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Plenary 2: Eating Green: Foods and diets, attitudes and policies

Eating green: the policy challenge of sustainable diets

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For decades, public health nutritional science has been grappling with the need to alter affluent society diets. The nutrition transition is now occurring globally. At the same time, in the last third of the 20th century, evidence mounted on the environmental impact of supposedly advanced food systems. Meanwhile, in the food economy, astonishing changes were pushed through food supply chains, with concomitant impacts on diet. This food state of affairs has been made all the more complex by the emergence of strong consumer demands for cheaper, better and plentiful food. Cheaper food releases spending, and has been an indicator of 'progress'. Yet it is this mix of transitions which now poses a deep problem in the 21st century. Anyone working in or on the food system in the early 21st century now has to face the competing demands of production, health, environment, society and economy.

In this lecture, I will explore: (a) why we need to face this coming clash; (b) the good news that there is some compatibility in these seemingly oppositional forces; but also (c) the bad news that something has to give; the question is what? Are humans going to continue eating as though there are multiple planets? Are we simply going to produce more food to enable the world to eat like the US (which eats as though there are five planets)? Or are we going to design diets and change culture to live within environmental ecosystem dynamics? Can the food supply industries change upstream by 'choice-editing' before consumer eat or see the products? Or will policy-makers have to engage with the great power of consumerism?

The lecture will summarise the rapid emergence of thinking about this huge policy challenge. The implications for nutrition and dietetics are immense. These include the need to consider replacing dietary guidelines with eco-nutrition guidelines. They certainly mean working collaboratively with other disciplines. And it does require clear messages to policy-makers with regard to food culture as well as the food economy. The food industry, moreover, is in the middle of trying to grapple with lowering brand and product footprints. So the implications of championing sustainable diets may not be as frightening or radical as they might appear. Moreover, both public health and nutrition sciences have long ecological traditions. Indeed, arguably both emerged in the 19th century as industrialisation first offered the prospect of beating the Malthusian nightmare. We need optimism not defensiveness if we are to tackle the 21st century crisis of sustainability. In that respect, a priority is to take waste out of the food system.

Source of Funding

None.

Eating green: research for nutrition and food sustainability

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Food production needs to meet the demands of a growing population and strong growth in per capita consumption. Humans need nutritional security (food that promotes a healthy life) not just food security (enough calories and protein to satisfy daily requirements). Agricultural innovation is the key option we have to meet these challenges. Agriculture already occupies a large part of the arable land on the planet. Food production competes with biodiversity conservation for land use. Sustainable food is something that consumers are likely to become more interested in as these issues become more critical. Eating green should mean eating food that has the lowest possible environmental footprint. This can best be defined as food produced using the smallest amount of land, water and nutrient (e.g. nitrogen and phosphorus) and with the lowest greenhouse gas impact. Technologies that reduce waste in the storage and processing of food are a very useful contribution to achieving sustainability. Innovation in agriculture has traditionally relied on two contributions. Firstly we have continued to select improved varieties of plants and animals to provide our food. This has delivered about half the increases in food production in the last century. Secondly we have developed technologies to better manage the growth and production of our food with improved inputs of nutrients and control of pests and diseases. These two areas of innovation are both essential to meeting our future nutritional security needs. We need to double food production by 2050 relative to 2000 levels to satisfy growing demand. New advances in information technology, nanotechnology and biotechnology are part of the mix of technologies that are likely to provide the main options to achieve this objective. Domestication of new species and increased diversity of crop varieties are key options. Rapid current advances in biological science will provide an underlying technology platform. The role of genetic modification and more conventional genetic improvement will be significant. Better management of production systems will be critical.

Source of Funding
Not Applicable.

The relationship between our food choices and farm animal welfare

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Not only do the choices we make about food influence our own health and well-being, but they may also affect the welfare of the animals that are farmed to produce our food. In this presentation I will consider the topic of farm animal welfare from an economic policy perspective. I will begin by identifying some of the factors that contribute to poor versus enhanced animal welfare. With these drivers in mind, I will discuss the role of the government in regulating animal welfare in general, and more specifically what is being done in New Zealand to ensure that our food is produced with an adequate standard of welfare. Given that enhanced animal welfare is likely to be achieved only at an increasing cost, I will also look at the distributional impacts of animal welfare policy, focusing in particular on who ultimately bears the cost of improving animal welfare. Finally I will consider farm animal welfare from a 'global' perspective, addressing the question of relative animal welfare standards, what varying standards might mean from the perspective of international trade and, ultimately, the amount of welfare that is 'embodied' in the food that we eat.

Source of Funding
None.

Parents know breakfast is the most important meal of the day, so why are so many children not eating breakfast?

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Background

Each school week over 100,000 children aged five to 14 years skip breakfast at least one day of the week. Breakfast has been linked to improved academic and physical performance, and is associated with less snacking and less weight gain. Pacific children are 5.7 times more likely and Maori children are 2.5 times more likely to skip breakfast than NZ European or other children.

Objective

To provide insight into the usual morning routines for some low-income Maori and Pacific families in the morning and to examine the barriers to, and facilitators of, breakfast consumption in children aged eight to 16 years.

