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New insights into the mechanisms of action by which n-3 fatty acids affect immune cell function

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Most interest in the influence of fatty acids on immune processes has centered on the frequently opposing actions of n-6 and n-3 polyunsaturated fatty acids (PUFAs), although recent studies have demonstrated novel actions of saturated fatty acids that are again opposed by n-3 PUFAs. Human immune cells are rich in n-6 PUFAs, especially arachidonic acid, relative to n-3 PUFAs. Arachidonic acid gives rise to the eicosanoid family of mediators (prostaglandins, leukotrienes and related metabolites) and these mediators regulate various inflammatory processes as well as the activities of immune cells. For example the arachidonic acid derivative prostaglandin (PG) E_2 acts to polarise T cell responses away from the T helper 1 phenotype associated with cell mediated immune responses. Although arachidonic acid-derived eicosanoids are widely regarded as being pro-inflammatory, recent work has shown that lipoxin A_4 is an important inflammation resolving signal. Consumption of long chain n-3 PUFAs (eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)) found in oily fish and in fish oils decreases the amount of arachidonic acid in immune cell membranes and so available for eicosanoid production. Thus, long chain n-3 PUFAs result in decreased production of eicosanoids from arachidonic acid. When consumed in increased amounts, EPA and DHA appear in immune cell membranes. The increased number of double bonds in n-3 PUFAs means that they can modify membrane order ("fluidity") which may in turn affect membrane-mediated functions involving protein movement within the membrane; this relationship has been best studied with regard to phagocytosis. Lipid rafts are microdomains within cell membranes that have a lipid and fatty acid composition that is different from non-raft regions. Rafts serve as platforms for assembly and interaction of proteins involved in early cell signaling events and their role has been extensively studied in T cells. EPA and DHA have been shown to affect raft formation in T cells and in other immune cells and so to influence early immune cell responses. Fatty acids probably affect other early signaling events in immune cells since these rely upon second messengers generated from phospholipids and phospholipid structure (i.e. fatty acid composition) modulates second messenger efficiency. Through effects at the membrane and signaling levels, n-3 PUFAs modify gene expression in immune cells. This has been most widely studied in inflammatory cells where the alterations in inflammatory gene expression appear to involve a reduced activation of the transcription factor nuclear factor κ B. However, several other transcription factors are also regulated by fatty acids both directly and indirectly. Apart from the effect of n-3 PUFAs on the production of eicosanoids from arachidonic acid, EPA acts as an alternative substrate for eicosanoid synthesis giving rise to mediators that are often less potent than the analogues produced from arachidonic acid; thus PGE_3 has a limited effect on T cell responses compared with PGE_2. EPA and DHA give rise to newly discovered families of mediators termed E- and D-resolvins, respectively, which have very potent anti-inflammatory, inflammation resolving and immunomodulatory actions in cell culture and animal model systems. Research on the action of fatty acids within the immune system continues to reveal novel mechanisms (e.g. on rafts, resolvins, transcription factors) which aids greater understanding of the comparative actions of different fatty acids and fatty acid families.

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Carbohydrate, respiratory illness and inflammation in elite athletes

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Background

In high-performance athletes the impact of recurrent episodes of upper respiratory illness (URI) on their ability to train and perform at optimal levels can be significant[1]. Over the past 30 years research investigating the associations between suspected infections and immune status has provided a few clear answers for the underlying causes. One of these being that the sore throats, thought to be upper respiratory tract infections (URTI) are often the result of non-infectious but exercise-induced inflammation[2]. Poor recovery practices from high-intensity and endurance training have also identified hypo-glycaemia as a common finding in athletes experiencing persistent fatigue[3]. Recent data has also demonstrated that an individual's immunogenetic profile can determine their risk for over production of inflammatory cytokines, particularly in athletes who experience recurrent URI[4]. Dietary interventions have focused on carbohydrate, vitamin supplementation and probiotics as modifiers of inflammatory cytokine responses, but the impacts on reducing respiratory illness have been limited[5].

Objective

This study examined the effects of both acute and chronic (28-days) carbohydrate (CHO) supplementation on cytokine responses to cycle ergometry with or without acute CHO beverage ingestion during the trials. The purpose was to determine whether chronic CHO supplementation had a synergistic effect on the responses associated with acute CHO ingestion.

Design

The study involved sixteen highly trained male cyclists/triathletes. One group (n=8) consumed a high-CHO (8.5 $g.kg^{-1}$ body mass) diet for 28 days; a second group (n=8) consumed a moderate-CHO diet (5.3 $g.kg^{-1}$ body mass). Athletes completed two trials in randomised order, each following a 24 hr standardised diet (60% CHO). One trial involved the consumption of a 10% CHO beverage (15$mL.kg^{-1}.hr^{-1}$); the other water (WAT). Both trials involved 100 min steady state cycle ergometry at 70% VO_{2max} followed by a time trial of ~30 min duration. Blood samples were collected pre-, immediately post- and 1 hr post-exercise. Plasma concentrations of pro- (IL-6, IL-8) and anti-inflammatory (IL-10, IL-1ra) cytokine concentrations were determined using a Bio-Plex Suspension Array System (Bio-Rad Laboratories Pty Ltd). Cytokine responses were compared between pre-and post-intervention trials for each of the groups using paired t-tests ($p<0.05$) and standardised mean changes to describe the likely range of the effect.

Results

Acute CHO beverage ingestion attenuated increases in anti-inflammatory cytokines at 1 hr post-exercise (30-40% reductions, trivial to moderate differences), but had less of an affect on pro-inflammatory cytokine responses. The 28-day high-CHO diet did not substantially affect cytokine responses to either WAT or CHO beverage exercise trials. In contrast, following the 28-day moderate-CHO diet, there were substantial reductions in anti-inflammatory cytokine responses to the WAT trial (30-50% reductions; trivial-moderate differences), as well as reductions in responses to the CHO beverage trial for both pro-inflammatory (15-45% reductions; trivial- moderate differences) and anti-inflammatory cytokines (20-50% reductions; trivial-moderate differences).

Conclusions

There did not appear to be a synergistic effect between acute and chronic-CHO consumption in protecting against post-exercise cytokine disruptions in athletes on a high CHO diet. In contrast where dietary CHO was lower, acute CHO use attenuated post-exercise disruptions in cytokine concentrations. This may have implications for athletes undertaking CHO-restricted diets for participation in sports with defined weight classes.

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Antioxidant supplements interfere with exercise training-induced adaptations

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Background

Antioxidant supplementation is a widespread practice amongst exercising individuals. The rationale is that because exercise results in an increased oxygen consumption this leads to the generation of more reactive oxygen species (ROS) and oxidative stress. The oxidative stress could then

affect exercise performance, recovery and the long-term health of the individual. However, nearly all studies investigating the effects of antioxidant supplements on exercise performance report no benefit, the data on recovery is equivocal and there is no evidence of long-term health benefits of antioxidant supplements in exercising individuals. Of concern are recent reports that antioxidant supplements can interfere with exercise training-induced beneficial health processes. Indeed, although ROS are associated with harmful biological events they are also essential to every cell's development and optimal function. ROS participate in important molecular signaling processes, play crucial roles in gene activation, cellular growth, modulation of chemical reactions and biosynthesis of other molecules. After decades of research it is now clear that maintainance of oxidant-antioxidant balance is critical for cell survival and normal function. Therefore, any attempts to upset this balance such as by consuming antioxidant supplements, may lead to negative heath effects.

Objective

To present a summary of studies investigating the effects of antioxidant supplements on exercise training-induced adaptations.

Design

A thorough literature search of the Medline database using PubMed was conducted to indentify appropriate studies.

Outcomes

Seventeen studies met the inclusion criteria (1-17). The majority of these studies used either vitamins C or E and reported effects including; increasing oxidative stress, decreasing performance time, interfering with exercise training-induced blood pressure lowering, improvements in insulin sensitivity and mitochondrial biogenesis.

Conclusion

Based on the findings that antioxidant supplements can interfere with exercise training-induced adaptations, they should not be recommended for exercising individuals. The message should continue to be that the majority of physically active individuals need to optimise their nutrition through food. Situations that may warrant antioxidant supplementation are when individuals struggle to meet dietary antioxidant requirements. This may result in specific deficiencies, although we currently do not have adequate laboratory based tests to determine if antioxidants are required. In these situations, a qualified sports dietician/nutritionist can assist.

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Concurrent Session 10: Body Composition

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Effects of lupin-enriched foods on body weight and composition in overweight individuals

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Background

Partial substitution of refined carbohydrates in the diet with protein and fibre may benefit body weight in overweight individuals via effects on appetite. Lupin kernel flour is a novel food ingredient that: (1) is high in protein (~40%) and fibre (~25%); (2) can be used to increase protein and fibre content of high carbohydrate foods; and (3) has been shown to significantly reduce appetite and energy intake acutely.

Objective

To investigate the effects of regular consumption of lupin kernel flour-enriched foods during and following energy restriction on body weight and composition in overweight men and women.

Design

Overweight, otherwise healthy, men and women (*n*=131), were recruited to a 12 months parallel-design trial. Participants were randomly assigned to consume lupin-enriched foods (lupin) or matching high carbohydrate foods (control) for 12 months. All participants underwent a 3 month intensive weight loss program involving energy restriction, 1 month weight stabilization, and then an 8 month period, with minimal investigator intervention, during which participants were instructed to maintain the weight loss achieved. Body weight and composition was assessed at baseline, 4 and 12 months.

