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Posters

P01

Energy utilisation and productivity of broiler chickens on diets containing triticale and supplemented with microbial enzymes

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Background
In a previous study, we showed that Bogong and Canobolas, two new cultivars of triticale developed at the University of New England, were superior to wheat in nutritive value for broiler chickens.

Objective
The objective of the current study was to investigate the pattern of utilisation of energy in Bogong and Canobolas in broiler diets with or without xylanase and phytase supplementation.

Design
Three hundred and sixty-nine day-old chicks (initial body weight, 40.3±0.34 g) were assigned to 8 diets, 6 cages per diet and 8 bids per cage in completely randomised design. A negative control diet (65 % maize), with or without xylanase (Econase XT) was compared to diets containing Bogong or Canobolas (replaced 46 % of maize) with no enzyme; with xylanase, or xylanase and phytase (Quantum XT). All diets were iso-caloric and iso-nitrogenous and were fed until 21 days of age. Data on feed intake, body weight and FCR were collected weekly for 3 weeks. The comparative slaughter technique was employed to determine energy utilisation, including measurements of nutrient retention, net energy of production (NEp), heat production (HP) and efficiencies of utilisation of protein, fat and metabolisable energy for energy retention. Data were analyzed using Minitab.

Outcomes
Weight gain to day 7 on Bogong and Canobolas with xylanase and phytase diets were higher (P<0.05) than on the other diets. Feed intake and FCR on the diets with Bogong and Canobolas were better (P<0.05) than maize diets. However, ME and fat intake was higher (P<0.01) on the maize diets than on Bogong and Canobolas diets but the triticale-containing diets were higher (P>0.05) in protein intake than maize diets. Although all diets were relatively similar in NEp, HP was lower (P<0.01) on the triticale-based diets than on the maize-based diets. Chicks on the triticale-based diets were also more efficient (P<0.05) than maize diets in using ME for energy, fat and protein retention.

Conclusion
The lower HP on the triticale-based diets would be responsible for their better nutritive value and possibly welfare of the birds. Nutritive value was further improved through microbial enzyme supplementation. There is a need to determine the NEp attributable to the grains themselves.

Source of Funding
AB Vista, UK.

P02

Ileal protein and starch digestibility of sorghum is improved in broilers by exogenous feed enzymes

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Background
Broilers fed sorghum-based diets often underperform due to reduced energy utilisation and this may reflect the presence of anti-nutritive factors; kafirin, phytate and certain polyphenols.

Objective
This study was undertaken to assess the nutrient digestibility of sorghum with the dietary addition of xylanase, phytase or protease.

Design
Four bioassay diets containing sorghum (918 g/kg of diet) were prepared with celite as an indigestible marker; a control diet and three experimental diets containing an enzyme.. Birds were fed the diets *ad libitum* from day 35 to 42 days of age. All birds were euthanised on day 42 and the contents of the distal half of the ileum were pooled per pen and freeze dried prior to analysis.. Digestibility coefficients were calculated and apparent metabolisable energy (AME) was determined.

Outcomes
Protease significantly (P<0.05) enhanced both protein and starch digestibility. A strong positive correlation (P<0.01, r=0.82) was observed between protein and starch digestibility coefficients. All three enzymes significantly (P<0.05) enhanced starch digestibility and this was reflected in increased AME values.

Conclusion
These findings demonstrate the role that feed enzymes can play in improving the nutrient value of sorghum. The different responses to different enzymes is consistent with what is known about the structure of the grain. Further research is required to refine the application of enzymes to sorghum based diets, including the efficacy of simultaneous enzyme application.

Source of Funding
Not applicable.

P03

Improving the extraction of the catechins from green tea in teabags using the microwave oven

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Background

Green tea is a rich source of catechins, which are well known antioxidants linked with reductions in the risks for obesity, diabetes, cardiovascular disease and cancers. Since the most popular way of making tea is by simply brewing a teabag in boiled water, it is of interest to understand how the extraction of the catechins from green tea in teabags can be maximised using common household preparation methods - in order to fully benefit from the health promoting properties of green tea.

Objective

To investigate the yield of catechins from green tea in teabags using common household preparation methods, boiled water and the microwave oven, taking into account the teabag manufacturer's instructions.

Design

The amount of extractable catechins from green tea in a teabag was measured by HPLC after brewing under optimal extraction conditions: 200ml water at 80°C for 30min. The effectiveness of the manufacturer's instructions, 200ml boiled water for 3min at room temperature (RT), was then determined. Two microwave assisted extraction (MAE) procedures were then applied: 1) cold MAE, where a teabag was put in 200ml of RT water and heated by MAE at 500W for 30-120sec; 2) hot MAE, where a teabag was brewed in 200ml boiled water for 30sec-4min followed by MAE at 500W for 30-60sec. All extractions were done in triplicate and the One-way ANOVA and the LSD post hoc test on SPSS for Windows were used to determine statistical significance ($p<0.05$).

Outcomes

The amount of extractable catechins from green tea in a teabag was 140±7mg/bag. Brewing as suggested by the manufacturer only extracted 62% (86±8mg/bag, $p<0.001$) of the extractable catechins. The amounts were also lower with cold MAE (46%, 64±5mg/bag, $p<0.001$) and hot MAE (79%, 111±2mg/bag, $p<0.001$). However, hot MAE extracted more catechins (129%, $p=0.001$) while cold MAE extracted less (74%, $p=0.005$) than the manufacturer's suggested extraction.

Conclusions

Brewing a teabag in boiled water for 1min followed by 1min in a microwave oven at 500W (hot MAE) improved the extraction of catechins by 29% and improved the yield of extractable catechins from 62% to 79%, compared to the manufacturer's instructions.

Source of Funding

QV Vuong was granted a scholarship by DEST Australia.

P04

Effect of pH on binding activity between oxalate and fibre in raw and cooked rhubarb

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Background

High oxalate intakes can lead to kidney stone formation, an unpleasant and painful disease. Soluble oxalates are easily absorbed and on excretion can bind with mineral ions to form renal stones, while insoluble oxalates are not absorbed in the digestive tract but are excreted via the faeces. pH changes in the digestive tract could result in a change in the form of oxalate and its potential to bind to dietary fibre.

Objective

To investigate whether pH changes in the digestive system may have an effect on binding activity between oxalate and dietary fibre.

Design

In vitro gastric and intestinal digestion experiments were carried out using saliva, gastric and intestinal juice at different pH values to simulate the physiological environment of the human digestive tract. Raw and cooked rhubarb were incubated separately at 37^0C in sequence with saliva, gastric and intestinal juice, and samples of gastric and intestinal fractions were taken after 2 and 4 hrs. The soluble and insoluble oxalate contents of the soluble and fibre fractions were separated after gastric and intestinal incubation and were analysed by HPLC.

Outcomes

The raw tissue extracted at pH 1.07 showed that 87.4% of the insoluble oxalate and 30.2% of soluble oxalate were bound to the fibre fraction. Following incubation at pH 8.0 in the intestinal solution 72.4% of the insoluble oxalates and 14.3% of the soluble oxalates remained bound to the fibre fraction.

The fibre fraction of the cooked rhubarb tissue contained lower levels of insoluble oxalate which reduced from 35.9% at pH 1.07 to 29.6% at pH 8.0. It was interesting to note that 22.2% of the total oxalate (soluble and insoluble) in the cooked rhubarb stems were still bound to fibre even after the intestinal digestion at pH 8.0 for 2 hours and, consequently, may not be absorbed from the digestive tract.

Conclusion

The pH in the digestive system significantly affects oxalate binding to dietary fibre. Therefore, monitoring the pH in the food and the dietary fibre intake may play an important role in reducing oxalate bioavailability in the digestive tract.

Source of Funding

None.

P05

Green kiwifruit: effects on plasma lipids and *APOE* interactions

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Background

Diet is a crucial element in the reduction of risk of cardiovascular disease (CVD). Furthermore, response to dietary change may be influenced by genotype. Kiwifruit are a good source of several dietary components shown to improve dyslipidaemia and lower CVD incidence such as soluble fibre and some vitamins and phytochemicals.

Objective

To investigate the effect of consuming two green kiwifruit daily in conjunction with a healthy diet on plasma lipids and examine response according to apolipoprotein E (*APOE*) genotype in hypercholesterolaemic men.

Design

Eighty-five hypercholesterolaemic men (low-density lipoprotein cholesterol (LDL-C) >3.0 mmol/L and triglycerides (TG) <3 mmol/L) completed an eight week randomised controlled cross-over study, after undergoing a four week healthy diet phase. The study consisted of two 4-week treatment sequences of 2 green kiwifruit/day plus healthy diet (intervention) or healthy diet alone (control). Fasting blood samples were taken at baseline, 4 and 8 weeks for the measurement of plasma lipids (total cholesterol (TC), LDL-C, TG, high-density lipoprotein cholesterol (HDL-C)), serum apolipoproteins A1 and B (apoA1 and apoB).

Outcomes

After the kiwifruit intervention plasma HDL-C concentrations were significantly higher (mean difference 0.04 [95% CI: 0.01, 0.07] mmol/L [*P*=0.004]) and the TC/HDL ratio was significantly lower (0.15 [-0.24, -0.05] mmol/L [*P*=0.002]), compared to control. In carriers of *APOE4* allele TG concentrations were significantly lower (0.18 [-0.34, -0.02] mmol/L [*P*=0.03]) after the kiwifruit intervention compared to control. There were no significant differences between the two treatments for plasma TC, TG, LDL-C and serum apoA1 or apoB.

Conclusion

The small but significant increase in HDL-C and decrease in TC/HDL ratio and TG (in *APOE4* carriers) suggests that the regular inclusion of green kiwifruit as part of a healthy diet may be beneficial in improving the lipid profiles of men with high cholesterol.

Source of Funding: ZESPRI® International
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P06

Do we need to correct for endogenous material when determining fibre fermentation in the gastrointestinal tract?

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Background
Dietary fibre is a heterogeneous material and depending on its composition can vary in terms of its fermentability in the gastrointestinal tract. In addition, negative ileal fermentability values have been reported for fibre, but these negative values remain unexplained.

Objective
Determine the ileal and faecal fermentability of dietary fibre in kiwifruit using the pig as a model for the human.

Design
Ileal T-cannulae were surgically implanted into seven pigs (46 kg live weight). The pigs were first fed with a fibre-free semi-synthetic diet for four days followed for 14 days by a semi-synthetic diet containing freshly peeled kiwifruit as the sole fibre source (13% kiwifruit dry matter in the diet). Titanium dioxide was included in all diets as an indigestible marker. Ileal digesta and faecal samples were collected on day 14 for determining the apparent fermentability of soluble (SDF), insoluble (IDF) and total dietary fibre (TDF) (Prosky method).

Outcomes
The apparent ileal and faecal SDF, IDF and TDF fermentability of the kiwifruit were 25%, -8% and 0.2% and 88%, 21% and 38%, respectively. For the pigs fed the fibre-free diet, the ileal digesta and faeces contained endogenous material that was determined as SDF, IDF and TDF based on the Prosky method (for ileal 4.0, 2.9 and 6.9 and for faeces 1, 13 and 14 g/kg DM intake, respectively). When the apparent fermentability values were corrected for this interfering endogenous material the resulting values at the ileum were 82%, 5% and 24% and over the total tract were 100%, 85% and 91% for SDF, IDF and TDF. These values were significantly ($P<0.05$) higher than their corresponding apparent values.

Conclusion
Apparent fibre fermentability values based on the Prosky method may underestimate the amount of fibre fermentation that occurs in the gastrointestinal tract. Therefore, apparent fermentability values should be corrected for the endogenous material present in the gastrointestinal tract that interferes with the fibre determination. Further work should focus on characterising this endogenous material.

Source of Funding
Supported by Zespri International Ltd.

P07

Characterisation of kiwifruit (*Actinidia deliciosa* var *Hayward*) fibre digestion

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Background
The high fibre content of kiwifruit suggests that it could contribute to the health of the gastrointestinal tract.

Objective
To determine the digestibility of kiwifruit fibre throughout the gastrointestinal tract using the growing pig as a model for the adult human.

Design
Semi-synthetic corn starch-based diets containing freeze-dried kiwifruit as the fibre source were fed to growing pigs. Digesta from the stomach, jejunum, ileum and faeces were analysed for fibre content after fractionation. Apparent digestibility of the fibre components was calculated for each gut section.

Outcomes
Apparent soluble dietary fibre digestibility of freeze dried kiwifruit increased significantly ($P<0.001$) as soluble fibre transited the gastrointestinal tract with little or no digestion occurring in the stomach to 37% digestibility of soluble fibre at the ileal level and 87% digestibility at the faecal level. Insoluble fibre digestibility also significantly ($P<0.001$) increased throughout the gut but to a much lower level (faecal digestibility = 26%). At the end of the tract more than 90% of the gut soluble fibre, hot water soluble fibre and oxalate soluble fibre and 75% of the hemicelluloses and 60% of the cellulose were digested. The gut soluble and oxalate soluble fibre fractions were primarily digested in the small intestine, the hot water soluble fibre was evenly digested between the small and large intestine, hemicelluloses were primarily digested in the small intestine and cellulose was digested along the length of the tract. Inclusion of dietary kiwifruit increased the water holding capacity and faecal bulking capacity of the digesta.

Conclusion
Digestion of the fibre fractions in kiwifruit occurred along the full length of the intestines with 80% of the total fibre digested by the end of the gastrointestinal tract. Kiwifruit possess properties that characterise a fibre source that may confer health benefits through its actions in the gastrointestinal tract.

Source of Funding
ZESPRI™ International Ltd.

P08

Measurement of exogenous thiamine in cereals

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Background
Beri-beri is a disease caused by the lack of thiamine (B_1), which leads to nerve degeneration, oedema and brain disorders. Therefore, the fortification of cereal products with thiamine is an important nutritional tool. However, although thiamine is well known to be heat labile, the AOAC extraction method, which is used to measure thiamine in food, is done at a relatively high temperature (at 121°C for 30 min). Therefore, the method used to measure thiamine may cause losses and lead to underestimation of the vitamin in fortified food products.

Objective
To determine the effectiveness of the AOAC method for measuring thiamine from three cereals: wheat, corn and rice, with and without cooking of the cereals.

Design
Wheat, corn and rice samples were analysed with and without cooking for 30, 60 and 90 min at 110, 122, and 135°C, using an autoclave. To extract the thiamine from the cereals, 25 mL of 0.1 M HCl was added to triplicate 5 g aliquots of each cereal and they were autoclaved at 121°C for 30 min. The endogenous thiamine in wheat, corn and rice was measured by HPLC without adding thiamine. After adding thiamine (exogenous) to fortify the cereals, the total (exogenous plus endogenous) thiamine was measured. The exogenous thiamine was calculated by subtracting the endogenous thiamine values from the total thiamine values.

Outcomes
Even without cooking, the percentage recoveries of exogenous thiamine from wheat, corn and rice were 28±1%, 66±2% and 33± 3%, respectively, compared to the amount of thiamine added (all $P<0.05$), Furthermore, the recovery of thiamine also significantly decreased (all $P<0.05$) as the cooking temperature and time was increased; no thiamine was detected for wheat and rice cooked at 135°C for 60 and 90 min and for corn cooked at 135°C for 90 min.

Conclusions
During the extraction step using the standard AOAC method, at least two thirds of the exogenous thiamine was lost when it was added to wheat and rice and one third was lost when it was added to corn, even without cooking. Therefore, the AOAC method may not be the ideal technique for the measurement of exogenous thiamine in fortified cereals.

Source of Funding
SP Tan was granted a scholarship from Sanitarium Health and Wellbeing.

P09

The effect of caralluma fimbriata extract in combination with lifestyle intervention on the risk factors of metabolic syndrome

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Background
Caralluma fimbriata extract is an edible succulent cactus that has been reported to significantly reduce waist circumference and hunger levels.

Objective
A randomised double blind placebo controlled clinical trial in overweight adults was conducted to determine whether *Caralluma fimbriata* extract in combination with lifestyle intervention attenuates or reverses metabolic disturbances seen in metabolic syndrome.

Design
Thirty three adults aged 29-59 years with a body mass index (BMI) >25kg/m^2 or a waist circumference > 94 cm (male), > 80 cm (female) completed the study. *Caralluma fimbriata* extract and placebo were administered as 500mg capsules twice daily (1g/day) and all subjects received diet and exercise advice weekly for 12 weeks. Baseline and week 12 fasting blood glucose and lipid profiles were measured along with the administration of a health and wellbeing survey. Blood pressure (BP) and anthropometry were measured on a weekly basis. Appetite was measured at baseline, week 6 and week 12.

Outcomes
There was a significant decline in waist circumference and waist to hip ratio (WHR) in the experimental group compared to the placebo group ($P<0.05$). The decline in waist circumference is important as it is reflective of visceral adiposity and the pathogenesis of metabolic syndrome. A significant reduction in body weight, BMI, hip circumference, systolic BP, heart rate (HR) and triglyceride levels in both placebo and experimental groups ($P<0.05$) was recorded. In addition, a significant reduction in total fat and saturated fat intake in both groups ($P<0.05$) was observed. Furthermore sodium intake was reduced significantly in the experimental group ($P<0.05$).

Conclusion
Caralluma fimbriata extract combined with lifestyle modification can curb central obesity which is associated with the aetiology of metabolic syndrome.

Source of Funding
The study was funded by Victoria University. Both *Caralluma fimbriata* and placebo capsules used in this study were provided by Gencor Pacific Group, *USA*.

P10

Effects of food structure on nutritionally distinct carbohydrate fractions in cereal

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Background
Food structure has an important influence on the rate at which foods are digested.

Objective
To examine the effect of cereal food structure, primary and secondary, on distinct carbohydrate fractions generated by digestion and studied microscopically.

Design
A range of starchy foods, including bakery products, breakfast cereals, pastas, and pulses, were digested *in vitro* and the time course of pancreatic digestion was followed for 180 min to measure rapidly-available carbohydrate (RAC) and slowly-digested starch (SDS). The digests were then homogenised and further digested to measure inaccessible digestible starch (IDS). Samples were also removed for light microscopy.

Outcomes
The digestion profile of the foods differed with food types. Bakery products and processed breakfast cereals disintegrated rapidly in digestion and yielded large amounts of RAC, less SDS and little IDS. Pastas, which were dense and homogeneous, were more gradually digested to completion by superficial erosion, yielding approximately equal proportions of RAC and SDS but little IDS. Pulse particles, which consisted of cotyledon fragments with robust cell walls, yielded a low proportion of RAC, a large proportion of SDS and more IDS than other foods, and their digestion profile was more linear than that of the cereal flour-based foods.

Conclusion
The preservation of native "primary" structure, and the use of processing to create "secondary" structure, are both means by which wholeness, in the sense of intactness, can be used to influence carbohydrate digestion to make foods of lower glycaemic impact.

Source of Funding
Oxford Brookes University (UK) and NZ Institute of Crop and Food Fellowship.

P11

The release of peptides by *in-vitro* digestion of fermented red deer *(Cervus elaphus)* and cow *(Bos primigenius)* milk

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Background
Fermentation and digestion release peptides from milk as a source of amino acid and energy, as well as a source of biofunctional peptides that may have health benefits.

Objective
The aim of this study was to ferment deer and cow milk using three strains of Lactic acid bacteria (LAB) and to compare the release of peptides following *in-vitro* digestion of the fermented milks.

Design
The three strains were *Lactobacillus belbrueckii subsp bulguricus*, *Streptococcus salivarius subs thermophilus* and *Lactobacillus casi* strain Shirota and the fermentations were carried at 37 ^{o}C for 24 hours. The *in-vitro* digestion was performed in two steps; imitating both the human stomach (Pepsin, pH 2.5) and the duodenum (Corolase PP, pH 7.5). Release of peptides during milk fermentation and subsequent digestion was quantified using OPA (*o-phthaldialdehyde)* assay. Changes in protein and peptide profiles were evaluated using sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE) and quantified using ImageJ software.

Outcomes
After 24 hours of fermentation, the pH of cow milk dropped below 4.6 and precipitated caseins while pH of deer milk remained above pH 4.6 for all three strains. Deer milk fermentations gave higher peptide production than cow milk fermentations. Following *in-vitro* digestion peptide production was significantly greater in deer milk than cow milk ($P \leq 0.05$). *Lactobacillus casi* strain Shirota showed the highest release of peptides. The main milk proteins were degraded during fermentation of both milks. Lactoferrin (LF) in cow milk was more resistant to fermentation than that in deer milk for all 3 strains. After 24 hours of fermentation by *Lactobacillus casi* strain Shirota, cow LF was still intact while 47% of the deer LF had degraded. Digestibility of β-lactoglobulin, α-lactalbumin of deer milk and immunoglobulin of cow milk was improved by fermentation.

Conclusion
This study showed LAB fermentation prior to *in-vitro* digestion increased the digestibility and release of peptides from both milks. This effect was greater in deer milk than cow milk.

Source of Funding
Not applicable.

P12

The relationship between physicochemical characteristics of mango and antioxidant activities of mango kernels

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Background

Materials discarded during fruit processing are often rich sources of antioxidants. The maturity of the fruit influences the total phenolic content and antioxidant capacity of the flesh itself and presumably other components of the fruit such as kernels.

Objective

To determine the relationship between the physicochemical parameters of mangoes and the total phenolic content (TPC) and total antioxidant capacity (TAC) of the kernels

To investigate the relationships between results of different antioxidant assays of kernel.

Design

The maturity of fresh mangoes (*Mangifera indica cv* "Tommy Atkins" n=12) was assessed by measuring colour, maturity score, firmness, total soluble solids (TSS), titratable acidity (TA), TSS/TA ratio, Vitamin C and moisture content. The total phenolic content of the freeze dried kernel was determined using Folin Ciocalteu reagent and the antioxidant capacity by ABTS, DPPH, FRAP, Hydrophilic ORAC (H-ORAC) and Lipophilic ORAC (L-ORAC) assays. Pearson correlation analysis and principal component analysis were performed using Minitab 16.