Design

Focus group interviews were conducted with 23 low-income Maori and Pacific parents (two Maori groups, two Pacific groups) who were in charge of the household's morning routine and whose children ate breakfast irregularly or did not eat a cereal or bread-based breakfast. Focus group interviews were analysed using thematic analysis.

Outcomes

Parents had heard breakfast is important but many did not know why or did not believe the message. Parents who did not eat breakfast themselves did not encourage their children to eat breakfast. Cost was the main reason for choosing breakfast food – nutritional benefits of the food were never mentioned. Parents' perceptions of why children did not eat breakfast included their children's focus on appearance (e.g. preening), skipping breakfast to avoid weight gain, not having breakfast made for them and parents not eating breakfast themselves. Most parents thought children older than eight or nine could make breakfast themselves and handed responsibility for, and overall decision making about, breakfast to the child.

Conclusion

Parental valuing and role-modelling of breakfast is important for increasing children's breakfast consumption. Parents retaining responsibility for their child's breakfast may slow the age-related decrease in breakfast consumption. Messages aimed at increasing breakfast consumption need to focus on fast, easy, low-cost breakfast solutions and the functional benefits of breakfast.

Source of Funding

Health Sponsorship Council is funded by Ministry of Health.

A randomised controlled trial to compare the effect of breakfast cereals differing in fibre content on short-term appetite and mood in 8-12 year old children

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Background

Fibre may promote satiety and the consumption of breakfast cereals may influence mood in children.

Objective

To examine the effect of breakfast cereals differing in fibre content on measures of satiety and perceptions of learning ability and mood in children.

Design

Forty-one children (Mean±SE: 10.3±0.23 yr, 26.8% overweight / obese) consumed three isocaloric breakfasts: a high-fibre (29.5/100g) shredded wheat cereal (HFSW), a high-fibre (13.2/100g) extruded wheat cereal (HFEW), a low-fibre (1.0/100g) puffed rice cereal (LFPR) or no breakfast (NB) in a randomised crossover study. After a standardised evening meal and overnight fast, breakfasts were given 120 min before an *ad libitum* buffet recess. Subjective feelings of satiety, perceptions of learning ability, and mood were assessed. Total kJ intake at recess was also measured. Mixed models were used to analyse four planned comparisons: HFSW vs NB; HFSW vs LFPR; HFEW vs NB; and HFEW vs LFPR.

Outcomes

Children reported greater feelings of satiety after consuming high-fibre cereals vs NB but no difference in subjective satiety between cereal types. Kilojoule intake at recess was higher after consuming the HFEW cereal relative to the LFPR cereal (not NB; +384 kJ, $P<0.05$) but this was not maintained for the reminder of the day. Daily fibre intake was higher after consuming HFSW (28.6±0.81g) and HFEW (23.5±1.0g) cereals relative to LFPR cereal (15.2±1.0g) and NB (19.0±0.91g) ($P<0.001$). Children reported higher perceived learning efficacy after consuming HFEW cereal relative to the LFPR cereal ($P<0.05$) and NB ($P<0.001$), and felt they would make significantly fewer mistakes in class after consuming HFEW cereal relative to NB ($P<0.05$). There were no differences in mood for any comparisons.

Conclusion

The finding of improved perceptions of learning ability after consumption of the high-fibre extruded wheat cereal warrants further study. Consumption of the higher fibre breakfast cereal was important for achieving daily dietary fibre recommendations in children.

Source of Funding

Kellogg Australia

The association between birth weight and current weight status in Australian children and adolescents

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Background

In 1980, a Tasmanian birth cohort study suggested birth weight was not an important factor in determining weight at 7 and 10 years. However, there has been a trend of increasing birth weight among the Australian population in the past decades which may have changed the association.

Objective

To examine the association between birth weight and current BMI and weight in a nationally representative sample of Australian children and adolescents.

Design

Data from the 2007 Australian National Children Nutrition and Physical Activity Survey (2007ANCNPAS) was used. We included only data from children and adolescents aged 9 years or above, who have a birth weight between 1.5 – 5.5 kg and provided 2 days of dietary data. Pearson's partial correlation coefficient between birth weight and current BMI and weight was calculated. Multiple linear regression modelling was used to test for the association between birth weight (per 100g) and current BMI and weight. Covariates controlled for included age, sex, current total daily energy intake, percentage energy from fat, glycemic index, physical activity level, breast feeding and annual household income.

Outcomes

Birth weight was a significant predictor of current BMI and weight (multivariate adjusted r = 0.107 and 0.163 respectively; $P < 0.001$). Each 100 g increase in birth weight corresponds to a 0.05 (SE 0.01) kg/m^2 and 0.23 (SE 0.03) kg increase in current BMI and weight respectively (both $P < 0.001$). When split by age groups (9 – 13 y and 14 – 16 years), the associations remained significant, but the magnitude of association was higher in the older age group.

Conclusion

Birth weight significantly predicts current weight status of Australian children and adolescents. The association is stronger among adolescents than in children, suggesting such association may extend beyond the childhood.

Source of Funding

Not applicable.