Outcomes

At baseline the mean ± SD body weights were: 93.7 ± 15.2 kg (control) and 91.8 ± 13.5 kg (lupin). Lupin, relative to control, did not significantly influence weight loss to 4 months, or body weight change to 12 months (P>0.5). Adjusted differences in body weight at 4 months and 12 months were: 0.2 kg (95% CI: -1.2, 1.6 kg) and -0.9 kg (95% CI: -2.4, 0.5 kg), respectively. Similarly, lupin relative to control, did not significantly influence measures of body composition.

Conclusion

Regular consumption of lupin-enriched foods does not enhance weight loss during energy restriction and does not improve weight maintenance following weight loss.

Nutrition after gastric banding: Is there a role for high protein diets? Baseline characteristics and early changes in anthropometry and biochemistry after surgery

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Background

In Australia there has been an exponential increase in laparoscopic adjustable gastric banding (LAGB) as a treatment strategy for obesity in recent years. It is unknown if there is a type of diet that may help to optimise weight loss, body composition and other nutrition-related health outcomes after surgery.

Objective

To describe baseline characteristics and changes in anthropometry and biochemistry at 3 months post-surgery for participants enrolled in a broader study investigating the utility of a high protein diet for individuals who have LAGB.

Design

Six month pseudo-randomised control trial comparing an ad-libitum energy high protein diet with usual care in subjects who have undergone LAGB. Weight loss, changes in body composition, waist circumference, blood lipids and glucose metabolism were assessed at baseline (1-2 weeks post-surgery) and 3 months.

Outcomes

Twenty-three participants have been recruited to date (18 females; 5 males) with a mean (±SD) age of 49.9 (6.3) years, BMI 42.6 (10) kgm^{-2}, weight 118.6 (28.4) kg, waist circumference 117.5 (15.6) cm, percent body fat 47.6 (6.3) and resting energy expenditure 1844 (262) kcal/day. Average 3 month weight loss (±SD) to date is 3.7 (2.3) %, with waist circumference decreasing by 3.1 (2.8) % and percent body fat by 6.4 (2.9) %. Mean changes (min, max) in blood lipids and glucose metabolism to date are heterogeneous: LDL +0.3 (+1.5, -0.48), HDL +0.3 (0.1, 0.4), triglycerides -0.16 (+0.3, -0.54), fasting glucose -0.24 (+0.1, -0.8) and insulin -0.74 (+7.6, -7.5) mmol/L.

Conclusion

Early changes in anthropometry and biochemistry are variable for individuals who have LAGB. Not all subjects achieve clinically significant weight loss by 3 months post-surgery. This is a likely reflection that subjects remain in a transitional phase at this time point, where a longer interval is required in order to achieve optimal band restriction and

patient understanding of how to best utilise the band as an effective tool for weight loss.

Secular trends in the waist to height ratio in Australian young people

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Background

Limited data suggest central adiposity, as measured by waist circumference, is increasing in children at a steeper rate compared with total adiposity. This is a concern because of its association with cardiovascular risk. While the waist to height ratio (WHtR) more readily identifies young people with adverse cardiovascular risk factors compared to waist circumference and BMI, little is known about the secular trends in WHtR.

Objectives

To examine secular change of WHtR in Australian children aged 7 to 15 yr.

Design

Secondary data analysis data of national Australian surveys; 1985 Health and Fitness Survey (n=8485), 1995 National Nutritional Survey (n=1579), and 2007 National Children's Nutrition and Physical Activity Survey (n=2585). Z scores from age and sex specific reference values were calculated for height, weight, BMI and waist.

Outcomes

Between 1985 and 2007 there was a significant increase in mean height, weight, BMI, and waist circumference z scores of 0.43 (95% CI 0.38 to 0.47), 0.49 (0.45 to 0.53), 0.33 (0.29 to 0.37) and 0.51 (0.46 to 0.55), respectively. The increase in height z score was particularly notable in children ≥12 yr (mean difference; 0.51, P<0.001), as was the increase in waist z score in girls ≥10 yr (0.65, P<0.001). During this period the mean WHtR increased by 0.016 (0.014 to 0.019) from 0.437 to 0.453 and the prevalence of overweight and obesity increased from 12% to 27%. For all anthropometric z scores the average rate of change was approximately three times higher between 1985 and 1995 compared to the change between 1995 and 2007. In contrast, the increase in WHtR was similar for both time periods (mean difference; 0.010 vs 0.007) and the number of children with a WHtR >0.5 increased steadily from 7% in 1985, to 11% in 1995 and 15% in 2007.

Conclusion

Between 1985 and 2007 both BMI and waist circumference significantly increased, however the rate of increase appears to be slowing. In contrast, central adiposity continues to increase relative to height. In part, this may represent earlier puberty in the later cohorts. However, we speculate that it is indicative of an escalating problem that needs to be urgently addressed to prevent the development of cardiovascular risk factors in young people.

Body composition in boys with Duchenne muscular dystrophy

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Background

Duchenne Muscular Dystrophy (DMD) is the most common and severe of the genetically inherited neuromuscular diseases, characterised by progressive muscle weakness and reduced muscle tone. Reports from the United States have suggested that 54% of boys with DMD are obese by early adolescence. Early introduction of corticosteroids is altering the disease progression but can contribute to excessive weight gain, which is a major concern to care givers.

Objective

This analysis aimed to evaluate body composition in boys with DMD living in Queensland compared to healthy controls.

Design

Subjects with DMD who were still physically mobile were age matched with healthy control boys. Weight and height were measured and body composition assessed using total body potassium (TBK) and Air Displacement Plethysomography (BodPod™).

Outcomes

Nine boys with DMD (8 treated with steroids), mean age 10 ± 3 and 9 control boys (10 ± 4) completed the study. There were no differences in weight (Control 40.94 ± 3.74 kg versus DMD 37.47 ± 8.35 kg) between the groups. Boys with DMD were significantly shorter (DMD 125.0 ± 6.1cm, versus Control 140.7 ± 22.1cm, P< 0.03) had a higher BMI (20.1± 4.12 versus 23.85 ± 4.29, P<0.04), a significantly greater % of body fat (45.22 ± 10.2) compared to control boys (25.84 ± 10.6, P < 0.05). DMD boys also a significantly lower body cell mass compared to controls (374g ± 70, 489g ± 156, P = 0.03).

Conclusion

Even ambulatory boys at a relatively young age and treated with steroids, have measureable alterations in body composition. Nutritional management needs to be focussed on providing sufficient energy for growth while trying to prevent the onset of obesity which in itself can limit mobility. Longitudinal measures of body composition may be used to guide clinical management which should aim to maintain lean muscle mass and minimise gain in body fat.

Sarcopenia and sarcopenic obesity in older people with COPD?

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Background

COPD may be complicated by progressive loss of skeletal muscle mass (sarcopenia), weight loss and exercise limitation. We have identified a high prevalence of overweight/obesity in COPD that is also accompanied by exercise limitation. In conditions such as metabolic syndrome, obesity and sarcopenia co-exist (sarcopenic obesity) where there is a raised body mass index (BMI) due to increased body fat, but reduced skeletal muscle mass due to sarcopenia. We hypothesized that older people with COPD and a high BMI had sarcopenic obesity.

Objective

To determine the prevalence of sarcopenic obesity in people > 55 years with COPD.

Design

Thirty eight participants underwent Dual Energy X-ray (DEXA), blood collection, spirometry and health status assessment. They were categorised into 2 groups based on body mass (BM); normal body mass (NBM) or Obese. Whole-body and regional body composition were estimated by using DEXA. The variables of interest were appendicular skeletal muscle mass (ASMM) and appendicular skeletal muscle mass index (ASMMI). Sarcopenia was defined as an ASMMI of <5.45kg/m2 for women and <7.26kg/m2 for men.

Outcome

We recruited 14 males and 24 females, 15 were in the normal BM group and 23 were obese. The mean age (SD) of the whole group was 70.4 (6.9) years and mean (SD) FEV1 percent predicted was 54.6 (20.5). In men, AASMI was maintained with no difference between groups detected (p=0.08). There was, however, a difference in ASSMI between NBM (5.3 kg/m2 (.39)) and obese (7.3kg/m2 (0.9)) females (p=<0.001). Sarcopenia was detected in 2 (34%) males in the NBM group and 1 (12.5%) of the obese males, 5 (55%) females in the NBM group were also sarcopenic. Sarcopenia was not detected in any of the obese females.

Conclusions

Sarcopenia was not detected in obese COPD. The observed maintenance of ASMM with obesity may be contributing to the protective effect or “obesity paradox” that has been reported in other studies. Older women with COPD and a normal BMI are at greatest risk of sarcopenia. Future work is required to investigate the mechanisms of increased ASMM and the effect of weight loss in obese COPD.

Energy requirements in boys with Duchenne muscular dystrophy

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Background

Duchenne muscular dystrophy (DMD) is a recessive X linked genetic disorder characterised by progressive muscle weakness and reduced muscle tone, affecting only boys it limits life expectancy to around 20 years. The use of corticosteroids early in life has an impact on nutritional status which is not well investigated. Standard predictive energy equations do not apply as energy expenditure is altered due to changes in body composition: an increase in fat and fibrous tissues and a decrease in lean muscle mass. The literature regarding energy expenditure in this population is currently limited with contradictory findings.

Objective

To explore the relationship between measured resting energy expenditure (REE) and body composition in ambulatory boys with DMD compared to healthy controls.