Outcomes

Total phenolics content of mango kernel was 139 mg gallic acid equivalents/g of dry matter. Total antioxidant capacity as determined by ABTS, DPPH, FRAP, H-ORAC and L-ORAC were 2228, 2206, 855, 907 and 13 µmol trolox equivalents/g of dry matter, respectively. Maturity score, total soluble solids and TSS/TA of fresh mango showed significant moderate correlations with TPC and TAC of freeze dried kernels. With the exception of L-ORAC, there were significant strong correlations ($P < 0.001$) between all the antioxidant assays used including TPC.

Conclusion

Maturity score, TSS and TSS/TA of mango fruit are good indicators of antioxidant activities of mango kernels. The total phenolic content was highly correlated with antioxidant activities, which suggests that the phenolic compounds of mango kernels contribute significantly to the antioxidant activity measured. The highly significant correlations between the results of antioxidant activity assays suggest one assay (e.g. TPC assay) could be chosen to conveniently monitor antioxidant capacity of mango kernels.

Source of Funding

None.

P13

New Zealand Green-lipped mussels enhance iron abosption in Caco-2 cells and mouse proximal small intestine

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Background

Iron bioavailability can be manipulated by the nutritional composition of a meal. Red meat has been repeatedly reported to significantly improve iron absorption, however because red meat contains a high concentration of saturated fatty acids, promoting red meat consumption in order to improve iron status at a population level may be problematic. For this reason, the identification of an alternative meat/poultry/fish factor source rich in polyunsaturated fatty acids or low in saturated fatty acids is warranted. The effects of oily fish on iron uptake in both rodents and humans have been previously investigated, however protocol inconsistencies have led to contradictory results.

Objective

To identify whether extracts of Green-lipped mussels (GLM) enhance non-haem iron absorption compared to egg albumin using Caco-2 cell monolayers and isolated mouse small intestinal sections.

Design

Raw GLM homogenate and egg albumin were digested in vitro with pepsin at pH 2, and pancreatin and bile salts at pH 7. Tracer ^{55}Fe combined with carrier iron in a molar ratio of 1:10 respectively was used to measure cellular iron uptake. Ascorbic acid was used as positive control and combined with the ^{55}Fe/carrier iron solution in a molar ratio of 4:1 respectively. Caco-2 cell monolayers and the mucosal surface of freshly dissected mouse proximal small intestine were incubated with digestate treatments for 60 minutes. All values were standardised per µg of treatment.

Outcomes

Results are expressed as percent absorption compared to egg albumin. Ascorbic acid significantly enhanced non-haem iron absorption compared to egg albumin by ~450% in Caco-2 cell monolayers ($P=0.001$) and 700% in isolated mouse small intestine ($P<0.0001$). GLM digestate significantly enhanced iron absorption by ~300% compared to egg albumin digestate in both Caco-2 cells ($P=0.01$) and small intestinal segments ($P=0.02$).

Conclusion

GLM may be a healthy alternative to red meat in order to improve non-haem iron absorption. Further investigation into the mechanism of enhancement is justified.

Source of Funding

Institute of Food, Nutrition and Human Health

P14

Effects of wild green oat extract (Neuravena®) on high demand cognitive performance and flow-mediated dilatation in older adults

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Background
Age-related cognitive decline may be related to poor arterial function. A single dose of a wild green oat extract, Neuravena® (ELFA® 955), has been shown to enhance cognitive performance in older adults.

Objectives
To investigate the effects of Neuravena® on human cognitive performance following 12 weeks of daily supplementation and whether such effects are related to improvements in vasodilator function.

Design
A 24-week randomised, double-blind, placebo controlled, crossover trial of Neuravena® (1500 mg/day) was conducted in 38 healthy older adults. Vasodilator function and cognitive assessments were conducted at the end of each 12 week treatment arm. Vasodilator function was measured, whilst fasted, using flow-mediated dilatation (FMD) at least 24 hrs after the last dose of supplement. A high demand cognitive test battery comprising the Stroop colour-word test, the letter cancellation task, the rule-shift task, a computerised multi-tasking test battery and the trail-making task was used to assess cognitive performance. Outcomes were analysed using paired t-tests in a crossover period at a 0.05 level of significance.

Outcomes
We found no significant effect of Neuravena® on any measures of cognitive performance in this healthy ageing population. Daily Neuravena® supplementation for 12 weeks resulted in a 41% improvement in FMD ($P<0.01$). There was no significant correlation between treatment-induced change in FMD and any cognitive measure.

Conclusion
Despite our earlier observation of an acute cognitive benefit of Neuravena® supplementation, we were unable to detect a sustained effect with chronic supplementation. However, this is the first study to demonstrate an improvement of FMD with Neuravena® supplementation. Moreover, this appears to be a sustained effect which may be beneficial for those at risk for cardiovascular disease.

Source of Funding
Financial support was provided by Frutarom, Switzerland.

P15

Probiotics in the Australian marketplace: a review of their efficacy in Irritable Bowel Syndrome

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Background
Probiotics are widely recommended by health practitioners as a therapy for various gastrointestinal disorders. However, their efficacy in improving symptoms of Irritable Bowel Syndrome (IBS), a common disorder with potential underlying alterations in the intestinal microbiota, remains controversial.

Objective
To provide an overview of the evidence for clinical efficacy of probiotics in the treatment of IBS.

Design
A literature review was conducted to meet the aim of this paper. Studies that were included had to be randomised-controlled trials (RCT) conducted in patients with IBS (meeting either the Rome or Manning criteria) and must have investigated probiotic strains that are available in Australia.

Outcomes
A total of 11 probiotic RCTs were reviewed. Probiotics as a group exerted a significant but small benefit on global IBS symptoms. Of all the probiotic strains reviewed, *Lactobacillus plantarum 299v* (IBS Support)*, Bifidobacteria animalis DN173010* (Danone Activia) and the combination probiotic of "Inner Health Plus" reduced flatulence or bloating compared with placebo but not overall IBS symptoms. The evidence was inconsistent in establishing the optimal dose or length of therapy for each probiotic strain due to the heterogeneity of study design used in trials.

Conclusion
The evidence is limited in recommending a specific probiotic strain for treating IBS. Clinicians need to ensure that the recommended probiotic strain has shown specific benefit in IBS. Large, multi-centred studies, potentially targeting specific groups of IBS patients are needed to confirm preliminary evidence.

Source of Funding
Not applicable

P16

Updating nutrition compositional data for New Zealand beef and lamb to re-establish a credible scientific resource

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Background
An up-to-date, comprehensive set of compositional nutrition data is one essential element of the nutritional 'toolkit'. At present, the nutrient data available on New Zealand beef and lamb is incomplete and out-of-date, possibly misrepresenting New Zealand product available worldwide. Establishing a credible technical resource, comprising a set of data for cooked and raw products, provides the fundamental platform on which all future activities relating to nutritional composition can be based.

Objective
To establish an up-to-date set of compositional data for New Zealand beef and lamb, to be used globally.

Design
Twenty three cuts of beef, including offal, and 25 cuts of lamb were selected for analysis, in both the raw and cooked state. Enough samples (usually 10) to yield 3kg for each analysis were collected from different parts of New Zealand over a 6-month period. Sample preparation and analysis methods were chosen based on a literature review and the requirements of international databases.

Outcomes
Twenty five nutrients and 40 fatty acids were analysed on both raw and cooked product. Basic proximate analysis, yielding protein, water, fat and ash, enabled the calculation of energy content. Additional data in this updated set includes figures for LCPUFAs and vitamin D. Lean tissue and fat were analysed separately, allowing calculation of cut composition for a variety of trim levels, according to market.

Conclusion
This analysis provides a set of up-to-date, comprehensive data for all user groups, including industry, nutrition scientists, health professionals and consumers. Its use helps to ensure nutrition information is accurate, current and science-based.

Source of Funding
Funding by Beef + Lamb New Zealand Ltd, Wellington, from farmer levies.

P17

Inclusion of pork meat in the diets of young women reduces snack food consumption and increases fruit and vegetable intakes

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Background
The failure to reach dietary guidelines is a particular concern for young women of childbearing years.

Objective
The aim of this study was to determine the effect of an intervention, with pork meat or an iron supplement, on the dietary profiles of young women.

Design
A randomised, semi-blinded, placebo-controlled, parallel group study was conducted between 2008 and 2009. Healthy women, 18-35 years, willing to consume daily capsules and pork meat were randomised to one of three groups for 12 weeks. They maintained three, seven day food diaries (21 days) while continuing their routine eating pattern (CG); maintaining this pattern while taking iron supplements (SG), or consuming their routine diet with the integration of 500g per week of pork meat (PG). The number of serves consumed from each of the five core food groups and 'extras" group was calculated and intakes compared to the recommendations in the Australian Guide to Healthy Eating (AGHE). The data were evaluated by analysis of variance (SPSS). Approval for the study was granted by the University of Sydney Human Ethics Review Committee.

Outcomes
Sixty-five participants, CG (*n=22), PG* (*n=21*) and SG (*n=22),* completed the study. They were 24.5 ± 4.3 years with a BMI of 21.8 ± 2.8 kg/m^2; 35.4% purchased foods for their household and 40% prepared their own meals. Except for the "meat, fish, poultry, eggs, nuts and legumes" group, none of the recommendations in the AGHE were achieved. In PG there was a statistically significant increase in fruit intake (54%, *P<0.05), r*educed "snack food" intake (33%, *P<0.05)* and stable body weights relative to CG. A trend of increasing vegetable intake was apparent in PG and dairy intake fell to less than half the AGHE recommendation (0.9 serves per day) in SG.

Conclusion
The inclusion of pork meat in the diets of young women is associated with an increase in fruit and vegetable intakes and a reduction in snack foods consumed. The effect may be explained by increased food knowledge and cooking skills.

Source of Funding
Pork (CRC) and Australian Pork Limited grant.

P18

Self-diagnosis of non-coeliac gluten intolerance by Australian adults: failure to exclude coeliac disease or benefit from a gluten-free diet

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Background
The existence of non-coeliac gluten intolerance (NCGI), defined as those without coeliac disease but whose gastrointestinal symptoms improve on a GFD has been recently confirmed. However, the widespread prescription of gluten-free diet (GFD) for gut and other symptoms may lead to missing the diagnosis of coeliac disease.

Objective
This study aimed to characterize patients who believed they have NCGI.

Design
Respondents to advertising through websites, local papers and local clinic rooms for adults who believed they had NCGI were asked to fill out a questionnaire about symptoms, diet and coeliac disease investigation.

Outcomes
Of 231 respondents to advertising, 129 completed the survey. Mean age was 45 years (range 7-84) and women predominated (8:1) and 22% met the description of NCGI. The remaining had inadequate exclusion of coeliac disease (64%), and/or uncontrolled symptoms despite gluten restriction (26%), and/or were not following a strict GFD (29%). The GFD was self-initiated in 43% or prescribed by alternative health professionals (22%), general practitioners (14%) and dietitians (19%). No investigations for coeliac disease (HLA gene status, antibody testing or small intestinal biopsies) had been performed in 17%. Of the 61 (47%) participants who had duodenal biopsies, 41% (25 of 61) had an inadequate gluten intake at the time of endoscopy (i.e. had already removed gluten from their diet or did not implement an adequate gluten challenge).

Conclusion
The practice of initiation of a GFD without adequate exclusion of coeliac disease is alarmingly common and the belief by 1 in 4 individuals that they are gluten-intolerant despite uncontrolled symptoms seems illogical, but most patients appear to be well versed in the GFD. Education of the wider health profession is needed so that the true prevalence of NCGI can be defined.

Source of Funding
Not applicable.

P19

Test-retest reproducibility of a food frequency questionnaire for New Zealand adults

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Background
Food frequency questionnaires (FFQs) are a relatively simple, cost-effective method of assessing diet in population-based studies. However, there are no up-to-date, validated multi-nutrient FFQs available for use in New Zealand (NZ) adults.

Objective
To develop and assess the reproducibility of a multi-nutrient FFQ for use in New Zealand adults.

Design
A semi-quantitative 143-item FFQ was developed to assess diet over the past year. This FFQ was tested in 135 adults aged 30-59 years. As part of a wider validation study, diet records were collected for eight days (8DDR) and the FFQ was administered twice over a year. Test-retest reproducibility of the FFQ was assessed using Spearman's correlations and weighed Kappa values for energy, vitamins A, C and E, and retinol and beta-carotene.

Outcomes
Preliminary analysis showed that mean energy intake was 9.2MJ for the 8DDR and 9.9MJ for the FFQ on both occasions. Spearman's correlations were 0.66 for energy, 0.61 for vitamin A, 0.66 for beta-carotene, 0.69 for retinol, 0.71 for vitamin C, and 0.68 for vitamin E. Weighed Kappa values were 0.36 for energy, 0.46 for vitamin A, 0.34 for beta-carotene, 0.48 for retinol, 0.44 for vitamin C, and 0.46 for vitamin E

Conclusion
The FFQ showed reasonable reproducibility for the selected nutrients. Further work will investigate the effect of energy adjustment as well as modification of the nutrient database on improving reproducibility and validity of this FFQ.

Source of Funding
University of Otago

P20

Correlates of fruit and vegetable consumption in secondary students in New Zealand

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Background
Healthy eating, including daily fruit and vegetable (F&V) consumption, is important for healthy weight maintenance and prevention of chronic disease. However, only a small proportion of New Zealand adolescents consume the recommended servings of fruits and vegetables.

Objective
The current study investigated the social and environmental factors correlated with fruit and vegetable intake in secondary school students.

Design
A web-based survey of 1858 students (13-18 years) from 19 secondary schools in Otago was conducted to collect information on food consumption (using a short, validated FFQ) and attitudes, beliefs, perceptions and other factors that may influence food choices. We examined associations between F&V consumption and potential correlates using the chi-squared test.

Outcomes
Only 53.9% of participants ate F&V daily (50.9% of boys and 57.2% of girls, P<0.001) and a higher proportion of students from urban schools ate F&V daily compared to those from rural schools. A higher proportion of girls (79.4%) considered the healthiness of food important compared to boys (63.9%, P=0.001). The ease of getting food was important for more boys (62.6%) than girls (55.7%, P=0.009), as was ease of eating. A higher proportion of those who consider healthiness of food important eat fruit daily (67.3% vs. 41.6%, P<0.001). A higher proportion of those who consider the easiness of food to get important are less likely to eat fruit daily (56.8% vs. 64.4%, P<0.001). Parental encouragement to eat F&V and the parents' own F&V consumption was also associated with students' F&V consumption.

Conclusion
F&V consumption differed significantly by gender and school location. Both students' and parents' beliefs and attitudes are related to F&V consumption.

Source of Funding
Supported by grants from the University of Otago, Dunedin City Council, and Otago Regional Council. Maria Polak was supported by a studentship from the Otago Medical Research Fund.

P21

Scoping the allied health eHealth landscape: a failed systematic review or a casualty of the business-government divide?

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Background
eHealth is about using technology to communicate health information securely across all health services and health sectors, with the promise to improve the quality and safety of patient care. Examples of commercial, and government-built eHealth systems exist and are in use by the medical professions working in primary and community care; less is known about eHealth systems for allied health professions.

Objective
To identify examples where an eHealth technology had been built and tested in practice using a scientific framework, and reported in the literature, for the allied health professions working in primary and community care. Of particular interest are trials reporting efficiency and effectiveness.

Design
A systematic review of: PUBMED, MEDLINE, EMBASE, CENTRAL, CINAHL, Dissertation Library, and cross referencing of citations. A matrix of eHealth terminologies, health professions, and search limits were applied to each database. Search limits: ≤10 Years; English. eHealth terms: Health technology; medical informatics OR health informatics; eHealth OR e-health; telehealth OR tele-health; computers OR information technology OR IT [OR ICT OR information communication technology].

Outcomes
No published randomised controlled trials of eHealth systems in primary care for any of the allied health professions were identified using the search strategy. The systematic review did identify a body of peer-reviewed opinion on the importance of eHealth technologies to be built and tested in a scientific framework in practice: new technology is first demonstrated to be better than, or as good as, current practice before it is adopted.

Conclusion
The systematic review revealed a call for eHealth systems to be built and tested in practice in a scientific framework, but no evidence was found that the rigour of a scientific framework is common practice in the eHealth literature. It is possible eHealth technologies are unable to meet the requirements of scientific methods because of fundamental differences between business and government.

Funding Source
Not applicable.

P22

Taste changes in chronic kidney disease

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Background
Saliva is composed of a number of taste active compounds which play a vital role in taste stimulation. Chronic kidney disease (CKD) patients have an impaired ability to recognise basic tastes and salivary composition differs with CKD. The link between salivary composition and variation in taste sensitivity is unknown.

Objective
To determine any associations between changes in salivary composition and altered taste perception in CKD patients and to investigate taste and gastrointestinal (GI) symptoms experienced by these patients and explore their impact on food intake and appetite.

Design
Thirty CKD patients (24 males, 6 females, age 69.7 ± 14.2 yrs, glomerular filtration rate (GFR) <25mL/min) and five healthy controls (1 male, 4 females, age 44.6 ± 10.3 yrs, GFR> 80mL/min) were recruited from the Austin Hospital outpatient renal clinic. A saliva sample was collected to determine biochemical composition. Participants performed a taste identification task to assess perception of the five basic tastes and completed a symptom questionnaire regarding taste changes.

Outcomes
It was shown that CKD patients have increased salivary bicarbonate, potassium and urea concentrations ($P<0.05$) and a poorer ability to perceive sour, glutamate and bitter tastes ($P<0.05$) when compared to controls. Correlation analysis revealed bicarbonate concentration was inversely related to both liking and intensity of glutamate taste and to the intensity of sour taste ($P<0.05$), whilst salivary urea was linked to the perceived intensity of bitter taste ($P<0.05$). 43% of patients indicated experience of GI symptoms contributed to decreased food intake.

Conclusion
This study provides evidence that taste active compounds present in the salivary fluid, in particular bicarbonate and urea are associated with taste perception and may influence taste function. Further research is required to clearly establish the link between reduced taste sensitivity and food intake in CKD patients.

Funding
Not applicable.

P23

The association between perceived sweetness intensity and dietary intake

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Background
Individual differences in taste perception may influence dietary habits, nutritional status and ultimately nutrition-related chronic disease risk.

Objective
The objective of the present study was to assess individual differences in sweetness intensity perception and the relationship between perceived sweetness intensity, food behaviours and dietary intake.

Design
Eighty five participants (BMI=21±3, 21±4 years) completed a food and diet questionnaire, food variety survey, two 24-hour food records and a perceived sweetness intensity measurement using the general labelled magnitude scale (gLMS).

Outcomes
There was large inter-individual variation in perceived sweetness intensity (0-34 gLMS units, mean 10±7). One-way ANOVA analysis revealed no difference between perceived sweetness intensity and degree of importance placed on not adding sugar to tea or coffee ($P=0.2$) and the degree of importance placed on avoiding sugar-sweetened or fizzy drinks ($P=1.0$). Independent t-test analysis revealed no significant association between perceived sweetness intensity and the food variety measure for sugar and confectionary intake ($P=0.6$) and selected fruit and vegetable intake ($P=0.1$-0.9). One-way ANOVA analysis also demonstrated no difference between tertiles of sweetness intensity and BMI ($p=0.1$), age ($P=0.3$) and food variety score ($p=0.5$). No correlation was observed with regards to perceived sweetness intensity and mean total energy intake ($r=0.05$, $p=0.7$), percent energy from total fat, saturated fat, protein, carbohydrate and grams of fiber ($r=-0.1$-0.1, $P=0.2$-0.8) and also for intake of the micro-nutrients: folate, magnesium, calcium, iron, and zinc ($r=0.1$-0.2, $P=0.1$-0.4). Only modest correlations were observed between sodium ($r=0.3$, $P<0.05$), vitamin C ($r=0.3$, $P<0.05$) and potassium ($r=0.2$, $P<0.05$) intake and perceived sweetness intensity.

Conclusion
Overall, perceived sweetness intensity does not appear to play a role in food behaviours relating to sugar consumption and dietary intake in healthy individuals.

Source of Funding
SRC funding, Faculty of Health, Deakin University, Australia.

P24

Test-retest reliability of fat taste thresholds

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Background
Evidence indicates the existence of a sixth taste, obtained by fatty acids, to convey the presence of fat in foods. Stability in measurement is required when assessing if there is functional significance associated with fat taste thresholds, for example, whether these can be altered by dietary intake.

Objective
This study aimed to determine the test-retest reliability of oral fatty acid thresholds, and if diet prior to testing influenced measured thresholds.

Design
Subjects (n=18, 8 males, BMI 22.9 ± 0.6 kg/m^2, 10 females, BMI 23.4 ± 0.9 kg/m^2) attended 30 laboratory sessions to determine detection thresholds for oleic acid (C18:1), linoleic acid (C18:2) and lauric acid (C12:0). Taste thresholds for the basic tastants were also performed using sucrose (sweet), citric acid (sour), sodium chloride (salty), caffeine (bitter) and monosodium glutamate (umami). Each stimulus was evaluated on 6 occasions using 3-Alternate Forced Choice methodology. Dietary records were taken on each test day.

Outcomes
Fatty acid thresholds were determined for all subjects. Strong intra-class correlations were found within day testing sessions for C18:1 (ICC=0.87, CI=0.70-0.95), C18:2 (ICC=0.88, CI=0.71-0.95) and C12:0 (ICC=0.80, CI=0.53-0.92), and across day testing sessions for C18:1 (ICC=0.77, CI=0.48-0.91), C18:2 (ICC=0.60, CI=0.21-0.83) and C12:0 (ICC=0.69, CI=0.34-0.87). Duplicate testing across days was also strongly correlated for C18:1 (ICC=0.84, CI=0.62-0.94), C18:2 (ICC=0.88, CI=0.71-0.95) and C12:0 (ICC=0.67, CI=0.30-0.86), as was across day triplicate testing for C18:1 (ICC=0.89, CI=0.74-0.96), C18:2 (ICC=0.94, CI=0.84-0.98) and C12:0 (ICC=0.80, CI=0.54-0.92). Strong correlations were also found for within day testing (sweet ICC=0.75, CI=0.45-0.90; sour ICC=0.87, CI=0.69-0.95; salty ICC=0.72, CI=0.40-0.89) and moderate for (bitter ICC=0.52, CI=0.08-0.79 and umami ICC=0.56, CI=0.15-0.81), and across day testing (sweet ICC=0.71, CI=0.37-0.88; sour ICC=0.87, CI=0.69-0.95; salty ICC=0.53, CI=0.10-0.79; bitter ICC=0.84, CI=0.63-0.94; umami ICC=0.77, CI=0.52-0.91). Diet on the morning of testing did not have an effect on taste thresholds.