Analysis of non-core food and beverage advertising to children on Australian television

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Background

The government in Australia is coming under increasing pressure to regulate the advertising of non-core food and beverage products to children, as it is suggested this will have an impact on reducing the prevalence of overweight and obesity. Central to this issue is monitoring rates of non-core food and beverage advertising to contribute to evidence-based decision making.

Objective

To measure the frequency of non-core food and beverage television advertising during children's viewing periods in Australia, as well as the extent of non-core food and beverage advertising in children's television programs.

Design

Two weeks of food and beverage television advertising data for 2010 were obtained (7-20 March). Advertised foods were classified as core, non-core or miscellaneous using the criteria from previous studies. Children's viewing periods included: weekdays: 0700 h to 0900 h and 1530 h to 2230 h; weekends: 0730 h to 1030 h and 1530 h to 2230 h. Children's programmes were identified through the programme rating, audience numbers and/or whether the content was directed to children. Advertising frequencies for non-core foods during children's viewing periods were calculated across the three main free-to-air channels (Seven, Nine and Ten). Also calculated was the proportion of non-core food advertisements that were shown in children's programmes.

Outcomes

Over the three channels, advertisements for non-core foods during children's viewing periods were shown at the frequency of 1.5 per hour. Of all food and beverage advertisements shown, those for non-core foods during children's programs represented 2.4%.

Conclusion

This study has found that the frequency of non-core food and beverage advertising during children's viewing periods is below that reported in previous Australian studies. In addition, the extent of non-core food and beverage advertising during children's programmes is low. Ongoing monitoring is, however, essential, to help inform the debate in this area, which includes the performance of industry's self-regulatory initiatives to moderate food and beverage advertising to children.

Source of Funding

Not applicable

Adequacy of current protein recommendations: A case for enteral feeding

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Background
Children with cerebral palsy are documented to have feeding difficulties, which increase in line with condition severity and result in lowered growth potential. Existing nutrition literature in these children surrounds energy, with limited information available on other parameters such as protein and micronutrient biochemistry, which are also important for growth and development.
Objective
We examined differences in protein intake and a variety of protein metabolism indices in children with cerebral palsy (CP) compared to controls.
Design
Twenty-four children aged 4-12 years with marked CP fed orally (O, n=15) or enterally (E, n=9) were recruited, including age-matched typically developing children (C, n=24). Fasting blood samples were analysed for levels of albumin, creatinine, urea and urate. Parents collected three consecutive days food replica of their child's actual intake, which were directly analysed for protein content.
Outcomes
Significant differences were found in protein intakes between the groups= mean % Estimated Average Requirements (±SD): E=178(±47); O=210(±91); C=311(±119), p=0.005. Despite all children consuming over recommended levels, E had significantly reduced levels of all of the protein metabolic indices compared to controls, while also compared to O for albumin z-scores mean(±SD): E=-1.35(±1.73); O=0.53(±1.03); C=0.71(±1.04), P<0.001. Orally fed children also displayed reduced z-scores of creatinine: E=(±5.6); O=-2.79(±1.02); C=-3.65(±0.65) P<0.001 and urate: E=-0.87(±0.71); O=-0.40(±1.02); C=0.18(±0.62), P=0.02, compared to controls.
Conclusion
Our data show potentially greater protein metabolism issues in the enterally fed, compared to the other groups. This data may also support newer amino acid requirement literature which outlines shortfalls in current recommendations. As enteral feeding may be a sole source of nutrition, ensuring adequacy of its contents to optimally maintain physiological function is imperative.
Source of Funding
Not Applicable

Reliability of a Food Frequency Questionnaire (FFQ) for New Zealand adolescents

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Background
As there is currently no up-to-date, validated food frequency questionnaire (FFQ) for use in New Zealand adolescents, there is a need to develop one as a cost-effective way to assess adolescents' food patterns in health and nutrition studies.
Objective
This study aims to examine the test-retest reliability of an FFQ to describe food patterns in adolescents aged 14 to 18 years.
Design
A non-quantitative FFQ comprising 72 food items from seven major food groups was developed and pretested. Fifty-two subjects (28 males, 24 females) aged 14.9±0.8 years completed the FFQ twice within a two-week period to assess short-term test-retest reliability.
Outcomes
Spearman's correlation tests showed that reliability ranged from 0.33 for peaches to 0.87 for non-standard milk. No more than 10% of participants were grossly misclassified for any food, and correct classification ranged from 54% (chocolate confectionary) to 94% (pizza). This high reliability was ascertained by the average weighted kappa value of 0.51 (95% CI: 0.46, 0.55). Among the seven food groups, milk and dairy products showed the best reliability (ρ=0.76, κ_w =0.70).
Conclusion
The FFQ exhibited excellent test-retest reliability in the estimates of intake frequency, particularly for foods consumed regularly. Further validation is currently underway to determine the relative validity of this FFQ.
Source of Funding
Supported by grants from the National Heart Foundation, Lottery Health NZ and the University of Otago.