Design

REE was measured using a Deltatrac Metabolic Cart after an overnight fast. Fat free mass (FFM) was measured using Air Displacement Plethysomography (BodPod™).

Outcomes

REE was measured in 9 DMD and 9 age and weight matched controls, mean age 9 (range 4-14 years). Eight of the nine boys with DMD were treated with prednisone (dose range 0.12mg/kg/day – 0.6mg/kg/day). Boys with DMD had significantly less fat free mass (19.53kg ± 1.65) compared to controls (29.93 kg± 10.29), P = 0.006. Mean REE in the DMD (5124kJ/day ± 1167) was similar to controls (6140kJ/day ± 1243). However, when expressed per kg of FFM, REE was significantly higher in DMD versus controls (266kJ/kg FFM ± 67, 202kJ/kg FFM ± 34, P= 0.03).

Conclusion

Measuring REE can be useful in boys with DMD treated with steroids to assist with clinical management of weight gain. However, energy needs to be interpreted with caution and in conjunction with body composition. To understand this further it is necessary to look beyond REE as this does not account for the energy expended in daily activities. In such conditions a measure of total energy expenditure is necessary to determine if energy requirements are different to that of a “healthy” population.

Concurrent Session 11: Socio-economic Aspects of Nurition

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Influences on diet quality among women from disadvantaged backgrounds

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Background

Socio-economically disadvantaged individuals are at increased risk of physical inactivity, poor diet and obesity.

Objectives

The aim of this study was to identify the personal, social and environmental correlates of healthy eating patterns among women aged 18-45 years from socio-economically disadvantaged areas, a group at particular risk of unhealthy weight gain.

Design

Analysis was based on a cross-sectional study of 3438 women from socio-economically disadvantaged areas in Victoria, Australia. Diet was assessed using a food-frequency questionnaire and participants were grouped according to a validated diet quality index with higher scores reflecting a diet consistent with national dietary guidelines. Personal, social and neighbourhood environment factors were assessed via self-report questions informed by a Social Ecological theoretical framework and logistic regression was used to identify associations between these factors and the likelihood of having a diet quality score in the top tertile, adjusting for covariates (age, education, marital status, employment and parity).

Outcomes

In multivariable models, home availability of fruit and vegetables, family support factors, perceived behavioural control, self-efficacy and nutrition knowledge were independently associated with diet quality after adjustment for covariates ($p<0.05$). Perceptions of the neighbourhood food environment, friend and colleague support, family barriers, frequency of family dinners, social norms and practises and outcome expectancies for fruit and vegetables were not significantly associated with diet quality.

Conclusion

This study highlights several individual and social level factors that are associated with healthy eating patterns. These findings can be used to inform nutrition interventions aimed at improving diet amongst socio-economically disadvantaged women.

Why do some women of low socioeconomic position eat better than others?

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Background

It is well established that people of low socioeconomic position (SEP) are less likely to consume adequate intakes of fruits and vegetables. However, not all persons of low SEP eat poorly. Little is known about characteristics of those of low SEP who eat well despite their disadvantaged circumstances. Such information could be important to inform nutrition promotion programs in disadvantaged groups.

Objectives

To examine individual, social and neighbourhood environment correlates of fruit and vegetable consumption among women experiencing socioeconomic disadvantage.

Design

This study was based on data from a cross-sectional survey of 355 women with less than 12 years of education (defined as low SEP) aged 18-65 randomly selected from 45 Melbourne suburbs. Women reported how many serves of fruit and how many serves of vegetables they ate each day. Frequent consumers of fruit were defined as those who ate two or more serves per day. Frequent consumers of vegetables were defined as those who ate three or more serves per day. Information was also sought on a range of potential correlates including individual, social and neighbourhood environment factors.

Outcomes

With respect to fruit, 54% of low SEP women were frequent consumers, while 30% were frequent vegetable consumers. Frequent consumers of fruits and vegetables were more confident in their ability to eat a healthy diet, had a stronger preference for fruit and vegetables and were more likely to use meal planning strategies ($p<0.05$). They were also more likely to report support from family and friends for healthy eating, less likely to report lack of storage space or cost as barriers to healthy eating, and more likely to report that healthy food options were available in their neighbourhood ($p<0.05$).

Conclusion

A considerable proportion of low SEP women manage to eat fruit and vegetables relatively frequently. A range of factors are correlated with fruit and vegetable consumption among low SEP women and these may be valuable in informing the development of nutrition promotion strategies amongst this high risk group.

Socioeconomic status is a less important determinant of obesity in Generation Y

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Background

Generation Y has a higher risk of overweight and obesity than their parents did at the same age. The mean body mass index at which Australians enter adulthood has been climbing since 1990 and it is clear that health promotion needs to target young adults and children. Reaching young adults is difficult but as schools have proven successful in connecting with children, tertiary education settings may be suitable for young adults. However, the caveat may be that because of their higher socioeconomic status these students are less vulnerable to the obesity epidemic and not the target group.

Objective

The aim of this study was to determine if tertiary educated young adults are vulnerable to overweight and obesity and if income is predictive of overweight in young adults

Design

The Australian Bureau of Statistics conducts regular National Health Surveys that include data on self-reported weight, height, education and various measures of socioeconomic status. A secondary statistical analysis of the Survey conducted in 2004/5 was performed and prevalence of overweight and obesity (ie body mass index of 25 kg/M^2 or greater) stratified by age, household income and education was calculated.

Outcomes

By decile of household income the prevalence of body mass index of 25 kg/M^2 or greater) was 41.7% for the highest decile, 41.2% for the third, 44.0% for the seventh and 40.6% for the lowest for those aged 20 to 29 years. Clearly household income is not a major determinant of obesity in this age demographic. We subsequently examined educational qualifications post-school in those aged 25 to 29 years (as younger adults are more likely still to be studying for a qualification). More than one in three graduates (36.1%) and almost half of those with vocational training (48.5%) were overweight or obese.

Conclusion

Clearly, the TAFE and University sectors should be considered as settings for educational and behavioural programs concerning weight gain and health risk. A further challenge will be to target the 53% of those young adults without any post-school qualifications who are overweight or obese.

Low fruit and vegetable consumption in disadvantaged communities: Are 'poor environments' to blame?

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Background

Persons of low socioeconomic position, including those living in socioeconomically disadvantaged neighbourhoods, are less likely than others to eat adequate fruits and vegetables for good health. The reasons for this remain poorly understood. While low fruit and vegetable consumption amongst persons experiencing disadvantage has been attributed to poor access to fruits and vegetables, there is little empirical data to support this hypothesis.

Objective

This study mapped local neighbourhood food environments to investigate whether poorer access to major supermarkets, other supermarkets, and fruit and vegetable shops in local neighbourhoods was associated with lower intakes of fruits and vegetables amongst women living in socioeconomically disadvantaged neighbourhoods.

Design

A sample of 4,349 women aged 18-46 years living in socioeconomically disadvantaged neighbourhoods in 40 rural and 40 urban areas of Victoria completed mailed surveys including data on their intakes of fruits and vegetables. Participants' home addresses were geocoded in a Geographic Information System (GIS). All major supermarkets, other chain supermarkets and fruit and vegetable shops within (and surrounding) the 80 neighbourhoods were also mapped in the GIS. The numbers of each type of shop within a 3km network buffer around women's homes, and the distance between participants' homes and the nearest shop of each type, were computed. Associations of shop numbers and distance with women's fruit and vegetable consumption were examined using linear regression analyses.

Outcomes

Of six food store access variables investigated, only one was associated with women's fruit consumption. A greater distance to the nearest fruit and vegetable shop predicted lower fruit intakes; this association remained significant after adjusting for women's age, education, and number of children. No food store access variables were associated with women's vegetable consumption.

Conclusion

These findings challenge assumptions that intakes of fruits and vegetables are associated with opportunities to purchase these foods amongst women living in socioeconomically disadvantaged neighbourhoods.

Look who's cooking and shopping. Involvement of young adults in food purchasing and preparation: socio-demographic correlates and associations with diet and weight status

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Background

Whether involvement in food purchasing and preparation influences diet quality and weight status has not been thoroughly investigated.

Objective

To describe the involvement of young adult men and women in food purchasing and preparation. To examine if the level of involvement is associated with sex, socioeconomic and lifestyle factors, diet quality and weight status.

Design

During 2004-2006 a national sample of 2,812 Australian adults aged 26-36 years completed a self-administered questionnaire on demographic and lifestyle factors, and a food frequency and food habits questionnaire. Participants were asked to report who was usually responsible for purchasing the groceries and preparing the main meal on working days. Responses were categorized as 'myself', 'shared' or 'someone else'. Mean number of daily serves were calculated for each food group. Waist circumference and BMI were measured. Prevalence ratios (PR) were calculated using log multinomial regression.

Outcomes

More women than men had sole responsibility for food purchasing (68% and 24%, respectively) and preparation (65% and 28%, respectively). Shared purchasing was reported by 25% of women and 35% of men, and 23% of women and 26% of men shared the food preparation. Shared purchasing and preparation was more common among men and women with higher education and non-manual occupations. Older women (34-36 years) more often had sole responsibility for these tasks. There were few significant differences in food intake by involvement in food purchasing and preparation. Those involved in food purchasing and preparation were less likely to be overweight or obese than those not involved but the associations were not statistically significant.

Conclusion

Significantly more women than men had sole responsibility for purchasing and preparing food though more than half the men reported either sharing or having sole responsibility for these tasks. Involvement in food purchasing and preparation was mostly unrelated to diet and weight status.

