptor 1 (*Prokr1*) genes compared to LAMS (P<0.05).

Conclusion
Feeding a Western-type diet supplemented with HAW and HAMS to rats increased large bowel SCFA pools but only HAMS lowered colonic contractility. The associated changes in colonic gene expression give insight into mechanisms of diet-induced alterations of colonic motility.

Source of funding: Not applicable

Poster Session 2: Thursday 2 December

P59

Diet, antioxidant status in muscles and storage quality of lamb

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Background
The stability of meat to minimise oxidation mainly depends on the balance of polyunsaturated fats, haem pigments, proteins and antioxidants. Previously we reported (Ponnampalam *et al.,* 2001,58: 151-161) that antioxidant status (vitamin E) of muscles from lambs grazing high quality pasture would be higher. This vitamin E reserve would be adequate to avoid oxidation of lipids or pigments in the meat from animals grazing low quality pasture or fed low quality forages with lipid supplements for eight to 10 weeks.

Objective
To examine the influence of diets on muscle antioxidant status and formation of oxidative substance in aged meat.

Design
Fifty four lambs were randomly allocated into four dietary treatments: lambs grazing perennial pasture (Trt1); lambs grazing annual pasture with Lucerne hay/oat grain pellet supplement (Trt2); lambs grazing annual pasture with Lucerne hay/oat grain/cracked flaxseed pellet supplement (Trt3); and lambs grazing annual pasture with Lucerne hay/oat grain/flaxmeal pellet supplement (Trt4). After seven weeks of feeding, lambs were slaughtered and muscle *longissimus lumborum* collected for determination of vitamin E and long chain polyunsaturated fatty acids (PUFA) in fresh meat and formation of lipid oxidative substance (malondialdehyde, MDA) in aged meat (stored at 2-3^{o}C for four weeks), respectively.

Outcomes
Vitamin E, PUFA and MDA ranged from 3.1-5.8 mg/kg muscle, 333-351 mg/100 g muscle and 1.1-2.3 mg/kg meat, respectively. Regression analysis indicates that there was no significant effect of PUFA on MDA formation, which is believed to be one of the major contributors of flavour deterioration in meat post-farm gate. The effect of vitamin E on the formation of lipid oxidative substances (MDA) during storage was significantly high ($P<0.001$) and the percentage variance accounted for was 47.

Conclusion
Results demonstrate that the relationship between PUFA and the formation of lipid oxidative substances (MDA) of meat is primarily mediated through the effects of vitamin E content in the muscle tissues at the time of slaughter. Feeding background and the relationship to antioxidant status and other components such as haem iron in muscle tissues on-farm requires further investigation.

Source of funding
Funding for this research was provided by the Department of Primary Industries, Victoria.

P60

The influence of caffeine in soft-drinks on the obesity epidemic

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Background
Obesity prevalence is high and increasing around the world. Sugar-sweetened beverages (SSBs) are likely to be in part responsible for excess energy intake (EI) and weight gain. The caffeine content of many SSBs may be promoting a higher EI as extra sugar is added to these SSBs to get equivalent sweetness compared with non-caffeinated SSBs. We name this the 'caffeine-calorie effect'.

Objective
To estimate the 'caffeine-calorie' effect on secular population weight gain for children (2-18 years) and adults (≥18 years) in the USA.

Design
Previous studies revealed that the inclusion of caffeine in SSBs requires 10% extra sugar for equivalent sweetness as non-caffeinated SSBs. NHANES consumption data were used to estimate the impact of the extra EI as a result of caffeine in SSBs on the total EI at the population level. The expected impact on mean population body weight was then estimated using validated coefficients for both children and adults. This was then expressed in terms of years of secular weight gain averted, using the average annual weight gain of these populations for the period 1970 - 2000.

Outcomes
This study estimated that the additional sugar in SSBs due to caffeine contributes 61kJ/day in excess EI for children and 56 kJ/day for adults. This may be expected to have led to 1.1 and 2.1 years of secular weight gain for children and adults respectively, based on an annual change in weight of 133g/year and 286g/year over 30 years for each population.