Body weight and mortality in older adults: a meta-analysis

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Background

The World Health Organization (WHO) defines a healthy body weight range for adults as a body mass index (BMI) between 18.5 and 24.9. However this range has been based on studies of young to middle aged adults and its applicability to older adults is questionable. There is literature to support that being overweight is not necessarily associated with higher mortality in age groups over 65, however most systematic reviews have used the WHO classification of healthy weight as the reference range, which does not adequately evaluate mortality in the lower range of BMIs.

Objective

To determine the BMI range associated with lowest mortality risk in older adults (≥ 65 years).

Design

A systematic literature review and meta-analysis was conducted of published papers between 1990 and 2011. A search of available databases, including MEDLINE, EMBASE and CINAHL, was performed independently by two of the investigators. Studies were included if they reported the relative risk (RR) of all-cause mortality for community based adults from predominantly Caucasian populations aged 65 years and over.

Outcomes

A total of 1,251 studies were identified, of which 24 met the inclusion criteria, including 126,139 individuals with an average follow-up of 9.7 years. Using a BMI of 22-25 as the reference range, a BMI between 25 and 30 was associated with the lowest mortality risk with a RR of 0.91 (95% CI 0.88-0.94). A BMI less than 22 was associated with a significant increase in mortality risk, 1.20 (1.13-1.26) at a BMI between 20.5 and 22.

Conclusion

This analysis provides strong evidence that a healthy BMI for older adults is greater than 22. Further investigation is required to identify whether higher BMI values are associated with increased morbidity, however our analysis suggests that there is no need to advocate weight loss for adults over 65 years with a BMI up to 30.

Source of Funding

Not applicable.

Investigating the obesity paradox in ex-smokers

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Background

Obstructive airway disease (OAD) most commonly occurs due to smoking. The obesity paradox has been described in OAD, where a high BMI is associated with reduced mortality.

Objective

To explore the obesity paradox in relation to body composition in ex-smokers.

Design

Adult ex-smokers (n=80), mean age of 56.7 ± 9.9 yrs, 33 male and 47 female with a median smoking history of 28 (5-141) pack years, underwent lung function testing. Post bronchodilator forced expiratory volume in 1 second (FEV_1): median FEV_1 % predicted 92 (16-136), forced vital capacity (FVC): median FVC % predicted 93 (29-129) and FEV_1/FVC: median 0.77 (0.26-0.88) were recorded. A dual energy x-ray absorbtiometry (DEXA) scan was performed to assess total and regional fat and lean muscle mass. Partial correlations were calculated between lung function and body composition adjusting for age, height, weight and smoking pack years.

Outcomes

As BMI category increased there was a statistically significant increase in both lean and fat mass, with those classified as overweight or obese demonstrating greater lean muscle mass than the healthy weight group ($P<0.01$) after post hoc testing. A statistically significant positive correlation was found between FEV_1 and FVC and total ($P<0.001$) and regional lean muscle mass (trunk $P<0.05$, arms $P<0.001$, legs $P<0.001$ and gynoid $P<0.01$). A statistically significant negative correlation was found between FEV_1 and FVC and total ($P<0.01$) and regional fat mass (trunk $P<0.01$, arms $P<0.01$, legs $P<0.05$ and android $P<0.01$).

Conclusion

Lean muscle mass is positively correlated with lung function in ex-smokers. Obese and overweight ex-smokers have an increase in both fat and lean muscle mass. The lean muscle may be responsible for the protective role of obesity in OAD.

Source of Funding

Not applicable.

A systematic review of corticosteroid use, dietary intake and body weight in adults

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Background
Obesity is a serious risk factor for chronic disease that places significant burden on individuals and healthcare systems. Commonly prescribed medications may be contributing to the prevalence of obesity.
Objective
This review aimed to systematically assess the impact of oral corticosteroids on obesity through effects on body weight, dietary intake and body composition.
Design
Relevant English language articles from 1973 to March 2010 were selected from MEDLINE, EMBASE, CINAHL and Cochrane databases. References from retrieved articles were also examined. Three independent reviewers selected studies with subjects over 18 years old that used an oral corticosteroid and measured; body weight, dietary intake, and body composition as outcomes. Article quality appraisal and data extraction were completed using standardised tools.
Outcomes
A total of 3,765 articles were identified, of which 566 abstracts were retrieved, from which 124 full text articles were retrieved and reviewed. Fifteen articles were included in the review. Differences in study design and duration, treatment dosage and patient population make results difficult to consolidate and generalise. Oral corticosteroid therapy may result in increased dietary energy intake, however this does not appear to result in increased body weight after short-term administration due to a concomitant increase in energy expenditure. Increased body weight and changes in body composition may occur after chronic (≥3 months) oral corticosteroid use. The influence of oral corticosteroids on appetite hormones such as leptin and varied responses within subject populations confound the relationship.
Conclusion
There is a lack of definitive evidence to suggest that oral corticosteroids affect dietary intake and body weight. Conclusions are limited due to the lack of high quality studies objectively measuring body weight, dietary intake or body composition in patients without pre-existing metabolic abnormalities taking oral corticosteroids.
Source of Funding
None