Feasibility of collecting and analysing shopping receipts to determine fruit and vegetable purchasing behaviour

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Background

Despite the health benefits of fruit and vegetables (F&V), a large proportion of Australians are not meeting the recommended servings. Given limitations of self-report and dietary recall methods of measuring F&V intake, there is a need to investigate objective measures, such as purchasing data.

Objective

To determine the feasibility of collecting & analysing shopping receipts to assess F&V purchasing.

Design

A pilot study recruited 20 community members with at least one primary school-aged child, from one supermarket in the Hunter region. Consenting participants were asked to collect their shopping dockets for any foods/beverages purchased for their family within a two-week period and return them to researchers. Returned shopping receipts were analysed and price & weight of F&V purchases were extracted. Purchased weights were compared to the weights required for the family to meet current health recommendations.

Outcomes

Recommendations for recruitment and retention of community participants in studies of this type will be discussed. Shopping receipts were returned by 60% of participants for the complete two-week period. An average of 20% of a family's food shopping was spent on F&V, with an average of 22 kg purchased per family. Only four families purchased enough fruit to meet their family's recommended intake, and only three purchased enough vegetables to meet their recommended intake. Some of the issues associated with this method of data collection include the potential for applying wastage calculations, the disparity between purchase of raw vegetables and the recommendations using the cooked weight, exclusion of fruit juice and potato and strategies for dealing with missing or incomplete data or missing receipts.

Conclusion

This pilot study demonstrates the feasibility of assessing purchasing behaviour using shopping receipts and provides practical guidance for other researchers considering this data collection approach.

Concurrent Session 12: Food Behaviours

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A culturally appropriate program to treat metabolic syndrome in female Pakistani immigrants

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Background

Metabolic Syndrome is a disorder characterised by a clustering of the cardiovascular risk factors; central/abdominal obesity, elevated blood pressure, elevated plasma glucose levels and dyslipidaemia. Generally, migration and lifestyle change leads to a higher prevalence of Metabolic Syndrome in migrant populations. While there is growing evidence that South Asians as an ethnic group seem to be particularly predisposed to the development Metabolic Syndrome, there has been little investigation of culturally appropriate and effective methods of treating obesity and the symptoms of Metabolic Syndrome in these population groups.

Objectives

To date, no intervention has specifically targeted Metabolic Syndrome in Pakistani migrants. The current study applied the principles of cultural competence to overcome cultural barriers and sustain the behavioural change needed to treat Metabolic Syndrome in Pakistani women.

Design

60 female Pakistani migrants completed the 12 week culturally appropriate, convenient and financially feasible education program called 'Step to Good Health'. The efficacy of the program was monitored via collection of anthropometric, biochemical and dietary data.

Outcomes

After 12 weeks the program significantly decreased body weight by 6%, BMI by 7%, waist circumference by 4%, blood pressure by 9%, blood glucose, plasma insulin, improved the blood lipid profile and increased physical activity. In addition a positive shift towards a healthier dietary pattern was observed.

Conclusion

A culturally appropriate program can be used to treat components of Metabolic Syndrome in migrant Pakistani women.

Understanding consumer knowledge of the potential health benefits of leafy green vegetables (baby spinach and rocket)

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Background

Epidemiological evidence supports increased consumption of vegetables to reduce a number of chronic health diseases. However dietary consumption of vegetables continues to be below recommendations in most developed countries. Working with producers and the food supply chain more broadly is a critical component to encourage an array of new forms of vegetables suited to current lifestyle trends. Baby leaf salad products, especially spinach and rocket, have become very popular alternatives in recent years and contain vitamins, minerals and antioxidants, which may promote health. Understanding how consumers might perceive less traditional forms of vegetables in their diet may lead to developing more appropriate delivery forms and effective communications.

Objective

This study aimed to describe consumer knowledge and understanding of the potential health benefits of leafy green vegetables (baby spinach and rocket).

Design

Three semi-structured focus groups were conducted using a purposeful non-probability sample including females representing main grocery buyers from three age groups(n= 23): 25-35. 35-50, and 50 +. Two coders examined each script and conducted thematic content analysis and constant comparison to identify main themes.

Outcomes

Preliminary analysis of the data reveals key themes pertaining to vegetable choice and consumption relate to usual shopping habits(influenced by time issues, convenience and access to quality and price competitive suppliers); understanding of cuisines(influenced by skills and understanding of modern and alternative cuisines); acceptability by household members; and perceptions of nutritional values of vegetables(especially leafy greens). Variations were evident related to life-stage in terms of level of importance for the themes.

Conclusion

Australian consumers generally view leafy green vegetables as healthy and embrace their use in the diet. Issues raised have implications for designing communications to further promote nutritional value and identify broad range of use in various cuisines to meet life-stage needs.

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Associations of parents' nutrition knowledge and attitudes with children's weight status

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Background
Young children are important targets of obesity prevention because in the early years of life children develop food preferences and dietary habits that are likely to be maintained as they grow older. Parents shape young children's food preferences and dietary intake through the home food environment, influenced by their own nutrition knowledge and attitudes to food, which may in turn influence children's weight status.

Objective
The aim of this study was to investigate the extent to which parental nutritional knowledge and attitudes about food predict children's weight status.

Design
One hundred and ninety-two children aged five to six years and their parents were recruited from 10 suburban Adelaide primary schools spanning a wide socioeconomic spectrum. Parents completed a questionnaire measuring their attitudes to food and nutrition knowledge. Children's height and weight were measured and used to calculate Body Mass Index z-scores. Associations were analysed using correlations and stepwise regression.

Outcomes
Parents' nutrition knowledge was a significant predictor of boys' weight status independent of SES (P=.000). Boys' weight status was also predicted by family structure (P=.000). Girls' weight status was inversely associated with the importance that parents place on cost in making food choices for their daughters (P=.001), although this association only explained 5% of the variance in weight status.

Conclusion
Results suggest that parents' nutrition knowledge and attitudes towards food are associated with children's weight status, but that these associations vary with the sex of the child. For boys, parents' nutrition knowledge may be associated with weight status. For girls, the associations are less clear; however parents' attitudes may be associated with weight status. If parents have adequate knowledge about nutrition and positive attitudes to food, they may be better equipped to provide a food environment that fosters good preferences and dietary habits in their children, assisting them to maintain a healthy weight status.

Food purchasing practices of families by socio-economic and food security status

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Background
Food insecurity is associated with poorer nutritional outcomes. In the 2002 NZ Children's Nutrition Survey half of households reported food insecurity. Both physical and economic access to food are important influences on food purchasing practices and food security status.

Objective
To describe access to food and food purchasing practices of New Zealand families living within Dunedin and Wellington and to examine how they differ by socio-economic status and food security status.

Design
The Family Food Environment Survey was a cross- sectional survey (October 2007- October 2008) among 136 New Zealand families with children living in Dunedin and Wellington. The household food preparer was interviewed regarding access to food, food purchasing and meal planning and preparation. Food security was measured using validated statements from the 1997 National Nutrition Survey and income was used as a proxy measure of socio-economic status.

Outcomes
Eighty seven percent of low income households reported food insecurity. More households in the low income group agreed that "buying more fruit than we already do would be difficult on our budget". (68%) compared to the medium and high income groups (41 & 25%). Households in the low income group purchased a lower number of types of fresh vegetables (6.0 per week) and canned vegetables compared to the high and medium income groups. The types of food shops used and the frequency of food shopping was similar by income and by food security status. All households reported favourable physical access to food shops. Overall use of ready to eat food was similar between groups but high income households were more likely to use restaurants (mean 1.2 occasions per month) and cafes (3.5) compared to low income households (cafes; 1.6 & restaurants; 0.3).

Conclusion
Physical access to food shops was not a barrier to food security for households in this survey however lack of money was. With the economic recession and the monetary constraints on many families being unlikely to ease the ability of some families to eat a healthy diet may be compromised.

Nutrition students' beliefs and knowledge of the role of food in health: a longitudinal study of the influence of tertiary nutrition education.

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Background

Several studies have shown that people with a university education have improved nutritional knowledge compared to the general population. It is not known if this is due to education *per se* or if education is a marker for some other social or lifestyle factor. This study aims to investigate the changes in nutrition knowledge and perception of the healthfulness of foods through the education process.

Objective

To investigate the changes in student's beliefs and knowledge of what foods are considered to promote health throughout a three-year undergraduate nutrition degree.

Design

Students answered three open-ended questions on their perceptions of foods; what they considered good or bad for health and what foods they considered could be used to treat specific health problems in 2007 and again in 2009. Responses were analysed using content analysis.

Outcomes

Students' survey responses to what foods can be considered good or bad for health were very similar between baseline (2007) and the follow-up (2009), with fresh fruits and vegetables, dairy, fish and wholegrains considered good for health and foods high in saturated fat and sugar such as fried foods, cakes, fast foods confectionary and soft drink bad for heath. Differences were observed in responses to 'can any food treat a health problem?' In 2009 responses were detailed and evidence based as 33% of responses were related to reducing the risk of CVD compared to only 2 responses (2%) in the initial baseline survey. At baseline 25% of student reported alternative and non-medical remedies to treat colds compared to only 8% of responses in the follow-up.

Conclusion

Students knowledge of what foods are good or bad for health did not differ significantly from baseline to follow-up. However, when asked what foods can treat health problems, at the commencement of their studies students' responses were more likely to be unscientific and broad compared to follow-up responses which were both specific and evidence based. These finding indicate that an undergraduate degree in nutrition may be beneficial in increasing nutrition knowledge.