Conclusion
This study confirms reliability of fatty acid taste thresholds is similar and often better than that of the other basic tastes.

Source of Funding
CPAN, Deakin University

P25

The effect of glycaemic load on satiety in healthy adult males

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Background
This study examines the feasibility of using glycaemic load as a predictor of appetite, satiety and hunger and its physiological and psychological impact. Blood glucose levels are an important determinant of food drive with low blood glucose signalling meal initiation and hunger. Low glycaemic load (GL) foods result in sustained glucose release and are thought to increase satiety.

Objective
To examine if individuals consuming a low GL diet will have a sustained blood glucose response and increased feelings of satiety when compared with those individuals consuming a high GL diet.

Design
In a randomised blinded cross-over trial, 24 healthy male individuals were asked to consume two diets, one low GL and one high GL, for a 12-hour period on two occasions at least 7 days apart. Diets were matched for macronutrient content and fibre and supplied an energy content of approximately 9000 kJ/day with 15% protein, 30% fat, 55% energy and 25 g fibre per day in line with the current New Zealand dietary recommendations. Over the test period, participants were monitored for their blood glucose response and completed subjective ratings (VAS) of satiety. Subjects also completed a 3-day diet record prior to each intervention.

Outcomes
The results of this study show that although blood glucose response was lower with the low GL diet (iAUC), the reduction was not significant (P≥0.05) similarly visual analogue scale ratings (iAUC) showed that satiety was not significantly greater when participants were fed the low GL diet (P≥0.05).

Conclusion
From the results of this study it is not possible to conclude that low glycaemic load diets result in greater satiety over a 12 hour period in a young male population.

Source of Funding
The project was funded through a Foundation for Research, Science and Technology programme, Foods for Energy Management.

P26

Correlates of dieting or trying to lose weight differ between male and female Otago adolescents

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Background
There is increasing pressure for adolescents to be thin and this may not always be acted upon in healthy ways, for example restriction of certain foods or by skipping meals.

Objective
To identify correlates of dieting or doing something to lose weight (DOTTLW) in adolescents from Otago, New Zealand.

Design
A web-based survey of students from school years nine and ten (mean age 14.1± 0.7 years) from 19 Otago secondary schools was conducted in 2009. The survey collected information on food consumption and factors influencing this. Associations between DOTTLW and potential correlates were examined using odds ratios.

Outcomes
10.2% of the 1379 participants reported that they were DOTTLW. 14.7% of girls reported that they were DOTTLW, compared with 7.0% of boys (p<0.001). 17.0% of those who were overweight were DOTTLW compared to 8.1% of those of normal weight (p<0.001). Girls who reported that they were DOTTLW were more likely to consider the healthiness of food that they eat as important (OR: 3.02, 95% CI: 1.34-6.80), report liking vegetables (OR: 1.47, 95%CI: 1.03-2.08) and wanting to eat vegetables everyday (OR: 1.64, 95%CI: 1.14-2.36) compared to those who were not. However, boys who reported that they were DOTTLW were less likely to report eating three meals a day (OR: 0.46, 95%CI: 0.26-0.82) and more likely to report they thought that "consuming fruit and vegetables daily makes you better looking" (OR: 2.09, 95%CI: 1.19-3.69).

Conclusion
These findings suggest that girls who were DOTTLW were more likely to be aware of the importance of doing so healthily. However, boys were more likely to engage in unhealthy practices. This suggests that healthy weight loss messages may need to be more widely promoted to boys.

Source of Funding
University of Otago, Dunedin City Council and Otago Regional Council.

P27

Effect of calcium supplement and dairy food interventions on body weight: A meta-analysis

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Background
There have been reports that high intakes of dietary calcium can assist in weight loss.

Objective
We conducted a meta-analysis of randomised controlled trials (RCTs) in adults to assess the effect dietary calcium has on body weight through provision of calcium supplements or dairy products.

Design
Electronic databases Medline, EMBASE and CINAHL from 1994 to September 2009 as well as the Cochrane Library of Controlled Trials using search terms: 'calcium' or 'dairy supplement' with 'weight' and 'administering'. RCTs of 12 weeks or longer with the provision of at least 300 mg/d of added calcium to participants over 18 years of age were included.

Outcomes
Twenty-two studies met the inclusion criteria (including 29 trial arms; 14 with dairy foods, 15 with calcium supplements). Calcium intake increased on average by 900mg per day in both intervention groups (calcium supplements, dairy foods). In the calcium supplement studies, there was no difference in mean weight change between the intervention (n = 1495) and control (n = 1522) groups (mean difference -0.76 (-1.63, 0.12) kg, P=0.97). In the dairy food intervention studies, there was no difference in mean weight change between the intervention (n = 506) and control (n = 492) groups (mean difference -1.15 (-3.03, 0.72) kg, P=0.18).

Conclusion
There is no evidence from randomised controlled trials of at least 12 weeks, that increasing dietary calcium intake by 900 mg/day either by supplements or dairy foods reduces body weight in adults.

Source of Funding
Deakin University.

P28

The relationship between dietary patterns and nutrition knowledge and taste preferences in adolescents from Otago, New Zealand

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Background
Only a small proportion of New Zealand adolescents consume the recommended servings of fruits and vegetables (F&V). However, limited information is available on the correlates of F&V consumption.

Objective
The current study aimed to identify if dietary patterns determined using principal component analysis (PCA) are associated with nutrition knowledge and taste preferences in Otago adolescents.

Design
A web-based survey of students from school years 9 and 10 (mean age 14.1±0.7 years) from 19 Otago schools was conducted in 2009. Information was collected on food consumption using a short, validated FFQ, and potential correlates of F&V consumption. Dietary patterns were determined using PCA. Associations between dietary patterns and nutrition knowledge and taste preferences were examined using Generalised Estimating Equations.

Outcomes
Two dietary patterns were identified using data from 847 boys and 660 girls. The first was a 'Treats" pattern that was associated with higher intakes of confectionery, sugary drinks, crisps and chips. The second was a "F&V" pattern that was associated with higher intakes of fruit and vegetables. A 1SD unit increase in the "F&V" score was associated with a 0.05 unit increase in the liking of F&V score (CI: 0.04, 0.06), a 0.17 unit increase in the liking starchy foods score (CI: 0.12, 0.21) and a 0.14 unit increase in the nutrition knowledge score (CI: 0.09, 0.19). A 1SD unit increase in the "Treats" score was associated with a 0.15 unit increase in liking sweet foods score (CI: 0.04, 0.06) and a 0.18 unit decrease in the nutrition knowledge score (CI: -0.23, -0.13).

Conclusion
Interventions focusing on improving food intake in these adolescents should include nutrition education and exposure to a wide range of F&V.

Source of Funding
Supported by grants from the University of Otago, Dunedin City Council, and Otago Regional Council. Maria Polak was supported by a studentship from the Otago Medical Research Fund.

P29

The relationship between dietary patterns and meal frequency and sleep in adolescents from Otago, New Zealand

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Background
Dietary patterns have been associated with some health related outcomes such as BMI, but to date their relationship with sleep remains understudied.

Objective
To identify if two dietary patterns determined using principal components analysis (PCA) are associated with meal frequency and sleep duration in Otago adolescents.

Design
A web-based survey of students from school years nine and ten (mean age 14.1± 0.7 years) from 19 Otago schools was conducted in 2009. Information was collected on food consumption (using a short, validated food frequency questionnaire) and potential correlates of fruit and vegetable (F&V) consumption. Dietary patterns were determined using PCA. Associations between dietary patterns and meal frequency and sleep duration were examined using Generalised Estimating Equations.

Outcomes
Dietary pattern, meal frequency and sleep duration data were available for 1346 participants. PCA produced two dietary patterns. The first "Treats" pattern was associated with higher intakes of confectionery, sugary drinks, crisps and chips. The second "F&V" pattern was associated with higher intakes of fruit and vegetables. Girls had a lower "Treats" score (-0.27) compared to boys (0.21, $p<0.001$) but there were no gender differences in "F&V" score. A SD unit increase in the "F&V" pattern score was associated with a five minute increase in average daily sleep time (CI:2,8), and an increased weekly frequency of consuming breakfast, lunch and evening meals. A SD unit increase in the "Treats" pattern score was associated with a four minute decrease in average daily sleep time (CI:1,7) and a decreased weekly frequency of consuming breakfast.

Conclusions
A more healthful dietary pattern was associated with more beneficial health behaviours. Interventions focusing on adolescent behaviours should focus on multiple outcomes.

Source of Funding
University of Otago, Dunedin City Council and Otago Regional Council.

P30

Consumption of dairy products: most Australians do not meet recommended targets

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Background
Only minimal monitoring of dietary patterns in Australia has been performed. The most recent population diet survey was performed prior to the introduction of quantitative targets for dairy consumption and data has not been compared to these targets. Furthermore, simple parameter estimates (mean, median, variance) are inadequate for describing the skewed distribution of dietary variables.

Objective
To describe the epidemiology of dairy consumption in Australians aged 12 years and over, and to compare patterns with national recommendations in standard serve units.

Design
We developed a new method of combining quantitative data from a food diary with semiquantitative data from a food frequency questionnaire (FFQ), to investigate the usual patterns of dairy consumption without needing to adjust data for within-person variance. We applied this to data from the 9,096 Australians aged 12 and over who completed the FFQ part of the most recent nationally representative nutrition study—the 1995 National Nutrition Survey.

Outcomes
When weighted according to the characteristics of the Australian population, we found that only 38% of FFQ respondents regularly achieve their recommended targets for dairy consumption. Notably, dairy consumption was lowest in the adolescent age bracket for whom targets are highest.

Conclusion
Given recent evidence indicating protective effects of dairy foods for a range of metabolic and cardiovascular diseases, and the high prevalence of low dairy consumption, the development of effective and cost-effective public health interventions that target increased dairy consumption as part of a balanced diet is warranted. Adolescents should be a particular focus of such campaigns.

Source of Funding
This research was funded by Dairy Australia.

P31

Dairy products, metabolic risk factor development and causal inference in nutrition research: revisiting the CARDIA study

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Background
Conceptual and statistical hurdles are common in nutrition research, stemming from the complexity of the underlying mechanisms and the frequent reliance upon observational study designs. Out of this sometimes contradictory literature, dairy foods have emerged as potentially offering protection against the development of obesity and other metabolic risk factors.

Objective
To investigate the effects of dairy consumption upon the development of metabolic risk factors in the Coronary Artery Risk Development in Young Adults (CARDIA) study, highlighting some of the pitfalls of nutrition research with respect to specification and evaluation of causal pathways.

Design
Original analysis of secondary data and assessment of the relevant conceptual frameworks and methodological approaches.

Outcomes
We found that in the CARDIA cohort, after 10 years of follow-up, individuals in the highest quintile of dairy consumption had a relative risk (RR) of obesity that was 48% lower than in the first quintile (RR, 0.52 [0.43, 0.65]), a 58% lower risk of hypertension (RR, 0.42 [0.29, 0.61]), a 43% lower risk of dyslipidemia (RR, 0.57 [0.42, 0.79]) and a 51% lower risk of abnormal glucose homeostasis (RR, 0.49 [0.35, 0.69]). In contrast to the original analysis, we found that these effects were only partially moderated by baseline weight status, and were of similar magnitude regardless of baseline overweight status.

Conclusion
Careful consideration must be given to causal pathways and the functional form of associations, to prevent biased estimation of effects and misinterpretation of results. Further investigation of the health effects of dairy consumption in the CARDIA cohort is warranted.

Source of Funding
This study was not funded by any research grants, financial or other assistance.

P32

Practicalities of menu-based changes to improve dairy calcium intake in ambulatory aged care residents

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Background
Low dietary calcium intakes (<600 mg/day) are common in low-level aged care residents and contribute to fracture risk. Limited data is available describing menu-based changes to improve dietary calcium intake and none have been comprehensively evaluated.

Objective
We aimed to increase dietary calcium intake in residents to recommended levels (1300 mg/day) via the food service by including two additional serves of dairy foods per day to the menu.

Design
Dietary intake was assessed using three-day food intake records in 64 low-level aged care residents (mean age 89 years, 75% females) from two facilities over six days throughout four-week menu cycles before, and after menu-modifications were commenced (12 days total). In consultation with food service staff, menu changes were made, consisting of recipe modifications, adding dairy foods to existing meals, substituting items for dairy foods or using dairy-based accompaniments to meals. Existing food ordering methods were used. Nutrient intake was evaluated using FoodWorks. Changes in dietary calcium intake were determined using repeated measures ANOVA.

Outcomes
Mean baseline dietary calcium intake was 550 ± 187 mg/day. During the supplementation period, mean calcium intake increased to 646 ± 290 mg/day (P<0.01). During the intervention period calcium intake improved over time, with a higher intake observed in the fourth week relative to the first week (860 ± 386 mg/day v 627 ± 344 mg/day, P<0.01).

Conclusion
Improvements in dairy calcium intake can be achieved through menu modifications however the aim of two additional serves of dairy was not obtained. Barriers included time constraints and reluctance to alter menus by food service staff. A more intensive intervention involving additional food service support is required and will be initiated to achieve the desired outcome of dietary calcium intakes at recommended levels.

Source of Funding
Supported by a grant from Dairy Australia.

P33

Copper intakes and food sources in northern Tasmanians

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Background
Copper is an essential trace element; copper containing cuproenzymes are involved in many processes ranging from the synthesis of neurotransmitters, myelin and prostaglandin to antioxidant defence. Recently, even mild deficiencies in copper have been associated with haematological abnormalities, altered immune function and hypercholesterolaemia. However, there is no Australian data in men, and little in women.

Objective
To assess the dietary copper intakes in northern Tasmanian men and women.

Design
The study was a cross-sectional observational study of 498 Tasmanian adults (192 men, 306 women). Subjects were recruited from an extract of the Australian electoral roll and completed a 121-item semi-quantitative food frequency questionnaire.

Outcomes
Absolute intakes of copper were significantly higher in men, compared to women (P=0.002). The mean intake for men (1.6 mg/d) was below the Australian/New Zealand AI of 1.7 mg/d; whereas the mean intake in women (1.4 mg/d) was above the AI of 1.2 mg/d. The lowest mean intakes and nutrient density were observed in men aged 25-34 yrs (100% consumed <AI) and women aged 45-54 yrs (50% consumed <AI). The largest contributors to dietary copper were cereal based foods (30%), vegetables (34%) and fruit (15%). Women had a higher copper nutrient density than men (0.21 µg/MJ v. 0.18 µg/MJ; P<0.001) and consumed proportionally more copper from vegetable, fruit and dairy sources, and less from meat. Overall, the major difference between subjects with higher or lower absolute intakes was energy intake; the mean difference in energy intakes between subjects that consumed <AI to those that consumed >AI was 36% (P<0.001).

Conclusion
Young men and middle aged women appeared to be at greatest risk of low copper intakes; however the lack of information regarding the dietary copper requirements of Australian populations makes the assessment difficult.

Source of Funding
Supported by a research grant from the Clifford Craig Medical Research Trust, Launceston, Tasmania.

P34

Increased risk of mild zinc deficiency in older male Tasmanians

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Background

Mild zinc deficiency is associated with delayed wound healing and impaired immune function. Although not always considered a problem in developed countries, zinc deficiency may actually be significant in these populations, particularly in older people.

Objective

To assess the zinc status of a sample of the Tasmanian population and determine which subgroups within the population may be at risk of suboptimal zinc status.

Design

This study used a cross-sectional observational design. In total, 498 northern Tasmanian adults (aged 25–84 yrs) were recruited from the Australian electoral roll. Subjects completed a semi-quantitative food frequency questionnaire, and provided blood samples collected into trace element free serum tubes; serum zinc was determined by flame atomic absorption spectroscopy.

Outcomes

Mean (SD) zinc intake was 11.9 (4.4) mg/day and 10.7 (3.6) mg/day for men and women, respectively. Fifty two percent of men and 9% of women consumed less than the Australian/NZ EAR of 12 mg/day and 6.5 mg/day, respectively. Major dietary sources were meat, fish and poultry (28%), cereal products, legumes and nuts (20%) and vegetables and dairy (18% for each). Mean serum zinc was 13.0 (2.4) µmol/L and 13.0 (2.5) µmol/L for men and women respectively; 15% of men and 7% of women had serum zinc concentration below the cut-off of 10.7 µmol/L and 10.1 µmol/L. The incidence of low intakes and serum zinc concentrations increased with increasing age in men; no men aged <45 yrs had low zinc status compared to 20% of men aged >55 yrs. A similar trend was not observed in women. Compared to other men, those with low serum zinc consumed 8% less zinc (P=0.13) and for these men meat sources contributed 28% less zinc (P<0.001).

Conclusion

The incidence of low zinc intakes and low serum zinc concentrations, particularly in men in the older age ranges, indicates that a significant proportion of this Tasmanian population may be at risk of suboptimal zinc status.

Source of Funding

Supported by a research grant from the Clifford Craig Medical Research Trust, Launceston, Tasmania, with technical support from J.Bartle, Royal Hobart Hospital.

P35

Fish oil as adjunct therapy for periodontitis- a review of the evidence

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Background

Periodontitis is a chronic inflammatory condition of the gums resulting from bacterial infection; if untreated it can result in tooth loss. Long chain omega-3 polyunsaturated fatty acids (LC n-3 PUFA) from fish oil are anti-inflammatory and have potential as adjunct therapy for several chronic diseases.

Objective

To review evidence for the use of fish oil supplementation in combination with standard treatment for periodontitis.

Design

A Medline and PubMed search was performed to identify relevant literature using search terms 'omega-3', 'n-3 PUFA', 'eicosapentaenoic acid (EPA)', 'docosahexaenoic acid (DHA)', 'periodontal disease' and 'periodontitis'.

Outcomes

Fish oil supplementation is associated with reductions of osteoclast activity and subsequent alveolar bone resorption in animal models of periodontal disease. Whilst studies in humans are limited, there is growing support for the use of fish oil for oral health. Three cross-sectional studies show that higher dietary intakes of DHA are associated with lower prevalence of periodontitis. Three clinical trials were identified with small participant numbers (ranging from 30-80 patients). LC n-3 PUFA dose ranged from 900 mg to 3000 mg per day with supplementation lasting between eight days and six months. None of these trials included measures of compliance to supplementation.

Conclusion

LC n-3 PUFA supplementation is consistently associated with reduced bone loss in animal models of periodontitis. Determining the molecular mechanisms underpinning this effect is an important next step. Long term clinical trials using feasible doses of fish oil as an adjunct therapy for periodontal diseases are warranted. Compliance with supplementation is critical for interpreting clinical outcomes.

Source of Funding

Not applicable

P36

Effect of Omani coffee on the glycaemic index of commonly consumed snack foods in Oman

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Background

Studies have shown that ingestion of caffeine/ coffee may affect insulin sensitivity and impair glucose homeostasis.

Objective

To study the effect of Omani coffee on the glycaemic response and glycaemic index of nine commonly consumed snack foods in Oman.

Design

Nine commonly consumed Omani snack foods were evaluated for their proximate chemical composition (AOAC, 2000) and glycaemic index. Portions of test foods and reference food (glucose) containing 50g of available carbohydrates were given in a random order to 12 healthy human volunteers with either water or Omani coffee to determine the glycaemic index (GI) according to methods described by Wolever et al. (1991 and FAO/WHO (1998).

Outcomes

Significant ($P<0.05$) differences were observed in the proximate chemical composition of foods. The moisture, crude protein and fat contents in these foods ranged from 21.9 to 67.5%, 4.3 to 17% and 2.7 to 23.4 % respectively. Almost similar blood glucose responses were observed when these foods were given with either water or Omani coffee. Significant ($P<0.05$) differences were observed in the glycaemic index of these foods. The glycaemic index of these foods when given with either water or Omani coffee ranged between 60 and 75 and 64 and 78 respectively. The lowest GI values (60 ± 5 and 57 ± 4) were observed for sambosa vegetables when given with water or Omani coffee respectively. Overall, no significant ($P<0.05$) differences were observed in the glycaemic index of foods when served with either water or Omani coffee.

Conclusion

Omani coffee did not significantly ($P>0.05$) affect the glycaemic response and glycaemic index of commonly consumed snack foods in healthy human volunteers.

Source of Funding

The financial assistance was provided by Sultan Qaboos University under research grant (IG/AGR/FOOD/11/01).

P37

The effects of dietary weight loss with or without exercise training on liver enzymes in obese metabolic syndrome subjects

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Background

Insulin resistance and visceral adiposity are predisposing factors for fatty liver disease.

Objectives

1. To compare the effects of dietary weight loss alone (WL) or together with aerobic exercise training (WL+EX) on liver enzymes, a surrogate marker of liver injury, in obese metabolic syndrome (MetS) subjects.
2. To identify anthropometric, metabolic, cardiovascular and dietary predictors of changes in liver enzymes

Design

Untreated men and women (n=63, aged 55 ± 1 yrs; BMI 32.7 ± 0.5 kg/m^2) who fulfilled ATP III MetS criteria were randomised to 12-weeks WL, WL+EX or no treatment (Control), using a modified DASH diet (30% fat, 22% protein, 48% CHO).