Factors associated with body mass index in a nationwide cohort of mid-age women

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Background
Autonomous and controlled styles of eating regulation (as described by Self-Determination Theory) and speed of eating may be important in influencing weight gain and degree of obesity. However these characteristics have rarely been investigated in representative samples of adult women.
Objective
To examine, in a nationwide sample of women, the association between different styles of eating behaviour regulation (autonomous and controlled) and body mass index (BMI), with specific eating habits as mediators, as well as the association between speed of eating and BMI.
Design
A nationwide study of 2500 randomly selected New Zealand women aged 40-50 years, using electoral rolls for the entire country. The survey yielded a 66% participation rate (n=1601).
Outcomes
Autonomous forms of regulation were negatively associated with BMI while controlled forms of regulation were positively associated with BMI. When controlling for confounding variable as well as specific food patterns that were possible mediators, there was a statistically significant inverse association between autonomous regulation and BMI (2.0% decrease for every 10-unit increase in autonomous regulation; 95% CI: 1.4%, 2.7%; P<0.001) and a statistically significant positive association between controlled regulation and BMI (1.4% increase for every 10-unit increase in controlled regulation; 95% CI: 0.4%, 2.3%; P=0.005). The relationships between autonomous regulation and BMI and controlled regulation and BMI were partially mediated by the specific food patterns measured. After adjusting for confounding variables, BMI statistically significantly increased by 2.8% (95% CI: 1.5%, 4.1%; P<0.001) for each category increase in self-reported speed of eating.
Conclusion
Autonomous styles of eating behaviour regulation are associated with lower BMI in mid-age women, and the associations are partially mediated by the specific food patterns measured. The results also suggest that faster eating is associated with higher BMI in mid-age women.
Source of Funding
Supported by the Department of Human Nutrition, PBRF fund, University of Otago, Dunedin, New Zealand.

Dietary induced weight loss improves asthma control and lung function after 10 weeks in obese children and adolescents with asthma

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Background
Weight loss may reduce systemic and airway inflammation, improving clinical asthma outcomes in asthmatic children and adolescents.
Objective
To investigate whether acute dietary-induced weight loss improves inflammatory and clinical asthma markers in obese asthmatic children and adolescents.
Design
In a 10 week pilot weight-loss intervention, 22 obese children and adolescents targeted a 2000kJ/day energy intake reduction, with weekly dietetic support. Lung function (spirometry, plethysmography), clinical asthma indicators (Asthma Control Questionnaire (ACQ), Paediatric Asthma Quality of Life Questionnaire (PAQLQ)), airway and systemic inflammatory markers (induced sputum cell counts, blood) and body composition (Dual Energy X-ray Absorptiometry) were measured pre-and post-intervention.
Outcomes
There was a clinically significant reduction in BMI *z*-score (P<0.001), waist circumference (P=0.003), total fat mass (P<0.001) and thoracic fat mass (P=0.001) following the intervention. There was a significant improvement in expiratory reserve volume (P=0.026). The ACQ (P=0.023) and PAQLQ symptom domain (P=0.017) scores improved significantly following the intervention. No changes were detected in airway or systemic inflammation.
Conclusion
Dietary-induced weight loss in asthmatic children and adolescents can successfully reduce BMI *z*-score and total and regional fat mass while preserving lean mass in a 10 week period. Weight loss had no detectable effect on systemic or airway inflammation. However, improvements in asthma control, symptom control and lung function were significant.
Source of Funding
Hunter Medical Research Institute Gastronomic Society Donor Grant.

Postprandial response of subcutaneous adipose tissue in healthy adults

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Background
Adipose tissue (AT) is an important endocrine organ in the regulation of metabolism. It has been identified as one of the first sites of meta-inflammation, which is a key event in the development of insulin resistance. While diets chronically high in saturated fat are known to induce AT dysregulation, less is known about the acute impact of nutrients on AT inflammation and metabolism.
Objective
To measure acute, postprandial changes in gene expression of subcutaneous AT in healthy volunteers following the consumption of a lipid or carbohydrate beverage.
Design
Thirty-three healthy adults were recruited and randomised to consume one of three beverages; placebo (0 kJ), lipid (1988 kJ) or carbohydrate (1856 kJ). Subcutaneous AT biopsies were taken at baseline (0 h), as well as 2 and 4 h following consumption of the beverage. RT-PCR was performed to measure changes in AT gene expression.
Outcomes
Groups were matched for height and weight. No differences were observed in adipokine gene expression between each group (*MCP-1, IL-6, TNF-α* and *Adiponectin*). Expression of metabolic gene *IRS2* was reduced with carbohydrate consumption at 2 h (P<0.001) and 4 h (P<0.01). In addition *PDK4* was reduced following carbohydrate consumption at 2 h (P<0.001) and 4 h (P<0.001); and after lipid consumption at 4 h (P<0.05). No changes were observed in *LPL, PPARγ or FAT-CD36*.
Conclusion
Carbohydrate and lipid differentially affect gene expression in subcutaneous AT. Understanding the impact of these macronutrients on AT may provide insight into the development of metabolic dysregulation of AT.
Source of Funding
Not applicable.