Motivating instructions increases children's taste sensitivity

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Background

Children's sensory taste system differs from those of adults. The development of child friendly methodology is needed in order to measure children's sensory perception

Objective

To determine the impact of competitive and cooperative instructions on children's motivation and performance of sensory tests.

Design

Children (n=202; 101 girls, 101 boys, 6-9 year-olds) participated in liking and difference tests after giving either 1) Competitive: "I want to see if you can do it better than others", 2) Cooperative: "Would you like to help me", 3) Competitive-Cooperative: "Would you like to help me to be better than the other group", or 4) Neutral-instructions: "Could you perform this test". Furthermore, they were asked questions about their motivation.

Outcomes

Cooperative instructions related to a better ability to discriminate between samples in terms of liking than competitive or neutral instructions ($P<0.05$ for all). Cooperative instructions were related to a higher intrinsic motivation after children completed the liking tests. Competitive instructions were related to a lower ability to perform the difference test compared to any other instruction ($P<0.05$). The more children enjoyed the task the better they were able to perform the difference test ($P<0.05$).

Conclusion

Cooperative instructions increase children's performance during a liking test, whereas competitive instructions decrease children's performance during a liking and difference test.

Plenary Session 4: Omega 3, Brain and Mental Health

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FADS2 polymorphisms modify the effect of formula feeding on child IQ

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IQ remains central to understanding interactions of natural genetic variants with nurture from nutrition. Dysfunctional polymorphisms in FADS2 (e.g. rs174575) impair metabolism from short to long chain polyunsaturated essential fatty acids (LC-PUFA). IQ may diminish when children with these variants are fed formulas virtually devoid in preformed LC-PUFA. We report an expected disadvantage of exclusive formula feeding compared to breastfeeding among children with the CC or CG genotype on full scale IQ points -5.8 [1.4, 10.1] (interaction p=0.0091). The additional detrimental effect of the GG genotype was 4.3 [95% CI 8.2, -0.4; p=0.0324] full scale IQ points. GG children of GG mothers performed better than expected, 7.6 points [2.1, 13.0] (p=0.0070) compared to GG children of CC or CG mothers. These interaction results were largely unaffected by adjustment for 7 factors. Results for the rs1535 FADS2 polymorphism, for performance and verbal IQ were similar but with smaller effect sizes. The effects of this minor allele on the fatty acid compositions of n= 7,767 maternal erythrocytes and n=4,090 umbilical cord serum samples are consistent with this finding.

Docosahexaenoic acid in neuronal survival, neurodevelopment and function: molecular perspective

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Background

Docosahexaenoic acid (DHA, 22:6n-3) is particularly enriched in neuronal tissues mainly as membrane phospholipids (1). Maintaining a high concentration of DHA in brain is essential for proper neuronal function, suggesting a unique role played by this fatty acid for an optimal membrane structure and function in the nervous system.

Objective

In search for mechanisms supporting essential function of DHA, we have investigated the role of DHA in membrane modification and cell signaling leading to neuronal survival and development.

Design

Neuro 2A or hippocampal neuronal cultures were supplemented with DHA and membrane phospholipids were determined using reversed phase liquid chromatography/mass spectrometry. Neuronal survival in relation to membrane modification was determined under trophic factor withdrawal conditions (2). Substrate preference in PS biosynthesis as well as intracellular localization of membrane phosphatidylserine (PS) was characterized by *in vitro* bioassay using stable isotope labeled phospholipids and mass spectrometry (3) and by monitoring Ca^{2+}-dependent localization of GFP-AnnexinV expressed in living cells (4), respectively. DHA-induced hippocampal neurite growth and synaptogenesis were evaluated using MAP2- and synapsin-positive immunocytochemistry, and synaptic function was evaluated by electrophysiological means (5).

Outcomes/Conclusion

We found that DHA promotes neuronal survival primarily by increasing PS, the major acidic phospholipid in cell membranes. DHA uniquely increases PS, specifically in neuronal cells by serving as the best substrates for PS biosynthesis (1,3). The plasmenyl and recycling endosomal membranes are the major sites of PS localization in the cytoplasmic face, indicating that the plasma membrane offers a specific target surface for interaction of cytosolic proteins with PS (4). N-3 fatty acid deficiency decreases the PS content selectively from neuronal membranes through the inhibition of PS biosynthetic activities. Reduction of PS from neuronal membranes affected membrane-protein interaction of Raf and Akt signaling, consequentially compromising neuronal survival. DHA also promotes neurite growth, synaptogenesis and glutamatergic synaptic function in developing hippocampal neurons (5), supporting often-observed positive effects of DHA in hippocampus-related functional outcome. DHA's role in promoting neuronal survival and hippocampal development along with associated molecular mechanisms will be presented.

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The Seychelles Child Development Nutrition Study

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Background

Maternal fish consumption can be an important source of nutrients (particularly long-chain polyunsaturated fatty acids, LCPUFA) for foetal growth and development of the brain[1]. Maternal fish consumption, however, can also expose the foetus to potentially detrimental effects of the neurotoxin, methyl mercury (MeHg).

Objective

The Seychelles Child Development Nutrition Study (SCDNS) was set up to investigate the possibility that maternal nutritional status might mask any detrimental effects of MeHg exposure on developmental outcomes of the offspring.

Design

The SCDNS is a longitudinal cohort study design. Models (a priori) of n-3 and n-6 LCPUFA measures in maternal serum (mean of 28 weeks and at delivery) were examined by multiple linear regression to test the hypothesis that these LCPUFA families before or after adjusting for prenatal MeHg exposure would be associated with child development assessed by the BSID-II at ages 9 and 30 months[3].

Outcomes

At 9 months, the PDI was positively associated with total n-3 LCPUFA and negatively associated with the ratio of n-6/n-3 LCPUFA in 229 children with complete outcome and covariate data available for analysis. These associations were stronger in models adjusted for prenatal MeHg exposure. At 30 months, there were significant adverse associations between prenatal MeHg and the PDI only when the LCPUFA measures were included in the regression analysis; there were no significant associations between LCPUFA measures and the PDI at that age. A subsequent longitudinal analysis, however, utilising linear models and providing increased power found that these associations did not change significantly from 9 to 30 months.

Conclusion

These findings highlight the potential importance to child development of the prenatal availability of n-3 LCPUFA from fish and the overall diet and also indicate possible modifications of such effects by both the n-6 LCPUFA and MeHg. One possible mechanism that might explain these findings is that the n-3 LCPUFA, in contrast to the n-6 LCPUFA, have anti-inflammatory effects which might counter any pro-inflammatory effects following possible oxidative damage of neural membranes by MeHg. A new cohort of 1500 mother-child pairs is being recruited currently in the Seychelles to test this hypothesis by examining interactive effects between foetal MeHg exposure and maternal LCPUFA and antioxidant (vitamin E and selenium) status

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A high protein diet with resistance exercise improves weight loss and body composition in overweight and obese patients with type 2 diabetes

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Background

Recent evidence suggests substitution of carbohydrate with protein in a low fat energy restricted diet enhances weight loss and has favourable effects on body composition, glycemic control and cardiovascular disease risk factors. The effects of this diet combined with exercise in patients with type 2 diabetes (T2D) remains unknown

Objective

To evaluate the effects of two low fat energy restricted diets differing in carbohydrate: protein ratio, with and without resistance exercise (EX), on weight loss, body composition and CVD risk outcomes in overweight and obese patients with T2D.

Design

In a parallel design, 83 men and women with T2D (age 56.12±7.53 yrs, BMI 35.4±4.6 kg/m^2) were randomly assigned to an isocaloric, energy restricted diet (6-7 MJ/day) of either high carbohydrate (HC; Carbohydrate:Protein:Fat, 55:20:25) or high protein (HP; 40:35:25), with or without EX (3 d/wk). Body weight and composition, waist circumference (WC) and cardio-metabolic markers were assessed pre- and post-intervention.

Outcomes

59 participants completed the study. There was a significant time x group effect (P≤0.04) for body weight, fat mass and WC such that the HP+EX had the greatest reduction for these parameters; weight (HC -8.61±4.61 kg, HP -8.98±4.82 kg, HC+EX -10.52±5.10 kg, HP+EX -13.79±5.98 kg), fat mass (HC -6.35±3.44 kg, HP -6.65±4.0 kg, HC+EX -7.91±3.73 kg, HP+EX -11.05±3.71 kg) and WC (HC -8.2±4.6 cm, HP -8.9±3.9 cm, HC+EX -11.3±4.6 cm, HP+EX -13.7±4.6 cm). Across the groups there was an overall reduction (P<0.001) in lean mass (-2.0±2.3 kg), blood pressure (-15/8±10/6 mmHg), fasting glucose (-2.1±2.2 mmol/L), insulin (-4.7±5.4 uM/L), HbA1c (-1.25±0.94 %), triglycerides (-0.47±0.81 mmol/L) total cholesterol (-0.67±0.69 mmol/L) and LDL-cholesterol (-0.37±0.53 mmol/L) with no significant difference between groups (P≥0.17, time x group interaction).

Conclusion

An energy restricted HP diet with EX resulted in greater weight loss and more favourable changes in body composition. All treatments had similar improvements in glycemic control and CVD risk markers.