Conclusion
While the removal of caffeine from SSBs is unlikely to be a practical option for obesity prevention given the likely opposition from industry and consumers, this study demonstrates the potentially significant impact of caffeine in SSBs on population weight gain.

Source of funding
Not applicable.

Poster Session 2: Thursday 2 December

P61

Mapping the molecular lipids in the brain: a review of the literature

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Background
The brain has the second highest content of lipids in the human body next to adipocytes, at 36-60%. We showed some years ago that the mammalian brain grey matter contains typically two omega 6 PUFA (arachidonic and docosatetraenoic acids) and one omega 3 PUFA (docosahexaenoic acid) in more than 30 different mammalian species (Sinclair 1975; Crawford, Casperd & Sinclair 1976) suggesting a high degree of evolutionary conservation of the neural lipid PUFA profile.

Objective
While it is superficially true that the composition of PUFA in brain glycerophospholipids is constant between different mammals, until recently there have been few studies which provided a systematic examination of the molecular lipids found in the brain of mammalian species.

Design
Review of the literature on molecular lipids in the brain different mammalian species, searching for quantitative data on the concentration of all brain lipids in both grey and white matter, and other specific brain regions. The search term used in pubmed was “phospholipids in the mammalian brain”.

Outcomes
In total, 10,164 entries were found using the search terms. When this was refined to include the words, mass spectrometry, in the search a total of 285 papers were found of which approximately half were published post 2003. Twenty eight papers were identified by title as being specific for the brain lipid analysis by a variety of mass spectrometry techniques, including the direct analysis of brain lipids (that is, without prior sample preparation). Some of the papers describe analysis of various micro-dissected brain regions, while others discuss the three-dimensional variations in mouse brain by lipid analysis, effects of age and gender in brain lipidomic profile, use of MALDI-TOF MS as a means of imaging brain sections

Conclusion
The new lipidomic technologies offer an exciting future for characterisation of a full molecular lipid map in microsections of the mammalian brain in addition to being able to be used to create specific molecular lipid images on the brain.

Source of funding
This research was supported by the Molecular & Medical Research Strategic Research Group, Deakin University.

P62

Determinants of risk of metabolic syndrome in first degree relatives of patients with end stage renal disease

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Background
End stage renal disease (ESRD) is a major problem in developing and developed countries. First degree family members (FDM) of these patients are at greater risk of kidney disease and other chronic conditions.

Objective
The aim was to understand the role of ethnic, socioeconomic, diet & lifestyle practices and glucose tolerance in the predisposition to metabolic syndrome (MetS) in FDM of ESRD patients.

Design
One hundred and thirty five FDM of ESRD patients from three haemodialysis centres in Miri, Sarawak, Malaysia consented to participate. They were compared to a spousal control group (n= 135) of similar age, gender and race with no personal or family history of kidney disease. All subjects underwent an oral glucose tolerance test, and completed a questionnaire in their local language that enquired about socioeconomic status, diet and lifestyle, personal and family medical history. Multivariate logistic regression was applied to determine factors associated with the risk of MetS. All variables of interest were included in the model as an initial step, and then a backward elimination procedure was applied to obtain the final model. The study was approved by HREC Curtin University.

Outcomes
The odds of MetS increased with age, added salt intake, personal history of smoking, family history of hypertension as well as coronary heart disease (CHD), increasing glucose intolerance and being FDM. Chinese and, to a lesser extent, Malays had significantly reduced odds of MetS relative to indigenous subjects.

Conclusion
FDM of ESRD patients, especially those from indigenous backgrounds, have a significantly greater risk of MetS. The stepwise deterioration of glucose tolerance, increased salt intake and presence of MetS could be mechanistically related. A family history of hypertension and of CHD proved to be significant markers for MetS in this study.