The effect of high fat dairy or high fat soy on anti-oxidative & oxidative markers

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Background
Dairy foods are a rich source of saturated fats; however unhealthy post-prandial changes in plasma biomarkers are often not seen. In contrast, soy lipid content is rich in poly-unsaturated fats, which are associated with healthy post-prandial effects.

Objective
To determine the postprandial effect of consuming high fat meals rich in dairy (saturated) or soy (poly-unsaturated) fats on markers of oxidative stress and antioxidant defences.

Design
Ten subjects consumed both iso-caloric meals, which were rich in either dairy or soy fats, in a random order and separated by a washout period. Blood was collected hourly from baseline to 5h post-prandial. Antioxidant (TAS, CAT, SOD) and oxidative (MDA, 8-isoprostanes) biomarkers were measured in the plasma collected.

Outcomes
There were no significant differences found between the effects seen following high fat dairy or soy meal consumption on TAS, SOD, CAT and MDA. Following the high fat dairy meal, CAT activity increased and SOD amounts decreased over time (repeated measures ANOVA: $p<0.05$), however these changes were not significantly different compared to changes following soy over time. The mean 8-isoprostane levels 4h post-dairy were 20.3pg/mL higher than in soy, but there were no differences between meals at any other time-point.

Conclusion
The effect of consuming a high saturated fat meal from a dairy source had almost the same effect on oxidative and antioxidant markers as consuming an equivalent amount of poly-unsaturated fat from soy. The higher level of 8-isoprostane seen at 4h post-dairy consumption could be due to the differences in the food matrix effects on intestinal absorption between the dairy, containing saturated fats, and the unsaturated soy fat meals. Overall, the lack of major differences between the effects of these meals may indicate saturated fat in dairy foods may not be as harmful as those in other saturated fat sources.

Source of Funding
Dairy Australia and Deakin University.

Antioxidant capacities of cooked spinach prepared in Indian styles

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Background
Dietary antioxidants play an important role in reducing the oxidative damage in humans due to their free radical scavenging capacity and thus may help to reduce the incidence of disease. Among dietary leafy vegetables, spinach is widely consumed and contains considerable antioxidant capacity.

Objective
To investigate the effects of Indian cooking methods and addition of ingredients such as spices and paneer (Indian milk product) on the antioxidant capacity of spinach.

Design
The hydrophilic antioxidant capacities of four different spinach dishes prepared in Indian cooking style namely 'palak', 'plain palak saak', 'palak saak with ginger' and 'palak paneer', were measured using oxygen radical absorption capacity (ORAC) assay. To determine the effect of cooking time on the antioxidant capacity of spinach, samples were collected at three different stages of preparation; raw and cooked for 15 and 25 minutes. All results were expressed as trolox equivalents/g dry matter (DM).

Outcomes
'Plain palak saak' contained the highest antioxidant capacity (163±39 µM TE/ g DM) compared to the other raw samples, while 'palak paneer', which was prepared using paneer, contained significantly lower antioxidant capacity (49±1 µM TE/ g DM). Substitution of malabathrum leaf with ginger decreased the antioxidant capacity of the dish even though ginger had higher antioxidant capacity than malabathrum. This indicates there is some interaction between antioxidants in the dishes. Antioxidant capacity tended to decrease with longer cooking but this effect was not statistically significant. For example, the ORAC values of 'plain palak saak' were 134±38 and 118±26 µM TE/ g DM after cooking for 15 and 25 minutes respectfully.

Conclusion
The antioxidant capacities of the spinach dishes depended on the combination of spices added. The addition of milk products like paneer reduced the antioxidant capacity of the spinach dish when considered on a dry matter basis but this was completely explained by the dilution effect. The effect of cooking time on the antioxidant capacity of the Indian spinach dishes was not significant.

Source of Funding
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Effects of oleocanthal and ibuprofen on proliferation in C2C12 myoblasts

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Background
Degenerative diseases such as arthritis are often prescribed NSAIDs for their known therapeutic and anti-inflammatory actions; however NSAIDS have been shown to disrupt skeletal muscle regeneration processes by inhibiting COX activity. The Mediterranean diet has been implicated in reduced incidence of inflammatory joint disease. Oleocanthal is a component of this diet and found in virgin olive oil. Oleocanthal mimics the anti-inflammatory action of ibuprofen through COX inhibition.

Objective
Our objective is to determine if oleocanthal mimics the actions of the synthetic NSAID ibuprofen in proliferating myoblasts, and to assess if these anti-inflammatory compounds have adverse effects on myoblast proliferation *in vitro*. We also aim to determine if various concentrations of LPS and IFNγ, and LPS and IFNγ combined have any effect on myoblast proliferation

Design
C2C12 Myoblasts were plated and allowed to attach overnight. Cells were treated with oleocanthal (10,25µM); ibuprofen (10,25µM); LPS (1µg/ml); IFNγ (30ng/ml); and LPS (1µg/ml) plus IFNγ (3ng/ml) for 24 and 48hrs and fixed with PFA (4%) and Triton (0.1%). Following fixation, myoblasts were incubated with DAPI (1µl/ml) for 20 min at room temperature followed by 3x5 min washes in PBS. Ten fields of view were randomly imaged and myoblast numbers were determined using Image J software.