Frequency of physical activity and screen viewing-time predict serum 25-hydroxyvitamin D concentrations in a national sample of school-aged children in New Zealand

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Background

Vitamin D is synthesised in skin exposed to ultraviolet light. Factors that determine exposure to ultraviolet light greatly affect the vitamin D status of a population. Results from a national survey in New Zealand of school children 5-14 y showed that mean serum 25-hydroxyvitamin D concentration in the population was 50 nmol/L. The major predictors of serum 25-hydroxyvitamin D, in decreasing order of influence, were season, ethnicity, obesity, and sex.

Objective

To determine the extent to which frequency of physical activity or time spent viewing TV or computers –behaviours that likely influence sun exposure in children – predict serum 25-hydroxyvitamin D concentrations.

Design

A population-based survey of 1277 school-aged children 5-14 y in New Zealand. Serum 25-hydroxyvitamin D concentrations were measured using a radioimmunoassay kit (DiaSorin, MN). Frequency of physical activity and hours of screen viewing-time were assessed using a computer-assisted interviewer-administered questionnaire.

Outcomes

Physical activity in the previous week predicted vitamin D status; for each 10 unit increase in weekly physical activity, serum 25-hydroxyvitamin D concentration was 2.4 nmol/L (95%CI, 0.7 to 4.1; *P*<0.01) higher. Weekly screen viewing time predicted vitamin D status; for each 10 h increase in weekly screen viewing time, serum 25-hydroxyvitamin D was 3.5 nmol/L (95%CI, 1.3 to 5.8; *P*<0.01) lower. The predicted changes in serum 25-hydroxyvitamin D concentration were attenuated slightly after adjustment for season, ethnicity, BMI, age, and sex but remained significant (*P*<0.05).

Conclusions

Our results show that physical activity and screen viewing-time predict serum 25-hydroxyvitamin D status of New Zealand children. Increased physical activity and decreased screen viewing-time are likely to improve the vitamin D status of New Zealand children.

Effect of energy-restriction and exercise on quality of life and depression in overweight and obese women with polycystic ovary syndrome

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Background

Previous studies have shown that the clinical features and potential health implications associated with polycystic ovary syndrome (PCOS) promote psychological morbidity, which leads to an increased likelihood of experiencing depressive symptoms and impaired health-related quality of life (HRQOL). There is limited evidence evaluating the effect of lifestyle interventions on depression and HRQOL in women with PCOS.

Objective

To assess the impact of lifestyle modification with dietary energy-restriction or dietary energy-restriction and exercise on depressive symptoms and HRQOL in women with PCOS.

Design

Forty-nine overweight/obese PCOS women (age 30.0±0.9yr; BMI 36.4±0.8kg/m^2) were randomised to one of two 20-week lifestyle programs: diet only (n=14; high-protein energy-restricted diet) and diet and exercise (n=35; exercising 5 times per week). Depression (CES-D), PCOS specific HRQOL (PCOSQ), weight, glucose, insulin, insulin resistance (HOMA2), sex-hormone binding globulin, testosterone and free androgen index were measured.

Outcomes

Both interventions resulted in weight loss (-9.5±0.9kg, P<0.001). CES-D scores were significantly reduced (P<0.001), such that scores decreased by Week 10 (-27.5±7.0%), but there was no further improvement by Week 20. There were improvements in PCOSQ scores by Week 20 for the emotion (16.6±4.1%), weight (77.0±12.1%), infertility problems (19.7±4.5%) and menstruation problems (28.0±6.9%) domain scores (P≤0.001), but not for body hair domain score (15.8±5.8%, P=0.11). There was no difference between treatments for all outcomes (P>0.11). Changes in CES-D and emotion and weight domain scores correlated with weight loss at Week 20 (r = 0.3, P=0.03; r = -0.4, P=0.01; and r = -0.4, P=0.002 respectively).

Conclusion

Energy-restriction improved depression and HRQOL in overweight/obese women with PCOS; however the addition of exercise to the diet had no added benefit. Improvements in psychological outcomes were primarily related to weight loss, further emphasizing the importance of weight loss programs for PCOS women.

Energy deficiency, menstrual disturbances and low bone mass: what do female athletes know about the female athlete triad?

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Background

Female athletes consuming inadequate energy to meet the energy demand of their training are at risk of menstrual dysfunction and poor bone health. Prevention of the so-called 'female athlete triad' is important as this condition is known to be difficult to treat.

Objective

The aim of this study was to investigate the knowledge, attitudes and behaviours of adult female exercisers in regards to eating patterns, menstrual cycles and bone health.

Design

A survey was conducted in female exercisers, aged 18-40 years, who engaged in a minimum of two hours of strenuous physical activity per week. Participants were asked about the female athlete triad, which sport(s) they practiced, as well as their training volume (hours/week) and level of competition.

Outcomes

A total of 191 women participated and 11 surveys were excluded due to incomplete answers (n=180). The most common sports were running (n=34), basketball (n=30), netball (n=21), soccer (n=17), hockey (n=17), triathlon (n=13), swimming (n=11), cycling (n=11) and dancing (n=9). Most participants were aged 18-24 years (52%) with the remainder being 25-30 years (26%) or 31-40 years (22%). Average training volume was 9 ± 5 hours per week, with participants competing at the local up to the international level. Only 10% of exercisers could name the three components of the triad. Missing periods over three months or more (amenorrhoea) was not thought to affect bone health for 45% of the participants, regardless of their history of stress fracture, and 22% of those involved in lean-build sports would do nothing if confronted with amenorrhoea (vs. 3.2% in non lean-build sports, P=0.005). Age category or competition level did not affect the participants' knowledge of the triad. The capacity to identify signs of energy deficiency was weakly but positively correlated with training volume (R=0.25, P<0.01).

Conclusion

These findings suggest that a substantial proportion of female exercisers have poor knowledge on the triad and would not act appropriately in the presence of long-term

amenorrhoea. This emphasizes the need for education to better prevent this condition.

Investigating lifestyle behaviours of Australian survivors of prostate cancer

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Background

It has been widely recommended that there is a need for lifestyle modifications for cancer survivors in order to promote health and wellness. A small number of studies have suggested that the health behaviours of prostate cancer survivors may not be consistent with these recommendations and that a poor diet, lack of physical activity and an unhealthy body weight can increase the risk of other chronic diseases.

Objective

To determine changes in body weight and lifestyle practices in early prostate cancer survivors.

Design

Cross-sectional mailed survey of men who had completed their primary treatment for early prostate cancer in the previous two to four years. Self reports of changes in body weight, dietary practices, smoking, alcohol consumption and physical activity were assessed in men from a single regional hospital site. Analyses were conducted using Chi^2 tests, t-tests and one-way ANOVAs.

Outcomes

Seventy-five men with a mean (±SD) age of 69.8 yrs (5.2) and body mass index of 27.4 (3.1) kgm^{-2} participated in the study (68% response). There was little change in BMI, smoking and alcohol consumption from pre-diagnosis to post-treatment. Overall prostate cancer survivors were less physically active than age-matched men from the general community ($P<0.05$) but the proportion of cancer survivors meeting fruit and vegetable (F&V) recommendations of "2+5 serves" was significantly greater ($P<0.05$). Post-diagnosis, less than half of the prostate cancer survivors (48%) reported a reduction in fatty and fried foods whereas 30% increased the use of low-fat foods.

Conclusion

In this pilot study, the majority of cancer survivors were overweight or obese. The prostate cancer survivors were mostly physically inactive but were more likely to meet the recommendations for F&V consumption, although many had not reduced the intake of fatty or fried foods. Future research should focus on diet and physical activity interventions to promote an optimal body weight and overall healthy lifestyle behaviours among survivors of prostate cancer.

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How Heart Foundation practice helps improve Australia's health: evidence and policy underpinning food supply practice

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Background

The relationship between what we eat and drink, our health status and the role of scientific research is well established. In 2006, heart, stroke and blood vessel disease accounted for 34% of all deaths in Australia. Cardiovascular disease is responsible for one in three Australian deaths each year. Poor nutrition is one of the risk factors for heart disease.

Objective

Every year, new findings purport benefits for improving our overall health. How do practitioners and policy makers decide which strategies and recommendations guide our practice? The Heart Foundation regularly updates its position statements to ensure they reflect the latest scientific evidence. Our latest position statement *Dietary fats and dietary cholesterol for cardiovascular health* is based on a rigorous process using sound scientific evidence to underpin the latest recommendations around dietary fat, dietary cholesterol and dietary sterols.

Outcomes

This session will outline how the science (findings and recommendations) is reviewed and feeds into Heart Foundation food supply initiatives at all levels so we can be confident that the 'what' and the 'way' we practice reflects the evidence-base found in the scientific literature. With approximately one third of Australian's food budget being spent on eating out, the initiatives undertaken by the Heart Foundation include both those in the supermarket and in eating out environments. Actual case studies will exemplify how Heart Foundation policy and guidelines have initiated reformulation of ingredients and food products, resulting in significant nutritional improvements in Australia's food supply. Examples will include foods that now have reduced salt content, increase fibre and/or vegetable content, smaller serving sizes and reduced trans fat. Current findings will be presented from our recent initiative to assist small to medium sized food service businesses to use healthier oils and fats.

Conclusion

While the Heart Foundation has a number of strategies in its new strategic plan for 2009-2012, we have already had some successes in improving the healthiness of our food supply that are underpinned by sound evidence.

Melbourne adults are at risk of mild-to-moderate iodine deficiency

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Background

Iodine deficiency affects health across the lifespan. Studies conducted over the last decade in Victoria and New South Wales have indicated mild-to-moderate iodine deficiency, however no data has been published for non-pregnant Victorian adults. Variation of iodine levels in the food supply means that regional data is important. Population dietary iodine intake is most accurately determined using 24-hr urine samples.