Source of funding
Not applicable

Poster Session 2: Thursday 2 December

P63

WITHDRAWN

P64

Determination of vitamin D and 25-hydroxyvitamin D in meat matrices by ion trap LC-MSMS

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Background
The importance of vitamin D in both calcium and phosphate homeostasis is well documented. The main forms of vitamin D found in food are cholecalciferol (D_3), ergocalciferol (D_2) and their respective 25-hydroxyvitamin D compounds.

Objective
To develop a method for the rapid, simultaneous analysis of low levels of cholecalciferol, 25-hydroxycholecalciferol, ergocalciferol and 25-hydroxyergocalciferol, in lean meat and other meat products, suitable for routine analysis in a commercial food analytical testing laboratory.

Design
The meat samples are saponified with ethanolic potassium hydroxide, hydrolysing D vitamers which are absorbed on diatomaceous earth; extracted into petroleum ether; concentrated by evaporation under nitrogen gas; re dissolved into n-heptane and then analysed by normal phase liquid chromatography (LC), ion trap mass spectroscopy (MS) with positive polarity and atmospheric pressure chemical ionisation (APCI).

Outcomes
APCI provided the best sensitivity for vitamin D analysis and when used in conjunction with normal phase chromatography enabled simple, sequential analysis for all the required vitamin D analytes in a single analytical run. This methodology required the use of deuterium labelled vitamin D and 25-hydroxyvitamin D internal standards, which are added as surrogates to the meat samples prior to saponification. The internal standards therefore corrected for any sample extraction inefficiencies as well as negating potential LC-MS matrix enhancement or suppression effects.
The successful development of this method facilitated NMI's participation in a collaborative study with the University of New South Wales and the University of Sydney.

Conclusion
The limits of detection and reporting for vitamin D and 25-hydroxyvitamin D are 0.03 and0.05 μg/100g respectively.

Source of funding
Meat & Livestock Australia (partial).

Poster Session 2: Thursday 2 December

P65

Diets containing flaxseed oil can improve omega-3 polyunsaturated fatty acid content similar to fish oil supplementation in cultured abalone

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Background
Abalone, like other seafoods, are a rich source of long chain omega-3 polyunsaturated fatty acids (LC n-3 PUFA). Cultured abalone show significantly lower content of these fatty acids compared to wild abalone. Our previous investigations demonstrated that a commercial diet supplemented with 1.5% fish oil (FO) increased the LC n-3 PUFA content in cultured abalone. This study investigated whether supplementation with flaxseed oil could achieve similar effects as fish oil supplementation.

Design
The feeding trial was conducted with Jade Tiger hybrid abalone (n=75). Five groups with 15 abalone each were used in the study. Control diet contained 100% FO at the level of 1.5%. Four other diets contained fish oil / flaxseed oil (FlxO) in ratios of 3:1 (FlxO 25%), 1:1 (FlxO 50%), 1:3 (FlxO 75%) and 100% FlxO. Abalone were fed once a day for 12 weeks. Lipids were extracted with chloroform:methanol (2:1 v/v). Total lipid content was determined gravimetrically. Fatty acid methyl esters were prepared by saponification of about 20mg lipid plus 2mg of methyl tricosanoate using KOH followed by transesterification in BF_3 in methanol. The fatty acid methyl esters were separated by capillary GLC.

Outcomes
Abalone fed the diets containing 25%, 50% and 75% flaxseed oil showed the similar high levels of total PUFA & n-3 PUFA, EPA (20:5n-3), DHA (22:6n-3) and DPA (22:5n-3) (P>0.05) as the control FO diet. Total n-6 PUFA content and n-3/n-6 PUFA ratio showed no significant difference between the control group and groups fed the diets containing flaxseed oil (P>0.05). In addition, the content of total saturated fatty acids and monounsaturated fatty acids showed no significant difference between the five groups of abalone (P>0.05).