Outcomes
Cell viability was not affected by treatment with oleocanthal at concentrations up to 200µM. There were no significant differences in cell number after 24 and 48 hr treatment with oleocanthal (10, 25µM)or ibuprofen (10, 25µM) when compared to controls. Treatment with LPS and IFNγ did not have a significant effect on myoblast proliferation.

Conclusion
Ibuprofen and oleocanthal did not have any adverse effects on myoblast proliferation and acted in a similar way, suggesting that these compounds do not affect myoblast proliferation. The long-term ingestion of oleocanthal as part of the Mediterranean diet and a synthetic NSAID such as ibuprofen at low concentrations may therefore have pharmacological actions without compromising muscle growth and regeneration.

Source of Funding
None.

Dietary supplementation with resveratrol normalizes histone deacetylase (HDAC4) in the hippocampus of streptozotocin-induced diabetic mice

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Background
Substantial preclinical and clinical evidence implicates diabetes in cognitive dysfunction and given the increasing prevalence of diabetes, approaches need to be developed to prevent or ameliorate associated cognitive impairments. Resveratrol (3,4',5-trihydroxystilbene) is both a powerful antioxidant and an anti-inflammatory agent which has been associated with a reduced risk of developing various chronic diseases and also to mimic calorie restriction in extending life span. The potential of nutritional intervention with resveratrol on brain function in a preclinical model for diabetes mellitus was investigated.

Objective
To examine the effect of dietary supplementation with resveratrol on hippocampal gene expression in streptozotocin-induced diabetic mice.

Design
Streptozotocin-induced diabetic mice were fed a diet supplemented with or without resveratrol (50mg/kg/day). Following six weeks of dietary intervention, mice were sacrificed; brain tissues were rapidly removed and frozen in isopentane. Brain tissue was cryosectioned and RNA extracted from the hippocampus. Microarrays were run at Australian Genome Research (AGRF) Melbourne. High priority genes of interest were selected from the microarray data and confirmed by qPCR.

Outcomes
In diabetic mice (blood glucose > 15mM) there was a 46% reduction in hippocampal expression of a histone deacetylase enzyme (HDAC4), compared to the non-diabetic control group. Dietary supplementation of diabetic animals with resveratrol, normalised the hippocampal expression of HDAC4 to the point where it was no longer significantly different to the non-diabetic control animals.

Conclusion
We have demonstrated that diet supplementation in sterptozotocin-induced diabetic mice with resveratrol can return the level of hippocampal HDAC4 expression to non-diabetic levels. These preliminary data indicate that resveratrol may be of potential therapeutic benefits for the treatment of diabetes related cognitive impairment.

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Emu oil enhances histological repair in a rat model of chemotherapy-induced intestinal mucositis

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Background

Mucositis resulting from cancer chemotherapy is characterised by intestinal inflammation and ulceration. In a previous study, Emu Oil (EO; extracted from Emu adipose tissue) decreased intestinal inflammation during the earlier stages of experimentally-induced mucositis.

Objective

To investigate the role of EO during the later stages of intestinal recovery in a chemotherapy-induced mucositis rat model.

Design

Dark Agouti rats (n=8/group) were gavaged with water, Olive Oil (OO) or EO for 10 days and injected with 5-Fluorouracil (5-FU) or saline, on day five. Metabolic parameters, organ weights and lengths and histological measurements were assessed. $P<0.05$ was considered significant.

Outcomes

5-FU decreased body weight and food intake compared with healthy rats ($P<0.05$). Total water intake and urine output during the post 5-FU period (days 5-10) were decreased by EO in 5-FU-injected rats and EO increased colon weight and small intestinal weight and length compared to 5-FU controls. EO significantly lengthened crypts in normal rats (122±2µm) compared with healthy controls (112±2µm; $P<0.05$). Crypts were significantly lengthened in all 5-FU-injected groups compared to healthy controls. However, in 5-FU-injected rats, crypt depth was significantly greater following OO- (144±2µm) and EO-treatment (150±2µm) compared with 5-FU control (127±1µm; $P<0.05$). Both OO and EO significantly lengthened villi in healthy (511±6µm and 543±6µm, respectively) and 5-FU treated rats (OO:509±5µm; 562±5µm) compared with controls (Saline:474±10µm; 5-FU:484±4µm). EO increased villus length compared to OO in both normal and 5-FU-injected rats ($P<0.05$).

Conclusion

EO enhances histological repair from chemotherapy-induced intestinal damage, suggesting its potential as an adjunct therapy to alleviate mucositis in cancer patients undergoing chemotherapy.

Source of Funding

Not applicable.

Antiviral activity of antioxidants against rhinovirus infection

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Background

Human rhinovirus (RV) is the most common cause of asthma exacerbations. RV-infection induces oxidative stress and antioxidants are hypothesized to reverse the infectivity of RV. PI3-kinase is involved in viral internalisation, thus may be a target for inhibiting viral replication.

Objective

To investigate whether enrichment of airway epithelial cells with dietary antioxidants will have antiviral effects on RV-infected cells.