Objective

To investigate iodine status in Melbourne adults using data from 24-hr urine samples, and to calculate dietary iodine intake to enable comparison with the Nutrient Reference Values.

Design

Single 24-hr urine samples were collected from a subgroup of 265 participants (133/132 females/males) of the Melbourne Collaborative Cohort Study during 2007-08. Urinary iodine concentration (UIC) (µg/L), daily urinary iodine excretion (µg/d) and daily iodine intake (µg/d) were determined using the Sandell–Kolthoff reaction at an accredited laboratory (Westmead hospital, NSW). Population iodine status was classified according to World Health Organization criteria: median UIC of 20-49 µg/L (moderate deficiency) and 50-99 µg/L (mild deficiency).

Outcomes

The mean (SD) age of participants was 68 (6) years. The median UIC was 49 µg/L (IQR = 33-67), indicating borderline moderate iodine deficiency in this population group. Of all participants, 89% had UIC < 100 µg/L and 51% had UIC < 50 µg/L. The mean (SD) urine volume was 2.1 L (0.8), median daily urinary iodine excretion was 90 µg/d (IQR = 69-121), and calculated median daily iodine intake was 98 µg/d (IQR = 75 – 132).

Conclusion

Results indicate mild-to-moderate iodine deficiency in this group of Melbourne adults. Of the group, 52% had calculated iodine intakes below the Estimated Average Requirement of 100 µg/d and the median iodine intake was well below the current Recommended Dietary Intake of 150 µg/d. These results underline the importance of future

monitoring to determine the impact of mandatory iodine fortification in Australia.

Fortification monitoring: tracking mandatory folic acid and iodine fortification in Australia and New Zealand

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Background

From September 2009 most bread in Australia and New Zealand will be required to contain added folic acid and iodine. Mandatory folic acid fortification is being introduced to help reduce the incidence of neural tube defects; and mandatory iodine fortification to address the documented re-emergence of iodine deficiency.

Objectives

As a result of these mandatory standards, there is a need for a monitoring program to assess the effectiveness of these public health initiatives. The Australian Institute of Health and Welfare (AIHW) was funded to produce a baseline report as the first step in the monitoring process.

Design

Monitoring frameworks for mandatory folic acid and iodine fortification were developed by Food Regulation Standing Committee expert groups. Each framework is based on an 'outcomes hierarchy' outlining the process, impact and outcome questions to be considered. The frameworks have five key components: food composition; nutrient intake; nutrient status; health benefits; and adverse health effects. A four-part classification system was developed by AIHW to guide the selection and presentation of data according to their strength in achieving the goals of the monitoring program. Category 1 data are the most ideal as they are representative of the population. Category 2a and 2b data can be used where no category 1 data exist or to complement them. Category 3 data have limitations with their use or interpretability but they may be of some benefit to monitoring.

Outcomes

The report has been produced and provides baseline data for each component of the monitoring framework. The report also provides recommendations for future monitoring activities.

Conclusion

Whilst there are adequate baseline data, an essential component for monitoring is the regular collection of national data, particularly on the population's nutrient intake and status. In Australia this would occur as part of the National Health Risks Survey Program currently being planned by the Department of Health and Ageing; and in New Zealand as part of the Nutrition Survey Program. A follow-up of the Australian National Iodine Nutrition Survey is also recommended.

Consumer perceptions of caffeinated sugar-sweetened soft-drinks in Australia

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Background

The incidence of overweight and obesity continues to be a significant health challenge in Australia. Reducing consumption of soft-drinks is an effective strategy for reducing body weight. In combination with aggressive marketing and the low cost of soft-drinks, the inclusion of caffeine, may help to maintain consumption. Understanding consumer beliefs and attitudes about caffeinated soft-drinks could help health professionals develop effective strategies for obesity prevention.

Objective

To explore consumer perceptions about caffeinated soft-drinks using an intercept survey.

Design

A cross-sectional survey investigating public attitudes towards caffeinated soft-drinks was administered to participants aged ≥12 years recruited from metropolitan (n=951) and non-metropolitan (n=200) shopping centres in Victoria, Australia (response rate=80%). Participants reported demographic characteristics and self-reported height and weight. Attitudes to the presence of caffeine in soft-drinks were determined by rating agreement and disagreement (using a 5 point likert scale) to a series of question about soft-drinks, for example, "soft-drinks containing caffeine should not be available to children".

Outcomes

Fifty-eight percent of respondents had a healthy BMI (mean = 21.9 kg/m^2), 35% were overweight or obese (mean = 29.0 kg/m^2), and 61% were female. When asked about sugar-sweetened soft-drink consumption, approximately half of consumers believed soft-drink vending machines should not be allowed in schools. The majority (58%) agreed that soft drinks should not be advertised to children, and drinking soft-drinks caused people to gain weight (78%). Eighty-one percent of consumers believed soft-drinks contained too much sugar. When asked specifically about caffeinated soft-drinks, half the respondents thought caffeine was added to soft-drinks to increase taste preference. Seventy percent of respondents believed caffeinated sugar-sweetened soft-drinks were harmful to health, and 65% believed soft drinks containing caffeine should not be available to children.

Conclusions

These findings suggest consumers view soft drinks negatively, particularly caffeinated soft-drinks. Consumers would therefore be responsive to health promotion messages continuing to target a reduction in soft-drink consumption.

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Implementing best practice in nutrition and hydration support in residential aged care: change in resident nutrition status

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Background

Adequate nutrition and hydration is essential for physical and mental performance, recovery and rehabilitation - it can reduce adverse health outcomes such as wounds, falls, urinary tract infections, constipation, dehydration, and delirium for older people.

Objective

A collaborative team from the University of Newcastle, Uniting Care Ageing and Baptist Community Services is undertaking an action research project to support implementation of best practice nutrition and hydration in nine aged care facilities throughout NSW, funded by the Australian Government Department of Health and Ageing under the Encouraging Best Practice in Residential Aged Care (EBPRAC) Program.

Design

In each facility, project activities were locally chosen, based on identified needs and Best Practice Guidelines, with sustainability as an important consideration. Best Practice Guidelines acted as a guide and resource for facility staff, while action research methods encouraged facility staff to develop an approach to best practice that fits into daily routines at minimal cost, with processes that suit individual facility needs. For up to 50 residents in each facility, the team assessed nutrition status at three time points, using several measures including: PGSGA; MST, BMI, other anthropometric measures and tetra-polar bioelectrical impedance.

Outcomes

For the first six facilities in the project, the baseline prevalence of moderate to severe protein energy malnutrition for residents ranged from 25% to 71%, revealing some scope for working with facilities to improve nutrition status. Follow-up data collection will be completed in September 2009. However, preliminary follow-up for four completed facilities have shown little positive change in nutrition status measures.

Conclusion

The effect of best practice implemented using action research methods will be discussed from the findings across the nine facilities.

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The relative levels of the two main catechins of green tea, EGCG and EGC, change markedly during the tea growing season on the NSW Central Coast

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Background

Green tea is a hot water infusion of budding leaves and shooting stems of the plant Camellia *sinensis*. It is an archetypal functional food which has several bioactive constituents including those known collectively as the catechins. The most studied of the catechins is epigallocatechin gallate (EGCG) because it is often the most abundant catechin and it is linked with many of the health benefits attributed to green tea. However, epigallocatechin (EGC) is also abundant in some teas but little is known about why this is. The relative amounts of these two catechins may also affect the taste of the green tea infusion, which changes through the seasons with the taste of the spring-harvested green tea being preferred, especially in Japan.

Objective

To determine whether seasonal variation during the green tea growing period affect the relative concentrations of the two main catechins, EGCG and EGC.

Design

Green tea plants (65) of the Japanese variety Yabukita were sampled weekly through the active growing season on the NSW Central Coast from September 2008 to April 2009. The EGCG and EGC were measured in leaves and stems using HPLC analysis and the ratio of the two catechins (EGCG over EGC) was used to compare the seasonal variation through spring (September-November), summer (December-February) and autumn (March-April). The one-way ANOVA and the Bonferroni post-hoc test were used to determine differences.

Outcomes

The leaves of the tea plants were found to have a significantly higher ratio of EGCG over EGC in the spring (1.70±0.15) than the following summer (1.14±0.10, P<0.001) and autumn (0.82±0.12, P<0.001) seasons. This was also seen in the stems where the EGCG/EGC ratio was significantly higher in spring (2.54±0.45) compared to summer (1.51±0.28, P<0.001) and autumn (1.07±0.12, P<0.001). The ratio was also higher in summer than in autumn (P<0.001) in leaves and stems.

Conclusion

Compared to EGC, EGCG was highest in spring. This may contribute to why the taste of the spring-harvested green tea is most desirable in Japan.

Effect of dietary supplementation of cinnamon on HbA1c, blood pressure and serum lipids in patients with type 2 diabetes mellitus

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Objective

To determine the therapeutic effect of dietary supplementation of cinnamon on glycated haemoglobin (HbA1c), blood pressure and lipid profiles in people with type 2 diabetes.

Design

This is a randomized, placebo controlled, double blind trial. A total of 58 patients (25 males and 33 females) with type 2 diabetes, aged 54.9 ± 9.8, treated only with hypoglycemic agents (not insulin) and with a HbA1c more than 7% were randomly assigned to receive either 2g of cinnamon or placebo every day for 12 weeks.