Outcomes

Body weight decreased by 7.1 ± 0.6 kg in the WL and 8.7 ± 1.0 kg in the WL+EX group ($P<0.001$); whole-body insulin sensitivity improved by 49 ± 11% and 45 ± 12% respectively ($P<0.001$). Fitness (maximal oxygen consumption) increased by 19 ± 4% ($P<0.001$) in the WL+EX group only. Alanine aminotransferase (ALT) decreased by 20 ± 5% in the WL and 24 ± 8% in the WL+EX group; corresponding values for γ-glutamyl transferase (GGT) were -28 ± 3% and -33 ± 4% respectively (all $P<0.001$ versus baseline; P=NS between groups). All parameters were unaltered in the Control group. Reduction in abdominal fat mass (measured by DEXA from L1-L4) independently predicted Δ ALT ($r=0.42$, $P=0.005$) and Δ GGT ($r=0.55$, $P<0.001$), whereas Δ dietary saturated fat intake was positively and independently associated with Δ ALT ($r=0.55$, $P=0.02$).

Conclusion

Reductions in central adiposity and saturated fat intake contribute to improvement in liver enzymes during lifestyle interventions.

Source of Funding

Supported by grants from Diabetes Australia and the National Health and Medical Research Council.

P38

Encouraging increased at-home evening meal preparation: an in-home study

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Background

Research suggests there have been increases in both expenditure and consumption of food away from home. Food prepared away from home is generally less healthy than foods prepared at home. Increased consumption of food away from home has been associated with a higher BMI, while frequency of at-home food preparation is positively associated with nutrition profile quality.

Objective

To examine barriers to and facilitators of preparing evening meals at home and to test the acceptability of homemade takeaway-style meals.

Design

In-home interviews were conducted with the primary food provider from 10 low-income New Zealand households (four Maori, four Pacific, and two NZ European) who had indicated they bought takeaways on at least two weekday evenings in the previous week. Following the interview, one of six takeaway-style replacement meals (eg pizza) was chosen, then prepared and consumed at home. All members of the household completed a post-meal questionnaire. Interviews were analysed using thematic analysis.

Outcomes

Families saw takeaways as an easy, hassle-free option the whole family enjoyed. However, given the opportunity to make and taste new meals, families enjoyed their homemade takeaway-style meals at least as much as store-bought takeaways. Takeaways were often purchased as a supplement to a meal in order to make home-prepared food 'go further', reduce the cost of purchasing takeaways for the whole family, reduce preparation time and dishes, or because parents knew children would eat takeaways. Although parents were keen to try new meals and add to their set repertoire, they were concerned that if their family didn't like the meal they would have wasted time, money, food and effort.

Conclusion

Participants' initial perceptions of a meal do not necessarily match their opinions once they have cooked and consumed the meal, emphasising the need for an experiential component in nutrition interventions. Understanding people's actual reactions to programme elements, such as recipes, aids message tailoring.

Source of Funding

Health Sponsorship Council is funded by Ministry of Health.

P39

Spring in2it! – a workplace wellness strategy

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Background

Over 50% of the New Zealand adult population is overweight or obese. The workplace has been found to be an ideal environment to implement wellness programmes as staff working together often have similar work environments, hours of work and conditions.

Objective

To assess an innovative self-monitored workplace wellness strategy, within a medium sized work environment. In particular to assess whether there can be change in risk factors for a number of lifestyle type diseases.

Design

Staff members were approached to participate in a 10 week wellness challenge. The challenge required people to complete a health screening and assessment prior to starting. The assessment included measures of body composition, blood pressure, blood lipids and glucose. Any significant issues were referred for medical assistance. Staffs were asked to record online their daily water intake, daily number of fruit and vegetables servings and daily minutes of exercise. At the end of 10 weeks they completed the same health screening and assessment.

Outcomes

A total of 84 participants completed the 10 week challenge. Over the 10 weeks the average exercise was 29min per day, fruit and vegetable intake was 3 servings per day and water intake was 1 litre per day. Over this time there was a significant decrease in total cholesterol ($5.37mmol/L_{pre}$, $5.17mmol/L_{post}$ P=0.018), systolic ($142mmHg_{pre}$, $139mmHg_{post}$ P=0.024) and diastolic ($86mmHg_{pre}$, $81mmHg_{post}$ (P<0.001)) blood pressure, weight ($79.3kg_{pre}$, $78.4kg_{post}$ (P<0.001)), girth ($95cm_{pre}$, $94cm_{post}$ (P=0.008)), fat mass ($27.6kg_{pre}$, $27.05kg_{post}$ (P=0.019)) and BMI ($28.6kg/m^2_{pre}$, $28.1kg/m^2_{post}$ (P<0.001)).

Conclusion

These findings suggest that a workplace wellness programme can have a positive effect on markers of health status, particularly cardiovascular disease and metabolic syndrome. The levels of exercise, fruit and vegetable intake and water intake were below the recommended levels as advised by the health authorities, and suggest that any change can be positive.

Source of Funding

Otago Polytechnic.

P40

Effects of a high salt meal on post-prandial serum sodium concentration

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Background
A meal high in salt has been shown to impair endothelial function post-prandially. The mechanism by which this occurs is not clear, but evidence suggests acute changes in plasma sodium may directly affect endothelial stiffness.

Objective
Our aim was to determine the acute effects of a high salt meal on post-prandial serum sodium concentration and whether it has a detrimental effect on augmentation index, a measure of arterial stiffness.

Design
Sixteen healthy normotensive adults received 250ml tomato soup with added salt containing 65mmol Na and a 250ml control tomato soup with no added salt containing 5mmol Na on two separate occasions in a randomised order. Serum electrolytes and osmolality, augmentation index (AIx), and blood pressure were measured fasting and post-prandially at 30 minute intervals up to 2 hours.

Outcomes
In response to the high salt meal serum sodium concentration was significantly increased to 141±1.26mmol/L, serum chloride by 106.69±2.70mmol/L and osmolality by 294.19±4.40mmol/L compared to the low salt control meal ($P<0.05$). Augmentation index increased post-prandially, but this was not significantly different between the high and low salt meals ($P>0.05$). No differences in blood pressure were observed between meals.

Conclusion
These results demonstrate that 3.8g salt, which represents an amount of salt consumed in a single meal, can raise plasma sodium post-prandially within 60 minutes. These changes in plasma sodium should be further explored to determine the mechanism by which salt may affect endothelial function.

Source of Funding
CSIRO Food and Nutritional Science.

P41

Fto gene expression under low or high glycemic index (GI) diet in pregnant mice and pups

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Background
Fetal tissues and organs go through critical periods of rapid development and cell division. Inappropriate fetal nutrition obtained via the placenta will program the distribution of cell types, hormonal feedback and metabolic activity. The mother's diet therefore shapes the metabolic programming of her fetus through epigenetic events. The fat mass and obesity associated gene (FTO) has been associated with increased weight and body mass index (BMI) and with other obesity-related traits such as leptin levels, subcutaneous and total fat, hip and waist circumference. Our hypothesis is that the expression of the FTO gene in the placenta and the tissues of pups of the low GI diet-fed mothers will be significantly lower those of the high GI diet mothers.

Objective
Our aim is to examine whether nutritionally different diets (high vs low GI) lead to up-regulation or dys-regulation of FTO gene expression and influence an individual's susceptibility to obesity.

Design
Before and after mating, female mice (n = 30) will be fed either a high GI diet or a low GI diet throughout pregnancy. Half of each diet group will be sacrificed at mid-gestation to recover placenta and embryo tissues for analysis. Male pups (n = 40) will be weaned at 3 weeks of age and fed a high GI diet. The two groups of pups will be further divided into 2 subgroups, one group controlled for energy intake, and one for weight. Pups will be weighed and glucose tolerance will be tested regularly to 4 months of age. Pups will then be sacrificed and all tissues will be collected for gene analysis, microarrays and other investigations.

Outcomes/Conclusion
This study will allow the investigation of the effects of nutritionally different regimes on FTO gene expression in specific tissues. If nutritional profile can differentially regulate the FTO gene expression and risk of obesity, then targeted interventions during pregnancy may reduce the risk of child obesity.

Source of Funding
Not applicable.

P42

Selenium-containing (Seleno) green tea: a possible chemopreventive activity against breast cancer in rats

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Background

Green tea has gained a good reputation for being a healthy drink and providing various health benefits including protective effects against cancer. The chemopreventive efficacies of various forms of selenium compounds against breast cancer have also been reported.

Objective

To assess the chemopreventive potential of selenium-containing green tea (Se-GTE) and regular green tea (R-GTE) against breast cancer induced by 7, 12-dimethyl-benz(*a*)anthracene (DMBA) in female Sprague Dawley rats.

Design

Forty, 50-day old, female rats were divided into 4 equal groups (n=10 rats/group). Groups 1 to 3 were orally gavaged with a single dose of DMBA (50 mg/kg body weight) while the fourth group was intubated with a similar dose of the vehicle (corn oil). One day after DMBA gavaging, the rats in the first group were gavaged with 10 ml of water extract (1% extract) prepared from Se-GTE 3 times weekly for 9 weeks while the rats in the second group were gavaged with a similar dose of N-GTE. The rats in the third and the fourth groups were gavaged with the same volume of water to serve as control groups.

Outcomes

Nine weeks after giving DMBA, mammary tumors were found in 8 (80 %) and 4 (40 %) of rats gavaged orally with water and 10 ml/kg of water extract from R-GTE, respectively. Rats gavaged with R-GTE had significantly fewer ($P<0.05$) tumors than control group gavaged with water. In contrast, rats gavaged with water extracts from Se-GTE had no mammary tumors. These results are the first to show that oral administration with Se-GTE extract after DMBA-dosing may provide protection against chemical-induced mammary cancer. Thus, Se-GTE may be a useful dietary ingredient with a possible anticarcinogenic capacity.

Conclusion

The superiority of Se-GTE over R-GTE may be due to the synergistic effect between polyphenolic compounds and organic selenium which are both potent antioxidants and have antiangiogenic capacities.

Source of funding

Supported by a grant from the Hawler Medical University, Erbil (Iraq).

P43

Characterisation of manuka honey produced in New Zealand based on pollen analysis, peroxide content and antioxidant activities

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Background

New Zealand manuka honey is recognised for its highly effective antimicrobial activity due to its hydrogen peroxide and antioxidant content. To be classified as a manuka honey it should contain more than 70% manuka pollen, unfortunately many honey brands sold in New Zealand do not reach this minimum standard.

Objective

To investigate the hydrogen peroxide content, antioxidant activity and other characteristics of manuka honey produced in New Zealand. To compare composition of manuka honey to clover honey.

Design

Seventy four honey samples produced in New Zealand were analysed for pollen, moisture, total acidity, total phenols, peroxide, glucose, fructose, HMF contents, pH, colour, conductivity value and antioxidant activities.

Outcomes

Thirty nine honey samples were labeled as pure manuka, 9 samples were labeled as manuka blends, while the remaining samples were clover (25) and tawari. From the pollen counts, only 17 samples could be classified as manuka honey. The pollen in 35 of the remaining samples was predominantly manuka pollen but this was less than 70%. Twenty two samples were clover. For all of the parameters measured, there was no significant difference ($P<0.01$) between the true manuka honeys and the blends containing manuka. Peroxide values ranged from 1.2-11.7 µg/g/h and antioxidant activity (ORAC) ranged from 3.6-14.5 µmol trolox equivalent/g. The total phenolic content of manuka honey was significantly ($P<0.0001$) correlated to both the ORAC activity ($r=0.672$) and colour ($r=0.874$). Total phenolics and peroxide content in true manuka honey was significantly different to those in clover honey ($P<0.01$) whereas there was no significant difference in antioxidant activity and other parameters between these honeys.

Conclusion

The labelling of manuka honey is often poor. Honeys with greater than 70% manuka pollen did not significantly differ from manuka blends (<70%) in the chemical parameters that were measured here. Manuka honey had significantly higher total phenolics and peroxide content than clover honey.

Source of Funding

Lincoln University post graduate research funds
Airborne Honey Ltd.

P44

Effect of all-vegetable diets on leg abnormalities of broiler chickens

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Background
The incidence and severity of leg problems in broiler chickens are of great concern, both from product quality and animal welfare points of view. The increased exclusion of animal protein from diets will aggravate this problem. The formulation of all-vegetable diets is also rather difficult.

Objective
To assess the incidence and severity of leg problems of broilers fed on all-vegetable diets.

Design
One hundred and sixty day-old chicks were assigned to five treatments with eight replicates, four chicks each replicate in a completely randomised design. Two diets were entirely vegetable and included soybean and canola meal in a 2:1 ratio. Another two diets were conventional, containing soybean, canola and fish meals. The Control was a commercial-type diet containing canola, soybean, mung bean and tallow mixer in addition to the basal grains. All diets were iso-caloric and iso-nitrogenous, supplemented with enzymes, and supplied to the birds from 1 to 35 days. Data on latency-to-sit (LTS) and gait-scoring tests (Berg and Sanotra, 2003; Webster et al., 2008), right tibia bone characteristics (bone weight, length, width, breaking strength, bone ash) and bone mineral contents (Ca, P, Mg, Fe, Mn, Zn and Cu) were measured and analyzed. All collected data were subjected to statistical analysis, using Minitab.

Outcomes
Birds on the conventional diets could stand longer ($P<0.01$) than the birds fed with all-vegetable and control diets. Conversely, birds on the all-vegetable and control diets had higher ($P>0.05$) gait scores than the ones in the conventional diet groups. The conventional diets supported increased ($P<0.05$) bone length and higher breaking strength than those on the other diets. Bone mineral concentrations were similar between the groups, except for Fe, which was significantly higher ($P<0.05$) in chicks on the conventional diets than on the others.

Conclusion
The conventional diets supported better leg bone development than the all-vegetable diets. However, there is a need to assess the effects of the two types of diets on meat yield, meat quality and product shelf life.

Source of Funding
The University of New England.

P45

Actinidin-containing kiwifruit extract enhances the stomach protein digestion of some dietary proteins in rats

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Background
Kiwifruit (*Actinidia deliciosa* cv. Hayward) contains the protease actinidin and anecdotally kiwifruit is believed to aid digestion through the action of actinidin.

Objective
To study the effect of actinidin on the gastric digestion and stomach emptying rate (SER) of selected dietary proteins.

Design
A total of 96 Sprague-Dawley male rats were fed with semi-synthetic diets containing either beef-muscle protein, whey protein isolate (WPI), soy protein isolate (SPI), gelatin, zein or gluten protein, as the sole nitrogen source, in either the presence (+A) or absence (-A) of an actinidin-containing kiwifruit extract. Titanium dioxide was used as an indigestible marker. Rats were fed freshly prepared diets, euthanised around five hours after meal ingestion and the gastric contents collected for electrophoresis (SDS-PAGE), densitometry and titanium dioxide analysis. Additionally, SER were measured in beef-muscle protein and WPI using a magnetic resonance spectroscopy (MRS) technique. Eight adult rats were fasted overnight and received a single gavaged dose of the dietary mixture (diet, $AlCl_3$ [marker detectable by MRS only in an acidic environment] and acidified water [pH 2], 7:1:9, w:w:v). The rats were immediately placed in the MRS and SER was estimated over 130 min from the disappearance of $AlCl_3$.

Outcomes
The presence of dietary actinidin increased ($P<0.05$) the gastric digestion of beef-muscle protein, gelatin, SPI and gluten (40, 60, 27 and 29% units, respectively). In contrast, actinidin did not affect the gastric digestion of zein and WPI ($P>0.05$). The SER was greater for the actinidin- containing beef muscle-based diet (10.6% per h, for [-A] and 18.5% for [+A], $P=0.001$). In contrast, no difference was found for the WPI-based diet (21.3% for [-A] and 24.0% for [+A] $P>0.05$).

Conclusion
Kiwifruit extract increases the stomach digestion and SER for some proteins possibly through the action of actinidin, which may have a positive effect on feelings of gastric over-fullness associated with high protein diets.

Source of Funding
Supported by Zespri International Ltd.

P46

Available (ATP) energy contents of two varieties of kiwifruit (*Actinidia deliciosa* var *Hayward* and *Actinidia chinensis* var *Hort16A*)

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Background
Current methods for calculating the energy content of foods using estimated food energy values (Atwater factors) may not be accurate for high fibre or high protein foods due to the diversity in chemical composition and digestibility of these macronutrients. A model which combines an *in vivo-in vitro* digestibility assay and stoichiometric relationships describing nutrient catabolism has been developed to allow prediction of the available energy content of a food in terms of its ATP yield.

Objective
To determine the available energy of two varieties of kiwifruit using the *in vivo–in vitro* digestibility assay.

Design
The *in vivo-in vitro* model uses the growing pig as a model for upper gastrointestinal tract digestion in humans and ileal digesta incubated *in vitro* with human faecal inocula to simulate large intestine fermentation. Kiwifruit was fed to growing pigs and ileal digesta collected. Ileal nutrient digestibilities were determined. A sample of ileal digesta was then incubated with a human faecal inoculum and the fermentable organic matter determined.

Outcomes
The predicted available ATP energy contents of the Hayward and Hort16A kiwifruits were 5.9 and 6.2 kJ g^{-1} dry matter respectively, approximately 47.2-50.8% of the determined metabolisable energy content. The available energy content of the kiwifruit expressed relative to the available energy content of dextrin (a highly digestible source of glucose) was 0.57 and 0.61 for Hayward and Hort16A respectively. Comparable ratios for metabolisable energy were 0.74 and 0.73. The energy content of kiwifruit in relation to dextrin was higher for Hayward kiwifruit compared to Hort16A when based on metabolisable energy but lower when based on available energy.

Conclusion
The metabolisable energy values overestimate the energy content of kiwifruit that is available to the cell. In addition, the two energy systems ranked the kiwifruit varieties differently in terms of energy supply to the body.

Source of Funding
ZESPRI™ International Ltd.

P47

Partial replacement of fish meal with whole hatchery waste meal and their effects on the performance and carcass characteristics of broilers

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Background
Performance and carcass characteristics of broilers may be improved with the partial replacement of fish meal (FM) with whole hatchery waste meal (WHWM) in broiler diets.

Objective
To determine whether 0, 10, 20 or 30% replacement of FM with WHWM in broiler diet may improve the general performance and carcass characteristics of broilers.

Design
A total of 180 day-old broilers were recruited and redistributed into four treatment groups consisting of 45 birds per treatment. In this study, processed WHWM replaced FM, protein for protein in broiler diets at 0, 10, 20 or 30% replacement levels. The experimental protocols lasted for 6 weeks and data were subjected to analysis of variance in a randomised complete block design to compare the effects of the four treatments diets on feed intake, weight gain, efficiency of feed utilisation, carcass weight, dressing percentage abdominal fat and internal organs.

Outcomes
Proximate analyses of the two test ingredients showed that WHWM had higher ash content and ether extract that FM. However, crude protein content of FM was higher than those of WHWM. Calcium-phosphorus ration was 16:6.1 for WHWM in comparison with 1.5:1 in the FM. Broilers fed 10% WHWM diet had highest significant values ($P<0.05$) in feed intake and weight gain, carcass weight, dressing percentage, internal organs (liver, lungs, heart and gizzard) and blood parameters. While as, feed conversion efficiency and abdominal fat were highest ($P<0.05$) at 30% WHWM replacement level compared to other treatment groups. Cost of feed consumption/bird decreased significantly ($P<0.01$) with increase in the levels of WHWM replacement in the diets.

Conclusion
Replacing fish meal with whole hatchery waste meal in broiler diet appears to be most beneficial in improving general performance and carcass traits of broilers.

Source of Funding
Supported by Research Innovation Fund of the Central University of Technology, Free State, South Africa.

P48

Vitamin E supplementation protocols and their effects on reproductive performance of South African mukota boars

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Background
The optimal level of vitamin E needed to improve the reproductive performance in boars and subsequent improvements in fecundity rate and litter size in artificially inseminated (AI) sows has not been conclusively determined.

Objective
To investigate whether vitamin E supplementation may improve boar libido and semen viability with a concomitant improvement in the fecundity rate of AI sows.

Design
A total of 12 mukota boars were recruited immediately after weaning and at 10 months of age they were subjected to a 2 x 3 factorial experiment in a randomised complete block design to compare the effects of 0, 40 and 70 IU per kg of dl-α-tocopheryl acetate per kg of diet on libido (reaction time), sperm quality and serum α-tocopherol of boars and subsequent fertility in AI sows in two breeding periods. Libido was recorded as the reaction time (RT) (in minutes) and was defined as the time from intromission to ejaculation. Semen was collected by the use of an artificial vagina device following RT, and analysed for quantitative and qualitative parameters using standard procedures.

Outcomes
In comparison with 0 IU (control), 40 and 70 IU per kg diet of dietary vitamin E supplements resulted in a significant reduction in the RT ($P<0.05$), mostly in the 70 IU vitamin E group. The 70 IU vitamin E boar group produced semen with the highest sperm cell viability ($P<0.05$). Sow fecundity and litter size were increased significantly ($P<0.01$) per breeding period, increasing more from periods one to two, mostly when dietary vitamin E was increased from 40 to 70 IU/kg diet.

Conclusion
Supplementing dietary vitamins E such as α-tocopheryl acetate in boar's diets appears to be most beneficial in optimising libido and spermatozoa viability in breeding boars, with subsequent improvements in fecundity rate and litter size in AI sows.

Source of Funding
Supported by Rated Researchers' Incentives from the National Research Foundation (NRF), South Africa.

P49

The effect of falcarinol on platelet aggregation: assay development using carrot cultivars

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Background
Platelets are specialised cells that play central roles in physiological responses, including haemostasis, inflammation and wound healing. These processes involve platelet aggregation. Falcarinol is a polyacetylene that is present in carrot (*Daucus carota* L.), and known to inhibit platelet aggregation, which may reduce aggregation and maintain healthy blood flow.

Objective
The aim of this study was to determine the inhibitory effects of falcarinol on platelet aggregation in the presence of the agonists, adenosine diphosphate (ADP) and arachidonic acid (AA), which trigger platelet aggregation by separate pathways.