Conclusion
Our results suggest that replacement of fish oil with flaxseed oil in the commercial abalone diets at the level of 25%-75% can improve the content of health-benefiting LC n-3 PUFA in cultured hybrid abalone, and achieve the similar outcomes as fish oil supplementation.

Source of funding
This project was funded by Victoria University, Melbourne Australia.

P66

Dietary supplementation with resveratrol reduces erythrocyte arachidonic and docosahexaenoic acids levels in diabetic mice

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Background
Resveratrol (3,4',5-trihydroxystilbene), with its powerful antioxidant and anti-inflammatory properties, has been associated with a reduced risk of developing chronic disease and mimic calorie restrictions in extending life expectancy. Molecular mechanisms by which resveratrol mediates health benefits are currently unknown.

Objective
To examine the effects of dietary supplementation with resveratrol on erythrocyte fatty acid composition in streptozotocin-induced diabetic mice.

Design
Streptozotocin-induced diabetic mice were fed diets supplemented with or without resveratrol (50 mg/kg/day). Following six weeks of dietary intervention, mice were sacrificed, blood samples collected by heart puncture and erythrocytes analysed for fatty acid composition by gas chromatography.

Outcomes
Induction of diabetes in mice had no effects on the fatty acid composition of erythrocytes. Resveratrol feeding resulted in a 30% reduction in erythrocyte arachidonic acid with no change in linoleic acid content. Dietary supplementation with resveratrol was also accompanied by a nearly 50% reduction in docosahexaenoic acid content of mouse erythrocytes compared to the unsupplemented diet group ($p \leq 0.001$).

Conclusion
We have demonstrated, for the first time that diets enriched with resveratrol deplete tissue levels of long chain omega-6 and omega-3 fatty acids. The implications of the resveratrol-mediated reductions in eicosanoid precursors (arachidonic and docosahexaenoic acids) in the development of chronic diseases and life expectancy remain to be elucidated.

Source of funding
JT is recipient of a UNRS Central Scholarship.

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WITHDRAWN

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Improving the efficiency of hot water extraction of theanine from green tea

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Background

Theanine is a unique nonprotein amino acid, which only exists in the tea plant, *Camellia sinensis,* and the mushroom, *Xerocomus badius*. Theanine contributes to the favourable sweet and brothy umami taste of green and black tea. It is also marketed around the world as a nutritional supplement because it is linked to beneficial health effects such as the enhancement of relaxation, improvement of learning ability, prevention of cancers and cardiovascular disease, promotion of weight loss, and improvement of the immune system. Therefore, an efficient method for the extraction of theanine from tea is of commercial importance.

Objective

To determine the effects of three extraction parameters, temperature, length of extraction and the ratio of water to tea in order to optimise the efficiency of the hot water extraction of theanine from green tea.

Design

To determine the effect of temperature, green tea (1g) was extracted with water at various temperatures (5-90ºC). The optimal temperature (80ºC) was then used to determine the impact of the length of extraction; green tea (1g) was extracted with water at 80ºC for various lengths of time (5-100min). Similarly, the optimal length for the extraction (30min) at 80ºC was used to determine the influence of the ratio of water to tea; green tea (1g) was extracted at various ratios of water to tea (10-100ml/g). After each infusion, the extracts were immediately put on ice to cool down to 25ºC, filtered through 0.45µm cellulose syringe filters and transferred to brown vials. The extracts were then injected onto a high performance liquid chromatography (HPLC) system and the theanine was measured by UV detection at 210 nm.

Outcomes

The amount of theanine extracted peaked at 80ºC when the temperature was varied from 5-90ºC. The theanine extracted reached a plateau after 30min when the length of extraction at 80ºC was varied from 5-100min. Finally, the optimum water to tea ratio was found to be 10ml/g when theanine was extracted at 80ºC for 30min.

Conclusion

The optimal conditions for the hot water extraction of theanine from green tea were infusion for 30min at a temperature of 80ºC and a water to tea ratio of 10ml/g.