Outcomes

After intervention, the mean HbA1c was significantly decreased (P<0.005) in the cinnamon group (from 8.22% to 7.86%) compared with the placebo group (from 8.55% to 8.68%). Mean SBP and DBP were significantly reduced (P<0.001) after 12 weeks of intervention in the cinnamon group (SBP - from 133 to 129 mmHg; DBP - from 85 to 80 mmHg) compared with the placebo group (SBP - from 135 to 135 mmHg; DBP - from 87 to 86 mmHg). A decreasing trend in fasting plasma glucose (FPG), waist circumference and body mass index (BMI) was observed for both groups, however this decrease was more pronounced in the cinnamon group, but was not significant. There were no significant differences in blood lipid profiles neither between nor within the groups. Three days total dietary intake was similar at baseline and post intervention (P > 0.05), and decreased by 2.4% and 0.05% in cinnamon and placebo groups respectively (cinnamon - from 1863 to 1818 kcal/day; placebo - from 1844 to 1843 kcal/day).

Conclusion

Dietary supplementation of 2g of cinnamon for 12 weeks may reduce the HbA1c, systolic and diastolic blood pressures among poorly controlled type 2 diabetic patients. Furthermore, cinnamon supplementation could be considered as an alternative dietary approach to regulate

blood glucose and blood pressure levels along with regular medications.

Consumption of ZESPRI® GOLD Kiwifruit by healthy older adults improves measures of upper respiratory tract infection and oxidative stress

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Background

Evidence suggests that diets rich in fruits and vegetables boost the body's natural defences against diseases caused by infection, and chronic oxidative stress. ZESPRI® GOLD Kiwifruit are rich in vitamin C, and contain several carotenoids, and both influence immune function and antioxidant activity.

Objective

We have investigated the effect of consumption of ZESPRI® GOLD Kiwifruit on the length and severity of symptoms of upper respiratory tract infection (URTI), and on markers of antioxidant capacity and oxidative stress in community-dwelling older adults.

Design

In a randomised, crossover trial, 32 adults (≥ 65 y) consumed an equivalent of 4 kiwifruit or placebo (equivalent of 2 banana) daily for 4 weeks, followed by a 4 week washout period and consumption of placebo or kiwifruit (4 weeks). Subjects completed a daily questionnaire of URTI symptoms, and blood samples were collected at the end of each period to measure plasma vitamin C, carotenoids, and antioxidant capacity, glutathione peroxidase and superoxide dismutase activity, glutathione levels, and lipid peroxidation and protein carbonyls levels.

Outcomes

If subjects suffered from cold or flu-like symptoms, consumption of kiwifruit reduced significantly the length of time subjects had a sore throat and the severity of head congestion ($P<0.05$). Kiwifruit significantly increased plasma vitamin C, α-tocopherol, and lutein/zeaxanthin levels ($P<0.05$), and the trend was for these to correlate with reduced URTI symptoms. Kiwifruit significantly reduced lipid peroxidation, and the trend was for most other antioxidant capacity/oxidative stress markers to improve with kiwifruit consumption.

Conclusion

Regular consumption of ZESPRI® GOLD Kiwifruit increases plasma vitamin C and selected carotenoid levels in older adults. Analysis suggests that consumption of kiwifruit may contribute to a reduction in oxidative stress, and reduced length and severity of selected URTI symptoms when they occur.

Grape seed extract metabolites found after fermentation by pig ileal microbiota

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Background

Grape Seed Extract (GSE), recognized as a rich source of phenolic compounds, has become a popular focus for research. However, the metabolic and absorptive pathways of GSE parent polyphenols and their metabolites, and the biochemical-protection target organs and/ or tissues for these polyphenols remain unclear. Gastro-intestinal microbiota, are purported to be able to break down high molecular polymers into smaller metabolites. GSE fermentation metabolites using pig ileal microbiota, were analysed, and small molecular compounds were sought.

Objective

To determine the small molecular metabolites (end-point) of GSE using pig ileal microbiota.

Design

Using strictly anaerobic procedures, medium, GSE solution (1 mL) and inoculum (2.5 mL) were added to a 60 mL serum bottle. Gelose 80 (starch-0.25g) was added as an energy source for the bacteria. The GSE source was Maganatural-AZ ® GSE (Polyphenolics, Madera CA, USA) sample (250 µg/mL). Upon addition of the inoculum, fermentation was conducted at 39oC for 72 h. The fermentation was stopped rapidly at different time intervals (0, 3, 9, 18, 24, 36, 42, 48, 72 h), by placing the vessels into an ice water bath followed by centrifugation at 13,000 rpm for 15 min. The supernatants were analysed by LC-MS.

Outcomes

Four compounds of small molecular weight, that were not present in the original GSE and blank samples, were detected in the fermented GSE samples. These had de-protonated molecular masses of $[M-H]^-$ 123, 149, 165, 193, which might be 2-(3,4-dihydroxyphenyl)acetic acid (3, 4-diHPA) , 3-phenylpropionic acid (3PP), 3-Hydroxyphenypropionic acid (3HPP) and 5-hydroxyphenyl-valeric acid(5HPV) individually and have also been found in other studies using GSE.

Conclusion

Data from this study suggest that during the in vitro experiment, pig ileal microbiota have the ability to degrade GSE phenolic compounds into smaller metabolites which seem to be very stable once they are detected.

Effects of ingestion conditions on the oral bioavailability of epigallocatechin gallate (EGCG) after a single-dose administration in healthy humans

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Background

Green tea consumption is related to numerous health benefits due to its high content of catechins, mainly epigallocatechin gallate (EGCG). The oral bioavailability of EGCG is known to be low in humans but a previous study found the absorption of EGCG in a green tea extract to be better in the fasted than in the fed state.

Objective

The aim of this study was to determine whether the absorption of pure EGCG was affected by food.

Design

After at least a 10 hour fast, 4 healthy volunteers (3 M, 1 F) ingested 500 mg of EGCG 1) in capsule form without breakfast (E), 2) in capsule form with a breakfast of cereal and milk (EB) or 3) with EGCG (0.25% w/w) incorporated in a strawberry sorbet (ES), on three consecutive weeks with the three ingestion conditions used in random order. All subjects were provided lunch 4 hours after the EGCG ingestion. Plasma samples were taken prior to ingestion and over a period of 8 hours post-ingestion (6 sampling times) and the plasma EGCG was measured using a HPLC-Mass Spectrometer. The EGCG maximum plasma concentration (C_{max}) and the area under the curve (AUC) for the EGCG concentration over time were determined and expressed as mean±sd for the 4 subjects and the oneway ANOVA and the Bonferonni test were used to determine differences between the 3 ingestion conditions.

Outcomes

The peak plasma EGCG concentration (ng/ml) was higher (C_{max}=824±171) for E than for EB (C_{max}=216±141, P<0.001) and ES (C_{max}=218±162, P<0.001) and there was no significant difference between the C_{max} for EB and ES. The peak concentration also occurred earlier for E (60 min) than for EB and ES (both 120 min). The AUC of EGCG (µg/ml/8hr) was also higher for E (174±68) than for EB (64±53, P=0.044) and ES (44±23, P=0.019) and there was no significant difference between the AUC for EB and ES.

Conclusions

The EGCG in capsule form after an overnight fast and without food for a further 4 hours (E) showed the highest bioavailability. Also, the bioavailability was decreased to a similar extent whether the EGCG was taken as a capsule with food, breakfast cereal and milk (EB), or incorporated in a food, strawberry sorbet in this case (ES).

Omega-3 polyunsaturated fatty acids and well-being in an older community-dwelling population

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Background

Growing scientific evidence points to the beneficial role of dietary omega-3 Polyunsaturated Fatty Acids (*n*-3 PUFAs) across a range of health outcomes, in particular, recent interest has focused on its relationship to various aspects of well-being including depression. Emerging evidence of this relationship is mixed; while there is some support for the role of *n*-3 PUFAs in alleviating symptoms associated with mood disorders in adults, other reports have suggested there is no association. Differential outcomes may be due to the considerable methodological differences between previous investigations.

Objective

The current objective is to examine the relationship between *n*-3 PUFA status, well-being and depression using baseline data obtained as part of the EPOCH (Older people, omega-3 and cognitive health) trial, a randomised, double-blind, placebo-controlled 18-month clinical trial.

Design

Participants (N=393), who were normally functioning (MMSE>23) community-dwelling older adults (53.7% female; Age: range = 65-90, *M*=72.32, *SD*=5.55) completed self-report measures of mood (life satisfaction, affect and depression) and two food frequency questionnaires to measure general nutritional status and dietary intake of *n*-3 PUFAs, respectively. Erythrocyte membrane *n*-3 PUFA status and APOE genotype was also assessed.

Outcomes

Associations were found between positive affect and total PUFA status (*r*=.10, P<0.05) and between measures of life satisfaction and both ALA (*r*=.10, P<0.05) and EPA (*r*=.13, P<0.05); no significant relationships were found between *n*-3 PUFAs and depression. Multiple regression will be used to further examine baseline relationships between *n*-3 PUFAs and measures of well-being. Interaction effects with APOE-ε4 status will be reported and all analyses will control for potential confounding factors including demographics (education, marital status, income and smoking status), physical activity and self-reported health.

Conclusion

Preliminary results presented here suggest that *n*-3 PUFAs may be related to aspects of well-being in community-dwelling older adults but not to depression. Further implications of these results will be discussed.