Design
An AA concentration of 62.5 µg/mL, an ADP concentration of 10 µM, and 80 % (v/v) platelet-rich plasma (PRP) were selected from the relevant dose response curves to give optimal platelet aggregation responses. A carrot cultivar with mean falcarinol content of 358 µg/g ± (90) dry weight was used for a preliminary human feeding trial. Healthy individuals (n = 3) received a dose of approximately 18 mg of falcarinol in 50 g of freeze-dried carrots for breakfast. Platelet aggregation induced by ADP or AA were measured using platelets obtained from the subjects before breakfast and 2 h after breakfast.

Outcomes
Consuming carrots caused a 40 % decrease in platelet aggregation induced by ADP and a 70 % decrease in aggregation induced by AA.

Conclusion
These preliminary results demonstrate inhibition of platelet aggregation across multiple pathways and support further investigation of falcarinol-rich carrot cultivars for their potential to help maintaining healthy blood flow.

Source of Funding
Not applicable.

P50

Osteochondritis Dissecans (OCD) in Thoroughbred horses is associated with hypoinsulaemia in early post-natal life

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Background

OCD is a common developmental orthopedic disease in young horses and foetal programming modulated by maternal diet may be important in its pathogenesis.

Objective

To examine the relationship between glucose homeostasis and the occurrence of OCD in Thoroughbred yearling horses.

Design

Jugular blood samples, following an overnight fast, were obtained from yearlings at Thoroughbred stud farms across two years. OCD and other skeletal abnormalities were determined via radiographic analysis and categorised as high-risk abnormalities (OCD and related subchondral bone cysts, fractures or lesions) versus no significant abnormalities (NSA). Plasma insulin and glucose concentrations were determined.

Outcomes

Overall, the incidence of high-risk abnormalities across sampled studs was 23.2%. Fasting plasma insulin concentrations were significantly ($P<0.01$) lower in yearlings within the high-risk group (2.3±0.2 mIU/L; n=42) compared to the NSA group (3.4±0.2 mIU/L; n= 91). However fasting glucose concentrations were not significantly different between groups. There was no significant effect of stud farm or year on overall insulin or glucose results. Furthermore, resting insulin concentrations from samples obtained earlier in post-natal life, at foal and weanling ages (3 and 6 months), revealed significant hypoinsulinaemia in horses that subsequently developed OCD and related bone abnormalities by yearling age.

Conclusion

The results suggest an association between OCD and chronic hypoinsulinaemia in early post-natal life. This would support the notion that the pathogenesis of equine OCD is related to development in utero.

Source of Funding

Supported by a grant from the RIRDC Horse Program.

P51

Comparison of carbohydrate composition in sweetpotato- and maize-based infant foods

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Background
Novel sweet potato-based complementary foods (oven-toasted, extrusion-cooked and roller-dried ComFa), which can be processed at both the household and industrial levels have been developed by the authors as an alternative to cereal-based infant foods, which are usually high in phytate, which limits the bioavailability of some nutrients. These ComFa formulations contain low levels of phytate and appreciable amounts of β-carotene (provitamin A) when compared with traditionally used maize-based infant food.

Objective
To compare the carbohydrate composition in the sweet potato-based formulations with the maize-based complementary food (Weanimix) because carbohydrate affects viscosity, and consequently the nutrient density.

Design
Total carbohydrate (by difference), maltose, sucrose and free D-glucose (using K-MASUG 10/04 assay kit) and free D-fructose (estimated) levels were determined in the formulations.

Outcomes
The total carbohydrate in the formulations were significantly different (P=0.0001), ranging from 50 to 60 g/100 g. The levels of the maltose and sucrose in the heat-processed sweet potato-based foods were more than 65% of the total carbohydrate compared to 6.0% for the maize-based product (P<0.0001) indicating a higher starch level in the maize-based formulation. Both free D-glucose and free D-fructose were relatively high in the ComFa formulations by a difference of more than 100% (P<0.0001 and P=0.002, respectively) than in the maize-based product.

Conclusion
The significantly higher levels of simple sugars (maltose, sucrose and fructose) and lower starch content of the sweetpotato-based complementary foods have significant nutritional implications. Porridge prepared from sweet potato-based complementary foods would not be as viscous as from the maize-based product, so it would not require extensive dilution with water, leading to "nutrient-thinning" (i.e. nutrient density dilution). The sweet potato-based foods would be naturally sweeter than the maize-based product which is likely to result in higher food intake by infants.

Source of Funding
Nutricia Research Foundation (Project number: 2011-30).

P52

The feasibility of baby-led weaning: formative research for a randomised controlled trial (BLISS)

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Background
Baby-Led Weaning (BLW) is an alternative method of introducing solid foods to babies that is baby-led rather than parent-led and thus has the potential to reduce excessive infant weight gain.

Objective
To describe the characteristics and popularity of BLW, and attitudes towards it, in New Zealand in order to determine its feasibility as an alternative infant feeding option.

Design
Phase 1: Interviews with 20 parents who had used BLW. Phase 2: Internet survey (n=230) to assess whether parents would be prepared to try BLW. Phases 3 and 4 followed families weekly for 3 months and compared the experience of following BLW (Phase 3; n=15) with that of following BLISS – Baby-Led Introduction to SolidS – a modified version of BLW to address iron and choking (Phase 4; n=14).

Outcomes
Parents who had used BLW liked the convenience and family-oriented mealtimes, and viewed BLW as being healthier than current practices, although they were worried about iron. Over 30% of our survey sample had tried BLW and 51% of those who had not would be willing to try it with a subsequent child. Parents who trialled our resources to support families implementing BLISS reported that "*they helped our level of 'parental anxiety', the resources were practical, easy to follow and engaging*". Those following BLISS offered considerably more iron-containing foods than those following BLW (2.1 vs 0.6 serves/day).

Conclusion
BLISS, a modified form of BLW, appears to be a viable way of introducing solids to infants and will be tested within a large randomised controlled trial commencing in 2011.

Source of Funding
Otago University

P53

The impact of mandatory fortification of bread with iodised salt in New Zealand school children

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Background
In response to the re-emergence of widespread mild iodine deficiency observed in New Zealand in the 1990s and early 2000s, the New Zealand government legislated the mandatory fortification of bread with iodised salt, effective from October 2009.

Objective
To evaluate the effect of the mandatory fortification of bread with iodised salt on the iodine status of schoolchildren.

Design
Primary schools in the cities of Dunedin and Wellington were randomly selected to participate. All children aged 8-10 years from each school were invited to take part. The following data were collected from each child: a casual urine sample for the determination of urinary iodine concentration (UIC), a 1 mL fingerprick blood sample for the determination of serum thyroxine, and general socio-demographic characteristics. In conjunction with a parent or caregiver, children were also asked about the usual consumption of foods that are typical sources of iodine in the diet, including fortified bread.

Outcomes
A total of 150 children took part in the study from 8 schools in Wellington (n=80) and 9 schools in Dunedin (n=70). The median UIC of the children was 113 µg/L (25^{th}, 75^{th} percentile: 78, 159); 40% of children had a UIC <100 µg/L and 12% <50 µg/L. The mean (SD) serum thyroxine concentration was 114 (17) nmol/L; the normal reference range for children of this age group is 69-154 nmol/L. Children consumed, on average, 1.5 servings of bread made with iodised salt each day.

Conclusion
The mandatory fortification of bread with iodised salt has improved the iodine status of New Zealand schoolchildren, however, this improvement is relatively modest. The use of iodised salt in a wider range of manufactured foods than bread should be considered to safeguard the iodine status of school children in New Zealand.

Source of Funding
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P54

Low serum concentrations of micronutrients are associated with high adiposity in Mexican American children

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Background
Micronutrients deficiencies may be underlying factors associated with increased body fat deposition.

Objective
To examine the association between serum micronutrients concentrations and adiposity in Mexican American children.

Design
We analyzed data from 1,131 Mexican American children 8–15 years of age included in the 2001–2004 US National Health and Nutrition Examination Surveys. Children's body mass index (BMI), trunkal fat mass (TrFat) and total body fat mass (TBF) were used as measures of body adiposity (BA). The associations of serum concentrations of micronutrients with BA were determined using linear and multinomial regression models under multiple imputation command that accommodates sample weight and potential confounders.

Outcomes
Serum concentrations of vitamin B12, folate, vitamin D, α-carotene, trans-β-carotene, cis-β-carotene, and α-tocopherol/cholesterol ratio were found to be inversely associated with BMI, TrFat and TBF. These associations persisted even after controlling for potential confounders. In multinomial regression model, the highest quartiles of α-tocopherol, vitamin B_{12}, α-carotene and trans-β-carotene concentrations were associated with a reduced risk of obesity (RRR=0.68, 95%CI=0.47–0.98, P=0.04; RRR=0.61, 95%CI=0.42–0.89, P=0.01; RRR=0.44, 95%CI=0.31–0.89, P=0.64; RRR=0.24, 95%CI=0.17–0.34, P<0.001). The highest quartiles of serum vitamin D, cis-β-carotene, and α-tocopherol/cholesterol ratio concentrations were associated with a reduced risk of overweight (RRR=0.58, 95%CI= 0.40–0.86, P=0.01; RRR=0.61, 95%CI=0.41–0.90, P=0.01; RRR=0.56, 95%CI=0.37–0.83, P=0.004) and obesity (RRR=0.49, 95%CI=0.34–0.69, P<0.001; RRR=0.33, 95% CI=0.23–0.46, P<0.001; RRR=0.40, 95%CI=0.27–0.60, P<0.001).

Conclusion
Serum micronutrient concentrations were inversely associated with BMI, TrFat and TBF in Mexican American children.

Source of Funding
None

P55

Engagement of schools with the Project Energize nutrition and physical activity programme

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Background
The environment provides an ideal setting for programmes to improve child health by encouraging daily moderate and vigorous physical activity and healthier eating patterns. Project Energize has been operating in Waikato (NZ) primary schools since 2005. The programme, delivered by Sport Waikato, currently includes 40,000 children, 244 schools, 27 "Energizers" and 1 dietitian. Energizers are assigned 8-12 schools each and act as a "one stop shop" to support activities that promote and coordinate improved nutrition and physical activity within schools. The programme was evaluated in early 2011.

Objective
To identify factors associated with the engagement of schools with the Energize programme.

Design
In a subsample of the 2011 Project Energize study the lead teacher in 25 of the 192 schools was interviewed. Independently, scores for engagement were derived from stocktakes of the nutrition and physical activity environment (n=192) Energizers rated the schools (n=192) and the schools were scored from the interview (n=25). Scores were compared using Spearman rank coefficients.

Outcomes
The strongest agreement was between the Energizer ratings and the interview score (ρ=0.676, P<0.000, n=24). Higher engagement was associated with higher socioeconomic status and time in programme. Themes identified from the interviews were: perception of a school community health need, committed school leaders and effective interaction. Challenges to engagement were related to lack of parental support, fundraising with unhealthy food, transience and limited time with the Energizer.

Conclusion
Information obtained from the interview supported the engagement rating of the Energizers. The Energize rating should be used to determine where additional support would be most productive in reducing disparity.

Source of Funding
Not applicable.

P56

Hydration status 24-hours following dehydrating exercise

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Background
Exercise places the body under stress and results in the loss of water through sweat, which is not always appropriately replaced. As adequate hydration for athletes is highly important for sporting performance both inadequate and excessive rehydration can result in decreased performance and impact on health, especially as many athletes train at least once a day.

Objective
The two objectives of this study were, first, to investigate whether individuals adequately rehydrate, ad libitum, in the 24-hours following a dehydrating exercise session. Second, to determine which markers of hydration status are most applicable to field studies.

Design
A descriptive study of 25 physically active men and women (aged 22 ± 3 yr) was conducted to assess the efficiency of individuals to rehydrate following a dehydrating exercise session. Body mass change and total body water (TBW) measurements were taken via bioelectrical impedance at three time points during a 24-hour period; at baseline, then, following a 50-minute session of dehydrating exercise (post-exercise) and 24 hours following baseline. Urine specific gravity (USG) was measured at baseline and the 24-hour time point. All baseline measures and 24-hour measures were taken in a fasted state. Participants completed the 50-minutes of cycle exercise (ergometer) at a self-selected pace in a climate chamber set at 30°C and 55% relative humidity.

Outcomes
A significant decrease in body mass was observed between pre-exercise (baseline) and post-exercise measures (71.5 ± 10.5 kg and 70.6 ± 10.3 kg respectively) (P<0.001). By the 24-hour time point there was a significant increase in body mass (72.1 ± 10.8 kg) compared to baseline (P<0.001). No significant differences were observed for other measures between baseline and the 24-hour time point.

Conclusion
According to body mass change, USG and TBW, rehydration does occur in the 24 hours following a dehydrating exercise session when ad libitum techniques of hydration occur. Body mass is seemingly the most sensitive of these three markers used to detect a change in hydration status, as no significant differences were seen in total body water or urine specific gravity measures.

Source of Funding
Not applicable.

P57

Vitamin D supplementation, serum 25-hydroxyvitamin D, body composition and performance in rugby union: a randomised controlled intervention trial

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Background
Vitamin D may affect athletic performance through effects on muscle mass and muscle hypertrophy.

Objective
To determine whether vitamin D supplementation improves vitamin D status and affects body composition, and improves strength and speed performance in elite rugby union players during pre-season training.

Design
A randomised, double blind, placebo controlled intervention trial in 57 elite rugby union players was conducted to evaluate whether supplementation of 3,333 IU/day vitamin D for 10-12 weeks affects vitamin D status, body composition, speed and strength during pre-season training. Fasting blood samples were collected at baseline, 5-6 weeks and 10-12 weeks for measurement of serum 25-hydroxyvitamin D, parathyroid hormone and insulin growth factor-1. Standardised rugby performance tests were conducted at the same time points. At baseline and weeks 10-12, the sum of skinfolds at eight anatomical sites, plus body composition using dual X-ray absorptiometry (DXA) was determined.

Outcomes
Players' mean (SD) age, height, weight and BMI was 21 y (2.8 y), 185 cm (6.9 cm), 97.3 kg (11 kg), and 28.3 kg/m^2 (2.0), respectively. The sum of eight skinfold measurements was 78 mm (25 mm). Percent body fat estimated by DXA was 15.0% (4.7%), lean tissue mass was 78.2 kg (8.8 kg), and bone mineral density was 1.47 g/cm^2 (0.08 g/cm^2). The sum of eight skinfolds was significantly correlated with percent body fat ($r = 0.923$, $P<0.01$). The effects of vitamin D supplementation on body composition, on serum 25-hydroxyvitamin D concentration and on strength and speed will be reported.

Conclusion
The effect of vitamin D supplementation on serum 25-hydroxyvitamin D status in young men with high BMI and low body fat is unknown.

Source of Funding
Supported by a grant from the Department of Human Nutrition Performance Based Research Fund (PBRF), University of Otago.

P58

Do sugary drinks have any role in the development of the metabolic syndrome in New Zealanders?

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Background
Fructose consumption has increased throughout the world in parallel with metabolic disorders including obesity and diabetes. Important dietary sources of fructose are table sugar and sugary drinks which account for most of this increase. Observational studies show a clear association between high intakes of sugary drinks and development of the metabolic syndrome (MS) and diabetes.

Objective
To examine the effect of excessive sugary drink consumption on development of the MS in New Zealand.

Design
A review of the literature relating to the effect of high fructose intakes on the risk factors associated with the MS was undertaken and the contribution of sugar and sucrose to the diet of New Zealanders was analysed using data from the 1997 New Zealand Nutrition Survey (NNS97).
A randomised trial to investigate whether exchanging sugary softdrinks for either milk, fruit juice or diet softdrink for eight weeks, in individuals who consume more than 500 mL of sugary beverages per day and have risk factors for the MS, positively influences risk factors associated with the MS will be described.

Outcomes
The NNS97 reported that non-alcoholic beverages, including softdrinks and fruit juice, contributed on average five percent of the total energy intake of New Zealanders. Total sugar intake was highest in overweight males aged 15-24 who consumed on average 176 g/d. Fifty-three percent of this group consumed carbonated drinks at least three times per week. However such cross-sectional data show no clear association between metabolic risk markers and sugary drink or total sugar consumption. Preliminary data from the randomised trial will be presented to describe the metabolic characteristics of very high consumers of sugary drinks.

Conclusion
Some New Zealanders consume very high quantities of fructose through excessive softdrink consumption. Our randomised trial will to help to determine whether or such consumption plays a causal role in the pathogenesis of the MS.

Source of Funding
Funded by the Riddet Institute, New Zealand.

P59

The effect of a micronutrient supplement 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 age until the telomere becomes critically short, typically signalling cellular senescence and ensuing cell death. Short telomere length (TL) has been associated with type II diabetes, obesity, cancer and cardiovascular disease. Recent data suggests that TL in peripheral blood lymphocytes (PBL) is associated with micronutrient levels in blood plasma.

Objective

The aim of this study is to investigate the effect of taking a micronutrient supplement containing folate (400 µg), vitamin B12 (6 µg), vitamin E (15 mg), retinol (800 µg), nicotinic acid (10 mg), and calcium (500 mg) for 16 weeks on TL in PBL of healthy, middle-aged men and women.

Design

Our randomised, double-blind, placebo-controlled design comprised 199 volunteers aged 26 – 61 y (43% male). Prior to, and at the conclusion of the intervention period, whole blood samples were collected for isolation of both PBL and blood plasma. Absolute TL in PBL was determined by a qPCR assay.

Outcomes

PBL TL was observed to decrease from 114 to 110 kb (n = 98) and increase from 109 to 110 kb (n = 101) in the *Polypill* and placebo group, respectively (P = 0.3). Change in an individual's TL was calculated as TL at study end minus TL at baseline and organised into distributions of TL gain (≥10% gain), maintenance (<10% change), or loss (≥10% loss). The observed individual gain: maintenance: loss ratio was 33: 31: 34 in the *Polypill* group and 39: 33: 29 in the placebo group (P = 0.63).

Conclusion

As we observed no significant difference in mean PBL TL over the 16 weeks between the placebo and *Polypill* intervention group, we conclude there was no evidence of an effect of micronutrient supplementation on PBL TL in this cohort. Further analysis is continuing to investigate the response to components of the *Polypill* in relation to plasma micronutrient levels on an individual basis.

Source of funding

This research was supported by NHMRC Grant #464895.

P60

Zinc deficiency increases genomic instability events in WIL2-NS human lymphoblastoid cell line

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Background

Zinc (Zn) is an essential cofactor required by numerous enzymes essential for cell metabolism and the maintenance of DNA integrity.

Objective

To investigate the effect of Zn deficiency or excess on cytotoxicity and genomic instability events as well as to determine the optimal concentration of two Zn compounds, Zn Sulphate ($ZnSO_4$) and Zn Carnosine (ZnC) that minimise DNA damage events in the WIL2-NS cell line.

Design

MTT assay was used to determine cell proliferation. DNA damage was determined using both the comet assay and the Cytokinesis-block micronucleus cytome (CBMN-Cyt) assay. Zn deficient medium (0 µM) was produced using Chelex treatment, and the two Zn compounds (ie. $ZnSO_4$ and ZnC) were tested at concentrations of 0.0, 0.4, 4.0, 16.0, 32.0 and 100.0 µM.

Outcomes

Results from MTT assay showed cell proliferation were decreased in Zn depleted cells (0 µM) as well as at 32 µM and 100 µM for both Zn compounds (P<0.0001). DNA strand breaks, as measured by the comet assay, were found to be increased in Zn depleted cells compared to the other treatment groups (P<0.05). The CBMN-Cyt assay showed a significant increase in the frequency of both apoptotic and necrotic cells under Zn deficient conditions (P<0.0001). Elevated frequencies of micronuclei (MNi), nucleoplasmic bridges (NPBs) and nuclear buds (NBuds) were induced in Zn depleted cells (P<0.0001) whereas genome damage was reduced in supplemented cultures for both Zn compounds at 4 µM and 16 µM, possibly suggesting these concentrations may be optimal for genome stability. Expression of γ-H2AX and OGG1 was increased in Zn depleted cells.

Conclusion

These results suggest that Zn plays important role in genomic stability and the optimal Zn concentration range for prevention of DNA damage and cytotoxicity *in vitro* lies between 4-16 µM.

Source of Funding

CSIRO Food and Nutritional Sciences and Ministry of Higher Education, Malaysia.

P61

Fibre intake is associated with decreased zinc bioavailability in type 2 diabetes mellitus

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Background
Individuals with type 2 diabetes mellitus (DM) are believed to be at an increased risk of zinc deficiency. Phytic acid is the major dietary factor responsible for decreasing the bioavailability of zinc. Phytic acid forms poorly soluble complexes with zinc in the gastrointestinal tract, resulting in reduced zinc absorption. The dietary management of type 2 DM includes emphasis on an eating pattern that is rich in dietary fibre and whole grain cereals, food sources which are abundant in phytic acid.

Objective
In women with Type 2 DM compared to healthy women, to: a) determine the phytate:zinc molar ratio as a measure of zinc bioavailability; and b) explore the relationships between the phytate:zinc molar ratio, the plasma zinc concentration, and the expression of zinc transporter genes in peripheral blood mononuclear cells (PBMCs).

Design
Fasting blood samples and estimated food records were collected from 40 participants (20 women with type 2 DM and 20 healthy women). Plasma zinc concentrations were determined and total RNA from PBMCs was isolated and transcribed into cDNA. Quantification of ZnT1, Zip1, and ZNT8 mRNA was conducted using Taqman real-time PCR. Nutrient intakes were calculated using Foodworks 2009. Phytate values were obtained primarily from the Phytate Food Composition Database 2009 (Navarro-Rosenblatt and Ferguson, personal communication).