Design

Human airway epithelial cells (Calu-3) were pre-treated with resveratrol, zinc, vitamin D, lycopene or wortmannin (PI3-kinase inhibitor) for 2, 4, 18 or 24 hrs prior to infection. Calu-3 cells were incubated with either RV1B or RV43 for 1 hour and agitated at room temperature to allow efficient binding of RV. PI3-kinase activation was determined by Western blot, viral RNA level was assessed by RT-qPCR, viral titer was assessed by $TCID_{50}$/ml and cell viability was assessed by Annexin V-PE and 7-AAD staining and analyzed by flow cytometry.

Outcomes

A significant reduction in RV43 viral titer was observed in cells pre-treated with resveratrol ($P=0.0076$), zinc ($P=0.0011$), vitamin D ($P=0.0022$) or lycopene ($P=0.0130$). Antioxidants (except zinc) and wortmannin inhibited RV-induced PI3-kinase activation ($P\leq0.05$). Inhibition of PI3-kinase with wortmannin reduced the viral titer without affecting cells viability. Resveratrol and lycopene were found to decrease viral RNA level. The precise mechanism by which antioxidants affect RV replication is currently under investigation.

Conclusion

Dietary antioxidants possess antiviral properties presumably via steps involved in viral endocytosis, viral replication or maturation of viral polypeptide.

Source of Funding

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Childhood obesity prevention in Europe: the science of behaviour change

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Background

The worldwide prevalence of overweight and obesity has been steadily increasing, including among children and adolescents, and is reaching alarming epidemic proportions in Europe and elsewhere. Overweight and obesity in adolescence is a very strong predictor of obesity in adulthood and of subsequent development of chronic ill health. Preventing excessive weight gain among schoolchildren will help to halt the increasing number of overweight adolescents and young adults, and will improve physical health, and may contribute to psychosocial well-being and school performance.

Objective

To provide an overview of some of the research conducted in Europe on childhood overweight and obesity, its behavioural, cognitive and environmental determinants and preventative intervention strategies.

Design

This keynote presentation will present results from systematic reviews, observational studies and intervention studies informed by the European Commission-funded Pro Children and ENERGY projects.

Conclusion

The evidence from European studies indicates that large differences in childhood overweight and obesity as well as risk behaviours for unnecessary weight gain are observed across Europe. Personal, social and physical environmental factors are important determinants of unhealthy eating, lack of physical activity and too much sitting time. Interventions that combine tailored health education with school and home environmental change appear to be most promising in promotion of healthy behaviours that may contribute to obesity prevention.

Source of Funding

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Socioeconomic disadvantage and diet: understanding and promoting 'resilience'

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Background

Socioeconomically disadvantaged individuals are less likely than their more advantaged counterparts to consume diets consistent with guidelines for good health. However, some disadvantaged individuals manage to eat well, despite their circumstances. A better understanding of the determinants of socioeconomic inequalities in diet may help in promoting 'resilience' to unhealthy eating amongst other socioeconomically disadvantaged individuals.

Objectives

To investigate the role of perceived intrapersonal, social and both perceived and objectively-assessed environmental factors in explaining socioeconomic inequalities in women's fruit and vegetable intakes; and to examine the feasibility of a nutrition promotion intervention approach addressing these factors in promoting 'resilience' to unhealthy eating amongst socioeconomically disadvantaged women.

Design

Data from a mail-based survey completed by 1540 women from across 45 neighbourhoods of varying disadvantage in Melbourne, was linked with objective audit data on supermarkets and fruit and vegetable stores in the 45 neighbourhoods. A separate convenience sample of 34 women pilot-tested skills-based materials to be incorporated into a nutrition promotion intervention.

Outcomes

Intrapersonal, social and perceived but not objectively-assessed environmental factors mediated some of the associations of socioeconomic position with fruit and vegetable consumption. In the pilot intervention study, women generally rated the intervention materials as useful and provided insights into how these could be improved.

Conclusion

Nutrition promotion initiatives in low-income women should focus on addressing selected intrapersonal, social and perceived environmental factors. An approach addressing these elements was regarded as feasible and useful by women. A randomised controlled trial investigating the effectiveness of the approach for promoting resilience to unhealthy eating in low-income women is now underway.

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Forget schools: how do we tackle the home environment for obesity prevention?

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Background

Considerable public attention and debate has surrounded the role that schools can or should play in obesity prevention in New Zealand. In contrast, the importance of the home food environment and its contribution to weight in children has received relatively little scrutiny.

Objective

To discuss the evidence regarding the potential effectiveness of different approaches to tackling obesity within the home.

Design and Outcomes

The importance of the home food supply is illustrated by national data reporting that although New Zealand children aged 5-14 years consume about one-third of their total energy intake while at school, the vast majority of this food (80%) comes from home. Important factors which might influence the types and amount of food available within the home, range from macro-level factors including the political and economic environment (advertising, government policies, and food pricing), to micro-levels factors such as parenting style, family eating patterns and work schedules. The contribution of these factors and how they might be manipulated to change the home environment in some way will be discussed.

Conclusion

The importance of the home environment should not be underestimated, and efforts to improve dietary intake and maximise health should concentrate where the majority of energy is consumed.

Source of Funding

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