Source of funding

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Changes in pig ileal bacterial numbers upon exposure to grape seed extract

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Background
Intestinal bacteria are reported to have the ability to break down high molecular polymers, such as grape seed extract (GSE) polyphenols, into small metabolites, where polymerisation impairs their intestinal absorption. However, phenolic compounds have been reported to have anti-bacterial properties, so a pilot experiment examining the effect of GSE on pig ileal bacterial populations during fermentation was examined.

Objective
To determine the changes in pig ileal bacteria following exposure to grape seed extract.

Design
The experiment was carried out using the following samples (50 mg): S1, original ileal fluid; S2, original ileal fluid; S3, GSE sample (to 34 mL medium inoculated 0.5 mL ileal fluid, anaerobic, GSE final concentration: 250 µg/mL) after 24 h fermentation; S4, GSE sample after 72 h fermentation; S5, ileal fluid after 72 h fermentation. To each of samples S2 – S5 was added 10 µL of *Escherichia coli* culture carrying a synthetic plasmid (pBS II) (not present in ileal fluid) as an internal control for DNA extraction. The DNA in each of the above samples was extracted using the Fecal DNA Extraction Kit (Qiagen). After extraction, samples were tested in two groups (A and B) for 16s rDNA changes using a real-time PCR machine (Roche). Primers targeting the 16s rDNA, (common to all bacteria), were used to generate one PCR product (PCR A) while primers specific for the pBS II DNA were used as a control for DNA extraction efficiency (PCR B). High resolution melt (HRM) analysis was carried out on PCR A products to monitor changes in the bacterial population.

Outcomes
Different crossing point (CP) values reveal different levels of DNA in different samples. It was found that the CP values of PCR B were similar; while in PCR A, a decrease in CP values from S2 through S4 indicated an increasing level of bacterial DNA present. This is in agreement with that found from cumulative gas production (combined study). The CP values of S4 and S5 were similar, which illustrates that there was comparable DNA in these two samples after 72 h fermentation. HRM analysis revealed a change in the population of bacteria during the fermentation over time

Conclusion
This experiment does indicate that there may be population changes occurring in the intestinal bacteria fermentation that are largely unaffected by GSE.

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Liver and vitamin D: fact or fiction?

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Background
It is commonly believed that liver is a good source of vitamin D in the diet. However this is only true of liver from some species. Fish liver is a good source of vitamin D because vitamin D as the fatty acid ester is stored in body fat, including the liver fat in fish. By contrast, liver from terrestrial animals contains very little vitamin D and hepatic catabolism in these animals is effective at destroying vitamin D.

Objective
To compare the intake of vitamin D from liver and liver products and margarine spreads, using consumption data from the 2007 National Children's Nutrition and Physical Activity survey (Kids Eat, Kids Play, KEKP).

Design
The analysis of naturally occurring vitamin D in food is difficult and the method of analysis is still being refined internationally. The vitamin D content of liver and liver products (e.g. pate) used to estimate vitamin D intakes for KEKP was borrowed from the Danish and German Food Composition Tables. The vitamin D content of margarine spreads was based on Australian analytical data. These levels are published as part of AUSNUT 2007.

Outcomes
Less than 0.5% of KEKP respondents consumed liver or liver containing products. The average level of vitamin D delivered by these foods was approximately 0.7 ng per day. In contrast approximately 50% of respondents consumed margarine spreads. The average amount of vitamin D delivered by such spreads was approximately 165 ng per day. Across the population consumption of margarine spreads delivered approximately 235 times more vitamin D than liver and liver containing products.

Conclusion
Foods such as margarine spreads are a better source of vitamin D because the vitamin D content is higher than the vitamin D content of terrestrial animal liver and because they are more widely consumed in the population. We suspect that correct information about the vitamin D content of fish liver has been inadvertently extrapolated to liver from all animals in the popular literature. However, it is postulated that there is an unidentified storage site for vitamin D outside the liver. This would explain the supply of dietary vitamin D to obligate carnivores like the cat family which are unable to make vitamin D in the skin.

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