Outcomes
Women with type 2 DM consumed 1130 ± 852 mg/d (mean ± SD) phytic acid and 13.3 ± 6.6 mg/d zinc. Healthy women consumed 1354 ± 711 mg/d phytic acid and 11.6 ± 3.8 mg/d zinc. Participants with Type 2 DM tended ($P=0.09$) to have a lower phytate:zinc ratio (9.5 ± 6.3) than healthy participants (13.4 ± 8.1). Positive correlations were observed between phytate and fibre in both the Type 2 DM ($r=0.6$, $P<0.01$) and healthy ($r=0.7$, $P<0.01$) groups. In a regression analysis, fibre was a determinant of the phytate:zinc ratio; plasma zinc variability was not explained by the phytate:zinc ratio or zinc transporter levels. The mRNA ratio of ZnT1 (zinc export) to Zip1 (zinc import) was lower in Type 2 DM compared to healthy participants ($P<0.001$).

Conclusion
The dietary intake of fibre is a determinant of zinc bioavailability due to its association with phytate in food. Zinc bioavailability should be evaluated alongside recommendations to increase dietary fibre in type 2 DM.

Source of funding
Sydney University Nutrition Research Foundation.

P62

Measuring nutrition in the residential aged care setting

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Background
There is good evidence that improvements in nutrition can have multiple positive impacts for residents in aged care. While there is a plethora of measures of nutritional status, none are demonstrably suitable for the residential aged care setting. To be most useful, a measure must be brief, psychometrically sound, easy to use, have face validity with clinicians, and be free to use.

Objective
This paper aims to compare different measures of nutritional status at baseline in a large intervention project for 294 residents across nine aged-care facilities.

Design
This team implemented and evaluated a Participatory Action Research project, funded by the Australian Government Department of Health and Ageing under the Encouraging Better Practice in Aged Care (EBPAC) initiative , to support development and implementation of best practice nutrition and hydration in nine aged care facilities in NSW. Resident nutrition status was measured using a battery of measures including PGSGA, BMI, MST, and MUST, for a cohort of 20-50 residents per facility.

Outcomes
The baseline prevalence of moderate to severe protein energy malnutrition for residents in project facilities ranged from 25% to 71%. Agreement between measures of nutrition was generally poor, with an individual resident able to be screened from “severe risk” to “no risk” according to the measure used (Kappa ≤ 0.2).

Conclusion
Measures of nutrition show little consistency in the residential aged care setting. There is need for a well designed examination of the best suite of tools for measuring nutrition in this at risk population.

Source of Funding
This project was funded by the Australian Government Department of Health and Ageing under the Encouraging Better Practice in Aged Care (EBPAC) initiative (formerly known as the Encouraging Best Practice in Residential Aged Care Program).

P63

Nutritional optic neuropathy in Papua New Guinean prisoners

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Background
Ophthalmologists working in Madang, Papua New Guinea suspected a high incidence of optic neuropathy (ON) occurring in a local facility, Beon prison.

Objective
To determine the prevalence and severity of ON in Beon prison and to determine demographic, dietary or toxic risk factors in order to provide advice for treatment.

Design
All 264 prisoners detained in Beon Prison were invited to participate. Consenting prisoners were interviewed regarding demography, general and ocular health, diet and lifestyle. Participants underwent a vision and ocular examination, a physical examination, and gave a blood sample.

Outcomes
Of the 135 consenting prisoners, 14 had 'definite' or 'likely' ON and 30 had 'possible' ON. The prisoner diet predominantly consisted of rice, canned corned beef, canned tuna, crackers, tea and water. Dietary analysis suggested that less than 25% of prisoners met the estimated average requirement (EAR) for vitamin A, folate, vitamin C, vitamin E, potassium and calcium. Over half of the prisoners fell below the cut-offs values of deficiency for biochemical indicators of vitamin A, folate and vitamin C. A significant inverse trend between ON severity was found with both whole blood folate and red blood cell folate concentrations using linear regression when adjusted for age and time of incarceration. On average, those with 'likely' or 'definite' ON had whole blood folate concentrations 26nmol/L lower than those without ON and had red blood cell folate concentrations 46nmol/L lower. Exposure to alcohol, cassava, tobacco, and lead toxicity were not correlated to disease.

Conclusion
Folate deficiency has a likely aetiological role in the ON found in this prisoner population. The involvement of other B-vitamins, nutrient deficiencies or toxic agents may however be causal or contributing to the onset and development of ON. Vitamin A supplementation has been procured to all prisoners of Beon jail and recommendations for dietary changes in order to halt disease progression and to prevent further cases.

Source of Funding
Supported by the NZ Agency for International Development, the University of Otago and the Fred Hollows Foundation.

P64

Gender specific effects of long-term dietary EPA and DHA supplementation in platelet aggregation in healthy human subjects

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Background
Increased platelet aggregation is a major manifestation of clotting tendency which causes heart attacks and stroke. Long chain n-3 fatty acids (LCn-3PUFA: eicosapentaenoic acid, EPA; docosahexaenoic acid, DHA) are known to reduce platelet aggregation; however the available evidence is equivocal. We have previously demonstrated gender-specific responses in the acute effects of LCn-3PUFA supplementation in human subjects.

Objective
To examine the effects of chronic dietary supplementation with EPA or DHA rich oils on platelet aggregation in male versus female subjects.

Design
A double-blinded placebo controlled trial was conducted in 95 healthy male and female adults. Platelet aggregation was measured at baseline and 4 weeks post-supplementation.

Outcomes
EPA and DHA effectively reduced platelet aggregation following 4 weeks supplementation relative to placebo (-11.4%, P=0.027 and -14.3%, P=0.02 respectively). Subgroup analyses showed that in males, only EPA effectively reduced platelet aggregation by -18.4% compared to the placebo (P=0.05) and female group (P=0.011). In contrast, in females DHA reduced platelet aggregation (-18.9%) compared to the placebo (P=0.001) and male group (P=0.017).

Conclusion
Significant interactions between gender and individual LCn-3PUFA exist to reduce platelet aggregation differentially in males versus females. Together with our previously published results on acute effects, this study demonstrated that EPA reduces platelet aggregation in male subjects while DHA is effective in females only.

Source of Funding
None.

P65

The neuroimmunological effects of omega-3 polyunsaturated fatty acids on depression

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Background
The increasing prevalence and burden of depression makes the search for an extended understanding of the causes of depression, and for the development of additional effective treatments, highly significant.

Objective
To systematically review the impact of omega-3 polyunsaturated fatty acids (PUFA) on cellular and humoral neuroimmune mechanisms in humans and in rodent models.

Design
The authors reviewed the scientific literature, both clinical and pre-clinical, on the subject from the last 15 years.

Outcomes
Omega-3 PUFAs reduce the production of proinflammatory cytokines (e.g. IL-1β, IL-6, IL-23, TNF-α, CRP), reduce oxidative stress (i.e. oxidised proteins containing carbonyl groups), reduce vascular adhesion markers (e.g. sICAM-1, sVCAM-1), reduce leukotriene B(4) along with nitric oxide synthase (NOS) and reduce cyclooxygenase-2 (COX-2) along with a reduction in various subtypes of PI3-kinase. Omega-3 PUFA may reduce inflammation and oxidation stress via increasing resolvins (D and E1) and docosanoids (neuroprotectin D1), modifying the activity of NF-KB and reducing the pro-inflammatory activity of microglia and monocyte-derived macrophages. Neuroimmunological mechanisms play an active role in the pathogenesis of depression and in the clinical efficacy of omega-3 in depression. It is unknown whether omega-3 PUFA has effects on specific neuroimmune markers implicated in the pathogenesis of depression such as markers of immunosenescence, B or T cell reactivity, astrocyte populations, self-specific CD4+ T cells, Th17 cells or Treg cells.

Conclusion
Multi-modal research methodologies should be employed to better understand the neuroimmunological effects of omega-3 PUFA in depression i.e. in human studies: neuroimaging and endophenotype/genetic analysis along with dietary intervention and behavioural assessment; in rodent studies: transgenic rodent models, and cellular neuroimmune markers in relevant brain regions. Further systematic research will help to elicit the neuroimmunological mechanisms to improve the understanding of depression and to enhance alternative or adjuvant treatment approaches to depression such as omega-3 PUFAs.

Source of Funding
Not applicable.

P66

Folate nutritional genetics and degenerative disorders in the elderly with special reference to hypertension and depression

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Background
Genetic polymorphisms in folate-related one-carbon metabolism may act as risk factors for phenotypic disorders associated with old age.

Objective
To investigate the association between two single nucleotide polymorphisms of folate-related one-carbon metabolism, (C1420T-SHMT and COMT Val158Met) and the degenerative diseases, hypertension and depression in an elderly population.

Design
224 randomly selected subjects over 65 yrs were recruited from two retirement villages (RV), while 100 clinically diagnosed dementia patients were recruited from a local neurology clinic. RV participants attended four clinics, which involved survey completion, questionnaires, anthropometric measurements, blood pressure and collection of urine and blood. Genotype analysis was performed using RFLP, and homocysteine and vitamin B_{12} levels were also measured. HADS and MMSE were used to assess psychometric indices and food frequency questionnaires determined dietary intake.

Outcomes
Results from the retirement village cohort showed: 1) C1420T-SHMT, predicted to raise vasculotoxic homocysteine, did not alter risk of hypertension. 2) COMT Val158Met, serum folate and serum vitamin B_{12} all showed a significant association with depression ($P<0.05$).This supports a role for vitamin related neurotransmitter (catecholamine) metabolism in depression. 3) In the dementia patient cohort, serum vitamin B_{12} and C1420T-SHMT both showed a significant association with anxiety ($P<0.05$). The reasons for this are unclear. 4) Serum vitamin B_{12}, serum folate and red cell folate predict cognitive function ($P<0.05$).

Conclusion
The C1420T-SHMT variant was not associated with increased homocysteine and was not a risk factor for hypertension. COMT Val158Met affects methyl group metabolism and hence may modify risk for depression. Dependant nutrients like vitamin B_{12} and folate may therefore also be critical in many cases.

Source of Funding
Northern Sydney Central Coast Health, Central Coast Health & Research Management and Pfizer.

P67

Dietary folate vitamers as potential risk factors in the aetiology of adenomatous polyps

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Background

Dietary folate exists in natural and synthetic vitamer forms. These forms may confer differential risk for cancer development and progression.

Objective

To ascertain whether any association exists between natural (5-MTHF) and synthetic dietary folate (PGA), and further, to see whether vitamin C is aetiologically important in any role folate may have on the incidence of colonic adenomatous polyps.

Design

A total of 202 participants were recruited from a local gastroenterology clinic. Colonoscopy was conducted as a screening protocol for colonic pathology. Subjects (40-89 yrs) compromised of 116 females and 86 males. All participants were mentally healthy to complete a food frequency interview. The food frequency questionnaires were analysed by Foodworks™ (version 3.02). Blood folate was measured using a chemiluminescent immunoassay.

Outcomes

PGA (for individuals below the median intake) was significantly related to adenomatous polyp incidence. Subjects with polyps showed a 1.77 times higher PGA intake than non-polyp subjects (P=0.0215).The intake of 5-MTHF showed the most significant relationship with RBC folate status in individuals with an adenomatous polyp (below the median RBC folate) (P= 0.039). Whereas PGA was most significantly related to RBC folate status in those subjects without a polyp (P= 0.019). Vitamin C was not linked to either RBC folate status or polyp incidence.

Conclusion

The type of folate vitamer may be an important risk factor for occurrence of adenomatous polyp. PGA intake may increase risk of adenomatous polyp. 5-MTHF might be a critical vitamer when folate status is lower, particularly in subjects with an adenomatous polyp. Vitamin C was not related to folyl vitamer in polyp aetiology. These findings raise issues in the context of folate fortification to prevent disease.

Source of Funding

Northern Sydney Central Coast Health

P68

The influence of brassicas on people with crohn's disease in a New Zealand cohort

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Background

Individuals with Crohn's disease have an aberrant immune function, which sometimes makes them react adversely to food items that would not normally trigger an immune response. Brassica intake contributes to immune function, possibly through release of a compound called sulforophane during cooking or chewing. This makes it important to identify, for people with Crohn's disease, which forms of Brassica ameliorate their symptoms and which exacerbate them.

Objective

1. To identify the effects of different forms of Brassicas consumed by people with Crohn's Disease as reported by New Zealand adults from the 'Genes and Diet in Inflammatory Bowel Disease' based in Auckland study.
2. To Identify if there were differences depending upon whether the Brassicas were cooked or not.
3. To investigate the possible reasons for and consequences of these differences using nutrition, clinical and genotype information.

Design

The consumption patterns of selected vegetables from the *Brassicale* group were identified in the adult subjects in the 'Genes and Diet in Inflammatory Bowel Disease' based in Auckland study. Symptoms associated with their consumption were identified. Nutrients that were missing and required to maintain normal homeostasis were identified through this and also through micronutrient analysis of serum samples. Key genotypes interacting with top listed nutrients and gene- nutrient interactions were ascertained.

Outcomes

There were significant differences in responses between individuals to some of the different species, group and forms of *Brassicales*.

Conclusion

One form of *Brassicale* if not tolerated can be substituted with another form and thus allow an individual to avail themselves of the nutritional benefits of *Brassicales* and thus improve their nutritional status.

Source of Funding

Fellowship from Nutrigenomics NZ, Auckland University.

P69

An evaluation of a healthy eating on a budget programme

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Background
Based on a "Train the Trainer" model, Cook'nKiwi was designed to increase the nutrition knowledge and awareness of staff from organisations working with vulnerable and disadvantaged families. The programme, which is offered across the Auckland Metropolitan region, provides healthy eating information that staff can give their clients on both a formal and informal basis. The community focused Cook'nKiwi programme works alongside the Gardens4Health programme to provide healthy low cost options. Ongoing support is given to staff for up to 6 months after the initial programme to facilitate lifestyle change.

Objective
To evaluate nutritional knowledge of and attitude towards a healthy lifestyle.

Design
A post programme questionnaire was used to evaluate nutritional knowledge and attitudes of participants attending programme presentations during 2011. In total, 20 groups (n= 184) completed the questionnaire.

Outcomes
A mean score of 68% was achieved for nutritional knowledge. Scores achieved ranged 24–90% between groups. Concepts that participants continue to struggle with are the number of recommended servings and serving sizes from the four food groups. Attitudinal trends showed more participants had addressed an increase in exercise (36.7%) as well as fruit and vegetables (39%) than decreasing fat (21%), sugar (26.3%) and portion size (16.6%). Requests are often made for healthy recipes and cooking classes. Participants frequently used the resources provided when visiting clients. However, lack of motivation, skills and financial constraints remained barriers to initiating dietary change. As a result of this, a training package was developed and launched in the April 2011 to increase access to accurate healthy eating information for both staff and clients.

Conclusion
The resources provided in the Train the Trainer package allow for more confident and accurate use of healthy eating information that meets the specific needs of the staff and clients of community focused organisations.

Source of Funding
Ministry of Health.

P70

Launch of the Monash Comprehensive Nutrition Assessment Questionnaire (CNAQ)

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Background
Food frequency questionnaires (FFQ) are often used in large scale epidemiological studies to assess relationships between diet and disease. There are many validated FFQs available, however they are often specific for a particular food group or they offer only general nutrition assessment. Research in the field of nutrition and gastroenterology lacks relevant dietary assessment tools.

Objective
To produce, validate and provide easy access to a semi-quantitative FFQ (Comprehensive Nutrition Assessment Questionnaire (CNAQ) able to assess intake of a range of macro- and micro-nutrients as well as short chain carbohydrate ingestion (FODMAPs) of relevance to gastrointestinal disorder research.

Design
75 healthy participants completed the CNAQ plus four, one-week food diaries kept over a 12 month period. Validation was assessed using four statistical methods. The CNAQ was also assessed for reproducibility. Technical advice was sought to develop the validated CNAQ as an online tool.

Outcomes
Consistent with other FFQs, this CNAQ overestimated nutrient intake by a mean 63% (range 14-164%). Despite this, the CNAQ demonstrated moderate validation for all macronutrients, dietary fibre, calcium, folate, iron, magnesium, niacin, phosphate, Vitamin A, Sodium, Thiamin, Vitamin C, Zinc, all short chain carbohydrates (FODMAPs) and glycaemic index. The only nutrient not validated was riboflavin, but the CNAQ was reproducible for all nutrients. This validated tool is being produced into online software, for automated reporting of results for researchers.

Conclusion
The CNAQ demonstrated adequate performance characteristics for the semi-quantitative evaluation of macro- and micro-nutrient and short chain carbohydrate intake. The validation of this tool and its availability as easy to use, online software will provide a useful tool for dietary research in many areas, but particularly for those investigating the role of dietary components in gastrointestinal disorders.

Source of Funding
JSB was in receipt of a Sir Robert Menzies Memorial Research Scholarship in the Allied Health Sciences.

P71

Breakfast cereal consumption is associated with higher micronutrient and milk intake among Australian children

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Background
Research worldwide shows that breakfast cereal consumers are more likely to meet nutrient intakes than non-consumers. Australian data among children are lacking.

Objective
The purpose of this study was to determine the contribution of breakfast cereals to nutrient intake, total milk intake and anthropometric measures among Australian children.

Design
Nutrient and milk intake reported via 24-hour recalls and anthropometric measurements collected from the 2007 Australian National Children's Nutrition and Physical Activity Survey were analysed. Children and adolescents (n= 4487, 2-16 y) were classified as breakfast cereal consumers (BCC) and non-consumers (NC). Breakfast cereals included ready-to-eat cereals, puffed corn, rice, wheat; muesli, wheat and oat biscuits, flakes, porridge, rolled oats, bran and semolina. Total daily energy, total nutrient intake, breakfast cereal contribution to nutrient intake, BMI and waist circumference were compared between categories of breakfast cereal consumption by anova models.

Outcomes
The majority of children consumed breakfast cereal between 0600h and 0930h, 69% were BCC. Intakes of fibre, calcium, iron, thiamin, niacin and folate (adjusted for age, gender and energy intake) were significantly higher and sodium intake was significantly lower for BCC in comparison to NC ($P<0.05$). Among BCC, breakfast cereals contributed 3%, 11% and 26% to total sugar, fibre and iron intake, respectively. BCC were also 2.3 times more likely to meet age and sex-specific recommended daily intakes for iron ($P<0.05$, Odds Ratio). Thirty-four per cent of total milk intake was consumed with breakfast cereal: 22% plain milk and 12% plain milk with the addition of sugar . BCC had higher sugar and energy intakes than NC ($P<0.05$), while BMI and waist circumference were comparable. Age-dependent differences in nutrient intake were not observed.

Conclusion
This study confirms the importance of breakfast cereals to fibre and micronutrient intakes in Australian children. Breakfast cereals may also be a practical and efficacious way to encourage milk consumption in children.

Source of Funding
Research grant from Cereal Partners Worldwide.

P72

Doubly labelled water validation of child versus parent report of total energy intake by food frequency questionnaire

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Background
The ability of children (8-12y) to accurately self-report dietary intake using a food frequency questionnaire (FFQ) is unclear. No previous study has compared whether parents or children are the most accurate reporters of child energy intake using the gold standard doubly-labelled water (DLW).

Objective
To evaluate accuracy of mother, father and child reports of child energy intake (EI) estimated by the Australian Child and Adolescent Eating Survey (ACAES) FFQ compared to total energy expenditure (TEE) measured by DLW method.

Design
TEE was assessed in weight stable children (n=9, mean ±SD: 9.8±1.3 years, BMI 17.6±2.9 kg/m^2, BMI z-score 0.35±0.94) over 10 days using the DLW method. Usual intake over the past 6 mo was estimated separately for mother, father and child ACAES FFQs. Mean daily EI (kJ) was derived from ACAES using standard child portions and national nutrient databases. Accuracy of reporting was calculated from absolute (EI-TEE) and percentage (EI/TEE x 100) differences between EI and TEE and testing associations using Pearson correlations and Bland-Altman plots.

Outcomes
Children were the most accurate reporters (mean difference113± 35 kJ) followed by fathers (121± 13 kJ) then mothers (144±26 kJ) with 44% of children over-reporting compared with 67% of fathers and 89% of mothers. Pearson's correlation between FFQ EI and TEE was statistically significant for fathers only, $r= 0.92$, $P<0.001$. Bland Altman plots for the difference in EI and TEE from child, mother and father showed the narrowest limits of agreement between measures was for fathers.

Conclusion
Children and fathers were more likely to accurately report child EI, while mothers over-reported to a greater degree. Children aged 8-12y may be able to report EI accurately using the ACAES FFQ. When EI is estimated by proxy, a potential impact on reporting accuracy should be considered

Source of Funding
University of Newcastle Early Career Grant (TB).

P73

Lean mass is positively associated with respiratory function in male asthmatic children

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Background
Obese asthma in childhood presents with different characteristics to that described in adulthood. Obese asthma in children is characterised by increased airway macrophages, more severe airway responsiveness and a greater forced vital capacity (FVC) %predicted compared to non-obese asthmatic children.

Objective
To investigate the association between respiratory function and regional distribution of lean mass and fat mass in asthmatic children and adolescents.

Design
Respiratory function, anthropometry, and dual DEXA scans were collected from obese and non-obese children aged 8-17 years, with asthma (n=35). Partial correlation analysis was used to assess associations between fat and lean mass, and anthropometric and respiratory variables.

Outcomes
BMI *z*-score was positively associated with FVC in asthmatic males (r=0.53, P=0.04). Body composition analysis revealed that thoracic lean mass in males correlated with FVC (r=0.53, P=0.04) and forced expiratory volume in 1 second (FEV_1) (r=0.55, P=0.03). Total lung capacity was associated with gynoid (r=0.56, P=0.03) and android (r=0.59, P=0.02) lean mass while waist circumference was negatively associated with expiratory reserve volume (r=0.60, P=0.03) in males only. Total and regional fat mass was not associated with respiratory function in male or female children with asthma.

Conclusion
In contrast to adult studies, fat mass had no detectable effect upon respiratory function in asthmatic children. The positive association between BMI *z*-score and respiratory function in male asthmatics appears to be driven largely by central lean mass. Body composition and anthropometric markers were not associated with respiratory function in female asthmatics. The optimum approach for future intervention studies in paediatric obese asthma may be to target increasing lean tissue mass, rather than body fat reduction alone.

Source of Funding
Hunter Medical Research Institute Gastronomic Society Donor Grant.

P74

Socio-economic position is associated to dietary salt consumption in Australian children

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Background
Socio-economic position (SEP) is associated with poor dietary habits, but the relationship to salt intake in children has not been investigated

Objective
To assess the relationship between SEP, salt intake and discretionary salt use in a nationally representative sample of Australian children (2-16 years) and to identify the major sources of salt and determine if the intake of salty foods differs across SEP categories.

Design
Analysis of the 2007 National Children's Nutrition and Physical Activity Survey. Two 24-hr dietary recalls were completed for 4487 children from which salt intake was determined. Children also reported the use of table salt and salt in cooking. Level of education of the primary care-giver was used to define SEP. Regression analysis was used to assess the relationship between dietary salt and SEP, with adjustment for confounders.

Outcomes
Salt intake was higher in children of low SEP (6.3 g/d), compared to high SEP (5.8 g/d) (P<0.001). After adjustment for age, gender and energy intake, a shift from high SEP to low SEP was associated with 0.5g/d increase in salt consumption (P<0.001). Children of low and mid SEP were more likely to add salt at the table than those of high SEP; 33%, 32% and 25%, respectively reported adding salt at the table (Pearson χ^2 42.5, df=4, P<0.001). The major sources of salt include bread (13%), mixed cereal dishes (9%), processed meat (8%), gravies/sauces (7%), pastries (5%), cheese (5%) and breakfast cereals (4%). Children of low SEP consumed greater quantities of potato snacks, potatoes, gravies and savoury sauces, processed meat, mixed dishes where meat/poultry is the main ingredient and mixed dishes where cereal is the main ingredient (P<0.05).

Conclusion
Children of low SEP consume more salt overall and are more likely to use table salt. In conjunction with an overall reduction in salt added to processed foods, it is important to ensure that health messages to reduce salt intake are appropriately disseminated to all population groups.

Source of Funding
Helen McPherson Smith Trust and the Heart Foundation (Australia).

P75

Individual or combination therapy of fish oil and genistein for protection against the adverse effects of methotrexate chemotherapy in bones

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Background
Cancer chemotherapy has been shown to induce long-term skeletal side effects such as osteoporosis and fracture; however, there are no preventative treatments.

Objective
This study investigated the damaging effects of methotrexate (MTX) and the potential protective effects of individual or combination therapy of omega-3 rich fish oil and soy isoflavone genistein.

Design
This study investigated the damaging effects of anti-metabolite (MTX) injections (0.75mg/kg) for five days and the potential protective benefits of a daily oral gavage of omega-3 rich fish oil (0.5mL/100g BW), genistein (20mg/kg BW) or their combination, in rats.

Outcomes
MTX significantly reduced primary spongiosa height, metaphyseal trabecular bone volume and slightly reduced the density of bone-forming osteoblasts at the metaphysis. Ex vivo osteogenic assays revealed a significant reduction in osteogenic differentiation and an increase in adipogenesis in bone marrow stromal cells. Consistently, in the stromal cell population, there was a lower expression of osteogenic transcription factors, Runx2 and Osx and a significantly increased expression of adipogenic genes, FABP4 and PPARγ. MTX significantly increased the density of $TRAP^+$ bone-resorbing osteoclasts and osteoclast precursor cell pool while enhancing the expression of proinflammatory and osteoclastogenic cytokines IL-1, IL-6, TNF-α, RANKL and the RANKL/OPG ratio. Fish oil and/or genistein significantly preserved metaphyseal trabecular bone volume, stimulated osteogenesis at the expense of adipogenesis and prevented MTX induced osteoclasts and proinflammatory cytokines.

Conclusion
MTX increases inflammation, osteoclast formation and decreases osteoblast thus leading to bone loss. Fish oil and/or genistein supplementation counteracted these inflammatory effects, helping to conserve the bone and prevent chemotherapy-induced bone loss.

Source of Funding
Fish oil/genistein was provided by DSM Nutritional Products, funded by NHMRC and Channel 7.

P76

Do monounsaturated or polyunsaturated fatty acids from nuts improve lipid profiles and metabolic control: Systematic review and Meta-analysis

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Background
A number of published studies suggest that a modest daily intake of nuts, improves lipid profiles, blood sugar control, weight management and thereby lowering the risk of many chronic diseases for populations.

Objective
The objective of this study was to conduct a systematic literature review and meta-analysis on these studies to understand the relationship between the intake of nuts and their influence on lipid profiles, blood glucose and weight management in diabetes and its complications.

Design
A number of good quality published studies of nuts high in mono-unsaturates and poly-unsaturates were selected. Sixteen walnuts studies (427 subjects) 10 almond studies (464 subjects) were identified. Macadamia nuts, a uniquely Australian product and very high in mono un-saturates, were investigated in six studies (143 subjects). In all, there were 32 studies with nuts which had predominantly monounsaturated fatty acids (959 subjects). These studies were analysed using the comprehensive meta-analysis statistical software.

Outcomes
Walnuts decreased total cholesterol (mean difference 0.341, P<0.001),LDL-cholesterol(–0.298,P<0.001),and triglycerides (-0.090, P=0.016), but had no effect on HDL-cholesterol. Again, with almonds total and LDL cholesterol were decreased (-0.384, P<0.001 and -0.335, P<0.001 respectively) but there was no effect on HDL cholesterol (-0.001, P=0.945) or triglycerides (-0.066, P=0.079). Macadamia nuts decreased total and LDL- cholesterol (-0.352, P=0.013 and -0.310, P<0.001 respectively), but were without effect on HDL-cholesterol or triglycerides. Nut supplementation decreased total cholesterol (-0.321, P< 0.001), LDL-cholesterol (-0.302, P<0.001), and triglycerides (-0.065, P=0.002), but had no effect on HDL-cholesterol (0.013, P=0.336).

Conclusion
In conclusion, nut supplemented diets decrease both total- and LDL-cholesterol, and additionally have a modest triglyceride lowering effect.

Source of Funding
Not applicable.

P77

Dietary supplementation with fish oil, flaxseed oil and canola oil can enhance the growth performance of cultured abalone

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Background
Fish oil and vegetable oils supplementation could improve the lipid profiles in Jade Tiger abalone and may also increase the growth performance of this animal.

Objective
To investigate the effects of supplementation with fish oil (FO), flaxseed oil (FlaxO) and canola oil (CO) on the growth performance of Jade Tiger hybrid abalone.

Design
Three experiments were conducted. In experiment 1 (E1) five test diets were formulated to contain 0.5, 1.0, 1.5, 2.0 and 2.5% of FO respectively. In experiment 2 (E2) abalone were fed five diets in which FO (control diet) was serially replaced by 25, 50, 75 and 100% FlaxO. In experiment 3 (E3) abalone were fed five diets in which FO (control diet) was serially replaced by 25, 50, 75 and 100% CO. Abalone were fed these diets at 2% of body weight daily for 90 days in each experiment.

Outcomes
In E1, abalone fed the diet supplemented with 1.5% FO showed a significantly higher daily growth rate (DGRw) compared to the other experimental diets. The control group had the lowest DGRw. The values of weight gain (WG) and specific growth rate (SGRw) were also the highest in the group fed 1.5% FO diet. In E2, abalone fed the control FO diet and the diets containing 25, 50 and 75% of FlaxO showed no significant differences in DGRw, WG and SGRw. The diet containing 100% FlaxO showed significantly lower values of these growth parameters. In E3, abalone fed the control FO diet and the diets containing 25% and 50% of CO showed no significant differences in DGRw, WG and SGRw. The diet containing 75% and 100% CO showed significantly lower values for DGRw, WG and SGRw.

Conclusion
Supplementation with FO in the normal commercial abalone diet can improve growth performance. FO supplementation at a concentration of 1.5% achieved the best outcome. In addition, it is feasible to replace 75% of dietary FO with FlaxO or 50% of dietary FO with CO, without negative effect on the growth performance of abalone.

Source of Funding
The study was funded by a PhD scholarship from the Victoria University, Australia.

P78

Palm diacylglycerol oil decreases postprandial triglyceride levels versus palm oil: a pilot study

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Background
Based on structure, palm diacylglycerol (DAG) oil is solid at room temperature yet it contains fewer metabolically available saturated fatty acids (SFA) than palm (triacylglycerol) oil. These properties are of considerable interest to the food industry.

Objective
The aim of this study was to determine the effects of a modified palm oil (palm DAG) versus conventional palm oil on postprandial lipids and lipoproteins, glucose and insulin.

Design
This pilot study implemented a randomised, 2-treatment, cross-over design. Ten healthy men and women, aged 30-60 yrs with moderately elevated low-density lipoprotein cholesterol (LDL-C; 3.1-4.5 mmol/L) participated in 2 postprandial tests. Test meals consisted of low calorie wheat bread and cinnamon spread containing 30g conventional palm oil (CON) or 30g palm DAG oil (DAG). Blood sampling occurred at 0 and 30 min, 1, 2, 4 & 6 h post meal. Data were analysed using repeated measures ANOVA (Model 1), and incremental (positive) Area Under the Curve (Model 2).

Outcomes
In Model 1, the CON oil elicited a lower overall LDL-C response compared to the DAG oil ($P<0.01$). For both treatments, plasma LDL-C increased over time and peaked at 6 h post meal consumption. The DAG oil blunted the overall postprandial triglyceride (TG) response compared to the CON oil ($P<0.05$). TG levels were significantly elevated at 4 h following both CON and DAG ($P<0.05$). In Model 2, there was a trend toward a lower AUC response with DAG compared to CON ($P=0.07$), which is consistent with the outcome from Model 1. CON resulted in a significantly lower AUC versus DAG for LDL-C ($P<0.05$). For both treatments, glucose and insulin peaked at 30 and 60 min, respectively and returned to near baseline levels by 120 min. There were no treatment differences for either of these variables.

Conclusion
This study provides preliminary evidence that palm DAG oils may elicit beneficial effects on postprandial TG metabolism. Additional testing in a larger population is needed to confirm these findings.

Source of Funding
Supported by Abunda Nutrition.

P79

Performance benefits of carbohydrate ingestion during high intensity exercise are not mimicked by mouth rinsing with a carbohydrate solution

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Background
The ergogenic effects of carbohydrate (CHO) ingestion during high intensity exercise are well established. However, studies investigating performance benefits of mouth rinsing with a CHO solution are inconclusive; positive effects were reported in some studies but no benefits were observed in the fed state.

Objective
The present study investigated the effects of CHO mouth rinsing in comparison with CHO ingestion or fluid ingestion on time trial performance in a fasted and glycogen-reduced state to investigate whether mouth rinsing with a CHO solution has any performance benefits.

Design
A randomised, double-blind, counterbalanced trial with 8 moderately-trained cyclists aged 18-55 years was performed. Four trials were arranged, separated by a week, and included a 90 min glycogen reducing exercise protocol, immediately followed by a low CHO meal and a subsequent overnight fast. The following morning a 1-hour time trial performance test was conducted. Participants performed a set amount of work as fast as possible using an electromagnetically braked cycle ergometer. The trials included CHO mouth rinse, CHO ingestion, placebo mouth rinse and placebo ingestion. Nine blood samples were taken per trial to investigate metabolic responses.

Outcomes
Performance time was not influenced by any treatment. However, power output was significantly increased ($P<0.01$) with CHO ingestion. Mouth rinsing with a CHO solution or the placebo fluid was without effect. Furthermore, plasma glucose and insulin levels were increased ($P<0.01$) and circulating concentrations of lactate were also elevated ($P<0.05$) in the CHO ingestion trial towards the end of the performance test.

Conclusion
In a fasted and glycogen-reduced state ingestion of a CHO solution during high intensity exercise enhanced performance through stimulation of insulin-mediated glucose uptake. The CHO mouth rinsing had no ergogenic effect.

Source of Funding
We gratefully acknowledge support from the Massey University Research Fund.

P80

Knowledge relating to fish consumption and perceived health outcomes in older Australian adults

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Background
Consumption of fish provides many health benefits. Outside the scientific community it is unclear what individuals know or understand about fish.

Objectives
To i) assess knowledge on fish consumption, health outcomes and recommendations; ii) determine how/where information on fish is received; and iii) determine whether knowledge predicts fish consumption among a nationally representative sample of Australian adults >51 years.

Design
Cross-sectional survey. Your Source Market Research agency conducted online (n=485) and computer assisted telephone interviews (n=369) using a quantitative fish frequency questionnaire and additional open and closed ended survey questions.

Outcomes
Forty four percent of respondents consumed fish/seafood at least twice per week. Ninety one percent agreed that fish improves general health and 84% agreed that fish improves heart health or lowers blood cholesterol/lipids. Thirty three percent reported they normally received information on fish or omega 3 fatty acids from "Health professionals", 30% "word of mouth", 23% reported "no information" received. Of the 10 sources listed, the median number received was 2. Sixty eight percent believed the recommendation for fish consumption was "2-3 times a week". Agreeing that fish consumption improves general health ($\beta=0.681$, $P<0.001$) and receiving more sources of information on fish ($\beta=0.119$, $P<0.001$) were predictors of increased fish consumption. Knowing the current recommendations for fish intake was not a significant predictor.

Conclusion
Consumption of fish is low despite many Australians >51 years agreeing that fish improves general health. Strategies to increase exposure from multiple information sources regarding the health benefits of fish to the broader public may facilitate improvement in fish consumption.

Source of Funding
Australian Seafood Cooperative Research Centre (CRC) Company Limited (Simplot Australia and Flinders University as core partners).

P81

Hydration status of male football players during training and competition

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Background
Acute hypohydration has frequently been observed during football and can negatively impact performance, particularly in the heat. Less well studied is hydration status over consecutive days encompassing football training and competition.

Objective
The aim of this study was to measure day to day hydration status, as well as acute losses, during training and competing in males participating in the New Zealand Football Championship league during the summer.

Design
Daily hydration status was determined by urine specific gravity (USG) from first void urine samples collected over 8 days, including 4 days of training and 1 day of competition. Acute changes in hydration status as a result of training and competition were estimated from body mass change. Sweat loss was calculated from body mass change taking into account fluid intake and urinary loss.

Outcomes
Mean net change in body mass during training for all players who completed training (n=12) was +0.40 ± 0.75% and all who completed a full game (n=7) was -3.02 ± 1.08%. Mean net body mass change in players who completed both training and competition (n=5) was -1.03 ± 0.28% and -3.45 ± 0.96%, respectively. Body mass change, fluid intake, sweat loss and sweat rate were greater ($P < 0.05$) during competition than training in those who completed both. Players were hypohydrated (USG > 1.020) on all mornings except competition day. Training did not affect hydration status, as indicated by USG the following morning.

Conclusion
Hydration status across an extended period of repeated training and competition appears to be suboptimal. Net fluid balance during training and competition is highly variable, with some players *over-hydrating* in training. Acute fluid loss is inevitable during football competition and is best managed by individualised drinking strategies that prevent weight gain or large loss during training and competition. Monitoring daily hydration status prior to subsequent endeavour may help achieve euhydration

Source of Funding
Conference funding was received from the Sports Nutrition and Exercise Metabolism Research Group Discretionary Fund (Dept of Human Nutrition) Otago University.

P82

The effect of a high protein, high fibre diet on insulin sensitivity measured using the Dynamic Insulin Sensitivity and Secretion Test (DISST)

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Background
Insulin resistance is a significant factor in the development of type 2 diabetes. While there is considerable evidence to show that weight loss can improve insulin sensitivity in individuals with insulin resistance or at risk of diabetes and cardiovascular disease, the lack of a cost effective, high resolution method of assessment has meant very few studies have examined the effect of macronutrient composition on direct measures of insulin sensitivity.

Objective
To examine the effects on directly assessed insulin sensitivity of dietary advice including moderate increases in protein and fibre without specifying energy intake.

Design
Eighty-nine overweight or obese women aged 18-65 years were randomised to either a standard diet that was intended to be low in fat and relatively high in carbohydrate (n=42) or to a relatively high protein (up to 30% of energy), relatively high fibre (>30g/day) diet (HPHFib) (n=47) for 10 weeks. Advice regarding strict adherence to energy intake goals was not given. Insulin sensitivity was assessed by a novel method - the Dynamic Insulin Sensitivity and Secretion Test (DISST) which has a correlation with the gold standard glucose clamp method of 0.82 and provides additional information regarding insulin secretion with less clinical intensity and lower cost.

Outcomes
In contrast to the improvements in body composition, indirect insulin sensitivity indices and other metabolic risk factors in those on HPHFib, DISST insulin sensitivity was reduced by 19.3% (95% CI: 31.8, 4.5%; $p=0.013$) in comparison with the standard diet. Basal insulin secretion and fasting plasma glucose were reduced, and first phase insulin secretion was increased on HPHFib, though the difference between diets did not reach conventional levels of statistical significance.

Conclusion
An ad-libitum diet relatively high in both protein and fibre indicated reduced insulin sensitivity when measured with our novel DISST method. This was in contrast to evidence suggesting metabolic improvements on the diet. Use of the DISST method in future studies will provide new information about the effect of dietary interventions on insulin sensitivity.

Source of Funding
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P83

Evidence-based practice or practice-based evidence?

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Background
Evidence-based nutrition lifestyle interventions can improve health outcomes when implemented in the general practice setting.

Objective
Evidence from the five International Heelsum Workshops is reviewed to determine which European approaches may be applicable in New Zealand and Australia

Design
Since 2004, a move initiated by the International Heelsum workshops saw the Cochrane Diet and Nutrition Sub Field accommodated within the Primary Health Care Field of the Cochrane Collaboration. This Sub Field includes evidence from non-randomised studies, not usually included in Cochrane reviews, but which form an important part of the evidence for the role of nutrition in health outcomes. The multidisciplinary group of experts formed from the Heelsum workshops contribute to this Sub Field by their research to support the foundation of practice-based nutrition in the consulting room.

Outcomes
General practitioners, patients' preferred source of nutrition information, require many resources to implement nutrition interventions. For their own nutrition education, nutrition updates electronically distributed are required, such as Australian 'Health Faxs" or the Cochrane Library's PEARLS. Other health practitioners, such as practice nurses, dietitians and physiotherapists can contribute to the collaborative approach. Tailoring the nutrition counselling, using 'patient centred' communication along with motivational interviewing facilitates movement through the stages of behavioural change and increases the programmes' effectiveness. With the involvement of large patient groups and limited resources, the use of an online tailoring expert system also shows promise. Here, computer tailored responses utilise the immediacy of electronic technology, analyzing patient data and queries personalising responses and can be supported with interactive social support technology, such as chat forums.

Conclusion
To facilitate effective nutrition and communication in the General Practice setting, interventions based on the Heelsum Workshop findings need to be trialled in New Zealand and Australia.

Source of Funding
University of Auckland.

P84

Effect of nutrition on the quality of life of cancer patients in hospice home care

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Background
Cancer patients frequently experience malnutrition and this is an important factor in impaired quality of life.

Objective
To investigate whether nutritional status has an impact on the quality of life of advanced cancer patients.

Design
This cross-sectional study examined the association between global quality of life and its various subscales with nutritional status among 61 (33 females and 28 males) advanced cancer patients cared for by selected hospices in peninsular Malaysia. The Patient Generated-Subjective Global Assessment (PG-SGA) and the Hospice Quality of Life Index (HQLI) were used to assess nutritional status and quality of life, respectively.

Outcomes
Nine (14.7%) patients were well-nourished, 32 (52.5%) were moderately or suspected of being malnourished while 20 (32.8%) of them were severely malnourished. The total HQLI mean score for these patients was 189.9±51.7, with possible scores ranging from 0 to 280. The most problem areas in these patients were in the domain of functional well-being and the least problems were found in the social/spiritual domain. PG-SGA scores significantly correlated with total quality of life scores ($R2= 0.38$, $P<0.05$), psychophysiological well-being ($R2= 0.37$, $P<0.05$), functional well-being ($R2= 0.42$, $P<0.05$) and social/ spiritual well-being ($R2= 0.07$, $P<0.05$).

Conclusion
Thus, patients with a higher PG-SGA score or poorer nutritional status exhibited a lower quality of life. Advanced cancer patients with poor nutritional status have a diminished quality of life. These findings suggest that there is a need for a comprehensive nutritional intervention for improving nutritional status and quality of life in terminally ill cancer patients under hospice care.

Source of funding
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P85

Assessing the prevalence of malnutrition in hospitalised children, evaluating the validity of three newly developed screening tools: a cross-sectional study in Iran

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Background
Hospitalised children are often at increased risk of nutritional impairment at or during admission. Three nutritional risk screening (NRS) tools (STAMP, STRONGkids and PYMS) have been validated in Europe but have not yet been utilised in a developing country.

Objective
The aims of this study were to (1) define the nutritional state of children admitted to an Iranian hospital with comparison to healthy children and (2) compare and contrast the three NRS tools for hospitalised children in terms of the ease of completion and the validity of scores with comparison to current nutritional status.

Design
Children admitted to a tertiary paediatric teaching hospital located in Mashhad, Iran, were enrolled over a 24 day period along with healthy control children from the same community. Nutritional state was assessed by anthropometry and classified as moderate/severe malnutrition according to WHO criteria. The three NRS tools were applied to all inpatients which classified patients from low to high risk.

Outcomes
One hundred nineteen inpatients and 100 controls (mean ages of 4.45 (± 3.58) and 4.75 (± 1.68) yr) were recruited. The prevalence of moderate and severe malnutrition (under-nutrition) in the inpatient group was 17.64% and 7.56% while it was 1% and 2% respectively in the control group. In contrast, the prevalence of overweight/obesity in the control group was 22%, contrasting to 2.5% in the inpatient group (P=0.04). NRS tools were able to identify most of the malnourished patients in the moderate to high risk groups. STRONGkids showed a better overall correlation with all anthropometric measurements.

Conclusion
Hospitalised children have higher rates of under-nutrition than healthy children from the same community. The three NRS tools were able to identify children at nutritional risk, but with differing utility. In this context, STRONGkids appeared to be the most useful and reliable tool.

Source of Funding
Not applicable.

P86

Mitochondrial function is altered in rats fed a high carbohydrate, high fat diet

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Background
Mitochondria help maintain cellular energy homeostasis. In obese individuals, fat deposition in cells disrupts the function of the energy-producing electron transport chain, stimulates mitochondria-dependent ROS generation and initiates cytochrome c release.

Objective
To evaluate liver mitochondrial function in diet-induced obese young and old rats.

Design
In this study, isolated liver mitochondrial function was evaluated polarographically using Ranks Oxygen electrode connected with Chart 5 recorder via Powerlab/4s instrument in 2-3 and 19-20 month old male Wistar rats fed corn starch (CS) or high carbohydrate, high fat (HCHF) diet for 8-16 weeks. Mitochondrial pellets were isolated by differential centrifugation; protein was estimated using BCA protein assay kit. Protein (0.35mg) was loaded in the experimental buffer solution (saturated with oxygen) in the oxygen electrode. The state two substrate, succinate, was used to energise the mitochondria and ADP was used to initiate state three respiration. Oligomycin was used to inhibit ATP synthase and azide was used to record uncoupled respiration.

Outcomes
Chronic HCHF diet feeding in rat decreased oxidative phosphorylation capacity in liver mitochondria. Both state 3 and state 4 respirations were also affected compared to the CS diet fed rats but both maintained the respiratory control ratio. Two way ANOVA revealed significant effect of diet on State 3 respiration (*P values*: age 0.2937, diet 0.0481, interaction 0.6610) among the groups. ADP/O ratio was also altered in HCHF diet-fed rat compared with the CS diet fed rat. Incubation with ferulic acid improved the phosphorylation capacity in aged rats fed HCHF diet.

Conclusion
HCHF diet aggravates the obesity-related complications in young and aged rats by disrupting mitochondrial function.

Source of Funding
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P87

Body composition and bone mass in rats

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Background
Although many studies have shown that greater body weight (BW) is associated with a larger bone mass, the relationship of the body mass compartments, fat mass (FM) and lean body mass (LBM), with bone mass is equivocal; FM and LBM having been shown to be both negatively and positively correlated with bone mass.

Objective
To determine the relationship between FM and LBM and bone mineral content (BMC), bone area (BA) and bone mineral density (BMD) in rats.

Design
A retrospective analysis of body composition data of rats (n=581) collected during studies of diet and the metabolic syndrome (MS). Adult male Wistar rats (8–9 weeks old) were fed (16 weeks duration) on either a corn starch-based diet (CS, 11.2 kJ/g) or high-carbohydrate, high-fat diet (HCHF, 17.8 kJ/g) to induce the characteristics of MS. In some studies nutritional supplements, e.g. chia seeds, were included. At the end of the feeding trials, all rats had their body composition determined by dual X-Ray absorptiometry using a Norland XR36 instrument in the small subject mode specific for laboratory animals according to manufacturer's guidelines. Relationships between body composition parameters were determined using correlation analysis.

Outcomes
Mean ±SD (range) values for body composition parameters were: BW, 438.0±70.1 (210.9-728.3) g; FM, 130.8±70.2 (<2–440.4) g; LBM, 293.7±37.9 (200.6-426.4) g; BMC, 13.9±2.1 (8.7-22.9) g; BMD, 0.163±0.010 (0.135-0.206) g/cm^2; BA, 85.1±10.1 (42.1-118.9) cm^2. FM was highly correlated with BMC and BA (r=0.88 and 0.83 respectively) but less so with BMD (r=0.58) while LBM was not significantly correlated with any bone measure (r=0.05 to 0.11) irrespective of dietary treatment, i.e. high fat or cornstarch feeding. LBM was poorly correlated with FM (r=0.31).

Conclusion
Higher bone mass and area were positively associated with increased fat mass but not lean body mass. If these observations hold in humans, they suggest that public health measures to decrease body adiposity may also have impacts on bone health.

Source of Funding
Not applicable.

P88

Association between dietary pattern and type 2 diabetes: a systematic literature review and meta-analysis

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Background
Despite single food analyses being valuable, it is difficult to examine the effects of individual dietary components separately in the development of diabetes. Thus, dietary pattern analysis is recommended to capture a snapshot of the entire diet and provide detailed information about the nutrition aetiology of diabetes.

Objective
To synthesise the best available evidence on the association between dietary pattern and the risk of type 2 diabetes.

Design
Pertinent studies were identified by searching several data bases and the reference lists of all identified studies up to April 2011. Studies were eligible for inclusion if: they were cohort studies that investigated the association between dietary pattern and the incidence of type 2 diabetes. Two independent reviewers extracted information and assessed the quality of studies included in the meta-analysis. Summary relative risks were estimated using a random-effects model. A random-effects model was used to derive overall relative risk estimates for type 2 diabetes.

Outcomes
Fifteen prospective cohort studies were eligible for inclusion criteria. The estimated summary RR and 95% confidence interval of type 2 diabetes comparing high verses low intake was for healthy (RR= 0.77, 0.69- 0.85, P=0.000), and for unhealthy (RR=1.36, 1.24-1.47, P= 0.000) dietary patterns. There were heterogeneity among studies (I^2=82.0%, p=0.000) for healthy ($I^{2=}$ 40.7%, p=0.000) and for unhealthy dietary patterns.

Conclusion
The results of this systematic review and meta-analysis suggest that dietary patterns are good predictors of the risk for the development of type 2 diabetes and emphasise the importance of good dietary practices for the prevention of type 2 diabetes.

Source of Funding
Not applicable.

P89

Diet/lifestyle factors for reducing colorectal cancer risk

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Background

A western diet and lifestyle of Australians is associated with a high annual incidence (70 per 100,000 population in 2010) and mortality (20.5) from colorectal cancer (CRC). Doll estimated that as much as 50-70% of sporadic CRC (80% of all CRC) was diet /lifestyle related and therefore potentially preventable.

Objective

To assess the influence of dietary factors influencing colon cancer expression, and thereby identify components which could help to avoid cancer and/or contribute to a cancer preventing diet (chemoprotection)/lifestyle.

Design

Using a rat colon cancer model (induced by dimethylhydrazine/azoxymethane) and a semipurified diet (AIN76 modified) a variety of nutrient and diet components were introduced post initiation to identify their influence in promoting or inhibiting colon cancer expression. A review of epidemiological evidence helped identify candidate foods/ nutrients [chemopreventive factors] for testing relative to AIN control diet.

Outcomes

Whereas high fat (polyunsaturated [sunflower seed oil] and saturated [beef] fat) diets, protein from grilled red meat (beef) and defatted soybean meal, high sugar and refined flour, low selenium and low calcium diets were associated with increased expression, dietary fibre rich foods (wheat and barley brans), low fat and fish oil, dairy foods -high calcium , high selenium, and folate were associated with reduced expression of tumours and cancers. Epidemiological evidence supported lean fish and chicken, apple and citrus fruits, wholegrains and legumes, and green leafy vegetables (eg. broccoli and spinach) as offering protection. There was good evidence for physical exercise being significantly protective, as was avoidance of overweight and obesity (restriction of total energy intake). The above protective components help define a “prudent diet/lifestyle” which could reduce risk by as much as 50%.

Conclusion

A prudent diet/lifestyle could offer significant reduction in risk of colorectal cancer expression for humans in middle age.

Funding source

Not applicable.

P90

Serum 25 hydroxyvitamin D in patients treated with glucocorticosteroids: a systematic review with meta analysis

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Background

Vitamin D supplementation is beneficial in the prevention and treatment of glucocorticoid-induced osteoporosis (GIO); yet the extent to which glucocortiocoid (GCS) treatment compromises vitamin D status remains unclear.

Objective

To systematically explore how serum 25-hydroxyvitamin D (25(OH)D) is altered in patients receiving GCS treatment.

Design

A systematic review with meta analysis was conducted. Studies were sourced from Medline and CINAHL (January 1970 - May 2010). All experimental studies were included in which 25(OH)D was measured in patients aged >18 years receiving GCS therapy. Studies were excluded if patients were receiving vitamin D supplementation ≥ 400 IU/day (10 µg /d); if GCS treatment was <2 weeks, if >50% of the study population was on GCS for renal, hepatic disease or post transplant, or if the study population included patients with Cushing’s syndrome. A weighted mean 25(OH)D was calculated in patients treated with GCS. Random effects meta analysis was also used to compare serum 25(OH)D in patients treated with GCS compared to steroid naive controls and in patients pre- and post- GCS administration. Heterogeneity was assessed using the I^2 statistic.

Outcomes

Twenty six eligible studies were retrieved. The weighted mean statistic by sample size was 22.5 (95% CI: 19.8, 25.2) ng/ml; and by standard deviation was 21.1 (95% CI: 13.7, 28.5) ng/ml. Serum 25(OH)D in GCS users was on average -0.529 (95% CI: -1.016, -0.042) ng/ml lower than healthy controls (P=0.03, I^2=56.4%). There was no difference in serum 25(OH)D between GCS users and disease controls (standardised mean difference=0.069 (95% CI: -0.155, 0.292) ng/ml; P=0.547, I^2=10.7%).

Conclusion

Adults receiving GCS appear to have suboptimal concentrations of serum 25(OH)D for prevention and management of GIO. Recommendations for vitamin D supplementation should be adjusted accordingly. Based on the weighted mean 25(OH)D, vitamin D supplementation at 1800 IU (45 µg)/day would be required to achieve 25(OH)D concentrations >32 ng/ml in patients receiving GCS.

Source of Funding

Not applicable.

P91

Asthmatics have an altered eating pattern with increased fat and decreased fibre intake associated with airway inflammation and poorer lung function

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Background
Evidence from experimental studies and changes to environmental exposures suggests that there may be a relationship between asthma development or progression and dietary intake.

Objective
To compare dietary intakes of asthmatics to healthy controls and investigate the relationships between the nutrient intake of asthmatics and their clinical asthma symptoms.

Design
In a cross-sectional study, dietary intakes were calculated from a 186-item food frequency questionnaire (FFQ) of adults with stable asthma (n=110, age 56yrs ± 15(SD)) and healthy controls (n= 65, age 47yrs ± 17(SD)). Spirometry, airway responsiveness to hypertonic saline, and induced sputum cell counts were also measured.

Outcomes
Subjects with severe persistent asthma (n=59) had significantly higher total fat intake than healthy controls (103 ± 49 (SEM) versus 98 ± 4 (SEM) g/day p=0.014) and significantly lower fibre intakes (32 ± 11(SEM) versus 37 ± 13 (SEM) g/day p=0.018). Multiple linear regression analysis revealed that a lower fibre intake in asthmatic subjects (n=124) was associated with lower FEV1 (L) (r=0.44, p=0.001), FVC (L) (R^2=0.56, p=0.002) and FEV1/FVC (R^2=0.16, p=0.035), indicating that those with higher fibre diets had better lung function. Higher fat and lower fibre intakes were associated with worse airway inflammation, demonstrated by higher absolute concentrations of sputum eosinophils (R^2=0.15, p=0.005, n=107).

Conclusion
Subjects with severe persistent asthma have an eating pattern of lower diet quality with higher intakes of fat and lower intakes of fibre than healthy controls. This is related to lower lung function and increased airway inflammation. Factors leading to altered dietary intake in severe asthma, causative pathways and mechanisms involved in these relationships require further investigation.

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Plasma leptin levels are elevated in stable asthma

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Background
Leptin is primarily known as an appetite hormone, however it has been suggested recently that leptin is associated with the immune system and airway function.

Objective
To investigate serum leptin levels in asthmatics compared to healthy controls and establish whether serum leptin concentrations are related to clinical asthma outcomes.

Design
In a cross sectional study, plasma leptin was measured by immunoassay in n=75 stable asthmatic adults (age 56±15 yrs (SD), BMI 27.7±4.6 kg/m^2) and n=52 healthy control adults (age 46±17 yrs (SD), BMI 25.1±3.7 kg/m^2). Spirometry, airway responsiveness to hypertonic saline, and induced sputum cell counts were also measured. Analysis was performed by both linear and logistic regression.

Outcomes
Plasma leptin levels of asthmatic subjects were higher than healthy controls in both male and female subjects, (P<0.001, adjusted for age, gender and BMI) with the highest leptin level in female asthmatics. Leptin and BMI were significantly and positively related in males (r=0.74, P<0.001) and females (r=0.71, P<0.0001) with asthma. There was a trend between leptin and BMI in female healthy controls (r=0.34, P=0.057, n=32) but not in male healthy controls. In a logistic regression model adjusted for age, gender and BMI, 1000pg/ml increase in leptin increased the risk of asthma 2.35 times [OR: 2.35 (SE: 0.42), CI: 1.65, 3.35, P<0.001]. In male asthmatics ICS dose significantly predicted leptin levels, after adjustment for age and BMI [Coef: 0.59 (SE 0.28), CI: 0.02, 1.17, P=0.045]. Leptin levels were not associated with lung function and airway or systemic inflammation.

Conclusion
Asthmatics have higher leptin levels suggesting that asthmatics may have developed leptin resistance. In this cohort higher leptin levels were not related to immune or airway function. Further investigation of the effects of leptin on respiratory function is warranted.

Source of Funding
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Effects of antioxidants on inflammation and apoptosis in rhinovirus-infected airway epithelial cells

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Background
Human rhinovirus (RV) is associated with the majority of asthma exacerbations. Epithelial cells of the airways are the host cells for invading RV and are believed to be central in enhancing airway inflammation leading to asthma exacerbations.

Objective
To investigate whether enrichment of airway epithelial cells with various antioxidants will have anti-inflammatory effects on virus-infected cells.

Design
Human airway epithelial cells (Calu-3) were pre-treated with resveratrol, zinc, vitamin D or lycopene for 2, 4, 18 or 24 hrs, respectively prior to infection. Calu-3 cells were incubated with RV43 for 1 hour and agitated at room temperature to allow efficient binding of RV. Infection media was then replaced with fresh media, and cells were incubated for 48 hours. Media was collected for measurement of IL-6, IP-10 and IL-8 by Cytometric Bead Array or ELISA. Cell viability was assessed via Annexin V-PE and 7-AAD staining and analyzed by flow cytometry.

Outcomes
Resveratrol significantly reduced RV-stimulated IL-8 secretion ($P=0.0036$). Vitamin D significantly increased RV-stimulated IL-8 ($P<0.0001$) and IL-6 ($P=0.0013$). Zinc and lycopene had no effect on RV-stimulated IL-6 and IL-8, and none of antioxidants affected RV-stimulated IP-10. RV infection significantly increased cell apoptosis ($p=0.0004$) and reduced cell viability ($p=0.0323$). Vitamin D, zinc and lycopene significantly reduced ($p<0.05$) the proportion of RV-stimulated cells undergoing apoptosis and necrosis and improved cell viability ($P<0.05$).

Conclusion
Dietary antioxidants had minimal effect on virus-induced inflammation, however, were effective in decreasing epithelial cell apoptosis following RV-infection. The latter effect may have important roles in regulating RV infectivity, since apoptosis facilitates the release of viral progeny.

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P94

Beaton's Probability Approach for estimating prevalence of inadequate iron intakes applied to Australian data

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Background
In 1985, Beaton noted two problems with calculations of prevalence estimates of inadequate nutrient intakes: one was using the Recommended Dietary Allowance as the cutpoint and the other was using dietary information from a single day. He illustrated an alternative, probabilistic, method based on a whole iron requirement distribution and usual food intake data from Canadian women.

Objective
To compare the prevalence of inadequate iron intake calculated using Beaton's Probability Approach (PA) versus the proportion with intakes below the Estimated Average Requirement (EAR cutpoint method, EAR-CM) using the Australia/New Zealand/USA/Canada iron requirement distributions and Australian iron intakes. The errors from using single day data will be examined.

Design
The 13,858 Australians aged ≥2 years from the 1995 National Nutrition Survey were divided into the 2006 Nutrient Reference Values age-sex groups and the group's usual iron intakes estimated using standard methods. The proportion with inadequate intakes within narrow bands of iron intake was calculated using the requirement distribution and summed within age-sex groups (PA). The proportion with intakes below the EAR was also calculated (EAR-CM). Both methods were applied to the usual intake estimates and the reported single day intakes.

Outcomes
Using usual intake data and the PA method, the prevalence of inadequate iron intakes ranged from 0% for males aged 19-30 years to 28% for females aged 31-50 years. The EAR-CM underestimated the prevalence for males aged 2-8 years and females of all ages (e.g. by 8% for women aged 31-50 years). Using single day iron intake data overestimated the prevalence of inadequate intakes for all groups (e.g. by 4-5% for males aged 19-30 years by both methods).

Conclusion
Using usual intake data, the EAR-CM underestimates the prevalence of inadequate iron intakes compared to the PA; the discrepancy is substantial when the prevalence is high. However, regardless of method, using single day data creates the appearance of inadequacy in groups which do not have inadequate intakes.

Source of Funding
Not applicable.

P95

The effects of non-anaemic iron deficiency on cognitive functioning: a double-blinded, placebo controlled trial of iron supplementation in women of childbearing age. A pilot study on acceptability and feasibility

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Background

Evidence suggests iron deficiency affects cognitive functioning in children and may affect women of childbearing age; however, there is no consistent evidence to date.

Objective

To examine the suitability of the IntegNeuro battery for assessing cognition in iron deficient and iron sufficient women and to determine an appropriate sample size for an RCT. To determine an efficacious iron dose to improve iron status of iron deficient participants, while maintaining blinding to treatment.

Design

A double-blinded, placebo-controlled RCT pilot was conducted in females of child-bearing age (18-35 years). Participants were of varied iron status at baseline; cognition and serum iron status were assessed. Iron deficient participants continued to the intervention where they were randomised to receive placebo, 60mg or 80mg elemental iron.

Outcomes

Promotion at lectures and on notice boards are effective methods of recruitment, however, multiple sites would be required to achieve adequate numbers for an RCT. Currently, 56 students and 4 staff have been recruited. The IntegNeuro battery of tests was simple to administer and well accepted. Women aged 18-35 years are interested in iron and its effect on cognition. This population comply adequately with the study protocol. Prevalence data indicates that 33% of participants had non-anaemic iron deficiency, and is consistent with Australian data.

Conclusion

IntegNeuro battery of tests is suitable for use in an adequately powered double-blinded RCT to determine the impact of iron deficiency and treatment on cognitive function in women of childbearing age. Further recruitment will allow a better estimate of variance and inform a future sample size calculation.

Source of Funding

A grant from Meat and Livestock Australia and a University of Newcastle postgraduate scholarship (AJ Greig).

P96

C776G TCNII genotype influences the relationship between blood vitamin B_{12} and cellular folate

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Background

Vitamin status and genetic polymorphisms in the folate/B_{12} nexus may affect the integrity of homocysteine remethylation and lead to degenerative disorders in the ageing population.

Objective

To investigate whether C776G transcobalmin II (TCNII) genotype influences the interaction between serum folate and B_{12} predicting red cell folate (RCF) levels. Such a nutrient-gene interaction would be a candidate risk factor for a range of degenerative disorders such as cardiovascular disease and cancer.

Design

209 patients with a mean age of 61.8 yrs were recruited from a local gastroenterology outpatient clinic and 20 mL of blood was collected for genotype analysis and nutrient assessment. DNA was extraction from whole blood and TCNII genotype determined using RFLP followed by gel electrophoresis. Serum folate, serum B_{12} and RCF status were measured at ICPMR (Westmead Hospital, Sydney) using chemiluminescent immunoassay.

Outcomes

The prevalence of each of the C776G TCNII genotypes in this study was 18.7%, 53.6% and 27.7% for wildtypes, heterozygotes and homozygote recessives respectively. Results showed that only in TCNII wildtype individuals do serum folate and serum B_{12} interact to predict RCF levels ($P<0.0001$). In those heterozygote for the polymorphism, serum B_{12} acts independently to predict RCF ($P=0.0123$), and in participants that have the TCNII recessive genotype there is no such association; serum B_{12} on its own or in combination with serum folate does not predict RCF. For all TCNII genotypes, as might be expected, serum folate independently predicts RCF.

Conclusion

The C776G TCNII genotype has functional consequences in terms of the biological properties of the expressed protein. It is possible that this polymorphism may affect the binding affinity of B_{12} and influence cellular delivery of the vitamin, raising the interesting question of whether B_{12} is less (or more) important in predicting RCF within certain population subgroups.

Source of Funding

Northern Sydney Central Coast Health.

P97

Changes in the sodium content of bread in Australia and New Zealand between 2007 and 2010 - implications for policy

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Background
Bread is the largest contributor to dietary sodium intakes in Australia and New Zealand. In 2007, the Australian Division of World Action on Salt and Health in Australia, and the Heart Foundation in New Zealand (NZ), each sought to engage industry in new programs to reduce the sodium content of bread.

Objective
To define the effectiveness of recent efforts to reduce salt levels in breads in Australia and New Zealand.

Design
Sodium data were collected from product labels for 157 packaged bread products in 2007 and 167 in 2010. Mean sodium values and proportions meeting targets were calculated overall, by bread type, and by manufacturer. Findings were compared across years and between countries.

Outcomes
Overall mean sodium content in bread in Australia was 434mg/100g in 2007 and 435mg/100g in 2010. Corresponding values for NZ were 469mg/100g and 439mg/100g. The proportion of Australian breads meeting the 400mg/100g national target increased from 29% in 2007 to 50% in 2010. The proportion of NZ breads meeting the 450mg/100g national target increased from 49% in 2007 to 90% in 2010. There were clear differences between the results achieved by different companies.

Conclusion
Voluntary efforts by non-governmental organisations have had some impact on sodium levels in bread, particularly in NZ. There remains, however, substantial room for further improvement. If additional reductions are not achieved under the current voluntary arrangements legislated approaches may be required.

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